CONTAMINATED MEDIA MANAGEMENT PLAN

point source solutions, llc

FORMER ESCO PLANT #1
TAX LOTS 1N1E29DA1700 and 1N1E29C00100
PORTLAND, MULTNOMAH COUNTY, OREGON

Report Prepared for and Reliance Provided to:

1535A1, LLC
PO BOX 10067
PORTLAND, OREGON 97296

Point Source Solutions Project No: OR180913-6B
September 12, 2019

10445 SW Canyon Road, Suite 115
Beaverton, Oregon 97005
503.236.5885

1.0 INTRODUCTION

This Contaminated Media Management Plan (CMMP) has been prepared by Point Source Solutions (Point Source) for the former ESCO Plant #1 property in Portland, Oregon (Site). This CMMP is intended to assist the construction team in field identification and management of contaminated media (soil) that could be encountered during site demolition/excavation work during site redevelopment.

This CMMP includes field protocol for identification, response actions, communications, removal, temporary storage or stockpiling, transportation, and treatment and/or disposal of contaminated media. Decisions pertaining to the identification and management of contaminated media will be made by the project environmental representative, property developer/owner and the Oregon Department of Environmental Quality (ODEQ).

A Site Location Map is included as Figure 1; a Topographic Map is included as Figure 2; and a Site Plan is included as Figure 3.

2.0 PROJECT SITE DESCRIPTION

2.1 FORMER ESCO PLANT #1

The Site address is 2141 NW 25th Avenue and 2300 NW 26th Avenue, Portland, Oregon. The Site includes Multnomah County tax lots 1N1E29DA01700 (2.36 acres) and 1N1E28C00100 (15.57 acres) comprising 17.93 acres. This Site is zoned EG1-General Employment and IH-Heavy Industrial by the City of Portland.

The Site has been divided into distinct areas for site characterization activities. These specific management areas are depicted on Figure 3.

Former ESCO Plant #1		
Area	**Characteristics**	**Comments**
Area A	Concrete slab and asphalt, structures previously demolished	Sampled during Baseline Survey
Area B	Concrete slab and asphalt, structures previously demolished	Sampled during Baseline Survey
Area H	Building #9 to be demolished in 2019	Post slab demo sampling needed Small area of Dx impacted soil to be remediated
Building 43	Concrete slab, structure previously demolished	Post slab demo sampling needed
Area C	Asphalt paved parking lot	Sampled during Baseline Survey
Roosevelt 2	Concrete slabs where structures were previously removed and a portion of Building #4 to be demolished in 2019	Sampled during Baseline Survey
Roosevelt 3	Concrete slab, structure previously demolished	Post slab demo sampling needed
Roosevelt 4	Concrete slab/rock, structure previously demolished	Post slab demo sampling needed
Roosevelt 5	Concrete slab/rock, structure previously demolished	Post slab demo sampling needed
Wilson 1	Building #15 to be demolished in 2019	Sampled during Baseline Survey
Wilson 2	Building #4 to be demolished in 2019	Sampled during Baseline Survey

All slab removal, including areas sampled as part of the May 2018 Baseline Survey will be followed by a visual inspection for contamination with sampling as deemed necessary.

Prior to demolition GPS data will be gathered to mark both building slab features and sampling locations where higher concentrations of contaminants of concern have been detected.

3.0 PLANNED REDEVELOPMENT

3.1 FORMER ESCO PLANT #1

At this time there are no plans for above grade structural development of the Site. Future plans will rely on market demand.

4.0 PROJECT SITE CHARACTERIZATION

The purpose of this section is to provide information pertaining to environmental conditions associated with the project site.

4.1 BIBLIOGRAPHY

Information pertaining to environmental investigations in this section are based on several previous reports by others and recent investigation activities completed by Point Source. Previous environmental reports reviewed during the preparation of this CMMP are summarized as follows:

- ***Final Phase I Environmental Site Assessment Report, ESCO Corporation, 2141 NW 25th Avenue, Portland, Oregon*** dated October 2006 prepared by ERM. Project #0053850;
- ***Baseline Environmental Site Assessment Report, Former Main Plant Properties ESCO Corporation, 2141 NW 25th Avenue, Portland, Oregon*** dated May 2018 prepared by Bridgewater Group in association with Tuppan Consultants LLC. Project #ESCO_BESA180427; and,
- ***Risk Based Corrective Action Determination, Former ESCO Plant #1, LUST Facility #26-18-0569, Portland, Oregon*** dated February 28, 2019 prepared by Point Source Solutions LLC. Project #OR180913-6.

Pertinent information relating to soil and groundwater conditions contained in these reports is summarized in the following sections.

4.2 PROJECT SITE DEVELOPMENT HISTORY

4.2.1 FORMER ESCO PLANT #1

The Site consists of two tax lots that include most of the land bounded by NW Wilson Street, NW 24th Avenue, NW Nicolai Street, and NW 26th Avenue. According to historical records, the Site was developed as a foundry between 1913 and the mid-1960s. Prior to the construction of the foundry, the Site was developed for commercial and residential use.

Former foundry buildings with the exception of Buildings #4, #9 and #15 were demolished in 2018. Buildings #4, #9 and #15 are scheduled for demolition in 2019.

4.3 SUBSURFACE CONDITIONS

4.3.1 Soil

Soil samples have been collected throughout the Site at depths up to 25 feet below ground surface (bgs).

Testing for soil was conducted at Apex Labs in Tigard, Oregon. The suite of analytes run as a result of various investigations include total petroleum hydrocarbons (TPH) as diesel and gasoline and heavy oil, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and a suite of 14 metals.

Petroleum impacted soils on the Site from ground surface to a depth of 15 feet below ground surface were removed during previous demolition activities including the decommissioning of all known USTs on the Site. One small area of diesel-range hydrocarbons is present in the southeast corner of Building #9 and was not removed do to potential impact on the building foundation.

The soil sample analytical results from baseline Incremental/Representative Sampling Methodology (ISM/RSM) are summarized in the table below compared to Soil Ingestion, Dermal Contact and Inhalation Risk Based Concentrations (RBCs) for various receptors.

2018 BASELINE ISM/RSM SOIL SAMPLING AVERAGE SOIL CONCENTRATIONS – PCBS/BAPe/ARSENIC/LEAD MG/KG					
Area	**Depth**	**PCBs**	**BAPe**	**Arsenic**	**Lead**
Area A	0.5-2.5’	10.2	**603.3***	**11.2***	220*
	2.5-5.0’	10.3	69.3	**14.0***	522*
Area B	0.5-2.5’	8.8	**926.7***	**9.9***	55.8*
	2.5-5.0’	10.4	35.5	**34.6***	16.8
Area H	0.5-2.5’	18.9	**437.0***	**9.0***	71.1*
	2.5-5.0’	9.21	**193.7***	**8.21**	23.7
Area C	0.5-2.5’	10.2	**612.7***	**9.5***	18.4
	2.5-5.0’	10.4	108.8	**9.4***	12.1
Roosevelt 2	0.5-2.5’	8.06	51.6	**8.9***	27.4
	2.5-5.0’	10.2	29.7	**9.9***	16.7
Wilson 1	0.5-2.5’	11.06	25.7	**8.4**	16.0
	2.5-5.0’	9.54	6.0	**8.7**	14.9
Wilson 2	0.5-2.5’	10.1	107.3	**9.1***	76.6*
	2.5-5.0’	10,1	8.5	**7.4**	14.2
Residential		**233**	**110**	**0.43**	**400**
Urban Residential		**330**	**250**	**1.0**	**400**
Occupational		**590**	**2100**	**1.9**	**800**
Construction/Excavation Worker		**4,900/140,000**	**17,000/490,000**	**15/420**	**800/800**
Background Levels of Metals in Soil/Clean Fill*		**NA/200**	**NA/110**	**8.8/8.8**	**79/28**

* Results indicate concentration above clean fill screening levels.

In addition to the ISM/RSM sampling, discreet sampling (66 soil borings) has been conducted on the Site.

- **EB31** - 1 of 4 shallow soil samples collected beneath Building 43 exceeds BAPe for occupational exposure.

- **EB37** - 1 of 4 shallow soil samples collected beneath Building 9 exceeds BAPe for occupational exposure.
- **EB33 and EB11** - 1 of 16 shallow soil samples collected beneath slabs in Roosevelt 4 exceeds BAPe for occupational exposure.
- **EB7** - 1 of 4 shallow soil samples collected in Area A exceeds BAPe for occupational exposure.

With the exception of arsenic, all other analytes were below occupational exposure limits.

RBCs for Soil Ingestion, Dermal Contact & Inhalation for Residential/Urban Residential/Occupational Receptors are below the established background level for arsenic in the Portland Basin of 8.8 mg/kg.

At this time only demolition of remaining Buildings #4, #9 and #15 as well as the removal of selected slabs are planned. All soil management will be conducted on the Site. None of the soil data from the 2018 baseline sampling indicates contaminants of concern above Construction Worker or Excavation Worker screening levels.

Site soil is suitable for disposal as non-hazardous waste at a RCRA Subtitle D Landfill (such as the Waste Management Hillsboro Landfill).

4.3.2 Groundwater

A network of eight monitoring wells was installed throughout the ESCO properties in 2017. Groundwater has been encountered at depths between 40 and 65 feet bgs in coarse-grained sediments in the vicinity of the Site. Groundwater flow has been calculated to be northeasterly.

Groundwater is not anticipated as a media of concern for development activities at the Site.

5.0 DEQ CLEAN FILL SCREENING LEVELS

There are currently no ODEQ regulations requiring pre-transport testing of soil that is reasonably expected to be clean. However, ODEQ has published an internal management directive (*Clean Fill Determinations*, dated July 23, 2014), which includes Clean Fill Screening Levels (CFSLs) to use as guidance when evaluating disposal options for soil with low levels of contamination. Soil that does not appear contaminated and contains contamination at levels less than the ODEQ CFSLs can generally be re-used on site or disposed of off-site without restrictions. Excavation spoils will not meet DEQ's definition of "clean fill" if field screening evidence of contamination is observed or other chemical constituents are found to be present though additional characterization during construction.

For this Site, contractors should assume that soil generated during construction will not qualify as clean fill, unless the results of soil testing indicate otherwise.

6.0 CONTAMINATED MEDIA MANAGEMENT PLAN

The goals of this CMMP are to (1) provide the excavation contractor with information on the preliminary spatial distribution of arsenic in soil at the Site, (2) establish a decision structure to assist the earthwork contractor in the detection and management of arsenic in soil during excavation activities, and (3) prevent the exacerbation of environmental conditions.

6.1 IDENTIFICATION AND MANAGEMENT OF CONTAMINATED SOIL

Soil impacted by BAPe, arsenic and/or lead generally does not exhibit distinct field screening characteristics. Soil management will rely on analytical results provided in the table in Paragraph 4.3.1 as well as owner specific sampling.

6.2 SOIL MANAGEMENT METHOD #1: OFF-SITE TRANSPORT AND DISPOSAL

Based on known subsurface conditions at the project site (Section 4.3), contractors should assume that soil generated during construction will not qualify as clean fill, unless the results of soil testing indicate otherwise.

Soil generated during development of the Site is expected to be suitable for disposal as non-hazardous waste at a RCRA Subtitle D Landfill or an ODEQ-approved disposal facility.

Where soil needs to be disposed of at an off-site facility, the excavation contractor will need to obtain a permit from the disposal facility prior to hauling the impacted soil to their facility. The earthwork contractor will likely need to provide chemical analytical laboratory data to the selected disposal facility.

Copies of the permit should accompany each load transported to the selected disposal facility.

Disposal facilities often have the following requirements prior to accepting material at their facility:

- No material will be received without a completed contaminated soil profile and application form (to be completed by the earthwork contractor), an approval of credit application on file and pre-approval from the disposal facility.
- Trucks will be permitted to weigh in as negotiated with the facility.
- Material may be sampled upon delivery by the disposal facility. Comparisons may be made between the submitted profile and on-site analysis. Soil transported to the disposal facility that is not consistent with the soil profile may be rejected.
- Exported soil must not contain any free liquids or foreign material (i.e., rebar, fittings, cans, wood, etc.). Truck loads with excessive foreign material may be reloaded and returned to the contractor or screened, sorted, and disposed of by the disposal facility for an additional fee.

The current Site Owner (1535-A1 LLC) intends for use of Site soil at the Former ESCO Plant #1 as fill is needed at this location as the result of on-going demolition activities of the Former ESCO Plant 1 sub-structures.

6.3 SOIL MANAGEMENT METHOD #2: ON-SITE RE-USE

Based on our knowledge of the environmental condition of the Site, soil generated during earthwork at the Site can be re-used on site without additional testing requirements, assuming (1) it is geotechnically suitable, (2) does not exceed the RBC for Soil Ingestion, Dermal Contact & Inhalation for a Construction Worker and (3) is ultimately capped with either a structure, pavement or an approved geotextile.

6.3.1 Stockpile Management

If potentially contaminated soil is encountered within the project site that cannot be immediately transported off site for disposal, it must be temporarily stockpiled in areas designated by Point Source. Soil that is placed in temporary stockpiles within the project site must be well maintained at all times. All stockpiled soil must be placed on impermeable plastic sheeting (minimum 6-mil thick) with a berm around the perimeter of the stockpile. The plastic sheeting and berm prevent the runoff of stockpiled soil contaminants to surrounding areas. The berm may be constructed with hay bales or other equivalent methods approved by Point Source. The bottom plastic sheeting should be lapped over the berm materials, and the soil stockpile within the berm should also be covered with plastic sheeting to prevent erosion or leaching of contaminants from the soil stockpile impacting the underlying soil. The upper plastic sheeting covering the soil stockpile should be secured using sand bags or equivalent. The upper plastic sheeting prevents the stockpiled soil from being exposed to precipitation and wind.

The contractor is responsible for restoration of all stockpiled areas to a pre-stockpile condition, which means all soil and debris should be removed from the area. Stockpile plastic debris is not to remain on the project site or any adjacent sites following stockpile soil removal. If stockpiled soil is removed for off-site disposal, completion of removal must be satisfactory to the owner and Point Source

6.3.2 Composite Soil Sampling

Potentially contaminated stockpiled soil will be sampled using composite soil sampling methods and analyzed for disposal profiling.

STOCKPILE SOIL SAMPLING FREQUENCY	
Stockpile Volume Cubic Yards	**Number of Composite Soil Samples to Collect**
0 - 10	1
11 - 50	2
51 - 100	3
101 - 500	4
Each composite soil sample will be comprised of three soil sub-samples collected from a particular area of the soil stockpile. Soil stockpiles greater than 1,000 cubic yards will be sampled at a rate of five composite soil samples for the first 500 cubic yards, plus one composite soil sample for each additional 500 cubic yards.	

Stockpile soil samples will be collected by hand or the use of hand tools. Decontaminated hand tools should be used to remove the surface layer of soil and then the soil sample will be retrieved with a decontaminated stainless steel scoop or disposable gloves. Chrome-plated tools will not be used.

Soil samples will be collected using the procedure outlined below. Disposable gloves will be worn and changed between samples.

- Remove the top layer of soil to the desired sampling depth using a decontaminated hand tool.
- Conduct an initial visual screen (based on discoloration and sheen) to help identify the most appropriate sampling location.
- Mix the discrete soil samples into one composite soil sample in a decontaminated stainless steel bowl or disposable plastic bag until thoroughly homogenized.
- Transfer the composite soil sample to a labeled, laboratory-prepared sample jar using a decontaminated stainless steel or plastic laboratory spoon. Fill the jar(s) completely to minimize headspace.

- Clean the jar rim(s) before tightening the lids, and quickly and adequately seal the sample containers.
- Collect a sufficient volume of soil sample for the particular analysis. Place the labeled soil sample jar(s) in an iced cooler for temporary storage. Transport the soil samples to the chemical analytical laboratory.
- Use a field notebook to record a description of the soil that was sampled, the location of soil sample, the sample I.D., and the time of soil sample collection. Record the sample on the soil sampling field forms and chain-of-custody form. The stockpile soil sample I.D. will include a prefix identifying the stockpile (SP) number followed by a sequential numeric designation. For example, the third composite soil sample collected from stockpile SP-3 will be identified as "SP3-3".
- Decontaminate the equipment between the collection of soil samples. Decontamination will include: (1) rinse with tap water and scrub with a scrub brush until free of large particles, (2) wash with phosphate-free detergent solution, (3) rinse with tap water and (4) rinse with distilled water.

Soil stockpile composite samples will be submitted to an analytical laboratory for analysis of the following (as required by the receiving disposal facility):

- Petroleum Hydrocarbons by NWTPH-GX and NWTPH-DX
- Volatile Organic Compounds by EPA Method 8260
- Polyaromatic Hydrocarbons by EPA Method 8270
- PCBs by EPA Method 8082
- RCRA Metals by EPA 6000/7000 Series Methods

The chemical analytical results shall be used to evaluate the appropriate off-site disposal location. All soil designated for off-site disposal must be characterized and permitted in accordance with the receiving facility's requirements prior to transport and disposal.

6.4 USTs

There is no evidence USTs exist at the Site. USTs were removed in 2018 and a "No Further Action" determination for LUST Facility #26-18-0569 has been issued by ODEQ.

6.5 EROSION AND DUST CONTROL

Once concrete slabs and asphalt paving have been removed from the Site, the exposed soil will become susceptible to erosion by wind and water; therefore, erosion control measures should be planned carefully and be in place before construction begins. Silt fences, hay bales, and/or granular haul roads will be used as required to reduce sediment transport during construction to acceptable levels.

Measures to reduce erosion should be implemented in accordance with OAR 340-41-006, OAR 340-41-455, and the City of Portland and Multnomah County regulations regarding erosion control. In general, erosion control measures must limit sediment transport to less than 1 ton per acre per year, as calculated by the Universal Soil Loss equation.

6.6 CULTURAL RESOURCES

The areas of planned excavations are not expected to contain cultural or archaeological artifacts. However, if cultural or archaeological resources are inadvertently discovered during excavation, work in the area must stop and the Legislative Commission on Indian Services shall be notified by calling 503.986.1067. The Oregon State Historic Preservation Office should be contacted regarding discovery or potential damage to archaeological sites. ODEQ should also be contacted so that modifications to the work scope may be discussed.

6.7 CONTRACTOR REPORTING REQUIREMENTS

The contractor is responsible for keeping a detailed daily record of all soil excavation, stockpiling, export, and disposal of potentially contaminated soil. This includes the purpose, origin, destination, and volume of soil that is (1) loaded and hauled to the approved off-site disposal sites, (2) re-used as fill on the project site, or (3) transported to temporary stockpile locations (within the project site). The contractor is responsible for preparing a daily field report for distribution to the owner that identifies the number of truck-loads of soil transported off site and daily tonnage for each disposal location. All soil excavation, handling, and disposal activities will be documented in these daily field reports by the contractor, and soil sampling and analysis by Point Source will be summarized in a final report submitted by Point Source. The daily reports should also contain documentation of any dewatering systems as described in Section 6.4.

6.8 GROUNDWATER MANAGEMENT

Groundwater is encountered at depths between 40 and 65 feet bgs in coarse-grained sediments in the vicinity of the Site. It is unlikely that groundwater will be encountered during excavation activities.

7.0 IMPORTED BACKFILL CONSIDERATIONS

All fill material imported to the project site shall consist of either a manufactured rock product (e.g., ¾-inch-minus crushed rock from a permitted rock quarry) or must be free of contaminants at concentrations exceeding DEQ's CFSLs. It is the contractor's responsibility to ensure all imported fill material meet these criteria and provide the owner with the imported material origin information and accompanying documentation demonstrating the material meets DEQ CFSLs, if not using a manufactured rock product. If the source facility or contractor cannot provide documentation demonstrating that the material meets ODEQ CFSL, the material should not be used as backfill at the project site. In addition, if evidence of contamination is observed in imported fill material, the contractor should reject the imported backfill and identify an alternate source. Also, material imported as structural backfill should be evaluated and approved by the geotechnical engineer before placement on the site.

8.0 UNFORESEEN CONDITIONS

In the event that undocumented contamination or other potentially hazardous conditions are encountered that are not addressed in this CMMP, the earthwork contractor shall cease work and notify the owner and Point Source. The earthwork contractor will then barricade or otherwise isolate the area and avoid filling the area until authorized to do so by Point Source. Point Source will determine the appropriate course of action to assess potential unknown conditions encountered during excavation. The earthwork contractor shall not replace any known or suspected contaminated soil in any excavation area without prior approval by Point Source.

9.0 ASSUMPTIONS AND LIMITATIONS

This CMMP is designed to provide earthwork contractors with guidance for the proper handling and management of arsenic-impacted soil. This document is intended to be used as a general overview document for the use of the excavation contractor and project development team during the earthwork portions of Site projects.

The prime contractor must prepare and implement during the project a site-specific Health and Safety Plan (HSP). The HSP fulfills "worker right to know" requirements (29 CFR 1926.59). A copy of the HSP must be submitted to the developer/owner prior to the start of work on the Site. During work on the project, the HCP must be posted at the project site. The prime contractor is responsible for notifying subcontractors of pertinent environmental conditions. Subcontractors may either adopt the prime contractor's HCP or must prepare their own HCP. This document should be used in conjunction with, not in place of, the HCP and the project specifications. Each contractor and subcontractor is responsible for the safety of its employees, including compliance with applicable OSHA regulations, and compliance with all specifications in the technical specifications manual for the project. In addition to implementation of an HSP, the prime earthwork contractor is responsible for preparation and implementation of a site-specific HSP to ensure adequate protection for their workers while on site.

This CMMP has been developed exclusively for use by 1535-A1 LLC or parties approved by 1535-A1 LLC and applies specifically to the Former ESCO parcels identified as Multnomah County tax lots 1N1E29DA01700 (2.36 acres) and 1N1E28C00100 (15.57 acres).

If you have any questions regarding this CMMP, please do not hesitate to contact the undersigned.

Prepared by:

Gil Cobb, RG
Registered Geologist (Oregon #G1440)

Point Source Solutions, LLC
10445 SW Canyon Road, Suite 115
Beaverton, Oregon 97005

Phone: 503.236.5885
Fax: 503.224.0449

Reviewed By:

Jeff Jackman
Environmental Professional

FIGURES

Figure 1	Site Location Map
Figure 2	Topographic Map
Figure 3	Site Plan

APPENDICES

Appendix A	Baseline Environmental Site Assessment

10445 SW Canyon Road, Suite 115
Beaverton, Oregon 97005
503.236.5885

FIGURES

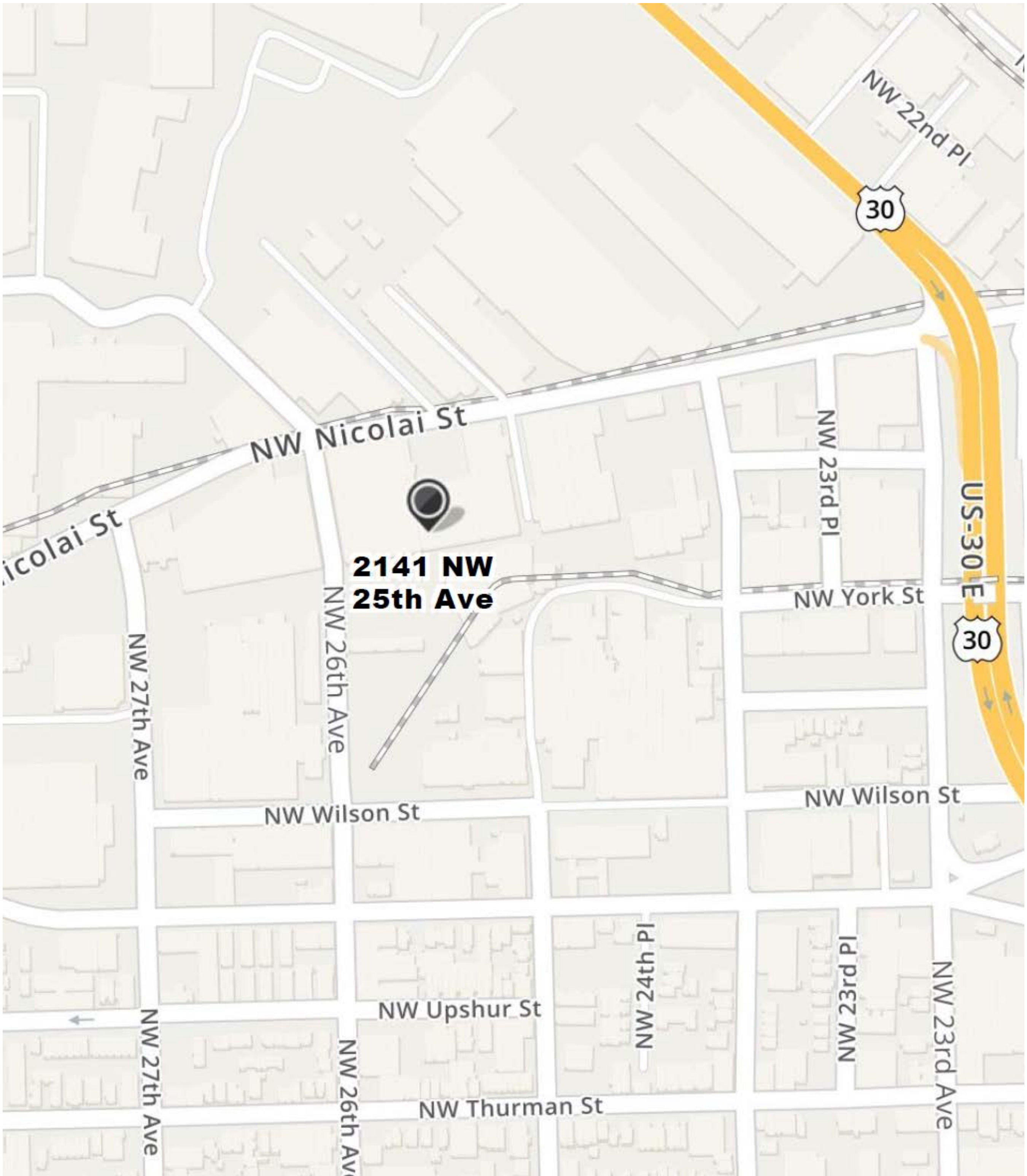


FIGURE 1 - SITE LOCATION MAP	**Map from MapQuest** **N↑**
point source solutions, llc ENGINEERING • ENVIRONMENTAL • SAFETY	**Site Name: Former ESCO Plant #1** **Portland, OR** **Project Number: OR180913-6B**

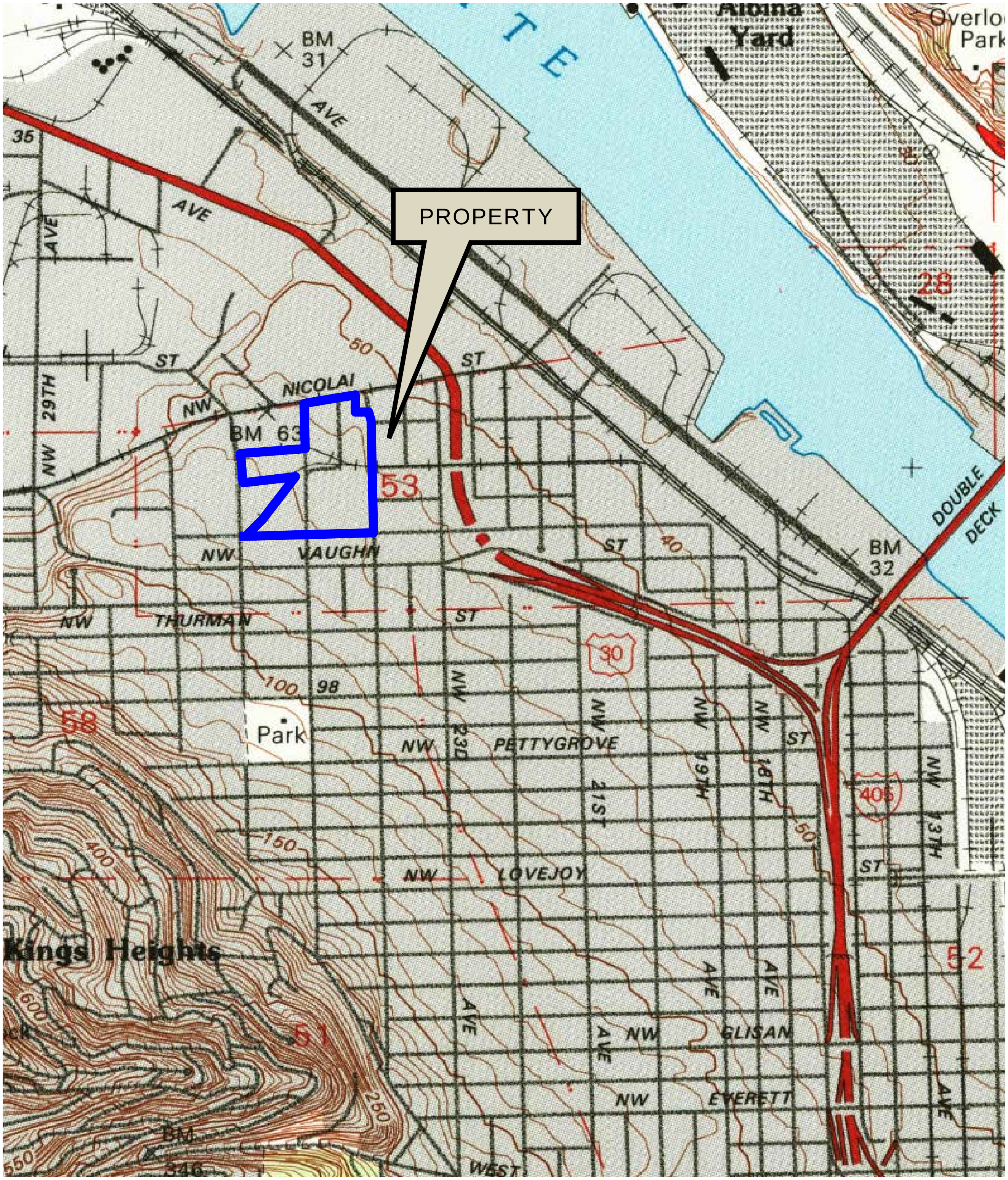


FIGURE 2 - TOPOGRAPHIC MAP

Source: USGS 7.5 Minute Topographic Map
Portland, OR Quadrangle 1990

N↑

point source solutions, llc
ENGINEERING • ENVIRONMENTAL • SAFETY

Site Name: Former ESCO Plant #1
Portland, OR

Project Number: OR180913-6B

FIGURE 3 - SITE PLAN	**Baseline Environmental Assessment**
point source solutions, llc ENGINEERING • ENVIRONMENTAL • SAFETY	**Site Name: Former ESCO Plant #1** **Portland, OR** **Project Number: OR180913-6B**

10445 SW Canyon Road, Suite 115
Beaverton, Oregon 97005
503.236.5885

APPENDICES

APPENDIX A

BASELINE ENVIRONMENTAL SITE ASSESSMENT REPORT

Baseline Environmental Site Assessment Report

Former Main Plant Properties

ESCO Corporation
2141 NW 25th Avenue
Portland, Oregon

May 2018

Prepared For:
ESCO Corporation

Prepared By:

BRIDGEWATER GROUP
7100 SW Hampton St. Suite 235
Tigard, OR 97223

In Association With

TUPPAN CONSULTANTS LLC
460 SECOND STREET, SUITE 103
LAKE OSWEGO, OREGON 97034

Baseline Environmental Site Assessment
ESCO Corporation Main Plant
Multnomah County, Oregon

The material and data in this report were prepared under the supervision and direction of the undersigned.

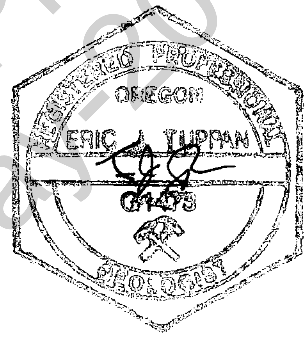
BRIDGEWATER GROUP, INC.

Expires December 31, 2019

Jeff Dresser

Jeffrey F. Dresser, P.E.

TUPPAN CONSULTANTS LLC



Expires December 1, 2018

Eric J. Tuppan, R.G.

CONTENTS

CONTENTS (Continued)

APPENDICES

TABLES AND ILLUSTRATIONS

Following Report:

Tables

Figures

EXECUTIVE SUMMARY

Existing soil and groundwater conditions at ESCO's former Main Plant property were assessed in the Baseline Environmental Site Assessment (BESA) investigation during 2017-2018. BESA objectives included (a) defining the site lithology and hydrogeology, (b) evaluating the lateral and vertical extent of site-derived chemicals in soil and groundwater (i.e., soil and groundwater quality), (c) assessing the extent, volume, and quality of onsite soil fill materials to inform the future development soil management strategy for site reuse and redevelopment, (d) measuring the infiltration capacity of soils at select site locations as it relates to the feasibility of future onsite stormwater management, (e) preliminarily assessing geotechnical properties of soil, and (f) evaluating the site for the presence of underground storage tanks (USTs).

