FINAL
Feasibility Study Report

Conducted on:

Petroleum Reclaiming Service, Inc.
3003 Taylor Way
Tacoma, Washington 98421-4309
Ecology Facility Site ID #1245

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1.0 INTRODUCTION

Associated Environmental Group, LLC (AEG) has completed a Feasibility Study (FS) at Petroleum Reclaiming Services, Inc. (PRSI), located at 3003 Taylor Way in Tacoma, Pierce County, Washington (Site). This FS was performed as required under Washington State Department of Ecology (Ecology) Agreed Order No. DE 11357. The purpose of this report is to document the screening of potential cleanup alternatives, and identify a preferred alternative for cleanup.

Information regarding the history of the Site and previous investigations are summarized in the *Final Remedial Investigation Report*, dated November 2, 2018, by AEG, and are not included here.

This report was developed by AEG based on our professional judgment and experience in accordance with requirements in the Model Toxics Control Act (MTCA) Cleanup Regulations (Chapter 173-340 WAC).

1.1 *General Site Information*

Site Name: Petroleum Reclaiming Services, Inc. (PRSI)
Site Address: 3003 Taylor Way, Tacoma, Washington 98421-4309
Facility/Site ID No.: 1245
Cleanup Site ID No.: 3255
Agreed Order No.: DE 11357
Property Owner: Petroleum Reclaiming Services, Inc.
Contacts: Mr. Tom Smith
Mr. Jay Johnson

The Site is located at located at 3003 Taylor Way in Tacoma, Washington (Figure 1, *Site Vicinity Map*). The PRSI facility is situated on two Pierce County Tax Parcels (0321363021 and 0321363028) totaling approximately 0.63 acres, and zoned for industrial use. The Site has two tank farms: Tank Farm A with 18 aboveground storage tanks (ASTs), and Tank Farm B with five ASTs, located within secondary containment. The Site has office space, drum storage, laboratory facility, boiler room, water/oil treatment equipment, parking and concrete pads for loading/unloading operations.

Remedial investigation activities performed at the Site to date are summarized in AEG's *Final Remedial Investigation Report*, dated November 2, 2018.

1.2 *Site Use*

The immediate vicinity of the Site is heavy industrial. The City of Tacoma has zoned the Site as Port Marine and Industrial and is listed for use as heavy industrial, warehousing, storage, and vehicle services and repair. The triangle-shaped Site is bounded to the north by vacant industrial property, formerly occupied by the Arkema Manufacturing Plant (Ecology Facility/Site ID 1219); to the east by a drainage swale and vacant industrial property used for parking new vehicles, formerly occupied by the Arkema Mound site (Ecology Facility/Site ID 1220); and to the southwest by Taylor Way and vacant industrial property known as the Port of Tacoma Blair Backup property. Figure 1, *Vicinity Map*, presents the general vicinity of the Site. The Site's current layout and features are provided in Figure 2, *Site Map*.

2.0 CONCEPTUAL SITE MODEL (CSM)

This section provides a conceptual understanding of the Site, derived from the results of the subsurface investigations and previous remedial actions performed at the Site. This Conceptual Site Model (CSM) will assist in determining the best remedial approach for the Site. The CSM is dynamic and may be refined as additional information becomes available.

2.1 *Constituents of Concern (COCs) and Affected Media*

The primary release mechanism for COCs at the Site appears to be associated with historical surface spills from mishandling of recycled materials and oils. This is supported by observations noted by Ecology inspectors that the secondary containment for the used oil storage was breached and allowed used oil to flow onto the Site soils. Additional surface staining was noted during other Site inspections. Characterization activities performed to date have identified the following affected media and COCs:

Surface Soils

The review of the soil analytical data collected to date (primarily circa 1991/1992), as compared to current MTCA cleanup levels, identified the following potential COCs for the subsurface soils to a depth of approximately 3 to 5 feet bgs (top of the shallow groundwater) at the Site:

- Gasoline-, diesel-, and oil-range TPH;
- Arsenic; and
- VOCs, including PCE and TCE.

In their 1996 RI Report, SECOR noted the following:

"Analysis of the Site data presented in this report, including comparison with preliminary primary ARARs, suggests that PCBs, VOC and semi-VOCs are not constituents of concern. PCBs were determined not to be a constituent of concern as soil samples analyzed using a Method 3630 cleanup prior to a Method 8080 were consistently below regulatory cleanup levels. The limited results showing concentrations above the cleanup level (2 samples out of a total of 43 samples analyzed) do not establish them as a constituent of concern for the Site. VOCs and semi-VOCs were not detected in the soil samples analyzed."

Given the frequency of detection in only a limited number of historic samples, PCE and TCE would not be considered primary COCs; however, their presence in shallow soil (and groundwater) would make them potential COCs nonetheless, and is consistent with the primary release mechanism for the Site (i.e., surface spillage).

Elevated concentrations of arsenic are common in the Tacoma Tideflats, known sources of which include the adjacent Arkema sites, slag from the ASARCO smelter in Ruston historically used for roadbed material in the area, and naturally occurring sources. The presence of arsenic in shallow soils on Site make it a potential COC; however, it does not appear to be associated with any known on-Site sources.

The extent of impacts to soil at the Site is illustrated on Figure 3, *Surface Soil Plume Contamination Above MTCA Circa 1991 & 1992*, in plan view. Cross sections are illustrated in Figure 5, *Geologic Cross Section A-A'*, Figure 6, *Geologic Cross Section B-B'*, and Figure 7, *Geologic Cross Section C-C'*. Analytical results of the soil samples are presented in Table 1, *Summary of Soil Analytical Results*.

Shallow Aquifer

The review of the analytical data collected to date, as compared to current MTCA cleanup levels, identified the following potential COCs for the Shallow Aquifer at the Site:

- Gasoline-, diesel-, and oil-range TPH;
- Arsenic; and
- Chlorinated VOCs, including PCE, TCE, cis-1,2-dichloroethylene (DCE), and vinyl chloride.

Given the presence of TPH in shallow soils, low detections in groundwater, and management of known TPH sources on Site, gasoline-, diesel-, and oil-range TPH are considered potential COCs for the Shallow Aquifer at the Site.

As noted above, elevated concentrations of arsenic have been detected in soil and groundwater in this area. While arsenic is not typically associated with the wastes handled at the Site, it is possible that it is present in some wastes. That said, arsenic exceeded the MTCA industrial cleanup level for soil in only 3 of about 50 soil samples collected to date from the Site, though it has been detected in every monitoring well at the Site.

There is a history of arsenic impacts throughout the tideflats. The practice of depositing dredging spoils and copper smelter slag sands, which contained high levels of arsenic, copper, and zinc taken from the ASARCO smelter and used as fill material, was historically common practice. At the time, this material was considered chemically stable and would not leach to the environment.

The Site is also bounded to the north by the former Arkema Manufacturing Area site (2901 Taylor Way), to the east by the Arkema Mound site (3009 Taylor Way), and to the west by the Wypenn

Area (2920 Taylor Way), collectively known as the AMP, which has been undergoing remediation since 2008. Within the Manufacturing Area of the AMP is an area called the Central Manufacturing Area, which included buildings to manufacture inorganic chemical products, tanks to store chemical products and fuels, electrical equipment (including transformers), shops, storage rooms and warehouse, and administrative offices. One chemical produced was a sodium arsenite herbicide called *Penite*, which was considered a contributing factor to the overall arsenic concentrations throughout the AMP site.

Soil and groundwater contamination within the AMP boundaries were discovered in 1981. To address the arsenic at the AMP site, an arsenic groundwater treatment plant was constructed in 1991 and operated until 2003. The Arkema Mound property was formerly used as a log sort yard and ASARCO slag was placed as ballast material. Arkema remediated the arsenic- containing slag by consolidating the materials and placing them in a lined and covered containment cell (mound). After the Port of Tacoma purchased the property, the mound was removed, and an RI/FS is being completed under Ecology AO DE6129.

Groundwater is characterized on the PRSI property in three zones, the shallow, intermediate, and deep aquifers *(discussed in greater detail in Section 2.2 below).* The aquifer studies on the Arkema properties, namely the Wypenn property, show that the shallow aquifer flow patterns suggest that groundwater may be infiltrating into the sewer lines that exist beneath Taylor Way.

The adjacent Arkema site has documented concentrations of arsenic in the Shallow and Intermediate Aquifers well above MTCA cleanup levels. The speciation of the arsenic may show the concentrations detected in monitoring well S04A may not be associated with any known on-Site sources. Arsenic (arsenite) has a solubility and mobility that have a lower affinity for anion exchange and adsorption to solid phase amorphous metal phosphates and oxides/hydroxides, and is influenced by the redox potential (ORP) of local aquifer. The specific sampling completed throughout 2008 to 2016 was for total arsenic and not for the forms of arsenic, such as arsenite. The presence of arsenic in every monitoring well on the Site, in both aquifers, show the nature of arsenic present in all areas surrounding the Site and in groundwater throughout the tideflats.

One or more chlorinated VOCs have been detected in the Shallow Aquifer both historically (S01A, C01A, and C03A – see SECOR Table 7a in Appendix F of AEG's *Final Remedial Investigation Report*), and more recently (S04A – see Table 2, *Summary of Groundwater Analytical Results*). Detections in C01A may be associated with off-Site sources, as this well was located in the proximity of a sanitary sewer line along Taylor Way, which may have acted as a preferential pathway. Well S04A is also located in proximity of Taylor Way, which may account for the periodic detections of PCE; however, the seasonal variation of the detections during the winter months (when groundwater levels are higher) versus non-detect in the summer months suggests

groundwater may be encountering potentially impacted shallow soils during the wetter seasons. That said, PCE has not been detected in shallow soils collected in the vicinity of S04A to date.

Intermediate Aquifer

The review of the analytical data collected to date does not support the identification of COCs for the Intermediate Aquifer at the Site.

Air Quality

No indoor air or soil vapor samples are known to have been collected from the Site to date. However, no significant sources of air emissions have been identified at the Site, and no volatile COCs are present at concentrations in soil or groundwater that are likely to result in exposure to vapors via vapor intrusion into on-Site structures.

2.2 *Site Geology and Hydrogeology*

The Site is located within the Commencement Bay tideflats between the Blair Waterway and the Hylebos Waterway (Figure 1, *Vicinity Map*). These tideflats lie at the mouth of the Puyallup River Basin, which consists of a sequence of Holocene- to Pleistocene-age, deltaic-alluvial sediments and marine sediments. These sediments were deposited in a deep embayment, which was created by several glacial episodes. Recent fill material has been placed over the native alluvial and/or marine sediments.

The stratigraphy of the Puyallup River Basin, as presented in a 1992 Phase 2 Report by EEC, consists of four geological units, which are described in the order they are encountered from ground surface as:

- Fill material, consisting of silt and sand, dredged from the Blair and Hylebos Waterways in the 1950s and 1960s as well as from gravel borrow sources. The fill material ranges in thickness from a few feet to approximately 25 feet.
- Deltaic-alluvial sediments, deposited by the Puyallup River, which flowed out of the Cascade Mountain Range to discharge into Commencement Bay of Puget Sound. A delta formed at the mouth of the Puyallup River in the Commencement Bay area, depositing alternating layers of sands and silts, which can be over 100 feet in thickness.
- Marine sediments deposited in a deep marine trough at the mouth of the Puyallup River, at a time when sea level was higher. Marine sediments are composed of fine-grained silts and clays and have been estimated to be over 300 feet in thickness.

- Glacial sediments deposited in troughs cut by advancing and receding glacial ice sheets. Glacial sediments consist of sand, gravel, and silt in estimated thicknesses ranging over 1,000 feet in the Puyallup River Valley

As reported in the EEC Phase 2 Report, three principle aquifers have been identified in the Commencement Bay tideflat area: the Shallow Aquifer (unconfined), the Intermediate Aquifer (confined), and the Deep Aquifer. The Shallow Aquifer consists of near-surface fill material; the Intermediate Aquifer consists of shallow deltaic sediments. An aquitard, locally known as the Upper Aquitard, separates the Shallow and Intermediate Aquifers. The Deep Aquifer consists of sand, and is separated from the Intermediate Aquifer by an aquitard known as the Lower Aquitard. A water supply aquifer is located in deltaic and glacial sediments within the Deep Aquifer.

According to EEC, a strong upward flow gradient between the water supply aquifer and the overlying Shallow, Intermediate, and Deep Aquifers is present in the Port of Tacoma area. However, this statement is inconsistent with another EEC statement that a downward flow locally occurs from the Shallow Aquifer into the Intermediate Aquifer as reported for the Blair Backup Property located adjacent south and west of the Site across Taylor Way, as well as for the Arkema Property located adjacent to the north of the Site.

Groundwater flow direction in the Shallow, Intermediate, and Deep Aquifers varies, and is affected by seasonal changes and local drainage patterns, such as drainage ditches and utility trenches. The regional groundwater is expected to flow towards the northwest and Commencement Bay of the Puget Sound. Tidal affects have been reported for the Intermediate and Deep Aquifers. The areas of the Shallow Aquifer that are located adjacent to surface waterways may be locally affected by tidal action.

EEC reported that the groundwater flow rate in the Shallow Aquifer ranges from 0.01 to 0.09 feet/day; in the Intermediate Aquifer, the flow rate ranges from 0.01 to 0.04 feet/day; and in the Upper Aquitard *(sic)*, the flow rate ranges from 0.0007 to 0.04 feet/day (no backup data were presented for these calculated values).

Monitoring wells installed on Site to date have been screened in both the Shallow and Intermediate Aquifers. However, a review of borings logs suggests some wells may have also intercepted the Deep Aquifer. Water level measurements collected from the on-Site monitoring wells vary from 1 to 15 feet below ground surface, depending on the aquifer, its location, and seasonal variations. The direction of groundwater flow seems to be dependent on seasonal variations.

South of the Site along Taylor Way is a 24-inch sewer utility line bedded in porous sands/gravel providing an easy path for groundwater to flow toward. This area acts as a sink for groundwater

during drier months allowing groundwater to flow southerly into the bedded area. Conversely during the wet season, the utility line bedded area is saturated with groundwater and seems to push groundwater away, reversing the flow of groundwater towards the north.

2.3 *Environmental Fate of COCs in the Subsurface*

TPH and associated compounds

Gasoline-, diesel-, and oil-range TPH and associated compounds are soluble, and migrate in groundwater. These compounds have a specific gravity that is less than water, and can be measured in monitoring wells as a Light Non-aqueous Phase Liquid (LNAPL). No LNAPL is known to have been measured at the Site to date. LNAPL can also exist as a residual non-mobile phase that is either sorbed to the soil or trapped in the pore spaces between the soil particles. Unless treated, residual LNAPL can act as a long-term source for groundwater contamination. While TPH has historically been detected in shallow soils beneath the Site, it has not been detected at significant concentrations in groundwater.

Gasoline-range TPH and the associated VOCs are volatilized under the appropriate conditions. In the subsurface, volatilization releases COCs into the soil vapor where, if conditions are right, COCs can migrate beneath or into structures as vapor. TPH and VOCs are also readily biodegraded in the subsurface by naturally occurring aerobic and anaerobic bacteria. Aerobic biodegradation is the most efficient of the biological activities. At this Site, ongoing biodegradation is most likely reducing TPH concentrations. In addition, surface cover at the Site consisting of asphalt, concrete, and Site structures likely prevent stormwater from infiltrating through the subsurface and mobilizing COCs into the Shallow Aquifer.

Arsenic

Arsenic occurs naturally in soil and minerals and it therefore may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching. Volcanic eruptions are another source of arsenic. Arsenic is associated with ores containing metals, such as copper and lead. Arsenic may enter the environment during the mining and smelting of these ores. Small amounts of arsenic also may be released into the atmosphere from coal-fired power plants and incinerators because coal and waste products often contain some arsenic. Arsenic cannot be destroyed in the environment. It can only change its form, or become attached to or separated from articles. It may change its form by reacting with oxygen or other molecules present in air, water, or soil, or by the action of bacteria that live in soil or sediment. Arsenic released from power plants and other combustion processes is usually attached to very small particles. Arsenic contained in wind-borne soil is generally found in larger particles. These particles settle to the ground or are washed out of the air by rain. Arsenic that is attached to very small particles may

stay in the air for many days and travel long distances. Many common arsenic compounds can dissolve in water. Thus, arsenic can get into lakes, rivers, or groundwater by dissolving in rain or snow or through the discharge of industrial wastes. Some of the arsenic will stick to particles in the water or sediment on the bottom of lakes or rivers, and some will be carried along by the water. Ultimately, most arsenic ends up in the soil or sediment.

Chlorinated VOCs

The density of the chlorinated VOCs PCE, TCE, DCE, and vinyl chloride 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. Unless treated, residual chlorinated VOCs can act as a long-term source for groundwater contamination. At this Site, localized residual dissolved-phase PCE, TCE, DCE, and vinyl chloride have been detected, as has sorbed-phase PCE and TCE.

Chlorinated VOCs and their associated compounds can be volatilized under the appropriate conditions. In the subsurface, volatilization releases COCs 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.

2.4 *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.

2.4.1 Potential Soil Exposure Pathways

Direct ingestion of, and dermal contact with soil containing Site COCs is considered a potential exposure pathway. On this Site, soil impacts are presumed to still exist beneath the surface cover, which consists of asphalt paving, concrete, and Site structures. As such, unless disturbed, these areas are not available for direct contact or ingestion.

2.4.2 Potential Groundwater Exposure Pathways

Groundwater in the area of the Site is not used for drinking water. In addition, due to the industrial nature of the area, and the proximity of the Site to marine surface water, groundwater is not likely to be considered a potential future source of drinking water. As such, groundwater is not considered an exposure pathway for ingestion. However, due to the shallow depth of the Shallow Aquifer (3 to 5 feet bgs), groundwater is considered an exposure pathway for direct contact.

The groundwater-to-surface water pathway is also considered potentially complete for the Site. Investigations performed on the adjacent AMP site have shown that both the Shallow and Intermediate Aquifers are hydraulically connected to the Hylebos Waterway. As previously noted, groundwater flow direction in the Shallow and Intermediate Aquifers varies, and is affected by seasonal changes and local drainage patterns, such as drainage ditches and utility trenches. The regional groundwater is expected to flow towards the northwest and Commencement Bay of the Puget Sound. Tidal affects have been reported for the Intermediate and Deep Aquifers, as well as for the Shallow Aquifer the closer you get to surface water. Groundwater flow rate beneath the PRSI Site in the Shallow Aquifer ranges from 0.01 to 0.09 feet/day; and from 0.01 to 0.04 feet/day in the Intermediate Aquifer.

Whichever path groundwater beneath the PRSI Site chooses to take to the Hylebos Waterway, it would have to flow through the AMP site, where it would have the potential to comingle with similar COCs prior to discharge to surface water. For the purposes of this report, while the Hylebos Waterway is not used as a drinking water source, ingestion of organisms is considered a potential exposure pathway to human health for the Site.

2.4.3 Potential Air Exposure Pathways

No ambient air sampling has been conducted to date. Since volatile components of TPH and chlorinated VOCs have been present in soil and groundwater samples at the Site, air quality is a potential concern at the Site. While unlikely given the concentrations detected to date, migration of vapors through the unsaturated soil to the surface, both indoors and outdoors, is considered a potential exposure pathway at the Site.

2.4.4 Terrestrial Ecological Evaluation

The Site qualifies for the following exclusion from further consideration of the Terrestrial Ecological Evaluation:

- Barriers to Exposure: WAC 173-340-7491(1)(b) – All soil contamination is covered by physical barriers (such as buildings, paved roads, and Site infrastructure) that prevent exposure to plants and wildlife, and institutional controls and possibly engineering controls will be used to manage remaining contamination.

3.0 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.

3.1 *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);
- Natural Background Soil Metals Concentrations in Washington State, Publication #94-115, October 1995;
- Water Quality Standards for Groundwaters of the State of Washington (WAC 173-200);
- U.S. EPA Clean Water Act (40 CFR 100-149);
- Water Quality Standards for Surface Waters of the State of Washington (WAC 173-201A);
- Washington Clean Air Act (Chapter 70.94 RCW);
- Puget Sound Clean Air Agency (PSCAA) Regulations;
- 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); and
- Cleanup standards established for the adjacent Arkema Manufacturing Plant and Arkema Mound facilities.

3.2 *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, groundwater, and soil vapors to levels protective of human health and the environment and which are protective of groundwater and surface water quality.*

3.3 *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.

3.3.1 Cleanup Levels

MTCA cleanup levels for industrial properties (Method A and Method C) are appropriate for Site soils. Since groundwater beneath the Site is not considered potable, Method C cleanup levels for protection of direct contact are used (if available) for COCs where the Method A cleanup level is based on protection of groundwater for drinking water uses, and groundwater data has empirically shown the COC to not be present in groundwater. One exception: Method C cleanup levels are being used for arsenic as they were also used at the adjacent Arkema facility during cleanup of the Wypenn Property [DOF, 2015a].

These cleanup levels are based on the most stringent values for each exposure pathway and are considered appropriate for the Site COCs. However, in October 1997, SECOR calculated a Method B cleanup level for TPH using Ecology's Interim TPH Policy and data from a shallow soil sample collected during the 1997 interim action. AEG utilized this value to evaluate the 1991/1992 soil data as the TPH data collected during these investigations was not quantified as gasoline, diesel, or oil. However, it is AEG's opinion that any current TPH data be evaluated against MTCA Method A cleanup levels, pending any further Method B or C calculations using current data, which is likely to be more representative of current Site conditions.

