REPORT

Union Pacific Railroad Co. - Feasibility Study (Revised)

Aluminum Recycling Trentwood Site

Submitted to:

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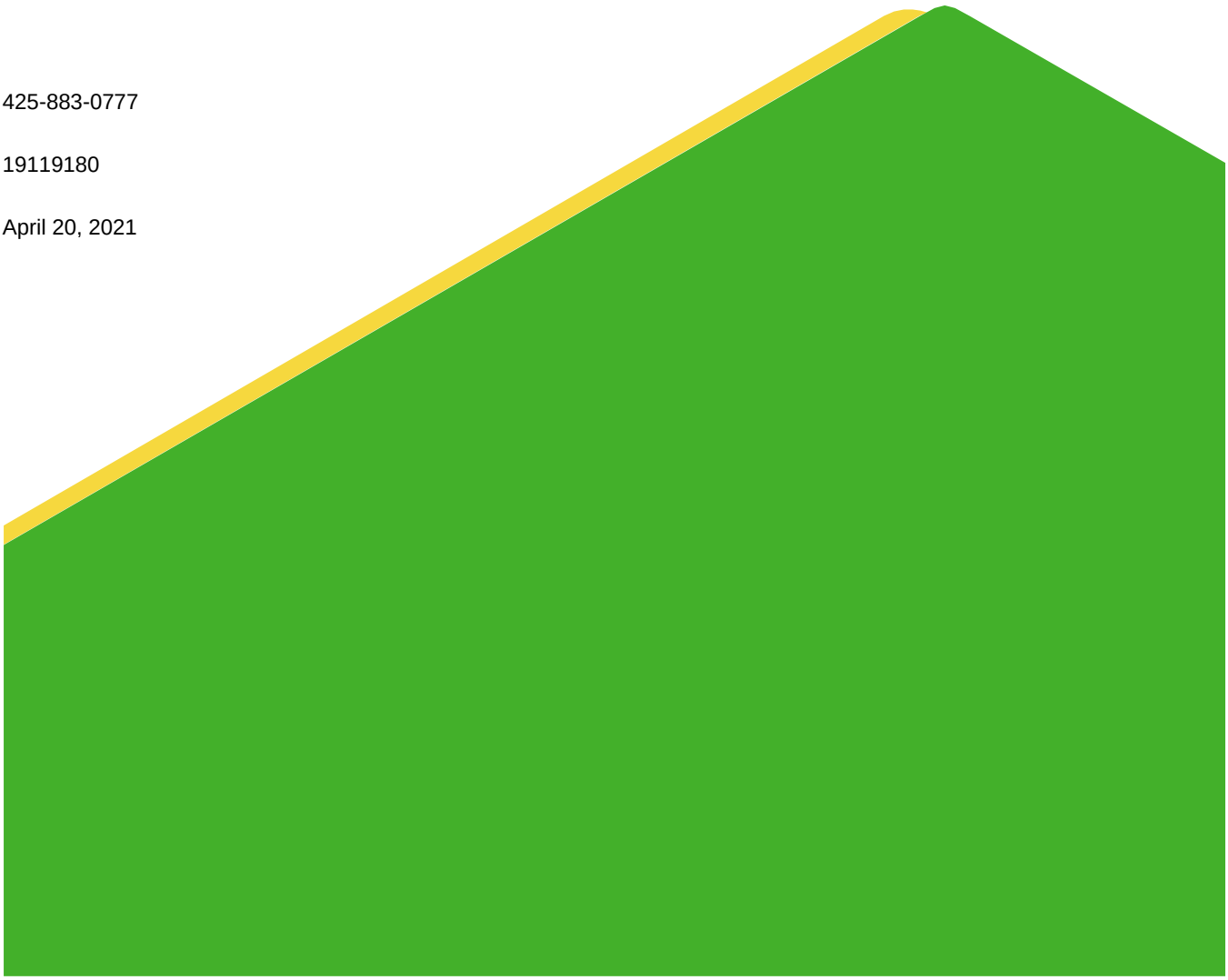

Executive Summary

1. Background

This document presents the revised Union Pacific Railroad Co. (UPRR) Feasibility Study (FS [Revised]) for the Aluminum Recycling Trentwood Site located at 2317 N Sullivan Rd, Spokane Valley, in Spokane County, Washington (Site). The Site is identified by the Washington State Department of Ecology (Ecology) as Facility Site ID 628 and Cleanup Site ID 1081.

Starting in 1979, UPRR's predecessor company leased its property to companies that recycled aluminum cans and/or aluminum dross into secondary aluminum which it then sold. Aluminum dross is a by-product of the aluminum smelting process. The aluminum dross was stockpiled on the property and is currently 5 to 30 feet in depth and approximately 57,000 cubic yards in volume. The primary contaminants of concern (COCs) associated with aluminum dross are metals such as aluminum, arsenic, barium, copper, and to a lesser extent mercury.

Through the process of stormwater runoff and wind erosion dross material migrated from the UPRR property onto adjacent properties currently owned by Pentzer Venture Holdings, II, Inc. (Pentzer) and the Washington State Department of Transportation (WSDOT). All three properties comprise the Site.

In accordance with a 2010 Agreed Order with Ecology, UPRR conducted a Remedial Investigation/Feasibility Study (RI/FS) for the Site to assess potential impacts to soil, groundwater, and the nearby Spokane River and evaluate potential cleanup alternatives. The 2012 RI/FS delineated the extent of soil impacts but determined that groundwater, which is approximately 50 to 60 feet below ground surface, and sediments in the Spokane River were not impacted by dross material.

Ecology approved a final RI/FS for public comment in 2012. In-situ capping of the stockpile and relocation/capping of the stockpile were recommended as potential preferred alternatives. The 2012 RI/FS stated the feasibility of these alternatives required further evaluation, including the availability of space at the current stockpile location for in-situ capping.

2. Changes to the 2012 RI/FS

Subsequent to the completion of the 2012 RI/FS, UPRR evaluated whether recycling the dross material was a feasible alternative. A pilot transport study and trial burn of dross material at a cement kiln were conducted. In addition, in 2020, UPRR removed dross material from WSDOT's property and surface dross-containing material from Pentzer's property and moved it to the existing dross stockpile on UPRR's property. UPRR also conducted a pre-design investigation (PDI) to further assess conditions on both properties. The information produced by these activities supported a reassessment of the cleanup actions evaluated in the 2012 RI/FS and how they comply with remedy evaluation and selection criteria under the Model Toxics Control Act (MTCA) and its implementing regulation.

The following outlines the primary differences between the evaluation of cleanup alternatives in the 2012 RI/FS compared to the 2021 FS (Revised):

- The 2012 FS recommended a Limited Purpose Landfill alternative in which the landfill would be constructed on a property adjacent to the UPRR property to the north of the Site. The adjacent property is no longer available for this use. The 2021 FS (Revised) does not include a Limited Purpose Landfill alternative.

- The pilot transport study and trial burn of dross material at the cement kiln raised significant uncertainty about the implementability of the Re-use of the Material in Recycling or Industrial Processes alternative.
- Ecology's selection of cleanup levels based on unrestricted use for the entire Site, including the Pentzer and WSDOT properties, and remediation levels on UPPR's property, increased the estimated cost and volume of material to be removed from the Site. The increased volume also adversely impacted the implementability of the In-situ Capping of Stockpile alternative described in the 2012 FS.
- Sampling results from the PDI increased the areal extent and quantities of contaminated material exceeding cleanup levels which also contributed to the increased estimate of the cost and volume of material to be removed from the Site compared to the 2012 FS.

The outcome of the reassessment is documented in this FS (Revised).

3. Exposure Pathways and Remedial Action Objective

The FS (Revised) Section 1 provides a brief updated summary of the background information and confirms the potentially complete exposure pathways associated with impacted soil as described in the 2012 RI/FS report as follows:

Human Health

- Dermal contact with stockpile material (current Site workers, trespassers, and construction workers)
- Dermal contact with surface water runoff from the stockpile (current Site workers, trespassers, construction workers, and adjacent off-property users)

Ecological

- Direct contact with stockpile material and surface water runoff from the stockpile material (flora and fauna)
- Ingestion of stockpile material and surface water runoff (small mammals and birds)
- Ingestion of plants or fauna that have been impacted by the above two pathways (predatory small mammals and birds)

Section 2 describes the Remedial Action Objective (RAO) to address the risks posed by the dross material and associated impacted soil is:

Eliminate the potential for ingestion or direct contact of stockpile material, or soil mixed with stockpile material, or stormwater runoff from the stockpile, by human and ecological receptors.

Section 2 also provides an updated summary of the applicable, relevant and appropriate requirements associated with the cleanup action at the Site.

4. Proposed Cleanup Levels and Evaluation of Cleanup Alternatives

The FS (Revised) proposes that cleanup levels for soil based on unrestricted land use are applicable on all three properties comprising the Site. The proposed cleanup levels for the COCs are based on MTCA Method A or B cleanup levels for unrestricted land use and are identified in Table 1.

UPRR's property is currently used by its tenant to produce industrial water treatment chemicals and does not stockpile or process aluminum dross. The property will continue to be used for industrial purposes for the foreseeable future. Accordingly, the FS (Revised) proposes that remediation levels be applicable to this property in the event cleanup levels cannot be achieved. The remediation levels for the COCs are based on MTCA Method C cleanup levels for industrial properties and are identified in Table 2.

Section 3 provides a summary of remedial technologies and an assessment of site-specific remedial technologies necessary to attain cleanup levels. Section 4 assembles the remedial technologies into the following four remedial alternatives for a detailed evaluation against MTCA evaluation and selection criteria.

Remedial Alternative 1 – Institutional Controls and Monitoring - This alternative is limited to the addition of fencing, posting signage, and institutional controls to restrict access to the Site.

Remedial Alternative 2 – In-situ Capping of Stockpile - Dross and dross-containing soil exceeding cleanup levels on the Pentzer and WSDOT properties would be excavated and consolidated with the dross stockpile on the UPRR property. The consolidated stockpile would be graded, shaped, compacted, and covered with an engineered multimedia cap consisting of a high density polyethylene (HDPE) liner and low-permeability soil to prevent infiltration of precipitation through the material, prevent transport of the material via surface water runoff and wind to adjacent areas, and prevent direct contact with the material. Soils exceeding cleanup levels that would not be able to be consolidated with the stockpile on the UPRR property due to volume restrictions would be disposed at a permitted landfill as described in Alternative 3. Access controls and signage indicating the presence of the cap would be required.

Remedial Alternative 3 – Removal of Stockpile and Impacted Soil to Off-Site Authorized Commercial Landfill - Stockpile material and dross-containing soil exceeding cleanup levels on the Pentzer and WSDOT properties would be excavated and removed from those properties and transported via truck to the permitted Graham Road Landfill located 5 miles east of Spokane. The properties would be regraded and revegetated. Stockpile material and dross-containing soil with concentrations above remediation levels on the UPRR property would also be removed and transported to the landfill. An ecological cap consisting of a combination of asphalt, concrete, and/or geotextile barrier/minimum of 6 inches of crushed rock will be placed over the areas on UPRR's property exceeding cleanup levels.

Remedial Alternative 4 – Re-use of the Material in Recycling or Industrial Processes - The dross stockpile and dross-containing soil exceeding cleanup levels would be removed from the Site and shipped via railcar to a selected facility to be re-used in an industrial process, such as an alternative raw material in cement production.

Section 4 summarizes the evaluation of the above alternatives in accordance with required MTCA criteria described in WAC 173-340-360(2) and (3). Alternative 1 does not meet threshold requirements because contaminated media would not be remediated. The remaining remedial alternatives were evaluated and ranked against each other by comparing their costs and benefits and assessing their compliance with the evaluation criteria in WAC 173-340-360(3). The comparison of benefits and costs are both quantitative and qualitative and are summarized in Section 4.3 and Table 4.

5. Preferred Alternative

Based on the evaluation of cleanup alternatives against MTCA criteria, Alternative 3 is UPRR's preferred cleanup action for the Site. As described above, dross material and soil exceeding cleanup levels would be removed from the Pentzer and WSDOT properties and transported by truck for disposal at the Graham Road Landfill. The

properties would be regraded and vegetated. Dross material and soil above remediation levels on UPRR's property would also be transported to the landfill. The estimated volume of materials to be removed is approximately 80,000 cubic yards.

Soil above cleanup levels on UPRR's property would be capped with a combination of asphalt, concrete, and/or geotextile barrier/minimum of 6 inches of crushed rock. UPRR's property would be regraded as necessary. Institutional controls to ensure periodic monitoring and maintenance of the cap and access restrictions would be required as will future periodic reviews conducted by Ecology to confirm the protectiveness of the remedy.

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Acronyms and Abbreviations

ARAR	applicable or relevant and appropriate requirement
ARC	Aluminum Recycling Corporation
bgs	below ground surface
CAP	Cleanup Action Plan
COC	contaminants of concern
CUL	cleanup level
Ecology	Washington State Department of Ecology
EGC	exposed geomembrane cover
FML	flexible membrane layer
FS	Feasibility Study
HDPE	high-density polyethylene
IWC	Imperial West Chemical
Kemira	Kemira Water Solutions
MTCA	Model Toxics Control Act
PDI	Pre-design Investigation
Pentzer	Pentzer Venture Holdings, II, Inc.
RAO	remedial action objective
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RI	Remedial Investigation
SEPA	State Environmental Policy Act
SRCAA	Spokane Regional Clean Air Agency
TSCA	Toxic Substances Control Act
UPRR	Union Pacific Railroad Company
WAC	Washington Administrative Code
WSDOT	Washington State Department of Transportation

1.0 BACKGROUND AND SUMMARY OF REMEDIAL INVESTIGATION

The Aluminum Recycling Trentwood Site (Site) is located in Spokane County, Washington in the Spokane Valley, within the incorporated limits of the City of Spokane Valley (Figure 1). The physical address of the Site is 2317 North Sullivan Road, Veradale, Washington. The Site is identified by the Washington State Department of Ecology (Ecology) as Facility Site ID 628 and Cleanup Site ID 1081. The Site consists of properties (or portions thereof) owned by Union Pacific Railroad Company (UPRR), the Washington State Department of Transportation (WSDOT), and Pentzer Venture Holdings, II, Inc. (Pentzer) as presented in Figure 2. All three properties are zoned industrial. The Site is approximately 9 acres, approximately 4 acres of which are covered by a stockpile of mixed aluminum process materials referred to as dross.

Results from applicable studies and reports are summarized to provide background information pertinent to the CAP. These studies and reports include:

- RI/FS Work Plan for the Aluminum Recycling Trentwood Site, Pastor, Behling & Wheeler LLC, 2010.
- Final Remedial Investigation/Feasibility Study, Pastor, Behling & Wheeler LLC, 2012.
- Union Pacific Railroad Co. Completion Report Dross Removal Project – WSDOT Property Union Pacific Railroad, Aluminum Recycling Trentwood Site. Golder Associates Inc. 2021a (WSDOT Removal Completion Report).
- Union Pacific Railroad Co. Completion Report Pre-Design Investigation Union Pacific Railroad, Aluminum Recycling Trentwood Site. Golder Associates Inc. 2021b. (PDI Completion Report).

Starting in 1979, UPRR's predecessor company leased its property to Aluminum Recycling Corporation (ARC) to recycle aluminum cans and aluminum dross into secondary aluminum which it then sold. Aluminum dross is a by-product of the aluminum smelting process. Aluminum dross was stockpiled on the property by ARC. ARC ceased operations in 1984 and is insolvent. Imperial West Chemical (IWC) subsequently operated on the property until 1995. IWC used aluminum dross to make aluminum sulfate and contributed dross to the stockpile. The current lessee, Kemira Water Solutions (Kemira), produces industrial water treatment chemicals and does not stockpile or process aluminum dross.

The stockpile varies in depth from 5 to 30 feet. The total volume of the stockpile is approximately 57,000 cubic yards and extends to the adjacent property owned by Pentzer (Figure 2). A silt fence and "ecology blocks" have been installed around the stockpile as an interim measure to control surface water runoff from the stockpile. The Spokane River is approximately 450 feet west of the Site.

UPRR conducted a Remedial Investigation/Feasibility Study (RI/FS) at the Site pursuant to a 2010 Agreed Order with Ecology under the Washington State Model Toxics Control Act (MTCA) Cleanup Regulation Chapter 173-340 Washington Administrative Code (WAC). The RI/FS report dated September 6, 2012 (2012 RI/FS) (PBW 2012) summarized the following:

- Site history;
- Previous investigations;
- RI fieldwork conducted in 2010;
- Risks associated with soil, groundwater, and ecological receptors;

- Remedial action objectives;
- A conceptual site model;
- Proposed cleanup levels (CULs);
- An evaluation of cleanup alternatives; and,
- A preferred alternative recommended for the cleanup action.

The 2012 RI/FS identified the extent of contaminant impacts in the dross stockpile and dross-containing soil on the three affected properties. During 2020 independent interim actions, some of the impacted surface soil on the WSDOT and Pentzer properties adjacent to the dross stockpile were removed and placed on the dross stockpile. The 2020 Pre-design Investigation (PDI) further delineated the extent of the impacts on the WSDOT and Pentzer properties. Through the processes of stormwater runoff and wind erosion of both dross material currently stockpiled on Site and likely historical dross placed on Site including dross place on the east side of the Kemira facility came to be deposited on the WSDOT and Pentzer properties and migrated into the soil column over the years since the site became active. In addition to the approximate 57,000 cubic yards of dross in the stockpile there is an estimated additional 23,000 cubic yards of dross and soil containing dross with concentrations that exceed Site-specific CULs on the Pentzer and WSDOT properties. The primary contaminants of concern (COCs) associated with aluminum dross in soil at the Site are metals such as aluminum, arsenic, barium, copper (primary COCs), and to lesser extent chromium (III) and mercury.

The 2012 RI/FS further determined that groundwater, which is approximately 50 to 60 feet below ground surface (bgs), and surface water and sediments in the nearby Spokane River, were not impacted by COCs. The 2012 RI/FS also determined that the dross material is not a dangerous waste under Washington State's Dangerous Waste Regulations Chapter 173-303 WAC (Ecology 2020) and was confirmed for this FS (Revised). As described in the 2012 RI/FS, the potentially complete exposure pathways associated with impacted soil at the Site are:

Human Health

- Dermal contact with stockpile material (current Site workers, trespassers, and construction workers)
- Dermal contact with surface water runoff from the stockpile (current Site workers, trespassers, construction workers, and adjacent off-property users)

Ecological

- Direct contact with stockpile material and surface water runoff from the stockpile material (flora and fauna)
- Ingestion of stockpile material and surface water runoff (small mammals and birds)
- Ingestion of plants or fauna that have been impacted by the above two pathways (predatory small mammals and birds)

UPRR's cooperation with Ecology and participation in a Site cleanup action will ensure that the potentially complete exposure pathways outlined above are addressed to protect human health and the environment. The Site cleanup action will also ensure the protection of surface water and sediments of the nearby Spokane River a vital resource for the local communities.