This report is solely intended to provide and document the results/findings of environmental investigatory work completed by ESCO Corporation at its former Main Plant facility since March 2017. This report is not intended to opine on whether environmental site remediation may be necessary or required by state, local, or federal governmental agencies.

Field Tasks. Fieldwork was completed in multiple phases beginning in Spring 2017. Tasks included (a) drilling shallow borings (i.e., less than 25 feet deep) with a sonic rig and deeper borings to collect one-time groundwater samples and to install monitoring wells, (b) drilling shallow borings at the site with a push probe rig, (c) excavating test pits in unpaved areas of the site, and (d) completing two rounds of Incremental Sampling Methodology (ISM) to characterize over 10 acres of shallow soils (0-5 ft) to inform onsite soil management options for future site redevelopment.

Site Hydrogeology. The site lithology can be separated into three types with increasing depth:

- Fill composed of gravelly sand or sand, typically below the paved surface of asphalt or concrete,
- Fine-grained sediments comprised of clay, silt, or fine sand, and
- Coarse-grained sediments of sand and gravel with varying percentages of silt.

Groundwater occurs in the coarse-grained sediments, at depths between 40 and 65 feet below ground surface (BGS). Over the course of completing monthly groundwater elevation monitoring since March 2017, the groundwater elevation was approximately 20 feet mean sea level (MSL) and varied seasonally approximately 1.5 feet. Over the past year, differences between groundwater elevations across the site are very low, ranging from 0.02 to 0.16 ft, with the flow direction toward the northeast (i.e., towards the Willamette River). This is consistent with the regional flow direction.

Soil Quality. Soil quality across the site is generally characterized as having minor organic or metals impacts in the shallow fill material and upper soil horizon to a depth of approximately 2.5 feet, with underlying native soils with constituents at or near established background concentrations for the Portland region. Over 210 soil samples from 66 borings and 8 test pits were tested as part of this investigation. Results for the analytical groups are summarized as follows:

- Total Petroleum Hydrocarbons (TPH). Over 95% (181 of 189) of samples quantified in the diesel/oil range were either nondetect or below the Oregon Department of Environmental Quality (DEQ) Risk-Based Concentration (RBC) for residential exposure. For gasoline-range hydrocarbons, all of the samples were nondetect or below the residential RBC. Affected soils were almost exclusively found in the shallow fill materials.

- Polychlorinated Biphenyls (PCBs). Over 92% (158 of 170) soil samples collected across the former Main Plant property were nondetect for PCBs. PCBs were detected in three locations: the alley between ESCO property and an adjoining property (EB-9), a boring at a former UST location (EB-32), the southeast part of former Building 9 (EB-36), and along the rail spur (R4-1, R5-2, and R5-5) near 24th Ave. In the samples where PCBs were detected on the former Main Plant property, total PCBs were below DEQ's clean fill criterion of 200 µg/Kg. PCBs were detected above the RBC for construction workers in the shallow fill interval of two borings (EB-25 and EB-26) on the adjoining ESCO-owned 0.23 acre Class-N-Kustom parcel located northeast of the Main Plant property.

- Polycyclic Aromatic Hydrocarbons (PAHs). Results were summed as Benzo(a)Pyrene equivalents (BaPeq) and compared with DEQ's soil RBCs that were updated in April 2018. Results for over 76% of the 215 soil samples collected and analyzed were at or below DEQ's clean fill criterion/residential RBC (110 µg/Kg) and over 95% (205 of 215) were below the occupational RBC (2,100 µg/Kg). Several isolated areas were above the occupational RBC, but were below the construction worker RBC (17,000 µg/Kg). Of the elevated concentrations detected, most were in shallow fill (i.e., less than 2.5 ft). Native soils at the intermediate depth were almost exclusively nondetect or below the urban residential RBC.

- Volatile Organic Compounds (VOCs). Results for the shallow fill interval (typically 0-2.5 ft) were primarily nondetect, with only several locations having detected values, all of which were below residential RBCs. The intermediate soil depths were exclusively nondetect for VOCs, except for one test pit location, in which VOCs were detected below residential RBCs.

- Metals. Overall, the metals in underlying native site soils at the property were comparable to background concentrations established by the DEQ for the Portland area, or were between DEQ's background/clean fill criteria and the RBCs for urban residential exposure. Shallow fill soils typically had higher concentrations for certain metals common to foundry operations such as chromium, copper, lead, and nickel. However, the concentrations of these metals were typically between the background/clean fill criteria and the RBCs for urban residential exposure.

- Soil ISM Results. Over 10 acres of the former Main Plant property soils were sampled using ISM sampling methodologies across seven (7) distinct soil areas. Samples from 210 shallow borings (30 from each ISM sample grid) were collected and processed using field ISM and laboratory Representative Sampling Methodologies (RSM) into two depth intervals; upper (0-2.5 ft) and lower (2.5-5.0 ft).

  - For PCBs, all ISM results in the upper and lower intervals had total PCB concentrations well below DEQ's clean fill criterion.

  - Fourteen (14) metals were analyzed; thirteen (13) metals had concentrations that met clean fill criteria or DEQ's residential RBC in both depth intervals. The remaining metal, arsenic, was generally at or below the DEQ-established Portland area background concentration.

  - The results for PAHs (tabulated as BaPeq) varied by area, but in general, the 2.5-5.0 ft soil zone met DEQ's clean fill criteria and the shallow zone ranged from clean fill to approximately one-half the RBC for occupational exposure.

Groundwater Quality. Potable water in this part of Portland is provided by the City of Portland's municipal water supply. The part of northwest Portland where ESCO's former Main Plant is located has been identified by the DEQ as an area with regional low-level groundwater contaminants. This is reflected in the trace to low-level concentrations of several PAHs and VOCs detected in eight groundwater monitoring wells installed around the perimeter of the site in 2017. The anomalous detection of chloroform is primarily attributed to municipal water used during well completion and has attenuated to nondetect with consecutive sampling events. PCBs were not detected in any groundwater sample. Metals were either not detected or detected at concentrations that are comparable to metals concentrations in upgradient monitoring wells. No detected constituent exceeded its respective Maximum Contaminant Level (MCL) established under the federal Safe Drinking Water Act (SDWA).

Underground Storage Tanks (USTs). Review of historical site drawings and reports, and recent surface geophysical surveys identified five known USTs at the site, and three areas that have records or indications of former tanks that are being investigated during May 2018. These investigations will include further geophysical surveys in two areas where former structures have recently been demolished and in a remaining ESCO building that was built over an area of 1930s-era homes that could have used heating oil supplied by residential heating oil tanks.

1 INTRODUCTION

This Baseline Environmental Site Assessment (BESA) Report documents environmental investigation tasks conducted at ESCO Corporation's former Main Plant properties to assess and document the existing environmental conditions at the facility during 2017-18. For soil and groundwater conditions, the baseline work was done to develop and present comparisons between observed environmental conditions and published risk-based concentrations (RBCs) developed and published by the Oregon Department of Environmental Quality (DEQ, 2018). As such, the results presented in this data report are compared with the RBCs, however, no professional opinions are rendered regarding whether environmental remediation, if any, may be necessary to obtain a no further action (NFA) determination from DEQ to facilitate future use and redevelopment of the property.

The site boundaries for this this report are generally defined as north of NW Wilson Street, east of NW 26th Avenue, south of NW Nicolai Street, and west of NW 24th Avenue, as shown in Figure 1-1.

The tasks described in this report follow Phase I Environmental Site Assessments for the main plant property reported by ERM in October 2006 and for the adjoining former Class-N-Kustom parcel located at 2404 Nicolai Street by Hahn and Associates (HAI) on June 8, 2017 (HAI, 2017).

Primary environmental consultants and contractors for this project included:

- Bridgewater Group, Inc. – project planning, management, coordination, pre-demolition evaluation of building materials, permitting, Phase I structural demolition contract management and contractor oversight, site stormwater management, and engineering evaluations.

- Tuppan Consultants LLC – coordinated baseline site investigation including soil and groundwater sampling plans, oversaw field work, laboratory oversight, database management, and reporting.

- Hahn and Associates, Inc. – provided field support for drilling soil borings and monitoring wells, sampled soil and groundwater, and building materials sampling.

- Apex Labs – laboratory analytical services for soil, water, and building materials.

- Cascade Technical Services, LLC – subcontractor services for drilling soil borings and monitoring wells.

1.1 Rationale and Objectives

The purpose of the baseline investigation at ESCO's Main Plant was to assess whether or not historical operations have impacted soil and groundwater below the site, including assessing the lateral and vertical extent of impacts. Subsidiary to this purpose was to characterize soils (e.g., limited geotechnical attributes), evaluate the extent of subsurface facility structures, and provide data that can be used to assist the future property owner/developer to develop appropriate soil management plans with regard to future redevelopment of the site.

Pursuant to this purpose, ESCO identified several objectives and developed a scope of work to evaluate those objectives. These included:

- Identify lithologic units and hydrogeologic characteristics below the site.

- Observe the occurrence of groundwater during drilling and estimate the flow direction of groundwater.

- Evaluate the lateral and vertical extent of site-derived chemicals in soil and groundwater beneath the site. To the extent historical information was readily available, sampling locations were placed adjacent to where facility operations could have potentially impacted the soil or groundwater, and near former and current underground storage tanks (USTs) identified through historical research.

- Determine upgradient groundwater quality and background soil quality.

- Assess the extent, volume, and quality of soil fill and provide data to assist future users of the property develop a soil management strategy for site development.

- Measure the infiltration capacity of soils at select locations as it relates to future feasibility of onsite stormwater infiltration and management options.

- Assess geotechnical properties of soil, including the consistency or density of subsurface fine- and coarse-grained soils.

- Evaluate the site for USTs. Research the presence of USTs based on examination of historical site drawings, internal ESCO documents, and DEQ Leaking Underground Storage Tank (LUST) reports, and conduct geophysical surveys of areas identified by drawings or reports.

1.2 Scope of Work

The fieldwork was completed in multiple phases beginning in March 2017. The first phase of field work was performed with a sonic drill rig, with the goals of drilling relatively shallow borings (i.e., less than 25 feet) to evaluate soil quality and deeper borings to collect one-time groundwater samples, and to install monitoring wells around the perimeter of the property.

Subsequent phases of work included drilling additional shallow borings at the site with a push probe rig that examined soil quality near former or current USTs and to better understand the distribution of the thickness of fill, excavating test pits in unpaved areas of the site, completing multiple phases of Incremental Sampling Methodology (ISM) to characterize shallow soils inform soil management options during site redevelopment, and installing additional off-site and upgradient wells with a sonic rig in a later phase of drilling. For the purpose of this report, these tasks are organized as follows:

1.2.1 Soil and Water Quality Tasks

These tasks are organized by methodology, even though they were performed over several phases.

- Soil Borings - Sonic Rig
  - Drilled to total depth of 25 ft; drove Standard Penetration Test (SPT) every 5 feet beginning at 5 ft, 10 ft, 15 ft, and 20 ft.
  - SPTs were driven in roughly half of the first round of borings completed in Spring 2017 (14 borings) that were evenly spaced throughout the site at the field geologist's discretion.
  - Discrete soil samples were collected at: 1 ft, 5 ft, 10 ft, 15 ft, 20 ft and 25 ft. The top (shallow) three samples were analyzed unless visual or olfactory evidence of contamination was apparent during sampling, or contamination was suspected to extend deeper based on initial analysis of the top three samples.
  - Fill materials were screened for environmental gamma radiation with a Ludlum Model 19 μR Survey Meter.
  - Soil samples were also field-screened for volatile organic vapors with a photo ionization detector (PID) equipped with a 10.6-ev lamp.

- Soil Borings to Groundwater - Sonic Rig
  - Drilled to upper 25 ft, with SPTs driven every 5 feet beginning at 5 ft, 10 ft, 15 ft, and 20 ft.
  - Collected soil samples at: 1 ft, 4 ft, 10 ft, 15 ft, 20 ft. Analyzed top three samples unless visual contamination extended deeper.
  - Drilled to water table and collected a groundwater sample using bailer, and submitted for laboratory analysis.

- Soil Borings - Push Probe Rig
  - Drilled to total depth of 25 ft.
  - Collected soil samples at: 1 ft, 5 ft, 10 ft, 15 ft, 20 ft and 25 ft. Analyzed top three samples unless visual/olfactory evidence that contamination extends deeper.
  - Any sample material containing fill materials were screened for environmental gamma radiation with a Ludlum Model 19 μR Survey Meter.
  - Soil samples were also field-screened for volatile organic vapors with a photo ionization detector (PID) equipped with a 10.6-ev lamp.
- Soil Borings - Push Probe Rig (Phase 2)
  - In Phase 2, which was completed in April 2018, sixteen (16) push probe borings were drilled in sampling areas R2, R3, and R5 to a total depth of 25 feet each. The sampling protocol deviated from the earlier phase of push probe drilling in which discrete samples were collected at the 1 ft and 5 ft depth intervals. For this later phase, the five feet below the paved/concrete surface was composited into two intervals (0-2.5 ft and 2.5-5.0 ft) to better represent the average concentrations for these two shallow depth intervals, and in keeping with the principles of Incremental Methodology Sampling described below in Section 1.2.4.
  - Any sample material containing fill materials were screened for environmental gamma radiation with a Ludlum Model 19 μR Survey Meter.
  - Soil samples were also field-screened for volatile organic vapors with a photo ionization detector (PID) equipped with a 10.6-ev lamp.
- Monitoring Wells - Sonic Rig
  - Installed along the perimeter of ESCO Main Plant property at assumed upgradient and downgradient positions (MW-1 through MW-6).
  - Installed two wells upgradient at two ESCO-owned off-site properties (MW-7 and MW-8).
  - No soil sampling was collected for analytical parameters unless visible signs of contamination were present during drilling.
  - Completed each well with flush-mount monuments except for a well in a gravel area (MW-2).

- Soil and groundwater quality testing consisted of a comprehensive suite of organic and inorganic analytes including: total petroleum hydrocarbons as diesel and gasoline (TPH-Dx, TPH-Gx), volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), polychlorinated biphenyls (PCBs), and a suite of 14 trace metals.

- Monthly depth-to-groundwater measurements between March 2017 and April 2018.

- Test Pits were excavated in select unpaved areas of the site to better examine the nature of the contact between the fill and native sediments.

- Scrap Yard and Reclamation Yard (Bldg. 21) - test pits were excavated to examine vertical extent of fill and underlying native soil; collected samples and tested for comprehensive suite of parameters.
- Lower Finishing (Bldg. 9) - test pits excavated to examine vertical extent of fill and underlying native soil; collected samples and tested for PAHs and metals.

1.2.2 Geophysical Surveys

Surface geophysical surveys were completed to assess the potential presence of underground storage tanks (USTs) associated with former industrial/commercial operations, and historical houses or structures that may have pre-dated more recent uses of the property. The geophysics surveys were performed by GeoPotential on April 25, 2017 and May 1, 2017. Additional geophysical work is underway in May 2018.

1.2.3 Infiltration Testing

The purpose of this element of the BESA investigation was to measure *in situ* infiltration rates to inform the future feasibility of onsite stormwater management/disposal at the site. These investigations were performed on September 25 and 26, 2017, by GeoDesign, Inc. Investigation findings are summarized in Section 3.5 and included in Appendix E.

1.2.4 Incremental Sampling Methodology (ISM) Soil Testing

The site was divided into seven (7) areas based on similarity of former foundry related operations, similar field/topographic conditions, and likelihood of potential future land uses based on location within the former ESCO Main Plant property. Early site characterization tasks completed in 2017 found that the upper 5 feet thick (approximate) layer of soils contained fill and native materials with some degree of soil impacts (primarily PAHs) when compared to published DEQ RBCs. The characterization of impacts relative to DEQ RBCs is discussed in Section 4.

To assess the feasibility of managing/incorporating impacted soils onsite as part of potential future redevelopment, ISM soil sampling methodologies and principles were employed to establish representative characterizations of the upper 5 feet of over 10 acres of site soil; the data from this testing can be used to help inform and assist future owners/developers develop soil management plans as part of the overall site redevelopment plan.

2 INVESTIGATION ACTIVITIES

Investigation tasks were phased over the past year, with drilling beginning in March 2017. Subsequent phases more fully developed an understanding of the vertical and lateral extent of site-related chemicals in soil and groundwater as well as aspects of the site conditions to inform future redevelopment planning.

2.1 Soil and Water Quality Tasks

2.1.1 Soil Borings and Sampling

Soil was drilled using either sonic methods, for geotechnical borings and monitoring wells, or push probes which were used for more rapid collection of shallower soil samples for laboratory analysis. Boring locations are shown in Figure 2-1.

2.1.1.1 Sonic Drilling and Geotechnical Borings

The first phase of geotechnical and soil quality borings was drilled during March 13-28, 2017, by Cascade Drilling, L.P., Clackamas, Oregon, with a sonic LS250 track-mounted drill rig. The sonic drill rig allowed drilling through the types of subsurface materials expected at the site, resulted in excellent recovery of lithologic samples, and produced minimal drill cuttings. The geotechnical borings were sampled with either a Standard Penetration Test (SPT) sampler or a 4-inch diameter sonic core that cuts ahead of the drive casing. Samples were collected continuously by alternating between the two sampling techniques, depending on the depth interval and requirements of the geotechnical testing program. This proceeded as follows:

- SPT split spoon samples with autohammer—tested every 5 feet (beginning at a depth of 5 feet) to the total depth of the boring. The auto-hammer simulates the equivalent of using a 140-lb hammer dropping 30 inches, and drives a 2-inch outside diameter sampler, while recovering a 1-3/8 inch diameter sample.

- 4-inch diameter core sample with outer casing diameter of 4-7/8 inches, beginning at the surface and for depth intervals between the SPT samples.

To maintain the stability of the borehole, the borings were cased with 6-inch diameter core barrel to prevent sloughing of the borehole walls. This typically occurred after down hole drilling of 5 to 10 feet, depending on the stability of the borehole. Once the larger diameter casing was set, drilling and sampling with the SPT or 4-inch core barrel proceeded. Total depths of the borings are indicated in Table 2-1.

After sampling at the prescribed depth, the sampler (either SPT or 4-inch core barrel) was withdrawn from the hole and detached from the drill rod. Samples from the SPT were removed after disassembling the sample barrel. The cores from the sonic drive casing were removed by vibrating the soil into clear tubular plastic bags with lengths of approximately 2.5 feet each. The sample bags were laid on the ground, cut open and the core examined. A geologist, registered in the State of Oregon, examined the soil consistent with the procedures of the American Society for Testing and Materials (ASTM) Designation D2488, "Standard Practice for Description and Identification of Soils (Visual-Manual Procedures)." The logging described texture, color, mineralogy, moisture content, degree of weathering, and other relevant characteristics of the sampled material. Drilling and soil information were recorded in the field on a boring-log form. Samples from each boring were collected in laboratory-supplied containers for analytical testing as described below.

Once the boring reached the final depth and samples were collected, the drive casing was removed from the ground and the borehole was backfilled with bentonite chips that were hydrated with clean water. Records of backfill material volume are compared with the calculated hole volume in Table 2-1. Copies of the boring logs and the reports were filed with Oregon Water Resources Department (WRD) by the driller and can be found in Appendices A and B, respectively.

2.1.1.2 One Time Groundwater Samples from Borings

Four soil borings (EB-5, EB-6, EB-11, and EB-17) were extended to the groundwater table, where one-time water samples were collected. Once the saturated zone was encountered, drilling continued approximately 10 to 15 feet below the water table and the 6-inch diameter drill casing was driven to the total depth. In most cases after cleaning out soil, the gravel and sand aquifer material heaved up into the casing. The steel drill casing was purged of approximately one borehole volume with a disposable bailer. Water samples were subsequently collected with the bailer from within the steel casing, or in the case of EB-6, from a 2-inch diameter PVC well point lowered into the saturated interval. Samples were delivered to the laboratory where they were tested as described in the analytical section.

2.1.1.3 Push Probe Drilling and Sampling

Push probe borings were drilled from depths of 5 to 25 feet, primarily in the shallower and less dense silt and fine sand interval. These sampling activities used a track-mounted Geoprobe drilling rig. A Geoprobe is a hydraulically-powered, direct push machine that uses static force as well as dynamic percussion force to drive steel boring rods into the subsurface. Probes are driven into the ground using a hydraulic hammer, which delivers a minimum of 1,800 blows per minute at a force greater than 15,000 pounds (66.6 KN) per blow. The hydraulic hammer allows the probes to be driven into the soil at a force greater than the weight of the rig thus allowing greater penetration depths than with a conventional hydraulic ram direct push tool of similar size.

Continuous soil core samples were collected by advancing a 5-foot long, 1.5-inch inside diameter (ID) Macro-Core sampler fitted with a clear PVC sleeve. The outside diameter of the sampler is 2.25 inches. The full length of each soil core was examined for soil type and the potential presence of contamination. The properties of each soil core were noted in the field by the geologist and recorded on the field logs.

After reaching final depths, the soil borings were backfilled with 3/8-inch bentonite chips to within one foot of the ground surface. Asphalt or concrete patching material was placed in the upper six inches of each boring to match the surrounding surface. The depths and volumes used for each boring are listed in Table 2-1.

Upon collection of the soil cores, samples retained for chemical analysis were placed in sample jars and capped with Teflon-lined lids. The sample jars were then labeled and transferred to a chilled, thermally-insulated container for shipment to the analytical laboratory. Standard protocols, including the use of chain-of-custody documentation, were followed for collecting soil samples to be tested at the analytical laboratory.

The soil samples were field-screened for the presence of potential contamination by the visual, olfactory, sheen test, and headspace vapor methods. Screening for the presence of organic vapors was conducted by the headspace method using a photoionization detector (PID) equipped with a 10.6-ev lamp. The results of the headspace screening were recorded on the boring log in parts per million by volume (ppmv). The headspace measurement results are intended for use as a qualitative indicator of the possible presence of contamination and are only used for relative comparison purposes. The boring logs as well as the field screening results are included in Appendix A.

2.1.1.4 Decontamination Procedures

To minimize the potential for cross-contamination between sampling locations, reusable down-hole drilling equipment and soil sampling equipment was thoroughly steam cleaned with potable water prior to use and between each sampling location.

2.1.2 Monitoring Well Installation

Each monitoring well was constructed consistent with applicable rules described in "Construction, Maintenance, Alteration, Conversion and Abandonment of Monitoring Wells, Geotechnical Holes and Other Holes in Oregon" (OAR 690-240; 2006) and the DEQ guidance "Groundwater Monitoring Well Drilling, Construction, and Decommissioning" (DEQ, 1992). Well construction and survey information, volumes of materials used to construct the wells, and well development data are summarized in Tables 2-2, 2-3, and 2-4. A copy of each boring log and well construction diagram can be found in Appendix A.

2.1.2.1 Drilling and Soil Sampling Procedures

The borings for the monitoring wells were drilled as described above with a sonic drill rig. The initial borings were continuously sampled with a 4-inch diameter core, which was subsequently reamed with a 6-inch diameter casing. SPT measurements were not completed for well boreholes, nor were soil samples collected and tested for analytical parameters, except for shallow samples at MW-4, where the fill interval (less than 2.2 feet) had a hydrocarbon odor. After drilling to the final depths at each boring, which was approximately 15 feet below the first encountered water, well casings were installed as described below.

2.1.2.2 Well Installation

Most of the well boreholes were over-drilled by a few feet because of heaving sands. In addition to the deeper initial drilling, and to prevent further sand heave, City of Portland potable water (from 60 to 120 gallons) was added to the drill pipe to drive the sands to the bottom of the drill casing so the well casing and sand filter pack could be installed. The monitoring wells were constructed of 2-inch-diameter, Schedule 40 PVC threaded well casing and a nominal 10 feet of 0.010-inch factory-slotted screen.

Once the casing was placed down the hole, an annular filter pack consisting of 10 x 20 graded silica sand, was placed around the well screen, extending approximately 3 feet above the top of the screen. The depth of the filter pack was carefully measured with a weighted line during placement and as the drill casing was removed from the hole. Annular seals were placed based on the top depth of the filter pack. For instances where the top of the sand filter pack was shallower than 50 feet, an annular seal of 3/8-inch bentonite chips was placed from the top of the sand to a depth approximately 1 to 2 feet below ground. During placement, the depth of the bentonite chips was measured with a weighted line as the steel casing was removed. The bentonite chips were subsequently hydrated with clean, potable water.

For wells in which the top of the filter pack was deeper than 50 feet, a 3- to 5-foot thick filter pack seal of 3/8-inch bentonite chips was placed above the sand. This was followed by an annular seal of bentonite grout to just below the ground surface. After pulling the steel drill casing, the borehole was topped off with additional bentonite chips to just below the ground surface. Volume calculations for well construction materials are presented on Table 2-3.

Seven of the wells were completed at the surface with flush-mounted, traffic-rated vault boxes set in concrete. For MW-2, the surface was gravel, and therefore, the surface completion consisted of a 6-inch square, steel protective cover that was cemented in place over the PVC casing. Three protective bollards were installed around the steel cover. Finally, the driller attached a state identification number tags on the PVC well casings.

Well completion diagrams can be found in Appendix A. Documentation that the driller submitted well logs to the Oregon Water Resources Department (WRD) can be found in Appendix B.

2.1.2.3 Well Development

The wells were allowed to stabilize several days before development. The newly installed monitoring well screens were developed by surging, bailing, or pumping techniques, consistent with procedures described in DEQ (1992) guidance. Primary goals of well development were to remove sediment that accumulated in the well casing during installation, remove the volume of water that was added during well completion to counter the heaving sands, and generally improve the hydraulic connection with the adjoining aquifer. Overall, from 66 to 150 gallons were removed from each well as part of well development. For each of the wells, pumping continued until field parameters stabilized, indicating formation water was entering the casing. Field parameters monitored during well development included depth to water, specific conductance, pH, temperature, oxidation-reduction potential, dissolved oxygen, turbidity, and visual clarity. Final measurements are summarized in Table 2-4, and well development logs can be found in Appendix C.

2.1.3 Investigation-Derived Waste

Residual soil, groundwater, and decontamination fluids (commonly referred to as investigation derived waste [IDW]) were handled as described in this section. Material generated during drilling and groundwater sampling were contained, identified, and characterized. Holding containers (55-gallon drums) were labeled with their contents, the date of collection, and the origin of the material. The drums were sealed and transferred to a designated area on the site. The IDW was stored in the designated holding area until it had been characterized.

After the work was completed and analytical results received, residual soils and liquids were evaluated to determine the appropriate disposal method. ESCO has managed IDW (including characterization), consistent with DEQ regulations.

Soil Cuttings. Soil cuttings originating from drilling were contained in 55-gallon drums. Based on the analysis of soil samples collected during exploration activities, soil cuttings could be managed onsite as part of a future sitewide soil management plan. However, in May 2018, ESCO elected to manage all containerized soil cuttings as a general solid waste at an offsite DEQ-permitted landfill facility.

Groundwater. Purge water generated during well development and sampling was contained in 55-gallon drums pending analytical results. Analytical results from the first round of sampling confirmed that accumulated waster met the discharge limits contained in ESCO's Phase I Demolition Wastewater Discharge Permit with the City of Portland. Therefore, ESCO discharged drummed purge and development water from groundwater monitoring episodes into the onsite sanitary or combined sewer discharge pipes in accordance with the Permit.

Decontamination Water. Water generated by equipment decontamination was contained during decontamination activities and transferred to 55-gallon drums with sealable lids. Each drum was labeled to indicate the source of the water. Given that soil and groundwater samples were below screening levels, decontamination water was comparable in character to groundwater purge water and discharged in accordance with the Phase I Demolition Wastewater Discharge Permit.

2.1.4 Surveying

Surveying was conducted in two rounds. The first was performed between April 27-28, 2017, by Statewide Land Surveying, Inc., of Gresham, Oregon, and included surveying monitoring wells MW-1 through MW-6 and borings EB-1 through EB-21. For the wells, the ground surface beside the wellhead, the tops of the PVC well casing, and the top of the vault box or steel cover were surveyed. For borings, the asphalt or concrete surface beside each hole was surveyed. The locations were referenced to the Oregon State Plane Coordinate System NAD83/2011, Epoch 2010.0000, North Zone 3601, Int Ft; the vertical elevation is referenced to the North American Vertical Datum of 1988 (NAVD88). The local benchmark used was the ORGN Station PDXA.

The second round of surveying was performed in July and August 2017 by AKS Engineering and Forestry of Tualatin, Oregon. This round included offsite and upgradient monitoring wells MW-7 and MW-8, and onsite borings EB-22 through EB-35, and test pits. Locations and elevations were referenced to the same datums listed above. Results of the surveying are provided on Table 2-5.

Coordinates for borings in subsequent phases of the investigation were estimated from LiDAR coordinates on the site map or in the field using a hand-held GPS unit. These approximate coordinates are also shown in Table 2-5 with the method of survey indicated.

2.1.5 Groundwater Sampling

ESCO conducted three groundwater sampling events as part of this baseline assessment: one between April 13-14, 2017 (MW-1 through MW-6); the second from June 21-26, 2017 (MW-1 through MW-8); and a third from January 4-8, 2018 (MW-1 through MW 8). For each sampling event, the field staff measured depth-to-water in the wells before water quality sampling. Groundwater was tested for the suite of parameters defined in Section 2.1.6.

Groundwater sample collection was consistent with standard low-flow purging and sampling procedures with a portable bladder pump. Low-flow refers to the velocity with which water enters the pump intake from the aquifer to the well screen. Water level drawdown provides the best indication of the stress imparted by a given flow rate for a given hydrogeological situation. Minimal and stable drawdown was achieved at each of the wells. Field sheets for the sampling events are provided in Appendix C.

2.1.6 Analytical Testing

Testing was conducted at Apex Labs in Tigard, Oregon. An index of the analytical suites tested by location, depth, and media are shown on Table 2-6.

2.1.6.1 Soil

Soil samples were collected every five feet in the soil borings beginning with the interval just below the paved ground surface through the total depth of the boring. For each boring, soils were generally tested from the upper three depth intervals, with the deeper samples placed on hold at the laboratory until the upper three sample results were received and reviewed. Tested soil intervals generally corresponded to the following:

- 0.5 to 1.0 ft
- 4 to 5 ft
- 9 to 10 ft

In rare instances, a deeper interval was later requested to be tested to define the vertical extent of a particular contaminant. In addition, in several borings, only deeper intervals were tested to confirm extent of contaminants below an assumed excavation depth of a removed underground tank (e.g., EB-34).

The suite of analytes included total petroleum hydrocarbons as diesel and gasoline, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs), and a suite of 14 metals[1].

2.1.6.2 Groundwater

Groundwater samples were tested for the same analytes as the soil samples. With regard to metals, both filtered and unfiltered samples were collected, but with the low turbidity seen from the low-flow purging techniques, only the unfiltered samples were tested. After the second round of sample analysis, the list of analytes was reduced to PAHs and VOCs, since these were the principal constituents found in groundwater during the first two monitoring episodes.

2.2 UST Assessment and Geophysical Survey

A summary of potential and identified USTs, and their disposition, along with a sketch showing their locations is shown in Table 2-7 and Figure 2-2. After indexing over 9,800 historical ESCO site drawings and engineering plans, drawing titles related to tanks or site plats were searched and reviewed; which resulted in a dozen drawings and details from approximately 1923 to 1958. In addition, ESCO's environmental files contained several UST decommissioning reports from 1989 to 1996; some of which had been submitted to the DEQ.

After assembling a list of potential tanks, ESCO completed a geophysical survey of each potential tank site. This survey followed three steps:

- Step 1 involved mapping the entire area of the suspected UST with a magnetic survey to detect whether buried ferrous (iron-bearing) objects were present.

[1] Arsenic (As), barium (Ba), boron (B), cadmium (Cd), chromium (Cr), copper (Cu), lead (Pb), mercury (Hg), nickel (Ni), molybdenum (Mo), selenium (Se), silver (Ag), uranium (U), and Zinc (Zn)

- Once a magnetic anomaly was identified, during Step 2, a ground penetrating radar (GPR) survey was conducted to map subsurface features such as USTs, utilities, or backfilled pits.

- During Step 3, additional details about subsurface anomalies identified by the magnetic survey and GPR were further delineated with hand-held pipe and cable locators that map the locations, depths, sizes, and shapes of the buried objects.

ESCO's UST analysis confirmed five (5) known USTs at the site, and three areas that have records of former tanks. The latter three areas are being investigated during May 2018 using geophysical survey techniques or by excavation to ascertain if a UST exists at that location. Reports of geophysical surveys completed as of May 2018 can be found in Appendix D.

2.3 Test Pits

Nine test pits were excavated with an excavator in several unpaved areas of the facility. These locations are denoted on Figures 2-1 as TPs. These included three test pits in the former heat makeup yard (Building 21) (TP-3, TP-4, and TP-5) with TP-5 meeting refusal on concrete at a depth of less than 1 foot; one test pit (TP-2) in the reclamation yard, and five test pits at unsurfaced floor areas in Building 9 (Geo1, Geo2, Geo3, QPB1, and Beta) that were formerly used for handling of steel castings. The test pits were dug to assess the depth and quality of fill material and the type and quality of underlying native sediments. Test pit materials in Building 9 were also checked for radiation with a field meter. Soil samples were collected from each horizon (fill and native materials) and tested as shown on Table 2-6.