The MTCA cleanup levels for the Site COCs in soil are as follows:

- TPH (unquantified) 1,630 mg/kg (Interim TPH Policy – Method B)
- Gasoline-range TPH 100 mg/kg (Method A Industrial)
- Diesel-range TPH 2,000 mg/kg (Method A Industrial)
- Oil-range TPH 2,000 mg/kg (Method A Industrial)
- Arsenic 88 mg/kg (Method C Direct Contact)
- PCE 0.05 mg/kg (Method A Industrial)
- TCE 0.03 mg/kg (Method A Industrial)

Since groundwater beneath the Site is not considered potable, the next most stringent exposure pathway is groundwater-to-surface water migration. As such, surface water quality criteria are appropriate for groundwater beneath the Site. Specifically, human health criteria for the ingestion of organisms only. However, no criteria exist for TPH or cis-1,2-DCE. Cleanup levels for these COCs will default to Method A and B, respectively. These cleanup levels are based on the most stringent values for each exposure pathway and are considered appropriate for the Site COCs. The MTCA cleanup levels for the Site COCs in groundwater are as follows:

- Gasoline-range TPH 800 µg/L (Method A)
- Diesel-range TPH 500 µg/L (Method A)
- Oil-range TPH 500 µg/L (Method A)
- Arsenic 10 µg/L (Method B Human Health Criteria – Organisms Only)
- PCE 7.1 µg/L (Method B Human Health Criteria – Organisms Only)
- TCE 0.86 µg/L (Method B Human Health Criteria – Organisms Only)
- cis-1,2-DCE 16 µg/L (Method B; Method A not established)
- Vinyl chloride 0.26 µg/L (Method B Human Health Criteria – Organisms Only)

µg/L = micrograms per liter

3.3.2 Points of Compliance

For this Site, it is assumed that standard POC will be used.

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

4.0 IDENTIFICATION AND SCREENING OF REMEDIATION TECHNOLOGIES

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

4.1 *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.

4.2 *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 3, *Identification and Screening of Response Actions and Remediation Technologies*, which provides a summary of the screening results. Seven 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.

4.2.1 No Action

No action at the Site is typically not a viable alternative as it is unable to achieve RAOs for the Site. It was retained for further consideration for comparison against other viable alternatives.

4.2.2 Institutional Controls

Institutional controls considered for this 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.

4.2.3 Monitored Natural Attenuation

The term "natural attenuation" as used in this 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. As part of the evaluation of monitored natural attenuation (MNA), specific soil and groundwater testing would be required to evaluate if conditions are appropriate for MNA for potential reduction of contaminates. A schedule and sampling criteria for regular monitoring must be part of the evaluation and conducted after implementation to ensure that MNA continues to reduce contaminate levels.

4.2.4 Containment (Capping)

This retained containment technology option for this Site would include capping portions of the Site with an impervious surface, such as use of the existing asphalt and concrete cover, as well as the existing infrastructure. Capping prevents exposure to contamination where contamination in soil or groundwater remains above cleanup levels at the end of any active remediation. Capping alone could not achieve full compliance with cleanup standards; therefore, if implemented, additional remediation technologies (such as institutional controls) would also be required to meet cleanup standards.

4.2.5 Removal (Soil Excavation)

Excavation of contaminated soil at the Site may be an effective method of reducing remaining PCS. However, the majority of impacted areas are present beneath the existing infrastructure, which would need to be completely demolished/removed to access the PCS. Excavated PCS would then be transported for disposal at an appropriate disposal facility, requiring access to the Site by transport trucks during the excavation. Such actions have already been outlined in the *Final Closure Plan with Sampling and Analysis Plan for Mitigating Soils at Closure* for the PRSI facility, which was approved by Ecology in April 2009. While a viable alternative for this Site, it may need to be combined with other short-term remedial solutions.

4.2.6 In-Situ Chemical Injection

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 petroleum hydrocarbons 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.

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

4.2.7 In-Situ 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 added to enhance bioremediation and contaminant desorption from subsurface materials. For this Site, in-situ treatment may consist of using the "Trap and Treat" process (BOS 200®) in which granulated carbon is injected in solution using a grid-like pattern in areas of concern. The product is typically mixed with water to create a slurry that can be applied using a variety of techniques including: direct-push injection, soil mixing techniques, and trenching. It is commonly employed in plume-wide treatment, including treatment of LNAPL source, mid, and downgradient plume regions. Plume area treatment is normally accomplished using slurry injection across the impacted thickness at a number of points located using a triangular grid pattern. The carbon traps the contaminants and provides plume control. The plume is then treated with a matrix that incorporates both aerobic and anaerobic biological processes, providing longer-term remedial degradation.

Adsorption is just the first step in the process. Further treatment is accomplished through biodegradation of the adsorbed contaminants. The result is metabolic by-products, small amounts of heat energy, and microbial propagation. The BOS 200® product contains selected nutrients, including phosphorus and nitrogen, and it contains a variety of microbes that can be utilized under aerobic or anaerobic conditions. For petroleum hydrocarbon breakdown, the aerobic microbes are suitable with sufficient available oxygen present.

The BOS 200® product is saturated with oxygen before injection into the contaminated formation. The product contains nitrate, ammonia, and a time release source of sulfate needed to supplement

biodegradation. The source of the time-release sulfate is gypsum or calcium sulfate. The product also provides a bio-available form of phosphorus (an essential nutrient) to the microorganisms that cannot be washed out by groundwater seep.

The manufacturer of BOS 200® recommends and uses a specific blend of microorganisms with its product. "*This is provided by a customized culture of facultative anaerobes that can take advantage of the wide swing in soil conditions presented by the injected BOS 200®. As a result, there are organisms present that can use the oxygen initially present. Further, there are nitrate reducers, iron reducers, sulfate reducers, fermenters, and methanogens. No matter what condition exists within the activated carbon, there are microorganisms present to take advantage. Metabolic by-products vary depending on what metabolic pathway is being used for hydrocarbon degradation. Carbon dioxide and water are common although many other compounds are possible, including various alcohols and volatile fatty acids. Acetate turns out to be produced by aerobic conditions as well as by anaerobic fermentation, and under methanogenic respiration. Other products include lactate, formate, butyrate, isobutyrate, pyruvate, and proprionate along with methane."*

The concept of respiration is important in that the organism literally breathes nitrate or sulfate while oxidizing hydrocarbons. In each case above, the energy derived decreases in the processing of nitrate toward methanogenic respiration. If oxygen is available, it will be the preferred electron acceptor. The BOS 200® product provides an aerobic base as it is saturated with oxygen. Once the oxygen is consumed, nitrate will become the next favored electron acceptor, finally settling into sulfate reduction along with some methanogenic respiration.

5.0 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 3, *Identification and Screening of Response Actions and Remediation Technologies*, and described above.

Two of the 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 4.2, *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.

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.

5.1 *Description of Remedial Alternatives*

Based upon the screening evaluation, MTCA threshold, and other requirements, AEG proposes three 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.

Options evaluated during the development of the document include:

A. No Action;

B. Institutional Controls, Long-Term Monitoring, and Implementation of the Site Closure Plan; and

C. In-Situ Treatment via Chemical Injection and Oxidation.

Local Requirements

All required local permits to implement the chosen Remedial Action will be obtained according to Pierce County, the Port of Tacoma, and the City of Tacoma requirements. These could include, but are not limited to, remediation implementation construction, air quality, right-of-way, and building permits, as well as lead agency status for SEPA checklist review.

5.1.1 Alternative 1 – No Action

Alternative 1 includes:

The no action alternative does not meet the RAOs identified for the Site and is not applicable; however, it is retained to provide a baseline of comparison for other more permanent remedial alternatives.

5.1.2 Alternative 2 – Institutional Controls, Long-Term Monitoring, and Implementation of the Site Closure Plan

Alternative 2 includes the following:

- Implementation of institutional controls by placing an environmental covenant on the property to prevent exposure to subsurface impacts present beneath the existing surface cover and infrastructure.
- Continued long-term groundwater monitoring (currently being done annually) to ensure impacts remain contained on Site.
- Implementation of the *Final Closure Plan with Sampling and Analysis Plan for Mitigating Soils at Closure* (Closure Plan) for the PRSI facility when the time comes that the facility ceases operations. A copy of the Closure Plan is included in Appendix A.
- Installation of a replacement monitoring well following implementation of the Closure Plan to allow for compliance monitoring in the area of S04A where elevated concentrations of arsenic and chlorinated VOCs have been detected.

Ecology approved the Closure Plan in April 2009, a *Final Closure Plan with Sampling and Analysis Plan for Mitigating Soils at Closure* for the PRSI facility.

The objectives of the Closure Plan are to:

1. Minimize the need for further maintenance;
2. Control, minimize, or eliminate the post-closure escape of waste oil and waste water, glycol onto the ground, into surface water or groundwater, or to the atmosphere; and
3. Remove all wastes and waste residues from tank systems containing processed oil, slop oils and waste water and properly dispose of the waste offsite.

Closure Plan tasks include, but are not limited to, the following:

1. Emptying and decontamination of tanks 1A, 2A, 3A, 7A, 8A, 9A, 10A, 11A, 12A, 20A, 30A, 1B, 2B, 3B, 4B, and 5B (see Figure 2, *Facility Site Map*), and properly disposing of rinsate;
2. Decontamination and removal of the containment system and piping in the secondary containment systems;
3. Cleaning the concrete surfaces and properly dispose of any waste/residue generated;
4. Soil testing and potential soil disposal or treatment after removal of tanks, slabs, oil/water separator, and other on-Site facilities.
5. Abandoning and properly decommissioning monitoring well S04A;
6. Excavating the general area around the monitoring well S04A to remove contaminated soils, field screen the soils during removal, and collecting confirmation soil samples after the excavation is completed per the Sampling and Analysis Plan (SAP);
7. Preparing a summary report describing the sampling activities, providing drawings of sample locations, including laboratory results with copies of the chain of custody and QA/QC documentation, along with photo documentation of the closure event;
8. Providing certification to Ecology that the oil recycling plant was closed in accordance to the Closure Plan.

A copy the *Final Closure Plan with Sampling and Analysis Plan for Mitigating Soils at Closure* for the PRSI facility is included in Appendix A.

Estimated time to closure: 15 to 20 years.

5.1.3 Alternative 3 – In-Situ Treatment via Chemical Injection and Oxidation

Alternative 3 includes the following:

- 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 20 feet bgs to target the highest concentrations of chlorinated VOCs. In addition to treating groundwater, injection points would need to be spaced appropriately to treat impacted soils in both the unsaturated and saturated zones.
- Two separate injection events would be completed approximately six months apart, if required.
- Compliance monitoring of COCs in Site monitoring wells to demonstrate reduction of COC concentrations and confirm the injections were successful in achieving MTCA cleanup standards for groundwater.
- Confirmation sampling of previously documented areas of contamination to confirm the injections were successful in achieving MTCA cleanup standards for soil.

Groundwater at the Site would be monitored for at least four quarters after the end of treatments to verify the decrease of contaminant concentrations at the Site, and the attainment of remedial action objectives. If MTCA Method B cleanup levels are not reached within the second quarter of groundwater monitoring, a second modified injection event will be evaluated.

To reduce the risk of rebound, a thorough site characterization to target contaminant area and depth in the subsurface is required. Proper injection point placement and the correct volume of product is crucial to provide coverage based on the soil types and groundwater patterns. The levels of contamination verses the quantity of injected products must be reviewed before using this option. The site characterization should include groundwater parameters that will be used as indicators of biological activities (dissolved oxygen, nitrates, sulfates, microbial counts, pH, ORP) used as a baseline and for comparison.

The advantages of this method is less Site disturbance to implement full scale. The injection area grid patterns can be pre-determined to allow for Site development and no infrastructure is left after the injections. There is no electrical equipment (i.e. pumps, blowers, etc.) to be installed or maintained during the treatment process.

If a permanent cleanup is unable to be performed due to accessibility associated with the existing infrastructure, institutional controls via an environmental covenant on the property would be needed to achieve cleanup standards. Compliance groundwater monitoring would then need to be

implemented, following by implementation of the facility's closure plan once PRSI ceased operations at the Site.

Estimated time to closure: 1 to 5 years.

5.2 *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.
- 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.
- Consider public concerns.

However, a disproportionate cost analysis may not be required if, after an Ecology review of a completed "DRAFT FS" and based on the provisions of WAC 173-340-360(3)(d), Ecology and PRSI make an agreement on the preferred potential cleanup action.

As defined in WAC 173-340-200:

> *"a disproportionate cost analysis shall not be required if the department and the potentially liable persons agree to a permanent cleanup action that will be identified by the department as the proposed cleanup action in the draft cleanup action plan."*

5.3 *Selection of Preferred Alternative*

Of the three alternatives, AEG does not recommend Alternative 1 (No Action) as it does not achieve RAOs for the Site.

Alternative 3 (In-Situ Treatment via Chemical Injection and Oxidation) would be the most expensive to implement in the short term via the use of angle borings, trenches, and/or flood galleries to ensure contact with the contamination. Given the presence of the existing

infrastructure at the Site, this alternative would likely result in the inability to treat some of the impacted areas due to accessibility constraints. As a result, Alternative 3 is likely to result in the need for implementing the actions under Alternative 2 (Institutional Controls, Long-Term Monitoring, and Implementation of the Site Closure Plan) as well. Lastly, with the existing Site cover and infrastructure acting as a cap and preventing direct exposure to contamination at the Site, implementing a more active remedial technology prior to initiating the facility's closure plan is not justified.

Alternative 2 alone would achieve RAOs for the Site, and is therefore AEG's preferred alternative for this Site.

6.0 LIMITATIONS

This report summarizes the findings of the services authorized under our agreement with PRSI and Mr. Tom Smith. 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 PRSI and Mr. Tom Smith 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.

7.0 REFERENCES

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FIGURES

2633 Parkmont Lane SW, Suite A • Olympia, WA • 98502-5751
Phone: 360-352-9835 • Fax: 360-352-8164 • Email: admin@aegwa.com

FILENAME	DRAWN BY		CHECKED BY		APPROVED BY		PROJECT NUMBER
16-120_16Q3.DWG	ICD	7/5/2016	NP	7/5/2016	NP	7/5/2016	16-120

N
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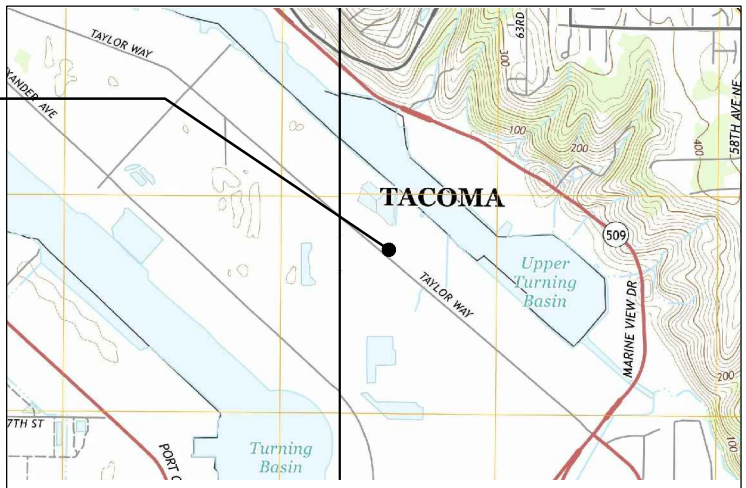
PROJECT LOCATION



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–2014, 7.5 MINUTE QUADRANGLE MAP
PROVERTY BAY, WASHINGTON

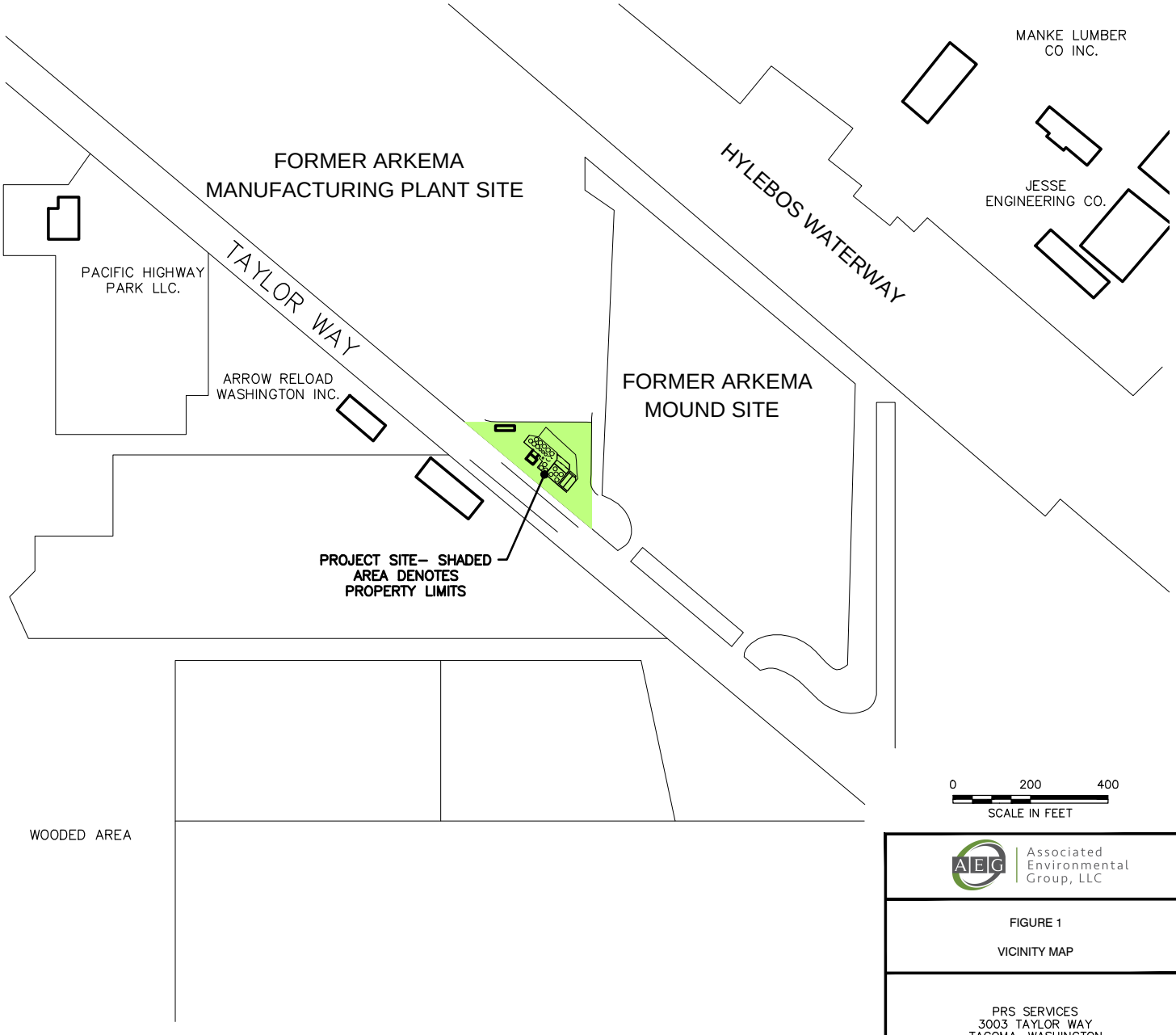


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FIGURE 1

VICINITY MAP

PRS SERVICES
3003 TAYLOR WAY
TACOMA, WASHINGTON

FILENAME	DRAWN BY	CHECKED BY	APPROVED BY	PROJECT NUMBER
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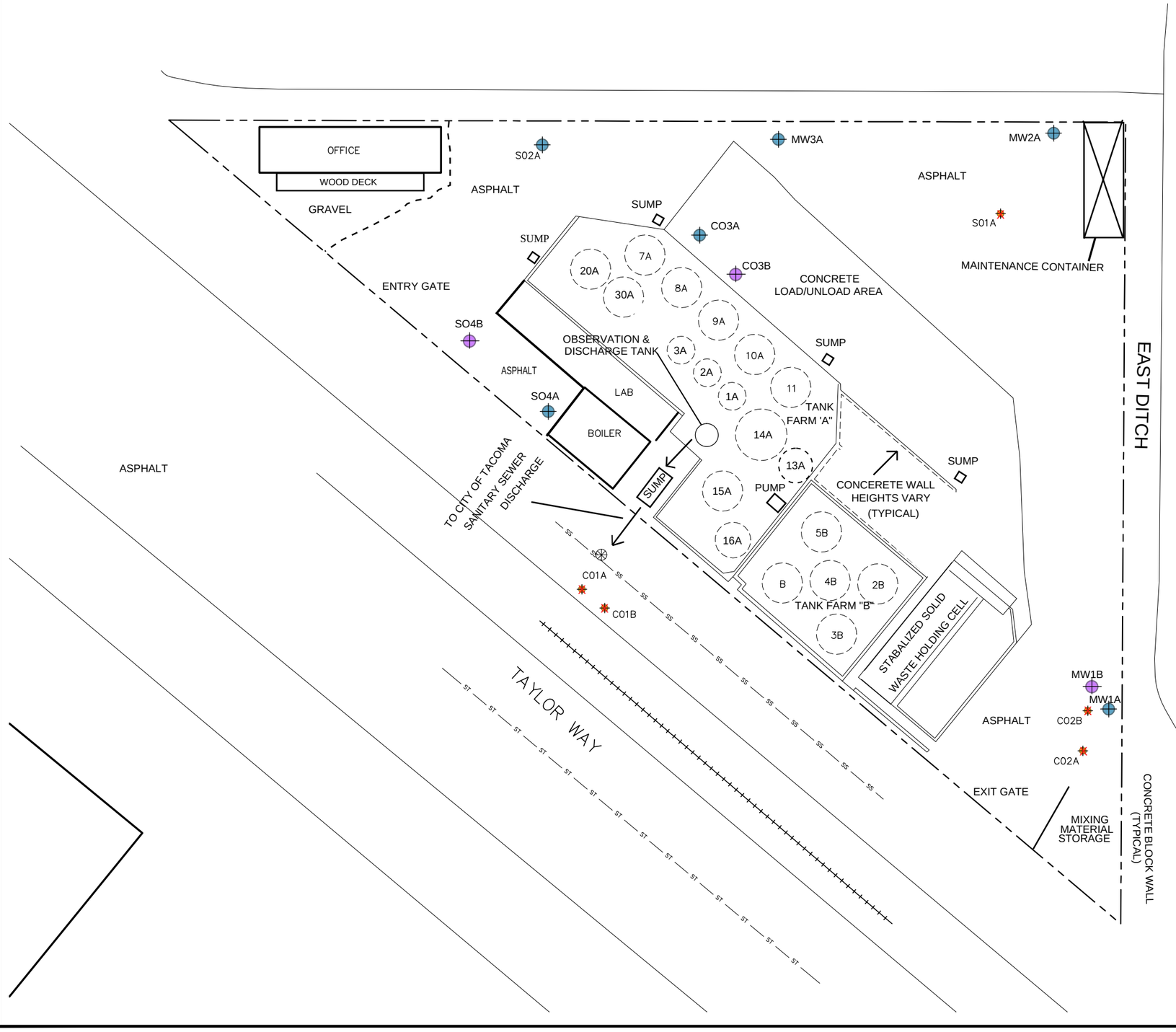

