



FOCUSED SITE INVESTIGATION WORK PLAN



Magnus Site

Lots 700 and 800 in Multnomah County
3074 and 3200 NW St. Helens Road
Portland, Oregon 97210

Agency Information

ODEQ ECSI No. 69
ODEQ UIC Facility Number 11941

Prepared for:

Wilhelm Trucking Company

P.O. Box 10363
Portland, OR 97296-0363

Issued on:

December 19, 2022

EVREN NORTHWEST, INC.
Project No. 927-22006-02

Offices in Portland and Bend, Oregon / San Rafael, California
P.O. Box 14488, Portland, Oregon 97293
T. 503-452-5561 / E. ENW@EVREN-NW.com

This

FOCUSED SITE INVESTIGATION WORK PLAN

For the:

Magnus Site

Lots 700 and 800 in Multnomah County
3074 and 3200 NW St. Helens Road
Portland, Oregon 97210

Has been prepared for the sole benefit and use of our Client:

Wilhelm Trucking Company

P.O. Box 10363
Portland, OR 97296-0363

Issued December 19, 2022 by:



Evan Bruggeman, R.G.
Principal Field Geologist

Lynn D. Green, C.E.G.
Principal Engineering Geologist

Limitations. This Focused Site Investigation Work Plan (FSI Work Plan) is reflective of site conditions discovered through environmental site assessments. Required actions described in this Plan are consistent with State of Oregon and Oregon Department of Environmental Quality rules, regulations and guidance enforce and available as of the Plan issue date. The Client is advised to check for any updates that may be applicable to a specific scope of work being conducted under this Plan.

No warranties are expressed or implied concerning potential contaminants or environmental media not addressed through sampling and analysis. EVREN Northwest is not responsible for conditions or consequences arising from information not available at the time of Plan preparation. This Plan was prepared in accordance with generally accepted professional practice in the area at this time for the exclusive use of our client and their agents or authorized third parties. No other warranty, either expressed or implied, is made.

Table of Contents

1.0	Introduction	1
2.0	Site Description	1
3.0	Site Background	3
3.1	Site History	3
3.2	Environmental History	4
4.0	Cleanup Standards and Other Numeric Criteria	7
4.1	Cleanup Standards	7
4.2	Other Numeric Criteria	9
5.0	Current Data Gaps	9
6.0	Constituents of Interest	10
7.0	Objectives and Overview of Proposed of Work	10
8.0	Pre-Field Activities	11
9.0	Proposed Scope of Work for Further Site Assessment	12
9.1	Surface Soil Assessment	12
9.1.1	Increment Sampling Locations	12
9.1.2	Incremental Sampling Depth	12
9.1.3	Laboratory Sub-Sampling and Compositing	12
9.2	Subsurface Assessment	13
9.2.1	Drilling	13
9.2.2	Soil Assessment	13
9.2.3	Reconnaissance Ground-Water Sampling	14
9.3	Install Ground Water Monitoring Network	16
9.3.1	Drilling	16
9.3.2	Soil Assessment	16
9.3.3	Monitoring Well Installation	17
9.3.4	Monitoring Well Development	17
9.3.5	Monitoring Well Surveying	18
9.3.6	Initial Ground Water Monitoring	18
9.3.7	Purging	18
9.3.8	Ground Water Sampling	19
9.4	Investigation of Historic Sanitary Sewer Line	20
9.5	AST Decommissioning	20
9.6	Equipment Calibration	21
9.7	Decontamination Procedures	21
9.8	Investigation-Derived Waste Storage and Disposal	21

10.0	Analytical Plan	21
11.0	Quality Assurance Project Plan	23
11.1	Transportation Blank	23
11.2	Rinsate Blank.....	23
11.3	Field Duplicates.....	24
11.4	Laboratory QA/QC	24
12.0	Risk-Based Assessment.....	25
12.1	Data Evaluation and Identification of COPCs.....	25
12.2	Beneficial Water Use Determination.....	25
12.3	Risk Characterization	25
13.0	Report Preparation.....	25
14.0	Project Schedule.....	25
15.0	Certification	26

List of Tables and Figures

Tables (in text)

- 9-1 Proposed Analytical Plan
- 9-2 Analytical Protocol

Tables (behind text)

- 1 Summary of Analytical Data, Soil
- 2 Summary of Analytical Data, Leachable Metals in Soil

Figures

- 1 Site Vicinity Map
- 2 Site Plan
- 3 Previous Sample Location Diagram – Tax Lots 700 and 800
- 4 Proposed Sample Location Diagram – Tax Lots 700 and 800

Attachment

- Laboratory ISM SOP

List of Acronyms and Abbreviations

BES	City of Portland Bureau of Environmental Services	L/min	liters per minute
bgs	below ground surface	mg/Kg	milligram per Kilogram
BNSF	Burlington Northern and Santa Fe	mL/min	milliliters per minute
		OAR	Oregon Administrative Rules
CERCLIS	Comprehensive Environmental Response, Compensation and Liability Information System	ODEQ	Oregon Department of Environmental Quality
		ORP	oxygen-reduction potential
		PA	Preliminary Assessment
		PAHs	polycyclic aromatic hydrocarbons
Client	Wilhelm Trucking	PCBs	polychlorinated biphenyls
COI	constituent of interest	PE	polyethylene
CoP	City of Portland	PID	photoionization detector
COPC	constituent of potential concern	ppmv	parts per million by volume
		PVC	polyvinyl chloride
		QA/QC	quality assurance and quality control
DU	decision unit		
DO	dissolved oxygen	QAPP	Quality Assurance Project Plan
DOT	Department of Transportation	RBCs	risk-based concentrations
DRO	diesel-range organics	RBDM	<i>Risk-Based Decision Making for the Remediation of Contaminated Sites</i> , an ODEQ guidance document
ECSI	Environmental Cleanup Site Information		
ENW	EVREN Northwest, Inc.	RPD	Relative Percent Difference
EPA	US Environmental Protection Agency	RRO	residual-range organics
EPC	exposure point concentrations	SLRBCs	screening-level risk-based concentrations
F&BI	Friedman & Bruya, Inc.	SI	Site Inspection
FSDS	Field Sampling Data Sheet	TCLP	Toxicity Characteristic Leaching Procedure
FSI	Focused Site Investigation		
HASP	Health and Safety Plan	TPH	total petroleum hydrocarbons
HOT	heating oil tank		
IDW	investigation-derived waste	UIC	Underground Injection Control
ISM	Incremental Sampling Method	UST	underground storage tank
ITRC	Interstate Technology & Regulatory Council	VOA	volatile organic analysis
JSCS	Joint Source Control Strategy	VOCs	volatile organic constituents
LCS	laboratory control sample		

1.0 Introduction

At the request of the Wilhelm Trucking Company (Client), EVREN Northwest, Inc. (ENW) has prepared this Focused Site Investigation (FSI) Work Plan for the Former Magnus Facility, 3074 and 3200 NW St Helens Road (Multnomah County Tax Lots 700 and 800), in Portland, Oregon (subject site; see Figures 1 and 2). This FSI work plan was developed in accordance with applicable Oregon Administrative Rules (OAR 340-122-0010 through -0115) and Oregon Department of Environmental Quality (ODEQ) Underground Storage Tank (UST) Cleanup Manual¹ and cleanup guidance.² Our Client is submitting this FSI Work Plan pursuant to a Voluntary Cleanup Program Letter Agreement between Client and ODEQ. Information gathered through this site investigation will support remedies, as warranted. Ultimately, the objective of the site investigation and remedies, as implemented, is to obtain a No Further Action (NFA) determination for the Site.

2.0 Site Description

The subject site is located in the Northwest Industrial Area of Portland, Oregon. The lower slopes of Forest Park are located about 400 feet west of the Site, while the Willamette River is approximately 3,800 feet to the northeast. Situs addresses are 3074 and 3200 NW St. Helens Road is comprised of two tax lots (TLs) owned by Wilhelm Trucking: Multnomah County Tax Lots TL 700 and TL 800. The Former Magnus Facility was located on TL 800 and this tax lot and the adjoining TL 700 are the focus of this FSI Work Plan.

A Burlington Northern and Santa Fe (BNSF) rail line is present along the eastern margin of both TL 700 and 800. Both TLs were served by a separate rail spur that runs parallel to and along the west side of the BNSF track; the spur served TL 700 and TL 800 during their former operations as a grain mill and foundry, respectively. A drum recycling business (Container Management Systems) was located south of Tax Lot 800; however, has closed operations. The subject site and surrounding properties are zoned IH for Heavy Industrial Use.

Tax Lot 700. Tax Lot 700 is generally triangular-shaped, with an area of 1.02 acres, and includes Building K (the building name pre-dates Client ownership), which was originally constructed in 1948 as a grain mill. Client previously used the building and parking area for trucking equipment storage. The northern half of the parcel, including Building K, has been rented for several years to a specialty automobile repair business, Land Cruiser NW. The one-story, barrel-roofed building is presently clad in wood and corrugated sheet metal. A small, paved parking area provides access to a loading dock located on the north side of the building. The remainder of TL 700 south of the building is a fenced gravel parking area. The auto repair business is separated by a fence from the rest of the gravel parking that is currently not in use. The loading dock parking area is the low

¹ <http://www.deq.state.or.us/lq/pubs/docs/tanks/USTCleanupManual.pdf>

² <http://www.deq.state.or.us/pubs/reports.htm#cuguidance>

point on the parcel at approximately 37 feet, while the gravel parking area is approximately 43-44 feet in elevation. A driveway with a short concrete apron provides access to the auto repair business' unpaved parking and to the service door to drive vehicles into the building. The south parking area is accessed by a gate at the southwest corner, which is serviced by the north driveway on TL 800.

Tax Lot 800. Tax Lot 800 is 1.0 acre in area and includes Building No. 4 (the building number pre-dates Client ownership), which has a footprint of 21,828 square feet per the Multnomah County Assessor records. Building No. 4 appears to have been added onto during its years as a foundry; most of the structure has a sheet metal exterior, although the 1936 office addition to the building is concrete masonry construction and includes a basement. The building has a concrete floor, as well as multiple rooflines with either metal or composite roofing materials that indicate multiple additions to the structure. Surrounding the building footprint, TL 800 is generally covered with concrete, asphalt, gravel, and soil. The area behind (to the east of) Building No. 4 was reportedly leveled with fill following construction of concrete retaining walls in approximately 1975. This area is fenced; access behind the building is provided from the TL 700 parking area. Currently, the elevations across TL 800 range from approximately 43 to 46 feet relative to the City of Portland vertical datum. Three driveways provide access from NW St. Helens Road to the western side of the property, including a truck loading area located at the northwest corner of the building and a small parking area located in front of the building. The third driveway is gated and provides access to the southwestern portion of TL 800, in front of the building.

Geographic Setting. The subject site is located in the Willamette Valley/Puget Sound lowland, which is a broad geologic structural depression that stretches from just south of Eugene, Oregon to the Georgia Strait in Washington. The Willamette Valley is bounded by the Cascade Mountains to the east and the Coast Range to the west. A number of tectonic events occurred to yield the volcanic rocks that are common throughout the region, including eruptions of volcanoes that formed the Cascades, the rifting in eastern Oregon and Washington that generated the Columbia River Basalt flows all the way to the Pacific Ocean, the uplift of the Coast Range, and the approximately 100 small cones of the Boring volcanic field in the Portland area. The Willamette Valley resulted from the depression of a series of fault-bounded blocks between the two mountain ranges. Sediments were deposited in the valley from various sources, including erosion of mountains and highland areas, lacustrine and alluvial deposits, and volcanic ash and lava flows. The surficial geology is largely due to the massive sedimentation from the Pleistocene ice age floods that are attributed to several sources; however, the greatest impact was due to the regular and frequent collapse of the ice dam forming glacial Lake Missoula in western Montana. These floodwaters filled the Portland Basin to an elevation approaching 400 feet above sea level, as well as flowed southward and thinned in depth in the Willamette Valley, reaching as far as Eugene and left deposits of boulders at the mouth of the Columbia River gorge, gravel deposits in the Lake Oswego/Tualatin area, and sediments that are now the agricultural fields of the Willamette Valley.

Geologic and Hydrogeologic Setting. The subject site is located along what once was the western shoreline of the former Guilds Lake, which was a crescent-shaped riparian marsh in an isolated oxbow channel adjacent to the Willamette River. The lake was filled during the early 20th century for subsequent development of Portland's Northwest Industrial Area. The lake fill is comprised of soil and gravel that was hydraulically sluiced from the nearby Portland Hills (south of the subject site) into the lake basin, as well as dredge spoils pumped from the Willamette River into the lake.³ The subject site is located slightly uphill "on the shore" of the lake fill. The BNSF rail line was originally located adjacent to the shoreline and separated the uphill lots from the flat lake fill. Based on past soil borings on the west side of TL 800,⁴ the subject site is comprised of native sandy silt to a depth of about 15 feet where the native soil transitions to a moist fine silty sand, with ground water at an approximate depth of 24-25 feet.⁵

3.0 Site Background

3.1 Site History

The subject site is located along what once was the western shoreline of the former Guilds Lake, which was the location for the 1905 Lewis and Clark Centennial Exposition.⁶ Following the Exposition, the lake was filled³ for subsequent development of Portland's Northwest Industrial Area. The subject site resulted from this redevelopment of the Guilds Lake area.

During World War II, the shipbuilding industry was booming in Portland Harbor and required housing for workers. Temporary housing was constructed on the Guilds Lake fill, including a housing area called Guilds Lake Courts. The sanitary and storm sewer infrastructure for Guilds Lake Courts was installed during the period 1943-1945, and upon removal of the housing continued to serve the redeveloped industrial area. This infrastructure reportedly included a 6-inch sanitary sewer lateral connection to the Magnus foundry on TL 800; however, no storm sewer connection was identified (Figure 3). A 1936 office addition to the Magnus Building No. 4 included a new bathroom that is thought to have been connected to the sanitary sewer along NW St. Helens Road, although a plumbing permit has not been located.⁷ Following redevelopment, the sanitary sewer connections for the subject site was redirected to the sanitary sewer main in the right-of-way of NW St. Helens Road. Much of the Guilds Lake Courts storm sewer system remains in use, including the 42-inch storm sewer that runs parallel to the eastern

³ Tucker, 2005. Kathleen D. Tucker, "We want smokestacks and not swamps": filling in Portland's Guild's Lake, 1906-1925; Portland State University, Dissertations and Theses, Paper 3557, <https://doi.org/10.15760/etd.5439>; 2005.