2.4 Infiltration Testing

Infiltration evaluation involved two tasks. The first was to evaluate the capacity of shallow soil to absorb rainwater through an infiltration structure. The second task was to assess deeper soil quality in two areas selected as potential locations for infiltration structures.

2.4.1 Infiltration Capacity

In the first task, GeoDesign, Inc., of Portland, Oregon, measured in situ infiltration rates to determine the feasibility of future onsite stormwater management and disposal at the site. Four areas of the site were tested based on topography and access, as shown on Figure 2-1 as borings GDB-1 through GDB-4. The scope of work included:

- Reviewing readily available published geologic data and GeoDesign's in-house files for existing information on subsurface conditions in the site vicinity.

- Drilling four borings at the site, each to a depth of 26.5 feet below ground surface (BGS).

- Completing infiltration testing in each boring at depths of 5.0 and 15.0 feet BGS. Testing was performed in general accordance with the City of Portland Stormwater Management Manual requirements.

- Classifying the material encountered in the explorations and maintaining a detailed log of each exploration.

- Completing the following laboratory tests:
  - Twenty moisture content determinations in general accordance with ASTM D 2216
  - Eight particle-size analyses (-200 wash) in general accordance with ASTM D 1140

- Providing unfactored infiltration rates and recommendations for the design of infiltration systems.

- Preparing a report that presented the results of GeoDesign's explorations, findings, conclusions, and recommendations. This report can be found in Appendix E.

2.4.2 Infiltration Soil Quality

In the second task, ESCO drilled two borings, designated COP-1 and COP-2 on Figure 2-1 to a depth of approximately 35 feet deep BGS, which assumed that the base/bottom of a future stormwater infiltration structure would be 10 ft. The borings were drilled with a 4.5-inch OD dual tube system to a depth of 10 feet. The inside of the casing was then cleaned out and set up for Macro Core push samples. These were pushed using two 5-foot-long cores (1.5-inch diameter clear PVC sleeves) in the depth interval below likely final excavated ground surface. The total depth of the core was 10 ft, with coring from a depth of 10 to 20 ft below the ground surface. The cores were retained for compositing as described below. At this depth, the driller continued to core an additional 15 ft below the likely proposed excavated infiltration structure bottom surface and logged the core for soil type and soil moisture conditions, presence of perched groundwater, or indications of seasonal high groundwater. The boring was subsequently backfilled to ground surface with bentonite chips.

2.4.2.1 Soil Compositing

The soil cores were extracted from each 5-foot long plastic sleeve immediately below the proposed excavated surface depth (i.e., from 10–15 ft and from 15-20 ft) and mixed thoroughly to create two composite samples consistent with guidance from the City of Portland, Bureau of environmental Services (BES) in its *Soil/Groundwater Sampling for Infiltration Facilities Located in Commercial/Industrial Areas, and Source Control Manual*.

2.4.2.2 Analytical Testing

Analytical groups and compounds required by BES for infiltration facilities included:

- Metals (As, Ba, B, Cd, Cr, Cu, Pb, Hg, Mo, Ni, Se, Ag, Zn)
- TPH (Gx and Dx)
- PAHs
- PCB
- VOCs, which includes BTEX

2.5 ISM Soil Testing

Field procedures for collecting shallow core samples as part of Incremental/Representative Sampling Methodology (ISM/RSM) techniques are summarized in the following sections. The procedures were developed for this site based on guidance by the *Interstate Technology & Regulatory Council, Incremental Sampling Methodology Team* (ITRC, 2012), and in coordination with Apex Laboratory, Portland, Oregon. The procedures were applicable for the various areas identified at ESCO's main plant and was intended to characterize the upper 4 to 5 feet of soils to inform future onsite soil management planning. This methodology applies to the following seven (7) areas as shown on Figure 2-3 and as further depicted in Appendix F: Area A, Area B, Area C, Wilson 1, Wilson 2, Roosevelt 2, and Area H (Bldg. 9).

2.5.1 Sampling Areas And Grids

The former Main Plant property was subdivided into eleven (11) areas, also generally referred to as soil management decision units (DUs), as shown on Figure 2-3. Seven (7) of the 12 DUs involved the use of ISM sampling methods.[2] Within each ISM DU, the total area was divided into 30 (roughly) equal subareas and numbered accordingly (W1-1 to W1-30, W2-1 to W2-30, etc.).

Depending on the size and shape of the DU, the subareas were gridded to accommodate the 30 subareas. To create a function of randomness, the grids were further divided into 9 nodes (A through H), one of which was sampled in each grid square based on a randomly assigned alphanumeric designation. As an example, for the Wilson 1 ISM area, grid location W1-1 was sampled in the H node, W1-2 in the E node, etc.

2.5.2 Field Methodology

2.5.2.1 Core description and Sample Collection

Each sampling location was cored with a push probe rig to a depth of 5 feet below the ground surface. Based on field experience at the site, this resulted in a core recovery of between 4 and 5 feet. The cores were contained in a 1.5-inch diameter clear plastic PVC

[2] In four (4) of the DU areas shown on Figure 2-3 (Bldg 43, Roosevelt 3, Roosevelt 4, and Roosevelt 5) discrete soil borings and soil sampling techniques were used in lieu of ISM sampling methodologies.

sleeve that lines the inside of the core barrel. At each location the following procedures were followed:

- Cut the plastic sleeve with cutters.

- Core length/recovery was measured and the contact between fill material and native soil was identified, which, based on site experience, is a clayey silt or silty clay.

- The field geologist logged the basic description of the physical properties of core as appropriate for this number of samples, including texture, color, odor, moisture content, or other relevant characteristics of the sampled material. Information was recorded in the field.

- Incremental samples from the upper half and lower half of the core were collected (roughly 2 feet each).

- The upper and lower increments soil increments were homogenized on separate aluminum sheet pans fitted with Teflon sheet liners. A sample aliquot was collected into a 2-oz sample jar using a square scoop provided by the laboratory from each depth interval and added to three (3) replicate sample containers for each depth interval for the entire DU composite. Each primary sample replicate container was a 1-gallon capacity glass container; for each DU, there were three upper and three lower 1-gallon containers.

- One 4-oz container of the homogenized sample from each boring location/depth with each ISM area was retained and submitted to the laboratory for frozen archived storage.

2.5.2.2 Sample Handling (Cohesive vs. Non-Cohesive Soil)

Typically, the fill material in the upper several feet of each boring location was non-cohesive and loose sandy to gravelly soil. Underlying this was a cohesive silty to clayey soil that retained its shape as a core inside the plastic sleeve, but was friable with the hand. From a practical perspective of sample handling, the following protocols for homogenizing the cores were developed to ensure representativeness of the entire sample depth interval:

- <u>All of the core is non-cohesive:</u> Homogenize in aluminum sheet pan/Teflon liner and then use a scoop to remove incremental sample volume for each of the composites. Remove any pebbles larger than 1-inch but retain all other grain sizes, which will be sieved/crushed in the laboratory.

- <u>All of the core is cohesive:</u> Scrape a core wedge (e.g., half of the core thickness lengthwise) into the mixing container, homogenize and then use a scoop to remove incremental sample volume for each composite.

- Part of upper/lower sample interval is cohesive and part is non-cohesive: Homogenize the entire interval in mixing container and then use a scoop to remove incremental sample volume for each of the composites.

2.5.2.3 Sample Container Decontamination

Given that all of the samples are composited into common containers, no extensive decontamination of the mixing pan was necessary between subsamples. However, the Teflon sheet liners were cleaned with a clean cloth between subsampling to remove residual particles. Fresh Teflon liners were used for each of the major DUs.

2.5.3 Final Sample Quantities And Nomenclature

At the end of sampling a DU, there were the following number of sample containers processed or archived at the laboratory. The same general nomenclature was used for each area. As an example, for area Wilson 1 (W1), the following sampling and labeling scheme was used:

- Composites of entire Area W1 from 30 locations
  – Three replicate samples for depth interval 0'- 2.5' (W1-U1, -U2, -U3): three 1-gallon containers each
  – Three replicate samples for depth interval 2.5' – 5.0' (W1-L1, -L2, -L3): three 1-gallon containers each

- Archived samples from 30 locations in Area W1 (W1-1 through W1-30)
  – 30 samples for depth interval 0'- 2.5': thirty 4-oz containers
  – 30 samples for depth interval 2.5' – 5.0': thirty 4-oz containers

2.5.4 Contingency Locations

With regard to poor recovery in the core barrel, if a sample recovered less than 50 percent of the 5-foot core, then the push probe rig was directed to step aside 1 to 2 feet and re-drill, if able (asphalt locations only).

3 HYDROGEOLOGY

The following sections provided the physical backdrop to the BESA and describe aspects of the site soils and groundwater within the larger regional framework in the Portland area.

3.1 Regional Setting

The ESCO former Main Plant site is along the southwestern edge of a geologic structure known as the Portland Basin. The Portland Basin is a downward-bowed structure bounded by folded and faulted uplands. The basin has been filled with up to 1,400 ft of alluvial and glacio-fluvial flood deposits since the middle Miocene (approximately 12 million years ago). These sediments overlie older (Eocene and Miocene) rocks including the Columbia River Basalt Group (CRBG) and older marine sediments. The geologic units found near and beneath the ESCO facility, from youngest to oldest, include:

- Recent Anthropomorphic Fill. Fill blankets much of the lowland area next to the river and is predominantly dredged river sediment, including fine sand, silty sand, silt and clay. In areas away from the river, the fill can consist of a variety of coarse and fine-grained materials. The thickness of this unit ranges from 0 to 20 or more feet in the vicinity of the former ESCO facility.

- Fine-grained Pleistocene Flood Deposits and Recent Alluvium (Undifferentiated). This unit includes fine-grained facies of the catastrophic Pleistocene Flood Deposits, as well as recent alluvium deposited by the present Willamette River. This unit generally consists of silt, clay, silty sand, and fine-to-medium sand that borders and underlies the present floodplain of the river, which is 2,000 ft east of the ESCO facility, extending west to the base of the West Hills. The thickness of this unit ranges from 20 to over 100 ft. This unit forms part of the Unconsolidated Sedimentary Aquifer regional hydrostratigraphic unit proposed by Swanson et al. (1993).

- Coarse-grained Pleistocene Flood Deposits (Gravels). The gravels include fluvial deposits from the Pleistocene Missoula floods. The deposits fill deep channels that were incised into the Troutdale Formation and Columbia River Basalt Group (CRBG) during the floods. The unit consists of uncemented sand, gravel, and cobbles with boulders in places. This unit is generally between 10 and 200 ft thick in the area.

- Upper Troutdale Formation. The upper Troutdale Formation includes cemented and uncemented alluvial sand, gravel, and cobbles deposited by the ancestral Willamette and Columbia rivers. This unit is present to thicknesses of 100 ft and has been mapped immediately west of the ESCO facility in the West Hills (Beeson and others, 1991).

- Lower Troutdale Formation/Sandy River Mudstone. The Sandy River Mudstone (SRM) is a fine-grained equivalent of the lower Troutdale Formation that overlies the Columbia River Basalts in the center of the basin and at the margins of the basin away from the axis of the Columbia River. The lower Troutdale Formation/SRM consists mostly of silt and clay with lenses of sand and gravel and tends toward fine-grained (low permeability) textures at the basin margins.

- Columbia River Basalt Group (CRBG). The CRBG consists of a thick sequence of Miocene basalt flows dating from between 16.5 million years ago (mya) and 12 mya in the Portland Basin. The CRBG is present at the surface or at relatively shallow depths west of the ESCO site.

3.2 Regional Hydrogeologic Units

The geologic units are grouped regionally into hydrogeologic units on the basis of having generally similar hydrogeologic characteristics. Important hydrogeologic characteristics include the position of the groundwater surface relative to each hydrogeologic unit and physical characteristics of each hydrogeologic unit, such as permeability, heterogeneity, and anisotropy (as a note, only the coarse grained units described below are saturated at the ESCO site). Hydrogeological units relevant to the ESCO facility include the following, from shallow to deep:

- Fill, Fine-grained Facies of Flood Deposits, and Recent Alluvium (FFA). The FFA unit is composed of the fill, the combined fine-grained facies of the Pleistocene flood deposits, and recent alluvium. Regionally, these units are grouped together on the basis of shared textures and intrinsic heterogeneity. Near the site, this unit consists of Pleistocene silt and clay overbank sediments, which are interbedded with lenses and layers of fine to coarse sand. While present, this unit is not saturated below the ESCO facility.

- Coarse-grained Flood Deposits and Upper Troutdale Formation (CGF). The CGF combines the unconsolidated coarse-facies flood deposits, including sands, gravels and cobbles, with the underlying uncemented and cemented gravels and cobbles of the upper Troutdale Formation.

3.3 Site Geology

The lithology at the site can be separated into three general types:

- Fill that is composed of gravelly sand or sand, typically below the paved surface of asphalt or concrete;

- Fine-grained native sediments comprised primarily of clay, silt, or fine sand;

- Coarse-grained sediments comprised of sand and gravel with varying percentage of silt.

Detailed descriptions of the soils at the facility can be found in boring logs in Appendix A.

3.3.1 Fill

The fill ranges in thickness from no fill to approximately 15 feet in older, back-filled underground tank excavations. In non-backfill areas, the average thickness ranges from approximately 0.5 to 2.5 feet. In borings and wells, composition of the fill is typically a sandy or gravelly base layer for the overlying paved surface. During drilling, the moisture content was typically dry to damp. Several areas of the site are unpaved, such as the former scrap/heat makeup yard (Building 21) and the reclamation yard. In these areas, the surface soil is more silty or sandy with bits of metal. In the Lower Finishing (Building 9), the fill soils excavated in test pits were varied, containing silty fine sand or sand, and contained cobbles and pebbles, pieces of metal, chunks of concrete, asphalt, or brick, pieces of wire, or other foundry materials.

Areas of backfill (from old tank excavations) were explored with borings EB-32 and EB-33. Fill was encountered in both borings to a depth of approximately 15 feet, which consisted of silty sand to sandy silt, with minor amounts of gravel-sized clasts. Another area of thicker, likely imported, fill material was found in borings below the floor of the former Distribution Center (Building 43). The fill material consisted primarily of silt that contained wood fragments, asphalt, brick, and glass to a depth of 8.5 to 9.0 feet.

3.3.2 Fine-Grained Sediments

Underlying the fill, and in several places directly below pavement, is an interval of clay, silt, and fine sand. In places (e.g., MW-5 at 12 to 15 feet), the silt can have up to 20 percent gravel, but this is not common. This fine-grained interval varies from 17 to 35 feet thick, and, on average is just over 30 feet thick. The shallower part of the sequence is mostly silt to clayey silt. At depth, the silty units become more sandy, eventually grading to fine sand or silty sand at the base of the unit. An interpretation of how these units grade laterally is shown in two cross sections, oriented roughly north-south and east-west across the site (*see* Figures 3-1 to 3-3).

Moisture conditions in this shallow unit is from dry to damp. The silt and clay soils are low to highly plastic, and very soft to stiff. The fine sand intervals are typically damp to moist and loose to medium dense. A summary of blow counts using SPT and other soil descriptions are presented on Table 3-1.

3.3.3 Coarse-Grained Sediments

Underlying the fine-grained shallow lithologies, a variety of well graded sands and gravels were found. The drilled thickness of this unit is up to 50 feet. The lithologic types ranged from sandy and silty gravels to gravelly sands and silts. Gravel clasts are typically subrounded to subangular and up to 4 inches across. Below the water table, this interval heaved because of its uncemented character, and required the addition of municipal water to counter the upward pressure in the drill casing. Within these coarser sediments are interbedded, but discontinuous fine sand or silt layers.

3.4 Groundwater Occurrence and Flow

Groundwater at the site occurs in the coarse-grained sediments, at depths between 40 and 65 feet, depending primarily on the ground surface elevation. The groundwater elevation below the site is approximately 20 feet mean sea level (MSL) (Table 3-2), relative to the vertical datum NAVD88. The vertical changes in groundwater elevation are shown in Figure 3-4. From the time of installation in late March 2017 through April 2018, the groundwater table in the area has varied seasonally approximately 1.5 feet.

Differences between groundwater elevations across the site are almost imperceptible during high water periods. For instance, in April and May of 2017, the vertical difference between upgradient and downgradient wells was only 0.06 and 0.02 feet, respectively. Since then, the vertical difference is slightly greater, at 0.16 feet, with the flow direction toward the northeast and the Willamette River (Figure 3-5), which is the expected regional flow direction.

3.5 Infiltration Capacity of Site Soil

Subsurface explorations consisted of four drilled borings (GDB-1 through GDB-4), each to a depth of 26.5 feet BGS. In general, subsurface conditions consist of varying layers or lenses of silt and sand to the explored depth of 26.5 feet BGS in each boring. The silt layers were generally medium stiff to stiff in consistency, and laboratory testing indicates that the material had moisture contents ranging from 26 to 36 percent. The sand layers were generally loose to medium dense in relative density, and laboratory testing indicates the material had moisture contents ranging from 10 to 27 percent.

Groundwater was not encountered in any of the borings at the time of the study, which is consistent with site hydrogeology defined by over 60 borings at the site and depth to groundwater of from 40 to 60 feet defined in Section 3.4.

Infiltration tests were conducted in general accordance with the recommendations presented in the City of Portland Stormwater Management Manual. Tests were conducted under low-head conditions of approximately 3 feet or less in each boring at depths of 5.0 and 15.0 feet BGS. Boring locations were placed in the vicinity of where potential future stormwater infiltration facilities might feasibly be located during site redevelopment.

The measured infiltration rates varied from 0.1 to 2.8 inches per hour (in/hr) in the shallow intervals averaging 2.0 in/hr. In the deeper interval tested, the range was 1.6 to 8.0 in/hr with an average of 4 in/hr. These findings are consistent with soil types in which the shallower depth intervals across the site are typically more silty, with sandy and gravelly intervals increasing with depth. A report by GeoDesign, Inc. that describes the test methods, includes boring logs and results for sieve analyses is provided in Appendix E.

4 SOIL AND WATER QUALITY

Results provided below are summarized from more comprehensive tables that can be found in Appendix G. These data are organized by analytical suites that include TPH, PCBs, PAHs, VOCs, and metals. Given the volume of data, summary figures are provided for each analyte class by depth interval with concentrations color-coded relative to RBCs established by the DEQ.

4.1 Soil Quality

Between March 2017 to April 2018, sixty-six (66) soil borings were completed to a depth of 25 feet BGS through several phases of sonic and push probe drilling. These data are depicted relative to published DEQ (RBCs) for the shallow depth interval, which is typically composed of fill, and the next deeper depth at approximately 5 feet BGS, which is typically comprised of native soil, usually silt. As noted previously, the upper three samples were tested in the laboratory, and if the deepest (i.e., 10-foot) sample was impacted, then the next deeper sample was also be tested to define the vertical extent of impact.

4.1.1 Discrete Soil Borings

4.1.1.1 Total Petroleum Hydrocarbons

TPH was quantified as diesel/oil range or gasoline range hydrocarbons. Of the 189 samples tested, 181 of those quantified in the diesel or oil range hydrocarbons were either nondetect or below the residential RBC. For gasoline-range hydrocarbons, all of the samples were either nondetect or below the residential RBC. In addition, impacted soils were almost exclusively in the shallow fill interval.

4.1.1.2 Polychlorinated Biphenyls

Over 92% (158 of 170) soil samples collected across the former Main Plant property were nondetect for PCBs. PCBs (principally Aroclors 1242, 1254, and 1260) were detected at three locations: one in the alley between ESCO and an adjoining property (EB-9), another in a boring at a former tank (EB-32) and in three borings located near the former reclamation yard and scrap yard/heat makeup area (borings R4-1, R5-2, and R5-5) near 24^{th} Ave. In the samples where PCBs were detected on the former Main Plant property, total PCBs were below DEQ's clean fill criterion of 200 μg/Kg and the residential RBC (230 μg/Kg).

A fourth area where PCBs were detected was on the adjoining (ESCO-owned) 0.23 acre former "Class-N-Kustom" property located at southwest corner of the intersection of

NW Nicolai St and NW 24th Ave. Total PCBs (primarily Aroclor 1242) were detected in borings EB-23 to EB-27. Two shallow soil samples (EB-25, EB-26) exceeded the 4.9 mg/Kg construction RBC. The shallow soil samples collected at EB-23, EB-24, and EB-27 exceeded DEQ's residential RBC. All deeper samples (3.5-4.0 ft) collected on the "Class-N-Kustom" property met DEQ's clean fill criterion.

Although regulatory conclusions are beyond the scope of this assessment, neither the detected PCB concentrations nor any other aspect of ESCO's assessment indicates that future management of PCB impacted soils at the property would be subject to 40 CFR 761.

4.1.1.3 Polycyclic Aromatic Hydrocarbons

Results for discrete boring samples are shown for the upper and intermediate depth samples on Figures 4-1 and 4-2. Samples were analyzed for PAHs, then summed as Benzo(a)Pyrene equivalents (BaPeq), and compared with DEQ's soil RBCs that were updated in April 2018.

Results for over 76% of the 215 soil samples collected and analyzed were at or below DEQ's clean fill criterion/residential RBC (110 µg/Kg) and over 95% (205 of 215) were below the occupational RBC (2,100 µg/Kg). Several isolated areas were above the occupational RBC (i.e., below former Building 43 and in soil used as backfill in a former UST pit), but were below the construction worker RBC (17,000 µg/Kg). Of the elevated concentrations detected, most were in shallow fill less than 2 ft deep (Figure 4-1). Native soils at the intermediate depth (Figure 4-2) were almost exclusively nondetect or below the urban residential RBC.

4.1.1.4 Volatile Organic Compounds

In soil borings, VOC results for the shallow depth interval in fill material were primarily nondetect, with only several locations having detected values, all of which were below residential RBCs (Figures 4-3 and 4-4). The intermediate depths were all nondetect, except for one test pit location, which was below residential RBCs.

4.1.1.5 Metals

Results for metals were slightly different between the fill depth interval and underlying native soil (see Figures 4-5 and 4-6). In general, the underlying native soils were comparable to background concentrations established by the DEQ for the Portland area, or were between the background/clean fill criteria and the RBCs for urban residential exposure.

On average, the shallow fill soils had higher concentrations than the underlying native soils for several metals that are typical of foundry operations, which included chromium, copper, lead, and nickel. For these soils, even for the foundry related metals, the concentrations were typically between the background/clean fill criteria and the RBCs for urban residential exposures at all sampled locations with a few exceptions. These included: lead that was above the urban residential RBC at 2 locations (EB-2 and EB-9) and the occupational RBC at one location (EB-26); and nickel that was above the RBC urban residential at one location (Test Pit Geo2).

As a note, the RBC for arsenic in soil is not applicable since the natural background concentration in the Portland area is above the RBC. For the site, the sample concentrations were comparable to, or slightly above the background concentration as established by the Oregon DEQ.

4.1.2 ISM Results

Seven of the eleven areas of the site shown on Figure 2-3 were sampled using an ISM approach to characterize shallow soils at two depth intervals within the upper 5 feet (0-2.5 ft and 2.5-5.0 ft). The total land area addressed using the ISM methodology exceeded 10 acres of the former Main Plant property. The ISM sample results can be used to inform the development of a soil management plan for site redevelopment.

ISM soil samples were collected and analyzed in triplicate for PCBs, PAHs, and a suite of 14 metals to obtain representative sample results for each area covered by the ISM grids. Results for each area relative to the DEQ's RBCs are shown in Tables 4-1 through 4-3. Detailed results are also presented in data tables contained in Appendix G. Comparison with the RBCs presents the following observations:

PCBs. Both upper (0-2.5 ft) and lower (2.5-5.0 ft) intervals in each of the seven ISM areas have concentrations that would qualify as clean fill under DEQ's clean fill criteria (DEQ, 2014). Results are provided in Table 4-1.

PAHs. The results for PAHs vary by area, but in general, the deeper zone, between 2.5 and 5.0 feet meets DEQ's clean fill criterion/residential RBC (Table 4-2). The shallow fill materials range from clean fill to below the RBC for occupational exposure, although several upper depth intervals also qualify as clean fill (e.g., Roosevelt 2, Wilson 1, and Wilson 2).

Metals. With one exception for lead in a 2.5-5.0 ft replicate sample in Area A, all metals concentrations met either the respective clean fill criterion, or were below the RBC for residential exposures (Table 4-3).

Arsenic falls outside the normal RBCs for residential (0.43 mg/Kg) and occupational exposures (1.9 mg/Kg) since it occurs naturally in Portland area soils at concentrations above these RBCs. All ISM arsenic soil concentrations were below the construction worker RBC (15 mg/Kg) and most typically were at or within 1-2 mg/Kg of the Portland area background concentration as well as the clean fill criterion for arsenic which has been established by DEQ at 8.8 mg/Kg.

4.2 Soil Quality at Potential Stormwater Infiltration Sites

For the two soil borings located at onsite locations that appeared potentially feasible to site future surface stormwater infiltration structures (COP-1 and COP-2), the soil quality for the intervals from 10 to 15 ft and 15 to 20 ft below ground surface was compared with trigger levels established by the Portland BES. The trigger levels for metals and for PCBs are shown at the bottom of tables in Appendix G. BES has not established "trigger" levels for PAHs, however, it was assumed that the DEQ RBC for the "soil leaching to groundwater" pathway is the appropriate criterion. The concentrations for soils at the intervals in these two borings were all well below the trigger levels, indicating that the underlying soil quality should be suitable for meeting the BES criteria for infiltration structures.

4.3 Groundwater Quality

Potable water in this part of Portland is provided by the City of Portland's municipal water supply. No detected constituent in any of eight (8) perimeter groundwater monitoring wells installed around the perimeter of the site in 2017 exceeded its respective Maximum Contaminant Level (MCL) established under the federal Safe Drinking Water Act (SDWA).

The part of northwest Portland in which ESCO's former Main Plant is located has been identified by the DEQ as an area with regional low-level groundwater contamination. This is reflected in the trace to low-level concentrations of several PAHs and VOCs detected in the perimeter groundwater monitoring wells.

4.3.1 Total Petroleum Hydrocarbons

Total petroleum hydrocarbons (TPH) as diesel and oil are nondetect at all wells for the sampling event. Initial sampling found two low to trace level detections of TPH-Gx in the background well MW-1 and in MW-5. Subsequent sampling events were nondetect.

4.3.2 Polychlorinated Biphenyls

Results were nondetect for all sampling events at each of the wells.

4.3.3 Polycyclic Aromatic Hydrocarbons

Trace concentrations of several PAHs have been observed upgradient wells MW-1, MW-2, MW-8, with comparable concentrations in downgradient wells MW-4, MW-5, and MW-6, suggesting that the PAHs from offsite are migrating through the groundwater below the site. Sample concentrations for these sampling events are below RBCs for occupational exposure.

4.3.4 VOCs

This part of northwest Portland is affected by the regional presence of low levels of VOCs. This is reflected in the trace to low levels of several VOCs (cis-1,2-dichlorothene, trichloroethene [TCE], tetrachloroethene [PCE], 1,1,1-trichloroethane [TCA], and carbon tetrachloride) in some of the wells (Figure 4-7). The VOCs are present both in upgradient and downgradient wells, with most concentrations below

2 µg/L. Naphthalene was detected in the January 2018 event, the presence of which is at least partly related to laboratory contamination. All VOC detections are below the RBCs for occupational exposure, with the exception of chloroform.

The presence of chloroform is primarily a result of injecting City of Portland municipal water to counter heaving sands and gravels during the well completions (municipal water tested at 29.1 µg/L of chloroform). Residual chloroform decreased between subsequent events, but there also appears to be some component of regional chloroform (e.g., at MW-6, no water completion water required, but still had trace levels of chloroform below 1 µg/L during all three sampling events).

4.3.5 Metals

For metals, no significant differences have been observed between upgradient and downgradient wells. Concentrations are below the RBCs for urban residential or other potentially applicable groundwater quality criteria. While arsenic is above its RBC, concentrations between upgradient and downgradient are comparable, indicating that the levels are naturally occurring in this part of Portland.

4.3.6 Area Sources of VOCs in Groundwater

As discussed above, organic compounds are present in groundwater regionally in northwest Portland. DEQ's Environmental Cleanup Site Information (ECSI) database for contaminated sites nearby the ESCO facility was researched and found three ECSI sites, one of which is a regional groundwater issue shown in Figure 4-8. The following information was taken from the DEQ ECSI web site reports.

ECSI #2015 – Regional Groundwater VOC Issue. In 1990, Ameritone Paints (2100 NW 22nd Ave.) began monitoring groundwater, in conjunction with the removal of two 8,000-gallon USTs that had been used to store mineral spirits. In the course of routine monitoring, several chlorinated solvents were discovered in the monitoring wells, most of which were installed beyond the Ameritone property boundary. In three rounds of monitoring for VOCs since 1991, water from these wells has contained low levels of TCE, PCE, TCA, methylene chloride, and chloroform (1 to 10 µg/L). Based on groundwater flow patterns and the lack of an onsite source for chlorinated solvents, DEQ believes that these substances migrated to the site from one or more unknown offsite sources.

ECSI #5103 – SFI. At this property (2407 NW 28th Ave.), there was a former solvent pump located in the northeast corner of the site that supplied solvent from a former solvent UST, located on the adjacent (north) property. Groundwater samples collected between April of 1993 through June of 2009 detected chlorinated VOCs such as PCE, TCE, and 1,1-dichloroethene. Monitoring through 2009 showed that concentrations of these chemicals were either stable or decreasing and were well below applicable risk-based concentrations (RBCs) for direct contact exposure to construction/excavation workers or vapor intrusion into indoor or outdoor air for an occupational setting.

ECSI #6049 – Romaine Electric. The site (1831 NW 28th Avenue) operated as Romaine Electric and included an approximately 23,000 square foot building with a half basement in the northern portion of the building. Onsite operations included automotive electrical parts assembly, re-manufacturing, warehousing, and retail sales. These operations included the use of solvents, reportedly Stoddard solvent and chlorinated solvents. New and waste solvents were stored in underground storage tanks (USTs) located in the southwestern and northern portions of the site. Soil gas investigations identified elevated concentrations of chlorinated solvents and related daughter products, including TCE and PCE in soil vapors throughout the site with the highest concentrations detected beneath the central portion of the building footprint.

4.4 Vapor Intrusion Pathway

VOC concentrations observed in the perimeter groundwater monitoring wells at the former ESCO facility were compared with the DEQ's RBCs for vapor intrusion to buildings. All detected concentrations of VOCs in groundwater are significantly below the DEQ RBCs.

LIMITATIONS

The services described in this report 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 report is solely for the use and information of our client unless otherwise noted. Any reliance on this report by a third party is at such party's sole risk.

Opinions and recommendations contained in this report 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, nor the use of segregated portions of this report.

The purpose of a geologic/hydrogeologic study is to reasonably characterize existing site conditions based on the geology/hydrogeology of the area. In performing such a study, it is understood that a balance must be struck between a reasonable inquiry into the site conditions and an exhaustive analysis of each conceivable environmental characteristic. The following paragraphs discuss the assumptions and parameters under which such an opinion is rendered.

No investigation is thorough enough to describe all geologic/ hydrogeologic conditions of interest at a given site. If conditions have not been identified during the study, such a finding should not therefore be construed as a guarantee of the absence of such conditions at the site, but rather as the result of the services performed within the scope, limitations, and cost of the work performed.

We are unable to report on or accurately predict events that may change the site conditions after the described services are performed, whether occurring naturally or caused by external forces. We assume no responsibility for conditions we were not authorized to evaluate, or conditions not generally recognized as predictable when services were performed.

Geologic/hydrogeologic conditions may exist at the site that cannot be identified solely by visual observation. Where subsurface exploratory work was performed, our professional opinions are based in part on interpretation of data from discrete sampling locations that may not represent actual conditions at unsampled locations.

REFERENCES

Beeson, M.H., Tolan, T.L., and Madin, I.P., 1991, Geologic map of the Portland quadrangle, Multnomah and Washington Counties, Oregon, and Clark County, Washington: State of Oregon Geological Map Series GMS-75, 1 sheet, scale 1:24,000

DEQ. 1992. Groundwater monitoring well drilling, construction, and decommissioning. State of Oregon, Department of Environmental Quality. August 24.

DEQ. 2014. Clean Fill Determinations, Internal Management Directive, prepared by Oregon Department of Environmental Quality, Solid Waste Program. July 23.

DEQ. 2015. Risk-Based Concentrations; tables from November 2015. Updated with revised PAH values in April 2018.

ERM. 2006. Final Phase I Environmental Site Assessment, 2141 NW 25th Avenue, Portland, Multnomah County, Oregon. Prepared by ERM, Portland, Oregon. October.

HAI. 2017. Phase I Environmental Site Assessment, Auto Body Shop Property, 2404 NW Nicolai Street, Portland, Multnomah County, Oregon. Prepared by Hahn and Associates, Inc. June 8.