N
W E
S

LEGEND

- PROPERTY LINE
- S01A — GOLDER ASSOCIATES SHALLOW AQUIFER WELLS
- INTERMEDIATE AQUIFER WELLS
- FORMER/REMOVED WELLS
- SANITARY SEWER MANHOLE
- SANITARY SEWER
- STORM SEWER
- RAILROAD

NOTES

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REFERENCE

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0 15 30
SCALE IN FEET

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FIGURE 2

FACILITY SITE MAP

PRS SERVICES
3003 TAYLOR WAY
TACOMA, WASHINGTON

FILENAME	DRAWN BY	CHECKED BY	APPROVED BY	PROJECT NUMBER
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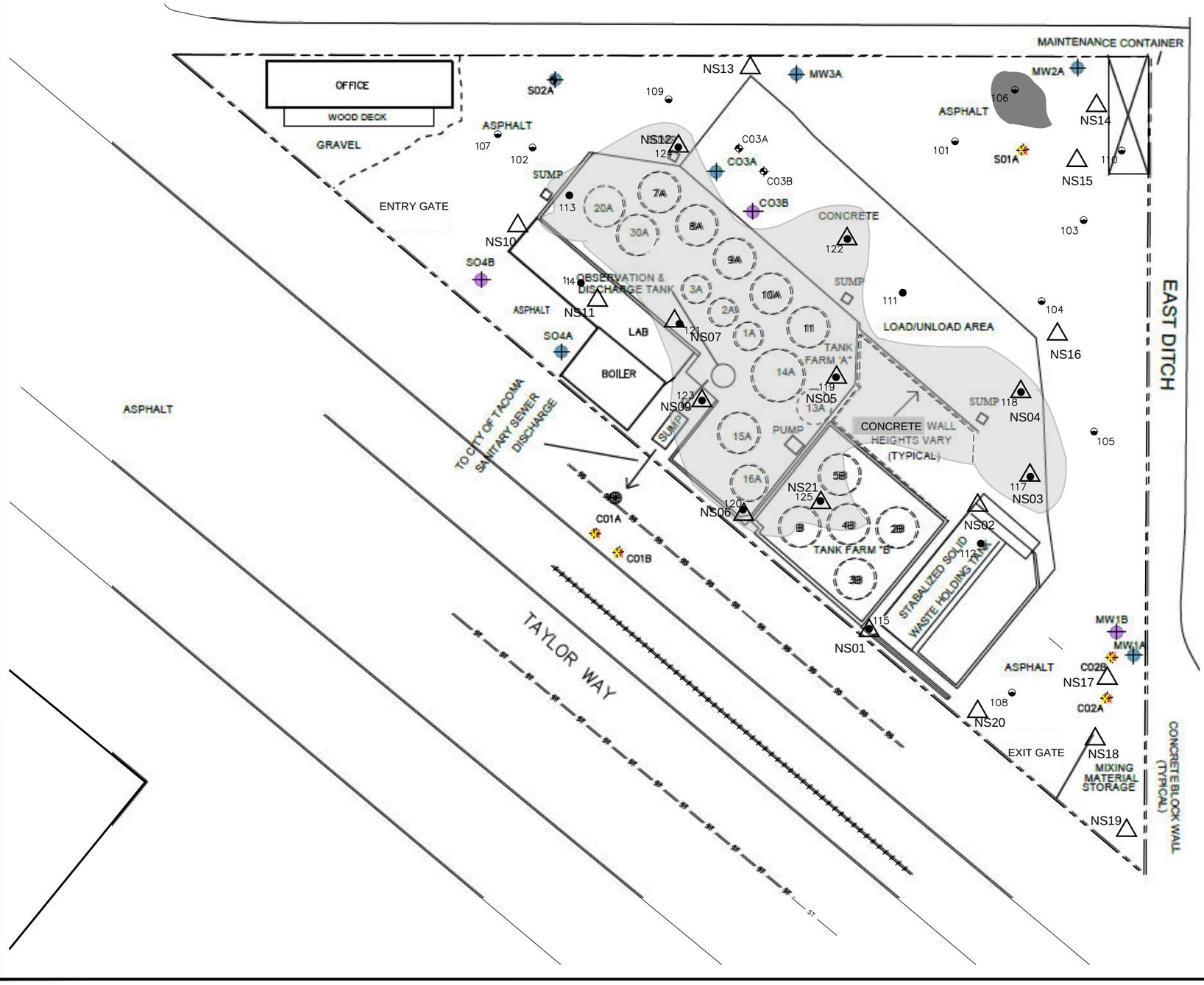

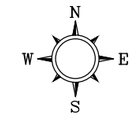

LEGEND

- PROPERTY LINE
- S01A — GOLDER ASSOCIATES MONITORING WELL
- FORMER/REMOVED WELLS
- 101 — ENVIRONMENTAL ENGINEERING & CONSULTING INC TEST PIT
- 111 — ENVIRONMENTAL ENGINEERING & CONSULTING INC BORING
- SANITARY SEWER MANHOLE
- SANITARY SEWER
- STORM SEWER
- RAILROAD
- SECOR BORINGS
- TPH (MG/KG) IN SOIL

NOTES

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REFERENCE

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

PCE/TCE (MG/KG) IN SOIL

SOIL DATA FROM SECOR RI DATED OCTOBER 2, 1996
SOIL SAMPLE DATES AUGUST 1991 AND OCTOBER 1992

0 15 30
SCALE IN FEET

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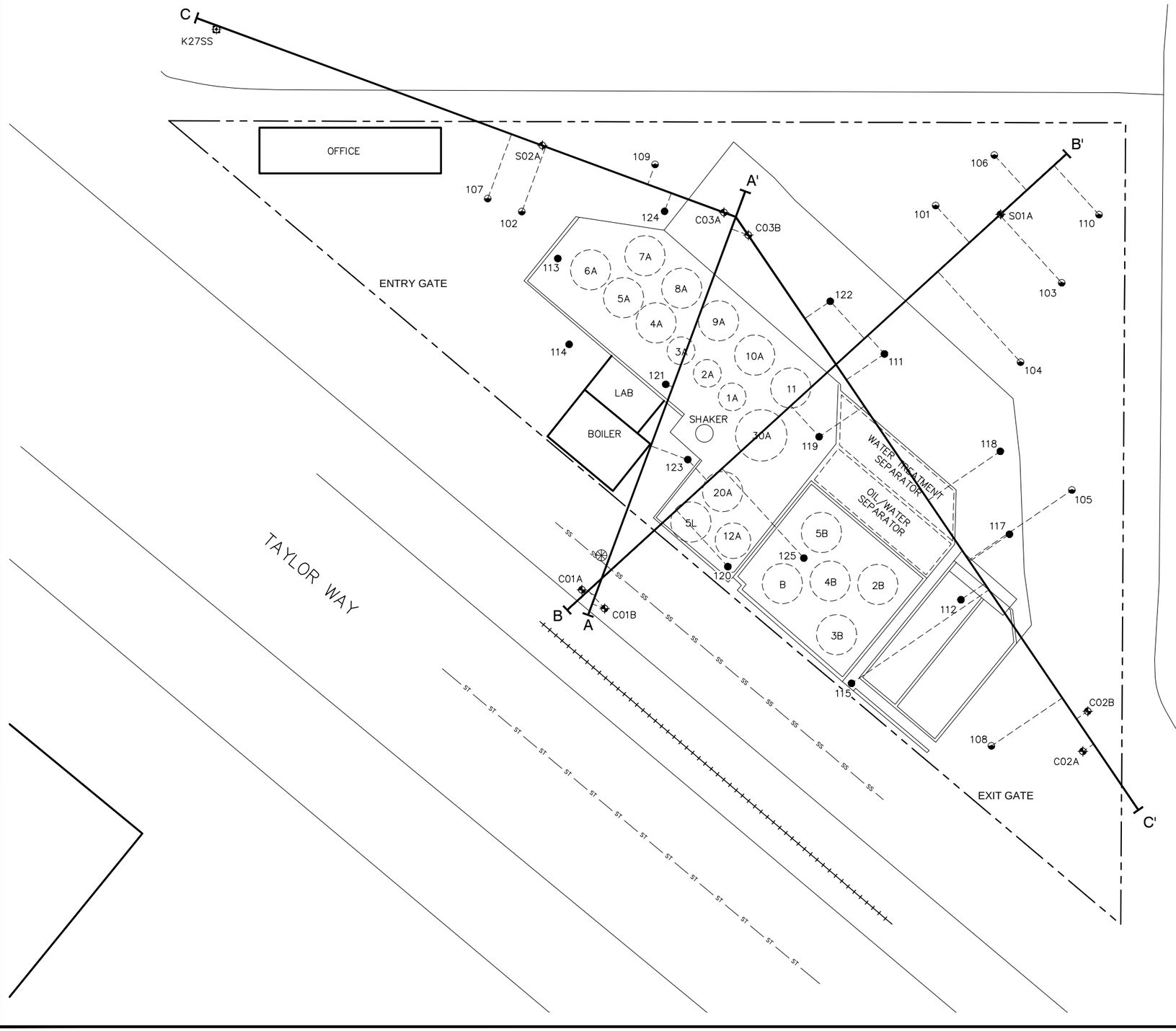
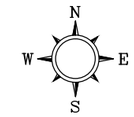
FIGURE 3
SURFACE SOIL PLUME CONTAMINATION
ABOVE MTCA CIRCA 1991 & 1992

PRS SERVICES
3003 TAYLOR WAY
TACOMA, WASHINGTON

FILENAME	DRAWN BY	CHECKED BY	APPROVED BY	PROJECT NUMBER
16-120_XSECTIONS.DWG	ICD 7/06/2016	NP 7/06/2016	NP 7/06/2016	16-120





LEGEND

- PROPERTY LINE
- S01A — GOLDER ASSOCIATES MONITORING WELL
- K27SS — KENNEDY/JENKS/CHILTON MONITORING WELL
- 101 — ENVIRONMENTAL ENGINEERING & CONSULTING INC TEST PIT
- 111 — ENVIRONMENTAL ENGINEERING & CONSULTING INC BORING
- SANITARY SEWER MANHOLE
- SS — SS — SANITARY SEWER
- ST — ST — STORM SEWER
- RAILROAD
- A — A' — LINE OF LITHOLOGIC CROSS SECTION AND PROJECTION LINE OR BORING/WELL

NOTES

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REFERENCE

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

0 15 30
SCALE IN FEET

Associated Environmental Group, LLC

FIGURE 4

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

PRS SERVICES
3003 TAYLOR WAY
TACOMA, WASHINGTON

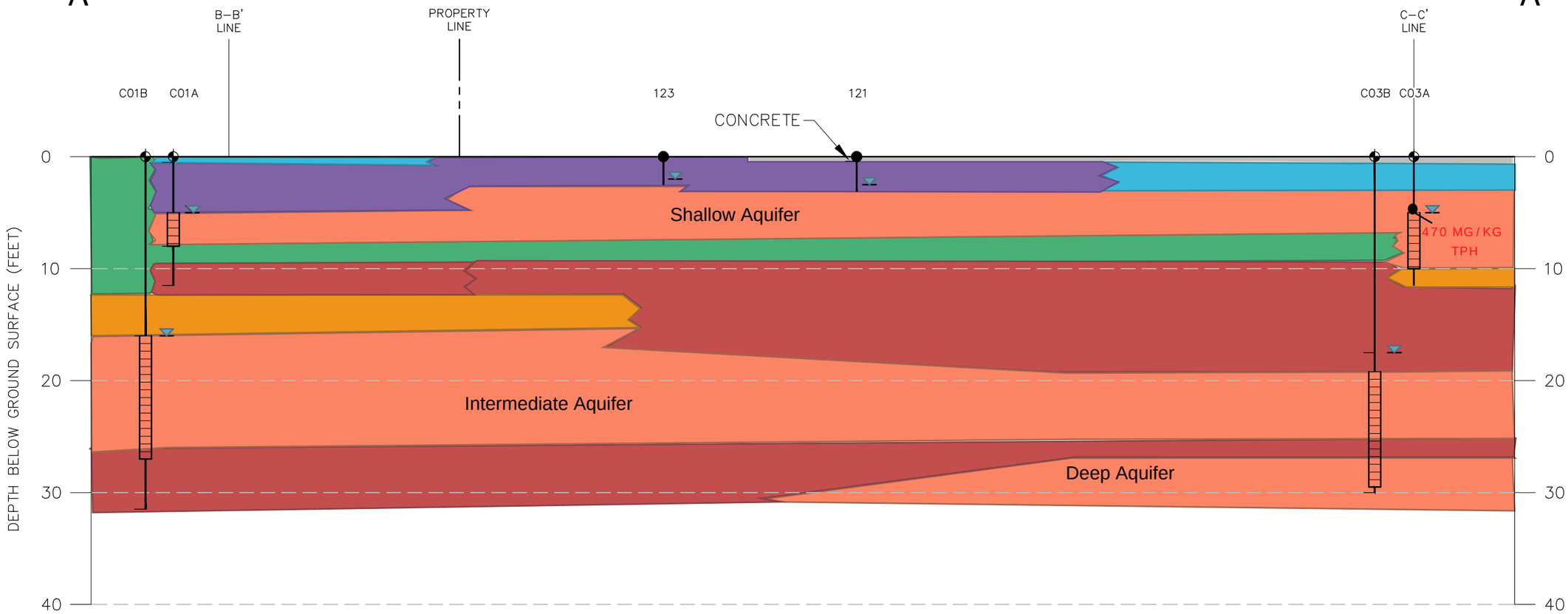
FILENAME	DRAWN BY	CHECKED BY	APPROVED BY	PROJECT NUMBER
16-120_XSECTIONS.DWG	ICD 7/06/2016	NP 7/06/2016	NP 7/06/2016	16-120

SOUTHWEST

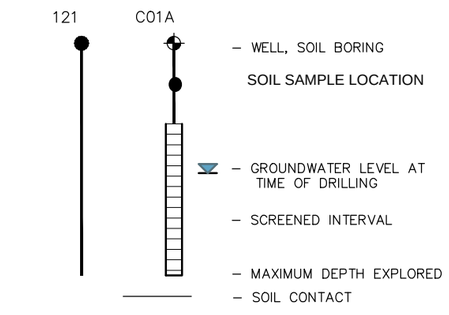
A

NORTHEAST

A'



LEGEND



SP	POORLY-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SM	SILTY-SANDS, SAND-SILT MIXTURES
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, LEAN CLAYS, SILT-CLAYS MIXTURES
PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS
OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
GP	POORLY-GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES

0 5 10
HORIZONTAL SCALE

0 5 10
VERTICAL SCALE

Associated Environmental Group, LLC

FIGURE 5

GEOLOGIC CROSS SECTION A-A'

PRS SERVICES
3003 TAYLOR WAY
TACOMA, WASHINGTON

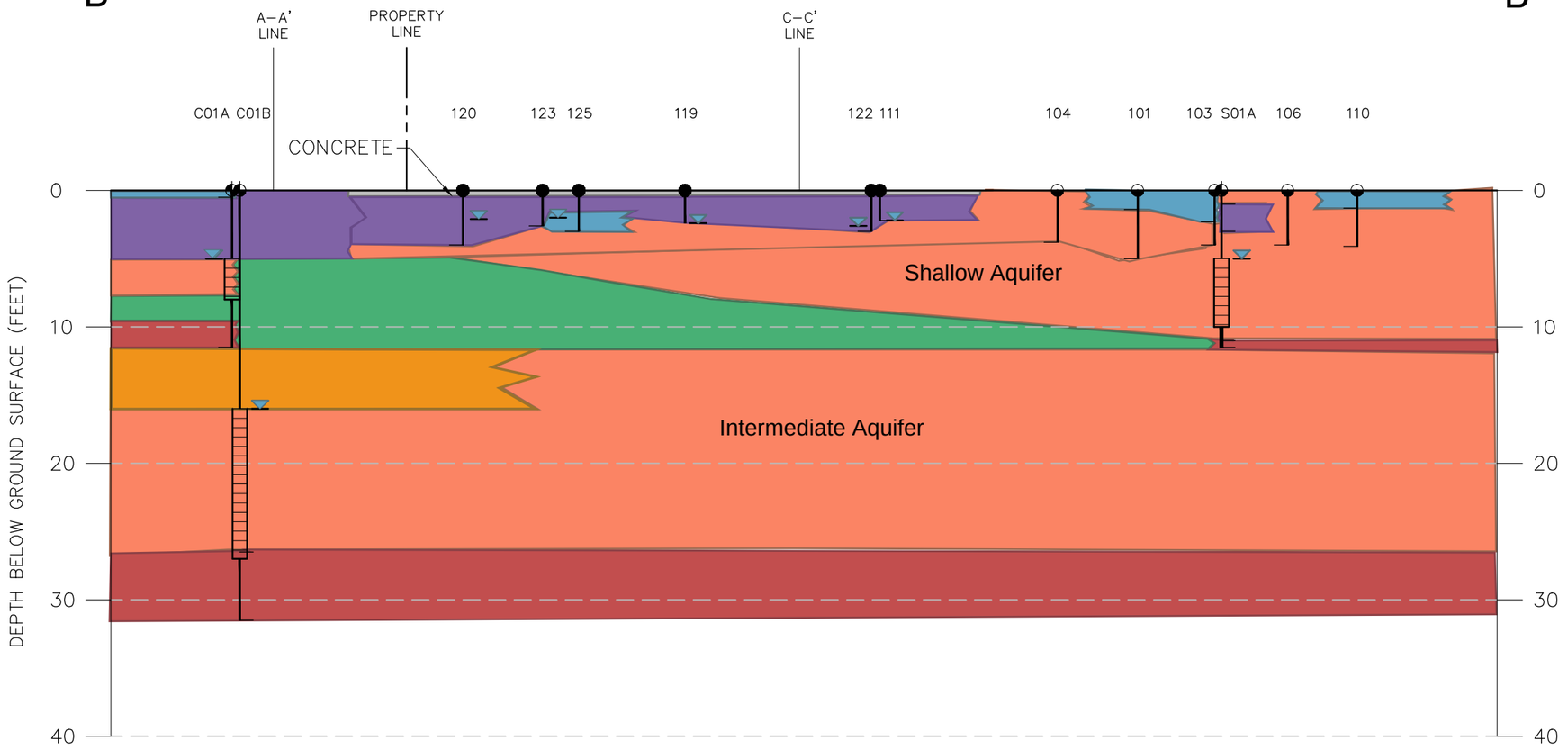
PROJECT NUMBER	APPROVED BY	CHECKED BY	DRAWN BY	FILENAME
16-120	NP 7/06/2016	NP 7/06/2016	ICD 7/06/2016	16-120_XSECTIONS.DWG

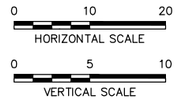
SOUTHWEST

B

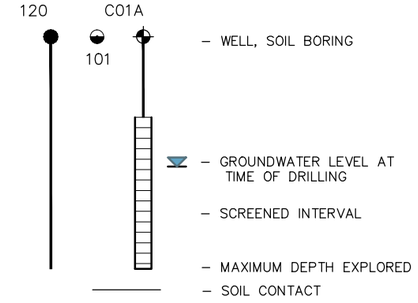
NORTHEAST

B'





LEGEND



SP	POORLY–GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SM	SILTY–SANDS, SAND–SILT MIXTURES
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, LEAN CLAYS, SILT–CLAYS MIXTURES
PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS
OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
GP	POORLY–GRADED GRAVELS, GRAVEL–SAND MIXTURES, LITTLE OR NO FINES

Associated Environmental Group, LLC

FIGURE 6

GEOLOGIC CROSS SECTION B-B'

PRS SERVICES
3003 TAYLOR WAY
TACOMA, WASHINGTON

NORTHWEST

C

SOUTHEAST

C'

PROPERTY LINE

A–A' LINE

B–B' LINE

PROPERTY LINE

K27SS 107 S02A 102 109 124 C03A C03B 122 111 119 118 105 117 112 115 108 C02B C02A

CONCRETE

CONCRETE

470 MG/KG TPH

Shallow Aquifer

Intermediate Aquifer

Deep Aquifer

DEPTH BELOW GROUND SURFACE (FEET)

