MAUL
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CITY OF ST. HELENS
CONTAMINATED MEDIA MANAGEMENT PLAN

400 SOUTH 1ST STREET
ST. HELENS, OREGON
ECSI NO. 3283

PREPARED FOR

CITY OF ST. HELENS

JUNE 18, 2015
PROJECT NO. 0830.01.01

PIONEERING CHANGE WITH INNOVATIVE SOLUTIONS

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Prepared by
Maul Foster & Alongi, Inc.
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The material and data in this plan were prepared under the supervision and direction of the undersigned.

MAUL FOSTER & ALONGI, INC.

This digital seal certifies the signatory and document content.

Ted Wall, PE
Principal Engineer, Oregon Operations Director

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Senior Geologist

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FOLLOWING PLAN:

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ACRONYMS AND ABBREVIATIONS

Boise	Boise Cascade Company
the City	City of St. Helens
CMMP	Contaminated Media Management Plan
COC	contaminant of concern
DEQ	Oregon Department of Environmental Quality
DRO	diesel-range organics
HASP	health and safety plan
HAZWOPER	hazardous waste operations and emergency response
NFA	No Further Action
ORO	oil-range organics
OSHA	federal Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PPA	Prospective Purchaser Agreement
RBC	risk-based concentration
RCRA	Resource Conservation and Recovery Act
the Site	Boise Cascade Veneer site at 400 South 1st Street, St. Helens, Oregon
VOC	volatile organic compound

1 INTRODUCTION

1.1 Introduction

Maul Foster & Alongi, Inc. has prepared this Contaminated Media Management Plan (CMMP) on behalf of the City of St. Helens (the City) for the Boise Cascade Veneer site located at 400 South 1st Street in St. Helens, Oregon (the Site). This CMMP fulfills the requirement put forth by the Oregon Department of Environmental Quality (DEQ) as part of a Prospective Purchaser Agreement (PPA) and Consent Judgment between the State of Oregon and the City.

1.2 Site Description

The Site encompasses 23.5 acres located at the southern end of 1st Street in St. Helens, Oregon, in the southeast quarter of the northwest quarter of section 3, township 4 north, range 1 west of the Willamette Meridian (see Figure 1). The property is located in Columbia County and includes tax lots 4N1W 300 100, 4N1W 3BD 1100, and 4N1W3BD 1200. The property is located between a steep basalt cliff on the west and the Multnomah Channel of the Willamette River on the east at its confluence with the Columbia River. Contained within Tax Lot 100, and also included in the Site, is a strip of land currently dedicated as a railroad right-of-way and owned by the Oregon Department of Transportation (Figure 2).

Historical maps show that a sawmill occupied the Site in 1911, but it is believed that sawmills operated on the Site as early as the mid-1800s (Boise Cascade Company [Boise], 2014). Boise purchased the Site as a sawmill in 1969 and built a veneer mill there in 1971. The sawmill was closed in 1978 and was intentionally demolished through a controlled burn in 1985. The veneer mill remained in operation until 2009. Equipment was removed from the mill in 2012, and the building was demolished in 2013.

1.3 Project Background

On December 4, 2003, Boise entered into a voluntary agreement with the DEQ to conduct an investigation at the Site (DEQ ECSI No. 3283). Boise investigated several areas of the Site over multiple rounds of sampling, and on May 6, 2004, the DEQ issued a conditional No Further Action (NFA) determination. It was determined at that time that, because high concentrations of petroleum hydrocarbons were detected beneath the lathe mill area (see Figure 2), contamination in that area should be fully evaluated when and if that area became exposed or otherwise uncovered in the future.

In 2013, in anticipation of selling the property, Boise conducted additional investigations including soil and groundwater sampling of the lathe area the former oil storage house, the sawmill transformer area, and the former log barker area. Based on the results of the 2013 investigation, Boise and the DEQ determined that additional groundwater investigation in the barker area, the lathe area, and the oil storage and transformer areas was warranted. In February 2014, Boise prepared an Environmental Summary Report and Site Investigation Work Plan.[1] The purpose of the report and proposed work was to resolve the condition described in the NFA determination under the lathe area because the building had been removed, and to investigate other areas that had since been identified as potential sources of historical contamination.

Because the 2004 NFA determination was based on assumed continued industrial use and did not account for changing land uses, Boise also proposed to conduct an investigation of shallow soils on the Site, including soil beneath paved areas. Shallow test pits were dug and tested to begin to address DEQ's more recent concerns about potential land use changes and future exposure scenarios.

The results of the 2014 sampling events are documented in the Site Investigation and Remediation Report prepared by ERM-West, Inc. on behalf of Boise Cascade; a copy of which is included as an Appendix to this report. The Boise investigation confirmed petroleum contaminated soil (diesel fuel and hydraulic oil) exists in a small area adjacent to the south side of the former lathe. Residual petroleum contamination in the lathe area includes a small area (<500 square feet) of shallow contamination (<5 feet deep). Most petroleum contamination generally occurs at depths greater than 10 feet over an area approximately 3000 square feet. The contaminated soil is currently covered with a concrete cap (Figures 3 and 4).

An isolated and localized area of PAHs above DEQ RBCs was discovered in test pit TP-13. The PAH benzo(a)pyrene was detected above urban residential RBCs in both samples collected from TP-13 and the one sample collected from TP-13A. The localized occurrence of benzo(a)pyrene does not present a human health risk, but should be noted and managed as appropriate during Site development.

Based on elevated lead in soil found at test pit TP-14, the investigation identified a previously unknown area of lead-impacted soil in the northern part of the Site. Boise Cascade completed a soil removal to address an approximately one-half acre of the Site where lead was detected above expected ambient background concentrations, with some areas above applicable DEQ risk-based concentrations (RBCs) for human health.

The goal was to remediate the top 3 feet to meet the direct contact RBC for urban residential, and to meet the construction worker RBC in soil below 3 feet. Target cleanup goals based on RBCs were 400 mg/kg for soil from 0 to 3 feet bgs and 800 mg/kg for soil greater than 3 feet bgs. Depth to bedrock in the excavation was less than 5 feet.

A total of approximately 1,700 cubic yards of soil was excavated and disposed of at Riverbend Landfill in McMinnville, Oregon (see Appendix). Residual lead levels above residential and construction/excavation worker RBCs are present in sidewall samples along the northern sidewall within about 3 feet of the property boundary; sidewall samples near the northwest corner of the excavation, and also in the north central excavation floor.

[1] Boise. 2014. Environmental summary report and site investigation work plan: Boise Cascade Veneer Mill site, St. Helens, Oregon. Boise Cascade Company. February 3.

The excavation was backfilled first with stockpiled soil that had been verified acceptable for onsite use. The upper 1.5 to 2 feet was backfilled with imported gravel from a local quarry. The cap prevents contact with residual impacted soil detected in the bottom and sidewalls.

A 2- to 3-foot wide strip of exposed soil that contains elevated lead concentrations above residential and construction/excavation worker RBCs remains along the northern property boundary, and portions of the western property near the northern corner of the excavation.

PAHs were detected in groundwater at two locations that exceed the RBC for direct contact by excavation workers, B-18 and B-20 (Figure 4).

Following review of the report, and a 30-day public comment period held in May 2015, DEQ issued a conditional no further action on June 8, 2015. To ensure protective conditions in the future the following conditions and restrictions were identified by DEQ:

1. Use of groundwater is prohibited, except for sampling or similar purposes as required by the Oregon Department of Environmental Quality.

2. A cap will be maintained in the lathe area to prevent potential future exposure by site workers or residents and to minimize future leaching of contamination into shallow groundwater.

3. Any contaminated soil or groundwater removed from the Site must be managed in accordance with a DEQ-approved Contaminated Media Management Plan (CMMP). Residual soil in the northern removal area, lathe area, and localized area around TP-13, and groundwater near B-18 and B-20, are identified as specific areas of concern in this CMMP (Figures 3 and 4). These restrictions and requirements should be memorialized in an Easement and Equitable Servitudes recorded on the Property deed.

1.4 Purpose of Contaminated Media Management Plan

This CMMP is a required component of the conditional no further action determination and is included in the Scope of Work, Exhibit C, to the PPA and outlines post-closing precautions and procedures necessary to protect human health and the environment from hazardous substances before, during, and after site development. This CMMP identifies site contaminants of concern (COCs), excavation protocols, soil- and groundwater-handling procedures, waste characterization and disposal requirements, and stormwater protection measures to be addressed and implemented at such time as the Site may be redeveloped by the City or any subsequent owner or developer pursuant to the PPA and the Consent Judgment.

Residual contamination above risk-based standards for human health is currently beneath a cap which prevents direct contact, or is localized and does not present a significant risk. Therefore, the risk associated with pre-development use is within acceptable limits provided the cap is maintained and residual contaminated soil is not disturbed.

The guidelines and procedures outlined in this CMMP are to be followed during any activities that may take place on the Site prior to and during site redevelopment and any subsequent projects that involve subsurface disturbance. Site redevelopment is expected to involve some import of fill. Imported fill must meet DEQ clean fill criteria[2]. Activities that are subject to this plan include any material disturbance of soils and/or subsurface soil present at the time of closing and execution of the PPA; imported fill that has met the DEQ clean fill criteria is not subject to this plan.

This CMMP may be reviewed and amended as necessary in the future to address isolated soil-disturbing activities or to support more comprehensive design concepts associated with development planning, or other activities that are unknown at this time. If the City wishes to amend the plan, they will work with the DEQ to obtain its approval.

1.5 Distribution of Contaminated Media Management Plan

The City or subsequent Site owner will provide this CMMP to all designers and contractors performing activities on the Site where disturbance and/or direct contact with contaminated soil or groundwater could occur. The Site owner will be responsible for ensuring that all contaminated media-handling activities have been properly planned and that additional investigations are completed as necessary before implementing a project.

This plan does not address potential physical hazards, which should also be considered during site use or site redevelopment planning.

2 DISTRIBUTION OF CONTAMINANTS OF CONCERN

2.1 Site Contaminants

Site contaminants of interest (COIs) include diesel, gasoline, and oil range organics (DRO, GRO and ORO, respectively), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), metals including arsenic, barium, cadmium, chromium, lead, mercury, selenium, and silver, and polychlorinated biphenyls (PCBs) (see Appendix). Chemicals of concern (COCs) are defined by known exceedances of the DEQ's RBCs for the protection of residents, occupational workers, and construction and excavation workers during construction and during post-construction maintenance involving contact with soil or groundwater.[3] COCs include DRO, ORO, benzo(a)pyrene, and lead in soil and benzo[a]pyrene in groundwater.

[2] DEQ Internal Management Direction, Clean Fill Determinations. Prepared by the Oregon Department of Environmental Quality. July 23, 2014.

[3] In the event soil is disturbed during development such that a previously buried layer of contamination is now within 3 feet of the surface, there may be exceedances of residential or occupational direct-contact exposure scenarios. In this instance, development design will need to address these exceedances.

2.2 Nature and Extent of Contamination

The following determination of the extent of contaminated areas is based on review of historical investigations and removal actions completed at the Site (see the Appendix for excerpts from the Boise Site Investigation and Remediation Report). The approximate extent of known contaminated soil and groundwater (designated restricted areas) is shown in Figures 3 and 4.

- Surface and subsurface soil in the former lathe area is expected to contain diesel and oil-range hydrocarbons above RBCs.
- A 2- to 3-foot wide strip of near surface soil that contains elevated lead concentrations above RBCs remains along the northern property boundary, and portions of the western property near the entrance off of 1st Street.
- Benzo(a)pyrene in soil in the vicinity of TP-13
- Groundwater in the former lathe and barker areas may contain benzo(a)pyrene above RBCs.

Given the history of the Site and the fact that during previous investigations it was not practicable to sample all potentially impacted areas, for the purposes of this CMMP it is assumed that impacted soil and/or groundwater may be encountered anywhere on the Site. During development or subsurface-disturbing activities, any areas with evidence of impacts, either visual or olfactory, will also become restricted areas subject to this CMMP.

The surveyed boundaries of the restricted areas are provided on Figure 4. The requirements outlined in this CMMP apply to all materials handled within these boundaries and within any additional suspect areas discovered during development i.e. where visual or olfactory evidence of potential contamination is identified.

3 PROTOCOLS FOR SUBSURFACE-DISTURBING ACTIVITIES

The following protocols shall be followed whenever soil is disturbed by construction or other activities. This includes predevelopment activities, as well as activities during development and construction, that penetrate the surface. The protocols shall apply to all individuals in the construction areas during soil-disturbing activities. The procedures listed in this section may be superseded by the project-specific health and safety plan (HASP, as described in Section 3.3). The DEQ must be notified in all cases of planned soil-disturbing activities at the site.

3.1 Description of Soil-Disturbing Activities

The details of future redevelopment activities are currently unknown; however, it is reasonable to expect that the placement of utilities and/or construction of building foundations may require excavation into areas of known contamination or areas discovered to be impacted based on visual and olfactory evidence. Any substantive breach of the existing ground surface must be conducted under the terms of this CMMP, and shall be performed by qualified personnel as described in Section 3.2. Contaminated soil generated by breach of the existing ground surface must be characterized and managed under the protocols defined in Section 4.

3.1.1 Cap

Because of contamination in shallow soil in the lathe area, it is required that a cap be maintained in that area of the Site in the event that contamination remains. Currently, the lathe area is covered by the concrete foundation remnant of the veneer mill, and therefore there is no current risk of exposure.

If the foundation is removed during development, it will be necessary to replace it with a cap unless residual soil contamination is removed to acceptable levels. The cap may incorporate proposed buildings, pavement, and other improvements constructed as part of the site redevelopment. It is expected that the cap installation will take place during, and will be coordinated with, site redevelopment activities. If material is imported on site to be used as a cap (or component of a cap) it must meet clean fill criteria[4].

3.2 Qualified Personnel

All on-site activities during which workers will come into direct contact with known contaminated soil or groundwater must be conducted by "qualified personnel," as defined below. Each worker must be familiar with the site HASP, which is designed to identify, evaluate, and control safety and health hazards, and to provide protocols for emergency response.

As required by the federal Occupational Safety and Health Administration (OSHA) regulations (29 Code of Federal Regulations § 1910.120 and § 1926.65), workers in any portion of the Site that has been designated a restricted area and that has not been covered by an engineered cap, and any workers who will come in contact with known contaminated soils, must be qualified personnel—i.e., must have completed 40 hours of OSHA-approved hazardous waste operations and emergency response (HAZWOPER) training before beginning work and must have at least three days of field experience under a trained, experienced supervisor. Managers and supervisors directly responsible for work in contaminated soil must have an additional eight hours of specialized training in hazardous waste management supervision.

For the remainder of the Site, i.e., areas that are not designated as restricted, at a minimum, managers and supervisors directly responsible for work will have completed the 40-hour

[4] DEQ Internal Management Direction, Clean Fill Determinations. Prepared by the Oregon Department of Environmental Quality. July 23, 2014.

HAZWOPER training. If contamination is observed during ground-disturbing activities, soil will require stabilization, segregation, and analysis under the direction of these managers/supervisors.

3.3 Health and Safety

All activities that have the potential to disturb contaminated site soil or groundwater shall be completed with appropriate protections defined by a project-specific, approved HASP. The HASP shall, at a minimum, set forth requirements and protections for working in areas of chemical contamination, and shall include:

- COCs/site background
- Personal protective equipment
- Personal hygiene/decontamination protocols
- Medical surveillance
- Hazard communication and site control
- Recordkeeping and reporting

In addition to the items listed above, physical hazards associated with predevelopment building remnants and uneven ground elevation should be considered. Physical hazards such as these are not addressed in this CMMP and should be managed during specific event/site use planning.

3.4 Notification and Reporting

The City or any subsequent Site owner must notify the DEQ at least seven days before starting any project that will substantively disturb soil at the Site in known restricted areas. The notification must include a general description of the activity, the location of the activity, the project schedule, and the anticipated volumes of contaminated soil to be managed. The notification will describe soil characterization procedures, disposal and/or storage locations of any excavated soil (i.e., whether it will be managed on site or transported off site), and the intended disposal methods.

The City or subsequent owner must notify DEQ within 48 hours upon discovery or observation of previously unknown contamination during site development activities.

3.5 Recordkeeping

Within 60 days following the completion of each project involving contaminated soil disturbance, the management of contaminated soil will be documented in a construction summary report submitted to the DEQ. The report shall include:

- A description of the activities that resulted in management of contaminated soil, including excavation and on-site disposal locations
- Estimated quantities of contaminated soil managed
- Results of soil sampling and analysis, if any

- Volumes and locations of soil disposed of off-site, and bills of lading and/or hazardous waste manifests
- Photographic documentation and mapping (including surveyed excavation limits for projects involving soil excavation) to show the location of the disturbed area(s) and cap construction
- Survey mapping of soils managed on site

The property owner must permanently maintain the records and provide them to any subsequent property owner.

4 MANAGEMENT OF EXCAVATED SOIL

Given the expected long-term use of this plan (and future versions), during planning for development or other activities involving earthwork, the responsible party (the City or a subsequent owner) will review underlying risk criteria (e.g., DEQ RBCs) and waste-handling and disposal regulations to ensure that procedures outlined in this plan meet statutory requirements.

4.1 Waste Characterization

Soil removed from the site for disposal may contain hazardous substances that are regulated under federal or State of Oregon solid or hazardous waste rules. Consequently, the soil must be adequately characterized, as described below, before its removal from the site, to ensure compliance with these regulations.

Waste characterization for Restricted Area soils may rely on existing data. Note however, that receiving waste facilities may require additional characterization sampling.

Field screening methods, including visual, olfactory, sheen tests, and the use of a photoionization detector (PID) meter, will need to be utilized during excavation activities in order to help identify potentially contaminated soil that was previously undiscovered. Should new soil contamination (actual or suspect) be discovered, characterization will be required. The specific sampling and analysis approach should be established with DEQ consultation, as well as communications with the planned disposal facility (for waste profiling). Generally, based on knowledge of historical site uses and previously confirmed contaminant types and levels, characterization will likely include one or more of the following: DRO, ORO, PAHs, volatile organic compounds (VOCs), Resource Conservation and Recovery Action (RCRA) 8 metals, and polychlorinated biphenyls.

The sampling regimen will be established based on site-specific conditions, with the following provided as general guidance – each 100-cubic-yard stockpile should be sampled using a five-point composite sampling approach. Each composite sample should be tested for one or more of the contaminant classes listed in the preceding paragraph. The analytical results should be compared to the criteria under code of federal regulations 40 CFR 261.24. Specifically, the "20 times rule" should be applied to determine if any of the tested compounds could fail the toxicity characteristic leaching procedure (TCLP) test, and if so TCLP testing should be conducted for those compounds.

If soil does not exhibit the toxicity characteristic and does not otherwise contain residue defined in Oregon Administrative Rules (OAR) 340-101-0033(2)[5], it can be managed and disposed as solid waste. If contaminant levels meet DEQ clean fill criteria the soil can be used without restrictions.

4.2 Screening/Handling

Mechanical screening methods, if conducted in a manner that minimizes dust generation, may be employed to separate contaminated soil from inert, oversized material (e.g., rocks and concrete). Contaminated soil must be managed as described in Section 4.4, but oversized rocks and concrete may be used for on-site fill or crushed and used as aggregate. Other oversized debris (wood, metal, solid waste) will be transported off site and disposed of appropriately. If any on-site or off-site recycling options are identified for other inert materials during final design or construction, the entity conducting the work (the City or a subsequent property owner) will coordinate with and seek approval from the DEQ before completing such recycling.

4.3 Stockpiling

Any potentially contaminated soil excavated at the Site and temporarily stockpiled shall be managed in a manner that minimizes erosion, contact with stormwater runoff, and worker contact, unless the soil is immediately placed into its final on-site disposal location or is loaded in trucks for off-site disposal.

Soil to be temporarily held on site shall be placed in stockpiles on an impervious surface or on 10-mil plastic sheeting (or similar material). The stockpile shall be covered with plastic sheeting at the end of each workday to prevent erosion, dust generation, and direct contact by humans. The plastic sheeting that covers the pile must be regularly inspected to ensure that it remains functional and protective of human health and the environment. In the event of precipitation, berms to restrict runoff from the stockpiles should be constructed. Temporary stockpiles of contaminated soil must be capped or properly disposed of off-site within 180 days of completion of excavation work, unless written approval is obtained from the DEQ for an alternative schedule.

Soil stockpiled for a longer term (e.g., for incorporation into redevelopment) must be placed on a geotextile fabric to prevent mixing with the underlying soil, and covered with a cap consisting of a demarcation layer and 6 inches of crushed rock, or a DEQ-approved geomembrane (see Section 6.3).

[5] Unless specific evidence is discovered regarding the presence of discarded commercial chemical products, off-specification species, container residues and residues thereof meeting the criteria specified in OAR 340-101-0033(2) and 40 CFR 261.33(e) and (f), OAR 340-101-0033(2) does not apply.

Following the stockpile removal, the area beneath the separation material shall be inspected, and any remaining stockpile soil shall be scraped, swept, or otherwise removed and properly disposed of.

4.4 Disposition of Excavated Soil

All soil excavated from the restricted areas or from areas with visual and olfactory evidence of impacts should be assumed to contain hazardous constituents above acceptable risk levels unless and until sampling and analysis as described in this plan demonstrate otherwise. Contaminated soil must be managed consistent with one of the methods described below.

4.4.1 Placement on Site

Movement of impacted soil or other material on the Site does not constitute generation of waste. The soil may be used as backfill for excavations, provided that it is covered by a cap.

4.4.2 Off-site Disposal

Soil to be disposed of off-site that is not a hazardous waste may be disposed of as special waste at a RCRA Subtitle D landfill.

Soil to be disposed of off-site that exhibits the characteristics of hazardous waste will be disposed of as hazardous waste at a subtitle C landfill unless it is treated (either on site or off-site) to render it nonhazardous. When managing soil falling under either the federal or state hazardous waste regulations, and to ensure compliance with current regulations, the party implementing this CMMP will consult with the DEQ. Regulations will be reviewed and standard waste profiling and disposal contracting processes will be followed to ensure regulatory compliance.

5 MANAGEMENT OF GROUNDWATER

In the event that groundwater is encountered during excavation and/or development activities in the former lathe and former barker areas, or visual/olfactory evidence indicates the potential for contamination, it will require characterization and management as outlined below. As with soil, RBCs and waste-handling and -disposal requirements applicable at the time of the planned work should be reviewed to ensure compliance.

5.1 Waste Characterization

Waste characterization for Restricted Area groundwater may rely on existing data. Note however, that receiving waste facilities may require additional characterization sampling.

Should new groundwater contamination (actual or suspect) be discovered, characterization will be required. The specific sampling and analysis approach should be established with DEQ consultation, as well as communications with the planned disposal facility (for waste profiling). Generally, based on knowledge of historical site uses and previously confirmed contaminant types and levels, characterization will likely include one or more of the following: diesel-range organics, VOCs, PAHs, and RCRA 8 metals.

5.2 Storage

Impacted groundwater that is first discovered during development activities will require pumping out and storage on site (e.g., in baker tanks), pending characterization data. Groundwater from an area with adequate in situ characterization data may be managed in a way that avoids temporary storage and moves directly to discharge (see Section 5.3 below).

5.3 Discharge of Dewatering Groundwater

When groundwater is found to be, or is already classified as, contaminated, it will require disposal at an off-site facility permitted to accept the waste. The contractor will be required to obtain the necessary permits approving dewatering discharge or disposal. The approved discharge method will depend on the water quality standards set forth in the permit. The specific permit requirements will also inform the need for additional sampling and monitoring. Monitoring could range from visual to periodic or regular sampling and analysis.

Dewatering pump rates will be monitored and documented by the contractor during construction and will be documented in daily reports. Groundwater monitoring will be documented in daily, weekly, or monthly reports, depending on the requirements of the specific permit obtained.

6 CAP AND MAINTENANCE

This section describes the steps to be implemented in covering excavated soils while they are present on site, as well as implementation and maintenance of the final cover for contaminated soils that will remain at the Site.

6.1 Lathe Area Cap

Based on existing site characterization data, a cap is required over soils in the lathe area (see Figure 4) to prevent contact with impacted soil and to prevent erosion. The components of the cap are described above in Section 3.

6.2 Demarcation Layer

Should a cap be required during development, a demarcation layer will be placed between contaminated soils and the engineered cap. The demarcation layer will provide a visible indicator for future workers that soil under the liner is contaminated. The demarcation fabric may be a geogrid, brightly colored geotextile, or construction fencing. The demarcation layer should be placed only to separate "clean" soil from potentially contaminated soil, and should not be placed over any soil backfill that is considered clean.

In the event of damage to the demarcation layer during future redevelopment or excavation activities, the contractor responsible for the damage shall repair or replace the damaged portions.

6.3 Stockpile Covers

Excavated site soil that is stockpiled will be covered with plastic sheeting and tied down at the end of each workday.

If a stockpile is to be left in place for eventual use during redevelopment and remains in place for longer than 180 days, a long-term stockpile cover will be used. This cover will consist of a demarcation layer and 6-inch minimum thickness of crushed rock, and will be designed to resist erosion by wind and rain (alternative methods with equivalent performance are acceptable). The long-term stockpile cover will be assessed by an engineer every 120 days to ensure integrity, unless an alternative inspection period is approved.

6.4 Long-Term Cap Maintenance

The property owner shall inspect the lathe area cap annually to identify any cap deterioration. Photo-documentation comparing conditions from one year to the next will be used to assess deterioration. Cracks increasing by an average width of 0.5 inch or more in any 12 month period shall be regarded as deterioration requiring maintenance. Such cracks shall be repaired with caulk, grout, or a concrete patch material designed to inhibit exposure of surface water to underlying soils, which could result in water quality degradation. If such repairs are impractical, deteriorated concrete shall be replaced with at least 3 inches of new concrete or asphalt pavement.[6]

7 STORMWATER MANAGEMENT SYSTEM DESIGN CONSIDERATIONS

Currently, stormwater at the Site is managed through a combination of infiltration and the catch basin/outfall system formally associated with the Boise Veneer Mill. As the Site may be redeveloped and new stormwater management systems designed and constructed, it will be necessary to take into consideration known and potential areas of subsurface contamination. Specifically, if development plans include stormwater management through concentrated infiltration (e.g., stormwater retention

[6] If new areas requiring a cap are discovered, these maintenance requirements will apply (comparable monitoring and maintenance requirements shall be developed if cap materials other than concrete are used).

pond, drainage swale), then an evaluation will be conducted at that time to assess (1) if contaminants are present in the proposed area of infiltration, (2) if present, the leaching potential of contaminants that could be mobilized by the additional water influx, (3) specific site conditions such as distance to surface water and attenuation potential, and (4) mass flux and dilution upon release to surface water.[7] The specific evaluation approach and methodology will be established during design in consultation with the DEQ. In the context of this evaluation, the only applicable receptor scenario related to stormwater and stormwater impacts to groundwater would be ecological receptors affected by impacted stormwater/groundwater discharges to the surface.

National Pollutant Discharge Elimination System 1200-C permits may be required for stormwater control during construction activities. The City or subsequent owners will contact DEQ to determine if a 1200-C permit is required. If not, Best Management Practices will be employed to ensure that adequate stormwater quality is maintained.

LIMITATIONS

The services undertaken in completing this plan were performed consistent with generally accepted professional consulting principles and practices. No other warranty, express or implied, is made. These services were performed consistent with our agreement with our client. This plan is solely for the use and information of our client unless otherwise noted. Any reliance on this plan by a third party is at such party's sole risk.

The approach and processes contained in this plan apply to conditions existing when services were performed and are intended only for the client, purposes, locations, time frames, and project parameters indicated. We are not responsible for the impacts of any changes in environmental standards, practices, or regulations subsequent to performance of services. We do not warrant the accuracy of information supplied by others, or the use of segregated portions of this plan.

[7] As it relates to stormwater and stormwater impacts to groundwater, the only applicable receptor scenario would be ecological receptors affected by impacted stormwater/groundwater discharge to surface water since institutional controls specified in the PPA prohibit use of groundwater.

FIGURES

Site Address: 400 South 1st Street, St. Helens, Oregon 97051
Source: Aerial (07/8/2010) obtained from Esri, ArcGIS Online
Taxlot 100 plus portion of adjacent railroad right-of-way in
Section 03 of Township 04 North, Range 01 West

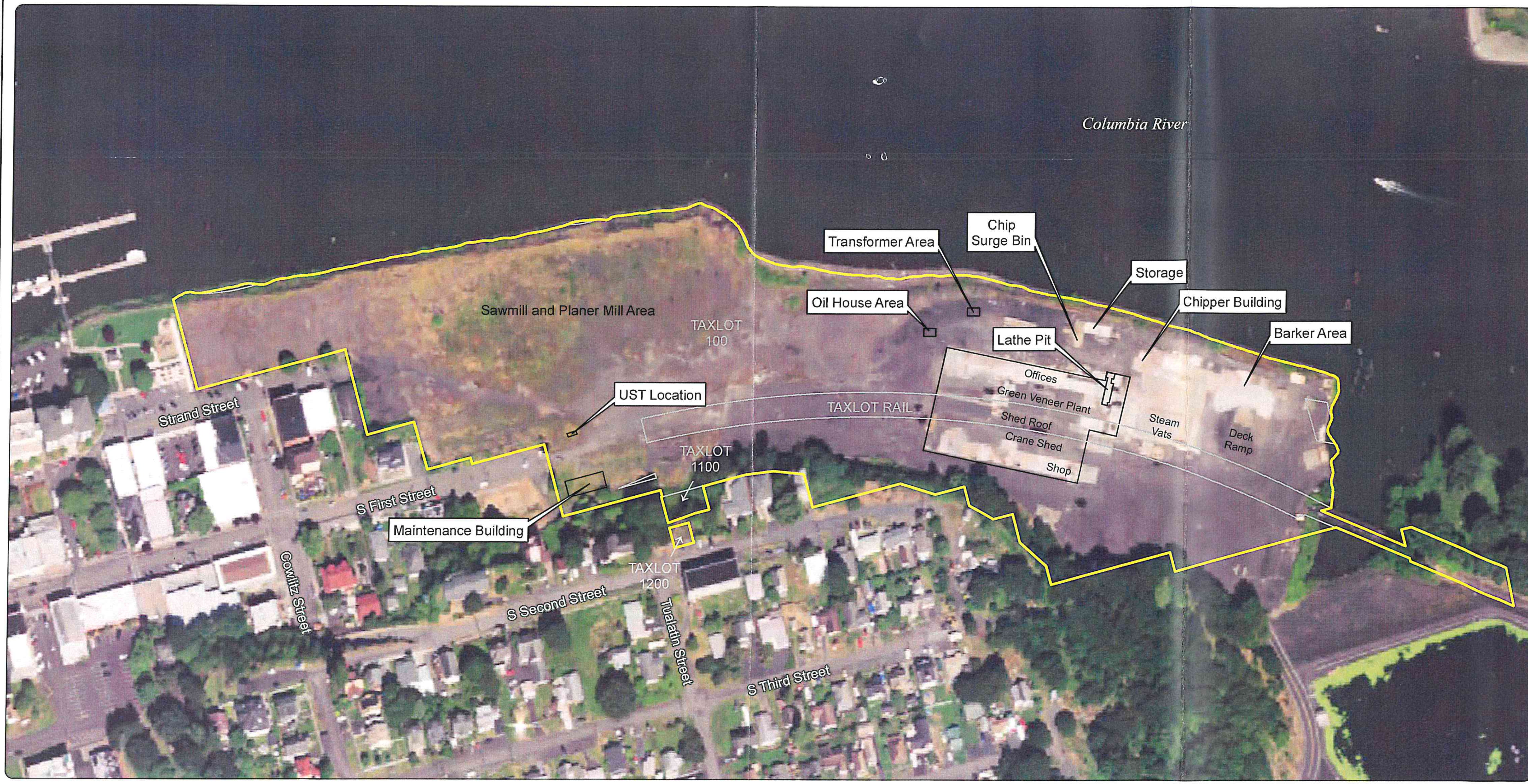
Figure 1
Site Location

City of St. Helens
St. Helens, Oregon

0 1,000 2,000
Feet

MAUL FOSTER ALONGI
p. 971 544 2139 | www.maulfoster.com

Path: X:\0830.01 City of St. Helens\01_Due Diligence Assistance\Projects\SDMMP\Fig1_Site Location_Aerial.mxd
Print Date: 4/15/2015
Approved By: mdandrea
Produced By: jschane
Project: 0830.01.01-04



Source: Aerial photograph (2014) obtained from the National Agriculture Imagery Program (NAIP).

Note: All site features are approximate and historic.
OHW = ordinary high-water

Legend

- Site Boundary (OHW)
- Tax Lots

0 100 200
Feet

Figure 2
Former Site Features

City of St. Helens
St. Helens, Oregon

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Path: X:\0830.01 City of St. Helens\01_Due Diligence Assistance\Projects\SDMMP\Fig2_Former Site Features.mxd
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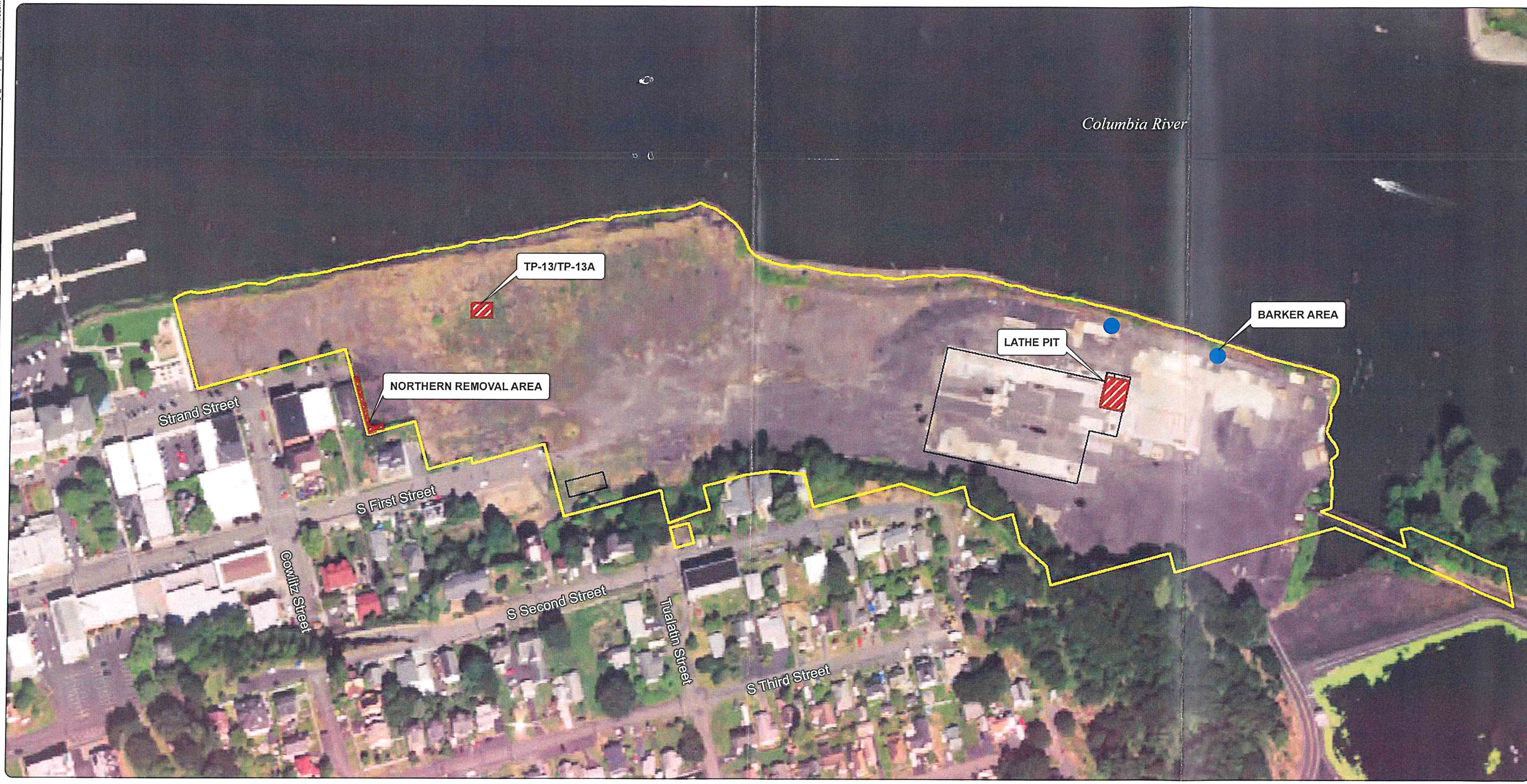
Approved By: mdandrea
Produced By: jschane
Project: 0830.01.01-04



Source: Aerial photograph (2014) obtained from the National Agriculture Imagery Program (NAIP).

Note:
OHW = ordinary high-water

Legend

- Soil Restricted
- Sample possibly containing elevated groundwater contamination
- Site Boundary (OHW)

0 100 200
Feet

Figure 3
Restricted Areas

City of St. Helens
St. Helens, Oregon

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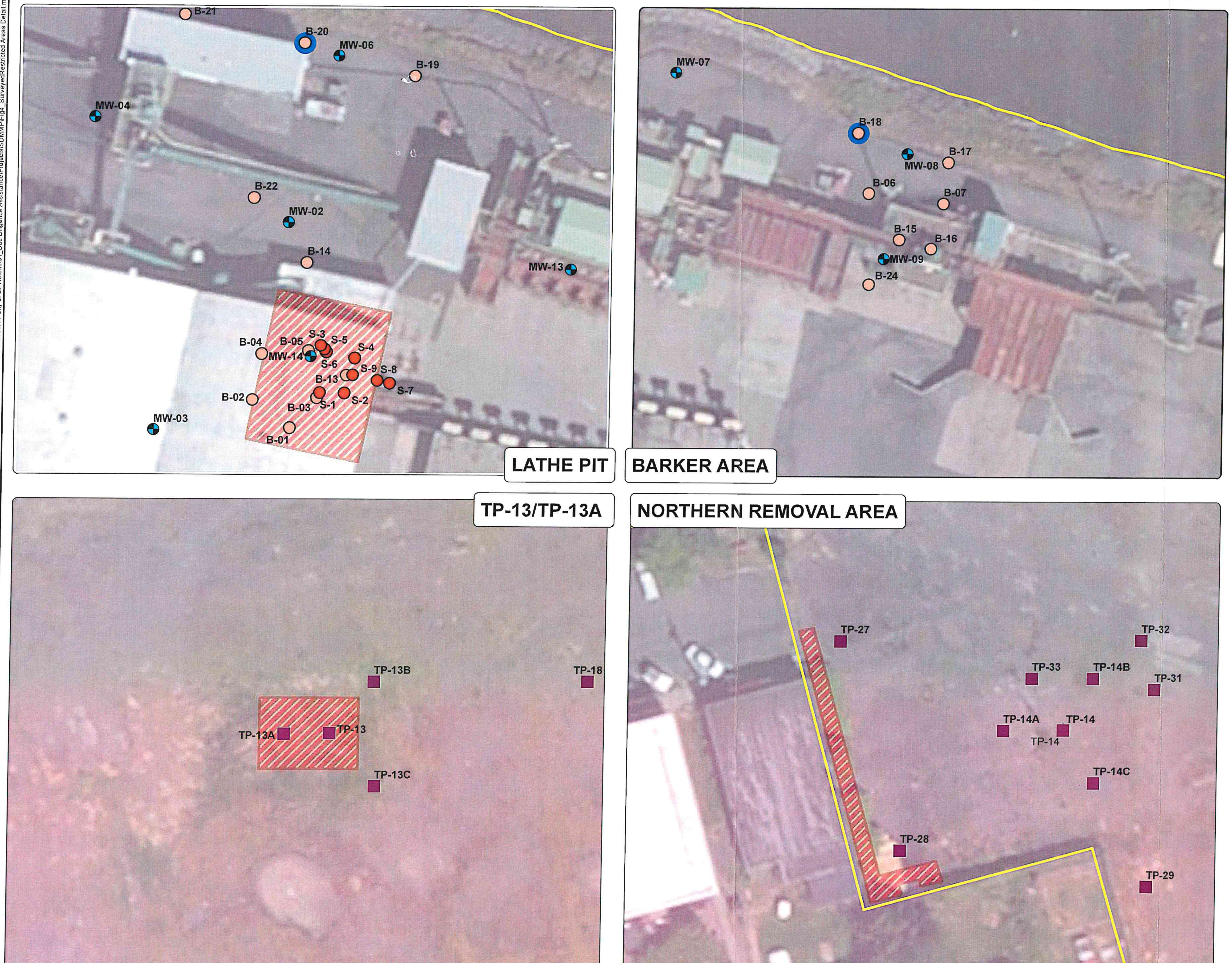
p. 971 544 2139 | www.maulfoster.com

Path: X:\0830.01 City of St. Helens\01_Due Diligence Assistance\Projects\SDMMP\Fig3_Surveyed_Restricted Areas.mxd

Project: 0830.01.01-04 Produced By: jaxelrod Approved By: mdandrea Print Date: 6/18/2015

Figure 4
Restricted Areas Detail

City of St. Helens
St. Helens, Oregon



Legend

- Site Boundary
- Lathe Pit
- Soil Restricted Area
- Sample possibly containing elevated groundwater contamination

SAMPLE LOCATIONS

- Soil Sample (2001)
- Boring (2013-2014)
- Test Pit (2014)
- Monitoring Well

0 20 40
Feet

Source: Aerial photograph obtained from Esri, ArcGIS Online; location of the lathe pit and sample locations TP-13A-C, TP-14A-C, and TP-27 through TP-37 (2014) digitized from figure provided by ERM; all other sample locations (2013-2014) obtained from AKS survey; 2001 sample locations obtained from hand-drawn map provided by Boise.

