DRAFT INTERIM ACTION WORK PLAN

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RGI PROJECT NO. 2017-015K

DRAFT INTERIM ACTION WORK PLAN

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TABLE OF CONTENTS

LIST OF APPENDICES

1 INTRODUCTION

The Riley Group, Inc. (RGI) is pleased to present this Draft Interim Action Work Plan (Work Plan), on behalf of Roystone on Queen Anne, LLC (Roystone) pertaining to the property located at 631 Queen Anne Avenue North in Seattle, Washington (herein referred to as the Property). The general location of the Property is depicted on Figure 1.

The Property is owned by Roystone and the Property is identified by King County tax parcel number 38789900425 (Parcel 0425) and occupies approximately 11,070 square feet. Previous project names for the Property, included, but are not necessarily limited to, Texaco 211577 Monterey Cleanup Site, Arnold's/Former Texaco Service Station, Roystone, and Manhattan Express.

This Work Plan pertains specifically to the Property, which is part of a larger Site identified by the Washington Department of Ecology (Ecology) as the Texaco 211577 Monterey Site (CSID 6663). A petroleum release associated with one or more of the former gasoline service stations located on the Property has been confirmed and well documented. Groundwater flow direction beneath the Property and adjoining properties has consistently been to the west -southwest. As a result of this groundwater flow direction, the contamination from the Property had migrated beneath the south, southwest, and west-adjoining properties. In addition, existing data confirms that the up-gradient, off-Site, properties (former dry cleaners and Unocal gasoline service station), located across West Roy Street, are not currently adversely impacting soil and/or groundwater underlying the Property (see Figure 2). Historically, portions of the Site situated outside the Property boundary were impacted by up-gradient sources and it is unknown what current conditions are in these portions of the Site.

The current Site previously consisted of two separate cleanup sites (Monterey Apartments [CSID 4813] and Texaco 211577 [CSID 6663]). The Monterey Apartments Site included Ecology-led interim remedial activities and site characterization associated with the identification of hydrocarbon odor and the associated vapor intrusion concern at the Monterey Apartments building in 1978 (prior to the identification of the Property as the source of contamination).

In 2001 consent decrees between the Washington Department of Ecology (Ecology) and both Arnold's (former Property owner) and Texaco were used to reclaim Ecology costs related to interim remedial actions conducted at the Monterey Apartments Site. Arnold's and Texaco were identified as potentially liable persons (PLPs) in 1994 and 1999, respectively.

The Texaco 211577 Site includes interim remedial activities and site characterization conducted on the Property and all off-Property parcels that have been impacted by the Property. This also includes independent cleanup activities that were not part of the Ecology-led interim remedial activities. The Texaco 211577 Site was enrolled by Texaco c/o Chevron Environmental Management Company (CEMC) into the Ecology Voluntary Cleanup Program (VCP) from 2002 to 2015 under VCP No. NW0911. CEMC (the corporate successor to Texaco) was the VCP customer during this time period. The Site was terminated from the VCP by Ecology in 2015.

Roystone enrolled the Texaco 211577 Site into the VCP briefly in 2019 under VCP No. NW3197 and proposed an interim remedial action on the Property as part of the upcoming redevelopment on the Site. A complete Ecology file review lead to the determination that the Site was too complex for the VCP and that cleanup should proceed under Ecology supervision. Ecology determined that Roystone was a PLP for the Site in 2019 and negotiations for an Agreed Order between Ecology, CEMC, and Roystone are currently underway. In order to better reflect the Site boundaries based on Ecology's current knowledge of the Site and the areas to be covered under the Agreed Order, the Monterey Apartments Site and the

Texaco 211577 Site were administratively combined into the Texaco 211577 Monterey Site in April 2019.

Under the Agreed Order, Roystone and CEMC have designated lead roles for work associated with the cleanup of the Site. Roystone would be responsible for the cleanup of the portion of the Site situated within the Property boundaries and the cleanup of the remainder of the Site, outside the Property boundaries, would be the responsibility of CEMC. The location of the Property is displayed on the attached Figure 2.

This draft Work Plan, based on the pending Agreed Order, is subject to: (1) Public review and comment; and (2) Ecology's approval of the final Work Plan.

RGI understands that Roystone intends to remediate all contaminated soil and groundwater (above cleanup levels) on the Property in conjunction with the lot-line to lot-line redevelopment of the Property. The redevelopment consists of demolishing the existing building and constructing a mixed-use, multi-story building with one level of underground parking. The one level underground parking garage will require excavations of up to approximately 13 to 14 feet below ground surface (bgs) or elevation 134'. In general, the maximum depth of soil contamination requiring remedial excavation beneath the Property, with concentrations above the cleanup levels, is 24 feet bgs (approximately 122'). However, other areas of the Property may require limited remedial excavations to depths greater the 24 feet bgs. Contamination is not anticipated to extend to depths greater than 31.5 feet bgs (or elevation 114.5') at any portion of the Property, which corresponds with the maximum depth of the Lawton Clay layer that underlies the Property. Following the completion of the remedial excavation and associated groundwater (perched) dewatering, the excavation will be backfilled to approximate elevation 134' and the one level underground parking garage will be constructed. The proposed depth to bottom of shoring is conservative and meant to be deep enough to allow for the remedial excavation of all contaminated soil within the Property containing concentrations of contaminants above the applicable Model Toxics Control Act (MTCA) cleanup levels.

After completion of the interim action, an Agency Review Draft Interim Action Report will be submitted to Ecology for review and approval within 60 days of receipt of all validated analytical data pertaining to the interim action. A Final Interim Action Report will be submitted to Ecology within 30 days after Ecology's approval of the Agency Review Draft Interim Action Report.

2 PROJECT OBJECTIVES

This Work Plan is meant to: (1) Provide the Property background; (2) Summarize the results of previous environmental investigations; (3) Present the Conceptual Site Model (CSM) for the Property (4) Select cleanup levels and present the selected interim action for the Property; and (5) Describe the interim action and provide details for implementing the selected interim action on the Property.

The scope of work presented in this Work Plan is intended to meet the substantive requirements of the Ecology Model Toxics Control Act (MTCA) Chapter 70.105D RCW, and its implementing regulations, Chapter 173-340 WAC.

The ultimate goal of the successful implementation and execution of this Work Plan is to bring soil and groundwater on the Property into compliance with MTCA regulations and qualify the Property for an Ecology Opinion letter indicating the IA was completed to the satisfaction of Ecology.

3 PROPERTY AND VICINITY USE

The Property is currently vacant and was previously occupied by Manhattan Express convenience store. Prior to that, the Property was occupied by various gasoline service stations from approximately 1927 to 1993.

Typical property use in the Property vicinity is a mixture of residential and commercial properties. Current and pertinent former uses of adjoining properties are summarized as follows:

North: West Roy Street beyond which retail stores and a restaurant. A dry cleaner previously operated in this location. Based on available data, the off-Property dry cleaners has not adversely affected the Property.

East: Queen Anne Ave North beyond which a parking lot (former Unocal service station) and condominiums (former Paramount dry cleaning facility) are situated. Data obtained from previous subsurface investigations indicate that these east-adjoining properties have not adversely affected the Property.

Southeast Marqueen Hotel and retail stores.

South: Former Lindberg Apartments & retail stores (currently the Bungalow).

Southwest: Monterey Apartments.

West: Delroy Apartments.

As previously stated, the southeast, south, southwest, and west-adjoining properties have been adversely affected by the Property (former gasoline service stations) and/or other potential off-Site sources.

4 PROPERTY HISTORY

The following sections present the historical ownership of the Property, history of business operations, and history of underground storage tanks (USTs) on the Property. The locations of pertinent historical features including the known former service stations, USTs, pump islands, are other related underground improvements are depicted on Figure 3. Note that numerous environmental investigations have been conducted on the Property. These investigations are summarized in Section 5 (Property Characterization).

4.1 OWNERSHIP HISTORY

In 1927, the Property was owned by James Estate and leased the Property to the California Petroleum Corporation (CalPet). CalPet opened the first gasoline service station on the Property and subsequently subleased the business to other operators. The Texaco Corporation (Texaco) acquired CalPet in 1929 and entered into a sublease.

In 1954, Texaco purchased the Property and demolished the first generation service station and constructed a new service station on the southern portion of the Property. In 1967, Texaco remodeled the service station. Texaco owned the Property through 1977 at which time the Property was purchased by the Arnolds Family Estate (Arnolds). Arnolds continued to operate as a Texaco-branded gasoline service station. Arnolds sold the Property to John Hee Yoo in 1989, but the sales agreement was rescinded in 1993 and ownership of the Property was transferred back to Arnolds in 1993. At that time, the gasoline service station was decommissioned by Arnolds and began operating as a convenience store/deli. The Property operated as a convenience store from 1993 to 2018.

Arnolds owned the Property through 2017 at which time the Property was sold to Roystone (current Property owner). The Property parking lot is currently utilized for paid parking and operated by Republic Parking.

4.2 PROPERTY HISTORY

The history of the Property, UST systems, and related underground improvements is summarized below and illustrated on the attached Figure 3.

The Property was depicted on historical Sanborn maps as being occupied by stores and dwellings from at least 1893 to 1969. In the 1917 map, the Property was depicted as vacant.

In 1927, CalPet opened a gasoline service station consisting of two 550-gallon USTs (USTs 1 and 2), which were reportedly constructed of concrete and installed beneath the sidewalk adjacent to Queen Anne Avenue North near the northeast corner of the Property. These USTs were reportedly abandoned in-place in sometime prior to 1934. Eight 50-gallon lube oil USTs were reportedly installed on both sides of the building on the central portion of the Property (four on the north side of the building and four on the south side of the building). However, the exact locations of these lube oil USTs were not provided in previous reports. In 1934, two 4,000-gallon USTs (USTs 5A and 6A) were installed on the eastern portion of the Property. Sometime prior to 1934, Texaco installed one 550-gallon UST and one 1,000-gallon UST (USTs 3 and 4) on the north-central and southwestern portions of the Property, respectively.

From 1927 to 1954, the southern portion of the Property was historically occupied by a service station, which included a wash rack, hoists, grease pits, and a lube service bay. A tire shop, tailor shop/Acme Cleaners, and an accessory store occupied this portion of the Property at that time. Archived assessor records indicated that the southeastern portion of the Property was historically occupied by the Acme Cleaners in 1927 (a possible dry cleaning facility). This area of the Property was occupied by a tailor shop and possibly Acme Cleaners, in 1934. It is unknown if the Acme Cleaners was in fact a dry cleaners, or how long the Acme Cleaners operated on the Property, but does not appear to be more than nine years. A service station building was present on the central portion of the Property from approximately 1927 to 1954.

In 1954, Texaco purchased the Property and the service station on the central portion of the Property was demolished and a new service station was constructed on the southern portion of the Property. It is suspected that the eight 50-gallon lube oil USTs associated with the former service station were removed. A dispenser island was installed on the northern portion of the Property and a 4,000-gallon UST (UST 7A) was installed to the west of UST 5A.

Texaco remodeled the station in 1967 and two 10,000-gallon USTs (USTs 8 and 9) were installed on the western portion of the Property. Canopies were also installed on the north-central and east-central portions of the Property. In 1971, one 6,000-gallon UST (UST 10) was installed when Texaco introduced leaded gasoline.

In 1978, apparent petroleum hydrocarbon odors were detected at the southwest-adjoining Monterey Apartments, which initiated a series of environmental investigations and remedial actions at the Property and off-Property. Previous environmental investigations conducted on the Property are summarized in Section 5. Previous environmental investigations completed on- and off-Property are discussed by others in various reports (see Appendix A – List of Previous Reports).

In 1982, Arnolds replaced UST 7A with a 6,000-gallon UST (UST 7B) and USTs 5A and 6A were replaced with two 8,000-gallon USTs (5B and 6B), which were intended to store diesel fuel. The eastern dispensers and lube service bay were removed in 1986 and replaced by restrooms and a deli.

In 1993, seven USTs (USTs 3, 4, 5B, 7B, 8, 9, and 10) were reportedly removed from the Property and the Property began operating as a convenience store/deli until 2018.

Based on information reported in previous reports by others, the possibility for several USTs to be currently present on the Property does exist. The concrete USTs 1 and 2 (beneath the sidewalk adjacent to Queen Anne Avenue North) were reported as abandoned in-place and there is no record of the removal of these USTs. UST 6B (on the eastern portion of the Property) was also reported as abandoned in-place.

The eight 50-gallon USTs surrounding the former service station on the central portion of the Property were suspected to be removed during demolition of the service station in 1954, but no official record of their removal exists.

RGI's subcontractor (Mr. Phil Duoos, Geophysicist) conducted an Electromagnetic/Ground Penetrating Radar (EM/GPR) survey across the eastern portion of the Property to the outermost portions of the sidewalks on West Roy Street and Queen Anne Ave North in March of 2019. The EM/GPR survey appeared to confirm the presence of UST 6B on the eastern portion of the Property, but did not identify the likely presence of any other USTs. The geophysicist indicated that the instruments used may not have been able to detect the presence of USTs 1 and 2 (beneath the east-adjoining sidewalk) due to the fact that the USTs were reportedly constructed of concrete, the sidewalk is concrete, and the USTs may have been filled with sand or concrete. All of these factors would have the potential to interfere with the capability of the instruments to detect the presence of these USTs. A copy of the Geophysical Investigation Report is included in Appendix B.

The potential exists for one or more of the above-mentioned USTs to be present, and/or encountered on-Property during construction, and this is taken into consideration as part of this Work Plan. RGI understands that Roystone will address any USTs encountered within the Property and that CEMC is responsible for any USTs located outside the Property.

5 PROPERTY CHARACTERIZATION

The nature and extent of soil and groundwater contamination on the Property and Site has been relatively well defined as presented in numerous reports listed in Appendix A. The Work Plan was developed based on information provided in these previous reports, including RGI's review of the following key reports as it pertains to the Property:

- *Supplemental Subsurface Investigation Report* (SSI Report) dated December 26, 2017 by RGI.
- *Groundwater Monitoring Report 2nd Quarter 201*7 dated April 19, 2017 by RGI.
- *Second Semi-annual Groundwater Monitoring Report* dated March 26, 2014 by Liedos.
- *Limited Subsurface Investigation Report* (LSI) dated July 10, 2012 by Sound Earth Strategies (SES).
- *Final Remedial Investigation and Site Summary Report* (RI) dated August 20, 2007 by Science Applications International Corporation (SAIC).
- *Conceptual Site Model, Risk Assessment, and Supplemental Investigation Proposal* dated August 21, 2002 by Delta Environmental Consultants (Delta).

Summaries of the above-referenced reports are provided below. The summaries below include only information considered relevant to the Property, which includes investigation/remedial action work conducted on the Property, or in close proximity to the Property boundaries. Additionally, numerous

groundwater monitoring events took place on the Property from 1986 to 2017. Therefore, routine groundwater monitoring activities are not summarized below.

For additional details, the reader should refer to the original documents in their entirety and the complete list of previous reports provided in Appendix A – List of Previous Reports.

The locations of historical features and sample locations are depicted on Figures 3 to 5. All soil and groundwater analytical data pertaining to the Property, as reported by RGI and others, are summarized in Tables 1 and 2, respectively. Copies of borelogs and monitoring well construction logs obtained from previous investigations associated with the Property are included in Appendix C.

5.1 CITY OF SEATTLE FIRE DEPARTMENT 1978

During a Seattle Fire Department investigation of apparent petroleum hydrocarbon odor complaints at the southeast adjoining Monterey Apartments building, light non-aqueous phase liquid (LNAPL), determined to be gasoline, was identified in a basement sump reportedly connected to the building footing draining system. This finding initiated investigation of the Property as a potential source of this contamination.

5.2 GEOENGINEERS 1986

In 1986, Geoengineers conducted a subsurface investigation on the Site at the request of Ecology. Groundwater monitoring wells MW6 and MW9 were installed on the Property and MW10 was installed off-Property, and up-gradient, in close proximity to the northeast corner of the Property. No contamination was identified at MW10. Evidence of petroleum hydrocarbon contamination was observed in wells MW6 and MW9 located on the Property. In addition, approximately two feet of LNAPL was observed in MW6. Groundwater flow direction across the Property was determined to be to the west-southwest.

5.3 ECOLOGY 1989 SUMMARY OF INVESTIGATIONS

In 1989, Ecology prepared a summary of previous investigations. Ecology noted problems with the installation of MW10 in 1986 and indicated that initial installation attempts encountered and punctured what was described as a concrete tank. A strong gasoline odor was noted after breaking through the concrete. Ecology thought the tanks may be related to the 1927 USTs (USTs 1 and 2) that were reported as abandoned in-place. It should be noted that groundwater concentrations of contaminants have been below MTCA cleanup levels for the past 16 years in well MW10.

Ecology indicated that recovery well RW2 was installed in 1986 during work on the adjoining Monterey Apartments property. RW2 is situated off-Property, but very close to the southwest corner of the Property. The well was reportedly inactivated due to its ineffectiveness at removing LNAPL.

5.4 ECOLOGY & ENVIRONMENT SEPTEMBER 1990

During an investigation of the Site, Ecology and Environment (E&E) conducted a soil gas survey, which included collecting soil vapor samples SG01 and SG05 near the western and southern Property boundaries, respectively. These locations were reported to have the highest BTEX soil gas concentrations reported in the survey. However, no soil gas analytical data was provided in the reports reviewed by RGI.

E&E also collected and analyzed a sample of LNAPL from MW6. Analytical results indicated that the LNAPL consisted of relatively non-degraded gasoline with approximately 20% diesel #2. It was also indicated that LNAPL was observed in well RW2.

5.5 ECOLOGY & ENVIRONMENT 1991

During the first phase of a Remedial Investigation of the Site, E&E concluded that the point source for the petroleum hydrocarbon vapors present on Monterey Apartments property was the Property and that these vapors would persist indefinitely unless the source contamination located beneath the Property was reduced or removed.

E&E collected groundwater samples throughout the Site, which included Property wells MW6 and MW9 and off-Property wells RW2 and MW10. Analytical results indicated widespread petroleum hydrocarbon groundwater contamination was present that extended from the Property to the west beyond 1st Avenue west. E&E estimated approximately 4,800 gallons of LNAPL were present beneath the Property.

E&E advanced 25 soil gas probes across the Site including soil gas probe 19 on the southeastern portion of the Property and soil gas probes 21 and 22 on the northwestern portion of the Property. Analytical results indicated that BTEX and TPH soil vapor impacts from beneath the Property may have extended as far as 2nd Avenue West. No actual soil vapor analytical data was provided in the reports obtained and reviewed by RGI.

5.6 SAIC/GLACIER FIELD NOTES 1993

In 1993, UST closure activities were conducted on the Property. However, no report documenting this work was encountered. Information found in field notes/maps obtained from the appendices of previous reports indicated that significant soil contamination was encountered at the eastern dispenser island. A hand drawn map of the excavation area displayed 11 soil sample locations throughout the excavation area (PIT-1 through PIT-11). The notes also indicated that a significant amount of petroleum contaminated soil (PCS) was encountered in the UST excavations and that this contaminated soil was used to backfill the excavation. In other words, it appears that the excavated contaminated soils was not transported off-Property for proper disposal.

The notes also indicated that a soil vapor extraction (SVE) and groundwater recovery systems were installed with a spray aeration vacuum extraction (SAVE) treatment system. The SAVE system operated on the Property and the southwest-adjoining Monterrey Apartments property. The SAVE system was also connected to horizontal extraction piping situated 8 to 10 feet deep in the former UST excavation area.

SAIC installed vapor extraction well VP9 on the northwest portion of the Property and recovery well RW4 on the west central portion of the Property in 1993. Soil samples were submitted for analyses from RW4.

5.7 GROUNDWATER TECHNOLOGIES, INC. 1996

In April 1996, Groundwater Technologies, Inc. replaced the SAVE system with a catalytic oxidizer in conjunction with the installation of vapor extraction wells. The system reportedly operated intermittently between September 1996 and December 1997, when the system was shut down. No remediation system as-built drawings or other reports relating to the operation and maintenance of this system were available.

5.8 ECOLOGY MAY 1998

Between October 1995 and November 1997, Ecology periodically sampled groundwater at the Site. Wells sampled on, or close to, the Property included MW6, MW9, MW10, and RW2. Ecology noted that the LNAPL thickness in well MW6 averaged from one foot to a maximum thickness of three feet.

5.9 FARALLON CONSULTING, DECEMBER 1999 TO JULY 2001 GROUNDWATER MONITORING

In December 1999 and June 2000, Farallon Consulting sampled wells MW9, MW10, and VP9 and installed absorbent socks in wells MW6 and RW2. The absorbent socks were reportedly changed on a monthly basis.

5.10 DELTA, SEPTEMBER 2002

In September of 2002, Delta installed direct push probes DP1 to DP7 and hollow stem auger borings DB2 (completed as well MW13) and DB3 on the Property. All wells were developed and surveyed and soil and groundwater samples were submitted for analyses.

5.11 SAIC 2003 SVE SYSTEM UPGRADE

In 2003, SAIC modified the non-operational SVE system primarily to create a negative pressure in soils beneath the southwest-adjoining Monterrey Apartments property. The system did remove a limited amount of soil vapor. In 2005, the system was shut down.

CEMC enrolled the Site into the VCP in 2003 and a Dual Phase Extraction (DPE) system was designed to extract groundwater and soil vapor beneath the Property and the south-adjoining Monterrey Apartments Property. Contaminants removed from the subsurface were treated on-Property by thermal oxidation and carbon filtration. Treated groundwater was presumably discharged on the Property to the sanitary sewer.

5.12 SAIC (MARCH 2004 –SEPTEMBER 2006)

In March of 2004, SAIC advanced soil boring SP1 on the west-central portion of the Property and soil samples were submitted for analyses.

In October of 2004, SAIC installed well MW24 off-Property in close proximity to the western Property boundary. The well was developed and surveyed and soil and groundwater samples were submitted for analyses.

In October 2005, SAIC initiated the installation of the DPE system, which included installing extraction wells DPE-5, DPE-6, and DPE-7 on the Property. All three wells were developed and surveyed and soil and groundwater samples were submitted for analyses. Pneumatic groundwater extraction pumps were installed in all three wells. The full system, which was designed to remediate the Property and the south-adjoining Monterrey Apartments property, began operation in November 2007. The system was shut down on April 2, 2008 after reportedly removing approximately 45,000 pounds of hydrocarbon mass.

5.13 SOUND EARTH STRATEGIES LIMITED SUBSURFACE INVESTIGATION (2012)

In 2012, SES conducted a Limited Subsurface Investigation (LSI) and advanced nine test probes (P01 through P09) across the Property. Soil samples were submitted to the laboratory for analyses from each location.

Soil analytical data obtained during the LSI indicated that soil containing concentrations of petroleum related contaminants of concern (COCs) exceeding applicable MTCA soil cleanup levels was present beneath two thirds of the Property. SES concluded that the thickness of petroleum contaminated soil extended from five feet thick on the eastern portion of the Property to 15 feet thick on the western portion of the Property.

SES also performed a Ground Penetrating Radar (GPR) Survey on the Property in an attempt to identify locations of remediation piping. However, the results of the GPR survey were inconclusive.

5.14 RGI SUPPLEMENTAL SUBSURFACE INVESTIGATION 2017

In 2017, RGI conducted a Supplemental Subsurface Investigation (SSI) and advanced eight test probes (P1, P2, P3 and SSI-P1 through SSI P5) throughout the Property and installed groundwater monitoring wells off-Property to the north (SSI-W2) and east (SSI-W1). Soil and groundwater samples were submitted to the laboratory for analyses.

Soil and groundwater analytical data obtained from the SSI indicated that soil and/or groundwater contamination likely extended off-Property to the north and east beneath the sidewalks along West Roy Street and Queen Anne Avenue North. Groundwater analytical data indicated that groundwater impacts did not extend beyond the northernmost and easternmost portions of the sidewalks where wells SSI-W1 and SSI-W2 were installed.

6 TERRESTRIAL ECOLOGICAL EVALUATION (TEE) RESULTS

WAC 174-340-7490 indicates that a Terrestrial Ecological Evaluation (TEE) must be performed at any site where there has been a release of a hazardous substance to soil. MTCA regulations require that one of the following actions be taken:

- Document a TEE exclusion using criteria in WAC 173-340-7491;
- Conduct a simplified TEE as set forth in WAC 173-340-7492; or
- Conduct a site-specific TEE as set forth in WAC 173-340-7493.

RGI evaluated the Site (which includes the Property) using the criteria described in WAC 173-340-7490(1) and determined that the Site qualifies for a TEE exclusion based on WAC 173-340-7491(1)(c)(i), which is applicable to sites that are not contaminated with chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor or heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, petachlorophenol, or pentachlorobenzene. This section states that if there is less than 1.5 acres of contiguous undeveloped land on or within 500 feet of any area of the site, no further evaluation of ecological impacts is required under MTCA.

Since none of the contaminants listed in WAC 173-340-7491(1)(c) are a concern for the Site, and there is not 1.5 acres of contiguous undeveloped land on or within 500 feet of any area of the Site, no further evaluation of ecological impacts is required under MTCA. A copy of the TEE Exclusion Form is included as Appendix D.

7 CONCEPTUAL SITE MODEL

A Conceptual Site Model (CSM) identifies sources of contamination, affected media, current and future land uses, known or potential exposure pathways and potential receptors that could be exposed to contamination. The CSM provides the basis for evaluating and selecting interim action alternatives.

This section discusses the CSM developed for the Property based on data obtained from previous subsurface investigation findings by RGI and others.

7.1 KNOWN AND SUSPECTED SOURCES OF CONTAMINATION

As previously described in Section 4 and displayed on Figure 3, the Property was previously occupied by several different configurations of gasoline service stations from 1927 to 1993. These service stations were situated in different locations throughout the Property and historically contained up to 23 USTs, pump islands, hoists, and grease pits. The sources of petroleum contaminated soil and groundwater observed on the Property are suspected to be the result of releases of petroleum products from USTs,

other portions of the fuel systems, and/or other service station related underground improvements (i.e., wash racks and hoists).

Based on data obtained from recent subsurface investigations, petroleum contaminated soil extends from approximately 5 feet (or less) to 24 feet bgs across a large portion of the Property. As previously discussed, the petroleum hydrocarbon contamination on the western and southwestern portions of the Property extends off-Property to the west-southwest. There are isolated areas beneath the southwestern portion of the Property where soil impacts may extend to depths between 24 and 31.5 feet bgs. Petroleum contaminated soil may also extend, to a much lesser degree, off-Property beneath the sidewalks to the north and east of the Property. In many locations, the maximum depth of soil contamination corresponds to the depth of the clayey silt layer, which is present at approximately 17 feet bgs beneath the eastern portion of the Property and up to 31.5 feet bgs beneath the western portion of the Property.

Groundwater flow direction across the Property has consistently been determined to be to the west-southwest. Petroleum contaminated groundwater is also present beneath most of the Property and extends off-Property to the west and southwest. Petroleum contaminated groundwater may also extend off-Property, to a much lesser degree, limited to just beneath the sidewalks to the north and east of the Property.

LNAPL was historically detected on the Property in wells MW6, MW9, RW4, DPE5, and DPE7. However, LNAPL is currently not present on the Property and the last time LNAPL was observed on the Property was in 2008. The in-situ cleanup effort performed by others appears to have been effective in reducing the occurrence of LNAPL.

Dissolved lead was historically detected in groundwater on the western portion of the Property (MW6) at concentrations exceeding the MTCA cleanup level. The source of this lead is suspected to be associated releases of leaded gasoline on the Property. Lead has not been detected in groundwater on the Property at a concentration above the MTCA cleanup level since 1997.

Dissolved arsenic was historically detected in groundwater at a concentration of 6.1 micrograms/Liter (µg/L) in well MW6 in 2002. This concentration slightly exceeded the MTCA cleanup level of 5 µg/L and may be attributed to background arsenic groundwater concentrations in the region. No source of arsenic contamination has been identified on the Property.

Archived assessor records indicate that the tailor shop/Acme Cleaners (potentially including dry cleaning) was present on the southeastern portion of the Property in 1927. However, no releases to soil and/or groundwater have been identified from this potential dry cleaning facility. Chlorinated solvents have never been detected in soil or groundwater on the Property at concentrations exceeding applicable MTCA cleanup levels.

Potential off-Site sources of contamination included the following properties:

- Gasoline service station (former Unocal service station) located northeast, and up-gradient of the Property (across the intersection of Queen Avenue North and West Roy Street).
- A former dry cleaning facility located north, and up-gradient of the Property (across West Roy Street).
- A former Paramount Cleaners located approximately one block east-northeast of the Property (across the intersection of Queen Anne Avenue North and West Roy Street).

Releases of chlorinated solvents and/or petroleum hydrocarbons were historically documented on one or more of these properties. However, recent soil and groundwater analytical data obtained from the

Property indicates that these up-gradient properties are not currently adversely impacting soil and/or groundwater underlying the Property. Historically, portions of the Site situated outside the Property boundary were impacted by up-gradient sources and it is unknown what current conditions are in these portions of the Site.

7.2 CURRENT AND FUTURE LAND USES

The Property is situated in the lower Queen Anne area, which includes commercial and residential areas. The Property is specifically zoned as a SM-UP-85 by Seattle Department of Construction and Inspections (SDCI). The Property is surrounded by apartment complexes, restaurants, and retail businesses.

The Property and existing building is currently vacant and the parking lot is utilized as a paid parking lot operated by Republic Parking. The exterior portions of the Property outside the vacant building are asphalt paved. The current plan is to redevelop the Property as a multi-use residential building with one level of underground parking. This construction is anticipated to begin in August of 2019.

7.3 CONTAMINANTS OF CONCERN AND AFFECTED MEDIA

The identified COCs that have been observed on the Property at concentrations exceeding applicable MTCA cleanup levels for a given media consist of the following:

- COCs in soil: Gasoline-, diesel-, and oil-range TPH, BTEX (benzene, toluene, ethylbenzene, xylenes), and naphthalene.
- COCs in groundwater: Gasoline- and diesel-range TPH, BTEX, lead, and arsenic.
- Potential COCs in soil vapor and air: Gasoline- and diesel-range TPH, BTEX, and naphthalene.

The selected cleanup levels for COCs are presented in Section 9.1.1.

7.4 EXPOSURE PATHWAYS & RECEPTORS

As described in Section 6, the Site (which includes the Property) qualifies for a TEE exclusion due to the fact there is not 1.5 acres of contiguous undeveloped land on, or within, 500 feet of any area of the Site. Additionally, there are no surface water bodies in close proximity to the Property. Therefore, evaluation of surface water and ecological receptors is not applicable to the Property and therefore not discussed in this section.

Mitigating the potential human health risk associated with the potential COCs in the affected media at the Property will be the primary objective of the selected cleanup action alternative. The exposure pathways that are applicable to the Property include soil, groundwater, and the vapor intrusion pathway and these are discussed further in the following sections.

A copy of the Property-Specific Health & Safety Plan associated with this Work Plan is included as Appendix E.

7.4.1 SOIL PATHWAY

The exposure pathways for soil include direct contact, soil leaching-to-groundwater, and soil vapor migrating into overlying structures.

Human health exposure pathways via direct soil contact include dermal contact and/or ingestion/inhalation of contaminated soil and dust. The point of compliance is defined as throughout the Property from the ground surface to 15 feet bgs. During redevelopment of the Property, the potential for constructions workers to come in contact with soil containing petroleum related compounds at concentrations above MTCA cleanup levels is high. In order to address this concern, all workers handling contaminated soil during redevelopment shall be Hazardous Waste Operations and

Emergency Response (HAZWOPER) trained and follow established safety protocols under the direction of the Health & Safety Officer and outlined in the Health and Safety Plan. The goal of the interim action will be to remove all contaminated soil containing concentrations of contaminants above the applicable cleanup levels from within the Property boundaries. However, if it is necessary to leave contaminated soil in-place for any reason, no contaminated soil shall be situated at depths above 15 feet bgs after redevelopment.

The leaching pathway (protection of groundwater) concerns contaminated soil impacting groundwater and potential ingestion of contaminated water via drinking water. The point of compliance for the leaching pathway is defined as throughout the soil profile within the Property boundaries. During the interim action, confirmation soil samples will be collected and submitted to the laboratory for analyses. Data obtained from these soil samples will be evaluated with cleanup levels established in Section 9 in order to demonstrate that soil concentrations of contaminants are protective of groundwater.

The soil to soil vapor pathway concerns volatile contaminants partitioning from soil to soil vapor and migrating into structures above and causing a potential threat to human health via inhalation of indoor air contaminants. The standard point of compliance pertaining to soil vapor is defined as throughout the Property from the uppermost groundwater saturated zone. During and/or after the interim action, RGI may collect soil vapor and/or indoor air samples to verify that indoor air is protected in accordance with MTCA.

Section 12 (Interim Action Plan) describes the process for the characterization, handling, and disposal/treatment of contaminated soils encountered during redevelopment of the Property.

7.4.2 GROUNDWATER PATHWAY

The exposure pathways for groundwater include the direct contact, groundwater-to-soil vapor resulting in migration of vapors into overlying buildings and subsequent inhalation of contaminated air, and ingestion via drinking water.

Shallow perched groundwater has historically been encountered on the Property between approximately 10 and 24 feet bgs. Groundwater beneath a large portion of the Property is contaminated with petroleum related compounds. The standard point of compliance for groundwater is defined as throughout the Property from the uppermost portion of the saturated zone to the maximum depth that impacted groundwater could be encountered. Considering that all COCs for the Property have a lower density than water, and shallow groundwater is located above the hard impervious clayey silt, groundwater contamination is not anticipated to extend far beneath the observed water bearing zone. Additionally, shallow groundwater beneath the Property is not currently used for drinking water and it is highly unlikely that it would be used for drinking water in the future. However, cleanup levels protective of drinking water will be used for evaluating compliance during the interim action since Ecology has indicated that there is insufficient evidence at this time to conclude that groundwater on the Property is non-potable.

The direct contact pathway exposure risk primarily relates to construction workers coming into contact with contaminated groundwater during the proposed redevelopment of the Property including excavations to depth up to 31.5 feet bgs. Therefore, contaminated groundwater is anticipated to be encountered during the interim action. All workers that have the potential to come into contact with contaminated groundwater during redevelopment will be HAZWOPER trained and follow established safety protocols under the direction of the appropriate Health and Safety Officer(s) and outlined in the Health & Safety Plan.

There are no drinking water wells located on, or in the vicinity of the Property. Based on the current land uses, it is highly unlikely that the shallow, low yield, perched water bearing zone would be used for drinking water in the foreseeable future. However, Ecology has recently determined that previous investigation data does not provide sufficient evidence to support that groundwater on the Property is non-potable. Therefore, Ecology considers groundwater to be potable at this time.

During the interim action, all contaminated soil will be removed from the Property and contaminated groundwater will be dewatered and disposed of off-Property by others (see Section 12.5 for more discussion).

Groundwater monitoring wells will be installed during and/or after the interim action to monitor the effectiveness of the remediation and determine if groundwater concentrations of COCs are in compliance with MTCA cleanup levels that are protective of drinking water (see Section 13.1 for more discussion).

Section 12 (Interim Action Plan) describes the process for characterization, handling, and disposal of any contaminated groundwater encountered during construction.

7.4.3 SOIL VAPOR PATHWAY

The soil vapor/air pathway includes workers coming directly in contact with contaminated vapors during construction and vapors from contaminated soil and/or groundwater migrating into the Property building.

During redevelopment of the Property, the potential for constructions workers to be exposed to petroleum contaminated soil and/or groundwater and come in contact with petroleum contaminated vapors does exist. In order to address this concern, all workers involved with the interim action shall be HAZWOPER trained and follow established safety protocols under the direction of a Health & Safety Officer and outlined in the Health & Safety Plan. This will include having a respirator on-Property if necessary. Air monitoring will be conducted in accordance with the Health & Safety plan and workers will be notified if concentrations of contaminants in air reach unsafe levels and appropriate action would be taken at that time to protect the safety of the workers.

Soil vapor impacts have not been thoroughly investigated on the Property during previous investigations by others. However, based on the concentrations of contaminants, depth of petroleum contamination, and the known rapid rate of attenuation of these compounds as they move through the vadose zone, the current risk for vapor intrusion in the Property building after the interim action is completed is considered low

Regarding future use, the goal of the interim action will be to remove all contaminated soil from within the Property boundaries. However, if it is necessary to leave contaminated soil in place for any reason, no contaminated soil shall be situated at depths above 15 feet bgs after redevelopment. Given that the future Property building will have a high air exchange rate associated with the parking garage, vapor intrusion likely would not be a concern for the Property after the completed interim action.

A vapor/waterproofing barrier will be installed along the outside of all subgrade parking garage walls (estimated 6,255 ft^2) and will extend parallel to all Property boundaries (east, west, north, south). The barrier will extend vertically from ground surface to the bottom of the one level underground parking garage at approximately 14 feet bgs. If contaminated vadose zone soil is left behind the perimeter shoring walls, off-Property and after the interim action is completed, the vertical barrier would prevent contaminated soil vapor (if any) from migrating into the parking garage or ground level retail space and causing a vapor intrusion concern in the building. This vapor/waterproofing barrier would also assist with preventing contaminated perched groundwater from re-contaminating the Property after the

interim action is completed. As discussed in Section 13, groundwater monitoring wells will be installed on the Property to assess groundwater quality after the interim action is completed.

The vapor/waterproofing barrier will also be installed beneath the eastern half of the concrete garage floor slab (an estimated 5,781 ft^2) to mitigate any vapor intrusion impacts that could potentially be caused by contaminated soil vapor migrating up from beneath the building. In addition, a vapor intrusion mitigation system will be installed beneath the western portion of the concrete garage floor slab to mitigate any potential vapor intrusion impacts in this area (an estimated 4,732 ft^2). The locations of the vapor/waterproofing barrier and sub-slab vapor mitigation system are depicted on Figure 7 and the specifications regarding the vapor barrier are included as Appendix F. Vapor intrusion mitigation strategies are also discussed further in Section 9.2.4.

RGI will conduct a Vapor Intrusion Assessment (VIA), which may consist of soil vapor and/or indoor air sampling after the interim action is completed and the majority of the building is constructed. The VIA is discussed further in Section 13.2.

8 PROPERTY GEOLOGY & HYDROGEOLOGY

In general, the soils underlying the Property consist of silty sands to depths of approximately 6 feet to 8 feet bgs, underlain by sand to depths of 17 to 31 feet bgs. The depth to the bottom of the sand horizon is shallower beneath the eastern portion of the Property (approximately 17 feet bgs) and deepens to the west (up to 31 feet bgs beneath the western portion of the Property). Underlying the sand is a hard to very hard, relatively impervious, clayey silt (Lawton Clay). A cross-section depicting subsurface conditions along the northern Property boundary is displayed on Figure 6.

In general, the unconfined, perched shallow water bearing zone is present across the Property and is typically found perched above the Lawton Clay. Depth to this water bearing zone beneath the eastern portion of the Property seasonally ranges from approximately 10 feet bgs to 13.5 feet bgs. Depth to this water bearing zone beneath the western portion of the Property seasonally ranges from approximately 18 feet bgs to 24 feet bgs. The groundwater flow direction has consistently been towards the west-southwest.

According to the RI report prepared by SAIC for the Property (dated August 2007), a deeper aquifer is reportedly separated by the shallow water bearing zone by more than 100 feet of the Lawton Clay or other fine-grained soils.

9 PROPERTY CLEANUP REQUIREMENTS

The MTCA regulation (chapter 173-340 WAC) governs site cleanups and defines a two-step approach for establishing cleanup requirements for individual sites:

- Establishing Cleanup Standards
- Selecting Cleanup Actions.

9.1 CLEANUP STANDARDS

The two primary standards pertaining to the cleanup action at the Property include:

- Cleanup Levels –The concentration at which a particular hazardous substance does not threaten human health and the environment.
- Point of Compliance- Designates the location on the Property where the cleanup levels must be met.

9.1.1 CLEANUP LEVELS

The MTCA regulation provides three options for establishing generic and site-specific cleanup levels for soil and groundwater. Method A cleanup levels have been adopted for specific purposes and are intended to provide conservative cleanup levels for sites undergoing routine site characterization or cleanup actions or those sites with relatively few hazardous substances. Method B and C cleanup levels are set using a site risk assessment, which focus on the use of "reasonable maximum exposure" assumptions based on site-specific characteristics and toxicity of the COCs.

The following cleanup levels have been selected for soil, groundwater, and air on the Property. Note surface water cleanup levels are not applicable to this project as no water bodies are situated in close proximity to the Property.

For this project, the MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses were selected for compounds detected in soil at concentrations above laboratory detection limits. MTCA Method A soil cleanup levels have been established for all COCs on the Property listed in the table below.

For groundwater, the MTCA Method A Cleanup Levels for Groundwater were selected for compounds detected in groundwater at concentrations above laboratory detection limits. MTCA Method A groundwater cleanup levels have been established for all COCs on the Property listed in the table below. If contaminants are encountered in groundwater during the cleanup action that do not have an established MTCA Method A groundwater cleanup level, the Applicable and Relevant or Appropriate Requirement (ARAR) will be referenced per WAC 173-340-700[5][a].

For air, The MTCA Method B Indoor Air Cleanup Levels are referenced in the table below. RGI will utilize information contained in *Draft Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial* (Ecology Draft VI Guidance) dated 2009 by Ecology and other applicable Ecology and EPA guidance documents for developing the Vapor Intrusion Assessment scope of work and evaluating soil vapor and indoor air data. See Section 13.2 for a list of guidance documents that may be utilized.

The soil and groundwater cleanup levels listed below are considered protective of direct contact and drinking water. The MTCA Method A soil and groundwater cleanup levels for compounds that have been detected at concentrations above laboratory detection limits on the Property are summarized below.

Contaminant	Media	Method A Soil Cleanup Level	Media	Method A Groundwater Cleanup Level	Media	Method B Indoor Air Cleanup Level
Gasoline-range TPH	soil	30 mg/kg	Groundwater	800 µg/L	Air	TBD
Diesel-range TPH	soil	2,000 mg/kg	Groundwater	500 µg/L	Air	TBD
Oil-range TPH	soil	2,000 mg/kg	Groundwater	500 µg/L	NA	NA
Benzene	soil	0.03 mg/kg	Groundwater	5 µg/L	Air	0.321 µg/m^3
Toluene	soil	7 mg/kg	Groundwater	1,000 µg/L	Air	2,290 µg/m^3
Ethylbenzene	soil	6 mg/kg	Groundwater	700 µg/L	Air	457 µg/m^3
Xylenes	soil	9 mg/kg	Groundwater	1,000 µg/L	Air	45.7 µg/m^3
Naphthalenes	soil	5 mg/kg	Groundwater	160 µg/L	Air	0.0735 µg/m^3
Tetrachloroethene	soil	0.05 mg/kg	Groundwater	5 µg/L	Air	9.62 µg/m^3
Trichloroethene	soil	0.03 mg/kg	Groundwater	5 µg/L	Air	0.37 µg/m^3

Lead	soil	250 mg/kg	Groundwater	15 µg/L	NA	NA
Arsenic	soil	20 mg/kg	Groundwater	5 µg/L	NA	NA

mg/kg = milligrams/kilogram
µg/L = micrograms/liter
µg/m^3 = micrograms/cubic meter
NA = Not applicable
TBD = A Property-specific Method B Indoor Air Cleanup Level for TPH will be calculated during the Vapor Intrusion Assessment in accordance with procedures set for in *Implementation Memorandum No. 18* dated January 10, 2018 by Ecology

9.1.2 POINTS OF COMPLIANCE

The regulatory requirements for establishing the "point of compliance" are described in WAC 173-340-720 through 173-340-360. The point of compliance is defined as the location within a particular medium where cleanup levels must be met. The points of compliance consists of a "standard" and "conditional" points of compliance. The standard point of compliance is generally defined as throughout the site indicating that the cleanup levels must be met at the standard point of compliance for each media (soil, groundwater, surface water, and air). Groundwater points of compliance for the Property-specific cleanup will include the post-cleanup installation of groundwater monitoring wells along the Property's downgradient property boundary (see Section 13.1 for more discussion). On certain sites, a conditional point of compliance is granted. However, the conditional point of compliance is not applicable to the Property.

As previously indicated, this interim action pertains only to the Property and not the entire Site, which extends beyond the Property boundaries.

The selected point of compliance for soil is throughout the Site (based on protection of groundwater).

The selected point of compliance for groundwater is throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest depth, which could potentially be impacted by COCs at the Site.

The selected point of compliance for air is in ambient air throughout the Site.

9.2 INTERIM ACTION METHODOLOGY

9.2.1 OVERVIEW

Cleanup actions can be divided into the following two main headings: in-situ and ex-situ remedial activities. Using available data, characteristics, and current and future land use, the remedial options are evaluated based on the following criteria: effectiveness, implementability, cost, anticipated time of completion and compliance with applicable laws and standards.

In-situ remedial technologies include groundwater pump and treat, air sparge, vapor extraction, chemical oxidation, bioremediation or combination or variation thereof. These in-situ technologies are effective in remediating VOC or petroleum hydrocarbon affected media. However, these technologies are reserved for projects where remedial excavation is not a valid or practical option. Since the Property will be excavated as part of the planned redevelopment, which includes installation of a one level underground parking garage, in-situ technologies are not evaluated further.

Ex-situ remedial technologies generally include soil excavation. Contaminated soil is either stockpiled on-Property and remediated above ground (e.g., land farmed); or are excavated and transported off-Property to a permitted disposal/treatment facility.

Remedial soil excavation (coupled with groundwater dewatering) is considered an effective approach for remediating contaminated properties undergoing redevelopment and is considered the appropriate interim action alternative for the Property.

9.2.2 SOIL REMEDIATION

Based on RGI's and Roystone's evaluations, the estimated total of contaminated soil (above cleanup levels) excavated, loaded, and transported off-site for proper disposal is approximately 7,000 cubic yards (or 10,500 tons, using a conversion multiplier of 1.5 from CYs tons).

The selected interim action for soil at the Property is direct excavation with off-Property disposal. This method was selected due to the fact that it is highly effective, permanent, has a short restoration timeframe and will limit interference with redevelopment activities. This method is also the most readily practicable and cost effective method and will ensure compliance with cleanup standards throughout the Property.

Advantages of this option include immediate and permanent source removal and off-Property disposal and/or treatment. The removal of contaminated soils situated between approximately 5 and 24 feet bgs from the Property will also have a positive effect on remediating petroleum contaminated groundwater known to be present beneath the Property. Remedial excavation may extend to greater depths on the western portion of the Property. The actual depth of remedial excavation in a given area will be based on analytical data and/or the results of field screening.

The decommissioning of potential USTs, hoists and other service station features in conjunction with the remedial excavation of accessible contaminated soils and dewatering of encountered contaminated groundwater is considered and retained as the most appropriate interim action for the Property.

This interim action will result in a short restoration timeframe that will coincide with the construction of the building tentatively scheduled for August of 2019.

9.2.3 GROUNDWATER REMEDIATION

The selected interim action for remediating groundwater on the Property is direct excavation of contaminated soil (source removal) as described in Section 9.2.2; in conjunction with groundwater dewatering (behind the perimeter shoring walls and trenches/sump sumps within the excavation footprint), and off-Property disposal of contaminated water.

This method was selected due to the fact that it is the most practicable and cost effective and will have limited interference with redevelopment activities. This option will also provide long term effectiveness and attainment of cleanup standards. Groundwater remediation is discussed further in Section 12.

9.2.4 VAPOR INTRUSION MITIGATION

The potential exists for volatile compounds that have the potential to pose a vapor intrusion concern to be present in soil in the sidewalls of the excavation along the Property lines and/or in groundwater beneath the building after the interim action is completed. Therefore, a chemical vapor barrier/waterproofing barrier (Preprufe 300R) will be installed along all of the exterior subgrade parking garage walls (total of 6,225 square feet) and beneath approximately 5,781 square feet of the eastern portion of the concrete grade floor slab to protect occupants of the future building from potential vapor intrusion impacts. The installation of the chemical vapor barrier will be completed by others. The locations of the chemical vapor barrier are displayed on Figure 7. Technical specifications and installation instructions pertaining to the Preprufe 300R vapor/waterproofing barrier are included in Appendix F.

A vapor intrusion mitigation system will be installed beneath approximately 4,732 square feet of the garage floor slab of the western portion of the building. This area of the building is situated above the seasonal high groundwater level. The vapor intrusion mitigation system will be designed and installed by others and will consist of a network of perforated pipe beneath that western portion of the slab that will be connected to a fan and exhaust piping that will discharge vapors approximately one foot above the roof line. Thereby, creating a negative pressure beneath the slab and eliminating any vapor intrusion concern. This system will only be operated if results of the Vapor Intrusion Assessment (see 13.2) indicate that vapor intrusion is a concern for the building. The location of the planned vapor intrusion mitigation system is depicted on Figure 7.

10 CONCEPTUAL SHORING SYSTEM AND LOCATION

Soldier piles with wood lagging and tiebacks was selected for temporary shoring (shoring Option 1 as outlined in RGI's *Geotechnical Engineering Report*, dated February 20, 2017). RGI also recommended installing Miradrain 6000 (or equivalent), including vapor membrane behind the wood lagging or shotcrete wall and perimeter foundation drains, as appropriate, and as designed by Client's building envelope subcontractor.

Based on subsequent conversations with the Client and design team, one level of underground parking, from lot-line to lot-line will be constructed. Soldier piles with wood lagging and tiebacks were selected for the project.

The bottom of shoring will be designed to intersect the Lawton Clay layer that underlies the Property and corresponds to the estimated maximum depth of soil contamination. The bottom of shoring will be situated at elevation 115' along the southern portion of the eastern Property boundary, the southern Property boundary, and the western Property boundary, which will allow for remedial excavations of up to approximately 31.5 feet bgs in these locations. The bottom of shoring will be situated at elevation 122' along the northern Property boundary and the northern portion of the eastern Property boundary, which will allow for remedial excavations of up to approximately 26 feet bgs in these locations. The estimated shoring locations and estimated bottom of shoring elevations are displayed on Figure 7.

11 POTENTIAL USTS AND FORMER UNDERGROUND IMPROVEMENTS

RGI's recommended scope of work regarding former USTs and/or other related underground improvements associated with the various gasoline service stations are as follows:

- During demolition of the existing building on the Property, RGI shall oversee the removal of its concrete slab. This area was previously utilized as a service garage and underground improvements (USTs, hoists, wash racks, and oil/water separators) may be present beneath the slab.
- RGI personnel will be on-Property at all times to oversee and document the decommissioning of any encountered USTs, hoists, and/or other underground improvements related to the former gasoline service stations; and to perform the necessary sampling and analyses, which is required by Ecology and/or necessary to document whether or not a release from these abandoned improvements have occurred. For any USTs encountered, the General Contractor (GC), or RGI (if requested to do so), will retain an International Council Code (ICC) certified UST decommissioning contractor to properly inert and decommission any encountered USTs and/or other related improvement in accordance with applicable regulations. All UST decommissioning work be will approved by a marine chemist and the City of Seattle Fire Department. If USTs are filled with a cement slurry, concrete, and/or sand, each UST will need to be cut open and

cleaned in-place prior to being removed and transported off-Property. Note that UST 6B was reported as abandoned in-place and identified to be present on the Property during a geophysical survey conducted in January of 2019. USTs 1, and 2(see Figure 3) were also reported in previous reports as having been abandoned in-place, but were not identified during the geophysical survey. Therefore, the potential for one or more of these USTs to be encountered during redevelopment does exist. UST locations are displayed on Figure 3.

- RGI's ICC certified UST Site Assessor will perform the required UST Site Assessment services and/or other sampling, analyses, and reporting associated with the removal of USTs and/or other encountered underground improvements. Discovery of unknown underground improvements during redevelopment will likely require sampling, analysis, and/or waste profiling for disposal purposes.
- If USTs, hoists, or other underground improvements are encountered during redevelopment, they should be emptied prior to off-Property transport and placed on plastic sheeting and additionally covered with plastic sheeting to prevent contaminating underlying soils. All UST/hoist decommissioning documentation such as fire marshal permits, hot works permits, pump and rinse certificates, and disposal certificates shall be provided to RGI and will be included in the appendices of the Agency Review Draft Interim Action Report, which will be submitted to Ecology for review and approval.

12 INTERIM ACTION PLAN

Previous investigations conducted on the Property have identified contaminated soil and groundwater beneath most portions of the Property outside of the existing building. No impacts have been identified beneath the building, however, the vertical depth of these investigations were very limited due to logistics involving drilling inside the building.

The interim action will consist of properly decommissioning and removing any potential fuel system components and other former and potential improvements related to the gasoline service station(s) located on the Property and the removal of contaminated soil and groundwater from the Property.

The proposed scope of work to implement the recommended interim action is presented below.

12.1 PRE-INTERIM ACTION ACTIVITIES

The following activities will be performed prior to commencing with the interim action:

1. Obtain, by others, the grading permit and Side Sewer Permit for Temporary Dewatering (SSPTD) from the City of Seattle.
2. Obtain the King County Industrial Waste (KCIW) and City of Seattle Side Sewer Permit for the temporary discharge of contaminated groundwater encountered and/or generated during excavation dewatering to the on-Property sanitary sewer (as permitted by KCIW). This task is currently being completed by others and an application has been submitted to KCIW and is undergoing review. A copy of the *KCIW Issuance of Wastewater Discharge Authorization No. 4490-01 to Roystone Apartments* is included in Appendix G.
3. Finalize Public Participation Plan and Ecology Fact Sheet. This tasks are scheduled to be completed by June 4, 2019.
4. Conduct a State Environmental Policy Act (SEPA) review in accordance with Chapter 43.21C RCW. Ecology has recently completed the SEPA checklist, which is undergoing review at the time

of this writing. The Determination of Non Significance (DNS) is schedule to occur in late June 2019. A copy of the SEPA checklist is included in Appendix H.

5. Complete public review and comment period. This is scheduled to take place in July 2019.
6. Finalize the Agreed Order with Ecology. This process is currently on-going and the Agreed Order is anticipated to be finalized in early August of 2019.
7. Install a *Notice of Intent* sign on the Property that briefly states the Interim Action Plan and provides contact information. This Notice of Intent also partially satisfies one of the Cost Recovery requirements set forth by Ecology. RGI recommends that the Client's legal counsel opine as to what other notifications may be required in order to fully support any cost recovery effort.
8. Profile contaminated soil and water on the Property and obtain the necessary waste manifests and clearances from the permitted landfill disposal or treatment facilities, which will be required for disposal of contaminated soil and/or water. Based on all available data generated for the Property to-date, all contaminated soil and/or groundwater encountered should be designated as a non-hazardous, routine petroleum contaminated soil. The generator (Roystone) is required to sign the waste profile paperwork.
9. Abandon all existing groundwater monitoring wells on the Property in accordance with Ecology's Minimum Standards for Construction and Maintenance of Wells (WAC 173-360). Note: Groundwater monitoring (resource protection) wells damaged during construction, without being first properly decommissioned, are subject to fines and penalties from Ecology.
10. Hold one or more meetings with the Client (or Client's representative), GC, excavation subcontractor, and any other potentially relevant parties to review the components of this Work Plan and develop a strategy for implementation of the interim action in conjunction with construction activities.
11. Oversee the removal of the slab associated with the existing building situated on the southern portion of the Property. This building was previously utilized for automobile repair and underground improvements may be present beneath the slab.
12. Direct test pitting activities and collect and analyze soil samples to define the vertical and lateral extent of soil impacts in locations of the Property where soil contamination is known or suspected to be present (including beneath the existing building in the vicinity of the alleged former hoists, wash racks, and grease pits. It is likely that multiple rounds of test pitting and sampling will be conducted during the course of the interim action to define the extent of planned remedial excavations at greater depths. This data will allow RGI to plan accordingly with the GC and minimize any delays in construction activities.

12.2 CONTAMINATED SOIL REMEDIATION & HANDLING

This section outlines the plan to excavate known petroleum contaminated soils and the procedure for inspecting other soils encountered or exposed during the Property cleanup effort. The estimated location where contaminated soil is anticipated to be encountered beneath the Property is displayed on Figure 4.

RGI personnel should be on-Property at all times that excavation of contaminated soil is taking place and when excavation is occurring in locations where contamination is suspected to be present. This is necessary to oversee and properly segregate, load, stockpile soils ("clean" versus "contaminated") and

to better document the interim action. RGI will also perform the necessary sampling, analyses, reporting, and direct contractors as needed regarding the handling and disposal of contaminated soil.

Whenever possible, we recommend that interim action activities be completed (to the maximum extent possible) prior to commencing with other mass soil excavation activities associated with general Property grading, shoring installation, and/or during excavations for the one level underground parking garage. However, RGI does realize that it will be necessary to perform a majority of the interim action in conjunction with the Property redevelopment.

The GC and/or their earthwork subcontractor will excavate and segregate Property soils under the direction of RGI's environmental professionals. One or two RGI environmental professionals will be present at all times during excavation of contaminated soils (two person staff will be needed when high volumes of contaminated soils are being removed, or when different areas of the Property are being cleaned up at the same time).

All contaminated soil shall be removed from areas within the Property boundaries. It is currently estimated that remedial excavations will extend to an average depth of approximately 24 feet bgs. Remedial excavation may extend to greater depths on the western portion of the Property. The actual depth of remedial excavation in a given area will be based on analytical data and/or the results of field screening. On the eastern portion of the Property, the maximum depth of contaminated soil appears to correlate to the depth of the Lawton Clay layer, which has low permeability and serves as a confining layer. The depth to the clay layer varies from approximately 17 feet bgs on the east side of the Property to approximately 31 feet on the west side of the Property. RGI will coordinate remedial excavation activities with the GC and/or other parties. In areas of the Property where soil contamination extends to greater depths, the remedial excavation of one area may take place in multiple phases during each successive lift required for redevelopment. This strategy will minimize any interference or delays with construction activities.

During remedial excavations, and due to logistics associated with soil management, it may be necessary to stockpile contaminated soil on the Property. All contaminated soil should be segregated, and kept segregated from clean soil until it is loaded for off-Property for transport and disposal. The use of plastic sheeting, beneath and over, the contaminated soil is necessary. This is particularly important during wet weather and required to prevent inadvertently contaminating underlying soils and/or prevent spreading of contamination due to rain.

Depending on the depth of excavation in a given area, it may necessary to maintain a 1:1 slope, or a slope deemed appropriate by the geotechnical engineer-on-record. This would likely be a concern in areas where contamination extends beyond the depth of the redevelopment subgrade or deeper excavations for dewatering purposes (discussed further in Section 12.5). Areas where localized excavations require excavation beneath the redevelopment subgrade of approximately elevation 134' (approximately 13 to 14 feet bgs) will require backfilling in order to reach the desired subgrade for construction. Material used for backfilling would be specified by the geotechnical engineer-on-record.

During drilling associated with the installation of shoring walls along the Property boundaries, it is likely that petroleum contaminated soil cuttings requiring special handling will be encountered. RGI will be on-Property to oversee drilling at Property boundaries where contaminated soil is suspected to be present. RGI will also assist with handling and disposal of any contaminated soil encountered.

During the interim action soil, groundwater, and excavation water samples will be submitted to a fixed-base and/or mobile analytical laboratory for analyses of COCs. The purpose of these samples will be to

direct interim actions, plan strategically, demonstrate compliance with MTCA regulations, and/or profile waste for disposal.

The GC will comply with the Temporary Erosion and Sediment Control Plan (TECS Plan), which will include implementing standard practices to prevent soil and turbid storm water run-off from leaving the Property. This will also include removing loose soil from trucks and other vehicles leaving the Property, street sweeping, silt fences, straw bales, wash stations (if needed), etc. These activities will be managed by the GC. See civil plans C1.2 and C1.3 for further details.

Specific protocols for the interim action at the Property are discussed further in the following sections.

12.3 SOIL SEGREGATION

The categories of contaminated soil, and their permitted end uses, anticipated to be encountered during the interim action are described below along with the methodology for segregating soil.

12.3.1 PETROLEUM CONTAMINATED SOIL (PCS) CATEGORIES

The four categories of soil are defined in Table 12.1 of Ecology's *Guidance for the Remediation of Petroleum Contaminated Soils* (Ecology PCS Guidance), revised in June 2016, and are summarized as follows:

1) **Category 1 –** Any soil that is not affected by any releases of contaminants or soils that do not contain any concentrations contaminants above the compound-specific analytical laboratory detection limits. These soils are referred to as "clean" soils and Category 1 soils can be re-used anywhere.

2) **Category 2 –** Any soils that contain concentrations ranges of petroleum related COCs published in the Ecology PCS Guidance. The Category 2 concentration ranges for Property COCs are as follows gasoline-range TPH (5-30 mg/kg), diesel-range TPH (25- 200 mg/kg), oil-range TPH (100-200 mg/kg), benzene (0.005-0.03 mg/kg), toluene (0.005-7 mg/kg), ethylbenzene (0.005-6 mg/kg), xylenes (0.015-9 mg/kg), naphthalenes (0.05-5 mg/kg), and lead (17-50 mg/kg). Category 2 soils are suitable for re-use as fill above the water table.

Note: a Category 2 soil may have a petroleum-like odor, and therefore may have concentrations of petroleum hydrocarbons below the analytical detection limits. In addition, Category 2 soils may or may not exhibit obvious petroleum odors or give a positive water sheen test.

3) **Category 3/4** - soil known or suspected to contain concentrations of petroleum-related COCs exceeding the maximum Category 2 concentrations published Ecology PCS Guidance. Category 3/4 soils contain concentrations of COCs higher than those allowed under the Category 2 classification. The re-use category for these soils is typically for asphalt manufacturing and road construction.

Based on soil analytical data obtained from the Property to date, and as stated above, RGI anticipates the majority of PCS removed from the Property will be classified as Category 3/4 soils. The known concentration ranges for Property COCs such as gasoline-range-TPH and benzene make it unlikely that a large volumes of Category 2 soils will be encountered during redevelopment. RGI anticipates that the majority of soil segregating on the Property will be distinguishing Category 1 ("clean" soils) from Category 3/4 soils. However, if encountered, soils will be removed as Category 2 soils if it is deemed cost-effective to do so.

12.3.2 POTENTIAL NON-PETROLEUM CONTAMINATED SOIL

RGI currently anticipates that all contaminated soil associated with the interim action will consist of petroleum hydrocarbon-related soil contamination. However, if non-petroleum soil contamination is encountered, or is suspected by RGI, beneath the building or in other locations on the Property, additional sampling, analyses, and waste profiling will be performed.

If compounds related to dry cleaning such as tetrachloroethene (PCE), trichloroethene (TCE), and/or other hazardous substances are encountered, the soil may need to be disposed of as an F-listed hazardous waste or disposed of under a Contained-in determination with Ecology. Coordinating disposal for such soils can result in delays relating to Ecology approval and/or the disposal facility accepting the waste. Therefore, the excavation contractor should be prepared for possible delays including temporary stockpiling on-Property. All stockpiled contaminated soil (regardless of the nature of the contamination) must be placed on plastic sheeting and covered with plastic sheeting to avoid spreading of contamination as a result of rain or other means.

12.3.3 SOIL SEGREGATION METHODOLOGY

During soil excavation, and as directed by the Client, RGI's environmental professional(s) will segregate soils using one or more of the following criteria:

1. **Existing Soil Quality Data.** For example, if existing soil quality data indicates that soil in a particular area of the Property classifies as a Category 3/4 PCS, it will be excavated, loaded, and transported off-Property as a Category 3/4 soil unless field screening data suggests otherwise. Alternatively, unknown soils may be stockpiled on plastic sheeting, sampled, and tested prior to making a determination.
2. **Field Screening Data.** Field screening methods will include a portable gas analyzer equipped with a photoionization detector (PID), to qualitatively estimate total VOCs and water sheen tests for longer chain petroleum hydrocarbons (diesel- and oil-range TPH).
3. **On-Property Analytical Laboratory.** An on-Property mobile analytical laboratory may be utilized for this project to assist with determining concentrations of contaminants encountered and with verifying clean soils (i.e., soils that do not contain concentrations of contaminants above laboratory method detection limits).
4. **Off-Property Laboratory Analytical.** An off-Property analytical laboratory will be used for interim and confirmation soil sampling analyses.
5. **LNAPL** – Based on current Property data, no LNAPL is suspected to be present on the Property. However, if LNAPL is observed in soil, the soil will be designated as a Class 3/4 soil. *Note: if LNAPL is present, LNAPL removal may be necessary before soil is loaded and transported off-Property.*

The objective during interim action is to minimize the handling and stockpiling clean soil and contaminated soils. All excavated soil will be categorized, based on field observations and/or laboratory analytical data, and transported off-Property to the appropriate disposal facility.

Based on available data, Property soils contain petroleum hydrocarbons (as gasoline-, diesel-, and oil-range TPH), BTEX, and naphthalenes. These soils are designated as PCS Category 2/3/4 soils and can be either stockpiled on-Property and/or directly loaded into trucks and transported to nearby transfer stations (i.e., Waste Management located in Seattle, Washington). Segregated Category 2 soils could be transported to other licensed and permitted disposal/treatment facilities (i.e., Cadman located in Everett, Washington).

As requested by the Client, or determined appropriate in the field, soil will be segregated during excavation into either Category 1, Category 2, or Category 3/4. The decision on where to dispose of contaminated soils will be based on COC concentrations, transportation costs, and/or costs associated with any additional handling of soils required to do so.

Alternatively, or as requested by the Client, all PCS may be transported and disposed of off-Property as a Category 3/4 PCS. This strategy may be cost effective when double handling of PCS and/or excessive stockpiling would be necessary to segregate PCS and may also reduce analytical costs associated with distinguishing Category 2 PCS from Category 3/4 PCS.

Once all PCS has been removed from the remedial excavation, confirmation soil samples will be collected from the limits of the remedial excavation and submitted to the laboratory for analyses. The purpose of confirmation soil sample is to demonstrate that soils at the limits of the remedial excavation are in compliance with MTCA regulations. The soil sampling strategy is discussed further in Section 12.4.

12.4 INTERIM AND CONFIRMATION SOIL SAMPLING

During (interim) and following the completion of remedial excavations (confirmation), RGI's environmental professional will collect soil samples at various locations throughout the Property.

Analytical results for each interim and confirmation soil sample will be used to confirm the soil quality within the excavation area and at the limits of the excavation. Soil samples will be collected along the excavation/shoring walls, prior to the placement of wood lagging, to also document in-situ soil quality at the Property boundaries in areas where remedial excavation extends to the Property boundaries. The location and depth of each sample will be based on subsurface soil conditions, field screening results, and/or professional judgment.

Soil confirmation samples collected from remedial excavation sidewall limits (for example, behind the shoring walls along all four sides of the Property) will be as follows:

- A minimum of one confirmation soil sample and up to two confirmation soil samples will be submitted for analysis for every 20 linear feet of sidewall (vertical and horizontal) based on the results of field screening. Soil samples with the highest field screening evidence of contamination will be submitted for analyses. Soil sample frequency will be increased in areas where contaminated soil is left in place to characterize the remaining area of contamination (if necessary). In addition, sidewall samples collected in the zone approximately 10 to 20 feet below grade (the approximate depth of groundwater prior to redevelopment) will be collected at a depth just above the highest pre-redevelopment groundwater elevation in a given location.

Soil confirmation samples collected the bottom floor of the excavation will be as follows:

- A minimum of one confirmation soil sample and up to 4 confirmation soil samples will be submitted for analyses for every 400 square feet of bottom of excavation based on the results of field screening and/or analytical data. Soil samples with the highest field screening evidence of contamination will be submitted for analyses. Bottom samples will also be collected beneath areas where the highest concentrations of contaminants were observed. Soil sample frequency will be increased in areas where contaminated soil is left in place to characterize the remaining area of contamination (if necessary).

All confirmation samples will be analyzed (at a minimum) for gasoline- diesel, and oil-range TPH and BTEX. Note that this soil sampling strategy and analyses complies with the agreement between the Client and CEMC and also complies with MTCA regulations.

Soil samples will be collected using standard decontamination procedures including disposable latex gloves, stainless-steel spoons, and Alconox wash prior to sampling events. Samples will be collected either directly from the backhoe bucket or by using stainless steel spoons or trowels and placed in preconditioned sterilized-glass jars provided by the project, Ecology-accredited, third-party analytical laboratory. All soil samples analyzed for volatile compounds will be collected using EPA Method 5035A.

All samples will either be stored in an iced cooler at approximately 4^{o} C while at the Property and during transportation to the fixed-base analytical laboratory or submitted directly to the mobile analytical laboratory located on-Property. A chain of custody form will accompany each cooler containing laboratory samples under standard sample chain of custody protocols.

12.5 PROPERTY GROUNDWATER DEWATERING DURING CONSTRUCTION

12.5.1 CONSTRUCTION DEWATERING

Available data indicates that contaminated shallow groundwater will be encountered as shallow as approximately 11.5 feet bgs during the interim action.

The GC, following, and/or in conjunction with the soil remedial excavation effort, will properly manage, pump, contain, store, and discharge contaminated groundwater encountered during construction. The dewatering design is outlined in the Revised Dewatering Plan dated March 22, 2019 by RGI.

The dewatering plan consists of installing a series of vacuum well points behind the shoring wall into the shallow water bearing zone. The dewatering plan also outlines the dewatering design elements, anticipated volume of groundwater withdrawal, number of dewatering points, sampling and testing requirements for discharge, permit requirements, and other pertinent information. A copy of RGI's Dewatering Plan and the *KCIW Issuance of Wastewater Discharge Authorization No. 4490-01 to Roystone Apartments* is included in Appendix G.