0 10 20 30 40

HORIZONTAL SCALE 0 15 30

VERTICAL SCALE 0 5 10

LEGEND

111 C02A

105 K27SS

- WELL, SOIL BORING
- SOIL BORING LOCATION
- GROUNDWATER LEVEL AT TIME OF DRILLING
- SCREENED INTERVAL
- MAXIMUM DEPTH EXPLORED
- SOIL CONTACT

NR NO RECOVERY

SP	POORLY–GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
SM	SILTY–SANDS, SAND–SILT MIXTURES
CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, LEAN CLAYS, SILT–CLAYS MIXTURES
OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS
GP	POORLY–GRADED GRAVELS, GRAVEL–SAND MIXTURES, LITTLE OR NO FINES

Associated Environmental Group, LLC

FIGURE 7

GEOLOGIC CROSS SECTION C-C'

PRS SERVICES
3003 TAYLOR WAY
TACOMA, WASHINGTON

PROJECT NUMBER	16–120	
APPROVED BY	NP	7/06/2016
CHECKED BY	NP	7/06/2016
DRAWN BY	ICD	7/06/2016
FILENAME	16-120_XSECTIONS.DWG	

TABLES

2633 Parkmont Lane SW, Suite A • Olympia, WA • 98502-5751
Phone: 360-352-9835 • Fax: 360-352-8164 • Email: admin@aegwa.com

Table 1 - Summary of Soil Analytical Results
Petroleum Reclaiming Services, Inc.
Tacoma, Washington

Sample Number	Depth Collected (feet)	Date Collected	Selected Volatile Organic Compounds						TPH	Selected Semivolatile Organic Compounds						Total cPAHs (TEF Adjusted)	Total PCBs	Selected ICP Metals						
			Benzene	Toluene	Ethyl benzene	Xylenes	PCE	TCE		Benzo(a) anthracene	Benzo(b) fluoranthene	Benzo(a) pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h) anthracene	Chrysene			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
C01A-2.5	2.5	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**170**	**0.28**	**0.72**	**0.42**	**0.37**	**0.07**	**0.33**	**0.5673**	<0.1	**19**	**1.4**	**48**	**57**	**42**	**0.33**	**94**
C01A-7.5	7.5	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<10	<0.66	<0.66	<0.66	<0.66	<0.66	<0.66	ND	<0.1	**11**	<0.3	**21**	**35**	**14**	**0.29**	**21**
C01B-12.5	12.5	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	ND	<0.1	<8.8	<0.22	**23**	**22**	**7.9**	**1.4**	**29**
C01B-15	15.0	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<10	<0.47	<0.47	<0.47	<0.47	<0.47	<0.47	ND	<0.1	<7.6	<0.19	**23**	**15**	**6.4**	**1.1**	**23**
C01B-27.5	27.5	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<10	<0.49	<0.49	<0.49	<0.49	<0.49	<0.49	ND	<0.1	<8.7	<0.21	**25**	**20**	**8.3**	**1.5**	**29**
C02A-5	5.0	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	--	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	ND	<0.1	<4.2	<0.11	**7.7**	**5.4**	**2.6**	<0.1	**9.1**
C02B-32.5	32.5	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	--	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	ND	<0.1	--	--	--	--	--	--	--
C02B DUP-32.5	32.5	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<10	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	ND	<0.1	--	--	--	--	--	--	--
C03A-5	5.0	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**470**	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	ND	<0.1	**20**	<0.13	**7.5**	**6.5**	**2.5**	<0.1	**10**
C03A-10	10.0	09/1991	--	--	--	--	--	--	**65**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C03B-2.5	2.5	09/1991	--	--	--	--	--	--	**15**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
C03B-5	5.0	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**18**	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	ND	<0.1	--	--	--	--	--	--	--
C03B-30	30.0	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**25**	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	ND	<0.1	--	--	--	--	--	--	--
C03B DUP-30	30.0	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	**30**	<0.33	<0.33	<0.33	<0.33	<0.33	<0.33	ND	<0.1	--	--	--	--	--	--	--
S01A-2.5	2.5	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	--	<0.36	<0.36	<0.36	<0.36	<0.36	<0.36	ND	<0.1	**218**	**0.19**	**8.1**	**6.9**	<1.2	<0.1	**9.5**
S02A-7.5	7.5	09/1991	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	--	<0.41	<0.41	<0.41	<0.41	<0.41	<0.41	ND	<0.1	<5.2	<0.13	**8**	**6.3**	**3.2**	<0.1	**11**
NS-01	1.5	09/1991	--	--	--	--	--	--	**350**	--	--	--	--	--	--	--	--	<6.7	<0.17	**22**	**15**	**8.7**	**0.11**	**35**
NS-02	1.2	09/1991	--	--	--	--	--	--	**660**	--	--	--	--	--	--	--	--	<7.7	<0.19	**27**	**28**	**9.8**	**1.7**	**42**
NS-03	1.7	09/1991	--	--	--	--	--	--	**2,500**	--	--	--	--	--	--	--	--	**39**	<0.15	**62**	**56**	**26**	**1.3**	**68**
NS-04	1.3	09/1991	--	--	--	--	--	--	**2,500**	--	--	--	--	--	--	--	--	**10**	<0.12	**22**	**20**	**16**	**0.5**	**48**
NS-05	0.4	09/1991	--	--	--	--	--	--	**57,000**	--	--	--	--	--	--	--	**0.2**	**24**	<0.12	**15**	**33**	**144**	<0.1	**161**
NS-06	0.75	09/1991	--	--	--	--	--	--	**4,000**	--	--	--	--	--	--	--	--	**60**	**0.28**	**18**	**36**	**45**	**0.5**	**110**
NS-07	0.3	09/1991	--	--	--	--	--	--	**88,000**	--	--	--	--	--	--	--	**3.8**	**82**	**2.9**	**60**	**114**	**259**	**0.2**	**490**
NS-08	2.0	09/1991	--	--	--	--	--	--	**710**	--	--	--	--	--	--	--	--	**20**	<0.11	**7.9**	**8.9**	**4.9**	<0.1	**20**
NS-09	0.75	09/1991	--	--	--	--	--	--	**2,000**	--	--	--	--	--	--	--	--	**29**	**30**	**17**	**490**	**63**	**0.1**	**335**
NS-12	1.3	09/1991	--	--	--	--	--	--	**17,000**	--	--	--	--	--	--	--	--	**30**	**1.3**	**23**	**4.2**	**46**	<0.1	**317**
NS-21	2.4	09/1991	--	--	--	--	--	--	**210**	--	--	--	--	--	--	--	--	<5.9	**2.5**	**34**	**23**	**8.8**	<0.1	**40**
101B-3'	3.0	10/1992	<0.2	**0.054**	**0.08**	**0.66**	<0.2	<0.2	**8,500**	--	--	--	--	--	--	--	<0.1	**78**	<0.081	**8.4**	**6.9**	--	<0.1	--
101C-5'	5.0	10/1992	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	**210**	--	--	--	--	--	--	--	<0.1	**86**	<0.11	**7.9**	**6.8**	--	<0.1	--
102B-3'	3.0	10/1992	--	--	--	--	--	--	<100	--	--	--	--	--	--	--	<0.1	**43**	<0.12	**6.7**	**6.2**	--	<0.1	--
102C-4'	4.0	10/1992	--	--	--	--	--	--	<100	--	--	--	--	--	--	--	<0.1	**14**	<0.094	**8.9**	**7.5**	--	<0.1	--
103B-3'	3.0	10/1992	--	--	--	--	--	--	<100	--	--	--	--	--	--	--	<0.1	**47**	**0.12**	**11**	**26**	--	**0.27**	--
104B-3'	3.0	10/1992	--	--	--	--	--	--	<100	--	--	--	--	--	--	--	<0.1	**20**	**0.12**	**11**	**7.8**	--	**0.15**	--
105B-3'	3.0	10/1992	--	--	--	--	--	--	<100	--	--	--	--	--	--	--	<0.1	<1.7	<0.085	**7.8**	**6.3**	--	<0.1	--
106B-3'	3.0	10/1992	<0.25	<0.25	<0.25	<0.25	**0.15**	**0.048**	<100	--	--	--	--	--	--	--	<0.1	**30**	<0.096	**7.5**	**8.4**	--	<0.1	--
107B-3'	3.0	10/1992	--	--	--	--	--	--	<100	--	--	--	--	--	--	--	<0.1	**25**	<0.085	**8.2**	**7.5**	--	<0.1	--
108B-3'	3.0	10/1992	--	--	--	--	--	--	<100	--	--	--	--	--	--	--	<0.1	<2.1	<0.11	**7.2**	**8.8**	--	**0.36**	--
109B-3'	3.2	10/1992	--	--	--	--	--	--	**450**	--	--	--	--	--	--	--	**2.9**	**51**	**0.17**	**20**	**40**	--	**0.15**	--
110B-3'	3.0	10/1992	--	--	--	--	--	--	<100	--	--	--	--	--	--	--	<0.1	**45**	<0.1	**11**	**7.4**	--	<0.1	--
111A-2'	2.0	11/1992	--	--	--	--	--	--	**980**	--	--	--	--	--	--	--	<0.1	**15**	**0.48**	**9.5**	**35**	--	**0.24**	--
112A-2.25'	2.25	11/1992	--	--	--	--	--	--	**150**	--	--	--	--	--	--	--	**0.1**	**15**	**0.41**	**20**	**42**	--	**1.1**	--
113A-2.75'	2.75	11/1992	--	--	--	--	--	--	**25,000**	--	--	--	--	--	--	--	**23**	**38**	**0.33**	**6.5**	**18**	--	<0.1	--
114A-2.3'	2.3	11/1992	--	--	--	--	--	--	**230**	--	--	--	--	--	--	--	**0.3**	**27**	**0.53**	**8**	**25**	--	<0.1	--
115A-2.2'	2.2	11/1992	--	--	--	--	--	--	**270**	--	--	--	--	--	--	--	**0.2**	**9.7**	**0.63**	**16**	**38**	--	<0.1	--
117A-3'	3.0	11/1992	--	--	--	--	--	--	**330**	--	--	--	--	--	--	--	<0.1	<1.9	**0.43**	**7.6**	**12**	--	<0.1	--
118A-1.8'	1.8	11/1992	--	--	--	--	--	--	**1,200**	--	--	--	--	--	--	--	**0.3**	**11**	**2**	**28**	**32**	--	**0.77**	--
119B-2'	2.0	11/1992	--	--	--	--	--	--	**26,000**	--	--	--	--	--	--	--	**0.4**	**36**	**0.63**	**7.3**	**16**	--	<0.1	--
120B-3.6'	3.6	11/1992	--	--	--	--	--	--	**48,000**	--	--	--	--	--	--	--	**4.4**	**41**	**0.33**	**7.8**	**15**	--	<0.1	--
121B-3.6'	3.6	11/1992	--	--	--	--	--	--	**750**	--	--	--	--	--	--	--	**0.3**	**23**	**0.44**	**6.9**	**17**	--	<0.1	--
122A-2.7'	2.7	11/1992	--	--	--	--	--	--	**2,400**	--	--	--	--	--	--	--	**0.2**	**25**	**0.61**	**10**	**37**	--	<0.1	--
123A-2.3'	2.3	11/1992	--	--	--	--	--	--	**3,500**	--	--	--	--	--	--	--	<0.1	**72**	**0.65**	**7.3**	**14**	--	<0.1	--
124A-2.1'	2.1	11/1992	--	--	--	--	--	--	**5,500**	--	--	--	--	--	--	--	**15**	**210**	**0.62**	**11**	**38**	--	**0.16**	--
125A-2.7'	2.7	11/1992	--	--	--	--	--	--	<100	--	--	--	--	--	--	--	<0.1	**5.1**	**0.76**	**12**	**31**	--	<0.1	--

Table 1 - Summary of Soil Analytical Results
Petroleum Reclaiming Services, Inc.
Tacoma, Washington

Sample Number	Depth Collected (feet)	Date Collected	Selected Volatile Organic Compounds						TPH	Selected Semivolatile Organic Compounds						Total cPAHs (TEF Adjusted)	Total PCBs	Selected ICP Metals						
			Benzene	Toluene	Ethyl benzene	Xylenes	PCE	TCE		Benzo(a) anthracene	Benzo(b) fluoranthene	Benzo(a) pyrene	Indeno(1,2,3-c,d)pyrene	Dibenzo(a,h) anthracene	Chrysene			Arsenic	Cadmium	Chromium	Copper	Lead	Mercury	Zinc
MW1A-5.0	5.0	03/2008	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<10	--	--	--	--	--	--	--	<0.05	--	--	--	--	--	--	**190**
MW2A-4.0	4.0	03/2008	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<10	--	--	--	--	--	--	--	<0.05	**90**	--	**52**	--	--	--	**52**
MW3A-3.5	3.5	03/2008	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<10	--	--	--	--	--	--	--	--	**35**	--	**63**	--	--	--	**76**
S04B-4.0	4.0	01/2010	<0.028	<0.04	<0.04	<0.08	<0.02	<0.03	<10	--	--	--	--	--	--	--	--	**11**	--	**13**	--	**33**	--	--
MW1B-4.0	4.0	01/2010	<0.028	<0.04	<0.04	<0.08	<0.02	<0.03	<10	--	--	--	--	--	--	--	--	**5.6**	--	**26**	--	**19**	--	--
MTCA Method A Industrial Cleanup Levels			0.03	7	6	9	0.05	0.03	1,630*	NA	NA	NA	NA	NA	NA	2	65.6**	88**	3,500**	2,000	1.4E+5**	1,000	2	1.05E+6**

Notes:
All values are presented in milligrams per kilogram (mg/kg)
-- = Not analyzed for constituent
< = Not detected at the listed laboratory detection limits
NL = Not Listed; no cleanup level has been established for this constituent
Red Bold indicates the detected concentration exceeds Ecology MTCA cleanup level
Bold indicates the detected concentration is below Ecology MTCA cleanup levels
* Method 418.1 used to analyze TPH, which does not quantify fuel type. Cleanup level for TPH was calculated using Interim TPH Policy
**Method C cleanup level; no Method A Industrial value has been established.

PCE = Tetrachloroethylene
TCE = Trichloroethylene
cPAHs = Carcinogenic polyaromatic hydrocarbons
TEF = Toxicity Equivalency Factor; MTCA Table 708-2
PCBs = Polychlorinated Biphenyls
ND = Non-Detect; no cPAHs were detected in the sample, so a total TEF-adjusted value was not calculated
NA = Not applcable; total cPAH cleanup level used for these constituents
TPH = Total Petroleum Hydrocarbons

Table 2 - Summary of Groundwater Analytical Results
Petroleum Reclaiming Services, Inc.
Tacoma, Washington

Monitoring Well	Sample Date	Total Petroleum Hydrocarbons			Volatile Organic Compounds								Metals			PCBs
		Gasoline	Diesel	Lube Oil	Benzene	Toluene	Chloro-benzene	MTBE	PCE	TCE	cis-1,2-DCE	Vinyl Chloride	Arsenic	Chromium	Lead	
Shallow Aquifer Wells																
C03A	4/16/2008	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**16**	<7.0	<1.0	<0.1
	1/26/2010	<100	<200	<400	**4.9**	**1.8**	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**38**	<5.0	<5.0	<0.1
	8/5/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**19.8**	<5.0	<5.0	--
	6/11/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**14.6**	**1.6**	<0.5	<0.1
	9/9/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**13.3**	**0.7**	<0.5	<0.1
	12/10/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**13.1**	**2.3**	<0.5	<0.1
	3/8/2016	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**10**	**0.8**	<0.5	<0.1
	6/13/2017	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**11**	**1.2**	<0.2	<0.1
	6/20/2018	<5	<100	<500	<1	<1	<1	<1	<1.0	<1.0	<1	<0.2	**11**	**0.6**	<0.5	<0.1
	6/20/2019	<50	<100	<500	<1	<1	<1	<1	<1.0	<1.0	<1	<0.2	**9.3**	**0.6**	<0.5	<0.1
MW1A	4/16/2008	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**68**	**14**	<1.0	<0.1
	1/26/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**20**	**6.9**	<5.0	<0.1
	8/5/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**34**	**10.7**	<5.0	--
	6/11/2015	<50	<100	<500	**0.88**	<1.0	<1.0	**2.24**	<1.0	<1.0	<1.0	<0.2	**46.2**	**3**	<0.5	<0.1
	9/8/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**54.3**	**4.3**	<0.5	<0.1
	12/11/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**61.1**	**5**	<0.5	<0.1
	3/9/2016	**55**	<100	<500	**9.3**	<1.0	<1.0	**16.7**	<1.0	<1.0	<1.0	<0.2	**67.1**	**3.1**	<0.5	<0.1
	6/13/2017	<50	**3,200**	**1,300**	<1.0	<1.0	<1.0	**3.8**	<1.0	<1.0	<1.0	<0.2	**46**	**3.6**	<0.2	<0.1
	6/20/2018	<5	<100	<500	**3.2**	<1	<1	<1	<1.0	<1.0	<1	<0.2	**27**	**2.6**	<0.5	<0.1
	6/20/2019	<50	**1,970**	**833**	<1	<1	<1	**1.75**	<1.0	<1.0	<1	<0.2	**14.2**	**2.2**	<0.5	<0.1
	4/2/2020	--	**310**	<500	--	--	--	--	--	--	--	--	--	--	--	--
MW2A	4/16/2008	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**79**	<7.0	<1.0	<0.1
	1/26/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	<5.0	<5.0	<5.0	<0.1
	8/5/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**10.3**	<5.0	<5.0	--
	6/11/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**26.6**	**1.6**	<0.5	<0.1
	9/8/2015	<50	<100	<500	<1.0	**2.3**	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**39**	**1.1**	<0.5	<0.1
	12/11/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**20.6**	**1.5**	<0.5	<0.1
	3/9/2016	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**26**	**0.7**	<0.5	<0.1
	6/13/2017	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**43**	**1.1**	<0.2	<0.1

Table 2 - Summary of Groundwater Analytical Results
Petroleum Reclaiming Services, Inc.
Tacoma, Washington

Monitoring Well	Sample Date	Total Petroleum Hydrocarbons			Volatile Organic Compounds								Metals			PCBs
		Gasoline	Diesel	Lube Oil	Benzene	Toluene	Chloro-benzene	MTBE	PCE	TCE	cis-1,2-DCE	Vinyl Chloride	Arsenic	Chromium	Lead	
MW3A	4/16/2008	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	74	<7.0	<1.0	<0.1
	1/26/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	51	<5.0	<5.0	<0.1
	8/5/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	59.4	13.4	<5.0	--
	6/11/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	38.2	1.4	<0.5	<0.1
	9/9/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	57.2	1.6	<0.5	<0.1
	12/11/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	47.1	4	0.8	<0.1
	3/9/2016	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	35.2	1.1	<0.5	<0.1
	6/13/2017	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	42	2.2	<0.2	<0.1
S02A	4/16/2008	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	6	<7.0	<1.0	<0.1
	1/26/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	7.4	<5.0	<5.0	<0.1
	8/5/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	<5.0	<5.0	<5.0	--
	6/11/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	9.9	1.1	<0.5	<0.1
	9/9/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	3.4	0.7	<0.5	<0.1
	12/10/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	5.9	2	<0.5	<0.1
	3/8/2016	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	5.8	0.6	<0.5	<0.1
	6/13/2017	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	5.3	1	<0.2	<0.1
S04A	4/16/2008	74	<100	<500	<1.0	<1.0	<1.0	<1.0	5	12	28	5	1,300	<7.0	<1.0	<0.1
	1/26/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	6.8	6.2	8.8	<0.2	217	<5.0	<5.0	<0.1
	8/5/2010	143	<200	<400	5.4	<1.0	36.5	<1.0	<1.0	<1.0	1.0	0.48	38	<5.0	<5.0	--
	6/11/2015	50	<100	<500	1.39	<1.0	14.7	<1.0	<1.0	<1.0	2.7	0.9	273	1.2	<0.5	<0.1
	6/11/2015*	52	<100	<500	1.47	<1.0	15.6	<1.0	<1.0	<1.0	2.86	0.8	280	1.3	<0.5	<0.1
	9/8/2015	55	<100	<500	1.5	<1.0	15.9	<1.0	<1.0	<1.0	1.9	1.2	46.9	<0.5	<0.5	<0.1
	12/10/2015	<50	<100	<500	<1.0	<1.0	1.9	<1.0	8.4	<1.0	<1.0	<0.2	197	0.8	<0.5	<0.1
	12/10/2015*	<50	<100	<500	<1.0	<1.0	2	<1.0	8.9	<1.0	<1.0	<0.2	202	0.8	<0.5	<0.1
	3/8/2016	76	<100	<500	<1.0	<1.0	1.5	<1.0	6.1	1.2	<1.0	<0.2	519	<0.5	<0.5	<0.1
	6/13/2017	<50	<100	<500	<1.0	<1.0	10.8	<1.0	<1.0	<1.0	1.3	<0.2	555	1.1	<0.2	<0.1
	6/20/2018	<5	<100	<500	1.3	<1	11.3	<1	<1.0	<1.0	<1	<0.2	291	1.1	<0.5	<0.1
	6/20/2019	<50	110	1,010	1.04	<1	8.16	<1	<1	<1	1.20	<0.2	331	0.7	<0.5	<0.1

Table 2 - Summary of Groundwater Analytical Results
Petroleum Reclaiming Services, Inc.
Tacoma, Washington

