Preliminary Site Investigation Work Plan

Simplot Grower Solutions

Facility Site Number: 84612438
VCP Number: CE0419

Moxee, Washington

February 2015

Prepared for:

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999 Main Street
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Acronyms

Acronym	Definition
BTEX	benzene, toluene, ethylbenzene, and xylenes
GRPH	gasoline range petroleum hydrocarbons
MCL	maximum contaminant level
MTCA	Model Toxic Control Act
RCRA	Resource Conservation Recovery Act
Simplot	J.R. Simplot Company
SOP	standard operating procedure
STP	*Sewage Treatment Plant*
TDS	total dissolved solids
USEPA	U.S. Environmental Protection Agency
Work Plan	*Preliminary Site Investigation Work Plan*

1 Introduction

The purpose of this *Preliminary Site Investigation Work Plan* (Work Plan) is to describe the proposed soil investigation activities to be conducted at the Simplot Grower Solutions site at 7528 Postma Road in Moxee, Washington (Facility Site Number 84612438; VCP Number CE0419).

1.1 Background

On July 2, 2014, the J.R. Simplot Company (Simplot) received an Early Notice Letter from Washington Department of Ecology (Ecology) regarding the potential release of hazardous substances from Simplot's Grower Solutions facility at 7528 Postma Road, Moxee, Washington (**Figure 1-1**). Ecology encouraged Simplot to enter into a voluntary clean-up arrangement to address potential site contamination. Ecology's findings are based on information provided by GeoEngineers, Inc. (GeoEngineers), a consulting firm contracted with Ecology. GeoEngineers is conducting site investigation activities at the Moxee City Shop, located at 7520 Postma Road, which is immediately adjacent and west of the Simplot facility (**Figure 1-2**). GeoEngineers summarizes their field activities and findings in the April 3, 2014 document, *Data Gap Investigation Report– Moxee City Shop and former Sewage Treatment Plant (STP), Moxie, Washington*.

This Work Plan, prepared by HDR, is in response to the Early Notice Letter. Simplot has entered into Ecology's Voluntary Cleanup Program, which was acknowledged by Ecology in a letter dated December 16, 2014.

1.1.1 Moxee Facilities

1.1.1.1 MOXEE CITY SHOP (FORMER STP) MOXEE, WA

The Moxee City Shop is located at 7520 Postma Road in Moxee, Washington, and occupies approximately 2.8 acres (**Figure 1-2**). The property is bounded by a railroad line and State Route 24 on the south, and commercial properties on the west, north, and east (Simplot Grower Solutions facility). The Moxee City Shop formerly contained a sewage treatment plant. Several buildings and structures associated with the plant remain in the western portion of the property. The property is currently used as a shop servicing City of Moxee equipment. The active portion of the property contains two buildings and an asphalt parking area associated with shop operations.

1.1.1.2 SIMPLOT GROWER SOLUTIONS, MOXEE, WA

The Simplot Grower Solutions site is located at 7528 Postma Road in Moxee, Washington, and occupies approximately 3.4 acres. The property is bounded by a railroad line and State Route 24 on the south, a municipal maintenance shop facility to the west (Moxee City Shop), and commercial properties on the north and east (**Figure 1-2**), including a fueling station northeast of the property. The facility operates as an agricultural products retail location. Five structures are on the property ranging from retail space to product storage warehouses.

A review of historic records for the Moxee facility indicates information dating back to 1947. According to historic aerial photographs from 1947 and 1968, the Simplot site was a pasture or agricultural field with no buildings on or adjacent to the property. The next available historic aerial photograph is from 1992, which shows that the adjacent sewage plant was in place, including the former sewage plant control building, but not the Moxee City Shop. The Simplot Growers Solution facility appears to be unpaved, but most of the site layout is consistent with the current layout. A review of historic aerial photographs found photos in 1947, 1968, 1992, 1998, 2002, 2005, 2006, 2009, 2010, 2011, and 2013 (Appendix C), which are summarized in **Table 1-1**:

Table 1-1. Summary of Historic Aerial Photographs

Aerial Photograph*	Description
1947	Aerial resolution is poor and difficult to discern site features. Postma Road on the north border of Simplot site. It is unclear if the railroad tracks or a road exist along current State Route 24.
1968	Aerial resolution is poor and difficult to discern site features, but it is clear that State Route 24 now exists along the south border of the property. The site location is still a field, which appears to not have been cultivated for agricultural use.
1992	The site location appears much like it does today. Most of the buildings and the STP exist on site.
1998	Consistent with 1992 photograph.
2002	The building in the center of the Simplot Grower's Solution added since 1998. Parts of the Simplot facility appear to have been changed from gravel to concrete.
2005-2009	No noticeable changes since 2002 except the CFN fueling station on the northeast side of the Simplot property was added between 2006 and 2009.
2010-2013	Corresponds with current day conditions (see Figure 1-2). The Moxee City shop is added where the sludge cells used to exist.

*See Appendix C for historic aerial photographs

Based on these aerial photographs, most of the buildings have been in place since at least 1992. It is assumed that the site was established before 1992 and sometime after 1968.