⁴ GeoEngineers, October 31, 1997. *Report of Subsurface Explorations and Dust Sampling*, Former Magnus Metals Company Site, 3074 Northwest St. Helens Road, Portland, Oregon.

⁵ GeoEngineers, October 31, 1997. *Report of Subsurface Explorations*, Former Magnus Metals Company Site, 3074 Northwest St. Helens Road, Portland, Oregon

⁶ Reed, 1904. Henry E. Reed, *Oregon: A Story of Progress and Development Together with an Account of the Lewis & Clark Centennial Exposition to be held in Portland, Oregon from June First to October Fifteenth Nineteen Hundred and Five*.

⁷ CoP, June 10, 1936. City of Portland Bureau of Development Services, Design Plan Set and Specifications, Office Building, Magnus Company, Inc., 3074 NW St. Helens Road, Portland, Oregon; File 233230.

margin of the adjacent BNSF rail line and discharges to City of Portland Outfall 18 at the Willamette River.

The Magnus Metals Company (ca. 1930-1936) and National Lead Company (ca. 1936-1967) operated a foundry on TL 800 for the rehabilitation of rail car journal bearings, which were heated to melt, remove, and replace the lead used on the bearing surfaces. During the foundry's operation, the area along the east side of the building previously sloped to the railroad tracks, including a ramp to a loading platform along a rail spur serving the foundry. The height of the slope along the building above the adjacent rail line was originally about 8 feet. Client acquired the TL 800 property in 1967, which was prior to general awareness of the potential for environmental liabilities, including typical due diligence that is now conducted during a Phase I Environmental Site Assessment. In approximately 1975, surface conditions were reportedly altered by the Client that included constructing a retaining wall along the east side and a portion of the south side of TL 800 and then backfilled behind the wall. This created the present level ground surface behind Building No. 4 where Wilhelm previously parked broken and inoperable flatbed trailers. Industrial Craters & Packers has leased the building for more than forty years as a custom crate design, manufacturing, and packing facility.

3.2 Environmental History

A foundry operated at Tax Lot 800 from approximately 1930 until 1967 to rehabilitate rail car journal bearings. Due to this use, in 1981, the site was added to the US Environmental Protection Agency (EPA) Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) for further consideration. From 1984 to 1986, EPA performed a Preliminary Assessment (PA) and Site Inspection (SI) at the site. In 1988, ODEQ listed the former foundry as Environmental Cleanup Site Information (ECSI) Site ID 69. EPA recommended in 1993 that no further remedial action was required under the federal program and ceded regulatory oversight to ODEQ.

In 1997, Client retained a firm to perform subsurface explorations for the possible presence of petroleum-related contamination in the vicinity of a heating oil tank (HOT) for a furnace and a possible underground storage tank (UST) behind the building.⁴ The soil explorations included eight push-probe soil borings, which identified a release of heating oil. The furnace HOT was in the basement inside the building and the release was believed to have been from the associated fill pipe, which exited the basement through the building wall and extended vertically through soil to an above-ground fill point. The location of a possible UST behind the building was not confirmed. This investigation found petroleum hydrocarbons in soil boring samples collected at three locations (See Figure 3):

- 1) Adjacent to the west side of Building No. 4 in the vicinity of the suspected HOT fill pipe (GP-16),
- 2) In the area of the possible UST on the east side of Building No. 4 (GP-4 through GP-7), and
- 3) In the fill placed in the southeast corner of the site (GP-8 and GP-12).

Concentrations of diesel-range organics (DRO) were elevated above the ODEQ Soil Matrix Cleanup Standard [Level II, 500 milligrams/Kilogram (mg/Kg)] and its screening-level risk-based concentration (SLRBC) at several locations (Table 1).

Client submitted an Initial Report Form for UST Cleanup Projects to ODEQ on August 28, 1997 for the petroleum release on the west side of Building No. 4. The site was subsequently assigned UST Cleanup List No. 26-97-0599.

Results of the chemical analysis of soil samples obtained during the 1997 subsurface investigation and observations of a possible vent pipe on the northern wall of Building No. 4 suggested the vent pipe was not connected to the HOT in the basement furnace room.⁸ Consequently, further investigation was conducted on March 30, 1999, where the parking area concrete slab was cut and removed to allow for the excavation of three test pits (TP-1 through TP-3) to depths ranging from 9.5 to 12 feet below existing ground surface (ft bgs). The vent pipe was determined to extend from the north wall of the office (Figure 2) beneath the concrete slab and connecting to a fill pipe; both pipes extended vertically downward to a previously unidentified UST. The top of the UST was observed at 9.5 ft bgs, estimated to have a capacity of 550 gallons, and was oriented in an east-west direction, approximately 3 feet from the north office wall. Petroleum-contaminated soil was observed visually at a depth of 10.5 ft bgs on the east end of the UST and at 12 ft bgs on the west end.

In addition to petroleum hydrocarbons, the previous consultant tested for select metals, both in and around Building No. 4.⁵ A total of 17 push-probe soil borings were completed, which included the eight borings where petroleum contamination was detected. The soil samples collected from the borings were analyzed for arsenic, cadmium, chromium, copper, lead, nickel, and silver. Of these metals, five were further analyzed using EPA's Toxicity Characteristic Leaching Procedure (TCLP), including arsenic, cadmium, chromium, lead, and silver (Table 2). The consultant also sampled dust inside Building No. 4, which indicated elevated concentrations of lead and copper. The Client subsequently contacted Philip West Industrial Services in 1999 to remove the metal-contaminated dust from inside the building.⁹

On August 25, 2004, the City of Portland Bureau of Environmental Services (BES) conducted in-line sediment sampling in the 42-inch storm sewer that runs beneath and parallel to the east margin of the adjacent BNSF rail line. This sampling event followed storm-water line maintenance from 2001 to 2004 to remove large quantities of sediment from the sewer.¹⁰ According to City of Portland (CoP) Public Works Sewer Service Request 104299, city personnel found manholes AAX265 and AAX281 (downstream and upstream from TL 800, respectively) were one-quarter to nine-tenths full of debris, which confirmed a complaint filed by a contractor installing a lateral

⁸ GeoEngineers, May 12, 1999. Draft Report of Test Pit Exploration, Former Magnus Metals Company Site, 3074 Northwest St. Helens Road, Portland, Oregon

⁹ GeoEngineers, December 14, 1999. *Letter Report, Dust Abatement Services*, Former Magnus Metals Company Site, 3074 Northwest St. Helens Road, Portland, Oregon

¹⁰ BES, March 21, 2006. City of Portland Bureau of Environmental Services, Technical Memorandum No. OF 18-1, City Outfall Basin 18, Inline Solids Sampling in the Vicinity of Container Management Service and Wilhelm Trucking Co.

storm water line to the 42-inch sewer.^{11,12} Sewer Work Orders 152193, 152200, 152205, 152208, 152209 and 152210 documented the sewer cleaning, which was completed by July 2001 (CoP, 2001d-h).^{13,14,15,16,17,18} The source of the debris in the sewer in 2001 does not appear to have been determined, although there were documented problems with upstream sources of debris in 2003 and 2004. In February 2003, mud and debris in the storm sewer was attributed to the hillside above NW Sussex Avenue at the upper end of the storm sewer drainage basin.¹⁹ Just one month prior to the BES in-line sediment sampling event in August 2004, three cubic yards of debris were removed upstream in July 2004 due to the collapse of the metal storm sewer piping crossing beneath the front storage yard of the adjacent Container Management Services property between the NW St. Helens Road right-of-way to the 42-inch storm sewer; this pipe breakdown was referred for repair.²⁰ In December 2017, the metal storm sewer piping, which was comprised of 55-gallon drums welded end-to-end, was replaced with a double-wall, high-density polyethylene pipe.²¹

In 2011, ODEQ requested collection of erodible soil and sediment samples from the subject site and the property to the east (east of the BNSF rail line, TL 600) which is also owned by Client, and sediment samples from the 42-inch storm sewer running through TL 600. A previous consultant collected sediment Sample 011 from Catch Basin No. 8 on TL 800 and surface soil grab samples from TL 700 and TL 800 adjacent to the right-of-way for NW St. Helens Road. Soil sample SS-004 was collected from the southwest corner of TL 700 and soil samples SS-005 and SS-006 were collected near the middle and south entrances of TL 800, respectively.²² Concentrations for metals, total polychlorinated biphenyls (PCBs), pesticides, bis(2-ethylhexyl) phthalate (BEHP), and polycyclic aromatic hydrocarbons (PAHs) were detected above Joint Source Control Strategy (JSCS) screening levels. At the time, however, the consultant could not isolate the source(s) of the contaminants to past site operations, aerial deposition, or storm water sprayed onto the property by passing traffic.

In late 2019, observations made by Client during video inspections of the catch basin CB8 on TL 800 discharge line and test pitting in the backfill behind the Building No. 4 determined that the catch basin piping ties in with the discharge piping from several roof downspouts, all of which tie together to discharge to the buried rock sump located near the east retaining wall. Video

¹¹ CoP. April 17, 2001. City of Portland Public Works, Sewer Service Request 103752

¹² CoP. April 25, 2001. City of Portland Public Works, Sewer Service Request 104299

¹³ CoP. April 17, 2001. City of Portland Public Works, Sewer Work Order 152210

¹⁴ CoP. May 10, 2001. City of Portland Public Works, Sewer Work Order 152193

¹⁵ CoP. May 10, 2001. City of Portland Public Works, Sewer Work Order 152200

¹⁶ CoP. May 10, 2001. City of Portland Public Works, Sewer Work Order 152205

¹⁷ CoP. May 10, 2001. City of Portland Public Works, Sewer Work Order 152208

¹⁸ CoP. May 10, 2001. City of Portland Public Works, Sewer Work Order 152209

¹⁹ CoP. February 3, 2003. City of Portland Public Works, Sewer Service Request 120523

²⁰ CoP. July 8, 2004. City of Portland Public Works, Sewer Work Order 156491

²¹ . SLR International Corporation. February 2019. Drum Pipeline Replacement Report, Container Management Services Site; Prepared for: IMACC Corporation

²²Hahn and Associates, Inc. January 12, 2012. *Storm Water Assessment, Erodible Soil and Storm Water Sediment Sampling Report*.

inspection confirmed the top of sump is buried approximately 8 ft bgs, which corresponds to the former ground surface prior to backfill placement in about 1975. Based on field observations, it appears that the rock sump, associated storm-water piping, and the backfill are contemporaneous. The rock sump, but not the piping, qualifies as an Underground Injection Control (UIC) device.

Wilhelm and ODEQ first entered into a Voluntary Cleanup Program Letter Agreement for both TL 600 and TL 800 on March 25, 2008. The Letter Agreement addressed completion of a stormwater assessment and implementation of source control measures. In July 2020, new Letter Agreements for TL for Tax Lots 600 and 800 were signed to separate assessment of the two properties. Accordingly, separate work plans prescribe the activities required for each tax lot.

4.0 Cleanup Standards and Other Numeric Criteria

Oregon's environmental cleanup rules (Oregon Administrative Rules [OAR] 340-122) establish the standards and procedures for the protection of current and future public health, safety and welfare, and the environment in the event of a release or threat of a release of a hazardous substance. In the event of a release of a hazardous substance, remedial actions shall be implemented to achieve:

- Acceptable risk levels defined in OAR 340-122-0115, as demonstrated by a residual risk assessment; or
- Numeric cleanup standards developed as part of an approved generic remedy identified or developed by the Department under OAR 340-122-0047, if applicable; or
- For areas where hazardous substances occur naturally (e.g., metals, etc.), the background level of the hazardous substances, if higher than those levels specified above.

Acceptable risk levels may be evaluated through conducting a site-specific risk assessment that calculates exposure point concentrations (EPCs) for specific exposure pathway receptor-scenarios or use generic for hazardous substances under ODEQ's Risk-Based Decision Making (RBDM) guideline to streamline the risk assessment process (see below).

4.1 Cleanup Standards

The assessment and remediation of hazardous substances in Oregon are conducted according to OAR 340, Division 122, *Hazardous Substance Remedial Action Rules*. The following cleanup standards and numeric criteria may be applied in evaluating site assessment results.

Soil Matrix. Under the Soil Matrix Cleanup Option (OARs 340-122-0320 through 0360) cleanup standards are determined by assigning site-specific values to environmental parameters (e.g., soil type, depth to ground water, etc.). For purposes of risk-based evaluations of soil, Soil Matrix Cleanup Levels are often used for screening purposes, where potentially significant levels of petroleum contamination may be present if concentrations of total petroleum hydrocarbons in

soil exceed their respective Soil Matrix Cleanup Level or Soil Matrix Level I for conservative screening purposes and may require remedial action. Concentrations of total petroleum hydrocarbons lower than their corresponding Soil Matrix Cleanup Level or Soil Matrix Level I if a cleanup level has not been determined, usually do not require any additional cleanup or risk management.

ODEQ Risk-Based Concentrations. ODEQ has compiled default risk-based screening reference levels [*Risk-Based Decision Making for the Remediation of Contaminated Sites* (RBDM) guidance document] for common exposure-pathway receptor-scenarios that may be utilized in lieu of site-specific risk calculations (OAR 340-122-0115). In particular, the pre-calculated risk-based concentration (RBC) represents the concentration of a contaminant of interest (COI) in the impacted medium (e.g., soil, ground water, or air) that potentially represents an unacceptable risk level.

The published RBCs represent a conservative default concentration of a COI in an impacted medium (e.g., soil, ground water, soil gas, or air). When COI concentrations on a site exceed the RBC, unacceptable human health impacts are possible.

- For carcinogens, the regulatory standard is represented by an excess cancer risk of one in one million (1×10^{-6});
- For non-carcinogens, this is represented by a Hazard Index of 1.