Monitoring Well	Sample Date	Total Petroleum Hydrocarbons			Volatile Organic Compounds								Metals			PCBs
		Gasoline	Diesel	Lube Oil	Benzene	Toluene	Chloro-benzene	MTBE	PCE	TCE	cis-1,2-DCE	Vinyl Chloride	Arsenic	Chromium	Lead	
Deep Aquifer Wells																
MW1B	1/26/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	<5.0	**16.5**	<5.0	<0.1
	8/5/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**38**	<5.0	<5.0	--
	12/14/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	<5.0	**16.0**	<5.0	--
	6/11/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**2.3**	**12.9**	<0.5	<0.1
	9/8/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**2.3**	**14**	<0.5	<0.1
	12/11/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**3.4**	**24.9**	<0.5	<0.1
	3/9/2016	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	<1.0	**20.2**	<0.5	<0.1
	6/13/2017	<50	<100	**620**	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**3**	**19**	<0.2	<0.1
	6/20/2018	--	<100	**3,100**	--	--	--	--	--	--	--	--	--	--	--	--
	6/20/2019	--	**320**	<500	--	--	--	--	--	--	--	--	--	--	--	--
	4/2/2020	--	**110**	<500	--	--	--	--	--	--	--	--	--	--	--	--
C03B	4/16/2008	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	**2**	**33**	**3**	<0.1
	1/26/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**6.1**	<5.0	<5.0	<0.1
	8/5/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**38**	<5.0	<5.0	--
	12/14/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**8.4**	**4.3**	<5.0	--
	6/11/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**14.1**	**5.3**	<0.5	<0.1
	9/9/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**12.7**	**3.9**	<0.5	<0.1
	12/10/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**19.8**	**8.9**	<0.5	<0.1
	3/8/2016	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**13.6**	**3.9**	<0.5	<0.1
	3/8/2016*	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**14.1**	**4.1**	<0.5	<0.1
	6/13/2017	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**12**	**5.6**	<0.2	<0.1

Table 2 - Summary of Groundwater Analytical Results
Petroleum Reclaiming Services, Inc.
Tacoma, Washington

Monitoring Well	Sample Date	Total Petroleum Hydrocarbons			Volatile Organic Compounds								Metals			PCBs
		Gasoline	Diesel	Lube Oil	Benzene	Toluene	Chloro-benzene	MTBE	PCE	TCE	cis-1,2-DCE	Vinyl Chloride	Arsenic	Chromium	Lead	
S04B	1/26/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**5.8**	<5.0	<5.0	<0.1
	8/5/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**38**	<5.0	<5.0	--
	12/14/2010	<100	<200	<400	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**10**	**8.5**	<5.0	--
	6/11/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**16.5**	**8.4**	<0.5	<0.1
	9/8/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**18.3**	**8.2**	<0.5	<0.1
	12/10/2015	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**31.1**	**16.9**	<0.5	<0.1
	3/8/2016	<50	<100	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**27.8**	**10.8**	<0.5	<0.1
	6/13/2017	<50	**470**	<500	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.2	**26**	**12**	<0.2	<0.1
PQL		5/50/100	100/200	400/500	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0/0.2	1.0/5.0	5.0	5.0/0.5	0.1
MTCA Method A Cleanup Levels		1,000/800	500	500	5	1,000	160**	20	5	5	16**	0.2	5	50	15	0.1

Notes:
All values are presented in micrograms per liter (µg/L)
*Field duplicate.
**MTCA Method B cleanup level; no Method A cleanup level has been established.
PQL = Practical Quantification Limit (laboratory detection limit)
< = Not detected above laboratory limits
-- = Not analyzed for this constituent
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

MTBE = Methyl Tert-Butyl Ether
PCE = Tetrachloroethylene
TCE = Trichloroethylene
DCE = Dichloroethylene
PCBs = Polychlorinated biphenyls

Table 3 - Identification and Screening of Response Actions and Remediation Technologies, Petroleum Reclaiming Services, Inc., 3003 Taylor Way, Tacoma, WA 98421

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	**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.	**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	**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	**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.

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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	Not 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	Not 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.

APPENDIX A

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STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47775 • Olympia, Washington 98504-7775 • (360) 407-6300

April 16, 2009

CERTIFIED MAIL
7008 2810 0001 3939 8881

Mr. Gary Smith, General Manager
Petroleum Reclaiming Services, Inc.
3003 Taylor Way
Tacoma, WA 98421

Subject: Used Oil Processing Facility Final Closure Plan with Sampling and Analysis Plan for Mitigating Soils at Closure
Facility ID Number WAD980511729

Dear Mr. Smith:

The purpose of this letter is to provide the final approved version of the Petroleum Reclaiming Services Inc. Closure Plan with attached "Sampling and Analysis Plan for Mitigating Soil" (SAPMS) developed by Ecology. The closure plan contains some minor final revisions that are shown in "redline/strikeout" format. I will also send you an electronic version of the closure plan by e-mail for your use.

The attached SAPMS was developed by Ecology to provide you with specific standards and procedures for below-surface cleanup of contaminated soil. This is based on the goal to clean close the site and address any unmitigated releases from historic practices.

It is my understanding that your company is not planning to move at this time, and will not be closing in the near future. Ecology is therefore requiring that you use the cost-estimating tool provided as a part of closure planning with third-party costs.

As required by WAC 173-303-620(1)(e) incorporated by reference in WAC 173-303-515(9), please submit the cost estimate based on this closure plan and attached SAPMS within sixty (60) days of receipt of this letter for Ecology review and approval.

Sincerely,

Kerry A. Graber

Kerry A. Graber
Hazardous Waste Inspector
Southwest Regional Office
(360) 407-0241
Kgra461@ecy.wa.gov

cc: Kaia Petersen
Kimberly Goetz

Ecology approved this revised version of the Petroleum Reclaiming Service's Closure Plan by letter dated April 16, 2009. Comments shown in redline/strikeout, and changes made, are considered final – Kerry Graber

1. Introduction

Pursuant to WAC 173-303-515(9) and WAC 173-303-610(2) and (12). Petroleum Reclaiming Services, Inc. submits a closure plan as follows:

This Closure Plan is for clean closure of the 131,100 gallon oil and glycol recycling units (including the secondary containment system, associated waste staging area, and solvent load and unload area) at PRS Group, Inc. (PRSI) facility~~,~~. PRS Group, Inc. is located in Tacoma, Washington. This Closure ~~plan~~ Plan accomplishes the following in as required under WAC 173-303-120 and WAC 173-303-610(2) and (12):

- **Closure performance Standard.** Establishes the closure performance standard in WAC 173-303-610(2)(b)(ii) for clean closure of the waste management units, and identifies criteria for satisfying the clean closure performance standard through removal and decontamination of waste oil, waste water, glycol and waste residues. (Since soil and groundwater contamination has been found at PRSI, a separate sampling and analysis plan (SAP) has been prepared to confirm whether soils and groundwater at the facility meet the closure performance standards required for soil and groundwater in WAC 173-303-610(2)(b)(i), and, ultimately, the closure performance standard in WAC 173-303-610(2)(a).)

Comment [SoW1]: It doesn't meet the closure performance standards in -610(2)(a) and (2)(b)(i) unless soil and groundwater contamination addressed. It might be appropriate to add a statement that the closure performance standard in -610(2) will be addressed after completion of the work being planned in the SAP. kp

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- **Waste Removal.** Provides an estimate of the maximum inventory of waste on-site during the active operation of the units; provides a detailed description of the methods to be used during closure for removing, transporting, treating, storing and/or disposing of all petroleum wastes, and residues; and identifies the type(s) of on-site and off-site waste management units to be used during closure activities.

- **Decontamination Procedures.** Provides a detailed description of the steps needed to decontaminate all tank systems with petroleum wastes during the operation of the facility. This includes performing an initial inspection of the condition of the waste management units before decontamination; and providing a detailed description of methods that will be used to collect and manage decontamination of waste petroleum and residuals.

1.1 Facility Contact Information

The facility owners are Gary Smith and Tom Smith, who are Managers of PRSI.

Telephone: 253-383-4175. Mailing address: 3003 Taylor Way, Tacoma, WA 98421. At the current time the project manager is Jay Johnson.

1.2 Facility Description

The PRS Group, Inc. facility is currently used for heavy industrial use with 16 aboveground storage tanks located within secondary containment, office space, and concrete pads for loading and off-loading activities.

PRSI's primary activity is a used/waste oil and water treatment facility with ethylene glycol storage (to support recycling) as secondary. Mechanical and chemical treatments are conducted to separate the various phases. Once achieved, the waste water is discharged to the Tacoma Sewer Utilities and the processed oil is marketed as an off-specification oil. Upon receipt of sufficient volume of ethylene glycol, the material is transported off-site permitted facility for recycling purposes.

The EPA/STATE ID number is WAD 980511729

PRSI is owned by Gary Smith and Tom Smith

1.3 Facility History, Function, Location and Layout

From 1977 to 1987, PRSI was owned and operated by Annon May and Wendell Smith. The previous owners submitted a Part A permit application in 1985 to handle, treat and store oils contaminated with <50 mg/kg of PCBs (W001). This permit application provided the facility with interim status for State-only wastes. In 1987, ownership of the site changed to the current owners.

Numerous Part A revised applications have been submitted since that data with the last one being June 1994, adding state waste codes. Over the ~~Life~~ life of the facility PCB oils and spent glycol has been accepted. The following Used Oil Waste Management Units will go through closure if this plan is implemented: 1A, 2A, 3A, 7A, 8A, 9A, 10A, 11A, 12A, 20A, 30A, 1B, 2B, 3B, 4B, and 5B. Tanks 2B and 3B have gone through partial decontamination and are currently used as described below.

In 1992, PRSI conducted partial closure by decontaminating tanks 5A and 6A.

In October 2003, PRSI clean closed tanks 4A, 5A and 6A. All three tank's residuals were pumped out and the tanks were tripled rinsed. Upon complete cleaning they were cut into scrap pieces and delivered to the local scrap metal recycler.

1.4 Products and Production Processes

The facility recycles slop oils (watery used oils). The slop oils are collected by facility drivers or contract drivers and delivered to the facility at the load and unload area. The load and unload area is outside, immediately adjacent to Tank Farms. The slop oils are

moved immediately from the load and unload area to the waste oil treatment tanks, tanks 1A, 2A and 3A. The waste oil is "cooked" in these tanks to separate the oil and waste water. The oil as product, is placed in tanks 11A, 10A, 9A, 8A, and 7A respectively. The waste water is transferred to tank farm B into tanks 1B, 2B, 3B, 4B, 5B. The waste water is chemically treated and transferred to tanks 20A and 30A. The water in 20A and 30A is then tested. The waste water from tanks 20A and 30A are then pumped to the sewer or tank 1A. Tank 1A is used for plant wash water. Tank 12A accepts Glycol from clients and is sold or transferred to a recycling company.

Tank Farm A is separated from Tank Farm B by an approximately three foot high concrete containment wall, and is therefore addressed as a petroleum waste management, separate and apart from Tank Farm B. Tank farm B contains five tanks used for the management of waste water from tank farm A. The containment area was constructed in the late 70s or early 80s and has approximately three feet high walls on all four sides.

1.5 Waste Management and Units

Waste is managed in two locations at the facility. Slop oils (watery used oils) are transferred to tanks 2A and 3A from the load/unload area using pipes and hoses and an electric pump. The slop oils (watery used oils) are then pretreated and cooked. This results in processed oil (product) and waste water. The resulting processed oil is transferred to tanks 7A, 8A, 9A, 10A, and 11A to be sold as product. The waste water is pumped using an electric pump by hoses and pipes to Tank Farm B in tanks 1B, 2B, 3B, 4B and 5B where the waste water is treated chemically. The result is clean water that is transferred to tanks 20A and 30A to be tested.

1.6 Unit Description

DWMU A --- Tank Farm A contains eleven tanks

At times ~~we~~ PRSI may have committed to contracts that forced ~~us~~PRSI to change the service of tanks from wastes to products. Typically ~~we~~ PRSI can accommodate contracts for on-spec oils and only need tanks 7A through 11A for spec oil. Every now and then, because of the time lag in getting the new wastewater discharge testing suite results as required by the Centralized Waste Treatment (CWT), ~~we are~~PRSI is forced to divert incoming oily slops into product tanks 8A-11A.

Tank 1A

Tank 1A is a 9,000 gallon aboveground storage tank placed into operation in 1977, reportedly for storing and treating used oils. In 1987, the tank contents were changed to processed oil. In 1993, it became a slop oil treatment tank. In 2004 the tank contents were changed to a clean water tank. The unit is made up of the tanks and associated piping and the tank is set upon a concrete pad. Waste water that is processed into clean water from Tank Farm B is pumped by pipes and hoses to Tank 20A or 30A. Then the water in 20A and 30A is tested for ultimate discharge. The clean water is then transferred to tank 1A to be used on the facility as wash down water and the balance of the water is discharged down the sewer.

Tank 2A

Tank 2A is a 10,000 gallon aboveground storage tank placed into operation in 1977, reportedly for storing and treating PCB oils. In 1987, the tank contents were changed to processed oil. In 1993, it became a slop oil treatment tank. For a brief time in 1995, it became a storage tank for State Persistent wastes. Currently, the tank is used as a pretreatment and Raw Tower Cook tank for cooking oil. The slop oils (watery used oils) are pumped into the tank by hoses and pipelines, the oil is cooked causing separation of the slop oil into processed oil (the final commodity), and waste water. Waste water is pumped into tank farm B using hoses and pipelines and the final commodity, processed oil, is pumped into Tanks 11A, 10A, 9A, 8A and 7A respectively. As each tank fills with processed oil commodity, the next tank is filled. The first tank that is filled is Tank 11A, the next is 10A and so on unless and until all commodity tanks 7A through 11A are filled.

Tank 3A

Tank 3A is a 10,000 gallon aboveground storage tank placed into operation in 1977, reportedly for storing and treating PCB oils. In 1987, the tank contents were changed to processed oil. In 1993, it became a slop oil treatment tank. For a brief time in 1995, it became a storage tank for State Persistent wastes. Slop oils (watery used oils) are received by tank truck and drums and pumped into the tank through hoses and pipelines. Currently, the tank is used as a pretreatment and Raw Tower Cook tank for cooking oil. The slop oils (watery used oils) are pumped into the tank by hoses and pipelines, the oil is cooked causing separation of the slop oil into processed oil (the final commodity), and waste water. Waste water is pumped into tank farm B using hoses and pipelines and the final commodity, processed oil, is pumped into Tanks 11A, 10A, 9A, 8A and 7A respectively. As each tank fills with processed oil commodity, the next tank is filled. The first tank that is filled is Tank 11A, the next is 10A and so on unless and until all commodity tanks 7A through 11A are filled.

Tank 7A

Tank 7A is a 20,200 gallon aboveground storage tank placed into operation in 1977 as a waste oil treatment tank. In 1987, the tank contents were changed to processed oil. In 1993, it became a slop oil treatment tank. For a brief time in 1995, it became a storage tank for State Persistent wastes. In 2004, the tank contents were again changed to processed oil. Currently, the tank receives processed oil (the final commodity) through Tank 2A and 3A after the slop oils (watery used oils) are cooked and separated.

Tank 8A

Tank 8A is a 22,200 gallon aboveground storage tank placed into operation in 1977 as a waste oil treatment tank. In 1987, the tank contents were changed to processed oil. In 1993, it became a slop oil treatment tank. For a brief time in 1995, it became a storage tank for State Persistent wastes. In 2004, the tank contents were again changed to processed oil. Currently, the tank receives processed oil (the final commodity) through

Tank 2A and 3A after the slop oils (watery used oils) are cooked and separated.

Tank 9A

Tank 9A is a 22,200 gallon aboveground storage tank placed into operation in 1977 as a waste oil treatment tank. In 1987, the tank contents were changed to processed oil. In 1993, it became a slop oil treatment tank. For a brief time in 1995, it became a storage tank for State Persistent wastes. In 2004, the tank contents were again changed to processed oil. Currently, the tank receives processed oil (the final commodity) through Tank 2A and 3A after the slop oils (watery used oils) are cooked and separated.

Tank 10A

Tank 10A is a 20,200 gallon aboveground storage tank placed into operation in 1977 as a waste oil treatment tank. At times since 1977 it has been a storage tank for processed oils. For a brief time in 1995, it became a storage tank for State Persistent wastes. In 2004, the tank contents were again changed to processed oil. Currently, the tank receives processed oil (the final commodity) through Tank 2A and 3A after the slop oils (watery used oils) are cooked and separated.

Tank 11A

Tank 11A is a 20,200 gallon aboveground storage tank placed into operation in 1989 as a waste oil treatment tank. At times since 1989 it has been a storage tank for processed oils. In 2004, the tank contents were again changed to processed oil. Currently, the tank receives processed oil (the final commodity) through Tank 2A and 3A after the slop oils (watery used oils) are cooked and separated.

Tank 12A

Tank 12A is a 7,200 gallon above ground storage tank placed into operation in 1989 as a Waste Lube tank. In 2004 the tank contents were changed to a Glycol holding tank. Customers provide Glycol to PRSI from their facilities along with slop oils. The Glycol is pumped from tank trucks to Tank 12A. The Glycol is never processed by PRSI. Instead, when Tank 12A fills up, it is disposed pumped by pipes and hoses to a tank truck and properly disposed through facilities authorized to process Glycol.

Tank 20A

Tank 20a is a 19,800 gallon water discharge tank. The unit is made up of the tanks and associated piping and the tank is set upon a concrete pad. Waste water that is processed into clean water from Tank Farm B is pumped by pipes and hoses to Tank 20A. The clean water is then pumped into the sewer system.

Tank 30A

Tank 30a is a 26,900 gallon water discharge tank. The unit is made up of the tanks and associated piping and the tank is set upon a concrete pad. Waste water that is processed into clean water from Tank Farm B is pumped by pipes and hoses to Tank 30A. The clean water is then pumped into the sewer system.

Tank Farm B containing five tanks

Tank 1B

Tank 1B is a 20,000 gallon above ground storage tank placed into operation in 1992 as a waste water storage tank. The tank currently is receives waste water from by hoses and pipes from Tanks 2A and 3A and direct from truck tanks using electric pumps. This waste water is treated with chemicals for PH adjustment and phase separation. The clean water is pumped to Tank 20A or 30A to be tested.

Tank 2B

Tank 2B is a 21,200 gallon above ground storage tank placed into operation in 1992 as a storage tank for spent ethylene glycol. In 1996 the Tank was converted to a waste water tank. The tank currently is receives waste water from by hoses and pipes from Tanks 2A and 3A and direct from truck tanks using electric pumps. This waste water is treated with chemicals for PH adjustment and phase separation. The clean water is pumped to Tank 20A or 30A to be tested. ——

Tank 3B

Tank 3B is a 21,200 gallon above ground storage tank placed into operation in 1992 as a storage tank for spent ethylene glycol. In 1996 the Tank was converted to a waste water tank. The tank currently is receives waste water from by hoses and pipes from Tanks 2A and 3A, and direct from truck tanks using electric pumps. This waste water is treated with chemicals for PH adjustment and phase separation. The clean water is pumped to Tank 20A or 30A to be tested.

Tank 4B

Tank 4B is a 20,300 gallon above ground storage tank placed into operation in 1992 as a waste water storage tank. The tank currently is receives waste water from by hoses and pipes from Tanks 2A and 3A, and direct from truck tanks using electric pumps. This waste water is treated with chemicals for PH adjustment and phase separation. The clean water is pumped to Tank 20A or 30A to be tested.

Tank 5B

Tank 5B is a 21,200 gallon above ground storage tank placed into operation in 1992 as a waste water storage tank. The tank currently is receives waste water from by hoses and pipes from Tanks 2A and 3A, and direct from truck tanks using electric pumps. This waste water is treated with chemicals for PH adjustment and phase separation. The clean water is pumped to Tank 20A or 30A to be tested.

1.6.1 Current Maximum Waste Inventory

The current maximum amount of waste inventory that could be present are waste oils in tanks 2A, 3A and 12A, waste water in tanks 1B, 2B, 3B, 4B and 5B. Therefore the maximum amounts of waste by unit is as follows:

Tank 2A

Tank 2A is a waste oil treatment tank. Waste oil is pumped by electric pump through hoses and pipes from the trucks to tank 2A where it is processed as described in section 1.6 above. The tank unit holds a maximum of 10,100 gallons in used oil. Therefore the total maximum waste oil inventory is 10,100 gallons. Waste oil is not accumulated, staged, or stored in the load unload area.

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Tank 3A

Tank 3A is a waste oil treatment tank. Waste oil is pumped by electric pump through hoses and pipes from the trucks to tank 3A where it is processed as described in section 1.6 above. The tank unit holds a maximum of 10,100 gallons in used oil. Therefore the total maximum waste oil inventory is 10,100 gallons. Waste oil is not accumulated, staged, or stored in the load unload area.

Tank 12A

Tank 12A is a Glycol holding storage tank. Its use is described in section 1.6 above. The Glycol is stored for transportation offsite to be recycled. The tank unit holds a maximum 7,200 gallons of Glycol, therefore the maximum glycol inventory for this unit is 7,200 gallons.

Tank 1B

Tank 1B is a waste water treatment tank. Waste water from tanks 2A and 3A are pumped by electric pump through hoses and pipes to tanks to tank 1B. The waste water is treated as described in 1.6 above. The tank unit holds a maximum of 20,000 gallons of waste water, therefore the maximum waste water inventory for this unit is 20,000 gallons.

Tank 2B

Tank 2B is a waste water treatment tank. Waste water from tanks 2A and 3A are pumped by electric pump through hoses and pipes to tanks to tank 2B. The waste water is treated as described in 1.6 above. The tank unit holds a maximum of 21,200 gallons of waste water, therefore the maximum waste water inventory for this unit is 21,200 gallons.