The dewatering effort during construction and its relative long term duration, be it by conventional trench and sump pumps or temporary dewatering wells, will substantially reduce groundwater concentrations beneath the Property. Any potential remaining residual dissolved phase contaminants located off-Property and up-gradient (north and east) of the Property are anticipated to be limited. Following completion of the contaminated soil removal and groundwater dewatering effort, the shallow groundwater located north and east (up-gradient) of the Property will eventually recharge and migrate back onto the Property.

12.5.2 ADDITIONAL GROUNDWATER REMEDIATION

During the interim action, RGI will direct additional groundwater remediation where isolated, or relatively small areas of groundwater contamination remain and/or are suspected to be located. In this event, RGI will direct the contractor to excavate trenches to a depth of a few feet below the level groundwater and dewater the location by utilizing sump pumps to transfer contaminated water into settlement tanks for temporary storage. Excavation water samples will be collected and submitted to the laboratory for analyses in order to determine concentrations of COCs in groundwater. Sampling and analyses may be repeated several times at the direction of the RGI environmental professional. Data obtained will be used to determine if the interim groundwater remediation effort was effective. If not, an oxidizing agent (for example, one of several proprietary chemical oxidizing products manufactured by Regenesis® or other supplier) could be mixed within the water saturated zone, prior to backfilling. .

12.6 SAMPLE LABELING & DOCUMENTATION

All soil, groundwater, and/or excavation water samples collected during the interim action will be labeled appropriately. Sample information will be written on a label affixed to the outside of the sample container. Samples will be given a mnemonic designation associated with the type of sample (i.e., remedial excavation, test pit, UST Site Assessment, waste characterization, and stockpile), sample location (intersection of nearest gridlines), sample number, sample designation (for remedial excavation samples only), and depth of sample. For example, RE-L5-1S-10 would indicate a remedial excavation soil sample collected near the intersection of gridlines L and 5, location #1 from the sidewall of the excavation at a depth of 10 feet bgs. All sample depths and locations will be recorded in feet relative to a fixed reference point.

A field logbook will be maintained to document all pertinent activities during the interim action. Soil and groundwater sampling notes will be recorded in the field logbook for one or more of the following:

- Sample identification
- Sample location
- Date and time of sample collection
- Sample depth
- Identity of samplers
- Sampling methods and devices used
- PID readings, sheen testing results, and olfactory and visual observations
- Purge volumes and devices used (groundwater sampling only)
- Depth to groundwater and pH, temperature, and conductivity readings (groundwater sampling only)
- Relative moisture content (dry, moist, wet, saturated) of the soil sample
- Soil type (e.g., silt, sand, gravel, etc.)
- Any other information considered relevant by the RGI professional

In addition, strict Chain-of-Custody protocols will be adhered to for all samples. A complete Chain-of-Custody will be returned with laboratory reports upon completion of analysis. Copy(s) of the Chain-of-Custody forms will be included in the Agency Review Draft Interim Action Report, which will be submitted to Ecology for review and approval. A copy of the Sampling and Analysis Plan/Quality Assurance Project Plans (SAP/QAAP) is included as Appendix I.

12.7 LABORATORY ANALYSES

Based on the current data and the required analyses outlined in Table 830-1 of MTCA, it is anticipated that soil, groundwater, and/or excavation water samples will be submitted to either a mobile or fixed-base laboratory and analyzed for one or more of the following:

- Diesel-range TPH by Northwest Test Method NWTPH-Dx.
- Gasoline-range TPH by Northwest Test Method NWTPH-Gx.
- BTEX by EPA Method 8021B
- Carcinogenic polycyclic aromatic hydrocarbons (cPAHs) by EPA Method 8270 Select Ion Monitoring (SIM).
- Volatile organic compounds (VOCs) by EPA Method 8260C.
- Total and dissolved lead and arsenic by EPA Method 200.8.
- Polychlorinated Biphenyls (PCBs) by EPA Method 8082.

If previously unknown contaminated media are identified, additional analyses may be required. A copy of the SAP/QAAP, which describes laboratory analysis and QA/QC procedures is included in Appendix I.

12.8 PROJECT COMMUNICATION

Daily Field Reports (DFRs) prepared by RGI's field environmental professional will be submitted to the GC's superintendent for each day RGI is on-site. Jerry Sawetz will be the Senior Project Manager for this project and Paul Riley, LG, LHG will be the Principal-In-Charge.

12.9 PROPERTY-SPECIFIC HEALTH & SAFETY PLAN

A Property-specific Health & Safety Plan (H&S Plan) has been prepared and is included in Appendix E. The H&S Plan will include descriptions of known Property hazards, identifies appropriate personal protection equipment (PPE), describes decontamination procedures and presents a contingency plan for emergencies.

12.10 PROPERTY CLOSURE AND REPORTING

Following remedial excavations, sampling, and review of all laboratory data, RGI will prepare an Agency Review Draft Interim Action Report (IA Report), which will be submitted to Ecology for review and approval within 60 days of receipt of all validated analytical data pertaining to the interim action. The IA Report will present our findings, conclusions, and recommendations. The report will include, but is not necessarily limited to, the following:

- Project Description, Purpose, and Background;
- Interim Action Methodologies;
- Laboratory Analyses;
- Data Validation Results;
- UST and Other Underground Improvement Decommissioning and Removal Documentation;
- Soil and Groundwater Remediation and Sampling;
- Estimated locations of any remaining soil and/or groundwater contamination;
- Contaminated Groundwater Treatment/Disposal (if any);
- Confirmation Sampling and Analysis;
- Compliance with Cleanup Standards;
- Property Restoration and Future Land Use;
- Evaluation of Vapor Intrusion Pathway;
- Soil and Groundwater Disposal Documentation;
- Groundwater Monitoring Well Installation, Development, Surveying, and Sampling Data;
- Conclusions and Recommendations.

The IA Report will include tables, figures, cross sections, analytical laboratory reports, and waste disposal documentation. A draft version of the IA Report will be distributed to Client and/or Clients representative(s) for review and comment prior to submitting the draft IA Report to Ecology for review. The IA Report will be finalized to include Ecology comments (if necessary).

13 POST-INTERIM ACTION ACTIVITIES

13.1 GROUNDWATER MONITORING WELL INSTALLATION

Upon completion of the shoring installation, remedial excavations, construction of the one level underground parking garage, and temporary groundwater dewatering, the shallow groundwater located north and east (up-gradient) of the Property will migrate back onto the Property.

Therefore, once remedial excavations are completed, RGI will install an estimated three to six groundwater monitoring wells on the Property during construction of the one level underground parking garage (and before the ground level PT deck is installed). This procedure typically entails picking the drill rig using the overhead crane to transfer the drill rig into the excavation. The purpose of these wells will be to obtain post-remediation and quarterly groundwater monitoring data to confirm whether or not groundwater is in compliance with MTCA regulations

Given the bathtub construction associated with the construction of the parking garage (at least on the eastern portion of the Property), groundwater monitoring wells may be installed at the time the vapor barrier is installed. In locations where the well casing intersects the vapor barrier, non-VOC containing material will be used to create an air tight seal between the well casing and the vapor barrier.

After well construction, sonotube will be placed around each well, which will allow for the foundation and concrete slab to be poured concrete around each well. Wells will also need to be protected as construction of the garage is completed. RGI requests that the Client retain their licensed surveyor to record each groundwater monitoring well location (in plan view) and top of north side of well casing (TOC) elevation.

The locations of these wells will be based on the findings of the interim action and the installation of these wells will be coordinated with Ecology and other on-site construction personnel. All groundwater monitoring wells will be constructed with a screened interval designed to intersect the saturated/unsaturated interface and flush mount monuments, which will match the existing grade of the parking garage floor after construction is completed. All wells will be developed and surveyed after installation.

In addition, groundwater monitoring wells will be sampled and groundwater samples will be submitted to the laboratory for analyses of COCs.

13.2 VAPOR INTRUSION ASSESSMENT

Ecology has indicated that a VIA will be required after the interim action is completed and the majority of the building has been constructed.

Based on the data obtained during the interim action, RGI will prepare a Vapor Intrusion Assessment Work Plan, which will be submitted to Ecology for review and approval. The work plan will describe the plan for assessing the potential for vapor intrusion on the Property using one or more of the following sources:

- *Draft Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial* (Draft Ecology VI Guidance). Including *Table B-1 Indoor Air Cleanup Levels, Groundwater Screening Levels, and Soil Gas Screening Levels* (Table B-1), which was revised April 6, 2015 by Ecology.
- *Implementation Memorandum No. 21* dated November 15, 2018
- *Implementation Memorandum No. 18* dated January 10, 2018 by Ecology.
- *Implementation Memorandum No. 14* dated March 31, 2016 by Ecology.
- *Technical Guide for Addressing Petroleum Vapor Intrusion at Leaking Underground Storage Tank Sites* dated June 2015 by the EPA.
- *Table B-1 Indoor Air Cleanup Levels, Groundwater Screening Levels, and Soil Gas Screening Levels (Table B-1) of the Draft Ecology VI Guidance* was revised April 6, 2015 by Ecology.

- *Petroleum Vapor Intrusion Fundamentals of Screening, Investigation, and Management* dated October 2014 by ITRC.
- *Evaluation of Empirical Data to Support Soil Vapor Intrusion Screening Criteria for Petroleum Hydrocarbon Compounds* dated 2013 by the EPA.

The VIA will include soil vapor and/or indoor/outdoor air sampling and will be documented in a final report.

13.3 OTHER POST-INTERIM ACTION ACTIVITIES

Other post-interim action activities include, but are not necessarily limited to:

- Entering all data into the Ecology Electronic Information Management (EIM) database;
- Providing Ecology with requested information;
- Frequent correspondence with Roystone, Ecology, and other interested stakeholders;
- Assisting Roystone with obtaining the letter from Ecology documenting satisfactory completion of the interim action;
- Preparation of an Environmental Covenant (only if it is necessary to leave contaminated soil on-Property after the interim action, which is not anticipated at this time).

14 LIMITATIONS

This work was performed by RGI on behalf of Roystone (the Client). This Work Plan was prepared in accordance with generally acceptable professional practices for the nature and conditions of work completed in the same or similar localities, at the time this Work Plan was prepared. This report does not represent a legal opinion. No other warranty, express or implied, is made.

If we may provide you with any additional information or clarification of this work, please contact the undersigned at (425) 415-0551.

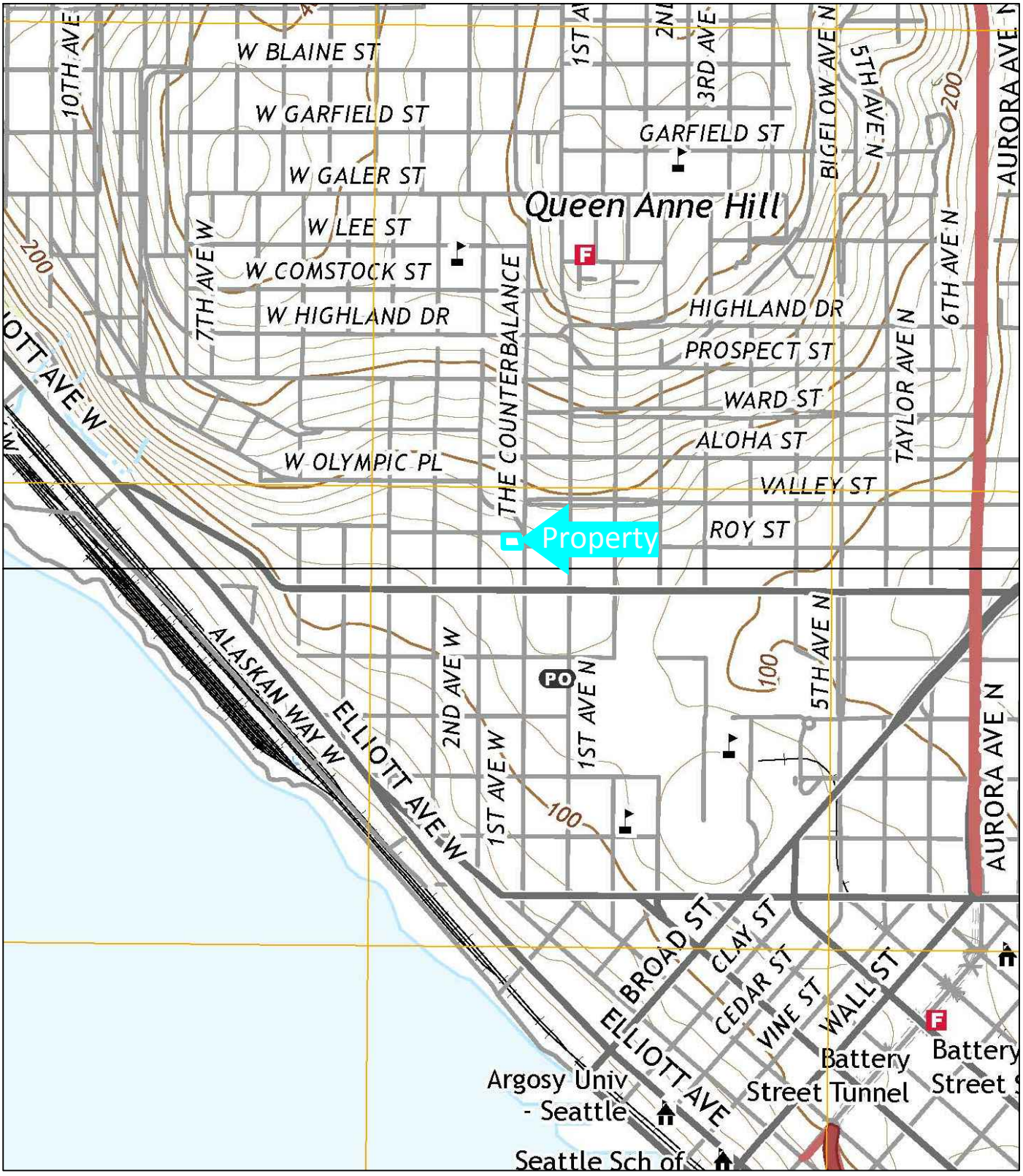
Sincerely,

THE RILEY GROUP, INC.

Jerry Sawetz
Senior Environmental Scientist

Paul D. Riley, LG, LHG
Principal

Distribution: *Mr. Pui Leung, Roystone on Queen Anne, LLC (electronic PDF)*
Ms. Jing Song, Washington State Department of Ecology Northwest Regional Office (electronic PDF))



USGS, 2017, Seattle North, Washington
USGS, 2017, Seattle South, Washington
7.5-Minute Quadrangle

Approximate Scale: 1"=1000'

0 500 1000 2000

N

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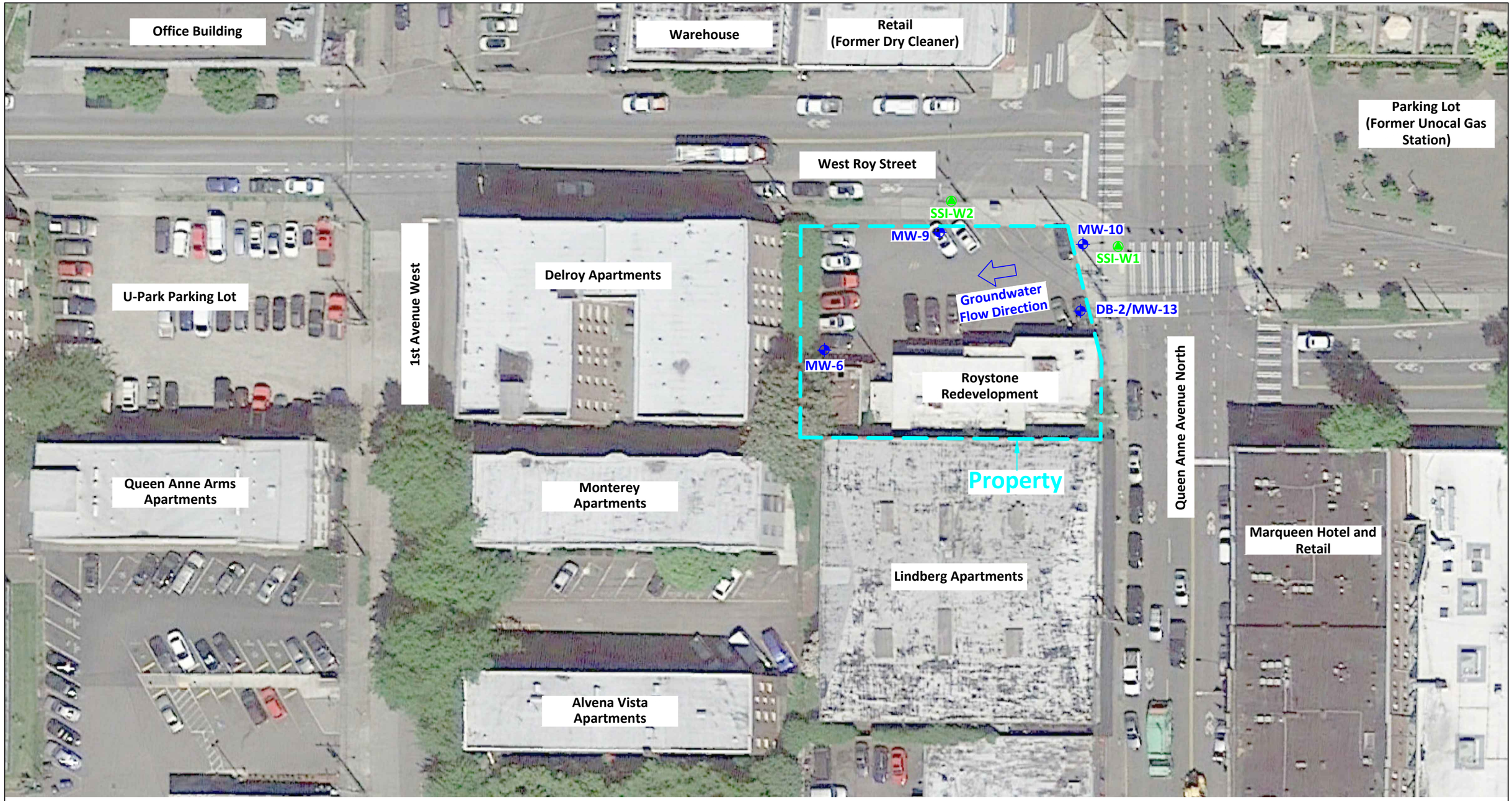
Roystone Redevelopment		Figure 1
RGI Project Number 2017-015K	Property Vicinity Map	Date Drawn: 06/2019
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		



Note: Other existing remediation wells and previous subsurface investigation locations on- and off-Property are not shown here. See Figure 4 for additional remediation wells and previous subsurface investigation locations on the Property.

Approximate Scale: 1"=40'

0 20 40 80

N

= Existing groundwater monitoring well by RGI, December 2017
= Existing groundwater monitoring well by others
= Property boundary

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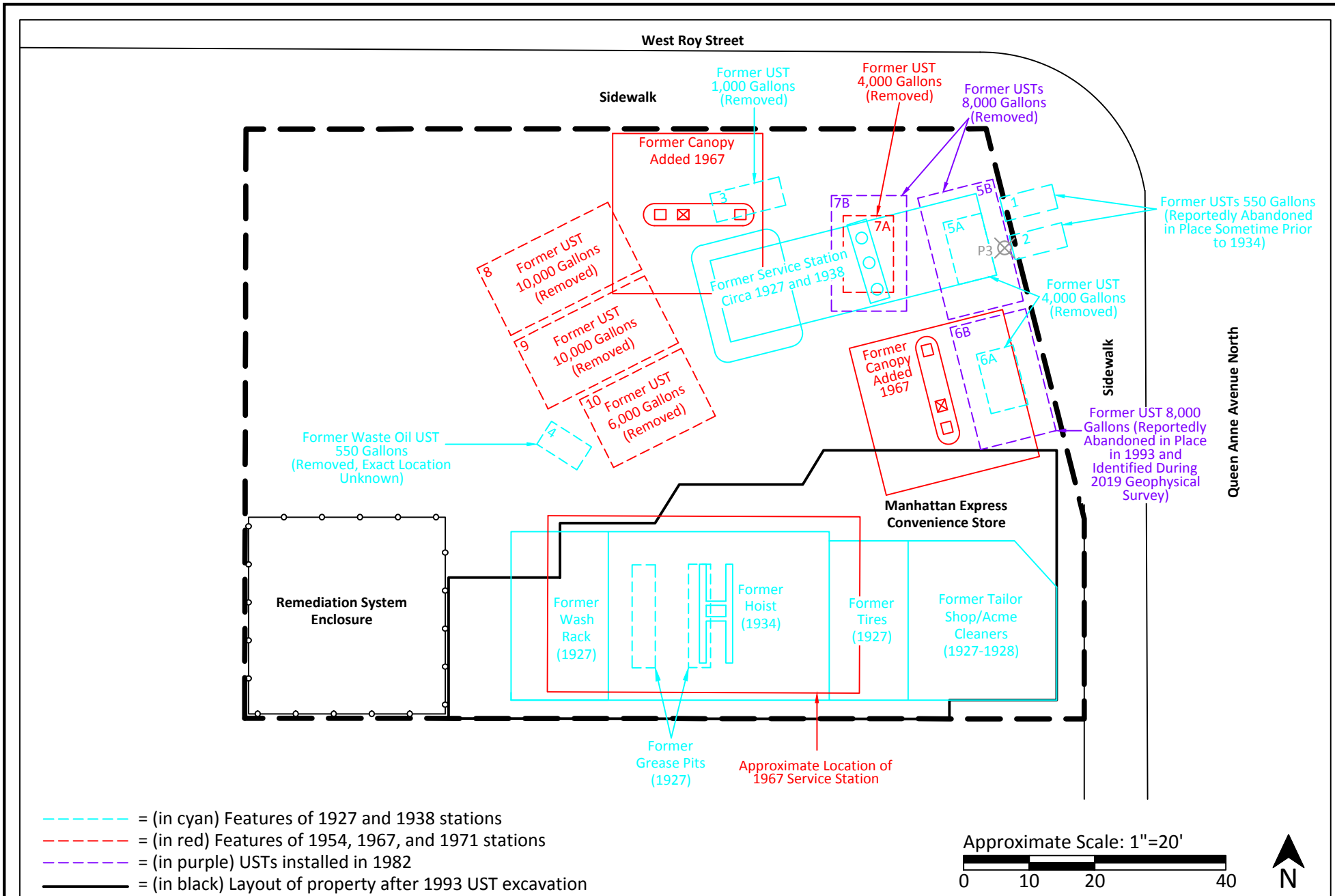
Roystone Redevelopment		Figure 2
RGI Project Number 2017-015K	Property Representation Map	Date Drawn: 06/2019
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		



– – – – – – = (in cyan) Features of 1927 and 1938 stations
– – – – – – = (in red) Features of 1954, 1967, and 1971 stations
– – – – – – = (in purple) USTs installed in 1982
——— = (in black) Layout of property after 1993 UST excavation

Approximate Scale: 1"=20'

0 10 20 40

N

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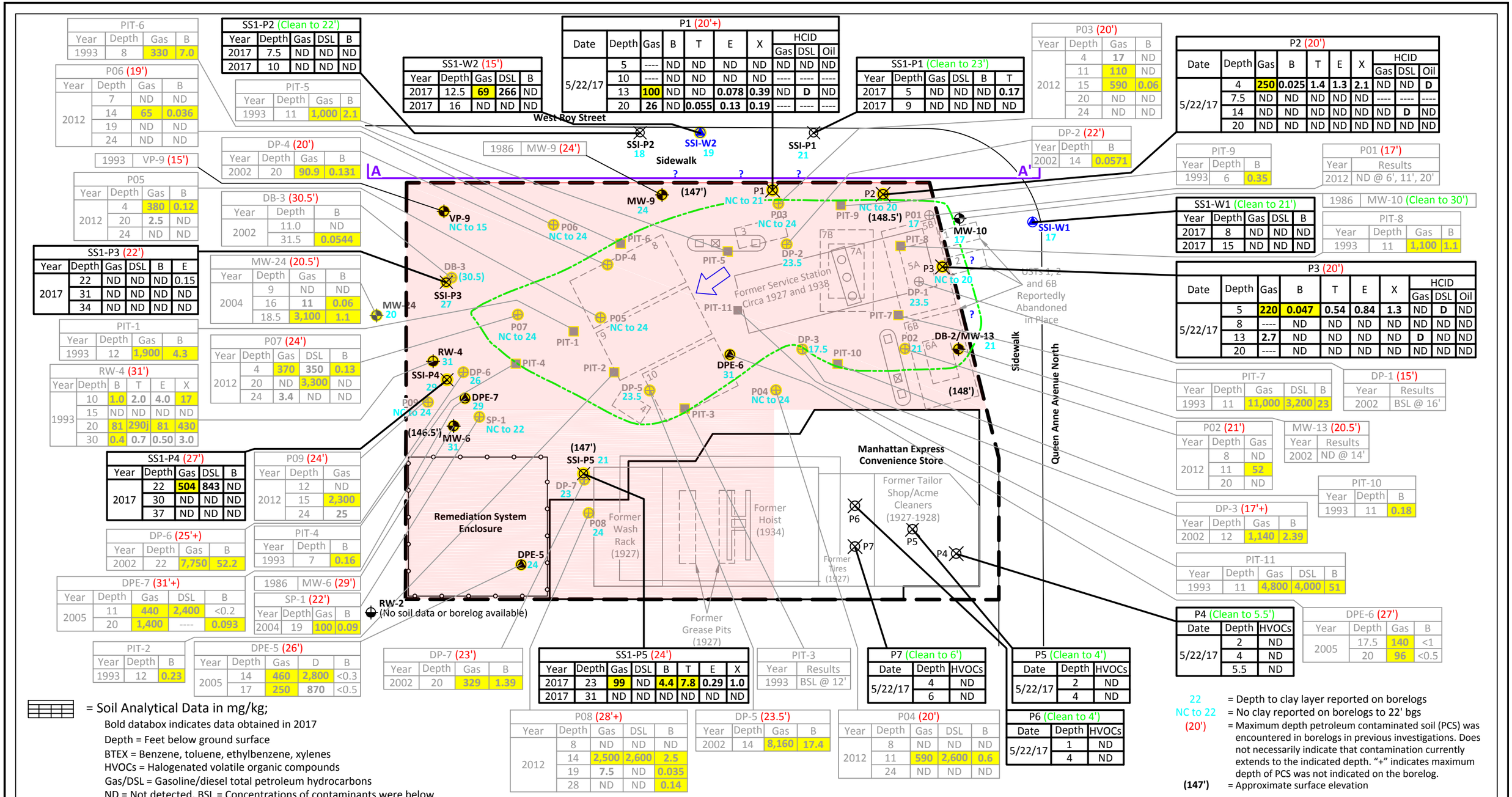
Roystone Redevelopment		Figure 3
RGI Project Number 2017-015K	Historical Property Features	Date Drawn: 06/2019
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		



PIT-6			
Year	Depth	Gas	B
1993	8	330	7.0

P06 (19')			
Year	Depth	Gas	B
2012	7	ND	ND
	14	65	0.036
	19	ND	ND
	24	ND	ND

1993	VP-9 (15')

P05			
Year	Depth	Gas	B
2012	4	380	0.12
	20	2.5	ND
	24	ND	ND

SS1-P3 (22')					
Year	Depth	Gas	DSL	B	E
2017	22	ND	ND	ND	0.15
	31	ND	ND	ND	ND
	34	ND	ND	ND	ND

PIT-1			
Year	Depth	Gas	B
1993	12	1,900	4.3

RW-4 (31')					
Year	Depth	B	T	E	X
1993	10	1.0	2.0	4.0	17
	15	ND	ND	ND	ND
	20	81	290j	81	430
	30	0.4	0.7	0.50	3.0

SS1-P4 (27')				
Year	Depth	Gas	DSL	B
2017	22	504	843	ND
	30	ND	ND	ND
	37	ND	ND	ND

DP-6 (25'+)			
Year	Depth	Gas	B
2002	22	7,750	52.2

DPE-7 (31'+)				
Year	Depth	Gas	DSL	B
2005	11	440	2,400	<0.2
	20	1,400	----	0.093

PIT-2		
Year	Depth	B
1993	12	0.23

DPE-5 (26')				
Year	Depth	Gas	D	B
2005	14	460	2,800	<0.3
	17	250	870	<0.5

SS1-P2 (Clean to 22')				
Year	Depth	Gas	DSL	B
2017	7.5	ND	ND	ND
2017	10	ND	ND	ND

PIT-5			
Year	Depth	Gas	B
1993	11	1,000	2.1

DP-4 (20')			
Year	Depth	Gas	B
2002	20	90.9	0.131

DB-3 (30.5')		
Year	Depth	B
2002	11.0	ND
	31.5	0.0544

MW-24 (20.5')			
Year	Depth	Gas	B
2004	9	ND	ND
	16	11	0.06
	18.5	3,100	1.1

P07 (24')				
Year	Depth	Gas	DSL	B
2012	4	370	350	0.13
	20	ND	3,300	ND
	24	3.4	ND	ND

P09 (24')		
Year	Depth	Gas
2012	12	ND
	15	2,300
	24	25

PIT-4		
Year	Depth	B
1993	7	0.16

1986	MW-6 (29')

SP-1 (22')			
Year	Depth	Gas	B
2004	19	100	0.09

1986	MW-9 (24')

SS1-W2 (15')				
Year	Depth	Gas	DSL	B
2017	12.5	69	266	ND
2017	16	ND	ND	ND

P1 (20'+)									
Date	Depth	Gas	B	T	E	X	HCID		
							Gas	DSL	Oil
5/22/17	5	----	ND	ND	ND	ND	ND	ND	ND
	10	----	ND	ND	ND	ND	----	----	----
	13	100	ND	ND	0.078	0.39	ND	D	ND
	20	26	ND	0.055	0.13	0.19	----	----	----

SS1-P1 (Clean to 23')					
Year	Depth	Gas	DSL	B	T
2017	5	ND	ND	ND	0.17
2017	9	ND	ND	ND	ND

P03 (20')			
Year	Depth	Gas	B
2012	4	17	ND
	11	110	ND
	15	590	0.06
	20	ND	ND
	24	ND	ND

DP-2 (22')		
Year	Depth	B
2002	14	0.0571

P2 (20')									
Date	Depth	Gas	B	T	E	X	HCID		
							Gas	DSL	Oil
5/22/17	4	250	0.025	1.4	1.3	2.1	ND	ND	D
	7.5	ND	ND	ND	ND	ND	----	----	----
	14	ND	ND	ND	ND	ND	ND	D	ND
	20	ND	ND	ND	ND	ND	ND	ND	ND

PIT-9		
Year	Depth	B
1993	6	0.35

P01 (17')	
Year	Results
2012	ND @ 6', 11', 20'

SS1-W1 (Clean to 21')				
Year	Depth	Gas	DSL	B
2017	8	ND	ND	ND
2017	15	ND	ND	ND

1986	MW-10 (Clean to 30')

PIT-8			
Year	Depth	Gas	B
1993	11	1,100	1.1

P3 (20')									
Date	Depth	Gas	B	T	E	X	HCID		
							Gas	DSL	Oil
5/22/17	5	220	0.047	0.54	0.84	1.3	ND	D	ND
	8	----	ND	ND	ND	ND	ND	ND	ND
	13	2.7	ND	ND	ND	ND	D	ND	ND
	20	----	ND	ND	ND	ND	ND	ND	ND

PIT-7				
Year	Depth	Gas	DSL	B
1993	11	11,000	3,200	23

DP-1 (15')	
Year	Results
2002	BSL @ 16'

P02 (21')		
Year	Depth	Gas
2012	8	ND
	11	52
	20	ND

MW-13 (20.5')	
Year	Results
2002	ND @ 14'

PIT-10		
Year	Depth	B
1993	11	0.18

DP-3 (17'+)			
Year	Depth	Gas	B
2002	12	1,140	2.39

PIT-11				
Year	Depth	Gas	DSL	B
1993	11	4,800	4,000	51

P4 (Clean to 5.5')		
Date	Depth	HVOCs
5/22/17	2	ND
	4	ND
	5.5	ND

DPE-6 (27')			
Year	Depth	Gas	B
2005	17.5	140	<1
	20	96	<0.5

SS1-P5 (24')							
Year	Depth	Gas	DSL	B	T	E	X
2017	23	99	ND	4.4	7.8	0.29	1.0
2017	31	ND	ND	ND	ND	ND	ND

PIT-3	
Year	Results
1993	BSL @ 12'

P7 (Clean to 6')		
Date	Depth	HVOCs
5/22/17	4	ND
	6	ND

P5 (Clean to 4')		
Date	Depth	HVOCs
5/22/17	2	ND
	4	ND

P6 (Clean to 4')		
Date	Depth	HVOCs
5/22/17	1	ND
	4	ND

P08 (28'+)				
Year	Depth	Gas	DSL	B
2012	8	ND	ND	ND
	14	2,500	2,600	2.5
	19	7.5	ND	0.035
	28	ND	ND	0.14

DP-5 (23.5')			
Year	Depth	Gas	B
2002	14	8,160	17.4

P04 (20')				
Year	Depth	Gas	DSL	B
2012	8	ND	ND	ND
	11	590	2,600	0.6
	24	ND	ND	ND

DP-7 (23')			
Year	Depth	Gas	B
2002	20	329	1.39

= Soil Analytical Data in mg/kg;
Bold databox indicates data obtained in 2017
Depth = Feet below ground surface
BTEX = Benzene, toluene, ethylbenzene, xylenes
HVOCs = Halogenated volatile organic compounds
Gas/DSL = Gasoline/diesel total petroleum hydrocarbons
ND = Not detected, BSL = Concentrations of contaminants were below applicable soil screening levels
Bold and yellow highlight indicates concentrations above MTCA soil screening levels. Highlighted symbol indicates location that contains, or is suspected to contain, concentrations of COCs above soil MTCA Cleanup levels.

= Cross section A-A'
= Fence
= Approximate location of 1993 UST excavation boundary
= Property boundary

= Estimated location where petroleum contaminated soils will be excavated from the surface to depths ranging from 21' to 27' bgs
P4 = RGI test probe location, P1 - P7 drilled May 2017 and SSI-P1 - SSI-P5 drilled December 2017
SSI-W1 = Existing groundwater monitoring well location. SSI-W1 and SSI-W2 installed by RGI in December 2017
MW-14 = Monitoring well by others
DPE-5 = Extraction well by others
RW-4 = Recovery well by others
DB,SP&DP = Soil boring by others
P09 = Soil boring (Sound Earth 2012)
Pit-1 = 1993 UST excavation sample

22 = Depth to clay layer reported on borelogs
NC to 22 = No clay reported on borelogs to 22' bgs
(20') = Maximum depth petroleum contaminated soil (PCS) was encountered in borelogs in previous investigations. Does not necessarily indicate that contamination currently extends to the indicated depth. "+" indicates maximum depth of PCS was not indicated on the borelog.
(147') = Approximate surface elevation

Approximate Scale: 1"=20'
0 10 20 40
N

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Roystone Redevelopment		Figure 4
RGI Project Number 2017-015K	Summary of Select HIstorical Soil Analytical Results	Date Drawn: 06/2019
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		

MW-9													
Date	LNAPL	Gas	DSL	Oil	DSL*	Oil*	B	T	E	X	cPAHs	HVOCs	VOCs
11/13/18	----	ND	**440x**	ND	**140**	ND	ND	ND	ND	ND	ND	----	ND
08/15/17	ND	----	**1,500x**	**490x**	----	----	----	----	----	----	----	----	----
04/06/17	ND	**480**	----	----	----	----	ND	**2.2**	**1.8**	**3.4**	----	ND	----
03/1991	**0.17**	----	----	----	----	----	----	----	----	----	----	----	----

SSI-P2 (Grab Sample)					
Date	LNAPL	Gas	DSL	Oil	BTEX
12/02/17	ND	ND	ND	ND	ND

SSI-W2					
Date	LNAPL	Gas	DSL	Oil	BTEX
11/13/18	----	ND	ND	ND	ND
12/06/17	ND	ND	ND	ND	ND

P1-W (Grab Sample)								
Date	LNAPL	Gas	DSL	Oil	B	T	E	X
05/22/17	ND	**7,100**	**110,000ve**	**3,800x**	ND	**12**	**5.4**	**27**

SSI-P1 (Grab Sample)					
Date	LNAPL	Gas	DSL	Oil	BTEX
12/02/17	ND	ND	ND	ND	ND

VP-9					
Date	LNAPL	Gas	DSL	Oil	BTEX
11/13/18	----	ND	ND	ND	ND
01/2005	ND	**100**	ND	ND	ND

P2-W (Grab Sample)								
Date	LNAPL	Gas	DSL	Oil	B	T	E	X
05/22/17	ND	ND	ND	ND	ND	ND	ND	ND

RW-4	LNAPL Last observed 07/2004

SSI-W1					
Date	LNAPL	Gas	DSL	Oil	BTEX
11/13/18	----	ND	ND	ND	ND
12/06/17	ND	ND	ND	ND	ND

MW-24							
Date	LNAPL	Gas	DSL	Oil	B	PCE	TCE
01/2005	ND	ND	ND	ND	ND	ND	ND

MW-10											
Date	LNAPL	Gas	DSL	Oil	B	T	E	X	PCE	TCE	HVOCs
11/13/18	----	ND	ND	ND	ND	ND	ND	ND	----	----	----
04/06/17	ND	ND	----	----	ND	ND	ND	ND	ND	ND	ND
11/13/13	ND	ND	ND	ND	ND	----	----	----	----	----	----

DPE-7													
Date	LNAPL	Gas	DSL	Oil	DSL*	Oil*	B	Naph	cPAHs	PCE	TCE	HVOCs	Pb
11/13/18	----	**700**	**4,100x**	**850x**	**430x**	ND	**3.3**	**1.3**	ND	----	----	----	ND
04/06/17	ND	----	----	----	----	----	----	----	----	ND	ND	ND	----
11/03/08	**0.01**	----	----	----	----	----	----	----	----	----	----	----	----
04/2008	ND	ND	**6,100**	ND	----	----	**7**	----	----	----	----	----	----

P3-W (Grab Sample)								
Date	LNAPL	Gas	DSL	Oil	B	T	E	X
05/22/17	ND	**1,200**	**1,400**	ND	ND	**9.7**	**8.2**	**19**

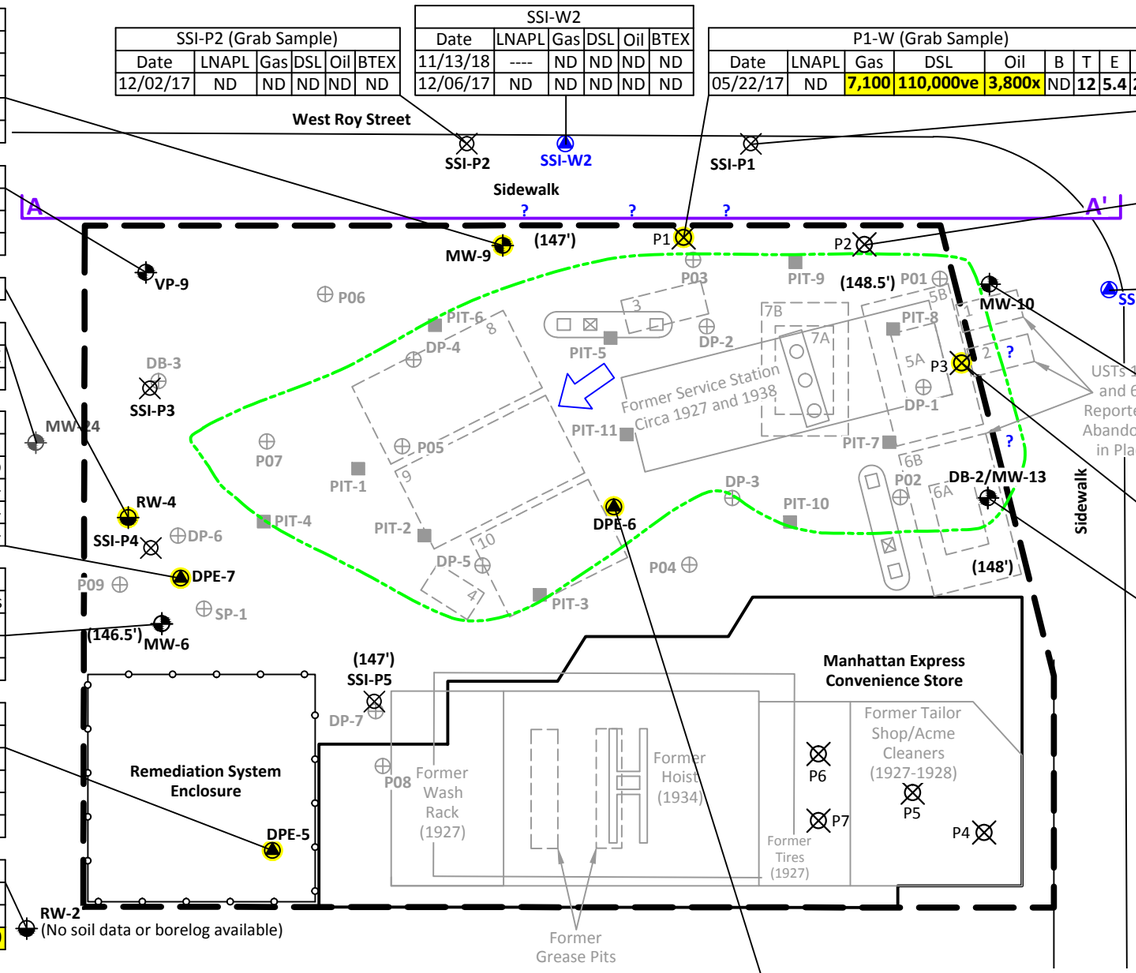
MW-6													
Date	LNAPL	Gas	DSL	Oil	DSL*	Oil*	B	T	E	X	cPAHs	VOCs
11/13/18	----	**110**	**1,000x**	ND	**570x**	ND	**0.89**	ND	ND	ND	ND	BSL
11/13/13	ND	**94**	**340**	ND	----	----	**3**	ND	**0.6**	**0.5**	----	----
04/2004	**0.02**	----	----	----	----	----	----	----	----	----	----	----

MW-13									
Date	LNAPL	Gas	DSL	Oil	B	T	E	X	HVOCs
08/15/17	ND	----	**60x**	ND	----	----	----	----	----
04/06/17	ND	ND	----	----	ND	ND	ND	ND	ND

DPE-5										
Date	LNAPL	Gas	DSL	Oil	DSL*	Oil*	B	PCE	TCE	HVOCs	Pb
11/13/18	----	ND	**1,300x**	**420x**	**99**	ND	**1.6**	----	----	----	**1.37**
04/07/17	ND	----	----	----	----	----	----	ND	ND	ND	----
11/13/13	ND	**5,400**	**150**	ND	----	----	**44**	----	----	----	----
01/2006	**0.05**	----	----	----	----	----	----	----	----	----	----

RW-2								
Date	LNAPL	Gas	DSL	Oil	B	T	E	X
11/13/13	ND	ND	ND	ND	**2**	ND	ND	ND
03/1991	**0.08**	----	----	----	**19,000**	**46,000**	**2,500**	**120,000**

DPE-6												
Date	LNAPL	Gas	DSL	Oil	DSL*	Oil*	B	PCE	TCE	HVOCs	VOCs	Pb
11/13/18	----	ND	**3,300x**	**610x**	**180**	ND	ND	ND	ND	----	ND	ND
04/06/17	ND	----	----	----	----	----	----	ND	ND	ND	----	----
11/13/13	ND	**140**	**1,100**	ND	----	----	**7**	----	----	----	----	----



= Groundwater Analytical Data in micrograms per liter (ug/L);

LNAPL = Light non-aqueous phase liquid. If LNAPL was historically detected in the well, the most recent date LNAPL was detected is displayed along with the thickness of LNAPL observed in feet. ND indicates LNAPL was not observed.
Gas/DSL/Oil = Gasoline/diesel/oil total petroleum hydrocarbons. An asterisk (*) indicates the sample was analyzed using silica gel cleanup.
BTEX = Benzene, toluene, ethylbenzene, xylenes
Naph = Napthalenes, cPAHs = Carcinogenic polycyclic aromatic hydrocarbons
PCE, TCE, HVOCs, VOCs = Tetrachloroethene, trichloroethene, halogenated volatile organic compounds, volatile organic compounds
Pb = Dissolved lead
x = The sample chromatographic pattern does not resemble the fuel standard used for quantitation.
ND = Not detected, ---- = Not sampled or not applicable
Bold and yellow highlight (if any) indicates concentrations above MTCA Groundwater cleanup levels.
BSL = Either not detected at a concentration above the laboratory detection limit or detected at a concentration below the groundwater screening level

Note: This figure includes the most recent groundwater results, not all historical data is shown here. See Table 2 for a summary of all groundwater data pertaining to the Property.

(147') = Approximate surface elevation

P4 = RGI test probe location, P1 - P7 drilled May 2017 and SSI-P1 - SSI-P5 drilled December 2017
SSI-W1 = Existing groundwater monitoring well location. SSI-W1 and SSI-W2 installed by RGI in December 2017
MW-14 = Monitoring well by others
DPE-5 = Extraction well by others
RW-4 = Recovery well by others
DB,SP&DP = Soil boring by others
P09 = Soil boring (Sound Earth 2012)
Pit-1 = 1993 UST excavation sample

= Cross section A - A'
= Groundwater flow direction
= Approximate location of 1993 UST excavation boundary
= Property boundary

Approximate Scale: 1"=20'
0 10 20 40
N

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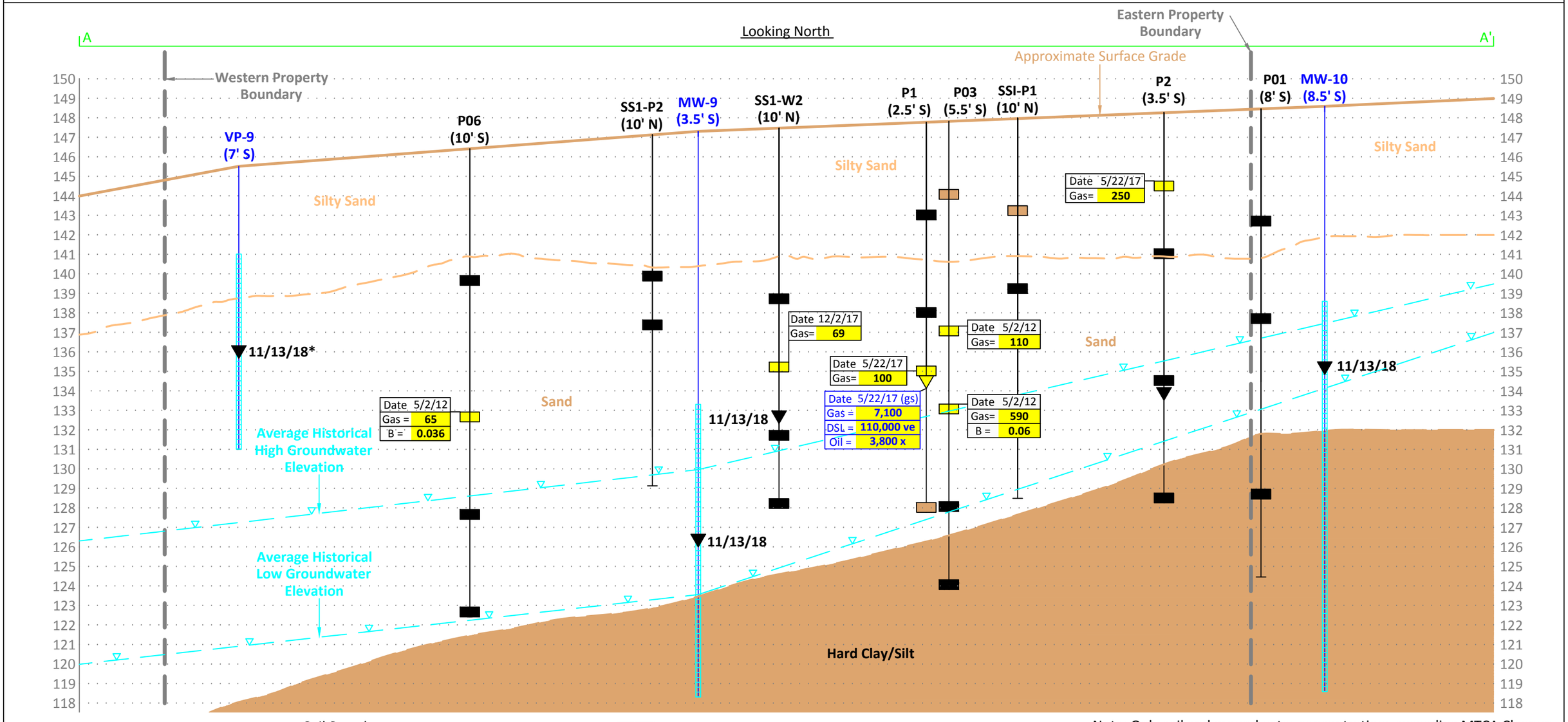
Roystone Redevelopment		Figure 5
RGI Project Number 2017-015K	Summary of Select Groundwater Analytical Data with Historical LNAPL Results	Date Drawn: 06/2019
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		



Soil Samples

= Concentration above cleanup level
= Concentration below cleanup level
= No contaminants of potential concern (COPCs) detected

Groundwater Samples

= Concentration above cleanup level
= Concentration below cleanup level
= No contaminants of potential concern (COPCs) detected

= Soil Analytical Data in mg/kg (in black data box);
Groundwater Analytical Data in ug/L (in blue data box);
B = Benzene
Gas/DSL/Oil = Gasoline/diesel/oil total petroleum hydrocarbons
(gs) = Indicates groundwater grab sample

= Average high/low groundwater elevation for entire Property
= Property line

= Screened interval

Note: Only soil and groundwater concentrations exceeding MTCA Cleanup Levels are displayed. See Tables 1 and 2 for a complete list of samples and concentrations.

Only highest and lowest groundwater elevations are displayed.

*Groundwater elevation appears anomalous and is not consistent with groundwater elevation data obtained from other Property wells.

Approximate Scale:
Horizontal: 1" = 10'
Vertical: 1" = 5'
Vertical Exaggeration: 2x

5 2.5 0
0 5 10 20

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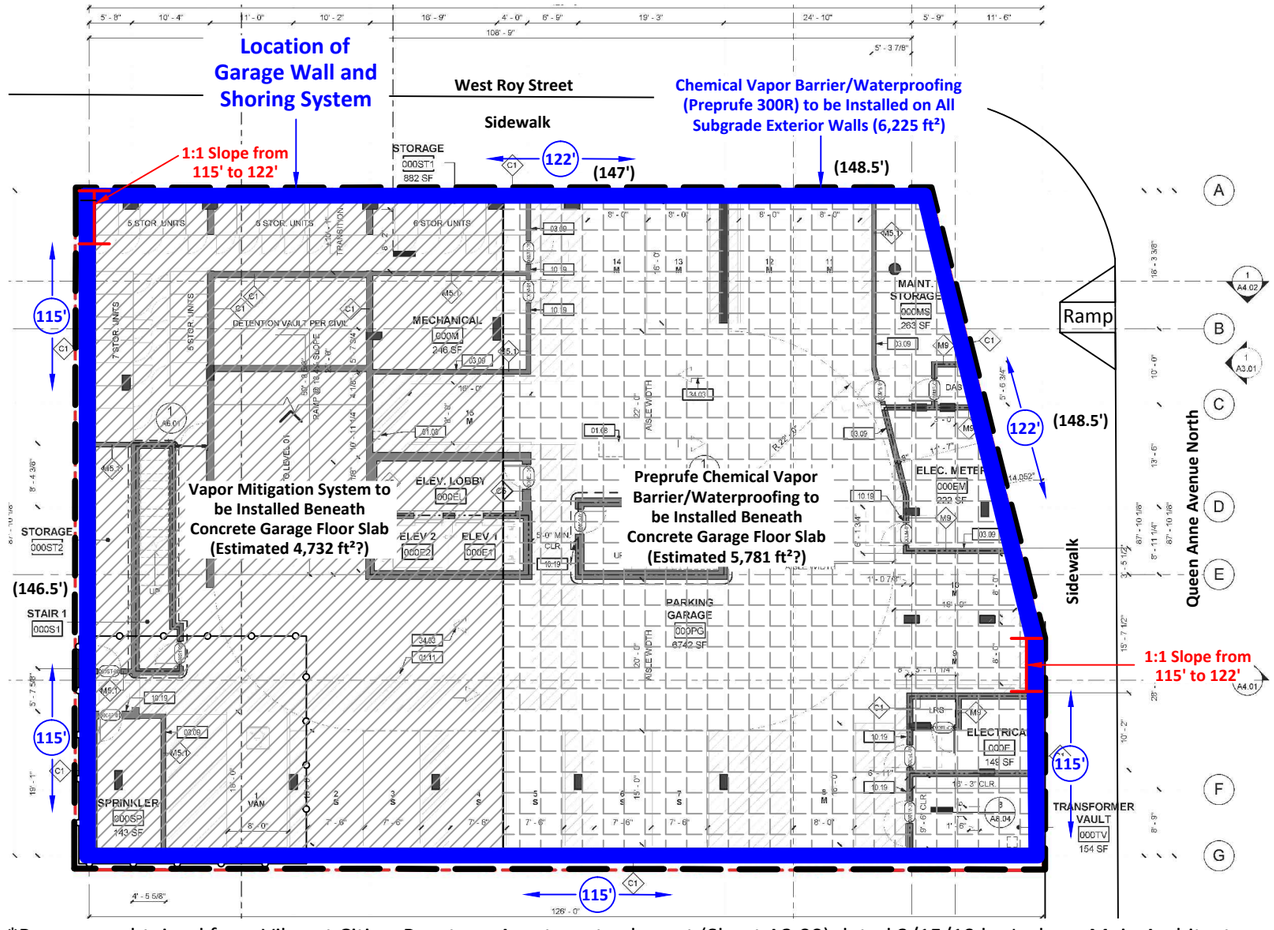
Roystone Redevelopment		Figure 6
RGI Project Number 2017-015K	Cross Section A - A'	Date Drawn: 06/2019
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		



*Base map obtained from Vibrant Cities: Roystone Apartments plan set (Sheet A2.00) dated 3/15/19 by Jackson Main Architecture.

Notes:
1. The estimated shoring depths are provided for planning and preliminary design and not intended to be used for final design or construction.
2. Depth of shoring was estimated based on a review of information obtained from available borelogs and analytical data. Not all areas of the Property were investigated.

= 5,781 ft² Area where Preprufe 300R chemical vapor barrier/waterproofing will be installed beneath the concrete garage floor slab

= 4,732 ft² Area where a vapor mitigation system will be installed beneath the concrete garage floor slab

(147') = Approximate surface elevation

(115) = Bottom of shoring elevation (in feet)

= Fence

= Property boundary

Approximate Scale: 1"=20'

0 10 20 40

N

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Roystone Redevelopment		Figure 7
RGI Project Number 2017-015K	Bottom of Shoring Elevations With Vapor Barrier and Vapor Mitigation System Locations	Date Drawn: 06/2019
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		

Table 1, Page 1 of 7. Summary of Soil Sample Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Sample Number	Sample Depth	Sample Date	Gasoline TPH	BTEX				Diesel TPH	Oil TPH	HCID			Naph.	cPAHs	MTBE	EDB	EDC	Other VOCs[4]	Pb	Other Metals
				B	T	E	X			Gasoline	Diesel	Oil								
RGI Supplemental Subsurface Investigation (December 2017)																				
SS1-P1-5	5	12/02/17	ND<10	ND<0.02	**0.17**	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-P1-9	9	12/02/17	ND<10	ND<0.02	ND<0.10	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-P1-14	14	12/02/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P1-17	17	12/02/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P1-19	19	12/02/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P1-19.5	19.5	12/02/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P2-7.5	7.5	12/03/17	ND<10	ND<0.02	ND<0.10	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-P2-10	10	12/03/17	ND<10	ND<0.02	ND<0.10	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-P2-15	15	12/03/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P2-15.5	15.5	12/03/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P2-18	18	12/03/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P3-5	5	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P3-10	10	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P3-12	12	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P3-17	17	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P3-22	22	12/04/17	ND<10	ND<0.02	ND<0.10	**0.15**	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-P3-27	27	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P3-31	31	12/04/17	ND<10	ND<0.02	ND<0.10	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-P3-34	34	12/04/17	ND<10	ND<0.02	ND<0.10	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-P3-35	35	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-5	5	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-7	7	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-7.5	7.5	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-10	10	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-11	11	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-14	14	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-17	17	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-18	18	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-19	19	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-22	22	12/04/17	**504**	ND<0.02	ND<0.10	ND<0.05	ND<0.15	**843**	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-27	27	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses			**100/30[1]**	**0.03**	**7**	**6**	**9**	**2,000**		**100/30[1]**	**2,000**		**5**	**0.1[3]**	**0.1**	**0.005**	**NVE**	**Analyte Specific**	**250**	**Analyte Specific**
MTCA Method B Soil Cleanup Levels for Unrestricted Land Uses[2]			**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**0.0231**	**Analyte Specific**	**---**	**Analyte Specific**

Table 1, Page 2 of 7. Summary of Soil Sample Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Sample Number	Sample Depth	Sample Date	Gasoline TPH	BTEX				Diesel TPH	Oil TPH	HCID			Naph.	cPAHs	MTBE	EDB	EDC	Other VOCs[4]	Pb	Other Metals
				B	T	E	X			Gasoline	Diesel	Heavy								
SS1-P4-30	30	12/04/17	ND<10	ND<0.02	ND<0.10	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-35	35	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P4-37	37	12/04/17	ND<10	ND<0.02	ND<0.10	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-P5-8	8	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P5-12.5	12.5	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P5-17	17	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P5-20	20	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P5-23	23	12/04/17	**99**	**4.4**	**7.8**	**0.29**	**1.0**	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-P5-28	28	12/04/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P5-31	31	12/04/17	ND<10	ND<0.02	ND<0.10	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-W1-8	8	12/02/17	ND<10	ND<0.02	ND<0.10	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-W1-15	15	12/02/17	ND<10	ND<0.02	ND<0.10	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-W1-18	18	12/02/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-W1-21	21	12/02/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-W2-9	9	12/02/17	ND<10	ND<0.02	ND<0.10	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-W2-12.5	12.5	12/02/17	**69**	ND<0.02	**0.12**	**0.56**	**0.84**	**266**	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-W2-16	16	12/02/17	ND<10	ND<0.02	ND<0.10	ND<0.05	ND<0.15	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
SS1-W2-19.5	19.5	12/02/17	ND<10	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
RGI Subsurface Investigation (May 2017)																				
P1-5	5	05/22/17	----	ND<0.02	ND<0.02	ND<0.02	ND<0.06	----	----	ND<20	ND<50	ND<250	----	----	----	----	----	----	----	----
P1-10	10	05/22/17	----	ND<0.02	ND<0.02	ND<0.02	ND<0.06	----	----	----	----	----	----	----	----	----	----	----	----	----
P1-13	13	05/22/17	**100**	ND<0.02	ND<0.02	**0.078**	**0.39**	----	----	ND<20	**D>50**	ND<250	----	----	----	----	----	----	----	----
P1-20	20	05/22/17	**26**	ND<0.02	**0.055**	**0.13**	**0.19**	----	----	----	----	----	----	----	----	----	----	----	----	----
P2-4	4	05/22/17	**250**	**0.025**	**1.4**	**1.3**	**2.1**	----	----	ND<20	ND<50	**D>250**	----	----	----	----	----	----	----	----
P2-7.5	7.5	05/22/17	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	----	----	----	----	----	----	----	----	----	----	----	----	----
P2-14	14	05/22/17	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	----	----	ND<20	ND<50	ND<250	----	----	----	----	----	----	----	----
P2-17	17	05/22/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P2-20	20	05/22/17	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	----	----	ND<20	ND<50	ND<250	----	----	----	----	----	----	----	----
P3-5	5	05/22/17	**220**	**0.047**	**0.54**	**0.84**	**1.3**	----	----	ND<20	**D>50**	ND<250	----	----	----	----	----	----	----	----
P3-8	8	05/22/17	----	ND<0.02	ND<0.02	ND<0.02	ND<0.06	----	----	ND<20	ND<50	ND<250	----	----	----	----	----	----	----	----
P3-13	13	05/22/17	**2.7**	ND<0.02	ND<0.02	ND<0.02	ND<0.06	----	----	**D>20**	ND<50	ND<250	----	----	----	----	----	----	----	----
P3-20	20	05/22/17	----	ND<0.02	ND<0.02	ND<0.02	ND<0.06	----	----	ND<20	ND<50	ND<250	----	----	----	----	----	----	----	----
MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses			**100/30[1]**	**0.03**	**7**	**6**	**9**	**2,000**		**100/30[1]**	**2,000**		**5**	**0.1[3]**	**0.1**	**0.005**	**NVE**	**Analyte Specific**	**250**	**Analyte Specific**
MTCA Method B Soil Cleanup Levels for Unrestricted Land Uses[2]			---	---	---	---	---	---	---	---	---	---	---	---	---	---	**0.0231**	**Analyte Specific**	---	**Analyte Specific**

Table 1, Page 3 of 7. Summary of Soil Sample Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Sample Number	Sample Depth	Sample Date	Gasoline TPH	BTEX				Diesel TPH	Oil TPH	HCID			Naph.	cPAHs	MTBE	EDB	EDC	Other VOCs[4]	Pb	Other Metals
				B	T	E	X			Gasoline	Diesel	Oil								
P4-2	2	05/22/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND	----	----
P4-4	4	05/22/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND	----	----
P4-5.5	5.5	05/22/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND	----	----
P5-2	2	05/22/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND	----	----
P5-4	4	05/22/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND	----	----
P6-1	1	05/22/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND	----	----
P6-4	4	05/22/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND	----	----
P7-2	2	05/22/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND	----	----
P7-4	4	05/22/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND	----	----
P7-6	6	05/22/17	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND	----	----
Sound Earth Strategies Limited Subsurface Investigation (May 2012)																				
P01-04	4	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P01-06	6	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P01-11	11	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P01-14	14	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P01-20	20	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P01-24	24	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P02-04	4	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P02-08	8	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P02-11	11	05/02/12	**52**	ND<0.02	**0.18**	**0.37**	**0.53**	**120**	ND<250	----	----	----	----	----	----	----	----	----	----	----
P02-16	16	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P02-20	20	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P02-24	24	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P03-04	4	05/02/12	**17**	ND<0.02	ND<0.02	ND<0.02	ND<0.06	**67 x**	ND<250	----	----	----	----	----	----	----	----	----	----	----
P03-08	8	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P03-11	11	05/02/12	**110**	ND<0.02	ND<0.02	**0.026**	**0.090**	**1,800**	ND<250	----	----	----	----	----	----	----	----	----	----	----
P03-15	15	05/02/12	**590**	**0.06**	**0.82**	**2.3**	**8.6**	**1,500**	ND<250	----	----	----	----	----	----	----	----	----	----	----
P03-20	20	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P03-24	24	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P04-04	4	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P04-08	8	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P04-11	11	05/02/12	**590**	**0.60**	**1.8**	**2.0**	**4.6**	**2,600**	ND<250	----	----	----	----	----	----	----	----	----	----	----
MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses			**100/30[1]**	**0.03**	**7**	**6**	**9**	**2,000**		**100/30[1]**	**2,000**		**5**	**0.1[3]**	**0.1**	**0.005**	**NVE**	**Analyte Specific**	**250**	**Analyte Specific**
MTCA Method B Soil Cleanup Levels for Unrestricted Land Uses[2]			---	---	---	---	---	---	---	---	---	---	---	---	---	---	**0.0231**	**Analyte Specific**	---	**Analyte Specific**

Table 1, Page 4 of 7. Summary of Soil Sample Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Sample Number	Sample Depth	Sample Date	Gasoline TPH	BTEX				Diesel TPH	Oil TPH	HCID			Naph.	cPAHs	MTBE	EDB	EDC	Other VOCs[4]	Pb	Other Metals
				B	T	E	X			Gasoline	Diesel	Oil								
P04-15	15	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P04-20	20	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P04-24	24	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P05-04	4	05/02/12	**380**	**0.12**	**0.82**	**3.1**	**3.1**	**530**	**360**	----	----	----	----	----	----	----	----	----	----	----
P05-08	8	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P05-11	11	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P05-15	15	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P05-20	20	05/02/12	**2.5**	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P05-24	24	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P06-04	4	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P06-07	7	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P06-11	11	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P06-14	14	05/02/12	**65**	**0.036**	**0.22**	**0.64**	**1.5**	**1,000 x**	ND<250	----	----	----	----	----	----	----	----	----	----	----
P06-19	19	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P06-24	24	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P07-04	4	05/02/12	**370**	**0.13**	**0.77**	**3.0**	**2.7**	**350**	ND<250	----	----	----	----	----	----	----	----	----	----	----
P07-08	8	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P07-11	11	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P07-14	14	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P07-20	20	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	**3,300**	ND<250	----	----	----	----	----	----	----	----	----	----	----
P07-24	24	05/02/12	**3.4**	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P08-08	8	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P08-11	11	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P08-14	14	05/02/12	**2,500**	**2.5**	**6.4**	**26**	**160**	**2,600**	ND<250	----	----	----	----	----	----	----	----	----	----	----
P08-16	16	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P08-19	19	05/02/12	**7.5**	**0.035**	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P08-28	28	05/02/12	ND<2	**0.14**	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P09-03	3	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P09-08	8	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P09-12	12	05/02/12	ND<2	ND<0.02	ND<0.02	ND<0.02	ND<0.06	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P09-15	15	05/02/12	**2,300**	ND<0.02j	**18**	**16**	**27**	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----
P09-20	20	05/02/12	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P09-24	24	05/02/12	**25**	ND<0.02	ND<0.02	ND<0.02	ND<0.06	**210**	ND<250	----	----	----	----	----	----	----	----	----	----	----
MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses			**100/30[1]**	**0.03**	**7**	**6**	**9**	**2,000**		**100/30[1]**	**2,000**		**5**	**0.1[3]**	**0.1**	**0.005**	**----**	**Analyte Specific**	**250**	**Analyte Specific**
MTCA Method B Soil Cleanup Levels for Unrestricted Land Uses[2]			**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**---**	**11**	**Analyte Specific**	**---**	**Analyte Specific**

Table 1, Page 5 of 7. Summary of Soil Sample Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Sample Number	Sample Depth	Sample Date	Gasoline TPH	BTEX				Diesel TPH	Oil TPH	HCID			Naph.	cPAHs	MTBE	EDB	EDC	Other VOCs[4]	Pb	Other Metals
				B	T	E	X			Gasoline	Diesel	Oil								
SAIC Subsurface Investigation (October 2005).																				
DPE-5-14	14	10/31/05	**460**	ND<0.3	ND<0.3	**5.3**	ND<1.5	**2,800**	ND<200	----	----	----	----	----	----	----	----	----	----	----
DPE-5-17	17	10/31/05	**250**	ND<0.5	ND<1.0	**4.8**	**24**	**870**	ND<100	----	----	----	----	----	----	----	----	----	----	----
DPE-6-17.5	17.5	10/17/05	**140**	ND<1.0	**1.8**	**2.4**	**13**	**420**	ND<50	----	----	----	----	----	----	----	----	----	----	----
DPE-6-20	20	10/17/05	**96**	ND<0.5	**0.5**	**0.4**	**2.1**	**360**	ND<50	----	----	----	----	----	----	----	----	----	----	----
DPE-7-11	11	10/21/05	**440**	ND<0.2	**0.5**	**1.6**	**6**	**2,000**	ND<120	----	----	----	----	----	----	----	----	----	----	----
DPE-7-20	20	10/21/05	**1,400**	**0.093**	**0.771**	**9.9**	**16**	----	----	----	----	----	----	ND	ND<0.022	----	ND<0.043	----	----	----
SAIC Subsurface Investigation (2004)																				
SB-24/MW24-9	9	10/05/04	ND<1.0	ND<0.0005	ND<0.001	ND<0.001	ND<0.001	ND<3.0	ND<10	----	----	----	----	----	ND<0.0005	----	----	----	----	----
SB-24/MW24-16	16	10/05/04	**11**	**0.060**	**0.082**	**0.077**	**0.41**	**6.3**	ND<10	----	----	----	----	----	ND<0.0005	----	----	----	----	----
SB-24/MW24-18.5	18.5	10/05/04	**3,100**	**1.1**	**11**	**6.0**	**40**	**64**	ND<10	----	----	----	----	----	ND<0.062	----	----	----	----	----
SP-1	1	03/12/04	**100**	**0.09**	**0.3**	**0.6**	**3.6**	**88**	ND<10	----	----	----	----	----	----	----	----	----	----	----
SAIC Subsurface Investigation (September 2002)																				
DP-1-16	16	09/18/02	ND<5.00	**0.004**	ND<0.0500	**0.0568**	**0.121**	ND<10	ND<25.0	----	----	----	ND<0.005	ND	ND<0.00100	ND<0.00500	ND<0.00200	----	**1.92**	BSL
DP-2-14	14	09/18/02	ND<5.00	**0.0571**	ND<0.0500	ND<0.0500	ND<0.100	ND<10	ND<25.0	----	----	----	ND<0.1	ND	ND<0.00100	ND<0.00500	ND<0.100	----	**2.39**	BSL
DP-2-20	20	09/20/02	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**1.85**	----
DP-3-12	12	09/20/02	**1,140**	**2.39**	**2.01**	**10.3**	**20.3**	**1,060**	ND<25.0	----	----	----	ND<0.1	ND	ND<0.00100	ND<0.00500	ND<0.100	----	**4.15**	BSL
DP-4-18	18	09/20/02	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**3.36**	----
DP-4-20	20	09/20/02	**90.9**	**0.131**	**0.248**	**0.851**	**3.34**	**18.4**	ND<25.0	----	----	----	**0.421**	ND	ND<0.00100	ND<0.00500	ND<0.100	----	**1.78**	BSL
DP-5-14	14	09/20/02	**8,160**	**17.4**	**98.2**	**97.2**	**569**	**1,200**	ND<25.0	----	----	----	**13.7**	ND	ND<0.00100	ND<0.00500	ND<0.100	----	**3.53**	----
DP-6-14	14	09/20/02	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**5.13**	----
DP-6-22	22	09/20/02	**7,750**	**52.2**	**448**	**112**	**629**	**88.7**	ND<25.0	----	----	----	**42.7**	ND	ND<0.0100	ND<0.0500	ND<1.00	----	**4.74**	BSL
DP-7-10	10	09/20/02	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**5.40**	----
DP-7-20	20	09/20/02	**329**	**1.39**	**9.49**	**4.83**	**27.9**	**788**	ND<25.0	----	----	----	**2.88**	ND	ND<0.00100	ND<0.00500	ND<0.100	----	**9.48**	BSL
DB-2/MW13	14	09/24/02	ND<5.00	ND<0.030	ND<0.0500	ND<0.0500	ND<0.100	ND<10	ND<25.0	----	----	----	ND<0.005	ND	----	----	----	----	**2.61**	BSL
DB-2/MW13	16.5	09/24/02	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	**2.56**	----
DB-3-11.0	11	09/26/02	**8.3**	ND<0.030	ND<0.050	**0.0602**	**0.176**	**10.5**	ND<25.0	----	----	----	ND<0.05	ND	----	----	----	----	**6.89**	BSL
DB-3-31.5	31.5	09/26/02	**5.74**	**0.0544**	**0.309**	**0.160**	**0.840**	ND<10	ND<25.0	----	----	----	----	----	----	----	----	----	**6.46**	----
SAIC/Glaceir UST Excavation/Recovery Well Installation (1993)																				
RW-4	10	05/25/93	----	**1.0**	**2.0**	**4.0**	**17**	----	----	----	----	----	----	----	----	----	----	----	----	----
	15	05/25/93	----	ND<0.1	ND<0.10	ND>0.1	ND<0.3	----	----	----	----	----	----	----	----	----	----	----	----	----
	20	05/25/93	----	**81**	**290 J**	**81**	**430**	----	----	----	----	----	----	----	----	----	----	----	----	----
MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses			**100/30[1]**	**0.03**	**7**	**6**	**9**	**2,000**		**100/30[1]**	**2,000**		**5**	**0.1[3]**	**0.1**	**0.005**	**NVE**	**Analyte Specific**	**250**	**Analyte Specific**
MTCA Method B Soil Cleanup Levels for Unrestricted Land Uses[2]			---	---	---	---	---	---	---	---	---	---	---	---	---	---	**0.0231**	**Analyte Specific**	---	**Analyte Specific**

Table 1, Page 6 of 7. Summary of Soil Sample Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Sample Number	Sample Depth	Sample Date	Gasoline TPH	BTEX				Diesel TPH	Oil TPH	HCID			Naph.	cPAHs	MTBE	EDB	EDC	Other VOCs[4]	Pb	Other Metals
				B	T	E	X			Gasoline	Diesel	Oil								
RW-4	30	05/25/93	----	0.4	0.7	0.50	3.0	----	----	----	----	----	----	----	----	----	----	----	----	----
PIT-1	12	1993	1,900	4.3	8.1	24	130	270	----	----	----	----	----	----	----	----	----	----	----	----
PIT-2	12	1993	3.3	0.23	ND	0.030	0.12	34	----	----	----	----	----	----	----	----	----	----	----	----
PIT-3	5	1993	19	ND	0.11	0.11	0.70	36	----	----	----	----	----	----	----	----	----	----	----	----
PIT-4	7	1993	25	0.16	0.13	0.09	0.79	47	----	----	----	----	----	----	----	----	----	----	----	----
PIT-5	11	1993	1,000	2.1	2	8.2	62	610	----	----	----	----	----	----	----	----	----	----	----	----
PIT-6	8	1993	330	7	4	5.1	22	45	----	----	----	----	----	----	----	----	----	----	----	----
PIT-7	11	1993	11,000	23	16	80	240	3,200	----	----	----	----	----	----	----	----	----	----	----	----
PIT-8	11	1993	1,100	1.1	ND	1.7	4.7	600	----	----	----	----	----	----	----	----	----	----	----	----
PIT-9	6	1993	17	0.35	0.12	0.16	0.72	67	----	----	----	----	----	----	----	----	----	----	----	----
PIT-10	----	1993	4.4	0.18	ND	0.1	0.42	34	----	----	----	----	----	----	----	----	----	----	----	----
PIT-11	6	1993	4,800	51	16	65	190	4,000	----	----	----	----	----	----	----	----	----	----	----	----
MTCA Method A Soil Cleanup Levels for Unrestricted Land Uses			**100/30[1]**	**0.03**	**7**	**6**	**9**	**2,000**		**100/30[1]**	**2,000**		**5**	**0.1[3]**	**0.1**	**0.005**	**NVE**	**Analyte Specific**	**250**	**Analyte Specific**
MTCA Method B Soil Cleanup Levels for Unrestricted Land Uses[2]			---	---	---	---	---	---	---	---	---	---	---	---	---	---	**0.0231**	**Analyte Specific**	---	**Analyte Specific**

Notes:
All results and detection limits are given in milligrams per kilogram (mg/kg); equivalent to parts per million (ppm).
Sample Depth = Soil sample depth interval in feet below ground surface (bgs).
Gasoline TPH (total petroleum hydrocarbons) determined using Northwest Test Method NWTPH Gx.
BTEX (benzene, toluene, ethylbenzene, and xylenes) determined using EPA Test Method 8021B or 8260C.
Diesel and Oil TPH (total petroleum hydrocarbons) determined using Northwest Test Method NWTPH-Dx without silica gel cleanup.
Gasoline, Diesel, and Oil HCID (hydrocarbon identification) determined using Northwest Test Method NWTPH-HCID.
Naph. (naphthalene) determined using EPA Methods 8260 or 8270.
cPAHs (carcinogenic polycyclic aromatic hydrocarbons) determined using EPA Method 8270.
MTBE (methyl tert-butyl ether), EDB (1,2-Dibromoethane), EDC (1,2-Dichloroethane), and other VOCs (volatile organic compounds) determined using EPA Test Method 8260.
Pb (lead) and other metals determined using EPA 6000/7000 Series Methods.
x = The sample chromatographic pattern does not resemble the fuel standard used for quantitations.
j = The result is below normal detection limits. The value reported is an estimate.
ND = Not detected above noted analytical detection limit.
NVE = No value established.
---- = Not analyzed or not applicable.
Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Method A Soil Cleanup Levels for Unrestricted Land Uses (WAC 173-340-900, Table 740-1). MTCA Method B Soil Screening Levels from Ecology's Cleanup Level and Risk Calculation (CLARC) database on December 15, 2017.
[1] The higher cleanup level is allowed if no benzene is detected in the sample and the total of toluene, ethylbenzene and xylenes is less than 1% of the gasoline mixture.
[2] No MTCA Method A Cleanup Level has been established. Therefore, the MTCA Method B Standard Formula Value protective of groundwater at 13°C is listed for reference.