RBC exceedances typically trigger further investigation and potentially a human health risk assessment. Therefore, RBCs can be applied at sites as generic, conservative cleanup standards and are routinely used by ODEQ to determine if a site requires additional action. Site-specific parameters used in the equations to develop the RBCs are often adjusted to match actual conditions in developing site-specific cleanup levels.

RBCs are generally used to evaluate sampling analytical results as follows:

- ODEQ's lowest RBC for all pathways for residential receptors is used as an initial 'conservative' screening of a constituent. If a constituent's concentration exceeds its screening-level RBC (SLRBC), it requires further evaluation. Otherwise, the constituent is considered unlikely to pose unacceptable risk to any human receptor.
- Because ODEQ Generic RBCs are based on several conservative assumptions (e.g., duration and type of exposure), exceeding an SLRBC does not necessarily indicate that additional investigation or remediation is required. Rather, the exceedance of a SLRBC may indicate that additional investigation and evaluation, including consideration of site-specific information (e.g., current, and future land uses), may be necessary to determine if remediation or other actions are necessary. In many cases, it is not possible to determine whether unacceptable risks to human health and the environment are present, and require further action, until a risk assessment, including evaluation of current and reasonably likely land and water uses, is complete.

- In general, ODEQ considers chemical concentrations less than SLRBCs to be protective of human health.

Should constituents be identified that also exceed their generic, but exposure pathway- and receptor-specific RBCs, then the appropriateness of additional site-specific methods allowed under the RBDM guidance document will be evaluated (e.g., the development of site-specific RBCs, sampling of soil gas and/or vapor, etc.).

4.2 Other Numeric Criteria

In addition to the above risk-based cleanup standards, concentrations will also be compared to the following numeric criteria to determine if possible enrichment was occurring, and/or determine if there may be offsite soil disposal restrictions.

- **Background Metals.** Analytical data were compared with background concentrations established by the ODEQ²³. ODEQ does not require cleanup for metals concentrations below default background concentrations.

5.0 Current Data Gaps

Based on review of existing data for soil, the following observations were made:

- Total arsenic, copper and lead were detected at several locations in surface and subsurface soil on TL 800 at concentrations exceeding both their SLRBCs and default background concentrations, suggesting possible enrichment of these metals at TL 800.
- DRO was detected in subsurface soil at GP-6-8, GP-12-12, and GP-16-10, at concentrations exceeding its SLRBC.
- PCBs were detected in a surface soil sample (SS-005) slightly exceeding its SLRBC.
- PAHs, specifically benzo(a)pyrene, was detected in surface soil at concentrations slightly exceeding its SLRBC.

Findings of previous soil sampling were limited and have not defined the magnitude and extent of soil impacts (both surface and subsurface) or confirmed if ground water impacts may be present. The soil data suggests multiple sources of onsite impacts, including:

- Prior use of TL 800 as a foundry.
- Presence of a leaking UST on the west side of Building 4 on TL 800.
- Possible presence of a UST on the east side of Building 4 on TL 800.
- Presence of undocumented fill on the east side of Building 4 on TL 800, between the building and the retaining wall along the eastern site margin.

²³ ODEQ. March 20, 2013, Fact Sheet: Background Levels of Metals in Soils for Cleanups.

- Presence of a dry well on the east side of Building 4 on TL 800, that is connected to a catch basin in the south-central portion of TL 800.

Since the source areas on TL 800 are in close proximity to TL 700, proposed sampling efforts will include sampling on TL 700 to determine extent of impacts on TL 800 towards and possibly on TL 700.

6.0 Constituents of Interest

Based on historical use of the subject site, and results from previous site investigations (Section 3), the following constituents of interest (COIs) were determined appropriate for the subject site.

- Prior foundry use (TL 800).
 - Priority pollutant metals
- Presence of a leaking UST on the west side of Building 4 on TL 800.
 - DRO, residual-range hydrocarbons (RRO), priority pollutant metals, volatile organic constituents (VOCs), PCBs, and PAHs [based on prior assessment of total petroleum hydrocarbons (TPH) at this location]
- Possible presence of a UST on the east side of Building 4 on TL 800
 - DRO, RRO, priority pollutant metals, VOCs, PCBs, and PAHs (based on prior assessment of TPH at this location)
- Possible presence of undocumented fill on the east side of Building 4 on TL 800
 - Priority pollutant metals
- Presence of a dry well on the east side of TL 800
 - DRO, RRO, priority pollutant metals, VOCs, PCBs, and PAHs (based on prior assessment of TPH at this location)

7.0 Objectives and Overview of Proposed Work

The following work is proposed to complete the assessment of COIs related impacts to past operations at the subject site (Section 5.0) and evaluate new and existing data for the purpose of determining appropriate steps to bring the site to regulatory closure through a communicative and iterative process designed to focus work in an efficient, timely and cost-effective manner. Work methods and procedures are described in Sections 7.0 through 10.0.

Overview. The following general tasks are planned:

1. Pre-field activities.
2. Further assessment of:

- a. Surface soil
 - b. Subsurface soil
 - c. Possible historical (circa 1940s) six (6)-inch sanitary sewer line on the east side of Building 4
3. Initial assessment of ground water using reconnaissance ground water samples from open boreholes with temporary well points.
4. Following initial ground water assessment using reconnaissance data, baseline ground water monitoring.
 - a. Install and develop five ground water monitoring wells.
 - b. Conduct first round of monitoring prior to implementation of any interim remedial measures, if any, to provide baseline data.
5. Initial Risk Assessment to include:
 - a. Assessment of the magnitude and extent of known residual impacts in soil and ground water, as applicable.
 - b. Results of a beneficial land and water use determination.
 - c. Results of risk assessment.

Details of the tasks listed above are presented in the following sections.

8.0 Pre-Field Activities

The following activities will be completed prior to beginning field work:

- Obtain written approval of this FSI Work Plan from ODEQ.
- Prepare a site-specific Health and Safety Plan (HASP) to address potential environmental and physical hazards associated with the proposed field activities. The HASP will establish personnel protection standards and mandatory safety practices and procedures for use during the field investigation. A copy of the site-specific HASP will be presented to all ENW field personnel and their subcontractors. A tailgate safety meeting will be conducted with all site workers, prior to the start of any work.
- A geophysical survey will be conducted on the subject site, to locate potential underground features of concern, if present. The survey will be conducted in all accessible areas of the subject site, and focused efforts will be made to try and locate the possible UST located on the east side of Building 4. The results of this survey may result in relocating proposed boring locations outlined in Section 9.2.
- Locate utilities in the area of work. At least 48 hours prior to the start of subsurface activities, proposed work locations will be marked with white paint and One-Call Utility Notification Service will be notified. In addition, a private underground utility locator will be contracted to map subsurface utilities and clear work locations.

9.0 Proposed Scope of Work for Further Site Assessment

9.1 Surface Soil Assessment

Surface soil samples will be collected using the Incremental Sampling Method (ISM) in accordance with ODEQ's Decision Unit Characterization guidance.²⁴ ISM sampling consists of collecting many small increments of soil (discrete soil increments) from a given decision unit (DU) and compositing them into one larger sample. The relatively large soil sample is thoroughly homogenized and subsampled in the laboratory. The resulting contaminant concentrations represent the average concentration for the entire DU. This sampling procedure will minimize effects of heterogeneity (micro scale and short scale) in the soil to provide a more accurate representation of contaminant concentrations within each DU.

9.1.1 Increment Sampling Locations

The locations targeted for ISM sampling are illustrated in Figure 4 (DU01 through DU06). The decision units will be divided in a grid pattern consisting of approximately 75 grids, following the State of Hawaii's guidance²⁵ where the soil incremental locations are evenly spaced. Soil increments (soil samples of equal mass) will be collected from the center node of each increment grid (grid-center systematic sampling) resulting in collection of 75 soil increments from each DU. Grid locations will be distributed evenly within the decision unit to ensure that the entire decision unit population is equally represented in the final multi-increment sample. Soil increments will be sampled with a stainless-steel push probe and/or hand auger. Wood debris and large rocks will be removed from each soil increment prior to combining in the laboratory-provided sample container.

9.1.2 Incremental Sampling Depth

Soil increments from each DU will be collected between approximately 0 and 0.5 ft bgs, or below aggregate fill, where present.

9.1.3 Laboratory Sub-Sampling and Compositing

Samples will be immediately placed in cooled storage until they are delivered to Friedman & Bruya, Inc. (F&BI) of Seattle, Washington. All laboratory subsampling and sample preparations will be conducted in accordance with Interstate Technology & Regulatory Council (ITRC) protocols²⁶ (air dried, sieved, subsampled, and composited). An ISM sub-sampling and compositing standard operating procedure prepared by Friedman & Bruya, Inc. (F&BI) of Seattle, Washington, is included as an Attachment.

²⁴ ODEQ, September 14, 2020. *Decision Unit Characterization. Internal Management Directive.*

²⁵ State of Hawaii Department of Health, July 2021. Characterization of Decision Units. <https://health.hawaii.gov/heer/tgm/section-04/#4.2.5>

²⁶ The Interstate Technology & Regulatory Council (ITRC), October 2020. Incremental Soil Sampling Methodology (ISM) Update.

The samples will be analyzed according to the Analysis Plan (Section 10) and sample containers, preservatives, and holding times for each analytical method are provided in Section 10 of this work plan. Chain-of-custody protocols will be followed.

9.2 Subsurface Assessment

The scope of work for this portion of the project is the installation of 39 temporary borings based on the following systematic sampling strategy:

- Borings on TL 800 will be sited node-center on 25-ft grids.
- Borings on TL 700 will be sited node-center on 50-ft grids.
- Three borings are located on Tax Lot 600 located to the west of the BNSF rail line, in the assumed hydraulic down-gradient direction with respect to TL 800.

Sampling from these borings will provide additional subsurface data (soil and reconnaissance ground water) for the subject site and assumed down-gradient areas. Methods and procedures are described below and proposed temporary boring locations are illustrated on Figure 4 (note, proposed boring locations may be adjusted/modified based on the results of the aforementioned geophysical survey).

9.2.1 Drilling

Drilling will be directed by ENW and performed by Cascade Drilling using a direct-push drill rig. In total, 39 borings will be advanced at locations identified on Figure 4. All sampling equipment will be steam-cleaned or otherwise decontaminated prior to use.

Soil borings will be completed to approximately five feet below the observed water table with total depths of approximately 25 feet bgs anticipated. Continuous soil cores will be collected to total depth in each boring and each five (5)-foot core will be sliced lengthwise to expose the soil core for observations and logging.

All soil cores will be logged by an ENW Geologist onto field boring logs with lithology described using the Unified Soil Classification System (Section 9.2.2).

Soil will be collected within five (5)-foot long cellulose acetate butyrate (CAB) sample tubes and evaluated, sampled, and analyzed according to the protocol and sampling plan described below.

9.2.2 Soil Assessment

Field Screening. Recovered soil cores will be inspected continuously for the presence of impacts. In general, petroleum-impacted soil and should be readily apparent based on visual appearance (e.g., green or gray staining, sheen, petroleum odor). Field headspace screening of soil cores at regular intervals will be collected from grab samples from the drilling core and readings recorded on the boring log. Field headspace will be measured by placing an aliquot of soil to be tested in a resealable plastic bag and inserting the tip of a photoionization detector (PID) into the bag and reading headspace volatiles in parts per million by volume (ppmv).

Soil Sampling. Soil samples will be collected continuously at five (5)-foot intervals in each boring. The sampling interval may be modified in the field based on the results of field screening, where soil with obvious indications of impacts will be preferentially sample. Soil sampling will continue to the soil/water interface where the final soil sample will be collected. The samples will be labeled as follows:

- Sample Designation, or Identification
- Date and time of collection
- Project number
- Analysis required
- Preservation (if applicable).

Samples will be immediately placed in cooled storage until they are delivered to F&BI. The samples will be analyzed according to the Analysis Plan (Section 10) and sample containers, preservatives, and holding times for each analytical method are provided in Section 10 of this work plan. Chain-of-custody protocols will be followed.

Soil Logging. Standards for uniformity in sample description are very important for correlating hydrostratigraphic units across the site. Soil samples will be described using appropriate geologic nomenclature and Unified Soil Classification System to the extent practical. Color will be described using the Munsell system. Information such as percentage of gravel, sand, and fines; particle size range, shape, and angularity; and plasticity, cohesiveness, strength, and dilatancy will be recorded, as appropriate. In addition, the presence of odors, moisture, sedimentary structure, weathering, , and interpretation of stratigraphic unit will be documented.

The format to be recorded on boring logs is shown below:

- Light brown (5YR 6/4) silty SAND (SM) – 80% fine sand, subrounded, micaceous, 15 to 20% silty fines with low plasticity, non-cohesiveness, low dry strength, no dilatancy, and low toughness; firm; wet; some organic debris; massive and reduced; and petroleum-like odor; (FILL).

9.2.3 Reconnaissance Ground-Water Sampling

A reconnaissance ground water sample will be collected from each of the proposed borings. Reconnaissance ground-water sampling tools will consist of:

- Temporary stainless-steel or polyvinyl chloride (PVC) well point
- Clean polyethylene (PE) tubing for each sample
- Peristaltic pump with low-flow capability
- Water-Level Indicator

Thirty-nine (39) reconnaissance ground water samples will be collected from clean stainless-steel or fresh PVC temporary well-points inserted into temporary boreholes. A water-level meter will

be inserted in the temporary well-point to determine static water levels to within 0.01 foot. This information will be recorded on the sample collection form for ground-water sampling.

Prior to sampling ground water, the well point will be purged using the peristaltic pump and disposable PE tubing or disposable Teflon or PE bailer. At least one (1) borehole volume of water will be removed or until the well point is purged dry. Purge volume will be calculated based on the following formula:

$$1 \text{ borehole volume (gallons)} = \pi r^2 h \times 7.48 \text{ gal/ ft}^3,$$

where $\pi = 3.14$, r = radius of well casing in feet, and h = height of water column from the bottom of the well in feet.