Tank 3B

Tank 3B is a waste water treatment tank. Waste water from tanks 2A and 3A are pumped by electric pump through hoses and pipes to tanks to tank 3B. The waste water is treated as described in 1.6 above. The tank unit holds a maximum of 21,200 gallons of waste water, therefore the maximum waste water inventory for this unit is 21,200 gallons.

Tank 4B

Tank 4B is a waste water treatment tank. Waste water from tanks 2A and 3A are pumped by electric pump through hoses and pipes to tanks to tank 4B. The waste water is treated as described in 1.6 above. The tank unit holds a maximum of 20,300 gallons of waste water, therefore the maximum waste water inventory for this unit is 20,300 gallons.

Tank 5B

Tank 5B is a waste water treatment tank. Waste water from tanks 2A and 3A are pumped by electric pump through hoses and pipes to tanks to tank 5B. The waste water is treated as described in 1.6 above. The tank unit holds a maximum of 21,000 gallons of waste water, therefore the maximum waste water inventory for this unit is 21,000 gallons.

There is maximum of 131,100 gallons of waste inventory in all tanks that can contain waste at one time.

2. Closure Performance Standard

The closure will require the emptying and decontamination of tanks 1A, 2A, 3A, 7A, 8A, 9A, 10A, 11A, 12A, 20A, 30A, 1B, 2B, 3B, 4B, and 5B. ~~1A, 2A, 3A, 12A, 1B, 2B, 3B, 4B and 5B. Tanks 7A, 8A, 9A, 10A and 11A contain product and will be sold at the time of closure and then those tanks will be decontaminated.~~ In addition, the containment system and piping in the secondary containment systems will be decontaminated and removed. These units will be closed in a manner that complies with the performance standards in WAC 173-303-610(2)(c)(ii)~~(a) and, therefore, achieves clean closure~~. The closure of the plant anticipates emptying, decontamination and removal of the tanks, secondary containment and piping from the site as described above. It is anticipated that the plant will essentially contain the fixtures as identified in Appendix 1.

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Comment [SoW2]: This list is consistent with my email of December 21, 2007, and with the statement on page 2 of this Closure Plan. kp

Comment [SoW3]: It doesn't meet the closure performance standards in -610(2)(a) and (2)(b)(i) unless soil and groundwater contamination addressed. It might be appropriate to add a statement that the closure performance standard in -610(2) will be addressed after completion of the work being planned in the SAP.

The objectives of ~~closure activities at~~this Closure Plan for the oil recycling plant are as follows:

(1) Minimize the need for further maintenance; (2) Control, minimize, or eliminate, to the extent necessary to protect human health and the environment, the post-closure escape of waste oil and waste water, and glycol into the ground, surface water, ground water, or to the atmosphere (3) Remove all waste and waste residues from the above cited tanks and properly dispose of the waste offsite.

In addition, this plan considers that the plant is fully utilized at the time of closure and that each tank is filled with the processed oil, slop oil (watery used oils) and waste water as described in sections 1.6 and 1.6.1 above.

To accomplish the above objectives, the storage tanks containing processed oil, slop oils (watery used oils) and waste water will need to be emptied, their contents sold and/or treated. After the tanks are emptied, they will need to be cleaned. All tanks on the

facility that are described in sections 1.6 and 1.6.1 will be emptied in accordance with the objectives defined in this section 2.

The closure will use the "Alternative Treatment Standard" to clean the surface of concrete. At least 0.6 cm of the concrete surface will be removed and all waste and waste residues from the concrete will be properly disposed offsite, if appropriate, at LRI in Pierce County. If concrete is determined to be hazardous waste it will be profiled into a local ~~Federally~~ federally regulated TSDF.

In addition, Monitoring Well SO4A will be abandoned, the general area excavated and removal of contaminated soils in the vicinity per our Sampling and Analysis Plan (SAP). Field tests will be used (for example, a PID) to determine extent of the area for excavation. Confirmational samples will be taken after excavation is complete.

3. Closure Activities

To affect the removal of the contents of the storage tanks and to meet the closure standards of the above Section 2, the closure activities listed below will need to be performed.

Tank 1A

Tank 1A is a 10,000 gallon above ground storage tank. It is currently a clean water tank as described in Section 1.6 above. This tank contains only clean water and does not contain any waste. Its contents will be transferred to a B yard tank to eventually be drained into the sewer. The tank will then be rinsed. The rinse water will be loaded onto a tank truck for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 2A

Tank 2A is a 10,100 gallon above ground storage tank that may contain slop oils (watery used oils) at the time of closure. The procedure for decontamination of this tank is to complete chemical treatment of its contents; transfer water to one of the B yard tanks and transfer treated oil to one of the processed oil tanks (7A - 11A); off load the remainder to a tank truck for disposal offsite. The tank will then be rinsed. The rinse water will be loaded onto the same tank truck for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 3A

Tank 3A is a 10,100 gallon above ground storage tank that may contain slop oils (watery used oils) at the time of closure. The procedure for decontamination of this tank is to complete chemical treatment of its contents; transfer water to one of the B yard tanks and transfer treated oil to one of the processed oil tanks (7A - 11A); off load the remainder to a tank truck for disposal offsite. The tank will then be rinsed. The rinse water will be loaded onto the same tank truck for disposal offsite. At this time the PE will obtain

samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 7A

Tank 7A is a 20,200 gallon aboveground storage tank that may contain processed oil, a commodity, at the time of closure. The contents will be loaded to tank truck and sold on the open market. The tank will then be rinsed. The rinse water will be loaded onto a tank truck for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 8A

Tank 8A is a 22,200 gallon aboveground storage tank that may contain processed oil, a commodity, at the time of closure. The contents will be loaded to tank truck and sold on the open market. The tank will then be rinsed. The rinse water will be loaded onto a tank truck for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 9A

Tank 9A is a 22,200 gallon aboveground storage tank that may contain processed oil, a commodity, at the time of closure. The contents will be loaded to tank truck and sold on the open market. The tank will then be rinsed. The rinse water will be loaded onto a tank truck for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 10A

Tank 10A is a 20,200 gallon aboveground storage tank that may contain processed oil, a commodity, at the time of closure. The contents will be loaded to tank truck and sold on the open market. The tank will then be rinsed. The rinse water will be loaded onto a tank truck for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 11A

Tank 11A is a 20,200 gallon aboveground storage tank that may contain processed oil, a commodity, at the time of closure. The contents will be loaded to tank truck and sold on the open market. The tank will then be rinsed. The rinse water will be loaded onto a tank truck for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 12A

Tank 12A is a 7,200 gallon above ground storage tank that may contain used Glycol at the time of closure. The contents will be loaded to tank truck and sold on the open market. The tank will then be rinsed. The rinse water will be loaded onto a tank truck

for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 20A

Tank 20A is a 19,800 gallon water discharge tank. It is a clean water tank as described in Section 1.6 above. This tank does not contain waste and its contents will be drained into the sewer at the time of closure.

Tank 30A

Tank 30A is a 26,900 gallon water discharge tank. It is a clean water tank as described in Section 1.6 above. This tank does not contain waste and its contents will be drained into the sewer at the time of closure.

Tank 1B

Tank 1B is a 20,000 gallon above ground storage. It is a waste water tank as described in Section 1.6 above. The procedure for decontamination of this tank is to complete the chemical treatment of its contents and transfer treated waters to either 20A or /30A for ultimate discharge to the local sewer utility. The tank will then be pumped/rinsed onto a tank truck for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 2B

Tank 2B is a 21,200 gallon above ground storage tank. It is a waste water tank as described in Section 1.6 above. The procedure for decontamination of this tank is to complete the chemical treatment of its contents and transfer treated waters to either 20A or /30A for ultimate discharge to the local sewer utility. The tank will then be pumped/rinsed onto a tank truck for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 3B

Tank 3B is a 21,200 gallon above ground storage tank. It is a waste water tank as described in Section 1.6 above. The procedure for decontamination of this tank is to complete the chemical treatment of its contents and transfer treated waters to either 20A or /30A for ultimate discharge to the local sewer utility. The tank will then be pumped/rinsed onto a tank truck for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 4B

Tank 4B is a 20,300 gallon above ground storage tank. It is a waste water tank as described in Section 1.6 above. The procedure for decontamination of this tank is to complete the chemical treatment of its contents and transfer treated waters to either 20~~/~~A or 30A for ultimate discharge to the local sewer utility. The tank will then be pumped/rinsed onto a tank truck for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

Tank 5B

Tank 5B is a 21,000 gallon above ground storage tank. It is a waste water tank as described in Section 1.6 above. The procedure for decontamination of this tank is to complete the chemical treatment of its contents and transfer treated waters to either 20~~/~~A or 30A for ultimate discharge to the local sewer utility. The tank will then be pumped/rinsed onto a tank truck for disposal offsite. At this time the PE will obtain samples per Section 3.7. This procedure will provide for a complete decontamination of the tank.

3.1 Removal of Wastes and Waste Residues

All wastes and residues in all units will be removed using the following procedure. (1) ~~the~~ The waste and waste residue for each unit will be pumped using pipes and hoses through an electric pump to tank trucks for removal to be disposed at an appropriate offsite waste facility. (2) Clean water will be disposed of through the sewer. (3) All waste material can be cleaned from the empty units using high pressure washers. (4) The remaining water in the units will be pumped using pipes and hoses through an electric pump to tank trucks for removal to an appropriate offsite waste facility.

PRSI will sample and analyze waste products in compliance with all federal, state, and local regulations in effect at the time of closure. See Table 1 for further details.

3.3 Unit Inspection Prior to Decontamination

PRSI will inspect the tanks for any openings, punctures, staining along the metal seams, cracks or other openings on the tanks and will seal or repair all holes, leaks, or cracks or other openings in the containment system.

PRSI will notify Ecology no less than 10 working days prior to conducting the Unit Inspection, so Ecology will have the opportunity to oversee the inspection.

PRSI will maintain a record of the location of any holes, leaks or cracks in the containment system. The records will be kept in PRSI's operating record or in the field notebook(s) used by the independent registered professional engineer overseeing foreclosure.

PRSI will clean, inspect and evaluate cracks and other openings in the concrete containment surfaces. The inspection shall require the following procedure~~:~~s.

3.3.1 Remove Dirt

The entire concrete pad and containment area within the tank farm will be mechanically cleaned by sweeping, and/or vacuuming all accessible surfaces. Accumulated concrete hazardous waste debris residue will be placed in Department of Transportation (DOT)-approved 55-gallon drums or bins, and disposed of as hazardous waste.

PRSI will sample and analyze waste products in compliance with all federal, state, and local regulations in effect at the time of closure.

3.3.3 Concrete Inspection

Upon completion of dirt removal the cleaned areas will be visually inspected for cracks and other openings greater than 1/4 inch in width. All cracks and damaged (i.e., failed or broken concrete) areas will be marked with spray paint. Photographs and/or written documentation identifying and describing the location and dimensions of all identified cracks or openings will be entered into the field log, and incorporated into the final closure report.

Cracks and damaged areas and other openings will be sealed and repaired prior to and during decontamination. ~~Our~~ The SAP will address any underlying contamination, staining and hot spots encountered during removal of concrete containment.

3.4 Decontamination

Metal tanks, containers, and piping
Interior metal surfaces of the tank systems, including piping, will be decontaminated using water washing and spraying until they meet the clean debris surface standard.

"Clean debris surface" means the surface, when viewed without magnification, shall be free of all visible contaminated soil and hazardous waste except that residual staining from soil and waste consisting of light shadows, slight streaks, or minor discolorations, and soil and waste in cracks, crevices, and pits may be present provided that such staining and waste and soil in cracks, crevices, and pits shall be limited to more than 5% of each square inch of surface area.

When decontamination is complete, wash water used in this process will be appropriately treated or loaded to trucks and disposed of off site. An independent qualified registered professional engineer will certify tanks are decontaminated to meet the clean debris surface standard and Ecology will then verify the closure certification. The tanks will be removed from the site after decontamination.

PRSI will sample and analyze waste products in compliance with all federal, state, and local regulations in effect at the time of closure.

Concrete Containment System, off-loading area and former glycol process area

3.4.1 Scarification Using the Alternative Treatment Standard

Scarification will proceed over the entire containment area with the PENTAK dustless decontamination and surface preparation system. The scarification shroud will be passed over the affected area, removing approximately 0.1 cm of concrete at each pass. The process will be repeated until 0.6 cm of concrete material has been removed. The scarification will be observed, and detailed field logs will be kept to document that the treatment standard has been met.

PRSI will sample and analyze waste products in compliance with all federal, state, and local regulations in effect at the time of closure.

3.4.2 Concrete Inspection

Upon completion of scarification and removal of 0.6 cm of surface, pavement contained within the decontaminated area will be visually inspected for cracks and other openings greater than 1/4 inch in width. All cracks and damaged (i.e., failed or broken concrete) areas will be marked with spray paint. Photographs and/or written documentation identifying and describing the location and dimensions of all identified cracks or openings will be entered into the field log, and incorporated into the final closure report.

3.4.3 Concrete Chip Sampling

Bias samples will be taken at cracks, gaps, stains, and the location of historic spills. Also, random samples at the rate of one per 3,000 square feet of containment will be obtained. The concrete samples should be analyzed for site constitutents of concern including metals, VOCs, NWTPH-Gx, and NWTPH-Dx.

3.4.4 Grinding and Notching

Concrete cracks will be ground down or sawed to a depth where the crack is less than 1/4 inch wide, but not less than one inch deep. The notches will be at least on inch width at the surface, and smoothly tapered to a point, in a "wedge" shape. Care must be taken to provide a tapered wedge, with no crevices or pits to promote entrapment of air bubbles or pockets during installation of the patch and overlay material.

Cracks and damaged areas and other openings will be sealed and repaired prior to and during decontamination.

PRSI will remove, disassemble, and decontaminate any tanks or concrete surfaces that cannot be decontaminated using the above procedure. All concrete will be removed from the site after decontamination.

PRSI will sample and analyze waste products in compliance with all federal, state, and

local regulations in effect at the time of closure.

3.5 Identifying and Managing Contaminated Environmental Media

Currently, the slop oil tanks, waste water tanks, glycol tank and processed oil are completely within a well maintained, bermed, sealed concrete containment structure; however, since soil and groundwater contamination has been found at PRSI requires a draft sampling and analysis plan (SAP) to confirm soils and groundwater at the facility meet the closure performance standards required for soil and groundwater in WAC 173-303-610(2)(b)(i)

PRSI will sample and analyze waste products in compliance with all federal, state, and local regulations in effect at the time of closure.

3.6 Confirming Clean Closure

Within 60 Days of completing the closure activities, PRSI will submit by registered mail to Ecology, a closure certification. The closure certification must certify that the dangerous waste recycling units or used oil processing units were closed in accordance with the requirements and specifications of ~~the~~ this approved closure plan. The facility owner/operator must sign the certification, and the "independent qualified registered professional engineer responsible for overseeing the closure must sign and stamp the certification.

When closure activities are complete, PRSI anticipates that all wastes and waste residues will be removed, the unit components, equipment and containment systems will have been decontaminated and removed from the site.

PRSI' PE or his agent will confirm that the tanks to be decontaminated as identified in sections 1.6 and 1.6.1 are decontaminated and meets the clean closure standard by visually inspecting all parts of each. Photos and field notes will be used to confirm that these standards are achieved.

The PE's report for confirming clean closure shall include a detailed summary of all decontamination activities, all field notes and photographs relating to closure activities, including the results of the inspection of tanks, piping, ancillary equipment and secondary containment for cracks, gaps, and staining. Also to be included is data from sampling and analytical activities including documentation of sampling procedures, sampling locations, quality assurance/quality control and chain of custody, and analytical results. Documentation of the final disposition of all dangerous wastes and dangerous waste residues, including contaminated media, debris, and all treatment residues.

PRSI will sample and analyze waste products in compliance with all federal, state, and local regulations in effect at the time of closure.

Section 3.7 Sampling and Analysis Plan

3.7.1 SAMPLING AND ANALYSIS PROCEDURES

This section covers sampling and analysis procedures for closure. The purpose and objectives of sampling procedures, sampling protocols, responsibilities, and project schedule are described in this section. Table 1 provides detail on each affected tank as to the each tanks current and historical usage and the appropriate analysis.

3.7.2 PURPOSE AND OBJECTIVE

The purpose and objective of sampling tank rinsate is to confirm decontamination of all dangerous waste tanks that will not be dismantled and managed according to the "scrap metal exemption." Quality Assurance and Quality Control activities are to ensure that both the sampler and laboratory are performing properly to result in data of sufficient quality.

3.7.3 RESPONSIBILITIES

Coordination of sampling and analysis activities will be conducted by the Environmental Affairs Manager or Operations Manager. Safety concerns of sampling will be the responsibility of the Health and Safety Director.

3.7.4 PROJECT SCHEDULE

Sampling activities will commence upon final decontamination of each of the metal tanks at the facility location. It is estimated to take two months to complete all sampling activities for tanks.

3.7.5 SAMPLING PROTOCOLS

The Health and Safety Director will inform the sampler of the risks involved with sampling activities and ensure proper protective equipment is utilized. One grab sample per each tank will be obtained and placed in a four ounce glass sampling jar with a Teflon lid. Each tank's sample will be uniquely identified by the tank number. The samples will be of the final rinse water.

Samples will be collected and analyzed to ensure representative and reliable results. To demonstrate this, rinsate blanks will be obtained to determine if decontamination procedures have been sufficient. Also, field blanks will be obtained from the laboratory and opened on-site to assess sampling methods and lab procedures. Each sample will be analyzed via standard methods and Quality Assurance and quality control (QA/QC) activities will include a field notebook maintained by the Professional Engineer.

The following Tank Sampling Equipment will be present on-site.

- Sampling Plan
- Safety equipment, as specified in the Health and Safety Plan

- Tape Measure
- Camera
- Stainless steel bucket or bowl
- Sample containers
- Zip lock bags
- Logbook
- Labels
- Chain of Custody forms
- Coolers
- Ice
- Glass thieves

Upon notification by the cleaning contractor that the final wash has been completed a sample will be obtained as follows:

- Certified clean laboratory jars will be obtained and used throughout the sampling activities.

- Wear clean latex exam gloves for each sample.

- Obtain the sample using a glass thief and transfer into the sample jar.

- Record all information on the sample data sheet and logbook.

- Label the container with the appropriate sample tag.

- Place sample in iced cooler.

- Dispose of the glass thief.

The samples will be transported to an accredited laboratory under chain of custody protocol for analysis. Table 1 indicates what analysis will be performed on what tank.

3.8 Role of the Independent Qualified Registered Professional Engineer

An independent qualified registered professional engineer will become familiar with PRSI's closure activities by observing field activities and reviewing records. At a minimum, this will include field observation and a review of records of the following activities:

(1) Removal of waste and disposition of waste to ensure the removal was complete and materials were properly disposed.

(2) Decontamination procedures and results to ensure that the closure plan for decontamination was followed and the clean closure standard for decontamination was achieved - this will include inspecting metal tanks and the concrete containment system after decontamination to confirm that a "clean debris surface" and other decontamination performance standards

are achieved.

(3) Management of decontamination residuals and demolition debris to ensure management was properly carried-out.

When closure is complete, the independent qualified registered professional engineer will sign and stamp PRSI's certification of clean closure.

3.9 Certification of Clean Closure

Within 60 days of closure of the oil recycling plant, PRSI will submit to Ecology, by registered mail, certification that the unit has been closed in accordance with this closure plan. The certification will be signed by PRSI's owner. PRSI's owner will make the following certification:

I certify under penalty of the law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based upon my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing of violations.

The closure certification also will be signed and stamped by an independent qualified registered professional engineer who is familiar with PRSI's closure activities.

PRSI will submit the following information to support its closure certification:

(1) All field notes and photographs related to closure activities, including the results of the inspection of the unit and containment system for cracks and other openings prior to decontamination.

(2) A description of any minor deviations from the approved closure plan and justification for these deviations and the documentation of approvals by Ecology.

(3) Documentation of the final disposition of all wastes and waste residues, including contaminated media, debris, and all treatment residuals.

(4) A description of what the unit area looks like at completion of closure, including a description of what parts of the former unit, if any, will remain after closure.

3.10 Conditions That Will Be Achieved When Closure Is Complete

The conditions that will be achieved at closure include the emptying and decontamination of tanks 1A, 2A, 3A, 7A, 8A, 9A, 10A, 11A, 12A, 20A, 30A, 1B, 2B, 3B, 4B, and 5B.~~2A, 3A, 12A, 1B, 2B, 3B, 4B and 5B. Tanks 7A, 8A, 9A, 10A and 11A contain product and will be sold after closure or undergo demolition.~~ These units will be closed in a manner that complies with the performance standards in WAC 173-303-610(2)(b)(ii)~~(a) and, therefore, achieve clean closure~~. The closure of the plant anticipates the emptying and decontamination of the tanks described above as well as removal from the site. It is anticipated that the plant will essentially contain the fixtures as identified in Figure 1.

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Comment [SoW4]: This list is consistent with my email of December 21, 2007, and with the statement on page 2 of this Closure Plan. kp

Comment [SoW5]: It doesn't meet the closure performance standards in -610(2)(a) and (2)(b)(i) unless soil and groundwater contamination addressed. It might be appropriate to add a statement that the closure performance standard in -610(2) will be addressed after completion of the work being planned in the SAP.