Table 1, Page 7 of 7. Summary of Soil Sample Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Notes:

[3] The toxicity of the cPAH mixture is compared to the MTCA Method A Soil Cleanup Level for benzo(a)pyrene using the toxicity equivalency methodology described in WAC 173-340-708(8).

[4] Other VOCs does not include petroleum-related VOCs that were not assessed independently due to the fact that they are factored into the MTCA Method A TPH Cleanup Levels.

Bold results indicated concentrations above laboratory detection limits.

Bold and yellow highlighted results indicate concentrations (if any) that the applicable soil screening level.

Table 2, Page 1 of 6. Summary of Groundwater Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Sample Number	Sample Date	TOC Elevation (ft)	Depth to Water Below Well TOC (ft)	LNAPL Thickness (ft)	Groundwater Elevation (ft)	Gasoline TPH	BTEX				Diesel TPH	Oil TPH	Diesel TPH	Oil TPH	Naph.	cPAHs	MTBE	EDB	EDC	PCE	TCE	cis-1,2-DCE	Other VOCs[7]	Total Pb	Dissolved Pb	Dissolved As	Other Metals
							B	T	E	X	without silica gel		with silica gel														
Groundwater Monitoring Wells																											
MW6	**Screened Interval 15-29 feet bgs, 2-Inch Diameter Casing**																										
MW6	11/13/18	146.05	20.70	0.00	125.35	**110**	**0.89**	ND<1	ND<1	ND<3	**1,000 x**	ND<250	**570 x**	ND<250	ND<0.8	ND	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND	----	----	----	----
	11/11-13/13[3]	146.05	19.87	0.00	126.18	**97**	**3**	ND<0.5	**0.6**	**0.5**	**340**	ND<70	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/20-22/13[3]	146.05	18.47	0.00	127.58	**280**	**5**	ND<0.5	**0.5**	**0.6**	**600**	ND<71	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/12-14/12[3]	146.05	19.74	0.00	126.31	**370**	**9**	**1**	**2**	**3**	**1,600**	**190**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/07-08/12[3]	146.05	18.50	0.00	127.55	**250**	**1**	ND<0.5	ND<0.5	ND<0.5	**540**	ND<70	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/10-12/11[3]	146.05	18.32	0.00	127.73	**600**	**12**	**0.7**	**1**	**0.9**	**12,000**	**1,500**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	01/17-20/11[3]	146.05	18.24	0.00	127.81	**130**	**4**	ND<0.5	ND<0.5	ND<0.5	**12,000**	**4,600**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/19-22/10[3]	146.05	18.83	0.00	127.22	**650**	**24**	**0.9**	**0.6**	**1**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	10/12-15/09[3]	146.05	20.28	0.00	125.77	**1,200**	**16**	**1**	**0.5**	**2**	**5,100**	ND<660	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/13-16/09[3]	146.05	20.18	0.00	125.87	**1,100**	**31**	**0.8**	**2**	**3**	**26,000**	**3,000**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/10/08[3]	146.05	20.93	0.00	125.12	ND<50.0	**0.6**	ND<0.5	ND<0.5	ND<0.5	**3,200**	ND<660	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/28-05/01/08	146.05	22.28	0.00	123.77	**360**	**3**	**0.7**	**5**	**3**	**8,600**	**1,200**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	08/09/06	113.32[6]	25.85	0.00	87.47	**15,000**	**1,900**	**1,000**	**590**	**1,700**	**14,000**	ND<2,300	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/18-21/05	113.32[6]	20.31	0.00	93.01	**3,600**	**1,000**	**120**	**110**	**360**	**7,700**	ND<1,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	01/24-31/05	113.32[6]	20.38	0.00	92.94	**5,600**	**220**	**60**	**110**	**310**	**11,000**	ND<480	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	10/28-11/01/04	113.32[6]	20.93	0.00	92.39	**24,000**	**8,600**	**2,800**	**690**	**3,100**	**9,200**	ND<96	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	7/15-16/04	113.32[6]	20.48	0.00	92.84	**46,600**	**9,610**	**3,190**	**758**	**3,060**	**3,800**	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	**1.69**	----	----
	4/29-30/04	113.32[6]	20.22	**0.02**	93.12	Not sampled due to the presence of LNAPL																					
	10/01-02/03	113.32[6]	23.07	**0.03**	90.27	Not sampled due to the presence of LNAPL																					
	06/30-07/01/03	113.32[6]	21.41	**0.03**	91.93	Not sampled due to the presence of LNAPL																					
	4/23-24/03	113.32[6]	20.91	**0.03**	92.43	Not sampled due to the presence of LNAPL																					
	01/21/03	113.32[6]	21.74	**0.03**	91.60	Not sampled due to the presence of LNAPL																					
	10/17-18/02	113.32[6]	20.69	**0.05**	92.67	Not sampled due to the presence of LNAPL																					
	07/24/02	113.32[6]	19.76	0.00	93.56	**31,000**	**8,900**	**1,600**	**820**	**4,200**	**29,000**	ND<10,000	----	----	----	----	----	----	----	----	----	----	----	----	**5.1**	----	----
	01/1997	113.38[6]	----	----	----	**54,000**	**7,290**	**12,400**	**2,340**	**19,800**	----	----	----	----	----	----	----	----	----	ND<1,000	ND<1,000	ND<1,000	----	----	**61.9**	----	----
	10/1995	113.38[6]	----	----	----	**62,000**	**12,000**	**13,800**	**920**	**5,690**	----	----	----	----	----	----	----	----	----	**1.6**	**2.3**	**2.9**	----	----	**33.3**	----	----
	07/07/93	113.38[6]	22.30	**1.60**	92.36	Not sampled due to the presence of LNAPL																					
	03/26-28/91	113.38[6]	21.22	**0.67**	92.70	----	**25,000**	**29,000**	**2,500**	**19,000**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	09/1990	113.38[6]	21.95	**0.81**	92.08	Not sampled due to the presence of LNAPL																					
	11/03/86	113.71[6]	24.29	**2.26**	91.23	Not sampled due to the presence of LNAPL																					
MW9	**Screened Interval 14-29 feet bgs, 2-Inch Diameter Casing**																										
MW9	11/13/18	147.18	21.17	0.00	126.01	ND<100	ND<1	ND<1	ND<1	ND<3	**440 x**	ND<250	**140**	ND<250	ND<0.4	ND	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND	----	----	----	----
	08/15/17	147.18	19.63	0.00	127.55	----	----	----	----	----	**1,500 x**	**490 x**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/06/17	147.18	17.93	0.00	129.25	**480**	ND<1	**2.2**	**1.8**	**3.4**	----	----	----	----	----	----	----	----	----	ND<1	ND<1	ND<1	ND	----	----	----	----
	11/11-13/13	147.18	20.21	0.00	126.97	**180**	ND<0.5	ND<0.5	ND<0.5	ND<0.5	**400**	ND<71	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/20-22/13	147.18	18.19	0.00	128.99	**240**	ND<0.5	ND<0.5	ND<0.5	ND<0.5	**1,400**	ND<68	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/12-14/12	147.18	20.09	0.00	127.09	**190**	ND<0.5	ND<0.5	ND<0.5	ND<0.5	**2,700**	**150**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/07-08/12	147.18	18.88	0.00	128.30	**230**	ND<0.5	ND<0.5	ND<0.5	ND<0.5	**1,500**	ND<67	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/10-12/11	147.18	18.68	0.00	128.50	**160**	ND<0.5	ND<0.5	ND<0.5	ND<0.5	**2,200**	**260**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	01/17-20/11	147.18	18.65	0.00	128.53	**280**	ND<0.5	ND<0.5	ND<0.5	ND<0.5	**6,400**	**1,400**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/19-22/10	147.18	19.04	0.00	128.14	**130**	**1**	ND<0.5	ND<0.5	ND<0.5	**1,200**	**190**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	10/12-15/09	147.18	20.67	0.00	126.51	**83**	ND<0.5	ND<0.5	ND<0.5	ND<0.5	**960**	ND<66	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/13-16/09	147.18	24.60	0.00	122.58	**160**	**0.7**	ND<0.5	ND<0.5	ND<0.5	**1,100**	**69**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/10/08	147.18	21.29	0.00	125.89	**130**	**0.5**	ND<0.5	ND<0.5	ND<0.5	**2,000**	**97**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	12/04-05/07	147.18	23.15	0.00	124.03	ND<50.0	ND<0.5	ND<0.5	ND<0.5	ND<1.5	**2,200**	**280**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
MTCA Method A Cleanup Levels for Ground Water						**800/1,000[1]**	**5**	**1,000**	**700**	**1,000**	**500**	**500**	**500**	**500**	**160**	**0.1**	**20**	**0.01**	**5**	**5**	**5**	**NVE**	**Analyte Specific**	**15**	**15**	**5**	**Analyte Specific**
Applicable or Relevant and Appropriate Requirements (ARARs)[2]						**----**	**5**	**1,000**	**700**	**10,000**	**----**	**----**	**----**	**----**	**----**	**----**	**----**	**0.05**	**5**	**5**	**5**	**70**	**Analyte Specific**	**15**	**15**	**10**	**Analyte Specific**

Table 2, Page 2 of 6. Summary of Groundwater Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Sample Number	Sample Date	TOC Elevation (ft)	Depth to Water Below Well TOC (ft)	LNAPL Thickness (ft)	Groundwater Elevation (ft)	Gasoline TPH	BTEX				Diesel TPH	Oil TPH	Diesel TPH	Oil TPH	Naph.	cPAHs	MTBE	EDB	EDC	PCE	TCE	cis-1,2-DCE	Other VOCs[7]	Total Pb	Dissolved Pb	Dissolved As	Other Metals
							B	T	E	X	without silica gel		with silica gel														
MW9	08/09/06	147.18	22.80	0.00	124.38	450	66	1.9	0.8	47	2,700	ND<540	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/18-21/05	147.18	20.59	0.00	126.59	480	1.4	ND<1.0	5.7	3.1	14,000	ND<630	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	01/24-31/05	147.18	20.66	0.00	126.52	730	1.7	ND<1.0	2.7	ND<6.0	140,000	ND<5,300	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	10/28-11/01/04	147.18	21.22	0.00	125.96	300	1.4	0.5	1.9	ND<3.0	3,900	420	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	7/15-16/04	147.18	20.71	0.00	126.47	9,540	3.84	10.4	25.9	31.6	2,540	ND<500	----	----	----	----	----	----	----	----	----	----	----	2.54	----	----
	4/29-30/04	147.18	20.38	0.00	126.80	1,200	2	1.2	10	7.8	92,000	ND<5,000	----	----	----	----	----	----	----	----	----	----	----	4.8	----	----
	1/21-23/04	147.18	20.36	0.00	126.82	2,300	7.2	2.4	45	19	100,000	ND<5,100	----	----	----	----	----	----	----	----	----	----	----	5.5	----	----
	10/1-02/03	147.18	21.26	0.00	125.92	3,500	110	30	100	ND<100	33,000	ND<5,000	----	----	----	----	----	----	----	----	----	----	----	3.9	----	----
	4/23-24/03	147.18	20.04	0.00	127.14	6,760	388	15.9	277	105	3,680	ND<500	----	----	----	----	----	----	----	----	----	----	----	1.31	----	----
	10/17-18/02	147.18	20.88	0.00	126.30	6,380	493	13.0	230	107	43,600	671[4]	----	----	----	----	----	----	----	----	----	----	----	2.66	----	----
	06/14/00	147.18	----	----	----	4,740	786	26.0	274	156	6,070	ND<500	----	----	----	----	----	----	----	----	----	----	----	7.86	1.59	----
	12/15/99	147.18	----	----	----	4,460	831	22.4	274	138	8,510	ND<500	----	----	----	----	----	----	----	----	----	----	----	15	1.03	----
	11/1997	147.18	----	----	----	5,000	2,010	80	334	400	----	----	----	----	----	----	----	----	----	ND<1	ND<1	ND<1	----	3.3	----	----
	07/1997	147.18	----	----	----	2,200 J	2,680	127	460	620 J	----	----	----	----	----	----	----	----	----	ND<200	ND<200	ND<200	----	8.6 j	----	----
	04/1997	147.18	----	----	----	9,100	2,980	173	413	674	----	----	----	----	----	----	----	----	----	ND<1	ND<1	ND<1	----	6.8	----	----
	01/01/97	147.18	----	----	----	4,400	2,600	53	310	285	----	----	----	----	----	----	----	----	----	----	----	----	----	4.6 P	----	----
	10/01/95	147.18	----	----	----	3,400	3,520	70 J	ND<200	312 J	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	03/26-28/91	114.65[6]	20.44	0.17	94.18	----	1,600	2,900	250	3,100	----	----	----	----	----	----	----	----	----	ND<250	ND<250	----	----	1.03	----	----
MW13	**Screened Interval 10-20 feet bgs, 2-Inch Diameter Casing**																									
MW13	11/13/18	147.88	----	----	Dry well																					
	08/15/17	147.88	18.04	----	129.84	----	----	----	----	----	60 x	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/06/17	147.88	16.26	----	131.62	ND<100	ND<1	ND<1	ND<1	ND<3	----	----	----	----	----	----	----	----	----	ND<1	ND<1	ND<1	ND	----	----	----
	2002-2013	147.88	----	0.00	Not Sampled																					
RW4	**Screened Interval 17-32 feet bgs, 8-Inch Diameter Casing**																									
RW4 (Product Recovery Well)	10/18/06	110.82[6]	23.64	0.00	87.18	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	07/15-16/04	110.82[6]	18.20	0.22	92.84	Not sampled due to the presence of LNAPL																				
	01/21/03	110.82[6]	17.88	0.00	92.94	689	0.991	ND<0.500	2.37	7.03	2,830	ND<500	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	10/17-18/02	110.82[6]	19.29	0.00	91.53	3,160	59.8	2.50	40.4	15.6	8,930	939	----	----	----	----	----	----	----	----	----	----	----	1.23	----	----
	07/24/02	110.82[6]	18.30	0.00	92.52	990	62	1.3	32	7.0	15,000	ND<2,000	----	----	5.0	----	ND<2	----	ND<2	ND<1	ND<1	ND<1	----	----	3.3	6.1	----
	07/07/93	110.82[6]	21.65	0.00	89.17	14,000	6,500	2,800	370	2,000	----	----	----	----	----	----	----	----	----	----	----	----	----	45	----	----	----
DPE5	**Screened Interval 14-24 feet bgs, 4-Inch Diameter Casing**																									
DPE 5 (Dual Phase Extraction Well)	11/21/18	113.81[6]	17.28	0.00	96.53	ND<100	1.6	ND<1	ND<1	ND<3	1,300 x	420 x	99	ND<250	ND<1	----	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND	----	1.37	----	----
	04/06/17	113.81[6]	13.37	0.00	100.44	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND<1	ND<1	ND<1	ND	----	----	----	----
	11/11-13/13	113.81[6]	16.68	0.00	97.14	5,400	44	20	690	290	150	ND<72	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/20-22/13	113.81[6]	16.65	0.00	97.17	5,700	41	22	620	550	120	ND<67	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/12-14/12	113.81[6]	15.35	0.00	98.47	580	5	2	56	46	260	ND<72	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/07-08/12	113.81[6]	14.08	0.00	99.74	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<29	ND<67	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/10-12/11	113.81[6]	16.16	0.00	97.66	520	18	4	30	63	1,900	270	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	01/17-20/11	113.81[6]	13.99	0.00	99.83	ND<50	ND<0.5	ND<0.5	2	1	540	230	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/19-22/10	113.81[6]	15.92	0.00	97.90	78	2	ND<0.5	ND<0.5	0.5	530	95	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	10/12-15/09	113.81[6]	18.60	0.00	95.22	490	22	2	19	10	25,000	ND<1,400	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/13-16/09	113.81[6]	14.63	0.00	99.19	110	2	ND<0.5	1	3	690	83	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/03/08	113.82[6]	22.45	0.00	91.37	460	77	7	4	17	12,000	ND<3,500	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/29-29/08[3]	113.82[6]	18.93	0.00	94.89	ND<250	32	4	3	22	11,000	ND<2,500	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	12/04-06/07	113.81[6]	23.72	0.00	90.09	180	0.6	0.5	0.6	4.3	4,000	ND<470	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/17-19/07	113.81[6]	23.78	0.00	90.03	200	17	2.6	1.6	11	4,600	ND<470	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/17/06	113.81[6]	----	----	----	19,000	1,100	1,400	160	2,900	4,800	ND<190	----	----	----	----	----	----	----	----	----	----	----	----	----	----
MTCA Method A Cleanup Levels for Ground Water						800/1,000[1]	5	1,000	700	1,000	500	500	500	500	160	0.1	20	0.01	5	5	5	NVE	Analyte Specific	15	15	5	Analyte Specific
Applicable or Relevant and Appropriate Requirements (ARARs)[2]						----	5	1,000	700	10,000	----	----	----	----	----	----	----	0.05	5	5	5	70	Analyte Specific	15	15	10	Analyte Specific

Table 2, Page 3 of 6. Summary of Groundwater Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Sample Number	Sample Date	TOC Elevation (ft)	Depth to Water Below Well TOC (ft)	LNAPL Thickness (ft)	Groundwater Elevation (ft)	Gasoline TPH	BTEX				Diesel TPH without silica gel	Oil TPH without silica gel	Diesel TPH with silica gel	Oil TPH with silica gel	Naph.	cPAHs	MTBE	EDB	EDC	PCE	TCE	cis-1,2-DCE	Other VOCs[7]	Total Pb	Dissolved Pb	Dissolved As	Other Metals
							B	T	E	X																	
DPE 5	01/23/06	113.81[6]	16.75	**0.05**	96.61	Not sampled due to the presence of LNAPL																					
	11/28/05	----	----	----	----	**36,000**					**5,300**	ND<1,000	----	----	----	----	ND<0.5	----	ND<0.5	ND<0.8	ND<1	ND<0.8	----	----	----	----	----
DPE6	**Screened Interval 15.5-30.5 feet bgs, 4-Inch Diameter Casing**																										
DPE 6 (Dual Phase Extraction Well)	11/13/18	113.32[6]	20.93	0.00	92.39	ND<100	ND<1	**1.1**	ND<1	ND<3	**3,300 x**	**610 x**	**180**	ND<250	ND<1	----	ND<1	ND<1	ND<1	ND<1	ND<1	ND<1	ND	----	ND<2	----	----
	04/06/17	113.32[6]	17.75	0.00	95.57	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND<1	ND<1	ND<1	ND	----	----	----	----
	11/11-13/13	114.14[6]	20.04	0.00	94.10	**140**	**7**	ND<0.5	ND<0.5	ND<0.5	**1,100**	ND<70	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/20-22/13	114.14[6]	18.62	0.00	95.52	**570**	**3**	**2**	**2**	**8**	**170**	ND<71	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/12-14/12	114.14[6]	19.90	0.00	94.24	**220**	**4**	ND<0.5	ND<0.5	**1**	**94**	ND<71	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/07-08/12	114.14[6]	18.80	0.00	95.43	**360**	**9**	**1**	**1**	**4**	**1,000**	ND<66	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/10-12/11	114.14[6]	18.44	0.00	95.70	**510**	**16**	**2**	**5**	**14**	**8,300**	**1,300**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	01/17-20/11	114.14[6]	18.61	0.00	95.53	**520**	**42**	**2**	**4**	**6**	**16,000**	**27,000**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/19-22/10	114.14[6]	19.02	0.00	95.12	**680**	**44**	**3**	**13**	**13**	**10,000**	**2,000**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	10/12-15/09	114.14[6]	20.51	0.00	93.63	**490**	**18**	**3**	**8**	**9**	**3,600**	ND<680	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/13-16/09	114.14[6]	20.60	0.00	93.54	**900**	**100**	**6**	**16**	**24**	**16,000**	**880**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/04/08	114.14[6]	21.30	0.00	92.84	**870**	**16**	**12**	**7**	**63**	**11,000**	ND<1,300	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/28-29/08[3]	114.14[6]	22.81	0.00	91.33	**460**	**1**	**6**	**2**	**32**	**8,500**	ND<480	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	12/04-05/07	113.32[6]	28.51	0.00	84.81	**160**	ND<2.0	**0.6**	ND<2.0	**3.8**	**1,100**	ND<190	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/17/07	113.32[6]	29.83	0.00	83.49	**5,400**	**27**	**39**	**35**	**350**	**110,000**	ND<9,300	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/17/06	113.32[6]	----	0.00	----	**38,000**	**3,000**	**5,400**	**690**	**4,900**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/28/05	----	----	----	----	**280**	----	----	----	----	**170**	ND<100	----	----	----	----	ND<0.5	----	ND<0.5	ND<0.8	ND<1	**8**	----	----	----	----	----
DPE7	**Screened Interval 11-29 feet bgs, 4-Inch Diameter Casing**																										
DPE 7 (Dual Phase Extraction Well)	11/13/18	113.15[6]	20.52	0.00	92.63	**700**	**3.3**	**8.1**	**2.3**	**30**	**4,100 x**	**850 x**	**430 x**	ND<250	**1.3**	ND	----	----	----	----	----	----	----	----	ND<2	----	----
	04/06/17	113.15[6]	17.28	0.00	95.87	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND<1	ND<1	ND<1	ND	----	----	----	----
	11/03/08	113.15[6]	20.96	**0.01**	92.18	Not sampled due to the presence of LNAPL																					
	04/28-29/08	113.15[6]	22.26	0.00	90.87	ND<250	**7**	**2**	**2**	**6**	**6,300**	ND<980	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	12/04-05/07	113.15[6]	27.52	0.00	85.63	**760**	**44**	**1.7**	**28**	**15**	**120,000**	ND<9,900	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/17/07	113.15[6]	27.00	0.00	86.15	**3,800**	**78**	**40**	**97**	**180**	**22,000**	ND<4,700	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/17/06	113.15[6]	----	----	----	**29,000**	**4,500**	**1,800**	**470**	**4,200**	**8,600**	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/28/05	----	----	----	----	**17,000**	----	----	----	----	**6,200**	ND<1,000	----	----	----	----	ND<0.5	----	ND<0.5	ND<0.8	ND<1	ND<0.8	----	----	----	----	----
VP9	**Screened Interval 4.5-14.5 feet bgs, 2-Inch Diameter Casing**																										
VP9 (Soil Vapor Extraction Well)	11/13/18	145.22	9.54	0.00	135.68	ND<100	ND<1	ND<1	ND<1	ND<3	ND<250	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	01/24-31/05	145.22	10.30	0.00	134.92	**100**	ND<0.5	ND<0.5	ND<0.5	ND<1.5	ND<250	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	10/28-11/01/04	145.22	9.82	0.00	135.40	**610**	ND<0.5	ND<0.5	ND<0.5	ND<1.5	ND<800	ND<1,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	7/15-16/04	145.22	11.15	0.00	134.07	**1,270**	**1.67**	**0.699**	**2.79**	**5.77**	**259**	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	4/29-30/04	145.22	9.58	0.00	135.64	**750**	**0.8**	ND<0.500	**13**	ND<1.5	**1,500**	ND<1,000	----	----	----	----	----	----	----	----	----	----	----	----	ND<0.99	----	----
	10/01-02/03	145.22	11.72	0.00	133.50	**1,600**	**5.3**	**1.4**	**2.3**	ND<10	**5,400**	**1,300**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	6/30-07/01/03	145.22	9.74	0.00	135.48	**681**	**1.22**	**0.735**	**5.07**	**3.28**	ND<250	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	4/23-24/03	145.22	8.28	0.00	136.94	ND<50.0	ND<0.500	ND<0.500	ND<0.500	ND<1.00	ND<250	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	10/17-18/02	145.22	11.90	0.00	133.32	**1,910**	**11.3**	**2.62**	**8.86**	**14.7**	**13,200**	**786[4]**	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	06/14/00	145.22	----	----	----	**474**	**4.97**	ND<1.30	**55.6**	**4.48**	**1,420**	ND<1,130	----	----	----	----	----	----	----	----	----	----	----	**15.2**	ND<1.00	----	----
	12/15/99	145.22	----	----	----	**118**	ND<0.500	ND<0.500	ND<0.500	ND<1.00	ND<250	ND<500	----	----	----	----	----	----	----	----	----	----	----	**5.72**	ND<1.00	----	----
Off-Property Wells Situated in Close Proximity to Property Boundary																											
SS1-W1	**Screened Interval 10-20 feet bgs, 1.5-Inch Diameter Casing**																										
SS1-W1	11/13/18	148.83	11.92	----	136.91	ND<100	ND<1	ND<1	ND<1	ND<3	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	12/06/17	148.83	10.75	----	138.08	ND<100	ND<1.0	ND<2.0	ND<1.0	ND<3.0	ND<200	ND<400	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
MTCA Method A Cleanup Levels for Ground Water						**800/1,000[1]**	**5**	**1,000**	**700**	**1,000**	**500**	**500**	**500**	**500**	**160**	**0.1**	**20**	**0.01**	**5**	**5**	**5**	**NVE**	**Analyte Specific**	**15**	**15**	**5**	**Analyte Specific**
Applicable or Relevant and Appropriate Requirements (ARARs)[2]						**----**	**5**	**1,000**	**700**	**10,000**	**----**	**----**	**----**	**----**	**----**	**----**	**----**	**0.05**	**5**	**5**	**5**	**70**	**Analyte Specific**	**15**	**15**	**10**	**Analyte Specific**

Table 2, Page 4 of 6. Summary of Groundwater Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Sample Number	Sample Date	TOC Elevation (ft)	Depth to Water Below Well TOC (ft)	LNAPL Thickness (ft)	Groundwater Elevation (ft)	Gasoline TPH	BTEX				Diesel TPH without silica gel	Oil TPH without silica gel	Diesel TPH with silica gel	Oil TPH with silica gel	Naph.	cPAHs	MTBE	EDB	EDC	PCE	TCE	cis-1,2-DCE	Other VOCs[7]	Total Pb	Dissolved Pb	Dissolved As	Other Metals
							B	T	E	X																	
SS1-W2	**Screened Interval 12-22 feet bgs, 1.5-Inch Diameter Casing**																										
SS1-W2	11/13/18	146.93	14.54	----	132.39	ND<100	ND<1	ND<1	ND<1	ND<3	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	12/06/17	146.93	13.65	----	133.28	ND<100	ND<1.0	ND<2.0	ND<1.0	ND<3.0	ND<200	ND<400	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
MW10	**Screened Interval 10-30 feet bgs, 2-Inch Diameter Casing**																										
MW10	11/13/18	148.16	13.33	0.00	134.83	ND<100	ND<1	ND<1	ND<1	ND<3	ND<50	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/06/17	148.16	11.43	0.00	136.73	ND<100	ND<1	ND<1	ND<1	ND<3	----	----	----	----	----	----	----	----	----	ND<1	ND<1	ND<1	ND	----	----	----	----
	11/11-13/13	148.16	12.54	0.00	135.62	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<31	ND<73	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/20-22/13	148.16	12.35	0.00	135.81	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<29	ND<68	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/12-14/12	148.16	12.28	0.00	135.88	**180**	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<30	**230**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/07-08/12	148.16	11.92	0.00	136.24	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<30	ND<70	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/10-12/11	148.16	12.02	0.00	136.14	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<30	ND<69	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	01/17-20/11	148.16	10.62	0.00	137.54	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<59[19]	**250[5]**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/19-22/10	148.16	11.93	0.00	136.23	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<31	ND<73	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	10/12-15/09	148.16	12.23	0.00	135.93	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<29	ND<67	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/13-16/09	148.16	12.11	0.00	136.05	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	ND<29	ND<67	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/10/08	148.16	12.66	0.00	135.50	ND<50	**0.7**	ND<0.5	ND<0.5	ND<0.5	ND<30	ND<69	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/28-05/01/08	148.16	12.71[5]	0.00	135.45	ND<50	**0.8**	ND<0.5	ND<0.5	ND<0.5	ND<77	ND<97	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	12/04-05/07	148.16	14.33	0.00	133.83	**150**	**2.0**	ND<2.0	**0.9**	ND<5.0	ND<78	ND<98	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/17-19/07	148.16	13.05	0.00	135.11	**100**	**1.4**	ND<0.5	ND<0.5	ND<1.5	ND<75	ND<94	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	01/24-31/05	148.16	12.36	0.00	135.80	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<1.5	ND<250	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	10/21-11/01/04	148.16	13.31	0.00	134.85	**210**	**4.1**	ND<0.5	**1.2**	**2.1**	ND<82	ND<00	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	07/15-16/04	148.16	13.44	0.00	134.72	**362**	**2.75**	ND<0.500	**0.549**	**3.45**	ND<250	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	04/29-30/04	148.16	13.23	0.00	134.93	ND<50	1.5	ND<0.5	ND<0.5	ND<1.5	ND<250	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	ND<0.99	----	----
	01/21-23/04	148.16	11.99	0.00	136.17	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<1.5	ND<250	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.2	----	----
	10/01-02/03	148.16	13.68	0.00	134.48	**190**	**2.6**	ND<0.5	**0.5**	ND<3.0	ND<250	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.2	----	----
	06/30-07/01/03	148.16	12.91	0.00	135.25	**255**	**2.01**	ND<0.500	**0.535**	**2.53**	ND<250	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	04/23-24/03	148.16	11.76	0.00	136.40	ND<50.0	ND<0.500	ND<0.500	ND<0.500	ND<1.00	----	----	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	01/21/03	148.16	12.46	0.00	135.70	**416**	**3.44**	**0.55**	**0.519**	**3.24**	ND<250	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	10/17-18/02	148.16	13.59	0.00	134.57	**490**	**3.42**	ND<0.500	**1.34**	**5.00**	**667**	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	7/24/02[3]	148.16	13.14	0.00	135.02	**240**	**2.5**	ND<0.500	ND<1.0	ND<1.5	**320**	**600**	----	----	ND<2	----	ND<2	----	ND<2	ND<1	ND<1	**15**	----	----	**1.3**	**4.1**	----
	06/14/00	148.16	----	----	----	**99.2**	**1.56**	ND	ND	ND	ND<250	ND<500	----	----	----	----	----	----	----	----	----	----	----	ND	ND	----	----
	12/15/99	148.16	----	----	----	**618**	**7.02**	ND<0.910	ND<0.850	ND<4.22	**353**	ND<500	----	----	----	----	----	----	----	----	----	----	----	ND<1	ND<1.00	----	----
	11/1997	148.16	----	----	----	**1,000**	**4.2**	**2**	**4.8**	**2.2 J**	----	----	----	----	----	----	----	----	----	----	----	----	----	**4.9**	----	----	----
	07/1997	148.16	----	----	----	**1,100**	**10**	**2.1**	**2.4**	**4.34 J**	----	----	----	----	----	----	----	----	----	----	----	----	----	**1.2 j**	----	----	----
	04/1997	148.16	----	----	----	**420**	**5.1**	**1**	ND<1	**2.0 J**	----	----	----	----	----	----	----	----	----	----	----	----	----	ND<1	----	----	----
	01/1997	148.16	----	----	----	**180**	**1.5**	ND<1	ND<1	ND<2	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	10/1995	148.16	----	----	----	**780**	**1.8**	**2.9**	**0.82 J**	**5.6**	----	----	----	----	----	----	----	----	----	ND<1	**0.7**	ND<1	----	ND<1	----	----	----
	07/07/93	115.75[6]	13.81	0.00	101.94	**380**	**13**	ND<5.0	**11**	**24**	----	----	----	----	----	----	----	----	----	----	----	----	----	**8**	----	----	----
	03/26-28/91[3]	115.75[6]	13.14	0.00	102.61	----	ND<5	ND<5	ND<5	ND<5	----	----	----	----	----	----	----	ND<0.01	ND<5	ND<5.0	ND<5.0	----	----	----	**12 j**	**21**	BSL
MW24	**Screened Interval 4.2-14.2 feet bgs, 0.75-Inch Diameter Casing**																										
MW24	01/24-31/05	107.95[6]	5.58	0.00	102.37	ND<50	ND<0.5	**0.6**	ND<0.5	**1.6**	ND<250	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
MW24	10/26-27/04	107.95[6]	----	----	----	**500**	----	----	----	----	ND<800	ND<1,000	----	----	----	----	ND<0.5	ND<0.5	ND<0.5	ND<0.8	ND<1	ND<0.8	----	----	----	----	----
RW2	**Screened Interval Unknown, 8-Inch Diameter Casing**																										
RW2 (Product Recovery Well)	11/11-13/13	106.63[6]	14.36	0.00	92.27	ND<50	**2**	ND<0.5	ND<0.5	ND<0.5	ND<31	ND<73	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	5/20-22/13	106.63[6]	12.57	0.00	94.06	ND<50	**1**	ND<0.5	ND<0.5	ND<0.5	ND<30	ND<69	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/12-14/12	106.63[6]	13.50	0.00	93.13	**87**	**5**	ND<0.5	ND<0.5	**0.9**	ND<29	ND<67	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/07-08/12	106.63[6]	11.40	0.00	95.23	ND<50	ND<0.5	ND<0.5	**2**	**3**	ND<30	ND<69	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	05/10-12/11	106.63[6]	11.96	0.00	94.67	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<0.5	**230**	**91**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	01/17-20/11	106.63[6]	9.70	0.00	96.93	**150**	ND<0.5	ND<0.5	**8**	**16**	**270**	**190**	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
MTCA Method A Cleanup Levels for Ground Water						**800/1,000[1]**	**5**	**1,000**	**700**	**1,000**	**500**	**500**	**500**	**500**	**160**	**0.1**	**20**	**0.01**	**5**	**5**	**5**	**NVE**	**Analyte Specific**	**15**	**15**	**5**	**Analyte Specific**
Applicable or Relevant and Appropriate Requirements (ARARs)[2]						**----**	**5**	**1,000**	**700**	**10,000**	**----**	**----**	**----**	**----**	**----**	**----**	**----**	**0.05**	**5**	**5**	**5**	**70**	**Analyte Specific**	**15**	**15**	**10**	**Analyte Specific**

Table 2, Page 5 of 6. Summary of Groundwater Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Sample Number	Sample Date	TOC Elevation (ft)	Depth to Water Below Well TOC (ft)	LNAPL Thickness (ft)	Groundwater Elevation (ft)	Gasoline TPH	BTEX				Diesel TPH	Oil TPH	Diesel TPH	Oil TPH	Naph.	cPAHs	MTBE	EDB	EDC	PCE	TCE	cis-1,2-DCE	Other VOCs[7]	Total Pb	Dissolved Pb	Dissolved As	Other Metals
							B	T	E	X	without silica gel		with silica gel														
RW2 (Product Recovery Well)	04/19-22/10	106.63[6]	12.56	0.00	94.07	160	9	0.7	ND<0.5	ND<0.5	430	240	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	10/12-15/09	106.63[6]	14.75	0.00	91.88	1,100	35	4	7	11	4,300	ND<680	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	4/13-16/09	106.63[6]	13.80	0.00	92.83	340	21	0.9	1	1	840	ND<65	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	11/04/08	106.63[6]	15.66	0.00	90.97	890	82	9	14	6	1,000	ND<66	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/28-29/08	106.63[6]	15.84	0.00	90.79	190	12	1	0.9	2	890	ND<95	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	12/04-06/07	106.63[6]	15.21	0.00	91.42	ND<50	ND<0.5	ND<0.5	ND<0.5	ND<1.5	400	ND<100	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/17-18/07	106.63[6]	17.12	0.00	89.51	650	54	12	10	35	15,000	ND<1,900	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	04/18-21/05	106.63[6]	9.18	0.00	97.45	130	0.8	ND<0.5	2.3	6.1	260	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	01/24-31/05	106.63[6]	11.57	0.00	95.06	94	ND<0.5	ND<0.5	ND<2.0	2.5	ND<250	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	10/28-11/01/04	106.63[6]	14.68	0.00	91.95	26,000	410	63	470	950	280,000	ND<40,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	07/15-16/04	106.63[6]	14.41	0.00	92.22	634	25.7	2.39	6.18	3.55	ND<250	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	04/29-30/04	106.63[6]	13.31	0.00	93.32	81	11	0.9	2.0	1.9	270	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	ND<0.99	----	----
	01/21-23/04	106.63[6]	10.22	0.00	96.41	53	1.2	0.7	1.3	8.9	ND<250	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.2	----	----
	10/01-02/03	106.63[6]	15.05	0.00	91.58	2,300	75	7.3	29	33	1,400	ND<250	----	----	----	----	----	----	----	----	----	----	----	----	4.9	----	----
	06/30-07/01/03	106.63[6]	13.72	0.00	92.91	2,380	53.5	8.72	39.8	43.2	505	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	1.43	----	----
	04/23-24/03	106.63[6]	10.30	0.00	96.33	55.7	ND<0.500	ND<0.500	0.642	2.64	ND<250	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	01/21/03	106.63[6]	10.61	0.00	96.02	126	33.5	0.859	1.28	4.11	ND<250	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	ND<1.00	----	----
	10/17-18/02	106.63[6]	14.44	0.00	92.19	1,380	90.5	8.05	29.2	31.5	988	ND<500	----	----	----	----	----	----	----	----	----	----	----	----	2.23	----	----
	11/1997	104.54[6]	----	----	----	4,400	3,140	1,200	338	2,265	----	----	----	----	----	----	----	----	----	ND<1	ND<1	ND<1	----	----	15.4	----	----
	07/1997	104.54[6]	----	----	----	24,000	4,230	2,490	398	2,732	----	----	----	----	----	----	----	----	----	ND<25	ND<25	ND<50	----	----	47.2	----	----
	04/1997	104.54[6]	----	----	----	11,000	189	243	99	743	----	----	----	----	----	----	----	----	----	ND<1	ND<1	ND<1	----	----	18.2	----	----
	01/1997	104.54[6]	----	----	----	390	31	14	6	49	----	----	----	----	----	----	----	----	----	ND<1	ND<1	ND<1	----	----	11	----	----
	3/26-28/91	104.54[6]	10.21	0.08	94.39	----	19,000	46,000	2,500	120,000	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
	09/1990	104.54[6]	12.72	0.04	91.85	Not sampled due to the presence of LNAPL																					
Groundwater Grab Samples																											
P1-W	05/22/17	----	13.00	----	----	7,100	ND<5	12	5.4	27	110,000ve	3,800 x	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P2-W	05/22/17	----	14.00	----	----	ND<100	ND<1	ND<1	ND<1	ND<3	ND<60	ND<300	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
P3-W	05/22/17	----	13.00	----	----	1,200	ND<5	9.7	8.2	19	1,400	ND<300	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
Off Property Groundwater Grab Samples																											
SS1-P1	12/02/17	----	----	----	----	ND<100	ND<1.0	ND<2.0	ND<1.0	ND<2.0	ND<200	ND<400	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
SS1-P2	12/02/17	----	----	----	----	ND<100	ND<1.0	ND<2.0	ND<1.0	ND<2.0	ND<200	ND<400	----	----	----	----	----	----	----	----	----	----	----	----	----	----	----
MTCA Method A Cleanup Levels for Ground Water						**800/1,000[1]**	**5**	**1,000**	**700**	**1,000**	**500**	**500**	**500**	**500**	**160**	**0.1**	**20**	**0.01**	**5**	**5**	**5**	**NVE**	**Analyte Specific**	**15**	**15**	**5**	**Analyte Specific**
Applicable or Relevant and Appropriate Requirements (ARARs)[2]						**----**	**5**	**1,000**	**700**	**10,000**	**----**	**----**	**----**	**----**	**----**	**----**	**----**	**0.05**	**5**	**5**	**5**	**70**	**Analyte Specific**	**15**	**15**	**10**	**Analyte Specific**

Notes:
Samples collected in 2017 by RGI field staff using a peristaltic pump under low-flow conditions. Groundwater samples collected prior to 2017 were obtained by others.
Unless otherwise noted, all analytical results are given in micrograms per liter (ug/L), equivalent to parts per billion (ppb).
TOC = Top of casing
Gasoline-range TPH (total petroleum hydrocarbons) determined using Northwest Test Method NWTPH-Gx.
Diesel- and Oil-range TPH (total petroleum hydrocarbons) determined using Northwest Test Method NWTPH-Dx.
BTEX (benzene, toluene, ethylbenzene, and xylenes) determined using EPA Test Method 8021B.
Naph. (naphthalene), MTBE (methyl tert-butyl ethere), EDB (1,2-dibromoethane), EDC (1,2-dichloroethane), PCE (tetrachloroethene), TCE (trichloroethene), cis-1,2-DCE (cis-1,2-dichloroethene), and other VOCs (volatile organic compounds) determined using EPA Test Method 8260.
LNAPL = Light non-aqueous phase liquid.
Pb (lead), As (arsenic) and other metals determined using EPA 6000/7000 Series Methods.
ve = The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.
x = The sample chromatographic pattern does not resemble the fuel standard used for quantitation.
j = The analyte was positively identified. The reported value is an estimate.
P = The analyte was detected above the instrument detection limit, but below the established minimum quantitation limit.
ND = Not detected above the noted analytical detection limit.

Table 2, Page 6 of 6. Summary of Groundwater Analytical Laboratory Results for the Property
Roystone Redevelopment
631 Queen Anne Avenue North, Seattle, Washington 98109
The Riley Group, Inc. Project No. 2017-015K

Notes continued:

NVE = No value established

---- = Not analyzed or not applicable.

Silica gel = Samle extract passed through a silica gel column prior to analysis. The silica gel column removes naturally occuring biogenic material that can interfere with TPH results when present.

Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Method A Cleanup Levels for Ground Water (WAC 173-340-900, Table 720-1). Federal and State ARARs obtained from Ecology's Cleanup Level and Risk Calculation (CLARC) database.

ARAR = Applicable or Relevant and Appropriate Requirement. ARARs for the Property are the Federal and State Primary Maximum Contaminant Levels (MCLs) as established under the Environmental Protection Agency (EPA) National Primary Drinking Water Regulations.

[1] The higher cleanup level is applicable if no benzene is detected in groundwater.

[2] No MTCA Method A Cleanup Level has been established. Therefore, the Federal and State ARAR is referenced.

[3] Indicates a duplicate sample was collected. The highest concentration for each analyte was reported.

[4] Laboratory report indicates heavy range organics are due to hydrocarbons primarily in the diesel range.

[5] The reporting limits were raised due to interference in the sample matrix.

[6] Top of casing elevation and groundwater elevation based on arbitrary datum. Not actual elevations.

[7] Only VOCs not factored into the MTCA Method A TPH cleanup levels are reported.

[8] Top of casing elevations for wells MW6, MW9, MW13, VP9, SSI-W1, SSI-W2, and MW10 were surveyed using actual elevation data in December 2018. Reports prepared prior to this time present top of casing elevations based on arbitrary datum.

Bold results indicated concentrations above laboratory detection limits or LNAPL detected in well.

Bold and yellow highlighted results indicate concentrations (if any) that exceed the applicable groundwater screening level.

APPENDIX A

List of Previous Reports

RILEYGROUP

APPENDIX A PREVIOUS REPORTS

The Site was previously enrolled in the VCP and identified as "Texaco Downstream #211577" (VCP No. 211577). Based on RGI's review of the Final Remedial Investigation & Site Summary Report dated August 20, 2007 by SAIC, the following reports are anticipated to be present in the Ecology file for the Texaco Downstream #211577:

1) SAIC, 2007. Final Remedial Investigation and Site Summary Report, August 20.
2) Delta Environmental Consultants (Delta), 2002. *Conceptual Site Model, Risk Assessment, and Supplemental Investigation Proposal, Former Texaco Station No. 211577, 631 Queen Anne Avenue North, Seattle, Washington*, August 21.
3) Delta, 2003. *Agency Draft, Remedial Investigation Report, Former Texaco Service Station No.211577, 631 Queen Anne Avenue North, Seattle, Washington,* March 3.
4) Ecology & Environment (E&E), 1990. *Monterey Apartments Site - Soil-Gas Pilot Study Summary,* September 11.
5) E&E, 1991. *Monterey Apartments Site, Phase 1 Remedial Investigation Work Plan.* January 14.
6) E&E, 1991. *Phase 1 Remedial Investigation Sampling and Analysis Plan,* March 4.
7) E&E, 1991. *Trip Report, Manhattan Express Tank Integrity Testing – Monterey Apartments Phase I Remedial Investigation*, April 23.
8) E&E, 1991. *Final Phase 1 Remedial Investigation,* May 15.
9) E&E, 1991. *Phase 1 Remedial Investigation Report, Monterey Apartments, Seattle Washington,* August.
10) Farallon Consulting (Farallon), 2000. *December 1999 Groundwater Sampling Analytical Results, Queen Anne Texaco, Seattle, Washington*, January 11.
11) Farallon, 2000. *Scope of Work, Queen Anne Texaco, Seattle, Washington.* February 8.
12) Farallon, 2000. *Pilot Test Summary Report, Queen Anne Texaco, Seattle, Washington,* July 19.
13) Farallon 2000. *December 1999 and June 2000 Groundwater Summary Report, Queen Anne Texaco, Seattle, Washington,* July 21.
14) Farallon, 2000. *Draft Work Plan, Additional Site Investigation, Queen Anne Texaco, Seattle, Washington*, November 30.
15) Farallon, 2001. *Draft Work Plan, Site Investigation, Queen Anne Texaco, Seattle, Washington,* January.
16) Science Applications International Corporation (SAIC), 1993. *Baseline Groundwater Monitoring Report, Monterey Apartments.*
17) SAIC, 1993. *Work Assignment #60 – Monterey Apartments, Seattle Task II - Construction Oversight Weekly Report, 17-21 May 1993,* May 23.
18) SAIC, 1993. *Work Assignment #60 - Monterey Apartments, Seattle Task II - Construction Oversight Weekly Report, 24-28 May 1993,* June 7.
19) SAIC, 1993. *Work Assignment #60 – Monterey Apartments, Seattle Task II - Construction Oversight Weekly Report, 1-4 June 1993,* June 17.
20) SAIC, 1993. *Work Assignment #60 – Monterey Apartments, Seattle Task II - Construction Oversight Weekly Report, 14-18 June 1993,* June 22.
21) SAIC, 1993. *Work Assignment #60 – Monterey Apartments, Seattle Task II - Construction*

Oversight Weekly Report, 21-25 June 1993, June 30.
22) SAIC, 1993. Work Assignment #60 - Monterey Apartments, Seattle Task II - Construction
23) Oversight Weekly Report, 28-30 June 1993, July 8.
24) SAIC, 2006a. Remediation System Startup and First Quarter 2006 Operations Report, Former Texaco Service Station No. 211577, 631 Queen Anne Avenue North, Seattle, Washington, May 19.
25) SAIC, 2006b. DPE Remediation System, Second Quarter 2006 Operations Report, Former Texaco Service Station No. 211577, 631 Queen Anne Avenue North, Seattle, Washington, August 30.
26) SAIC, 2007a. DPE Remediation System, Third Quarter 2006 Operations Report, Former Texaco Service Station No. 211577, 631 Queen Anne Avenue North, Seattle, Washington, January 8.
27) SAIC, 2007b. DPE Remediation System, Fourth Quarter 2006 Operations Report, Former
28) Texaco Service Station No. 211577, 631 Queen Anne Avenue North, Seattle, Washington, March 8.
29) Texaco Inc., September 2000, Background Investigation Report.
30) Washington State Department of Ecology (WDOE), 1989. Monterey Apartments, Internal
31) Report, March
32) WDOE, 1989. Request for Proposal to Provide Technical Services at the Monterey Apartments, Queen Anne District, March 17.
33) WDOE Letter, 1991. Re: Underground Storage Tank (UST) Compliance Schedule, July 8.
34) WDOE, 1998. Monterey Apartments Ground Water Monitoring, October 1995 – November, 1997, May.

APPENDIX B

Geophysical Investigation Report

RILEYGROUP

GEOPHYSICAL INVESTIGATION REPORT

631 QUEEN ANNE AVENUE NORTH SITE
SEATTLE, WASHINGTON

FOR

THE RILEY GROUP, INC.
BOTHELL, WASHINGTON

MARCH 6, 2019

PHILIP H. DUOOS
GEOPHYSICAL CONSULTANT

Philip H. Duoos **Geophysical Consultant**

March 6, 2019 Our Ref.: 1322-19

Mr. Jerry Sawetz
The Riley Group, Inc.
17522 Bothell Way NE
Bothell, WA 98011

REVISED REPORT: Geophysical Investigation
631 Queen Anne Avenue North Site
Seattle, Washington

Dear Mr. Sawetz:

This letter report summarizes the results of the investigation that I performed on February 18. The primary purpose of the investigation was to locate possible underground storage tanks (USTs) and perhaps fuel lines associated with the USTs as well as other utilities. A comprehensive utility locating survey was beyond the scope of work.

The survey area was investigated using electromagnetic (EM-61) and ground penetrating radar (GPR) techniques. A brief description of the methods is attached.

The large UST (UST 6B) is interpreted to remain in place. The survey did not identify any other USTs. However, the potential exists for USTs 1 and 2 to be present as they may not have been detected due to the fact that they are constructed of concrete. If these USTs were abandoned in place and filled with some material such as sand or cement, disturbed soils due to the sidewalk and electrical utility construction would have the potential to mask the small concrete tanks. Numerous linear features were interpreted from the data and may be pipes or utilities.

INTERPRETATION RESULTS

Figure 1 is a sketch map which shows the interpretation results as well as various reference features including the building, sidewalk, visible utility features, monitoring wells and changes in the asphalt parking lot such as the edge of a probable large patch as well as cracks in the asphalt.

The results of the survey indicate the location of a large probable UST which is probably the 8,000 gallon UST labelled 6B on your site map (**Figure 3**). The approximate depth to the top of the UST is estimated at six feet deep. This is approximate and based on the GPR data. This location also has a large EM anomaly which correlates to the metal construction of the UST. The delineation of this UST using the GPR is more difficult because the UST has been filled with material. Care should be taken in excavating or construction until the exact depth and dimensions of the UST are determined.

The electrical power lines running between the various electrical vaults and power poles were interpreted from the GPR data. These locations correlate fairly well with the existing marks on the ground made by others. Below the east sidewalk there are two power lines that are parallel to each other and run north-south. The GPR loses the target for the eastern power line to the north, and it may bend to the west and combine with the deeper powerline. In this area there are marks for the powerline that run midway between the two interpreted locations.

Two probable pipes or utilities are shown by the pink dashed lines running east-west along about Line 35N and along Line 12N. Possible pipes/utilities are shown that connect strong GPR targets of similar depths. These features are less distinct and are often over fairly short distances. They may indicate former buried foundations or other linear features; or they may just be random objects of fill material (cobbles, debris, etc.) that just seem to form a linear pattern. This area contains numerous PVC pipes used for the remediation of the site, and I imagine that many of these interpreted possible pipes are related to that system. The pink open circles indicate discreet GPR targets of moderate strength and may indicate a small object.

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PH/FAX: (425) 882-2634 **Email: geopyg@aol.com**

Near the east edge of the asphalt parking lot, and below the sidewalk just to the east, there are two zones with shallow GPR reflections indicating a flat surface (blue shaded areas). When I first observed these reflections in the field data I thought they might indicate the tops of the flat, rectangular concrete tanks (USTs, #1 and #2). However, these reflections are only about 1 foot to 1.5 feet to the tops of the layers, and the large zone in the parking lot is in an area that has been excavated. This shallow layer is also above the interpreted location of the large UST.

These layer reflections may be related to a change in soil conditions such as increased moisture and/or finer grained materials. It may be related to activities related to abandoning the USTs in place – in which case the smaller zone below the sidewalk may give some indication of the location of the two concrete tanks. The small concrete tanks were not interpreted from the data. The EM method only detects metal objects, and the GPR method often cannot delineate a buried concrete slab with soil above and below it. The shallow soils have been disturbed by the numerous utilities and the sidewalk reconfiguration making it impossible to recognize disturbed soil layers associated with the small tanks.

The EM-61 data (**Figure 2**) responds to nearby metal. The data is complicated by buildings, utility vaults and poles, monitoring well covers and other features. The high values near coordinate 25E, 25N are interpreted to be caused by the large metal UST. Higher EM values also seem to correlate with the possible pipe/utility running north along about Line 15E near the south end of the survey area.

METHODOLOGY

The geophysical surveys were referenced to numerous reference baselines that were marked at 5-foot intervals using tape measures and pink spray paint. Line 30E runs along the east edge of the asphalt parking lot, with Station 0 North located at the NE corner of the building.

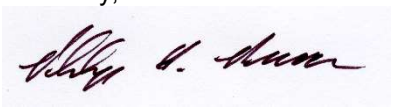
The electromagnetic survey was performed using a Geonics EM-61 High Resolution Metal Detector with data digitally recorded and downloaded to a laptop computer. EM-61 data were recorded at approximate 1-foot intervals along each survey line. EM-61 survey lines were spaced 5 feet apart and oriented in two directions over most of the site.

GPR data were obtained using a GSSI SIR 3000 Digital Radar with a 400 MHz antenna along lines spaced 5 feet apart and oriented in two directions (north-south and east-west) over the entire site. Over the vicinity of the suspected small concrete tanks, GPR lines were spaced 2.5 feet apart and oriented in two directions. The GPR obtained depths of penetration of about six to seven feet over most of the site.

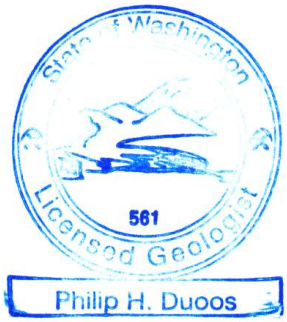
The use of these techniques provided a rapid and non-intrusive means of investigating the area of interest for possible USTs and utilities. However, because of the numerous variables involved in geophysical investigations, there is a possibility that some features may not have been detected. Only direct observations using test pits or other means can ultimately characterize subsurface conditions.

Please contact me if you have any questions or comments regarding this information, or if you require further assistance. I appreciated the opportunity to work with you on this project and look forward to providing you with geophysical services in the future.

Sincerely,



Philip H. Duoos
Geophysical Consultant



Attachments:

Description of Methods
Figure 1: Interpretation Results Map
Figure 2: EM-61 Data Contour Map
Figure 3: Historical Property Features Map (Riley)

DESCRIPTION OF METHODS

ELECTROMAGNETICS (EM-61)

The EM-61 is a high-resolution metal detector that can detect both ferrous and non-ferrous metallic objects. It is a rapid, wheel-mounted system requiring one operator, and digitally records data at a high density (usually at 1-foot intervals or less along a survey line).

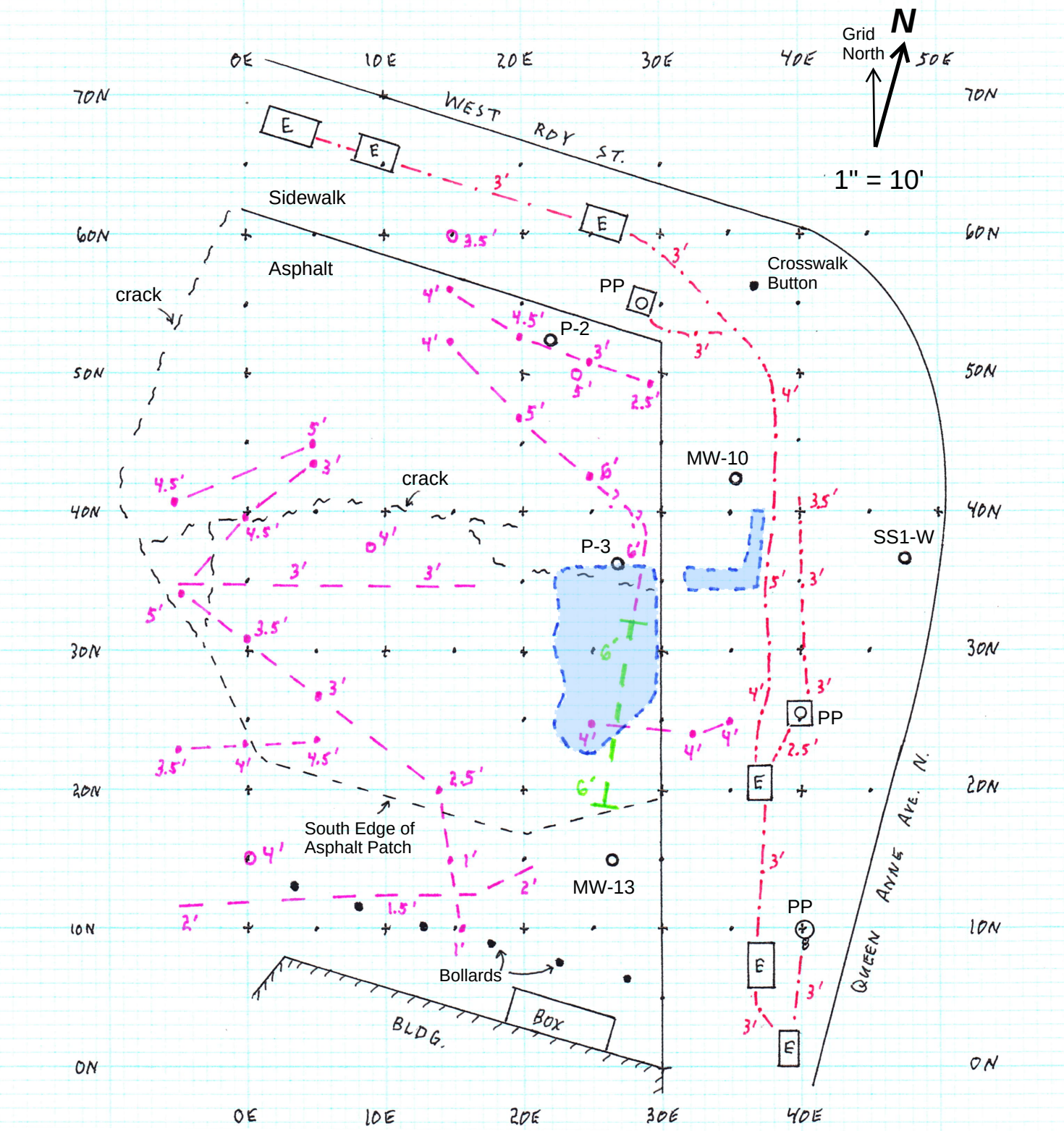
The EM-61 utilizes time-domain EM theory, and uses a pulsed primary magnetic field to induce EM currents in metallic objects below the instrument. The decay of these currents over time is measured by two receiver coils, and digitally recorded for further processing. The relative response of the anomalies on the two coils can often be evaluated to provide a depth estimate of the buried metal. The EM-61 can detect a 55-gallon drums at depths of over 5 feet, and will also respond to small shallow objects only inches in diameter.

The EM-61 is not affected by changes in subsurface conductivity due to soil and moisture conditions. It is also less sensitive than other methods to surface metal such as buildings, fences, and vehicles as it is focused to detect objects directly below (and above) the receiver coils. However, this also requires that spacing between survey lines should be small to provide adequate coverage.

GROUND PENETRATING RADAR

Some of the uses of GPR include locating buried tanks and drums, delineating boundaries of landfills and trenches, and defining voids and geologic stratigraphy. Although other techniques can also provide this information, GPR is less affected by cultural interferences such as overhead powerlines, buildings, and fences. GPR can also provide higher resolution of the target in many cases. A variety of antennas can be used depending on subsurface conditions and the objective of the survey. Resolution of shallow objects requires higher frequencies, while lower frequencies work better for deeper investigations.

Several factors can affect the effectiveness of the GPR method including reinforced concrete at the surface, the presence of highly conductive materials (such as clays and water), the size, depth, and physical property of the target and; in stratigraphic investigations, the conductivity contrast between stratigraphic units. The presence of numerous buried objects may mask objects and/or stratigraphy below.



Centerline of Probable UST	
Electrical Utility	
Probable Pipe/ Utility	
Possible Pipe/ Utility	
Strong GPR Target	
Moderate GPR Target	
Shallow, Flat GPR Layer (1 foot to top)	

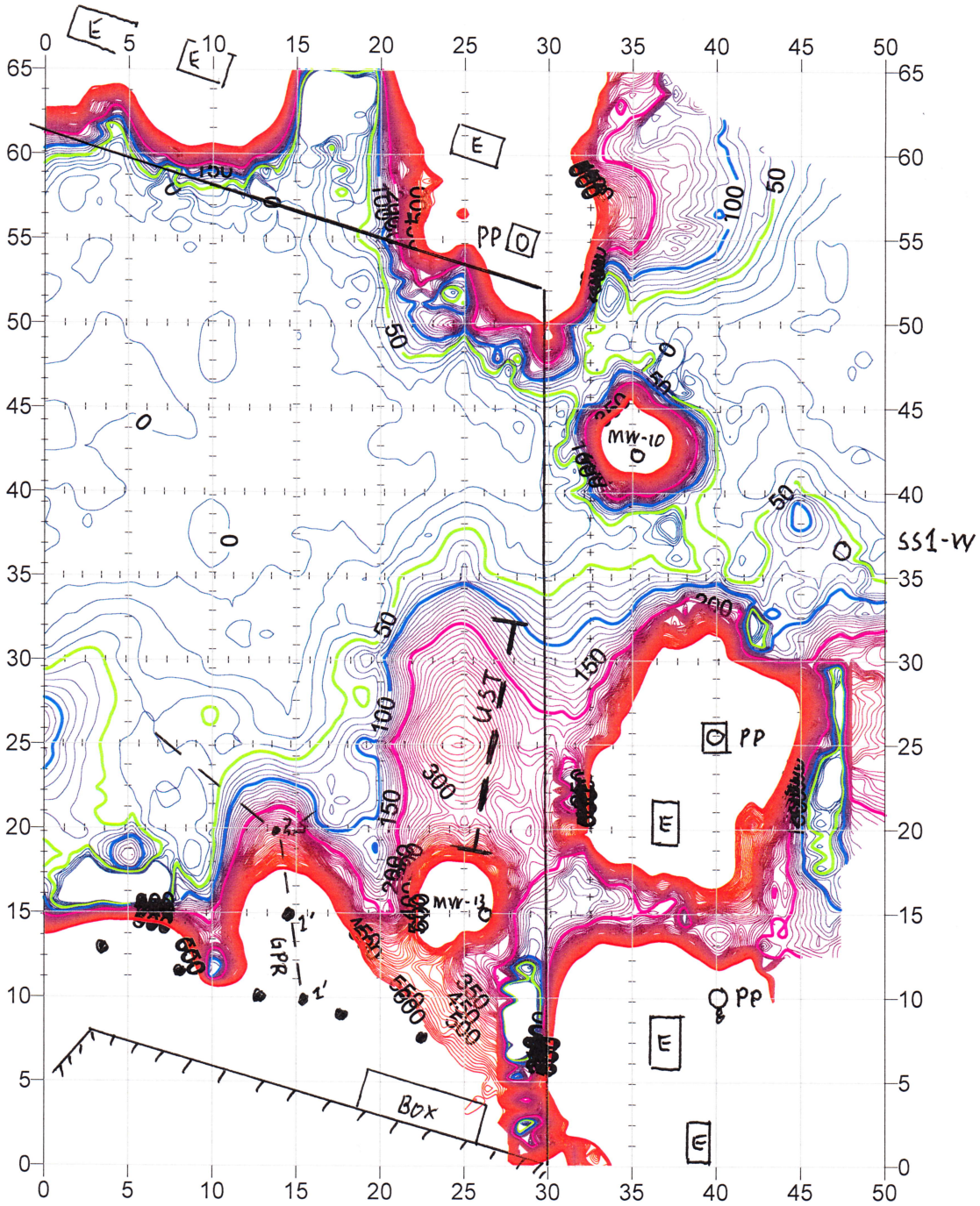
Depths (ft.) shown to tops of features.