ITRC. 2012. Incremental Sampling Methodology, Technical and Regulatory Guidance. Prepared by the Interstate Technology & Regulatory Council, Incremental Sampling Methodology Team. February.

Swanson, R.D., W.D. McFarland, J.B. Gonthier, and J.M. Wilkinson. 1993. A description of hydrogeologic units in the Portland Basin, Oregon and Washington. U.S. Geological Survey, Water Resources Investigations Report 90-4196.

TABLES

Table 2-1
Borehole Depths and Sealing Volumes
Former ESCO Main Plant Property

Boring ID	Drilling Date	Borehole Depth Drilled (ft)	Borehole Diameter (in)	Borehole Volume (ft3)	Sacks[a] of Chips	Volume Chips (ft3)	Percent Chips/Casing Volume
EB-1	3/22/17	25.0	6.0	4.9	7.1	5.0	102%
EB-2	3/22/17	25.0	6.0	4.9	7.1	5.0	102%
EB-3	3/22/17	25.0	6.0	4.9	7.1	5.0	102%
EB-4/EB-29	5/15/17	25.0	2.25	0.70	0.9	0.66	94%
EB-5	3/15/17	60.0	6.0	11.8	17.1	12.0	102%
EB-6	3/16/17	60.0	6.0	11.8	17.1	12.0	102%
EB-7	3/13/17	25.0	6.0	4.9	7.1	5.0	102%
EB-8	3/13/17	25.0	6.0	4.9	7.1	5.0	102%
EB-9	3/17/17	25.0	6.0	4.9	7.1	5.0	102%
EB-10	3/20/17	25.0	6.0	4.9	7.1	5.0	102%
EB-11	3/21/17	75.0	6.0	14.7	21.4	15.0	102%
EB-12	3/23/17	25.0	6.0	4.9	7.1	5.0	102%
EB-13	3/20/17	25.0	6.0	4.9	7.1	5.0	102%
EB-14	3/22/17	25.0	6.0	4.9	7.1	5.0	102%
EB-15	3/23/17	25.0	6.0	4.9	7.1	5.0	102%
EB-17	3/17/17	80.0	6.0	15.7	22.9	16.0	102%
EB-18	3/21/17	25.0	6.0	4.9	7.1	5.0	102%
EB-19	3/28/17	25.0	6.0	4.9	7.1	5.0	102%
EB-20	3/28/17	25.0	6.0	4.9	7.1	5.0	102%
EB-21	3/28/17	25.0	6.0	4.9	7.1	5.0	102%
EB-22	5/15/17	5.0	2.25	0.14	0.2	0.13	94%
EB-23	5/15/17	25.0	2.25	0.70	0.9	0.66	94%
EB-24	5/15/17	25.0	2.25	0.70	0.9	0.66	94%
EB-25	5/15/17	25.0	2.25	0.70	0.9	0.66	94%
EB-26	5/15/17	5.0	2.25	0.14	0.2	0.13	94%
EB-27	5/15/17	5.0	2.25	0.14	0.2	0.13	94%
EB-28	5/15/17	20.0	2.25	0.56	0.8	0.53	94%
EB-30	5/19/17	25.0	2.25	0.70	0.9	0.66	94%
EB-31	5/19/17	25.0	2.25	0.70	0.9	0.66	94%
EB-32	5/19/17	25.0	2.25	0.70	0.9	0.66	94%
EB-33	5/19/17	25.0	2.25	0.70	0.9	0.66	94%
EB-34	5/19/17	20.0	2.25	0.56	0.8	0.53	94%
EB-35	5/19/17	10.0	2.25	0.28	0.4	0.26	94%
EB-36	3/29/18	25.0	2.25	0.70	0.9	0.66	94%
EB-37	3/29/18	25.0	2.25	0.70	0.9	0.66	94%
EB-38	3/29/18	25.0	2.25	0.70	0.9	0.66	94%
EB-39	3/27/18	25.0	2.25	0.70	0.9	0.66	94%
EB-40	3/29/18	25.0	2.25	0.70	0.9	0.66	94%

Table 2-1
Borehole Depths and Sealing Volumes
Former ESCO Main Plant Property

Boring ID	Drilling Date	Borehole Depth Drilled (ft)	Borehole Diameter (in)	Borehole Volume (ft3)	Sacks[a] of Chips	Volume Chips (ft3)	Percent Chips/Casing Volume
DC-1	8/16/18	10.0	2.25	0.28	0.4	0.26	94%
DC-2	8/16/18	10.0	2.25	0.28	0.4	0.26	94%
DC-3	8/16/18	10.0	2.25	0.28	0.4	0.26	94%
DC-4	8/16/18	10.0	2.25	0.28	0.4	0.26	94%
DC-5	8/16/18	10.0	2.25	0.28	0.4	0.26	94%
DC-6	4/18/18	10.0	2.25	0.28	0.4	0.26	94%
DC-7	4/18/18	10.0	2.25	0.28	0.4	0.26	94%
DC-8	4/19/18	10.0	2.25	0.28	0.4	0.26	94%
R3-1	4/18/18	25.0	2.25	0.70	0.9	0.66	94%
R3-2	4/18/18	25.0	2.25	0.70	0.9	0.66	94%
R3-3	4/18/18	25.0	2.25	0.70	0.9	0.66	94%
R3-4	4/18/18	25.0	2.25	0.70	0.9	0.66	94%
R3-5	4/18/18	25.0	2.25	0.70	0.9	0.66	94%
R4-1	4/20/18	25.0	2.25	0.70	0.9	0.66	94%
R4-2	4/19/18	25.0	2.25	0.70	0.9	0.66	94%
R4-3	4/19/18	25.0	2.25	0.70	0.9	0.66	94%
R4-4	4/18/18	25.0	2.25	0.70	0.9	0.66	94%
R4-5	4/18/18	25.0	2.25	0.70	0.9	0.66	94%
R4-6	4/20/18	25.0	2.25	0.70	0.9	0.66	94%
R5-1	4/19/18	25.0	2.25	0.70	0.9	0.66	94%
R5-2	4/19/18	25.0	2.25	0.70	0.9	0.66	94%
R5-3	4/19/18	25.0	2.25	0.70	0.9	0.66	94%
R5-4	4/20/18	25.0	2.25	0.70	0.9	0.66	94%
R5-5	4/19/18	25.0	2.25	0.70	0.9	0.66	94%

[a]One sack of 3/8" bentonite chips is approximately 0.70 ft^3 per manufacturer specification; number estimated from hole depth.
Borehole volumes: 6" = 0.196 ft^3/linear ft; 2.25" = 0.028 ft^3/linear ft

Table 2-2
Well Construction Summary
Former ESCO Main Plant Property

Location	Date Well Installed	Ground Surface Elevation (ft MSL)	Top of Casing Elevation (ft MSL)	Northing	Easting	Stickup (ft)	Drilled Boring Depth (ft bgs)	Total Depth Casing (ft bgs)	Total Casing Length (ft)	Screened Interval (ft bgs)	Screened Length (ft)	Filter Pack Interval (ft bgs)	Seal (ft bgs)	Borehole Diameter (inches)	Well Diameter (inches)	Drilling Method
MW-1	3/24/17	78.99	78.67	689,616.14	7,637,751.45	-0.32	85.2	85.04	84.73	74.6-84.6	10	71.6-85.2	3.0-71.6	6	2	Sonic
MW-2	3/23/17	81.13	84.11	689,829.95	7,637,342.20	2.98	85.3	85.37	88.33	75.3-85.0	9.7	71.2-85.3	0.5-71.2	6	2	Sonic
MW-3	3/24/17	78.50	78.26	690,290.05	7,637,244.08	-0.24	80.5	80.19	79.95	70.1-79.7	9.6	67.0-80.5	1.3-67.0	6	2	Sonic
MW-4	3/21/17	59.78	59.55	690,825.20	7,637,957.96	-0.23	61.0	58.98	58.71	48.9-58.5	9.6	46.8-61.0	2.0-46.8	6	2	Sonic
MW-5	3/22/17	62.91	62.73	690,666.42	7,638,168.57	-0.18	65.0	64.67	64.52	54.6-64.2	9.7	51.9-65.0	1.3-51.9	6	2	Sonic
MW-6	3/27/17	69.71	69.37	690,027.09	7,638,182.99	-0.34	70.0	70.23	69.90	60.1-69.7	9.6	56.2-70.0	1.5-56.2	6	2	Sonic
MW-7	6/14/17	80.07	79.73	689,733.95	7,637,547.86	-0.34	90.0	89.95	89.65	79.9-89.6	9.7	76.9-90.2	3.0-76.9	6	2	Sonic
MW-8	6/15/17	82.98	82.65	689,383.48	7,637,760.56	-0.33	85.0	84.95	84.65	74.8-84.6	9.8	71.8-85.2	3.0-71.8	6	2	Sonic

Notes: Elevations are based on NAVD88
Northing and Easting referenced to Oregon State Plane, North Zone

Table 2-3
Well Materials Volume Comparisons
Former ESCO Main Plant Property

	Filter Pack					Filter Pack Seal				Bentonite Seal (Chips and/or Grout)										
Well	Total Depth Boring (ft bgs)	Filter Pack Thickness (ft)	Calc. Filter Pack (ft^3)	Sand Used (sacks)	Actual Filter Pack (ft^3)	Bentonite Chips Thickness (ft)	Calculated Chips Volume (ft^3)	Bentonite Chips Used (sacks)	Actual Chip Seal Volume (ft^3)	G/C Seal Length (ft)	G/C Annular Volume (ft^3)	Number Drums	Grout Pumped (gallons)	Grout Pumped (ft^3)	Bentonite Chips Used (sacks)	Actual Chip Seal Volume (ft^3)	Combined Grout/ Chip Vol. (ft^3)	Percent Grout/ Borehole Volume	Borehole Diameter (inches)	Well Diameter (inches)
MW-1	85.2	13.1	2.3	4.0	2.0	4.8	0.8	1.0	0.7	68.6	12.0	2.0	84	11	14.0	9.8	21.0	175%	6	2
MW-2	85.3	14.1	2.5	5.5	2.8	3.0	0.5	0.5	0.4	67.7	11.8	1.0	42	5.6	14.0	9.8	15.4	130%	6	2
MW-3	80.5	13.5	2.4	6.0	3.0	3.0	0.5	0.8	0.5	62.7	10.9	2.0	84	11.2	5.3	3.7	14.9	136%	6	2
MW-4	61.0	13.2	2.3	4.0	2.0	—	—	—	—	44.8	7.8	—	—	—	14.0	9.8	9.8	125%	6	2
MW-5	65.0	13.1	2.3	4.3	2.1	—	—	—	—	50.6	8.8	—	—	—	12.0	8.4	8.4	95%	6	2
MW-6	70.0	13.8	2.4	3.0	1.5	5.1	0.9	1.0	0.7	49.6	8.7	4.0	168	22.4	9.5	6.7	29.1	336%	6	2
MW-7	90.2	13.0	2.3	6.0	3.0	3.0	0.5	1.0	0.7	73.9	12.9	4.0	168	22	1.0	0.7	23.1	179%	6	2
MW-8	85.2	13.0	2.3	5.0	2.5	5.0	0.9	1.0	0.7	68.8	12.0	4.0	168	22	2.5	1.8	24.2	201%	6	2

Note: All volumes approximate

Annular Volumes

Diameters (hole-casing)	ft^3	
6"- 2"	0.1745	
6" (open hole)	0.1963	
Unit Volumes		
Sand (50 lb. sack)	0.5	ft^3
Bent. 3/8" Chips (50 lb. sack)	0.70	ft^3
Drum (Bentonite Grout)	42	gallons
7.5 gallons/ft^3		

Abbreviations: ft: feet; ft^3: cubic feet; bgs: below ground surface; lb.: pounds.

G/C: grout and/or chip seal above filter pack seal

Table 2-4
Monitoring Well Development Summary
Former ESCO Main Plant Property

Well	Date	Initial Depth-to-Water (ft btc)	Final Depth-to-Water (ft btc)	Volume Added during Well Installation (gal)	Total Volume Removed (gal)	Specific Conductance (µS/cm)	Temperature ºC	pH (pH Units)	Oxidation Reduction Potential (mV)	Dissolved Oxygen (mg/L)	Turbidity (NTUs)	Clarity/ Color/ Remarks
MW-1	04/07/17	59.50	59.53	90	100	0.457	12.19	8.13	-20.9	4.90	108	Very clear
MW-2	04/05/17	65.05	65.07	120	131.5	0.340	12.13	7.27	66.8	11.57	26	Very clear
MW-3	04/10/17	60.00	58.90	120	138	0.356	12.17	7.21	48.6	12.69	15	Very clear
MW-4	04/04/17	40.42	40.47	120	150	0.284	12.38	6.70	137.3	10.22	282	—
MW-5	04/03/17	43.65	43.64	60	66	0.422	14.90	7.10	-17.3	5.59	45	Cloudy
MW-6	04/06/17	50.20	50.20	0	75	0.399	13.09	7.91	39.0	5.59	227	Cloudy
MW-7	06/16/17	61.90	61.90	100	125	0.371	13.30	6.80	138.3	10.1	211	Cloudy
MW-8	06/16/17	58.97	59.00	50	70	0.300	12.46	6.30	180.7	13.11	15	Almost clear

Note: Final measurements at end of well development.

Table 2-5
Survey Information
Former ESCO Main Plant Property

Well	Northing (Y)	Easting (X)	Latitude	Longitude	Elev Gnd	Elev Rim	Elev PVC	Other
Borings								
EB-2	689857.96	7638182.49	N45°32'16.146"	W122°42'03.928"	70.15	—	—	
EB-3	690019.26	7638067.16	N45°32'17.707"	W122°42'05.609"	72.69	—	—	
EB-4	690191.02	7638011.41	N45°32'19.387"	W122°42'06.458"	69.76	—	—	
EB-5	690399.70	7638015.31	N45°32'21.448"	W122°42'06.483"	66.97	—	—	
EB-6	690413.80	7638175.56	N45°32'21.630"	W122°42'04.238"	63.03	—	—	
EB-7	690647.16	7638004.14	N45°32'23.887"	W122°42'06.735"	62.82	—	—	
EB-8	690521.27	7637937.77	N45°32'22.627"	W122°42'07.619"	65.61	—	—	
EB-9	690638.68	7637707.02	N45°32'23.724"	W122°42'10.904"	65.47	—	—	
EB-10	690393.40	7637824.67	N45°32'21.334"	W122°42'09.158"	70.77	—	—	
EB-11	690208.55	7637898.20	N45°32'19.530"	W122°42'08.055"	72.65	—	—	
EB-12	689918.10	7637863.07	N45°32'16.653"	W122°42'08.437"	77.16	—	—	
EB-13	690280.53	7637737.93	N45°32'20.197"	W122°42'10.333"	73.42	—	—	
EB-14	689946.33	7637768.73	N45°32'16.907"	W122°42'09.773"	77.52	—	—	
EB-15	690272.71	7637500.60	N45°32'20.056"	W122°42'13.663"	72.08	—	—	
EB-17	689973.10	7637436.84	N45°32'17.082"	W122°42'14.444"	79.29	—	—	
EB-18	689840.10	7637632.37	N45°32'15.822"	W122°42'11.647"	78.47	—	—	
EB-19	690009.07	7637662.11	N45°32'17.497"	W122°42'11.294"	78.34	—	—	
EB-20	690122.63	7637568.40	N45°32'18.593"	W122°42'12.654"	78.85	—	—	
EB-21	690334.69	7637904.28	N45°32'20.776"	W122°42'08.017"	68.82	—	—	
EB-22	690843.22	7638072.70	N45°32'25.841"	W122°42'05.847"	57.99	—	—	
EB-23	690827.66	7638088.29	N45°32'25.691"	W122°42'05.622"	58.04	—	—	
EB-24	690772.36	7638084.12	N45°32'25.144"	W122°42'05.659"	58.44	—	—	
EB-25	690805.74	7638134.39	N45°32'25.487"	W122°42'04.966"	57.51	—	—	
EB-26	690782.23	7638150.76	N45°32'25.260"	W122°42'04.727"	57.64	—	—	
EB-27	690780.94	7638103.61	N45°32'25.234"	W122°42'05.389"	58.14	—	—	
EB-28	690173.42	7638125.56	N45°32'19.244"	W122°42'04.848"	70.67	—	—	
EB-29	690236.86	7638027.33	N45°32'19.844"	W122°42'06.252"	69.39	—	—	
EB-30	690026.69	7638073.69	N45°32'17.782"	W122°42'05.520"	73.20	—	—	
EB-31	690419.74	7637603.13	N45°32'21.535"	W122°42'12.280"	75.99	—	—	
EB-32	690297.39	7637969.14	N45°32'20.426"	W122°42'07.092"	69.66	—	—	
EB-33	690298.68	7637946.39	N45°32'20.432"	W122°42'07.412"	69.66	—	—	
EB-34	690420.79	7637961.06	N45°32'21.641"	W122°42'07.253"	67.53	—	—	
EB-35	690257.06	7637660.14	N45°32'19.944"	W122°42'11.417"	74.82	—	—	

Table 2-5
Survey Information
Former ESCO Main Plant Property

Well	Northing (Y)	Easting (X)	Latitude	Longitude	Elev Gnd	Elev Rim	Elev PVC	Other
EB-36	690574.73	7637874.74	N45°32'23.14"	W122°42'8.52"	~65.8			LiDAR
EB-37	690638.12	7637791.22	N45°32'23.74"	W122°42'9.72"	~65.8			LiDAR
EB-38	690687.03	7637707.39	N45°32'24.20"	W122°42'10.92"	~65.8			LiDAR
EB-39	689890.09	7637557.21	N45°32'16.29"	W122°42'12.72"	~79.0			LiDAR
EB-40	689869.94	7638042.96	N45°32'16.23"	W122°42'5.89"	~70.1			LiDAR
DC-1	690356.66	7637582.98	—	—	73.70	—	—	LiDAR
DC-2	690340.71	7637639.68	—	—	73.40	—	—	LiDAR
DC-3	690303.67	7637523.55	—	—	73.00	—	—	LiDAR
DC-4	690362.04	7637519.90	—	—	72.40	—	—	LiDAR
DC-5	690396.44	7637494.03	—	—	73.90	—	—	LiDAR
DC-6	—	—	45.53939500	-122.7031275	~73.4	—	—	GPS
DC-7	—	—	45.53925946	-122.7036345	~73.4	—	—	GPS
DC-8	—	—	45.53885730	-122.7035191	~73.4	—	—	GPS
R3-1	—	—	45.53889435	-122.7025218	~73.8	—	—	GPS
R3-2	—	—	45.53863610	-122.7023440	~73.8	—	—	GPS
R3-3	—	—	45.53823771	-122.7020693	~77.2	—	—	GPS
R3-4	—	—	45.53838196	-122.7027186	~77.5	—	—	GPS
R3-5	—	—	45.53868800	-122.7027310	~73.8	—	—	GPS
R4-1	—	—	45.53889653	-122.7016579	~66.3	—	—	GPS
R4-2	—	—	45.53851197	-122.7018235	~69.8	—	—	GPS
R4-3	—	—	45.53806362	-122.7018902	~72.6	—	—	GPS
R4-4	—	—	45.53823084	-122.7019720	~72.6	—	—	GPS
R4-5	—	—	45.53842982	-122.7020249	~72.6	—	—	GPS
R4-6	—	—	45.53864767	-122.7020360	~69.7	—	—	GPS
R5-1	—	—	45.53889812	-122.7013596	~67.0	—	—	GPS
R5-2	—	—	45.53907054	-122.7012699	~64.5	—	—	GPS
R5-3	—	—	45.53857600	-122.7012419	~72.0	—	—	GPS
R5-4	—	—	45.53813361	-122.7011206	~72.9	—	—	GPS
R5-5	—	—	45.53908017	-122.7016176	~66.5	—	—	GPS
COP-1	690795.42	7638039.13	—	—	~60.2	—	—	LiDAR
COP-2	690406.73	7637456.00	—	—	~72.2	—	—	LiDAR
Test Pits								
TP-2	690361.96	7638066.60	N45°32'21.089"	W122°42'05.748"	66.41	—	—	
TP-3	690165.71	7638070.39	N45°32'19.153"	W122°42'05.620"	70.72	—	—	
TP-4	690115.77	7638071.57	N45°32'18.661"	W122°42'05.584"	71.31	—	—	

Table 2-5
Survey Information
Former ESCO Main Plant Property

Well	Northing (Y)	Easting (X)	Latitude	Longitude	Elev Gnd	Elev Rim	Elev PVC	Other
GEO-1	690624.49	7637796.79	N45°32'23.608"	W122°42'09.638"	65.88	—	—	
GEO-2	690742.54	7637775.16	N45°32'24.767"	W122°42'09.987"	65.56	—	—	
GEO-3	690756.82	7637841.81	N45°32'24.926"	W122°42'09.057"	65.79	—	—	
QPB-1	690796.26	7637815.48	N45°32'25.308"	W122°42'09.441"	66.13	—	—	
BETA	690713.31	7637867.56	N45°32'24.503"	W122°42'08.678"	65.18	—	—	
Monitoring Wells								
MW-1	689616.14	7637751.45	N45°32'13.643"	W122°42'09.889"	78.99	79.05	78.67	
MW-2	689829.95	7637342.20	N45°32'15.643"	W122°42'15.718"	81.13	84.47	84.11	
MW-3	690290.05	7637244.08	N45°32'20.158"	W122°42'17.273"	78.50	78.53	78.26	
MW-4	690825.20	7637957.96	N45°32'25.632"	W122°42'07.451"	59.78	59.82	59.55	
MW-5	690666.42	7638168.57	N45°32'24.122"	W122°42'04.432"	62.91	62.94	62.73	
MW-6	690027.09	7638182.99	N45°32'17.815"	W122°42'03.985"	69.71	69.74	69.37	
MW-7	689733.95	7637547.86	N45°32'14.751"	W122°42'12.793"	80.07	80.16	79.73	
MW-8	689383.48	7637760.56	N45°32'11.349"	W122°42'09.672"	82.98	82.94	82.65	

Coordinate System	UTM Zone	Vertical Datum	Site	Address
Nad 83/2011	10	NAVD88	ESCO Corporation	2141 NW 25th Ave
Epoch 2010.0000				Portland, Oregon 97210
Oregon State Plane				
North Zone 3601, Int Ft				
Benchmark used: ORGN Station PDXA				

Note:
Other: coordinates estimated from LiDAR or hand-held GPS unit.
~72.0: ground elevations estimated from surveyed building slabs or ground surface topographic contours.

Table 2-6
Analytical Testing Schedule
Former ESCO Main Plant Property

Boring	TPH-Dx/Gx	PCB Aroclors	PAHs	SVOCs	VOCs	Metals	Rationale
SOIL							
Onsite Soil Borings							
EB-2	X	X	X		X	A	Near chemical storage (binders)
EB-3	X	X	X		X	A	Near chemical storage
EB-5	X	X	X		X	A	Near former UST (Tank 12)
EB-6	X	X	X		X	A	General
EB-7	X	X	X		X	A	General
EB-8	X	X	X		X	A	Near former transformer location
EB-9	X	X	X		X	A	General (chemical storage)
EB-10	X	X	X		X	A	Near current transformers
EB-11	X	X	X		X	A	Near decommissioned UST (Tank 9)
EB-12	X	X	X		X	A	General
EB-13	X	X	X		X	A	Near former transformer location
EB-14	X	X	X		X	A	Near chemical storage (binders)
EB-15	X	X	X		X	A	General
EB-17	X	X	X		X	A	Near oil/water separator and wash rack
EB-18	X	X	X		X	A	General (near paint pit)
EB-19	X	X	X		X	A	Near current UST (Tank 8)
EB-20	X	X	X		X	A	Near current UST (Tank 7)
EB-21	X	X	X		X	A	Near decommissioned UST (Tank 2/10)
EB-28	X	X	X		*BTEX		Near current UST (Tank 13)
EB-29/4	X	X	X		X	A	Near former transformer location
EB-30	X		X				EB-3 delineation
EB-31	X	X	X			A	Distribution Center fill
EB-32	X	X	X		*BTEX		Within former UST Tank backfill (Tank 11/4)
EB-33	X	X	X		*BTEX		Within former UST Tank backfill (Tank 11/4)
EB-34	X	X	X		*BTEX		Near decommissioned UST (Tank 1)
EB-35	X	X	X		*BTEX		Near potential UST and hydraulic oil (Tank 5)
EB-36	X	X	X		X	A	Bldg. 9

Table 2-6
Analytical Testing Schedule
Former ESCO Main Plant Property

Boring	TPH-Dx/Gx	PCB Aroclors	PAHs	SVOCs	VOCs	Metals	Rationale
EB-37	X	X	X		X	A	Bldg. 9
EB-38	X	X	X		X	A	Bldg. 9
EB-39	X	X	X		X	A	Bldg. 4
EB-40	X	X	X		X	A	Bldg. 15
MW-4	X	X	X		X	A	Visually impacted fill soil in well boring
DC-1			X				Distribution Center fill
DC-2			X				Distribution Center fill
DC-3			X				Distribution Center fill
DC-4			X				Distribution Center fill
DC-5			X				Distribution Center fill
DC-6			X				Distribution Center fill
DC-7			X				Distribution Center fill
DC-8			X				Distribution Center fill
R3-1	X	X	X		X	A	Main Plant-Sampling Area R3
R3-2	X	X	X		X	A	Main Plant-Sampling Area R3
R3-3	X	X	X		X	A	Main Plant-Sampling Area R3
R3-4	X	X	X		X	A	Main Plant-Sampling Area R3
R3-5	X	X	X		X	A	Main Plant-Sampling Area R3
R4-1	X	X	X		X	A	Main Plant-ISM Area R4
R4-2	X	X	X		X	A	Main Plant-ISM Area R4
R4-3	X	X	X		X	A	Main Plant-ISM Area R4
R4-4	X	X	X		X	A	Main Plant-ISM Area R4
R4-5	X	X	X		X	A	Main Plant-ISM Area R4
R4-6	X	X	X		X	A	Main Plant-ISM Area R4
R5-1	X	X	X		X	A	Main Plant-ISM Area R5
R5-2	X	X	X		X	A	Main Plant-ISM Area R5
R5-3	X	X	X		X	A	Main Plant-ISM Area R5
R5-4	X	X	X		X	A	Main Plant-ISM Area R5
R5-5	X	X	X		X	A	Main Plant-ISM Area R5

Table 2-6
Analytical Testing Schedule
Former ESCO Main Plant Property

Boring	TPH-Dx/Gx	PCB Aroclors	PAHs	SVOCs	VOCs	Metals	Rationale
Class-N-Kustom							
EB-22	X	X	X		X	A	Class-N-Kustom operations
EB-23	X	X	X		X	A	Class-N-Kustom operations
EB-24	X	X	X		X	A	Class-N-Kustom operations
EB-25	X	X	X		X	A	Class-N-Kustom operations
EB-26	X	X	X		X	A	Class-N-Kustom operations
EB-27	X	X	X		X	A	Class-N-Kustom operations
Test Pits							
TP-2	X	X	X		X	A	Reclamation Yard
TP-3	X	X	X		X	A	Scrap Yard
TP-4	X	X	X		X	A	Scrap Yard
GEO1			X			B	Lower Finishing-near dye check
GEO2			X			B	Lower Finishing-near powder burn oven
GEO3			X			B	Lower Finishing-in front of rotoblast and heat treat oven
BETA			X			B	Lower Finishing-in former Betatron pit
QPB1			X			B	Lower Finishing-adjacent to quench pit
GROUNDWATER							
One-Time Boring Samples							
EB-5	X	X	X		X	A	Below/downgradient of former USTs
EB-6	X	X	X		X	A	Downgradient of former USTs
EB-11	X				X	A	Below decommissioned UST (Tank 9)
EB-17	X	X	X		X	A	Below oil/water separator and wash rack

Table 2-6
Analytical Testing Schedule
Former ESCO Main Plant Property

Boring	TPH-Dx/Gx	PCB Aroclors	PAHs	SVOCs	VOCs	Metals	Rationale
Monitoring Wells							
MW-1	X	X	X		X	A	Groundwater-sampled May, June, January
MW-2	X	X	X		X	A	Groundwater-sampled May, June, January
MW-3	X	X	X		X	A	Groundwater-sampled May, June, January
MW-4	X	X	X		X	A	Groundwater-sampled May, June, January
MW-5	X	X	X		X	A	Groundwater-sampled May, June, January
MW-6	X	X	X		X	A	Groundwater-sampled May, June, January
MW-7	X	X		X	X	A	Groundwater-sampled June and January
MW-8	X	X	X		X	A	Groundwater-sampled June and January
Muni. Water					X		Check for trihalomethanes in completion water

Notes:
*BTEX if TPH-Gx detected
Metals
A: Arsenic (As), Barium (Ba), Boron (B), Cadmium(Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Molybdenum (Mo), Nickel (Ni), Silver (Ag), Selenium (Se), Uranium (U), Zinc (Zn)
B: Arsenic (As), Barium (Ba), Cadmium(Cd), Chromium (Cr), Copper (Cu), Lead (Pb), Mercury (Hg), Molybdenum (Mo), Nickel (Ni), Silver (Ag), Selenium (Se), Zinc (Zn), Uranium (U), Thorium (Th)

Table 2-7
Petroleum Hydrocarbon Storage Tanks
Former ESCO Main Plant Property

Tank ID	Type	Size (Gallons)	Decommission Date/Status	Comments	Further Action
7	Diesel oil	2,500	To be removed	Confirmed with geophysics at depth of 7.5 ft; dimensions are 6 x 10 ft. Soil investigation suggests shallow impacts.	Excavate tank after demolition
8	Light fuel oil	Unknown	To be removed	Fill port still exists. Results of soil sampling showed minimal impacts in shallow soil. Tank emptied in November 2017.	Excavate tank after demolition
9	Light fuel oil	Unknown	To be removed	One of two possible tanks confirmed to be decommissioned by filling with sand when discovered in 2013. A second tank may exist nearby.	Excavate tanks after demolition
13	Diesel oil	Unknown	To be removed	Tank confirmed with geophysics (magnetics and GPR) at depth of 2.5 ft.; dimensions are 5 x 8 ft. Shallow impacts below RBCs.	Excavate tank after demolition
15	Oil	Unknown	N/A	Possible the same as tanks 4 and 11. Reference document shows this proposed tank location; it is shown as alongside tracks and below the extreme north end of Bldg 20.	Geophysics after demolition
16	Gasoline	2,000	Likely removed in 1993	Possible LUST #26-93-0026. Geophysics found magnetic anomaly potentially suggesting buried fill pipe. GPR also indicated a possible 8 x 20 ft tank at depth of 13 feet. Recommend confirm whether tank is present.	Expose potential fill pipe and check for tank.
17	Oil	Unknown	N/A	Based on historic map, location appears to be below Bldgs 20/21 wall and beneath office adjacent to transfer track with no access for drilling. Recommend check location after demolition.	Geophysics after demolition

Table 3-1
Summary of Standard Penetration Testing
Former ESCO Main Plant Property