Water quality parameters (observations / measurements regarding color, turbidity, or other factors that may be important in evaluation of sample quality) will be recorded on the sample collection form following sample collection. As these borings are temporary and the well-points are not developed or surveyed wells, this information is only for qualitative purposes and will be used for placement of a monitoring well network.

The well points will be purged at a rate below the rate that was used for development and below their recovery rate to prevent further development of the well. Purge data will be recorded on the sample collection form. Purge and decontamination water will be contained in drums at the facility for proper disposal.

Ground-water sampling will begin immediately following well purging or the borehole purges dry, as soon as enough water is available in the well for sampling. Sample data will be recorded on the sample collection form, including sample number and time collected, the observed physical characteristics of the sample (e.g., color, turbidity, etc.) and other data that may be important in the evaluation of sample quality.

Ground-water samples will be collected for all parameters using a peristaltic pump with disposable PE tubing or a disposable Teflon or PE bailer; volatile organic analysis (VOA) samples will be collected first, using a peristaltic pump with low-flow sampling. To prevent degassing during sampling, the pumping rate will be adjusted below 100 milliliters per minute (mL/min), or a bailer will be lowered gently into the water column. Clean Nitrile gloves will be worn when collecting each sample.

Volatile Organic Constituents. The water sample will be discharged slowly and carefully into VOA containers to prevent aeration; each VOA will be completely filled so that no headspace remains. VOA sample containers will be checked for air bubbles by turning the bottle upside down, tapping it lightly to make air bubbles move to the bottom of the sample bottle. If air bubbles are observed in any of the VOA containers, the container will be re-topped off with fresh sample (refilled, once only, or a new container used).

Metals. Samples of ground water collected for metals analysis will be filtered through a 0.45-micron filter prior to collection in a sample container with an aliquot of nitric acid.

Samples will be labeled consistent with the protocol previously provided for soil samples and immediately placed in cooled storage until they are delivered to F&BI. The samples will be analyzed according to the Analysis Plan (Section 10). Sample containers, preservatives, and holding times for each analytical method are provided in Section 10 of this work plan. Chain-of-custody protocols will be followed. All sampling will be conducted in accordance with the appropriate provisions of the project Health and Safety Plan.

9.3 Install Ground Water Monitoring Network

Based on the results of subsurface assessment (Section 8.2) a ground water monitoring well network will be installed to provide quantitative ground-water data, information on ground-water gradient and flow, as well as information related to seasonal variations in that data. The scope of work for this portion of the project includes the installation of five (5) ground water monitoring wells; however, the locations of these monitoring well will be determined using data obtained during initial subsurface assessment. It is anticipated that these wells will be sited to provide information related to up-gradient locations (one monitoring well), areas down-gradient for likely ground-water source areas (two to three monitoring wells), and information proximate to likely ground-water source areas (one to two monitoring wells). Methods and procedures are described below.

9.3.1 Drilling

Drilling will be directed by ENW and performed by Cascade Drilling using a direct-push drill rig. In total, five well borings will be advanced at locations to be determined, as outlined in Section 9.2.1.

Based on information obtained during initial subsurface assessment (Section 9.2), well borings will be completed at least five feet below the observed water table with total depths determined based on the likely range of seasonal ground-water fluctuation informed from lithologic evaluation. Continuous soil cores will be collected to total depth in each boring and each 5-foot core will be sliced lengthwise to expose the soil core for observations and logging.

All soil cores will be logged by an ENW Geologist onto field boring logs with lithology described as outlined in Section 9.2.2.

9.3.2 Soil Assessment

Field Screening. Recovered soil cores will be inspected continuously for the presence of petroleum impacts. In general, petroleum-impacted soil should be readily apparent based on visual appearance (e.g., green or gray staining, sheen, petroleum odor). Field headspace screening of soil cores at regular intervals will be collected from grab samples from the drilling core and readings recorded on the boring log. Field headspace will be measured by placing an aliquot of soil to be tested in a resealable plastic bag and inserting the tip of a PID into the bag and reading headspace volatiles in ppmv.

Soil Sampling. No soil samples are anticipated to be retained for laboratory analysis while drilling monitoring well borings, since it is anticipated that all borings will be sited proximate to areas previously assessed by similar drilling methods as described above.

9.3.3 Monitoring Well Installation

At a minimum, this work will include installation, development, and quarterly sampling of a network of five ground water monitoring wells (MW01 through MW05) in accordance with OAR 340-122-0240(2). The monitoring wells will be constructed by an Oregon-licensed well driller, with details of the construction recorded by ENW geologist. Screened intervals will be based on field observations of subsurface lithology and indications of petroleum impacts. Each well will be constructed of the following materials:

- Two (2)-inch inside diameter (ID), Schedule 40 PVC blank casing
- 10-slot (0.010-inch) pre-pack well screen, and end cap
- Annular seal composed of hydrated bentonite chips
- Both surface monuments (in impervious areas of concrete or asphaltic concrete cover) and above-ground locking monuments with three bollards set in concrete (in areas of pervious soil cover) are anticipated.

9.3.4 Monitoring Well Development

Monitoring wells MW01 through MW05 will be developed through a process of surging and pumping until development water is clear of sediment and monitored ground-water parameters have stabilized. Development water and recovered sediment will be placed in Department of Transportation (DOT) approved 55-gallon drums for off-site recycling and disposal.

Development of each well will be completed using a Waterra HydroLift pump and/or an electric submersible pump connected to a power source at the surface. The pump discharge rate will be recorded, and water quality parameters will be measured regularly during discharge to track the progress of development, including:

- pH
- Temperature
- Conductivity
- ORP (oxygen-reduction potential)
- DO (dissolved oxygen)

Each well will be surged during pumping by moving the pump intake up and down the well screen within the water column, to allow the suspension of sediment within the water column and subsequent removal by pumping. This will be repeated several times.

At a minimum, six (6) well volumes and up to ten (10) or more well volumes may be purged from each well. All purge water will be contained in 55-gallon DOT drums. Once the water has cleared substantially with pumping and surging, no further development will be conducted.

Development data will be recorded on a Well Development Measurements forms, and include purge volumes, time of beginning and termination of purging, and observations regarding color and water quality parameters and depth to water measures with recovery.

9.3.5 Monitoring Well Surveying

The monitoring wells will be professionally surveyed relative to an arbitrary datum to the nearest 0.01-vertical foot relative to this elevation. The northing and easting coordinates of the monitoring well monuments will also be established.

9.3.6 Initial Ground Water Monitoring

Ground water samples will be collected from new monitoring wells MW01 through MW05 following their development. Prior to purging, depth to water and well completion depth will be measured using a water level indicator in all five (5) wells. The depth to water will be recorded to the nearest 0.01 foot in all wells on the sample collection form for ground water sampling.

9.3.7 Purging

The monitoring wells will be purged using dedicated PE tubing and a peristaltic pump. All purge water will be contained in 55-gallon DOT drums.

During purging, water-quality indicator parameters (pH, temperature, specific conductance, ORP, and DO) will be monitored using a water quality meter (e.g., Horiba U52 or InSitu AquaTroll 500) equipped with a flow-through cell and recorded on a field sampling data sheet.

Generally, the following protocol will be followed:

- Measure the water level and record on the Field Sampling Data Sheet (FSDS).
- Slowly lower the PE tubing into the monitoring well until the intake end is centered in the screened portion of the monitoring well.
- Connect the discharge line from the peristaltic pump to a flow-through cell. Direct the discharge line from the flow-through cell to a container to contain the purge water during the purging and sampling of the monitoring well.
- Initial pumping at a low flow rate (0.1 to 0.5 liters per minute [L/min]) and check water level to ensure total drawdown is less than 10 cm (or 0.3 feet), otherwise lower the pumping rate.
- Measure the discharge rate of the pump with a graduated cylinder and a stopwatch. Record both depth to water and flow rate on FSDS every three (3) to five (5) minutes.

- Purge a minimum of one (1) tubing volume (including volume of water in pump and flow cell) prior to recording water-quality indicator parameters (dissolved oxygen, specific electrical conductance, pH, ORP and temperature). Note, ORP may not always be an appropriate stabilization parameter, and will depend on site-specific conditions. However, readings will be recorded as a double check for oxidizing conditions. The stabilization criterion is based on three successive readings of water quality field parameters, as referenced below:
 - pH $\pm$ 0.1
 - Temperature $\pm$ 0.1 °C
 - Conductivity $\pm$ 3% μ S/cm
 - ORP (oxygen-reduction potential) $\pm$ 10mV
 - Turbidity $\pm$ 10%
 - DO (dissolved oxygen) $\pm$ 10%

9.3.8 Ground Water Sampling

Ground water well sampling will begin immediately following purging, or as soon as enough water is available for sampling. Ground water samples will be collected using a decontaminated peristaltic pump with dedicated PE tubing. To prevent degassing during sampling, the pump will be adjusted to a low flow rate. Clean Nitrile gloves will be worn when collecting each sample.

Sample data will be recorded on the FSDS, including sample number and time collected, and the observed physical characteristics of the sample (e.g., color, visual turbidity, etc.) and other data that may be important in the evaluation of sample quality. The water sample will be discharged slowly and carefully into VOA containers to prevent aeration; each VOA will be filled so that no headspace remains. VOA sample containers will be checked for air bubbles by turning the bottle upside down, tapping it lightly to make air bubbles move to the bottom of the sample VOA. If air bubbles are observed in any of the VOAs, the container will be re-topped off with fresh sample (refilled, once only, or a new container used).

The samples will be labeled as follows:

- Sample Designation, or Identification
- Location
- Date and time of collection
- Project number
- Analysis required
- Preservation (if applicable).

Samples will be immediately placed in cooled storage until they are delivered to F&BI of Seattle, Washington. The samples will be analyzed according to the Analysis Plan shown in Section 10. Sample containers, preservatives, and holding times for each analytical method are provided in Section 10.

9.4 Investigation of Historic Sanitary Sewer Line

A map of the Guilds Lake Court temporary housing indicates that a 6-inch sanitary sewer line may have served TL 800 (Figure 3) and appears to enter the property in the area near the rock sump UIC. Test pitting is proposed on TL 800 to confirm (or disprove) that this sewer was installed to serve the foundry. This activity will be coordinated with the decommissioning of the rock sump UIC, which is proposed to be removed using a backhoe. If the sanitary sewer lateral is observed during the UIC decommissioning, then the proposed test pitting (discussed below) will not be required.

In order to confirm or disprove that a sanitary sewer lateral provided service to TL 800 from the east, a test pit is proposed to intersect with the sewer pipe in the general area identified on Figure 3. The proposed test pit location extends for approximately 60 feet adjacent to the retaining wall along the east side of the property (Figure 4) and will be excavated to a depth of approximately 3-4 ft bgs. A recent property boundary survey indicated the retaining wall is set back 6.85 feet from the property boundary in the area of the proposed test pit, which will allow sufficient space for a small backhoe or trencher to work on TL 800 without interfering with the railroad right-of-way. Prior to excavation, the test pit area will be checked for utilities through Oregon Utility Notification Center, as well as with a private locator.

The test pit is proposed to be excavated along the outside of the retaining wall in order to minimize the depth of the excavation. No more than 5 feet in length of the test pit will be open to its full depth at any time during excavating. If the sanitary sewer lateral is intercepted, the line will be assessed with a pipeline video camera that includes a transponder to follow the progress of the camera and locate the piping in three dimensions (i.e., horizontal directions and depth) below the ground surface.

9.5 AST Decommissioning

An approximately 275-gallon above ground storage tank (AST) is present in the basement of Building 4. A vent pipe and remote fill port were observed on the exterior southwest corner of the office portion of Building 4 adjacent to the AST's location in the basement. On November 14, 2022 the AST was assessed and found to contain approximately 30 inches of liquid with a petroleum odor and red appearance. A sample was collected, and laboratory analysis indicated diesel-range petroleum hydrocarbons, consistent with heating oil. The red dye present in the product as well as copper supply lines from the tank were observed to connect to the defunct furnace suggest it was at one time used for heating oil.

The contents of the AST will be pumped out and the interior of the tank triple rinsed. All generated liquids (product and associated rinse) will be transported off-site by a licensed waste hauler for appropriate disposal. Following tank pumping and cleaning, the AST will be removed from the building and scrapped.

9.6 Equipment Calibration

Monitoring equipment used during sampling (e.g., PID, specific conductance and pH meters) will be calibrated according to manufacturer's specifications at the beginning of each sample day. Meter calibration will be checked at least twice during a sample day (middle and end of day) or when meter drift is suspected. The meters will be calibrated with gases or buffered solutions closest to known field parameters (usually this is pH = 7, specific conductivity = 240 micro siemens [μS] and VOC concentration = 100 micrograms per cubic meter [$\mu\text{g}/\text{m}^3$] methane or heptane for PID calibration).

9.7 Decontamination Procedures

Before collecting any sample, collection tools will be decontaminated by steam-cleaning or alternatively using a sequential wash of Alconox®, rinsed in tap water from a known source (e.g., municipal water), and subjected to a final rinse with distilled water. Wash and rinse liquids will be changed frequently during sampling activities, as appropriate. Wash and rinse fluids will be collected, if possible, and appropriately disposed. Fresh nitrile gloves will be worn during any sample collection and when handling tools which are to be inserted into sampling areas. Solid waste generated during sampling activities (gloves, foil, paper towels, etc.) will be appropriately disposed.

9.8 Investigation-Derived Waste Storage and Disposal

Potentially impacted investigation-derived waste (IDW) will be generated during well installation. All IDW, including soil cuttings and development/purge water, will be placed in DOT-approved 55-gallon drums. All containers will be properly sealed/covered and labeled. Analytical data from the IDW characterization sampling will be used to profile the soil cuttings and water IDW for disposal. Soil IDW will be characterized by collecting composite samples from soil-containing drums and purge water/decontamination water-containing drums.

10.0 Analytical Plan

Samples collected during this interim action will be analyzed according to the plan and protocol described in the following tables. As a note, the analytical plan for ground water monitoring wells will be determined based on the qualitative reconnaissance ground-water results.

