Remedial Investigation / Feasibility Study Report

Conducted on:

4 Corners Cleaners
2386 SE Kent-Kangley Road
Maple Valley, Washington 98038-6848

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1.0 INTRODUCTION

This report presents the findings of a Remedial Investigation and Feasibility Study (RI/FS) conducted by Associated Environmental Group, LLC (AEG) at the 4 Corners Cleaners located at 23886 SE Kent-Kangley Road, Maple Valley, WA (Site). The purpose of this report is to document the completion of the RI, and provide support for remedial actions proposed in the FS. The scope of work for this investigation was developed based on our professional judgment and experience in accordance with requirements in the Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Cleanup Regulations (Chapter 173-340 WAC). The investigation was performed in general accordance with the American Society for Testing and Materials (ASTM) Standard E 1903-11, Standard Guide Environmental Site Assessments: Phase II Environmental Site Assessment Process.

1.1 *General Site Information*

Site Name: 4 Corners Cleaners
Site Address: 23886 SE Kent-Kangley Road, Maple Valley, WA 98038-6848
King County Parcel No.: 510711-0010
Property Owner: ROIC Four Corner Square, LLC

The Site is located northwest of the intersection between SE Kent-Kangley Road and Highway 169 in Maple Valley, King County, Washington. The Site is positioned on an approximately 9.57-acre parcel with five retail buildings totaling 254,663 square feet. An "L" shaped building on the southwest portion of the parcel includes the 4 Corners Cleaners tenant space. The remainder of the parcel not covered by buildings is improved with asphalt-paved parking and driveways, and landscaped areas. The immediate vicinity of the Site is primarily commercial businesses. Figure 1, *Site Location Map*, presents the general layout of the Site vicinity. The Site's current layout can be seen in Figure 2, *Site Map*.

1.2 *Site History*

This Site History refers to activities performed at both the Site (current 4 Corners Cleaners) and the property situated to the east, which was enrolled in the Washington State Department of Ecology (Ecology) Voluntary Cleanup Program (VCP) # NW2931, hereafter referred to as site NW2931, and was previously issued a *No Further Action* (NFA) Determination, issued on March 2, 2015. Based on the site assessment results for site NW2931, the results for tetrachloroethene (PCE) and related daughter products were confirmed in soil. Impacts of these contaminants to the surface and subsurface soils occurred over time through releases from the operation of the former dry cleaning facility. This property was redeveloped in 2012, and is currently an asphalt parking lot and

Walgreens pharmacy. Refer to this letter for a summary of prior activities regarding site NW2931 (Appendix B, *No Further Action Letter - NW2931*).

The current 4 Corners Cleaners, has had site assessments conducted on the Site from 2003 to 2014 that confirmed the presence of PCE and daughter products in the soil vapor. A NFA determination was issued for the current 4 Corners Cleaners (VCP# NW2932) on February 28, 2017. Refer to this letter for a summary of prior activities (Appendix B, *No Further Action Letter - NW2932*).

The current 4 Corners Cleaners switched to a hydrocarbon dry cleaning machine in 2017, which triggered a Phase II Environmental Site Assessment (ESA) from the tenant's environmental insurance. The results of this Phase II ESA and subsequent investigations are further summarized in Section 2.0.

1.3 *Site Use*

The Site is located northwest of the intersection between SE Kent-Kangley Road and Highway 169 in Maple Valley, Washington, and operates within a single suite within the retail shopping center. Current tenants in the "L" shaped building along the southern portion of the property include: 4 Corners Cleaners, Bellissimo Lashes and Nails, Papa Murphy's Pizza, Allstate Insurance, Serena Hair Design, a chiropractic office, Smoke & Vape shop, Four Corners Family Dentist, Bike Masters, and Maple Valley Bar and Grill. Gravity Coffee, MOD Pizza, and a Verizon Retailer occupy the square building located in the southeast portion of the property. North of the "L" shaped building, and the 4 Corners Cleaners tenant space, is Johnsons Home & Garden, Dog Spaw, Subway, Discovery Playtown, and Grocery Outlet.

2.0 FIELD INVESTIGATIONS

2.1 *Site Characterization History (Post NFA Letter)*

2.1.1 Phase II Environmental Site Assessment – AEG, March 2017

On March 13, 2017, AEG supervised the advancement of three borings (B-1 through B-3) to a maximum depth of 2 feet below ground surface (bgs) inside the current dry cleaning facility. One soil sample was collected from each boring. AEG returned to the Site on March 31, 2017 and collected soil vapor samples from 14 sub-slab vapor locations (SV-1 through SV-14). The soil vapor was sampled from directly beneath the slab. The soil and sub-sab vapor sample locations are illustrated on Figure 2, *Site Map*. Based on the analytical results, AEG concluded the following:

- *PCE* [tetrachloroethene] *was detected in Site soil exceeding the MTCA Method A cleanup levels of 0.05 mg/kg* [milligrams per kilogram] *in B1-22 at 1.8 feet bgs at 0.058 mg/kg and B3-23 at 1.9 feet bgs at 0.067 mg/kg and sub-slab vapor at concentrations exceeding Method B screening levels in all samples, except SV-13, which as below the Method B screening levels of 321 µg/m^3 at 180 µg/m^3. These exceedances suggest a release from dry cleaning operations has occurred at the Site.*
- *Other VOCs* [volatile organic compounds], *including dichlorodifluoromethane, chloroform, and 1,1,2-trichloroethane, were also detected in sub-slab vapor above their respective MTCA Method B screening levels. The source of these VOCs is unknown at this time.*

AEG recommended:

- *Further Site characterization, including the installation of at least three groundwater monitoring wells to assess the depth of potential impacts in soil and groundwater, and to identify groundwater gradient and potential for off-property migration of PCE.*
- *Additional soil borings in the parking areas and near the entrance roadway to assess the potential source of the dichlorodifluoromethane, which is a refrigerant and not usually associated with dry cleaning operations.*
- *A Tier II Vapor assessment be performed to determine the lateral extent of VOCs present in sub-slab soil vapor, and whether those vapors may be impacting indoor air. AEG recommends advancing a soil vapor probes outside the building perimeter, and concurrently collecting one indoor air sample and one background ambient air sample.*

Analytical results of the soil and sub-slab vapor samples are presented in Table 1, *Summary of Soil Analytical Results*, and Table 2, *Summary of Sub-Slab Vapor Analytical Results*, respectively.

2.1.2 Remedial Investigation – AEG, July 2018

In July 2018, AEG returned to the Site to define the extent of contamination in soil and to determine if contamination was present in groundwater. AEG advanced 10 borings (B-4 through B-13) to a maximum depth of 35 feet bgs using a limited-access sonic drill rig, operated by Cascade Drilling. Soil and groundwater (where encountered) samples were collected from the borings, and analyzed for PCE and its daughter products. Soil sample B11-18 at 18 feet bgs reported PCE at 0.053 milligrams per kilogram (mg/kg), which was the only soil sample collected during this event that was above the MTCA Method A cleanup level for PCE (0.05 mg/kg). Deeper sample results from the same boring at 21 and 24 feet bgs (0.034 mg/kg and 0.046 mg/kg respectively) were below the MTCA cleanup level. Groundwater was encountered in six of the 10 borings (not including B-11), and no contaminants were detected.

Analytical results of the soil and groundwater samples are presented in Table 1, *Summary of Soil Analytical Results*, and Table 3, *Summary of Groundwater Analytical Results*, respectively.

2.1.3 SVE Pilot Test – AEG, December 2018

On December 4, 2018, for the purpose of performing a Soil Vapor Extraction (SVE) pilot test, eight temporary wells (T-1 through T-8) were installed at the Site with specific spacing used to determine the effectiveness of SVE as a remedial option. The temporary wells were completed with 10 feet of slotted screen from 5 to 15 feet bgs. The wells were sealed with bentonite for the top 5 feet of the boring and were installed to measure the radius of influence (ROI) and vacuum during the pilot test. No soil samples were collected during the temporary well installations. The well logs are included in Appendix B, Supporting Documents, *Boring/Well Logs*.

On December 5, 2018, AEG performed a SVE pilot test over one day at the Site using the temporary wells, with T-1 as the extraction point and field monitoring in wells T-2 through T-8. A summary of the pilot test is included in Appendix C, *Soil Vapor Extraction Pilot Testing Summary Report*.

2.2 *Field Methodology*

AEG supervised the advancement of soil borings as described in Section 2.1, *Site Characterization History.* Soil samples were collected during drilling for field screening and laboratory analyses. Groundwater samples were collected following borehole completion. These sampling locations are illustrated in Figure 2, *Site Map*.

2.2.1 Soil Sampling Procedures

Soil sampling methods for this work followed the protocols established by Ecology and the U.S. Environmental Protection Agency (EPA). To minimize VOC losses, soil sampling for VOCs and field preservation methods followed methods set forth by EPA's Method 5035A and Ecology's guidance, "Collecting and Preparing Soil Samples for VOC Analysis". Soil samples were collected from the boreholes via continuous soil cores in an acetate sleeve inside the drilling rod's core barrel. Soils were observed to document soil lithology, color, moisture content, and sensory evidence of contamination.

Soil samples from each boring were transferred to laboratory provided pre-weighed 40-milliliter (ml) volatile organic analysis (VOA) glass vials and 4-ounce (oz.) glass jars. The soil samples were submitted for laboratory analysis to Libby Environmental (Libby), a Washington State-certified laboratory, following industry standard chain-of-custody procedures. Samples were either submitted to Libby's Olympia laboratory, or to their mobile laboratory, which was on Site during the July 2018 sampling event.

Soil laboratory analytical results are provided in Appendix B, Supporting Documents, *Laboratory Datasheets*.

2.2.2 Soil Vapor Procedures

Soil vapor sampling methods for this work followed the protocols established by the Interstate Technology and Regulatory Council (ITRC). After the roto-hammer boring was completed to about 1 foot bgs, the sample probe and rod were inserted and sealed with molding clay. AEG attached a certified-clean, 1-liter (L) Tedlar sampling bag via ¼-inch Teflon tubing attached to a disposable sampling tip. The vapor sample was extracted using a peristaltic pump with new tubing into the Tedlar sample bag. The approximate sampling time to fill a 1-L sampling bag was 5 to 10 minutes. Once the sampling bag was filled, it was identified with a sample number, sample location, date collected, and work assignment number on a chain of custody form. Chain of custody sheets accompanied all samples to the laboratory and transported via ESN in Olympia, Washington, and analyzed for chlorinated VOCs by EPA Method 8260C.

Soil vapor laboratory analytical results are provided in Appendix B, Supporting Documents, *Laboratory Datasheets*.

2.2.3 Groundwater Sampling Procedures

AEG sampled the groundwater from each of the borings where groundwater was encountered. A temporary PVC well screen was installed in each boring to collect a groundwater sample immediately after reaching the total boring depth. The temporary well screen was placed at the

interval below the vadose zone where groundwater was encountered during drilling activities. Dedicated polyethylene tubing was inserted into the retractable screen, and groundwater was then purged using a peristaltic pump until the discharge was relatively free of sediment, for sample collection via the EPA approved low-flow purge technique.

Groundwater samples were collected in laboratory provided 40-milliliter (ml) vials. Upon collection, the samples were placed in a chilled cooler for transport to Libby's mobile laboratory.

Groundwater laboratory analytical results are provided in Appendix B, Supporting Documents, *Laboratory Datasheets*.

2.2.4 Quality Controls

To ensure that quality information was obtained at the Site:

- All samples were collected in general accordance with industry protocols for the collection, documentation, and handling of samples.
- Nitrile gloves were used in handling all sampling containers and sampling devices.
- Upon sampling, all soil vapor samples were placed into a cooler.
- The samples were transported under a chain-of-custody to the laboratory for analysis.

The laboratory provided standard quality assurance/quality control (QA/QC), which included:

- Surrogate recoveries for each sample.
- Method blank results.
- Duplicate analyses, matrix or blank spiked analyses.
- Duplicate spiked analyses.

2.2.5 Investigation-Derived Waste

Investigation-derived waste for this project consisted of soil cuttings from the subsurface exploration activities, and decontamination water from decontamination of the drilling core barrel and associated equipment. These wastes were separated and placed in Washington State Department of Transportation (DOT) approved 55-gallon drums. The drums were appropriately labelled and stored on Site for subsequent characterization and disposal.

2.3 *Analytical Results*

Soil, groundwater, and sub-slab vapor samples collected to date have been analyzed for the following analyses:

- Chlorinated VOCs using EPA Method 8260.

All analytical results were compared to MTCA Method A or B cleanup levels for soil and groundwater, and Method B sub-slab screening levels for sub-slab vapor. Copies of the laboratory datasheets are provided in Appendix B, Supporting Documents, *Laboratory Datasheets*.

2.3.1 Soil Results

Soil sample results indicated PCE was detected **above** the MTCA Method A cleanup level of 0.05 mg/kg in the following samples:

- B1-22 at 1.8 feet bgs at 0.058 mg/kg. This sample was inside the building beneath the floor.
- B3-23 at 1.9 feet bgs at 0.067 mg/kg. This sample was inside the building beneath the floor.
- B11-18 at 18 feet bgs at 0.053 mg/kg. This sample was outside the building to the north.

No other chlorinated VOCs were detected in any of the other soil samples. Table 1, *Summary of Soil Analytical Results*, presents analytical results as compared to MTCA cleanup levels for soil.

2.3.2 Groundwater Results

Groundwater sample results were non-detect for all samples analyzed. Table 3, *Summary of Groundwater Analytical Results*, present analytical results compared to MTCA cleanup levels for groundwater.

2.3.3 Soil Vapor Results

Analytical results of the sub-slab vapor samples indicated the presence of PCE **above** the MTCA Method B sub-slab screening level of 321 micrograms per cubic meter ($\mu g/m^3$) in all vapor samples, except SV-13. Concentrations of PCE ranged from 850 $\mu g/m^3$ in SV-6 to 6,300 $\mu g/m^3$ in SV-11, with the highest concentrations being around the current and former dry cleaning machine.

Additional VOCs were detected in the soil vapor samples, the source(s) of which are unknown. These include the following:

- Dichlorodifluoromethane was detected **above** the MTCA Method B screening level of 1,520 µg/m^3 in 10 of 14 sub-slab vapor samples. Concentrations of dichloro-difluoromethane ranged from 2,500 µg/m^3 in SV-9 to 15,000 µg/m^3 in SV-4.
- Chloroform was detected **above** the MTCA Method B screening level of 3.62 µg/m^3 in samples SV-9 and SV-10 at 310 µg/m^3 and 31,000 µg/m^3, respectively.
- 1,1,2-Trichloroethane was detected **above** the MTCA Method B screening level of 5.31 µg/m^3 in sample SV-10 at 380 µg/m^3.

Table 2, *Summary of Sub-Slab Vapor Analytical Results,* presents analytical results as compared to MTCA Method B screening levels for sub-slab soil vapor.

3.0 CONCEPTUAL SITE MODEL (CSM)

This section provides a conceptual understanding of the Site, derived from the results of the subsurface investigations performed at the Site. The CSM is dynamic and may be refined as additional information becomes available.

3.1 *Constituents of Concern and Affected Media*

The chlorinated VOC PCE and its anaerobic sequential degradation chain constituents, including trichloroethene (TCE), cis-1,2-dichloroethene (DCE), trans-1,2-DCE, and vinyl chloride, are the contaminants of concern (COCs) for the Site. Soil and soil vapor are the media affected. Groundwater was encountered at various depths from 25 to 33 feet bgs in six of the ten borings, and did not contain detectable VOCs. Soil impacts at the Site are likely the result of use and storage of PCE formerly used in the dry cleaner machine and dry cleaning process.

PCE was the only COC detected in soil above MTCA cleanup levels. PCE exceeded the MTCA Method A cleanup level in AEG soil samples B1-22 (1.8 feet bgs) and B3-23 (1.9 feet bgs). Both of these borings were located inside the building. The vertical extent of PCE in these borings could not be determined due to the very dense soils encountered and the limitations of drilling in these soils inside the building.

PCE was also detected in boring B-11 at 18 feet bgs (0.053 mg/kg). Given the distance of this detection from the dry cleaning machine, the dense soils encountered, and the presence of clean borings in between (B-9, B-12, and B-13), it does not appear that the dry cleaning machine would have been the source. Further, given the detection is just barely above the cleanup level (i.e., less than twice the cleanup level), and the fact that its presence is in less than 10% of the overall samples analyzed for PCE, AEG considers this detection to statistically meet MTCA cleanup standards. It should also be noted that the detection was at 18 feet bgs, which is below the point of compliance for direct contact, and while soils were wet at about 22 feet bgs, insufficient groundwater was present within the temporary well point to a total depth of 37.5 feet bgs to collect a groundwater sample. There is also a utility corridor near B-11, including water and electricity, which runs east to west; however, there is no direct connection to the dry cleaner tenant space to suggest this as a preferential pathway to explain the impacts at B-11. The utilities are illustrated on Figure 2, *Site Map*.

The distribution of soil concentrations in excess of MTCA Method A cleanup levels in is illustrated in plan view on Figure 3, *PCE Concentrations in Soil Map,* and in cross section on Figure 5, *Geologic Cross Section A-A',* and Figure 6, *Geologic Cross Section B-B'.*

AEG believes the Site has been sufficiently characterized to be able to establish cleanup standards and select a cleanup action for the Site. Remedial alternatives presented in the accompanying FS contemplate contamination in both accessible and inaccessible areas of the Site.

3.2 *Site Geology and Hydrogeology*

The Site and vicinity are primarily underlain by Vashon till, a dense unconsolidated glacial deposit characterized by poorly-sorted materials including gravel, sand, silt, and clay. A thin veneer of Vashon recession outwash deposits is also present, as recorded in well logs to depths of at least 20 feet bgs, overlying the till.

According to the United States Department of Agriculture Natural Resources Conservation Service soil survey, surface soils beneath the Site consist of soil unit Everett very gravelly sandy loam, consist of moderately deep soils and is somewhat excessively drained. Typically, the surface layer is slightly decomposed plant material. The upper part of the soil is very gravelly sandy loam and transitions to extremely cobbly coarse sand.

Soils encountered at the Site during subsurface investigations generally consisted of silt with gravel to approximately 5 feet bgs, underlain by dense, sandy gravel with fine- to coarse-sized gravels, and cobbles to about 35 feet bgs. Groundwater at the time of drilling was encountered at various depths from 25 to 33 feet bgs. This is assumed to be a perched shallow groundwater-bearing zone. Based on the 2004 *Supplemental Phase II Subsurface Investigation* performed by the Riley Group on the former dry cleaner space to the east, the groundwater flow direction (measured via three installed monitoring wells) is generally to the north.

3.3 *Environmental Fate of Chlorinated Solvents in the Subsurface*

The density of PCE and its breakdown products is greater than water. Upon release into the environment, chlorinated VOCs can sink through the vadose zone, through the water table, and possibly penetrate leaking aquitards. These chemicals can also exist as a residual non-mobile phase either sorbed to the soil or trapped in the pore spaces between the soil particles. At this Site, residual dissolved-phase PCE, TCE, DCE, and vinyl chloride have not been detected in groundwater; however, sorbed-phase PCE has been detected in soil, and PCE is present in soil gas. No dense non-aqueous phase liquid (DNAPL) has been detected.

Chlorinated VOCs and their associated compounds can be volatilized under the appropriate conditions. In the subsurface, volatilization releases COCs from soil and/or groundwater into soil vapor where, if conditions are right, can migrate beneath or into structures.

The most common anaerobic dechlorination pathway of PCE is the degradation to ethenes. In the sequential transformation of the chlorinated ethenes, chlorine is replaced using hydrogen as an electron donor. The occurrence of the lesser chlorinated ethenes (such as vinyl chloride and DCE) in groundwater is primarily a consequence of incomplete anaerobic reductive dechlorination of the more highly chlorinated ethenes (PCE and TCE). Vinyl chloride and DCE are toxic, and vinyl chloride is a known human carcinogen.

3.4 *Potential Exposure Pathways*

As defined in WAC 173-340-200, an exposure pathway describes the mechanism by which a hazardous substance takes or could take a pathway from a source or contaminated medium to an exposed receptor.

3.4.1 Potential Soil Exposure Pathways

Potentially complete soil exposure pathways at the Site include:

- Contact (dermal contact, incidental ingestion) with hazardous substances in soil by visitors, residents, and workers (including excavation workers). Direct ingestion of, or dermal contact with, soil containing PCE is considered a potential exposure pathway. Impacted areas are currently covered by the building, asphalt and landscaped areas, and unless disturbed, are not available for potential direct contact or ingestion. Soil impacts have been documented at and below 2 feet bgs.

3.4.2 Potential Groundwater Exposure Pathways

Potentially complete groundwater exposure pathways at the Site include:

- Contact (dermal, incidental ingestion) with hazardous substances dissolved in groundwater by visitors, residents, and workers (including excavation workers). Groundwater was not encountered in all borings at the Site; where it was encountered, depths ranged from about 25 to 33 feet bgs. Further, the Site is currently covered by asphalt, the Site building, and landscape areas and, unless disturbed, are not available for potential direct contact or ingestion.
- Consumption of hazardous substances in groundwater. Currently, drinking water is provided by the city. For the purpose of this CSM, consumption of hazardous substances in groundwater is considered a completed pathway.

3.4.3 Potential Air Exposure Pathways

Potentially complete air exposure pathways include:

- Inhalation of hazardous substances in soil vapor by visitors, residents, and workers (including excavation workers). Analytical results of the sub-slab vapor samples indicated the presence of PCE and TCE above their respective MTCA Method B screening levels for sub-slab vapor. However, no samples of the indoor air have been collected to date. The sub-slab vapor data suggests that impacts present beneath the building may migrate into the building potentially impacting indoor air. For the purpose of this CSM and establishing cleanup standards, this pathway is considered potentially complete.

3.4.4 Terrestrial Ecological Evaluation

This Site qualifies for an exclusion from further terrestrial ecological evaluation based on the following:

- 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 1.5 acres of contiguous undeveloped land on or within 500 feet of any area of the Site.

A Terrestrial Ecological Evaluation Form is included in Appendix B.

4.0 CLEANUP STANDARDS

The following sections identify applicable or relevant and appropriate requirements (ARARs), remedial action objectives (RAOs), and preliminary cleanup standards for the Site, which were developed to address Ecology's requirements for cleanup. These requirements address conditions relative to potential identified impacts. Together, ARARs, RAOs, and cleanup standards provide the framework for evaluating remedial alternatives.

4.1 *Potentially Applicable Laws*

All cleanup actions conducted under MTCA shall comply with applicable state and federal laws [WAC 173-340-710(1)]. MTCA defines applicable state and federal laws to include legally applicable requirements and those requirements that are relevant and appropriate. Collectively, these requirements are referred to as ARARs. The primary ARAR is the MTCA regulation (WAC 173-340), especially with regard to the development of cleanup levels and procedures for development and implementation of a cleanup under MTCA. ARARs for the Site cleanup also include the following:

- Federal Safe Drinking Water Act Maximum Contaminant Levels (MCLs; 40 CFR Part 141).
- Washington Clean Air Act (Chapter 70.94 RCW).
- Puget Sound Clean Air Agency (PSCAA), Regulation I.
- Washington Solid and Hazardous Waste Management (RCW 70.105); Chapter 173-303 WAC; 40 CFR 241, 257; Chapter 173-350 and 173-351 WAC) and Land Disposal Restrictions (40 CFR 268; WAC 173-303-340).
- Washington Industrial Safety and Health Act (RCW 49.17) and other Federal Occupational Safety and Health Act (29 CFR 1910, 1926).

4.2 *Remedial Action Objectives*

RAOs have been established for the Site to establish remedial alternatives protective of human health and the environment under the MTCA cleanup process (WAC 173-340-350). The primary RAO for this cleanup action focuses on substantially eliminating, reducing, and controlling unacceptable risks to human health and the environment posed by the COCs, to the greatest extent practicable.

RAOs are important for the evaluation of the general response actions, technologies, process options, and cleanup action alternatives. Based on the assessment of Site-specific conditions and the potentially applicable cleanup levels presented below, the RAOs for the Site have been established as follows:

- *In a reasonable restoration time frame, reduce concentrations of COCs in Site soils and soil vapors to levels protective of human health and the environment and which are protective of groundwater quality.*

4.3 *Cleanup Standards*

Cleanup standards include cleanup levels and points of compliance (POCs) as described in WAC 173-340-700 through WAC 173-340-760. Cleanup standards must also incorporate other state and federal regulatory requirements applicable.

4.3.1 Proposed Cleanup Levels

MTCA Method A cleanup levels for the soil exposure pathways are appropriate for this Site. MTCA Method B cleanup levels are appropriate for the air exposure pathway, and for constituents where MTCA Method A cleanup levels are not promulgated. These cleanup levels are based on the most stringent values for each exposure pathway and are considered appropriate for the Site COCs. Proposed MTCA cleanup levels for the Site COCs that have been measured in soil at the Site include:

Constituent	Soil	Groundwater	Indoor Air
• PCE	0.05 mg/kg	5 µg/L	9.62 µg/m^3*
• TCE	0.03 mg/kg	5 µg/L	0.37 µg/m^3*
• cis-1,2- DCE	160 mg/kg*	16 µg/L*	NL
• trans-1,2- DCE	1,600 mg/kg*	160 µg/L*	NL
• Vinyl Chloride	0.67 mg/kg*	0.2 µg/L	0.28 µg/m^3*

mg/kg = milligrams per kilogram
µg/m^3 = micrograms per cubic meter
NL = Not Listed; no cleanup/screening levels have been promulgated for these constituents
* Method B cleanup level (Method A cleanup level not established)

4.3.2 Points of Compliance

For this Site, it is assumed that standard points of compliance will be used.

- Soil – Direct Contact: For soil cleanup levels based on human exposure via direct contact, the point of compliance is throughout the Site from the ground surface to 15 feet bgs.
- Soil – Leaching: For soil cleanup levels based on protection of groundwater, the point of compliance is throughout the Site.

- Groundwater: For groundwater, the point of compliance is throughout the Site from the uppermost level of the saturated zone extending vertically to the lowest most depth that could potentially be affected by the Site.
- Indoor Air/Soil Gas: The point of compliance is ambient and indoor air throughout the Site.

5.0 IDENTIFICATION AND SCREENING OF REMEDIATION TECHNOLOGIES

This section identifies general response actions and screens remediation technologies for use in assembling remediation alternatives.

5.1 *General Response Actions*

General response actions are broad categories of remedial actions that can be combined to meet the RAOs for a site. The following are typical general response actions that are applicable to most impacted sites:

- No action
- Institutional controls
- Monitored natural attenuation
- Containment
- Removal
- Ex-situ treatment
- In-situ treatment

Potentially applicable technologies associated with these general response actions have been identified and screened based on the Site COCs and affected media, and take into consideration the current and future use of the property. An overview of those technologies is provided in the following section.

5.2 *Identification and Screening of Applicable Technologies*

Applicable technologies associated with general response actions have been identified and screened for potential inclusion in the remediation alternatives for the Site. Each identified technology was screened based on applicability to Site conditions, overall effectiveness, implementability, and relative cost. Potentially applicable technologies considered for the Site are presented in Table 4, *Identification and Screening of Response Actions and Remediation Technologies*, which provides a summary of the screening results. Twelve remedial technologies were retained for further consideration. Details of each technology are summarized below. The technologies determined to be most appropriate for the Site were then incorporated into three potentially applicable remediation alternatives.

5.2.1 Institutional Controls

Institutional controls considered for this RI/FS include legal restrictions on land and on groundwater use to limit potential exposure to contamination, often through an environmental covenant filed at the time of Site closure. Environmental covenants are often appropriate as a component of a remedial alternative for Sites where residual contamination is constrained within

the property at the completion of active remediation, and where a POC can be determined and monitored over time. Such controls prohibit or limit activities on a property that may interfere with the integrity of engineered controls or result in exposure to hazardous substances. Except under certain specified circumstances, such controls must be executed through an environmental covenant on the affected property. Environmental covenants are typically not appropriate for sites where residual contamination above cleanup standards extends off property at the time of closure unless agreed upon by adjacent property owners. Institutional controls alone do not fully mitigate the potential vapor migration pathway, and additional technologies may be required to address that exposure pathway as part of the overall cleanup.

5.2.2 Monitored Natural Attenuation

The term "natural attenuation" as used in this RI/FS refers to a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of hazardous substances in the environment (Ecology, 2005). These in-situ processes include: natural biodegradation, dispersion, dilution by recharge, sorption, volatilization, chemical or biological stabilization, transformation or destruction of hazardous substances (WAC 173-340-200).

When applied as part of a cleanup action, natural attenuation is often referred to by EPA as "monitored natural attenuation" to distinguish the action from "no action". "Monitored natural attenuation", as the term is used in EPA OSWER Directive 9200.4-17P (1999a), means the reliance on natural attenuation processes (within the context of a carefully controlled and monitored site cleanup approach) to achieve site-specific remedial objectives within a timeframe that is reasonable compared to that offered by more active cleanup methods.

The natural attenuation processes can be classified as either physical (dispersion, dilution by recharge, and volatilization), chemical (sorption and chemical degradation), or biological (biodegradation).

Natural attenuation processes that result in the reduction of concentration or mobility of a contaminant, but not the total mass, are referred to as "non-destructive" mechanisms. Those processes include the physical dispersion and dilution processes and the chemical sorption process (ASTM, 1998). Natural attenuation processes that result in the reduction of the total contaminant mass in the system are referred to as "destructive" mechanisms. Those processes include the chemical and biological degradation processes. For petroleum hydrocarbons in the subsurface, biological degradation is often the most important destructive mechanism because hydrocarbons can be destroyed (ASTM, 1998).

Although some natural attenuation typically occurs at most contaminated sites, the effectiveness of these processes varies depending on the types and concentrations of contaminants present at the site and the physical, chemical, and biological characteristics of the site. Natural attenuation should be evaluated as one potential remedial approach along with other cleanup action alternatives involving more active remedial technologies. Natural attenuation processes alone do not fully mitigate the potential vapor migration pathway, and additional technologies would be required to address that exposure pathway as part of the overall cleanup.

5.2.3 Containment (Capping)

This retained containment technology option for this Site would include retaining capped portions of the Site with an impervious surface, such as use of the existing building and asphalt. Capping would prevent exposure to contamination in soil or groundwater if contamination remains above cleanup levels at the end of any active remediation. Capping would be memorialized with institutional controls at the Site. Containment technologies do not fully mitigate the potential vapor migration pathway, and additional technologies may be required to address that exposure pathway as part of the overall cleanup.

5.2.4 Removal (Soil Excavation)

Excavation of contaminated soil at the Site may be an effective method of reducing remaining PCS on the property. Excavated PCS would be transported for disposal at an appropriate disposal facility, requiring access to the Site by transport trucks during the excavation. At this Site, excavation of VOC-contaminated soils is not applicable based on the building constraints.

5.2.5 Removal (Groundwater Extraction)

Groundwater extraction would consist of submersible and/or aboveground pumping equipment used to remove and treat impacted groundwater from extraction wells. This technology would require installation of additional extraction wells within the contaminant plume. If implemented as a component of a remedial alternative, groundwater extraction would be combined with other technologies to treat the water. Treated water could either be discharged to the sanitary sewer or re-injected at the Site as part of an in-situ treatment component. Disposal of untreated groundwater to an off-Site facility may be cost-prohibitive.

5.2.6 Ex-Situ Treatment, Groundwater (Activated Carbon Adsorption)

Granulated activated carbon (GAC) treatment is a physical and chemical process that removes a wide variety of contaminants by adsorbing them from liquid streams onto an activated carbon filter. This treatment technology is most commonly used to separate organic contaminants from contaminated water. The contaminant adsorbs to the surface of GAC until the available surface area of the GAC is exhausted, after which the GAC can be either reactivated, regenerated, or

discarded. If GAC is discarded, it may be considered a hazardous waste. Groundwater extracted from the subsurface of the Site could be treated through GAC to reduce contaminant concentrations to below remedial objectives, and be reinjected or discharged.

5.2.7 Ex-Situ Treatment, Groundwater (Air Stripping/Aeration)

Air stripping is a full-scale technology in which volatile organics are partitioned from groundwater by greatly increasing the surface area of the contaminated water exposed to air. Types of aeration methods include packed towers, diffused aeration, tray aeration, and spray aeration.

Air stripping involves the mass transfer of volatile contaminants from water to air. For groundwater remediation, this process is typically conducted in a packed tower or an aeration tank. The typical packed tower air stripper includes a spray nozzle at the top of the tower to distribute contaminated water over the packing in the column, a fan to force air countercurrent to the water flow, and a sump at the bottom of the tower to collect decontaminated water. Auxiliary equipment that can be added to the basic air stripper includes an air heater to improve removal efficiencies; automated control systems with sump level switches and safety features, such as differential pressure monitors, high sump level switches, and explosion-proof components; and air emission control and treatment systems, such as activated carbon units, catalytic oxidizers, or thermal oxidizers. Packed tower air strippers are installed either as permanent installations on concrete pads or on a skid or a trailer.

Aeration tanks strip volatile compounds by bubbling air into a tank through which contaminated water flows. A forced air blower and a distribution manifold are designed to ensure air-water contact without the need for any packing materials. The baffles and multiple units ensure adequate residence time for stripping to occur. The discharge air from aeration tanks can be treated using the same technology as for packed tower air discharge treatment.

Modifying packing configurations greatly increase removal efficiency. The low-profile air stripper packs a number of trays in a very small chamber to maximize air-water contact while minimizing space. This unit offers significant vertical and horizontal space savings. Air strippers can be operated continuously or in a batch mode where the air stripper is intermittently fed from a collection tank. The batch mode ensures consistent air stripper performance and greater energy efficiency than continuously operated units because mixing in the storage tanks eliminates any inconsistencies in feed water composition.

5.2.8 In-Situ Treatment (Air/Ozone Sparging)

Sparging consists of injecting air or generated ozone into groundwater below the water table. Volatile contaminants are transferred from the dissolved phase to the vapor phase for recovery.

Air sparging has the additional benefit of increasing the dissolved oxygen content of groundwater and facilitating aerobic biological degradation of petroleum hydrocarbons and the co-metabolic biodegradation of co-located chlorinated VOCs.

Implementation of sparging technology at the Site would require installation of injection wells, and delivering air or generated ozone to the wells using a blower or compressor. Sparging wells can be either vertical wells or horizontal wells. Vapor recovery may also need to be implemented to capture volatilized compounds generated from the air sparging process. Air sparging systems are typically installed in conjunction with a soil vapor extraction (SVE) system. SVE wells can also be installed as either vertical or horizontal wells. The selection of vertical or horizontal wells and the spacing and construction of such wells would require system design and operation based upon the current ozone sparging system.

As with aeration and air stripping treatment technologies, fouling by iron and manganese can be problematic; therefore, testing for dissolved iron and manganese at the Site would be recommended prior to implementing this technology. If selected for the cleanup action, remedial pilot testing should be conducted at the Site to evaluate the effective radius of influence of injected air and determine the appropriate spacing for air sparging injection wells.

5.2.9 In-Situ Treatment (Soil Vapor Extraction)

SVE technology may be implemented alone or coupled with other technologies such as groundwater extraction or air sparging. This technology would require installation of SVE wells screened within the vadose zone where impacts are present in soil. SVE technology may also utilize appropriately constructed monitoring wells for either vapor and vacuum monitoring or for active extraction. Using vacuum blower equipment, a vacuum is applied to the SVE wells to extract volatile contaminants from the subsurface. Volatile compounds are present in soil gas either through volatilization or as the result of extraction.