Boring	Depth Interval (ft bgs)	Blow Count	SPT N-Value	Soil Description
EB-1	5 - 5.5	3		SILT, brown, moist, stiff, highly plastic
	5.5 - 6	4		SILT, brown, moist, stiff, highly plastic
	6 - 6.5	5	9	SILT, brown, moist, stiff, highly plastic
	10 - 10.5	4		SAND, brown, moist, loose, fine grained, poorly graded
	10.5 - 11	3		SAND, brown, moist, loose, fine grained, poorly graded
	11 - 11.5	3	6	SAND, brown, moist, loose, fine grained, poorly graded
	15 - 15.5	5		SAND, brown, moist, medium dense, fine grained, poorly graded
	15.5 - 16	5		SAND, brown, moist, medium dense, fine grained, poorly graded
	16 - 16.5	6	11	SAND, brown, moist, medium dense, fine grained, poorly graded
	20 - 20.5	8		SAND, brown, moist, medium dense, fine grained, poorly graded
	20.5 - 21	7		SAND, brown, moist, medium dense, fine grained, poorly graded
	21 - 21.5	9	16	SAND, brown, moist, medium dense, fine grained, poorly graded
EB-3	5 - 5.5	1		SILT, brown, moist, very soft, medium to high plasticity
	5.5 - 6	1		SILT, brown, moist, very soft, medium to high plasticity
	6 - 6.5	1	2	SILT, brown, moist, very soft, medium to high plasticity
	10 - 10.5	2		SAND, brown, moist, very loose, fine grained, poorly graded
	10.5 - 11	1		SAND, brown, moist, very loose, fine grained, poorly graded
	11 - 11.5	1	2	SAND, brown, moist, very loose, fine grained, poorly graded
	15 - 15.5	4		SAND, brown, moist, loose, fine grained, poorly graded
	15.5 - 16	4		SAND, brown, moist, loose, fine grained, poorly graded
	16 - 16.5	5	9	SAND, brown, moist, loose, fine grained, poorly graded
	20 - 20.5	6		SAND, brown, moist, medium dense, fine grained, poorly graded
	20.5 - 21	7		SAND, brown, moist, medium dense, fine grained, poorly graded
	21 - 21.5	7	14	SAND, brown, moist, medium dense, fine grained, poorly graded
EB-5	5 - 5.5	3		SILT, brown, moist, stiff, high plasticity
	5.5 - 6	4		SILT, brown, moist, stiff, high plasticity
	6 - 6.5	6	10	SILT, brown, moist, stiff, high plasticity
	10 - 10.5	2		SILT, brown, moist, medium stiff, low plasticity
	10.5 - 11	2		SILT, brown, moist, medium stiff, low plasticity
	11 - 11.5	3	5	SILT, brown, moist, medium stiff, low plasticity
	15 - 15.5	2		SAND, brown, moist, loose, fine grained, poorly graded
	15.5 - 16	4		SAND, brown, moist, loose, fine grained, poorly graded
	16 - 16.5	5	9	SAND, brown, moist, loose, fine grained, poorly graded
	20 - 20.5	3		SAND, brown, moist, loose, fine grained, poorly graded
	20.5 - 21	3		SAND, brown, moist, loose, fine grained, poorly graded
	21 - 21.5	5	8	SAND, brown, moist, loose, fine grained, poorly graded
EB-6	5 - 5.5	2		SILT, brown, moist, stiff, medium to high plasticity
	5.5 - 6	4		SILT, brown, moist, stiff, medium to high plasticity
	6 - 6.5	7	11	SILT, brown, moist, stiff, medium to high plasticity
	10 - 10.5	2		SAND, brown, moist, loose, fine grained, poorly graded
	10.5 - 11	4		SAND, brown, moist, loose, fine grained, poorly graded
	11 - 11.5	6	10	SAND, brown, moist, loose, fine grained, poorly graded
	15 - 15.5	2		SAND, brown, moist, loose, fine grained, poorly graded
	15.5 - 16	2		SAND, brown, moist, loose, fine grained, poorly graded
	16 - 16.5	5	7	SAND, brown, moist, loose, fine grained, poorly graded
	20 - 20.5	5		SAND, brown, moist, loose, fine grained, poorly graded
	20.5 - 21	9		SAND, brown, moist, loose, fine grained, poorly graded
	21 - 21.5	11	20	SAND, brown, moist, loose, fine grained, poorly graded

Table 3-1
Summary of Standard Penetration Testing
Former ESCO Main Plant Property

Boring	Depth Interval (ft bgs)	Blow Count	SPT N-Value	Soil Description
EB-7	5 - 5.5	6		SILT, brown, moist, stiff, highly plastic
	5.5 - 6	5		SILT, brown, moist, stiff, highly plastic
	6 - 6.5	6	11	SILT, brown, moist, stiff, highly plastic
	10 - 10.5	2		SILT, brown, moist, soft, low plasticity
	10.5 - 11	1		SILT, brown, moist, soft, low plasticity
	11 - 11.5	2	3	SILT, brown, moist, soft, low plasticity
	15 - 15.5	4		SAND, brown, moist, loose, fine grained, poorly graded
	15.5 - 16	4		SAND, brown, moist, loose, fine grained, poorly graded
	16 - 16.5	5	9	SAND, brown, moist, loose, fine grained, poorly graded
	20 - 20.5	4		SAND, brown, moist, medium dense, fine grained, poorly graded
	20.5 - 21	5		SAND, brown, moist, medium dense, fine grained, poorly graded
	21 - 21.5	7	12	SAND, brown, moist, medium dense, fine grained, poorly graded
EB-9	5 - 5.5	4		SILT, brown, moist, medium stiff, medium plasticity
	5.5 - 6	5		SILT, brown, moist, medium stiff, medium plasticity
	6 - 6.5	5	10	SILT, brown, moist, medium stiff, medium plasticity
	10 - 10.5	2		SILT, brown, moist, medium stiff, medium plasticity
	10.5 - 11	2		SILT, brown, moist, medium stiff, medium plasticity
	11 - 11.5	3	5	SILT, brown, moist, medium stiff, medium plasticity
	15 - 15.5	3		SAND, brown, moist, loose, fine grained, poorly graded
	15.5 - 16	4		SAND, brown, moist, loose, fine grained, poorly graded
	16 - 16.5	5	9	SAND, brown, moist, loose, fine grained, poorly graded
	20 - 20.5	6		SAND, brown, moist, loose, fine grained, poorly graded
	20.5 - 21	7		SAND, brown, moist, loose, fine grained, poorly graded
	21 - 21.5	6	13	SAND, brown, moist, loose, fine grained, poorly graded
EB-11	5 - 5.5	3		silty SAND, brown, moist, loose, fine grained, poorly graded
	5.5 - 6	3		silty SAND, brown, moist, loose, fine grained, poorly graded
	6 - 6.5	3	6	silty SAND, brown, moist, loose, fine grained, poorly graded
	10 - 10.5	3		SILT w/trace of sand, brown, moist, medium stiff, medium plasticity
	10.5 - 11	4		SILT w/trace of sand, brown, moist, medium stiff, medium plasticity
	11 - 11.5	4	8	SILT w/trace of sand, brown, moist, medium stiff, medium plasticity
	15 - 15.5	5		SAND, brown, moist, medium dense, fine grained, poorly graded
	15.5 - 16	6		SAND, brown, moist, medium dense, fine grained, poorly graded
	16 - 16.5	6	12	SAND, brown, moist, medium dense, fine grained, poorly graded
	20 - 20.5	11		SAND, brown, moist, medium dense, fine grained, poorly graded
	20.5 - 21	11		SAND, brown, moist, medium dense, fine grained, poorly graded
	21 - 21.5	11	22	SAND, brown, moist, medium dense, fine grained, poorly graded
EB-13	5 - 5.5	3		SAND w/trace of silt, brown, moist, loose, fine grained, poorly graded
	5.5 - 6	3		SAND w/trace of silt, brown, moist, loose, fine grained, poorly graded
	6 - 6.5	5	8	SAND w/trace of silt, brown, moist, loose, fine grained, poorly graded
	10 - 10.5	2		SILT w/trace of sand, brown, moist, soft, low to medium plasticity
	10.5 - 11	2		SILT w/trace of sand, brown, moist, soft, low to medium plasticity
	11 - 11.5	2	4	SILT w/trace of sand, brown, moist, soft, low to medium plasticity
	15 - 15.5	3		SAND, brown, moist, loose, fine grained, poorly graded
	15.5 - 16	3		SAND, brown, moist, loose, fine grained, poorly graded
	16 - 16.5	4	7	SAND, brown, moist, loose, fine grained, poorly graded
	20 - 20.5	4		SAND, brown, moist, loose, fine grained, poorly graded
	20.5 - 21	3		SAND, brown, moist, loose, fine grained, poorly graded
	21 - 21.5	3	6	SAND, brown, moist, loose, fine grained, poorly graded

Table 3-1
Summary of Standard Penetration Testing
Former ESCO Main Plant Property

Boring	Depth Interval (ft bgs)	Blow Count	SPT N-Value	Soil Description
EB-14	5 - 5.5	3		SILT, brown, moist, stiff, low plasticity
	5.5 - 6	5		SILT, brown, moist, stiff, low plasticity
	6 - 6.5	8	13	SILT, brown, moist, stiff, low plasticity
	10 - 10.5	3		SILT, brown, moist, stiff, low plasticity
	10.5 - 11	3		SILT, brown, moist, stiff, low plasticity
	11 - 11.5	5	8	SILT, brown, moist, stiff, low plasticity
	15 - 15.5	3		SAND w/trace of silt, brown, moist, loose, fine grained, poorly graded
	15.5 - 16	5		SAND w/trace of silt, brown, moist, loose, fine grained, poorly graded
	16 - 16.5	5	10	SAND w/trace of silt, brown, moist, loose, fine grained, poorly graded
	20 - 20.5	6		SAND w/trace of silt, brown, moist, loose, fine grained, poorly graded
	20.5 - 21	6		SAND w/trace of silt, brown, moist, loose, fine grained, poorly graded
	21 - 21.5	6	12	SAND w/trace of silt, brown, moist, loose, fine grained, poorly graded
EB-15	5 - 5.5	2		SILT w/trace of sand, brown, moist, medium stiff, medium plasticity
	5.5 - 6	3		SILT w/trace of sand, brown, moist, medium stiff, medium plasticity
	6 - 6.5	4	7	SILT w/trace of sand, brown, moist, medium stiff, medium plasticity
	10 - 10.5	3		SILT w/trace of sand, brown, moist, stiff, medium plasticity
	10.5 - 11	4		SILT w/trace of sand, brown, moist, stiff, medium plasticity
	11 - 11.5	5	9	SILT w/trace of sand, brown, moist, stiff, medium plasticity
	15 - 15.5	3		SAND, brown, moist, loose, fine grained, poorly graded
	15.5 - 16	2		SAND, brown, moist, loose, fine grained, poorly graded
	16 - 16.5	3	5	SAND, brown, moist, loose, fine grained, poorly graded
	20 - 20.5	3		SAND, brown, moist, loose, fine grained, poorly graded
	20.5 - 21	4		SAND, brown, moist, loose, fine grained, poorly graded
	21 - 21.5	4	8	SAND, brown, moist, loose, fine grained, poorly graded
EB-17	5 - 5.5	4		SAND, brown, moist, medium dense, fine grained, poorly graded
	5.5 - 6	5		SAND, brown, moist, medium dense, fine grained, poorly graded
	6 - 6.5	6	11	SAND, brown, moist, medium dense, fine grained, poorly graded
	10 - 10.5	4		SAND, brown, moist, medium dense, fine grained, poorly graded
	10.5 - 11	5		SAND, brown, moist, medium dense, fine grained, poorly graded
	11 - 11.5	6	11	SAND, brown, moist, medium dense, fine grained, poorly graded
	15 - 15.5	5		SAND, brown, moist, medium dense, fine grained, poorly graded
	15.5 - 16	5		SAND, brown, moist, medium dense, fine grained, poorly graded
	16 - 16.5	7	12	SAND, brown, moist, medium dense, fine grained, poorly graded
	20 - 20.5	10		SAND, brown, moist, medium dense, fine grained, poorly graded
	20.5 - 21	8		SAND, brown, moist, medium dense, fine grained, poorly graded
	21 - 21.5	9	17	SAND, brown, moist, medium dense, fine grained, poorly graded
EB-18	5 - 5.5	3		SILT w/trace of sand, brown, moist, medium stiff, low plasticity
	5.5 - 6	3		SILT w/trace of sand, brown, moist, medium stiff, low plasticity
	6 - 6.5	4	7	SILT w/trace of sand, brown, moist, medium stiff, low plasticity
	10 - 10.5	2		SILT w/trace of sand, brown, moist, medium stiff, low plasticity
	10.5 - 11	4		SILT w/trace of sand, brown, moist, medium stiff, low plasticity
	11 - 11.5	4	8	SILT w/trace of sand, brown, moist, medium stiff, low plasticity
	15 - 15.5	4		SAND, brown, moist, loose, fine to medium grained, poorly graded
	15.5 - 16	5		SAND, brown, moist, loose, fine to medium grained, poorly graded
	16 - 16.5	5	10	SAND, brown, moist, loose, fine to medium grained, poorly graded
	20 - 20.5	4		SAND, brown, moist, medium dense, fine to medium grained, moderately graded
	20.5 - 21	7		SAND, brown, moist, medium dense, fine to medium grained, moderately graded
	21 - 21.5	6	13	SAND, brown, moist, medium dense, fine to medium grained, moderately graded

Table 3-1
Summary of Standard Penetration Testing
Former ESCO Main Plant Property

Boring	Depth Interval (ft bgs)	Blow Count	SPT N-Value	Soil Description
EB-20	5 - 5.5	2		SILT, brown, moist, stiff, medium plasticity
	5.5 - 6	3		SILT, brown, moist, stiff, medium plasticity
	6 - 6.5	6	9	SILT, brown, wet, stiff, medium plasticity
	10 - 10.5	2		SILT, brown, wet, stiff, medium plasticity
	10.5 - 11	3		SILT, brown, wet, stiff, medium plasticity
	11 - 11.5	4	7	SILT, brown, wet, stiff, medium plasticity
	15 - 15.5	3		sandy SILT, brown, moist, medium stiff, low plasticity
	15.5 - 16	3		sandy SILT, brown, moist, medium stiff, low plasticity
	16 - 16.5	4	7	sandy SILT, brown, moist, medium stiff, low plasticity
	20 - 20.5	4		sandy SILT, brown, moist, stiff, low plasticity
	20.5 - 21	5		sandy SILT, brown, moist, stiff, low plasticity
	21 - 21.5	5	10	sandy SILT, brown, moist, stiff, low plasticity
EB-21	5 - 5.5	3		sandy SILT, brown, moist, medium stiff, low plasticity
	5.5 - 6	4		sandy SILT, brown, moist, medium stiff, low plasticity
	6 - 6.5	4	8	sandy SILT, brown, moist, medium stiff, low plasticity
	10 - 10.5	2		sandy SILT, brown, wet, medium stiff, low plasticity
	10.5 - 11	2		sandy SILT, brown, wet, medium stiff, low plasticity
	11 - 11.5	3	5	sandy SILT, brown, wet, medium stiff, low plasticity
	15 - 15.5	3		SAND, brown, moist, loose, fine grained, poorly graded
	15.5 - 16	4		SAND, brown, moist, loose, fine grained, poorly graded
	16 - 16.5	3	7	SAND, brown, moist, loose, fine grained, poorly graded
	20 - 20.5	2		SAND, brown, wet, very loose, fine grained, poorly graded
	20.5 - 21	2		SAND, brown, wet, very loose, fine grained, poorly graded
	21 - 21.5	2	4	SAND, brown, wet, very loose, fine grained, poorly graded

Notes
ft bgs = feet below ground surface
SPT = Standard Penetration Test (ASTM D1586)

Table 3-2
Groundwater Elevations
Former ESCO Main Plant Property

Well	Date	*Top of Casing (FT-MSL)*	*Ground Level*	*Stickdown/ Stickup*	Depth to Water (FT-BTOC)	Groundwater Elevation	Time	Comments
MW-1	03/27/17	78.67	78.99	0.32	60.07	18.60	—	Installed 3/24/17; pre-development
MW-1	04/07/17	78.67	78.99	0.32	59.48	19.19	9:25	Day of development, first measurement
MW-1	04/13/17	78.67	78.99	0.32	59.34	19.33	11:06	First sampling event; post development
MW-1	05/12/17	78.67	78.99	0.32	58.62	20.05	11:57	Monthly
MW-1	06/21/17	78.67	78.99	0.32	57.87	20.80	10:38	Monthly
MW-1	07/19/17	78.67	78.99	0.32	58.11	20.56	13:08	Monthly
MW-1	08/24/17	78.67	78.99	0.32	58.65	20.02	10:42	Monthly
MW-1	09/22/17	78.67	78.99	0.32	58.99	19.68	13:02	Monthly
MW-1	10/20/17	78.67	78.99	0.32	59.33	19.34	12:06	Monthly
MW-1	11/21/17	78.67	78.99	0.32	59.33	19.34	12:27	Monthly
MW-1	01/04/18	78.67	78.99	0.32	59.40	19.27	10:49	Third sampling event
MW-1	02/13/18	78.67	78.99	0.32	58.95	19.72	13:11	Monthly
MW-1	04/13/18	78.67	78.99	0.32	58.90	19.77	14:23	Monthly
MW-2	03/27/17	84.11	81.13	-2.98	65.59	18.52	—	Installed 3/23/17; pre-development
MW-2	04/05/17	84.11	81.13	-2.98	65.05	19.06	10:15	Day of development, first measurement
MW-2	04/13/17	84.11	81.13	-2.98	64.83	19.28	11:17	First sampling event; post development
MW-2	05/12/17	84.11	81.13	-2.98	64.12	19.99	11:57	Monthly
MW-2	06/21/17	84.11	81.13	-2.98	63.37	20.74	11:02	Second sampling event
MW-2	07/19/17	84.11	81.13	-2.98	63.60	20.51	13:03	Monthly
MW-2	08/24/17	84.11	81.13	-2.98	64.14	19.97	10:54	Monthly
MW-2	09/22/17	84.11	81.13	-2.98	64.50	19.61	12:21	Monthly
MW-2	10/20/17	84.11	81.13	-2.98	64.83	19.28	12:27	Monthly
MW-2	11/21/17	84.11	81.13	-2.98	64.84	19.27	11:30	Monthly
MW-2	01/04/18	84.11	81.13	-2.98	64.90	19.21	10:38	Third sampling event
MW-2	02/13/18	84.11	81.13	-2.98	64.44	19.67	13:16	Monthly
MW-2	04/13/18	84.11	81.13	-2.98	64.40	19.71	14:32	Monthly
MW-3	03/27/17	78.26	78.50	0.24	58.60	19.66	—	Installed 3/24/17; pre-development
MW-3	04/10/17	78.26	78.50	0.24	59.07	19.19	9:35	Day of development, first measurement
MW-3	04/13/17	78.26	78.50	0.24	58.95	19.31	11:10	First sampling event; post development
MW-3	05/12/17	78.26	78.50	0.24	58.21	20.05	11:45	Monthly
MW-3	06/21/17	78.26	78.50	0.24	57.47	20.79	11:45	Second sampling event
MW-3	07/19/17	78.26	78.50	0.24	57.72	20.54	12:22	Monthly
MW-3	08/24/17	78.26	78.50	0.24	58.27	19.99	11:02	Monthly
MW-3	09/22/17	78.26	78.50	0.24	58.62	19.64	12:50	Monthly
MW-3	10/20/17	78.26	78.50	0.24	58.94	19.32	11:24	Monthly

Table 3-2
Groundwater Elevations
Former ESCO Main Plant Property

Well	Date	*Top of Casing (FT-MSL)*	*Ground Level*	*Stickdown/ Stickup*	Depth to Water (FT-BTOC)	Groundwater Elevation	Time	Comments
MW-3	11/21/17	78.26	78.50	0.24	58.95	19.31	10:50	Monthly
MW-3	01/04/18	78.26	78.50	0.24	59.00	19.26	11:30	Third sampling event
MW-3	02/13/18	78.26	78.50	0.24	58.55	19.71	12:47	Monthly
MW-3	04/13/18	78.26	78.50	0.24	58.51	19.75	14:42	Monthly
MW-4	03/27/17	59.55	59.82	0.27	40.85	18.70	—	Installed 3/21/17; pre-development
MW-4	04/04/17	59.55	59.82	0.27	40.41	19.14	10:12	Day of development, first measurement
MW-4	04/13/17	59.55	59.82	0.27	40.19	19.36	11:32	First sampling event; post development
MW-4	05/12/17	59.55	59.82	0.27	39.50	20.05	11:28	Monthly
MW-4	06/21/17	59.55	59.82	0.27	38.84	20.71	11:36	Second sampling event
MW-4	07/19/17	59.55	59.82	0.27	39.14	20.41	12:33	Monthly
MW-4	08/24/17	59.55	59.82	0.27	39.70	19.85	11:09	Monthly
MW-4	09/22/17	59.55	59.82	0.27	40.04	19.51	12:35	Monthly
MW-4	10/20/17	59.55	59.82	0.27	40.35	19.20	10:35	Monthly
MW-4	11/21/17	59.55	59.82	0.27	40.34	19.21	11:40	Monthly
MW-4	01/04/18	59.55	59.82	0.27	40.35	19.20	11:41	Third sampling event
MW-4	02/13/18	59.55	59.82	0.27	39.94	19.61	13:01	Monthly
MW-4	04/13/18	59.55	59.82	0.27	39.86	19.69	14:48	Monthly
MW-5	03/27/17	62.73	62.91	0.18	44.07	18.66	—	Installed 3/22/17; pre-development
MW-5	04/03/17	62.73	62.91	0.18	43.67	19.06	12:53	Day of development, first measurement
MW-5	04/13/17	62.73	62.91	0.18	43.38	19.35	11:36	First sampling event; post development
MW-5	05/12/17	62.73	62.91	0.18	42.72	20.01	10:47	Monthly
MW-5	05/12/17	62.73	62.91	0.18	42.70	20.03	11:22	Monthly
MW-5	06/21/17	62.73	62.91	0.18	42.03	20.70	11:29	Second sampling event
MW-5	07/19/17	62.73	62.91	0.18	42.33	20.40	12:40	Monthly
MW-5	08/24/17	62.73	62.91	0.18	42.86	19.87	11:14	Monthly
MW-5	09/22/17	62.73	62.91	0.18	43.21	19.52	12:40	Monthly
MW-5	10/20/17	62.73	62.91	0.18	43.53	19.20	10:42	Monthly
MW-5	11/21/17	62.73	62.91	0.18	43.50	19.23	11:35	Monthly
MW-5	01/04/18	62.73	62.91	0.18	43.53	19.20	11:36	Third sampling event
MW-5	02/13/18	62.73	62.91	0.18	43.12	19.61	12:56	Monthly
MW-5	04/13/18	62.73	62.91	0.18	43.05	19.68	14:52	Monthly
MW-6	03/27/17	69.37	69.71	0.34	50.85	18.52	—	Installed 3/27/17; pre-development
MW-6	04/06/17	69.37	69.71	0.34	50.20	19.17	10:27	Day of development, first measurement
MW-6	04/13/17	69.37	69.71	0.34	50.04	19.33	11:27	First sampling event; post development

Table 3-2
Groundwater Elevations
Former ESCO Main Plant Property

Well	Date	*Top of Casing (FT-MSL)*	*Ground Level*	*Stickdown/ Stickup*	Depth to Water (FT-BTOC)	Groundwater Elevation	Time	Comments
MW-6	05/12/17	69.37	69.71	0.34	49.34	20.03	11:35	Monthly
MW-6	06/21/17	69.37	69.71	0.34	48.65	20.72	11:21	Second sampling event
MW-6	07/19/17	69.37	69.71	0.34	48.92	20.45	12:52	Monthly
MW-6	08/24/17	69.37	69.71	0.34	49.45	19.92	11:21	Monthly
MW-6	09/22/17	69.37	69.71	0.34	49.80	19.57	12:56	Monthly
MW-6	10/20/17	69.37	69.71	0.34	50.11	19.26	10:53	Monthly
MW-6	11/21/17	69.37	69.71	0.34	50.13	19.24	11:00	Monthly
MW-6	01/04/18	69.37	69.71	0.34	50.15	19.22	11:15	Third sampling event
MW-6	02/13/18	69.37	69.71	0.34	49.75	19.62	12:37	Monthly
MW-6	04/13/18	69.37	69.71	0.34	49.66	19.71	12:08	Monthly
MW-7	06/16/17	79.73	80.07	0.34	58.97	20.76	12:56	Day of development, first measurement
MW-7	06/21/17	79.73	80.07	0.34	58.96	20.77	10:45	First sampling event
MW-7	07/19/17	79.73	80.07	0.34	59.20	20.53	13:16	Monthly
MW-7	08/24/17	79.73	80.07	0.34	59.74	19.99	10:50	Monthly
MW-7	09/22/17	79.73	80.07	0.34	60.09	19.64	12:18	Monthly
MW-7	10/20/17	79.73	80.07	0.34	60.42	19.31	12:20	Monthly
MW-7	11/21/17	79.73	80.07	0.34	60.35	19.38	12:14	Monthly
MW-7	01/04/18	79.73	80.07	0.34	60.49	19.24	10:47	Second sampling event
MW-7	02/13/18	79.73	80.07	0.34	60.06	19.67	12:11	Monthly
MW-7	04/13/18	79.73	80.07	0.34	59.97	19.76	14:27	Monthly
MW-8	06/16/17	82.65	82.98	0.33	61.90	20.75	8:45	Day of development, first measurement
MW-8	06/21/17	82.65	82.98	0.33	61.89	20.76	9:05	First sampling event
MW-8	07/19/17	82.65	82.98	0.33	62.11	20.54	13:26	Monthly
MW-8	08/24/17	82.65	82.98	0.33	62.69	19.96	10:36	Monthly
MW-8	09/22/17	82.65	82.98	0.33	63.02	19.63	12:11	Monthly
MW-8	10/20/17	82.65	82.98	0.33	63.34	19.31	12:17	Monthly
MW-8	11/21/17	82.65	82.98	0.33	63.34	19.31	12:20	Monthly
MW-8	01/04/18	82.65	82.98	0.33	63.40	19.25	10:59	Second sampling event
MW-8	02/13/18	82.65	82.98	0.33	62.99	19.66	12:16	Monthly
MW-8	04/13/18	82.65	82.98	0.33	62.90	19.75	14:09	Monthly

Table 4-1

ISM/RSM Soil Sample Results -- PCBs

ESCO Corporation - Former Main Plant Property

Clean Fill | Residential

Sample ID	APEX Lab ID	Sample Date	PCB Aroclors (EPA Method 8082A, µg/Kg, dry weight basis)							Total PCBs as Aroclors
			1016	1221	1232	1242	1248	1254	1260	
AREA A - Upper Soil Horizon (0.5-2.5 ft bgs)										
AP-U1	A8A0980-62	01/29/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U
AP-U2	A8A0980-64	01/29/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U
AP-U3	A8A0980-66	01/29/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U
AREA A - Lower Soil Horizon (2.5-5.0 ft bgs)										
AP-L1	A8A0980-68	01/29/18	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U
AP-L2	A8A0980-70	01/29/18	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U
AP-L3	A8A0980-72	01/29/18	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U
AREA B - Upper Soil Horizon (0.5-2.5 ft bgs)										
BP-U1	A8B0071-AW	01/29/18	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	**6.16** J	**6.16** J
BP-U2	A8B0071-AY	01/29/18	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U
BP-U3	A8B0071-BA	01/29/18	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U
AREA B - Lower Soil Horizon (2.5-5.0 ft bgs)										
BP-L1	A8B0071-BC	01/29/18	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U
BP-L2	A8B0071-BE	01/29/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U
BP-L3	A8B0071-BG	01/29/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U
AREA C - Upper Soil Horizon (0.5-2.5 ft bgs)										
CP-U1	A8B0071-BU	01/30/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U
CP-U2	A8B0071-BW	01/30/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U
CP-U3	A8B0071-BY	01/30/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U
AREA C - Lower Soil Horizon (2.5-5.0 ft bgs)										
CP-L1	A8B0071-CA	01/30/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U
CP-L2	A8B0071-CC	01/30/18	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U
CP-L3	A8B0071-CE	01/30/18	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U	10.7 U
AREA H - Bldg 9 Upper Soil Horizon (0.5-2.5 ft bgs)										
H-U1	A8D0026-02	03/29/18	9.17 U,Q42	9.17 U,Q42	9.17 U,Q42	9.17 U,Q42	9.17 U,Q42	**12.2** P10	**7.49** J	**19.7** J
H-U2	A8D0026-04	03/29/18	9.89 U,Q42	9.89 U,Q42	9.89 U,Q42	9.89 U,Q42	9.89 U,Q42	**10.5** P10	**9.97** P10	**20.5** J
H-U3	A8D0026-06	03/29/18	9.35 U,Q42	9.35 U,Q42	9.35 U,Q42	9.35 U,Q42	9.35 U,Q42	**9.19** J	**7.18** J	**16.4** J
AREA H - Bldg 9 Lower Soil Horizon (2.5-5.0 ft bgs)										
H-L1	A8D0026-08	03/29/18	8.73 U	8.73 U	8.73 U	8.73 U	8.73 U	8.73 U	8.73 U	8.73 U
H-L2	A8D0026-10	03/29/18	9.58 U	9.58 U	9.58 U	9.58 U	9.58 U	9.58 U	9.58 U	9.58 U
H-L3	A8D0026-12	03/29/18	9.32 U	9.32 U	9.32 U	9.32 U	9.32 U	9.32 U	9.32 U	9.32 U
WILSON 1 - Upper Soil Horizon (0.5-2.5 ft bgs)										
W1-U1	A8C1156-02	03/28/18	9.24 U	9.24 U	9.24 U	**14.7** P09	9.24 U	9.24 U	9.24 U	**14.7** J
W1-U2	A8C1156-04	03/28/18	9.39 U	9.39 U	9.39 U	**9.85** P09	9.39 U	9.39 U	9.39 U	**9.85** J
W1-U3	A8C1156-06	03/28/18	9.31 U	9.31 U	9.31 U	**8.63** P09	9.31 U	9.31 U	9.31 U	**8.63** J
WILSON 1 - Lower Soil Horizon (2.5-5.0 ft bgs)										
W1-L1	A8C1156-08	03/28/18	9.55 U	9.55 U	9.55 U	9.55 U	9.55 U	9.55 U	9.55 U	9.55 U
W1-L2	A8C1156-10	03/28/18	9.42 U	9.42 U	9.42 U	9.42 U	9.42 U	9.42 U	9.42 U	9.42 U
W1-L3	A8C1156-12	03/28/18	9.65 U	9.65 U	9.65 U	9.65 U	9.65 U	9.65 U	9.65 U	9.65 U

Table 4-1

ISM/RSM Soil Sample Results -- PCBs

ESCO Corporation - Former Main Plant Property

Clean Fill | Residential

Sample ID	APEX Lab ID	Sample Date	PCB Aroclors (EPA Method 8082A, µg/Kg, dry weight basis) 1016	1221	1232	1242	1248	1254	1260	Total PCBs as Aroclors
WILSON 2 - Upper Soil Horizon (0.5-2.5 ft bgs)										
W2-U1	A8C1149-02	03/26/18	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U
W2-U2	A8C1149-04	03/26/18	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U
W2-U3	A8C1149-06	03/26/18	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U
WILSON 2 - Lower Soil Horizon (2.5-5.0 ft bgs)										
W2-L1	A8C1149-08	03/26/18	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U
W2-L2	A8C1149-10	03/26/18	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U	10.1 U
W2-L3	A8C1149-12	03/26/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U
ROOSEVELT 2 - Upper Soil Horizon (0.5-2.5 ft bgs)										
R2-U1	A8C1152-02	03/27/18	10.3 U	10.3 U	10.3 U	10.3 U	10.3 U	**6.84** Ja	10.3 U	**6.84** J
R2-U2	A8C1152-04	03/27/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	**8.43** Ja	10.2 U	**8.43** J
R2-U3	A8C1152-06	03/27/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	**8.91** Ja	10.2 U	**8.91** J
ROOSEVELT 2 - Lower Soil Horizon (2.5-5.0 ft bgs)										
R2-L1	A8C1152-08	03/27/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U
R2-L2	A8C1152-10	03/27/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U
R2-L3	A8C1152-12	03/27/18	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U	10.2 U

Notes/Qualifiers

See Appendix F for maps depicting the ISM sample grids for each area.

U: The analyte was analyzed for, but was not detected above the level of the reported sample quantitation limit (MRL).

Ja: Estimated Result. Result detected below the lowest point of the calibration curve, but above the specified MDL.

UJ: Not detected at the value shown, which is estimated due to low surrogate recovery.

Q42: Matrix Spike and/or Duplicate analysis was performed on this sample. % Recovery or RPD for this analyte is outside laboratory control limits.

R02: Reporting limits raised to account for interference from coeluting organic compounds present in the sample.

P09: Due to weathering and/or the presence of an unknown mixture of PCB Congeners, the pattern does not match the standard used for calibration. Results are Estimated and based on the closest matching Aroclor.

P10: Result estimated due to the presence of multiple PCB Aroclors and/or matrix interference.