Table 9-1. Proposed Analytical Plan

Analytical Method	Constituents	Soil	Ground Water
NWTPH-Dx	TPH – Diesel- and/or Residual-range quantification (DRO and/or RRO, respectively)	All	All
EPA 5032\8260B	Volatile organic constituents	Select samples, based on the magnitude of combined DRO+RRO concentration detected (if over 500 mg/Kg).	All
EPA 8270	Polycyclic Aromatic Hydrocarbons	Select samples, based on the magnitude of DRO detected.	All samples with DRO > 100 µg/L
EPA 8082-SIM	Polychlorinated biphenyls (PCBs) (as Aroclors) • Aroclor 1221 • Aroclor 1232 • Aroclor 1016 • Aroclor 1242 • Aroclor 1248 • Aroclor 1254 • Aroclor 1260 • Aroclor 1262 • Aroclor 1268	All	All
EPA 200.8/6020	Priority Pollutant (PP) Metals: • Antimony • Arsenic • Beryllium • Cadmium • Chromium (total) • Copper • Lead • Nickel • Selenium • Silver • Thallium • Zinc	All	Dissolved Arsenic, Copper, and Lead in reconnaissance ground-water samples. All PP metals in samples from future monitoring wells
EPA 1631/7041	Mercury	All	All

EPA = U.S. Environmental Protection Agency

Table 9-2. Analytical Protocol

Analyte(s)	Analytical Method	Container and preservative	Holding time	Preservation
Soil:				
VOCs	EPA Methods 8260/8021/8010/5035A	Fine-grained soil: Laboratory pre-tared polyethylene syringes	14-days until analysis	Ice/Methanol
		Coarse-grained soil: 4-oz Clear wide mouth glass, minimum headspace	14-days	Ice
DRO	NWTPH-Dx	4-oz Clear wide mouth glass, minimum headspace	14-days	Ice
PCBs	EPA 8082	4-oz Clear wide mouth glass, minimum headspace	14-days	Ice
PAHs	EPA 8270	4-oz Clear wide mouth glass, minimum headspace	14-days	Ice
Reconnaissance Ground Water:				
VOCs	EPA Method 8260	40-ml Teflon cap VOA containers, no headspace	14-days	Ice & HCl

Analyte(s)	Analytical Method	Container and preservative	Holding time	Preservation
DRO	NWTPH-Dx	500-ml Amber bottle with Teflon-lined cap	14-days	Ice & HCl
PCBs	EPA 8082	1-L Amber bottle with Teflon-lined cap	14-days	Ice & HCl
PAHs	EPA 8270	1-L Amber bottle with Teflon-lined cap	14-days	Ice & HCl

11.0 Quality Assurance Project Plan

This Quality Assurance Project Plan (QAPP) presents the quality assurance and quality control (QA/QC) program to be conducted as part of this investigation. The purpose of this QAPP is to describe the field and laboratory procedures that will be undertaken during this investigation of magnitude and extent to assure that data collected are suitable for their intended purposes. This QAPP has been developed in general accordance with the EPA Quality Assurance Guidance for Conducting Brownfields Site Assessments. The subject investigation will utilize the procedures included in the QAPP for the following elements:

- Project Management – Quality objectives and criteria for measurement data and documentation, and records.
- Data Generation and Acquisition – Sample process design; sampling methods; analytical methods; quality control; instrument/equipment testing, inspection, and maintenance; inspection/acceptance of supplies and consumables; non-direct measurements; and data management.
- Assessment and Oversight – Assessment and response actions, and routine reporting.
- Data Validation and Usability – Procedures and methods for data quality review, verification, validation, and reconciliation.

Field QA/QC samples will be used to assess data quality in terms of precision and accuracy and monitor whether sampling procedures, equipment cleaning, packaging, and shipping are compromising sample integrity or validity of sample data. Such QA/QC samples are prepared in the field to monitor the various phases of the sampling process.

11.1 Transportation Blank

A trip blank will be utilized during each sampling event to ensure there is not cross-contamination during sample collection and transport to the laboratory.

11.2 Rinsate Blank

Rinsate samples will be used to evaluate the effectiveness of decontamination procedures to ensure samples have not been cross-contaminated by carryover from sampling equipment. One rinsate sample will be collected for every field day and analyzed for total COIs by the laboratory.

11.3 Field Duplicates

The field QA/QC activities will include collection of field duplicated soil samples. One field duplicate for soil will be collected for every 100 discrete soil samples collected and every 20 reconnaissance ground water samples. Field duplicates will be blind duplicates, meaning the identity of the samples will be unknown to the analyzing laboratory. Each field duplicate sample will be collected, handled, and analyzed in the same manner as its paired primary field sample.

Results from field duplicates are useful in determining potential sampling variability. Greater than expected differences between duplicates may occur due to variability within the sample matrix. Field duplicates shall be used as a quality control measure to monitor precision of sample collection methods.

Precision is independent of the error (accuracy) of the analyses and reflects only the degree to which the measurements agree with one another, not the degree to which they agree with the “true” value for the parameter measured. Precision is calculated in terms of Relative Percent Difference (RPD), which is expressed as:

$$RPD = \frac{|X_1 - X_2|}{(X_1 + X_2) / 2} \times 100$$

Where X1 and X2 represent the individual values found for the target analytes in the duplicate analyses. RPDs for field duplicate samples include the additional variability of field sampling methods and sample homogeneity. Therefore, RPDs for field duplicate samples will be evaluated against an acceptance criterion of 50 percent for quantitative data.

11.4 Laboratory QA/QC

Analytical QA/QC will be monitored through laboratory quality control checks. Laboratory data, including analytical results for laboratory control samples (LCSs), LCS duplicate samples, and matrix spike (MS), MS duplicate, and method blank samples, will undergo verification and validation.

Data quality objectives will be developed to ensure the collection of useful data for the risk screening. The data quality objectives for the project include the utilization of laboratory method reporting limits that are sufficiently low to allow for evaluation of results against generic human health risk-based screening levels. In general, the laboratory will be requested to ensure laboratory method reporting limits for COIs are lower than their respective risk-based screening level, based on current EPA laboratory methodologies.

12.0 Risk-Based Assessment

The assessment will be developed based on ODEQ's Risk-Based Decision Making (RBDM²⁷) cleanup guidance, which provides RBCs that are protective of human health under a number of exposure conditions. Data collected during this investigation, will be compared to applicable receptors and pathways determined by previous investigations by others.

12.1 Data Evaluation and Identification of COPCs

A risk-based screening procedure will be conducted to identify constituents of potential concern (COPCs) for the site. Maximum concentrations of constituents detected in each medium will be compared to applicable RBCs.

Constituents with maximum detected concentrations below applicable RBCs will be eliminated from further consideration. Identified COPCs, if any, will be further evaluated for potential risk.

12.2 Beneficial Water Use Determination

A beneficial water use determination will be conducted to evaluate the occurrence and beneficial uses of surface water and ground water in the vicinity of the subject site, to support an assessment of potential risk to human and ecological receptors.

12.3 Risk Characterization

The analytical results from the investigations will be compared to risk-based concentrations for site-specific pathways determined applicable by others. The results of the analysis will be used to provide recommendations on closure, additional monitoring, or limited remediation, as applicable.

13.0 Report Preparation

Final reports will be prepared documenting the work conducted and subsequent assessments for risk and beneficial uses of water in the area. During the course of this work, should results indicate a need for additional work, ODEQ will be consulted regarding proposed actions.

14.0 Project Schedule

ENW is prepared to immediately initiate Pre-Field Activities upon ODEQ approval. The start of field activities will be dependent on receiving necessary permits and subcontractor availability. Field activities should also be coordinated in a manner that considers Client seasonal access

²⁷ ODEQ. 2003. Risk-Based Decision Making for the Remediation of Contaminated Sites

needs, weather (dry weather would reduce the need to manage shallow ground water), profile approval and availability of subcontractors.

15.0 Certification

This Work Plan has been prepared under the supervision of the following Oregon-registered Certified Engineering Geologist and Oregon-registered geologist.

EVREN Northwest, Inc.



Lynn D. Green, C.E.G.

Principal Engineering Geologist

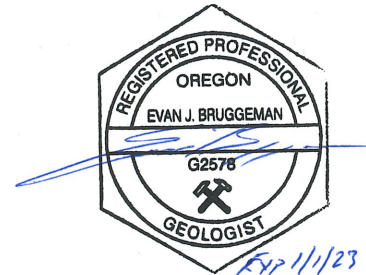


EXP. 2/1/2023

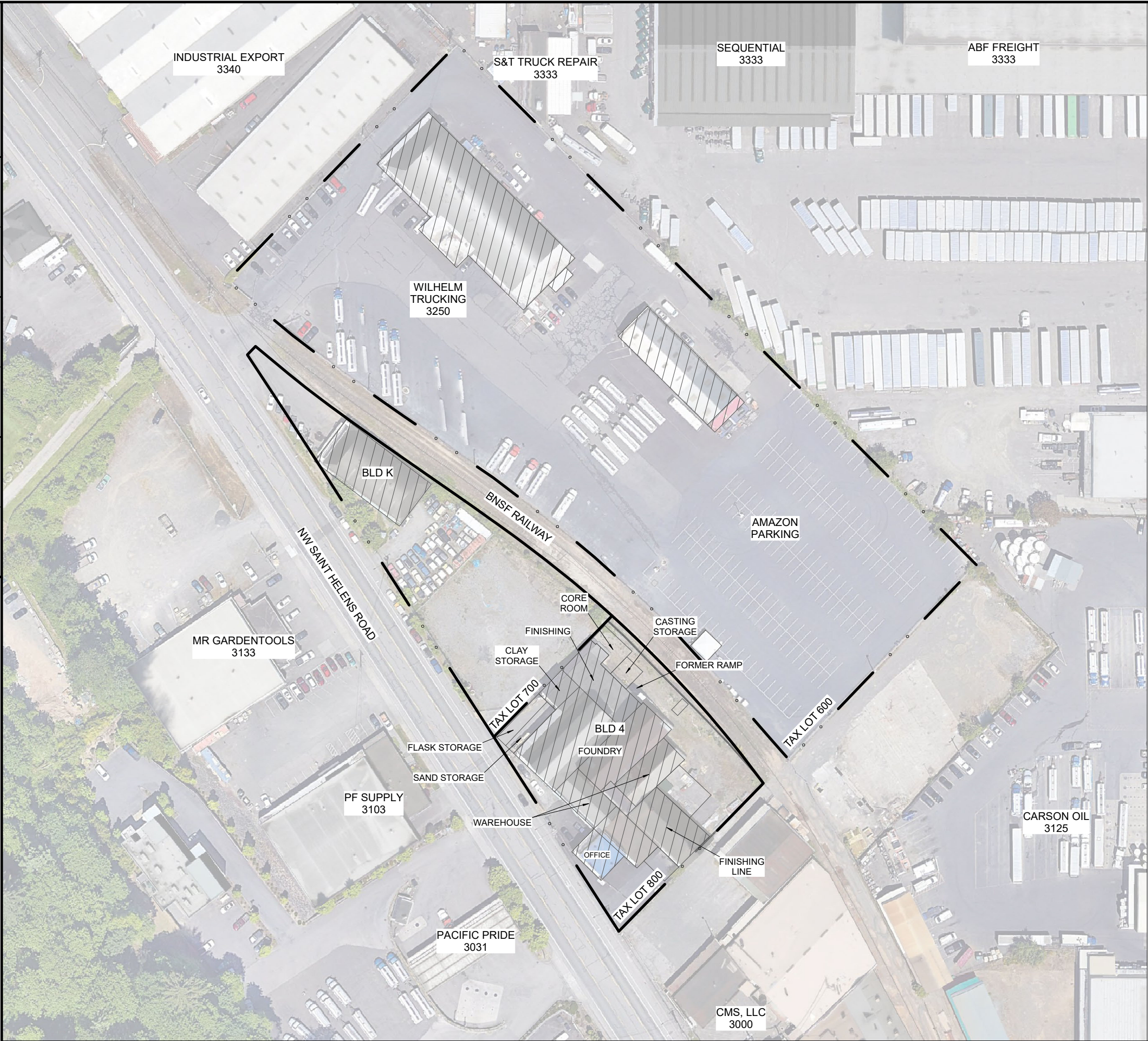


Evan Bruggeman, R.G.

Principal Field Geologist



Figures



LEGEND:

SUBJECT BUILDINGS

SUBJECT PROPERTY BOUNDARIES

- NOTES:
1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2021 AND ENW FIELD NOTES.