Note: All feature locations are approximate.

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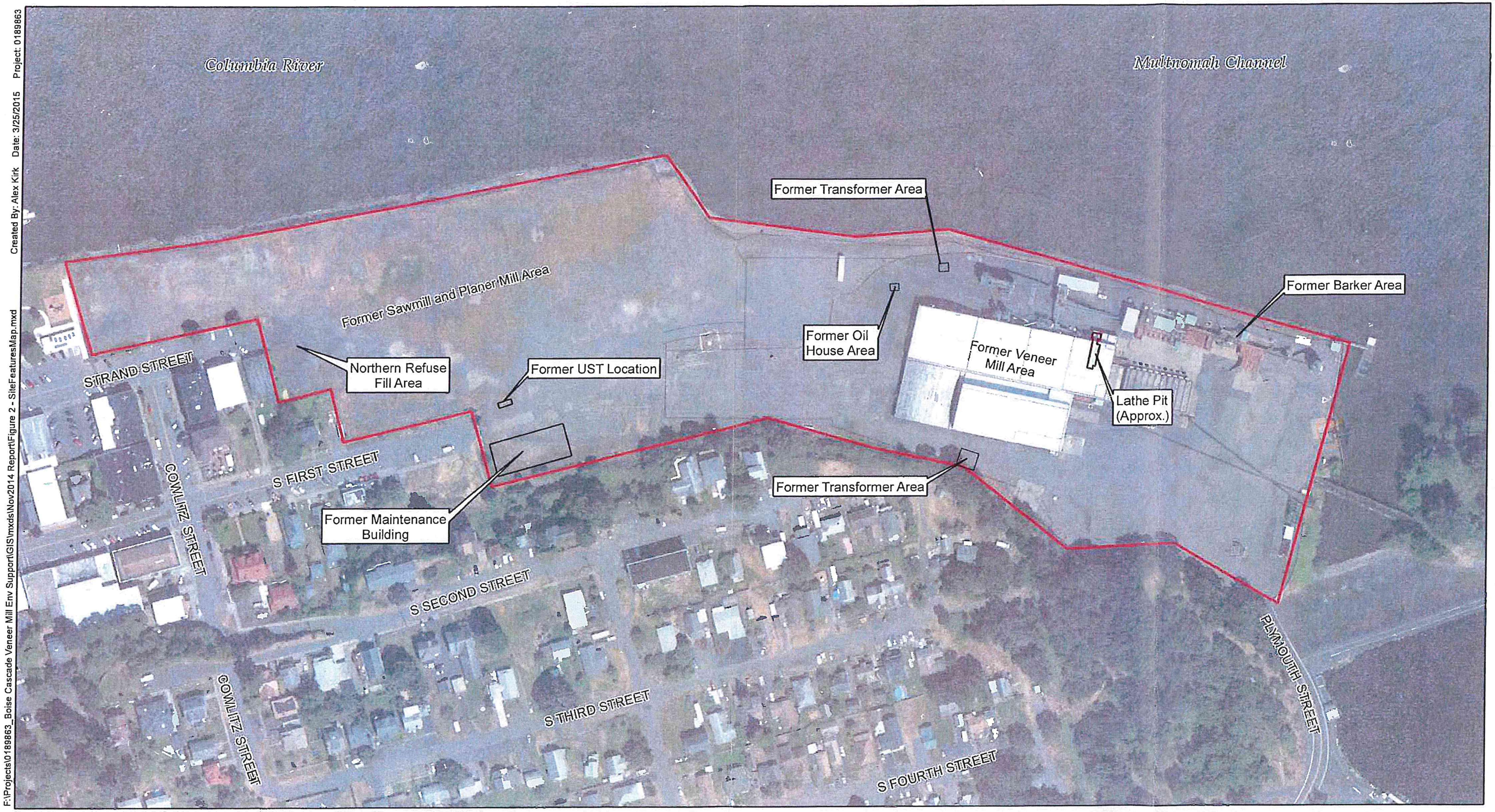
Path: X:\0830.01 City of St. Helens\01_Due Diligence Assistance\Projects\SDMMP\Fig4_SurveyedRestricted Areas Detail.mxd
Print Date: 6/18/2015
Approved By: mdandrea
Produced By: jaxelrod
Project: 0830.01.01-04



Legend

Site Boundary

N

0 87.5 175 350 Feet

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 2
Site Features
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204 ERM.

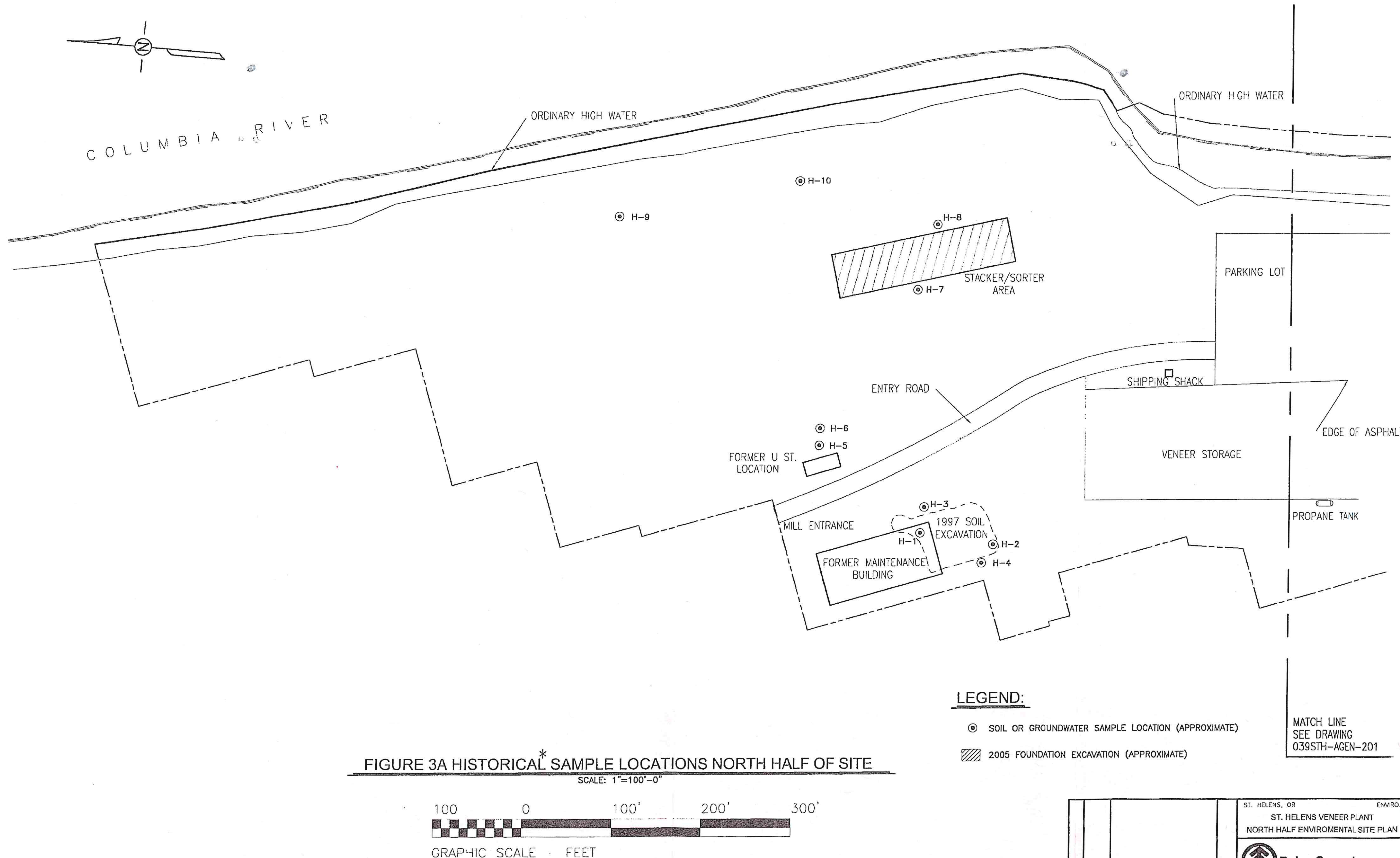


FIGURE 3A HISTORICAL* SAMPLE LOCATIONS NORTH HALF OF SITE

SCALE: 1"=100'-0"

* HISTORICAL SAMPLES WERE COLLECTED FROM 1996 THROUGH 2003

DATE: 01-20-15
PRELIMINARY

NO.	DATE	TABLE OF REVISIONS	BY
P3	01-20-15	GENERAL UPDATE	RJD
P2	01-30-14	PRELIMINARY	RJD
P1	09-03-13	PRELIMINARY	RJD

PLOT SCALE 600 — SEE DWG. REGISTER FOR LATEST REVISION # DO NOT SCALE DRAWING — SCALE 1"=50'

ST. HELENS, OR — ENVIRO.

ST. HELENS VENEER PLANT
NORTH HALF ENVIROMENTAL SITE PLAN

Boise Cascade
Engineering & Construction - Boise, Idaho

DATE 02-23-12 DR. RJD CHKD. – APP. –

JOB NO. – LOCATION – DWG TYPE – DWG NUMBER: 1110STH-AGEN-201 REV. P3

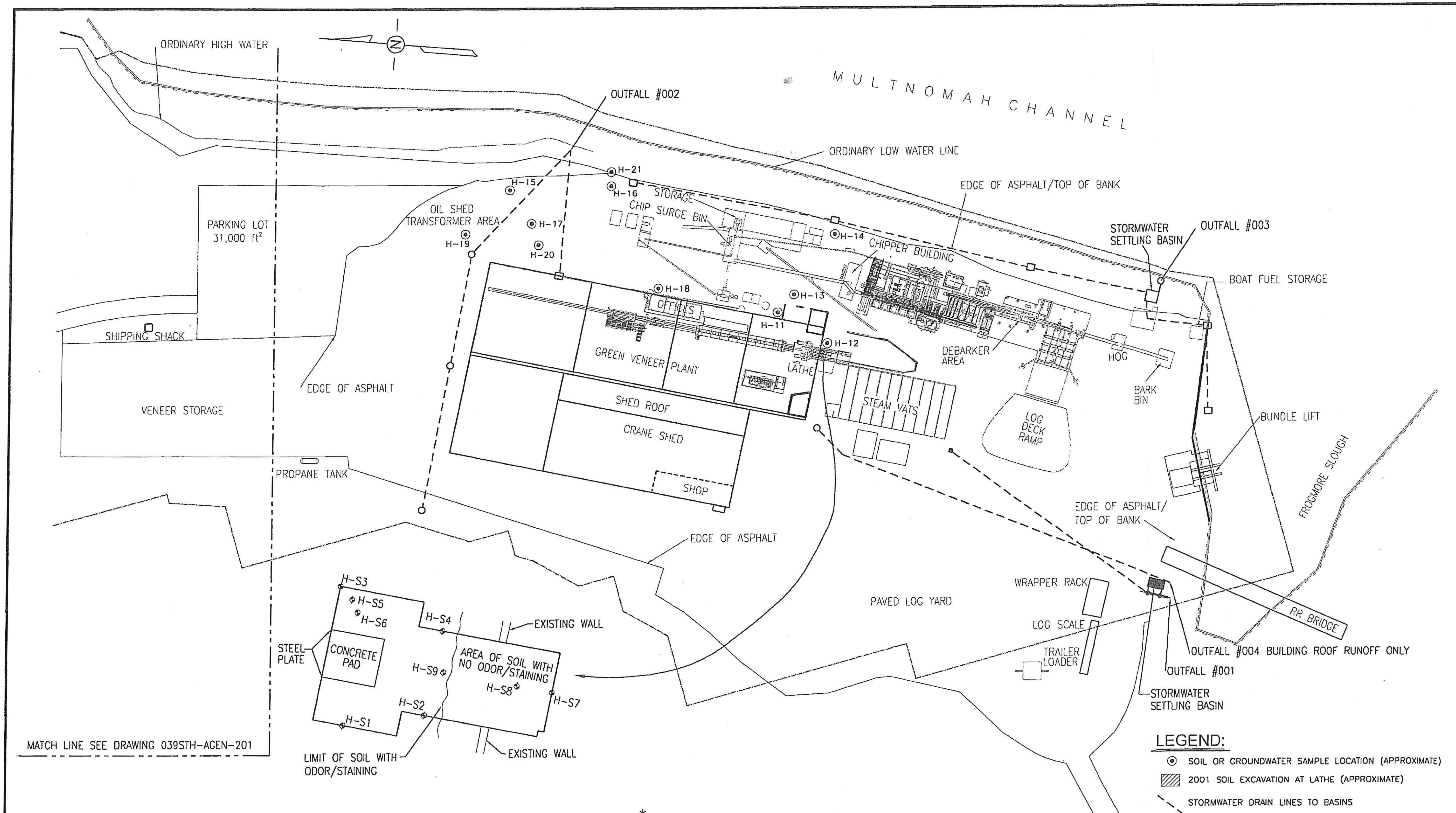


FIGURE 3B HISTORICAL* SAMPLE LOCATIONS SOUTH HALF OF SITE

SCALE: 1"=100'-0"

100 0 100' 200' 300'

GRAPHIC SCALE - FEET

* HISTORICAL SAMPLES WERE COLLECTED FROM 1996 THROUGH 2003

DATE: 04-01-15
PRELIMINARY

NO	DATE	TABLE OF REVISIONS	BY
P4	04-01-15	UPDATE SETTLING BASINS	RJD
P3	01-20-15	GENERAL UPDATE	RJD
P2	01-30-14	PRELIMINARY	RJD
P1	09-03-13	PRELIMINARY	RJD

PLOT SCALE 600 | SEE DWG. REGISTER FOR LATEST REVISION # DO NOT SCALE DRAWING | SCALE 1"=50'

ST. HELENS, OR. ENVIRO.

ST. HELENS VENEER PLANT
SOUTH HALF ENVIROMENTAL SITE PLAN

Boise Cascade
Engineering & Construction - Boise, Idaho

DATE 02-23-12 | DR RJD | CHKD – | APP –

JOB NO. LOCATION - DWG TYPE - DWG NUMBER: 1110STH-AGEN-202 | REV. P4

F:\Projects\0189863_Boise Cascade Veneer Mill Env Support\GIS\mxds\Nov2014 Report\Figure 4A - GeologicCrossSections.mxd Created By: Alex Kirk Date: 2/18/2015 Project: 0189863

Legend

- Monitoring Well
- Borehole (ERM)
- Borehole (Maul Foster)
- Test Pit
- A—A' Cross-Section

N

0 75 150 300 Feet

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 4A
Geologic Cross-Section Profiles
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.

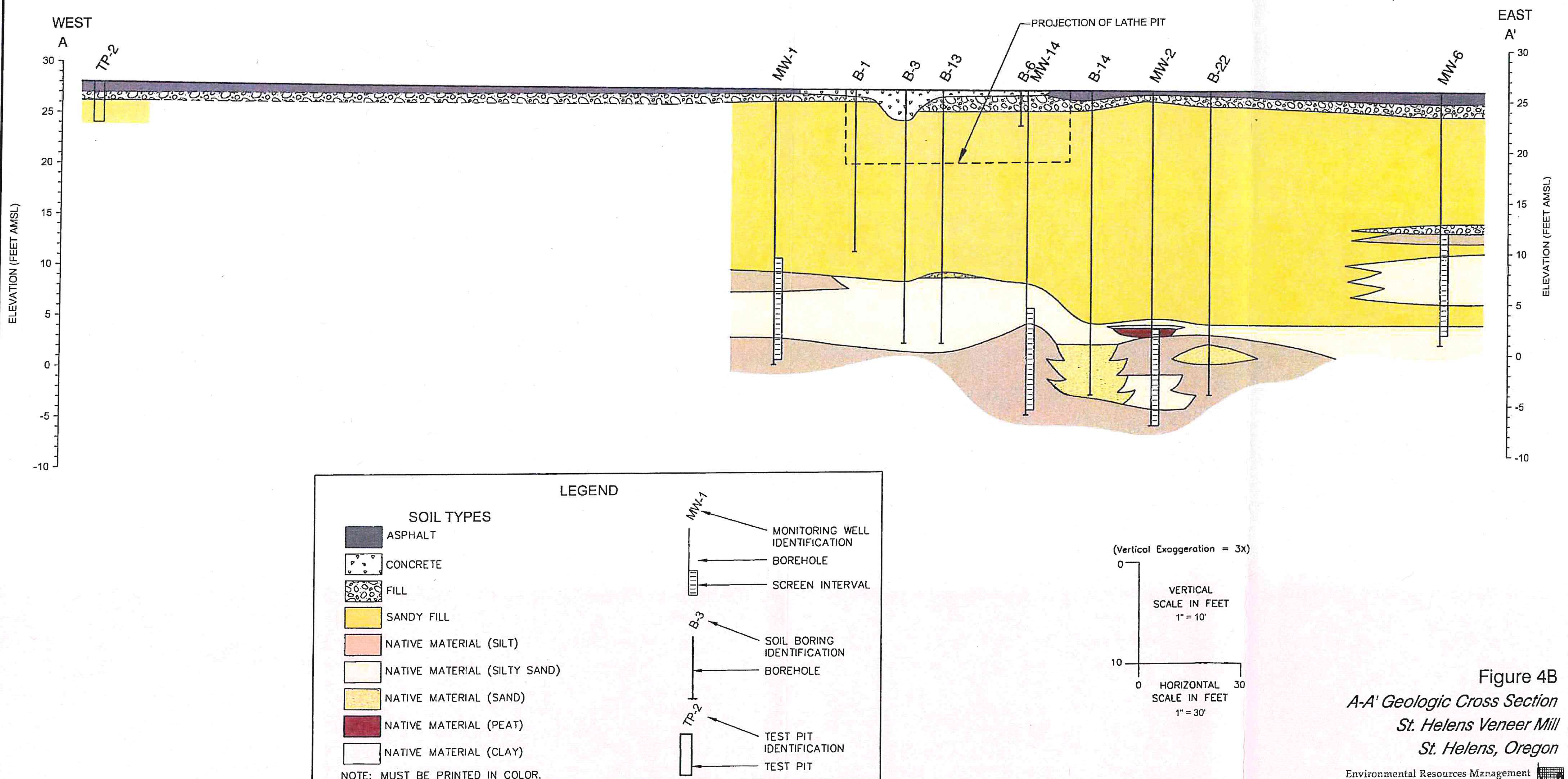
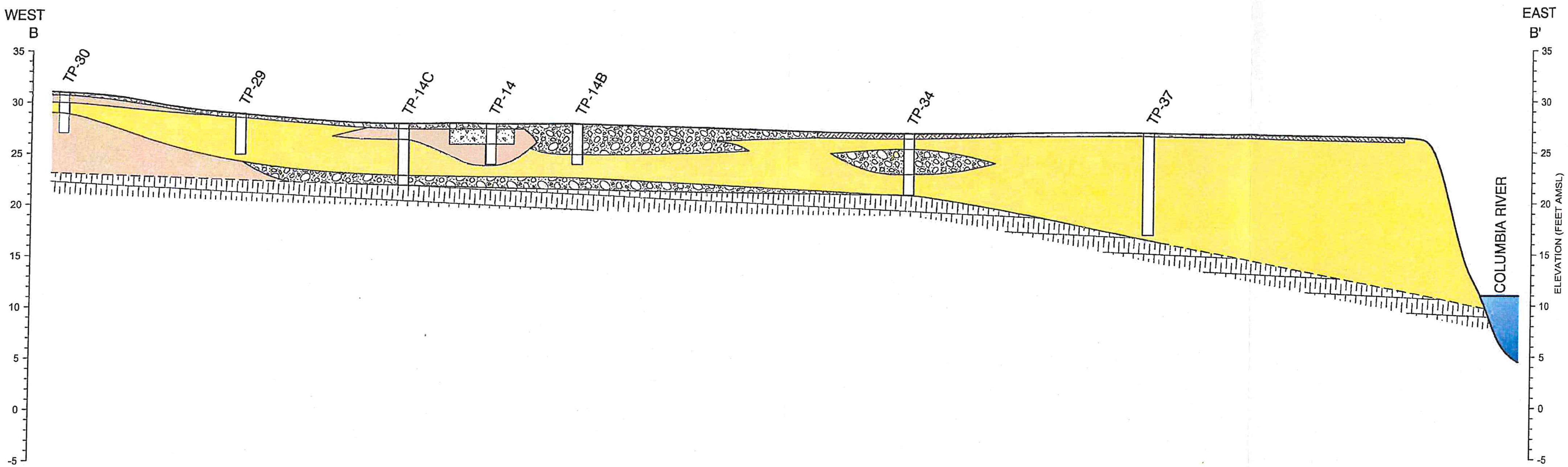


Figure 4B
A-A' Geologic Cross Section
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St., Suite 1010
Portland, Oregon 97204
ERM

CAD File: G:\\0273009\01\027300901-01.dwg Date: 03/11/15



LEGEND

SOIL TYPES

- CONCRETE
- FILL
- SANDY FILL
- SILTY FILL
- BASALT BEDROCK

TP-29 — TEST PIT IDENTIFICATION

TEST PIT

NOTE: MUST BE PRINTED IN COLOR.

(Vertical Exaggeration = 3X)

VERTICAL SCALE IN FEET 1" = 10' (0–10)

HORIZONTAL SCALE IN FEET 1" = 30' (0–30)

CAD File: G:\\0273009\01\027300901-01.dwg Date: 03/11/15

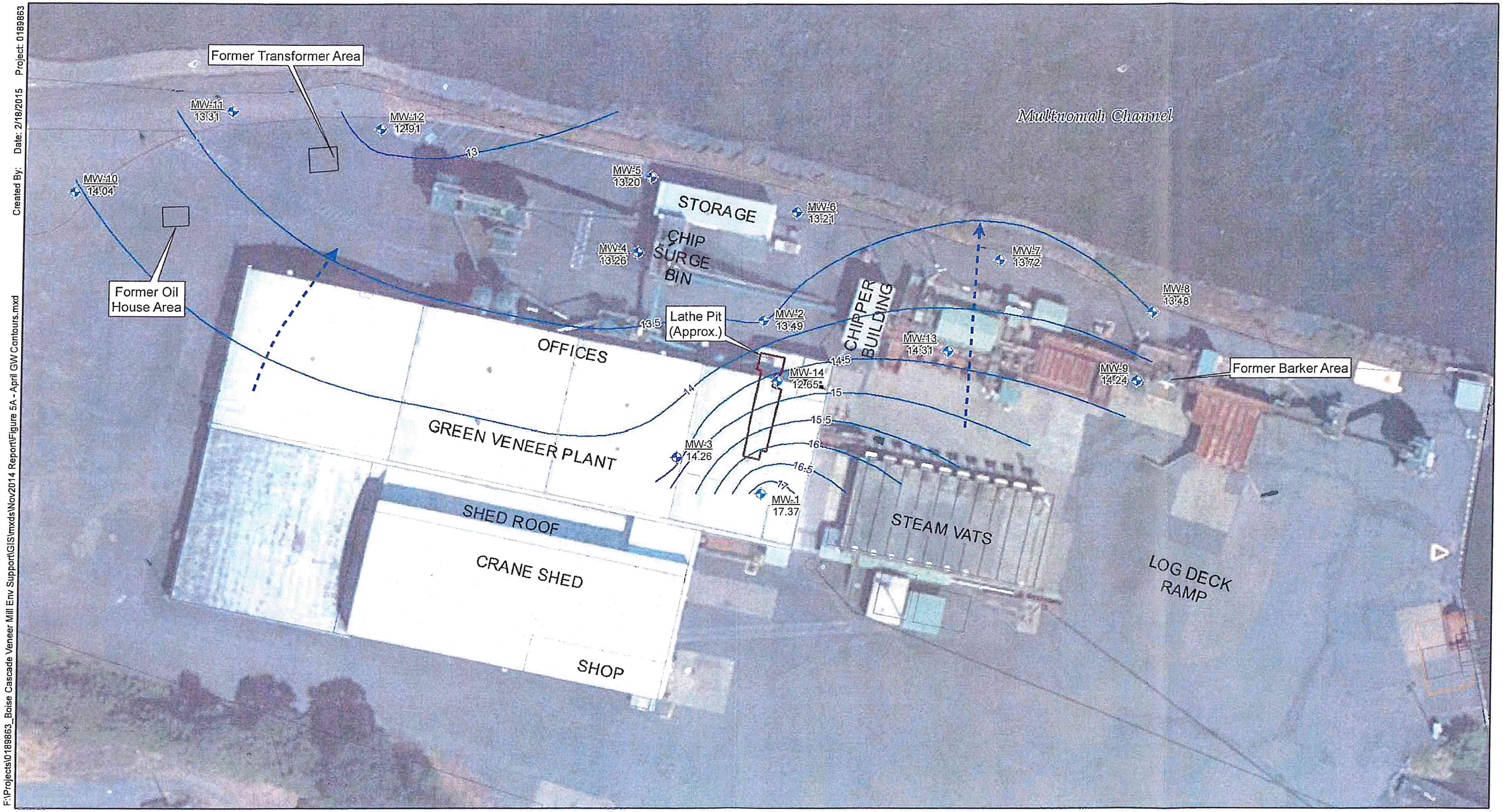
Figure 4C

B-B' Geologic Cross Section

St. Helens Veneer Mill

St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St., Suite 1010
Portland, Oregon 97204
ERM



Legend

- Monitoring Well (March 2014)
- Lathe Pit Boundary (Approximate)
- Groundwater Contour (0.5 ft)
- Groundwater Flow Direction

Notes:
* - Anamolous data not used in contouring
All groundwater elevations in feet above mean sea level, NAVD88

N

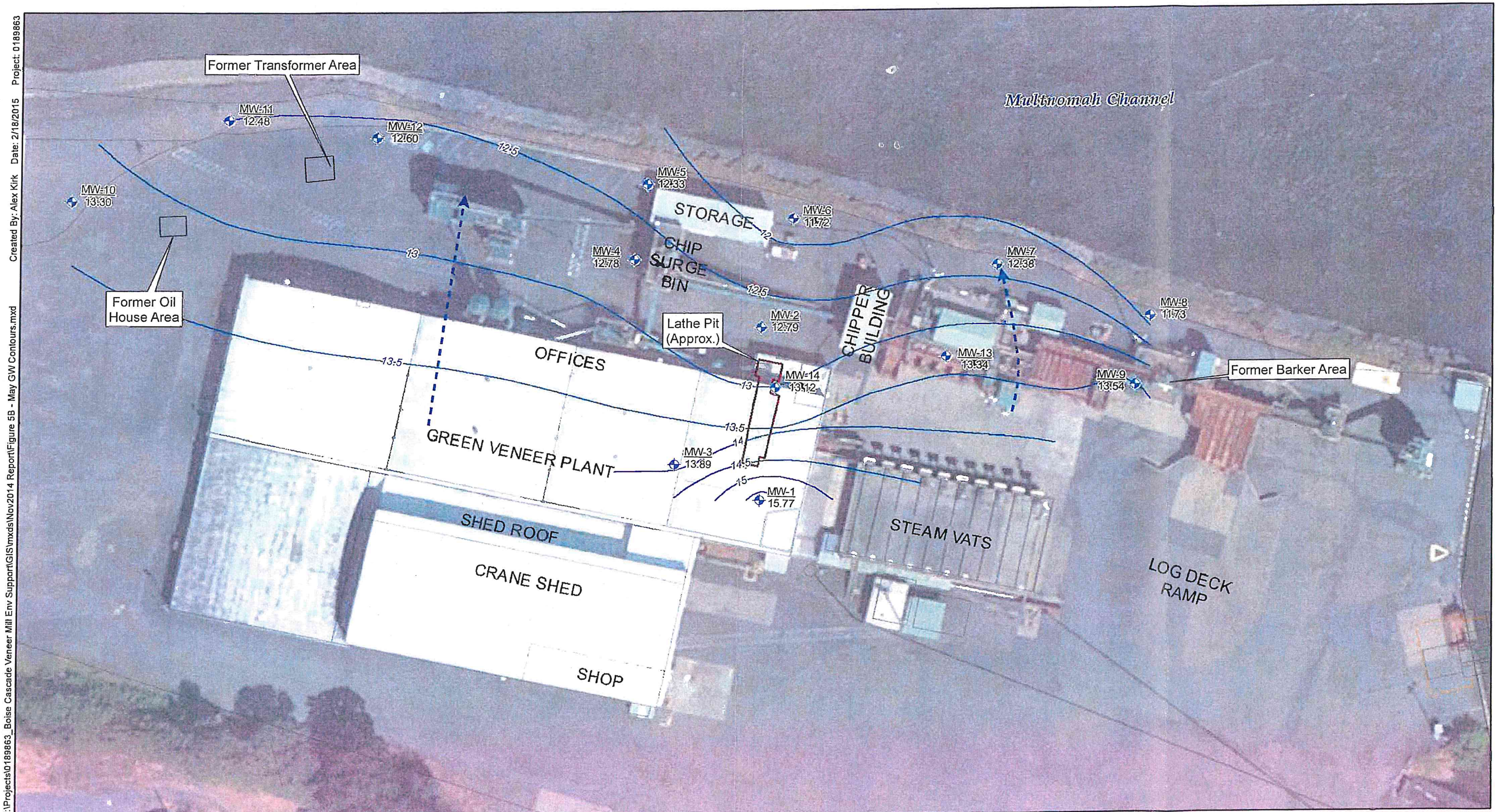
0 30 60 120 Feet

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 5A

Groundwater Contours April 3, 2014
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.



Legend

- Monitoring Well (March 2014)
- Lathe Pit Boundary (Approximate)
- Groundwater Contour (0.5 ft)
- Groundwater Flow Direction

Notes:
All groundwater elevations in feet above mean sea level, NAVD88

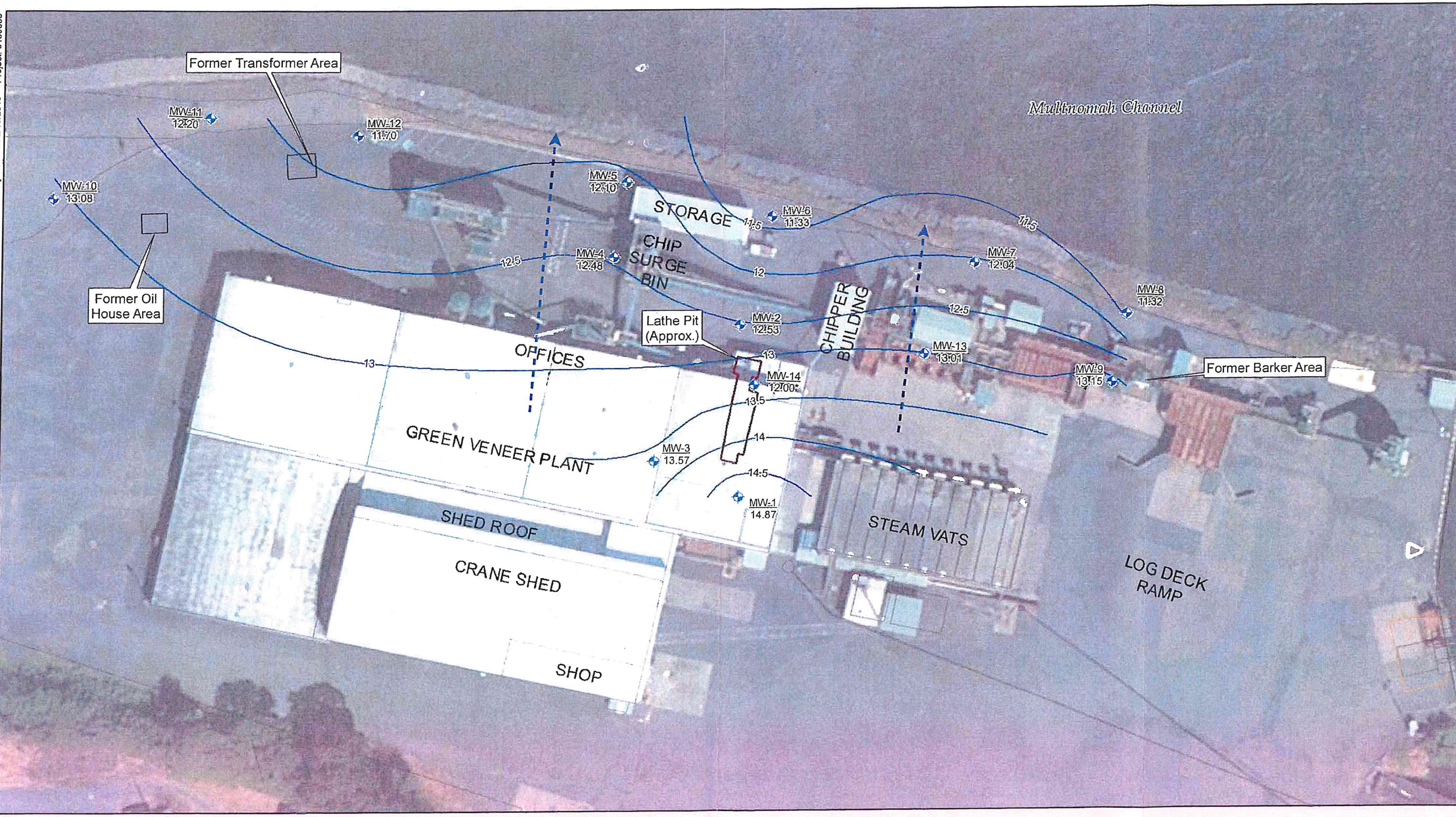
0 30 60 120 Feet

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 5B

Groundwater Contours for May 9, 2014
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.



F:\Projects\0189863_Boise Cascade Veneer Mill Env Support\GIS\mxds\Nov2014 Report\Figure 5C - June GW Contours.mxd

Created By: Date: 2/18/2015 Project: 0189863

Legend

- Monitoring Well (March 2014)
- Lathe Pit Boundary (Approximate)
- Groundwater Contour (0.5 ft)
- Groundwater Flow Direction

Notes:
* - Anamolous; not used for contouring
All groundwater elevations in feet above mean sea level, NAVD88

N

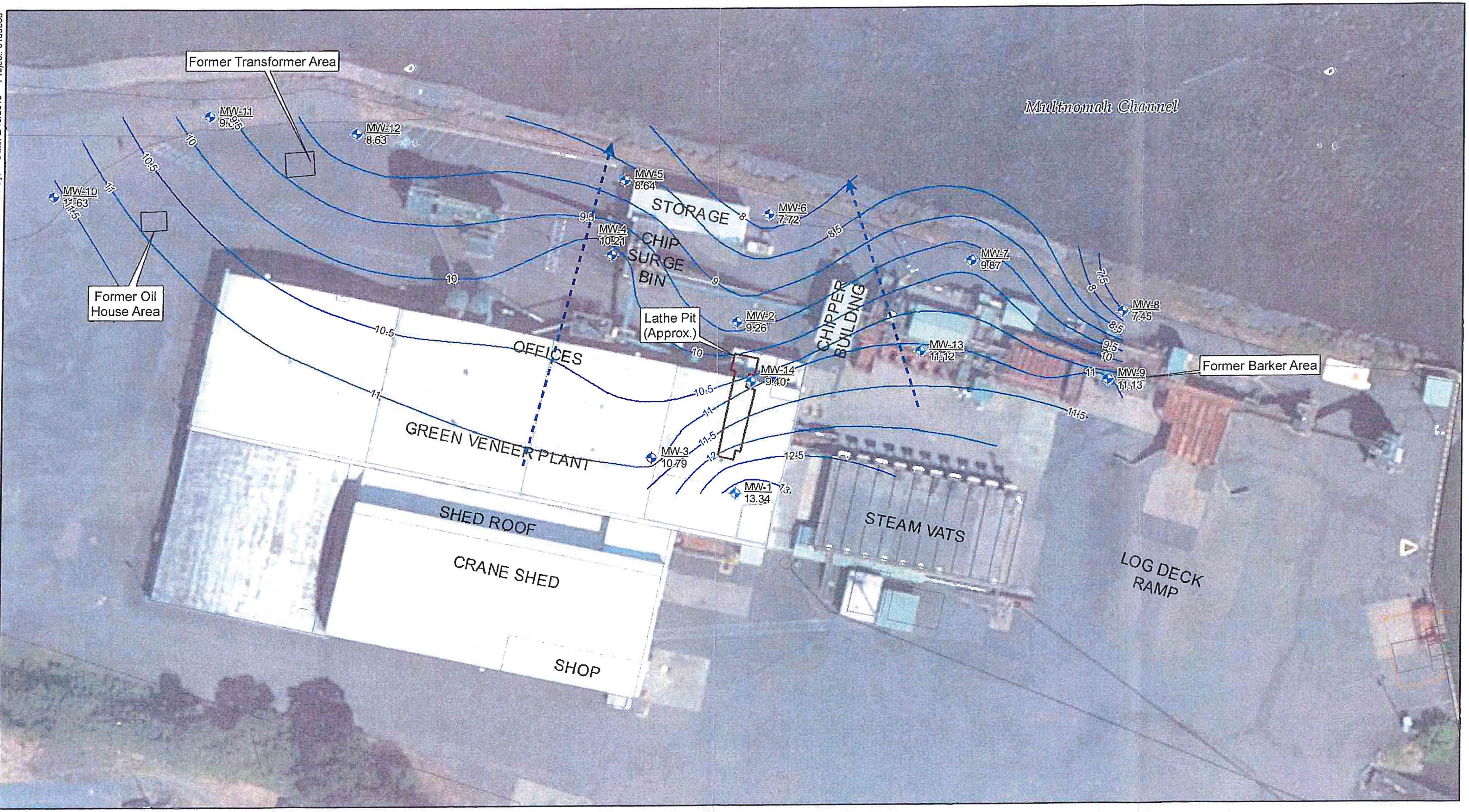
0 30 60 120 Feet

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 5C
Groundwater Contours June 12, 2014
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204 ERM.