Extracted vapors require treatment prior to atmospheric discharge. Vapor effluent treatment technologies include GAC, thermal oxidation (therm-ox), or catalytic oxidation (cat-ox). Any thermal treatment of chlorinated VOCs may require preliminary treatment of the air stream before entering the destruction chamber of the unit. GAC is typically applicable to lower air effluent discharges while therm-ox and cat-ox are more applicable to higher mass loadings. If vapor concentrations are expected to be significantly elevated during the initial phase of remediation, a therm-ox or cat-ox is often more suitable and more cost-effective than using GAC adsorption equipment for vapor treatment. However, GAC could be more practical for vapor treatment once concentrations are significantly reduced. Remedial pilot testing should be conducted for this technology to evaluate the effective radius of influence for extraction and determine the appropriate well spacing.

5.2.10 In-Situ Treatment (Enhanced Bioremediation)

Enhanced bioremediation is a process in which indigenous or inoculated micro-organisms (e.g., fungi, bacteria, and other microbes) degrade (metabolize) organic contaminants found in soil and/or groundwater, converting them to innocuous end products. Nutrients, oxygen, or other amendments may be used to enhance bioremediation and contaminant desorption from subsurface materials. For this Site, in-situ treatment may consist of using the "Trap and Treat" process in which granulated carbon is injected in a grid-like pattern in areas of concern, which traps the contaminants and provides plume control. The plume is then treated with a matrix, which incorporates both aerobic and anaerobic biological processes, providing longer term remedial degradation.

5.2.11 In-Situ Treatment (Chemical Oxidation)

Application of chemical oxidation technology mineralizes contaminants within subsurface soil and groundwater through chemical reactions. A mixture of oxidant and buffering compounds are typically injected into impacted soil and groundwater and, upon contact with contaminants, the oxidizer(s) break down the dissolved contaminants into carbon dioxide, water, and salts.

Delivery of oxidants to the subsurface can be conducted using direct-push probes or injection wells installed across the Site. Typical chemical oxidants used for chemical oxidation of chlorinated VOCs include Fenton's reagent and ozone, both of which have been proven to effectively destroy petroleum hydrocarbons and chlorinated solvents. Fenton's reagent consists of hydrogen peroxide combined with an iron catalyst. The injection mixture also typically includes the addition of acid, as Fenton's reagent is more effective at acidic pH. Regardless of the oxidant that is used, the destruction efficiency of contaminants can be greatly affected by the organic content of the soil and other subsurface characteristics that can be readily oxidized. Therefore, testing should be conducted at the Site to analyze the overall soil and water oxygen demand and determine the appropriate oxidant dose to be applied.

Permanganates are chemical oxidants that exist as salts and are traditionally available in a sodium or potassium form. Permanganates are commonly used for many industrial purposes including water and wastewater treatment operations. The use of permanganates in groundwater treatment applications is a proven, well documented technology. In-situ permanganate oxidation technology relies on the enhanced delivery of a permanganate oxidant compound within the subsurface providing recalcitrant contaminant (e.g., TCE, trichloroethane, dichloroethene isomers, and vinyl chloride) remediation; with final benign reaction products of carbon dioxide, water, and inorganic salts (e.g. chlorides) via direct electron exchange processes.

When ozone is used for chemical oxidation, it is applied through sparging technology, discussed above. For ozone sparging, ozone is generated on site from air and then injected as a gas into the subsurface.

5.2.12 In-Situ Treatment (Thermal Desorption)

Electrical Resistance Heating (ERH) is an in-situ, thermal technology that uses commonly available electricity and applies it into the ground through electrodes. These electrodes can be installed either vertically to any depth or horizontally underneath buildings, operating facilities, and in the presence of buried utilities. The technology is equally effective in both soil and groundwater.

Electric current is passed through a targeted soil volume between subsurface electrode elements. The resistance to electrical flow that exists in the soil causes the formation of heat; resulting in an increase in temperature until the boiling point of water at depth is reached. After reaching this temperature, further energy input causes a phase change, forming steam and removing volatile contaminants. ERH is typically more cost effective when used for treating contaminant source areas.

In-Situ Thermal Conduction Heating (TCH) is a soil remediation process in which heat and vacuum are applied simultaneously to subsurface soils, either with surface heater blankets or with an array of vertical heater/vacuum wells. Radiation heat transport dominates near the heaters, which are operated at 800 to 900°C; however, thermal conduction accounts for most of the heating at greater distances into the soil. As soil is heated, contaminants in the soil are vaporized or destroyed by a number of mechanisms, including (1) evaporation into the air stream, (2) steam distillation into the water vapor stream, (3) boiling, (4) oxidation, and (5) pyrolysis. The vaporized water, contaminants, and natural organic compounds are drawn by the vacuum in a direction countercurrent to the heat flow into the vacuum source using trenches or wells.

ERH and TCH are typically most effective on chlorinated VOCs. Less volatile contaminants like xylene or diesel can also be remediated with ERH, but energy requirements increase as the volatility decreases.

6.0 DESCRIPTION AND SELECTION OF REMEDIAL ALTERNATIVES

Based on the requirements of WAC 173-340-360, *Selection of Cleanup Actions*, three potential remedial alternatives were developed from the general response actions and technologies screened in Table 5, *Identification and Screening of Response Actions and Remediation Technologies,* and described above.

All three alternatives directly address soil and groundwater contamination at the Site, and are also intended to indirectly address ambient air quality at the Site. By reducing remaining contamination in the soil and groundwater to below cleanup levels, the source of contamination for ambient air is removed, and ambient air is expected to meet appropriate cleanup standards.

Based on preliminary screening of the general response actions identified in Section 5.2, *Identification and Screening of Remediation Technologies,* individual general response actions are not expected to individually meet MTCA threshold requirements, and therefore are not considered as stand-alone remedial alternatives.

6.1 *MTCA Threshold Requirements*

Potential remedial alternatives must meet the threshold requirements described in WAC 173-340-360(2)(a), which specifies that cleanup actions shall:

- Protect human health and the environment;
- Comply with cleanup standards;
- Comply with applicable state and federal laws; and
- Provide for compliance monitoring.

MTCA [WAC 173-340-360(2)(b)] also indicates other requirements that must be met by any cleanup alternative:

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

Local Requirements

All required local permits to implement the chosen Remedial Action will be obtained according to King County requirements. These could include, but are not limited to, construction, air quality, right-of-way (ROW), and building permits.

6.2 *Description of Remedial Alternatives*

Based upon the screening evaluation, MTCA threshold and other requirements, AEG proposes four remedial alternatives for the Site. The alternatives were developed and are evaluated with the goal of achieving remedial objectives within a reasonable timeframe, with the most permanent cleanup and minimal disruption to the Site.

6.2.1 Alternative 1 – In-Situ Treatment via Chemical Injection and Oxidation

Alternative 1 includes:

- Acquire injection permits from Ecology and the local water board.
- Injection of a mixture of sodium and potassium permanganate solution with water in areas exceeding MTCA Method A cleanup levels at the Site, using angle borings, trenches or flood galleries as accessible, to a total of 2 to 10 feet bgs to target the highest concentrations of chlorinated VOCs.
- Two separate injection events would be completed approximately six months apart.
- Soil gas monitoring event(s) would be completed after six months to compare the levels to MTCA cleanup levels.
- Confirmatory sampling and injection point abandonment.

If a permanent cleanup is unable to be performed due to accessibility, institutional controls via an environmental covenant on the property would be needed to achieve cleanup standards.

Estimated time to closure: 1 to 3 years.

6.2.2 Alternative 2 – In-Situ Treatment via Soil Vapor Extraction

Alternative 2 includes:

- Installation of four SVE extraction wells on the north and eastern side of the existing building.
- Complete underground conveyance piping to the four dual-phase extraction wells, and place vacuum equipment on the north and east sides of the building.
- Provide electrical power to the remediation equipment from the existing building power source.
- Treatment of extracted soil vapors with carbon filtration.

- Obtain air permits from the State and Local authorities.
- Eight quarters of performance monitoring using vapor samples pre & post GAC filtration units to establish trends in contaminant reduction and for permit requirements.
- Confirmatory sampling and SVE well abandonment.

Alternative 2 would cause the most impacts on vehicular and pedestrian traffic in the parking lot during installation of the extraction wells and conveyance piping. If a permanent cleanup is unable to be performed due to accessibility, institutional controls via an environmental covenant on the property would be needed to achieve cleanup standards.

Estimated time to closure: 3 to 5 years.

6.2.3 In-Situ Electrical Resistance Heating and Monitoring

Alternative 3 includes the installation and operation of an in-situ electrical resistance heating system and soil vapor recovery system at the Site, and includes:

- Development of necessary work plans and permitting.
- Drilling, soil disposal, and electrical connection of the heating system.
- Installation of electrodes in a grid pattern adjacent to the building to the north and east of the existing building.
- Operation of the electrical heating system for approximately 6-12 months.
- Installation and operation of co-located soil vapor recovery wells and treatment of recovered vapors.
- Confirmatory sampling and well abandonment.

Alternative 3 is the most costly option, yet provides a reliable and accepted method for quickly reducing contamination in the subsurface. This alternative would require few traffic impacts, mainly during installation and decommissioning of the system. Treated vapors would be discharged at the Site.

Estimated time to closure: 2 to 3 years.

6.3 *Evaluation of Remedial Alternatives*

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

1. Protectiveness;
2. Permanence;
3. Effectiveness over the long term;
4. Management of short-term risks;
5. Technical and administrative implementability;
6. Consideration of public concerns;
7. Restoration time frame; and
8. Cost.

Each of these criterion is evaluated below, except for cost, which is evaluated separately. A summary of the evaluation is provided in Table 5, *Remedial Alternatives Evaluation / Disproportionate Cost Analysis*. The overall evaluation is then used to determine the relative benefit of each alternative.

Each criterion was first assigned a score ranging from 5 (best) to 1 (worst), based upon AEG's experience, best professional judgement, and the application of scientific principles. Each score is based on the perceived benefit associated with the criterion, and is included in Table 5, *Remedial Alternatives Evaluation / Disproportionate Cost Analysis*. Alternatives deemed equally beneficial are given the same score. Several criteria are comprised of subcriteria. In such cases, each subcriterion is scored and the average of those scores is used as the criterion score.

6.3.1 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 and alternative, and improvement of the overall environmental quality.*"

Each of the three remedial alternatives reduce risk at the Site, and each is protective of human health and the environment. Alternative 1 is the least certain to reduce risks and attain cleanup standards at the Site due to a lack of shallow groundwater and access within the tenant space, and received the lowest score. Alternatives 2 and 3 ranked similarly for protectiveness.

6.3.2 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, each of the alternatives would result in a solution that is permanent. Permanence includes the subcriteria of reduction in toxicity, degree of irreversibility, and the type and character of the waste streams generated during treatment. While each of the technologies, if successfully implemented would be permanent, the degree of certainty in the success of the technology varies due to the nature of the technologies. Alternative 1 received the lowest score due to the timeframe associated with reducing toxicity, mobility, and volume, as well as its reversibility. Alternatives 2 and 3 ranked similarly for permanence.

6.3.3 Effectiveness over the Long Term

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

> "*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.*"

Long-term effectiveness includes the subcriteria of certainty, reliability, residual risk, and utilization of preferred remedies. Each of the alternatives have the intent of meeting cleanup standards and protecting human health and the environment after completion of the remedial action. However, there are varying levels of uncertainty and reliability associated with each technology throughout the process. Alternative 1 is the least certain to reduce risks and attain

cleanup standards at the Site due to a lack of shallow groundwater and access within the tenant space, and received the lowest score. Alternatives 2 and 3 ranked similarly as they intend to destroy the contaminants in-situ, and not leave any residuals behind.

6.3.4 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.*"

All of the alternatives have manageable short-term risks and effective measures for mitigating those risks. All alternatives ranked similarly as they all include intrusive activities.

6.3.5 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. The primary determining subcriterion is technical possibility. Alternative 1 is technically possible, but has issues with access and a lack of shallow groundwater. Alternative 1 received the lowest score. Alternative 2 and Alternative 3 received a similar score based on their similar advantages and disadvantages.

6.3.6 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.*"

Alternatives with significant construction components, or alternatives that leave contamination in place at the end of active remedial activities are assumed to have the most concern to the public. All three alternatives ranked similarly for this category.

6.3.7 Restoration Time Frame

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

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

Estimates of restoration time frame are necessarily subjective. Each of the alternatives is assumed to provide a reasonable restoration time frame. Actual estimates of effectiveness are premature without performance monitoring data regarding actual effectiveness. Reasonable restoration time frame was ranked based upon the general aggressiveness of each of the technologies and perceived certainty associated with the technology. Alternative 2 received a slightly lower score than Alternative 1 and Alternative 3.

6.4 *Benefit Value Determination*

Average criterion scores determined in Section 6.3 are multiplied by weighting. Weighting factors adapted from those established by Ecology are used to determine the total weighted scores:

Criteria	Weighting Factor
Protectiveness	30%
Permanence	25%
Long Term Effectiveness	20%
Short-Term Risk Management	5%
Implementability	5%
Public Concerns	10%
Restoration Time Frame	5%
Total	**100%**

Each criteria is multiplied by the weighting factor and the products summed to determine each Alternative's Benefit Value. The scoring of these values is summarized in Table 5, *Remedial Alternatives Evaluation / Disproportionate Cost Analysis*.

The results show that Alternative 3 is the preferred alternative for the non-cost criteria, as it results in the highest overall benefit value. Alternative Benefit Values are compared to Estimated Alternative Costs, discussed below.

6.4.1 Estimated Alternative Costs

Cost is defined in WAC 173-340-360(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.*"

Estimated Alternative costs have been estimated for each of the remedial alternatives based on the descriptions and associated assumptions presented above. The expected accuracy range of the cost estimates is -30% to +50%. Costs are based on typical costs for Washington State, and the current knowledge of the Site. All costs are assumed to be for newly purchased equipment. Cost estimates are not based upon refurbished or used equipment. Estimated capital costs are based on current dollar values. Estimated recurring costs and periodic costs associated with system operation and maintenance, performance and compliance monitoring, and Site closure activities are adjusted to reflect the net present value. The following table summarizes estimated costs for each alternative. These costs are for comparison purposes only and actual implementation costs will vary from those provided. 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		
Alternative Number	**Remedial Alternative**	**Estimated Alternative Costs**
1	In-Situ Treatment via Chemical Injection and Oxidation	$103,450
2	In-Situ Treatment via Soil Vapor Extraction	$294,392
3	In-Situ Treatment via Thermal Heating and Vapor Extraction	$1,137,621

6.5 *Disproportionate Cost Analysis*

The disproportionate cost analysis is made by comparing Alternative Benefit Values from Section 6.3, to each remedial alternative's estimated cost from Section 6.4. Based upon WAC 173-340-360(3)(e), 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."*

This comparison is provided below:

Disproportionate Cost Analysis			
Alternative Number	**Cost**	**Benefit Value**	**Cost per Benefit Value**
1	$103,450	2.56	$40,489
2	$294,392	3.70	$79,601
3	$1,137,621	4.10	$277,581

The results of the disproportionate cost analysis show that the cost per benefit value of Alternative 1 is least. The results also show that Alternatives 2 and 3 are each incrementally more costly per Benefit Value than Alternative 1. Based solely upon analysis of disproportionate cost, Alternative 1 is the preferred alternative.

All alternatives have a similar restoration time frame. However, Alternative 2 has a similar cost per benefit value than Alternative 1, and a significantly higher overall benefit value. Therefore, the results of the disproportionate cost analysis for practicable alternatives with similar reasonable restoration timeframes show that Alternative 2 is the preferred alternative. The analysis of disproportionate cost is included in the attachments graphically as *Chart 1, Disproportionate Cost Analysis*.

6.6 *Selection of Preferred Alternative*

Selection of the preferred alternative for the Site takes into account the following considerations:

- RAOs for the Site.
- Restoration Timeframe.
- Regulatory Requirements.
- Disproportionate Cost Analysis.
- The Site's continued retail operation.

Based solely on the Disproportionate Cost Analysis, Alternative 1 would be the preferred alternative, as Alternatives 2 and 3 are incrementally more costly per benefit value.

While all three alternatives are assumed to meet RAOs, Alternatives 1 and 3 have a restoration timeframe of between 2 and 3 years, and Alternative 2 a restoration timeframe of between 3 and 5 years.

Alternative 3 is the most expensive, and provides the highest benefit value. However, the net benefit value and restoration timeframe of Alternative 3 is very similar to Alternative 2, and its cost is substantially more.

Meeting regulatory requirements is also not as certain for Alternative 1 as the other two alternatives. The net benefit value of Alternative 1 is close to one half of Alternative 3, reflecting uncertainties regarding outcome. For these reasons, AEG does not currently recommend Alternative 1 as the preferred alternative.

Alternative 3 is the most expensive, and provides the highest benefit value. However, the net benefit value and restoration timeframe of Alternative 3 is very similar to Alternatives 2, and its cost is substantially more. Of the three alternatives with similar net benefit values, Alternative 2 is the least expensive, and is therefore AEG's preferred alternative for this Site.

AEG will draft a Cleanup Action Plan that includes a detailed summary of Alternative 2 (In-Situ Treatment via Soil Vapor Extraction), and how AEG intends to implement it at the Site.

7.0 LIMITATIONS

This report summarizes the findings of the services authorized under our agreement with Mr. Chang Kim. It has been prepared using generally accepted professional practices, related to the nature of the work accomplished. This report was prepared for the exclusive use of Mr. Chang Kim and his designated representatives for the specific application to the project purpose.

Recommendations, opinions, site history, and proposed actions contained in this report apply to conditions and information available at the time this report was completed. Since conditions and regulations beyond our control can change at any time after completion of this report, or our proposed work, we are not responsible for any impacts of any changes in conditions, standards, practices, and/or regulations subsequent to our performance of services. We cannot warrant or validate the accuracy of information supplied by others, in whole or part.

8.0 REFERENCES

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FIGURES

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FILENAME	DRAWN BY		CHECKED BY		APPROVED BY		PROJECT NUMBER
17-126_17Q1.DWG	ICD	3/22/2017	CS	3/22/2017	CS	3/22/2017	17-126

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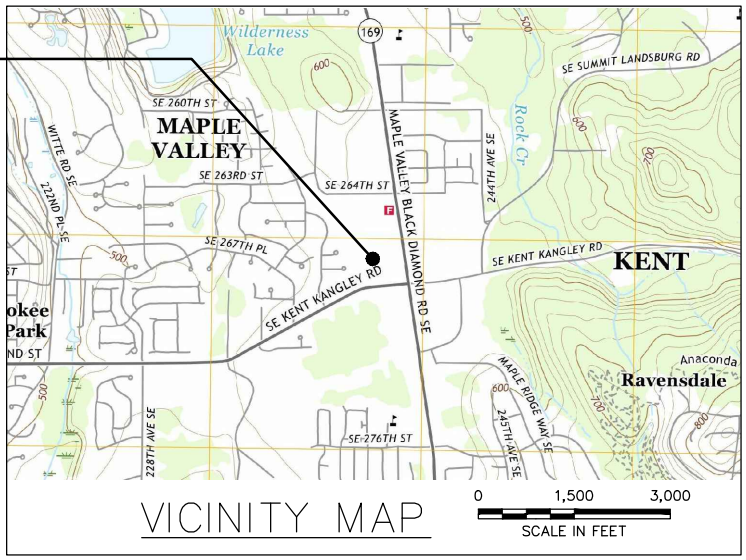
PROJECT LOCATION



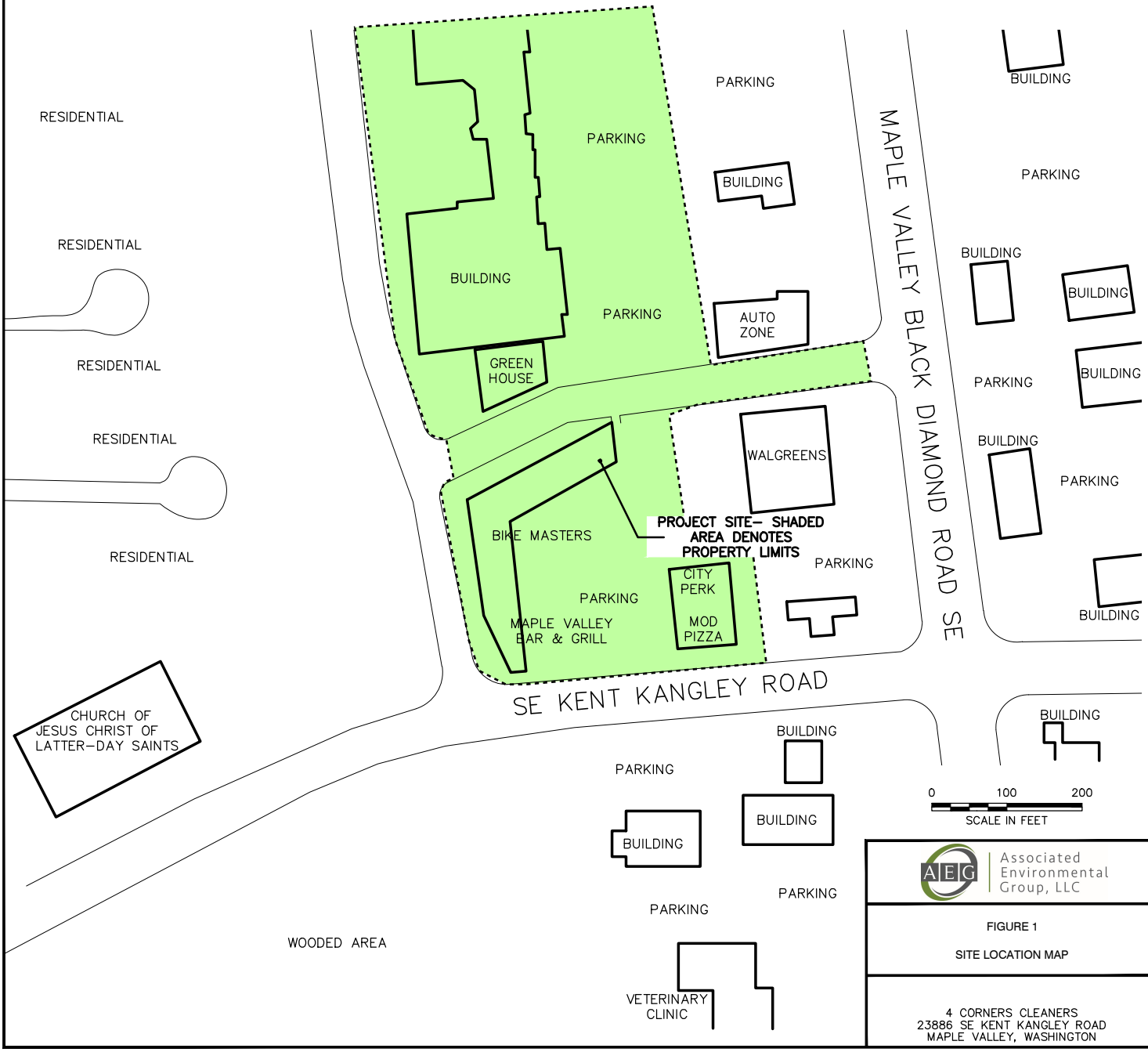
VICINITY MAP

NOTES

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT.

REFERENCE

DRAWING CREATED FROM AERIAL PHOTOGRAPH AND NOTES PROVIDED BY AEG, LLC.
VICINITY IMAGE SOURCE: U.S. GEOLOGICAL SURVEY–2017, 7.5 MINUTE QUADRANGLE MAP
BLACK DIAMOND, WASHINGTON



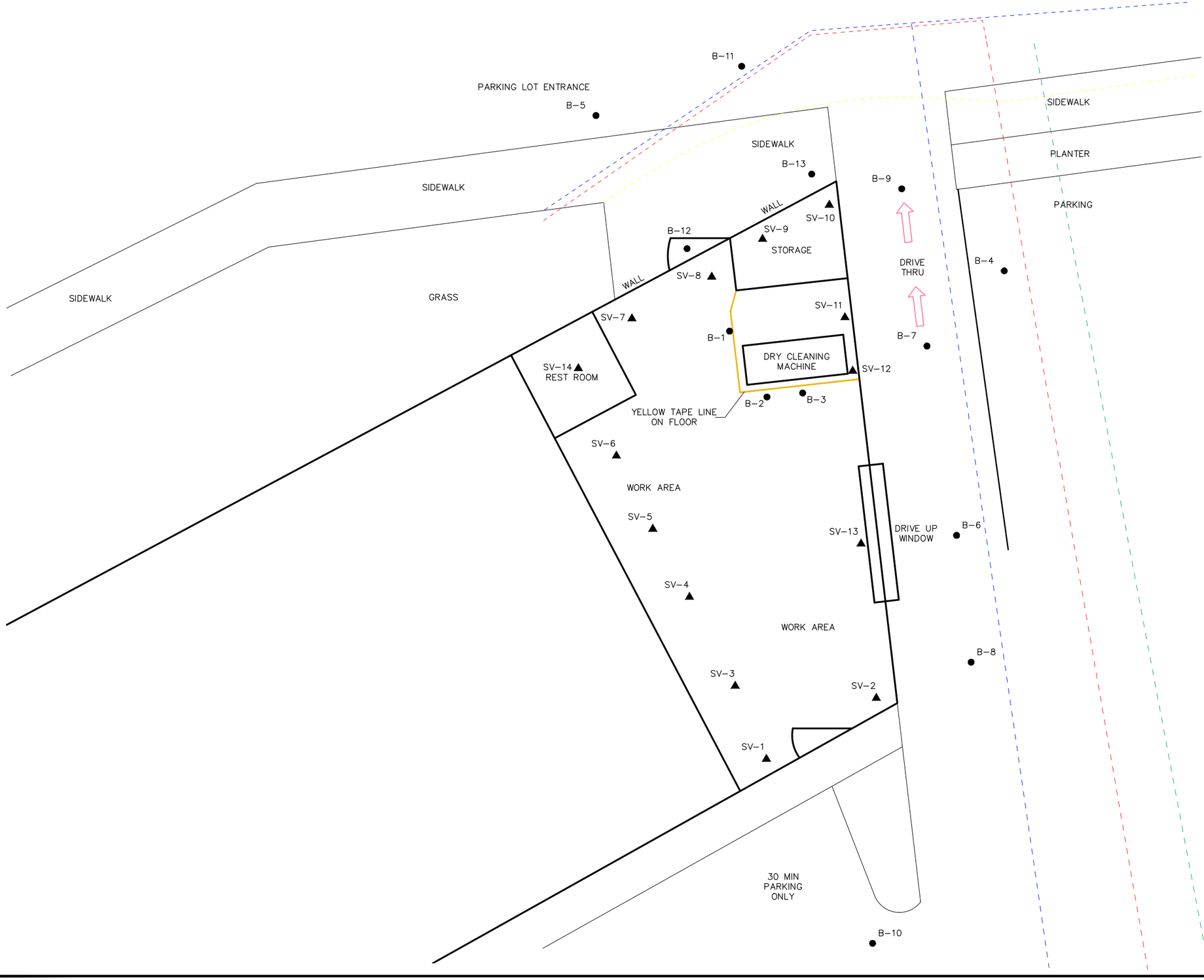
Associated Environmental Group, LLC

FIGURE 1

SITE LOCATION MAP

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

PROJECT NUMBER	17-126
APPROVED BY	BD 9/27/2018
CHECKED BY	BD 9/27/2018
DRAWN BY	ICD 9/27/2018
FILENAME	17-126_1803.DWG



LEGEND

- B-1 ● SOIL BORING LOCATION
- SV-1 ▲ SOIL VAPOR LOCATION
- APPROX. LOCATION OF GAS LINE
- APPROX. LOCATION OF ELECTRIC LINE
- APPROX. LOCATION OF WATER LINE
- APPROX. LOCATION OF SEWER/STORMWATER

NOTES

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT.

REFERENCE

DRAWING CREATED FROM AERIAL PHOTOGRAPH AND NOTES PROVIDED BY AEG, LLC.

0 5 10
SCALE IN FEET

Associated Environmental Group, LLC

FIGURE 2

SITE MAP

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

PROJECT NUMBER	17-126
APPROVED BY	BD 1/11/2019
CHECKED BY	BD 1/11/2019
DRAWN BY	ICD 1/11/2019
FILENAME	17-126_1803_1.DWG

B-5					
07/17/18					
DP	5.0'	10.0'	15.0'	25.0'	30.0'
PCE	<0.02	<0.02	<0.02	<0.02	<0.02

B-13				
07/23/18				
DP	3.0'	18.0'	35.0'	37.0'
PCE	<0.02	<0.02	<0.02	<0.02

B-11								
07/20/18								
DP	3.0'	6.0'	9.0'	15.0'	18.0'	21.0'	24.0'	33.0'
PCE	<0.02	<0.02	<0.02	<0.02	**0.053**	**0.034**	**0.046**	<0.02

B-12				
07/23/18				
DP	3.0'	18.0'	33.0'	37.0'
PCE	<0.02	<0.02	<0.02	<0.02

B-1	
03/13/17	
DP	1.8'
PCE	**0.058**

B-2	
03/13/17	
DP	1.6'
PCE	**0.044**

B-9					
07/19/18					
DP	3.0'	9.0'	15.0'	24.0'	33.0'
PCE	<0.02	<0.02	<0.02	<0.02	<0.02

B-4			
07/17/18			
DP	5.0'	10.0'	25.0'
PCE	<0.02	<0.02	<0.02

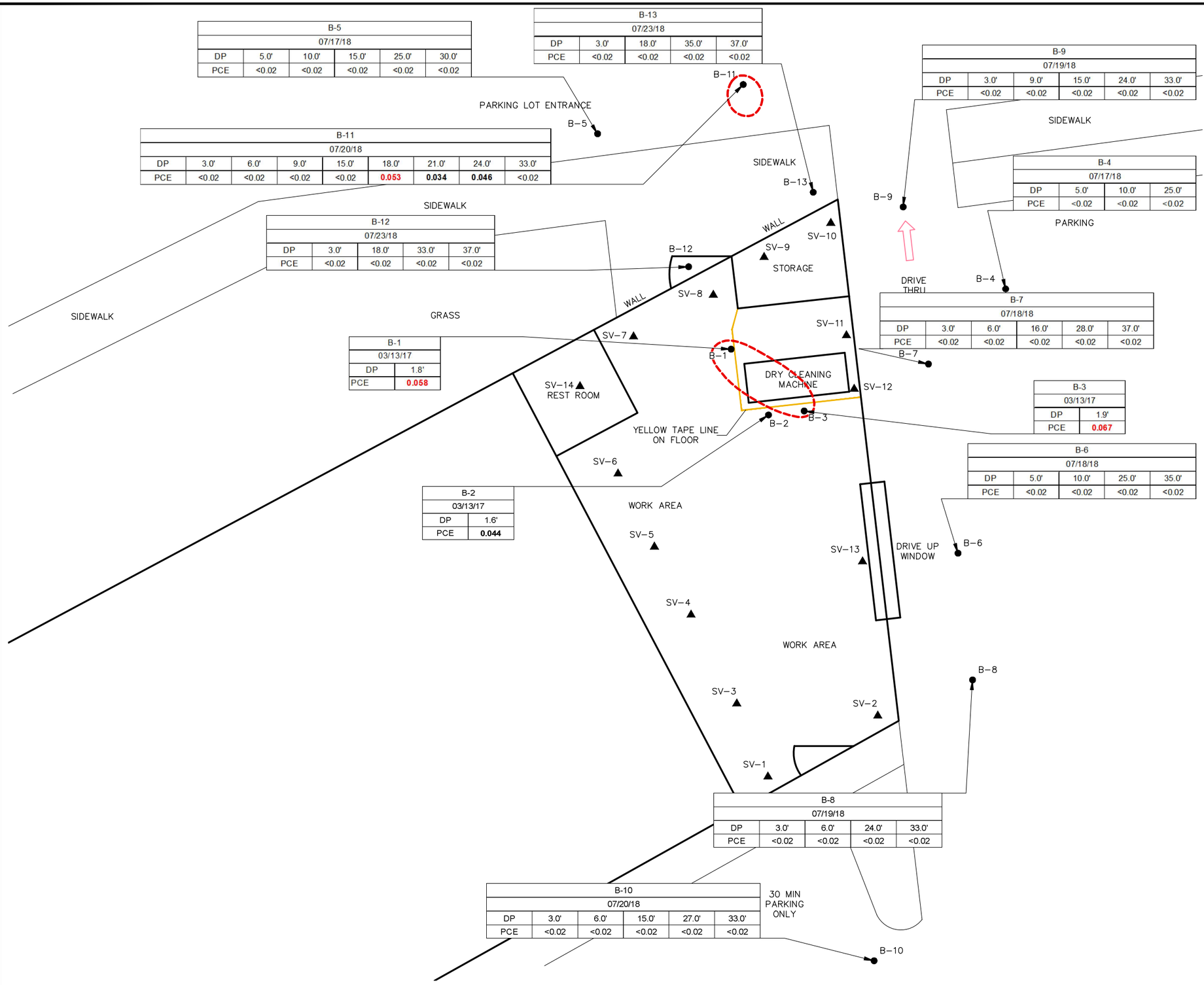
B-7					
07/18/18					
DP	3.0'	6.0'	16.0'	28.0'	37.0'
PCE	<0.02	<0.02	<0.02	<0.02	<0.02

B-3	
03/13/17	
DP	1.9'
PCE	**0.067**

B-6				
07/18/18				
DP	5.0'	10.0'	25.0'	35.0'
PCE	<0.02	<0.02	<0.02	<0.02

B-8				
07/19/18				
DP	3.0'	6.0'	24.0'	33.0'
PCE	<0.02	<0.02	<0.02	<0.02

B-10					
07/20/18					
DP	3.0'	6.0'	15.0'	27.0'	33.0'
PCE	<0.02	<0.02	<0.02	<0.02	<0.02



LEGEND

B-1 ●	SOIL BORING LOCATION
SV-1 ▲	SOIL VAPOR LOCATION
PCE	TETRACHLOROETHENE (mg/kg)
- - - - -	SOIL PCE PLUME (INDICATING EXCEEDANCE OF MTCA CUL 0.05 mg/kg)
<	NOT DETECTED ABOVE LIMIT NOTED
mg/kg	MILLIGRAMS PER KILOGRAM
DP	DEPTH IN FEET

BOLD VALUE INDICATES THE DETECTED CONCENTRATION IS BELOW ECOLOGY MTCA METHOD A CLEANUP LEVELS

RED BOLD VALUE INDICATES THE DETECTED CONCENTRATION EXCEEDS ECOLOGY MTCA METHOD A CLEANUP LEVELS

NOTES

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT.

REFERENCE

DRAWING CREATED FROM AERIAL PHOTOGRAPH AND NOTES PROVIDED BY AEG, LLC.