2. ALL BUILDING, STREET, AND FEATURE LOCATIONS ARE APPROXIMATE.

3. SYMBOLS REPRESENT LOCATION AND DO NOT ALWAYS REPRESENT EXACT SHAPE, SIZE, OR ORIENTATION.

APPROXIMATE SCALE

0

100

200 FEET

environmental natural resource consultants

PO BOX 14488, PORTLAND, OREGON 97293

P: (503)452-5561, E: ENW@EVREN-NW.COM

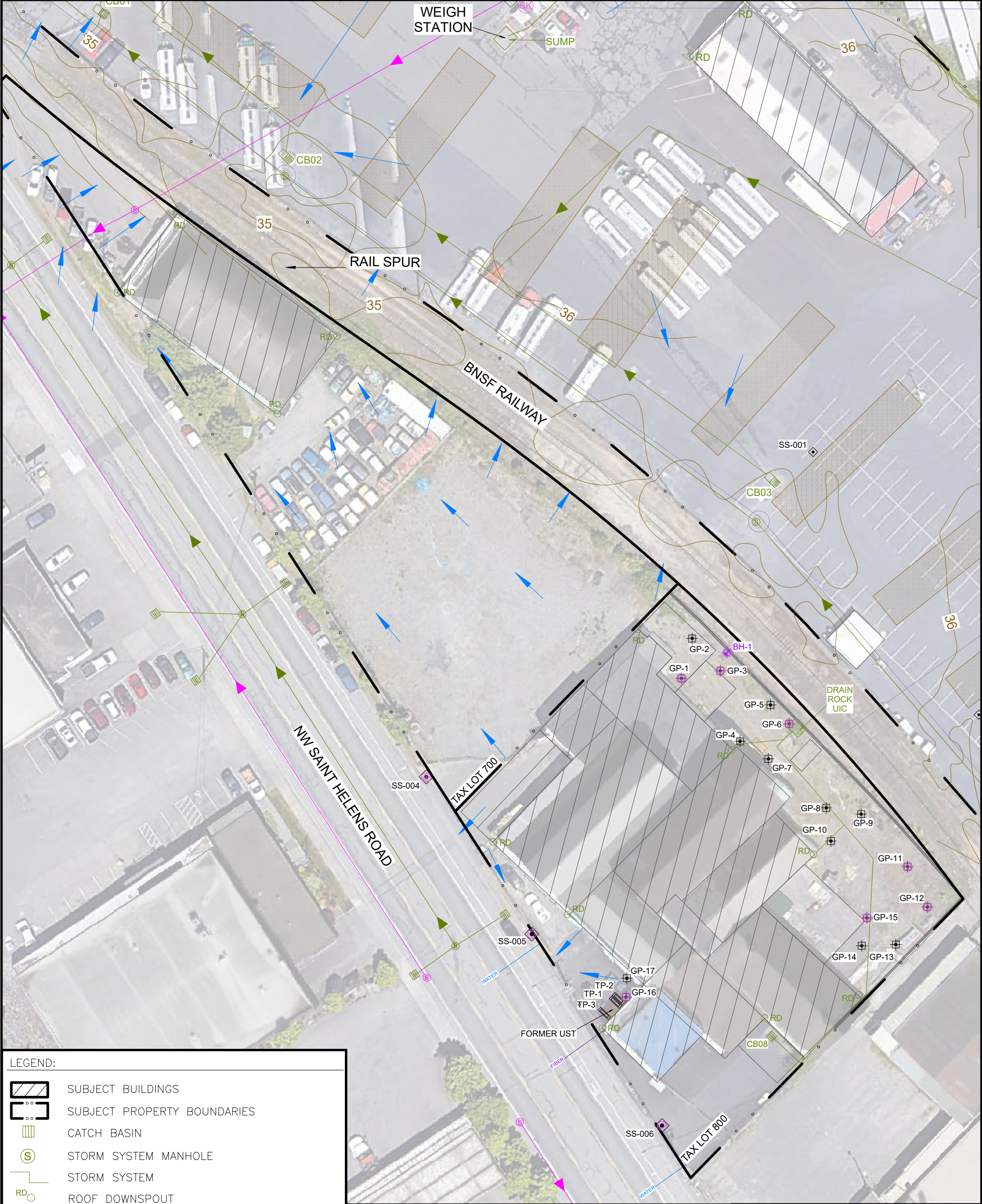
FIGURE 2

SITE PLAN

WILHELM TRUCKING

3250 NW SAINT HELENS ROAD

PORTLAND, OREGON

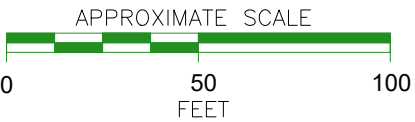


LEGEND:

- | | |
|------|--|
| | SUBJECT BUILDINGS |
| | SUBJECT PROPERTY BOUNDARIES |
| | CATCH BASIN |
| | STORM SYSTEM MANHOLE |
| | STORM SYSTEM |
| | ROOF DOWNSPOUT |
| | SANITARY SEWER MANHOLE |
| | SANITARY SEWER PIPE |
| | HISTORICAL STORM SYSTEM (FROM 1943 MAP) |
| | SURFACE FLOW DIRECTION |
| | UNDERGROUND STORAGE TANK (UST) |
| 006 | 2011 HAHN & ASSOCIATES SURFACE SAMPLE LOCATION |
| BH-1 | 1992 REIDEL ENVIRONMENTAL SERVICES SOIL BORING |
| TP-2 | 1997 GEOENGINEERS TEST PIT LOCATION |
| GP-9 | 1997 GEOENGINEERS SOIL BORING LOCATION |
| | 1 OR MORE CONSTITUENTS EXCEEDED SLRBCS |
| | HISTORICAL HOUSING |

NOTES:

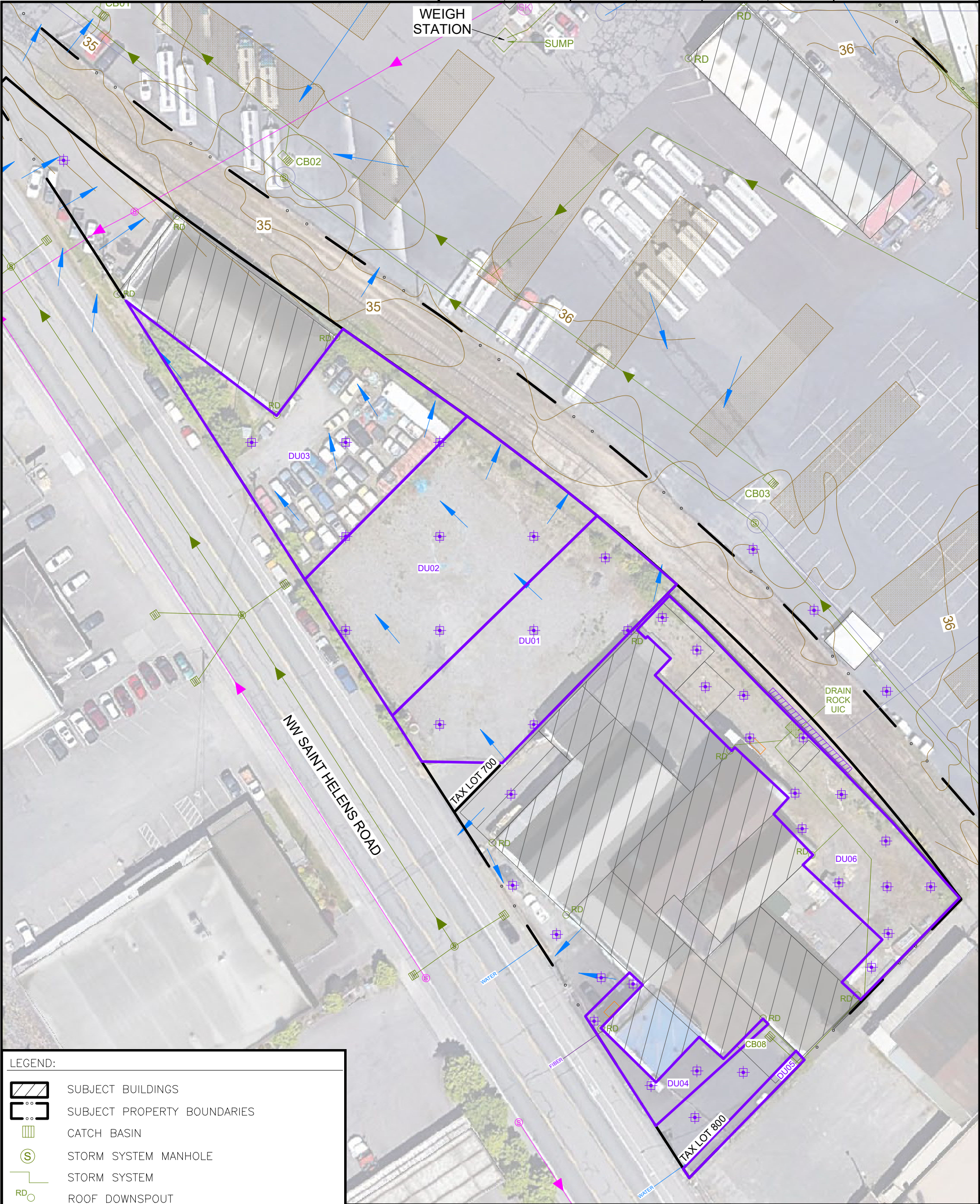
1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2017 AND ENW FIELD NOTES.
2. ALL BUILDING, STREET, AND FEATURE LOCATIONS ARE APPROXIMATE.
3. SYMBOLS REPRESENT LOCATION AND DO NOT ALWAYS REPRESENT EXACT SHAPE, SIZE, OR ORIENTATION.



PO BOX 14488, PORTLAND, OREGON 97293
P: (503)452-5561, E: ENW@EVREN-NW.COM

FIGURE 3
PREVIOUS SAMPLE LOCATION DIAGRAM
TAX LOTS 700 & 800

WILHELM TRUCKING
3250 NW SAINT HELENS ROAD
PORTLAND, OREGON

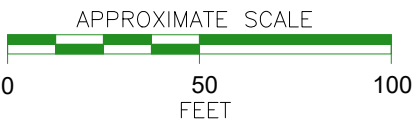


LEGEND:

- SUBJECT BUILDINGS
- SUBJECT PROPERTY BOUNDARIES
- CATCH BASIN
- STORM SYSTEM MANHOLE
- STORM SYSTEM
- ROOF DOWNSPOUT
- SANITARY SEWER MANHOLE
- SANITARY SEWER PIPE
- HISTORICAL STORM SYSTEM (FROM 1943 MAP)
- SURFACE FLOW DIRECTION
- UNDERGROUND STORAGE TANK (UST)
- HISTORICAL HOUSING
- ENW PROPOSED TEST PIT
- ENW PROPOSED BORING SAMPLE LOCATION
- DU03 DECISION UNIT BOUNDARY

NOTES:

1. BASE MAP DEVELOPED FROM AN AERIAL PHOTOGRAPH MAP DATED 2017 AND ENW FIELD NOTES.
2. ALL BUILDING, STREET, AND FEATURE LOCATIONS ARE APPROXIMATE.
3. SYMBOLS REPRESENT LOCATION AND DO NOT ALWAYS REPRESENT EXACT SHAPE, SIZE, OR ORIENTATION.



PO BOX 14488, PORTLAND, OREGON 97293
P: (503)452-5561, E: ENW@EVREN-NW.COM

FIGURE 4
PROPOSED SAMPLE LOCATION DIAGRAM
TAX LOTS 700 & 800

WILHELM TRUCKING
3250 NW SAINT HELENS ROAD
PORTLAND, OREGON

Tables

Table 1 - Summary of Analytical Data, Soil

Location ID		BH-1		GP-1		GP-3			GP-4	GP-5	GP-6		GP-7
Sample ID		BH-1	BH-1	GP-1-1.5	GP-1-6	GP-3-2	GP-3-4	GP-3-8	GP-4-8	GP-5-8	GP-6-8	GP-6-12	GP-7-8
Date Sampled		12/2/1992	12/2/1992	7/22/1997	7/22/1997	7/22/1997	7/22/1997	7/22/1997	7/22/1997	7/22/1997	7/22/1997	7/22/1997	7/22/1997
Depth Sampled (feet)		3	8	1.5	6	2	4	8	8	8	8	12	8
Sampled By		Reidel	Reidel	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Location		NE Unpaved Area - Ramp (TL800)		Core Room (TL800)		NE Unpaved Area (TL800)			NE Unpaved Area - Ramp (TL800)	NE Unpaved Area - Ramp (TL800)	NE Unpaved Area - UIC (TL800)		NE Unpaved Area - UST (TL800)
Constituent of Interest	Note	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)
Volatile Organic Constituents													
Benzene	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Bromodichloromethane	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Bromoform	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Bromomethane	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Carbon tetrachloride	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Chlorobenzene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Chlorodibromomethane (dibromochloromethane)	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Chloroethane (ethyl chloride)	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Chloroform	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Chloromethane	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichlorobenzene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	c, v	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethane	c, v	---	---	---	---	---	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Dichloromethane	c, v	---	---	---	---	---	---	---	---	---	---	---	---
EDB (1,2-dibromoethane)	c, v	---	---	---	---	---	---	---	---	---	---	---	---
EDC (1,2-dichloroethane)	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Ethylbenzene	c, v	---	---	---	---	---	---	---	---	---	---	---	---
MTBE (methyl t-butyl ether)	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Naphthalene	c, v	---	---	---	---	---	---	---	---	---	---	---	---
iso-Propylbenzene (cumene)	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Tetrachloroethene (PCE)	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Toluene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
1,1,1-Trichloroethane	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
1,1,2-Trichloroethane	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Trichloroethene	NA, v	---	---	---	---	---	---	---	---	---	---	---	---
Trichlorofluoromethane (Freon 11)	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
2,4,6-Trichlorophenol	c, nv	---	---	---	---	---	---	---	---	---	---	---	---
Vinyl chloride	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Xylenes	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Metals													
Arsenic	c, nv	---	---	18	7.3	130	42	4.1	---	---	---	---	---
Barium	nc, nv	---	---	---	---	---	---	---	---	---	---	---	---
Cadmium	nc, nv	---	---	8.0	<1 (ND)	3.7	11	<1 (ND)	---	---	---	---	---
Chromium (III)	nc, nv	---	---	16	23	9.2	68	17	---	---	---	---	---
Copper	nc, nv	---	---	53000	24	340000	510000	41	---	---	---	---	---
Lead	NA, nv	560	5620	11000	17	74000	540000	27	---	---	---	---	---
Mercury	nc, nv	---	---	---	---	---	---	---	---	---	---	---	---
Nickel	c, nv	---	---	150	16	1100	240	10	---	---	---	---	---
Silver	nc, nv	---	---	8.8	<1 (ND)	68	26	<1 (ND)	---	---	---	---	---

Table 1 - Summary of Analytical Data, Soil

Location ID		BH-1		GP-1		GP-3			GP-4	GP-5	GP-6		GP-7
Sample ID		BH-1	BH-1	GP-1-1.5	GP-1-6	GP-3-2	GP-3-4	GP-3-8	GP-4-8	GP-5-8	GP-6-8	GP-6-12	GP-7-8
Date Sampled		12/2/1992	12/2/1992	7/22/1997	7/22/1997	7/22/1997	7/22/1997	7/22/1997	7/22/1997	7/22/1997	7/22/1997	7/22/1997	7/22/1997
Depth Sampled (feet)		3	8	1.5	6	2	4	8	8	8	8	12	8
Sampled By		Reidel	Reidel	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Location		NE Unpaved Area - Ramp (TL800)		Core Room (TL800)		NE Unpaved Area (TL800)			NE Unpaved Area - Ramp (TL800)	NE Unpaved Area - Ramp (TL800)	NE Unpaved Area - UIC (TL800)		NE Unpaved Area - UST (TL800)
Constituent of Interest		Note	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)
Semivolatile Organic Constituents													
Polychlorinated biphenyls (Total PCBs)	c, v		---	---	---	---	---	---	---	---	---	---	---
Polycyclic Aromatic Hydrocarbons													
Acenaphthene	nc, v		---	---	---	---	---	---	---	---	---	---	---
Anthracene	nc, v		---	---	---	---	---	---	---	---	---	---	---
Benz[a]anthracene	c, v		---	---	---	---	---	---	---	---	---	---	---
Benzo[a]pyrene (BaP equivalents)	c, nv		---	---	---	---	---	---	---	---	---	---	---
Benzo[b]fluoranthene	c, nv		---	---	---	---	---	---	---	---	---	---	---
Benzo[k]fluoranthene	c, nv		---	---	---	---	---	---	---	---	---	---	---
Chrysene	c, nv		---	---	---	---	---	---	---	---	---	---	---
Dibenz[a,h]anthracene	c, nv		---	---	---	---	---	---	---	---	---	---	---
Fluoranthene	nc, nv		---	---	---	---	---	---	---	---	---	---	---
Fluorene	nc, v		---	---	---	---	---	---	---	---	---	---	---
Indeno[1,2,3-cd]pyrene	c, nv		---	---	---	---	---	---	---	---	---	---	---
Pyrene	nc, v		---	---	---	---	---	---	---	---	---	---	---
Total Petroleum Hydrocarbons													
Generic Gasoline (GRO)	nc, v		---	---	<20 (NP)	---	---	---	---	---	<20 (NP)	---	
Generic Diesel / Heating Oil (DRO)	nc, v		---	---	<50 (NP)	---	---	---	300	200	9000	51	100
Generic Mineral Insulating Oil (RRO)	nc, nv		---	---	<100 (NP)	---	---	---	600	180	830	<50 (ND)	100

Notes:

mg/Kg = milligram per kilogram or parts per million (ppm).