RBDM RBC	
--Soil ingestion, contact, inhalation (Res)	**233**
--Soil ingestion, contact, inhalation (Urb Res)	330
--Soil ingestion, contact, inhalation (Occup)	590
--Soil ingestion, contact, inhalation (Const. W)	4,900
--Soil ingestion, contact, inhalation (Excv. W)	140,000
--Leaching to Groundwater (res/Urban Res)	240/1,100
DEQ Background Concentrations (2013)	—
Clean Fill	**200**
RBC-Generic Remedy (Industrial)	7,500
BES Trigger Level for CSA Stormwater Infiltration	500

Table 4-2

ISM/RSM Soil Sample Results -- PAHs as BaP Equivalents

ESCO Corporation - Former Main Plant Property

Clean Fill (<Residential)	>Residential and <Urban Residential	>Urban Residential and <Occupational	>Occupational and <Construction

			Polynuclear Aromatic Hydrocarbons (PAHs, EPA 8270D SIM, µg/Kg, dry weight basis)								
Sample ID	APEX Lab ID	Sample Date	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene	BaP Equivalence (ND=0.5 MDL)
Area A - Upper Soil Horizon (0.5-2.5 ft bgs)											
AP-U1	A8A0980-62	01/29/18	222 M05	352	557 M05	216 M05	475	352 M05	92.6 Ja	442	**597**
AP-U2	A8A0980-64	01/29/18	251 M05	432	628 M05	255 M05	524	408 M05	88.2 Ja	478	**691**
AP-U3	A8A0980-66	01/29/18	204 M05	321	503 M05	181 M05	388	317 M05	68.5 Ja	362	**522**
Area A - Lower Soil Horizon (2.5-5.0 ft bgs)											
AP-L1	A8A0980-68	01/29/18	28.3 M05	43.2	66.1 M05	27.4 M05	53.5	44.9 M05	8.56 Ja	48.6	**69.8**
AP-L2	A8A0980-70	01/29/18	29.3 M05	44.3	65.7 M05	29.6 M05	49.6	49.2 M05	8.18 Ja	46.4	**70.6**
AP-L3	A8A0980-72	01/29/18	30.6 M05	41.5	65.2 M05	28.1 M05	50.0	51.2 M05	8.13 Ja	45.6	**67.6**
Area B - Upper Soil Horizon (0.5-2.5 ft bgs)											
BP-U1	A8B0071-AW	01/29/18	540 M05	630	934 M05	314 M05	468	744 M05	113	498	**984**
BP-U2	A8B0071-AY	01/29/18	868 M05	708	1040 M05	365 M05	436	1210 M05	123	464	**1121**
BP-U3	A8B0071-BA	01/29/18	401 M05	425	616 M05	229 M05	302	495 M05	85.1	319	**675**
Area B - Lower Soil Horizon (2.5-5.0 ft bgs)											
BP-L1	A8B0071-BC	01/29/18	26.1 M05	29.8	37.4 M05	14.3 M05	28.3	31.6 M05	5.41 J	25.9	**46.2**
BP-L2	A8B0071-BE	01/29/18	21.1 M05	21.4	31 M05	10.3 M05	21.5	26.2 M05	5.1 U	20.3	**32.7**
BP-L3	A8B0071-BG	01/29/18	19.7 M05	17.2	30.5 M05	9.12 J	16.6	22.4 M05	5.06 U	16.8	**27.7**
Area C - Upper Soil Horizon (0.5-2.5 ft bgs)											
CP-U1	A8B0071-BU	01/30/18	442	456	471 M05	180 M05	280 Q42	536 Q42	56.9	286	**659**
CP-U2	A8B0071-BW	01/30/18	388	406	453 M05	167 M05	244	471	53.6	262	**594**
CP-U3	A8B0071-BY	01/30/18	406	406	439 M05	157 M05	213	464	48.9	235	**585**
Area C - Lower Soil Horizon (2.5-5.0 ft bgs)											
CP-L1	A8B0071-CA	01/30/18	20.1 M05	7.09 J	21.3 M05	7.81 J	9.86 J	20.6 M05	5.08 U	12.5	**16.1**
CP-L2	A8B0071-CC	01/30/18	223	185	251 M05	88.7 M05	132	248	22.8	144	**282**
CP-L3	A8B0071-CE	01/30/18	25.1 M05	17.8	24.9 M05	9.74 J	13.3	26.1 M05	5.35 U	14.2	**28.3**
Area H - Bldg 9 Upper Soil Horizon (0.5-2.5 ft bgs)											
H-U1	A8D0026-02	03/29/18	169 M05	285	445 M05	170 M05	269	280 M05	68.3	297	**467**
H-U2	A8D0026-04	03/29/18	138 M05	234	383 M05	134 M05	215	224 M05	60.6	239	**388**
H-U3	A8D0026-06	03/29/18	157 M05	275	459 M05	146 M05	249	272 M05	72.0	280	**456**
AREA H - Bldg 9 Lower Soil Horizon (2.5-5.0 ft bgs)											
H-L1	A8D0026-08	03/29/18	58.0 M05	86.5	135 M05	49.2 M05	70.6	93.7 M05	20.7	80.4	**141**
H-L2	A8D0026-10	03/29/18	157 M05	163	198 M05	85.0 M05	102	273 M05	31.5	31.5	**245**
H-L3	A8D0026-12	03/29/18	99.8 M05	123	174 M05	64.0 M05	89.8	173 M05	26.3	97.3	**195**
Wilson 1 - Upper Soil Horizon (0.5-2.5 ft bgs)											
W1-U1	A8C1156-02	03/28/18	11.2 M05	14.5	22.3 M05	10.8 M05	15.6	12.7 M05	4.88 U	16.4	**23.3**
W1-U2	A8C1156-04	03/28/18	9.95 J	14.5	23.1 M05	9.82 J	15.6	13.2 M05	5.13 U	16.8	**23.3**
W1-U3	A8C1156-06	03/28/18	13.9 M05	19.6	31.0 M05	13.7 M05	21.1	19.1 M05	5.00 U	21.1	**30.5**

Table 4-2

ISM/RSM Soil Sample Results -- PAHs as BaP Equivalents

ESCO Corporation - Former Main Plant Property

Clean Fill (<Residential)	>Residential and <Urban Residential	>Urban Residential and <Occupational	>Occupational and <Construction

			Polynuclear Aromatic Hydrocarbons (PAHs, EPA 8270D SIM, µg/Kg, dry weight basis)								
Sample ID	APEX Lab ID	Sample Date	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene	BaP Equivalence (ND=0.5 MDL)
Wilson 1 - Lower Soil Horizon (2.5-5.0 ft bgs)											
W1-L1	A8C1156-08	03/28/18	4.86 U	4.86 U	4.86 U	4.86 U	4.86 U	4.86 U	4.86 U	4.86 U	**5.9** U
W1-L2	A8C1156-10	03/28/18	5.03 U	5.03 U	5.03 U	5.03 U	5.03 U	5.03 U	5.03 U	5.03 U	**6.1** U
W1-L3	A8C1156-12	03/28/18	4.92 U	4.92 U	4.92 U	4.92 U	4.92 U	4.92 U	4.92 U	4.92 U	**6.0** U
Wilson 2 - Upper Soil Horizon (0.5-2.5 ft bgs)											
W2-U1	A8C1149-02	03/26/18	51.2 M05	65.5	115 M05	42.2 M05	75.1	89.1 M05	13.6	71.6	**109**
W2-U2	A8C1149-04	03/26/18	42.6 M05	58.0	104 M05	30.9 M05	67.7	73.4 M05	14.2	64.2	**97.8**
W2-U3	A8C1149-06	03/26/18	52.2 M05	73.3	118 M05	38.8 M05	71.1	84.9 M05	22.9 U	73.0	**115**
Wilson 2 - Lower Soil Horizon (2.5-5.0 ft bgs)											
W2-L1	A8C1149-08	03/26/18	6.97 J	4.32 U	7.89 J	4.32 U	4.32 U	5.99 J	4.32 U	4.88 J	**6.6**
W2-L2	A8C1149-10	03/26/18	5.85 J	5.07 U	5.38 U	5.07 U	5.07 J	5.07 J	5.07 U	5.07 U	**6.5**
W2-L3	A8C1149-12	03/26/18	6.31 J	4.33 U	6.98 J	4.33 U	4.33 U	5.47	4.33 U	4.33 U	**6.2**
Roosevelt 2 - Upper Soil Horizon (0.5-2.5 ft bgs)											
R2-U1	A8C1152-02	03/27/18	30.0 M05	34.8	67.4 M05	24.2 M05	39.9	46.0 M05	7.88 J	37.3	**59.4**
R2-U2	A8C1152-04	03/27/18	26.3 M05	28.5	57.2 M05	19.4 M05	33.1	41.2 M05	8.05 J	30.7	**50.7**
R2-U3	A8C1152-06	03/27/18	22.1 M05	25.6	48.6 M05	18.0 M05	28.5	33.8 M05	6.86 J	28.0	**44.8**
Roosevelt 2 - Lower Soil Horizon (2.5-5.0 ft bgs)											
R2-L1	A8C1152-08	03/27/18	6.08 J	5.25 J	8.77 J	5.09 U	6.63 J	5.43 J	5.09 U	7.16 J	**10.4**
R2-L2	A8C1152-10	03/27/18	7.09 J	5.66 J	13.1 M05	5.15 J	12.9	5.92 J	5.09 U	11.3	**12.1**
R2-L3	A8C1152-12	03/27/18	5.52 J	5.11 U	6.77 J	5.11 U	5.11 U	5.11 U	5.11 U	5.43 J	**7.2**

Notes/Qualifiers

See Appendix F for maps depicting the ISM sample grids for each area.

U = Constituent not detected at reported Method Detection Limit (MDL).

J =Estimated Result. Result detected below the lowest point of the calibration curve, but above the specified MDL.

Ja = Estimated Result. Result detected below the lowest point of the calibration curve, but above the specified MDL.

M05 = Estimated results. Peak separation for structural isomers is insufficient for accurate quantification.

Q42 = 'Matrix Spike and/or Duplicate analysis was performed on this sample. % Recovery or RPD for this analyte is outside laboratory control limits.

RBDM RBC ***(NOTE: BaPeq RBCs Updated by DEQ in April 2018)***

	Benz(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(g,h,i)perylene	Chrysene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene	BaP Equivalence
--Soil ingestion, contact, inhalation (Res)									**110**
--Soil ingestion, contact, inhalation (Urb Res)									**250**
--Soil ingestion, contact, inhalation (Occup)									**2,100**
--Soil ingestion, contact, inhalation (Const. W)									**17,000**
--Soil ingestion, contact, inhalation (Exc. W)									**490,000**
--Leaching to Groundwater	640	600	6,200	>Csat	—	>Csat	2,000	>Csat	
DEQ Background Concentrations (2013)	—	—	—	—	—	—	—	—	
Clean Fill (assumed = Residential RBC)									**110**

Table 4-3

ISM/RSM Soil Sample Results -- Total Metals

ESCO Corporation - Former Main Plant Property

Clean Fill or Background	>Clean Fill and <Residential	>Occupational and >Construction	>Background and <Construction

Sample ID	APEX Lab ID	Sample Date	Total Metals (EPA Method 6020A, mg/kg, dry weight basis)											
			Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
AREA A - Upper Soil Horizon (0.5-2.5 ft bgs)														
AP-U1	A8A0980-62	01/29/18	11.3	161	0.760	142	157 Q39,Q42	203	0.242 U,A01a	14.6	89.4	0.561 Ja	0.440	186
AP-U2	A8A0980-64	01/29/18	10.7	162	0.711	121	64.7	188	0.178 U,A01a	13.3	81.9	0.503 Ja	0.355	181
AP-U3	A8A0980-66	01/29/18	11.7	175	0.693	150	70.0	269	0.248 U,A01a	11.5	75.1	0.990 U	0.307	191
AREA A - Lower Soil Horizon (2.5-5.0 ft bgs)														
AP-L1	A8A0980-68	01/29/18	13.5	210	0.593	32.7	507	308	0.0879 U,A01a	3.81	30.2	1.10 U	0.220	171
AP-L2	A8A0980-70	01/29/18	14.2	215	0.660	33.3	212	323	0.103 U,A01a	4.01	30.0	1.03 U	0.124 Ja	140
AP-L3	A8A0980-72	01/29/18	14.2	196	0.649	32.4	113	936	0.0838 U,A01a	3.70	29.3	1.05 U	0.377	149
AREA B - Upper Soil Horizon (0.5-2.5 ft bgs)														
BP-U1	A8B0071-AW	01/29/18	9.50	144	0.476	95.2	64.6	60.7	0.227 U,A01a	17.4	76.3	1.08 U	0.130 J	126
BP-U2	A8B0071-AY	01/29/18	11.0	116	0.420	91.0	62.0	51.0	0.310 U,A01a	12.7	72.9	1.00 U	0.120 J	100
BP-U3	A8B0071-BA	01/29/18	9.24	124	0.464	84.9	56.3	55.8	0.194 U,A01a	13.3	63.1	1.08 U	0.119 J	107
AREA B - Lower Soil Horizon (2.5-5.0 ft bgs)														
BP-L1	A8B0071-BC	01/29/18	11.2	179	0.405	27.8	27.2	16.5	0.0853 U,A01a	1.79	19.6	1.07 U	0.213 U	93.2
BP-L2	A8B0071-BE	01/29/18	11.6	185	0.422	26.7	25.7	17.0	0.0904 U,A01a	1.51	18.3	1.00 U	0.201 U	97.0
BP-L3	A8B0071-BG	01/29/18	11.8	192	0.433	28.6	26.5	17.0	0.0825 U,A01a	1.57	19.9	1.03 U	0.206 U	97.0
AREA C - Upper Soil Horizon (0.5-2.5 ft bgs)														
CP-U1	A8B0071-BU	01/30/18	9.32	164	0.455	19.0	28.4	16.8	0.0887 U,A01a	0.787 J	17.5	1.11 U	0.222 U	83.9
CP-U2	A8B0071-BW	01/30/18	10.7	191	0.513	23.7	32.0	21.6	0.0874 U,A01a	0.765 J	21.1	1.09 U	0.218 U	99.6
CP-U3	A8B0071-BY	01/30/18	8.49	155	0.458	18.5	24.9	17.0	0.0814 U,A01a	0.509 J	16.7	1.02 U	0.203 U	80.3
AREA C - Lower Soil Horizon (2.5-5.0 ft bgs)														
CP-L1	A8B0071-CA	01/30/18	9.40	167	0.530	20.4	25.9	11.6	0.0848 U,A01a	1.06 U	18.1	1.06 U	0.212 U	74.3
CP-L2	A8B0071-CC	01/30/18	9.84	173	0.569	21.7	27.5	12.2	0.0859 U,A01a	1.07 U	19.5	1.07 U	0.215 U	78.0
CP-L3	A8B0071-CE	01/30/18	9.10	171	0.515	20.3	26.4	12.4	0.0936 U,A01a	1.17 U	18.5	1.17 U	0.234 U	74.2

Table 4-3

ISM/RSM Soil Sample Results -- Total Metals

ESCO Corporation - Former Main Plant Property

Clean Fill or Background	>Clean Fill and <Residential	>Occupational and >Construction	>Background and <Construction

			Total Metals (EPA Method 6020A, mg/kg, dry weight basis)											
Sample ID	APEX Lab ID	Sample Date	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
AREA H - Bldg 9 Upper Soil Horizon (0.5-2.5 ft bgs)														
H-U1	A8D0026-02	03/29/18	8.49	153	0.744	166 Q42	107	68.1	0.204 U	54.8	207 Q42	0.510 U	0.298	130 Q42
H-U2	A8D0026-04	03/29/18	8.16	150	0.671	168	106	68.6	0.206 U	58.2	331	0.749 J	0.364	136
H-U3	A8D0026-06	03/29/18	10.2	165	0.790	194	110	76.6	0.198 U	58.9	258	0.495 U	0.521	143
AREA H - Bldg 9 Lower Soil Horizon (2.5-5.0 ft bgs)														
H-L1	A8D0026-08	03/29/18	8.44	154	0.480	27.5	35.3	25.4	0.208 U	2.81	33.1	0.520 U	0.104 U	80.2
H-L2	A8D0026-10	03/29/18	7.86	141	0.428	23.6	38.3	20.4	0.211 U	2.17	26.0	0.527 U	0.105 U	71.3
H-L3	A8D0026-12	03/29/18	8.39	159	0.492	25.9	33.9	25.4	0.205 U	2.51	31.3	0.512 U	0.102 U	79.1
WILSON 1 - Upper Soil Horizon (0.5-2.5 ft bgs)														
W1-U1	A8C1156-02	03/28/18	8.27	152	0.566	21.5	27.7	15.3	0.135 R01	0.919 J	21.5	0.561 U	0.226	110
W1-U2	A8C1156-04	03/28/18	8.03	154	0.555	20.2	26.5	15.3	0.135 R01	0.873 J	19.5	0.563 U	0.317	106
W1-U3	A8C1156-06	03/28/18	8.90	158	0.611	23.1	29.4	17.4	0.129 R01	0.937 J	21.4	0.537 U	0.176	114
WILSON 1 - Lower Soil Horizon (2.5-5.0 ft bgs)														
W1-L1	A8C1156-08	03/28/18	8.60	152	0.634	20.2	25.0	15.1	0.133 R01	0.596 J	19.6	0.554 U	0.111 U	75.8
W1-L2	A8C1156-10	03/28/18	8.72	145	0.599	19.9	26.8	14.0	0.124 R01	0.572 J	19.1	0.519 U	0.104 U	75.9
W1-L3	A8C1156-12	03/28/18	8.63	146	0.596	20.3	25.2	15.6	0.131 R01	0.573 J	18.8	0.548 U	0.201	76.3
WILSON 2 - Upper Soil Horizon (0.5-2.5 ft bgs)														
W2-U1	A8C1149-02	03/26/18	9.48	197	1.47	23.3	31.6	92.8	0.104 Q29,R01	1.95	20.1	0.541 Q17,J	0.270	130
W2-U2	A8C1149-04	03/26/18	9.21	185	1.19	22.7	28.8	73.1	0.0837 Q29,R01	1.76	20.4	0.523 U	0.398	112
W2-U3	A8C1149-06	03/26/18	8.72	172	1.81	22.1	28.5	64.0	0.0893 Q29,R01	1.79	20.6	0.558 U	0.201 J	113
WILSON 2 - Lower Soil Horizon (2.5-5.0 ft bgs)														
W2-L1	A8C1149-08	03/26/18	7.78	159	0.519	22.9	27.5	14.7	0.0902 Q29,R01	0.936 J	18.8	0.564 U	0.113 U	79.3
W2-L2	A8C1149-10	03/26/18	7.23	156	0.531	19.5	27.0	13.5	0.0849 Q29,R01	0.849 J	18.4	0.531 U	0.106 U	72.3
W2-L3	A8C1149-12	03/26/18	7.26	156	0.519	18.3	49.4	14.4	0.0884 Q29,R01	0.806	17.4	0.552 U	0.110 U	72.1

Table 4-3

ISM/RSM Soil Sample Results -- Total Metals

ESCO Corporation - Former Main Plant Property

Clean Fill or Background	>Clean Fill and <Residential	>Occupational and >Construction	>Background and <Construction

Sample ID	APEX Lab ID	Sample Date	Total Metals (EPA Method 6020A, mg/kg, dry weight basis) Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
ROOSEVELT 2 - Upper Soil Horizon (0.5-2.5 ft bgs)														
R2-U1	A8C1152-02	03/27/18	8.91	174	0.470	38.2	28.5	24.1	0.107 Q29,R01	2.99	22.1	0.534 U	0.107 J	102
R2-U2	A8C1152-04	03/27/18	9.53	186	0.445	33.1	31.1	34.1	0.130 Q29,R01	2.97	21.8	0.543 U	0.141 J	120
R2-U3	A8C1152-06	03/27/18	8.32	173	0.446	28.3	26.1	23.9	0.123 Q29,R01	2.68	19.6	0.557 U	0.145 J	97.5
ROOSEVELT 2 - Lower Soil Horizon (2.5-5.0 ft bgs)														
R2-L1	A8C1152-08	03/27/18	10.4	192	0.435	26.2	27.7	18.0	0.0810 Q29,R01	1.18	19.2	0.506 U	0.101 U	94.3
R2-L2	A8C1152-10	03/27/18	8.61	165	0.353	20.2	26.0	16.6	0.0934 Q29,R01	0.872 J	15.8	0.872 J	0.104 U	83.2
R2-L3	A8C1152-12	03/27/18	10.6	198	0.420	24.6	25.9	15.5	0.102 Q29,R01	1.12 J	19.9	0.567 U	0.113 J	96.0

Notes/Qualifiers

See Appendix F for maps depicting the ISM sample grids for each area.
U: Not detected at the Method Detection Limit (MDL) shown.
J: Estimated concentration detected <MRL and >MDL.
Ja: Estimated Result. Result detected below the lowest point of the calibration curve, but above the specified MDL.
Q17: RPD between original and duplicate sample is outside of established control limits.
Q29: Recovery for Lab Control Spike (LCS) is above the upper control limit. Data may be biased high.
Q39: Results for sample duplicate are significantly higher than the sample results.
Q42: Matrix Spike and/or Duplicate analysis was performed on this sample. % Recovery or RPD for this analyte is outside laboratory control limits.
R01: The Reporting Limit for this analyte has been raised to account for matrix interference.
A01a: MDL raised to account for matrix interference from tungsten.

	Arsenic	Barium	Cadmium	Chromium	Copper	Lead	Mercury	Molybdenum	Nickel	Selenium	Silver	Zinc
RBDM RBC												
--Soil ingestion, contact, inhalation (Res)	0.43	15,000	78	120,000	3,100	400	23	—	1,500	—	390	—
--Soil ingestion, contact, inhalation (Urb Res)	1.0	31,000	160	230,000	6,200	400	47	—	3,100	—	780	—
--Soil ingestion, contact, inhalation (Occup)	1.9	220,000	1,100	>Max	47,000	800	350	—	22,000	—	5,800	—
--Soil ingestion, contact, inhalation (Const. W)	15	69,000	350	530,000	14,000	800	110	—	7,000	—	1,800	—
--Soil ingestion, contact, inhalation (Excv. W)	420	>max	9,700	>Max	390,000	800	2,900	—	190,000	—	49,000	—
--Leaching to Groundwater	—	—	—	—	—	30	—	—	—		—	
DEQ Background Concentrations (2013)	8.791	791.6	0.627	75.79	33.75	79.06	0.23	—	47.35	0.71	0.818	182.9
Clean Fill	8.8	790	0.63	76	34	28	0.23	—	47	0.71	—	180
EPA RSL (Residential, HQ=1)								390		390		23000
BES Trigger Level for CSA Stormwater Infiltration	100	—	20	100	40	100	4	20	100	20	100	370

FIGURES

United States Geological Survey 7.5-minute series US Topo, Portland, OR-WA, 2014

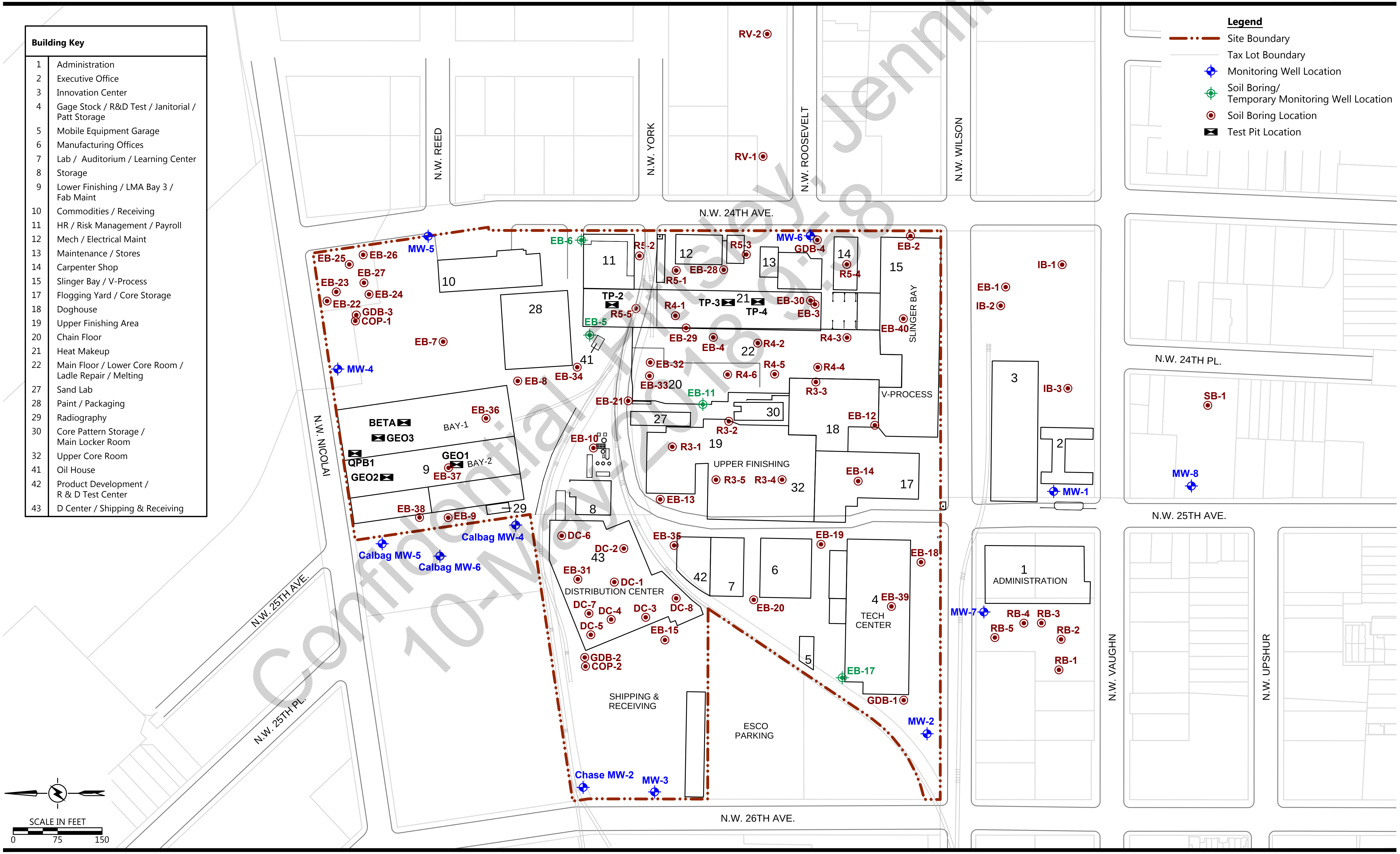
ESCO_Site_1804.dwg, 4/25/2018 - 12:35 PM

BRIDGEWATER GROUP

Site Location
ESCO Corporation
Portland, Oregon

Figure
1-1

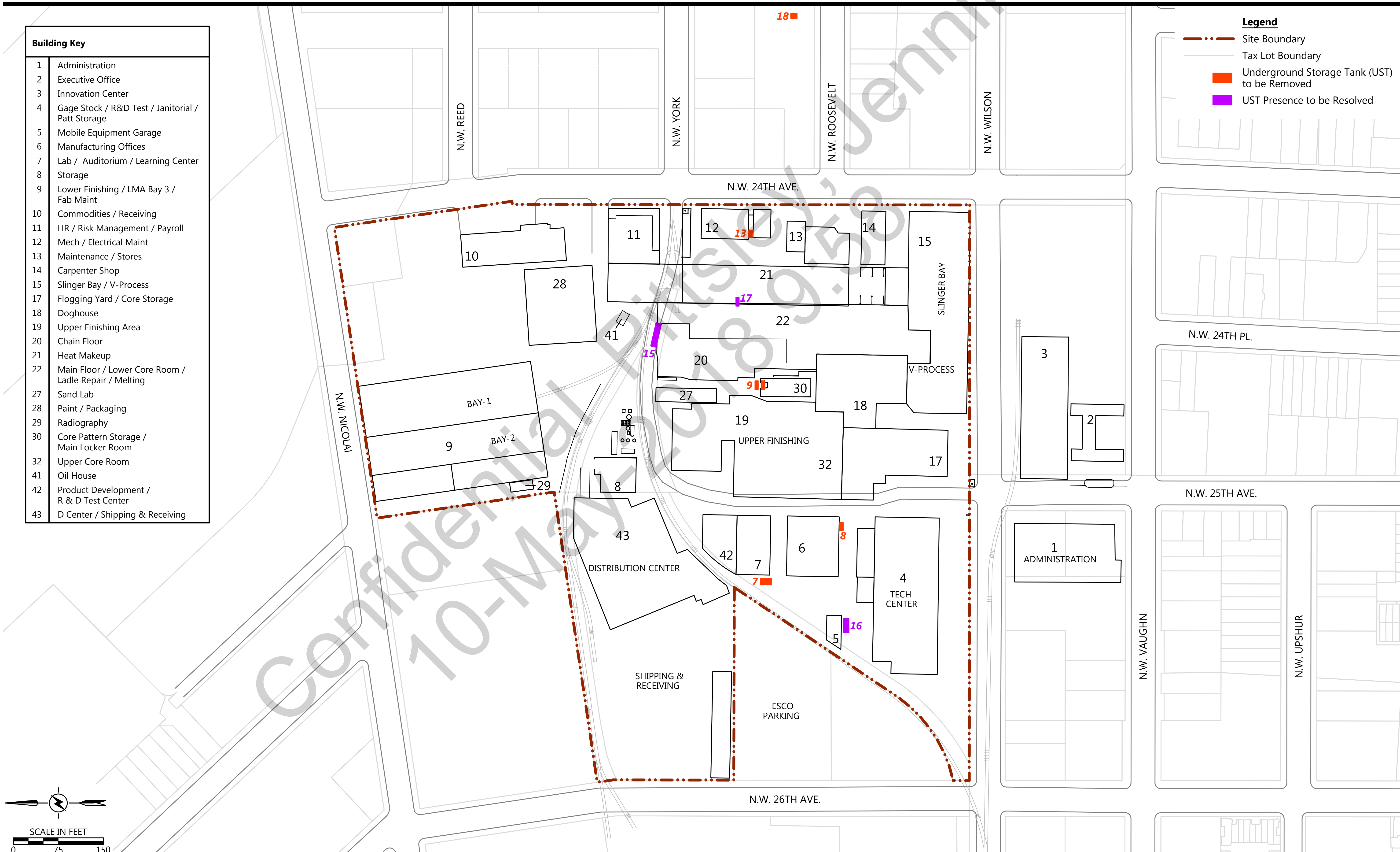
Building Key	
1	Administration
2	Executive Office
3	Innovation Center
4	Gage Stock / R&D Test / Janitorial / Patt Storage
5	Mobile Equipment Garage
6	Manufacturing Offices
7	Lab / Auditorium / Learning Center
8	Storage
9	Lower Finishing / LMA Bay 3 / Fab Maint
10	Commodities / Receiving
11	HR / Risk Management / Payroll
12	Mech / Electrical Maint
13	Maintenance / Stores
14	Carpenter Shop
15	Slinger Bay / V-Process
17	Flogging Yard / Core Storage
18	Doghouse
19	Upper Finishing Area
20	Chain Floor
21	Heat Makeup
22	Main Floor / Lower Core Room / Ladle Repair / Melting
27	Sand Lab
28	Paint / Packaging
29	Radiography
30	Core Pattern Storage / Main Locker Room
32	Upper Core Room
41	Oil House
42	Product Development / R & D Test Center
43	D Center / Shipping & Receiving



ESCO_locations_1804.dwg, 4/26/2018 - 04:45 PM

Well and Soil Boring Locations
ESCO Corporation
Portland, Oregon

Figure
2-1



Building Key

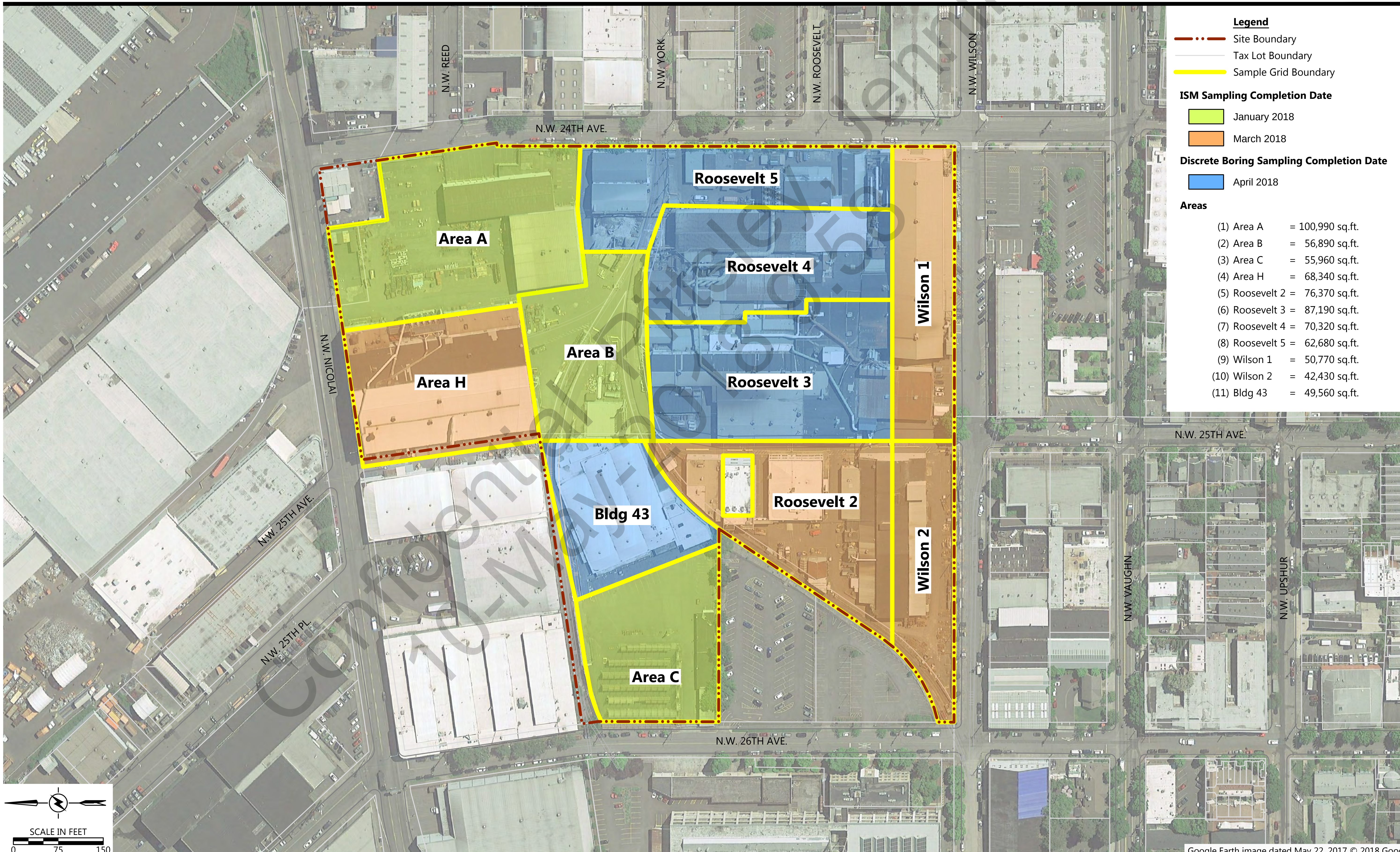
1	Administration
2	Executive Office
3	Innovation Center
4	Gage Stock / R&D Test / Janitorial / Patt Storage
5	Mobile Equipment Garage
6	Manufacturing Offices
7	Lab / Auditorium / Learning Center
8	Storage
9	Lower Finishing / LMA Bay 3 / Fab Maint
10	Commodities / Receiving
11	HR / Risk Management / Payroll
12	Mech / Electrical Maint
13	Maintenance / Stores
14	Carpenter Shop
15	Slinger Bay / V-Process
17	Flogging Yard / Core Storage
18	Doghouse
19	Upper Finishing Area
20	Chain Floor
21	Heat Makeup
22	Main Floor / Lower Core Room / Ladle Repair / Melting
27	Sand Lab
28	Paint / Packaging
29	Radiography
30	Core Pattern Storage / Main Locker Room
32	Upper Core Room
41	Oil House
42	Product Development / R & D Test Center
43	D Center / Shipping & Receiving

