

SUBMITTED TO:
Sound Transit
401 South Jackson Street
Seattle, WA 98104-2826

BY:
Shannon & Wilson
400 N. 34th Street, Suite 100
Seattle, WA 98103

(206) 632-8020
www.shannonwilson.com

PHASE II ENVIRONMENTAL SITE ASSESSMENT REPORT
West Pierce Fire & Rescue
Maintenance Facility
LAKEWOOD, WASHINGTON

Submitted To: Sound Transit
401 South Jackson Street
Seattle, WA 98104-2826

Subject: PHASE II ENVIRONMENTAL SITE ASSESSMENT REPORT, WEST PIERCE FIRE
& RESCUE MAINTENANCE FACILITY, LAKEWOOD, WASHINGTON

Shannon & Wilson prepared this report and participated in this project as a consultant to Sound Transit under our On-Call Architectural & Engineering Consultant Services Contract No. RTA/AE 0107-14(C). Our scope of services was specified in our proposal dated August 21, 2019, and authorized by Task Order Number 038-00 (signed by Ms. Susan Penoyar, Sound Transit, on August 23, 2019). This report presents the findings of our Phase II Environmental Site Assessment for the West Pierce Fire & Rescue Maintenance Facility. This report was prepared by the undersigned.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or we may be of further service, please contact us.

Sincerely,

SHANNON & WILSON



Christian Canfield
Environmental Staff



Agnes Tirao, PE
Project/Environmental Manager

CTC: KRF:ACT:SWG/ctc

EXECUTIVE SUMMARY

Shannon & Wilson completed a Phase II Environmental Site Assessment (ESA) to support Sound Transit's planned property acquisition of West Pierce Fire & Rescue Maintenance Facility (subject property) as part of the Sounder Maintenance Base Project. The subject property is located at 9410 39th Avenue Court SW in Lakewood, Washington.

The parcel was first developed in 1990 with the original portion of the current structure, which was used as a lumber warehouse. The subject property was purchased by the fire department in 2002 for use as a fire department vehicle maintenance facility. In 2004, a sub-floor hydraulic lift was installed in the original building, and an addition was constructed to house the grounds and building maintenance equipment. A 30,000-gallon subsurface drafting pit was also constructed in 2004 to hold water for testing pumper trucks.

The Phase II ESA included collection of reconnaissance soil and groundwater samples from an installed monitoring well. This Phase II ESA was completed to evaluate recognized environmental condition (REC) identified during the Phase I ESA within the proposed acquisition area:

- Transfer of firefighting foam concentrate to tanks on fire trucks may have resulted in release of per- and polyfluoroalkyl substances (PFAS) to onsite dry wells.

Several additional non-REC issues were identified that could benefit from investigation, including:

- Unknown quality of fill brought onsite.
- Localized areas of impacted or contaminated soil that could be present, particularly in unpaved areas of the subject property where drums and containers are stored.
- Localized areas of impacted or contaminated soil that could be present in the vicinity of a gasoline aboveground storage tank (AST) (located in an unpaved and uncovered area).

Based on the data collected for this Phase II ESA, we can offer the following conclusions for the West Pierce Fire & Rescue Maintenance Facility:

- In the absence of state or federal regulatory limits for perfluorooctanoic acid (PFOA) and perfluorooctanesulfonic acid (PFOS) in soil and groundwater, we reference the U.S. Environmental Protection Agency's (EPA's) Lifetime Health Advisory (LHA) level of 70 nanograms per liter (ng/L) for the sum of PFOS and PFOA as the preliminary remediation goal (PRG) for impacted groundwater. The sum of PFOS and PFOA in sample SWI-6:GW and (duplicate sample) SWI-200:GW exceeded the LHA with concentrations of 84 and 85 ng/L, respectively. The apparent source of PFAS is from

- transferring fire-fighting foam between different containers located on site; however, due to the limited nature of this assessment, an off-site source of the impacted groundwater cannot be ruled out. The extent of the PFAS contamination in groundwater is not known.
- Diesel-range total petroleum hydrocarbons (TPH-D) were detected at 9,300 milligrams per kilogram (mg/kg) in the soil collected 1 foot below ground surface (bgs) in sample SS-1. This concentration exceeds the Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Method A cleanup level (CUL) of 2,000 mg/kg for TPH-D. The contamination is likely due to leaking drums and equipment exposed to the surface. The near-surface soil (up to 3 feet bgs) in the vicinity of the outdoor drum storage is considered to be contaminated with various concentrations of diesel-range hydrocarbons.
 - Total petroleum hydrocarbons (TPH) and metal contamination were not detected above regulatory limits for unrestricted land use in the groundwater sample analyzed.
 - Near-surface soil in the vicinity of the gasoline AST did not present TPH or metal contamination (sample SS-2:C). Oil-range total petroleum hydrocarbons (TPH-O) were detected at 75 mg/kg in composite sample SS-2:C. This detection is below the MTCA Method A criterion of 2,000 mg/kg.

CONTENTS

1 Introduction1

2 Background1

 2.1 Site Description.....1

 2.2 Phase I Environmental Site Assessment (ESA).....2

 2.3 Site Geology and Hydrogeology.....3

 2.3.1 Site Geology3

 2.3.2 Site Groundwater4

3 Field Activities.....4

 3.1 Field Explorations5

 3.2 Per- and Polyfluoroalkyl Substances (PFAS) Quality Control Sampling5

 3.3 Analytical Testing Methods.....6

4 Analytical Results6

 4.1 Soil.....7

 4.2 Groundwater.....7

 4.2.1 Petroleum and Metals.....7

 4.2.2 Per- and Polyfluorinated Alkyl Substances (PFAS)8

 4.3 PFAS Quality-Control Samples.....9

5 Investigation-Derived Waste (IDW).....9

6 Conclusions.....9

7 References10

Tables

- Table 1: Summary of Samples Collected and Analyses Performed
- Table 2: Summary of Soil Analytical Results
- Table 3: Summary of Groundwater Analytical Results
- Table 4: Summary of Groundwater and Water PFAS Analytical Results

Figures

- Figure 1: Vicinity Map
- Figure 2: Site and Exploration Plan
- Figure 3: Sounder Maintenance Base Site and Exploration Plan

Appendices

Appendix A: Field Methods and Exploration Logs

Appendix B: Laboratory Analytical Reports

Important Information

ACRONYMS

AST	aboveground storage tank
bgs	below ground surface
CUL	cleanup level
Ecology	Washington State Department of Ecology
EDR	Environmental Data Resources, Inc.
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
GIS	geographic information system
IDW	investigation-derived waste
LHA	lifetime health advisory
mg/kg	milligrams per kilogram
MTCA	Model Toxics Control Act
ng/L	nanograms per liter
NWTPH	Northwest Total Petroleum Hydrocarbons
NWTPH-Dx	Northwest Total Petroleum Hydrocarbons Diesel Extended
NWTPH-Gx	Northwest Total Petroleum Hydrocarbons Gasoline Extended
PFAS	per- and polyfluoroalkyl substances
PFBS	perfluorobutanesulfonic acid
PFHpA	perfluoroheptanoic acid
PFNA	perfluorononanoic acid
PFOA	perfluorooctanoic acid
PFOS	perfluorooctanesulfonic acid
PHF _x S	perfluorohexanesulfonic acid
PPE	personal protection equipment
PQL	practical quantitation limit
PRG	preliminary remediation goal
REC	recognized environmental condition
TPH	total petroleum hydrocarbons
TPH-D	diesel-range total petroleum hydrocarbons
TPH-G	gasoline-range total petroleum hydrocarbons
TPH-O	oil-range total petroleum hydrocarbons
UCMR	Unregulated Contaminant Monitoring rule

1 INTRODUCTION

Shannon & Wilson has completed a Phase II ESA for the West Pierce Fire & Rescue Maintenance Facility located at 9410 39th Avenue Court SW in Lakewood, Washington (the subject property). The subject property is designated as Sound Transit's Sounder Maintenance Base Right-of-Way Number SMB012.1. The work was conducted in accordance with our proposal dated August 21, 2019, under Sound Transit Contract #RTA/AE 0107-14(C), Task Order 38. The task order was authorized by Ms. Susan Penoyar on August 23, 2019. The study was conducted to assist Sound Transit's plans for acquisition of the subject property in conjunction with development of its Sounder Maintenance Base. The objective of this Phase II ESA was to evaluate the RECs identified during the Phase I ESA. Our scope of services included the following tasks:

- Soil and reconnaissance groundwater sampling and analysis.
- Preparation of this report.

The scope of services focused on identifying and evaluating environmental concerns with significant potential to contaminate the subject property. The field sampling was a screening level effort intended to identify potential widespread contamination rather than define the lateral or vertical extent of soil and/or groundwater contamination.

2 BACKGROUND

2.1 Site Description

The subject property is located in the southwest quarter of the southeast quarter of Section 36, Township 24 North, Range 2 East of the Willamette Meridian. The subject property is identified as Pierce County tax parcel 5087000040. The site vicinity is shown in Figure 1.

The subject property is a 1.08-acre parcel occupied by an 8,000-square-foot, single-story, building used for vehicle maintenance and offices. The parcel is owned by Pierce County Fire District 3.

Site structures include the maintenance building; an attached compressor shed; and a small, free-standing storage shed. The maintenance building includes a large vehicle service shop; a storage area for grounds and building maintenance equipment; a staff kitchen/lounge; and a mezzanine level with offices, a locker room, and the furnace. The compressor shed is

attached to the north side of the service shop. The small storage shed is located near the northwest corner of the parcel.

The subject property is located near the eastern edge of the City of Lakewood. The site vicinity consists primarily of commercial and industrial businesses, including the following land uses on adjacent properties:

- To the north is an equipment cleaning business (Nilfisk).
- To the east, across 39th Avenue Court SW, are Pierce Transit vehicle parking, equipment storage, and warehouse facilities (Pierce Transit's West Base).
- To the south is a roofing contractor (McDonald & Wetle).
- To the west are railroad tracks and a building used by Sound Transit's train and engine crews.

Contours on the U.S. Geological Survey topographic map for the Tacoma South Quadrangle and Pierce County's geographic information system (GIS) indicate that the ground surface elevation at the subject property is approximately 270 feet above the North American Vertical Datum of 1988 (Environmental Data Resources, Inc. [EDR], 2019; Pierce County Public GIS, 2019). Land surface at the subject property is essentially flat. In the site vicinity, the land surface generally slopes down to the northwest, toward Flett Creek, located approximately ½-mile northwest of the subject property.

2.2 Phase I Environmental Site Assessment (ESA)

The research conducted for the Phase I ESA (Shannon & Wilson, 2020b) indicated that the subject property was first developed in 1990 with the current structure, according to assessor records. The building was originally constructed as a lumber warehouse and office.

The subject property was purchased by Pierce County Fire District 3 in 2002, according to assessor records. In 2004, an addition was constructed at the west side of the building and an underground concrete drafting pit was installed at the northeast corner of the parcel. The approximately 30,000-gallon drafting pit contains water used to test the ability of a pumper truck to draw from a static water source, such as a pond (Shuster, 2019).

Records relating to the subject property were obtained from Ecology's website and included annual dangerous waste reports from 2013 to 2018. The most recent annual report identifies the facility as a small quantity generator (less than 220 pounds per month). The waste codes indicate that the types of wastes generated include ignitable wastes and wastes containing lead, benzene, and solvents, including methyl ethyl ketone and tetrachloroethylene.

According to onsite personnel, these wastes generally consist of automotive products in spray cans and other small containers (Shuster, 2019).

The Phase I ESA identified the following REC for the subject property:

- Transfer of firefighting foam concentrate to tanks on fire trucks may have resulted in release of PFAS to onsite dry wells.

Several additional non-REC issues were identified that could benefit from investigation, including:

- Unknown quality of fill brought onsite.
- Localized areas of impacted or contaminated soil that could be present, particularly in unpaved areas of the subject property where drums and containers are stored.
- Localized areas of impacted or contaminated soil that could be present in the vicinity of a gasoline AST (located in an unpaved and uncovered area).

2.3 Site Geology and Hydrogeology

The subject property is located in the Puget Sound Lowland, which is a topographic depression bounded by the Cascade Mountains to the east and the Olympic Mountains to the west. It is typically characterized by deep bedrock (over 1,000 feet bgs) and complicated, thick sequences of sediments deposited by repeated glaciations that moved back and forth across the region over 10,000 years ago.

2.3.1 Site Geology

The most significant geologic deposits in the project area that are related to contaminant fate and transport include the Steilacoom Gravel and the related Vashon Recessional Outwash. The Vashon Recessional Outwash forms a surficial blanket over most of the area. These units are underlain by Vashon Drift (including Vashon Till and Vashon Advance Outwash) and the underlying interglacial deposits known locally as the Olympia Beds. In addition to these major geologic units, there are also isolated pockets of stream deposits and peat that can have a local but important influence on shallow groundwater conditions and contaminant migration (Shannon & Wilson, 2019).

During the explorations completed for this assessment, Shannon & Wilson completed a boring to a maximum depth of 26.2 feet bgs. Below the asphalt, gravels with silt and sand was encountered to 12 feet bgs followed by a 2-foot layer of silt. Gravels with sand were encountered again from 14 to 18.2 feet bgs followed by a 1.3-foot layer of lean clay and silt. Gravels with sand persisted until the completion of the boring at 26.2 feet bgs.

2.3.2 Site Groundwater

Five groundwater monitoring wells exist within the Sounder Maintenance Base study area (Shannon & Wilson, 2020a). These wells are located approximately 1,200 feet or more to the north of the subject property. Four of these wells are screened within a shallow, unconfined aquifer. Quarterly groundwater measurements in 2019 indicate that the highest recorded groundwater levels in these wells occurred in January 2019 and range from approximately 256 to 265 feet in elevation. This would correspond to depths of approximately 5 to 14 feet bgs at the subject property. One well was screened within a deeper, confined aquifer and the January 2019 groundwater level was measured at approximately 233 feet in elevation, which would correspond to approximately 37 feet bgs at the subject property. Well locations can be seen in Figure 3.

The direction of groundwater flow in the Sounder Maintenance Base shallow wells was estimated to be generally toward the south-southwest. Groundwater flow in the deeper aquifer was not evaluated because no other deep aquifer wells are present in the project area.

During the explorations completed for this assessment, a water-bearing aquifer was encountered at 21 feet bgs. A small amount of groundwater was observed to be perched above the lean clay and silt layer at 18.2 feet bgs. Following installation of the well, groundwater was measured at approximately 14.2 feet bgs.

Based on the local topography, Sounder Maintenance Base data, and the location of nearby water bodies, shallow groundwater in the site vicinity likely flows to the northwest, toward Flett Creek. The groundwater flow direction may fluctuate in response to precipitation and other factors, including variability of subsurface lithology, subsurface utilities, fill, and buried structures.

3 FIELD ACTIVITIES

The Phase II ESA field activities included completion of one boring using a hollow-stem auger drill rig, two shallow explorations using hand tools, well development, and groundwater sampling. Field activities were conducted between January 15 and 22, 2020.

Prior to sampling, APS Locates, under subcontract to Shannon & Wilson, completed private utility location services in the vicinity of the proposed explorations.

Field activities and analytical results are discussed in the following sections. Field methods, exploration logs, which include estimated depths to water, are provided in Appendix A. Exploration locations are shown in Figure 2.

3.1 Field Explorations

On January 15, 2020, Holocene Drilling, Inc., under subcontract to Shannon & Wilson, used a hollow-stem auger drill rig to complete one boring (SWI-6-19). Prior to drilling, Shannon & Wilson rinsed the auger, rods, and samplers with laboratory-supplied PFAS-free water. The boring was advanced to 25 feet bgs. Groundwater was encountered within the boring at a depth of 21 feet bgs. A permanent well was installed (screened from 20 to 25 feet bgs) within the boring. Well construction consisted of a 2-inch-diameter, Schedule 40 polyvinyl chloride with a machine slotted 0.010-inch screen. No signs of contamination such as odor, staining, or elevated photoionization detector readings were observed during drilling. The well was developed and sampled by a Shannon & Wilson representative on January 21 and 22, 2020, respectively.

Near-surface soil samples were collected from two locations (SS-1 and SS-2) using hand tools to excavate down to 1 foot bgs. Garden trowel equipment was used to reach the target depth. Tools were decontaminated between each location. The sample collected from exploration SS-2 was a composite from three locations on the north, west, and south sides of the gasoline AST. A diesel odor was noted in the soil sample collected from SS-1.

3.2 Per- and Polyfluoroalkyl Substances (PFAS) Quality Control Sampling

Three quality control samples for PFAS analysis were collected during drilling and groundwater sampling activities, including a rinsate sample, a field blank sample, and an equipment blank. The purpose of these samples was to determine if cross-contamination from sampling equipment, clothing, or air particulates influenced the project sample analytical results. We collected the quality control samples using certified PFAS-free water provided by TestAmerica Laboratories, Inc.

We collected the rinsate sample (SWI-6:Rinsate) by pouring the PFAS-free, laboratory-provided water over the 3-inch steel split-spoon sampler following sample collection and decontamination. Rinsate samples provide information used to evaluate if decontamination methods were effective in removing potential PFAS contamination between sampling intervals.

We collected the field blank sample (SWI-6:FB) by pouring PFAS-free, laboratory-provided water directly into the collection bottles in the same area as the project sample was collected.

Field blank samples are used to evaluate whether potential ambient PFAS in the air could be influencing our groundwater sample results.

We collected the equipment blank sample (SWI-6:EB) by collecting PFAS-free, laboratory provided water using fresh sampling equipment (peristaltic pump, high-density polyethylene tubing, and silicon tubing). Equipment blank samples demonstrate the potential for the sample tubing to introduce PFAS contamination into the project sample.

3.3 Analytical Testing Methods

A summary of the samples collected from each exploration, purpose, and select laboratory analyses performed is provided in Table 1.

Soil samples were collected from just above the observed groundwater interface or just below the near-surface soils. Four soil samples and one groundwater sample (and duplicate) were collected. Three quality control samples were also collected. Select samples were submitted under standard chain of custody procedures to OnSite Environmental or TestAmerica Laboratories, Inc. for the below-listed analyses.

Select soil samples were analyzed for:

- Gasoline-range hydrocarbons using Northwest Total Petroleum Hydrocarbons (NWTPH) as Gasoline Extended (NWTPH-Gx).
- Diesel- and oil-range hydrocarbons using NWTPH as Diesel Extended (NWTPH-Dx).
- Resource Conservation and Recovery Act metals by EPA Methods 6010D and 7471B.
- The third Unregulated Contaminant Monitoring rule (UCMR) PFAS by EPA Method 537 Modified.

Groundwater samples were analyzed for:

- Gasoline-range hydrocarbons using NWTPH-Gx.
- Diesel- and oil-range hydrocarbons using NWTPH-Dx.
- Total and dissolved priority pollutant metals using EPA Methods 200.8 and 7470A.
- The third UCMR PFAS by EPA Method 537 Modified.

4 ANALYTICAL RESULTS

Analytical results are provided in Tables 2 through 4 and Appendix B. The results of the analytical results have been screened against MTCA Method A CULs, MTCA Method B CULs (Ecology, 2013), and the EPA LHA (EPA, 2019).

4.1 Soil

The soil analytical results are presented in Table 2 and the parameters are summarized below. Where no criterion is established under MTCA Method A for a parameter, MTCA Method B values are used:

- TPH-D were detected at 9,300 mg/kg in sample SS-1. This detection exceeds the MTCA Method A criterion of 2,000 mg/kg. TPH-D were not detected in the other soil samples analyzed.
- TPH-O were detected at 75 mg/kg in composite sample SS-2:C. This detected is below the MTCA Method A criterion of 2,000 mg/kg. TPH-D were not detected in the other soil samples analyzed.
- Barium was detected at concentrations between 31 and 35 mg/kg in the four soil samples analyzed. These detections are below the MTCA Method B criterion of 16,000 mg/kg.
- Total chromium was detected at concentrations between 11 and 13 mg/kg in the four soil samples analyzed. These detections were screened against the MTCA Method A criterion for chromium VI, the most stringent regulated chromium element. These detections are below the MTCA Method A criterion of 19 mg/kg for chromium VI.
- Arsenic, cadmium, lead, mercury, selenium, and silver were not detected in any of the soil samples analyzed.
- PFAS was not detected in the one soil sample analyzed (SWI-6:18).
- Gasoline-range total petroleum hydrocarbons (TPH-G) were not detected in any of the soil samples analyzed. However, the practical quantitation limit (PQL) for sample SS-1:1 exceeded the regulatory level of 100 mg/kg. We cannot assess if gasoline-range petroleum is present above the regulatory level due to the elevated PQL.

4.2 Groundwater

4.2.1 Petroleum and Metals

Groundwater petroleum and metals analytical results are presented in Table 3 and summarized below.

- TPH-G, TPH-D, and TPH-O were not detected in the one groundwater sample analyzed (SWI-6:GW).
- Total metals including arsenic, chromium, copper, lead, nickel, and zinc were detected in the one groundwater sample analyzed (SWI-6:GW). However, each of those analytes were not detected in their dissolved analyses. This suggests that detected concentrations in the total metal analysis were a result of turbidity in the collected sample. Additionally, each total metal sample detection was below their respective MTCA Method A and/or Method B criterion.

4.2.2 Per- and Polyfluorinated Alkyl Substances (PFAS)

One groundwater sample and a field duplicate (SWI-6:GW and SWI-200:GW) were analyzed for the PFAS UCMR analytes. Groundwater analytical results for PFAS are presented in Table 4 and summarized below.

- PFOA was detected at 16 ng/L in both groundwater samples analyzed.
- PFOS was detected at 68 and 69 ng/L in samples SWI-6:GW and SWI-200:GW, respectively.
- Perfluorobutanesulfonic acid (PFBS) was detected at 11 ng/L in both groundwater samples analyzed.
- Perfluorohexanesulfonic acid (PFHxS) was detected at 50 and 51 ng/L in samples SWI-6:GW and SWI-200:GW, respectively.
- Perfluoroheptanoic acid (PFHpA) was detected at 130 and 140 ng/L in samples SWI-6:GW and SWI-200:GW, respectively.
- Perfluorononanoic acid (PFNA) was detected at 7.2 and 7.3 ng/L in samples SWI-6:GW and SWI-200:GW, respectively.

In 2016, the EPA issued the LHA, indicating drinking water concentrations for the sum of PFOA and PFOS exceeding 70 ng/L for individuals throughout their lives may result in adverse health effects. In the absence of state and federal regulatory limits, we reference the EPA's PFOA and PFOS LHA level of 70 ng/L as the PRG for impacted groundwater. The total PFOA and PFOS concentrations in project samples SWI-6:GW and SWI-200:GW exceeded this criterion with concentrations of 84 and 85 ng/L, respectively.

