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Remedial Investigation, Feasibility Study, and Interim Remedial Action Report

Modera River Trail Property
15881 Northeast 85th Street
Redmond, Washington

Prepared For:

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August 12, 2020

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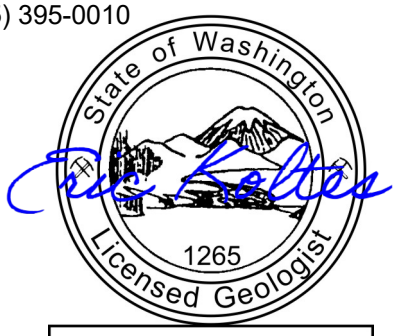

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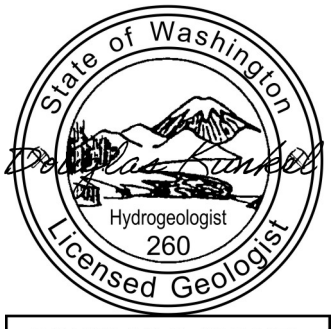

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ABBREVIATIONS AND ACRONYMS

Abbreviation / Acronym	Definition
ARAR	Applicable or Relevant and Appropriate Requirements
bgs	Below ground surface
COC	Contaminant of Concern
COPC	Contaminant of Potential Concern
CSID	Cleanup Site Identification number
CSM	Conceptual Site Model
CUL	Cleanup level
EC	Environmental Covenant
Ecology	Washington State Department of Ecology
FOC	Fraction of Organic Carbon
FS	Feasibility Study
FSID	Facility Site identification number
HASP	Health and Safety Plan
IRA	Interim remedial action
MTCA	Model Toxics Control Act
RAO	Remedial Action Objective
RAR	Remedial Action Report
RCW	Revised Code of Washington
RTF	Restoration Time Frame
SIM	Selective Ion Monitoring
TEE	Terrestrial Ecological Evaluation
TEF	Toxicity equivalency factors
TRC	TRC Environmental Corporation
VIMP	Vapor intrusion mitigation plan
WAC	Washington State Administrative Code

EXECUTIVE SUMMARY

TRC Environmental Corporation (TRC) is pleased to submit this *Remedial Investigation, Feasibility Study, and Interim Remedial Action Report* (Report) for the properties located at 15881 Northeast 85th Street, Redmond, King County, Washington (collectively, Subject Property). The former addresses of the property were 15801 and 15945 Northeast 85th Street. The general location of the Subject Property is indicated on Figure 1. This Report has been prepared in accordance with the Model Toxics Control Act (Chapter 70.105D RCW) and its implementing regulations (Chapter 173-340 WAC), collectively referred to as "MTCA," and in conformance with applicable policies and guidance issued by the Washington State Department of Ecology (Ecology).

The Subject Property was developed in the 1970s with an office building located at 15945 NE 85th Street. A second building was added in 1990 at 15801 NE 85th Street. Historical operations at the Subject Property have included the dental office and commercial offices. The Subject Property is currently being redeveloped with a mixed-used residential structure with slab-on-grade construction. As described herein, the Subject Property represents the entirety of the "Site" as that term is defined under MTCA.

During demolition, approximately 50 8-inch-diameter timber piles were discovered beneath the property. The timber piles were determined to have been installed as structural support for the 2-story building constructed in 1990. The timber piles, which were approximately 15 feet in length, were located only in the northwestern corner of the Subject Property beneath the building located at 15801 NE 85th Street. No piles were observed beneath any other structure at the Subject Property.

TRC investigated the timber piles and determined that the timber piles were preserved in creosote. The contaminants of concern (COCs) presented by the timber piles included creosote-like compounds and included carcinogenic polyaromatic hydrocarbons (cPAHs) and total naphthalenes. No other COCs were identified for the Subject Property.

After multiple rounds of site investigation activities, it was determined that soils surrounding the timber piles were impacted with COCs at concentrations exceeding CULs. Groundwater was determined to not be impacted at concentrations exceeding CULs.

Based on the results of the sampling, soil impacts were confirmed to be restricted to the area immediately surrounding the timber piles. The distribution of contamination demonstrates low vertical and lateral mobility, likely due to the capped nature of the Subject Property with buildings and asphalt, the low leachability of the COCs, and low viscosity of the carrier preservative material. Soil vapor sampling demonstrated that vapor intrusion could be an issue for the current building under construction.

A MTCA-compliant Feasibility Study (FS) identified three remedial alternatives:

- Alternative 1 – Vapor Barrier and Institutional Controls
- Alternative 2 – Removal of Wood Timber Piles and Institutional Controls
- Alternative 3 – Full Removal of Impacts

After appropriate analysis, Alternative 1 (Vapor Barrier and Institutional Controls) was selected as the preferred remedial approach for addressing the impacts in at the Site. Based on the conclusion of the FS, installation of a vapor barrier was performed during construction as an interim remedial action (IRA) as documented in this report. The timber piles and associated impacted soils are now fully capped and encapsulated beneath the new building and vapor barrier on the property. Future actions will include preparing and implementing an Environmental Covenant (EC) that imposes restrictions on the use of Subject Property where soil impacts remain. Eventually, a Restricted No Further Action (NFA) determination will be requested for the site.

1.0 INTRODUCTION

TRC Environmental Corporation (TRC) is pleased to submit this *Remedial Investigation, Feasibility Study, and Interim Remedial Action Report* (Report) for the properties located at 15881 Northeast 85th Street, Redmond, King County, Washington (collectively, Subject Property, or "Site"). The general location of the Subject Property is indicated on Figure 1.

This Report has been prepared in accordance with the Model Toxics Control Act (Chapter 70.105D Revised Code of Washington [RCW]) and its implementing regulations (Chapter 173-340 Washington Administrative Code [WAC]), collectively referred to as "MTCA," and in conformance with applicable policies and guidance issued by the Washington State Department of Ecology (Ecology).

This report meets the following Ecology checklist requirements for reporting:

- *Remedial Investigation Checklist* – Publication #16-09-006
- *Feasibility Study Checklist* – Publication #16-09-007

Additionally, this report includes a cleanup section that describes the interim remedial action (IRA) conducted in response to the identified and fully characterized soil and soil vapor contamination at the Subject Property.

1.1 General Site Information

The Subject Property is located at the southeast corner of Northeast 85th Street and 158th Avenue Northeast in a suburban commercial setting along the eastern border of the Downtown Town Square of Redmond, Washington. The former addresses of the property were 15801 and 15945 Northeast 85th Street. Washington State Highway 202 is located is located approximately 0.4 mile east of the Subject Property. The Subject Property and surrounding properties are illustrated on Figure 2.

The Subject Property is located in an area of the City of Redmond that is zoned as Sammamish Trail Zone (SMT). The SMT zone allows for mixed-use residential/office. The Subject Property comprises prior King County Tax Parcel No. 7198900170 and covers approximately 1.5 acres. The approximate geographic coordinates for the Subject Property are 47.678 north latitude, 122.129 west longitude.

1.2 Physiographic Setting of Subject Property

The Subject Property is located in downtown Redmond, at an approximate elevation of about 18 feet above mean sea level. The ground surface has a relatively flat topography. The Sammamish River is located approximately 0.125 miles west of the Subject Property.

1.3 Site History

TRC performed a Phase I Environmental Site Assessment (ESA) for the Subject Property as documented in a report dated December 5, 2017. This ESA revealed no evidence of recognized environmental conditions (RECs) in connection with the Subject Property.

The Subject Property was developed in the 1970s with the dental office building located at 15945 NE 85th Street. Other portions of the Subject Property remained largely undeveloped until construction of the office building in 1990 located at 15801 NE 85th Street. Historical operations at the Subject Property have included the dental office and other commercial office uses.

The Subject Property is currently being redeveloped as a mixed-used residential structure with slab on grade construction.

During demolition, approximately 50 8-inch-diameter timber piles were discovered beneath the property. The timber piles were determined to have been installed as structural support for the 2-story building constructed in 1990 at 15801 NE 85th Street. The timber piles, which were approximately 15 feet in length, were located only in the northwestern corner of the Subject Property. The locations of the timber piles are limited to the footprint of the former building in the northwest portion of the Subject Property and are depicted on Figure 2.

TRC investigated the timber piles and determined that the timber piles were preserved in creosote. The contaminants of concern (COCs) presented by the timber piles included creosote-like compounds and included carcinogenic polyaromatic hydrocarbons (cPAHs) and total naphthalenes. No other COCs were identified for the Subject Property.

1.4 Site Use

The Subject Property is under construction as a mid-rise mixed-used residential structure with slab on grade construction. The development will be completed as a single lot line to lot line construction with commercial shops, parking, and six residential units on the ground floor, with residential units above. A figure showing the post construction configuration of the main floor is included as Figure 3.

2.0 FIELD INVESTIGATIONS

The following sections present the environmental characterization of the Subject Property.

2.1 Site Characterization

TRC performed four investigation mobilizations to characterize the nature and extent of contamination on and beneath the Subject Property. The four investigations are described below:

- **Groundwater Sampling.** TRC collected groundwater samples from three existing monitoring wells on May 6, 2019 that were installed as part of a previous geotechnical investigation. The purpose of this sampling event was to screen groundwater at the property for creosote-related compounds.

- **Post Demolition Timber Pile Sampling.** Post demolition timber pile sampling was performed in November 20, 2019 to confirm the absence or presence of contamination associated with the creosote preservative used on the timber piles.

- **Supplemental Soil and Groundwater Investigation.** Post-demolition soil and wood-material sample analytical results indicated that concentrations of compounds associated with the creosote preservative used on the timber piles remained in soil at the Subject Property at concentrations exceeding applicable CULs. Therefore, a supplemental soil and groundwater investigation was performed on December 2 to 4, 2019 to characterize the nature and extent of impacts to soil and groundwater associated with the timber piles.

- **Soil Vapor Investigation.** Soil analytical results from the supplemental soil and groundwater investigation indicated that concentrations of COCs exceeding applicable CULs remain in soil (but not groundwater) at the Subject Property. Additional assessment was performed to evaluate the potential for vapor intrusion related to soil gas generated by residual contamination associated with the timber piles. Soil vapor sampling was performed on December 26, 2019.

The methodology and work performed during each mobilization is documented as follows.

2.1.1 Sampling and Methodology

The following methodologies and rationale were used during all investigations as follows.

All samples were handled and transported under standard chain-of-custody protocols. All sampling procedures were consistent with the standard of care for similar assessment and investigations.

2.1.1.1 Groundwater Sampling – May 6, 2019

On May 6, 2019 TRC collected samples from three existing monitoring wells (B-1, B-2, and B-4) that were installed as part of a previous geotechnical investigation.

TRC collected samples from each well using standard low-flow purging and sampling techniques. Samples were collected with a peristaltic pump equipped with single-use disposable tubing and placed directly into 1-Liter laboratory-supplied amber glass sample containers. The samples were then labeled and placed into an iced cooler pending submittal to Friedman & Bruya Laboratories in Seattle, Washington. The 3 samples were analyzed for cPAHs using U.S. Environmental Protection Agency (EPA) Method 8270 with selected ion monitoring (SIM).

2.1.1.2 Post Demolition Timber Pile Sampling – November 20, 2019

On November 20, 2019, TRC mobilized to the Subject Property following the demolition of the 2-story building located at 15801 NE 85th Street. The objective of the sampling was to analyze for creosote-related compounds on the timber piles and in the soil proximate to the timber piles.

TRC collected two wood-material samples (Pile-1 and Pile-2) directly from the timber piles at depths ranging from 3 feet below ground surface (bgs) to 5 feet bgs and submitted for analysis. Nine soil samples (SS-1 through SS-9) were also collected at various depths proximate to the timber piles and submitted for analysis. Sample locations are depicted in Figure 4.

Samples were collected with single-use disposable equipment and placed directly into 4-ounce laboratory-supplied glass sample containers. The samples were then labeled and placed into an iced cooler pending submittal to Friedman & Bruya Laboratories in Seattle, Washington. The 11 samples (2 wood and 9 soil) were analyzed for creosote-related compounds (cPAHs and total naphthalenes) using EPA Method 8270 with SIM.

2.1.1.3 Supplemental Soil and Groundwater Investigation – December 2 to 4, 2019

Post-demolition soil and wood-material sample analytical results indicated that compounds associated with the creosote preservative on the timber piles remained in soil at the Subject Property at concentrations exceeding applicable CULs. Additional characterization was required to determine and delineate the extent of impacts to soil and groundwater at the Subject Property.

A total of 12 soil borings with temporary wells were installed using direct-push technology (DPT) drilling and sampling methods. All drilling was performed by a Washington-state licensed driller under the supervision and direction of an experienced environmental professional from TRC. Soil boring locations are depicted on Figure 5.

Prior to drilling, TRC notified Washington One-Call Service to identify publicly owned subsurface utilities at the subject properties. The notification was initiated a minimum of three business days prior to scheduled field activities.

During drilling at each location, soil samples were collected and screened for the presence of volatile compounds using a photoionization detector (PID) and field methods such as visual and olfactory inspection. The soil samples were collected and placed directly into 4-ounce laboratory-supplied glass sample containers and submitted for laboratory analysis for cPAHs and total naphthalenes using EPA Method 8270 with SIM.

Soil conditions encountered at each location were logged using the Unified Soil Classification System with visual-manual procedures (ASTM Method 2488D). Soil conditions and field screening results are presented on boring and well completion logs in Attachment A.

The 12 soil borings (DPT-1 through DPT-12) were advanced to a total depth of 25 feet bgs. Two soil samples from each boring (24 total) were retained and submitted for laboratory analysis. Additionally, single-use temporary well screens were placed into each boring for collection of reconnaissance groundwater samples.

Immediately upon collection the soil samples were labeled and placed in an iced cooler pending submittal to the analytical laboratory. Samples were transported to Friedman & Bruya Laboratory, Inc, in Seattle, Washington, under standard chain-of-custody protocols. Soil samples were analyzed for cPAHs and total naphthalenes using EPA Method 8270 with SIM.

Well development was performed prior to groundwater collection from temporary wells by continuous pumping at a steady rate using a peristaltic pump. Well development was terminated when the turbidity of the discharge water decreased to less than 10 nephelometric turbidity units (NTU) or to the satisfaction of the on-Site TRC personnel. Purge water was stored on-site in 55-gallon drums pending analytical results.

Six of the newly installed temporary wells (DPT-1 through DPT-6) were surveyed by TRC personnel. The survey included the measurements of the top edge of the north side of the well casing to an accuracy of ±0.01 foot.

The temporary wells were allowed to equilibrate to ambient conditions for not less than 48 hours. Prior to sampling, depth to groundwater measurements were obtained from the surveyed edge of the well casing using a decontaminated electronic water level meter to determine hydraulic gradient and direction. Groundwater samples were then collected from each of the six temporary wells using standard low-flow purging and sampling techniques with a peristaltic pump.

Immediately upon collection, groundwater samples were labeled and placed in an iced cooler pending submittal to the analytical laboratory. Samples were transported to Friedman & Bruya Laboratory, Inc, in Seattle, Washington, under standard chain-of-custody protocols. Reconnaissance groundwater samples were analyzed for cPAHs and total naphthalenes using EPA Method 8270 with SIM.

2.1.1.4 Soil Vapor Investigation – December 26, 2019

Soil analytical results from the supplemental soil and groundwater investigation indicated that concentrations of compounds exceeding applicable CULs remain in soil only at the Subject Property. Additional assessment was required to evaluate the potential for vapor intrusion proximate to soil impacts associated with the timber piles.

On December 26, 2019, TRC mobilized to the Subject Property to conduct a soil vapor assessment in order to evaluate the potential risk for vapor intrusion into new structures constructed at the Subject Property. TRC collected five soil vapor samples (SG-1 through SG-5) from soil vapor probes SG-1 through SG-5 in the northwestern portion of the Subject Property proximate to the timber piles as depicted on Figure 6. All soil vapor probes were installed to a depth of 5 feet bgs. Soil vapor samples were collected by connecting flexible tubing to the soil vapor probes with a flow-controlled inlet valve to a 1-Liter Summa Canister. Regulators were set to collect the sample in a one-hour timeframe.

After collection, the soil vapor samples were transported under standard chain-of-custody procedures and submitted to Friedman & Bruya Laboratories in Seattle, Washington, for laboratory analysis of naphthalene by EPA Method TO-15.

2.1.2 Site Geology

The maximum depth of exploration at the Subject Property was 25 feet bgs. The soil conditions consisted of a mixture of Silty Sand with Gravel underlain by Silt with varying percentages of organic material underlain by Poorly-Graded Sand and Gravel to the maximum depth of exploration.

2.1.3 Site Hydrogeology

A local water table aquifer was consistently encountered at a depth of between 6.5 and 13 feet bgs. The local hydraulic gradient is relatively flat with inferred groundwater flow to the west toward the Sammamish River. Groundwater piezometric data, elevation contours, and flow direction are depicted on Figure 7.

2.1.4 Terrestrial Ecological Evaluation

In accordance with WAC 173-340-7490, a terrestrial ecological evaluation (TEE) was performed for the Site to determine if it poses a threat to the terrestrial environment. The Site qualifies for the TEE exclusion set forth at WAC 173-340-7491(1)(c)(i), which states:

> *"For sites with hazardous substances other than those specified in (c)(ii) of this subsection [chlorinated dioxins or furans, PCB mixtures, DDT, DDE, DDD, aldrin chlordane, dieldrin, endosulfan, endrin, heptachlor, heptachlor epoxide, benzene hexachloride, toxophene, hexachlorobenzene, pentachlorophenol, or pentachlorobenzene], there is less than 1.5 acres of contiguous undeveloped land on or within 500 feet of any area of the Site."*

Since these conditions are met, terrestrial ecological exposures do not require further consideration. The completed *TEE Process – Primary Exclusions* form is provided as Attachment B.

2.2 Sampling / Analytical Results

The following sections describe the analytical procedures and results for the all mobilizations. Laboratory data sheets for all four mobilizations are presented in Attachment C.

2.2.1 Quality Analyses

All samples were transported to Friedman and Bruya, Inc. (FBI), a Washington-state accredited laboratory, under standard chain-of-custody with no discrepancies or issues. All samples were delivered to the laboratory in iced coolers within 24 hours of sample collection and all analyses were performed

within analyte-specific hold times. The samples collected and submitted to the laboratory, sample media, and requested analysis are summarized in Table 1.

2.2.2 Results

The following sections present the analytical results for analysis performed.

Concentrations of cPAHs were evaluated using adjusted totals after applying toxicity equivalency factors (TEF) detailed under WAC 173-340-708(e) in accordance with Table 708-2 (in WAC 173-340-900).

2.2.2.1 Wood Piling and Soil

A total of two wood piling samples and 33 soil samples were collected and submitted for analysis during the soil investigations performed at the Subject Property. The analytical results are presented in Table 2. Soil sample locations and analytical results are depicted on Figure 8. Copies of the original laboratory reports are presented in Attachment C.

- Concentrations of total naphthalenes and TEF-adjusted cPAHs exceeding MTCA Method A CULs were detected in both wood piling samples (PILE-1 and PILE-2).
- Concentrations of total naphthalenes exceeding MTCA Method A CULs were detected in three soil samples (SS-1:6, SS-2:6 and SS-6:4).
- Concentrations of TEF adjusted cPAHs exceeding MTCA Method A CULs were detected in four soil samples (SS-1:6, SS-2:6, SS-6:4, and DPT-3:5).

2.2.2.2 Groundwater

A total of nine groundwater samples were submitted for analysis. Analytical results for the groundwater samples are summarized in Table 3. Groundwater sample locations and analytical results are depicted on Figure 9. Copies of the original laboratory analytical reports are provided in Attachment C.

The analytical results are described below:

- Only two cPAH compounds were detected in one sample (DPT-3). Both detected concentrations of cPAHs in sample DPT-3 were less than MTCA Method A CULs for TEF-adjusted cPAHs.
- Total naphthalenes were detected in one sample (DPT-3). The detected total naphthalenes concentration in sample DPT-3 was less than MTCA Method A Cleanup Levels.

2.2.2.3 Soil Vapor Survey

A total of five soil vapor samples were submitted for laboratory analysis. Sample locations are depicted on Figure 6. Analytical results are presented in Table 4. Copies of the laboratory analytical reports are provided in Attachment C. The analytical results are described below:

- Naphthalene was detected in three (SG-2, SG-3, and SG-4) soil vapor samples collected at concentrations ranging from 0.75 micrograms per cubic meter (µg/m^3) to 100 µg/m^3.

- Concentrations of naphthalene exceed the MTCA Method B Sub-Slab Soil Gas Screening Level (SL_{sg}) of 2.5 µg/m^3 in two soil vapor samples (SG-3 and SG-4).

3.0 CONCEPTUAL SITE MODEL

A conceptual site model (CSM) was developed based on the data collected at the Subject Property. The CSM identifies current and potential future exposure pathways for human and ecological receptors. The CSM is presented as Attachment D and is discussed below:

- Approximately 50 8-inch-diameter timber piles were used in the construction of the now-demolished 2-story building that was previously located at 15801 NE 85th Street in the northwest corner of the Subject Property. The timber piles are approximately 15 feet in length. The timber piles were treated with a creosote-like material. The creosote-like material appears to have leached contaminants into adjacent shallow soils.

- Total naphthalenes and cPAHs are the COCs associated with the creosote-like material, as these COCs were detected in soils in the immediate vicinity of the timber piles. The lateral and vertical extents of impacts to soil are well defined and are limited to the footprint of the former building located at 15801 NE 85th Street to a maximum depth of 8 to 10 feet bgs. The distribution of contamination demonstrates low vertical and lateral mobility, likely due to the capped nature of the Subject Property with buildings and asphalt, the low leachability of the COCs, and low viscosity of the carrier preservative material.

- The COCs identified at the Site have a very low potential for leaching to groundwater. Groundwater sampling both before and after redevelopment demonstrated no groundwater impacts due to the localized areas of residual impacted soil adjacent to the timber piles.

- The environmental media of concern at the Site are soil and soil vapor. Potential current or future exposure pathways to remaining COCs include dermal, ingestion, and inhalation exposure by commercial workers during construction activities. Residential exposures by dermal contact with or ingestion of soil are not possible given the future use of the Subject Property.

- Soil impacts are restricted to the footprint of the former building in the northwest corner of the Subject Property and are co-located with the timber piles. Due to the previous cap

consisting of the former building and associated at grade parking lot, lateral dispersion of contamination was very low. Construction of the new building with no below grade improvements will create a stabilized condition with no potential for future contaminant migration in soil or leaching to groundwater.

- Soil vapor is impacted at concentrations that potentially pose a risk to future building occupants of the current building under construction at the Subject Property. The impacted soil vapor is restricted to an area within the footprint of the former building located in the northwest corner of the Subject Property. This potential risk has been mitigated by the installation of a vapor barrier in areas above the residual impacted soil (see Section 8.0).

- Based on WAC 173-340-7491, the Site qualifies for the exclusion from a TEE, as there is not a completed exposure pathway for TEE receptors (i.e., less than 1.5 acres of contiguous undeveloped land).

4.0 PROPOSED CLEANUP STANDARDS

Cleanup standards consist of CULs and the point of compliance at which those levels must be met. Cleanup standards are used as the basis for developing remedial action objectives for a cleanup action.

4.1 Cleanup Levels

Cleanup levels (CULs) for affected media at the Site were evaluated in accordance with MTCA and take into consideration exposure pathways and receptors based on current and likely future uses of the Site. Because the Site and surrounding area are currently developed for mixed-use commercial and residential use and will likely remain so into the foreseeable future, and the Site qualifies for a TEE exclusion under WAC 173-340-7491(1)l(i), only potential exposure pathways for human receptors have been taken into consideration. Based on current and future land uses, the potential pathways for exposure to COCs at the Site include direct contact (i.e., dermal, ingestion, and inhalation exposures) with soil by workers during construction activities and inhalation of COC vapors (i.e., indoor air) by future building occupants.

CULs under MTCA may be established under Method A, Method B, or Method C. Under WAC 173-340-704(1), MTCA Method A CULs are appropriate for use at sites where:

- Few hazardous substances have been detected;
- The site is undergoing a routine cleanup action; and
- Numerical standards are available for applicable COCs and media of concern.

MTCA Method A CULs are generally appropriate for the Site because there are a limited number of COCs detected in soil, soil vapor, and groundwater, the current cleanup action is considered a routine cleanup action, and there are established MTCA CULs for the COCs in the affected media of concern.

Soil vapor screening levels were evaluated to determine if existing COC concentrations in soil vapor represent a potential threat to indoor air. The screening levels are based on Ecology's Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action (Ecology Publication 09-09-047). The updated values in Ecology's Cleanup Level and Risk Calculation (CLARC) database were used for this evaluation.

4.1.1 Soil Cleanup Levels

The COPCs and their associated CULs for soil at the Site include the following:

- TEF-Adjusted cPAHs – 0.1 mg/kg; and
- Total naphthalenes (naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene) – 5 mg/kg.

4.1.2 Groundwater Cleanup Levels

The COPCs and their associated CULs for groundwater at the Site include the following:

- TEF-Adjusted cPAHs – 0.1 µg/L; and
- Total naphthalenes (naphthalene, 1-methylnaphthalene, and 2-methylnaphthalene – 160 µg/L.

4.1.3 Soil Vapor Screening Levels

The only COPC with a corresponding sub slab soil vapor screening level is naphthalene. The soil vapor screening level for naphthalene is 2.5 micrograms/meter^3 (µg/m^3).

4.2 Points of Compliance

A point of compliance is that point or location on a property where CULs must be attained. Because the CUL for soil is based on protection of groundwater, the point of compliance is all soil throughout the Site [WAC 173-340-740(6)(b)]. The standard point of compliance for groundwater extends throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest depth that could potentially be affected by the COCs [WAC 173-340-720(8)(b)]. Based on the lithology of the Site, the point of compliance for groundwater extends from the uppermost elevation of the perched groundwater table at approximately 7 to 9 feet bgs, to the bottom of the perched groundwater layer at an estimated depth of approximately 20 feet bgs.

5.0 NATURE AND EXTENT OF CONTAMINATION

The primary sources of impacts at the Site are the creosote-treated timber piles associated with the former building located in the northwest corner of the Subject Property. The timber piles were treated with a creosote-like preservative that has leached COCs into the soil adjacent to the piles. The creosote-related compounds have leached from the timber piles and impacted soils and soil vapor in the northwest corner of the Subject Property.

5.1 Soil

Soil is impacted with creosote-related compounds at concentrations exceeding CULs at the Subject Property. The impacted soil is restricted to the footprint of the former building located in the northwest corner of the Subject Property. The area of impacts is depicted on Figure 8. The depth of impacts is less than 25 feet bgs.

Analytical data representing current conditions in Site soil are summarized in Table 2 and corresponding soil sample locations are shown on Figure 8. The cross-section on Figure 10 illustrates current soil conditions at depth.

5.2 Groundwater

No impacts to groundwater were observed at concentrations exceeding potential CULs as depicted on Figure 9.

5.3 Soil Vapor

Soil vapor is impacted by COCs at concentrations that pose a potential risk to future building occupants. The impacted soil vapor is restricted to an area within the northwest corner of the Subject Property.

Analytical data representing current conditions in Site soil vapor are summarized in Table 4 and corresponding soil vapor sample locations are shown on Figure 6.

6.0 CONCLUSIONS AND NEXT STEPS

The following conclusions are supported by the findings of the soil, soil vapor, and groundwater investigations at the Site:

- Contaminant impacts are confined to within the legal boundaries of the Subject Property, such that the Subject Property represents the entire “Site” as defined under MTCA.

- Concentrations of cPAHs and naphthalenes at concentrations exceeding MTCA Method A CULs in two samples collected directly from the timber piles are indicative of the timber piles being treated with creosote.

- Residual impacts to soil at the Subject Property are limited to the soil immediately proximate to the timber piles. Soil analytical results from the supplemental soil and groundwater investigation indicate that soil impacts are localized and are not widespread at the Subject Property.

- Groundwater at the Subject Property is not impacted. No concentration of any of the compounds analyzed in groundwater samples exceeds MTCA Method A CULs for groundwater.

- Soil vapor analytical data indicates that vapor intrusion presents a potential exposure pathway for human receptors in the northwest corner of the structure currently being constructed at the Subject Property. This potential exposure pathway is being addressed through installation of a vapor barrier in the northwest corner of the structure (see Section 8.0).

6.1 Next Steps

Based on the conclusions of the RI, an FS was performed to determine the most appropriate remedial alterative. The contamination identified in soil at the Site is in a stable condition with little to no potential for future dispersion or leaching to groundwater. The FS documented in the following Section 7.0 considers the limited potential for future exposure and presents a remedial alternative that is fully protective of potential receptors, practicable, implementable, and cost-effective.

7.0 FEASIBILITY STUDY

The following presents a FS in compliance with MTCA requirements and consistent with the Ecology's *Feasibility Study Checklist* (Publication #16-09-007).

7.1 Remedial Action Objectives

Remedial action objectives (RAOs) have been established for the Site to provide the technical basis for evaluating remedial alternatives that protect human health and the environment under the MTCA cleanup process (WAC 173-340-350). Based on the assessment of conditions at the Site and the CULs presented in Section 4.0, the RAOs have been established as follows:

- Prevent human exposure to soil exhibiting COC concentrations exceeding applicable CULs identified in Section 4.0.

- Prevent human exposure to soil vapor exhibiting COC concentrations exceeding applicable CULs identified in Section 4.0.

The RAOs are of primary importance to the evaluation of the general response actions, technologies, process options, and cleanup action alternatives presented in this Feasibility Study.

7.2 Analysis of All Known, Available, and Reasonable Technologies

Based on the physical conditions at the Site, the available remedial options are limited. Typically, general response actions that are applicable to most impacted sites include the following:

- No action;
- Institutional controls;
- Containment;
- Removal;
- *Ex situ* treatment; and
- *In situ* treatment.

Potentially applicable technologies associated with these general response actions were identified and screened based on the Site COCs and affected media and take into consideration the current and future use of the Subject Property. The remedial alternatives under evaluation herein are based on the response actions and applicable technologies and are presented in the following section.

7.3 Description of Remedial Alternatives

TRC evaluated the following remedial alternatives to address the remaining impacts to soil at the Site. This evaluation is based upon TRC's past experience, best professional judgment, and the application of scientific principles to the known and available data.

The following three remedial alternatives were evaluated as part of this FS:

- Alternative 1 – Vapor Barrier and Institutional Controls
- Alternative 2 – Removal of Wood Timber Piles and Institutional Controls
- Alternative 3 – Full Removal of Impacts

Descriptions of each of the remedial alternatives are provided below.

7.3.1 Alternative 1 – Vapor Barrier and Institutional Controls

This remedial alternative consists of installation of a vapor barrier beneath the new structure and implementing institutional controls to limit potential exposures to remaining impacts. No additional excavation would be performed under this alternative, as the wood timber piles and impacted soil are stable and do not pose any potential for leaching to groundwater.

The new building will prevent direct exposure or contact with residual impacts, and there are no subsurface improvements, uses, or access points. The protective vapor barrier installed as part of construction of the new building will isolate exposure to residual COC impacts in soil vapor. The impacted soil and timber piles would remain in place beneath the building and vapor barrier, while an Environmental Covenant (EC) would restrict certain specific uses of the Site to prevent the creation of any exposure pathway in the future.

The EC would also include notifications to inform future property owners of the presence and location of soil contaminants. Implementation of this remedial alternative would include preparation and submittal of a Remedial Action Report (RAR) as part of a request for a Site-Wide Restricted No Further Action (NFA) determination.

The general scope of Alternative 1 would consist of the following:

- Installation of an approved vapor barrier
- Prepare an EC according to Ecology's template;
- Implement and record the EC;
- Finalize RAR; and
- Obtain a Restricted NFA determination from Ecology for the Site.

7.3.2 Alternative 2 – Removal of Wood Timber Piles and Institutional Controls

This remedial alternative consists of excavation and removal of wood timber piles and installation of a vapor barrier. No additional excavation would be performed, such that residual impacted soil will remain in place.

The building and the protective vapor barrier will continue to isolate the residual soil impacts from human contact. The impacted soil would remain in place, while an EC would restrict certain specific uses of the Site.

For Alternative 2, it is assumed that remediation would consist of removal of approximately 2,200 cubic yards of overburden to expose the wood timber piles, followed by excavation and transport of timber piles to an off-site facility for disposal.