F:\Projects\0189863_Boise Cascade Veneer Mill Env Support\GIS\mxds\Nov2014 Report\Figure 5D - Sept GW Contours.mxd Created By: Date: 2/18/2015 Project: 0189863



Legend

- Monitoring Well (March 2014)
- Lathe Pit Boundary (Approximate)
- Groundwater Contour (0.5 ft)
- Groundwater Flow Direction

Notes:
* - Anamolous; not used for contouring
All groundwater elevations in feet above mean sea level, NAVD88

0 30 60 120 Feet

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 5D
Groundwater Contours Sept. 24, 2014
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204 ERM.

F:\Projects\0189863_Boise Cascade Veneer Mill Env Support\GIS\mxds\Nov2014 Report\Figure 6A - SampleLocations.mxd
Created By: Alex Kirk Date: 2/18/2015 Project: 0189863

Legend

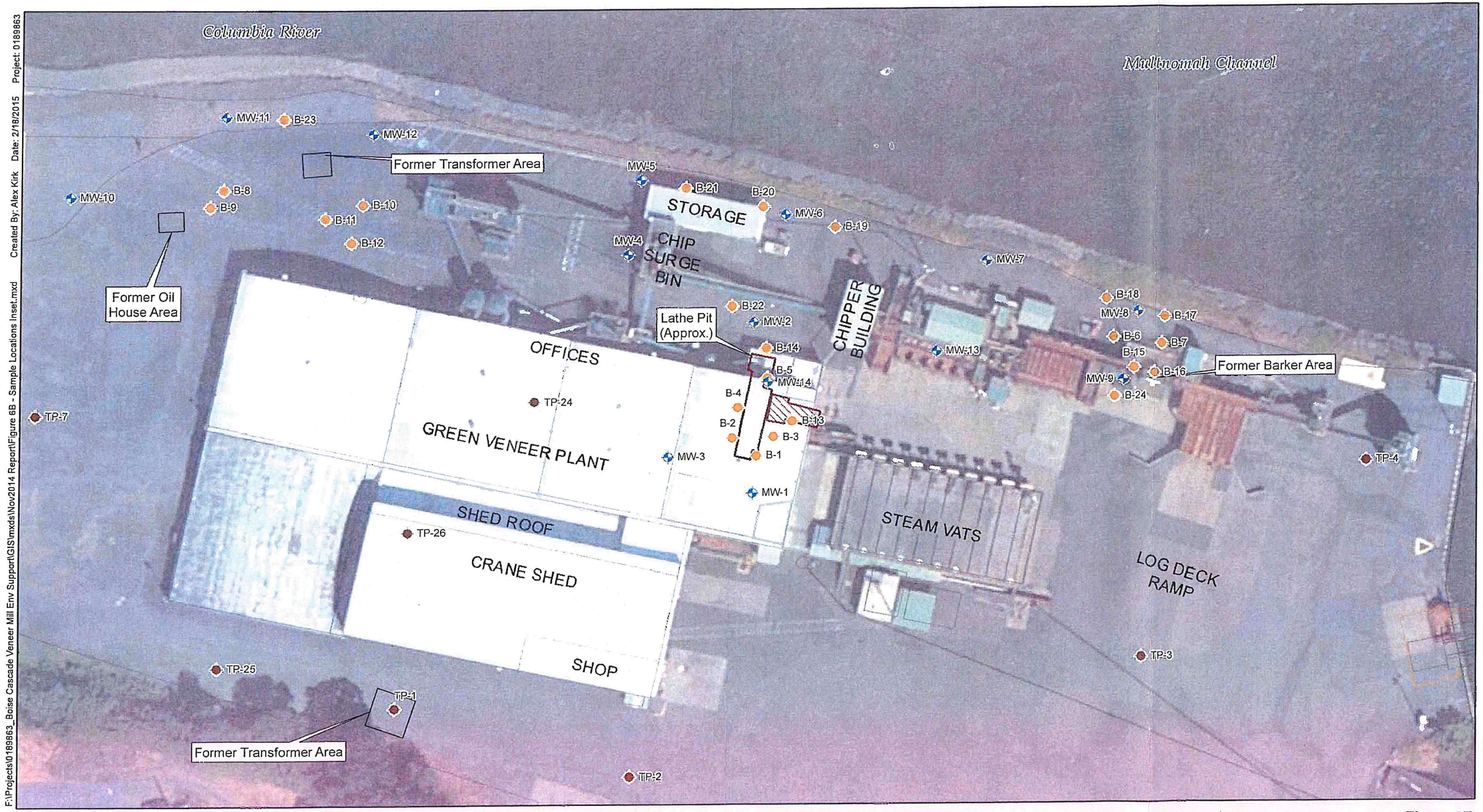
- Monitoring Well
- Borehole (ERM)
- Borehole (Maul Foster)
- Test Pit

0 75 150 300 Feet

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 6A
Borehole, Test Pits, and Monitoring Well Locations
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.



Legend

- Monitoring Well
- Borehole (ERM)
- Borehole (Maul Foster)
- Test Pit
- Lathe Pit Boundary (Approximate)
- 2001 Lathe Soil Excavation

N

0 30 60 120 Feet

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 6B

Borehole, Test Pits, and Monitoring Well Locations Inset
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM

Legend

- Monitoring Well
- Borehole (ERM)
- Borehole (Maul Foster)
- Test Pit

Notes:
Results shown for all organic constituents exceeding one or more screening levels.
All soil results are reported in milligrams per kilogram (mg/kg).
B(a)P - Benzo(a)pyrene
B(b)F - Benzo(b)fluoranthene
D(a,h)A - Dibenz(a,h)anthracene

N

0 75 150 300 Feet

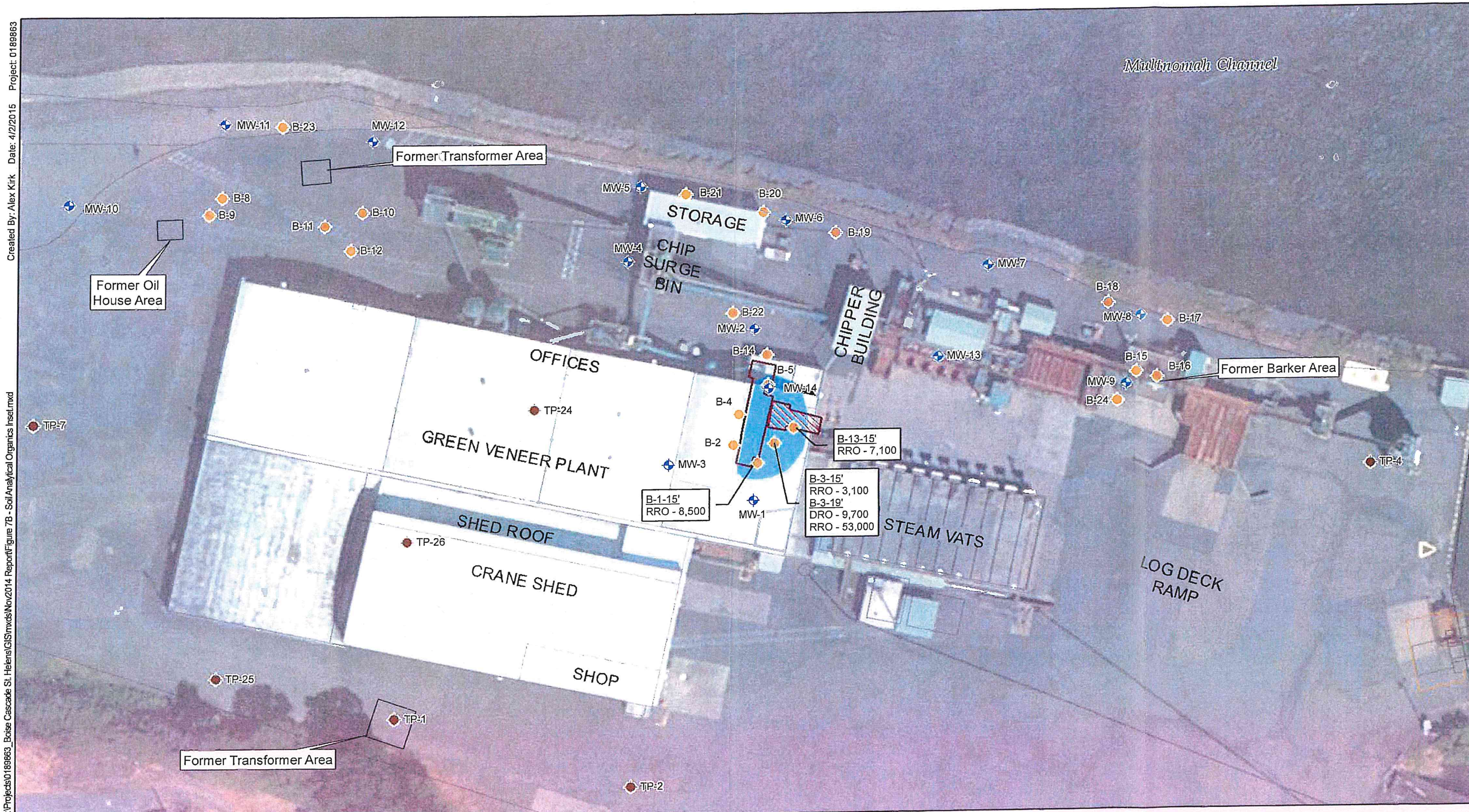
Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 7A
Soil Sample Analytical Results -
Organic Constituents Exceeding Screening Level
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.

Created By: Alex Kirk Date: 4/2/2015 Project: 0189863

F:\Projects\0189863_Boise Cascade St. Helens\GIS\mxds\Nov2014 Report\Figure 7B - Soil Analytical Organics Inset.mxd



Legend

- Monitoring Well
- Borehole (ERM)
- Borehole (Maul Foster)
- Test Pit
- Lathe Pit Boundary (Approximate)
- Extent of Petroleum Contaminated Soil (Approximate)
- 2001 Lathe Soil Excavation

Notes:
Results shown for all organic constituents exceeding one or more screening levels
All soil results are reported in milligrams per kilogram (mg/kg)
DRO - Diesel Range Organics
RRO - Residual Range Organics

Z

0 30 60 120 Feet

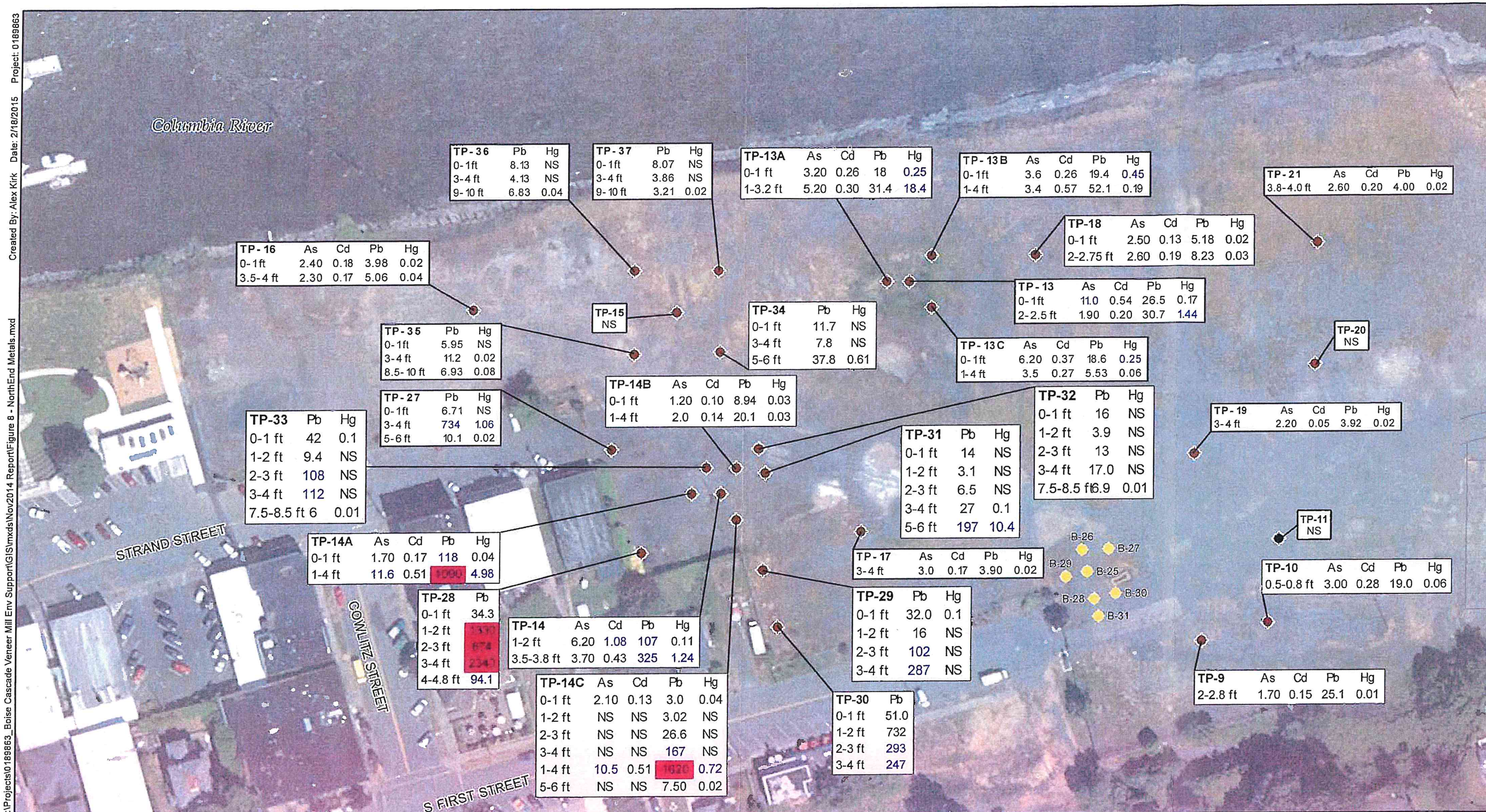
Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 7B

Soil Sample Analytical Results Inset - Organic Constituents Exceeding Screening Level
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.

F:\Projects\0189863_Boise Cascade Veneer Mill Env Support\GIS\mxds\Nov2014 Report\Figure 8 - NorthEnd Metals.mxd Created By: Alex Kirk Date: 2/18/2015 Project: 0189863



Legend

- Monitoring Well
- Borehole (ERM)
- Borehole (Maul Foster)
- Test Pit

Notes:
As - Arsenic
Cd - Cadmium
Pb - Lead
Hg - Mercury
0.38 - Exceeds the March 2013 ODEQ Regional Background Metals Concentrations in Soil.
1.23 - Exceeds one or more applicable risk-based standards.
NS - Not Sampled

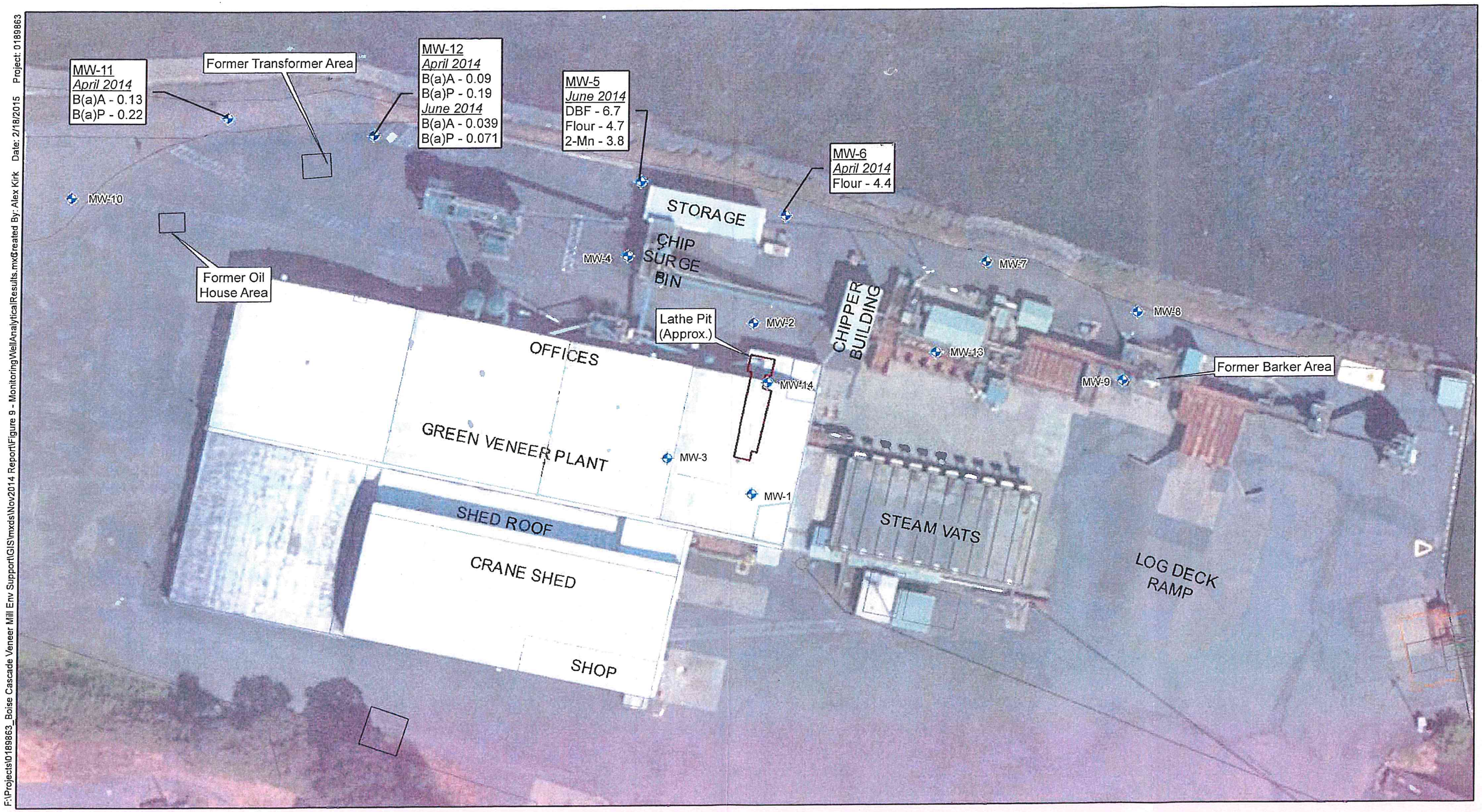
N

0 40 80 160 Feet

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 8
Soil Sample Analytical Results - Metals
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.



Legend

Surveyed Locations

- Monitoring Well (March 2014)
- 2001 Soil Excavation at Lathe (Approximate)

Notes:
Results shown for all organic constituents exceeding one or more screening levels.
Samples collected April and June 2014.
All groundwater results are reported in micrograms per liter (µg/L)
B(a)A - Benzo(a)anthracene
B(a)P - Benzo(a)pyrene
DBF - Dibenzofuran
Flour - Flourene
2-Mn - 2-Methylnaphthalene

N

0 30 60 120 Feet

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 9
Monitoring Well Analytical Resutls
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204 ERM.

Legend

- Test Pit (ERM)

Notes and Key:
ft bgs = feet below ground surface
To Be Removed = Soils to be excavated and transported off-site
To Be Stockpiled = Soils to be stockpiled on-site and replaced in excavation; assuming acceptable chemical concentrations
Excavation boundaries are approximate and subject to change in the field

Z

0 30 60 120 Feet

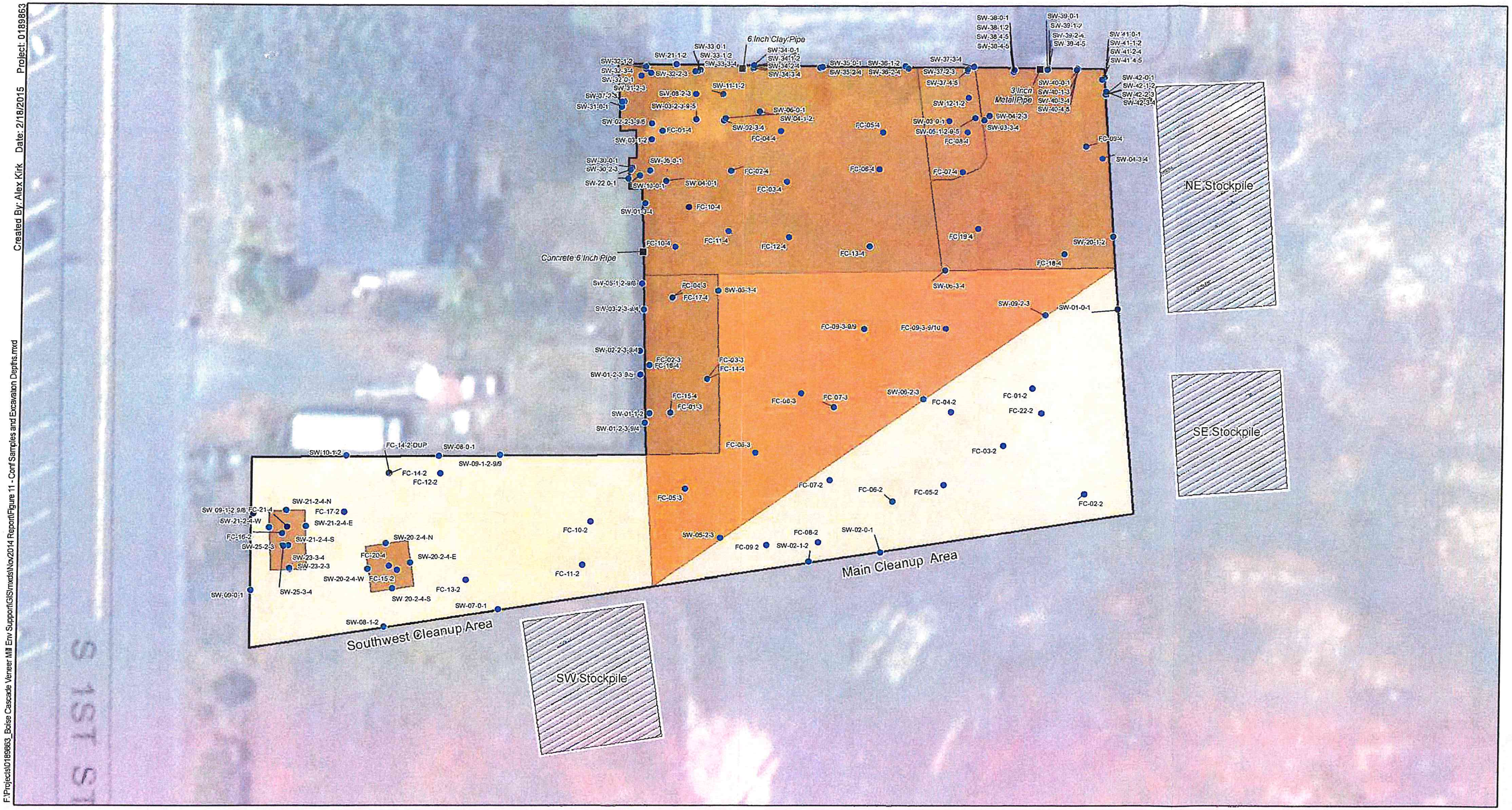
Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 10
Proposed Soil Excavation Area
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.

Created By: Alex Kirk Date: 2/18/2015 Project: 0189863

F:\Projects\0189863_Boise Cascade Veneer Mill Env Support\GIS\mxds\Nov2014 Report\Figure 11 - Conf Samples and Excavation Depths.mxd



Legend

- Confirmation Samples
- Subsurface Features
- Stockpiles
- 2' Below Ground Surface
- 3' Below Ground Surface
- 4' Below Ground Surface

Notes:
ft bgs = feet below ground surface
Excavation boundaries are approximate

N

0 15 30 60 Feet

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 11

Excavation Depths and Locations for all Post-Excavation Soil Confirmation Samples
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.

F:\Projects\0189863_Boise Cascade Veneer Mill Env Support\GIS\mxds\Nov2014 Report\Figure 12 - Post Excavation.mxd Created By: Alex Kirk Date: 2/18/2015 Project: 0189863

Legend

- Lead Exceeds the Screening Criteria
- Lead does not Exceed the Screening Criteria
- Subsurface Features
- Stockpiles
- 2' Below Ground Surface
- 3' Below Ground Surface
- 4' Below Ground Surface

Notes:
All concentrations for Lead given in milligrams per kilogram (mg/kg)
ft bgs = feet below ground surface
Excavation boundaries are approximate

N

0 15 30 60 Feet

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 12
Post-Excavation Confirmation Sample Results
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.

F:\Projects\0189863_Boise Cascade Veneer Mill Env Support\GIS\mxds\Nov2014 Report\Figure 13 - Backfill.mxd Created By: Alex Kirk Date: 2/18/2015 Project: 0189863

Legend

- Backfill with Gravel: 0 to 1 ft bgs; Asphalt Fragments: 1 to 2 ft bgs; NE Stockpile: 2 to 3 ft bgs; SE Stockpile: 3 ft bgs to bottom of excavation
- Backfill with Concrete Debris and Gravel
- Backfill with Gravel: 0 to 1.5 ft bgs; NE Stockpile: 1.5 ft bgs to bottom of excavation
- Backfill with Gravel: 0 to 1.5 ft bgs; SW Stockpile: 1.5 ft bgs to bottom of excavation
- Stockpiles

N

0 15 30 60 Feet

Notes:
ft bgs = feet below ground surface
Excavation boundaries are approximate

Aerial Image - USGS State Orthoimagery, July 2010, 1 ft per pixel.

Figure 13
Backfill Materials and Depths
St. Helens Veneer Mill
St. Helens, Oregon

Environmental Resources Management
1001 SW 5th St, Suite 1010
Portland, Oregon 97204
ERM.

Tables

Table 1. **Summary of Site Investigation and Remediation Activities**

Date	Description of Activity	Results and Conclusion	Reporting	Project Consultant
1987	UST Removal: 1 diesel and 1 gasoline were removed from the Site. USTs were filled with sand in 1982. During removal, the sand was washed from the tank.	No significant contamination observed. BTEX not detected in the post-removal soil sample. BTEX was detected above regulatory levels in a water sample collected from the excavation, possibly from washing of sand from the USTs prior to removal.	Report submitted to ODEQ in 2002 as part of requested site investigation (ECSI File No. 3283).	Lambier Stevenson Engineers
1996	Former Maintenance Shop Remediation: Former maintenance shop demolished and approximately 400 tons of PCS excavated and treated for recycling at TPS Technologies Soil Recycling Facility in Portland, Oregon.	Post-excavation soil samples indicated most PCS was removed. Highest concentration in samples was <600 mg/Kg diesel TPH. MEK, acetone and toluene detected at <1.3 mg/Kg.	Reports submitted to ODEQ in 2002 as part of requested site investigation (ECSI File No. 3283).	LPG Associates, Inc.
2001	Lathe Area PCS Removal: PCS was discovered beneath concrete during a project to replace part of the veneer lathe.	Approximately 40 cubic yards of PCS was excavated beneath mill floor under lathe. Some PCS remained where it could not be excavated without potential damage to building or equipment. Post-excavation samples contained up to 33,700 ppm of diesel TPH.	Reports submitted to ODEQ in 2002 as part of requested site investigation (ECSI File No. 3283).	LPG Associates, Inc.
2002 - 2004	Remedial Investigation/Feasibility Study Requested by ODEQ: In 2002 Boise Cascade initiated a RI/FS of the Site at the request of ODEQ. Soil and groundwater samples were collected at locations around the Site with known or suspected contamination. Areas included the former USTs, former maintenance shop, lathe area, former oil house and transformer area, and former hydraulic lift at former sawmill lumber sorter/stacker. (ECSI No. 3283)	Investigation documented soil contamination in lathe area and in former oil house/transformer area. No evidence of impacts to river. ODEQ issued a Conditional No Further Action letter for the Site on May 6, 2004. NFA condition required investigation or remediation of PCS in lathe area whenever mill was demolished.	Reports submitted to ODEQ in 2002-04 as part of RI/FS site investigation (ECSI File No. 3283). NFA Letter attached.	LPG Associates, Inc. and URS Corporation.

Table 1. **Summary of Site Investigation and Remediation Activities** **Boise Cascade St. Helens Veneer Mill Site**

Date	Description of Activity	Results and Conclusion	Reporting	Project Consultant
2004	Phase 1 Environmental Site Assessment: Boise Cascade initiated a Phase 1 ESA in anticipation of sale of the Site.	Phase 1 ESA reviewed previous environmental investigations. No other new or historic Recognized Environmental Conditions were identified.	Report submitted to ODEQ in February 2014 as an attachment to the Environmental Summary Report and Site Investigation Work Plan prepared by Boise Cascade.	AMEC Earth & Environmental, Inc.
2005	Concrete Vault Removal: During removal of a concrete building foundation in 2005, a buried concrete vault containing oily water was discovered. The purpose of the vault was not known.	Approximately 660 gallons of oily water was pumped from the vault and the vault was removed. The was no evidence that oily water breached the vault. No evidence of oil was observed in the soil or shallow groundwater. Additional investigation was not recommended.	Report submitted to ODEQ in February 2014 as an attachment to the Environmental Summary Report and Site Investigation Work Plan prepared by Boise Cascade.	SECOR Inc.
2013	Storm Drain Cleanout: Following demolition of the veneer manufacturing equipment and buildings, the storm drain lines were flushed and the settling basin tanks were cleaned.	Sumps and catch basins vacuumed to remove water and sludge. Wastewater and sludge transported to treatment facility.	No reports prepared.	PPVInc/Bravo Environmental
2013 - Present	Soil and Groundwater Investigation and Soil Remediation: Boise Cascade demolished the remaining structures at the Site and initiated a soil and groundwater investigation in anticipation of the sale of the Site. Areas investigated included the lathe area, former oil house and transformer area, former log debarker area, and north end former sawmill area.	The investigation included collection of soil and groundwater samples from soil borings and temporary and permanent monitoring wells. In addition, at the request of ODEQ, soil samples were collected from random test pits across the areas of the Site where samples had not been previously collected. That sampling led to discovery of lead contaminated soil (LCS) in the north end of the Site. The LCS was excavated and disposed off-site.	The investigation and remediation is documented in this report.	Environmental Resource Management, Inc. (ERM)

Table 1. **Summary of Site Investigation and Remediation Activities**

Date	Description of Activity	Results and Conclusion	Reporting	Project Consultant
2014	UST Investigation: Consultants for prospective purchaser of the Site conducted a soil and groundwater investigation in the area of the former USTs.	Evidence of contamination was observed in two of seven soil borings. Groundwater samples from these borings were analyzed and contained <1 mg/l of TPH and PAHs. Only 2 PAHs exceeded urban residential standard. Investigation concluded extensive contamination is not present in UST area.	UST investigation report was completed on April 14, 2014. A copy of the report is attached.	Maul Foster & Alongi, Inc.

Table 2 Historic Soil Samples[1,2] **Boise Cascade St. Helens Veneer Mill Site**

Complete Exposure Pathways / Receptors			PCBs	VOCs	NWTPH-DX		PAHs (mg/kg)																	
Sample Date	Map ID	Sample Depth (ft/bgs)	(mg/kg)	(ug/L)	DRO (mg/kg)	RRO	A-thene	A-ylene	Anth	B(a)anth	B(a)pyr	B(b)fluor	B(k)fluor	B(g,h,i)per	Chrysene	D(a,h)an	Dibenzf	Fluoran	Fluorene	I(1,2,3)pyr	2-Mnap	Naph	Phenan	Pyrene
Maintenance Shop Area																								
July 1996	H-1	Post-Ex	All ND		52																			
July 1996	H-2	Post-Ex	All ND		590																			
May 2003	H-3	5		All ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	<0.07	ND	ND	ND	ND	<0.07	<0.07
May 2003	H-4	4		All ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	ND	ND	ND	ND	0.03	0.03
UST Area																								
May 2003	H-5	5			<25	<50																		
May 2003	H-6	10			<25	71																		
Sorter-Stacker Hydraulic Lift Area																								
May 2003	H-7	13		All ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
May 2003	H-8	13			<25	<50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Lathe Area																								
Dec 2001	H-S1	Post-Ex @ 1			5,880	28,200																		
Dec 2001	H-S2	Post-Ex @ 1			5,170	25,700																		
Dec 2001	H-S3	Post-Ex @ 1			11,300	33,700																		
Dec 2001	H-S4	Post-Ex @ 1			128	218																		
Dec 2001	H-S5	Post-Ex @ 3			21,800	28,500																		
Dec 2001	H-S6	Post-Ex @ 2			1,600	4,500																		
Dec 2001	H-S7	Post-Ex @ 1			<25	<50																		
Dec 2001	H-S8	Post-Ex @ 2			<25	<50																		
Dec 2001	H-S9	Post-Ex @ 2			<23	1,810																		
May 2003	H-11	15			<25	<50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
May 2003	H-12	15			<25	<50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
May 2003	H-13	15			<25	<50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Oil House and Transformer Area																								
May 2003	H-15	0.5	All ND				ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	ND	ND	ND	ND	0.07	0.3
		20			<25	<50																		
Nov 2003	H-17	19			ND	14,600	2.83	ND	ND	0.347	ND	ND	ND	ND	0.356	ND		2.7	2.22	ND		ND	ND	2.42
Nov 2003	H-18	25			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND	ND	ND
Nov 2003	H-19	23			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND	ND	ND
Nov 2003	H-20	25			ND	ND	ND	0.108	0.575	0.874	0.731	0.398	0.461	0.339	0.928	0.0888		1.37	0.145	0.289		ND	1.48	2.09
Nov 2003	H-21	26			ND	ND	ND	ND	ND	0.0204	0.024	ND	0.0156	0.0179	0.0223	ND		0.0434	ND	0.014		ND	0.0237	0.0719

Notes:

See Table 4 for abbreviations and analytical qualifiers.

[1] See Figures 3A and 3B for location of historic sample locations.

[2] Dectection limits not included for historic samples previously reviewed by ODEQ. See specific reports for detection limits.

Sample Date	Map ID	NWTPH-DX DRO (mg/L)	NWTPH-DX RRO (mg/L)	VOCs[3] (ug/L)	A-thene	A-ylene	Anth	B(a)anth	B(a)pyren	B(b)fluor	B(k)fluor	B(g,h,i)per	Chrysene	Db(a,h)an	Dibenzf	Fluoran	Fluorene	I(1,2,3)pyr	2-Mnaph	Naph	Phenan	Pyrene
					PAHs (ug/L)																	
Maintenance Shop & UST Area																						
May 2003	H-5			2	4.39	<1.0	2.28	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0		2.28	4.05	<1.0	<1.0	<1.0	21.3	1.08
Sorter/Stacker Area																						
May 2003	H-8			All ND	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
May 2003	H-9			All ND	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
May 2003	H-10			59	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
Lathe Area																						
May 2003	H-14			All ND	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.24		<0.12	<0.12	<0.12		<0.12	<0.12	<0.12
Oil House & Transformer Area																						
May 2003	H-15	<2.5	176	All ND	9.97	<2.75	<2.75	<2.75	<2.75	<2.75	<2.75	<2.75	<2.75	<5.5		10.5	6.54	<2.75		<2.75	<2.75	6.9
May 2003	H-16			4	14.5	0.15	0.62	0.14	<0.1	<0.1	<0.1	<0.1	0.16	<0.2		1.89	5.71	<0.1		23.1	8.10	1.02
November 2003	H-17	<0.25	<0.5		13.6	<0.1	0.427	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		1.3	5.93	<0.1		13.6	4.49	0.845
November 2003	H-18	<0.25	<0.5		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
November 2003	H-19	<0.25	<0.5		0.177	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
November 2003	H-20	2.13	<0.5		0.30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	0.104	<0.1		<0.1	<0.1	<0.1
November 2003	H-21	<0.25	<0.5		0.849	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	0.285	<0.1		<0.1	<0.1	<0.1

Notes:

See Table 4 for abbreviations and analytical qualifiers.

[1] See Figures 3A and 3B for location of historic sample locations.

[2] Dectection limits not included for historic samples previously reviewed by ODEQ. See specific reports for detection limits.

[3] Maximum concentration of any single VOC detected in the sample. See Table 15 for more details.

Table 4 **Key to Abbreviations on Tables**

Unless otherwise specified, these abbreviations and notes apply to all report tables.

Abbreviations:

mg/Kg = milligrams per kilogram
mg/L = milligrams per liter
µg/L = micrograms per liter
ft bgs = feet below ground surface
SWL = static water level
RBC = Risk Based Concentration for human risk
amsl = above mean sea level
ft btoc = feet below top of casing
UST = underground storage tank
ft or ' = foot or feet
NA = not applicable
SLV = Screening Level Value for ecological risk

Analyte Key:

PCBs = Polychlorinated Biphenyls
DRO = Diesel Range Organics
PAH = Polycyclic Aromatic Hydrocarbons
A-thene = Acenaphthene
A-ylene = Acenaphthylene
Anth = Anthracene
B(a)anth = Benzo(a)anthracene
B(a)pyr = Benzo(a)pyrene
B(b)fluor = Benzo(b)fluoranthene
B(k)fluor = Benzo(k)fluoranthene
B(g,h,i)per = Benzo(g,h,i)perylene
D(a,h)an = Dibenzo(a,h)anthracene
Dibenzf = Dibenzofuran
Fluoran = Fluoranthene
I(1,2,3)pyr = Indeno(1,2,3-cd)pyrene
2-Mnap = 2-Methylnaphthalene
Naph = Naphthalene
Phenan = Phenanthrene
TPH = Total Petroleum Hydrocarbons
RRO = Residual Range Organics
VOC = Volatile Organic Compound
IPT = Isopropyltoluene
Bbenz = Butylbenzene
Pbenz = Propylbenzene
3Mbenz = 1, 2, 4 Trimethylbenzene
Metals
As = Arsenic
Ba = Barium
Cd = Cadmium
Cr(III) = Trivalent Chromium
Hg = Mercury
Pb = Lead
Se = Selenium
Ag = Silver

Analytical Qualifiers:

"<" The constituent was not detected at the identified Method Reporting Limit.
"L" Chromatographic fingerprint resembles a petroleum product, but pattern indicates presence of a greater amount of lighter weight constituents than the calibration standard.
"H" Chromatographic fingerprint resembles a petroleum product, but pattern indicates presence of a greater amount of heavier weight constituents than the calibration standard.
"O" Chromatographic fingerprint resembles an oil, but pattern does not match calibration standard.
"Y" Chromatographic fingerprint resembles a petroleum product eluting in approximately the correct carbon range, but pattern does not match calibration standard.
"Z" The chromatographic fingerprint does not resemble a petrolum product.
"X" Slight high bias for this result. See case narrative for specific explanation.