EPA is prioritizing public health impacts by focusing on addressing groundwater that is a current or potential source of drinking water. The guidance recommends:

- Using a screening level of 40 ng/L to determine if PFOA and/or PFOS is present at a site and may warrant further attention.
 - Screening levels are risk-based values that are used to determine if levels of contamination may warrant further investigation at a site.
- Using EPA's PFOA and PFOS LHA level of 70 ng/L as the PRG for impacted groundwater that is a current or potential source of drinking water, where no state or tribal maximum contaminant level or other applicable or relevant and appropriate requirements are available or sufficiently protective.
 - PRGs are generally initial targets for cleanup, which may be adjusted on a site-specific basis as more information becomes available.

4.3 PFAS Quality-Control Samples

Shannon & Wilson collected three quality control samples for PFAS analysis using laboratory supplied PFAS-free water, as discussed in Section 3.2 of this report. Analytical results for the PFAS quality control samples are presented in Table 4 and summarized below.

- PFHxS was detected at an estimated concentration (below the PQL) of 0.31 J, 0.28 J, and 0.26 J ng/L in quality control samples SWI-6:Rinsate, SWI-6:FB, and SWI-6:EB, respectively. However, the laboratory also detected the compound in the associated laboratory method blank sample at a similar, estimated concentration of 0.313 J ng/L, indicating laboratory contamination is responsible for PFHxS detections in the quality control samples. PFHxS results for samples SWI-6:Rinsate, SWI-6:FB, and SWI-6:EB are considered not detected, flagged with a “B” at the PQL.
- PFBS, PFHpA, PFOA, PFOS, and PFNA were not detected in the quality control samples analyzed.

5 INVESTIGATION-DERIVED WASTE (IDW)

IDW generated during sampling included soil cuttings, decontamination fluids, purge water, used personal protection equipment (PPE), and disposable sampling equipment. Soil cuttings were contained in three 55-gallon labeled Washington State Department of Transportation-approved drums. Decontamination fluids and purge water were also contained within a 55-gallon labeled Washington State Department of Transportation-approved drum. Both IDW drums are being temporarily stored offsite pending approval for disposal by an appropriately licensed waste transporter. PPE and disposable sampling equipment were placed in a plastic bag and disposed as solid waste.

6 CONCLUSIONS

Based on the data collected for this Phase II ESA, we can offer the following conclusions for the West Pierce Fire & Rescue Maintenance Facility:

- In the absence of state or federal regulatory limits for PFOA and PFOS in soil and groundwater, we reference EPA's LHA level of 70 ng/L for the sum of PFOS and PFOA as the PRG for impacted groundwater. The sum of PFOS and PFOA in sample SWI-6:GW and (duplicate sample) SWI-200:GW exceeded the LHA with concentrations of 84 and 85 ng/L, respectively. The apparent source of PFAS is from transferring fire-fighting foam between different containments located on site; however, due to the limited nature of this assessment, an off-site source of the impacted groundwater cannot be ruled out. The extent of the PFAS contamination in groundwater is not known.

- TPH-D were detected at 9,300 mg/kg in the soil collected from 1-foot bgs in sample SS-1. This detection exceeds the MTCA Method A CUL of 2,000 mg/kg for TPH-D. The contamination is likely due to leaking drums and equipment exposed to the surface. The extent of contaminated soil is not known.
- Near-surface soil in the vicinity of the gasoline AST did not present TPH or metal contamination. TPH-O were detected at 75 mg/kg in composite sample SS-2:C. This detection is below the MTCA Method A criterion of 2,000 mg/kg.
- TPH and metal contamination were not detected in the groundwater sample analyzed.

Shannon & Wilson has prepared the enclosed "Important Information About Your Environmental Site Assessment/Evaluation Report" to assist you and others in understanding the use and limitations of our reports.

7 REFERENCES

- Environmental Data Resources, Inc. (EDR), 2019, The EDR historical topo map report, Pierce County Fire Station, 9410 39th Avenue Ct SW, Lakewood, WA 98499: Report prepared by Environmental Data Resources, Inc., Shelton, Connecticut, inquiry number 5765972.4, for Shannon & Wilson, Inc., Seattle, Washington, August 26.
- Pierce County Public Geographic Information System (GIS), 2019, maps of the subject property and surrounding area, available:
<https://matterhornwab.co.pierce.wa.us/publicgis/>, accessed September 2019.
- Shannon & Wilson, 2019, Draft hydrogeologic assessment, Sounder Maintenance Base project, Lakewood, Washington: Report prepared by Shannon & Wilson, for Sound Transit, Seattle, Wash., October 31.
- Shannon & Wilson, 2020a, Draft environmental and hydrogeologic conditions summary report, Sounder Maintenance Base, Lakewood, Washington: Report prepared by Shannon & Wilson, for Sound Transit, Seattle, Wash., March.
- Shannon & Wilson, 2020b, Phase I environmental site assessment, West Pierce Fire & Rescue Maintenance Facility, Lakewood, Washington: Report prepared by Shannon & Wilson, Inc., Seattle, Wash., for Sound Transit, Seattle, Wash., project no. 21-1-16700-371, February 13.
- Shuster, Mike, Mechanic, West Pierce Fire & Rescue, 2019, personal communication with Dion Valdez of Constellation Services, November 5.

U.S. Environmental Protection Agency (EPA), 2019, Interim recommendations to address groundwater contaminated with perfluorooctanoic acid and perfluorooctanesulfonate: Memorandum prepared by U.S. Environmental Protection Agency, directive no. 9283.1-47, December 19.

Washington State Department of Ecology (Ecology), 2013, Model Toxics Control Act Regulation and Statute: MTCA Cleanup Regulation, Chapter 173-340 WAC; Model Toxics Control Act, Chapter 70.105D RCW; Uniform Environmental Covenants Act, Chapter 64.70 RCW (rev.): Olympia, Wash., Washington Department of Ecology Publication No. 95.06, 324 p., available:
<https://fortress.wa.gov/ecy/publications/summarypages/9406.html>

Table 1 - Summary of Samples Collected and Analyses Performed

Exploration	Purpose of Exploration	Sample Number	Sample Depth (feet bgs)	Sample Media				Priority Pollutant	
					NWTPH-Gx	NWTPH-Dx	RCRA Metals	Metals ^b	PFAS ^c
SWI-6-19	Evaluate potential soil and groundwater impacts from long-term maintenance of firefighting vehicles.	SWI-6:18	18	Soil	X	X	X		X
		SWI-6:25	25	Soil	X	X	X		
		SWI-6:GW	20-25 ^a	Groundwater	X	X		X	X
		SWI-200:GW	20-25 ^a	Groundwater					X
SS-1	Evaluate near-surface soils in vicinity of outdoor drum storage and maintenance equipment.	SS-1:1	1	Soil	X	X	X		
SS-2	Evaluate near-surface soils near outdoor fuel tank.	SS-2:C	1 - Composite from three locations	Soil	X	X	X		

NOTES:
^a Well screened between 5 and 10 feet bgs.

^b Metals analysis is RCRA 8 metals in soil and total and dissolved priority pollutant metals in groundwater.

^c Six per- and polyfluoroalkyl substances (PFAS) were tested under Third Unregulated Contaminant Monitoring Rule.

bgs = below ground surface; NWTPH-Dx = Northwest Total Petroleum Hydrocarbon-Diesel Extended; NWTPH-Gx = Northwest Total Petroleum Hydrocarbon-Gasoline Extended; RCRA = Resource Conservation and Recovery Act; X = analyzed

Table 2 - Summary of Soil Analytical Results

Boring Number:	SWI-6-19		SS-1	SS-2	MTCA Method A CUL for Unrestricted Land Use ¹
Sample Number:	SWI-6:18	SWI-6:25	SS-1:1	SS-2:C	
Sample Depth (feet bgs):	18	25	1	1	
Sample Date:	01/15/20	01/15/20	01/15/20	01/15/20	
Total Petroleum Hydrocarbons - (mg/kg)					
Gasoline-Range Organics	< 5.3	< 5.9	< 1,100	< 5.7	500
Diesel-Range Organics	< 28	< 27	9,300²	< 27	2,000
Oil-Range Organics	< 56	< 53	< 990	75	2,000
Metals - (mg/kg)					
Arsenic	< 11	< 11	< 11	< 11	20
Barium	31	33	35	34	<i>16,000</i>
Cadmium	< 0.56	< 0.53	< 0.53	< 0.55	2
Chromium	13	11	11	11	19
Lead	< 5.6	< 5.3	< 5.3	5.6	250
Mercury	< 0.28	< 0.27	< 0.27	< 0.27	2
Selenium	< 11	< 11	< 11	< 11	400
Silver	< 1.1	< 1.1	< 1.1	< 1.1	400
Per- and Polyfluoroalkyl Substances (PFAS) - (ug/kg)					
Perfluorobutanesulfonic acid (PFBS)	< 0.23 J	--	--	--	NE
Perfluorohexanesulfonic acid (PFHxS)	< 0.23 J	--	--	--	NE
Perfluoroheptanoic acid (PFHpA)	< 0.23 J	--	--	--	NE
Perfluorooctanoic acid (PFOA)	< 0.23 J	--	--	--	NE
Perfluorooctanesulfonic acid (PFOS)	< 0.58 J	--	--	--	NE
Perfluorononanoic acid (PFNA)	< 0.23 J	--	--	--	NE

NOTES:

¹ MTCA Method A CUL for unrestricted land use; only provided for petroleum hydrocarbons and metals. If Method A CUL not available, *Method B CUL provided in italics.*

² Result reported as Diesel #2.

Bold text indicates detected analyte.

Gray shaded text indicates concentrations exceeds the cleanup criterion.

J = Percent moisture laboratory duplicate failure

-- = not analyzed or not applicable; < = not detected above indicated laboratory reporting limit; bgs = below ground surface; CUL = cleanup level; mg/kg = milligrams per kilogram; ug/kg = micrograms per kilogram; MTCA = Model Toxics Control Act; NE = not established

Table 3 - Summary of Groundwater Analytical Results

Boring Number:	SWI-6-19	MTCA Method A CUL for Unrestricted Land Use	MTCA Method B CUL (Noncancer)
Sample Number:	SWI-6:GW		
Depth to Water (feet bgs):	14.18		
Sample Date:	01/22/20		
Total Petroleum Hydrocarbons - (ug/L)			
Gasoline-Range Organics	< 100	1,000	NE
Diesel-Range Organics	< 220	500	NE
Oil-Range Organics	< 220	500	NE
Total Metals - (ug/L)			
Antimony	< 5.6	NE	6.4
Arsenic	4.5	5	4.8
Beryllium	< 11	NE	32
Cadmium	< 4.4	5	8
Chromium	39	50	24,000/48*
Copper	46	NE	640
Lead	5.1	15	NE
Mercury	< 0.50	2	NE
Nickel	64	NE	180
Selenium	< 5.6	NE	80
Silver	< 11	NE	80
Thallium	< 5.6	NE	0.16
Zinc	57	NE	4,800
Dissolved Metals - (ug/L)			
Antimony	< 5.0	NE	6.4
Arsenic	< 3.0	5	4.8
Beryllium	< 10	NE	32
Cadmium	< 4.0	5	8
Chromium	< 10	50	24,000/48*
Copper	< 10	NE	640
Lead	< 1.0	15	NE
Mercury	< 0.50	2	NE
Nickel	< 20	NE	180
Selenium	< 5.0	NE	80
Silver	< 10	NE	80
Thallium	< 5.0	NE	0.16
Zinc	< 25	NE	4,800

NOTES:

* = Chromium MTCA Method B CUL is 24,000 ug/L for chromium (III) and 48 ug/L for chromium (VI)

Bold text indicates detected analyte.

< = not detected above indicated laboratory reporting limit; bgs = below ground surface; CUL = cleanup level; MTCA = Model Toxics Control Act;

NE = not established; ug/L = micrograms per liter

Table 4 - Summary of Groundwater and Water PFAS Analytical Results

Boring Number:	SWI-6-19					EPA Preliminary Remediation Goal
	SWI-6:GW	SWI-200:GW	SWI-6:Rinsate	SWI-6:FB	SWI-6:EB	
Sample Number:	SWI-6:GW	SWI-200:GW	SWI-6:Rinsate	SWI-6:FB	SWI-6:EB	
Depth to Water (feet bgs):	14.18	14.18	N/A	N/A	N/A	
Sample Date:	01/22/20	01/22/20	01/22/20	01/22/20	01/22/20	
Per- and Polyfluoroalkyl Substances (PFAS) - (ng/L)						
Perfluorobutanesulfonic acid (PFBS)	11	11	< 1.9	< 1.8	< 1.8	NE
Perfluorohexanesulfonic acid (PFHxS)	50	51	< 1.9 B	< 1.8 B	< 1.8 B	NE
Perfluoroheptanoic acid (PFHpA)	130	140	< 1.9	< 1.8	< 1.8	NE
Perfluorooctanoic acid (PFOA)	16	16	< 1.9	< 1.8	< 1.8	NE
Perfluorooctanesulfonic acid (PFOS)	68	69	< 1.9	< 1.8	< 1.8	NE
Perfluorononanoic acid (PFNA)	7.2	7.3	< 1.9	< 1.8	< 1.8	NE
PFOA + PFOS =	84	85	< 1.9	< 1.8	< 1.8	70

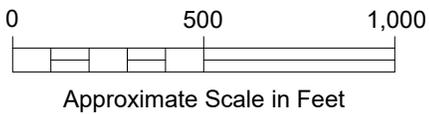
NOTES:

Bold text indicates detected analyte.

Gray shaded text indicates concentrations exceeds the preliminary remediation goal.

B = compound was found in the blank and sample.

< = not detected above indicated laboratory reporting limit; bgs = below ground surface; EPA = U.S. Environmental Protection Agency; NA = not applicable; NE = not established; ng/L = nanograms per liter



West Pierce Fire & Rescue Maintenance Facility
Phase II ESA
Lakewood, Washington

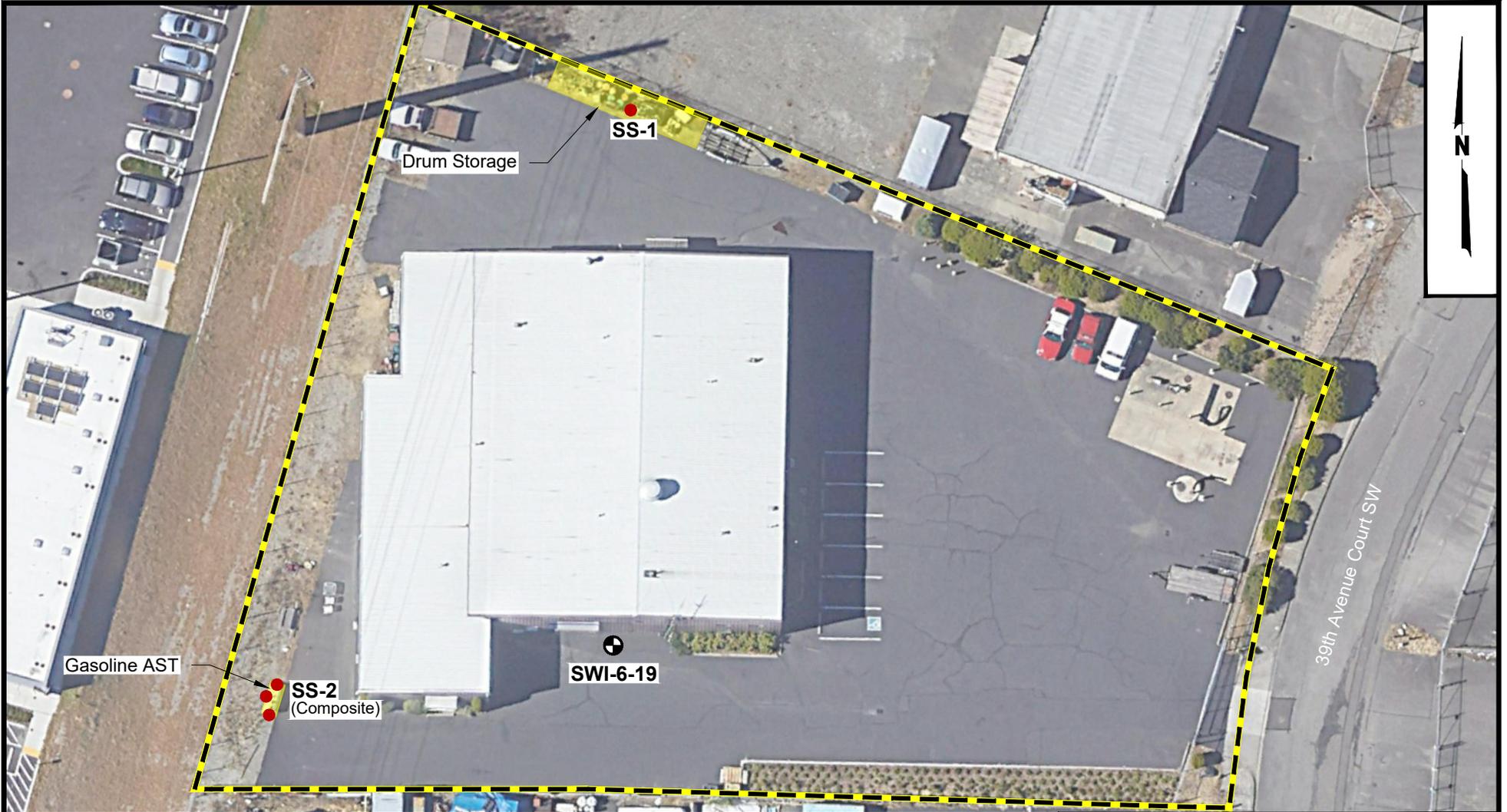
VICINITY MAP

March 2020

21-1-16700-373

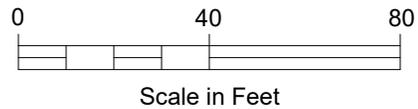


FIG. 1



LEGEND

-  Site Parcel Boundary
-  **SWI-6-19** Groundwater Monitoring Well Designation and Approximate Location
-  **SS-1** Hand Boring Designation and Approximate Location

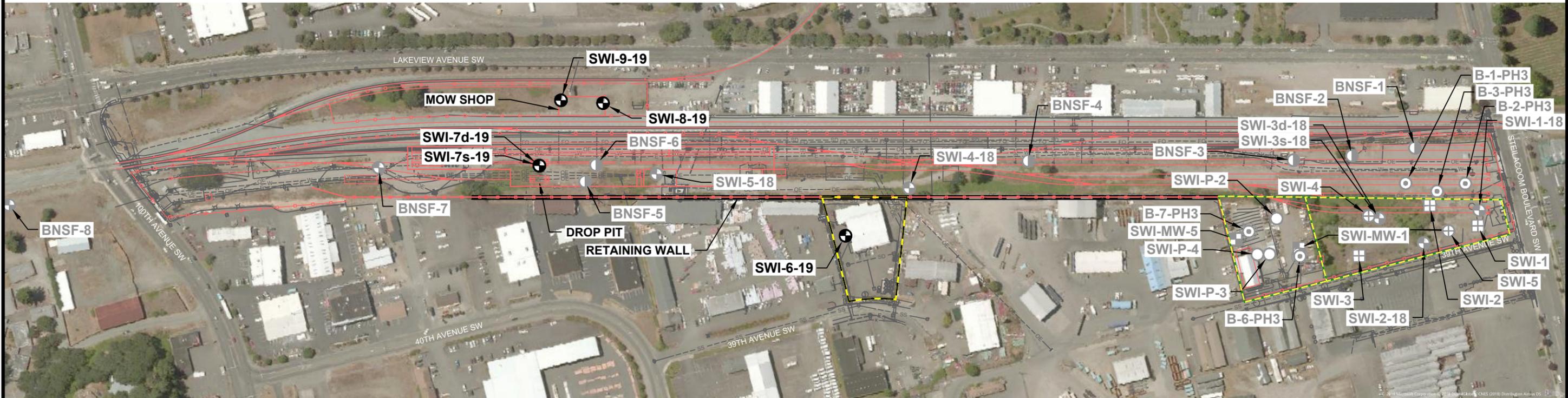


West Pierce Fire & Rescue Maintenance Facility
Phase II ESA
Lakewood, Washington

SITE AND EXPLORATION PLAN

March 2020

21-1-16700-373



LEGEND

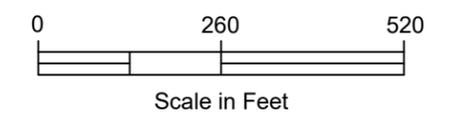
- SWI-6-19** Soil Boring Designation and Approximate Location by S&W (2019)
- SWI-1-18** Soil Boring Designation and Approximate Location by S&W (2018)
- SWI-1** Monitoring Well Designation and Approximate Location by S&W (2017)
- SWI-4** Boring Designation and Approximate Location by S&W (2017)
- SWI-MW-1** Monitoring Well Designation and Approximate Location by S&W (2017)
- B-1-PH3** Boring Designation and Approximate Location by GeoEngineers (2015)
- SWI-P-3** Boring Designation and Approximate Location by S&W (2005 and 2014)
- BNSF-1** BNSF Soil Boring Designation and Approximate Location by S&W (2004)
- Proposed Development
- Paige & Burgess Parcels
- West Pierce Fire and Rescue Maintenance Facility (Subject Property)

NOTE

Figure adapted from WSP USA files xSMB-CU-CRP100.dwg, xSMB-CU-APP100.dwg, xSMB-CU-KAP100.dwg dated 06/07/2018, xSMB-VRX001.dwg dated 04/03/2018, xSMB-VSF001.dwg, xSMB-VUT001.dwg dated 04/18/2018, xSMB-VSF002.dwg dated 06/21/2018, and SMB Site 20190930 - C.dwg received 12/02/2019.

EXPLORATION LOCATION			
	ID	NORTHING	EASTING
2018 Explorations	SWI-1-18	678279.2	1145718
	SWI-2-18	678115.6	1145762
	SWI-3d-18 (Dual)	678019.8	1145668
	SWI-3s-18 (Dual)	678019.8	1145668
	SWI-4-18	676852.0	1145261
2019-2020 Explorations	SWI-5-18	676222.6	1145048
	SWI-6-19	676657.5	1145337
	SWI-7d-19 (Dual)	675931.9	1144944
	SWI-7s-19 (Dual)	675931.9	1144944
	SWI-8-19	676137.0	1144831
	SWI-9-19	676032.4	1144794

NOTE
Northings and Eastings are in Washington State Plane, South Zone, US Foot.