Based on reducing risks from the above pathways, soil CULs for unrestricted land use are proposed to address the COCs in the dross stockpile and dross impacted soil at the Site. The proposed CULs are based on MTCA Method A or B for unrestricted land use criteria and are presented on Table 1. The UPRR property will continue to be used for industrial purposes and, therefore, it may not necessary to achieve CULs based on unrestricted use for this portion of the Site. Remediation levels for soil may be applied to portions of the Site (UPRR property) where CULs for unrestricted use are not achieved. MTCA (Chapter 173-340-200 WAC) defines remediation levels as "…a concentration…of a hazardous substance in soil, water, air, or sediment above which a particular cleanup action component will be required as part of a cleanup action at a site" (Ecology 2007). If soil CULs are not achieved on portions of the UPRR property, soil remediation levels will be applicable. Soil exceeding remediation levels will be removed from the UPRR property. Proposed soil remediation levels are presented on Table 2. The proposed soil remediation levels are based on MTCA Method C CULs for industrial properties, as appropriate. Ecology will select the final Site soil CULs and remediation levels in the Final Cleanup Action Plan (CAP).

Institutional controls and an "ecological cap" will be installed over areas where COC concentrations are below remediation levels but not in compliance with Site soil CULs. The "ecological cap" (*e.g.,* asphalt pavement or fabric liner and 6 inches of crushed rock) will be designed to protect human health and ecological receptors by preventing exposure by wildlife to soil exceeding cleanup levels on the property and erosion of such soil via wind or water off Union Pacific's property to adjacent properties.

The dross stockpile and areal extent of the dross-containing soil requiring remediation based on the exceedance of the proposed CULs are shown on Figure 3. Based on current and future industrial use of UPRR's property, use of remediation levels is appropriate. CULs for unrestricted land use will be applied to the adjacent WSDOT and Pentzer properties during implementation of the cleanup action. The application of CULs sitewide is a common element to all of the remedial alternatives described in Sections 4.3.1 through 4.3.4.

The standard point of compliance for soil CULs based on human health throughout the Site is from ground surface to 15 feet bgs in accordance with WAC 173-340-740(6)(d)[1].

A summary of RI dross and soil sampling results are summarized in Table 2 of the 2012 RI/FS and are provided in Appendix A this FS (Revised) with the RI sample location map (Figure 3).

In October 2019, UPRR submitted a work plan to Ecology for removal of aluminum dross material from the parcel owned by WSDOT and surface dross-containing soil from the Pentzer property. The work was conducted in March 2020 as an independent action. The area subject to the removal of dross material is shown on Figure 3 of the WSDOT Removal Completion Report. Confirmation samples were collected after the work was performed. WSDOT Removal Completion Report Figures 4 and 5 identify the confirmation sample locations. Figures 3, 4, and 5 are provided in Appendix B.

A PDI was performed as an independent action in 2020. A work plan (Golder 2020) was prepared and submitted to Ecology in August 2020 for the PDI. The PDI provided additional data to refine the lateral and vertical delineation of COCs that exceed CULs and supported re-examination of the remedial technologies and remedial alternatives in this FS (Revised). PDI sample locations and the analytical results are presented in the PDI Completion Report. PDI Completion Report Figure 5 identifies the PDI sample locations and is provided in

[1] For sites with institutional controls (i.e., Union Pacific property) to prevent excavation of deeper soil, a conditional point of compliance may be set at the biologically active soil zone. This zone is assumed to extend to 6 feet bgs.

Appendix C. The analytical results for soil samples collected in association with the independent actions are summarized in Table 3 of this FS (Revised).

This FS (Revised) re-visits the remediation technologies presented in the 2012 RI/FS (i.e., capping, excavation and off-site disposal at an authorized commercial landfill, and reuse of the material in industrial process or recycling). In addition, this FS (Revised) includes evaluation of the updated information on the feasibility of the alternatives and selects a revised preferred cleanup action alternative.

2.0 FEASIBILITY STUDY (REVISED)

Subsequent to the completion of the 2012 RI/FS report (PBW 2012), a pilot transport study and trial burn of dross material at a cement kiln were conducted. The information produced by these activities, in addition to information from the 2020 independent action and PDI, required a reassessment of the cleanup actions evaluated in the 2012 RI/FS, including their estimated costs and implementability. This revised FS is a summary of the reassessment of cleanup alternatives.

2.1 Definition of the Remedial Action Objective

The remedial action objective (RAO) for the Site is based on the need to address the aluminum dross stockpile material (stockpile material), which is a solid waste and contains hazardous substances identified in the 2012 RI/FS. The specific RAO for the Site is to:

- Eliminate the potential for ingestion or direct contact of stockpile material, or soil mixed with stockpile material, or stormwater runoff from the stockpile, by human and ecological receptors.

2.2 Applicable, Relevant, and Appropriate Requirements (ARARs) Analysis

MTCA requires that all cleanup actions considered at the Site comply with applicable state and federal laws as required in WAC 173-340-360(2). State and federal laws are defined as “legally applicable requirements” and “applicable or relevant and appropriate requirements” (ARARs).

The potential ARARs for the cleanup are described in the following sections.

2.2.1 Chemical-Specific ARARs

Chemical-specific ARARs refer to the values established to ensure protection of human health and the environment and generally indicate the amount or concentration of a compound that may remain at the Site in a particular media. The chemical-specific ARARs considered for the Site are screening levels established for soil (groundwater is not applicable to this Site) in accordance with MTCA Chapters 173-340-720, -740, -745, and -747 WAC. Final CULs will be selected by Ecology in the final CAP.

2.2.2 Action-Specific ARARs

Action-specific ARARs refer to restrictions placed on activities or technologies used in conjunction with hazardous materials. Action-specific ARARs may include regulations that establish the design, construction, and operating characteristics of remedial technologies, remedial actions, and remediation equipment. Potential action-specific ARARs were considered based on the remedial alternatives selected and the preferred remedial alternatives in Section 1.8. Action-specific ARARs considered for the remedial actions include the requirements of the Washington Solid Waste Handling Standards (MTCA Chapter 173-350 WAC) and the requirements of the Spokane Regional Clean Air Agency (SRCAA) in compliance with the Washington Clean Air Act. Potential

remedial actions may require permitting for grading from the City of Spokane Valley. Other action-specific ARARs include compliance with the State Environmental Policy Act (SEPA) and may include permitting requirements of the Spokane Regional Health District if the material is left in place and capped.

2.2.3 Location-Specific ARARs

ARARs related to land use or geographic concerns are considered location-specific ARARs. These restrictions may be relevant due to the presence of wildlife habitat, flood plains, water bodies or similar geographical or physical characteristics. Location-specific ARARs considered for cleanup actions at the Site include the requirements for ecological assessment in accordance with MTCA 173-340-7490 through -7494 WAC and for land use in accordance with Chapter 173-340-740 WAC.

2.2.4 Other Considerations

Cleanup actions conducted at the Site will be performed in accordance with all applicable federal, state, and local requirements, including requirements to obtain necessary permits, except as provided in Revised Code of Washington (RCW) Section 70.105D.090. The federal, state, local, and permit requirements that may be applicable to this Site are those included in the ARARs listed above. Under RCW Section 70.105D.090, remedial actions conducted under a Consent Decree, Order, or Agreed Order are exempt from the procedural requirements of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 RCW, as well as the procedural requirements of any laws requiring or authorizing local government permits or approvals for the remedial action. However, the remedial actions will comply with the substantive provisions of Chapters 70.94, 70.95, 70.105, 77.55, 90.48, and 90.58 RCW, and the substantive provisions of any laws requiring or authorizing local government permits or approvals. During the cleanup actions, UPRR and/or its contractors in consultation with Ecology will continue to evaluate the need for additional permits or approvals. Ecology will be the lead agency for addressing the aforementioned provisions, including any SEPA-specific requirements.

Following identification of the preferred remedial alternative, additional ARARs may be identified as part of the regulatory and public review process.

2.3 Definition of Cleanup Action Areas

Per the RAO developed for the Site, the cleanup action areas consist of the stockpile and the areas where stockpile material has come to be located at concentrations exceeding CULs for unrestricted land use. These areas are shown on Figure 3**.**

3.0 IDENTIFICATION AND INITIAL SCREENING OF REMEDIAL TECHNOLOGIES

WAC 173-340-350(8)(b) affords the person conducting the FS the opportunity to screen alternatives or components from detailed evaluation. This section identifies and screens preliminary technologies or components that may be included as part of the remediation alternatives for the Site. The following remedial technologies were considered for achieving the RAO for the Site.

- No action;
- Institutional Controls (includes monitoring);
- Containment (Capping);
- Removal (Excavation of dross stockpile and dross contaminated soil),

- Disposal (Off-site at an authorized commercial landfill or On-site at limited use landfill); and
- Recycling or re-use of the dross stockpile material.

3.1 Summary of Remedial Technologies

Each of the preliminary technologies identified above are generally part of a broader category of remedial technologies. The remedial technologies are summarized in the following sections more narrowly with respect to the Site cleanup action.

3.1.1 No Action

No action as a remedial technology involves no further actions at the Site (i.e., no implementation of a remedial technology, monitoring, or maintenance).

3.1.2 Institutional Controls (includes monitoring)

Institutional controls are legal and physical restrictions placed on a site to prevent exposure to COCs. Risk is mitigated by institutional controls to the extent that they prevent exposure to affected media including areas where elevated concentrations are present. However, institutional controls alone do not prevent off-site transport of constituents. Institutional controls include any maintenance required for ongoing effectiveness. Institutional controls often take the form of site access restrictions or land use restrictions. Institutional controls are retained for further consideration.

3.1.3 Containment (Capping)

Containment would consist of excavation of dross-containing soil with COC concentrations above CULs, relocating the dross-containing soil to the main stockpile, and the covering of the resulting stockpile at its current location with a physical barrier (i.e., a cap). The cap could consist of an exposed geomembrane cover (EGC), a multimedia cap (a combination of a liner, sand, clay, and vegetative cover), or other type of cap (concrete, asphalt, or crushed rock). Capping is a proven, effective technology for providing reliable long-term containment and preventing or minimizing off-site migration of constituents. Capping minimizes risk by preventing direct contact from humans and wildlife with hazardous substances in affected soil and prevents off-site migration of COCs in surface water or airborne dust. Containment is retained for further consideration.

There are various types of caps (Section 4.1.1) and selection of a specific type of cap is an integral part of the development of a remedial alternative.

3.1.4 Removal

Removal for this remedial action entails excavation of the stockpile material and dross-containing soil with COC concentrations above CULs or remediation levels, as appropriate. Excavation for media affected by COCs prior to ex-situ treatment or disposal (on-site or off-site) can be complete (i.e., removal of all portions of soil or dross with constituents above CULs or remediation levels), but removal by itself is not a complete remedial action and must be combined with subsequent treatment and/or disposal of the removed media. Commercial or municipal landfills could be used for disposal of waste or affected soil excavated from the removal areas. The appropriate landfill depends on the nature of the material for disposal and available methods of transport. This technology considers transport by truck and/or rail.

Municipal landfills are allowed to accept waste that is not classified as hazardous under federal Resource Conservation and Recovery Act (RCRA) regulations or as dangerous under Washington State regulations. The

cost of off-site disposal could potentially be decreased if this technology were combined with sorting of large cobbles and boulders encountered during excavation. Removal is retained for further consideration.

3.1.5 Disposal

Disposal is a general remedial technology for final disposition of excavated stockpile material or dross-containing soil with COC concentrations above CULs or remediation levels, or waste generated by treatment processes. Landfill disposal relocates COCs from one place to another for long-term containment; it does not use treatment to destroy or detoxify COCs. However, if needed, treatment can be used prior to disposal. The options for disposal following excavation are an on-site constructed landfill and an off-site landfill (including any treatment under land disposal regulations).

Off-Site Disposal - Commercial or municipal landfills can be used for disposal of waste or affected soil excavated from the remediated areas. The appropriate landfill depends on the nature of the material for disposal and viable methods of transportation. Municipal landfills are allowed to accept waste that is not classified as hazardous under federal (RCRA) regulations or as dangerous under Washington State regulations.

Removal and disposal of stockpile material and soil containing stockpile material in a permitted off-site disposal facility would meet the RAO. Off-site disposal is retained for further consideration.

On-Site Disposal - On-site disposal requires excavation and consolidation of stockpile material and dross-containing soil with COC concentrations above CULs or remediation levels, as appropriate and an area large enough to contain the contaminated soil, containment (i.e., liner), and cap (e.g., the UPRR property north of the rail line). In-place containment would provide protection against direct contact or migration of COCs. Long-term monitoring would also be required.

3.1.6 Recycling or Re-Use of the Stockpile Material

Reuse and/or recycling of impacted soil or materials is considered a potential remedial technology. For instance, the dross stockpile material could be used as an alternative raw material in the production of cement. This technology considers the potential use of the stockpiled dross and dross-containing soil above CULs in industrial processes or recycling. Recycling or re-use of stockpile material is retained for further consideration.

3.2 Site-Specific Remedial Technologies Assessment

The following sections identify the remedial technologies that were rejected or retained for further evaluation and consideration for inclusion in the assembly of the remedial alternatives.

3.2.1 Rejected Technologies

The following technologies were rejected and will not be further evaluated or considered in the assembly of remedial alternatives in this FS (Revised).

- The no action as a remedial technology was eliminated from further evaluation since it would not satisfy the RAO. The stockpile material is a solid waste that contains hazardous substances and must be addressed through a remedial action.
- The on-site disposal technology would require relocation and capping of the stockpile material and dross-containing soil with COC concentrations above CULs or remediation levels, as appropriate, on the adjacent UPRR property in a limited purpose landfill. This technology was eliminated from further consideration because the property considered for construction of the landfill is not available.

3.2.2 Retained Technologies

The following technologies were retained for subsequent consideration in the assembly and evaluation of remedial alternatives:

- Institutional Controls (includes monitoring);
- Containment (Capping);
- Removal (Excavation of dross stockpile and dross-containing soil COC concentrations above CULs or remediation levels, as appropriate);
- Disposal (Off-site at an authorized commercial landfill); and
- Recycling or re-use of the dross stockpile material.

4.0 DEVELOPMENT OF PRELIMINARY REMEDIAL ALTERNATIVES

In this section, remediation alternatives are developed from the remediation technologies retained after screening. The technologies are combined to create a number of focused alternatives that represent various approaches to achieving the remedial action objective. The alternatives are then evaluated in Section 5.

Considering MTCA regulations, other ARARs, remedial action objectives, and the technology screening, the following alternatives have been assembled:

- Alternative 1: Institutional Controls and Monitoring
- Alternative 2: Capping (Dross Stockpile) and Off-Site Landfill
- Alternative 3: Removal and Off-Site Landfill with Ecological Cap
- Alternative 4: Removal, Off-Site Recycling, and Off-Site Landfill

4.1 Common Elements

The remedial alternatives developed include retained technologies and also consider other factors related to each technology (i.e., the various types of cap and off-site disposal location for dross and impacted soil. Several alternatives share common elements in their formulation. To avoid repetition, this section presents the descriptions of elements common to two or more alternatives. These common elements are then referenced in the descriptions of the alternatives.

4.1.1 Cleanup Criteria

CULs for unrestricted land use will be used for the entire Site. However, the UPRR property is currently zoned, used, and will continue to be used as an industrial property. Therefore, remediation levels will be used if soils exceed Site CULs (Alternative 2 and 3). Soils on the WSDOT and Pentzer properties will be removed to meet CULs for Alternatives 2, 3, and 4.

4.1.2 Institutional Controls

Institutional controls are a key component to maintain long-term effectiveness for alternatives where COCs remain above CULs on-site following completion of a remedial action. Deed restrictions would be instituted for Alternatives 1, 2, and 3 to ensure that site use restrictions on the UPRR property remain and to notify any prospective purchasers of that property of the presence of subsurface hazardous substances. For capping

alternatives, restrictions would prohibit penetrating the cap and any site use that could damage the cap or significantly reduce its effectiveness. Warning signs would be used to provide notice of the presence of a contaminated site. Site use restrictions would remain indefinitely unless CULs are attained.

Permanent fencing may be required if remediation levels are used for industrial properties. Permanent fencing would provide adequate protection against direct contact for passersby until a cap could be installed or the COCs above MTCA cleanup criteria are removed. Signage would be placed to notify Site workers of hazards and restrictions. Periodic site inspections and maintenance of a cap, fencing, signs, and potentially other physical components of the institutional controls would be included in the capping alternatives.

4.1.3 Monitoring

Monitoring is included as a component of all alternatives. Separate monitoring programs will be used for the compliance/short term (during remedial action and verification period) and the long term (following completion of remediation). Compliance/short-term monitoring is viewed as being conducted for a period of up to five years; long-term monitoring is viewed as a period of 20 to 30 years. The monitoring requirements will be evaluated if required as part of the CAP. In particular, monitoring frequency and number of years over which monitoring will be required will be defined in the CAP. Detailed monitoring plans will be developed for the selected remedy during final design.

4.1.3.1 Short-Term Monitoring

Short-term monitoring is required during remediation to ensure that there are no adverse effects from remediation activities, to provide quality control, and to confirm the attainment of CULs and/or relevant performance criteria. Health and safety monitoring is also performed to ensure that site workers are not exposed to undue or unexpected risks.

Short-term monitoring to demonstrate attainment of CULs is applicable for Alternatives 2, 3, and 4 because affected soil will be removed and either capped on-site or disposed of off-site. This monitoring would include confirmatory soil sampling and analysis to verify the attainment of CULs in the removal areas. No short-term monitoring would be required for Alternative 1.

4.1.3.2 Long-Term Monitoring

Long-term monitoring is conducted to 1) verify that the remedy performs as expected over time, and 2) allow timely maintenance of a cap (Alternative 3) and other physical components of an alternative. Periodic site inspections and surveys would be sufficient for determining maintenance needs and monitoring cap performance. Long-term cap monitoring would continue during the post-closure period, assumed for the purposes of this FS (Revised) to last 20 years per WAC 173-340-350, and then cease for cost estimating purposes. However, long-term monitoring would be required for as long as Site COCs remain in soil above CULs. It is not expected that long-term monitoring would be required for Alternative 4.

Cap monitoring would consist primarily of visual inspections for damage and subsidence. The cap would be periodically examined for the presence of offsets, scarps, low-points, ponded water, odd changes in grade, and excessive erosion. For the first year, such inspections may be performed quarterly and may then be reduced to once per year. Cap monitoring would be required for Alternatives 2 and 3. No alternatives will require groundwater monitoring during or after completion of the remedial action.