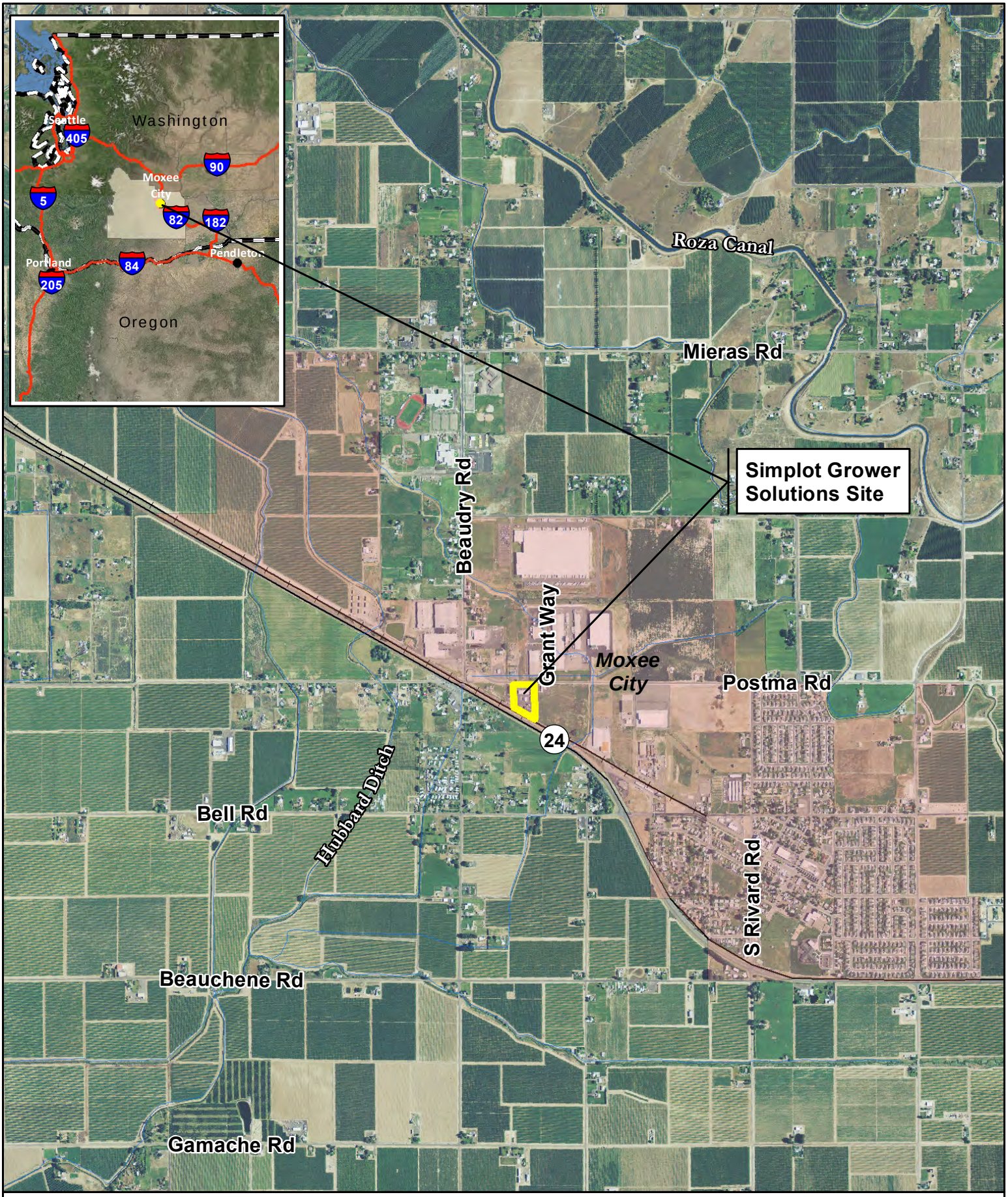

Figure 1-1: Project Vicinity
Simplot Grower Solutions, Moxee, WA

Imagery: 2013 NAIP, I meter resolution
Source: USDA/NRCS Digitatl Gateway

Map Date: 10/14/2014
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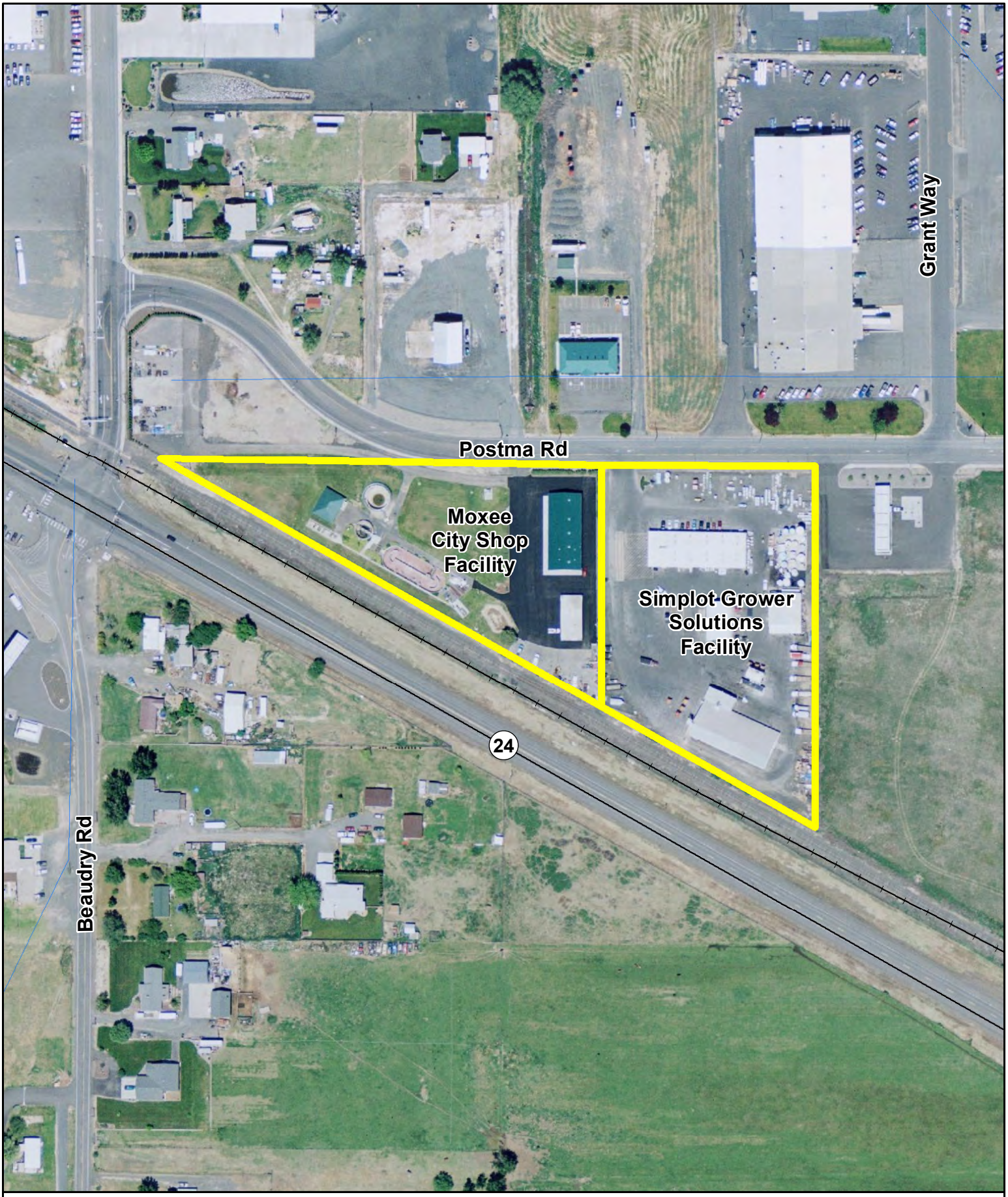

Figure 1-2: Site Map

Simplot Grower Solutions, Moxee, WA

Imagery: ESRI World Imagery, June 2011 Imagery
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Map Date: 10/14/2014
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Feet

1.3 Area Setting

The Simplot site and the City of Moxee are located in a relatively flat valley that rises in topography to Rattlesnake Hills to the south and the Yakima Ridge to the north. The elevation of the Simplot site is approximately 1,030 feet above mean sea level. The base of the Yakima Ridge is located approximately 2.5 miles to the north. The base of the Rattlesnake Hills is approximately 2.5 miles to the south. A small ditch flowing along the north side of Potsma Road shows up on historical aerial photography until 1992, but was apparently abandoned, or routed underground, after the area to the north was converted from agricultural use to commercial use. A ditch 900 feet to the east of the Simplot site is still in use. The Yakima River is located 3 miles to the west.

According to the National Oceanic and Atmospheric Administration, from 1950 to 1999, the City of Moxee received an average of approximately 8.1 inches of precipitation per year. The maximum average monthly precipitation occurs in December at 1.14 inches. The driest months are July and August with an average precipitation of 0.24 inches. Minimum average temperatures occur in January, while maximum average temperatures occur in July. **Table 1-2** summarizes precipitation and temperature averages for Moxee.

Table 1-2. Summary of Climatological Characteristics for the City of Moxee

Month	Avg Min Temp (^{o}F)	Avg Max Temp (^{o}F)	Avg Precip (in)
January	25	38	0.91
February	27	45	0.59
March	31	55	0.67
April	35	62	0.71
May	42	71	0.79
June	48	78	0.75
July	53	87	0.24
August	53	86	0.24
September	46	77	0.39
October	37	62	0.67
November	29	47	0.98
December	22	35	1.14

1.3.1 Soil

According to the Natural Resources Conservation Service, the Simplot site and adjoining properties are mainly comprised of Umapine silt loam, making up approximately 90 percent of nearby soil composition. This soil possesses moderately high to high hydraulic conductivity (0.57 to 1.98 inches per hour), and the depth to the water table is between 24 and 48 inches. The remaining mapped soils are small areas of other silt loams, loamy fine sand, and fine sandy loam typical of alluvial, lacustrine, and eolian deposits.

1.3.2 Soil and Groundwater Conditions

Information presented in this section is based on reports generated by GeoEngineers, Ecology's contractor who investigated the adjacent Moxee City Shop.

1.3.2.1 SOIL AND GROUNDWATER INVESTIGATIONS BY GEOENGINEERS IN 2012

GeoEngineers conducted a soil assessment and groundwater assessment for Ecology at the Moxee City Shop in March and October 2012. Activities included six direct-push soil borings (DP-1 through DP-5 and MW-1) to depths ranging from about 8 to 12 feet and one monitoring well installation in one of the soil borings (MW-1) in March 2012 (on Moxee City Shop property only). In addition, three hollow-stem auger soil borings were advanced to depths of approximately 12 feet in October 2012. Monitoring wells (MW-2, MW-3 and MW-4) were installed in the borings (making a total of four monitoring wells in 2012, which are illustrated in Appendix D). Soil samples from each direct-push and hollow-stem auger boring were field-screened for the potential presence of petroleum contamination by visual examination, headspace vapor monitoring with a photo-ionization detector (PID), and water-sheen testing. In addition, GeoEngineers submitted one soil sample each from direct-push soil borings and hollow-stem auger borings for chemical analysis. In areas of suspected petroleum contamination on the city site, the analytical suite included gasoline range petroleum hydrocarbons (GRPH), benzene, toluene, ethylbenzene, and xylenes (BTEX), n-hexane, and naphthalene. Groundwater samples were also analyzed for natural attenuation parameters, including nitrate, manganese, sulfate, methane, and alkalinity.

Results of 2012 field activities are as follows (see Appendix D for maps with well and boring locations):

- During GeoEngineers' March and October 2012 investigations, petroleum compounds were not detected in soil samples at concentrations greater than Model Toxics Control Act (MTCA) Method A cleanup levels. However, GRPH were detected at concentrations greater than the applicable MTCA Method A cleanup level in the primary and duplicate groundwater samples collected from monitoring well MW-1, which was installed in boring DP-6 (see GeoEngineers "Figure 2" in Appendix D). This well is hydraulically downgradient of a former underground storage tank on the city site.
- Shallow groundwater flow beneath the Moxee City Shop site was toward the southwest (November 2012). Hydraulic gradient was about 0.003 feet per foot (ft/ft).
- For natural attenuation parameters, nitrate-N concentration ranged from <0.200 milligrams per liter (mg/L) in MW-1 to 176 mg/L in MW-2. Sulfate concentration ranged from 18.3 mg/L in MW-1 to 290 mg/L in MW-2.
- As described by GeoEngineers, "nitrate concentration (176 mg/L) was observed in the groundwater sample collected from upgradient monitoring well MW-2. This observation along with the high specific conductivity (7.079 milliSiemens per centimeter [mS/cm]) and sulfate results reported for MW-2, suggests a wastewater influence could be occurring in this area."

1.3.2.2 SOIL AND GROUNDWATER INVESTIGATIONS BY GEOENGINEERS IN 2013

In 2013, GeoEngineers conducted quarterly groundwater sampling from the four on-site monitoring wells (MW-1 through MW-4) and also conducted a hydraulic test (slug test). Monitoring wells MW-5 and MW-6 were added in December 2013. Groundwater samples were analyzed for GRPH, BTEX, naphthalene, nitrate, and sulfates.

Relative to previous site groundwater monitoring events, the groundwater elevation distribution observed during May 2013 was not consistent with previous measurements. Apparent mounded groundwater conditions near MW-1 caused interpreted groundwater flow direction to be toward the southeast in the east portion of the site and to the southwest in the west portion of the site. During previous groundwater monitoring events in November 2012 and February 2013, interpreted groundwater flow was toward the southwest.

GeoEngineers estimated the groundwater flow velocity within the shallow unconsolidated aquifer underlying the site is about 0.32 inches per day. The time of travel for groundwater at this velocity from monitoring well MW-1 to the south site boundary is approximately 3.6 years.

Also in 2013, GeoEngineers, conducted the following activities:

- Drilled nine direct-push borings at the Moxee City Shop site (DP-6 through DP-14 (see GeoEngineers' Figure 2 in Appendix D)) and collected continuous soil samples. Also, field-screen soil for visual observations, water sheen, and headspace vapor measurements with a PID to assess for petroleum.
- Submitted one soil sample from each boring to the laboratory for chemical analysis. In addition, collected groundwater samples from seven of the nine borings.
- Analyzed soil and groundwater samples for GRPH, BTEX, n-hexane, and naphthalene. In addition, collected and analyzed samples near MW-2 for nitrate and sulfate.
- Constructed two monitoring wells (MW-5 and MW-6) with a hollow stem auger (see map in Appendix D). Sampled all six wells on December 30, 2013.
- Advanced three borings (B-1, B-2, and B-3) with the hollow stem auger on Simplot property. Also, collected five soil samples from the borings and a groundwater sample from each boring (no wells were installed).

Data summary tables GeoEngineers generated for soil and groundwater sampling results are presented in Appendix D.

1.3.2.2.1 Soils

In general, soil is not impacted by petroleum hydrocarbons (or of limited extent). However, nitrate concentrations were elevated in two soil samples (borings B-1 and B-2) collected within the Simplot property, and in boring DP-10, located near the east boundary of the Moxee City Shop property. The average nitrate concentration in these three borings (68 milligrams per kilogram [mg/kg]) was over 10 times higher than the average nitrate concentration in the remaining soil samples submitted for nitrate analysis. Sulfate concentrations were elevated in all three soil samples collected within the Simplot property (borings B-1 through B-3), with an

average sulfate concentration 333 mg/kg, which is over 10 times higher than the average sulfate concentration in samples collected from the Moxee City Shop property.

1.3.2.2.2 Groundwater

Groundwater flow in the shallow unconfined aquifer beneath the area bounded by the monitoring well network generally was toward the southwest on December 30, 2013. Average hydraulic gradient was about 0.004 ft/ft. This is generally consistent with previous events. However, in May 2003, groundwater flow direction was interpreted to be in a southeasterly direction near monitoring well MW-2. It is unclear whether this reflects a seasonal shift in the groundwater flow regime characteristic of spring conditions.

The concentration of nitrate in shallow groundwater beneath the project area appears to attenuate to less than 1 mg/L downgradient of the former sewage treatment plant control office. Observed nitrate concentrations increase to the north and east and generally are above the maximum contaminant level (MCL) north and east of the former sewage treatment plant control office, reaching an observed maximum of 263 mg/L (more than 26 times the MCL) in boring DP-10. The concentration of sulfate in shallow groundwater beneath the project area appears to attenuate to 10 to 50 mg/L downgradient of the former sewage treatment plant control office. Observed sulfate concentrations increase to the north and east and generally are above groundwater standards east of the former sewage treatment plant control office, reaching an observed maximum of 1,670 mg/L in boring B-2. GeoEngineers concluded that “these groundwater anion data support the suggestion that a source area exists near and east of the Moxee City Shop/Simplot property boundary and anion mobilization and downgradient transport via groundwater flow are ongoing” (GeoEngineers 2014).