Upon completion of the removal action, an EC would be implemented for the Site to address residual soil impacts at concentrations greater than the applicable CULs. The land use restrictions and deed notifications associated with implementing the EC would be equivalent to those described in Alternative 1.

The general scope of Alternative 2 would consist of the following:

- Prepare an Engineering Design Report and Work Plan;
- Prepare a Sampling and Analysis Plan and a Health and Safety Plan (HASP);

- Obtain appropriate construction permits;
- Excavate 2,200 cubic yards of clean overburden and stockpile on-Site;
- Excavate, load and transport wood timber piles off-Site;
- Sample and analyze excavated timber piles to document timber piles conditions for disposal;
- Performance and confirmation sampling following removal of timber piles;
- Off-Site disposal of wood timber piles;
- Transport and placement backfill material in areas of excavation, including compaction to geotechnical standards;
- Geotechnical study to determine if the Site soils, with the timber piles removed, would support the planned building;
- Possible implementation of soil stabilization measures based on the geotechnical study;
- Place, and compact clean soil in the excavated area;
- Install vapor barrier and restore the ground surface to pre-existing conditions;
- Prepare an EC according to Ecology's template for remaining impacted soil;
- Implement the EC; and
- Prepare a final RAR requesting a Restricted Site-Wide NFA determination from Ecology.

7.3.3 Alternative 3 – Full Removal of Impacts

This remedial alternative consists of larger timber pile and soil removal efforts than the wood timber piles removal action described in Alternative 2, which would include full removal of all timber piles and all impacted soils.

For Alternative 3, it is assumed that remediation would consist of excavation and stockpile approximately 2,200 cubic yards of clean overburden on-Site and full excavation of the impacted soil to at least a depth of 20 feet below ground surface. This alternative would include the excavation, load and transport of approximately 7,600 cubic yards of impacted soil to an off-Site facility for disposal.

The general scope of Alternative 3 would consist of the following:

- Prepare an Engineering Design Report and Work Plan;
- Prepare a Sampling and Analysis Plan and a HASP;
- Obtain appropriate construction permits;
- Excavate 2,200 cubic yards of clean overburden and stockpile on-Site;
- Excavate, load and transport wood timber piles off-Site;
- Excavate, load and transport 7,600 cubic yards of impacted soil;
- Installation of shoring elements in association with excavation of timber piles and impacted soil, including necessary dewatering elements;
- Sample and analyze excavated timber piles and impacted soil to document timber piles and soil conditions for disposal;
- Off-Site disposal of wood timber piles and impacted soil;
- Performance and confirmation sampling following removal of timber piles and impacted soil;
- Transport and placement backfill material in areas of excavation, including compaction to geotechnical standards;

- Geotechnical study to determine if the Site soils, with the timber piles removed, will support the planned building;
- Possible implementation of additional soil stabilization measures based on the geotechnical study;
- Backfill and compact clean soil in the excavated area;
- Restore the ground surface to pre-existing conditions; and
- Prepare a final RAR requesting an Unrestricted Site-Wide NFA determination from Ecology.

7.4 MTCA Threshold Requirements

A selected cleanup action must satisfy the requirements of WAC 173-340-360(2). These requirements include both threshold requirements (WAC 173-340-360(2)(a)) and other requirements (WAC 173-340-360(2)(b)). The threshold requirements include:

- Protection of human health and the environment;
- Compliance with cleanup standards;
- Compliance with applicable state and federal laws; and
- Provisions for compliance monitoring.

Other requirements include:

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

7.5 Evaluation of Remedial Alternatives

This section presents an evaluation and comparison of the proposed remedial alternatives for selecting the preferred cleanup action for the Site. In accordance with MTCA, the alternatives are evaluated relative to the criteria and sub-criteria specified in WAC 173-340-360(3)(f) and WAC 173-340-360(4), which include the following:

- Protectiveness;
- Permanence;
- Effectiveness over the long term;
- Management of short-term risks;
- Technical and administrative implementability;
- Consideration of public concerns;
- Restoration time frame; and
- Cost.

A summary of the evaluation of the proposed alternatives is provided in Table 5 and each criterion is addressed in Sections 7.3.1 through 7.3.3. The overall evaluation is then used to determine the relative benefit of each alternative.

Based upon TRC's experience, best professional judgment, and the application of scientific principles, each alternative has been assigned a score for each criterion ranging from 5 (best) to 1 (worst). Each score is based on the perceived benefit associated with the criterion and is included in Table 5. Several of the criteria are comprised of sub-criteria. In such cases, each sub-criterion is scored and the average of those scores is used as the criterion score. Alternatives deemed equally beneficial for a criterion or sub-criterion are given the same score. The highest score is the preferred alternative for the non-cost criteria.

For the disproportionate cost analysis (DCA), the non-cost criteria are weighted based on weighting factors established by Ecology and then summed. That summed score is then compared to the estimated cost of each alternative. The results of the DCA are presented in Section 7.5.9.

7.5.1 Protectiveness

Protectiveness is defined in WAC 173-340-360(3)(f)(i) as:

> *Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-site and off-site risks resulting from implementing the alternative, and improvement of the overall environmental quality.*

All remedial alternatives are protective of human health and the environment. Two of the alternatives actively remediate the Site by removing timbers or both timbers and impacted soil, while one alternative imposes restrictions to prevent exposures. Alternative 3 is most protective because it removes all impacted soils to the maximum extent practicable in the shortest amount of time. Alternatives 1 and 2 are less protective than Alternative 3 primarily because Alternatives 1 and 2 leave impacted soil in place and only impose restrictions to prevent exposures.

Alternative 1 is assigned a score of 3.5, Alternative 2 is assigned a score of 3.5, and Alternative 3 is assigned a score of 5.0.

7.5.2 Permanence

Permanence is defined in WAC 173-340-360(3)(f)(ii) as:

> *The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and*

> *sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and improvement of the overall environmental quality.*

At the completion of remedial activities, Alternative 3 will result in a permanent solution. Alternatives 1 and 2 would also be a permanent solution but would have a lower degree of permanence during their implementation due to residual contamination remaining in place for a longer time frame.

Permanence includes the sub-criteria of reduction in toxicity, degree of irreversibility, and the type and character of the waste streams generated during treatment. Alternative 3 is ranked higher due to the extensive excavation and removal of impacted material. While all three of the evaluated technologies, if successfully implemented, would be permanent, the degree of certainty in the success of each technology varies due to the nature of the technologies.

Alternative 1 is assigned a score of 3.3, Alternative 2 is assigned a score of 3.3, and Alternative 3 is assigned a score of 3.7.

7.5.3 Effectiveness Over the Long Term

Effectiveness over the long term is defined in WAC 173-340-360(3)(f)(iv) as:

> *Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes. The following types of cleanup action components may be used as a guide, in descending order, when assessing the relative degree of long-term effectiveness: reuse or recycling; destruction or detoxification; immobilization or solidification; on-site or off-site disposal in an engineered, lined and monitored facility; on-site isolation or containment with attendant engineering controls; and institutional controls and monitoring.*

Alternative 3 has the intent and goal of meeting cleanup standards and protecting human health and the environment after completion of the remedial action, while Alternatives 1 and 2, both have the intent and goal of protecting human health and the environment after completion of the remedial action through implementation of mitigation measures. There are varying levels of uncertainty and reliability associated with each technology throughout the process. Long-term effectiveness includes the sub-criteria of certainty, reliability, residual risk, and utilization of preferred remedies. Alternative 3 is ranked higher for long-term effectiveness than Alternatives 1 and 2 primarily due to its higher degree of certainty and general reliability.

Alternative 1 is assigned a score of 3.5, Alternative 2 is assigned a score of 3.3, and Alternative 3 is assigned a score of 3.8.

7.5.4 Management of Short-Term Risks

Management of short-term risks is defined in WAC 173-340-360(3)(f)(v):

> *The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks.*

Each of the alternatives has manageable short-term risks and effective measures for mitigating those risks. Alternative 1 has been ranked the highest for this criterion because it does not involve any intrusive work and, therefore, has little to no short-term risks. Alternatives 2 and 3 have the highest level of short-term risk due to the extensive excavation work.

Alternative 1 is assigned a score of 5.0, Alternative 2 is assigned a score of 2.0, and Alternative 3 is assigned a score of 2.0.

7.5.5 Technical and Administrative Implementability

Technical and administrative implementability is defined in WAC 173-340-360(3)(f)(vi):

> *Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary off-site facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions.*

This criterion includes the concepts of technical possibility, access, necessary resources, monitoring requirements, and integration into existing facility features. All three alternatives are technically possible to implement, but vary based primarily on their overall complexity. Alternative 1 received the highest implementability score because it is the simplest to implement. Alternative 3 received the lowest score due to the necessary excavation of timber piles and impacted soil and transportation and off-Site disposal of impacted material, which would include shoring, dewatering, backfill compaction, and other logistical issues. Soil removal and site restoration likely require several weeks to complete due to additional site preparations and safety requirements. Moreover, additional geotechnical studies would likely be required following completion of timber removal for Alternative 3. Alternative 2 received a slightly higher score than Alternative 3 but has similar challenges and complexities due to the removal, transportation and off-Site disposal of timber piles and additional geotechnical concerns.

Alternative 1 is assigned a score of 4.8, Alternative 2 is assigned a score of 2.7, and Alternative 3 is assigned a score of 2.2.

7.5.6 Consideration of Public Concerns

Consideration of public concerns is defined in WAC 173-340-360(3)(f)(vii):

> *Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the site.*

Public concerns are expected to vary depending on the remedial action. There would likely be more significant concerns associated with Alternatives 2 and 3 due to the mobilization and use of heavy equipment, noise, the high potential for dust during excavation activities, and transport of impacted soil on public roadways. Alternative 1 would not have these concerns but would likely have concerns associated with leaving impacted soil in place and related issues involving potential future redevelopment.

Alternative 1 is assigned a score of 3.0, Alternative 2 is assigned a score of 2.0, and Alternative 3 is assigned a score of 1.0.

7.5.7 Restoration Time Frame

Restoration Time Frame (RTF) is evaluated using the following factors described in WAC 173-340-360(4)(b)(i through ix):

- *Potential risks posed by the site to human health and the environment*
- *Practicability of achieving a shorter restoration timeframe*
- *Current use of the site*
- *Potential future use of the site*
- *Availability of alternative water supplies*
- *Likely effectiveness and reliability of institutional controls*
- *Ability to monitor and control migration of hazardous substances from the site*
- *Toxicity of hazardous substances at the site*
- *Natural processes that reduce concentrations of hazardous substances at the site*

Estimates of RTF are necessarily subjective. Each of the alternatives is assumed to provide a reasonable RTF.

RTF was ranked based on the general aggressiveness of each of the remedial actions and perceived certainty associated with the action. Alternative 3 is judged to be the most aggressive based on the greatest volume of contaminant mass removed in the shortest period of time. Although Alternative 2 also reduces contaminant mass, it will have a longer restoration time frame than Alternative 3 due to leaving impacted soil in place. Alternative 1 would have a longer restoration time frame than the other alternatives due to leaving impacted timber piles and soil in place without implementing any active remediation.

Alternative 1 is assigned a score of 3.0, Alternative 2 is assigned a score of 4.0, and Alternative 3 is assigned a score of 5.0.

7.5.8 Cost

Cost is defined in WAC 173-340-360(3)(f)(iii) as:

> *The cost to implement the alternative, including the cost of construction, the net present value of any long-term costs, and agency oversight costs that are cost recoverable. Long-term costs include operation and maintenance costs, monitoring costs, equipment replacement costs, and the cost of maintaining institutional controls. Cost estimates for treatment technologies shall describe pretreatment, analytical, labor, and waste management costs. The design life of the cleanup action shall be estimated and the cost of replacement or repair of major elements shall be included in the cost estimate.*

Order-of-magnitude remediation costs (i.e., ± 30 to 50 percent) have been estimated for each of the remedial alternatives based on the descriptions and associated assumptions presented in Section 7.3, and without engineering design or contractor bidding. The order-of-magnitude remedial costs are based on typical costs for Washington State and the current knowledge of the Site and are summarized in the following table. Costs are detailed in Tables 6 through 8. These costs are for comparison purposes only and actual implementation costs will vary from those provided below. These estimated costs incorporate a variety of necessary assumptions and the validity of those assumptions cannot be fully known at this time.

Remedial Alternatives Cost Summary

Remedial Alternative	Order-of-Magnitude Remediation Cost Estimate
1. Institutional Controls with Vapor Barrier	$ 259,000
2. Removal of Timber Piles and Institutional Controls	$ 832,000
3. Full Removal of All Impacts	$ 2,764,000

7.5.9 Disproportionate Cost Analysis

Under WAC 173-340-360(3)€, a cleanup action shall not be considered practicable "*if the incremental cost of the alternative over that of a lower cost alternative exceeds the incremental degree of benefits achieved by the alternative over that of the other lower cost alternative*". The determination of practicability is made using an analysis of benefit versus cost. The DCA can be performed quantitatively using the judged scoring of the non-cost criteria as the net benefit.

As previously discussed, each alternative was assigned a score for each of the non-cost evaluation criteria, with a score of 5 representing the highest overall perceived benefit and a score of 1 representing

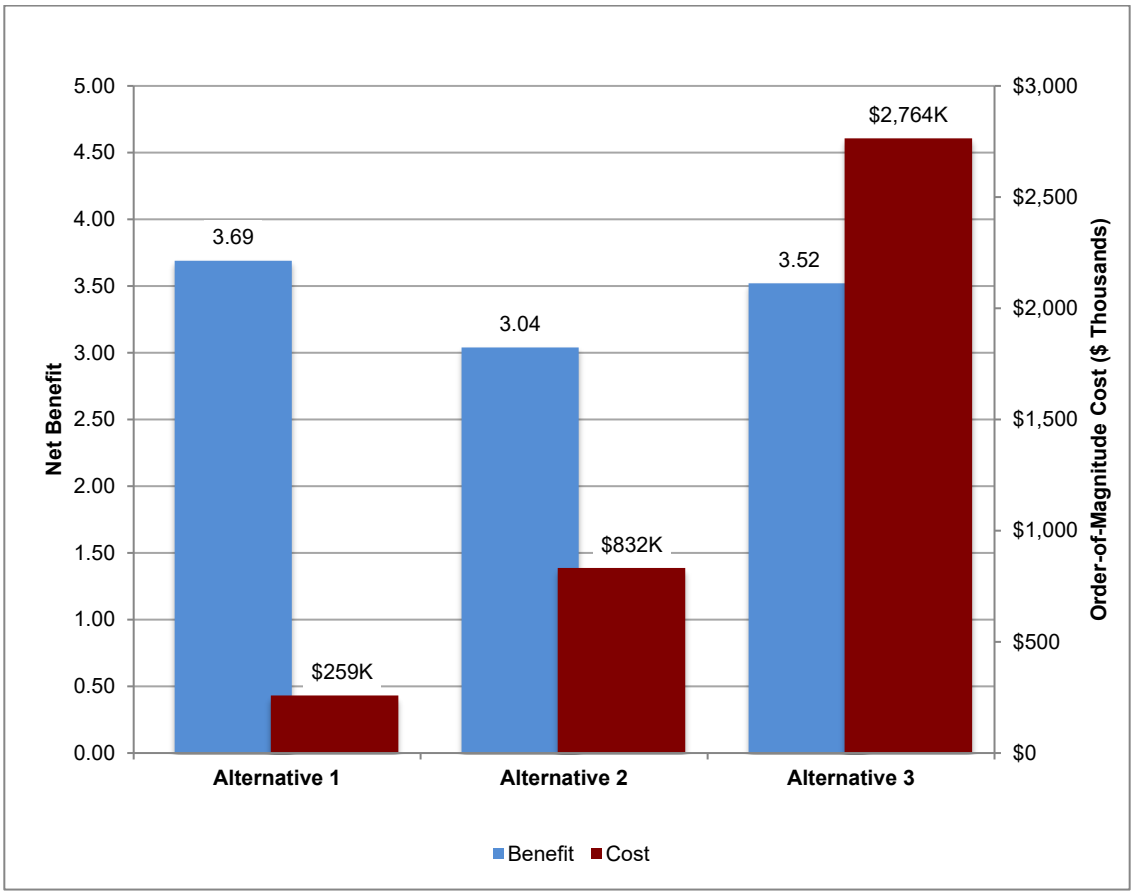
the lowest overall perceived benefit. The raw scores that were assigned in Sections 7.5.1 through 7.5.7 are summarized below and are weighted for each criterion according to weighting factors established by Ecology. The sum of the individual weighted scores for each alternative represents a value of the overall benefit of the alternative.

The charts below present the DCA using the estimated order-of-magnitude costs and quantitative net benefit values.

Remedial Alternatives Benefit Scoring Summary

Criteria *(Weighting Factor)*	Alternative 1		Alternative 2		Alternative 3	
	Rank	Value	Rank	Value	Rank	Value
Protectiveness *(0.3)*	3.5	1.05	3.5	1.05	5.0	1.5
Permanence *(0.2)*	3.3	0.66	3.3	0.66	3.7	0.74
Long-Term Effectiveness *(0.2)*	3.5	0.70	3.3	0.66	3.8	0.76
Short-Term Risk *(0.1)*	5.0	0.50	2.0	0.20	2.0	0.20
Implementability *(0.1)*	4.8	0.48	2.7	0.27	2.2	0.22
Public Concerns *(0.1)*	3.0	0.30	2.0	0.20	1.0	0.10
BENEFIT VALUE	**3.69**		**3.04**		**3.52**	

Cost-to-Benefit Analysis



7.6 Recommended Remedial Alternative

The FS and DCA indicate that Alternative 1, Vapor Barrier and Institutional Controls, best meets the MTCA criteria for selection of a remedial action at the Site. This approach provides the greatest benefit to the Site at the lowest cost, complies with applicable regulations, is protective of human health and the environment, is reasonably practicable, and can be readily implemented at the Site to effectively prevent exposures to residual soil contaminants.

Site-specific factors that support the conclusion that Alternative 1, Vapor Barrier and Institutional Controls, is appropriate and protective of human health and the environment include:

- Potential exposures to remaining impacts are minimal due to the building and vapor barrier covering the shallow impacted soil that remains beneath the Site. The presence of a building and protective vapor barrier will continue to isolate the residual wood timber piles and soil impacts from human contact.

- Remaining impacts do not pose a risk of vapor intrusion since there are no plans for the construction of an underground parking structure at the Subject Property and since a vapor barrier will be installed.

- The presence of a building covering impacted soil significantly reduces the potential for leaching contaminants from soil to groundwater and current groundwater conditions do not exhibit an adverse impact. Therefore, there is no soil-to-groundwater pathway for potential off-Site migration of impacts.

7.7 Implementation of Selected Remedial Action

Vapor Barrier and Institutional Controls is the selected remedial approach for addressing the impacts in soil at the Site. No other media are impacted, and the building and vapor barrier will cover the impacted soil and mitigate the risk for vapor intrusion.

Based on this conclusion, installation of a vapor barrier was performed during construction of the building as an interim remedial action (IRA) as documented in Section 8.0. Future actions will include preparing and implementing an EC that imposes restrictions on the use of Subject Property due to residual soil contamination.

The remaining portions of implementation for the selected remedial approach includes the following actions:

- Preparation of a draft EC utilizing the current Ecology template;
- Approval of the EC by Ecology; and
- File and record the EC with King County.

Implementation of the selected remedy will allow the Site to meet the requirements for obtaining a Restricted Site-Wide NFA determination from Ecology.

8.0 INTERIM REMEDIAL ACTION

In May through August 2020, an IRA consisting of vapor barrier installation was implemented during construction activities at the Subject Property.

8.1 Vapor Intrusion Mitigation Plan

Due to the documented presence of naphthalene impacts to soil vapor within the footprint of the former building located at 15801 NE 85th Street, this vapor intrusion mitigation plan (VIMP) was prepared to mitigate the potential for soil vapor intrusion into the future building.

The VIMP includes the installation of an appropriately rated vapor barrier. The vapor barrier will serve as barrier for preventing soil vapors from entering the building.

The vapor barrier consists of below slab installation of VaporBlock® Plus™ 20 (20 mil thick polyethylene sheeting with added butyl) manufactured by Raven Industries (VBP20), which was installed with seam taping and seals to concrete and any utility or column penetrations of the barrier. VBP20 specifications and installation guidelines are included as Attachment E.

The extent of the vapor barrier is based upon Ecology's *Implementation Memorandum No. 14 Updated Process for Initially Assessing the Potential for Petroleum Vapor Intrusion* dated March 31, 2016 (Memo 14). Memo 14 states:

> *"If the degree and extent of contamination is well-defined and the dissolved phase plume is stable or receding, then a horizontal separation distance of 30 feet would generally be appropriate for establishing a lateral inclusion zone."*

The soil contamination at the Subject Property meets these criteria. Therefore, a 30-foot lateral inclusion zone was determined to be appropriate. Therefore, the designed extent of the VBP20 covers all of the residual soil impacts within the footprint of the newly constructed building, plus a buffer of approximately 30 feet on the interior portions of the building. The constructed extent of the vapor barrier is demonstrated on Figure 1 in Attachment E.

8.2 Vapor Intrusion Mitigation

The VBP20 product was installed in five phases. This report documents TRC's inspection of the VBP20 installation. As constructed, the vapor intrusion mitigation system relies on the vapor barrier to prevent potential soil vapors from entering the newly constructed building.

8.2.1 Construction Inspection: Vapor Barrier

TRC personnel visually inspected the installation of the VBP20 in five mobilizations. Inspection dates included:

- May 21, 2020
- May 29, 2020
- June 11, 2020
- June 15, 2020
- July 29, 2020
- August 7, 2020

The initial inspection of VBP20 installation was performed on May 21, 2020. The contractor satisfied the minimum 30-foot offset from the delineated area of contamination indicated on Figure 1 in Attachment E, along the eastern extent of the designed extent. The contractor maintained a 12-inch overlap between VBP20 sheets and the installation of the installed section of VBP20 complied with the manufacturer's recommended installation procedures and guidance.

The second inspection for VBP20 installation was performed on May 29, 2020. This section was installed along the northern extent of the section inspected on May 21, 2020 and extended to the northern VBP20 design extent. The 12-inch minimum overlap between VBP20 rolls was observed and verified. Several areas were observed where VaporSeal tape did not appear to be adequately sealed. Areas requiring repairs and improvements were brought to the contractor's attention and were appropriately addressed. Upon completion of these repairs and improvements, the installation of VBP20 in this area complied with the manufacturer's recommended installation procedures and guidance.

The third inspection for VBP20 installation was performed on June 11, 2020. This section was installed adjacent to the two previously inspected sections and extended this boundary approximately 40 feet to the west. The required 12-inch minimum overlap between VBP20 rolls was observed and verified in areas where VBP20 placement was complete. Rebar placement was still ongoing and features penetrating the VBP20 vapor barrier were in the process of being sealed. Several areas were observed where VaporSeal tape did not appear to be adequately sealed, VBP20 sealing was not fully completed due to ongoing work in this area, or VBP20 was punctured. Areas requiring repairs and improvements were brought to MCRT's attention. Corrective actions were performed after the rebar installation was completed.

A fourth inspection was performed on June 15, 2020 as a follow up to the June 11 inspection and to inspect an additional area of installed. The repairs and improvements were completed and the installed VBP20 section complied with the manufacturer's installation procedures.

A new VBP20 section was installed along the southern boundary of the section inspected on June 11, 2020 and satisfies the 30-foot minimum offset from the delineated "area of contamination" along the southern VBP20 design extent. The required 12-inch minimum overlap between VBP20 rolls was observed and verified in areas where VBP20 placement was complete. The southern extent of the VBP20 met the 30-foot minimum offset from the area of contamination. Several areas were observed where

VaporSeal tape did not appear to be adequately sealed or VBP20 sealing around surface penetrations was not completed. Areas requiring repairs and improvements were brought to MCRT's attention. Repairs and improvements were completed to satisfy the manufacturer's installation procedures.

The fifth inspection for VBP20 installation was performed on July 29, 2020. This section was installed adjacent to the previously inspected sections and extended this boundary approximately 45 feet to the west. The required 12-inch minimum overlap between VBP20 rolls was observed and verified in areas where VBP20 placement was complete. Rebar placement was complete and features penetrating the VBP20 vapor barrier were observed to be sealed. Several areas of the vapor barrier were punctured by the rebar placement. Areas requiring repairs and improvement were brought to MCRT's attention. Corrective actions were performed and the areas requiring repairs were sealed to satisfy the manufacturer's installation procedures.

The sixth and final inspection for VBP20 installation was performed on August 7, 2020. This section was installed adjacent to the previously inspected section inspected on July 29, 2020 and extended this boundary approximately 35 feet to the south. The required 12-inch minimum overlap between VBP20 rolls was observed and verified in areas where VBP20 placement was complete. Rebar placement was complete and features penetrating the VBP20 vapor barrier were observed to be sealed. Several areas were observed where VaporSeal tape did not appear to be adequately sealed due to standing water on the vapor barrier. Areas requiring repairs and improvement were brought to MCRT's attention. Standing water was removed and corrective actions were performed and the areas requiring repairs were sealed to satisfy the manufacturer's installation procedures.

Photographs 1 through 4 in Attachment E provide photo documentation of each phase of the vapor barrier installation.

8.2.2 Future Actions

Currently, no future actions are required or scheduled to mitigate potential vapor intrusion into the Building. If soil vapor intrusion is suspected or odors are reportedly observed within the Building, then indoor air monitoring within the Building is advised.

8.2.3 Certification

Construction of the vapor barrier was completed in accordance with the manufacturer's installation specifications and in accordance with the VIMP. The vapor barrier was installed and sealed to the Building concrete walls, columns, and utility penetrations. All repairs and modifications were completed prior to concrete pouring. No additional action items are required at this time.

Tables

Table 1
Summary of Requested Analyses
Remedial Investigation, Feasibility Study, and Interim Remedial Action Report
Modera River Trail Property
15801 and 15945 Northeast 85th Street, Redmond, Washington

Sample ID	Sample Depth (feet)	Sample Type	Sample Date	Naphthalene[a]	Naphthalenes[b]	Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)[b]
B-1	NA	Groundwater	5/6/2019	--	--	X
B-2	NA	Groundwater	5/6/2019	--	--	X
B-4	NA	Groundwater	5/6/2019	--	--	X
SS-1:6	6	Soil	11/20/2019	--	X	X
SS-2:6	6	Soil	11/20/2019	--	X	X
SS-3:5	5	Soil	11/20/2019	--	X	X
SS-4:5	5	Soil	11/20/2019	--	X	X
SS-5:5	5	Soil	11/20/2019	--	X	X
SS-6:4	4	Soil	11/20/2019	--	X	X
SS-7:4	4	Soil	11/20/2019	--	X	X
SS-8:4	4	Soil	11/20/2019	--	X	X
SS-9:4	4	Soil	11/20/2019	--	X	X
PILE-1	NA	Soil	11/20/2019	--	X	X
PILE-2	NA	Soil	11/20/2019	--	X	X
DPT-1:5	5	Soil	12/2/2019	--	X	X
DPT-1:25	25	Soil	12/2/2019	--	X	X
DPT-1	NA	Groundwater	12/4/2019	--	X	X
DPT-2:5	5	Soil	12/2/2019	--	X	X
DPT-2:25	25	Soil	12/2/2019	--	X	X
DPT-2	NA	Groundwater	12/4/2019	--	X	X
DPT-3:5	5	Soil	12/2/2019	--	X	X
DPT-3:25	25	Soil	12/2/2019	--	X	X
DPT-3	NA	Groundwater	12/4/2019	--	X	X
DPT-4:8	8	Soil	12/2/2019	--	X	X
DPT-4:25	25	Soil	12/2/2019	--	X	X
DPT-4	NA	Groundwater	12/4/2019	--	X	X
DPT-5:9	9	Soil	12/2/2019	--	X	X
DPT-5:25	25	Soil	12/2/2019	--	X	X
DPT-5	NA	Groundwater	12/4/2019	--	X	X
DPT-6:9	9	Soil	12/2/2019	--	X	X
DPT-6:25	25	Soil	12/2/2019	--	X	X
DPT-6	NA	Groundwater	12/4/2019	--	X	X
DPT-7:1	1	Soil	12/4/2019	--	X	X
DPT-7:25	25	Soil	12/4/2019	--	X	X
DPT-8:10	10	Soil	12/4/2019	--	X	X
DPT-8:25	25	Soil	12/4/2019	--	X	X
DPT-9:10	10	Soil	12/4/2019	--	X	X
DPT-9:25	25	Soil	12/4/2019	--	X	X
DPT-10:15	15	Soil	12/4/2019	--	X	X
DPT-10:25	25	Soil	12/4/2019	--	X	X
DPT-11:10	10	Soil	12/4/2019	--	X	X
DPT-11:25	25	Soil	12/4/2019	--	X	X
DPT-12:10	10	Soil	12/4/2019	--	X	X
DPT-12:25	25	Soil	12/4/2019	--	X	X
SG-1	NA	Soil Vapor	12/26/2019	X	--	--
SG-2	NA	Soil Vapor	12/26/2019	X	--	--
SG-3	NA	Soil Vapor	12/26/2019	X	--	--
SG-4	NA	Soil Vapor	12/26/2019	X	--	--
SG-5	NA	Soil Vapor	12/26/2019	X	--	--

Notes:

a	Analyzed by EPA Method TO-15.
b	Analyzed by 8270D SIM.
--	Not analyzed.
NA	Not applicable.

Table 2
Summary of Soil Analytical Results
Remedial Investigation, Feasibility Study, and Interim Remedial Action Report
Modera River Trail Property
15801 and 15945 Northeast 85th Street, Redmond, Washington

Sample ID	Sample Depth (feet)	Sample Date	Naphthalenes[a]				Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)[a]							TEF-Adjusted Total cPAHs[b]
			Naphtha-lene	1-Methyl-naphtha-lene	2-Methyl-naphtha-lene	Total Naphthalenes	Benzo(a) pyrene	Benz(a) anthracene	Benzo(b) fluoran-thene	Benzo(k) fluoran-thene	Chrysene	Dibenz(a,h) anthracene	Indeno (1,2,3-cd) pyrene	
SS-1:6	6	11/20/2019	**1.4**	**1.6**	**3.1**	**6.1**	**0.28**	**0.96**	**0.44**	**0.18**	**0.77**	**0.015**	**0.087**	**0.4559**
SS-2:6	6	11/20/2019	**8.4**	**10**	**20**	**38.4**	**2.1**	**6.4**	**3.3**	**1.3**	**5.4**	**0.14**	**0.63**	**3.331**
SS-3:5	5	11/20/2019	<0.01	<0.01	<0.01	ND	**0.012**	<0.01	**0.017**	<0.01	**0.01**	<0.01	**0.013**	**0.0166**
SS-4:5	5	11/20/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
SS-5:5	5	11/20/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
SS-6:4	4	11/20/2019	**33**	**27**	**59**	**119**	**4.3**	**14**	**6.5**	**2.6**	**12**	<1	**1.2**	**6.90**
SS-7:4	4	11/20/2019	<0.01	<0.01	**0.011 fb**	**0.011**	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
SS-8:4	4	11/20/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
SS-9:4	4	11/20/2019	**0.018**	**0.02**	**0.042**	**0.08**	<0.01	**0.023**	**0.012**	<0.01	**0.025**	<0.01	<0.01	**0.01025**
PILE-1	NA	11/20/2019	**17,000**	**17,000**	**33,000**	**67,000**	**2,200**	**8,500**	**3,600**	**1,600**	**7,700**	**110**	**380**	**3,696**
PILE-2	NA	11/20/2019	**2,700**	**2,100**	**4,500**	**9,300**	**260**	**860**	**360**	**140**	**840**	**18**	**70**	**413.2**
DPT-1:5	5	12/2/2019	<0.02	<0.02	<0.02	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	ND
DPT-1:25	25	12/2/2019	<0.01	<0.01	<0.01	ND	<0.1	<0.01	<0.1	<0.1	<0.01	<0.1	<0.1	ND
DPT-2:5	5	12/2/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-2:25	25	12/2/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-3:5	5	12/2/2019	**0.46**	**0.57**	**1.1**	**2.13**	**0.14**	**0.44**	**0.28**	**0.11**	**0.34**	<0.01	**0.027**	**0.2296**
DPT-3:25	25	12/2/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-4:8	8	12/2/2019	<0.02	<0.02	<0.02	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	ND
DPT-4:25	25	12/2/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-5:9	9	12/2/2019	<0.02	<0.02	<0.02	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	ND
DPT-5:25	25	12/2/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-6:9	9	12/2/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-6:25	25	12/2/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-7:1	1	12/4/2019	<0.01	<0.01	<0.01	ND	**0.025**	**0.021**	**0.042**	**0.015**	**0.024**	<0.01	**0.01**	**0.03454**
DPT-7:25	25	12/4/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-8:10	10	12/4/2019	<0.02	<0.02	<0.02	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	ND
DPT-8:25	25	12/4/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-9:10	10	12/4/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-9:25	25	12/4/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-10:15	15	12/4/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-10:25	25	12/4/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-11:10	10	12/4/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-11:25	25	12/4/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
DPT-12:10	10	12/4/2019	<0.02	<0.02	<0.02	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	ND
DPT-12:25	25	12/4/2019	<0.01	<0.01	<0.01	ND	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	ND
MTCA Method A Soil Cleanup Level[c]			**See Cleanup Level for Total Naphthalenes**			**5**	**See Cleanup Level for TEF-Adjusted Total cPAHs**							**0.1**

Notes:
All results presented in milligrams per kilogram (mg/kg).