West Pierce Fire & Rescue Maintenance Facility
Phase II ESA
Lakewood, Washington

**SOUNDER MAINTENANCE BASE
SITE AND EXPLORATION PLAN**

March 2020 21-1-16700-373



Appendix A

Field Methods and Exploration Log

CONTENTS

- A.1 Introduction A-1
- A.2 Pre-Sampling Activities..... A-1
- A.3 Sample Collection A-1
 - A.3.1 Hollow-Stem Auger Drilling..... A-2
 - A.3.1.1 Soil Sampling..... A-2
 - A.3.1.2 Well Installation A-2
 - A.3.1.3 Well Development A-2
 - A.3.2 Groundwater Sampling..... A-2
 - A.3.3 Near-Surface Soil Sampling..... A-3
- A.4 Sampling Handling..... A-3
- A.5 Field Screening Methods..... A-3
 - A.5.1 Photoionization Detector (PID) Measurements..... A-4
 - A.5.2 Visual Observation..... A-4
 - A.5.3 Odors..... A-5
 - A.5.4 Field Screening Documentation A-5
- A.6 Analytical Methods..... A-5
- A.7 Decontamination Methods A-5
 - A.7.1 Hollow-Stem Auger..... A-6
 - A.7.2 Sampling Equipment..... A-6
- A.8 Investigation-Derived Waste (IDW)..... A-6

Figures

Figure A-1: Soil Description and Log Key (3 sheets)

Figure A-2: Log of Boring SWI-6-19 (2 sheets)

A.1 INTRODUCTION

The project consisted of collection of soil and groundwater samples from one boring and collection of soil from two near-surface sample locations. One near-surface sample location consisted of composited materials from three locations surrounding a gasoline aboveground storage tank (AST). Groundwater was collected after well construction and development. The activities were completed to support planned property acquisitions associated with the Sounder Maintenance Base project in Lakewood, Washington.

The assessment was completed to assess current conditions related to recognized environmental conditions on the subject property.

Standard investigation methods, including sample collection, field screening, documentation procedures, and selected analyses are described briefly in the following subsections. Sample collection and documentation were completed in accordance with Shannon & Wilson's standard operating procedures.

A.2 PRE-SAMPLING ACTIVITIES

Shannon & Wilson coordinated with Sound Transit to gain access to the subject property. Coordination included the preparation of a Property Access Plan to support an invasive right-of-entry. A representative of Shannon & Wilson notified the Underground Utilities Location Center (1-800-424-5555) at least 48 hours before the start of subsurface work at the site. Applied Professional Services surveyed the area within 10 feet of the proposed boring locations to look for private utilities.

A.3 SAMPLE COLLECTION

During the field investigation, soil and groundwater samples were collected to evaluate the potential for site contamination. The various methods of collecting samples are presented below. Sample handling procedures are summarized in Section A.4. Select samples were submitted to OnSite Analytical, Inc., in Redmond, Washington, and TestAmerica Laboratories, Inc., in Sacramento, California. Samples were analyzed by the methods discussed in Section A.6.

Decontamination procedures are presented in Section A.7.

A.3.1 Hollow-Stem Auger Drilling

A truck-mounted hollow-stem auger rig was used to collect subsurface soil samples. An 8-inch-diameter auger was advanced to 25 feet. A total of two soil samples were collected from the single exploration. A log for the exploration is included as Figure A-2.

A.3.1.1 Soil Sampling

Soil was visually described using Shannon & Wilson's soil classification procedure, which is a modified version of the Unified Soil Classification System. The soil classification procedure can be seen in Figure A-1. The soil descriptions were recorded on the field log. When a soil sample was selected for chemical analysis, the soil sample was placed into laboratory-supplied glassware using disposable, stainless steel spoons, or disposable plastic syringes. A soil sample was collected at the approximate soil-water interface at two locations within the boring. The soil-water interface is the minimum depth at which the soil is in contact with groundwater. A soil sample was collected at the perched groundwater zone and the water-bearing aquifer.

A.3.1.2 Well Installation

A well was installed in SWI-6-19 to collect groundwater samples. The well was set just off the bottom of the hole and screened to the observed groundwater. The well was constructed of 2-inch-diameter, Schedule 40 polyvinyl chloride pipe. A 5-foot screened segment was installed from 20 to 25 feet below ground surface (bgs). The sand filter pack was placed around the screened segment, bentonite chips were filled in around the blank pipe segment, and the monument was grouted into place.

A.3.1.3 Well Development

At least 24 hours after the well was installed, it was developed by using a surge block to remove turbid water and infiltrated filter pack. Well development was completed at least 24 hours prior to collection of groundwater parameters and sampling. Water removed from the wells was placed into drums for later disposal (see Section A.8).

A.3.2 Groundwater Sampling

Two groundwater samples (one sample and a duplicate) were collected from SWI-6-19. Groundwater was withdrawn using a peristaltic pump and disposable per- and polyfluoroalkyl substances (PFAS-) free tubing. Field personnel purged each well using a low-flow peristaltic pump set to a rate of less than 500 milliliters per minute. Purging continued until the turbidity of the groundwater visually appeared to stabilize; however, turbidity appeared relatively high even after stabilization. The purge water was collected in

a bucket and transferred to a drum pending disposal. Following purging, groundwater samples were collected using the peristaltic pump.

A.3.3 Near-Surface Soil Sampling

Near-surface soil samples were collected using hand tools to excavate down to 1 foot bgs. Sample SS-2 consisted of composited soil collected from three locations surrounding the gasoline AST. Garden trowel equipment was used to reach the target depth. Tools were decontaminated between each location.

A.4 SAMPLING HANDLING

Environmental samples were collected using disposable sampling equipment. PFAS-free gloves were worn by the sample handler during collection of each sample. Non-disposable sampling equipment was decontaminated between sample locations to reduce potential for cross contamination. Field notes documented site conditions and sample collection activities.

Samples collected for laboratory analysis were placed into pre-cleaned laboratory-provided glassware and containerized sequentially, with the most volatile target analyte collected first. The preferred collection order for some of the more common analytes is: (a) volatile organics and petroleum, (b) semi-volatile organics, and (c) metals. The sample container labels were completed using indelible ink. The samples were sealed in plastic bags and then placed into a cooler and maintained at 4 degrees Celsius (°C) (+ 2°C) with “blue ice.”

Sample information was recorded on chain-of-custody forms, and these forms accompanied the samples to the laboratory. Samples were maintained under chain-of-custody until delivered to either OnSite Environmental or TestAmerica Laboratories, Inc.

A.5 FIELD SCREENING METHODS

Field screening of soil samples helped evaluate the potential presence of contamination. Typically, at a nonhazardous waste site, the most likely locations to encounter contamination are in fill, at the water table interface, in the water table smear (fluctuation) zone, at fill/native soil contacts, and at pronounced changes in permeability. However, the location of contamination, if any, is site-dependent.

Field screening methods typically consisted of:

- Photoionization detector (PID) measurements.
- Visual observations.
- Olfactory observations.

The three methods were used for the site. Decontaminated PFAS-free gloves were worn by the field personnel during the screening. Environmental samples were collected using disposable sampling equipment.

A.5.1 Photoionization Detector (PID) Measurements

PID measurements were collected on soil samples to screen for volatile organic vapors such as gasoline and solvents. Typically, decaying organics can elevate PID measurements and diesel and oil can rarely be detected with the PID. PID measurements were obtained by passing the instrument directly over the soil or by performing a headspace measurement.

Headspace measurements were used to confirm low PID readings or to check for low volatility contaminants such as old petroleum products by the following procedure:

- Place an amount of soil into a Ziploc™ bag.
- Place the bag in a warm environment.
- Wait a consistent amount of time for the soil to reach “ambient” conditions (usually 15 minutes).
- Insert the top of the PID into a very small slit in the bag.
- Take a PID reading and record the data.

A.5.2 Visual Observation

Visual observations of soil samples and cuttings were recorded in the boring log or in the field logbook. Indications of contamination include:

- Black, tarry substances.
- Oily or shiny soil.
- Metallic flakes.
- Free product petroleum or organic hydrocarbons.
- Gray, pink, red, or black discolorations.

A.5.3 Odors

Unusual odors were recorded when noted during drilling or sampling. Soil was not intentionally smelled for contamination. Soil was not tasted for classification purposes.

A.5.4 Field Screening Documentation

During screening, the following items were recorded:

- Type of measurement/observation.
- Depth.
- Time of measurement or observation.
- Possible source.
- Description of odor (petroleum, decaying organics, creosote, cedar, etc.).

A.6 ANALYTICAL METHODS

Selected soil samples were analyzed for:

- Gasoline-range hydrocarbons using Northwest Total Petroleum Hydrocarbons (NWTPH) as Gasoline Extended (NWTPH-Gx).
- Diesel- and oil-range hydrocarbons using NWTPH as Diesel Extended (NWTPH-Dx).
- Resource Conservation and Recovery Act metals by U.S. Environmental Protection Agency (EPA) Methods 6010D and 7471B.
- The third Unregulated Contaminant Monitoring rule (UCMR) list of PFAS by EPA Method 537 Modified.

Selected groundwater samples were analyzed for:

- Gasoline-range hydrocarbons using NWTPH-Gx.
- Diesel- and oil-range hydrocarbons using NWTPH-Dx.
- Total and dissolved priority pollutant metals using EPA Methods 200.8 and 7470A.
- UCMR list of PFAS by EPA Method 537 Modified.

A.7 DECONTAMINATION METHODS

The primary objective of the decontamination process is to reduce the potential for the accidental introduction of contaminants to non-contaminated areas or samples. This section describes the methods associated with decontamination of field equipment.

A.7.1 Hollow-Stem Auger

Equipment used during soil activities was steam cleaned prior to use. Prior to drilling, Shannon & Wilson rinsed the auger, drilling head, samplers, and rods with PFAS-free water provided by the analytical laboratory. Following decontamination, caution was taken to keep the equipment off the ground.

The drilling subcontractor provided a wash station for sampling equipment to be washed and a pressure wash bath followed by a PFAS-free water rinse to clean the auger segments and other downhole equipment between each sampling depth.

A.7.2 Sampling Equipment

Groundwater and soil sampling equipment was cleaned prior to and at the completion of sampling. Non-dedicated sampling equipment used during the field activities was decontaminated as follows:

- Remove gross contamination and particulate matter.
- Wash thoroughly with Alconox™ or similar non-phosphate detergent plus tap water or designated decontamination water supply source.
- Rinse equipment thoroughly with PFAS-free water.

A.8 INVESTIGATION-DERIVED WASTE (IDW)

IDW is waste generated during sampling activities. IDW that was generated during these sampling activities included soil cuttings, development water, purge water, and decontamination water. IDW was placed into steel drums. The drums are temporarily stored off-site on a Sound Transit-owned (Burgess) parcel.

Miscellaneous IDW consisted of used personal protective equipment (PPE); disposable sampling equipment (spoons, tubing, etc.); and other wastes that originated from site activities. This IDW was placed in doubled, heavy-duty plastic bags. The waste PPE and disposable sampling equipment was disposed of in a dumpster at the drilling subcontractor's facility and the Shannon & Wilson offices.

Shannon & Wilson, Inc. (S&W), uses a soil identification system modified from the Unified Soil Classification System (USCS). Elements of the USCS and other definitions are provided on this and the following pages. Soil descriptions are based on visual-manual procedures (ASTM D2488) and laboratory testing procedures (ASTM D2487), if performed.

S&W INORGANIC SOIL CONSTITUENT DEFINITIONS

CONSTITUENT ²	FINE-GRAINED SOILS (50% or more fines) ¹	COARSE-GRAINED SOILS (less than 50% fines) ¹
Major	Silt, Lean Clay, Elastic Silt, ³ or Fat Clay	Sand or Gravel ⁴
Modifying (Secondary) Precedes major constituent	30% or more coarse-grained: Sandy or Gravelly ⁴	More than 12% fine-grained: Silty or Clayey ³
Minor Follows major constituent	15% to 30% coarse-grained: with Sand or with Gravel ⁴ 30% or more total coarse-grained and lesser coarse-grained constituent is 15% or more: with Sand or with Gravel ⁵	5% to 12% fine-grained: with Silt or with Clay ³ 15% or more of a second coarse-grained constituent: with Sand or with Gravel ⁵

¹All percentages are by weight of total specimen passing a 3-inch sieve.
²The order of terms is: *Modifying Major with Minor*.
³Determined based on behavior.
⁴Determined based on which constituent comprises a larger percentage.
⁵Whichever is the lesser constituent.

MOISTURE CONTENT TERMS

Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp but no visible water
Wet	Visible free water, from below water table

STANDARD PENETRATION TEST (SPT) SPECIFICATIONS

Hammer:	140 pounds with a 30-inch free fall. Rope on 6- to 10-inch-diam. cathead 2-1/4 rope turns, > 100 rpm
	NOTE: If automatic hammers are used, blow counts shown on boring logs should be adjusted to account for efficiency of hammer.
Sampler:	10 to 30 inches long Shoe I.D. = 1.375 inches Barrel I.D. = 1.5 inches Barrel O.D. = 2 inches
N-Value:	Sum blow counts for second and third 6-inch increments. Refusal: 50 blows for 6 inches or less; 10 blows for 0 inches.
	NOTE: Penetration resistances (N-values) shown on boring logs are as recorded in the field and have not been corrected for hammer efficiency, overburden, or other factors.

PARTICLE SIZE DEFINITIONS

DESCRIPTION	SIEVE NUMBER AND/OR APPROXIMATE SIZE
FINES	< #200 (0.075 mm = 0.003 in.)
SAND Fine Medium Coarse	#200 to #40 (0.075 to 0.4 mm; 0.003 to 0.02 in.) #40 to #10 (0.4 to 2 mm; 0.02 to 0.08 in.) #10 to #4 (2 to 4.75 mm; 0.08 to 0.187 in.)
GRAVEL Fine Coarse	#4 to 3/4 in. (4.75 to 19 mm; 0.187 to 0.75 in.) 3/4 to 3 in. (19 to 76 mm)
COBBLES	3 to 12 in. (76 to 305 mm)
BOULDERS	> 12 in. (305 mm)

RELATIVE DENSITY / CONSISTENCY

COHESIONLESS SOILS		COHESIVE SOILS	
N, SPT, BLOWS/FT.	RELATIVE DENSITY	N, SPT, BLOWS/FT.	RELATIVE CONSISTENCY
< 4	Very loose	< 2	Very soft
4 - 10	Loose	2 - 4	Soft
10 - 30	Medium dense	4 - 8	Medium stiff
30 - 50	Dense	8 - 15	Stiff
> 50	Very dense	15 - 30	Very stiff
		> 30	Hard

WELL AND BACKFILL SYMBOLS

	Bentonite Cement Grout		Surface Cement Seal
	Bentonite Grout		Asphalt or Cap
	Bentonite Chips		Slough
	Silica Sand		Inclinometer or Non-perforated Casing
	Perforated or Screened Casing		Vibrating Wire Piezometer

PERCENTAGES TERMS^{1,2}

Trace	< 5%
Few	5 to 10%
Little	15 to 25%
Some	30 to 45%
Mostly	50 to 100%

¹Gravel, sand, and fines estimated by mass. Other constituents, such as organics, cobbles, and boulders, estimated by volume.

²Reprinted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

West Pierce Fire & Rescue Maintenance Facility
Lakewood, Washington

SOIL DESCRIPTION AND LOG KEY

March 2020

21-1-16700-373

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-1
Sheet 1 of 3

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)
(Modified From USACE Tech Memo 3-357, ASTM D2487, and ASTM D2488)

MAJOR DIVISIONS			GROUP/GRAPHIC SYMBOL	TYPICAL IDENTIFICATIONS
COARSE-GRAINED SOILS <i>(more than 50% retained on No. 200 sieve)</i>	Gravels <i>(more than 50% of coarse fraction retained on No. 4 sieve)</i>	Gravel <i>(less than 5% fines)</i>	GW 	Well-Graded Gravel; Well-Graded Gravel with Sand
			GP 	Poorly Graded Gravel; Poorly Graded Gravel with Sand
		Silty or Clayey Gravel <i>(more than 12% fines)</i>	GM 	Silty Gravel; Silty Gravel with Sand
			GC 	Clayey Gravel; Clayey Gravel with Sand
	Sands <i>(50% or more of coarse fraction passes the No. 4 sieve)</i>	Sand <i>(less than 5% fines)</i>	SW 	Well-Graded Sand; Well-Graded Sand with Gravel
			SP 	Poorly Graded Sand; Poorly Graded Sand with Gravel
		Silty or Clayey Sand <i>(more than 12% fines)</i>	SM 	Silty Sand; Silty Sand with Gravel
			SC 	Clayey Sand; Clayey Sand with Gravel
FINE-GRAINED SOILS <i>(50% or more passes the No. 200 sieve)</i>	Silt and Clays <i>(liquid limit less than 50)</i>	Inorganic	ML 	Silt; Silt with Sand or Gravel; Sandy or Gravelly Silt
			CL 	Lean Clay; Lean Clay with Sand or Gravel; Sandy or Gravelly Lean Clay
		Organic	OL 	Organic Silt or Clay; Organic Silt or Clay with Sand or Gravel; Sandy or Gravelly Organic Silt or Clay
	Silt and Clays <i>(liquid limit 50 or more)</i>	Inorganic	MH 	Elastic Silt; Elastic Silt with Sand or Gravel; Sandy or Gravelly Elastic Silt
			CH 	Fat Clay; Fat Clay with Sand or Gravel; Sandy or Gravelly Fat Clay
		Organic	OH 	Organic Silt or Clay; Organic Silt or Clay with Sand or Gravel; Sandy or Gravelly Organic Silt or Clay
HIGHLY-ORGANIC SOILS	Primarily organic matter, dark in color, and organic odor	PT 	Peat or other highly organic soils (see ASTM D4427)	

NOTE: No. 4 size = 4.75 mm = 0.187 in.; No. 200 size = 0.075 mm = 0.003 in.

NOTES

- Dual symbols (*symbols separated by a hyphen, i.e., SP-SM, Sand with Silt*) are used for soils with between 5% and 12% fines or when the liquid limit and plasticity index values plot in the CL-ML area of the plasticity chart. Graphics shown on the logs for these soil types are a combination of the two graphic symbols (e.g., SP and SM).
- Borderline symbols (*symbols separated by a slash, i.e., CL/ML, Lean Clay to Silt; SP-SM/SM, Sand with Silt to Silty Sand*) indicate that the soil properties are close to the defining boundary between two groups.

West Pierce Fire & Rescue Maintenance Facility
Lakewood, Washington

**SOIL DESCRIPTION
AND LOG KEY**

March 2020

21-1-16700-373

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-1
Sheet 2 of 3

GRADATION TERMS

Poorly Graded	Narrow range of grain sizes present or, within the range of grain sizes present, one or more sizes are missing (Gap Graded). Meets criteria in ASTM D2487, if tested.
Well-Graded	Full range and even distribution of grain sizes present. Meets criteria in ASTM D2487, if tested.

CEMENTATION TERMS¹

Weak	Crumbles or breaks with handling or slight finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

PLASTICITY²

DESCRIPTION	VISUAL-MANUAL CRITERIA	APPROX. PLASTICITY INDEX RANGE
Nonplastic	A 1/8-in. thread cannot be rolled at any water content.	< 4
Low	A thread can barely be rolled and a lump cannot be formed when drier than the plastic limit.	4 to 10
Medium	A thread is easy to roll and not much time is required to reach the plastic limit. The thread cannot be rerolled after reaching the plastic limit. A lump crumbles when drier than the plastic limit.	10 to 20
High	It takes considerable time rolling and kneading to reach the plastic limit. A thread can be rerolled several times after reaching the plastic limit. A lump can be formed without crumbling when drier than the plastic limit.	> 20

ADDITIONAL TERMS

Mottled	Irregular patches of different colors.
Biorturbated	Soil disturbance or mixing by plants or animals.
Diamict	Nonsorted sediment; sand and gravel in silt and/or clay matrix.
Cuttings	Material brought to surface by drilling.
Slough	Material that caved from sides of borehole.
Sheared	Disturbed texture, mix of strengths.

PARTICLE ANGULARITY AND SHAPE TERMS¹

Angular	Sharp edges and unpolished planar surfaces.
Subangular	Similar to angular, but with rounded edges.
Subrounded	Nearly planar sides with well-rounded edges.
Rounded	Smoothly curved sides with no edges.
Flat	Width/thickness ratio > 3.
Elongated	Length/width ratio > 3.

ACRONYMS AND ABBREVIATIONS

ATD	At Time of Drilling
Diam.	Diameter
Elev.	Elevation
ft.	Feet
FeO	Iron Oxide
gal.	Gallons
Horiz.	Horizontal
HSA	Hollow Stem Auger
I.D.	Inside Diameter
in.	Inches
lbs.	Pounds
MgO	Magnesium Oxide
mm	Millimeter
MnO	Manganese Oxide
NA	Not Applicable or Not Available
NP	Nonplastic
O.D.	Outside Diameter
OW	Observation Well
pcf	Pounds per Cubic Foot
PID	Photo-Ionization Detector
PMT	Pressuremeter Test
ppm	Parts per Million
psi	Pounds per Square Inch
PVC	Polyvinyl Chloride
rpm	Rotations per Minute
SPT	Standard Penetration Test
USCS	Unified Soil Classification System
q _u	Unconfined Compressive Strength
VWP	Vibrating Wire Piezometer
Vert.	Vertical
WOH	Weight of Hammer
WOR	Weight of Rods
Wt.	Weight

STRUCTURE TERMS¹

Interbedded	Alternating layers of varying material or color with layers at least 1/4-inch thick; singular: bed.
Laminated	Alternating layers of varying material or color with layers less than 1/4-inch thick; singular: lamination.
Fissured	Breaks along definite planes or fractures with little resistance.
Slickensided	Fracture planes appear polished or glossy; sometimes striated.
Blocky	Cohesive soil that can be broken down into small angular lumps that resist further breakdown.
Lensed	Inclusion of small pockets of different soils, such as small lenses of sand scattered through a mass of clay.
Homogeneous	Same color and appearance throughout.