Table 5 Groundwater Elevations

Well ID	Total Well Depth (ft bgs)	Top of Casing Elevation[1] (amsl)	Well Screen Interval				Groundwater Elevations							
							April 2014		May 9, 2014		June 12, 2014		September 24, 2014	
			Top (ft bgs)	Bottom (ft bgs)	Top (amsl)	Bottom (amsl)	SWL (ft btoc)	Elevation (amsl)	SWL (ft btoc)	Elevation (amsl)	SWL (ft btoc)	Elevation (amsl)	SWL (ft btoc)	Elevation (amsl)
MW-1	27.40	27.49	17.0	27.0	10.49	0.49	10.12	17.37	11.72	15.77	12.62	14.87	14.15	13.34
MW-2	33.88	27.40	23.0	33.0	4.40	-5.60	13.91	13.49	14.61	12.79	14.87	12.53	18.14	9.26
MW-3	26.35	27.59	15.0	26.0	12.59	1.59	13.33	14.26	13.70	13.89	14.02	13.57	16.8	10.79
MW-4	30.34	27.29	20.0	30.0	7.29	-2.71	14.03	13.26	14.51	12.78	14.81	12.48	17.08	10.21
MW-5	24.57	25.79	14.0	24.0	11.79	1.79	12.59	13.20	13.46	12.33	13.69	12.10	17.15	8.64
MW-6	24.57	25.23	14.0	24.0	11.23	1.23	12.02	13.21	13.51	11.72	13.90	11.33	17.51	7.72
MW-7	21.83	25.48	11.5	21.5	13.98	3.98	11.76	13.72	13.10	12.38	13.44	12.04	15.61	9.87
MW-8	25.30	24.03	15.0	25.0	9.03	-0.97	10.55	13.48	12.30	11.73	12.71	11.32	16.58	7.45
MW-9	23.08	26.25	11.5	21.5	14.75	4.75	12.01	14.24	12.71	13.54	13.10	13.15	15.12	11.13
MW-10	16.72	26.98	6.0	16.0	20.98	10.98	12.94	14.04	13.68	13.30	13.90	13.08	15.35	11.63
MW-11	25.19	27.76	14.5	24.5	13.26	3.26	14.45	13.31	15.28	12.48	15.56	12.20	18.1	9.66
MW-12	22.23	27.35	11.5	21.5	15.85	5.85	14.44	12.91	14.75	12.60	15.65	11.70	18.72	8.63
MW-13	18.03	26.62	7.5	17.5	19.12	9.12	12.31	14.31	13.28	13.34	13.61	13.01	15.5	11.12
MW-14	32.70	27.55	22.0	32.0	5.55	-4.45	14.90	12.65	14.43	13.12	15.55	12.00	18.15	9.40

Notes:

See Table 4 for abbreviations and analytical qualifiers.

[1] Top of casing elevations measured on north each of casing.

ft btoc = feet below top of casing

Table 6 Monitoring Well Construction Details[1]

Monitoring Well ID	Date Completed	Borehole Depth (ft bgs)	Well Completion Depth	Water Level[2] (approx.)	Top of Casing Elevation[3]	Well Screen Interval Top (ft bgs)	Well Screen Interval Bottom (ft bgs)	Well Screen Interval Top (amsl)	Well Screen Interval Bottom (amsl)	Sand Pack Interval Top (ft bgs)	Sand Pack Interval Bottom (ft bgs)
MW-1	3/29/2014	27.2	27.2	20	27.49	17.0	27.0	10.5	0.49	14.5	27.2
MW-2	3/29/2014	33.5	33.5	28	27.40	23.0	33.0	4.4	-5.60	21.5	33.5
MW-3	3/25/2014	26.5	26.5	20	27.59	16.0	26.0	11.6	1.59	14.0	26.5
MW-4	3/26/2014	30.0	30.0	23	27.29	20.0	30.0	7.3	-2.71	16.0	30.0
MW-5	3/26/2014	25.0	24.5	17	25.79	14.0	24.0	11.8	1.79	12.0	25.0
MW-6	3/26/2014	25.0	24.5	17	25.23	14.0	24.0	11.2	1.23	12.0	25.0
MW-7	3/24/2014	22.5	22.0	15	25.48	11.5	21.5	14.0	3.98	9.5	22.5
MW-8	3/24/2014	30.0	25.5	18	24.03	15.0	25.0	9.0	-0.97	13.0	30.0
MW-9	3/24/2014	23.0	23.0	15	26.25	12.5	22.5	13.8	3.75	10.5	23.0
MW-10	3/27/2014	16.5	16.5	14	26.98	6.0	16.0	21.0	10.98	4.0	16.5
MW-11	3/27/2014	25.5	25.5	18	27.76	15.0	25.0	12.8	2.76	13.0	25.5
MW-12	3/21/2014	22.5	22.5	15	27.35	12.0	22.0	15.4	5.35	10.0	22.5
MW-13	3/24/2014	23.5	18.0	16	26.62	7.0	17.0	19.6	9.62	5.5	23.5
MW-14	3/26/2014	32.0	32.0	22	27.55	21.5	31.5	6.1	-3.95	19.5	32.0

Notes:

See Table 4 for abbreviations and analytical qualifiers.

[1] Monitoring Well Construction Notes

All boreholes constructed by 3.75-inch-diameter direct-push method.

All monitoring wells constructed with 2-inch-diameter schedule 40 PVC, 0.010-inch slot size, and 10/20 Colorado silica sand filter pack.

All wells constructed with flush-mount well box set in Portland cement grout with locking well cap.

All wells constructed with bentonite seal from approximately 3 feet bgs to top of sand pack.

All screen intervals and sand pack intervals to nearest half-foot bgs.

[2] Depth at which water was observed during drilling and placement of well screen and sandpack.

[3] Top of casing elevation measured on north side of casing.

PVC = polyvinyl chloride

Table 7 **Sample Matrix** **Boise Cascade St. Helens Veneer Site**

Sample Location	Matrix	Sample Date	Sample Depth (ft bgs)	TPH	PCBs	PAHs	VOCs	Metals
B-1	Soil	August 2013	5 - 6	X				
B-1	Soil	August 2013	15 - 16	X				
B-2	Soil	August 2013	10-11	X				
B-2	Soil	August 2013	20 - 21	X				
B-3	Soil	August 2013	5 - 6	X				X
B-3	Soil	August 2013	10 - 11	X				
B-3	Soil	August 2013	15 - 16	X				
B-3	Soil	August 2013	19 - 20	X		X		
B-3	Soil	August 2013	24 - 25	X				
B-3	GW	August 2013		X		X	X	X
B-4	Soil	August 2013	10 - 11	X				
B-4	Soil	August 2013	20 - 21	X				
B-4	GW	August 2013		X		X	X	X
B-5	Soil	August 2013	15 - 16	X				
B-5	Soil	August 2013	24 - 25	X				
B-8	Soil	August 2013	3 - 4	X				
B-8	Soil	August 2013	15 - 16	X		X		
B-8	Soil	August 2013	24 - 25	X				
B-8	GW	August 2013		X		X		
B-9	Soil	August 2013	10 - 11	X				
B-9	Soil	August 2013	19 - 20	X				
B-10	Soil	August 2013	10 - 11	X				
B-10	Soil	August 2013	15 - 16	X	X			
B-10	Soil	August 2013	29 - 30	X				
B-11	Soil	August 2013	3 - 4	X	X			
B-11	Soil	August 2013	19 - 20	X		X		
B-11	Soil	August 2013	24 - 25	X				
B-12	Soil	August 2013	5 - 6	X	X			
B-12	Soil	August 2013	15 - 16	X				
B-12	Soil	August 2013	24 - 25	X	X	X		
B-12	GW	August 2013		X		X		
B-13	Soil	August 2013	5 - 6	X				
B-13	Soil	August 2013	10 - 11	X				
B-13	Soil	August 2013	15 - 16	X				
B-13	GW	August 2013		X		X		
B-14	Soil	August 2013	3 - 4	X				X
B-14	Soil	August 2013	10 - 11	X				

Sample Location	Matrix	Sample Date	Sample Depth (ft bgs)	TPH	PCBs	PAHs	VOCs	Metals
B-14	Soil	August 2013	24 - 25	X				
B-14	GW	August 2013		X		X	X	X
B-15	Soil	August 2013	10 - 11	X	X			
B-15	Soil	August 2013	14 - 15	X				
B-16	Soil	August 2013	9 - 10	X	X			
B-16	Soil	August 2013	15 - 16	X				
B-16	Soil	August 2013	20 - 21	X				
B-16	GW	August 2013		X		X		
B-17	Soil	October 2013	20 - 21	X				
B-17	GW	October 2013		X		X		
B-18	Soil	October 2013	15 - 16	X				
B-18	Soil	October 2013	19 - 20	X				
B-18	GW	October 2013		X		X		
B-19	Soil	October 2013	8 - 9	X		X		
B-19	Soil	October 2013	20 - 21	X				
B-19	Soil	October 2013	28 - 29	X				
B-19	GW	October 2013		X		X	X	
B-20	Soil	October 2013	8 - 9	X				
B-20	Soil	October 2013	15 - 16	X		X		
B-20	Soil	October 2013	24 - 25	X				
B-20	GW	October 2013		X		X	X	
B-21	Soil	October 2013	9 - 10	X				
B-21	Soil	October 2013	20 - 21	X				
B-21	Soil	October 2013	29 - 30	X				
B-21	GW	October 2013		X		X	X	
B-22	Soil	October 2013	3 - 4	X				
B-22	Soil	October 2013	20 - 21	X				
B-22	Soil	October 2013	29 - 30	X				
B-22	GW	October 2013		X		X		X
B-23	Soil	October 2013	8 - 9	X				
B-23	Soil	October 2013	15 - 16	X				
B-23	GW	October 2013		X		X		
B-24	Soil	October 2013	8 - 9	X				
B-24	GW	October 2013		X		X		
MW-1	Soil	April 2014	4 - 5	X				
MW-1	Soil	April 2014	19 - 20	X		X		
MW-1	GW	April 2014		X		X		
MW-1	GW	June 2014		X		X		
MW-2	Soil	April 2014	7.5 - 8.5	X				
MW-2	Soil	April 2014	17 - 18	X				
MW-2	GW	April 2014		X		X		

Sample Location	Matrix	Sample Date	Sample Depth (ft bgs)	TPH	PCBs	PAHs	VOCs	Metals
MW-2	GW	June 2014		X		X		
MW-3	Soil	April 2014	3 - 4	X				
MW-3	Soil	April 2014	19 - 19.5	X				
MW-3	GW	April 2014		X		X		
MW-3	GW	June 2014		X		X		
MW-4	Soil	April 2014	3 - 4	X				
MW-4	Soil	April 2014	22 - 23	X				
MW-4	GW	April 2014		X		X		
MW-4	GW	June 2014		X		X		
MW-5	Soil	April 2014	19 - 20	X				
MW-5	GW	April 2014		X		X		
MW-5	GW	June 2014		X		X		
MW-6	Soil	April 2014	3 - 4	X		X		
MW-6	Soil	April 2014	14 - 15	X				
MW-6	GW	April 2014		X		X		
MW-6	GW	June 2014		X		X		
MW-7	Soil	April 2014	14 - 15	X				
MW-7	Soil	April 2014	21.5 - 22.5	X				
MW-7	GW	April 2014		X		X		
MW-7	GW	June 2014		X		X		
MW-8	Soil	April 2014	17 - 18	X				
MW-8	GW	April 2014		X		X		
MW-8	GW	June 2014		X		X		
MW-9	Soil	April 2014	6 - 7	X				
MW-9	Soil	April 2014	19 - 20	X		X		
MW-9	GW	April 2014		X		X		
MW-9	GW	June 2014		X		X		
MW-10	Soil	April 2014	13 - 14	X				
MW-10	GW	April 2014		X		X		
MW-10	GW	June 2014		X		X		
MW-11	Soil	April 2014	8 - 9	X		X		
MW-11	Soil	April 2014	17 - 18	X		X		
MW-11	GW	April 2014		X		X		
MW-11	GW	June 2014		X		X		
MW-12	Soil	April 2014	14 - 15	X				
MW-12	GW	April 2014		X		X		
MW-12	GW	June 2014		X		X		
MW-13	Soil	April 2014	3 - 4	X				
MW-13	Soil	April 2014	15 - 16	X				
MW-13	GW	April 2014		X		X		
MW-13	GW	June 2014		X		X		
MW-14	Soil	April 2014	1 - 2	X				
MW-14	Soil	April 2014	17 - 18	X				

Sample Location	Matrix	Sample Date	Sample Depth (ft bgs)	TPH	PCBs	PAHs	VOCs	Metals
MW-14	GW	April 2014		X		X		
MW-14	GW	April 2014		X		X		
TP-1	Soil	April 2014	3 - 4	X	X			X
TP-2	Soil	April 2014	3.8 - 4		X			X
TP-4	Soil	April 2014	3 - 4	X	X			X
TP-5	Soil	April 2014	3.8 - 4	X	X			X
TP-6	Soil	April 2014	3 - 4	X	X			X
TP-7	Soil	April 2014	3 - 4	X	X			X
TP-9	Soil	April 2014	2 - 2.8	X	X			X
TP-10	Soil	April 2014	0.5 - 0.8	X	X			X
TP-13	Soil	April 2014	0 - 1	X	X	X		X
TP-13	Soil	April 2014	2 - 2.6	X		X		X
TP-14	Soil	April 2014	1 - 2	X	X			X
TP-14	Soil	April 2014	3.5 - 3.8	X	X			X
TP-16	Soil	April 2014	0 - 1	X	X			X
TP-16	Soil	April 2014	3.5 - 4	X	X			X
TP-17	Soil	April 2014	3 - 4	X	X			X
TP-18	Soil	April 2014	0 - 1	X	X			X
TP-18	Soil	April 2014	2 - 2.75	X		X		X
TP-19	Soil	April 2014	3 - 4	X	X			X
TP-21	Soil	April 2014	3.8 - 4	X	X			X
TP-22	Soil	April 2014	3 - 4	X	X			X
TP-24	Soil	April 2014	3.75 - 4		X			X
TP-25	Soil	April 2014	2.5 - 3.1		X			X
TP-26	Soil	April 2014	3 - 3.8	X	X			X
TP-13A	Soil	June 2014	0 - 1		X	X		X
TP-13A	Soil	June 2014	1 - 3.2					X
TP-13B	Soil	June 2014	0 - 1		X	X		X
TP-13B	Soil	June 2014	1 - 4					X
TP-13C	Soil	June 2014	0 - 1		X	X		X
TP-13C	Soil	June 2014	1 - 4					X
TP-14A	Soil	June 2014	0 - 1			X		X
TP-14A	Soil	June 2014	1 - 4					X
TP-14B	Soil	June 2014	0 - 1			X		X
TP-14B	Soil	June 2014	1 - 4					X
TP-14C	Soil	June 2014	0 - 1			X		X
TP-14C	Soil	June 2014	1 - 2					X
TP-14C	Soil	June 2014	2 - 3					X
TP-14C	Soil	June 2014	3 - 4					X
TP-14C	Soil	June 2014	1 - 4			X		X
TP-14C	Soil	June 2014	5 - 6					X
TP-27	Soil	June 2014	0.75 - 1					X
TP-27	Soil	June 2014	1 - 2					X

Sample Location	Matrix	Sample Date	Sample Depth (ft bgs)	TPH	PCBs	PAHs	VOCs	Metals
TP-27	Soil	June 2014	2 - 3					X
TP-27	Soil	June 2014	3 - 4					X
TP-27	Soil	June 2014	5 - 6					X
TP-28	Soil	June 2014	0.75 - 1					X
TP-28	Soil	June 2014	1 - 2					X
TP-28	Soil	June 2014	2 - 3					X
TP-28	Soil	June 2014	3 - 4					X
TP-28	Soil	June 2014	4 - 4.8					X
TP-29	Soil	June 2014	0 - 1					X
TP-29	Soil	June 2014	1 - 2					X
TP-29	Soil	June 2014	2 - 3					X
TP-29	Soil	June 2014	3 - 4					X
TP-30	Soil	June 2014	0 - 1					X
TP-30	Soil	June 2014	1 - 2					X
TP-30	Soil	June 2014	2 - 3					X
TP-30	Soil	June 2014	3 - 4					X
TP-31	Soil	June 2014	0 - 1					X
TP-31	Soil	June 2014	1 - 2					X
TP-31	Soil	June 2014	2 - 3					X
TP-31	Soil	June 2014	3 - 4					X
TP-31	Soil	June 2014	5 - 6					X
TP-32	Soil	June 2014	0 - 1					X
TP-32	Soil	June 2014	1 - 2					X
TP-32	Soil	June 2014	2 - 3					X
TP-32	Soil	June 2014	3 - 4					X
TP-32	Soil	June 2014	7.5 - 8.5					X
TP-33	Soil	June 2014	0 - 1					X
TP-33	Soil	June 2014	1 - 2					X
TP-33	Soil	June 2014	2 - 3					X
TP-33	Soil	June 2014	3 - 4					X
TP-33	Soil	June 2014	7.5 - 8.5					X
TP-34	Soil	June 2014	0 - 1					X
TP-34	Soil	June 2014	3 - 4					X
TP-34	Soil	June 2014	5 - 6					X
TP-35	Soil	June 2014	0 - 1					X
TP-35	Soil	June 2014	3 - 4					X
TP-35	Soil	June 2014	8.5 - 10					X
TP-36	Soil	June 2014	0 - 1					X
TP-36	Soil	June 2014	3 - 4					X
TP-36	Soil	June 2014	9 - 10					X
TP-37	Soil	June 2014	0 - 1					X
TP-37	Soil	June 2014	3 - 4					X
TP-37	Soil	June 2014	9 - 10					X

Sample Location	Matrix	Sample Date	Sample Depth (ft bgs)	TPH	PCBs	PAHs	VOCs	Metals

GW = Groundwater

NS = No sample collected

Table 8 TPH and PAHs in Lathe Area Soil Samples

Complete Exposure Pathways / Receptors			NWTPH-DX		PAHs																	
Sample Date	Map ID	Sample Depth (ft/bgs)	DRO (mg/Kg)	RRO	A-thene	A-ylene	Anth	B(a)anth	B(a)pyr	B(b)fluor	B(k)fluor	B(g,h,i)per	Chrysene (mg/Kg)	D(a,h)an	Dibenzf	Fluoran	Fluorene	I(1,2,3)pyr	2-Mnap	Naph	Phenan	Pyrene
Ingest, Contact, Inhale / Urban Residential[1,2]			2,200	2200*	9,400	-	47,000	0.34	0.034	0.34	3.4	-	32	0.034	-	4,600	6,300	0	-	25	-	3,400
Ingest, Contact, Inhale / Construction[3]			4,600	4600*	19,000	-	93,000	21	2.1	21	210	-	2,100	2.1	-	8,900	12,000	21	-	580	-	6,700
Volatilization / Urban Residential			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-
Vapor Intrusion / Urban Residential			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-
December 2001	H-S1[4]	1	5,880	28,200																		
December 2001	H-S2[4]	1	5,170	25,700																		
December 2001	H-S3[4]	1	11,300	33,700																		
December 2001	H-S4[4]	1	128	218																		
December 2001	H-S5[4]	3	21,800	28,500																		
December 2001	H-S6[4]	2	1,600	4,500																		
December 2001	H-S7[4]	1	<25	<50																		
December 2001	H-S8[4]	2	<25	<50																		
December 2001	H-S9[4]	2	<23	1,810																		
May 2003	H-11[4]	15	<25	<50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
May 2003	H-12[4]	15	<25	<50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
May 2003	H-13[4]	15	<25	<50	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
August 2013	B-1	5	<27	<110																		
		15	1,500 H	8,500 O																		
August 2013	B-2	10	<27	<110																		
		20	40 H	240 O																		
August 2013	B-3	5	<27	<110																		
		10	43 Y	<110																		
		15	2,100 Y	3,100 O																		
		19	9,700 H	53,000 O	1.8	0.064 X	0.48	0.57	0.23	0.35	0.13	0.11	0.44	<0.098	0.9	3.1	1.4	<0.098	0.78	1.7	5.7	2.8
		24	<43	170 O																		
August 2013	B-4	10	<30	<120																		
		20	48 H	190 O																		
August 2013	B-5	15	<27	<110																		
		24	680 Z	610 Z																		
August 2013	B-13	5	<27	<110																		
		10	<26	<110																		
		15	1,400 Y	7,100 O																		
August 2013	B-14	3	<27	<110																		
		10	<27	<110																		
		24	260 Y	600 O																		
October 2013	B-22	3	<27	<110																		
		20	<31	<130																		
		30	<30	<150																		
April 2014	MW-1	4	<27	<110																		
		19	160 Y	<390	<0.010	<0.010	<0.010	0.029	0.053	0.05	0.016	0.065	0.045	<0.010	<0.010	0.08	<0.010	0.052	<0.010	0.017	0.065	0.095
April 2014	MW-2	7.5	<27	<110																		
		17	<30	<120																		
April 2014	MW-3	3	<27	<110																		
		19	<40	<160																		
April 2014	MW-4	3	<27	<110																		
		22	<30	<120																		
April 2014	MW-14	1	<27	<110																		
		17	4.3 J	9.5 J																		

Notes:

See Table 4 for abbreviations and analytical qualifiers.

[1] RBCs for this exposure pathway and receptors apply only to surface soils (0 - 3 feet BGS).

[2] Occupational worker RBCs are not included in table because they are less stringent than urban residential RBCs and apply to same depth.

[3] Excavation worker RBCs are not included because they are equal to or less stringent than construction worker RBCs and apply to same depth.

[4] See Figures 3A and 3B for location of historic sample locations. Detection limits not included for historic samples previously been reviewed by ODEQ.

Sample silica gel treated prior to TPH analysis.

Exceeds one or more applicable Human Health RBCs.

"-" Generic RBCs or SLVs are not established for this constituent.

*A generic RBC for RRO has not been established. For screening purposes, the DRO RBC is used for RRO.

Table 9 PCBs, TPH and PAHs in Oil House and Transformer Area Soil Samples

Complete Exposure Pathways / Receptors: Sample Date	Map ID	Sample Depth (ft/bgs)	PCBs (mg/Kg)	NWTPH-DX (mg/Kg): DRO	NWTPH-DX (mg/Kg): RRO	PAHs (mg/Kg): A-thene	A-ylene	Anth	B(a)anth	B(a)pyr	B(b)fluor	B(k)fluor	B(g,h,i)per	Chrysene	D(a,h)an	Dibenzf	Fluoran	Fluorene	I(1,2,3)pyr	2-Mnap	Naph	Phenan	Pyrene
Ingest, Contact, Inhale / Urban Residential[1,2]			0.31	2,200	2200*	9400	-	47000	0.34	0.034	0.34	3.4	-	32	0.034	-	4600	6300	0.34	-	25	-	3400
Ingest, Contact, Inhale / Construction[3]			4.4	4,600	4600*	19000	-	93000	21	2.1	21	210	-	2100	2.1	-	8900	12000	21	-	580	-	6700
Volatilization / Urban Residential			0.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-
Vapor Intrusion / Urban Residential			0.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-
May 2003	H-15[4]	0.5	ND			ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.05	ND	ND	ND	ND	0.07	0.3
		20		<25	<50																		
November 2003	H-17[4]	19		ND	14,600	2.83	ND	ND	0.347	ND	ND	ND	ND	0.356	ND		2.7	2.22	ND		ND	ND	2.42
November 2003	H-18[4]	25		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND	ND	ND
November 2003	H-19[4]	23		ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND		ND	ND	ND		ND	ND	ND
November 2003	H-20[4]	25		ND	ND	ND	0.108	0.575	0.874	0.731	0.398	0.461	0.339	0.928	0.0888		1.37	0.145	0.289		ND	1.48	2.09
November 2003	H-21[4]	26		ND	ND	ND	ND	ND	0.0204	0.024	ND	0.0156	0.0179	0.0223	ND		0.0434	ND	0.014		ND	0.0237	0.0719
August 2013	B-8	3		<33	<130																		
		15		250 H	420 O	0.015	0.061	0.069	0.3	0.54	0.59	0.23	0.45	0.34	0.075	0.064	0.47	0.024	0.45	0.093	0.24	0.32	0.36
		24		150 Z	570 Z																		
August 2013	B-9	10		<32	<130																		
		20		<40	<160																		
August 2013	B-10	10		<27	<110																		
		15	All < 0.2	<27	<110																		
		30		<36	<150																		
August 2013	B-11	3	All <0.2	<27	<110																		
		20		140 Y	400 O	0.39	0.13	0.17	0.29	0.36	0.34	0.11	0.31	0.36	0.031	0.72	0.93	0.16	0.26	0.13	0.46	0.84	1.1
		25		<32	<130																		
August 2013	B-12	5	All <0.2	<27	<110																		
		15		<26	<110																		
October 2013	B-23	8		<28	<120																		
		15		<27	<110																		
April 2014	MW-10	13		<27	14 J																		
April 2014	MW-11	8		120 H	1,300 O	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	0.004	<0.003
		17		30 J	450 O	<0.003	<0.003	<0.003	<0.003	0.004	0.005	<0.003	0.007	0.004	<0.003	<0.003	0.006	<0.003	0.006	<0.003	<0.003	0.005	0.006 X
April 2014	MW-12	14		6.8 J	56 J																		

Notes:

See Table 4 for abbreviations and analytical qualifiers.

[1] RBCs for this exposure pathway and receptors apply only to surface soils (0 - 3 feet BGS).

[2] Occupational worker RBCs are not included in table because they are less stringent than urban residential RBCs and apply to same depth.

[3] Excavation worker RBCs are not included because they are equal to or less stringent than construction worker RBCs and apply to same depth.

[4] See Figures 3A and 3B for location of historic sample locations. Detection limits not included for historic samples previously been reviewed by ODEQ.

Sample silica gel treated prior to TPH analysis.

Exceeds one or more applicable Human Health RBCs.

"-" Generic RBCs or SLVs are not established for this constituent.

*A generic RBC for RRO has not been established. For screening purposes, the DRO RBC is used for RRO.

Table 11 PCBs, TPH and PAHs in Test Pit Soil Samples Boise Cascade St. Helens Veneer Mill Site

Complete Exposure Pathways / Receptors			PCBs	TPH		PAHs																	
Sample Date	Test Pit No.	Sample Depth (ft/bgs)	(mg/Kg)	DRO (mg/Kg)	RRO	A-thene	A-ylene	Anth	B(a)anth	B(a)pyr	B(b)fluor	B(k)fluor	B(g,h,i)per	Chrysene (mg/Kg)	D(a,h)an	Dibenzf	Fluoran	Fluorene	I(1,2,3)pyr	2-Mnap	Naph	Phenan	Pyrene
Ingest, Contact, Inhale / Urban Residential[1,2]			0.310	2,200	2200*	9400	-	47000	0.34	0.034	0.34	3.4	-	32	0.034	-	4600	6300	0.34	-	25		3400
Ingest, Contact, Inhale / Construction Worker[3]			120	-	-	520000	-	-	590	59	590	5900	-	57000	59	-	250000	340000	590	-	16000		190000
Volatilization / Urban Residential			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18		-
Vapor Intrusion / Urban Residential			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18		-
April 2014	TP-1	4	All <0.016	<32	<130																		
April 2014	TP-2	3.8 - 4	All <0.016																				
April 2014	TP-4	4	All <0.016	<27	<110																		
April 2014	TP-5	3.8	All <0.016	<27	<110																		
April 2014	TP-6	4	All <0.016	<26	140 O																		
April 2014	TP-7	4	All <0.016	<27	<110																		
April 2014	TP-9	2.6	All <0.016	<28	<110																		
April 2014	TP-10	0.5 - 0.8	All <0.016	<31	<130																		
April 2014	TP-13	1	0.028 X[4]	38 H	<150	0.008	0.065	0.039	0.043	0.310	0.350	0.120	0.380	0.300	0.043	0.018	0.360	0.012	0.310	0.025	0.130	0.240	0.380
	TP-13	2.6		45 H	440 O	0.014	0.017	0.060	0.230	0.230	0.240	0.082	0.190	0.360	0.032	0.024	0.500	0.015	0.140	0.057	0.066	0.330	0.660
June 2014	TP-13A	0 - 1	All <0.016			0.004	0.008	0.010	0.061	0.081	0.100	0.033	0.097	0.110	0.014	0.005	0.085	<0.004	0.082	0.007	0.014	0.047	0.130
	TP-13A	1 - 3.2																					
June 2014	TP-13B	0 - 1	All <0.016			<0.004	<0.004	<0.004	0.017	0.025	0.034	0.010	0.038	0.032 X	0.005	<0.004	0.033	<0.004	0.027	0.004	0.008	0.020	0.051
June 2014	TP-13C	0 - 1	All <0.016			<0.004	<0.004	0.004	0.018	0.026	0.035	0.011	0.036	0.033	0.005	<0.004	0.034	<0.004	0.027	0.005	0.011	0.024	0.048
April 2014	TP-14	2	All <0.016	<75	390 O																		
	TP-14	3.5 - 3.8	All <0.016	<53	270 O																		
June 2014	TP-14A	0 - 1				0.024	0.078	0.024	0.020 X	0.033	0.045	0.011 X	0.180	0.030	0.014	0.028	0.140	0.017	0.076	0.080	0.310	0.190	0.140
June 2014	TP-14B	0 - 1				<0.003	<0.003	<0.003	0.003 X	0.003	0.004	<0.003	0.007	0.009 X	<0.003	<0.003	0.004	0.004	<0.003	0.007	0.005	0.012	0.009
June 2014	TP-14C	0 - 1				<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
	TP-14C	1 - 4				0.330	1.400	0.270	0.063 X	0.038	0.086	<0.030 X	0.120	0.110	<0.006	0.400	1.600	0.380	0.045	0.920	5.300	3.000	1.800
April 2014	TP-16	1	All <0.016	<27	<110																		
	TP-16	3.5 - 4	All <0.016	<27	<110																		
April 2014	TP-17	4	All <0.016	<31	<130																		
April 2014	TP-18	1	All <0.016	<29	<120																		
	TP-18	2.75		610 Y	540 O	0.140	0.012	0.086	0.067	0.034	0.064	0.021	0.027	0.084	0.006	0.085	0.350	0.130	0.024	0.053	0.540	0.520	0.230
April 2014	TP-19	4	All <0.016	<27	<110																		
April 2014	TP-21	3.8	All <0.016	<27	<110																		
April 2014	TP-22	4	All <0.016	<27	<110																		
April 2014	TP-24	3.5 - 4	All <0.016																				
April 2014	TP-25	3.2	All <0.016																				
April 2014	TP-26	3.8	All <0.016	<27	<110																		

Notes:

See Table 4 for abbreviations and analytical qualifiers.

[1] RBCs and SLVs for this exposure pathway and receptors apply only to surface soils (0 - 3 feet BGS).

[2] Occupational worker RBCs are not included in table because they are less stringent than urban residential RBCs.

[3] Excavation worker RBCs are not included because they are equal to or less stringent than construction worker RBCs.

[4] Total Aroclors. Aroclor 1254 = 12 ug/kg, Aroclor 1260 = 16 ug/kg. See analytical report for comments.

Sample silica gel treated prior to TPH analysis.

Exceeds one or more applicable Human Health RBCs.

"-" Generic RBCs or SLVs are not established for this constituent.

*A generic RBC for RRO has not been established. For screening purposes, the DRO RBC is used for RRO.

Table 12 **Heavy Metals in Test Pit Soil Samples** **Boise Cascade St. Helens Veneer Mill**

Complete Exposure Pathways / Receptors		Arsenic (mg/Kg)		Cadmium (mg/Kg)		Lead (mg/Kg)			Mercury (mg/Kg)		
Ingest, Contact, Inhale / Urban Residential[1,2]		1[5]	NA	78	NA	400	NA		47	NA	
Ingest, Contact, Inhale / Construction[3]		13	13	150	150	800	800		93	93	
Portland Basin Background Soil Concentrations[4]		8.8[5] (2.4 - 9.5)		0.63 (0.15 - 0.83)		79 (7 - 100)			0.23 (0.2 - 0.23)		
Sample Date	**Test Pit or Borehole No.**	**0 - 3 ft[6]**	**3 - 4 ft**	**0 - 3 ft[6]**	**3 - 4 ft**	**0 - 3 ft[6]**	**3 - 4 ft**	**>4 ft[7]**	**0 - 3 ft[6]**	**3 - 4 ft**	**>4 ft[7]**
August 2013	B-3[8]		<3.8		<0.2		4			<0.02	
August 2013	B-14[8]		<3.7		<0.2		4			<0.02	
April 2014	TP-1		2.1		0.21		28			0.38	
April 2014	TP-2		2.5		0.24		7			0.05	
April 2014	TP-4		2.3		0.19		4			0.02	
April 2014	TP-5		2.9		0.19		4			0.02	
April 2014	TP-6		2.8		0.19		4			0.01	
April 2014	TP-7		3		0.12		3			0.03	
April 2014	TP-9		1.7		0.15		25			0.01	
April 2014	TP-10		3		0.28		19			0.06	
April 2014	TP-13	11.0	1.9	0.54	0.20	27	31		0.17	1.44	
June 2014	TP-13A	3.2	5.2	0.26	0.30	18	31		0.25	18.4	
June 2014	TP-13B	3.6	3.4	0.26	0.57	19	52		0.45	0.19	
June 2014	TP-13C	6.2	3.5	0.37	0.27	19	6		0.25	0.06	
April 2014	TP-14	6.2	3.7	1.08	0.43	107	325		0.11	1.24	
June 2014	TP-14A	1.7	11.6	0.17	0.51	118	1090		0.04	4.98	
June 2014	TP-14B	1.2	2	0.10	0.14	9	20		0.03	0.03	
June 2014	TP-14C	2.1	10.5	0.13	0.51	3	1620	8	0.04	0.72	0.02
April 2014	TP-16	2.4	2.3	0.18	0.17	4	5		0.02	0.04	
April 2014	TP-17		3		0.17		4			0.02	
April 2014	TP-18	2.5	2.6	0.13	0.19	5	8		0.02	0.03	
April 2014	TP-19		2.2		0.05		4			0.02	
April 2014	TP-21		2.6		0.20		4			0.02	
April 2014	TP-22		2.4		0.18		4			0.02	
April 2014	TP-24		2.5		0.18		3			0.02	
April 2014	TP-25		2.5		0.17		8			0.03	
April 2014	TP-26		2.6		0.20		3			0.02	
June 2014	TP-27					7	734	10		1.06	0.02
June 2014	TP-28					34	2340				
June 2014	TP-29					32	287		0.05		
June 2014	TP-30					51	247				
June 2014	TP-31					14	27	197		0.12	10.4
June 2014	TP-32					16	17	7			0.01
June 2014	TP-33					42	112	6	0.07		0.01
June 2014	TP-34					12	8	38			0.61
June 2014	TP-35					6	11	7		0.02	0.08
June 2014	TP-36					8	4	7			0.04
June 2014	TP-37					8	4	3			0.02

NOTES:

See Table 4 for abbreviations and analytical qualifiers.

1 RBCs for this exposure pathway and receptors apply only to surface soils (0 - 3 feet BGS).

2 Occupational RBCs are not included in table because they are less stringent than urban residential RBCs.

3 Excavation worker RBCs are not included because they are equal to or less stringent than construction worker RBCs.

4 From ODEQ March 2013 Technical Report. Columbia County identified within Portland Basin. Range of concentrations detected in parentheses.

5 The ODEQ Regional Background Soil Concentration is substituted for the screening level RBC because natural background is greater than RBC.

6 Shallow samples collected from 0 to 1 foot below ground surface or from first soil encountered if below pavement or compacted gravel.

7 Actual depth of these samples range from 5 to 10 feet below ground surface.

8 Samples collected from these two boreholes were also analyzed for Ba, Cr, Se, and Ag. All were below applicable risk-based standards.

Exceeds one or more applicable Human Health RBCs.

Exceeds March 2013 ODEQ Regional Background Metals Concentrations in Soil.

Table 13 **Lead in North End Refuse Fill Area Soil Samples** **Boise Cascade St. Helens Veneer Mill Site**

Complete Exposure Pathways / Receptors		Lead (mg/Kg)				
Ingest, Contact, Inhale / Urban Residential[1,2]		400			NA	
Ingest, Contact, Inhale / Construction[3]		800			800	
Regional Background Soil Concentrations[4]		79			79	
Sample Date	**Test Pit No.**	**0 - 1 ft**	**1 - 2 ft**	**2 - 3 ft**	**3 - 4 ft**	**5 - 10 ft[5]**
April 2014	14		107		325	
June 2014	14A	118		1,090		
June 2014	14B	9		20		
June 2014	14C	3	3	1,620	167	8
June 2014	27	7	12.4	16	734	10
June 2014	28	34	1,330	674	2,340	94
June 2014	29	32	16.2	102	287	
June 2014	30	51	732	293	247	
June 2014	31	14	3	7	27	197
June 2014	32	16	4	13	17	7
June 2014	33	42	9	108	112	6

Notes:

See Table 4 for abbreviations and analytical qualifiers.

1 RBCs for this exposure pathway and receptors apply only to surface soils (0 - 3 feet BGS).

2 Occupational RBCs are not included in table because they are less stringent than urban residential RBCs.

3 Excavation worker RBCs are not included because they are equal to or less stringent than construction worker RBCs.

4 Regional background concentrations are not RBCs or cleanup standards, but are an indication of whether metals are naturally occurring.

5 Actual depth of these samples range from 5 to 10 feet below ground surface.

Exceeds one or more applicable Human Health RBCs.

Exceeds March 2013 ODEQ Regional Background Metals Concentrations in Soil.