4.1.4 Excavation

Excavation is included in Alternatives 2, 3, and 4. Excavation of the dross stockpile or dross-containing soil with concentrations above CULs would protect human health and the environment by locating and removing affected soil from the Site for capping or offsite disposal.

The cleanup criteria considered in the removal alternatives involve removal to meet MTCA CULs or remediation levels protective of human health and the environment. Removal of COCs to detection limits was not considered due to the practical benefit compared to costs.

Prior to initiation of construction activities, some of the existing Site fence may be removed to facilitate remediation activities. Temporary fencing will be placed around the perimeter of the excavation and loading area.

Conventional construction equipment such as backhoes and scrapers would be used for soil excavation. Excavation equipment would not require decontamination until completion of the project. Equipment will be decontaminated prior to removal from the project area.

Excavation will be performed according to standard industry practices. Water spray would be used if necessary, for dust suppression during excavation and loading activities. Low volume water sprays will be applied to material surfaces using equipment appropriate for the task. Water trucks will be used for suppression of roadway dust if necessary.

The average depth of the excavation is anticipated to be 4 to 5 feet bgs and occasionally extend up to 15 feet bgs, based on existing COC concentration data from soil samples. Means of egress for both personnel and equipment would be provided in accordance with Washington State Labor and Industry requirements (WAC 296-155). If the excavation depth exceeds 4 feet, the excavation side slopes will be 1.5 feet horizontal to 1 foot vertical (WAC 296-155-657) or properly shored for stability.

Excavated soils may be placed directly into the transport vehicles, or loading may occur from temporary stockpiles adjacent to the excavation.

All excess water (if present) would be drained from soil in trucks prior to transporting soil from the excavation area. Impacted drainage from the trucks will be captured and treated on-site then discharged or taken off-site for treatment and disposal. On-site stockpiles would be placed on sheeting and surrounded by berms constructed of soil, hay bales, or other suitable materials sufficient to prevent off-site migration of the stockpiled soils. Stockpiles would be covered overnight to minimize wind-blown dust or exposure to precipitation.

Transport vehicles and transportation will be provided by the selected construction contractor. Conventional highway-approved equipment would be used, and could include standard dump trucks, pony trailers, and roll-off containers. All excavated soil loads would be covered during transport to the disposal facility.

The excavation would remain open and secured with fencing as appropriate until confirmation sampling results have been received and evaluated. The excavated area would then be backfilled with clean fill and the area will be returned to its original grade on WSDOT and Pentzer properties. Restoration will also occur on the UPRR property to the extent necessary to bring the final surface up to elevations comparable to the adjacent properties (after they are backfilled) and provide UPRR with a flat surface. Backfill would be placed in lifts and compacted to a stated compaction level within a defined moisture content range that will be specified in the design report.

4.2 Remedial Alternatives

Considering the range of remedial alternatives outlined above, the following alternatives were developed to meet the applicable solid waste and MTCA requirements and RAOs. These alternatives were developed to be protective of human health and the environment, comply with waste regulations, and comply with state and federal laws.

4.2.1 Remedial Alternative 1 – Institutional Controls and Monitoring

This alternative involves no active measures towards Site cleanup. Actions would be limited to the addition of fencing and posting signage to restrict access and institutional controls including deed restrictions. Access controls would need to be continuously maintained.

4.2.2 Remedial Alternative 2 – In-situ Capping of Stockpile

Dross and dross-containing soil exceeding CULs on Pentzer and WSDOT properties (estimated 23,000 cubic yards) would be excavated and consolidated with the dross stockpile on the Union Pacific property. Those soils exceeding CULs that would not be able to be placed on UPRR property due to volume restrictions would have to be disposed of offsite at a permitted landfill consistent with alternative 3. Following consolidation of stockpile material and dross-containing soil with concentrations above CULs into the main stockpile (Figure 5), the stockpile at its current location would be graded, shaped, and compacted to accommodate a cap. The resulting stockpile would be covered with a traditional engineered multimedia cap consisting of a High-Density Polyethylene (HDPE) liner and low-permeability soil. Capping the stockpile with a synthetic membrane will prevent infiltration of precipitation through the material, prevent transport of the material via surface water runoff and wind to adjacent areas, and prevent direct contact with the material.

Institutional controls would be implemented in conjunction with the cap, including access controls and signage indicating the presence of the cap and prohibiting subsurface disturbance.

Final design of the capped stockpile is dependent on the area available for construction. Limiting the extent of the cap to the UPRR property is not feasible due to steep slopes that would be required to build the cap in the small area. Therefore, Alternative 2 requires the use of a portion of the Pentzer property for the cap and the cooperation of Pentzer. If Pentzer rejects use of their property for use as part of the stockpile and capping, excess soil removed from the WSDOT or Pentzer properties exceeding the capacity of the viable capping area would require disposal off-site in a manner consistent with Alternative 3.

Capping the stockpile in its current configuration on UPRR property would result in a capped stockpile approximately 32 feet high with side slopes of 33% (3:1) or less. The cap proposed for this alternative consists of a flexible membrane layer (FML) covered by a soil layer for protection and drainage. A preliminary design for this alternative is presented on Figure 5. The extent of the cap for this option would not be within 100 feet of adjacent properties owned by parties other than UPRR, the required setback distance for landfills in industrial settings.

4.2.3 Remedial Alternative 3 – Removal of Stockpile and Impacted Soil to Off-Site Authorized Commercial Landfill

All stockpile material (estimated 57,000 cubic yards) and dross-containing soil with concentrations above CULs on the Pentzer and WSDOT properties (estimated 23,000 cubic yards) as shown on Figure 3 would be excavated and removed from those properties and transported to an off-site permitted landfill. Areas subject to excavation will be backfilled and generally restored to grade. If COC concentrations are below remediation level, a portion of these soils may be used as fill to dress the slope on the south side of the UPRR property or lessen the degree of

slope. All stockpile material and dross-containing soil with concentrations above remediation levels on the UPRR property would also be removed as shown on Figure 4 and transported to an off-site permitted landfill. Following removal of the dross stockpile areas excavated to below grade will be backfilled to the extent necessary to bring the final surface up to elevations comparable to the adjacent properties (after they are backfilled) and provide the UPRR property with a flat surface. An ecological cap will be required to cover the areas with soil COC concentrations exceeding CULs and less than remediation levels on the UPRR property in addition to requirements for institutional controls.

A typical ecological cap consists of asphalt or concrete pavement or fabric liner and 6 inches of crushed rock. This option would eliminate the potential for wildlife exposure on the UPRR property and prevent transport of soil exceeding CULs to adjacent properties via surface water runoff and wind. Institutional controls are required if remediation levels are used.

However, if removal of stockpile material or dross-containing soil achieves CULs on the UPRR property, an ecological cap and institutional controls will not be required.

Numerous landfills considered for this alternative are served by rail and therefore represent some cost savings in direct transportation costs. However, due to the configuration of rail at the Site, rail cars would have to be loaded from the “wye track” area north of the Site where a “staging pad” was previously constructed. This alternative could require construction of a temporary rail crossing if the stockpile material were moved across the tracks to the staging pad/loading area.

Furthermore, due to space constraints and lack of rail car storage in the area, if rail cars are available, only an estimated 10 to 20 rail cars (approximately 100 cubic yards each) could be staged/loaded weekly, requiring one to two years to remove the entire stockpile. Loading rail cars would have to be coordinated with UPRR mainline rail traffic and switching would be coordinated with the adjacent Kemira facility. Dust management may be required for this transportation option.

A practicable alternative is to move the material via truck using Sullivan Road. The following landfills were used to develop the range of cost estimates for this alternative.

Waste Management Graham Road Landfill – The Graham Road Landfill is located 5 miles east of Spokane and represents the closest option for landfill disposal. Disposal at this location would require transport by a traditional semi-tractor trailer. Landfill personnel indicates that this material would be useful to them as daily cover at the landfill.

Waste Management Columbia Road Landfill – The Columbia Ridge Landfill is located in Arlington, Oregon and is served by rail. Offloading of rail cars is performed by elevated backhoes, requiring that the rail cars have no internal bracing.

ECDC Environmental Inc. – The ECDC Landfill is located in East Carbon, Utah, is permitted to accept waste from aluminum production operations, and is well integrated into the national railroad system. The ECDC facility provides rail cars for waste transport and provides dispatching and logistical support for transportation.

RCRA and Toxic Substances Control Act (TSCA) US Ecology Landfill – The US Ecology Landfill is located in Grand View, Idaho and is served by rail. The US Ecology facility provides rail cars for waste transport.

The Graham Road Landfill proved to be the best option based on cost and implementability.

4.2.4 Remedial Alternative 4 – Re-use of the Material in Recycling or Industrial Processes

The dross stockpile and dross-containing soil with concentrations above CULs would be removed from the Site and re-used in an industrial process, such as an alternative raw material in cement production. Material testing was performed that showed the waste material was appropriate for use as an alternative raw material in cement production.

Under this alternative, the material would be loaded to rail cars and shipped to the selected facility. As with the landfill disposal alternative, loading the material to rail cars would need to be performed from the "wye track" area north of the Site, could require construction of a temporary rail crossing, and would be subject to the limitations on the availability of rail cars and on rail car movement and storage described for the previous alternative. The staging pad noted above would be used for staging the stockpile material prior to loading. Dust management may need to be implemented during this portion of the work. Disposal fees would not be assessed for this alternative.

4.3 Evaluation of Alternatives

The alternatives for addressing the stockpile and dross-containing soil with concentrations above CULs have been evaluated within the framework of the MTCA requirements, as described below.

The remedial alternative selected for the Site must meet the threshold requirements provided in WAC 173-340-360(2)(a) as follows:

- Protect human health and the environment;
- Comply with cleanup standards (and waste regulations, as applicable);
- Comply with applicable state and federal laws; and
- Provide for compliance monitoring (as applicable).

The selected remedial alternative must also meet other requirements as provided in WAC 173-340-360(2)(b):

- Use permanent solutions to the maximum extent practicable;
- Provide for a reasonable restoration time frame; and
- Consider public concerns.

The following evaluation criteria are provided by MTCA for comparison of remedial alternatives:

- Protectiveness;
- Permanence;
- Cost;
- Long-term effectiveness;
- Management of short-term risk;
- Technical and administrative implementability; and
- Consideration of public concerns.

Evaluation of the alternatives has been summarized on Table 4 and includes a quantitative and qualitative assessment. The evaluation compares each of the potential remedial alternatives to the MTCA threshold requirements and evaluation criteria.

The criteria described above are used to determine whether the costs for each cleanup alternative are disproportionate relative to the benefit of the alternative (disproportionate cost analysis). Costs are considered disproportionate if the incremental degree of benefit provided by the more costly alternative is less than the degree of benefit provided by other low-cost alternatives. In accordance with WAC 173-340-360(3)(e)(ii)(c), when the degree of benefit between alternatives is equal, Ecology selects the alternative with the lowest cost.

The cost estimates shown on Table 4 for the implementation of each alternative have been developed and are based on capping or disposal of approximately 71,000 tons of stockpile material and over-excavated material from below the stockpile, and an additional 50,000 tons of soil from the surrounding areas. Detailed cost estimates for the alternatives are presented in Appendix D. The costs are based on the labor, material, and engineering requirements necessary to implement the alternatives. The cost estimates are budgetary estimates for the purpose of comparing the alternatives. Preliminary subcontractor cost estimates were provided by Pacific West LLC, Belfor, Lone Wolf Resources, Waste Management, and Cape.

The cost estimated for Alternative 2 (in-situ capping) is approximately $4,080,000. The cost for Alternative 3 (disposal at an authorized commercial landfill) is estimated to be approximately $8,082,000 if transported by truck to Waste Management's Graham Road Landfill. For Alternative 4 (re-use of the material in an industrial process or recycling), the cost is estimated to be approximately $6,737,000. The incremental benefit of the re-use option is not significantly greater than the benefit derived from the removal and off-site disposal option and, as noted above, uncertainly exists with regard to the implementability of this alternative.

The stockpile is currently stable and does not represent an immediate threat to human health or the environment as demonstrated by the results of the RI (i.e., no groundwater impacts, low potential for leaching). The remedy selection process considers the RAO, the nature of the material, the physical constraints of the Site, MTCA regulations, solid waste and dangerous waste criteria, and the costs of the potential remedy.

Removal of dross-containing soil with concentrations above CULs from all areas of the Site outside the main stockpile (i.e., the Pentzer property as indicated on Figure 2) is considered a component of any remedial alternative and is expected to be implemented regardless of the final disposition of the main stockpile. Removal of dross-containing soil with concentrations above CULs from the ground surface plus one additional foot of underlying material represents a permanent cleanup action that meets the RAO and threshold requirements for the environmental media outside of the main stockpile.

In-situ impermeable capping of the stockpile material is a viable option, notwithstanding the engineering issues related to the limited space available and the aesthetics. This option is cost-effective but the viability of this option will be dependent on the ability to use the current stockpile footprint for creation of the capped stockpile (i.e., the capped area would not be limited to the UPRR property). Implementation of this alternative allows for the exemptions provided under RCW Section 70.105D.090 (Section 4.2.4). Compliance with SEPA would still be required.

Disposal of the stockpile material at a landfill is the most aesthetically preferable alternative. This alternative provides more permanence and long-term effectiveness than the capping option. The increased cost to implement this alternative is higher but not disproportionate to the cost of the in-situ capping alternative because

permanently removing the dross material and dross-containing soil with concentrations above CULs and remediation levels from the Site is more permanent, long-term effective, technically implementable, and likely to be approved by the public than creating a large stockpile approximately 32 feet high spread out over the UPRR and Pentzer properties. The least costly and time-consuming landfill alternative is the disposal at Graham Road Landfill using trucks to transport the material. Disposal at Graham Road Landfill using trucks would also face fewer logistical issues than disposal at a landfill using rail cars.

Re-use or recycling of the stockpile material in an industrial process is also an aesthetically preferable alternative because it removes the material from the Site. However, there is a high degree of uncertainty with the logistics and scheduling of this alternative, including whether the material can be delivered to a facility on a regular schedule compatible with industrial and commercial requirements. Therefore, re-use of the stockpile material at an industrial facility is not a practicable remedial alternative and is not recommended to be the preferred alternative.

4.4 Recommended Alternative

Based on the evaluation of alternatives and disproportionate cost analysis summarized on Table 4, Alternative 3 is recommended as the preferred cleanup action for the Site. Alternative 3 includes the excavation of contaminated stockpile materials and soil containing Site COCs above CULs identified on Table 1, transport via truck to the Graham Road Landfill (a permitted disposal facility), and grading and revegetating the ground surface on the Pentzer and WSDOT properties. For the UPRR property, the same actions will be taken except that remediation levels will be used to determine which soils will be excavated/disposed and which soils will be capped. There is an estimated 57,000 cubic yards of dross stockpile material and an additional 23,000 cubic yards of soil containing concentrations of Site COCs that exceed the Site-specific CULs that will be removed and transported offsite for disposal at the Graham Road Landfill. For those soils exceeding cleanup levels but are below remediation levels, they will be capped with a combination of asphalt, concrete, and/or geotextile barrier/minimum of 6 inches of crushed rock.

Because contaminated material would remain on the UPRR property exceeding unrestricted cleanup levels, periodic monitoring and maintenance, institutional controls, and future periodic reviews will be required for soil and cap on that property.

During and after implementation of the cleanup, groundwater will not be further monitored for compliance with cleanup levels. Soil will be monitored for compliance with the cleanup levels for contaminants shown as “Primary COC” on Table 1.

Signature Page

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5.0 REFERENCES

Golder Associates Inc (Golder). 2020. Sampling and Analysis Plan, Pre-Design Investigation, Union Pacific Railroad, Aluminum Recycling Trentwood Site. August.

Golder. 2021a. Dross Removal Project - WSDOT Property Union Pacific Railroad, Aluminum Recycling Trentwood Site. February.

Golder. 2021b. Pre-Design Investigation, Union Pacific Railroad, Aluminum Recycling Trentwood Site. February.

Pastor, Behling & Wheeler, LLC (PBW). 2010. RI/FS Work Plan for the Aluminum Recycling Trentwood Site.

PBW. 2012. *Remedial Investigation/Feasibility Study Report.* Report Submitted to Washington State Department of Ecology. September 6.

Washington State Department of Ecology (Ecology). 2007. Model Toxics Cleanup Act Regulation Chapter 173-340 WAC.

Ecology. 2020. Dangerous Waste Regulations Chapter 173-303 WAC.

Tables

Table 1: Cleanup Levels - Unrestricted Land Use
Aluminum Recycling Trentwood - FS (Revised)
Union Pacific Rail Road

Constituent of Concern (COC)	Units	Maximum Value	Method A Unrestricted[(a)]	Method B Unrestricted Non-Cancer[(b)]	Method B Unrestricted Cancer[(c)]	Ecological Indicator Values[(d)]	Background[(e)] (Spokane Co.)	Unrestricted Land Use Cleanup Level (mg/kg)	Primary COC	Basis
Aluminum	mg/kg	121,000	-	80,000	-	50	21,400	21,400	yes	background
Arsenic	mg/kg	16	20	24	0.67	10	9	10	yes	ecological
Barium	mg/kg	381	-	16,000	-	102	-	102	yes	ecological
Chromium (III)	mg/kg	172	2000*	120,000	-	42	18	42	yes	ecological
Copper	mg/kg	1,460	-	3,200	-	50	22	50	yes	ecological
Lead	mg/kg	93.8	250*	1,050	-	50	15	50	no**	Cm<Cul
Mercury	mg/kg	5	2*	-	-	0.1	0.02	0.1	yes	ecological

Notes:

- Not Available

* - Method A number based on protection of groundwater and Site RI determined groundwater was not impacted.

(e) - Use of remediation levels requires institutional controls and construction of ecological cap in areas where COC concentrations exceed unrestricted CULs and are below remediation levels on industrial (Union Pacific) property. Use of Method C values is based on the cap eliminating the ecological exposure pathway and the UPRR property meeting the definition of an industrial property .

(b) - Method B unrestricted land use non-cancer values based on WAC 173-740 Equation 740-1.

(c) - Method B unrestricted land use cancer values based on WAC 173-740 Equation 740-2.

(d) - Ecological indicator values are based on WAC 173-900, Table 749-3 for protection of plants, soil biota and wildlife.

(e) - Natural Background Soil Metals Concentrations in Washington State (Ecology 1994).

