DEPARTMENT OF
ECOLOGY
State of Washington

Draft
Cleanup Action Plan

Former Reynolds Metals Reduction Plant – Longview

Cowlitz County, Washington

~~**January 2016**~~
August 2018

Publication and Contact Information

This report is available on the Department of Ecology's website at https://fortress.wa.gov/ecy/gsp/CleanupSiteDocuments.aspx?csid=11796

For more information contact:

~~Guy Barrett~~
James DeMay, Section Manager
Industrial Section
300 Desmond Dr. SE
Lacey, WA 98504-7600

Phone: [360] 407-~~6999~~6868

Washington State Department of Ecology - www.ecy.wa.gov

If you need this document in a format for the visually impaired, call the Industrial Section at 360-407-6000. Persons with hearing loss can call 711 for Washington Relay Service. Persons with a speech disability can call 877-833-6341.

Draft
Cleanup Action Plan

Former Reynolds Metals Reduction Plant – Longview

Cowlitz County, Washington

Industrial Section
Washington State Department of Ecology
Olympia, Washington

Table of Contents

List of Figures

List of Tables

List of Appendices

List of Acronyms and Abbreviations

µg	microgram
Alcoa	Alcoa, Inc.
Anchor	Anchor Environmental, L.L.C.
Anchor QEA	Anchor QEA, LLC
AO	Agreed Order
ARAR	Applicable or Relevant and Appropriate Requirement
AST	aboveground storage tank
bgs	below ground surface
BMP	Black Mud Pond
BPA	Bonneville Power Administration
CAP	Cleanup Action Plan
CCC	Cowlitz County Code
CDID	Consolidated Diking Improvement District
CFR	Code of Federal Regulations
CMCRP	Compliance Monitoring and Contingency Response Plan
COC	contaminant of concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSL	Cleanup Screening Level
CVI	Chinook Ventures, Inc.
CWA	Clean Water Act
DCA	disproportionate cost analysis
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
ELW	extreme low water
EPA	U.S. Environmental Protection Agency
Former Reynolds Plant	former Reynolds Metals Reduction Plant
FS	Feasibility Study
HTM	heat transfer media

kg	kilogram
L	liter
MBT-Longview	Millennium Bulk Terminals – Longview, LLC
MCL	maximum contaminant level
mg	milligram
MTCA	Model Toxics Control Act
NEPA	National Environmental Policy Act
Northwest Alloys	Northwest Alloys, Inc.
NPDES	National Pollutant Discharge Elimination System
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
POC	point of compliance
PRB	permeable reactive barrier
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
Reynolds	Reynolds Metals Company
RI	Remedial Investigation
SCO	Sediment Cleanup Objective
SEPA	State Environmental Policy Act
SMS	Sediment Management Standards
SPL	spent potliner
SQAPP	Sampling and Quality Assurance Project Plan
SU	site unit
SU1	Landfill #2
SU2	Fill Deposit B-3
SU3	Fill Deposit B-2
SU4	Former Cryolite Area Ditches
SU5	Former Stockpile Area
SU6	Fill Deposit B-1

SU7	Fill Deposit A
SU8	Landfill #1
SU9	Pitch Storage Area
SU10	Landfill #3
SU11	Flat Storage Area
SU12	Sediments in the Vicinity of Outfall 002A
SU13	localized total petroleum hydrocarbon area
TEE	Terrestrial Ecological Evaluation
TEF	Toxicity Equivalency Factor
TPH	total petroleum hydrocarbon
TSCA	Toxic Substances Control Act
TSDF	treatment, storage, and disposal facility
USC	United States Code
UST	underground storage tank
WAC	Washington Administrative Code
WDNR	Washington State Department of Natural Resources

EXECUTIVE SUMMARY

This Cleanup Action Plan (CAP) was prepared by the Washington State Department of Ecology (Ecology) in accordance with the requirements of the Model Toxics Control Act (MTCA; Ecology 2007). The CAP presents Ecology's selected cleanup action for the remediation of the former Reynolds Metals Reduction Plant (Former Reynolds Plant) and describes how that decision was developed.

The selected cleanup actions will focus on 12 distinct site units (SUs) containing fluoride and/or polycyclic aromatic hydrocarbon (PAH) compounds in soil and two areas of shallow groundwater (i.e., the West Groundwater Area and the East Groundwater Area) containing fluoride. These areas were identified in the Remedial Investigation and Feasibility Study (RI/FS; Anchor QEA 2015). The cleanup action also addresses a small area of stained soil containing petroleum hydrocarbons that was identified within the eastern portion of the Site during demolition activities.

Ecology has selected Alternative 4 presented in the RI/FS as the final cleanup action for the Site, consistent with MTCA remedy selection criteria (Washington Administrative Code [WAC] 173-340-360). That remedy meets MTCA cleanup requirements using several different remedial technologies, including excavation with off-site disposal, excavation with on-site consolidation, construction of low-permeability soil caps, and groundwater treatment using reactive backfill and permeable reactive barriers (PRBs).

When compared with Alternative 4, the costs of alternatives relying on off-site disposal (i.e., RI/FS Alternatives 5 and 6) are disproportionate to the added benefits and do not provide significant incremental increases in environmental protectiveness.

The cleanup described in this document will be implemented under the terms of a legal agreement called a consent decree. That legal agreement will be signed by the State of Washington, Northwest Alloys, Inc. (the land owner), and Millennium Bulk Terminals – Longview, LLC (the tenant and operator).

The CAP describes the anticipated schedule for implementation of the cleanup action. At the conclusion of construction of the selected cleanup action, an environmental

covenant will be recorded with the Cowlitz County Auditor. The environmental covenant will place restrictions on disturbance of the low permeability caps, PRBs, and on the use of shallow groundwater at the Site for areas located south of Industrial Way.

Long-term monitoring is an integral part of the selected cleanup action. Such monitoring will be conducted to verify effectiveness of the remedial action at containing fluoride in shallow groundwater and for ensuring that the low permeability caps and PRBs installed as part of the cleanup action are effective.

1 Introduction

This Cleanup Action Plan (CAP) presents the selected cleanup action for the remediation of the former Reynolds Metals Reduction Plant (Former Reynolds Plant) in Longview, Washington. This CAP was developed by the Washington State Department of Ecology (Ecology) using information presented in the *Remedial Investigation and Feasibility Study, Former Reynolds Metals Reduction Plant – Longview* (RI/FS; Anchor QEA 2015) and prepared in accordance with the requirements of the Model Toxics Control Cleanup Act (MTCA; Ecology 2007), Chapter 70.105D Revised Code of Washington (RCW), administered by Ecology under the MTCA Cleanup Regulation, Chapter 173-340 Washington Administrative Code (WAC).

1.1 Purpose and Scope

This CAP has been prepared by Ecology to specify cleanup standards and identify the cleanup action to be implemented at the Former Reynolds Plant. As required by the MTCA regulations, this CAP describes the cleanup action selected by Ecology for remediation of the areas where contaminants have come to be located (Site). Figure 1-1 shows the Site boundaries, features, and vicinity.

This CAP is written according to the requirements set forth in WAC 173-340-380.

This CAP was developed following completion of an RI/FS consistent with the requirements of Agreed Order (AO) No. DE-8940 (Ecology 2012). The AO is a formal agreement between Ecology, Northwest Alloys, Inc. (Northwest Alloys; the property owner), and Millennium Bulk Terminals – Longview, LLC (MBT-Longview; the owner of the improvements, property tenant, and terminal operator). The RI/FS included detailed discussion of the Site history, previous cleanup actions, current environmental conditions, and a range of evaluated cleanup alternatives. This CAP presents Ecology's cleanup decision for the Site and describes how that decision was developed.

One component of Ecology's cleanup decision, remediation of a localized area of impacted sediments in the Columbia River, was implemented as an Interim Action

under the AO, as amended on June 2, 2014, and is incorporated into the final cleanup. That work is documented in the *Former Reynolds Metals Reduction Plant Sediment Interim Action Completion Report* (Anchor QEA 2017), which was approved by Ecology on August 15, 2017.

SOURCE Aerial from Google Earth
HORIZONTAL DATUM Washington State Plane South, NAD83, U.S. Feet.
NOTE BPA property is not included as part of the Site.

0 2000
Scale in Feet

Mar 02, 2018 8:18am chewett K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\0730-RP-002 (Plate 2-1).dwg Figure 1-1

DEPARTMENT OF ECOLOGY
State of Washington

Figure 1-1
Site Features and Vicinity Map
Cleanup Action Plan
Former Reynolds Metals Reduction Plant – Longview

1.2 Consideration of Current and Future Land Use

The Former Reynolds Plant is located within an existing industrial area and is zoned and used for industrial purposes. Therefore, this CAP considers potential exposure risks and cleanup requirements within the context of ongoing industrial uses.

Portions of the Former Reynolds Plant are currently used for transloading and shipping bulk materials. Although MBT-Longview has applied for permits for a proposed project at the property for the export of coal, the environmental review process for MBT-Longview's proposed project is separate from the final MTCA cleanup of the facility. Ecology's cleanup decision and its implementation are separate actions that are needed regardless of any particular reuse plan for this Site.

1.3 Legal Agreement to Conduct the Cleanup

The cleanup described in this Cleanup Action Plan will be implemented under the terms of a legal agreement called a consent decree. A consent decree is a legal agreement or settlement to resolve a dispute between parties – in this case, the State of Washington, NW Alloys, and MBT-Longview. A consent decree is entered in court, and the court maintains supervision of the terms of the agreement. The ~~final~~ consent decree for this Site ~~will specify~~specifies the terms and conditions under which the actual cleanup work will take place.

~~Once final, this~~This Cleanup Action Plan ~~will become~~is an enforceable part of the legal agreement described by the consent decree. A proposed Consent Decree for this Site ~~has been~~was made available for public review and comment with ~~this~~the draft Cleanup Action Plan in early 2016.

1.4 Coordination of the Cleanup with State and Federal Hazardous Waste Requirements

The federal Resource Conservation and Recovery Act (RCRA) and the State's Hazardous Waste Management Act establish requirements for the safe management of hazardous wastes. Washington State is authorized to carry out RCRA under its Dangerous Waste Regulations in Chapter 173-303 WAC.

The state and federal hazardous waste regulations specify that certain facilities that have applied for RCRA permits to treat, store, or dispose of wastes and where releases of hazardous wastes have occurred are subject to "corrective action" (i.e., cleanup) under those rules. Under Washington's Dangerous Waste rules, the MTCA cleanup process is used to meet the state and federal corrective action requirements. There are also state and federal requirements for closure of certain facilities that treated, stored, or disposed of hazardous wastes.

Together, this Cleanup Action Plan and the accompanying Consent Decree address the corrective action and closure requirements of state and federal hazardous waste rules for the Former Reynolds Plant. The cleanup described in this Cleanup Action Plan addresses the corrective action requirements and the accompanying Consent Decree serves as an enforceable document in lieu of a post-closure permit as allowed in 40 CFR 270.1(c)(7) and adopted by reference under Chapter 173-303 WAC.

1.5 Coordination of the Cleanup with National Pollutant Discharge Elimination System Requirements

The federal Clean Water Act established the National Pollutant Discharge Elimination System (NPDES) permitting program for the discharge of pollutants to surface waters. Washington State has been delegated authority to implement the NPDES permit program by the United States Environmental Protection Agency.

An NPDES permit establishes conditions including the effluent limitations, monitoring requirements, and general and special conditions that regulate point source discharges to surface waters of the United States. NPDES permits are periodically reviewed and updated to incorporate new information and requirements. The former Reynolds Plant is covered by NPDES Permit No. WA000008-6.

The NPDES permit for the Site was issued when the former Reynolds Plant was an operating smelter. ~~Ecology is in the process of revising this~~ Ecology issued the final revised permit on February 6, 2018, ~~to~~ that reflects activities at the Site, including discharges from the planned cleanup activities. ~~Once ready, the proposed updated~~

~~permit will be made available to the public for review and comment prior to being issued.~~

The final NPDES Permit was effective March 1, 2018, and regulates wastewaters from the Site, including commingled stormwater~~, sanitary wastewater, process~~ and wastewater~~,~~ and, in the future, waters associated with the cleanup activities. ~~The Site's sanitary wastewater has recently been connected to the City of Longview's sanitary sewer system for treatment at the Three Rivers Treatment Plant. This leaves stormwater, process wastewater, and future cleanup related water that will be regulated by the updated permit.~~

Under Washington's NPDES permit program, pollutants must be provided with "All Known, Available and Reasonable" methods of treatment prior to discharge and must not cause or contribute to a violation of the state's Water Quality Standards. ~~Once issued, the updated~~ The permit ~~will define~~defines effluent limitations, operation, monitoring, and reporting requirements for the water associated with the construction of the cleanup actions described in this plan.

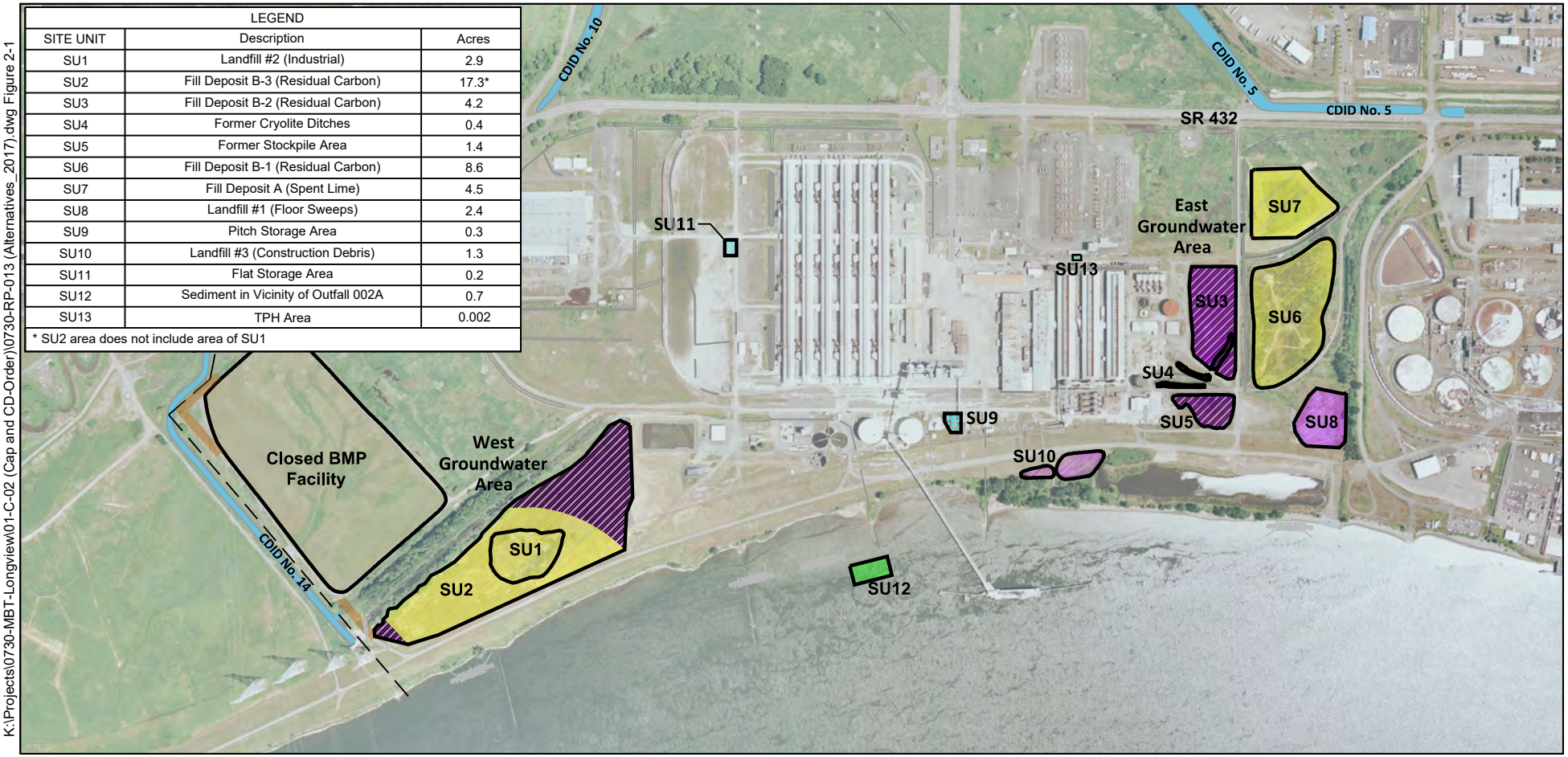
2 Selected Cleanup Action

Ecology has selected Alternative 4 presented in the RI/FS (Anchor QEA 2015) as the final cleanup action for the Site, consistent with MTCA remedy selection criteria (WAC 173-340-360). Ecology concludes that Alternative 4 (Figure 2-1) accomplishes the following:

- Complies with MTCA and with other applicable standards and laws
- Achieves human health and environmental protection in a relatively rapid time frame, compared with the range of alternatives evaluated and to the extent practicable with respect to groundwater restoration
- Reduces the volume of affected media and waste in the environment
- Includes protective, engineered in situ confinement of residual carbon fill deposits that are not practicable to remove
- Consolidates impacted soils/solid media remaining on site to the extent practicable, consistent with expectations for remedial alternatives (WAC-173-340-370)
- Has minimal and manageable short-term construction risks, compared with the range of alternatives evaluated
- Uses multiple technologies to provide maximum long-term effectiveness
- Is implementable
- Is protective under the industrial land uses for which the property is zoned
- Includes long-term monitoring and institutional controls defined in this document to ensure long-term effectiveness in accordance with WAC 173-340-400 and 173-340-410
- Is cost effective, relative to the range of alternatives evaluated

When compared with Alternative 4, the costs associated with implementing other alternatives with a potential for additional environmental benefit (i.e., RI/FS Alternatives 5 and 6) are disproportionate and do not provide significant incremental increases to environmental protectiveness.

LEGEND		
SITE UNIT	Description	Acres
SU1	Landfill #2 (Industrial)	2.9
SU2	Fill Deposit B-3 (Residual Carbon)	17.3*
SU3	Fill Deposit B-2 (Residual Carbon)	4.2
SU4	Former Cryolite Ditches	0.4
SU5	Former Stockpile Area	1.4
SU6	Fill Deposit B-1 (Residual Carbon)	8.6
SU7	Fill Deposit A (Spent Lime)	4.5
SU8	Landfill #1 (Floor Sweeps)	2.4
SU9	Pitch Storage Area	0.3
SU10	Landfill #3 (Construction Debris)	1.3
SU11	Flat Storage Area	0.2
SU12	Sediment in Vicinity of Outfall 002A	0.7
SU13	TPH Area	0.002
* SU2 area does not include area of SU1		



SOURCE: Drawing prepared from Alta Survey (Minister & Glaeser Surveying, Inc.) by November 11, 2010. Aerial image from Aerometric dated June 2013.

LEGEND:

- Low Permeability Cap
- Excavate and Consolidate On-site
- Excavate and Dispose Off-site
- Backfill (Reactive Agent Below Waterline)
- Permeable Reactive Barrier
- SU12 Removal (Completed During 2016)

0 1000
Scale in Feet

K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\0730-RP-013 (Alternatives_2017).dwg Figure 2-1
Feb 22, 2018 1:31pm chewett

DEPARTMENT OF ECOLOGY
State of Washington

Figure 2-1
Selected Cleanup Action - Alternative 4
Cleanup Action Plan
Former Reynolds Metals Reduction Plant – Longview

2.1 Cleanup Action Description

Components of the selected cleanup action are shown in Figure 2-1 and summarized in Tables 2-1 and 2-2.

Specifically, cleanup actions will focus on 12 distinct site units (SUs) and two areas of affected groundwater (i.e., the West Groundwater Area and the East Groundwater Area) that were identified during the RI/FS investigations (Figure 2-1).

The cleanup action also addresses a small area of stained soil containing petroleum hydrocarbons that was identified in the northern area of the Site during demolition activities. This area contains less than 10 cubic yards of impacted soil and has been identified as localized total petroleum hydrocarbon (TPH) area (SU13)[1]. As described in Appendix C, these soils are to be removed for off-site disposal.

Table 2-1 Components of the Selected Cleanup Action

Remedial Action Type	Cleanup Action Component
Institutional Controls	Filing of environmental covenant to prohibit consumption of Site groundwater as drinking water and limit activities potentially encountering or disturbing hazardous materials
Natural Attenuation	Natural geochemistry at the Site limits migration of fluoride in groundwater to off-site receptors
In Situ Treatment	Construction of two PRBs to intercept and treat groundwater
	Backfilling on-site ditches that intercept groundwater, with an upgrade to reactive backfill within select SUs
Material Consolidation	Focused remedial excavation and on-site consolidation of six SUs, including two outside of the CDID levee
On-site Containment	Construction of low-permeability caps over areas with soils, landfills, and fill deposits exceeding cleanup levels
Off-site Disposal	Removal and disposal of materials from ~~three~~four SUs, where COCs exceed cleanup levels
Other	Long-term monitoring of surface water and groundwater at points of compliance

Notes:
CDID = Consolidated Diking Improvement District
COC = contaminant of concern
PRB = permeable reactive barrier
SU = site unit

[1] PCBs greater than 1 milligrams per kilogram (mg/kg), if present, must be removed in conjunction with cleanup of SU13.

Table 2-2 Selected Cleanup Action: Remedial Actions by Site Unit

Site Unit	Description	Proposed Remedial Action				
		Excavate and Off-site Disposal	Excavation and On-site Consolidation	Reactive Backfill Below Water Line	Low-Permeability Soil Cap[2]	PRB
SU1	Landfill #2 (Industrial)				x	
SU2	Fill Deposit B-3 (Residual Carbon)		Eastern and western portions[1,6]		Center portion	
SU3	Fill Deposit B-2 (Residual Carbon)		x[1,3,8]	x		
SU4	Former Cryolite Area Ditches			x[5]		
SU5	Former Stockpile Area		x[1,3,8]	x		
SU6	Fill Deposit B-1 (Residual Carbon)				x	
SU7	Fill Deposit A (Spent Lime)				x	
SU8	Landfill #1 (Floor Sweeps)		x[4,7]			
SU9	Pitch Storage Area	x[3]				
SU10	Landfill #3 (Construction Debris)		x[1,7]			
SU11	Flat Storage Area	x[1]				
SU12	Vicinity of Outfall 002A	x[1,9]	~~x[1,9]~~			
SU13	Localized area of TPH-impacted soil	x[1]				
Other	PRB west of SU2; PRB northwest of Closed BMP Facility					x

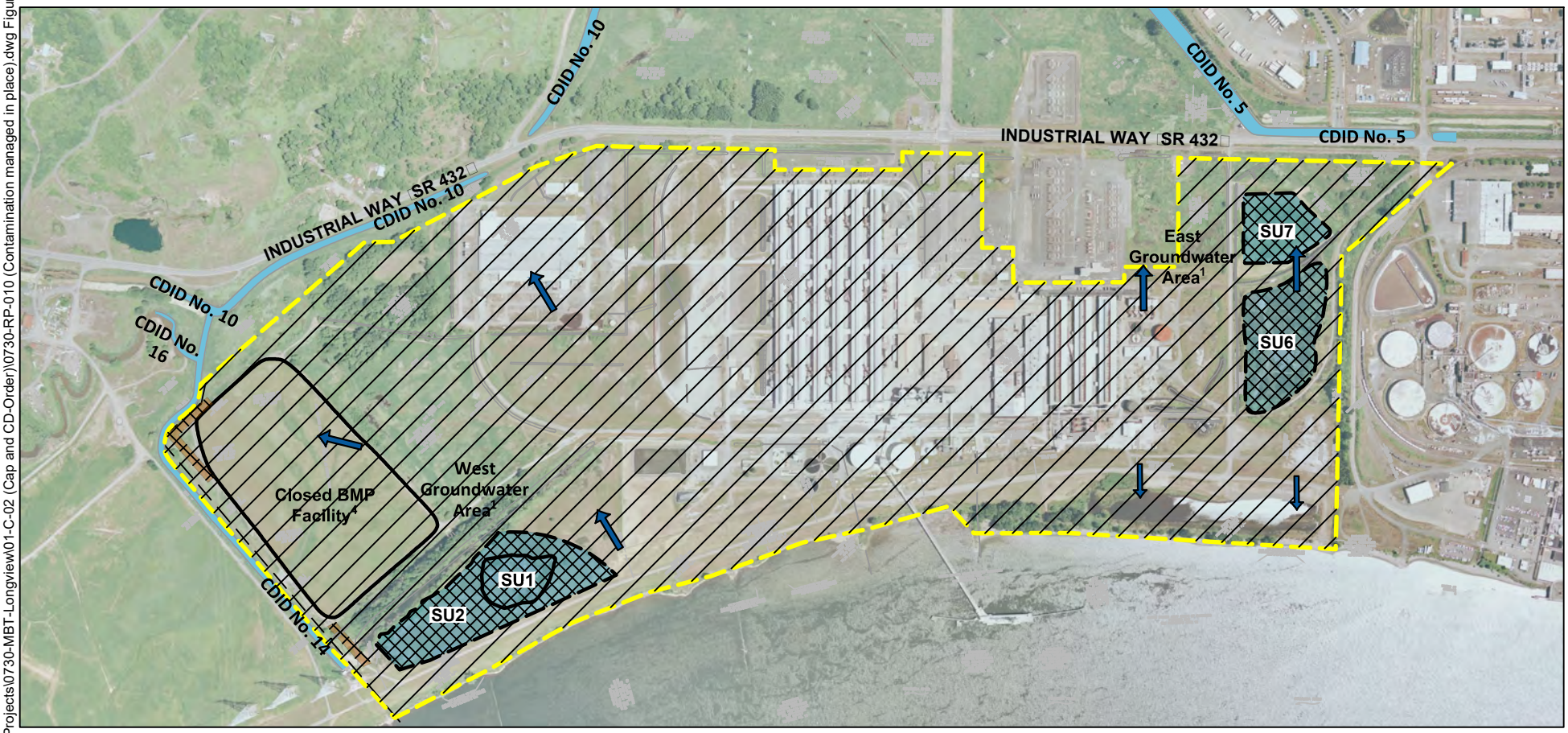
Notes:
Consolidation areas listed in Table 2-2 are preliminary and subject to modification during final design and permitting.
1 = Followed by backfill with general fill.
2 = Finished operating surface would be hydroseed.
3 = Finished operating surface would be gravel.
4 = Followed by new soil cover. Finished operating surface would be hydroseed.
5 = Railroad and angle ditches would receive a 6-inch reactive cover. Cryolite ditches would receive reactive fill below the water line and general fill above.
6 = Excavated material would be consolidated within the same SU.
7 = Excavated material would be transferred to SU7 prior to capping of SU7.
8 = Excavated material would be transferred to SU6 prior to capping of SU6.
9 = ~~Excavated material would be transferred to SU2 prior to capping~~Removal of ~~SU2. If~~ SU12 was completed in late 2016. Removed sediments ~~are not managed in SU2, they may alternately be~~were managed by off-site disposal.
BMP = Black Mud Pond
PRB = permeable reactive barrier
SU = site unit
TPH = total petroleum hydrocarbon

2.1.1 Landfill and Fill Deposit Consolidation and Capping

Several of the fill deposits listed in Table 2-2 (SU1, SU2, SU6, and SU7) within the Site will be managed using containment, engineering controls, and monitoring. The locations of fill deposits to be managed in place are shown in Figure 2-2. Impacted materials from other Site areas (SU3, SU5, SU8, and SU10) will be removed and consolidated with these fill deposits prior to placement of low permeability caps. The final consolidation areas may be adjusted (subject to Ecology review and approval) during final design and permitting. The consolidation and capping will minimize the potential for direct contact and migration of hazardous substances.

- Materials excavated from SU8 and SU10 will be consolidated within SU7. The excavation areas within SU8 will be backfilled with general fill and a surface cover of gravel. After backfill, SU10 will receive a new soil cover and hydroseed.
- Materials excavated from SU3 and SU5 will be consolidated within SU6. The excavation area within SU3 will be backfilled with reactive backfill below the water line and general fill above the water line to further immobilize residual fluoride. The excavation area within SU5 will be backfilled with general fill and will be resurfaced with gravel.
- The eastern and western portions of SU2 will be excavated and consolidated within the same SU to minimize the potential for direct contact and migration of hazardous substances. The excavated areas will be filled with reactive fill below the water line and general fill above the water line.
- Sediments removed from SU12 located within the Columbia River adjacent to Outfall 002A (see Section 2.1.3) ~~will also be consolidated and capped along with SU2.~~[2] were managed by off-site disposal.

[2] ~~If SU12 sediments are not managed in SU2, they may alternately be managed by off-site disposal.~~



SOURCE Aerial from Aerometric, dated June 2013.
HORIZONTAL DATUM Washington State Plane South, NAD83, U.S. Feet.

NOTES

1. Shallow groundwater remains above cleanup levels within the West and East Groundwater Areas, and will be subject to ongoing monitoring and PRB treatment, consistent with Alternative 4.
2. Final footprints of contained soil are subject to adjustment during design and permitting and will be documented in the Engineering Design Report.
3. Institutional controls are not applicable north of Industrial Way, in off-property areas, nor in rivers or ditches.
4. The Closed BMP Facility is a portion of the site subject to existing Institutional Controls.
5. This does preclude use of groundwater for industrial purposes or dewatering to facilitate construction and cleanup.

LEGEND:

- Low Permeability Cap
- Permeable Reactive Barrier
- Approximate Future Cap Boundary[2]
- Portion of Site Subject to Groundwater Controls and Deed Restriction Preventing Potable Use Within Fill and Upper Alluvium[5]
- Portion of Site Subject to Institutional Controls Applicable to Remedial Actions
- Inferred Groundwater Flow Direction

0 1000
Scale in Feet

K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\0730-RP-010 (Contamination managed in place).dwg Figure 2-2
Mar 21, 2018 2:35pm tgriga

DEPARTMENT OF ECOLOGY
State of Washington

Figure 2-2
Areas of Contamination Managed in Place as Part of the Cleanup
Cleanup Action Plan
Former Reynolds Metals Reduction Plant – Longview

After consolidation, the fill areas (SU1, SU2, SU6, and SU7) will be covered with a low permeability cap to prevent future exposure to and reduce infiltration through the affected material. The final design of the low permeability caps will be determined in the Engineering Design Report (EDR). The conceptual cap design includes a 12-inch layer of low-permeability (1×10^{-6} cm/sec maximum) soil, overlain by a geocomposite drainage layer topped with 12 inches of top soil and hydroseed, and sloped at a minimum of 2%. Alternative cap designs (i.e., those using an alternative working surface such as gravel, asphalt or concrete) that perform at least as well as the conceptual cap may be considered by Ecology to enable appropriate reuse of capped areas (e.g., parking or storage). Any future reuse of capped areas will need to be compatible with and must not adversely impact the function, integrity, and performance of the caps. The final cap design for each area will be documented in the EDR. The EDR is specified as a deliverable in Exhibit C of the Consent Decree.

2.1.2 Other Soil Removals

Impacted soils will be excavated and managed by off-site disposal from three areas. These include the Pitch Storage Area (SU9), the Flat Storage Area (SU11), and SU13. Soil removed from these areas will be disposed at an appropriately permitted facility. Following confirmational soil sampling, these areas will then be backfilled with general fill after contaminated materials have been removed. The final surface cover will be composed of gravel in these areas.

2.1.3 Sediment Removal

The RI/FS determined that sediment quality within the Site ~~complies~~complied with applicable cleanup levels, with the exception of SU12. ~~SU12is~~SU12 was a localized area of sediment near Outfall 002A.

During June of 2014, Ecology executed an Amendment to AO No. DE-8940 to implement an interim remedial action and expedite the final cleanup of this area. ~~Permitting for that cleanup is ongoing. Because permitting and cleanup construction have not been completed, these activities are~~The removal of sediment from SU12 was performed in October and November 2016 and documented in the *Former Reynolds Metals Reduction Plant Sediment Interim Action Completion Report* (Anchor QEA

2017). That report was approved by Ecology on August 15, 2017. Cleanup of SU12 is incorporated as part of the final cleanup action and ~~are carried forward as requirements of~~ the Consent Decree ~~and associated schedule (Exhibit C to Consent Decree).~~.

The sediment cleanup work include~~d~~s the removal of shallow polycyclic aromatic hydrocarbon (PAH~~-~~)-impacted sediments (less than 2 feet below the sediment mudline) from an area approximately 0.7 acres in size, backfilling of the dredging area with clean sandy materials, and documenting the work with sediment testing~~, and submittal of a completion report to Ecology~~. Completion of this work ~~will address~~addressed the areas of sediment impact identified in the RI.

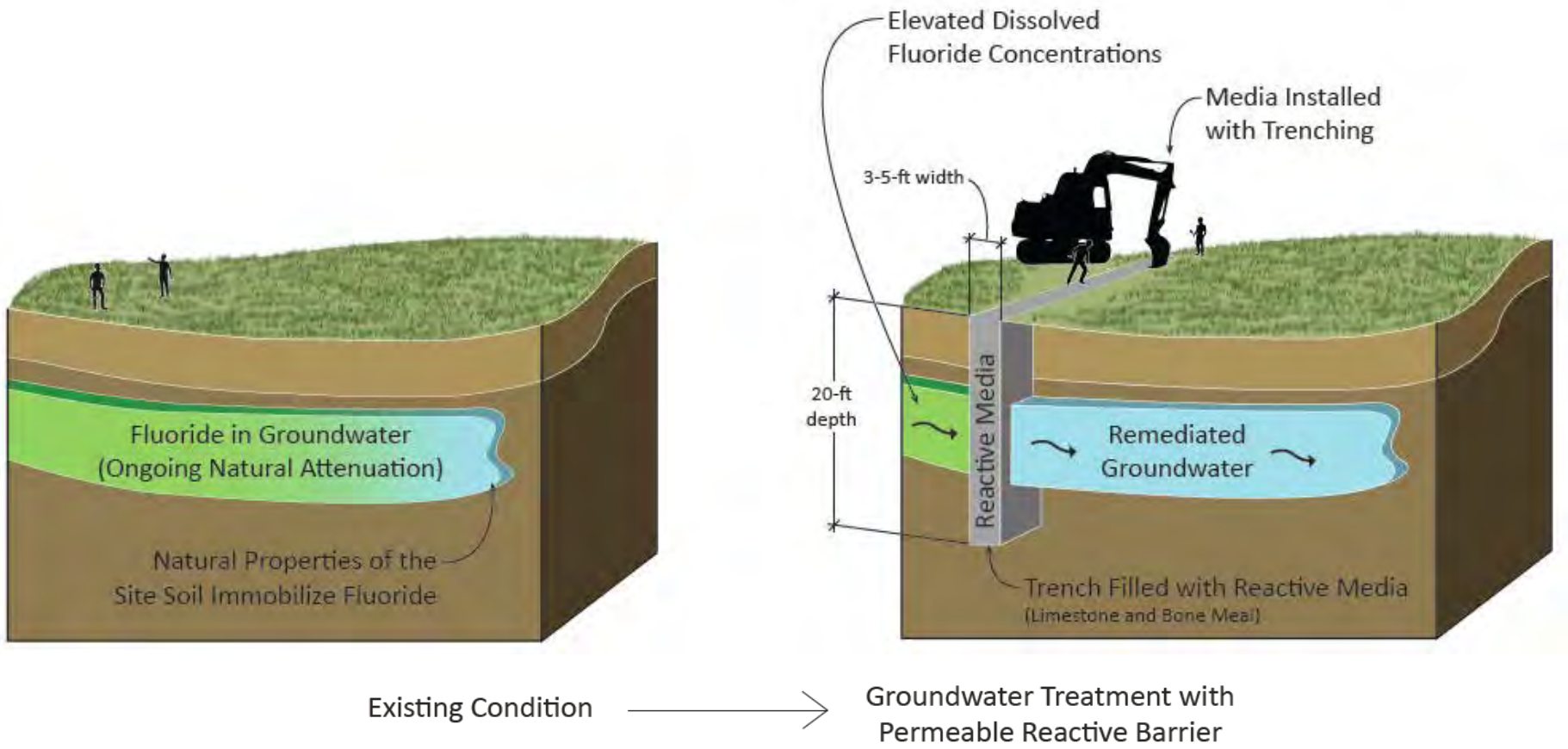
2.1.4 Groundwater

Groundwater concentrations of fluoride exceed the maximum contaminant levels (MCLs) in portions of the West Groundwater Area and East Groundwater Area and in a localized area adjacent to the southeast debris fill area. However, natural geochemical processes occurring in Site soils and groundwater limit the migration of fluoride both laterally and vertically; in addition, Site hydrogeologic conditions (i.e., upward hydraulic gradients) protect deep groundwater from fluoride contamination. Nevertheless, the selected cleanup action includes groundwater treatment to further protect groundwater and surface water receptors from the migration of Site fluoride.

The selected cleanup action includes the construction of two permeable reactive barriers (PRBs)—vertical trenches, perpendicular to contaminated groundwater flow, that are backfilled with selected reactive media—to further limit the mobility of fluoride in groundwater and satisfy requirements for groundwater cleanup actions. The locations of the PRBs are shown in Figure 2-1. Figure 2-3 illustrates the function of a PRB.

- One 350-feet-long PRB will be located at the western perimeter of SU2, where groundwater flows from the Site towards CDID Ditch No 14.
- A second, 725-feet-long PRB will be "L-shaped" and located northwest of the Closed Black Mud Pond (BMP) Facility.
- The PRB media will consist of a mixture of calcite, in the form of limestone, and apatite, in the form of bone meal. Final composition of the treatment media will be defined during engineering design.

- PRB width, depth, and composition will depend on a number of factors including treatment longevity, cost, and other design considerations and will be determined during engineering design.



The selected cleanup action includes the construction of two permeable reactive barriers (PRBs) - vertical trenches, perpendicular to contaminated groundwater flow, that are backfilled with selected reactive media. The PRBs limit the mobility of fluoride in groundwater and satisfy requirements for groundwater cleanup actions. One 350-feet-long PRB will be located at the western perimeter of SU2, where groundwater flows from the site towards CDID Ditch No 14. A second, 725-feet-long PRB will be "L-shaped" and located northwest of the Closed BMP Facility. The PRB media will consist of a mixture of calcite, in the form of limestone, and apatite, in the form of bone meal. The final dimensions and treatment media composition of the PRBs are subject to adjustment during design and permitting and will be documented in the Engineering Design Report.

Figure 2-3
Groundwater Treatment with a Permeable Reactive Barrier
Cleanup Action Plan
Former Reynolds Metals Reduction Plant – Longview

DEPARTMENT OF ECOLOGY
State of Washington

The selected cleanup action also includes the use of reactive backfill for select areas. Similar to the PRB composition, the reactive backfill will have mineral amendments, such as calcite and apatite, to reduce fluoride concentrations in groundwater flowing through the backfill. Below the water line, portions of SU2 in the eastern and western areas and SU3 will receive reactive backfill post-excavation; the Former Cryolite Ditches (SU4) and SU5 will receive reactive backfill to augment the geochemical and other interactions occurring at the point of exchange between groundwater and ditch water. Above the water line, these areas will receive general fill.

2.1.5 Institutional Controls

At the conclusion of construction of the selected cleanup action, an environmental covenant ~~will~~must be recorded by the current owner of the property and attached to the deed at the Cowlitz County Auditor's Office. The environmental covenant shall restrict future activities and uses of that portion of the Site located south of Industrial Way where remedial activity was completed and shall not be required for that portion of the Site located north of Industrial Way (see Figure 2-2). The environmental covenant ~~will~~must include the following:

- A description of the affected property areas
- A description of the cleanup action as completed at the Site
- Requirements to make provisions for continued monitoring and operation and maintenance of the remedial action prior to conveying title, easement, lease, or other interest in the Site
- Requirements that owners of the property notify all lessees or property purchasers of the restrictions on the use of the property
- Restrictions on uses and activities that would compromise the performance of the remedial action (e.g., low permeability caps and PRBs)
- Requirements that the Site remain zoned and used for Industrial purposes, unless a change in use is approved by Ecology
- Prohibition of consumptive (i.e., potable) use of groundwater from impacted portions of the upper water bearing zone (Fill and Upper Alluvium) within the East Groundwater Area and the West Groundwater Area

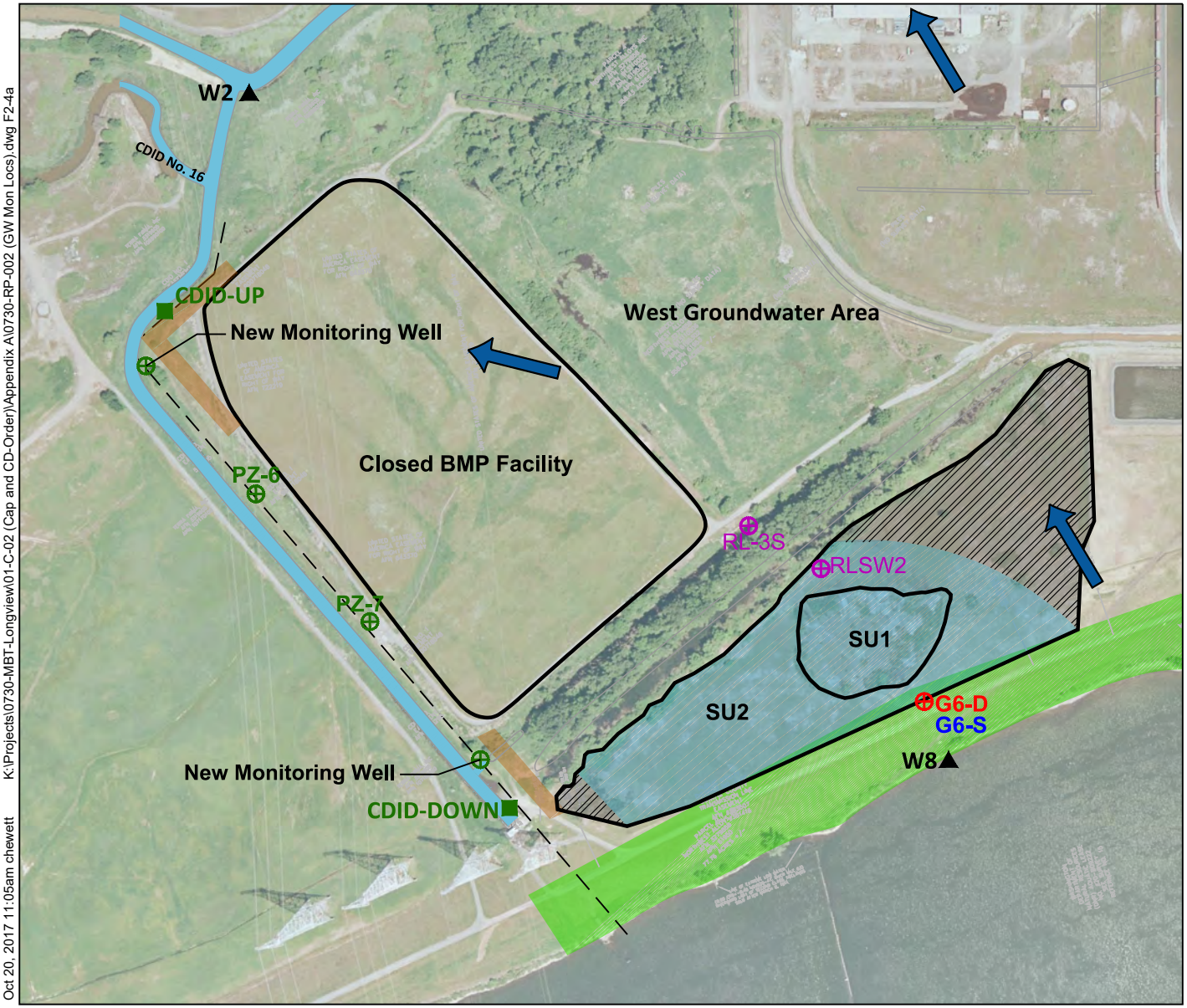
The environmental covenant ~~will~~must run with the land and, as provided by law, ~~will~~must be binding on all parties, including all current and future owners of any interest in the property or a portion of the property.

The above-described institutional controls do not limit other uses of the property and do not restrict the ability of the property to be re-graded or modified in areas outside of the capped areas or for on-site groundwater to be extracted and managed in compliance with applicable regulations and permit requirements. The protocols for management of on-site media described in Appendix D have been developed as part of this CAP and activities consistent with the protocols in Appendix D do not require separate approval by Ecology. These protocols do not apply to excavations below the low permeability caps, modifications to the PRBs, or consumptive (i.e., potable) use of groundwater from the East or West Groundwater Areas.

The deed notices that were previously filed for the Closed BMP Facility (Section 3.4.4) and for the cleanup in the diesel storage tank area (see Section 3.4.3) ~~will remain in effect as part of the selected cleanup action~~must also be revised at the same time the additional deed notices are filed for the CAP and Consent Decree for consistency with RCW 64.70.

2.1.6 Long-term Monitoring

Long-term monitoring is an integral part of the selected cleanup action. Such monitoring ~~will~~must be conducted to verify effectiveness of the remedial action at containing fluoride in shallow groundwater, protecting fish and other aquatic life, and for ensuring that the low permeability caps and PRBs installed as part of the cleanup action are effective. ~~Groundwater monitoring~~Monitoring locations are shown in Figures 2-4a ~~and~~through 2-~~4b~~4c.