<# (ND) = not detected at or above the laboratory method reporting limit shown.

NE = not established.

NP = not present at or above the laboratory method reporting limit shown (HCID analysis).

— = not analyzed or not applicable.

c = carcinogenic

nc = noncarcinogenic

v = volatile

nv = nonvolatile

GRO = gasoline-range organics.

DRO = diesel-range organics.

RRO = residual-range organics.

Shaded concentrations exceed screening level risk-based concentrations and background concentrations, as applicable.

¹ Lowest Risk-Based Concentration for soil (screening level assumes residential use, from ODEQ RBCs dated May 2018).

(Y) indicates analyte not detected, but detection limit is above screening concentration.

j = The result is below method reporting limits. The value reported is an estimate.

Table 1 - Summary of Analytical Data, Soil

Location ID		GP-8	GP-11			GP-12		GP-15			GP-16		
Sample ID		GP-8-10	GP-11-8	GP-11-10	GP-11-12	GP-12-12	GP-12-14	GP-15-2	GP-15-4	GP-15-12	GP-16-2	GP-16-10	GP-16-16
Date Sampled		7/22/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997
Depth Sampled (feet)		10	8	10	12	12	14	2	4	12	2	10	16
Sampled By		GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Location		NE Unpaved Area (TL800)	NE Unpaved Area (TL800)			NE Unpaved Area (TL800)		NE Unpaved Area (TL800)			Adjacnet to east end of UST (TL800)		
Constituent of Interest	Note	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)
Volatile Organic Constituents													
Benzene	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Bromodichloromethane	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Bromoform	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Bromomethane	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Carbon tetrachloride	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Chlorobenzene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Chlorodibromomethane (dibromochloromethane)	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Chloroethane (ethyl chloride)	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Chloroform	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Chloromethane	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
1,2-Dichlorobenzene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
1,4-Dichlorobenzene	c, v	---	---	---	---	---	---	---	---	---	---	---	---
1,1-Dichloroethane	c, v	---	---	---	---	---	---	---	---	---	---	---	---
cis-1,2-Dichloroethene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
trans-1,2-Dichloroethene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Dichloromethane	c, v	---	---	---	---	---	---	---	---	---	---	---	---
EDB (1,2-dibromoethane)	c, v	---	---	---	---	---	---	---	---	---	---	---	---
EDC (1,2-dichloroethane)	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Ethylbenzene	c, v	---	---	---	---	---	---	---	---	---	---	---	---
MTBE (methyl t-butyl ether)	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Naphthalene	c, v	---	---	---	---	---	---	---	---	---	---	---	---
iso-Propylbenzene (cumene)	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Tetrachloroethene (PCE)	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Toluene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
1,1,1-Trichloroethane	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
1,1,2-Trichloroethane	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Trichloroethene	NA, v	---	---	---	---	---	---	---	---	---	---	---	---
Trichlorofluoromethane (Freon 11)	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
2,4,6-Trichlorophenol	c, nv	---	---	---	---	---	---	---	---	---	---	---	---
Vinyl chloride	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Xylenes	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Metals													
Arsenic	c, nv	---	9.9	7.5	4.5	---	---	27	17	9.8	6.7	---	---
Barium	nc, nv	---	---	---	---	---	---	---	---	---	---	---	---
Cadmium	nc, nv	---	2.9	3.8	<1 (ND)	---	---	13	5.4	<1 (ND)	<1 (ND)	---	---
Chromium (III)	nc, nv	---	23	20	18	---	---	26	16	20	14	---	---
Copper	nc, nv	---	17000	4500	51	---	---	36000	250000	36	24	---	---
Lead	NA, nv	---	27000	1400	22	---	---	48000	160000	41	11	---	---
Mercury	nc, nv	---	---	---	---	---	---	---	---	---	---	---	---
Nickel	c, nv	---	600	24	16	---	---	180	79	17	16	---	---
Silver	nc, nv	---	4.4	<1 (ND)	<1 (ND)	---	---	29	7.0	<1 (ND)	<1 (ND)	---	---

Table 1 - Summary of Analytical Data, Soil

Location ID		GP-8	GP-11			GP-12		GP-15			GP-16		
Sample ID		GP-8-10	GP-11-8	GP-11-10	GP-11-12	GP-12-12	GP-12-14	GP-15-2	GP-15-4	GP-15-12	GP-16-2	GP-16-10	GP-16-16
Date Sampled		7/22/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997	7/23/1997
Depth Sampled (feet)		10	8	10	12	12	14	2	4	12	2	10	16
Sampled By		GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers	GeoEngineers
Location		NE Unpaved Area (TL800)	NE Unpaved Area (TL800)			NE Unpaved Area (TL800)		NE Unpaved Area (TL800)			Adjacnet to east end of UST (TL800)		
Constituent of Interest	Note	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)
Semivolatile Organic Constituents													
Polychlorinated biphenyls (Total PCBs)	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Polycyclic Aromatic Hydrocarbons													
Acenaphthene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Anthracene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Benz[a]anthracene	c, v	---	---	---	---	---	---	---	---	---	---	---	---
Benzo[a]pyrene (BaP equivalents)	c, nv	---	---	---	---	---	---	---	---	---	---	---	---
Benzo[b]fluoranthene	c, nv	---	---	---	---	---	---	---	---	---	---	---	---
Benzo[k]fluoranthene	c, nv	---	---	---	---	---	---	---	---	---	---	---	---
Chrysene	c, nv	---	---	---	---	---	---	---	---	---	---	---	---
Dibenz[a,h]anthracene	c, nv	---	---	---	---	---	---	---	---	---	---	---	---
Fluoranthene	nc, nv	---	---	---	---	---	---	---	---	---	---	---	---
Fluorene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Indeno[1,2,3-cd]pyrene	c, nv	---	---	---	---	---	---	---	---	---	---	---	---
Pyrene	nc, v	---	---	---	---	---	---	---	---	---	---	---	---
Total Petroleum Hydrocarbons													
Generic Gasoline (GRO)	nc, v	---	---	---	---	<20 (NP)	---	---	---	---	---	<20 (NP)	---
Generic Diesel / Heating Oil (DRO)	nc, v	<19 (ND)	---	---	---	2900	<15 (ND)	---	---	---	---	7700	<15 (ND)
Generic Mineral Insulating Oil (RRO)	nc, nv	56	---	---	---	1200	<50 (ND)	---	---	---	---	140	<50 (ND)

Notes:

mg/Kg = milligram per kilogram or parts per million (ppm).

<# (ND) = not detected at or above the laboratory method reporting limit shown.

NE = not established.

NP = not present at or above the laboratory method reporting limit shown (HCID analysis).

— = not analyzed or not applicable.

c = carcinogenic

nc = noncarcinogenic

v = volatile

nv = nonvolatile

GRO = gasoline-range organics.

DRO = diesel-range organics.

RRO = residual-range organics.

Shaded concentrations exceed screening level risk-based concentrations and background concentrations, as applicable.

¹ Lowest Risk-Based Concentration for soil (screening level assumes residential use, from ODEQ RBCs dated May 2018).

(Y) indicates analyte not detected, but detection limit is above screening concentration.

j = The result is below method reporting limits. The value reported is an estimate.

Table 1 - Summary of Analytical Data, Soil

Location ID		GP-17	SS-004	SS-005	SS-006	Maximum Soil Concentration (remaining soil)	Soil Matrix Cleanup Level	ODEQs Screening-Level Risk-Based Concentrations SLRBCs ¹ (Soil)	Background Concentrations (Regional Default)	Clean Fill Screening Levels or Background Concentrations (as applicable)	Exceeds ODEQs Screening-Level SLRBCs (Soil)	Exceeds Background Concentrations (metals) or Clean Fill Screening	
Sample ID		GP-17-12	SS-004	SS-005	SS-006								
Date Sampled		7/23/1997	10/18/2011	10/18/2011	10/18/2011								
Depth Sampled (feet)		12	0-0.25	0-0.25	0-0.25								
Sampled By		GeoEngineers	HAA	HAA	HAA								
Location		Northeast of UST (TL800)	TL 700, Drainage Basin 8	TL 800, S of Building #4	TL 800, SE of Building #4						Portland Basin		TRUE OR Y FALSE OR N
Constituent of Interest		Note	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)							
Volatile Organic Constituents													
Benzene	c, v	---	<0.0013 (ND)	0.0018 J	<0.0014 (ND)	0.0018 J	NE	0.023	---	0.023	N	FALSE	
Bromodichloromethane	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.002	---	0.002	N	FALSE	
Bromoform	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.046	---	0.046	N	FALSE	
Bromomethane	nc, v	---	<0.0013 (ND)	0.0051	<0.0014 (ND)	0.0051	NE	0.083	---	0.083	N	FALSE	
Carbon tetrachloride	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.013	---	0.013	N	FALSE	
Chlorobenzene	nc, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	5.8	---	2.4	N	FALSE	
Chlorodibromomethane (dibromochloromethane)	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.0024	---	0.0024	N	FALSE	
Chloroethane (ethyl chloride)	nc, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	310	---	310	N	FALSE	
Chloroform	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.0034	---	0.0034	N	FALSE	
Chloromethane	nc, v	---	<0.0013 (ND)	0.003	<0.0014 (ND)	0.003	NE	2.2	---	2.2	N	FALSE	
1,2-Dichlorobenzene	nc, v	---	<0.0163 (ND)	<0.0153 (ND)	<0.0142 (ND)	<0.0163 (ND)	NE	36	---	0.92	N	FALSE	
1,4-Dichlorobenzene	c, v	---	<0.019 (ND)	<0.0179 (ND)	<0.0166 (ND)	<0.019 (ND)	NE	0.057	---	0.057	N	FALSE	
1,1-Dichloroethane	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.044	---	0.044	N	FALSE	
cis-1,2-Dichloroethene	nc, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.63	---	0.63	N	FALSE	
trans-1,2-Dichloroethene	nc, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	7.0	---	7	N	FALSE	
Dichloromethane	c, v	---	<0.0045 (ND)	<0.0048 (ND)	<0.0046 (ND)	0.0048	NE	0.14	---	0.14	N	FALSE	
EDB (1,2-dibromoethane)	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.00012	---	0.00012	(Y)	(TRUE)	
EDC (1,2-dichloroethane)	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.0028	---	0.0028	N	FALSE	
Ethylbenzene	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.22	---	0.22	N	FALSE	
MTBE (methyl t-butyl ether)	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.11	---	0.11	N	FALSE	
Naphthalene	c, v	---	<0.0302 (ND)	0.0499 J	<0.0278 (ND)	0.0499 J	NE	0.077	---	0.077	N	FALSE	
iso-Propylbenzene (cumene)	nc, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	96	---	96	N	FALSE	
Tetrachloroethene (PCE)	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.46	---	0.18	N	FALSE	
Toluene	nc, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	83	---	23	N	FALSE	
1,1,1-Trichloroethane	nc, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	190	---	190	N	FALSE	
1,1,2-Trichloroethane	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.0063	---	0.0063	N	FALSE	
Trichloroethene	NA, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.013	---	0.013	N	FALSE	
Trichlorofluoromethane (Freon 11)	nc, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	61	---	52	N	FALSE	
2,4,6-Trichlorophenol	c, nv	---	<0.0317 (ND)	<0.0299 (ND)	<0.0276 (ND)	<0.0317 (ND)	NE	2.4	---	2.4	N	FALSE	
Vinyl chloride	c, v	---	<0.0013 (ND)	<0.0014 (ND)	<0.0014 (ND)	<0.0014 (ND)	NE	0.00057	---	0.00057	(Y)	(TRUE)	
Xylenes	nc, v	---	<0.004 (ND)	<0.0043 (ND)	<0.0041 (ND)	<0.0043 (ND)	NE	23	---	1.4	N	FALSE	
Metals													
Arsenic	c, nv	---	2.5 J	5.9 J	2.1 J	130	NE	0.43	8.8	8.8	Y	TRUE	
Barium	nc, nv	---	---	---	---	0	NE	15000	790	790	N	FALSE	
Cadmium	nc, nv	---	<0.061 (ND)	1.4 J	0.36	13	NE	78	0.63	0.63	N	TRUE	
Chromium (III)	nc, nv	---	27.4	66	30.1	68	NE	120000	76	76	N	FALSE	
Copper	nc, nv	---	112	1080	84	510000	NE	3100	34	34	Y	TRUE	
Lead	NA, nv	---	131	1680	155	540000	NE	30	79	28	Y	TRUE	
Mercury	nc, nv	---	0.037 J	0.22	0.072 J	0.22	NE	23	0.23	0.23	N	FALSE	
Nickel	c, nv	---	18	52.3	21	1100	NE	1500	47	47	N	TRUE	
Silver	nc, nv	---	<0.12 (ND)	<0.11 (ND)	<0.11 (ND)	68	NE	390	0.82	0.82	N	TRUE	