Table 2: Remediation Levels
Aluminum Recycling Trentwood - FS (Revised)
Union Pacific Rail Road

Constituent of Concern (COC)	Units	Maximum Value	Method A Industrial[(a)]	Method C Industrial Non-Cancer[(b)]	Method C Industrial Cancer[(c)]	Ecological Indicator Values[(d)]	Remediation Levels[(e)]	Basis
Aluminum	mg/kg	121,000	-	3,500,000	-	50	3,500,000	Human Health
Arsenic	mg/kg	16	20	1,100	88	132	88	Human Health
Barium	mg/kg	381	-	700,000	-	102	700,000	Human Health
Chromium (III)	mg/kg	172	2000*	5,300,000	-	67[f]	5,300,000	Human Health
Copper	mg/kg	1,460	-	140,000	-	217	140,000	Human Health
Mercury	mg/kg	5	2*	1,050	-	5.5	1,050	Human Health

Notes:

- Not Available

* - Method A number based on protection of groundwater and Site RI determined groundwater was not impacted.

(a) - Method A Industrial values based on WAC 173-900, Table 745-1.

(b) - Method C industrial non-cancer values based on WAC 173-745 Equation 745-1.

(c) - Method C industrial cancer values based on WAC 173-745 Equation 745-2.

(d) - Ecological indicator values are based on WAC 173-900, Table 749-3 for protection of plants, soil biota and wildlife.

(e) - Use of remediation levels requires institutional controls and construction of ecological cap in areas where COC concentrations exceed unrestricted CULs and are below remediation levels on industrial (Union Pacific) property. Use of Method C values is based on the cap eliminating the ecological exposure pathway and the UPRR property meeting the definition of an industrial property .

(f) - Value based on total chromium, chromium III value not available.

Table 3: Summary of Independent Remedial Action Analytical Results
Aluminum Recycling Trentwood - FS (Revised)
Union Pacific Rail Road

Property	Sample ID	Abbrev. Sample ID	Location ID	Sample Date	Sample Depth (ft BGS)[1]	Aluminum (mg/kg)[2]	Q[3]	Arsenic (mg/kg)	Q	Barium (mg/kg)	Q	Chromium (mg/kg)	Q	Hexavalent Chromium (mg/kg)	Q	Copper (mg/kg)	Q	Lead (mg/kg)	Q	Silver (mg/kg)	Q	Mercury (mg/kg)	Q	Total Solids (%)
	Proposed Clean-Up Level[4]					21,400		10		102		42				50		50		2		0.1		
WSDOT /Pentzer Property Independent Removal Action Confirmation Sample Results																								
WSDOT	SO-2494-SO01-20200324	SO01	NA	3/24/2020	0-1	26,300		7.35		78.5		20.2				185		17.6		0.125	U	0.0744		95.7
	SO-2494-SO02-20200324	SO02	NA	3/24/2020	0-1	28,200		13.8		130		24.0				171		21.8		0.126	U	0.111		95.5
	SO-2494-SO03-20200324	SO03	NA	3/24/2020	0-1	15,000		12.3		142		50.2				608		35.5		0.127	U	0.120		94.6
	SO-2494-SO04-20200324	SO04	NA	3/24/2020	0-1	57,400		9.11	J	105		39.5				408		22.0		0.129	U	0.0873		92.9
	SO-2494-FD04-20200324	SO04 (Dup)	NA	3/24/2020	0-1	33,100		4.57	J	70.9		23.7				257		18.5		0.129	U	0.102		93.3
	SO-2494-SO05-20200324	SO05	NA	3/24/2020	0-1	11,900		6.76		51		10.6				46.9		11.3		0.124	U	0.0164		96.8
	SO-2494-SO06-20200324	SO06	NA	3/24/2020	0-1	66,900		6.83		121		50.2				599		27.7		0.128	U	0.189		93.4
	SO-2494-SO07-20200324	SO07	NA	3/24/2020	0-1	18,900		7.23		99.4		15.9				94.4		16.1		0.124	U	0.107		96.7
	SO-2494-SO08-20200324	SO08	NA	3/24/2020	0-1	9,060		2.86		41.2		7.36				100		9.14		0.127	U	0.144		94.8
	SO-2494-SO09-20200324	SO09	NA	3/24/2020	0-1	11,000		5.27		73.2		10.3				49.4		14.8		0.126	U	0.105		95.1
	SO-2494-SO10-20200324	SO10	NA	3/24/2020	0-1	23,500		2.62		109		17.3				154		19.1		0.125	U	0.331		95.8
Pentzer	SO-2494-SO11-20200323	SO11	NA	3/23/2020	0-1	22,800		6.32		92.1		18.3				125		8.28		0.224	J	0.00946	J	90.4
	SO-2494-SO12-20200323	SO12	NA	3/23/2020	0-1	26,900		5.35		118		19.4				112		10.4		0.275	J	0.0545		91.3
	SO-2494-SO13-20200323	SO13	NA	3/23/2020	0-1	33,400		5.39		226		17.0				368		14.0		0.372	J	0.0231	J	90.1
	SO-2494-SO14-20200323	SO14	NA	3/23/2020	0-1	18,200		3.02		134		9.89				26.4		7.07		0.206	J	0.106		90.9
	SO-2494-SO15-20200323	SO15	NA	3/23/2020	0-1	24,300		5.85		136		17.1				134		12.4		0.224	J	0.0628		89.2
	SO-2494-SO16-20200323	SO16	NA	3/23/2020	0-1	30,600		5.27		210		15.8				85.9		11.8		0.197	J	0.0188	J	88.5
	SO-2494-SO17-20200323	SO17	NA	3/23/2020	0-1	25,700		5.93		155		18.4				184		14.6		0.166	J	0.125		91.0
	SO-2494-FD17-20200323	SO17 (Dup)	NA	3/23/2020	0-1	26,400		6.19		157		14.7				26.5		12.1			U	0.0194		90.3
	SO-2494-SO18-20200323	SO18	NA	3/23/2020	0-1	23,000		6.92		136		13.3				82.9		9.58		0.284	J	0.0253	J	91.4
	SO-2494-SO19-20200323	SO19	NA	3/23/2020	0-1	26,600		5.40		167		19.8				34.3		10.8		0.270	J	0.00892	J	90.0
	SO-2494-SO20-20200323	SO20	NA	3/23/2020	0-1	26,400		6.19		157		14.7				26.5		12.1		0.318	J	0.0194	J	90.3

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Aluminum Recycling Trentwood - FS (Revised)
Union Pacific Rail Road

Property	Sample ID	Abbrev. Sample ID	Location ID	Sample Date	Sample Depth (ft BGS)[1]	Aluminum (mg/kg)[2]	Q[3]	Arsenic (mg/kg)	Q	Barium (mg/kg)	Q	Chromium (mg/kg)	Q	Hexavalent Chromium (mg/kg)	Q	Copper (mg/kg)	Q	Lead (mg/kg)	Q	Silver (mg/kg)	Q	Mercury (mg/kg)	Q	Total Solids (%)
	Proposed Clean-Up Level[4]					21,400		10		102		42				50		50		2		0.1		
Pre-Design Investigation Sample Results																								
WSDOT	SO-2494-SO21-20200808	SO21	Cell 19	8/8/2020	0-1	39,400		7.51		166		28.3				277		29.4		0.23	U	0.435		99.22
UPRR	SO-2494-SO22-20200808	SO22	Cell 13	8/8/2020	0-1	91,900		8.18		116		71.5				826		43.8		1.15	U	0.463		98.7
WSDOT	SO-2494-SO23-20200808	SO23	Cell 24	8/8/2020	0-1	121,000		8.74		381		95.4				1460		93.8		0.233	U	2.04		98
	SO-2494-SO24-20200808	SO24	Cell 30	8/8/2020	0-1	12,600		9.96		77.7		13				28		19.4		0.23	U	0.0368		99.3
	SO-2494-SO25-20200826	SO25	SB09	8/26/2020	0-1	49,000		8.10		135		40.5		0.771	J	422		45.7		0.237	U	1.01		96.3
	SO-2494-SO26-20200826	SO26	SB09	8/26/2020	2-3	28,500		1.56	J	217		18.6				132		11.2		0.229	U	0.157		99.4
	SO-2494-SO27-20200826	SO27	SB09	8/26/2020	4-5	16,700		5.47		81.9		16.8				77.1		10.9		0.235	U	0.0396	J	96.9
	SO-2494-SO28-20200826	SO28	SB09	8/26/2020	7-8	7,960		6.17		248						16.6								
	SO-2494-SO29-20200826	SO29	SB09	8/26/2020	9-10	8,360		3.34		37.1						8.69								
	SO-2494-SO32-20200826	SO32	SB10	8/26/2020	0-1	8,810		6.69		44.8		8.18				19.7		7.8		0.236	U	0.0186	U	96.7
	SO-2494-SO33-20200826	SO33	SB10	8/26/2020	2-3	14,500		9.10		83.2		14.4				30.7		13.2		0.233	U	0.0184	U	97.7
	SO-2494-SO34-20200826	SO34	SB10	8/26/2020	4-5	14,700		10.4		70.4		18.6				25.8		12.3		0.232	U	0.0183	U	98.2
WSDOT	SO-2494-SO39-20200826	SO39	SB11	8/26/2020	0-1	43,500		6.56		195		36.9				359		18.4		0.232	U	0.0449		98.2
	SO-2494-SO40-20200826	SO40	SB11	8/26/2020	2-3	37,500		7.64		116		73.2		0.310	J	227		13.4		0.233	U	0.0203	J	97.7
	SO-2494-SO41-20200826	SO41	SB11	8/26/2020	4-5	11,200		7.55		58.7		12.4				17.9		16.1		0.238	U	0.0188	U	95.8
	SO-2494-SO46-20200826	SO46	SB12	8/26/2020	0-1	13,700		2.28		48.1		11.7				63.6		5.97		0.244	U	0.0260	J	93.3
	SO-2494-SO47-20200826	SO47	SB12	8/26/2020	2-3	24,800		5.52		211		27.2				98.4		11.4		0.233	U	0.0476		98.0
	SO-2494-SO48-20200826	SO48	SB12	8/26/2020	4-5	22,500		7.31		74.9		20.7				124		11.9		0.240	U	0.0243	J	95.0
	SO-2494-SO49-20200827	SO49	SB12	8/26/2020	7-8	12,700		7.13		92						18								
	SO-2494-SO50-20200827	SO50	SB12	8/26/2020	9-10	8,580		6.64		53						2.09								
	SO-2494-SO53-20200826	SO53	SB13	8/26/2020	0-1	24,100		6.89		93.5		21.2				167		17.6		0.231	U	0.0653		98.9
	SO-2494-SO54-20200826	SO54	SB13	8/26/2020	2-3	10,200		10.2		61.4		10.1				22.4		13.1		0.238	U	0.0188	U	95.7
	SO-2494-SO55-20200826	SO55	SB13	8/26/2020	4-5	8,020		9.47		57.3		9.20				15.00		9.67		0.237	U	0.0187	U	96.2
UPRR	SO-2494-SO56-20200826	SO56	SB14	8/26/2020	0-1	14,400		9.44		63.8		11.1				89.4		14.0		0.237	U	0.0420		96.3
	SO-2494-SO57-20200826	SO57	SB14	8/26/2020	2-3	10,600		7.63		63.7		11.3				23.7		10.8		0.237	U	0.0187	U	96.1
	SO-2494-SO58-20200826	SO58	SB14	8/26/2020	4-5	9,700		7.74		66.0		11.6				17.5		12.4		0.235	U	0.0186	U	97.0
WSDOT	SO-2494-SO63-20200826	SO63	SB15	8/26/2020	0-1	13,400		8.31		101		16.2				40.4		12.7		0.231	U	0.0978		98.6
	SO-2494-SO64-20200826	SO64	SB15	8/26/2020	2-3	14,300		8.19		91.6		14.8				58.2		10.9		0.232	U	0.0183	U	98.5
	SO-2494-SO65-20200826	SO65	SB15	8/26/2020	4-5	13,300		14.8		69.5		13.5				32.5		10.5		0.231	U	0.0183	U	98.5
	SO-2494-SO69-20200827	SO69	SB16	8/27/2020	0-1	19,500		4.58		165		12.4				17.0		9.99		0.263	U	0.0207	U	86.7
	SO-2494-SO70-20200827	SO70	SB16	8/27/2020	2-3	12,900		10.1		86.3		12.9				20.1		14.2		0.241	U	0.0190	U	94.8
	SO-2494-SO71-20200827	SO71	SB16	8/27/2020	4-5	10,300		10.7		72.2		10.3				18.5		14.6		0.240	U	0.0190	U	94.9
	SO-2494-SO75-20200827	SO75	SB17	8/27/2020	0-1	9,040		14.0		52.7		10.5				14.7		8.88		0.246	U	0.0194	U	92.7
	SO-2494-SO76-20200827	SO76	SB17	8/27/2020	2-3	9,510		7.93		48.6		8.69				16.0		9.38		0.245	U	0.0193	U	93.0
	SO-2494-SO77-20200827	SO77	SB17	8/27/2020	4-5	12,300		7.49		61.5		9.48				19.1		11.2		0.239	U	0.0189	U	95.4
	SO-2494-SO82-20200827	SO82	SB18	8/27/2020	0-1	25,400		11.1		86.4		15.5				157		14.4		0.234	U	0.220		97.3
	SO-2494-SO83-20200828	SO83	SB18	8/27/2020	7-8	9,650		9.18		58.5						20.3								

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	Proposed Clean-Up Level[4]					21,400		10		102		42				50		50		2		0.1		
UPRR	SO-2494-SO84-20200827	SO84	SB19	8/27/2020	0-1	11,400		7.44		44.3		9.09				27.8		7.46		0.237	U	0.0195	J	96.2
	SO-2494-SO85-20200827	SO85	SB19	8/27/2020	2-3	9,430		12.5		64.6		10.8				17.6		14.3		0.241	U	0.0190	U	94.6
	SO-2494-SO86-20200827	SO86	SB19	8/27/2020	4-5	12,400		7.72		84.8		15.1				23.8		8.85		0.237	U	0.0187	U	96.4
WSDOT	SO-2494-SO88-20200827	SO88	SB20	8/27/2020	0-1	16,400		2.83		88.3		19.5				71.1		8.85		0.249	U	0.114		91.5
	SO-2494-SO89-20200827	SO89	SB20	8/27/2020	2-3	24,400		5.02		116		19.0				103		15.7		0.238	U	0.157		95.9
	SO-2494-SO90-20200827	SO90	SB20	8/27/2020	4-5	16,600		3.87		71.8		11.7				83.0		10.3		0.242	U	0.113		94.3
	SO-2494-SO91-20200828	SO91	SB20	8/27/2020	7-8	40,300		9.73		151						298.0								
	SO-2494-SO92-20200829	SO92	SB20	8/27/2020	9-10	71,300		6.79		197						613.0								
	SO-2494-SO93-20200829	SO93	SB20	8/27/2020	11-12	61,400		2.31	J	164						751.0								
	SO-2494-SO94-20200829	SO94	SB20	8/27/2020	14-15	3,820		5.67		32.9						27.3								
Pentzer	SO-2494-SO95-20200827	SO95	SB21	8/27/2020	0-1	22,300		4.21		165		15.8				23.5		27.5		0.255	U	0.0339	J	89.3
	SO-2494-SO96-20200827	SO96	SB21	8/27/2020	2-3	12,900	01, V	3.33		75.8		13.6				15.7		12.7		0.232	U	0.0183	U	98.3
	SO-2494-SO97-20200827	SO97	SB21	8/27/2020	4-5	12,600		10.4		107		18.6				19.5		6.97		0.232	U	0.0183	U	98.5
	SO-2494-SO98-20200828	SO98	SB21	8/27/2020	7-8	14,700		11.5		82.5						19.7								
	SO-2494-SO99-20200829	SO99	SB21	8/27/2020	9-10	1,100		6.27		59.9						19.5								
	SO-2494-SO102-20200827	SO102	SB22	8/27/2020	0-1	23,800		4.11		197		15.5				81.9		39.6		0.241	U	0.147		94.8
	SO-2494-SO103-20200827	SO103	SB22	8/27/2020	2-3	24,000		5.29		161		15.3				23.0		10.8		0.244	U	0.0193	U	93.3
	SO-2494-SO104-20200827	SO104	SB22	8/27/2020	4-5	12,300		14.1		80.8		13.1				17.7		9.47		0.236	U	0.0186	U	96.6
	SO-2494-SO109-20200827	SO109	SB23	8/27/2020	0-1	21,300		4.65		142		16.1				34.8		15.1		0.234	U	0.0699		97.4
	SO-2494-SO110-20200827	SO110	SB23	8/27/2020	4-5	22,900		4.77		167		17.1				43.5		21.0		0.235	U	0.0661		97.0
	SO-2494-SO111-20200828	SO111	SB23	8/27/2020	7-8	10,200		7.94		65.5						20.6								
	SO-2494-SO112-20200829	SO112	SB23	8/27/2020	9-10	19,300		5.46		130						35.1								
	SO-2494-SO115-20200828	SO115	SB24	8/28/2020	0-1	23,200		4.40		118		16.3				17.2		9.08		0.249	U	0.0197	U	91.6
	SO-2494-SO116-20200828	SO116	SB24	8/28/2020	2-3	16,600	01, V	10.6		68.0	O1	14.9	O1		O1	23.3		15.5		0.237	U, O1	0.0187	U	96.1
	SO-2494-SO117-20200828	SO117	SB24	8/28/2020	4-5	13,400		7.58		62.7		12.9				23.5		16.8		0.239	U	0.0189	U	95.4
UPRR	SO-2494-SO122-20200828	SO122	SB25	8/28/2020	0-1	18,900		9.19		99.9		17.2				79.2		16.2		0.232	U	0.0788		98.4
	SO-2494-SO123-20200828	SO123	SB25	8/28/2020	2-3	9,540		10.2		71.2		8.95				20.1		11.0		0.237	U	0.0187	U	96.0
	SO-2494-SO124-20200828	SO124	SB25	8/28/2020	4-5	9,730		9.19		62.4		10.0				15.3		10.3		0.237	U	0.0187	U	96.1
Pentzer	SO-2494-SO131-20200825	SO131	SO131	8/25/2020	0-1	26,400		6.32		192		16.7				40.7		56.9		0.235	U	0.0514		96.9
UPRR	SO-2494-SO132-20200825	SO132	SO132	8/25/2020	0-1	24,100		5.38		182		14.1				33.2		25.4		0.233	U	0.0832		98.0
Pentzer	SO-2494-SO133-20200825	SO133	SO133	8/25/2020	0-1	24,300		6.75		144		16.3				44.0		17.4		0.238	U	0.0330	J	95.8
	SO-2494-SO134-20200825	SO134	SO134	8/25/2020	0-1	28,500	01, V	6.51		210	J6, O1	16.1	O1		O1	72.8	O1	32.3	O1	0.239	U, O1	0.0492		95.4
WSDOT	SO-2494-SO135-20200825	SO135	SO135	8/25/2020	0-1	14,600		8.20		83.8		15.3				59.6		13.3		0.229	U	0.0293	J	99.5
UPRR	SO-2494-SO136-20200825	SO136	SO136	8/25/2020	0-1	18,900		13.6		69.5		15.5				101		15.6		0.231	U	0.0182	U	98.8