INTERPRETATION RESULTS MAP

631 Queen Anne Avenue North Site
Seattle, Washington

P. Duoos, Geophysical Consultant
March 6, 2019 PN 1322-19

Fig. 1



Data Range: 0 - 600 ppt
Contour Interval: 10 ppt

Grid North

1 inch = 10 feet

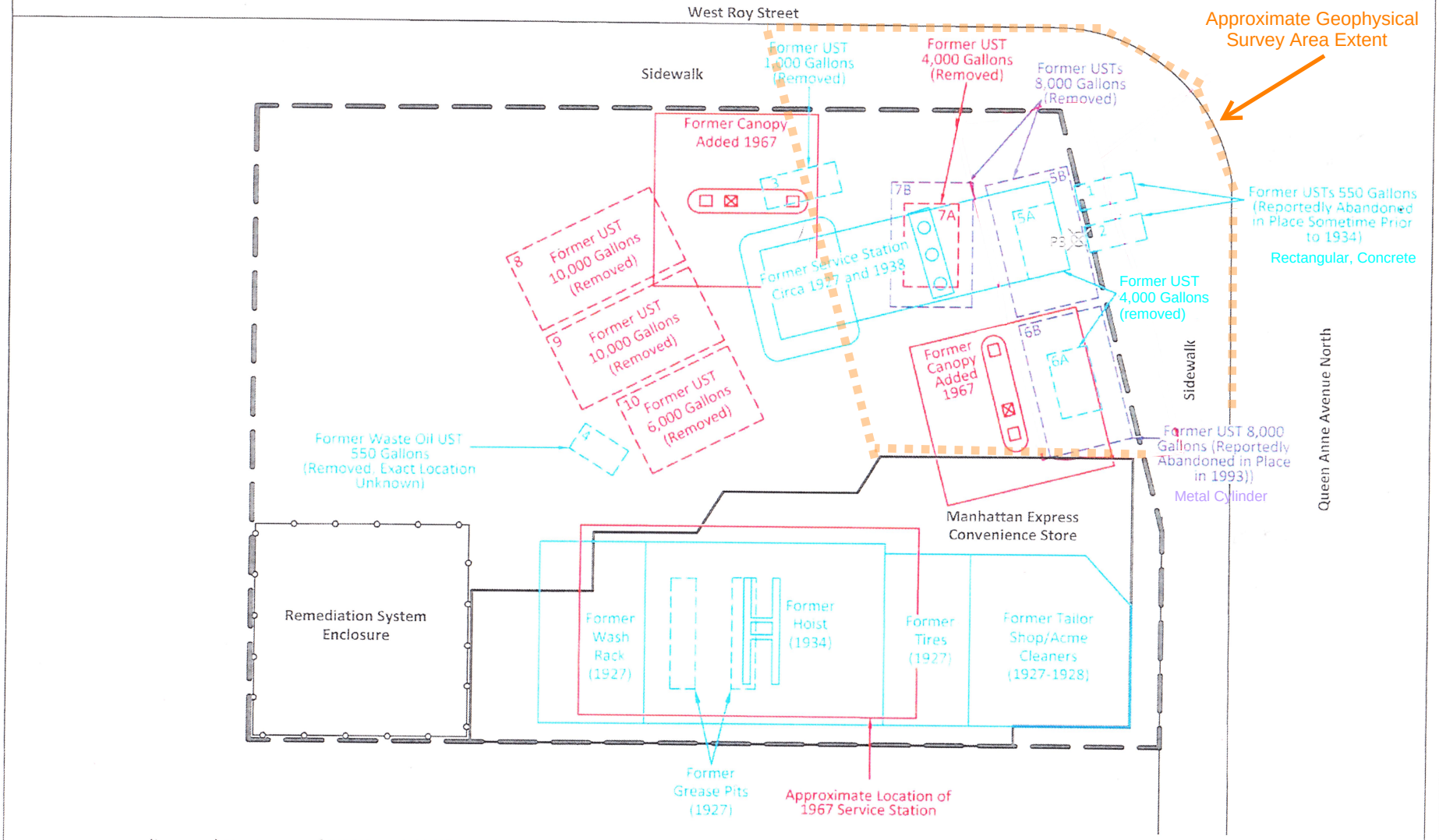
EM-61 DATA CONTOUR MAP

631 Queen Anne Ave. North Site
Seattle, Washington

PN 1322-19, March 6, 2019

FIG. 2

Philip H. Duoos, Geophysical Consultant



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Roystone on Queen Anne		Figure 3
RGI Project Number 2017-015E	Historical Property Features	Date Drawn: 11/2018
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		

APPENDIX C

Borelogs & Monitoring Well Construction Logs

RILEYGROUP

Project Name: **Arnold's/Former Texaco Service Station No. 211577**	Test Probe/Well No.: **SSI-W1**
Project Number: **2017-015D**	**Sheet 1 of 1**
Client: **Vibrant Cities**	

RILEYGROUP

Date(s) Drilled: **12/02/17**	Logged By: **LC**	Surface Conditions: **Concrete**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **3.25" Diameter**	Total Depth of Borehole: **21 feet bgs**
Drill Rig Type: **Geoprobe**	Drilling Contractor: **RGI**	Approximate Surface Elevation (feet amsl): **115'**
Groundwater Level: **10.75' on 12/06/17**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North,Seattle, Washington 98109**	

Elevation (feet)	Depth (feet)	Sample Type	Sample ID	Sampling Resistance, blows/ft	PID Reading, ppm	Recovery (%)	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Well Log	REMARKS AND OTHER TESTS
	0						Concrete		Concrete		Concrete 0 - 1
							SM		Brown, silty SAND to SAND with some silt, medium dense, damp (fill)		Blank 1.5" PVC 0 - 10
											Bentonite 1 - 3
							ML		Gray, SILT with trace sand and gravel, stiff, damp		
	5										
			SS1-W1-6		0.0	50%					
							SP-SM		Light brown to blue-gray, SAND with some silt and trace gravel to silty SAND with some gravel, dense, moist to wet, hydrocarbon odor		
	10	▼									Prepack Slotted 1.5" PVC 10 - 20
	15		SS1-W1-15		0.1	95%					
			SSW-W1-18		0.0	90%	CL		Light brown to blue-gray, silty CLAY with some gravel and trace sand, very stiff, damp		
	20								No gravel or sand		
			SS1-W1-21		0.0	100%					
									Boring terminated 21 feet bgs		

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Project Name: **Arnold's/Former Texaco Service Station No. 211577**	Test Probe/Well No.: **SSI-W2**
Project Number: **2017-015D**	**Sheet 1 of 1**
Client: **Vibrant Cities**	RILEYGROUP

Date(s) Drilled: **12/02/17**	Logged By: **LC**	Surface Conditions: **Concrete**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **3.25" Diameter**	Total Depth of Borehole: **22 feet bgs**
Drill Rig Type: **Geoprobe**	Drilling Contractor: **RGI**	Approximate Surface Elevation (feet amsl): **114'**
Groundwater Level: **13.65' on 12/06/17**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North,Seattle, Washington 98109**	

Elevation (feet)	Depth (feet)	Sample Type	Sample ID	Sampling Resistance, blows/ft	PID Reading, ppm	Recovery (%)	USCS Symbol	Graphic Log	MATERIAL DESCRIPTION	Well Log	REMARKS AND OTHER TESTS
	0						Concrete		Concrete		Concrete 0 - 1
							SM		Brown, silty SAND to SAND with some silt, medium dense, damp (fill)		Blank 1.5" PVC 0 - 12
											Bentonite 1 - 3
							ML		Black to brown, sandy SILT with trace gravel, very stiff, damp		
	5										
							SM		Light brown to gray, SAND with some silt, soft to medium dense, wet, hydrocarbon odor		
			SS1-W2-9		0.0	70%			Trace gravel and silt 8' - 10'		
	10										
			SS1-W2-12.5		51.8	100%	ML		Sandy SILT and CLAY, stiff		Prepack Slotted 1.5" PVC 12 - 22
							SM		Light brown to gray, SAND with some silt, soft to medium dense, wet, hydrocarbon odor		
	15		SSW-W2-16		0.0	100%			Trace silt		
									Silty with trace gravel		
			SS1-W2-19.5		0.0	100%	CL		Light brown to gray, silty CLAY with trace sand, very stiff, wet		
	20										
									Boring terminated 22 feet bgs		

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015D**
Client: **Vibrant Cities**

RILEYGROUP

Test Probe No.: SSI-P1

Sheet 1 of 1

Date(s) Drilled: **12/02/17**	Logged By: **LC**	Surface Conditions: **Concrete**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **3.25" Diameter**	Total Depth of Borehole: **23 feet bgs**
Drill Rig Type: **Geoprobe**	Drilling Contractor: **RGI**	Approximate Surface Elevation: **114.5'**
Groundwater Level: **12.37' on 12/3**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North, Seattle, Washington 98109**	

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION
					0	Concrete
						Light brown to gray, silty SAND with trace gravel, medium dense, damp to moist
						Light brown to gray, sandy SILT with trace gravel, medium dense, damp to moist
0.0	SSI-P1-5		60%		5	Light brown to gray, SILT with trace gravel, medium dense, damp to moist
0.0	SSI-P1-9		60%		10	Less gravel
0.0	SSI-P1-14		100%	▼		Light brown to gray, SAND with trace to some silt, medium dense, wet
1.0	SSI-P1-17		66%		15	
0.0	SSI-P1-19		100%			Silty sand
0.0	SSI-P1-19.5		100%		20	Gray, silty CLAY, very stiff, damp
						Boring terminated 23 feet bgs
					25	

Graphic Log

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Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015D**
Client: **Vibrant Cities**

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Test Probe No.: SSI-P2

Sheet 1 of 1

Date(s) Drilled: **12/02/17**	Logged By: **LC**	Surface Conditions: **Concrete**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **3.25" Diameter**	Total Depth of Borehole: **22 feet bgs**
Drill Rig Type: **Geoprobe**	Drilling Contractor: **RGI**	Approximate Surface Elevation: **114**
Groundwater Level: **19.17' on 12/2**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North, Seattle, Washington 98109**	

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
					0	Concrete	
						Light brown to gray, silty SAND with trace gravel and some silt, medium dense, damp, hydrocarbon odor	
					5		
0.0	SSI-P2-7.5		50%				
						Light brown to gray, gravelly SAND with some silt, medium dense, damp	
0.0	SSI-P2-10		75%		10	Wet, loose	
0.0	SSI-P2-15		100%		15	Light brown/black, medium to coarse SAND, medium dense, wet, hydrocarbon odor	
0.0	SSI-P2-15.5		100%			Light brown, SILT with trace sand, very stiff, damp, hydrocarbon odor	
0.0	SSI-P2-18		100%			Gray, silty CLAY, very stiff, damp	
				▽	20		
						Boring terminated 22 feet bgs	
					25		

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Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015D**
Client: **Vibrant Cities**

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Test Probe No.: SSI-P3

Sheet 1 of 2

Date(s) Drilled: **12/04/17**	Logged By: **LC**	Surface Conditions: **Asphalt**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **3.25" Diameter**	Total Depth of Borehole: **35 feet bgs**
Drill Rig Type: **Geoprobe**	Drilling Contractor: **RGI**	Approximate Surface Elevation: **113.5'**
Groundwater Level: **Not measured**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North, Seattle, Washington 98109**	

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
					0	Asphalt	
						Fill	
						Light brown to gray, silty SAND to sandy SILT with some gravel, dense, damp, hydrocarbon odor	
0.1	SSI-P3-5		60%		5	Light brown to gray, silty SAND to SAND with trace silt and gravel, dense, damp, hydrocarbon odor	
0.1	SSI-P3-10		80%		10		
2.3	SSI-P3-12		100%			Light brown to gray, SAND with trace silt and gravel, soft, wet, hydrocarbon odor	
0.1	SSI-P3-17		100%		15		
						Less gravel	
					20	Some gravel	
69.7	SSI-P3-22		90%			Slight sheen potentially related to groundwater contamination	
					25		

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015D**
Client: **Vibrant Cities**

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Test Probe No.: SSI-P3

Sheet 2 of 2

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
0.1	SSI-P3-27		100%		25		
						Gray, CLAY with trace sand, stiff, damp	
					30		
0.1	SSI-P3-31		100%			Very stiff, no odor	
0.1	SSI-P3-34		100%				
0.1	SSI-P3-35		100%		35	Refusal at 35 feet bgs	
					40		
					45		
					50		
					55		
					60		

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015D**
Client: **Vibrant Cities**

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Test Probe No.: SSI-P4

Sheet 1 of 2

Date(s) Drilled: **12/04/17**	Logged By: **LC**	Surface Conditions: **Asphalt**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **3.25" Diameter**	Total Depth of Borehole: **37 feet bgs**
Drill Rig Type: **Geoprobe**	Drilling Contractor: **RGI**	Approximate Surface Elevation: **113'**
Groundwater Level: **Not measured**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North, Seattle, Washington 98109**	

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
					0	Asphalt	
						Light to medium brown/black, sandy SILT, medium stiff, damp, hydrocarbon odor	
						SAND	
						Light to medium brown/black, sandy SILT, medium stiff, damp, hydrocarbon odor	
0.0	SSI-P4-5		60%		5	Light brown to black, silty SAND, medium dense, damp, odor	
						Gravelly, asphaltic lens	
0.0	SSI-P4-7		100%			Light brown to black, silty SAND, medium dense, damp, odor	
0.0	SSI-P4-7.5		66%			Light brown to brick red to black, sandy SILT, medium stiff, damp to moist	
						Light brown, SAND with some silt and trace sand, medium dense, damp, odor	
0.0	SSI-P4-10		66%		10	Light brown to gray, sandy SILT to silty SAND with trace gravel, medium stiff, dense, no odor	
0.0	SSI-P4-11		50%				
3.4	SSI-P4-14		100%			Light brown to dark gray, SAND with trace to some silt, loose to medium dense, wet, hydrocarbon odor	
					15	Trace gravel	
19	SSI-P4-17		100%				
0.2	SSI-P4-18		100%			Strong sheen 18' to 23' bgs. Hydrocarbon odor to 28' bgs	
17.5	SSI-P4-19		100%		20		
27.4	SSI-P4-22		100%		25		

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015D**
Client: **Vibrant Cities**

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Test Probe No.: SSI-P4

Sheet 2 of 2

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
0.1	SSI-P4-27		100%		25		
						Light brown, sandy SILT, medium stiff, damp, slight hydrocarbon odor	
0.1	SSI-P4-30		100%		30	Gray, CLAY with trace to no sand, very stiff, damp, no odor	
0.1	SSI-P4-35		100%		35		
0.1	SSI-P4-37		100%			Refusal at 37 feet bgs	
					40		
					45		
					50		
					55		
					60		

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015D**
Client: **Vibrant Cities**

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Test Probe No.: SSI-P5

Sheet 1 of 2

Date(s) Drilled: **12/04/17**	Logged By: **LC**	Surface Conditions: **Asphalt**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **3.25" Diameter**	Total Depth of Borehole: **31 feet bgs**
Drill Rig Type: **Geoprobe**	Drilling Contractor: **RGI**	Approximate Surface Elevation: **113'**
Groundwater Level: **Not encountered**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North, Seattle, Washington 98109**	

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
					0	Asphalt	
						Light to medium brown/gray to black, silty SAND with some gravel, medium dense, damp (fill)	
0.1	SSI-P5-8		50%		5		
815	SSI-P5-12.5		95%		10	Light brown to gray, medium SAND with trace silt and gravel, medium dense, moist, strong hydrocarbon odor, strong sheen 10' to 20' bgs	
195	SSI-P5-17		100%		15	Loose, damp	
145	SSI-P5-20		100%		20		
5.2	SSI-P5-23		100%			Gray, CLAY, very stiff, damp, no odor	
					25		

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015D**
Client: **Vibrant Cities**

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Test Probe No.: **SSI-P5**
Sheet 2 of 2

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
					25	Gray, CLAY, very stiff, damp, no odor	
0.2	SSI-P5-28		100%				
					30		
0.1	SSI-P5-31					Refusal at 31 feet bgs	
					35		
					40		
					45		
					50		
					55		
					60		

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015C**
Client: **Vibrant Cities**

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Test Probe No.: P1

Sheet 1 of 1

Date(s) Drilled: **05/22/17**	Logged By: **SL**	Surface Conditions: **Asphalt**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **2" Probe**	Total Depth of Borehole: **20 feet bgs**
Drill Rig Type: **Truck-Mounted**	Drilling Contractor: **Holocene**	Approximate Surface Elevation: **114'**
Groundwater Level: **13' bgs**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North, Seattle, Washington 98109**	

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
					0	Asphalt	
			75			Grayish brown, silty SAND, dense, moist, no odor, no sheen	
0.051	P1-5				5		
			80				
0.029	P1-10				10		
31	P1-13		70	▽		Gray, silty SAND, dense, wet, strong odor, sheen	
					15		
			70				
33	P1-20				20	Boring terminated 20 feet bgs	
					25		

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Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015C**
Client: **Vibrant Cities**

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Test Probe No.: P2

Sheet 1 of 1

Date(s) Drilled: **05/22/17**	Logged By: **SL**	Surface Conditions: **Asphalt**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **2" Probe**	Total Depth of Borehole: **20 feet bgs**
Drill Rig Type: **Truck-Mounted**	Drilling Contractor: **Holocene**	Approximate Surface Elevation: **114.5'**
Groundwater Level: **14' bgs**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North, Seattle, Washington 98109**	

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
					0	Asphalt	
			70			Grayish brown, silty SAND, dense, moist, strong odor, slight sheen	
42	P2-4						
			85		5		
41	P2-7.5						
						Compact density fill (CDF) or concrete	
						Brown, silty SAND, dense, moist, slight odor, slight sheen	
			75		10		
25	P2-14			▽			
						Gray, silty SAND, dense, moist, strong odor, sheen	
0.021	P2-17		90		15		
0.031	P2-20				20	Boring terminated 20 feet bgs	
					25		

The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015C**
Client: **Vibrant Cities**

RILEYGROUP

Test Probe No.: P3

Sheet 1 of 1

Date(s) Drilled: **05/22/17**	Logged By: **SL**	Surface Conditions: **Asphalt**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **2" Probe**	Total Depth of Borehole: **20 feet bgs**
Drill Rig Type: **Truck-Mounted**	Drilling Contractor: **Holocene**	Approximate Surface Elevation: **114'**
Groundwater Level: **13' bgs**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North, Seattle, Washington 98109**	

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
					0	Asphalt	
			60			Brown, silty SAND, medium dense, moist, no odor, no sheen	
7.032	P3-5				5	Gray, silty SAND, medium dense, moist, strong odor, slight sheen	
			85				
0.15	P3-8					Brown, silty SAND, moist, no odor, no sheen	
					10		
			75				
30	P3-13			▽		Gray, silty SAND, medium dense, odor, slight sheen	
						Wet	
					15		
						No odor	
			90				
25	P3-20				20	Boring terminated 20 feet bgs	
					25		

The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015C**
Client: **Vibrant Cities**

RILEYGROUP

Test Probe No.: P4

Sheet 1 of 1

Date(s) Drilled: **05/22/17**	Logged By: **SL**	Surface Conditions: **Concrete**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **2" Probe**	Total Depth of Borehole: **5.5 feet bgs**
Drill Rig Type: **Track-Mounted, Limited Access**	Drilling Contractor: **Holocene**	Approximate Surface Elevation: **114'**
Groundwater Level: **Not Encountered**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North, Seattle, Washington 98109**	

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
					0	Concrete	
			80			Light brown, silty SAND, medium dense, moist, no odor, no sheen	
0.013	P4-2						
			80				
0.01	P4-4						
			70		5		
0.01	P4-5.5					Boring refusal at 5.5 feet bgs	
					10		
					15		
					20		
					25		

The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015C**
Client: **Vibrant Cities**

RILEYGROUP

Test Probe No.: P5

Sheet 1 of 1

Date(s) Drilled: **05/22/17**	Logged By: **SL**	Surface Conditions: **Concrete**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **2" Probe**	Total Depth of Borehole: **6 feet bgs**
Drill Rig Type: **Track-Mounted, Limited Access**	Drilling Contractor: **Holocene**	Approximate Surface Elevation: **114'**
Groundwater Level: **Not Encountered**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North, Seattle, Washington 98109**	

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
					0	Concrete	
			80			Light brown, silty SAND, dense, moist, no odor, no sheen	
0.013	P5-2						
			45				
0.011	P5-4						
			0		5		
						Boring refusal at 6 feet bgs	
					10		
					15		
					20		
					25		

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015C**
Client: **Vibrant Cities**

RILEYGROUP

Test Probe No.: P6

Sheet 1 of 1

Date(s) Drilled: **05/22/17**	Logged By: **SL**	Surface Conditions: **Concrete**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **2" Probe**	Total Depth of Borehole: **4 feet bgs**
Drill Rig Type: **Track-Mounted, Limited Access**	Drilling Contractor: **Holocene**	Approximate Surface Elevation: **114'**
Groundwater Level: **Not Encountered**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North, Seattle, Washington 98109**	

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
					0	Concrete	
0.021	P6-1		80			Light brown, silty SAND with gravel, dense, moist, no odor, no sheen	
0.017	P6-4		75			Boring refusal at 4 feet bgs	
					5		
					10		
					15		
					20		
					25		

The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015C**
Client: **Vibrant Cities**

RILEYGROUP

Test Probe No.: P7

Sheet 1 of 1

Date(s) Drilled: **05/22/17**	Logged By: **SL**	Surface Conditions: **Concrete**
Drilling Method(s): **Direct Push**	Drill Bit Size/Type: **2" Probe**	Total Depth of Borehole: **6 feet bgs**
Drill Rig Type: **Track-Mounted, Limited Access**	Drilling Contractor: **Holocene**	Approximate Surface Elevation: **114'**
Groundwater Level: **Not Encountered**	Sampling Method(s): **Continuous**	Hammer Data : **n/a**
Borehole Backfill: **Bentonite**	Location: **631 Queen Anne Avenue North, Seattle, Washington 98109**	

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
					0	Concrete	
			80			Light brown, silty SAND, dense, moist, no odor, no sheen	
0.009	P7-2						
			75				
0.010	P7-4				5		
			70				
0.011	P7-6					Boring refusal at 6 feet bgs	
					10		
					15		
					20		
					25		

The Riley Group, Inc.
17522 Bothell Way NE, Bothell, WA 98011

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015D**
Client: **Vibrant Cities**

RILEYGROUP

Boring Log Key

Sheet 1 of 1

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
1	2	3	4	5	6	7	8

COLUMN DESCRIPTIONS

1. PID Reading, ppm: The reading from a photo-ionization detector, in parts per million.
2. Sample ID: Sample identification number.
3. Sample Type: Type of soil sample collected at the depth interval shown.
4. % Recovery: % Recoverysquare foot.
5. GW Depth: Groundwater depth in feet below the ground surface.
6. Depth (feet): Depth in feet below the ground surface.
7. MATERIAL DESCRIPTION: Description of material encountered. May include consistency, moisture, color, and other descriptive text.
8. Graphic Log: Graphic depiction of the subsurface material encountered.

FIELD AND LABORATORY TEST ABBREVIATIONS

CHEM: Chemical tests to assess corrosivity
COMP: Compaction test
CONS: One-dimensional consolidation test
LL: Liquid Limit, percent
PI: Plasticity Index, percent
SA: Sieve analysis (percent passing No. 200 Sieve)
UC: Unconfined compressive strength test, Qu, in ksf
WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

- Asphaltic Concrete (AC)
- Lean CLAY, CLAY w/SAND, SANDY CLAY (CL)
- Portland Cement Concrete
- AF
- Poorly graded GRAVEL (GP)
- SILT, SILT w/SAND, SANDY SILT (ML)
- Silty SAND (SM)
- Silty SAND to Sandy SILT (SM-ML)
- Poorly graded SAND (SP)
- Poorly graded SAND with Silt (SP-SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

- Auger sampler
- Bulk Sample
- 3-inch-OD California w/ brass rings
- CME Sampler
- Grab Sample
- 2.5-inch-OD Modified California w/ brass liners
- Pitcher Sample
- 2-inch-OD unlined split spoon (SPT)
- Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

- Water level (at time of drilling, ATD)
- Water level (after waiting)
- Minor change in material properties within a stratum
- Inferred/gradational contact between strata
- Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

Project Name: **Arnold's/Former Texaco Service Station No. 211577**
Project Number: **2017-015C**
Client: **Vibrant Cities**

RILEYGROUP

Boring Log Key

Sheet 1 of 1

PID Reading, ppm	Sample ID	Sample Type	% Recovery	GW Depth	Depth (feet)	MATERIAL DESCRIPTION	Graphic Log
1	2	3	4	5	6	7	8

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WA: Wash sieve (percent passing No. 200 Sieve)

MATERIAL GRAPHIC SYMBOLS

Asphaltic Concrete (AC)

Portland Cement Concrete

Silty SAND (SM)

TYPICAL SAMPLER GRAPHIC SYMBOLS

Auger sampler

Bulk Sample

3-inch-OD California w/ brass rings

CME Sampler

Grab Sample

2.5-inch-OD Modified California w/ brass liners

Pitcher Sample

2-inch-OD unlined split spoon (SPT)

Shelby Tube (Thin-walled, fixed head)

OTHER GRAPHIC SYMBOLS

Water level (at time of drilling, ATD)

Water level (after waiting)

Minor change in material properties within a stratum

Inferred/gradational contact between strata

Queried contact between strata

GENERAL NOTES

1: Soil classifications are based on the Unified Soil Classification System. Descriptions and stratum lines are interpretive, and actual lithologic changes may be gradual. Field descriptions may have been modified to reflect results of lab tests.
2: Descriptions on these logs apply only at the specific boring locations and at the time the borings were advanced. They are not warranted to be representative of subsurface conditions at other locations or times.

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	3.6' S of MW10
Well Location E/W:	4.2' W of MW10
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P01

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
0						SP		**Asphalt at surface.**	
			80	1.0				**Damp to moist, medium to fine SAND with silt and gravel, light brown, no hydrocarbon odor (10-80-10).**	
				1.1	P01-04				
5						SM		**Damp, dense, silty SAND with gravel, dark brown, no hydrocarbon odor (20-70-10).**	
			80	3.8	P01-06				
				1.9		SP		**Moist, dense, medium to fine SAND with silt and gravel, brown, no hydrocarbon odor (10-85-5).**	
10			70	4.3					
				11.1	P01-11			**Wet, dense, medium to fine SAND with silt and gravel, reddish-brown, no hydrocarbon odor (10-85-5).**	
			100	44	P01-14			**Wet, dense, medium to fine SAND with silt, brownish gray to gray, slight to moderate hydrocarbon odor (5-95-0).**	
15									

Drilling Co./Driller:	ESN/Don		
Drilling Equipment:	Direct Push		
Sampler Type:	--		
Hammer Type/Weight:	--	lbs	
Total Boring Depth:	24	feet bgs	
Total Well Depth:	--	feet bgs	
State Well ID No.:	--		

Well/Auger Diameter:	--/2	inches
Well Screened Interval:	--	feet bgs
Screen Slot Size:	--	inches
Filter Pack Used:	--	
Surface Seal:	Asphalt	
Annular Seal:	Bentonite	
Monument Type:	--	

Notes/Comments:

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	3.6' S of MW10
Well Location E/W:	4.2' W of MW10
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P01

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
15				3.8					
				2.1		ML		**Damp, dense, SILT with fine sand, brown, no hydrocarbon odor (60-40-0).**	
			100						
20				2.1	P01-20				
				1.0				**Damp, dense, SILT with fine sand, gray, no hydrocarbon odor (60-40-0).**	
			100						
				1.0	P01-24				
								Boring terminated at 24' bgs.	
25									
30									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	0' S of MW13
Well Location E/W:	11.5' W of MW13
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P02

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
0						SM		**Asphalt at surface.**	
			80	1.0				**Damp, dense, silty SAND with gravel, brown, no hydrocarbon odor (20-75-5).**	
				1.3	P02-04			**Moist, dense, silty SAND with gravel, brown, no hydrocarbon odor (20-75-5).**	
5			80	1.0					
				0.8	P02-08	SP		**Moist, dense, medium to fine SAND with silt and gravel, brown, no hydrocarbon odor (10-85-5).**	
				2.4					
10			90						
				24.7	P02-11			**Wet, dense, medium to fine SAND with silt and gravel, brown, moderate hydrocarbon odor (10-85-5).**	
				4.3					
			100						
15									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	0' S of MW13
Well Location E/W:	11.5' W of MW13
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P02

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
15				4.3	P02-16				
				1.9					
			--						
20				2.4	P02-20				
				1.0		ML		**Damp, dense, SILT with fine sand, gray, no hydrocarbon odor (60-40-0).**	
			--						
				0.5	P02-24				
								Boring terminated at 24' bgs.	
25									
30									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	2.0' S of MW09
Well Location E/W:	75.2' E of MW09
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P03

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
0						SM		**Asphalt at surface.**	
			80	1.9				**Damp, dense, silty SAND with gravel, brown, no hydrocarbon odor (20-70-10).**	
				34.5	P03-04			**Damp, dense, silty SAND with gravel, dark brown, moderate hydrocarbon odor (20-75-5).**	
5									
			80	4.9				**Damp, dense, silty SAND with gravel, brown, no hydrocarbon odor (20-70-10).**	
				2.9	P03-08	SP		**Moist, dense, medium to fine SAND with silt and gravel, brown, no hydrocarbon odor (5-90-5).**	
				4.6					
10			100						
				100.2	P03-11			**Wet, dense, medium to fine SAND with silt and gravel, gray to brownish gray, moderate to strong hydrocarbon odor (5-90-5).**	
				23.6					
			100						
15									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	2.0' S of MW09
Well Location E/W:	75.2' E of MW09
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P03

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
15				203.5	P03-15				
						ML		**Damp, dense, SILT with fine sand, dark brown, no hydrocarbon odor (60-40-0).**	
				648		SP		**Wet, dense, medium to fine SAND with silt and gravel, gray, strong hydrocarbon odor (10-80-10).**	
			100						
								Wet, dense, medium to fine SAND with silt and gravel, gray, no hydrocarbon odor (10-80-10).	
20				4.0	P03-20			**Wet, dense, medium to fine SAND with silt and gravel, brown, no hydrocarbon odor (10-80-10).**	
				4.0					
			--						
				2.7	P03-24				
								Boring terminated at 24' bgs.	
25									
30									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	7.6' S of DPE-G
Well Location E/W:	10.0' E of DPE-C
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P04

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
0						SM		**Asphalt at surface.**	
			90	1.0				**Damp, dense, silty SAND with gravel, light brown, no hydrocarbon odor (20-70-10).**	
				1.9	P04-04			**Damp, dense, silty SAND with gravel, light brown, no hydrocarbon odor (20-75-5).**	
5			90	2.1					
				3.8	P04-08			**Damp, dense, silty SAND with gravel, light brown, no hydrocarbon odor (20-70-10).**	
				4.6		SP		**Moist, dense, medium to fine SAND with silt and gravel, grayish-brown, no hydrocarbon odor (10-80-10).**	
10			--						
				567	P04-11			**Wet, dense, medium to fine SAND with silt and gravel, gray, strong hydrocarbon odor (10-80-10).**	
			--						
15									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	7.6' S of DPE-G
Well Location E/W:	10.0' E of DPE-C
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P04

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
15				76.2	P04-15			**Wet, dense, medium to fine SAND with silt and gravel, brownish-gray, slight hydrocarbon odor (5-85-10).**	
				63.2					
			100						
								Wet, dense, medium to fine SAND with silt and gravel, brown, no hydrocarbon odor (5-95-0).	
20				9.5	P04-20				
				3.9					
				2.4	P04-24				
								Boring terminated at 24' bgs.	
25									
30									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	8' N of DPE-6
Well Location E/W:	27.8' W of DPE-6
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P05

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
0			100	1.6		SP		**Asphalt at surface.** **Damp, dense, medium to fine SAND with gravel and silt, light brown, no hydrocarbon odor (10-80-10).**	
5			80	29.1	P05-04	SM		**Damp, dense, silty SAND with gravel, dark brown, moderate hydrocarbon odor (20-75-5).**	
				30.0				**Damp, dense, silty SAND with gravel, dark brown, brick fragments and fill debris towards bottom, no hydrocarbon odor (20-70-10).**	
				2.4	P05-08				
10			--	6.0					
				6.2	P05-11	SP		**Wet, dense, medium to fine SAND with silt and gravel, dark brown to dark gray, slight hydrocarbon odor (10-85-5).**	
				10.3				**Wet, dense, medium to fine SAND with silt, dark brown to dark gray, slight hydrocarbon odor (10-90-0).**	
15			--						

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	8' N of DPE-6
Well Location E/W:	27.8' W of DPE-6
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P05

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
15				12.5	P05-15			**Wet, dense, medium to fine SAND with silt, brown, no hydrocarbon odor (5-95-0).**	
				12.5				**Moist, dense, medium to fine SAND with gravel and silt, brown, no hydrocarbon odor (10-80-10).**	
			--						
								Wet, dense, medium to fine SAND, dark gray, strong hydrocarbon odor (5-95-0).	
20				827	P05-20				
								Wet, dense, medium to fine SAND with silt, grayish-brown, slight hydrocarbon odor (5-95-0).	
			100	46.8					
								Wet, dense, medium to fine SAND with silt, brown, no hydrocarbon odor (5-95-0).	
				3.5	P05-24				
								Boring terminated at 24' bgs.	
25									
30									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	6.6' S of MW09
Well Location E/W:	23.3' W of MW09
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P06

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
0			90	1.0		SM		**Asphalt at surface.** **Damp, dense, silty SAND with gravel and brick fragments, light brown, no hydrocarbon odor (20-70-10).**	
5				1.0	P06-04	ML		**Damp, dense SILT with gravel and fine sand, dark brown, no hydrocarbon odor (40-50-10).**	
			--	1.0		SP		**Damp, dense, medium to fine SAND, light brown, no hydrocarbon odor (5-95-0).**	
				0.8	P06-07	ML		**Damp, dense, SILT with fine sand and wood fragments, dark brown, no hydrocarbon odor (40-50-10).**	
10			--	4.3		SP		**Moist, dense, medium to fine SAND with silt, brown, no hydrocarbon odor (5-95-0).**	
				74.3	P06-11			**Wet, dense, medium to fine SAND with silt brownish grey, slight hydrocarbon odor (10-80-10).**	
15			--	116	P06-14				

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	6.6' S of MW09
Well Location E/W:	23.3' W of MW09
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P06

Site Address: 631 Queen Anne Avenue North
Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
15				28.7				**Wet, dense, medium to fine SAND with gravel and silt, brownish gray to gray, slight to moderate hydrocarbon odor (10-80-10).**	
			--						
				PID inoperable	P06-19				
20								**Wet, dense, medium SAND with silt and gravel, gray, no hydrocarbon odor (5-90-5).**	
			--						
				PID inoperable	P06-24				
25								**Boring terminated at 24' bgs.**	
30									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	-/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	26' S of MW09
Well Location E/W:	31' W of MW09
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P07

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
0						SM		**Asphalt at surface.**	
			90					**Damp, dense, silty SAND with gravel, light brown, no hydrocarbon odor (20-70-10).**	
				PID Inoperable	P07-04			**Damp, dense, silty SAND with gravel, dark brown, slight hydrocarbon odor (20-75-5).**	
5			90						
				PID Inoperable	P07-08			**Damp, dense, silty SAND with gravel and asphalt debris, dark brown, strong hydrocarbon odor (20-75-5).**	
								Damp, dense, silty SAND with gravel, dark brown, slight hydrocarbon odor (20-75-5).	
10			80			SP		**Wet, dense, medium to fine SAND with silt, dark gray, slight hydrocarbon odor (5-95-0).**	
				PID Inoperable	P07-11				
								Wet, dense, medium to fine SAND, dark gray, strong hydrocarbon odor (5-95-0).	
			100	315	P07-14				
15									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	26' S of MW09
Well Location E/W:	31' W of MW09
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P07

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
15				326				**Wet, dense, medium to fine SAND, reddish-brown, slight hydrocarbon odor (5-95-0).**	
				7.2					
			--					**Silt lens.**	
								Wet, dense, medium to fine SAND, dark gray, strong hydrocarbon odor (5-95-0).	
20				476	P07-20				
			--	285					
				4.2	P07-24			**Wet, dense, medium to fine SAND, gray, slight hydrocarbon odor (5-95-0).**	
								Boring terminated at 24' bgs.	
25									
30									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	-/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	4.4' S of NW corner of ramp
Well Location E/W:	4.8' W of NW corner of ramp
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P08

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
0			--			Blank		**Asphalt at surface.** **Rotten log.**	
5			50						
				0.2	P08-08	SM		**Damp, loose, silty SAND with gravel, dark brown, no hydrocarbon odor (20-75-5).** **Moist, dense, silty SAND with gravel, dark brown, no hydrocarbon odor (20-75-5).**	
10			80	0.3		SP		**Wet, dense, medium to fine SAND with silt, brownish-gray, no hydrocarbon odor (5-95-0).**	
				3.7	P08-11				
			75	662	P08-14			**Wet, medium to fine SAND with silt, gray, strong hydrocarbon hydrocarbon odor (5-95-0).**	
15									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	28	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	4.4' S of NW corner of ramp
Well Location E/W:	4.8' W of NW corner of ramp
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P08

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 11 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
15				36.0	P08-16			**Wet, dense, medium to fine SAND, gray, no hydrocarbon odor (5-95-0).**	
				237				**Moist, dense, medium to fine SAND, brown, strong hydrocarbon odor (5-95-0).**	
			90						
				298	P08-19				
20								**Wet, dense, medium to fine SAND, brown, strong hydrocarbon odor (5-95-0).**	
			--	277					
				30.1		ML		**Damp, dense, SILT with fine sand, brown, moderate hydrocarbon odor (60-40-0).**	
25			--	7.0				**Damp, dense, SILT with fine sand, gray, no hydrocarbon odor (70-30-0).**	
				2.4	P08-28				
								Boring terminated at 28' bgs.	
30									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	-/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	28	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	0' N of DPE-7
Well Location E/W:	8.7' W of DPE-7
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P09

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 12 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
0						SM		**Asphalt at surface.** **Damp, loose, silty SAND with gravel, dark brown, no hydrocarbon odor (20-75-5).**	
			90	0.9		SP		**Damp, loose, medium to fine SAND with silt, light brown, no hydrocarbon odor (5-95-0).**	
5			100	0.8	P09-03	SM		**Damp, loose, silty SAND with gravel, dark brown, no hydrocarbon odor (20-75-5).**	
				1.5	P09-08				
10			--	1.6		SP		**Moist, dense, medium to fine SAND with silt, light brown, no hydrocarbon odor (5-95-0).**	
				6.5	P09-12			**Wet, dense, medium to fine SAND with silt, light brown, no hydrocarbon odor (5-95-0).**	
				16					
15			--						

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

SoundEarth Strategies

Project:	Arnold's Property
Project Number:	0320-001
Logged by:	RAH
Date Started:	5/2/12
Surface Conditions:	Asphalt
Well Location N/S:	0' N of DPE-7
Well Location E/W:	8.7' W of DPE-7
Reviewed by:	RKB
Date Completed:	5/2/12

BORING LOG | P09

Site Address: 631 Queen Anne Avenue North, Seattle, Washington

Water Depth At Time of Drilling: 12 feet bgs
Water Depth After Completion: -- feet bgs

Depth (feet bgs)	Interval	Blow Count	% Recovery	PID (ppmv)	Sample ID	USCS Class	Graphic	Lithologic Description	Well Construction Detail
15				177	P09-15			**Wet, dense, medium to fine SAND, dark gray, strong hydrocarbon odor (5-95-0).**	
								Wet, dense, medium to fine SAND, brown.	
				2.3					
			90						
								Wet, dense, medium to fine SAND with silt, gray, moderate hydrocarbon odor (5-95-0).	
20				42.3	P09-20				
				4.7				**Wet, dense, medium to fine SAND with silt, light gray to gray, no hydrocarbon odor (5-95-0).**	
				4.4	P09-24				
								Boring terminated at 24' bgs.	
25									
30									

Drilling Co./Driller:	ESN/Don		**Well/Auger Diameter:**	--/2	inches	**Notes/Comments:**
Drilling Equipment:	Direct Push		**Well Screened Interval:**	--	feet bgs	
Sampler Type:	--		**Screen Slot Size:**	--	inches	
Hammer Type/Weight:	--	lbs	**Filter Pack Used:**	--		
Total Boring Depth:	24	feet bgs	**Surface Seal:**	Asphalt		
Total Well Depth:	--	feet bgs	**Annular Seal:**	Bentonite		
State Well ID No.:	--		**Monument Type:**	--		

BORING LOG Page 1 of 3

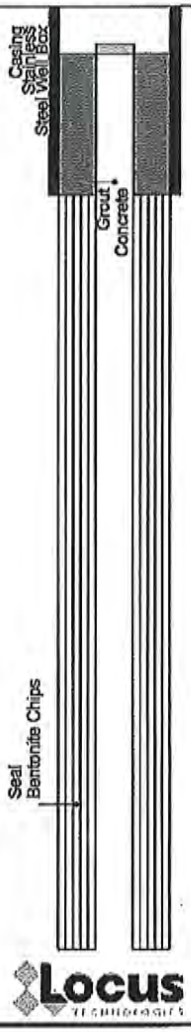
From Science to Solutions™

Well No: DPE-5
Chevron Site No: 211577
Site Location: 631 QUEEN ANNE AVE N SEATTLE WA
Date: 10/26/2005 - 10/31/2005

Well Diameter: 4 in	Driller: Cascade Drilling, Inc.	Total Depth: 28.0 Ft
Well Depth: 28 Ft	Drilling Method: Sonic Drilling	GW Depth: 18.0 Ft
Well Screen: 14-24 Ft 10 Slot	Consultant: SAIC	
Filter Pack: 16/30 Colorado Snd	Well Casing: Sch 40 PVC Elevation (TOC): 146.68 Ft	

Recov.	Depth Ft	Moist.	Blow Cnt	PPM	Soil Code	Soil Pattern	Soil Description
	0						Concrete and Asphalt. Airknife to 10 feet bgs.
		Moist			SW		Brown, very dense, fine to coarse SAND with silt and gravel.
	5						
		Moist			SP		Brown, dense, fine to medium SAND.
	10						

Well Construction



Locus

BORING LOG

From Science to Solutions™

Well No: DPE-5
Chevron Site No: 211577
Site Location: 631 QUEEN ANNE AVE N SEATTLE WA
Date: 10/26/2005 - 10/31/2005

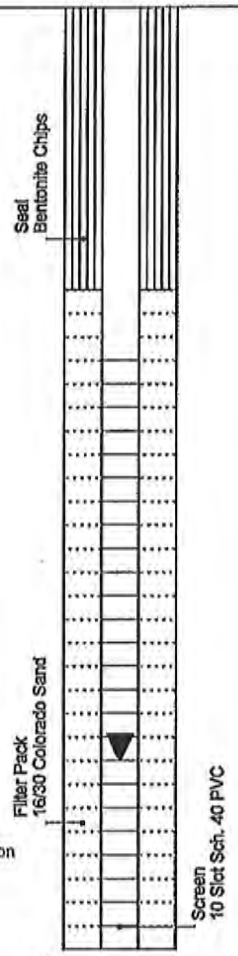
Well Diameter: 4 In
Well Depth: 28 Ft
Well Screen: 14-24 Ft 10 Slot
Filter Pack: 16/30 Colorado Snd

Driller: Cascade Drilling, Inc.
Drilling Method: Sonic Drilling
Consultant: SAIC
Well Casing: Sch 40 PVC
Elevation (TOC): 146.68 Ft

Total Depth: 28.0 Ft
GW Depth: 18.0 Ft

Recov.	Depth Ft	Moist.	Blow Cnt	PPM	Soil Code	Soil Pattern	Soil Description
	10	Moist		45.1	SW		Brown to gray, dense, fine to coarse SAND with 10% gravel and 5% silt; no odor; no sheen.
		Moist		86.9			Same as above; moderate odor; strong sheen.
		Moist		215	SP		Gray, fine to medium SAND with 10% silt and no gravel; strong odor; moderate sheen.
	15	Moist		1908			
		Moist		2073			Gray, fine to medium SAND, no gravel, no silt; strong odor; moderate sheen.
		Wet		2214	SM-SP		Gray, fine to medium SAND with two 2-inch silt layers interbedded; no gravel; strong odor; moderate sheen.
		Moist		2806	ML		Brown, reddish, sandy silt with 15% fine to medium sand and 5% gravel; dropstones and iron oxidation present; slight HC odor; slight sheen. (TILL?)
		Moist		1656			
	20			1165	SP		

Well Construction



Locus Technologies

BORING LOG

From Science to Solutions™

Well No: DPE-5
Chevron Site No: 211577
Site Location: 631 QUEEN ANNE AVE N SEATTLE WA
Date: 10/26/2005 - 10/31/2005

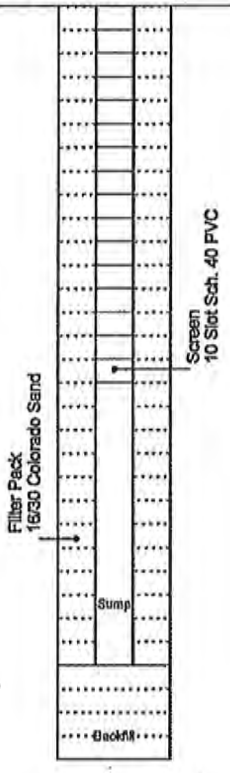
Well Diameter: 4 in
Well Depth: 28 Ft
Well Screen: 14-24 Ft 10 Slot
Filter Pack: 16/30 Colorado Snd

Driller: Cascade Drilling, Inc.
Drilling Method: Sonic Drilling
Consultant: SAIC
Well Casing: Sch 40 PVC Elevation (TOC): 146.68 Ft

Total Depth: 28.0 Ft
GW Depth: 18.0 Ft

Recov.	Depth Ft	Moist.	Blow Cnt	PPM	Soil Code	Soil Pattern	Soil Description
	20	Moist		1569	SP		Gray, fine to coarse SAND with 5% silt and 10% gravel; moderate HC odor; moderate sheen.
		Wet		1412	ML		Gray, fine sandy SILT with 15% SAND; moderate HC odor; strong sheen.
		Wet		2107	SP-SM		Brown to slightly gray, fine to coarse SAND with 15% gravel and 10% silt; strong HC odor; strong sheen.
				782			
				852			
				176			
	25						
		Dry		217	ML/CL		Gray, SILT with moderate plasticity and 10% gravel in upper 1.5 feet; no odor; no sheen.
				29			
				31.8			
				40.0			
	28.0						

Well Construction



Locus Technologies

BORING LOG

From Science to Solutions™

Well No: DPE-6
Chevron Site No: 211577
Site Location: 631 Queen Anne Ave N, Seattle, WA
Date: 10/17/2005

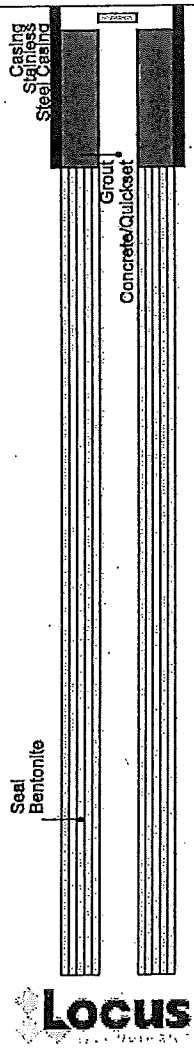
Well Diameter: 4 inches
Well Depth: 33.5 ft
Well Screen: 15.5-30.5 ft 10-Slot
Filter Pack: 16/30 Colorado Snd

Driller: Cascade Drilling, Inc.
Method: AirPercussion, Hollow Stem
Consultant: Gabriel Cisneros (SAIC, Bothell)
Well Casing: Sch 40 PVC Elevation (TOC): 146.19 msl

Total Depth: 33.5 Ft
GW Depth: 19.5 Ft

Recov.	Depth Ft	Moist.	Blow Cnt	OVM	Soil Code	Soil Pattern	Soil Description
	0	Moist			SW		Asphalt top 2-inches. Airknifed to 8 feet bgs. FILL: Brown, silty, gravelly SAND with chunks of concrete.
	5	Moist			SP-SM		Gray to brown, silty, fine to medium SAND with a silt layer at 8.25 feet and organics, no gravel; no odor; no sheen.
		Moist	8/13/16				Brown, fine to coarse SAND with thin interbeds of silt; less than 5% silt in sand beds, no gravel; slight odor; moderate sheen.
	10	Moist	15/50				Brown to gray, fine to medium, SAND interbedded with thin, organic, gray silt layers; no gravel and less than 5% silt in sandy layers; slight odor; moderate sheen in sandy layers.
		Moist					
	12						

Well Construction



Locus

BORING LOG

From Science to Solutions™

Well No: DPE-6
Chevron Site No: 211577
Site Location: 631 Queen Anne Ave N, Seattle, WA
Date: 10/17/2005

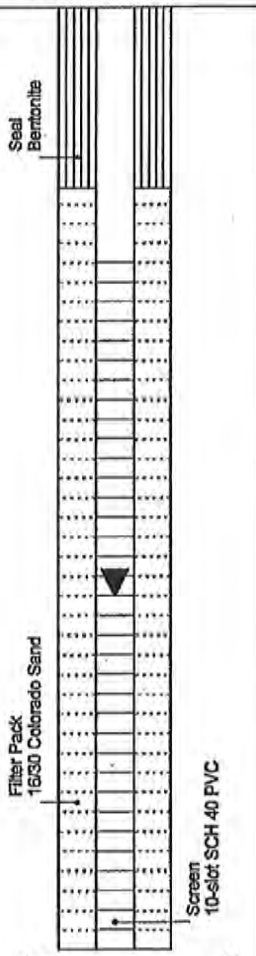
Well Diameter: 4 Inches
Well Depth: 33.5 ft
Well Screen: 15.5-30.5 ft 10-Slot
Filter Pack: 16/30 Colorado Snd

Driller: Cascade Drilling, Inc.
Method: AirPercussion, Hollow Stem
Consultant: Gabriel Cisneros (SAIC, Bothell)
Well Casing: Sch 40 PVC Elevation (TOC): 146.19 msl

Total Depth: 33.5 Ft
GW Depth: 19.5 Ft

Recov	Depth Ft	Moist.	Blow Cnt	OVM	Soil Code	Soil Pattern	Soil Description
	12	Moist					Same as above; moderate odor; moderate sheen.
			50				Same as above.
	15	Moist			SP-SM		Same as above; Brown to gray, fine to medium SAND with a 2-inch silt layer at top and 1-inch silt layer at bottom; 10% silt in sand layers; HC odor; moderate sheen.
		Moist	50				Same as above.
		Moist					Same as above; moderate HC odor; moderate sheen.
			16/50		SP		Orangish brown; fine to medium SAND; no silt; no gravel; no odor; no sheen.
	20	Moist			SP-SM		Gray, silty, fine to medium SAND with 30% silt and an organic silt layer at top; strong HC odor; moderate sheen.
			13/32/50		SP		Gray, fine to medium SAND with 5% silt; moderate HC odor; moderate sheen.
		Moist			SM		Gray, fine, silty SAND with 30% silt; moderate odor; no sheen.
		Wet					Same as above.
		Wet	50		SP		Orangish brown, fine to coarse SAND with 5% silt; no gravel; slight HC odor; slight sheen.
	24						

Well Construction



Locus Technologies

BORING LOG

SAIC® From Science to Solutions™

Well No: DPE-6
Chevron Site No: 211577
Site Location: 631 Queen Anne Ave N, Seattle, WA
Date: 10/17/2005

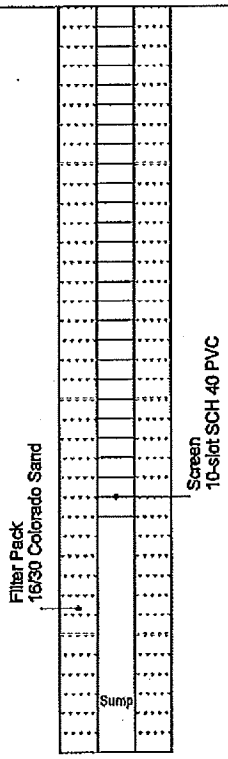
Well Diameter: 4 inches
Well Depth: 33.5 ft
Well Screen: 15.5-30.5 ft 10-Slot
Filter Pack: 16/30 Colorado Snd

Driller: Cascade Drilling, Inc.
Method: AirPercussion, Hollow Stem
Consultant: Gabriel Cisneros (SAIC, Bothell)
Well Casing: Sch 40 PVC Elevation (TOC): 146.19 msl

Total Depth: 33.5 Ft
GW Depth: 19.5 Ft

Recov.	Depth Ft	Moist.	Blow Cnt	OVM	Soil Code	Soil Pattern	Soil Description
	24	Wet			SP		
	25	Sat	50				Same as above; no odor; no sheen.
		Sat.	50				Gray, fine to medium SAND; no silt; no gravel; no odor; no sheen.
	30	Sat.					Same as above; no odor; no sheen.
		Moist	13/22/37		ML/CL		Gray, hard, SILT with low plasticity; no odor; no sheen.

Well Construction



Locus Technologies

BORING LOG

Page 1 of 4

From Science to Solutions™

Well No: DPE-7
Chevron Site No: 211577
Site Location: 631 Queen Anne N, Seattle, WA
Date: 10/17/2005 - 10/21/2005

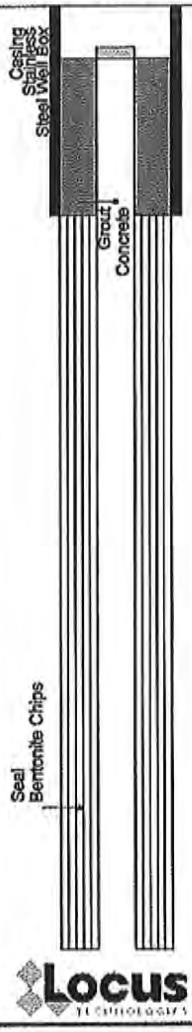
Well Diameter: 4 Inches
Well Depth: 32 ft
Well Screen: 11-29 ft 10-Slot
Filter Pack: 16/30 Colorado Snd

Driller: Cascade Drilling, Inc.
Method: AirPercussion, Hollow Stem
Consultant: Gabriel Cisneros (SAIC, Bothell)
Well Casing: Sch 40 PVC Elevation (TOC): 146.02 msl

Total Depth: 33.5 Ft
GW Depth: 23.0 Ft

Recov.	Depth Ft	Moist.	Blow Cnt	OVM	Soil Code	Soil Pattern	Soil Description
	0	Moist			SW		Asphalt top 2-inchesSilty, gravelly, fine to coarse SAND with blocks of concrete and large rocks; (FILL). Airknifed down to 8 feet bgs.
	5				SM		Silty, hard SAND (Till?)
		Moist	3/4/8	7.5			Gray, dark brown, silty fine-grained SAND with 13% silt and large angular clasts of silt; no odor; no sheen.
	9						

Well Construction



Locus Technologies

BORING LOG

From Science to Solutions™

Well No: DPE-7
Chevron Site No: 211577
Site Location: 631 Queen Anne N, Seattle, WA
Date: 10/17/2005 - 10/21/2005

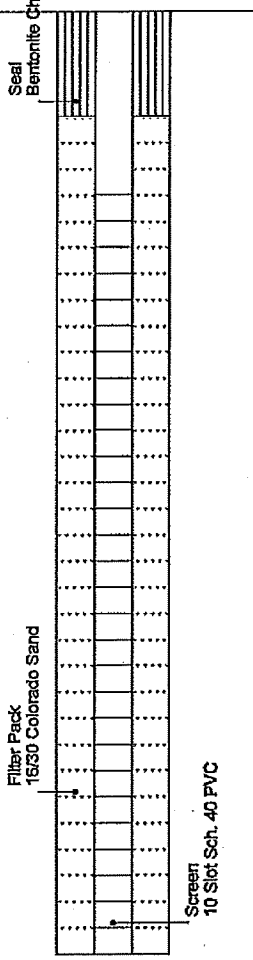
Well Diameter: 4 inches
Well Depth: 32 ft
Well Screen: 11-29 ft 10-Slot
Filter Pack: 16/30 Colorado Snd

Driller: Cascade Drilling, Inc.
Method: AirPercussion, Hollow Stem
Consultant: Gabriel Cisneros (SAIC, Bothell)
Well Casing: Sch 40 PVC Elevation (TOC): 146.02 msl

Total Depth: 33.5 Ft
GW Depth: 23.0 Ft

Recov	Depth Ft	Moist.	Blow Cnt	OVM	Soil Code	Soil Pattern	Soil Description
	9	Moist	3/4/8	7.5	SM		Gray, dark brown, silty fine-grained SAND with 13% silt and large angular clasts of silt; no odor; no sheen.
	10		5/8	8.3			
		Moist	11	722	SP		Gray to dark gray, fine to medium SAND with 5% silt, no gravel; strong HC odor; moderate sheen.
		Moist	8/11	182			Light brown, fine to medium SAND with no silt and no gravel; slight odor; slight sheen.
		Moist	11	16.7	SM		Light brown to gray, silty fine SAND with 20% silt and no gravel; slight HC odor; slight sheen.
	15	Moist	2/11	573	SM-SP		Light gray to brown, fine to medium SAND with 10% silt, no gravel; moderate HC odor; slight sheen.
		Moist	16	17.6			Same as above but with 5% silt and a 2-inch thick silt/clay layer interbedded within fine SAND; slight HC odor; slight sheen.
		Wet	14/14	231	SP		Brown, fine to coarse SAND with no silt and no gravel; slight odor; moderate sheen.
	18						

Well Construction



Locus TECHNOLOGIES

BORING LOG

From Science to Solutions™

Well No: DPE-7
Chevron Site No: 211577
Site Location: 631 Queen Anne N, Seattle, WA
Date: 10/17/2005 - 10/21/2005

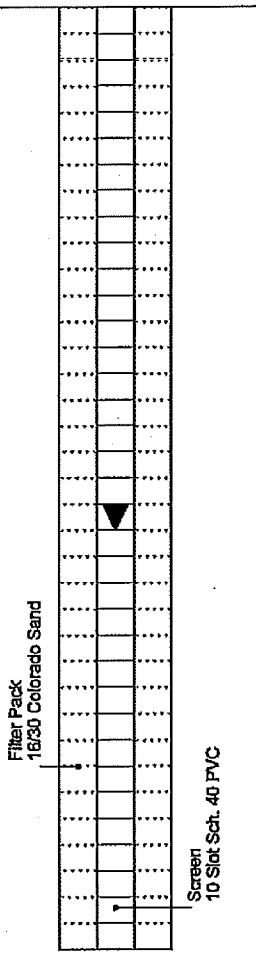
Well Diameter: 4 inches
Well Depth: 32 ft
Well Screen: 11-29 ft 10-Slot
Filter Pack: 16/30 Colorado Snd

Driller: Cascade Drilling, Inc.
Method: AirPercussion, Hollow Stem
Consultant: Gabriel Cisneros (SAIC, Bothell)
Well Casing: Sch 40 PVC Elevation (TOC): 146.02 msl

Total Depth: 33.5 Ft
GW Depth: 23.0 Ft

Recov.	Depth Ft	Moist.	Blow Cnt	OVM	Soil Code	Soil Pattern	Soil Description
	18	Wet	14/14	231	SP		Brown, fine to coarse SAND with no silt and no gravel; slight odor; moderate sheen.
		Wet					Gray, fine medium SAND with 5% silt; no gravel; slight odor; moderate sheen.
	20		12/16	17			
		Wet	22	580			Same as above but with a 2-inch silt layer interbedded within the sand at 20.5' bgs; strong HC odor; strong sheen.
			13/18	527			
			18	630			
		Wet			ML		Gray, stiff SILT with moderate plasticity; moderate HC odor; strong sheen.
	25	Sat.	22/50	590	SP		Gray, fine to medium SAND with no silt and no gravel; strong HC odor; moderate to heavy sheen.
	27						

Well Construction



Locus Technologies

BORING LOG

From Science to Solutions™

Well No: DPE-7
Chevron Site No: 211577
Site Location: 631 Queen Anne N, Seattle, WA
Date: 10/17/2005 - 10/21/2005

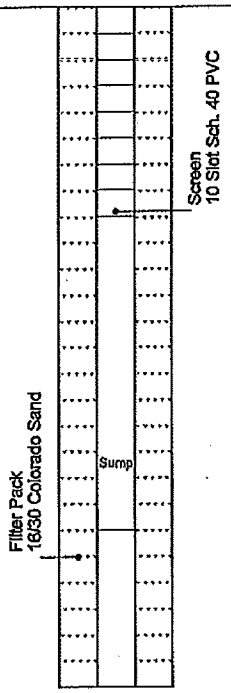
Well Diameter: 4 inches
Well Depth: 32 ft
Well Screen: 11-29 ft 10-Slot
Filter Pack: 16/30 Colorado Snd

Driller: Cascade Drilling, Inc.
Method: AirPercussion, Hollow Stem
Consultant: Gabriel Cisneros (SAIC, Bothell)
Well Casing: Sch 40 PVC Elevation (TOC): 146.02 msl

Total Depth: 33.5 Ft
GW Depth: 23.0 Ft

Recov	Depth Ft	Moist.	Blow Cnt	OVM	Soil Code	Soil Pattern	Soil Description
	27						
		Sat.	10/30	450	SP		Gray, fine to coarse SAND with no silt and 5% gravel; moderate HC odor; no sheen.
			48	384			
	30						
			7/9	402			
		Moist	11	15.8	ML/CL		Gray, clayey SILT with moderate to high plasticity; slight odor; very slight sheen at bottom.

Well Construction



Locus Technologies

BORING LOG

From Science to Solutions™

Well No: DPE-6
Chevron Site No: 211577
Site Location: 631 Queen Anne Ave N, Seattle, WA
Date: 10/17/2005

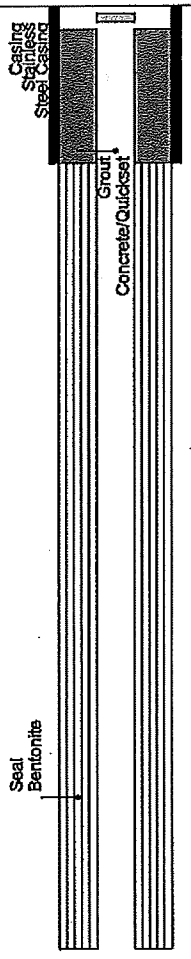
Well Diameter: 4 inches
Well Depth: 33.5 ft
Well Screen: 15.5-30.5 ft 10-Slot
Filter Pack: 16/30 Colorado Snd

Driller: Cascade Drilling, Inc.
Method: AirPercussion, Hollow Stem
Consultant: Gabriel Cisneros (SAIC, Bothell)
Well Casing: Sch 40 PVC Elevation (TOC): 146.19 msl

Total Depth: 33.5 Ft
GW Depth: 19.5 Ft

Recov.	Depth Ft	Moist.	Blow Cnt	OVM	Soil Code	Soil Pattern	Soil Description
	0	Moist			SW		Asphalt top 2-Inches. Airknifed to 8 feet bgs. FILL: Brown, silty, gravelly SAND with chunks of concrete.
	5	Moist	8/13/16		SP-SM		Gray to brown, silty, fine to medium SAND with a silt layer at 8.25 feet and organics, no gravel; no odor; no sheen.
		Moist					Brown, fine to coarse SAND with thin interbeds of silt; less than 5% silt in sand beds, no gravel; slight odor; moderate sheen.
	10	Moist	15/50				Brown to gray, fine to medium, SAND interbedded with thin, organic, gray silt layers; no gravel and less than 5% silt in sandy layers; slight odor; moderate sheen in sandy layers.
		Moist					
	12						

Well Construction



Locus

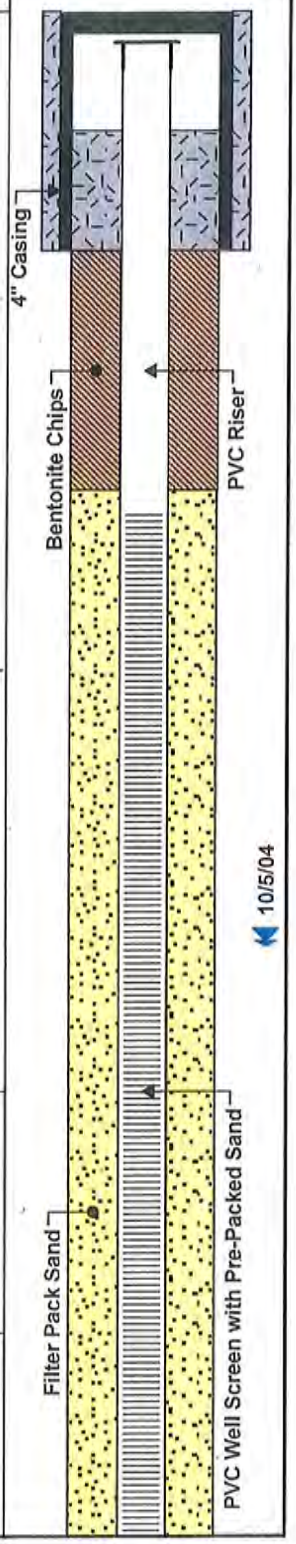
BORING/MONITORING WELL LOG: SB-24/MW-24

SITE No: 211577
LOCATION: 631 Queen Ave, Seattle
CLIENT: Chevron
DATE: 10/5/04
LOGGED BY: G. Cisneros

DRILLER: Cascade
DRILL METHOD: Limited-Access Geoprobe
SAMPLE METHOD: Geoprobe
HOLE DIAMETER: 2"
HOLE DEPTH: 20.5

WELL DIAMETER: 0.75"
SCREEN INTERVAL: 4.2-14.2
WELL CASING: Sch. 40 PVC
FILTER PACK: 10/20 Colorado Sand
TOC ELEVATION: 107.95'

MOISTURE	PID (ppm)	DEPTH	DESCRIPTION
		0	Ground Surface
			Airknifed to 8' Layer of bricks at 6-inches. Gravelly SAND
Moist	0.4	4	**SAND (SW)** Dark brown, gravelly SAND with 15-20% gravel and 5% silt; no odor; no sheen.
Moist	0.0	6	**SAND (SP)** Dark brown, fine to medium SAND with 5% gravel; no odor; no sheen.
Wet	5.5	8	**8-9' SAND (SP)** Brown to light gray, fine to medium SAND; no silt; no gravel; no odor; no sheen.
Sat	1.5	9	**9-10' SAND (SP-SM)** Light brown, very dense, fine to medium SAND with silt layers interbedded (15-20% silt); no odor; no sheen.
Sat	7.1	10	**10-11' SAND (SP-SM)** Same as above; no odor; no sheen.
Wet	1.0	11	**11-12' Silty SAND (SM)** Light brown, very dense, fine to medium SAND with 25% silt and 15% gravel; slight odor, no sheen.
Moist	8.9	12	**12-13' Silty SAND (SM)** Same as above; slight odor; no sheen.