LEGEND:

- Low Permeability Cap
- Excavate and Consolidate On-site
- Backfill (Reactive Agent below Waterline)
- Permeable Reactive Barrier
- Area with Observed Tidal Influence During RIFS Tidal Study (Anchor QEA, 2015)
- G6-D — Groundwater Compliance Monitoring Location
- PZ-6 — Post-closure Groundwater Monitoring Location for Closed BMP Facility[1]
- CDID-UP — Post-closure Surface Water Monitoring Location for Closed BMP Facility
- G6-S — Groundwater Sentinel Monitoring Location (Perched Water)
- RL-3S — Interior Groundwater Monitoring Location
- W3 — Surface Water Monitoring Location
- Inferred Groundwater Flow Direction

0 500
Scale in Feet

SOURCE: Drawing prepared from Alta Survey (Minister & Glaeser Surveying, Inc.) dated November 11, 2010. Aerial image from Aerometric dated June 2013.

[1] These wells are sampled in accordance with the Post-Closure Plan Amendment (Appendix B) but sampling is coordinated and performed with Compliance Monitoring and Contingency Response Plan sampling. Reporting of results will be done on a site-wide basis to evaluate performance of the cleanup actions as described in Section 5.

K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\Appendix A\0730-RP-002 (GW Mon Locs).dwg F2-4a
Oct 20, 2017 11:05am chewett

ANCHOR QEA

Figure 2-4a
Groundwater and Surface Water Monitoring Locations - West Groundwater Area
Cleanup Action Plan
Former Reynolds Metals Reduction Plant – Longview

LEGEND:

- Low Permeability Cap
- Excavate and Consolidate On-site
- Excavate and Dispose Off-site
- Backfill (Reactive Agent below Waterline)
- Area with Observed Tidal Influence During RIFS Tidal Study (Anchor QEA, 2015)

- R-2 ⊕ Groundwater Compliance Monitoring Location
- G2-S ⊕ Interior Groundwater Monitoring Location
- G4-D ⊕ Groundwater Sentinel Monitoring Location
- W9 ▲ Surface Water Monitoring Location
- Inferred Groundwater Flow Direction

0 500
Scale in Feet

SOURCE: Drawing prepared from Alta Survey (Minister & Glaeser Surveying, Inc.) dated November 11, 2010. Aerial image from Aerometric dated June 2013.

K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\Appendix A\0730-RP-002 (GW Mon Locs).dwg F2-4b
Oct 20, 2017 11:05am chewett

Figure 2-4
Groundwater and Surface Water Monitoring Locations - East Groundwater Area
Cleanup Action Plan
Former Reynolds Metals Reduction Plant – Longview

ANCHOR QEA

SOURCE: Aerial from Google Earth
HORIZONTAL DATUM: Washington State Plane South, NAD83, U.S. Feet.
NOTE[1]: Locations are approximate. Final locations will be established in a Sampling and Quality Assurance Plan.

LEGEND:

PW-1 Pore Water Monitoring Location and Contingent Bioassay Station[1]

DB-1 Contingent Ditch Water Bioassay Location[1]

0 1600
Scale in Feet

Oct 20, 2017 3:50pm chewett K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\Appendix A\0730-RP-009 (Porewater Sampling_2017).dwg F2-4c

ANCHOR QEA

Figure 2-4c
Pore Water and Contingent Bioassay Monitoring Locations
Cleanup Action Plan
Former Reynolds Metals Reduction Plant – Longview

Appendix A provides the Compliance Monitoring and Contingency Response Plan (CMCRP).

In addition to describing the ~~groundwater~~ monitoring plan for the Site, the CMCRP also summarizes the following requirements for capped and PRB areas:

- Routine inspection requirements for low-permeability cap and PRB areas
- Discussion of routine maintenance activities covered within the scope of the CAP
- Contingent inspection requirements to be applied after extreme events (e.g., floods or seismic events)
- Discussion of contingency responses potentially applicable to cap and PRB areas
- Reporting requirements

A Closed BMP Facility Post-Closure Plan Amendment is provided as Appendix B. The original Closure/Post-Closure Plan for the Closed BMP Facility was issued in 1991 (Reynolds and CH2M Hill 1991). The Post-Closure Plan Amendment addresses facility changes since initial construction, clarifies certain requirements, updates maintenance provisions, and aligns monitoring requirements with the monitoring framework under the CAP. The Post-Closure Plan Amendment complies with MTCA compliance monitoring requirements as described in WAC 173-340-410 and requirements for Post-Closure Plans as defined in WAC 173-303-610(8). The Post-Closure Plan Amendment ~~will~~must supersede the previous version.

2.2 Summary of Impacted Media Remaining on Site

Figure 2-2 provides a visual depiction of the Site following implementation of the selected cleanup action, subject to final engineering design and permitting. The following areas of impacted media will remain on Site:

- Capped fill materials will remain in SU1, SU2, SU6, and SU7. These areas ~~will~~must be covered with low-permeability caps and ~~will~~must be subject to long-term maintenance and monitoring requirements as described in Appendix A. These areas ~~will~~must also be addressed in the restrictive covenants to be filed following completion of the cleanup action.

- Capped fill materials will also remain in the Closed BMP Facility, which was closed consistent with the Ecology-approved Closure/Post-Closure Plan. This area is capped with a low-permeability cap and ~~will~~must be subject to long-term maintenance and monitoring requirements as described in Appendix B. This facility is addressed by the restrictive covenant filed in 1993 following closure (Reynolds 1993).
- Groundwater exceeding cleanup levels for fluoride will remain in shallow areas of the Upper Alluvium within the West Groundwater Area and the East Groundwater Area. These areas are subject to long-term monitoring as described in Appendix A. PRBs (Figure 2-3) will enhance the natural ability of Site soils to immobilize fluoride in the western portion of the Site. Restrictive covenants ~~will~~must prevent consumptive (i.e., potable) use of shallow groundwater from these two areas.

The remaining areas of the Site currently meet applicable cleanup levels for industrial uses.

2.3 Cleanup Schedule

Removal of sediments from SU12 has been completed, and removal of soils from SU13 is expected to occur in ~~2016, pending the receipt of the federal permit~~2018. The remainder of upland construction will take approximately two construction seasons and will likely begin in ~~2017~~2019 or ~~2018~~2020 depending on time required for design and permitting. Work may be expedited in SU9, SU11, and SU13, assuming work in these areas does not require federal permits applicable to the other SUs. Key milestones to complete the cleanup include the following:

- ~~**Completion of SU12 Remediation:** Ecology previously authorized remediation of SU12 as part of Amendment 1 to AO No. DE 8940, and permitting for this work is ongoing. Cleanup construction will be implemented during a single permit-defined work window after receipt of required permits. The results of construction and post-construction monitoring will be documented in an as-built report to be submitted to Ecology.~~
- **Sampling and Quality Assurance Project Plan:** A Sampling and Quality Assurance Project Plan (SQAPP) will be required to ensure there will be no biological impact to aquatic receptors, which will be verified by supplemental porewater and contingent bioassay monitoring. The SQAPP will describe the

methods to be used for conducting post-construction groundwater, surface water, and porewater monitoring.

- **Engineering Design and Permitting:** Engineering design and permitting for upland cleanup actions will be completed in several steps. First, pre-design testing activities will be performed as required to inform the remedial design. These testing activities will be completed in accordance with Draft and Final Plans for pre-design activities and any applicable permits. After collection of the pre-design testing data, a draft EDR will be prepared and submitted to Ecology. The Draft EDR will include engineering plans describing the proposed methods for implementation of the cleanup action (including proposed project schedule) and will document the collected pre-design data. The Revised EDR will address Ecology's comments on the draft version. After receipt of all required permits, a Final EDR will be issued. The Final EDR will be unchanged from the Revised EDR except where required to incorporate permit conditions. The Final EDR will include a proposed project schedule for construction of the cleanup action.
- **Cleanup Construction—SU9, SU11, and SU13:** Construction activities in three upland Site areas (SU9, SU11, and SU13) are not expected to require federal permits. Soil removal and backfill activities in these areas may be approved by Ecology following execution of the Consent Decree (SU13) and following completion of the Revised EDR (SU9 and SU11).
- **Cleanup Construction—Remaining Areas:** The construction in remaining upland Site areas will likely require at least two construction seasons to complete. The construction work ~~will~~must be completed after receipt of required permits consistent with the schedule contained in the Final EDR.
- **As-Built Report:** Following completion of all construction activities, a project As-Built report(s) ~~will~~must be submitted to Ecology documenting work performed. A Construction Completion Letter will be provided by Ecology upon approval of the As-Built Report.
- **Recording of Institutional Controls:** An Environmental Covenant ~~will~~must be recorded at Cowlitz County upon completion of the cleanup actions required by the CAP (after receipt of the Construction Completion Letter) and ~~will~~must remain in place indefinitely or until approved for removal by Ecology. A copy

of the recorded Environmental Covenant ~~will~~must be provided to Ecology and the parties identified in the Uniform Environmental Covenants Act (RCW 64.70.070(1)).

- **Post-Construction Monitoring and Reporting:** Post-construction monitoring and reporting ~~will~~must be performed as defined in the CMCRP (see Appendix A) and a subsequent SQAPP. Post-closure care of the Closed BMP Facility ~~will~~must be conducted as defined in the Closed BMP Facility Post-Closure Plan Amendment (see Appendix B).

3 Site Background

3.1 Site Description and Current Land Use

The Site is located at 4029 Industrial Way, just outside the city limits of Longview in Cowlitz County, Washington 98632. The Site consists of properties that were associated with operation of the Former Reynolds Plant and adjacent areas of the Columbia River.

Figure 1-1 shows the extent of the properties owned by Northwest Alloys, a wholly owned subsidiary of Alcoa, Inc. (Alcoa). This ownership includes property located on both the north and south sides of Industrial Way. Only the southern portions of the property located south of Industrial Way were used for aluminum manufacturing operations and were found to contain contaminants above applicable cleanup levels. The Former Reynolds Plant, buildings and other improvements are owned by MBT-Longview and occupy approximately 436 acres, including the property associated with the former Cable Plant and property located west of the main aluminum manufacturing facilities.

The Northwest Alloys properties are currently leased to MBT-Longview for operation of a bulk products terminal. MBT-Longview has leased the property since January 2011 when it purchased the facility assets from Chinook Ventures, Inc. (CVI). The MBT-Longview terminal currently handles several bulk products (including alumina and coal) that have been historically managed at the Former Reynolds Plant. Alumina is received by ship, stored, and is transloaded into railcars for shipment to an operating aluminum manufacturing facility, Alcoa Wenatchee, in Malaga, Washington. MBT-Longview also receives coal by rail, stores it, and transports it by truck to a neighboring facility. Other materials handled at the facility since aluminum production ceased are carbon for the steel industry, cement, fly ash, green petroleum coke, and miscellaneous other materials.

The Former Reynolds Plant also includes an existing dock structure and two wastewater outfalls that are located within the Columbia River. The Northwest Alloys-owned property extends to the extreme low water (ELW) mark within the Columbia

River. The aquatic lands located waterward of the ELW mark within the Columbia River are owned by the State of Washington and are managed by the Washington State Department of Natural Resources (WDNR). Portions of the dock and outfalls are located on land leased by Northwest Alloys from WDNR under Aquatics Lands Lease No. 20-B09222.

The Former Reynolds Plant property and all adjacent properties are zoned for industrial use. Adjacent industrial properties are owned by the Port of Longview (vacant development parcel), Weyerhaeuser (active pulp mill), and the City of Longview (Mint Farm Industrial Park). Properties located to the north and northwest include several Bonneville Power Administration (BPA)-owned properties located along Industrial Way/Highway 432 and a quarry.

The Consolidated Diking and Improvement District (CDID) operates a system of levees and drainage ditches present near the Site. The CDID provides protection from external flooding from the Cowlitz and Columbia Rivers. As described in Section 4, the CDID ditch system also affects shallow groundwater gradients in the vicinity of the Site.

3.2 History of the Former Reynolds Plant

Aluminum production operations began in 1941, with construction and operation of the first aluminum production (i.e., reduction or smelting) and casting operations. In 1967, operations expanded to include additional aluminum production capacity in the North Plant.

Alumina used at the Former Reynolds Plant was received by ship or by rail. Alumina was unloaded and transferred to the alumina storage silos and from there to the potline buildings. Solid alumina was placed in a "pot" and dissolved in a cryolite solution (consisting of sodium, fluoride, and aluminum). Electricity was then passed through the material in the pot to produce molten aluminum. The aluminum was then cast into solid form inside the cast houses. A detailed description of the aluminum production process is provided in the RI/FS (Anchor QEA 2015, Section 2.2.1).

Aluminum manufacturing ceased in 2001, but the dock and storage silos remain in use for import of bulk products, including alumina required by the operating aluminum facility in Malaga, Washington.

Residual carbon or black mud (remaining solids after extraction of reusable fluoride and aluminum) produced at the Former Reynolds Plant after 1972 was managed in an impoundment constructed within the western plant area, known as the Closed BMP Facility. This 33-acre facility was formally closed in 1993, consistent with regulatory requirements under the Washington Dangerous Waste regulations in place at that time (see Section 3.4.4).

Lime was processed at the Site to produce the sodium hydroxide solution used in the cryolite recovery process (Anchor QEA 2015, Section 2.2.3). Spent lime (known during plant operations as "white mud," due to its characteristic white color) was generated during this process. This spent lime was initially segregated and managed in SU7 located in the East Plant area. After SU7 was closed in the 1970s, the spent lime was no longer segregated and was combined and managed with the residual carbon.

The Former Reynolds Plant includes three historical on-site landfills, which were used during facility operations for construction debris and other materials and are addressed as part of Ecology's selected cleanup action. Use of these three landfills ceased in the 1980s. At its peak, the Former Reynolds Plant employed more than 1,200 people. The facility included many support operations necessary for aluminum manufacturing, including maintenance facilities, wastewater treatment, and industrial water supply wells. Nine deep (over 200 feet) water supply wells remain at the Former Reynolds Plant. Monitoring of these wells has shown that the water generated from these deep wells is clean except for the presence of naturally occurring iron, manganese, and arsenic, which are characteristic of the regional water supply aquifer under this portion of Cowlitz County.

The former Cable Plant (see Figure 1-1) is located within the Former Reynolds Plant, to the west of the aluminum production areas. No cleanup activities are required in this area.

3.3 Historical Uses after Closure of Former Reynolds Plant

In 2000, Alcoa purchased Reynolds Metals Company (Reynolds) as a wholly owned subsidiary. To comply with antitrust requirements associated with this transaction, Reynolds was required to divest the Longview smelter. To fulfill this obligation, Reynolds sold the facility to Longview Aluminum in 2001 but retained ownership of the land. Reynolds then entered into a ground lease with Longview Aluminum. Longview Aluminum immediately shut down aluminum production operations. Longview Aluminum declared bankruptcy in 2003, and Development Services, Inc., took over operations for the bankruptcy court as the trustee of the estate.

In December 2004, CVI purchased the Longview assets from the bankruptcy trustee and entered into a long-term ground lease with Reynolds. Reynolds continued to retain ownership of the land. In September 2005, ownership of the land transferred from Reynolds to Northwest Alloys, both wholly owned subsidiaries of Alcoa.

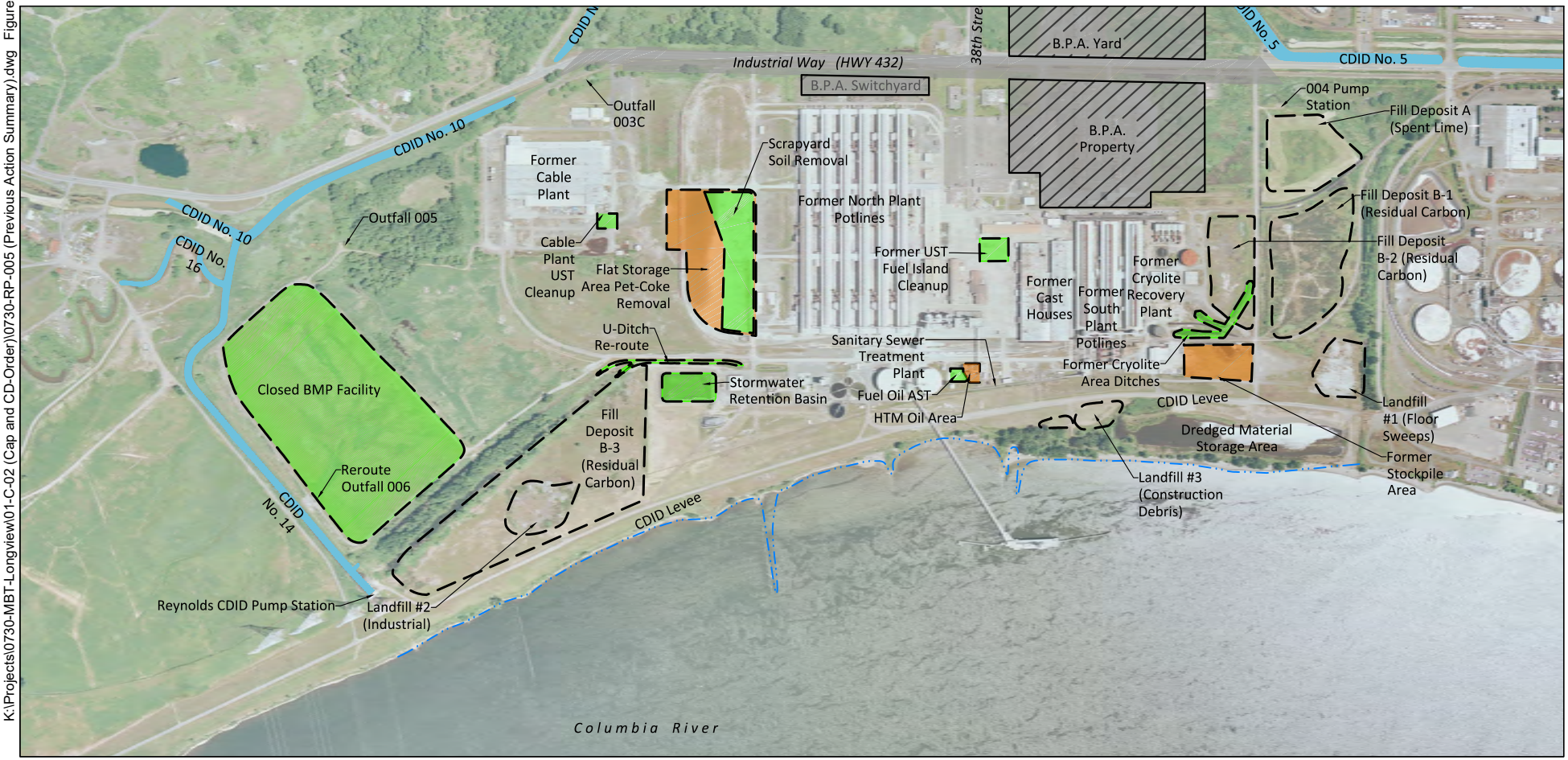
CVI was the sole operator of the facility between 2004 and 2011. CVI used the Site as a terminal for the import, handling, and export of dry bulk materials, such as alumina, coal, green petroleum coke, cement, fly ash, slag, and other materials.

During its occupancy, CVI decommissioned the majority of the facilities associated with aluminum manufacturing operations. These activities included the removal and disposal or recycling of alumina, electrolyte bath, coal, and carbon products.

On January 11, 2011, CVI sold its Longview assets to MBT-Longview. MBT-Longview has subsequently removed most of the structures that were constructed by CVI and has continued decommissioning buildings, and removal of materials left on Site by CVI.

3.4 Previously Completed Cleanup Actions

A number of cleanup actions (see Figure 3-1) were completed in coordination with Ecology prior to the RI/FS to address areas of localized soil contamination. These actions are incorporated into the final cleanup action.



K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\0730-RP-005 (Previous Action Summary).dwg Figure 3-1
Apr 30, 2015 12:15pm hhayward

SOURCE: Drawing prepared from Alta Survey (Minister & Glaeser Surveying, Inc.) by November 11, 2010. Aerial image from Aerometric dated June 2013.

NOTE A series of removal and cleanup actions (green areas) were completed in coordination with the Washington State Department of Ecology. The Remedial Investigation/Feasibility Study (RI/FS) investigated conditions within the remaining areas of the Site, building on the extensive data set available from previous environmental investigations.

LEGEND

- Approximate Ordinary High Water Line
- BPA Property
- Previous Removal, Closure, or Cleanup Action Completed
- Completed Cleanup or Removal with Further Evaluation Under RI/FS

0 1000
Scale in Feet

DEPARTMENT OF ECOLOGY
State of Washington

Figure 3-1
Summary of Previous Cleanups and Removal Areas
Cleanup Action Plan
Former Reynolds Metals Reduction Plant – Longview

- **Scrap Yard Soil Cleanup.** The scrap yard was located west of the former North Plant potlines (see Figure 3-1) and was historically used during Former Reynolds Plant operations for the handling of materials designated for reuse or off-site recycling (Anchor 2007a). PAH-impacted soil in this area was removed in 2005 by CVI as a voluntary, independent cleanup action. Soil samples collected after the cleanup confirmed that remaining soil PAH concentrations were less than the MTCA Industrial Use cleanup levels (Anchor 2007b).
- **Cable Plant Underground Storage Tank Cleanup.** An underground storage tank (UST) located adjacent to the Cable Plant (see Figure 3-1) was removed in 2001. Localized gasoline-impacted soil and groundwater in this area were cleaned up with Ecology oversight under the Voluntary Cleanup Program. In 2003, Ecology provided a No Further Action determination for this area (Anchor 2003).
- **Warehouse UST and Fuel Island Cleanup.** A cleanup was completed during the CVI tenancy to address a localized area of diesel-impacted soil associated with a former UST fuel island (see Figure 3-1). Soils from this area were excavated and treated successfully using on-site bioremediation and with Ecology's approval, the treated soils were reused on Site as fill.
- **Soil Removal from SU4.** During 2008, soils containing elevated PAH concentrations were removed from the three ditches located southeast of the former cryolite plant (see Figure 3-1). The cleanup included removal of 5 to 6 feet (approximately 2,663 tons) of material from the bottom and sides of the ditches, and removed soils were disposed in an off-site Subtitle D landfill (Northwest Alloys 2011). Confirmation sampling established that the soil in the bottom of the ditches was below Method A soil cleanup levels.
- **Cleanup at the Diesel Aboveground Storage Tank.** In 1991, Reynolds conducted an independent cleanup action to remove approximate 480 cy of diesel-impacted soils adjacent to the 200,000-gallon diesel aboveground storage tank (AST; see Figure 3-1). Testing of groundwater indicated that the impacts were limited to soil (Reynolds 1991). The excavation removed all of the impacted soils that could be safely accessed without compromising the integrity of the tank foundation. The cleanup of the diesel AST area included recording of institutional controls (Reynolds 1991) that ~~will~~must remain in place under the final cleanup action described in this CAP.

- **Drum Soil Cleanup (1984).** In July 1984, a release from a drum was noted near Shed No. 1 near the North Plant at the Reynolds site (Reynolds 1984). PCBs were detected in soil samples, and associated impacted soils were removed in October 1984 and July and August 1985 (Reynolds 1984, 1986). Final confirmation samples verified that trichlorobenzene and PCB concentrations were below 1 milligram per kilogram (mg/kg; i.e., below the current industrial and residential soil cleanup levels; Ecology 1986). On February 20, 1986, Ecology approved the work as complete based on review of Reynolds' summary report and laboratory results (Ecology 1986).
- **Cleanup of Heat Transfer Media.** During CVI operations at the Site, a release of heat transfer media (HTM) oil from the tank heating system was discovered within the containment area around the pitch storage tanks (see Figure 3-1). HTM oil is similar to mineral oil. CVI removed oil-impacted soil in the HTM Oil Area. Additional testing performed in the RI/FS (Anchor QEA 2015) confirmed that no further actions were required to comply with MTCA cleanup levels applicable to this area.

3.4.1 Closure and Post-Closure Monitoring of the BMP Facility

The Closed BMP Facility (see Figure 3-1) was used to manage residual carbon between 1972 and the cessation of the on-site cryolite recovery process; the last residual carbon was added in June 1990. Following a public comment and hearing process, Ecology-approved the Closure/Post-Closure Plan (Reynolds and CH2M Hill 1991) in 1992. That plan required the construction of a landfill cover, consisting of a multi-layer, low permeability cover and drainage conveyance.

The final cover was constructed in 1992, and in a letter to Ecology dated April 20, 1993 (Reynolds 1993), Reynolds submitted the final closure requirements: a closure certification by an independent engineer licensed in the state of Washington and notice of a deed restriction filed with the Cowlitz County Auditor. Since 1992, the Closed BMP Facility has been subject to an ongoing maintenance and monitoring program, as specified in the Ecology-approved Closure/Post-Closure Plan (Reynolds and CH2M Hill 1991), the Reynolds' Operation and Maintenance Manual (Reynolds 1992), and an updated maintenance plan (Anchor QEA 2011).

Engineering and institutional controls ~~will~~must continue to remain in place at the Closed BMP Facility. The deed notice filed for the Closed BMP Facility ~~and financial~~must be revised at the same time additional deed notices are filed for the CAP and Consent Decree for consistency with RCW 64.70. Financial assurance for post-closure care ~~will~~must also remain in place under the final Site cleanup action as described in this CAP. ~~-~~This CAP includes a Closed BMP Facility Post-Closure Plan Amendment (see Appendix B), which ~~will~~must be implemented as an enforceable part of the final Site cleanup described in this CAP. This document supersedes the other closure/post-closure documents.

3.4.2 Sediment Action

The RI/FS determined that sediment quality within the Site complies with applicable cleanup levels, with the exception of SU12. SU12 is a localized area of sediment near Outfall 002A. Testing demonstrated that the sediment impacts were not the result of ongoing operations. Sediment trend analysis showed that sources from Outfall 002A had been controlled previously and sediment quality was already recovering when MBT-Longview became a property tenant.

During June of 2014, Ecology executed an Amendment to AO No. DE-8940 to implement an interim remedial action and expedite the final cleanup of this area. ~~Permitting for that cleanup is ongoing. Because permitting and cleanup construction have not been completed, these activities are incorporated as part of the final cleanup action and are carried forward as requirements of the Consent Decree and associated schedule (Exhibit C to Consent Decree).~~The cleanup of SU12 was performed in October and November of 2016 and documented in the *Former Reynolds Metals Reduction Plant Sediment Interim Action Completion Report* (Anchor QEA 2017). That report was approved by Ecology on August 15, 2017.

The sediment cleanup work include~~d~~s the removal of shallow PAH-impacted sediments (less than 2 feet below the sediment mudline) from an area approximately 0.7 acres in size, backfilling of the dredging area with clean sandy materials, and documenting the work with sediment testing~~, and submittal of a completion report to~~

~~Ecology.~~. Completion of this ~~action will address~~work addressed the areas of sediment impact identified in the RI.

4 Site Conditions

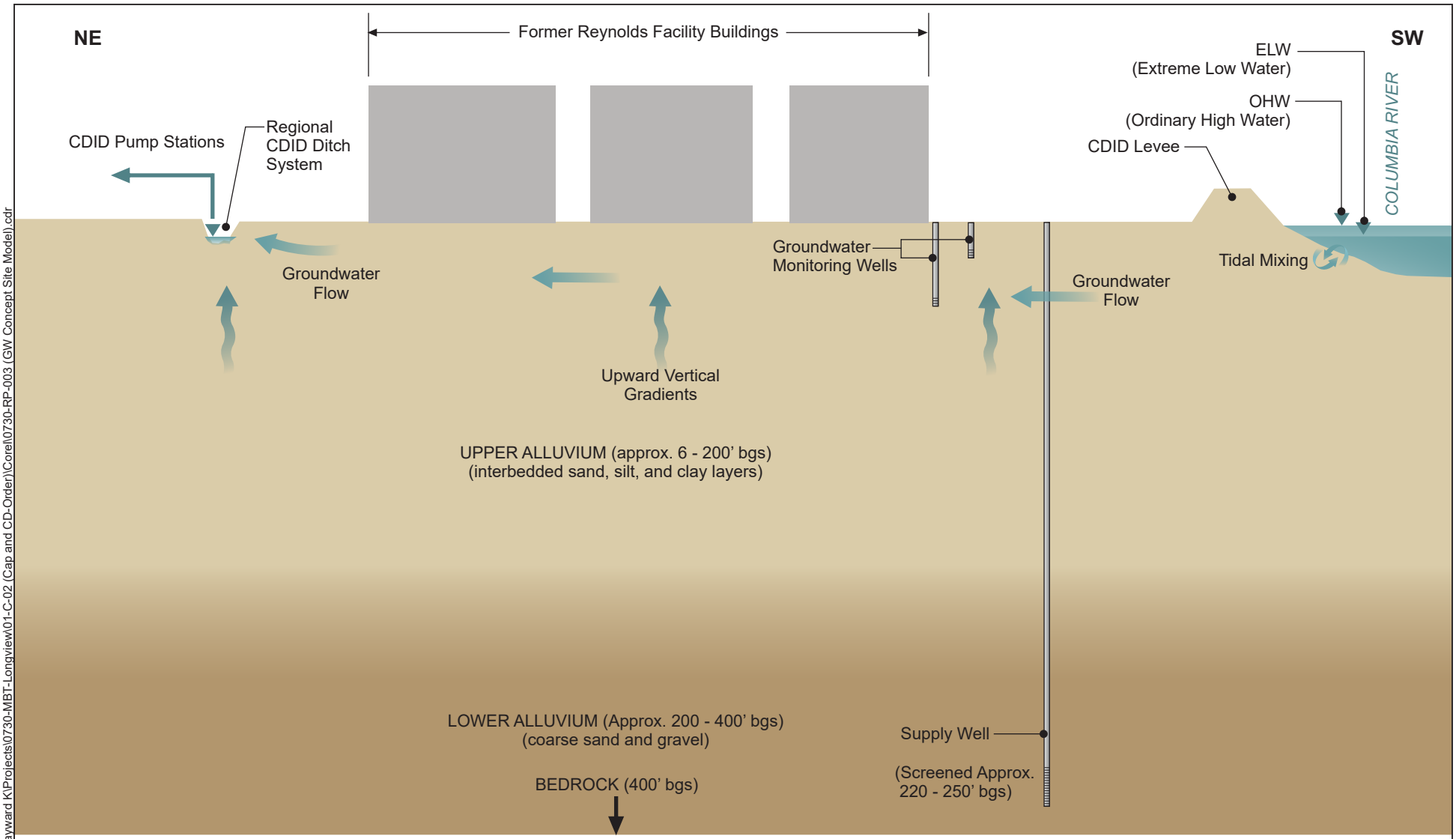
4.1 Geologic and Hydrogeologic Setting

As shown on Figure 4-1, there are two principal water bearing zones beneath the Site. These include a deeper zone of higher hydraulic conductivity known as the Lower Alluvium and an upper zone of much lower hydraulic conductivity consisting of silt and clay soils of the Upper Alluvium.

- **Upper Alluvium.** The Upper Alluvium within the Site consists of fine-grained silt and clay deposits. The Upper Alluvium locally consists of interbedded silt and fine-grained sand layers, with minor fractions of silty sand, sandy silt, and clay interbeds, overlying the Lower Alluvium. This fine-grained Upper Alluvium averages approximately 200 feet in thickness beneath the Site and is approximately 200 to 300 feet thick along the Columbia River shoreline.
- **Lower Alluvium.** The Lower Alluvium consists of a deeper, coarse-grained geologic unit containing gravels and cobbles. Beneath the Site, the Lower Alluvium consists of coarse-grained sand and gravel deposits and ranges in thickness from 100 to 350 feet.

Vertical groundwater gradients have been shown to be upward between the Lower Alluvium and the Upper Alluvium in the vicinity of the Site (Kennedy/Jenks 2010). The aquifer within the Lower Alluvium behaves as a confined system near the Columbia River where the silty deposits of the Upper Alluvium are the thickest. This includes the area within and adjacent to the Site.

The groundwater impacts associated with the Former Reynolds Plant are limited to the shallow groundwater located within the silt and clay soils of the upper portion of the Upper Alluvium. No Site-related groundwater impacts have been noted in the groundwater of the Lower Alluvium, which is on average more than 200 feet below ground surface (bgs). The upward groundwater gradients limit potential downward migration of site contaminants (i.e., fluoride).



NOTE: The Site is located within the Longview-Kelso basin, which is composed by a two-layer alluvial system: the Upper Alluvium (interbedded silt and fine-grained sand layers, with minor fractions of silty sand, sandy silt, and clay interbeds) and the Lower Alluvium (deeper, coarse-grained geologic unit containing gravels and cobbles). Vertical gradients between the Lower Alluvium and Upper Alluvium showed the presence of an upward gradient. Contaminant concentrations are elevated only in groundwater present in the upper fill and silt/clay soils immediately within or adjacent to the landfill and fill deposits. Constituents have limited mobility and are not impacting down gradient groundwater, surface water quality, or water quality in the Lower Alluvium.

DEPARTMENT OF ECOLOGY
State of Washington

Figure 4-1
Groundwater Conceptual Site Model
Cleanup Action Plan
Former Reynolds Metals Reduction Plant – Longview

Shallow groundwater within the Upper Alluvium and surficial soils typically flows north and west, away from the Columbia River. This groundwater gradient is primarily the result of relative water levels in the Columbia River, the regional CDID ditch system, and the on-site ditches. Shallow groundwater elevations vary seasonally, due to higher levels of precipitation and groundwater recharge in the wet season than during the dry season. Higher Columbia River levels also typically occur during winter months.

In localized areas, shallow groundwater exhibits a perched condition. For example, some of the environmental monitoring wells (i.e., G6-S and RLSW-4, which are located along the CDID levee near the Columbia River) exhibited water elevations that do not correlate well with river stage in comparison to deeper-screened wells in these areas. The observations indicate that groundwater in this area is perched on low permeability silt and clay layers, as noted in the boring logs for these wells.

Tidal fluctuation in the Columbia River induces tidal effects and groundwater mixing within nearshore Site groundwater. These tidal influences on groundwater mixing were quantified during the RI/FS.

4.2 Nature and Extent of Contamination

The RI/FS documented the nature and extent of contamination at the Site.

A synopsis of key findings as described in Section 5 of the RI/FS is provided below:

- The principal Site contaminants in soil/solid media are fluoride and PAH compounds. These compounds are associated with former smelter operations and are primarily present in localized areas in the eastern and western area of the Site where landfills and fill deposits are currently managed on site.
- The contents of several of the closed landfills and fill deposits contain elevated concentrations of PAH compounds. Fluoride concentrations in these materials generally meet levels protective of human health under industrial exposure scenarios.
- There were no exceedances of soil screening levels for mercury, solvents, or pesticides.

- Soil quality outside of the contained landfills and fill deposits is protective of terrestrial ecological exposures.
- As described in Section 3.4.4, sediment impacts were localized in SU12, an area immediately adjacent to Outfall 002A.
- Fluoride is the principal contaminant of concern (COC) for Site shallow groundwater. Groundwater concentrations of fluoride exceed applicable screening levels in portions of the West Groundwater Area and East Groundwater Area and in a localized area adjacent to SU10. As described in Section 4.3, natural processes limit the transport of fluoride.
- Other Site COCs are relatively immobile, as evidenced by the lack of groundwater impacts. No volatile organic compounds or PCBs were detected in groundwater. Cyanide levels are protective of drinking water and surface water quality. Fluoride and PAH concentrations are elevated only in groundwater present in the upper fill and silt/clay soils immediately within or adjacent to the landfill and fill deposits. Monitoring shows that these constituents have limited mobility and are not impacting down-gradient groundwater or surface water quality.
- No exceedances of cleanup levels were detected in surface water in the Columbia River or CDID ditches.

4.3 Fluoride Fate and Transport

The factors affecting the potential fate and transport of fluoride at the Site were evaluated in detail during the RI/FS. Findings of the fate and transport evaluation are summarized in Section 6 of the RI/FS. In summary, natural attenuation processes have limited the migration of fluoride both laterally and vertically. Key geochemical processes affecting the fate and transport of fluoride within soil, solid media, and groundwater at the Site include precipitation as fluorite and fluorapatite, ion exchange and adsorption. Geochemical analysis of Site soils indicates that these processes will continue to limit transport of fluoride under the Site's current conditions. The same natural processes that limit fluoride migration also make it impracticable to restore shallow groundwater to cleanup levels throughout the Site quickly. The added controls in the selected cleanup for the Site will further reduce transport of fluoride by capping wastes and installing PRBs in key locations.

5 Cleanup Requirements

This section describes the requirements that must be met by the cleanup action.

5.1 Cleanup Objectives

Based on the results of the RI, the following objectives have been identified for cleanup of the Site:

- Protection of surface water in the Columbia River and CDID ditches.
- Protection of human health and the environment by limiting direct contact with contaminants based on an industrial use scenario.
- Protection of human health and the environment by controlling migration of fluoride-impacted groundwater from fill deposits, landfills, and impacted soil.
- Protection of terrestrial ecological receptors from exposure to contaminants.
- Protection of aquatic and benthic ecological receptors from exposure to contaminants in sediments or surface water.

5.2 Cleanup Standards

A cleanup standard is defined based on the point of compliance (POC) and the concentration of a hazardous substance that must be met to avoid risks to human health and the environment through a specified exposure pathway (i.e., the cleanup level).

5.2.1 Methodology

The MTCA Cleanup Regulations (WAC Sections 173-340-720, -730, and -740) establish procedures to develop cleanup levels for surface water, groundwater, and soil. The MTCA Method A procedure is applicable to sites with relatively few hazardous substances and is applicable to the Former Reynolds Plant because fluoride is the primary COC in groundwater and there are reliable and proven remedial options for aluminum smelter sites. Cleanup levels based on this method are derived through selection of the most stringent concentration presented in the following sources:

- Concentrations listed in WAC Tables 173-720-1, -740-1, and -745-1 (for groundwater and soil)

- Concentrations established under Applicable or Relevant and Appropriate Requirements (ARARs)
- Concentrations protective of the environment and surface water beneficial uses

Where numeric values were not available from these sources, Method C procedures were used to develop site-specific cleanup levels. MTCA Method C procedures employ a risk-based evaluation of potential human health and environmental exposures to Site COCs and are applicable to all industrial sites. Therefore, cleanup levels for the Former Reynolds Plant are based on a combination of Method A and Method C procedures.

The Method C procedure also requires that a cleanup level for one medium must also be protective of the beneficial uses of other affected media. For example, Site groundwater discharges into the CDID regional drainage ditches, which discharge into the Columbia River. Therefore, site-specific groundwater cleanup levels are also considered surface water protection requirements. The procedures for developing cleanup levels for groundwater, surface water, and soil are outlined in the MTCA Cleanup Regulations, WAC Sections 173-340-720, -730, and -740, respectively. Included in these sections are the specific rules for evaluating cross-media protectiveness.

The Sediment Management Standards (SMS) regulations (Chapter 173-204 WAC) establish procedures to develop cleanup levels for sediment.

5.2.2 Surface Water Cleanup Levels and Points of Compliance

In accordance with WAC 173-340-730, surface water cleanup levels must be at least as stringent as the criteria established under WAC 173-201A, Section 304 of the Federal CWA, and the National Toxics Rule (40 Code of Federal Regulations [CFR] Part 131). In addition, for surface water resources that may potentially be used as a drinking water source, criteria set forth in WAC 173-340-720 of MTCA must also be considered. As discussed in the RI/FS (Anchor QEA 2015), free cyanide and fluoride have been detected in groundwater adjacent to locations where groundwater discharges into the CDID regional drainage ditches. Free cyanide and fluoride have not been detected above applicable screening levels in Columbia River surface water adjacent to the Site.

For free cyanide, numeric criteria are published in the state and federal regulations cited previously. These criteria are less than the state MCL (200 micrograms per liter [µg/L]) and are, therefore, also protective of drinking water resources. ~~There are no published state and federal surface water quality criteria for fluoride. The state and federal MCL for fluoride is 4 mg/L.~~

There are no published state and federal surface water quality criteria for fluoride. The surface water, at a minimum, must comply with the state and federal MCL for fluoride, which is 4 milligrams per liter (mg/L). Ecology has also set a narrative surface water cleanup level of no adverse effects on the protection and propagation of fish and aquatic life using supplemental porewater and contingent bioassay monitoring to make this demonstration. This supplemental monitoring is described in Appendix A.

The POC for surface water cleanup levels is the point or points at which hazardous substances are released to surface waters of the state (WAC 173-340-730[6]). The CDID regional drainage ditches convey water from various locations within the cities of Kelso and Longview to the Columbia River to prevent flooding of the area. The water contained within the ditches is considered surface water of the state. Although the CDID ditches themselves are not direct sources of drinking water, they are subject to the same surface water criteria as the river.

The POCs for surface water are in the CDID Ditch No. 14 and Columbia River water column adjacent to the Site. Table 5-1 summarizes the cleanup levels and POC for surface water.

Table 5-1 Surface Water Cleanup Standards

Chemical of Potential Concern	Surface Water Cleanup Level	Protection Basis	Point of Compliance
Fluoride (total)	4 mg/L	State Drinking Water MCL	Columbia River and CDID Ditch No. 14
	Narrative Standard	No adverse effects as described in the Narrative Standard	
Free Cyanide ~~(dissolved)~~	5.2 µg/L	WAC 173-201A	

Notes:
µg/L = microgram per liter
CDID = Consolidated Diking Improvement District
MCL = maximum contaminant level

mg/L = milligram per liter
WAC = Washington Administrative Code

5.2.3 Groundwater Cleanup Levels and Points of Compliance

Shallow water-bearing layers of the Upper Alluvium are not currently used for drinking water. The shallow water-bearing layers are isolated from the deeper production aquifer used for drinking water at the Site. The City of Longview confirmed that impacted groundwater at the Site will not impact the Mint Farm Wellfield installed in the deep aquifer due to the presence of the silt/clay confining layer and upward groundwater gradients (Kennedy/Jenks 2012).

However, consistent with MTCA, potential drinking water uses and surface water protection were considered in the initial development of groundwater cleanup levels. Because the Site has few groundwater contaminants, Method A was used to develop cleanup levels for the Site. Final cleanup levels were selected as the most stringent values from the following sources:

- Method A WAC 173-720-1 table values
- Federal Drinking Water Standards and Health Advisories (EPA 2002)
- State Primary Drinking Water Regulations (Chapter 246-290 WAC)

For Site locations where groundwater discharges to CDID drainage ditches, surface water criteria may also apply. ~~Since fluoride is the primary COC for groundwater, the surface water cleanup level established in the previous section is based on the MCL; therefore, no adjustment to the initial groundwater cleanup level was~~There are no published state or federal surface water quality criteria for fluoride, and therefore, no further adjustments from the MCL were necessary to protect surface water resources. The protectiveness of this cleanup level to aquatic receptors will be verified by supplemental porewater and contingent bioassay monitoring incorporated in the long-term compliance monitoring plan as described in Appendix A.

In accordance with WAC 173-340-720(7c), natural background groundwater concentrations were considered in developing the cleanup levels. For example, naturally occurring arsenic has been observed at concentrations above MTCA Method A values and MCLs: 5 µg/L and 10 µg/L, respectively. Data available from the

State Department of Health for Cowlitz County for the period 2001 to 2011 show an arsenic concentration range of up to 55 µg/L in groundwater. Per the guidelines in WAC 173-340-709(3), the 90th percentile of the background concentrations was calculated, and a screening level of 42 µg/L was established in Section 5.1 of the RI/FS. Site groundwater data were screened against this value, and no data were identified above the screening level; therefore, arsenic was not identified as a Site COC, and no cleanup level is established in this section.

Under MTCA, the standard POC for groundwater extends from the uppermost level of the saturated zone to the lowest depth that could be potentially affected by Site releases. For fluoride, Ecology has determined that it would not be practicable[3] to meet groundwater cleanup levels throughout the Site within a reasonable timeframe.

Because it is not practicable to meet the standard POC in groundwater for fluoride, compliance with the fluoride groundwater cleanup level ~~will~~must be measured at conditional POC monitoring points located downgradient from the respective source areas but prior to the property line or discharge to surface water, in accordance with WAC 173-340-720(8)(c). Where these monitoring points are located within the existing plumes and an extended timeframe (i.e., hundreds of years) is anticipated to comply with Site cleanup levels, groundwater remediation levels have been established along with contingency response measures to ensure protection of adjacent surface waters.

For all other constituents, compliance ~~will~~must be evaluated at wells located where remedial action occurs or adjacent to SUs. Table 5-2 summarizes the cleanup levels and POC for groundwater.

[3] Practicability is based on a determination that a more permanent cleanup action is not practicable based on the disproportionate cost analysis in WAC 173-340-360(3)(e) (see Section 7).

Table 5-2 Groundwater Cleanup Standards

Chemical of Potential Concern	Groundwater Cleanup Level	Protection Basis	Point of Compliance	Remediation Levels
Fluoride (total)	4 mg/L	State Drinking Water MCL	Conditional POC at property line and Groundwater-Ditch Boundary	Refer to Appendix A for discussion of remediation levels to be used as part of Compliance Monitoring and Contingency Response Plan
Free cyanide ~~(dissolved)~~	200 µg/L	State Drinking Water MCL	Wells adjacent to applicable SUs	Not applicable
cPAHs	0.1 µg/L	MTCA Method A Standard Value		
TPH Diesel Range	500 µg/L	MTCA Method A Standard Value		
TPH Oil Range	500 µg/L	MTCA Method A Standard Value		

Notes:
µg/L = microgram per liter
cPAH = carcinogenic polycyclic aromatic hydrocarbon
MCL = maximum contaminant level
mg/L = milligram per liter
MTCA = Model Toxics Control Act
POC = point of compliance
SU = site unit
TPH = total petroleum hydrocarbon

5.2.4 Soil Cleanup Levels and Points of Compliance

Soil cleanup levels for industrial uses were developed for fluoride, PAHs, TPH, and PCBs by considering the following potential exposure/risk pathways:

- Human health protection from direct soil contact
- Human health protection from soil-to-groundwater pathway exposure
- Human health protection from soil-to-air pathway exposure
- Terrestrial ecological protection

The final cleanup levels for Site soils are summarized in Table 5-3. Development of these cleanup levels is discussed below by pathway.