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Aluminum Recycling Trentwood - FS (Revised)
Union Pacific Rail Road

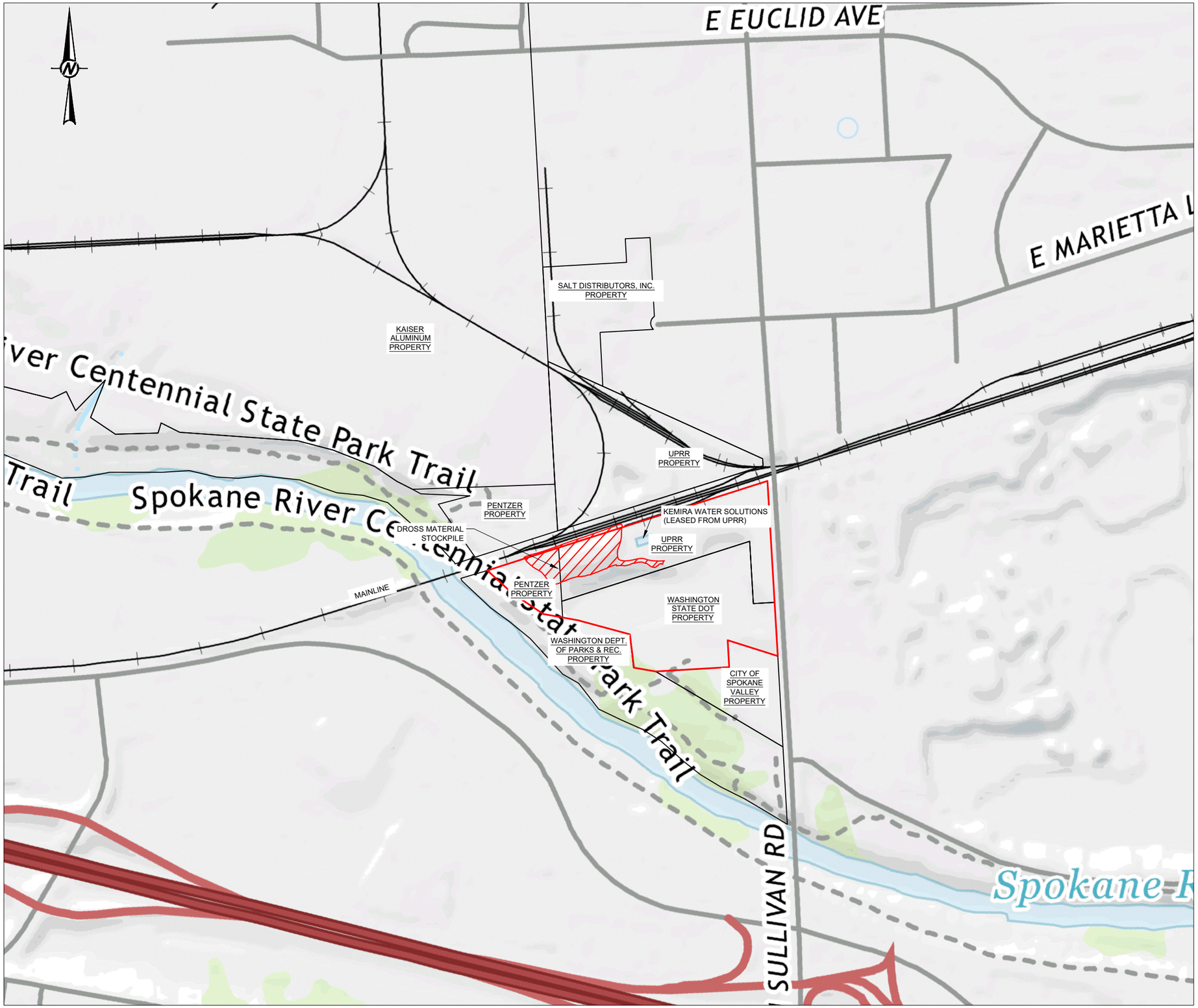
Property	Sample ID	Abbrev. Sample ID	Location ID	Sample Date	Sample Depth (ft BGS)[1]	Aluminum (mg/kg)[2]	Q[3]	Arsenic (mg/kg)	Q	Barium (mg/kg)	Q	Chromium (mg/kg)	Q	Hexavalent Chromium (mg/kg)	Q	Copper (mg/kg)	Q	Lead (mg/kg)	Q	Silver (mg/kg)	Q	Mercury (mg/kg)	Q	Total Solids (%)
	Proposed Clean-Up Level[4]					**21,400**		**10**		**102**		**42**				**50**		**50**		**2**		**0.1**		
WSDOT	SO-2494-SO137-20200825	SO137	SO137	8/25/2020	0-1	26,000		5.62		223		11.6				22.8		10.1		0.235	U	0.0203	J	96.9
	SO-2494-SO138-20200825	SO138	SO138	8/25/2020	0-1	20,100		7.41		127		16.9				29.3		12.8		0.231	U	0.109		98.7
	SO-2494-SO139-20200825	SO139	SO139	8/25/2020	0-1	14,500		9.46		92.7		13.5				25.0		15.0		0.230	U	0.0182	U	99.0
UPRR	SO-2494-SO140-20200825	SO140	SO140	8/25/2020	0-1	12,400		12.3		72.3		13.0				21.7		11.8		0.230	U	0.0182	U	99.1
	SO-2494-SO141-20200828	SO141	SO141	8/28/2020	0-1	27,100		7.87		172		16.6				38.8		13.8		0.235	U	0.0287	J	97.1
	SO-2494-SO142-20200828	SO142	SO142	8/28/2020	0-1	19,500		10.1		110		16.7				74.0		15.3		0.231	U	0.0496		98.8

Notes:
1) ft BGS - feet below ground surface
2) mg/kg - milligrams per kilogram
3) Q - qualifiers:
U - Not detected at the Reporting Limit
J - The identification of the analyte is acceptable; the reported value is an estimate.
J6 - The sample matrix interfered with the ability to make any accurate determination; spike value is low.
O1 - The analyte failed the method required serial dilution test and/or subsequent post-spike criteria. These failures indicate matrix interference.
V - The sample concentration is too high to evaluate accurate spike recoveries.
4) Unrestricted Land Use Proposed Clean-Up Levels calculated using MTCA Method B or C Standard Equation.
5) Results are reported based on the dry weight of the sample.
6) Highlighted cells indicate an exceedance of the associated Proposed Clean-Up Level.

Table 4: Detailed Evaluation of Alternatives
Aluminum Recycling Trentwood - FS (Revised)
Union Pacific Rail Road

Alternatives	Alternative 1		Alternative 2		Alternative 3		Alternative 4	
	Institutional Controls and Monitoring		Consolidation and Capping		Removal and Off-site Disposal at Approved Commercial Landfill		Removal and Off-site Reuse or Recycling	
Description	Institutional controls will be implemented to prevent direct contact with dross stockpile and dross impacted soil		Consolidated material will be capped at the existing stockpile location using multimedia cap.		Dross stockpile and impacted soil will be sent via truck to landfill for disposal, (remediation levels will likely be implemented for industrial property).		Stockpile material will be sent to industrial facility for re-use/recycling in an industrial process. May be shipped via truck or rail, depending on the facility receiving the material.	
Estimated Cost (includes 15 yrs O&M)	$420,000		$3,929,000		$8,082,000		$6,737,000	
MTCA Threshold Criteria								
Protect Human Health and the Environment	No		Yes, potential contamination and source area removed or contained					
Comply with Cleanup Standards	No		Yes, potential contamination and source area removed or contained					
Comply with Applicable State and Federal Laws	No		Yes, potential contamination and source area removed or contained					
Provide for Compliance Monitoring	Yes		Yes		Yes		Not Applicable	
Permanent Solution	No		Yes		Yes		Yes	
Reasonable Restoration Time Frame	No		Yes		Yes		Yes	
Consider Public Concerns	No		Yes		Yes		Yes	
Disproportionate Cost Analysis - Relative Benefits Ranking (1 -10 scale)		Score		Score		Score		Score
Protectiveness	Alternative does not achieve RAOs for protectiveness or meet Threshold Criteria. Institutional Controls and Monitoring is not a viable Alternative (retained for baseline comparison).	**0**	Alternative achieves RAOs for protectiveness.	**9**	Alternative achieves RAOs for protectiveness.	**9**	Alternative achieves highest level of protectiveness.	**10**
Permanence	Alternative does not represents permanent reduction of exposure to source material through isolation/containment.	**0**	Alternative represents permanent reduction of exposure to source material through isolation/containment.	**8**	This alternative represents a high level of permanence because it removes the source material from the Site, and if remediation levels are implemented on the Union Pacific property an ecological cap and institutional controls will be required to provide containment.	**9**	This alternative represents the greatest permanence because it removes the source material from the Site and the material is consumed in an industrial process. Material that is unsuitable for re-use Predominately gravelly soil would have to be disposed at an authorized landfill.	**10**
Cost	Least expensive alternative.	**10**	Least expensive alternative that meets Threshold Criteria.	**10**	Of the options that achieve the highest level of permanence, this alternative is moderately expensive.	**6**	Moderately expensive option.	**7**
Long-term Effectiveness	Institutional Controls would support prevention of on-site prevent of future exposure.	**5**	Capping of stockpile material and institutional controls would be used to prevent future exposure. Long-term effectiveness is dependent on maintenance of cap.	**7**	Stockpile material would be permanently removed from the Site. This alternative represents a high level of long-term effectiveness.	**8**	Stockpile material would be permanently removed from the Site and is consumed in an industrial process. This alternative represents a high level of long-term effectiveness.	**9**
Management of Short Term Risk	This alternative represents the lowest level of short-term risk since the material would be left in place and not require extensive excavation activities.	**9**	This alternative represents the lowest level of short-term risk since most of the material would be left in place for capping and not require extensive excavation activities.	**9**	This alternative requires excavation and road transportation to a landfill facility. This alternative has a moderate level of short-term risk due to the amount of construction and transportation activities required.	**7**	This alternative requires excavation, transport to loading areas, blending operations, and rail transportation to a receiving facility. This alternative has the highest level of short-term risk due to the amount of construction and transportation activities required.	**5**
Technical Implementability	Implementation of institutional controls is technically feasible.	**10**	Small construction area creates steep slopes for cap but engineering issues are manageable.	**4**	Easiest of all options to implement - requires material to be loaded directly to trucks for transport via road to landfill.	**9**	Moderately difficult to implement using either trucks or rail to transport material to receiving facility. The pilot test and trial burn had less than desirable results, the length of time to remove additional WSDOT and Pentzer soils would have a substantial impact on the project's timeframe.	**4**
Consideration of Public Concerns	Undesirable option for aesthetics due to size and appearance of cap in close proximity to public use area.	**5**	Least desirable option for aesthetics due to size and appearance of cap in close proximity to public use area.	**4**	Most preferable aesthetically, has potential environmental impacts associated with transport and landfill disposal.	**8**	Most preferable aesthetically, has potential environmental impacts associated with transport. The material would be consumed in an industrial process and would be most desirable.	**9**
Relative Benefits Average Score	Alternative 1	**5.6**	Alternative 2	**7.3**	Alternative 3	**8.0**	Alternative 4	**7.7**
Disproportionate Cost Analysis								
Estimated Alternative Cost	$420,000		$3,929,000		$8,082,000		$6,737,000	
Costs Proportional to Incremental Benefits	No		Yes		Yes		Yes	
Practicability of Alternative	Not Practicable it does not meet RAO		Practicable, requires cooperation of Pentzer property owner		Practicable		Questionable based on Pilot Study and Trial Burn	
Permanent Remedy	No		Yes		Yes		Yes	
Final Alternative Selection	**Not applicable - does not meet threshold criteria**		**3rd**		**1st**		**2nd**	

Figures



LEGEND

APPROXIMATE MTCA SITE BOUNDARY

REFERENCE(S)

BASE MAP TAKEN FROM USGS.GOV, GREENACRES, WASH 7.5 MIN. USGS QUADRANGLE DATED 2020, DOWNLOADED IN PDF FORMAT.

0 300 600
1" = 300' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
ALUMINUM RECYCLING TRENTWOOD SITE
FEASIBILITY STUDY (REVISED)
SPOKANE VALLEY, WASHINGTON

TITLE
SITE MAP

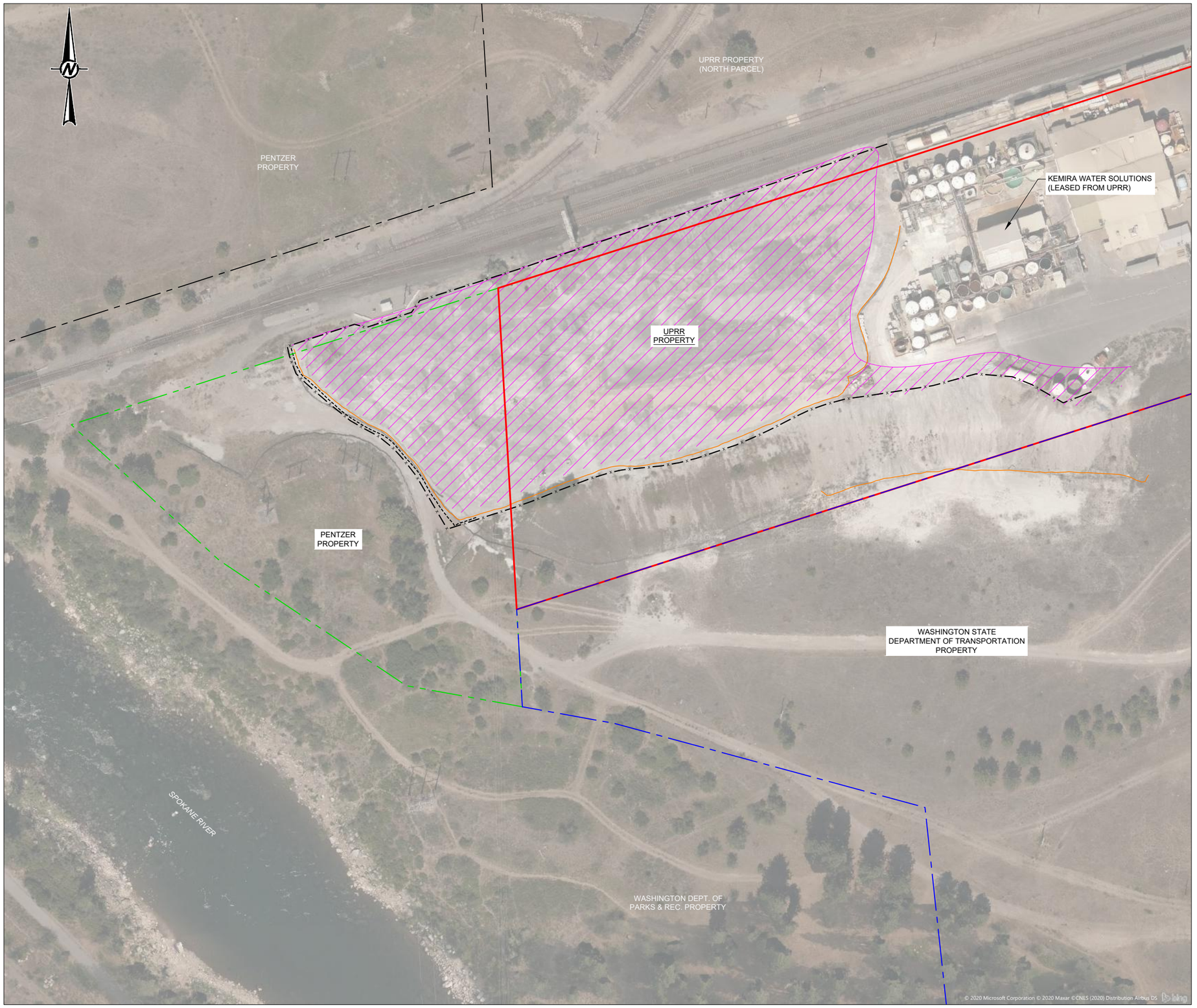
CONSULTANT
GOLDER

YYYY-MM-DD	2021-04-16
DESIGNED	TN
PREPARED	REDMOND
REVIEWED	FS
APPROVED	TN

PROJECT NO.	PHASE	REV.	FIGURE
19119180	1000	A	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 1 in



LEGEND

- APPROXIMATE UPRR PROPERTY BOUNDARY (SOUTH PARCEL)
- APPROXIMATE PENTZER PROPERTY BOUNDARY
- APPROXIMATE WSDOT PROPERTY BOUNDARY
- LIMITS OF DROSS STOCKPILE
- SECURITY FENCE
- SILT FENCE
- ECOLOGY BLOCK LOCATION

NOTE(S)

1. BLACK LABELED PROPERTIES ARE PART OF MTCA SITE.

0 50 100
1" = 50' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
ALUMINUM RECYCLING TRENTWOOD SITE
FEASIBILITY STUDY (REVISED)
SPOKANE VALLEY, WASHINGTON