West Pierce Fire & Rescue Maintenance Facility
Lakewood, Washington

SOIL DESCRIPTION AND LOG KEY

March 2020

21-1-16700-373

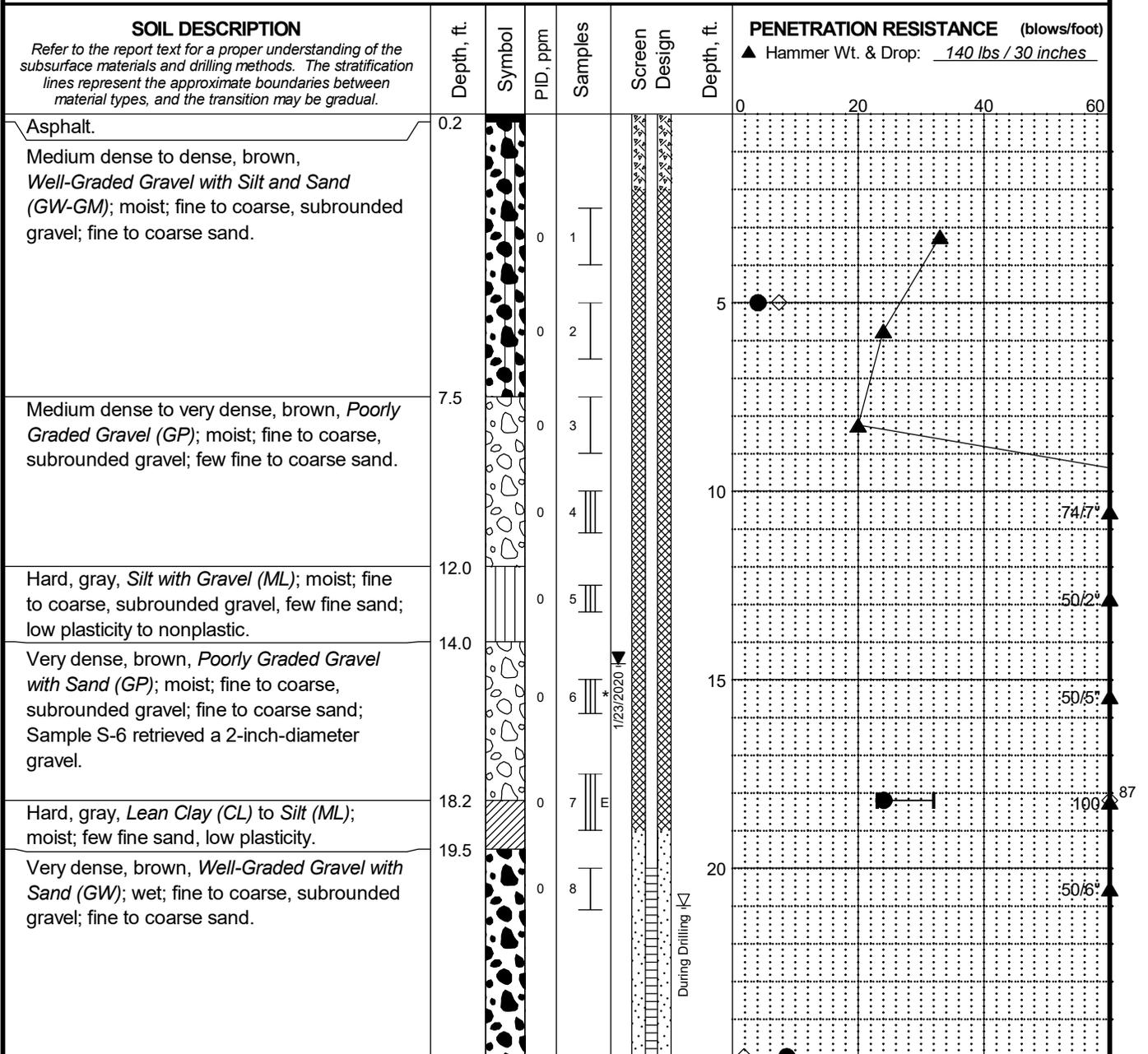
SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-1
Sheet 3 of 3

¹Reprinted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

²Adapted, with permission, from ASTM D2488 - 09a Standard Practice for Description and Identification of Soils (Visual-Manual Procedure), copyright ASTM International, 100 Barr Harbor Drive, West Conshohocken, PA 19428. A copy of the complete standard may be obtained from ASTM International, www.astm.org.

Total Depth: 26.2 ft. Northing: ~ 676,634 ft. Drilling Method: Hollow Stem Auger Hole Diam.: 10 in.
 Top Elevation: ~ 267 ft. Easting: ~ 1,145,304 ft. Drilling Company: Holocene Drilling Rod Diam.: AWJ
 Vert. Datum: NAVD88 Station: ~ Drill Rig Equipment: Diedrich D-90 Hammer Type: Automatic
 Horiz. Datum: WA State South Offset: ~ Other Comments: SPT blowcounts do not include 86% energy correction



CONTINUED NEXT SHEET

LEGEND

- * Sample Not Recovered
- E Environmental Sample Obtained
- 2.0" O.D. Split Spoon Sample
- 3" O.D. Split Spoon Sample
- Well Screen and Sand Filter
- Bentonite-Cement Grout
- Bentonite Chips/Pellets
- Bentonite Grout
- Ground Water Level ATD
- Ground Water Level in Well

NOTES

1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
2. Groundwater level, if indicated above, is for the date specified and may vary.
3. USCS designation is based on visual-manual classification and selected lab testing.
4. The hole location was measured from existing site features and should be considered approximate.

- ◇ % Fines (<0.075mm)
- % Water Content
- Plastic Limit |—●—| Liquid Limit
- Natural Water Content

West Pierce Fire & Rescue Maintenance Facility
Lakewood, Washington

LOG OF BORING SWI-6-19

March 2020

21-1-16700-373

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. A-2
Sheet 1 of 2

Log: CTC Rev: SAW Typ: LKN MASTER LOG E: 100792.GPJ SHAN WILGDT 2/20/20

Total Depth: 26.2 ft. Northing: ~ 676,634 ft. Drilling Method: Hollow Stem Auger Hole Diam.: 10 in.
 Top Elevation: ~ 267 ft. Easting: ~ 1,145,304 ft. Drilling Company: Holocene Drilling Rod Diam.: AWJ
 Vert. Datum: NAVD88 Station: ~ Drill Rig Equipment: Diedrich D-90 Hammer Type: Automatic
 Horiz. Datum: WA State South Offset: ~ Other Comments: SPT blowcounts do not include 86% energy correction

SOIL DESCRIPTION <i>Refer to the report text for a proper understanding of the subsurface materials and drilling methods. The stratification lines represent the approximate boundaries between material types, and the transition may be gradual.</i>	Depth, ft.	Symbol	PID, ppm	Samples	Screen Design	Depth, ft.	PENETRATION RESISTANCE (blows/foot)				
							▲ Hammer Wt. & Drop: <u>140 lbs / 30 inches</u>				
BOTTOM OF BORING COMPLETED 1/15/2020	26.2		0	9		0	20	40	60	95.7° ▲	
						0	20	40	60		
						0	20	40	60		
						0	20	40	60		
						0	20	40	60		
						0	20	40	60		
						0	20	40	60		
						0	20	40	60		
						0	20	40	60		
						0	20	40	60		

Log: CTC Rev: SAW Typ: LKN MASTER LOG E 100792.GPJ SHAN WILGDT 2/20/20

LEGEND

* Sample Not Recovered		Well Screen and Sand Filter	◇ % Fines (<0.075mm)
E Environmental Sample Obtained		Bentonite-Cement Grout	● % Water Content
┌ 2.0" O.D. Split Spoon Sample		Bentonite Chips/Pellets	Plastic Limit —●— Liquid Limit
└ 3" O.D. Split Spoon Sample		Bentonite Grout	Natural Water Content
	▽	Ground Water Level ATD	
	▼	Ground Water Level in Well	

- NOTES**
1. Refer to KEY for explanation of symbols, codes, abbreviations and definitions.
 2. Groundwater level, if indicated above, is for the date specified and may vary.
 3. USCS designation is based on visual-manual classification and selected lab testing.
 4. The hole location was measured from existing site features and should be considered approximate.

West Pierce Fire & Rescue Maintenance Facility
Lakewood, Washington

LOG OF BORING SWI-6-19

March 2020 21-1-16700-373

SHANNON & WILSON, INC. Geotechnical and Environmental Consultants	FIG. A-2 Sheet 2 of 2
---------------------------------------------------------------------------------	---------------------------------

Appendix B

Laboratory Analytical Reports

APPENDIX B: LABORATORY ANALYTICAL REPORTS



14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

January 28, 2020

Agnes Tirao
Shannon & Wilson, Inc.
400 N 34th Street, Suite 100
Seattle, WA 98103

Re: Analytical Data for Project 100792-453.02
Laboratory Reference No. 2001-168

Dear Agnes:

Enclosed are the analytical results and associated quality control data for samples submitted on January 16, 2020.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

A handwritten signature in black ink, appearing to read "DB", with a long horizontal flourish extending to the right.

David Baumeister
Project Manager

Enclosures



OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: January 28, 2020
Samples Submitted: January 16, 2020
Laboratory Reference: 2001-168
Project: 100792-453.02

Case Narrative

Samples were collected on January 15, 2020 and received by the laboratory on January 16, 2020. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.



Date of Report: January 28, 2020
 Samples Submitted: January 16, 2020
 Laboratory Reference: 2001-168
 Project: 100792-453.02

**GASOLINE RANGE ORGANICS
 NWTPH-Gx**

Matrix: Soil
 Units: mg/kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	SWI-6:18					
Laboratory ID:	01-168-01					
Gasoline	ND	5.3	NWTPH-Gx	1-18-20	1-19-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Fluorobenzene</i>	92	58-129				
Client ID:	SWI-6:25					
Laboratory ID:	01-168-02					
Gasoline	ND	5.9	NWTPH-Gx	1-18-20	1-19-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Fluorobenzene</i>	81	58-129				
Client ID:	SS-1:1					
Laboratory ID:	01-168-03					
Gasoline	ND	1100	NWTPH-Gx	1-18-20	1-19-20	U1
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Fluorobenzene</i>	77	58-129				
Client ID:	SS-2:C					
Laboratory ID:	01-168-04					
Gasoline	ND	5.7	NWTPH-Gx	1-18-20	1-20-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Fluorobenzene</i>	95	58-129				



Date of Report: January 28, 2020
 Samples Submitted: January 16, 2020
 Laboratory Reference: 2001-168
 Project: 100792-453.02

**GASOLINE RANGE ORGANICS
 NWTPH-Gx
 QUALITY CONTROL**

Matrix: Soil
 Units: mg/kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0118S2					
Gasoline	ND	5.0	NWTPH-Gx	1-18-20	1-18-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Fluorobenzene</i>	<i>93</i>	<i>58-129</i>				

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	01-112-03							
	ORIG	DUP						
Gasoline	ND	ND	NA	NA	NA	NA	NA	30
<i>Surrogate:</i>								
<i>Fluorobenzene</i>				105	106	58-129		



Date of Report: January 28, 2020
 Samples Submitted: January 16, 2020
 Laboratory Reference: 2001-168
 Project: 100792-453.02

**DIESEL AND HEAVY OIL RANGE ORGANICS
 NWTPH-Dx**

Matrix: Soil
 Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	SWI-6:18					
Laboratory ID:	01-168-01					
Diesel Range Organics	ND	28	NWTPH-Dx	1-17-20	1-17-20	
Lube Oil Range Organics	ND	56	NWTPH-Dx	1-17-20	1-17-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>o-Terphenyl</i>	67	50-150				

Client ID:	SWI-6:25					
Laboratory ID:	01-168-02					
Diesel Range Organics	ND	27	NWTPH-Dx	1-17-20	1-17-20	
Lube Oil Range Organics	ND	53	NWTPH-Dx	1-17-20	1-17-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>o-Terphenyl</i>	63	50-150				

Client ID:	SS-1:1					
Laboratory ID:	01-168-03					
Diesel Fuel #2	9300	270	NWTPH-Dx	1-17-20	1-17-20	
Lube Oil Range Organics	ND	990	NWTPH-Dx	1-17-20	1-17-20	U1
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>o-Terphenyl</i>	---	50-150				S

Client ID:	SS-2:C					
Laboratory ID:	01-168-04					
Diesel Range Organics	ND	27	NWTPH-Dx	1-17-20	1-17-20	
Lube Oil	75	55	NWTPH-Dx	1-17-20	1-17-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>o-Terphenyl</i>	70	50-150				



Date of Report: January 28, 2020
 Samples Submitted: January 16, 2020
 Laboratory Reference: 2001-168
 Project: 100792-453.02

**DIESEL AND HEAVY OIL RANGE ORGANICS
 NWTPH-Dx
 QUALITY CONTROL**

Matrix: Soil
 Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0117S2					
Diesel Range Organics	ND	25	NWTPH-Dx	1-17-20	1-17-20	
Lube Oil Range Organics	ND	50	NWTPH-Dx	1-17-20	1-17-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>o-Terphenyl</i>	65	50-150				

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	01-168-03							
	ORIG	DUP						
Diesel Fuel #2	8730	8650	NA	NA	NA	NA	1	NA
Lube Oil Range	ND	ND	NA	NA	NA	NA	NA	U1
<i>Surrogate:</i>								
<i>o-Terphenyl</i>				---	---	50-150		S,S



Date of Report: January 28, 2020
 Samples Submitted: January 16, 2020
 Laboratory Reference: 2001-168
 Project: 100792-453.02

TOTAL METALS
EPA 6010D/7471B

Matrix: Soil
 Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	SWI-6:18					
Laboratory ID:	01-168-01					
Arsenic	ND	11	EPA 6010D	1-22-20	1-22-20	
Barium	31	2.8	EPA 6010D	1-22-20	1-22-20	
Cadmium	ND	0.56	EPA 6010D	1-22-20	1-22-20	
Chromium	13	0.56	EPA 6010D	1-22-20	1-22-20	
Lead	ND	5.6	EPA 6010D	1-22-20	1-22-20	
Mercury	ND	0.28	EPA 7471B	1-22-20	1-22-20	
Selenium	ND	11	EPA 6010D	1-22-20	1-22-20	
Silver	ND	1.1	EPA 6010D	1-22-20	1-22-20	

Client ID:	SWI-6:25					
Laboratory ID:	01-168-02					
Arsenic	ND	11	EPA 6010D	1-22-20	1-22-20	
Barium	33	2.7	EPA 6010D	1-22-20	1-22-20	
Cadmium	ND	0.53	EPA 6010D	1-22-20	1-22-20	
Chromium	11	0.53	EPA 6010D	1-22-20	1-22-20	
Lead	ND	5.3	EPA 6010D	1-22-20	1-22-20	
Mercury	ND	0.27	EPA 7471B	1-22-20	1-22-20	
Selenium	ND	11	EPA 6010D	1-22-20	1-22-20	
Silver	ND	1.1	EPA 6010D	1-22-20	1-22-20	

Client ID:	SS-1:1					
Laboratory ID:	01-168-03					
Arsenic	ND	11	EPA 6010D	1-22-20	1-22-20	
Barium	35	2.7	EPA 6010D	1-22-20	1-22-20	
Cadmium	ND	0.53	EPA 6010D	1-22-20	1-22-20	
Chromium	11	0.53	EPA 6010D	1-22-20	1-22-20	
Lead	ND	5.3	EPA 6010D	1-22-20	1-22-20	
Mercury	ND	0.27	EPA 7471B	1-22-20	1-22-20	
Selenium	ND	11	EPA 6010D	1-22-20	1-22-20	
Silver	ND	1.1	EPA 6010D	1-22-20	1-22-20	



Date of Report: January 28, 2020
 Samples Submitted: January 16, 2020
 Laboratory Reference: 2001-168
 Project: 100792-453.02

**TOTAL METALS
 EPA 6010D/7471B**

Matrix: Soil
 Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	SS-2:C					
Laboratory ID:	01-168-04					
Arsenic	ND	11	EPA 6010D	1-22-20	1-22-20	
Barium	34	2.7	EPA 6010D	1-22-20	1-22-20	
Cadmium	ND	0.55	EPA 6010D	1-22-20	1-22-20	
Chromium	11	0.55	EPA 6010D	1-22-20	1-22-20	
Lead	5.6	5.5	EPA 6010D	1-22-20	1-22-20	
Mercury	ND	0.27	EPA 7471B	1-22-20	1-22-20	
Selenium	ND	11	EPA 6010D	1-22-20	1-22-20	
Silver	ND	1.1	EPA 6010D	1-22-20	1-22-20	



Date of Report: January 28, 2020
 Samples Submitted: January 16, 2020
 Laboratory Reference: 2001-168
 Project: 100792-453.02

**TOTAL METALS
 EPA 6010D/7471B
 QUALITY CONTROL**

Matrix: Soil
 Units: mg/Kg (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0122SM4					
Arsenic	ND	10	EPA 6010D	1-22-20	1-22-20	
Barium	ND	2.5	EPA 6010D	1-22-20	1-22-20	
Cadmium	ND	0.50	EPA 6010D	1-22-20	1-22-20	
Chromium	ND	0.50	EPA 6010D	1-22-20	1-22-20	
Lead	ND	5.0	EPA 6010D	1-22-20	1-22-20	
Selenium	ND	10	EPA 6010D	1-22-20	1-22-20	
Silver	ND	1.0	EPA 6010D	1-22-20	1-22-20	

Laboratory ID:	MB0122S1					
Mercury	ND	0.25	EPA 7471B	1-22-20	1-22-20	

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	01-209-01							
	ORIG	DUP						
Arsenic	ND	ND	NA	NA	NA	NA	20	
Barium	85.0	88.4	NA	NA	NA	4	20	
Cadmium	ND	ND	NA	NA	NA	NA	20	
Chromium	20.5	22.5	NA	NA	NA	9	20	
Lead	ND	ND	NA	NA	NA	NA	20	
Selenium	ND	ND	NA	NA	NA	NA	20	
Silver	ND	ND	NA	NA	NA	NA	20	

Laboratory ID:	01-209-01							
Mercury	ND	ND	NA	NA	NA	NA	20	

MATRIX SPIKES

Laboratory ID:	01-209-01									
	MS	MSD	MS	MSD	MS	MSD				
Arsenic	95.6	95.5	100	100	ND	96	96	75-125	0	20
Barium	199	193	100	100	85.0	114	108	75-125	3	20
Cadmium	44.4	44.2	50.0	50.0	ND	89	88	75-125	0	20
Chromium	114	114	100	100	20.5	94	93	75-125	0	20
Lead	230	231	250	250	ND	92	92	75-125	0	20
Selenium	94.9	96.2	100	100	ND	95	96	75-125	1	20
Silver	21.1	20.6	25.0	25.0	ND	84	82	75-125	2	20

Laboratory ID:	01-209-01									
Mercury	0.506	0.511	0.500	0.500	0.0207	97	98	80-120	1	20



OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: January 28, 2020
Samples Submitted: January 16, 2020
Laboratory Reference: 2001-168
Project: 100792-453.02

% MOISTURE

Client ID	Lab ID	% Moisture	Date Analyzed
SWI-6:18	01-168-01	11	1-17-20
SWI-6:25	01-168-02	6	1-17-20
SS-1:1	01-168-03	6	1-17-20
SS-2:C	01-168-04	9	1-17-20





Data Qualifiers and Abbreviations

- A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.
 - B - The analyte indicated was also found in the blank sample.
 - C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.
 - E - The value reported exceeds the quantitation range and is an estimate.
 - F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.
 - H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.
 - I - Compound recovery is outside of the control limits.
 - J - The value reported was below the practical quantitation limit. The value is an estimate.
 - K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.
 - L - The RPD is outside of the control limits.
 - M - Hydrocarbons in the gasoline range are impacting the diesel range result.
 - M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.
 - N - Hydrocarbons in the lube oil range are impacting the diesel range result.
 - N1 - Hydrocarbons in diesel range are impacting lube oil range results.
 - O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.
 - P - The RPD of the detected concentrations between the two columns is greater than 40.
 - Q - Surrogate recovery is outside of the control limits.
 - S - Surrogate recovery data is not available due to the necessary dilution of the sample.
 - T - The sample chromatogram is not similar to a typical _____.
 - U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
 - U1 - The practical quantitation limit is elevated due to interferences present in the sample.
 - V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.
 - W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.
 - X - Sample extract treated with a mercury cleanup procedure.
 - X1 - Sample extract treated with a sulfuric acid/silica gel cleanup procedure.
 - Y - The calibration verification for this analyte exceeded the 20% drift specified in methods 8260 & 8270, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.
 - Z -
- ND - Not Detected at PQL
 PQL - Practical Quantitation Limit
 RPD - Relative Percent Difference



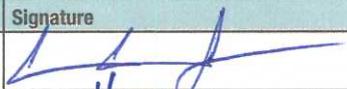
Chain of Custody

Company: Shannon & Wilson, Inc.
 Project Number: 100792-453.02
 Project Name: West Pierce Fire
 Project Manager: Agnes Tirao
 Sampled by: Christian Canfield

Turnaround Request (in working days)
 (Check One)
 Same Day 1 Day
 2 Days 3 Days
 Standard (7 Days)
 _____ (other)

Laboratory Number: 01-168

Lab ID	Sample Identification	Date Sampled	Time Sampled	Matrix	Number of Containers	NWTPH-HCID	NWTPH-Gw/BTEX	NWTPH-Gx	NWTPH-Dx (<input type="checkbox"/> Acid / SG Clean-up)	Volatiles 8260C	Halogenated Volatiles 8260C	EDB EPA 8011 (Waters Only)	Semivolatiles 8270D/SIM (with low-level PAHs)	PAHs 8270D/SIM (low-level)	PCBs 8082A	Organochlorine Pesticides 8081B	Organophosphorus Pesticides 8270D/SIM	Chlorinated Acid Herbicides 8151A	Total RCRA Metals	Total MTCA Metals	TCLP Metals	HEM (oil and grease) 1664A	% Moisture	
						1	SWI-6:18	1/15/20	1015	S	6			XX										
2	SWI-6:25	1/15/20	1050	S	6			XX	X				X							X				X
3	SS-1:1	1/15/20	1415	S	6			XX	X				X							X				X
4	SS-2:C	1/15/20	1335	S	6			XX												X				X

Signature	Company	Date	Time	Comments/Special Instructions
	SWI	1/15/20	1835	(X) Hold
#175	Speedy Alpha	1/16/20	8:55	
#176	Speedy Alpha	1/16/20	01:15	
Maseen Lizcan	OSE	1/16/20	1315	
				Data Package: Standard <input checked="" type="checkbox"/> Level III <input type="checkbox"/> Level IV <input type="checkbox"/>
Reviewed/Date	Reviewed/Date			Chromatograms with final report <input type="checkbox"/> Electronic Data Deliverables (EDDs) <input type="checkbox"/>

Laboratory Data Review Checklist

Completed By:

Brittany Blood

Title:

Environmental Engineering Staff

Date:

2/13/2020

Consultant Firm:

Shannon and Wilson, Inc.

Laboratory Name:

OnSite Environmental, Inc.

Laboratory Report Number:

2001-168

Laboratory Report Date:

1/16/2020

CS Site Name:

West Pierce Fire

ADEC File Number:

N/A

Hazard Identification Number:

N/A

2001-168

Laboratory Report Date:

1/16/2020

CS Site Name:

West Pierce Fire

Note: Any N/A or No box checked must have an explanation in the comments box.

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

Yes No N/A Comments:

b. If the samples were transferred to another “network” laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

Yes No N/A Comments:

2. Chain of Custody (CoC)

a. CoC information completed, signed, and dated (including released/received by)?