Table 5-3 Soil Cleanup Levels

Chemical of Potential Concern	Soil Cleanup Level	Protection Basis
Fluoride[1]	3,100 mg/kg[1]	Protection of Groundwater, Method C
PAHs[2]	18 mg/kg	Method C

Chemical of Potential Concern	Soil Cleanup Level	Protection Basis
PCBs	10 mg/kg	Method A[3]
TPH Diesel Range	2,000 mg/kg	Method A
TPH Heavy Oil Range	2,000 mg/kg	Method A
TPH Mineral Oil	4,000 mg/kg	Method A
HTM Oil	10,000 mg/kg	Protection of Groundwater[4]

Notes:
1 = Using Method C, 210,000 mg/kg is protective of human health for direct contact under industrial exposure scenarios (Federal Integrated Risk Information System database). However, this cleanup level was adjusted downward to protect groundwater. Excluding residual carbon or spent lime, Site media containing between 3,100 mg/kg and 210,000 mg/kg fluoride may be reused on site if it can be shown that groundwater will be protected. See Appendix D, *On-Site Media Management Plan*.
2 = Cleanup level developed for potentially carcinogenic PAHs based on the approved MTCA TEF procedure.
3 = This is a total value for all PCBs. This value may be used if the PCB contaminated soils are capped and the cap is maintained as required by 40 CFR 761.61. If this condition cannot be met, the value for unrestricted site use (1 mg/kg) must be used. High occupancy is assumed for the Site.
4 = As presented in Section 8.5.4 of the RI/FS, the soil to air pathway resulted in the most conservative cleanup level for HTM Oil. Therefore, 10,000 mg/kg is selected as the soil cleanup level.
HTM = heat transfer media
mg/kg = milligram per kilogram
MTCA = Model Toxics Control Act
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
TEF = Toxicity Equivalency Factor
TPH = total petroleum hydrocarbon

- **Direct Soil Contact Pathway Exposure:** The primary potential pathway for direct contact would occur during earthwork operations and other activities required for Site development. Accordingly, cleanup levels were initially derived using Method C WAC Equations 173-340-745-1, -745-2, and -745-3 for non-carcinogenic, carcinogenic, and petroleum COCs, respectively. No modifications were made to the standard parameters for these equations. However, because the TSCA regulation for PCBs lists more restrictive cleanup levels than those derived under Method C, the initial PCB cleanup level was adjusted downward from 66 to 10 mg/kg. This value is also consistent with the Method A concentration for Industrial Use scenarios.
- **Soil to Groundwater Pathway Exposure:** Cleanup levels must also consider the protection of groundwater resources. However, when empirical data indicates that current groundwater impacts are not occurring and sufficient time has elapsed for migration from source areas to the point of measurement to render that demonstration reliable, then cleanup levels derived for direct contact may not require adjustment.

- The PAH soil cleanup level was not adjusted downward for protection of groundwater resources. Based on groundwater monitoring data (Anchor QEA 2015, Section 5), carcinogenic PAH (cPAH) concentrations were observed below 0.1 µg/L (Method A groundwater cleanup level for cPAHs). Concentrations of PAHs in groundwater have been observed slightly above 0.1 µg/L in wells PZ-1 and PZ-4 at SU3 and in well G2-D in the East Groundwater Area; however, concentrations at SU3 have reduced significantly since 2006 when cPAH concentrations were observed up to 1 µg/L in some wells.

  The fluoride soil cleanup level was adjusted downward based on a predicted soil concentration derived using Equation 173-340-747-1. That equation (the standard three-phase partitioning model) is the approach used by Ecology to determine soil constituent concentrations protective of groundwater resources. This equation yields a calculated fluoride remediation level protective of groundwater 3,100 mg/kg based on 2006 lysimeter data and 2007 SPLP data collected from SU8 and SU5, and an average Kd of 39L/kg. Materials enriched with calcium may be protective of groundwater at higher concentrations. In accordance with Appendix D, materials exceeding 3,100 mg/kg may be reused on site outside of containment areas if testing indicates leaching characteristics that are protective of groundwater.

- **Soil-to-Air Pathway Exposure:** For COCs that readily evaporate (such as diesel and solvents), the inhalation of vapors from impacted soil must be considered. Under Method C, the vapor pathway must be evaluated whenever a volatile substance is expected on site. On this Site, diesel and oil range hydrocarbons are present; however, the pathway is considered incomplete whenever the TPH concentration is less than 10,000 mg/kg for diesel range constituents (see WAC 173-340-745(5)(b)(iii)(C)(II)). For TPH (diesel and oil range), the pathway is considered incomplete when the existing concentrations are approximate to the cleanup level derived for protection of groundwater resources. The maximum TPH concentrations in SU9 and SU10 are less than 10,000 mg/kg. TPH cleanup levels for the Site are protective of the soil-to-air pathway.

- **Terrestrial Ecological Protection:** The Terrestrial Ecological Evaluation (TEE) conducted as part of the RI/FS determined that a release of cyanide and fluoride is unlikely to pose a risk to terrestrial wildlife at the Site. Cyanide concentrations in all Site soil samples were below the calculated protective concentration. Section 8.5.4.4 of the RI/FS (Anchor QEA 2015) provides a summary and detailed evaluation of the site-specific TEE conducted using Ecology guidance (WAC 173-340-7493) and procedures provided via the TEE Interactive User's Guide (Ecology 2014). Therefore, soil cleanup levels were not further adjusted to protect terrestrial ecological resources.
- **Soil Point of Compliance:** The standard POC for direct contact with soils extends from the ground surface throughout the Site to 15 feet bgs (see WAC 173-340-740(6)(d)). As set forth in WAC 173-340-740(6)(f), for MTCA cleanup actions that involve containment of hazardous substances, soil cleanup levels will typically not be met at the standard POC in soils shallower than 15 feet bgs. In these cases, a cleanup action consisting of engineered caps is determined to comply with cleanup standards, provided that certain conditions are met. All of these conditions are met at the Site.

5.2.5 Sediment Cleanup Levels and Points of Compliance

SMS cleanup standards are developed based on protection of human health, higher trophic level species, and the benthic community.

Average concentrations in sediments at the Site are below the applicable risk-based threshold concentrations for all bioaccumulative chemicals (e.g., cPAHs and PCBs). Therefore, sediments are protective of human health at baseline conditions and cleanup standards were not developed for protection of human health. Similarly, cleanup standards were not developed for higher trophic level species because sediments are below applicable risk-based threshold concentrations at baseline conditions.

Cleanup standards were developed for the benthic community based on the chemical and biological (i.e., bioassay) criteria in WAC 173-204-563. WAC 173-204-563 provides two levels for potential use as cleanup standards for each contaminant: the Sediment Cleanup Objective (SCO) and the Cleanup Screening Level (CSL). The SCO

is set at a concentration at which no adverse effects have been shown to occur, including no acute or chronic adverse effects on biological resources. The CSL is a minor adverse effects level, which is the minimum level to be achieved in SMS cleanup actions. The more stringent SCO criteria were selected as cleanup levels for the Site. No exceedances of sediment cleanup levels were noted within the Site other than in SU12, which ~~is~~has been addressed as part of the cleanup. Sediment monitoring ~~will be~~was performed following cleanup of SU12 to document compliance of this area with SCO criteria.

The POC for sediment cleanup levels is the biologically active zone, which is the upper 10 cm of sediment.

5.3 Applicable, Relevant, and Appropriate Requirements

In addition to specific requirements of MTCA, the cleanup action must also comply with elements of other environmental ARARs and permits. WAC 173-340-710 provides that MTCA cleanup actions must comply with applicable state and federal laws. Though a cleanup action performed under formal MTCA authorities (e.g., an order or a decree) is exempt from the procedural requirements of most state and all local environmental laws, the action must comply with the substantive requirements of such laws (RCW 70.105D.090 and WAC 173-340-710). In addition, any applicable federal permits must be obtained.

Table 5-4 presents ARARs that were applied in the selection of chemical-specific cleanup levels at the Site. Table 5-5 presents action- or location-specific ARARs that apply depending on the selected remedial activities.

Table 5-4 Chemical-specific ARARs for Remedial Action at the Site

Act/Authority	Criteria/Issue	Citation	Brief Description
Public Water Supply Regulations	State Drinking Water Regulations	Chapters 43.20 and 70.119A RCW, Chapter 246-290 WAC	Establishes MCLs for drinking water.
Safe Drinking Water Act	National Primary Drinking Water Regulations	42 USC 300f, 40 CFR 141	Establishes MCLs for drinking water.
Surface Water Quality Standards	State Ambient Water Quality Criteria	Chapter 90.48 RCW, Chapter 173-201A WAC	Establishes water quality standards for protection of human health and for protection of aquatic life (for both acute and chronic exposure durations).
Clean Water Act/National Toxics Rule	Federal Ambient Water Quality Criteria	33 USC 1251, 40 CFR 131	Requires the establishment of guidelines and standards to control the discharge of pollutants to waters of the United States. Two kinds of water quality criteria are developed—one for protection of human health and one for protection of aquatic life. The federal recommended water quality criteria are published on EPA's website: http://water.epa.gov/scitech/swguidance/standards/criteria/current/index.cfm.
Sediment Management Standards	State Sediment Quality Criteria	Chapters 90.48 and 70.105D RCW, Chapter 173-204 WAC	Establishes numerical standards for the protection of benthic invertebrates in marine sediments. Ecology adopted amendments to the SMS rule on February 22, 2013, including freshwater SCOs protective of aquatic organisms. The new freshwater standards include chemical criteria and provisions for overriding the chemical criteria using bioassay tests. The amendments also establish methodology for assessing risks to human health. The revised SMS criteria became effective on September 1, 2013.

Notes:
ARAR = Applicable or Relevant and Appropriate Requirement
CFR = Code of Federal Regulations
Ecology = Washington State Department of Ecology
EPA = U.S. Environmental Protection Agency
MCL = maximum contaminant level
RCW = Revised Code of Washington
SCO = Sediment Cleanup Objective
SMS = Sediment Management Standards
USC = United States Code
WAC = Washington Administrative Code

Table 5-5 Action- or Location-specific ARARs for Remedial Action at the Site

Remedial Activity	Act/Authority	Criteria/Issue	Citation	Brief Description
Soil and/or Waste Excavation, Upland Filling and Disposal	Washington Water Pollution Control Act	Protects surface water; establishes mitigation policy for aquatic resources	Chapter 90.48 RCW, Chapter 173-201A WAC	Regulates construction activities in wetlands and surface waters, or for projects impacting water quality.
	Clean Water Act (§ 401 and 404)	Discharges of pollutants or placement of fill into navigable waters and wetlands	33 USC 1341 and 1344, 40 CFR Part 230	Regulates the placement of fill material in waters of the United States, including fill placement below ordinary high water elevation or within navigable waters or wetlands.
	NPDES	Discharge of pollutants to waters of the United States	40 CFR Part 122, Chapter 90.48 RCW, Chapter 173-226 WAC	Permitting system for discharging pollutants into waters of the United States.
	Washington Hazardous Waste Management Act	State equivalent of RCRA requirements for designating certain solid wastes as "dangerous waste"; governs and establishes regulations for hazardous waste TSDFs	Chapter 70.105 RCW, Chapter 173-303 WAC	Any dangerous waste generated at the Site must be managed in accordance with these regulations. See also WAC 173-340-710(9)(b).
	RCRA	Generation and transportation of hazardous waste and waste management activities at TSDFs; off-site land disposal considerations	42 USC 6921-22; 40 CFR Parts 260, 261, and 268; Chapter 70.105 RCW	See previous description—this is an authorized state program under the Washington Hazardous Waste Management Act.
	TSCA	Tracks industrial chemicals in the United States and regulates intrastate and interstate commerce	15 USC s/s 2601 et seq. [1976]	Regulates PCBs, asbestos, indoor radon gas, and lead-based paint.
	Washington Hydraulics Code	Protection of fish and aquatic resources	Chapters 75.20 and 77.55 RCW, Chapter 220-110 WAC	Exempt from procedural requirements of Chapter 75.20/77.55 under WAC 173-340-710(9)(b).
	SEPA	Consideration and analysis of environmental impacts of major proposed actions	Chapter 43.21C RCW, Chapter 197-11 WAC	Construction activities associated with implementing a MTCA CAP.

Remedial Activity	Act/Authority	Criteria/Issue	Citation	Brief Description
	Washington and Cowlitz County Shoreline Management Act	Requirements for developments within water areas of the state or within 200 feet of the shoreline	Chapter 90.58 RCW, Chapter 173-16 WAC	Exempt from procedural requirements under WAC 173-340-710(9)(b). Drainage ditches built to control flooding, to drain lands, and controlled by mechanical pumps are not "naturally occurring" streams and are not shorelines of the state.
Other Remedial Activities	National Historic Preservation Act	Protection of cultural or historic sites	30 CFR 800	In conjunction with the federal permitting process, the federal agency must consult with the State Historic Preservation Office and the federal Advisory Council on Historic Preservation to determine if the project would affect cultural or historic sites on, or eligible for, the National Register of Historic Places.
	State Historic Preservation Act	Protection of cultural or historic sites	Chapter 27, 34, 44, and 52 RCW	
	Endangered Species Act	Effects on listed endangered or threatened species	16 USC 1531 et seq., 50 CFR Part 17	Actions authorized, funded, or carried out by federal agencies may not jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their critical habitats.
	Federal Clean Air Act; Washington Clean Air Act; SWCAA	Protects air quality	42 USC §7401 et seq., Chapter 70.94 RCW, Chapter 173-400 WAC	Regulates air emission discharges, including fugitive dust.
	Minimum Standards for Construction and Maintenance of Wells	Water well construction	Chapter 18.104 RCW, Chapter 173-160 WAC	Establishes minimum standards for the construction and decommissioning of all wells in the state of Washington.

Notes:
ARAR = Applicable or Relevant and Appropriate Requirement
CAP = Cleanup Action Plan
CFR = Code of Federal Regulations
MTCA = Model Toxics Control Act
NEPA = National Environmental Policy Act
NPDES = National Pollutant Discharge Elimination System
PCB = polychlorinated biphenyl
RCRA = Resource Conservation and Recovery Act
RCW = Revised Code of Washington
SEPA = State Environmental Policy Act
SPL = spent potliner
SWCAA = Southwest Clean Air Agency
TSCA = Toxic Substances Control Act
TSDF = treatment, storage, and disposal facility
USC = United States Code
WAC = Washington Administrative Code

5.4 Permits and Substantive Requirements

This section identifies the permits or specific federal, state, or local requirements that Ecology has determined are applicable and that are known at this time. In performing the Cleanup Action under an Order or Consent Decree, MBT-Longview and Northwest Alloys are exempt from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 RCW and of any laws requiring or authorizing local government permits or approvals but must comply with the substantive requirements of such permits or approvals.

5.4.1 Applicable Permits and Requirements

Procurement of or compliance with the following permits and environmental reviews ~~will~~must be required:

- U.S. Army Corps of Engineers Nationwide Permit 6
- U.S. Army Corps of Engineers Nationwide Permit 38, including Associated Reviews and Consultations
- State Environmental Policy Act
- Compliance with NPDES Permit Requirements under NPDES Permit No. WA 000008-6

5.4.2 Permit Exemptions and Substantive Requirements

The cleanup action ~~will~~must comply with the substantive requirements of the following state and local regulations and other requirements, though the cleanup action is procedurally exempt from these permit requirements. Substantive requirements may be further identified in the EDR after Ecology review.

- Section 401 Water Quality Review, Ecology
- Hydraulics Project Approval, Washington Department of Fish and Wildlife
- Shoreline Management Act, RCW 90.58; Cowlitz County Shoreline Permit, Cowlitz County Code (CCC) 19.20
- Major Grading Permit; Cowlitz County Grading Ordinance, CCC 16.35
- Cowlitz County Stormwater Requirements, CCC 16.22
- Critical Areas Permit; Cowlitz County Critical Areas Ordinance, CCC 19.15

6 Description of Feasibility Study Alternatives

As part of the RI/FS and the development of this CAP, Ecology considered and evaluated a range of six alternatives against MTCA requirements. This section describes the other alternatives that were considered by Ecology.

In the RI/FS, these six alternatives were developed based on combinations of suitable cleanup technologies and evaluated for their applicability in addressing Site contamination, achieving remedial objectives, and meeting cleanup standards. The alternatives presented a full range of potential remediation options available for the Site and highlight tradeoffs associated with implementation of different remedial technologies, consistent with Ecology's expectations for cleanup actions.

The six alternatives were arranged based generally on increasing removal/disposal/ treatment volumes and costs. Table 6-1 provides a summary of the components used in each alternative.

Table 6-1 Summary of Upland Remedial Alternative Components

Remedial Alternative	Institutional Controls	Natural Attenuation	In Situ Treatment	Waste Consolidation	On-site Containment	Off-site Disposal
1	Yes	Yes	No	No	Yes	No
2	Yes	Yes	No	No	Yes	Yes
3	Yes	Yes	Yes	Yes	Yes	Yes
4	Yes	Yes	Yes	Yes	Yes	Yes
5	Yes	Yes	Yes	Yes	Yes	Yes
6	Yes	Yes	Yes	No	No	Yes

Table 6-2 provides a summary of the remedial work included in each alternative for each SU, along with the estimated remedial costs. All six of the cleanup alternatives ~~include~~incorporate sediment removal from SU12. In addition to the work described in the RI/FS, all six alternatives include the removal and off-site disposal of TPH-impacted soil (estimated volume 10 cy) from the localized area identified as SU13. The location of SU13 is shown in Figure 2-1.

Table 6-2
Summary of Feasibility Study Alternatives and Costs

Site Unit		Alternative 1		Alternative 2		Alternative 3	
West Groundwater Area							
	Groundwater					Install Permeable Reactive Barrier at SU2	$191,000
SU1	Landfill #2 (Industrial) (SW Corner)	No Further Action	$0	Enhance Existing Soil Cover (Hydroseed Surface)	$175,000	Enhance Existing Soil Cover (Hydroseed Surface)	$175,000
SU2	Fill Deposit B-3 (Residual Carbon) (SW Corner)	No Further Action	$0	Enhance Existing Soil Cover (Hydroseed Surface)	$1,017,000	Excavate and Consolidate Waste within SU2; Construct Soil Cover (Hydroseed Surface); Backfill Excavated Areas with Reactive Material and General Fill	$3,537,000
East Groundwater Area							
	Groundwater					Install Permeable Reactive Barrier at SU3	$547,000
SU3	Fill Deposit B-2 (Residual Carbon)	No Further Action	$0	Construct Soil Cover (Gravel Surface)	$523,000	Construct Soil Cover (Gravel Surface)	$523,000
SU4	Former Cryolite Plant Ditches	No Further Action	$0	Backfill Former Cryolite Ditch with General Fill; Construct Soil Cover (Gravel Surface); Place Residual Sand Cover in Angle and Railroad Ditches	$63,000	Backfill Former Cryolite Ditch with Reactive Material and General Fill; Construct Soil Cover (Gravel Surface); Place Residual Reactive Cover in Angle and Railroad Ditches	$93,000
SU5	Former Stockpile Area (SE Side of Site)	No Further Action	$0	Backfill Former SPL Ditch with General Fill; Enhance Existing Soil Cover (Gravel Surface)	$114,000	Backfill Former SPL Ditch with Reactive Material and General Fill; Enhance Existing Soil Cover (Gravel Surface)	$127,000
SU6	Fill Deposit B-1 (Residual Carbon) (East Side of Site)	No Further Action	$0	Enhance Existing Soil Cover (Hydroseed Surface)	$503,000	Enhance Existing Soil Cover (Hydroseed Surface)	$503,000
SU7	Fill Deposit A (Spent Lime) (East Side of Site)	No Further Action	$0	Enhance Existing Soil Cover (Hydroseed Surface)	$269,000	Incorporate SU10 Material; Construct Soil Cover (Hydroseed Surface)	$582,000
SU8	Landfill #1 (Floor Sweeps)	No Further Action	$0	Construct Existing Soil Cover (Hydroseed Surface)	$316,000	Construct Existing Soil Cover (Hydroseed Surface)	$316,000
Other Focus Areas							
SU9	Pitch Storage Area	No Further Action	$0	Excavate Pitch and Affected Soil and Dispose (Off-Site)	$50,000	Excavate Pitch and Affected Soil and Dispose (Off-Site)	$50,000
SU10	Landfill # 3 (Construction Debris)	No Further Action	$0	Construct Soil Cover (Hydroseed Surface)	$140,000	Excavate Waste and Affected Soil and Consolidate below SU7 Soil Cover; Backfill with General Fill (Hydroseed Surface)	$542,000
SU11	Flat Storage Area	No Further Action	$0	Excavate Affected Soil and Dispose (Off-Site)	$8,000	Excavate Affected Soil and Dispose (Off-Site)	$8,000
Construction Cost Subtotal			***$0***		***$3,178,000***		***$7,194,000***
OTHER CONTRACTOR COSTS							
	Construction Mob-Demob/ Site Controls/Survey		$0		$317,800		$719,400
	Tax		$0		$251,000		$568,000
	Subtotal				$569,000		$1,287,000
TOTAL CONSTRUCTION COSTS			***$0***		***$3,747,000***		***$8,481,000***
OTHER PROJECT COSTS							
	Institutional Controls		$20,000		$20,000		$20,000
	Engineering/Permitting		$0		$175,000		$396,000
	Construction Oversight and Management		$0		$350,000		$554,000
	Long-term Groundwater Monitoring		$840,000		$2,062,500		$2,062,500
	O&M for Soil Covers and Caps (30 years)		$0		$441,600		$367,200
	Subtotal		**$860,000**		**$3,049,000**		**$3,400,000**
UPLAND REMEDIATION TOTAL COST (EST)			$860,000		$6,800,000		$11,900,000
SEDIMENT REMEDIATION TOTAL COST (EST)			$693,000		$693,000		$693,000
ESTIMATED TOTAL COST			$1,553,000		$7,493,000		$12,593,000
(-30% Contingency)			$1,087,000		$5,245,000		$8,815,000
(+50% Contingency)			$2,330,000		$11,240,000		$18,890,000

Table 6-2
Summary of Feasibility Study Alternatives and Costs

Site Unit		Alternative 4		Alternative 5		Alternative 6	
West Groundwater Area							
	Groundwater	Install Permeable Reactive Barrier at SU2 and NW corner	$588,000	Install Permeable Reactive Barrier at SU2 and NW corner	$588,000	Install Permeable Reactive Barrier at NW corner	$382,000
SU1	Landfill #2 (Industrial) (SW Corner)	Construct Low Permeability Cap (Hydroseed Surface)	$623,000	Excavate Waste and Dispose (Off-Site); Construct Low Permeability Cap (Hydroseed Surface)	$4,199,000	Excavate Waste and Dispose (Off-Site)	$3,634,000
SU2	Fill Deposit B-3 (Residual Carbon) (SW Corner)	Excavate and Consolidate Waste within SU2; Construct Low Permeability Cap (Hydroseed Surface; Backfill Excavated Areas with Reactive Material and General Fill (Hydroseed Surface)	$4,460,000	Excavate and Consolidate Waste within SU2; Construct Low Permeability Cap (Hydroseed Surface); Backfill Excavated Areas with Reactive Material and General Fill (Hydroseed Surface)	$5,114,000	Excavate Waste and Dispose (Off-Site); Backfill Excavated Areas with Reactive Material and General Fill (Hydroseed Surface)	$61,481,000
East Groundwater Area							
	Groundwater			Install Permeable Reactive Barrier at SU6/7	$1,012,000		
SU3	Fill Deposit B-2 (Residual Carbon)	Excavate Waste and Affected Soil and Consolidate below SU6 Low-Permeability Cap; Backfill with Reactive Material and General Fill (Gravel Surface)	$2,055,000	Excavate Waste and Affected Soil and Dispose (Off-Site); Backfill with Reactive Material and General Fill (Gravel Surface)	$15,922,000	Excavate Waste and Affected Soil and Dispose (Off-Site); Backfill with Reactive Material and General Fill (Gravel Surface)	$15,922,000
SU4	Former Cryolite Plant Ditches	Backfill Former Cryolite Ditch with Reactive Material and General Fill; Place Residual Reactive Cover in Angle and Railroad Ditches	$70,000	Backfill Former Cryolite Ditch with Reactive Material and General Fill; Place Residual Reactive Cover in Angle and Railroad Ditches	$70,000	Backfill Former Cryolite Ditch with Reactive Material and General Fill; Place Residual Reactive Cover in Angle and Railroad Ditches	$70,000
SU5	Former Stockpile Area (SE Side of Site)	Excavate Affected Soil and Consolidate with SU6; Backfill with Reactive Material and General Fill (Gravel Surface)	$373,000	Excavate Affected Soil and Dispose (Off-Site); Backfill with Reactive Material and General Fill (Gravel Surface)	$702,000	Excavate Affected Soil and Dispose (Off-Site); Backfill with Reactive Material and General Fill (Gravel Surface)	$702,000
SU6	Fill Deposit B-1 (Residual Carbon) (East Side of Site)	Incorporate SU3 and SU5 Material; Construct Low Permeability Cap (Hydroseed Surface)	$1,785,000	Construct Low Permeability Cap (Hydroseed Surface)	$1,785,000	Excavate Waste and Affected Soil and Dispose (Off-Site); Resurface Excavation with Topsoil and Hydroseed	$82,164,000
SU7	Fill Deposit A (Spent Lime) (East Side of Site)	Incorporate SU8 and SU10 Material; Construct Low Permeability Cap (Hydroseed Surface)	$955,000	Construct Low Permeability Cap (Hydroseed Surface)	$955,000	Excavate Waste and Affected Soil and Dispose (Off-Site); Resurface Excavation with Topsoil and Hydroseed	$6,178,000
SU8	Landfill #1 (Floor Sweeps)	Excavate Waste and Affected Soil and Consolidate below SU7 Low-Permeability Cap; Resurface Excavation with Topsoil and Hydroseed	$779,000	Excavate Waste and Affected Soil and Dispose (Off-Site); Resurface Excavation with Topsoil and Hydroseed	$5,139,000	Excavate Waste and Affected Soil and Dispose (Off-Site); Resurface Excavation with Topsoil and Hydroseed	$5,139,000
Other Focus Areas							
SU9	Pitch Storage Area	Excavate Pitch and Affected Soil and Dispose (Off-Site)	$50,000	Excavate Pitch and Affected Soil and Dispose (Off-Site)	$50,000	Excavate Pitch and Affected Soil and Dispose (Off-Site)	$50,000
SU10	Landfill # 3 (Construction Debris)	Excavate Waste and Affected Soil and Consolidate below SU7 Soil Cover; Backfill with General Fill (Hydroseed Surface)	$547,000	Excavate Waste and Affected Soil and Dispose (Off-Site); Backfill with General Fill (Hydroseed Surface)	$1,308,000	Excavate Waste and Affected Soil and Dispose (Off-Site); Backfill with General Fill (Hydroseed Surface)	$1,308,000
SU11	Flat Storage Area	Excavate Affected Soil and Dispose (Off-Site)	$8,000	Excavate Affected Soil and Dispose (Off-Site)	$8,000	Excavate Affected Soil and Dispose (Off-Site)	$8,000
Construction Cost Subtotal			***$12,293,000***		***$36,852,000***		***$177,038,000***
OTHER CONTRACTOR COSTS							
	Construction Mob-Demob/ Site Controls/Survey		$1,229,300		$3,685,100		$17,703,783
	Tax		$971,000		$2,911,000		$13,986,000
	Subtotal		$2,200,000		$6,596,000		$31,690,000
TOTAL CONSTRUCTION COSTS			***$14,493,000***		***$43,447,000***		***$208,727,833***
OTHER PROJECT COSTS							
	Institutional Controls		$20,000		$20,000		$20,000
	Engineering/Permitting		$676,000		$2,027,000		$9,737,000
	Construction Oversight and Management		$947,000		$2,027,000		$9,737,000
	Long-term Groundwater Monitoring		$1,362,500		$1,362,500		$687,500
	O&M for Soil Covers and Caps (30 years)		$281,500		$291,700		$0
	Subtotal		**$3,287,000**		**$5,728,000**		**$20,182,000**
UPLAND REMEDIATION TOTAL COST (EST)			$17,800,000		$49,200,000		$228,900,000
SEDIMENT REMEDIATION TOTAL COST (EST)			$693,000		$693,000		$693,000
ESTIMATED TOTAL COST			$18,493,000		$49,893,000		$229,593,000
(-30% Contingency)			$12,945,000		$34,925,000		$160,715,000
(+50% Contingency)			$27,740,000		$74,840,000		$344,390,000

Notes:

1. Costs exclude consultant labor associated with developing the RI/FS and Consent Decree negotiations.
2. Costs are based on RS Means Heavy Construction Cost Data 2012 and vendor quotes from 2011-2013; costs shown in table were updated to 2013 by assuming an annual 3% increase.
3. Cost for the PRB for SU7 is incorporated into the SU6 cost.

The following compares the differences among the six remedial alternatives as considered by Ecology:

- **Alternative 1 – Institutional Controls and Natural Attenuation.** Alternative 1 was a baseline developed for an evaluation of existing Site conditions and comparison only. Under this alternative, no additional removal or containment of waste and impacted soil (beyond current activities required by the existing regulatory orders) would be performed. An environmental covenant or other institutional control would be recorded to limit consumption of Site groundwater as drinking water and activities potentially encountering or disturbing hazardous materials (exposure to contaminated soil). Long-term monitoring would be conducted to verify natural attenuation and stability of groundwater conditions, as well as to verify continued protection of surface water resources at the points of compliance.
- **Alternative 2 – Localized Removal and Off-site Disposal, Soil Capping, Natural Attenuation, and Institutional Controls.** Alternative 2 emphasized use of physical barriers to prevent direct contact with affected media, specifically remaining fill deposit and landfill materials and soils and groundwater with elevated COC concentrations. Containment technologies would be used to achieve compliance with cleanup levels at the Site, including placement of soil cover over areas of concern and backfilling select on-site ditches that intercept groundwater. Upland soil covers would be constructed in most impacted areas. For SUs where small volumes of material with COCs exceeding cleanup levels are present, specifically SU9 and SU11, the material would be removed from the Site and disposed of at an approved off-site disposal facility. An environmental covenant would be recorded to limit consumption of Site groundwater as drinking water, the disturbance of soil covers, and activities potentially encountering or disturbing hazardous materials. Long-term monitoring would be performed to verify natural attenuation and stability of groundwater conditions, as well as to verify continued protection of surface water resources at the points of compliance.
- **Alternative 3 – Localized Removal and Off-site Disposal, Excavation and Consolidation, Groundwater Treatment, Soil Capping, Natural Attenuation, and Institutional Controls.** Alternative 3 included all of remedial technologies identified for Alternative 2 with the addition of focused excavation and on-site

consolidation of SU2 and SU10, the construction of two PRBs, and the upgrade to reactive backfill within select SUs. The consolidation of fill deposit and landfill materials would remove materials located on the riverward side of the CDID levee and would increase the areas of the Site that would comply with the standard soil POC. An environmental covenant would be recorded as described for Alternative 2. Long-term monitoring would be conducted to verify remedy effectiveness, natural attenuation and stability of groundwater conditions, as well as to verify continued protection of surface water resources at the points of compliance.

- **Alternative 4 – Localized Removal and Off-site Disposal, Excavation and Consolidation, Groundwater Treatment, Low-permeability Capping, Natural Attenuation, and Institutional Controls.** Alternative 4 includes all of the remedial technologies identified for Alternative 3, but groundwater areas would be further addressed by additional treatment measures. Additional areas of affected soil and waste would be managed by excavation, disposal, backfilling, and on-site consolidation. Areas of remaining or consolidated wastes would be capped with a low-permeability cap to reduce infiltration and further isolate affected media. The final design and performance of the low permeability caps would be based on a process similar to that used to quantitatively evaluate relative performance of different caps in the RI/FS, and presented in the EDR. An environmental covenant would be recorded as described for Alternative 2. Long-term monitoring would be conducted to verify remedy effectiveness, natural attenuation and stability of groundwater conditions, as well as to verify continued protection of surface water resources at the points of compliance.
- **Alternative 5 – Expanded Removal and Off-site Disposal, Excavation and Consolidation, Groundwater Treatment, Low-permeability Capping, Natural Attenuation, and Institutional Controls.** Alternative 5 included all of remedial technologies identified for Alternative 4, but with expanded groundwater treatment and significantly expanded removal and off-site disposal of source areas. An environmental covenant would be recorded as described for Alternative 2. Long-term monitoring would be conducted to verify remedy effectiveness, natural attenuation and stability of groundwater conditions, as well as to verify continued protection of surface water resources at the points of compliance.

- **Alternative 6 – Aggressive Removal and Off-site Disposal, Natural Attenuation, and Institutional Controls.** Alternative 6 consisted of the removal of affected soils, fill deposit, and landfill materials to achieve cleanup levels as well as groundwater treatment measures in an effort to reduce the restoration timeframe. The goal of this alternative was to minimize the restrictions and institutional controls necessary at the Site by removing and disposing of known residual materials off site. An environmental covenant would be recorded as described for Alternative 2. Long-term monitoring would be conducted to verify remedy effectiveness, natural attenuation and stability of groundwater conditions, as well as to verify continued protection of surface water resources at the points of compliance.

7 Evaluation of Remedial Alternatives

This section summarizes the comparative evaluation of the six remedial alternatives described in Section 6 and evaluated by Ecology. MTCA identifies specific criteria against which alternatives are to be evaluated and categorizes them as either "threshold" or "other" requirements. All cleanup actions must at a minimum meet the threshold requirements. The other MTCA requirements are considered when selecting from among the alternatives that fulfill the threshold requirements.

7.1 Minimum Requirements for Cleanup Actions

WAC 173-340-360(2) defines the minimum requirements that all remedial alternatives must achieve in order to be selected as a final cleanup action at a site. This section provides an overview of these regulatory criteria.

7.1.1 Threshold Requirements

The MTCA threshold requirements for a selected cleanup action are as follows:

- Protect human health and the environment
- Comply with cleanup standards (established in Section 5.2)
- Comply with applicable state and federal laws (identified in Section 5.3)
- Provide for compliance monitoring

The overall protectiveness that a cleanup alternative provides depends on its ability to meet cleanup standards for Site COCs. Cleanup standards include a cleanup level and a location (i.e., POC) where compliance with the cleanup level must be achieved.

7.1.2 Other Model Toxics Control Act Requirements

Other requirements for evaluating remedial alternatives for the selection of a cleanup action include the following:

- Use of permanent solutions to the maximum extent practicable (WAC 173-340-360(3)). MTCA specifies that when selecting a cleanup action, preference shall be given to actions that are "permanent solutions to the maximum extent practicable." The regulations specify the manner in which this analysis of permanence is to be conducted. Specifically, the regulations require that the

costs and benefits of each of the project alternatives be balanced using a disproportionate cost analysis (DCA).

- Provide for a reasonable restoration timeframe (WAC 173-340-360(4)). MTCA places a preference on those alternatives that, while equivalent in other respects, achieve cleanup levels at the POCs established for the Site in a shorter period of time. MTCA includes a summary of factors that can be considered in evaluating whether a cleanup action provides for a reasonable restoration timeframe.
- Consider public concerns (WAC 173-340-360). Ecology considers public concerns by making draft copies of RI/FS and remedial decision documents available for review and comment and by evaluating and responding to comments received on the remedial alternatives.

7.2 Alternatives Evaluation

This section provides a qualitative evaluation of each alternative with respect to the seven MTCA criteria included in WAC 173-340-360(3)(e) as part of the DCA procedures. Alternatives were then compared to each other with respect to the criteria to determine which alternative would implement the most practicable permanent solution for the Site. A reasonable restoration timeframe evaluation was then performed considering the factors in WAC 173-340-360(4)(b). Table 7-1 provides a summary of the DCA.

7.2.1 Protectiveness

Protectiveness is defined as the degree to which human health and the environment are protected by a given alternative. This includes: the extent of risk reduction; the length of time required to meet cleanup standards at the Site; risks, both on- and off-site, that would occur from implementing the alternative; and the overall improvement of environmental quality.

With the exception of Alternative 1, all of the alternatives provide adequate degrees of protectiveness by preventing direct contact with waste materials and including varying degrees of treatment for affected groundwater. The discussion presented in Table 7-1 provides numeric values for each alternative that are intended to be relative to the other

alternatives, and are based on the degree of overall protectiveness of the proposed technologies associated with each alternative.

7.2.2 Permanence

The permanence of a cleanup action is measured by the degree to which it permanently reduces the toxicity, mobility, or volume of hazardous substances. For example, treatment actions that destroy contaminants (thereby reducing toxicity, mobility, and volume) are considered under MTCA to be more permanent than containment or removal actions (which only reduce the mobility).

The toxicity and volume of contaminants is not changed by either on-site of off-site containment. However, both on-site and off-site containment reduce the mobility of the contaminants by providing barriers that reduce infiltration and leaching. The more robust the containment system, the more the mobility is reduced. Alternatives providing groundwater treatment with PRBs reduce the mobility of Site contaminants by enhancing precipitation and adsorption onto Site soils. To evaluate the relative permanence of these alternatives, a comparative analysis of the degree of permanence of the remedial alternatives over the short term is presented in Table 7-1.

Table 7-1
Summary of Remedial Alternative Disproportionate Cost Analysis

Remedial Alternative[1]	Protectiveness (25%)[2]	Permanence (20%)	Long-Term Effectiveness (20%)
	Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and off-site risks resulting from implementing the alternative, and improvement of the overall environmental quality.	*The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and quantity of treatment residuals generated.*	*Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes. The following types of cleanup action components may be used as a guide, in descending order, when assessing the relative degree of long-term effectiveness: reuse or recycling; destruction or detoxification; immobilization or solidification; on-site or off-site disposal in an engineered, lined and monitored facility; on-site isolation or containment with attendant engineering controls; and institutional controls and monitoring.*
Alternative 1	This alternative provides no significant increase in protectiveness of either human health or the environment from baseline conditions; however, natural attenuation has been demonstrated to control off-site risks. Restoration timeframe for groundwater is expected to be greater than 100 years. 2	This alternative does not enhance the natural attenuation processes that are occurring at the site, although the process does effectively control off-site migration and reduce toxicity of contaminants. No soil or waste removal is included under this alternative; therefore, no volume reduction would occur. 2	This alternative relies on natural attenuation to reduce COC concentrations below cleanup levels. The reliability of this as an action plan is moderately high given the observed trends in groundwater concentrations across the site. This alternative, however, relies on existing soil cover and institutional controls to address direct contact with waste materials. 2
Alternative 2	Similar protectiveness to Alternative 1; however, enhancements to existing soil covers increase the overall protectiveness of the alternative. 5	Alternative 2 provides a marginal increase in permanence in comparison to Alternative 1 through the removal of 395 cy of impacted soil and waste. 4	Given the natural attenuation processes at the site and the removal of fill deposit and landfill materials from direct contact by soil cover, this alternative scores relatively high on the long-term effectiveness. The potential for erosional or other natural forces that would degrade the cover is the greatest threat to effective long-term management of materials on-site under this scenario. 5
Alternative 3	On-site risks are reduced with the use of reactive backfill materials to treat groundwater in situ resulting in potential reduction in the time required to achieve groundwater cleanup levels at the standard POC. Source control and natural attenuation is enhanced by treatment PRBs. 6	This alternative uses active solutions to reduce contaminant mobility and reduce contaminant toxicity. Groundwater treatment is used to reduce contaminants. Contaminant mobility is reduced by consolidating impacted soil, fill deposit and landfill materials to reduce the footprint in which rainwater can infiltrate. 6	Effectively, Alterative 3 is similar to the previous alternative, in that fill deposits and landfills will be managed by soil cover. The added groundwater treatment of this alternative will increase its overall effectiveness at containing affected groundwater. The treatment technology is relatively low-tech, and as such, its reliability over the long term should not be a source of concern. This will lead to detoxification of groundwater migrating towards surface water from the two focused zones of treatment. 6.5
Alternative 4	Greater protectiveness than Alternative 3. All material contained on site would be isolated using low-permeability caps which is not expected to significantly reduce the groundwater restoration timeframe at standard POC in comparison to Alternative 3, but provides an added level of protection to surface water (the Columbia River). 7.5	Additional groundwater treatment options are added, as well as increased consolidation of fill deposit and landfill material and off-site disposal in comparison to Alternative 3. The inclusion of low-permeability capping as part of this alternative reduces the contaminant mobility. 8	The reliability of this alternative to effectively address site contaminants in the long term is incrementally greater than the previous alternative. This is due to the increased removal of source material (both off-site and consolidated on-site) and additional groundwater treatment (PRB in the northwest corner of the West Groundwater Area). The reduction in infiltration associated with the upgrade to low permeability caps offers greater protection against migration of fluoride toward the Columbia River. As such, this score reflects this additional environmental benefit. 7.5
Alternative 5	No incremental benefit is achieve with respect to reducing on-site risks in comparison to Alternative 4. Approximately 134,000 cy of impacted soil, fill deposit and landfill materials would be disposed of off site, which could increase potential off-site risks during transport. 8	Similar level of permanence as Alternative 4 with respect to mobility and toxicity. This alternative expands groundwater treatment aspects with the addition of a PRB in the East Cryolite Area. Although volume reduction is increased, material removed from the site is not treated, so toxicity would not decrease. 8	Again, the reliability of this alternative to effectively address site contaminants in the long term is incrementally greater than the previous alternative. This is due to the additional increased removal and disposal of source material off-site and the additional groundwater treatment. Therefore, this score reflects the additional environmental benefit. 8
Alternative 6	With respect to on-site risk, this alternative removes the most contaminant mass from the site which would result in the shortest restoration timeframe for soil and groundwater at standard POCs. However, the excavation and transport of approximately 587,000 cy would likely pose a temporary off-site risk during construction. 9	With respect to on-site hazardous substances toxicity, mobility, and volume, this alternative provides the greatest benefits within the shortest timeframe in comparison to the other alternatives. This is due to the overall removal of known site contaminants and the treatment associated with backfilling with reactive agent. The alternative has the potential to generate significant releases during construction. 9	This alternative includes more of the higher ranking cleanup action components as listed in the column heading above in comparison to the other alternatives because of the removal of known source material from the site. Therefore, this alternative ranks most preferred for this category. 9

Table 7-1
Summary of Remedial Alternative Disproportionate Cost Analysis

Remedial Alternative[1]	Short-Term Risk Management (15%)	Technical and Administrative Implementability (10%)	Public Concerns (10%)	Environmental Benefit Score[3]	Probable Cost[4]
	The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks.	*Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary off-site facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions.*	*Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.*		
Alternative 1	This alternative results in the least disturbance of contaminants and accordingly poses the least short-term risk; therefore, the alternative meets the criteria to the highest degree. 10	This alternative is the most technically and administratively implementable alternative and consists of remedial action components that are regularly implemented at cleanup sites. 10	A low score is assigned to this alternative to reflect lack of support for the lower level of overall protectiveness, and lack of groundwater treatment, consolidation and off-site disposal relative to other alternatives. 1	3.9	$2.3M
Alternative 2	Minimal disturbance of site contaminants will occur as a result of this alternative. Minor grading will occur and any potential disturbances can be mitigated with standard erosion control best management practices. 9	This alternative is a technically and administratively implementable alternative and consists of remedial action components that are regularly implemented at cleanup sites. However, it is more complex than Alternative 1 and was assigned a lower score. 9	A low score is assigned to this alternative to reflect lack of support for the lower level of overall protectiveness, and lack of groundwater treatment, consolidation and off-site disposal relative to other alternatives. 1	5.4	$11.2M
Alternative 3	This alternative has slightly elevated risks associated with construction due to the consolidation of soils and the associated transport. Given the relatively low toxicity of the source material and the short distances of travel between SUs the risks are not expected to be significant and can be easily mitigated with standard construction soil tracking and erosion control best management practices. 8	Similar to Alternative 2, this alternative consists of remedial action components that are regularly implemented at cleanup sites. It is likely that a bench scale study would be required to verify the backfill composition of the full-scale groundwater treatment portion of this alternative. This, along with the additional scope and complexity of material management of the individual SUs, is slightly elevated relative, and as such, the value assigned to it is lower. 8.5	Relative to Alternatives 1 and 2, Alternative 3 includes elements for which commenters expressed support: groundwater treatment, consolidation and off-site disposal. However, the relatively low score reflects lesser use of groundwater treatment, consolidation and off-site disposal relative to Alternatives 4, 5 and 6. 2	6.3	$18.9M
Alternative 4	This alternative has slightly elevated risks relative to Alternative 3, but overall potential risks to human health the environment as a result of construction and implementation are still not substantial. Again, risks associated with construction would result from consolidation or off-site disposal of soils and the associated transport. It assumed that the risks could be easily mitigated with standard construction soil tracking and erosion control best management practices. 7.5	This alternative consists of similar remedial action components as the previous alternative and has a similar scale of complexity and scope. However, because more material is removed by this alternative, schedule and logistical considerations are increased, along with the potential for impacts to current operations. 8	Multiple commenters expressed support for Alternative 4 due to the overall protectiveness of the remedy, the reduction of the footprint of the site requiring engineering controls over Alternative 3 and the balance of cost to benefits for the alternative. 5	7.4	$27.7M
Alternative 5	This alternative has slightly elevated risks relative to the previous alternatives, but overall potential risks to human health the environment as a result of construction and implementation are still not substantial. With a greater volume of material transported off-site, this alternative warranted a lower valuation. 6	This alternative consists of similar remedial action components as the previous two alternatives and has a similar scale of complexity and scope, with the exception that a greater volume of soil will be excavated and disposed of off-site. Increased impacts to operations in comparison to Alternative 4 are expected. 7	This alternative includes removal of more contaminated material from the site than Alternatives 1, 2, 3 or 4, lessening concerns regarding potential impacts to site redevelopment associated with containment features. This also helps reduce concerns about natural disasters compromising the containment features. 7	7.5	$75M
Alternative 6	This alternative has the greatest risks to human health and the environment relative to the other alternatives due to the largest volume of material to be excavated and transported off-site. In addition, groundwater treatment (primarily backfill with reactive agent) will be the most wide spread under this alternative. As such, the assigned value is lower than the previous alternatives. 4	This alternative relies on excavating and hauling source material off-site and as such, is a relatively simple alternative. However, the greatest schedule and logistical challenges exist for this alternative to minimize impacts to current operations. This alternative would also require several months to construct. 5	This alternative results in the least amount of contaminated materials remaining on-site and addresses concerns regarding the long-term integrity of containment features and their potential impacts to site redevelopment. 9	7.9	$344M

Notes:

1. Consideration of public concerns is not addressed in this table because the public has not yet had an opportunity to provide comments.
2. Each of the DCA criteria listed were weighted, so the overall DCA score would be influenced by criteria directly relating to protectiveness and effectiveness. A score of 10 represents an alternative that satisfies the criteria to the highest degree.
3. Although allowed, costs were not considered in the environmental benefit scoring.
4. Probable cost reflects the total estimated cost + 50% contingency (Table 10-3).