BORING/MONITORING WELL LOG: SB-24/MW-24

SITE No: 211577
LOCATION: 631 Queen Ave, Seattle
CLIENT: Chevron
DATE: 10/5/04
LOGGED BY: G. Cisneros

DRILLER: Cascade
DRILL METHOD: Limited-Access Geoprobe
SAMPLE METHOD: Geoprobe
HOLE DIAMETER: 2"
HOLE DEPTH: 20.5

WELL DIAMETER: 0.75"
SCREEN INTERVAL: 4.2-14.2
WELL CASING: Sch. 40 PVC
FILTER PACK: 10/20 Colorado Sand
TOC ELEVATION: 107.95'

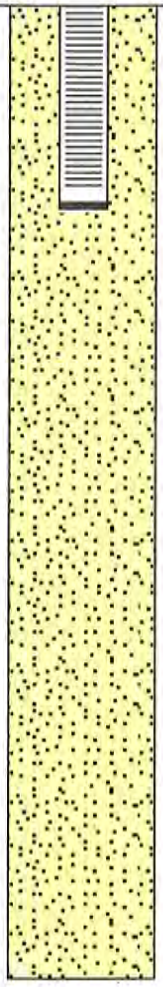
MOISTURE	PID (ppm)	DEPTH	DESCRIPTION
Moist	14.8	13	**13-14' Silty SAND (SM)** Same as above; slight odor; no sheen.
Moist	16.4	14	**14-15' SAND (SP-SM)** Brown to gray, very dense, fine to medium SAND with 2-inch silty SAND layers; slight odor; no sheen.
Moist	6.9	15	**15-16' SAND (SP-SM)** Same as above; no odor; no sheen.
Wet	205.8	16	**16-17' SAND (SP-SM)** Gray, fine to medium SAND with a 1-inch silty sand layer at 16.5 feet; strong odor; moderate sheen.
Moist	>4506	17	**17-18' SAND (SP)** Same as above; strong odor; moderate sheen.
Moist	>4506	18	**18-19.5' SAND (SP)** Gray, dense, medium to coarse SAND; no silt; no gravel; strong odor; moderate sheen.
Moist	177.8	19	
Moist	48.3	20	**19.5-20' Silty SAND (SM)** Gray to brown, very dense SAND with 15% silt, no gravel; moderate odor; slight sheen.
Moist	11.8		**20-20.5' Clayey SILT (ML-CL)** Very hard, clayey SILT with moderate plasticity; slight odor; no sheen.
		21	
		22	
		23	
		24	
		25	

GRAPHIC LOG

SAMPLE INTERVAL

Sloughed Sand

WELL COMPLETION DETAILS



An Employee Owned Company

BORING LOG: SP-1

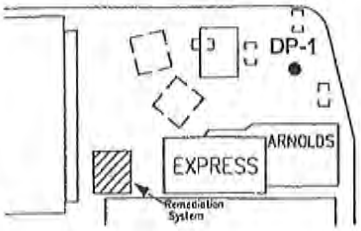
SHEET 1 of 1

SITE No: 211577
LOCATION: 631 Queen Anne Ave, Seattle
CLIENT: Chevron/Texaco
DATE: 3/12/04
LOGGED BY: GC

DRILLER: Cascade
DRILL METHOD: Geoprobe
SAMPLE METHOD: Split-Spoon with Liner
HOLE DIAMETER: 2"
HOLE DEPTH: 22'

MOISTURE	PID (ppm)	DEPTH	GRAPHIC LOG	SAMPLE INTERVAL	DESCRIPTION
		0			Ground Surface
		1			Airknifed to 8' Asphalt from 0-3"
		2			
		3			
		4			
		5			SAND (SM) Dark brown, very dense, well-graded, gravelly, silty, SAND.
		6			
		7			
		8			SAND (SM) Dark brown, well-graded, very dense, medium to coarse sand with 15% gravel and 15% silt; slight hydrocarbon odor; no sheen.
Dry to Moist	0	9			
	0	10			
	0	11			SAND and SILT (SM) Dark gray to black SAND with thin silt layers; hydrocarbon odor; no sheen.
Moist	1553	12			
	1674	13			SAND (SP) Brownish gray to dark gray, poorly graded, very dense SAND with <5% silt.
	1569	14			
	>4040	15			
	850.2	16			
	>4040	17			SAND (SP) Brownish gray, poorly graded, very dense SAND; increasing silt content with depth.
Moist to Wet	238.0	18			
	1.4	19			Groundwater at 19.5'
Wet to Sat	2928	20			SAND (SP-SM) Same as above; more silty with depth; HC odor; no sheen.
Sat	>4040	21			Silty SAND (SM) Brownish gray, well-graded, very dense, fine to medium silty SAND.
	>4040	22			

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DP-1

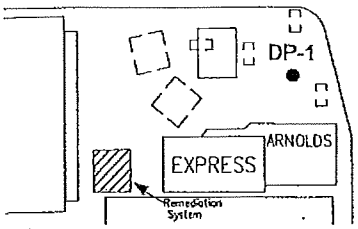
INSTALLATION DATE: 9/18/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 24'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION	
SURVEY DATE:	
DTW:	

DESCRIPTION/LOGGED BY: SHAWN MADISON

WELL/BORING COMPLETION	FIRST	STABILIZED	MOISTURE	PID (ppm)	DEPTH (FEET)	USCS SYMBOL	DESCRIPTION
Asphalt / Bentonite					1	SM	SILTY SAND: grayish brown; 20% fines; fine to medium sand; 15% gravel; no odor.
			DP	2.7	2		
					3		
			DP	59.0	4	SM	SILTY SAND: brownish gray; 10% fines; fine to medium sand; 25% gravel; odor.
					5		
			DP	23.0	6		SILTY SAND: dark gray; 15% fines; medium to coarse sand; 10% gravel; odor.
					7		
			DP	11.0	8		Same as above.
					9		
			DP	14.5	10	SP	SAND: gray; <5% fines; fine sand; no odor.
	▽				11		
			WT	33.3	12		Same as above with odor.
					13		
			DP	0	14	SP	SAND: grayish brown; medium to coarse sand; no odor.
					15		
			DP	70.1	16		Same as above.
	▽				17		
			WT	0	18	SM	SILTY SAND: grayish brown; 15% fines; fine to medium sand; no odor.
					19		
			WT	5.7	20		SILTY SAND: gray; 20% fines; fine to medium sand; 30% gravel; no odor.
					21		
			WT	1.2	22	SM	Same as above.

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DP-1

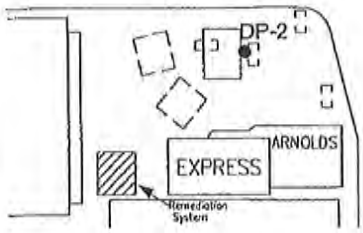
INSTALLATION DATE: 9/18/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 24'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION	
SURVEY DATE:	
DTW:	

DESCRIPTION/LOGGED BY: SHAWN MADISON

WELL/BORING COMPLETION	FIRST ▽	STABILIZED ▼	MOISTURE	PID (ppm)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC	DESCRIPTION
Bentonite			WT	0.6	23			SM		SILTY SAND: gray; 20% fines; fine to medium sand; 30% gravel; no odor.
			DP		24			CL		CLAY: gray; medium plasticity; stiff; no odor.
					25					
					26					
					27					
					28					
					29					
					30					
					31					
					32					
					33					
					34					
					35					
					36					
					37					
					38					
					39					
					40					
					41					
					42					
					43					
					44					
					45					

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

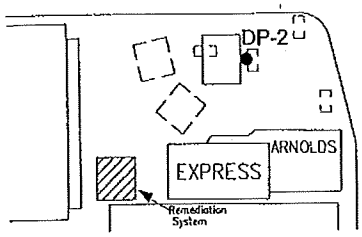
WELL/BORING: DP-2

INSTALLATION DATE: 9/18/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 24'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION
SURVEY DATE:
DTW:

WELL/BORING COMPLETION	FIRST ▽	STABILIZED ▼	MOISTURE	PID (ppm)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC	DESCRIPTION/LOGGED BY: SHAWN MADISON
Asphalt					1			SM		
			DP	0	2					SILTY SAND: grayish brown; 20% fines; fine to medium sand 30% gravel; no odor.
					3					
			DP	0	4					Same as above with odor.
					5					
			DP	672	6					SILTY SAND: dark gray; 20% fines; fine to medium sand; 10% gravel; odor.
					7					
			DP	238	8					Same as above but very dark gray.
					9			SM		
Bentonite			DP	1340	10					Same as above but dark greenish gray; 2% wood debris.
					11					
			DP	1875	12					SILTY SAND: dark gray; 10% fines; fine to medium sand; 10% gravel; odor; minimal recovery. * See Page 2 of well log for note.
					13					
			DP	2000	14					Same as above; minimal recovery * See Page 2 of well log for note.
					15					
			DP	5.3	16					SILTY SAND: dark gray; 10% fines; medium to coarse sand; 5% gravel; odor.
					17					
			DP	7.1	18			SP		SAND: brown; medium sand; odor.
					19					
	▽		DP	10.2	20					Same as above.
					21					
			WT	21.7	22			SP		SAND: grayish brown; fine to medium sand; no odor.

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DP-2

INSTALLATION DATE: 9/18/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 24'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION	
SURVEY DATE:	
DTW:	

DESCRIPTION/LOGGED BY: SHAWN MADISON

WELL/BORING COMPLETION	FIRST ▽	STABILIZED ▼	MOISTURE	PID (ppm)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC
Bentonite			WT		23			SP	
								CL	
			DP	0	24				
					25				
					26				
					27				
					28				
					29				
					30				
					31				
					32				
					33				
					34				
					35				
					36				
					37				
					38				
					39				
					40				
					41				
					42				
					43				
					44				
					45				

SAND: grayish brown; fine to medium sand; no odor.

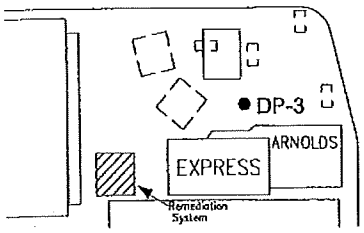
CLAY: yellowish brown; medium plasticity; stiff; no odor.

* Redrilled 1 foot north to get recovery for the 12 and 14 foot intervals.

10'-12' SILTY SAND: dark gray; 10% fines; fine to medium sand; 10% gravel; odor; P.I.D. reading 2000.

12'-14' SILTY SAND: dark gray; 10% fines; fine to medium sand; 10% gravel; odor; P.I.D. reading 2000.

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DP-3

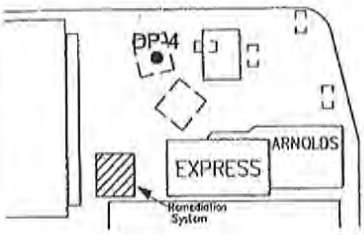
INSTALLATION DATE: 9/20/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 18'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION	
SURVEY DATE:	
DTW:	

DESCRIPTION/LOGGED BY: SHAWN MADISON

WELL/BORING COMPLETION	FIRST ▽	STABILIZED ▼	MOISTURE	PID (ppm)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC	DESCRIPTION
Asphalt					1			SM		SILTY SAND: brown; 30% fines; very fine to fine sand; no odor.
				0	2					Same as above with construction debris; no odor.
					3					Same as above.
				0	4					
					5					
				0	6					Same as above without construction debris.
					7					
Bentonite				0	8					Same as above with 2% wood debris; very dark brown with color.
					9			SM		
				48.3	10					SILTY SAND: dark brownish gray; 10% fines; fine sand; 5% gravel; odor.
	▽				11					
			WT	2000	12					@11.5' SILT: dark gray; fines; 25% very fine to fine sand; stiff; odor.
					13					
			WT	2000	14					
					15					
			WT	1557	16					@15.5' SILTY SAND: dark gray; 15% fines; fine sand; odor.
					17					
			DP	146	18			CL		@17.5' CLAY: reddish brown with gray streaks; medium plasticity; stiff; odor.
					19					
					20					
					21					
					22					

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DP-4

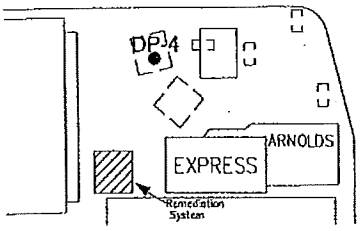
INSTALLATION DATE: 9/20/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 28'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION:
SURVEY DATE:
DTW:

DESCRIPTION/LOGGED BY: SHAWN MADISON

WELL/BORING COMPLETION	FIRST	STABILIZED	MOISTURE	PID (ppm)	DEPTH (FEET)	USCS SYMBOL	DESCRIPTION
Asphalt					1	SM	
			DRY	0	2		SILTY SAND: gray; 30% fines; fine sand; 10% gravel; no odor.
					3		
			DP	801	4		Same as above with light odor.
					5		
			DP	49.4	6		SILTY SAND: dark gray; 10% fines; fine to medium sand; light odor.
					7		
			DP	0	8		Same as above with 5% gravel.
Bentonite					9	SM	
			DP	0	10		Same as above with 15% gravel.
					11		
			DP	8.3	12		SILTY SAND: very dark gray; 10% fines; medium to coarse sand; light odor; encountered PVC well screen at 12 feet.
					13		
			DP	174	14		SAND: dark gray to brown; fine to medium sand; no odor.
					15		15 to 15.5' SILTY SAND: 30% fine; fine to medium sand; no odor.
			DP	219	16		@15.5' SAND: brownish gray; <5% fines; fine to medium sand; 15% coarse sand; no odor.
					17		
			DP	58.4	18	SP	
	▽				19		SAND: gray; fine sand; odor.
			WT	2000	20		
					21		
				21.7	22		Same sand grades to medium sand; odor.

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DP-4

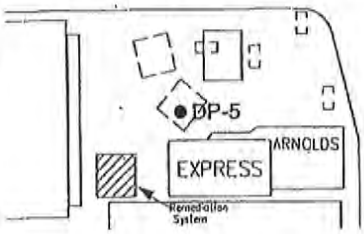
INSTALLATION DATE: 9/20/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 28'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION	
SURVEY DATE:	
DTW:	

DESCRIPTION/LOGGED BY: SHAWN MADISON

WELL/BORING COMPLETION	FIRST ▽	STABILIZED ▼	MOISTURE	PID (ppm)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC	DESCRIPTION
Bentonite			WT	1	23–24			SP		SAND: brownish gray; <5% fines; medium to coarse sand; odor.
			DP	0	25–26					
					26			CL		@26.25' CLAY: reddish brown with gray molting; medium plasticity; stiff; no odor.
			WT	0	27–28			SP		@27.0" SAND: gray; coarse sand; no odor.
					29–45					

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

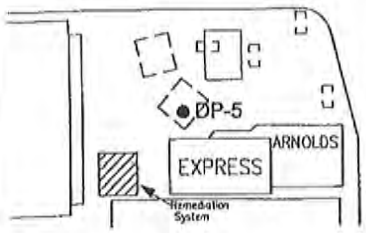
WELL/BORING: DP-5

INSTALLATION DATE: 9/20/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 24'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION:
SURVEY DATE:
DTW:

WELL/BORING COMPLETION	FIRST	STABILIZED	MOISTURE	PID (ppm)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC	DESCRIPTION/LOGGED BY: SHAWN MADISON
Asphalt					1			SM		
			DP	0	2					SILTY SAND: brown; 15% fines; fine to medium sand; no odor.
					3					
			DP	77.0	4					Same as above grades to grayish brown.
					5					
			DP	77.4	6					Same as above; gray to dark gray; construction debris (Brick); no odor.
					7					
			DP	8.0	8					Same as above with construction debris (Asphalt); no odor.
Bentonite					9			SM		
			DP	0	10					Same as above with Asphalt and wood debris.
					11					
			DP	166	12					SILTY SAND: dark gray; 15% fines; fine sand; odor.
	▽				13					
			WT	2000	14					Same as above; 30% fines; odor.
					15					
			WT	2000	16					SILTY SAND: gray to brownish gray; 20% fines; very fine to fine sand; odor.
					17					
			WT	1345	18			SP		
					19					SAND: brownish gray; <5% fines; fine to medium sand; odor.
			WT	2000	20					Same as above.
					21					
			WT	1162	22					Same as above.

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DP-5

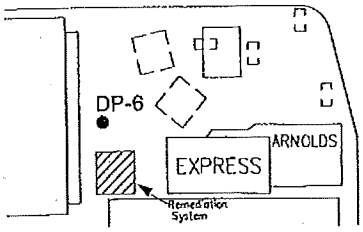
INSTALLATION DATE: 9/20/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 24'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION	
SURVEY DATE:	
DTW:	

DESCRIPTION/LOGGED BY: SHAWN MADISON

WELL/BORING COMPLETION	FIRST ▽	STABILIZED ▼	MOISTURE	PID (ppm)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC	DESCRIPTION
Bentonite			WT		23			SP		SAND: brownish gray; <5% fines; fine to medium sand; coarse sand; odor.
			DP	3.1	24			CL		@23.5' CLAY: brown; medium plasticity; stiff; no odor.
					25					
					26					
					27					
					28					
					29					
					30					
					31					
					32					
					33					
					34					
					35					
					36					
					37					
					38					
					39					
					40					
					41					
					42					
					43					
					44					
					45					

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DP-6

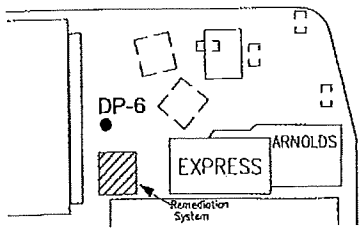
INSTALLATION DATE: 9/20/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 26'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION	
SURVEY DATE:	
DTW:	

DESCRIPTION/LOGGED BY: SHAWN MADISON

WELL/BORING COMPLETION	FIRST ▽	STABILIZED ▼	MOISTURE	PID (ppm)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC	DESCRIPTION
Asphalt / Bentonite					1			SM		SILTY SAND: brownish gray; 40% fines; fine to medium sand; 10% gravel; 5% construction debris (Brick); no odor.
			DP	0	2					
					3					SILTY SAND: dark brownish gray; 25% fines; fine sand; 10% medium sand; no odor.
			DP	0	4					
					5					@5.5' SILTY SAND: very dark gray; 15% fines; medium to coarse sand; no odor.
			DP	0	6					
					7					@7.5' CLAY: very dark gray; medium plasticity; 10% very fine to fine sand; no odor.
			DP	7.4	8					
					9			SM		@9.0' SILTY SAND: 15% fines; 40% fine sand; medium to coarse and; no odor; minimal recovery.
			DP	6.9	10					
					11					Same as above.
	▽		DP	67.4	12					Minimal Recovery
					13					
			WT	231	14			SP		SAND: grayish brown; <5% fines; very fine to fine sand; odor.
					15					
			WT	72	16					Same as above.
					17					
			WT	4.2	18					@17.5' SAND: grayish brown; <5% fines; 30% medium sand; coarse sand; odor.
					19			CL		19.25' to 19.5' CLAY: yellowish brown; stiff; sand stringers; very fine sand; odor.
			WT	341	20			SM		@19.5' SILTY SAND: brownish gray; 30% fines; very fine to fine sand; odor.
					21					
			WT	2000	22					Same as above.

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DP-6

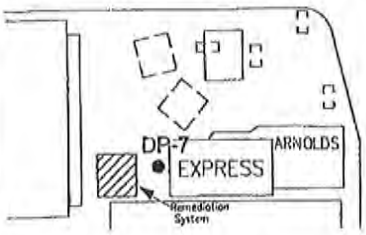
INSTALLATION DATE: 9/20/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 26'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION	
SURVEY DATE:	
DTW:	

DESCRIPTION/LOGGED BY: SHAWN MADISON

WELL/BORING COMPLETION	FIRST ▽	STABILIZED ▼	MOISTURE	PID (ppm)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC	DESCRIPTION
Bentonite					23			SM		SILTY SAND: brownish gray; 30% fines; very fine to fine sand; odor.
			WT	2000	24			SP		SAND: brownish gray; <5% fines; very fine to fine sand; odor.
					25					
			DP	33.4	26			CL		@25.4' CLAY: brownish yellow; medium plasticity; stiff; odor.
					27					
					28					
					29					
					30					
					31					
					32					
					33					
					34					
					35					
					36					
					37					
					38					
					39					
					40					
					41					
					42					
					43					
					44					
					45					

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DP-7

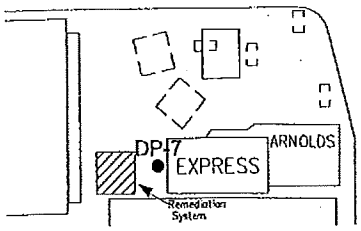
INSTALLATION DATE: 9/20/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 24'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION	
SURVEY DATE:	
DTW:	

DESCRIPTION/LOGGED BY: SHAWN MADISON

WELL/BORING COMPLETION	FIRST	STABILIZED	MOISTURE	PID (ppm)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC	DESCRIPTION
Asphalt					1			SM		SILTY SAND: brown; 20% fines; fine to medium sand; 10% gravel; no odor.
			DRY	0	2					
					3					Same but brown to dark brown with construction debris (Brick); no odor.
			DP	0	4					
					5					
			DP	0	6					SILTY SAND: brownish gray; 10% fines; fine to medium sand; no odor.
					7					@7.5' SILTY SAND: dark brown; 35% fines; fine to medium sand; 10% coarse sand; no odor.
			DP	0	8					
Bentonite	▽				9			SM		@9.5' Grades to brown in color; odor.
			WT	110	10					@10.5' grades to gray; 10% fines; odor.
					11					
			WT	193	12					
					13			SP		SAND; gray; fine sand; odor.
			WT	307	14					
					15					
			WT	126	16					SAND: brownish gray; fine sand; odor.
					17					SAND: brownish gray; fine to medium sand; odor.
			WT	355	18					
					19					
			WT	2000	20					@20' Grades to very fine sand.
					21					
			WT	2000	22					@22' Grades to fine to medium sand; odor.

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DP-7

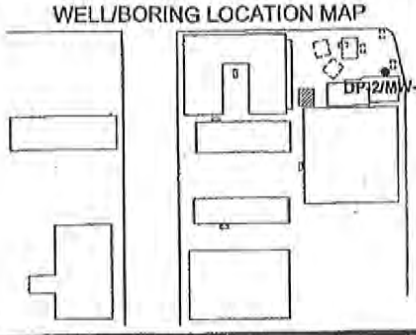
INSTALLATION DATE: 9/20/02	DRILLING METHOD: Geo Probe
PROJECT: TW21577	SAMPLING METHOD: Sleeve
CLIENT: Chevron 21-1577	BORING DIAMETER: 1 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 24'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION	
SURVEY DATE:	
DTW:	

DESCRIPTION/LOGGED BY: SHAWN MADISON

WELL/BORING COMPLETION	FIRST ▽	STABILIZED ▼	MOISTURE	PID (ppm)	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC	DESCRIPTION
Bentonite			DP	18.2	23			CL		@23' CLAY: yellowish brown with gray streaks; medium plasticity; stiff; no odor.
					24					
					25					
					26					
					27					
					28					
					29					
					30					
					31					
					32					
					33					
					34					
					35					
					36					
					37					
					38					
					39					
					40					
					41					
					42					
					43					
					44					
					45					

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DB-2
MW-13

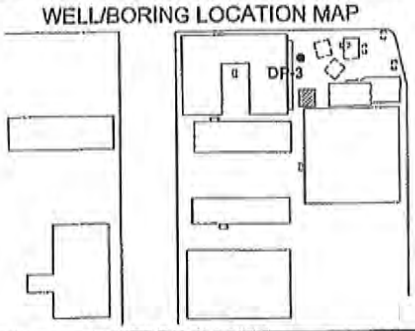
INSTALLATION DATE: 9/24/02	DRILLING METHOD: Hollow Stem Auger
PROJECT: TW21577	SAMPLING METHOD: DM Split Spoon
CLIENT: Chevron 21-1577	BORING DIAMETER: 8 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 21.5'
CITY: Seattle	WELL CASING: SCH 40 PVC 2"
STATE: WA	WELL SCREEN: 10-20' (0.010")
DRILLER: Cascade	SAND PACK: 7-21.5' (2 X12)

CASING ELEVATION	114.80
SURVEY DATE:	9/26/02
DTW:	19.0

DESCRIPTION/LOGGED BY: MATT MILLER

WELL/BORING COMPLETION	FIRST	STABILIZED	MOISTURE	PID (ppm)	DENSITY BLOWS / 6"	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC	DESCRIPTION
Concrete						0					Asphalt/concrete surface
Bentonite						1			SP		SAND: brown to gray; trace to 5% fines;
						2					
						3					
						4					
						5					
						6					
						7					
						8					
						9			SM		
					15	10					
					25						
					27	11					@11.5' No recovery.
						12					
			DP	277	21	13					SILTY SAND: dark gray; 5% fines; fine sand; thin interbedded clay lense (<0.5"); very dense; strong hydrocarbon odor; sheen.
					50-5"	14					
Sand						15					
	▽		WT	68	11	16					@16.5'; as above; iron oxide staining; trace to 10% gravel; very dense.
					21						
					30	17					
			MST	14	50-6"	18					
		▼				19					
						20					
			DP	11	19				CL		CLAY: dark gray; low plasticity; very hard; no hydrocarbon odor.
					29	21					
					50						
						22					

WELL/BORING LOCATION MAP



Delta Environmental Consultants, Inc.

WELL/BORING: DB-3

INSTALLATION DATE: 9/26/02	DRILLING METHOD: Hollow Stem Auger
PROJECT: TW21577	SAMPLING METHOD: DM Split Spoon
CLIENT: Chevron 21-1577	BORING DIAMETER: 8 "
LOCATION: 631 Queen Anne Ave No.	BORING DEPTH: 31.5'
CITY: Seattle	WELL CASING: NA
STATE: WA	WELL SCREEN: NA
DRILLER: Cascade	SAND PACK: NA

CASING ELEVATION	
SURVEY DATE:	
DTW:	

WELL/BORING COMPLETION	FIRST ▽	STABILIZED ▼	MOISTURE	PID (ppm)	DENSITY BLOWS / 6"	DEPTH (FEET)	RECOVERY	SAMPLE INTERVAL	USCS SYMBOL	GRAPHIC	DESCRIPTION/LOGGED BY: MATT MILLER
Backfilled with Bentonite			WT	89	50 50	23			SM		SILTY SAND: very dark gray; 10% fines; fine to coarse sand; trace gravel; very dense; hydrocarbon odor.
						24					
						25					
						26					
						27					
						28					
						29					
						30					
			WT	33	14 15 19	31			CL		CLAY: dark gray; low plasticity; hard; no hydrocarbon odor.
						32					
						33					
						34					
						35					
						36					
						37					
						38					
						39					
						40					
						41					
						42					
						43					
						44					

First Page missing from report

5-17-93

Changed 6/10/93 ~~VP-8~~ VP9

1300 Move Rig a/ VP-1. Load up supplies

1315 Move Rig To ~~VP-8.~~ → Changed to VP-9 on 6/10/93 Set up & plumb Rig. Doug Pearman back on site Excavating crew on lunch

1324 Begin Drilling, break up asphalt

Surface sample - ~2-5" asphalt
Sand & gravel - fill
loose
10YR 3/3

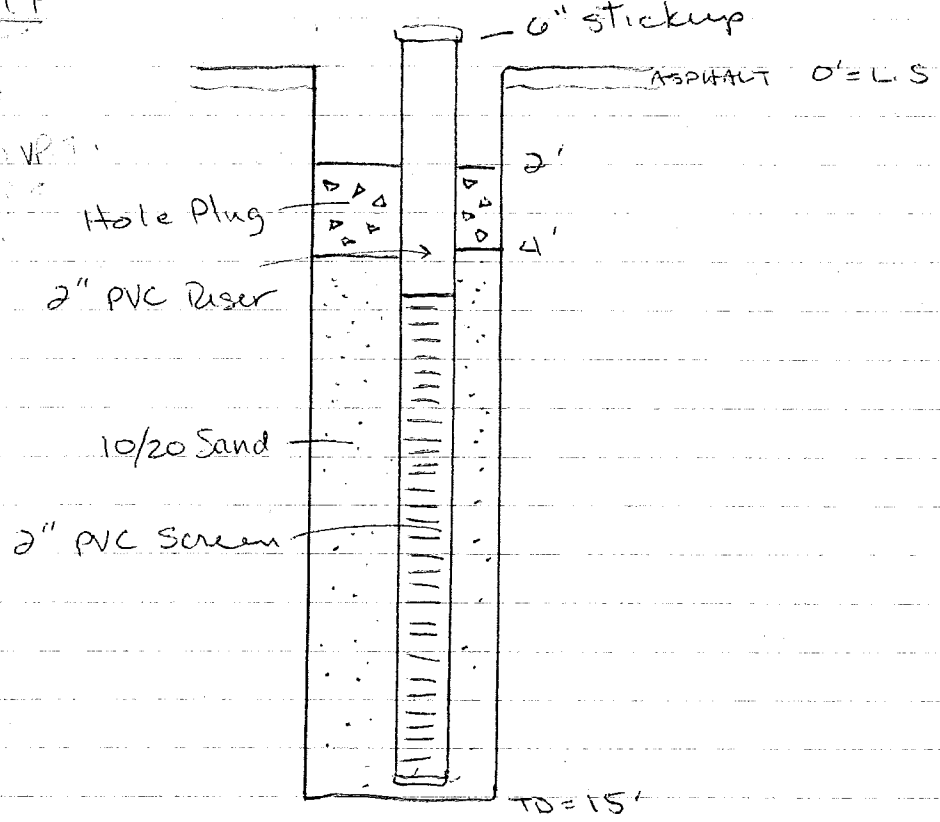
Gravelly to 2.5'

1335 Sample @ 2.5'
BC = 3/1/1
10YR 4/1
Med - coarse SAND w/ Gravel FILL
some brick fragments
1" gravels
Dry, loose
SW-SP

1342 Sample @ 7.5'
BC = 5/6/7
5Y 4/1
SAND - med w/ little silt
moist to sl-wet, loose
SP-SW/SM

5-17-93

As-Built
VP-8
VP-9
the yellow VP-9
[illegible]
Schedule



1445 Drillers decanning augers.

1530 Signed dailys.
Drillers off site for the day

GES securing site

1535 Pouring dry ice down the UST

1350 Ecology folks off-site for the day

5-25-93 RW-4

1615

1530 Begin Drilling, break asphalt

1540 Sample @ 5'
BC = 35/21/16
color = 10YR 7/1
dry
rubble, fill, concrete
GM

Gravel (rock) @ 4'

1622

Grab from cuttings @ 7'
high organic, soft, molds, clayey silt & fine Sand
2.5Y 2/0 Sl. moist
OL org. & fuel smell

1555 Sample @ 10'
BC 5/3/5
5Y 4/1
Sand fine-coarse w/ sub gravel & some silt
V. moist
loose H2S pid = 264 ppm
SP-SM

- Collected the last samples from the pit #9, 10, 11.
- Pump the last of H2O out of RW-1
- Last VES tree going in

4

1615 Sample @ 12.5
BC 3/4/4
5Y 4/2 (12.5-13.5') to 5Y 4/1 (13.5-14')
fine to Med Sand w/ Silt
(rock) grades to more silt @ 13.5-14' (finer sand)
V moist, ~~loose~~ compact
SP-SM
no water yet

1622 Sample @ 15'
BC 2/4/10
(15-16') → (5Y 4/1 to 5Y 4/3) w/ 2.5Y 5/6 intermixed w/ 16-17'
y silt / fine Sand
Fine Sand SAND w/ a 2" Silt layer at 16'
↳ gray w/ iron streaks
V. moist to wet above silt layer
compact to loose
SP-SM

ravel

Sample @ 17.5
2.5Y 5/6 (17.5-18')
5Y 5/3 (18-19')

Med SAND (17.5-18') grades to fine Sand 18-19'
Gravel at top of sample 17-17.5 thicker

Sl. moist compact to loose
str. HC odor

SP

5-25-93

1645 Sample @ 20'
BC 1/5/8
PID on sample = 1200 ppm !

ML dense, silt layer @ 20-20.5', soft
2.5Y 5/3
SM fine sand w/ silt 20.5-21.5'
5Y 5/2

1700 Augers at 22'. Shut down Rig. Secure site.

1745

Glacier securing/covering pit

label, pack up & transfer. Pit samples to Rig. in Glacier's apart./office.

Chung-Pi: since RW-1 seems to be recovering, he really would like RW-4 moved north ~ 10' feet also so to have both wells recovering, spread out a bit

Will continue to sample this hole looking for that confining clayer

1725 Tried telephoning D. Pearman at Bothell office to update - not in

5-24-93 RW-4

weather: p. cloudy 60°, hi 70°
geologists V. Metcalfe
drillers: Charles, Tom

0715 leave home for Site

0750 Arrive at Site

Pack up Samples for lab Pick-up

0845 Drillers arrive
(RW-4) *
SWL - 20.3' BLS

0850 Sample @ 22.5'
BC = 2/5/5
5Y 5/2
wet
strong HC odor
SAND - fine-med w/ little silt
PID = 770 ppm

0905 Sample @ 25'
BC = 3/5/9 PID = 270-300 ppm

Same as above
w/ some gravel (26-26.5')
slightly coarser sand

0915

0925

1005

1020

5-26-93

0915 Sample @ 27.5' wet
PID = 95 ppm
change at 28' from same as above to a fine SAND (5Y 4/3) w/ silt
trace silt at tip of shoe.
iron streak at tip

0925 Sample @ 30'
BC: 1/2/3 wet
silt/clay at 31'
dense, molds
SAND (30-31') fine-med w/ silt

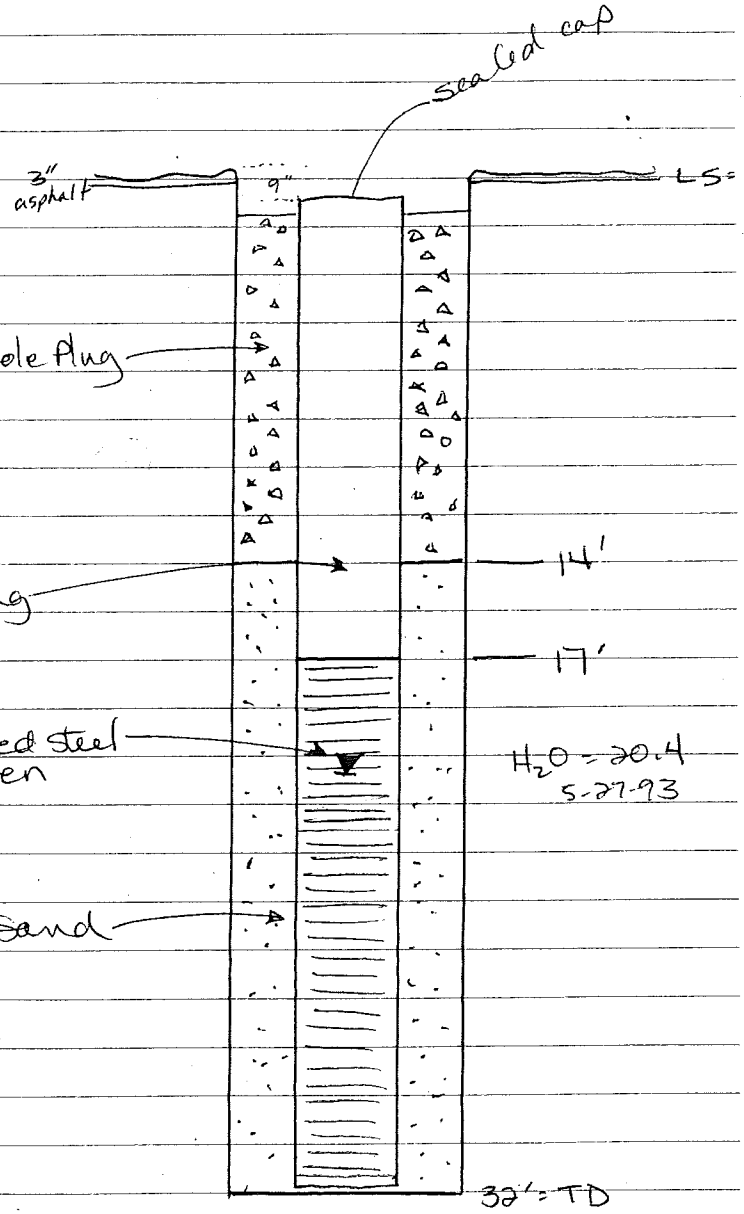
~~Plug~~ Bit is in the auger - try & retrieve

1005 going to set the well here. TD = 32'
Screen from 17-32'.

1020 Start getting things together to weld screen

As-built

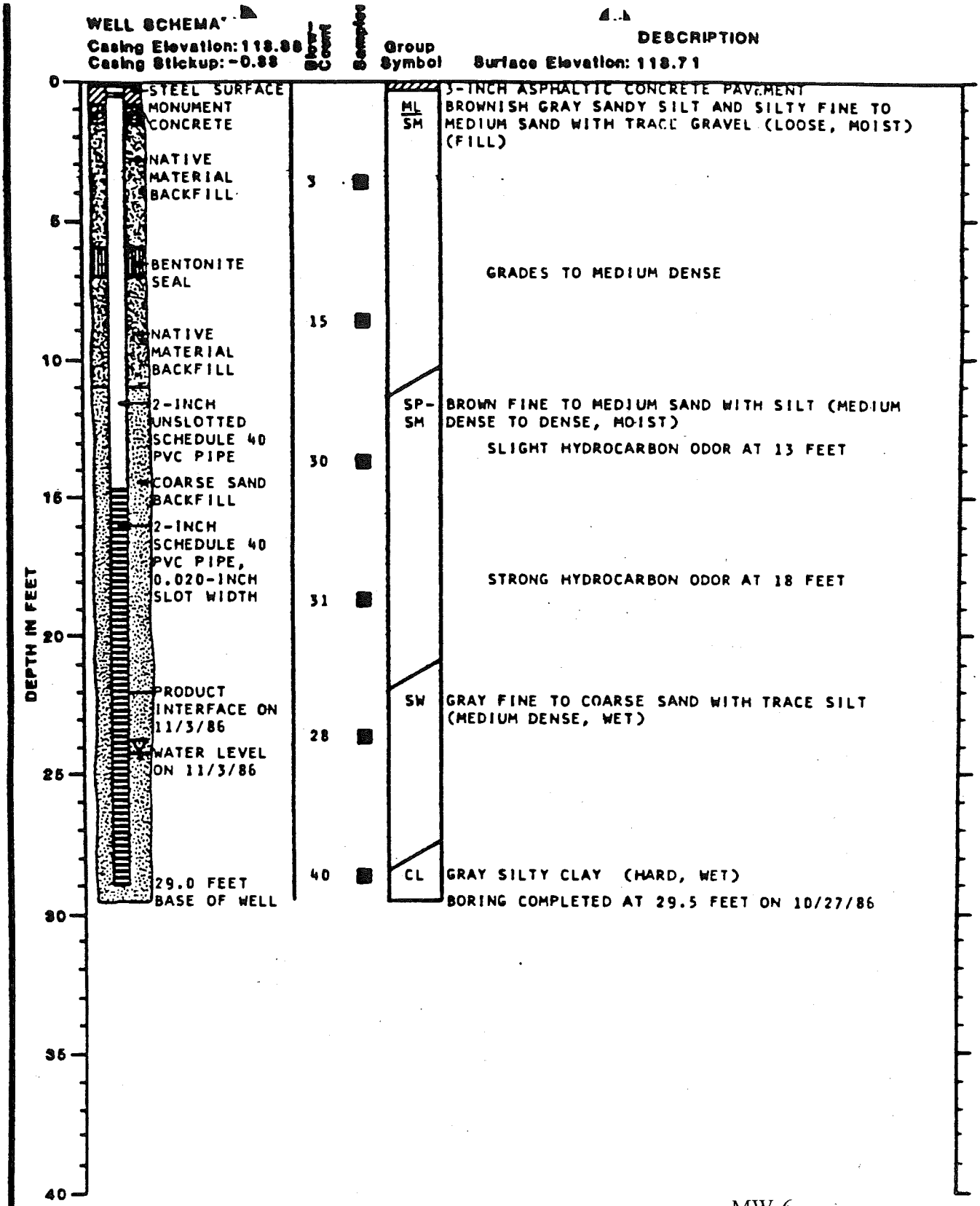
RW-4



1630 Clean up Site. Lower Mast.

Mom Rig -to Dcon

DRAFT



504-04 JAM:DMP 11-13-86

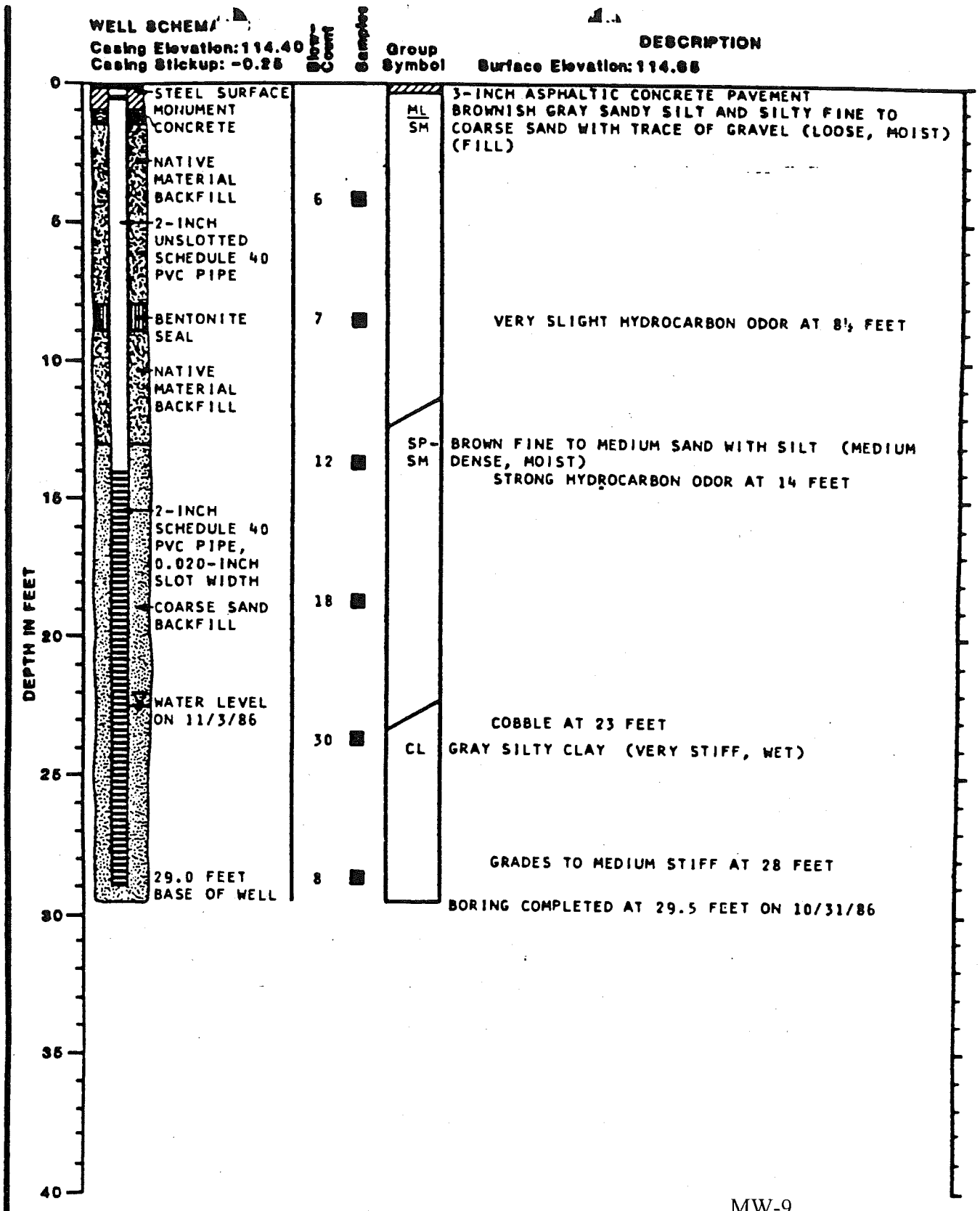
MW-6

GeoEngineers Incorporated

LOG OF MONITOR WELL

FIGURE 7

DRAFT



504-04 JAM:DMP 11-13-86

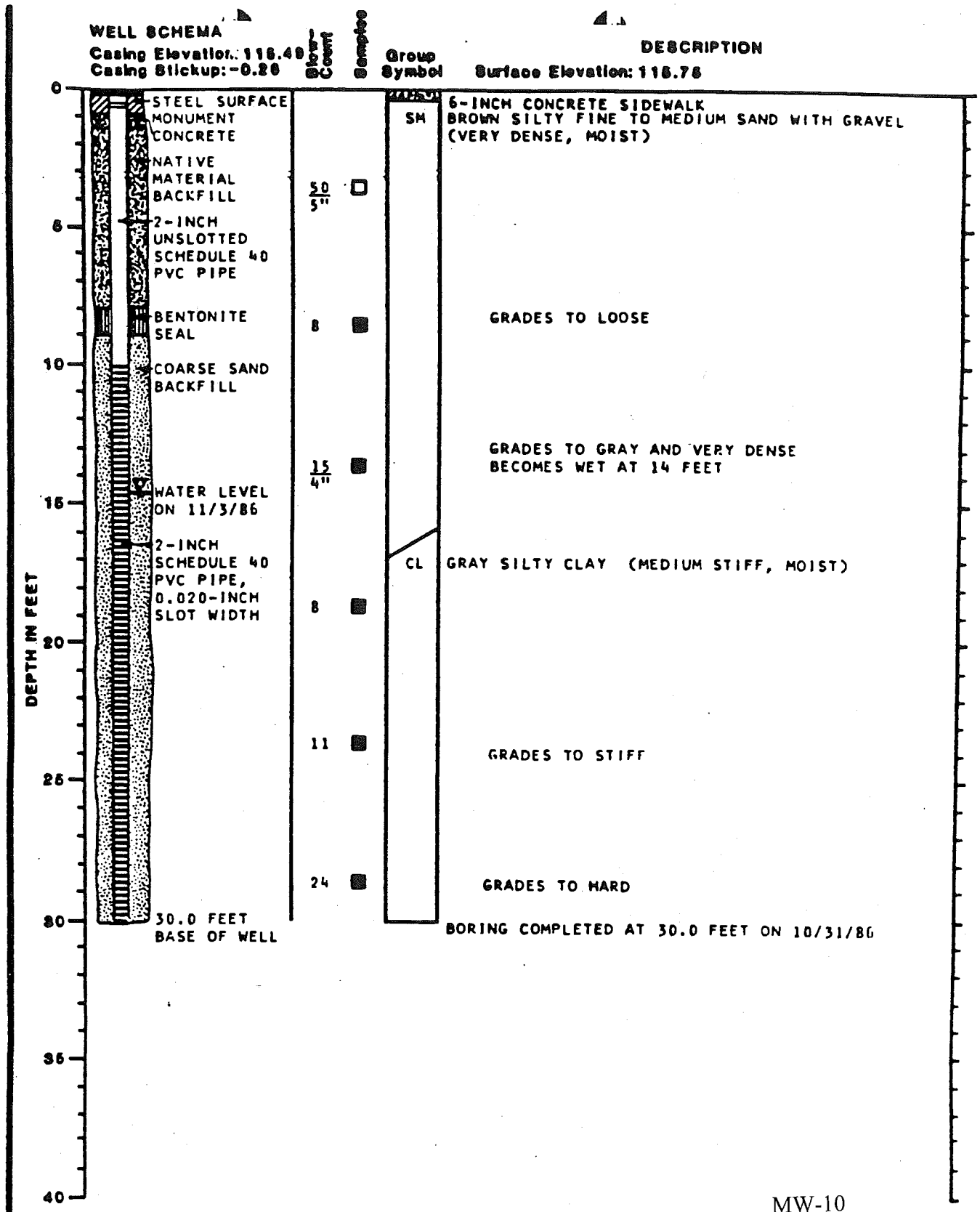
MW-9

GeoEngineers Incorporated

LOG OF MONITOR WELL

FIGURE 10

DRAFT



SG4-04 JAM:DMP 11-13-86

GeoEngineers Incorporated

LOG OF MONITOR WELL

FIGURE 11

APPENDIX D

Terrestrial Ecological Evaluation

RILEYGROUP

Voluntary Cleanup Program

Washington State Department of Ecology
Toxics Cleanup Program

TERRESTRIAL ECOLOGICAL EVALUATION FORM

Under the Model Toxics Control Act (MTCA), a terrestrial ecological evaluation is necessary if hazardous substances are released into the soils at a Site. In the event of such a release, you must take one of the following three actions as part of your investigation and cleanup of the Site:

1. Document an exclusion from further evaluation using the criteria in WAC 173-340-7491.
2. Conduct a simplified evaluation as set forth in WAC 173-340-7492.
3. Conduct a site-specific evaluation as set forth in WAC 173-340-7493.

When requesting a written opinion under the Voluntary Cleanup Program (VCP), you must complete this form and submit it to the Department of Ecology (Ecology). The form documents the type and results of your evaluation.

Completion of this form is not sufficient to document your evaluation. You still need to document your analysis and the basis for your conclusion in your cleanup plan or report.

If you have questions about how to conduct a terrestrial ecological evaluation, please contact the Ecology site manager assigned to your Site. For additional guidance, please refer to https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Terrestrial-ecological-evaluation.

Step 1: IDENTIFY HAZARDOUS WASTE SITE	
Please identify below the hazardous waste site for which you are documenting an evaluation.	
Facility/Site Name: Texaco 211577 Monterey Cleanup Site - Roystone Redevelopment	
Facility/Site Address: 631 Queen Anne Avenue North, Seattle, Washington	
Facility/Site No: 77774779	VCP Project No.: Agreed Order (in progress)

Step 2: IDENTIFY EVALUATOR		
Please identify below the person who conducted the evaluation and their contact information.		
Name: Jerry Sawetz		Title: Project Manager
Organization: Riley Group, Inc.		
Mailing address: 17522 Bothell Way Northeast		
City: Bothell	State: WA	Zip code: 98011
Phone: 425-415-0551	Fax: 425-415-0311	E-mail: jsawetz@riley-group.com

Step 3: DOCUMENT EVALUATION TYPE AND RESULTS

A. Exclusion from further evaluation.

1. Does the Site qualify for an exclusion from further evaluation?

☒ Yes *If you answered **"YES,"** then answer **Question 2**.*

☐ No or Unknown *If you answered **"NO" or "UNKNOWN,"** then skip to **Step 3B** of this form.*

2. What is the basis for the exclusion? *Check all that apply. Then skip to **Step 4** of this form.*

Point of Compliance: WAC 173-340-7491(1)(a)

☐ All soil contamination is, or will be,* at least 15 feet below the surface.

☐ All soil contamination is, or will be,* at least 6 feet below the surface (or alternative depth if approved by Ecology), and institutional controls are used to manage remaining contamination.

Barriers to Exposure: WAC 173-340-7491(1)(b)

☐ All contaminated soil, is or will be,* covered by physical barriers (such as buildings or paved roads) that prevent exposure to plants and wildlife, and institutional controls are used to manage remaining contamination.

Undeveloped Land: WAC 173-340-7491(1)(c)

☐ There is less than 0.25 acres of contiguous[#] undeveloped[±] land on or within 500 feet of any area of the Site and any of the following chemicals is present: chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin, chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, benzene hexachloride, toxaphene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene.

☒ For sites not containing any of the chemicals mentioned above, there is less than 1.5 acres of contiguous[#] undeveloped[±] land on or within 500 feet of any area of the Site.

Background Concentrations: WAC 173-340-7491(1)(d)

☐ Concentrations of hazardous substances in soil do not exceed natural background levels as described in WAC 173-340-200 and 173-340-709.

* An exclusion based on future land use must have a completion date for future development that is acceptable to Ecology.

[±] "Undeveloped land" is land that is not covered by building, roads, paved areas, or other barriers that would prevent wildlife from feeding on plants, earthworms, insects, or other food in or on the soil.

[#] "Contiguous" undeveloped land is an area of undeveloped land that is not divided into smaller areas of highways, extensive paving, or similar structures that are likely to reduce the potential use of the overall area by wildlife.

B. Simplified evaluation.

1. Does the Site qualify for a simplified evaluation?

☐ Yes *If you answered **"YES,"** then answer **Question 2** below.*

☐ No or Unknown *If you answered **"NO"** or **"UNKNOWN,"** then skip to **Step 3C** of this form.*

2. Did you conduct a simplified evaluation?

☐ Yes *If you answered **"YES,"** then answer **Question 3** below.*

☐ No *If you answered **"NO,"** then skip to **Step 3C** of this form.*

3. Was further evaluation necessary?

☐ Yes *If you answered **"YES,"** then answer **Question 4** below.*

☐ No *If you answered **"NO,"** then answer **Question 5** below.*

4. If further evaluation was necessary, what did you do?

☐ Used the concentrations listed in Table 749-2 as cleanup levels. *If so, then skip to **Step 4** of this form.*

☐ Conducted a site-specific evaluation. *If so, then skip to **Step 3C** of this form.*

5. If no further evaluation was necessary, what was the reason? *Check all that apply. Then skip to **Step 4** of this form.*

Exposure Analysis: WAC 173-340-7492(2)(a)

☐ Area of soil contamination at the Site is not more than 350 square feet.

☐ Current or planned land use makes wildlife exposure unlikely. Used Table 749-1.

Pathway Analysis: WAC 173-340-7492(2)(b)

☐ No potential exposure pathways from soil contamination to ecological receptors.

Contaminant Analysis: WAC 173-340-7492(2)(c)

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations that exceed the values listed in Table 749-2.

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations that exceed the values listed in Table 749-2, and institutional controls are used to manage remaining contamination.

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 15 feet at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays.

☐ No contaminant listed in Table 749-2 is, or will be, present in the upper 6 feet (or alternative depth if approved by Ecology) at concentrations likely to be toxic or have the potential to bioaccumulate as determined using Ecology-approved bioassays, and institutional controls are used to manage remaining contamination.

C. Site-specific evaluation. A site-specific evaluation process consists of two parts: (1) formulating the problem, and (2) selecting the methods for addressing the identified problem. Both steps require consultation with and approval by Ecology. *See* WAC 173-340-7493(1)(c).

1. Was there a problem? *See* WAC 173-340-7493(2).

☐ Yes *If you answered **"YES,"** then answer **Question 2** below.*

☐ No *If you answered **"NO,"** then identify the reason here and then skip to **Question 5** below:*

- ☐ No issues were identified during the problem formulation step.
- ☐ While issues were identified, those issues were addressed by the cleanup actions for protecting human health.

2. What did you do to resolve the problem? *See* WAC 173-340-7493(3).

- ☐ Used the concentrations listed in Table 749-3 as cleanup levels. *If so, then skip to **Question 5** below.*
- ☐ Used one or more of the methods listed in WAC 173-340-7493(3) to evaluate and address the identified problem. *If so, then answer **Questions 3 and 4** below.*

3. If you conducted further site-specific evaluations, what methods did you use?
Check all that apply. See WAC 173-340-7493(3).

- ☐ Literature surveys.
- ☐ Soil bioassays.
- ☐ Wildlife exposure model.
- ☐ Biomarkers.
- ☐ Site-specific field studies.
- ☐ Weight of evidence.
- ☐ Other methods approved by Ecology. If so, please specify:

4. What was the result of those evaluations?

- ☐ Confirmed there was no problem.
- ☐ Confirmed there was a problem and established site-specific cleanup levels.

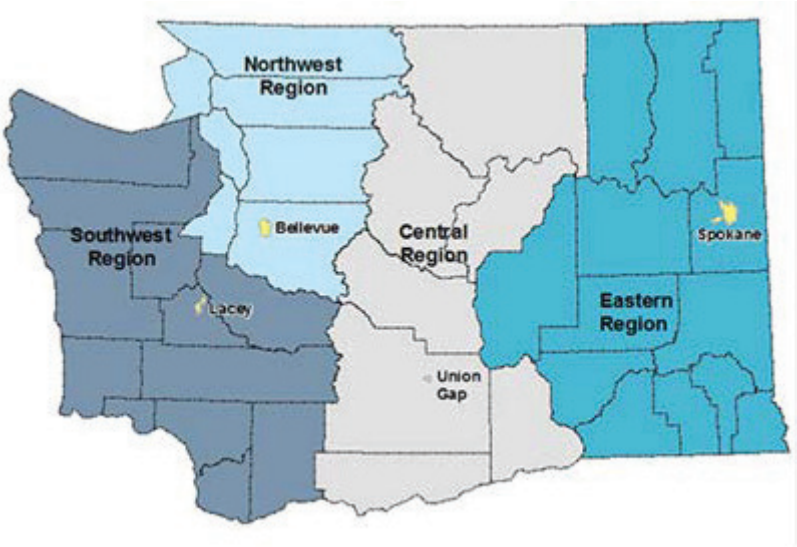
5. Have you already obtained Ecology's approval of both your problem formulation and problem resolution steps?

☐ Yes If so, please identify the Ecology staff who approved those steps:

☐ No

Step 4: SUBMITTAL

Please mail your completed form to the Ecology site manager assigned to your Site. If a site manager has not yet been assigned, please mail your completed form to the Ecology regional office for the County in which your Site is located.



Northwest Region: Attn: VCP Coordinator 3190 160th Ave. SE Bellevue, WA 98008-5452	**Central Region:** Attn: VCP Coordinator 1250 West Alder St. Union Gap, WA 98903-0009
Southwest Region: Attn: VCP Coordinator P.O. Box 47775 Olympia, WA 98504-7775	**Eastern Region:** Attn: VCP Coordinator N. 4601 Monroe Spokane WA 99205-1295

If you need this publication in an alternate format, please call the Toxics Cleanup Program at 360-407-7170. People with hearing loss can call 711 for Washington Relay Service. People with a speech disability can call 877-833-6341.

APPENDIX E

Property Specific Heath & Safety Plan

RILEYGROUP

PROPERTY SPECIFIC HEALTH AND SAFETY PLAN

PREPARED BY:

THE RILEY GROUP, INC.
17522 BOTHELL WAY NORTHEAST
BOTHELL, WASHINGTON 98011

PREPARED FOR:

ROYSTONE ON QUEEN ANNE, LLC
606 MAYNARD AVENUE SOUTH
SEATTLE, WASHINGTON, 98104

RGI PROJECT NO. 2017-015K

PROPERTY-SPECIFIC HEALTH AND SAFETY PLAN

ROYSTONE REDEVELOPMENT
631 QUEEN ANNE AVENUE NORTH
SEATTLE, WASHINGTON 98109

TAX PARCEL NO. 38789900425

MAY 14, 2019

Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone 425.415.0551 ♦ Fax 425.415.0311

www.riley-group.com

EMERGENCY TELEPHONE NUMBERS

Ambulance/Police/Fire:	911
Poison Control Center:	800.222.1222
National Response Center:	800.424.8802
EPA Environmental Response Team:	206.553.1200
Utility Notification Center (King Co.):	800.424.5555
Washington OSHA Center (Olympia):	360.902.5495
Washington Emergency Management:	800.562.6108
Emergency Natural Gas	
Puget Sound Energy:	888.225.5773

PROJECT-SPECIFIC CONTACT INFORMATION

Provided in section 3.

EMERGENCY ROUTE TO NEAREST HOSPITAL/EMERGENCY MEDICAL CENTER

From: Roystone Queen Anne at
631 Queen Anne Avenue North
Seattle, WA

To: Virginia Mason Hospital Emergency Room and Medical Center
First Hill
1100 9th Avenue
Seattle, WA 98101

Takes approximately 15 minutes to arrive in normal traffic

1. Head south onto Queen Anne Avenue North (446 feet) toward Mercer Street
   - Turn left onto Mercer Street (0.7 mi)
   - Turn right onto Dexter Avenue North (0.4 mi)
   - Turn left onto Denny Way (0.3 mi)
   - Turn right onto Boren Avenue (0.7 mi)
2. Turn right onto Seneca Street to Virginia Mason Medical Center (322 mi)
   - Turn left and destination will be on the left

Travel takes approximately 15 minutes to arrive in normal traffic. Consider the situation and travel time when determining whether or not to call an ambulance.

RILEYGROUP

TABLE OF CONTENTS

SUPPORTING DATA

TABLES

APPENDICES

Appendix A: Field Safety Plan Consent Agreement
Appendix B: Safety Meeting Minutes
Appendix C: Route to Hospital
Appendix D: Incident/Accident Report Form

1. PROJECT LOCATION AND DESCRIPTION

1.1 Project Location

Property/Project Name:	Texaco 211577 Monterey Cleanup Site – Roystone Redevelopment
Property Address:	631 Queen Anne Avenue North
Property City/State/Zip Code	Seattle, Washington 98109
Current Property Use:	Vacant
Drinking Water/Sanitary:	On-Property

1.2 Project Description

RGI will complete an interim action consisting of remediating petroleum contaminated soil and groundwater in conjunction with the redevelopment of the Property as a multi-use retail/residential building. If underground storage tanks (USTs) are encountered during redeveloped they will be properly decommissioned in accordance with applicable regulations. Groundwater monitoring wells will also be installed using direct push and/or hollow stem auger (HSA) drilling technologies.

1.3 Dates of Work

The interim action is scheduled to begin in August of 2019 and be completed in October of 2019.

2. PURPOSE AND DESCRIPTION OF THE HAZARDOUS SUBSTANCE HEALTH AND SAFETY PLAN

2.1 Property-Specific Health and Safety Plan (PSHSP) Regulatory Requirement

A health and safety plan (PSHSP) that meets Occupational Safety and Health Act (OSHA) requirements (29 Code of Federal Regulation [CFR] 1910.120) and Washington Administrative Code (WAC) is required to address potential human health risk related to anticipated hazards. Roystone on Queen Anne, LLC has retained Riley Group, Inc. (RGI) to develop this PSHSP to be utilized during activities on the Property in which soil and groundwater impacted with petroleum-related contaminants may be encountered. Workers engaging in construction activities must familiarize themselves with the contents of this PSHSP, and sign that they have been informed as to the contents. An employee signature page is included in Appendix A.

2.2 Purpose

This PSHSP describes the specific responsibilities, training requirements, protective equipment, and operating procedures necessary to minimize potential hazards and accidents that may occur during construction activities, as well as, details the actions taken during a project emergency. The plan primarily addresses potential worker exposure to petroleum products or petroleum-impacted soil or groundwater during planned work. The staffing and monitoring requirements in this PSHSP are not intended for general construction activities performed in uncontaminated media. RGI will inform its subcontractors working on-Property of potential fire, explosion, health, safety or other hazards associated with planned project activities, and can make available to them this PSHSP. **However, all subcontractors are solely responsible for preparation of their own PSHSP, and for the safety of their employees.**

2.3 How Is this PSHSP Different from the Contractor's General Safety Program?

The PSHSP is intended to supplement the Contractor's General Safety Program; job activities not related to work performed around or within petroleum containing or impacted media are not discussed in this PSHSP. The Contractor's General Safety Program is prepared separately. Personnel working on the Property must comply with their employer's General Safety Program in addition to the requirements of this PSHSP. If workers believe the contents of the PSHSP and their employer's General

Safety Program are in conflict, they should work with their supervisor and the contractor field manager to resolve the conflict.

2.4 How Has this PSHSP Been Prepared?

During development of this PSHSP, consideration was given to current safety standards as defined by the Environmental Protection Agency (EPA), OSHA, Washington State Department of Labor and Industries (WA L&I) and National Institute for Occupational Safety and Health (NIOSH). Specifically, RGI uses the following reference sources in the preparation of this Property-specific health and safety plans:

- 29 CFR 1926.65 (Construction Standard) and 1910.120 (General Industry Standard) and 40 CFR 311 (Protection of Environment)
- WA L&I: Chapter 296-843 and 296-155-100 WAC (Department of Labor and Industries)
- NIOSH Pocket Guide to Chemical Hazards, DHHS (NIOSH) Publication No. 2005-149, September 2007

Work and environmental conditions at the Property may change over the course of the project; as such, this PSHSP is dynamic and may be modified to encompass changes in work conditions or other unanticipated events and hazards.

3 KEY PERSONNEL AND RESPONSIBILITIES

The following table lists key personnel assigned to this project and their responsibilities.

Table 1. Key Personnel

Title	Name	Affiliation/ Company	E-mail	Phone Numbers
OTHERS AS NEEDED				
Project Owner Contact	Ryan Stoller	Stoller, LLC	ryan@stollerllc.com	(206) 660-0329
Contractor Project Supervisor				
Contractor Project Manager				
Contractor Project Superintendent				
Fieldwork Manager	Logan Chinn		lchinn@riley-group.com	(206) 963-3420
RGI Environmental Project Manager	Jerry Sawetz	RGI	jsawetz@riley-group.com	Mobile: 425-301-1227 Office: 425.415.0551
Corporate Safety Officer	Audrey Heisey, LHG	RGI	aheisey@riley-group.com	Mobile: 206.503.1562 Office: 425.415.0551

4 KNOWN ENVIRONMENTAL CONDITIONS

4.1 Property Investigations

In generating this PSHSP, information from the following document, which summarizes all previous investigations, was used:

- Interim Action Work Plan dated May 17, 2019 by RGI

4.2 Chemical of Concern

The presence of petroleum vapors (e.g. potential residual fuel in/near work area) may pose a risk to construction and excavation workers during the course of the work. Constituents found at the Property include a range of total petroleum hydrocarbons (TPH) consisting of gasoline, diesel and oil and may include petroleum volatile organic compounds (VOCs), naphthalene, and benzene, toluene, ethylbenzene, and xylenes. Free product is not expected to be encountered during the course of the work.

Table 3 provides the exposure routes and common health effects for the contaminants, along with OSHA and WA L&I permissible exposure limits (PEL).

4.3 Identified Human Health Risk

Acute exposure to petroleum hydrocarbons can cause coughing, difficulty breathing, abdominal pain and vomiting, drowsiness, restlessness, and convulsions.

Chronic exposure may cause damage to the liver, decreased immune response, dermatitis, impaired neurological function, and impaired hearing. Benzene and naphthalene, constituents in fuel, are known carcinogens. Repeated and prolonged exposure may increase chances for some kinds of cancer.

5 HAZARD ANALYSIS

The evaluation of hazards is based on the conditions, previous investigations, and anticipated risks posed by specific operations. Hazards, hazardous conditions, or materials may be present or encountered within the project boundaries that are not anticipated based on available background information. This PSHSP is considered dynamic and shall be changed or updated as necessary.

This hazard analysis focuses on work tasks that may pose a hazard due to contaminated soil and groundwater. It is assumed that hazards related to regular construction activities have been assessed and formally communicated to employees in each employer's general safety program.

5.1 Work Task Descriptions

Work activities where personnel are expected to encounter contamination include the following:

- Soil excavation, trenching, or grading
- Fuel product transfer to vacuum truck, and pipe cutting and capping
- Removal of groundwater from excavation
- Drilling for installation of groundwater monitoring wells.

5.2 Chemical Hazards and Controls

Chemicals that may be encountered during the work include petroleum hydrocarbons. These compounds can enter the body through inhalation, skin absorption, ingestion, or a cut in the skin. If unknown chemical hazards are encountered during construction activities, this section will be revised to reflect the new conditions. Exposure is limited to vapors from potential residual fuel in/near work area.

This PSHSP provides direction for the use of personal protective equipment (PPE) to eliminate contact of chemical hazards. Personnel working on the Property should comply with PPE requirements to minimize these hazards. If material is encountered that is determined to pose a chemical hazard to personnel the Project Supervisor shall be notified immediately to assess and work with personnel to respond appropriately.

5.3 Physical Hazards and Controls

The nature of construction work poses physical hazards to construction workers and visitors or trespassers to the Property. As previously noted, these hazards should be addressed in the contractor's general safety program. Physical barriers will be installed to prevent unauthorized access to the Property. Table 2 summarizes typical hazards associated with gasoline and diesel product or contaminated media along with recommended preventive actions or controls.

6 PROPERTY ACCESS CONTROL

The following section defines measures and procedures for maintaining project control, which is an essential component in the implementation of the PSHSP. Project control is necessary when work is being conducted in association with regulated substances and access to the work area needs to be controlled for the safety of the workers and the general public.

6.1 Area Boundaries and Barriers

If a task requires that the work area be controlled, area boundaries shall be established by the Project Supervisor or designee and marked in a manner that informs personnel or visitors that access to that area is limited. This may be accomplished by the use of barricades, cones, and/or warning tape. Alternately, a worker may be stationed to direct traffic away from the restricted area. If the affected area is located where unauthorized personnel are likely to pass, temporary security fencing should be used to prevent contact with the affected area.

6.2 Engineering Controls and Work Practices

To the extent feasible, engineering controls and work practices will be implemented to reduce and maintain employee exposure below the permissible exposure limit for contaminants of concern and associated constituent vapors and/or dust. Personnel working on the Property will be informed at safety briefings if engineering controls and work practices are instituted.

Engineering control options that can be implemented to reduce potential employee exposure in the event elevated vapors above the permissible exposure limit include but are not limited to:

- Removal of personnel from the affected area to an upwind location
- Use of industrial ventilation fans to provide fresh air circulation in the employee work zones
- Progressive excavation and grading techniques, which may include:
    - Potholing to identify potential impacted areas in advance of excavation activities
    - Graduated excavation in impacted areas (i.e. excavating to depth in lifts in order to minimize potential breathing zone hazards)
    - Till or scrape soil to disturb impacted soils and allow soil to remain undisturbed in order to let vapors dissipate below permissible exposure limits prior to resuming work in these areas.

Any reasonable combination of engineering controls, work practices, and PPE shall be used to reduce and maintain employee exposures below the permissible exposure limits. The amount of personnel and equipment in impacted areas shall be minimized yet allow for effective project operations.

6.2 Operational Zones

The potential health hazards of petroleum impacted media are not expected to require the delineation of specific operational work zones; however, if field conditions indicate that these zones are required or if media with unidentified contamination is discovered during the interim action, specific work zones may be established to prevent accidents and/or unauthorized entry into the affected area(s). If operational zones are required as a standard protocol for the project, this PSHSP should be revised to reflect this change.

6.3 Ongoing Safety Briefings

The Project Supervisor will conduct or coordinate ongoing safety briefings to ensure that new personnel working on the Property are familiar with the contents and requirements of the PSHSP. It is the responsibility of the Project Supervisor to determine when workers require the initial PSHSP awareness safety training, and alert the environmental consultant that additional training is needed.

7 PROPERTY STANDARD OPERATING PROCEDURES

Field personnel will comply with SOPs in their employer's general safety program and will use the following hygiene practices while working on-Property:

- No person will eat, drink, and chew gum or tobacco in potentially contaminated areas. Drinking of replacement fluids for heat stress control will be permitted only in areas that are free from contamination, except in emergency situations.
- Smoking is prohibited except in designated areas of the Property.
- Long hair will be secured away from the face so that it does not interfere with any activities.
- All personnel leaving potentially contaminated areas will wash their hands and face prior to entering any eating areas.
- Personnel leaving potentially contaminated areas will shower (including washing hair) and change to clean clothing as soon as practical after leaving the property.