1.4 Summary of Soil and Groundwater Sampling on Simplot Property

As described above, Ecology received permission from Simplot to advance three borings on the Simplot property (B-1 through B-3). The locations are illustrated in GeoEngineers’ Figure 2 in Appendix D. A summary of soil and groundwater results are presented in **Table 1-3** and **Table 1-4**, respectively.

Table 1-3. Summary of Soil Sampling on Simplot Property Conducted by Ecology in 2013

Sample ID	Description	Nitrate-N	Sulfate
		(mg/Kg)	
B-1	Soil from B-1, 2.5 to 3.0 feet bgs	110	200
B-2	Soil from 2.5 to 3.0 feet bgs	47	440
B-3	Soil from 5.5 to-6.5 feet bgs	<2.3	360

Table 1-4. Summary of Groundwater Sampling on Simplot Property Conducted by Ecology in 2013

Sample ID	Description	Nitrate-N	Sulfate
		(mg/L)	
B-1	Groundwater at 15 feet bgs	199	725
B-2	Groundwater at 15 feet bgs	94.0	1670
B-3	Groundwater at 15 feet bgs	0.17	1520

Typical agricultural soil nitrate concentrations range from 5 to 40 mg/Kg, so the 110 mg/Kg measurement is slightly elevated, though in the range for agricultural soil that receives fertilizer additions. Sulfate soil concentrations appear elevated compared to typical soil levels (5 to 100 mg/Kg range). Washington's groundwater quality criteria for nitrate-N and sulfate are 10 mg/L and 250 mg/L, respectively. The groundwater concentration values in B-1 through B-3 were above the criteria, except for water sample in B-3 for nitrate-N.

In response to the Ecology letter regarding potential nitrate and sulfate sources on the Simplot property, Simplot collected two water samples from its scale drain in July 2014. This water is associated with stormwater entering the drain. **Table 1-5** summarizes the results of these samples.

Table 1-5. Summary of Scale Drain Sampling by Simplot

Description	Nitrate-N	Sulfate	Chloride
	(mg/L)		
Scale Drain	76.1	1640	187
Load Out Drain	169	1584	228

Nitrate-N and sulfate in the two drain samples are elevated compared to typical groundwater levels and are above Washington groundwater standards.

2 Proposed Site Investigation Activities

This section presents data objectives and needs and proposed field activities.

2.1 Data Objectives and Needs

Based on the investigation and reports prepared by GeoEngineers, Ecology developed the Early Notice Letter to Simplot indicating that there is sufficient evidence to suggest that the Simplot Grower Solutions facility is a potential source of release of nitrate and sulfate to soil and groundwater. Based on the limited seasonal groundwater elevation monitoring data and the potential variability inherent in the shallow unconfined groundwater-bearing zone underlying the project area, HDR notes some uncertainty in the groundwater flow direction suggested by the GeoEngineers reports. The variability in groundwater levels in MW-1 and the gradient encountered between MW-3, MW-4, and MW-5 suggest there may be seasonally varying groundwater flow directions in the area of investigation. In particular, there may be a "ridge" along the line between MW-1, MW-2, and MW-5 separating a southwest flow direction (towards MW-3) and a southeast flow direction (towards MW-4) (see GeoEngineer's figures in Appendix D). Additionally, the groundwater elevations are likely influenced by the rate of groundwater recharge (infiltration of precipitation and snowmelt) within associated upland areas to the north, east, and south of the site, and potentially, the stage of adjacent surface water within the Yakima River and irrigation canals.

Additional uncertainty lies with the sample collected from the stormwater drain located on the Simplot Grower Solutions site. Analytical results from this sampling event performed in July of 2014 indicate that the nitrate-N concentration is 76.1 mg/L and sulfate concentration is 1,640 mg/L, exceeding the respective Washington groundwater standards. While these concentrations correspond with the concentrations measured in soil and groundwater samples taken from the Moxee City Shop facility monitoring wells and soil borings, more information is required with respect to the location of the storm drain sample collection and the stormwater surface elevation and utility layout in order to make any conclusions on the suspected contribution of this system to the areas of impact.

The objective of preliminary investigation activities is to assess the potential for elevated nitrate and sulfates in soil and groundwater beneath the Simplot Grower Solutions facility. Based on the preliminary investigations results, recommendations for further action will be made, including the potential need for groundwater monitoring wells. Soil samples will be tested for nitrate-N, sulfate, ammonium-N, and soluble salts using appropriate U.S. Environmental Protection Agency (USEPA) or Washington methodology by a qualified laboratory. Groundwater samples will be tested for nitrate-N, sulfate, and total dissolved solids (TDS).

2.2 On-Site Investigation Activities

Site investigation activities will include sampling on-site soil and groundwater.

2.2.1 On-Site Soil Investigation

To characterize soil quality, the general approach will be to conduct soil sampling using a GeoProbe drill-type system. The GeoProbe operates using a truck-mounted hydraulic push probe that collects undisturbed soil cores. The GeoProbe is often a preferred method for subsurface sampling due to the relatively small hole created (2 inches in diameter) and the small amount of waste produced. Furthermore, the GeoProbe can collect both soil and groundwater samples in the same boring. While the GeoProbe can be advanced through soil, it is not able to penetrate bedrock and sometimes can reach refusal in gravel/cobble lithology or hardpan soil.

HDR proposes (10) borings be advanced with the GeoProbe within the boundary of the Simplot facility. **Figure 2-1** illustrates the approximate boring locations. The goal will be to obtain a spatial representation of soil and groundwater nitrate and sulfate concentrations with the goal to identify areas of elevated constituents. The exact location of each boring will be determined in the field following consultation with the site manager, review of utility locations, and consideration of personnel safety and facility operations. Prior to advancing GeoProbe borings, Simplot will contact the Washington Utilities Coordinating Council (Call Before You Dig, 1-800-424-5555) to locate public utilities. HDR will also consult with the facility managers for the Simplot property regarding knowledge of utilities.

The proposed number of soil samples per boring is presented in **Table 2-1**.

Table 2-1. Number of Soil Samples to be collected from each Boring

Soil Depth	Number of Soil Samples	Description
Surface to groundwater or refusal (shallow)	3	Sample 1 – 0-12 inches from surface Sample 2 – midway between surface and groundwater Sample 3 – within 6 inches of soil/groundwater interface

In general, the approach is to collect a sample at the surface, one-midway depth between the surface and groundwater, and one near the soil/groundwater interface. This approach allows for assessing constituents with depth and mapping the thickness of the soil in the area. A total of 30 soil samples will be collected. In addition, one duplicate soil sample will be collected to help assess variability.

The standard operating procedure (SOP) for GeoProbe sampling is presented in Appendix A. Standard chain-of-custody procedures will be followed from the time samples are collected until the samples arrive at the laboratory. All samples will be immediately labeled and placed in a clean ice chest and chilled until delivery to the laboratory.

After sampling, borings will be plugged with bentonite clay and then capped with clay, concrete, or asphalt, depending on the existing surface completion at each boring location. Soil cuttings will be placed in a container. The container will be labeled as to its content, and will include the date and the statement “Laboratory analysis pending.” Once laboratory results are obtained, proper disposal of the containers will be determined.

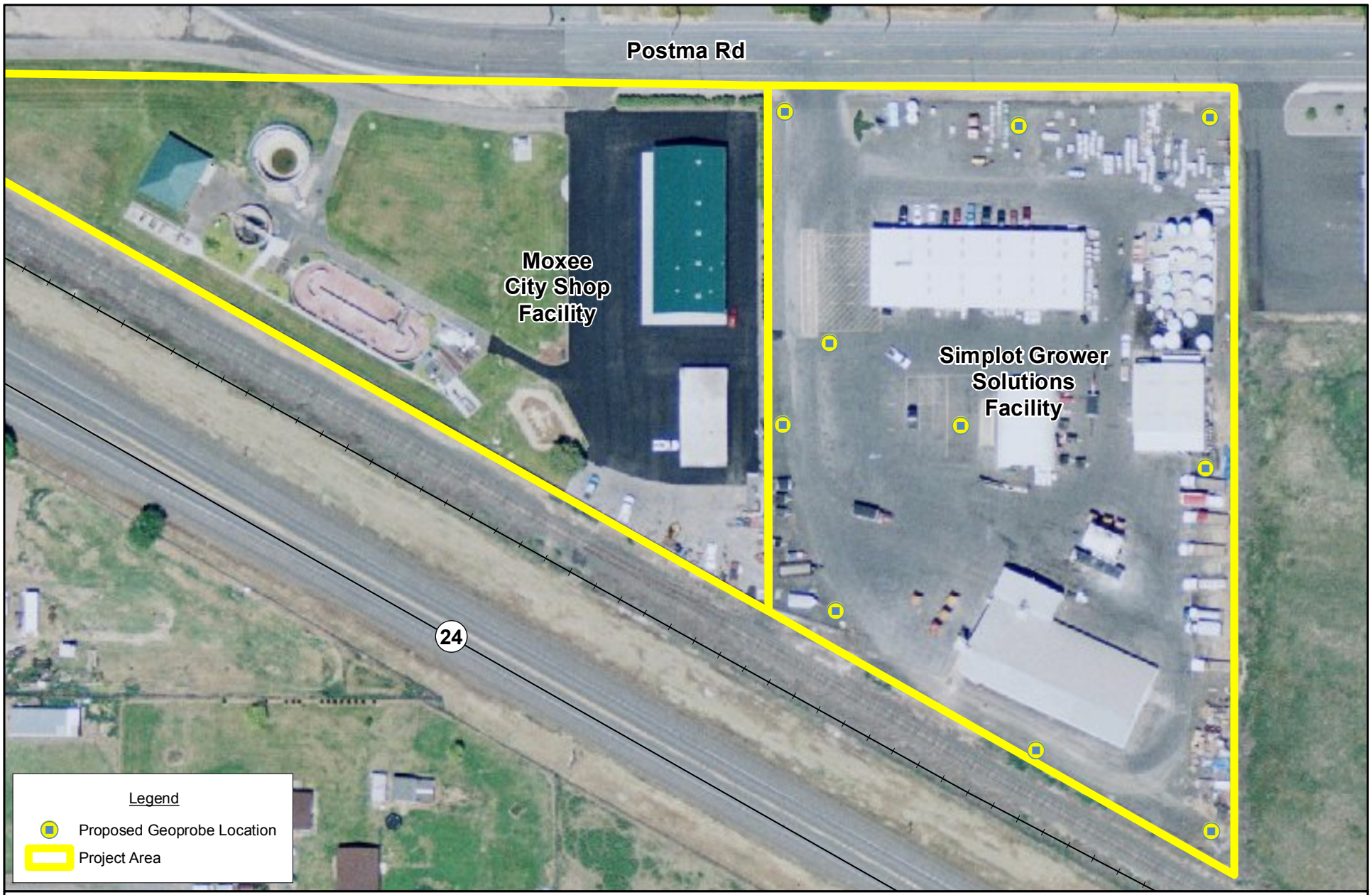

Figure 2-1: Proposed Geoprobe Locations
Simplot Grower Solutions, Moxee, WA

Imagery: ESRI World Imagery, June 2011 Imagery
Source: Esri, DigitalGlobe, GeoEye, i-cubed, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community

Map Date: 2/4/2015
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Feet

2.2.2 On-Site Groundwater Investigation

After collecting soil samples, the GeoProbe system will be used to collect groundwater grab samples in the same boring using a stainless steel screen and ¼-inch tubing equipped with a foot valve or peristaltic pump to convey water to the surface. The SOP for GeoProbe sampling in Appendix A describes groundwater sampling procedures. Samples will be collected within the upper 2 to 3 feet of the water table. At each sample location, the sample screen will be purged by pumping approximately 2 liters of groundwater prior to sample collection. Purged water will be placed in a container. The container will be labeled as to its content, and will include the date and the statement "Laboratory analysis pending." Once laboratory results are obtained, proper disposal of the containers will be determined.