0 5 10
SCALE IN FEET

Associated Environmental Group, LLC

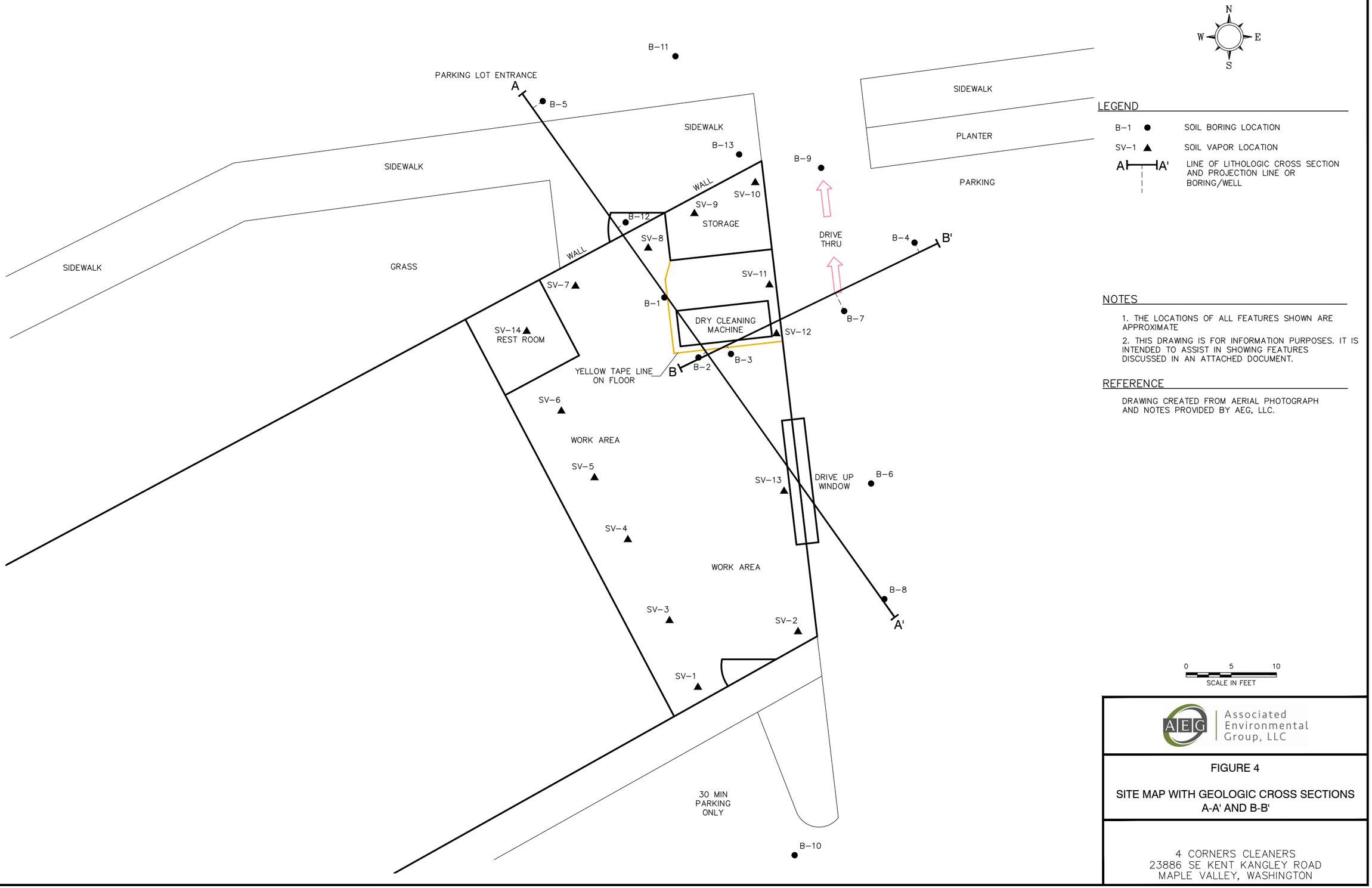
FIGURE 3

PCE IN SOIL PLUME MAP

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

PROJECT NUMBER 17-126

APPROVED BY	BD	1/11/2019
CHECKED BY	BD	1/11/2019
DRAWN BY	ICD	1/11/2019
FILENAME	17-126_XSECTIONS.DWG	



LEGEND

B-1 ●	SOIL BORING LOCATION
SV-1 ▲	SOIL VAPOR LOCATION
A A'	LINE OF LITHOLOGIC CROSS SECTION AND PROJECTION LINE OR BORING/WELL

NOTES

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT.

REFERENCE

DRAWING CREATED FROM AERIAL PHOTOGRAPH AND NOTES PROVIDED BY AEG, LLC.

0 5 10
SCALE IN FEET

Associated Environmental Group, LLC

FIGURE 4

SITE MAP WITH GEOLOGIC CROSS SECTIONS A-A' AND B-B'

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

PROJECT NUMBER	APPROVED BY	CHECKED BY	DRAWN BY
17-126	BD 1/11/2019	BD 1/11/2019	ICD 1/11/2019

FILENAME: 17-126_XSECTIONS.DWG

NORTHWEST

A

SOUTHEAST

A'

B-B' LINE

BUILDING

B-5 B-12 B-1 B-2 B-8

DEPTH BELOW GROUND SURFACE (FEET)

0 10 20 30 40

B-1	
03/13/17	
DP	1.8'
PCE	**0.058**

B-2	
03/13/17	
DP	1.6'
TPH-d	**0.044**

0 2.5 5
HORIZONTAL SCALE

0 5 10
VERTICAL SCALE

LEGEND

B-2 – SOIL BORING

– GROUNDWATER LEVEL AT TIME OF DRILLING

– MAXIMUM DEPTH EXPLORED

– SOIL CONTACT

SANDY GRAVEL

GRAVELLY SILT

PCE	TETRACHLOROETHENE (mg/kg)
<	NOT DETECTED ABOVE LIMIT NOTED
mg/kg	MILLIGRAMS PER KILOGRAM
DP	DEPTH IN FEET

BOLD VALUE INDICATES THE DETECTED CONCENTRATION IS BELOW ECOLOGY MTCA METHOD A CLEANUP LEVELS

RED BOLD VALUE INDICATES THE DETECTED CONCENTRATION EXCEEDS ECOLOGY MTCA METHOD A CLEANUP LEVELS

AEG Associated Environmental Group, LLC

FIGURE 5

GEOLOGIC CROSS SECTION A-A'

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

FILENAME	DRAWN BY	CHECKED BY	APPROVED BY	PROJECT NUMBER
17-126_XSECTIONS.DWG	ICD 1/11/2019	BD 1/11/2019	BD 1/11/2019	17-126

SOUTHWEST

B

A–A' LINE

BUILDING

B–2 B–3 B–7 B–4

NORTHEAST

B'

DEPTH BELOW GROUND SURFACE (FEET)

0 10 20 30 40

B-2	
03/13/17	
DP	1.6'
PCE	**0.044**

B-3	
03/13/17	
DP	1.9'
PCE	**0.067**

HORIZONTAL SCALE 0 2.5 5

VERTICAL SCALE 0 5 10

LEGEND

B–2 – SOIL BORING

– GROUNDWATER LEVEL AT TIME OF DRILLING

– MAXIMUM DEPTH EXPLORED

– SOIL CONTACT

SANDY GRAVEL

GRAVELLY SILT

PCE	TETRACHLOROETHENE (mg/kg)
<	NOT DETECTED ABOVE LIMIT NOTED
mg/kg	MILLIGRAMS PER KILOGRAM
DP	DEPTH IN FEET

BOLD VALUE INDICATES THE DETECTED CONCENTRATION IS BELOW ECOLOGY MTCA METHOD A CLEANUP LEVELS

RED BOLD VALUE INDICATES THE DETECTED CONCENTRATION EXCEEDS ECOLOGY MTCA METHOD A CLEANUP LEVELS

AEG Associated Environmental Group, LLC

FIGURE 6

GEOLOGIC CROSS SECTION B-B'

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

TABLES

605 11th Ave. SE, Suite 201 • Olympia, WA • 98501
Phone: 360-352-9835 • Fax: 360-352-8164 • Email: admin@aegwa.com

Table 1 - Summary of Soil Analytical Results

4 Corners Dry Cleaning

Maple Valley, Washington

Sample Number	Depth Collected (feet)	Date Collected	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride
B1-22	1.8	3/13/2017	**0.058**	<0.02	<0.05	<0.05	<0.02
B2-20	1.6	3/13/2017	**0.044**	<0.02	<0.05	<0.05	<0.02
B3-23	1.9	3/13/2017	**0.067**	<0.02	<0.05	<0.05	<0.02
B4-5	5.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B4-10	10.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B4-25	25.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B5-5	5.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B5-10	10.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B5-15	15.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B5-25	25.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B5-30	30.0	7/17/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B6-5	5.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B6-10	10.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B6-25	25.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B6-35	35.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B7-3	3.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B7-6	6.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B7-16	16.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B7-28	28.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B7-37	37.0	7/18/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B8-3	3.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B8-6	6.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B8-24	24.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B8-33	33.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B9-3	3.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B9-9	9.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B9-15	15.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B9-24	24.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B9-33	33.0	7/19/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B10-3	3.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B10-6	6.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B10-15	15.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B10-27	27.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B10-33	33.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B11-3	3.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B11-6	6.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B11-9	9.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B11-15	15.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B11-18	18.0	7/20/2018	**0.053**	<0.02	<0.05	<0.05	<0.02
B11-21	21.0	7/20/2018	**0.034**	<0.02	<0.05	<0.05	<0.02
B11-24	24.0	7/20/2018	**0.046**	<0.02	<0.05	<0.05	<0.02
B11-33	33.0	7/20/2018	<0.02	<0.02	<0.05	<0.05	<0.02

Table 1 - Summary of Soil Analytical Results

4 Corners Dry Cleaning

Maple Valley, Washington

Sample Number	Depth Collected (feet)	Date Collected	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride
B12-3	3.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B12-18	18.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B12-33	33.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B12-37	37.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B13-3	3.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B13-18	18.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B13-35	35.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
B13-37	37.0	7/23/2018	<0.02	<0.02	<0.05	<0.05	<0.02
PQL			0.02	0.02	0.05	0.05	0.02
MTCA Method A Cleanup Levels			0.05	0.03	160*	1,600*	0.67*

Notes:

All values are presented in milligrams per kilogram (mg/kg)

< = Not detected at the listed laboratory detection limits

PQL = Practical Quantification Limit (laboratory detection limit)

*Method B cleanup level for direct contact; no Method A cleanup has been established.

Red Bold indicates the detected concentration exceeds Ecology MTCA Method A cleanup level

Bold indicates the detected concentration is below Ecology MTCA Method A cleanup levels

PCE = Tetrachloroethene

TCE = Trichloroethene

DCE = Dichloroethene

Table 2 - Summary of Sub-Slab Vapor Analytical Results
4 Corners Cleaners
Maple Valley, Washington

Sample Number	Depth Collected (feet)	Date Collected	PCE and Daughter Products					Other Detected Volatile Organic Compounds		
			PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride	Chloroform	Dichloro-difluoromethane	1,1,2-Trichloroethane
SV-1	SUB-SLAB	3/31/2017	**1,600**	<10	<10	<10	<10	<10	<10	<10
SV-2	SUB-SLAB	3/31/2017	**1,800**	<10	<10	<10	<10	<10	**8,600**	<10
SV-3	SUB-SLAB	3/31/2017	**1,500**	<10	<10	<10	<10	<10	**12,000**	<10
SV-4	SUB-SLAB	3/31/2017	**790**	<10	<10	<10	<10	<10	**15,000**	<10
SV-5	SUB-SLAB	3/31/2017	**940**	<10	<10	<10	<10	<10	**8,200**	<10
SV-6	SUB-SLAB	3/31/2017	**850**	<10	<10	<10	<10	<10	**7,200**	<10
SV-7	SUB-SLAB	3/31/2017	**1,700**	<10	<10	<10	<10	<10	**870**	<10
SV-8	SUB-SLAB	3/31/2017	**1,100**	<10	<10	<10	<10	<10	**290**	<10
SV-9	SUB-SLAB	3/31/2017	**2,800**	<10	<10	<10	<10	**310**	**2,500**	<10
SV-10	SUB-SLAB	3/31/2017	**2,100**	<10	<10	<10	<10	**31,000**	**3,100**	**380**
SV-11	SUB-SLAB	3/31/2017	**6,300**	<10	<10	<10	<10	<10	**2,800**	<10
SV-12	SUB-SLAB	3/31/2017	**2,600**	<10	<10	<10	<10	<10	**3,400**	<10
SV-13	SUB-SLAB	3/31/2017	**180**	<10	<10	<10	<10	<10	**9,000**	<10
SV-14	SUB-SLAB	3/31/2017	**2,600**	<10	<10	<10	<10	<10	**610**	<10
PQL			10.0	10.0	10.0	10.0	10.0	10.0	10.0	10.0
MTCA Method B Sub-Slab Screening Levels			321	12.3	NL	NL	9.33	3.62	1,520	5.21

Notes:
All values are presented in micrograms per cubic meter (µg/m³)
< = Not detected at the listed laboratory detection limits
PQL = Practical Quantification Limit (laboratory detection limit)
PCE = Tetrachloroethene
TCE = Trichloroethene
DCE = Dichloroethene
NL = Not Listed; no sub-slab screening levels have been established for this constituent/
Red Bold indicates the detected concentration exceeds Ecology MTCA Method B sub-slab screening level
Bold indicates the detected concentration is below Ecology MTCA Method B sub-slab screening levels

Table 3 - Summary of Groundwater Analytical Results

4 Corners Cleaners

Maple Valley, Washington

Sample Number	Date Collected	PCE	TCE	cis-1,2-DCE	trans-1,2-DCE	Vinyl Chloride
B4-W	7/17/2018	<1.0	<1.0	<1.0	<1.0	<0.2
B5-W	7/17/2018	<1.0	<1.0	<1.0	<1.0	<0.2
B6-W	7/18/2018	<1.0	<1.0	<1.0	<1.0	<0.2
B7-W	7/18/2018	<1.0	<1.0	<1.0	<1.0	<0.2
B8-W	7/19/2018	<1.0	<1.0	<1.0	<1.0	<0.2
B9-W	7/19/2018	<1.0	<1.0	<1.0	<1.0	<0.2
PQL		1.0	1.0	1.0	1.0	0.2
MTCA Method A Cleanup Levels		5.0	5.0	160*	16*	0.2

Notes:

All values present are micrograms per liter (µg/L)

-- = Not analyzed for constituent

< = Not detected at the listed laboratory detection limits

PQL = Practical Quantification Limit (laboratory detection limit)

Red Bold indicates the detected concentration exceeds Ecology MTCA Method A cleanup level

Bold indicates the detected concentration is below Ecology MTCA Method A cleanup levels

PCE = Tetrachloroethene

TCE = Trichloroethene

DCE = Dichloroethene

* MTCA Method B cleanup level; Method A cleanup level not established

Table 4 - Identification and Screening of Response Actions and Remediation Technologies, 4 Corners Cleaners, 2386 SE Kent Kangley Road, Maple Valley, Washington 98038

General Response Action	Technology/Options	Process Description	Applicability to Site Conditions	Effectiveness	Implementability	Relative Cost	Retain for Further Consideration	Reasons for Screening Decision
No Action	None	--	Not applicable. Contamination exceeds MTCA Method A cleanup levels	Unable to achieve RAOs. Not effective.	Not implementable	Low	Not retained	RAOs not achievable.
Institutional Controls	Site access and use restrictions	Legal Restrictions/environmental covenant limiting exposure to contamination. Deed restrictions to control soil excavation or access to groundwater.	Possibly applicable for closure after site demonstrates no off-property impacts	Effective at limiting exposure pathways to remaining contamination above CULs on-property, where disproportionate cost analysis demonstrates additional remediation not cost-effective.	Implementable	Low, with possible future monitoring requirements.	**Retained**	Environmental Covenant may be appropriate as part of a remedial option.
Monitored Natural Attenuation	Long term monitoring of affected media at Site	Actively and regularly monitor ongoing natural processes acting to reduce contaminant concentrations in affected media. Enhancement of natural attenuation processes possible through injection of chemicals or microbes to increase the rate of attenuation.	May be applicable	Effective on petroleum hydrocarbons where natural conditions determined to be conducive to attenuation.	Implementable	Low, with possible future monitoring requirements.	Not retained	Could be appropriate remedial solution for residual contamination.
Containment	Vertical Barriers	Impermeable subsurface slurry wall or dike constructed to prevent migration of contamination.	Not applicable	Can be effective for preventing lateral migration of contaminants. Not effective in reducing LNAPL or dissolved phase contamination.	Not implementable	High	Not retained	No LNAPL present with a number of utilities present make it impractical.
	Hydraulic Containment	Groundwater pumping.	Not applicable	Not effective in Site-specific conditions.	Not implementable	High	Not retained	Low permeability soils make hydraulic containment ineffective at this site.
	Capping	Impervious concrete or asphalt surfaces over contamination, limiting exposure pathways at Site.	May be applicable	Effective at limiting exposure pathways to remaining contamination above CULs.	Implementable	Moderate	Not retained	Site is currently capped in some areas with impermeable surfaces.
Removal	Soil Excavation	Excavation and removal of contaminated soil.	Not applicable	Effective at removing PCS where accessible.	Not implementable	High	Not retained	Contaminated soil excavation is not appropriate with the building and sidewalk placement.
	LNAPL Recovery	Extraction of LNAPL from groundwater table by pumping or skimming.	Not applicable	Effective at reducing LNAPL sources.	Not implementable	Moderate	Not retained	LNAPL not present at Site
	Groundwater Extraction	Pumping groundwater from extraction wells to ex-situ treatment system	Not applicable	Effective at removing dissolved phase contamination from groundwater.	Not implementable	High	Not retained	Groundwater not an issue at the Site.
Ex-Situ Treatment-Soil	Excavated soil treatment	Treatment and on-site reuse of contaminated soil.	Not applicable	Effective at reducing soil contamination levels.	Not implementable.	High, depending on methods of access and treatment.	Not retained	Not likely implementable at this Site. Possible permitting issues. Would require areas on the property to properly contain and treat contaminated soil.
Ex-Situ Treatment-Groundwater	Activated Carbon Adsorption	Contaminated groundwater is passed through granular activated carbon (GAC) filters to absorb contaminants. Treated water may be discharged or reinjected.	Not applicale	Effective for reducing dissolved phase contamination in groundwater.	Not implementable	Moderate	Not retained	Groundwater not an issue at the Site.
	Air Stripping	Extract groundwater to volatilize through air stripper.	Not applicable	Effective for reducing dissolved phase contamination in groundwater.	Not implementable	Moderate	Not retained	Groundwater not an issue at the Site.
	Chemical Oxidation	Injection of chemical oxidants such as ozone or hydrogen peroxide into extracted groundwater.	Not applicable	Effective for reducing dissolved phase contamination in groundwater.	Not Implementable	High	Not retained	Groundwater not an issue at the Site.

Table 4 - Identification and Screening of Response Actions and Remediation Technologies, 4 Corners Cleaners, 2386 SE Kent Kangley Road, Maple Valley, Washington 98038

General Response Action	Technology/Options	Process Description	Applicability to Site Conditions	Effectiveness	Implementability	Relative Cost	Retain for Further Consideration	Reasons for Screening Decision
In-Situ Treatment, Soil and Groundwater	Air/Ozone Sparging	Air or ozone injection into the subsurface to volatilize contamination and provide oxygen for enhanced aerobic biodegradation.	Applicable	Effective for reducing dissolved phase contamination in groundwater.	Not implementable	Moderate	Not retained	Groundwater not an issue at the Site.
	Soil Vapor Extraction	Extract volatile contaminants by applying a vacuum to subsurface. Collected gasses would require additional treatment in vapor phase-GAC filter or through thermal treatment prior to discharge.	Applicable	Effective for reducing dissolved phase contamination.	Implementable	Moderate	**Retained**	Appropriate for soils at the Site.
	High Vacuum Dual-Phase Extraction	Extract volatile and dissolved phase contaminants by applying a vacuum to subsurface. Collected water and soil gasses would require additional treatment in liquid and vapor phase-GAC filters .	Not applicable	Effective for reducing dissolved phase contamination.	Implementable	Moderate	Not retained	Groundwater not an issue at the Site.
	In-Situ Chemical Injection	Injection of chemicals and substances promoting degradation of contamination into the subsurface.	Applicable	Effective for reducing dissolved phase contamination.	Implementable	Moderate	**Retained**	Appropriate for soils at the Site.
	Enhanced Bioremediation	Injection of chlorinated hydrocarbon-degrading microbes along with other substances to provide additional biodegradation in the subsurface	Applicable	Can be effective.	Implementable	Moderate	**Retained**	Appropriate for groundwater and soils at the Site and deeper groundwater table.
	Electrical Resistance Heating	Heat subsurface by heated water, steam or electrical resistance to volatilize contamination.	Applicable	Effective for reducing dissolved phase contamination in groundwater.	Implementable	High	**Retained**	Appropriate for soils at the Site and groundwater table but the limitations of ERH needs large area of equipment makes this option very costly and will impede site activities.

TABLE 5 - Remedial Alternatives Evaluation / Disproportionate Cost Analysis, 4 Corners Cleaners, 2386 SE Kent Kangley Road, Maple Valley, Washington 98038

	Alternative 1		Alternative 2		Alternative 3	
Description of Alternative	Alternative 1, In-situ treatment via chemical injection and oxidation, includes: • Acquire injection permits from Ecology and the local water board. • Injection of a mixture of sodium & potassium permanganate mixture with water in areas exceeding MTCA Method A cleanup levels at the Site, using angle borings as accessible, or from inside the building, to a total of 2 to 15 feet bgs to target the highest concentrations of chlorinated VOCs • In situ chemical oxidation (ISCO) refers to the injection and distribution of an oxidant into the subsurface to achieve oxidation of the contaminants of concern (COCs) present in soil. The target COCs are generally oxidized to relatively non-toxic products, such as carbon dioxide and water. ISCO treatment systems utilize one or more strong oxidants, which typically include permanganate, persulfate, hydrogen peroxide, or ozone. • Confirmation borings and soil sampling will be completed to assess the soil concentration levels and compare to MTCA A CULs. Alternative 1 includes the confirmatory soil and indoor air sampling, and injection well point abandonment. Challenges with this alternative include a lack of groundwater to distribute ISCO fluid, and a lack of access to directly apply fluids to impacted area.		Alternative 2, Soil Vapor Extraction (SVE), includes: • The design, installation, and operation of the soil vapor extraction (SVE) system; compliance air/vapor sampling. • Confirmatory soil sampling; and system/well decommissioning. • SVE is a process that extracts soil vapor from unsaturated soils in the vadose zone by applying a vacuum to the subsurface, to further extract and contain volatile chemicals from groundwater and the soils. The vacuum is applied via a blower connected to extraction wells screened in the area of contamination. Soil vapor extracted from the subsurface is processed through a treatment system, typically including filters for particulate removal, condensate removal, and treatment by thermal oxidation or granular activated carbon filtration. • The SVE system would operate for up to 3 years followed by 4 quarters of compliance monitoring. Alternative 2 includes the installation and operation of the SVE system, compliance air sampling and confirmatory soil and indoor air sampling, system decommissioning and well abandonment.		Alternative 3 involves heating the subsurface with thermal conduction heating (TCH) to volatilize contamination, collecting/condensing steam generated and treatment of condensate along with VOCs in the vapor phase prior to discharge. This includes the installation and operation of an in-situ electrical resistance heating system and soil vapor recovery system at the Site, and includes: • Development of necessary work plans and permitting. • Drilling, soil disposal, and large load electrical supply from power grid and field connection of the heating system. • Installation of heating elements in a grid pattern east the building and possibly beneath the floor in the dry cleaner building. • Installation of steam condensation system, water collection/treatment system, control/monitoring CPU system, startup and optimization of electrical heating grid. • Operation of the electrical heating system for approximately 6 -12 months. • Installation and operation of co-located soil vapor recovery wells and treatment of recovered vapors. • Confirmatory sampling and well abandonment.	
		SCORE		***SCORE***		***SCORE***
Protectiveness						
Overall protectiveness	*Not as protective when complete*	*1*	*More protective when complete*	*4*	*More protective when complete*	4
Reduces existing risks	*Reduces risks when implemented*	*2*	*Reduces risks when implemented*	*4*	*Reduces risks when implemented*	4
Time required to reduce risk	*Longer duration required with less certainty*	*1*	*Medium duration to reduce risks*	*3*	*Medium duration to reduce risks*	5
On-Site risks	*Reduces risk with lower level of certainty*	*1*	*Reduces risks with a moderate level of certainty*	*3*	*Reduces risks with a moderate level of certainty*	5
Off-Site risks	*Reduces risk with lower level of certainty*	*1*	*Reduces risks with a moderate level of certainty*	*3*	*Reduces risks with a moderate level of certainty*	5
Improvement in environmental quality	*Low level of improvement*	*1*	*Moderate to high level of improvement*	*4*	*Moderate to high level of improvement*	4
Criterion Score x weighting factor (average 0.30)*		***0.35***		***1.05***		***1.35***
Permanence						
Reduces toxicity, mobility, and volume	*Longer term reduction*	*1*	*Reduces toxicity, mobility, and volume rapidly. May leave some toxicity in place under building or in vadose zone soils.*	*4*	*Reduces toxicity, mobility, and volume rapidly. May leave some toxicity in place under building or in vadose zone soils.*	4
Degree of irreversibility	*Can be reversed*	*1*	*Irreversible. Waste treated in-situ.*	*4*	*Irreversible. Waste treated in-situ.*	4
Waste characteristics	*No waste generated from action. Some waste from monitoring.*	*4*	*Solid waste from monitoring and air treatment operations.*	*2*	*No waste generated from action. Some waste from monitoring.*	2
Criterion Score x weighting factor (average 0.25)*		***0.50***		***0.83***		***0.83***
Long-Term Effectiveness						
Degree of Certainty	*Moderately certain. May be unable to inject under building. May leave some waste in place under the building vadose zone soils.*	*3*	*Moderately certain. May leave some waste in place under the building vadose zone soils.*	*4*	*Moderately certain. May leave some waste in place under the building vadose zone soils.*	4
Reliability	*Moderate reliable*	*4*	*Reliable and proven*	*5*	*Newer technology proven for groundwater treatment, less for soil treatment*	5
Residual Risk	*Moderate to low*	*4*	*Moderate to High level based on potential to leave residuals in soil.*	*4*	*Moderate to High level based on potential to leave residuals in soil.*	4
Technology hierarchy	*Mid rank - treats in-situ*	*4*	*Mid rank - treats in-situ*	*4*	*Mid rank - treats in-situ*	4
Criterion Score x weighting factor (average 0.20)*		***0.75***		***0.85***		***0.85***
Short-Term Risk Management						
During construction	*Moderate risk associated with access within space to inject ISCO mixture.*	*3*	*Moderate risks associated with system installation, utilities, and traffic*	*3*	*Moderate risks associated with utilities, access, and traffic*	3
Effectiveness of risk management	*Effective*	*4*	*Moderately effective*	*4*	*Moderately effective*	4
Criterion Score x weighting factor (average 0.05)*		***0.18***		***0.18***		***0.18***
Implementability						
Technically possible	*Possible, though would be issues with access and lack of groundwater*	*2*	*Possible, demonstrated at similar sites. Possible issues with residuals in Site soils.*	*4*	*Possible, demonstrated at similar sites. Possible issues with residuals in Site soils.*	3
Access	*Difficult to moderatey accessible*	*2*	*Moderately to Easily accessible*	*4*	*Moderately to Easily accessible*	4
Availability of necessary resources	*Readily available*	*5*	*Readily available*	*5*	*Readily available*	3
Monitoring requirements	*High*	*1*	*Moderate*	*3*	*Moderate*	3
Integration with existing features	*Access to interior of building is required*	*3*	*Moderate*	*3*	*No Changes required*	1
Criterion Score x weighting factor (average 0.05)*		***0.13***		***0.19***		***0.14***
Public Concerns						
Public Concerns	*Leaves contamination in place and possible concerns with injected materials.*	*4*	*Treats contamination in place. May leave residuals under the building and/or in vadose zone soils.*	*4*	*Treats contamination in place. May leave residuals under building and/or in vadose zone soils.*	*5*
Criterion Score x weighting factor (average 0.10)*		***0.40***		***0.40***		***0.50***
Restoration Time Frame						
Restoration Time Frame	*Moderate time frame (1-3 years)*	*5*	*Less to moderate time frame (3-5 years)*	*4*	*Moderate time frame (2-3 years)*	*5*
Criterion Score x weighting factor (average 0.05)*		***0.25***		***0.20***		***0.25***
Alternative Benefit Value	*2.56*		*3.70*		*4.10*	
Estimated Alternative Cost to Closure	$103,450		$294,392		$1,137,621	
Cost per Benefit Value	$40,489		$79,601		$277,581	

* Alternative Benefit Values are determined by multiplying criterion scores by weighting factors described in Section 10.4

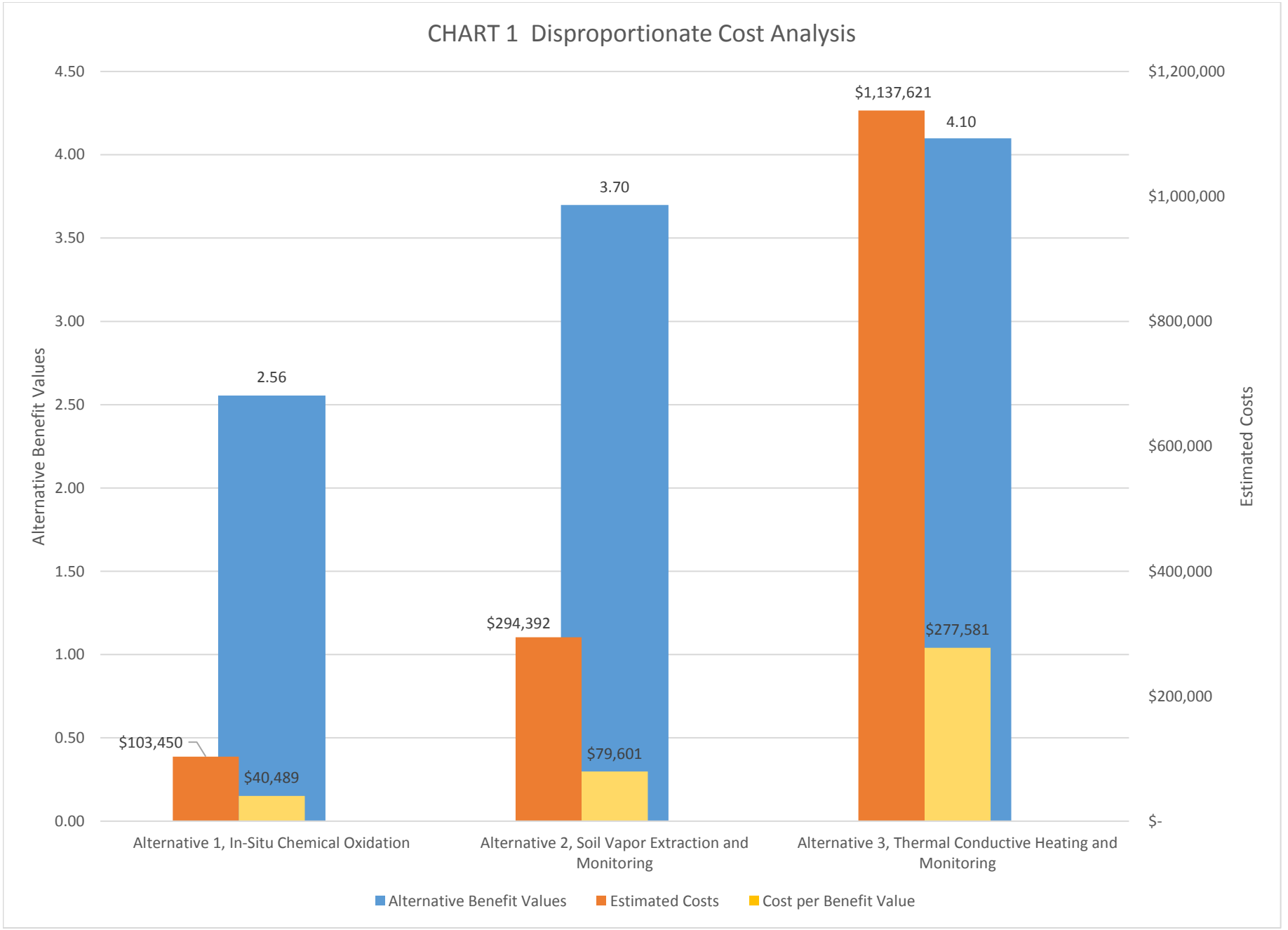


CHART 1 Disproportionate Cost Analysis
Alternative Benefit Values
Estimated Costs
4.50
4.00
3.50
3.00
2.50
2.00
1.50
1.00
0.50
0.00
$1,200,000
$1,000,000
$800,000
$600,000
$400,000
$200,000
$-
2.56
3.70
4.10
$103,450
$40,489
$294,392
$79,601
$1,137,621
$277,581
Alternative 1, In-Situ Chemical Oxidation
Alternative 2, Soil Vapor Extraction and Monitoring
Alternative 3, Thermal Conductive Heating and Monitoring
Alternative Benefit Values
Estimated Costs
Cost per Benefit Value

APPENDIX A

Site Photographs

605 11th Ave. SE, Suite 201 • Olympia, WA • 98501
Phone: 360-352-9835 • Fax: 360-352-8164 • Email: admin@aegwa.com

Associated Environmental Group, LLC

SITE PHOTOGRAPHIC RECORD

Project No.: 4 Corners Cleaners **Project Name: 17-126**

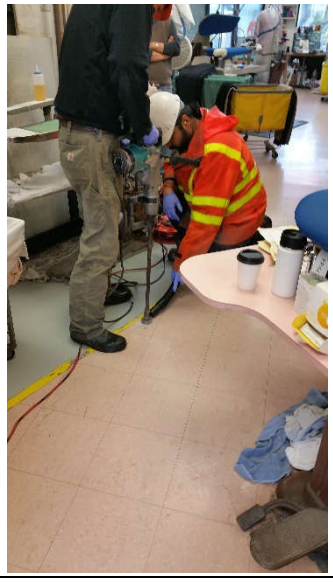


Photo #1:	Coring through concrete at sample location B-1.

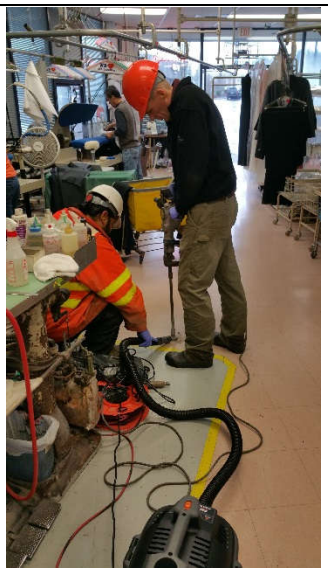


Photo #2:	Coring through concrete at sample location B-2.

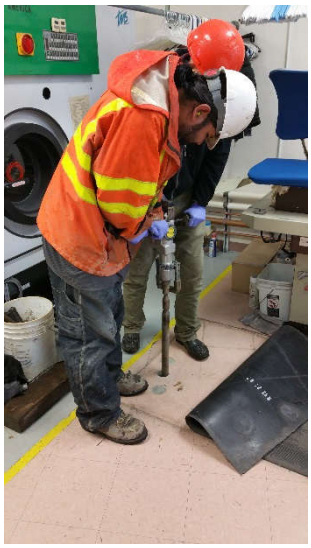


Photo #2:	Core barrel advance at sample location B-3.

Photo #4:	Soil sample material from B-1 refusal at 22 inches bsg.

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SITE PHOTOGRAPHIC RECORD

Project No.: 4 Corners Cleaners **Project Name: 17-126**

Photo #5: Soil sample material B-2 refusal at 20 inches bsg.

Photo #6: Soil sample material B-3 refusal at 23 inches bsg.

Photo #7: Sample location of SV-1.

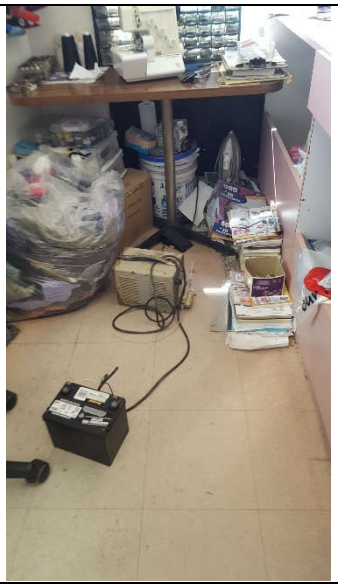

Photo #8: Vapor sample collection equipment at sample location SV-2.