TITLE
SITE PLAN

CONSULTANT
GOLDER

YYYY-MM-DD	2021-04-16
DESIGNED	TN
PREPARED	REDMOND
REVIEWED	FS
APPROVED	TN

PROJECT NO.	PHASE	REV.	FIGURE
19119180	1000	A	2

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI D

0 1in

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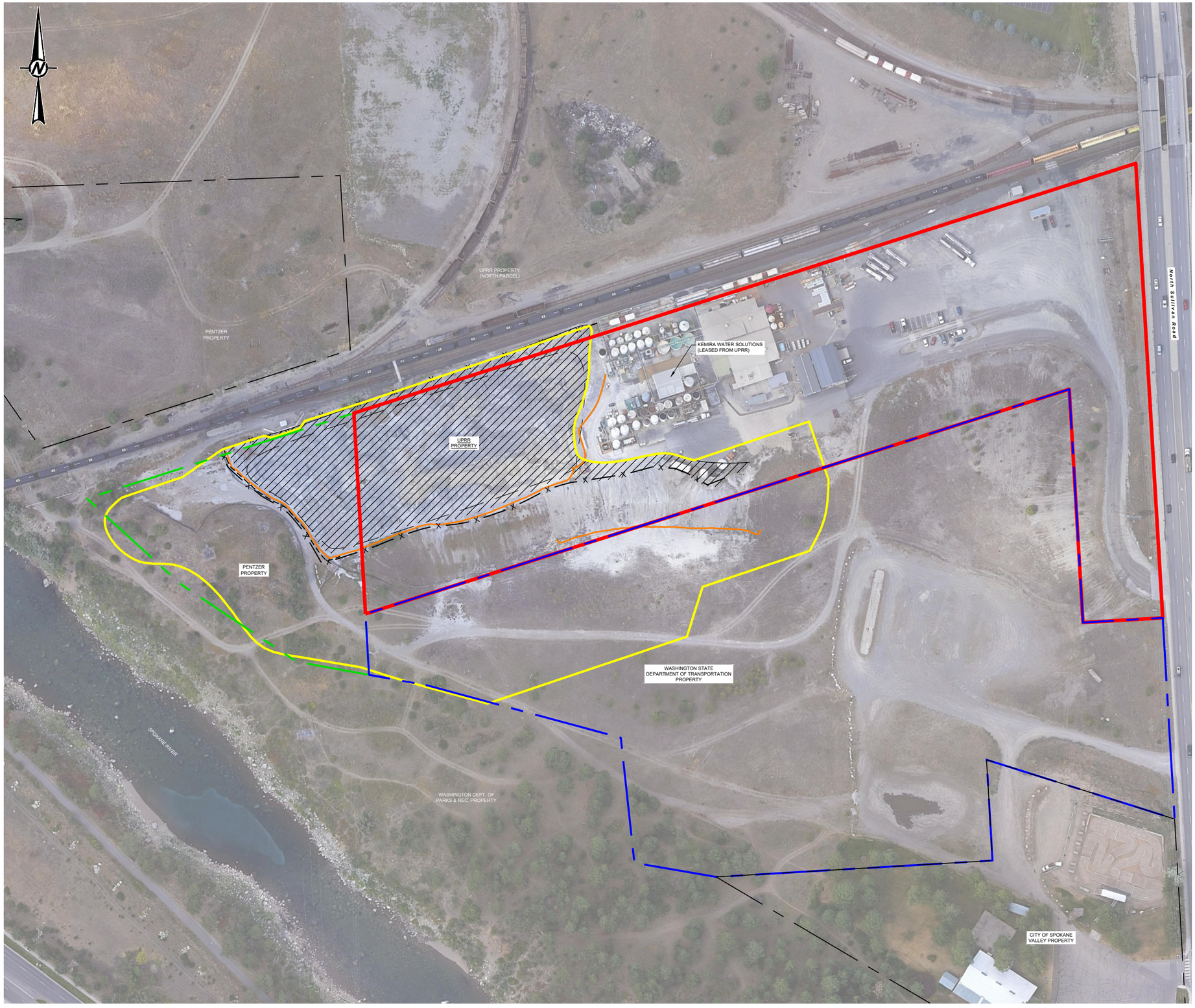

LEGEND

- APPROXIMATE UPRR PROPERTY BOUNDARY (SOUTH PARCEL)
- APPROXIMATE PENTZER PROPERTY BOUNDARY
- APPROXIMATE WSDOT PROPERTY BOUNDARY
- LIMITS OF DROSS STOCKPILE
- SECURITY FENCE
- SILT FENCE
- ECOLOGY BLOCK LOCATION
- APPROXIMATE CLEAN-UP AREA OF DROSS STOCKPILE AND DROSS-CONTAINING SOIL TO ACHIEVE CLEANUP LEVELS BASED ON UNRESTRICTED USE

NOTE(S)

1. BLACK PROPERTY LABEL INDICATES PROPERTY IS PART OF MTCA SITE.
2. * DENOTES SURFACE SAMPLES THAT WERE COLLECTED FOR CALIBRATION OF THE XRF.

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 7/18/19.

0 80 160
1" = 160' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
ALUMINUM RECYCLING TRENTWOOD SITE
FEASIBILITY STUDY (REVISED)
SPOKANE VALLEY, WASHINGTON

TITLE
APPROXIMATE AREA SUBJECT TO CLEANUP ACTIONS (COCs > CULs)

CONSULTANT
GOLDER

YYYY-MM-DD	2021-04-16
DESIGNED	TN
PREPARED	REDMOND
REVIEWED	FS
APPROVED	TN

PROJECT NO.	PHASE	REV.	FIGURE
19119180	1000	A	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 in
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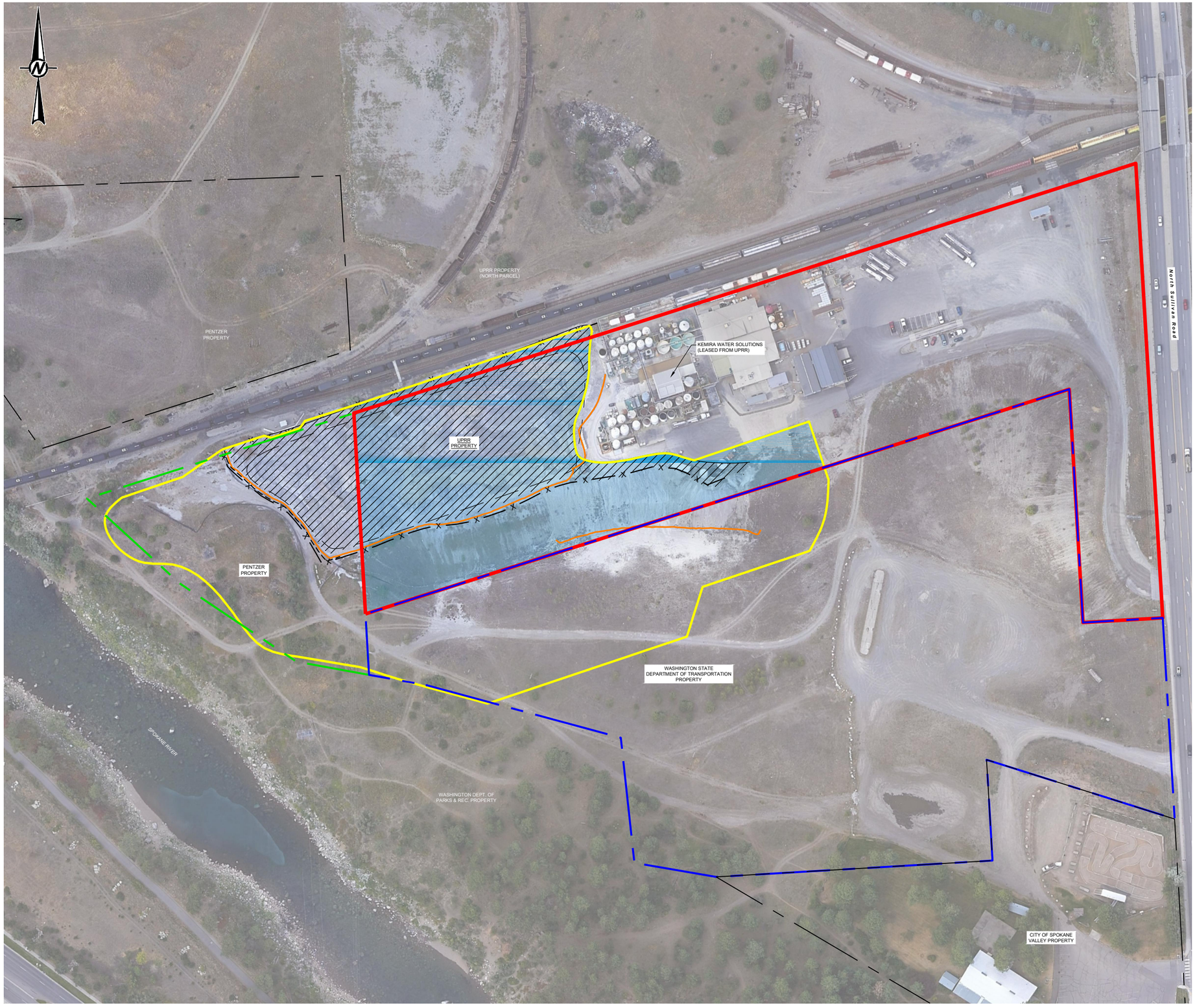

LEGEND

- APPROXIMATE UPRR PROPERTY BOUNDARY (SOUTH PARCEL)
- APPROXIMATE PENTZER PROPERTY BOUNDARY
- APPROXIMATE WSDOT PROPERTY BOUNDARY
- LIMITS OF DROSS STOCKPILE
- SECURITY FENCE
- SILT FENCE
- ECOLOGY BLOCK LOCATION
- APPROXIMATE CLEAN-UP AREA OF DROSS STOCKPILE AND DROSS-CONTAINING SOIL TO ACHIEVE CLEANUP LEVELS BASED ON UNRESTRICTED USE
- INDUSTRIAL PROPERTY QUALIFIES FOR USE OF REMEDIATION LEVELS

NOTE(S)

1. BLACK PROPERTY LABEL INDICATES PROPERTY IS PART OF MTCA SITE.
2. * DENOTES SURFACE SAMPLES THAT WERE COLLECTED FOR CALIBRATION OF THE XRF.

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 7/18/19.

0 80 160
1" = 160' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
ALUMINUM RECYCLING TRENTWOOD SITE
FEASIBILITY STUDY (REVISED)
SPOKANE VALLEY, WASHINGTON

TITLE
AREA OF QUALIFYING FOR USE OF REMEDIATION LEVELS

CONSULTANT
GOLDER

YYYY-MM-DD	2021-04-16
DESIGNED	TN
PREPARED	REDMOND
REVIEWED	FS
APPROVED	TN

PROJECT NO.	PHASE	REV.	FIGURE
19119180	1000	A	4

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B
1 in
0

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Pentzer Property

Pentzer Property

Kemira Water Solutions

Washington State Department of Transportation Property

Spokane River

A

A'

0+00

2+78

2000

2010

2020

2030

2040

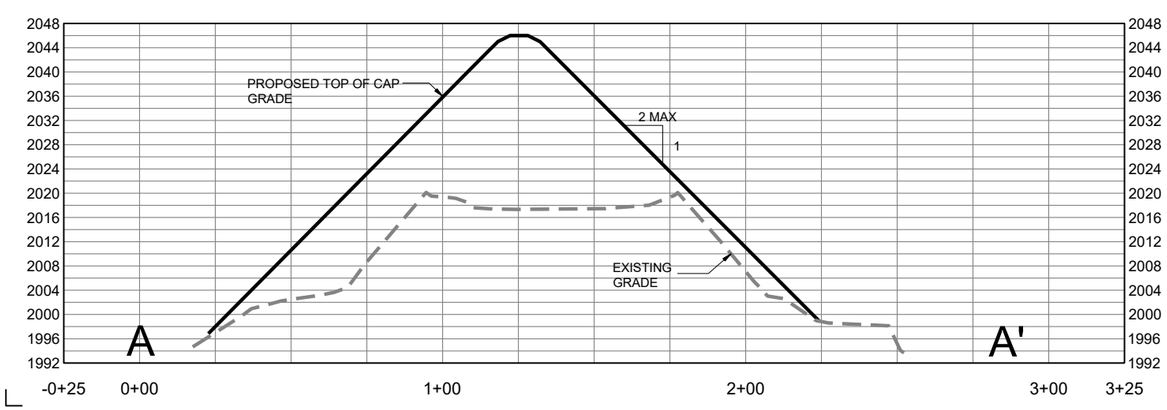
1990

-2.0:1

-2.1:1

-3:1

0 50 100
1" = 100' FEET



LEGEND

- AREA TO BE EXCAVATED TO 1 FT AND PLACED IN LANDFILL
- EXTENT OF CURRENT STOCKPILE
- 2010 — 10 FT - MAJOR CONTOUR-CAP
  2 FT - MINOR CONTOUR-CAP
- EXTENT OF CAP
- PROPERTY LINE
- 2010 — 10 FT - MAJOR CONTOUR-EXISTING STOCKPILE
  2 FT - MINOR CONTOUR-EXISTING STOCKPILE
- A — A' CROSS SECTION PATH
- -2:1 SURFACE SLOPE
- 100 FT SET BACK

NOTE(S)

1. TOTAL SURFACE AREA OF IN-SITU CAP IS APPROXIMATELY 92,500 SQUARE FEET.
2. TOTAL CAPACITY OF IN-SITU CAP IS APPROXIMATELY 70,500 CUBIC YARDS.
3. ELEVATIONS ARE REPRESENTED IN NAVD88 VERTICAL DATUM.

REFERENCE(S)

SOURCE OF PHOTO: GOOGLE EARTH, IMAGERY DATED AUGUST 2011.
SOURCE OF SURVEY: USKH, DANIEL T. PROSZEK, DATE OCTOBER 2010.

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
ALUMINUM RECYCLING TRENTWOOD SITE
FEASIBILITY STUDY (REVISED)
SPOKANE VALLEY, WASHINGTON

TITLE
ALTERNATIVE 2 - CONCEPTUAL CONSOLIDATION AND CAPPING

CONSULTANT
GOLDER

YYYY-MM-DD	2021-04-16
DESIGNED	TN
PREPARED	REDMOND
REVIEWED	FS
APPROVED	TN

PROJECT NO.	PHASE	REV.	FIGURE
19119180	1000	A	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in

0

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APPENDIX A

RI Table 2 Summary of Soil Analytical Results and RI Sample Location Map Figure 3

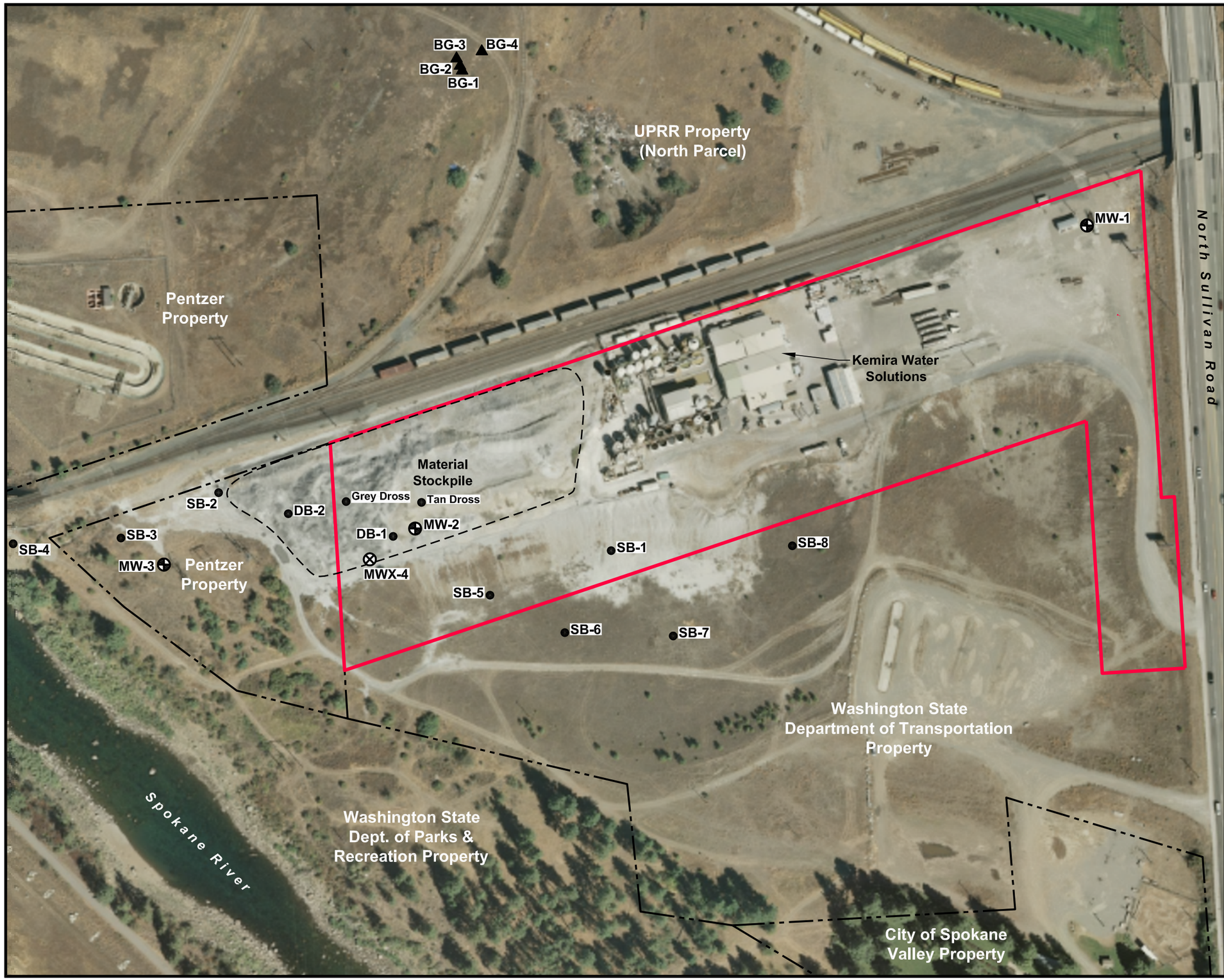
TABLE 2

SUMMARY OF SOIL ANALYTICAL RESULTS
ALUMINUM RECYCLING TRENTWOOD SITE
VERADALE, WASHINGTON

	Unrestricted	Industrial	Dross Boring DB-1				Dross Boring DB-2					Soil Boring SB-1			Soil Boring SB-2		
Location ID:	Land Use	Land Use	DB-1	DB-1	DB-1	DB-1	DB-2	DB-2	DB-2	DB-2	DB-2	SB-1	SB-1	SB-1	SB-2	SB-2	SB-2
Sample Date:	Proposed	Proposed	10/20/2010	10/20/2010	10/20/2010	10/20/2010	10/20/2010	10/20/2010	10/20/2010	10/20/2010	10/20/2010	10/20/2010	10/20/2010	10/20/2010	10/21/2010	10/21/2010	10/21/2010
Sample Interval (ft bgs):	CUL	CUL	2-3	4-5	8-9	18-19	1-2	5-6	6-7	10-11	20-21	0-1	4-5	14-15	1-2	5-6	15-16
Constituent	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Metals																	
Aluminum	21,400	21,400	***49,000***	***70,000***	6600J	6,700	***45,000***	***42,000***	11,000	8,900	5,500	<5.4	3,700	3,700	21,000	7,800	5,200
Arsenic	10	132	2.2	6.5	6.1J	***16***	2.7J	3.3	6.4	10	5.8	6.7	6.7J	4.8	7.9	4	8.5
Barium	102	102	67J	47J	39J	38J	***240J***	***170J***	59J	37J	42J	***170J***	36J	23J	***120***	32	42
Cadmium	4	14	<0.053	<0.077	<0.078	<0.07	<0.1	<0.058	<0.081	<0.068	<0.077	<0.049	<0.065	<0.077	<0.076	<0.065	<0.06
Chromium	42	67	12J	***52J***	7.3J	7.3J	***43J***	***45J***	9.5J	7.3J	17J	***86***	3.7J	5.1	20	6	9
Copper	50	217	***97J***	***300J***	19J	12J	***260J***	***340J***	20J	29J	15J	***980***	8.9	5.4	***250***	***52***	15
Lead	50	118	15J	22J	8.1J	6.8J	***54J***	48J	9.7J	7.2J	9.4J	50J	6.2J	5.6J	18	4.4	6.6
Selenium	0.3	0.3	<0.08	<0.12	<0.12	<0.1	<0.16	<0.087	<0.12	<0.1	<0.12	<0.073	<0.098	<0.12	<0.11	<0.098	<0.09
Silver	2	3.91	0.31J	<0.043	<0.044	<0.0039	0.36J	0.30J	<0.046	<0.038	<0.043	<0.027	<0.037	<0.043	<0.043	<0.037	<0.034
Mercury	0.1	5.5	***24J***	0.0085J	0.013J	0.0067J	***5.7J***	***9.0J***	0.023J	0.0058J	<0.0053	***0.43***	<0.0053	<0.0053	0.07	0.0053J	<0.0052
Conventionals																	
Chloride	NA	NA	370	29.3	28	72	40.1	78.8	17.7	14.7	14.8	1.06J	0.842J	0.517J	3.44J	2.41J	1.62J
Fluoride	4,324	80,000	82.7	14.1	19.8J	3.09J	309	600	143	78.1	9.22J	273	6.95J	1.96J	19J	30.5J	8.09J
Nitrate-Nitrogen	115,315	2,133,333	129	101	94.4	25.1	0.763J	<0.014	<0.0115	<0.0116	2.18	6.35	1.26J	0.413J	<0.0118	11.6	3.44
Nitrite-Nitrogen	7,207	133,333	<0.0206	<0.0172	<0.0167	<0.0165	<0.0203	<0.0203	<0.0168	<0.0168	<0.0166	<0.0169	<0.0168	<0.0165	<0.0172	<0.0168	<0.0162
Sulfate	NA	NA	9370	1100	1260	776	10500	15000	4490	3040	1450	162	33.7	17.9J	1380	4450	367