COC = chemical of concern
cy = cubic yards
POC = point of compliance

7.2.3 Effectiveness over the Long Term

Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the restoration timeframe, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage remaining hazardous substances.

Fate and transport modeling demonstrates that suitable conditions exist on site to prevent migration of fluoride in groundwater for the long term. Each of the alternatives would use relatively low-tech solutions and require only basic monitoring and maintenance to be effective, so the degree of certainty and reliability of the alternatives is relatively constant. The rankings in Table 7-1 reflect the discussion above.

7.2.4 Management of Short-term Risks

Short-term risks consider the degree to which human health and the environment are protected during construction and implementation of an alternative.

Given the moderate toxicity of waste material at the Site, short-term risks are relatively minimal for all of the alternatives. Standard best management practices are expected to be implemented to manage potential risks to human health and the environment. Alternatives with increased excavation have higher short-term risks, due to handling and disposal concerns and the risks associated with high volumes of off-site truck traffic. As with the other criteria, the values presented in Table 7-1 are intended to be relative to the other alternatives.

7.2.5 Technical and Administrative Implementability

Evaluating an alternative's technical and administrative implementability includes consideration of the following:

- Whether the alternative is technically possible
- Availability of necessary facilities, services, and materials
- Administrative and regulatory requirements
- Scheduling

- Size and complexity of the alternative
- Monitoring requirements
- Access for construction and monitoring
- Integration of existing operations with the remedial action

In general, all of the alternatives use technologies that are commonly applied as part of remedial actions and, hence, the benefit values shown in Table 7-1 are relative to the other alternatives. The general complexity is the most variable factor and the values presented have less to do with the remaining considerations because all of the remaining considerations are relatively constant between the alternatives.

7.2.6 Consideration of Public Concerns

The draft RI/FS was made available for public review and comment during June and July 2014. The concerns expressed by the public and the degree to which each alternative addresses those concerns were evaluated based on the public comments received during the public comment period. The MTCA evaluation was modified in the RI/FS (Anchor QEA 2015) to reflect public input received.

The "public concerns" ratings included within the DCA and presented in Table 7-1 reflect comments received during the public review of the RI/FS. Public concern rankings in the DCA provide a summary of these community concerns based on public comments received on the RI/FS.

7.2.7 Cost

Estimated costs for each remedial alternative are summarized in Table 6-2 and Table 7-1. Details regarding the assumptions and methodology used to develop the cost estimate were provided in the RI/FS (Anchor QEA 2015, Appendix L). Cost estimates include design, construction oversight, capital costs, and long-term operation and maintenance costs but do not include past costs to develop the RI/FS, Ecology oversight costs, or legal costs. The costs presented reflect FS-level design estimates and are presented with a range of uncertainty (+50/-30 percent).

7.2.8 Provision for a Reasonable Restoration Timeframe

The restoration timeframe analysis can consist of qualitative and relative estimates of the restoration timeframe for each alternative. Under MTCA, evaluation of a reasonable restoration timeframe considers the following factors:

- Potential risks posed by the site to human health and the environment
- Practicability of achieving a shorter restoration time-frame
- Current use of the site, surrounding areas, and associated resources that are, or maybe, affected by releases from the site
- Potential future use of the site, surrounding areas, and associated resources that are, or may be, affected by releases from the site
- Availability of alternative water supplies
- Likely effectiveness and reliability of institutional controls
- Ability to control and monitor migration of hazardous substances from the site
- Toxicity of the hazardous substances at the site
- Natural processes that reduce concentrations of hazardous substances and have been documented to occur at the site or under similar site conditions

Under all alternatives, groundwater and surface water cleanup standards are currently met within ditch and surface waters of the Columbia River. Therefore, the restoration timeframe to protect ecological receptors is immediate. The alternatives, with the exception of Alternative 1, achieve soil cleanup standards immediately after construction of engineering controls (e.g., soil covers) and implementation of institutional controls (e.g., deed restriction regarding disturbance of soil and groundwater). All alternatives will include long-term management of groundwater quality within the Site in a manner protective of groundwater and surface water resources and meet groundwater cleanup levels at locations within the property where a conditional POC could be established. Where these conditional POC are located within the existing plumes and an extended timeframe is anticipated to comply with Site cleanup levels, remediation levels have been established along with contingency response measures to ensure protection of adjacent surface waters.

None of the alternatives is expected to meet the standard POC for groundwater in a relatively short restoration time-frame (i.e., potentially not for hundreds of years)

because solid media impacting the entire groundwater plume would have to be excavated to the depth of the deepest wells with fluoride concentrations exceeding the cleanup level, which is not practicable.

7.3 Basis for Alternative 4 Selection

Using the criteria in MTCA, Alternative 4 is selected by Ecology as the cleanup action for the Site because it is permanent to the maximum extent practicable. This alternative blends a number of remedial technologies, including removal, consolidation, capping, groundwater treatment, and monitored natural attenuation, resulting in a cost-effective approach for addressing Site COCs. Alternatives 5 and 6 are much more costly and provide little or no incremental benefits in comparison to Alternative 4.

Table 7-1 provides a summary of the qualitative DCA criteria evaluation for each alternative discussed in the preceding section. It also provides a numeric rating of the environmental benefits provided by each alternative, with 10 representing an alternative that satisfies the criteria to the highest degree and 0 representing the least. The final environmental benefit score is then compared to the estimated cost of each alternative to determine which alternative provides the incrementally greatest degree of environmental benefit while considering the most cost-effective use of technology—that is, which alternative uses permanent solutions to the maximum extent practicable.

Figure 7-1 provides a graphic summary of the DCA and compares environmental benefits and costs for each alternative. Environmental benefits ranged from 3.9 (Alternative 1) to 7.9 (Alternative 6). In general, the greatest environmental benefits were associated with higher cost alternatives. However, the breakpoint at which incremental costs begin to outweigh incremental environmental benefits is illustrated in Figure 7-1.

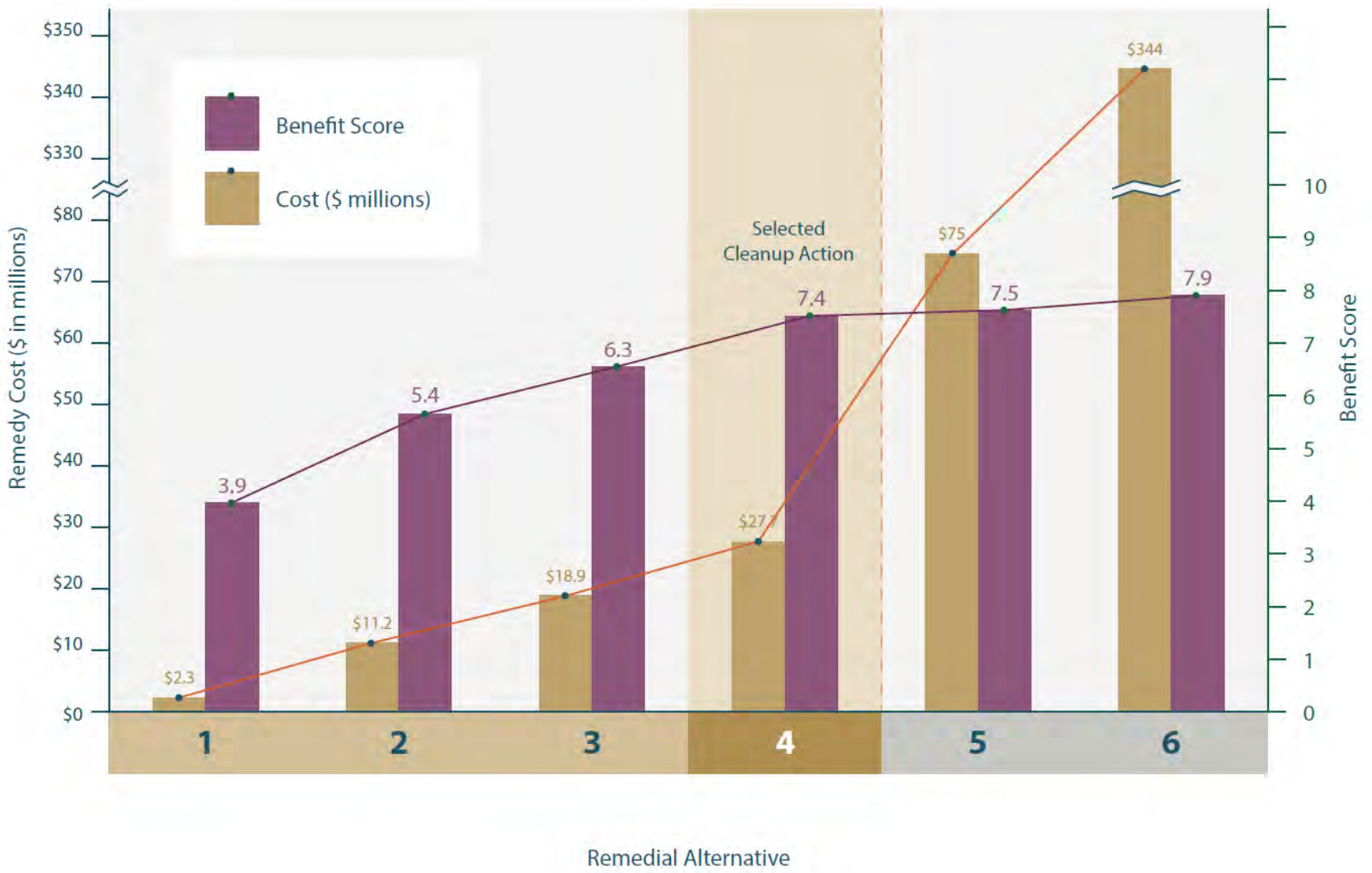


Figure 7-1
Summary of MTCA Disproportionate Cost Analysis
Cleanup Action Plan
Former Reynolds Metals Reduction Plant – Longview

DEPARTMENT OF ECOLOGY
State of Washington

A "plateau" in the benefits line graph is evident beginning with Alternative 4, indicating that incremental costs associated with Alternatives 5 and 6 are disproportionate, given the lack of increased benefits over Alternative 4. The chart also indicates the rate at which costs increase among alternatives. The point at which additional costs begin to outweigh additional benefits can be estimated as the point where the cost line graph becomes steeper and while the benefit line levels off. While Alternative 3 has a relatively high benefit score, offers a high degree of protection, and is cost-effective, Ecology selected a more permanent alternative. Alternative 4 is more permanent, provides additional source control, and reduces infiltration in capped areas. Ecology concluded that the additional benefits and costs associated with Alternative 4 over Alternative 3 are not disproportionate, and Ecology has determined that Alternative 4 meets the definition of *"permanent to the maximum extent practicable,"* per WAC 173-340-360(3)(e).

In addition, Ecology has determined that Alternative 4 complies with ARARs (see Section 5), complies with requirements for use of a conditional POC, and meets Ecology's expectations for cleanup actions and for groundwater cleanups.

- **Consistency with Capping ARARs.** Based on the evaluations performed in the RI/FS as approved by Ecology, the low permeability caps to be constructed as part of the remedial action comply with ARARS.
- **Conditional Point of Compliance for Groundwater.** Alternative 4 meets MTCA requirements for use of a conditional POC for groundwater (WAC 173-340-720(8)(c)). All evaluated alternatives have comparable restoration timeframes given the site-specific fate and transport properties of fluoride (i.e., the limited solubility of fluorite that has precipitated in groundwater beneath source areas). Alternative 4 includes all practical methods of treatment.
- **Ecology's Cleanup Expectations.** Alternative 4 complies with cleanup action expectations as defined in WAC 173-340-370 and Ecology requirements for groundwater cleanups as described in WAC 173-340-360(2)(c)(ii).

8 References

Anchor (Anchor Environmental, L.L.C.), 2003. *Voluntary Cleanup Report – Underground Gasoline Tank – Former Reynolds Longview Cable Plant*. Prepared for Washington Department of Ecology. January 2003.

Anchor, 2007a. *Remedial Investigation Work Plan: Chinook Ventures, Inc*. Prepared for Washington State Department of Ecology. June 2007.

Anchor, 2007b. *Remedial Investigation Report: Chinook Ventures, Inc. and Northwest Alloys, Inc*. Prepared for Washington State Department of Ecology. June 2007.

Anchor QEA (Anchor QEA, LLC), 2011. *Closed Black Mud Pond Cover Maintenance Plan – AO 8027, Condition 5*. Prepared for Washington State Department of Ecology on behalf of Millennium Bulk Terminals – Longview, LLC. August 2011.

Anchor QEA, 2015. *Former Reynolds Metals Reduction Plant - Longview, Remedial Investigation and Feasibility Study Report*. Prepared for Northwest Alloys, Inc., and Millennium Bulk Terminals – Longview, LLC. January 2015.

Anchor QEA, 2017. *Former Reynolds Metals Reduction Plant Sediment Interim Action Completion Report*. Prepared for Northwest Alloys, Inc., and Millennium Bulk Terminals – Longview, LLC. August 2017.

Ecology, 1986. Memorandum: Reynolds PCB Cleanup. Attachment: Letter to Tom Dickey, Reynolds Metals Company, dated February 20, 1986. February 14, 1986.

Ecology, 2007. Model Toxics Control Act Statute and Regulation. Toxics Cleanup Program. Chapter 70.105 D and Chapter 173-340 WAC. November, 2007.

Ecology, 2012. Agreed Order No. DE 8940. Issued to Northwest Alloys, Inc., and Millennium Bulk Terminals – Longview, LLC. February 2012

Ecology, 2014. TEE Interactive User's Guide. Updated: March 4, 2014. Cited: March 4, 2014. Available from: http://www.ecy.wa.gov/programs/tcp/policies/terrestrial/TEEHome.htm.

EPA, 2002. National Primary Drinking Water Regulations – Announcement of the Results of EPA's Review of Existing Drinking Water Standards and Request for Public Comment: Proposed Rule. Federal Register. Vol. 67, No. 74. P. 19,030. April 17, 2002.

Kennedy/Jenks (Kennedy/Jenks Consultants), 2010. *City of Longview Mint Farm Regional Water Treatment Plant Preliminary Design Report: Part 2A Hydrogeologic Characterization*. Prepared for the City of Longview. March 2010.

Kennedy/Jenks, 2012. Source Approval Documents City of Longview Mint Farm Wellfield. Prepared for Washington State Department of Health. September 2012.

Northwest Alloys (Northwest Alloys, Inc.), 2011. Demolition and Cleanup Accomplishments at the Former Reynolds – Longview Plant. June 2011.

Reynolds (Reynolds Metals Company), 1984. Correspondence between Reynolds Metals Company and Washington Department of Ecology. Regarding: PCB Spill in July 1984. July to October 1984.

Reynolds, 1986. *Summary Report of PCB Clean-up Activities – Reynolds Metals Company*. Prepared for Washington State Department of Ecology. January 1986.

Reynolds, 1991. 200,000-gallon Diesel Aboveground Storage Tank Independent Cleanup Documents. 1991-1993.

Reynolds, 1992. Operations and Maintenance Manual: Black Mud Pond Post-Closure Care. November, 1992.

Reynolds, 1993. Letter to: Don Reif, DOE Industrial Section. April 20, 1993.

Reynolds and CH2M Hill, 1991. *Closure Plan and Post-Closure Plan for the Longview Reduction Plant*. Prepared for Washington State Department of Ecology. July 1991.

APPENDIX A
COMPLIANCE MONITORING AND CONTINGENCY RESPONSE PLAN

COMPLIANCE MONITORING AND CONTINGENCY RESPONSE PLAN

FORMER REYNOLDS METALS REDUCTION PLANT – LONGVIEW

Prepared for

Washington State Department of Ecology

On Behalf of

Northwest Alloys, Inc.

Millennium Bulk Terminals – Longview, LLC

Prepared by

Anchor QEA, LLC

6720 SW Macadam Avenue, Suite 125~~6650 SW Redwood lane, Suite 333~~

Portland, Oregon 97219~~24~~

~~**January 2016**~~**August 2018**

TABLE OF CONTENTS

List of Tables

List of Figures

~~List of Attachments~~

LIST OF ACRONYMS AND ABBREVIATIONS

ASTM	ASTM International
CAP	Cleanup Action Plan
CDID	Consolidated Diking Improvement District
cm	centimeter
CMCRP	Compliance Monitoring and Contingency Plan
COC	chain of custody
DQO	~~D~~data ~~Q~~quality ~~O~~objective
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
FC	Field Coordinator
MBT-Longview	Millennium Bulk Terminals – Longview
MCL	maximum contaminant level
mg/L	milligram per liter
NMDS	nylon-mesh diffusion samplers
Plan	Compliance Monitoring and Contingency Response Plan
PRB	permeable reactive barrier
RI/FS	Remedial Investigation/Feasibility Study
Site	Former Reynolds Metal Reduction Plant
SQAPP	Sampling and Quality Assurance Project Plan
USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WAC	Washington Administrative Code

1 INTRODUCTION

This Compliance Monitoring and Contingency Response Plan (Plan) describes the long-term monitoring program to be implemented as part of the final cleanup at the Former Reynolds Metal Reduction Plant (Site) in Longview, Washington. This work ~~will~~must be performed by Millennium Bulk Terminals – Longview (MBT-Longview) on behalf of MBT-Longview and Northwest Alloys, Inc. (Northwest Alloys) consistent with the *Cleanup Action Plan* (CAP; Ecology ~~2015~~2017) issued by the Washington State Department of Ecology (Ecology).

1.1 Purpose

This Plan describes the long-term confirmational monitoring to be performed at the Site to verify that the cleanup action meets the ~~groundwater~~ cleanup standards defined in the CAP. These cleanup standards are described in Section 5.2 of the CAP and are summarized in Section 1.2 of this Plan. Environmental monitoring activities are included for groundwater, surface water, ditch water, and sediment porewater.

This Plan also describes inspection and reporting activities to be implemented to document the integrity of the low-permeability caps and permeable reactive barriers (PRBs) to be constructed as part of the cleanup action and to verify compliance with the restrictive covenants to be recorded for certain areas of the Site, as described in the CAP.

~~The~~The detailed methods to be used for long-term monitoring activities described in this Plan ~~will be implemented once~~ must be documented in a Sampling and Quality Assurance Project Plan (SQAPP). That document must be finalized prior to implementation of post-construction ~~of the cleanup action has been completed.~~monitoring. This Plan ~~will~~and the SQAPP must be implemented in accordance with confirmational monitoring requirements of Washington Administrative Code (WAC) 173-340-410(1)(c).

This Plan does not describe protection monitoring [WAC-173-340-410(1)(a)] and performance monitoring [WAC-173-340-410(1)(b)] to be implemented during construction of the cleanup action. Those methods ~~will~~must be defined in the Engineering Design Report (EDR) to be submitted to Ecology prior to construction of the cleanup action.

1.2 Groundwater Cleanup Levels

Section 5.2.3 of the CAP describes the cleanup standards applicable to groundwater, including the cleanup levels and points of compliance. These groundwater cleanup levels are shown in Table 1. Groundwater monitoring locations are described further in Section 3 of this Plan.

Table 1
Groundwater Cleanup Standards

Chemical of Potential Concern	Groundwater Cleanup Level	Protection Basis	Point of Compliance	Remediation Levels
Fluoride (total)	4 mg/L[1]	State Drinking Water MCL[1]	Conditional POC at property line and ~~Groundwater-Ditch Boundary~~groundwater-ditch boundary	~~Remediation~~Groundwater remediation levels are described in Section ~~3.5~~3.6 of this Plan for specific monitoring locations
Free cyanide ~~(dissolved)~~	200 µg/L	State Drinking Water MCL	Wells adjacent to applicable SUs	Not applicable
cPAHs	0.1 µg/L	MTCA Method A Standard Value		
TPH Diesel Range	500 µg/L	MTCA Method A Standard Value		
TPH Oil Range	500 µg/L	MTCA Method A Standard Value		

Notes:
1 = Compliance with the MCL will be assessed using the running average method consistent with WAC 173-340-720(9)(c)(ii), WAC 246-290-310(3)(b), and 40 CFR 141.23(i).
µg/L = microgram per liter
cPAH = carcinogenic polycyclic aromatic hydrocarbon
MCL = maximum contaminant level
mg/L = milligram per liter
MTCA = Model Toxics Control Act
POC = point of compliance
SU = site unit
TPH = total petroleum hydrocarbon

Section 3.~~5~~6 of this Plan also describes the groundwater remediation levels for fluoride. As described in Section 2.1.3 of the CAP, the cleanup action includes treatment and containment measures that augment natural geochemical processes already occurring in the

shallow silt and clay soils at the Site. Together, these actions will serve to ensure that fluoride remains contained within Site groundwater. The remediation levels will define for each monitoring location when additional monitoring and/or contingency response actions will be implemented to ensure protection of adjacent surface water during the groundwater restoration timeframe, as described in the CAP.

Cleanup levels applicable to adjacent surface water are described in Section 5.2.2 of the CAP and are summarized in Table 2. The fluoride cleanup standard (4.0 milligrams per liter [mg/L]) was developed based on protection of human health and compliance with the State Drinking Water maximum contaminant level (MCL). Ecology has also set a narrative surface water cleanup level of no adverse effects on the protection and propagation of fish and aquatic life using porewater and surface water monitoring with contingent bioassay testing (see Section 3.4) to make this demonstration.

Table 2
Surface Water Cleanup Standards

Chemical of Potential Concern	Surface Water Cleanup Level	Protection Basis	Point of Compliance
Fluoride (total)	4 mg/L[1]	State Drinking Water MCL[1]	Columbia River and CDID Ditch No. 14
	Narrative Standard	No adverse effects as described in the Narrative Standard	
Free Cyanide ~~(dissolved)~~	5.2 µg/L	WAC 173-201A	

Notes:
1 = Compliance with the MCL will be assessed using the running average method consistent with WAC 173-340-720(9)(c)(ii), WAC 246-290-310(3)(b) and 40 CFR 141.23(i).
µg/L = microgram per liter
CDID = Consolidated Diking Improvement District
MCL = maximum contaminant level
mg/L = milligram per liter
WAC = Washington Administrative Code

2 PROJECT ROLES AND RESPONSIBILITIES

The monitoring and reporting activities described in this Plan ~~will~~must be initially implemented by MBT-Longview in coordination with Northwest Alloys and on behalf of both MBT-Longview and Northwest Alloys. If there are changes to project roles or responsibilities, Ecology ~~will~~must be notified of these changes.

MBT-Longview ~~will~~must identify a Project Manager to lead implementation of this Plan. The Project Manager ~~will~~must provide overall project coordination, including production of all project deliverables and administrative coordination to ensure timely and successful completion of this Plan.

The Field Coordinator (FC) ~~will~~must serve at the direction of the Project Manager. The FC ~~will~~must supervise all monitoring activities, including physical inspections and collection of all samples; ensuring conformance to sampling and handling requirements; and completing chain of custody (COC) forms. The FC ~~will~~must be responsible for compliance with the requirements of this Plan. In addition, the FC ~~will~~must be responsible for the submittal of environmental samples to the designated laboratories for chemical analyses.

All chemical and bioassay testing activities ~~will~~must be performed by laboratories certified by the State of Washington. 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~~data quality objectives (DQOs), as defined in ~~Attachment A~~the SQAPP.

MBT-Longview ~~will~~must review all work products prepared by its contractors and consultants and ~~will~~must communicate to the Ecology project coordinator any concerns that may arise regarding the implementation of the monitoring activities.

3 LONG-TERM MONITORING

This section describes groundwater, ditch ~~and,~~ surface water, and porewater monitoring locations, parameters, and frequencies. For fluoride, this section also describes how remediation levels will be used to determine whether contingency response actions are needed.

3.1 Groundwater Compliance Monitoring Locations

Groundwater compliance monitoring locations are shown in Figures 1 and 2. These groundwater monitoring locations include both existing groundwater monitoring well locations, as well as new groundwater monitoring wells that ~~will~~must be installed downgradient of the PRBs to be constructed as part of the cleanup action.

Groundwater monitoring locations were selected based on the Site conditions documented in the Remedial Investigation/Feasibility Study (RI/FS; Anchor QEA 2015). Compliance monitoring wells are located in areas hydraulically downgradient of former source areas located in the West Groundwater Area (Figure 1) and the East Groundwater Area (Figure 2). The monitoring locations provide the ability to monitor the groundwater migration pathways between these former source areas and adjacent surface waters.

The compliance monitoring wells are screened at appropriate intervals to monitor contaminant levels in groundwater along each migration pathway. With the exception of one pair of wells located in an area with perched groundwater, groundwater compliance wells are screened across the water table. Well logs and construction details are included in the appendices to the RI/FS (Anchor QEA 2015).

Compliance monitoring locations are organized into five compliance groups (CG-01 through CG-05), as shown in Table 3. Two of these groups are in locations upgradient of the Consolidated Diking Improvement District (CDID) ditches. The remaining three compliance groups are located in between groundwater remediation areas and the Columbia River.

Table 3
Groundwater Compliance Monitoring Locations

Groundwater Area	Transport Pathway	Compliance Group Number	Groundwater Monitoring Locations
West Groundwater Area	Predominant Groundwater Flow Direction from West Groundwater Area Northwest Flow Toward the CDID Ditch	CG-01[1]	**Existing:** PZ-6, PZ-7 **New:** 2 new shallow wells between the constructed PRBs and the CDID Ditch
	Secondary Pathway Between Perched Zone and the Columbia River	CG-02	**Existing:** G6-D
East Groundwater Area	Predominant Groundwater Flow Direction from East Groundwater Area North Toward the CDID Ditch North of Industrial Way	CG-03	**Existing:** G4-S, R-2
	Secondary Pathway Between East Groundwater Area and the Columbia River	CG-04	**Existing:** G1-S, R-4S, R-1S
	Groundwater Pathway Between SU10 and the Columbia River	CG-05	**Existing:** SSA7-MW-01

Notes:
1 = These wells are sampled in accordance with the Post-Closure Plan Amendment (CAP, Appendix B), but that sampling will be coordinated with the monitoring described in this Plan.
CDID = Consolidated Diking Improvement District
PRB = permeable reactive barrier

In addition to the compliance monitoring wells listed in Table 3, supplemental fluoride monitoring ~~will~~must be performed at two sentinel wells, as shown in Table 4. The sentinel wells will be used to monitor potential changes in groundwater quality as follows:

- Well G6-S: This is a shallow well adjacent to the CDID levee. Monitoring of this well ~~will~~must be performed in parallel with compliance monitoring of well G6-D to document potential changes in perched zone water quality (Figure 1).
- Well G4-D: This well is located in clean deeper groundwater between the Site and off-site areas to the north. This well ~~will~~must be monitored to verify that Site conditions continue to be protective of regional groundwater resources (Figure 2). These data supplement other regional groundwater monitoring activities.

Table 4
Groundwater Sentinel Well Locations

Groundwater Area	Compliance Group	Sentinel Well Location	Purpose
West Groundwater Area	CG-02	G6-S	Monitored in parallel with compliance monitoring well G6-D to document potential changes in perched zone water quality
East Groundwater Area	CG-03	G4-D	Monitored to provide supplemental demonstration that fluoride in Site groundwater is not migrating toward deep water supply wells located northeast of the Site

Groundwater monitoring ~~will~~must also include supplemental testing locations in the interior of the ~~site~~Site. These other interior well locations are shown in Figures 1 and 2 and are listed in Table 5.

Table 5
Other Interior Well Locations[1]

Groundwater Area	Compliance Group	Interior Well Location	Purpose[1]
West Groundwater Area	CG-01	RL-3S	Document groundwater quality at boundary between Closed BMP Facility and internal U-ditch
		RLSW2	Document groundwater quality at boundary between deposit SU-2 and internal U-ditch
East Groundwater Area	CG-04	G2-S	Document groundwater quality downgradient of deposit SU-8 (deposit to be removed)
		G3-S	Document groundwater quality adjacent to deposit SU-6

Note~~s~~:
1 = Ecology will review the results of monitoring from interior wells to document the response of groundwater in response to the remedial action. Analysis of the data from these wells will be included in Ecology's periodic reviews of the cleanup. In the event that these wells show unexpected and significant increases in concentrations, Ecology may request additional monitoring or investigation to determine the cause and whether additional actions are necessary to ensure the effectiveness of the cleanup actions.

3.2 Ditch and Surface Water Monitoring Locations

Surface water monitoring locations are also included for each compliance group, as shown in Figures 1 and 2. These monitoring locations are located in the Columbia River and in the

CDID ditches located adjacent to the Site. One ambient monitoring station located in the CDID ditch system and one ambient monitoring station located in the Columbia River are included to document ambient water quality in areas away from the Site. Ditch and surface water testing locations are listed in Table 6.

Table 6
Ditch and Surface Water Monitoring Locations

Adjacent Groundwater Area	Transport Pathway	Compliance Group Number	Corresponding Ditch and Surface Water Monitoring Locations
West Groundwater Area	Predominant Groundwater Flow Direction from West Groundwater Area Northwest Toward the CDID Ditch	CG-01[1]	**Existing:** CDID-Up, CDID-Down
	Secondary Pathway Between Perched Zone and the Columbia River	CG-02	**Existing:** W8
East Groundwater Area	Predominant Groundwater Flow Direction from East Groundwater Area North Toward the CDID Ditch North of Industrial Way	CG-03	**Existing:** W1
	Secondary Pathway Between East Groundwater Area and the Columbia River	CG-04	**Updated:** W10[2]
	Groundwater Pathway Between SU10 and the Columbia River	CG-05	**Updated:** W9[2]
Ambient Stations[4]	Stations Used to Document Ambient Water Quality Data for the CDID Ditches and the Columbia River	--[3]	**Existing:** W2, W5~~, W2~~

Notes:
1 = These locations are sampled in accordance with the Closed BMP Facility Post-Closure Plan Amendment (Appendix B to the CAP), but that sampling will be coordinated with the monitoring described in this Plan.
2 = Sampling locations W9 and W10 have been updated from corresponding locations sampled during the RI/FS.
3 = Station W5 ~~will~~must be sampled whenever Columbia River water testing is performed for CG-~~-~~02, CG-04, or CG-05. Station W2 ~~will~~must be sampled whenever ditch water testing is performed for CG-01 or CG-03.
4 = Sampling at ambient station~~s W5 and~~ W2 ~~will~~must be conducted to inform data analysis tasks regarding ~~potential~~ ambient fluoride concentrations in ditch ~~and surface~~ waters, and testing at ambient station W5 will provide information on ambient fluoride concentrations in the Columbia River. However, the results of compliance monitoring will not be adjusted based on the results of the testing results at ambient stations.
CDID = Consolidated Diking Improvement District

3.3 Monitoring Parameters and Frequency

Table 7 presents the monitoring parameters and frequency for both surface water and groundwater.

- Groundwater and surface water monitoring described in CAP Appendix B for the Closed BMP Facility ~~will~~must continue during construction of the cleanup action. Following construction of the PRBs in the areas monitored under compliance group CG-01, groundwater monitoring locations will use the new wells located downgradient of the PRBs, as shown in Figure 1 and Table 3.
- Following completion of cleanup construction, groundwater monitoring, as described in Table 7, ~~will~~must be initiated. This will include all of the groundwater monitoring locations listed in Tables 3, 4, and 5.
  - Long-term groundwater monitoring ~~will~~must include total and dissolved fluoride and field parameters (pH, specific conductance, temperature, and turbidity). Monitoring ~~will~~must be performed at the frequencies described in Table 7.
  - Testing for free cyanide and PAH compounds ~~will~~must be performed for all wells during Year 1 and for wells in CG-02 through CG-05 during Year 2. Free ~~C~~cyanide currently complies with groundwater cleanup levels. However, testing ~~will~~must be performed during the first eight quarters to verify that conditions do not change as a result of cleanup construction activities. PAH compounds have been detected above cleanup levels only at locations directly within the eastern fill deposits, and then only sporadically. Testing for PAH compounds ~~will~~must be performed in areas downgradient of each of the cleanup construction areas during the first eight quarters to verify that concentrations of these contaminants continue to comply with Site cleanup levels at the compliance monitoring locations.
  - Monitoring for free cyanide and PAH compounds will be discontinued after Year 1 (CG-01) and Year 2 (CG-02 through CG-05), provided there are no confirmed exceedances of groundwater cleanup levels for those contaminants at the compliance monitoring locations.
  - Provided that total fluoride does not exceed remediation levels for groundwater (see Section 3.~~5~~7), groundwater monitoring for fluoride ~~will~~must be performed

semi-annually during Year 3 and Year 4 and annually between Year 5 and Year 10. After Year 10, groundwater monitoring for fluoride ~~will~~must continue indefinitely every 2 years, unless termination of groundwater monitoring or a request for implementation of an alternative monitoring schedule is approved by Ecology.

- Quarterly post-construction surface water monitoring for total and dissolved fluoride will be conducted in the first 2 years following completion of the cleanup action. This monitoring ~~will~~must be performed at each compliance group and at the ~~two~~ ambient stations listed in Table 6. Surface water monitoring will be discontinued if no confirmed exceedances of the fluoride MCL are detected.

Table 7

Long-term Monitoring Parameters and Frequency for Groundwater and Surface Water

~~Time Frame~~Timeframe (After Completion of Cleanup Construction)	Frequency[1]	~~Groundwater Monitoring Parameters[2]~~Groundwater[2]		Surface ~~Water Monitoring Parameters[2]~~Water[2]
		Total and Dissolved Fluoride	PAHs and Free Cyanide[3]	Total and Dissolved Fluoride
Year 1	Quarterly	~~x~~X	~~x~~X	~~x~~X[4]
Year 2	Quarterly	~~x~~X	~~x~~[3]X[3]	~~x~~X[4]
Year 3	Semi-~~Annually~~annually	~~x~~X	-[3]	-[4]
Year 4	Semi-~~Annually~~annually	~~x~~X	-	-
Year 5 through Year 10	Annually	~~x~~X	-	-
Year 11 and beyond	Every 2 years	~~x~~X	-	-

Notes:
Compliance with cleanup levels and remediation levels will be assessed separately for each compliance group.
1 = Frequency of groundwater sampling ~~will~~must be as shown in this table unless there are exceedances of remediation levels (refer to Section 3.~~5~~6 and data evaluation process shown in Figure ~~3~~4).
2 = Field parameters to be monitored during each event for groundwater and surface water testing. Field parameters ~~will~~must include pH, specific conductance, temperature, and turbidity.
3 = PAHs and free cyanide ~~will~~must be sampled at all groundwater monitoring locations during Year 1 and at well locations in CG-02 through CG-05 during Year 2. Monitoring for these parameters will be discontinued after Year 2, assuming there are no confirmed exceedances of cleanup levels at compliance monitoring locations.

4 = Surface water monitoring for fluoride ~~will~~must be discontinued for each compliance group after Year 2 provided there are no confirmed detections of total fluoride in excess of 4.0 mg/L during the Year 1 and Year 2 monitoring events. Surface water monitoring may be resumed for a compliance group, as described in Section 3.~~5~~6, in the event that groundwater remediation levels are exceeded.

~~3.4 Sampling and Analysis Methods~~

3.4 Porewater and Contingent Bioassay Monitoring

In addition to the chemical testing of groundwater and surface water as described in Table 7, testing must be performed to demonstrate the absence of adverse effects on the protection and propagation of fish and other aquatic life. That testing must be performed at the appropriate locations described in Figure 3 at the frequencies listed in Table 8. Testing triggers and methods are described in Sections 3.4.1 and 3.4.2. Final testing locations will be determined in the SQAPP. A fluoride concentration of 1.8 mg/L will be used as the screening level to trigger bioassay sampling. Additional details will be provided in the SQAPP.

3.4.1 Contingent Ditch Water Bioassays

During Years 1 and 2 following completion of the cleanup action, contingent ditch water bioassays must be performed at station CDID-Down (Figure 3). These contingent bioassays will be triggered if fluoride levels measured at station CDID-Down during quarterly monitoring exceeds the screening levels.

If contingent bioassay testing is triggered, water samples must be collected from station CDID-Down for chemical and bioassay testing. Chemical testing must include alkalinity, chloride, hardness, total organic carbon, total volatile solids, and pH. Chronic bioassay testing must be performed using three different aquatic species as approved by Ecology. Details of test performance and interpretation will be defined in the SQAPP.

Fluoride levels at station CDID-Down must be retested at least once prior to each 5-year review unless otherwise approved by Ecology. If fluoride levels exceed the screening level during this retesting, contingent bioassay testing will be performed.

3.4.2 Porewater and Contingent Sediment Bioassays

During Years 1 through 4, following completion of the cleanup action, sediment porewater must be collected on a semi-annual basis from six testing stations (PW-1 through PW-6; Figure 3) and up to two ambient Columbia River testing locations (PW-7 and/or PW-8; Figure 3) for analysis of fluoride concentrations and conventional parameters (alkalinity, chloride, hardness, total organic carbon, total volatile solids, and pH). This testing must be performed using methods as described in Section 3.5 and as defined in the SQAPP.

At the time porewater samplers are retrieved, whole sediment (including entrained porewater) will be collected and archived from each of the sites and ambient locations for contingent bioassay testing. Bioassay testing must be initiated at those site stations where porewater fluoride concentrations exceed the screening level. If contingent bioassay testing is performed, sediment bioassays must also be performed on sediments from one or both of the ambient stations (PW-7 and/or PW-8) alongside the test samples to provide information on the response of the bioassay test organisms to ambient conditions.

Bioassay testing, if performed, must use chronic bioassays and three different test organisms as approved by Ecology. Details of test performance and interpretation will be defined in the SQAPP.

Fluoride levels in porewater from the six test stations must be retested at least once prior to each 5-year review unless otherwise approved by Ecology. If fluoride levels exceed the screening level during this retesting, contingent bioassay testing of sediments from those test stations must be performed. That bioassay testing must also include testing of sediments from one or more of the ambient stations to provide information on the response of the bioassay test organisms to ambient conditions.

Table 8
Porewater Contingent Bioassay Monitoring

Timeframe (After Completion of Cleanup Construction)	Ditch Water Testing at Station CDID-Down[1,2,3,4,8,10]		Sediment Porewater Testing at Stations PW-1 through PW-6 and Ambient Stations[2,3,5,6,7,8]	Analysis of Sediment and Entrained Porewater at Stations PW-1 through PW-6 and Ambient Stations[6,7]
	Total and Dissolved Fluoride, Field and Conventional Parameters[2,3,8]	Contingent Chronic Bioassay Testing[4,8,10]	Dissolved Fluoride, Field and Conventional Parameters[2,3,5,7,9]	Contingent Sediment Bioassays[6,7,9,10]
Year 1	Quarterly	Contingent (Quarterly)	Semi-Annually	Contingent (Semi-Annually)
Year 2	Quarterly	Contingent (Quarterly)	Semi-Annually	Contingent (Semi-Annually)
Year 3	--	--	Semi-Annually	Contingent (Semi-Annually)
Year 4	--	--	Semi-Annually	Contingent (Semi-Annually)
Year 5	--	--	--	--[8]
Sampling preceding 5-year reviews	Once prior to each 5-year review[8]	Contingent (Based on fluoride levels)[8]	Once prior to each 5-year review[9]	Contingent (Based on porewater fluoride levels)[9]

Notes:
1 = Ditch water must be collected at CDID-Down, the monitoring location prior to the entrance to the ditch outfall.
2 = Field parameters to be monitored during collection of ditch water or sediment porewater and must include pH, specific conductance, temperature, and turbidity.
3 = Conventional parameters to be analyzed include alkalinity, chloride, hardness, total organic carbon, total volatile solids, and pH.
4 = Ditch water testing at CDID-Down for fluoride, conventional parameters, and field parameters must be performed during Years 1 and 2. If fluoride levels at CDID-Down exceed the 1.8 mg/L screening level as discussed in the SQAPP, contingent chronic bioassay testing must be completed. Ditch water monitoring will be discontinued after Years 1 and 2 provided there are no confirmed exceedances of screening levels defined in the SQAPP.

5 = Sediment porewater for fluoride, conventional parameters, and field parameters must be performed on a semi-annual basis during Years 1 through 4. If fluoride levels at a sediment porewater location exceed the 1.8 mg/L screening level as discussed in the SQAPP, contingent bioassay monitoring must be completed at that same location. Porewater testing must include six testing stations and up to two ambient stations (locations shown in Figure 3 are approximate). Final testing stations will be defined in the SQAPP. Porewater monitoring will be discontinued after Years 1 through 4 provided there are no confirmed exceedances of screening levels defined in the SQAPP.

6 = Sediments and entrained porewater must be collected and archived from each of the porewater test stations (PW-1 through PW-6) and from up to two ambient stations (PW-7 and/or PW-8). Contingent bioassay testing must be performed on sediments from those stations with porewater fluoride concentrations exceeding the 1.8 mg/L screening level as discussed in the SQAPP. Bioassay testing must include chronic bioassay tests performed with three different organisms and methods defined in the SQAPP. If contingent sediment bioassay testing is performed, testing must also be performed on at least one of the ambient stations (PW-7 and/or PW-8) to evaluate the response of the test organisms to ambient conditions.

7 = Porewater and contingent sediment bioassay testing will be terminated following Year 4 at those stations for which there were no confirmed exceedances of 1.8 mg/L screening level as discussed in the SQAPP during Years 1 through 4.

8 = After Year 5, one round of ditch water monitoring for fluoride, conventional parameters, and field parameters must be performed at Station DB-1 as a spot check before each 5-year review. If fluoride levels in that sample exceed the 1.8 mg/L screening level defined in the SQAPP, chronic bioassay testing must also be performed as part of the spot check.

9 = After Year 5, one round of porewater monitoring for fluoride and conventional parameters must be performed at Stations PW-1 through PW-6 and one or more of the ambient stations (PW-7 and/or PW-8) as a spot check before each 5-year review. If porewater fluoride levels from any of the six test stations exceed the 1.8 mg/L screening level defined in the SQAPP, chronic bioassay testing must also be performed on sediments from those test stations and one or more of the ambient stations.

10 =Contingent chronic bioassay tests, if triggered, must utilize three different organisms as approved by Ecology and the methods defined in the SQAPP.

3.5 SQAPP Development

A SQAPP must be developed and submitted to Ecology for approval prior to implementation of post-construction monitoring. The SQAPP will define specific methods and locations by which the monitoring must be performed for each of the activities listed in this section. Prior to development of the SQAPP, a Sampling Location Study Work Plan will be developed and submitted to Ecology for approval. The Sampling Location Study Work Plan will describe the site-specific data that will be collected and/or evaluated to select post-construction porewater monitoring locations and timing such as groundwater monitoring data, tidal information, and video documentation of tidal changes and active seeps.

3.5.1 Groundwater Testing

Groundwater samples will be collected via standard low-flow sampling techniques using a peristaltic pump and pre-cleaned disposable tubing. This method is consistent with the RI/FS sampling techniques. Water quality parameters (pH, specific conductance, temperature, and turbidity) will be monitored during well purging ~~and three consecutive readings within 10 percent of each other will indicate that the well has stabilized and a sample can be collected~~.

~~Groundwater samples will be collected directly into pre-cleaned sample containers provided by the analytical laboratory and will be immediately placed on ice in a cooler. Samples designated for dissolved fluoride will be filtered at the time of sampling through a 0.45-micron disposable membrane filter.~~

Groundwater samples ~~will~~must be analyzed for total and dissolved fluoride, PAHs, and free cyanide, as shown in Table 7. Monitoring for PAHs and free cyanide will be performed during Years 1 and 2. Sampling parameters for Year 3 and beyond will include total and dissolved fluoride. Analytical methods, sample container requirements, and ~~data quality objectives~~DQOs for the water quality monitoring will be ~~equivalent to those used during~~ defined in the ~~RI/FS investigations and are included in Attachment A.~~SQAPP.