ESCO_UST_1804.dwg, 4/25/2018 - 11:27 AM

BRIDGEWATER GROUP

Underground Storage Tank Measures
ESCO Corporation
Portland, Oregon

Figure 2-2

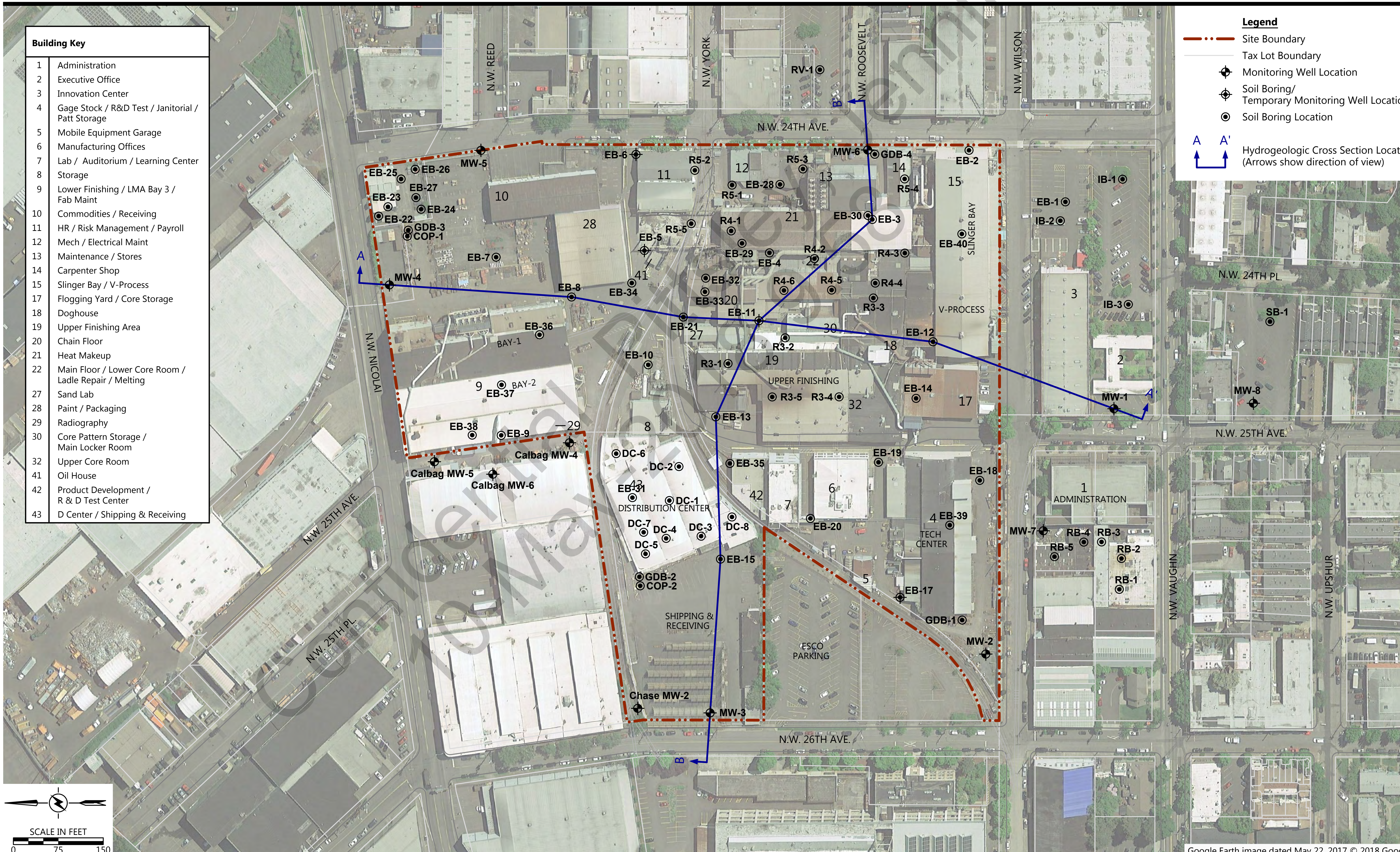


ESCO_grid_1804.dwg, 4/25/2018 - 10:54 AM

BRIDGEWATER GROUP

Site Sampling Areas
ESCO Corporation
Portland, Oregon

Figure
2-3

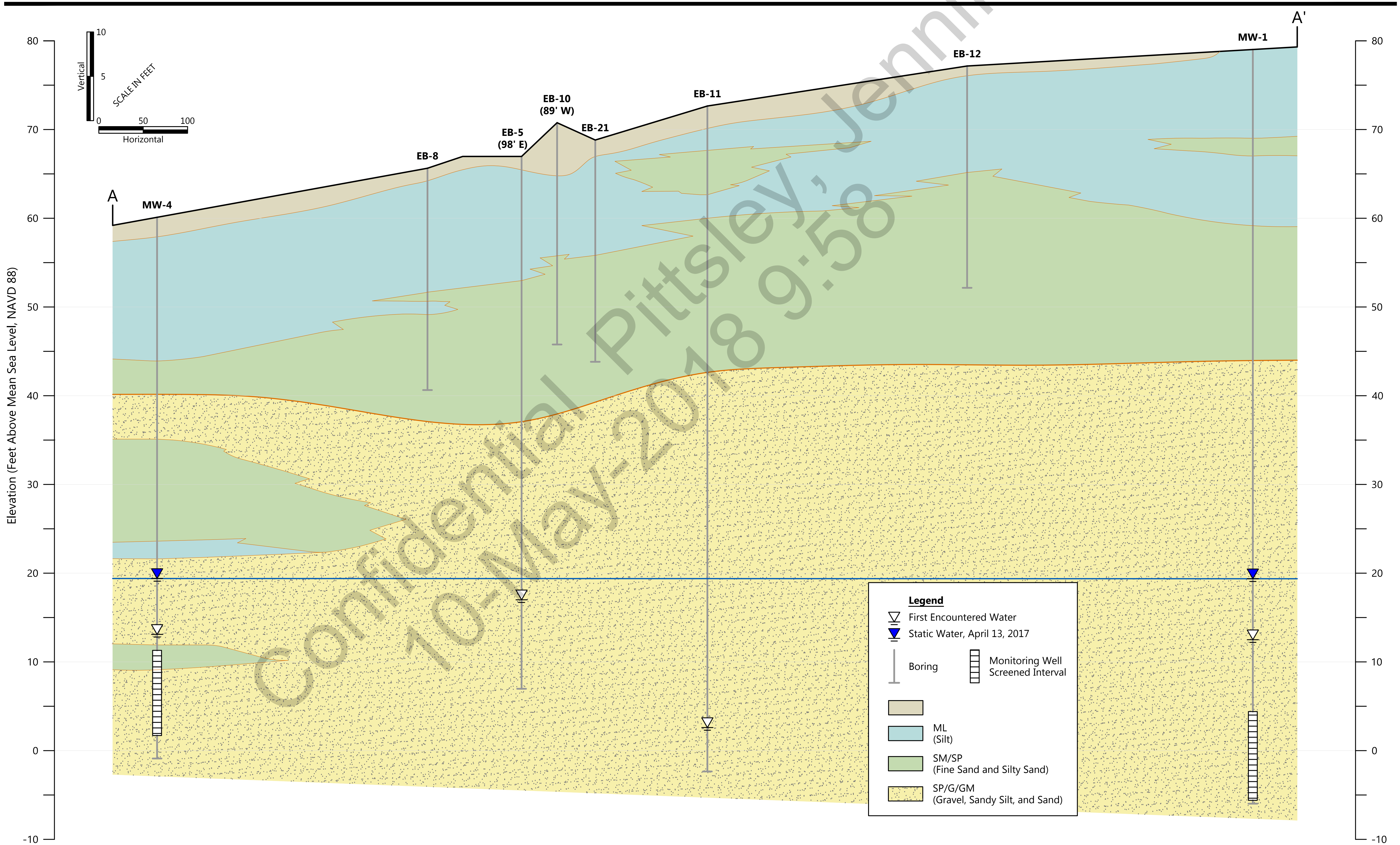


ESCO_xsec_loc_1804.dwg, 4/26/2018 - 04:46 PM

BRIDGEWATER GROUP

Cross Section Lines
ESCO Corporation
Portland, Oregon

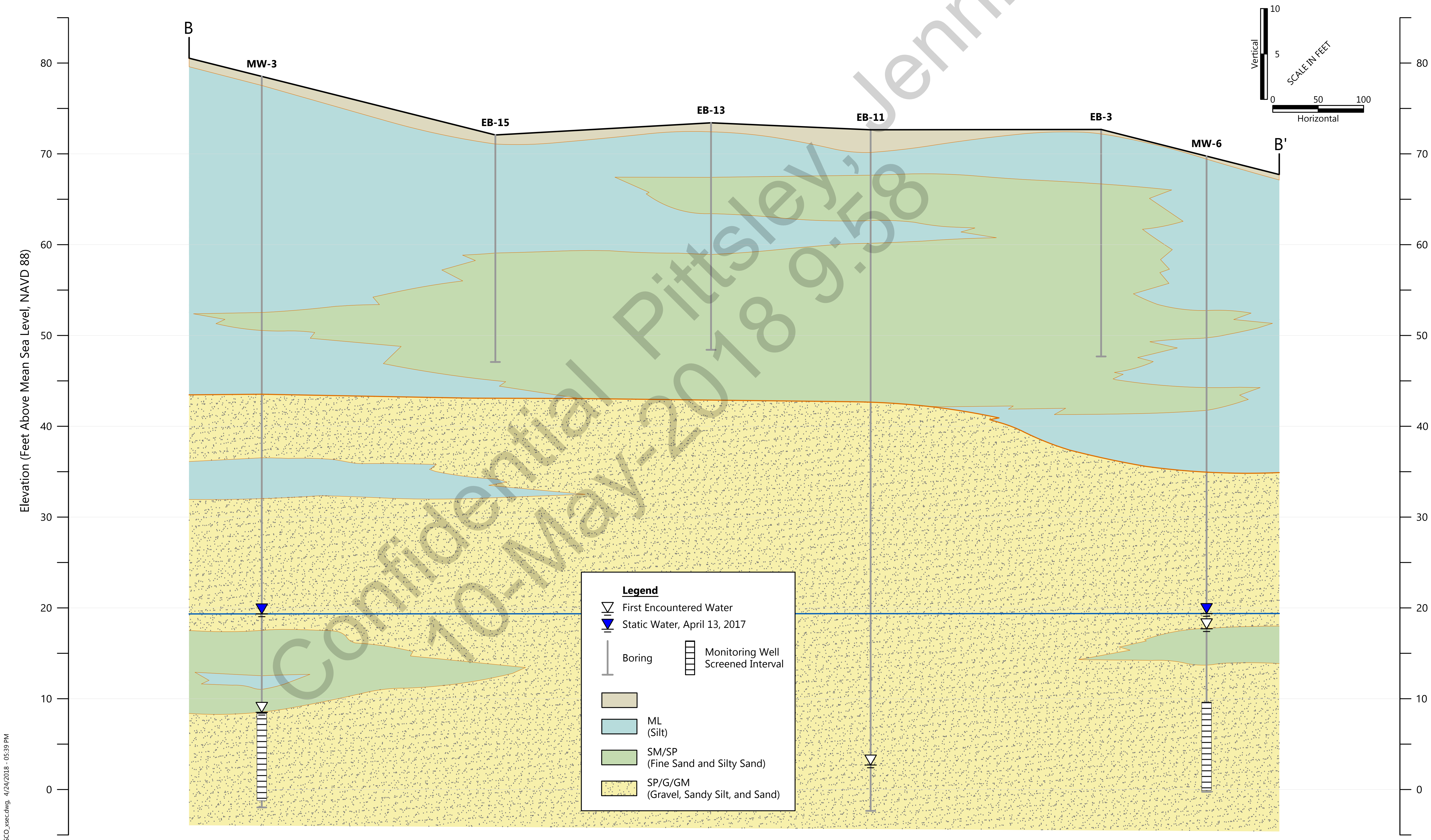
Figure
3-1



BRIDGEWATER GROUP

North - South Cross Section
ESCO Corporation
Portland, Oregon

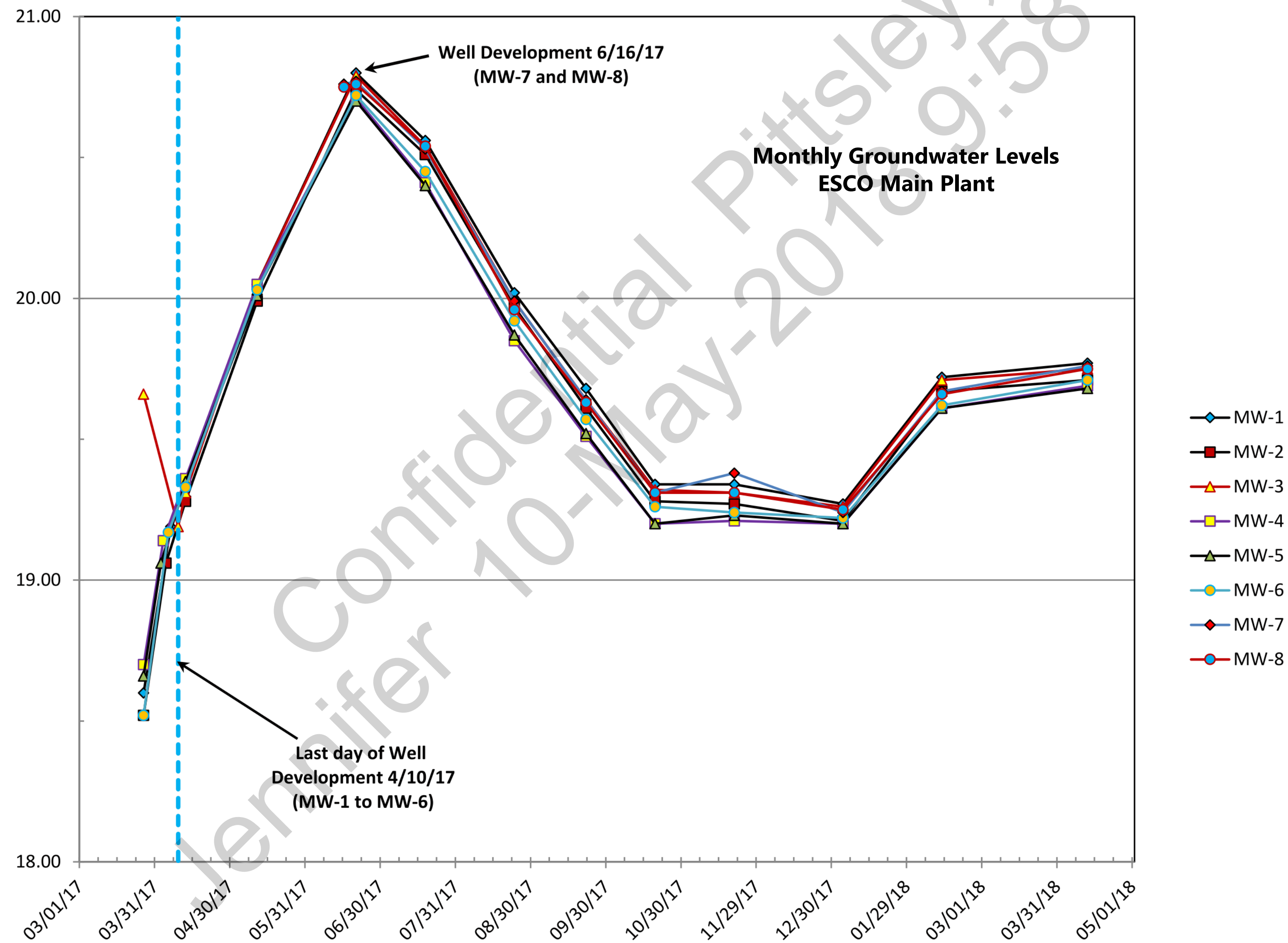
Figure
3-2



BRIDGEWATER GROUP

West - East Cross Section
ESCO Corporation
Portland, Oregon

Figure
3-3



ESCO_Hydro_1804.dwg, 4/25/2018 - 11:48 AM

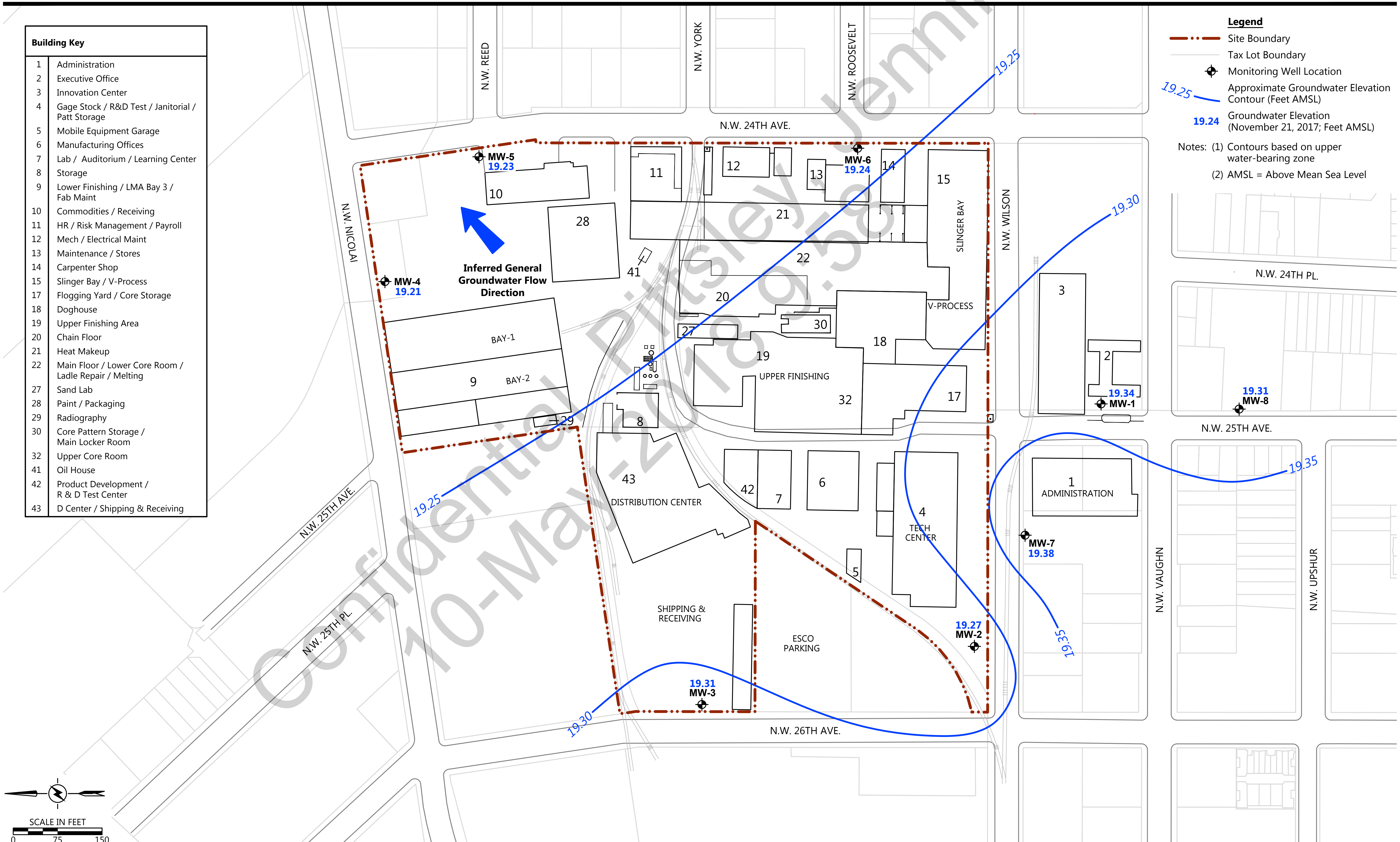
BRIDGEWATER GROUP

Hydrographs for Site Wells
ESCO Corporation
Portland, Oregon

Figure
3-4

Building Key

1	Administration
2	Executive Office
3	Innovation Center
4	Gage Stock / R&D Test / Janitorial / Patt Storage
5	Mobile Equipment Garage
6	Manufacturing Offices
7	Lab / Auditorium / Learning Center
8	Storage
9	Lower Finishing / LMA Bay 3 / Fab Maint
10	Commodities / Receiving
11	HR / Risk Management / Payroll
12	Mech / Electrical Maint
13	Maintenance / Stores
14	Carpenter Shop
15	Slinger Bay / V-Process
17	Flogging Yard / Core Storage
18	Doghouse
19	Upper Finishing Area
20	Chain Floor
21	Heat Makeup
22	Main Floor / Lower Core Room / Ladle Repair / Melting
27	Sand Lab
28	Paint / Packaging
29	Radiography
30	Core Pattern Storage / Main Locker Room
32	Upper Core Room
41	Oil House
42	Product Development / R & D Test Center
43	D Center / Shipping & Receiving

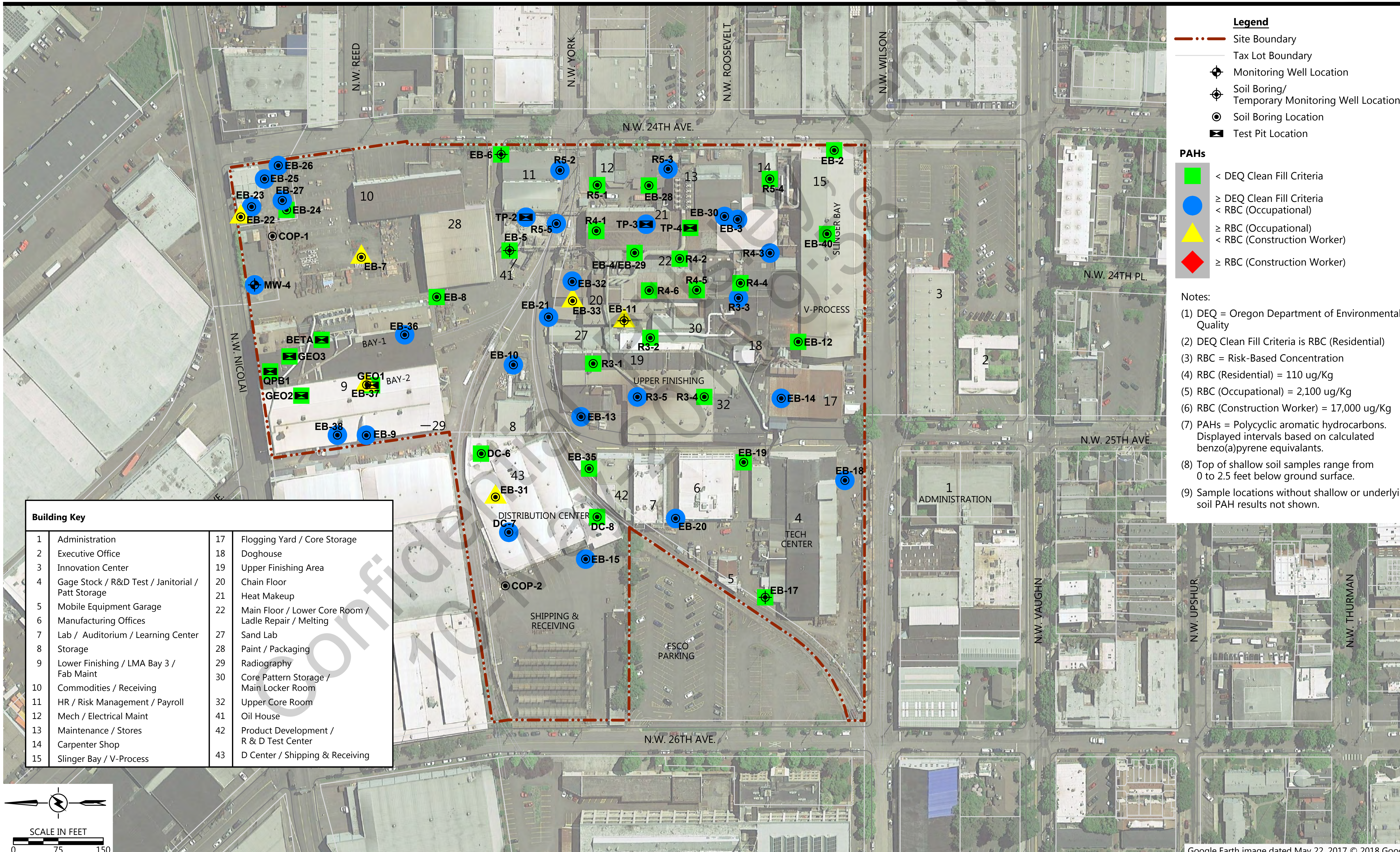


ESCO_cntr_171121_1804.dwg, 4/26/2018 - 11:42 AM

BRIDGEWATER GROUP

Groundwater Elevation Contours - November 2017
ESCO Corporation
Portland, Oregon

Figure
3-5



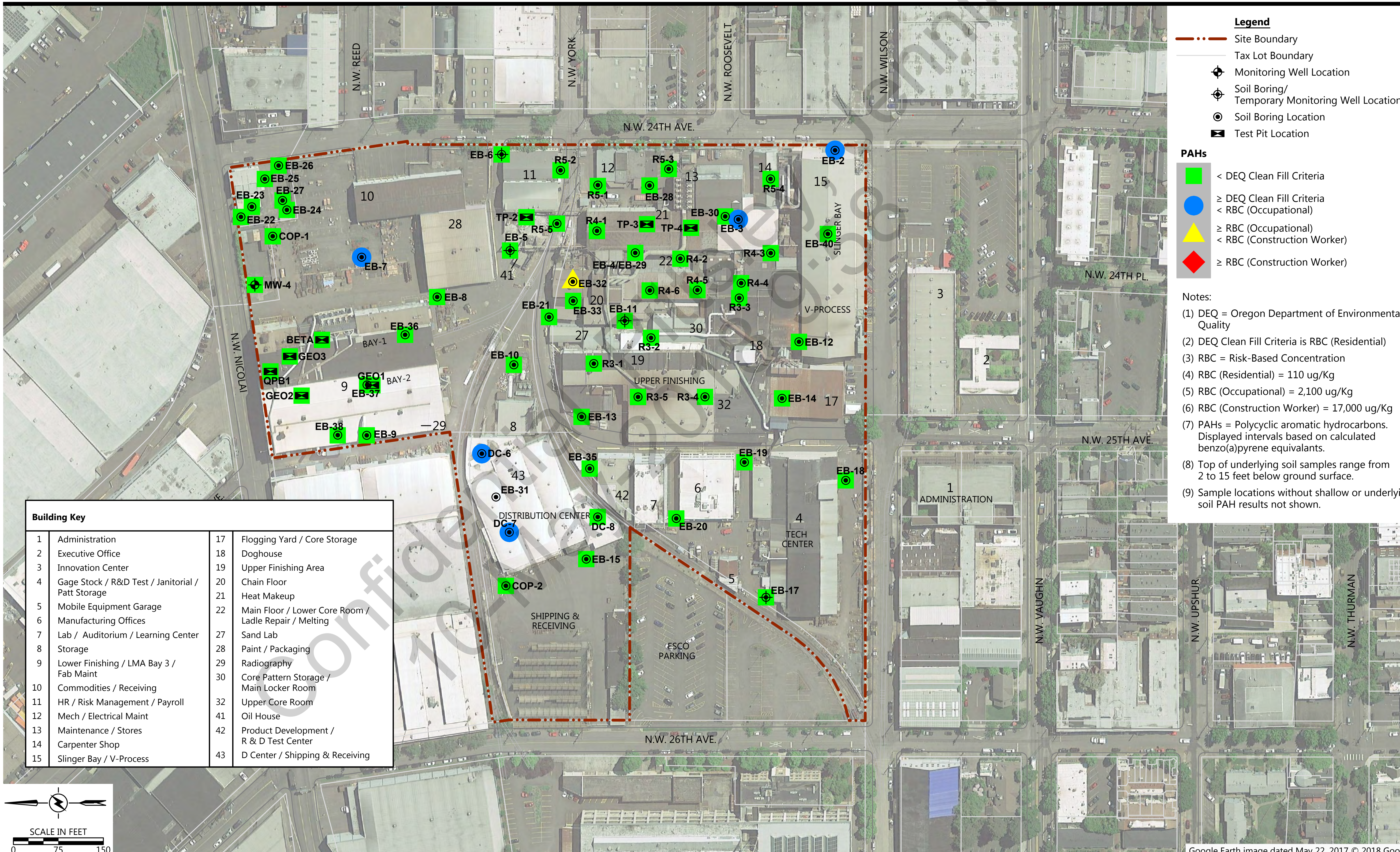
Building Key

1	Administration	17	Flogging Yard / Core Storage
2	Executive Office	18	Doghouse
3	Innovation Center	19	Upper Finishing Area
4	Gage Stock / R&D Test / Janitorial / Patt Storage	20	Chain Floor
5	Mobile Equipment Garage	21	Heat Makeup
6	Manufacturing Offices	22	Main Floor / Lower Core Room / Ladle Repair / Melting
7	Lab / Auditorium / Learning Center	27	Sand Lab
8	Storage	28	Paint / Packaging
9	Lower Finishing / LMA Bay 3 / Fab Maint	29	Radiography
10	Commodities / Receiving	30	Core Pattern Storage / Main Locker Room
11	HR / Risk Management / Payroll	32	Upper Core Room
12	Mech / Electrical Maint	41	Oil House
13	Maintenance / Stores	42	Product Development / R & D Test Center
14	Carpenter Shop	43	D Center / Shipping & Receiving
15	Slinger Bay / V-Process		

BRIDGEWATER GROUP

PAHs in Shallow Soil Samples
ESCO Corporation
Portland, Oregon

Figure
4-1



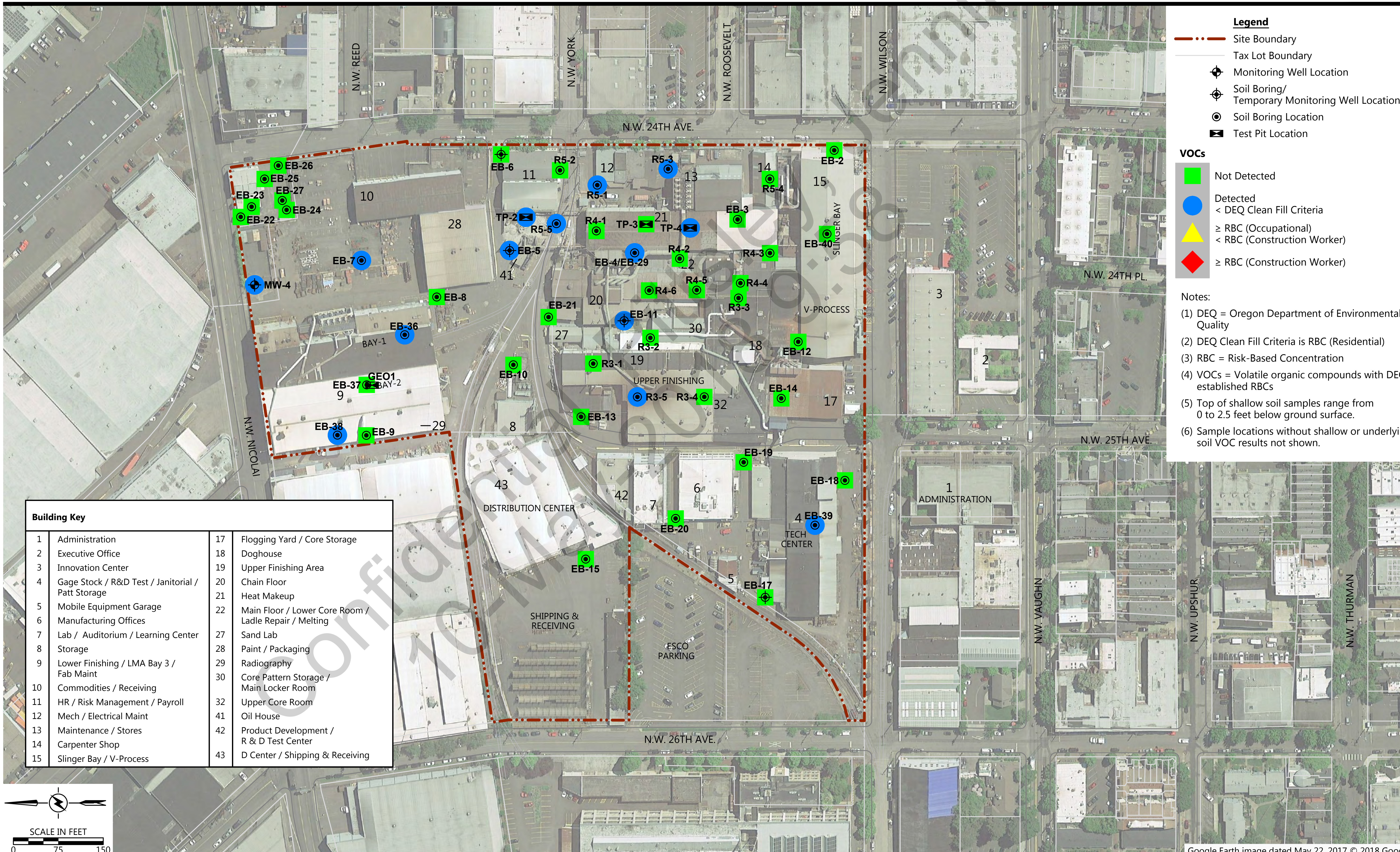
Building Key

1	Administration	17	Flogging Yard / Core Storage
2	Executive Office	18	Doghouse
3	Innovation Center	19	Upper Finishing Area
4	Gage Stock / R&D Test / Janitorial / Patt Storage	20	Chain Floor
5	Mobile Equipment Garage	21	Heat Makeup
6	Manufacturing Offices	22	Main Floor / Lower Core Room / Ladle Repair / Melting
7	Lab / Auditorium / Learning Center	27	Sand Lab
8	Storage	28	Paint / Packaging
9	Lower Finishing / LMA Bay 3 / Fab Maint	29	Radiography
10	Commodities / Receiving	30	Core Pattern Storage / Main Locker Room
11	HR / Risk Management / Payroll	32	Upper Core Room
12	Mech / Electrical Maint	41	Oil House
13	Maintenance / Stores	42	Product Development / R & D Test Center
14	Carpenter Shop	43	D Center / Shipping & Receiving
15	Slinger Bay / V-Process		

BRIDGEWATER GROUP

PAHs in Underlying Soil Samples
ESCO Corporation
Portland, Oregon

Figure
4-2



Legend

- Site Boundary
- Tax Lot Boundary
- Monitoring Well Location
- Soil Boring/ Temporary Monitoring Well Location
- Soil Boring Location
- Test Pit Location

VOCs

- Not Detected
- Detected < DEQ Clean Fill Criteria
- ≥ RBC (Occupational) < RBC (Construction Worker)
- ≥ RBC (Construction Worker)

Notes:

(1) DEQ = Oregon Department of Environmental Quality

(2) DEQ Clean Fill Criteria is RBC (Residential)

(3) RBC = Risk-Based Concentration

(4) VOCs = Volatile organic compounds with DEQ established RBCs

(5) Top of shallow soil samples range from 0 to 2.5 feet below ground surface.