Groundwater samples will be collected in laboratory-supplied sampling bottles. One duplicate groundwater sample will be collected in the field.

2.2.3 Sample Identification Protocol

Borings will be labeled from B-01 through B-10. Samples will be identified with the boring number, followed by "S" for soil or "W" for water to identify media sampled, followed by depth of the sample. For example, a soil sample collected at borehole B-02 at a depth of 10 feet would be labeled B-02-S-10. A water sample collected at borehole B-04 at a depth of 12 feet would be labeled B-04-W-12.

2.2.4 Laboratory Analyses

Soil samples will be sent to Kuo Laboratory in Othello, Washington. Groundwater samples will be sent to ESC Lab Sciences in Mt. Juliet, Tennessee. Kuo is a soil testing laboratory that is part of the North American Proficiency Testing Program for soils. ESC Lab Sciences is Washington-certified for analysis of air, drinking water, Resource Conservation Recovery Act, underground storage tanks, and wastewater (Certificate #C1915). Proposed laboratory analyses for soil and groundwater samples are summarized in **Table 2-2**.

Table 2-2. Proposed Laboratory Analyses

Analytical Parameter	Method	Preservative	Constituents of Concern Included
Soil Samples			
Nitrate-N	2M KCl Extraction[1]	None	Nitrate-Nitrogen
Ammonium-N	1N KCl Extraction	None	Ammonium-Nitrogen
Soluble Salts	Sat. Extract	None	Salts
Groundwater Samples			
Sulfate	EPA 300.0	None	Sulfate-Sulfur
Nitrate-N	EPA 353.2 or EPA 300.0	Sulfuric Acid (H_2SO_4)	Nitrate-Nitrogen
Ammonium-N	SM20 4500 NH3 D or EPA 350	Sulfuric Acid (H_2SO_4)	Ammonium-Nitrogen
TDS	SM2540D	None	Total dissolved solids

[1]Procedure and analytical methods for soil nitrate, ammonium, and soluble salts will follow the *Western States Laboratory Plant, Soil and Water Analysis Manual,* 2nd Edition, 2003.

2.2.5 Quality Assurance and Quality Control

Table 2-3 summarizes quality assurance/quality control (QA/QC) field samples to be collected. Appendix B describes QA/QC procedures.

Table 2-3. Quality Assurance and Quality Control Field Samples

QA/QC Type	Number of Samples	Description (see Appendix B)
Duplicate	1 soil sample 1 groundwater sample	Duplicate is collected using the same sampling technique as the original sample.
Rinsate Decon	1 water rinsate sample	Collected during decontamination of equipment. After decontamination of probe has occurred, run distilled water over the probe and collect rinsate into appropriate sample bottles.
Field Sample Blank	1 water blank sample	Pour distilled water directly into appropriate sample bottles.

In addition to the field QA/QC samples described in **Table 2-3**, ESC Lab Sciences will follow appropriate laboratory QA/QC procedures as dictated by the USEPA method and the laboratory's SOPs.

2.3 Health and Safety

All activities will be conducted under the supervision of senior project personnel and in strict accordance with a health and safety plan, which will be completed prior to commencement of field activities.

The site is in full operation. Investigation activities will be coordinated with Simplot Grower Solutions to ensure little to no disruption in site operation occurs. Sampling activities will also follow any special safety requirements at the site.

2.4 Reporting

HDR will prepare a preliminary site investigation report that will describe field activities, soil lithology, results of analyses, maps and figures, and findings. This report will be presented to Ecology.

2.5 Schedule

Following Ecology's approval of this Work Plan, arrangements will be made with a driller to conduct the sampling. The preliminary site investigation report is expected to take approximately 90 days following Ecology's approval of this Work Plan.

3 References

GeoEngineeers. Data Gap Investigation Report Moxee City Shop and Former STP, Moxee, Washington for Washington State Department of Ecology. April 3, 2014.

GeoEngineers. Soil and Groundwater Assessment. City Shop and Sewage Treatment Plant Moxee, Washington for Washington Department of Ecology. May 14, 2013

GeoEngineers. Quarterly Groundwater Monitoring and Hydraulic Testing Second Quarter 2013. City Shop and Sewage Treatment Plant, Moxee, Washington for Washington Department of Ecology. August 23, 2013.

Custom Soil Resource Report for Yakima County Area, Washington Moxee Soil Map. http://websoilsurvey.nrcs.usda.gov/app/HomePage.htm Viewed January 29, 2015.

APPENDIX A
STANDARD OPERATING PROCEDURE
SOIL BORING AND SUBSURFACE SAMPLE COLLECTION
(GeoProbe™)

Purpose

This procedure describes the soil boring method and subsurface soil and groundwater sample collection techniques for GeoProbe™ operations that should be followed to ensure acceptable, consistent collection of subsurface samples for chemical and physical analysis and physical description.

Applicability

The requirements of this procedure are applicable to project activities involving soil borings, soil sample collection, groundwater sample collection, sample logging, examination, and classification.

The extent of project activities identified by this procedure is controlled at the direction of the project manager.

These are standard (i.e., typically applicable) operation procedures that may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the actual procedures used should be documented and described in an appropriate site report.

References

- Project Health and Safety Plan
- Preliminary Site Assessment Work Plan (Plan)

Procedures

<u>Site Mobilization and Set-Up</u>

- Inspect the GeoProbe™ rig and materials to ensure they arrived on site in a clean condition and are free of oil, grease, and debris. The field manager shall inspect the rig for any significant fluid leaks. If leaking fluids are present, repair or contain them.
- Ensure that the probes, drills, and accessories are steam-cleaned prior to the start of drilling. Inspect the cleaned materials for residues such as machine oils. If residues are observed, steam-clean the equipment until such residues are removed.
- Perform decontamination procedures between probing.

- Set up the decontamination area for sampling equipment, and decontaminate any non-disposable sampling equipment prior to use.
- Use potable water for decontamination.
- If required, obtain the anticipated number of solid and liquid 55-gallon drums required to contain the soil and decontamination waste, and have drums ready for drilling activities.

Soil Probing

- Notify the Washington Utilities Coordinating Council (Call Before You Dig, 1-800-424-5555) to identify utilities prior to soil probing.
- Mobilize the GeoProbe™ to the boring location; prepare the exclusion or safety zone.
- If required, adjust the proposed probe locations in the field, based on site access, property boundaries, and/or surface obstructions.
- Review the safety level for soil probing and related activities in the site-specific health and safety plan.
- Drill soil borings as per this procedure using a GeoProbe™ rig (e.g., Model 5400).
- If concrete or asphalt is present, use the boring or drill hammer equipment, present on most GeoProbe™ rigs, to penetrate the material in order to access soil and groundwater.
- Collect continuous samples with a soil-sampling tube attached to a probe rod. (Note: Check the *Preliminary Site Investigation Work Plan* for additional requirements or exceptions). An on-site geologist or other authorized personnel will examine and classify the soil sample.
- Standard sampling tube is in 4-foot lengths.
- Continue probing to the depth specified in the *Preliminary Site Investigation Work Plan*.
- Decontaminate the GeoProbe™ rig between relocations to boreholes as specified in the following “Soil Sampling” section.

Soil Sampling

- To collect intact subsurface soil samples from boreholes, advance the probe at 4-foot intervals or other intervals as specified in the *Preliminary Site Investigation Work Plan*. Drive the probe rod and sampler to a designated depth and then retract the probe rod from the hole to recover the sample tube.
- For each sample, record the following in the field logbook:
    - Date and time of collection
    - Depth of sample collection

    - Sample recovery
    - Qualitative description of the soil sample

- As specified in the *Preliminary Site Investigation Work Plan*, collect a representative sample and place it in the appropriate sample container(s).

- Obtain the soil samples for volatile organic analyses first, and immediately place them in the proper sample bottles to minimize volatilization of such compounds.

- Sampling personnel shall remove outer gloves (latex) and discard them between borings to minimize the potential for sample cross-contamination.

- Decontaminate the sampling equipment between each sampling interval as described in the following "Groundwater Sampling" section.

Groundwater Sampling

- To collect groundwater samples using the GeoProbe™, advance the probe, equipped with a Mill-Slotted Well Rod, to the desired depth. Collect a groundwater grab sample by placing 1/4-inch tubing with an attached foot valve down in the well and conveying water to the surface with an up-and-down motion of the foot valve. Other alternatives for conveying water are by using a manual bailer or a peristaltic pump attached to 1/4-inch tubing. The field team manager will select the sampling device based on type of constituents being sampled and depth to groundwater. Directly pump water by mechanical action to the surface and into laboratory-supplied sample bottles. Use new tubing for each borehole, and clean and decontaminate the rods, sampler, and screen after sampling each borehole.

- For each groundwater sample, record the following in the field logbook:

    - Date and time of collection
    - Depth of sample collection
    - Qualitative description of the water sample (turbidity, odor, color, etc.)

Field Duplicate Samples

If duplicate samples are specified in the *Preliminary Site Investigation Work Plan*, collect them from the same stainless steel, tempered glass, or aluminum container as the routine field sample.

Sample Handling, Labeling and Documentation

- Complete a record of each sample and the required analysis at the time of sample collection on the chain-of-custody form.

- Label each sample with the following information:

    - Sample identification code

    - Type of sample
    - Collection date/time
    - Preservatives
    - Analysis

- Pressure wash the GeoProbe™ rig, probes, tools, bits, and samplers used during drilling to prevent cross contamination between each test boring. Inspect the rig for any residues after washing. If the equipment is not clean, repeat the cleaning procedure. Decontaminate the drill rig and associated equipment consistent with the health and safety plan.