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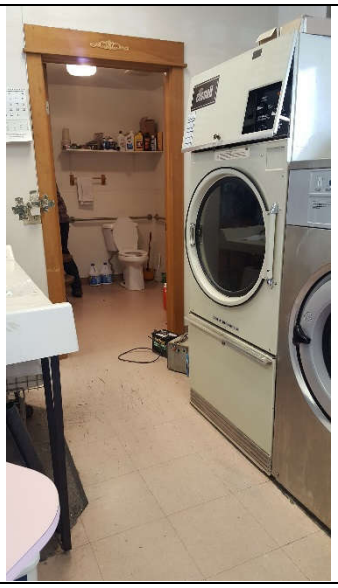
SITE PHOTOGRAPHIC RECORD

Project No.: 4 Corners Cleaners **Project Name: 17-126**

			
Photo #9:	Sample location of SV-3.	Photo #10:	Sample location of SV-7 and SV-14.
			
Photo #11:	Vapor sample collection from sample location SV-8.	Photo #12:	Vapor sample SV-9 from the boiler room.

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SITE PHOTOGRAPHIC RECORD

Project No.: 4 Corners Cleaners **Project Name: 17-126**

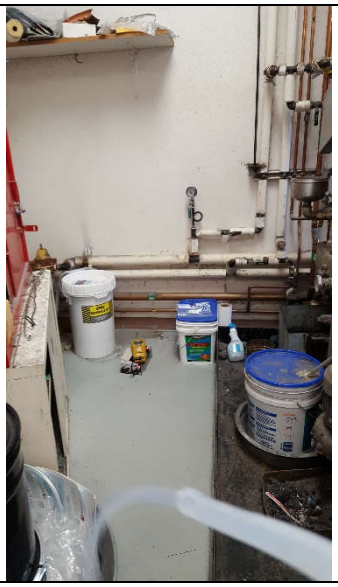

Photo #13:	Vapor sample collection from sample location SV-11, behind the current dry cleaning machine..

Photo #14:	Vapor sample SV-12 collected in front of the cleaning machine.

Photo #15:	Installation of boring B-4 east of building in the parking lot area facing west.

Photo #16:	Typical soil types for all drilling locations.

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SITE PHOTOGRAPHIC RECORD

Project No.: 4 Corners Cleaners **Project Name: 17-126**

Photo #17:	Installation of boring B-6 in the drive thru lane east of the building facing south.

Photo #18:	Installation of boring B-7 in the drive thru lane east of the building facing north.

Photo #19:	Installation of boring B-10 in the front parking lot south of the building facing north.

Photo #20:	Installation of boring B-13 in the sidewalk north of the building facing east.

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APPENDIX B

Supporting Documents

Boring/Well Logs
Laboratory Datasheets
TEE Form
No Further Action Letter - NW2931
No Further Action Letter - NW2932

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Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *B-1* **PAGE 1 OF 1**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: ESN		**Equipment / Drilling Method: LAR Direct Push**	
Date:	*March 3, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Conrete undrlain by;		1							
	brown, moist, medium stiff, GRAVELY SILT; fine to medium gravel		2		B1-22					

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *b-2* **PAGE 1 OF 1**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: ESN		**Equipment / Drilling Method: LAR Direct Push**	
Date:	*March 3, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Conrete undrlain by;		1							
	brown, moist, medium stiff, GRAVELY SILT; fine to medium gravel		2		B2-20					

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *B-3* **PAGE 1 OF 1**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: ESN		**Equipment / Drilling Method: LAR Direct Push**	
Date:	*March 3, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Conrete undrlain by;		1							
	brown, moist, medium stiff, GRAVELY SILT; fine to medium gravel		2		B3-23					

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *B-4* **PAGE 1 OF 2**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: Cascade/Jeffery Johnson		**Equipment / Drilling Method: Sonic**	
Date:	*July 17, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Asphalt underlain by;					10:07				
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain gravel									
5					B4-5	10:18				
	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles									
10					B4-10	10:18				
15					B4-15	10:34				
	at 17.5 feet; moist									
20					B4-20	10:57				
25					B4-25	10:57				

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB # *17-126***	**BORING # *B-4***	**PAGE 2 OF 2**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: *Cascade/Jeffery Johnson*	**Equipment / Drilling Method: Sonic**		
Date: *July 17, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
30		▼			B4-30	11:50				
35					B4-35	12:37				
40										
	Total Depth = 35 feet									
45										
50										

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *B-5* **PAGE 1 OF 2**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: Cascade/Jeffery Johnson		**Equipment / Drilling Method: Sonic**	
Date:	*July 17, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Asphalt underlain by;					14:05				
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain gravel									
5	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles				B5-5	14:10				
10					B5-10	14:20				
15					B5-15	14:30				
	at 17.5 feet; moist									
20					B5-20	14:37				
25					B5-25	14:50				

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB #** *17-126*	**BORING #** *B-5*	**PAGE 2 OF 2**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: *Cascade/Jeffery Johnson*	**Equipment / Drilling Method: Sonic**		
Date: *July 17, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
30		▼	26 27 28 29 30 31 32 33 34 35		B5-30	15:00				
35					B5-35	15:07				
	Total Depth = 35 feet									

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *B-6* **PAGE 1 OF 2**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: Cascade/Jeffery Johnson		**Equipment / Drilling Method: Sonic**	
Date:	*July 18, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Asphalt underlain by;					8:00				
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain gravel									
5	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles				B6-5	8:38				
10					B6-10	8:38				
15					B6-15	8:45				
	at 17.5 feet; moist									
20					B6-20	8:56				
25					B6-25	9:05				

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** ***17-126***	**BORING #** ***B-6*** **PAGE 2 OF 2**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller:	*Cascade/Jeffery Johnson*	**Equipment / Drilling Method:**	*Sonic*
Date:	*July 18, 2018*	**Logged By:**	*B. Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
30			26 27 28 29 30 31 32 33 34 35 36 37 38		B6-30	9:30				
35		▼			B6-35	9:30				
					B6-37.5	9:44				
	Total Depth = 37.5 feet bgs									

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *B-7* **PAGE 1 OF 2**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: Cascade/Jeffery Johnson		**Equipment / Drilling Method: Sonic**	
Date:	*July 18, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Asphalt underlain by;					10:50				
					B7-3					
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain gravel									
5										
	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles				B7-6	11:03				
					B7-8					
10										
					B7-11	11:01				
					B7-13					
15										
					B7-16	11:09				
	at 17.5 feet; moist									
					B7-19	11:16				
20										
					B7-22	11:25				
25					B7-25	11:35				

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB #** *17-126*	**BORING #** *B-7*	**PAGE 2 OF 2**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: *Cascade/Jeffery Johnson*	**Equipment / Drilling Method: Sonic**		
Date: *July 18, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
			26							
			27							
			28		B7-28					
			29							
30		▼	30							
			31		B7-31	11:37				
			32							
			33							
			34							
35			35							
			36							
			37		B7-37	11:48				
			38							
	Total Depth = 37.5 feet bgs									

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *B-8* **PAGE 1 OF 2**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: Cascade/Jeffery Johnson		**Equipment / Drilling Method: Sonic**	
Date:	*July 19, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Asphalt underlain by;					8:43				
					B8-3					
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain gravel									
5										
	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles				B8-6					
					B8-9					
10										
						8:50				
					B8-12					
					B8-15					
15										
	at 15.0 feet; moist					8:59				
					B8-18					
20										
					B8-21					
						9:05				
	at 22.0 feet; brown, wet, dense, **SANDY GRAVEL**; fine to coarse grain sand, fine to coarse grain gravel with cobbles	▼								
					B8-24					
25						9:13				

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB # *17-126***	**BORING # *B-8***	**PAGE 2 OF 2**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: *Cascade/Jeffery Johnson*	**Equipment / Drilling Method: Sonic**		
Date: *July 19, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
			26		B8-27					
			27							
			28							
			29							
30			30		B8-30	9:22				
			31							
			32							
			33		B8-33	9:33				
			34							
35			35							
	Total Depth = 35 feet bgs									

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *B-9* **PAGE 1 OF 2**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: Cascade/Jeffery Johnson		**Equipment / Drilling Method: Sonic**	
Date:	*July 19, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Asphalt underlain by;		1			13:11				
			2							
			3		B9-3					
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain gravel		4							
5			5							
	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles		6		B9-6					
			7							
			8							
			9		B9-9					
10			10							
			11			13:19				
			12		B9-12					
			13							
			14							
15			15		B9-15					
	at 15.0 feet; moist		16			13:26				
			17							
			18		B9-18					
			19							
20			20							
			21		B9-21					
			22			13:34				
	at 22.0 feet; brown, wet, dense, **SANDY GRAVEL**; fine to coarse grain sand, fine to coarse grain gravel with cobbles	▼	23							
			24		B9-24					
25			25			13:40				

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB #** *17-126*	**BORING #** *B-9*	**PAGE 2 OF 2**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: *Cascade/Jeffery Johnson*	**Equipment / Drilling Method: Sonic**		
Date: *July 19, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
			26							
			27		B9-27					
			28							
			29							
30			30		B9-30	13:49				
			31							
			32							
			33		B9-33	13:57				
			34							
35			35							

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *B-10* **PAGE 1 OF 2**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: Cascade/Jeffery Johnson		**Equipment / Drilling Method: Sonic**	
Date:	*July 20, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Asphalt underlain by;		1			7:15				
			2							
			3		B10-3					
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain gravel		4							
5			5							
	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles		6		B10-6					
			7							
			8							
			9		B10-9					
10			10							
			11			7:26				
			12		B10-12					
			13							
			14							
15			15		B10-15					
	at 15.0 feet; moist		16			7:36				
			17							
			18		B10-18					
			19							
20			20							
			21		B10-21					
			22							
	at 22.0 feet; brown, wet, dense, **SANDY GRAVEL**; fine to coarse grain sand, fine to coarse grain gravel with cobbles	▼	23							
			24		B10-24					
25			25			7:46				

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB # *17-126***	**BORING # *B-10***	**PAGE 2 OF 2**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: *Cascade/Jeffery Johnson*	**Equipment / Drilling Method: Sonic**		
Date: *July 20, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
			26							
			27		B10-27					
			28							
			29							
30			30		B10-30	7:48				
			31							
			32							
			33		B10-33	7:55				
			34							
35			35							
			36							
			37							
			38							
	Total epth = 37.5 feet bgs									

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *B-11* **PAGE 1 OF 2**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: Cascade/Jeffery Johnson		**Equipment / Drilling Method: Sonic**	
Date:	*July 20, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Asphalt underlain by;					9:21				
					B11-3					
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain gravel									
5										
	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles				B11-6					
					B11-9					
10										
						9:33				
					B11-12					
15					B11-15					
	at 15.0 feet; moist					9:33				
					B11-18	9:40				
20										
					B11-21					
						9:40				
	at 22.0 feet; brown, wet, dense, **SANDY GRAVEL**; fine to coarse grain sand, fine to coarse grain gravel with cobbles									
					B11-24					
25						9:50				

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB # *17-126***	**BORING # *B-11*** **PAGE 2 OF 2**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller:	*Cascade/Jeffery Johnson*	**Equipment / Drilling Method: Sonic**	
Date:	*July 20, 2018*	**Logged By:**	*B. Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
			26							
			27							
			28		B11-28					
			29							
30			30		B11-30	9:50				
			31							
			32							
			33		B11-33	9:58				
			34							
35			35							
			36							
			37							
			38			10:01				
	Total Depth = 37.5 feet bgs									

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *B-12* **PAGE 1 OF 2**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: Cascade/Jeffery Johnson		**Equipment / Drilling Method: Sonic**	
Date:	*July 23, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Asphalt underlain by;					8:25				
					B12-3					
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain gravel									
5										
	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles				B12-6					
						8:52				
					B12-9					
10										
						8:58				
					B12-12					
15					B12-15					
	at 15.0 feet; moist					9:02				
					B12-18					
20										
					B12-21					
						9:15				
	at 22.0 feet; brown, moist, dense, **SANDY GRAVEL**; fine to coarse grain sand, fine to coarse grain gravel with cobbles									
					B12-24					
25						9:26				

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB # *17-126***	**BORING # *B-12***	**PAGE 2 OF 2**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: *Cascade/Jeffery Johnson*	**Equipment / Drilling Method: Sonic**		
Date: *July 23, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
30	at 30 feet; wet	▼	26 27 28 29 30 31 32 33 34 35 36 37 38		B12-27 B12-30 B12-33 B12-37	9:27 10:04				
35										
40	Total Depth = 37.0 feet									
45										
50										

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT:	***4 Corners Cleaners***	**JOB #** *17-126*	**BORING #** *B-13* **PAGE 1 OF 2**
Location:	*23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**	
Subcontractor / Driller: Cascade/Jeffery Johnson		**Equipment / Drilling Method: Sonic**	
Date:	*July 23, 2018*	**Logged By:**	*B.Dilba*

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
	Asphalt underlain by;		1			11:15				
			2							
			3		B13-3					
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain gravel		4							
5			5							
	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles		6		B13-6					
			7			11:38				
			8							
			9		B13-9					
10			10							
			11			11:44				
			12		B13-12					
			13							
			14							
15			15		B13-15					
	at 15.0 feet; moist		16			11:52				
			17							
			18		B13-18					
			19							
20		▼	20							
	at 20.0 feet; wet		21		B13-21					
			22							
	at 22.0 feet; brown, moist, dense, **SANDY GRAVEL**; fine to coarse grain sand, fine to coarse grain gravel with cobbles		23							
			24		B13-24					
25			25			12:10				

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB # *17-126***	**BORING # *B-13***	**PAGE 2 OF 2**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: *Cascade/Jeffery Johnson*	**Equipment / Drilling Method: Sonic**		
Date: *July 23, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Observations
			26							
			27		B13-27					
			28							
			29							
30			30		B13-30	12:24				
			31							
			32							
			33							
			34							
35			35		B13-35	12:26				
			36							
			37							
			38							
	Total Depth = 37.0 feet bgs									
40										
45										
50										

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- ATD — Groundwater level at time of drilling or date of measurement

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB #** *17-126*	**Monitoring Well #** *T1*	**PAGE 1 OF 1**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: Cascade/ Aaron	**Equipment / Drilling Method:** **Sonic**		
Date: *December 4, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Monitoring Well Construction
	Asphalt underlain by;									
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain grvel									
5	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles									
10										
15										

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- Groundwater level at time of drilling or date of measurement (AT)

Monitoring Well Construction

- Grout/Concrete
- 3/4-inch bentonite chips
- Silica sand
- 2-inch diameter blank PVC casing from
- 2-inch diameter PVC 0.01 slotted screen

Ecology Tag #

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB #** *17-126*	**Monitoring Well #** *T2*	**PAGE 1 OF 1**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: Cascade/ Aaron	**Equipment / Drilling Method:** **Sonic**		
Date: *December 4, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Monitoring Well Construction
	Asphalt underlain by;									
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain grvel									
5	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles									
10										
15										

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- Groundwater level at time of drilling or date of measurement (AT)

Monitoring Well Construction

- Grout/Concrete
- 3/4-inch bentonite chips
- Silica sand
- 2-inch diameter blank PVC casing from
- 2-inch diameter PVC 0.01 slotted screen

Ecology Tag #

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB #** *17-126*	**Monitoring Well #** *T3*	**PAGE 1 OF 1**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: Cascade/ Aaron	**Equipment / Drilling Method:** **Sonic**		
Date: *December 4, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Monitoring Well Construction
	Asphalt underlain by;									
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain grvel									
5	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles									
10										
15										

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- Groundwater level at time of drilling or date of measurement (AT)

Monitoring Well Construction

- Grout/Concrete
- 3/4-inch bentonite chips
- Silica sand
- 2-inch diameter blank PVC casing from
- 2-inch diameter PVC 0.01 slotted screen

Ecology Tag #

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB #** *17-126*	**Monitoring Well #** *T4*	**PAGE 1 OF 1**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: Cascade/ Aaron	**Equipment / Drilling Method:** **Sonic**		
Date: *December 4, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Monitoring Well Construction
	Asphalt underlain by;									
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain grvel									
5	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles									
10										
15										

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- Groundwater level at time of drilling or date of measurement (AT)

Monitoring Well Construction

- Grout/Concrete
- 3/4-inch bentonite chips
- Silica sand
- 2-inch diameter blank PVC casing from
- 2-inch diameter PVC 0.01 slotted screen

Ecology Tag #

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB #** *17-126*	**Monitoring Well #** *T5*	**PAGE 1 OF 1**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: Cascade/ Aaron	**Equipment / Drilling Method:** **Sonic**		
Date: *December 4, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Monitoring Well Construction
	Asphalt underlain by;									
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain grvel									
5	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles									
10										
15										

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- Groundwater level at time of drilling or date of measurement (AT)

Monitoring Well Construction

- Grout/Concrete
- 3/4-inch bentonite chips
- Silica sand
- 2-inch diameter blank PVC casing from
- 2-inch diameter PVC 0.01 slotted screen

Ecology Tag #

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB #** *17-126*	**Monitoring Well #** *T6*	**PAGE 1 OF 1**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: Cascade/ Aaron	**Equipment / Drilling Method:** **Sonic**		
Date: *December 4, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Monitoring Well Construction
	Asphalt underlain by;									
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain grvel									
5	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles									
10										
15										

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- Groundwater level at time of drilling or date of measurement (AT)

Monitoring Well Construction

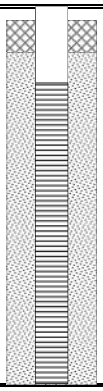
- Grout/Concrete
- 3/4-inch bentonite chips
- Silica sand
- 2-inch diameter blank PVC casing from
- 2-inch diameter PVC 0.01 slotted screen

Ecology Tag #

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB #** *17-126*	**Monitoring Well #** *T7*	**PAGE 1 OF 1**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: Cascade/ Aaron	**Equipment / Drilling Method:** **Sonic**		
Date: *December 4, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Monitoring Well Construction
	Asphalt underlain by;									
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain grvel									
5	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles									

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- Groundwater level at time of drilling or date of measurement (AT)

Monitoring Well Construction

- Grout/Concrete
- 3/4-inch bentonite chips
- Silica sand
- 2-inch diameter blank PVC casing from
- 2-inch diameter PVC 0.01 slotted screen

Ecology Tag #

Associated Environmental Group, LLC

LOG OF BOREHOLE

PROJECT: *4 Corners Cleaners*	**JOB #** *17-126*	**Monitoring Well #** *T8*	**PAGE 1 OF 1**
Location: *23886 SE Kent Kangley Road, Maple Valley, WA*	**Approximate Elevation:**		
Subcontractor / Driller: Cascade/ Aaron	**Equipment / Drilling Method:** **Sonic**		
Date: *December 4, 2018*	**Logged By:** *B. Dilba*		

Boring Depth (feet)	Soil Description	Unified Soil Symbol	Sample Depth	Sample Recovery	Sample Number	Time	Blows/Foot	PID Reading	Sheen	Monitoring Well Construction
	Asphalt underlain by;									
	at 3.0 feet; brown, moist, medium stiff, **GRAVELY SILT**; fine to medim grain grvel									
5	at 5.0 feet; gray, dry, dense, **SANDY GRAVEL**; fine to medium grain sand, fie to coarse grain gravel with cobbles									
10										
15										

Explanation

- Sample Advance / Recovery
- No Recovery
- Contact located approximately
- Groundwater level at time of drilling or date of measurement (AT)

Monitoring Well Construction

- Grout/Concrete
- 3/4-inch bentonite chips
- Silica sand
- 2-inch diameter blank PVC casing from
- 2-inch diameter PVC 0.01 slotted screen

Ecology Tag #

ESN NORTHWEST
Environmental
Services Network

March 20, 2017

Charlie Swift
Associated Environmental Group, Inc.
605 11th Ave. SE, Suite 201
Olympia, WA 98501

Dear Mr. Swift:

Please find enclosed the analytical data report for the 4 Corners Cleaners in Kent, Washington. Probe services were conducted on March 13, 2016. Soil samples were analyzed for Chlorinated VOC's by Method 8260 on March 15, 2017.

The results of the analyses are summarized in the attached table. All soil values are reported on a dry weight basis. Applicable detection limits and QA/QC data are included. An invoice for this work is also enclosed.

ESN Northwest appreciates the opportunity to have provided analytical services to Associated Environmental Group, Inc. for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Michael A Korosec

Michael A. Korosec
President

1210 Eastside Street SE, Suite 200 ■ Olympia, Washington 98501 ■ 360.459.4670 ■ FAX 360.459.3432
Web Site: *www.esnnw.com* E-Mail: *info@esnnw.com*

ESN NORTHWEST CHEMISTRY LABORATORY

Associated Environmental Group
PROJECT FOUR CORNERS CLEANERS
PROJECT #17-126
Kent, Washington

ESN Northwest
1210 Eastside Street SE Suite 200
Olympia, WA 98501
(360) 459-4670 (360) 459-3432 Fax
lab@esnnw.com

Analysis of Chlorinated Volatile Organic Compounds in Soil by Method 8260C/5035

	RL	MB	LCS	LCSD	B-3-23	B-2-20	B-1-22
Date extracted		03/15/17	03/15/17	03/15/17	03/13/17	03/13/17	03/13/17
Date analyzed	(mg/Kg)	03/15/17	03/15/17	03/15/17	03/15/17	03/15/17	03/15/17
% Moisture					5%	6%	6%
Dichlorodifluoromethane	0.05	nd			nd	nd	nd
Chloromethane	0.05	nd			nd	nd	nd
Vinyl chloride	0.02	nd	149*%	139*%	nd	nd	nd
Chloroethane	0.05	nd			nd	nd	nd
Trichlorofluoromethane	0.05	nd			nd	nd	nd
1,1-Dichloroethene	0.05	nd	83%	78%	nd	nd	nd
Methylene chloride	0.05	nd			nd	nd	nd
trans-1,2-Dichloroethene	0.05	nd			nd	nd	nd
1,1-Dichloroethane	0.05	nd			nd	nd	nd
cis-1,2-Dichloroethene	0.05	nd			nd	nd	nd
2,2-Dichloropropane	0.05	nd			nd	nd	nd
Chloroform	0.05	nd	84%	77%	nd	nd	nd
Bromochloromethane	0.05	nd			nd	nd	nd
1,1,1-Trichloroethane	0.05	nd			nd	nd	nd
1,2-Dichloroethane (EDC)	0.05	nd			nd	nd	nd
1,1-Dichloropropene	0.05	nd			nd	nd	nd
Carbon tetrachloride	0.05	nd			nd	nd	nd
Trichloroethene (TCE)	0.02	nd	96%	89%	nd	nd	nd
1,2-Dichloropropane	0.05	nd	94%	87%	nd	nd	nd
Bromodichloromethane	0.05	nd			nd	nd	nd
cis-1,3-Dichloropropene	0.05	nd			nd	nd	nd
trans-1,3-Dichloropropene	0.05	nd			nd	nd	nd
1,1,2-Trichloroethane	0.05	nd			nd	nd	nd
1,3-Dichloropropane	0.05	nd			nd	nd	nd
Dibromochloromethane	0.05	nd			nd	nd	nd
Tetrachloroethene (PCE)	0.02	nd	101%	96%	**0.067**	**0.044**	**0.058**
Chlorobenzene	0.05	nd	94%	91%	nd	nd	nd
1,1,1,2-Tetrachloroethane	0.05	nd			nd	nd	nd
1,1,2,2-Tetrachloroethane	0.05	nd			nd	nd	nd
1,2,3-Trichloropropane	0.05	nd			nd	nd	nd
2-Chlorotoluene	0.05	nd			nd	nd	nd
4-Chlorotoluene	0.05	nd			nd	nd	nd
1,3-Dichlorobenzene	0.05	nd			nd	nd	nd
1,4-Dichlorobenzene	0.05	nd			nd	nd	nd
1,2-Dichlorobenzene	0.05	nd			nd	nd	nd
1,2-Dibromo-3-Chloropropane	0.05	nd			nd	nd	nd
1,2,4-Trichlorobenzene	0.05	nd			nd	nd	nd
Hexachloro-1,3-butadiene	0.05	nd			nd	nd	nd
1,2,3-Trichlorobenzene	0.05	nd			nd	nd	nd
Surrogate recoveries							
Dibromofluoromethane		111%	115%	114%	127%	120%	123%
Toluene-d8		79%	75%	73%	82%	81%	81%
4-Bromofluorobenzene		120%	113%	113%	119%	122%	119%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

ESN NORTHWEST, INC. Environmental Services Network

CHAIN-OF-CUSTODY RECORD

CLIENT: AEG, LLC
ADDRESS: 605 - 11th Ave SE, Suite 201, Olympia, WA
PHONE: 360 - 352-5835 FAX: 360 - 352 - 8164
CLIENT PROJECT #: 17-126 PROJECT MANAGER: C. Swift

DATE: 3/13/17 PAGE _____ OF _____
PROJECT NAME: 4 - Corners Cleaners
LOCATION: Kent - Maple Valley, WA
COLLECTOR: C. Swift DATE OF COLLECTION: 3/13/17

Sample Number	Depth	Time	Sample Type	Container Type	TPH - HCID	TPH - Diesel & Oil	TPH - Gasoline	BTEX	VOC 8260CL	VOC 8260	SemiVol 8270	PAH's 8270	PCB's 8082	CL Pesticides 8081	RCRA 8 Metals	MTCA 5 Metals	Pb	Asbestos - PLM	GRO Suite	DRO Suite	WO Suite	NOTES	Total Number of Containers	Laboratory Note Number
1. B-3-23	23'	10:30	Soil	8oz					X													No Preservatives		
2. B-2-20	20'	10:50	Soil	8oz					X															
3. B-1-22	22'	11:00	Soil	8oz					X															
4.																								
5.																								
6.																								
7.																								
8.																								
9.																								
10.																								
11.																								
12.																								
13.																								
14.																								
15.																								
16.																								
17.																								
18.																								

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
[signature]	3/13/17 / 3:58	[signature]	3/13/17 4:05
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

Turn Around Time: 24 HR 48 HR 5 DAY

1210 Eastside Street SE, Suite 200
Olympia, Washington 98501
Phone: 360-459-4670
Fax: 360-459-3432
Website: www.esnnw.com
E-Mail: info@esnnw.com

ESN NORTHWEST
Environmental
Services Network

April 5, 2017

Becky Dilba
Associated Environmental Group, Inc.
605 11th Ave. SE, Suite 201
Olympia, WA 98501

Dear Ms. Dilba:

Please find enclosed the analytical data report for the Four Corners Cleaners in Maple Valley, Washington. Probe services were conducted on March 31, 2017. Soil vapor samples were analyzed for Chlorinated VOC's by Method 8260 on April 1, 2017.

The results of the analyses are summarized in the attached table. Applicable detection limits and QA/QC data are included. An invoice for this work is also enclosed.

ESN Northwest appreciates the opportunity to have provided analytical services to Associated Environmental Group, Inc. for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Michael A Korosec

Michael A. Korosec
President

1210 Eastside Street SE, Suite 200 ■ Olympia, Washington 98501 ■ 360.459.4670 ■ FAX 360.459.3432
Web Site: *www.esnnw.com* E-Mail: *info@esnnw.com*

ESN NORTHWEST CHEMISTRY LABORATORY

Associated Environmental Group
PROJECT FOUR CORNERS CLEANERS
PROJECT #17-126
Maple Valley, Washington

ESN Northwest
1210 Eastside Street SE Suite 200
Olympia, WA 98501
(360) 459-4670 (360) 459-3432 Fax
lab@esnnw.com

Analysis of Chlorinated Volatile Organic Compounds in Soil Vapor by Method 8260C

Analytical Results

	RL	MB	LCS	LCSD	SV1	SV2	SV3	SV4	SV5	SV6
Date analyzed	(ug/m3)	04/01/17	04/01/17	04/01/17	04/01/17	04/01/17	04/01/17	04/01/17	04/01/17	04/01/17
Dichlorodifluoromethane	10.0	nd			nd	**8,600**	**12,000**	**15,000**	**8,200**	**7,200**
Chloromethane	10.0	nd			nd	nd	nd	nd	nd	nd
Vinyl chloride	10.0	nd	130%	125%	nd	nd	nd	nd	nd	nd
Chloroethane	10.0	nd			nd	nd	nd	nd	nd	nd
Trichlorofluoromethane	10.0	nd			nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	10.0	nd	83%	86%	nd	nd	nd	nd	nd	nd
Methylene chloride	10.0	nd			nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	10.0	nd			nd	nd	nd	nd	nd	nd
1,1-Dichloroethane	10.0	nd			nd	nd	nd	nd	nd	nd
cis-1,2-Dichloroethene	10.0	nd			nd	nd	nd	nd	nd	nd
2,2-Dichloropropane	10.0	nd			nd	nd	nd	nd	nd	nd
Chloroform	10.0	nd	103%	111%	nd	nd	nd	nd	nd	nd
Bromochloromethane	10.0	nd			nd	nd	nd	nd	nd	nd
1,1,1-Trichloroethane	10.0	nd			nd	nd	nd	nd	nd	nd
1,2-Dichloroethane (EDC)	10.0	nd			nd	nd	nd	nd	nd	nd
1,1-Dichloropropene	10.0	nd			nd	nd	nd	nd	nd	nd
Carbon tetrachloride	10.0	nd			nd	nd	nd	nd	nd	nd
Trichloroethene (TCE)	10.0	nd	93%	98%	nd	nd	nd	nd	nd	nd
1,2-Dichloropropane	10.0	nd			nd	nd	nd	nd	nd	nd
Bromodichloromethane	10.0	nd			nd	nd	nd	nd	nd	nd
cis-1,3-Dichloropropene	10.0	nd			nd	nd	nd	nd	nd	nd
trans-1,3-Dichloropropene	10.0	nd			nd	nd	nd	nd	nd	nd
1,1,2-Trichloroethane	10.0	nd			nd	nd	nd	nd	nd	nd
1,3-Dichloropropane	10.0	nd			nd	nd	nd	nd	nd	nd
Dibromochloromethane	10.0	nd			nd	nd	nd	nd	nd	nd
Tetrachloroethene (PCE)	10.0	nd	97%	97%	**1,600**	**1,800**	**1,500**	**790**	**940**	**850**
Chlorobenzene	10.0	nd	98%	100%	nd	nd	nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	10.0	nd			nd	nd	nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	10.0	nd			nd	nd	nd	nd	nd	nd
1,2,3-Trichloropropane	10.0	nd			nd	nd	nd	nd	nd	nd
2-Chlorotoluene	10.0	nd			nd	nd	nd	nd	nd	nd
4-Chlorotoluene	10.0	nd			nd	nd	nd	nd	nd	nd
1,3-Dichlorobenzene	10.0	nd			nd	nd	nd	nd	nd	nd
1,4-Dichlorobenzene	10.0	nd			nd	nd	nd	nd	nd	nd
1,2-Dichlorobenzene	10.0	nd			nd	nd	nd	nd	nd	nd
1,2-Dibromo-3-Chloropropane	10.0	nd			nd	nd	nd	nd	nd	nd
1,2,4-Trichlorobenzene	10.0	nd			nd	nd	nd	nd	nd	nd
Hexachloro-1,3-butadiene	10.0	nd			nd	nd	nd	nd	nd	nd
1,2,3-Trichlorobenzene	10.0	nd			nd	nd	nd	nd	nd	nd
Surrogate recoveries										
Dibromofluoromethane		104%	112%	114%	102%	106%	106%	107%	108%	112%
Toluene-d8		105%	96%	94%	105%	107%	107%	107%	107%	110%
4-Bromofluorobenzene		104%	98%	100%	108%	107%	107%	104%	103%	101%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

ESN NORTHWEST CHEMISTRY LABORATORY

Associated Environmental Group
PROJECT FOUR CORNERS CLEANERS
PROJECT #17-126
Maple Valley, Washington

ESN Northwest
1210 Eastside Street SE Suite 200
Olympia, WA 98501
(360) 459-4670 (360) 459-3432 Fax
lab@esnnw.com

Analysis of Chlorinated Volatile Organic Compounds in Soil Vapor by Method 8260C

Analytical Results

	RL	SV7	SV8	SV9	SV10	SV11	SV12	SV13	SV14
Date analyzed	(ug/m3)	04/01/17	04/01/17	04/01/17	04/01/17	04/01/17	04/01/17	04/01/17	04/01/17
Dichlorodifluoromethane	10.0	**870**	**290**	**2,500**	**3,100**	**2,800**	**3,400**	**9,000**	**610**
Chloromethane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
Vinyl chloride	10.0	nd	nd	nd	nd	nd	nd	nd	nd
Chloroethane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
Trichlorofluoromethane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
Methylene chloride	10.0	nd	nd	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,1-Dichloroethane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
cis-1,2-Dichloroethene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
2,2-Dichloropropane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
Chloroform	10.0	nd	nd	**310**	**31,000**	nd	nd	nd	nd
Bromochloromethane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,1,1-Trichloroethane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,2-Dichloroethane (EDC)	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,1-Dichloropropene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
Carbon tetrachloride	10.0	nd	nd	nd	nd	nd	nd	nd	nd
Trichloroethene (TCE)	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,2-Dichloropropane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
Bromodichloromethane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
cis-1,3-Dichloropropene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
trans-1,3-Dichloropropene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,1,2-Trichloroethane	10.0	nd	nd	nd	**380**	nd	nd	nd	nd
1,3-Dichloropropane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
Dibromochloromethane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
Tetrachloroethene (PCE)	10.0	**1,700**	**1,100**	**2,800**	**2,100**	**6,300**	**2,600**	**180**	**2,600**
Chlorobenzene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,1,1,2-Tetrachloroethane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,1,2,2-Tetrachloroethane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,2,3-Trichloropropane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
2-Chlorotoluene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
4-Chlorotoluene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,3-Dichlorobenzene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,4-Dichlorobenzene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,2-Dichlorobenzene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,2-Dibromo-3-Chloropropane	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,2,4-Trichlorobenzene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
Hexachloro-1,3-butadiene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
1,2,3-Trichlorobenzene	10.0	nd	nd	nd	nd	nd	nd	nd	nd
Surrogate recoveries									
Dibromofluoromethane		107%	111%	108%	111%	102%	100%	103%	110%
Toluene-d8		104%	105%	103%	104%	112%	106%	106%	104%
4-Bromofluorobenzene		106%	104%	106%	105%	110%	104%	106%	106%

Data Qualifiers and Analytical Comments

nd - not detected at listed reporting limits
Acceptable Recovery limits: 65% TO 135%
Acceptable RPD limit: 35%

ESN NORTHWEST, INC. Environmental Services Network

CHAIN-OF-CUSTODY RECORD

CLIENT: AEG

ADDRESS: 1005 11th Ave SE, Olympia

PHONE: (360) 352-5832 FAX:

CLIENT PROJECT #: 17-126 PROJECT MANAGER:

DATE: 3/31/17 PAGE 1 OF 1

PROJECT NAME: 4 Corners Cleaners

LOCATION: 23886 Kent-Kangley Rd, Maple Valley

COLLECTOR: B Hahn DATE OF COLLECTION: 3/31/17

Sample Number	Depth	Time	Sample Type	Container Type	TPH - HCID	TPH - Diesel & Oil	TPH - Gasoline	BTEX	VOC 8260CL	VOC 8260	SemiVol 8270	PAH's 8270	PCB's 8082	CL Pesticides 8081	RCRA 8 Metals	MTCA 5 Metals	Pb	Asbestos - PLM	GRO Suite	DRO Suite	WO Suite	NOTES	Total Number of Containers	Laboratory Note Number
1.																								
2. SV1		1247	AIR	Tedlar				T																
3. SV2		1105																						
4. SV3		1109																						
5. SV4		1115																						
6. SV5		1121																						
7. ~~8~~ SV6		1130																						
8. SV7		1140																						
9. SV8		1155																						
10. SV9		1204																						
11. SV10		1211																						
12. SV11		1218																						
13. SV12		1230																						
14. SV13		1236																						
15. SV14		~~1147~~																						
16.																								
17.																								
18.																								

RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME
	3/31/17	1354	1:54
RELINQUISHED BY (Signature)	DATE/TIME	RECEIVED BY (Signature)	DATE/TIME

SAMPLE RECEIPT	
TOTAL NUMBER OF CONTAINERS	
CHAIN OF CUSTODY SEALS Y/N/NA	
SEALS INTACT? Y/N/NA	
RECEIVED GOOD COND./COLD	
NOTES:	

LABORATORY NOTES:

AIR

Turn Around Time: 24 HR 48 HR 5 DAY

1210 Eastside Street SE, Suite 200
Olympia, Washington 98501
Phone: 360-459-4670
Fax: 360-459-3432
Website: www.esnnw.com
E-Mail: info@esnnw.com

Libby Environmental, Inc.
4139 Libby Road NE • Olympia, WA 98506-2518

July 23, 2018

Becky Dilba
Associated Environmental Group, LLC
605 11th Avenue SE, Suite 201
Olympia, WA 98501

Dear Ms. Dilba:

Please find enclosed the analytical data report for the 4 Corners Cleaners Project located in Maple Valley, Washington.

The results of the analyses are summarized in the attached tables. Applicable detection limits and QA/QC data are included. The sample(s) will be disposed of in 30 days unless we are contacted to arrange long term storage.

Libby Environmental, Inc. appreciates the opportunity to have provided analytical services for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Sherry L. Chilcutt
Senior Chemist
Libby Environmental, Inc.

Phone (360) 352-2110 • Fax (360) 352-4154 • libbyenv@aol.com

Libby Environmental, Inc.

4139 Libby Road NE
Olympia, WA 98506
Phone: (360) 352-2110
FAX: (360) 352-4154
Email: libbyenv@aol.com

4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180717-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA 8260C in Soil

Sample Description		Method Blank	B4-5	B4-10	B4-25	B4-25 Dup	B4-30
Date Sampled		n/a	7/17/18	7/17/18	7/17/18	7/17/18	7/17/18
Date Analyzed	PQL (mg/kg)	7/17/18 (mg/kg)	7/17/18 (mg/kg)	7/17/18 (mg/kg)	7/17/18 (mg/kg)	7/17/18 (mg/kg)	7/17/18 (mg/kg)
Vinyl Chloride (VC)	0.02	nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	0.05	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
cis -1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
Trichloroethene (TCE)	0.03	nd	nd	nd	nd	nd	nd
Tetrachloroethene (PCE)	0.02	nd	nd	nd	nd	nd	nd
Surrogate Recovery							
Dibromofluoromethane		103	93	92	95	100	92
1,2-Dichloroethane-d4		100	98	98	92	85	101
Toluene-d8		88	85	93	83	89	83
4-Bromofluorobenzene		96	96	96	97	91	98

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

4139 Libby Road NE
Olympia, WA 98506
Phone: (360) 352-2110
FAX: (360) 352-4154
Email: libbyenv@aol.com

4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180717-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA 8260C in Soil

Sample Description		B5-5	B5-10	B5-15	B5-25	B5-30
Date Sampled		7/17/18	7/17/18	7/17/18	7/17/18	7/17/18
Date Analyzed	PQL	7/17/18	7/17/18	7/17/18	7/17/18	7/17/18
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Vinyl Chloride (VC)	0.02	nd	nd	nd	nd	nd
1,1-Dichloroethene	0.05	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd
cis -1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd
Trichloroethene (TCE)	0.03	nd	nd	nd	nd	nd
Tetrachloroethene (PCE)	0.02	nd	nd	nd	nd	nd
Surrogate Recovery						
Dibromofluoromethane		92	92	90	90	91
1,2-Dichloroethane-d4		102	101	89	97	103
Toluene-d8		81	80	83	83	82
4-Bromofluorobenzene		99	101	92	92	92

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180717-40
Client Project # 17-126

QA/QC Data - EPA 8260C Analyses

Sample Identification: B4-10							
	Matrix Spike			Matrix Spike Dup			RPD
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	
1,1-Dichloroethene	0.50	0.41	82	0.50	0.42	84	2.4
Chlorobenzene	0.50	0.40	80	0.50	0.41	82	2.5
Trichloroethene (TCE)	0.50	0.40	80	0.50	0.43	86	7.2
Surrogate Recovery							
Dibromofluoromethane			91			92	
1,2-Dichloroethane-d4			98			97	
Toluene-d8			83			82	
4-Bromofluorobenzene			96			96	

	Laboratory Control Sample		
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)
1,1-Dichloroethene	0.50	0.38	76
Chlorobenzene	0.50	0.35	70
Trichloroethene (TCE)	0.50	0.35	70
Surrogate Recovery			
Dibromofluoromethane			100
1,2-Dichloroethane-d4			95
Toluene-d8			93
4-Bromofluorobenzene			99

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 65%-135%
ACCEPTABLE RPD IS 35%

ANALYSES PERFORMED BY: Paul Burke

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180717-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons (EPA 8260C) in Water

Sample Description		Method Blank	B4-W	B4-W Dup	B5-W
Date Sampled		n/a	7/17/18	7/17/18	7/17/18
Date Analyzed	PQL (µg/L)	7/17/18 (µg/L)	7/17/18 (µg/L)	7/17/18 (µg/L)	7/17/18 (µg/L)
Vinyl Chloride (VC)	0.2	nd	nd	nd	nd
1,1-Dichloroethene	0.5	nd	nd	nd	nd
trans-1,2-Dichloroethene	1.0	nd	nd	nd	nd
cis-1,2-Dichloroethene	1.0	nd	nd	nd	nd
Trichloroethene (TCE)	1.0	nd	nd	nd	nd
Tetrachloroethene (PCE)	1.0	nd	nd	nd	nd
Surrogate Recovery					
Dibromofluoromethane		103	89	91	88
1,2-Dichloroethane-d4		100	93	99	99
Toluene-d8		88	92	79	90
4-Bromofluorobenzene		96	93	93	93

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180717-40
Client Project # 17-126

QA/QC Data - EPA 8260C Analyses

Sample Identification: B5-W							
	Matrix Spike			Matrix Spike Dup			RPD
	Spiked Conc. (µg/L)	Measured Conc. (µg/L)	Spike Recovery (%)	Spiked Conc. (µg/L)	Measured Conc. (µg/L)	Spike Recovery (%)	
1,1-Dichloroethene	10	7.8	78	10	8.6	86	9.8
Chlorobenzene	10	7.3	73	10	7.8	78	6.6
Trichloroethene (TCE)	10	7.7	77	10	8.3	83	7.5
Surrogate Recovery							
Dibromofluoromethane			95			92	
1,2-Dichloroethane-d4			114			111	
Toluene-d8			82			91	
4-Bromofluorobenzene			94			96	

Laboratory Control Sample			
	Spiked Conc. (µg/L)	Measured Conc. (µg/L)	Spike Recovery (%)
1,1-Dichloroethene	10	7.5	75
Chlorobenzene	10	7.0	70
Trichloroethene (TCE)	10	7.1	71
Surrogate Recovery			
Dibromofluoromethane			100
1,2-Dichloroethane-d4			95
Toluene-d8			93
4-Bromofluorobenzene			99

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 65%-135%
ACCEPTABLE RPD IS 35%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc. | **Chain of Custody Record** | www.LibbyEnvironmental.com

4139 Libby Road NE
Olympia, WA 98506
Ph: 360-352-2110
Fax: 360-352-4154

Client: AEG	Date: 7/17/18 — Page: 1 of 1
Address:	Project Manager: Becky Dilba
City: Oly — State: WA — Zip:	Project Name: 4 Corners Cleaners
Phone: 360-352-9835 — Fax:	Location: 23886 SE Kent Kangley Rd. — City, State: Maple Valley, WA
Client Project # 17-126	Collector: Becky Dilba — Date of Collection: 7/17/18
	Email: bdilba@aegwa.com

	Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals	PCE's Daughters			Field Notes
1	B4-5	5	1018	Soil	VOA / Jar													X			
2	B4-10	10	1018															X			
3	B4-15	15	1034																		
4	B4-25	25	1057															X			
5	B4-20	20	1057																		
6	B4-30	30	1150															X			
7	B4-35	35	1237																		
8	B4-W	—	1304	H2O	VOA x2													X			
9	B5-5	5	1400	Soil	VOA / Jar													X			
10	B5-10	10	1410															X			
11	B5-15	15	1430															X			
12	B5-20	20	1437																		
13	B5-25	25	~~1500~~ 1450															X			
14	B5-30	30	1520															X			
15	B5-35	35	1507																		
16	B5-W	—	1557	H2O	VOA x3													X			
17																					

Relinquished by:	Date / Time	Received by:	Date / Time
[signature]	7/17/18 1540	[signature]	7/17/18 1540
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt
- Good Condition? Y (N)
- Temp. Abient °C
- Seals Intact? (Y) N N/A
- Total Number of Containers: 47

Remarks: Mobile ML

TAT: 24HR 48HR 5-DAY

Libby Environmental, Inc.
4139 Libby Road NE • Olympia, WA 98506-2518

July 23, 2018

Becky Dilba
Associated Environmental Group, LLC
605 11th Avenue SE, Suite 201
Olympia, WA 98501

Dear Ms. Dilba:

Please find enclosed the analytical data report for the 4 Corners Cleaners Project located in Maple Valley, Washington.

The results of the analyses are summarized in the attached tables. Applicable detection limits and QA/QC data are included. The sample(s) will be disposed of in 30 days unless we are contacted to arrange long term storage.

Libby Environmental, Inc. appreciates the opportunity to have provided analytical services for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Sherry L. Chilcutt
Senior Chemist
Libby Environmental, Inc.

Phone (360) 352-2110 • Fax (360) 352-4154 • libbyenv@aol.com

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180718-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA 8260C in Soil

Sample Description		Method Blank	B6-5	B6-5 Dup	B6-10	B6-25	B6-35
Date Sampled		n/a	7/18/18	7/18/18	7/18/18	7/18/18	7/18/18
Date Analyzed	PQL	7/18/18	7/18/18	7/18/18	7/18/18	7/18/18	7/18/18
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Vinyl Chloride (VC)	0.02	nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	0.05	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
cis -1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
Trichloroethene (TCE)	0.03	nd	nd	nd	nd	nd	nd
Tetrachloroethene (PCE)	0.02	nd	nd	nd	nd	nd	nd
Surrogate Recovery							
Dibromofluoromethane		93	91	87	88	87	87
1,2-Dichloroethane-d4		109	113	111	118	102	101
Toluene-d8		94	85	83	83	91	93
4-Bromofluorobenzene		93	91	93	95	89	89

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180718-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA 8260C in Soil

Sample Description		B7-3	B7-6	B7-16	B7-28	B7-37
Date Sampled		7/18/18	7/18/18	7/18/18	7/18/18	7/18/18
Date Analyzed	PQL	7/18/18	7/18/18	7/18/18	7/18/18	7/18/18
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Vinyl Chloride (VC)	0.02	nd	nd	nd	nd	nd
1,1-Dichloroethene	0.05	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd
cis -1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd
Trichloroethene (TCE)	0.03	nd	nd	nd	nd	nd
Tetrachloroethene (PCE)	0.02	nd	nd	nd	nd	nd
Surrogate Recovery						
Dibromofluoromethane		87	88	88	85	86
1,2-Dichloroethane-d4		117	124	115	114	110
Toluene-d8		81	92	89	90	82
4-Bromofluorobenzene		92	87	90	91	92

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180718-40
Client Project # 17-126

QA/QC Data - EPA 8260C Analyses

Sample Identification: B6-35							
	Matrix Spike			Matrix Spike Dup			RPD
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	
1,1-Dichloroethene	0.50	0.33	66	0.50	0.39	78	16.7
Chlorobenzene	0.50	0.33	66	0.50	0.35	70	5.9
Trichloroethene (TCE)	0.50	0.35	70	0.50	0.39	78	10.8
Surrogate Recovery							
Dibromofluoromethane			88			85	
1,2-Dichloroethane-d4			110			109	
Toluene-d8			84			92	
4-Bromofluorobenzene			92			90	

	Laboratory Control Sample		
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)
1,1-Dichloroethene	0.50	0.34	68
Chlorobenzene	0.50	0.34	68
Trichloroethene (TCE)	0.50	0.34	68
Surrogate Recovery			
Dibromofluoromethane			103
1,2-Dichloroethane-d4			116
Toluene-d8			134
4-Bromofluorobenzene			98

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 65%-135%
ACCEPTABLE RPD IS 35%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180718-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons (EPA 8260C) in Water

Sample Description		Method Blank	B6-W	B6-W Dup	B7-W
Date Sampled		n/a	7/18/18	7/18/18	7/18/18
Date Analyzed	PQL (µg/L)	7/19/18 (µg/L)	7/19/18 (µg/L)	7/19/18 (µg/L)	7/19/18 (µg/L)
Vinyl Chloride (VC)	0.2	nd	nd	nd	nd
1,1-Dichloroethene	0.5	nd	nd	nd	nd
trans-1,2-Dichloroethene	1.0	nd	nd	nd	nd
cis -1,2-Dichloroethene	1.0	nd	nd	nd	nd
Trichloroethene (TCE)	1.0	nd	nd	nd	nd
Tetrachloroethene (PCE)	1.0	nd	nd	nd	nd
Surrogate Recovery					
Dibromofluoromethane		91	87	90	82
1,2-Dichloroethane-d4		117	104	112	119
Toluene-d8		83	92	93	85
4-Bromofluorobenzene		90	89	88	83

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180718-40
Client Project # 17-126

QA/QC Data - EPA 8260C Analyses

Sample Identification: B8-W			
Matrix Spike			
	Spiked Conc. (µg/L)	Measured Conc. (µg/L)	Spike Recovery (%)
1,1-Dichloroethene	10	8.8	88
Chlorobenzene	10	7.7	77
Trichloroethene (TCE)	10	8.6	86
Surrogate Recovery			
Dibromofluoromethane			86
1,2-Dichloroethane-d4			117
Toluene-d8			77
4-Bromofluorobenzene			90

Laboratory Control Sample			
	Spiked Conc. (µg/L)	Measured Conc. (µg/L)	Spike Recovery (%)
1,1-Dichloroethene	10	8.2	82
Chlorobenzene	10	7.2	72
Trichloroethene (TCE)	10	8.0	80
Surrogate Recovery			
Dibromofluoromethane			92
1,2-Dichloroethane-d4			105
Toluene-d8			93
4-Bromofluorobenzene			86

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 65%-135%
ACCEPTABLE RPD IS 35%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

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Olympia, WA 98506
Ph: 360-352-2110
Fax: 360-352-4154

Date: 7/18/18 Page: 1 of 2

Client: AEG

Project Manager: Becky Dilba

Address:

Project Name: 4 Corners Cleaners

City: olympia State: WA Zip:

Location: Maple Valley, WA City, State:

Phone: 360-352-9835 Fax:

Collector: Beck Dilba Date of Collection: 7/18

Client Project # 17-126

Email:

	Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals	PCB: dissolved		Field Notes
1	B6-S		828	Soil	1 Jar 2 Voa												X			
2	B6-10		838														X			
3	B6-15		845																	
4	B6-20		845																	
5	B6-25		915														X			
6	B6-35		930														X			
7	B6-30		930																	
8	B6-W		950	H2O	3 Voas												X			Run @ end of day
9	B7-3		1103	Soil	1 Jar 2 Voas												X			
10	B7-8		1101																	
11	B7-6		1103														X			
12	B7-11		1101																	
13	B7-13		1109																	
14	B7-16		1116														X			
15	B7-19		1116																	
16	B7-22		1125																	
17	B7-25		1135																	

Relinquished by:	Date / Time	Received by:	Date / Time	**Sample Receipt**
	7/18 1331	Paul Burke	7/18/18 1319	Good Condition? (Y) N
Relinquished by:	Date / Time	Received by:	Date / Time	Temp. Ambient °C
				Seals Intact? (Y) N N/A
Relinquished by:	Date / Time	Received by:	Date / Time	Total Number of Containers: 62

Remarks: mobile ML

TAT: 24HR 48HR 5-DAY

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

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Olympia, WA 98506
Ph: 360-352-2110
Fax: 360-352-4154

Date: 7/18/18 Page: 2 of 2

Client: ARG

Project Manager: B. Dilba

Address:

Project Name: 4 Corners

City: Olympia State: WA Zip:

Location: City, State: Maple Valley, WA

Phone: 360-352-9835 Fax:

Collector: B. Dilba Date of Collection: 7/18/18

Client Project # 17-126

Email:

	Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals PbE		Field Notes
1	B7-20		1137	soil	5jar 2voa												X		
2	B7-37		1148	soil	2voa												X		
3	B7-31		1148	soil	2voa														
4	B7-(D)		1250	soil	2voa												X		
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			

Relinquished by:	Date / Time	Received by:	Date / Time
	1331 7/18/18		
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition? Y N

Temp. Ambient °C

Seals Intact? Y N N/A

Total Number of Containers

Remarks:

Mobile ML

TAT: 24HR 48HR 5-DAY

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.
4139 Libby Road NE • Olympia, WA 98506-2518

July 23, 2018

Becky Dilba
Associated Environmental Group, LLC
605 11th Avenue SE, Suite 201
Olympia, WA 98501

Dear Ms. Dilba:

Please find enclosed the analytical data report for the 4 Corners Cleaners Project located in Maple Valley, Washington.

The results of the analyses are summarized in the attached tables. Applicable detection limits and QA/QC data are included. The sample(s) will be disposed of in 30 days unless we are contacted to arrange long term storage.

Libby Environmental, Inc. appreciates the opportunity to have provided analytical services for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Sherry L. Chilcutt
Senior Chemist
Libby Environmental, Inc.

Phone (360) 352-2110 • Fax (360) 352-4154 • libbyenv@aol.com

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180719-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA 8260C in Soil

Sample Description		Method Blank	B8-33	B8-24	B8-6	B8-3	B8-3 Dup
Date Sampled		n/a	7/19/18	7/19/18	7/19/18	7/19/18	7/19/18
Date Analyzed	PQL (mg/kg)	7/19/18 (mg/kg)	7/19/18 (mg/kg)	7/19/18 (mg/kg)	7/19/18 (mg/kg)	7/19/18 (mg/kg)	7/19/18 (mg/kg)
Vinyl Chloride (VC)	0.02	nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	0.05	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
cis -1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
Trichloroethene (TCE)	0.03	nd	nd	nd	nd	nd	nd
Tetrachloroethene (PCE)	0.02	nd	nd	nd	nd	nd	nd
Surrogate Recovery							
Dibromofluoromethane		91	90	84	79	85	85
1,2-Dichloroethane-d4		117	131	115	93	114	120
Toluene-d8		83	93	91	82	91	92
4-Bromofluorobenzene		90	85	89	83	90	88

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

4139 Libby Road NE
Olympia, WA 98506
Phone: (360) 352-2110
FAX: (360) 352-4154
Email: libbyenv@aol.com

4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180719-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA 8260C in Soil

Sample Description		B9-3	B9-9	B9-15	B9-24	B9-33
Date Sampled		7/19/18	7/19/18	7/19/18	7/19/18	7/19/18
Date Analyzed	PQL	7/19/18	7/19/18	7/19/18	7/19/18	7/19/18
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Vinyl Chloride (VC)	0.02	nd	nd	nd	nd	nd
1,1-Dichloroethene	0.05	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd
cis-1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd
Trichloroethene (TCE)	0.03	nd	nd	nd	nd	nd
Tetrachloroethene (PCE)	0.02	nd	nd	nd	nd	nd
Surrogate Recovery						
Dibromofluoromethane		80	82	83	84	77
1,2-Dichloroethane-d4		126	120	111	125	107
Toluene-d8		93	91	82	80	93
4-Bromofluorobenzene		90	87	85	89	83

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180719-40
Client Project # 17-126

QA/QC Data - EPA 8260C Analyses

Sample Identification: B8-33							
	Matrix Spike			Matrix Spike Dup			RPD
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	
1,1-Dichloroethene	0.50	0.36	72	0.50	0.39	78	8.0
Chlorobenzene	0.50	0.36	72	0.50	0.39	78	8.0
Trichloroethene (TCE)	0.50	0.40	80	0.50	0.44	88	9.5
Surrogate Recovery							
Dibromofluoromethane			84			84	
1,2-Dichloroethane-d4			109			113	
Toluene-d8			93			92	
4-Bromofluorobenzene			84			84	

	Laboratory Control Sample		
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)
1,1-Dichloroethene	0.50	0.41	82
Chlorobenzene	0.50	0.36	72
Trichloroethene (TCE)	0.50	0.40	80
Surrogate Recovery			
Dibromofluoromethane			92
1,2-Dichloroethane-d4			105
Toluene-d8			93
4-Bromofluorobenzene			86

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 65%-135%
ACCEPTABLE RPD IS 35%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180719-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons (EPA 8260C) in Water

Sample Description		Method Blank	B8-W	B8-W Dup	B9-W
Date Sampled		n/a	7/19/18	7/19/18	7/19/18
Date Analyzed	PQL (µg/L)	7/19/18 (µg/L)	7/20/18 (µg/L)	7/20/18 (µg/L)	7/19/18 (µg/L)
Vinyl Chloride (VC)	0.2	nd	nd	nd	nd
1,1-Dichloroethene	0.5	nd	nd	nd	nd
trans-1,2-Dichloroethene	1.0	nd	nd	nd	nd
cis -1,2-Dichloroethene	1.0	nd	nd	nd	nd
Trichloroethene (TCE)	1.0	nd	nd	nd	nd
Tetrachloroethene (PCE)	1.0	nd	nd	nd	nd
Surrogate Recovery					
Dibromofluoromethane		91	84	87	83
1,2-Dichloroethane-d4		117	122	108	101
Toluene-d8		83	88	79	78
4-Bromofluorobenzene		90	88	84	85

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180719-40
Client Project # 17-126

QA/QC Data - EPA 8260C Analyses

Sample Identification: B8-W							
	Matrix Spike			Matrix Spike Dup			RPD
	Spiked Conc. (µg/L)	Measured Conc. (µg/L)	Spike Recovery (%)	Spiked Conc. (µg/L)	Measured Conc. (µg/L)	Spike Recovery (%)	
1,1-Dichloroethene	10	8.5	85	10	8.8	88	3.5
Chlorobenzene	10	7.6	76	10	7.7	77	1.3
Trichloroethene (TCE)	10	8.7	87	10	8.6	86	1.2
Surrogate Recovery							
Dibromofluoromethane			84			84	
1,2-Dichloroethane-d4			109			113	
Toluene-d8			93			92	
4-Bromofluorobenzene			84			84	

Laboratory Control Sample			
	Spiked Conc. (µg/L)	Measured Conc. (µg/L)	Spike Recovery (%)
1,1-Dichloroethene	10	8.2	82
Chlorobenzene	10	7.2	72
Trichloroethene (TCE)	10	8.0	80
Surrogate Recovery			
Dibromofluoromethane			92
1,2-Dichloroethane-d4			105
Toluene-d8			93
4-Bromofluorobenzene			86

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 65%-135%
ACCEPTABLE RPD IS 35%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

4139 Libby Road NE
Olympia, WA 98506
Ph: 360-352-2110
Fax: 360-352-4154

Date: 7/19/18 Page: 1 of 2

Client: AEG

Project Manager: B. Dilba

Address: 605 11th Ave SE Suite 201

Project Name: 4 Corners Cleaners

City: Olympia State: WA Zip: 98501

Location: City, State: Maple Valley, WA

Phone: 360.352.9835 Fax:

Collector: B. Dilba Date of Collection: 7/19/18

Client Project # 17-126

Email: bdilba@aeglocal.com

	Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals	PCE + daughters		Field Notes
1	BB-33		933	Soil	VOA jar												X			
2	BB-30		922																	
3	BB-27		922																	
4	BB-24		913														X			
5	BB-21		913																	
6	BB-18		905														X			Not Analyzed - as per Becky Telecon 7/19 @ 1530
7	BB-15		859																	
8	BB-12		859																	
9	BB-9		850																	
10	BB-6		850														X			
11	BB-3		850														X			
12	BB-W		1030	H2O	VOA x3												X			
13	BG-3		1319	Soil	VOA Jar												X			
14	BG-6		1314																	
15	BG-9		1319														X			
16	BG-12		1326																	
17	BG-15		1326														X			

Relinquished by:	Date / Time	Received by:	Date / Time
[signature]	7/19/18 1450	Paul Buk	7/19/18 1450
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition?	Y	N	
Temp.		°C	
Seals Intact?	Y	N	N/A
Total Number of Containers			

Remarks:

ML

TAT: 24HR 48HR 5-DAY

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

4139 Libby Road NE
Olympia, WA 98506
Ph: 360-352-2110
Fax: 360-352-4154

Date: 7/19/18 Page: 2 of 2

Client: NEG

Project Manager: B. Dilba

Address:

Project Name: 4 Corners Cleaners

City: State: Zip:

Location: City, State: Maple Valley, WA

Phone: 360-352-9835 Fax:

Collector: B. Dilba Date of Collection: 7/19/18

Client Project # 17-126

Email: bdilba@ecologwa.com

	Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals	PCE & Daughters		Field Notes
1	BG-18		1334	Soil	40A/Jar															
2	BG-21		1340																	
3	BG-24		1340														X			
4	BG-27		1349																	
5	BG-30		1407																	
6	BG-33		1407														X			
7	BG-40		1446														X			
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				

Relinquished by:	Date / Time	Received by:	Date / Time
	7/19/18 1450	Paul Park	7/19/18 1450
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition?	Y	N	
Temp.		°C	
Seals Intact?	Y	N	N/A
Total Number of Containers			

Remarks: ML

TAT: 24HR 48HR 5-DAY

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.
4139 Libby Road NE • Olympia, WA 98506-2518

July 23, 2018

Becky Dilba
Associated Environmental Group, LLC
605 11th Avenue SE, Suite 201
Olympia, WA 98501

Dear Ms. Dilba:

Please find enclosed the analytical data report for the 4 Corners Cleaners Project located in Maple Valley, Washington.

The results of the analyses are summarized in the attached tables. Applicable detection limits and QA/QC data are included. The sample(s) will be disposed of in 30 days unless we are contacted to arrange long term storage.

Libby Environmental, Inc. appreciates the opportunity to have provided analytical services for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Sherry L. Chilcutt
Senior Chemist
Libby Environmental, Inc.

Phone (360) 352-2110 • Fax (360) 352-4154 • libbyenv@aol.com

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180720-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA 8260C in Soil

Sample Description		Method Blank	B10-3	B10-6	B10-6 Dup	B10-15	B10-27
Date Sampled		n/a	7/20/18	7/20/18	7/20/18	7/20/18	7/20/18
Date Analyzed	PQL	7/20/18	7/20/18	7/20/18	7/20/18	7/20/18	7/20/18
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Vinyl Chloride (VC)	0.02	nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	0.05	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
cis -1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
Trichloroethene (TCE)	0.03	nd	nd	nd	nd	nd	nd
Tetrachloroethene (PCE)	0.02	nd	nd	nd	nd	nd	nd
Surrogate Recovery							
Dibromofluoromethane		89	81	85	80	86	83
1,2-Dichloroethane-d4		120	102	117	113	128	114
Toluene-d8		93	92	93	92	92	92
4-Bromofluorobenzene		84	82	87	82	86	88

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180720-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA 8260C in Soil

Sample Description		B10-33	B11-3	B11-6	B11-9	B11-21	B11-21 Dup
Date Sampled		7/20/18	7/20/18	7/20/18	7/20/18	7/20/18	7/20/18
Date Analyzed	PQL (mg/kg)	7/20/18 (mg/kg)	7/20/18 (mg/kg)	7/20/18 (mg/kg)	7/20/18 (mg/kg)	7/20/18 (mg/kg)	7/20/18 (mg/kg)
Vinyl Chloride (VC)	0.02	nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	0.05	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
cis -1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
Trichloroethene (TCE)	0.03	nd	nd	nd	nd	nd	nd
Tetrachloroethene (PCE)	0.02	nd	nd	nd	nd	0.034	0.026
Surrogate Recovery							
Dibromofluoromethane		88	89	83	76	78	81
1,2-Dichloroethane-d4		127	134	118	128	117	122
Toluene-d8		93	90	93	91	91	88
4-Bromofluorobenzene		85	86	87	87	74	87

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180720-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA 8260C in Soil

Sample Description		B11-33
Date Sampled		7/20/18
Date Analyzed	PQL	7/20/18
	(mg/kg)	(mg/kg)
Vinyl Chloride (VC)	0.02	nd
1,1-Dichloroethene	0.05	nd
trans-1,2-Dichloroethene	0.02	nd
cis -1,2-Dichloroethene	0.02	nd
Trichloroethene (TCE)	0.03	nd
Tetrachloroethene (PCE)	0.02	nd
Surrogate Recovery		
Dibromofluoromethane		85
1,2-Dichloroethane-d4		109
Toluene-d8		94
4-Bromofluorobenzene		83

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180720-40
Client Project # 17-126

QA/QC Data - EPA 8260C Analyses

Sample Identification: B10-15							
	Matrix Spike			Matrix Spike Dup			RPD
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	
1,1-Dichloroethene	0.50	0.41	82	0.50	0.40	80	2.5
Chlorobenzene	0.50	0.42	84	0.50	0.40	80	4.9
Trichloroethene (TCE)	0.50	0.47	94	0.50	0.45	90	4.3
Surrogate Recovery							
Dibromofluoromethane			85			84	
1,2-Dichloroethane-d4			128			122	
Toluene-d8			93			86	
4-Bromofluorobenzene			88			88	

	Laboratory Control Sample		
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)
1,1-Dichloroethene	0.50	0.44	88
Chlorobenzene	0.50	0.39	78
Trichloroethene (TCE)	0.50	0.45	90
Surrogate Recovery			
Dibromofluoromethane			93
1,2-Dichloroethane-d4			129
Toluene-d8			82
4-Bromofluorobenzene			89

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 65%-135%
ACCEPTABLE RPD IS 35%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

4139 Libby Road NE
Olympia, WA 98506
Ph: 360-352-2110
Fax: 360-352-4154

Date: 7/20/18 Page: 1 of 2

Client: AEG

Project Manager: Becky Dilba

Address:

Project Name: 4 corners Cleaners

City: Olympia State: WA Zip:

Location: City, State: Maple Valley WA

Phone: 360-352-9835 Fax:

Collector: Becky D. Date of Collection: 7/20/18

Client Project # 17-126

Email:

	Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals	VCE + Daughters		Field Notes
1	B10-3	3	726	soil													X			
D 2	B10-6	6	726														X			
3	B10-9	9	724																	
4	B10-12	12	724																	
MS 5	B10-15	15	736														X			
6	B10-18	18	734																	
7	B10-21	21	744																	
8	B10-24	24	744																	
9	B10-27	27	748														X			
10	B10-30	30	748																	
11	B10-33	33	755														X			
12	B11-3		933														X			
13	B11-6		933														X			
14	B11-9		933														X			
15	B11-12		933																	
16	B11-15		940																	
17	B11-18		940																	

Relinquished by: Date / Time Received by: Paul Burk 7/20/18 11:30 Date / Time

Relinquished by: Date / Time Received by: Date / Time

Relinquished by: Date / Time Received by: Date / Time

Sample Receipt

Good Condition?	Y	N	
Temp.			°C
Seals Intact?	Y	N	N/A
Total Number of Containers			

Remarks: ML

TAT: 24HR 48HR 5-DAY

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

4139 Libby Road NE
Olympia, WA 98506

Ph: 360-352-2110
Fax: 360-352-4154

Date: 7/20/18 Page: 2 of 2

Client: MFG

Project Manager: B. Dilba

Address:

Project Name: 4 corners Cleaners

City: Olympia State: WA Zip:

Location: City, State: Maple Valley, WA

Phone: 360-352-9835 Fax:

Collector: B. Dilba Date of Collection: 7/20/18

Client Project # 17-126

Email:

	Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals	~~PB~~ RCE	Dissolved	Field Notes
1	B11-21		940														X			
2	~~B11-22~~		~~950~~																	
3	B11-24		915																	
4	B11-23		950																	
5	B11-33		958														X			
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				

Relinquished by:	Date / Time	Received by:	Date / Time
		Paul Bunk	7/20/18 1130
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition?	Y	N	
Temp.		°C	
Seals Intact?	Y	N	N/A
Total Number of Containers			

Remarks:

ML

TAT: 24HR 48HR 5-DAY

LEGAL ACTION CLAUSE: *In the event of default of payment and/or failure to pay, Client agrees to pay the costs of collection including court costs and reasonable attorney fees to be determined by a cout of law.*

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.
4139 Libby Road NE • Olympia, WA 98506-2518

July 24, 2018

Becky Dilba
Associated Environmental Group, LLC
605 11th Avenue SE, Suite 201
Olympia, WA 98501

Dear Ms. Dilba:

Please find enclosed the analytical data report for the 4 Corners Cleaners Project located in Maple Valley, Washington.

The results of the analyses are summarized in the attached tables. Applicable detection limits and QA/QC data are included. The sample(s) will be disposed of in 30 days unless we are contacted to arrange long term storage.

Libby Environmental, Inc. appreciates the opportunity to have provided analytical services for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Sherry L. Chilcutt
Senior Chemist
Libby Environmental, Inc.

Phone (360) 352-2110 • Fax (360) 352-4154 • libbyenv@aol.com

Libby Environmental, Inc.