8 DECONTAMINATION

8.1 Worker Decontamination

Given the current understanding of the work, the decontamination procedure is limited to ensuring that residual contaminated soil is removed from work clothing and boots prior to leaving the work zone, and all personnel exposed to impacted soils thoroughly wash their hands, face and exposed body parts prior to breaks and at the end of every work shift. Assuming normal working conditions, remove and thoroughly wash work clothes between shifts. Personnel shall maintain a change of work clothes on-Property in the event contamination saturates work clothes in contact with skin. If Property conditions require identification of a Hot Zone, worker decontamination procedures will be re-evaluated for effectiveness.

8.2 Equipment Decontamination

The Project Supervisor shall ensure that equipment entering the Property is properly decontaminated to prevent cross-contamination from previous projects and to ensure that personnel do not come in

contact with unidentified and unknown hazards. Heavy equipment used by field personnel must be adequately decontaminated prior to moving between specific excavation areas. This shall consist of sweeping away loose soil and removal of significant quantities of adhered soil with hand tools. Trucks will be broom-cleaned before leaving the loading area.

Residual contaminated soil encountered during decontamination of equipment shall be captured and either placed in a truck containing similar material or stored on heavy-duty plastic for later disposal.

8.3 Disposition of Decontamination Wastes

Equipment and supplies used for the decontamination process shall be decontaminated or disposed of in accordance with applicable regulations.

8.4 Excavated Soil

When it is necessary to stockpile contaminated soil over clean soil, visqueen must be placed beneath contaminated soil with bermed edges. The stockpile must also be covered with visqueen and weighted to minimize chance for spreading of contamination by wind or rain; appropriate disposition of the soil will be based on soil quality data collected at each location.

9 HAZARD ANALYSIS

The potential hazards and corresponding control measures for planned project work activities are as follows:

Table 2. Hazard Analysis

Work Activity	Primary Potential Hazards	Control Measures
Remedial excavation	Getting hit by equipment, especially from overhead.	Stay back from equipment and stay alert. Modified Level D PPE (with hard hat, traffic vest, steel-toe boots).
	Excessive noise.	Wear hearing protection.
	Chemical exposure (skin contact, ingestion, inhalation).	Modified Level D PPE. Air monitoring.
Sampling	Getting hit by excavator.	Wear traffic vest. Stay back from excavator and maintain eye contact with operator.
	Falling into open excavation, engulfment.	Do not enter excavation >4 feet deep unless properly shored or sloped. Stay back from unstable slopes. Sample from excavator bucket where needed.
	Chemical exposure (skin contact, ingestion, inhalation).	Modified Level D PPE. Air monitoring.
All	Getting hit by other trucks working on the property.	Wear traffic vest. Stay back from roads and stay alert.
	Heat stress	Take breaks, seek shade, and increase fluid intake.

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Table 3. Chemical Hazard Information

Substance	Medium	OSHA PEL	OSHA STEL	IDLH	Carcinogen or Other Hazard
Gasoline-Range Petroleum	Soil, GW	10 ppmv	15 ppmv	250 ppmv	T
Diesel- and Oil-Range Petroleum	Soil, GW	1 ppmv	5 ppmv	500 ppmv	T
Benzene	Soil, GW	1 ppmv	5 ppmv	500 ppmv	C
Toluene	Soil, GW	200 ppmv	----	500 ppmv	T
Ethylbenzene	Soil, GW	100 ppmv	----	800 ppmv	T
Xylenes	Soil, GW	100 ppmv	150 ppmv	900 ppmv	T
Heavy Metals, lead	Soil, GW	Pb: 0.05 mg/m^3	Pb: ----	Pb: 0.05 mg/m^3	T

Notes:

-- = none established
OSHA = Occupational Safety and Health Administration
IDLH = immediately dangerous to life or health
N/A = not applicable/not available
C = carcinogen
T = toxic
PEL = permissible exposure level (8-hour time-weighted average)
STEL = short-term exposure level

10 PERSONAL PROTECTIVE EQUIPMENT

Based on the hazards identified above, the following personal protective equipment (PPE) will be required for the following field activities. This section specifies both an initial level of protection and a more protective (contingency) level or protection, in the event conditions should change. The contingency defines the PPE that will be available on-Property.

Work Activity	Level of Protection	
	Initial	Contingency
Remedial Excavation	D	Mod. D or C
Soil and Groundwater Sampling	D	Mod. D or C
Drilling	D	Mod. D or C
Other activities (list):		

Mod. = Modified

Each level of protection will incorporate the following equipment (specify type of protective clothing, boots, gloves, respiratory cartridges or other protection, safety glasses, hardhat, and hearing protection):

Level of Protection	Specific PPE
Level D	Work clothing, traffic vest, rubber (nitrile) gloves, steel toe and shank boots, safety glasses, hearing protection, and hardhat.
Modified D	Level D plus Tyvek coveralls or rain gear, and neoprene outer gloves.
Level C	Level D plus air-purifying respirator with combination organic vapor/HEPA dust cartridges. Level C protection must be approved by Corporate Health and Safety Officer and proper training certificates in place. Medical monitoring and fit test certificates must be on-Property for respirator use.

NOTE: Project personnel are not permitted to deviate from the specified levels of protection without the prior approval of the Project Safety Supervisor. A traffic vest is not needed if work clothes are suitably visible (e.g., orange/yellow rain gear or white/yellow chemical protective clothing).

11 AIR MONITORING

Air monitoring will be conducted periodically with a photoionization detector (PID) to identify potentially hazardous environments and determine reference or background concentrations. Air monitoring can be used to define exclusion zones. Air monitoring can also be conducted to evaluate relative concentrations of volatile organic chemicals in samples. RGI will make air monitoring data available to the contractor but contractor is responsible for their own monitoring and their employee's safety.

The following equipment will be used to monitor air quality in the breathing zone during work activities:

Monitoring Instrument	Calibration Frequency	Parameters of Interest	Sampling Frequency
PID	**Daily**	**Petroleum -related Volatile organic compounds**	During collection of each soil sample during drilling. During excavation if workers smell petroleum odor. During routine monitoring of remediation equipment.
Detector tube (specify chemical)	**As required**	**Benzene**	As needed based on PID monitoring

Use the following action levels to determine the appropriate level of personal protection to be used during field activities:

Monitoring Instrument	Reading in Breathing Zone	Action	Comments
PID	**10 PID units above background for 5 minutes**	**Confirm with detector tube (specify chemical) or upgrade to Level C (air-purifying respirator with organic vapor cartridge).**	**Alternatively, use engineering controls (ventilation) or leave location and return at a later time.**
Detector tube (specify chemical)	**Chemical Specific > PEL**	**Upgrade to Level C (air-purifying respirator with organic vapor cartridge).**	**Leave location pending further evaluation by RGI Corporate Safety Officer.**
PID	**100 PID units above background for 5 minutes**	**Leave location pending further evaluation by RGI Corporate Safety Officer.**	

12 SAFETY EQUIPMENT

The following safety equipment will be on-Property during the proposed field activities:

Other Required Items (check items required)	
First aid kit	**x**
Eyewash (e.g., bottled water)	
PID	**x**
Drinking water	**x**
Fire extinguisher	**x**
Other Required Items (check items required)	
Brush fan	
Wind sox	
Other:	

13 SPILL CONTAINMENT

Will the proposed field work include the handling of bulk chemicals?	**Yes**	**No X**
If yes, describe spill containment provisions for the property:		

14 CONFINED SPACE ENTRY

Will the proposed field work include confined space entry?	**Yes**	**No X**
If yes, attach to this plan the confined space entry checklist and permit.		

15 RGI TRAINING AND MEDICAL MONITORING

RGI employees who perform project work are responsible for understanding potential health and safety hazards of the Property. All RGI project workers will have health and safety training for hazardous waste operations, in accordance with 296-843-200 WAC. In addition, RGI requires medical monitoring for all employees potentially exposed to chemical hazards in concentrations in excess of the permissible exposure limit (PEL) for more than 30 days per year, as required under 296-843- 210 WAC. Employees who use respirators for their work will have a respirator medical evaluation as required under Chapter 296-842-WAC.

16 DISCLAIMER

The Riley Group, Inc. does not guarantee the health or safety of any person entering this property. Because of the potentially hazardous nature of this property and the activity occurring thereon, it is not possible to discover, evaluate, and provide protection for all possible hazards that may be encountered. Strict adherence to the health and safety guidelines set forth herein will reduce, but not eliminate, the potential for injury and illness at this property. The health and safety guidelines in this plan were prepared specifically for this project and should not be used on any other property without prior evaluation by trained health and safety personnel.

FIELD SAFETY PLAN CONSENT AGREEMENT

RGI Consulting Employees

I have reviewed the project-specific health and safety plan, dated May 17, 2019 for the planned remedial activities at the 631 Queen Anne Avenue North project (Property). I understand the purpose of the plan and I consent to adhere to its procedures and guidelines while conducting activities on Property that are described in the plan.

Employee Printed Name	Signature	Date

Property Visitors

I have been briefed on the contents of the project-specific health and safety plan. I am responsible for my own health and safety.

Visitor Printed Name and Organization/Company	Signature	Date

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FIELD SAFETY MEETING MINUTES

Project Name_____ **Project No.** _____

Meeting Location _____

Meeting Date _____ **Time**_____ **Conducted by**_____

Pre-field Work Orientation_____ **Weekly Safety Meeting**_____ **Other**_____

Subject Discussed _____

_____

_____

_____

Project Safety Supervisor Comments _____

_____

_____

_____

Participants

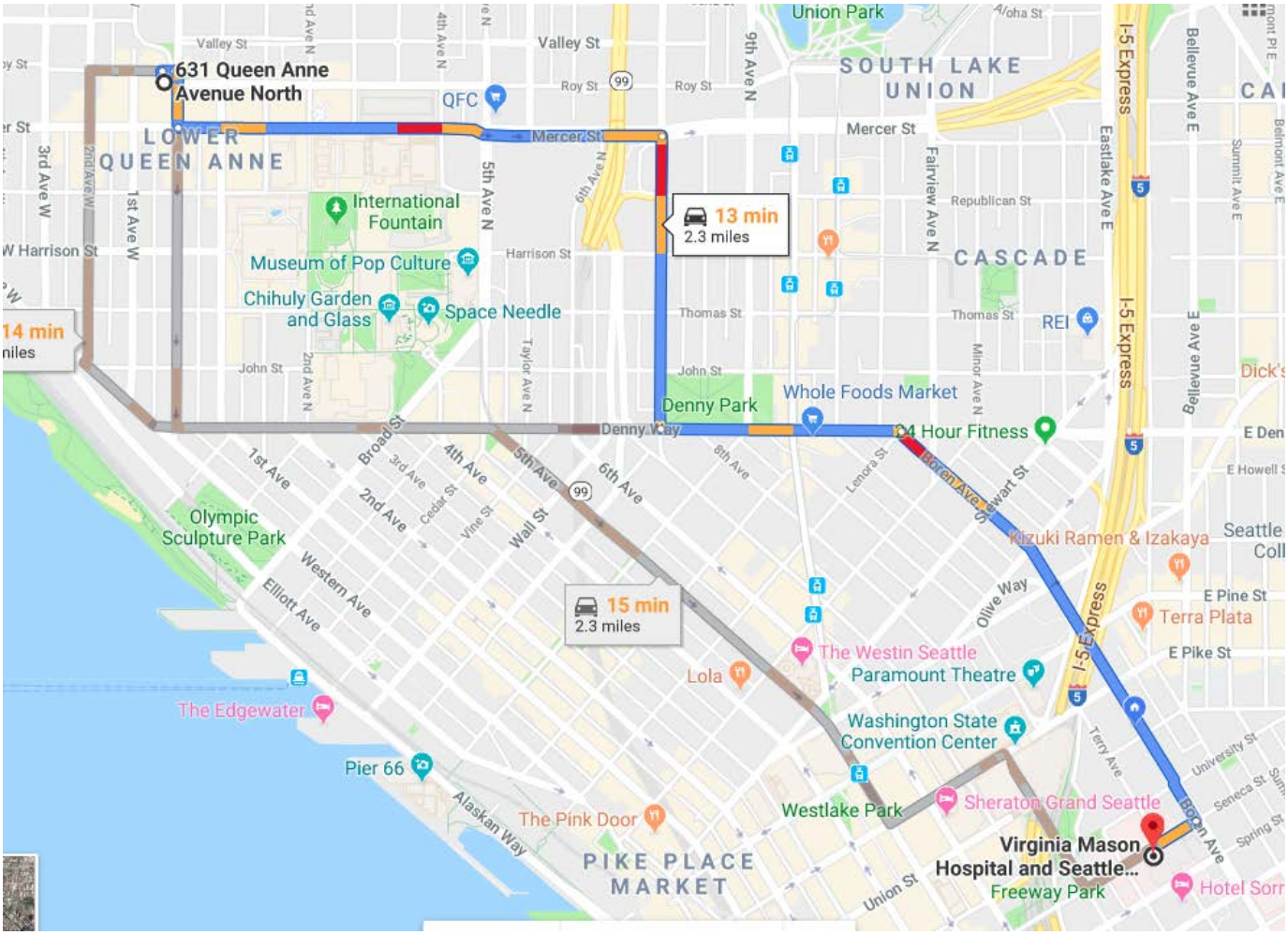
Printed Name (and company if subcontractor)	Signature

ROUTE TO HOSPITAL

Directions from 631 Queen Anne Avenue North to Virginia Mason Emergency Room

Travel takes approximately 15 minutes to arrive in normal traffic. Consider the situation and travel time when determining whether or not to call an ambulance.

1. Head south onto Queen Anne Avenue North (446 feet) toward Mercer Street
   - Turn left onto Mercer Street (0.7 mi)
   - Turn right onto Dexter Avenue North (0.4 mi)
   - Turn left onto Denny Way (0.3 mi)
   - Turn right onto Boren Avenue (0.7 mi)
2. Turn right onto Seneca Street to Virginia Mason Medical Center (322 feet)
   - Turn left and destination will be on the left



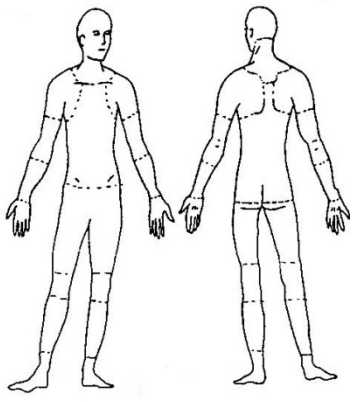
Accident/Incident Investigation Checklist

All incidents are to be investigated. Area management must be included in this process. The objective of investigation is to identify facts and **modify management systems** to prevent a recurrence. **It is critical not to attribute blame**.

This checklist will assist managers gather facts and conduct a thorough investigation of any incident occurring in company work activities. An Incident includes all work related occurrences such as Near Misses, Injuries and Diseases.

The incident reporting process is detailed in the Corporate Health and Safety Plan.

Incident Identification:	
Short description of accident/incident:	
Location:	
Accident/incident date:	

Name:	Sex: ☐ Male ☐ Female	Age:
Department:	Job title at time of incident:	
Part of body affected: (shade all that apply) 	**Nature of injury: (most serious one)** ☐ **Abrasion, scrapes** ☐ **Amputation** ☐ **Broken bone** ☐ **Bruise** ☐ **Burn (heat)** ☐ **Burn (chemical)** ☐ **Concussion (to the head)** ☐ **Crushing Injury** ☐ **Cut, laceration, puncture** ☐ **Hernia** ☐ **Illness** ☐ **Sprain, strain** ☐ **Damage to a body system:** ☐ **Other** _____	This employee works: ☐ Regular full time ☐ Regular part time ☐ Seasonal ☐ Temporary Months with this employer: Months doing this job:

Corporate Office
17522 Bothell Way Northeast
Bothell, Washington 98011
Phone 425.415.0551 ♦ Fax 425.415.0311

www.riley-group.com

Notes:

- Photographs are to be taken of area/equipment from various angles.
- Section 39 of the OHS Act 2004 requires that an accident/incident site be left undisturbed in the event of a reportable accident/incident unless advised otherwise. Exceptions to this include steps necessary to
    - protect the health or safety of a person
    - aid an injured person involved in an incident
    - make the site safe or to prevent a further occurrence of the incident
- Record serial/registration numbers of equipment concerned.
- Sketch location of incident below or add additional sheet.

LOCATION SKETCH: (show as much detail as possible, for example: movement direction, distances, relative locations, use back of page if needed).

Step 1: FACT FINDING *(to be completed at the scene location)*

WHO?	
Who was involved in the incident?	
Who saw the incident?	
Who was working with the involved person?	
Who else was involved?	
Who has information on events prior to the incident?	
Who assessed the risks involved in the job?	
Who checked safety of equipment/area prior to work commencing?	

WHERE?	
Where did the incident occur?	
Where did the damage occur?	
Where was the supervisor at the time?	
Where were the witnesses at the time?	

Step 2: ACCIDENT/INCIDENT PROCESS DESCRIPTION
(to be completed after the facts have been gathered)

How did the incident occur? *(list steps that led to incident)*	
1	
2	
3	
4	
5	

How did the injury occur? *(list steps that led to injury)*	
1	
2	
3	
4	
5	

Step 3: IDENTIFY ESSENTIAL CONTRIBUTING FACTORS
(refer to following table of potential contributing factors)

List possible contributing factors.	
1	
2	
3	
4	
5	

POSSIBLE CONTRIBUTING FACTORS

(This list provides the more common contributing factors; it is not an exhaustive list.)

ENVIRONMENT		**DESIGN**	
Slippery surface	Rain	Equipment	Protective equipment
Rough terrain	Low light levels	Vibration	Tools
Dust/particles	Fungi	Posture	Plant
Fumes	Bacteria	Posture	Furniture
Fibers	Virus	Force _____kg	Material
Liquid or chemical	Insects	Weight _____kg	Substance
Mist	Radiation solar	Layout	
Noise	Radiation other		
Heat	Mud		

SYSTEMS		**HUMAN**	
Written job procedures	Hazard detection	Inexperience	Inattention
Training (induction)	Licenses	Fatigue	Illness
Supervision	Endorsements	Understanding	Relationship
Instruction	Hours of work	Procedures	Language
Maintenance	Work demands	Followed	Lifestyle
Storage or stacking	Movement	Disability	Reflex action
Policy/manuals	Repetition	Misconduct	
Housekeeping	Required equipment available		

Essential Contributing Factors are those factors that satisfy the question, "Would the incident have still occurred if this factor had not been present?"

List all essential contributing factors.	
1	
2	
3	

Step 4: Prepare Accident/Incident Report

APPENDIX F

Preprufe 300R Chemical Vapor/Waterproofing Barrier Specifications

RILEYGROUP

PREPRUFE® 300R & 160R

Pre-applied waterproofing membranes that bond integrally to poured concrete for use below slabs or behind basement walls on confined sites

Product Description

Preprufe® 300R & 160R membranes are unique composite sheets comprised of a thick HDPE film, pressure sensitive adhesive and weather resistant protective coating. Designed with Advanced Bond Technology™, Preprufe 300R & 160R membranes form a unique, integral bond to poured concrete, preventing both the ingress and lateral migration of water while providing a robust barrier to water, moisture and gas.

The Preprufe R System includes:

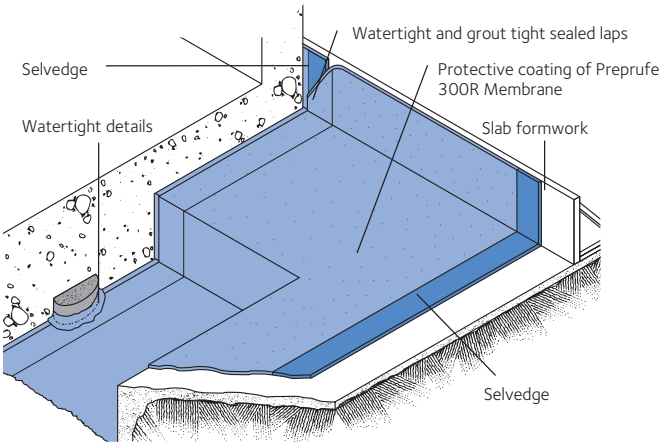
- **Preprufe 300R** – heavy-duty grade for use below slabs and on rafts (i.e. mud slabs). Designed to accept the placing of heavy reinforcement using conventional concrete spacers
- **Preprufe 160R** – thinner grade for blindside, zero property line applications against soil retention systems. Vertical use only
- **Preprufe Tape LT** – for covering cut edges, roll ends, penetrations and detailing (temperatures between 25°F (-4°C) and 86°F (+30°C))
- **Preprufe Tape HC** – for covering cut edges, roll ends, penetrations and detailing (minimum 50°F (10°C))
- **Preprufe CJ Tape LT** – for construction joints and detailing (temperatures between 25°F (-4°C) and 86°F (+30°C))
- **Preprufe CJ Tape HC** – for construction joints and detailing (minimum 50°F (10°C))
- **Bituthene® Liquid Membrane** – for sealing around penetrations, etc.
- **Adcor® ES** – waterstop for joints in concrete walls and floors
- **Preprufe Tieback Covers** – preformed cover for soil retention wall tieback heads
- **Preprufe Preformed Corners** – preformed inside and outside corners

Preprufe 300R & 160R membranes are applied either horizontally to smooth prepared concrete, carton forms or well rolled and compacted earth or crushed stone substrate; or vertically to permanent formwork or adjoining structures. Concrete is then cast directly against the adhesive side of the membranes. The specially developed Preprufe adhesive layers work together to form a continuous and integral seal to the structure.

Preprufe products can be returned up the inside face of slab formwork but is not recommended for conventional twin-sided formwork on walls, etc. Use Bituthene self-adhesive membrane or Procor fluid-applied membrane to walls after removal of formwork for a fully bonded system to all structural surfaces.

Advantages

- Forms a unique continuous adhesive bond to concrete poured against it - prevents water migration and makes it unaffected by ground settlement beneath slabs
- Fully-adhered watertight laps and detailing
- Provides a barrier to water, moisture and gas - physically isolates the structure from the surrounding ground
- BBA Certified for basement Grades 2, 3, & 4 to BS 8102:1990
- Zero permeance to moisture
- Solar reflective - reduced temperature gain
- Simple and quick to install - requiring no priming or fillets
- Can be applied to permanent formwork - allows maximum use of confined sites
- Self protecting - can be trafficked immediately after application and ready for immediate placing of reinforcement
- Unaffected by wet conditions - cannot activate prematurely
- Inherently waterproof, non-reactive system:
  1. not reliant on confining pressures or hydration
  2. unaffected by wet/dry cycling
- Chemical resistant - effective in most types of soils and waters, protects structure from salt or sulphate attack



Drawings are for illustration purposes only.
Please refer to gcpat.com for specific application details.

Installation

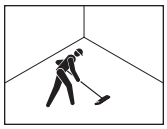
The most current application instructions, detail drawings and technical letters can be viewed at gcpat.com. For other technical information contact your local GCP representative.

Preprufe 300R & 160R membranes are supplied in rolls 4 ft (1.2 m) wide, with a selvedge on one side to provide self-adhered laps for continuity between rolls. The rolls of Preprufe Membrane and Preprufe Tape are interwound with a disposable plastic release liner which must be removed before placing reinforcement and concrete.

Substrate Preparation

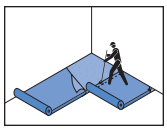
All surfaces - It is essential to create a sound and solid substrate to eliminate movement during the concrete pour. Substrates must be regular and smooth with no gaps or voids greater than 0.5 in. (12 mm). Grout around all penetrations such as utility conduits, etc. for stability (see Figure 1).

Figure 1



Horizontal - The substrate must be free of loose aggregate and sharp protrusions. Avoid curved or rounded substrates. When installing over earth or crushed stone, ensure substrate is well compacted to avoid displacement of substrate due to traffic or concrete pour. The surface does not need to be dry, but standing water must be removed.

Figure 2

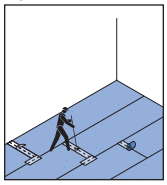


Vertical - Use concrete, plywood, insulation or other approved facing to sheet piling to provide support to the membrane. Board systems such as timber lagging must be close butted to provide support and not more than 0.5 in. (12 mm) out of alignment.

Membrane Installation

Preprufe membranes can be applied at temperatures of 25°F (-4°C) or above. When installing Preprufe product in cold or marginal weather conditions 55°F (<13°C) the use of Preprufe Tape LT is recommended at all laps and detailing. Preprufe Tape LT should be applied to clean, dry surfaces and the release liner must be removed immediately after application. Alternatively, Preprufe Low Temperature (LT) membrane is available for low temperature condition applications. Refer to Preprufe LT data sheet and GCP tech letter 16 for more information.

Figure 3



Horizontal substrates - Place the membrane HDPE film side to the substrate with the clear plastic release liner facing towards the concrete pour. End laps should be staggered to avoid a build up of layers. Leave plastic release liner in position until overlap procedure is completed (see Figure 2).

Accurately position succeeding sheets to overlap the previous sheet 3 in. (75 mm) along the marked selvedge. Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Peel back the plastic release liner from between the overlaps as the two layers are bonded together. Ensure a continuous bond is achieved without creases and roll firmly with a heavy roller. Completely remove the plastic liner to expose the protective coating. Any initial tack will quickly disappear.

Refer to GCP tech letter 15 for information on suitable rebar chairs for Preprufe products.

Vertical substrates - Mechanically fasten the membrane vertically using fasteners appropriate to the substrate with the the clear plastic release liner facing towards the concrete pour. The membrane may be installed in any convenient length. Fastening can be made through the selvedge using a small and low profile head fastener so that the membrane lays flat and allows firmly rolled overlaps. Immediately remove the plastic release liner.

Ensure the underside of the succeeding sheet is clean, dry and free from contamination before attempting to overlap. Roll firmly to ensure a watertight seal.

Roll ends and cut edges - Overlap all roll ends and cut edges by a minimum 3 in. (75 mm) and ensure the area is clean and free from contamination, wiping with a damp cloth if necessary. Allow to dry and apply Preprufe Tape LT (or HC in hot climates) centered over the lap edges and roll firmly (see Figure 3). Immediately remove printed plastic release liner from the tape.

Details

Detail drawings are available at gcpat.com.

Membrane Repair

Inspect the membrane before installation of reinforcement steel, formwork and final placement of concrete. The membrane can be easily cleaned by power washing if required. Repair damage by wiping the area with a damp cloth to ensure the area is clean and free from dust, and allow to dry. Repair small punctures (0.5 in. (12 mm) or less) and slices by applying Preprufe Tape centered over the damaged area. Repair holes and large punctures by applying a patch of Preprufe membrane, which extends 6 in. (150 mm) beyond the damaged area. Seal all edges of the patch with Preprufe Tape. Any areas of damaged adhesive should be covered with Preprufe Tape. Where exposed selvedge has lost adhesion or laps have not been sealed, ensure the area is clean and dry and cover with fresh Preprufe Tape. All Preprufe Tape must be rolled firmly and the tinted release liner removed. Alternatively, use a hot air gun or similar to activate the adhesive using caution not to damage the membrane and firmly roll lap to achieve continuity.

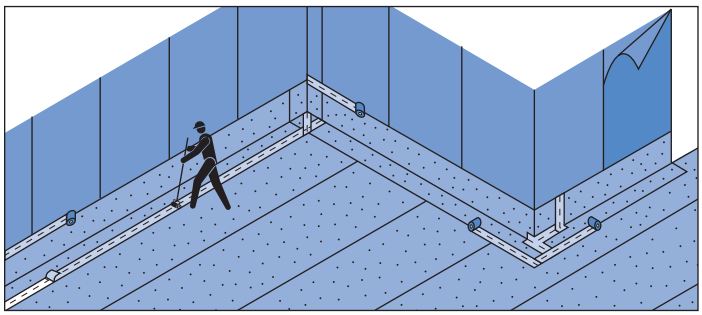
Pouring of Concrete

Ensure the plastic release liner is removed from all areas of Preprufe membrane and tape.

It is recommended that concrete be poured within 56 days (42 days in hot climates) of application of the membrane. Following proper ACI guidelines, concrete must be placed carefully and consolidated properly to avoid damage to the membrane. Never use a sharp object to consolidate the concrete.

Removal of Formwork

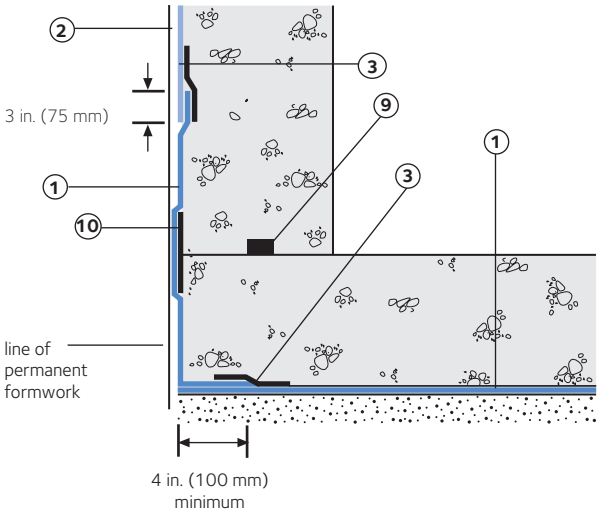
Preprufe membranes can be applied to removable formwork, such as slab perimeters, elevator and lift pits, etc. Once the concrete is poured the formwork must remain in place until the concrete has gained sufficient compressive strength to develop the surface bond. Preprufe membranes are not recommended for conventional twin-sided wall forming systems, see GCP tech letter 13 for information on forming systems used with Preprufe products.



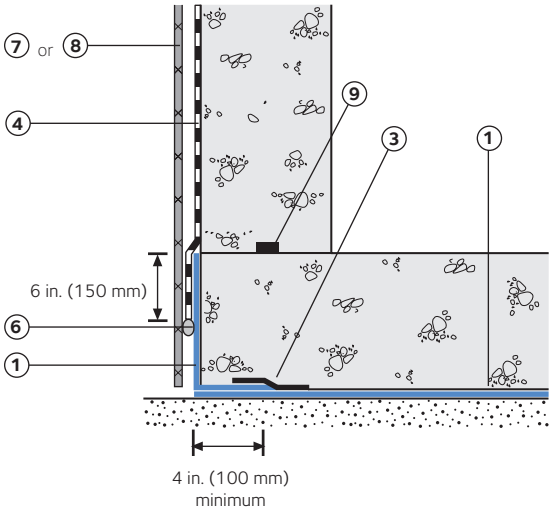
Detail Drawings

Details shown are typical illustrations and not working details.For a list of the most current details, visit us at gcpat.com. For technical assistance with detailing and problem solving please call toll free at 866-333-3SBM (3726).

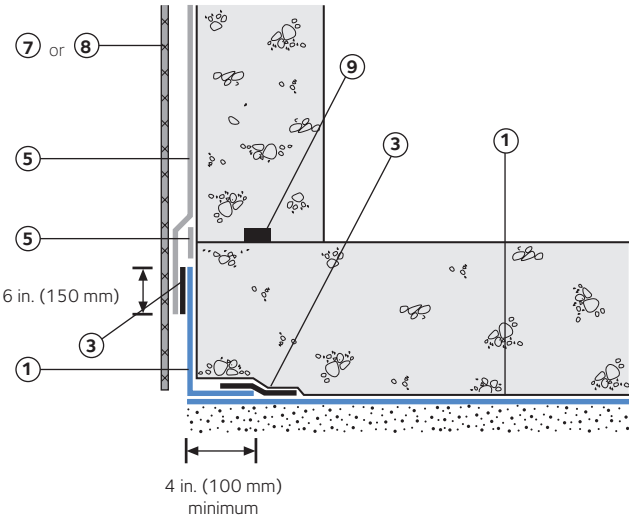
Wall base detail against permanent shutter



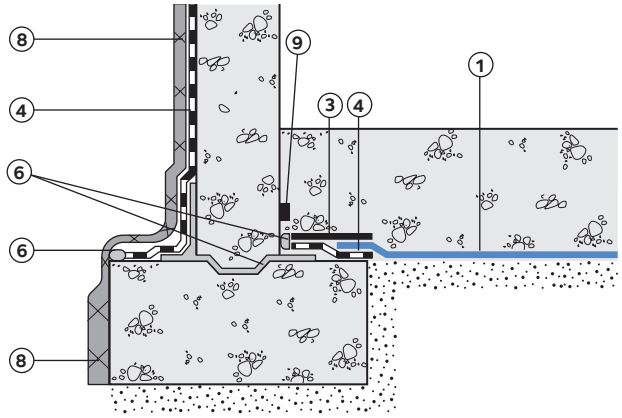
Bituthene® wall base detail (Option 1)



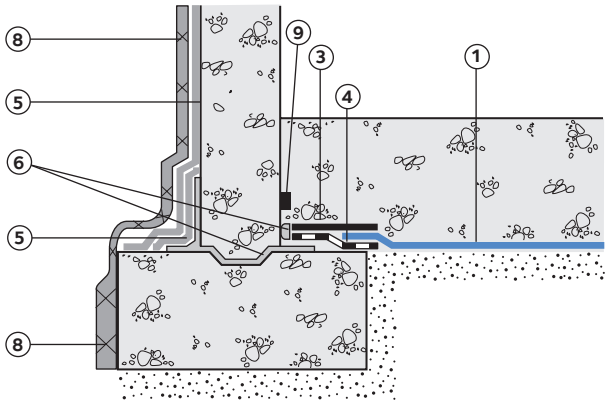
Procor® wall base detail (Option 1)



Bituthene® wall base detail (Option 2)



Procor® wall base detail (Option 2)



1 Preprufe® 300R
2 Preprufe® 160R
3 Preprufe® Tape
4 Bituthene®
5 Procor®
6 Bituthene® Liquid Membrane
7 Approved Protection Course
8 Hydroduct®
9 Adcor™ ES
10 Preprufe® CJ Tape

Supply

Dimensions (Nominal)	Preprufe 300R Membrane	Preprufe 160R Membrane	Preprufe Tape (LT or HC*)
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	
Roll size	4 ft x 98 ft (1.2 m x 30 m)	4 ft x 115 ft (1.2 m x 35 m)	4 in. x 49 ft (100 mm x 15 m)
Roll area	392 ft^2 (36 m^2)	460 ft^2 (42 m^2)	
Roll weight	108 lbs (50 kg)	92 lbs (42 kg)	4.3 lbs (2 kg)
Minimum side/end laps	3 in. (75 mm)	3 in. (75 mm)	3 in. (75 mm)

Physical Properties

Property	Typical Value 300R	Typical Value 160R	Test Method
Color	white	white	
Thickness	0.046 in. (1.2 mm)	0.032 in. (0.8 mm)	ASTM D3767
Lateral Water Migration Resistance	Pass at 231 ft (71 m) of hydrostatic head pressure	Pass at 231 ft (71 m) of hydrostatic head pressure	ASTM D5385, modified[1]
Low temperature flexibility	Unaffected at -20°F (-29°C)	Unaffected at -20°F (-29°C)	ASTM D1970
Resistance to hydrostatic head	231 ft (71 m)	231 ft (71 m)	ASTM D5385, modified[2]
Elongation	500%	500%	ASTM D412, modified[3]
Tensile strength, film	4000 psi (27.6 MPa)	4000 psi (27.6 MPa)	ASTM D412
Crack cycling at -9.4°F (-23°C), 100 cycles	Unaffected, Pass	Unaffected, Pass	ASTM C836
Puncture resistance	221 lbs (990 N)	100 lbs (445 N)	ASTM E154
Peel adhesion to concrete	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D903, modified[4]
Lap peel adhesion	5 lbs/in. (880 N/m)	5 lbs/in. (880 N/m)	ASTM D1876, modified[5]
Permeance to water vapor transmission	0.01 perms (0.6 ng/(Pa x s x m^2))	0.01 perms (0.6 ng/(Pa x s x m^2))	ASTM E96, method B
Water absorption	0.5%	0.5%	ASTM D570

Footnotes:
1. Lateral water migration resistance is tested by casting concrete against membrane with a hole and subjecting the membrane to hydrostatic head pressure with water. The test measures the resistance of lateral water migration between the concrete and the membrane.
2. Hydrostatic head tests of Preprufe Membranes are performed by casting concrete against the membrane with a lap. Before the concrete cures, a 0.125 in. (3 mm) spacer is inserted perpendicular to the membrane to create a gap. The cured block is placed in a chamber where water is introduced to the membrane surface up to the head indicated.
3. Elongation of membrane is run at a rate of 2 in. (50 mm) per minute.
4. Concrete is cast against the protective coating surface of the membrane and allowed to properly dry (7 days minimum). Peel adhesion of membrane to concrete is measured at a rate of 2 in. (50 mm) per minute at room temperature.
5. The test is conducted 15 minutes after the lap is formed (per GCP published recommendations) and run at a rate of 2 in. (50 mm) per minute.

Removal of Formwork (continued)

A minimum concrete compressive strength of 3000 psi (20 N/mm^2) is recommended prior to stripping formwork supporting Preprufe membranes. Premature stripping may result in displacement of the membrane and/or spalling of the concrete.

Refer to GCP Tech Letter 17 for information on removal of formwork for Preprufe products.

Specification Clauses

Preprufe 300R or 160R membrane shall be applied with its protective coating presented to receive fresh concrete to which it will integrally bond. Only GCP Applied Technologies approved membranes shall be bonded to Preprufe 300R/160R product. All Preprufe 300R/160R system materials shall be supplied by GCP Applied Technologies, and applied strictly in accordance with their instructions. Specimen performance and formatted clauses are also available.

NOTE: Use Preprufe Tape to tie-in Procor® fluid-applied membrane with Preprufe products.

Health and Safety

Refer to relevant SDS (Safety Data Sheet). Complete rolls should be handled by a minimum of two persons.

BBA BRITISH BOARD OF AGREEMENT CERTIFICATE No.

GCP Applied Technologies Inc., 62 Whittemore Avenue, Cambridge, MA 02140 USA.

In Canada, 294 Clements Road, West, Ajax, Ontario, Canada L1S 3C6.

GCP0083 PF-111-1216

gcp applied technologies

APPENDIX G

KCIW Discharge Authorization and Dewatering Plan

RILEYGROUP

King County
Wastewater Treatment Division
Industrial Waste Program
Department of Natural Resources and Parks
201 South Jackson Street, Suite 513
Seattle, WA 98104-3855
206-477-5300 Fax 206-263-3001
TTY Relay: 711

May 14, 2019

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

Piu Leung
Roystone On Queen Anne, LLC
606 Maynard Avenue S., Ste 251
Seattle, WA 98104

Issuance of Wastewater Discharge Authorization No. 4490-01 to Roystone Apartments

Dear Mr. Piu Leung:

The King County Industrial Waste Program (KCIW) has reviewed your application to discharge construction dewatering to the sewer system from the Roystone Apartments construction project located at 631 Queen Anne Avenue N, Seattle, Washington, and has issued the enclosed Major Discharge Authorization.

This authorization permits you to discharge limited amounts of industrial wastewater into King County's sewer system in accordance with the effluent limitations and other requirements and conditions set forth in the document and the regulations outlined in King County Code 28.84.060 (enclosed). As long as you maintain compliance with regulations and do not change the nature and volume of your discharge, KCIW will not require you to apply for an industrial wastewater discharge permit, a type of approval that would result in additional requirements and increased fees.

If you propose to increase the volume of your discharge or change the type or quantities of substances discharged, you must contact KCIW at least 60 days before making these changes.

Self-monitoring shall begin in September 2019 with the first self-monitoring report due to the KCIW office by October 15, 2019. A self-monitoring report form is included.

King County Code 28.84 authorizes a fee for each Major Discharge Authorization issued by the King County Department of Natural Resources and Parks. The current fee for issuance of a Major Discharge Authorization is $3000. King County will send you an invoice for this amount.

If you have any questions about this discharge authorization or your wastewater discharge, please call me at 206-477-5433 or email me at lydia.eng@kingcounty.gov. You may also wish to visit our program's Internet pages at: www.kingcounty.gov/industrialwaste.

Thank you for helping support our mission to protect public health and enhance the environment.

Sincerely,

Lydia Eng
Compliance Investigator

Enclosures

cc: Ryan Stoller, Stoller LLC (via email)
Jim Mahady, Seattle Public Utilities
SPU_Construction_Dewatering@seattle.gov, Seattle Public Utilities

King County

MAJOR DISCHARGE AUTHORIZATION
King County Industrial Waste Program
201 S. Jackson Street, Suite 513
Seattle, WA 98104-3855

NUMBER 4490-01
for

Roystone Apartments

Site address: 631 Queen Anne Avenue N.
Seattle, Washington 98109

Mailing address: 606 Maynard Ave S, Ste 251
Seattle, Washington 98104

Phone: 206-659-5750

Emergency (24-hour) phone: 206-660-0329

Industry type: Construction Dewatering

Discharge to: West Point

*Note: This authorization is valid only for the specific discharges shown below:

Discharge process: Wastewater generated by Construction Dewatering operation

Effective date: September 1, 2019
Expiration date: September 30, 2020

DESCRIPTION OF SAMPLE SITES AND DISCHARGE VOLUMES

Sample Site No.	Description	Maximum Daily Discharge Volume (gallons per day)	Maximum Discharge Rate (gallons per minute)
IW1434A	Sampling spigot in discharge line after treatment system	50,000	Up to 230

Permission is hereby granted to discharge industrial wastewater from the above-identified site into the King County sewer system in accordance with the effluent limitations and monitoring requirements set forth in this authorization.

If the industrial user wishes to continue to discharge after the expiration date, an application must be filed for re-issuance of this discharge authorization at least 90 days prior to the expiration date. For information concerning this King County Discharge Authorization, please call Industrial Waste Compliance Investigator Lydia Eng at 206-477-5433.

24-HOUR EMERGENCY NOTIFICATION

West Point Treatment Plant: 206-263-3801
Washington State Department of Ecology: 425-649-7000

SPECIAL CONDITIONS

A. Discharge to the sanitary sewer shall not begin until KCIW has conducted a preoperative inspection of the pretreatment facilities and has sent written notification (email is sufficient) to the permittee that discharges may begin.

B. No later than October 15, 2019, the permittee must submit a list of Roystone Apartments and contractor personnel responsible for dewatering activities, including operation and maintenance of the wastewater treatment system and monitoring of the discharge to the sanitary sewer. The list shall include the site contacts' name, title, company, and phone numbers (office and cell).

C. In accordance with Seattle Public Utilities (SPU) requirements, the discharge point shall be an existing side sewer to Queen Anne Avenue N. as pre-approved by SPU, or as directed by SPU staff. If applicable, a temporary cover must be placed over the manhole and temporary fencing must be placed around the manhole to restrict accessibility.

D. For batch sedimentation discharges a minimum 60-minute quiescent settling time must be maintained prior to any discharges. During this settling time, no discharges to or from the sedimentation tank can occur.

E. All persons responsible for monitoring the discharge to the sanitary sewer shall review a copy of this authorization.

F. A copy of this authorization shall be on site at all times for review and reference.

G. This authorization grants the discharge of limited amounts of wastewater from the following waste streams:

1. Contaminated stormwater runoff
2. Excavation dewatering
3. Well(s) dewatering

Wastes or contaminants from sources other than permitted herein shall not be discharged to the sanitary sewer without prior approval from KCIW.

H. The discharge shall not cause hydraulic overloading conditions of the sewerage conveyance system. During periods of peak hydraulic loading KCIW and Seattle Public Utilities representatives reserve the authority to request that discharge to the sewer be stopped.

I. This discharge authorization is being issued with the understanding that known soil or groundwater contamination is present on site. The authorization holder is responsible for contacting KCIW should site conditions indicate an increased potential for contamination to occur that was not present in the original application.

J. All wastewater shall be collected and treated in accordance with treatment methods approved by KCIW. Wastewater shall not bypass treatment systems. Modifications to wastewater treatment systems shall not occur without prior approval from KCIW.

K. Totalizing and non-resettable flow meters must be installed on all permitted discharge pipes to the sewer.

L. An accessible sampling spigot must be installed on the discharge pipe from the last treatment unit of the wastewater treatment system. The sample site shall be representative of all industrial waste streams discharged to the sewer from this site. Each sample site shall be accessible to KCIW representatives when discharge to the sewer is occurring.

M. The contractor shall implement erosion control best management practices to minimize the amount of solids discharged to the sanitary sewer system. As a minimum precaution, the wastewater must be pumped to an appropriately sized settling tank(s) prior to entering the sewer system.

N. The permittee shall properly operate and maintain all wastewater treatment units to ensure compliance with established discharge limits. Solids accumulation in tanks used for solids settling shall not exceed 25 percent of the tank's working hydraulic capacity. Each tank's working hydraulic capacity is based on the water column height as measured from the bottom of the tank to either the invert elevation of the tank's outlet pipe (gravity discharges) or discharge pump intake (pumped discharges).

O. Granulated Activated Carbon (GAC) Vessels Breakthrough Monitoring Requirements:

1. Roystone Apartments shall collect routine samples between the lead and lag GAC vessels (mid GAC) to check for breakthrough. Samples must be analyzed for BTEX.

2. The mid GAC sample results required by the permit shall be retained on site for a period of three years and shall be available for review at reasonable times by authorized representatives of KCIW.

3. If any of the compounds are detected in the effluent of the lead GAC unit at concentrations exceeding the established discharge limit (see General Discharge Limits), the permittee shall cease treatment and discharge to the sanitary sewer system until GAC change out of the lead unit is performed.

P. Results of all required self-monitoring sampling must be recorded daily. Recorded information for each discharge site must include:

1. Sample date
2. Sample time
3. Sample results
4. Operator name
5. Comments (if applicable)

These records shall be maintained on site and shall be available for review by KCIW personnel during normal business hours.

Q. The permittee must establish a sewer account with Seattle Public Utilities and provide necessary reports to ensure accurate assessment of sewer charges for all construction dewatering discharge sites associated with this project.

SELF-MONITORING REQUIREMENTS

A. The following self-monitoring requirements shall be met for this discharge authorization:

Sample Site No.	Parameter	Sample Type	Frequency
IW1434A	pH	Grab, Meter Reading	Daily, when discharging to the sewer
	Settleable Solids, Volumetric[B]	Grab	
	Discharge Volume (gallons per day)	Meter Reading	
	Flow Rate (gallons per minute)	Meter Reading	
	Total Monthly Flow	Continuous	Record Monthly
	Nonpolar Fats, Oils, and Grease[C]	3 Grabs	Sample, analyze, and record once a month when discharging to the sewer
	Hydrogen sulfide	Meter reading	Only if operating criteria are exceeded
	Explosivity	Meter reading	

B. The settleable solids field test by Imhoff cone must be performed as follows:

1. Fill Imhoff cone to one-liter mark with well-mixed sample
2. Allow 45 minutes to settle
3. Gently stir sides of cone with a rod or by spinning; settle 15 minutes longer
4. Record volume of settleable matter in the cone as ml/L

C. The three nonpolar fats, oils, and grease (FOG) grab samples shall be of equal volume, collected at least five minutes apart, and analyzed separately. When using U.S. Environmental Protection Agency approved protocols specified in 40 CFR Part 136, the individual grab samples may be composited (at the laboratory) prior to analysis. The result of the composite sample or the average of the concentrations of the three grab samples may be reported as Total FOG unless the value is 100 mg/L or greater, in which case the concentration of nonpolar FOG must be reported.

D. If a violation of any discharge limits or operating criteria is detected in monitoring, you shall notify KCIW immediately upon receipt of analytical data.

E. A self-monitoring report shall be filed with KCIW no later than the 15th day of the time period following the sample collection (e.g., the 15th day of the following month for monthly, weekly, daily samples; the 15th day of the following quarter for quarterly samples). If no discharge takes place during any monitoring period, it shall be noted on the report.

Self-monitoring shall begin in September 2019 with the first self-monitoring report due to the KCIW office by October 15, 2019.

F. All self-monitoring data submitted to KCIW, which required a laboratory analysis, must have been performed by a laboratory accredited by the Washington State Department of Ecology for each parameter tested, using procedures approved by 40 CFR 136. This does not apply to field measurements performed by the industrial user such as pH, temperature, flow, atmospheric hydrogen sulfide, total dissolved sulfides, total settleable solids by Imhoff cone, or process control information.

G. All sampling data collected by the permittee and analyzed using procedures approved by 40 CFR 136, or approved alternatives, shall be submitted to KCIW whether required as part of this authorization or done voluntarily by the permittee.

H. Self-monitoring reports shall be signed by an authorized representative of the industrial user. The authorized representative of the industrial user is defined as:

1. The president, secretary, treasurer, or a vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy or decision-making functions for the corporation

2. The manager of one or more manufacturing, production, or operating facilities, but only if the manager:

   a. Is authorized to make management decisions that govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiate and direct other comprehensive measures to assure long-term environmental compliance with environmental laws and regulations
   b. Can ensure that the necessary systems are established or actions taken to gather complete and accurate information for control mechanism requirements and knowledgeable of King County reporting requirements
   c. Has been assigned or delegated the authority to sign documents, in accordance with corporate procedures

3. A general partner or proprietor if the industrial user is a partnership or proprietorship, respectively

4. A director or highest official appointed or designated to oversee the operation and performance of the industry if the industrial user is a government agency

5. The individuals described in one through four above may designate an authorized representative if:

   a. The authorization is submitted to King County in writing.
   b. The authorization specifies the individual or position responsible for the overall operation of the facility from which the discharge originates or having overall responsibility for environmental matters for the company or agency.

GENERAL DISCHARGE LIMITATIONS

Operating criteria

There shall be no odor of solvent, gasoline, or hydrogen sulfide (rotten egg odor), oil sheen, unusual color, or unusual turbidity. You must collect additional monitoring samples in accordance with Part A of the Self-Monitoring Requirements if you observe any of the preceding conditions. If any of the discharge limits are exceeded, you must stop discharging and notify KCIW at 206-477-5300. You may resume discharging when you have verified a return to compliance with the discharge limitations. Any additional monitoring samples collected in accordance with part A of the Self-Monitoring Requirements must be submitted to King County on your self-monitoring report. Failure to collect additional samples in accordance with Part A will result in violation of your permit conditions and result in potential enforcement action.

Corrosive substances

Limits

Maximum:	pH 12.0 (s.u.)
Instantaneous minimum[1]:	pH 5.0 (s.u.)
Daily minimum[2]:	pH 5.5 (s.u.)

The instantaneous minimum pH limit is violated whenever any single grab sample or any instantaneous recording is less than pH 5.0. The daily minimum pH limit is violated whenever any continuous recording of 15 minutes or longer remains below pH 5.5 or when each pH value of four consecutive grab samples collected at 15-minute intervals or longer within a 24-hour period remains below pH 5.5.

Discharges of more than 50 gallons per day of caustic solutions equivalent to more than 5 percent NaOH by weight or greater than pH 12.0 are prohibited unless authorized by KCIW and subject to special conditions to protect worker safety, the collection system, and treatment works.

Fats, oils, and grease

Discharge of FOG shall not result in significant accumulations that either alone or in combination with other wastes are capable of obstructing flow or interfere with the operation or performance of sewer works or treatment facilities.

Dischargers of polar FOG (oil and grease from animal and/or vegetable origin) shall minimize free-floating polar FOG. Dischargers may not add emulsifying agents exclusively for the purpose of emulsifying free-floating FOG.

Nonpolar FOG limit: 100 mg/L

The limit for nonpolar FOG is violated when the arithmetic mean of the concentration of three grab samples, taken no more frequently than at five minute intervals, or when the results of a composite sample exceed the limitation.

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[1] The instantaneous minimum pH limit is violated whenever any single grab sample or any instantaneous recording is less than pH 5.0.

[2] The daily minimum pH limit is violated whenever any continuous recording of 15 minutes or longer remains below pH 5.5 or when each pH value of four consecutive grab samples collected at 15-minute intervals or longer within a 24-hour period remains below pH 5.5.

Flammable or explosive materials

No person shall discharge any pollutant, as defined in 40 CFR 403.5, that creates a fire or explosion hazard in any sewer or treatment works, including, but not limited to, waste streams with a closed cup flashpoint of less than 140° Fahrenheit or 60° Centigrade using the test methods specified in 40 CFR 261.21.

At no time shall two successive readings on an explosion hazard meter, at the point of discharge into the system (or at any point in the system), be more than 5 percent nor any single reading be more than 10 percent of the lower explosive limit (LEL) of the meter.

Pollutants subject to this prohibition include, but are not limited to, gasoline, kerosene, naphtha, benzene, toluene, xylene, ethers, alcohols, ketones, aldehydes, peroxides, chlorates, perchlorates, bromates, carbides, hydrides, and sulfides, and any other substances that King County, the fire department, Washington State, or the U.S. Environmental Protection Agency has notified the user are a fire hazard or a hazard to the system.

Petroleum Compounds	Maximum Concentration ppm (mg/L)
Benzene	0.07
Ethylbenzene	1.7
Toluene	1.4
Total xylenes	2.2

Heavy metals/cyanide

The industrial user shall not discharge wastes, which exceed the following limitations:

Heavy Metals & Cyanide	Instantaneous Maximum ppm (mg/L)[1]	Daily Average ppm (mg/L)[2]
Arsenic	4.0	1.0
Cadmium	0.6	0.5
Chromium	5.0	2.75
Copper	8.0	3.0
Lead	4.0	2.0
Mercury	0.2	0.1
Nickel	5.0	2.5
Silver	3.0	1.0
Zinc	10.0	5.0
Cyanide	3.0	2.0

[1]The instantaneous maximum is violated whenever the concentration of any sample, including a grab within a series used to calculate daily average concentrations, exceeds the limitation.

[2]The daily average limit is violated: a) for a continuous flow system when a composite sample consisting of four or more consecutive samples collected during a 24-hour period over intervals of 15 minutes or greater exceeds the limitation, or b) for a batch system when any sample exceeds the limitation. A composite sample is defined as at least four grab samples of equal volume taken throughout the processing day from a well-mixed final effluent chamber, and analyzed as a single sample.

High temperature

The industrial user shall not discharge material with a temperature in excess of 65° C (150° F).

Hydrogen sulfide

Atmospheric hydrogen sulfide: 10.0 ppm
(As measured at a monitoring manhole designated by KCIW)

Soluble sulfide limits may be established on a case-by-case basis depending upon volume of discharge and conditions in the receiving sewer, including oxygen content and existing sulfide concentrations.

Organic compounds

No person shall discharge any organic pollutants that result in the presence of toxic gases, vapors, or fumes within a public or private sewer or treatment works in a quantity that may cause worker health and safety problems.

Organic pollutants subject to this restriction include, but are not limited to: Any organic pollutants compound listed in 40 CFR Section 433.11 (e) (total toxic organics [TTO] definition), acetone, 2-butanone (MEK), 4-methyl-2-pentanone (MIBK), and xylenes.

Settleable solids

Settleable solids concentrations: 7.0 mL/L

GENERAL CONDITIONS

A. All requirements of King County Code pertaining to the discharge of wastes into the municipal sewer system are hereby made a condition of this discharge authorization.

B. The industrial discharger shall implement measures to prevent accidental spills or discharges of prohibited substances to the municipal sewer system. Such measures include, but are not limited to, secondary containment of chemicals and wastes, elimination of connections to the municipal sewer system, and spill response equipment.

C. Any facility changes, which will result in a change in the character or volume of the pollutants discharged to the municipal sewer system, must be reported to your KCIW representative. Any changes that will cause the violation of the effluent limitations specified herein will not be allowed.

D. In the event the permittee is unable to comply with any of the conditions of this discharge authorization because of breakdown of equipment or facilities, an accident caused by human error, negligence, or any other cause, such as an act of nature the company shall:

1. Take immediate action to stop, contain, and clean up the unauthorized discharges and correct the problem.
2. Immediately notify KCIW and, if after 5 p.m. weekdays and on weekends, call the emergency King County treatment plant phone number on Page 1 so steps can be taken to prevent damage to the sewer system.
3. Submit a written report within 14 days of the event (*14-Day Report*) describing the breakdown, the actual quantity and quality of resulting waste discharged, corrective action taken, and the steps taken to prevent recurrence.

E. Compliance with these requirements does not relieve the permittee from responsibility to maintain continuous compliance with the conditions of the discharge authorization or the resulting liability for failure to comply.

F. The permittee shall, at all reasonable times, allow authorized representatives of KCIW to enter that portion of the premises where an effluent source or disposal system is located or in which any records are required to be kept under the terms and conditions of this authorization.

G. Nothing in this discharge authorization shall be construed as excusing the permittee from compliance with any applicable federal, state, or local statutes, ordinances, or regulations including discharge into waters of the state. Any such discharge is subject to regulation and enforcement action by the Washington State Department of Ecology.

H. This discharge authorization does not authorize discharge after its expiration date. If the permittee wishes to continue to discharge after the expiration date, an application must be filed for reissuance of this discharge authorization at least 90 days prior to the expiration date. If the permittee submits its reapplication in the time specified herein, the permittee shall be deemed to have an effective wastewater discharge authorization until KCIW issues or denies the new wastewater discharge authorization. If the permittee fails to file its reapplication in the time period specified herein, the permittee will be deemed to be discharging without authorization.

Compliance Investigator: _____ Date: May 14, 2019

Lydia Eng

King County

Industrial Waste Program Monthly Self-Monitoring Report

Send to: King County Industrial Waste Program
201 S. Jackson Street, Suite 513
Seattle, WA 98104-3855
Phone 206-477-5300 / FAX 206-263-3001
Email: info.kciw@kingcounty.gov

Company Name: Roystone Apartments **Sample Site No.** IW1434A **Permit/DA No.:** 4490-01

Please Specify Month & Year: **Month:** _____ **20**____

This form is available at: www.kingcounty.gov/industrialwaste.

All units are mg/L unless otherwise noted.

Sample Date		pH	Maximum Daily Settleable Solids (mL/L)	NP Fats, Oils, and Grease (Average of 3 grabs)	Benzene (µg/L)	Ethylbenzene (µg/L)	Toluene (µg/L)	Total Xylenes (µg/L)	Maximum Daily Flow Rate (gallons per minute)		Daily Flow (gallons per day)	Notes If relief only, indicate why discharging to sanitary sewer.
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
12												
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I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations. I further certify that all data requiring a laboratory analysis were analyzed by a Washington State Department of Ecology accredited laboratory for each parameter tested.

Signature of Principal Executive or Authorized Agent _____ Date

Monthly Min pH		& Date		Total Monthly Flow (gallons)	
Monthly Max pH		& Date		Maximum Daily Flow	& Date

PLEASE CIRCLE ALL VIOLATIONS

Due Date: Monthly report is due by the 15th each month.

March 22, 2019

Mr. Pui Leung
Roystone on Queen Anne, LLC
606 Maynard Avenue South
Seattle, Washington 98104

Subject: **Roystone on Queen Anne**
Revised: Dewatering Plan
631 Queen Anne Avenue North
Seattle, Washington 98109
RGI Project No. 2017-015G

Dear Mr. Leung:

As requested, The Riley Group, Inc. (RGI) has developed a Dewatering Plan for the Roystone on Queen Anne Site located at 631 Queen Anne Avenue North, Seattle, King County, Washington (herein referred to as the Site, Figures 1 and 2). Our services were completed in accordance with our proposal PRP2018-266A dated September 11, 2018 as authorized by Roystone on Queen Anne, LLC (hereafter referred to as the Client) on September 17, 2018. The information in this dewatering evaluation is based on historical groundwater levels measured at the Site by RGI and others from 1991 to 2018 for the existing Site monitoring wells, descriptions of soil conditions documented in previous reports prepared by RGI and others, and our understanding of the proposed Site development as based on discussions with Roystone on Queen Anne, LLC. Site development will include excavating contaminated soil across the entire property as needed to complete site cleanup, which will require dewatering of groundwater as needed. Following cleanup the excavation will be backfilled to allow for one level for parking garage construction.

RGI previously completed a dewatering evaluation at the Site which included hydraulic testing in the existing Site monitoring wells, an evaluation of historic groundwater level data, and estimates of discharge rates to dewater the Site. This report provides recommendations regarding a dewatering plan for the Site.

INTRODUCTION

The project Site is located at the southwest corner of West Roy Street and Queen Anne Avenue North in Seattle, Washington. The approximate location of the Site is shown on Figure 1.

Based on our understanding of the depth of impacted soil and the groundwater conditions at the Site, excavations of up to 35 feet below existing Site grade in localized areas will be required in some areas to remove petroleum impacted soils. However, in general the majority of the contaminated soil will be removed with excavations to depths of 20 to 25 feet bgs. Based on groundwater level data for the Site, excavations deeper than 11 feet below existing grade could extend below the groundwater table at the Site.

This report presents a Groundwater Control Plan outlining dewatering measures that will likely be needed to control groundwater levels during Site redevelopment.

SITE CONDITIONS

Surface Conditions

The Site consists of King County tax parcel 387990-0425, which is rectangular shaped area approximately 11,000 square feet in size. The Site is currently occupied by a paved parking and convenience store (currently vacant). Most of the Site is asphalt-paved outside of the existing buildings. The Site relatively flat. The Site is bordered by sidewalks and West Roy Street and Queen Anne Avenue North to the north and east, Lindberg Apartments to the south, and the Delroy Apartments to the west.

Soil Conditions

Based on the subsurface conditions noted on the boring logs, the sediments underlying the Site include the Lawton Clay unit, at depth overlain by a sand/silty sand unit. The silty sand unit is present from below the asphalt surface to a depth of approximately 8 to 10 feet below grade. A sand unit is located below the upper silty sand unit. The Lawton clay surface forms the base of the groundwater system at the Site. The Lawton clay surface slopes from east to west from a depth of approximately 18 feet on the eastern edge of the Site to a depth of approximately 32 feet at the western property boundary. The groundwater system at the Site is located in the sand unit between the base of the silty sand and the Lawton clay at depth.

GROUND WATER CONDITIONS

General

Based on a review of subsurface conditions as described on the available boring logs for the Site monitoring wells, the groundwater system in the sand unit above the Lawton clay appears to be unconfined.

The Lawton clay unit forms the base of the unconfined aquifer at the Site. The Lawton clay surface slopes from east to west. The depth to the Lawton clay surface at the east property boundary is approximately 18 feet below grade (Elevation 132). The Lawton clay surface slopes to the west to a depth of approximately 31 feet below grade (Elevation 118) at the western property line. The thickness of the unconfined aquifer is variable at the Site, with the thickest portion of the groundwater system located on the western half of the Site. Review of recorded groundwater levels in the Site monitoring wells indicates under the high groundwater level regime the aquifer thickness ranges from approximately 5 feet on the eastern portion of the Site to 10 feet at the western property boundary. Under the low groundwater level regime the unconfined aquifer is only several feet in thickness across the Site.

Groundwater at the Site is impacted by gasoline-, diesel- and oil-range hydrocarbons and benzene.

Ground Water Levels

RGI reviewed the available historical groundwater level information from 1991 through 2017 for the Site monitoring wells. RGI also measured the depth to groundwater in select (MW-6, MW-9, and MW-10) on August 9, 2018.

The depth to groundwater at the Site has ranged from as shallow as approximately 11.5 feet below existing grade to as deep as 26 feet below existing grade based on historical groundwater level data. Historical groundwater level data indicate average depths to groundwater at the Site have ranged from approximately 12.5 to 21 feet below existing grade. The highest groundwater

levels measured at the Site were approximately 11.5 feet below existing grade, on the eastern portion of the Site, measured in early 2017. The lowest groundwater levels were measured in 2006/2007. Groundwater levels measured at the Site in August 2018 were close to the average groundwater levels for the Site (Table 1).

Table 1. Historical Depth to Ground Water Levels 1991 to 2018

Well	Minimum Depth to Water bgs (feet)	Average Depth to Water bgs (feet)	Maximum Depth to Water bgs (feet)	August 2018 Depth to Water bgs (feet)
MW-6	18.24	20.78	25.85	19.76
MW-9	17.93	20.43	24.60	20.05
MW-10	11.43	12.56	14.33	13.30
MW-13	16.26	17.15	18.04	--

For the purpose of the development of this Dewatering Plan, the unconfined aquifer was assumed to be 10 feet in thickness.

Ground Water Flow Direction

The groundwater flow direction was evaluated using the dataset of groundwater levels. Groundwater flow at the Site is generally to the southwest.

Hydraulic Conductivity

Estimated hydraulic conductivity values from the hydraulic testing in monitoring wells MW-6, MW-9 and MW-10 ranged from approximately 3 and 16 feet/day. Published hydraulic conductivity values for sand/fine sand range from 3 to 25 feet/day. The estimated hydraulic conductivity values for monitoring wells MW-6, MW-9, and MW-10 are within the range of published hydraulic conductivity estimates for sand and fine sand, Fetter (1994).

DEWATERING

General

We understand current Site development plans include excavation below existing grade to a depths of up to 35 feet to remove contaminated soil. However, in general the majority of the contaminated soil will be removed with excavations to depths of 20 to 25 feet bgs. We further understand that soldier pile and lagging and/or soil nail shoring methods will be used during Site excavation work and temporary shoring installation.

Groundwater levels at the Site measured in August 2018 were at average depths/elevations for the groundwater level dataset (12.5 to 21 feet below existing site grade), based on historic water level data for the Site. Dewatering will be necessary to complete the excavations required to remove petroleum impacted soils at the Site. We would expect the vast majority of any dewatering discharge to originate in the sand unit on top of the Lawton Clay. If the excavation extends into the Lawton clay unit we would expect very little yield of groundwater from the Lawton clay unit. The main goal of dewatering will be to dewater the groundwater system in the sand unit overlying the Lawton Clay.

Based on the proposed shoring plan for the Site the shoring will extend into the Lawton Clay unit at depth around the perimeter of the excavation. As such the aquifer will be truncated and horizontal flow beneath the Site will be impeded by the shoring walls. The dewatering array will include wellpoints around the perimeter of the Site as wells as sumps or dewatering wells within the perimeter of the Site shoring.

Dewatering Array Design

RGI used the United States Geological Survey (USGS) three-dimensional groundwater flow model MODFLOW to evaluate dewatering at the Site. Visual MODFLOW was used to evaluate the number and spacing of wellpoints and estimate discharge rates required to lower the water table to the desired dewatering level, the Lawton clay surface. Aquifer hydraulic properties were estimated from site specific hydraulic testing previously completed by RGI at the Site. The following parameters were used in the MODFLOW simulations:

Aquifer thickness: 10 feet

Desired dewatering depth: 10 feet (Elevation 190)

Specific yield: 0.20 unitless

Hydraulic conductivity 25 feet/day

The planned shoring was also input into the MODFLOW simulation using the "Wall" Module.

The MODFLOW simulations using the above described parameters indicate a well point system installed in 10 foot spacing along the east, west, north and south walls of the excavation, as shown on Figure 3. Dewatering modeling indicates the ground water level would be drawn down to the desired 10 feet in approximately two weeks. This simulation also included two points of ground water withdrawal in the base of the excavation located along an east-west centerline of the excavation base and the western portion of the excavation, as shown on Figure 3. As described above a vacuum wellpoint system is recommended for the perimeter dewatering points, the simulated groundwater extraction points in the center-base of the excavation could consist of either a dewatering well or sump system which will be discussed in more detail below.

The initial dewatering discharge rate from the wellpoint and sump system under the dewatering simulations was approximately 20 to 25 gallons per minute (gpm). We would expect these rates to occur for the initial dewatering of the aquifer beneath the excavation footprint and then decrease given the limited aquifer thickness beneath the site (10 feet) and the shoring which will extend into the clay unit that forms the base of the aquifer at the site, limiting horizontal flow.

Groundwater levels in the Site monitoring wells should be monitored to track when drawdown stabilizes.

Drawdown/Radius of Influence Analysis

The radius of influence, and specifically predicted drawdown expected to occur off-site from the operation of the dewatering system during Site redevelopment were estimated based on the MODFLOW modeling simulations. The MODFLOW simulations indicate minimal off-site drawdown due to the fact the site shoring will be embedded into the clay layer that forms the base of the aquifer. The MODFLOW simulations indicate a drawdown of less than one foot, 50 feet from the perimeter of the shoring.

GROUNDWATER DEWATERING DESIGN RECOMMENDATIONS

Existing Site Monitoring Wells

We recommend that existing Site monitoring wells be maintained for as long as possible during dewatering to track dewatering progress.

Vacuum Wellpoints

The locations of the proposed wellpoints are shown on Figure 3. The wellpoints should be installed to a depth of approximately 20 to 30 feet bgs or until the Lawton clay, which forms the base of the aquifer at the Site, is encountered near this elevation. If the Lawton clay unit is encountered the wellpoint should be completed so the screened interval of the wellpoint is located in the sand aquifer material, above the Lawton clay unit.

Wellpoints borehole should be drilled using air or other drilling methods that will allow installation of a temporary 6-inch diameter casing in the wellpoint borehole. The wellpoint casing should consist of a minimum diameter of 1.5 inch PVC well casing with 3 feet of 20-slot PVC well screen. A 10-20 washed Colorado silica sand filter pack, or similar washed filter pack should be placed in the annular space around the wellpoint well screen to approximately one-foot above the top of the wellpoint well screen. A bentonite seal using bentonite pellets and/or pressure grout should be placed between the top of the sand pack and the ground surface and hydrated.

We recommend RGI personnel conduct periodic site visits during wellpoint installation to observe well completions and document subsurface conditions.