APPENDIX B

QUALITY ASSURANCE PLAN

The following standards will be maintained during sampling and analysis to ensure that the data generated meets required data quality objectives:

Field QA/QC

- Collect field duplicate samples simultaneously with a standard sample from the same source under identical conditions into separate sample containers. Treat a duplicate sample independent of its counterpart in order to assess laboratory performance through comparison of the results. Collect one soil and one groundwater sample duplicate.
- Perform all sampling using pre-cleaned or dedicated equipment, following sampling procedures specified in U.S. EPA guidelines.
- Collect a rinsate sample during decontamination between boreholes.
- Collect a field sample blank of the potable water used to conduct decontamination between boreholes.
- Maintain chain-of-custody from the time of sample collection until the time the samples are received by the analytical laboratory.
- Record field notes and take photographs where necessary to document sampling activities. Document deviations from the original sampling plan.

Laboratory QA/QC

- Send soil samples to Kuo Laboratory of Othello, WA. Send groundwater samples to Environmental Science Corporation, Mt. Juliet, TN.
- Performa all sampling analysis within the holding time specified for the individual analysis. Note any exceedance of sample holding time in the final report.
- Follow the individual protocol specified by U.S. EPA or Standard Method (groundwater samples), or North American Proficiency Testing Program (soil samples) for the analytical method in question for all laboratory analysis.
- Perform internal laboratory procedures, such as laboratory blank and surrogate analysis, as specified for individual methods. At a minimum, analytical data sheets generated by the laboratory must contain the following information: sample number and laboratory identification number, analysis method type or number, detection limits (practical quantitation limit), and date of analysis.
- Document any problems encountered by the laboratory with regard to chain-of-custody, sample holding time, sample analysis, laboratory contamination, etc., and detail them in the data validation report.

Sample Methods

Analytical Parameter	Method	Preservative	Constituents of Concern Included
Soil Samples			
Nitrate-N	2M KCl Extraction[1]	None	Nitrate-Nitrogen
Ammonium-N	1N KCl Extraction	None	Ammonium-Nitrogen
Soluble Salts	Sat. Extract	None	Salts
Groundwater Samples			
Sulfate	EPA 300.0	None	Sulfate-Sulfur
Nitrate-N	EPA 353.2 or EPA 300.0	Sulfuric Acid (H_2SO_4)	Nitrate-Nitrogen
Ammonium-N	SM20 4500 NH3 D or EPA 350	Sulfuric Acid (H_2SO_4)	Ammonium-Nitrogen
TDS	SM2540D	None	Total dissolved solids

[1]Procedure and analytical methods for soil nitrate, ammonium, and soluble salts will follow the *Western States Laboratory Plant, Soil and Water Analysis Manual,* 2nd Edition, 2003.

APPENDIX C
HISTORIC AERIAL PHOTOGRAPHS


BEAUDRY
BELL
BEAUCHENE
CAMPBELL
LA FRAMBOISE
RIVARD
CAMPBELL
FAUGHER
FAUGHER
1947


D-285
D-510
D-515
D981
D980
D-525
A
29.4
C
14.3
B
3.3
2
D-511
D 860
D-530
D-820
A
31.5
B
5.4
A
8.8
D-859
A
11.5
A
38.6
C
5.5
B
21.9
D-514
D-531
A
C
16.2
A
17.9
D-532
D-514
A
4.8
B
4.5
1968


1992


1998

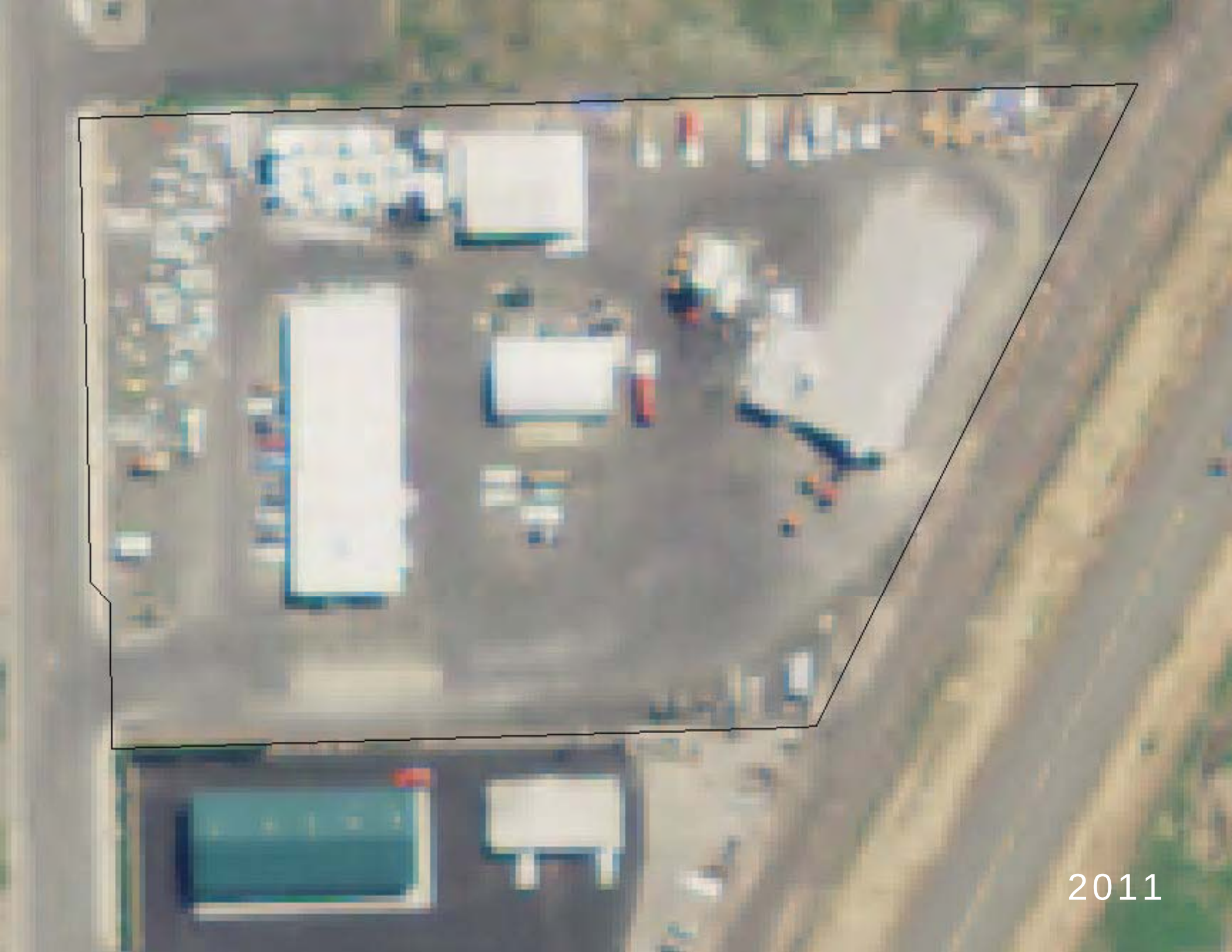

2002


2005


2006


2009


Rd
Postma Rd
2010
24


2011


2013

APPENDIX D

SELECTED TABLES AND FIGURES FROM STUDIES AT MOXEE CITY SHOP

Approximate Direct-Push Boring Location (November 2013)

Approximate Hollow-Stem Auger Boring Location (December 2013)

Approximate Direct-Push Boring Location (March 2012)

Approximate New Monitoring Well Location (December 2013)

Approximate Existing Monitoring Well Location (March and October 2012)

Approximate Property Boundary

Approximate Location of 1996 UST Excavation

N W E S

0 60

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
Data Sources: Aerial from ESRI Data Online.
Projection: NAD 1983, Washington State Plane South, feet.

Site Plan

Moxee City Shop and Former STP
Moxee, Washington

GeoEngineers

Figure 2

Office: SPOK Path: W:\Spokane\Projects\0\0504078\GIS\01\0504078 01_F2_SitePlan.mxd Map Revised: 17 February 2014 tkauhi

MW-2 (1,019.74) Approximate Monitoring Well Location and Groundwater Elevation

Approximate Location of 1996 UST Excavation

Approximate Groundwater Elevation Contour (0.2-foot interval)

Interpreted Groundwater Flow Direction

N
W E
S

60 0 60
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Groundwater elevations are presented in feet relative to the North American Vertical Datum of 1988 (NAVD88).
4. The groundwater elevation reported for MW-1 reflects a suspected measurement error and was not used to develop the groundwater elevation contours or interpreted flow direction.
Data Sources: Aerial from ESRI Data Online.
Projection: NAD 1983, Washington State Plane South, feet.

Groundwater Elevations
December 30, 2013

Moxee City Shop and Former STP
Moxee, Washington

GeoEngineers

Figure 3

Office: SPO Path: W:\Spokane\Projects\0\0504078\GIS\01\0504078O1_F3_GW_Dec2013.mxd Map Revised: 27 March 2014 tkauhi

Approximate Direct-Push Boring Location (November 2013)

Approximate Direct Push Boring Location (March 2012)

Approximate New Monitoring Well Location (December 2013)

Approximate Existing Monitoring Well Location (March and October 2012)

Petroleum-Based Compounds Either Not Detected or Detected at Concentrations Less Than Cleanup Levels in Soil Samples

Approximate Location of 1996 UST Excavation

N
W E
S

0 40
Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3.All soil sample petroleum-based contaminant concentrations were less than applicable Model Toxics Control Act Method A or B cleanup levels, or were not detected.
4. Locations where soil samples were not collected for petroleum-based analytes are omitted from this figure.
Data Sources: Aerial from ESRI Data Online.
Projection: NAD 1983, Washington State Plane South, feet.

Sampling Locations - Petroleum-Based Compounds in Soil

Moxee City Shop and Former STP
Moxee, Washington

GeoEngineers

Figure 4

Office: SPO Path: W:\Spokane\Projects\0\0504078\GIS\01\0504078 01_F4_Soils_PH_Dec2013.mxd Map Revised: 27 March 2014 tkauhi

B-1 110 — Approximate Boring Location and Soil Nitrate Concentration (mg/kg)

MW-6 <2.4 — Approximate Monitoring Well Location and Soil Nitrate Concentration (mg/kg)

Approximate Location of 1996 UST Excavation

N W E S

40 0

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Locations where soil samples were not collected for nitrate analysis were omitted from this figure.
4. mg/kg = milligrams per kilograms

Data Sources: Aerial from ESRI Data Online.
Projection: NAD 1983, Washington State Plane South, feet.

Nitrate Concentrations in Soil

Moxee City Shop and Former STP
Moxee, Washington

GeoEngineers

Figure 5

Office: SPO Path: W:\Spokane\Projects\0\0504078\GIS\01\0504078 01_F5_Soil_Nitrate.mxd Map Revised: 25 March 2014 tkauhi

B-1 200 — Approximate Boring Location and Soil Sulfate Concentration (mg/kg)

MW-6 48 — Approximate Monitoring Well Location and Soil Sulfate Concentration (mg/kg)

Approximate Location of 1996 UST Excavation

N W E S

40 0

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Locations where soil samples were not collected for sulfate analysis were omitted from this figure.
4. mg/kg = milligrams per kilograms

Data Sources: Aerial from ESRI Data Online.
Projection: NAD 1983, Washington State Plane South, feet.