	Soil Boring SB-3			SB-4	Soil Boring SB-5			SB-6	SB-7	SB-8	Monitoring Well MW-2			Monitoring Well MW-3		
Location ID:	SB-3	SB-3	SB-3	SB-4	SB-5	SB-5	SB-5	SB-6	SB-7	SB-8	MW-2	MW-2	MW-2	MW-3	MW-3	MW-3
Sample Date:	10/21/2010	10/21/2010	10/21/2010	10/20/2010	10/20/2010	10/20/2010	10/20/2010	12/8/2010	12/8/2010	12/8/2010	10/20/2010	10/20/2010	10/20/2010	10/21/2010	10/21/2010	10/21/2010
Sample Interval (ft bgs):	0-1	4-5	14-15	0-1	0-1	4-5	14-15	0-1	0-1	0-1	8-9	12-13	22-23	0-1	4-5	14-15
Constituent	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Metals																
Aluminum	14,000	9,000	4,900	10,000	***52,000***	6,000	4,100	8,990	***49,700***	18,000	12,000	5,400J	2,100	***25,000***	10,000	5,900
Arsenic	6.9	8.0	4.2	9.9	3.5	10	***11***	***10.2J***	4.14J	8.59J	5.7	3.7	1.9J	6.9	5.1	7.5
Barium	***150***	77	34	57J	***130J***	36J	41J	52J	69.6J	59.7J	98J	29J	9.5J	***160***	41	58
Cadmium	<0.085	<0.063	<0.072	<0.075	<0.075	<0.071	<0.05	<0.0215	<0.0214	<0.0218	<0.083	<0.089	<0.073	<0.071	<0.07	<0.071
Chromium	34	11	6.9	11	***83J***	6.6J	5.9	7.34	33	16.3	10J	6.0J	2.2J	18	11	8.6
Copper	44	23	8.8	47	***570J***	16J	11	***64.9***	***219***	***129***	33J	14J	5.5J	***110***	15	14
Lead	40	9.2	5.9	15J	40J	9.9J	11J	8.56	10.1	16.5	12J	6.2J	3.1J	31	15	6.5
Selenium	<0.13	<0.095	<0.11	<0.11	<0.11	<0.11	<0.075	<0.323	<0.322	<0.327	<0.13	<0.13	<0.11	<0.11	<0.11	<0.11
Silver	<0.048	<0.036	<0.041	<0.042	0.054J	<0.04	<0.028	<0.291	<0.289	<0.294	<0.047	<0.05	0.11J	<0.04	<0.04	<0.04
Mercury	0.054	0.0069J	<0.0052	0.011J	***5.2***	<0.0053	<0.0053	0.0652J	0.0334J	0.0829J	***0.12***	<0.0057	<0.017	0.098J	<0.0053	<0.0053
Conventionals																
Chloride	1.36J	0.912J	1.35J	1.37J	2.38J	1.02J	3.8J	0.59J	<0.59	0.66J	1130	326	196	2.31J	0.515J	1.79J
Fluoride	15J	26.0J	1.14J	4.10J	7.69J	19.6	6.19J	2.6	44	15	26	17.7	2.31J	16.8	0.617J	1.47J
Nitrate-Nitrogen	1.78J	<0.0111	0.416J	0.947J	10.2	<0.0112	0.543J	<0.21	0.66	<0.2	50.3	20.2	4.72	1.62J	0.412J	<0.0116
Nitrite-Nitrogen	<0.0168	<0.0162	<0.0166	<0.0168	<0.0173	<0.0163	<0.0174	2.9J	3.6J	4.2J	<0.0184	<0.0177	0.629J	<0.0185	<0.0165	<0.0168
Sulfate	6.39J	15.0J	13.6J	4.52J	648	1300	67	1.9J	3.8	2.9	904	293	342	9.03J	3.50J	6.84J

Notes:
1. Samples collected from the stockpile are indicated by shaded cells.
2. Proposed cleanup levels calculated using MTCA Method B or C Standard Equations.
3. Concentrations exceeding the proposed cleanup level for unrestricted land use are indicated by ***bold/italics/underlined*** text.
4. Concentrations exceeding the proposed cleanup level for industrial land use are indicated by highlighted cells.
5. < = Compound not detected at indicated detection limit. J = Estimated value. NA = Not applicable/available.



EXPLANATION

- Approximate UPRR Property Boundary (South Parcel)
- Extent of Stockpile
- RI/FS Groundwater Monitoring Well Location
- Existing Monitoring Well Location
- Soil Boring Location
- Background Soil Sample Location

N

Approx. Scale in Feet

0 75 150

Source of photo: www.spokanecity.org/services/gis/data, imagery date 2007.

UNION PACIFIC RAILROAD CO.

ALUMINUM RECYCLING TRENTWOOD SITE
VERADALE, WASHINGTON

Figure 3

SAMPLE LOCATION MAP

PROJECT: 3171	BY: ZGK	REVISIONS
DATE: JULY, 2011	CHECKED: MKW	

PASTOR, BEHLING & WHEELER, LLC
CONSULTING ENGINEERS AND SCIENTISTS

APPENDIX B

WSDOT Removal Report - Figures 3, 4 and 5

LEGEND

- APPROXIMATE UPRR PROPERTY BOUNDARY (SOUTH PARCEL)
- APPROXIMATE PENTZER PROPERTY BOUNDARY
- APPROXIMATE WSDOT PROPERTY BOUNDARY
- LIMITS OF DROSS STOCKPILE
- LIMITS OF DROSS-CONTAINING SOIL REMOVED IN MARCH 2020
- SECURITY FENCE
- SILT FENCE
- ECOLOGY BLOCK LOCATION

NOTE(S)

1. BLACK LABELED PROPERTIES ARE PART OF MTCA SITE.

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 7/18/19.

0 50 100
1" = 100' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
ALUMINUM RECYCLING TRENTWOOD SITE
INDEPENDENT ACTION - WSDOT DROSS REMOVAL PROJECT
SPOKANE VALLEY, WASHINGTON

TITLE
DROSS REMOVAL INDEPENDENT ACTION ADDITIONAL FEATURES

CONSULTANT
GOLDER

YYYY-MM-DD	2021-04-16
DESIGNED	TN
PREPARED	REDMOND
REVIEWED	FS
APPROVED	TN

PROJECT NO.	PHASE	REV.	FIGURE
19119180	1000	A	3

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

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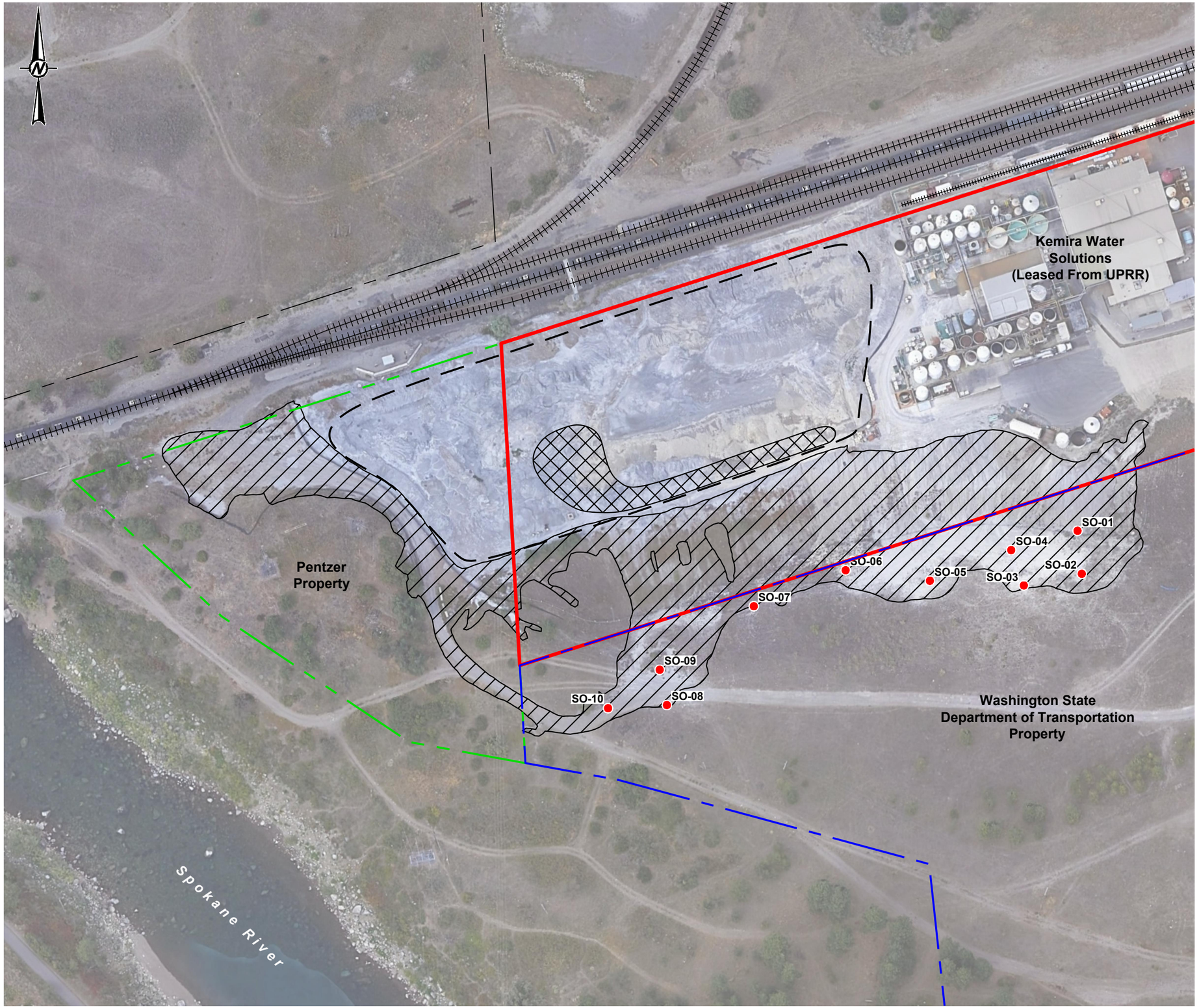


LEGEND

- APPROXIMATE UPRR PROPERTY BOUNDARY (SOUTH PARCEL)
- APPROXIMATE PENTZER PROPERTY BOUNDARY
- APPROXIMATE WSDOT PROPERTY BOUNDARY
- EXTENT OF STOCKPILE
- AREA OF DROSS MATERIAL EXCAVATION
- DROSS MATERIAL PLACEMENT AREA
- POST-EXCAVATION SAMPLE LOCATION

NOTE(S)

1. BLACK LABELED PROPERTIES ARE PART OF MTCA SITE.

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 7/18/19.

0 50 100
1" = 100' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

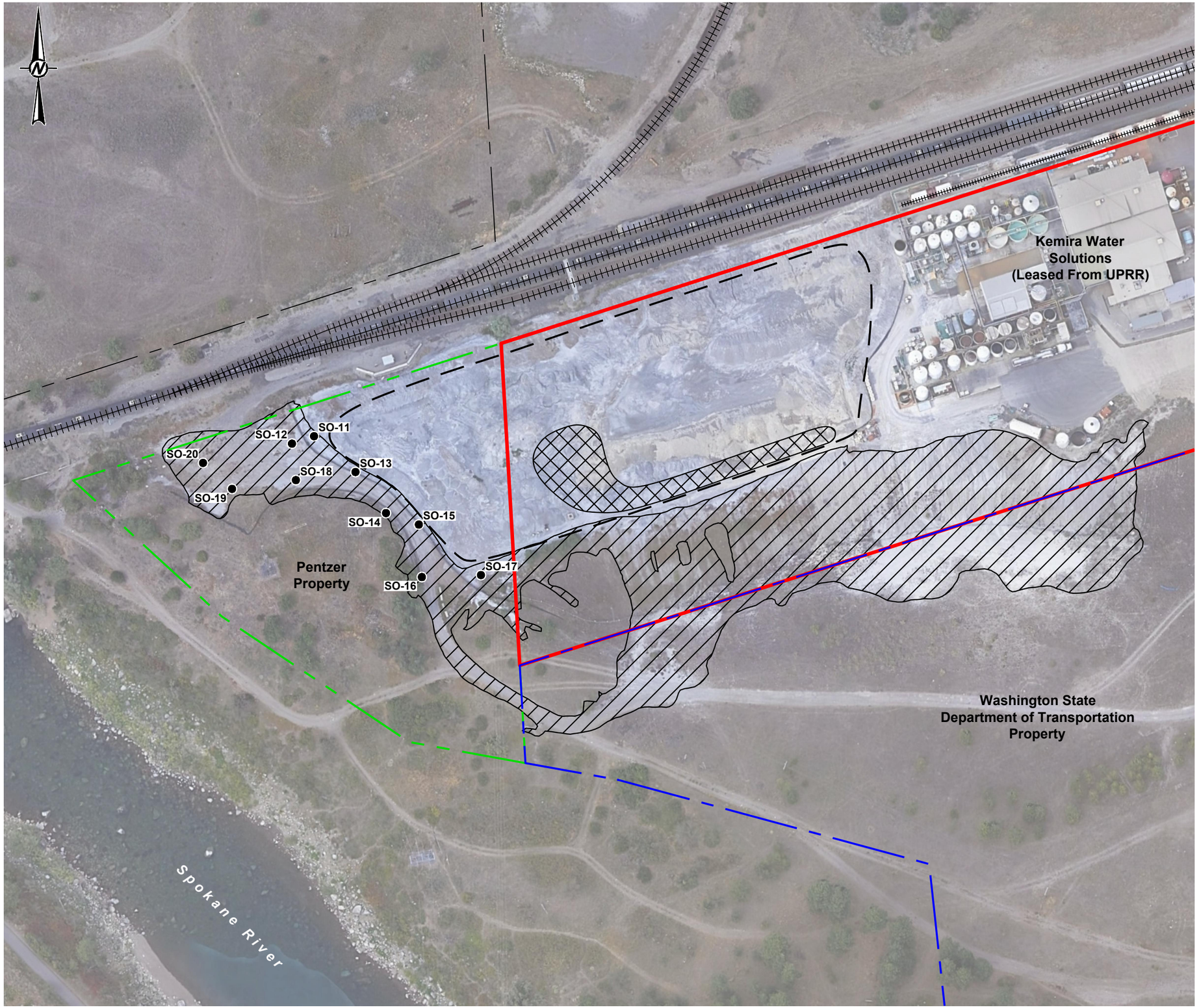
PROJECT
ALUMINUM RECYCLING TRENTWOOD SITE
INDEPENDENT ACTION - WSDOT DROSS REMOVAL PROJECT
SPOKANE VALLEY, WASHINGTON

TITLE
WSDOT PROPERTY POST-EXCAVATION SAMPLE LOCATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2021-04-16
DESIGNED	TN
PREPARED	REDMOND
REVIEWED	FS
APPROVED	TN

PROJECT NO.	PHASE	REV.	FIGURE
19119180	1000	A	4



LEGEND

- APPROXIMATE UPRR PROPERTY BOUNDARY (SOUTH PARCEL)
- APPROXIMATE PENTZER PROPERTY BOUNDARY
- APPROXIMATE WSDOT PROPERTY BOUNDARY
- EXTENT OF STOCKPILE
- AREA OF DROSS MATERIAL EXCAVATION
- DROSS MATERIAL PLACEMENT AREA
- POST-EXCAVATION SAMPLE LOCATION

NOTE(S)

1. BLACK LABELED PROPERTIES ARE PART OF MTCA SITE.

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 7/18/19.