3.5.2 ~~Ditch and surface~~Surface Water Testing

Surface water samples will be collected from the designated sampling locations using a peristaltic pump and pre-cleaned disposable tubing. The samples will be collected in the surface water from within 1 foot of the mud-line. This method is consistent with the RI/FS sampling techniques. ~~Surface water samples from the Columbia River will be collected during the 2-hour period following low-tide conditions. Water quality parameters (pH, specific conductance, temperature, and turbidity) will be monitored during sample collection. Surface water samples will be collected directly into pre-cleaned sample containers provided by the analytical laboratory and will be immediately placed on ice in a cooler. Samples designated for dissolved fluoride will be filtered at the time of sampling through a 0.45-micron disposable membrane filter. Analytical methods, sample container requirements, and data quality objectives for the water quality monitoring will be equivalent to those used during the RI/FS investigations and are included in Attachment A.~~

Water quality parameters (pH, specific conductance, temperature, and turbidity) will be monitored during sample collection. Testing methods, sample container requirements, and DQOs for the water quality monitoring will be defined in the SQAPP.

3.5.3 Ditch Water Testing at CDID-Down

Surface water samples will be collected at CDID-Down using a single-use polyethylene disposable bailer. The samples will be collected by lowering the bailer into the ditch to a minimum depth of 2 feet below the water surface. This method is consistent with the sampling technique used for the current Closed BMP monitoring program. The location of CDID Ditch No. 14 and the surface water sample locations are shown in Figure 1.

Water quality parameters (pH, specific conductance, temperature, and turbidity) will be monitored during sample collection. Samples of the ditch water must be submitted for laboratory analysis of dissolved fluoride, hardness, alkalinity, chloride, total organic carbon, total volatile solids, and pH. Testing methods, sample container requirements, and DQOs for the water quality monitoring will be defined in the SQAPP.

Adequate sample volume will be properly collected to be submitted to the laboratory pending decision on contingent ditch water bioassay testing.

3.5.4 Contingent Ditch Water Bioassay Testing

Contingent bioassay testing of ditch water at station CDID-Down must be performed at the frequencies listed in Table 8 when fluoride concentrations measured at location CDID-Down exceed the screening level.

If contingent bioassay testing is triggered at CDID-Down, water quality parameters (pH, specific conductance, temperature, and turbidity) will be monitored during sample collection, and samples of the water must be submitted for laboratory analysis of hardness, alkalinity, chloride, total organic carbon, total volatile solids, and pH.

Bioassay testing, when triggered, must be performed using chronic toxicity testing protocols and three different organisms. Bioassay testing must be performed by a Washington state certified laboratory using testing protocols certified by the U.S. Environmental Protection Agency (USEPA), ASTM International (ASTM), Environment Canada, or other methods approved by Ecology. Testing methods, sample container requirements, and DQOs for the water quality monitoring and contingent bioassay testing will be defined in the SQAPP.

3.5.5 Porewater Testing

Porewater will be collected from the six test stations (PW-1 through PW-6) and from one or more ambient stations (PW-7 and/or PW-8) as shown in Figure 3 (final locations will be defined in the SQAPP and may vary from those shown in Figure 3) using nylon-mesh diffusion samplers (NMDS) using methods developed by the U.S. Geological Survey (USGS) and USEPA (Zimmerman et al. 2005) and/or push point type samplers. The sampling collection methods will be determined in the SQAPP. NMDS are a type of passive sampler that can be used in both course and fine-grained sediments to sample porewater while limiting the introduction of confounding factors (such as introduction of changed geochemical conditions or introduction of surface water during sampling).

NMDS will be deployed at the target locations within the sediment intertidal zone during low tide. NMDS samplers will be placed within the sediment at the base of the bioactive zone 10 centimeters (cm) below the mudline. USGS studies have demonstrated that NMDS samplers typically require 4 days to reach equilibrium and fully exchange the initial deionized water with sediment porewater. Detailed methods for NMDS sampler preparation, deployment, retrieval, and sampling will be defined in the SQAPP.

Water quality parameters (pH, specific conductance, temperature, and turbidity) will be monitored on porewater during sample collection. Samples of the porewater will be submitted for laboratory analysis of dissolved fluoride, hardness, alkalinity, chloride, total organic carbon, total volatile solids, and pH. An ion selective electrode may be used to determine instantaneous fluoride readings from the active seeps.

3.5.6 Contingent Sediment Bioassay Testing

Sediment samples for contingent bioassay testing will be collected from the porewater test stations and the ambient stations at the time that the NMDS samplers are retrieved. Samples must be collected from undisturbed sediments located at the same mudline elevation and within 25 feet upriver/downriver of the deployed NMDS samplers. Sediment samples will consist of sediment collected from depths of 0 to 10 cm below the sediment mudline using either hand tools (if water depths allow collection while wading or by diver) or a Van Veen sampler (if high water levels require sample collection by boat).

Samples will be submitted upon collection to the bioassay testing laboratory. Samples will be archived at 4°C with zero headspace until porewater fluoride data have been received and reviewed.

If triggered based on exceedances of the screening levels for fluoride in porewater, contingent bioassay testing must be performed on the corresponding sediment samples using chronic toxicity testing protocols and three different organisms. If sediment bioassay testing is triggered at one or more test stations, that testing must also include bioassay testing of sediments from one or more of the ambient stations. Bioassay testing methods will be defined in the SQAPP and must use testing protocols certified by USEPA, ASTM, Environment Canada, or other methods approved by Ecology.

3.5.7 Data Validation and Reporting

All compliance monitoring data ~~will~~must be validated prior to use in data reporting. Data validation protocols will be defined in the SQAPP.

In the event that data are rejected during data validation for data quality concerns, the sampling event ~~will~~must be repeated for the affected monitoring locations. Data from the resampling will replace the initially collected, rejected data, provided that the resampling is completed within 60 days of the initial sampling event and that the data from the resampling event are determined to meet ~~data quality objectives.~~DQOs. If replicate fluoride data are available for a monitoring location during a single sampling event and neither sample has been invalidated due to data quality concerns, the average of the two samples will be used for reporting and compliance evaluation consistent with WAC 246-290-310(2)(e) and 40 CFR 141.23(f).

~~3.5~~3.6 ~~Fluoride~~Groundwater Remediation Levels and Contingency Response Actions

This section describes how long-term fluoride monitoring data will be reviewed to assess whether site conditions following post-construction period (Years 1 and 2 following construction) are stable. In the event that suspect conditions are identified, additional monitoring or other contingency response actions will be performed, as described in this section, to ensure protectiveness of the cleanup action.

The factors affecting the potential fate and transport of fluoride at the Site were evaluated in detail during the RI/FS. Natural attenuation processes have limited the migration of fluoride both laterally and vertically. Key geochemical processes affecting the fate and transport of fluoride in soil, solid media, and groundwater at the Site include precipitation as fluorite and fluorapatite, ion exchange, and adsorption. Geochemical analysis of Site soils indicates that these processes will continue to limit transport of fluoride under the Site's current conditions. The added controls in the selected cleanup for the Site will further reduce transport of fluoride by constructing low-permeability caps over remaining contaminated soil and fill deposits and installing PRBs in key locations.

However, the cleanup action was selected with the understanding that an extended restoration timeframe will be required before total fluoride cleanup levels will be met at all compliance monitoring locations (see Section 5.2.3 of the CAP). During this restoration period, the compliance monitoring program includes the use of remediation levels, as described in Table 98. ~~In the event that~~If remediation levels are exceeded for total fluoride, then additional contingency response actions ~~will~~must be implemented as illustrated in Figure ~~3.~~4.

During compliance monitoring, the groundwater total fluoride data ~~will~~must be analyzed for compliance with the cleanup level (4.0 ~~milligram per liter [~~mg/L~~]~~) and for concentration trends. Compliance with the groundwater cleanup level ~~will~~must be evaluated at each compliance monitoring location using the running average method consistent with WAC 173-340-720(9)(c)(ii), WAC 246-290-310(3)(b), and 40 CFR 141.23(i). The concentration trend analysis ~~will~~must be performed for new and existing data using outlier analysis and the Theil-Sen trend test in ProUCL, or other methods approved by Ecology. The trend analysis ~~will~~must be performed first after a minimum of 8 data points are available for a given sampling location. The certainty of the trend analysis improves with the quantity of data. Provided that concentration trends for total fluoride are found to be stable or decreasing, monitoring activities ~~will~~must continue as defined in Table 7.

In the event that upward concentration trends are identified in well(s) of a compliance group exceeding the fluoride cleanup level, contingent monitoring for total and dissolved fluoride ~~will~~must be performed in the corresponding ditch or surface water location(s), as described in Table 7. That monitoring ~~will~~must be performed quarterly at the surface water sampling station(s) located downgradient of the respective compliance group, as indicated in Tables 6 and ~~8~~9. Monitoring ~~will~~must also include the ambient stations (W2 for ditch water testing at compliance group CG-01 or CG-03; W5 for surface water testing at compliance groups CG-02, CG-04, or CG-05). Surface water monitoring ~~will~~must be conducted in parallel with the next scheduled monitoring event for that compliance group. These data ~~will~~must be included in the monitoring report along with the groundwater monitoring data.

If contingent ditch or river water monitoring is triggered, the surface water monitoring ~~will~~ be repeated for at least four quarters. Compliance with surface water cleanup levels ~~will~~must be evaluated at each surface water compliance monitoring location using the running average method, consistent with WAC 173-340-730, WAC 246-290-310(3)(b), and 40 CFR 141.23(i). If total fluoride concentrations in the contingent surface water monitoring locations comply with surface water cleanup standards, no contingent actions will be required other than monitoring. However, surface water monitoring ~~will~~must continue until: 1) a stable or downward trend is confirmed in the groundwater monitoring data; and 2) no confirmed measurements in excess of 4.0 mg/L total fluoride occur during the surface water sampling events for that compliance group during four consecutive monitoring events. During this time, quarterly groundwater monitoring for the affected compliance group ~~will~~must continue. Once a stable or downward trend in groundwater concentrations has been demonstrated and surface water total fluoride concentrations remain consistently below 4.0 mg/L for four monitoring events, the monitoring program ~~will~~must resume for that compliance group, as described in Table 7.

If a sustained exceedance of the ~~surface water cleanup level~~MCL is confirmed (i.e., exceedances are recurring), a ~~Supplemental Remedial Measures Work~~Contingency Plan ~~will~~must be developed and submitted to Ecology for review and comment. ~~The Supplemental Remedial Measures Work~~The Contingency Plan ~~will~~must include the results of supplemental testing activities necessary to determine the cause of the exceedance and ~~will~~must also assess the practicability of targeted response actions to address the affected surface water monitoring location(s). Where appropriate, the ~~Supplemental Remedial Measures Work~~Contingency Plan ~~will~~must propose supplemental groundwater monitoring, treatment, and/or containment measures for the affected location(s), as determined to be practicable under WAC 173-360(3)(e), along with a schedule for implementation, monitoring, and reporting of those measures. Following Ecology review and approval, the ~~Supplemental Remedial Measures Work~~Contingency Plan ~~will~~must be implemented according to the approved schedule, including applicable monitoring and reporting.

3.7 Other Contingency Response Actions

A Contingency Plan will be submitted in the event that the results of contingent toxicity bioassays performed at ditch water Station DB-1 or the six porewater testing stations (PW-1

through PW-6; Figure 3) demonstrate adverse effects on the protection and propagation of fish and other aquatic life using protocols defined in the SQAPP. Ecology will review the Contingency Plan, and following written approval by the Ecology project coordinator, the potentially liable parties will implement the Contingency Plan or initiate dispute resolution pursuant to section XIV of the Consent Decree.

Table ~~9~~8

~~Fluoride~~Groundwater Remediation Levels and Contingent Monitoring Locations

Group Location	Compliance Group Number	Groundwater Monitoring Locations	Groundwater Fluoride Concentration Range During RI/FS (mg/L)	Groundwater Currently Complies with Fluoride Cleanup Level	Fluoride Remediation Level for Groundwater	Contingent Monitoring (if REL is exceeded)	Surface Water Monitoring Locations[2]
West Groundwater Area	CG-01[1]	Existing: PZ-6, PZ-7 New: 2 new shallow wells between PRBs and the CDID Ditch	7.35 to 94.4	No	Lack of upward trend in groundwater fluoride concentrations.	If upward trend in fluoride concentrations is detected and groundwater concentration exceeds the MCL, then fluoride sampling will be performed in the CDID ditch at locations W3 and W4.	CDID-Up, CDID-Down
	CG-02	Existing: G6-D	< 0.1 to 1.77	Yes	Continued compliance with CUL in well G6-D.	If cleanup level is exceeded, then fluoride sampling will be performed in the Columbia River at location W8.	W8
East Groundwater Area	CG-03	Existing: G4-S, R-2	0.256 to 0.521	Yes	Continued compliance with CUL in the CG-03 monitoring group	If cleanup level is exceeded, then fluoride sampling will be performed in the CDID ditch at location W1.	W1
	CG-04	Existing: G1-S, R-4S, R-1S	8.25 to 32.5	No	Lack of upward trend in groundwater fluoride concentrations.	If upward trend in fluoride concentrations is detected and groundwater concentration exceeds the MCL, then fluoride sampling will be performed in the Columbia River at location W10.	W10
	CG-05	SSA7-MW-01	8.51 to 12.9	No	Lack of upward trend in groundwater fluoride concentrations following SU10 removal.	If upward trend in fluoride concentrations is detected and groundwater concentration exceeds the MCL, then fluoride sampling will be performed in the Columbia River at location W9.	W9

Notes:
1 = These wells are sampled in accordance with the Post-Closure Plan Amendment (Appendix B) but sampling is coordinated and performed with Compliance Monitoring and Contingency Response Plan sampling. Reporting of results will be done on a site-wide bases to evaluate performance of the cleanup actions as described in Section 5.
2 = If ditch water monitoring is conducted, Station W2 will be monitored in parallel to document ambient conditions. If surface water monitoring in the Columbia River is conducted, Station W5 will be monitored in parallel to document ambient conditions.
CDID = Consolidated Diking Improvement District
Ecology = Washington State Department of Ecology
CUL = cleanup levels

4 PERIODIC INSPECTIONS

This section describes how long-term monitoring will be coordinated with inspection activities and with ongoing reviews associated with the environmental covenant recorded for the Site.

4.1 Inspection Methods

Inspections ~~will~~must be used to assess the condition of the low-permeability caps covering the fill deposits, the condition of the PRBs, and the condition of the groundwater compliance wells and sentinel wells. Detailed inspection methods ~~will~~must be defined in the EDR but ~~will~~must include, at a minimum, inspection of the following:

- Condition of engineered caps constructed as part of the remedial action, including any indications of settlement, ponded water, groundwater seepage, damage or obstructions to the cap, and other deviations from anticipated conditions as defined in the EDR.
- Conditions in vicinity of the PRBs, including any indications of ground disturbance that has the potential to disrupt PRB function.
- Condition of the groundwater compliance monitoring wells and of the sentinel wells.

Scheduled inspections ~~will~~must occur at the frequency defined in the EDR, provided that the minimum inspection frequency is no less frequent than the groundwater monitoring frequency described Section 3.3 and Table 7.

In addition to scheduled inspections, supplemental inspections ~~will~~must be conducted following an extreme event with the potential to adversely impact the cleanup action (e.g., a significant flood over-topping the CDID levee or a large seismic event resulting in ground disturbance in the vicinity of the Site).

4.2 Review of Compliance with the Environmental Covenant

Compliance with the requirements of the environmental covenant recorded in accordance with the CAP (Ecology 2015) ~~will~~must be assessed at least once during each year that groundwater monitoring or inspections are performed. This review will include verification of the following for the areas subject to the environmental covenant:

- Land use remains industrial
- Shallow groundwater is not used for potable uses
- Notifications required by the environmental covenant have been made
- Property uses do not compromise the performance of the remedial action

4.3 Contingency Response Actions

If periodic inspections indicate potential damage to engineered caps, or damage to a PRB, or the need for repair or replacement of a monitoring well, response measures ~~will~~must be defined in a ~~Supplemental Remedial Measures Work~~Contingency Plan. The ~~Supplemental Remedial Measures Work~~Contingency Plan ~~will~~must include a schedule for implementation (including monitoring and reporting) of those measures. Following Ecology review and approval, the ~~Supplemental Remedial Measures Work~~Contingency Plan ~~will~~must be implemented according to the approved schedule.

If deficiencies are noted related to the requirements of the environmental covenant, Ecology will be notified and these issues will be corrected.

5 REPORTING

Monitoring and inspections from a given monitoring year ~~will~~must be summarized in a Compliance Report to be prepared and submitted to Ecology by April of the following year. All chemical monitoring data ~~will~~must be validated and ~~will~~must be submitted to Ecology in hard copy and appropriate electronic data formats. The current procedure for data submittal is Ecology's Toxics Cleanup Program Policy 840 (Data Submittal Requirements). Documentation of inspection and maintenance activities will be filed on site.

The Compliance Report ~~will~~must include the following sections:

- Site background and context for the current report
- Monitoring and inspection objective(s) and methods
- Deviations in monitoring or inspections methods
- Findings of site inspections
- Review of compliance with the environmental covenant recorded in accordance with the CAP
- Results of compliance monitoring activities for groundwater ~~monitoring~~, surface water, porewater, and contingent bioassays as applicable, including the following:
  - Evaluation of compliance with cleanup and remediation levels
  - Discussion of potential areas of concern
  - Frequency and parameters to be monitored for the next period

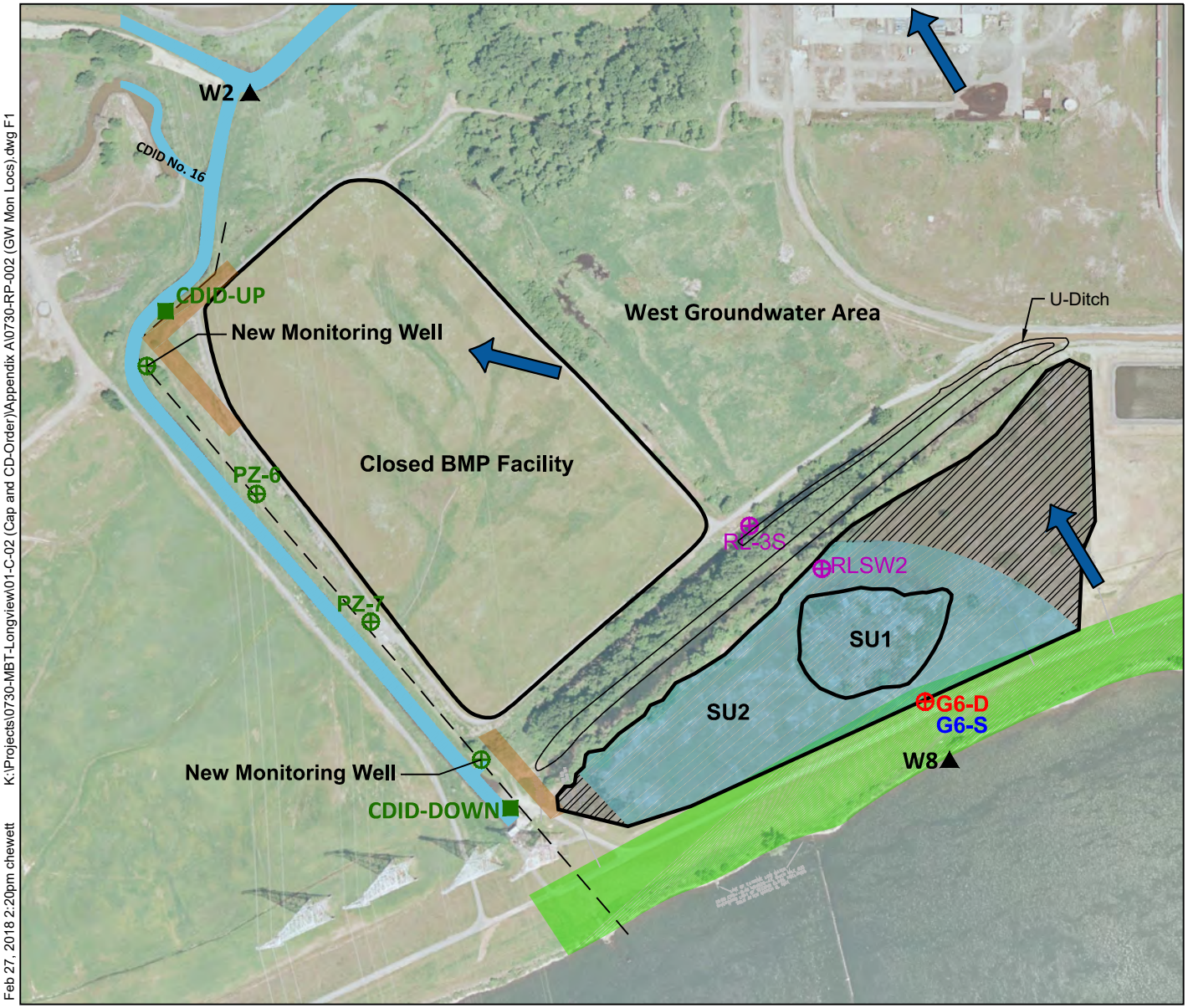
6 REFERENCES

Anchor QEA (Anchor QEA, LLC), 2015. *Former Reynolds Metals Reduction Plant - Longview, Remedial Investigation and Feasibility Study Report*. Prepared for Northwest Alloys, Inc., and Millennium Bulk Terminals – Longview, LLC. January 2016.

Ecology (Washington State Department of Ecology), 20172015. ~~*Draft*~~ *Cleanup Action Plan*. Final. Former Reynolds Metals Reduction Plant – Longview. ~~May 2015.~~ In preparation.

Zimmerman, M.J., D.A. Vroblesky, K.W. Campo, A.J. Massey, and W. Scheible, 2005. *Field Tests of Nylon-Screen Diffusion Samplers and Pushpoint Samplers for Detection of Metals in Sediment Pore Water, Ashland and Clinton, Massachusetts, 2003.* U.S. Department of the Interior, U.S. Geological Survey. In cooperation with the U.S. Environmental Protection Agency Measurement and Monitoring of the 21st Century Initiative. Scientific Investigations Report 2005-5155.

FIGURES



LEGEND:

- Low Permeability Cap
- Excavate and Consolidate On-site
- Backfill (Reactive Agent below Waterline)
- Permeable Reactive Barrier
- Area with Observed Tidal Influence During RIFS Tidal Study (Anchor QEA, 2015)
- G6-D ⊕ Groundwater Compliance Monitoring Location
- PZ-6 ⊕ Post-closure Groundwater Monitoring Location for Closed BMP Facility[1]
- CDID-UP ■ Post-closure Surface Water Monitoring Location for Closed BMP Facility
- G6-S ⊕ Groundwater Sentinel Monitoring Location (Perched Water)
- RL-3S ⊕ Interior Groundwater Monitoring Location
- W3 ▲ Surface Water Monitoring Location
- Inferred Groundwater Flow Direction

0 500
Scale in Feet

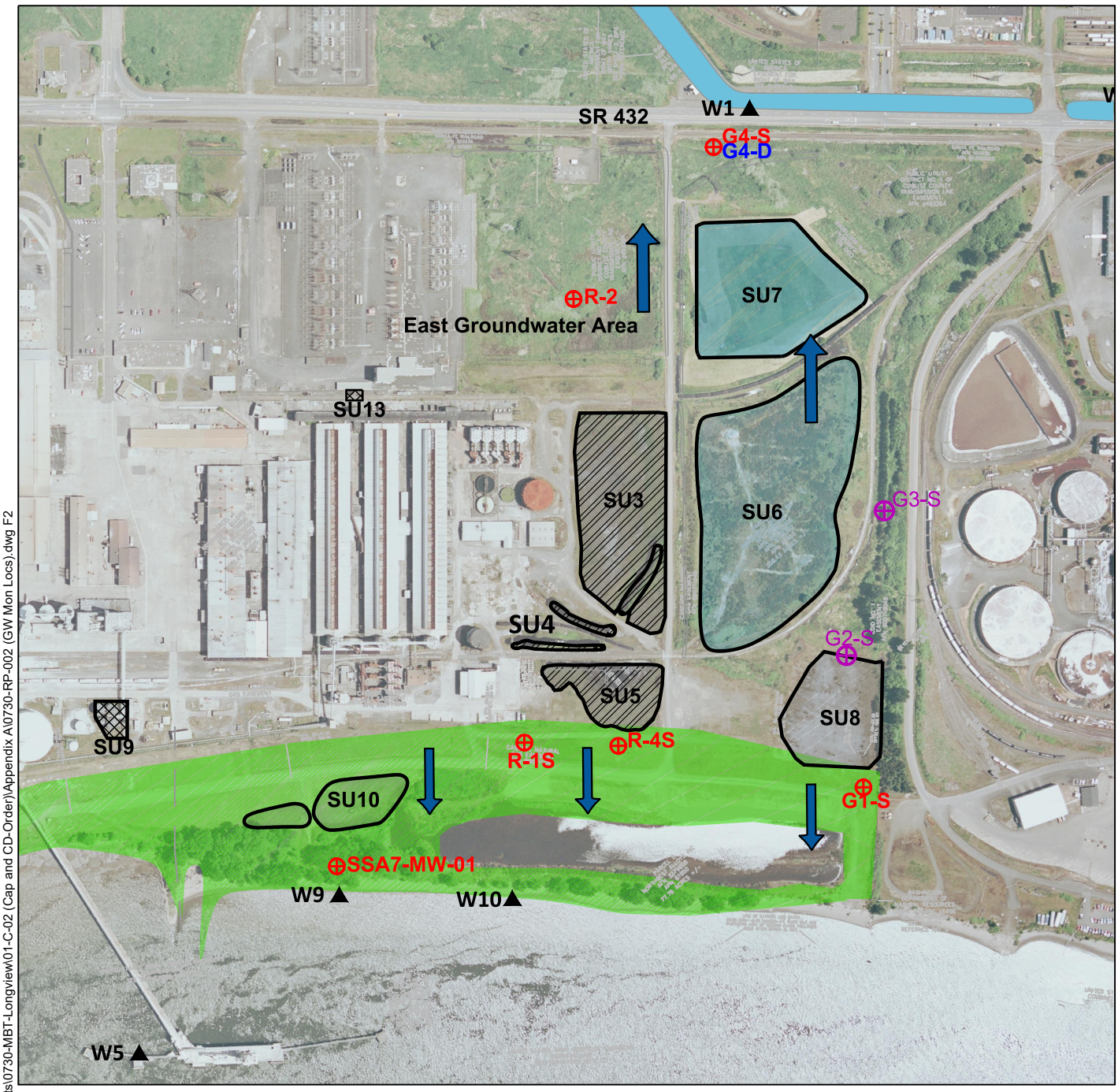
SOURCE: Drawing prepared from Alta Survey (Minister & Glaeser Surveying, Inc.) dated November 11, 2010. Aerial image from Aerometric dated June 2013.

[1] These wells are sampled in accordance with the Post-Closure Plan Amendment (Appendix B) but sampling is coordinated and performed with Compliance Monitoring and Contingency Response Plan sampling. Reporting of results will be done on a site-wide basis to evaluate performance of the cleanup actions as described in Section 5.

Feb 27, 2018 2:20pm chewett K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\Appendix A\0730-RP-002 (GW Mon Locs).dwg F1

ANCHOR QEA

Figure 1
Groundwater and Surface Water Monitoring Locations - West Groundwater Area
Compliance Monitoring and Contingency Response Plan
Former Reynolds Metals Reduction Plant – Longview



LEGEND:

- Low Permeability Cap
- Excavate and Consolidate On-site
- Excavate and Dispose Off-site
- Backfill (Reactive Agent below Waterline)
- Area with Observed Tidal Influence During RIFS Tidal Study (Anchor QEA, 2015)

- R-2 ⊕ Groundwater Compliance Monitoring Location
- G2-S ⊕ Interior Groundwater Monitoring Location
- G4-D ⊕ Groundwater Sentinel Monitoring Location
- W9 ▲ Surface Water Monitoring Location
- Inferred Groundwater Flow Direction

0 500
Scale in Feet

SOURCE: Drawing prepared from Alta Survey (Minister & Glaeser Surveying, Inc.) dated November 11, 2010. Aerial image from Aerometric dated June 2013.

K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\Appendix A\0730-RP-002 (GW Mon Locs).dwg F2
Oct 20, 2017 11:03am chewett

Figure 2
Groundwater and Surface Water Monitoring Locations - East Groundwater Area
Compliance Monitoring and Contingency Response Plan
Former Reynolds Metals Reduction Plant – Longview

ANCHOR QEA

SOURCE Aerial from Google Earth
HORIZONTAL DATUM Washington State Plane South, NAD83, U.S. Feet.
NOTE [1] Locations are approximate. Final locations will be established in a Sampling and Quality Assurance Plan.

LEGEND:

PW-1 Porewater Monitoring Location and Contingent Bioassay Station[1]

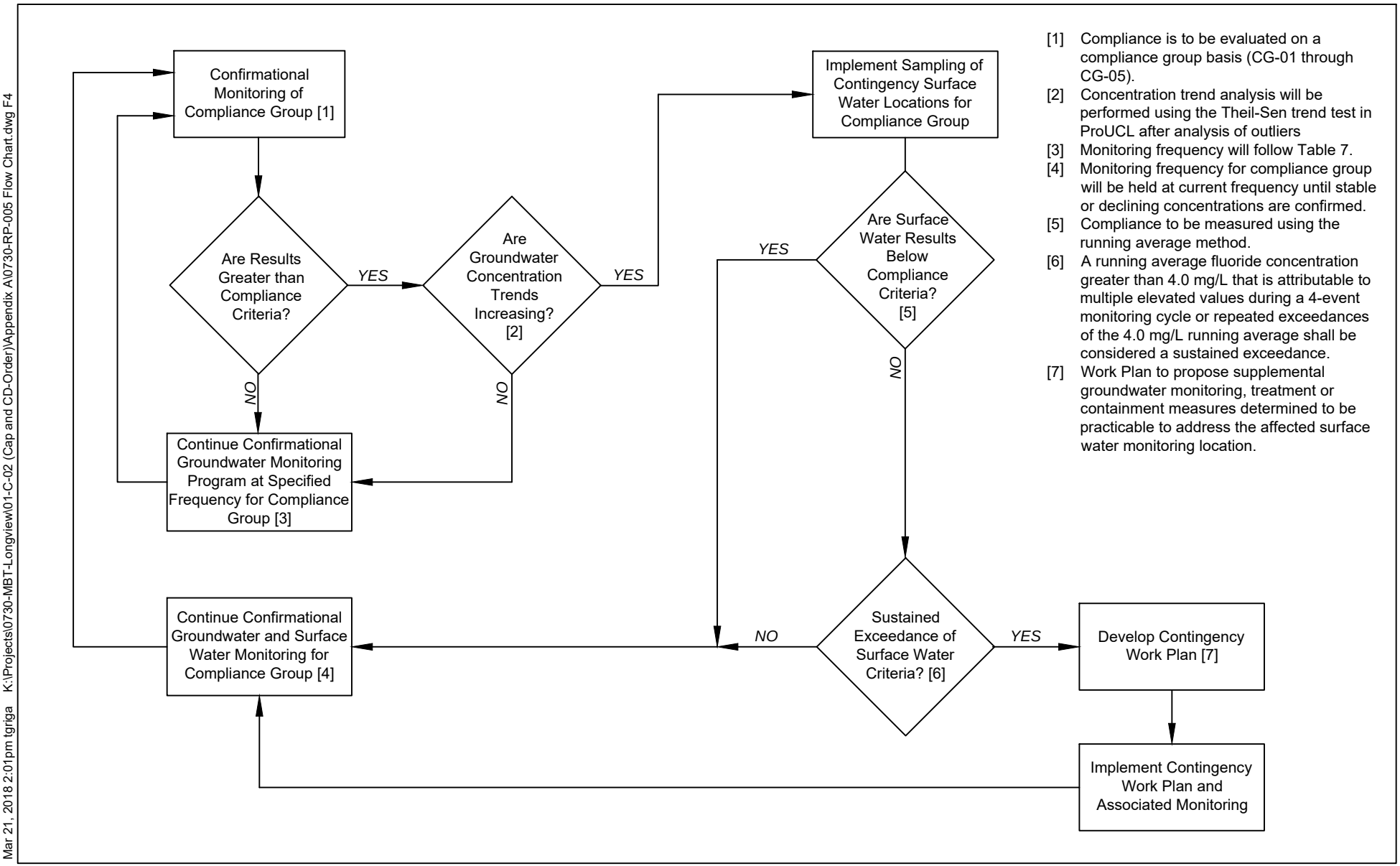
DB-1 Contingent Ditch Water Bioassay Location[1]

0 1600
Scale in Feet

K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\Appendix A\0730-RP-009 (Porewater Sampling_2017).dwg F3
Mar 21, 2018 1:59pm tgriga

ANCHOR QEA

Figure 3
Porewater and Contingent Bioassay Monitoring Locations
Compliance Monitoring and Contingency Response Plan
Former Reynolds Metals Reduction Plant – Longview



Mar 21, 2018 2:01pm tgriga K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\Appendix A\0730-RP-005 Flow Chart.dwg F4

Figure 4
Groundwater Compliance Evaluation Process
Compliance Monitoring and Conitgency Response Plan
Former Renolds Metals Reduction Plant - Longview

~~ATTACHMENT A — COMPLIANCE MONITORING METHODS AND DATA QUALITY OBJECTIVES~~

APPENDIX B
CLOSED BMP FACILITY POST-CLOSURE PLAN AMENDMENT

CLOSED BMP FACILITY POST-CLOSURE PLAN AMENDMENT

FORMER REYNOLDS METALS REDUCTION PLANT – LONGVIEW

Prepared for

Washington State Department of Ecology

On Behalf of

Northwest Alloys, Inc.

Millennium Bulk Terminals – Longview, LLC

Prepared by

Anchor QEA, LLC

6720 SW Macadam Avenue, Suite 125~~6650 SW Redwood lane, Suite 333~~

Portland, Oregon 9721924

~~January 2016~~August 2018

TABLE OF CONTENTS

List of Tables

List of Figures

List of Attachments

LIST OF ACRONYMS AND ABBREVIATIONS

CAP	Cleanup Action Plan
CDID	Consolidated Diking Improvement District
Closed BMP Facility	Closed Black Mud Pond Facility
Closure and Post-Closure Plan	Closure Plan and Post-Closure Plan for the Longview Reduction Plant
Ecology	Washington State Department of Ecology
Former Reynolds Plant	former Reynolds Metals Reduction Plant
MBT-Longview	Millennium Bulk Terminals – Longview, LLC
mg/L	milligram per liter
MTCA	Model Toxics Control Act
ppm	part per million
PRB	permeable reactive barrier
O&M Manual	Operation and Maintenance Manual for BMP Post-Closure Care
Reynolds	Reynolds Metals Company
RI/FS	Remedial Investigation and Feasibility Study
WAC	Washington Administrative Code

1 INTRODUCTION

The Closed Black Mud Pond Facility (Closed BMP Facility) is a closed, 33-acre impoundment situated in the northwestern corner of the former Reynolds Metals Reduction Plant (Former Reynolds Plant) located at 4029 Industrial Way in Longview, Washington. The location of the Closed BMP Facility is shown in Figure B-1.

The Closed BMP Facility contains residual carbon generated during the former on-site recycling process operated by Reynolds Metals Company (Reynolds). The Closed BMP Facility was considered a dangerous waste management facility and operated from 1972 until 1990. Closure activities were completed in 1992, consistent with a Washington State Department of Ecology (Ecology)-approved *Closure Plan and Post-Closure Plan for the Longview Reduction Plant* (Closure and Post-Closure Plan; Reynolds and CH2M Hill 1991), prepared in compliance with the State Dangerous Waste Regulations (Washington Administrative Code [WAC] 173-303) in effect at that time. Since 1992, the Closed BMP Facility has been subject to post-closure care consisting of ongoing maintenance and monitoring as specified in the Closure and Post-Closure Plan.

This plan provides an overview of the Closed BMP Facility history, updates maintenance provisions, and aligns monitoring requirements with the compliance monitoring framework under the *Draft Cleanup Action Plan* (CAP; Ecology 2015a) issued by Ecology. The plan complies with Model Toxics Control Act (MTCA) compliance monitoring requirements as described in WAC 173-340-410 and requirements for post-closure plans as defined in WAC 173-303-610(8). This Post-Closure Plan Amendment will supersede the previous version and ~~will~~must be implemented following the entry of the Consent Decree. As the Consent Decree, including its attached CAP, provides an alternative enforceable document under WAC 173-303-800(12), no post-closure permit will be required.

2 BACKGROUND

2.1 Origin of Residual Carbon

Residual carbon is a byproduct of the on-site recycling process that was used at the former Reynolds Plant between 1953 and 1990. That process was known as the "cryolite recovery" process and was conducted in the Cryolite Recovery Plant located on the east side of the Former Reynolds Plant. The Cryolite Recovery Plant ceased operation in 1990 and has since been removed.

Residual carbon is the solid carbonaceous material left over after the cryolite recovery process is complete. It has a characteristic dark color, consistent with the carbonaceous materials used to construct the aluminum manufacturing cathodes. Residual carbon contained within the Closed BMP Facility was approximately 15 to 30% solids by weight, consisting of mostly carbon and alumina (Reynolds and CH2M Hill 1991).

2.2 Construction and Operation of Closed BMP Facility

The Closed BMP Facility was initially constructed in 1972 for the collection and management of residual carbon from the cryolite recovery process. The Closed BMP Facility was formed by earth dikes and a clay bottom liner constructed above the natural ground surface (Reynolds 1992). Additional construction details are provided in Appendix B of the Remedial Investigation and Feasibility Study (RI/FS; Anchor QEA 2015).

Between 1972 and 1990, residual carbon was pumped via pipeline as a fine slurry into the Closed BMP Facility. Entrained water was separated by gravity and subsequently recycled for use in the Former Reynolds Plant's emissions control system. Residual carbon from the Cryolite Recovery Plant was the only material managed in the Closed BMP Facility throughout its operational history (Reynolds and CH2M Hill 1991). The cryolite recovery process and resulting residual carbon material were consistent throughout the Cryolite Recovery Plant's operation. As a result, the residual carbon materials are chemically homogenous.

2.3 Closure

The Closure and Post-Closure Plan for the Closed BMP Facility was developed consistent with regulatory requirements that were applicable when the facility was closed. These closure requirements were based on the results of analyses performed using a particular bioassay testing protocol that was used for state-only dangerous waste characterization under WAC 173-303 between 1983 and 1995.

Following promulgation of WAC 173-303 in 1983, Ecology implemented state-only waste characterization protocols that included fish bioassay tests. These tests were used to identify materials that were subject to special regulatory requirements as state-only dangerous wastes. The residual carbon managed in the Closed BMP Facility was tested at multiple times during its operation, using Washington's static acute fish toxicity tests (Ecology 1982; Reynolds 1982). The residual carbon materials passed these tests at a concentration of 100 parts per million (ppm), which is the current test protocol used by Ecology for waste characterization testing. However, at the time, Ecology used a bioassay test protocol at a concentration of 1,000 ppm. Using that testing protocol, the residual carbon was determined to be subject to regulation as state-only dangerous waste under WAC 173-303.

Because residual carbon was considered a state-only dangerous waste in 1983, per the acute fish toxicity test results, Reynolds submitted a Dangerous Waste Management Facility (Part B) permit application to Ecology in 1984. Ecology commented on the document in December 1984 (Ecology 1984), and Reynolds prepared a revised Part B permit application in 1985 (Reynolds and CH2M Hill 1985). Reynolds operated under the provisions of the Part B permit application until the facility operations were terminated and the facility was closed. Since that time, the dangerous waste regulations (WAC 173-303) have been updated; under the revised bioassay testing criteria, residual carbon does not designate as a state-only dangerous waste.

No more residual carbon was produced at the Reynolds facility after May 1990, when operations of the Cryolite Recovery Plant ceased (Northwest Alloys 2011). The Closure and Post-Closure Plan (Reynolds and CH2M Hill 1991) for the Closed BMP Facility was submitted to Ecology in 1991. Closure was completed in 1992 as a landfill under the State Dangerous Waste Regulations. Closure activities are described in Appendix B of the RI/FS

(Anchor QEA 2015). Reynolds submitted documentation of closure certification by an independent engineer licensed in the State of Washington and notice of a deed restriction filed with the Cowlitz County Auditor in a letter to Ecology dated April 20, 1993 (Reynolds 1993; Ecology 2011).

2.4 Post-Closure Care and Monitoring

Since 1992, the Closed BMP has been subject to an ongoing maintenance and monitoring program consistent with requirements specified in the Closure and Post-Closure Plan (Reynolds and CH2M Hill 1991), including cover, dikes, access roads, and control devices inspections and quarterly groundwater and surface water monitoring. The Closed BMP Facility has also been managed under the Reynolds' Operation and Maintenance Manual for BMP Post-Closure Care (O&M Manual; Reynolds 1992). Post-closure care operations and maintenance activities conducted throughout the post-closure period are described in Appendix B of the RI/FS (Anchor QEA 2015). Results of monitoring are also presented in Appendix B of the RI/FS and have shown that the closure activities at the facility have been effective. The appendix also summarizes recent repairs and upgrades to the Closed BMP Facility that were performed by Millennium Bulk Terminals – Longview, LLC (MBT-Longview) under Ecology oversight after acquisition of the facility assets from Chinook Ventures, Inc., in early 2011.

3 CLOSURE AND POST-CLOSURE REQUIREMENTS

The Ecology-approved Closure and Post-Closure Plan (Reynolds and CH2M Hill 1991) and the O&M Manual established a post-closure inspection and monitoring program for the Closed BMP Facility. With the closure of the BMP Facility, some of the inspection and monitoring program elements are no longer active, have been removed, or have been modified. The program elements detailed in the Closure and Post-Closure Plan and the amended inspection and monitoring elements are compared in Table 1.

Table 1

Comparison of Closure and Post-Closure Inspection and Monitoring Elements

1991 Inspection and Monitoring Elements for Closed BMP Facility[1]	Amended Inspection and Monitoring Elements for Closed BMP Facility
Security Control Devices	
• **Fence –** inspect entire perimeter for breach or damage • **Warning Signs –** make sure signs are in place and unobstructed • **Gates –** check for proper gate lock functions	Inspection element remains the same.
Final Cover	
• **Benchmarks –** check to make sure benchmarks are in good condition and clearly identified • **Vegetation –** check for bald spots or dead vegetation; check for deep-rooted plant starts; mow on schedule • **Cover –** check for holes, burrows, cracks, subsidence, or signs of erosion; check for ponded water or puddles; check drain pipes for function and integrity	Inspection element remains the same, plus long-term maintenance of the cover, dikes, and access road to prevent and control the growth of invasive blackberry and weeds with damaging root systems as specified in Section 4.4.
Gas Vents	
• **Pipes –** make sure pipe is in vertical position • **Screens –** inspect for damage; clean screens	Inspection element remains the same.
Dikes and Access Road	
• **Dikes –** check for signs of erosion, burrows, subsidence, and displacement • **Access Road –** make sure surface course is in good condition; check that surface is free-draining away from cover	Inspection element remains the same.
Temporary Dewatering Sump and Leachate Pipeline	
• Check that sump is free of sediment • Check for subsidence of soil adjacent to sump • Inspect pump for proper operation without leaks • Mark pipeline for protection from traffic • Check pipeline for signs of leaks • Make sure pipe supports are in good condition	Inspection element removed because leachate water no longer drains into the sump and pump was removed in 2000. Sump to be abandoned (i.e., filled) and pipeline to be removed (see Figure B-2).

1991 Inspection and Monitoring Elements for Closed BMP Facility[1]	Amended Inspection and Monitoring Elements for Closed BMP Facility
Leachate Collection Ditch (now known as the former leachate ditch)	
• **Recycle Pump –** check for proper operation, leaks, and indications of needed maintenance • **Dam at East End –** make sure dam is intact; check for signs of erosion and leakage and that gate valve is closed • **Dam at West End –** make sure dam is intact; check for signs of erosion and leakage and that gate valve is closed	Inspection element removed because ditch no longer receives inflow from Closed BMP Facility. Former leachate ditch (see Figure B-2) to be modified at east end to allow gravity drainage to the U-ditch (Figure B-3). Ditch to be modified as part of Site remediation (i.e., partially filled) at west end to improve separation from the CDID ditch and provide for PRB construction as part of the site-wide MTCA cleanup action.
Groundwater Monitoring Program	
• Nine wells (RL-1S/1D, RL-2S/2D, RL-3S/3D, RL-4S/4D, and RL-5) • Two ditch water locations (CDID Up and CDID Down) • Sample quarterly • Monitor for pH, specific conductance, chloride, fluoride, sulfate, free cyanide, total cyanide, arsenic, calcium, chromium, copper, magnesium, nickel, and sodium • Wells are inspected during sampling events; check for integrity or deterioration; check for signs of tampering, open cap, or open lock	Inspection element remains but with modifications to monitoring locations, sampling frequency, and monitoring parameters (see Section 4.5) and alignment of the monitoring program for the site-wide MTCA cleanup action

Notes:
1 = Inspection elements from Closure and Post-Closure Plan (Reynolds and CH2M Hill 1991) and 1992 Operation and Maintenance Manual (Reynolds 1992)
BMP = Black Mud Pond
CDID = Consolidated Diking Improvement District
MTCA = Model Toxics Control Act
PRB = permeable reactive barrier

The removal, abandonment, or modification of Closed BMP Facility post-closure elements ~~will~~must be performed after approval of the CAP and entry of the Consent Decree, and receipt of required permits. These elements include the following:

- **Abandonment of sump and pipeline.** The temporary dewatering sump, pump, and pipeline were installed after the closure of the BMP Facility to remove the entrained water and assist in consolidation of the carbon material (Reynolds 1992). Water collected from the temporary dewatering sump was pumped over to an internal facility ditch (now known as the former leachate ditch) located along the south side of the Closed BMP Facility (see Figure B-2). A dam and gate valve were constructed at each end of the former leachate ditch. The water collected in the leachate ditch was pumped back into the plant for makeup water in the plant's air scrubber system

(or electrostatic precipitators) using an enclosed pipeline. The temporary dewatering system was discontinued in 2000 because water was no longer collecting in the dewatering sump. The pump has been removed from the temporary dewatering sump. The sump ~~will~~must be filled and the pipeline removed, as these features are no longer necessary.