Yes No N/A Comments:

b. Correct analyses requested?

Yes No N/A Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (0° to 6° C)?

Yes No N/A Comments:

The laboratory indicates that the sample temperatures were maintained between 0° to 6° C at the laboratory; however, they did not indicate the temperature upon arrival.

b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

Yes No N/A Comments:

The laboratory did not note unacceptable sample preservation.

2001-168

Laboratory Report Date:

1/16/2020

CS Site Name:

West Pierce Fire

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

Yes No N/A Comments:

The laboratory did not note poor sample condition.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

Yes No N/A Comments:

No discrepancies were noted by the laboratory.

e. Data quality or usability affected?

Comments:

Data quality and/or usability were not affected; see above.

4. Case Narrative

a. Present and understandable?

Yes No N/A Comments:

b. Discrepancies, errors, or QC failures identified by the lab?

Yes No N/A Comments:

The case narrative notes QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference comment or explanation on the data qualifier page.

c. Were all corrective actions documented?

Yes No N/A Comments:

Corrective action was not necessary.

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Data quality and or usability are not affected according to the case narrative.

2001-168

Laboratory Report Date:

1/16/2020

CS Site Name:

West Pierce Fire

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

Yes No N/A Comments:

b. All applicable holding times met?

Yes No N/A Comments:

The laboratory does not indicate an exceedance of hold time.

c. All soils reported on a dry weight basis?

Yes No N/A Comments:

d. Are the reported LOQs less than the Cleanup Level or the minimum required detection level for the project?

Yes No N/A Comments:

The PQL for sample *SS-1:1* is elevated for Gasoline analysis due to matrix interferences. The regulatory limit for Gasoline is 100 mg/kg.

e. Data quality or usability affected?

We cannot access if Gasoline is present above the regulatory limit for sample *SS-1:1* due to the elevated PQL.

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

Yes No N/A Comments:

A method blank was submitted for GRO, DRO, Lube Oil, and Total Metals.

ii. All method blank results less than limit of quantitation (LOQ) or project specified objectives?

Yes No N/A Comments:

2001-168

Laboratory Report Date:

1/16/2020

CS Site Name:

West Pierce Fire

iii. If above LOQ or project specified objectives, what samples are affected?

Comments:

No samples were affected.

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

Yes No N/A Comments:

v. Data quality or usability affected?

Comments:

Data quality and/or usability were not affected; see above.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

Yes No N/A Comments:

A laboratory duplicate pair was analyzed for GRO, DRO, and Heavy Oil Range Organics.

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

Yes No N/A Comments:

A laboratory duplicate pair was analyzed for the analysis of Total Metals.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

Yes No N/A Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits and project specified objectives, if applicable? RPD reported from LCS/LCSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

Yes No N/A Comments:

2001-168

Laboratory Report Date:

1/16/2020

CS Site Name:

West Pierce Fire

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

No samples were affected; see above.

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

Yes No N/A Comments:

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

Data quality and/or usability were not affected; see above.

c. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Note: Leave blank if not required for project

i. Organics – One MS/MSD reported per matrix, analysis and 20 samples?

Yes No N/A Comments:

An MS/MSD was not submitted for GRO, DRO, and Heavy Oil Range Organics; please refer to the laboratory duplicate for accuracy and precision.

ii. Metals/Inorganics – one MS and one MSD reported per matrix, analysis and 20 samples?

Yes No N/A Comments:

An MS/MSD was submitted for Total Metals.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

Yes No N/A Comments:

2001-168

Laboratory Report Date:

1/16/2020

CS Site Name:

West Pierce Fire

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits and project specified objectives, if applicable? RPD reported from MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

Yes No N/A Comments:

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

Yes No N/A Comments:

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

Data quality and/or usability were not affected; see above.

d. Surrogates – Organics Only or Isotope Dilution Analytes (IDA) – Isotope Dilution Methods Only

i. Are surrogate/IDA recoveries reported for organic analyses – field, QC and laboratory samples?

Yes No N/A Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

Yes No N/A Comments:

Surrogate recovery information was not presented for sample SS-1:1 for DRO and Heavy Oil Range Organics. The laboratory noted the surrogate recovery data is not available due to the dilution of the sample. The project sample results are unaffected by this discrepancy.

2001-168

Laboratory Report Date:

1/16/2020

CS Site Name:

West Pierce Fire

iii. Do the sample results with failed surrogate/IDA recoveries have data flags? If so, are the data flags clearly defined?

Yes No N/A Comments:

See above.

iv. Data quality or usability affected?

Comments:

Data quality and/or usability were not affected; see above.

e. Trip Blanks

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)

Yes No N/A Comments:

A trip blank was not submitted with the samples within this work order.

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

Yes No N/A Comments:

iii. All results less than LOQ and project specified objectives?

Yes No N/A Comments:

iv. If above LOQ or project specified objectives, what samples are affected?

Comments:

v. Data quality or usability affected?

Comments:

Data quality and/or usability reported in this work order are not affected.

2001-168

Laboratory Report Date:

1/16/2020

CS Site Name:

West Pierce Fire

f. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

Yes No N/A Comments:

A field duplicate was not submitted within this work order.

ii. Submitted blind to lab?

Yes No N/A Comments:

iii. Precision – All relative percent differences (RPD) less than specified project objectives?
(Recommended: 30% water, 50% soil)

$$RPD (\%) = \text{Absolute value of: } \frac{(R_1 - R_2)}{((R_1 + R_2) / 2)} \times 100$$

Where R₁ = Sample Concentration
R₂ = Field Duplicate Concentration

Yes No N/A Comments:

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

Data quality and/or usability were not affected; see above.

g. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below)?

Yes No N/A Comments:

An equipment blank was not submitted with this work order.

i. All results less than LOQ and project specified objectives?

Yes No N/A Comments:

2001-168

Laboratory Report Date:

1/16/2020

CS Site Name:

West Pierce Fire

ii. If above LOQ or project specified objectives, what samples are affected?

Comments:

iii. Data quality or usability affected?

Comments:

Data quality and/or usability were not affected.

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

Yes No N/A

Comments:



14648 NE 95th Street, Redmond, WA 98052 • (425) 883-3881

January 31, 2020

Agnes Tirao
Shannon & Wilson, Inc.
400 N 34th Street, Suite 100
Seattle, WA 98103

Re: Analytical Data for Project 100792-453.02
Laboratory Reference No. 2001-242

Dear Agnes:

Enclosed are the analytical results and associated quality control data for samples submitted on January 23, 2020.

The standard policy of OnSite Environmental, Inc. is to store your samples for 30 days from the date of receipt. If you require longer storage, please contact the laboratory.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning the data, or need additional information, please feel free to call me.

Sincerely,

David Baumeister
Project Manager

Enclosures



OnSite Environmental, Inc. 14648 NE 95th Street, Redmond, WA 98052 (425) 883-3881

This report pertains to the samples analyzed in accordance with the chain of custody, and is intended only for the use of the individual or company to whom it is addressed.

Date of Report: January 31, 2020
Samples Submitted: January 23, 2020
Laboratory Reference: 2001-242
Project: 100792-453.02

Case Narrative

Samples were collected on January 22, 2020 and received by the laboratory on January 23, 2020. They were maintained at the laboratory at a temperature of 2°C to 6°C.

Please note that any and all soil sample results are reported on a dry-weight basis, unless otherwise noted below.

General QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference to a comment or explanation on the Data Qualifier page. More complex and involved QA/QC issues will be discussed in detail below.



Date of Report: January 31, 2020
 Samples Submitted: January 23, 2020
 Laboratory Reference: 2001-242
 Project: 100792-453.02

GASOLINE RANGE ORGANICS
NWTPH-Gx

Matrix: Water
 Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	SWI-6:GW					
Laboratory ID:	01-242-01					
Gasoline	ND	100	NWTPH-Gx	1-24-20	1-24-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Fluorobenzene</i>	97	59-122				



Date of Report: January 31, 2020
 Samples Submitted: January 23, 2020
 Laboratory Reference: 2001-242
 Project: 100792-453.02

**GASOLINE RANGE ORGANICS
 NWTPH-Gx
 QUALITY CONTROL**

Matrix: Water
 Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0124W2					
Gasoline	ND	100	NWTPH-Gx	1-24-20	1-24-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>Fluorobenzene</i>	96	59-122				

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	01-177-02							
	ORIG	DUP						
Gasoline	240	237	NA	NA	NA	1	30	
<i>Surrogate:</i>								
<i>Fluorobenzene</i>				102	98	59-122		



Date of Report: January 31, 2020
 Samples Submitted: January 23, 2020
 Laboratory Reference: 2001-242
 Project: 100792-453.02

**DIESEL AND HEAVY OIL RANGE ORGANICS
 NWTPH-Dx**

Matrix: Water
 Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	SWI-6:GW					
Laboratory ID:	01-242-01					
Diesel Range Organics	ND	0.22	NWTPH-Dx	1-24-20	1-24-20	
Lube Oil Range Organics	ND	0.22	NWTPH-Dx	1-24-20	1-24-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>o-Terphenyl</i>	<i>87</i>	<i>50-150</i>				



Date of Report: January 31, 2020
 Samples Submitted: January 23, 2020
 Laboratory Reference: 2001-242
 Project: 100792-453.02

**DIESEL AND HEAVY OIL RANGE ORGANICS
 NWTPH-Dx
 QUALITY CONTROL**

Matrix: Water
 Units: mg/L (ppm)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0124W1					
Diesel Range Organics	ND	0.20	NWTPH-Dx	1-24-20	1-27-20	
Lube Oil Range Organics	ND	0.20	NWTPH-Dx	1-24-20	1-27-20	
<i>Surrogate:</i>	<i>Percent Recovery</i>	<i>Control Limits</i>				
<i>o-Terphenyl</i>	<i>101</i>	<i>50-150</i>				

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	01-238-01							
	ORIG	DUP						
Diesel Range	ND	ND	NA	NA	NA	NA	NA	NA
Lube Oil Range	ND	ND	NA	NA	NA	NA	NA	NA
<i>Surrogate:</i>								
<i>o-Terphenyl</i>				95	101	50-150		



Date of Report: January 31, 2020
 Samples Submitted: January 23, 2020
 Laboratory Reference: 2001-242
 Project: 100792-453.02

PRIORITY POLLUTANT METALS
EPA 200.8/7470A

Matrix: Water
 Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	SWI-6:GW					
Laboratory ID:	01-242-01					
Antimony	ND	5.6	EPA 200.8	1-27-20	1-27-20	
Arsenic	4.5	3.3	EPA 200.8	1-27-20	1-27-20	
Beryllium	ND	11	EPA 200.8	1-27-20	1-27-20	
Cadmium	ND	4.4	EPA 200.8	1-27-20	1-27-20	
Chromium	39	11	EPA 200.8	1-27-20	1-27-20	
Copper	46	11	EPA 200.8	1-27-20	1-27-20	
Lead	5.1	1.1	EPA 200.8	1-27-20	1-27-20	
Mercury	ND	0.50	EPA 7470A	1-27-20	1-27-20	
Nickel	64	22	EPA 200.8	1-27-20	1-27-20	
Selenium	ND	5.6	EPA 200.8	1-27-20	1-27-20	
Silver	ND	11	EPA 200.8	1-27-20	1-27-20	
Thallium	ND	5.6	EPA 200.8	1-27-20	1-27-20	
Zinc	57	28	EPA 200.8	1-27-20	1-27-20	



Date of Report: January 31, 2020
 Samples Submitted: January 23, 2020
 Laboratory Reference: 2001-242
 Project: 100792-453.02

**PRIORITY POLLUTANT METALS
 EPA 200.8/7470A
 QUALITY CONTROL**

Matrix: Water
 Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0127WM1					
Antimony	ND	5.6	EPA 200.8	1-27-20	1-27-20	
Arsenic	ND	3.3	EPA 200.8	1-27-20	1-27-20	
Beryllium	ND	11	EPA 200.8	1-27-20	1-27-20	
Cadmium	ND	4.4	EPA 200.8	1-27-20	1-27-20	
Chromium	ND	11	EPA 200.8	1-27-20	1-27-20	
Copper	ND	11	EPA 200.8	1-27-20	1-27-20	
Lead	ND	1.1	EPA 200.8	1-27-20	1-27-20	
Nickel	ND	22	EPA 200.8	1-27-20	1-27-20	
Selenium	ND	5.6	EPA 200.8	1-27-20	1-27-20	
Silver	ND	11	EPA 200.8	1-27-20	1-27-20	
Thallium	ND	5.6	EPA 200.8	1-27-20	1-27-20	
Zinc	ND	28	EPA 200.8	1-27-20	1-27-20	
Laboratory ID:	MB0127W1					
Mercury	ND	0.50	EPA 7470A	1-27-20	1-27-20	



Date of Report: January 31, 2020
 Samples Submitted: January 23, 2020
 Laboratory Reference: 2001-242
 Project: 100792-453.02

PRIORITY POLLUTANT METALS
EPA 200.8/7470A
QUALITY CONTROL

Matrix: Water
 Units: ug/L (ppb)

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	01-251-06							
	ORIG	DUP						
Antimony	ND	ND	NA	NA	NA	NA	NA	20
Arsenic	ND	ND	NA	NA	NA	NA	NA	20
Beryllium	ND	ND	NA	NA	NA	NA	NA	20
Cadmium	ND	ND	NA	NA	NA	NA	NA	20
Chromium	ND	ND	NA	NA	NA	NA	NA	20
Copper	ND	ND	NA	NA	NA	NA	NA	20
Lead	ND	ND	NA	NA	NA	NA	NA	20
Nickel	ND	ND	NA	NA	NA	NA	NA	20
Selenium	ND	ND	NA	NA	NA	NA	NA	20
Silver	ND	ND	NA	NA	NA	NA	NA	20
Thallium	ND	ND	NA	NA	NA	NA	NA	20
Zinc	ND	ND	NA	NA	NA	NA	NA	20

Laboratory ID:	01-128-01							
Mercury	ND	ND	NA	NA	NA	NA	NA	20

MATRIX SPIKES

Laboratory ID:	01-251-06									
	MS	MSD	MS	MSD		MS	MSD			
Antimony	113	114	111	111	ND	102	103	75-125	1	20
Arsenic	118	111	111	111	ND	106	100	75-125	6	20
Beryllium	113	114	111	111	ND	102	102	75-125	1	20
Cadmium	112	114	111	111	ND	101	102	75-125	1	20
Chromium	119	119	111	111	ND	107	108	75-125	0	20
Copper	122	125	111	111	ND	110	112	75-125	3	20
Lead	113	113	111	111	ND	102	102	75-125	1	20
Nickel	119	120	111	111	ND	107	108	75-125	1	20
Selenium	107	107	111	111	ND	97	96	75-125	0	20
Silver	120	118	111	111	ND	108	107	75-125	1	20
Thallium	113	114	111	111	ND	102	103	75-125	1	20
Zinc	117	117	111	111	ND	106	105	75-125	1	20

Laboratory ID:	01-128-01									
Mercury	12.9	13.5	12.5	12.5	ND	103	108	75-125	4	20



Date of Report: January 31, 2020
 Samples Submitted: January 23, 2020
 Laboratory Reference: 2001-242
 Project: 100792-453.02

**DISSOLVED PRIORITY POLLUTANT METALS
 EPA 200.8/7470A**

Matrix: Water
 Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
Client ID:	SWI-6:GW					
Laboratory ID:	01-242-01					
Antimony	ND	5.0	EPA 200.8	1-23-20	1-27-20	
Arsenic	ND	3.0	EPA 200.8	1-23-20	1-27-20	
Beryllium	ND	10	EPA 200.8	1-23-20	1-27-20	
Cadmium	ND	4.0	EPA 200.8	1-23-20	1-27-20	
Chromium	ND	10	EPA 200.8	1-23-20	1-27-20	
Copper	ND	10	EPA 200.8	1-23-20	1-27-20	
Lead	ND	1.0	EPA 200.8	1-23-20	1-27-20	
Mercury	ND	0.50	EPA 7470A	1-23-20	1-27-20	
Nickel	ND	20	EPA 200.8	1-23-20	1-27-20	
Selenium	ND	5.0	EPA 200.8	1-23-20	1-27-20	
Silver	ND	10	EPA 200.8	1-23-20	1-27-20	
Thallium	ND	5.0	EPA 200.8	1-23-20	1-27-20	
Zinc	ND	25	EPA 200.8	1-23-20	1-27-20	



Date of Report: January 31, 2020
 Samples Submitted: January 23, 2020
 Laboratory Reference: 2001-242
 Project: 100792-453.02

**DISSOLVED PRIORITY POLLUTANT METALS
 EPA 200.8/7470A
 QUALITY CONTROL**

Matrix: Water
 Units: ug/L (ppb)

Analyte	Result	PQL	Method	Date Prepared	Date Analyzed	Flags
METHOD BLANK						
Laboratory ID:	MB0123F1					
Antimony	ND	5.0	EPA 200.8	1-23-20	1-27-20	
Arsenic	ND	3.0	EPA 200.8	1-23-20	1-27-20	
Beryllium	ND	10	EPA 200.8	1-23-20	1-27-20	
Cadmium	ND	4.0	EPA 200.8	1-23-20	1-27-20	
Chromium	ND	10	EPA 200.8	1-23-20	1-27-20	
Copper	ND	10	EPA 200.8	1-23-20	1-27-20	
Lead	ND	1.0	EPA 200.8	1-23-20	1-27-20	
Nickel	ND	20	EPA 200.8	1-23-20	1-27-20	
Selenium	ND	5.0	EPA 200.8	1-23-20	1-27-20	
Silver	ND	10	EPA 200.8	1-23-20	1-27-20	
Thallium	ND	5.0	EPA 200.8	1-23-20	1-27-20	
Zinc	ND	25	EPA 200.8	1-23-20	1-27-20	
Laboratory ID:	MB0123F1					
Mercury	ND	0.50	EPA 7470A	1-23-20	1-27-20	



Date of Report: January 31, 2020
 Samples Submitted: January 23, 2020
 Laboratory Reference: 2001-242
 Project: 100792-453.02

**DISSOLVED PRIORITY POLLUTANT METALS
 EPA 200.8/7470A
 QUALITY CONTROL**

Matrix: Water
 Units: ug/L (ppb)

Analyte	Result	Spike Level	Source Result	Percent Recovery	Recovery Limits	RPD	RPD Limit	Flags
DUPLICATE								
Laboratory ID:	01-242-01							
	ORIG	DUP						
Antimony	ND	ND	NA	NA	NA	NA	NA	20
Arsenic	ND	ND	NA	NA	NA	NA	NA	20
Beryllium	ND	ND	NA	NA	NA	NA	NA	20
Cadmium	ND	ND	NA	NA	NA	NA	NA	20
Chromium	ND	ND	NA	NA	NA	NA	NA	20
Copper	ND	ND	NA	NA	NA	NA	NA	20
Lead	ND	ND	NA	NA	NA	NA	NA	20
Nickel	ND	ND	NA	NA	NA	NA	NA	20
Selenium	ND	ND	NA	NA	NA	NA	NA	20
Silver	ND	ND	NA	NA	NA	NA	NA	20
Thallium	ND	ND	NA	NA	NA	NA	NA	20
Zinc	ND	ND	NA	NA	NA	NA	NA	20

Laboratory ID:	01-242-01							
Mercury	ND	ND	NA	NA	NA	NA	NA	20

MATRIX SPIKES

Laboratory ID:	01-242-01									
	MS	MSD	MS	MSD	MS	MSD				
Antimony	78.6	82.8	80.0	80.0	ND	98	104	75-125	5	20
Arsenic	82.0	87.0	80.0	80.0	ND	103	109	75-125	6	20
Beryllium	80.8	84.2	80.0	80.0	ND	101	105	75-125	4	20
Cadmium	80.8	83.0	80.0	80.0	ND	101	104	75-125	3	20
Chromium	66.2	68.8	80.0	80.0	ND	83	86	75-125	4	20
Copper	73.4	76.6	80.0	80.0	ND	92	96	75-125	4	20
Lead	74.4	76.6	80.0	80.0	ND	93	96	75-125	3	20
Nickel	73.8	78.0	80.0	80.0	ND	92	98	75-125	6	20
Selenium	81.0	79.2	80.0	80.0	ND	101	99	75-125	2	20
Silver	81.4	84.8	80.0	80.0	ND	102	106	75-125	4	20
Thallium	75.4	76.4	80.0	80.0	ND	94	96	75-125	1	20
Zinc	80.8	85.2	80.0	80.0	ND	101	107	75-125	5	20

Laboratory ID:	01-242-01									
Mercury	13.0	14.5	12.5	12.5	ND	104	116	75-125	11	20





Data Qualifiers and Abbreviations

- A - Due to a high sample concentration, the amount spiked is insufficient for meaningful MS/MSD recovery data.
 - B - The analyte indicated was also found in the blank sample.
 - C - The duplicate RPD is outside control limits due to high result variability when analyte concentrations are within five times the quantitation limit.
 - E - The value reported exceeds the quantitation range and is an estimate.
 - F - Surrogate recovery data is not available due to the high concentration of coeluting target compounds.
 - H - The analyte indicated is a common laboratory solvent and may have been introduced during sample preparation, and be impacting the sample result.
 - I - Compound recovery is outside of the control limits.
 - J - The value reported was below the practical quantitation limit. The value is an estimate.
 - K - Sample duplicate RPD is outside control limits due to sample inhomogeneity. The sample was re-extracted and re-analyzed with similar results.
 - L - The RPD is outside of the control limits.
 - M - Hydrocarbons in the gasoline range are impacting the diesel range result.
 - M1 - Hydrocarbons in the gasoline range (toluene-naphthalene) are present in the sample.
 - N - Hydrocarbons in the lube oil range are impacting the diesel range result.
 - N1 - Hydrocarbons in diesel range are impacting lube oil range results.
 - O - Hydrocarbons indicative of heavier fuels are present in the sample and are impacting the gasoline result.
 - P - The RPD of the detected concentrations between the two columns is greater than 40.
 - Q - Surrogate recovery is outside of the control limits.
 - S - Surrogate recovery data is not available due to the necessary dilution of the sample.
 - T - The sample chromatogram is not similar to a typical _____.
 - U - The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
 - U1 - The practical quantitation limit is elevated due to interferences present in the sample.
 - V - Matrix Spike/Matrix Spike Duplicate recoveries are outside control limits due to matrix effects.
 - W - Matrix Spike/Matrix Spike Duplicate RPD are outside control limits due to matrix effects.
 - X - Sample extract treated with a mercury cleanup procedure.
 - X1 - Sample extract treated with a sulfuric acid/silica gel cleanup procedure.
 - Y - The calibration verification for this analyte exceeded the 20% drift specified in methods 8260 & 8270, and therefore the reported result should be considered an estimate. The overall performance of the calibration verification standard met the acceptance criteria of the method.
 - Z -
- ND - Not Detected at PQL
 PQL - Practical Quantitation Limit
 RPD - Relative Percent Difference



Laboratory Data Review Checklist

Completed By:

Brittany Blood

Title:

Environmental Engineering Staff

Date:

2/13/2020

Consultant Firm:

Shannon and Wilson, Inc.