Table 14 **TPH and PAHs in Groundwater Samples** **Boise Cascade St. Helens Veneer Mill Site**

Area	Sample Date	Map ID[1]	NWTPH-DX (mg/L) DRO	RRO	PAHs (ug/L) A-thene	A-ylene	Anth	B(a)anth	B(a)pyren	B(b)fluor	B(k)fluor	B(g,h,i)per	Chrysene	Db(a,h)an	Dibenzf	Fluoran	Fluorene	I(1,2,3)pyr	2-Mnaph	Naph	Phenan	Pyrene
Volatization Outdoor Air / Urban Residential[2]			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8,400	-	-
Vapor Intrusion / Urban Residential[2]			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,800	-	-
GW in Excavation / Excavation Workers[3]			-	-	-	-	-	9.1	0.53	-	-	-	-	0.21	-	-	-	-	-	500	-	-
Ecological / Freshwater Aquatic			-	-	520	-	13	0.027	0.014	-	-	-	-	-	3.7	6.16	3.9	-	2.1	620	6.3	-
Ecological / Birds			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ecological / Mammals			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	284,000	-	-
Lathe Area	August 2013	B-3	1.6 Z	2.3 O	8.7	0.11	0.16	0.17	0.22	0.22	0.083	0.24	0.17	0.038	2	1.1	2.8	0.21	1.9	1.6	3.4	0.82
	August 2013	B-4	0.65 Z	2.1 Z	0.34	0.1	0.091	0.19 X	0.36	0.31	0.1	0.43	0.28	0.06	0.041	0.37	0.069	0.36	0.1	0.85	0.28	0.43
	August 2013	B-13	4.1 Y	17.0 O	0.091	<0.031	<0.031	<0.031	0.054	0.046	<0.031	0.084	0.042 X	<0.031	0.052	0.084	0.067	0.064	0.12	0.18	0.11	0.084
	August 2013	B-14	0.36 Z	0.75 Z	0.5	<0.02	<0.02	<0.02	0.023	<0.02	<0.02	0.027	<0.02	<0.02	0.057	0.12	0.095	0.022	0.032	0.14	0.2	0.1
	October 2013	B-22	0.48 Y	<0.52	0.69	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
	April 2014	MW-1	<0.260	<0.520	0.058	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.035	<0.02	<0.02	0.05	0.055	<0.02
	June 2014	MW-1	<0.260	<0.510	0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.064	<0.019	<0.019
	April 2014	MW-2	<0.260	<0.520	0.83	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.026	0.049	<0.02	<0.02	0.053	0.056	0.024
	June 2014	MW-2	<0.260	<0.510	0.66	0.038	0.038	<0.019	<0.019	<0.019	<0.019	<0.019	0.046	<0.019	<0.019	0.024	0.19	<0.019	0.094	5.6	0.32	0.03
	April 2014	MW-3	<0.270	<0.530	0.035	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.055	<0.02	<0.02	<0.02	0.066	<0.02
	June 2014	MW-3	<0.260	<0.520	0.022	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.02	2.5	<0.019	<0.019
	April 2014	MW-4	<0.270	<0.530	0.15	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.054	<0.02	<0.02	0.036	0.039	<0.02
	June 2014	MW-4	<0.260	<0.520	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.066	<0.019	<0.019
	April 2014	MW-14	<0.260	<0.520	0.12	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.046	<0.02	0.022	0.078	0.044	<0.02
	June 2014	MW-14	<0.260	<0.510	0.044	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.02	0.14	<0.019	<0.019
Oil House & Transformer Area	May 2003	H-15[1]	<2.5	176	9.97	<2.75	<2.75	<2.75	<2.75	<2.75	<2.75	<2.75	<2.75	<5.5		10.5	6.54	<2.75		<2.75	<2.75	6.9
	May 2003	H-16[1]			14.5	0.15	0.62	0.14	<0.1	<0.1	<0.1	<0.1	0.16	<0.2		1.89	5.71	<0.1		23.1	8.10	1.02
	November 2003	H-17[1]	<0.25	<0.5	13.6	<0.1	0.427	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		1.3	5.93	<0.1		13.6	4.49	0.845
	November 2003	H-18[1]	<0.25	<0.5	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
	November 2003	H-19[1]	<0.25	<0.5	0.177	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
	November 2003	H-20[1]	2.13	<0.5	0.30	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	0.104	<0.1		<0.1	<0.1	<0.1
	November 2003	H-21[1]	<0.25	<0.5	0.849	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	0.285	<0.1		<0.1	<0.1	<0.1
	August 2013	B-8	<0.26	<0.52	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.069	<0.02	<0.02
	August 2013	B-12	0.27 Z	0.65 Z	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.059	<0.019	<0.019
	October 2013	B-23	0.45 H	1.1 O	2.1	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	0.32	<0.19	1.2	<0.19	<0.19	1.8	0.28	<0.19
	April 2014	MW-10	<0.260	<0.520	3.1	<0.02	0.03	<0.02	<0.02	<0.02	<0.02	<0.02	0.021	<0.02	0.038	0.023	0.35	<0.02	0.04	0.06	0.21	0.051
	June 2014	MW-10	<0.260	<0.520	3.7	0.025	0.054	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.12	<0.019	0.24	<0.019	0.05	0.078	0.096	0.11
	April 2014	MW-11[4]	<0.270	<0.540	4.3	0.073	0.54	0.13 X	0.22	0.2	0.066	0.26	0.17	0.027	0.52	1.3	3.2	0.21	0.15	1.1	1.7	1.1
	June 2014	MW-11[4]	<0.260	<0.520	0.10	<0.019	0.038	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.020	2.0	<0.019	<0.019
	April 2014	MW-12[4]	<0.260	<0.530	1	0.025	0.052	0.09 X	0.19	0.16	0.056	0.24	0.12	<0.02	0.068	0.27	0.41	0.19	0.062	0.079	0.54	0.29
	June 2014	MW-12[4]	<0.260	<0.510	0.044	0.021	0.021	0.036	0.071	0.063	0.020	0.089	0.041	<0.019	<0.019	0.11	0.025	0.069	0.027	0.17	0.092	0.12
Barker & Log Utilization Area	August 2013	B-16	0.51 Y	1.2 O	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.039	<0.02	<0.02
	October 2013	B-17[4]	<1.9	4.9 O	<0.95	<0.95	<0.95	<0.95	<0.95	<0.95	<0.95	1.4	<0.95	<0.95	<0.95	<0.95	<0.95	1.2	<0.95	<0.95	<0.95	<0.95
	October 2013	B-18[4]	1.7 Y	3.6 O	<0.2	0.24	<0.2	0.69	1.8	1.8	0.46	2.3	0.92	<0.2	<0.2	1.7	<0.2	1.8	<0.2	0.63	0.67	2.0
	October 2013	B-24	1.3 H	6.4 O	<0.19	<0.19	<0.19	<0.19	0.39	0.31	<0.19	0.53	0.2	<0.19	<0.19	0.33	<0.19	0.37	<0.19	<0.19	<0.19	0.42
	April 2014	MW-8[4]	<0.280	<0.550	0.91	<0.02	0.025	<0.02	<0.02	<0.02	<0.02	0.034	<0.02	<0.02	0.051	0.1	0.23	0.024	0.063	0.9	0.096	0.072
	June 2014	MW-8[4]	<0.260	<0.510	0.36	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.028	0.069	<0.019	<0.019	0.12	0.038	0.021
	April 2014	MW-9	<0.270	<0.530	0.08	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.056	<0.02	<0.02	0.03	0.07	<0.02
	June 2014	MW-9	<0.260	<0.520	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.074	<0.019	<0.019
	April 2014	MW-13	<0.260	<0.510	1.1	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.035	<0.02	<0.02	0.024	0.029	<0.02
	June 2014	MW-13	<0.260	<0.520	1.5	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.081	<0.019	<0.019

Area	Sample Date	Map ID[1]	NWTPH-DX (mg/L) DRO	RRO	PAHs (ug/L) A-thene	A-ylene	Anth	B(a)anth	B(a)pyren	B(b)fluor	B(k)fluor	B(g,h,i)per	Chrysene	Db(a,h)an	Dibenzf	Fluoran	Fluorene	I(1,2,3)pyr	2-Mnaph	Naph	Phenan	Pyrene
Volatization Outdoor Air / Urban Residential[2]			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8,400	-	-
Vapor Intrusion / Urban Residential[2]			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,800	-	-
GW in Excavation / Excavation Workers[3]			-	-	-	-	-	9.1	0.53	-	-	-	-	0.21	-	-	-	-	-	500	-	-
Ecological / Freshwater Aquatic			-	-	520	-	13	0.027	0.014	-	-	-	-	-	3.7	6.16	3.9	-	2.1	620	6.3	-
Ecological / Birds			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ecological / Mammals			-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	284,000	-	-
Shop & UST Area	May 2003	H-5[1]			4.39	<1.0	2.28	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<2.0		2.28	4.05	<1.0	<1.0	<1.0	21.3	1.08
	March 2014	MFA-25[5]	0.042 J	0.24 J	0.023	0.07	0.034	0.024 X	0.032	0.043	<0.019	0.048	0.04	<0.019	0.043	0.1	0.035	0.036	0.097	0.62	0.2	0.1
	March 2014	MFA-28[5]	0.42 L	0.41 J	0.068	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.04	0.31	0.033	<0.019
Sorter/Stacker Area	May 2003	H-8[1]			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
	May 2003	H-9[1]			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
	May 2003	H-10[1]			<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.2		<0.1	<0.1	<0.1		<0.1	<0.1	<0.1
Riverside	May 2003	H-14[1]			<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.12	<0.24		<0.12	<0.12	<0.12		<0.12	<0.12	<0.12
	May 2003	H-15[1,4]	<2.5	176	9.97	<2.75	<2.75	<2.75	<2.75	<2.75	<2.75	<2.75	<2.75	<5.5		10.5	6.54	<2.75		<2.75	<2.75	6.9
	May 2003	H-16[1,4]			14.5	0.15	0.62	0.14	<0.1	<0.1	<0.1	<0.1	0.16	<0.2		1.89	5.71	<0.1		23.1	8.10	1.02
	October 2013	B-17[4]	<1.9	4.9 O	<0.95	<0.95	<0.95	<0.95	<0.95	<0.95	<0.95	1.4	<0.95	<0.95	<0.95	<0.95	<0.95	1.2	<0.95	<0.95	<0.95	<0.95
	October 2013	B-18[4]	1.7 Y	3.6 O	<0.2	0.24	<0.2	0.69	1.8	1.8	0.46	2.3	0.92	<0.2	<0.2	1.7	<0.2	1.8	<0.2	0.63	0.67	2.0
	October 2013	B-19	7.0 H	81.0 O	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8
	October 2013	B-20	2.0 H	7.2 O	4.2	0.47	0.50	0.51	1.0	1.0	0.29	1.4	0.65	<0.19	0.54	3.1	2.1	1.1	0.43	5.2	5.0	2.0
	October 2013	B-21	<6.0	15.0 O	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8	<4.8
	October 2013	B-23	0.45 H	1.1 O	2.1	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	<0.19	0.32	<0.19	1.2	<0.19	<0.19		0.28	<0.19
	April 2014	MW-5	<0.270	<0.530	12	0.12	0.058	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.95	0.067	3.2	<0.02	0.31	0.26	0.32	0.03
	June 2014	MW-5	<0.260	<0.520	29	0.24	0.23	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	6.7	0.55	4.7	<0.019	3.8	7.1	1.9	0.22
	April 2014	MW-6	<0.270	<0.530	7	<0.38	0.32	0.027	<0.02	<0.02	<0.02	<0.02	0.024	<0.02	1.6	1	4.4	<0.02	0.76	1	4.6	0.52
	June 2014	MW-6	<0.260	<0.520	0.29	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.057	0.028	0.14	<0.019	0.037	0.15	0.14	<0.019
	April 2014	MW-7	<0.270	<0.530	0.44	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.033	<0.02	<0.02	0.069	0.047	<0.02
	June 2014	MW-7	<0.260	<0.510	0.53	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.083	<0.019	<0.019
	April 2014	MW-8[4]	<0.280	<0.550	0.91	<0.02	0.025	<0.02 X	<0.02	<0.02	<0.02	0.034	<0.02	<0.02	0.051	0.1	0.23	0.024	0.063	0.9	0.096	0.072
	June 2014	MW-8[4]	<0.260	<0.510	0.36	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.028	0.069	<0.019	<0.019	0.12	0.038	0.021
	April 2014	MW-11[4]	<0.270	<0.540	4.3	0.073	0.54	0.13 X	0.22	0.2	0.066	0.26	0.17	0.027	0.52	1.3	3.2	0.21	0.15	1.1	1.7	1.1
	June 2014	MW-11[4]	<0.260	<0.520	0.10	<0.019	0.038	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	<0.019	0.020	2.0	<0.019	<0.019
	April 2014	MW-12[4]	<0.260	<0.530	1	0.025	0.052	0.09 X	0.19	0.16	0.056	0.24	0.12	<0.02	0.068	0.27	0.41	0.19	0.062	0.079	0.54	0.29
	June 2014	MW-12[4]	<0.260	<0.510	0.044	0.021	0.021	0.036 X	0.071	0.063	0.020	0.089	0.041	<0.019	<0.019	0.11	0.025	0.069	0.027	0.17	0.092	0.12

Notes:
See Table 4 for abbreviations and analytical qualifiers.
[1] See Figures 3A and 3B for location of historic sample locations.
[2] Occupational worker RBCs are not included in table because they are less stringent than urban residential RBCs.
[3] Excavation worker RBCs are not included because they are equal to or less stringent than construction worker RBCs.
[4] These boreholes and monitoring wells represent two areas. Analytical results are included in both areas.
[5] This sample was also analyzed for NWTPH-DX GRO. MFA-25 <250 ug/L and MFA-28 = 610 ug/L.

Sample silica gel treated prior to TPH analysis.
Exceeds one or more applicable Human Health RBCs.
Exceeds one or more applicable ecological level II SLVs.
"-" Generic RBCs or SLVs are not established for this constituent.

Table 15 **Metals and VOCs in Groundwater Samples** **Boise Cascade St. Helens Veneer Mill Site**

Area	Sample Date	Map ID[1]	Metals (ug/L) As	Ba	Cd	Cr(III)	Pb	Hg	Se	Ag	VOCs (ug/L) Toluene	IPT	Bbenz	Pbenz	3Mbenz	Others
Volatization Outdoor Air / Urban Residential[2]			-	-	-	-	-	-	-	-	-	-	-	-	-	varies
Vapor Intrusion / Urban Residential[2]			-	-	-	-	-	-	-	-	-	-	-	-	5,000	varies
GW in Excavation / Excavation Workers[3]			5,800	25000000	57,000	-	-	-	-	1E+06	210,000	-	-	-	1,700	varies
Ecological / Aquatic Freshwater			150	4	2.2	74	2.5	0.77	5	0.12	9.8	-	-	-	-	varies
Ecological / Birds			18,000	150,000	100,000	7,200	28,000	3,300	3,600	-	-	-	-	-	-	varies
Ecological / Mammals			6,000	39,000	8,000	21,000	323,000	10,000	1,500	-	104,000	-	-	-	-	varies
Lathe Area	August 2013	B-3[5]	17.8	405	1.16	36	57.5	0.4	<2.0	0.5	5.3	<2	<2	<2	<2	All ND
	August 2013	B-4[5]	193	7,080	24.9	926	791	3.8	17.1	6.7	1	<2	<2	<2	<2	All ND
	August 2013	B-14[5]	20.9	1,430	7.39	212	129	0.2	2.0	0.53	<0.5	3.8	<2	<2	<2	All ND
	October 2013	B-22	0.5	97.8	0.02	0.4	0.02	0.2	1.0	0.02						
Transformer & Oil House Area	May 2003	H-15[1,4]									ND	ND	ND	ND	ND	All ND
	May 2003	H-16[1,4]									4	ND	ND	ND	ND	All ND
Shop/UST Area	May 2003	H-5[1]									ND	ND	1	2	2	All ND
	March 2014	MFA-25									<0.5	<2	<2	<2	<2	All ND
	March 2014	MFA-28									<0.5	<2	<2	<2	<2	All ND
Sorter/Stacker Area	May 2003	H-8[1]									ND	ND	ND	ND	ND	All ND
	May 2003	H-9[1]									ND	ND	ND	ND	ND	All ND
	May 2003	H-10[1]									1	59	ND	ND	ND	All ND
Riverside	May 2003	H-14[1]									ND	ND	ND	ND	ND	All ND
	May 2003	H-15[1,4]									ND	ND	ND	ND	ND	All ND
	May 2003	H-16[1,4]									4	ND	ND	ND	ND	All ND
	October 2013	B-19	0.5	74.2	0.06	0.5	0.03	0.4	1	0.02						
	October 2013	B-20	1.9	103	0.02	0.7	0.02	1.76	1	0.02						
	October 2013	B-21	1.2	125	0.04	1.1	0.02	0.8	1	0.02						

Notes:

See Table 4 for abbreviations and analytical qualifiers.

[1] See Figures 3A and 3B for location of historic sample locations.

[2] Occupational worker RBCs are not included in table because they are less stringent than urban residential RBCs.

[3] Excavation worker RBCs are not included because they are equal to or less stringent than construction worker RBCs.

[4] These boreholes and monitoring wells represent two areas. Analytical results are included in both areas.

[5] These samples were not filtered prior to metals analysis.

Exceeds one or more applicable Human Health RBCs.

Exceeds one or more applicable ecological level II SLVs.

"-" Generic RBCs or SLVs are not established for this constituent.

Table 16 **Metals, PAHs and PCBs in Storm Water Samples[1]** **Boise Cascade St. Helens Veneer Mill Site**

Constituent	Freshwater Aquatic SLV (ug/L)	Storm Water Concentrations (ug/L) Outfall 1	Outfall 2	Outfall 3	Constituent	Freshwater Aquatic SLV (ug/L)	Storm Water Concentrations (ug/L) Outfall 1	Outfall 2	Outfall 3
Arsenic	150	0.5	0.5	0.5	Naphthalene	620	0.055	0.03	0.075
Cadmium	2	0.15	0.02	0.14	2-Methylnaphthalene	2.1	<0.020	<0.020	0.033
Lead	2.5	0.73	0.13	0.66	Acenaphthylene	-	<0.020	<0.020	<0.020
Mercury	0.77	0.2	0.2	0.2	Acenaphthene	520	<0.020	<0.020	<0.020
Aroclor 1016	-	<0.0050	<0.0052	<0.0052	Dibnezofuran	3.7	<0.020	<0.020	<0.020
Aroclor 1221	0.28	<0.010	<0.11	<0.11	Fluorene	3.9	<0.020	<0.020	<0.020
Aroclor 1232	0.58	<0.0050	<0.0052	<0.0052	Phenanthrene	6.3	<0.020	<0.020	<0.020
Aroclor 1242	0.053	<0.0050	<0.0052	<0.0052	Anthracene	13	<0.020	<0.020	<0.020
Aroclor 1248	0.081	<0.0050	<0.0052	<0.0052	Fluoranthene	6.16	<0.020	<0.020	<0.020
Aroclor 1254	0.033	<0.0050	<0.0052	<0.0052	Pyrene	-	<0.020	<0.020	<0.020
Aroclor 1260	94	<0.0050	<0.0052	<0.0052	Benz(a)anthracene	0.027	<0.020	<0.020	<0.020
					Chrysene	-	<0.020	<0.020	<0.020
					Benzo(b)fluoranthene	-	<0.020	<0.020	<0.020
					Benzo(k)fluroanthene	-	<0.020	<0.020	<0.020
					Benzo(a)pyrene	0.014	<0.020	<0.020	<0.020
					Indeno(1,2,3-cd)pyrene	-	<0.020	<0.020	<0.020
					Dibenzo(a,h)anthracene	-	<0.020	<0.020	<0.020
					Benzo(g,h,i)perylene	-	<0.020	<0.020	<0.020

Notes:

See Table 4 for abbreviations and analytical qualifiers.

[1] Samples collected in June 2014.

"-" Generic SLVs are not established for this constituent.

Table 17 **Conceptual Site Model Based on Urban Residential and/or Commercial Use** **Boise Cascade St. Helens Veneer Mill Site**

Primary Sources	Release Mechanism	Affected Media	Transport Mechanism	Tertiary Sources	Exposure Routes	Urban Residents	Occupational Workers	Excavation Workers	Construction Workers	Aquatic	Birds & Mams
Exposure Pathway						Future Potential Human Receptors				Potential Fresh Water Receptors	
Manufacturing Area Petroleum Sources: Lathe, Oil House & Transformer, Debarker	Surface Spills & Leaks	Surface Soil[1] (<3 ft)	Volatilization[2]	Air (Outdoor)	Inhalation	0	0	0	0	NA	NA
			Particles (dust)	Air (Outdoor)	Inhalation	+	+	+	+	NA	NA
			Vapor Intrusion[2]	Air (Indoor)	Inhalation	0	0	0	0	NA	NA
					Ingestion	+	+	+	+	NA	NA
					Dermal Contact	+	+	+	+	NA	NA
			Stormwater Runoff to Surface Water	⊘	Contact/Ingest	0	0	-	-	0	0
		Subsurface Soil (>3 feet)	Volatilization[2]	Air (Outdoor)	Inhalation	-	-	0	0	NA	NA
			Particles (dust)	Air (Outdoor)	Inhalation	-	-	+	+	NA	NA
			Vapor Intrusion[2]	Air (Indoor)	Inhalation	0	0	0	0	NA	NA
					Ingestion	-	-	+	+	NA	NA
					Dermal Contact	-	-	+	+	NA	NA
		Groundwater	Vol. at Tap	Air (Indoor) ⊘	Inhalation[3]	-	-	-	-	NA	NA
				Drinking Water ⊘	Ingestion[3]	-	-	-	-	NA	NA
			Volatilization[2]	Air (Outdoor)	Inhalation	0	0	0	0	NA	NA
			Vapor Intrusion[2]	Air (Indoor)	Inhalation	0	0	0	0	NA	NA
					Dermal Contact	-	-	+	+	NA	NA
			Migration	Surface Water	Dermal Contact	0	0	-	-	0	0
					Ingestion	0	0	-	-	0	0
Northern Refuse Fill Area	Lead Contaminated Soil Placed On-Site	Surface Soil (<3 ft)	Particles (dust)	Air (Outdoor)	Inhalation	+	+	+	+	NA	NA
					Ingestion	+	+	+	+	NA	NA
					Dermal Contact	+	+	+	+	NA	NA
			Stormwater Runoff to Surface Water	⊘	Contact/Ingest	0	0	-	-	0	0
		Subsurface Soil (>3 feet)	Particles (dust)	Air (Outdoor)	Inhalation	-	-	+	+	NA	NA
					Ingestion	-	-	+	+	NA	NA
					Dermal Contact	-	-	+	+	NA	NA
			Leaching[4]	Groundwater ⊘	Ingestion[3]	-	-	-	-	-	-

NOTES

[1] Assumes existing concrete or asphalt cover is removed during site development exposing PCS.

[2] Most contaminants at the Site are non-volatile or semi-volatile and therefore should not cause an indoor or outdoor inhalation exposure. However, this pathway is still considered potentially complete for naphtalene.

[3] This pathway will be eliminated by deed restriction which prohibits groundwater use.

[4] Assume leaching does not occur due to bedrock at approximately 4 - 5 feet BGS. TCLP data supports very low leaching potential of lead.

⊘ Indicates exposure pathway is blocked either by chemical characteristics, deed restriction, or surface cover (e.g. pavement).

NA = Not Applicable to this exposure pathway due to incorrect media (i.e. water vs soil)

\- Indicates exposure pathway is not complete for these receptors.

\+ Indicates exposure pathway is complete for these receptors.

0 Indicates exposure pathway is complete for these receptors but judged to be negligible due to very limited exposure, dilution in adjacent river, and/or RBCs or SLVs are not established for these exposure pathways.

Soil Regional Background and Risk Based Concentrations (RBCs)

Exposure Pathway / Population	Total PCBs (mg/Kg)	NWTPH-DX (mg/Kg)		PAHs (mg/Kg)																		Metals (mg/Kg)							
		DRO	RRO	A-thene	A-ylene	Anthrac	B(a)A	B(a)P	B(b)F	B(k)F	B(g,h,i)P	Chrysene	D(a,h)A	Dbf	Fluor	Fluorene	I(1,2,3)P	2-Mn	Naph	Phenan	Pyrene	As	Ba	Cd	CrIII	Pb	Hg	Se	Ag
Regional Background Concentration	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	8.8	790	0.63	76	79	0.23	0.71	0.82
Ingest, Contact, Inhale / Urban Residential	0.31^	2,200	2200*	9,400	-	47,000	0.34	0.034	0.34	3.4	-	32	0.034	-	4,600	6,300	0.34	-	25	-	3,400	1	31,000	78	230,000	400	47	-	780
Ingest, Contact, Inhale / Occupational	0.31	14,000	14000*	61,000	-	310,000	207	0.27	2.7	27	-	250	0.27	-	29,000	41,000	2.7	-	23	-	21,000	1.7	190,000	510	-	800	310	-	5,100
Ingest, Contact, Inhale / Construction	4.4	4,600	4600*	19,000	-	93,000	21	2.1	21	210	-	2,100	2.1	-	8,900	12,000	21	-	580	-	6,700	13	60,000	150	460,000	800	93	-	1,500
Ingest, Contact, Inhale / Excavation	120	-	-	520,000	-	-	590	59	590	5,900	-	57,000	59	-	250,000	340,000	590	-	16,000	-	190,000	370	-	4,300	-	800	2,600	-	43,000
Volatilization Outdoor Air / Urban Residential	0.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-
Volatilization Outdoor Air / Occupational	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99	-	-	-	-	-	-	-	-	-	-
Vapor Intrusion / Urban Residential	0.56	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18	-	-	-	-	-	-	-	-	-	-
Vapor Intrusion / Occupational	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	99	-	-	-	-	-	-	-	-	-	-
Leach to Groundwater / Urban Residential	-	9,500	9500*	-	-	-	10	2.7	-	-	-	-	-	-	-	-	-	-	0.47	-	-	**	**	**	**	30	**	**	**
Leaching to Groundwater / Occupational	0.55	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.44	-	-	**	**	**	**	30	**	**	**

Groundwater Risk Based Concentrations (RBCs)

Exposure Pathway / Population	Total PCBs (ug/L)	NWTPH-DX (ug/L)		PAHs (ug/L)																		Metals (ug/L)							
		DRO	RRO	A-thene	A-ylene	Anthrac	B(a)A	B(a)P	B(b)F	B(k)F	B(g,h,i)P	Chrysene	D(a,h)A	Dbf	Fluor	Fluorene	I(1,2,3)P	2-Mn	Naph	Phenan	Pyrene	AsIII	Ba	Cd	CrIII	Pb	Hg	Se	Ag
Ingest, Inhale / Urban Residential	0.024	100	100*	-	-	-	0.088	0.0088	0.039	-	-	0.66	0.0088	-	-	-	-	-	0.78	-	-	0.13	15000	37	110,000	15	22	-	370
Ingest, Inhale / Occupational	0.027	430	430*	-	-	-	0.56	0.056	0.16	-	-	-	0.056	-	-	-	-	-	0.72	-	-	0.27	29000	73	220,000	15	44	-	730
Volatization Outdoor Air / Urban Residential	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8,400	-	-	-	-	-	-	-	-	-	-
Volatization Outdoor Air / Occupational	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16,000	-	-	-	-	-	-	-	-	-	-
Vapor Intrusion / Urban Residential	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1,800	-	-	-	-	-	-	-	-	-	-
Vapor Intrusion / Occupational	22	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10,000	-	-	-	-	-	-	-	-	-	-
GW in Excavation / Excavation Workers	1.9	-	-	-	-	-	9.1	0.53	-	-	-	-	0.21	-	-	-	-	-	500	-	-	5,800	2.5E+07	57,000	-	-	-	-	1E+06

Surface Water Ecological Level II Screening Level Values (SLVs)

Exposure Pathway / Population	Total PCBs (ug/L)	NWTPH-DX (ug/L)		PAHs (ug/L)																		Metals (ug/L)							
		DRO	RRO	A-thene	A-ylene	Anthrac	B(a)A	B(a)P	B(b)F	B(k)F	B(g,h,i)P	Chrysene	D(a,h)A	Dbf	Fluor	Fluorene	I(1,2,3)P	2-Mn	Naph	Phenan	Pyrene	AsIII	Ba	Cd	CrIII	Pb	Hg	Se	Ag
Ecological / Freshwater Aquatic	0.014	-	-	520	-	13	0.027	0.014	-	-	-	-	-	3.7	6.16	3.9	-	2.1	620	6.3	-	150	4	2.2	74	2.5	0.77	5	0.12
Ecological / Birds	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	18,000	150,000	100,000	7,200	28,000	3,300	3,600	-
Ecological / Mammals	270	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	284,000	-	-	6,000	39,000	8,000	21,000	323,000	10,000	1,500	-

Notes:

Volatile Organic Compounds (VOCs) are not included because these COCs were not detected.

^ The Occupational Worker RBC for PCBs was used because a Urban Residential RBC has not been established.

*A generic RBC for RRO has not been established. For screening purposes, the DRO RBC is used for RRO.

** Leaching to groundwater RBCs must be calculated from site specific leaching tests if this pathway is a concern.

NA = Not Applicable. Background concentrations have only been established for naturally occuring metals.

Complete exposure pathway with potential receptors. RBCs and SLVs used for screening.

Complete exposure pathway with potential receptors, but RBCs are not used for screening because more stringent RBCs are used for screeing.

Incomplete exposure pathway. RBCs are not used for screening the site.

"-" Generic RBCs or SLVs are not established for this constituent.

Table 19 *Occurrence, Distribution, and Selection of Contaminants in Groundwater Monitoring Wells*[1]

Chemical	Minimum Detected Concentration (µg/L)	Maximum Detected Concentration (µg/L)	Range of Detection Limits[2] (µg/L)	Location of Maximum Detected Concentration	Total Number of Samples	Number of Detections Greater than Detection Limit	Number of Exceedances Greater than Screening Level	Freshwater Aquatic Screening Level (µg/L)	95% UCL[3] (µg/L)	Distribution	UCL Method	UCL Greater than Screening Level?
Benz(a)anthracene	0.027	0.13	0.019 - 0.02	MW-11[4]	28	4	4	0.027	0.0353	Normal	95% KM (t) UCL	Yes[5]
Benzo(a)pyrene	0.071	0.22	0.019 - 0.02	MW-11[4]	28	3	3	0.014	0.0533	Normal	95% KM (t) UCL[6]	Yes[5]
Dibenzofuran	0.038	6.70	0.019 - 0.02	MW-5[4]	28	9	1	3.7	0.805	Gamma	95% KM (t) UCL	No
Fluorene	0.025	4.70	0.019	MW-5[4]	28	20	2	3.9	3.241	Nonparametric	95% KM (Chebyshev) UCL	No
2-Methylnaphthalene	0.02	3.80	0.019 - 0.02	MW-5[4]	28	15	1	2.1	0.44	Nonparametric	95% KM (t) UCL[7]	No

Notes and Key:

[1] April and June monitoring well samples only. Grab samples from soil borings are not included because monitoring well results are considered more representative of actual groundwater conditions.

[2] All results reported to the Method Reporting Limit.

[3] UCL = Upper Confidence Limit calculated by ProUCL.

[4] Wells MW-5 and MW-11 are approximately 30 feet from the shore of the Multnomah Channel of the Willamette River, at the confluence with the Columbia River.

[5] 95% UCL is essentially equal to the screening level, actual concentrations reaching the river very unlikely to exceed the screening level.

[6] UCL Warning "Data set has only 3 detected values. Not enough to compute meaningful or reliable statistics and estimates."

[7] No suggested UCL, therefore used "most common" . The 95% KM Chebyshev UCL = 0.807 ug/L.

Sample ID	Sample Collection Date	Sample Depth (ft bpeg)	Sample Location	Lead Concentration (mg/Kg)	Applicable Screening Level[1] (mg/Kg)
FC-10-2	9/9/2014	2'	Southwest Area	18.7	400
FC-11-2	9/9/2014	2'	Southwest Area	71.9	400
FC-12-2	9/9/2014	2'	Southwest Area	73.4	400
FC-13-2	9/9/2014	2'	Southwest Area	47.4	400
FC-14-2	9/8/2014	2'	Southwest Area	127 (8)[2]	400
FC-17-2	9/8/2014	2'	Southwest Area	89.5	400
FC-20-4	9/11/2014	4'	Southwest Area	16.3	800
FC-21-4	9/11/2014	4'	Southwest Area	12.5	800
FC-01-2	9/3/2014	2'	Main Area, South	39.0	400
FC-02-2	9/3/2014	2'	Main Area, South	3.5	400
FC-03-2	9/3/2014	2'	Main Area, South	3.1	400
FC-04-2	9/3/2014	2'	Main Area, South	15.9	400
FC-05-2	9/3/2014	2'	Main Area, South	3.9	400
FC-06-2	9/3/2014	2'	Main Area, South	2.8	400
FC-07-2	9/3/2014	2'	Main Area, South	2.7	400
FC-08-2	9/3/2014	2'	Main Area, South	3.6	400
FC-09-2	9/3/2014	2'	Main Area, South	3.6	400
FC-22-2	9/11/2014	2'	Main Area, South	33.5	400
FC-05-3	9/8/2014	3'	Main Area, South	3.4	800
FC-06-3	9/8/2014	3'	Main Area, South	2.8	800
FC-07-3	9/9/2014	3'	Main Area, South	208	800
FC-08-3	9/9/2014	3'	Main Area, South	144	800
FC-09-3-9/10	9/10/2014	3'	Main Area, South	607	800
FC-09-3-9/9	9/9/2014	3'	Main Area, South	148	800
FC-01-4	9/4/2014	4'	Main Area, North	9.3	800
FC-02-4	9/4/2014	4'	Main Area, North	167	800
FC-03-4	9/4/2014	4'	Main Area, North[3]	1470	800
FC-04-4	9/4/2014	4'	Main Area, North	30.3	800
FC-05-4	9/4/2014	4'	Main Area, North	397	800
FC-06-4	9/4/2014	4'	Main Area, North[3]	6920	800
FC-07-4	9/8/2014	4'	Main Area, North	330	800
FC-08-4	9/8/2014	4'	Main Area, North	640	800
FC-09-4	9/9/2014	4'	Main Area, North	210	800
FC-10-4	9/4/2014	4'	Main Area, North	13.2	800
FC-11-4	9/5/2014	4'	Main Area, North	102 (29.9)[2]	800
FC-12-4	9/5/2014	4'	Main Area, North	41.7	800
FC-13-4	9/8/2014	4'	Main Area, North	648	800
FC-14-4	9/8/2014	4'	Main Area, North	12.1	800
FC-15-4	9/8/2014	4'	Main Area, North	6.4	800
FC-16-4	9/8/2014	4'	Main Area, North	28.3	800
FC-17-4	9/8/2014	4'	Main Area, North	9.7	800
FC-18-4	9/10/2014	4'	Main Area, North	636	800
FC-19-4	9/10/2014	4'	Main Area, North	362	800

Notes

See Table 4 for abbreviations and analytical qualifiers.

[1] Applicable screening levels are based on urban residential from 0 - 3 ft bpeg and construction/excavation worker > 3 ft bpeg.

[2] Laboratory duplicates.

[3] Sample collected by scraping soil from bedrock surface. Very little soil remaining.

ft bpeg = feet below pre-excavation grade

Sample ID	Sample Collection Date	Sample Depth (ft bpeg)	Sample Location	Lead Concentration (mg/kg)	Applicable Screening Level[1] (mg/kg)
SW-09-0-1	9/8/2014	0-1'	Southwest Area, West Wall	15	400
SW-09-1-2-9/8	9/8/2014	1-2'	Southwest Area, West Wall	27	400
SW-23-2-3	9/15/2014	2-3'	Southwest Area, 4-foot excavation	20 (21)[2]	400
SW-21-2-4-E	9/11/2014	2-4'	Southwest Area, 4-foot excavation	36	400
SW-21-2-4-N	9/11/2014	2-4'	Southwest Area, 4-foot excavation	95	400
SW-21-2-4-W	9/11/2014	2-4'	Southwest Area, 4-foot excavation	66	400
SW-23-3-4	9/15/2014	3-4'	Southwest Area, 4-foot excavation	15	800
SW-08-0-1	9/8/2014	0-1'	Southwest Area, North Wall	40	400
SW-09-1-2-9/9	9/9/2014	1-2'	Southwest Area, North Wall	70	400
SW-10-1-2	9/8/2014	1-2'	Southwest Area, North Wall	7	400
SW-07-0-1	9/8/2014	0-1'	Southwest Area, South Wall	16	400
SW-08-1-2	9/8/2014	1-2'	Southwest Area, South Wall	9	400
SW-20-2-4-E	9/11/2014	2-4'	Southwest Area, 4-foot excavation	38	400
SW-20-2-4-N	9/11/2014	2-4'	Southwest Area, 4-foot excavation	14	400
SW-20-2-4-S	9/11/2014	2-4'	Southwest Area, 4-foot excavation	75	400
SW-20-2-4-W	9/11/2014	2-4'	Southwest Area, 4-foot excavation	19	400
SW-22-0-1	9/11/2014	0-1'	Main Area, West Wall	460	400
SW-30-0-1	9/16/2014	0-1'	Main Area, West Wall	324 (450)[2]	400
SW-31-0-1	9/16/2014	0-1'	Main Area, West Wall	938	400
SW-05-1-2-9/8	9/8/2014	1-2'	Main Area, West Wall	4	400
SW-01-2-3-9/4	9/4/2014	2-3'	Main Area, West Wall	60	400
SW-01-2-3 9/5	9/5/2014	2-3'	Main Area, West Wall	184	400
SW-02-2-3-9/4	9/4/2014	2-3'	Main Area, West Wall	92	400
SW-03-2-3-9/4	9/4/2014	2-3'	Main Area, West Wall	75	400
SW-30-2-3	9/16/2014	2-3'	Main Area, West Wall	202	400
SW-31-2-3	9/16/2014	2-3'	Main Area, West Wall	62	400
SW-01-3-4	9/4/2014	3-4'	Main Area, West Wall	62 (41)[2]	800
SW-32-0-1	9/16/2014	0-1'	Main Area, North Wall	758	400
SW-33-0-1	9/16/2014	0-1'	Main Area, North Wall	1980	400
SW-34-0-1	9/16/2014	0-1'	Main Area, North Wall	1360	400
SW-35-0-1	9/16/2014	0-1'	Main Area, North Wall	1820	400
SW-38-0-1	9/19/2014	0-1'	Main Area, North Wall	107	400
SW-39-0-1	9/19/2014	0-1'	Main Area, North Wall	365	400
SW-40-0-1	9/19/2014	0-1'	Main Area, North Wall	32	400
SW-41-0-1	9/19/2014	0-1'	Main Area, North Wall	16	400
SW-32-1-2	9/16/2014	1-2'	Main Area, North Wall	1290	400
SW-33-1-2	9/16/2014	1-2'	Main Area, North Wall	1800	400
SW-34-1-2	9/16/2014	1-2'	Main Area, North Wall	1590	400
SW-36-1-2	9/16/2014	1-2'	Main Area, North Wall	74	400
SW-38-1-2	9/19/2014	1-2'	Main Area, North Wall	211	400
SW-39-1-2	9/19/2014	1-2'	Main Area, North Wall	275	400
SW-41-1-2	9/19/2014	1-2'	Main Area, North Wall	32	400
SW-40-1-3	9/19/2014	1-3'	Main Area, North Wall	110	400
SW-32-2-3	9/16/2014	2-3'	Main Area, North Wall	197	400
SW-34-2-3	9/16/2014	2-3'	Main Area, North Wall	21	400
SW-37-2-3	9/16/2014	2-3'	Main Area, North Wall	128 (114)[2]	400
SW-35-2-4	9/16/2014	2-4'	Main Area, North Wall	29	400
SW-36-2-4	9/16/2014	2-4'	Main Area, North Wall	109	400
SW-38-2-4	9/19/2014	2-4'	Main Area, North Wall	3220	400

Sample ID	Sample Collection Date	Sample Depth (ft bpeg)	Sample Location	Lead Concentration (mg/kg)	Applicable Screening Level[1] (mg/kg)
SW-39-2-4	9/19/2014	2-4'	Main Area, North Wall	496	400
SW-41-2-4	9/19/2014	2-4'	Main Area, North Wall	39	400
SW-32-3-4	9/16/2014	3-4'	Main Area, North Wall	35	800
SW-33-3-4	9/16/2014	3-4'	Main Area, North Wall	69	800
SW-34-3-4	9/16/2014	3-4'	Main Area, North Wall	29	800
SW-37-3-4	9/16/2014	3-4'	Main Area, North Wall	393	800
SW-40-3-4	9/19/2014	3-4'	Main Area, North Wall	263	800
SW-37-4-5	9/16/2014	4-5'	Main Area, North Wall	38	800
SW-38-4-5	9/19/2014	4-5'	Main Area, North Wall	127	800
SW-39-4-5	9/19/2014	4-5'	Main Area, North Wall	139	800
SW-40-4-5	9/19/2014	4-5'	Main Area, North Wall	95	800
SW-41-4-5	9/19/2014	4-5'	Main Area, North Wall	198	800
SW-01-0-1	9/3/2014	0-1'	Main Area, East Wall	184 (33)[2]	400
SW-04-3-4	9/9/2014	3-4'	Main Area, East Wall	42	800
SW-20-1-2	9/11/2014	1-2'	Main Area, East Wall	46	400
SW-42-0-1	9/19/2014	0-1'	Main Area, East Wall	21	400
SW-42-1-2	9/19/2014	1-2'	Main Area, East Wall	60 (45)	400
SW-42-2-3	9/19/2014	2-3'	Main Area, East Wall	84	400
SW-42-3-4	9/19/2014	3-4'	Main Area, East Wall	109	800
SW-02-0-1	9/3/2014	0-1'	Main Area, South Wall	14	400
SW-02-1-2	9/3/2014	1-2'	Main Area, South Wall	3	400
SW-05-2-3	9/9/2014	2-3'	Main Area, Diagonal Wall	3	400
SW-06-2-3	9/9/2014	2-3'	Main Area, Diagonal Wall	27	400
SW-09-2-3	9/10/2014	2-3'	Main Area, Diagonal Wall	30	400
SW-05-3-4	9/10/2014	3-4'	Main Area, Near Center	552 (1040)[2]	800
SW-06-3-4	9/10/2014	3-4'	Main Area, Near Center	24	800

Notes

See Table 4 for abbreviations and analytical qualifiers.