- **Modification of the former leachate ditch.** The former leachate ditch no longer receives leachate but still collects groundwater and surface water runoff. The ditch system (dams, gate valves, and pumps) is still in operation, and water levels are currently controlled using an automatic level control pump (see Figure B-2). When water levels exceed those specified for the control pump, water from the ditch (i.e., groundwater and stormwater) is pumped to the wastewater treatment plant for treatment prior to discharge to the Columbia River via Outfall 002A. The earthen dam that separates the former leachate ditch from the U-ditch (Figure B-3) ~~will~~must be modified to allow for gravity drainage to the U-ditch, which in turn drains to the on-site water treatment facilities. Gravity drainage at this location shall be established either by removing a portion of the dam (minimum removed width of 4 feet as measured at the base of the existing ditches) or by installing a culvert (minimum diameter 2 feet; invert elevation within 2 feet of the bottom of the existing ditches) through the dam. As part of the final Site-wide MTCA cleanup action, the west end of the ditch ~~will~~must be modified to improve separation from CDID Ditch No. 14 and provide for permeable reactive barrier (PRB) construction.

4 AMENDED POST-CLOSURE REQUIREMENTS

The post-closure inspections, maintenance, and monitoring activities ~~will~~must be ongoing to ensure that cleanup standards are met and long-term effectiveness of the Closed BMP Facility is maintained. These activities ~~will~~must be implemented after approval of the CAP and entry of the Consent Decree. These elements include the following:

4.1 Inspection of Final Cover, Dikes, and Access Road

The cover, dikes, and access road ~~will~~must be inspected monthly. Post-closure inspection elements are shown on Figure B-4, and the inspection form is included as Attachment A.

- The cover system ~~will~~must be visually inspected for evidence of erosion, overgrown vegetation, significant differential settlement, ponding of stormwater, or other evidence of leaks in the cover system.
- Special attention ~~will~~must be paid to ponding on the cover and ensuring that the road surface is free-draining away from the cover.
- The gas vents ~~will~~must be inspected to ensure that they are in the vertical position.
- Screens ~~will~~must be inspected for damage and cleaned as necessary.
- Maintenance of the cover, dikes, and access road to prevent and control the growth of invasive blackberry and weeds is described in Section 4.4.
- Routine maintenance ~~will~~must be conducted on the Closed BMP Facility cover, dikes, and access road, as necessary, to meet these requirements.
- Survey benchmarks ~~will~~must be inspected for integrity at least annually and repaired or replaced if necessary.

Documentation of inspection and maintenance activities will be filed on site.

4.2 Contingent Cover Settlement Surveys

The cover has been surveyed routinely since at least 1997. Settlement was consistent each year from 1997 to 2002 with settlement in the range of 1.5 inches per year. Settlement has since slowed down, with approximately 0.3 inch of settlement occurring per year (2010 to 2014). Periodic surveys ~~will~~must be conducted, if necessary, to supplement visual inspections if erosion or ponding is observed. Given the observed reduction in settlement

rates, surveys ~~will~~must generally be performed on a 5-year interval, unless visual inspections indicate ponding or other potential areas of concern, or unless there is a seismic event of sufficient magnitude to result in observations of ground disturbance in the Cowlitz County area. Surveys (if applicable) should be conducted after mowing has occurred. Survey documentation ~~will~~must be filed on site.

4.3 Maintenance of Security Control Devices

Security measures and fences prevent the potential entry of large animals that may damage the cover and restrict trespassing, limiting the possibility of vandalism. Security measures ~~will~~must be maintained in place. The fence and gate ~~will~~must be repaired as needed to maintain a barrier around the Closed BMP Facility. Documentation of maintenance/repair activities ~~will~~must be filed on site.

4.4 Maintenance of Cover, Dikes, and Access Road

Long-term maintenance for the Closed BMP Facility cover, dikes, and access road includes the following activities to prevent and control the growth of invasive blackberry and weeds with damaging root systems:

- The grass surface of the cover ~~will~~must be mowed annually. Mowing should occur during late June or July after the rains have subsided and growth has maximized. Clippings will be left on the cover for mulch.
- The cover ~~will~~must be inspected every month during growing season (generally April 1 through October 31). During inspections, the following shall be observed:
  - Blackberries
    - On cover: if observed, wait until blackberries grow to 12 inches in height and mow down to 3 inches or less
    - On access road and dikes: cut and spray with herbicide[1]
  - Weeds
    - On cover: hand pull or grub, bag, and remove
    - On access road and dikes: mow and spray with herbicide

[1] In lieu of annual cutting and spraying, MBT-Longview may also choose to eradicate the blackberries through root pulling and replanting the growth area with native species.

- Trees and shrubs
  - On cover: grub, bag, and remove
  - On access road and dikes: grub, bag, and remove

Application of chemical pesticides ~~will~~must be in accordance with the local recommendations, Ecology guidance, the Cowlitz County Critical Areas Ordinance, and Washington State Department of Agriculture laws and regulations. The applicator shall be licensed by the State of Washington as a Commercial Applicator or Commercial Operator with additional endorsements as required for the products and methods used. Documentation of inspection and maintenance activities ~~will~~must be filed on site.

4.5 Groundwater Monitoring Program

The objective of the amended groundwater monitoring program is to verify the long-term effectiveness of the Closed BMP Facility and compliance with the CAP's site-specific cleanup levels. The amended groundwater monitoring program will be implemented in two phases. The first phase ~~will~~must be executed after approval of the CAP and entry of the Consent Decree. The second phase ~~will~~must be implemented after the installation of two new groundwater monitoring wells and the PRBs, as outlined in the CAP (Ecology 2015a). This section describes the groundwater monitoring locations, testing frequency, and monitoring parameters for the two phases.

4.5.1 Monitoring Locations

Phase 1 groundwater monitoring ~~will~~must be performed at five existing monitoring wells (RL-1S, RL-2S, RL-3S, PZ-6, and PZ-7; see Figure B-2). Phase 1 monitoring of surface water contained in the CDID ditch ~~will~~must include monitoring at existing locations CDID-Up and CDID-Down. Monitoring ~~will~~must also include testing at the ambient station W-2 (Figure B-2).

Phase 2 groundwater monitoring ~~will~~must be performed at five monitoring wells

- Existing well RL-3S
- Two locations sampled during the RI/FS (PZ-6 and PZ-7) and Phase 1
- Two new groundwater monitoring wells to be installed downgradient of the planned

PRBs (see Figure B-4). These new groundwater monitoring wells ~~will~~must be screened in the upper alluvium shallow water bearing zone in areas downgradient of the fill deposits and upgradient of CDID Ditch No. 14.

Existing wells formerly included in the post-closure monitoring program that are not needed for ongoing monitoring ~~will~~must be abandoned. These wells include those that have already demonstrated compliance with Site cleanup levels during post-closure monitoring conducted to date (RL-1D, RL-3D, RL-4S, RL-4D, RL-5) and the three wells (RL-1S, RL-2S, RL-2D) that will be located upgradient of the PRBs to be constructed as part of the site-wide MTCA cleanup action. The function of these wells is being replaced by new wells to be installed on the downgradient sides of the PRBs.

4.5.2 Monitoring Parameters and Frequency

Phase 1 groundwater and ditch water monitoring ~~will~~must be conducted quarterly (i.e., four times per year). Groundwater samples ~~will~~must be monitored for water quality parameters (pH, specific conductance, temperature, and turbidity) and analyzed for total and dissolved fluoride.[2] Ditch water samples ~~will~~must be monitored for water quality parameters (pH, specific conductance, temperature, and turbidity) and analyzed for total and dissolved fluoride. Monitoring for other constituents previously included in post-closure monitoring will no longer be performed because the final RI/FS (Anchor QEA 2015) concluded that these parameters did not exceed applicable site-wide cleanup levels.

Following installation of the PRBs and two new groundwater wells (Phase 2), groundwater and ditch water monitoring ~~will~~must be conducted concurrently with site-wide groundwater monitoring under the following frequency:

- Years 1 and 2: Quarterly (i.e., four times per year)
- Years 3 and 4: Semi-annually (i.e., twice per year)
- Year 5 through Year 10: Annually
- After Year 10: Every 2 years

[2] As described in the RI/FS, fluoride is the only constituent in groundwater at the Closed BMP Facility that exceeds applicable cleanup levels.

Table 2 presents the parameters to be analyzed under each monitoring frequency for the Phase 2 groundwater monitoring program. Ditch water monitoring ~~will~~must be performed quarterly during Years 1 and 2. Ditch water monitoring will be discontinued after Year 2, provided there are no confirmed readings of total fluoride in surface water in excess of 4 milligrams per liter (mg/L) during Years 1 and 2.

Table 2
Phase 2 Monitoring Parameters and Frequency

Time Frame (After Completion of Cleanup Construction)	Frequency[1]	Groundwater Monitoring Parameters[2]		Ditch Water Monitoring Parameters[2]
		Total and Dissolved Fluoride	PAHs and Free Cyanide[3]	Total and Dissolved Fluoride
Year 1	Quarterly	x	X	x
Year 2	Quarterly	x	-[3]	x
Year 3	Semi-Annually	x	-	-[4]
Year 4	Semi-Annually	x	-	-
Year 5 through Year 10	Annually	x	-	-
Year 11 and beyond	Every 2 years	x	-	-

Notes:
Compliance with cleanup levels and remediation levels will be assessed separately for each compliance group.
1 = Frequency of groundwater sampling will be as shown in this table unless there are exceedances of remediation levels (refer to Section 3.5 and data evaluation process shown in Figure 3).
2 = Field parameters to be monitored during each event for groundwater and surface water testing. Field parameters will include pH, specific conductance, temperature, and turbidity.
3 = Groundwater to be monitored during Year 1 following completion of construction to verify the absence of construction-related changes to groundwater quality. Testing for these parameters will be discontinued following Year 1, provided there are no exceedances of groundwater cleanup levels.
4 = Ditch water monitoring for fluoride will be discontinued for each compliance group after Year 2, provided there are no confirmed detections of total fluoride in excess of 4.0 mg/L. Surface water monitoring may be resumed, in the event that groundwater remediation levels are exceeded.

For both Phase 1 and 2, groundwater samples ~~will~~must be collected using standard low-flow sampling techniques, using a peristaltic pump and pre-cleaned disposable tubing. Water quality parameters (pH, specific conductance, temperature, and turbidity) ~~will~~must be monitored during well purging, and three consecutive readings within 10% of each other will indicate that the well has stabilized and a sample can be collected.

Groundwater samples ~~will~~must be collected directly into pre-cleaned sample containers provided by the analytical laboratory and will be immediately placed on ice in a cooler.

Samples designated for dissolved fluoride ~~will~~must be filtered at the time of sampling through a 0.45-micron disposable membrane filter.

Ditch water samples ~~will~~must be collected from the designated sampling locations using a peristaltic pump and pre-cleaned disposable tubing. The samples ~~will~~must be collected within the surface water from within 1 foot of the mud-line. Water quality parameters (pH, specific conductance, temperature, and turbidity) ~~will~~must be monitored during sample collection. Surface water samples ~~will~~must be collected directly into pre-cleaned sample containers provided by the analytical laboratory and ~~will~~must be immediately placed on ice in a cooler. Samples designated for dissolved fluoride ~~will~~must be filtered at the time of sampling through a 0.45-micron disposable membrane filter.

All monitoring data ~~will~~must be validated prior to use in data reporting. In the event that data are rejected during data validation for data quality concerns, the sampling event will be repeated for the affected monitoring locations. Data from the resampling will replace the initially collected, rejected data, provided that the resampling is completed within 60 days of the initial sampling event and that the data from the resampling event are determined to meet data quality objectives. If replicate fluoride data are available for a monitoring location during a single sampling event and neither sample has been invalidated due to data quality concerns, the average of the two samples will be used for reporting and compliance evaluation, consistent with WAC 246-290-310(2)(e) and 40 CFR 141.23(f).

4.5.3 Wellhead Inspections and Maintenance/Replacement

The integrity of the groundwater monitoring wells ~~will~~must be inspected prior to each sampling event. Wells that show signs of failure or deterioration ~~will~~must be repaired or replaced. Wells ~~will~~must also be replaced if the wellhead is severely damaged or the well does not produce water sufficient for monitoring activities. If replacement wells are required, they ~~will~~must be installed within 30 feet of the original location unless otherwise approved by Ecology.

4.5.4 Contingency Response Actions

This section describes how long-term fluoride monitoring data will be reviewed to assess whether site conditions following the post-construction period (Years 1 and 2 following construction) are stable. In the event that suspect conditions are identified, additional monitoring or other contingency response actions ~~will~~must be performed, as described in this section, to ensure protectiveness of the cleanup action.

After each monitoring period, the groundwater total fluoride data ~~will~~must be analyzed for compliance with the cleanup level (4.0 mg/L) and for concentration trends. Compliance with the groundwater cleanup level ~~will~~must be evaluated at each compliance monitoring location using the running average method consistent with WAC 173-340-720(9)(c)(ii), WAC 246-290-310(3)(b), and 40 CFR 141.23(i). The concentration trend analysis ~~will~~must be performed for new and existing data using outlier analysis and the Theil-Sen trend test in ProUCL, or other methods approved by Ecology. The trend analysis ~~will~~must be performed first after a minimum of 8 data points are available for a given sampling location. The certainty of the trend analysis improves with the quantity of data. Provided that concentration trends for fluoride are found to be stable or decreasing, monitoring activities ~~will~~must continue as defined in Table 2.

As long as the total fluoride concentrations are stable or declining, the remedy will be considered to be protective of the surface water in the CDID ditch, as demonstrated by data presented in the RI/FS (Anchor QEA 2015). Groundwater monitoring ~~will~~must continue according to the schedule in Table 2.

In the event that upward concentration trends are identified in any of the four monitoring wells located along the CDID-ditch, contingent monitoring for total and dissolved fluoride ~~will~~must be performed on a quarterly basis at locations CDID-Up, CDID-Down, and W2 located in the CDID ditch (see Figure B-4). Monitoring ~~will~~must be implemented in parallel with the next groundwater monitoring event. These data ~~will~~must be included in the monitoring report along with the groundwater monitoring data.

If contingent ditch water monitoring is triggered, the surface water monitoring ~~will~~must be repeated for at least four quarters. Compliance with surface water cleanup levels ~~will~~must be evaluated at each surface water compliance monitoring location using the running average

method, consistent with WAC 173-340-730, WAC 246-290-310(3)(b), and 40 CFR 141.23(i). If fluoride concentrations at the surface water monitoring locations comply with surface water cleanup levels, no contingent actions will be required other than monitoring. However, surface water monitoring ~~will~~must continue until: 1) a stable or downward trend is confirmed in the four groundwater monitoring wells located along the CDID ditch; and 2) no confirmed measurements in excess of 4.0 mg/L total fluoride occur during the surface water sampling events. During this time, groundwater monitoring for the affected compliance group ~~will~~must be maintained at a quarterly frequency. Once a stable or downward trend in groundwater concentrations has been demonstrated and surface water fluoride concentrations remain consistently below 4.0 mg/L for four quarters, the monitoring program will resume, as described in Table 2.

If a sustained exceedance of the surface water cleanup level is confirmed (i.e., exceedances of the 4.0 mg/L running average are recurring), a ~~Supplemental Remedial Measures Work~~Contingency Plan ~~will~~must be developed and submitted to Ecology for review and comment. The ~~Supplemental Remedial Measures Work~~Contingency Plan ~~will~~must include the results of supplemental testing activities necessary to determine the cause of the exceedance and ~~will~~must also assess the practicability of targeted response actions to address the affected surface water monitoring location(s). Where appropriate, the ~~Supplemental Remedial Measures Work~~Contingency Plan ~~will~~must propose supplemental groundwater monitoring, treatment, and/or containment measures for the affected location(s), as determined to be practicable under WAC 173-360(3)(e), and ~~will~~must propose a schedule for implementation, monitoring, and reporting of those measures. Following Ecology review and approval, the ~~Supplemental Remedial Measures Work~~Contingency Plan ~~will~~must be implemented according to the approved schedule, including applicable monitoring and reporting.

4.6 Reporting

Reporting of quarterly results collected during Phase 1 ~~will~~must continue on an annual basis until Phase 2 begins.

Phase 2 monitoring data collected from a given monitoring year ~~will~~must be summarized in the site-wide groundwater monitoring report to be prepared and submitted to Ecology as outlined in the *Compliance Monitoring and Contingency Response Plan* (Ecology 2015b).

5 REFERENCES

Anchor QEA (Anchor QEA, LLC), 2015. *Former Reynolds Metals Reduction Plant – Longview, Remedial Investigation and Feasibility Study Report*. Prepared for Northwest Alloys, Inc., and Millennium Bulk Terminals – Longview, LLC. January 2015.

Ecology (Washington State Department of Ecology), 1982. Memorandum: 96-hour Bioassay Information for sample from Reynolds Metals, Longview. Results of static basic acute toxicity bioassay testing on rainbow trout. July 8, 1982.

Ecology, 1984. Letter to: John Larsen, Reynolds Metals Company. Regarding: Part B application. December 10, 1984.

Ecology, 2011. Regarding: Reynolds Aluminum "Certificate of Closure" for the Black Mud Pond. Email to: Kristin Gaines, Millennium Bulk Terminals - Longview, LLC. Email from: Judith Schwieters. July 19, 2011.

Ecology, 2015a. *Draft Cleanup Action Plan.* Former Reynolds Metals Reduction Plant – Longview. May 2015.

Ecology, 2015b. *Compliance Monitoring and Contingency Response Plan*. Former Reynolds Metals Reduction Plant – Longview. June 2015.

Northwest Alloys (Northwest Alloys, Inc.), 2011. *Demolition and Cleanup Accomplishments at the Former Reynolds – Longview Plant*. Prepared for Alcoa. Prepared by Northwest Alloy, Inc. June 2011.

Reynolds (Reynolds Metals Company), 1982. Acute toxicity bioassay testing on rainbow trout. Letter and Data Sheet from BioMed Research Laboratories to Reynolds Metals Company. July 14, 1982.

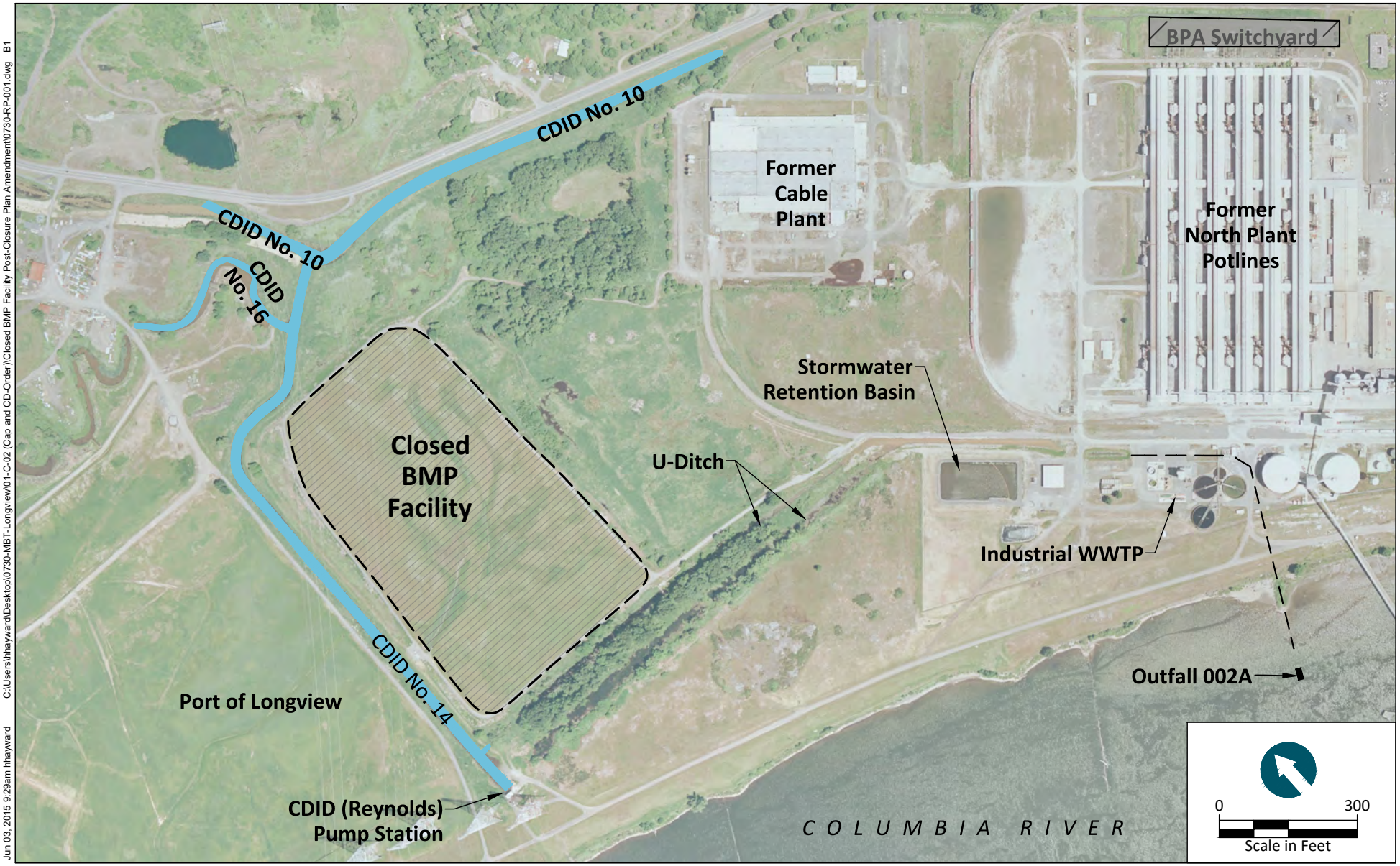
Reynolds, 1992. *Operations and Maintenance Manual: Black Mud Pond Post-Closure Care*. Prepared by Reynolds. November 1992.

Reynolds, 1993. Letter to: Don Reif, DOE Industrial Section. April 20, 1993.

Reynolds and CH2M Hill, 1985. Dangerous Waste Management Facility Permit Part B Application for the Longview Reduction Plant. Prepared for Washington State Department of Ecology. Prepared by Reynolds and CH2M Hill. September 1984. Revised May 1985.

Reynolds and CH2M Hill, 1991. *Closure Plan and Post-Closure Plan for the Longview Reduction Plant.* Longview, Washington. Prepared for the Washington Department of Ecology. July 1991.

FIGURES

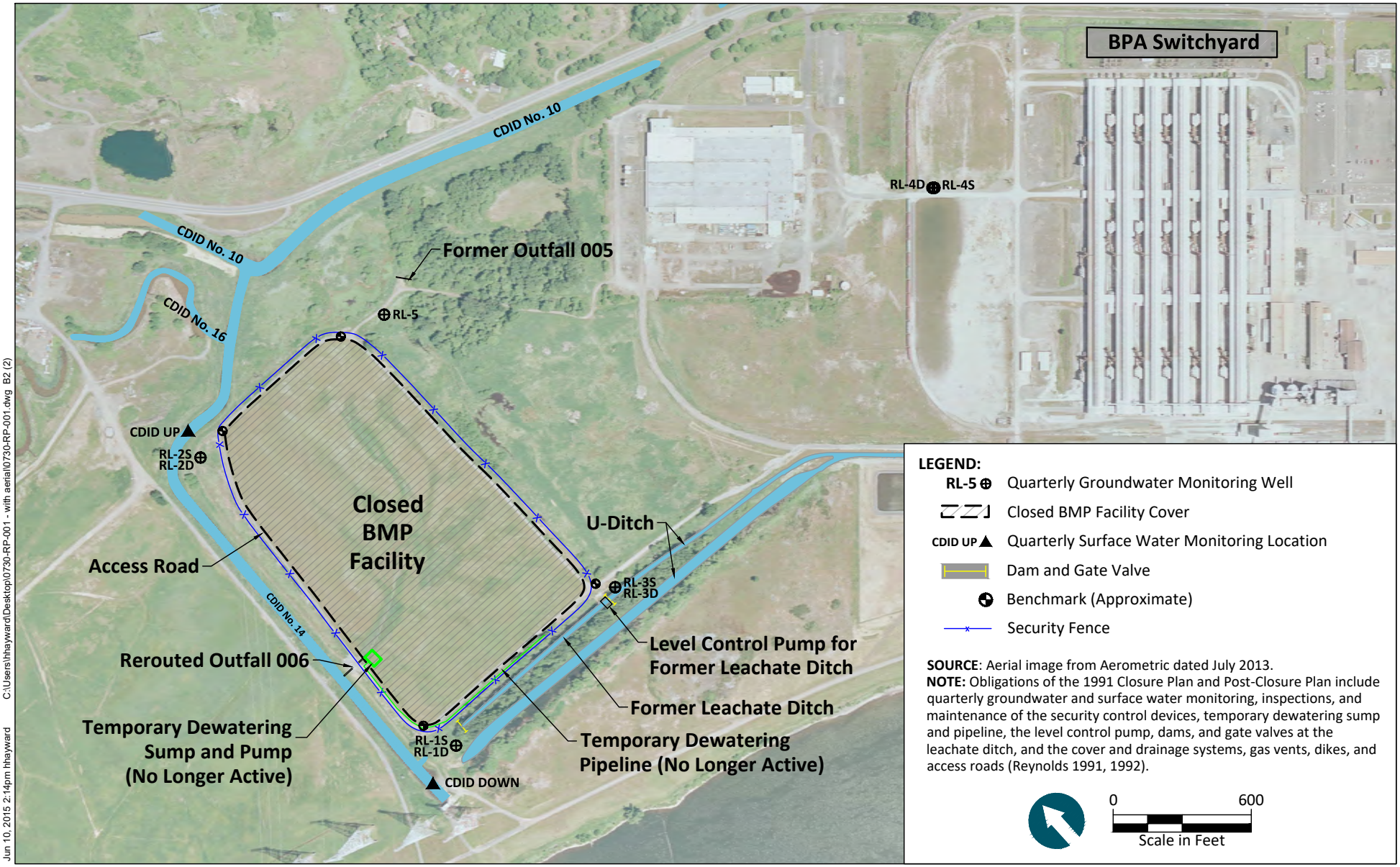


Jun 03, 2015 9:29am hhayward C:\Users\hhayward\Desktop\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\Closed BMP Facility Post-Closure Plan Amendment\0730-RP-001.dwg B1

SOURCE: Aerial image from Aerometric dated July 2013.

ANCHOR QEA

Figure B-1
Location of the Closed BMP Facility
Closed BMP Facility Post-Closure Plan Amendment
Former Reynolds Metals Reduction Plant – Longview



SOURCE: Aerial image from Aerometric dated July 2013.

ANCHOR QEA

Figure B-2
Historic Closed BMP Facility Monitoring Elements
Closed BMP Facility Post-Closure Plan Amendment
Former Reynolds Metals Reduction Plant – Longview

SOURCE: Aerial image from Aerometric dated July 2013. Contours from Minister & Glaeser, dated January 2011.
HORIZONTAL DATUM: Washington State Plane South Zone, NAD83, U.S. Feet.
VERTICAL DATUM: North American Vertical Datum of 1988.

NOTES

1. Gravity drainage at this location shall be established either by removing a portion of the dam (minimum removed width of 4 feet as measured at the base of the existing ditches) or by installing a culvert (minimum diameter 2 feet; invert elevation within 2 feet of the bottom of the existing ditches) through the dam.

LEGEND:

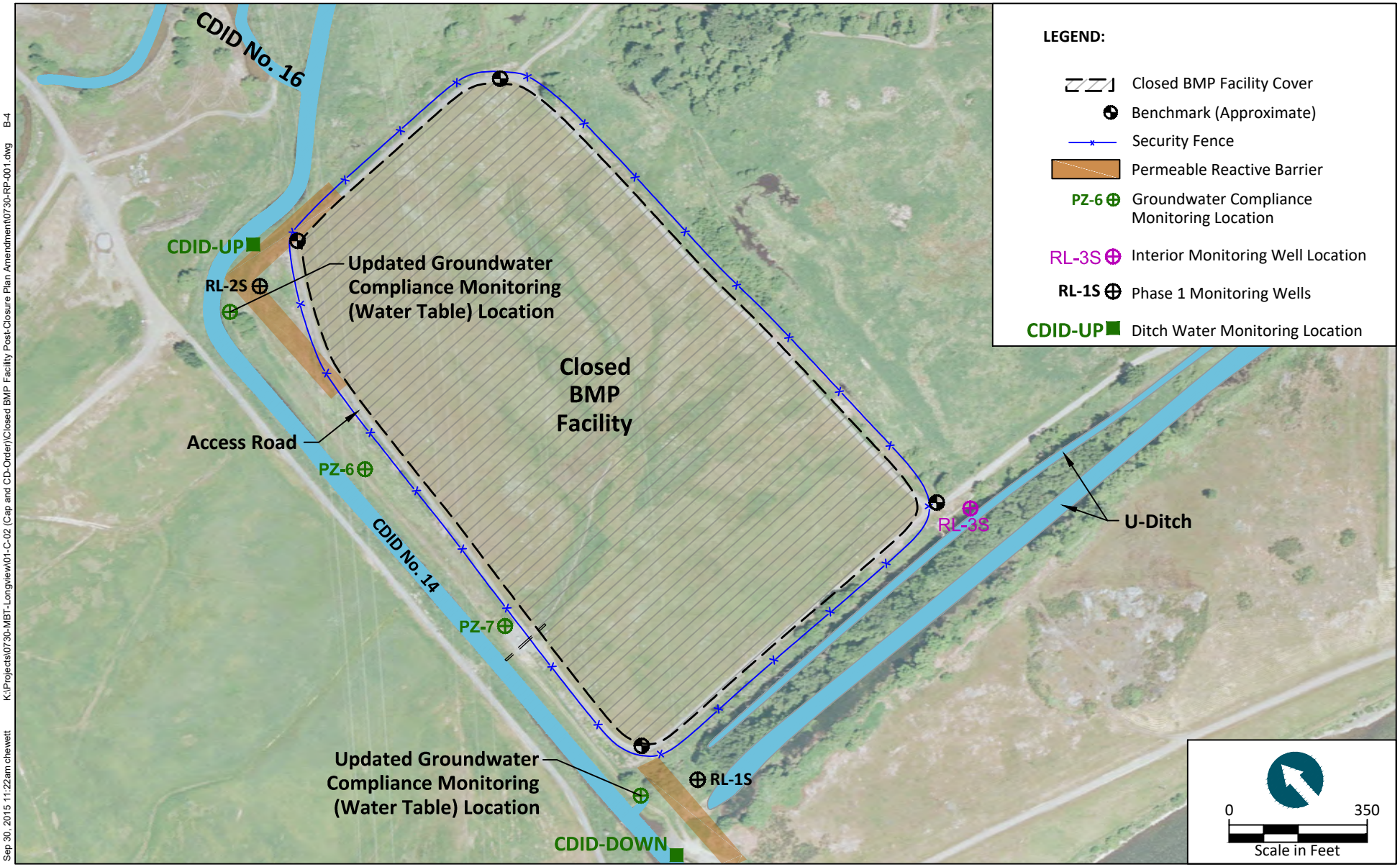
- Closed BMP Facility Cover
- Dam and Gate Valve
- Security Fence
- Existing Contours (1' and 5' Interval)

0 100
Scale in Feet

K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\Closed BMP Facility Post-Closure Plan Amendment\0730-RP-002 (U-Ditch Zoom).dwg B-3
Dec 04, 2015 4:21pm chewett

ANCHOR QEA

Figure B-3
Leachate Ditch and U-Ditch Connection
Closed BMP Facility Post-closure Plan Amendment
Former Reynolds Metals Reduction Plant – Longview



Sep 30, 2015 11:22am chewett K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\Closed BMP Facility Post-Closure Plan Amendment\0730-RP-001.dwg B-4

SOURCE: Aerial image from Aerometric dated July 2013.

ANCHOR QEA

Figure B-4
Amended Closed BMP Facility Monitoring Elements
Closed BMP Facility Post-Closure Plan Amendment
Former Reynolds Metals Reduction Plant – Longview

ATTACHMENT A
CLOSED BMP FACILITY INSPECTION FORM

Closed BMP Facility Inspection and Maintenance Checklist

Check each inspection element with a yes or no in the satisfactory column. Items that receive a "no" must be repaired, and the follow-up maintenance section filled out after the repair has been implemented. Use the following guidelines for each element:

1. Final Cover, Dikes, and Access Road
   - Inspection (Monthly):
     - Check for cover and dikes for holes, burrows, cracks, subsidence, or signs of erosion
     - Check cover for ponded water
     - Check for bald spots of vegetation; check for deep-rooted plant starts (during growing season—April 1 through October 31)
     - Make sure access road is free-draining away from cover and surface course is in good condition
     - Check that gas vents are in vertical position and inspect for damaged screens.
   - Maintenance (during growing season—April 1 through October 31):
     - Mow grass on cover and leave clippings for mulch
     - Mow blackberries on cover when 12 inches high
     - Mow and spray blackberries and weeds on access road and dikes
     - Grub, bag and remove weeds, trees, and shrubs
     - Survey after mowing if erosion or ponding is observed

2. Security Control Devices
   - Inspection (Annually):
     - Inspect entire fence for breach or damage
     - Make sure warning signs are in place and unobstructed
     - Check that gates lock properly
   - Maintenance:
     - Repair fence or gates, as necessary

3. Survey Benchmarks
   - Inspection (Annually):
     - Inspect for damage and integrity
   - Maintenance:
     - Repair or replace if necessary

4. Groundwater Monitoring Wells
   - Inspection (Quarterly during groundwater monitoring events):
     - Inspect wells for integrity or deterioration; check for signs of tampering, open cap, or open lock
   - Maintenance:
     - Repair or replace wells that show signs of failure or deterioration.

Inspections:

Element	Satisfactory		Explanation of Deficiency or "No"
	Yes	No	
Cover			
Dikes			
Access Road			
Gas Vents			
Security Control Devices			
Survey Benchmarks			
Groundwater Monitoring Wells *Inspected during monitoring event on [_____]			

Inspected By: _____

Signature: _____

Date/Time: _____

Maintenance:

Separately described maintenance/repairs implemented to address each deficiency noted in the "inspections" section.

Element	Description of Maintenance	Date	Completed By

Additional Notes: _____

APPENDIX C
TPH-AREA WORK PLAN

TPH AREA WORK PLAN
FORMER REYNOLDS METALS REDUCTION PLANT – LONGVIEW

Prepared for

Washington State Department of Ecology

On Behalf of

Northwest Alloys, Inc.

Millennium Bulk Terminals – Longview, LLC

Prepared by

Anchor QEA, LLC

6720 SW Macadam Avenue, Suite 125

Portland, Oregon 97224

August 2018

TABLE OF CONTENTS

List of Tables

List of Figures

List of Attachments

LIST OF ACRONYMS AND ABBREVIATIONS

CAP	Cleanup Action Plan
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
Site	former Reynolds Metals Reduction Plant
MBT-Longview	Millennium Bulk Terminals – Longview, LLC
NWTPH-Dx	Northwest Total Petroleum Hydrocarbon – Diesel Range
PCB	polychlorinated biphenyl
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbon
TPH-Dx	total petroleum hydrocarbon, diesel-range
TPH Area	localized area of surface soil containing TPH
SU	Site Unit

1 INTRODUCTION

This document presents the work plan for the cleanup of a localized area of surface soil containing total petroleum hydrocarbons (TPH) located at the former Reynolds Metals Reduction Plant (Site) in Longview, Washington. The cleanup of this localized area (TPH Area) is included in the work to be performed as part of the Washington State Department of Ecology's (Ecology's) selected cleanup action for the Site, as described in the Cleanup Action Plan (CAP; Ecology 2015).

1.1 Site Description

The Site is located in Cowlitz County, Washington, approximately 2.9 miles northwest of the center of Longview and 4.8 miles northwest of Interstate 5. The location of the Site is shown in Figure C-1. The physical plant, buildings, and other improvements are owned by Millennium Bulk Terminals – Longview, LLC (MBT-Longview), while the upland property is owned by Northwest Alloys, Inc., which is a wholly owned subsidiary of Alcoa, Inc.

1.2 Background

During Site demolition activities in May 2014, MBT-Longview identified a localized area of stained surface soil northeast of the former south plant as shown in Figure C-2. Soil samples were collected, as described in Section 2 of this Work Plan, to characterize the material. The presence of the stained soil and the testing results were reported to Ecology.

Ecology requested that the removal of the stained soil be incorporated into the final cleanup action of the Site as defined in the CAP (Ecology 2015). This Work Plan presents the existing data and describes the work to be performed to complete the cleanup of the TPH Area. The TPH Area is defined as Site Unit 13 (SU-13) in the CAP (Ecology 2015).

2 TPH AREA CHARACTERISTICS

This section describes the existing data available for the TPH Area.

2.1 Soil Sampling Procedures

Soil surface grab samples were taken from eight locations within the area containing stained surface soil. The area is approximately 12 feet long by 7 feet wide (see Figure C-3). Each surface grab was taken at a depth of 0 to 6 inches below ground surface. No staining was visible below this depth. In some locations, concrete is present just below the stained soil.

Samples were collected in laboratory-supplied containers, placed in a cooler, and shipped to Specialty Laboratories, LLC, under chain-of-custody. The eight samples and one duplicate sample were analyzed for the following parameters:

- Total petroleum hydrocarbon – Northwest Total Petroleum Hydrocarbon – Diesel Range (NWTPH-Dx)
- Toxicity characteristic leaching procedure (TCLP) metals by U.S. Environmental Protection Agency (EPA) Method SW1311
- Polychlorinated biphenyls (PCBs) by EPA Method SW8082a

2.2 Sample Results

Soil testing results are listed in Table C-1. Results confirmed that TPH was present in the stained soil in excess of Site cleanup levels for soil as defined in the CAP (Ecology 2015). No exceedances of TCLP criteria were noted in any of the samples (Washington Administrative Code 173-303-090(8)(c)). PCB concentrations were below the Site soil cleanup level as defined in the CAP. The laboratory report is included as Attachment A.

3 TPH AREA WORK PLAN

The TPH Area will be cleaned up using soil removal and off-Site disposal. The following work will be performed:

- When impacted material is excavated and handled, temporary erosion and sedimentation control practices compliant with applicable state and local laws, regulations, and permits will be followed.
- Construction best management practices will be implemented to minimize generation of dust throughout handling of impacted soil. The contractor will be required to provide a written plan addressing these construction items prior to work.
- Stained soils will be removed and placed directly into drums or into a roll-off box. If drums are used, the drums will be secured with tightly closed lids, rings, and bungs. If a roll-off box is used, the box will be provided with an appropriate cover. The soil will be profiled for disposal and appropriately managed on-Site until transport to an approved landfill.
- The removal of impacted soils will be confirmed by collecting soil samples from the base of the excavation, except where the excavation removes soils present in the area where soils overlie concrete. Soil samples will be collected from the eight locations shown in Figure C-3 and from six adjacent perimeter locations. Soil samples will be analyzed for total petroleum hydrocarbon, diesel-range (TPH-Dx) by NWTPH-Dx and PCBs by EPA Method SW8082a.
- Confirmation samples will be compared to the cleanup levels defined in the CAP (Ecology 2015) in accordance with data analysis procedures described in WAC 173-340-740(7). These procedures require that no single confirmation sample concentration shall be greater than two times the cleanup level, less than 10% of the sample concentrations shall exceed the cleanup level, and the 95% upper confidence limit shall be less than the cleanup level. If comparison of confirmation sample results with cleanup levels does not demonstrate compliance with cleanup levels, additional excavation will be performed and confirmation samples collected until compliance is demonstrated.
- Following confirmation of compliance with cleanup levels, the excavation area will be backfilled with clean gravel or crushed concrete.

- Tools and construction equipment used for the soil removal will be decontaminated following soil removal. Following profiling, decontamination water will be appropriately managed for off-Site disposal or on-Site treatment through the wastewater treatment plant.
- A summary report documenting the removal and the confirmation sampling results will be submitted to Ecology within 90 days following completion of the work and receipt of validated analytical results.
- The TPH Area cleanup will be implemented within 1 year of the effective date of the Consent Decree, pending receipt of required permits/approvals, consistent with the Scope of Work in Exhibit C to the Consent Decree.

4 REFERENCES

Ecology (Washington State Department of Ecology), 2015. *Draft Cleanup Action Plan*. Former Reynolds Metals Reduction Plant – Longview.

TABLE

Table C-1
TPH Area Soil Sample Results

		Location ID	G1	G2	G3	G4	G5	G5	G6	G7	G8
		Sample ID	MBTL-G1-060614	MBTL-G2-060614	MBTL-G3-060614	MBTL-G4-060614	MBTL-G5-060614	MBTL-G5D-060614	MBTL-G6-060614	MBTL-G7-060614	MBTL-G8-060614
		Sample Date	6/6/2014	6/6/2014	6/6/2014	6/6/2014	6/6/2014	6/6/2014	6/6/2014	6/6/2014	6/6/2014
		Depth	0 – 0.5 feet	0 – 0.5 feet	0 – 0.5 feet	0 – 0.5 feet	0 – 0.5 feet	0 – 0.5 feet	0 – 0.5 feet	0 – 0.5 feet	0 – 0.5 feet
		Sample Type	N	N	N	N	N	FD	N	N	N
	Method	Soil Screening Level/DW Threshold Value[1,2,3]									
TCLP Metals (mg/L)											
Arsenic	SW6010C	5.0	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U
Barium	SW6010C	100.0	**0.5640**	**0.4970**	**0.6330**	**0.5555**	**0.5795**	**0.6625**	**0.5600**	**0.6065**	**0.4970**
Cadmium	SW6010C	1.0	0.05000 U	0.05000 U	**0.009500**	0.05000 U	0.05000 U	0.05000 U	0.05000 U	**0.02100**	0.05000 U
Chromium	SW6010C	5.0	**0.0400**	0.02500 U	0.02500 U	0.02500 U	0.02500 U	0.02500 U	0.02500 U	**0.03950**	0.02500 U
Lead	SW6010C	5.0	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U
Selenium	SW6010C	1.0	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U	0.1000 U
Silver	SW6010C	5.0	0.05000 U	0.05000 U	0.05000 U	0.05000 U	0.05000 U	0.05000 U	0.05000 U	0.05000 U	0.05000 U
Mercury	E7470A	0.2	0.0001 U	0.0001 U	0.0001 U	0.0001 U	0.0001 U	**0.00206**	**0.000826**	0.0001 U	**0.00103**
PCB Aroclors (mg/kg)											
Aroclor 1016	SW8082A	--	0.0173 U	0.0172 U	0.00717 U	0.00688 U	0.00697 U	0.00702 U	0.00706 U	0.00697 U	0.00712 U
Aroclor 1221	SW8082A	--	0.0173 U	0.0172 U	0.00717 U	0.00688 U	0.00697 U	0.00702 U	0.00706 U	0.00697 U	0.00712 U
Aroclor 1232	SW8082A	--	0.0173 U	0.0172 U	0.00717 U	0.00688 U	0.00697 U	0.00702 U	0.00706 U	0.00697 U	0.00712 U
Aroclor 1242	SW8082A	--	0.0173 U	0.0172 U	0.00717 U	0.00688 U	0.00697 U	0.00702 U	0.00706 U	0.00697 U	0.00712 U
Aroclor 1248	SW8082A	--	0.0173 U	0.0172 U	0.00717 U	0.00688 U	0.00697 U	0.00702 U	0.00706 U	0.00697 U	0.00712 U
Aroclor 1254	SW8082A	--	0.0173 U	0.0172 U	0.00717 U	0.00688 U	0.00697 U	0.00702 U	0.00706 U	0.00697 U	0.00712 U
Aroclor 1260	SW8082A	--	**8.59**	**5.57**	**6.09**	**7.81**	**9.99**	**8.03**	**5.02**	**7.15**	**1.47**
Aroclor 1262	SW8082A	--	0.0173 U	0.0172 U	0.00717 U	0.00688 U	0.00697 U	0.00702 U	0.00706 U	0.00697 U	0.00712 U
Aroclor 1268	SW8082A	--	0.0173 U	0.0172 U	0.00717 U	0.00688 U	0.00697 U	0.00702 U	0.00706 U	0.00697 U	0.00712 U
Total PCB Aroclors (U = 1/2)[4]		10	8.660	5.708	6.119	7.838	10.078	8.058	5.048	7.178	1.498
Total Petroleum Hydrocarbons (mg/kg)											
Diesel	NWTPH-Dx	2000	**21200**	**14900**	**30200**	**19600**	**28300**	**36600**	**11300**	**16000**	**716**
Lube Oil	NWTPH-Dx	2000	**4790**	**1770**	**5420**	**2280**	**4230**	**5330**	**1520**	**2750**	**418**

Notes:

= Detected concentration greater than soil screening level — **Bold = Detected result**

-- = Results not reported or not applicable — U = Compound analyzed but not detected above detection limit

1 = DW threshold values for TCLP metals was obtained from the toxicity characteristics list in WAC 173-303-090 (8)(c.