Laboratory Name:

OnSite Environmental, Inc.

Laboratory Report Number:

2001-242

Laboratory Report Date:

1/31/2020

CS Site Name:

West Pierce Fire

ADEC File Number:

N/A

Hazard Identification Number:

N/A

2001-242

Laboratory Report Date:

1/31/2020

CS Site Name:

West Pierce Fire

Note: Any N/A or No box checked must have an explanation in the comments box.

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

Yes No N/A Comments:

b. If the samples were transferred to another “network” laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

Yes No N/A Comments:

2. Chain of Custody (CoC)

a. CoC information completed, signed, and dated (including released/received by)?

Yes No N/A Comments:

b. Correct analyses requested?

Yes No N/A Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (0° to 6° C)?

Yes No N/A Comments:

The laboratory indicates that the sample temperatures were maintained between 0° to 6° C at the laboratory; however, they did not indicate the temperature upon arrival.

b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

Yes No N/A Comments:

The laboratory does not indicate unacceptable preservation.

2001-242

Laboratory Report Date:

1/31/2020

CS Site Name:

West Pierce Fire

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

Yes No N/A Comments:

The laboratory does not indicate poor sample conditions.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

Yes No N/A Comments:

The laboratory does not indicate discrepancies.

e. Data quality or usability affected?

Comments:

Data quality and/or usability are not affected; see above.

4. Case Narrative

a. Present and understandable?

Yes No N/A Comments:

b. Discrepancies, errors, or QC failures identified by the lab?

Yes No N/A Comments:

The case narrative notes QA/QC issues associated with the analytical data enclosed in this laboratory report will be indicated with a reference comment or explanation on the data qualifier page.

c. Were all corrective actions documented?

Yes No N/A Comments:

Corrective action was not necessary.

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Data quality and/or usability were not affected; see above.

2001-242

Laboratory Report Date:

1/31/2020

CS Site Name:

West Pierce Fire

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

Yes No N/A Comments:

b. All applicable holding times met?

Yes No N/A Comments:

The laboratory does not indicate exceedance of hold time

c. All soils reported on a dry weight basis?

Yes No N/A Comments:

Soil samples were not submitted as a part of this work order.

d. Are the reported LOQs less than the Cleanup Level or the minimum required detection level for the project?

Yes No N/A Comments:

e. Data quality or usability affected?

Data quality and/or usability are not affected; see above.

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

Yes No N/A Comments:

A method blank was submitted for GRO, DRO, Total Metals, and Heavy Oil Range Organics.

ii. All method blank results less than limit of quantitation (LOQ) or project specified objectives?

Yes No N/A Comments:

2001-242

Laboratory Report Date:

1/31/2020

CS Site Name:

West Pierce Fire

iii. If above LOQ or project specified objectives, what samples are affected?

Comments:

No samples were affected.

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

Yes No N/A Comments:

v. Data quality or usability affected?

Comments:

Data quality and/or usability were not affected; see above.

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

Yes No N/A Comments:

A laboratory duplicate was analyzed for GRO, DRO, and Heavy Oil Range Organics.

ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

Yes No N/A Comments:

A laboratory duplicate was analyzed for Total Metal analysis.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

Yes No N/A Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits and project specified objectives, if applicable? RPD reported from LCS/LCSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

Yes No N/A Comments:

2001-242

Laboratory Report Date:

1/31/2020

CS Site Name:

West Pierce Fire

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

Yes No N/A Comments:

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

Data quality and/or usability were not affected; see above.

c. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Note: Leave blank if not required for project

i. Organics – One MS/MSD reported per matrix, analysis and 20 samples?

Yes No N/A Comments:

An MS/MSD was not submitted for GRO, DRO, and Heavy Oil Range Organics; please refer to the laboratory duplicate for accuracy and precision.

ii. Metals/Inorganics – one MS and one MSD reported per matrix, analysis and 20 samples?

Yes No N/A Comments:

An MS/MSD for total metals was reported.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

Yes No N/A Comments:

2001-242

Laboratory Report Date:

1/31/2020

CS Site Name:

West Pierce Fire

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits and project specified objectives, if applicable? RPD reported from MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

Yes No N/A Comments:

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

Yes No N/A Comments:

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

Data quality and/or usability were not affected; see above.

d. Surrogates – Organics Only or Isotope Dilution Analytes (IDA) – Isotope Dilution Methods Only

i. Are surrogate/IDA recoveries reported for organic analyses – field, QC and laboratory samples?

Yes No N/A Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

Yes No N/A Comments:

iii. Do the sample results with failed surrogate/IDA recoveries have data flags? If so, are the data flags clearly defined?

Yes No N/A Comments:

2001-242

Laboratory Report Date:

1/31/2020

CS Site Name:

West Pierce Fire

iv. Data quality or usability affected?

Comments:

Data quality and/or usability are not affected; see above.

e. Trip Blanks

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)

Yes No N/A Comments:

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC? (If not, a comment explaining why must be entered below)

Yes No N/A Comments:

iii. All results less than LOQ and project specified objectives?

Yes No N/A Comments:

iv. If above LOQ or project specified objectives, what samples are affected?

Comments:

v. Data quality or usability affected?

Comments:

Data quality and/or usability is not affected; see above.

f. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

Yes No N/A Comments:

A field duplicate was not submitted with this work order.

2001-242

Laboratory Report Date:

1/31/2020

CS Site Name:

West Pierce Fire

ii. Submitted blind to lab?

Yes No N/A Comments:

iii. Precision – All relative percent differences (RPD) less than specified project objectives?
(Recommended: 30% water, 50% soil)

$$RPD (\%) = \text{Absolute value of: } \frac{(R_1 - R_2)}{((R_1 + R_2) / 2)} \times 100$$

Where R_1 = Sample Concentration
 R_2 = Field Duplicate Concentration

Yes No N/A Comments:

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

g. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below)?

Yes No N/A Comments:

An equipment blank was not submitted for these analyses.

i. All results less than LOQ and project specified objectives?

Yes No N/A Comments:

ii. If above LOQ or project specified objectives, what samples are affected?

Comments:

iii. Data quality or usability affected?

Comments:

Data quality and/or usability not affected; see above.

2001-242

Laboratory Report Date:

1/31/2020

CS Site Name:

West Pierce Fire

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

Yes No N/A

Comments:

ANALYTICAL REPORT

Eurofins TestAmerica, Sacramento
880 Riverside Parkway
West Sacramento, CA 95605
Tel: (916)373-5600

Laboratory Job ID: 320-58052-1
Client Project/Site: West Pierce Fire

For:
Shannon & Wilson, Inc
400 N. 34th Suite 100
PO BOX 300303
Seattle, Washington 98103

Attn: Ms. Agnes Tirao



Authorized for release by:
2/10/2020 3:07:13 PM

David Alltucker, Project Manager I
(916)374-4383
david.alltucker@testamericainc.com

LINKS

Review your project
results through
TotalAccess

Have a Question?



Visit us at:
www.testamericainc.com

The test results in this report meet all 2003 NELAC and 2009 TNI requirements for accredited parameters, exceptions are noted in this report. This report may not be reproduced except in full, and with written approval from the laboratory. For questions please contact the Project Manager at the e-mail address or telephone number listed on this page.

This report has been electronically signed and authorized by the signatory. Electronic signature is intended to be the legally binding equivalent of a traditionally handwritten signature.

Results relate only to the items tested and the sample(s) as received by the laboratory.



Table of Contents

Cover Page	1
Table of Contents	2
Definitions/Glossary	3
Case Narrative	4
Detection Summary	5
Client Sample Results	6
Isotope Dilution Summary	9
QC Sample Results	10
QC Association Summary	14
Lab Chronicle	15
Certification Summary	17
Method Summary	18
Sample Summary	19
Chain of Custody	20
Receipt Checklists	21

Definitions/Glossary

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Qualifiers

LCMS

Qualifier	Qualifier Description
B	Compound was found in the blank and sample.
J	Result is less than the RL but greater than or equal to the MDL and the concentration is an approximate value.

General Chemistry

Qualifier	Qualifier Description
F3	Duplicate RPD exceeds the control limit

Glossary

Abbreviation	These commonly used abbreviations may or may not be present in this report.
α	Listed under the "D" column to designate that the result is reported on a dry weight basis
%R	Percent Recovery
CFL	Contains Free Liquid
CNF	Contains No Free Liquid
DER	Duplicate Error Ratio (normalized absolute difference)
Dil Fac	Dilution Factor
DL	Detection Limit (DoD/DOE)
DL, RA, RE, IN	Indicates a Dilution, Re-analysis, Re-extraction, or additional Initial metals/anion analysis of the sample
DLC	Decision Level Concentration (Radiochemistry)
EDL	Estimated Detection Limit (Dioxin)
LOD	Limit of Detection (DoD/DOE)
LOQ	Limit of Quantitation (DoD/DOE)
MDA	Minimum Detectable Activity (Radiochemistry)
MDC	Minimum Detectable Concentration (Radiochemistry)
MDL	Method Detection Limit
ML	Minimum Level (Dioxin)
NC	Not Calculated
ND	Not Detected at the reporting limit (or MDL or EDL if shown)
PQL	Practical Quantitation Limit
QC	Quality Control
RER	Relative Error Ratio (Radiochemistry)
RL	Reporting Limit or Requested Limit (Radiochemistry)
RPD	Relative Percent Difference, a measure of the relative difference between two points
TEF	Toxicity Equivalent Factor (Dioxin)
TEQ	Toxicity Equivalent Quotient (Dioxin)

Case Narrative

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Job ID: 320-58052-1

Laboratory: Eurofins TestAmerica, Sacramento

Narrative

**Job Narrative
320-58052-1**

Receipt

The samples were received on 1/24/2020 9:40 AM; the samples arrived in good condition, properly preserved and, where required, on ice. The temperature of the cooler at receipt was 0.8° C.

LCMS

No analytical or quality issues were noted, other than those described in the Definitions/Glossary page.

General Chemistry

Method Moisture: The sample duplicate precision for analytical batch 320-353262 was outside control limits. Sample matrix interference and/or non-homogeneity are suspected. The sample matrix consisted of rocks and mud. Data is being reported with this narration. SWI-6:18 (320-58052-1) and (320-58052-A-1 DU)

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Organic Prep

Method 3535: Insufficient sample volume was available to perform a matrix spike/matrix spike duplicate (MS/MSD) associated with preparation batch 320-353185.

Method 3535: The following samples contain a thin layer of sediments at the bottom of the bottle prior to extraction: SWI-6:GW (320-58052-4) and SWI-200:GW (320-58052-7).

Method 3535: During the extraction process, the following samples have non-settleable particulates which clogged the extraction column: SWI-6:GW (320-58052-4) and SWI-200:GW (320-58052-7).

Method SHAKE: The following sample: SWI-6:18 (320-58052-1) lost approximately 5 mL of volume during the transfer step. The spiked isotopes are within acceptable recovery limits, no corrective action taken.

No additional analytical or quality issues were noted, other than those described above or in the Definitions/Glossary page.

Detection Summary

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Client Sample ID: SWI-6:18

Lab Sample ID: 320-58052-1

No Detections.

Client Sample ID: SWI-6:Rinsate

Lab Sample ID: 320-58052-3

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorohexanesulfonic acid (PFHxS)	0.31	J B	1.9	0.16	ng/L	1		537 (modified)	Total/NA

Client Sample ID: SWI-6:GW

Lab Sample ID: 320-58052-4

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanesulfonic acid (PFBS)	11		1.8	0.18	ng/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	50	B	1.8	0.16	ng/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	130		1.8	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	16		1.8	0.78	ng/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	68		1.8	0.50	ng/L	1		537 (modified)	Total/NA
Perfluorononanoic acid (PFNA)	7.2		1.8	0.25	ng/L	1		537 (modified)	Total/NA

Client Sample ID: SWI-6:FB

Lab Sample ID: 320-58052-5

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorohexanesulfonic acid (PFHxS)	0.28	J B	1.8	0.15	ng/L	1		537 (modified)	Total/NA

Client Sample ID: SWI-6:EB

Lab Sample ID: 320-58052-6

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorohexanesulfonic acid (PFHxS)	0.26	J B	1.8	0.15	ng/L	1		537 (modified)	Total/NA

Client Sample ID: SWI-200:GW

Lab Sample ID: 320-58052-7

Analyte	Result	Qualifier	RL	MDL	Unit	Dil Fac	D	Method	Prep Type
Perfluorobutanesulfonic acid (PFBS)	11		1.8	0.18	ng/L	1		537 (modified)	Total/NA
Perfluorohexanesulfonic acid (PFHxS)	51	B	1.8	0.15	ng/L	1		537 (modified)	Total/NA
Perfluoroheptanoic acid (PFHpA)	140		1.8	0.23	ng/L	1		537 (modified)	Total/NA
Perfluorooctanoic acid (PFOA)	16		1.8	0.77	ng/L	1		537 (modified)	Total/NA
Perfluorooctanesulfonic acid (PFOS)	69		1.8	0.49	ng/L	1		537 (modified)	Total/NA
Perfluorononanoic acid (PFNA)	7.3		1.8	0.24	ng/L	1		537 (modified)	Total/NA

This Detection Summary does not include radiochemical test results.

Eurofins TestAmerica, Sacramento

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Client Sample ID: SWI-6:18

Lab Sample ID: 320-58052-1

Date Collected: 01/15/20 10:15

Matrix: Solid

Date Received: 01/24/20 09:40

Percent Solids: 85.0

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	ND		0.23	0.029	ug/Kg	☼	01/27/20 06:06	02/06/20 06:32	1
Perfluorohexanesulfonic acid (PFHxS)	ND		0.23	0.036	ug/Kg	☼	01/27/20 06:06	02/06/20 06:32	1
Perfluoroheptanoic acid (PFHpA)	ND		0.23	0.034	ug/Kg	☼	01/27/20 06:06	02/06/20 06:32	1
Perfluorooctanoic acid (PFOA)	ND		0.23	0.10	ug/Kg	☼	01/27/20 06:06	02/06/20 06:32	1
Perfluorooctanesulfonic acid (PFOS)	ND		0.58	0.23	ug/Kg	☼	01/27/20 06:06	02/06/20 06:32	1
Perfluorononanoic acid (PFNA)	ND		0.23	0.042	ug/Kg	☼	01/27/20 06:06	02/06/20 06:32	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
18O2 PFHxS	71		25 - 150				01/27/20 06:06	02/06/20 06:32	1
13C4 PFHpA	78		25 - 150				01/27/20 06:06	02/06/20 06:32	1
13C4 PFOA	76		25 - 150				01/27/20 06:06	02/06/20 06:32	1
13C3 PFBS	69		25 - 150				01/27/20 06:06	02/06/20 06:32	1
13C4 PFOS	64		25 - 150				01/27/20 06:06	02/06/20 06:32	1
13C5 PFNA	77		25 - 150				01/27/20 06:06	02/06/20 06:32	1

General Chemistry

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Percent Moisture	15.0		0.1	0.1	%			01/27/20 12:02	1
Percent Solids	85.0		0.1	0.1	%			01/27/20 12:02	1

Client Sample ID: SWI-6:Rinsate

Lab Sample ID: 320-58052-3

Date Collected: 01/15/20 10:30

Matrix: Water

Date Received: 01/24/20 09:40

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	ND		1.9	0.19	ng/L		01/27/20 04:56	01/31/20 23:32	1
Perfluorohexanesulfonic acid (PFHxS)	0.31	J B	1.9	0.16	ng/L		01/27/20 04:56	01/31/20 23:32	1
Perfluoroheptanoic acid (PFHpA)	ND		1.9	0.23	ng/L		01/27/20 04:56	01/31/20 23:32	1
Perfluorooctanoic acid (PFOA)	ND		1.9	0.80	ng/L		01/27/20 04:56	01/31/20 23:32	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.9	0.51	ng/L		01/27/20 04:56	01/31/20 23:32	1
Perfluorononanoic acid (PFNA)	ND		1.9	0.25	ng/L		01/27/20 04:56	01/31/20 23:32	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
18O2 PFHxS	94		25 - 150				01/27/20 04:56	01/31/20 23:32	1
13C4 PFHpA	98		25 - 150				01/27/20 04:56	01/31/20 23:32	1
13C4 PFOA	102		25 - 150				01/27/20 04:56	01/31/20 23:32	1
13C3 PFBS	93		25 - 150				01/27/20 04:56	01/31/20 23:32	1
13C4 PFOS	97		25 - 150				01/27/20 04:56	01/31/20 23:32	1
13C5 PFNA	101		25 - 150				01/27/20 04:56	01/31/20 23:32	1

Client Sample ID: SWI-6:GW

Lab Sample ID: 320-58052-4

Date Collected: 01/22/20 14:15

Matrix: Water

Date Received: 01/24/20 09:40

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	11		1.8	0.18	ng/L		01/27/20 04:56	01/31/20 23:40	1
Perfluorohexanesulfonic acid (PFHxS)	50	B	1.8	0.16	ng/L		01/27/20 04:56	01/31/20 23:40	1
Perfluoroheptanoic acid (PFHpA)	130		1.8	0.23	ng/L		01/27/20 04:56	01/31/20 23:40	1

Euofins TestAmerica, Sacramento

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Client Sample ID: SWI-6:GW

Lab Sample ID: 320-58052-4

Date Collected: 01/22/20 14:15

Matrix: Water

Date Received: 01/24/20 09:40

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorooctanoic acid (PFOA)	16		1.8	0.78	ng/L		01/27/20 04:56	01/31/20 23:40	1
Perfluorooctanesulfonic acid (PFOS)	68		1.8	0.50	ng/L		01/27/20 04:56	01/31/20 23:40	1
Perfluorononanoic acid (PFNA)	7.2		1.8	0.25	ng/L		01/27/20 04:56	01/31/20 23:40	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
18O2 PFHxS	80		25 - 150				01/27/20 04:56	01/31/20 23:40	1
13C4 PFHpA	82		25 - 150				01/27/20 04:56	01/31/20 23:40	1
13C4 PFOA	77		25 - 150				01/27/20 04:56	01/31/20 23:40	1
13C3 PFBS	76		25 - 150				01/27/20 04:56	01/31/20 23:40	1
13C4 PFOS	78		25 - 150				01/27/20 04:56	01/31/20 23:40	1
13C5 PFNA	83		25 - 150				01/27/20 04:56	01/31/20 23:40	1

Client Sample ID: SWI-6:FB

Lab Sample ID: 320-58052-5

Date Collected: 01/22/20 14:45

Matrix: Water

Date Received: 01/24/20 09:40

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	ND		1.8	0.18	ng/L		01/27/20 04:56	01/31/20 23:48	1
Perfluorohexanesulfonic acid (PFHxS)	0.28	J B	1.8	0.15	ng/L		01/27/20 04:56	01/31/20 23:48	1
Perfluoroheptanoic acid (PFHpA)	ND		1.8	0.23	ng/L		01/27/20 04:56	01/31/20 23:48	1
Perfluorooctanoic acid (PFOA)	ND		1.8	0.77	ng/L		01/27/20 04:56	01/31/20 23:48	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.8	0.49	ng/L		01/27/20 04:56	01/31/20 23:48	1
Perfluorononanoic acid (PFNA)	ND		1.8	0.25	ng/L		01/27/20 04:56	01/31/20 23:48	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
18O2 PFHxS	98		25 - 150				01/27/20 04:56	01/31/20 23:48	1
13C4 PFHpA	103		25 - 150				01/27/20 04:56	01/31/20 23:48	1
13C4 PFOA	101		25 - 150				01/27/20 04:56	01/31/20 23:48	1
13C3 PFBS	91		25 - 150				01/27/20 04:56	01/31/20 23:48	1
13C4 PFOS	94		25 - 150				01/27/20 04:56	01/31/20 23:48	1
13C5 PFNA	99		25 - 150				01/27/20 04:56	01/31/20 23:48	1

Client Sample ID: SWI-6:EB

Lab Sample ID: 320-58052-6

Date Collected: 01/22/20 15:00

Matrix: Water

Date Received: 01/24/20 09:40

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	ND		1.8	0.18	ng/L		01/27/20 04:56	01/31/20 23:56	1
Perfluorohexanesulfonic acid (PFHxS)	0.26	J B	1.8	0.15	ng/L		01/27/20 04:56	01/31/20 23:56	1
Perfluoroheptanoic acid (PFHpA)	ND		1.8	0.23	ng/L		01/27/20 04:56	01/31/20 23:56	1
Perfluorooctanoic acid (PFOA)	ND		1.8	0.77	ng/L		01/27/20 04:56	01/31/20 23:56	1
Perfluorooctanesulfonic acid (PFOS)	ND		1.8	0.49	ng/L		01/27/20 04:56	01/31/20 23:56	1
Perfluorononanoic acid (PFNA)	ND		1.8	0.24	ng/L		01/27/20 04:56	01/31/20 23:56	1
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
18O2 PFHxS	91		25 - 150				01/27/20 04:56	01/31/20 23:56	1
13C4 PFHpA	98		25 - 150				01/27/20 04:56	01/31/20 23:56	1
13C4 PFOA	101		25 - 150				01/27/20 04:56	01/31/20 23:56	1

Eurofins TestAmerica, Sacramento

Client Sample Results

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Client Sample ID: SWI-6:EB

Lab Sample ID: 320-58052-6

Date Collected: 01/22/20 15:00

Matrix: Water

Date Received: 01/24/20 09:40

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac
13C3 PFBS	92		25 - 150	01/27/20 04:56	01/31/20 23:56	1
13C4 PFOS	92		25 - 150	01/27/20 04:56	01/31/20 23:56	1
13C5 PFNA	95		25 - 150	01/27/20 04:56	01/31/20 23:56	1