4. Closure Schedule and Timeframe

4.1 Closure Schedule

Notification of intent to close will be sent to Ecology at least 45 days before beginning final closure of the oil processing units. PRS Group, Inc. will complete closure activities in accordance with the approved closure plan within 180 days. PRS Group, Inc. will submit closure certification to Ecology within 60 days following completion of closure activities at each closing unit and/or completion of final facility closure.

5. Cost of Closure

5.1 Closure Cost Estimate

The information presented in this section for implementing the Closure Plan has been prepared in accordance with WAC 173-303-620(3). The following assumptions were used in developing the cost estimate:

(1) A third party will be used to conduct closure activities.
(2) The maximum waste volume will be present on site and managed during closure.
(3) Salvage value salable product is not included in the closure cost estimate. The salvage value for recyclable oil was determined based on the average value of recycled oil in the past calendar year.
(4) Costs will be incurred for management of wastes handled during closure. Closure certification activities will be conducted by an independent qualified registered professional engineer registered in Washington State and a certification that closure has been done in accordance with the approved closure plan will be submitted to Ecology as required in WAC 173-303-610(6).

The closure cost estimate will be adjusted annually for inflation as specified in WAC 173-303-620(3)(c)(i) and (ii). Costs for closure labor, equipment, and analytical services are based on currently available rates. At the time of implementation of this Closure Plan, PRSI reserves the option to use any other appropriately-permitted facility for disposal or recycling of wastes.

The cost estimate for closure of the recycling unit at PRSI is presented in Appendix B, along with a more detailed breakdown of the cost estimates.

5.2 Financial Assurance for Closure

PRS Group, Inc. will meet the financial assurance requirements specified under WAC 173-303-620(4) through continual maintenance of a financial assurance mechanism for closure with the Department of Ecology. The amount of the mechanism will be no less than the closure cost estimate provided in Appendix B of this Closure Plan. PRS Group, Inc. will provide documentation of financial assurance in at least the amount of the current cost estimate, as required by WAC 173-303-620(4) and (10). PRS Group, Inc. has chosen to use a trust account as its financial assurance mechanism for closure. The Department of Ecology shall be named as a secondary beneficiary on the trust account. Details of the financial assurance insurance policy for closure are provided in Appendix C.

5.3 Financial Assurance for Liability

PRS Group, Inc. will meet the financial assurance requirements for specified under WAC 173-303-620(8) through an insurance policy. Details of the insurance policy are provided in Appendix C.

6. Figures and Tables

Figure 1: Plan view of facility showing all locations where waste is managed.

Table 1 Individual Tank Detail and applicable analysis.

7. Appendices

Appendix A: Closure Cost Estimate

Appendix B: Financial Assurance for Closure Through a Trust Account

Appendix C: Financial Assurance for Liability Through Property Casualty Insurance policy

Table 1 - Individual Tank Detail

Tank No. (Capacity)	Previous Use(s)	Previous Contents	Current Use	Type of Bottle required	Appropriate analysis
Tank 1A (10,000 G)	• Placed into operation in 1977 for storage and treatment of PCB oils (1977-1987) • Storage of processed oils (1987-1993) • Slop oil treatment tank (1993-2004) • WP02 storage	Halogenated and PCB oils	Storage of clean water (since 2004)	250 ml; HCL preserved HDPE 1 liter amber - non preserved 250 ml; preserved w/nitric HDPE	• Total Halogens • PCBs • Total Metals
Tank 2A (10,000 G)	• Placed into operation in 1977 for storage and treatment of PCB oils (1977-1987) • Storage of processed oils (1987-1993) • Slop oil treatment tank (1993-present) • WP02 storage	Halogenated and PCB oils	Treatment of waste oil (since 1993)	250 ml; HCL preserved HDPE 1 liter amber - non preserved 250 ml; preserved w/nitric HDPE	• Total Halogens • PCBs • Total Metals
Tank 3A (10,000 G)	• Placed into operation in 1977 for storage and treatment of PCB oils (1977-1987) • Storage of processed oils (1987-1993) • Slop oil treatment tank (1993-present) • WP02 storage	Halogenated and PCB oils	Treatment of waste oil (since 1993)	250 ml; HCL preserved HDPE 1 liter amber - non preserved 250 ml; preserved w/nitric HDPE	• Total Halogens • PCBs • Total Metals
Tank 7A (20,200 G)	• Placed into operation in ~~1989~~ 1977 for treatment of waste oil • Storage of processed oils (1987-1993) • Slop oil treatment tank (1993-	Halogenated oils	Storage of processed oil (since 2004)	250 ml; HCL preserved HDPE 250 ml; preserved w/nitric HDPE	• Total Halogens • Total Metals

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Table 1 - Individual Tank Detail

Tank No. (Capacity)	Previous Use(s)	Previous Contents	Current Use	Type of Bottle required	Appropriate analysis
	2004) • WP02 storage				
Tank 8A (22,200 G)	• Placed into operation in 1977 for treatment of waste oil • Storage of processed oils (1987-1993) • Slop oil treatment tank (1993-2004) • WP02 storage	Halogenated oils	Storage of processed oil (since 2004)	250 ml; HCL preserved HDPE 250 ml; preserved w/nitric HDPE	• Total Halogens • Total Metals
Tank 9A (22,200 G)	• Placed into operation in 1977 for treatment of waste oil • Storage of processed oils (1987-1993) • Slop oil treatment tank (1993-2004) • WP02 storage	Halogenated oils	Storage of processed oil (since 2004)	250 ml; HCL preserved HDPE 250 ml; preserved w/nitric HDPE	• Total Halogens • Total Metals
Tank 10A (20,200 G)	• Placed into operation in 1977 for treatment of waste oil • At times since 1977 ~~(?)~~ has been used for storage of processed oils • WP02 storage	Halogenated oils	Storage of processed oil (since 2004)	250 ml; HCL preserved HDPE 250 ml; preserved w/nitric HDPE	• Total Halogens • Total Metals
Tank 11A (20,200 G)	• Placed into operation in 1989 for treatment of waste oil • At times since ~~1977~~ 1989 has been used for storage of processed oils		Storage of processed oil (since 2004)	250 ml; HCL preserved HDPE 250 ml; preserved w/nitric HDPE	• Total Halogens • Total Metals
Tank 12A (7,200 G)	• Placed into operation in 1989 for storage of waste lube oil	~~Ethylene glycol~~Waste lube oil	Glycol holding tank (since 2004)	2 oz plastic 250 ml; preserved w/nitric HDPE	• Ethylene glycol • Total Metals

Table 1 - Individual Tank Detail

Tank No. (Capacity)	Previous Use(s)	Previous Contents	Current Use	Type of Bottle required	Appropriate analysis
Tank 20A (19,800 G)	• Storage of ~~Treated~~ treated ~~Waste~~ waste ~~W~~water for ~~Discharge~~discharge		Water discharge tank	N/A	• N/A
Tank 30A (26,900 G)	• Storage of ~~Treated~~ treated ~~Waste~~ waste ~~W~~water for ~~Discharge~~discharge		Water discharge tank	N/A	• N/A
Tank 1B (20,000 G)	• Placed into operation in 1992 for storage of wastewater. Also receives waters from slop oil tanks.		Storage and treatment of wastewater (since 1992)	250 ml; HCL preserved HDPE 250 ml; preserved w/nitric HDPE	• Total Halogens • Total Metals
Tank 2B (21,200 G)	• Placed into operation in 1992 for storage of spent ethylene glycol. In 1996 contents were converted to wastewater from slop oil tanks.	Ethylene glycol	Storage and treatment of wastewater (since 1996)	250 ml; HCL preserved HDPE 250 ml; preserved w/nitric HDPE 2 oz plastic	• Total Halogens • Total Metals • Ethylene glycol
Tank 3B (21,200 G)	• Placed into operation in 1992 for storage of spent ethylene glycol. In 1996 contents were converted to wastewater from slop oil tanks.	Ethylene glycol	Storage and treatment of wastewater (since 1996)	250 ml; HCL preserved HDPE 250 ml; preserved w/nitric HDPE 2 oz plastic	• Total Halogens • Total Metals • Ethylene glycol
Tank 4B (20,300 G)	• Placed into operation in 1992 for storage of wastewater. Also receives waters from slop oil tanks.		Storage and treatment of wastewater (since 1992)	250 ml; HCL preserved HDPE 250 ml; preserved	• Total Halogens • Total Metals

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Table 1 - Individual Tank Detail

Tank No. (Capacity)	Previous Use(s)	Previous Contents	Current Use	Type of Bottle required	Appropriate analysis
				w/nitric HDPE	
Tank 5B (21,200 G)	• Placed into operation in 1992 for storage of wastewater. Also receives waters from slop oil tanks.		Storage and treatment of wastewater (since 1992)	250 ml; HCL preserved HDPE 250 ml; preserved w/nitric HDPE	• Total Halogens • Total Metals

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Petroleum Reclaiming Services Inc.
Draft Sampling and Analysis Plan
for Mitigating Soils at Closure

April 2009

Developed by Department of Ecology
Hazardous Waste and Toxics Reduction Program
Southwest Regional Office

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1 Parameter, Applicable Methods and Required Reporting Limits

2 Number of Samples for Excavated Soil

3 Analytical Methods, Containers, Preservation and Holding Time Requirements

4 Soil Excavation and Sampling Matrix Summary

1.0 Introduction

The purpose of this plan is to provide a basic blueprint for soil sampling at the closure of the Petroleum Reclaiming Services Inc. (hereinafter PRS) facility at Taylor Way, Tacoma, Washington. Since it is PRS's stated goal to remove all facility structures and remove contaminated soil to the greatest extent possible, this plan provides in general the approach advocated by Ecology to accomplish this goal.

The closure sampling and analysis plan for mitigating soils (hereinafter referred to as SAPMS) provides enough detail to use to add the estimated number of samples to the final closure cost estimate for the closure plan. Ecology will use the SAPMS to correctly reflect the complete costs of closure in the closure cost estimate.

This plan may be revised at any time with notification and written agreement by the Department of Ecology (Ecology) site contact.

1.1 Background

For a full account of the history of this used oil processing facility please refer to PRS's most recent closure plan. The PRS facility conducted used oil transfer, treatment of oily water, and blending of used oil fuel into on-specification products. Past practices included acceptance of hazardous wastes either through accident or mismanagement of the profile system. The facility has accepted antifreeze in the past and current processes antifreeze loads through a filtration system. The facility has a pre-treatment permit for the discharge of treated wastewater to the City of Tacoma's sewage treatment plant, and a solid waste permit for handling oily solids, stabilizing them, and sending them to the landfill by permission from the Tacoma-Pierce County Health Department.

The closure approach is to remove all of the above-ground facility structures consisting of two tank farms, a laboratory building, product dispensing area, solidification area, and office building. Once the containment structures are removed, including below-grade sumps and an oil/water separator, evidence of contamination from past practices or containment failure may be discovered. The PRS closure plan states that, once facility structures are removed, contaminated soil will be removed and disposed of off-site. Excavations and sampling will pursue the contamination until PRS believes all the contaminated soil has been found, or until the confining silt layer is encountered.

Groundwater contamination has been investigated at this facility through a series of well-installations and sampling, and past monitoring events, and is an on-going responsibility for PRS. Groundwater is contaminated with volatile organic compounds (benzene, dichlorobenzene, tetrachloroethylene, trichloroethylene, and vinyl chloride) and metals (arsenic) above groundwater cleanup levels, as well as petroleum hydrocarbons (gasoline and diesel range organics).

1.2 Organization and Schedule

This document contains the following sections:

- **Section 1, Introduction.** Provides project background, organization of this document and schedule for field work.
- **Section 2, Data Quality Objectives.** Outlines the data quality objectives and measurement quality objectives.
- **Section 3, Measurement Quality Objectives.** Outlines the measurement quality objectives.
- **Section 4, Sampling Requirements/Sampling Design.** Briefly outlines the sampling design.
- **Section 5, Sampling Procedures.** Outlines the field procedures to be used.
- **Section 6, Quality Control Samples.** Quality control procedures in the field and in the lab.
- **Section 7, Data Management.** Outlines how data would be managed.
- **Section 8, Data Review and Usability.** Outlines data review requirements and data usability.
- **Section 9, Reporting.** Outlines the reporting requirements.
- **Section 10, References.** Cites references used in this document.

The schedule for implementing the SAPMS depends on the timing for closure and the time it takes to clear surface structures. Project managers should plan on scheduling this project immediately after containment structures are removed and soil is exposed.

2.0 Data Quality Objectives

This section details the data quality objectives (DQOs) as they relate to the soil sampling and follows the format presented in *Data Quality Objectives Process for Hazardous Waste Site Investigations* (USEPA 2000).

Step 1. State the Problem

(1)	Identify members of the planning team	Kerry Graber and Kaia Petersen—Ecology Project Managers Jay Johnson—PRS Project Manager Gary Smith—President of PRS PRS Consultant
(2)	Identify the primary decision-maker	Decisions will be made by consensus between Ecology, PRS, and PRS Consultant
(3)	Develop a concise description of the problem	Soil contaminated with petroleum products, VOCs, and metals are potentially present in excess of MTCA Method B CUL levels in the soil under the containment slabs and around the oil/water separator. If soil contamination is identified during the removal phase, data will be needed to characterize the soils for offsite disposal and to confirm that cleanup levels have been achieved.

(4)	Specify available resources and relevant deadlines for the study	Soil investigation must be completed in a timely manner once the containment is removed due to exposure of soils to weather.

Step 2. Identify the Decision

(1)	Identify the principal study question	Is contamination present in soil underneath the facility structures? If so, is the soil remaining below the applicable cleanup levels?
(2)	Define alternative actions that could result from resolution of the principal study question	Screening of soil indicates that soil contamination is not present. Soil analysis results indicate potential contaminants are below applicable cleanup standards and the soils portion of the closure plan can be certified. Contamination is identified. Excavate contaminated soil to the extent possible. Stockpile soil on site for further analysis and offsite disposal. Collect confirmation sample from excavation limits. Back-fill excavation with clean material. Closure certification of the soils portion of the closure plan can proceed after soil analysis results indicate contaminants are below applicable cleanup standards.
(3)	Combine the principal study question and the alternative actions into a decision statement	a. Examine soil during excavation below facility tank farms footprint and oil/water separator. Proceed with closure certification of the soils portion of the closure plan after soils sample results indicate contamination is below applicable cleanup standards, or is not present. b. Examine soil during excavation below facility tank farms' footprint and oil/water separator. Identify contaminated locations and intervals, excavate contaminated soil to the extent possible. Collect confirmation samples from excavation limits. Segregate and stock pile excavated soil that is contaminated for further analysis and disposal. Compare confirmation sample concentrations with applicable cleanup levels and continue excavation if necessary. c. Remove monitoring well S04A and excavate contaminated soil around the casing during removal. Identify whether this is a hot spot with soil samples and field observation and remove contamination to the extent possible in coordination with the larger excavation under the tank farm containment. Properly close the well in accordance with state regulations.

Step 3. Identify Inputs to the Decision

(1)	Identify information that will be required to resolve the decision statement	Field observations: visual and olfactory, PID readings List of contaminants of concern (TPH-Gasoline, TPH-diesel and oil, metals, and VOCs) Regulatory action levels for contaminants of concern Measured contaminant levels in soil
(2)	Determine the sources for each item of information required	Field observations Ongoing wastewater discharge permit report and groundwater monitoring data reports MTCA Method B CULs where available. Method A CULs will be used if Method B CUL is not available. Chemical analysis of soil samples

(3)	Identify the information that is needed to establish the action level	Chemical analysis of soil samples MTCA Method B CULs where available. Method A CULs will be used if Method B CUL is not available. For example, Method A CUL for TPH and lead will be used because Method B CULs are not available for these analytes.
(4)	Confirm that the appropriate measurement methods exist to provide the necessary data	Methods consistent with the above needs are identified in this SAPMS.

Step 4. Define the Boundaries for the Study

(1)	Specify the characteristics that define the population of interest	Source Characterization – Contaminated soil located near surface cracks and around oil/water separator. Vertical extent – Uncontaminated subsurface soil beneath contaminated soil in source area. Lateral extent – Uncontaminated surface and subsurface soil.
(2)	Define the spatial boundary of the decision statement	Length – approximately 165 feet encompassing the two tank farms and solidification area from northwest to southwest. Width – approximately 90 feet from the fence line to the edge of the load/unload pad. Depth – Approximately 0 to possibly 10 feet below ground surface in areas depending on the depth to the confining silt layer.
(3)	Define the temporal boundary of the decision statement	Sampling will be completed subsequent to the removal of the surface structures during excavation. Closure has not been scheduled at this time. Soil samples analyzed for TPH will be analyzed on 24-hour turn-around time to minimize the time excavation will remain open.
(4)	Define the scale of decision-making	Scale of the decision depends on conditions encountered in the field and results of sample analysis.
(5)	Identify practical constraints on data collection	If the extent of contamination extends beyond the facility boundary, or has migrated below the confining silt layer, removal of contaminated soil would have to be halted.

Step 5. Develop a Decision Rule

(1)	Specify the statistical parameter that characterizes the population of interest.	Source characterization and extent determinations will be made primarily on an individual sample basis. Samples used to delineate extent of contamination will also be grouped for comparison to the three MTCA criteria that together demonstrate compliance with cleanup levels. One of these criteria includes calculation of the 95% UCL for each contaminant.
(2)	Specify the action level for the study	The applicable minimum regulatory values are MTCA Method B cleanup levels for soil or MTCA Method A CUL if Method B is not available.

3.0 Measurement Quality Objectives (MQO)

Measurement quality objectives (MQOs) specify how good the data must be in order to meet the objectives of the project. MQOs are the performance or acceptance thresholds or goals for the project's data, based primarily on the data quality indicators including representativeness,

comparability, accuracy, precision, and completeness. Definitions of these terms, the applicable procedures, and level of effort are described below. The applicable QC procedures, quantitative target limits, and level of effort for assessing data quality are dictated by the intended use of the data and the nature of the analytical methods. Chemical parameters, analytical methods, applicable detection levels are presented in Table 1 below.

TABLE 1
Parameter, Applicable Methods and Required Reporting Limits
Petroleum Reclaiming Services

Parameter	Analysis Method	Reporting Limits
	Confirmation Samples	
TPH	NWTPH-G and/or NWTPH-D	20 mg/kg (gasoline range organics) 50 mg/kg (diesel range organics) 100 mg/kg (motor oils)
VOCs	SW846 5035 (Sampling and preservation method) SW846 8260B	1 to 50 µg/kg
Metals[a]	SW846 6010/7000	0.05 mg/kg to 5 mg/kg
	Waste Characterization Samples	
Paint Filter Test	SW846 9095B	NA
TPH[a]	NWTPH-HCID with followup NWTPH-G and or NWTPH-Dx	20 mg/kg (gasoline range organics) 50 mg/kg (diesel range organics) 100 mg/kg (motor oils)
VOCs[a]	SW846 5035 (Sampling and preservation method) SW846 8260B	1 to 50 µg/kg
Metals[a]	SW846 6010/7000	0.05 mg/kg to 5 mg/kg

SW846 - Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition, March 1986 and revisions, U.S. EPA.

[a] Needed only if the method of soil disposal is other than landfilling at a permitted facility.

4.0 Sampling Requirements (Sampling Design)

After above-ground structures are removed evidence of contaminated soil may be observed. These may include visual or olfactory observations such as staining, petroleum odor, or elevated photoionization detector (PID) readings. If no evidence of contaminated soil is observed, collect confirmatory soil samples from the area underneath the oil/water separator and the sidewall of excavation limits. Confirmatory soil samples will be analyzed for TPH (diesel and gasoline

range), metals, and VOCs as identified in Table 1. If soil sample results (analyzed on 24-hour turn-around basis) show that soil present is below applicable cleanup standards, certification of the soils portion of the closure plan is appropriate. These soil sample results will be used to document "clean-closure".

If evidence of contamination is observed, contaminated soil will be excavated until visibly contaminated soil is removed or to the extent possible. At this point, confirmation soil samples will be collected from the area underneath the oil/water separator and the bottom and the sidewall of excavation limits. Confirmation samples will be analyzed for TPH (diesel and gasoline range), metals and VOCs as identified in Table 1. If the samples fail the cleanup levels for parameters detected, additional excavation will be required until a passing sample is achieved. Confirmation samples will be collected as the excavation progresses.

In addition to confirmation sampling, waste disposal characterization sampling will also be conducted. Contaminated soil, if found, will be excavated and stockpiled in roll-off bins separately from non-contaminated soil to the extent possible.

Depending on the sampling results, soil will either be reused on site or be disposed of at a permitted offsite disposal facility.

5.0 Sampling Procedures

This section describes the procedures that field personnel will use to collect samples, label and package samples, and maintain sampling records. Sampling procedures are detailed in the following subsections.

5.1 Confirmation Sampling

If no evidence of contaminated soil is observed, confirmation sampling will consist of soil samples collected from beneath the oil/water separator and from excavation bottom throughout the excavation area. If evidence of contaminated soil is observed and soil excavation is conducted to remove the contaminated soil, soil samples will be collected from the sidewalls in addition to and the excavation bottom samples, Below the oil/water separator once removed, and at the bottom of monitoring well S04A excavation.

Oil/Water Separator Samples

The oil/water separator extends below surface to about ten feet below grade. Once the oil/water separator itself is removed a substantial excavated area will remain. A minimum of three grab samples from the bottom of the excavation will be collected with a clean spoon and placed directly in laboratory supplied container with Teflon-lined lids. Four grab samples from the side walls of the excavation will also be collected. The samples for gasoline range organics and VOC analysis will be collected according to procedures outlined in SW846 5035 and in Ecology's technical memo for collecting and preparing soil samples for VOC analysis (Ecology, 2004b).