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Email: libbyenv@aol.com

4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180723-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA 8260C in Soil

Sample Description		Method Blank	B11-18	B11-24	B11-24 Dup	B11-15	B12-18
Date Sampled		n/a	7/20/18	7/20/18	7/20/18	7/20/18	7/23/18
Date Analyzed	PQL (mg/kg)	7/23/18 (mg/kg)	7/23/18 (mg/kg)	7/23/18 (mg/kg)	7/23/18 (mg/kg)	7/23/18 (mg/kg)	7/23/18 (mg/kg)
Vinyl Chloride (VC)	0.02	nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	0.05	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
cis -1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
Trichloroethene (TCE)	0.03	nd	nd	nd	nd	nd	nd
Tetrachloroethene (PCE)	0.02	nd	0.053	0.032	0.046	nd	nd
Surrogate Recovery							
Dibromofluoromethane		90	89	92	87	87	87
1,2-Dichloroethane-d4		119	123	129	124	124	130
Toluene-d8		92	94	91	76	77	76
4-Bromofluorobenzene		89	89	91	90	87	88

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

4139 Libby Road NE
Olympia, WA 98506
Phone: (360) 352-2110
FAX: (360) 352-4154
Email: libbyenv@aol.com

4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180723-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA 8260C in Soil

Sample Description		B12-3	B12-33	B12-37	B13-3	B13-18	B13-35
Date Sampled		7/23/18	7/23/18	7/23/18	7/23/18	7/23/18	7/23/18
Date Analyzed	PQL	7/23/18	7/23/18	7/23/18	7/23/18	7/23/18	7/23/18
	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)	(mg/kg)
Vinyl Chloride (VC)	0.02	nd	nd	nd	nd	nd	nd
1,1-Dichloroethene	0.05	nd	nd	nd	nd	nd	nd
trans-1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
cis -1,2-Dichloroethene	0.02	nd	nd	nd	nd	nd	nd
Trichloroethene (TCE)	0.03	nd	nd	nd	nd	nd	nd
Tetrachloroethene (PCE)	0.02	nd	nd	nd	nd	nd	nd
Surrogate Recovery							
Dibromofluoromethane		82	85	83	82	83	82
1,2-Dichloroethane-d4		121	127	132	123	125	134
Toluene-d8		91	78	91	92	92	91
4-Bromofluorobenzene		88	91	90	81	90	91

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180723-40
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA 8260C in Soil

Sample Description		B13-35 Dup	B13-37
Date Sampled		7/23/18	7/23/18
Date Analyzed	PQL (mg/kg)	7/23/18 (mg/kg)	7/23/18 (mg/kg)
Vinyl Chloride (VC)	0.02	nd	nd
1,1-Dichloroethene	0.05	nd	nd
trans-1,2-Dichloroethene	0.02	nd	nd
cis -1,2-Dichloroethene	0.02	nd	nd
Trichloroethene (TCE)	0.03	nd	nd
Tetrachloroethene (PCE)	0.02	nd	nd
Surrogate Recovery			
Dibromofluoromethane		84	85
1,2-Dichloroethane-d4		123	130
Toluene-d8		83	75
4-Bromofluorobenzene		88	91

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

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4 CORNERS CLEANERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L180723-40
Client Project # 17-126

QA/QC Data - EPA 8260C Analyses

Sample Identification: B11-18							
	Matrix Spike			Matrix Spike Dup			RPD
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)	
1,1-Dichloroethene	0.50	0.36	72	0.50	0.34	68	5.7
Chlorobenzene	0.50	0.33	66	0.50	0.34	68	3.0
Trichloroethene (TCE)	0.50	0.36	72	0.50	0.37	74	2.7
Surrogate Recovery							
Dibromofluoromethane			86			84	
1,2-Dichloroethane-d4			109			128	
Toluene-d8			77			92	
4-Bromofluorobenzene			92			90	

	Laboratory Control Sample		
	Spiked Conc. (mg/kg)	Measured Conc. (mg/kg)	Spike Recovery (%)
1,1-Dichloroethene	0.50	0.42	84
Chlorobenzene	0.50	0.33	66
Trichloroethene (TCE)	0.50	0.39	78
Surrogate Recovery			
Dibromofluoromethane			92
1,2-Dichloroethane-d4			116
Toluene-d8			92
4-Bromofluorobenzene			87

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 65%-135%
ACCEPTABLE RPD IS 35%

ANALYSES PERFORMED BY: Paul Burke

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

4139 Libby Road NE
Olympia, WA 98506
Ph: 360-352-2110
Fax: 360-352-4154

Date: 7/23/18 Page: 1 of 2

Client: AEG

Project Manager: Becky Dilba

Address:

Project Name: 4 Corners Cleaners

City: Olympia State: WA Zip:

Location: City, State: Maple Valley, WA

Phone: 360-352-9835 Fax:

Collector: B Dilba Date of Collection: 7/20 & 7/~~22~~ 23

Client Project # 17-126

Email:

	Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals	PCE & Daughter		Field Notes
1	B11-18	18	9:40	Soil	2 VOAs, 1 Jar												X			Sample 7/20
D 2	B11-24	24	9:50	Soil	" "												X			" "
3	B11-15	15	9:40	Soil	" "												X			Sample 7/20
MS 4	B12-18	18	9:15	Soil	" "												X			Sampled 7/23
5	B12-3	3	852														X			
6	B12-6	6	852																	
7	B12-9	9	858																	
8	B12-12	12	902																	
9	B12-15	15	907																	
10	B12-~~B~~21	21	915																	
11	B12-24	24	926																	
12	B12-27	27	927																	
13	B12-30	30	927																	
14	B12-33	33	1004	↓	↓												X			
15	B12-~~X~~37	37	1051	Mud	3 VOAs												X			
16	B13-3	3	1138	Soil	2 VOAs, 1-Jar												X			
17	B13-6	6	1133	↓	↓															

Relinquished by:	Date / Time	Received by:	Date / Time
	7/23/18 1326		7/23/18 1326
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition?	Y	N	
Temp.	Ambient	°C	
Seals Intact?	Y	N	N/A
Total Number of Containers			

Remarks:

ML

TAT: 24HR 48HR 5-DAY

Distribution: White - Lab, Yellow - File, Pink - Originator

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

4139 Libby Road NE
Olympia, WA 98506
Ph: 360-352-2110
Fax: 360-352-4154

Date: 7/23/18 Page: 2 of 2

Client: AEG

Project Manager: Becky D.

Address:

Project Name: 4 Corners Cleaners

City: Olympia State: WA Zip:

Location: City, State: Maple Valley, WA

Phone: 360-352-9835 Fax:

Collector: B. Dilba Date of Collection: 7/23/18

Client Project # 17-126

Email:

	Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals	PCE & Daughter		Field Notes
1	B13-9	9	1133	Soil	2-4oz/-Jar															
2	B13-12	12	1144																	
3	B13-15	15	1144																	
4	B13-18	18	1152															X		
5	B13-21	21	1210																	
6	B13-24	24	1210																	
7	B13-27	27	1224																	
8	B13-30	30	1224																	
9	B13-35	35	1226															V		
10	B13-37	37	1308	↓	↓													X		
11																				
12																				
13																				
14																				
15																				
16																				
17																				

Relinquished by:	Date / Time	Received by:	Date / Time
	7/23/18 1326		7/23/18 1326
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition?	Y	N	
Temp.	Ambient	°C	
Seals Intact?	Y	N	N/A
Total Number of Containers			

Remarks: ML

TAT: 24HR 48HR 5-DAY

Distribution: White - Lab, Yellow - File, Pink - Originator

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 www.ecy.wa.gov/programs/tcp/policies/terrestrial/TEEHome.htm.

Step 1: IDENTIFY HAZARDOUS WASTE SITE	
Please identify below the hazardous waste site for which you are documenting an evaluation.	
Facility/Site Name: 4 Corners Dry Cleaners	
Facility/Site Address: 2386 SE Kent-Kangley Road, Maple Valley, WA 98038	
Facility/Site No:	VCP Project No.:

Step 2: IDENTIFY EVALUATOR		
Please identify below the person who conducted the evaluation and their contact information.		
Name: Charles Swift		Title: Project Manager
Organization: Associated Environmental Group		
Mailing address: 605 11th Ave SE, Suite 201		
City: Olympia	State: WA	Zip code: 98501
Phone: 360-352-9835	Fax: 360-352-8164	E-mail: cswift@aegwa.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 "UKNOWN,"** 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 15 W. Yakima Ave., Suite 200 Yakima, WA 98902
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

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office • 3190 160th Ave SE • Bellevue, WA 98008-5452 • 425-649-7000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

March 2, 2015

Mr. Mark Jenkins
Kite Realty Group
30 South Meridian Street, Suite 1100
Indianapolis, IN 46204

Re: No Further Action at the Following Site:

- **Name:** Four Corners Cleaners Original Location
- **Address:** 23900 Kent–Kangley Road, Maple Valley, WA
- **Facility/Site No.:** 98451692
- **Cleanup Site ID No.:** 12512
- **VCP No.:** NW2931

Dear Mr. Jenkins:

The Washington State Department of Ecology (Ecology) received your request for an opinion on your independent cleanup of the Four Corners Cleaners Original Location facility (Site). This letter provides our opinion. We are providing this opinion under the authority of the Model Toxics Control Act (MTCA), Chapter 70.105D RCW.

Issue Presented and Opinion

Is further remedial action necessary to clean up contamination at the Site?

NO. Ecology has determined that no further remedial action is necessary to clean up contamination at the Site.

This opinion is based on information and data provided in the Remedial Action Report dated August 22, 2014. The report documents the remedial activities that have addressed contamination in soil at the Site due to operations of the former dry cleaning facility.

This opinion is also based on an analysis of whether the remedial action meets the substantive requirements of MTCA, Chapter 70.105D RCW, and its implementing regulations, Chapter 173-340 WAC (collectively "substantive requirements of MTCA"). The analysis is provided below.

Description of the Site

This opinion applies only to the Site described below. The Site is defined by the nature and extent of contamination associated with the following releases:

- Perchloroethylene (PCE), Trichloroethene (TCE), cis-1,2-Dichloroethene (cis-1,2-DCE), and trans-1,2-Dichloroethene (trans-1, 2-DCE) into Soil.

Basis for the Opinion

This opinion is based on the information contained in the following documents:

1. The Riley Group, Inc., August 22, 2014, Remedial Action Report.
2. The Riley Group, Inc., February 26, 2014, Addendum to 2012 Additional Subsurface Investigation Report.
3. The Riley Group, Inc., September 28, 2012, Additional Subsurface Investigation Report.
4. The Riley Group, Inc., May 9, 2012, Phase I Environmental Site Assessment Update.
5. The Riley Group, Inc., December 7, 2004, Supplemental Phase II Subsurface Investigation.
6. The Riley Group, Inc., September 30, 2003, Phase I Environmental Site Assessment.

Those documents listed above are kept in the Central Files of the Northwest Regional Office of Ecology (NWRO) for review by appointment only. You can make an appointment by calling the NWRO resource contact at (425) 649-7235 or by sending an email to nwro_public_request@ecy.wa.gov.

This opinion is void if any of the information contained in those documents is materially false or misleading.

Analysis of the Cleanup

Ecology has concluded that **no further remedial action** is necessary to further clean up the contaminated soil at the Site. That conclusion is based on the following analysis:

1. **Characterization of the Site.**

   Ecology has determined characterization of the Site is sufficient to establish cleanup standards and select cleanup actions for removal of the contaminated soil exceeding MTCA Method A cleanup levels and confirmation of the groundwater quality.

   a. Site assessments conducted at this Site from 1989 to 2014 confirmed the presence of chemicals of concern (COCs) as aforementioned in soil. The studies also concluded that the contamination resulted from operations of the former dry cleaning facility.

   b. Following completion of Site characterization, cleanup actions were conducted in August 2014. The remedial activities included excavation of approximately 134 tons of impacted soil at two locations (Figure 3), collection of confirmation soil samples in both of the excavations and transport of the soil to Columbia Ridge Subtitle D Landfill for disposal.

   c. Laboratory analysis results of the soil samples collected from the bottoms and sidewalls of the two excavations (Figure 3) confirmed that the contaminated soil exceeding MTCA Method A cleanup levels has been cleaned up at this Site.

   d. Soil vapor measurement was conducted in two soil borings with PCE during the site characterization in 2004. The study concluded that there was no soil vapor pathway existing at this Site.

   e. Ground water encountered in the monitoring wells at approximately 21 feet bgs was analyzed during Site assessment activities. None of the samples contained COCs at concentrations exceeding MTCA Method A cleanup levels. Ground water was not present in either of the two excavations at the maximum depth of approximately seven feet bgs, which is about 14 feet above the ground water table. Ground water at this Site was unlikely impacted by releases due to operations of the facility.

2. **Establishment of cleanup standards.**

   a. **Substance-specific standards.**

      Ecology has determined the cleanup levels and points of compliance you established for the Site meet the substantive requirements of MTCA.

      Cleanup levels for soil contamination at this Site are defined as the MTCA Method A cleanup levels, which are classified for unrestricted land use.

Cleanup levels for ground water contamination at this Site are defined as the MTCA Method A cleanup levels.

b. Action and location-specific requirements.

The requirements to clean up this Site included removal and disposal of the contaminated soil exceeding the MTCA Method A cleanup levels.

3. Selection of cleanup action.

Ecology has determined the cleanup action you selected for the Site meets the substantive requirements of MTCA.

a. Investigations were conducted to characterize the Site, and remediation was performed later to remove contaminated soil which was disposed of at an appropriate facility.

b. Confirmation soil samples were collected for laboratory analysis at the bottoms and sidewalls of the two excavations. The results indicated the concentrations of COCs were either undetectable, or below the MTCA Method A cleanup levels.

c. Ground water was detected for the COCs at concentrations below the MTCA Method A cleanup levels for unrestricted land use.

4. Cleanup.

Ecology has determined the cleanup you performed meets the cleanup standards established for the Site at MTCA Method A cleanup levels for all the COCs aforementioned. This determination is based on the performances specified below.

a. PCE, TCE, cis-1,2-DCE, and trans-1,2-DCE-contaminated soils exceeding MTCA Method A cleanup levels were excavated; a total of approximately 134 tons of the soil was disposed of at a subtitle D landfill. The follow up soil confirmation sample analysis concluded that completion of soil removal to undetectable, or below MTCA Method A cleanup levels was achieved.

b. Laboratory results demonstrated the ground water had not been impacted due to operation of the former dry cleaning facility.

Listing of the Site

Based on this opinion, Ecology will initiate the process of removing the Site from our lists of hazardous waste sites, including:

- Confirmed and Suspected Contaminated Sites List.

Limitations of the Opinion

1. **Opinion does not settle liability with the state.**

   Liable persons are strictly liable, jointly and severally, for all remedial action costs and for all natural resource damages resulting from the release or releases of hazardous substances at the Site. This opinion **does not**:

   - Resolve or alter a person's liability to the state.
   - Protect liable persons from contribution claims by third parties.

   To settle liability with the state and obtain protection from contribution claims, a person must enter into a consent decree with Ecology under RCW 70.105D.040(4).

2. **Opinion does not constitute a determination of substantial equivalence.**

   To recover remedial action costs from other liable persons under MTCA, one must demonstrate that the action is the substantial equivalent of an Ecology-conducted or Ecology-supervised action. This opinion does not determine whether the action you performed is substantially equivalent. Courts make that determination. *See* RCW 70.105D.080 and WAC 173-340-545.

3. **State is immune from liability.**

   The state, Ecology, and its officers and employees are immune from all liability, and no cause of action of any nature may arise from any act or omission in providing this opinion. *See* RCW 70.105D.030(1)(i).

Termination of Agreement

Thank you for cleaning up the Site under the Voluntary Cleanup Program (VCP). This opinion terminates the VCP Agreement governing this project #NW2931.

For more information about the VCP and the cleanup process, please visit our web site: www. ecy.wa.gov/programs/tcp/vcp/vcpmain.htm. If you have any questions about this opinion or the termination of the Agreement, please contact me by phone at (425) 649-7126 or e-mail at gyan461@ecy.wa.gov.

Sincerely,

Grant Yang

Grant Yang
Toxics Cleanup Program

Enclosures: A - Site Description
B - Site Diagrams

cc: Jerry Sawetz, The Riley Group, Inc.
Sonia Fernandez, VCP Coordinator, Ecology
Dolores Mitchell, VCP Financial Manager, Ecology

Site Description

This enclosure provides Ecology's understanding and interpretation of Site conditions and forms part of the basis for the opinion expressed in the letter.

Site: The Site is located at 23886 Kent-Kangley Road in Maple Valley, WA (Property) (see Figure 1) and consists of PCE, TCE, and DCE contamination in soil. The Property covers King County tax parcel number 2722069086.

Area and Property Description: The Property is located in a mixed commercial and residential area with a size of less than 5,000 square feet (< 1 acre; Figure 2).

Property History and Current Use: The Site was historically occupied by a dry cleaning facility, 4 Corners Cleaners, which operated from 1984 to 2000. The Site was redeveloped as a parking lot for a newly constructed Walgreens at the same time when the remedial action was performed in 2014.

Source of Contamination: Based on the Site assessment results, the presence of PCE and related degradation products (TCE, cis-1,2-DCE, and trans-1,2-DCE) were confirmed in soil at this Site. Impacts of these contaminants to the surface and subsurface soils occurred over time through releases from operations of the former dry cleaning facility.

Physiographic Setting: The Site is located on the Des Moines drift upland at an elevation of approximately 500 feet above mean sea level. The Site is relatively level, with a slight gradient toward the north.

Surface/Storm Water System: The closest surface water body to the Site is Wilderness Lake, which is approximately 4,000 feet to the northwest. Surface water and storm water runoff on and in the vicinity of the Site disperse via sheet flow to the city of Maple Valley's storm water drainage system.

Ecological Setting: There is no terrestrial habitat within 1000 feet of any part of the Site, which is surrounded by the developed land occupied by residential and commercial buildings, roads, paved areas and other barriers. Therefore, the environment prevents wildlife from feeding on plants, earthworms, insects, or other food in or on the soil.

Geology: The Site and vicinity are primarily underlain by the Vashon till, a dense unconsolidated glacial deposit characterized by poorly-sorted materials. A thin veneer of Vashon recessional outwash deposits is also present, as recorded in well logs to depths of at least 20 feet below the ground surface (bgs) overlying the till at this Site.

Ground Water: A perched shallow ground water-bearing zone was encountered at depths of approximately 21 feet bgs at the Site. The ground water flow direction is generally north.

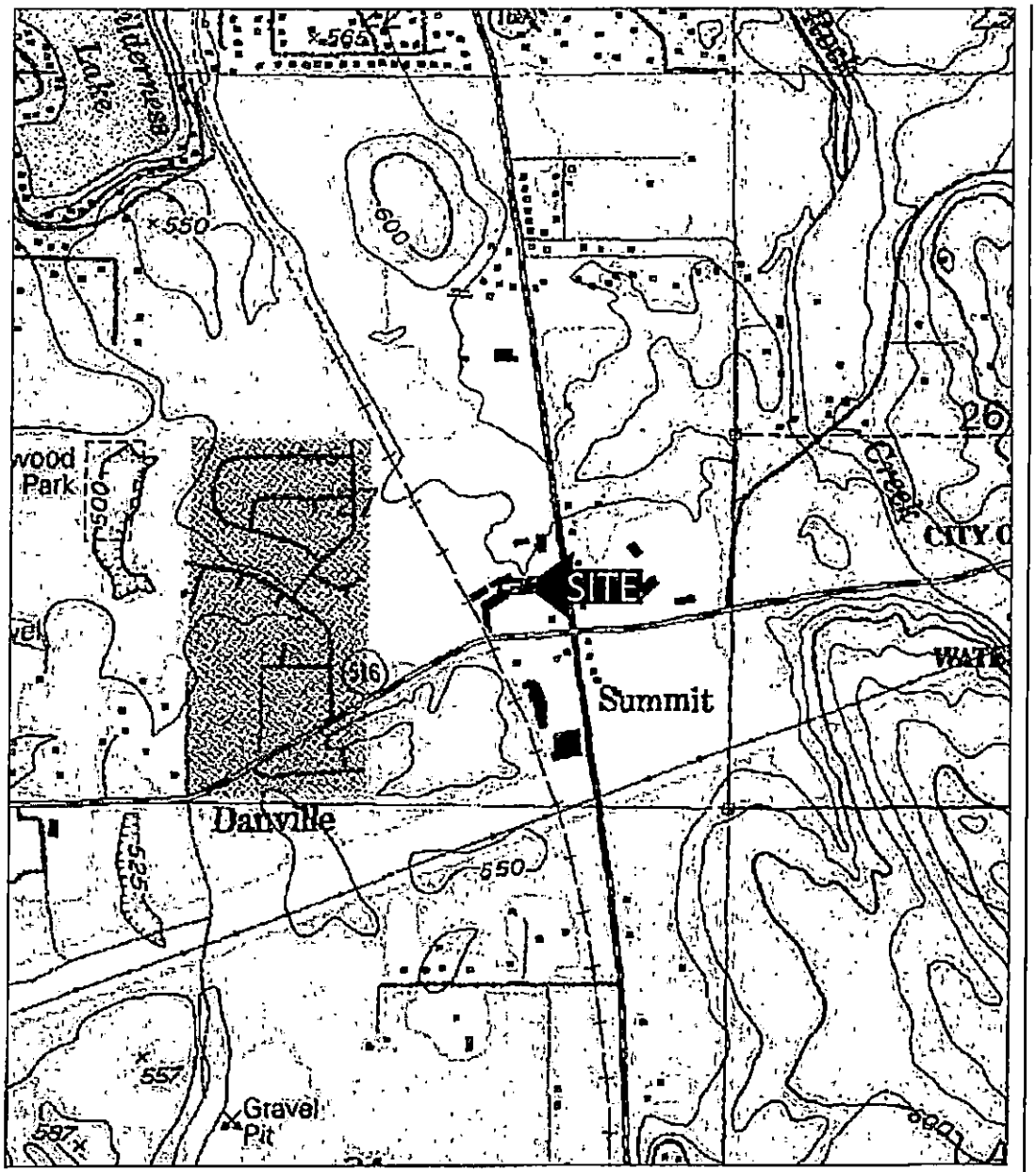
Water Supply: A public water supply is currently provided to the Site by the Covington Water District which obtains water from the Lake Sawyer wellfield in Black Diamond. According to Ecology's well log data base, there are no private drinking water wells located within approximately 1,000 feet of the Property.

Releases and Extent of Soil Contamination: Soil was contaminated due to releases from operations of the former dry cleaning facility from 1984 to 2000. From 1989 to 2014, various investigative and cleanup efforts were conducted at the Site, which included characterization of the Site contamination and over-excavation of the contaminated soil. As a result, approximately 134 tons of the soil contaminated by PCE, TCE and DCEs were excavated at two locations (Figure 3) and the materials were disposed off-site at a regulated disposal landfill afterwards.

Confirmation soil sampling conducted in 2014 indicated that concentrations of the COCs in the soil were at the non-detectable or below MTCA Method A cleanup levels. The vapor intrusion study concluded that there was no a vapor intrusion pathway in the Site. Therefore, Ecology determines the cleanup at this Site is complete.

Releases and Extent of Ground Water Contamination: Ground water samples collected at 21 feet bgs from two monitoring wells were analyzed for the COCs at the Site. The laboratory results indicated that the concentrations in the water did not exceed MTCA Method A cleanup levels.

Figure 1 Location of the Site



USGS, 1994, Black Diamond, Washington
7.5-Minute Quadrangle

Approximate Scale: 1"=1000'
0 500 1000 2000
N

Corporate Office 17522 Bothell Way Northeast Bothell, Washington 98011 Phone: 425.415.0551 Fax: 425.415.0311 RILEYGROUP	Former 4 Corners Cleaners	Figure 1
	RGI Project Number: 2003-165L Site Vicinity Map	Date Drawn: 08/2014
	Address: 23886 Southeast Kent-Kangley Road, Maple Valley, Washington 98038	

Figure 2 General Vicinity Map of the Site

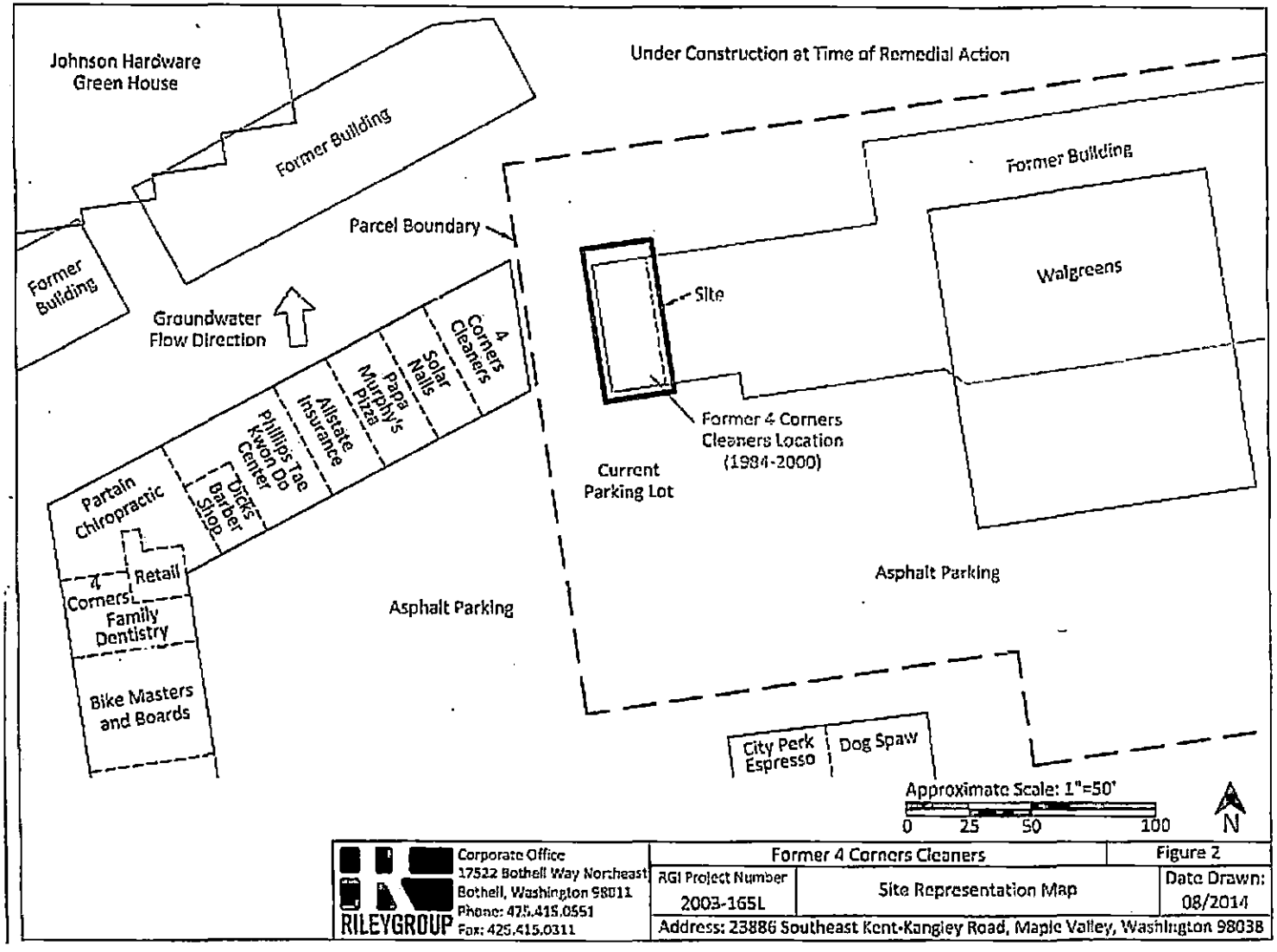
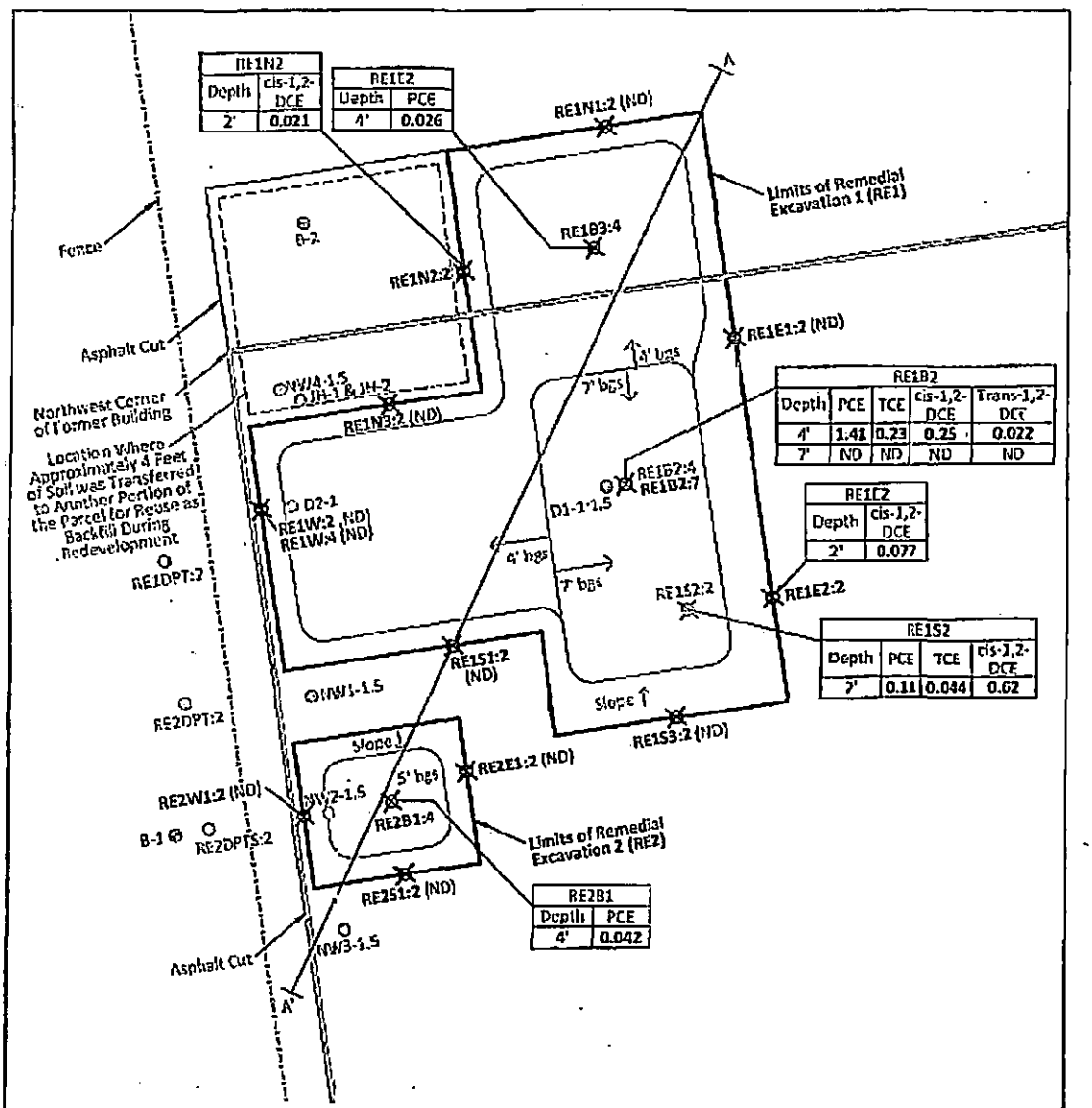
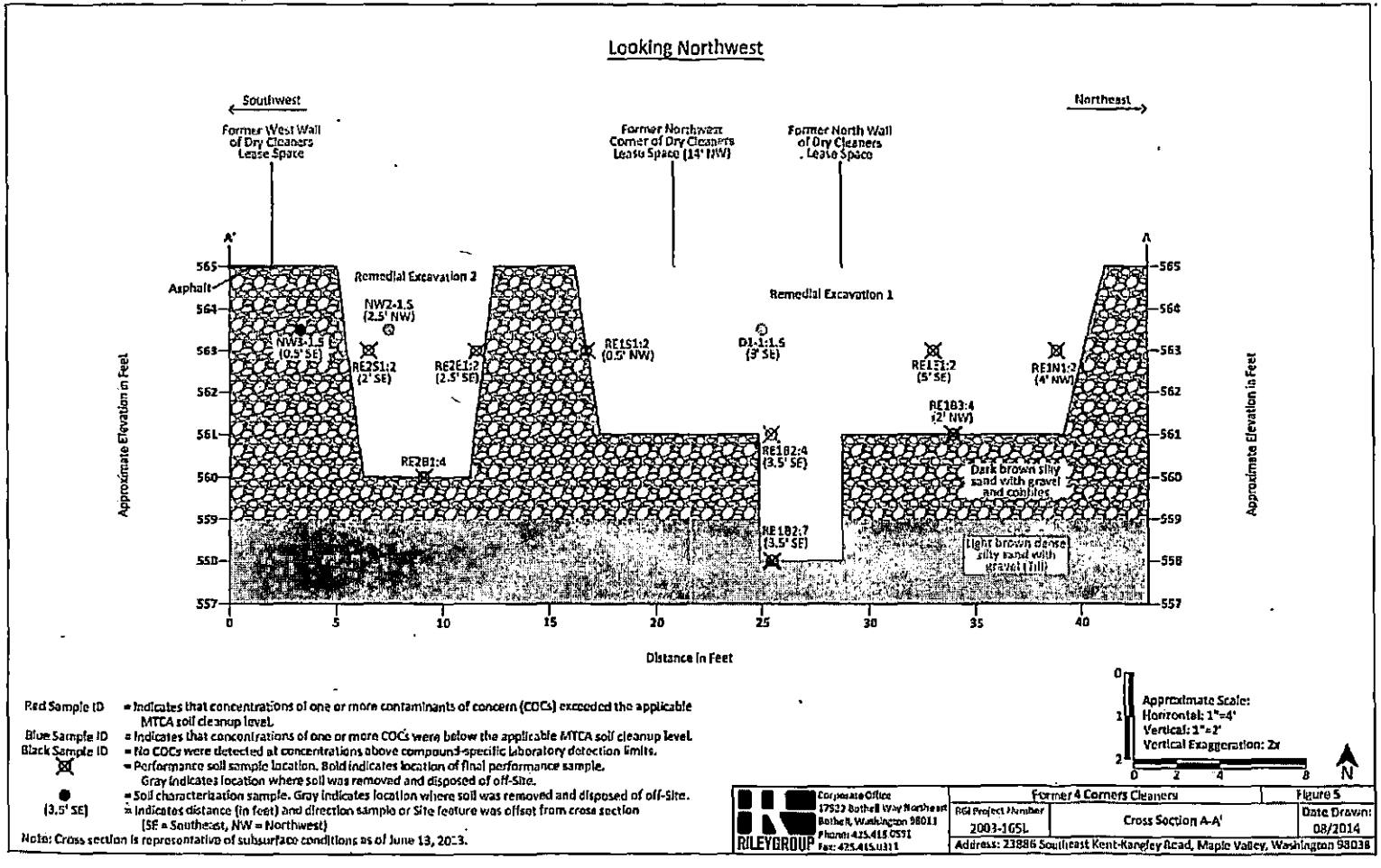


Figure 3 Confirmation Soil Locations with Analytical Results (mg/kg) at the Excavations



RILEYGROUP Corporate Office 17522 Bothell Way Northeast Bothell, Washington 98011 Phone: 425.415.0551 Fax: 425.415.0311	Former 4 Corners Cleaners		Figure 4
	RGI Project Number 2003-165L	Remedial Excavation Areas 1 and 2 with Performance Soil Sample Analytical Data	Date Drawn: 08/2014
	Address: 23886 Southeast Kent-Kangley Road, Maple Valley, Washington 98038		

Figure 4 Soil Sampling Locations Showing at the Cross Section



STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
Northwest Regional Office • 3190 160th Ave SE • Bellevue, WA 98008-5452 • 425-649-7000
711 for Washington Relay Service • Persons with a speech disability can call 877-833-6341

February 28, 2017

Mr. Mark Jenkins
Kite Realty Group
30 South Meridian St Ste 1100
Indianapolis IN 46204

Re: No Further Action at the following Site:

- **Name:** Four Corners Cleaners New Location
- **Address:** 23886 Kent–Kangley Road, Maple Valley, WA
- **Facility/Site No.:** 5867
- **Cleanup Site ID No.:** 12513
- **VCP No.:** NW2932

Dear Mr. Jenkins:

The Washington State Department of Ecology (Ecology) received your request for an opinion on your independent cleanup of the Four Corners Cleaners New Location facility (Site). This letter provides our opinion. We are providing this opinion under the authority of the Model Toxics Control Act (MTCA), Chapter 70.105D RCW.

Issue Presented and Opinion

Is further remedial action necessary to clean up contamination at the Site?

NO. Ecology has determined that no further remedial action is necessary to clean up contamination at the Site.

This opinion is based on information and data provided in the Addendum to 2012 Additional Subsurface Investigation Report dated February 26, 2014 and Response to Ecology Comments Dated June 22, 2015. The reports document the remedial activities that have addressed contamination in soil at the Site due to operations of the former dry cleaning facility.

This opinion is also based on an analysis of whether the remedial action meets the substantive requirements of MTCA, Chapter 70.105D RCW, and its implementing regulations, Chapter 173-340 WAC (collectively "substantive requirements of MTCA"). The analysis is provided below.

Description of the Site

This opinion applies only to the Site described below. The Site is defined by the nature and extent of contamination associated with the following releases:

- Perchloroethylene (PCE) and Trichloroethene (TCE) into Soil.

Enclosure A includes a detailed description of the Site, as currently known to Ecology.
Enclosure B includes diagrams of the Four Corners Cleaners New Location Site.

Please note a parcel of real property can be affected by multiple sites. At this time, we have no information that the parcel associated with this Site is affected by other sites.