Sulfate Concentrations in Soil

Moxee City Shop and Former STP
Moxee, Washington

GeoEngineers

Figure 6

Office: SPO Path: W:\Spokane\Projects\0\0504078\GIS\01\0504078 01_F6_Soil_Sulfate.mxd Map Revised: 27 March 2014 tkauhi

DP-6 1,340 — Approximate Direct-Push Boring Location and Groundwater GRPH Concentration (µg/l) during November 2013

MW-1 1,690 — Approximate Monitoring Well Location and Groundwater GRPH Concentration (µg/l) during December 2013

Interpreted Limits of Petroleum-Based Groundwater Contamination in Excess of Cleanup Levels

Petroleum-Based Compounds Either Not Detected or Detected at Concentrations Less Than Cleanup Levels in Project Groundwater Sample(s)

Petroleum-Based Compounds Detected at Concentrations Greater Than Cleanup Levels in Project Groundwater Sample(s)

Approximate Location of 1996 UST Excavation

N W E S

0 60

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Groundwater sample contaminant concentrations are referenced to Model Toxics Control Act Method A or B cleanup levels, depending on analyte.
4. Soil borings where groundwater samples were not collected for petroleum-based analysis are omitted from this figure.
5. µg/l = micrograms per liter; GRPH = gasoline-range petroleum hydrocarbons

Data Sources: Aerial from ESRI Data Online.
Projection: NAD 1983, Washington State Plane South, feet.

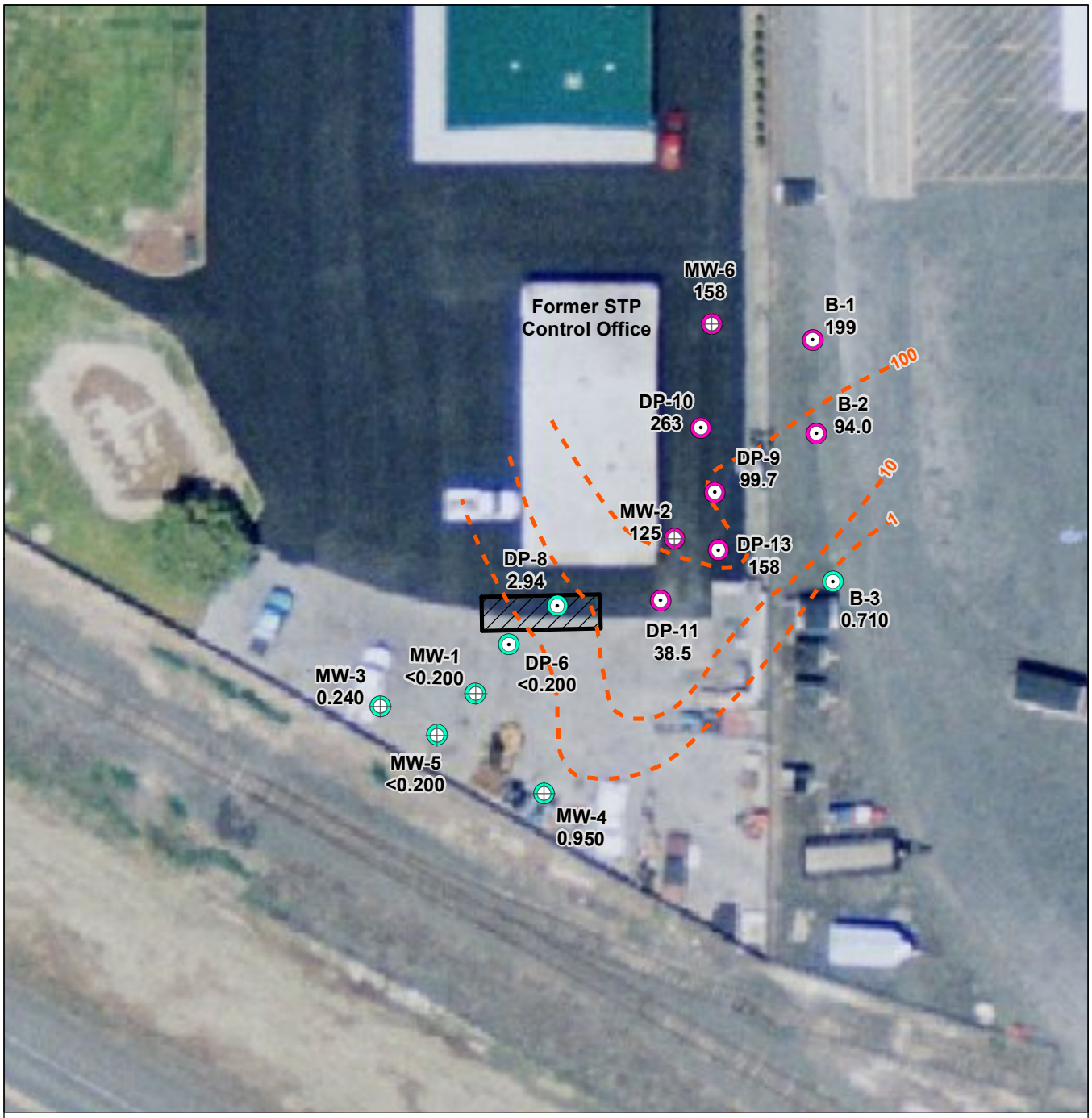
Cleanup Level Exceedances - Petroleum-Based Compounds in Groundwater

Moxee City Shop and Former STP
Moxee, Washington

GeoEngineers

Figure 7

Office: SPO Path: W:\Spokane\Projects\0\0504078\GIS\01\0504078 01_F7_GW_PH_Dec2013.mxd Map Revised: 25 March 2014 tkauhi



B-1 199 — Approximate Boring Location and Groundwater Nitrate Concentration (mg/L)

MW-1 <0.200 — Approximate Monitoring Well Location and Groundwater Nitrate Concentration (mg/L)

1 — Approximate Groundwater Nitrate Concentration Contour (mg/L; variable interval)

Nitrate Detected at Concentrations Greater than the MCL in Groundwater Sample(s)

Nitrate Either Not Detected or Detected at Concentrations Less than the MCL in Groundwater Sample(s)

Approximate Location of 1996 UST Excavation

N W E S

40 0

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Groundwater sample nitrate concentrations are specific to November or December 2013 referenced to the Maximum Containment Level (MCL) of 10 milligrams per liter (mg/L).
4. Locations where groundwater samples were not collected for nitrate analysis were omitted from this figure.
Data Sources: Aerial from ESRI Data Online.
Projection: NAD 1983, Washington State Plane South, feet.

Nitrate Concentrations and MCL Exceedances in Groundwater

Moxee City Shop and Former STP
Moxee, Washington

GeoEngineers

Figure 8

Office: SPOK Path: W:\Spokane\Projects\0\0504078\GIS\01\0504078O1_F8_GW_NitrateMCL.mxd Map Revised: 25 March 2014 tkauhi

B-1 785 — Approximate Boring Location and Groundwater Sulfate Concentration (mg/L)

MW-1 14.4 — Approximate Monitoring Well Location and Groundwater Sulfate Concentration (mg/L)

100 — Approximate Groundwater Sulfate Concentration Contour (mg/L; variable interval)

Sulfate Either Not Detected or Detected at Concentrations Less than the Secondary MCL in Groundwater Sample(s)

Sulfate Detected at Concentrations Greater than the Secondary MCL in Groundwater Sample(s)

Approximate Location of 1996 UST Excavation

N W E S

40 0

Feet

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Groundwater sample sulfate concentrations are specific to November or December 2013 referenced to the secondary Maximum Containment Level (MCL) of 250 milligrams per liter (mg/L).
4. Locations where groundwater samples were not collected for sulfate analysis were omitted from this figure.
Data Sources: Aerial from ESRI Data Online.
Projection: NAD 1983, Washington State Plane South, feet.

Sulfate Concentrations and Secondary MCL Exceedances in Groundwater

Moxee City Shop and Former STP
Moxee, Washington

GeoEngineers

Figure 9

Office: SPOK Path: W:\Spokane\Projects\0\0504078\GIS\01\0504078 01_F9_GW_SulfateMCL.mxd Map Revised: 25 March 2014 tkauhi

Table 1

Summary of Groundwater Level Measurements

Moxee City Shop and Former STP

Moxee, Washington

Well Number	Top of Casing Elevation [1] (feet)	Screen Elevation [1] (feet)	Date Measured	Monitoring Well Headspace [2] (ppm)	Depth to Groundwater [3] (feet)	Groundwater Elevation [1] (feet)	Change in Groundwater Elevation [4] (feet)
MW-1	1,024.95	1,011.3 to 1,023.3	11/01/12	0.0	7.35	1,017.60	NA
			02/13/13	0.0	7.55	1,017.40	-0.20
			05/27/13	0.0	2.83	1,022.12	4.72
			08/21/13	NM	5.31	1,019.64	-2.48
			12/30/13	3.9	4.70	1,020.25	0.61
MW-2	1,025.49	1,013.9 to 1,021.9	11/01/12	0.0	7.65	1,017.84	NA
			02/13/13	0.0	7.96	1,017.53	-0.31
			05/27/13	0.0	3.00	1,022.49	4.96
			08/21/13	NM	5.72	1,019.77	-2.72
			12/30/13	0.0	5.75	1,019.74	-0.03
MW-3	1,025.24	1,013.6 to 1,021.6	11/01/12	0.0	7.81	1,017.43	NA
			02/13/13	0.0	8.06	1,017.18	-0.25
			05/27/13	0.0	3.22	1,022.02	4.84
			08/21/13	NM	5.78	1,019.46	-2.56
			12/30/13	0.0	5.89	1,019.35	-0.11
MW-4	1,025.56	1,013.9 to 1,021.9	11/01/12	0.0	7.95	1,017.61	NA
			02/13/13	0.0	8.14	1,017.42	-0.19
			05/27/13	0.0	3.29	1,022.27	4.85
			08/21/13	NM	5.93	1,019.63	-2.64
			12/30/13	0.0	6.06	1,019.50	-0.13
MW-5	1,025.31	1,010.1 to 1,022.6	12/30/13	1.0	5.89	1,019.67	--
MW-6	1,025.37	1,010.4 to 1,022.9	12/30/13	1.1	5.64	1,019.92	--

Notes:

[1]Elevations are referenced to the North American Vertical Datum of 1988 (NAVD88).

[2]Well headspace measurements were obtained using a photoionization detector immediately upon removal of the well's compression cap.

[3]Depth to water measurements obtained from top of well casing. Wells are contained in flush-mounted protective steel monuments installed at or near existing grade.