0 50 100
1" = 100' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
ALUMINUM RECYCLING TRENTWOOD SITE
INDEPENDENT ACTION - WSDOT DROSS REMOVAL PROJECT
SPOKANE VALLEY, WASHINGTON

TITLE
PENTZER PROPERTY POST-EXCAVATION SAMPLE LOCATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2021-04-16
DESIGNED	TN
PREPARED	REDMOND
REVIEWED	FS
APPROVED	TN

PROJECT NO.	PHASE	REV.	FIGURE
19119180	1000	A	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

1 in
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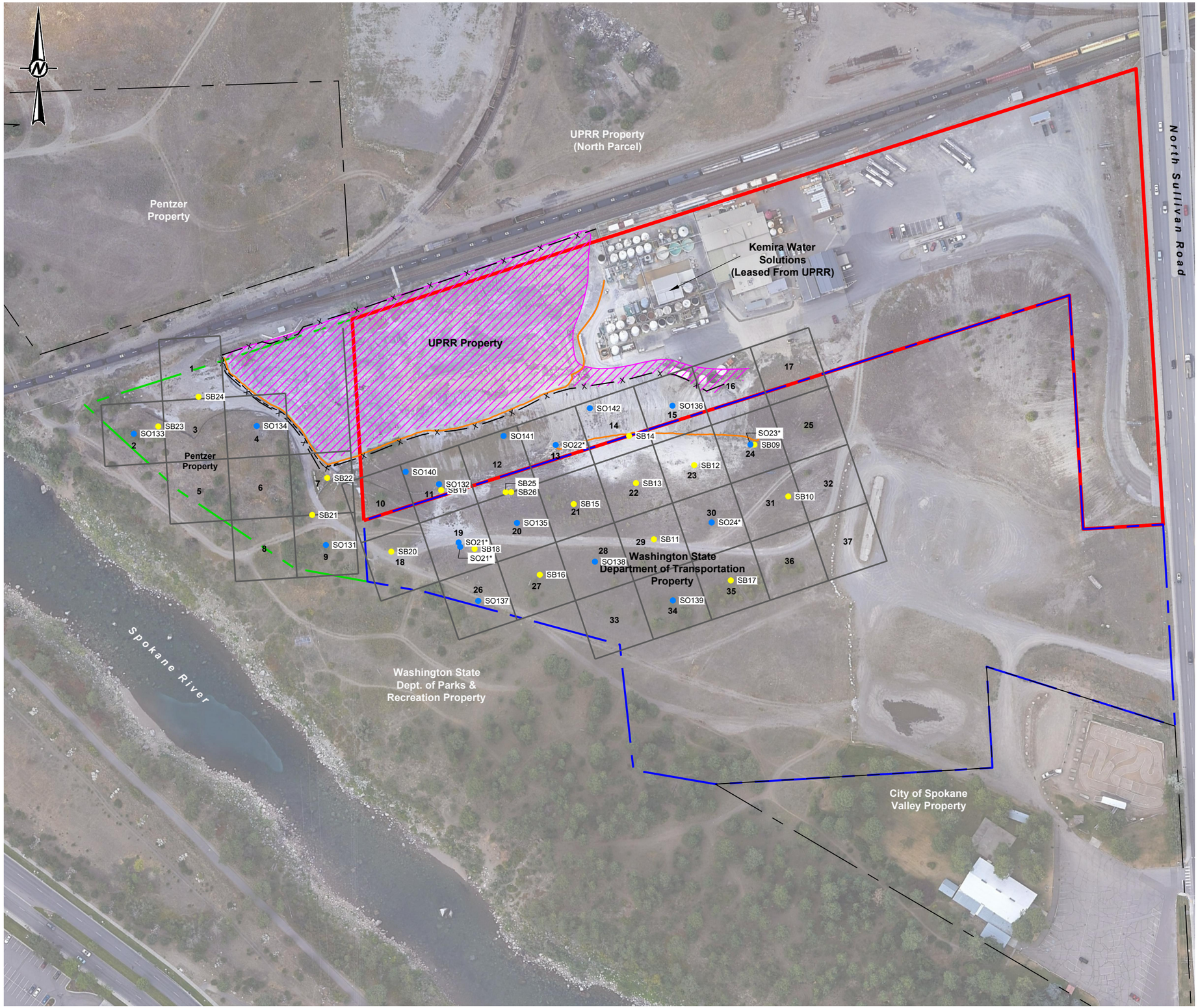
APPENDIX C

PDI Report - Figure 5



LEGEND

- APPROXIMATE UPRR PROPERTY BOUNDARY (SOUTH PARCEL)
- APPROXIMATE PENTZER PROPERTY BOUNDARY
- APPROXIMATE WSDOT PROPERTY BOUNDARY
- LIMITS OF DROSS STOCKPILE
- SECURITY FENCE
- SILT FENCE
- ECOLOGY BLOCK LOCATION
- 100 FT X 100 FT GRID
- SURFACE SOIL SAMPLE LOCATION
- SOIL BORING LOCATION

NOTE(S)

1. BLACK PROPERTY LABEL INDICATES PROPERTY IS PART OF MTCA SITE.
2. * DENOTES SURFACE SAMPLES THAT WERE COLLECTED FOR CALIBRATION OF THE XRF.

REFERENCE(S)

BASE MAP TAKEN FROM GOOGLE EARTH, IMAGERY DATED 7/18/19.

0 80 160
1" = 160' FEET

CLIENT
UNION PACIFIC RAILROAD CO.

PROJECT
ALUMINUM RECYCLING TRENTWOOD SITE
PRE-DESIGN INVESTIGATION
SPOKANE VALLEY, WASHINGTON

TITLE
PRE-DESIGN INVESTIGATION SOIL SAMPLE LOCATIONS

CONSULTANT
GOLDER

YYYY-MM-DD	2021-04-16
DESIGNED	TN
PREPARED	REDMOND
REVIEWED	FS
APPROVED	TN

PROJECT NO.	PHASE	REV.	FIGURE
19119180	1000	A	5

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Path: \\redmond.golder.gds\data\geomatics\UnionPacificRailroad\Trentwood\WA99_PROJECTS\19119180\1000\02_PRODUCTION\DWG\ | File Name: 19119180_1000_001.dwg | Last Edited By: tyclar | Date: 2021-02-22 Time:12:53:46 PM | Printed By: tyclar Date: 2021-04-16 Time:1:15:05 PM

APPENDIX D

Proposed Remedial Alternative Cost Estimates

APPENDIX D
PROPOSED REMEDIAL ALTERNATIVE COST ESTIMATES

ALUMINUM RECYCLING TRENTWOOD SITE
VERADALE, WASHINGTON

Alternative 1: Institutional Controls and Monitoring

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	**Pre-Construction Activities and Mobilization**				
1a	General/reports/meetings/mobilize equipment	1	LS	$75,000	$75,000
1c	SEPA/Ecology checklists and permitting	1	LS	$10,000	$10,000
1d	SEPA/Ecology checklists and permitting	1	LS	$10,000	$10,000
				Subtotal	**$95,000**
3	**Site Maintenance**				
3a	Preparation and maintenance of dross pile area and roads	1	LS	$40,000	$40,000
3b	Inspections, maintenance, removal and replacement of security fence and BMPs	1,500	FT	$30	$45,000
3c	Construction oversight, QA/QC	2	WK	$9,000	$18,000
				Subtotal	**$103,000**
5	**Post-Construction Activities**				
5b	Plug and abandon monitoring wells	1	LS	$10,000	$10,000
5c	As-Built Report (Cleanup Action Report)	1	LS	$25,000	$25,000
5d	Environmental Covenants	1	LS	$10,000	$10,000
				Subtotal	**$45,000**
6	**Washington Dept. of Ecology Oversight Costs**				
6b	Oversight Costs (2021)	1	LS	$50,000	$50,000
				Subtotal	**$50,000**
7	**Ongoing Project Technical Support**				
7a	Cleanup Action Plan (CAP) Support (FS/Reviews/Meetings)	1	LS	$25,000	$25,000
7b	Golder Technical Support	1	LS	$50,000	$50,000
7c	Meetings/Reports	1	LS	$50,000	$50,000
				Subtotal	**$125,000**
				TOTALS:	**$418,000**

APPENDIX D
PROPOSED REMEDIAL ALTERNATIVE COST ESTIMATES

ALUMINUM RECYCLING TRENTWOOD SITE
VERADALE, WASHINGTON

Alternative 2: Consolidation and Capping

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	**Pre-Construction Activities and Mobilization**				
1a	Spec Package/Engineering Drawings/Bidding/Contracting/Safety	1	LS	$75,000	$75,000
1b	SEPA/Ecology checklists and permitting	1	LS	$10,000	$10,000
1c	SPCC, Dust Control, and H&S Plans	1	LS	$10,000	$10,000
1d	Temporary Erosion Control and SWPPP	1	AC	$2,000	$2,000
1e	Mobilize/Demobilize equipment	1	LS	$80,000	$80,000
				Subtotal	**$177,000**
2	**Excavate and Transport Outlying Soil (off property)**				
2a	Excavate and transport outlying soil	45,000	TON	$48	$2,160,000
2b	Backfill	27,000	BCY	$15	$405,000
2c	Area Restoration - Regrading	16,000	CY	$5	$80,000
2e	Area Restoration - Top Soil Placement	2,000	CY	$25	$50,000
2f	Area Restoration -Hydroseeding	5	AC	$5,000	$25,000
2g	Construction oversight, QA/QC	10	WK	$9,000	$90,000
2h	Construction oversight, Sampling	6	WK	$9,000	$54,000
2h	Ecology regulatory costs	1	LS	$15,000	$15,000
				Subtotal	**$2,879,000**
3	**Cap Construction/Installation**				
3a	Closure Turf	93,000	SF	$3.50	$325,500
3b	Cap construction oversight (Golder), QA/QC	5	WK	$9,000	$45,000
				Subtotal	**$370,500**
4	**Drainage**				
4a	Construct Stormwater Ditches (w/ rock lining)	1,500	LF	$30.00	$45,000
				Subtotal	**$45,000**
5	**Fencing**				
5a	Remove temporary fencing and install permanent fence	1,500	LF	$80.00	$120,000
				Subtotal	**$120,000**
6	**Post-Construction Activities**				
6a	Soil confirmation sampling, analysis & reporting	1	LS	$20,000	$20,000
6b	Environmental covenants	1	LS	$10,000	$10,000
6c	Well Plugging (Four wells)	1	LS	$10,000	$10,000
6d	Well Installation (Four wells)	1	LS	$37,862	$37,862
6e	Monitoring Plan	1	LS	$20,000	$20,000
6f	Oversight labor and expenses	1	LS	$15,000	$15,000
6g	As-Built Report (Cleanup Action Report)	1	LS	$25,000	$25,000
				Subtotal	**$137,862**
7	**Washington Dept. of Ecology Oversight Costs**				
7a	Oversight Costs (2021)	1	LS	$50,000	$50,000
7b	Oversight Costs (2022)	1	LS	$50,000	$50,000
				Subtotal	**$100,000**
8	**Ongoing Project Technical Support**				
8a	Golder Technical Support	1	LS	$50,000	$50,000
8b	Meetings/Reports	1	LS	$50,000	$50,000
				Subtotal	**$100,000**
				TOTAL CAPITAL COSTS:	**$3,929,362**
9	**Long-term Operation and Maintenance**				
9a	Cap Maintenance	15	Year	$10,000	$150,000
				TOTAL COSTS (WITH O&M):	**$4,079,362**

Notes:
1) Grey line items indicate vendor cost estimates.
2) AC - acre
3) LS - lump sum
4) LF - linear foot
5) SY - square yard
6) SF- square foot
7) CY - cubic yard

APPENDIX D
PROPOSED REMEDIAL ALTERNATIVE COST ESTIMATES

ALUMINUM RECYCLING TRENTWOOD SITE
VERADALE, WASHINGTON

Alternative 3: Removal and Off-Site Disposal At Authorized Commercial Landfill (Graham Road Landfill, Medical Lake, WA)

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	**Pre-Construction Activities and Mobilization**				
1a	Agreed Order (AO)/ Draft Cleanup Action Plan (DCAP) Support (FS/Reviews/Meetings)	1	LS	$25,000	$25,000
1b	Environmental Covenants	1	LS	$10,000	$10,000
1c	SEPA/Ecology checklists and permitting	1	LS	$10,000	$10,000
1d	Access Agreements	1	LS	$6,000	$6,000
1e	Engineering Design Report	1	LS	$15,000	$15,000
1f	Project Spec Package	1	LS	$25,000	$25,000
1g	Bid/Contracting Support	1	LS	$25,000	$25,000
1h	Mobilize equipment	1	LS	$75,000	$75,000
				Subtotal	**$191,000**
2	**Excavate and Transport Outlying Soil (off-property)**				
2a	Excavate, transport and disposal of outlying soil (off-property)	50,000	ton	$48	$2,400,000
2b	Backfill	27,000	bcy	$15	$405,000
2c	Area Restoration - Regrading	16,000	cy	$5	$80,000
2d	Area Restoration - Topsoil Placement	2,000	cy	$25	$50,000
2e	Area Restoration - Hydroseeding	5	acre	$5,000	$25,000
2f	Construction oversight, QA/QC	10	wk	$9,000	$90,000
2g	Construction oversight, Sampling	5	wk	$9,000	$45,000
2h	Ecology regulatory costs	1	LS	$10,000	$10,000
				Subtotal	**$3,105,000**
3	**Site Maintenance**				
3a	Preparation and maintenance of dross pile area and roads	1	LS	$40,000	$40,000
3b	Inspections, maintenance, removal and replacement of security fence and BMPs	1,500	LS	$30	$45,000
3c	Construction oversight, QA/QC	2	wk	$9,000	$18,000
				Subtotal	**$103,000**
4	**Excavate Load, Transport, Dispose Material (UP on-property)**				
4a	Excavate, transport and disposal soil	71,000	Tons	$48	$3,408,000
4b	Backfill	4,000	bcy	$15	$60,000
4c	Ecological Cap	196,000	sq ft	$3.88	$761,012
4d	Construction oversight, QA/QC	15	wk	$9,000	$135,000
4e	Construction oversight, Sampling	6	wk	$9,000	$54,000
				Subtotal	**$4,418,012**
5	**Post-Construction Activities**				
5a	Soil confirmation sampling analysis & reporting	1	LS	$30,000	$30,000
5b	Plug and abandon monitoring wells	1	LS	$10,000	$10,000
5c	As-Built Report (Cleanup Action Report)	1	LS	$25,000	$25,000
				Subtotal	**$65,000**
6	**Washington Dept. of Ecology Oversight Costs**				
6a	Oversight Costs (2020)	1	LS	$50,000	$50,000
6b	Oversight Costs (2021)	1	LS	$50,000	$50,000
				Subtotal	**$100,000**
7	**Ongoing Project Technical Support**				
7a	Golder Technical Support	1	LS	$50,000	$50,000
7b	Meetings/Reports	1	LS	$50,000	$50,000
				Subtotal	**$100,000**
				TOTALS:	**$8,082,012**

Notes:
1) The Graham Road Landfill is located approximately 22 miles from the Site.
2) Need to discuss UP's internal cost for railcar movement
3) Historical analytical data developed from the site should be sufficient for the disposal permit.
4) Timeframe: WM anticipates moving ~1,000 tons/day. Total project would be around 21 weeks to complete.
5) Cape cost estimate for loading and transport of material to WM facility: $2.1 million
6) Grey line items indicate vendor cost estimates.

APPENDIX D
PROPOSED REMEDIAL ALTERNATIVE COST ESTIMATE

ALUMINUM RECYCLING TRENTWOOD SITE
VERADALE, WASHINGTON

Alternative 4: Removal and Off-Site Re-use or Recycling (Assumes Lehigh, Cupertino, CA)

ITEM	DESCRIPTION	QUANTITY	UNITS	UNIT COST	TOTAL COST
1	**Pre-Contruction Activities and Mobilization**				
1a	General/HASP/meetings	1	LS	$75,000	$75,000
1b	SWPP/TESC Measures	1	LS	$50,000	$50,000
1c	Access Agreement with SDI	3	Year	$3,500	$10,500
1d	Spec Package/Engineering Drawings/Bidding/Contracting/Safety	1	LS	$35,000	$35,000
1e	SEPA/Ecology Checklists and Permitting	1	LS	$10,000	$10,000
1f	Engineering Design Report	1	LS	$15,000	$15,000
1g	SAP/Material Specification	1	LS	$10,000	$10,000
1h	Rail inspection of the Wye track	1	LS	$10,000	$10,000
1i	Mobilize equipment	1	LS	$100,000	$100,000
1j	Testing physical properties of material	1	LS	$50,000	$50,000
				Subtotal	**$365,500**
2	**Excavate and Transport Outlying Soil (off-property)**				
2a	Excavate, transport and disposal of outlying soil (off-property)	50,000	ton	$48	$2,400,000
2b	Backfill	27,000	bcy	$15	$405,000
2c	Area Restoration - Regrading	16,000	cy	$5	$80,000
2d	Area Restoration - Topsoil Placement	2,000	cy	$25	$50,000
2e	Area Restoration - Hydroseeding	5	acre	$5,000	$25,000
2f	Construction oversight, QA/QC	10	wk	$9,000	$90,000
2g	Construction oversight, Sampling	5	wk	$9,000	$45,000
2h	Ecology regulatory costs	1	LS	$10,000	$10,000
				Subtotal	**$3,105,000**
3	**Site Maintenance**				
3a	Preparation and maintenance of dross pile area, staging pad area, and roads	1	LS	$40,000	$40,000
3b	Road maintenance	1	LS		$0
3b	Inspections, maintenance, removal and replacement of security fence and BMPs	1,500	LS	$30	$45,000
3c	Construction oversight, QA/QC	2	wk	$9,000	$18,000
				Subtotal	**$103,000**
4	**Excavate, Transport, Screen, Blend, Stage, Load Material (UP on-property)**				
4a	Excavate, screen, and stockpile all material from dross stockpile	1	LS	$931,756	$932,000
4b	Blend and stockpile <2" material at staging pad	1	LS	$205,195	$206,000
4c	Load, transport by truck, and dispose of > 2" material at Graham Road Landfill	1	LS	$209,986	$210,000
4d	Load <2" material into railcars (side-dump, gondola, or covered-bottom drop hopper)	1	LS	$65,486	$66,000
4f	Load, transport by truck, and dispose of staging pad material at Graham Road Landfill	1	LS	$58,667	$59,000
4a	Transport and disposal of screened material at Lehigh	67,000	Tons		
4h	Sampling and analysis to meet Lehigh specifications	1	LS	$100,000	$100,000
4e	Project scale trial shipment	1	LS	$50,000	$50,000
4f	Backfill	4,000	bcy	$15	$60,000
4g	Ecological Cap	196,000	sq ft	$3.88	$762,000
4h	Installation of temporary security fence	1	LS		
4i	Construction oversight, QA/QC	15	wk	$9,000	$135,000
4j	Construction oversight, Sampling	6	wk	$9,000	$54,000
				Subtotal	**$2,634,000**
5	**Material Handling and Transport to End User**				
5a	Railcars (leasing - if needed) (30 cars for 18 months)	18	Month	$12,750	$229,500
5b	Coordinate the transport of the loaded railcars to the final destination	1	LS	$15,000	$15,000
5c	Movement of lease cars to and from Trentwood	1	LS	$20,000	$20,000
5d	Construction oversight, QA/QC	0	LS	$100,000	$0
				Subtotal	**$264,500**
6	**Post-Construction Activities**				
6a	Area restoration	1	LS		
6b	Soil confirmation sampling and analysis	1	LS	$30,000	$30,000
6c	As-Built Report (Cleanup Action Report)	1	LS	$25,000	$25,000
6d	Plug and abandon monitoring wells	1	LS	$10,000	$10,000
				Subtotal	**$65,000**
7	**Washington Dept. of Ecology Oversight Costs**				
7b	Oversight Costs (Year 1)	1	LS	$50,000	$50,000
7c	Oversight Costs (Year 2)	1	LS	$50,000	$50,000
				Subtotal	**$100,000**
8	**Ongoing Project Technical Support**				
8a	Golder Technical Support	1	LS	$50,000	$50,000
8b	Meetings/Reports	1	LS	$50,000	$50,000
				Subtotal	**$100,000**
				TOTALS:	**$6,737,000**

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