[1] Applicable screening levels are based on urban residential from 0 - 3 ft bpeg and construction/excavation worker > 3 ft bpeg.

[2] Laboratory duplicates.

ft bpeg = feet below pre-excavation grade

Table 22 **Backfill Stockpile Soil Samples** **Boise Cascade St. Helens Veneer Mill Site**

Sample ID	Sample Collection Date	Location	Lead Concentration (mg/kg)	Applicable Screening Level[1] (mg/kg)
SP-01	9/5/2014	SE stockpile	92.2	400
SP-02	9/5/2014	SE stockpile	373	400
SP-03	9/5/2014	SE stockpile	112	400
SP-04	9/5/2014	SE stockpile	145	400
SP-05	9/5/2014	SE stockpile	105	400
SP-06	9/8/2014	NE stockpile	13.5	400
SP-07	9/8/2014	NE stockpile	14.2	400
SP-08	9/8/2014	NE stockpile	16.6	400
SP-09	9/8/2014	NE stockpile	163	400
SP-10	9/8/2014	NE stockpile	30.3	400
SP-11	9/9/2014	SW stockpile	31.2	400
SP-12	9/9/2014	SW stockpile	94.1	400
SP-13	9/9/2014	SW stockpile	23.8	400
SP-14	9/9/2014	SW stockpile	24.1	400
SP-16	9/11/2014	NE stockpile	15.7	400
SP-17	9/11/2014	NE stockpile	16.5	400
SP-18	9/11/2014	NE stockpile	19.9	400
SP-19	9/11/2014	NE stockpile	19.0	400
SP-20	9/11/2014	NE stockpile	20.9	400
Number of Samples			19	
Average			70	
Maximum			373	400
ProUCL 5.0 Best Fit			Gamma	
Correlation Coefficient			96	
Best Fit UCL@90% (Adjusted<50)			101	400

Notes

See Table 4 for abbreviations and analytical qualifiers.

[1] Applicable screening level for all backfill soil is based on urban residential RBC.

Table 23 **Heavy Metals in Soil Samples from Areas Not Excavated** **Boise Cascade St. Helens Veneer Mill**

Complete Exposure Pathways / Receptors		Arsenic (mg/Kg)		Cadmium (mg/Kg)		Lead (mg/Kg)			Mercury (mg/Kg)		
Ingest, Contact, Inhale / Urban Residential[1,2]		1[5]	NA	78	NA	400	NA		47	NA	
Ingest, Contact, Inhale / Construction[3]		13	13	150	150	800	800		93	93	
Regional Background Soil Concentrations[4]		8.8	8.8	0.63	0.63	79	79		0.23	0.23	
Sample Date	**Test Pit or Borehole No.**	**0 - 3 ft[6]**	**3 - 4 ft**	**0 - 3 ft[6]**	**3 - 4 ft**	**0 - 3 ft[6]**	**3 - 4 ft**	**>4 ft[7]**	**0 - 3 ft[6]**	**3 - 4 ft**	**>4 ft[7]**
August 2013	B-3[8]		<3.8		<0.2		4			<0.02	
August 2013	B-14[8]		<3.7		<0.2		4			<0.02	
April 2014	TP-1		2.1		0.21		28			0.38	
April 2014	TP-2		2.5		0.24		7			0.05	
April 2014	TP-4		2.3		0.19		4			0.02	
April 2014	TP-5		2.9		0.19		4			0.02	
April 2014	TP-6		2.8		0.19		4			0.01	
April 2014	TP-7		3.0		0.12		3			0.03	
April 2014	TP-9		1.7		0.15		25			0.01	
April 2014	TP-10		3.0		0.28		19			0.06	
April 2014	TP-13	11.0	1.9	0.54	0.20	27	31		0.17	1.44	
June 2014	TP-13A	3.2	5.2	0.26	0.30	18	31		0.25	18.4	
June 2014	TP-13B	3.6	3.4	0.26	0.57	19	52		0.45	0.19	
June 2014	TP-13C	6.2	3.5	0.37	0.27	19	6		0.25	0.06	
April 2014	TP-14	XXX	XXX	XXX	XXX	XXX	XXX		XXX	XXX	
June 2014	TP-14A	XXX	XXX	XXX	XXX	XXX	XXX		XXX	XXX	
June 2014	TP-14B	XXX	2	XXX	0.14	XXX	20		XXX	0.03	
June 2014	TP-14C	XXX	XXX	XXX	XXX	XXX	XXX	8	XXX	XXX	0.02
April 2014	TP-16	2.4	2.3	0.18	0.17	4	5		0.02	0.04	
April 2014	TP-17		3		0.17		4			0.02	
April 2014	TP-18	2.5	2.6	0.13	0.19	5	8		0.02	0.03	
April 2014	TP-19		2.2		0.05		4			0.02	
April 2014	TP-21		2.6		0.20		4			0.02	
April 2014	TP-22		2.4		0.18		4			0.02	
April 2014	TP-24		2.5		0.18		3			0.02	
April 2014	TP-25		2.5		0.17		8			0.03	
April 2014	TP-26		2.6		0.20		3			0.02	
June 2014	TP-27					XXX	XXX	10		XXX	0.02
June 2014	TP-28					XXX	XXX				
June 2014	TP-29					XXX	287		XXX		
June 2014	TP-30					XXX	247				
June 2014	TP-31					14	27	197		0.12	10.4
June 2014	TP-32					16	17	7			0.01
June 2014	TP-33					XXX	112	6	XXX		0.01
June 2014	TP-34					XXX	8	38			0.61
June 2014	TP-35					6	11	7		0.02	0.08
June 2014	TP-36					8	4	7			0.04
June 2014	TP-37					8	4	3			0.02
Count		6	22	6	22	11	33	9	6	24	9
Mean		4.8	2.7	0.29	0.21	13	30	31	0.19	0.88	1.25
ProUCL 5.0 Best Fit		Gamma	LogNrm	Gamma	LogNrm	Gamma	NonPar	NonPar	Normal	NonPar	NonPar
Correlation Coefficient		0.97	0.96	0.99	0.91	0.97			0.96		
UCL @ 90% for Best Fit		8.8	2.9	0.47	0.24	18	33	58	0.29	1.86	2.71

NOTES:

See Table 4 for abbreviations and analytical qualifiers.

[1] RBCs for this exposure pathway and receptors apply only to surface soils (0 - 3 feet BGS).

[2] Occupational RBCs are not included in table because they are less stringent than urban residential RBCs.

[3] Excavation worker RBCs are not included because they are less stringent than construction worker RBCs and apply to same depth.

[4] Regional background concentrations are not RBCs or cleanup standards, but are an indication of whether metals are naturally occurring.

[5] The ODEQ Regional Background Concentration is substituted for the RBC because natural background is greater than RBC.

[6] Shallow samples collected from 0 to 1 foot below ground surface or from first soil encountered if below pavement or compacted gravel.

[7] Actual depth of these samples range from 5 to 10 feet below ground surface.

[8] These results were not included in the statistical analysis because they were less than the Method Detection Limit.

XXX Indicates soil from this area was excavated and disposed off-site. Therefore, this sample was excluded from statistical analysis.

Exceeds one or more applicable Human Health RBCs.

Exceeds March 2013 ODEQ Regional Background Metals Concentrations in Soil.

APPENDIX

EXCERPT: BOISE CASCADE COMPANY SITE INVESTIGATION AND REMEDIATION REPORT

Site Investigation and Remediation Report for Boise Cascade* St. Helens, Oregon Veneer Mill Site

* Boise Cascade Wood Products, L.L.C. (BCWP), formerly known as Boise Building Solutions Manufacturing, L.L.C., is a wholly owned subsidiary of Boise Cascade Company (BC) formerly known as Boise Cascade, L.L.C. BC and its subsidiaries were formerly owned by Boise Cascade Corporation (BCC). Unless specifically stated in the report, "Boise Cascade" means BCWP, BC, or BCC as applicable.

Site Investigation and Remediation Report for St. Helens, Oregon Veneer Mill Site
Volume I: Report, Figures, and Tables

April 2015

Russell Strader, *Environmental Manager,*
Boise Cascade Company

Shira DeGrood, R.G., *Project Manager,*
ERM-West, Inc.

Kim Marcus, R.G., *Partner-In-Charge,*
ERM-West, Inc.

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Registered Geologist's Certification

I, Shira DeGrood, do certify that to the best of my knowledge the data, information, and interpretation presented in this Remedial Investigation report for the Former Veneer Mill Site in St. Helens, Oregon, is accurate and complete. In addition, I have reviewed and verified the authenticity of the information presented in this Site Investigation and Remediation Report.

20 April 2015

Shira DeGrood, Geologist
ERM-West, Inc.
Oregon R.G. # G2310

Date

Stamp:

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List of Acronyms and Abbreviations

<	Less than
°F	Degrees Fahrenheit
AOC	Area of concern
amsl	Above mean sea level
BCWP	Boise Cascade Wood Products, LLC
Bgs	Below ground surface
BTEX	Benzene, toluene, ethylbenzene and xylenes
COI	Constituent of interest
CSM	Conceptual Site Model
DRO	Diesel-range organics
GRO	Gasoline-range organics
IDW	Investigation-derived waste
LUC	Log utilization center
MFA	Maul, Foster & Alongi
mg/kg	Milligrams per kilogram
mg/L	Milligrams per liter
NFA	No Further Action
ODEQ	Oregon Department of Environmental Quality
ORBSC	Oregon Regional Background Soil Concentration
PAH	Polycyclic aromatic hydrocarbons
PCB	Polychlorinated biphenyls
PCS	Petroleum contaminated soil
PPA	Prospective Purchaser Agreement

ppb	Parts per billion
ppm	Parts per million
RBC	Risk-based concentration
RRO	Residual-range organics
SLV	Screening level value
SOP	Standard Operating Procedure
TCL	Target cleanup level
TCLP	Toxicity Characteristic Leaching Procedure
TPS	TPS Technologies, Inc.
UCL	Upper confidence limit
ug/L	Micrograms per liter
USEPA	United States Environmental Protection Agency
UST	Underground storage tank
VOC	Volatile organic compound

Executive Summary

A multi-phase site investigation, risk assessment, and soil removal action was conducted for the Boise Cascade Veneer Mill Site (the "Site"), located adjacent to the confluence of the Columbia River and the Multnomah Channel in St. Helens, Oregon (the Site). Site investigation activities occurred between August 2013 and June 2014. Removal action activities occurred in August and September 2014. The investigation and removal actions were undertaken to address environmental concerns as required by the Oregon Department of Environmental Quality to obtain a no further action determination, and in anticipation of the City of St. Helens (the City) purchasing the Site under a Prospective Purchaser Agreement.

Boise Cascade entered into an agreement with ODEQ in 2013 to participate in their Voluntary Cleanup Program Independent Cleanup Pathway. Boise Cascade has regularly consulted with ODEQ regarding interim results of the investigation and recommendations for additional investigation. In addition to consultations with ODEQ (meetings, emails, and telephone calls) for this investigation, Boise Cascade has shared information with the City and its environmental consultant, Maul Foster Alongi (MFA). Boise Cascade has sought input from the City and MFA and has allowed MFA to observe all phases of the investigation and remediation that occurred after the City entered into a Purchase Agreement with Boise Cascade.

Site Location and Description

The Site is located at the southern end of First and Strand Streets in St. Helens, Oregon. Data indicate that sawmills were built on the northern portion of the Site prior to 1911. Additional area was acquired in the northwest corner of the Site sometime between 1921 and 1939. The northern half of the Site historically included two sawmills, planer mills, lumber stackers, dry kilns, a machine shop, electrical transformers, wood-fired boilers and a wood refuse burner. The sawmills and associated buildings were closed in 1978 and later demolished. The southern half of the Site was initially a planer mill and warehouse that was converted to a veneer mill after Boise Cascade purchased the Site in 1971. The veneer mill ceased production in 2008. Boise Cascade removed all manufacturing equipment from the Site and demolished the last buildings in 2013.

Site Environmental Setting

The Site is located between a basalt cliff on the west side and the Columbia River/Multnomah Channel confluence to the east. The Site is relatively flat with a slight downward slope to the east and south toward the adjacent river.

The site is underlain by dense, impermeable basalt of the Columbia River Basalt Group. In the northwest portion of the Site, bedrock was encountered as shallow as 4 feet below ground surface (bgs) and is covered primarily by sand, gravel, and concrete rubble fill. The southern portion of the site consists of similar fill material to approximately 20 feet bgs, where historic alluvial deposits are encountered.

A shallow groundwater aquifer is present in the southern portion of the site. In the northern portion, perched groundwater was observed overlying the bedrock in some test pits in June, however it was not observed during excavation of the northern refuse fill area in September and therefore likely intermittent and seasonal. Depth to groundwater in the southern portion of the site varies between 10 and 15 feet bgs during the wet season, and 14 to 19 feet in the dry season.

Land and Beneficial Water Use Determination

The Site is currently vacant and pedestrian access is blocked by fences or natural barriers (a cliff face to the southwest and river to the east). Future use of the Site has not been established. Boise Cascade's contractual obligations with the City specify that the expected future site uses include residential, commercial and/or industrial.

Groundwater at the Site is not currently used, and it will not be used in the future. Drinking water for the Site is supplied by the City from two collector wells located on the west bank of the Columbia River in Columbia City to the north of the City and from one emergency use ground well located near Scappoose Bay Marina south of the City (City of St. Helens 2013). There are no drinking water intakes in the rivers adjacent to the Site. Groundwater at the Site discharges to the Multnomah Channel and the Columbia River. Beneficial uses of these waters include recreation, irrigation, and providing habitat for wildlife including salmon.

Scope of Site Investigation

Four Areas of Concern were selected in the former veneer mill area based on the historical use of the Site, results of previous investigations, and consultation with ODEQ and included:

- The lathe area, located in the southeast corner of the former veneer mill in the southern portion of the Site (Figure 2);
- The former oil house and transformer area, located northeast of the former veneer mill, in the southern portion of the Site;
- The log debarker area, located in the southeast corner of the Site; and
- The riverbank near the former veneer mill area, located along the southeast edge of the Site.

Random test pit sampling was completed across the site, as requested by ODEQ, and an additional Area of Concern was identified:

- The northern refuse fill area, located in the northwest corner of the Site.

Shallow and deep soil samples were collected by excavating test pits and by advancing direct-push boreholes. Grab groundwater samples were collected from select boreholes. Fourteen monitoring wells were installed on the site and low-flow groundwater samples were collected from all 14 wells in April and June 2014.

Nature and Extent of Contaminants of Interest

Lathe Area Soil:

In the lathe area, located in the southeast corner of the former veneer mill, concentrations of diesel range organics (DRO) and residual oil range organics (RRO) exceeded the DRO human health screening level in historic shallow soil samples (1 to 3 feet below ground surface [bgs]) and in more recently collected deep soil samples (15 to 19 feet bgs). Concentrations of polycyclic aromatic hydrocarbons (PAHs) in soil were less than their respective human health screening levels.

Former Oil House and Transformer Area Soil:

One historic soil sample, collected at 19 feet bgs (H-17) in the former oil house and transformer area, contained RRO at a concentration greater than the screening level. Concentrations in other samples in the vicinity of H-17 ranged from non-detect to levels lower than the screen level.

Veneer Mill Area Groundwater and Stormwater:

Concentrations of DRO, RRO and most PAH in groundwater samples collected from monitoring wells were less than their applicable risk-based screening levels. The concentration of benzo(a)pyrene exceeded excavation worker RBCs in two grab groundwater samples. Metals were detected at elevated concentrations in grab groundwater samples, but these concentrations are more likely related to higher suspended solid concentrations associated with grab groundwater sampling from a temporary borehole. None exceeded an applicable RBC. Concentrations of some COIs in groundwater exceeded potentially applicable urban residential and occupational drinking water RBCs. However, these RBCs are not applicable to the Site because a groundwater use restriction will be established for the Site.

PAH concentrations greater than ecological screening levels were detected in four of six monitoring wells installed near the riverbank. All concentrations were less than applicable human health screening levels. The 95% upper confidence limit was calculated for PAHs that exceeded the screening level. Results indicated that the overall concentration of PAHs reaching the river through groundwater discharge was likely to be less than the screening level. Therefore, PAHs in groundwater do not present a risk to ecological receptors in surface water.

The concentrations of all COIs, including metals, PCBs, and PAHs, in stormwater samples collected from three outfalls in the veneer mill area were all below their respective freshwater aquatic screening levels. Therefore, surface water runoff from the Site should not impact the adjacent river under the current conditions of the Site.

Northern Refuse Fill Area:

Lead concentrations were detected above recently established clean fill guidance (ODEQ 2014) and regional background soil concentrations (ODEQ 2013) in portions of the northern refuse fill area. Some areas also exceeded the applicable human health screening levels. Benzo(a)pyrene also slightly exceeded an applicable RBC in TP-14C. Due to the high concentration of lead, a removal action was completed in this area to reduce contaminated soil subject to special management and to eliminate potential human health risk.

Site-Wide Random Test Pits:

Exceedances of arsenic and mercury were noted in the northeast portion of the site at concentrations that slightly exceeded expected natural background levels. Concentrations of these metals are likely related to naturally-occurring sources, rather than on-site activity. Impacts to human and ecological health from these constituents are considered negligible due to the low area of potential exposure.

The PAHs benzo(a)pyrene, benzo(b)fluoranthene, and/or dibenzo(a,h)anthracene were detected in samples from TP-13 and TP-13A at concentrations that slightly exceeded the applicable RBCs. Since concentrations in nearby test pits did not exceed the applicable RBCs, PAH impacts in this area are limited.

Removal Action Measures

Lead concentrations in the northern refuse fill area at depths from 1 to 4 feet bgs were greater than the applicable RBC within an approximately 16,000 square foot area. A removal action was implemented to remove soil in this area that exceeded applicable screening levels. Based on the primary pathways of concern, a target cleanup level (TCL) of 400 milligrams per kilogram (mg/kg) was selected for shallow soil up to 3 feet bgs and a TCL of 800 mg/kg was selected for soil greater than 3 feet bgs. These TCLs are protective for urban residents, occupational and construction worker/excavation workers.

Non-impacted surface soil was excavated and stockpiled on site. Approximately 1,708 tons of soil was excavated and transported to the Riverbend Landfill in McMinnville, Oregon.

Confirmation samples were collected from the floor and sidewalls and the excavation boundaries were extended until lead concentrations in confirmation samples were less than the TCL, with limited exceptions. Floor samples in the deepest portion of the excavation were collected by scraping soil off the surface of the basalt. Concentrations of lead in three of these floor samples exceeded the TCL. However, these samples represent a negligible risk to human and environmental health due to their location and the small area that they represent. In addition, several samples collected from the north and northwest sidewalls exceeded the TCL. The sidewalls were excavated to the furthest extent considered to be safe without potentially undercutting the fill material on the adjacent properties to the west and damaging the adjacent building on the north. Several lines of evidence indicate that the lead contaminated soil does not extend beyond the property boundary.

The excavation was backfilled with the stockpiled soil, concrete debris, and asphalt fragments from the excavation and with gravel obtained from a local quarry.

Conclusions and Restrictions

The site characterization, investigation, and removal action were based on ODEQ guidance and clean-up criteria. As previously stated, ODEQ was periodically consulted for specific guidance and work plan review. Based on the investigations results and the removal action the Site meets ODEQ standards for urban residential, occupational, and industrial use under current conditions. Petroleum contaminated soil (diesel fuel and hydraulic oil) exists in a small area adjacent to the south side of the former lathe. The contaminated soil is currently covered with a concrete cap. PAHs have been detected in the groundwater at low concentrations that exceed excavation worker RBCs and surface water ecological SLVs. Groundwater contamination appears to be stable and does not appear to be an ongoing source to the adjacent river.

A 2- to 3-foot wide strip of soil with lead concentrations exceeding applicable RBCs remains along portions of the western and northern property boundaries in the northern refuse area. This soil could not be removed due to concerns about potential damage to adjacent properties. Evidence suggests the lead contaminated soil was fill material placed on the Site circa 1912/13. Potential impacts to adjacent properties to the west and north of the northern refuse area have not been investigated, but some evidence suggests these properties would not be impacted by the fill placed on the Site.

To ensure protective conditions in the future the following conditions and restrictions are recommended:

1. No water supply wells for any purpose will be allowed.

2. The concrete cap will be maintained in the lathe area to prevent potential future exposure by site workers or residents and to minimize future leaching of contamination into shallow groundwater

3. Any contaminated soil or groundwater removed from the Site must be managed in accordance with an ODEQ-approved Contaminated Media Management Plan (CMMP). Residual soil in the northern refuse fill area, lathe area, and localized area around TP-13, and groundwater near B-18 and B-20 will be identified as specific areas of concern in the CMMP. In addition, many soil samples collected from the Site exceed one or more of recently established clean fill criteria (ODEQ 2014). This may limit options for disposal of materials removed from the Site in the future, and all soil destined for off-site disposal or use should be evaluated against applicable clean fill criteria. Soil with concentrations below applicable RBCs, but above clean fill criteria, may be re-used on Site property with no restrictions on its placement.

These restrictions and requirements should be memorialized in an Easement and Equitable Servitudes or similar enforceable document recorded on the Site property deed.

1.0 Introduction

1.1 Project Introduction

Boise Cascade owns approximately 22 acres of land adjacent to the Columbia River in downtown St. Helens, Oregon (the Site). Boise Cascade operated a green veneer mill on the Site from 1971 until manufacturing was ceased in 2008. In 2013, all manufacturing equipment was removed from the Site, and all the buildings were demolished to ground level. Boise Cascade now intends to sell the Site and has entered into an agreement to sell the Site property to the City of St. Helens, Oregon (the City). The City has not defined a specific future use of the Site but will likely convert the Site from industrial to urban residential and/or commercial use.

There were several known or suspected areas of soil contamination on the Site that Boise Cascade investigated and/or remediated between 1996 and 2008. Some of those areas required additional investigation and/or remediation. In 2013 Boise Cascade retained ERM-West, Inc. (ERM) as their environmental consultant to assist with the additional work. ERM conducted additional investigation of the Site in 2013/14 following the demolition of the mill. Subsequent to that investigation, ERM performed a soil removal action of lead contaminated soil. This report is intended to provide a brief summary of historic operations and previous investigations and to document the recent investigation, establish areas of concern (AOC) for the Site, and document the recent removal action.

This report was prepared collaboratively by Boise Cascade and ERM with Boise Cascade as the lead author. In general, sections on site history and previous investigations were prepared by Boise Cascade because of familiarity with the Site and previous investigation. Boise Cascade was involved in development of work plans, assisted with selection of soil boring, monitoring well, and test pit locations in order to ensure samples were collected in the areas of known or potential sources of contamination. Boise Cascade was the primary contact with Oregon Department of Environmental Quality (ODEQ) for questions regarding the project. ERM served as technical consultant on work plans, selection of soil boring, monitoring well and test pit locations, and conducted or managed all field activities including installation of borings, monitoring wells, and test pits, collection of samples, and coordination of analytical work.

Boise Cascade has owned the Site since 1971. Boise Cascade reviewed historic maps and photos to locate potential historic sources of contamination. These documents have been provided to ERM, ODEQ, and the City.

ERM is not responsible for the accuracy of the historic information described in the report. ERM's professional judgment was relied upon as necessary to interpret historical information and develop and implement the investigation, and execute the removal action.

1.2 Project Objective

The objective of the project is to obtain a No Further Action (NFA) determination from the ODEQ. Boise Cascade entered into an agreement with ODEQ in 2013 to participate in their Voluntary Cleanup Program Independent Cleanup Pathway. The City desires to enter into a Prospective Purchaser Agreement (PPA) with ODEQ. Obtaining a NFA from ODEQ is a prerequisite of the sale and will support the City's PPA.

1.3 Summary of Previous Investigations and Remedial Actions

Table 1 provides a summary of site investigations and remedial activities that have been previously performed at the Site and included:

- Underground storage tank removal and confirmation sampling in 1987;
- Maintenance shop soil removal action in 1996;
- Lathe area soil removal action in 2001;
- Remediation investigation/feasibility study in 2002 through 2004;
- Phase I environmental site assessment in 2004;
- Concrete vault removal in 2005;
- Stormwater drain and sump cleanout in 2013;
- Soil and groundwater investigation in 2013 through 2014; and
- Soil removal action for shallow metals in 2014.

See Table 1 for a brief summary and timeline. Additional details of all previous investigations are provided in Section 2.4, and documents for all previous investigations are attached (Appendix A).

1.4 Report Structure

In order to simplify a complete review of the Site investigation and remediation activities this report is intended to be a stand-alone document and includes a summary of the historical environmental investigations of the Site. Details of the previous investigation methods are not provided, but the reports describing those investigations are attached (see Appendix A).

The main objectives of this report are to:

1) Detail the methods and results of Site investigation activities conducted in 2013 and 2014 by or under the direction of ERM,

2) Provide the conceptual site model and identify pathways of potential risk to human health and to the environment,

3) Describe the removal action conducted in 2014 and evaluate any residual risk to human health and ecological receptors associated with the Site.

2.0 Site Background

2.1 Site Location and Description

The Site is located at the southern end of First and Strand Streets in St. Helens, Oregon within the southeast quarter of the northwest quarter of Section 3, Township 4 North, Range 1 west of the Willamette Meridian (Figures 1 and 2) and includes tax lots 4N1W 300 100, 4N1W 3BD 1100, and 4N1W3BD 1200 (Appendix B). Tax lot 4N1W 300 occupies most of the Site and lies between a steep basalt cliff on the west and the Multnomah Channel of the Willamette River on the east at its confluence with the Columbia River. The remaining two tax lots are small parcels located on the top of the basalt cliff where a water tank is located. An approximately five-acre section at the north end of the Site lies between Strand Street to the west and the Columbia River to the east. The Site encompasses an area of approximately 24 acres with 22 acres above the ordinary high water mark. Much of the Site consists of fill materials brought in from unknown sources at various times. Much of the fill appears to be river dredge materials. The Site is relatively flat with the north end at approximately 30 feet above mean sea level (amsl) and the south end approximately 24 feet amsl.

2.2 Site History and Facility Operations

2.2.1 Ownership History

The ownership history is provided in the attached Chain of Title Report (Appendix B). Boise Cascade Wood Products, L.L.C. (BCWP), formerly known as Boise Building Solutions, L.L.C., is the current owner of the Site. BCWP acquired the Site from Boise Cascade Corporation (BCC) in 2004. BCC acquired the Site from Pope & Talbot, Inc. (previously Pope & Talbot Lumber Co.) in 1971. Pope & Talbot acquired the Site from McCormick Lumber Co. in 1938. McCormick Lumber Co. acquired the Site from St. Helens Lumber Co. and St. Helens Dock & Terminal Co. in 1925. The ownership of the Site prior to 1925 is not described in the Chain of Title Report. Based on the oldest available Sanborn fire insurance map, the Site was owned by St. Helens Lumber Company in 1911. The St. Helens Lumber Company mill was built in 1909 after a lumber mill previously located on the Site burned in a 1904 fire that destroyed the business block bounded by First (formerly Columbia), Cowlitz and Strand Streets (USDI 1984). Charles and Hamlin McCormick purchased the property in 1908 from Charles and James Muckle. The Muckle brothers purchased the previous sawmill in the 1870s. Sanborn maps, historic photos, historic site plans of the mill area, and other historical information sources are provided in Appendices C, D, E, F, and W.

2.2.2 Operating History

Based on historical sources, a sawmill existed on the Site at least as early as the 1870s and possibly earlier. The earliest photos or maps of the Site discovered for this review are dated 1909 to 1911 so there is no information on which to evaluate the Site prior to that time. Various websites with historical information pertaining to Columbia County indicate that St. Helens was developed as a river port in the 1840s and sawmills in the area were stimulated by the California gold rush. Sanborn maps and undated photos show that the sawmill operation occupied most of the Site, with most operations concentrated in the northern two-thirds of the Site. A series of site maps showing the progression of buildings on the Site beginning in 1940 is provided in Appendix E. These site maps were created from historic Sanborn maps and other site plans.

The northern half of the Site historically included two sawmills, planer mills, lumber stackers, dry kilns, a machine shop, and electrical transformers. There were also wood fired boilers and a wood refuse burner located near the center of the Site. Logs were apparently stored in the river. The southern half of the Site was primarily a planer and warehouse that was later converted for use as a veneer mill.

The historic photos and maps show that most of the Site not occupied by buildings was used for lumber storage or loading docks. It is also reasonable to conclude from these historic documents that the boundaries of the Site, particularly on the north end and along the river, have changed over time as fill was added to the Site and to adjacent properties over time. The State of Oregon has deeded these overflow lands to predecessors of Boise Cascade. Platforms are identified across most of the Site on that plan, and "Fill" has been hand written on site plans across much of the Site. This apparently indicates much of the Site is fill material.

In the northern portion of the site, at least one historic photo shows what appears to be a wharf adjacent to Strand Street in an area that is now the northernmost part of the Site. A 1911 Sanborn map shows a building identified as "Moving Pictures" adjacent to the former Mill Street on a north property boundary. Mill Street has been abandoned, and it appears that at least part that former street and the area with the Moving Pictures building may have been incorporated into the Site sometime between 1921 and 1939. This may be the area acquired from St. Helens Dock & Terminal Co. in 1925, though that has not been confirmed. Lead contaminated soil was discovered in a portion of this area during this investigation as discussed in Section 5.4.6.

There are no areas of the Site identified as waste disposal areas. A 1953 Pope & Talbot site plan (Appendix C) has an area east of the former plant offices in the northwest corner of the Site labeled as "Platform Average 2' Above Refuse Fill". It is not clear from the context of the Pope & Talbot site plan if "refuse fill" is intended to mean household waste, demolition materials, or soil fill. Based on the available historic information, it is reasonable to conclude that Boise Cascade and its predecessors typically used this area as lumber storage. Furthermore, that area is in very close proximity to the planer mill and would not likely be used for anything other than wood storage due to the limited space availability. It appears this area is where the former Mill Street and the Moving Pictures building were formerly located, and fill materials may have been placed there prior to construction of the street and building.

Based on this site plan, various historic photos, and second-hand reports by Boise Cascade employees, it appears much of the sawmill area, located in the northern half of the Site, was covered at one time by a wooden platform. Boise Cascade shut down the last sawmill in 1978 and demolished most of the remaining sawmill buildings over a period of several years. Occasionally logs were stored in the former sawmill area, but for most of the time since 1978 there was no manufacturing activity on the northern half of the Site other than access to the Site from the First Street entrance.

Soon after purchasing the Site in 1971, Boise Cascade constructed a veneer production plant in the lumber shed building on the southern half of the Site. The Boise Cascade veneer mill operation included a log utilization center (LUC) consisting of a log debarker (a.k.a. barker) and block saw, block steam vats heated by natural gas steam generators, a veneer lathe, a veneer clipper, a veneer stacker and veneer chipper. Bark was conveyed to a truck bin at the LUC. Scrap veneer was chipped and conveyed to truck bins adjacent to the mill. Chips and bark were sold to other companies. Most equipment was operated by hydraulic power and electric motors. Most hydraulic tanks were located inside fully contained buildings, though some hydraulic tanks, such as the log debarker hydraulic tank were located outside. All hydraulic tanks and motors had drip pans. Veneer manufacturing is not a chemically intensive process. The primary chemicals used and stored on-site were hydraulic oil, engine oil, fuels, and caustic (sodium hydroxide). The primary fuel used was diesel fuel. Chemicals, oils, and fuels were all stored in tanks located within covered secondary containment. Small quantities of other various chemicals were used for maintenance activities. Logs were stored in the river and in the southwest corner of the Site. An electric powered log bundle lift was located on the south end of the Site in Frogmore Slough near the former rail spur trestle. Logs were loaded onto the LUC via a large paved ramp near the southern end of the Site. There is no indication that wood preserving or treatment occurred at the Site.

The veneer mill ceased production in 2008. Boise Cascade removed all manufacturing equipment from the Site and demolished the last buildings in 2013. At this time there are no manufacturing operations and no buildings on the Site. Pavement, concrete footings and floor slabs, and the log loading ramp have not been removed. Boise Cascade does not plan to remove any of these structures.

At one time a rail spur entered the southern end of the Site. That rail spur was abandoned and the area was subsequently paved.

2.2.3 Northern Refuse Fill Area History

During the investigation lead impacted soil was discovered in a portion of the Site near the northern entrance. Following this discovery, Boise Cascade reviewed additional historical information in an effort to determine possible source(s) and timing of fill placement. As mentioned above, a Pope & Talbot site map identified the area as "Refuse Fill". For this report the area is identified as the Northern Refuse Fill Area (or Refuse Fill Area) as shown on Figure 2. The documents relied on for this assessment are attached as Appendix W and include Sanborn maps, historic photos, newspaper articles, property deeds and the National Register of Historic Places Inventory.

There is no clear indication when the area was filled. Observations made during excavation of test pits and removal of the lead impacted soil indicate the material removed was primarily non-native rock and soil fill with various items, including lumber, PVC pipe and glass bottles. Historic buildings previously located on the Site within the Refuse Fill Area include an unidentified building immediately south of the off-site antique warehouse building and a "Moving Pictures" building about two lots further south. By 1916, the Moving Pictures building had been demolished and a new unidentified building was constructed on the previously vacant lot to the north of the new Mill Street.Both of these unidentified buildings located on the Refuse Fill Area were demolished sometime between 1940 and 1948, most likely soon after the Refuse Fill Area was purchased by Pope & Talbot in 1941. From the available photographs and Sanborn maps, it is reasonable to conclude the fill material in the north half of the Refuse Fill Area was placed there after these buildings were demolished.

Buildings on adjacent properties include an antique warehouse to the north, built circa 1908, and a house to the west, built circa 1910, but apparently relocated one lot north in circa 1912/13. The antique warehouse building has continuously occupied the adjacent property to the north since 1908, and therefore that property was not likely filled at the same time as the Refuse Fill Area.

Mill Street, as shown on the 1916 Sanborn map, was relocated to that location in circa 1912/13. Prior to that date the Mill Street right-of-way had been located approximately 100 feet to the south. A 1912 city ordinance required the St. Helens Lumber Company to "open, fill and prepare for travel" the new right-of-way for Mill Street. The east half of Mill Street was later vacated and incorporated into Site. The residential property to the west may have been filled prior to original construction in circa 1910, during relocation of Mill Street in circa 1912/13, or it may have never been filled considering it's higher elevation location relative to the Refuse Fill Area.

2.3 Previous Investigations and Removal Actions

Between 1987 and 2005, Boise Cascade investigated and/or remediated several known or suspected sources of contamination.

In 2002 ODEQ investigated the Site as part of a comprehensive investigation of sources that could be contributing contaminants to the adjacent river (ODEQ ESCI #3283). ODEQ requested that Boise Cascade provide historic environmental information for their review. Subsequent to that review, Boise Cascade conducted a soil and groundwater investigation of the Site and submitted the results of that investigation to ODEQ. The areas investigated at that time included the former UST area, the former maintenance shop area, the former oil house and transformer area, former sorter/stacker hydraulic tank area, and the existing lathe area. See Table 1 for a brief summary and timeline. Additional details of all previous investigations are provided in Section 2.4, and documents for all previous investigations are attached (Appendix A).

Following the completion of that investigation, ODEQ issued a conditional NFA determination for the Site. The NFA concluded that relatively high concentrations of petroleum hydrocarbons were documented in the soil beneath the lathe area that could not be fully characterized or remediated due to access limitations and structural concerns. Therefore, ODEQ determined that as a condition of the NFA, the contamination should be fully evaluated if exposed or otherwise uncovered in the future. Otherwise, the concrete foundation above the lathe area contamination must be maintained to eliminate direct contact exposure or mobilization of the contamination through leaching. Because the objective of ODEQ's investigation at that time was to assess whether the Site was likely to be a source of on-going contamination to the adjacent river, the NFA was primarily to address that concern. Furthermore, the NFA assumed the Site would remain in industrial use.

Investigation activities conducted between 1987 and 2005 are summarized below. All available reports for these activities were provided to ODEQ as part of the 2002/03 site investigation or in the February 2014 *Environmental Summary Report and Site Investigation Work Plan.* Soil and groundwater analytical results for previous investigations are provided in Tables 2 and 3. Analyte names and abbreviations contained in Tables 2 through 23 are defined in Table 4. The approximate locations of the samples collected for these activities are shown in Figures 3A and 3B. Precise location of the samples was difficult because the sample locations were not always clearly identified with respect to a known benchmark in the respective reports.

2.3.1 UST Removal

Gasoline and diesel fuel tanks were formerly located near the north entrance (Figures 2 and 3A). These tanks were removed in 1987 by a contractor under the supervision of an environmental consultant. The report noted that groundwater was present in the excavated areas approximately 2.5 to 3 feet below ground surface (bgs) and that a very light sheen was present on a portion of the water, but there were no measurable floating oil evident on groundwater within the excavation. One post-excavation soil sample was collected and tested for benzene, toluene, ethylbenzene and xylenes (BTEX). BTEX was not detected in the soil sample.

As part of the 2002/03 investigation of the Site, two soil borings were installed east of the pit in an assumed downgradient location. Basalt was encountered at 6 to 10 feet bgs. Seventy-one parts per million (ppm) of oil was detected in one soil sample at 10 feet. Polycyclic aromatic hydrocarbons (PAHs) were detected in a water sample from the deeper boring and ranged in concentration from non-detect to 21 parts per billion (ppb). PAHs were determined to be below the human health risk-based standards. However, phenanthrene at 21 ppb and flourene at 4 ppb were slightly above their current respective ecological risk-based standards. The former underground storage tank (UST) area is approximately 700 feet from the river. It is reasonable to conclude that these low concentrations of PAHs, if they still exist, would not likely reach the river in concentrations above the ecological standards. This conclusion is supported by data from water samples collected from two borings (H-9 and H-10) installed approximately 500 to 600 feet east of the former UST location near the river. PAHs were not detected in either of those samples.

Based on the available information, it was concluded that there was no evidence of significant soil or groundwater contamination at the UST area. ODEQ has not requested additional investigation of this area.

2.3.2 1996 Former Maintenance Shop Remediation

A maintenance shop formerly located near the northwest corner of the Site was demolished in mid-1990s and petroleum contaminated soil (PCS) was discovered under the concrete floor. The PCS was excavated in 1996 and approximately 400 tons of PCS was disposed at TPS Technologies, Inc. (TPS). TPS issued a Soil Recycling Certificate that 404.4 tons of PCS received from Boise Cascade in St. Helens was properly recycled to approved regulatory standards at their Soil Recycling Facility in Portland, Oregon. Bedrock was encountered at approximately 5 feet. One post-excavation sample contained less than (<) 600 ppm diesel range organics (DRO). Most post-excavation samples were non-detect. Three volatile organic compounds (VOCs), methyl ethyl ketone, acetone, and toluene, were detected at < 1.3 ppm in the residual soil. Polychlorinated biphenyl (PCBs) were not detected.

Two soil borings were installed in the area of the maintenance shop in 2002/03 for the ODEQ-requested investigation. Soil samples were analyzed for VOCs and PAHs. VOCs were not detected in either sample. Very low concentrations of some PAHs were detected in one sample. Groundwater was not encountered. The area where the shop was located is upgradient to the former UST area, and investigations in that area did not discover contaminants that might have migrated from the former shop area.

ODEQ reviewed the available data for this area in 2002/03 and did not include any conditions for this area as part of the NFA. It is reasonable to conclude that any residual oil that might be present is below risk based cleanup standards and is very limited in extent. ODEQ has not requested additional investigation of this area.