Table 1 - Summary of Analytical Data, Soil

Location ID		GP-17	SS-004	SS-005	SS-006	Maximum Soil Concentration (remaining soil)	Soil Matrix Cleanup Level	ODEQs Screening-Level Risk-Based Concentrations SLRBCs ¹ (Soil)	Background Concentrations (Regional Default)	Clean Fill Screening Levels or Background Concentrations (as applicable)	Exceeds ODEQs Screening-Level SLRBCs (Soil)	Exceeds Background Concentrations (metals) or Clean Fill Screening	
Sample ID		GP-17-12	SS-004	SS-005	SS-006				Portland Basin		TRUE OR Y FALSE OR N	TRUE OR Y FALSE OR N	
Date Sampled		7/23/1997	10/18/2011	10/18/2011	10/18/2011								
Depth Sampled (feet)		12	0-0.25	0-0.25	0-0.25								
Sampled By		GeoEngineers	HAA	HAA	HAA								
Location		Northeast of UST (TL800)	TL 700, Drainage Basin 8	TL 800, S of Building #4	TL 800, SE of Building #4								
Constituent of Interest		Note	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)	mg/Kg (ppm)						
Semivolatile Organic Constituents													
Polychlorinated biphenyls (Total PCBs)		c, v	---	0.0111	0.358	0.0451	0.358	NE	0.23	---	0.23	Y	TRUE
Polycyclic Aromatic Hydrocarbons													
Acenaphthene		nc, v	---	<0.0134 (ND)	0.0367 J	<0.0124 (ND)	0.0367	NE	770	---	0.25	N	FALSE
Anthracene		nc, v	---	0.0418 J	0.114	0.0261 J	0.114	NE	8200	---	6.8	N	FALSE
Benz[a]anthracene		c, v	---	0.142	0.286	0.103	0.286	NE	1.1	---	0.73	N	FALSE
Benzo[a]pyrene (BaP equivalents)		c, nv	---	0.157	0.38	0.114	0.38	NE	0.11	---	0.11	Y	TRUE
Benzo[b]fluoranthene		c, nv	---	0.29	0.541	0.181	0.541	NE	1.1	---	1.1	N	FALSE
Benzo[k]fluoranthene		c, nv	---	0.0808	0.214	0.0619 J	0.214	NE	11	---	11	N	FALSE
Chrysene		c, nv	---	0.254	0.506	0.145	0.506	NE	110	---	3.1	N	FALSE
Dibenz[a,h]anthracene		c, nv	---	0.0289 J	0.0537 J	0.0209 J	0.0537	NE	0.11	---	0.11	N	FALSE
Fluoranthene		nc, nv	---	0.349	0.822	0.216	0.822	NE	2400	---	10	N	FALSE
Fluorene		nc, v	---	<0.0161 (ND)	0.0354 J	<0.0148 (ND)	0.0354	NE	770	---	3.7	N	FALSE
Indeno[1,2,3-cd]pyrene		c, nv	---	0.157	0.328	0.0872	0.328	NE	1.1	---	1.1	N	FALSE
Pyrene		nc, v	---	0.337	0.828	0.195	0.828	NE	1800	---	10	N	FALSE
Total Petroleum Hydrocarbons													
Generic Gasoline (GRO)		nc, v	---	<2.8 (NP)	<3.1 (NP)	<2.6 (NP)	20	80	31	---	520	N	FALSE
Generic Diesel / Heating Oil (DRO)		nc, v	<15 (ND)	24.8	82.1	26	9000	500	1100	---	90	Y	TRUE
Generic Mineral Insulating Oil (RRO)		nc, nv	<50 (ND)	230	419	149	1200		2800	---	140,000	N	FALSE

Notes:

mg/Kg = milligram per kilogram or parts per million (ppm).

<# (ND) = not detected at or above the laboratory method reporting limit shown.

NE = not established.

NP = not present at or above the laboratory method reporting limit shown (HCID analysis).

— = not analyzed or not applicable.

c = carcinogenic

nc = noncarcinogenic

v = volatile

nv = nonvolatile

GRO = gasoline-range organics.

DRO = diesel-range organics.

RRO = residual-range organics.

Shaded concentrations exceed screening level risk-based concentrations and background concentrations, as applicable.

¹ Lowest Risk-Based Concentration for soil (screening level assumes residential use, from ODEQ RBCs dated May 2018).

(Y) indicates analyte not detected, but detection limit is above screening concentration.

j = The result is below method reporting limits. The value reported is an estimate.

Table 2 - Summary of Analytical Data, Leachable Metals in Soil

Location ID		GP-3		GP-11	RCRA ¹ Toxicity Characteristic
Sample ID		GP-3	GP-3	GP-11	
Date Sampled		7/22/1997	7/22/1997	7/23/1997	
Depth Sampled (feet)		4	8	8	
Sampled By					
Location		NE Unpaved Area (TL800)	NE Unpaved Area (TL800)	NE Unpaved Area (TL800)	
Constituent of Interest	Note	mg/L (ppm)	mg/L (ppm)	mg/L (ppm)	mg/L (ppm)
Metals					
Arsenic	c, nv	<0.021 (ND)	<0.004 (ND)	<0.023 (ND)	5
Cadmium	nc, nv	0.059		0.05	1
Chromium (III)	nc, nv	<0.05 (ND)	<0.05 (ND)	<0.05 (ND)	5
Copper	nc, nv	80	0.13	230	
Lead	NA, nv	37	<0.1 (ND)	490	5
Mercury	nc, nv	---	---	---	0.2
Nickel	c, nv	0.13	<0.05 (ND)	0.65	
Silver	nc, nv	<0.05 (ND)	---	<0.05 (ND)	5

Notes:

¹ Resource Conservation and Recovery Act, 1976

mg/L = milligram per Liter or parts per million (ppm).

<# (ND) = not detected at or above the laboratory method reporting limit shown.

NE = not established.

— = not analyzed or not applicable.

c = carcinogenic

nc = noncarcinogenic

nv = nonvolatile

Shaded concentrations exceed RCRA Toxicity Characteristic concentration, as applicable.

Attachment

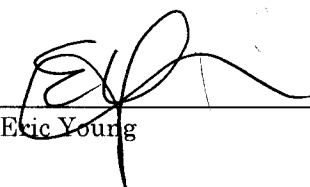
Sample Drying and Sieve Preparation for Multi Increment Soil Sampling

Friedman & Bruya, Inc. Standard Operating Procedure

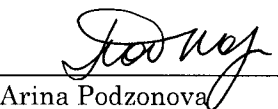
Revision Number 2
September 25, 2019

Approved by

Extraction Manager:


Eric Young

Quality Assurance Manager:


Arina Podzonova

This document may contain confidential and/or proprietary information and disclosure or reproduction of these materials without written authorization of Friedman and Bruya, Inc. is prohibited.

Document Control Number: 2

1.0 SCOPE, APPLICATION, AND SUMMARY

- 1.1 This Standard Operating Procedure (SOP) is used by Friedman and Bruya, Inc. (F&BI) to prepare soil and solid samples that require sieve and/or drying prior to extraction and analysis, including sub samples collected for soil multi increment sampling.
- 1.2 Deviation from the procedures outlined in this SOP may sometimes be needed, due to specific project requirements, or due to laboratory circumstances. Deviations are documented using the extraction worksheet, analysis logs, and/or other documents such as the non-conformance report form.

2.0 METHOD BASIS

The following regulatory method serves as the basis for this standard operating procedure. Adherence to the minimum criteria set forth in this method is a general data quality objective of this SOP.

- 2.1 State of Alaska Department of Environmental Conservation, "Draft Guidance on Multi Increment Soil Sampling", March 2009.

3.0 DEFINITIONS

- 3.1 A list of definitions for terms used in this SOP may be found in the F&BI Quality Assurance Manual, appendix F.

4.0 SAFETY

- 4.1 The most important safety measure is to handle all samples and equipment in an appropriate manner to ensure a minimum of personal danger and exposure to potentially hazardous chemicals.
- 4.2 When samples are handled, appropriate personal protection equipment (PPE) should be used. Gloves, lab coat, and goggles are all available for use.
- 4.3 Glassware can break at any time, so caution needs to be used at all times when handling it. Cut resistant gloves are available for use.
- 4.4 MSDSs for all chemicals in the lab are available to all employees. They are located in the GC room, and all employees are strongly encouraged to read them.
- 4.5 Analysts are required to complete general safety training prior to performing any analysis. Details of initial and on-going safety training are provided in the F&BI Quality Assurance Manual and "Training" SOP.
- 4.6 If uncertain about the safety of a material or procedure or in the event that a spill or other potentially hazardous situation arises, notify your supervisor or any chemist immediately.

5.0 INTERFERENCES

- 5.1 Certain sample matrices may not be amenable to sieving, such as peat or tundra. Alternate sample processing measures would be required for those media.

6.0 APPARATUS AND EQUIPMENT

- 6.1 #10 Sieve – particle size <2mm
- 6.2 Drying Pans (Aluminum or Pyrex)
- 6.3 Stainless Steel Scoopula
- 6.4 Analytical Balance
- 6.5 4 oz. or 8 oz. Glass Jars with Lid
- 6.6 Steel Baking Sheet or Other Tray
- 6.7 Stainless Steel Bowl

7.0 REAGENTS AND CHEMICALS

- 7.1 Methylene Chloride, pesticide grade or better
- 7.2 Alconox

8.0 SAMPLE HANDLING, PRESERVATION, AND PREPARATION

- 8.1 Before preparing the samples, double check the sample identification on the container to that listed on the Chain of Custody. Document that the sample ID has been checked by initialing the extraction worksheet.
 - 8.1.1 If more than one container exists for the sample, write the corresponding letter of the container used in the extraction on the extraction paperwork.
- 8.2 Note any unexpected sample characteristics on the extraction worksheet under “Observations” heading.
- 8.3 Sample Moisture Determination Procedure
 - 8.3.1 The analyst will perform the following to determine if the sample will require a drying procedure. Drying should only be performed if necessary.
 - 8.3.2 Visually inspect the sample to determine if free liquid is present. Samples containing a visible liquid layer will require drying prior to sieve

preparation.

- 8.3.3 For samples that do not contain free liquid but appear moist, a small amount of sample (~10.0 grams) will be tested in the sieve. The sample will require the drying procedure if sample fines do not pass through the sieve screen.

8.4 Sample Drying Procedure

- 8.4.1 Assign F&B sample ID to a drying pan.
- 8.4.2 Empty the entire contents of the sample container into the drying pan to a depth of ½ to 1 inch in thickness.
- 8.4.3 Place drying pan in fume hood at ambient temperature until processing.
- 8.4.4 Drying at elevated temperatures, i.e. “baking” is not allowed. Turning the soil can be used to facilitate the drying process.
- 8.4.5 Drying is acceptable for less temperature sensitive contaminants such as metals, PCBs, DRO, RRO, etc. Drying may not be appropriate for some contaminants, including volatile constituents or PAHs. If samples are processed for non-appropriate testing, the data will be estimated and qualified appropriately.

8.5 Sieve Procedure

- 8.5.1 Wash sieve with warm water and Alconox and allow to dry.
- 8.5.2 For samples requiring organic analysis, triple rinse sieve screen with methylene chloride and allow to dry.
- 8.5.3 Place entire contents of sampling container or drying pan into the sieve. The minimum amount of sample required for sieve preparation is 30 g.
- 8.5.4 Shake sieve for 2 minutes.
- 8.5.5 Remove sample collection tray from sieve and collect the entire contents into a labeled 4 oz. or 8 oz. glass jar.
- 8.5.6 When multiple sub samples are sieved, the entire contents of each sieved sub sample will be poured into a stainless steel bowl, stirred for a minimum of 30 seconds and collected for sample analysis.

9.0 **SAMPLE ANALYSIS**

- 9.1 Wash a steel baking sheet or other tray with warm water and Alconox and allow to dry.

- 9.2 For samples requiring organic analysis, triple rinse the tray with methylene chloride and allow to dry.
- 9.3 Pour the entire contents of the sample into the tray to a depth of no more than ½ inch.
- 9.4 Individual aliquots of sample will be randomly scooped from a minimum of 20 distinctly different areas of the tray and added to the extraction vessel until the required sample amount is reached.

10.0 QUALITY CONTROL AND CORRECTIVE ACTIONS

General quality control procedures are outlined in the corresponding F&B analytical method SOPs. F&BI QC procedures are described in sections 12 and 13 of the QA Manual. If, following corrective actions, quality control results still fail, or if corrective actions are not possible, then affected results are reported with appropriate qualifying flags.

The minimum requirements for QC samples analyzed with each preparation batch (within 24 hours) of up to 20 samples are:

1 sample duplicate

11.0 DATA ARCHIVAL

- 11.1 The hardcopy of the QA paperwork is filed in the extraction room on the paperwork desk.
- 11.2 The extraction paperwork for each project is filed in the downstairs filing cabinets with the hardcopies of the final reports.

12.0 HAZARDOUS WASTE MANAGEMENT AND POLLUTION PREVENTION

- 12.1 Hazardous waste managements procedures are found in the F&BI QA Manual section 10, and the "Disposal" SOP.
- 12.2 Actions that can result in the reduction or elimination of chemical wastes and chemical pollutants associated with this SOP are strongly encouraged. Such actions should be discussed with the Executive Committee for approval prior to implementation.

END OF DOCUMENT