WellPoint Development

Well points should be developed after completion. Well point development could be accomplished by pumping each individual wellpoint, surging of water into the wellpoint followed by pumping, or a combination of both methods. Development of each wellpoint shortly after completion will increase the efficiency of each well point and aid in reducing turbidity during the operation of the dewatering system. Wellpoint development will also allow identification of specific areas where zones of higher hydraulic conductivity may occur, and additional wellpoints may be needed to control ground water during the Site excavation work. We recommend RGI personnel conduct periodic site visits during wellpoint development to observe wellpoint development.

Pumps

The vacuum wellpoint pump system should be capable of generating at least 22-inches (Hg) of vacuum at each wellpoint header. Pumps for the interior sumps should be capable of operating under dry well conditions with intermittent pumping. Both the vacuum system and sump systems should have a dedicated continuous power supply, with emergency backup power supply, of the length of the necessary dewatering. The dewatering system should be left operational until backfilling in the excavation has occurred to a level three feet above the water table, based on ground water level monitoring in the existing site monitoring wells.

Wellpoint System Piping

The wellpoint vacuum system header system should be constructed of a minimum diameter of 6-inch PVC piping. The wellpoint piping system should be protected from site traffic and excavation work. The desired dewatering depth in relation to the existing Site grade will require the wellpoint and header system to be attached to the face of the shoring walls. The dewatering contractor will

need to coordinate with the shoring designer and/or shoring contractor regarding any modifications to the shoring design to allow for the header system to be attached securely to the perimeter shoring at the Site. The header system should be constructed to allow additional well points if needed, if higher permeability zones are encountered in portions of the excavation.

Larger Diameter Dewatering Wells/Dewatering Sumps

As stated previously dewatering simulations included two dewatering points in the western and eastern center of the planned excavation. Additional dewatering wells/sumps may be needed in the interior of the excavation to dewater the interior of the excavation. Once the initial well point system is running horizontal groundwater flow in the aquifer underlying the Site will essentially be cut off from the shoring, which will form a barrier to horizontal flow with dewatering behind the shoring on the east and north sides of the site. Additional interior dewatering wells/sumps may be needed in the interior of the excavation as horizontal flow from the interior of the excavation will also be cut off from the well points on the exterior of the shoring on the north and east sides of the Site. Monitoring of ground water levels in the excavation after the vacuum wellpoint system has been in operation will determine if the sumps are needed as the excavation progresses below the water table. If needed, the sumps should be constructed of some perforated casing or housing which can be surrounded by a sand or gravel pack to minimize clogging and the pumping of turbid water.

DEWATERING SYSTEM OPERATION

The wellpoint system should operate for at least two-weeks prior to excavation below the existing water table elevation. We anticipate the wellpoint system individual wellpoints may need to have valving adjustments during the initial startup period to maximize the system performance. Ground water levels should be monitored to track dewatering progress during the initial startup period. The vacuum well point system should be checked daily for leaks and vacuum levels.

Groundwater levels should be measured in the Site monitoring wells prior to starting the dewatering system. Groundwater levels in the Site monitoring wells should be measured daily until groundwater levels stabilize under the dewatering system operation. Groundwater levels should then be monitored weekly.

The wellpoint spacing and depths are based on available Site ground water and hydraulic conductivity data, variations in these parameters may be encountered. We recommend RGI personnel be on-site during the dewatering system startup to evaluate the system operation.

In addition to the “dewatering effort” for mass excavation of impacted soils, the dewatering system may need to remain at some level of operation for an extended period of time in order to remediate impacted ground water as part of the cleanup effort at the Site.

Dewatering System Discharge

Based on the most recent groundwater data for the Property and available information from KCIW, treatment of petroleum constituents in water being discharged to the sanitary sewer does not appear necessary. Note that under a King County Industrial Waste (KCIW) Discharge Authorization there will be other requirements with regards to managing settleable solids with a settling tank, monitoring other water quality parameters, and documenting the amount of water discharged to the sanitary sewer. All requirement will be outlined in the KCIW Discharge Authorization.

PROJECT LIMITATIONS

This report is the property of RGI, Mr. Pui Leung, Roystone on Queen Anne, LLC, and their authorized representatives or affiliates and was prepared in a manner consistent with the level of skill and care ordinarily exercised by members of the profession currently practicing in the same locality and under similar conditions. This report is intended for specific application to the Roystone site located at 631 Queen Anne Avenue North, Seattle, Washington. No other warranty, expressed or implied, is made.

The analyses and recommendations presented in this report are based upon data obtained from our review of available information at the time of preparing this report, limited hydraulic testing in Site monitoring wells, or other noted data sources.

Please contact the undersigned at (425) 415-0551 should you have any questions or need additional information.

Sincerely,

The Riley Group, Inc.

David Baumgarten LG, LHG
Hydrogeologist

Ricky Wang, PhD, PE
Principal Engineer

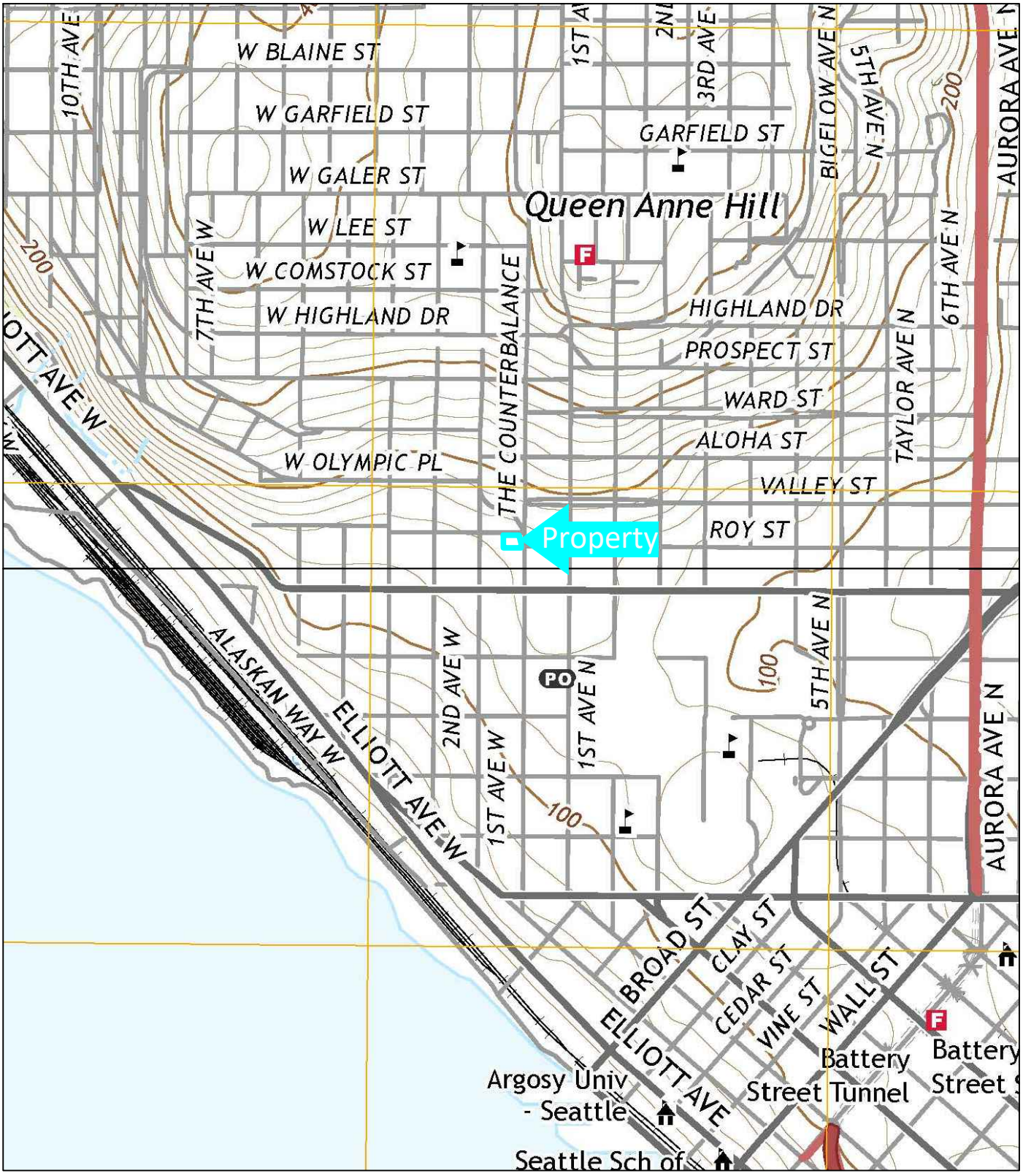
Attachments: *Figure 1, Property Vicinity Map*

Figure 2, Property Representation Map

Figure 3, Dewatering Plan

Figure 4, Dewatering Plan Cross Section North/South Walls

Figure 5, Dewatering Plan Cross Section East/West Walls



USGS, 2017, Seattle North, Washington
USGS, 2017, Seattle South, Washington
7.5-Minute Quadrangle

Approximate Scale: 1"=1000'

0 500 1000 2000

N

RILEYGROUP
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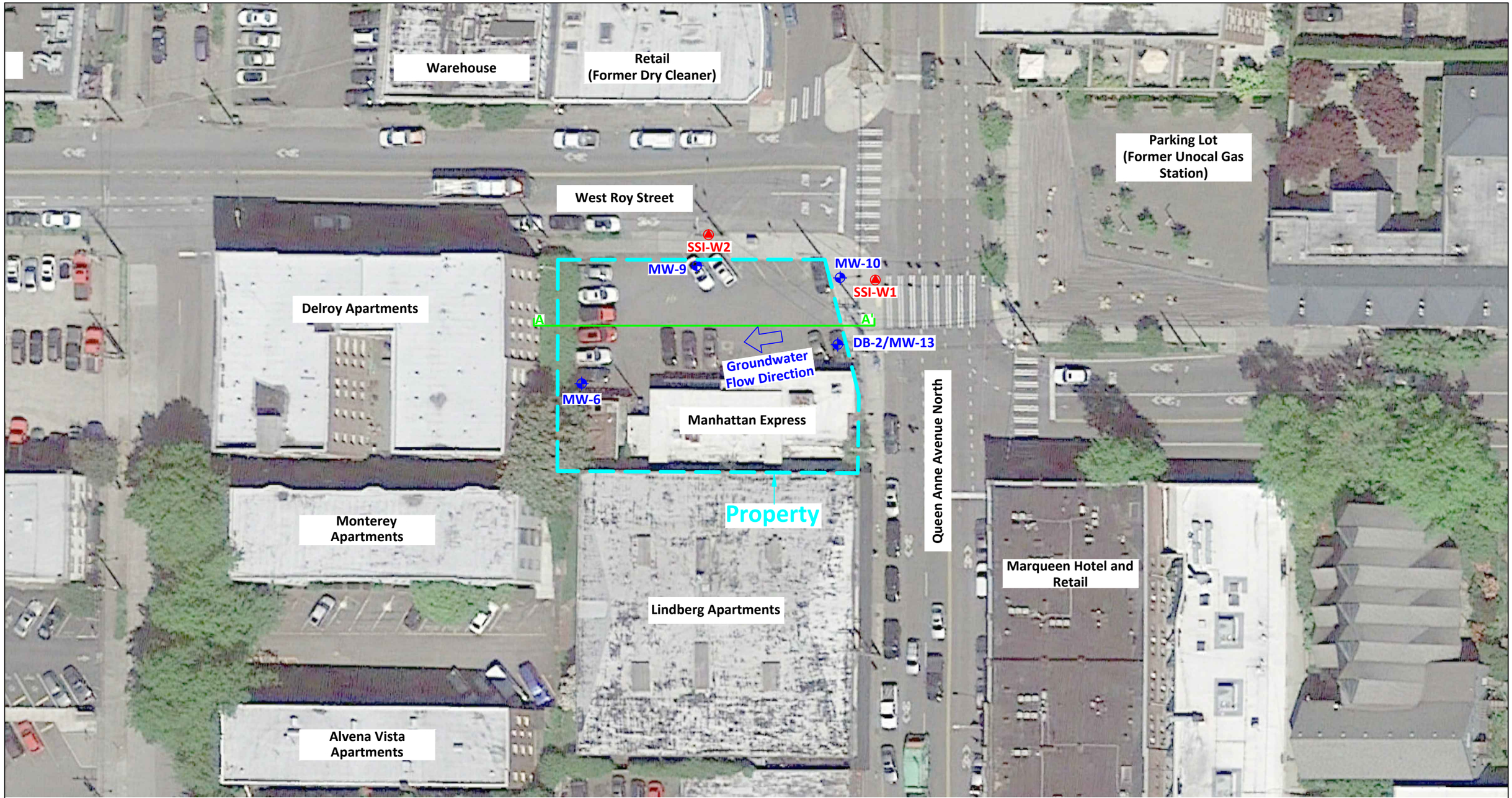
Fax: 425.415.0311

Roystone on Queen Anne		Figure 1
RGI Project Number 2017-015G	Property Vicinity Map	Date Drawn: 03/2019
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		



Approximate Scale: 1"=40'

0 20 40 80

N

= Groundwater monitoring well by RGI, Decemeber 2017

= Groundwater monitoring well by others

= Property boundary

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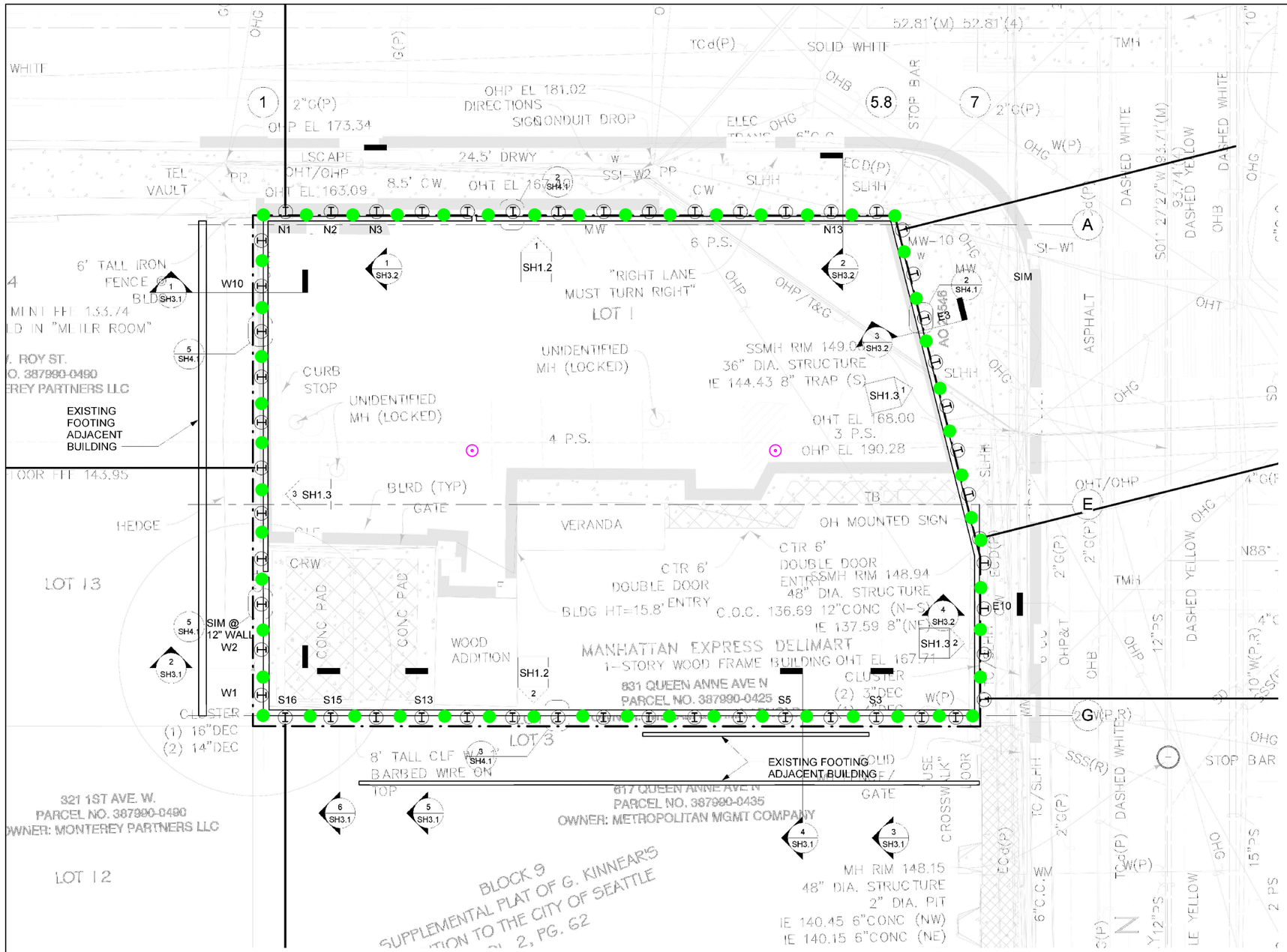
Roystone on Queen Anne		Figure 2
RGI Project Number 2017-015G	Property Representation Map	Date Drawn: 03/2019
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		



Approximate Scale: 1"=20'

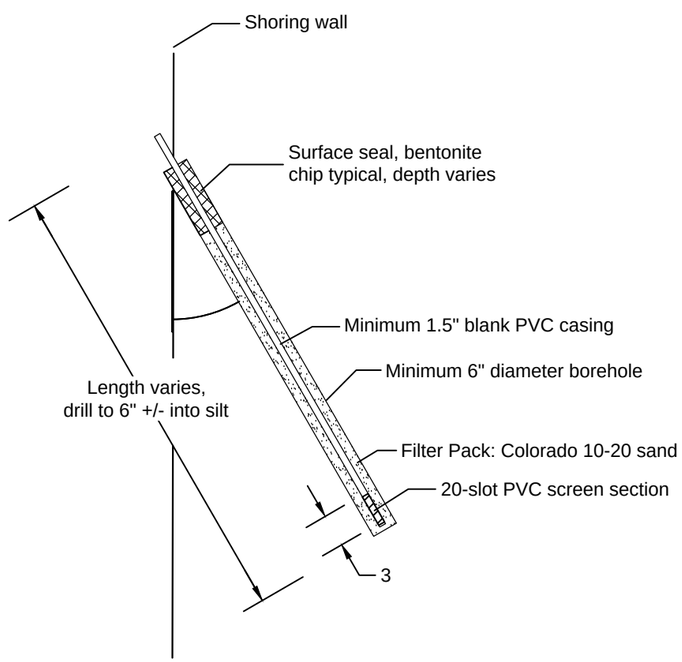
0 10 20 40

N

● = Vacuum well point

⊙ = Dewatering sump

Well Point Detail (NTS)



Notes

1. Well points and header manifold shall be attached to shoring wall at or below elevation 135 to allow suction/pumping from elevations as low as 115.
2. All drill cuttings from the well point installation shall be assumed to be contaminated with petroleum-range hydrocarbons and shall be contained or drummed for later disposal as directed by the Riley Group, Inc.
3. All well point development water shall be assumed to be contaminated and contained or drummed for disposal as directed by the Riley Group, Inc.
4. Utility clearance to be provided and verified by others prior to installation.

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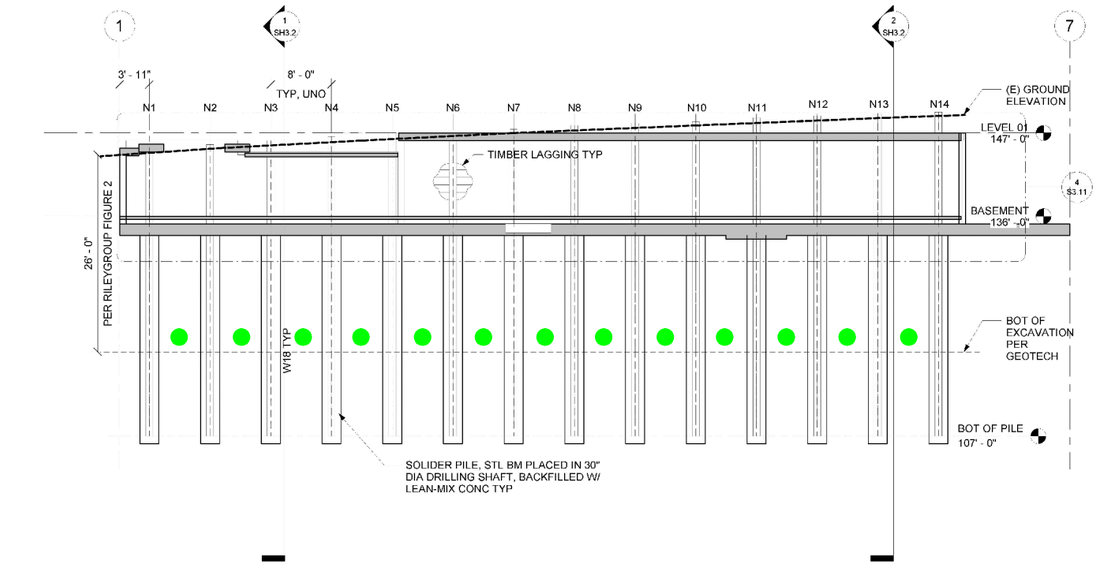
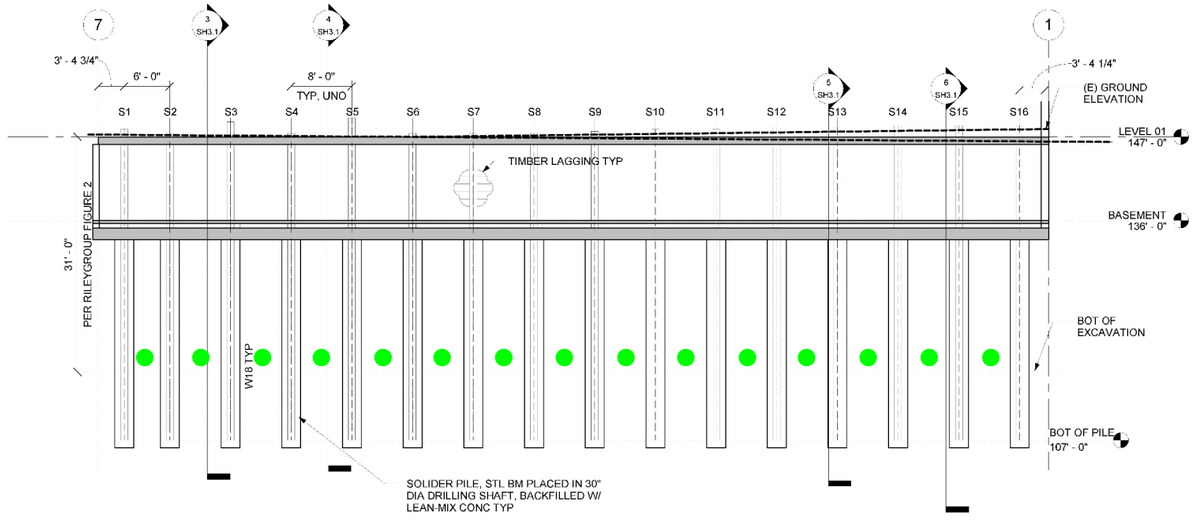
Roystone on Queen Anne		Figure 3
RGI Project Number 2017-015G	Dewatering Plan	Date Drawn: 03/2019
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		



1 NORTH ELEVATION

1/8" = 1'-0"



Approximate Scale: 1"=20'

0 10 20 40

N

● = Vacuum well point

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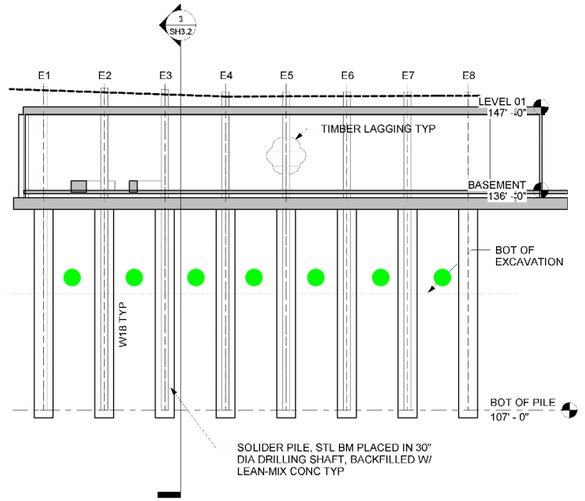
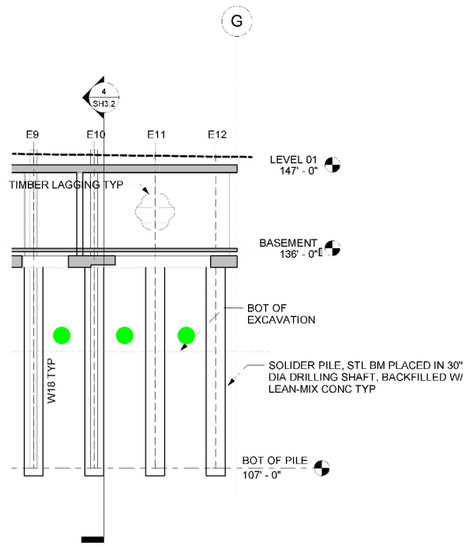
Roystone on Queen Anne		Figure 4
RGI Project Number 2017-015G	Dewatering Plan Cross Section North/South Walls	Date Drawn: 03/2019
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		



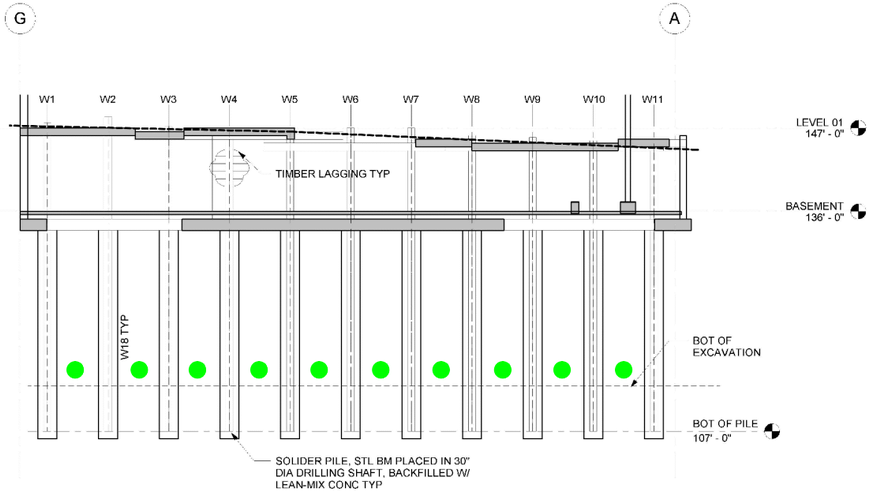
1 EAST ELEVATION - NORTH

1/8" = 1'-0"



2 EAST ELEVATION - SOUTH

1/8" = 1'-0"



Approximate Scale: 1"=20'

0 10 20 40

N

● = Vacuum well point

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Roystone on Queen Anne		Figure 5
RGI Project Number 2017-015G	Dewatering Plan Cross Section East/West Walls	Date Drawn: 03/2019
Address: 631 Queen Anne Avenue North, Seattle, Washington 98109		

APPENDIX H

SEPA Checklist

RILEYGROUP

APPENDIX I

Sampling and Analysis Plan/Quality Assurance Project Plans (SAP/QAPP)

RILEYGROUP

SAMPLING AND ANALYSIS PLAN/
QUALITY ASSURANCE PROJECT PLAN

PREPARED BY:

THE RILEY GROUP, INC.
17522 BOTHELL WAY NORTHEAST
BOTHELL, WASHINGTON 98011

PREPARED FOR:

MR. PUI LEUNG
ROYSTONE ON QUEEN ANNE, LLC
606 MAYNARD AVENUE SOUTH #104
SEATTLE, WASHINGTON 98104
RGI PROJECT NO. 2017-015K

SAMPLING AND ANALYSIS PLAN/
QUALITY ASSURANCE PROJECT PLANS

ROYSTONE REDEVELOPMENT
631 QUEEN ANNE AVENUE NORTH
SEATTLE, WASHINGTON 98109

JUNE 6, 2019

Corporate Office
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www.riley-group.com

TABLE OF CONTENTS

LIST OF ATTACHMENTS

1 INTRODUCTION

This Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP) has been prepared for the property located at 631 Queen Anne Avenue North in Seattle, Washington (hereafter referred to as the Property). The Property is currently in the process of entering into an Agreed Order with the Washington Department of Ecology (Ecology) and an interim action is scheduled to begin in August of 2019. The interim action is described in detail in the *Draft Interim Action Work Plan* (Work Plan) dated June 3, 2019 by RGI. The Work Plan is referenced in this SAP/QAPP when applicable.

This SAP/QAPP was prepared in accordance with the Washington State Department of Ecology (Ecology) "TCP Data Validation and Sampling Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP)" dated September 23, 2016.

The purpose of the SAP is to describe the field work protocols to be used during the interim action in order to remediate soil and groundwater on the Property. The purpose of the QAPP is to describe the data quality objectives, quality assurance/quality control, data management, and data validation procedures to ensure that the data obtained during the interim action is sufficient to meet the project objectives.

2 BACKGROUND

Numerous previous investigations and remedial actions have been conducted on the Property. Information pertaining to the history of the Property, previous investigation and the Conceptual Site Model for the Property are summarized Sections 4, 5, and 7 of the Work Plan, respectively.

Petroleum related soil and groundwater impacts have been well characterized within the Property boundaries.

3 PROJECT DESCRIPTION

The Client intends to redevelop the Property as a multi-use retail/residential building beginning in August of 2019. During redevelopment contaminated soil and groundwater containing concentrations of contaminants exceeding applicable MTCA soil and groundwater cleanup levels will be removed from the Property to the fullest extent possible.

The objective of this project is to bring soil and groundwater into compliance with MTCA regulations in accordance with the Agreed Order and obtain an opinion letter from Ecology indicating that the interim action was completed to the satisfaction of Ecology.

The tasks required to complete the interim action are described in Section 12 of the Work Plan.

4 ORGANIZATION AND SCHEDULE

Key individuals and their roles are described below.

Project Manager: RGI. The project manager will oversee all interim action work, including coordination with project team members and Ecology, direct and oversee field activities, sample collection, and sample analysis. The project manager will coordinate and review all laboratory

analysis reports and provide regular updates to the project team and Ecology of the on-going work and necessary reporting.

Fieldwork Management: RGI. Fieldwork oversight will include having personnel onsite to manage all tasks required to complete the remedial action directing management and coordination of all soil and groundwater sampling including soil excavation limit samples, trip blanks/duplicate samples, and oversite of COC protocol and sample management. The fieldwork oversite will also include oversite of field screening equipment and protocol and site Health and Safety Plan compliance.

Data Quality Control Management: RGI. The data quality manager will be responsible for selection of the laboratory analyses, overseeing laboratory performance, and overseeing QA/QC of laboratory reports.

Laboratory Project Manager: Friedman & Bruya, Inc/Libby Environmental, Inc. RGI will submit samples to Freidman and Bruya, Inc (FBI) and Libby Environmental (Libby) for the chemical analyses described in Section 12.7 of the Work Plan. The laboratory project managers will ensure all analytical procedures conform to the laboratory requirements for the project, including prescribed analytical methods and data quality.

Data Validation Management: Pyron Environmental – Pyron Environmental will validate all analytical data obtained during this project in accordance with EPA Stage 2B criteria.

The interim action is scheduled to commence in August of 2019 and be completed by November of 2019. The Agency Review Draft Interim Action Report documenting all interim action activities will be submitted to Ecology for review and approval within 60 days after all analytical data is received and analytical data has undergone the required data validation (see Section 6), which is anticipated to occur in December of 2019. A Final Interim Action Report will be submitted to Ecology within 30 days after Ecology's approval of the Agency Review Draft Interim Action Report.

5 SAMPLING AND ANALYSIS PLAN

This section provides details on the soil and groundwater sampling procedures required to complete the interim action, which will include collection of performance and confirmation soil samples from the remedial excavation, test pit samples and stockpile soil samples for soil characterization purposes, excavation water samples, samples from groundwater monitoring wells, and samples for water being discharged to the sanitary sewer. Additional information pertaining to these tasks is described in Section 12 of the Work Plan.

Quality control samples (field duplicates, trip blanks, and equipment blanks) will be collected from each media and are discussed further in the QAPP.

Soil and groundwater sampling activities will be conducted in general accordance with the *Guidance on Remediation of Petroleum Contaminated Sites* (Ecology PCS Guidance) dated June 2016 by Ecology. All soil samples collected during this project will be submitted for gasoline-,

diesel-range total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene, and xylenes (BTEX) at a minimum.

5.1 SOIL SAMPLING PROTOCOLS

Soil samples collected during the interim action will be used to demonstrate compliance with MTCA regulations at the remedial excavation limits, perform Site Assessments in locations of underground storage tanks (USTs), and characterize soil to strategically plan remedial excavation and/or to characterize soil for disposal.

All soil samples will be collected using disposable nitrile gloves that will be discarded after each use. Samples will either be collected directly from the track hoe bucket or collected directly from the excavation and transferred into laboratory supplied containers appropriate for the intended analyses.

All soil samples will be collected in accordance with our standard operating and decontamination procedures. Soil samples will be placed in preconditioned, sterilized containers provided by an Ecology-accredited analytical laboratory. Soil samples retained for analysis of non-volatile compounds will be placed in a 4-ounce laboratory supplied jars. Samples collected for analysis of VOCs will be collected using standard EPA Method 5035A methodology.

Upon collection, all soil samples will be labeled and placed in an iced cooler pending submittal to the fixed-base analytical laboratory or immediately submitted to the onsite mobile laboratory. Some soil samples may be archived at the laboratory and selected archived samples may be analyzed at a later time. A written chain-of-custody will be completed listing all samples submitted to the laboratory during the investigation and will accompany all samples submitted to the laboratory.

5.1.1 FIELD SCREENING AND LOGGING

The soil conditions encountered during the excavation will be described using the Unified Soil Classification System (USCS) visual-manual procedures (ASTM 2488-06). The results of field screening and the soil conditions encountered will be presented reporting the borelogs, which will be included in the Agency Review Draft Interim Action Report.

Soil will be field screened using visual and olfactory observations and a photoionization detector (PID) to measure the concentrations of VOCs.

For each soil sample, soil will be placed in a plastic bag, disaggregated, and allowed to sit undisturbed for at least five minutes. The PID inlet tube will then be inserted into the bag and the highest observed reading will be recorded in the field logbook. The PID will be calibrated each day before use by RGI personnel using 100ppm isobutylene gas.

Water sheen testing will also be performed to assess for visual presence of petroleum hydrocarbons. A portion of the sample will be placed in a pan of water and the water surface will be observed for signs of sheen. Sheens will be noted as one of four categories: No Sheen, Slight Sheen, Moderate Sheen, and Heavy Sheen.

All field screening results will be noted in the field logbook.

5.1.2 CHARACTERIZATION AND CONFIRMATION SOIL SAMPLES

Confirmation soil samples will be collected along the excavation/shoring walls, prior to the placement of wood lagging, to document in-situ soil quality at the Property boundaries in areas where remedial excavation extends to the Property boundaries. Data obtained from these soil samples will be used to determine if soil is in compliance with MTCA regulations on the Property. Confirmation samples will also be collected from the bottom excavation limits in order to confirm that all contaminated soil has been removed from within the Property boundaries. The location and depth of each sample will be based on subsurface soil conditions, field screening results, and/or analytical data. Soil samples collected during the interim action will be grab samples.

Soil confirmation samples collected from remedial excavation sidewall limits (for example, behind the shoring walls along all four sides of the Property) will be as follows:

- A minimum of one confirmation soil sample and up to two confirmation soil samples will be submitted for analysis for every 20 linear feet of sidewall (vertical and horizontal) based on the results of field screening. Soil samples with the highest field screening evidence of contamination will be submitted for analyses. Soil sample frequency will be increased in areas where contaminated soil is left in place to characterize the remaining area of contamination (if necessary). In addition, sidewall samples collected in the zone approximately 10 to 20 feet below grade (the approximate depth of groundwater prior to redevelopment) will be collected at a depth just above the highest pre-redevelopment groundwater elevation in a given location.

Soil confirmation samples collected the bottom floor of the excavation will be as follows:

- A minimum of one confirmation soil sample and up to 4 confirmation soil samples will be submitted for analyses for every 400 square feet of bottom of excavation based on the results of field screening and/or analytical data. Soil samples with the highest field screening evidence of contamination will be submitted for analyses. Bottom samples will also be collected beneath areas where the highest concentrations of contaminants were observed. Soil sample frequency will be increased in areas where contaminated soil is left in place to characterize the remaining area of contamination (if necessary).

A substantial amount of previous analytical data exists pertaining to soil conditions within the Property boundaries and this data will be used to plan remedial excavation activities. Performance soil samples and test pit samples will also be collected during the remedial excavation to guide remedial excavation activities and strategically plan excavation in conjunction with construction activities.

5.1.3 UST SITE ASSESSMENT & FUEL SYSTEM DECOMMISSIONING SOIL SAMPLES

During the interim action, it may be necessary to decommission underground storage tanks (USTs) and/or other underground improvements. UST Site Assessments will be conducted in accordance with the *Guidelines for Site Checks and Site Assessments for USTs* dated February 1991 (revised April, 2003) by Ecology, the Ecology PCS Guidance, and WAC 173-360A. UST Site Assessment and other underground improvement soil samples will be collected at the following frequency:

- For USTs less than 20,000-gallons, a minimum of 3 soil samples will be collected (2 from sidewalls and 1 from bottom.
- For USTs greater than 20,000-gallons, at least 5 soil samples will be collected (1 from underneath the UST and 1 from each sidewall)
- When multiple USTs are being removed from one excavation pit, at least 1 soil sample will be collected beneath each additional UST.
- If dispenser islands and associated piping are encountered, at least 1 soil sample will be collected two feet beneath area where piping enters dispenser and at least one soil sample will be collected beneath every 50 feet of piping.

All laboratory analyses pertaining to UST Site assessment and other underground improvements will be conducted in accordance with MTCA Table 830-1 Required Testing for Petroleum Releases.

5.1.4 STOCKPILE SOIL SAMPLES

During the interim action, it may be necessary to stockpile soil on plastic to characterize overburden soil or other soils which require segregation. Stockpile soil sampling will be collected in accordance with the Ecology PCS Guidance. Stockpile soil samples will be collected using decontaminated hand tools approximate 6 to 12 inches below the surface of the stockpile. Stockpile soil samples will be collected at the following frequency:

- 3 discrete soil sample every for every 1-100 cubic yards (cy) of soil;
- 5 discrete soil sample every for every 101-500 cy of soil;
- 7 discrete soil sample every for every 501-1,000 cy of soil;
- 10 discrete soil sample every for every 1,001-2,000 cy of soil,
- 1 additional discrete soil sample for every 500 cy over 2,000 cy.

5.2 GROUNDWATER AND OTHER WATER SAMPLE PROTOCOLS

During the interim action, RGI will collect samples from groundwater monitoring wells, open excavations, and samples to evaluate the quality of water being discharged to the sanitary sewer.

5.2.1 GROUNDWATER MONITORING WELL SAMPLING

RGI will sample groundwater monitoring wells during the course of the project. Groundwater samples from groundwater monitoring wells will be collected using the following procedures:

- RGI will open and remove j-plugs from all groundwater monitoring wells to allow time for groundwater levels to equilibrate;
- An electronic water level will be used to measure the water level from the northernmost point of the top of each well casing. Water level measurements will be recorded to an accuracy of 0.01';
- After collection of groundwater level data, wells will be purged using a peristaltic pump and dedicated tubing. Measurements of water quality parameters (temperature, pH, conductivity, dissolved oxygen, oxidation/reduction potential, and/or total dissolved solids) will be recorded using a multi-variable meter (i.e., Horiba) equipped with a flow through cell. Purging will continue until either water quality parameters have stabilized or three wetted casing volumes of groundwater are purged from each well.

- During sample collection, the flow rate of the pump will be reduced to less than 100 milliliters per minute (mL/min) in accordance with standard low flow sampling techniques. Groundwater will be pumped directly through dedicated tubing into laboratory-supplied containers appropriate for the intended analyses. If samples are collected for metals, they will be field filtered in the field using a 0.45 micron or a pre-filter and a 0.1 micron filter.
- Field duplicates, trip blanks, and equipment blank samples will be collected at the frequency described in the QAPP.
- Following sampling, all wells will be secured.

5.2.2 EXCAVATION WATER SAMPLING

Excavation water samples may be collected from open excavations during the interim action either to assess groundwater concentrations of contaminants of concern or to evaluate if dewatering is effective at reducing groundwater concentrations of contaminants. Excavation samples will be collected either using a peristaltic pump or a dedicated bailer depending on which method will allow for the most representative sample to be collected. Excavation water will either be pumped from the excavation into laboratory supplied containers using a peristaltic pump at a low flow rate or transferred directly from the bailer to laboratory supplied containers.

5.2.3 BAKER TANK WATER SAMPLING

It may be necessary to temporarily store water dewatered from the excavation in settling tanks prior to discharge to the sanitary sewer. Discharge to the sanitary sewer will be conducted in accordance with *Issuance of Wastewater Discharge Authorization No. 4490-01 to Roystone Apartments* dated May 14, 2019 by King County Industrial Waste (KCIW). A copy of this document is included in Appendix G of the work plan.

Prior to discharge to the sewer, water samples will be collected directly from a sample port on the settling tank and transferred directly into appropriate laboratory supplied containers or container necessary to measure required water quality parameters (i.e., Imhoff Cone). The following analyses and water quality parameters will be monitored and documented in a report that will be submitted to KCIW:

- Settleable solids by Imhoff Cone (not to exceed 7.0 mL/L);
- pH (not to exceed 12 or be less than 5)
- Total Fats, Oils, and Grease (not to exceed 100 mg/L) ;
- Benzene (not to exceed 0.07 mg/L);
- Ethylbenzene (not to exceed 1.7 mg/L);
- Toluene (not to exceed 1.4 mg/L);
- Total xylenes (not to exceed 2.2 mg/L);

If concentrations of any of the water quality parameters or analytes listed above do not comply with the levels listed above, KCIW will be notified and water treatment options will be evaluated and implemented. Based on the previous groundwater data, RGI does not consider it likely that levels of FOG, BTEX or pH will be detected in groundwater above levels listed above.

5.3 SAMPLE LABELING AND DOCUMENTATION

All soil and groundwater samples collected will be labeled appropriately. Sample information will be written on a label affixed to the outside of the sample container. Samples will be given a mnemonic designation associated with the type of sample (i.e., remedial excavation, test pit, fuel system decommissioning, waste characterization, stockpile, groundwater monitoring well, excavation water, or water treatment), sample location (intersection of nearest gridlines), sample number, sample designation (for remedial excavation samples only), and depth of sample. For example, RE-L5-1S-10 would indicate a remedial excavation soil sample collected near the intersection of gridlines L and 5, location #1 from the sidewall of the excavation at a depth of 10 feet bgs. All sample depths and locations will be recorded in feet relative to a fixed reference point.

A field logbook will be maintained to document all pertinent Property activities. The following information pertaining to sampling will be recorded in the field logbook and/or chain-of-custody:

- Sample identification;
- Sample location;
- Date and time of sample collection;
- Sampling depth;
- Identity of samplers;
- Relative moisture content (dry, moist, wet, saturated) of the soil sample;
- Soil type (e.g., silt, sand, gravel, etc.), and
- Any other information considered relevant by the RGI professional.

In addition, strict Chain-of-Custody (COC) protocols will be adhered to for all samples. COC is a procedure that provides a written record that can be used to trace the possession and handling of a sample from the time of sample collection through laboratory analysis. Once a sample has been collected, a written account of the sample name, medium, depth, date, time of collection, and requested analyses will be placed on a pre-printed COC form supplied by the analytical laboratory. The sampler(s) will then sign the COC and each subsequent custodian of the sample(s) will sign and date the COC form until it is delivered to the laboratory for analysis. A complete COC will be returned with laboratory reports upon completion of analysis. Copies of the COCs will be included in the Agency Review Draft Interim Action Report, which will be submitted to Ecology for review and approval.

5.4 INVESTIGATION-DERIVED WASTE MANAGEMENT

Investigation derived waste (IDW) may be generated during the interim action may include soil cuttings, purge water, and/or equipment decontamination water.

IDW produced during the interim action will be placed in Department of Transportation (DOT) approved 55-gallon drums that will be temporarily stored on the Property until IDW is properly characterized for disposal with an appropriate disposal facility. IDW drums will be clearly labeled to indicate the contents, date, and origin/location of the material.

RGI will maintain all records pertaining to IDW disposal.

5.5 DECONTAMINATION PROCEDURES

In order to avoid cross-contamination during soil and water sampling, RGI will decontaminate non disposal sampling equipment, meters, or any other equipment with potential to cause cross contamination.

Decontamination procedures will involve washing equipment with a mixture of Alconox and water, then rinsing equipment with potable water. Equipment will then be rinsed with deionized or distilled water. Reusable sampling tools will be covered with aluminum foil after decontamination is complete.

Equipment blank QC samples will be collected during each sampling event to confirm that cross contamination from equipment is not occurring. QA/QC procedures are discussed further in the QAPP.

6 QUALITY ASSURANCE PROJECT PLANS (QAPP)

Guidelines for Preparing Quality Assurance Project Plans for Environmental Studies dated July 2004 (revised December 2016, by Ecology (Publication No. 04-03-030) provides guidance for developing a QAPP that describes the project objectives and procedures required to achieve those objectives.

The preparation of the QAPP accomplishes the following:

- Lists the goals and objectives of a study (see Section 3);
- Identifies the type and quality of data needed;
- Describes the sampling and measurement procedures needed to acquire those data, and
- Describes the QC and assessment procedures needed to ensure that the project objectives are met.

Tables pertaining to laboratory QA/QC, equipment, required sample container and hold times, method detection limits, acceptance criteria and corrective actions provided by Friedman & Bruya, Inc. (FBI) and Libby Environmental, Inc. (Libby) and are included as Attachments A and B, respectively. Laboratory accreditations for each laboratory are included in Attachment C and D.

6.1 DATA QUALITY OBJECTIVES (DQOS)

The *Guidance on Systematic Planning Using the Data Quality Objectives Process* dated February 2006 by the EPA describes a seven step DQO process consisting of defining the problem, identifying the type of data required, outlining the analytical approach and planning data collection effort. All of these topics are addressed in other sections of this QAPP. Step six of this process requires specifying performance or acceptance criteria and is included here.

The primary data quality objective for this project is to collect and analyze soil and groundwater samples to demonstrate that the interim action has effectively remediated petroleum contaminated soil and groundwater on the property. Soil and groundwater samples will be analyzed using standard methods to obtain analytical data that meets the measurement quality objectives (MQOs) discussed in the following sections. FBI's *QC Frequency and Acceptance Limits Summary* table is included in Attachment A.

6.2 MEASUREMENT QUALITY OBJECTIVES (MQOS)

MQOs specify the required quality of the data to meet the project objectives. MQOs consist of precision, bias, sensitivity, comparability, representativeness, and completeness, which are further described in the following sections. Tables pertaining to MQOs from Libby Environmental are included in Attachment B.

6.2.1 PRECISION

Precision is a measurement of the reproducibility of a result. Except when otherwise noted by an accredited method, the QC objective for precision is 20% as measured by relative percent difference (RBD) as determined by duplicate analysis. RPD is calculated as follows:

$$RPD = \frac{(X1-X2)}{[(X1 + X2)/2]} \times 100$$

Where X1 and X2 are the first and second values obtained for analysis. Precision may be evaluated using a duplicate sample, matrix spike and/or laboratory control sample.

Potential sources of random errors include field sampling procedures, handling transport, and preparation of samples, obtaining a portion of an initial sample for analysis, laboratory preparation of sample, and analysis and handling of the sample.

One blind field duplicate sample will be submitted to the laboratory for every 20 samples submitted for analysis in a given media. Alternatively, one field duplicate sample will be submitted for analysis if less than 20 samples are submitted for analysis in order to evaluate precision.

6.2.2 BIAS

Bias is a measurement of the difference between a result and the true or expected value and is generally determined using a matrix spike and/or laboratory control sample. Bias is expressed as percent recovery (%R) and is calculated as follows:

$$\%R = [(Xs – Xa)/Ct \times 100$$

Where Xs is the observed concentration of the spiked sample, Xa is the observed concentration of the sample that was not spiked. Ct represents the concentration of the spike.

Potential sources of bias include sampling procedures, instability of samples, interference and matrix effects, inability to measure all forms of the parameter of interest, calibration of equipment, and contamination of equipment.

6.2.3 SENSITIVITY

Sensitivity is a measurement of the capability of a method to detect a substance and is commonly referred to as the method detection limit (MDL). The MDL is the minimum concentration that can be measured and reported with 99% confidence that the analyte concentration is greater than zero. It is important that the method used for analysis have a detection limit below the referenced cleanup level.

6.2.4 COMPARABILITY

Comparability is used to express confidence when comparing one data set to another. Comparability will be ensured during this project by consistently utilizing Ecology/EPA approved sampling procedures. In addition, the analytical laboratories involved on this project (Libby and FBI) will be required to adhere to the MQOs and QC requirements described in the QAPP.

6.2.5 REPRESENTATIVENESS

Representativeness refers to the degree which a sample in a given media represents the overall material. During this project, the laboratory will assure that samples are adequately homogenized prior to taking aliquots for analysis. This will ensure that the reported results are representative of the sample submitted for analysis. In addition, laboratory preservatives, consistent use of EPA/Ecology approved sample collection and storage techniques, and use of duplicate samples and trip blanks will be used to evaluate representativeness.

6.2.6 COMPLETENESS

The EPA has defined completeness as a measure of the amount of valid data needed to be obtained from a measurement system. Completeness refers to the percentage of the data that the QC data are found to be acceptable. If precision and accuracy results are outside the QA objectives due to sample related causes, the data will be qualified. The QC goal for completeness on this project is 100%. However, 90% will be considered the minimum acceptable level.

6.3 QUALITY CONTROL OBJECTIVES

The following section discusses quality control for laboratory and field operations, which will be utilized to ensure the project goal is met.

6.4 LABORATORY ANALYTICAL METHODS

During this project, soil and/or groundwater samples will be analyzed for contaminants with the corresponding method listed below:

Contaminant	Analytical Method
Gasoline-range TPH	Northwest Method NWTPH-Gx
Diesel- Oil-range TPH	NWTPH-Dx
BTEX	EPA 8260C or 8021B
VOCs	EPA Method 8260C
Lead	EPA Method 200.8
Arsenic	EPA Method 200.8

Tables containing information regarding sample containers, preservation and hold times for each lab and method detection limits are included in Attachments A and B.

6.5 LABORATORY/FIELD QUALITY CONTROL

Quality control samples will be routinely analyzed by the laboratory and collected in the field in order to demonstrate that the laboratory is operating within the QC objectives and to determine the validity of the data.

6.5.1 LABORATORY QUALITY CONTROL

Laboratory QC samples will consist of the following

- **Method Blank Samples (MB)** – used to assess the preparation batch (discussed below) for possible contamination during the preparation and processing steps. The method blank sample will consist of a matrix that is similar to the associated field samples and one method blank sample will be analyzed with each batch. The goal is to have no detectable contaminants. However, if contamination is detected in the MB the nature of the interference and effect on the analysis of each sample in the batch will be evaluated and the problem will be corrected.
- **Laboratory Control Samples (LC)** – used to assess the performance of the total analytical system. One LC will be analyze for each preparation batch. The LC will be either free of the analytes of interest or spiked with a known concentration of the analyte. LC are calculated in %R (see Section 6.2.2) and results are compared to established acceptance criteria. If the LC is determined to be outside the established criteria. The system will be considered "out of control" and any affected samples will be re-processed and re-analyzed. If re-analyzing is not possible, the results will be reported with the appropriate data qualifying codes.
- **Matrix Spike (MS) and Matrix Spike Duplicate Samples (MSD)** – used to assess the effect the sample matrix has on precision and accuracy. The MS sample will be analyzed with each preparation batch and will be performed on the aliquots of actual samples. Samples will be spiked with known concentrations of analytes at concentrations within the calibration range of the method. MS/MSD samples are expressed in %R and relative percent difference (RPD, see Section 6.2.1) and results are compared to the established acceptance criteria. If results are outside of the criteria, the cause is investigated and corrective actions are taken if necessary or MS/MSD data is reported with appropriate qualifiers.
- **Matrix Duplicate Samples (MD)** – MD samples are duplicate aliquots of the same sample taken through the entire analytical procedure. The results are used to determine the precision of the results for the specific sample and method. One MD sample will be analyzed with each batch. If sufficient volume is not available, an LC sample will be analyzed. MD results are used to assess the precision of results in a given matrix and expressed in RPD. Results are compared to the established acceptance criteria. If results are outside of the criteria, the cause is investigated and corrective actions are taken if necessary or MD data is reported with appropriate qualifiers.
- **Surrogate Standard Analyses** – Surrogates are added prior to sample preparation and extraction and used in organic chromatography test methods. Surrogates are chosen

represent the chemistries of the targeted compounds and provide a measure of recovery for every sample matrix. Surrogates will be added to all samples, standards, and blanks for all appropriate test methods. Surrogates are calculated in %R and compared to the established acceptance criteria. If results are outside of the criteria, the cause is investigated and corrective actions are taken (if necessary) or affected data is reported with appropriate qualifiers.

- **Proficiency Testing (PT) Samples** – PT samples are blind samples purchased by a certified provider and are used to evaluate the performance of the total analytical system. They are processed in the same manner as other samples. PT samples are typically analyzed once a year for each analyte method and matrix. PT samples are either prepared in a clean matrix provided by a third party or prepared in the laboratory using instructions provided by a third party. PT results are evaluated by a third party and reported directly to regulatory agencies. PT results that are reported as not acceptable are reviewed and corrective actions are taken as needed.

The preparation batch is a basic unit of quality control. To ensure that QC results for accredited analyses are representative, all samples in a batch will be extracted, analyzed, and calculated the same way as follows

- A maximum of 20 field samples in a batch;
- All samples in a batch must be the same matrix;
- For each batch, QC samples will consist of 1 method blank, one laboratory control sample, one matrix spike, and either one matrix spike duplicate or one matrix duplicate;
- The same reagent and laboratory analyst will be used to process each batch;
- The maximum time between the start of processing the first and last samples in a batch is 24 hrs;
- QC samples will be prepared and analyzed with the with the associated field samples, and
- Each batch will be assigned a unique ID which links it to the associated field samples.

6.5.2 FIELD QUALITY CONTROL

The analytical laboratory will conduct internal QA/QC. All laboratory QA/QC methods will be reported in the laboratory reports for each set of samples analyzed. The following QA/QC samples will be collected in the field to verify the project quality control objectives are being met.

- **Trip Blanks -** A trip blank sample is a sample of a given media that is free of measurable volatile contaminants (i.e., gasoline-range TPH and VOCs). Trip blanks are transported to the sampling site and accompany other samples being transported to the laboratory. The purpose of the trip blank is to assess whether contamination was introduced during sample shipment. During the interim action, one trip blank sample will be submitted to the laboratory for each media when gasoline-range TPH and VOCs are being analyzed.

- **Equipment Blank -** An equipment blank sample is used to evaluate the decontamination process and is prepared by exposing clean material to the sampling equipment after the equipment has been used in the field and decontaminated. The equipment blank is also useful for detected contamination from other sources (surroundings or containers). One equipment blank sample will be submitted to the laboratory during each sampling event.

- **Field Duplicates -** Field duplicate samples will be collected from each media in order to verify field and laboratory precision. Field duplicates will consist of a split sample from a given media and will be discretely labeled with a unique identifier that will not be provided to the laboratory. Field duplicate samples will be collected at a rate of 5% for each media. However, at a minimum, one duplicate sample will be submitted to the laboratory for each batch of samples submitted to the laboratory for a given media regardless of the quantity.

6.6 PREVENTATIVE MAINTENANCE

Each laboratory has an established preventative maintenance program that they adhere to and these procedures are outlined in their internal Laboratory Assurance Manual.

6.7 AUDITS

In order to ensure that the QAPP is implemented correctly, quality of the data is acceptable, and that corrective actions are implemented, RGI may initiate one or more of the following audits:

- Technical Systems Audit – A qualitative audit of conformance with the QAPP, which is conducted soon after work starts to allow for corrective actions to be implemented.
- Proficiency Testing – A quantitative determination of an analyte in a blind standard use to evaluate the proficiency of the analytical chemist.

6.8 CORRECTIVE ACTIONS

If QA/QC protocols indicate problems with data during the course of the project. The following actions may be taken:

- Retrieving missing information
- Recalibration of equipment
- Re-analyses of samples (within required hold times)
- Modifying analytical procedures
- Collecting additional samples
- Qualifying results

Sample analysis will not proceed unless initial calibrations meet method criteria. Calibrations must meet the method requirements or recalibration must be performed. If equipment does not meet the calibration requirements, it will be taken out of service and repaired. Records of all repairs will be maintained. If equipment cannot be repaired it will be discarded.

A copy of the FBI QC Corrective Actions table is included in Attachment A.

6.9 DATA MANAGEMENT PROCEDURES

All analytical data reported in the final laboratory must be calculated, reviewed, and validated following established procedures. SOPs for each method describe the specific calculation procedures. The laboratory has established procedures pertaining to data reduction, validation, and reporting.

RGI Field staff are to review their field data and implement any necessary corrective actions prior to submitting data for use. Any corrective actions will be documented in the daily field report.

The submittal from the analytical laboratory will be tracked and reviewed by the RGI Project Manager. Laboratory data will be provided in an electronic and/or hard copy report format. Data reviewed by RGI will include reported data, sample number verification, parameter spelling check, reporting unit consistency, consistency between electronic and validated results, chain of custody, detection limit specifications, and any other appropriate consistency checks of the data will be reviewed. No project data will be released for use until QC checks have been performed and discrepancies resolved.

6.10 DATA VERIFICATION AND VALIDATION

6.10.1 DATA VERIFICATION

Data verification includes reviewing data for errors and omissions as well as assessing results for compliance with QC acceptance criteria. This task is completed by the experienced laboratory staff and environmental professionals in the field. Data verifications is completed for the following reasons:

- To ensure data is correct with no errors or omissions;
- To verify that analysis of QC samples was performed;
- Ensure QC met the established acceptance criteria;
- Ensure data qualifiers were applied appropriately;
- Ensure protocols in the QAPP were followed;

Laboratory data are to be reviewed by the laboratory QC chemist prior to delivery as prescribed in the analytical laboratories Laboratory Control Manual. Data will be reviewed following appropriate SOPs and the DQOs. Data reviews by the laboratory QC chemist will include calibration, blanks, laboratory control spikes, duplicates, controls, surrogates, and MS/MSD. The reviews will include an assessment of accuracy, precision, representativeness, calibration, comparability, sensitivity, and completeness, any performance or system audit results, and any significant QA problems encountered. Data that are qualified (flagged) during analysis or review will be noted as such in reports where they are used.

The RGI Project Manager will conduct the initial review of the laboratory report for RGI. The sample parameter quantification level data will be reviewed and include cross-checking data from original, duplicate, and MS/MSD samples for consistency. This will include a review of any flagged data by the laboratory. The data will then then compared with Ecology requirements and DQOs before being submitted.

If no qualifiers are present in the lab report, this will indicate that the data are acceptable both qualitatively and quantitatively. If it is determined that data needs to be flagged during the review QC data review, the appropriate data qualifiers will be used. Under certain circumstances, additional flags may be used if necessary. Tables displaying data qualifiers for each lab are contained in Attachments A and B.

6.10.2 DATA VALIDATION

Data validation is performed in order to determine the quality of an analytical dataset, which involves a detailed review of the laboratory data package to determine whether the MQOs for precision, bias, and sensitivity were met.

As required by Ecology under the Agreed Order, data validation during this project will be performed consistent with EPA Stage 2B criteria, which involves completeness and compliance checks of sample receipt conditions and sample related and instrument related QC results. Data validation on this project will be completed by Pyron Environmental Inc. (an independent third party).

The *TCP Data Validation and Sampling and Analysis Plan (SAP)/Quality Assurance Project Plan (QAPP) for data validation for all Formal Cleanup Sites* dated September 23, 2016 by Ecology describes procedures for data validation. Data validation will be performed in accordance with the following EPA Stage 2B criteria:

Completeness and compliance checks include:

- Identify laboratory conducting analysis and includes documentation for all samples submitted for analyses;
- Review of analytical methods & analysis dates;
- Confirm that target analyte results and units are reported along with the original laboratory; data qualifiers and definitions for each data qualifier;
- Review of sample method detection limits;
- Review of sampling dates and laboratory receipt dates, and
- Review preservation.

Sample related QC checks includes:

- Review of sample handling, preparation, cleanup, and analytical methods;
- Review of sample-related QC data and QC acceptance criteria (method blanks, surrogate recoveries, LC recoveries, duplicate analyses, matrix spike and matrix spike duplicate recoveries, and reference materials) are provided and linked to the reported field QC samples (i.e., trip blanks and equipment blanks);
- Review of sample holding time, and
- Review of sample QC frequency.

Instrument related QC checks includes:

- Verify that appropriate number and concentration of initial calibration standards are present;
- Review continuing calibration data (e.g., continuing calibration verification [CCV] standards and continuing calibration blanks [CCBs]);
- Reported samples are bracketed by CCV standards and CCBs standards as appropriate;
- Verify that method specific instrument performance checks were performed, and
- Review frequency of instrument QC samples

7 REFERENCES

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ATTACHMENT A

Tables Provided by Friedman & Bruya

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Parameter	Method	Matrix	Minimum Sample Volume	Container	Preservation	Maximum Holding Time
Organic Analysis						
Diesel Range Organics (Extractable TPH)	8015M NWTPH-Dx	Water	500 mL	500 mL glass	*Cool, ≤6°C	*7 days to extract, 40 days after extr.
	AK 102	Water	1 L	1 L glass		
	8015M NWTPH-Dx AK102/103	Soil	50 grams	4 oz glass	Cool, ≤6°C	14 days to extract, 40 days after extr.
Gasoline Range Organics (Purgable TPH)	8015M NWTPH-Gx AK101	Water	40 mL	40 mL VOA	Cool, ≤6°C, HCl to pH<2, no headspace	14 days
	8015M NWTPH-Gx	Soil	20 grams	3 x 5035 kit or MeOH pres. vial	Cool, ≤6°C/Freeze <-7°C	14 days
	AK101	Soil	app. 50 g	4 oz glass septum top	Methanol	28 days
HCID	NWTPH-HCID	Water	500 mL	500 mL glass	Cool, ≤6°C	7 days to extract, 40 days after extr.
		Soil	50 grams	4 oz glass	Cool, ≤6°C	14 days
HEM (O&G), SGT-HEM	1664	Water	1 Liter	1 L glass	Cool, ≤6°C, H_2SO_4 to pH<2	28 days
PCBs	8082A	Water	1 Liter	1 L glass	Cool, ≤6°C	none
	8082A	Soil	50 grams	4 oz glass	Cool, ≤6°C	none
PNAs (PAHs)	8270D or 8270D SIM	Water	500 mL	500 mL glass	Cool, ≤6°C	7 days to extract, 40 days after extr.
	8270D or 8270D SIM	Soil	50 grams	4 oz glass	Cool, ≤6°C	14 days to extract, 40 days after extr.
Purgable Aromatic Hydrocarbons (BTEX, MTBE)	8021B or AK101	Water	40 mL	40 mL VOA	Cool, ≤6°C, HCl to pH<2, no headspace	14 days
	8021B	Soil	20 grams	3 x 5035 kit or MeOH pres. vial	Cool, ≤6°C/Freeze <-7°C	14 days
	AK101	Soil	app. 50 g	4 oz glass septum top	Methanol	28 days
Semivolatile Organic Compounds (SVOCs, BNAs)	8270D	Water	1 Liter	1 L glass	Cool, ≤6°C	7 days to extract, 40 days after extr.
	8270D	Soil	50 grams	4 oz glass	Cool, ≤6 °C	14 days to extract, 40 days after extr.

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Parameter	Method	Matrix	Minimum Sample Volume	Container	Preservation	Maximum Holding Time
Organic Analysis (Continued)						
Volatile Organic Compounds (VOCs)	8260C	Water	40 mL	40 mL VOA	Cool, ≤6°C, HCl to pH<2, no headspace	14 days
	8260C	Soil	10 grams	40 mL VOA	Freeze within 48 hrs., ≤0°C	14 days

* For NWTPH-Dx and AK102 methods, if preserved with HCl or H_2SO_4 to pH<2, holding time is 14 days to extract.

SAMPLE CONTAINERS, PRESERVATION, AND HOLDING TIMES

Parameter	Method	Matrix	Minimum Sample Volume	Container	Preservation	Maximum Holding Time
Inorganic Analysis						
Alkalinity	SM2320B	Water	100 mL	500 mL poly	Cool, ≤6°C	14 days
BOD	405.1	Water	1 Liter	1 L glass	Cool, ≤6°C	48 hours
Chloride	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	28 days
COD	410.4	Water	100 mL	500 mL poly	H_2SO_4 to pH<2	28 days
Conductivity	120.1	Water	100 mL	500 mL poly	Cool, ≤6°C	28 days
Cyanide, total	335.2	Water	1 Liter	1 L glass	NaOH to pH 12	14 days
Fluoride	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	28 days
Hardness	SM2340B	Water	100 mL	500 mL poly	HNO_3 to pH,<2	6 months
Nitrate	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	48 hours
Nitrite	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	48 hours
Nitrate-Nitrite	353.2	Water	100 mL	500 mL poly	Cool, ≤6°C, H_2SO_4 to pH<2	28 days
pH	9040/150.1	Water	20 mL	500 mL poly	None	As soon as possible
	9045	Soil	20 grams	4 oz glass	None	28 days
Phosphorus, total	365.2	Water	100 mL	500 mL poly	Cool, ≤6°C, H_2SO_4 to pH<2	28 days
Sulfate	300.0	Water	100 mL	500 mL poly	Cool, ≤6°C	28 days
Sulfide	376.2	Water	500 mL	500 mL poly	Cool, ≤6°C ZnAcetate plus NaOH to pH>9	7 days
Sulfite	377.1	Water	100 mL	500 mL poly	None	24 hours
Total Dissolved Solids (TDS)	SM2540C/ 160.1	Water	500 mL	500 mL poly	Cool, ≤6°C	7 days
Total Organic Carbon (TOC)	415.1/ 9060M	Water	100 mL	500 mL poly	H_2SO_4 to pH<2	28 days
Total Suspended Solids (TSS)	SM2540D	Water	250 mL	500 mL poly	Cool, ≤6°C	7 days
Turbidity	SM2130B	Water	20 mL	500 mL poly	Cool, ≤6°C	48 hours
Metals Analysis						
Metals (except Cr VI and Mercury)	200.8/6020 or 6010	Water	200 mL	500 mL poly or glass	HNO_3 to pH<2 at least 24 hours prior to analysis	6 months
	200.8/6020 or 6010	Soil	20 grams	4 oz glass	Cool, ≤6°C	6 months
Chromium VI	SM3500Cr	Water	100 mL	500 mL poly	Cool, ≤6°C	24 hours
	7196A	Soil	50 grams	4 oz glass	Cool, ≤6°C	30 days
Mercury	1631/7040	Water	125 mL	250 mL poly, fluoropolymer, or glass	HNO_3 to pH<2	28 days (48 hours if not preserved)
	1631/7041	Soil	50 grams	4 oz glass	Cool, ≤6°C	28 days

Table 12-1
QC Frequency and Acceptance Limits Summary
(For Accredited Analysis, Method requirements may supersede these.)

Quality Control Element	Frequency	Acceptance Limits
Method Detection Limit (MDL)	Initially, annually, and with substantial change to method or instrument.	40CFR Part 136, Appendix B calculations.
Demonstration of Capability (DOC)	Annually for each analyst.	Average of replicates within method established control limits of true value, and not >20% RSD for each analyte.
Initial Calibration	Initially and if ICV or CCV fail.	Per method specific requirements.
Initial Calibration Verification (ICV/Second Source)	Following every initial calibration, prior to sample analysis.	Per method specific requirements.
Continuing Calibration Verification (CCV)	When an initial calibration has not been performed: i) At the beginning and end of analysis of 20 samples (max). Concentrations vary. ii) At the beginning of 12 hour shift if internal calibration used.	Per method specific requirements.
Method Blank (MB)	1 per preparation batch of 20 (or fewer) samples.	Concentration for each analyte below RL.
Laboratory Control Sample (LCS)	1 per preparation batch of 20 (or fewer) samples.	Per laboratory established control limits (or default limits.)
Matrix Spike (MS)	1 per preparation batch of 20 (or fewer) samples.	Per laboratory established control limits (or default limits.) Does not control batch.
Duplicate Analysis (Sample Duplicate (Dup), MSD or LCSD)	1 per preparation batch of 20 (or fewer) samples. i) Dup or MSD if sufficient sample. ii) LCSD if not.	Percent recovery per laboratory established control limits (or default limits.) RPD 0% to 30%. Dup and MSD do not control batch.
Surrogate	Each field and QC sample for accredited organic analyses.	Per laboratory established control limits (or default limits.)
Proficiency Testing (PT) Samples	Twice per year per accredited method/analyte/matrix.	Per PT provider.

Table 13-1
QC Corrective Actions
(For Accredited Analysis, Method requirements may supersede these.)