[4]Change in groundwater elevation is relative to the previous measurement at the respective well location.

ppm = parts per million; NA = Not Applicable; NM = Not Measured

Table 2

Summary of Chemical Analytical Results - Soil [1,2]

Moxee City Shop and Former STP
Moxee, Washington

Boring		DP-2[4]	DP-3[4]	DP-4[4]	DP-5[4]	DP-6[4]	DP-6	DP-7	DP-8	DP-9	DP-10	DP-11	DP-12	DP-13	DP-14
Sample Depth (feet)	**Regulatory**	**4.5-5**	**4-4.5**	**4-4.5**	**4-5**	**4.5-5**	**1.5-2.5**	**1-1.8**	**1-1.8**	**1-2**	**1.3-2**	**2-2.5**	**1-2**	**1-2**	**1-2**
Date Sampled	**Levels [3]**	**03/01/12**	**03/01/12**	**03/01/12**	**03/01/12**	**03/01/12**	**11/14/13**	**11/14/13**	**11/14/13**	**11/14/13**	**11/14/13**	**11/14/13**	**11/14/13**	**11/14/13**	**11/14/13**
Method EPA 8260C - NWTPH-Gx and Volatile Organic Compounds (mg/kg)															
Gasoline-range hydrocarbons	30/100 [5]	<7.62	<7.94	37.9	<7.48	<7.74	<6.72	<6.25	<6.94	NT	NT	NT	<5.01	NT	<6.54
MTBE	0.10	<0.0457	<0.0476	<0.0425	<0.0449	<0.0464	NT	NT	NT	NT	NT	NT	NT	NT	NT
Benzene	0.03	<0.0229	<0.0238	<0.0213	<0.0224	<0.0232	<0.00672	<0.00625	<0.00694	NT	NT	NT	<0.00501	NT	<0.00654
Ethylbenzene	6	<0.152	<0.159	<0.142	<0.150	<0.155	<0.134	<0.125	<0.139	NT	NT	NT	<0.100	NT	<0.131
Toluene	7	<0.152	<0.159	<0.142	<0.150	<0.155	<0.134	<0.125	<0.139	NT	NT	NT	<0.100	NT	<0.131
o-Xylene	9 [6]	<0.305	<0.317	<0.284	<0.299	<0.309	<0.269	<0.250	<0.278	NT	NT	NT	<0.200	NT	<0.261
m,p-Xylene	9 [6]	<0.609	<0.635	<0.567	<0.598	<0.619	<0.537	<0.500	<0.555	NT	NT	NT	<0.400	NT	<0.523
Xylenes (total)	9 [6]	<2.29	<2.38	<2.13	<2.24	<2.32	<2.02	<1.87	<2.08	NT	NT	NT	<1.50	NT	<1.96
Hexane	4,800 [7]	<0.152	<0.159	<0.142	<0.150	<0.155	<0.134	<0.125	<0.139	NT	NT	NT	<0.100	NT	<0.131
1,2-Dichloroethane (EDC)	11[8]	<0.152	<0.159	<0.142	<0.150	<0.155	NT	NT	NT	NT	NT	NT	NT	NT	NT
Method EPA 8011 (µg/kg)															
1,2-Dibromoethane (EDB)	5	<1.27	<1.31	**<12.0**	<1.19	<1.28	NT	NT	NT	NT	NT	NT	NT	NT	NT
Method EPA 8270D - Polynuclear Aromatic Compounds (PAH) by GC/MS with Selected Ion Monitoring[9] (mg/kg)															
Naphthalene	5[10]	<0.305	<0.305	<0.284	<0.309	<0.309	<0.0121	<0.0119	<0.0125	NT	NT	NT	<0.0106	NT	<0.0124
2-Methylnaphthalene	5 [10]	<0.0130	<0.0129	0.0289	<0.0127	<0.0126	<0.0121	<0.0119	<0.0125	NT	NT	NT	<0.0106	NT	<0.0124
1-Methylnaphthalene	5 [10]	<0.0130	<0.0129	0.0185	<0.0127	<0.0126	<0.0121	<0.0119	<0.0125	NT	NT	NT	<0.0106	NT	<0.0124
Method EPA 6010C (mg/kg)															
Lead	250	5.30	6.18	5.53	4.95	7.24	NT	NT	NT	NT	NT	NT	NT	NT	NT
Method EPA 300 - Anions (mg/kg)															
Nitrate	130,000 [7]	NT	NT	NT	NT	NT	NT	NT	NT	12	47	<1.6	NT	14	NT
Sulfate	RND	NT	NT	NT	NT	NT	NT	NT	NT	12	49	15	NT	21	NT

Boring	Regulatory Levels [3]	MW-2[4]	MW-3[4]	MW-4[4]	MW-5	MW-6	B-1	B-2	B-3
Sample Depth (feet)		6	6	2.5	5-5.5	5-5.5	2-2.5	2.5-3	5.5-6.5
Date Sampled		10/31/12	10/31/12	10/31/12	12/12/13	12/13/13	12/12/13	12/12/13	12/12/13
Method EPA 8260C - NWTPH-Gx and Volatile Organic Compounds (mg/kg)									
Gasoline-range hydrocarbons	30/100 [5]	73.5	<7.75	<8.18	<7.46	13.5	NT	NT	NT
MTBE	0.10	NT	NT	NT	NT	NT	NT	NT	NT
Benzene	0.03	<0.00732	<0.00775	<0.00818	<0.00746	<0.00663	NT	NT	NT
Ethylbenzene	6	<0.146	<0.155	<0.164	<0.149	<0.133	NT	NT	NT
Toluene	7	<0.146	<0.155	<0.164	<0.149	<0.133	NT	NT	NT
o-Xylene	9 [6]	<0.293	<0.310	<0.327	<0.298	<0.265	NT	NT	NT
m,p-Xylene	9 [6]	<0.586	<0.620	<0.654	<0.596	<0.530	NT	NT	NT
Xylenes (total)	9 [6]	<2.20	<2.33	<2.45	<2.24	<1.99	NT	NT	NT
Hexane	4,800 [7]	<0.146	<0.155	<0.164	<0.149	<0.133	NT	NT	NT
1,2-Dichloroethane (EDC)	11[8]	NT	NT	NT	NT	NT	NT	NT	NT
Method EPA 8011 (µg/kg)									
1,2-Dibromoethane (EDB)	5	NT	NT	NT	NT	NT	NT	NT	NT
Method EPA 8270D - Polynuclear Aromatic Compounds (PAH) by GC/MS with Selected Ion Monitoring[9] (mg/kg)									
Naphthalene	5[10]	<0.0126	<0.0129	<0.0132	<0.0161	<0.0128	NT	NT	NT
2-Methylnaphthalene	5 [10]	<0.0126	<0.0129	<0.0132	<0.0161	<0.0128	NT	NT	NT
1-Methylnaphthalene	5 [10]	<0.0126	<0.0129	<0.0132	<0.0161	<0.0128	NT	NT	NT
Method EPA 6010C (mg/kg)									
Lead	250	NT	NT	NT	NT	NT	NT	NT	NT
Method EPA 300 - Anions (mg/kg)									
Nitrate	130,000 [7]	NT	NT	NT	NT	<2.4	110	47	<2.3
Sulfate	RND	NT	NT	NT	NT	48	200	440	360

Notes:

[1] Chemical analyses conducted by TestAmerica of Spokane, Washington.

[2] All analyte concentrations presented in milligrams per kilogram (mg/kg), unless otherwise noted.

[3] Regulatory level refers to Washington State Model Toxics Control Act (MTCA) Method A cleanup level unless otherwise footnoted.

[4] Data are adapted from previous project report. Data from borings DP-2 through DP-6 were initially reported by GeoEngineers (2012B) and data from borings MW-2 to MW-4 were initially reported by GeoEngineers (2013A).

[5] Gasoline-range petroleum hydrocarbon cleanup levels in soil are 30 mg/kg when benzene is detected and 100 mg/kg when benzene is not detected.

[6] Cleanup level for total xylenes.

[7] Standard formula value for MTCA Method B, Non-Carcinogen, in Soil, as calculated by Ecology's Cleanup Levels and Risk Calculations (CLARC) database. The nitrate regulatory level is specific to ingestion. Additional evaluation would be required to determine a soil cleanup level protective of groundwater and other pathways.

[8] Standard formula value for MTCA Method B, Carcinogen, In Soil, as calculated by Ecology's CLARC database.

[9] Napthalene data for DP-2 through DP-6 were analyzed by Method EPA 8260C.

[10] Cleanup level refers to sum of naphthalenes.

mg/kg = milligrams per kilogram; µg/kg = micrograms per kilogram; EPA = Washington State Environmental Protection Agency; NT = not tested; MTBE = methyl teriary butly ether

RND = Researched-No Data under MTCA Method A and not researched under MTCA Methods B and C.

Table 3

Summary of Chemical Analytical Results - Groundwater Samples from Soil Borings [1]

Moxee City Shop and Former STP
Moxee, Washington

Boring	Regulatory	DP-6	DP-8	DP-9	DP-10	DP-11	DP-12	DP-13	B-1	B-2	B-3
Date Sampled	Levels [2]	11/14/13	11/14/13	11/14/13	11/14/13	11/14/13	11/14/13	11/14/13	12/12/13	12/12/13	12/12/13
Sample Depth (feet bgs)		4 to 8 [3]	4 to 8 [3]	4 to 8 [3]	4 to 8 [3]	4 to 8 [3]	4 to 8 [3]	4 to 8 [3]	15	15	15
Method EPA 8260C - NWTPH-Gx and Volatile Organic Compounds (µg/L)											
Gasoline-range hydrocarbons	1,000/800 [4]	**1,340**	<90.0	NT	NT	NT	NT [10]	NT	NT	NT	NT
Benzene	5	0.530	<0.200	NT	NT	NT	NT [10]	NT	NT	NT	NT
Toluene	1,000	<0.500	<0.500	NT	NT	NT	NT [10]	NT	NT	NT	NT
Ethylbenzene	700	<0.500	<0.500	NT	NT	NT	NT [10]	NT	NT	NT	NT
m,p-Xylene	1,000 [5]	33.4	<0.500	NT	NT	NT	NT [10]	NT	NT	NT	NT
o-Xylene	1,000 [5]	29.8	<0.500	NT	NT	NT	NT [10]	NT	NT	NT	NT
Xylenes (total)	1,000 [5]	63.2	<1.50	NT	NT	NT	NT [10]	NT	NT	NT	NT
Hexane	480 [6]	<1.00	<1.00	NT	NT	NT	NT [10]	NT	NT	NT	NT
Method EPA 8270D - Polycyclic Aromatic Compounds (PAH) by GC/MS with Selected Ion Monitoring (µg/L)											
Naphthalene	160 [7]	1.25	<0.107	NT	NT	NT	<0.0980	NT	NT	NT	NT
2-Methylnaphthalene	160 [7]	0.155	<0.107	NT	NT	NT	<0.0980	NT	NT	NT	NT
1-Methylnaphthalene	160 [7]	1.28	<0.107	NT	NT	NT	<0.0980	NT	NT	NT	NT
Method EPA 300 - Polynuclear Aromatic Compounds (PAH) by GC/MS with Selected Ion Monitoring (mg/L)											
Nitrate	10 [8]	<0.200	2.94	**99.7**	**263**	**38.5**	NT	**158**	**199**	**94.0**	0.710
Sulfate	250 [9]	105	96.2	**251**	**361**	192	NT	**329**	**735**	**1670**	**1520**

Notes:

[1] Chemical analyses conducted by TestAmerica of Spokane, Washington.