2.3.3 Lathe Area Petroleum Contaminated Soil

In 2001, Boise Cascade replaced part of the veneer lathe. This required removal of a portion of the building's concrete floor on the south side of the lathe. PCS was discovered in the soil beneath the floor and approximately 10 cubic yards of PCS was removed and disposed off-site. However, all the PCS could not be excavated without undermining the remaining structure. Post-excavation soil samples contained up to 21,800 ppm of DRO and 33,700 ppm of residual oil range organics (RRO). Three soil borings (Figure 3b, H-11, H-12, and H-13) were installed in the vicinity of the lathe in 2003. Petroleum contaminants were not detected in soil or samples collected from these borings.

ODEQ reviewed the information for this area in their 2002/03 investigation. As a condition of the NFA, ODEQ concluded the residual contamination must be investigated and/or remediated if the building is demolished. The building was demolished in 2013 and this area is included in the 2013/14 investigation. The foundations and concrete floors were not removed as part of the demolition.

2.3.4 Former Sawmill Oil House and Transformer Area

A 1968 site plan (Appendix E) shows an oil house and a large transformer were formerly located between the old sawmill and the lumber storage building (near the northwest corner of the veneer mill building). Both are potential sources of oil contamination and both have been previously investigated and reported to ODEQ as part of the 2003 investigation. Transformers are also shown on the 1968 site plan near the southwest corner of the dry planer building. That area was not included in previous investigations.

There are no documented releases of oil at any of these locations. Neither the oil house nor the transformers were located on Site at the time of the investigation and placement of the borings (Figure 3b, H-15, H-16, H-17, H-18, H-19, H-20 and H-21) was based on the memory of mill employees. Soil samples were analyzed for oil and for PCBs. There was no evidence of shallow soil contamination in this area. Sample location H-17 contained RRO at 19 feet bgs at 14,600 ppm (Table 2), but this result appeared to be isolated as DRO and RRO were not detected in other deep samples or in subsequent investigations.

In groundwater, RRO was detected at 176 ppm in H-15 in May 2003 and DRO was detected at 2.1 ppm in H-20 in November 2003. Neither DRO nor RRO were detected in the three other groundwater samples from this area, including H-17. Several PAHs were also detected in some soil and groundwater samples from this area.

ODEQ issued the NFA in 2004 without any conditions for further investigation or remediation of the former oil storage house and transformer area. This appeared to be a reasonable conclusion at the time. However, when those results are compared to current applicable ecological risk-based standards, this area could not be ruled out as a potential source of contaminants to the adjacent river. Therefore, this area was included in the 2013/14 investigation.

2.3.5 Former Lumber Sorter Hydraulic Lift and Concrete Vault

As part of the 2002/03 site investigation Boise Cascade evaluated other potential sources of contamination. The maintenance superintendent at the veneer mill, a long-time Boise Cascade employee, recalled a hydraulic lift in the sorter-stacker building that had previously been demolished. He identified the area of the building based on the remaining concrete pad. He did not recall any release from the lift, but suggested the area should be investigated. Based on his memory, two soil borings were installed in the vicinity of the former hydraulic lift (Figure 3A, H-7 and H-8). Soil and groundwater samples were analyzed for DRO, RRO, VOCs, and/or PAHs. None of these analytes were detected. Additional groundwater samples were collected from borings H-9 and H-10 located in the vicinity of the sorter-stacker building near the river. Toluene and isopropyltoluene were detected at very low concentrations in a sample from H-10 (1 and 59 ug/L), and well below applicable screening levels (Table 15). PAHs were not detected in samples from H-9 or H-10.

In 2005, Boise Cascade removed the sorter/stacker building concrete pad. During that project a buried concrete vault was discovered. The vault contained hydraulic oil and water. An environmental consultant was retained to oversee removal and assessment of potential soil contamination. The oil/water mixture was removed and the vault was removed. The concrete vault was determined to be in good condition with no evidence of cracks, joints or seams. There was no evidence of any release of hydraulic oil into the soil, and the consultant determined soil samples were not necessary. This information was not available at the time of the 2002/03 investigation. The consultant's report was included in the Environmental Summary Report and Site Investigation Work Plan submitted to ODEQ in February 2014.

2.4 Regulatory Interaction

As discussed above, at ODEQ's request, Boise Cascade conducted an investigation of the Site in 2002/03 (ESCI File No. 3283). At the completion of that investigation, ODEQ issued a conditional No Further Action letter for the Site. The NFA was based on an assumed industrial use of the Site. The condition for the NFA was that Boise Cascade would further investigate and remediate if necessary, residual petroleum contaminated soil in the lathe area when the mill was demolished. The investigation and risk evaluation documented in this report is intended to satisfy the NFA requirement to investigate and to support remediation decisions.

Boise Cascade is conducting this investigation through ODEQ's Voluntary Cleanup Program Independent Cleanup Pathway. Boise Cascade has regularly consulted with ODEQ regarding interim results of the investigation and recommendations for additional investigation. ODEQ provided comments on the Site Investigation Work Plan and subsequent work plans for additional investigations (Appendix G).

In addition to consultations with ODEQ (meetings, emails, and telephone calls) for this investigation, Boise Cascade has shared information with the City and its environmental consultant, Maul Foster Alongi (MFA). Boise Cascade has sought input from the City and MFA and has allowed MFA to observe all phases of the investigation and remediation that occurred after the City entered into a Purchase Agreement with Boise Cascade.

3.0 Environmental Setting

3.1 Climate Information

The average high temperature in St. Helens, Oregon ranges from 42 degrees Fahrenheit (°F) in December to 79°F in August. The average low temperature ranges from 32°F to 55°F in those same months. The average annual rainfall is 47 inches, most of which falls from November through March (Source: www.weather.com).

3.2 Topography

The Site is located between a basalt cliff on the west side and the Columbia River/Multnomah Channel confluence (the River) to the east. The Site is relatively flat with a slight downward slope to the east and south toward the adjacent river (Figure 2). Surface elevations range from approximately 24 to 30 feet above mean sea level (Appendix H).

3.3 Regional and Site Geology and Soils

The Site is underlain by the Columbia River Basalt Group, which consists of flood basalt erupted 17 to 6 million years ago. These Miocene-age flood basalts are characterized by a thick sequence of dense, impermeable basalt flows separated by permeable interflow zones. The Columbia River Basalt Group dips steeply to the southeast from the basalt cliff located west of the Site to the River. The top of the Columbia River Basalt Group was encountered at depths of 4 feet bgs in the northwest corner and 10 feet bgs in the northeast corner of the Site; basalt was not encountered in the southern portion of the Site.

In the northern portion of the site, the Columbia River basalt flows are overlain by fill material, which consists of sand and gravel and minor amounts of construction debris (e.g. concrete, formed lumber). In the southern portion of the site, the fill material is present from the surface until approximately 20 feet bgs and overlies historic alluvial deposits, as evidenced by finer-grained material with a higher organic material content. Borehole logs are provided in Appendices J and K. The site plan and cross sections for the northern and southern portions of the Site are provided in Figures 4a through 4c. In the central portion of the site, the top 4 feet of soil consists of fill material. Deeper materials were not assessed in this area.

3.4 Site Surface Hydrology

The Site is adjacent to the Multnomah Channel of the Willamette River on the southeast, to the Columbia River on the northeast and Frogmore Slough on the south side. Frogmore Slough is a small backwater area of the Channel. There are no surface water streams on the Site. On the north end of the Site, storm water either infiltrates or may discharge as sheet flow or channeled flow directly to the Columbia River. The southern half of the Site is paved and storm water in that area discharges through one of three outfalls to the Multnomah Channel.

The Columbia River is tidally influenced by the Pacific Ocean in this area and surface water elevations vary daily with tide and seasonally with rainfall.

3.5 Site Hydrogeology

Groundwater elevations were measured in April, May, June, and September 2014 (Table 5). Depth to groundwater varied between 10 and 15 feet bgs during the wet season, and 14 to 19 feet in the dry season. Groundwater topographic maps produced with this data show a general groundwater flow direction to the east toward the river (Figures 5A through 5D). Elevations were consistently highest at MW-1 and lowest at monitoring wells along the riverbank.

Site geology indicates that the shallow groundwater on site is hydrologically connected with the River. Because this reach of the River is tidally influenced, a hyporheic zone is likely present in the aquifer along the riverbank.

4.0 Land and Water Use Determinations

4.1 Current and Future Land Use

The Site is currently vacant but most recently used as industrial property occupied by a wood products veneer mill. The Site has been used as either a sawmill or veneer mill since circa 1900. The Site is currently fenced on the north and south property boundaries, and much of the western boundary. However, these fences may be removed by the City at a later date. Access from the southwest is limited, though not prevented, by a steep basalt cliff. Access from the east is also limited, though not prevented, by the adjacent rivers.

Future use of the Site has not been established. Boise Cascade's contractual obligations with the City specify that cleanup standards are based on use of the Site for residential development consistent with the DEQ urban residential exposure scenario. Other uses could include commercial/retail and/or industrial. Cleanup standards for those uses are less stringent than those for urban residential.

4.2 Beneficial Uses of Water

Groundwater at the Site is not currently used, and it will not be used in the future. Drinking water for the Site is supplied by the City. A deed restriction preventing all future uses of the groundwater will be recorded.

The Site is adjacent to the Multnomah Channel of the Willamette River and the Columbia River. Beneficial uses of these waters include boating, swimming, and fishing. There are no known drinking water intakes in these waterways near the Site.

5.0 Recent Site Investigation

Beginning in August 2013 and continuing through June 2014, ERM conducted soil and groundwater investigation activities at the Site. The site investigation activities described in this report was conducted in several phases and included installation of soil borings, test pits, temporary monitoring wells, and permanent monitoring wells in areas of the Site with known or suspected sources of contamination.

The first phase of soil borings and temporary groundwater monitoring wells were advanced in August 2013. Additional soil borings and temporary groundwater monitoring wells were advanced in October 2013. Fourteen permanent groundwater monitoring wells were installed in April 2014. Random test pit sampling was completed in April 2014 with two phases of follow-up test pit sampling completed in June 2014.

5.1 Selection of Areas for Additional Investigation

After the veneer mill was demolished in 2013, four areas of the Site initially were selected for additional investigation. The four areas of investigation were selected based on the historical use of the Site, results of previous investigations described in section 2.0, and consultation with ODEQ. Based on the results of the random soil sampling, and in consultation with ODEQ, one additional area was selected for further investigation.

Identified AOCs, as shown on Figure 2, included:

1. The lathe area, located in the southeast corner of the former veneer mill in the southern portion of the Site (Figure 2);
2. The former oil house and transformer area, located northeast of the former veneer mill, in the southern portion of the Site;
3. The log debarker area, located in the southeast corner of the Site;
4. The riverbank near the former veneer mill area, located along the southeast edge of the Site; and
5. The northern refuse fill area, located in the northwest corner of the Site.

Each AOC is described in further detail below.

5.1.1 Former Lathe Area

Constituents of interest (COIs) in the shallow soils beneath the concrete floor in the former lathe area consist of DRO and RRO. PAHs, a common constituent of DRO and RRO, were not analyzed in these shallow samples, and they were not detected in soil samples collected at 15 feet bgs in May 2003 (Table 2). Previous investigations at the Site concluded that migration of these COIs was minimal and that groundwater was not significantly impacted. A condition of the 2004 NFA included fully evaluating impacts beneath the former lathe area if exposed or otherwise uncovered in the future. The concrete floor has not been removed to date, but additional investigation was determined to be necessary in anticipation of removal of the concrete and to further evaluate the potential of leaching of contaminants into the groundwater.

5.1.2 Former Oil House and Transformer Area

Investigations were completed in the vicinity of the former oil house and transformer areas of the Site from 2002 to 2003. Sample location H-17 contained RRO at 19 feet bgs at 14,600 milligrams per kilogram (mg/kg). After additional review of historic site maps, it was determined that data gaps existed from the previous investigations and additional borings may be necessary to assess areas closer to the potential sources. Considering that at least one soil sample exceeded the construction worker standard and due to the proximity of high detected concentration in the soil sample near the adjacent river, additional investigation of that area was considered necessary to assess potential impacts to the river. The goal of the investigation was also to identify any new shallow COIs that might be contributing to deeper potentially impacted areas that had not been discovered. The investigation in this area included the characterization of soil and groundwater.

5.1.3 Former Log Debarker Area

A past leaking hydraulic unit at the former log debarker was identified as a potential source of oil as a COI. The area where that unit was located is currently paved and oil leaks and spills were routinely cleaned up. However, because this area was identified as a suspected AOC, an investigation was determined to be necessary. The investigation in this area included soil and groundwater characterization.

5.1.4 Former Veneer Manufacturing Riverside

In order to assess potential groundwater migration of COIs to the Columbia River on the east side of the former veneer manufacturing area, soil and groundwater was characterized in this area. Concentrations of petroleum constituents were detected in groundwater samples collected from temporary monitoring wells. Based on these results, permanent groundwater monitoring wells were installed along the river bank.

5.1.5 Site-Wide Test Pits

Limited site characterization had previously been completed on the northern portion of the Site and near the southwest end of the Site because Boise Cascade had limited information regarding any release or suspected release in those areas. Because of the extensive history of use of the Site as a sawmill, ODEQ determined that previously unassessed areas of the Site were a data gap. Boise Cascade agreed to collect soil samples from randomly selected test pit locations across the Site and from several specific areas where planer mills and a large transformer had been formerly been located. Groundwater samples were not collected during test pit soil sampling activities.

To select the test pit locations, a 50-foot by 100-foot grid of the investigation area was drawn on a site map. Each grid intersection point was numbered and numbers were randomly drawn to identify which points would be selected for investigation. The scope of work included the collection of a shallow (0 – 3 feet bgs) soil sample and a deeper (3 – 4 feet bgs) soil sample from each test pit. The shallow soil sample was collected beneath the pavement or subgrade gravel at the depth where soil was first encountered. In some test pits, the shallow sample was collected from 0 to 1 foot bgs. In other test pits, the shallow sample was collected from 1 to 2 feet bgs or 2 to 3 feet bgs. Shallow samples could not be collected in some test pits because the top 3 feet was predominantly pavement and rock.

5.1.6 Northern Refuse Fill Area

The northern refuse fill area was not originally considered for investigation. However, lead was detected at 325 mg/kg in random test pit TP-14, which significantly exceeds the regional background concentration (79 mg/kg). Based on the soil sample result, additional investigation was determined to be necessary in the vicinity of that test pit. Additional detections of lead were reported in two of three samples collected in nearby test pits at concentrations of 1,090 and 1,620 mg/kg. These soil sample results indicated a more thorough investigation of the area was necessary. Part of the investigation included review of historic site maps and photos to determine potential sources of the lead as a COI. It was during historical review that the "Refuse Fill" was first observed on the 1953 Pope & Talbot site plan described in Section 2.3.2. Soil samples were collected and groundwater was not encountered during the subsequent investigation of the area. Bedrock was encountered at approximately 4 to 5 feet bgs during investigation activities.

5.1.7 Areas Not Selected for Additional Investigation

Additional investigation of the former UST, maintenance shop, sorter/stacker hydraulic unit, and concrete vault areas was not determined to be necessary based on results of previous investigations in these areas that did not discover any significant findings. The results of previous investigations in all of these areas, except the concrete vault area, had been reviewed by ODEQ during the 2002 to 2003 site investigation activities. The report on the concrete vault area was provided to ODEQ as part of the February 2014 *Environmental Summary Report and Site Investigation Work Plan*. The Work Plan concluded additional investigation of these areas was not recommended. ODEQ reviewed the Work Plan and did not provide any recommendations for further evaluation of these areas.

In March 2014, MFA, environmental consultants, on behalf of the City of St. Helens, Oregon, conducted additional soil and groundwater investigation in the UST area. MFA's report is attached in Appendix I, and their analytical results are included in the tables along with results of recent investigations by Boise Cascade and ERM. The locations of the borings are shown on Figure 6A. MFA installed seven Geoprobe™ soil borings (B25 to B31) in the vicinity of the former USTs. The borings were advanced until refusal at a depth of approximately 7 feet bgs. Temporary groundwater wells were constructed and set in each boring location. MFA collected soil and groundwater samples from each boring. Groundwater samples were collected from borings B25 and B28 and sent to the lab for chemical analysis. Evidence of petroleum COIs was not observed in the other borings advanced in the vicinity of the former USTs.

The groundwater samples were analyzed for DRO and gasoline-range organics (GRO) by Methods NWTPH-Dx and NWTPH-Gx, for VOCs by United States Environmental Protection Agency (USEPA) Method 8260C, and for PAHs by USEPA Method 8270D SIM. Both samples contained less than 1 ppm each of DRO, RRO, and GRO. Several PAHs were also detected at sub-ppm concentrations. Only two PAH constituents, benzo(a)pyrene and benzo(b)fluoranthene, in one groundwater sample exceeded the respective urban residential ingestion standard. Based on MFAs investigation, it was concluded that extensive contamination is not present in the former UST area. This conclusion indicates that additional investigation of that area is not necessary.

5.2 Investigation Methods

5.2.1 Soil Borings

Boreholes were advanced at locations B-1 through B-14 and were also advanced from the bottom of the test pit at locations TP-14C (June 2014), TP-27, and TP-31 through TP-37. The locations of soil borings are shown on Figures 6A and 6B. Boring logs are attached in Appendix J.

Borings were advanced using a combination of hand auger and direct-push drilling techniques. Most borings were advanced by hand auger or excavator to a depth of 4 feet bgs to minimize the potential for disturbing on-site utilities. After initial clearance, the direct-push drill rig was used to advance the boring to the target depth. Drill rods and hand auguring equipment were decontaminated between each boring location. Soils penetrated by the direct-push borings were classified according to the Unified Soil Classification System and American Society for Testing and Materials Designation D2488-00, "Description of Soils (Visual Manual Procedure)." In addition, the presence of volatile compounds in soil was assessed in the field using a photoionization detector. Standard operating procedures (SOPs) for hand auguring, soil logging, direct-push drilling, and ambient vapor sampling are provided in Appendix K.

Upon completion of the sampling, equipment was removed from the borehole. The borehole was then abandoned and filled with hydrated granular bentonite. Boreholes were surveyed by a licensed, professional surveyor to an accuracy of 0.01 foot.

5.2.2 Monitoring Well Installation

The monitoring wells were installed in general accordance with *Division 690-240 of the Oregon Administrative Rules, Construction, Maintenance, Alteration, Conversion and Abandonment of Monitoring Wells, Geotechnical Holes and Other Holes in Oregon*. The wells were installed by a licensed monitoring well constructor from Stratus Corporation of Gaston, Oregon. The locations of monitoring wells are shown on Figure 6B. Boring logs and monitoring well construction details are provided in Appendix L and summarized in Table 6.

Monitoring well construction was performed by an Oregon-licensed well driller from Stratus Corporation. The monitoring wells were constructed using 2-inch diameter Schedule 40 polyvinyl chloride with 0.010-slot screen. The screened borehole annulus was packed with a Colorado 10/20 silica sand to approximately 2.0 feet above the screened interval. The primary seal was installed using approximately 10 feet of hydrated bentonite chips placed on top of the sand pack. The borehole was then filled to approximately 1.5 feet bgs with a Portland cement grout. The monitoring wells were completed at ground surface with traffic-rated, flush-mounted well boxes set in concrete. Monitoring wells were surveyed by a licensed, professional surveyor to an accuracy of 0.01 foot.

Following installation, monitoring wells were developed using a submersible plastic impeller "whale" pump and disposable bailers. The wells were developed by alternating surging with a disposable bailer and purging the well with the whale pump discharging at a rate of 0.5 to 1.0 gallons per minute.

Temperature, specific conductance, pH, oxidation reduction potential, and turbidity were measured at regular intervals while developing the well. Surging and pumping continued until:

- Turbidity decreased to 5 Nephelometric Turbidity Units or less and field parameters readings stabilized to a less than 10 percent variance in specific conductance and pH and less than 1 degree Celsius in temperature; or
- A minimum of 10 casing volumes was removed.

Wells were purged continuously except for MW-1 and MW-3. The recharge rate in these wells was slow and the wells became dry several times so purging was postponed until water levels recharged. The purged groundwater was contained in 55-gallon steel drums for characterization and disposal.

5.2.3 Test Pit Excavation

Test pits were advanced using an excavator fitted with an 18-inch bucket. The excavator bucket was decontaminated between each test pit location. Soils in the sidewall and floor were classified according to the Unified Soil Classification System and American Society for Testing and Materials Designation D2488-00, "Description of Soils (Visual Manual Procedure)." The locations of all test pits are shown on Figures 6A and 6B. Test pits advanced in March 2014 were surveyed by a licensed, professional surveyor to an accuracy of 0.01 foot. Subsequent test pits were surveyed using a hand-held surveyor with accuracy of approximately 1 foot. Test pit logs are attached in Appendix M. Test pit soil was placed back in the test pit upon completion of sampling.

5.2.4 Soil Sample Collection and Analysis

Soil samples were submitted to ALS Environmental Laboratory in Kelso, Washington. The samples were analyzed for one or more of the following COIs in accordance with the referenced analytical method: DRO and RRO by Method NWTPH-Dx, PAHs by USEPA Method 8270D, PCBs by USEPA Method 8082A, total arsenic, cadmium, and lead by USEPA Method 6020A, and total mercury by USEPA Method 7471B. See Table 7 for identification of complete list of the soil samples collected during the investigation and the COIs analyzed for each sample.

SOPs for sample handling are provided in Appendix K.

5.2.5 Grab Groundwater Sample Collection and Analysis

Temporary monitoring wells were constructed in some of the soil borings and "grab" groundwater samples were collected from these wells. SOPs for sample handling are provided in Appendix K.

Groundwater samples were obtained with a peristaltic pump discharging directly into pre-cleaned sampling containers provided by the analytical laboratory. Groundwater samples analyzed for VOCs were filled completely and capped with a Teflon™ septum lid such that zero headspace was achieved and no air bubbles were visible when the vial was inverted to minimize volatilization. Groundwater samples collected for metals analysis were collected as non-filtered and filtered (maximum diameter of 0.45 microns) subsamples and preserved with nitric acid. Samples for metals analysis collected in August 2013 (B-3, B-4, and B-14) represent total metals concentrations. Samples collected for metals analysis in October 2013 (B-19 through B-22) were filtered through a 0.45 micron filter prior to analysis and represent dissolved metals.

The grab groundwater samples were submitted to ALS Environmental Laboratory in Kelso, Washington. The samples were analyzed for one or more of the following COIs in accordance with the referenced analytical method: DRO and RRO by Method NWTPH-Dx, PAHs by USEPA Method 8270D, VOCs by USEPA Method 8260C, total arsenic, barium, cadmium, chromium, lead, selenium, and silver by USEPA Method 6020, and total mercury by USEPA Method 7470. See Table 7 for identification of complete list of the grab groundwater samples collected during the investigation and the COIs analyzed for each sample.

5.2.6 Monitoring Well Groundwater Sample Collection and Analysis

Groundwater samples were collected from each of the permanent monitoring wells in April and June 2014 using USEPA low-flow well purging/ sample collection techniques to obtain representative groundwater samples. SOPs for measuring depth to groundwater and for collecting groundwater samples are provided in Appendix K.

Low-flow purging procedures are designed to minimize the volume of purge water and disturbance of the water column, and maximize the contribution of formation water from a given interval of interest. Groundwater was pumped at a rate of approximately 300 milliliters per minute and groundwater quality parameters were measured using a flow-through cell equipped with a meter for measuring pH, temperature, specific conductivity, dissolved oxygen and oxidation/reduction potential. Once a well was purged using the low-flow methods described in SOP H, samples were collected from the discharge of the pump into appropriate laboratory supplied sample containers.

Groundwater samples were submitted to ALS Environmental Laboratory in Kelso, Washington. The samples were analyzed for one or more of the following COIs in accordance with the referenced analytical method: DRO and RRO by Method NWTPH-Dx, and PAHs by USEPA Method 8270D. These samples were not analyzed for VOCs or metals based on the results from the grab samples. See Table 7 for identification of complete list of the monitoring well groundwater samples collected during the investigation and the COIs analyzed for each sample.

5.2.7 Storm Water Sample Collection and Analysis

Storm water grab samples were collected from outfalls 001, 002, and 003 (Figure 3B) on June 12, 2014. Outfall 001 drained the former logyard area, and has an approximately 5,000 gallon settling basin. Outfall 002 drained the building roof and paved truck loading areas. Outfall 003 drained the log utilization area (debarker and block saw), and has an approximately 15,000 gallon settling basin. Outfall 004 was not sampled because that outfall formerly drained only the building roof runoff, and there is essentially no discharge from Outfall 004 since the buildings were demolished in 2013.

The SOP for collecting storm water samples is provided in Appendix K. Storm water on the site collects in large sumps where water levels can decrease through evaporation. No storm water discharges from the outfalls until the sumps are full. Therefore, discharge from the outfalls may occur several hours after initiation of a rain event. Water was collected by hand from each outfall approximately 1 hour after the beginning of the rain event.

The samples were collected directly into the appropriate bottles, sealed, labeled, and preserved according to standard procedures. The samples were submitted to the analytical laboratory on June 13, 2014, and analyzed for PCBs (USEPA Method 8082A), PAHs (USEPA Method 8270D SIM), and total arsenic, cadmium, lead and mercury (USEPA Methods 200.8 and 245.1).

5.2.8 Investigation Derived Waste

Investigation-derived environmental waste (IDW) included nonhazardous soil (drill cuttings), nonhazardous rinsate water from decontamination of equipment, and nonhazardous purge water from development and sampling of monitoring wells. Solid waste included paper, cardboard, tubing, and plastic trash. IDW was determined to be nonhazardous based on analytical results of soil and groundwater samples. Nonhazardous soil and water was placed in labeled, sealed, 55-gallon drums pending profiling, manifesting, transporting, and disposal. Waste profiles and manifests are provided in Appendix N.

5.3 Soil Investigation Results Summary

The soil analytical reports for the recent investigation are provided in Appendices O, P and Q and the results are summarized in Tables 8 through 13 and Figures 7A, 7B, and 8. Analytical results of samples collected by the City's environmental consultant (MFA) are included in the tables and their report is also attached (Appendix I). Analytical results from previous investigations are also included in the tables when those results were considered relevant to evaluating the risk assessment and/or remediation of the Site. The results are reported by AOC, with some results reported for two adjacent areas in order to support the conclusions for each area.

It should be noted that laboratory results from the recent investigation activities reported qualifiers indicating minor problems matching the chromatographic fingerprint to the calibration standard for DRO and RRO analyses. The qualifiers are explained in Table 4. The qualifier for several samples stated the fingerprint does not resemble a petroleum product and may indicate naturally-occurring organic material or partially degraded petroleum products. Some PAH analytical results were marked with a qualifier indicating slight high bias. The case narratives attached to each analytical report did not identify any significant concern with the analytical results, therefore it is reasonable to determine them reliable.

5.3.1 Former Lathe Area

Eight soil borings and five monitoring wells were installed in the former lathe area (Figure 7B). Including samples collected in 2003, there were 35 soil samples collected and analyzed for petroleum constituents at depths ranging from 1 to 30 feet bgs (Table 8). DRO and RRO were detected in several samples collected between 10 and 24 feet bgs in this area. This is likely the smear zone associated with changing groundwater levels. DRO ranged from 4.3 to 9,700 mg/kg and RRO ranged from 9.5 to 53,000 mg/kg in these same samples. The highest concentrations for DRO and RRO were detected in the sample at 19 feet bgs from borehole B-3. Boring B-3 is located slightly west of the 2001 excavated area. Borings B-1 and B-13 were the only other borings with detected concentrations of DRO and RRO in soil exceeding 1,000 mg/kg. Borings B-1 and B-13 were also located near the 2001 excavated area.

Concentrations of DRO and RRO were not detected in soil samples collected from less than 10 feet bgs in the lathe area. The soil samples collected from less than 10 feet bgs were not analyzed for PAHs because DRO and RRO were not detected. This indicates that DRO and RRO in shallow soils near the lathe area is limited to a small area adjacent to the lathe pit, as documented by the 2001 post-excavation soil samples and summarized in Section 2.3 of this report.

Only two soil samples from this area, including B-3 at 19 feet bgs, were analyzed for PAHs. PAHs were detected at very low concentrations in both samples.

5.3.2 Former Oil House and Transformer Area

Six soil borings and three monitoring wells were installed in the former oil house and transformer area (Figure 7B) with 19 soil samples collected and analyzed for petroleum constituents at depths ranging from 3 to 30 feet bgs (Table 9). DRO and/or RRO were detected in seven samples, and the maximum concentration detected for DRO and RRO was 250 mg/kg and 1,300 mg/kg, respectively. Concentrations of DRO and RRO were not detected in any of the samples collected from less than 8 feet bgs. Minimal concentrations of DRO/RRO were detected in soil borings at less than 15 feet bgs.

PAHs were detected in several soil samples at very low concentrations. Concentrations were not detected in the three soil samples selected for PCB analysis.

To date, the investigation of the former oil house and transformer area has not identified a source of DRO or RRO in shallow soils that could be the source of the deeper impacts noted in H-17 during the 2001 environmental investigation. The results suggest that if COIs were present in shallow soils in the area, it has been remediated or is very limited in extent.

5.3.3 Former Log Debarker Area

Seven soil borings and four monitoring wells were installed in the area (Figure 7B) with 16 samples collected and analyzed for petroleum constituents at depths ranging from 3 to 22 feet bgs (Table 10). DRO/RRO was detected in four samples, and the maximum detected concentration of DRO and RRO was 760 mg/kg and 1,800 mg/kg, in the soil sample MW-9 at 19 feet bgs, respectively. PAHs were detected at low concentrations in soil sample MW-9 at 19 feet bgs. Concentrations of DRO/RRO were not detected in any of the soil samples shallower than 15 feet bgs. Concentrations were not detected in the two samples selected for PCB Analysis.

5.3.4 Riverside Area

Six soil borings and six monitoring wells were installed near the river along the eastern edge of the Site, (Figure 7B) with 24 soil samples collected and analyzed for petroleum constituents at depths ranging from 3 to 28 feet bgs (Table 10). The maximum detected concentrations of DRO and RRO were 230 mg/kg and 1,500 mg/kg in soil sample B-20 at 24 feet bgs. PAHs were detected at low concentrations in several soil samples collected.

5.3.5 Site-Wide Test Pits

Twenty-six test pits (TP-1 through TP-26) were excavated at randomly selected locations across the site, primarily in the northern part of the Site, to address data gaps in sampling coverage (Figures 7A and 8). An additional six test pits were excavated in early June 2014 in the vicinity of TP-13 and TP-14 (TP-13A, TP-13B, TP-13C, TP-14A, TP-14B, TP-14C). The test pits were excavated to a total depth of approximately 4 feet bgs and soil samples were collected from 26 test pits. Proposed samples could not be collected from the other six test pits because the profile consisted of gravel or cobble fill and no soil was available for analysis. Several shallow soil samples also could not be collected due to the abundance of pavement, gravel, and cobbles.

Woody materials were observed in several test pits and creosote-like odors were observed in TP-14 and TP-18. Foam and/or sheen was observed on shallow groundwater that accumulated in TP-14B and TP-14C. The woody materials were likely associated with pilings and/or lumber decking previously covering much of the Site. PAHs in soil samples from TP-14B and TP-18 were less than applicable RBCs, and soil in the vicinity of TP-14 and TP-14C was excavated as part of the removal action.

<u>Organic Chemicals: DRO/RRO, PAHs, and PCBs</u>

Organic chemical analytical results for these test pit samples are provided in Table 11.

DRO was detected in 3 of 20 samples with detected concentrations ranging from 38 mg/kg to 610 mg/kg. RRO was detected in 5 of 20 samples with concentrations ranging from 140 mg/kg to 540 mg/kg.

PAHs were detected in 9 of 10 soil samples with maximum detected concentrations ranging from 0.310 mg/kg to 0.350 mg/kg.

PCBs were detected in 1 of 24 samples with a total concentration of 0.028 mg/kg of Aroclor 1254 + Aroclor 1260.

<u>Heavy Metals: Arsenic, Cadmium, Lead and Mercury</u>

Thirty-nine soil samples from the test pits were analyzed for arsenic, cadmium, mercury, and lead (Table 12). Because these metals are naturally occurring minerals in soil, it was assumed they would be detected in the soil samples.

The concentration of arsenic in these samples ranged from 1.2 to 11.6 mg/kg. The Oregon Regional Background Soil Concentration (ORBSC) for arsenic in the Portland Basin is 8.8 mg/kg (ODEQ, 2013). Three samples exceeded the ORBSC, however, the three soil sample concentrations are within 2 mg/kg of the range reported for the Portland Basin. The detected concentrations of arsenic in the soil samples collected were below the ORBSC level of 12 mg/kg for arsenic in Coast Range soils. Based on the range of concentrations of arsenic detected in soils on the Site relative to concentrations detected in native soils in the Portland Basin and the Coast Range, and because arsenic was not used or generated during historical site operations, it is reasonable to conclude the results do not indicate a release of arsenic or arsenic contaminated media on the Site. Therefore, further investigation of arsenic in soils at the Site was not determined to be necessary.

The detected concentrations of cadmium in soil samples collected ranged from 0.1 to 1.08 mg/kg. One soil sample exceeded the ORBSC level of 0.63 mg/kg. Based on this data, it is reasonable to conclude the results do not indicate a release of cadmium or cadmium contaminated media on the Site. Therefore, further investigation of cadmium in soils at the Site was not determined to be necessary.

The detected concentrations of lead in soil samples collected ranged from 3 to 2,340 mg/kg. Eleven samples exceeded the ORBSC level of 79 mg/kg, with the majority of the soil samples at least three times the ORBSC level. The soil samples exceeding the ORBSC level for lead were collected within or near a relatively small area of the Site, now referred to as the Northern Refuse Fill Area or Refuse Fill Area and discussed in further detail in Section 5.3.6. Based on these data, additional investigation and/or evaluation was completed.

The detected concentrations of mercury in the soil samples collected ranged from 0.01 to 18.4 mg/kg. Twelve samples exceeded the ORBSC level for mercury of 0.23 mg/kg. Eight soil samples exceeded the ORBSC for mercury by at least two times the level. All but one soil sample collected that exceeded the ORBSC was collected within or near the area now referred to as Northern Refuse Area. Based on these data additional investigation and/or evaluation of mercury was completed.

5.3.6 Former Northern Refuse Fill Area

As discussed above, soil samples collected from the initial random test pits indicated soils near the north end of the Site contained COIs, including lead and mercury. Very low concentrations of TPH and/or PAHs were detected in some soil samples from test pits TP-14, TP-14A, TP-14B and TP-14C in Refuse Fill Area, but only one sample from these test pits exceeded an applicable RBC for any PAH. An additional 11 test pits (TP-27 through TP-37) were excavated in this area to delineate lead and mercury concentrations. In addition, TP-14C was re-excavated and samples were collected at discrete depth intervals (1 to 2, 2 to 3, and 3 to 4 feet bgs) to further refine depth of impacts in this area.

These soil analytical results, combined with analytical results of the samples collected in previous sampling events, are provided in Table 13 and Appendix Q. The detected concentrations of lead in soil samples collected from 0 to 1 foot bgs ranged from 3 to 118 mg/kg. The detected concentrations of lead in soil samples collected from 1 to 2 feet bgs ranged from 3 to 1,330 mg/kg. The detected concentrations of lead in soil samples collected from 2 to 3 feet bgs ranged from 17 to 1,620 mg/kg. The detected concentrations of lead in soil samples collected from 3 to 4 feet bgs ranged from 17 to 2,340 mg/kg. A minimal amount of soil samples were collected deeper than 4 feet bgs because bedrock was encountered at approximately that depth throughout most of subsurface in the area. The detected concentration of lead in the samples collected below 5 feet bgs ranged from 6 to 197 mg/kg. The soil sample results for lead indicated that approximately one-half acre of the Site near the north gate had lead as a COI in soil below a depth of 1 foot.

5.4 Groundwater Investigation Results

The groundwater analytical results for samples collected from temporary and permanent groundwater monitoring wells in 2003, 2013 and 2014 are summarized in Tables 14 (DRO/RRO and PAHs) and 15 (metals and VOCs). Analytical reports for samples collected in 2013 and 2014 are in Appendices O and P. Some groundwater analytical results are provided in Figure 9.

Depth to groundwater across the site varied between 10 and 15 feet bgs during the wet season, and 14 to 19 feet in the dry season. Groundwater elevation contour maps show a general groundwater flow direction to the east toward the river (Figures 5A through 5D). Elevations were consistently highest at MW-1 and lowest at monitoring wells along the riverbank. Groundwater elevations were consistently highest in April 2014 and decreased during each subsequent measuring event. Groundwater elevations were lowest in September in all wells with the average elevation approximately 4 feet lower than in April.

Concentrations of DRO and RRO were detected in the majority of the groundwater samples collected from the temporary monitoring wells. The maximum detected concentrations of DRO and RRO in the groundwater samples collected was 7 mg/L and 81 mg/L, respectively. PAHs also were detected at low concentrations in many of the same groundwater samples. Concentrations of DRO and RRO were not detected in groundwater samples collected from the permanent monitoring wells. Groundwater quality parameters were monitored during sample collection from permanent wells and the samples were silica gel treated to reduce interference from natural organic materials. The laboratory qualifiers associated with the detected values are indication of analytical interference associated with the grab groundwater samples that were non-treated samples collected from temporary wells.

Similar results were observed for PAHs. PAHs were frequently detected in the grab groundwater samples collected from the temporary wells, but were detected with less frequency in the groundwater samples collected from permanent wells. When a PAH was detected in a temporary well sample, the concentration of that PAH was either not detected or much lower in the sample collected from the closest permanent well. The data for both temporary and permanent wells and the data from historic water samples are provided in attached tables. The data from the permanent monitoring wells compared with data from temporary wells showed the higher concentrations in grab groundwater samples were due to contaminants adsorbed to suspended solids in the non-filtered samples. These samples overestimate dissolve concentrations that may be mobile in the environment. Thus, monitoring well results were used to assess potentially mobile groundwater contamination that could migrate to the river.

Detected concentrations of PAHs in the groundwater monitoring wells adjacent to the river were typically greater than the detected concentrations of PAHs in the groundwater monitoring wells near the known or suspected source areas such as the lathe, debarker and former oil house. Other potential sources of PAHs may be present in the veneer mill area, but that seems unlikely based on our current understanding of distribution of

COIs in soil and historic site use. There is no evidence that suggests a significant, unidentified source of PAHs in groundwater exists within the manufacturing area.

Several samples collected from temporary wells in the former lathe area were analyzed for VOCs. Toluene and/or isopropyltoluene were detected in three samples with maximum concentrations of 5.3 ug/L and 3.8 ug/L. One or both of these VOCs were detected in groundwater samples collected in H-10 and H-16 in 2003. H-10 is located near the north end of the property near the river and H-16 is located in the transformer and oil house area. The maximum concentrations of toluene and isopropyltoluene detected in those samples were 4 and 59 ug/L. Three other VOCs, butylbenzene, propylbenzene, and 1,2,4-trimethylbenzene were detected at 1, 2 and 2 ug/L, respectively, in a sample collected in 2003 from H-5 near the former UST area. There were no VOCs detected in either of two groundwater samples collected in the UST area by MFA in 2014. Additional risk screening for VOCs in groundwater is provided in Section 6.6.

Several samples from the temporary monitoring wells in the former lathe area and the riverside area were analyzed for eight total metals. The samples collected in August 2013 were not filtered prior to analysis. The samples collected in October 2013 were filtered prior to analysis and the concentrations of metals in the filtered samples were significantly lower than in the non-filtered groundwater samples. It is believed that non-filtered samples from temporary wells overestimate the concentration of potentially mobile dissolved metals in groundwater. Based on the low concentrations of metals in filtered groundwater results, additional investigation of metals in groundwater is not considered necessary.