Quality Control Element	Corrective Action(s)	Documentation
Method Detection Limit (MDL)	Determine source of problem, correct, reanalyze (re-extract if necessary).	Instrument raw data.
Demonstration of Capability (DOC)	Determine source of problem, correct, reanalyze (re-extract if necessary).	Instrument raw data. DOC Certificate
Initial Calibration	Determine source of problem and recalibrate. Reanalyze any affected samples.	Instrument raw data. Flag sample results if not corrected. Non-Conformance Form if not corrected.
Initial Calibration Verification (ICV/Second Source)	Re-inject ICV. If ICV fails a second time, a new initial calibration is required. Reanalyze any affected samples.	Instrument raw data. Flag sample results if not corrected. Non-Conformance Form if not corrected.
Continuing Calibration Verification (CCV)	Determine source of problem and re-inject CCV. If second CCV fails, either correct problem and pass two consecutive CCVs, or a new initial calibration is required. Reanalyze any affected samples unless: i) CCV is high and sample is ND. ii) CCV is low and sample result is above regulatory/action limit.	Instrument raw data. Flag sample results if not corrected. Non-Conformance Form if not corrected.
Method Blank (MB)	Reduce background contamination. Re-extract and reanalyze MB and all affected samples in batch. Sample result can be reported if MB is <1/10 of sample result, or if sample is ND.	Instrument raw data. Flag MB and sample results if not corrected. Non-Conformance Form if not corrected.
Laboratory Control Sample (LCS/LCSD)	Determine source of problem. Correct and: i) If instrument related, reanalyze LCS and all affected samples in batch. ii) If spike related, re-extract and reanalyze LCS. iii) If other, re-extract and reanalyze LCS and all affected samples in batch.	Instrument raw data. Flag LCS and sample results if not corrected. Non-Conformance Form if not corrected.

Note: Verify calculations prior to other corrective actions.

Table 13-1
QC Corrective Actions (continued)
(For Accredited Analysis, Method requirements may supersede these.)

Quality Control Element	Corrective Action(s)	Documentation
Matrix Spike (MS)	Determine source of problem. i) If instrument related, reanalyze MS and all affected samples in batch. ii) If spike related, re-extract and reanalyze MS. iii) If LCS passes, flag failing MS result as matrix effect.	Instrument raw data. Flag MS result if not corrected. Non-Conformance Form if not corrected.
Duplicate Analysis (Sample Duplicate (Dup), or MSD)	Determine source of problem. i) If instrument related, reanalyze duplicate and all affected samples in batch. ii) If other, re-extract and reanalyze sample and duplicate (or MS and MSD). iii) If LCS passes, flag failing result as matrix effect.	Instrument raw data. Flag duplicate result if not corrected. Non-Conformance Form if not corrected.
Surrogate	Determine source of problem. i) If instrument related, reanalyze sample. ii) If spike related, re-extract and reanalyze sample. iii) If matrix related, flag failing result as matrix effect.	Instrument raw data. Flag surrogate result if not corrected. Non-Conformance Form if not corrected.
Proficiency Testing (PT) Samples	Determine and correct source of problem. Pass minimum of 2 of last 3 for each accredited method/analyte/matrix.	PT provider report. Corrective action letters to regulatory agency.

Note: Verify calculations prior to other corrective actions.

EQUIPMENT MAINTENANCE PROGRAM
(GENERAL GUIDANCE)

Instrument	Activity	Approximate Frequency
GC 5 *(HFS* Agilent 5890 Series II	Clean FID	Weekly or as needed
	Check Gases	Replace at 200 PSI
	Change Liner	Every 200 injections or as needed due to response change
	Change Septum	Every 200 injections
	Replace Syringe	As needed if clogged or broken
	Clip Column	As needed to improve chromatography
	Replace Column	As needed
	Change Gold Seal	As needed
GC/MS 3, GC/MS 6, GC/MS 8, and GC/MS 10 *(Semivolatiles and Methamphetamine)*	Check Gases	Replace at 200 PSI
	Change Liner	Every 200 injections or if tune fails due to degradation of DDT > 20
	Change Septum	Every 200 injections
	Replace Syringe	As needed if clogged or broken
	Clip Column	As needed to improve chromatography
	Replace Column	As needed
	Change Gold Seal	As needed
	Change Pump Oil	Every 6 months
	Clean Source	As needed
GC/MS 4, GC/MS 9, and GC/MS 7 *(Volatiles)*	Check Gases	Replace at 200 PSI
	Replace Column	As needed
	Change Pump Oil	Every 6 months
	Clean Source	As needed
CVAFS *(Mercury)*	Clean Liquid Gas Separator	Before each run
	Clean Cuvette	As needed
	Replace Lamp	As needed
	Change Tubing	As needed
ICP/MS *(Metals)*	Change Torch	As needed
	Change Tubing	As needed
	Change Coolant	As needed
	Clean Cones	As needed

MAJOR ANALYTICAL EQUIPMENT

Make/Model	Type	Identifier	Software
Agilent 5890	GC/FID	GC 1	ChemStation
Agilent 5890 with Varian Archon and OI 4560	GC/FID/PID Autosampler Purge & Trap	GC 2	ChemStation
Agilent 5890 with Varian Archon and OI 4560	GC/FID/PID Autosampler Purge & Trap	GC 3	ChemStation
Agilent 5890	GC/FID	GC 4	ChemStation
Agilent 5890	GC/FID	GC 5	ChemStation
Agilent 5890	GC/FID	GC 6	ChemStation
Agilent 6890	GC/ECD/ECD	GC 7	EnviroQuant
Agilent 5890 with Tekmar 7000	GC/FID Headspace Autosampler	GC 8	ChemStation
Agilent 6890 with Agilent 5973	GC MSD	GC/MS 3	EnviroQuant
Agilent 6890N with Agilent 5973N and OI 4552 and OI 4660	GC MSD Autosampler Purge & Trap	GC/MS 4	EnviroQuant
Agilent 7890 with Agilent 5975 and OI 4552 and OI 4660	GC MSD Autosampler Purge & Trap	GC/MS 9	EnviroQuant
Agilent 6890 with Agilent 5973	GC MSD	GC/MS 6	EnviroQuant
Agilent 7890A with Agilent 5975C and Markes Model # TD- 100 and Entech Model #7200 and Entech Model #7016D and Entech Model #3100D and Entech Model #31-350ER	GC MSD Autosampler/ Concentrator/ Calibration Solution Loading Rig (CSLR) Concentrator Autosampler/ Vacuum Cleaning System Oven/Vacuum	GC/MS 7	EnviroQuant Maveric Entech Entech Entech 3100D Entech 3100D

MAJOR ANALYTICAL EQUIPMENT
(Continued)

Make/Model	Type	Identifier	Software
and Entech Model #39-FP-01 and Entech DDS Model #PG7-50.00-PSIA	Flow Professor Digital Dilution System (DDS)	GC/MS 7	Entech Flow Professor
Agilent 6890 with Agilent 5975C	GC MSD	GC/MS 8	EnviroQuant
Agilent 7890B with Agilent 5977A	GC MSD	GC/MS 10	EnviroQuant
PerkinElmer NexION 300D	ICP/MS	ICP/MS	PerkinElmer Syngistix
PerkinElmer S10 Autosampler	ICP/MS Autosampler	ICP/MS	PerkinElmer S10 Utility
Tekran 2600	CVAFS	CVAFS	Tekran
VWR Model 800	Turbidimeter	Turbidimeter	N/A
Mettle-Toledo Seven Compact	pH Meter	pH Meter	N/A
UV-VIS, Shimadzu UV-2450	Spectrophotometer	Spectrophotometer	N/A
Rae Systems, Model# PGM-30 (2)	Hand Held PID	Hand Held PID	N/A
Buck Scientific, Model# HC-404 (1)	IR analyzer	IR analyzer	N/A
Beckman Model TJ-6 (2)	Centrifuge	Centrifuge	N/A
Vortex Genie 2, Model G-560 (3)	Vortex Mixer	Vortex Mixer	N/A
Thermo Scientific Precision Water Bath, Model #2849	Water Bath	Water Bath	N/A
Organomation Associates, Inc. Model #120 (1)	Water Bath	Water Bath	N/A
Branson Untrasonics Corporation, Model# 450 (2)	Sonicator	Sonicator	N/A
Sonics and Material, Inc. Model# VC600 (1)	Sonicator	Sonicator	N/A

MAJOR ANALYTICAL EQUIPMENT
(Continued)

Make/Model	Type	Identifier	Software
Marathon Electric, Model 0523-N191Q-G588 (1)	Sonicator	Sonicator	N/A
Sonics and Material, Inc. Model# VC750 (2)	Sonicator	Sonicator	N/A
Mettler Electronics Group, Model#ME 4.6 (1)	Cavitator	Cavitator	N/A
Brenson Ultrasonic Bath, Model #M3800	Cavitator	Cavitator	N/A
Torbal, Fulcrum Inc., Model #AGCN 100	Analytical Balance	Analytical Balance	N/A
AND Model #HA-120M (1) (white)	Analytical Balance	Analytical Balance	N/A
AND Model #EK-1200A (1)	Analytical Balance	Analytical Balance	N/A
Mettler Toledo, Model #ML1502E/03 (2)	Analytical Balance	Analytical Balance	N/A
Mettler Toledo, Model #ML1501E/03 (2)	Analytical Balance	Analytical Balance	N/A
Denver Instrument Model #XP-1500 (1)	Analytical Balance	Analytical Balance	N/A
US Electrical Motors, Model #E438 (1)	Tumbler	Tumbler	N/A
Emerson Electric Co. (2)	Vacuum Pump	Vacuum Pump	N/A
Stabil-Therm Gravity Oven Model#OV-484A (1)	Oven	Oven	N/A
Precision Scientific Group, Model 26 (1)	Mechanical Convention Oven	Mechanical Convention Oven	N/A
Thermolyne Corporation, Model # F6000 (1)	Muffle Furnace	Muffle Furnace	N/A
Barnstead/Thermolyne Model#1415M (1)	Muffle Furnace	Muffle Furnace	N/A
Thermolyne Corporation, Model # HPA2245M (2)	Hot Plate	Hot Plate	N/A
Corning Laboratory, Model#PC-300 (1)	Hot Plate	Hot Plate	N/A

MAJOR ANALYTICAL EQUIPMENT
(Continued)

Make/Model	Type	Identifier	Software
Corning Laboratory Model #PC-520 (1)	Hot Plate/Stirrer	Hot Plate/Stirrer	N/A
Corning Laboratory Model #PC-420 (1)	Hot Plate/Stirrer	Hot Plate/Stirrer	N/A
CPI-MOD Block (70 mL) Digest Heater Block with Controler (2)	Digester/Heater Block	Digester/Heater Block	N/A
Julabo Labortachnik, Model#FC600 or equivalent (2)	Chilling Unit	Chilling Unit	N/A
PolyScience 6000 Series Chiller Model #0772046	Chilling Unit	Chilling Unit	N/A

Data Qualifiers & Definitions

a - The analyte was detected at a level less than five times the reporting limit. The RPD results may not provide reliable information on the variability of the analysis.

b - The analyte was spiked at a level that was less than five times that present in the sample. Matrix spike recoveries may not be meaningful.

ca - The calibration results for the analyte were outside of acceptance criteria. The value reported is an estimate.

c - The presence of the analyte may be due to carryover from previous sample injections.

cf - The sample was centrifuged prior to analysis.

d - The sample was diluted. Detection limits were raised and surrogate recoveries may not be meaningful.

dv - Insufficient sample volume was available to achieve normal reporting limits.

f - The sample was laboratory filtered prior to analysis.

fb - The analyte was detected in the method blank.

fc - The compound is a common laboratory and field contaminant.

hr - The sample and duplicate were reextracted and reanalyzed. RPD results were still outside of control limits. Variability is attributed to sample inhomogeneity.

hs - Headspace was present in the container used for analysis.

ht – The analysis was performed outside the method or client-specified holding time requirement.

ip - Recovery fell outside of control limits. Compounds in the sample matrix interfered with the quantitation of the analyte.

j - The analyte concentration is reported below the lowest calibration standard. The value reported is an estimate.

J - The internal standard associated with the analyte is out of control limits. The reported concentration is an estimate.

jl - The laboratory control sample(s) percent recovery and/or RPD were out of control limits. The reported concentration should be considered an estimate.

js - The surrogate associated with the analyte is out of control limits. The reported concentration should be considered an estimate.

lc - The presence of the analyte is likely due to laboratory contamination.

L - The reported concentration was generated from a library search.

nm - The analyte was not detected in one or more of the duplicate analyses. Therefore, calculation of the RPD is not applicable.

pc - The sample was received with incorrect preservation or in a container not approved by the method. The value reported should be considered an estimate.

ve - The analyte response exceeded the valid instrument calibration range. The value reported is an estimate.

vo - The value reported fell outside the control limits established for this analyte.

x - The sample chromatographic pattern does not resemble the fuel standard used for quantitation.

ATTACHMENT B

Tables Provided by Libby Environmental

LIBBY ENVIRONMENTAL, INC.

CONTAINER, PRESERVATION AND HOLDING TIMES GUIDE

Parameter	Method	Soil / Sediment			Water		
		Container	Holding Time	Preservation	Container	Holding Time	Preservation
BTEX (soil) EPA 8021B / EPA 8260C	w/ 5035 preservation (Approx 5 grams soil)	40 mL Glass VOA Vial (x2)	48 Hours	Cool 4°C	---	---	---
BTEX (soil) EPA 8021B / EPA 8260C	w/ 5035 preservation (Approx 5 grams soil)	40 mL Glass VOA Vial (x2)	14 Days	Cool 4°C, MeOH	---	---	---
BTEX (water)	EPA 8021B / EPA 8260C	---	---	---	40 mL Glass VOA Vial (x3)	7 Days	Cool 4°C
BTEX (water)	EPA 8021B / EPA 8260C	---	---	---	40 mL Glass VOA Vial (x3)	14 Days	Cool 4°C, HCl
Diesel Range Organics (water)	NWTPH-Dx/ Dx Extended	---	---	---	1 Liter Glass Amber	14 Days	Cool 4°C, HCl
Diesel Range Organics (water)	NWTPH-Dx/ Dx Extended	---	---	---	1 Liter Glass Amber	7 Days	Cool 4°C
Diesel Range Organics (soil)	NWTPH-Dx/ Dx Extended	4 oz. Glass Jar	14 Days	Cool 4°C	---	---	---
Gasoline Range Organics (soil) NWTPH-Gx	w/ 5035 preservation (Approx 5 grams soil)	40 mL Glass VOA Vial (x2)	48 Hours	Cool 4°C	---	---	---
Gasoline Range Organics (soil) NWTPH-Gx	w/ 5035 preservation (Approx 5 grams soil)	40 mL Glass VOA Vial (x2)	14 Days	Cool 4°C, MeOH	---	---	---
Gasoline Range Organics (water)	NWTPH-Gx	---	---	---	40 mL Glass VOA Vial (x3)	7 Days	Cool 4°C
Gasoline Range Organics (water)	NWTPH-Gx	---	---	---	40 mL Glass VOA Vial (x3)	14 Days	Cool 4°C, HCl
Mercury (Hg)	EPA 7471	4 oz. Glass Jar	28 Days	Cool 4°C	250 mL Poly	28 Days	Cool 4°C, HNO_3
Metals, Dissolved (Ar, Cd, Cr, Pb, Zn, Cu)	EPA 7010 Series	---	---	---	250 mL Poly - Field Filter	6 Months	Cool 4°C
Metals, Dissolved (Except Mercury)	EPA 6020 / 7010 & 200 Series	---	---	---	250 mL Poly - Field Filter	6 Months	Cool 4°C
Metals, Total (Ar, Cd, Cr, Pb, Zn, Cu)	EPA 7010 Series	4 oz. Glass Jar	6 Months	Cool 4°C	250 mL Poly	6 Months	Cool 4°C, HNO_3
Metals, Total (Except Mercury)	EPA 6020 / 7010 & 200 Series	4 oz. Glass Jar	6 Months	Cool 4°C	250 mL Poly	6 Months	Cool 4°C, HNO_3
PAH - Polyaromatic Hydrocarbons (☼)	EPA 8270	4 oz. Glass Jar (x2)	14 Days	Cool 4°C	1 Liter Glass Amber	7 Days/40 Days	Cool 4°C
VOC - Volatile Organic Compounds	EPA 8260C	---	---	---	40 mL Glass VOA Vial (x3)	7 Days	Cool 4°C
VOC - Volatile Organic Compounds EPA 8260C	w/ 5035 preservation (Approx 5 grams soil)	40 mL Glass VOA Vial (x2)	48 Hours	Cool 4°C	---	---	---
VOC - Volatile Organic Compounds EPA 8260C	w/ 5035 preservation (Approx 5 grams soil)	40 mL Glass VOA Vial (x2)	14 Days	Cool 4°C, MeOH	---	---	---

(#) Extract within 128 Days (Hg = 28 Days)

(!) 48 hour notice to prepare solutions

(%) No preservative

(☼) PAH soil - 14 days to be extracted , THEN 40 days hold time

Note: VOC - HCl degrades the Vinyl Chloride

All Soil Samples Require a 4oz. Jar (unpreserved)

Data Quality	Quality Control Parameters
Precision	RPD Values
	1.) LCS/LCSD
	2.) MS/MSD
	3.) Field Duplicate
Accuracy/Bias	Percent Recovery(%R) for:
	1.) Initial Calibration and Calibration Verification
	2.) LCS
	3.) MS
	4.) Surrogate Spikes
	Results of:
	1.) Method Blank
	2.) Trip Blank
	3.) Instrument Blank (if required)
Representativeness	Sample Integrity (COC and Sample Receipt Forms)
	Results of Blanks
	Holding Times
Comparability	Sample Collection Methods
	Laboratory Analytical Methods
	Site-Specific Reporting Limits
Completeness	Laboratory Deliverables
	Reported/Requested Valid Results
	Data Qualifiers
Sensitivity	MDLs and PQLs

NOTES:
LCS = laboratory control sample
MDL = method detection limit
PQL = practical quantitation limit
MS/MSD = matrix spike/matrix spike duplicate
QC = Quality Control

VOC by 8260C Soil mg/kg	PQL	MDL	LCS %R	%RPD	Surrogate %R
Dichlorodifluoromethane	0.06	0.0333	n/a	≤35	n/a
Chloromethane	0.06	0.0135	n/a	≤35	n/a
Vinyl chloride	0.02	0.0070	n/a	≤35	n/a
Bromomethane	0.09	0.0260	n/a	≤35	n/a
Chloroethane	0.06	0.0160	n/a	≤35	n/a
Trichlorofluoromethane	0.05	0.0309	n/a	≤35	n/a
1,1-Dichloroethene	0.05	0.0206	65-135	≤35	n/a
Methylene chloride	0.02	0.0092	n/a	≤35	n/a
Methyl tert-Butyl Ether (MTBE)	0.05	0.0232	n/a	≤35	n/a
trans-1,2-Dichloroethene	0.02	0.0107	n/a	≤35	n/a
1,1-Dichloroethane	0.03	0.0143	n/a	≤35	n/a
2,2-Dichloropropane	0.05	0.0131	n/a	≤35	n/a
cis-1,2-Dichloroethene	0.02	0.0078	n/a	≤35	n/a
Chloroform	0.02	0.0114	n/a	≤35	n/a
1,1,1-Trichloroethane (TCA)	0.02	0.0113	n/a	≤35	n/a
Carbon tetrachloride	0.03	0.0108	n/a	≤35	n/a
1,1-Dichloropropene	0.02	0.0121	n/a	≤35	n/a
Benzene	0.02	0.0142	65-135	≤35	n/a
1,2-Dichloroethane (EDC)	0.03	0.0125	n/a	≤35	n/a
Trichloroethene (TCE)	0.03	0.0079	65-135	≤35	n/a
1,2-Dichloropropane	0.02	0.0109	n/a	≤35	n/a
Dibromomethane	0.04	0.0148	n/a	≤35	n/a
Bromodichloromethane	0.02	0.0100	n/a	≤35	n/a
cis-1,3-Dichloropropene	0.02	0.0104	n/a	≤35	n/a
Toluene	0.10	0.0120	65-135	≤35	n/a
Trans-1,3-Dichloropropene	0.03	0.0113	n/a	≤35	n/a
1,1,2-Trichloroethane	0.03	0.0141	n/a	≤35	n/a
Tetrachloroethene (PCE)	0.02	0.0138	n/a	≤35	n/a
1,3-Dichloropropane	0.05	0.0159	n/a	≤35	n/a
Dibromochloromethane	0.03	0.0147	n/a	≤35	n/a
1,2-Dibromoethane (EDB) *	0.005	0.00021	n/a	≤35	n/a
Chlorobenzene	0.02	0.0145	65-135	≤35	n/a
1,1,1,2-Tetrachloroethane	0.03	0.0107	n/a	≤35	n/a
Ethylbenzene	0.05	0.0163	n/a	≤35	n/a
Total Xylenes	0.15	0.0147	n/a	≤35	n/a
Styrene	0.02	0.0122	n/a	≤35	n/a
Bromoform	0.03	0.0148	n/a	≤35	n/a
Isopropylbenzene	0.05	0.0180	n/a	≤35	n/a
1,2,3-Trichloropropane	0.05	0.0121	n/a	≤35	n/a
Bromobenzene	0.03	0.0153	n/a	≤35	n/a
1,1,2,2-Tetrachloroethane	0.03	0.0174	n/a	≤35	n/a
n-Propylbenzene	0.04	0.0292	n/a	≤35	n/a
2-Chlorotoluene	0.03	0.0207	n/a	≤35	n/a
4-Chlorotoluene	0.03	0.0197	n/a	≤35	n/a
1,3,5-Trimethylbenzene	0.03	0.0182	n/a	≤35	n/a
tert-Butylbenzene	0.03	0.0220	n/a	≤35	n/a
1,2,4-Trimethylbenzene	0.03	0.0125	n/a	≤35	n/a
sec-Butylbenzene	0.03	0.0134	n/a	≤35	n/a
1,3-Dichlorobenzene	0.03	0.0161	n/a	≤35	n/a
Isopropyltoluene	0.03	0.0162	n/a	≤35	n/a
1,4-Dichlorobenzene	0.03	0.0155	n/a	≤35	n/a
1,2-Dichlorobenzene	0.03	0.0187	n/a	≤35	n/a
n-Butylbenzene	0.05	0.0125	n/a	≤35	n/a
1,2-Dibromo-3-Chloropropane	0.05	0.0263	n/a	≤35	n/a
1,2,4-Trichlorolbenzene	0.05	0.0310	n/a	≤35	n/a
Hexachloro-1,3-butadiene	0.10	0.0296	n/a	≤35	n/a
Naphthalenes	0.10	0.0449	n/a	≤35	n/a
1,2,3-Trichlorobenzene	0.10	0.0495	n/a	≤35	n/a
Dibromofluoromethane	n/a	n/a	65-135	≤35	65-135
1,2-Dichloroethane-d4	n/a	n/a	65-135	≤35	65-135
Toluene-d8	n/a	n/a	65-135	≤35	65-135
4-Bromofluorobenzene	n/a	n/a	65-135	≤35	65-135

VOC by 8260C Water µg/L	PQL	MDL	LCS %R	%RPD	Surrogate %R
Dichlorodifluoromethane	2.0	0.67	n/a	≤35	n/a
Chloromethane	2.0	0.27	n/a	≤35	n/a
Vinyl chloride	0.2	0.14	n/a	≤35	n/a
Bromomethane	2.0	0.52	n/a	≤35	n/a
Chloroethane	2.0	0.32	n/a	≤35	n/a
Trichlorofluoromethane	2.0	0.62	n/a	≤35	n/a
1,1-Dichloroethene	0.5	0.41	65-135	≤35	n/a
Methylene chloride	1.0	0.18	n/a	≤35	n/a
Methyl tert-Butyl Ether (MTBE)	5.0	0.46	n/a	≤35	n/a
trans-1,2-Dichloroethene	1.0	0.21	n/a	≤35	n/a
1,1-Dichloroethane	1.0	0.29	n/a	≤35	n/a
2,2-Dichloropropane	2.0	0.26	n/a	≤35	n/a
cis-1,2-Dichloroethene	1.0	0.16	n/a	≤35	n/a
Chloroform	1.0	0.23	n/a	≤35	n/a
1,1,1-Trichloroethane (TCA)	1.0	0.23	n/a	≤35	n/a
Carbon tetrachloride	1.0	0.22	n/a	≤35	n/a
1,1-Dichloropropene	1.0	0.24	n/a	≤35	n/a
Benzene	1.0	0.28	65-135	≤35	n/a
1,2-Dichloroethane (EDC)	1.0	0.25	n/a	≤35	n/a
Trichloroethene (TCE)	1.0	0.16	65-135	≤35	n/a
1,2-Dichloropropane	1.0	0.22	n/a	≤35	n/a
Dibromomethane	1.0	0.30	n/a	≤35	n/a
Bromodichloromethane	1.0	0.20	n/a	≤35	n/a
cis-1,3-Dichloropropene	1.0	0.21	n/a	≤35	n/a
Toluene	1.0	0.24	65-135	≤35	n/a
Trans-1,3-Dichloropropene	1.0	0.23	n/a	≤35	n/a
1,1,2-Trichloroethane	1.0	0.28	n/a	≤35	n/a
Tetrachloroethene (PCE)	1.0	0.28	n/a	≤35	n/a
1,3-Dichloropropane	1.0	0.32	n/a	≤35	n/a
Dibromochloromethane	1.0	0.29	n/a	≤35	n/a
1,2-Dibromoethane (EDB) *	0.01	0.0041	n/a	≤35	n/a
Chlorobenzene	1.0	0.29	65-135	≤35	n/a
Ethylbenzene	1.0	0.33	n/a	≤35	n/a
1,1,1,2-Tetrachloroethane	1.0	0.21	n/a	≤35	n/a
Total Xylenes	2.0	0.29	n/a	≤35	n/a
Styrene	1.0	0.24	n/a	≤35	n/a
Bromoform	1.0	0.30	n/a	≤35	n/a
Isopropylbenzene	4.0	0.36	n/a	≤35	n/a
1,2,3-Trichloropropane	1.0	0.24	n/a	≤35	n/a
Bromobenzene	1.0	0.31	n/a	≤35	n/a
1,1,2,2-Tetrachloroethane	1.0	0.35	n/a	≤35	n/a
n-Propylbenzene	1.0	0.58	n/a	≤35	n/a
2-Chlorotoluene	1.0	0.41	n/a	≤35	n/a
4-Chlorotoluene	1.0	0.39	n/a	≤35	n/a
1,3,5-Trimethylbenzene	1.0	0.36	n/a	≤35	n/a
tert-Butylbenzene	1.0	0.44	n/a	≤35	n/a
1,2,4-Trimethylbenzene	1.0	0.25	n/a	≤35	n/a
sec-Butylbenzene	1.0	0.27	n/a	≤35	n/a
1,3-Dichlorobenzene	1.0	0.32	n/a	≤35	n/a
Isopropyltoluene	1.0	0.32	n/a	≤35	n/a
1,4-Dichlorobenzene	1.0	0.31	n/a	≤35	n/a
1,2-Dichlorobenzene	1.0	0.37	n/a	≤35	n/a
n-Butylbenzene	1.0	0.25	n/a	≤35	n/a
1,2-Dibromo-3-Chloropropane	1.0	0.53	n/a	≤35	n/a
1,2,4-Trichlorolbenzene	2.0	0.62	n/a	≤35	n/a
Hexachloro-1,3-butadiene	5.0	0.59	n/a	≤35	n/a
Naphthalenes	5.0	0.90	n/a	≤35	n/a
1,2,3-Trichlorobenzene	5.0	0.99	n/a	≤35	n/a
Dibromofluoromethane	n/a	n/a	65-135	≤35	65-135
1,2-Dichloroethane-d4	n/a	n/a	65-135	≤35	65-135
Toluene-d8	n/a	n/a	65-135	≤35	65-135
4-Bromofluorobenzene	n/a	n/a	65-135	≤35	65-135

NWTPH Soil mg/kg	PQL	MDL	LCS %R	%RPD	Surrogate %R
Gasoline Range Hydrocarbons	10	2.0	65-135	≤35	n/a
Toluene-d8	n/a	n/a	n/a	≤35	65-135
Diesel Range Hydrocarbons	50	6.7	65-135	≤35	n/a
Oil Range Hydrocarbons	250	6.1	65-135	≤35	n/a
2-Fluorobiphenyl	n/a	n/a	n/a	≤35	65-135
NWTPH Water µg/L	PQL	MDL	LCS %R	%RPD	Surrogate %R
Gasoline Range Hydrocarbons	100	40.2	n/a	≤35	n/a
Toluene-d8	n/a	n/a	n/a	≤35	65-135
Diesel Range Hydrocarbons	200	67.2	65-135	≤35	n/a
Oil Range Hydrocarbons	400	61.3	65-135	≤35	n/a
2-Fluorobiphenyl	n/a	n/a	n/a	≤35	65-135

MTCA Metals by 7010 Soil mg/kg	PQL	MDL	LCS %R	%RPD	Surrogate %R
Arsenic	5.0	0.084	80-120	≤20	n/a
Cadmium	1.0	0.018	80-120	≤20	n/a
Chromium	5.0	0.10	80-120	≤20	n/a
Lead	5.0	0.017	80-120	≤20	n/a
MTCA Metals by 7010 Water µg/L	PQL	MDL	LCS %R	%RPD	Surrogate %R
Arsenic	3.0	1.7	80-120	≤20	n/a
Cadmium	0.50	0.35	80-120	≤20	n/a
Chromium	5.0	2.0	80-120	≤20	n/a
Lead	5.0	0.34	80-120	≤20	n/a
Mercury by 7471 Soil mg/kg	PQL 0.50	MDL 0.019	LCS %R 80-120	%RPD ≤20	Surrogate %R n/a
Mercury by 7471 Water µg/L	PQL 0.50	MDL 0.19	LCS %R 80-120	%RPD ≤20	Surrogate %R n/a

Data Qualifiers

Result Data Qualifier Code	Result Data Qualifier Description
B	Analyte detected in sample and method blank. Reported result is sample concentration without blank correction or associated quantitation limit.
B1	Analyte detected in sample and method blank. Reported result is blank-corrected.
BAT	Instrument experienced battery problems; reported result is an estimate
E	Reported result is an estimate because it exceeds the calibration range.
EST	Measurement value reported is estimated
FA	No site access
FD	Site was dry
FE	Equipment failure
FH	Flow too high to measure
FI	Ice impacted
FL	Above or below instrument or method limit
FS	Stagnant water - no flow
FT	Flow tidally impacted
G	Value is likely greater than the reported result. Reported result may be biased low.
IC	Instrument result corrected; reported result meets study objectives
ICE	Instrument result corrected; reported result is an estimate
J	Analyte was positively identified. The reported result is an estimate.
JG	Analyte was positively identified. Value may be greater than the reported estimate.
JK	Analyte was positively identified. Reported result is an estimate with unknown bias.
JL	Analyte was positively identified. Value may be less than the reported estimate.
JT	Analyte was positively identified. Reported result is an estimate below the associated quantitation limit but above the MDL.
JTG	Analyte was positively identified. Value may be greater than the reported result, which is an estimate below the associated quantitation limit but above the MDL.
JTK	Analyte was positively identified. Reported result is an estimate with unknown bias, below the associated quantitation limit but above the MDL.
JTL	Analyte was positively identified. Value may be less than the reported result which is an estimate below associated quantitation limit but above MDL.
K	Reported result with unknown bias.
L	Value is likely less than the reported result. Reported result may be biased high.
N	There is evidence the analyte is present in the sample. Tentatively identified analyte.
NJ	There is evidence that the analyte is present in the sample. Reported result for the tentatively identified analyte is an estimate .
NJT	There is evidence the analyte is present in the sample. Reported result for the tentatively identified analyte is an estimate below the associated quantitation limit but above the MDL.
NU	There is evidence the analyte is present in the sample. Tentatively identified analyte was not detected at or above the reported result.
NUJ	There is evidence the analyte is present in the sample. Tentatively identified analyte was not detected at or above the reported estimate.
REJ	Data are unusable for all purposes. Sample results rejected due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. The presence or absence of the analyte cannot be verified.
T	Reported result below associated quantitation limit but above MDL
U	Analyte was not detected at or above the reported result.
UJ	Analyte was not detected at or above the reported estimate
UJG	Analyte was not detected at or above the reported estimate with likely low bias.
UJK	Analyte was not detected at or above the reported estimate with unknown bias.
UJL	Analyte was not detected at or above the reported estimate with likely high bias.
VAR	Unexplained variation in the dataset; reported result is an estimate
WLA	Well water level affected by atmospheric pressure.
WLB	Well water level affected by tidal stage.
WLC	Well water level affected by ice.
WLD	Well was dry during measurement attempt.
WLE	Well was flowing recently.
WLF	Well was flowing and could not be measured.
WLG	Nearby well(s) flowing during measurement.
WLH	Nearby well(s) flowing recently.
WLI	Well site was being injected during measurement.
WLJ	Nearby well site(s) being injected during measurement.
WLK	Water was cascading down inside of well.
WLL	Well water level affected by brackish or saline water.
WLM	Well was plugged and not in hydraulic contact with the aquifer.
WLN	Well measurement discontinued.
WLO	Well water level affected by/could not be measured due to obstruction in well.
WLP	Well site was being pumped during measurement.
WLR	Well site was pumped recently.
WLS	Nearby well(s) being pumped during measurement.
WLT	Nearby well(s) pumped recently.
WLV	LNAPL (floating product) or other foreign substance on well water.
WLW	Well was destroyed; water level could not be measured.
WLX	Well water level affected by nearby surface-water stage.
WLZ	Well water level affected by other conditions.

ATTACHMENT C

Friedman & Bruya Accreditations

WASHINGTON STATE DEPARTMENT OF ECOLOGY

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

SCOPE OF ACCREDITATION

Friedman & Bruya, Inc.

Seattle, WA

is accredited for the analytes listed below using the methods indicated. Full accreditation is granted unless stated otherwise in a note. EPA is the U.S. Environmental Protection Agency. SM is "Standard Methods for the Examination of Water and Wastewater." SM refers to EPA approved method versions. ASTM is the American Society for Testing and Materials. USGS is the U.S. Geological Survey. AOAC is the Association of Official Analytical Chemists. Other references are described in notes.

Matrix/Analyte	Method	Notes
Air		
1,1,1-Trichloroethane	EPA TO-15 Rev. 2 (1999)	1
1,1,2,2-Tetrachloroethane	EPA TO-15 Rev. 2 (1999)	1
1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA TO-15 Rev. 2 (1999)	1
1,1,2-Trichloroethane	EPA TO-15 Rev. 2 (1999)	1
1,1-Dichloroethane	EPA TO-15 Rev. 2 (1999)	1
1,1-Dichloroethylene	EPA TO-15 Rev. 2 (1999)	1
1,2,4-Trichlorobenzene	EPA TO-15 Rev. 2 (1999)	1
1,2,4-Trimethylbenzene	EPA TO-15 Rev. 2 (1999)	1
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-15 Rev. 2 (1999)	1
1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)	EPA TO-15 Rev. 2 (1999)	1
1,2-Dichlorobenzene	EPA TO-15 Rev. 2 (1999)	1
1,2-Dichloroethane (Ethylene dichloride)	EPA TO-15 Rev. 2 (1999)	1
1,2-Dichloropropane	EPA TO-15 Rev. 2 (1999)	1
1,3,5-Trimethylbenzene	EPA TO-15 Rev. 2 (1999)	1
1,3-Butadiene	EPA TO-15 Rev. 2 (1999)	1
1,3-Dichlorobenzene	EPA TO-15 Rev. 2 (1999)	1
1,4-Dichlorobenzene	EPA TO-15 Rev. 2 (1999)	1
1,4-Dioxane (1,4- Diethyleneoxide)	EPA TO-15 Rev. 2 (1999)	1
1-Butanol (n-Butanol)	EPA TO-15 Rev. 2 (1999)	1
1-Propene	EPA TO-15 Rev. 2 (1999)	1
2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-15 Rev. 2 (1999)	1
2-Hexanone	EPA TO-15 Rev. 2 (1999)	1

Matrix/Analyte	Method	Notes
2-Propanol	EPA TO-15 Rev. 2 (1999)	1
4-Methyl-2-pentanone (MIBK)	EPA TO-15 Rev. 2 (1999)	1
Acetone	EPA TO-15 Rev. 2 (1999)	1
Acrolein (Propenal)	EPA TO-15 Rev. 2 (1999)	1
APH Aliphatics C5-C8	EPA TO-15 Rev. 2 (1999)	1
APH Aliphatics C9-C12	EPA TO-15 Rev. 2 (1999)	1
APH Aromatics C9-C10	EPA TO-15 Rev. 2 (1999)	1
Benzene	EPA TO-15 Rev. 2 (1999)	1
Benzyl chloride	EPA TO-15 Rev. 2 (1999)	1
Bromodichloromethane	EPA TO-15 Rev. 2 (1999)	1
Bromoform	EPA TO-15 Rev. 2 (1999)	1
Carbon disulfide	EPA TO-15 Rev. 2 (1999)	1
Carbon tetrachloride	EPA TO-15 Rev. 2 (1999)	1
Chlorobenzene	EPA TO-15 Rev. 2 (1999)	1
Chlorodibromomethane	EPA TO-15 Rev. 2 (1999)	1
Chloroform	EPA TO-15 Rev. 2 (1999)	1
cis-1,2-Dichloroethylene	EPA TO-15 Rev. 2 (1999)	1
cis-1,3-Dichloropropene	EPA TO-15 Rev. 2 (1999)	1
Cyclohexane	EPA TO-15 Rev. 2 (1999)	1
Dichlorodifluoromethane (Freon-12)	EPA TO-15 Rev. 2 (1999)	1
Ethanol	EPA TO-15 Rev. 2 (1999)	1
Ethyl chloride	EPA TO-15 Rev. 2 (1999)	1
Ethylbenzene	EPA TO-15 Rev. 2 (1999)	1
Hexachlorobutadiene	EPA TO-15 Rev. 2 (1999)	1
m+p-xylene	EPA TO-15 Rev. 2 (1999)	1
Methyl bromide (Bromomethane)	EPA TO-15 Rev. 2 (1999)	1
Methyl chloride (Chloromethane)	EPA TO-15 Rev. 2 (1999)	1
Methyl tert-butyl ether (MTBE)	EPA TO-15 Rev. 2 (1999)	1
Methylene chloride (Dichloromethane)	EPA TO-15 Rev. 2 (1999)	1
Naphthalene	EPA TO-15 Rev. 2 (1999)	1
n-Hexane	EPA TO-15 Rev. 2 (1999)	1
n-Pentane	EPA TO-15 Rev. 2 (1999)	1
o-Xylene	EPA TO-15 Rev. 2 (1999)	1
Styrene	EPA TO-15 Rev. 2 (1999)	1
Tetrachloroethylene (Perchloroethylene)	EPA TO-15 Rev. 2 (1999)	1
Toluene	EPA TO-15 Rev. 2 (1999)	1

Matrix/Analyte	Method	Notes
trans-1,2-Dichloroethylene	EPA TO-15 Rev. 2 (1999)	1
trans-1,3-Dichloropropylene	EPA TO-15 Rev. 2 (1999)	1
Trichloroethene (Trichloroethylene)	EPA TO-15 Rev. 2 (1999)	1
Trichlorofluoromethane (Freon 11)	EPA TO-15 Rev. 2 (1999)	1
Vinyl acetate	EPA TO-15 Rev. 2 (1999)	1
Vinyl chloride	EPA TO-15 Rev. 2 (1999)	1
1,1,1,2-Tetrachloroethane	EPA TO-17 Rev. 2 (1999)	1
1,1,1-Trichloroethane	EPA TO-17 Rev. 2 (1999)	1
1,1,2,2-Tetrachloroethane	EPA TO-17 Rev. 2 (1999)	1
1,1,2-Trichloroethane	EPA TO-17 Rev. 2 (1999)	1
1,1-Dichloroethane	EPA TO-17 Rev. 2 (1999)	1
1,1-Dichloroethylene	EPA TO-17 Rev. 2 (1999)	1
1,1-Dichloropropene	EPA TO-17 Rev. 2 (1999)	1
1,2,3-Trichlorobenzene	EPA TO-17 Rev. 2 (1999)	1
1,2,3-Trichloropropane	EPA TO-17 Rev. 2 (1999)	1
1,2,4-Trichlorobenzene	EPA TO-17 Rev. 2 (1999)	1
1,2,4-Trimethylbenzene	EPA TO-17 Rev. 2 (1999)	1
1,2-Dibromo-3-chloropropane (DBCP)	EPA TO-17 Rev. 2 (1999)	1
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-17 Rev. 2 (1999)	1
1,2-Dichlorobenzene	EPA TO-17 Rev. 2 (1999)	1
1,2-Dichloroethane (Ethylene dichloride)	EPA TO-17 Rev. 2 (1999)	1
1,2-Dichloropropane	EPA TO-17 Rev. 2 (1999)	1
1,3,5-Trimethylbenzene	EPA TO-17 Rev. 2 (1999)	1
1,3-Dichlorobenzene	EPA TO-17 Rev. 2 (1999)	1
1,3-Dichloropropane	EPA TO-17 Rev. 2 (1999)	1
1,4-Dichlorobenzene	EPA TO-17 Rev. 2 (1999)	1
1-Methylnaphthalene	EPA TO-17 Rev. 2 (1999)	1
2,2-Dichloropropane	EPA TO-17 Rev. 2 (1999)	1
2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-17 Rev. 2 (1999)	1
2-Chlorotoluene	EPA TO-17 Rev. 2 (1999)	1
2-Hexanone	EPA TO-17 Rev. 2 (1999)	1
2-Methylnaphthalene	EPA TO-17 Rev. 2 (1999)	1
4-Chlorotoluene	EPA TO-17 Rev. 2 (1999)	1
4-Isopropyltoluene (p-Cymene)	EPA TO-17 Rev. 2 (1999)	1
4-Methyl-2-pentanone (MIBK)	EPA TO-17 Rev. 2 (1999)	1
Benzene	EPA TO-17 Rev. 2 (1999)	1

Matrix/Analyte	Method	Notes
Bromobenzene	EPA TO-17 Rev. 2 (1999)	1
Bromodichloromethane	EPA TO-17 Rev. 2 (1999)	1
Bromoform	EPA TO-17 Rev. 2 (1999)	1
Carbon tetrachloride	EPA TO-17 Rev. 2 (1999)	1
Chlorobenzene	EPA TO-17 Rev. 2 (1999)	1
Chlorodibromomethane	EPA TO-17 Rev. 2 (1999)	1
Chloroform	EPA TO-17 Rev. 2 (1999)	1
cis-1,2-Dichloroethylene	EPA TO-17 Rev. 2 (1999)	1
cis-1,3-Dichloropropene	EPA TO-17 Rev. 2 (1999)	1
Dibromomethane	EPA TO-17 Rev. 2 (1999)	1
Dichlorodifluoromethane (Freon-12)	EPA TO-17 Rev. 2 (1999)	1
Ethylbenzene	EPA TO-17 Rev. 2 (1999)	1
Hexachlorobutadiene	EPA TO-17 Rev. 2 (1999)	1
Isopropyl alcohol (2-Propanol, Isopropanol)	EPA TO-17 Rev. 2 (1999)	1
Isopropylbenzene	EPA TO-17 Rev. 2 (1999)	1
m+p-xylene	EPA TO-17 Rev. 2 (1999)	1
Methyl tert-butyl ether (MTBE)	EPA TO-17 Rev. 2 (1999)	1
Naphthalene	EPA TO-17 Rev. 2 (1999)	1
n-Hexane	EPA TO-17 Rev. 2 (1999)	1
n-Propylbenzene	EPA TO-17 Rev. 2 (1999)	1
o-Xylene	EPA TO-17 Rev. 2 (1999)	1
sec-Butylbenzene	EPA TO-17 Rev. 2 (1999)	1
Styrene	EPA TO-17 Rev. 2 (1999)	1
tert-Butyl alcohol	EPA TO-17 Rev. 2 (1999)	1
tert-Butylbenzene	EPA TO-17 Rev. 2 (1999)	1
Tetrachloroethylene (Perchloroethylene)	EPA TO-17 Rev. 2 (1999)	1
Toluene	EPA TO-17 Rev. 2 (1999)	1
trans-1,2-Dichloroethylene	EPA TO-17 Rev. 2 (1999)	1
trans-1,3-Dichloropropylene	EPA TO-17 Rev. 2 (1999)	1
Trichloroethene (Trichloroethylene)	EPA TO-17 Rev. 2 (1999)	1
Vinyl chloride	EPA TO-17 Rev. 2 (1999)	1
Xylene (total)	EPA TO-17 Rev. 2 (1999)	1
Non-Potable Water		
n-Hexane Extractable Material (O&G)	EPA 1664A_1_1999	
Turbidity	EPA 180.1_2_1993	6
Hardness (calc.)	SM 2340 B-2011	1,88

Matrix/Analyte	Method	Notes
Solids, Total Suspended	SM 2540 D-2011	
Mercury	EPA 1631 E-02	1
Antimony	EPA 200.8_5.4_1994	1
Arsenic	EPA 200.8_5.4_1994	1
Barium	EPA 200.8_5.4_1994	1
Beryllium	EPA 200.8_5.4_1994	1
Cadmium	EPA 200.8_5.4_1994	1
Chromium	EPA 200.8_5.4_1994	1
Cobalt	EPA 200.8_5.4_1994	1
Copper	EPA 200.8_5.4_1994	1
Iron	EPA 200.8_5.4_1994	1
Lead	EPA 200.8_5.4_1994	1
Manganese	EPA 200.8_5.4_1994	1
Mercury	EPA 200.8_5.4_1994	1,3
Molybdenum	EPA 200.8_5.4_1994	1
Nickel	EPA 200.8_5.4_1994	1
Selenium	EPA 200.8_5.4_1994	1
Silver	EPA 200.8_5.4_1994	1
Thallium	EPA 200.8_5.4_1994	1
Vanadium	EPA 200.8_5.4_1994	1
Zinc	EPA 200.8_5.4_1994	1
Ethane	EPA RSK-175	1
Ethene	EPA RSK-175	1
Methane	EPA RSK-175	1
Solid and Chemical Materials		
pH	EPA 150.2_1971	4,6
pH	EPA 9045D_2002	5
Mercury	EPA 1631 E-02	1
Antimony	EPA 200.8_5.4_1994	1
Arsenic	EPA 200.8_5.4_1994	1
Barium	EPA 200.8_5.4_1994	1
Beryllium	EPA 200.8_5.4_1994	1
Cadmium	EPA 200.8_5.4_1994	1
Chromium	EPA 200.8_5.4_1994	1
Cobalt	EPA 200.8_5.4_1994	1

Matrix/Analyte	Method	Notes
Copper	EPA 200.8_5.4_1994	1
Lead	EPA 200.8_5.4_1994	1
Manganese	EPA 200.8_5.4_1994	1
Mercury	EPA 200.8_5.4_1994	1
Molybdenum	EPA 200.8_5.4_1994	1
Nickel	EPA 200.8_5.4_1994	1
Selenium	EPA 200.8_5.4_1994	1
Silver	EPA 200.8_5.4_1994	1
Thallium	EPA 200.8_5.4_1994	1
Vanadium	EPA 200.8_5.4_1994	1
Zinc	EPA 200.8_5.4_1994	1
Antimony	EPA 6020B_(7/14)	1
Arsenic	EPA 6020B_(7/14)	1
Barium	EPA 6020B_(7/14)	1
Beryllium	EPA 6020B_(7/14)	1
Cadmium	EPA 6020B_(7/14)	1
Chromium	EPA 6020B_(7/14)	1
Cobalt	EPA 6020B_(7/14)	1
Copper	EPA 6020B_(7/14)	1
Lead	EPA 6020B_(7/14)	1
Manganese	EPA 6020B_(7/14)	1
Mercury	EPA 6020B_(7/14)	1
Molybdenum	EPA 6020B_(7/14)	1
Nickel	EPA 6020B_(7/14)	1
Selenium	EPA 6020B_(7/14)	1
Silver	EPA 6020B_(7/14)	1
Thallium	EPA 6020B_(7/14)	1
Vanadium	EPA 6020B_(7/14)	1
Zinc	EPA 6020B_(7/14)	1
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8011-94	1
Benzene	EPA 8021B_2_(12/96)	1
Ethylbenzene	EPA 8021B_2_(12/96)	1
Toluene	EPA 8021B_2_(12/96)	1
Xylene (total)	EPA 8021B_2_(12/96)	1
4,4'-DDD	EPA 8081B_(2/07)	1
4,4'-DDE	EPA 8081B_(2/07)	1

Matrix/Analyte	Method	Notes
4,4'-DDT	EPA 8081B_(2/07)	1
Aldrin	EPA 8081B_(2/07)	1
alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 8081B_(2/07)	1
alpha-Chlordane	EPA 8081B_(2/07)	1
beta-BHC (beta-Hexachlorocyclohexane)	EPA 8081B_(2/07)	1
delta-BHC	EPA 8081B_(2/07)	1
Dieldrin	EPA 8081B_(2/07)	1
Endosulfan I	EPA 8081B_(2/07)	1
Endosulfan II	EPA 8081B_(2/07)	1
Endosulfan sulfate	EPA 8081B_(2/07)	1
Endrin	EPA 8081B_(2/07)	1
Endrin aldehyde	EPA 8081B_(2/07)	1
Endrin ketone	EPA 8081B_(2/07)	1
gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 8081B_(2/07)	1
gamma-Chlordane	EPA 8081B_(2/07)	1
Heptachlor	EPA 8081B_(2/07)	1
Heptachlor epoxide	EPA 8081B_(2/07)	1
Methoxychlor	EPA 8081B_(2/07)	1
Toxaphene (Chlorinated camphene)	EPA 8081B_(2/07)	1
Aroclor-1016 (PCB-1016)	EPA 8082A_(2/07)	1
Aroclor-1221 (PCB-1221)	EPA 8082A_(2/07)	1
Aroclor-1232 (PCB-1232)	EPA 8082A_(2/07)	1
Aroclor-1242 (PCB-1242)	EPA 8082A_(2/07)	1
Aroclor-1248 (PCB-1248)	EPA 8082A_(2/07)	1
Aroclor-1254 (PCB-1254)	EPA 8082A_(2/07)	1
Aroclor-1260 (PCB-1260)	EPA 8082A_(2/07)	1
Aroclor-1262 (PCB-1262)	EPA 8082A_(2/07)	1
Aroclor-1268 (PCB-1268)	EPA 8082A_(2/07)	1
Diesel range organics (DRO)	WDOE NWTPH-Dx_(1997)	1
Gasoline range organics (GRO)	WDOE NWTPH-Gx_(1997)	1
1,4-Dioxane (1,4- Diethyleneoxide)	EPA 8260C SIM	1,4
1,1,1,2-Tetrachloroethane	EPA 8260C_(8/06)	1
1,1,1-Trichloroethane	EPA 8260C_(8/06)	1
1,1,2,2-Tetrachloroethane	EPA 8260C_(8/06)	1
1,1,2-Trichloroethane	EPA 8260C_(8/06)	1

Matrix/Analyte	Method	Notes
1,1-Dichloroethane	EPA 8260C_(8/06)	1
1,1-Dichloroethylene	EPA 8260C_(8/06)	1
1,1-Dichloropropene	EPA 8260C_(8/06)	1
1,2,3-Trichlorobenzene	EPA 8260C_(8/06)	1
1,2,3-Trichloropropane	EPA 8260C_(8/06)	1
1,2,4-Trichlorobenzene	EPA 8260C_(8/06)	1
1,2,4-Trimethylbenzene	EPA 8260C_(8/06)	1
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260C_(8/06)	1
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260C_(8/06)	1
1,2-Dichlorobenzene	EPA 8260C_(8/06)	1
1,2-Dichloroethane (Ethylene dichloride)	EPA 8260C_(8/06)	1
1,2-Dichloropropane	EPA 8260C_(8/06)	1
1,3,5-Trimethylbenzene	EPA 8260C_(8/06)	1
1,3-Dichlorobenzene	EPA 8260C_(8/06)	1
1,3-Dichloropropane	EPA 8260C_(8/06)	1
1,4-Dichlorobenzene	EPA 8260C_(8/06)	1
2,2-Dichloropropane	EPA 8260C_(8/06)	1
2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260C_(8/06)	1
2-Chlorotoluene	EPA 8260C_(8/06)	1
2-Hexanone	EPA 8260C_(8/06)	1
4-Chlorotoluene	EPA 8260C_(8/06)	1
4-Isopropyltoluene (p-Cymene)	EPA 8260C_(8/06)	1
4-Methyl-2-pentanone (MIBK)	EPA 8260C_(8/06)	1
Acetone	EPA 8260C_(8/06)	1
Benzene	EPA 8260C_(8/06)	1
Bromobenzene	EPA 8260C_(8/06)	1
Bromodichloromethane	EPA 8260C_(8/06)	1
Bromoform	EPA 8260C_(8/06)	1
Carbon tetrachloride	EPA 8260C_(8/06)	1
Chlorobenzene	EPA 8260C_(8/06)	1
Chlorodibromomethane	EPA 8260C_(8/06)	1
Chloroethane (Ethyl chloride)	EPA 8260C_(8/06)	1
Chloroform	EPA 8260C_(8/06)	1
cis-1,2-Dichloroethylene	EPA 8260C_(8/06)	1
cis-1,3-Dichloropropene	EPA 8260C_(8/06)	1
Dibromomethane	EPA 8260C_(8/06)	1

Matrix/Analyte	Method	Notes
Dichlorodifluoromethane (Freon-12)	EPA 8260C_(8/06)	1
Di-isopropylether (DIPE)	EPA 8260C_(8/06)	1
Ethylbenzene	EPA 8260C_(8/06)	1
Ethyl-t-butylether (ETBE)	EPA 8260C_(8/06)	1
Hexachlorobutadiene	EPA 8260C_(8/06)	1
Isopropylbenzene	EPA 8260C_(8/06)	1
m+p-xylene	EPA 8260C_(8/06)	1
Methyl bromide (Bromomethane)	EPA 8260C_(8/06)	1
Methyl chloride (Chloromethane)	EPA 8260C_(8/06)	1
Methyl tert-butyl ether (MTBE)	EPA 8260C_(8/06)	1
Methylene chloride (Dichloromethane)	EPA 8260C_(8/06)	1
Naphthalene	EPA 8260C_(8/06)	1
n-Hexane	EPA 8260C_(8/06)	1
n-Propylbenzene	EPA 8260C_(8/06)	1
o-Xylene	EPA 8260C_(8/06)	1
sec-Butylbenzene	EPA 8260C_(8/06)	1
Styrene	EPA 8260C_(8/06)	1
tert-amylmethylether (TAME)	EPA 8260C_(8/06)	1
tert-Butyl alcohol	EPA 8260C_(8/06)	1
tert-Butylbenzene	EPA 8260C_(8/06)	1
Tetrachloroethylene (Perchloroethylene)	EPA 8260C_(8/06)	1
Toluene	EPA 8260C_(8/06)	1
trans-1,2-Dichloroethylene	EPA 8260C_(8/06)	1
trans-1,3-Dichloropropylene	EPA 8260C_(8/06)	1
Trichloroethene (Trichloroethylene)	EPA 8260C_(8/06)	1
Trichlorofluoromethane (Freon 11)	EPA 8260C_(8/06)	1
Vinyl chloride	EPA 8260C_(8/06)	1
1,2,4-Trichlorobenzene	EPA 8270D_(2/07)	1
1,2-Dichlorobenzene	EPA 8270D_(2/07)	1
1,2-Diphenylhydrazine	EPA 8270D_(2/07)	1
1,3-Dichlorobenzene	EPA 8270D_(2/07)	1
1,4-Dichlorobenzene	EPA 8270D_(2/07)	1
1-Methylnaphthalene	EPA 8270D_(2/07)	1,2
2,2'-Oxybis(1-chloropropane)	EPA 8270D_(2/07)	1
2,4,5-Trichlorophenol	EPA 8270D_(2/07)	1
2,4,6-Trichlorophenol	EPA 8270D_(2/07)	1

Matrix/Analyte	Method	Notes
2,4-Dichlorophenol	EPA 8270D_(2/07)	1
2,4-Dimethylphenol	EPA 8270D_(2/07)	1
2,4-Dinitrophenol	EPA 8270D_(2/07)	1
2,4-Dinitrotoluene (2,4-DNT)	EPA 8270D_(2/07)	1
2,6-Dinitrotoluene (2,6-DNT)	EPA 8270D_(2/07)	1
2-Chloronaphthalene	EPA 8270D_(2/07)	1
2-Chlorophenol	EPA 8270D_(2/07)	1
2-Methylnaphthalene	EPA 8270D_(2/07)	1,2
2-Methylphenol (o-Cresol)	EPA 8270D_(2/07)	1
2-Nitroaniline	EPA 8270D_(2/07)	1
2-Nitrophenol	EPA 8270D_(2/07)	1
3,3'-Dichlorobenzidine	EPA 8270D_(2/07)	1
3-Nitroaniline	EPA 8270D_(2/07)	1
4,6-Dinitro-2-methylphenol	EPA 8270D_(2/07)	1
4-Bromophenyl phenyl ether (BDE-3)	EPA 8270D_(2/07)	1
4-Chloro-3-methylphenol	EPA 8270D_(2/07)	1
4-Chloroaniline	EPA 8270D_(2/07)	1
4-Chlorophenyl phenylether	EPA 8270D_(2/07)	1
4-Nitroaniline	EPA 8270D_(2/07)	1
4-Nitrophenol	EPA 8270D_(2/07)	1
Acenaphthene	EPA 8270D_(2/07)	1,2
Acenaphthylene	EPA 8270D_(2/07)	1,2
Anthracene	EPA 8270D_(2/07)	1,2
Benzo(a)anthracene	EPA 8270D_(2/07)	1,2
Benzo(a)pyrene	EPA 8270D_(2/07)	1,2
Benzo(g,h,i)perylene	EPA 8270D_(2/07)	1,2
Benzo(k)fluoranthene	EPA 8270D_(2/07)	1,2
Benzo[b]fluoranthene	EPA 8270D_(2/07)	1,2
Benzoic acid	EPA 8270D_(2/07)	1
Benzyl alcohol	EPA 8270D_(2/07)	1
bis(2-Chloroethoxy)methane	EPA 8270D_(2/07)	1
bis(2-Chloroethyl) ether	EPA 8270D_(2/07)	1
Butyl benzyl phthalate	EPA 8270D_(2/07)	1
Carbazole	EPA 8270D_(2/07)	1
Chrysene	EPA 8270D_(2/07)	1,2
Di(2-ethylhexyl)phthalate	EPA 8270D_(2/07)	1

Matrix/Analyte	Method	Notes
Dibenz(a,h) anthracene	EPA 8270D_(2/07)	1,2
Dibenzofuran	EPA 8270D_(2/07)	1
Diethyl phthalate	EPA 8270D_(2/07)	1
Dimethyl phthalate	EPA 8270D_(2/07)	1
Di-n-butyl phthalate	EPA 8270D_(2/07)	1
Di-n-octyl phthalate	EPA 8270D_(2/07)	1
Fluoranthene	EPA 8270D_(2/07)	1,2
Fluorene	EPA 8270D_(2/07)	1,2
Hexachlorobenzene	EPA 8270D_(2/07)	1
Hexachlorobutadiene	EPA 8270D_(2/07)	1
Hexachlorocyclopentadiene	EPA 8270D_(2/07)	1
Hexachloroethane	EPA 8270D_(2/07)	1
Indeno(1,2,3-cd) pyrene	EPA 8270D_(2/07)	1,2
Isophorone	EPA 8270D_(2/07)	1
m+p Cresol	EPA 8270D_(2/07)	1
Methamphetamine	EPA 8270D_(2/07)	2
Naphthalene	EPA 8270D_(2/07)	1,2
Nitrobenzene	EPA 8270D_(2/07)	1
n-Nitrosodimethylamine	EPA 8270D_(2/07)	1
N-Nitroso-di-n-propylamine	EPA 8270D_(2/07)	1
n-Nitrosodiphenylamine	EPA 8270D_(2/07)	1
Pentachlorophenol	EPA 8270D_(2/07)	1,2
Phenanthrene	EPA 8270D_(2/07)	1,2
Phenol	EPA 8270D_(2/07)	1
Pyrene	EPA 8270D_(2/07)	1,2

Matrix/Analyte	Method	Notes

Accredited Parameter Note Detail

(1) Accreditation based in part on recognition of Oregon NELAP accreditation. (2)Accreditation includes selective ion monitoring (SIM). (3) Method not approved for NPDES testing.(4) Accrediltation is limited to liquid matrix only.(5) Provisional accreditation pending submittal of acceptable Proficiency Testing (PT) results (WAC 173-50-110) and acceptable corrective action report. (6) Interim accreditation pending the successful completion of an on-site audit to verify method capabilities (WAC 173-50-100). (88) Interim Washington accreditation pending receipt of an updated Scope from your other recognized accreditors, ORELAP. This accreditation is based in part on recognition of your currently held accreditations for previous method versions.

Rebecca Wood

Authentication Signature
Rebecca Wood, Lab Accreditation Unit Supervisor

01/18/2019

Date

ATTACHMENT D

Libby Environmental Accreditations

The State of Washington Department of Ecology

Libby Environmental, Inc.
Olympia, WA

has complied with provisions set forth in Chapter 173-50 WAC and is hereby recognized by the Department of Ecology as an ACCREDITED LABORATORY for the analytical parameters listed on the accompanying Scope of Accreditation. This certificate is effective April 22, 2018 and shall expire April 21, 2019.

Witnessed under my hand on April 30, 2018

Rebecca Wood
Lab Accreditation Unit Supervisor

Laboratory ID
C855

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 488 • Manchester, WA 98353-0488 • (360) 871-8840

April 27, 2018

Ms. Jamie Deyman
Libby Environmental, Inc.
4139 Libby Road NE
Olympia,WA 98506

Dear Ms. Deyman:

Thank you for your application for renewal in the Environmental Laboratory Accreditation Program. Enclosed is a new Certificate of Accreditation covering the one-year period beginning April 22, 2018 and a current Scope of Accreditation.

In order to comply with the recent CWA MUR effective September 27, 2017, applicable methods on your scope of accreditation have been updated to include method versions approved in the updated 40CFR136.3. Please ensure that these are the method versions used in the laboratory and cited on your PT reports. Please update your SOPs to the approved method versions.

If your laboratory methods require MDLs, the laboratory should begin using the new MDL procedure for their next regular annual MDL studies. See the link below for the new MDL procedure (Definition and Procedure for the Determination of the Method Detection Limit, Revision 2, PDF):

https://www.epa.gov/cwa-methods/procedures-detection-and-quantitation-documents

Renewal of accreditation is based in part on review of your lab's performance over the past year as evidenced by participation in proficiency testing (PT) studies.

As a reminder, continued participation in the Ecology Lab Accreditation Program requires the lab to:

- Submit a renewal application and fees annually.
- Report significant changes in facility, personnel, analytical methods, equipment, the lab's quality assurance (QA) manual or QA procedures as they occur.
- Participate in proficiency testing studies semi-annually, with the following exception: **For each parameter where all PT results were satisfactory, you are required to submit only one PT result over this next year, and in subsequent years, as long as the results are satisfactory.**

If you have any questions concerning the accreditation of your lab, please contact Kamilee Ginder at (360) 871-8841, fax (360) 871-8849, or by e-mail at kamilee.ginder@ecy.wa.gov.

Sincerely,

Lab Accreditation Unit Supervisor

RW:KG:kg
Enclosures

WASHINGTON STATE DEPARTMENT OF ECOLOGY

ENVIRONMENTAL LABORATORY ACCREDITATION PROGRAM

SCOPE OF ACCREDITATION

Libby Environmental, Inc.

Olympia, WA

is accredited for the analytes listed below using the methods indicated. Full accreditation is granted unless stated otherwise in a note. EPA is the U.S. Environmental Protection Agency. SM is "Standard Methods for the Examination of Water and Wastewater." SM refers to EPA approved method versions. ASTM is the American Society for Testing and Materials. USGS is the U.S. Geological Survey. AOAC is the Association of Official Analytical Chemists. Other references are described in notes.

Matrix/Analyte	Method	Notes
Non-Potable Water		
Turbidity	EPA 180.1_2_1993	
Solids, Total Suspended	SM 2540 D-2011	
Solid and Chemical Materials		
Arsenic	EPA 7010 (2007)	
Cadmium	EPA 7010 (2007)	
Chromium	EPA 7010 (2007)	
Copper	EPA 7010 (2007)	
Lead	EPA 7010 (2007)	
Zinc	EPA 7010 (2007)	
Mercury, Liquid Waste	EPA 7470A_1_1994	
Mercury, Solid Waste	EPA 7471B_(2/07)	
Benzene	EPA 8021B_3_(7/14)	
Ethylbenzene	EPA 8021B_3_(7/14)	
Toluene	EPA 8021B_3_(7/14)	
Xylene (total)	EPA 8021B_3_(7/14)	
Aroclor-1016 (PCB-1016)	EPA 8082A_(2/07)	
Aroclor-1221 (PCB-1221)	EPA 8082A_(2/07)	
Aroclor-1232 (PCB-1232)	EPA 8082A_(2/07)	
Aroclor-1242 (PCB-1242)	EPA 8082A_(2/07)	
Aroclor-1248 (PCB-1248)	EPA 8082A_(2/07)	
Aroclor-1254 (PCB-1254)	EPA 8082A_(2/07)	
Aroclor-1260 (PCB-1260)	EPA 8082A_(2/07)	

Matrix/Analyte	Method	Notes
Diesel range organics (DRO)	WDOE NWTPH-Dx_(1997)	
Gasoline range organics (GRO)	WDOE NWTPH-Gx_(1997)	
1,1,1,2-Tetrachloroethane	EPA 8260C_(8/06)	
1,1,1-Trichloroethane	EPA 8260C_(8/06)	
1,1,2,2-Tetrachloroethane	EPA 8260C_(8/06)	
1,1,2-Trichloroethane	EPA 8260C_(8/06)	
1,1-Dichloroethane	EPA 8260C_(8/06)	
1,1-Dichloroethylene	EPA 8260C_(8/06)	
1,1-Dichloropropene	EPA 8260C_(8/06)	
1,2,3-Trichlorobenzene	EPA 8260C_(8/06)	
1,2,3-Trichloropropane	EPA 8260C_(8/06)	
1,2,4-Trichlorobenzene	EPA 8260C_(8/06)	
1,2,4-Trimethylbenzene	EPA 8260C_(8/06)	
1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260C_(8/06)	
1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260C_(8/06)	
1,2-Dichlorobenzene	EPA 8260C_(8/06)	
1,2-Dichloroethane (Ethylene dichloride)	EPA 8260C_(8/06)	
1,2-Dichloropropane	EPA 8260C_(8/06)	
1,3,5-Trimethylbenzene	EPA 8260C_(8/06)	
1,3-Dichlorobenzene	EPA 8260C_(8/06)	
1,3-Dichloropropane	EPA 8260C_(8/06)	
1,4-Dichlorobenzene	EPA 8260C_(8/06)	
2,2-Dichloropropane	EPA 8260C_(8/06)	
2-Chlorotoluene	EPA 8260C_(8/06)	
4-Chlorotoluene	EPA 8260C_(8/06)	
4-Isopropyltoluene (p-Cymene)	EPA 8260C_(8/06)	
Benzene	EPA 8260C_(8/06)	
Bromobenzene	EPA 8260C_(8/06)	
Bromochloromethane	EPA 8260C_(8/06)	
Bromodichloromethane	EPA 8260C_(8/06)	
Bromoethene	EPA 8260C_(8/06)	
Bromoform	EPA 8260C_(8/06)	
Carbon tetrachloride	EPA 8260C_(8/06)	
Chlorobenzene	EPA 8260C_(8/06)	

Matrix/Analyte	Method	Notes
Chlorodibromomethane	EPA 8260C_(8/06)	
Chloroethane (Ethyl chloride)	EPA 8260C_(8/06)	
Chloroform	EPA 8260C_(8/06)	
cis-1,2-Dichloroethylene	EPA 8260C_(8/06)	
cis-1,3-Dichloropropene	EPA 8260C_(8/06)	
Dibromomethane	EPA 8260C_(8/06)	
Dichlorodifluoromethane (Freon-12)	EPA 8260C_(8/06)	
Ethylbenzene	EPA 8260C_(8/06)	
Hexachlorobutadiene	EPA 8260C_(8/06)	
Isopropylbenzene	EPA 8260C_(8/06)	
m+p-xylene	EPA 8260C_(8/06)	
Methyl chloride (Chloromethane)	EPA 8260C_(8/06)	
Methyl tert-butyl ether (MTBE)	EPA 8260C_(8/06)	
Methylene chloride (Dichloromethane)	EPA 8260C_(8/06)	
Naphthalene	EPA 8260C_(8/06)	
n-Butylbenzene	EPA 8260C_(8/06)	
n-Propylbenzene	EPA 8260C_(8/06)	
o-Xylene	EPA 8260C_(8/06)	
sec-Butylbenzene	EPA 8260C_(8/06)	
Styrene	EPA 8260C_(8/06)	
tert-Butylbenzene	EPA 8260C_(8/06)	
Tetrachloroethylene (Perchloroethylene)	EPA 8260C_(8/06)	
Toluene	EPA 8260C_(8/06)	
trans-1,2-Dichloroethylene	EPA 8260C_(8/06)	
trans-1,3-Dichloropropylene	EPA 8260C_(8/06)	
Trichloroethene (Trichloroethylene)	EPA 8260C_(8/06)	
Trichlorofluoromethane (Freon 11)	EPA 8260C_(8/06)	
Vinyl chloride	EPA 8260C_(8/06)	
Xylene (total)	EPA 8260C_(8/06)	

Matrix/Analyte	Method	Notes

Accredited Parameter Note Detail

Rebecca Wood

Authentication Signature
Rebecca Wood, Lab Accreditation Unit Supervisor

04/27/2018

Date