Bold Bold results exceed the laboratory reporting limit.
Shaded results exceed the cleanup level.
< Analyte was not detected at a concentration exceeding the listed laboratory reporting limit.
a Analyzed by 8270D SIM.
b Toxicity Equivalency Factors (TEFs) calculated under WAC 173-340-708(e) in accordance with Table 708-2 (in WAC 173-340-900).
c Model Toxics Control Act (MTCA) Method A Soil Cleanup Level of Unrestricted Land Uses, Table 740-1 of Washington Administrative Code Chapter 170-340-900.
ND None of the analyzed compounds were detected at a concentration exceeding the laboratory reporting limit.

Qualifier:
fb The analyte was detected in the method blank.

Table 3
Summary of Groundwater Analytical Results
Remedial Investigation, Feasibility Study, and Interim Remedial Action Report
Modera River Trail Property
15801 and 15945 Northeast 85th Street, Redmond, Washington

Sample ID	Sample Date	Naphthalenes[a]				Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)[a]							TEF-Adjusted Total cPAHs[b]
		Naphthalene	1-Methylnaphthalene	2-Methylnaphthalene	Total Naphthalenes	Benzo(a)pyrene	Benz(a)anthracene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Chrysene	Dibenz(a,h)anthracene	Indeno(1,2,3-cd)pyrene	
B-1	5/6/2019	--	--	--	--	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	ND
B-2	5/6/2019	--	--	--	--	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	ND
B-4	5/6/2019	--	--	--	--	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	ND
DPT-1	12/4/2019	<0.2	<0.2	<0.2	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	ND
DPT-2	12/4/2019	<0.2	<0.2	<0.2	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	ND
DPT-3	12/4/2019	**1.3**	**0.96**	**1.5**	**3.76**	<0.02	**0.036**	<0.02	<0.02	**0.034**	<0.02	<0.02	**0.01794**
DPT-4	12/4/2019	<0.2	<0.2	<0.2	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	ND
DPT-5	12/4/2019	<0.2	<0.2	<0.2	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	ND
DPT-6	12/4/2019	<0.2	<0.2	<0.2	ND	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	ND
MTCA Method A Groundwater Cleanup Level[c]		**See Cleanup Level for Total Naphthalenes**			**160**	**See Cleanup Level for TEF-Adjusted Total cPAHs**							**0.1**

Notes:
All results presented in micrograms per liter (µg/L).
Bold Bold results exceed the laboratory reporting limit.
< Analyte was not detected at a concentration exceeding the listed laboratory reporting limit.
a Analyzed by 8270D SIM.
b Toxicity Equivalency Factors (TEFs) calculated under WAC 173-340-708(e) in accordance with Table 708-2 (in WAC 173-340-900).
c Model Toxics Control Act (MTCA) Method A Groundwater Cleanup Levels, Table 720-1, Washington Administrative Code (WAC) 173-340-900.
d MTCA Method B Groundwater Cleanup Levels from Cleanup Levels and Risk Calculations (CLARC) database.
ND None of the analyzed compounds were detected at a concentration exceeding the laboratory reporting limit.

Table 4
Summary of Soil Vapor Analytical Results
Remedial Investigation, Feasibility Study, and Interim Remedial Action Report
Modera River Trail Property
15801 and 15945 Northeast 85th Street, Redmond, Washington

Sample ID	Sample Date	Volatile Organic Compounds[a]
		Naphthalene
SG-1	12/26/2019	<0.71
SG-2	12/26/2019	**0.75**
SG-3	12/26/2019	**100**
SG-4	12/26/2019	**5.54**
SG-5	12/26/2019	<1.4
Sub-Slab Soil Gas Screening Level[b]		**2.50**

Notes:

All results presented in micrograms per cubic meter (µg/m^3).

Bold Bold results exceed the laboratory reporting limit.

Shaded results exceed the Sub-Slab Soil Vapor Screening Level.

< Analyte was not detected at a concentration exceeding the listed laboratory reporting limit.

a Analyzed by EPA Method TO-15.

b Method B Sub-slab Soil Vapor Screening Levels, from Draft Vapor Intrusion Guidance Document, Washington Department of Ecology, Table B-1. Where levels based on carcinogenic and non-carcinogenic, the lower value is listed.

Table 5
Remedial Alternatives Evaluation
Remedial Investigation, Feasibility Study, and Interim Remedial Action Report
Modera River Trail Property
15801 and 15945 Northeast 85th Street, Redmond, Washington

	Alternative 1		Alternative 2		Alternative 3	
Criteria	**Institutional Controls**	***Score*** [a]	**Removal of Timber Piles and Institutional Controls**	***Score*** [a]	**Full Removal of Impacts**	***Score*** [a]
Description/Issues	Implement institutional controls to place a deed restriction on the impacted property. Will require installation of a vapor barrier. Wood timber piles and impacted soil will remain in place.		Remove all timber piles and transport to an off-Site facility for disposal. Impacted soil will be left in place. Will require removal of overburden to expose timber piles. Excavate soil to at least a depth of 5 feet below ground surface. Implement institutional controls to place a deed restriction on the property where contamination remains. Will require installation of vapor barrier.		Remove all timber piles and impacted soil. Full excavation of the impacted soil to at least a depth of 20 feet below ground surface; transport timber piles and impacted soil to an offSite facility for treatment and/or disposal. Physical removal of all accessible impacted soil using standard excavation equipment and hauling off-Site for disposal.	
Protectiveness	Overall protectiveness of human health and the environment, including the degree to which existing risks are reduced, time required to reduce risk at the facility and attain cleanup standards, on-Site and off-Site risks resulting from implementing the alternative, and improvement of the overall environmental quality.					
Overall protectiveness	*Protective if maintained*	*5*	*Protective when complete*	*3*	*Protective when complete*	*5*
Reduces existing risks	*Reduces risks if maintained*	*4*	*Reduces risks when implemented*	*4*	*Reduces risks when implemented*	*5*
Time required to reduce risk	*Longer duration to reduce risks*	*3*	*Shortest duration to reduce risks*	*4*	*Shortest duration to reduce risks*	*5*
On-Site risks	*Reduces risks with high level of certainty*	*5*	*Reduces risks with high level of certainty*	*4*	*Reduces risks with high level of certainty*	*5*
Off-Site risks	*Reduces risks with moderate level of certainty*	*3*	*Reduces risks with high level of certainty*	*3*	*Reduces risks with high level of certainty*	*5*
Improvement in environmental quality	*No immediate change in environmental quality*	*1*	*Moderate level of improvement; impacts will still remain in place.*	*3*	*High level of improvement*	*5*
Criterion Score		***3.5***		***3.5***		***5.0***
Permanence	The degree to which the alternative permanently reduces the toxicity, mobility or volume of hazardous substances, including the adequacy of the alternative in destroying the hazardous substances, the reduction or elimination of hazardous substance releases and sources of releases, the degree of irreversibility of waste treatment process, and the characteristics and improvement of the overall environmental quality.					
Reduces toxicity, mobility, and volume	*Reduces toxicity, mobility, and volume slowly*	*2*	*Reduces toxicity, mobility, and volume rapidly*	*4*	*Reduces toxicity, mobility and volume moderately*	*5*
Degree of irreversibility	*Low degree of irreversibility*	*3*	*Irreversible*	*4*	*Irreversible*	*5*
Waste characteristics	*No waste stream generated*	*5*	*Generates moderate soil waste stream*	*2*	*Generates high soil waste stream*	*1*
Criterion Score		***3.3***		***3.3***		***3.7***
Long-Term Effectiveness	Long-term effectiveness includes the degree of certainty that the alternative will be successful, the reliability of the alternative during the period of time hazardous substances are expected to remain on-Site at concentrations that exceed cleanup levels, the magnitude of residual risk with the alternative in place, and the effectiveness of controls required to manage treatment residues or remaining wastes. The following types of cleanup action components may be used as a guide, in descending order, when assessing the relative degree of long-term effectiveness: Reuse or recycling; destruction or detoxification; immobilization or solidification; on-Site or off-Site disposal in an engineered, lined and monitored facility; on-Site isolation or containment with attendant engineering controls; and institutional controls and monitoring.					
Degree of Certainty	*Moderately certain*	*3*	*Somewhat certain*	*4*	*Highly certain*	*5*
Reliability	*Moderately reliable*	*4*	*Somewhat reliable*	*4*	*Highly reliable*	*5*
Residual Risk	*Moderate to high*	*3*	*Moderate for contamination remaining in place*	*3*	*Low*	*4*
Technology hierarchy	*Moderate*	*4*	*Low rank due to offSite soil disposal*	*2*	*Low rank due to offSite soil disposal*	*1*
Criterion Score		***3.5***		***3.3***		***3.8***
Short-Term Risk Management	The risk to human health and the environment associated with the alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks.					
During construction and implementation	*Low risks*	*5*	*High risks associated with excavation*	*2*	*High risks associated with excavation*	*2*
Effectiveness of risk management	*Very effective*	*5*	*Moderately effective*	*2*	*Moderately effective*	*2*
Criterion Score		***5.0***		***2.0***		***2.0***

Table 5
Remedial Alternatives Evaluation
Remedial Investigation, Feasibility Study, and Interim Remedial Action Report
Modera River Trail Property
15801 and 15945 Northeast 85th Street, Redmond, Washington

	Alternative 1		Alternative 2		Alternative 3	
Criteria	**Institutional Controls**	***Score*** [a]	**Removal of Timber Piles and Institutional Controls**	***Score*** [a]	**Full Removal of Impacts**	***Score*** [a]
Description/Issues	Implement institutional controls to place a deed restriction on the impacted property. Will require installation of a vapor barrier. Wood timber piles and impacted soil will remain in place.		Remove all timber piles and transport to an off-Site facility for disposal. Impacted soil will be left in place. Will require removal of overburden to expose timber piles. Excavate soil to at least a depth of 5 feet below ground surface. Implement institutional controls to place a deed restriction on the property where contamination remains. Will require installation of vapor barrier.		Remove all timber piles and impacted soil. Full excavation of the impacted soil to at least a depth of 20 feet below ground surface; transport timber piles and impacted soil to an offSite facility for treatment and/or disposal. Physical removal of all accessible impacted soil using standard excavation equipment and hauling off-Site for disposal.	
Implementability	Ability to be implemented including consideration of whether the alternative is technically possible, availability of necessary off-Site facilities, services and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for construction operations and monitoring, and integration with existing facility operations and other current or potential remedial actions.					
Technically possible	*Possible for subject property.*	*5*	*Possible, but would require significant efforts removing the timber piles.*	*2*	*Possible, but would require significant efforts removing the timber piles and for stabilizing ground during excavation work.*	*1*
Access	*No access issues related to implementing institutional controls including installation of vapor barrier.*	*5*	*Site is fully accessible for removal of timber piles and vapor barrier installation.*	*3*	*Site is fully accessible for removal of timber piles and excavation of impacted soils.*	*3*
Availability of necessary resources	*Readily available*	*5*	*Readily available*	*3*	*Readily available*	*2*
Scheduling, size, and complexity	*Moderate complexity; require installation of vapor barrier.*	*4*	*High complexity due to necessary excavation of timber piles, and disposal of soil. Soil removal, Site restoration and installation of vapor barrier would likely require several weeks to complete due to additional Site preparations and safety requirements.*	*2*	*High complexity due to necessary excavation of timber piles and impacted soil, transportation and disposal of impacted material. Soil removal, Site restoration and installation of vapor barrier would likely require several weeks to complete due to additional Site preparations and safety requirements.*	*1*
Monitoring requirements	*Low*	*5*	*Low to moderate*	*3*	*Low to moderate*	*3*
Integration with existing features	*High*	*5*	*Moderate*	*3*	*Moderate*	*3*
Criterion Score		***4.8***		***2.7***		***2.2***
Public Concerns	Whether the community has concerns regarding the alternative and, if so, the extent to which the alternative addresses those concerns. This process includes concerns from individuals, community groups, local governments, tribes, federal and state agencies, or any other organization that may have an interest in or knowledge of the Site.					
Concerns	*Potential concerns regarding impacts remaining in soil and potentially necessary modification of the remedy if future redevelopment is desired.*	***3.0***	*Potential concerns regarding mobilization of equipment, use of heavy equipment, dust generation, noise issues, and transport of timber piles on public roadways.*	***2.0***	*Potential concerns regarding mobilization of equipment, use of heavy equipment, dust generation, noise issues, and transport of timber piles and impacted soil on public roadways.*	***1.0***
Restoration Time Frame	Determination of whether a cleanup action provides for a reasonable restoration time frame based on criteria in WAC 173-340-360(4)(b).					
Time Frame	*Moderate to longer time frame*	***3.0***	*Moderate to shorter time frame*	***4.0***	*Moderate to shorter time frame*	***5.0***
TOTAL SCORE	*26.2*		*20.8*		*22.6*	
Conceptual Level Cost	$259,000		$832,000		$2,764,000	

Note:
a Each sub-criterion is scored from 5 (best) to 1 (worst) based on the perceived benefit; the total criterion score is the average of the associated sub-criterion scores.

Table 6
Order-of-Magnitude Cost Estimate
Alternative 1 – Vapor Barrier and Institutional Controls
Remedial Investigation, Feasibility Study, and Interim Remedial Action Report
Modera River Trail Property
15801 and 15945 Northeast 85th Street, Redmond, Washington

Task	Component	Units	Basis	Unit Cost	Subtotal	Professional Labor	Component Subtotal	Task Subtotal
Implement Institutional Controls								
	Implement Environmental Covenant	1	LS			$ 5,000	$ 5,000	
	Interactions with Agencies and Property Owners	1	LS			$ 4,000	$ 4,000	
	Finalize Feasibility Study-CAR	1	LS			$ 10,000	$ 10,000	
	Administrative Maintenance	1	LS			$ 1,000	$ 1,000	***$ 20,000***
Installation of Vapor Barrier								
	Vapor Block Plus (VBP 20) and Installation	1	LS	$ 87,500	$ 87,500	$ 3,000	$ 90,500	***$ 90,500***
	Category Subtotals				$ 87,500	$ 3,000	$ 90,500	
	Tax on Contractor Services/Capital Equipment (10%)				$ 8,750		$ 8,750	
	Project Contingency (50% of Subtotal)						$ 49,625	***$ 148,875***
PROJECT TOTAL								**$ 259,000**

Notes:
LS Lump sum

Table 7
Order-of-Magnitude Cost Estimate
Alternative 2 – Removal of Timber Piles and Institutional Controls
Remedial Investigation, Feasibility Study, and Interim Remedial Action Report
Modera River Trail Property
15801 and 15945 Northeast 85th Street, Redmond, Washington

Task	Component	Units	Basis	Unit Cost	Subtotal	Professional Labor	Component Subtotal	Task Subtotal
Implement Institutional Controls								
	Preparation of Environmental Covenant	1	LS			$ 8,000	$ 8,000	
	Coordination with Agencies and Property Owners	1	LS			$ 4,000	$ 4,000	
	Cleanup Action Report	1	LS			$ 15,000	$ 15,000	
	Administrative Maintenance	1	LS			$ 1,000	$ 1,000	**$ 28,000**
Pre-Remedial Activities								
	Engineering Design Report and Work Plan	1	LS			$ 20,000	$ 20,000	
	Grading & Construction Permit	1	LS	$ 5,000	$ 5,000	$ 3,000	$ 8,000	
	Bid Solicitation	3	each			$ 2,500	$ 7,500	
	Contracting	1	LS			$ 5,000	$ 5,000	***$ 40,500***
Removal of Timber Piles								
	Site Preparation	1	LS	$ 3,000	$ 3,000	$ 3,000	$ 6,000	
	Excavate and Stockpile Clean Overburden On-Site	2,200	CY	$ 120	$264,000	$ 15,000	$ 279,000	
	Excavate, Load, and Transport Timber Piles Off-Site	1	LS	$ 5,000	$ 5,000	$ 12,000	$ 17,000	
	Waste Disposal Profiling and Sampling	5	sample	$ 200	$ 1,000	$ 5,000	$ 6,000	
	OffSite Disposal of Timber Piles	3	tons	$ 50	$ 150	$ 6,000	$ 6,150	
	Backfill, Compaction and Site Restoration	1	LS	$ 10,000	$ 10,000	$ 3,000	$ 13,000	
	Soil Re-Compaction	1	LS	$ 15,000	$ 15,000	$ 5,000	$ 20,000	
	Confirmation Testing	1	LS	$ 5,000	$ 5,000	$ 5,000	$ 10,000	
Installation of Vapor Barrier								
	Vapor Block Plus (VBP 20)	1	LS	$ 87,500	$ 87,500	--	$ 87,500	
	Cleanup Action Report	1	LS	$ 25,000		$ 25,000	$ 25,000	
	Category Subtotals				*$ 390,650*	*$ 79,000*	*$ 469,650*	
	Tax on Contractor Services/Capital Equipment (10%)				$ 39,100		$ 39,100	
	Project Contingency (50% of Subtotal)						$ 254,400	***$ 763,200***
PROJECT TOTAL								**$ 832,000**

Notes:
ft bgs Feet below ground surface
LS Lump sum
CY Cubic yards

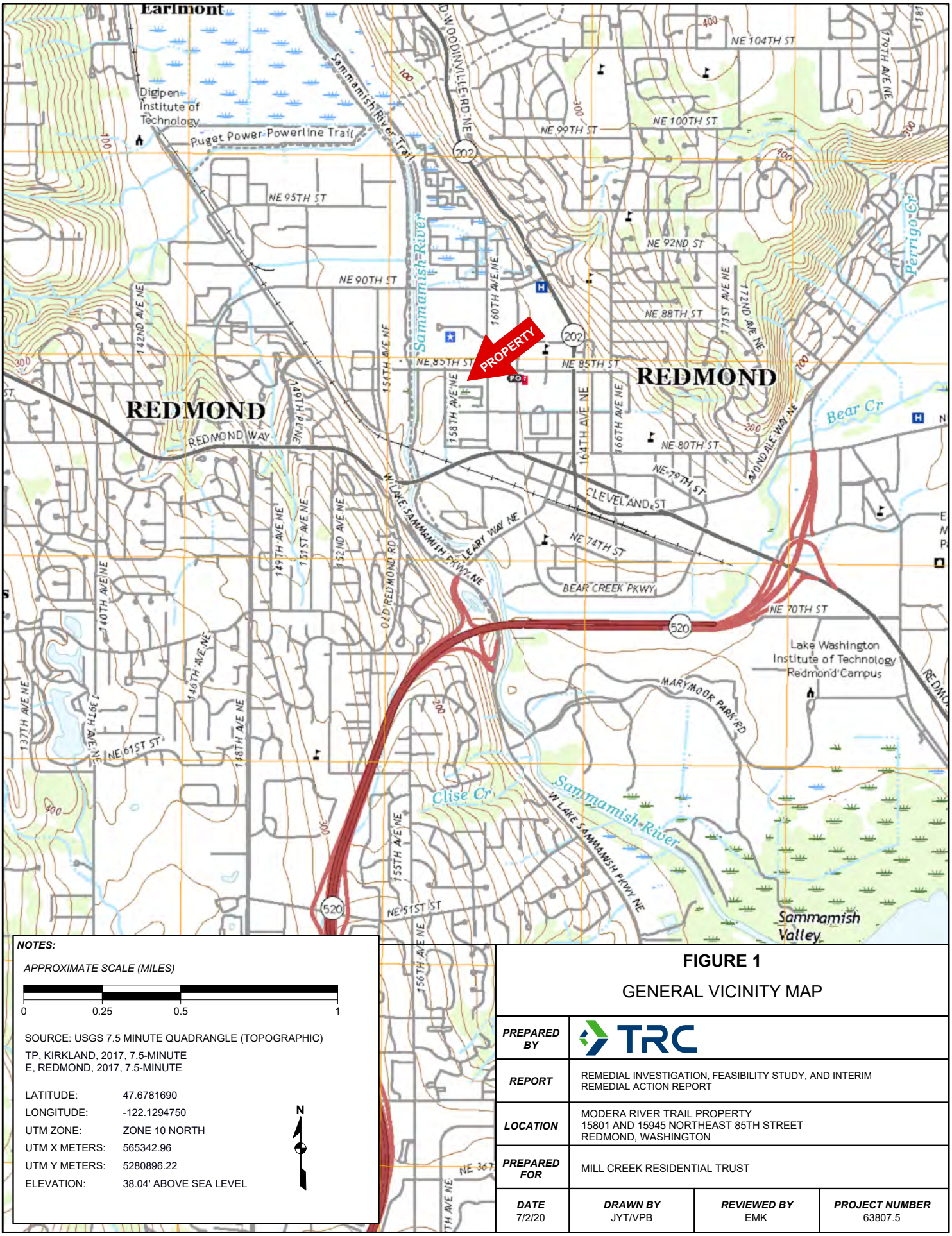
Table 8
Order-of-Magnitude Cost Estimate
Alternative 3 – Full Removal of Impacts
Remedial Investigation, Feasibility Study, and Interim Remedial Action Report
Modera River Trail Property
15801 and 15945 Northeast 85th Street, Redmond, Washington

Task	Component	Units	Basis	Unit Cost	Subtotal	Professional Labor	Component Subtotal	Task Subtotal
Pre-Remedial Activities								
	Engineering Design Report and Work Plan	1	LS			$ 25,000	$ 25,000	
	Grading & Construction Permit	1	LS	$ 5,000	$ 5,000	$ 3,000	$ 8,000	
	Bid Solicitation	3	each			$ 2,500	$ 7,500	
	Contracting	1	LS			$ 5,000	$ 5,000	***$ 45,500***
Removal of Timber Piles and Impacted Soil								
	Site Preparation	1	LS	$ 3,000	$ 3,000	$ 3,520	$ 6,520	
	Permitting	1	LS	$ 25,000	$ 25,000	$ 5,000	$ 30,000	
	Excavate and Stockpile Clean Overburden On-Site	2,200	CY	$ 100	$ 220,000	$ 15,000	$ 235,000	
	Excavate, Load, and Transport Timber Piles Off-Site	3	ton					
	Excavate, Load, and Transport Impacted Soil Off-Site	7,600	CY	$ 100	$ 760,000	$ 12,000	$ 772,000	
	Waste Disposal Profiling and Sampling	5	sample	$ 200	$ 1,000	$ 5,000	$ 6,000	
	OffSite Treatment and Disposal of Impacted Material	2,000	tons	$ 50	$ 100,000	$ 6,000	$ 106,000	
	Confirmation Soil Sampling & Analysis	200	sample	$ 200	$ 40,000	$ 5,000	$ 45,000	
	Backfill, Compaction and Site Restoration	7,600	CY	$ 25	$ 190,000	$ 3,000	$ 193,000	
	Shoring	1	LS	$150,000	$ 150,000	$ 25,000	$ 175,000	
	Dewatering	1	LS	$ 50,000	$ 50,000	$ 15,000	$ 65,000	
	Cleanup Action Report	1	LS	$ 25,000		$ 25,000	$ 25,000	
	Category Subtotals				*$ 1,539,000*	*$ 119,520*	*$ 1,658,520*	
	Tax on Contractor Services/Capital Equipment (10%)				$ 153,900		$ 153,900	
	Project Contingency (50% of Subtotal)						$ 906,200	***$ 2,718,600***
PROJECT TOTAL								**$ 2,764,000**

Notes:

ft bgs	Feet below ground surface
LS	Lump sum
CY	Cubic yards

Figures



NOTES:

APPROXIMATE SCALE (MILES)

SOURCE: USGS 7.5 MINUTE QUADRANGLE (TOPOGRAPHIC)
TP, KIRKLAND, 2017, 7.5-MINUTE
E, REDMOND, 2017, 7.5-MINUTE

LATITUDE:	47.6781690
LONGITUDE:	-122.1294750
UTM ZONE:	ZONE 10 NORTH
UTM X METERS:	565342.96
UTM Y METERS:	5280896.22
ELEVATION:	38.04' ABOVE SEA LEVEL

FIGURE 1

GENERAL VICINITY MAP

PREPARED BY	TRC		
REPORT	REMEDIAL INVESTIGATION, FEASIBILITY STUDY, AND INTERIM REMEDIAL ACTION REPORT		
LOCATION	MODERA RIVER TRAIL PROPERTY 15801 AND 15945 NORTHEAST 85TH STREET REDMOND, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 7/2/20	***DRAWN BY*** JYT/VPB	***REVIEWED BY*** EMK	***PROJECT NUMBER*** 63807.5

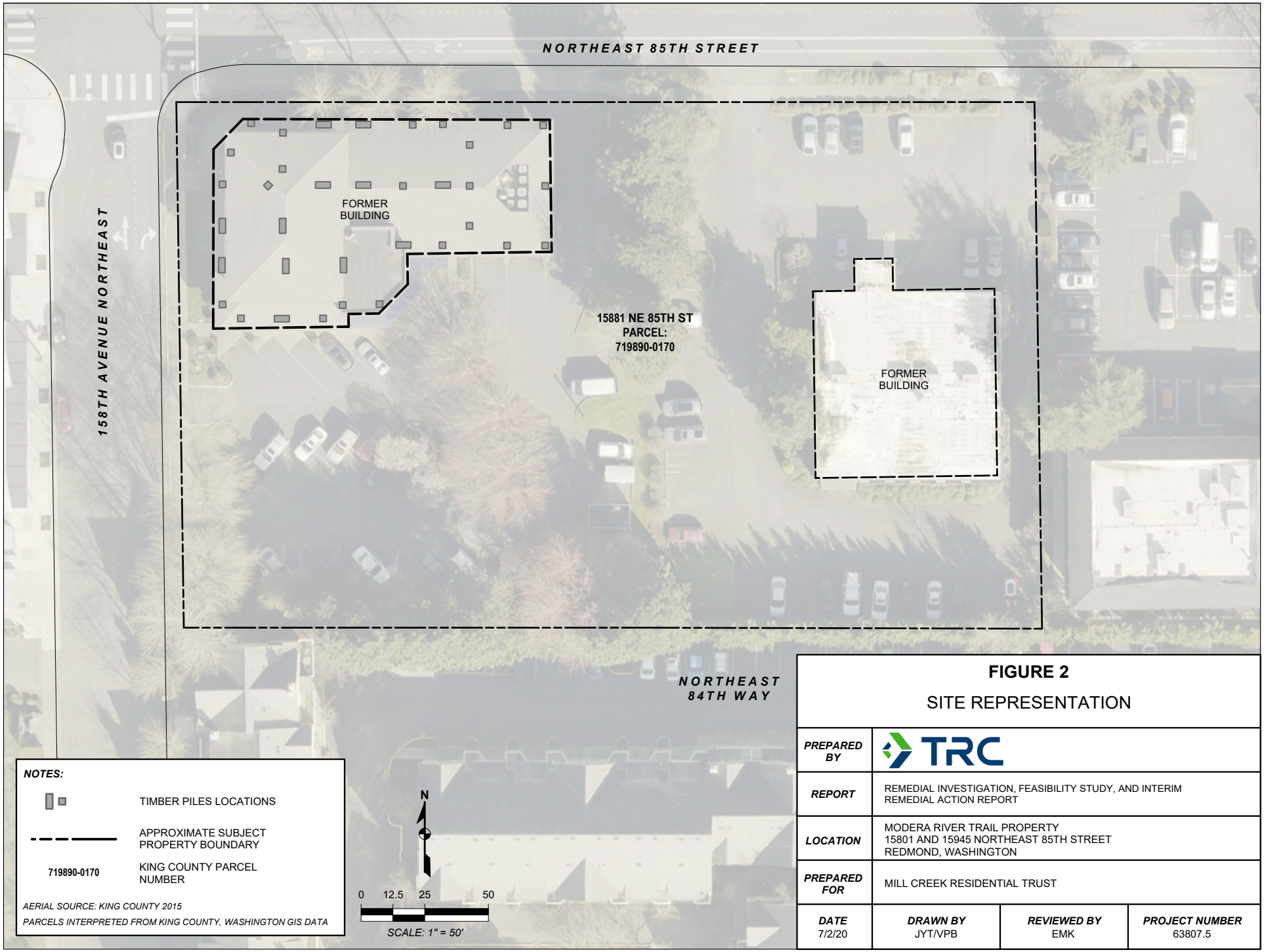
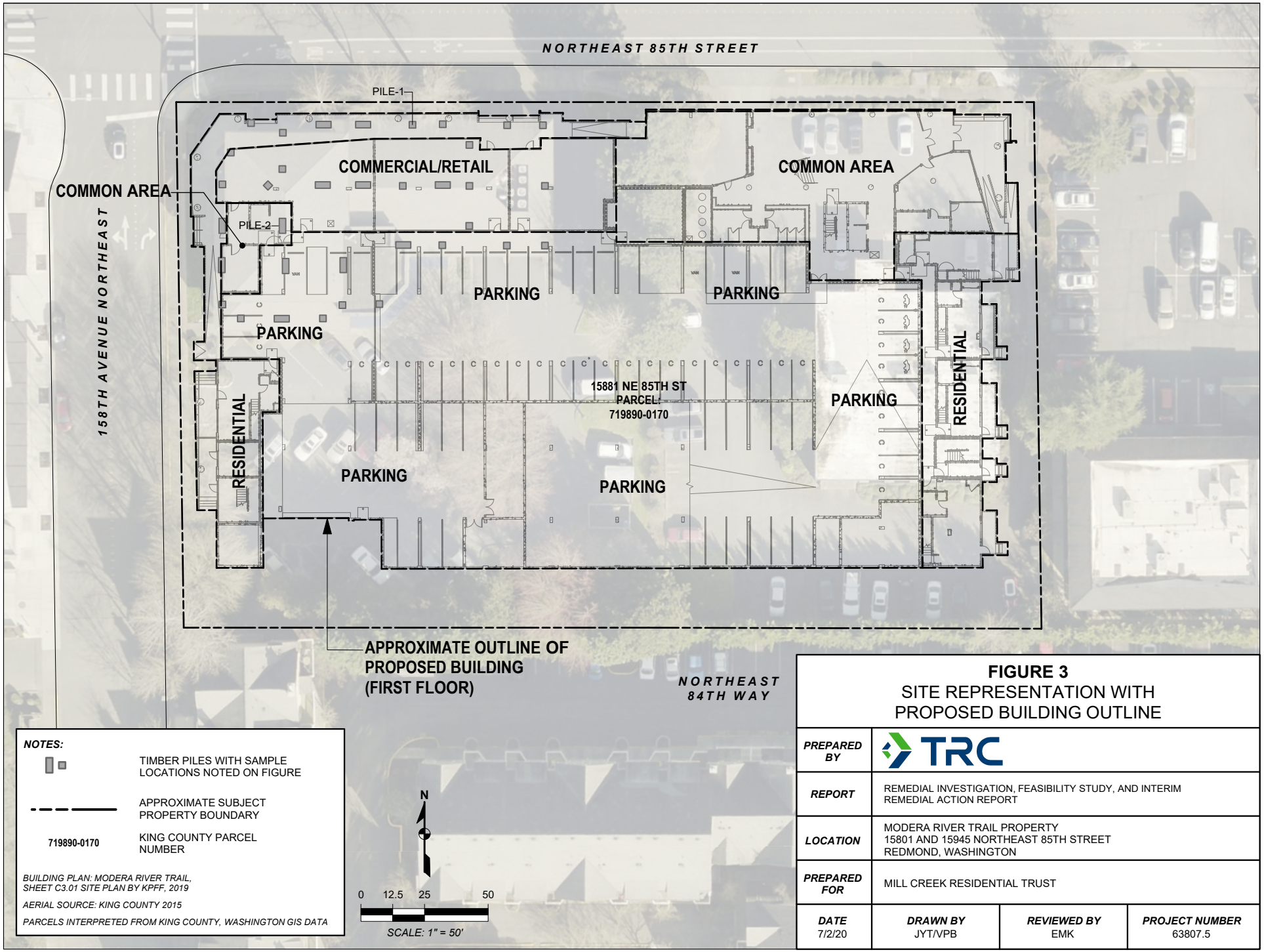