Based on the groundwater results from the permanent groundwater monitoring wells, it is reasonable to conclude that the investigation has adequately characterized the groundwater quality in the former veneer manufacturing area and additional groundwater monitoring is not necessary.

5.5 Storm Water Sample Results

Storm water sample analytical results are provided in Table 16 and Appendix R. PCBs were not detected in any of the storm water samples. Naphthalene was detected in three samples at 0.055, 0.03, and 0.075 ug/L. No additional PAHs were detected in the three storm water samples collected. Arsenic, cadmium, lead, and mercury were detected in the three storm water samples collected at less than 1 ug/L each.

The detected concentrations of metals, PCBs, and PAHS in the three storm water samples collected were below the ODEQ Level II screening level values for fresh surface water receptors (SLVs). It is concluded that no further sampling of storm water outfalls at the Site is necessary.

6.0 Exposure Assessment

Based on the results of the investigations, various metals, PAHs, and DRO and RRO have been detected in soil and/or groundwater on the Site. In order to evaluate the risk these contaminants pose to human health and the environment, a conceptual site model (CSM) was developed for the Site to establish which potential exposure pathways are complete and which receptors might be exposed to the contaminants by each pathway. After exposure pathways and receptors are identified, screening levels were selected and compared to soil and groundwater analytical results for the Site.

6.1 Conceptual Site Model

The CSM (Table 17) is used to describe the sources of chemicals at a site, their release and transfer through environmental media (e.g., soil, sediment, water, air, and food), and the points and means by which human and ecological receptors might contact the chemicals. The CSM presents a hypothesis of possible future exposure pathways, and may not represent actual exposure and/or effects on future receptors.

The majority of the site has been covered with imported granular fill, which has been highly compacted through years of use. Other areas are covered with asphalt or concrete foundation remnants. There is minimal vegetation. It is possible that small mammals such as voles, or birds may use the site, but it is not considered to provide quality habitat. Given site conditions and the likelihood that the site will be developed, exposure of terrestrial ecological receptors to contamination in site soil is not considered to be a pathway of concern and was not carried forward in the ecological risk evaluation. However, potential discharge of stormwater and/or groundwater to surface water was retained for the ecological screening. Potential surface water receptors include benthic organisms, aquatic life, birds, and mammals.

Soil and groundwater are the primary media of concern for human health. No human exposure is occurring at the Site. The site is currently gated and locked in areas where pedestrian or vehicular traffic could reasonably access the site and no trespassing signs are posted. Future potential human receptors are identified as urban residential, occupational workers, and construction and excavation workers In considering the potential receptors for each exposure mechanism, the following points were considered:

a. Specific areas of the Site for future activities have not been identified, therefore potential exposures were considered.

b. Site-specific risk-based contractions (RBCs) were not developed for the Site because of the uncertainties of future use. ODEQ screening RBCs were selected for risk assessment and remediation target levels. ODEQ SLVs were selected for ecological risk assessment.

c. The groundwater at the Site will not be used for human consumption or any other uses where humans will be in contact with groundwater. Groundwater is typically at least 10 feet bgs, so construction or excavation workers are unlikely to come into contact with the groundwater. However, because there is potential for groundwater in a deep excavation, the groundwater in excavation exposure pathway cannot be eliminated.

d. Soil and groundwater COIs at the Site were metals, PAHs, and DRO and RRO. These compounds generally have low vapor pressures and do not readily volatilize at ambient temperatures. One exception is naphthalene which is relatively volatile compared to other PAHs. Naphthalene is the only PAH with an RBC for volatilization to outdoor air or vapor intrusion into buildings from either soil or groundwater. All detected concentrations of naphthalene in soil and in groundwater were well below the applicable RBCs, including volatilization to outdoor air (18 mg/kg for soil and 8,400 µg/L for groundwater) and vapor intrusion to indoor air (18 mg/kg for soil and 1,800 µg/L for groundwater). While these pathways are considered complete in the manufacturing area for both soil and groundwater, exposures are negligible due to the low concentrations in soil and groundwater, and therefore no further assessment is necessary.

e. Much of the Site where PCS is known or suspected to exist is currently paved. Therefore, exposure is limited in those areas. It is anticipated that concrete and pavement will be removed during site development.

f. Urban residential direct contact, ingestion and inhalation RBCs were applied to soils from zero to three feet bgs.

g. Excavation worker and construction worker RBCs apply to any depth at which these workers could be exposed during construction or excavation activities. Because specific site development plans have not been established it was not possible to determine where construction and/or excavation activities might encounter contaminated soils. It was also not possible to establish the depth at which workers could be exposed to contaminated soil. Therefore, the excavation and construction worker direct contact RBCs were considered applicable for the entire Site at all depths. For purposes of evaluating remediation alternatives, it was assumed that buildings would not likely have basements and would likely be constructing on pilings due to the adjacent rivers and the extensive fill material. Therefore excavation for footings and utilities would likely be limited to a depth of 4 to 5 feet, and remediation to that depth was considered appropriate for the Site in general. Potential worker exposure to contaminated soil deeper than four feet below ground surface would be addressed in a Contaminated Media Management Plan (CMMP) required by the Prospective Purchaser Agreement.

h. Due to potential migration of groundwater from the Site to the adjacent rivers, ODEQ SLVs for fresh surface water receptors were selected as site screening levels for groundwater. These values would be considered very conservative screening levels because contaminants would attenuate during migration to the groundwater-surface water interface, and be further diluted by surface water.

i. Stormwater from the paved areas of the Site discharges to the adjacent rivers through one of three outfalls. Most stormwater from the non-paved areas infiltrates with only minimal discharge to the adjacent rivers. SLVs were also selected as the site screening levels for stormwater. The PCS in the lathe area is all currently covered with concrete so there is no stormwater exposure associated with the PCS in that area. Lead contaminated soils were typically at least one foot bgs in the Refuse Fill Area, and almost all of the lead-contaminated soil in this area has been removed. Therefore, exposure of stormwater to sources of contamination is minimal. For all practical purposes, this pathway is not complete.

j. There is minimal natural habitat, very limited vegetation, and the Site is reasonably certain to be fully developed in the future. Therefore, it is reasonable to exclude terrestrial ecological receptors from the risk assessment. Surface water ecological receptors will be retained in the risk assessment.

k. Cultivation of vegetation on the Site will require importing adequate top soil prior to plantings. The current ground surface consists of sands and gravels that are unlikely to support vegetation. Therefore, uptake by plants, followed by ingestion, is not a complete pathway.

6.2 Identification of Exposure Pathways: Veneer Manufacturing Area

Five complete exposure pathways with potential receptors were identified for the petroleum-related COIs in the soil and groundwater in the veneer manufacturing area of the Site.

1. As discussed above (Section 6.1.e), all inhalation pathways of volatilized compounds from soil and groundwater are considered complete but negligible for all human receptors due to the low volatility of the COIs.

2. Surface soil ingestion, dermal contact, and dust inhalation are currently not complete pathways for any receptors because the area is paved. However, due to the potential for some or all of the pavement will be removed during site development, this pathway is considered complete for all receptors.

3. Subsurface soil Ingestion, dermal contact, and inhalation are currently not complete pathways for any potential receptors because the area is paved. However, due to the potential for some or all of the pavement will be removed during site development, this pathway is considered completed for excavation workers and construction workers.

4. Dermal contact with groundwater in excavation is a potentially complete pathway for construction workers and excavation workers.

5. Dermal contact and ingestion of surface water due to migration of groundwater to adjacent rivers for urban residents, occupational workers, freshwater aquatic organisms, birds and mammals. The human contact and ingestion was based on

the possibility that residents or occupation workers may decide to swim in the river. Considering that the river will greatly dilute the groundwater and the infrequent use by human receptors, this pathway is considered complete but negligible. This same conclusion is valid for potential exposures by birds and mammals. Potential exposure pathway may be complete for freshwater aquatic and for sediment-dwelling invertebrates.

Leaching of contaminants in the lathe area is limited by the existing pavement and foundation, and groundwater sampling shows its contribution to groundwater is stable and limited. A deed restriction will be placed on groundwater use to ensure there is no future potential complete ingestion or contact pathway.

6.3 Identification of Exposure Pathways: Northern Refuse Fill Area

Two complete exposure pathways were identified for the lead contaminated soil in the northern refuse fill area of the Site.

1. Surface soil ingestion, dermal contact, and dust inhalation is considered a complete pathway for urban residents, occupational workers, construction workers, and excavation workers.

2. Subsurface soil Ingestion, dermal contact, and dust inhalation is considered a complete pathway for construction workers and excavation workers.

Inhalation to outdoor air and vapor intrusion to indoor air pathways are considered incomplete for all receptors due to the non-volatile COIs in the soil. There are no RBCs established for these pathways and COIs.

The leaching to groundwater pathway was eliminated because groundwater in this area is intermittent, seasonal, and very shallow. Groundwater is unlikely to be present long enough for leaching to typically occur and transport is unlikely due to the intermittent nature of groundwater in this area. Furthermore, a groundwater use restriction will be placed on the deed at the time the property is sold.

6.4 Selection of Screening Levels and Target Cleanup Levels

ODEQ human health RBCs were selected as the appropriate screening levels for the Site. In addition, ODEQ SLVs were included for impacts to freshwater aquatic organisms from groundwater. These RBCs and SLVs are based on reasonably conservative default values for a generic site.

The applicable RBCs and SLVs for the all analytes retained as constituents of potential concern (COPC) for each potential exposure pathway are provided in Table 18. In addition, RBCs and SLVs for incomplete pathways and for COIs not retained as COPCs are provided for information purposes only and are not considered applicable to the Site. For each pathway where both urban residents and occupational workers are potential receptors, the urban residential RBCs are more stringent and were therefore selected as the applicable RBCs. For each pathway where both excavation workers and construction workers are potential receptors, the more stringent of the construction worker and excavation worker RBCs were selected as the applicable RBCs. The applicable RBCs and SLVs for each complete exposure pathway are provided on each table of soil and groundwater analytical results.

The same RBCs were selected as cleanup target levels when remediation was considered appropriate (see Section 7). The cleanup standards selected for the lead contaminated soil were 400 mg/kg for soil from 0 to 3 feet bgs and 800 mg/kg for soil greater than 3 feet bgs. These are the applicable risk based concentrations for urban residential and construction/excavation workers, respectively.

6.5 Evaluation of Soil Exposure

6.5.1 Veneer Manufacturing Area

Three areas in the former veneer mill area have been extensively investigated for soil contamination. These areas include the former lathe area, the former oil house and transformer area, and the former log debarker area. Soil samples have also been collected from borings adjacent to the river in the veneer manufacturing area.

Five of the 2001 lathe-area post-excavation shallow soil samples (1 to 3 feet bgs) exceeded the applicable RBCs for DRO and/or RRO (Figure 3B and Table 8). None of the post-excavation samples were analyzed for PAHs. An additional nine shallow soil samples were collected in 2013/14 (Tables 8, 9, and 10). DRO, RRO, and PAH concentrations were non-detect or less than the applicable RBC in the samples. Therefore, the potential for exposure of urban residents to DRO/RRO contamination in the veneer manufacturing area is limited to a small area near the former lathe. The lathe area is currently covered with approximately 8 inches of concrete so there is no current potential for exposure to elevated DRO and RRO and potential PAHs.

Sixteen soil samples were collected from intermediate depths (3 to 10 feet bgs) in the former veneer mill area (Tables 8, 9 and 10). DRO and RRO concentrations were detected in four samples at concentrations well below the applicable construction worker RBC of 4,600 mg/kg.

Forty-seven deep soil samples (greater than 10 feet bgs) were collected during the recent investigation, and nine deep samples were collected during historic investigations in this area. The samples were analyzed for DRO and RRO. Of these, 16 were also analyzed for PAHs. PAHs did not exceed the applicable RBCs in any deep soil sample. Of the samples collected to date, DRO and/or RRO exceeded applicable RBCs in four of those samples, three of these samples were collected from borings in the lathe area with concentrations ranging up to 53,000 mg/kg of RRO (Table 8). The concentration of RRO was approximately 5 times greater than the concentration of DRO in each of those three samples. The three of these samples were collected from borings located within the lathe pit area, indicating the deeper soil contamination is not extensive. As discussed in Section 6.3, the construction worker standard would apply at any depth where construction workers are exposed, it is not likely that excavation at this

Site will be deeper than 10 feet bgs. Therefore, the potential exposure of construction workers to DRO/RRO contamination in the veneer manufacturing area appears to be limited to a small area in the former lathe area. The fourth sample was located near the former oil house and was collected in 2003. RRO concentrations in H-17 exceeded the applicable RBCs. Therefore, RRO impacts are limited to the vicinity of this sample.

The only other deeper soil sample collected during any phase of the investigation that exceeded an applicable DRO/RRO RBC was a sample collected in 2003 in the oil house and transformer area. The concentration of RRO in that sample was 14,600 mg/kg (Table 9). No other sample collected in the oil house area contained a similar RRO concentration, and no additional DRO/RRO or PAH detections exceeded an applicable RBC. RRO concentrations may have attenuated or may be very localized. The recent investigation has not been able to discover any evidence that confirms the deeper contamination discovered in 2003.

Based on the data collected to date for the former veneer mill area, it is reasonable to conclude that only the soil in a small area in the former lathe area exceeds an applicable human health RBC.

The lathe area impacted soil is fully covered with concrete and/or asphalt and therefore there is no current exposure risk to human receptors. The shallow impacts in the lathe area appears to be limited to an area within approximately 20 feet south of the lathe pit, as shown on Figure 7B. Exposure to construction workers or excavation workers to the deeper soil contamination was considered to be unlikely under current conditions and future use. Furthermore, the lathe area is currently covered with a thick concrete slab in good condition that will prevent casual exposure to both human and ecological receptors. The concrete cap will also minimize the potential for vertical migration of residual contamination through leaching. It is reasonable to conclude that the concrete will remain in place until the Site is developed by the City at a later date, and that the small quantity of petroleum contaminated soil that exists in this area can easily be excavated after the concrete cap is removed in the event excavation is called for in future building plans. Excavation and disposal of this soil in the future would be managed in accordance with a CMMP. The lathe pit has been filled with concrete rubble, but should be easily located in the future. The approximate midpoint coordinates of the contaminated area south of the lathe pit are 45.857468 degrees north latitude and -122.796385 degrees west longitude.

6.5.2 Northern Refuse Fill Area

Soil samples collected in the Northern Refuse Fill Area at depths from 1 to 4 feet bgs contained lead at concentrations greater than applicable RBCs in some areas. The highest lead concentration (2,340 mg/kg) was detected in a composite sample collected from 3 to 4 feet bgs. Very few samples were collected below 4 feet because bedrock was encountered at approximately 4 to 5 feet bgs in the northwest corner of the site (Figure 4C). No sample collected below 5 feet exceeded any applicable RBC.

Based on this investigation, it was concluded that lead was a constituent of concern (COC) in the northern refuse fill area. Shallow (up to 3 feet bgs) soils in the area contained lead exceeding the applicable urban residential and construction worker RBCs and deeper soils (3 to 4 feet bgs) contained lead exceeding the construction worker RBC. Data indicated that lead impacts were limited to an area of approximately ½ acre. To reduce the risk of direct contact by future residents and workers, a remedial action was completed, as described in Section 7.

6.5.3 Site-Wide Test Pits

Areas of the Site without known or suspected releases were evaluated with soil samples collected from random test pits in order to provide better overall site coverage in case there were previously unknown source areas. Results are shown on Tables 11, 12 and 13. Test pits that are not included in the AOCs addressed in the previous subsections are screened against applicable RBCs here:

- One shallow sample (0-3 feet) contained arsenic at 11.0 mg/kg, which exceeds the applicable RBCs and also slightly exceeded DEQ's default background screening concentration (8.8 mg/kg) for the Portland Basin. Since on-site concentrations of arsenic were generally less than background, and this one sample only slightly exceeded background, overall risk to human health due to exposure to arsenic from man-made sources is considered negligible (Tables 12 and 13 and Figure 8).

- Three samples collected in close proximity contained mercury at concentrations that exceeded regional background concentrations.

- PCBs: Concentrations of PCBs were non-detect or less than the applicable RBCs (Table 11);

- DRO/RROs: Concentrations of DRO/RROs were non-detect or less than the applicable RBCs (Table 11);

- PAHs: PAH concentrations were generally non-detect or less than the applicable RBCs (Table 11). Benzo(a)pyrene, benzo(b)fluoranthene, and/or dibenzo(a,h)anthracene were detected in samples from TP-13 and TP-13A at concentrations that slightly exceeded the applicable RBCs. Samples collected from nearby test pits TP-13B, TP-13C, and TP-18 did not exceed the applicable RBCs. Therefore it is reasonable to conclude the PAH impacts in this area are very localized. However, this area should be identified in the CMMP in the event this area is excavated during future development.

6.6 Evaluation of Groundwater Exposure

Grab groundwater samples were collected in May 2003 and October 2013 for initial screening of groundwater. These samples were analyzed for VOCs, DRO, RRO, PAHs, and Resource Conservation and Recovery Act 8 metals. Based on these results, and on soil analytical results, 14 permanent monitoring wells were installed in the Veneer Mill Area and sampled for DRO/RROs and PAHs to evaluate current conditions. The results for these analyses are provided in Tables 14 and 15.

Concentrations of VOCs were non-detect or less than the applicable RBC and ecological SLVs in samples. Therefore, VOCs are not considered to pose any exposure risk at this Site.

Eight metals were detected in the grab samples from the temporary monitoring wells. Samples collected in August 2013 (B-3, B-4, and B-14) represent total metals concentrations. Concentrations of metals in grab groundwater samples are elevated due to the high volume of particulates that become suspended in the groundwater during the drilling process, and do not represent the mobile metals fraction in groundwater. Samples collected in October 2013 (B-19 through B-22) were filtered through a 0.45 micron filter prior to analysis and represent dissolved metals. The concentrations of metals in the filtered samples were much lower than the concentrations for the same metals in the non-filtered samples. Concentrations of metals in non-filtered samples exceeded the ecological SLV for aquatic freshwater receptors. However, impacts to surface water receptors are considered negligible for the following reasons;

1. Historical operations did not include use of metals; metals concentrations are likely due to naturally occurring sources; and

2. Attenuation through formation of organo-metalloid complexes and through dilution is expected when groundwater recharges to surface water.

No RBC is provided for the applicable pathways of exposure for DRO or RRO. The groundwater in excavation RBC for DRO and RRO is the saturation limit. No non-aqueous phase liquid (NAPL) was noted during soil or groundwater sampling events.

PAH concentrations in permanent monitoring wells were less than the applicable human health RBCs (Tables 14 and 19). Concentrations of benzo(a)pyrene exceeded the excavation worker RBC in two grab groundwater samples (B-18 and B-20) and presents a localized potential exposure if excavation in these areas extends to groundwater during site development activities.

Concentrations of one or more PAHs exceeded the SLVs in B-3, B-4, B-13, B-14, and B-24. Of these, concentrations of five PAHs (fluorene, benzo(a)anthracene, benzo(a)pyrene, dibenzofuran, and 2-methylnaphthalene) also exceeded an applicable ecological SLV in monitoring wells MW-5, MW-6, MW-11, and MW-12, located east of the former veneer plant, approximately 30 feet from the edge of the river.

Concentrations of benzo(a)pyrene in monitoring wells MW-6 and MW-8 (co-located with B-20 and B-18, respectively) were non-detect, indicating that concentrations of PAHs in grab groundwater samples are elevated due to the high volume of particulates that become suspended in the groundwater during the drilling process, and do not represent the mobile PAH fraction in groundwater.

For each PAH that exceeded the applicable SLVs in one or more monitoring well samples, the 95 percent upper confidence limit (UCL) was calculated. Grab groundwater samples were not included, as they do not represent the mobile fraction. Risk assessment guidance acknowledges that organisms are not exposed to a single point location; therefore, the approach for assessing exposure is to look at average concentrations within an "exposure area." The exposure area in this case is the stretch of river bordering the site, and the organisms that reside/contact that area of the river. If the calculated UCL is lower than the applicable screening level, it indicates that the ecosystem of concern (i.e. the river adjacent to the shoreline, especially the bioactive sediment on the shoreline) would encounter an actual concentration that is less than the UCL. Calculations were performed using the USEPA's ProUCL 5.0.

Calculated UCLs are provided in Table 19 and printouts from ProUCL are provided in Appendix X. The 95% UCL was less than the screening level for three of the five PAHs (dibenzofuran, fluorene, and 2-methylnaphthalene), indicating that the overall concentration of these compounds reaching the river is less than the screening level. The 95 percent UCL for benzo(a)anthracene and benzo(a)pyrene was slightly greater than the screening level. However, the reporting limit for both of these PAHs is very similar to the screening level, and concentrations in most samples were non-detect. Since non-detects are included in the calculation[1], the actual concentration reaching the river is likely less than the calculated UCL.

Based on these calculations, and that groundwater concentrations are stable and not increasing, PAHs concentrations in groundwater at the Site are not adversely affecting surface water and are not expected to affect it in the future.

6.7 Evaluation of Storm Water Exposure

The concentrations of chemical constituents in the storm water samples were less than the applicable freshwater aquatic SLVs. This is evidence that the storm water collection system does not contain harmful quantities of chemical constituents. These storm water pipes were flushed as part of the final part of the final cleanup following demolition. These results indicated storm water discharged from these outfalls will not contain harmful quantities of these chemical constituents. These samples were collected from outfalls draining paved areas so it is not possible to make general conclusions about storm water runoff from non-paved areas. However, the Site is relatively flat and most storm water on the non-paved areas tends to infiltrate into the porous soils.

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[1] The MRL is not used directly, but is used to statistically estimate a range of possible concentrations in the non-detected samples in EPA's ProUCL program

7.0 Remedial Action

7.1 Veneer Mill Area

PCS in the lathe area appears limited to a small area currently covered by a thick concrete foundation in good condition. This concrete will prevent exposure to soil and will also limit leaching to groundwater. Therefore, no removal action was implemented for this area.

7.2 Groundwater Contamination

Groundwater with low levels of PAHs that exceeded construction worker human health RBCs were detected in some samples from temporary monitoring wells. The concentrations do not exceed volatilization to outdoor air or indoor vapor intrusion RBCs. Therefore, groundwater remediation was not implemented. Excavation and construction worker protections should be implemented during any future excavation that encounters groundwater. Other potential human exposure will be eliminated with a deed restriction on groundwater use. Groundwater flowing to the river does not present a human health or an ecological risk.

7.3 Northern Refuse Fill Area

Based on this investigation it was determined that some samples collected within an approximately one-half acre area contained lead concentrations that exceeded applicable RBCs. Because much of the contamination was relatively shallow, there was reasonable potential for exposure to lead by all receptors. Therefore, the lead-impacted soil was excavated to eliminate that potential exposure risk, and to confirm there were no sources of the lead contamination buried in the refuse fill area.

7.4 Northern Refuse Fill Area Removal Action Plan and Implementation

7.4.1 Basis of Design

Soils collected from test pit samples in the Northern Refuse Fill Area contained concentrations of lead that exceeded the applicable screening levels (Section 6.4.2) at depths of 1 to 4 feet bgs. The horizontal and vertical extent was adequately delineated and no elevated lead concentrations were noted at depths greater than 4 feet bgs.

Based on the CSM (Table 17), the primary pathways of concern was ingestion, dermal contact, and inhalation by urban residents for the top 3 feet and ingestion, dermal contact, and inhalation by construction/excavation workers from the surface to the depth of bedrock (approximately 4 to 5 feet bgs). Therefore, the target cleanup standards selected for the Site are 400 mg/kg for soil from 0 to 3 feet bgs and 800 mg/kg for soils greater than 3 feet bgs.

7.4.2 Excavation Plan

Based on the pre-excavation soil samples, an excavation plan was developed for the main cleanup area and the southwest cleanup area (Figure 10). Soil exceeding the applicable standards would be excavated to 3 or 4 feet bgs and disposed at a permitted landfill.

The lead concentration in the samples from 0 to 1 foot deep ranged from 3 to 118 mg/kg with an average lead concentration of approximately 33 mg/kg. Most soil samples collected from 1 to 2 feet bgs also contained lead concentrations less than 100 mg/kg. Since the maximum concentration was well below the 400 mg/kg target cleanup standard, the decision was made to stockpile this soil to use as backfill material. The excavation plan directed that profile samples be collected from the stockpile to confirm that the lead concentrations were below the shallow soil cleanup target level.

Confirmation samples would be collected from sidewalls and from the floor of the excavation and analyzed for lead. If lead concentrations exceeded the target cleanup levels, than additional material would be excavated and disposed of off-site. In addition, if visual evidence indicated the presence of impacted soils, than that material would be excavated and removed.

7.4.3 Waste Profiling and Soil Disposal

Prior to excavation, four soil samples collected from test pits TP-14A, TP-14C, TP-27, and TP-28 were analyzed for Toxicity Characteristic Leaching Procedure (TCLP) lead (USEPA Method 6010C) to verify the soil would not be hazardous waste when disposed.

For waste profiling, four samples that were previously analyzed for lead (TP-14A, TP-14C, TP-27, and TP-28) were re-submitted for TCLP analysis. Total lead concentrations in these samples ranged from 734 to 2,340 mg/kg. TCLP lead concentrations in these samples ranged from of 0.11 to 0.65 mg/L. Upon request of the landfill, TCLP analysis was performed on one sample with mercury reported at 4.98 mg/kg. TCLP mercury concentration in this sample was non-detect. The hazardous waste standard for lead is 5.0 mg/L and the hazardous waste standard for mercury is 0.2 mg/L. Based on these test results it was concluded that the soil proposed for excavation would not be hazardous waste when disposed. A copy of the waste profile is attached (Appendix S).

7.4.4 Health and Safety

To prevent mobilization of lead-impacted soil, water was applied as necessary to the excavated area to minimize the potential for wind-blown dust. In addition, stockpiled soil was covered with plastic sheeting except periods when materials were being added or removed from the piles.

Dust monitors were placed on the fence along the north and west property boundaries in accordance with the Health and Safety Plan in order to evaluate air quality during the excavation. Dust levels were checked at these monitors periodically throughout the day and remained at background for the duration of on-site activities.

In addition, a lead personal sampler was placed on the excavator operator each day that soils were being disturbed. The dust sampler was collected at the end of each day and submitted to the laboratory for analysis of lead; analytical results are provide in Appendix T. Lead concentrations remained non-detect throughout the excavation activities.

7.4.5 Excavation Implementation

The contaminated soil was excavated in September 2014 using a backhoe and a bulldozer. The excavation generally was implemented as planned. Figure 11 provides the final excavation depths and boundaries. Based on the results of confirmation samples, some areas were excavated deeper than planned. A total of 1,708 cubic yards of soil was excavated and disposed of at Riverbend Landfill in McMinnville, Oregon.

Confirmation soil samples were collected as the excavation progressed. These samples were submitted to the lab for rush (24-hour) analysis in order to assess whether the excavation had achieved the target cleanup levels. If concentrations exceeded the target cleanup levels, additional soil was excavated until the target cleanup level was achieved, bedrock was encountered, or the excavation reached the property boundary. If bedrock was encountered, a confirmation sample was collected by scraping soil from the cracks within the basalt surface. The north and west excavation boundaries are approximately 2 feet from the property boundaries and additional excavation was considered unsafe due to the potential damage to adjacent properties.

During the excavation, three buried pipes were observed entering the property from the west and north side walls (Figure 11). A City utility crew inspected the pipes with cameras and determined they were abandoned lines. The crew authorized Boise Cascade to plug the lines. The pipes were capped with concrete prior to backfilling the excavation.

Materials within the excavation consisted mainly of sandy and gravelly material, with the following exceptions. There was no evidence of household waste.

- A wooden pad, constructed of approximately 6-inch-thick formed lumber, was discovered at approximately 3 feet bgs, located near samples FC-01-3.
- Several large concrete blocks were also discovered and left in the excavation. For convenience of later removal, they were placed in the northeast corner of the excavation prior to backfilling.
- Miscellaneous debris, including a few broken bottles and a few old metal pipes were noted in the northern portion of the excavation.

7.4.6 Soils Stockpiled For Backfill

Soil excavated from the area was temporarily stockpiled on Site. Soil slated for backfill was stockpiled in three separate piles (identified as NE Stockpile, SE Stockpile, and SW Stockpile) for convenience.

Nineteen samples were collected from the stockpiled soil and analyzed for total lead to confirm the concentration of lead in the stockpiled soil was less than the target cleanup level for shallow soil. (Table 20 and Appendix U). Samples were identified as SP-1 through SP-14 and SP-16 through SP-20; no sample SP-15 was collected. The concentration of lead in the samples ranged from 13.5 mg/kg to 373 mg/kg. Fourteen samples were less than 100 mg/kg total lead, four samples were between 100 and 200 mg/kg and only one sample exceeded 200 mg/kg. The average concentration of the 19 samples was 70 mg/kg and the 90 percent UCL was 101 mg/kg. Because concentrations were less than the target cleanup level and generally below the regional background concentration, stockpile soils were identified as acceptable backfill material.

7.2 Post-Excavation Confirmation Sampling

As excavation proceeded, confirmation soil samples were collected from the floor and sidewalls of the main and southwest cleanup areas. These samples were submitted to the analytical laboratory for rush (24-hour) analysis in order to identify soils in exceedance of target cleanup levels. Additional excavation was conducted as necessary in those areas, and the areas were resampled. A total of 145 post-excavation samples were collected (Appendix U). Of those 145 samples, 28 exceeded the applicable target and additional soil was excavated from those areas. Over 100 confirmation samples were collected of the final floor and sidewall boundaries.

7.2.1 Floor Confirmation Samples

Forty-four final post-excavation soil samples were collected from the floor of the excavation (Table 21). The excavation was approximately 21,000 square feet in area and the sample density was approximately 1 sample per 50 square feet. Only three of the 44 post-excavation floor samples exceeded the applicable target cleanup level (400 mg/kg for soils less than 3 feet bgs and 800 mg/kg for soils greater than 3 feet bgs). Those sample results are shown on Figure 12. All three samples were collected from a small quantity of soil scraped from the bedrock surface, approximately 4 feet bgs. Additional excavation at these locations was not considered necessary or feasible. The highest concentration of any floor confirmation sample collected at less than 3 feet bgs was 127 mg/kg collected at 2 feet bgs. These confirmation samples indicate the removal action adequately achieved the cleanup target level.

7.2.2 Side Wall Confirmation Samples

Seventy-five post-excavation samples were collected from the side walls of the excavation (Table 22). Most of these samples were collected along the property boundary adjacent to the west and north side walls of the main cleanup area because lead impacts were greatest in this area and required additional delineation.

The concentration of lead was less than 100 mg/kg, below the applicable cleanup target levels, in the samples collected on the eastern and southern sidewalls of the main cleanup area. On the western and northern sidewalls of the main cleanup area, 15 final confirmation samples exceeded the applicable target cleanup level. Those sample results are shown on Figure 12. The maximum lead concentration in the soil samples collected from the west and north sidewalls was 938 and 3,220 mg/kg, respectively, with the highest concentration in a sample collected from 2 to 4 feet bgs. Several samples collected from 0 to 1 feet bgs had lead concentrations as high as 1,980 mg/kg.

These results indicate that the south and east excavation sidewalls are in compliance with the applicable target cleanup levels, but residual lead impacts greater than the target cleanup level are in place along the northern and western sidewalls. The excavation is within 2 feet of the north and west property boundaries and additional soil cannot be excavated without potentially damaging structures on the adjacent property to the north or undercutting the fill material on the adjacent property to the west.

7.3 Excavation Backfilling

The excavation was backfilled with a combination of the stockpiled soil described above and gravel purchased from a local quarry. Large concrete blocks that were removed from the area were also placed back in the excavation along with chunks of weathered asphalt that had partially covered the refuse fill area.

Large concrete fragments excavated from the southwestern portion of the main excavation were placed in a discrete area in the northern portion of the excavation. Soils from the SE Stockpile, were placed in the bottom of the northern, deepest part of the excavation (Figure 13) to a surface depth of approximately 3 feet bgs. Soil from the NE Stockpile was placed on top of this and on the remainder of the Main Cleanup Area to a surface depth of approximately 1.5 to 2 feet bgs. The SW Stockpile was used to backfill the Southwest Cleanup Area to a surface depth of approximately 1.5 feet bgs. 1,640.80 tons of crushed gravel from a local quarry was then spread over the entire area at depths ranging from 1.5 to 2 feet in order to return the excavation area to its original grade.

8.0 Residual Risk Summary

Based on the evidence collected during the historical and recent investigations of the Site and on the post-excavation sample results, there are four areas of the Site with COIs that exceed applicable human health risk-based concentrations and/or ecological screening level values and therefore pose some level of potential risk to human health or the environment.

8.1 Lathe Area Petroleum Contaminated Soil

PCS is present in the area where the former veneer mill lathe was located. The contamination exists in the shallow and deep soil, but appears to be limited to a small area south of the lathe pit. The petroleum is a combination of DRO and RRO, most likely a combination of diesel, kerosene and hydraulic oil used to clean and power the lathe. The DRO and RRO concentrations exceed applicable RBCs. PAHs do not exceed applicable RBCs, though post-excavation soil samples with elevated DRO and RRO concentrations (collected in 2001) were not analyzed for PAHs.

This area is currently covered with a thick concrete cap which will likely remain in place until the Site is developed. The concrete cap will prevent exposure to human and ecological receptors and minimize potential migration of contaminants via leaching to the groundwater. If the concrete cap is removed, the petroleum contaminated soil should be removed or otherwise treated at that time to achieve the applicable RBCs. PCS excavated from this area must be managed in accordance with an approved CMMP.

Data indicates that PCS in the former lathe area is not a significant source of DRO, RRO, or PAHs to groundwater.

8.2 Oil House and Transformer Petroleum Contaminated Soil

Data indicates that PCS in this area is limited to a very small area located 19 feet bgs and that impacts in the area do not pose a risk to human health or the environment. One soil sample collected in 2003 had a RRO concentration of 14,600 mg/kg. No other samples collected in this area have exceeded any applicable RBC for DRO/RRO or PAHs.

Data indicates that the PCS in the former oil house and transformer is not a significant source of RRO or PAHs to groundwater contamination.

8.3 Northern Refuse Fill Area Lead Contaminated Soil

Approximately 1,708 tons of lead contaminated soil was removed from the Northern Refuse Fill Area. Floor and sidewall soil samples confirmed that areas with impacted soil were removed, with two exceptions:

1. In the deepest part of the excavation, soil was removed to bedrock (4 to 5 feet bgs). Floor samples were collected from the thin soil layer embedded in the top of the basalt. Lead concentrations in three floor samples exceeded applicable RBCs, however, the residual risk is slight, since these samples represent a very small volume on the top of the basalt surface. Any soil or bedrock excavated from this area must be managed in accordance with an approved CMMP.

2. Residual lead concentrations exceeding the applicable RBCs are present in the shallow soils along the north and northwest property boundaries. Removing the remaining soil would potentially cause damage to adjacent buildings and/or properties. Considering the location of the soil in a narrow strip of land along the property boundaries, current or future human exposure would be limited. Depending on site development plans, this soil may require excavation and or capping at a future date in order to prevent exposure to potential receptors. Any soil removed from the area must be managed in accordance with an approved CMMP (Appendix V).

Elevated lead concentrations are not expected on adjacent properties, therefore, adjacent properties to the west and north of the Refuse Fill Area were not investigated for potential lead contaminated soil. Several lines of evidence indicate that the lead is non-mobile, that impacted soil was due to fill material brought on Site, and that this lead-impacted fill was not used on adjacent properties.

1. Soil TCLP tests indicate the lead is not readily leachable, and therefore not likely to migrate through groundwater flow.

2. Transport through surface soil erosion is unlikely because the adjacent properties are higher in elevation.

3. Neither of the adjacent properties were ever part of the Site, and the structures on these properties pre-date the most likely dates when fill may have been placed on the Site. Therefore, fill materials placed on those properties, if any, were likely placed at a different time and likely came from a different source than lead-impacted fill present along the north and north-west Site boundary.

4. The lead concentrations in most of the soil samples collected from the excavation bordering the residential property to the west were below the applicable urban residential RBCs.

Based on these lines of evidence, it is reasonable to conclude that the adjacent properties were not significantly impacted by the lead-contaminated soil recently removed from the Site.

8.4 Veneer Manufacturing Area Groundwater

The primary pathway of COPCs in groundwater (notably PAHs) is exposure of aquatic life in the Columbia River or Multnomah Channel from PAH-impacted groundwater flowing into surface water. Calculated UCLs indicate that the overall concentration of PAHs is less than applicable screening levels. Based on these calculations, PAHs concentrations in groundwater at the Site are not expected to result in PAH concentrations in surface water that would result in impacts to aquatic life.

Groundwater will not be contacted directly by human or ecological receptors and a restriction prohibiting any beneficial use of the groundwater will be placed on the property deed either prior to, or at the time of transfer of the property to future owners.

9.0 Conclusions and Restrictions

The site characterization, investigation, and removal action were based on ODEQ guidance and clean-up criteria. As previously stated, ODEQ was periodically consulted for specific guidance and work plan review. Based on the investigations results and the removal action the Site meets ODEQ standards for urban residential, occupational, and industrial use under current conditions.

Petroleum contaminated soil (diesel fuel and hydraulic oil) exists in a small area adjacent to the south side of the former lathe. The contaminated soil is currently covered with a concrete cap. PAHs have been detected in the groundwater at low concentrations that exceed excavation worker RBCs and surface water ecological SLVs. Groundwater contamination appears to be stable and does not appear to be an ongoing source to the adjacent river.

A 2- to 3-foot wide strip of soil with lead concentrations exceeding applicable RBCs remains along portions of the western and northern property boundaries in the northern refuse area. This soil could not be removed due to concerns about potential damage to adjacent properties. Evidence suggests the lead contaminated soil was fill material placed on the Site circa 1912/13. Potential impacts to adjacent properties to the west and north of the northern refuse area have not been investigated, but some evidence suggests these properties would not be impacted by the fill placed on the Site.

To ensure protective conditions in the future the following conditions and restrictions are recommended:

4. No water supply wells for any purpose will be allowed.
5. The concrete cap will be maintained in the lathe area to prevent potential future exposure by site workers or residents and to minimize future leaching of contamination into shallow groundwater
6. Any contaminated soil or groundwater removed from the Site must be managed in accordance with an ODEQ-approved Contaminated Media Management Plan (CMMP). Residual soil in the northern refuse area, lathe area, and localized area around TP-13, and groundwater near B-18 and B-20 will be identified as specific areas of concern in the CMMP. In addition, many soil samples collected from the Site exceed one or more of recently established clean fill criteria (ODEQ 2014). This may limit options for disposal of materials removed from the Site in the future, and all soil destined for off-site disposal or use should be evaluated against applicable clean fill criteria. Soil with concentrations below applicable RBCs, but above clean fill criteria, may be re-used on Site property with no restrictions on its placement.

These restrictions and requirements should be memorialized in an Easement and Equitable Servitudes or similar enforceable document recorded on the Site property deed.

10.0 References

City of St. Helens 2013. Water Department 2013 Water Quality Report.

Oregon Department of Environmental Quality (ODEQ). 2010. Human health risk assessment guide. Environmental Cleanup Program. October 2010.

ODEQ 2003. Risk-based decision making for petroleum contaminated sites. Land Quality Division. September 2003.

ODEQ 1998. Guidance for ecological risk assessments: levels I, II, III, IV. Waste Management and Cleanup Division. April 1998, Tier II screening levels (Table 1) updated in 2001.

ODEQ 2013. Development of Oregon Background Metals Concentrations in Soil. Technical Report. March 2013.

ODEQ 2014. Clean Fill Determinations. Internal Management Directive. July 16, 2014.