2 = The value for total PBCs may be used if the PCB contaminated soils are capped and the cap is maintained as required by 40 CFR 761.61. If this condition cannot be met, the value for unrestricted site use (1 mg/kg) must be used.

3 = Soil screening level for TPH was obtained from the CAP (Ecology 2015) using MTCA Method A Industrial (soil cleanup levels presented in Table 173-340-745-1).

4 = Totals are calculated as the sum of all detected results and half of the reporting limit of undetected results (U = 1/2). If all are non-detect, the highest reporting limit value is reported as the sum.

CAP = Cleanup Action Plan
CFR = Code of Federal Regulations
DW = dangerous waste
FD = field duplicate
MBTL = Millennium Bulk Terminals – Longview, LLC
mg/kg = milligram per kilogram
mg/L = milligram per liter
MTCA = Model Toxics Control Act
N = normal
NWTPH-Dx = Northwest Total Petroleum Hydrocarbon – Diesel Range
PCB = polychlorinated biphenyl
TCLP = toxicity characteristic leaching procedure
TPH = total petroleum hydrocarbon
WAC = Washington Administrative Code

FIGURES

AERIAL SOURCE Google Earth Pro, dated 07-2014.

0 5,000
Scale in Feet

K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\TPH-Area Work Plan\0730-RP-001 (VMAP).dwg C-1

May 04, 2015 1:22pm hhayward

ANCHOR QEA

Figure C-1
Vicinity Map
TPH Area Work Plan
Former Reynolds Metals Reduction Plant – Longview

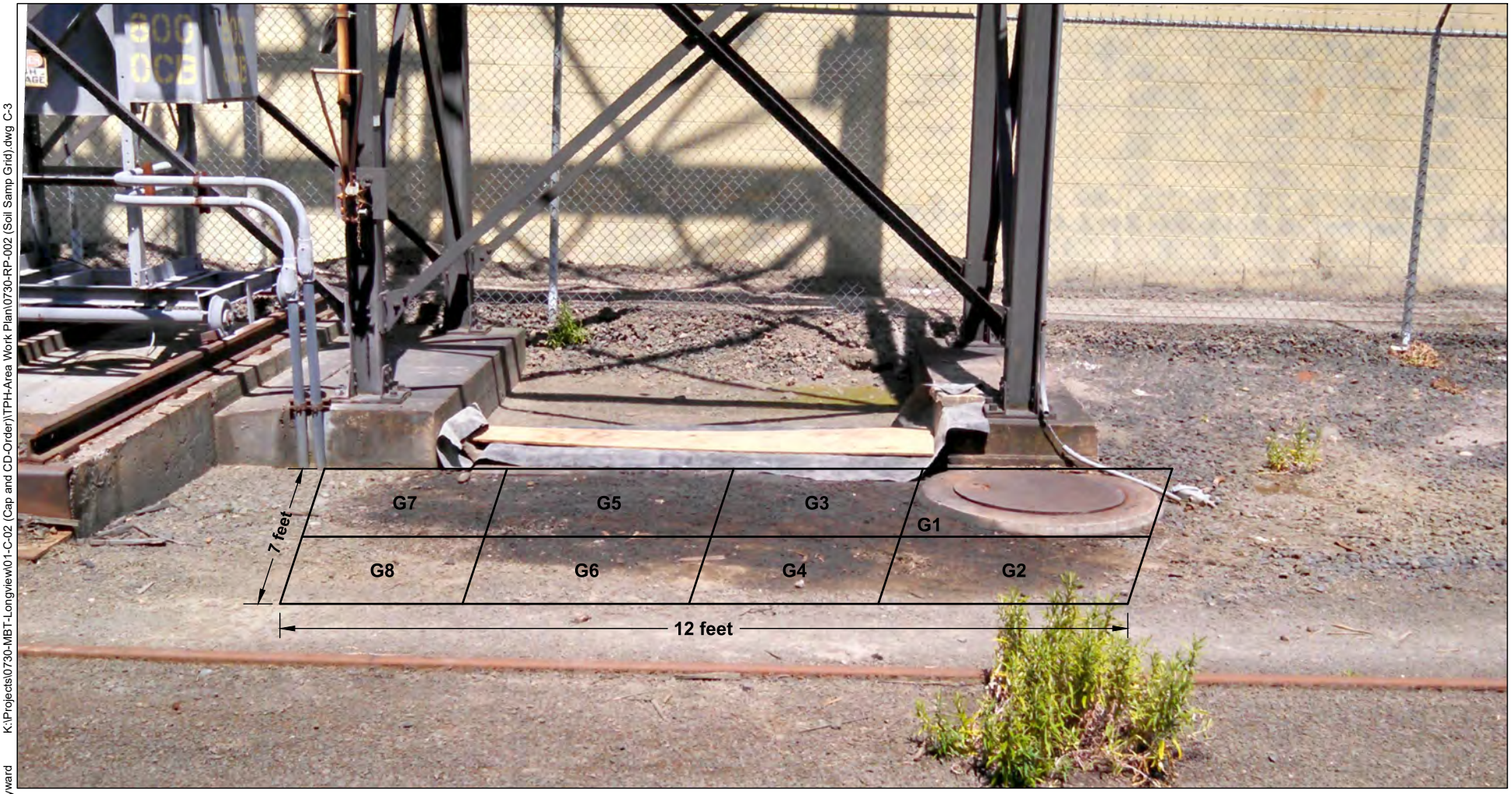
Q:\Jobs\110730-01.05_Millennium_Bulk_Term_Holdback_AgrmtMaps\2015_03\MBTL_Fig2_TPHspill.mxd lhudson 5/5/2015 7:48:52 AM

TPH Area Location

NOTE:
1. Aerial imagery acquired from Google Earth (2014).

Feet
0 100 200

Figure C-2
TPH Area Location Map
TPH Area Work Plan
Former Reynolds Metals Reduction Plant – Longview



LEGEND

G1 Surface Soil Sample Location

Not to Scale

May 04, 2015 1:23pm hhayward K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\TPH-Area Work Plan\0730-RP-002 (Soil Samp Grid).dwg C-3

ANCHOR QEA

Figure C-3
Soil Sampling Locations
TPH Area Work Plan
Former Reynolds Metals Reduction Plant – Longview

ATTACHMENT A
LABORATORY REPORT

Specialty Analytical

11711 SE Capps Road, Ste B
Clackamas, Oregon 97015
TEL: 503-607-1331 FAX: 503-607-1336
Website: www.specialtyanalytical.com

June 16, 2014

Cheryl Vezzani
Millennium Bulk Terminal-Longview
PO Box 2098
4029 Industrial Way
Longview, WA 98632

TEL: (503) 502-8925
FAX (360) 636-8340

RE: Waste Charaterization

Dear Cheryl Vezzani: Order No.: 1406062

Specialty Analytical received 11 sample(s) on 6/9/2014 for the analyses presented in the following report.

There were no problems with the analysis and all data for associated QC met EPA or laboratory specifications, except where noted in the Case Narrative, or as qualified with flags. Results apply only to the samples analyzed. Without approval of the laboratory, the reproduction of this report is only permitted in its entirety.

If you have any questions regarding these tests, please feel free to call.

Sincerely,

Marty French
Lab Director

Specialty Analytical

Date Reported: 16-Jun-14

CLIENT: Millennium Bulk Terminal-Longview
Collection Date: 6/6/2014 2:38:00 PM
Project: Waste Charaterization
Lab ID: 1406062-002
Client Sample ID: MBTL-G1-060614
Matrix: SOLID

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
NWTPH-DX		**NWTPH-DX**				Analyst: **BS**
Diesel	21200	156		mg/Kg-dry	10	6/13/2014 2:08:50 PM
Lube Oil	4790	519		mg/Kg-dry	10	6/13/2014 2:08:50 PM
Surr: o-Terphenyl	218	50-150	SMI	%REC	10	6/13/2014 2:08:50 PM
TCLP 8 ICP METALS- TOTAL RECOVERABLE		**SW6010C**				Analyst: **VAS**
Arsenic, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:07:16 PM
Barium, TCLP	0.5640	0.05000		mg/L	1	6/12/2014 4:07:16 PM
Cadmium, TCLP	ND	0.005000		mg/L	1	6/12/2014 4:07:16 PM
Chromium, TCLP	0.04000	0.02500		mg/L	1	6/12/2014 4:07:16 PM
Lead, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:07:16 PM
Selenium, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:07:16 PM
Silver, TCLP	ND	0.05000		mg/L	1	6/12/2014 4:07:16 PM
TCLP 8 TOTAL MERCURY		**E7470A**				Analyst: **VAS**
Mercury, TCLP	ND	0.000100		mg/L	1	6/12/2014 1:49:00 PM
PCB'S IN SOLIDS		**SW 8082A**				Analyst: **ajr**
Aroclor 1016	ND	17.3		µg/Kg-dry	50	6/13/2014 2:55:00 PM
Aroclor 1221	ND	17.3		µg/Kg-dry	50	6/13/2014 2:55:00 PM
Aroclor 1232	ND	17.3		µg/Kg-dry	50	6/13/2014 2:55:00 PM
Aroclor 1242	ND	17.3		µg/Kg-dry	50	6/13/2014 2:55:00 PM
Aroclor 1248	ND	17.3		µg/Kg-dry	50	6/13/2014 2:55:00 PM
Aroclor 1254	ND	17.3		µg/Kg-dry	50	6/13/2014 2:55:00 PM
Aroclor 1260	8590	17.3		µg/Kg-dry	50	6/13/2014 2:55:00 PM
Aroclor 1262	ND	17.3		µg/Kg-dry	50	6/13/2014 2:55:00 PM
Aroclor 1268	ND	17.3		µg/Kg-dry	50	6/13/2014 2:55:00 PM
Surr: Decachlorobiphenyl	92.5	56.5-130		%REC	50	6/13/2014 2:55:00 PM

Specialty Analytical

Date Reported: 16-Jun-14

CLIENT: Millennium Bulk Terminal-Longview
Collection Date: 6/6/2014 2:43:00 PM
Project: Waste Charaterization
Lab ID: 1406062-003
Client Sample ID: MBTL-G2-060614
Matrix: SOLID

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
NWTPH-DX		**NWTPH-DX**				Analyst: **BS**
Diesel	14900	77.4		mg/Kg-dry	5	6/14/2014 1:50:50 AM
Lube Oil	1770	258	M	mg/Kg-dry	5	6/14/2014 1:50:50 AM
Surr: o-Terphenyl	338	50-150	SMI	%REC	5	6/14/2014 1:50:50 AM
TCLP 8 ICP METALS- TOTAL RECOVERABLE		**SW6010C**				Analyst: **VAS**
Arsenic, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:12:24 PM
Barium, TCLP	0.4970	0.05000		mg/L	1	6/12/2014 4:12:24 PM
Cadmium, TCLP	ND	0.005000		mg/L	1	6/12/2014 4:12:24 PM
Chromium, TCLP	ND	0.02500		mg/L	1	6/12/2014 4:12:24 PM
Lead, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:12:24 PM
Selenium, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:12:24 PM
Silver, TCLP	ND	0.05000		mg/L	1	6/12/2014 4:12:24 PM
TCLP 8 TOTAL MERCURY		**E7470A**				Analyst: **VAS**
Mercury, TCLP	ND	0.000100		mg/L	1	6/12/2014 1:52:00 PM
PCB'S IN SOLIDS		**SW 8082A**				Analyst: **ajr**
Aroclor 1016	ND	17.2		µg/Kg-dry	50	6/13/2014 3:12:00 PM
Aroclor 1221	ND	17.2		µg/Kg-dry	50	6/13/2014 3:12:00 PM
Aroclor 1232	ND	17.2		µg/Kg-dry	50	6/13/2014 3:12:00 PM
Aroclor 1242	ND	17.2		µg/Kg-dry	50	6/13/2014 3:12:00 PM
Aroclor 1248	ND	17.2		µg/Kg-dry	50	6/13/2014 3:12:00 PM
Aroclor 1254	ND	17.2		µg/Kg-dry	50	6/13/2014 3:12:00 PM
Aroclor 1260	5570	17.2		µg/Kg-dry	50	6/13/2014 3:12:00 PM
Aroclor 1262	ND	17.2		µg/Kg-dry	50	6/13/2014 3:12:00 PM
Aroclor 1268	ND	17.2		µg/Kg-dry	50	6/13/2014 3:12:00 PM
Surr: Decachlorobiphenyl	148	56.5-130	SMI	%REC	50	6/13/2014 3:12:00 PM

Specialty Analytical

Date Reported: 16-Jun-14

CLIENT: Millennium Bulk Terminal-Longview
Collection Date: 6/6/2014 2:48:00 PM
Project: Waste Charaterization
Lab ID: 1406062-004
Client Sample ID: MBTL-G3-060614
Matrix: SOLID

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
NWTPH-DX		**NWTPH-DX**				Analyst: **BS**
Diesel	30200	162		mg/Kg-dry	10	6/13/2014 4:08:50 PM
Lube Oil	5420	539		mg/Kg-dry	10	6/13/2014 4:08:50 PM
Surr: o-Terphenyl	254	50-150	SMI	%REC	10	6/13/2014 4:08:50 PM
TCLP 8 ICP METALS- TOTAL RECOVERABLE		**SW6010C**				Analyst: **VAS**
Arsenic, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:17:30 PM
Barium, TCLP	0.6330	0.05000		mg/L	1	6/12/2014 4:17:30 PM
Cadmium, TCLP	0.009500	0.005000		mg/L	1	6/12/2014 4:17:30 PM
Chromium, TCLP	ND	0.02500		mg/L	1	6/12/2014 4:17:30 PM
Lead, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:17:30 PM
Selenium, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:17:30 PM
Silver, TCLP	ND	0.05000		mg/L	1	6/12/2014 4:17:30 PM
TCLP 8 TOTAL MERCURY		**E7470A**				Analyst: **VAS**
Mercury, TCLP	ND	0.000100		mg/L	1	6/12/2014 1:55:00 PM
PCB'S IN SOLIDS		**SW 8082A**				Analyst: **ajr**
Aroclor 1016	ND	7.17		µg/Kg-dry	20	6/13/2014 12:23:00 PM
Aroclor 1221	ND	7.17		µg/Kg-dry	20	6/13/2014 12:23:00 PM
Aroclor 1232	ND	7.17		µg/Kg-dry	20	6/13/2014 12:23:00 PM
Aroclor 1242	ND	7.17		µg/Kg-dry	20	6/13/2014 12:23:00 PM
Aroclor 1248	ND	7.17		µg/Kg-dry	20	6/13/2014 12:23:00 PM
Aroclor 1254	ND	7.17		µg/Kg-dry	20	6/13/2014 12:23:00 PM
Aroclor 1260	6090	7.17		µg/Kg-dry	20	6/13/2014 12:23:00 PM
Aroclor 1262	ND	7.17		µg/Kg-dry	20	6/13/2014 12:23:00 PM
Aroclor 1268	ND	7.17		µg/Kg-dry	20	6/13/2014 12:23:00 PM
Surr: Decachlorobiphenyl	129	56.5-130		%REC	20	6/13/2014 12:23:00 PM

Specialty Analytical

Date Reported: 16-Jun-14

CLIENT: Millennium Bulk Terminal-Longview
Collection Date: 6/6/2014 2:56:00 PM
Project: Waste Charaterization
Lab ID: 1406062-005
Client Sample ID: MBTL-G4-060614
Matrix: SOLID

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
NWTPH-DX		**NWTPH-DX**				Analyst: **BS**
Diesel	19600	77.5		mg/Kg-dry	5	6/14/2014 2:12:50 AM
Lube Oil	2280	258	M	mg/Kg-dry	5	6/14/2014 2:12:50 AM
Surr: o-Terphenyl	381	50-150	SMI	%REC	5	6/14/2014 2:12:50 AM
TCLP 8 ICP METALS- TOTAL RECOVERABLE		**SW6010C**				Analyst: **VAS**
Arsenic, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:22:39 PM
Barium, TCLP	0.5555	0.05000		mg/L	1	6/12/2014 4:22:39 PM
Cadmium, TCLP	ND	0.005000		mg/L	1	6/12/2014 4:22:39 PM
Chromium, TCLP	ND	0.02500		mg/L	1	6/12/2014 4:22:39 PM
Lead, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:22:39 PM
Selenium, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:22:39 PM
Silver, TCLP	ND	0.05000		mg/L	1	6/12/2014 4:22:39 PM
TCLP 8 TOTAL MERCURY		**E7470A**				Analyst: **VAS**
Mercury, TCLP	ND	0.000100		mg/L	1	6/12/2014 1:58:00 PM
PCB'S IN SOLIDS		**SW 8082A**				Analyst: **ajr**
Aroclor 1016	ND	6.88		µg/Kg-dry	20	6/13/2014 12:40:00 PM
Aroclor 1221	ND	6.88		µg/Kg-dry	20	6/13/2014 12:40:00 PM
Aroclor 1232	ND	6.88		µg/Kg-dry	20	6/13/2014 12:40:00 PM
Aroclor 1242	ND	6.88		µg/Kg-dry	20	6/13/2014 12:40:00 PM
Aroclor 1248	ND	6.88		µg/Kg-dry	20	6/13/2014 12:40:00 PM
Aroclor 1254	ND	6.88		µg/Kg-dry	20	6/13/2014 12:40:00 PM
Aroclor 1260	7810	6.88		µg/Kg-dry	20	6/13/2014 12:40:00 PM
Aroclor 1262	ND	6.88		µg/Kg-dry	20	6/13/2014 12:40:00 PM
Aroclor 1268	ND	6.88		µg/Kg-dry	20	6/13/2014 12:40:00 PM
Surr: Decachlorobiphenyl	77.1	56.5-130		%REC	20	6/13/2014 12:40:00 PM

Specialty Analytical

Date Reported: 16-Jun-14

CLIENT: Millennium Bulk Terminal-Longview
Collection Date: 6/6/2014 3:04:00 PM
Project: Waste Charaterization
Lab ID: 1406062-006
Client Sample ID: MBTL-G5-060614
Matrix: SOLID

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
NWTPH-DX		**NWTPH-DX**				Analyst: **BS**
Diesel	28300	157		mg/Kg-dry	10	6/13/2014 2:38:50 PM
Lube Oil	4230	524		mg/Kg-dry	10	6/13/2014 2:38:50 PM
Surr: o-Terphenyl	256	50-150	SMI	%REC	10	6/13/2014 2:38:50 PM
TCLP 8 ICP METALS- TOTAL RECOVERABLE		**SW6010C**				Analyst: **VAS**
Arsenic, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:27:44 PM
Barium, TCLP	0.5795	0.05000		mg/L	1	6/12/2014 4:27:44 PM
Cadmium, TCLP	ND	0.005000		mg/L	1	6/12/2014 4:27:44 PM
Chromium, TCLP	ND	0.02500		mg/L	1	6/12/2014 4:27:44 PM
Lead, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:27:44 PM
Selenium, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:27:44 PM
Silver, TCLP	ND	0.05000		mg/L	1	6/12/2014 4:27:44 PM
TCLP 8 TOTAL MERCURY		**E7470A**				Analyst: **VAS**
Mercury, TCLP	ND	0.000100		mg/L	1	6/12/2014 2:01:00 PM
PCB'S IN SOLIDS		**SW 8082A**				Analyst: **ajr**
Aroclor 1016	ND	6.97		µg/Kg-dry	20	6/13/2014 12:57:00 PM
Aroclor 1221	ND	6.97		µg/Kg-dry	20	6/13/2014 12:57:00 PM
Aroclor 1232	ND	6.97		µg/Kg-dry	20	6/13/2014 12:57:00 PM
Aroclor 1242	ND	6.97		µg/Kg-dry	20	6/13/2014 12:57:00 PM
Aroclor 1248	ND	6.97		µg/Kg-dry	20	6/13/2014 12:57:00 PM
Aroclor 1254	ND	6.97		µg/Kg-dry	20	6/13/2014 12:57:00 PM
Aroclor 1260	9990	6.97		µg/Kg-dry	20	6/13/2014 12:57:00 PM
Aroclor 1262	ND	6.97		µg/Kg-dry	20	6/13/2014 12:57:00 PM
Aroclor 1268	ND	6.97		µg/Kg-dry	20	6/13/2014 12:57:00 PM
Surr: Decachlorobiphenyl	60.5	56.5-130		%REC	20	6/13/2014 12:57:00 PM

Specialty Analytical

Date Reported: 16-Jun-14

CLIENT: Millennium Bulk Terminal-Longview
Collection Date: 6/6/2014 3:06:00 PM
Project: Waste Charaterization
Lab ID: 1406062-007
Client Sample ID: MBTL-G5D-060614
Matrix: SOLID

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
NWTPH-DX		**NWTPH-DX**				Analyst: **BS**
Diesel	36600	158		mg/Kg-dry	10	6/13/2014 3:08:50 PM
Lube Oil	5330	527		mg/Kg-dry	10	6/13/2014 3:08:50 PM
Surr: o-Terphenyl	319	50-150	SMI	%REC	10	6/13/2014 3:08:50 PM
TCLP 8 ICP METALS- TOTAL RECOVERABLE		**SW6010C**				Analyst: **VAS**
Arsenic, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:32:49 PM
Barium, TCLP	0.6625	0.05000		mg/L	1	6/12/2014 4:32:49 PM
Cadmium, TCLP	ND	0.005000		mg/L	1	6/12/2014 4:32:49 PM
Chromium, TCLP	ND	0.02500		mg/L	1	6/12/2014 4:32:49 PM
Lead, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:32:49 PM
Selenium, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:32:49 PM
Silver, TCLP	ND	0.05000		mg/L	1	6/12/2014 4:32:49 PM
TCLP 8 TOTAL MERCURY		**E7470A**				Analyst: **VAS**
Mercury, TCLP	0.00206	0.000100		mg/L	1	6/12/2014 2:04:00 PM
PCB'S IN SOLIDS		**SW 8082A**				Analyst: **ajr**
Aroclor 1016	ND	7.02		µg/Kg-dry	20	6/13/2014 1:14:00 PM
Aroclor 1221	ND	7.02		µg/Kg-dry	20	6/13/2014 1:14:00 PM
Aroclor 1232	ND	7.02		µg/Kg-dry	20	6/13/2014 1:14:00 PM
Aroclor 1242	ND	7.02		µg/Kg-dry	20	6/13/2014 1:14:00 PM
Aroclor 1248	ND	7.02		µg/Kg-dry	20	6/13/2014 1:14:00 PM
Aroclor 1254	ND	7.02		µg/Kg-dry	20	6/13/2014 1:14:00 PM
Aroclor 1260	8030	7.02		µg/Kg-dry	20	6/13/2014 1:14:00 PM
Aroclor 1262	ND	7.02		µg/Kg-dry	20	6/13/2014 1:14:00 PM
Aroclor 1268	ND	7.02		µg/Kg-dry	20	6/13/2014 1:14:00 PM
Surr: Decachlorobiphenyl	108	56.5-130		%REC	20	6/13/2014 1:14:00 PM

Specialty Analytical

Date Reported: 16-Jun-14

CLIENT: Millennium Bulk Terminal-Longview
Collection Date: 6/6/2014 3:11:00 PM
Project: Waste Charaterization
Lab ID: 1406062-008
Client Sample ID: MBTL-G6-060614
Matrix: SOLID

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
NWTPH-DX		**NWTPH-DX**				Analyst: **BS**
Diesel	11300	79.5		mg/Kg-dry	5	6/14/2014 2:34:50 AM
Lube Oil	1520	265	M	mg/Kg-dry	5	6/14/2014 2:34:50 AM
Surr: o-Terphenyl	237	50-150	SMI	%REC	5	6/14/2014 2:34:50 AM
TCLP 8 ICP METALS- TOTAL RECOVERABLE		**SW6010C**				Analyst: **VAS**
Arsenic, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:37:54 PM
Barium, TCLP	0.5600	0.05000		mg/L	1	6/12/2014 4:37:54 PM
Cadmium, TCLP	ND	0.005000		mg/L	1	6/12/2014 4:37:54 PM
Chromium, TCLP	ND	0.02500		mg/L	1	6/12/2014 4:37:54 PM
Lead, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:37:54 PM
Selenium, TCLP	ND	0.1000		mg/L	1	6/12/2014 4:37:54 PM
Silver, TCLP	ND	0.05000		mg/L	1	6/12/2014 4:37:54 PM
TCLP 8 TOTAL MERCURY		**E7470A**				Analyst: **VAS**
Mercury, TCLP	0.000826	0.000100		mg/L	1	6/12/2014 2:07:00 PM
PCB'S IN SOLIDS		**SW 8082A**				Analyst: **ajr**
Aroclor 1016	ND	7.06		µg/Kg-dry	20	6/13/2014 1:31:00 PM
Aroclor 1221	ND	7.06		µg/Kg-dry	20	6/13/2014 1:31:00 PM
Aroclor 1232	ND	7.06		µg/Kg-dry	20	6/13/2014 1:31:00 PM
Aroclor 1242	ND	7.06		µg/Kg-dry	20	6/13/2014 1:31:00 PM
Aroclor 1248	ND	7.06		µg/Kg-dry	20	6/13/2014 1:31:00 PM
Aroclor 1254	ND	7.06		µg/Kg-dry	20	6/13/2014 1:31:00 PM
Aroclor 1260	5020	7.06		µg/Kg-dry	20	6/13/2014 1:31:00 PM
Aroclor 1262	ND	7.06		µg/Kg-dry	20	6/13/2014 1:31:00 PM
Aroclor 1268	ND	7.06		µg/Kg-dry	20	6/13/2014 1:31:00 PM
Surr: Decachlorobiphenyl	105	56.5-130		%REC	20	6/13/2014 1:31:00 PM

Specialty Analytical

Date Reported: 16-Jun-14

CLIENT: Millennium Bulk Terminal-Longview
Collection Date: 6/6/2014 3:17:00 PM
Project: Waste Charaterization
Lab ID: 1406062-009
Client Sample ID: MBTL-G7-060614
Matrix: SOLID

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
NWTPH-DX		**NWTPH-DX**				Analyst: **BS**
Diesel	16000	157		mg/Kg-dry	10	6/13/2014 3:38:50 PM
Lube Oil	2750	523		mg/Kg-dry	10	6/13/2014 3:38:50 PM
Surr: o-Terphenyl	159	50-150	SMI	%REC	10	6/13/2014 3:38:50 PM
TCLP 8 ICP METALS- TOTAL RECOVERABLE		**SW6010C**				Analyst: **VAS**
Arsenic, TCLP	ND	0.1000		mg/L	1	6/12/2014 5:03:43 PM
Barium, TCLP	0.6065	0.05000		mg/L	1	6/12/2014 5:03:43 PM
Cadmium, TCLP	0.02100	0.005000		mg/L	1	6/12/2014 5:03:43 PM
Chromium, TCLP	0.03950	0.02500		mg/L	1	6/12/2014 5:03:43 PM
Lead, TCLP	ND	0.1000		mg/L	1	6/12/2014 5:03:43 PM
Selenium, TCLP	ND	0.1000		mg/L	1	6/12/2014 5:03:43 PM
Silver, TCLP	ND	0.05000		mg/L	1	6/12/2014 5:03:43 PM
TCLP 8 TOTAL MERCURY		**E7470A**				Analyst: **VAS**
Mercury, TCLP	ND	0.000100		mg/L	1	6/12/2014 2:10:00 PM
PCB'S IN SOLIDS		**SW 8082A**				Analyst: **ajr**
Aroclor 1016	ND	6.97		µg/Kg-dry	20	6/13/2014 1:47:00 PM
Aroclor 1221	ND	6.97		µg/Kg-dry	20	6/13/2014 1:47:00 PM
Aroclor 1232	ND	6.97		µg/Kg-dry	20	6/13/2014 1:47:00 PM
Aroclor 1242	ND	6.97		µg/Kg-dry	20	6/13/2014 1:47:00 PM
Aroclor 1248	ND	6.97		µg/Kg-dry	20	6/13/2014 1:47:00 PM
Aroclor 1254	ND	6.97		µg/Kg-dry	20	6/13/2014 1:47:00 PM
Aroclor 1260	7150	6.97		µg/Kg-dry	20	6/13/2014 1:47:00 PM
Aroclor 1262	ND	6.97		µg/Kg-dry	20	6/13/2014 1:47:00 PM
Aroclor 1268	ND	6.97		µg/Kg-dry	20	6/13/2014 1:47:00 PM
Surr: Decachlorobiphenyl	99.0	56.5-130		%REC	20	6/13/2014 1:47:00 PM

Specialty Analytical

Date Reported: 16-Jun-14

CLIENT: Millennium Bulk Terminal-Longview
Collection Date: 6/6/2014 3:23:00 PM
Project: Waste Charaterization
Lab ID: 1406062-010
Client Sample ID: MBTL-G8-060614
Matrix: SOLID

Analyses	Result	RL	Qual	Units	DF	Date Analyzed
NWTPH-DX		**NWTPH-DX**				Analyst: **BS**
Diesel	716	16.0		mg/Kg-dry	1	6/13/2014 12:38:50 PM
Lube Oil	418	53.4	M	mg/Kg-dry	1	6/13/2014 12:38:50 PM
Surr: o-Terphenyl	185	50-150	SMI	%REC	1	6/13/2014 12:38:50 PM
TCLP 8 ICP METALS- TOTAL RECOVERABLE		**SW6010C**				Analyst: **VAS**
Arsenic, TCLP	ND	0.1000		mg/L	1	6/12/2014 5:08:48 PM
Barium, TCLP	0.4970	0.05000		mg/L	1	6/12/2014 5:08:48 PM
Cadmium, TCLP	ND	0.005000		mg/L	1	6/12/2014 5:08:48 PM
Chromium, TCLP	ND	0.02500		mg/L	1	6/12/2014 5:08:48 PM
Lead, TCLP	ND	0.1000		mg/L	1	6/12/2014 5:08:48 PM
Selenium, TCLP	ND	0.1000		mg/L	1	6/12/2014 5:08:48 PM
Silver, TCLP	ND	0.05000		mg/L	1	6/12/2014 5:08:48 PM
TCLP 8 TOTAL MERCURY		**E7470A**				Analyst: **VAS**
Mercury, TCLP	0.00103	0.000100		mg/L	1	6/12/2014 2:13:00 PM
PCB'S IN SOLIDS		**SW 8082A**				Analyst: **ajr**
Aroclor 1016	ND	7.12		µg/Kg-dry	20	6/13/2014 2:04:00 PM
Aroclor 1221	ND	7.12		µg/Kg-dry	20	6/13/2014 2:04:00 PM
Aroclor 1232	ND	7.12		µg/Kg-dry	20	6/13/2014 2:04:00 PM
Aroclor 1242	ND	7.12		µg/Kg-dry	20	6/13/2014 2:04:00 PM
Aroclor 1248	ND	7.12		µg/Kg-dry	20	6/13/2014 2:04:00 PM
Aroclor 1254	ND	7.12		µg/Kg-dry	20	6/13/2014 2:04:00 PM
Aroclor 1260	1470	7.12		µg/Kg-dry	20	6/13/2014 2:04:00 PM
Aroclor 1262	ND	7.12		µg/Kg-dry	20	6/13/2014 2:04:00 PM
Aroclor 1268	ND	7.12		µg/Kg-dry	20	6/13/2014 2:04:00 PM
Surr: Decachlorobiphenyl	114	56.5-130		%REC	20	6/13/2014 2:04:00 PM

QC SUMMARY REPORT

WO#: **1406062**

Specialty Analytical

16-Jun-14

Client: Millennium Bulk Terminal-Longview
Project: Waste Charaterization **TestCode:** **6010_W**

Sample ID: **ICV** SampType: **ICV** TestCode: **6010_W** Units: **mg/L** Prep Date: RunNo: **15510**
Client ID: **ICV** Batch ID: **7577** TestNo: **SW6010C** **SW3010A** Analysis Date: **6/12/2014** SeqNo: **203603**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic, TCLP	1.003	0.02000	1.000	0	100	90	110				
Barium, TCLP	0.5071	0.01000	0.5000	0	101	90	110				
Cadmium, TCLP	0.04960	0.001000	0.05000	0	99.2	90	110				
Chromium, TCLP	0.2570	0.005000	0.2500	0	103	90	110				
Lead, TCLP	1.028	0.02000	1.000	0	103	90	110				
Selenium, TCLP	1.009	0.02000	1.000	0	101	90	110				
Silver, TCLP	0.4881	0.01000	0.5000	0	97.6	90	110				

Sample ID: **CCV** SampType: **CCV** TestCode: **6010_W** Units: **mg/L** Prep Date: RunNo: **15510**
Client ID: **CCV** Batch ID: **7577** TestNo: **SW6010C** **SW3010A** Analysis Date: **6/12/2014** SeqNo: **203604**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic, TCLP	0.9894	0.02000	1.000	0	98.9	90	110				
Barium, TCLP	0.5104	0.01000	0.5000	0	102	90	110				
Cadmium, TCLP	0.04980	0.001000	0.05000	0	99.6	90	110				
Chromium, TCLP	0.2576	0.005000	0.2500	0	103	90	110				
Lead, TCLP	1.035	0.02000	1.000	0	104	90	110				
Selenium, TCLP	1.008	0.02000	1.000	0	101	90	110				
Silver, TCLP	0.4813	0.01000	0.5000	0	96.3	90	110				

Qualifiers:
B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
O RSD is greater than RSDlimit
R RPD outside accepted recovery limits
S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

16-Jun-14

Specialty Analytical

Client: Millennium Bulk Terminal-Longview

Project: Waste Charaterization **TestCode:** **6010_W**

Sample ID: **MBLK-7577** SampType: **MBLK** TestCode: **6010_W** Units: **mg/L** Prep Date: RunNo: **15510**

Client ID: **PBW** Batch ID: **7577** TestNo: **SW6010C** **SW3010A** Analysis Date: **6/12/2014** SeqNo: **203605**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic, TCLP	ND	0.02000									
Barium, TCLP	ND	0.01000									
Cadmium, TCLP	ND	0.001000									
Chromium, TCLP	ND	0.005000									
Lead, TCLP	ND	0.02000									
Selenium, TCLP	ND	0.02000									
Silver, TCLP	ND	0.01000									

Sample ID: **LCS-7577** SampType: **LCS** TestCode: **6010_W** Units: **mg/L** Prep Date: **6/12/2014** RunNo: **15510**

Client ID: **LCSW** Batch ID: **7577** TestNo: **SW6010C** **SW3010A** Analysis Date: **6/12/2014** SeqNo: **203606**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic, TCLP	0.9885	0.02000	1.000	0	98.9	93.8	107				
Barium, TCLP	0.5082	0.01000	0.5000	0	102	95	111				
Cadmium, TCLP	0.04960	0.001000	0.05000	0	99.2	91.8	115				
Chromium, TCLP	0.2560	0.005000	0.2500	0	102	93.9	113				
Lead, TCLP	1.025	0.02000	1.000	0	103	93.1	112				
Selenium, TCLP	0.9970	0.02000	1.000	0	99.7	93.9	111				
Silver, TCLP	0.4946	0.01000	0.5000	0	98.9	87.1	113				

Qualifiers:

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- O RSD is greater than RSDlimit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

Specialty Analytical

16-Jun-14

Client: Millennium Bulk Terminal-Longview

Project: Waste Charaterization **TestCode: 6010_W**

Sample ID: **1406071-002BDUP** SampType: **DUP** TestCode: **6010_W** Units: **mg/L** Prep Date: **6/12/2014** RunNo: **15510**

Client ID: **ZZZZZZ** Batch ID: **7577** TestNo: **SW6010C** **SW3010A** Analysis Date: **6/12/2014** SeqNo: **203608**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic, TCLP	ND	0.02000						0	0	20	
Barium, TCLP	0.07750	0.01000						0.08220	5.89	20	
Cadmium, TCLP	ND	0.001000						0	0	20	
Chromium, TCLP	0.006000	0.005000						0.007800	26.1	20	RF
Lead, TCLP	ND	0.02000						0	0	20	
Selenium, TCLP	ND	0.02000						0	0	20	
Silver, TCLP	ND	0.01000						0	0	20	

Sample ID: **1406071-002BMS** SampType: **MS** TestCode: **6010_W** Units: **mg/L** Prep Date: **6/12/2014** RunNo: **15510**

Client ID: **ZZZZZZ** Batch ID: **7577** TestNo: **SW6010C** **SW3010A** Analysis Date: **6/12/2014** SeqNo: **203609**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic, TCLP	0.9812	0.02000	1.000	0	98.1	90.1	110				
Barium, TCLP	0.5784	0.01000	0.5000	0.08220	99.2	90.7	112				
Cadmium, TCLP	0.04910	0.001000	0.05000	0	98.2	93.4	115				
Chromium, TCLP	0.2499	0.005000	0.2500	0.007800	96.8	93.4	112				
Lead, TCLP	0.9924	0.02000	1.000	0	99.2	91.9	112				
Selenium, TCLP	1.017	0.02000	1.000	0	102	93.5	113				
Silver, TCLP	0.4715	0.01000	0.5000	0.007600	92.8	90.1	113				

Qualifiers:

B Analyte detected in the associated Method Blank

H Holding times for preparation or analysis exceeded

ND Not Detected at the Reporting Limit

O RSD is greater than RSDlimit

R RPD outside accepted recovery limits

S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

16-Jun-14

Specialty Analytical

Client: Millennium Bulk Terminal-Longview

Project: Waste Charaterization **TestCode: 6010_W**

Sample ID: **CCV** SampType: **CCV** TestCode: **6010_W** Units: **mg/L** Prep Date: RunNo: **15510**

Client ID: **CCV** Batch ID: **7577** TestNo: **SW6010C** **SW3010A** Analysis Date: **6/12/2014** SeqNo: **203610**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic, TCLP	0.9961	0.02000	1.000	0	99.6	90	110				
Barium, TCLP	0.5101	0.01000	0.5000	0	102	90	110				
Cadmium, TCLP	0.04960	0.001000	0.05000	0	99.2	90	110				
Chromium, TCLP	0.2572	0.005000	0.2500	0	103	90	110				
Lead, TCLP	1.029	0.02000	1.000	0	103	90	110				
Selenium, TCLP	1.006	0.02000	1.000	0	101	90	110				
Silver, TCLP	0.4849	0.01000	0.5000	0	97.0	90	110				

Sample ID: **1406071-002BMSD** SampType: **MSD** TestCode: **6010_W** Units: **mg/L** Prep Date: **6/12/2014** RunNo: **15510**

Client ID: **ZZZZZZ** Batch ID: **7577** TestNo: **SW6010C** **SW3010A** Analysis Date: **6/12/2014** SeqNo: **203611**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic, TCLP	1.004	0.02000	1.000	0	100	90.1	110	0.9812	2.30	20	
Barium, TCLP	0.5913	0.01000	0.5000	0.08220	102	90.7	112	0.5784	2.21	20	
Cadmium, TCLP	0.05000	0.001000	0.05000	0	100	93.4	115	0.04910	1.82	20	
Chromium, TCLP	0.2563	0.005000	0.2500	0.007800	99.4	93.4	112	0.2499	2.53	20	
Lead, TCLP	1.015	0.02000	1.000	0	102	91.9	112	0.9924	2.25	20	
Selenium, TCLP	1.018	0.02000	1.000	0	102	93.5	113	1.017	0.0983	20	
Silver, TCLP	0.4659	0.01000	0.5000	0.007600	91.7	90.1	113	0.4715	1.19	20	

Qualifiers:

B Analyte detected in the associated Method Blank

H Holding times for preparation or analysis exceeded

ND Not Detected at the Reporting Limit

O RSD is greater than RSDlimit

R RPD outside accepted recovery limits

S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

Specialty Analytical

16-Jun-14

Client: Millennium Bulk Terminal-Longview
Project: Waste Charaterization **TestCode:** **6010_W**

Sample ID: **CCV** SampType: **CCV** TestCode: **6010_W** Units: **mg/L** Prep Date: RunNo: **15510**
Client ID: **CCV** Batch ID: **7577** TestNo: **SW6010C** **SW3010A** Analysis Date: **6/12/2014** SeqNo: **203620**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic, TCLP	0.9991	0.02000	1.000	0	99.9	90	110				
Barium, TCLP	0.5097	0.01000	0.5000	0	102	90	110				
Cadmium, TCLP	0.04950	0.001000	0.05000	0	99.0	90	110				
Chromium, TCLP	0.2589	0.005000	0.2500	0	104	90	110				
Lead, TCLP	1.044	0.02000	1.000	0	104	90	110				
Selenium, TCLP	1.000	0.02000	1.000	0	100	90	110				
Silver, TCLP	0.4838	0.01000	0.5000	0	96.8	90	110				

Sample ID: **CCV** SampType: **CCV** TestCode: **6010_W** Units: **mg/L** Prep Date: RunNo: **15510**
Client ID: **CCV** Batch ID: **7577** TestNo: **SW6010C** **SW3010A** Analysis Date: **6/12/2014** SeqNo: **203634**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Arsenic, TCLP	0.9865	0.02000	1.000	0	98.6	90	110				
Barium, TCLP	0.5096	0.01000	0.5000	0	102	90	110				
Cadmium, TCLP	0.04990	0.001000	0.05000	0	99.8	90	110				
Chromium, TCLP	0.2507	0.005000	0.2500	0	100	90	110				
Lead, TCLP	1.042	0.02000	1.000	0	104	90	110				
Selenium, TCLP	0.9958	0.02000	1.000	0	99.6	90	110				
Silver, TCLP	0.4790	0.01000	0.5000	0	95.8	90	110				

Qualifiers:
B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
O RSD is greater than RSDlimit
R RPD outside accepted recovery limits
S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

Specialty Analytical

16-Jun-14

Client: Millennium Bulk Terminal-Longview
Project: Waste Charaterization **TestCode:** **8082LL_S**

Sample ID: **1016/1260 CCV**	SampType: **CCV**	TestCode: **8082LL_S**	Units: **µg/Kg**	Prep Date:	RunNo: **15521**
Client ID: **CCV**	Batch ID: **7578**	TestNo: **SW 8082A**	**3545_8082LL**	Analysis Date: **6/13/2014**	SeqNo: **203811**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aroclor 1016/1260	63.8	22.2	66.67	0	95.8	85	115				
Aroclor 1260	66.3	22.2	66.67	0	99.4	85	115				

Sample ID: **MB-7578**	SampType: **MBLK**	TestCode: **8082LL_S**	Units: **µg/Kg**	Prep Date: **6/12/2014**	RunNo: **15521**
Client ID: **PBS**	Batch ID: **7578**	TestNo: **SW 8082A**	**3545_8082LL**	Analysis Date: **6/13/2014**	SeqNo: **203812**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aroclor 1016	ND	0.333									
Aroclor 1221	ND	0.333									
Aroclor 1232	ND	0.333									
Aroclor 1242	ND	0.333									
Aroclor 1248	ND	0.333									
Aroclor 1254	ND	0.333									
Aroclor 1260	ND	0.333									
Aroclor 1262	ND	0.333									
Aroclor 1268	ND	0.333									
Surr: Decachlorobiphenyl	6600		6667		99.0	56.5	130				

Sample ID: **LCS-7578**	SampType: **LCS**	TestCode: **8082LL_S**	Units: **µg/Kg**	Prep Date: **6/12/2014**	RunNo: **15521**
Client ID: **LCSS**	Batch ID: **7578**	TestNo: **SW 8082A**	**3545_8082LL**	Analysis Date: **6/13/2014**	SeqNo: **203813**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aroclor 1016/1260	58.1	0.333	66.67	0	87.2	44.3	137				

Qualifiers:
B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
O RSD is greater than RSDlimit
R RPD outside accepted recovery limits
S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

16-Jun-14

Specialty Analytical

Client: Millennium Bulk Terminal-Longview

Project: Waste Charaterization **TestCode: 8082LL_S**

Sample ID: **LCS-7578**	SampType: **LCS**	TestCode: **8082LL_S**	Units: **µg/Kg**	Prep Date: **6/12/2014**	RunNo: **15521**
Client ID: **LCSS**	Batch ID: **7578**	TestNo: **SW 8082A**	**3545_8082LL**	Analysis Date: **6/13/2014**	SeqNo: **203813**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Sample ID: **1406062-005AMS**	SampType: **MS**	TestCode: **8082LL_S**	Units: **µg/Kg-dry**	Prep Date: **6/12/2014**	RunNo: **15521**
Client ID: **MBTL-G4-060614**	Batch ID: **7578**	TestNo: **SW 8082A**	**3545_8082LL**	Analysis Date: **6/13/2014**	SeqNo: **203825**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aroclor 1016/1260	3040	6.88	68.88	0	4420	56.6	123				SMC

Sample ID: **1406062-005AMSD**	SampType: **MSD**	TestCode: **8082LL_S**	Units: **µg/Kg-dry**	Prep Date: **6/12/2014**	RunNo: **15521**
Client ID: **MBTL-G4-060614**	Batch ID: **7578**	TestNo: **SW 8082A**	**3545_8082LL**	Analysis Date: **6/13/2014**	SeqNo: **203826**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aroclor 1016/1260	4150	6.88	68.88	0	6020	56.6	123	3043	30.7	20	SRMC