FIGURE 2

SITE REPRESENTATION

PREPARED BY	TRC		
REPORT	REMEDIAL INVESTIGATION, FEASIBILITY STUDY, AND INTERIM REMEDIAL ACTION REPORT		
LOCATION	MODERA RIVER TRAIL PROPERTY 15801 AND 15945 NORTHEAST 85TH STREET REDMOND, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 7/2/20	**DRAWN BY** JYT/VPB	**REVIEWED BY** EMK	**PROJECT NUMBER** 63807.5



NOTES:

- TIMBER PILES WITH SAMPLE LOCATIONS NOTED ON FIGURE
- APPROXIMATE SUBJECT PROPERTY BOUNDARY
- 719890-0170 — KING COUNTY PARCEL NUMBER

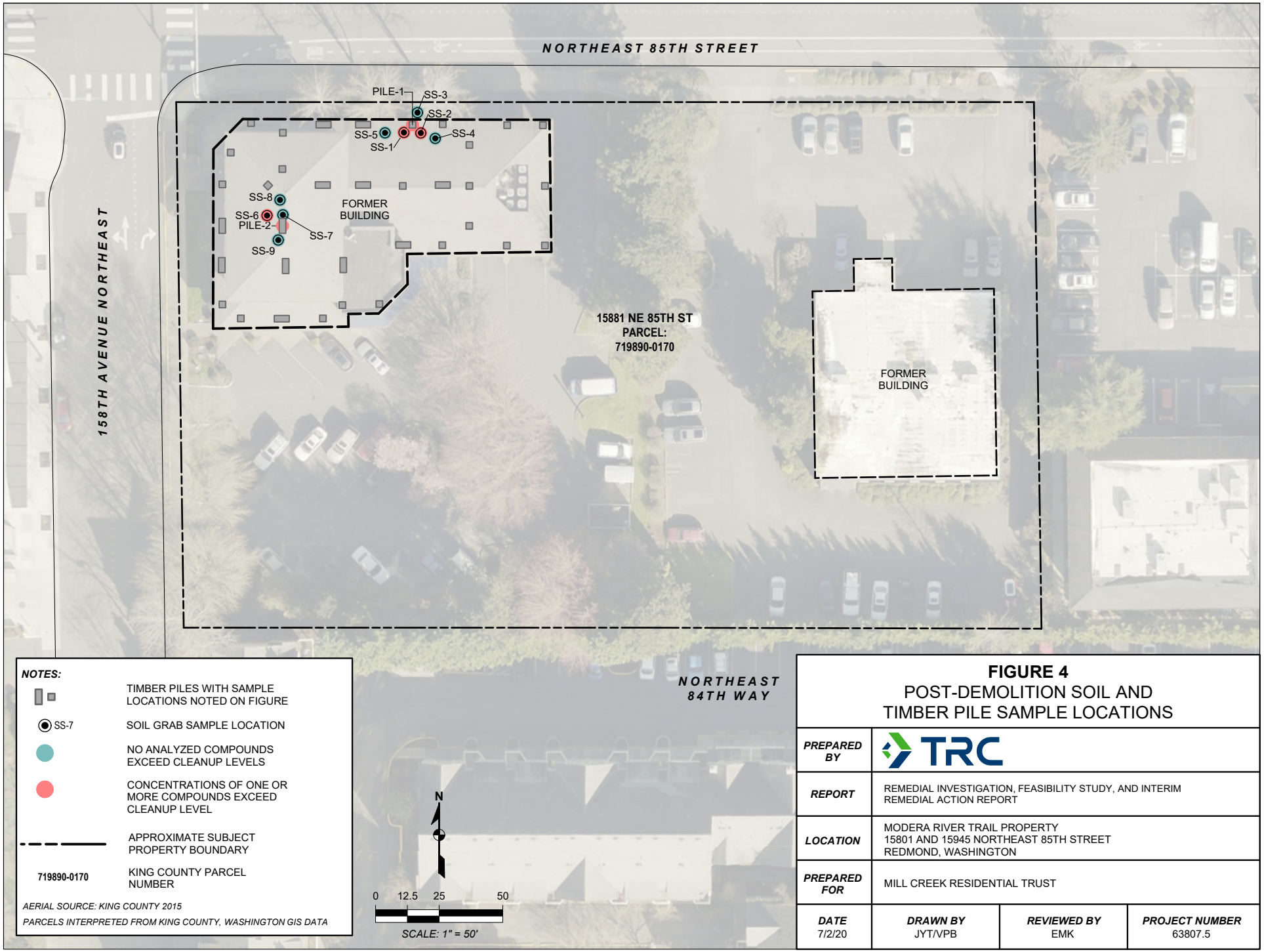
BUILDING PLAN: MODERA RIVER TRAIL, SHEET C3.01 SITE PLAN BY KPFF, 2019

AERIAL SOURCE: KING COUNTY 2015

PARCELS INTERPRETED FROM KING COUNTY, WASHINGTON GIS DATA

FIGURE 3
SITE REPRESENTATION WITH PROPOSED BUILDING OUTLINE

PREPARED BY	TRC		
REPORT	REMEDIAL INVESTIGATION, FEASIBILITY STUDY, AND INTERIM REMEDIAL ACTION REPORT		
LOCATION	MODERA RIVER TRAIL PROPERTY 15801 AND 15945 NORTHEAST 85TH STREET REDMOND, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 7/2/20	***DRAWN BY*** JYT/VPB	***REVIEWED BY*** EMK	***PROJECT NUMBER*** 63807.5



NOTES:

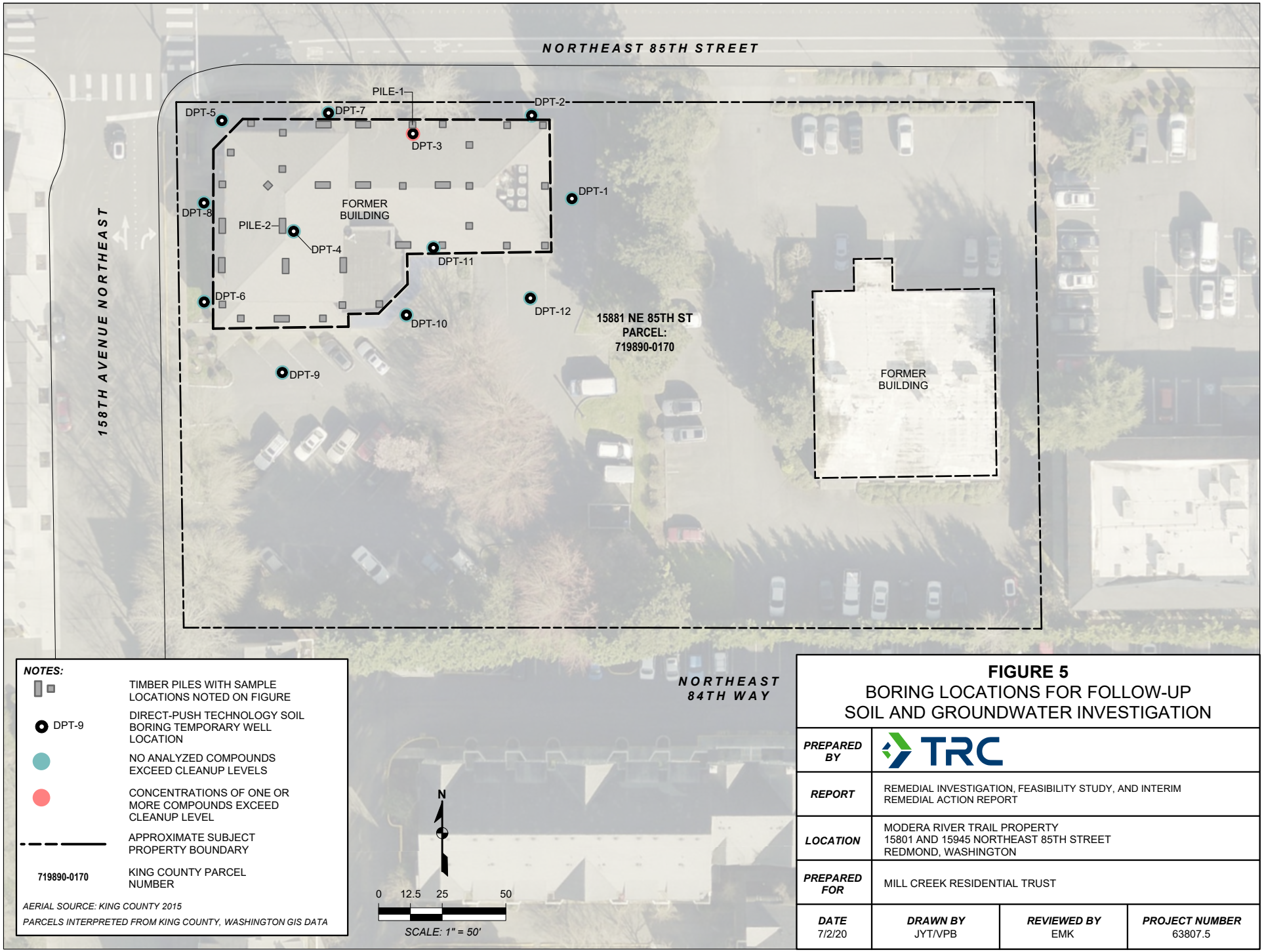
- TIMBER PILES WITH SAMPLE LOCATIONS NOTED ON FIGURE
- SS-7 — SOIL GRAB SAMPLE LOCATION
- NO ANALYZED COMPOUNDS EXCEED CLEANUP LEVELS
- CONCENTRATIONS OF ONE OR MORE COMPOUNDS EXCEED CLEANUP LEVEL
- APPROXIMATE SUBJECT PROPERTY BOUNDARY
- 719890-0170 — KING COUNTY PARCEL NUMBER

AERIAL SOURCE: KING COUNTY 2015

PARCELS INTERPRETED FROM KING COUNTY, WASHINGTON GIS DATA

FIGURE 4
POST-DEMOLITION SOIL AND TIMBER PILE SAMPLE LOCATIONS

PREPARED BY	TRC		
REPORT	REMEDIAL INVESTIGATION, FEASIBILITY STUDY, AND INTERIM REMEDIAL ACTION REPORT		
LOCATION	MODERA RIVER TRAIL PROPERTY 15801 AND 15945 NORTHEAST 85TH STREET REDMOND, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 7/2/20	**DRAWN BY** JYT/VPB	**REVIEWED BY** EMK	**PROJECT NUMBER** 63807.5



NOTES:

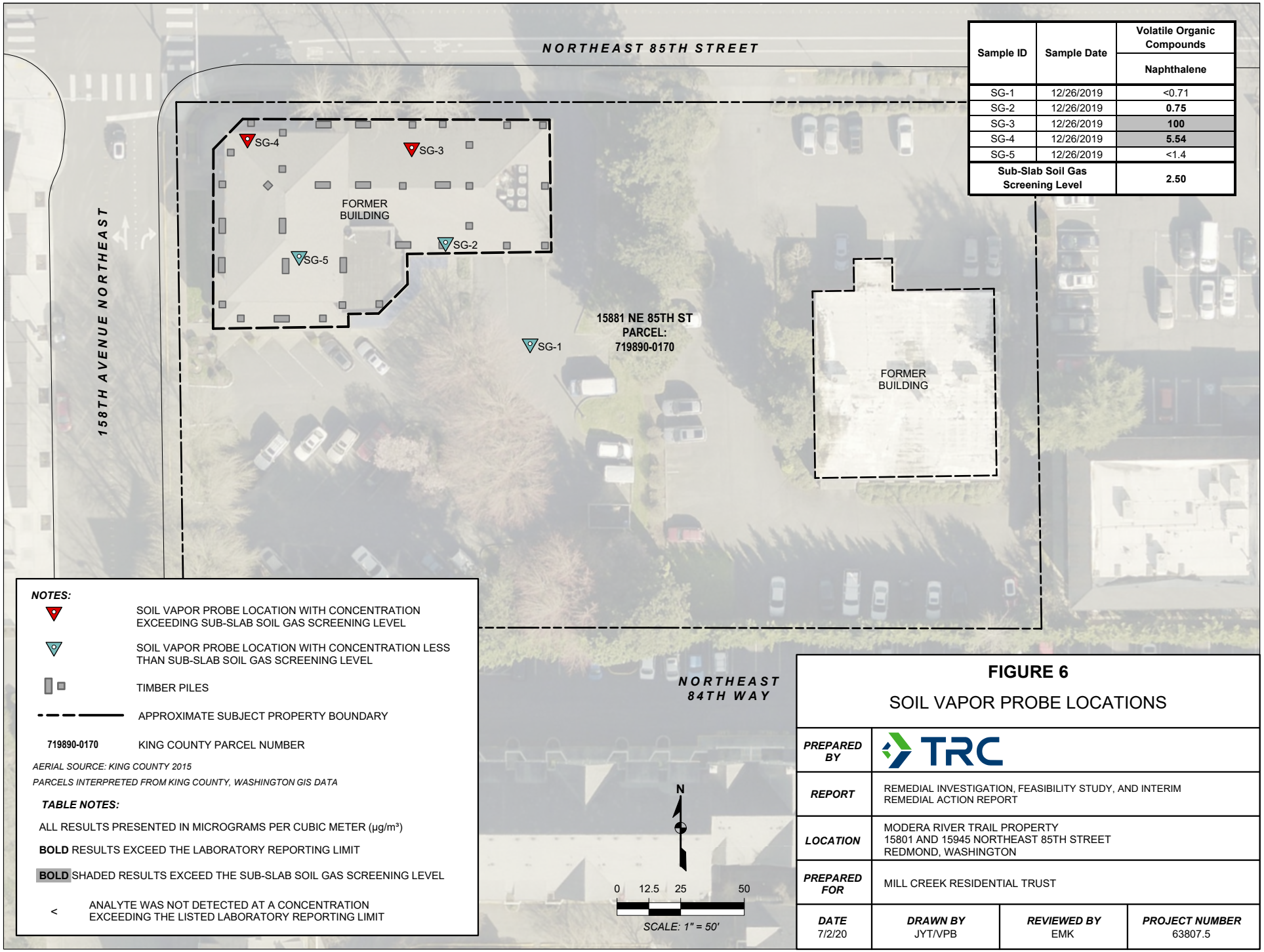
- TIMBER PILES WITH SAMPLE LOCATIONS NOTED ON FIGURE
- DPT-9: DIRECT-PUSH TECHNOLOGY SOIL BORING TEMPORARY WELL LOCATION
- NO ANALYZED COMPOUNDS EXCEED CLEANUP LEVELS
- CONCENTRATIONS OF ONE OR MORE COMPOUNDS EXCEED CLEANUP LEVEL
- APPROXIMATE SUBJECT PROPERTY BOUNDARY
- 719890-0170: KING COUNTY PARCEL NUMBER

AERIAL SOURCE: KING COUNTY 2015

PARCELS INTERPRETED FROM KING COUNTY, WASHINGTON GIS DATA

FIGURE 5
BORING LOCATIONS FOR FOLLOW-UP SOIL AND GROUNDWATER INVESTIGATION

PREPARED BY	TRC		
REPORT	REMEDIAL INVESTIGATION, FEASIBILITY STUDY, AND INTERIM REMEDIAL ACTION REPORT		
LOCATION	MODERA RIVER TRAIL PROPERTY 15801 AND 15945 NORTHEAST 85TH STREET REDMOND, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 7/2/20	***DRAWN BY*** JYT/VPB	***REVIEWED BY*** EMK	***PROJECT NUMBER*** 63807.5



Sample ID	Sample Date	Volatile Organic Compounds
		Naphthalene
SG-1	12/26/2019	<0.71
SG-2	12/26/2019	**0.75**
SG-3	12/26/2019	**100**
SG-4	12/26/2019	**5.54**
SG-5	12/26/2019	<1.4
Sub-Slab Soil Gas Screening Level		**2.50**

NOTES:

SOIL VAPOR PROBE LOCATION WITH CONCENTRATION EXCEEDING SUB-SLAB SOIL GAS SCREENING LEVEL

SOIL VAPOR PROBE LOCATION WITH CONCENTRATION LESS THAN SUB-SLAB SOIL GAS SCREENING LEVEL

TIMBER PILES

APPROXIMATE SUBJECT PROPERTY BOUNDARY

719890-0170 KING COUNTY PARCEL NUMBER

AERIAL SOURCE: KING COUNTY 2015

PARCELS INTERPRETED FROM KING COUNTY, WASHINGTON GIS DATA

TABLE NOTES:

ALL RESULTS PRESENTED IN MICROGRAMS PER CUBIC METER (µg/m³)

BOLD RESULTS EXCEED THE LABORATORY REPORTING LIMIT

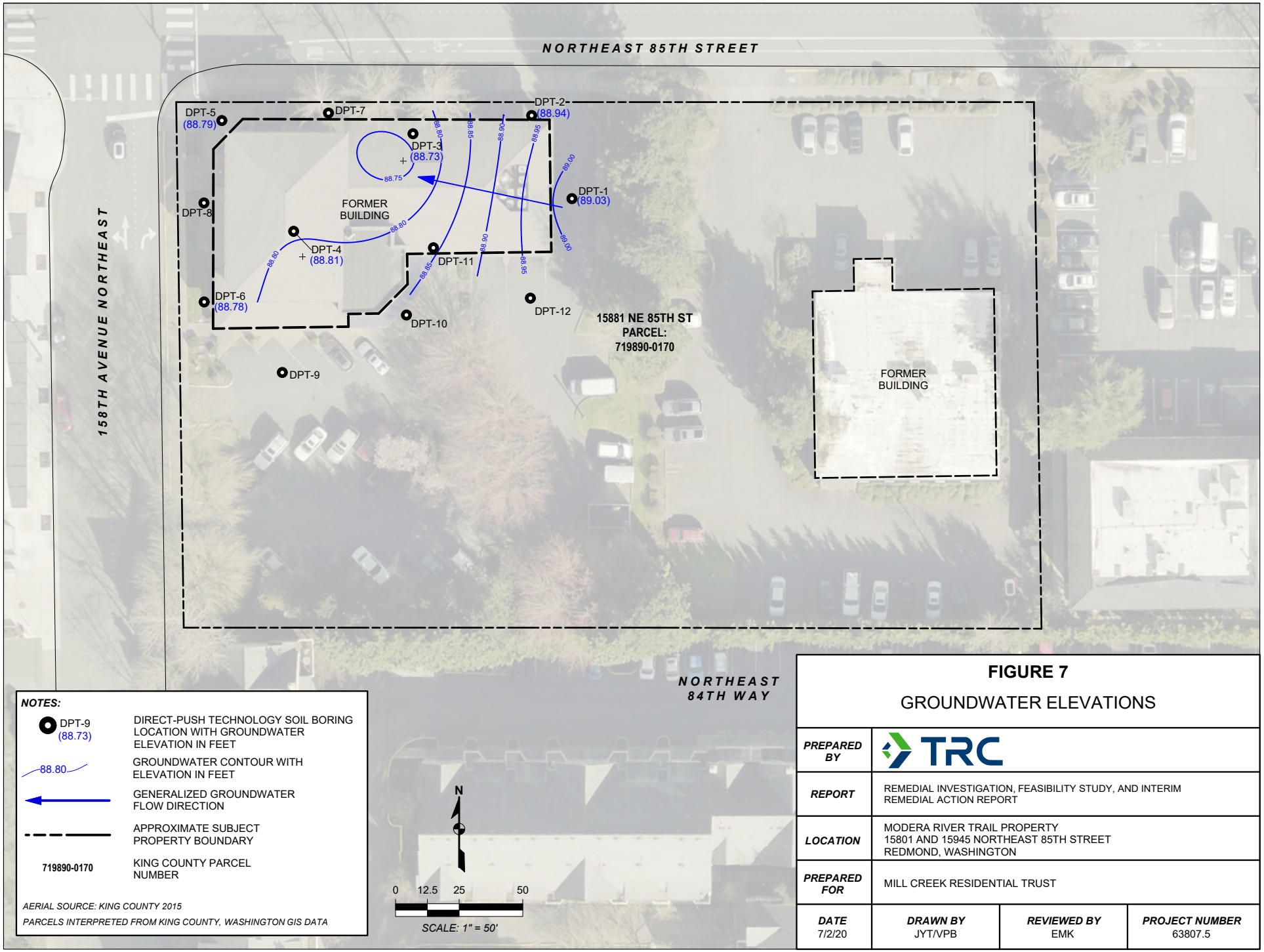
BOLD SHADED RESULTS EXCEED THE SUB-SLAB SOIL GAS SCREENING LEVEL

< ANALYTE WAS NOT DETECTED AT A CONCENTRATION EXCEEDING THE LISTED LABORATORY REPORTING LIMIT

FIGURE 6

SOIL VAPOR PROBE LOCATIONS

PREPARED BY	TRC		
REPORT	REMEDIAL INVESTIGATION, FEASIBILITY STUDY, AND INTERIM REMEDIAL ACTION REPORT		
LOCATION	MODERA RIVER TRAIL PROPERTY 15801 AND 15945 NORTHEAST 85TH STREET REDMOND, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 7/2/20	***DRAWN BY*** JYT/VPB	***REVIEWED BY*** EMK	***PROJECT NUMBER*** 63807.5



NOTES:

- DPT-9 (88.73) — DIRECT-PUSH TECHNOLOGY SOIL BORING LOCATION WITH GROUNDWATER ELEVATION IN FEET
- 88.80 — GROUNDWATER CONTOUR WITH ELEVATION IN FEET
- GENERALIZED GROUNDWATER FLOW DIRECTION
- APPROXIMATE SUBJECT PROPERTY BOUNDARY
- 719890-0170 — KING COUNTY PARCEL NUMBER

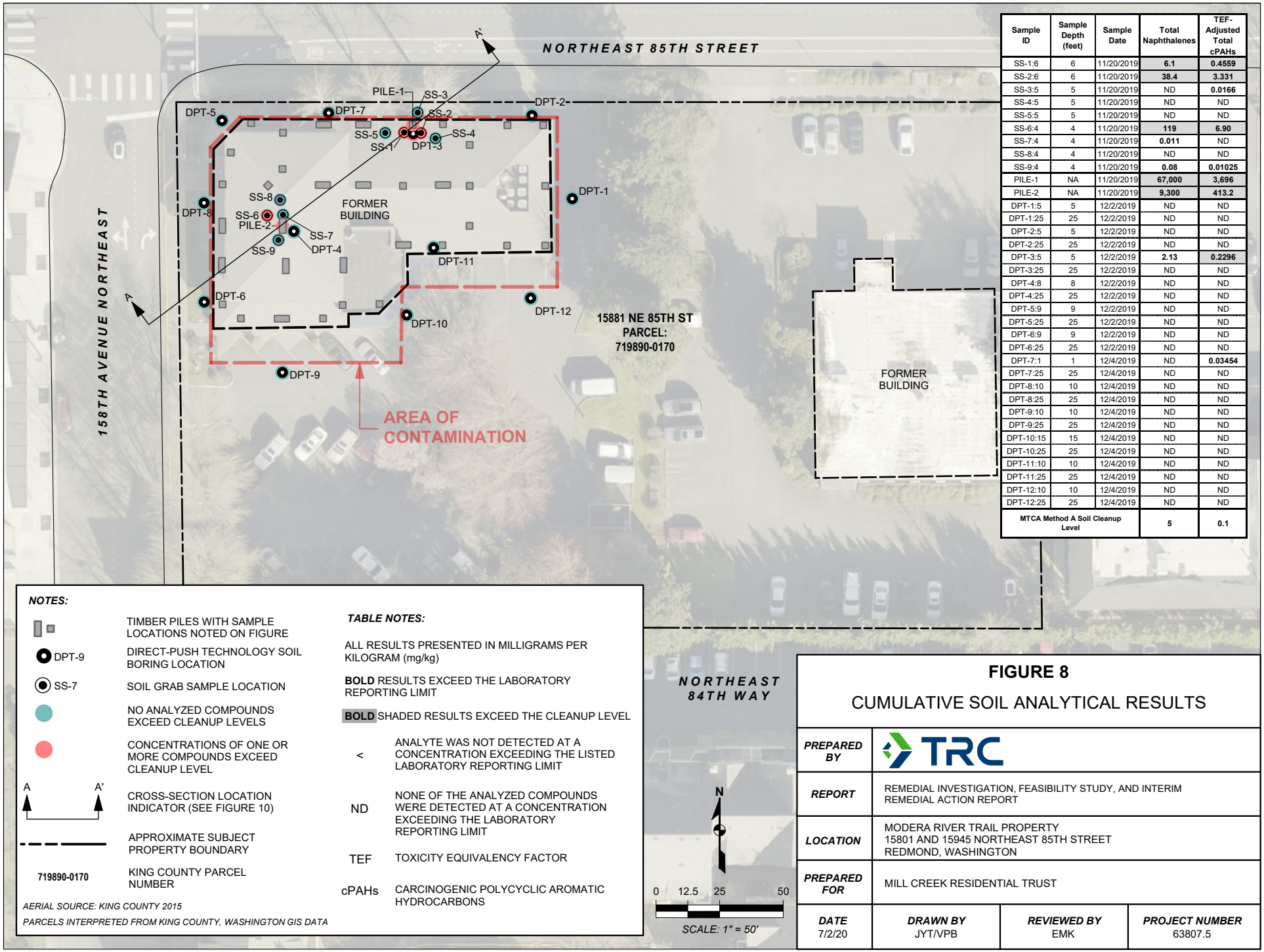
AERIAL SOURCE: KING COUNTY 2015

PARCELS INTERPRETED FROM KING COUNTY, WASHINGTON GIS DATA

FIGURE 7

GROUNDWATER ELEVATIONS

PREPARED BY	TRC		
REPORT	REMEDIAL INVESTIGATION, FEASIBILITY STUDY, AND INTERIM REMEDIAL ACTION REPORT		
LOCATION	MODERA RIVER TRAIL PROPERTY 15801 AND 15945 NORTHEAST 85TH STREET REDMOND, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 7/2/20	***DRAWN BY*** JYT/VPB	***REVIEWED BY*** EMK	***PROJECT NUMBER*** 63807.5



Sample ID	Sample Depth (feet)	Sample Date	Total Naphthalenes	TEF-Adjusted Total cPAHs
SS-1:6	6	11/20/2019	**6.1**	**0.4559**
SS-2:6	6	11/20/2019	**38.4**	**3.331**
SS-3:5	5	11/20/2019	ND	**0.0166**
SS-4:5	5	11/20/2019	ND	ND
SS-5:5	5	11/20/2019	ND	ND
SS-6:4	4	11/20/2019	**119**	**6.90**
SS-7:4	4	11/20/2019	**0.011**	ND
SS-8:4	4	11/20/2019	ND	ND
SS-9:4	4	11/20/2019	**0.08**	**0.01025**
PILE-1	NA	11/20/2019	**67,000**	**3,696**
PILE-2	NA	11/20/2019	**9,300**	**413.2**
DPT-1:5	5	12/2/2019	ND	ND
DPT-1:25	25	12/2/2019	ND	ND
DPT-2:5	5	12/2/2019	ND	ND
DPT-2:25	25	12/2/2019	ND	ND
DPT-3:5	5	12/2/2019	**2.13**	**0.2296**
DPT-3:25	25	12/2/2019	ND	ND
DPT-4:8	8	12/2/2019	ND	ND
DPT-4:25	25	12/2/2019	ND	ND
DPT-5:9	9	12/2/2019	ND	ND
DPT-5:25	25	12/2/2019	ND	ND
DPT-6:9	9	12/2/2019	ND	ND
DPT-6:25	25	12/2/2019	ND	ND
DPT-7:1	1	12/4/2019	ND	**0.03454**
DPT-7:25	25	12/4/2019	ND	ND
DPT-8:10	10	12/4/2019	ND	ND
DPT-8:25	25	12/4/2019	ND	ND
DPT-9:10	10	12/4/2019	ND	ND
DPT-9:25	25	12/4/2019	ND	ND
DPT-10:15	15	12/4/2019	ND	ND
DPT-10:25	25	12/4/2019	ND	ND
DPT-11:10	10	12/4/2019	ND	ND
DPT-11:25	25	12/4/2019	ND	ND
DPT-12:10	10	12/4/2019	ND	ND
DPT-12:25	25	12/4/2019	ND	ND
MTCA Method A Soil Cleanup Level			**5**	**0.1**

NOTES:

- TIMBER PILES WITH SAMPLE LOCATIONS NOTED ON FIGURE
- DPT-9 — DIRECT-PUSH TECHNOLOGY SOIL BORING LOCATION
- SS-7 — SOIL GRAB SAMPLE LOCATION
- NO ANALYZED COMPOUNDS EXCEED CLEANUP LEVELS
- CONCENTRATIONS OF ONE OR MORE COMPOUNDS EXCEED CLEANUP LEVEL
- A — A' — CROSS-SECTION LOCATION INDICATOR (SEE FIGURE 10)
- APPROXIMATE SUBJECT PROPERTY BOUNDARY
- 719890-0170 — KING COUNTY PARCEL NUMBER

AERIAL SOURCE: KING COUNTY 2015

PARCELS INTERPRETED FROM KING COUNTY, WASHINGTON GIS DATA

TABLE NOTES:

ALL RESULTS PRESENTED IN MILLIGRAMS PER KILOGRAM (mg/kg)

BOLD RESULTS EXCEED THE LABORATORY REPORTING LIMIT

BOLD SHADED RESULTS EXCEED THE CLEANUP LEVEL

< — ANALYTE WAS NOT DETECTED AT A CONCENTRATION EXCEEDING THE LISTED LABORATORY REPORTING LIMIT

ND — NONE OF THE ANALYZED COMPOUNDS WERE DETECTED AT A CONCENTRATION EXCEEDING THE LABORATORY REPORTING LIMIT

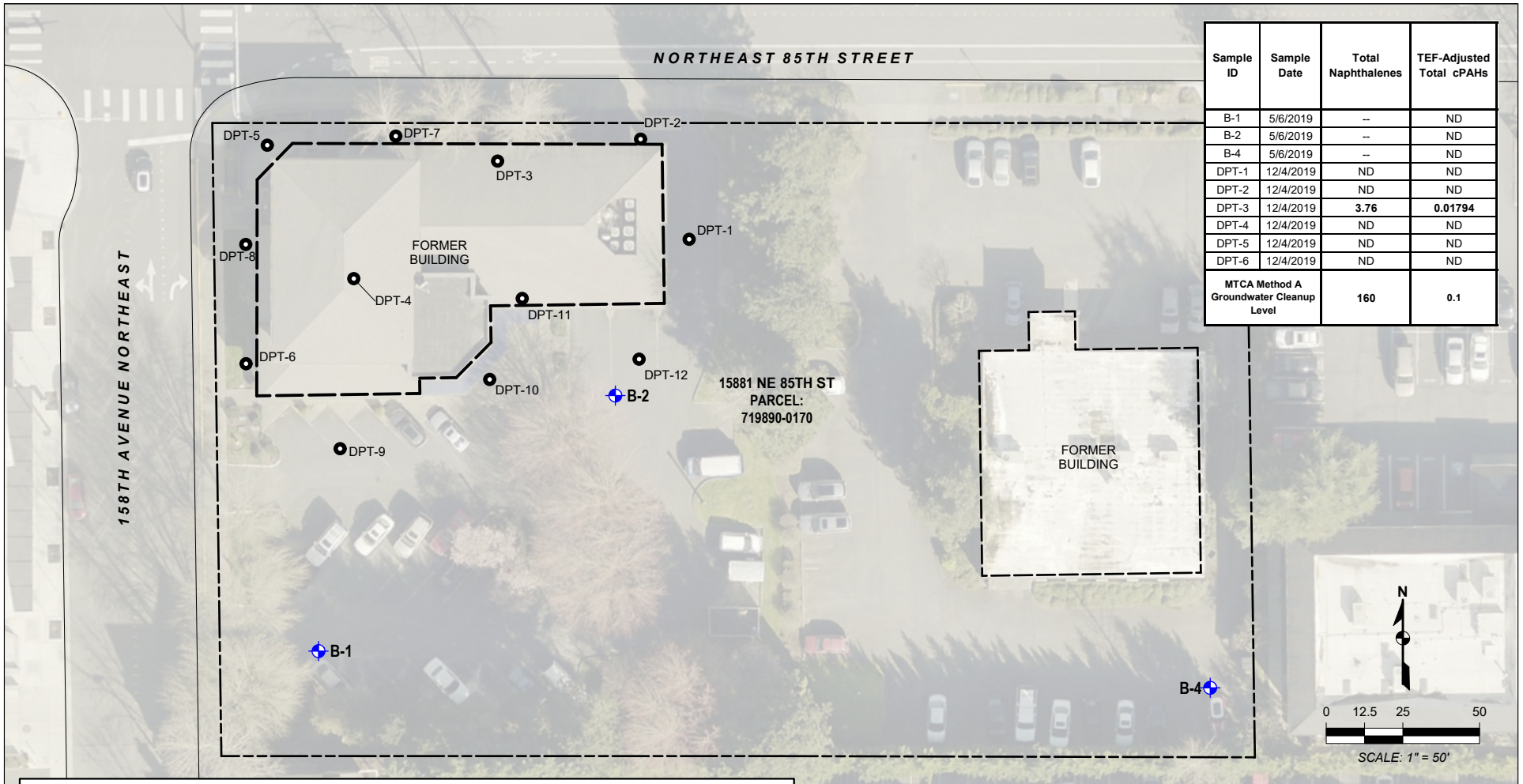
TEF — TOXICITY EQUIVALENCY FACTOR

cPAHs — CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS

FIGURE 8

CUMULATIVE SOIL ANALYTICAL RESULTS

PREPARED BY	TRC		
REPORT	REMEDIAL INVESTIGATION, FEASIBILITY STUDY, AND INTERIM REMEDIAL ACTION REPORT		
LOCATION	MODERA RIVER TRAIL PROPERTY 15801 AND 15945 NORTHEAST 85TH STREET REDMOND, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 7/2/20	***DRAWN BY*** JYT/VPB	***REVIEWED BY*** EMK	***PROJECT NUMBER*** 63807.5