[2] Regulatory level refers to Washington State Model Toxics Control Act (MTCA) Method A cleanup level unless otherwise footnoted.

[3] To collect groundwater samples from direct-push borings, a 4-foot-long screen was placed from about 4 to 8 feet bgs. If insufficient volume was achieved at that depth, the screen was lowered to about 8 to 12 feet bgs.

[4] Gasoline-range petroleum hydrocarbon cleanup levels in groundwater are 1,000 µg/L when benzene is detected and 800 µg/L when benzene is not detected.

[5] Cleanup level for total xylenes.

[6] Standard formula value for MTCA Method B, Non-Carcinogen, in Groundwater, as calculated by Ecology's Cleanup Levels and Risk Calculations (CLARC) database.

[7] Cleanup level refers to sum of naphthalenes.

[8] Maximum contaminant level established by Title 40, Volume 19 of the Code of Federal Regulations.

[9] Secondary maximum contaminant level recommeded by the Environmental Protection Agency.

[10] The sample containers for Method EPA 8260C and associated with the groundwater sample collected from boring DP-12 broke in shipment to the analytical laboratory.

Bold indicates analyte concentration exceeds referenced Regulatory Level.

mg/L=milligrams per liter; µg/L = micrograms per liter; NT = not tested; bgs = below ground surface

Table 4

Summary of Chemical Analytical Results - Groundwater Samples from Monitoring Wells[1]

Moxee City Shop and Former STP
Moxee, Washington

	Regulatory Level[2]	Monitoring Well, Screen Depths and Date Sampled																
		MW-1						MW-2						MW-3				
		Screen: 1.8 to 11.8 feet bgs						Screen: 4.0 to 12.0 feet bgs						Screen: 4.0 to 12.0 feet bgs				
		03/01/12	11/01/12	02/13/13	05/27/13	08/21/13	12/30/13	11/01/12	02/13/13	05/27/13	08/21/13	12/30/13	Duplicate-1-123013	11/01/12	02/13/13	05/27/13	08/21/13	12/30/13
Method EPA 8260C (µg/L)																		
Gasoline-range petroleum hydrocarbons	1,000/800[3]	**1,550**	**2,500**	571	**1,440**	**1,660**	**1,690**	<90.0	<90.0	<90.0	<90.0	<90.0	<90.0	<90.0	<90.0	<90.0	<90.0	<90.0
Benzene	5	0.210	0.300	0.210	<0.200	<0.200	0.290	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Toluene	1,000	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Ethylbenzene	700	80.9	101	46.3	29.7	26.0	34.4	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
m,p-Xylene	1,000[4]	NT	15.5	61.0	1.67	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
o-Xylene	1,000[4]	NT	2.44	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Xylenes (total)	1,000[4]	11.1	18.0	61.3	2.00	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50
Hexane	480[5]	1.30	3.46	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Method EPA 8270 (µg/L)																		
Naphthalene	160[6]	9.32	4.47	2.06	1.83	0.294	1.28	<0.191	<0.0953	<0.0951	<0.0961	<0.0951	<0.103	<0.190	<0.0945	<0.0954	<0.0957	<0.0988
2-Methylnaphthalene	160[6]	0.495	0.944	<0.0946	0.110	<0.267	<0.0984	<0.191	<0.0953	<0.0951	<0.0961	<0.0951	<0.103	<0.190	<0.0945	<0.0954	<0.0957	<0.0988
1-Methylnapthalene	160[6]	4.74	7.77	2.95	4.57	0.855	5.37	<0.191	<0.0953	<0.0951	<0.0961	<0.0951	<0.103	<0.190	<0.0945	<0.0954	<0.0957	<0.0988
Method EPA 200.7 - Dissolved Metals by EPA 200 Series Methods (mg/L)																		
Manganese	2.2[5]	NT	0.943	0.582	0.683	0.608	0.863	0.678	0.256	0.293	0.442	0.306	0.311	0.178	0.0213	0.0331	0.0358	0.0224
Method RSK-175 - Dissolved Gases (GC) (mg/L)																		
Methane	NE	NT	0.0108	<0.00500	<0.00500	0.0577	0.00695	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	<0.00500	0.00508	<0.00500	0.0909	<0.00500
Method EPA 300.0 - Anions by EPA Method 300.0 (mg/L)																		
Nitrate-Nitrogen	10[7]	NT	<0.200	0.250	<0.200	0.200	<0.200	**176**	**123**	**119**	**143**	**125**	**113**	1.12	0.730	1.090	0.500	0.240
Sulfate	250[8]	NT	18.3	24.1	28.0	19.1	14.4	**290**	236	226	236	219	204	34.2	31.3	34.8	31.3	23.2
Method SM 2320B - Conventional Chemistry Parameters by APHA/EPA Methods (mg/L)																		
Total Alkalinity	NE	NT	480	485	570	500	445	230	255	255	235	270	265	335	325	375	405	280

	Regulatory Level[2]	MW-4 Screen: 4.0 to 12.0 feet bgs 11/01/12	MW-4 Screen: 4.0 to 12.0 feet bgs 02/13/13	MW-4 Screen: 4.0 to 12.0 feet bgs 05/27/13	MW-4 Screen: 4.0 to 12.0 feet bgs 08/21/13	MW-4 Screen: 4.0 to 12.0 feet bgs 12/30/13	MW-5 12/30/13	MW-6 12/30/13
Method EPA 8260C (µg/L)								
Gasoline-range petroleum hydrocarbons	1,000/800[3]	<90.0	<90.0	<90.0	<90.0	<90.0	<90.0	<90.0
Benzene	5	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200	<0.200
Toluene	1,000	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Ethylbenzene	700	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
m,p-Xylene	1,000[4]	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
o-Xylene	1,000[4]	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Xylenes (total)	1,000[4]	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50	<1.50
Hexane	480[5]	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00	<1.00
Method EPA 8270 (µg/L)								
Naphthalene	160[6]	<0.190	<0.0952	<0.0953	<0.0954	<0.0985	<0.102	<0.0982
2-Methylnaphthalene	160[6]	<0.190	<0.0952	<0.0953	<0.0954	<0.0985	<0.102	<0.0982
1-Methylnapthalene	160[6]	<0.190	<0.0952	<0.0953	<0.0954	<0.0985	<0.102	<0.0982
Method EPA 200.7 - Dissolved Metals by EPA 200 Series Methods (mg/L)								
Manganese	2.2[5]	0.208	<0.0100	0.0201	<0.0100	<0.0100	0.120	0.414
Method RSK-175 - Dissolved Gases (GC) (mg/L)								
Methane	NE	<0.00500	<0.00500	<0.00500	0.00579	<0.00500	<0.00500	<0.00500
Method EPA 300.0 - Anions by EPA Method 300.0 (mg/L)								
Nitrate-Nitrogen	10[7]	0.420	2.81	3.14	1.41	0.950	<0.200	**158**
Sulfate	250[8]	31.7	43.0	37.9	34.2	30.7	23.0	249
Method SM 2320B - Conventional Chemistry Parameters by APHA/EPA Methods (mg/L)								
Total Alkalinity	NE	245	435	405	345	320	135	195

Notes:

[1]Chemical analyses conducted by TestAmerica Laboratories, Inc. of Spokane, Washington.

[2]Regulatory Level refers to Washington State Model Toxics Control Act (MTCA) Method A cleanup level unless otherwise footnoted.

[3]MTCA Method A cleanup level for gasoline-range petroleum hydrocarbons is 1,000 µg/l, if benzene is not detected; otherwise the cleanup level is 800 µg/l.

[4]Cleanup level for total xylenes.

[5]Standard formula value for MTCA Method B in groundwater as calculated by Ecology's Cleanup Levels and Risk Calculations (CLARC) database.

[6]Cleanup level refers to sum of naphthalenes.

[7]Maximum contaminant level established by Title 40, Volume 19 of the Code of Federal Regulations.

[8]Secondary Maximum Contaminant Level recommended by the Environmental Protection Agency.

Bold indicates analyte concentration exceeds referenced Regulatory Level.

NE = not established; µg/L = micrograms per liter; mg/L = milligrams per liter; NT = not tested; bgs = below ground surface

Table 5

Summary of Field-Measured Natural Attenuation Parameters

Moxee City Shop and Former STP

Moxee, Washington

Well Number	Date Collected	pH	Temperature (°C)	Specific Conductivity (mS/cm)	Dissolved Oxygen (mg/L)	Oxidation Reduction Potential (mV)	Soluble Ferrous Iron (mg/L)
MW-1	11/01/12	7.69	19.15	0.833	0.65	-36	NT
	02/13/13	7.62	9.50	0.683	1.78	-41	<0.2
	05/27/13	8.11	15.45	0.805	1.60	-55	<0.2
	08/21/13	7.81	23.47	0.955	1.43	206	<0.2
	12/30/13	7.73	13.60	0.639	0.30	-148	0.5
MW-2	11/01/12	7.66	18.77	2.079	1.99	313	NT
	02/13/13	8.07	12.74	1.314	0.11	-49	<0.2
	05/27/13	8.04	14.46	1.296	0.13	183	<0.2
	08/21/13	7.84	18.71	1.521	0.07	406	<0.2
	12/30/13	7.94	13.86	1.234	0.09	-58	<0.2
MW-3	11/01/12	8.73	17.82	0.617	3.29	289	NT
	02/13/13	7.27	11.53	0.511	0.27	-34	<0.2
	05/27/13	9.02	14.46	0.581	0.24	288	<0.2
	08/21/13	8.65	19.56	0.674	0.03	311	<0.2
	12/30/13	9.05	14.32	0.458	0.06	-124	<0.2
MW-4	11/01/12	8.77	17.47	0.463	4.70	297	NT
	02/13/13	7.56	11.27	0.704	0.45	-41	<0.2
	05/27/13	8.58	14.41	0.663	0.41	233	<0.2
	08/21/13	8.29	19.69	0.610	1.02	364	<0.2
	12/30/13	8.45	12.68	0.531	0.19	-82	<0.2
MW-5	12/30/13	8.45	13.74	0.251	1.47	-68	<0.2
MW-6	12/30/13	7.78	13.88	1.387	2.36	-25	<0.2

Notes:

[1]Reported water quality parameters reflect stabilized conditions at the conclusion of well purging during low-flow sampling.

°C = degrees Celsius; mS/cm = millisiemens per centimeter; mg/L = milligrams per liter; mV = millivolts; NT = not tested