Sample ID: **1016/1260 CCV**	SampType: **CCV**	TestCode: **8082LL_S**	Units: **µg/Kg**	Prep Date:	RunNo: **15521**
Client ID: **CCV**	Batch ID: **7578**	TestNo: **SW 8082A**	**3545_8082LL**	Analysis Date: **6/13/2014**	SeqNo: **203827**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Aroclor 1016/1260	61.8	0.333	66.67	0	92.8	85	115				
Aroclor 1260	70.8	0.333	66.67	0	106	85	115				

Qualifiers:

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- O RSD is greater than RSDlimit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

Specialty Analytical

16-Jun-14

Client: Millennium Bulk Terminal-Longview
Project: Waste Charaterization **TestCode:** **HG_CT**

Sample ID: **MB-R15497**	SampType: **MBLK**	TestCode: **HG_CT**	Units: **mg/L**	Prep Date:	RunNo: **15497**
Client ID: **PBW**	Batch ID: **7579**	TestNo: **E7470A**	**E245.1**	Analysis Date: **6/12/2014**	SeqNo: **203430**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury, TCLP	ND	0.000100									

Sample ID: **LCS-R15497**	SampType: **LCS**	TestCode: **HG_CT**	Units: **mg/L**	Prep Date:	RunNo: **15497**
Client ID: **LCSW**	Batch ID: **7579**	TestNo: **E7470A**	**E245.1**	Analysis Date: **6/12/2014**	SeqNo: **203431**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury, TCLP	0.00392	0.000100	0.004000	0	97.9	85.4	116				

Sample ID: **1406008-004DDUP**	SampType: **DUP**	TestCode: **HG_CT**	Units: **mg/L**	Prep Date: **6/12/2014**	RunNo: **15497**
Client ID: **ZZZZZZ**	Batch ID: **7579**	TestNo: **E7470A**	**E245.1**	Analysis Date: **6/12/2014**	SeqNo: **203433**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury, TCLP	ND	0.000100						0	0	20	

Sample ID: **1406008-004DMS**	SampType: **MS**	TestCode: **HG_CT**	Units: **mg/L**	Prep Date: **6/12/2014**	RunNo: **15497**
Client ID: **ZZZZZZ**	Batch ID: **7579**	TestNo: **E7470A**	**E245.1**	Analysis Date: **6/12/2014**	SeqNo: **203434**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury, TCLP	0.00325	0.000100	0.004000	0	81.3	69.5	125				

Qualifiers:
B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
O RSD is greater than RSDlimit
R RPD outside accepted recovery limits
S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

16-Jun-14

Specialty Analytical

Client: Millennium Bulk Terminal-Longview

Project: Waste Charaterization **TestCode: HG_CT**

Sample ID: **1406008-004DMSD**	SampType: **MSD**	TestCode: **HG_CT**	Units: **mg/L**	Prep Date: **6/12/2014**	RunNo: **15497**
Client ID: **ZZZZZZ**	Batch ID: **7579**	TestNo: **E7470A**	**E245.1**	Analysis Date: **6/12/2014**	SeqNo: **203435**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury, TCLP	0.00328	0.000100	0.004000	0	82.0	69.5	125	0.003253	0.827	20	

Sample ID: **CCV**	SampType: **CCV**	TestCode: **HG_CT**	Units: **mg/L**	Prep Date:	RunNo: **15497**
Client ID: **CCV**	Batch ID: **7579**	TestNo: **E7470A**	**E245.1**	Analysis Date: **6/12/2014**	SeqNo: **203449**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury, TCLP	0.00396	0.000100	0.004000	0	99.1	90	110				

Sample ID: **CCV**	SampType: **CCV**	TestCode: **HG_CT**	Units: **mg/L**	Prep Date:	RunNo: **15497**
Client ID: **CCV**	Batch ID: **7579**	TestNo: **E7470A**	**E245.1**	Analysis Date: **6/12/2014**	SeqNo: **203450**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury, TCLP	0.00396	0.000100	0.004000	0	99.0	90	110				

Sample ID: **ICV**	SampType: **ICV**	TestCode: **HG_CT**	Units: **mg/L**	Prep Date:	RunNo: **15497**
Client ID: **ICV**	Batch ID: **7579**	TestNo: **E7470A**	**E245.1**	Analysis Date: **6/13/2014**	SeqNo: **203507**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury, TCLP	0.00388	0.000100	0.004000	0	96.9	90	110				

Qualifiers:

- B Analyte detected in the associated Method Blank
- H Holding times for preparation or analysis exceeded
- ND Not Detected at the Reporting Limit
- O RSD is greater than RSDlimit
- R RPD outside accepted recovery limits
- S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

16-Jun-14

Specialty Analytical

Client: Millennium Bulk Terminal-Longview

Project: Waste Charaterization **TestCode: HG_CT**

Sample ID: **CCV** SampType: **CCV** TestCode: **HG_CT** Units: **mg/L** Prep Date: RunNo: **15497**

Client ID: **CCV** Batch ID: **7579** TestNo: **E7470A** **E245.1** Analysis Date: **6/13/2014** SeqNo: **203513**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Mercury, TCLP	0.00393	0.000100	0.004000	0	98.3	90	110				

Qualifiers:

B	Analyte detected in the associated Method Blank	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

Specialty Analytical

16-Jun-14

Client: Millennium Bulk Terminal-Longview
Project: Waste Charaterization **TestCode:** **NWTPHDX_S**

Sample ID: **CCV**	SampType: **CCV**	TestCode: **NWTPHDX_S**	Units: **mg/Kg**	Prep Date:	RunNo: **15514**
Client ID: **CCV**	Batch ID: **7581**	TestNo: **NWTPH-Dx**	**SW3545A**	Analysis Date: **6/13/2014**	SeqNo: **203678**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Diesel	1020	15.0	999.0	0	102	85	115				
Lube Oil	491	50.0	499.5	0	98.3	85	115				

Sample ID: **CCB**	SampType: **CCB**	TestCode: **NWTPHDX_S**	Units: **mg/Kg**	Prep Date: **6/12/2014**	RunNo: **15514**
Client ID: **CCB**	Batch ID: **7581**	TestNo: **NWTPH-Dx**	**SW3545A**	Analysis Date: **6/13/2014**	SeqNo: **203679**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Diesel	ND	15.0									
Lube Oil	ND	50.0									
Surr: o-Terphenyl	40.3		33.30		121	50	150				

Sample ID: **LCS-7581**	SampType: **LCS**	TestCode: **NWTPHDX_S**	Units: **mg/Kg**	Prep Date: **6/12/2014**	RunNo: **15514**
Client ID: **LCSS**	Batch ID: **7581**	TestNo: **NWTPH-Dx**	**SW3545A**	Analysis Date: **6/13/2014**	SeqNo: **203680**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Diesel	196	15.0	166.7	0	118	76.3	125				
Lube Oil	161	50.0	166.7	0	96.7	69.9	127				

Sample ID: **1406062-001ADUP**	SampType: **DUP**	TestCode: **NWTPHDX_S**	Units: **mg/Kg-dry**	Prep Date: **6/12/2014**	RunNo: **15514**
Client ID: **MBTL-VLT-060614**	Batch ID: **7581**	TestNo: **NWTPH-Dx**	**SW3545A**	Analysis Date: **6/13/2014**	SeqNo: **203686**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:
B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
O RSD is greater than RSDlimit
R RPD outside accepted recovery limits
S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

Specialty Analytical

16-Jun-14

Client: Millennium Bulk Terminal-Longview
Project: Waste Charaterization **TestCode:** **NWTPHDX_S**

Sample ID: **1406062-001ADUP** SampType: **DUP** TestCode: **NWTPHDX_S** Units: **mg/Kg-dry** Prep Date: **6/12/2014** RunNo: **15514**
Client ID: **MBTL-VLT-060614** Batch ID: **7581** TestNo: **NWTPH-Dx** **SW3545A** Analysis Date: **6/13/2014** SeqNo: **203686**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Diesel	52500	157						53920	2.61	20	
Lube Oil	6910	522						6409	7.51	20	M

Sample ID: **CCV** SampType: **CCV** TestCode: **NWTPHDX_S** Units: **mg/Kg** Prep Date: RunNo: **15514**
Client ID: **CCV** Batch ID: **7581** TestNo: **NWTPH-Dx** **SW3545A** Analysis Date: **6/13/2014** SeqNo: **203693**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Diesel	1370	15.0	1332	0	103	85	115				
Lube Oil	628	50.0	666.0	0	94.3	85	115				

Sample ID: **MB-7581** SampType: **MBLK** TestCode: **NWTPHDX_S** Units: **mg/Kg** Prep Date: **6/12/2014** RunNo: **15514**
Client ID: **PBS** Batch ID: **7581** TestNo: **NWTPH-Dx** **SW3545A** Analysis Date: **6/13/2014** SeqNo: **203694**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Diesel	ND	15.0									
Lube Oil	ND	50.0									
Surr: o-Terphenyl	41.1		33.30		123	50	150				

Sample ID: **1406064-001ADUP** SampType: **DUP** TestCode: **NWTPHDX_S** Units: **mg/Kg-dry** Prep Date: **6/12/2014** RunNo: **15514**
Client ID: **ZZZZZZ** Batch ID: **7581** TestNo: **NWTPH-Dx** **SW3545A** Analysis Date: **6/13/2014** SeqNo: **203696**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:
B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
O RSD is greater than RSDlimit
R RPD outside accepted recovery limits
S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

Specialty Analytical

16-Jun-14

Client: Millennium Bulk Terminal-Longview
Project: Waste Charaterization **TestCode:** **NWTPHDX_S**

Sample ID: **1406064-001ADUP**	SampType: **DUP**	TestCode: **NWTPHDX_S**	Units: **mg/Kg-dry**	Prep Date: **6/12/2014**	RunNo: **15514**
Client ID: **ZZZZZZ**	Batch ID: **7581**	TestNo: **NWTPH-Dx**	**SW3545A**	Analysis Date: **6/13/2014**	SeqNo: **203696**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Diesel	ND	25.9						0	200	20	RF
Lube Oil	ND	86.5						0	0	20	

Sample ID: **CCV**	SampType: **CCV**	TestCode: **NWTPHDX_S**	Units: **mg/Kg**	Prep Date:	RunNo: **15514**
Client ID: **CCV**	Batch ID: **7581**	TestNo: **NWTPH-Dx**	**SW3545A**	Analysis Date: **6/13/2014**	SeqNo: **203705**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Diesel	1030	15.0	999.0	0	103	85	115				
Lube Oil	463	50.0	499.5	0	92.7	85	115				

Sample ID: **CCB**	SampType: **CCB**	TestCode: **NWTPHDX_S**	Units: **mg/Kg**	Prep Date:	RunNo: **15514**
Client ID: **CCB**	Batch ID: **7581**	TestNo: **NWTPH-Dx**	**SW3545A**	Analysis Date: **6/14/2014**	SeqNo: **203759**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Diesel	ND	15.0									
Lube Oil	ND	50.0									
Surr: o-Terphenyl	42.0		33.30		126	50	150				

Sample ID: **CCV**	SampType: **CCV**	TestCode: **NWTPHDX_S**	Units: **mg/Kg**	Prep Date:	RunNo: **15514**
Client ID: **CCV**	Batch ID: **7581**	TestNo: **NWTPH-Dx**	**SW3545A**	Analysis Date: **6/14/2014**	SeqNo: **203760**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual

Qualifiers:
B Analyte detected in the associated Method Blank
H Holding times for preparation or analysis exceeded
ND Not Detected at the Reporting Limit
O RSD is greater than RSDlimit
R RPD outside accepted recovery limits
S Spike Recovery outside accepted reco

QC SUMMARY REPORT

WO#: **1406062**

Specialty Analytical

16-Jun-14

Client: Millennium Bulk Terminal-Longview

Project: Waste Charaterization **TestCode:** **NWTPHDX_S**

Sample ID: **CCV** SampType: **CCV** TestCode: **NWTPHDX_S** Units: **mg/Kg** Prep Date: RunNo: **15514**

Client ID: **CCV** Batch ID: **7581** TestNo: **NWTPH-Dx** **SW3545A** Analysis Date: **6/14/2014** SeqNo: **203760**

Analyte	Result	PQL	SPK value	SPK Ref Val	%REC	LowLimit	HighLimit	RPD Ref Val	%RPD	RPDLimit	Qual
Diesel	1410	15.0	1332	0	106	85	115				
Lube Oil	621	50.0	666.0	0	93.2	85	115				

Qualifiers:

B	Analyte detected in the associated Method Blank	H	Holding times for preparation or analysis exceeded	ND	Not Detected at the Reporting Limit
O	RSD is greater than RSDlimit	R	RPD outside accepted recovery limits	S	Spike Recovery outside accepted reco

KEY TO FLAGS

Rev. May 12, 2010

A	This sample contains a Gasoline Range Organic not identified as a specific hydrocarbon product. The result was quantified against gasoline calibration standards
A1	This sample contains a Diesel Range Organic not identified as a specific hydrocarbon product. The result was quantified against diesel calibration standards.
A2	This sample contains a Lube Oil Range Organic not identified as a specific hydrocarbon product. The result was quantified against a lube oil calibration standard.
A3	The result was determined to be Non-Detect based on hydrocarbon pattern recognition. The product was carry-over from another hydrocarbon type.
A4	The product appears to be aged or degraded diesel.
B	The blank exhibited a positive result great than the reporting limit for this compound.
CN	See Case Narrative.
D	Result is based from a dilution.
E	Result exceeds the calibration range for this compound. The result should be considered as estimate.
F	The positive result for this hydrocarbon is due to single component contamination. The product does not match any hydrocarbon in the fuels library.
G	Result may be biased high due to biogenic interferences. Clean up is recommended.
H	Sample was analyzed outside recommended holding time.
HT	At clients request, samples was analyzed outside of recommended holding time.
J	The result for this analyte is between the MDL and the PQL and should be considered as estimated concentration.
K	Diesel result is biased high due to amount of Oil contained in the sample.
L	Diesel result is biased high due to amount of Gasoline contained in the sample.
M	Oil result is biased high due to amount of Diesel contained in the sample.
MC	Sample concentration is greater than 4x the spiked value, the spiked value is considered insignificant.
MI	Result is outside control limits due to matrix interference.
MSA	Value determined by Method of Standard Addition.
O	Laboratory Control Standard (LCS) exceeded laboratory control limits, but meets CCV criteria. Data meets EPA requirements.
Q	Detection levels elevated due to sample matrix.
R	RPD control limits were exceeded.
RF	Duplicate failed due to result being at or near the method-reporting limit.
RP	Matrix spike values exceed established QC limits; post digestion spike is in control.
S	Recovery is outside control limits.
SC	Closing CCV or LCS exceeded high recovery control limits, but associated samples are non-detect. Data meets EPA requirements.
*	The result for this parameter was greater that the maximum contaminant level of the TCLP regulatory limit.

CHAIN OF CUSTODY RECORD

Specialty Analytical
11711 SE Capps Road
Clackamas, OR 97015
Phone: 503-607-1331
Fax: 503-607-1336

Contact Person/Project Manager: Cheryl Vezzani / Kristin Gaine
Company: MBTL Longview
Address: 4029 Industrial Way
Longview WA 98632
Phone: 503-502-8925 Fax:
Project No.: Project Name: Waste Characterization
Project Site Location OR: WA: ✓ Other:
Invoice To: P.O. No.:

Collected By:
Signature: Cheryl Vezzani
Printed: Cheryl Vezzani

Signature:
Printed:

Turn Around Time
☐ Normal 5-7 Business Days June 13th
☐ Rush
Specify
Rush Analyses Must Be Scheduled With The Lab In Advance

For Laboratory Use
Lab Job No. 1406062
Shipped Via Specialty
Air Bill No.
Temperature On Receipt 4 °C
Specialty Analytical Containers? (Y) N
Specialty Analytical Trip Blanks? Y / N

Date	Time	Sample I.D.	Matrix	No. of Containers	Analyses: TCLP Metals 8	TPH - DX	PCB	Comments	Lab I.D.
06-06-14	1419	MBTL-VLT-060614	Solid	1	X	X	X	Solid	
06-06-14	1438	MBTL-G1-060614	Solid	1	X	X	X	Gravel + soil	
06-06-14	1443	MBTL-G2-060614	Solid	1	X	X	X		
06-06-14	1448	MBTL-G3-060614	Solid	1	X	X	X		
06-06-14	1456	MBTL-G4-060614	Solid	1	X	X	X		
06-06-14	1504	MBTL-G5-060614	Solid	1	X	X	X		
06-06-14	1506	MBTL-G5D-060614	Solid	1	X	X	X		
06-06-14	1511	MBTL-G6-060614	Solid	1	X	X	X		
06-06-14	1517	MBTL-G7-060614	Solid	1	X	X	X		
06-06-14	1523	MBTL-G8-060614	Solid	1	X	X	X	"	
06-06-14	1531	MBTL-TRE-060614	Solid	1	X	X	X	Sand	

Relinquished By	Date	Time	Received By	Relinquished By	Date	Time
Cheryl Vezzani	6/9/14	0400			6/9/14	1145
Company: MBTL Longview			Company:	Company:		

Unless Reclaimed, Samples Will Be Disposed of 60 Days After Receipt.
Samples held beyond 60 days subject to storage fee(s)

Received For Lab By: Cindy Hillegard — Date 6/9/14 — Time 1145

APPENDIX D
ON-SITE MEDIA MANAGEMENT PLAN

ON-SITE MEDIA MANAGEMENT PLAN FORMER REYNOLDS METALS REDUCTION PLANT – LONGVIEW

Prepared for

Washington State Department of Ecology

On Behalf of

Northwest Alloys, Inc.

Millennium Bulk Terminals – Longview, LLC

Prepared by

Anchor QEA, LLC

6720 SW Macadam Avenue, Suite 125~~6650 SW Redwood lane, Suite 333~~

Portland, Oregon 9721924

~~January 2016~~August 2018

TABLE OF CONTENTS

List of Tables

List of Figures

LIST OF ACRONYMS AND ABBREVIATIONS

CAP	Cleanup Action Plan
Ecology	Washington State Department of Ecology
OMMP	On-Site Media Management Plan
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
RI/FS	Remedial Investigation/Feasibility Study
Site	Former Reynolds Metal Reduction Plant
SPLP	synthetic precipitation leaching procedure
TPH	total petroleum hydrocarbon
USEPA	U.S. Environmental Protection Agency

1 INTRODUCTION

This *On-Site Media Management Plan* (OMMP) establishes standards and procedures for on-Site reuse of environmental media that may be generated during future maintenance or construction-related activities at the former Reynolds Metals Reduction Plant (Site) located at 4029 Industrial Way in Longview, Washington.

The on-Site soil reuse standards have been reviewed and pre-approved by the Washington State Department of Ecology (Ecology). Reuse of such materials in accordance with the OMMP complies with the cleanup standards defined in the *Cleanup Action Plan* (CAP; Ecology 2015). Therefore, the protocols described in this plan for on-Site management of environmental media do not require notification to Ecology unless soils or media are identified that exceed the soil cleanup levels defined in Table 5-3 of the CAP (Ecology 2015).

This OMMP does not define protocols for the management of deposits of residual carbon or spent lime or for construction of the cleanup action. Protocols for the management of soil and fill materials during construction of the cleanup action will be defined in detail in the Engineering Design Report. This OMMP also does not apply to future ground-disturbing activities in areas of the Site subject to engineering and institutional controls for containment of contaminated soils. The approximate locations of these areas are shown in Figure 1 (hereinafter "the Restricted Areas"). These Restricted Areas include the Closed Black Mud Pond Facility, the soil underlying the 200,000-gallon diesel tank, and the soils to be contained beneath low permeability caps as part of the final cleanup action. The final boundaries of the low permeability caps will be documented in restrictive covenants to be filed after completion of cleanup construction and Ecology approval of the As-Built Report. Future ground-disturbing work in these Restricted Areas will be conducted in compliance with the restrictive covenants and will require prior notification of Ecology.

As required by the Clean Water Act, waters requiring specific management such as construction waters (e.g., soil and sediment dewatering, construction stormwater, and waters from redevelopment activities) and remediation waters (e.g., soil and sediment dewatering, construction stormwater, and waters from decommissioning and cleanup) accessed from the

shallow water bearing zone (WBZ) underlying the Site (isolated by the upper alluvium) are managed in compliance with the Site's NPDES permit using the on-Site wastewater and stormwater management facilities or using appropriately permitted off-Site management facilities. This OMMP does not modify those procedures or requirements.

2 MEDIA MANAGEMENT PROCEDURES

Extensive environmental testing was conducted during the development of the *Remedial Investigation/Feasibility Study* (RI/FS; Anchor QEA 2015). After implementation of the final cleanup action as described in the CAP, the areas of known contaminated soils and fill managed on Site will be limited to the Restricted Areas shown in Figure 1. Therefore, except in the Restricted Areas, ground-disturbing activities (e.g., trenching, grading, excavation, and backfill) do not require special management protocols.

2.1 Soil Reuse Standards

Table 1 identifies Site-specific soil reuse standards applicable to on-Site reuse of soil. Soil that complies with these soil reuse standards may be reused as clean surface fill (i.e., within the vadose zone) within the boundaries of the Site. No additional notification or soil management requirements apply to on-Site management of soils that comply with the Table 1 soil reuse standards.

2.2 Testing of Potentially Contaminated Soil

With the exception of the Restricted Areas, chemical testing is not required prior to the implementation of ground-disturbing activity. However, testing shall be performed if soils show indications of potential soil contamination, including one or more of the following:

- Soils or materials that exhibit unusual staining
- Soils or materials that exhibit an unusual odor
- Soils or materials that produce a hydrocarbon-like sheen under wet conditions

Table 1
On-Site Soil Reuse Standards

Chemical of Potential Concern	On-Site Soil Reuse Standards[1]	Protection Basis
Fluoride	3,100 mg/kg or SPLP Testing Demonstration[2]	Method C and Soil-to-Groundwater Protectiveness Evaluation[2]
PAHs[3]	18 mg/kg	Method C
PCBs	1 mg/kg[4]	Method A[4]
TPH Diesel Range	2,000 mg/kg[5]	Method A[5]
TPH Heavy Oil Range	2,000 mg/kg[5]	Method A[5]
TPH Mineral Oil	4,000 mg/kg[5]	Method A[5]

Notes:

1 = On-Site soil reuse standards include both MTCA soil cleanup levels and additional considerations to ensure protection of groundwater and compliance with other applicable regulations.

2 = Using Method C, a total fluoride concentration of 210,000 mg/kg is protective of human health based on direct contact under industrial exposure scenarios (Federal Integrated Risk Information System database). This cleanup level was adjusted downward in the CAP to address protection of groundwater. Site media above 3,100 mg/kg may be reused on Site if it can be shown using Equation 173-340-747-1 that the materials are protective of groundwater quality at a target groundwater fluoride concentration of 4.0 mg/L. That equation (the standard three-phase partitioning model) is the standard approach used by Ecology to determine soil constituent concentrations protective of groundwater resources. In performing this evaluation, the material-specific partitioning coefficient (K_d) shall be quantified as the ratio of total fluoride measured in the soil (F_s) to the fluoride concentrations measured in the SPLP leachate (F_{SPLP}) tested in one or more representative samples of the material (at least one sample per 1,000 cubic yards material). Using MTCA default assumptions and Equation 173-340-747-1, the protective soil concentration is determined as follows:

$$\text{Protective Soil Fluoride Concentration (mg/kg)} = 4.0 \text{ mg/L} \times 20 \times [(F_{Soil} / F_{SPLP}) + 0.2)]$$

Materials that are visually different shall be sampled and managed separately for the purposes of defining k^d and leaching potential.

3 = Cleanup level developed for potentially carcinogenic PAHs based on the approved MTCA TEF procedure.

4 = This is a total value for all PCBs measured as PCB Aroclors. The soil cleanup level for PCBs in soil is 10 mg/kg as established in the CAP. However, this value may be used only if the PCB contaminated soils are capped and the cap is maintained as required by 40 CFR 761.61. For soil reuse on Site, the value for unrestricted Site use (1 mg/kg) must be used. High occupancy is assumed for the Site.

5 = These soil reuse standards for total petroleum hydrocarbons in soil apply to on-Site soil reuse unless a demonstration of compliance with MTCA cleanup levels for protection of direct contact and for protection of groundwater is made using media-specific TPH fractionation data and the protocols defined in WAC 173-340-745.

CFR = Code of Federal Regulations
Ecology = Washington State Department of Ecology
Kd = partitioning coefficient
L/kg = liter per kilogram
mg/kg = milligram per kilogram
MTCA = Model Toxics Control Act
PAH = polycyclic aromatic hydrocarbon
PCB = polychlorinated biphenyl
SPLP = synthetic precipitation leaching procedure
TEF = Toxicity Equivalency Factor
TPH = total petroleum hydrocarbon

If areas of potentially impacted soil are encountered, a minimum of three samples of the soils exhibiting these characteristics shall be collected from each area. Additional samples will be collected based on the following minimum sampling frequency:

- Estimated volumes less than 2,000 cubic yards: At least one sample for every 200 cubic yards
- Estimated volumes beyond 2,000 cubic yards: At least one sample for every additional 500 cubic yards.

Collected soil samples shall be analyzed at a minimum for the following parameters:

- Polychlorinated biphenyl (PCB) Aroclors (U.S. Environmental Protection Agency [USEPA] Method SW8082a)
- Polycyclic aromatic hydrocarbon (PAHs; USEPA Method 8270)
- Total petroleum hydrocarbons (TPH; Method NWTPH-Dx)
- Total fluoride (SM4500-F-C with Bellack distillation)

Additional testing parameters may be warranted if field observations indicate the potential presence of other hazardous chemicals beyond those for which cleanup standards are specified in the Cleanup Action Plan.

If testing shows that chemical concentrations comply with Table 1 soil reuse standards, then the materials may continue to be managed on Site as clean soil, and no additional notification or management provisions are required. If soils are identified that exceed the soil reuse standards in Table 1, then these materials shall be managed as contaminated soil unless otherwise directed by Ecology.

This plan does not supersede or replace legal/regulatory requirements to characterize and report previously unknown releases of hazardous chemicals for which there are not cleanup standards specified in the Cleanup Action Plan.

In the event that contaminated soils are identified, Ecology shall be notified in writing within 90 days regarding the presence, type, and estimated quantity of contaminated soils. For estimated contaminated soil volumes greater than 200 cubic yards, that notice shall be

provided at least 15 days in advance of removal/management of the contaminated soils unless otherwise waived by Ecology. The following procedures are pre-approved for management of small quantities (e.g., less than 2,000 cubic yards) of contaminated soil:

- **Soil Excavation**. Excavated soil that contains contaminants at concentrations exceeding soil reuse standards shall be maintained within the limits of the excavation, placed inside a building, stockpiled in accordance with this plan, or placed immediately into a drum, tote, truck, railcar or covered drop box.
- **Stockpiling**. Removed soil that is not containerized or placed inside a building shall be managed using a lined and covered stockpile. Stockpiles of contaminated soil must be constructed and maintained to prevent erosion, contact with stormwater run-on and runoff, dust generation, and worker contact. Stockpiles shall be placed on plastic sheeting and must be covered when not in use. The plastic sheeting must have a minimum thickness of 10 mils and must be anchored as needed (e.g., sandbags and straw bales) to prevent being removed by wind or other disturbance. Tears or discontinuities in the stockpile cover must be repaired. Stockpiles must be inspected at least once per week to ensure they remain properly covered.
- **Loading and Disposal**. Excavated soil may be loaded into trucks or rail cars for hauling to a disposal facility. During loading, care shall be taken to minimize spillage of soil. Loose soil on the exterior of trucks or rail cars shall be removed prior to leaving the loading area. Trucks or rail cars shall not be allowed to leave the facility if liquids are draining from the load. Transport of contaminated soil or liquids must comply with applicable transportation regulations. Contaminated soil shall be treated, recycled, or disposed in accordance with local, state, and federal regulations

If contaminated soils are identified and removed using the above-described protocols, then Ecology will be provided with confirmatory sampling data documenting that such removal has fully addressed the identified soil contamination.

2.3 Reuse of Concrete, Refractory Brick, and Similar Media

The reuse of concrete, refractory brick, or other similar reusable media is pre-approved, provided the materials have been shown by chemical testing to comply with the soil reuse standards in Table 1. Prior to reuse, concrete, refractory brick, or other similar media shall

be tested to verify that it complies with the soil reuse standards. Testing shall be performed on a minimum of one composite sample from every 1,000 cubic yards of concrete/brick.

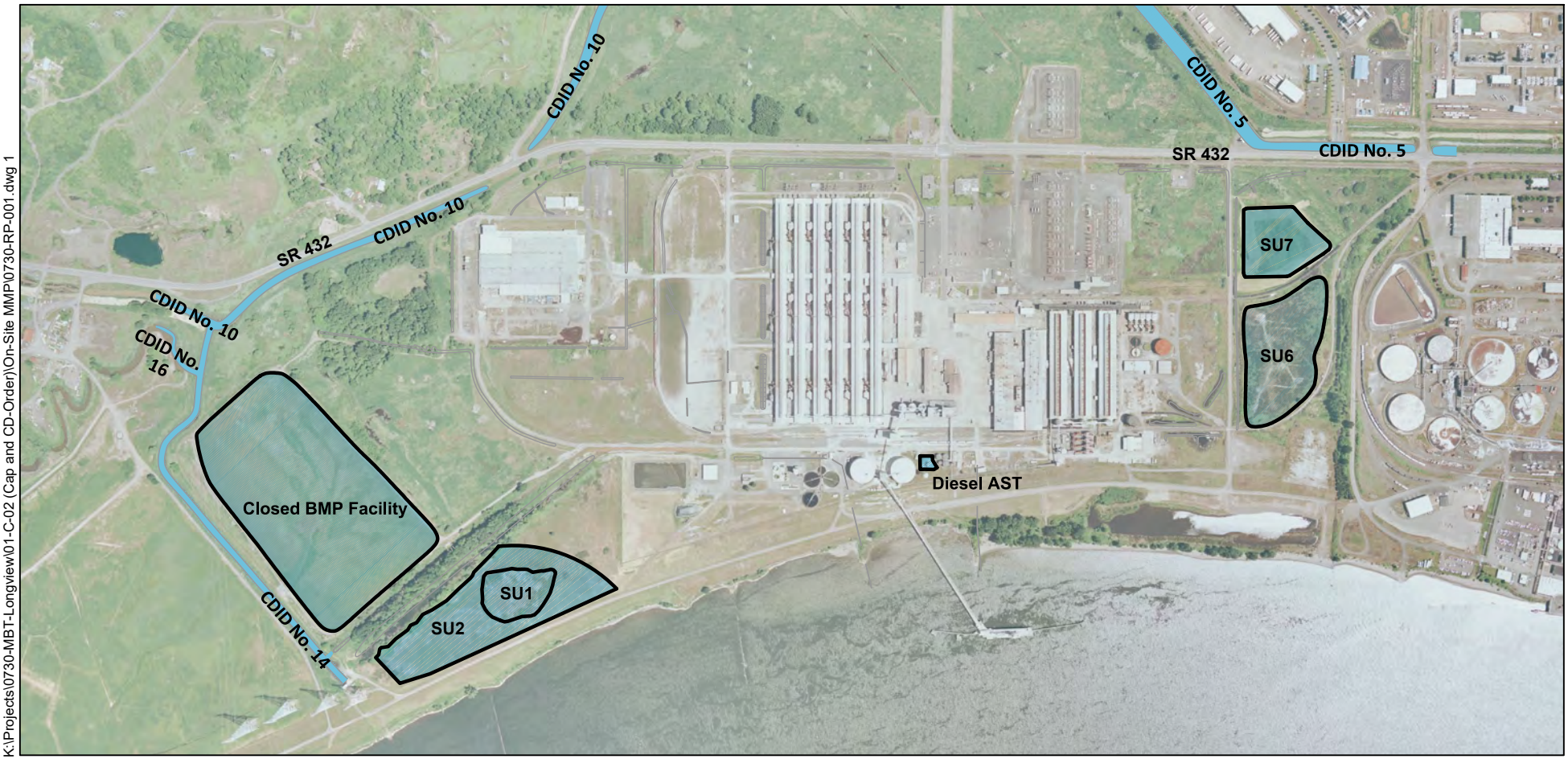
If the initial composite sample of concrete/brick meets the soil reuse standard from Table 1, the materials may be used on Site as clean surface fill. If the initial composite sample does not meet the soil reuse standard, each stockpile of 1,000 cubic yards (or less) will either be managed using an appropriately permitted off-Site recycling, treatment, or disposal facility or divided into four quadrants and resampled. If synthetic precipitation leaching procedure (SPLP) testing is performed to demonstrate compliance with the fluoride reuse standard, it shall be performed in addition to (i.e., on the same sample) a test for total fluoride, and the SPLP test shall be performed on representative size fractions of the material to be reused and meeting the criteria of the SPLP test protocol. Materials from stockpile quadrants that do not meet the soil reuse standards are prohibited from reuse on Site as fill.

3 REFERENCES

Anchor QEA (Anchor QEA, LLC), 2015. *Remedial Investigation and Feasibility Study*. Former Reynolds Metals Reduction Plant – Longview. Prepared for Washington State Department of Ecology. January 2015.

Ecology (Washington State Department of Ecology), 2015. *Draft Cleanup Action Plan*. Former Reynolds Metals Reduction Plant – Longview. May 2015.

FIGURE



K:\Projects\0730-MBT-Longview\01-C-02 (Cap and CD-Order)\On-Site MMP\0730-RP-001.dwg 1

Jul 10, 2015 4:26pm tgriga

AERIAL SOURCE: Aerometric, dated June 2015.
HORIZONTAL DATUM: Washington State Plane South, NAD83, U.S. Feet.
NOTES:

1. The OMMP is not intended for use during implementation of the cleanup action or for use in Restricted Areas subject to engineering and institutional controls for management of contaminated soil and fill.
2. Final footprints of the Restricted Areas are subject to adjustment during design and permitting and will be documented in the Engineering Design Report and in the final As-Built report.

LEGEND:

Restricted Areas: Areas of Consolidated Soil and Fill Deposits Managed In-place with Engineering and Institutional Controls (see Note 2)

0 1000
Scale in Feet

ANCHOR QEA

Figure 1
Restricted Areas Not Intended for Soil Management Under the OMMP
On-Site Media Management Plan
Former Reynolds Metals Reduction Plant – Longview

APPENDIX E
COST ESTIMATE FOR SELECTED CLEANUP ACTION

Appendix E
Cost Estimate for Selected Cleanup Action - Alternative 4

Remedial Action Summary

- Institutional controls would be established
- All fill deposits, landfills and soils exceeding cleanup levels would be capped with low-permeability caps
- 14 acres of impacted soil, fill deposit and landfill materials would be excavated and consolidated
- Reactive backfill would be used in excavated areas exceeding groundwater cleanup levels
- PRB would be installed downgradient of SU2 and at the northwest corner of the Closed BMP Facility
- Approximately 400 cy soil would be excavated and transported for off-site disposal
- Sediment cleanup costs for SU12 remediation are based on RI/FS cost estimates for on-site sediment placement. The selected cleanup action also allows for alternative use of off-site disposal at a permitted landfill
- Long-term monitoring will be performed consistent with Appendix A - Compliance Monitoring and Contingency Response Plan

Site Unit	Units	Unit Cost	No. of Units	Cost
DIRECT CONSTRUCTION COSTS				
West Groundwater Area				
Groundwater				
PRB Trench at SU2	Linear Foot	$520	350	$182,000
PRB Trench at northwest corner	Linear Foot	$520	725	$377,000
Consolidate Trench Soil in SU2	CY	$12	2389	$28,667
Subtotal				**$588,000**
SU1 - Landfill # 2 (Industrial)				
Grading	Acre	$18,740	3.0	$56,220
Low-Permeability Cap (hydroseed surface)	Acre	$188,820	3.0	$566,460
Subtotal				**$623,000**
SU2 - Fill Deposit B-3 (Residual Carbon)				
Grading	Acre	$18,740	11.4	$213,636
Excavate, Haul, & Consolidate on-site	CY	$12	54,800	$657,600
Backfill - purchase, deliver, place, and compact	CY	$27	46,550	$1,256,850
Reactive - purchase, deliver, place, and compact	CY	$63	2,450	$154,350
Low-Permeability Cap (hydroseed surface)	Acre	$188,820	11.4	$2,152,548
Soil Confirmation Sampling (10 per acre removed)	Each	$500	50	$25,000
Subtotal				**$4,460,000**
East Groundwater Area				
Groundwater				
No construction	--	--	--	--
Subtotal				**$0**
SU3 - Fill Deposit B-2 (Residual Carbon)				
Excavate, Haul, & Consolidate on-site	CY	$12	40,310	$483,720
Increased Low Permeability Cap Area due to Consolidation	Acre	$188,820	0.2	$33,811
Reactive - purchase, deliver, place, and compact	CY	$63	2,608	$164,283
Backfill - purchase, deliver, place, and compact	CY	$27	37,702	$1,017,963
Gravel Surface	Acre	$19,850	4.3	$85,355
Dewatering- wellpoint, pump, on-site treatment	Acre	$19,130	13.0	$248,690
Transport & Off-site Disposal (Dangerous Waste including K088)	CY	$353	43	$15,179
Subtotal				**$2,049,000**
SU4 - Former Cryolite Ditches				
RR and Angle Residual Reactive Cover	CY	$63	199	$12,567
Cryolite Backfill - purchase, deliver, place, and compact	CY	$27	640	$17,276
Cryolite Reactive - purchase, deliver, place, and compact	CY	$63	640	$40,311
Subtotal				**$70,000**

Appendix E
Cost Estimate for Selected Cleanup Action - Alternative 4

Remedial Action Summary

- Institutional controls would be established
- All fill deposits, landfills and soils exceeding cleanup levels would be capped with low-permeability caps
- 14 acres of impacted soil, fill deposit and landfill materials would be excavated and consolidated
- Reactive backfill would be used in excavated areas exceeding groundwater cleanup levels
- PRB would be installed downgradient of SU2 and at the northwest corner of the Closed BMP Facility
- Approximately 400 cy soil would be excavated and transported for off-site disposal
- Sediment cleanup costs for SU12 remediation are based on RI/FS cost estimates for on-site sediment placement. The selected cleanup action also allows for alternative use of off-site disposal at a permitted landfill
- Long-term monitoring will be performed consistent with Appendix A - Compliance Monitoring and Contingency Response Plan

Site Unit	Units	Unit Cost	No. of Units	Cost
SU5 - Former Stockpile Area				
SPL Ditch Backfill - purchase, deliver, place, and compact	CY	$27	351	$9,488
SPL Ditch Reactive - purchase, deliver, place, and compact	CY	$63.0	351	$22,139
Excavate, Haul, & Consolidate on-site	CY	$12	5,780	$69,360
Backfill - purchase, deliver, place, and compact	CY	$27	3,538	$95,515
Reactive - purchase, deliver, place, and compact	CY	$63	2,242	$141,271
Gravel Surface	Acre	$19,850	1.4	$27,790
Soil Confirmation Sampling (10 per acre removed)	Each	$500	14	$7,000
Subtotal				**$373,000**
SU6 - Fill Deposit B-1 (Residual Carbon)				
Grading	Acre	$18,740	8.6	$161,164
Low-Permeability Cap (hydroseed surface)	Acre	$188,820	8.6	$1,623,852
Subtotal				**$1,785,000**
SU7 - Fill Deposit A (Spent Lime)				
Grading	Acre	$18,740	4.6	$86,204
Low-Permeability Cap (hydroseed surface)	Acre	$188,820	4.6	$868,572
Subtotal				**$955,000**
SU8 - Landfill # 1 (Floor Sweeps)				
Grading	Acre	$18,740	2.5	$46,850
Excavate, Haul, & Consolidate onsite	CY	$12	52,910	$634,920
Increased Low Permeability Cap Area due to Consolidation	Acre	$188,820	0.2	$37,192
Soil Confirmation Sampling (10 per acre removed)	Each	$500	25.0	$12,500
Resurface Excavation with topsoil and hydroseed	Acre	$18,950	2.5	$47,375
Subtotal				**$779,000**
SU9 - Pitch Storage Area				
Soil Confirmation Sampling (10 per acre removed)	Each	$500	3	$1,500
Excavate and Load for Off-site Disposal - Pitch Unloading Area	CY	$3	120	$360
Transport & Off-site Disposal (Dangerous Waste including K088)	CY	$353	120	$42,360
Gravel Surface	Acre	$19,850	0.3	$5,955
Subtotal				**$50,000**
SU10 - Landfill # 3 (Construction Debris)				
New Soil Cover (hydroseed surface)	--	--	--	--
Excavate, Haul, & Consolidate on-site	CY	$12	13,560	$162,720
Increased Low Permeability Cap Area due to Consolidation	Acre	$188,820	0.1	$11,270
Soil Confirmation Sampling (10 per acre removed)	Each	$500	13	$6,500
Backfill - purchase, deliver, place, and compact	CY	$27	13,560	$366,120
Subtotal				**$547,000**

Appendix E
Cost Estimate for Selected Cleanup Action - Alternative 4

Remedial Action Summary

- Institutional controls would be established
- All fill deposits, landfills and soils exceeding cleanup levels would be capped with low-permeability caps
- 14 acres of impacted soil, fill deposit and landfill materials would be excavated and consolidated
- Reactive backfill would be used in excavated areas exceeding groundwater cleanup levels
- PRB would be installed downgradient of SU2 and at the northwest corner of the Closed BMP Facility
- Approximately 400 cy soil would be excavated and transported for off-site disposal
- Sediment cleanup costs for SU12 remediation are based on RI/FS cost estimates for on-site sediment placement. The selected cleanup action also allows for alternative use of off-site disposal at a permitted landfill
- Long-term monitoring will be performed consistent with Appendix A - Compliance Monitoring and Contingency Response Plan

Site Unit	Units	Unit Cost	No. of Units	Cost
SU11 - Flat Storage Area				
Backfill - purchase, deliver, place, and compact	CY	$27	70	$1,890
Excavate and Load for Off-site Disposal	CY	$3	70	$210
Soil Confirmation Sampling (10 per acre removed)	Each	$500	2	$1,000
Transport & Off-site Disposal (Solid Waste)	CY	$66	70	$4,620
Subtotal				**$8,000**
SU13 - Localized Area of TPH-impacted Soil				
Excavate and Load for Off-site Disposal	CY	$3	10	$30
Backfill - purchase, deliver, place, and compact	CY	$27	10	$270
Transport & Off-site Disposal (Solid Waste)	CY	$66	10	$660
Soil Confirmation Sampling (14 samples)	Lump Sum	$2,586	1	$2,586
Subtotal				**$4,000**
Construction Cost Subtotal (CCS)				***$12,291,000***
OTHER CONTRACTOR COSTS				
Construction Mob-Demob/Site Controls/Survey	% of CCS	10%	--	$1,229,100
Tax	% of CCS	7.9%	--	$970,989
Subtotal				**$2,200,000**
Total Construction Costs (TCC)				***$14,491,000***
OTHER PROJECT COSTS				
Institutional Controls	Lump Sum	$20,000	1	$20,000
Engineering/Permitting	% of TCC (less tax)	5%	--	$676,000
Construction Oversight and Management	% of TCC (less tax)	7%	--	$946,000
Long-term Monitoring and Cap O&M (30 years)	Total Lump Sum	--	--	$1,644,000
Subtotal				**$3,286,000**
Upland Remediation Estimated Total Cost (EST)				***$17,800,000***

Appendix E
Cost Estimate for Selected Cleanup Action - Alternative 4

Remedial Action Summary

- Institutional controls would be established
- All fill deposits, landfills and soils exceeding cleanup levels would be capped with low-permeability caps
- 14 acres of impacted soil, fill deposit and landfill materials would be excavated and consolidated
- Reactive backfill would be used in excavated areas exceeding groundwater cleanup levels
- PRB would be installed downgradient of SU2 and at the northwest corner of the Closed BMP Facility
- Approximately 400 cy soil would be excavated and transported for off-site disposal
- Sediment cleanup costs for SU12 remediation are based on RI/FS cost estimates for on-site sediment placement. The selected cleanup action also allows for alternative use of off-site disposal at a permitted landfill
- Long-term monitoring will be performed consistent with Appendix A - Compliance Monitoring and Contingency Response Plan

Site Unit	Units	Unit Cost	No. of Units	Cost
SU12 - Sediment in Vicinity of Outfall 002A				
Project Permitting	Lump Sum	$80,000	1	$80,000
Pre-design Work and Design Reports and PS&E	Lump Sum	$95,000	1	$95,000
Mobilization/Demobilization	Each	$53,500	1	$53,500
Sediment Dredging	CY	$24	3600	$86,400
Sediment Offloading	CY	$10	3600	$36,000
Sediment Containment Embankment	CY	$12	1400	$16,800
Water Management	Each	$10,000	1	$10,000
Grading - Sand Purchase and Delivery	TN	$18	5,670	$102,060
Grading - Placement	CY	$15	4,200	$63,000
Verification, CM, and Reporting	Lump Sum	$150,000	1	$150,000
Subtotal				**$693,000**
Sediment Remediation Estimated Total Cost (EST)				***$700,000***
UPLAND AND SEDIMENT REMEDIATION ESTIMATED SUBTOTAL COST (EST)				***$18,500,000***
Contingency (+50%)				***$9,250,000***
ESTIMATED TOTAL COSTS (EST)				***$27,750,000***

~~APPENDIX F~~
~~SITE UNIT 12 WORK PLAN~~