Client Sample ID: SWI-200:GW

Lab Sample ID: 320-58052-7

Date Collected: 01/22/20 14:30

Matrix: Water

Date Received: 01/24/20 09:40

Method: 537 (modified) - Fluorinated Alkyl Substances

Analyte	Result	Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	11		1.8	0.18	ng/L		01/27/20 04:56	02/01/20 00:20	1
Perfluorohexanesulfonic acid (PFHxS)	51	B	1.8	0.15	ng/L		01/27/20 04:56	02/01/20 00:20	1
Perfluoroheptanoic acid (PFHpA)	140		1.8	0.23	ng/L		01/27/20 04:56	02/01/20 00:20	1
Perfluorooctanoic acid (PFOA)	16		1.8	0.77	ng/L		01/27/20 04:56	02/01/20 00:20	1
Perfluorooctanesulfonic acid (PFOS)	69		1.8	0.49	ng/L		01/27/20 04:56	02/01/20 00:20	1
Perfluorononanoic acid (PFNA)	7.3		1.8	0.24	ng/L		01/27/20 04:56	02/01/20 00:20	1
Isotope Dilution	%Recovery	Qualifier	Limits	Prepared	Analyzed	Dil Fac			
18O2 PFHxS	72		25 - 150	01/27/20 04:56	02/01/20 00:20	1			
13C4 PFHpA	75		25 - 150	01/27/20 04:56	02/01/20 00:20	1			
13C4 PFOA	73		25 - 150	01/27/20 04:56	02/01/20 00:20	1			
13C3 PFBS	69		25 - 150	01/27/20 04:56	02/01/20 00:20	1			
13C4 PFOS	71		25 - 150	01/27/20 04:56	02/01/20 00:20	1			
13C5 PFNA	75		25 - 150	01/27/20 04:56	02/01/20 00:20	1			

Isotope Dilution Summary

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Method: 537 (modified) - Fluorinated Alkyl Substances

Matrix: Solid

Prep Type: Total/NA

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	PFHxS (25-150)	PFHpA (25-150)	PFOA (25-150)	3C3-PFB: (25-150)	PFOS (25-150)	PFNA (25-150)
320-58052-1	SWI-6:18	71	78	76	69	64	77
320-58052-1 MS	SWI-6:18	77	93	86	79	80	94
320-58052-1 MSD	SWI-6:18	83	96	93	81	79	92
LCS 320-353190/2-A	Lab Control Sample	99	100	96	95	87	93
MB 320-353190/1-A	Method Blank	96	96	95	93	88	91

Surrogate Legend

PFHxS = 18O2 PFHxS
PFHpA = 13C4 PFHpA
PFOA = 13C4 PFOA
13C3-PFBS = 13C3 PFBS
PFOS = 13C4 PFOS
PFNA = 13C5 PFNA

Method: 537 (modified) - Fluorinated Alkyl Substances

Matrix: Water

Prep Type: Total/NA

Percent Isotope Dilution Recovery (Acceptance Limits)

Lab Sample ID	Client Sample ID	PFHxS (25-150)	PFHpA (25-150)	PFOA (25-150)	3C3-PFB: (25-150)	PFOS (25-150)	PFNA (25-150)
320-58052-3	SWI-6:Rinsate	94	98	102	93	97	101
320-58052-4	SWI-6:GW	80	82	77	76	78	83
320-58052-5	SWI-6:FB	98	103	101	91	94	99
320-58052-6	SWI-6:EB	91	98	101	92	92	95
320-58052-7	SWI-200:GW	72	75	73	69	71	75
LCS 320-353185/2-A	Lab Control Sample	95	98	99	91	93	91
LCSD 320-353185/3-A	Lab Control Sample Dup	97	103	101	94	95	98
MB 320-353185/1-A	Method Blank	95	105	101	94	95	97

Surrogate Legend

PFHxS = 18O2 PFHxS
PFHpA = 13C4 PFHpA
PFOA = 13C4 PFOA
13C3-PFBS = 13C3 PFBS
PFOS = 13C4 PFOS
PFNA = 13C5 PFNA

QC Sample Results

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Method: 537 (modified) - Fluorinated Alkyl Substances

Lab Sample ID: MB 320-353185/1-A
Matrix: Water
Analysis Batch: 354375

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 353185

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	ND		2.0	0.20	ng/L		01/27/20 04:56	01/31/20 23:08	1
Perfluorohexanesulfonic acid (PFHxS)	0.313	J	2.0	0.17	ng/L		01/27/20 04:56	01/31/20 23:08	1
Perfluoroheptanoic acid (PFHpA)	ND		2.0	0.25	ng/L		01/27/20 04:56	01/31/20 23:08	1
Perfluorooctanoic acid (PFOA)	ND		2.0	0.85	ng/L		01/27/20 04:56	01/31/20 23:08	1
Perfluorooctanesulfonic acid (PFOS)	ND		2.0	0.54	ng/L		01/27/20 04:56	01/31/20 23:08	1
Perfluorononanoic acid (PFNA)	ND		2.0	0.27	ng/L		01/27/20 04:56	01/31/20 23:08	1

Isotope Dilution	MB %Recovery	MB Qualifier	Limits	Prepared	Analyzed	Dil Fac
18O2 PFHxS	95		25 - 150	01/27/20 04:56	01/31/20 23:08	1
13C4 PFHpA	105		25 - 150	01/27/20 04:56	01/31/20 23:08	1
13C4 PFOA	101		25 - 150	01/27/20 04:56	01/31/20 23:08	1
13C3 PFBS	94		25 - 150	01/27/20 04:56	01/31/20 23:08	1
13C4 PFOS	95		25 - 150	01/27/20 04:56	01/31/20 23:08	1
13C5 PFNA	97		25 - 150	01/27/20 04:56	01/31/20 23:08	1

Lab Sample ID: LCS 320-353185/2-A
Matrix: Water
Analysis Batch: 354375

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 353185

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	Limits
Perfluorobutanesulfonic acid (PFBS)	35.4	37.1		ng/L		105	67 - 127
Perfluorohexanesulfonic acid (PFHxS)	36.4	35.7		ng/L		98	59 - 119
Perfluoroheptanoic acid (PFHpA)	40.0	41.3		ng/L		103	72 - 132
Perfluorooctanoic acid (PFOA)	40.0	37.1		ng/L		93	70 - 130
Perfluorooctanesulfonic acid (PFOS)	37.1	36.3		ng/L		98	70 - 130
Perfluorononanoic acid (PFNA)	40.0	45.2		ng/L		113	75 - 135

Isotope Dilution	LCS %Recovery	LCS Qualifier	Limits
18O2 PFHxS	95		25 - 150
13C4 PFHpA	98		25 - 150
13C4 PFOA	99		25 - 150
13C3 PFBS	91		25 - 150
13C4 PFOS	93		25 - 150
13C5 PFNA	91		25 - 150

Lab Sample ID: LCSD 320-353185/3-A
Matrix: Water
Analysis Batch: 354375

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 353185

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	Limits	RPD	RPD Limit
Perfluorobutanesulfonic acid (PFBS)	35.4	37.8		ng/L		107	67 - 127	2	30
Perfluorohexanesulfonic acid (PFHxS)	36.4	35.7		ng/L		98	59 - 119	0	30
Perfluoroheptanoic acid (PFHpA)	40.0	39.3		ng/L		98	72 - 132	5	30
Perfluorooctanoic acid (PFOA)	40.0	37.4		ng/L		93	70 - 130	1	30

Eurofins TestAmerica, Sacramento

QC Sample Results

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Lab Sample ID: LCSD 320-353185/3-A
Matrix: Water
Analysis Batch: 354375

Client Sample ID: Lab Control Sample Dup
Prep Type: Total/NA
Prep Batch: 353185

Analyte	Spike Added	LCSD Result	LCSD Qualifier	Unit	D	%Rec	%Rec. Limits	RPD	RPD Limit
Perfluorooctanesulfonic acid (PFOS)	37.1	37.4		ng/L		101	70 - 130	3	30
Perfluorononanoic acid (PFNA)	40.0	42.3		ng/L		106	75 - 135	7	30
LCSD LCSD									
Isotope Dilution	%Recovery	Qualifier	Limits						
18O2 PFHxS	97		25 - 150						
13C4 PFHpA	103		25 - 150						
13C4 PFOA	101		25 - 150						
13C3 PFBS	94		25 - 150						
13C4 PFOS	95		25 - 150						
13C5 PFNA	98		25 - 150						

Lab Sample ID: MB 320-353190/1-A
Matrix: Solid
Analysis Batch: 355379

Client Sample ID: Method Blank
Prep Type: Total/NA
Prep Batch: 353190

Analyte	MB Result	MB Qualifier	RL	MDL	Unit	D	Prepared	Analyzed	Dil Fac
Perfluorobutanesulfonic acid (PFBS)	ND		0.20	0.025	ug/Kg		01/27/20 06:06	02/06/20 06:12	1
Perfluorohexanesulfonic acid (PFHxS)	ND		0.20	0.031	ug/Kg		01/27/20 06:06	02/06/20 06:12	1
Perfluoroheptanoic acid (PFHpA)	ND		0.20	0.029	ug/Kg		01/27/20 06:06	02/06/20 06:12	1
Perfluorooctanoic acid (PFOA)	ND		0.20	0.086	ug/Kg		01/27/20 06:06	02/06/20 06:12	1
Perfluorooctanesulfonic acid (PFOS)	0.352	J	0.50	0.20	ug/Kg		01/27/20 06:06	02/06/20 06:12	1
Perfluorononanoic acid (PFNA)	ND		0.20	0.036	ug/Kg		01/27/20 06:06	02/06/20 06:12	1
MB MB									
Isotope Dilution	%Recovery	Qualifier	Limits				Prepared	Analyzed	Dil Fac
18O2 PFHxS	96		25 - 150				01/27/20 06:06	02/06/20 06:12	1
13C4 PFHpA	96		25 - 150				01/27/20 06:06	02/06/20 06:12	1
13C4 PFOA	95		25 - 150				01/27/20 06:06	02/06/20 06:12	1
13C3 PFBS	93		25 - 150				01/27/20 06:06	02/06/20 06:12	1
13C4 PFOS	88		25 - 150				01/27/20 06:06	02/06/20 06:12	1
13C5 PFNA	91		25 - 150				01/27/20 06:06	02/06/20 06:12	1

Lab Sample ID: LCS 320-353190/2-A
Matrix: Solid
Analysis Batch: 355379

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 353190

Analyte	Spike Added	LCS Result	LCS Qualifier	Unit	D	%Rec	%Rec. Limits
Perfluorobutanesulfonic acid (PFBS)	1.77	1.85		ug/Kg		105	69 - 129
Perfluorohexanesulfonic acid (PFHxS)	1.82	1.85		ug/Kg		102	62 - 122
Perfluoroheptanoic acid (PFHpA)	2.00	2.21		ug/Kg		111	71 - 131
Perfluorooctanoic acid (PFOA)	2.00	1.97		ug/Kg		98	72 - 132
Perfluorooctanesulfonic acid (PFOS)	1.86	1.97		ug/Kg		106	68 - 141
Perfluorononanoic acid (PFNA)	2.00	2.21		ug/Kg		110	73 - 133
LCS LCS							
Isotope Dilution	%Recovery	Qualifier	Limits				
18O2 PFHxS	99		25 - 150				
13C4 PFHpA	100		25 - 150				

Eurofins TestAmerica, Sacramento

QC Sample Results

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Method: 537 (modified) - Fluorinated Alkyl Substances (Continued)

Lab Sample ID: LCS 320-353190/2-A
Matrix: Solid
Analysis Batch: 355379

Client Sample ID: Lab Control Sample
Prep Type: Total/NA
Prep Batch: 353190

<i>Isotope Dilution</i>	<i>LCS %Recovery</i>	<i>LCS Qualifier</i>	<i>Limits</i>
13C4 PFOA	96		25 - 150
13C3 PFBS	95		25 - 150
13C4 PFOS	87		25 - 150
13C5 PFNA	93		25 - 150

Lab Sample ID: 320-58052-1 MS
Matrix: Solid
Analysis Batch: 355379

Client Sample ID: SWI-6:18
Prep Type: Total/NA
Prep Batch: 353190

<i>Analyte</i>	<i>Sample Result</i>	<i>Sample Qualifier</i>	<i>Spike Added</i>	<i>MS Result</i>	<i>MS Qualifier</i>	<i>Unit</i>	<i>D</i>	<i>%Rec</i>	<i>Limits</i>
Perfluorobutanesulfonic acid (PFBS)	ND		1.94	1.94		ug/Kg	☼	100	69 - 129
Perfluorohexanesulfonic acid (PFHxS)	ND		2.00	2.03		ug/Kg	☼	101	62 - 122
Perfluoroheptanoic acid (PFHpA)	ND		2.20	2.36		ug/Kg	☼	107	71 - 131
Perfluorooctanoic acid (PFOA)	ND		2.20	2.20		ug/Kg	☼	100	72 - 132
Perfluorooctanesulfonic acid (PFOS)	ND		2.04	2.19		ug/Kg	☼	107	68 - 141
Perfluorononanoic acid (PFNA)	ND		2.20	2.28		ug/Kg	☼	104	73 - 133

<i>Isotope Dilution</i>	<i>MS %Recovery</i>	<i>MS Qualifier</i>	<i>Limits</i>
18O2 PFHxS	77		25 - 150
13C4 PFHpA	93		25 - 150
13C4 PFOA	86		25 - 150
13C3 PFBS	79		25 - 150
13C4 PFOS	80		25 - 150
13C5 PFNA	94		25 - 150

Lab Sample ID: 320-58052-1 MSD
Matrix: Solid
Analysis Batch: 355379

Client Sample ID: SWI-6:18
Prep Type: Total/NA
Prep Batch: 353190

<i>Analyte</i>	<i>Sample Result</i>	<i>Sample Qualifier</i>	<i>Spike Added</i>	<i>MSD Result</i>	<i>MSD Qualifier</i>	<i>Unit</i>	<i>D</i>	<i>%Rec</i>	<i>Limits</i>	<i>RPD</i>	<i>Limit</i>
Perfluorobutanesulfonic acid (PFBS)	ND		2.07	2.14		ug/Kg	☼	103	69 - 129	10	30
Perfluorohexanesulfonic acid (PFHxS)	ND		2.13	2.19		ug/Kg	☼	103	62 - 122	8	30
Perfluoroheptanoic acid (PFHpA)	ND		2.34	2.60		ug/Kg	☼	111	71 - 131	10	30
Perfluorooctanoic acid (PFOA)	ND		2.34	2.31		ug/Kg	☼	98	72 - 132	5	30
Perfluorooctanesulfonic acid (PFOS)	ND		2.18	2.40		ug/Kg	☼	110	68 - 141	9	30
Perfluorononanoic acid (PFNA)	ND		2.34	2.62		ug/Kg	☼	112	73 - 133	14	30

<i>Isotope Dilution</i>	<i>MSD %Recovery</i>	<i>MSD Qualifier</i>	<i>Limits</i>
18O2 PFHxS	83		25 - 150
13C4 PFHpA	96		25 - 150
13C4 PFOA	93		25 - 150
13C3 PFBS	81		25 - 150
13C4 PFOS	79		25 - 150
13C5 PFNA	92		25 - 150

QC Sample Results

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Method: D 2216 - Percent Moisture

Lab Sample ID: 320-58052-1 DU

Matrix: Solid

Analysis Batch: 353262

Client Sample ID: SWI-6:18

Prep Type: Total/NA

Analyte	Sample Result	Sample Qualifier	DU Result	DU Qualifier	Unit	D	RPD	RPD Limit
Percent Moisture	15.0		10.4	F3	%		36	20
Percent Solids	85.0		89.6		%		5	20

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

QC Association Summary

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

LCMS

Prep Batch: 353185

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-58052-3	SWI-6:Rinsate	Total/NA	Water	3535	
320-58052-4	SWI-6:GW	Total/NA	Water	3535	
320-58052-5	SWI-6:FB	Total/NA	Water	3535	
320-58052-6	SWI-6:EB	Total/NA	Water	3535	
320-58052-7	SWI-200:GW	Total/NA	Water	3535	
MB 320-353185/1-A	Method Blank	Total/NA	Water	3535	
LCS 320-353185/2-A	Lab Control Sample	Total/NA	Water	3535	
LCSD 320-353185/3-A	Lab Control Sample Dup	Total/NA	Water	3535	

Prep Batch: 353190

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-58052-1	SWI-6:18	Total/NA	Solid	SHAKE	
MB 320-353190/1-A	Method Blank	Total/NA	Solid	SHAKE	
LCS 320-353190/2-A	Lab Control Sample	Total/NA	Solid	SHAKE	
320-58052-1 MS	SWI-6:18	Total/NA	Solid	SHAKE	
320-58052-1 MSD	SWI-6:18	Total/NA	Solid	SHAKE	

Analysis Batch: 354375

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-58052-3	SWI-6:Rinsate	Total/NA	Water	537 (modified)	353185
320-58052-4	SWI-6:GW	Total/NA	Water	537 (modified)	353185
320-58052-5	SWI-6:FB	Total/NA	Water	537 (modified)	353185
320-58052-6	SWI-6:EB	Total/NA	Water	537 (modified)	353185
320-58052-7	SWI-200:GW	Total/NA	Water	537 (modified)	353185
MB 320-353185/1-A	Method Blank	Total/NA	Water	537 (modified)	353185
LCS 320-353185/2-A	Lab Control Sample	Total/NA	Water	537 (modified)	353185
LCSD 320-353185/3-A	Lab Control Sample Dup	Total/NA	Water	537 (modified)	353185

Analysis Batch: 355379

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-58052-1	SWI-6:18	Total/NA	Solid	537 (modified)	353190
MB 320-353190/1-A	Method Blank	Total/NA	Solid	537 (modified)	353190
LCS 320-353190/2-A	Lab Control Sample	Total/NA	Solid	537 (modified)	353190
320-58052-1 MS	SWI-6:18	Total/NA	Solid	537 (modified)	353190
320-58052-1 MSD	SWI-6:18	Total/NA	Solid	537 (modified)	353190

General Chemistry

Analysis Batch: 353262

Lab Sample ID	Client Sample ID	Prep Type	Matrix	Method	Prep Batch
320-58052-1	SWI-6:18	Total/NA	Solid	D 2216	
320-58052-1 DU	SWI-6:18	Total/NA	Solid	D 2216	

Lab Chronicle

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Client Sample ID: SWI-6:18

Date Collected: 01/15/20 10:15

Date Received: 01/24/20 09:40

Lab Sample ID: 320-58052-1

Matrix: Solid

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Analysis	D 2216		1			353262	01/27/20 12:02	HRB	TAL SAC

Client Sample ID: SWI-6:18

Date Collected: 01/15/20 10:15

Date Received: 01/24/20 09:40

Lab Sample ID: 320-58052-1

Matrix: Solid

Percent Solids: 85.0

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	SHAKE			5.03 g	10.00 mL	353190	01/27/20 06:06	AEC	TAL SAC
Total/NA	Analysis	537 (modified)		1			355379	02/06/20 06:32	S1M	TAL SAC

Client Sample ID: SWI-6:Rinsate

Date Collected: 01/15/20 10:30

Date Received: 01/24/20 09:40

Lab Sample ID: 320-58052-3

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			266.6 mL	10.0 mL	353185	01/27/20 04:56	PV	TAL SAC
Total/NA	Analysis	537 (modified)		1			354375	01/31/20 23:32	RS1	TAL SAC

Client Sample ID: SWI-6:GW

Date Collected: 01/22/20 14:15

Date Received: 01/24/20 09:40

Lab Sample ID: 320-58052-4

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			272.1 mL	10.0 mL	353185	01/27/20 04:56	PV	TAL SAC
Total/NA	Analysis	537 (modified)		1			354375	01/31/20 23:40	RS1	TAL SAC

Client Sample ID: SWI-6:FB

Date Collected: 01/22/20 14:45

Date Received: 01/24/20 09:40

Lab Sample ID: 320-58052-5

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			275.4 mL	10.0 mL	353185	01/27/20 04:56	PV	TAL SAC
Total/NA	Analysis	537 (modified)		1			354375	01/31/20 23:48	RS1	TAL SAC

Client Sample ID: SWI-6:EB

Date Collected: 01/22/20 15:00

Date Received: 01/24/20 09:40

Lab Sample ID: 320-58052-6

Matrix: Water

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			276.9 mL	10.0 mL	353185	01/27/20 04:56	PV	TAL SAC
Total/NA	Analysis	537 (modified)		1			354375	01/31/20 23:56	RS1	TAL SAC

Lab Chronicle

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Client Sample ID: SWI-200:GW

Lab Sample ID: 320-58052-7

Date Collected: 01/22/20 14:30

Matrix: Water

Date Received: 01/24/20 09:40

Prep Type	Batch Type	Batch Method	Run	Dil Factor	Initial Amount	Final Amount	Batch Number	Prepared or Analyzed	Analyst	Lab
Total/NA	Prep	3535			275.9 mL	10.0 mL	353185	01/27/20 04:56	PV	TAL SAC
Total/NA	Analysis	537 (modified)		1			354375	02/01/20 00:20	RS1	TAL SAC

Laboratory References:

TAL SAC = Eurofins TestAmerica, Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15

Accreditation/Certification Summary

Client: Shannon & Wilson, Inc
 Project/Site: West Pierce Fire

Job ID: 320-58052-1

Laboratory: Eurofins TestAmerica, Sacramento

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
Alaska (UST)	State	17-020	01-20-21
ANAB	Dept. of Defense ELAP	L2468	01-20-21
ANAB	Dept. of Energy	L2468.01	01-20-21
ANAB	ISO/IEC 17025	L2468	01-20-21
Arizona	State	AZ0708	08-11-20
Arkansas DEQ	State	19-042-0	06-17-20
California	State	2897	01-31-20 *
California	State	2897	01-31-22
Colorado	State	CA0004	08-31-20
Connecticut	State	PH-0691	06-30-21
Florida	NELAP	E87570	06-30-20
Georgia	State	4040	01-30-21
Hawaii	State	<cert No.>	01-29-20 *
Hawaii	State	<cert No.>	01-29-21
Illinois	NELAP	200060	03-17-20
Kansas	NELAP	E-10375	10-31-20 *
Louisiana	NELAP	01944	06-30-20
Maine	State	2018009	04-14-20
Michigan	State	9947	01-29-20 *
Nevada	State	CA000442020-1	07-31-20
New Hampshire	NELAP	2997	04-18-20
New Jersey	NELAP	CA005	06-30-20
New York	NELAP	11666	04-01-20
Oregon	NELAP	4040	01-29-21
Pennsylvania	NELAP	68-01272	03-31-20
Texas	NELAP	T104704399-19-13	05-31-20
US Fish & Wildlife	US Federal Programs	58448	07-31-20
USDA	US Federal Programs	P330-18-00239	07-31-21
Utah	NELAP	CA000442019-01	02-29-20
Vermont	State	VT-4040	04-16-20
Virginia	NELAP	460278	03-14-20
Washington	State	C581	05-05-20
West Virginia (DW)	State	9930C	12-31-19 *
West Virginia (DW)	State	9930C	12-31-20
Wyoming	State Program	8TMS-L	01-28-19 *

* Accreditation/Certification renewal pending - accreditation/certification considered valid.