Sample ID	Sample Date	Total Naphthalenes	TEF-Adjusted Total cPAHs
B-1	5/6/2019	--	ND
B-2	5/6/2019	--	ND
B-4	5/6/2019	--	ND
DPT-1	12/4/2019	ND	ND
DPT-2	12/4/2019	ND	ND
DPT-3	12/4/2019	**3.76**	**0.01794**
DPT-4	12/4/2019	ND	ND
DPT-5	12/4/2019	ND	ND
DPT-6	12/4/2019	ND	ND
MTCA Method A Groundwater Cleanup Level		**160**	**0.1**

NOTES:

DPT-9 — DIRECT-PUSH TECHNOLOGY SOIL BORING LOCATION WITH GROUNDWATER SAMPLE

B-1 — MONITORING WELL LOCATION

APPROXIMATE SUBJECT PROPERTY BOUNDARY

719890-0170 — KING COUNTY PARCEL NUMBER

AERIAL SOURCE: KING COUNTY 2015

PARCELS INTERPRETED FROM KING COUNTY, WASHINGTON GIS DATA

TABLE NOTES:

ALL RESULTS PRESENTED IN MICROGRAMS PER LITER (µg/L)

BOLD RESULTS EXCEED THE LABORATORY REPORTING LIMIT

< — ANALYTE WAS NOT DETECTED AT A CONCENTRATION EXCEEDING THE LISTED LABORATORY REPORTING LIMIT

ND — NONE OF THE ANALYZED COMPOUNDS WERE DETECTED AT A CONCENTRATION EXCEEDING THE LABORATORY REPORTING LIMIT

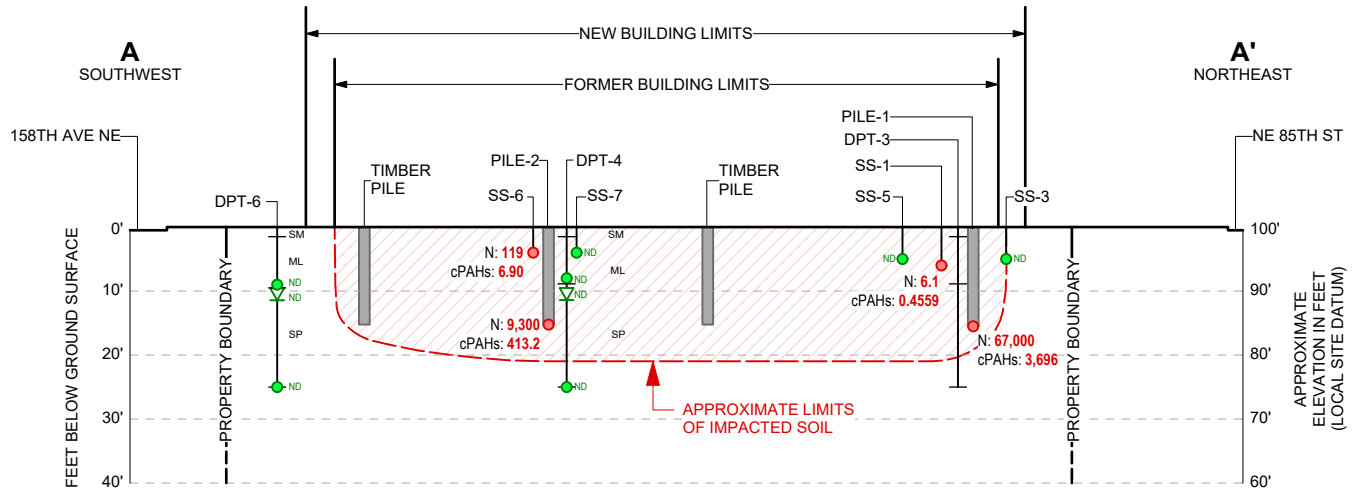
TEF — TOXICITY EQUIVALENCY FACTOR

cPAHs — CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS

FIGURE 9

GROUNDWATER ANALYTICAL RESULTS

PREPARED BY	ENVIRONMENTAL PARTNERS INC		
REPORT	REMEDIAL INVESTIGATION, FEASIBILITY STUDY, AND INTERIM REMEDIAL ACTION REPORT		
LOCATION	MODERA RIVER TRAIL PROPERTY 15801 AND 15945 NORTHEAST 85TH STREET REDMOND, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 7/2/20	***DRAWN BY*** JYT/VPB	***REVIEWED BY*** EMK	***PROJECT NUMBER*** 63807.5



0 5 10 15 30

SCALE: 1" = 30' 1H:1V

NOTES:

- SOIL SAMPLE LOCATION. NO ANALYZED COMPOUNDS EXCEED CLEANUP LEVELS.
- SOIL SAMPLE LOCATION. CONCENTRATIONS OF ONE OR MORE COMPOUNDS EXCEED CLEANUP LEVEL.
- GROUNDWATER SAMPLE LOCATION AND APPROXIMATE GROUNDWATER LEVEL (AS MEASURED 12/4/19). NO ANALYZED COMPOUNDS EXCEED CLEANUP LEVELS.

AERIAL SOURCE: KING COUNTY 2015

PARCELS INTERPRETED FROM KING COUNTY, WASHINGTON GIS DATA

ANALYTICAL NOTES:

NAPHTHALENE — N: 67,000

CARCINOGENIC POLYCYCLIC AROMATIC HYDROCARBONS — cPAHs: 3,696

SOIL ANALYTICAL RESULTS PRESENTED IN MILLIGRAMS PER KILOGRAM (mg/kg)

ND NO ANALYZED COMPOUNDS EXCEED CLEANUP LEVELS

LITHOLOGY NOTES:

SM SILTY SAND

ML SILT

SP POORLY GRADED SAND

FIGURE 10

CROSS-SECTION A-A'

PREPARED BY	TRC		
REPORT	REMEDIAL INVESTIGATION, FEASIBILITY STUDY, AND INTERIM REMEDIAL ACTION REPORT		
LOCATION	MODERA RIVER TRAIL PROPERTY 15801 AND 15945 NORTHEAST 85TH STREET REDMOND, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 7/2/20	***DRAWN BY*** JYT/VPB	***REVIEWED BY*** EMK	***PROJECT NUMBER*** 63807.5

Attachment A
Boring Logs

ENVIRONMENTAL PARTNERS INC

BORING ID: DPT-1

SITE ADDRESS: **15801 NE 85th St, Redmond, WA**	CLIENT: **MCRT West Coast**	CASING MATERIAL AND SIZE: **1" Sch 40 PVC**
DRILLING CONTRACTOR: **Cascade Drilling**	PROJECT #: **63807.5**	SCREEN SIZE: **0.010" Slot**
DRILLING EQUIPMENT: **Geoprobe 7822DT**	DATE: **12/2/19**	SCREEN INTERVAL: **5'-15' bgs**
DRILLING METHOD: **Direct Push Technology**	GROUND SURFACE ELEV. FT AMSL: **Not Measured**	FILTER PACK: **N/A**
LOGGED BY: **N. Dorfner** / BOREHOLE SIZE: **2.25"**	TOTAL DEPTH: **25' bgs**	FILTER PACK INTERVAL: **N/A**

Depth (feet)	USCS	Description (USCS name; Color; Moisture; Density; Plasticity; Dilatency; EPI description; Other)	Interval & % Recovery	PID (ppm)	Sample	Well Construction
0	SM	SILTY SAND WITH GRAVEL; dark brown; moist; loose; silty sand with gravel; no odor				
1	ML	SILT; light gray; moist; medium dense; silt with organics		0.0		
2			50	0.0		Temporary Well Casing
3				0.0		
4				0.0		
5				0.0	DPT-1:5	
6		6' Color becomes strong brown		0.0		
7		7.5' Damp	100	0.0		
8		8.5' Few sand		0.0		
9	SP	POORLY-GRADED SAND WITH GRAVEL; grayish brown with orange staining; wet; dense; poorly-graded medium to coarse-grained sand, rounded gravel		0.0		
10				0.0	DPT-1:10	Temporary Well Screen
11				0.0		
12			100	0.0		
13	SP	POORLY-GRADED SAND; grayish brown; wet; dense; poorly-graded medium-grained sand; no odor		0.0		
14				0.0		
15				0.0	DPT-1:15	
16				0.0		
17			100	0.0		
18				0.0		
19	SP	POORLY-GRADED SAND WITH GRAVEL; grayish brown; saturated; dense; poorly-graded medium to coarse-grained sand, rounded gravel		0.0		
20				0.0	DPT-1:20	
21				0.0		
22			100	0.0		
23				0.0		
24				0.0		
25				0.0	DPT-1:25	
26		End of Borehole				

NOTES: DTW = 9.49' bgs. Temporary well installed after boring DPT-1. GW Sample DPT-1 collected, then borehole filled with hydrated bentonite chips.

ENVIRONMENTAL PARTNERS INC

BORING ID: DPT-2

SITE ADDRESS	CLIENT:	CASING MATERIAL AND SIZE:
15801 NE 85th St, Redmond, WA	**MCRT West Coast**	**1" Sch 40 PVC**
DRILLING CONTRACTOR:	PROJECT #:	SCREEN SIZE:
Cascade Drilling	**63807.5**	**0.010" Slot**
DRILLING EQUIPMENT:	DATE:	SCREEN INTERVAL:
Geoprobe 7822DT	**12/2/19**	**5'-15' bgs**
DRILLING METHOD:	GROUND SURFACE ELEV. FT AMSL:	FILTER PACK:
Direct Push Technology	**Not Measured**	**N/A**
LOGGED BY: / BOREHOLE SIZE:	TOTAL DEPTH:	FILTER PACK INTERVAL:
N. Dorfner / **2.25"**	**25' bgs**	**N/A**

Depth (feet)	USCS	Description (USCS name; Color; Moisture; Density; Plasticity; Dilatency; EPI description; Other)	Interval & % Recovery	PID (ppm)	Sample	Well Construction
0–1	SM	SILTY SAND WITH GRAVEL; dark brown; moist; loose; silty sand with gravel; no odor		0.0		
2–4	ML	SILT; light gray; moist; medium dense; silt with organics	60	0.0		Temporary Well Casing
5	ML	5.5' Color becomes strong brown		0.0	DPT-2:5	
6–9	ML	8.5' Few sand	100	0.0		
10	SP	POORLY-GRADED SAND WITH GRAVEL; grayish brown with orange staining; wet; dense; poorly-graded medium to coarse-grained sand, rounded gravel; no odor		0.0	DPT-2:10	Temporary Well Screen
11–13	SP		90	0.0		
14	SP	POORLY-GRADED SAND; grayish brown; saturated; dense; poorly-graded medium-grained sand; no odor		0.0		
15	SP			0.0	DPT-2:15	
16–18	SP		100	0.0		
19	SP			0.0		
20	SP			0.0	DPT-2:20	
21–22	SP			0.0		
22	SP	POORLY-GRADED SAND WITH GRAVEL; grayish brown; saturated; dense; poorly-graded medium to coarse-grained sand, rounded gravel	100	0.0		
23	SP			0.0		
24	SP	POORLY-GRADED SAND; grayish brown; saturated; dense; poorly-graded medium sand		0.0		
25		End of Borehole		0.0	DPT-2:25	
26						

NOTES: DTW = 9.30' bgs. Temporary well installed after boring DPT-2. GW Sample DPT-2 collected, then borehole filled with hydrated bentonite chips.

ENVIRONMENTAL PARTNERS INC

BORING ID: DPT-3

SITE ADDRESS	CLIENT:	CASING MATERIAL AND SIZE:
15801 NE 85th St, Redmond, WA	**MCRT West Coast**	**1" Sch 40 PVC**
DRILLING CONTRACTOR:	PROJECT #:	SCREEN SIZE:
Cascade Drilling	**63807.5**	**0.010" Slot**
DRILLING EQUIPMENT:	DATE:	SCREEN INTERVAL:
Geoprobe 7822DT	**12/2/19**	**5'-15' bgs**
DRILLING METHOD:	GROUND SURFACE ELEV. FT AMSL:	FILTER PACK:
Direct Push Technology	**Not Measured**	**N/A**
LOGGED BY: / BOREHOLE SIZE:	TOTAL DEPTH:	FILTER PACK INTERVAL:
N. Dorfner / **2.25"**	**25' bgs**	**N/A**

Depth (feet)	USCS	Description (USCS name; Color; Moisture; Density; Plasticity; Dilatency; EPI description; Other)	Interval & % Recovery	PID (ppm)	Sample	Well Construction
0–4	SM	SILTY SAND WITH GRAVEL; dark brown; moist; loose; silty sand with gravel; no odor	25	0.0		Temporary Well Casing
5				5.5	DPT-3:5	
6–8			25			
9–10	SP	POORLY-GRADED SAND WITH GRAVEL; grayish brown; wet; dense; poorly-graded medium to coarse-grained sand, rounded gravel; no odor		3.7	DPT-3:10	Temporary Well Screen
11				0.0		
12–13	SP	POORLY-GRADED SAND; grayish brown; saturated; dense; poorly-graded medium to coarse-grained sand; no odor	100	0.8		
13				0.0		
14				0.0		
15				3.5	DPT-3:15	
16–17			90	0.0		
18				0.0		
19	GW	WELL-GRADED GRAVEL WITH SAND; grayish brown; saturated; dense; well-graded fine to coarse gravel with medium to coarse-grained sand; no odor		0.0		
20				0.0	DPT-3:20	
21				0.0		
22–23			90	0.0		
24				0.0		
25				0.0	DPT-3:25	
26		End of Borehole				

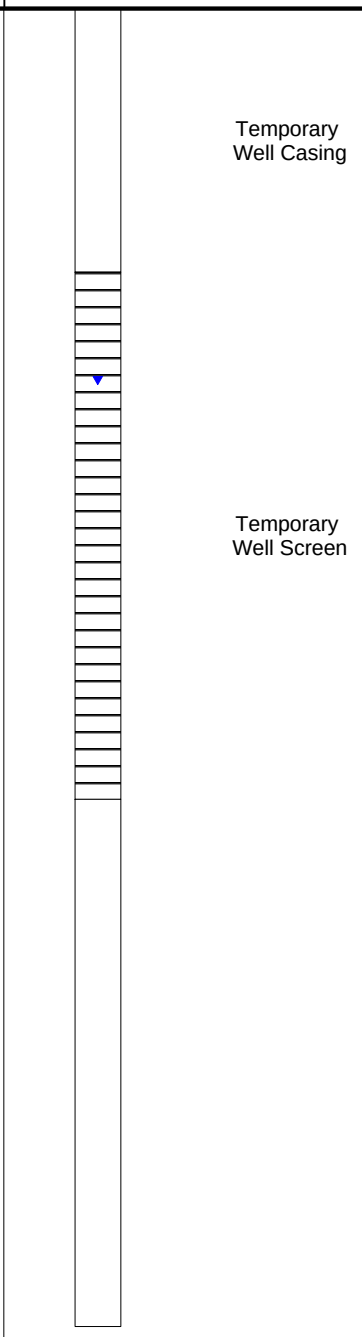
NOTES: DTW = 6.80' bgs. Temporary well installed after boring DPT-3. GW Sample DPT-3 collected, then borehole filled with hydrated bentonite chips.

ENVIRONMENTAL PARTNERS INC

BORING ID: DPT-4

SITE ADDRESS: **15801 NE 85th St, Redmond, WA**	CLIENT: **MCRT West Coast**	CASING MATERIAL AND SIZE: **1" Sch 40 PVC**
DRILLING CONTRACTOR: **Cascade Drilling**	PROJECT #: **63807.5**	SCREEN SIZE: **0.010" Slot**
DRILLING EQUIPMENT: **Geoprobe 7822DT**	DATE: **12/2/19**	SCREEN INTERVAL: **5'-15' bgs**
DRILLING METHOD: **Direct Push Technology**	GROUND SURFACE ELEV. FT AMSL: **Not Measured**	FILTER PACK: **N/A**
LOGGED BY: **N. Dorfner** / BOREHOLE SIZE: **2.25"**	TOTAL DEPTH: **25' bgs**	FILTER PACK INTERVAL: **N/A**

Depth (feet)	USCS	Description (USCS name; Color; Moisture; Density; Plasticity; Dilatency; EPI description; Other)	Interval & % Recovery	PID (ppm)	Sample
0	SM	SILTY SAND WITH GRAVEL; dark brown; moist; loose; silty sand with gravel; no odor		0.0	
1					
2	ML	SILT; light gray; moist; medium dense; silt with organics; no odor	60	0.0	
3					
4					
5				0.0	DPT-4:5
6		6' Color becomes dark brown		0.0	
7			90	0.0	
8				1.4	
9		POORLY-GRADED SAND WITH GRAVEL; dark gray to bluish gray; wet; dense; poorly-graded medium to coarse-grained sand, rounded gravel; no odor		0.0	
10				0.4	DPT-4:10
11				0.0	
12				0.3	
13		12.5' Color becomes grayish brown	90	0.0	
14				0.0	
15				0.0	DPT-4:15
16	SP			0.0	
17				0.0	
18			50	0.0	
19				0.0	
20				0.0	DPT-4:20
21				0.0	
22				0.0	
23			90	0.0	
24				0.0	
25		End of Borehole		0.0	DPT-4:25
26					



NOTES: DTW = 7.03' bgs. Temporary well installed after boring DPT-4. GW Sample DPT-4 collected, then borehole filled with hydrated bentonite chips.

ENVIRONMENTAL PARTNERS INC

BORING ID: DPT-5

SITE ADDRESS: **15801 NE 85th St, Redmond, WA**	CLIENT: **MCRT West Coast**	CASING MATERIAL AND SIZE: **1" Sch 40 PVC**
DRILLING CONTRACTOR: **Cascade Drilling**	PROJECT #: **63807.5**	SCREEN SIZE: **0.010" Slot**
DRILLING EQUIPMENT: **Geoprobe 7822DT**	DATE: **12/2/19**	SCREEN INTERVAL: **5'-15' bgs**
DRILLING METHOD: **Direct Push Technology**	GROUND SURFACE ELEV. FT AMSL: **Not Measured**	FILTER PACK: **N/A**
LOGGED BY: **N. Dorfner** / BOREHOLE SIZE: **2.25"**	TOTAL DEPTH: **25' bgs**	FILTER PACK INTERVAL: **N/A**

Depth (feet)	USCS	Description (USCS name; Color; Moisture; Density; Plasticity; Dilatency; EPI description; Other)	Interval & % Recovery	PID (ppm)	Sample
0–1	SM	SILTY SAND WITH GRAVEL; dark brown; moist; loose; silty sand with gravel; no odor		0.0	
1–5	ML	SILT; light gray; moist; medium dense; silt with organics; no odor	75	0.0 0.0 0.0 0.0	
5–9	ML	7.5' Color becomes dark brown	75	0.0 0.0 0.0 0.0	DPT-5:5
9–12	SP	POORLY-GRADED SAND; dark gray; wet; poorly-graded medium-grained sand; no odor	60	1.4 0.0 0.0 0.0	DPT-5:9
12–15	SP	POORLY-GRADED SAND WITH GRAVEL; dark gray to bluish gray; saturated; poorly-graded medium to coarse-grained sand, rounded gravel; no odor	60	0.0 0.0 0.0 0.0	DPT-5:15
15–20	SP	16' Color becomes grayish brown	60	0.0 0.0 0.0 0.0 0.0	DPT-5:20
20–25	SP		100	0.0 0.0 0.0 0.0 0.0	DPT-5:25
25–26		End of Borehole			

Well Construction: Temporary Well Casing; Temporary Well Screen

NOTES: DTW = 8.43' bgs. Temporary well installed after boring DPT-5. GW Sample DPT-5 collected, then borehole filled with hydrated bentonite chips.

ENVIRONMENTAL PARTNERS INC

BORING ID: DPT-6

SITE ADDRESS: **15801 NE 85th St, Redmond, WA**	CLIENT: **MCRT West Coast**	CASING MATERIAL AND SIZE: **1" Sch 40 PVC**
DRILLING CONTRACTOR: **Cascade Drilling**	PROJECT #: **63807.5**	SCREEN SIZE: **0.010" Slot**
DRILLING EQUIPMENT: **Geoprobe 7822DT**	DATE: **12/2/19**	SCREEN INTERVAL: **5'-15' bgs**
DRILLING METHOD: **Direct Push Technology**	GROUND SURFACE ELEV. FT AMSL: **Not Measured**	FILTER PACK: **N/A**
LOGGED BY: **N. Dorfner** / BOREHOLE SIZE: **2.25"**	TOTAL DEPTH: **25' bgs**	FILTER PACK INTERVAL: **N/A**

Depth (feet)	USCS	Description (USCS name; Color; Moisture; Density; Plasticity; Dilatency; EPI description; Other)	Interval & % Recovery	PID (ppm)	Sample	Well Construction
0–1	SM	SILTY SAND WITH GRAVEL; dark brown; moist; loose; silty sand with gravel; no odor		0.2		
2–4	ML	SILT; light gray; moist; medium dense; silt with organics	50	0.0		Temporary Well Casing
5	ML			0.2	DPT-6:5	
6	ML			0.0		
7	ML		50	1.1		
8	ML	8' Color becomes dark brown		0.0		
9	ML			2.3	DPT-6:9	
10–11	SP	POORLY-GRADED SAND WITH GRAVEL; dark gray to bluish gray; wet; dense; poorly-graded medium to coarse-grained sand, rounded gravel; no odor		0.0		Temporary Well Screen
12	SP		90	0.0		
13	SP	13.5' Color becomes grayish brown		0.0		
14	SP			0.0		
15	SP			0.0	DPT-6:15	
16	SP			0.0		
17	SP		100	0.0		
18	SP			0.0		
19	SP			0.0		
20	SP			0.0	DPT-6:20	
21	SP			0.0		
22	SP		100	0.0		
23	SP			0.0		
24	SP			0.0		
25	SP			0.0	DPT-6:25	
26		End of Borehole				

NOTES: DTW = 9.5' bgs. Temporary well installed after boring DPT-6. GW Sample DPT-6 collected, then borehole filled with hydrated bentonite chips.

ENVIRONMENTAL PARTNERS INC

BORING ID: DPT-7

SITE ADDRESS	CLIENT:	CASING MATERIAL AND SIZE:
15801 NE 85th St, Redmond, WA	**MCRT West Coast**	**1" Sch 40 PVC**
DRILLING CONTRACTOR:	PROJECT #:	SCREEN SIZE:
Cascade Drilling	**63807.5**	**0.010" Slot**
DRILLING EQUIPMENT:	DATE:	SCREEN INTERVAL:
Geoprobe 7822DT	**12/4/19**	**5'-15' bgs**
DRILLING METHOD:	GROUND SURFACE ELEV. FT AMSL:	FILTER PACK:
Direct Push Technology	**Not Measured**	**N/A**
LOGGED BY: / BOREHOLE SIZE:	TOTAL DEPTH:	FILTER PACK INTERVAL:
N. Dorfner / **2.25"**	**25' bgs**	**N/A**

Depth (feet)	USCS	Description (USCS name; Color; Moisture; Density; Plasticity; Dilatency; EPI description; Other)	Interval & % Recovery	PID (ppm)	Sample	Well Construction
0–3	SM	SILTY SAND WITH GRAVEL; dark brown; moist; loose; silty sand with gravel; no odor; roots 0'-1'	90	539.7 31.7 7.1	DPT-7:1	Temporary Well Casing
3–5	ML	SILT; light gray; moist; medium dense; silt with organics; no odor		3.8 14.0	DPT-7:5	
5–10	ML	6.5' Color becomes dark brown	100	5.5 3.3	DPT-7:10	Temporary Well Screen
10–15	SP	POORLY-GRADED SAND WITH GRAVEL; grayish brown; moist; dense; poorly-graded medium to coarse-grained sand, rounded gravel; no odor 11' Becomes wet 12' Color becomes bluish gray 14' Color becomes grayish brown	90	1.2 1.2 0.1	DPT-7:15	
15–20	SP		90	0.2 0.2	DPT-7:20	
20–25	SP / GW		100	0.2		
24–25	GW	WELL-GRADED GRAVEL WITH SAND; grayish brown; saturated; dense; well-graded gravel with medium to coarse-grained sand; no odor		0.2	DPT-7:25	
25		End of Borehole				

NOTES: DTW = 11' bgs. Temporary well installed after boring DPT-7. GW Sample DPT-7 collected, then borehole filled with hydrated bentonite chips.

ENVIRONMENTAL PARTNERS INC

BORING ID: DPT-8

SITE ADDRESS	CLIENT:	CASING MATERIAL AND SIZE:
15801 NE 85th St, Redmond, WA	**MCRT West Coast**	**1" Sch 40 PVC**
DRILLING CONTRACTOR:	PROJECT #:	SCREEN SIZE:
Cascade Drilling	**63807.5**	**0.010" Slot**
DRILLING EQUIPMENT:	DATE:	SCREEN INTERVAL:
Geoprobe 7822DT	**12/4/19**	**5'-15' bgs**
DRILLING METHOD:	GROUND SURFACE ELEV. FT AMSL:	FILTER PACK:
Direct Push Technology	**Not Measured**	**N/A**
LOGGED BY: / BOREHOLE SIZE:	TOTAL DEPTH:	FILTER PACK INTERVAL:
N. Dorfner / **2.25"**	**25' bgs**	**N/A**

Depth (feet)	USCS	Description (USCS name; Color; Moisture; Density; Plasticity; Dilatency; EPI description; Other)	Interval & % Recovery	PID (ppm)	Sample	Well Construction
0–1	SM	SILTY SAND WITH GRAVEL; dark brown to grayish brown; moist; loose; no odor		0.0		
1–2				0.0		Temporary Well Casing
2–3			60			
3–4	ML	SILT; light gray; moist; medium dense; silt with organics		0.0		
4–5				0.0		
5				0.0	DPT-8:5	
6				2.6		
7		7.5' Color becomes dark brown	75	0.0		
8				0.0		
9						
10				1.5	DPT-8:10	Temporary Well Screen
11	SP	POORLY-GRADED SAND WITH GRAVEL; dark gray to bluish gray; wet; dense; poorly-graded medium to coarse-grained sand, rounded gravel; no odor		0.4		
12			80	0.1		
13						
14		14' Color becomes grayish brown				
15				0.4	DPT-8:15	
16						
17	GW	WELL-GRADED GRAVEL WITH SAND; grayish brown; saturated; dense; well-graded gravel with medium to coarse-grained sand; no odor	60	0.0		
18				0.0		
19	SP	POORLY-GRADED SAND WITH GRAVEL; grayish brown; saturated; dense; poorly-graded medium to coarse-grained sand, rounded gravel; no odor				
20				0.0	DPT-8:20	
21						
22			80	0.1		
23				0.1		
24						
25		End of Borehole		0.1	DPT-8:25	
26						

NOTES: DTW = 11' bgs. Temporary well installed after boring DPT-8. GW Sample DPT-8 collected, then borehole filled with hydrated bentonite chips.

ENVIRONMENTAL PARTNERS INC

BORING ID: DPT-9

SITE ADDRESS: **15801 NE 85th St, Redmond, WA**	CLIENT: **MCRT West Coast**	CASING MATERIAL AND SIZE: **1" Sch 40 PVC**
DRILLING CONTRACTOR: **Cascade Drilling**	PROJECT #: **63807.5**	SCREEN SIZE: **0.010" Slot**
DRILLING EQUIPMENT: **Geoprobe 7822DT**	DATE: **12/4/19**	SCREEN INTERVAL: **5'-15' bgs**
DRILLING METHOD: **Direct Push Technology**	GROUND SURFACE ELEV. FT AMSL: **Not Measured**	FILTER PACK: **N/A**
LOGGED BY: **N. Dorfner** / BOREHOLE SIZE: **2.25"**	TOTAL DEPTH: **25' bgs**	FILTER PACK INTERVAL: **N/A**

Depth (feet)	USCS	Description (USCS name; Color; Moisture; Density; Plasticity; Dilatency; EPI description; Other)	Interval & % Recovery	PID (ppm)	Sample	Well Construction
0–1	SM	SILTY SAND WITH GRAVEL; dark brown to grayish brown; moist; loose; silty sand with gravel; no odor		0.0		
1–5	ML	SILT; light gray; moist; medium dense; silt with organics; no odor	60	0.0, 0.0, 0.0, 0.0		Temporary Well Casing
5–10	ML	7' Color becomes dark brown	60	0.0, 0.0, 0.0, 0.0, 0.0	DPT-9:5	
10–13	SP	POORLY-GRADED SAND WITH GRAVEL; dark gray to bluish gray; saturated; dense; poorly-graded medium to coarse-grained sand, rounded gravel; no odor	90	0.0, 0.0, 0.0, 0.0	DPT-9:10	Temporary Well Screen
13–20	SP	POORLY-GRADED SAND; grayish brown; saturated; dense; poorly-graded medium-grained sand; no odor	75	0.0, 0.0, 0.0, 0.0, 0.0, 0.0, 0.0	DPT-9:15	
20–21	SP	21' Transition to poorly-graded medium to coarse-grained sand		0.0	DPT-9:20	
21–23	GW	WELL-GRADED GRAVEL WITH SAND; grayish brown; saturated; dense; well-graded gravel with medium to coarse-grained sand; no odor	75	0.0, 0.0, 0.0, 0.0		
25		End of Borehole		0.0	DPT-9:25	

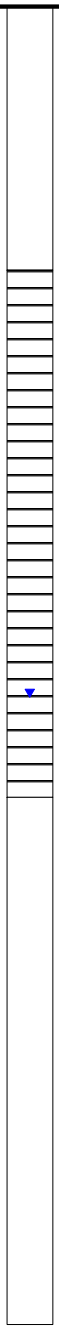
NOTES: DTW = 9.5' bgs. Temporary well installed after boring DPT-9. GW Sample DPT-9 collected, then borehole filled with hydrated bentonite chips.

ENVIRONMENTAL PARTNERS INC

BORING ID: DPT-10

SITE ADDRESS: **15801 NE 85th St, Redmond, WA**	CLIENT: **MCRT West Coast**	CASING MATERIAL AND SIZE: **1" Sch 40 PVC**
DRILLING CONTRACTOR: **Cascade Drilling**	PROJECT #: **63807.5**	SCREEN SIZE: **0.010" Slot**
DRILLING EQUIPMENT: **Geoprobe 7822DT**	DATE: **12/4/19**	SCREEN INTERVAL: **5'-15' bgs**
DRILLING METHOD: **Direct Push Technology**	GROUND SURFACE ELEV. FT AMSL: **Not Measured**	FILTER PACK: **N/A**
LOGGED BY: **N. Dorfner** / BOREHOLE SIZE: **2.25"**	TOTAL DEPTH: **25' bgs**	FILTER PACK INTERVAL: **N/A**

Depth (feet)	USCS	Description (USCS name; Color; Moisture; Density; Plasticity; Dilatency; EPI description; Other)	Interval & % Recovery	PID (ppm)	Sample	Well Construction
0–4	SM	SILTY SAND WITH GRAVEL; grayish brown; moist; loose; silty sand with gravel; no odor	50	0.0		Temporary Well Casing
5				0.0	DPT-10:5	
6–8			25	0.0		
9–12	ML	SILT; light gray; damp; medium dense; silt with organics; no odor 10' Color becomes dark brown	60	0.2	DPT-10:10	Temporary Well Screen
13–14	SP	POORLY-GRADED SAND WITH GRAVEL; dark gray to bluish gray; saturated; dense; poorly-graded medium to coarse-grained sand, rounded gravel; no odor		0.9		
15		14.5' Color becomes grayish brown		1.4	DPT-10:15	
16–17			90	1.3		
18–19	SP	POORLY-GRADED SAND; grayish brown; saturated; dense; poorly-graded medium to coarse-grained sand; no odor				
20				0.3	DPT-10:20	
21–22			100	0.0		
23–24	SP	POORLY-GRADED SAND WITH GRAVEL; grayish brown; saturated; dense; poorly-graded medium to coarse-grained sand, rounded gravel; no odor				
25				0.0	DPT-10:25	
26		End of Borehole				



NOTES: DTW = 13' bgs. Temporary well installed after boring DPT-10. GW Sample DPT-10 collected, then borehole filled with hydrated bentonite chips.

ENVIRONMENTAL PARTNERS INC

BORING ID: DPT-11

SITE ADDRESS: **15801 NE 85th St, Redmond, WA**	CLIENT: **MCRT West Coast**	CASING MATERIAL AND SIZE: **1" Sch 40 PVC**
DRILLING CONTRACTOR: **Cascade Drilling**	PROJECT #: **63807.5**	SCREEN SIZE: **0.010" Slot**
DRILLING EQUIPMENT: **Geoprobe 7822DT**	DATE: **12/4/19**	SCREEN INTERVAL: **5'-15' bgs**
DRILLING METHOD: **Direct Push Technology**	GROUND SURFACE ELEV. FT AMSL: **Not Measured**	FILTER PACK: **N/A**
LOGGED BY: **N. Dorfner** / BOREHOLE SIZE: **2.25"**	TOTAL DEPTH: **25' bgs**	FILTER PACK INTERVAL: **N/A**

Depth (feet)	USCS	Description (USCS name; Color; Moisture; Density; Plasticity; Dilatency; EPI description; Other)	Interval & % Recovery	PID (ppm)	Sample	Well Construction
0–3	SM	SILTY SAND WITH GRAVEL; dark brown; moist; loose; silty sand with gravel; no odor	50	0.0		Temporary Well Casing
3–8	ML	SILT; light gray; moist; medium dense; silt with organics; no odor 5' Color becomes dark brown	90	0.0 0.1 0.1	DPT-11:5	
8–15	SP	POORLY-GRADED SAND WITH GRAVEL; grayish brown; wet; dense; poorly-graded medium to coarse-grained sand, rounded gravel; no odor	50	1.1 0.0 0.0 0.0	DPT-11:10 DPT-11:15	Temporary Well Screen
15–20	SP	POORLY-GRADED SAND; grayish brown; wet; dense; poorly-graded medium to coarse-grained sand; no odor	100	0.0 0.0 0.0	DPT-11:20	
20–25	SP	22'-24' Minor gravel	100	0.2 0.0 0.0	DPT-11:25	
25–26		End of Borehole				

NOTES: DTW = 8.5' bgs. Temporary well installed after boring DPT-11. GW Sample DPT-11 collected, then borehole filled with hydrated bentonite chips.

ENVIRONMENTAL PARTNERS INC

BORING ID: DPT-12

SITE ADDRESS: **15801 NE 85th St, Redmond, WA**	CLIENT: **MCRT West Coast**	CASING MATERIAL AND SIZE: **1" Sch 40 PVC**
DRILLING CONTRACTOR: **Cascade Drilling**	PROJECT #: **63807.5**	SCREEN SIZE: **0.010" Slot**
DRILLING EQUIPMENT: **Geoprobe 7822DT**	DATE: **12/4/19**	SCREEN INTERVAL: **5'-15' bgs**
DRILLING METHOD: **Direct Push Technology**	GROUND SURFACE ELEV. FT AMSL: **Not Measured**	FILTER PACK: **N/A**
LOGGED BY: **N. Dorfner** / BOREHOLE SIZE: **2.25"**	TOTAL DEPTH: **25' bgs**	FILTER PACK INTERVAL: **N/A**

Depth (feet)	USCS	Description (USCS name; Color; Moisture; Density; Plasticity; Dilatency; EPI description; Other)	Interval & % Recovery	PID (ppm)	Sample	Well Construction
0		Asphalt Surface				
1	SM	SILTY SAND WITH GRAVEL; grayish brown; moist; loose; silty sand with gravel; no odor	50	0.0		Temporary Well Casing
2				0.0		
3						
4	ML	SILT; light gray; moist; medium dense; silt with organics; no odor				
5				0.0	DPT-12:5	
6						
7		7.5' Color becomes dark brown	75	0.0		
8				0.0		
9						
10	SP	POORLY-GRADED SAND WITH GRAVEL; dark gray to bluish gray; moist; dense; poorly-graded medium to coarse-grained sand, rounded gravel; no odor		0.0	DPT-12:10	Temporary Well Screen
11						
12		12' Wet	75	0.0		
13		13' Color becomes grayish brown		0.0		
14						
15				0.0	DPT-12:15	
16						
17			100	0.0		
18				0.0		
19						
20				0.0		
21				0.1		
22				0.0		
23	SP	POORLY-GRADED SAND; grayish brown; saturated; dense; poorly-graded medium to coarse-grained sand; no odor	100	0.0		
24						
25		End of Borehole		0.0	DPT-12:25	
26						

NOTES: DTW = 12' bgs. Temporary well installed after boring DPT-12. GW Sample DPT-12 collected, then borehole filled with hydrated bentonite chips.

Attachment B
Terrestrial Ecological Evaluation

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: MODERA RIVER TRAIL PROPERTY	
Facility/Site Address: 15881 NE 85TH STREET, REDMOND, WA	
Facility/Site No: N/A	VCP Project No.: N/A

Step 2: IDENTIFY EVALUATOR		
Please identify below the person who conducted the evaluation and their contact information.		
Name: MR. ERIC KOLTES, L.G.		Title: SENIOR GEOLOGIST
Organization: TRC ENVIRONMENTAL CORPORATION		
Mailing address: 1180 NW MAPLE STREET, SUITE 310		
City: ISSAQUAH	State: WA	Zip code: 98027
Phone: 425-395-0010	Fax:	E-mail: EKOLTES@TRCCOMPANIES.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.

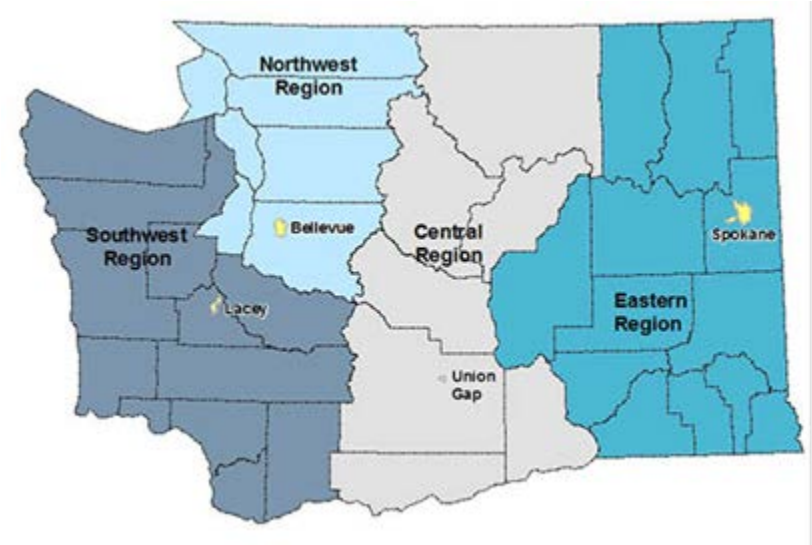
5. Have you already obtained Ecology's approval of both your problem formulation and problem resolution steps?

☐ 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.

Attachment C
Laboratory Analytical Reports

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

May 13, 2019

Eric Koltes, Project Manager
Environmental Partners, Inc.
1180 NW Maple St, Suite 310
Issaquah, WA 98027

RE: 63807, F&BI 905122

Dear Mr Koltes:

Included are the results from the testing of material submitted on May 6, 2019 from the 63807, F&BI 905122 project. There are 7 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Cynthia Moon
EPI0513R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on May 6, 2019 by Friedman & Bruya, Inc. from the Environmental Partners 63807, F&BI 905122 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Environmental Partners
905122-01	B-1
905122-02	B-2
905122-03	B-4

All quality control requirements were acceptable.

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	B-1	Client:	Environmental Partners
Date Received:	05/06/19	Project:	63807, F&BI 905122
Date Extracted:	05/07/19	Lab ID:	905122-01 1/2
Date Analyzed:	05/08/19	Data File:	050813.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	108	31	160
Benzo(a)anthracene-d12	94	25	165

Compounds:	Concentration ug/L (ppb)
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	B-2	Client:	Environmental Partners
Date Received:	05/06/19	Project:	63807, F&BI 905122
Date Extracted:	05/07/19	Lab ID:	905122-02 1/2
Date Analyzed:	05/08/19	Data File:	050814.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	106	31	160
Benzo(a)anthracene-d12	98	25	165

Compounds:	Concentration ug/L (ppb)
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	B-4	Client:	Environmental Partners
Date Received:	05/06/19	Project:	63807, F&BI 905122
Date Extracted:	05/07/19	Lab ID:	905122-03 1/2
Date Analyzed:	05/08/19	Data File:	050815.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	108	31	160
Benzo(a)anthracene-d12	103	25	165

Compounds:	Concentration ug/L (ppb)
Benz(a)anthracene	<0.04
Chrysene	<0.04
Benzo(a)pyrene	<0.04
Benzo(b)fluoranthene	<0.04
Benzo(k)fluoranthene	<0.04
Indeno(1,2,3-cd)pyrene	<0.04
Dibenz(a,h)anthracene	<0.04

Analysis For Semivolatile Compounds By EPA Method 8270E SIM

Client Sample ID:	Method Blank	Client:	Environmental Partners
Date Received:	Not Applicable	Project:	63807, F&BI 905122
Date Extracted:	05/07/19	Lab ID:	09-1049 mb
Date Analyzed:	05/08/19	Data File:	050806.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	106	31	160
Benzo(a)anthracene-d12	116	25	165

Compounds:	Concentration ug/L (ppb)
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02

Date of Report: 05/13/19
Date Received: 05/06/19
Project: 63807, F&BI 905122

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270E SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Benz(a)anthracene	ug/L (ppb)	1	94	92	60-118	2
Chrysene	ug/L (ppb)	1	92	90	66-125	2
Benzo(b)fluoranthene	ug/L (ppb)	1	87	86	55-135	1
Benzo(k)fluoranthene	ug/L (ppb)	1	86	87	62-125	1
Benzo(a)pyrene	ug/L (ppb)	1	90	89	58-127	1
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	94	89	36-142	5
Dibenz(a,h)anthracene	ug/L (ppb)	1	89	85	37-133	5

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 analyte 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 due to sample matrix effects.

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.

905122

SAMPLE CHAIN OF CUSTODY

ME 05-06-19

Page # 1 of 1 DO4

Report To Eric Kolles, Betsy Wing

Company EPI

Address 1180 NW Maple St Suite 310

City, State, ZIP Issaquah, WA 98027

Phone (425) 395-0010 Email erick@epi-wa.com betsyw@epi-wa.com

SAMPLERS (signature) Betsy Wing

PROJECT NAME Redmond II

PO # 03807

REMARKS Need results by Friday, May 10th @ 1200pm

INVOICE TO EPI

TURNAROUND TIME
- ☐ Standard Turnaround
- ☒ RUSH Results by 5/10/19 @ 1200
- Rush charges authorized by:

SAMPLE DISPOSAL
- ☒ Dispose after 30 days
- ☐ Archive Samples
- ☐ Other

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	cPAHs-8270				Notes
						ANALYSES REQUESTED											
B-1	01	5/6/19	1120	H_2O	1								X				
B-2	02	5/6/19	1200	H_2O	1								X				
B-4	03	5/6/19	1240	H_2O	1								X				

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by: Betsy Wing	Betsy Wing	EPI	5/6/19	1538
Received by: D. M-R	Liz Webber-Bruya	F?B1	5/6/19	1538
Relinquished by:				
Received by:				

Samples received at 4 °C

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

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Arina Podnozova, B.S.
Eric Young, B.S.

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www.friedmanandbruya.com

December 2, 2019

Eric Koltes, Project Manager
Environmental Partners, Inc.
1180 NW Maple St, Suite 310
Issaquah, WA 98027

RE: MCRT Redmond 68307, F&BI 911317

Dear Mr Koltes:

Included are the results from the testing of material submitted on November 20, 2019 from the MCRT Redmond 68307, F&BI 911317 project. There are 19 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Cynthia Moon, Nate Hinsperger
EPI1202R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on November 20, 2019 by Friedman & Bruya, Inc. from the Environmental Partners MCRT Redmond 68307, F&BI 911317 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Environmental Partners
911317-01	PILE-1
911317-02	SS-1:6
911317-03	SS-2:6
911317-04	PILE-2
911317-05	SS-6:4
911317-06	SS-7:4
911317-07	SS-8:4
911317-08	SS-9:4
911317-09	SS-3:5
911317-10	SS-4:5
911317-11	SS-5:5

2-Methylnaphthalene was detected in the 8270D SIM method blank at a level greater than one tenth the concentration detected in sample SS-7:4. The data were flagged accordingly.

All other quality control requirements were acceptable.

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	PILE-1	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-01 1/5000
Date Analyzed:	11/21/19	Data File:	112112.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	259 d	31	163
Benzo(a)anthracene-d12	246 d	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	9,500 ve
2-Methylnaphthalene	19,000 ve
1-Methylnaphthalene	9,600 ve
Benz(a)anthracene	4,600 ve
Chrysene	4,600 ve
Benzo(a)pyrene	1,600
Benzo(b)fluoranthene	2,700 ve
Benzo(k)fluoranthene	880
Indeno(1,2,3-cd)pyrene	380
Dibenz(a,h)anthracene	110

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	PILE-1	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-01 1/100000
Date Analyzed:	11/25/19	Data File:	112517.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	0 d	31	163
Benzo(a)anthracene-d12	0 d	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	17,000
2-Methylnaphthalene	33,000
1-Methylnaphthalene	17,000
Benz(a)anthracene	8,500
Chrysene	7,700
Benzo(a)pyrene	2,200
Benzo(b)fluoranthene	3,600
Benzo(k)fluoranthene	1,600
Indeno(1,2,3-cd)pyrene	<1,000
Dibenz(a,h)anthracene	<1,000

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SS-1:6	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-02 1/5
Date Analyzed:	11/21/19	Data File:	112108.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	91	31	163
Benzo(a)anthracene-d12	99	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	1.3
2-Methylnaphthalene	2.9 ve
1-Methylnaphthalene	1.4
Benz(a)anthracene	0.87
Chrysene	0.69
Benzo(a)pyrene	0.26
Benzo(b)fluoranthene	0.43
Benzo(k)fluoranthene	0.16
Indeno(1,2,3-cd)pyrene	0.069
Dibenz(a,h)anthracene	0.015

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SS-1:6	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-02 1/25
Date Analyzed:	11/21/19	Data File:	112119.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	119 d	31	163
Benzo(a)anthracene-d12	106 d	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	1.4
2-Methylnaphthalene	3.1
1-Methylnaphthalene	1.6
Benz(a)anthracene	0.96
Chrysene	0.77
Benzo(a)pyrene	0.28
Benzo(b)fluoranthene	0.44
Benzo(k)fluoranthene	0.18
Indeno(1,2,3-cd)pyrene	0.087
Dibenz(a,h)anthracene	<0.05

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SS-2:6	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-03 1/25
Date Analyzed:	11/21/19	Data File:	112109.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	117 d	31	163
Benzo(a)anthracene-d12	116 d	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	8.0 ve
2-Methylnaphthalene	19 ve
1-Methylnaphthalene	9.6 ve
Benz(a)anthracene	6.2
Chrysene	5.0
Benzo(a)pyrene	2.1
Benzo(b)fluoranthene	3.3
Benzo(k)fluoranthene	1.3
Indeno(1,2,3-cd)pyrene	0.63
Dibenz(a,h)anthracene	0.14

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SS-2:6	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-03 1/500
Date Analyzed:	11/22/19	Data File:	112224.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	177 d	31	163
Benzo(a)anthracene-d12	113 d	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	8.4
2-Methylnaphthalene	20
1-Methylnaphthalene	10
Benz(a)anthracene	6.4
Chrysene	5.4
Benzo(a)pyrene	2.0
Benzo(b)fluoranthene	3.3
Benzo(k)fluoranthene	1.1
Indeno(1,2,3-cd)pyrene	<1
Dibenz(a,h)anthracene	<1

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	PILE-2	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-04 1/1000
Date Analyzed:	11/21/19	Data File:	112111.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	496 d	31	163
Benzo(a)anthracene-d12	349 d	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	2,500 ve
2-Methylnaphthalene	4,200 ve
1-Methylnaphthalene	2,000 ve
Benz(a)anthracene	780 ve
Chrysene	850 ve
Benzo(a)pyrene	260
Benzo(b)fluoranthene	430 ve
Benzo(k)fluoranthene	140
Indeno(1,2,3-cd)pyrene	70
Dibenz(a,h)anthracene	18

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	PILE-2	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-04 1/20000
Date Analyzed:	11/22/19	Data File:	112225.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	0 d	31	163
Benzo(a)anthracene-d12	0 d	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	2,700
2-Methylnaphthalene	4,500
1-Methylnaphthalene	2,100
Benz(a)anthracene	860
Chrysene	840
Benzo(a)pyrene	210
Benzo(b)fluoranthene	360
Benzo(k)fluoranthene	<200
Indeno(1,2,3-cd)pyrene	<200
Dibenz(a,h)anthracene	<200

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SS-6:4	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-05 1/500
Date Analyzed:	11/22/19	Data File:	112213.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	405 d	31	163
Benzo(a)anthracene-d12	138 d	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	33
2-Methylnaphthalene	59
1-Methylnaphthalene	27
Benz(a)anthracene	14
Chrysene	12
Benzo(a)pyrene	4.3
Benzo(b)fluoranthene	6.5
Benzo(k)fluoranthene	2.6
Indeno(1,2,3-cd)pyrene	1.2
Dibenz(a,h)anthracene	<1

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SS-7:4	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-06 1/5
Date Analyzed:	11/21/19	Data File:	112107.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	84	31	163
Benzo(a)anthracene-d12	81	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	0.011 fb
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SS-8:4	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-07 1/5
Date Analyzed:	11/22/19	Data File:	112210.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	81	31	163
Benzo(a)anthracene-d12	86	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SS-9:4	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-08 1/5
Date Analyzed:	11/22/19	Data File:	112207.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	80	31	163
Benzo(a)anthracene-d12	87	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	0.018
2-Methylnaphthalene	0.042
1-Methylnaphthalene	0.020
Benz(a)anthracene	0.023
Chrysene	0.025
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	0.012
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SS-3:5	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-09 1/5
Date Analyzed:	11/22/19	Data File:	112208.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	87	31	163
Benzo(a)anthracene-d12	97	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	0.010
Benzo(a)pyrene	0.012
Benzo(b)fluoranthene	0.017
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	0.013
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SS-4:5	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-10 1/5
Date Analyzed:	11/22/19	Data File:	112209.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	86	31	163
Benzo(a)anthracene-d12	94	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	SS-5:5	Client:	Environmental Partners
Date Received:	11/20/19	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	911317-11 1/5
Date Analyzed:	11/22/19	Data File:	112211.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	81	31	163
Benzo(a)anthracene-d12	89	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	Environmental Partners
Date Received:	Not Applicable	Project:	MCRT Redmond 68307, F&BI 911317
Date Extracted:	11/21/19	Lab ID:	09-2866 mb 1/5
Date Analyzed:	11/21/19	Data File:	112106.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	96	31	163
Benzo(a)anthracene-d12	95	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Date of Report: 12/02/19
Date Received: 11/20/19
Project: MCRT Redmond 68307, F&BI 911317

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR PAHS BY EPA METHOD 8270D SIM

Laboratory Code: 911317-06 1/5 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Acceptance Criteria
Naphthalene	mg/kg (ppm)	0.17	<0.01	81	44-129
2-Methylnaphthalene	mg/kg (ppm)	0.17	<0.01	79	45-135
1-Methylnaphthalene	mg/kg (ppm)	0.17	<0.01	81	40-141
Benz(a)anthracene	mg/kg (ppm)	0.17	<0.01	81	23-144
Chrysene	mg/kg (ppm)	0.17	<0.01	76	32-149
Benzo(b)fluoranthene	mg/kg (ppm)	0.17	<0.01	69	23-176
Benzo(k)fluoranthene	mg/kg (ppm)	0.17	<0.01	73	42-139
Benzo(a)pyrene	mg/kg (ppm)	0.17	<0.01	67	21-163
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.17	<0.01	62	23-170
Dibenz(a,h)anthracene	mg/kg (ppm)	0.17	<0.01	63	31-146

Laboratory Code: Laboratory Control Sample 1/5

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	mg/kg (ppm)	0.17	88	88	58-121	0
2-Methylnaphthalene	mg/kg (ppm)	0.17	89	89	58-123	0
1-Methylnaphthalene	mg/kg (ppm)	0.17	91	91	60-124	0
Benz(a)anthracene	mg/kg (ppm)	0.17	96	96	51-115	0
Chrysene	mg/kg (ppm)	0.17	93	93	55-129	0
Benzo(b)fluoranthene	mg/kg (ppm)	0.17	83	79	56-123	5
Benzo(k)fluoranthene	mg/kg (ppm)	0.17	81	84	54-131	4
Benzo(a)pyrene	mg/kg (ppm)	0.17	79	78	51-118	1
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.17	85	82	49-148	4
Dibenz(a,h)anthracene	mg/kg (ppm)	0.17	87	82	50-141	6

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 analyte 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 due to sample matrix effects.

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.

9113 IT

SAMPLE CHAIN OF CUSTODY

ME 11-20-19 Page # 1 of 2 B03

Report To ERIC KATES, NATE LINSPENGER

Company EPI

Address 1180 NW MAPLE ST. SUITE 310

City, State, ZIP ISSAQUAH, WA. 98027

Phone _____ Email _____

SAMPLERS (signature)

PROJECT NAME: NCRT REDMOND 68307

PO #

REMARKS

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME
- ☐ Standard turnaround
- ☒ RUSH 24 HR
- Rush charges authorized by:

SAMPLE DISPOSAL
- ☐ Archive samples
- ☐ Other
- Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	cPALs	Naphthalenes			Notes
						ANALYSES REQUESTED											✓ - per NH 11/21
PICE-1	01	11/20/19	755	SOIL	1								X	X			ARCHIVE ALL SAMPLES NOT MARKED FOR ANALYSIS
SS-1:6	02		758										X	X			
SS-2:6	03		800										X	X			
PICE-2	04		810										X	X			
SS-6:4	05		817										✓	✓			
SS-7:4	06		821										X	X			
SS-8:4	07		823										✓	✓			
SS-9:4	08		825										✓	✓			
SS-3:5	09		835										✓	✓			Samples received at 13 °C
SS-4:5	10	↓	837	↓	↓								✓	✓			

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	N. LINSPENGER	EPI	11/20/19	1445
Received by:	Khoi Hoang	FBE	11/20/19	1445
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

91317

SAMPLE CHAIN OF CUSTODY

ME 11-20-19

Page # 2 of 2 B03

Report To ERIC KOLES, NATE WINSPENCER

Company EPI

Address 1180 NW MAPLE ST. SUITE 310

City, State, ZIP ISSAQUAH, WA. 98027

Phone (425) 395-0614 Email

SAMPLERS (signature)

PROJECT NAME: MCFT - REDMOND 68307

PO #

REMARKS

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME
- ☐ Standard turnaround
- ☒ RUSH 24 HR
- Rush charges authorized by:

SAMPLE DISPOSAL
- ☐ Archive samples
- ☐ Other
- Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	cPAHs	naphthalene			Notes
SS-5:5	11	11/20/19	839	SOIL	1								✓	✓			

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	N. WINSPENCER	EPI	11/20/19	1445
Received by:	Khoi Hoang	FBI	11/20/19	1445
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

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December 9, 2019

Eric Koltes, Project Manager
Environmental Partners, Inc.
1180 NW Maple St, Suite 310
Issaquah, WA 98027

RE: MCRT Redmond 63807, F&BI 912059

Dear Mr Koltes:

Included are the results from the testing of material submitted on December 5, 2019 from the MCRT Redmond 63807, F&BI 912059 project. There are 16 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Cynthia Moon, Nate Hinsperger
EPI1209R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on December 5, 2019 by Friedman & Bruya, Inc. from the Environmental Partners MCRT Redmond 63807, F&BI 912059 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Environmental Partners
912059 -01	DPT-7:1
912059 -02	DPT-7:5
912059 -03	DPT-7:10
912059 -04	DPT-7:15
912059 -05	DPT-7:20
912059 -06	DPT-7:25
912059 -07	DPT-8:5
912059 -08	DPT-8:10
912059 -09	DPT-8:15
912059 -10	DPT-8:20
912059 -11	DPT-8:25
912059 -12	DPT-9:5
912059 -13	DPT-9:10
912059 -14	DPT-9:15
912059 -15	DPT-9:20
912059 -16	DPT-9:25
912059 -17	DPT-10:5
912059 -18	DPT-10:10
912059 -19	DPT-10:15
912059 -20	DPT-10:20
912059 -21	DPT-10:25
912059 -22	DPT-11:5
912059 -23	DPT-11:10
912059 -24	DPT-11:15
912059 -25	DPT-11:20
912059 -26	DPT-11:25
912059 -27	DPT-12:5
912059 -28	DPT-12:10
912059 -29	DPT-12:15
912059 -30	DPT-12:25

All quality control requirements were acceptable.

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-7:1	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	912059-01 1/5
Date Analyzed:	12/06/19	Data File:	120605.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	100	31	163
Benzo(a)anthracene-d12	120	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	0.021
Chrysene	0.024
Benzo(a)pyrene	0.025
Benzo(b)fluoranthene	0.042
Benzo(k)fluoranthene	0.015
Indeno(1,2,3-cd)pyrene	0.010
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-7:25	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	912059-06 1/5
Date Analyzed:	12/06/19	Data File:	120529.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	98	31	163
Benzo(a)anthracene-d12	108	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-8:10	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	912059-08 1/10
Date Analyzed:	12/06/19	Data File:	120606.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	88	31	163
Benzo(a)anthracene-d12	92	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.02
2-Methylnaphthalene	<0.02
1-Methylnaphthalene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-8:25	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	912059-11 1/5
Date Analyzed:	12/06/19	Data File:	120530.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	105	31	163
Benzo(a)anthracene-d12	124	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-9:10	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	912059-13 1/5
Date Analyzed:	12/06/19	Data File:	120531.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	93	31	163
Benzo(a)anthracene-d12	107	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-9:25	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	912059-16 1/5
Date Analyzed:	12/06/19	Data File:	120532.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	98	31	163
Benzo(a)anthracene-d12	110	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-10:15	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	912059-19 1/5
Date Analyzed:	12/06/19	Data File:	120607.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	98	31	163
Benzo(a)anthracene-d12	112	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-10:25	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	912059-21 1/5
Date Analyzed:	12/06/19	Data File:	120608.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	100	31	163
Benzo(a)anthracene-d12	112	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-11:10	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	912059-23 1/5
Date Analyzed:	12/06/19	Data File:	120609.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	93	31	163
Benzo(a)anthracene-d12	104	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-11:25	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	912059-26 1/5
Date Analyzed:	12/06/19	Data File:	120610.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	93	31	163
Benzo(a)anthracene-d12	103	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-12:10	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	912059-28 1/10
Date Analyzed:	12/06/19	Data File:	120611.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	VM

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	84	31	163
Benzo(a)anthracene-d12	81	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.02
2-Methylnaphthalene	<0.02
1-Methylnaphthalene	<0.02
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-12:25	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	912059-30 1/5
Date Analyzed:	12/05/19	Data File:	120527.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	93	31	163
Benzo(a)anthracene-d12	107	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	Environmental Partners
Date Received:	Not Applicable	Project:	MCRT Redmond 63807
Date Extracted:	12/05/19	Lab ID:	09-2976 mb 1/5
Date Analyzed:	12/05/19	Data File:	120526.D
Matrix:	Soil	Instrument:	GCMS6
Units:	mg/kg (ppm) Dry Weight	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	95	31	163
Benzo(a)anthracene-d12	104	24	168

Compounds:	Concentration mg/kg (ppm)
Naphthalene	<0.01
2-Methylnaphthalene	<0.01
1-Methylnaphthalene	<0.01
Benz(a)anthracene	<0.01
Chrysene	<0.01
Benzo(a)pyrene	<0.01
Benzo(b)fluoranthene	<0.01
Benzo(k)fluoranthene	<0.01
Indeno(1,2,3-cd)pyrene	<0.01
Dibenz(a,h)anthracene	<0.01

Date of Report: 12/09/19
Date Received: 12/05/19
Project: MCRT Redmond 63807, F&BI 912059

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF SOIL SAMPLES FOR PAHS BY EPA METHOD 8270D SIM

Laboratory Code: 912059-30 1/5 (Matrix Spike)

Analyte	Reporting Units	Spike Level	Sample Result (Wet wt)	Percent Recovery MS	Acceptance Criteria
Naphthalene	mg/kg (ppm)	0.17	<0.01	79	44-129
2-Methylnaphthalene	mg/kg (ppm)	0.17	<0.01	85	45-135
1-Methylnaphthalene	mg/kg (ppm)	0.17	<0.01	85	40-141
Benz(a)anthracene	mg/kg (ppm)	0.17	<0.01	87	23-144
Chrysene	mg/kg (ppm)	0.17	<0.01	83	32-149
Benzo(b)fluoranthene	mg/kg (ppm)	0.17	<0.01	83	23-176
Benzo(k)fluoranthene	mg/kg (ppm)	0.17	<0.01	79	42-139
Benzo(a)pyrene	mg/kg (ppm)	0.17	<0.01	74	21-163
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.17	<0.01	63	23-170
Dibenz(a,h)anthracene	mg/kg (ppm)	0.17	<0.01	60	31-146

Laboratory Code: Laboratory Control Sample 1/5

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	mg/kg (ppm)	0.17	91	87	58-121	4
2-Methylnaphthalene	mg/kg (ppm)	0.17	99	94	58-123	5
1-Methylnaphthalene	mg/kg (ppm)	0.17	96	91	60-124	5
Benz(a)anthracene	mg/kg (ppm)	0.17	101	97	51-115	4
Chrysene	mg/kg (ppm)	0.17	95	92	55-129	3
Benzo(b)fluoranthene	mg/kg (ppm)	0.17	87	87	56-123	0
Benzo(k)fluoranthene	mg/kg (ppm)	0.17	90	80	54-131	12
Benzo(a)pyrene	mg/kg (ppm)	0.17	88	85	51-118	3
Indeno(1,2,3-cd)pyrene	mg/kg (ppm)	0.17	87	91	49-148	4
Dibenz(a,h)anthracene	mg/kg (ppm)	0.17	81	85	50-141	5

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 analyte 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 due to sample matrix effects.

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.

912059

SAMPLE CHAIN OF CUSTODY ME 12/5/19

C05

Page # 1 of 3

Report To ERIC KOTES, NATE LINDSPERGER

Company EPI

Address 1180 NW MAPLE ST. SUITE 310

City, State, ZIP ISSAQUAH, WA. 98027

Phone _____ Email _____

SAMPLERS (*signature*)

PROJECT NAME: MCRT REDMOND 63807

PO #

REMARKS

Project specific RLs? - Yes / No

INVOICE TO

TURNAROUND TIME

~~Standard turnaround~~

X RUSH 24 hr per NH 12/5/19

Rush charges authorized by: ME

SAMPLE DISPOSAL

☐ Archive samples

☐ Other _____

Default: Dispose after 30 days

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: NWTPH-Dx	NWTPH-Gx	BTEX EPA 8021	NWTPH-HCID	VOCs EPA 8260	PAHs EPA 8270	PCBs EPA 8082	cPAHs	TOTAL NAPHTHALENE			Notes
DPT-7:1	01	12/04/19	848	SOIL	1								X	X			
DPT-7:5	02		850														
DPT-7:10	03		852														
DPT-7:15	04		907														
DPT-7:20	05		910														
DPT-7:25	06		913										X	X			
DPT-8:5	07		955														
DPT-8:10	08		1001										X	X			
DPT-8:15	09		1004														
DPT-8:20	10	↓	1009	↓	↓												

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	NATE DORFNER	EPI	12/5/19	0632
~~Received by~~:	Michael Ewell	FBnc	〃	〃
Relinquished by:				
Received by:		Samples received at 4 °C		

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

912059

SAMPLE CHAIN OF CUSTODY ME 12/5/19

COC

Page # 2 of 3

Report To ERIC KOLTES, NATE HINSPERGER

Company EPI

Address 1180 NW MAPLE ST. SUITE 310

City, State, ZIP ISSAQUAH, WA. 98027

Phone (425) 395-0010 Email

SAMPLERS (*signature*)

PROJECT NAME: MERT REDMOND 63807

PO #

REMARKS

INVOICE TO

TURNAROUND TIME
- [x] Standard Turnaround
- [ ] RUSH
- Rush charges authorized by:

SAMPLE DISPOSAL
- [ ] Dispose after 30 days
- [ ] Archive Samples
- [ ] Other

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	ANALYSES REQUESTED: TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	cPAHs	Total Naphthalenes			Notes
DPT-8:25	11	12/04/19	1015	Soil	1								X	X			
DPT-9:5	12		1100														
DPT-9:10	13		1103										X	X			
DPT-9:15	14		1110														
DPT-9:20	15		1115														
DPT-9:25	16		1130										X	X			
DPT-10:5	17		1213														
DPT-10:10	18		1216														
DPT-10:15	19		1217										X	X			
DPT-10:20	20	↓	1225	↓	↓												

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	NATE DORFNER	EPI	12/5/19	0682
Received by:	Michael Eccl	FIBrn	↓	↓
Relinquished by:				
Received by:		Samples received at 4 °C		

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

912059

SAMPLE CHAIN OF CUSTODY ME 12/5/19

Page # 3 of 3

Report To ERIC KOCTES, NATE HINSPERGER
Company EPI
Address 1180 NW MAPLE ST. SUITE 310
City, State, ZIP ISSAQUAH, WA. 98027
Phone (425) 395-0000 Email

SAMPLERS (signature)
PROJECT NAME MCRT REDMOND 63807
PO #
REMARKS
INVOICE TO

TURNAROUND TIME
☒ Standard Turnaround
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Dispose after 30 days
☐ Archive Samples
☐ Other

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	cPAHs	Total Naphthalenes			Notes
DPT-10:25	21	12/04/19	1237	SOIL	1								X	+			
DPT-11:5	22		1252														
DPT-11:10	23		1256										X	X			
DPT-11:15	24		1300														
DPT-11:20	25		1305														
DPT-11:25	26		1320										X	X			
DPT-12:5	27		1355														
DPT-12:10	28		1400									SAA	X	X			
DPT-12:15	29		1405														
DPT-12:25	30		1420										X	X			

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	NATE DORFNER	EPI	12/5/19	0632
Received by:	Michael Echl	TIBin	1	1
Relinquished by:				
Received by:		Samples received at 4 °C		

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

December 9, 2019

Eric Koltes, Project Manager
Environmental Partners, Inc.
1180 NW Maple St, Suite 310
Issaquah, WA 98027

RE: MCRT Redmond 63807, F&BI 912060

Dear Mr Koltes:

Included are the results from the testing of material submitted on December 5, 2019 from the MCRT Redmond 63807, F&BI 912060 project. There are 10 pages included in this report. Any samples that may remain are currently scheduled for disposal in 30 days, or as directed by the Chain of Custody document. If you would like us to return your samples or arrange for long term storage at our offices, please contact us as soon as possible.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Cynthia Moon, Nate Hinsperger
EPI1209R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on December 5, 2019 by Friedman & Bruya, Inc. from the Environmental Partners MCRT Redmond 63807, F&BI 912060 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Environmental Partners
912060 -01	DPT-7
912060 -02	DPT-1
912060 -03	DPT-2
912060 -04	DPT-3
912060 -05	DPT-4
912060 -06	DPT-8
912060 -07	DPT-5
912060 -08	DPT-6
912060 -09	DPT-9
912060 -10	DPT-10
912060 -11	DPT-11
912060 -12	DPT-12

All quality control requirements were acceptable.

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-1	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807, F&BI 912060
Date Extracted:	12/05/19	Lab ID:	912060-02
Date Analyzed:	12/05/19	Data File:	120520.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	103	31	160
Benzo(a)anthracene-d12	102	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
2-Methylnaphthalene	<0.2
1-Methylnaphthalene	<0.2
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-2	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807, F&BI 912060
Date Extracted:	12/05/19	Lab ID:	912060-03
Date Analyzed:	12/05/19	Data File:	120521.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	111	31	160
Benzo(a)anthracene-d12	97	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
2-Methylnaphthalene	<0.2
1-Methylnaphthalene	<0.2
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-3	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807, F&BI 912060
Date Extracted:	12/05/19	Lab ID:	912060-04
Date Analyzed:	12/05/19	Data File:	120522.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	100	31	160
Benzo(a)anthracene-d12	93	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	1.3
2-Methylnaphthalene	1.5
1-Methylnaphthalene	0.96
Benz(a)anthracene	0.036
Chrysene	0.034
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-4	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807, F&BI 912060
Date Extracted:	12/05/19	Lab ID:	912060-05
Date Analyzed:	12/05/19	Data File:	120523.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	99	31	160
Benzo(a)anthracene-d12	99	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
2-Methylnaphthalene	<0.2
1-Methylnaphthalene	<0.2
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-5	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807, F&BI 912060
Date Extracted:	12/05/19	Lab ID:	912060-07
Date Analyzed:	12/05/19	Data File:	120524.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	99	31	160
Benzo(a)anthracene-d12	97	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
2-Methylnaphthalene	<0.2
1-Methylnaphthalene	<0.2
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	DPT-6	Client:	Environmental Partners
Date Received:	12/05/19	Project:	MCRT Redmond 63807, F&BI 912060
Date Extracted:	12/05/19	Lab ID:	912060-08
Date Analyzed:	12/05/19	Data File:	120525.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	99	31	160
Benzo(a)anthracene-d12	95	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
2-Methylnaphthalene	<0.2
1-Methylnaphthalene	<0.2
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02

Analysis For Semivolatile Compounds By EPA Method 8270D SIM

Client Sample ID:	Method Blank	Client:	Environmental Partners
Date Received:	Not Applicable	Project:	MCRT Redmond 63807, F&BI 912060
Date Extracted:	12/05/19	Lab ID:	09-2978 mb
Date Analyzed:	12/05/19	Data File:	120519.D
Matrix:	Water	Instrument:	GCMS6
Units:	ug/L (ppb)	Operator:	ya

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
Anthracene-d10	114	31	160
Benzo(a)anthracene-d12	124	25	165

Compounds:	Concentration ug/L (ppb)
Naphthalene	<0.2
2-Methylnaphthalene	<0.2
1-Methylnaphthalene	<0.2
Benz(a)anthracene	<0.02
Chrysene	<0.02
Benzo(a)pyrene	<0.02
Benzo(b)fluoranthene	<0.02
Benzo(k)fluoranthene	<0.02
Indeno(1,2,3-cd)pyrene	<0.02
Dibenz(a,h)anthracene	<0.02

Date of Report: 12/09/19
Date Received: 12/05/19
Project: MCRT Redmond 63807, F&BI 912060

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF WATER SAMPLES FOR PAHS BY EPA METHOD 8270D SIM

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Percent Recovery LCSD	Acceptance Criteria	RPD (Limit 20)
Naphthalene	ug/L (ppb)	1	85	82	57-114	4
2-Methylnaphthalene	ug/L (ppb)	1	94	91	63-122	3
1-Methylnaphthalene	ug/L (ppb)	1	90	88	65-122	2
Benz(a)anthracene	ug/L (ppb)	1	97	96	60-118	1
Chrysene	ug/L (ppb)	1	90	90	66-125	0
Benzo(b)fluoranthene	ug/L (ppb)	1	84	86	55-135	2
Benzo(k)fluoranthene	ug/L (ppb)	1	79	79	62-125	0
Benzo(a)pyrene	ug/L (ppb)	1	89	87	58-127	2
Indeno(1,2,3-cd)pyrene	ug/L (ppb)	1	83	84	36-142	1
Dibenz(a,h)anthracene	ug/L (ppb)	1	71	71	37-133	0

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 analyte 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 due to sample matrix effects.

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.

912060

SAMPLE CHAIN OF CUSTODY

ME 12-05-19

Page # 1 of 1

Report To ERIC KOLTES, NATE LINSPENGER

Company EPT

Address 1180 NW MAPLE ST. SUITE 310

City, State, ZIP ISSAQUAH, WA. 98027

Phone (425) 395-0014 Email

SAMPLERS (signature)

PROJECT NAME: MGRT REDMOND 63807

PO #

REMARKS

INVOICE TO

TURNAROUND TIME
- ☐ Standard Turnaround
- ☒ RUSH 24 hr per NH 12/5/19

Rush charges authorized by: ME

SAMPLE DISPOSAL
- ☐ Dispose after 30 days
- ☐ Archive Samples
- ☐ Other

COS

Sample ID	Lab ID	Date Sampled	Time Sampled	Sample Type	# of Jars	TPH-HCID	TPH-Diesel	TPH-Gasoline	BTEX by 8021B	VOCs by 8260C	SVOCs by 8270D	PAHs 8270D SIM	cPAHs	Total Naphthalenes			Notes
DPT-7	01 A-D	12/04/19	945	WATER	4												
DPT-1	02		950										X	X			
DPT-2	03		1000										X	X			
DPT-3	04		1025										X	X			
DPT-4	05		1050										X	X			
DPT-8	06		1100														
DPT-5	07		1110										X	X			
DPT-6	08		1130										X	X			
DPT-9	09		1200														
DPT-10	10	↓	1255	↓	↓									Samples received at 4 °C			
DPT-11	11		1350														
DPT-12	12		1450														

ANALYSES REQUESTED

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	NATE DORFNER	EPT	12/5/19	0635
Received by:	Michael Enchill	FBA	↓	↓
Relinquished by:				
Received by:				

Friedman & Bruya, Inc.

3012 16th Avenue West

Seattle, WA 98119-2029

Ph. (206) 285-8282

FRIEDMAN & BRUYA, INC.

ENVIRONMENTAL CHEMISTS

James E. Bruya, Ph.D.
Yelena Aravkina, M.S.
Michael Erdahl, B.S.
Arina Podnozova, B.S.
Eric Young, B.S.

3012 16th Avenue West
Seattle, WA 98119-2029
(206) 285-8282
fbi@isomedia.com
www.friedmanandbruya.com

January 8, 2020

Eric Koltes, Project Manager
Environmental Partners, Inc.
1180 NW Maple St, Suite 310
Issaquah, WA 98027

RE: 63807-MCRT, F&BI 912454

Dear Mr Koltes:

Included are the results from the testing of material submitted on December 27, 2019 from the 63807-MCRT, F&BI 912454 project. There are 9 pages included in this report.

We appreciate this opportunity to be of service to you and hope you will call if you have any questions.

Sincerely,

FRIEDMAN & BRUYA, INC.

Michael Erdahl
Project Manager

Enclosures
c: Cynthia Moon
TRC0108R.DOC

CASE NARRATIVE

This case narrative encompasses samples received on December 27, 2019 by Friedman & Bruya, Inc. from the Environmental Partners 63807-MCRT, F&BI 912454 project. Samples were logged in under the laboratory ID's listed below.

Laboratory ID	Environmental Partners
912454 -01	SG-1
912454 -02	SG-2
912454 -03	SG-3
912454 -04	SG-4
912454 -05	SG-5

All quality control requirements were acceptable.

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SG-1	Client:	Environmental Partners
Date Received:	12/27/19	Project:	63807-MCRT, F&BI 912454
Date Collected:	12/26/19	Lab ID:	912454-01 1/2.7
Date Analyzed:	01/03/20	Data File:	010234.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	111	70	130

Compounds:	Concentration ug/m3	ppbv
Naphthalene	<0.71	<0.13

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SG-2	Client:	Environmental Partners
Date Received:	12/27/19	Project:	63807-MCRT, F&BI 912454
Date Collected:	12/26/19	Lab ID:	912454-02 1/2.7
Date Analyzed:	01/03/20	Data File:	010235.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	106	70	130

Compounds:	Concentration ug/m3	ppbv
Naphthalene	0.75	0.14

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SG-3	Client:	Environmental Partners
Date Received:	12/27/19	Project:	63807-MCRT, F&BI 912454
Date Collected:	12/26/19	Lab ID:	912454-03 1/7.1
Date Analyzed:	01/03/20	Data File:	010237.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	92	70	130

Compounds:	Concentration ug/m3	ppbv
Naphthalene	100	20

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SG-4	Client:	Environmental Partners
Date Received:	12/27/20	Project:	63807-MCRT, F&BI 912454
Date Collected:	12/26/19	Lab ID:	912454-04 1/36
Date Analyzed:	01/03/20	Data File:	010238.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	107	70	130

Compounds:	Concentration ug/m3	ppbv
Naphthalene	5.54	1.0

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	SG-5	Client:	Environmental Partners
Date Received:	12/27/19	Project:	63807-MCRT, F&BI 912454
Date Collected:	12/26/19	Lab ID:	912454-05 1/5.2
Date Analyzed:	01/03/20	Data File:	010236.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	97	70	130

Compounds:	Concentration ug/m3	ppbv
Naphthalene	<1.4	<0.26

Analysis For Volatile Compounds By Method TO-15

Client Sample ID:	Method Blank	Client:	Environmental Partners
Date Received:	Not Applicable	Project:	63807-MCRT, F&BI 912454
Date Collected:	Not Applicable	Lab ID:	00-017 mb
Date Analyzed:	01/02/20	Data File:	010211.D
Matrix:	Air	Instrument:	GCMS7
Units:	ug/m3	Operator:	MS

Surrogates:	% Recovery:	Lower Limit:	Upper Limit:
4-Bromofluorobenzene	103	70	130

	Concentration	
Compounds:	ug/m3	ppbv
Naphthalene	<0.1	<0.02

Date of Report: 01/08/20
Date Received: 12/27/19
Project: 63807-MCRT, F&BI 912454

QUALITY ASSURANCE RESULTS FOR THE ANALYSIS OF AIR SAMPLES FOR VOLATILES BY METHOD TO-15

Laboratory Code: Laboratory Control Sample

Analyte	Reporting Units	Spike Level	Percent Recovery LCS	Acceptance Criteria
Naphthalene	ppbv	5	105	70-130

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 analyte 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 due to sample matrix effects.

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.

912454

SAMPLE CHAIN OF CUSTODY

ME 12/27/19

Page # 1 of 1

Report To Eric Koltes

Company EPI

Address 1180 NW Maple St, Suite 310

City, State, ZIP Issaquah, WA 98027

Phone 425-395-0010 Email erick@epi-wa.com

SAMPLERS (signature)	
PROJECT NAME & ADDRESS	PO #
63807-MCRT	63807
NOTES:	INVOICE TO
	EPI

TURNAROUND TIME
☑ Standard
☐ RUSH
Rush charges authorized by:

SAMPLE DISPOSAL
☐ Archive Samples
☐ Other

SAMPLE INFORMATION										ANALYSIS REQUESTED						
Sample Name	Lab ID	Canister ID	Flow Cont. ID	Reporting Level: IA=Indoor Air SG=Soil Gas (Circle One)	Date Sampled	Initial Vac. ("Hg)	Field Initial Time	Final Vac. ("Hg)	Field Final Time	TO15 Full Scan	TO15 BTEXN	TO15 cVOCs	APH	Helium	Naphthalene	Notes
SG-1		3347	229	IA / (SG)	12/26/19	29.5	0903	3.0	0913						X	
SG-2		3249	03	IA / (SG)	"	30.0	0920	2.5	0928						X	
SG-3		3311	18	IA / (SG)	"	30.0	0939	3.0	0949						X	
SG-4		4185	02	IA / (SG)	"	29.0	1000	3.0	1012						X	
SG-5		4180	12	IA / (SG)	↓	30.0	1019	140	1055						X	
				IA / SG												
				IA / SG												
				IA / SG												Samples received at 17°C

SIGNATURE	PRINT NAME	COMPANY	DATE	TIME
Relinquished by:	Joe Sherod	EPI	~~12/27/19~~ 12/26/19	11:36
Received by:	Kaela Shoe	FedEx	12-27-19	11:36
Relinquished by:				
Received by:	Nhan Pham	FEBI.	12/27/19	1300

Friedman & Bruya, Inc.
3012 16th Avenue West
Seattle, WA 98119-2029
Ph. (206) 285-8282
Fax (206) 283-5044

Attachment D
Conceptual Site Model

Primary Sources	Contaminants of Potential Concern	Media of Concern	Transport Mechanisms
Releases of creosote-like compounds from subsurface timber piles	Carcinogenic Polycyclic Aromatic Hydrocarbons and Naphthalenes	☐ Surface Soil (0–2 feet bgs)	☐ Direct release to soil ☐ Migration to subsurface soil ☐ Migration to groundwater ☐ Volatilization ☐ Runoff or erosion ☐ Utake by plant or animal ☐ Other (list) _____
		☒ Soil (> 2 feet bgs)	☒ Direct release to soil ☐ Migration to groundwater ☐ Volatilization ☐ Other (list) _____
		☐ Groundwater	☐ Release to groundwater ☐ Volatilization ☐ Future migration to surface water ☐ Future migration to sediment ☐ Uptake by plant or animal ☐ Other (list) _____
	☒ Adsorbed onto soil ☐ Dissolved in water ☐ Non-aqueous phase	☐ Surface Water	☐ Release to surface water ☐ Volatilization ☐ Sedimentation ☐ Uptake by plant or animal ☐ Other (list) _____
		☐ Sediment	☐ Release to surface water ☐ Resuspension or erosion ☐ Uptake by plant or animal ☐ Other (list) _____

Exposure Media	Exposure Pathway	Current (C) and Potential Future (F) Receptors: Commercial Industrial	Construction Worker	Residential/ Recreational	TEE Receptors
☒ Soil	☒ Ingestion		C,F	C	
	☒ Dermal Exposure		C,F	C	
☐ Groundwater	☐ Ingestion				
	☐ Dermal Exposure				
☒ Air	☒ Inhalation		F	F	
☐ Surface Water	☐ Ingestion				
	☐ Dermal Contact				
☐ Sediment	☐ Ingestion				
	☐ Dermal Contact				
☐ Indoor Air	☐ Inhalation				

NOTES:
bgs = below ground surface

ATTACHMENT D
CONCEPTUAL SITE MODEL

PREPARED BY	TRC		
REPORT	REMEDIAL INVESTIGATION, FEASIBILITY STUDY, AND INTERIM REMEDIAL ACTION REPORT		
LOCATION	15801 and 15945 NE 85th ST REDMOND, KING COUNTY, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 07/01/2020	***DRAWN BY*** ***EM***	***REVIEWED BY*** DK	***PROJECT NUMBER*** 015353.0005

Attachment E
Vapor Barrier Design

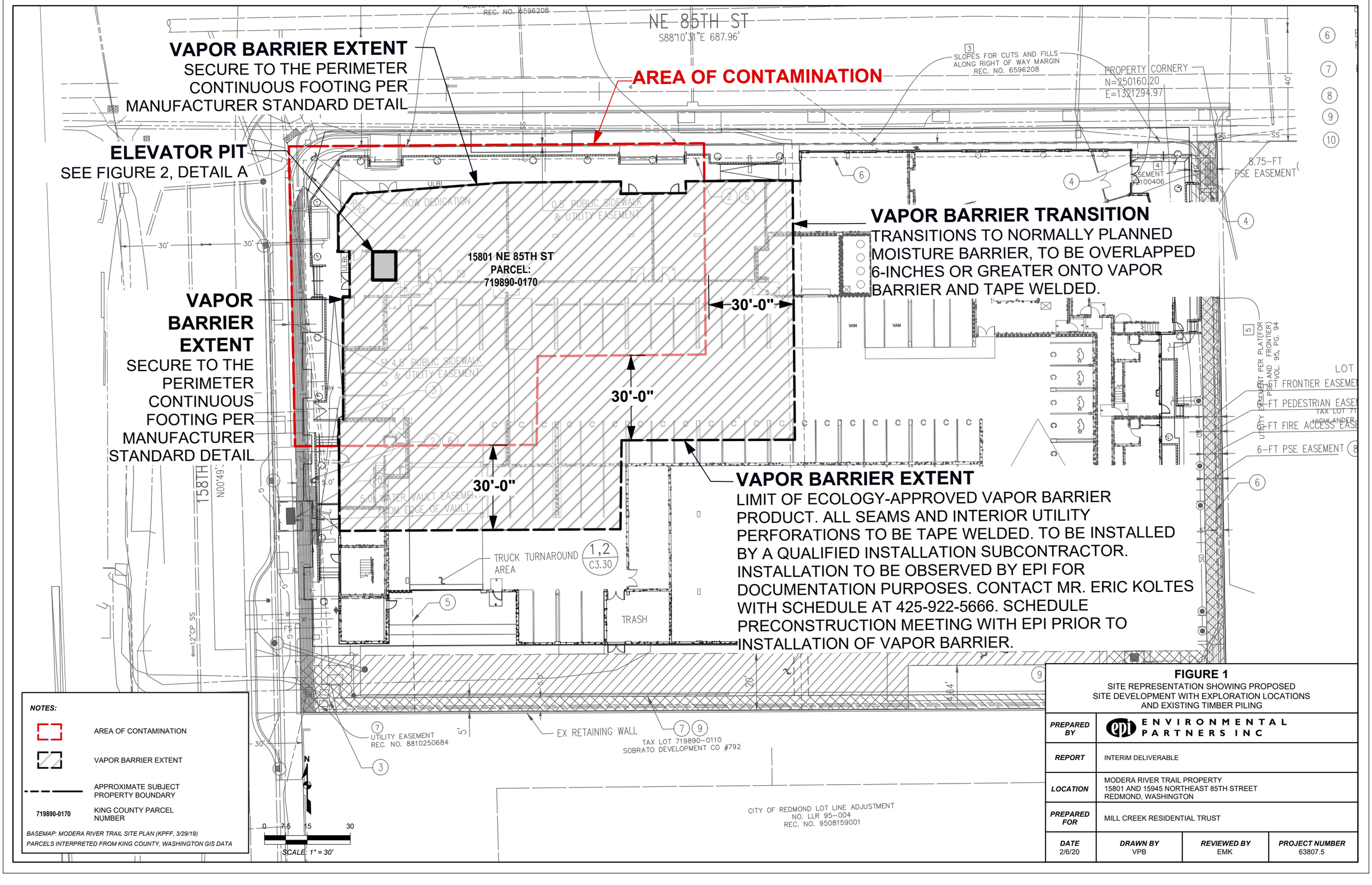

FIGURE 1
SITE REPRESENTATION SHOWING PROPOSED SITE DEVELOPMENT WITH EXPLORATION LOCATIONS AND EXISTING TIMBER PILING

PREPARED BY	epi ENVIRONMENTAL PARTNERS INC		
REPORT	INTERIM DELIVERABLE		
LOCATION	MODERA RIVER TRAIL PROPERTY 15801 AND 15945 NORTHEAST 85TH STREET REDMOND, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 2/6/20	***DRAWN BY*** VPB	***REVIEWED BY*** EMK	***PROJECT NUMBER*** 63807.5

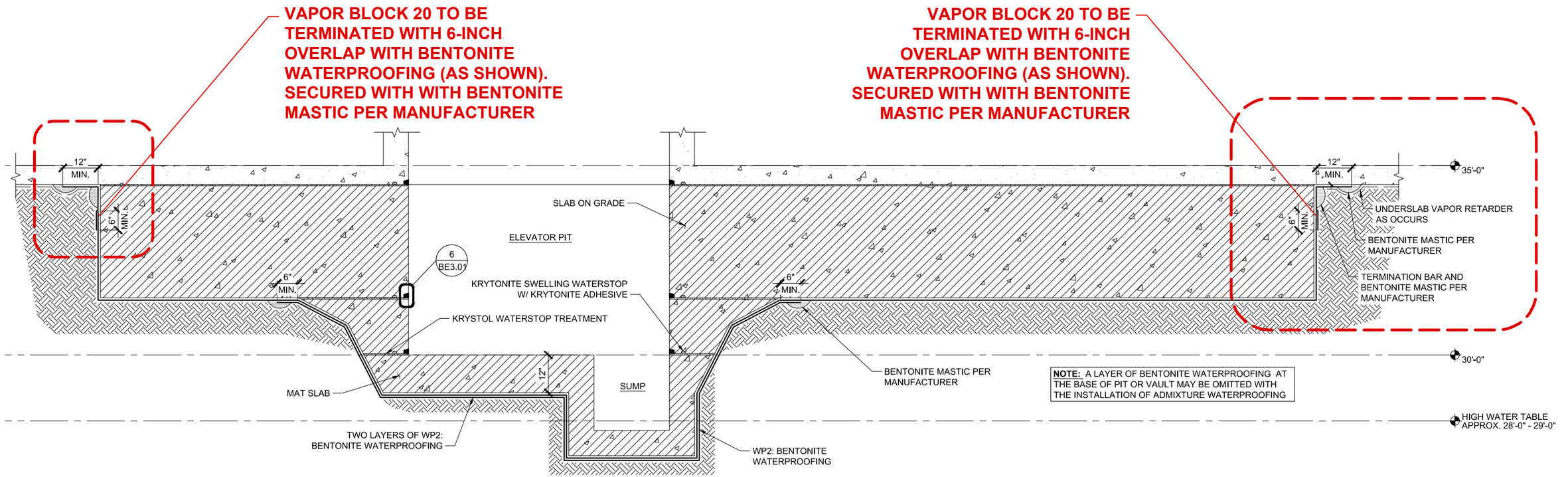

FIGURE 2

DETAIL A

PREPARED BY	ENVIRONMENTAL PARTNERS INC		
REPORT	INTERIM DELIVERABLE		
LOCATION	MODERA RIVER TRAIL PROPERTY 15801 AND 15945 NORTHEAST 85TH STREET REDMOND, WASHINGTON		
PREPARED FOR	MILL CREEK RESIDENTIAL TRUST		
DATE 2/3/20	***DRAWN BY*** VPB	***REVIEWED BY*** EMK	***PROJECT NUMBER*** 63807.5

VAPORBLOCK® PLUS™ VBP20

UNDER-SLAB VAPOR / GAS BARRIER

RAVEN

PRODUCT DESCRIPTION

VaporBlock® Plus™ 20 is a seven-layer co-extruded barrier made from state-of-the-art polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission. VaporBlock® Plus™ 20 is a highly resilient underslab / vertical wall barrier designed to restrict naturally occurring gases such as radon and/or methane from migrating through the ground and concrete slab. VaporBlock® Plus™ 20 is more than 100 times less permeable than typical high-performance polyethylene vapor retarders against Methane, Radon and other harmful VOCs.

VaporBlock® Plus™ 20 is one of the most effective underslab gas barriers in the building industry today far exceeding ASTM E-1745 (Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs) Class A, B and C requirements. Available in a 20 (Class A) mil thicknesses designed to meet the most stringent requirements. VaporBlock® Plus™ 20 is produced within the strict guidelines of our ISO 9001:2008 Certified Management System.

PRODUCT USE

VaporBlock® Plus™ 20 resists gas and moisture migration into the building envelop when properly installed to provide protection from toxic/harmful chemicals. It can be installed as part of a passive or active control system extending across the entire building including floors, walls and crawl spaces. When installed as a passive system it is recommended to also include a ventilated system with sump(s) that could be converted to an active control system with properly designed ventilation fans.

VaporBlock® Plus™ 20 works to protect your flooring and other moisture-sensitive furnishings in the building's interior from moisture and water vapor migration, greatly reducing condensation, mold and degradation.

SIZE & PACKAGING

VaporBlock® Plus™ 20 is available in 10' x 150' rolls to maximize coverage. All rolls are folded on heavy-duty cores for ease in handling and installation. Other custom sizes with factory welded seams are available based on minimum volume requirements. Installation instructions and ASTM E-1745 classifications accompany each roll.

Under-Slab Vapor/Gas Retarder

PRODUCT	PART #
VaporBlock® Plus™ 20	VBP20

APPLICATIONS

- Radon Barrier
- Methane Barrier
- VOC Barrier
- Under-Slab Vapor Retarder
- Foundation Wall Vapor Retarder

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

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VAPORBLOCK® PLUS™ VBP20

UNDER-SLAB VAPOR / GAS BARRIER

		VAPORBLOCK® PLUS™ 20	
PROPERTIES	TEST METHOD	IMPERIAL	METRIC
Appearance		White/Gold	
Thickness, Nominal		20 mil	0.51 mm
Weight		102 lbs/MSF	498 g/m^2
Classification	ASTM E 1745	CLASS A, B & C	
[3] Tensile Strength	ASTM E 154 Section 9 (D-882)	58 lbf	102 N
Impact Resistance	ASTM D 1709	2600 g	
Permeance (new material)	ASTM E 154 Section 7 ASTM E 96 Procedure B	0.0098 Perms grains/(ft^2·hr·in·Hg)	0.0064 Perms g/(24hr·m^2·mm Hg)
Permeance (after conditioning) (same measurement as above permeance)	ASTM E 154 Section 8, E96 Section 11, E96 Section 12, E96 Section 13, E96	0.0079 0.0079 0.0097 0.0113	0.0052 0.0052 0.0064 0.0074
WVTR	ASTM E 96 Procedure B	0.0040 grains/hr-ft^2	0.0028 gm/hr-m^2
Benzene Permeance	See Note [6]	1.57E-10 m/s	
Toluene Permeance	See Note [6]	2.18E-10 m/s	
Ethylbenzene Permeance	See Note [6]	1.71E-10 m/s	
M & P-Xylenes Permeance	See Note [6]	1.62E-10 m/s	
O-Xylene Permeance	See Note [6]	1.53E-10 m/s	
Radon Diffusion Coeffiecient	K124/02/95	< 1.1 x 10^{-13} m^2/s	
Methane Permeance	ASTM D 1434	3.68E^{-12} m/s Gas Transmission Rate (GTR): 0.32 mL/m^2•day•atm	
Maximum Static Use Temperature		180° F	82° C
Minimum Static Use Temperature		- 70° F	- 57° C

[3] Tests are an average of machine and transverse directions.

[6] Aqueous Phase Film Permeance.
Permeation of Volatile Organic Compounds through EVOH Thin Film Membranes and Coextruded LLDPE/EVOH/LLDPE Geomembranes, McWatters and Rowe, Journal of Geotechnical and Geoenvironmental Engineering© ASCE/September 2015. (Permeation is the Permeation Coefficient adjusted to actual film thickness)

VaporBlock® Plus™ Placement

All instructions on architectural or structural drawings should be reviewed and followed. Detailed installation instructions accompany each roll of VaporBlock® Plus™ and can also be located on our website.
ASTM E-1643 also provides general installation information for vapor retarders.

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

VaporBlock® Plus™ is a seven-layer co-extruded barrier made using high quality virgin-grade polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission.

Scan QR Code to download current technical data sheets via the Raven website.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance, odor transmission, longevity as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage. Limited Warranty available at wwww.RavenEFD.com

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VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

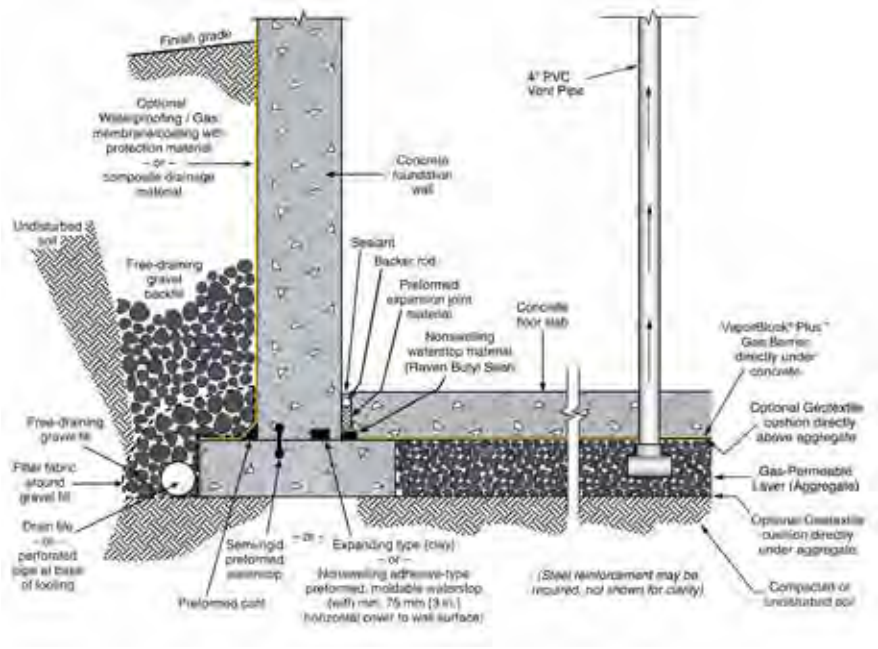
INSTALLATION GUIDELINES - With VaporSeal™ Tape

Please Note: Read these instructions thoroughly before installation to ensure proper use of VaporBlock® Plus™. ASTM E 1465, ASTM E 2121 and, ASTM E 1643 also provide valuable information regarding the installation of vapor / gas barriers. When installing this product, contractors shall conform to all applicable local, state and federal regulations and laws pertaining to residential and commercial building construction.

- When VaporBlock® Plus™ gas barrier is used as part of an active control system for radon or other gas, a ventilation system will be required.
- If designed as a passive system, it is recommended to install a ventilation system that could be converted to an active system if needed.

NOT APPLICABLE

Materials List:
VaporBlock® Plus™ Vapor / Gas Barrier
VaporSeal™* 4" Seaming Tape
VaporSeal™* 12" Seaming/Repair Tape
Butyl Seal 2-Sided Tape
VaporBoot Plus Pipe Boots 12/Box (recommended)
VaporBoot Tape (optional)
POUR-N-SEAL™ (optional)
1" Foam Weather Stripping (optional)
Mako® Screed Supports (optional)



Elements of a moisture/gas-resistant floor system. General illustration only.
(Note: This example shows multiple options for waterstop placement.

VAPORBLOCK® PLUS™ PLACEMENT

1.1. Level and tamp or roll granular base as specified. A base for a gas-reduction system may require a 4" to 6" gas permeable layer of clean coarse aggregate as specified by your architectural or structural drawings after installation of the recommended gas collection system. In this situation, a cushion layer consisting of a non-woven geotextile fabric placed directly under VaporBlock® Plus™ will help protect the barrier from damage due to possible sharp coarse aggregate.

1.2. Unroll VaporBlock® Plus™ running the longest dimension parallel with the direction of the pour and pull open all folds to full width. (Fig. 1)

1.3. Lap VaporBlock® Plus™ over the footings and seal with Raven Butyl Seal tape at the footing-wall connection. Prime concrete surfaces, when necessary, and assure they are dry and clean prior to applying Raven Butyl Seal Tape. Apply even and firm pressure with a rubber roller. Overlap joints a minimum of 6" and seal overlap with 4" VaporSeal™ Tape. When used as a gas barrier, overlap joints a minimum of 12" and seal in-between overlap with an optional 2-sided Raven Butyl Seal Tape. Then seal with 4" VaporSeal™ Tape centered on the overlap seam. (Fig. 2)

Fig. 1: VaporBlock® Plus™ Overlapping Roll-out Method

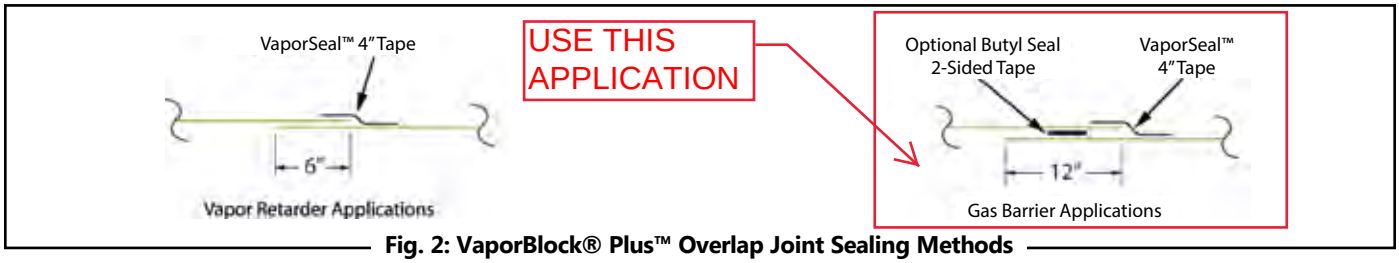


Fig. 2: VaporBlock® Plus™ Overlap Joint Sealing Methods

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Reference: Kanare, Howard M., Concrete Floors and Moisture, EB119, Portland Cement Association, Skokie, Illinois, and National Ready Mixed Concrete Association, Silver Spring, Maryland, USA, 2008, 176 pages.
by the Portland Cement Association

SINGLE PENETRATION PIPE BOOT INSTALLATION

1.4. Seal around all plumbing, conduit, support columns or other penetrations that come through the VaporBlock® Plus™ membrane.

1.4a. **Method 1:** Pipes four inches or smaller can be sealed with Raven VaporBoot Plus preformed pipe boots. VaporBoot Plus preformed pipe boots are formed in steps for 1", 2", 3" and 4" PVC pipe or IPS size and are sold in units of 12 per box (Fig. 3 & 5).

Pipe boots may also be fabricated from excess VaporBlock® Plus™ membrane (Fig. 4 & 6) and sealed with VaporBoot Tape or VaporSeal™ Tape (sold separately).

1.4b. **Method 2:** To fabricate pipe boots from VaporBlock® Plus™ excess material (see Fig. 4 & 6 for A-F):

A) Cut a square large enough to overlap 12" in all directions.

B) Mark where to cut opening on the center of the square and cut four to eight slices about 3/8" less than the diameter of the pipe.

C) Force the square over the pipe leaving the tightly stretched cut area around the bottom of the pipe with approximately a 1/2" of the boot material running vertically up the pipe. (no more than a 1/2" of stretched boot material is recommended)

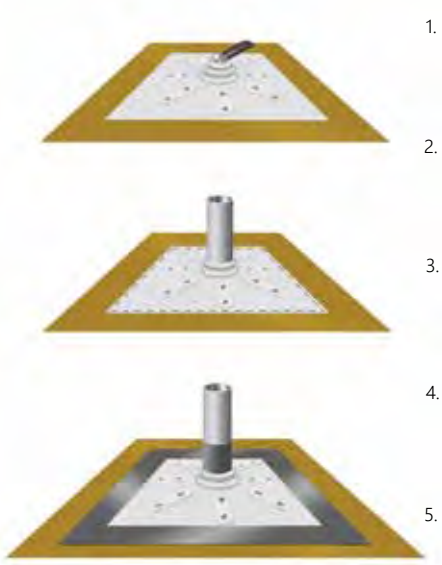
D) Once boot is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape in between the two layers. Secure boot down firmly over the membrane taking care not to have any large folds or creases.

E) Use VaporBoot Tape or VaporSeal™ Tape to secure the boot to the pipe.

VaporBoot Tape (option) – fold tape in half lengthwise, remove half of the release liner and wrap around the pipe allowing 1" extra for overlap sealing. Peel off the second half of the release liner and work the tape outward gradually forming a complete seal.

VaporSeal™ Tape (option) - Tape completely around pipe overlapping the VaporBlock® Plus™ square to create a tight seal against the pipe.

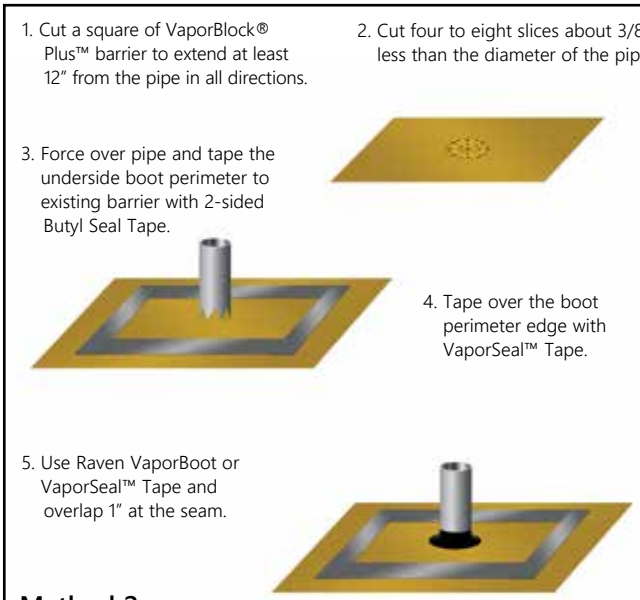
F) Complete the process by taping over the boot perimeter edge with VaporSeal™ Tape to create a monolithic membrane between the surface of the slab and gas/moisture sources below and at the slab perimeter. (Fig. 4 & 6)



1. Cut out one of the preformed boot steps (1" to 4").
2. Tape the underside boot perimeter with 2-sided Butyl Seal Tape.
3. Force the boot over pipe and press tape firmly in place.
4. Use VaporSeal™ Tape to secure boot to the pipe.
5. Tape around entire boot edge with VaporSeal™ Tape.

Method 1

Fig. 3



1. Cut a square of VaporBlock® Plus™ barrier to extend at least 12" from the pipe in all directions.
2. Cut four to eight slices about 3/8" less than the diameter of the pipe.
3. Force over pipe and tape the underside boot perimeter to existing barrier with 2-sided Butyl Seal Tape.
4. Tape over the boot perimeter edge with VaporSeal™ Tape.
5. Use Raven VaporBoot or VaporSeal™ Tape and overlap 1" at the seam.

Method 2

Fig. 4

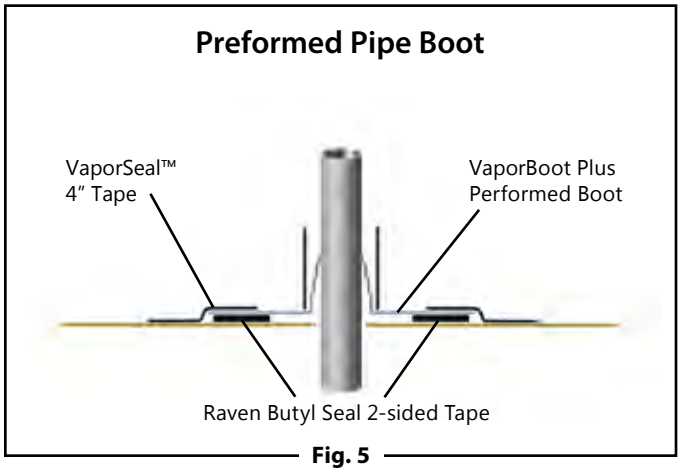


Fig. 5

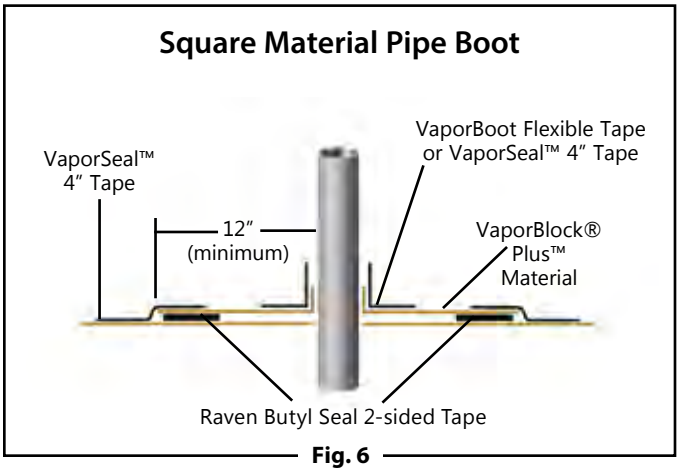


Fig. 6

Reference: Kanare, Howard M., Concrete Floors and Moisture, EB119, Portland Cement Association, Skokie, Illinois, and National Ready Mixed Concrete Association, Silver Spring, Maryland, USA, 2008, 176 pages.
ortland Cement Association.

MULTIPLE PENETRATION PIPE BOOT INSTALLATION

1.5. Sealing side-by-side multiple penetrations (option 1);

A) Cut a patch large enough to overlap 12" in all directions (Fig. 7) of penetrations.

B) Mark where to cut openings and cut four to eight slices about 3/8" less than the diameter of the penetration for each.

C) Force patch material over penetration to achieve a tight fit and form a lip.

D) Once patch is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape in-between the two layers. (Fig. 8)

E) After applying Raven Butyl Seal Tape between the patch and membrane, tape around each of the penetrations and the patch with VaporSeal™ 4" tape. (Fig. 9) For additional protection apply POUR-N-SEAL™ or an acceptable polyurethane elastomeric sealant around the penetrations. (Fig. 10)

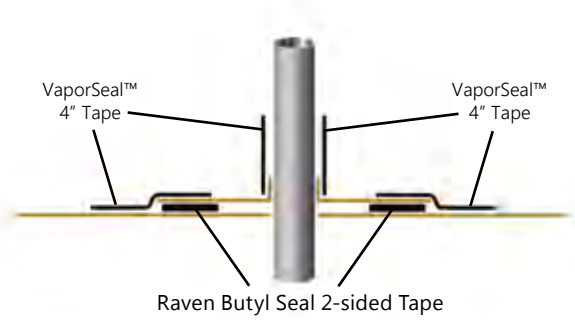


Fig. 6

Option 1

Cut a patch large enough to overlap 12" in all directions and slide over penetrations (Make openings as tight as possible.)

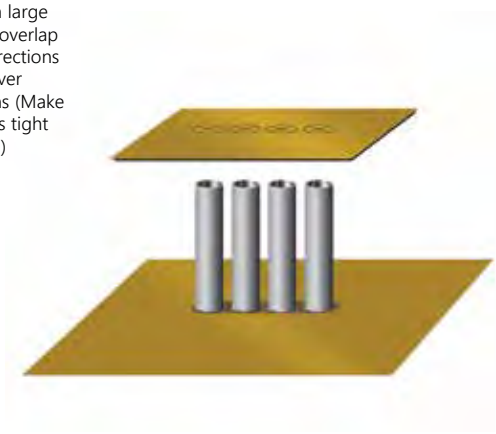


Fig. 7

Once the overlay patch is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape in-between the two layers.

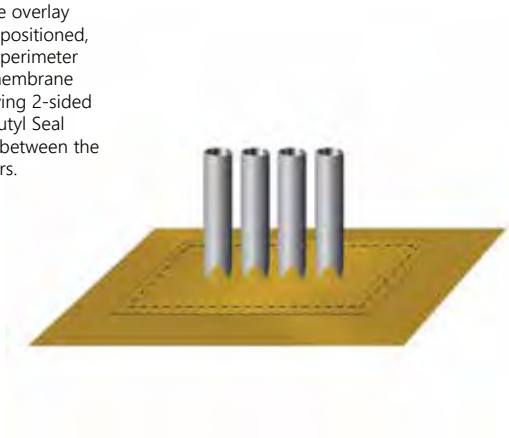


Fig. 8

After applying Raven Butyl Seal Tape between the patch and membrane, tape around the perimeter of the penetration and the patch with VaporSeal™ 4" Tape.

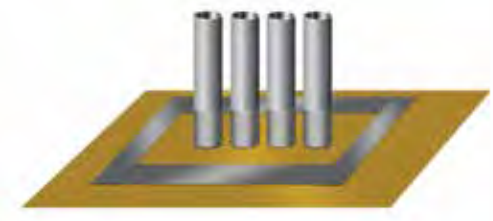


Fig. 9

For additional protection apply POUR-N-SEAL™ or an acceptable polyurethane elastomeric sealant around the penetrations.

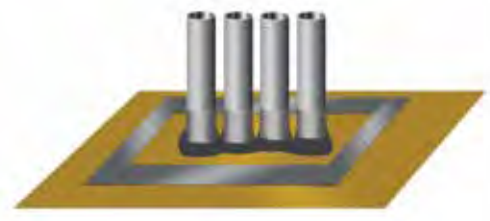


Fig. 10

Option 2

1.6. POUR-N-SEAL™ method of sealing side-by-side multiple penetrations (option 2);

A) Install the vapor barrier as closely as possible to pipe penetrations to minimize the amount of POUR-N-SEAL™ necessary to seal around all penetrations.

B) Once barrier is in place, remove soil or other particles with a dry cloth or a fine broom to allow for improved adhesion to the POUR-N-SEAL™ liquid.

C) Create a dam around the penetration area approximately 2" away from the pipe or other vertical penetrations by removing the release liner from the back of a 1" weather stripping foam and adhere to the vapor barrier. Form a complete circle to contain the POUR-N-SEAL™ materials (Fig. 11).

D) Once mixed, pour contents around the pipe penetrations. If needed, a brush or a flat wooden stick can be used to direct the sealant completely around penetrations creating a complete seal (Fig. 12-13).

E) DO NOT leave excess POUR-N-SEAL™ in plastic container for longer than the time it takes to pour sealant.

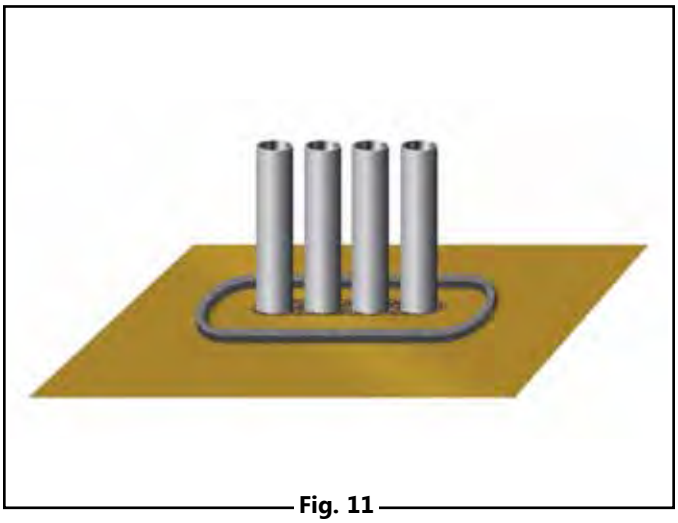


Fig. 11

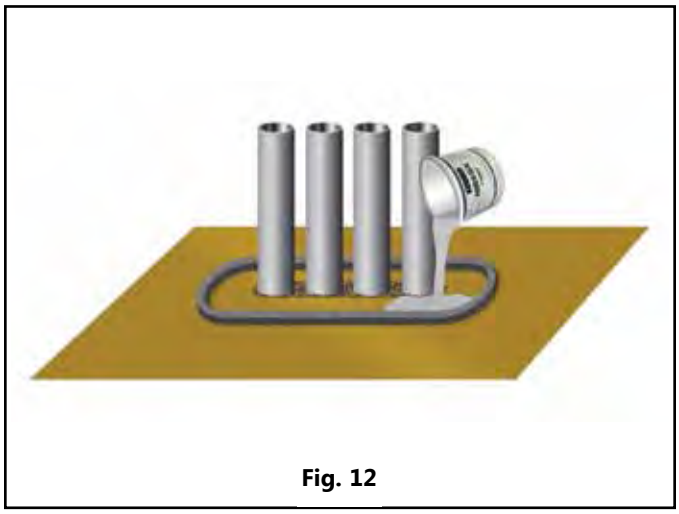


Fig. 12

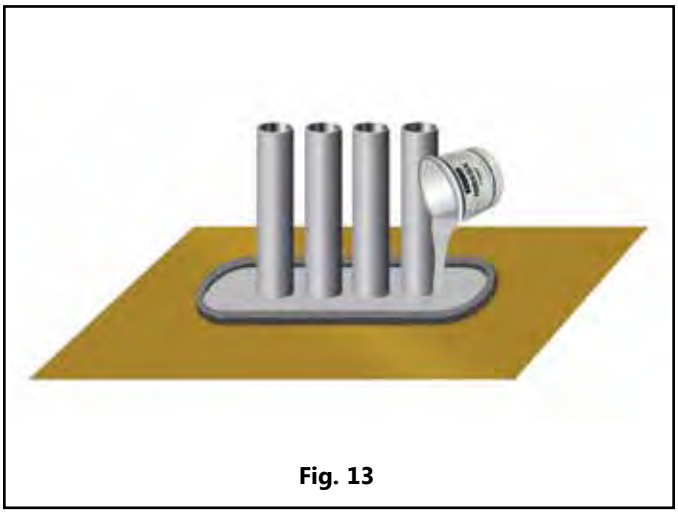


Fig. 13

VAPORBLOCK® PLUS™ REPAIR INSTRUCTIONS

1.7. Proper installation requires all holes and openings are repaired prior to placing concrete. When patching small holes, simply cut a 12" long piece of 12" wide VaporSeal™ tape. Remove release liner and center over the opening. Apply pressure to create a seal (Fig. 14-15).

1.8. When installing VaporBlock® Plus™ around pipe penetrations, vertical columns, electrical ducts and other obstructions, you will find it necessary to cut it to the nearest outside edge. This cut can be easily sealed with 12" wide VaporSeal™ tape, by simply centering it over the cut, 6" on either side. Once the tape is placed correctly, apply pressure to assure a complete seal (Fig. 16).

Reminder Note: All holes or penetrations through the membrane will need to be patched with 12" VaporSeal™ Tape.

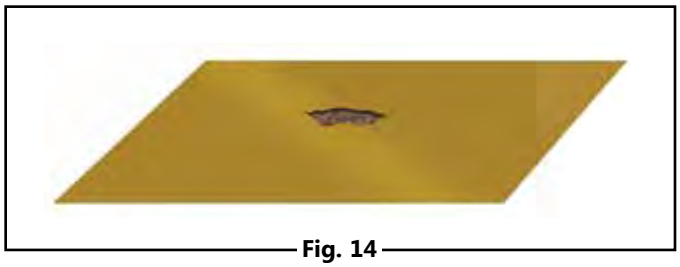


Fig. 14

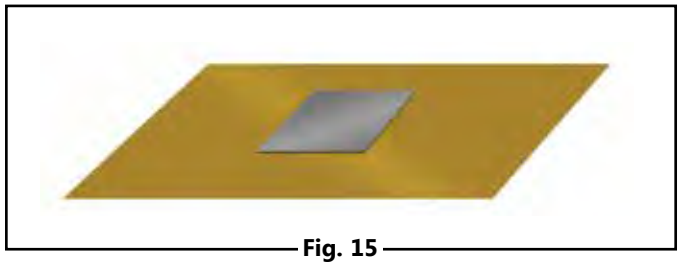


Fig. 15

2.1. When installing reinforcing steel and utilities, in addition to the placement of concrete, take precaution to protect VaporBlock® Plus™. Carelessness during installation can damage the most puncture–resistant membrane. Sheets of plywood cushioned with geotextile fabric temporarily placed on VaporBlock® Plus™ provide for additional protection in high traffic areas including concrete buggies.

2.2. Use only brick-type or chair-type reinforcing bar supports to protect VaporBlock® Plus™ from puncture.

2.3. Avoid driving stakes through VaporBlock® Plus™. If this cannot be avoided, each individual hole must be repaired per section 1.7.

2.4. To avoid penetrating VaporBlock® Plus™ when installing screed supports, utilize non-penetrating support, such as the Mako® Screed Support System (Fig. 17). Avoid driving stakes through VaporBlock® Plus™. If this cannot be avoided, each individual hole must be repaired per figures 14-15.

2.5. If a cushion or blotter layer is required in the design between VaporBlock® Plus™ and the slab, additional care should be given if sharp crushed rock is used. Washed rock will provide less chance of damage during placement. Care must be taken to protect blotter layer from precipitation before concrete is placed.

VaporBlock® Plus™ Gas & Moisture Barrier can be identified on site as gold/white in color printed in black ink with following logo and classification listing (Fig. 18)

VaporBlock® Plus™
Gas & Moisture Barrier

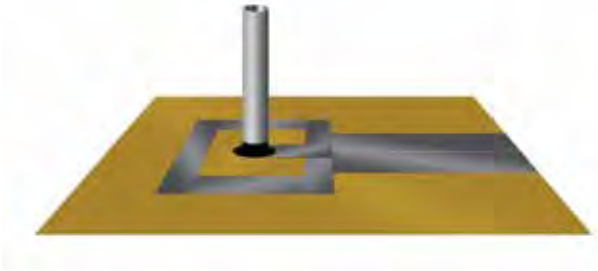


Fig. 16

Fig. 17

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

Fig. 18

* Patent Pending

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance, odor transmission, longevity as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage. Limited Warranty available at wwww.RavenEFD.com

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ACCESSORIES

SEAMING TAPES & OTHER ACCESSORIES FOR PLASTIC SHEETING

From tie-down fasteners to field seaming tape, Raven Industries has the accessories you need to maximize your film's versatility and minimize installation time on the job.

ACCESSORY TAPES AND EPOXY

VaporBond Tape (TVB4)

This white single-sided tape combines a heavy-duty, weather-resistant polyethylene backing with an aggressive rubber adhesive. VaporBond Tape offers excellent seaming capabilities for our materials with an "Easy Tear" feature to reduce installation time. TVB4 has a WVTR of 0.18 perms per ASTM D3833. Typical applications include vapor retarders, covers and liners.
Available in 4" x 210' roll.

R25B Tape (R25B)

R25B Tape is a single sided aggressive synthetic elastomeric adhesive that bonds instantly to properly prepared polyethylene and polypropylene. The black polymer backing and adhesive is specially formulated to provide years of performance even in direct sunlight. A poly release liner provides for ease of installation.
Available in 4" x 100' roll.

VaporSeal™ Tape (TVSP4/TVSP12)

VaporSeal™ Tape is a patented single-sided 7-layer gas barrier tape with a release liner for ease of installation. The backing contains a layer of highly impermeable EVOH designed to block migration of radon, methane and VOC's. An aggressive acrylic adhesive provides outstanding adhesion to polyethylene over a wide temperature range. Typical uses include joining, repairing and sealing gas/moisture barriers.
Available in 4" x 160' and 12" x 50' rolls.

Butyl Seal Tape (TP2BR)

Butyl seal is a double-sided reinforced aggressive black butyl rubber tape used to join panels of polyethylene and polypropylene together by overlapping the edges and applying Butyl Seal in between. It is also used to adhere to concrete walls and footings when properly prepared. Butyl Seal is non-hardening and flexible.
Available in 2" x 50' roll.

VaporBoot Tape (TBOOT)

VaporBoot Tape is a single-sided elastomeric butyl tape used to complete pipe boot installations (sealing the boot to the pipe). The 100% stretchable Butyl adhesive features excellent adhesion values and 3-D stretching that can be easily molded to multiple surfaces without any creases and folds.
Available in 2" x 16.4' roll.

POUR-N-SEAL™ (PNS1G)

POUR-N-SEAL™ is a gray two part epoxy used to seal around multi-pipe penetrations in areas where pipe boots are not practical, when installing VaporBlock or Absolute Barrier. The POUR-N-SEAL system includes 25 lineal feet of a 1" adhesive-backed foam to form a dam around multi-pipe penetrations to contain POUR-N-SEAL™ during the setting process.

ADDITIONAL ACCESSORIES

VaporBoot\VaporBoot G System (VBOOT\VBOOTG)

The VaporBoot System is designed to assist in securing pipe and other penetrations that run vertically through the vapor retarder material. The VaporBoot System offers a quick solution and is delivered to the jobsite in a complete package. VaporBoots are produced from high performance VaporBlock® and VaporBlock® G™ material.

Package Contents:
25 - VaporBoots (18" x 18", w/precut center marker)
1 - roll of VaporBoot Tape

VaporBoot Plus Preformed Pipe Boots (VBPBT)

VaporBoot Plus Preformed Pipe Boots are produced from heavy 40 mil co-extruded polyethylene and barrier resins for excellent strength and durability. The preformed boots are stepped to fit 1" to 4" wide pipe penetrations. VaporBoot Plus Preformed Pipe Boots are available in quantities of 12 per box.

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ACCESSORIES

SEAMING TAPES & OTHER ACCESSORIES FOR PLASTIC SHEETING

ADDITIONAL ACCESSORIES (CONTINUED)

Dura♦Skrim® Reinforced Sandbags

Dura♦Skrim reinforced sandbags are used to secure large covers and liners to prevent wind damage. Stock bags are produced with strong Dura♦Skrim 8 & 12 mil reinforced polyethylene. These 15" wide x 24" long bags are designed to hold 35 lbs. Sandbags are also available in other Raven reinforced materials with minimum order requirements. 11.8" Cable Ties are also available.

Dura-Clip™ (CLIP11)

These full size clips are 11" long and fit most commercial scaffolding. Dura-Clips will securely fasten your poly sheeting to scaffolding, reducing wind whip and increasing the life of your enclosure. Clips are normally placed about every 3' onto the enclosure.

Tie-Down Buttons (BUTI) & Tarp Grabbers (BUTEZ)

Tie-Down Buttons & Tarp Grabbers help keep plastic sheeting securely in place. Tie-Down Buttons are designed to eliminate traditional grommets in plastic sheeting up to 10 mil thick and are reusable plastic fittings that are easy to install in any position. Tarp Grabbers are up to 4 times stronger than a brass grommet and are typically used in heavier plastic sheeting from 10 mil to 30 mil thick. Great for equipment covers, large storage covers and truck tarps.

Raven Welding Rod

Raven Welding Rod is used for field seaming, repairs and detail work, such as installing pipe boots. Packaged in 25 lb spools, it is available in 4mm and 5mm sizes to fit most brands of extrusion guns. Raven Welding Rod is made from a thermally UV stabilized LLDPE resin and is available in both black and white to correspond with the color of geomembranes being utilized.

TAPE ACCESSORY PROPERTIES

PROPERTIES	VaporBond Tape (TVB4)	VaporSeal™ Tape (TVSP4)	VaporBoot Tape (TBOOT)	R25B Tape (R25B)	Butyl Seal Tape (TP2BR)
BACKING	6.7 mil Polyethylene	7 mil LDPE	30 mil EPDM	8 mil Multipolymer	NA
ADHESIVE	3.3 mil Rubber Based Pressure-Sensitive	2 mil Acrylic Adhesive Pressure-Sensitive	20 mil Butyl Rubber	17 mil Synthetic Elastomeric	40 mil Butyl Rubber
COLOR	White	Silver	Black	Black	Black
TYPE	Single Sided	Single Sided	Single Sided	Single Sided	Double Sided
SIZE	4" x 210'	4" x 160' / 12" x 50'	2" x 16.4'	4" x 100'	2" x 50'
ROLLS PER CASE	12	12 / 4	64	6	20
WEIGHT PER CASE	45 lbs	50 lbs / 18 lbs	45 lbs	33 lbs	55 lbs
ADHESION VALUES	35 oz. / in. (to steel)	80 oz. / in. (to steel)	145 oz. / in. (to steel)	144 oz. / in. (to steel)	88 oz. / in. (to steel)
PERMS	0.89 g/(24h*100 in^2)	0.014 g/(24h*100 in^2)	N/A	<0.005 g/(24h*100 in^2)	0.82 g/(24h*100 in^2)
SERVICE TEMP.	-40° F to +180° F	-40° F to +190° F	+14° F to +122° F	+20° F to +180° F	0° F to +170° F
MIN. APPLICATION TEMP.	50° F	50° F	14° F	35° F	35° F
IDEAL STORAGE TEMP./HUMIDITY	70° F w/ 40-50 %	60°-80° F w/ 40-60 %	70° F w/ 70 %	70° F w/ 40-50 %	70° F w/ 40-50 %

Scan QR Code to download current technical data sheets via the Raven website.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance, odor transmission, longevity as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage. Limited Warranty available at wwww.RavenEFD.com

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