(6) Sample locations without shallow or underlying soil VOC results not shown.

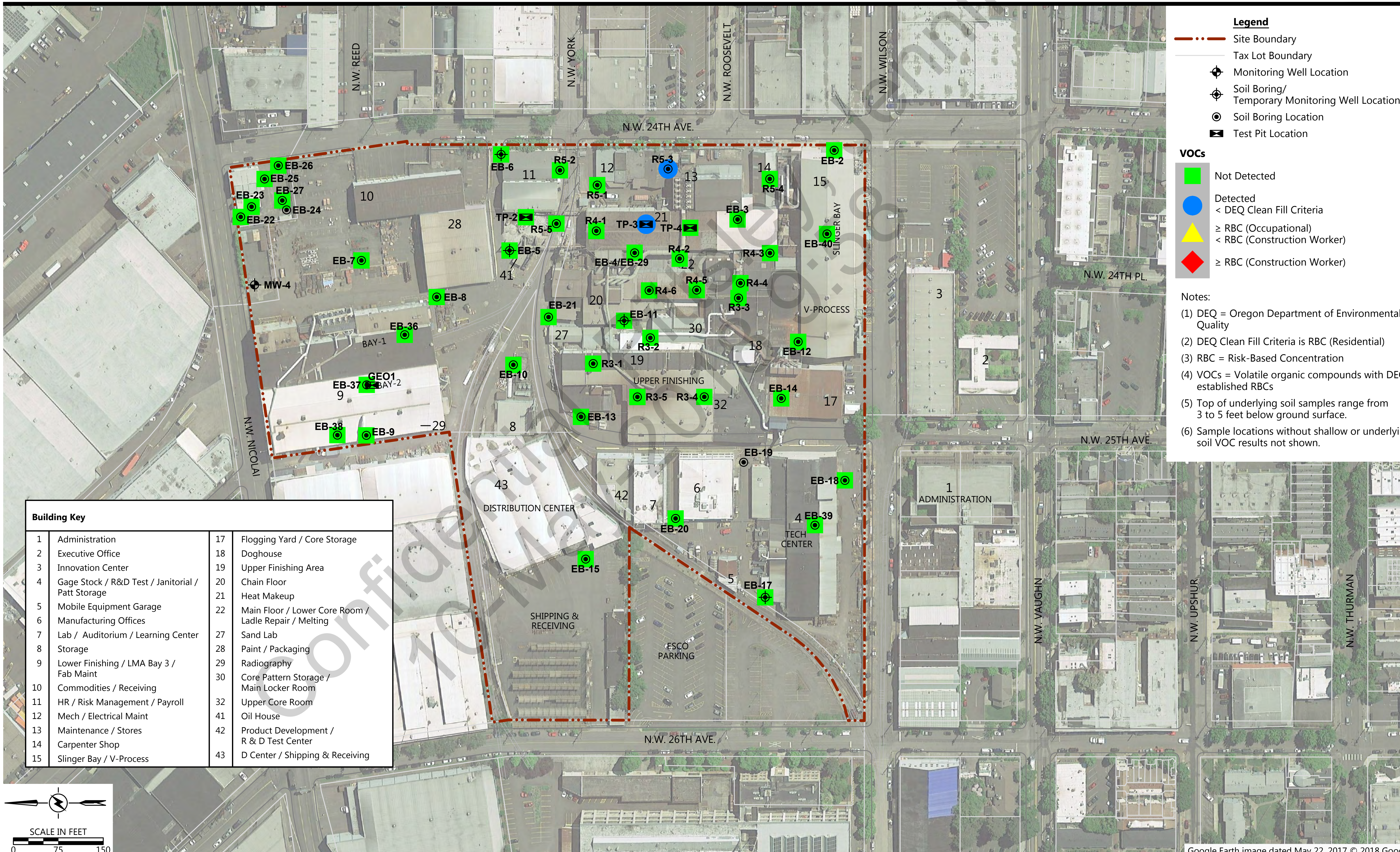
Building Key

1	Administration	17	Flogging Yard / Core Storage
2	Executive Office	18	Doghouse
3	Innovation Center	19	Upper Finishing Area
4	Gage Stock / R&D Test / Janitorial / Patt Storage	20	Chain Floor
5	Mobile Equipment Garage	21	Heat Makeup
6	Manufacturing Offices	22	Main Floor / Lower Core Room / Ladle Repair / Melting
7	Lab / Auditorium / Learning Center	27	Sand Lab
8	Storage	28	Paint / Packaging
9	Lower Finishing / LMA Bay 3 / Fab Maint	29	Radiography
10	Commodities / Receiving	30	Core Pattern Storage / Main Locker Room
11	HR / Risk Management / Payroll	32	Upper Core Room
12	Mech / Electrical Maint	41	Oil House
13	Maintenance / Stores	42	Product Development / R & D Test Center
14	Carpenter Shop	43	D Center / Shipping & Receiving
15	Slinger Bay / V-Process		

BRIDGEWATER GROUP

VOCs in Shallow Soil Samples
ESCO Corporation
Portland, Oregon

Figure 4-3



Legend

- Site Boundary
- Tax Lot Boundary
- Monitoring Well Location
- Soil Boring/ Temporary Monitoring Well Location
- Soil Boring Location
- Test Pit Location

VOCs

- Not Detected
- Detected < DEQ Clean Fill Criteria
- ≥ RBC (Occupational) < RBC (Construction Worker)
- ≥ RBC (Construction Worker)

Notes:

(1) DEQ = Oregon Department of Environmental Quality

(2) DEQ Clean Fill Criteria is RBC (Residential)

(3) RBC = Risk-Based Concentration

(4) VOCs = Volatile organic compounds with DEQ established RBCs

(5) Top of underlying soil samples range from 3 to 5 feet below ground surface.

(6) Sample locations without shallow or underlying soil VOC results not shown.

Building Key

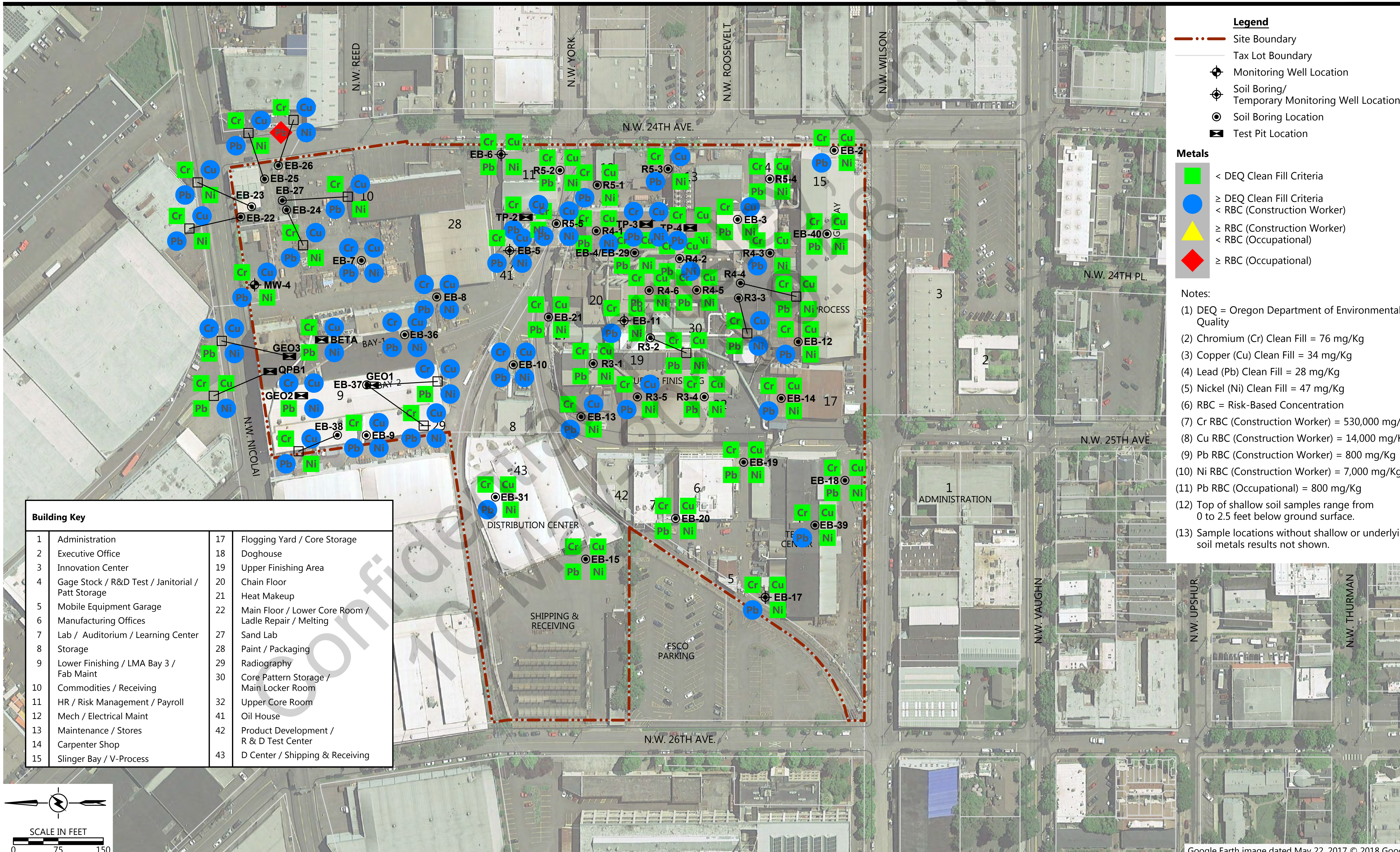
1	Administration	17	Flogging Yard / Core Storage
2	Executive Office	18	Doghouse
3	Innovation Center	19	Upper Finishing Area
4	Gage Stock / R&D Test / Janitorial / Patt Storage	20	Chain Floor
5	Mobile Equipment Garage	21	Heat Makeup
6	Manufacturing Offices	22	Main Floor / Lower Core Room / Ladle Repair / Melting
7	Lab / Auditorium / Learning Center	27	Sand Lab
8	Storage	28	Paint / Packaging
9	Lower Finishing / LMA Bay 3 / Fab Maint	29	Radiography
10	Commodities / Receiving	30	Core Pattern Storage / Main Locker Room
11	HR / Risk Management / Payroll	32	Upper Core Room
12	Mech / Electrical Maint	41	Oil House
13	Maintenance / Stores	42	Product Development / R & D Test Center
14	Carpenter Shop	43	D Center / Shipping & Receiving
15	Slinger Bay / V-Process		

ESCO_VOC_soil_1804.dwg, 4/26/2018 - 05:14 PM

BRIDGEWATER GROUP

VOCs in Underlying Soil Samples
ESCO Corporation
Portland, Oregon

Figure
4-4



Legend

- Site Boundary
- Tax Lot Boundary
- Monitoring Well Location
- Soil Boring/ Temporary Monitoring Well Location
- Soil Boring Location
- Test Pit Location

Metals

- < DEQ Clean Fill Criteria
- ≥ DEQ Clean Fill Criteria < RBC (Construction Worker)
- ≥ RBC (Construction Worker) < RBC (Occupational)
- ≥ RBC (Occupational)

Notes:

(1) DEQ = Oregon Department of Environmental Quality
(2) Chromium (Cr) Clean Fill = 76 mg/Kg
(3) Copper (Cu) Clean Fill = 34 mg/Kg
(4) Lead (Pb) Clean Fill = 28 mg/Kg
(5) Nickel (Ni) Clean Fill = 47 mg/Kg
(6) RBC = Risk-Based Concentration
(7) Cr RBC (Construction Worker) = 530,000 mg/Kg
(8) Cu RBC (Construction Worker) = 14,000 mg/Kg
(9) Pb RBC (Construction Worker) = 800 mg/Kg
(10) Ni RBC (Construction Worker) = 7,000 mg/Kg
(11) Pb RBC (Occupational) = 800 mg/Kg
(12) Top of shallow soil samples range from 0 to 2.5 feet below ground surface.
(13) Sample locations without shallow or underlying soil metals results not shown.

Building Key

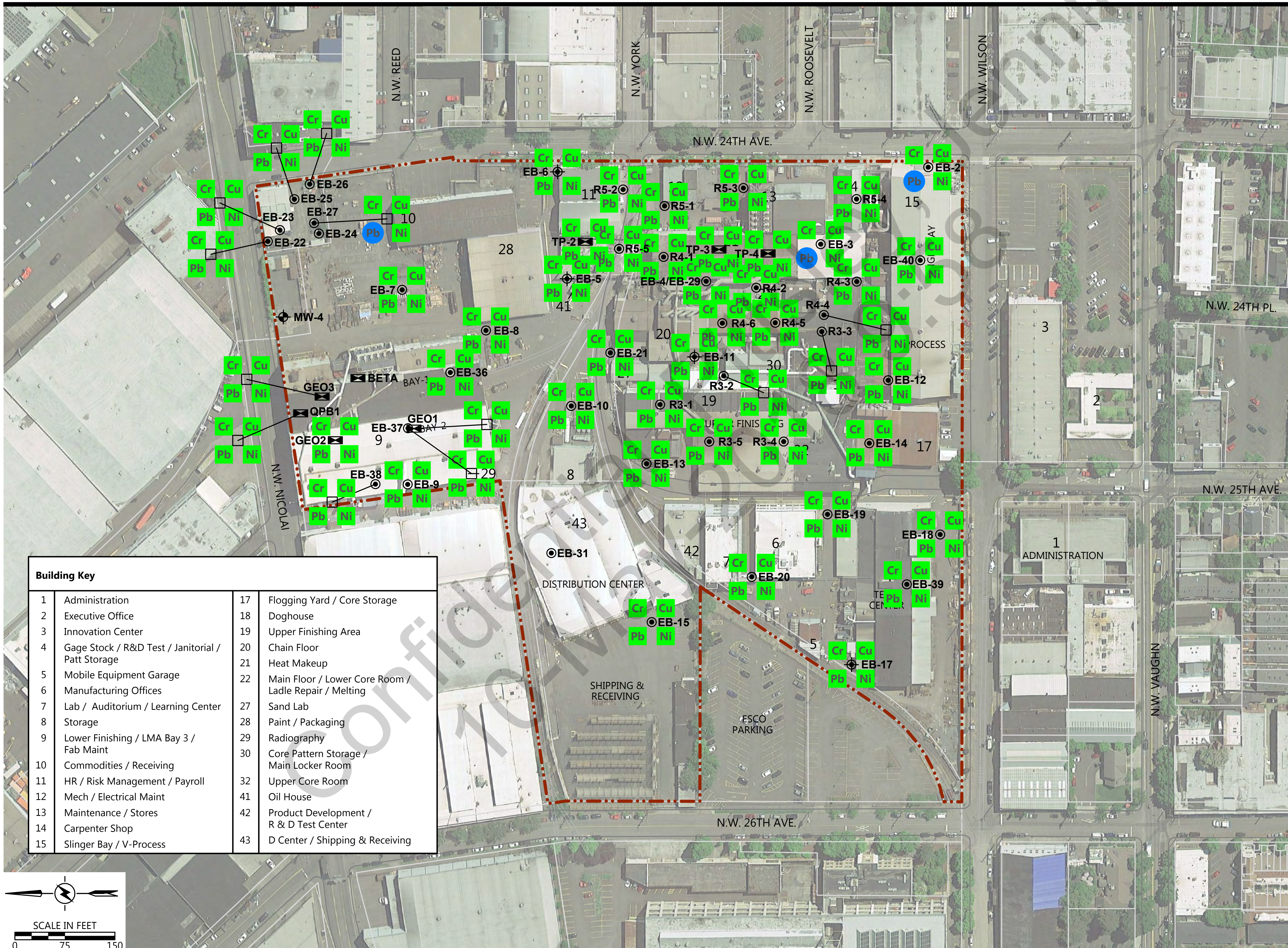
1	Administration	17	Flogging Yard / Core Storage
2	Executive Office	18	Doghouse
3	Innovation Center	19	Upper Finishing Area
4	Gage Stock / R&D Test / Janitorial / Patt Storage	20	Chain Floor
5	Mobile Equipment Garage	21	Heat Makeup
6	Manufacturing Offices	22	Main Floor / Lower Core Room / Ladle Repair / Melting
7	Lab / Auditorium / Learning Center	27	Sand Lab
8	Storage	28	Paint / Packaging
9	Lower Finishing / LMA Bay 3 / Fab Maint	29	Radiography
10	Commodities / Receiving	30	Core Pattern Storage / Main Locker Room
11	HR / Risk Management / Payroll	32	Upper Core Room
12	Mech / Electrical Maint	41	Oil House
13	Maintenance / Stores	42	Product Development / R & D Test Center
14	Carpenter Shop	43	D Center / Shipping & Receiving
15	Slinger Bay / V-Process		

ESCO_Metals_1804.dwg, 4/26/2018 - 05:17 PM

BRIDGEWATER GROUP

Metals in Shallow Soil Samples
ESCO Corporation
Portland, Oregon

Figure
4-5



Legend

- Site Boundary
- Tax Lot Boundary
- Monitoring Well Location
- Soil Boring/ Temporary Monitoring Well Location
- Soil Boring Location
- Test Pit Location

Metals

- < DEQ Clean Fill Criteria
- ≥ DEQ Clean Fill Criteria < RBC (Construction Worker)
- ≥ RBC (Construction Worker) < RBC (Occupational)
- ≥ RBC (Occupational)

Notes:

(1) DEQ = Oregon Department of Environmental Quality
(2) Chromium (Cr) Clean Fill = 76 mg/Kg
(3) Copper (Cu) Clean Fill = 34 mg/Kg
(4) Lead (Pb) Clean Fill = 28 mg/Kg
(5) Nickel (Ni) Clean Fill = 47 mg/Kg
(6) RBC = Risk-Based Concentration
(7) Cr RBC (Construction Worker) = 530,000 mg/Kg
(8) Cu RBC (Construction Worker) = 14,000 mg/Kg
(9) Pb RBC (Construction Worker) = 800 mg/Kg
(10) Ni RBC (Construction Worker) = 7,000 mg/Kg
(11) Pb RBC (Occupational) = 800 mg/Kg
(12) Top of underlying soil samples range from 2.25 to 5 feet below ground surface.
(13) Sample locations without shallow or underlying soil metals results not shown.

Building Key

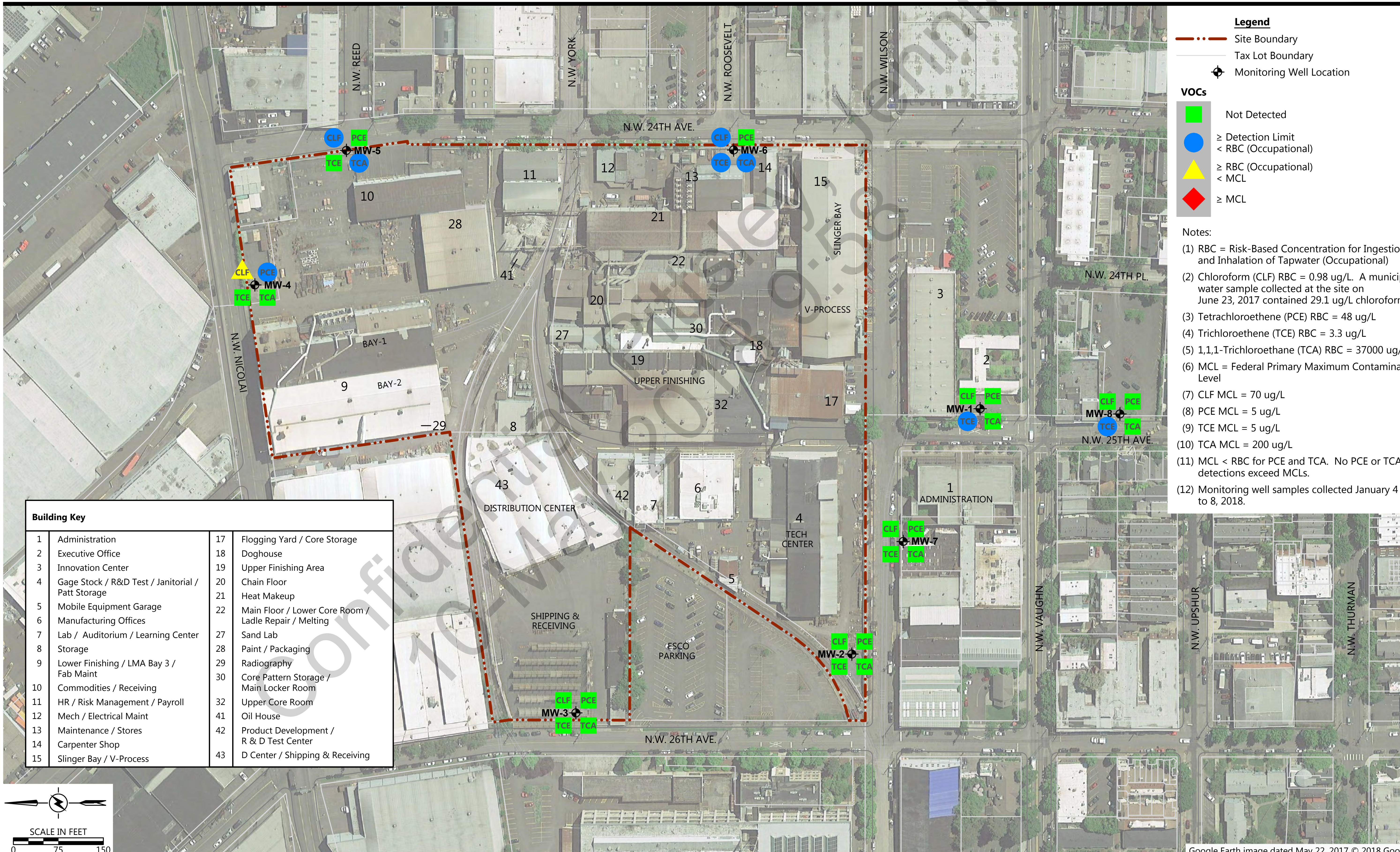
1	Administration	17	Flogging Yard / Core Storage
2	Executive Office	18	Doghouse
3	Innovation Center	19	Upper Finishing Area
4	Gage Stock / R&D Test / Janitorial / Patt Storage	20	Chain Floor
5	Mobile Equipment Garage	21	Heat Makeup
6	Manufacturing Offices	22	Main Floor / Lower Core Room / Ladle Repair / Melting
7	Lab / Auditorium / Learning Center	27	Sand Lab
8	Storage	28	Paint / Packaging
9	Lower Finishing / LMA Bay 3 / Fab Maint	29	Radiography
10	Commodities / Receiving	30	Core Pattern Storage / Main Locker Room
11	HR / Risk Management / Payroll	32	Upper Core Room
12	Mech / Electrical Maint	41	Oil House
13	Maintenance / Stores	42	Product Development / R & D Test Center
14	Carpenter Shop	43	D Center / Shipping & Receiving
15	Slinger Bay / V-Process		

ESCO_Metals_1804.dwg, 4/26/2018 - 05:16 PM

BRIDGEWATER GROUP

Metals in Underlying Soil Samples
ESCO Corporation
Portland, Oregon

Figure
4-6



Legend

- Site Boundary
- Tax Lot Boundary
- Monitoring Well Location

VOCs

- Not Detected
- ≥ Detection Limit < RBC (Occupational)
- ≥ RBC (Occupational) < MCL
- ≥ MCL

Notes:

(1) RBC = Risk-Based Concentration for Ingestion and Inhalation of Tapwater (Occupational)

(2) Chloroform (CLF) RBC = 0.98 ug/L. A municipal water sample collected at the site on June 23, 2017 contained 29.1 ug/L chloroform.

(3) Tetrachloroethene (PCE) RBC = 48 ug/L

(4) Trichloroethene (TCE) RBC = 3.3 ug/L

(5) 1,1,1-Trichloroethane (TCA) RBC = 37000 ug/L

(6) MCL = Federal Primary Maximum Contaminant Level

(7) CLF MCL = 70 ug/L

(8) PCE MCL = 5 ug/L

(9) TCE MCL = 5 ug/L

(10) TCA MCL = 200 ug/L

(11) MCL < RBC for PCE and TCA. No PCE or TCA detections exceed MCLs.

(12) Monitoring well samples collected January 4 to 8, 2018.

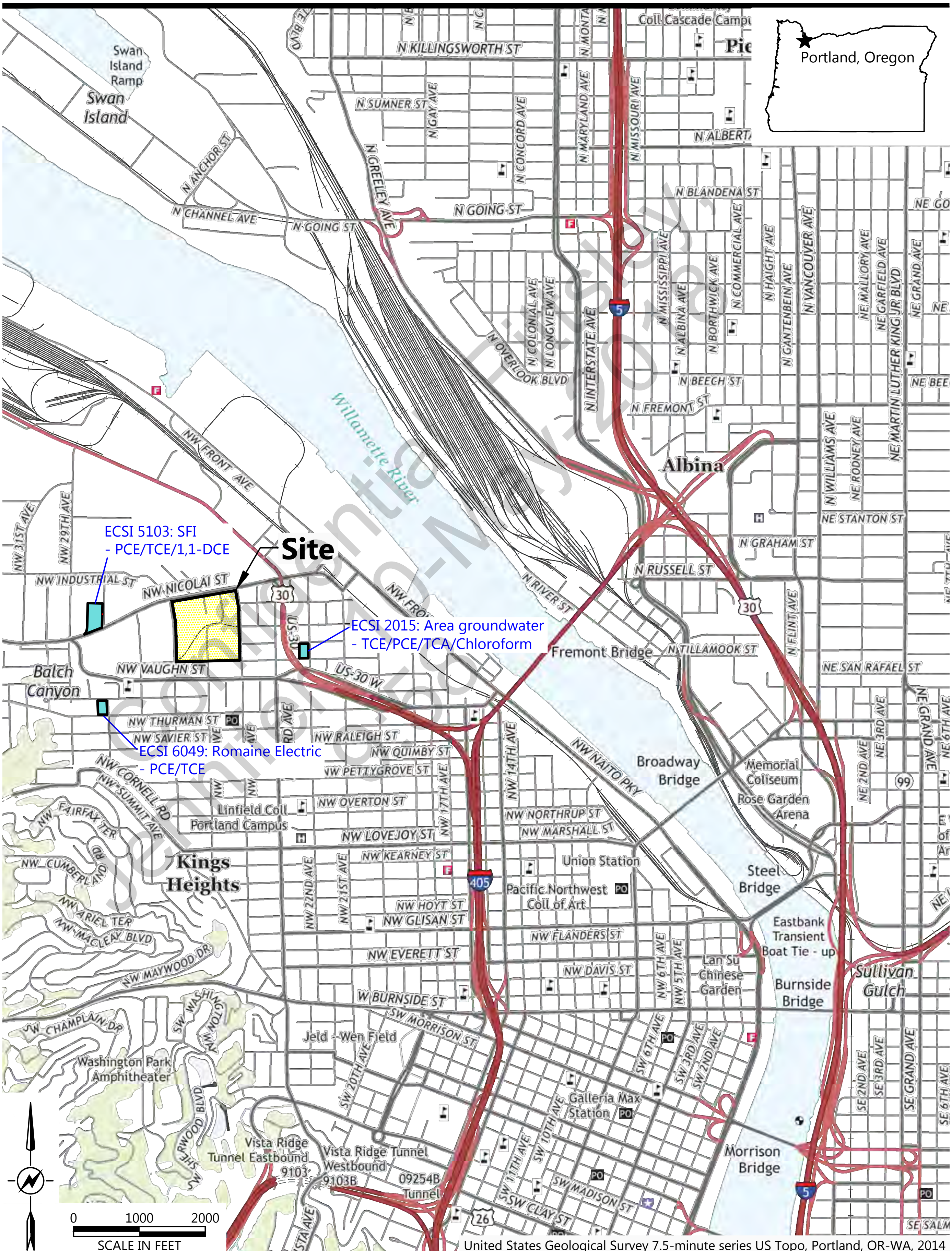
Building Key

1	Administration	17	Flogging Yard / Core Storage
2	Executive Office	18	Doghouse
3	Innovation Center	19	Upper Finishing Area
4	Gage Stock / R&D Test / Janitorial / Patt Storage	20	Chain Floor
5	Mobile Equipment Garage	21	Heat Makeup
6	Manufacturing Offices	22	Main Floor / Lower Core Room / Ladle Repair / Melting
7	Lab / Auditorium / Learning Center	27	Sand Lab
8	Storage	28	Paint / Packaging
9	Lower Finishing / LMA Bay 3 / Fab Maint	29	Radiography
10	Commodities / Receiving	30	Core Pattern Storage / Main Locker Room
11	HR / Risk Management / Payroll	32	Upper Core Room
12	Mech / Electrical Maint	41	Oil House
13	Maintenance / Stores	42	Product Development / R & D Test Center
14	Carpenter Shop	43	D Center / Shipping & Receiving
15	Slinger Bay / V-Process		

BRIDGEWATER GROUP

VOCs in Shallow Groundwater Samples - January 2018
ESCO Corporation
Portland, Oregon

Figure
4-7



ESCO_Site_1804.dwg, 4/25/2018 - 12:33 PM

BRIDGEWATER GROUP

ECSI Sites Near ESCO
ESCO Corporation
Portland, Oregon

Figure
4-8