Basis for the Opinion

This opinion is based on the information contained in the following documents:

1. The Riley Group, Inc., June 22, 2015, Response to Ecology Comments dated April 2, 2015.

2. The Riley Group, Inc., February 26, 2014, Addendum to 2012 Additional Subsurface Investigation Report.

3. The Riley Group, Inc., September 28, 2012, Additional Subsurface Investigation Report.

4. The Riley Group, Inc., May 9, 2012, Phase I Environmental Site Assessment Update Report.

5. The Riley Group, Inc., January 18, 2011, Phase I Environmental Site Assessment Update Report.

6. The Riley Group, Inc., January 3, 2011, Drycleaners Compliance Review Report.

7. The Riley Group, Inc., December 7, 2004, Supplemental Phase II Subsurface Investigation.

8. The Riley Group, Inc., September 30, 2003, Phase I Environmental Site Assessment.

Those documents listed above are kept in the Central Files of the Northwest Regional Office of Ecology (NWRO) for review by appointment only. You can make an appointment by calling the NWRO resource contact at (425) 649-7235, or sending an email to nwro_public_request@ecy.wa.gov.

This opinion is void if any of the information contained in those documents is materially false or misleading.

Analysis of the Cleanup

Ecology has concluded that **no further remedial action** is necessary to further clean up the contaminated soil at the Site. That conclusion is based on the following analysis:

1. Characterization of the Site.

Ecology has determined that your characterization of the Site is sufficient to establish cleanup standards, and select cleanup actions for removal of the contaminated soil exceeding MTCA Method A cleanup levels and confirmation of the groundwater quality.

a. Site assessments conducted at this Site from 2003 to 2014 confirmed the presence of chemicals of concern (COCs) as aforementioned in soil vapor. The studies also concluded that the contamination resulted from operations of the former dry cleaning facility on the Property, Four Corners Cleaners.

b. While a total of 16 soil samples were collected from the soil borings at a range of 0.1 to 30 feet below the ground surface (bgs), three ground water samples were obtained from the soil borings where ground water was encountered between 21 to 23 feet bgs. The laboratory results indicated none of the analytes (gasoline, diesel, heavy oil, PCE, TCE, 1,2-dichloroethylene and vinyl chloride) were found in Site soil or ground water.

c. Soil vapor measurements were conducted during the Site characterization in 2004. PCE and TCE were the only chlorinated compounds detected and occurred at concentrations in the soil vapor at 1,000 and 11 $\mu g/m^3$ respectively. RGI utilized the Environmental Protection Agency (EPA) online Johnson and Ettinger Model (JEM) to calculate property-specific soil vapor screening levels for PCE and TCE. The calculated Site-specific soil vapor screening levels were 2,755 $\mu g/m^3$ for PCE and 103 $\mu g/m^3$ for TCE. Therefore, there is no soil vapor intrusion risk at this Site since the field measurements were detected at 1,000 and 11$\mu g/m^3$ for PCE and TCE, respectively.

2. Establishment of cleanup standards.

a. Substance-specific standards.

Ecology has determined the cleanup levels and points of compliance you established for the Site meet the substantive requirements of MTCA.

Cleanup levels for soil contamination at this Site are defined as the MTCA Method A cleanup levels, which are classified for unrestricted land use.

Cleanup levels for ground water contamination at this Site are defined as the MTCA Method A cleanup levels.

Cleanup level for soil vapor at this Site is defined as the MTCA Method B calculated site-specific concentration screening levels.

b. Action and location-specific requirements.

The requirement to clean up this Site includes reducing concentrations of soil vapor to the MTCA Method B calculated site-specific concentration screening level.

3. Selection of cleanup action.

Ecology has determined the cleanup action you selected for the Site meets the substantive requirements of MTCA.

a. Investigations conducted to characterize the Site indicated the exceedance was not found in soil and ground water.

b. The soil vapor study concluded that vapor intrusion is not of concern at this Site because measured soil vapor concentrations of PCE and TCE are below MTCA Method B calculated Site-specific concentration screening levels (JEM Model) of 2,755 and 103 $\mu g/m^3$, respectively.

4. Cleanup.

Ecology has determined the cleanup you performed meets the cleanup standards established for the Site at MTCA Method A cleanup levels for the COCs aforementioned. This determination is based on the performances specified below.

a. PCE and TCE detected in soil vapor were below MTCA Method B calculated site-specific concentration screening levels.

b. Laboratory results demonstrated the COCs in soil and ground water were at concentrations below the detectable levels.

Listing of the Site

Based on this opinion, Ecology will initiate the process of removing the Site from our lists of hazardous waste sites, including:

- Confirmed and Suspected Contaminated Sites List.

Limitations of the Opinion

1. **Opinion does not settle liability with the state.**

   Liable persons are strictly liable, jointly and severally, for all remedial action costs and for all natural resource damages resulting from the release or releases of hazardous substances at the Site. This opinion **does not**:

   - Resolve or alter a person's liability to the state.
   - Protect liable persons from contribution claims by third parties.

   To settle liability with the state and obtain protection from contribution claims, a person must enter into a consent decree with Ecology under RCW 70.105D.040(4).

2. **Opinion does not constitute a determination of substantial equivalence.**

   To recover remedial action costs from other liable persons under MTCA, one must demonstrate that the action is the substantial equivalent of an Ecology-conducted or Ecology-supervised action. This opinion does not determine whether the action you performed is substantially equivalent. Courts make that determination. *See* RCW 70.105D.080 and WAC 173-340-545.

3. **State is immune from liability.**

   The state, Ecology, and its officers and employees are immune from all liability, and no cause of action of any nature may arise from any act or omission in providing this opinion. *See* RCW 70.105D.030(1)(i).

Termination of Agreement

Thank you for cleaning up the Site under the Voluntary Cleanup Program (VCP). This opinion terminates the VCP Agreement governing this project #NW2931.

For more information about the VCP and the cleanup process, please visit our web site: www. ecy.wa.gov/programs/tcp/vcp/vcpmain.htm. If you have any questions about this opinion or the termination of the Agreement, please contact me by phone at (425) 649-7126 or e-mail at gyan461@ecy.wa.gov.

Sincerely,

Grant Yang

Toxics Cleanup Program

Enclosures (2) A - Site Description
B - Site Diagrams

cc: Jerry Sawetz, The Riley Group, Inc.
Sonia Fernandez, VCP Coordinator, Ecology
Matt Alexander, VCP Financial Manager, Ecology

Enclosure A: Site Description

This enclosure provides Ecology's understanding and interpretation of Site conditions and forms part of the basis for the opinion expressed in the letter.

Site: The Site is located at 23886 Kent-Kangley Road in Maple Valley, Washington (Property) (see Figure 1) and consists of PCE and TCE in soil vapor.

Area and Property Description: The Property is located in a mixed commercial and residential area with a size of less than 5,000 square feet (Figure 2).

Property History and Current Use: The Site was historically occupied by a dry cleaning facility, Four Corners Cleaners, which operated from 1984 to 2000. The Site was redeveloped as a parking lot for a newly constructed Walgreens at the same time as the Site assessment was performed in 2014.

Source of Contamination: Based on the Site assessment results, the presence of PCE and a related degradation product, TCE, were confirmed in soil vapor at this Site. Impacts of these contaminants to the surface and subsurface soils occurred over time through releases from operations of the former dry cleaning facility. Once in the soil, PCE and TCE volatilized and migrated into the soil vapor.

Physiographic Setting: The Site is located on the Des Moines drift upland at an elevation of approximately 500 feet above mean sea level. The Site is relatively level, with a slight gradient toward the north.

Surface/Storm Water System: The closest surface water body to the Site is Rock Creek, which is approximately 2,000 feet to the east. Surface water and storm water runoff on and in the vicinity of the Site disperses via sheet flow to the city of Maple Valley's storm water drainage system.

Ecological Setting: There is no terrestrial habitat within 1,000 feet of any part of the Site, which is surrounded by the developed land occupied by residential and commercial buildings, roads, paved areas and other barriers. Therefore, the environment prevents wildlife from feeding on plants, earthworms, insects, or other food in or on the soil.

Geology: The Site and vicinity are primarily underlain by the Vashon till, a dense unconsolidated glacial deposit characterized by poorly-sorted materials including gravel, sand, silt and clay. A thin veneer of Vashon recessional outwash deposits is also present, as recorded in well logs to depths of at least 20 feet below the ground surface (bgs) overlying the till at this Site.

Ground Water: A perched shallow ground water-bearing zone was encountered at depths of approximately 21 to 23 feet bgs at the Site. Based on the formation of ground water encountered in soil borings and monitoring wells, the ground water flow direction is generally north.

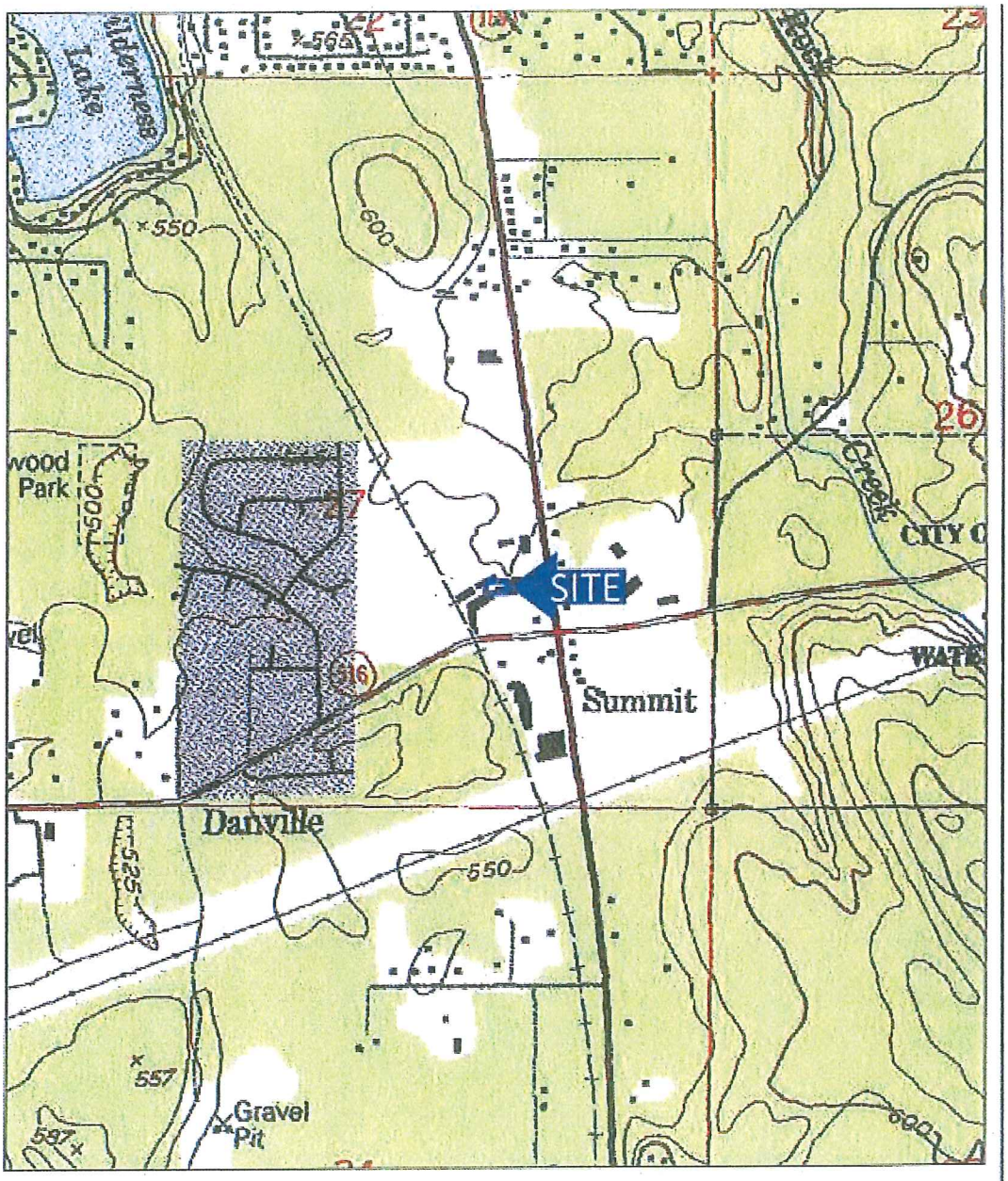
Water Supply: A public water supply system is currently provided to the Site by the Covington Water District which obtains water from the Lake Sawyer wellfield in Black Diamond. According to Ecology's well log data base, there are no private drinking water wells located within approximately 1,000 feet of the Property.

Releases and Extent of Soil Contamination: Soil was contaminated due to releases from operations of the former dry cleaning facility from 1984 to 2000. From 1989 to 2014, various investigative were conducted at the Site, which included characterization of the Site contamination in soil and performance of a soil vapor study. Based on the conclusions obtained from these remedial investigations, soil was not found to be exceeded with PCE and TCE above MTCA Cleanup levels.

PCE and TCE were detected in soil during the site assessment at levels of 1,000 and 11 $\mu g/m^3$. In accordance with the calculations used Ecology's MTCA Method B and EPA's JEM, the Site-specific screening levels for PCE and TCE are 1,680 and 65 $\mu g/m^3$; and 2,755 and 103 $\mu g/m^3$, respectively. The soil vapor study indicated that there is no a vapor intrusion pathway on the Site since the detected levels were below the Site-specific screening levels. Therefore, Ecology determines the cleanup at this Site is complete.

Releases and Extent of Ground Water Contamination: Ground water samples collected at 21 to 23 feet bgs from three monitoring wells were analyzed for the COCs at the Site. The laboratory results indicated that the concentrations of COCs in the ground water were at undetectable levels.

Enclosure B: **Figure 1 Location of the Site**

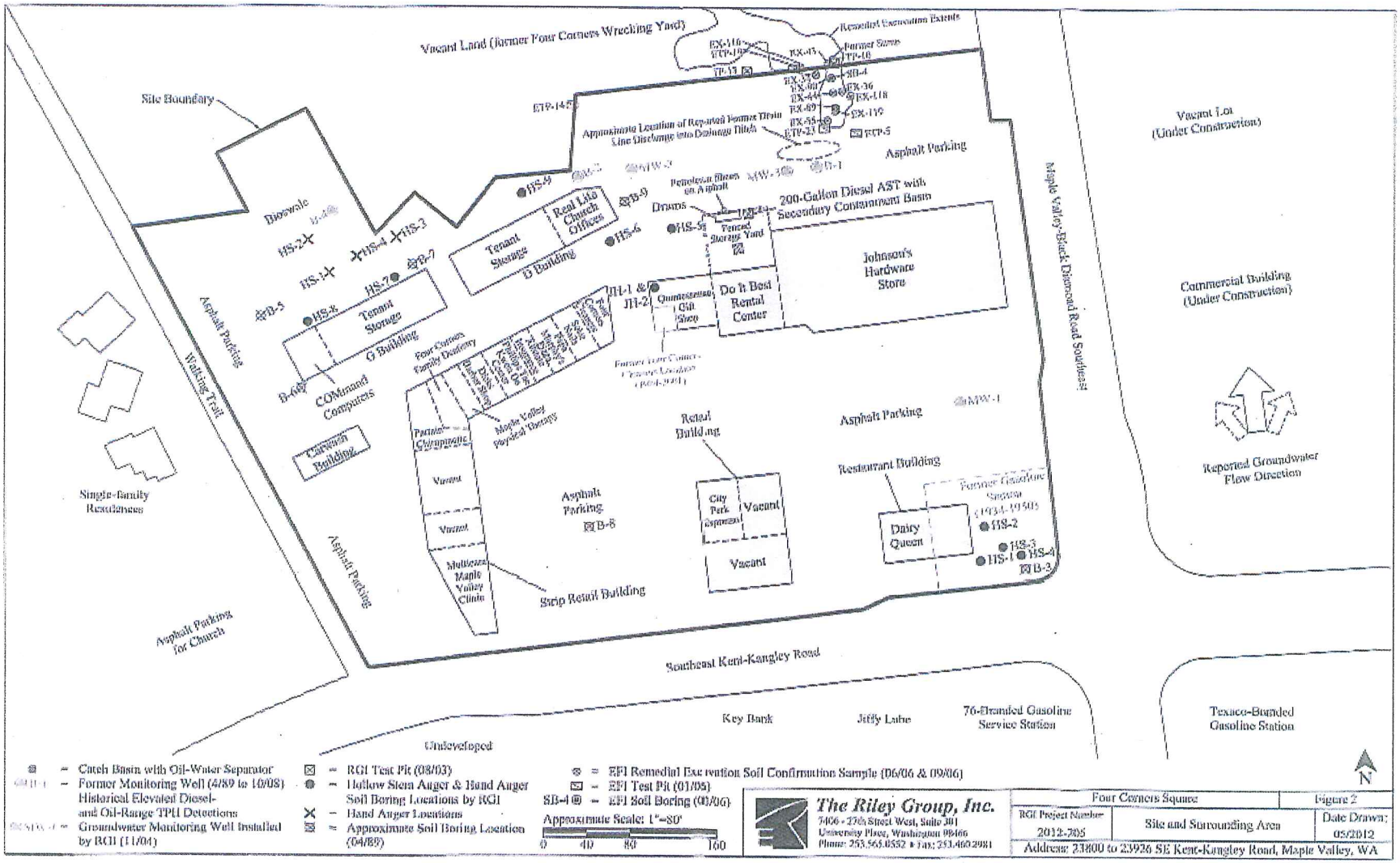


USGS, 1994, Black Diamond, Washington
7.5-Minute Quadrangle

Approximate Scale: 1"=1000'
0 500 1000 2000 N

RILEYGROUP Corporate Office 17522 Bothell Way Northeast Bothell, Washington 98011 Phone: 425.415.0551 Fax: 425.415.0311	Former 4 Corners Cleaners	Figure 1
	RGI Project Number 2003-165L / Site Vicinity Map	Date Drawn: 08/2014
	Address: 23886 Southeast Kent-Kangley Road, Maple Valley, Washington 98038	

Figure 2 General Vicinity Map of the Site



APPENDIX C

Soil Vapor Extraction Pilot Testing Event Summary Report

605 11th Ave. SE, Suite 201 • Olympia, WA • 98501
Phone: 360-352-9835 • Fax: 360-352-8164 • Email: admin@aegwa.com

Soil Vapor Extraction
Pilot Testing Event Summary Report

Conducted on:
4 Corners Cleaners
2386 SE Kent-Kangley Road
Maple Valley, Washington 98038-6848

Prepared for:
Mr. Chang Kim
23886 SE Kent-Kangley Road
Maple Valley, Washington 98038-6848

Prepared & Reviewed by:

Charles Swift, R.S.A.
Project Manager

Scott Rose, L.H.G.
Senior Hydrogeologist

State of Washington
Hydrogeologist
2635
Licensed Geologist
SCOTT I ROSE

AEG Project #: 17-126
Date of Report: January 7, 2019

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FIGURES

TABLES

APPENDICES

1.0 INTRODUCTION

This report presents the results of a soil vapor extraction (SVE) pilot testing conducted by Associated Environmental Group, LLC (AEG) at the 4 Corners Cleaners located at 23886 SE Kent-Kangley Road, Maple Valley, WA (Site). The purpose of this report is to document the completion and results of the SVE pilot testing. The scope of work for this pilot test was developed based on our professional judgment and experience in accordance with requirements in the Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Cleanup Regulations (Chapter 173-340 WAC).

1.1 *General Site Information*

Site Name: 4 Corners Cleaners – Maple Valley
Site Address: 23886 SE Kent-Kangley Road, Maple Valley, WA 98038-6848
Property Owner: ROIC Four Corner Square, LLC

The Site is located northwest of the intersection between SE Kent-Kangley Road and Highway 169 in Maple Valley, Washington. The Site is positioned on an approximately 9.57-acre lot with five buildings totaling 254,663 square feet. Two of the five buildings are situated in an "L" shape along the northwest corner of the property, including the 4 Corners Cleaners Site. The three other buildings are situated along the east side and center of the Property with the rest of the Site being asphalt and vegetation. The immediate vicinity of the Site is primarily commercial businesses. Figure 1, *Site Location Map*, presents the general layout of the Site vicinity. The Site's current layout can be seen in Figure 2, *Site Map*.

1.2 *Objectives*

The scope of work was developed to evaluate extracting soil vapors in the unsaturated zone for use as an alternative remediation technology to remove chlorinated volatile organic compounds (CVOCs) present in soil at the Site. This summary of the pilot testing is intended to be used as part of the Feasibility Study to support SVE as a remedial option for the Site.

The objectives of the SVE test are to collect the following data:

- Applied wellhead vacuums and corresponding vapor flow rates (at a minimum of three applied vacuums).
- Extracted vapor CVOC concentrations at the beginning and end of the test.
- Vacuum measurements in depth-specific monitoring points and nearby temporary monitoring points.

These data will be used to estimate the soil permeability to air flow and the initial vapor-phase chlorinated constituents SVE mass removal rates for the potential design of an SVE system, if appropriate.

The SVE pilot test consisted of applying a vacuum to the test extraction well (T-1) using a portable SVE system to achieve at least three different flow rates to assess the relationship between applied wellhead vacuum and resulting air flow rate.

For each applied wellhead vacuum, the following parameters were monitored and recorded in the field:

- Applied wellhead vacuum (inches of water column)
- Undiluted extracted flow rate from the well (standard CFM)
- Undiluted CVOC concentrations in the extracted vapors with an FID (ppmv)
- Transient and steady state vacuum at observation wells (inches of water column)
- SVE system operating parameters (e.g., temperatures and pressures)

Vapor samples were collected from the undiluted air stream from the extraction point (T-1). The samples were collected into Tedlar bags and analyzed for halogenated and aromatic hydrocarbons by EPA Method 8260C, which identifies tetrachloroethylene (PCE) with any breakdown products. Additionally, vapor samples from the extracted vapors were analyzed in the field using a photoionization detector (PID).

2.0 SVE PILOT STUDY TESTING PROCEDURES

On December 4, 2018, AEG personnel supervised the installation of eight temporary wells to be used for the SVE testing the following day. The 2-inch diameter temporary wells were advanced to 15 feet bgs using "sonic drilling" technology by Cascade Drilling. The temporary wells were completed with 10 feet of slotted screen from 5 to 15 feet below ground surface (bgs). The wells were sealed with bentonite for the top 5 feet of the boring.

AEG arrived at the Site on December 5, 2018 to setup the portable generator and SVE unit in the parking area to the east of the building. The designated work area was coned and marked with "caution tape" to separate the parking lot from access to the equipment. Temporary wells T-2, T-3, T-4, T-5, T-6, T-7, and T-8 (see Figure 2 attached) were accessed, and vacuum monitoring (Magnehelic™) gauges were attached to each point.

The vacuum equipment was connected to well T-2 for vapor extraction using flexible piping. The testing was performed at increasing vacuum levels and to the maximum that could be achieved by the equipment. The remaining seven wells were used to measure the response to the vacuum energy applied to the subsurface during the pilot study.

Periodic SVE system readings were collected, including influent vacuum at the wellhead connection, and SVE system vacuum at the regenerative blower inlet. Please refer to Table 1, *SVE Testing Field Data Summary*, for detailed information and a summary of the field parameters collected over the duration of the SVE event.

At 11:00 AM, the SVE system was started and the vacuum was applied at the lowest vacuum with the dilution bypass fully open (100 % open) and began extracting soil vapors from the subsurface (7 inches of water column [Inches W.C.]). The system was operated for 30 minutes and the dilution bypass valve was closed down (50%) and the vacuum increased to 14 inches W.C., vacuum response and PID readings were recorded. After 90 minutes, the dilution bypass valve was closed completely to a maximum vacuum of 26 inches W.C. The system was operated for an additional 90 minutes at the highest vacuum. The SVE system was shut down at 14:00 after the readings at the maximum achieved vacuum were stable for over 90 minutes. AEG completed the field logs, and the Site was secured prior to departure, and for the removal of the temporary well points on December 6, 2018.

Periodic SVE system readings were collected, including influent vacuum at the wellhead connection and SVE system vacuum at the blower. Please refer to Table 1, *SVE Testing Field Data Summary*, for detailed information and a summary of the field parameters collected over the duration of the SVE event.

Two effluent off-gas samples (AS-1 and AS-2) were collected during the extraction period and prior to the termination of the SVE event in 1-liter laboratory-prepared "Tedlar" bags. The bags were labeled with a sample number, date, time, and sampler name, and transported under the appropriate Chain-of-Custody procedures. The off-gas air samples were delivered to Libby Environmental, Inc. (Libby) in Olympia, Washington for laboratory analysis for halogenated and aromatic hydrocarbons (PCE and breakdown products) by EPA Method 8260C.

3.0 SVE PILOT STUDY TEST RESULTS

3.1 *Field Data Summary*

The SVE pilot testing event was conducted on December 5, 2018. The testing was conducted on temporary well points installed on December 4, 2018. The monitoring well parameters recorded during the SVE pilot study are presented in Table 1, *SVE Testing Field Data Summary*.

During the test, an incremental vacuum was applied to the extraction test well T-2. At the initial vacuum rate of 7 inches W.C., immediate vacuum response of 1.0 inches W.C. was observed at T-2 (approximately 8.5 feet away) and 0.40 inches W.C. was observed at well T-5 (approximately 22.5 feet away). Vacuum was not observed at well T-8. Vacuum readings at the observation wells stabilized after approximately 10 minutes, and the system was operated for 30 minutes.

Vacuum was increased to approximately 14 inches of W.C. by reducing flow through the manual dilution valve located at the blower. Vacuum readings stabilized at the observation wells after approximately 5 minutes. The vacuum response of 1.65 inches W.C. was observed at T-2 and 0.04 inches W.C. was observed at well T-7 (approximately 22.5 feet away). Vacuum was not observed at well T-8 (approximately 30 feet away). Vacuum readings at the observation wells stabilized after approximately 5 minutes and the system was operated for 60 minutes.

Vacuum was increased to a maximum rate of approximately 26 inches of W.C. for approximately 90 minutes. The vacuum response of 0.9 inches W.C. was observed at T-6 (approximately 18 feet away) and 1.25 inches W.C. was observed at well T-6 (approximately 18 feet away). Vacuum response of 0.5 inches W.C. was observed at well T-8. Vacuum readings at the observation wells stabilized after approximately 2 minutes and the system was operated for 60 minutes.

The vapor flow rate at 26 inches W.C. was estimated using the performance curves of the blower unit at approximately 150 CFM. A soil-vapor sample was collected at the end of the vapor extraction test. Two effluent off-gas samples were collected during the extraction period and prior to the termination of the SVE event in 1-liter laboratory-prepared "Tedlar" bags for laboratory analysis for PCE and breakdown products by EPA Method 8260C.

3.2 *Laboratory Results*

The information from the laboratory analysis was used to estimate the average vapor-phase VOCs removed during the extraction event. The vapor sample results for AS-1 and AS-2 indicated PCE concentrations of 61 micrograms per cubic meter (µg/m^3) and 163 µg/m^3, respectively. The total pounds (lbs) of vapor-phase CVOCs removed was estimated at 0.00016 pounds (lbs) over 180 minutes of extracting at vapor point T-1.

The vapor-phase contaminant concentration and removal calculation summaries are presented in Table 2, *Potential to Emit Summary*. Laboratory reports for samples submitted are attached in Appendix B, *Supporting Documents*.

3.3 *Soil Permeability Results*

Field permeability to air flow is a soil property that relates to how easily a gas will flow through soil matrix. High permeabilities are characteristic of coarse-grained soil, such as gravel and sand, while low permeabilities are characteristic of silts and clay. EPA guidance suggests that SVE may not be appropriate for sites with field permeabilities of less than 0.1 darcy (USEPA, 1991). Field permeabilities were calculated using the following equation (Johnson et al., 1990):

$$\frac{Q}{H} = P_w \pi \frac{k}{\mu} \frac{\left[1 - \left(P_m / P_w\right)^2\right]}{\ln\left(R_w / R_m\right)^2}$$

Where:

Q	=	Flow from extraction well (cm^3/s)
H	=	Screened interval (cm)
μ	=	Viscosity of air (1.8×10^{-4} g/cm-s)
Pw	=	Absolute vacuum at extraction well (1.01×106 g/cm-s^2)
Pm	=	Absolute vacuum at monitoring well (g/cm-s^2)
Rw	=	Radius of extraction well (cm)
Rm	=	Distance of monitoring well from extraction well (cm)
k	=	Permeability to air flow (cm^2) (1 darcy = 10^{-8} cm^2)

From this equation, the permeability to air flow was calculated for the average vacuum applied (26 inches W.C.) to the extraction point T-1 in relation to monitoring point T-8, to be equal to 1.85×10^{-6} cm^2 or 185.012 darcy. This value of the "k" permeability is typical to soil types of clean sands to gravels (100 to 1000 darcy) [Freeze & Cherry, 1979].

The radius of influence (ROI) or effective radius is the maximum radial distance away from the extraction point that induced vacuum or groundwater drawdown is measured. The ROI was estimated based upon a semi-log plot of measured drawdown verses distance from the extraction point. The drawdown verses distance relationship is a variation modeled after the distance-drawdown plots generated from steady-state groundwater pumping tests (Driscoll, 1986). This application (The Modified Cooper-Jacob's Method) is based upon the assumption that during a

period in which a vacuum is applied to the soil, the log of the distance from the applied vacuum is proportional to the induced pressure drop or drawdown at the point from which the distance was measured. Field readings are plotted against the log of the distance from the extraction point. Assuming homogenous soils, the resulting trend can be approximated by a straight line. The point at which the induced vacuum is zero or a point that the line crosses the x-axis (distance) can be assumed to be the maximum theoretical ROI (see Figure 3 attached). The theoretical ROI was calculated to exceed 28 feet using the field data collected and the Modified Cooper-Jacob's Method of data reduction. To be more conservative, a 25-foot ROI would be more appropriate for a system well field design for this Site.

4.0 CONCLUSIONS

The following conclusions are based on AEG's knowledge of the Site from Site observations and information gathered during vapor extraction pilot testing activities. These conclusions are subject to the limitations presented in this report, and may change if additional information becomes available.

- Soil vapors collected during the vapor extraction test indicate that soil ventilation effectively volatilized CVOCs from the vadose zone and is a viable remedial option.
- The effective radius of influence for the vapor extraction test conducted at the temporary well T-1 is estimated to be approximately 25 feet for an applied vacuums of 26 inches of W.C.
- The total lbs of vapor-phase CVOCs removed was estimated at 0.00016 lbs over 180 minutes of extracting at vapor point T-1.

Two exhaust airflow samples (AS-1 and AS-2) were collected on December 5, 2018 after 110 minutes of extraction and at 180 minutes of operation, respectively. The "Tedlar" bag samples were analyzed for PCE and breakdown products. The laboratory result for air sample AS-1 collected at 12:51 PM (at 26 inches of W.C. vacuum applied) indicated vapor concentrations of 61 µg/m^3 PCE. After 180 minutes of extraction, the vapor sample collected at 2:00 PM indicated vapor concentrations of 163 µg/m^3 PCE. This is a 63 percent (%) difference (increase) in vapor-phase concentrations.

The SVE testing was stopped based on the maximum measured induced vacuum readings being stabilized for 90 minutes. The ability to move air through the soil media (185 darcy), and the vapor-phase CVOC concentrations demonstrate that SVE would be applicable at this Site for soil remediation.

Extending the estimated removal rate to a daily average of approximately 0.231 lbs per day of total vapor-phase PCE would remove an estimated 84.3 lbs per year from the unsaturated soil. This is an average value that would equate to 6.13 gallons of PCE removed from the subsurface.

5.0 LIMITATIONS

This report summarizes the findings of the services authorized under our agreement with Mr. Chang Kim. It has been prepared using generally accepted professional practices, related to the nature of the work accomplished. This report was prepared for the exclusive use of Mr. Chang Kim and his designated representatives for the specific application to the project purpose.

Recommendations, opinions, site history, and proposed actions contained in this report apply to conditions and information available at the time this report was completed. Since conditions and regulations beyond our control can change at any time after completion of this report, or our proposed work, we are not responsible for any impacts of any changes in conditions, standards, practices, and/or regulations subsequent to our performance of services. We cannot warrant or validate the accuracy of information supplied by others, in whole or part.

6.0 REFERENCES

American Society for Testing and Materials (ASTM) Standard E 1903-11. *Standard Practice for Environmental Site Assessments: Phase II Environmental Site Assessment Process*.

American Society for Testing and Materials (ASTM) E 1943-98 (2015), *Standard Guide for Remediation of Ground Water by Natural Attenuation at Petroleum Release Sites*

Driscoll, Fletcher. 1986. *Groundwater and Wells*.

R. Allan Freeze/John A. Cherry. 1979. *Groundwater*, by Prentice-Hall, Inc.

United States Environmental Protection Agency. 1991. *Risk Reduction Engineering Laboratory - Soil Vapor Extraction Technology Reference Handbook*, dated June 1991.

US EPA, Engineering Bulletin, Granular Activated Carbon Treatment, EPA/540/2-91/024, October 1991.

US EPA OSWER Directive 9200.4-17P, 1999a, *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites.*

US EPA OSWER Publication 9200.2-154, June 2015, *OSWER Technical Guide for Assessing and Mitigating the Vapor Intrusion Pathway from Subsurface Vapor Sources to Indoor Air.*
Washington State Department of Ecology, 2004, *Collecting and Preparing Soil Samples for VOC Analysis*, Implementation Memorandum #5.

Washington State Department of Ecology, 2009, *Guidance for Evaluating Soil Vapor Intrusion in Washington State: Investigation and Remedial Action*, Publication number 09-09-047. DRAFT.

Washington State Department of Ecology, 2013, *Model Toxic Control Act Statute and Regulation – Chapter 173-340 WAC*, Publication number 94-06 (Revised 2013).

Washington State Department of Natural Resources, 2013, The Geology of Washington State, http://file.dnr.wa.gov/publications/ger_geol_map_washington_pagesize.pdf.

FIGURES

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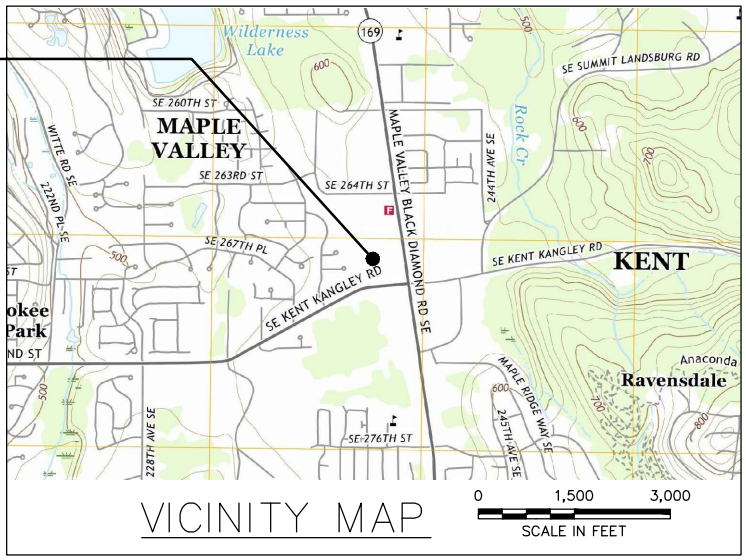
FILENAME	DRAWN BY		CHECKED BY		APPROVED BY		PROJECT NUMBER
17-126_17Q1.DWG	ICD	3/22/2017	CS	3/22/2017	CS	3/22/2017	17-126

N
W E
S

PROJECT LOCATION



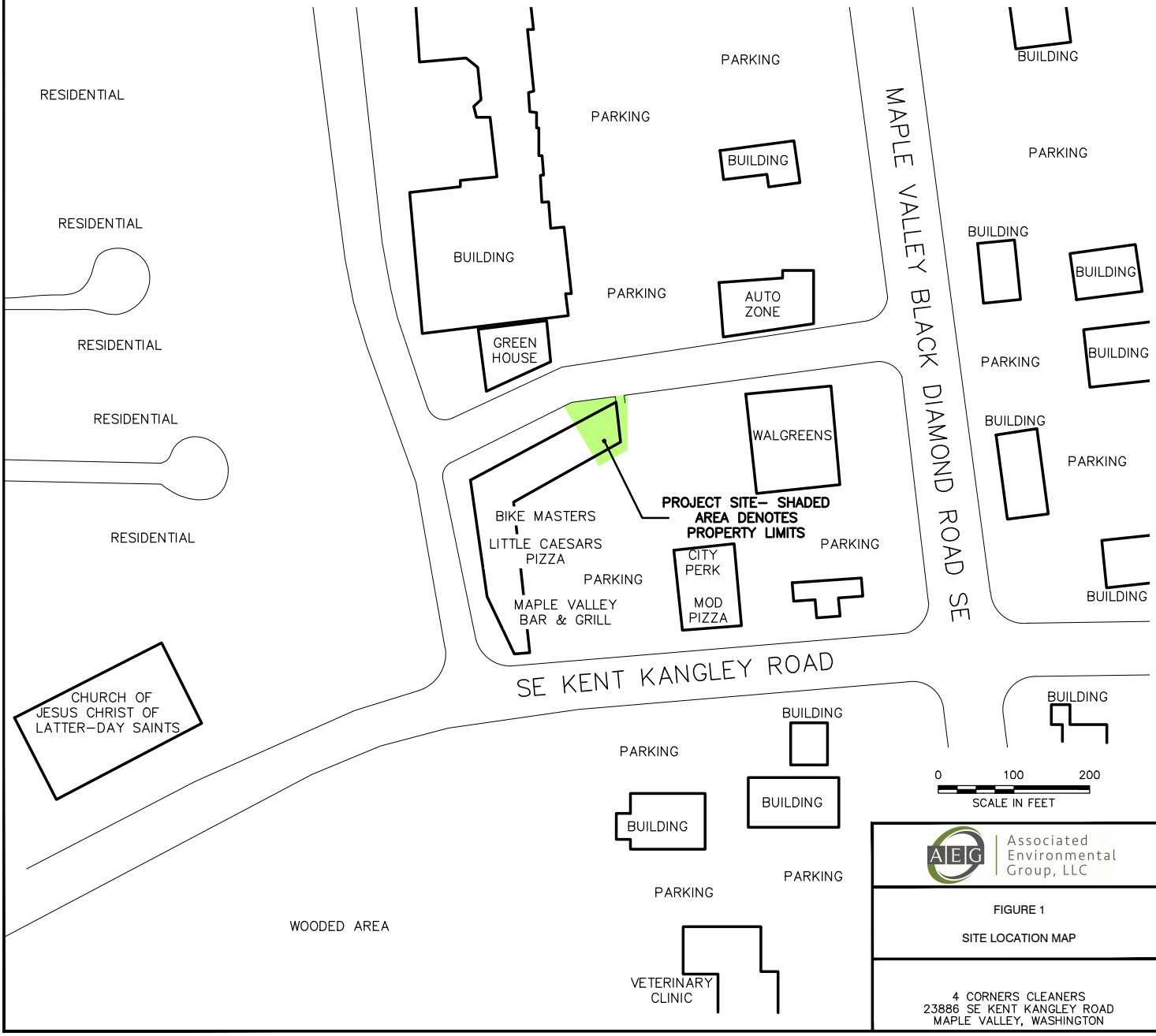
VICINITY MAP

NOTES

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT.

REFERENCE

DRAWING CREATED FROM AERIAL PHOTOGRAPH AND NOTES PROVIDED BY AEG, LLC.
VICINITY IMAGE SOURCE: U.S. GEOLOGICAL SURVEY–2017, 7.5 MINUTE QUADRANGLE MAP
BLACK DIAMOND, WASHINGTON



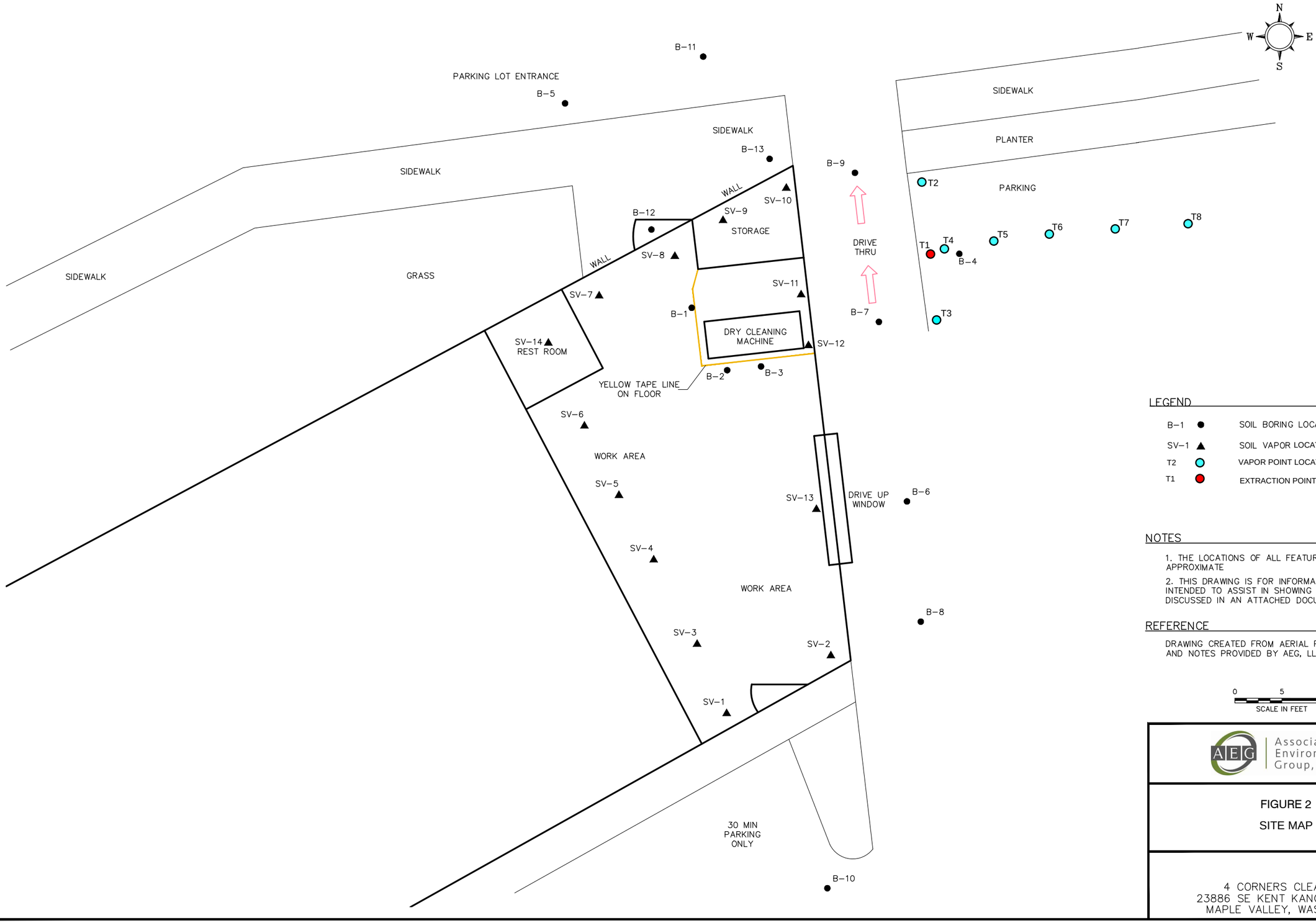
AEG Associated Environmental Group, LLC

FIGURE 1

SITE LOCATION MAP

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

PROJECT NUMBER	17-126
APPROVED BY	BD 9/27/2018
CHECKED BY	BD 9/27/2018
DRAWN BY	ICD 9/27/2018
FILENAME	17-126_1803.DWG



LEGEND

B-1 ●	SOIL BORING LOCATION
SV-1 ▲	SOIL VAPOR LOCATION
T2 ○	VAPOR POINT LOCATION
T1 ●	EXTRACTION POINT

NOTES

1. THE LOCATIONS OF ALL FEATURES SHOWN ARE APPROXIMATE
2. THIS DRAWING IS FOR INFORMATION PURPOSES. IT IS INTENDED TO ASSIST IN SHOWING FEATURES DISCUSSED IN AN ATTACHED DOCUMENT.

REFERENCE

DRAWING CREATED FROM AERIAL PHOTOGRAPH AND NOTES PROVIDED BY AEG, LLC.

0 5 10
SCALE IN FEET

Associated Environmental Group, LLC

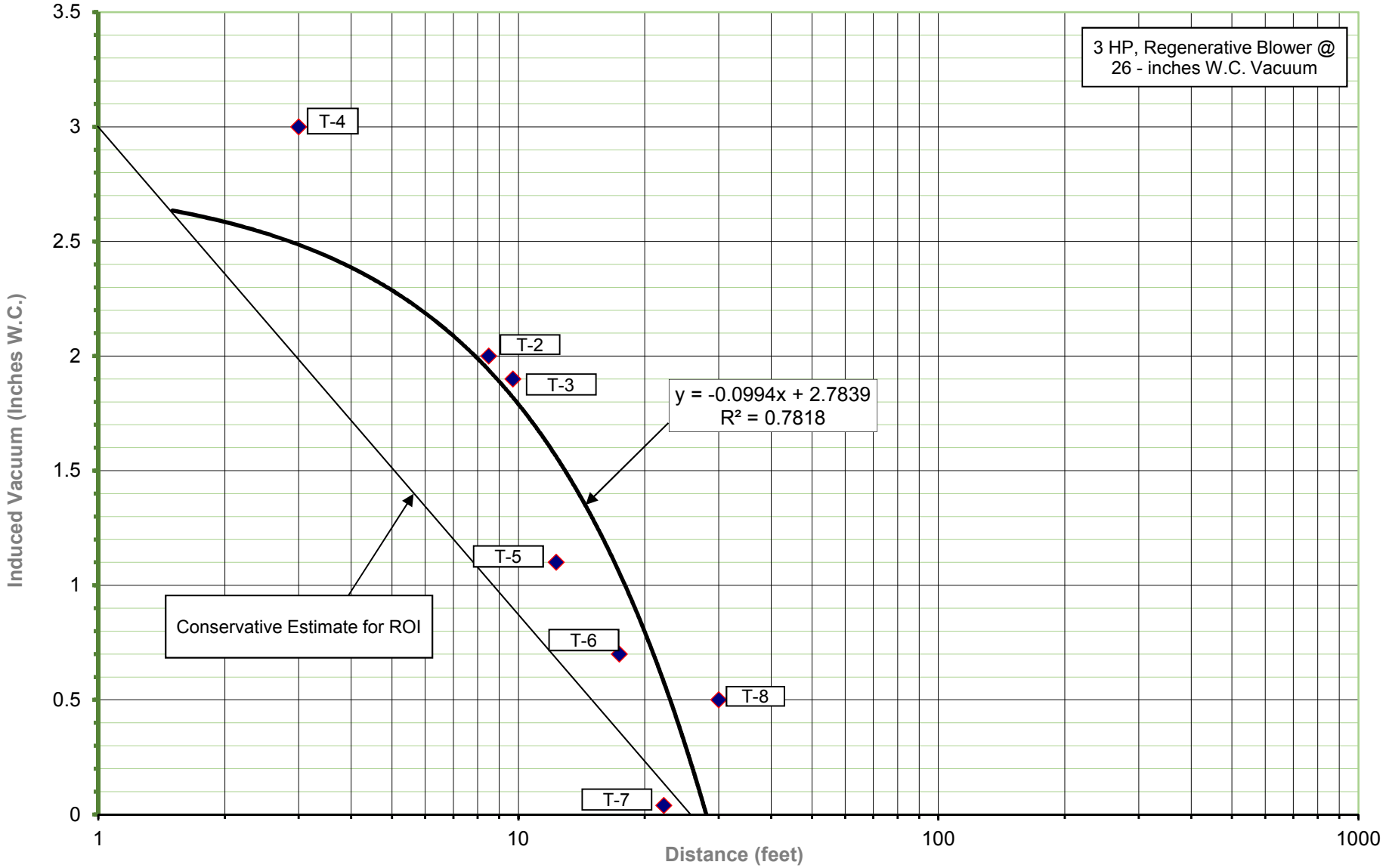
FIGURE 2

SITE MAP

4 CORNERS CLEANERS
23886 SE KENT KANGLEY ROAD
MAPLE VALLEY, WASHINGTON

FIGURE 3
4 Corners Cleaners SVE Testing 12/05/18 - 13:30
Induced Vacuum vs. Distance

Associated Environmental Group, LLC



TABLES

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TABLE 1 - SVE TESTING FIELD DATA SUMMARY

PROJECT NUMBER: 4 Corners Cleaners
LOCATION:

DATE: 12/5/2018

EXTRACTION POINT T1

EQUIPMENT USED:
SVE EN606
AS

PERSONNEL B. Dilba
C. Swift

WELL ID	T1	T2	T3	T4	T5	T6	T7	T8	PID from Exhaust
TIME	MEASURED INDUCED VACUUM (INCHES W.C.)	MEASURED INDUCED VACUUM (INCHES W.C.)	MEASURED INDUCED VACUUM (INCHES W.C.)	MEASURED INDUCED VACUUM (INCHES W.C.)	MEASURED INDUCED VACUUM (INCHES W.C.)	MEASURED INDUCED VACUUM (INCHES W.C.)	MEASURED INDUCED VACUUM (INCHES W.C.)	MEASURED INDUCED VACUUM (INCHES W.C.)	
11:00	7.00	1.00	--	0.60	0.40	--	0.00	--	2.00
11:15	7.00	1.00	--	1.20	0.40	--	0.00	--	1.00
11:30	14.00	1.70	--	2.40	0.85	--	0.02	--	3.40
11:45	14	1.65	1.2	2.6	0.8	0	0.02	0	3.7
12:00	14	1.9	1.3	2.4	1	0.5	0.04	0	--
12:38	22	2	1.7	3	1.25	0.9	0.04	0.5	5.5
13:03	26	2	2.2	3	1.25	0.6	0.04	0.6	9.1
13:30	26	2	1.4	3	1.1	0.9	0.05	0.5	16.9
14:00	26	2	1.9	3	1.1	0.7	0.04	0.5	16.3

REMARKS AND OBSERVATIONS
11:00-11:30 @ 100% Dilution 11:30:00 to 12:38 AM @ 50% Dilution 16 amps of power 12:38 to @ 0% dilution +/- 150 from curve
AS1 Sample taken @ 12:51 AS2 @1357

TABLE 2
Potential to Emit Summary
SVE Pilot Testing Event - December 5, 2018 - 12:51 PM
4 Corners Cleaners, Maple Valley, Washington

Date	Sample ID	Contaminant	Laboratory Sample Results parts per million volume (ppmv)	Molecular Weight (1) grams per - mole (g/mole)	Flowrate Measured (2) cubic feet per minute (cfm)	Potential To Emit Estimated Flow Rate pounds per minute (lb/minute)
12/5/2018	**AS-1** 12:51 PM Flow Temp = 160 F 25-inches W.C. Total System Vacuum	Tetrachloroethene (PCE)	0.0090	165.85	150	0.0000687
12/5/2018	**AS-2** 14:00 PM Flow Temp = 160 F 25-inches W.C. Total System Vacuum	Tetrachloroethene (PCE)	0.0240	165.85	150	0.0000917
					Estimated Pounds of PCE Removed Testing Period	**0.000160**
					Estimated Total Pounds of PCE Removed per Day	**0.230968**

Notes:

CFM = Flow rate of gas (standard cubic feet per minute)

PPMV = Concentration of gas in parts per million by volume

1 Pound = 453.6 grams

1 Liter = 0.03531 cubic feet

1 Mole of gas = 24.46 Liters volume at STP (77"F and 29.92 "w.c.)

ft/min = feet per minute

inches W.C. = Inches of Water Column

TO CALCULATE TOTAL POUNDS REMOVED:

TOTAL LBS	=	**MW** g	x	1 lb	x	1 mole	x	1 L	x	**SCFM** std cu ft	x	**CONC** ppmv
REMOVED		1 mole		453.6 g		24.46 std L		0.03531 cu ft		min		$1x10^6$ /ppmv

(1) = Taken from the National Institute for Occupational Safety and Health (NIOSH) Pocket Guide to Chemical Hazards.
(2) = Velocity estimated from Rotron 606 flow curves based on 25 inches W.C. vacuum at the system inlet.

APPENDIX A

Site Photographs

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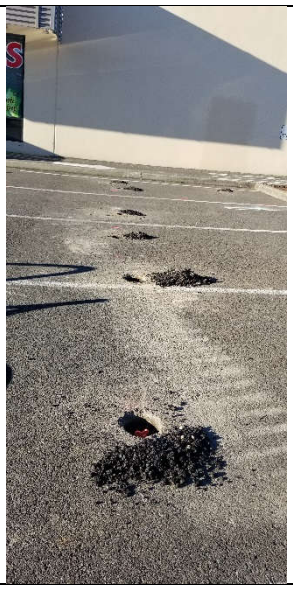
Associated Environmental Group, LLC

SITE PHOTOGRAPHIC RECORD

Project No.: 4 Corners Cleaners **Project Name: 17-126**

			
Photo #1:	Installation of temporary point T-1.	Photo #2:	All temporary vapor points installed in parking area facing the east 4 Corners Cleaners building wall.

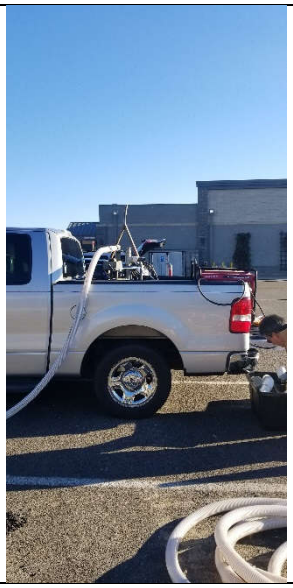
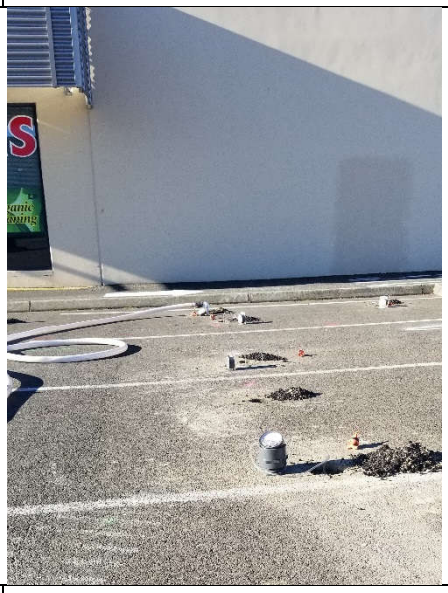

		

Photo #3:	Portable SVE equipment and generator.	Photo #4:	Extraction point T-1 showing vacuum gauges on all temporary vacuum monitoring wells.

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APPENDIX B

Supporting Documents

Laboratory Datasheets
5 Hp ROTRON EN 6 Series
Specifications

605 11th Ave. SE, Suite 201 • Olympia, WA • 98501
Phone: 360-352-9835 • Fax: 360-352-8164 • Email: admin@aegwa.com

Libby Environmental, Inc.
4139 Libby Road NE • Olympia, WA 98506-2518

December 12, 2018

Becky Dilba
Associated Environmental Group, LLC
605 11th Avenue SE, Suite 201
Olympia, WA 98501

Dear Ms. Dilba:

Please find enclosed the analytical data report for the 4 Corners Project located in Maple Valley, Washington.

The results of the analyses are summarized in the attached tables. Applicable detection limits and QA/QC data are included. The sample(s) will be disposed of in 30 days unless we are contacted to arrange long term storage.

Libby Environmental, Inc. appreciates the opportunity to have provided analytical services for this project. If you have any further questions about the data report, please give me a call. It was a pleasure working with you on this project, and we are looking forward to the next opportunity to work together.

Sincerely,

Sherry L. Chilcutt
Senior Chemist
Libby Environmental, Inc.

Phone (360) 352-2110 • Fax (360) 352-4154 • libbyenv@gmail.com

Libby Environmental, Inc.

4139 Libby Road NE
Olympia, WA 98506
Phone: (360) 352-2110
FAX: (360) 352-4154
Email: libbyenv@gmail.com

4 CORNERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L181206-1
Client Project # 17-126

Specific Halogenated and Aromatic Hydrocarbons by EPA Method 8260C in Vapor

Sample Description		Method Blank	AS1	AS2	AS2 Dup
Date Sampled		n/a	12/5/18	12/5/18	12/5/18
Date Analyzed	PQL	12/7/18	12/7/18	12/7/18	12/7/18
	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)	($\mu g/m^3$)
Vinyl Chloride (VC)	5	nd	nd	nd	nd
1,1-Dichloroethene	100	nd	nd	nd	nd
trans-1,2-Dichloroethene	100	nd	nd	nd	nd
cis -1,2-Dichloroethene	100	nd	nd	nd	nd
Trichloroethene (TCE)	10	nd	nd	nd	nd
Tetrachloroethene (PCE)	25	nd	61	163	130
Surrogate Recovery					
Dibromofluoromethane		123	97	107	103
1,2-Dichloroethane-d4		132	89	80	98
Toluene-d8		106	88	91	102
4-Bromofluorobenzene		118	123	109	112

"nd" Indicates not detected at listed detection limit.
"int" Indicates that interference prevents determination.

ACCEPTABLE RECOVERY LIMITS FOR SURROGATE : 65% TO 135%

ANALYSES PERFORMED BY: Kodey Eley

Libby Environmental, Inc.

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Email: libbyenv@gmail.com

4 CORNERS PROJECT
AEG, LLC
Maple Valley, Washington
Libby Project # L181206-1
Client Project # 17-126

QA/QC Data - EPA 8260C Analyses

Laboratory Control Sample

	Spiked Conc. ($\mu g/m^3$)	Measured Conc. ($\mu g/m^3$)	Spike Recovery (%)
1,1-Dichloroethene	10	10.1	101
Chlorobenzene	10	11.1	111
Trichloroethene (TCE)	10	12.3	123

Surrogate Recovery	
Dibromofluoromethane	114
1,2-Dichloroethane-d4	98
Toluene-d8	92
4-Bromofluorobenzene	110

ACCEPTABLE RECOVERY LIMITS FOR MATRIX SPIKES: 65%-135%
ACCEPTABLE RPD IS 35%

ANALYSES PERFORMED BY: Kodey Eley

Libby Environmental, Inc.

4139 Libby Road NE
Olympia, WA 98506
Phone: (360) 352-2110
FAX: (360) 352-4154
Email: libbyenv@gmail.com

4 CORNERS PROJECT
AEG, LLC
Libby Project # L181206-1
Date Received 12/6/2018
Time Received 11:38 AM

Received By EB

Sample Receipt Checklist

Chain of Custody

1. Is the Chain of Custody is complete?	☑	Yes	☐	No		
2. How was the sample delivered?	☐	Hand Delivered	☑	Picked Up	☐	Shipped

Log In

3. Cooler or Shipping Container is present.	☐	Yes	☐	No	☑	N/A
4. Cooler or Shipping Container is in good condition.	☐	Yes	☐	No	☑	N/A
5. Cooler or Shipping Container has Custody Seals present.	☐	Yes	☐	No	☑	N/A
6. Was an attempt made to cool the samples?	☐	Yes	☐	No	☑	N/A
7. Temperature of cooler (0°C to 8°C recommended)	N/A °C					
8. Temperature of sample(s) (0°C to 8°C recommended)	N/A °C					
9. Did all containers arrive in good condition (unbroken)?	☑	Yes	☐	No		
10. Is it clear what analyses were requested?	☑	Yes	☐	No		
11. Did container labels match Chain of Custody?	☑	Yes	☐	No		
12. Are matrices correctly identified on Chain of Custody?	☑	Yes	☐	No		
13. Are correct containers used for the analysis indicated?	☑	Yes	☐	No		
14. Is there sufficient sample volume for indicated analysis?	☑	Yes	☐	No		
15. Were all containers properly preserved per each analysis?	☑	Yes	☐	No		
16. Were VOA vials collected correctly (no headspace)?	☐	Yes	☐	No	☑	N/A
17. Were all holding times able to be met?	☑	Yes	☐	No		

Discrepancies/ Notes

18. Was client notified of all discrepancies?	☐	Yes	☐	No	☑	N/A

Person Notified: _____ Date: _____

By Whom: _____ Via: _____

Regarding: _____

19. Comments. _____

Libby Environmental, Inc.

Chain of Custody Record

www.LibbyEnvironmental.com

4139 Libby Road NE
Olympia, WA 98506
Ph: 360-352-2110
Fax: 360-352-4154

Date: 12/6/18 Page: 1 of 1

Client: AEG Project Manager: 4 Corners

Address: Project Name: B.D./bq

City: Olympia State: WA Zip: 98 Location: City, State: Maple Valley, WA

Phone: 360-352-9835 Fax: Collector: B.D./bq Date of Collection: 12/5/18

Client Project # 17-126 Email: bd.libep@aegwa.com

	Sample Number	Depth	Time	Sample Type	Container Type	VOC 8260	NWTPH-Gx	BTEX 8021	NWTPH-HCID	NWTPH-Dx	NWTPH-Dx/Dx	c PAH 8270	PAH 8270	Semi Vol 8270	PCB 8082	MTCA 5 Metals	RCRA 8 Metals	PCE; Dup/MS		Field Notes
1	AS1	—	1257	Air	Tedlar												X			
2	AS2	—	1352	Air	Tedlar												X			
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
12																				
13																				
14																				
15																				
16																				
17																				

Relinquished by:	Date / Time	Received by:	Date / Time
	12/5/18 1712		12/6/18 1138
Relinquished by:	Date / Time	Received by:	Date / Time
Relinquished by:	Date / Time	Received by:	Date / Time

Sample Receipt

Good Condition?	Y	N	
Temp.		°C	
Seals Intact?	Y	N	N/A
Total Number of Containers			

Remarks:

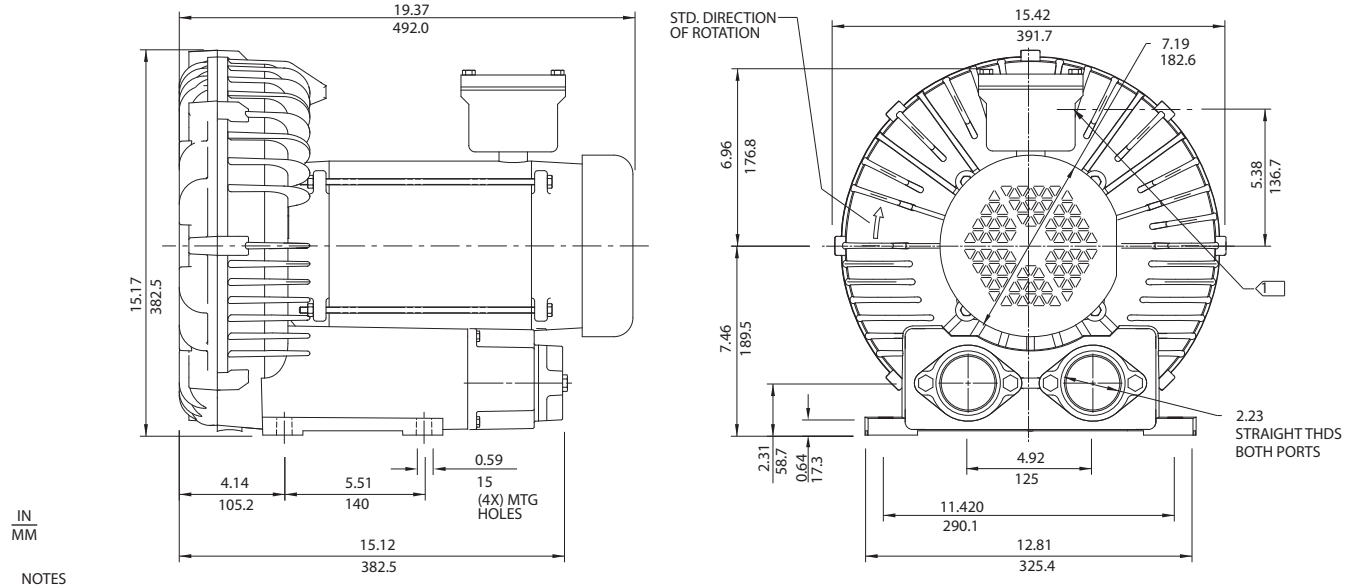
TAT: 24HR 48HR 5-DAY

Distribution: White - Lab, Yellow - File, Pink - Originator

EN 656 & CP 656

ROTRON®

3.0 HP Sealed Regenerative w/Explosion-Proof Motor



NOTES
1. TERMINAL BOX CONNECTOR HOLE 3/4" NPT.
2. DRAWING NOT TO SCALE, CONTACT FACTORY FOR SCALE CAD DRAWING.
3. CONTACT FACTORY FOR BLOWER MODEL LENGTHS NOT SHOWN.

Similar to this model

		Part/ Model Number			
		EN656M5XL	EN656M72XL	EN656M86XL	CP656FU72XLR
Specification	Units	080060	080059	080058	080142
Motor Enclosure - Shaft Mtl.	-	Explosion-proof-CS	Explosion-proof-CS	Explosion-proof-CS	Chem XP-SS
Horsepower	-	3	3	3	3
Phase - Frequency	-	Single-60 hz	Three-60 hz	Three-60 hz	Three-60 hz
Voltage	AC	208-230	208-230/460	575	208-230/460
Motor Nameplate Amps	Amps (A)	15.5-14.5	7.4/3.7	3.0	7.4/3.7
Max. Blower Amps	Amps (A)	17	10/5	4.1	10/5
Inrush Amps	Amps (A)	95-86	54/27	21.6	54/27
Service Factor	-	1.0	1.0	1.0	1.0
Starter Size	-	1	0/0	0	0/0
Thermal Protection	-	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty	Class B - Pilot Duty
XP Motor Class - Group	-	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G	I-D, II-F&G
Shipping Weight	Lbs	142	117	117	117
	Kg	64.4	53.1	53.1	53.1

Voltage - ROTRON motors are designed to handle a broad range of world voltages and power supply variations. Our dual voltage 3 phase motors are factory tested and certified to operate on both: **208-230/415-460 VAC-3 ph-60 Hz** and **190-208/380-415 VAC-3 ph-50 Hz**. Our dual voltage 1 phase motors are factory tested and certified to operate on both: **104-115/208-230 VAC-1 ph-60 Hz** and **100-110/200-220 VAC-1 ph-50 Hz**. All voltages above can handle a ±10% voltage fluctuation. Special wound motors can be ordered for voltages outside our certified range.

Operating Temperatures - Maximum operating temperature: Motor winding temperature (winding rise plus ambient) should not exceed 140°C for Class F rated motors or 120°C for Class B rated motors. Blower outlet air temperature should not exceed 140°C (air temperature rise plus inlet temperature). Performance curve maximum pressure and suction points are based on a 40°C inlet and ambient temperature. Consult factory for inlet or ambient temperatures above 40°C.

Maximum Blower Amps - Corresponds to the performance point at which the motor or blower temperature rise with a 40°C inlet and/or ambient temperature reaches the maximum operating temperature.

XP Motor Class - Group - See Explosive Atmosphere Classification Chart in Section I

AMETEK TECHNICAL & INDUSTRIAL PRODUCTS
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Customer Service Fax: +1 215.256.1338
www.ametektip.com

AMETEK® TECHNICAL & INDUSTRIAL PRODUCTS

Environmental / Chemical Processing Blowers

EN 656 & CP 656

ROTRON®

3.0 HP Sealed Regenerative w/Explosion-Proof Motor

FEATURES

- Manufactured in the USA - ISO 9001 and NAFTA compliant
- Maximum flow: 212 SCFM
- Maximum pressure: 75 IWG
- Maximum vacuum: 73 IWG
- Standard motor: 3.0 HP, explosion-proof
- Cast aluminum blower housing, impeller , cover & manifold; cast iron flanges (threaded); teflon® lip seal
- UL & CSA approved motor with permanently sealed ball bearings for explosive gas atmospheres Class I Group D minimum
- Sealed blower assembly
- Quiet operation within OSHA standards

MOTOR OPTIONS

- International voltage & frequency (Hz)
- Chemical duty, high efficiency, inverter duty or industry-specific designs
- Various horsepowers for application-specific needs

BLOWER OPTIONS

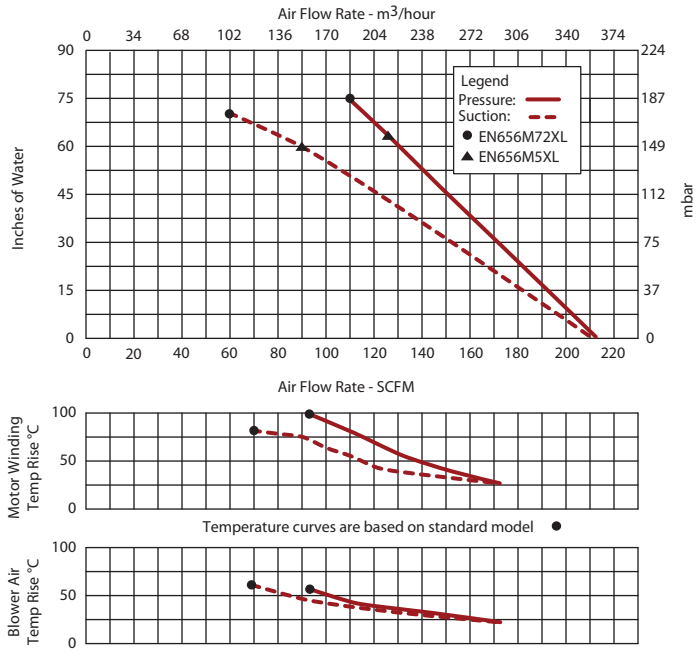
- Corrosion resistant surface treatments & sealing options
- Remote drive (motorless) models
- Slip-on or face flanges for application-specific needs

ACCESSORIES

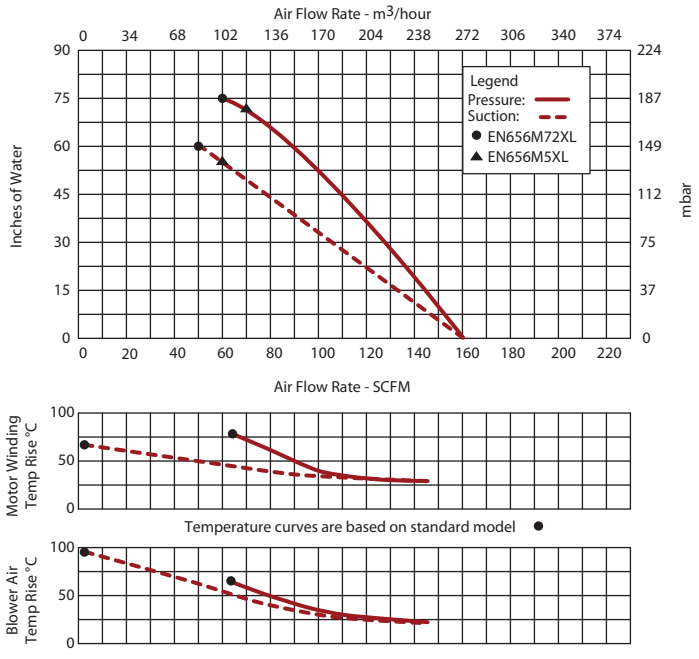
- Flowmeters reading in SCFM
- Filters & moisture separators
- Pressure gauges, vacuum gauges, & relief valves
- Switches - air flow, pressure, vacuum, or temperature
- External mufflers for additional silencing
- Air knives (used on blow-off applications)
- Variable frequency drive package

Blower Performance at Standard Conditions

60 Hz



50 Hz



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