The sample designation will be as follows:

PRS-OWS-xx

where:

PRS = Petroleum Reclaiming Services

OWS = Oil/water separator

xx = Sample Number (01 to 02)

Excavation Bottom Samples

Bottom samples will be collected to document the existence or absence of contamination at the extent of the excavation. Bottom samples will be collected from a depth interval of zero to 6 inches below the excavation bottom. Samples will be collected at a frequency of one sample for each approximately 500 square feet of excavation bottom (estimated at 30 samples). The samples will be collected from the excavator bucket at the sample location or directly by sample personnel if the excavation is safe to enter based on the HSP. The sample will be collected with a clean spoon and placed directly in laboratory supplied container with Teflon-lined lids. The samples for VOC analysis will be collected according to procedures outlined in SW846 5035.

The sample designation will be as follows:

PRS-BD-xx

where:

PRS = Petroleum Reclaiming Services

BD = Bottom Samples

xx = Sample Number (01 to 30)

Excavation Sidewall Samples

Sidewall samples from an area excavated due to soil contamination will be collected at a frequency of one sample per 30 lineal feet of sidewall (estimate at 15 samples). The samples will be composite from an area approximately 2 feet in diameter around the sample location. The samples for non-VOCs will either be collected from the excavator bucket or the sidewalls of the excavation if safe to enter. The soil from the two sample intervals will be placed in a clean bowl or tray and homogenized prior to placement in laboratory supplied containers. Avoid any large rocks, plant material or other material that is not representative of the soil. The samples for VOCs analysis will be collected according to procedures outlined in SW846 5035.

The sample designation will be as follows:

PRS-SW-xx-y

where:

PRS = Petroleum Reclaiming Services

SW = Sidewall Sample

xx = Sample Number (01 to 15)

y = Sample Location (E for East Wall, W for West Wall, N for North Wall, and S for South Wall)

Excavated Soil Samples

Field personnel will observe staining and utilize a PID to help determine whether a particular batch of soil is heavily contaminated. To assist with visual observations, field samples will be obtained from the bucket of the backhoe or from the excavation if it is deemed safe to enter. These samples will be placed in a plastic bag and "sniffed" with a PID to determine whether VOCs are present.

Table 2 indicates the minimum number of samples to take from stockpiled soils. Discrete grab samples should be collected with hand tools 6 to 12 inches beneath the surface of the pile. The locations of each of these samples shall be where field instrument readings indicate contamination is most likely to be present. If field instruments do not indicate contamination, the pile should be divided into sections and each section sampled.

Table 2: Number of samples for excavated soil	
Cubic yards of soil	Minimum number of samples
0-100	3
101-500	5
501-1000	7
1001-2000	10
>2000	10 +1 for each additional 500 cubic yards

If the site manager decides to take a sample for designation from a contaminated, segregated batch of soil, a separate sample will be taken from the batch (not from the bag) and handled in accordance with the required procedures.

The sample designation will be as follows:

PRS-ESP-xx-y

where:

PRS = Petroleum Reclaiming Services

ESP = Excavated soil pile

xx = Sample Number (01 etc.)

y = Soil Pile Letter (A, B, etc.)

Monitoring Well S04A Excavation

During monitoring well removal and closure soil will be observed both visually and with a PID for evidence of contamination. Field personnel will, at a minimum, take confirmation samples if no soil contamination is observed.

Once the well casing itself is removed a substantial excavated area will remain.

A minimum of three grab samples from the bottom of the excavation will be collected with a clean spoon and placed directly in laboratory supplied container with Teflon-lined lids if no other evidence of contamination is observed. Four grab samples from the side walls of the excavation will also be collected. The samples for gasoline range organics and VOC analysis will be collected according to procedures outlined in SW846 5035 and in Ecology's technical memo for collecting and preparing soil samples for VOC analysis (Ecology, 2004b).

The sample designation will be as follows:

PRS-MWS04ABD-xx

where:

PRS = Petroleum Reclaiming Services

MWS04ABD = Monitoring Well S04A bottom samples

MWS04ASW= Monitoring Well S04A side wall samples

xx = Sample Number (01 to 02)

5.2 Sample Documentation

Sample numbers will be recorded in the field logbook, on sample container labels, and chain-of-custody forms. Other information recorded on the sample container label includes:

- Time and date of sample collection
- Initials of sampler(s)
- Laboratory analyses to be performed
- Preservatives uses

After collection, all samples will be placed in coolers with enough ice to maintain an internal temperature of 4°C for the duration of the sampling and transportation period. Samples will be delivered to the contracted laboratory for analysis following chain-of-custody procedures (Section 6.6.3 of this plan).

5.3 Turn-Around-Time, Sample Containers, Preservation, and Holding Times

A 5-day turn around time will be requested for all of the analyses.

Table 3 presents the sample containers, preservation requirements, and holding times that will be used or followed for this investigation.

5.4 Sample Identification and Labeling

All samples will be appropriately labeled for identification and tracking. Sample labels will be completed using waterproof-ink pens and affixed to containers at the time of sampling. The

sample designation number will include identifiers that facilitate sample tracking. The proposed sample designation scheme will be as presented in Section 5.1.

In addition to sample identification, spaces on the label are also provided on the sample identification label to record the following information at the time of actual sample collection:

- Initials of person(s) collecting the sample
- Time of sample collection to the nearest minute
- Requested laboratory analyses

TABLE 3

Analytical Methods, Containers, Preservation and Holding Time Requirements
Petroleum Reclaiming Services

Parameter	Analytical Method	Container	Preservation	Holding Time
TPH-Dx	NWTPH-Diesel Extended	8-oz wide mouth glass jar (soil), Teflon-lined septa	4 ± 2° C	14 days
TPH-Gx	NWTPH-Gasoline	3 airtight sample capsules (ESS Core N' One™ or equivalent PLUS 1 2-oz or 4-oz glass jar with septum	Cool to ≤ 6° C OR freeze between -7 and -20° C (lower temperatures may compromise core seal)	Get cores to lab within 24 hours; 48 hours to preservation or analysis
VOCs	SW846 5030A (sample collection) SW846 8260B	(3) 40-ml vials	4 ± 2° C Methanol and Sodium Bisulfide	14 days
Total Metals – Priority Pollutants (ICP-MS)	SW846 6010/7000B	4-oz wide mouth glass jar (soil), Teflon-lined; Mercury requires 100g.	Cool to ≤ 6° C	6 months; Holding time from collection to analysis is 28 days for mercury, 6 months for all other metals.

EPA SW846 - Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW846, 3rd Edition, March 1986 and revisions, U.S. EPA.

6.0 Field Activities

6.1 Utility Locating

Public and private utility locates will be conducted prior to excavation or any subsurface work. Utilities and pipes should be clearly marked at the facility. A minimum of two days notice **should be given for the utility locate service to come out to mark the utilities.**

6.2 Removal of Structures

PRS is responsible for the removal or demolition of all above-ground structures prior to beginning excavation. Removal will take place in the following general order:

- Remove tanks, equipment, buildings, and other structures obscuring a clear examination of secondary containment structures.
- Before demolition of secondary containment structures, observe and document with notes and photos any significant cracks, gaps, staining, or other problems with containment surfaces.
- Demolish secondary containment concrete; scrape surface and remove demolition debris before beginning soil excavation.

6.3 Soil Excavation

Removal of soil will proceed in such a way that allows field personnel to make observations of condition of excavated material and take samples, if necessary. Therefore excavation and backhoe operators will be directed by field personnel who are familiar with this plan and are responsible for its implementation. The excavation process will follow these general procedures:

- Observe and document any significant staining or other anomalies that may impact segregation of batches of removed soil before beginning excavation (heavily stained soil may be segregated from areas that appear relatively clean for sampling and disposal).
- Field personnel will observe staining and utilize a PID to help determine whether a particular batch of soil is heavily contaminated. To assist with visual observations, field samples will be obtained from the bucket of the backhoe or from the excavation if it is deemed safe to enter. These samples will be placed in a plastic bag and "sniffed" with a PID to determine whether VOCs are present.
- Field personnel will direct soil excavation within the dimensions of the footprint of the secondary containment pads down to the point that the confining clay/silt layer is observed. This may vary within the excavation. Soil removal will not proceed below the confining layer.

6.4 Confirmation Sampling Process

Confirmation samples will be taken from the bottom and side walls of the excavation to determine whether clean closure of the subsurface has been achieved by this removal action. The Field Representative will determine when the excavation appears to have adequately removed all of the visible or field screened contamination in accordance with the procedures described in 5.0 above.

Table 4 contains a summary estimate of the sample collection and laboratory analysis to be completed.

TABLE 4 SOIL EXCAVATION AND SAMPLING MATRIX SUMMARY - *PETROLEUM RECLAIMING SERVICES*

Sample Number Protocol	General Location	Sampling Depth	Analytical Parameter*
PRS-OWS-xx	Side walls and bottom of excavation around and below the in-ground oil/water separator	Approximately 10 feet or more below grade for the bottom. Side wall sample locations to be selected based on observation and/or field screening.	NWTPH-Diesel extended NWTPH-Gasoline VOC – if evidence of contamination observed Total Metals-Priority Pollutants
PRS-BD-xx	Bottom of excavation once the footprint of the secondary containment has been excavated.	0 to 6 inches below the bottom of the excavation. Bottom of excavation will follow contours of the confining silt/clay layer, ranging 6 to 10 feet below grade due to fill in estuarine environment.	NWTPH-Diesel extended NWTPH-GasolineVOC – if evidence of contamination observed Total Metals-Priority Pollutants
PRS-SW-xx-y	Side walls of excavation once the footprint of the secondary containment has been excavated	Samples taken at 30 lineal feet measured along sidewalls; composite around a selected sample area that may vary in depth from surface.	NWTPH-Diesel extended NWTPH-GasolineVOC – if evidence of contamination observed Total Metals-Priority Pollutants
PRS-ESP-xx-y	Excavated soil batches sampled from backhoe bucket, from within the excavation, or from a soil pile	TBD	NWTPH-Diesel extended NWTPH-Gasoline VOC – if evidence of contamination observed Total Metals-Priority Pollutants
PRS-MWS04ASW-xx	Side Walls of excavation once the monitoring well has been removed and contaminated soil has been excavated	Four samples taken along sidewalls; composite around a selected sample area that may vary in depth from surface.	NWTPH-Diesel extended NWTPH-Gasoline VOC – if evidence of contamination observed Total Metals-Priority Pollutants
PRS-MWS04ABD-xx	Bottom of excavation once the monitoring well has been removed and contaminated soil has been excavated	0 to 6 inches below the bottom of the excavation.	NWTPH-Diesel extended NWTPH-Gasoline VOC – if evidence of contamination observed Total Metals-Priority Pollutants

TBD – Exact depth to be determined based on evidence of contamination.

Evidence of contamination include staining, odor and elevated PID reading.

The field samples with the 3 highest PID readings will be selected for VOC analysis.

PRS may use totals to determine whether metals in soil piles may exceed TCLP by dividing the analytical result of a RCRA-8 metal by 20 and comparing the result to the regulatory limits.

The field representative will be responsible for establishing exact sampling locations in the field, directing excavation activities, documenting observations, and following the procedures in this plan. The field representative will also keep a daily log of all activities performed and materials used.

The backhoe bucket will be decontaminated initially, and again if separate contaminated areas are identified.

The following information will be recorded in the field logbook for each sample collected:

- Sample location
- Sample depth and time collected
- Sample recovery lengths or percent recovery
- Visual evidence of contamination
- Geologic features
- Description of soil following USCS guidelines
- PID/FID headspace reading

6.5 Sampling Tool Decontamination

All sampling tools that come in contact with the soils will be properly decontaminated prior to and between sampling locations or depth intervals.

If the sampling equipment is not single-use disposable equipment or dedicated, it will be decontaminated between each sampling location using the following procedures:

1. Wash in solution of Liquinox® (or equivalent) and potable tap water
2. Rinse with potable tap water
3. Rinse with distilled and deionized water (ASTM Type I or II)
4. If visual contamination persists, or gross contamination is suspected, the decontamination steps used for aqueous sampling equipment will be used.

Multiple-use sampling equipment such as stainless steel bowls and spoons used for soil sampling will be wrapped in aluminum foil after being decontaminated unless they are used immediately after decontamination.

The excavator backhoe bucket or other excavating apparatus will be decontaminated by steam cleaning before use and between use in different probe locations. Steam-cleaned equipment will be inspected by field personnel prior to use. If the equipment is not decontaminated to the satisfaction of the field personnel it will be decontaminated again.

A decontamination pad or trailer will be constructed or provided for use during steam cleaning of excavating equipment. Fluids collected in the decontamination pad and from sampling tool decontamination will be drummed for characterization and disposal by PRS.

6.6 Documentation and Field Observations

During secondary containment and soil removal the soil conditions and/or evidence of contaminated soil should be documented in the field log and photographed. These may include visual or olfactory observations such as staining, petroleum odor, or elevated PID readings. In addition, the conditions and integrity any catch basins, below ground piping, or other below

ground features should also be noted and documented during the excavation. Field personnel will use a site diagram to map approximate locations of high contaminant concentrations as the excavation progresses, utilizing a grid if necessary to keep track of hot spots and noting depth and lateral extent.

6.6.1 Field Logbooks

The field representative will maintain a field logbook that contains all information pertinent to the field sampling program. The logbook will include the following, at a minimum:

- Project name
- Project number
- Personnel
- Weather conditions
- Equipment calibration and decontamination
- Health and safety monitoring
- Photograph log
- Sample data
  - Location of sample
  - Date of sample collection
  - Time of sample collection
  - Type of samples taken
  - Sample identification numbers
  - Sampling method
  - Lithology
- Personnel decontamination procedures

The coordinates of each sample location will be located and recorded using a handheld GPS. Sample locations will also be documented with digital photographs. Horizontal control for GPS will be to the North American Datum 1983, adjusted in 1991 (NAD 83/91). Ground elevations (vertical) will be from the National Geodetic Vertical Datum (NAVD88). All coordinates will be recorded in the field logbook.

The photograph log should include photos showing the excavation process: progress of the demolition of the secondary containment and other surface or below ground features; excavation of the soil; removal the oil/water separator; soil conditions around piping and any staining; the extent of excavation once it has reached its greatest extent; and the replacement fill.

All members of the field team will use the logbook, make entries in ink, then initial and date each page.

6.6.2 Corrections to Documentation

All entries in field and laboratory notebooks will be written in waterproof ink. No accountable serialized documents will be destroyed or thrown away, even when they are illegible or contain

inaccuracies that require a replacement document. When an error is made on an accountable document, the person who made the error will make the correction by crossing a line through the error and entering the correct information. The erroneous information should not be obliterated. Any subsequent error discovered on an accountable document should be corrected by the person who made the entry. All corrections will be initialed and dated.

6.6.3 Chain-of-Custody and Shipment of Samples

The management of samples collected in the field samples involves specific procedures that must be followed to ensure field sample integrity and custody. The possession of samples must be traceable from the time they are collected through the time they are analyzed by the contract laboratory.

The chain of custody of a sample is defined by the following criteria:

- The sample is in a person's possession, or is in his/her view after being in his/her possession.
- The sample was in a person's possession and was locked up or transferred to a designated secure area by him/her.

Each time the samples change hands, both the sender and receiver will sign and date a chain-of-custody form and specify which item(s) has changed hands. When a sample shipment is sent to the laboratory, the top signature copy is enclosed in plastic with the sample documentation and secured to the inside of the sample shipment containers. The second copy of the chain-of-custody form will be retained in the project files. A chain-of-custody record will be completed for each shipping container.

The following information is included on the chain-of-custody form:

- Sample number
- Signature of sampler
- Date and time of collection
- Project name and number
- Type of sample
- Number of containers
- Inclusive dates of possession
- Signature of receiver

In addition to the labels, seals, and chain-of-custody form, other sample tracking components include the field logbook, sample request sheet, sample shipment receipt, and laboratory logbook. Before packaging samples, field personnel will make certain that the exterior of the sample container is clean and that the sample label is legible.

6.6.4 Sample Packaging

Waterproof ice chests and coolers will be used as containers. Coolers may be provided by the contracted laboratory. Samples are to be hand-delivered or by overnight express delivery to the analytical laboratory. The following sample packing protocol will be followed:

- The outside of any wet sample bottles will be wiped with paper towel wetted with distilled or deionized water.

- The cooler(s) will be packed to minimize movement during transport.
- Double-bagged ice will be added as necessary to maintain an internal cooler temperature of 4 °C or lower.

6.8 Management of Sampling-Derived Waste

Excavated soil will be stored onsite pending the results of soil analyses. Soil analysis results will be evaluated to determine a proper disposal method. PRS will be responsible for proper disposal of excavated soil.

The soil piles will be identified on documentation or maps as A, B, etc., and additional information by soil pile will be tracked, including a description of the contents, the area of the excavation the soil came from by depth interval (e.g., 0 to 4 feet below surface) and general location (e.g., northwest corner).

Decontamination fluids generated onsite, including steam-cleaner water, will be placed in drums for designation and disposal by PRS, clearly labeled with their contents and the words "Pending Analysis".

Disposable materials generated during the sampling activities will be limited to personal protective equipment (PPE), absorbents, and single-use sampling tool (stainless steel spoons). All PPE, absorbents, and sampling tools will be handled as solid waste and disposed of accordingly.

6.9 Subcontractor Project Activities

The following field activities will be conducted by subcontractors under direction by PRS:

- Private utility locate (need at least 2 working days prior to digging)
- Demolition and excavation
- Laboratory analysis and reporting

Utility Locate	**800-424-5555 (One-Call center for public utility locate)** **800-840-7760 (Locate Down Under for private utility locate)**
Demolition and Excavation	**TBD**
Analytical Laboratory:	**TBD**

7.0 Quality Control Samples

7.1 Field Quality Assurance/Quality Control Samples

Field and laboratory quality control samples collected will consist of trip blanks. No field duplicate sample or project-specific matrix spike/matrix spike duplicate (MS/MSD) samples will be collected.

Trip Blanks

One trip blank will be included in each cooler used for the daily shipment of VOC samples. If more than one cooler is being sent on a given day, all of the VOC samples should be placed in one cooler, if possible, to minimize the number of trip blanks needed. The trip blanks will be prepared before each sampling event, shipped or transported to the field with the samples, and return unopened for analysis. Trip blanks will indicate if there is any contamination introduced during shipment to the field, from storage in the field, or from shipment from the field to the analytical laboratory. The analytical laboratory will use the quality control elements including matrix spikes, duplicate, and laboratory blanks as specified in the methods indicated in the scope of work.

7.2 Laboratory Quality Assurance/Quality Control Samples

Extensive and detailed requirements for laboratory QC procedures are provided in the analytical methods that will be used for this project. Every method protocol includes description of QC procedures, and many incorporate additional QC requirements by reference to separate QC chapters. QC requirements include control limits and requirements for corrective action in many cases.

The frequency of analysis for laboratory control samples, matrix spike samples, matrix spike duplicates or laboratory duplicates, and method blanks will be one for every 20 samples or one per extraction batch, whichever is more frequent. Surrogate spikes and internal standards will be added to every field sample and QC sample, as required. Calibration procedures will be completed at the frequency specified in ach method description. As required for EPA SW-846 methods, performance-based control limits have been established by the laboratory. These and all other control limits specified in the method descriptions will be used by the laboratory to establish the acceptability of the data or the need for reanalysis of the sample.

The laboratory performing the analyses will be responsible for following the QC procedures established in its quality assurance document as will the QC requirements established by the analytical method and as defined above. QA/QC requirements will meet or exceed protocols specified in the referenced analytical method.

8.0 Data Management

Laboratory final data package documentation will be as follows. Field documentation requirements have been described in Section 6.

1. Analytical results for environmental samples and field QC samples (field duplicate and equipment blank). The table will contain the following fields: batch; sample_id; date analyzed; date sampled; date lab received; date extracted; lab sample number; analysis class; analysis sequence; dilution factor; parameter name; Chemical Abstracts Service (CAS) number; concentration; qualifier; method detection limit (MDL); reporting limit matrix; percent moisture; units; lab name; and analytical method. If the field is not applicable, then it may be left blank.

2. Internal laboratory QA/QC sample results, including method blank results, laboratory control spikes results, and surrogate percent recovery. The following fields should be listed: batch;

date analyzed; date extracted, lab sample number; analysis class; analysis sequence; dilution factor; parameter name; CAS number; concentration; qualifier; MDL; reporting limit, matrix; units; lab name; and analytical method.

3. Method blank association list. Each method blank should be listed, along with its associated environmental sample identifiers and laboratory identifiers.

8.0 Data Review and Usability

Field data will be verified during preparation of samples and COCs. Field data and COCs will be reviewed by the field team leader after the field effort is complete. After field data are entered into the project database, 100% verification of the entries will be completed to ensure the accuracy and completeness of the database. Any discrepancies will be resolved before the final data is issued.

Data reviews will be performed at two levels: at the laboratory and outside the laboratory by an independent chemist. At the laboratory, 100 percent of the raw and quality control data will be reviewed. Analytical data that are out of specified quality assurance control limits will be flagged as estimated by the laboratory. Outside the laboratory, 100 percent of the quality control data will be reviewed by PRS.

9.0 Reporting

A summary report will be prepared and submitted to PRS. At a minimum, the report will contain the following information:

- A narrative describing the sampling activities performed during the event and any notable deviations from the SAPMS
- A figure showing sample locations
- Analytical results summary table compared to MTCA Method B soil cleanup levels.
- Laboratory data sheets (presented as an attachment).
- Copy of the chain of custody form (presented as an attachment).
- Photolog of the event (presented as an attachment).

10.0 References

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