Method Summary

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Method	Method Description	Protocol	Laboratory
537 (modified)	Fluorinated Alkyl Substances	EPA	TAL SAC
D 2216	Percent Moisture	ASTM	TAL SAC
3535	Solid-Phase Extraction (SPE)	SW846	TAL SAC
SHAKE	Shake Extraction with Ultrasonic Bath Extraction	SW846	TAL SAC

Protocol References:

ASTM = ASTM International

EPA = US Environmental Protection Agency

SW846 = "Test Methods For Evaluating Solid Waste, Physical/Chemical Methods", Third Edition, November 1986 And Its Updates.

Laboratory References:

TAL SAC = Eurofins TestAmerica, Sacramento, 880 Riverside Parkway, West Sacramento, CA 95605, TEL (916)373-5600



Sample Summary

Client: Shannon & Wilson, Inc
Project/Site: West Pierce Fire

Job ID: 320-58052-1

Lab Sample ID	Client Sample ID	Matrix	Collected	Received	Asset ID
320-58052-1	SWI-6:18	Solid	01/15/20 10:15	01/24/20 09:40	
320-58052-3	SWI-6:Rinsate	Water	01/15/20 10:30	01/24/20 09:40	
320-58052-4	SWI-6:GW	Water	01/22/20 14:15	01/24/20 09:40	
320-58052-5	SWI-6:FB	Water	01/22/20 14:45	01/24/20 09:40	
320-58052-6	SWI-6:EB	Water	01/22/20 15:00	01/24/20 09:40	
320-58052-7	SWI-200:GW	Water	01/22/20 14:30	01/24/20 09:40	

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

Chain of Custody Record

327509

TestAmerica

THE LEADER IN ENVIRONMENTAL TESTING
TestAmerica Laboratories, Inc.

TAL-8210 (0713)

Regulatory Program: DW NPDES RCRA Other:

Client Contact		Project Manager: Agnès Tirao		Site Contact:		Date: 1/22/2020		Carrier:		COC No: 327509	
Company Name: Shannon & Wilson, Inc.		Tel/Fax: 206-695-6881		Lab Contact: Alltveker		Sampler: Christian Confield		For Lab Use Only:		1 of 1 COCs	
Address: 400 N. 34th St, Suite 100		City/State/Zip: Seattle, WA 98103		Analysis Turnaround Time		Walk-in Client:		Lab Sampling:		Job / SDG No.:	
Phone: 206-695-6716		Fax: 206-695-6777		TAT if different from Below		Site: West Pierce Fire		Job / SDG No.:		Sample Specific Notes:	
Project Name: West Pierce Fire		Site: West Pierce Fire		PO # 100792-453.02		P O #		Job / SDG No.:		Sample Specific Notes:	
Sample Identification		Sample Date	Sample Time	Sample Type (C-Comp, G-Grab)	Matrix	# of Cont.	Filtered Sample (Y/N)	Perform MS / MSD (Y/N)	Sample Specific Notes:		
SWI-6: 1B		1/15/20	1015	G	S	1	N	N	 <p>320-58052 Chain of Custody</p>		
SWI-6: 2S		1/15/20	1050	G	S	1	N	N			
SWI-6: Rinsate		1/15/20	1030	G	W	2	N	N			
SWI-6: G-W		1/22/20	1415	G	G-W	2	N	N			
SWI-6: FB		1/22/20	1445	G	W	2	N	N			
SWI-6: EB		1/22/20	1500	G	W	2	N	N			
SWI-200: G-W		1/22/20	1430	G	G-W	2	N	N			
Temp Blank						1					

Sample Disposal (A fee may be assessed if samples are retained longer than 1 month)

Return to Client Disposal by Lab Archive for _____ Months

Special Instructions/QC Requirements & Comments:

⊗ Hold, please call Christian Confield at 206-695-6716 when samples are received.

Preservation Used: 1= Ice, 2= HCl; 3= H2SO4; 4= HNO3; 5= NaOH; 6= Other	1
Possible Hazard Identification: Are any samples from a listed EPA Hazardous Waste? Please List any EPA Waste Codes for the sample in the Comments Section if the lab is to dispose of the sample.	
Relinquished by: 	Date/Time: 1/22/20 1830
Relinquished by: 	Date/Time: 1/24/20 940
Relinquished by:	Date/Time:
Relinquished by:	Date/Time:



Login Sample Receipt Checklist

Client: Shannon & Wilson, Inc

Job Number: 320-58052-1

Login Number: 58052

List Source: Eurofins TestAmerica, Sacramento

List Number: 1

Creator: Thompson, Sarah W

Question	Answer	Comment
Radioactivity wasn't checked or is \leq background as measured by a survey meter.	True	
The cooler's custody seal, if present, is intact.	True	1085438
Sample custody seals, if present, are intact.	N/A	
The cooler or samples do not appear to have been compromised or tampered with.	True	
Samples were received on ice.	True	
Cooler Temperature is acceptable.	True	
Cooler Temperature is recorded.	True	
COC is present.	True	
COC is filled out in ink and legible.	True	
COC is filled out with all pertinent information.	True	
Is the Field Sampler's name present on COC?	True	
There are no discrepancies between the containers received and the COC.	True	
Samples are received within Holding Time (excluding tests with immediate HTs)	True	
Sample containers have legible labels.	True	
Containers are not broken or leaking.	True	
Sample collection date/times are provided.	True	
Appropriate sample containers are used.	True	
Sample bottles are completely filled.	True	
Sample Preservation Verified.	N/A	
There is sufficient vol. for all requested analyses, incl. any requested MS/MSDs	True	
Containers requiring zero headspace have no headspace or bubble is <math><6\text{mm}</math> (1/4").	True	
Multiphasic samples are not present.	True	
Samples do not require splitting or compositing.	True	
Residual Chlorine Checked.	N/A	

Laboratory Data Review Checklist

Completed By:

Brittany Blood

Title:

Environmental Engineering Staff

Date:

2/12/2020

Consultant Firm:

Shannon and Wilson, Inc.

Laboratory Name:

Eurofins/TestAmerica, Sacramento

Laboratory Report Number:

320-58052-1

Laboratory Report Date:

2/10/2020

CS Site Name:

West Pierce Fire

ADEC File Number:

N/A

Hazard Identification Number:

N/A

320-58052-1

Laboratory Report Date:

2/10/2020

CS Site Name:

West Pierce Fire

Note: Any N/A or No box checked must have an explanation in the comments box.

1. Laboratory

a. Did an ADEC CS approved laboratory receive and perform all of the submitted sample analyses?

Yes No N/A Comments:

b. If the samples were transferred to another “network” laboratory or sub-contracted to an alternate laboratory, was the laboratory performing the analyses ADEC CS approved?

Yes No N/A Comments:

2. Chain of Custody (CoC)

a. CoC information completed, signed, and dated (including released/received by)?

Yes No N/A Comments:

b. Correct analyses requested?

Yes No N/A Comments:

3. Laboratory Sample Receipt Documentation

a. Sample/cooler temperature documented and within range at receipt (0° to 6° C)?

Yes No N/A Comments:

Chain of custody form indicates that the sample temperatures were 0.8° C.

b. Sample preservation acceptable – acidified waters, Methanol preserved VOC soil (GRO, BTEX, Volatile Chlorinated Solvents, etc.)?

Yes No N/A Comments:

Analysis of PFAS compounds does not require chemical preservation.

320-58052-1

Laboratory Report Date:

2/10/2020

CS Site Name:

West Pierce Fire

c. Sample condition documented – broken, leaking (Methanol), zero headspace (VOC vials)?

Yes No N/A Comments:

The sample receipt form notes that the samples were received in good condition.

d. If there were any discrepancies, were they documented? For example, incorrect sample containers/preservation, sample temperature outside of acceptable range, insufficient or missing samples, etc.?

Yes No N/A Comments:

There were no discrepancies noted by the laboratory in the sample receipt documentation.

e. Data quality or usability affected?

Comments:

Data quality and/or usability were not affected; see above.

4. Case Narrative

a. Present and understandable?

Yes No N/A Comments:

The samples arrived in good condition, properly preserved and at the temperature of 0.8° C.

The case narrative also notes the following:

The laboratory sample duplicate precision for analytical batch 320-353262 was outside control limits. Sample matrix interference and/or non-homogeneity are suspected. Data is being reported with this narration. *SWI-6:18* (320-58052-1) and (320-58052-A-1 DU).

Insufficient sample volume to perform a matrix spike/matrix spike duplicate associated with preparation batch 320-353185 in Method 3535.

The following samples contain a thin layer of sediment at the bottom of the bottle prior to extraction in samples *SWI-6:GW* and *SWI-200:GW* for Method 3535.

The case narrative notes that during the extraction process the following samples have non-settleable particulates which clogged the extraction column: *SWI-6:GW* and *SWI-200:GW*.

Sample *SWI-6:18* lost approximately 5 mL of volume during the transfer step. The spiked isotopes are within the acceptable recovery limits; therefore, no corrective action was necessary.

320-58052-1

Laboratory Report Date:

2/10/2020

CS Site Name:

West Pierce Fire

b. Discrepancies, errors, or QC failures identified by the lab?

Yes No N/A Comments:

See above.

c. Were all corrective actions documented?

Yes No N/A Comments:

Corrective actions were not necessary for the discrepancies noted within the case narrative.

d. What is the effect on data quality/usability according to the case narrative?

Comments:

Data quality and/or usability were not affected; see above.

5. Samples Results

a. Correct analyses performed/reported as requested on COC?

Yes No N/A Comments:

b. All applicable holding times met?

Yes No N/A Comments:

c. All soils reported on a dry weight basis?

Yes No N/A Comments:

d. Are the reported LOQs less than the Cleanup Level or the minimum required detection level for the project?

Yes No N/A Comments:

e. Data quality or usability affected?

Data quality and/or usability were not affected; see above.

320-58052-1

Laboratory Report Date:

2/10/2020

CS Site Name:

West Pierce Fire

6. QC Samples

a. Method Blank

i. One method blank reported per matrix, analysis and 20 samples?

Yes No N/A Comments:

Method blank 320-353185/1-A was analyzed with preparatory batch 353185.

Method blank 320-353190/1-A was analyzed with preparatory batch 353190.

ii. All method blank results less than limit of quantitation (LOQ) or project specified objectives?

Yes No N/A Comments:

The results of Method Blank 320-353185/1-A and 320-353190/1-A were less than the limit of quantitation. However, PFHxS was present above the detection limit for preparatory batch 353185 at 0.313 J $\mu\text{g}/\text{kg}$. PFOS was detected above the detection limit for preparatory batch 353190 at 0.352 J $\mu\text{g}/\text{kg}$.

iii. If above LOQ or project specified objectives, what samples are affected?

Comments:

No samples were affected by the detection associated with preparatory batch 353190, as PFOS was not detected in the associated sample.

Sample *SWI-6:Rinsate*, *SWI-6:EB*, and *SWI-6:FB* were affected by the detection associated with preparatory batch 353185.

iv. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

Yes No N/A Comments:

Project samples with concentrations within 5 times the method blank concentration are considered not detected and flagged 'UB' at the LOQ or detected concentration, whichever is greater.

PFHxS is considered not detected, flagged with a 'UB' at the LOQ (RL) for samples *SWI-6:Rinsate*, *SWI-6:FB*, and *SWI-6:EB*.

Samples *SWI-6:GW* and *SWI-200:GW* were not flagged as the PFHxS concentrations reported for these samples are greater than 10 times the MB detection.

v. Data quality or usability affected?

Comments:

Data quality and/or usability were affected; see above.

320-58052-1

Laboratory Report Date:

2/10/2020

CS Site Name:

West Pierce Fire

b. Laboratory Control Sample/Duplicate (LCS/LCSD)

- i. Organics – One LCS/LCSD reported per matrix, analysis and 20 samples? (LCS/LCSD required per AK methods, LCS required per SW846)

Yes No N/A Comments:

An LCS/LCSD was submitted for preparatory batch 353185.

An LCS, MS/MSD and laboratory duplicate were submitted for preparatory batch 353190.

- ii. Metals/Inorganics – one LCS and one sample duplicate reported per matrix, analysis and 20 samples?

Yes No N/A Comments:

Metals and/or inorganics were not analyzed as a part of this work order.

- iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

Yes No N/A Comments:

- iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits and project specified objectives, if applicable? RPD reported from LCS/LCSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

Yes No N/A Comments:

An LCSD was not reported for preparatory batch 353190. We refer to the MS/MSD for precision.

A percent moisture laboratory duplicate sample was submitted for sample *SWI-6:18*; the RPD was reported outside QC limits.

- v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

See above.

- vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

Yes No N/A Comments:

SWI-6:18 is considered estimated and flagged 'J' due to RPD failure for the percent moisture analysis.

320-58052-1

Laboratory Report Date:

2/10/2020

CS Site Name:

West Pierce Fire

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

Data quality and/or usability were affected; see above.

c. Matrix Spike/Matrix Spike Duplicate (MS/MSD)

Note: Leave blank if not required for project

i. Organics – One MS/MSD reported per matrix, analysis and 20 samples?

Yes No N/A Comments:

An MS/MSD was submitted for preparatory batch 353190, please refer to the LCS/LCSD for the accuracy and precision of preparatory batch 353185.

ii. Metals/Inorganics – one MS and one MSD reported per matrix, analysis and 20 samples?

Yes No N/A Comments:

Metals and/or inorganics were not submitted as a part of this work order.

iii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods: AK101 60%-120%, AK102 75%-125%, AK103 60%-120%; all other analyses see the laboratory QC pages)

Yes No N/A Comments:

iv. Precision – All relative percent differences (RPD) reported and less than method or laboratory limits and project specified objectives, if applicable? RPD reported from MS/MSD, and or sample/sample duplicate. (AK Petroleum methods 20%; all other analyses see the laboratory QC pages)

Yes No N/A Comments:

v. If %R or RPD is outside of acceptable limits, what samples are affected?

Comments:

320-58052-1

Laboratory Report Date:

2/10/2020

CS Site Name:

West Pierce Fire

vi. Do the affected sample(s) have data flags? If so, are the data flags clearly defined?

Yes No N/A Comments:

vii. Data quality or usability affected? (Use comment box to explain.)

Comments:

Data quality and/or usability were not affected; see above.

d. Surrogates – Organics Only or Isotope Dilution Analytes (IDA) – Isotope Dilution Methods Only

i. Are surrogate/IDA recoveries reported for organic analyses – field, QC and laboratory samples?

Yes No N/A Comments:

ii. Accuracy – All percent recoveries (%R) reported and within method or laboratory limits and project specified objectives, if applicable? (AK Petroleum methods 50-150 %R; all other analyses see the laboratory report pages)

Yes No N/A Comments:

iii. Do the sample results with failed surrogate/IDA recoveries have data flags? If so, are the data flags clearly defined?

Yes No N/A Comments:

See above.

iv. Data quality or usability affected?

Comments:

Data quality and/or usability were not affected; see above.

e. Trip Blanks

i. One trip blank reported per matrix, analysis and for each cooler containing volatile samples? (If not, enter explanation below.)

Yes No N/A Comments:

PFAS are not volatile compounds; therefore, a trip blank is not required.

320-58052-1

Laboratory Report Date:

2/10/2020

CS Site Name:

West Pierce Fire

ii. Is the cooler used to transport the trip blank and VOA samples clearly indicated on the COC?
(If not, a comment explaining why must be entered below)

Yes No N/A Comments:

N/A; a trip blank is not required.

iii. All results less than LOQ and project specified objectives?

Yes No N/A Comments:

N/A; a trip blank is not required.

iv. If above LOQ or project specified objectives, what samples are affected?

Comments:

v. Data quality or usability affected?

Comments:

Data quality and/or usability were not affected.

f. Field Duplicate

i. One field duplicate submitted per matrix, analysis and 10 project samples?

Yes No N/A Comments:

Field duplicate pair *SWI-200:GW* and *SWI-6:GW* were submitted as a part of this work order.

ii. Submitted blind to lab?

Yes No N/A Comments:

320-58052-1

Laboratory Report Date:

2/10/2020

CS Site Name:

West Pierce Fire

iii. Precision – All relative percent differences (RPD) less than specified project objectives?
(Recommended: 30% water, 50% soil)

$$RPD (\%) = \text{Absolute value of: } \frac{(R_1 - R_2)}{((R_1 + R_2) / 2)} \times 100$$

Where R₁ = Sample Concentration
R₂ = Field Duplicate Concentration

Yes No N/A Comments:

iv. Data quality or usability affected? (Use the comment box to explain why or why not.)

Comments:

Data quality and/or usability were not affected; see above.

g. Decontamination or Equipment Blank (If not applicable, a comment stating why must be entered below)?

Yes No N/A Comments:

A rinsate sample, field blank, and equipment blank were submitted as a part of this work order for groundwater sampling.

i. All results less than LOQ and project specified objectives?

Yes No N/A Comments:

All results were less than the LOQ, however, the PFHxS was detected in the field blank and the equipment blank at a concentration greater than the detection limit.

The detection of PFHxS in these samples is associated with a method blank failure. PFHxS is considered not detected in the blank samples.

ii. If above LOQ or project specified objectives, what samples are affected?

Comments:

See above.

iii. Data quality or usability affected?

Comments:

Data quality and/or usability were not affected; see above.

320-58052-1

Laboratory Report Date:

2/10/2020

CS Site Name:

West Pierce Fire

7. Other Data Flags/Qualifiers (ACOE, AFCEE, Lab Specific, etc.)

a. Defined and appropriate?

Yes No N/A

Comments:

Sample Name	Analyte	Flag	Reported Result	Reason for flag
SWI-6: Rinsate	PFHxS	UB	<1.9 B	Method blank failure
SWI-6:FB	PFHxS	UB	<1.8 B	Method blank failure
SWI-6:EB	PFHxS	UB	<1.8 B	Method blank failure
SWI-6:GW	PFHxS	None	50	Remove laboratory flag for final table, result is greater than 10 times the MB detection, not necessary.
SWI-200:GW	PFHxS	None	51	Remove laboratory flag for final table, result is greater than 10 times the MB detection, not necessary.
SWI-6:18	PFHxS	J	<0.23 J	Percent moisture laboratory duplicate failure
SWI-6:18	PFHpA	J	<0.23 J	Percent moisture laboratory duplicate failure
SWI-6:18	PFOS	J	<0.58 J	Percent moisture laboratory duplicate failure
SWI-6:18	PFOA	J	<0.23 J	Percent moisture laboratory duplicate failure
SWI-6:18	PFNA	J	<0.23 J	Percent moisture laboratory duplicate failure
SWI-6:18	PFBS	J	<0.23 J	Percent moisture laboratory duplicate failure

Important Information

About Your Environmental Site Assessment/Evaluation Report

IMPORTANT INFORMATION

ENVIRONMENTAL SITE ASSESSMENTS/EVALUATIONS ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

This report was prepared to meet the needs you specified with respect to your specific site and your risk management preferences. Unless indicated otherwise, we prepared your report expressly for you and for the purposes you indicated. No one other than you should use this report for any purpose without first conferring with us. No one is authorized to use this report for any purpose other than that originally contemplated without our prior written consent.

The findings and conclusions documented in this site assessment/evaluation have been prepared for specific application to this project and have been developed in a manner consistent with that level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in this area. The conclusions presented are based on interpretation of information currently available to us and are made within the operational scope, budget, and schedule constraints of this project. No warranty, express or implied, is made.

OUR REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

Our environmental site assessment is based on several factors and may include (but not be limited to) reviewing public documents to chronicle site ownership for the past 30, 40, or more years; investigating the site's regulatory history to learn about permits granted or citations issued; determining prior uses of the site and those adjacent to it; reviewing available topographic and real estate maps, historical aerial photos, geologic information, and hydrologic data; reviewing readily available published information about surface and subsurface conditions; reviewing federal and state lists of known and potentially contaminated sites; evaluating the potential for naturally occurring hazards; and interviewing public officials, owners/operators, and/or adjacent owners with respect to local concerns and environmental conditions.

Except as noted within the text of the report, no sampling or quantitative laboratory testing was performed by us as part of this site assessment. Where such analyses were conducted by an outside laboratory, Shannon & Wilson relied upon the data provided and did not conduct an independent evaluation regarding the reliability of the data.

CONDITIONS CAN CHANGE.

Site conditions, both surface and subsurface, may be affected as a result of natural processes or human influence. An environmental site assessment/evaluation is based on conditions that existed at the time of the evaluation. Because so many aspects of a historical review rely on third-party information, most consultants will refuse to certify (warrant) that a site is free of contaminants, as it is impossible to know with absolute certainty if such a condition exists. Contaminants may be present in areas that were not surveyed or sampled or may migrate to areas that showed no signs of contamination at the time they were studied.

Unless your consultant indicates otherwise, your report should not be construed to represent geotechnical subsurface conditions at or adjacent to the site and does not provide sufficient information for construction-related activities. Your report also should not be used following floods, earthquakes, or other acts of nature; if the size or configuration of the site is altered; if the location of the site is modified; or if there is a change of ownership and/or use of the property.

INCIDENTAL DAMAGE MAY OCCUR DURING SAMPLING ACTIVITIES.

Incidental damage to a facility may occur during sampling activities. Asbestos and lead-based paint sampling often require destructive sampling of pipe insulation, floor tile, walls, doors, ceiling tile, roofing, and other building materials. Shannon & Wilson does not provide for paint repair. Limited repair of asbestos sample locations is provided. However, Shannon & Wilson neither warrants repairs made by our field personnel, nor are we held liable for injuries or damages as a result of those repairs. If you desire a specific form of repair, such as those provided by a licensed roofing contractor, you need to request the specific repair at the time of the proposal. The owner is responsible for repair methods that are not specified in the proposal.

READ RESPONSIBILITY CLAUSES CAREFULLY.

Environmental site assessments/evaluations are less exact than other design disciplines because they are based extensively on judgment and opinion and there may not have been any (or very limited) investigation of actual subsurface conditions. Wholly unwarranted claims have been lodged against consultants. To limit this exposure, consultants have developed a number of clauses for use in their contracts, reports, and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses may appear in this report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

Consultants cannot accept responsibility for problems that may develop if they are not consulted after factors considered in their reports have changed or conditions at the site have changed. Therefore, it is incumbent upon you to notify your consultant of any factors that may have changed prior to submission of the final assessment/evaluation.

An assessment/evaluation of a site helps reduce your risk but does not eliminate it. Even the most rigorous professional assessment may fail to identify all existing conditions.

ONE OF THE OBLIGATIONS OF YOUR CONSULTANT IS TO PROTECT THE SAFETY, HEALTH, PROPERTY, AND WELFARE OF THE PUBLIC.

If our environmental site assessment/evaluation discloses the existence of conditions that may endanger the safety, health, property, or welfare of the public, we may be obligated under rules of professional conduct, statutory law, or common law to notify you and others of these conditions.

The preceding paragraphs are based on information provided by the ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland