CONTOUR ENGINEERING • LLC

DRAINAGE REPORT

FOR

BASS PRO SHOPS WAREHOUSE ACCESS CONNECTION

CITY OF PUYALLUP, WASHINGTON

OCTOBER 2025

Prepared For:
1124 Valley Ave LLC
550 S Michigan Street
Seattle, WA 98108

Prepared By:
Oksana Krokhaleva, E.I.T., Design Engineer

Approved By:
Brett Allen, P.E.,

PO Box 949
Gig Harbor, WA 98332
(253) 857-5454

Project # 25-026

October 15, 2025

*I hereby state that this **Drainage Report** for the **Bass Pro shops Access Connection** has been prepared by me or under my supervision and meets the standard of care and expertise that is usual and customary in this community of professional engineers. The analysis has been prepared utilizing procedures and practices specified by the City of Puyallup and within the standard accepted practices of the industry. I understand that the City of Poulsbo does not and will not assume liability for the sufficiency, suitability or performance of drainage facilities prepared by Contour Engineering, LLC.*

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1.0 PROJECT OVERVIEW

Purpose and Scope

This drainage report accompanies the development plans to construct a Bass Pro Shops access connection in Puyallup, Washington. The access connection will consist of a 2,128 paved area. No structures are proposed as part of this development. The project site is located along Valley Ave on three tax parcels 6026520020, 0420163077 and 0420163042 within the Southwest ¼ of Section 16, Township 20 North, Range 4 East, W.M. See Appendix A for Vicinity Map.

The 2019 Department of Ecology Stormwater Management Manual for Western Washington (Ecology Manual) will establish the methodology and design criteria used for this project.

Project Description

As referenced above, the site is located along Valley Ave NW in the City of Puyallup, Washington. The site consists of three contiguous parcels. When combined, the parcels encompass approximately 14.87 acres. The site is bounded by developed industrial sites parcels to the north, south and west, and Valley Ave NW to the east.

The following is a description of pertinent site information associated with the proposed project:

Parcel #:	6026520020, 0420163077 & 0420163042
Address:	1212, 1042 & 1036 Valley Ave NW, Puyallup, WA 98371
Zoning:	Limited Manufacturing (ML)
Lot Size:	13.12 acres (Parcel # 6026520020)
	1.636 acres (Parcel # 0420163077)
	0.114 acres (Parcel# 0420163042)

The project proposed paving an access area that will replace approximately 2,128 sq. ft. of hard surfaces.

Minimum Requirements Summary

Since the project proposed over 2,000 square feet of new or replaced hard surface area, all applicable minimum requirements (Minimum Requirements #1 through #5) apply and are discussed below.

#1 - Preparation of Stormwater Site Plans

This drainage report and associated civil engineering plans fulfill this requirement.

#2 - Construction Stormwater Pollution Prevention Plan (SWPPP)

A Construction Stormwater Pollution Prevention Plan will be submitted with the drainage report.

#3 - Source Control of Pollution
Applicable Source Control BMPs that may be needed for this project are located within Appendix C.

#4 - Preservation of Natural Drainage Systems and Outfalls
The proposed project preserves the existing drainage pattern of the site.

#5 - On-site Stormwater Management
See Section 6.0 of this report for a discussion of the onsite storm system.

2.0 EXISTING SITE CONDITIONS

Pre-Developed Site Conditions
The western lot, is developed with a warehouse and a paved parking lot. The central lot is developed with a paved lot. The smaller lot located in the southeast corner of the project site is also developed with two structures and a concrete parking lot. Where there are no structures or driveways the area is primarily pasture.

Topography
According to the soils report prepared by Georesources LLC, "the site slopes down from Valley Avenue to the southwest at about 0 to 3 percent to a wide shallow depression located in the central portion of the site. The western portion of the site then slopes back up to the southwest at about 0 to 3 percent. The total topographic relief across the site is on the order of 6 feet." See Appendix B for a copy of the complete soils report.

Groundcover
Vegetation across the site generally consists of pasture grasses with ornamental trees, plants and shrubs.

Adjacent Land Uses
The project area is surrounded by the following uses and entities:

NORTH: Industrial Property (Zoned Limited Manufacturing)
SOUTH: Industrial Property (Zoned Limited Manufacturing)
EAST: Valley Avenue NW (Public ROW)
WEST: Industrial Property (Zoned Limited Manufacturing)

Native Soils
The United States Department of Agriculture Natural Resources Conservation Service (NRCS) maps the site as being underlain by Brsicot loam (6A) and Sultan Silt loam (42A). Brsicot loam soil is classified within the Hydrologic Soil Group B/D. Sultan silt loam is classified withing the hydrologic Soil Group C/D. See section 4.0 for more

about the native soils in the project area. A copy of the Geotechnical report can also be found in Appendix B.

Critical and Sensitive Areas

SLOPES

The topography of the project area does not include slopes more than 30%.

LANDSLIDE HAZARD

No potential landslide hazards have been identified on site per from the Geotechnical report.

EROSION HAZARD

No erosion hazards have been identified on the project site.

SEISMIC HAZARD

No seismic hazards have been identified on the project site.

FLOODPLAIN

According to Pierce County GIS, the project site does not fall within the regulated floodplain.

AQUIFER RECHARGE

The project is located in an Aquifer Recharge Area per the Pierce County aquifer recharge map.

Other Existing Site Information

The entire site is located in a Lahar hazard area.

3.0 PROPOSED SITE CONDITIONS

The project proposes to pave a connection between two sites. No structures are proposed..

Stormwater runoff from the proposed paved area will be collected in an existing BioPod Biofilter System Surface Vault with internal bypass along the south side of the paved area. It will then enter the detention chambers and be released to the existing stormwater system located within Valley Avenue NW.

4.0 INFILTRATION FEASIBILITY ASSESSMENT AND BMP DESIGN

The USDA Natural Resources Conservation (NRCS) Web Soil Survey maps most of the site as being underlain by Briscot Loam (Type 6A) soils.

On December 10, 2021, a field representative from GeoResources visited the site and monitored the drilling of two hollow-stem auger borings to depths of about 16½ feet below the existing ground surface, logged the subsurface conditions encountered in

each boring, and obtained representative soil samples. At the locations of their explorations, they encountered relatively uniform subsurface conditions that, in their opinion, generally confirmed the mapped stratigraphy within the site vicinity. In boring B-1, they encountered approximately ½ foot of topsoil overlying grey-brown silty gravelly sand, which they interpreted to be consistent with undocumented fill soils. Underlying the fill, and at the surface of boring B-2, they encountered mottled grey-brown sand with silt interbeds. These soils were encountered to the full depth explored in B-1. Underlying these soils in boring B-2, their exploration encountered black silty sand to the full depth explored. They interpret these soils to be consistent with alluvium.

GeoResources determined that onsite infiltration into the native alluvium deposits is feasible dependent on the type of infiltration BMP. Based on their wet season monitoring, it appears the seasonal high groundwater occurs at about elevation 36.2 to 37.0 feet at the locations monitored, approximately 2.8 to 3.0 feet below the ground surface. Based on separation requirements for infiltration BMP's and the shallow depth to the water table, GeoResources does not recommend using a pond or gallery, but state that shallow infiltration facilities such as rain gardens, bioretention, and permeable pavement appear to be feasible. They calculated the preliminary design infiltration rate to be 1 inch per hour after the applied correction factors. A copy of the Geotechnical Engineering Report provided by GeoResources can be found in Appendix B.

5.0 LEVEL 1 DOWNSTREAM ANALYSIS

All available information provided at this time regarding the level 1 downstream analysis study area has been reviewed. Reviewed material includes the NRSC soil map, City of Puyallup GIS Maps, Pierce County GIS Maps and topographic survey data. See Appendix A for appropriate maps and information.

Onsite stormwater runoff in the developed conditions is discharged to the stormwater conveyance system within Valley Avenue NW. Stormwater is conveyed northwesterly within an 18-inch pipe for roughly 1,200 feet where it turns westerly on 27th Avenue CT NW, runs for about 1,250 feet, and is discharged to Wapato Creek.

6.0 HYDROLOGIC & HYDRAULIC ANALYSIS

Provide documentation showing Pro Shops' system can handle the additional runoff and any runon from the existing contractor yard.

Onsite Stormwater Management

Since the project triggers minimum requirements #1-5, the project must employ stormwater management BMPs in order to infiltrate, disperse, or retain stormwater runoff on-site to the maximum extent feasible without causing flooding or erosion impacts. The project elects to follow the requirements of List #1.

The downstream path is not clear. Provide an exhibit showing the downstream path that shows the biopod filter catch basin mentioned. Since there are two parcels involved, the narrative needs to be clear which parcel the new runoff flows to and how it is being mitigated.

Stormwater runoff from the proposed paved surface will be collected by three existing Oldcastle BioPod Biofilter surface vaults. These structures will provide enhanced water quality treatment before conveying the runoff to the detention chambers system. After passing through the flow control and water quality systems, stormwater runoff will be conveyed to the existing stormwater system located within Valley Ave NW.

Lawn and Landscape Areas

1. *Post-Construction Soil Quality and Depth BMP (T5.13)*

   The project will employ Ecology BMP T5.13 to preserve undisturbed soils to the greatest extent possible and to restore soils where disturbed by construction activity.

Roofs

No structures are proposed in this project.

Other Hard Surfaces

1. *Full Dispersion BMP (T5.30)*

   This BMP is not feasible due to the lack of available space that can be provided to meet the required native vegetation protection area.

2. *Permeable Pavement (BMP T5.15) or Rain Gardens (BMP T5.14) or Bioretention (BMP T7.30)*

   Due to the expected truck volume on the site, it is expected that permeable pavements cannot provide sufficient strength to support the loads. The use of Rain Gardens and Bioretention is infeasible due to lack of usable space on the site.

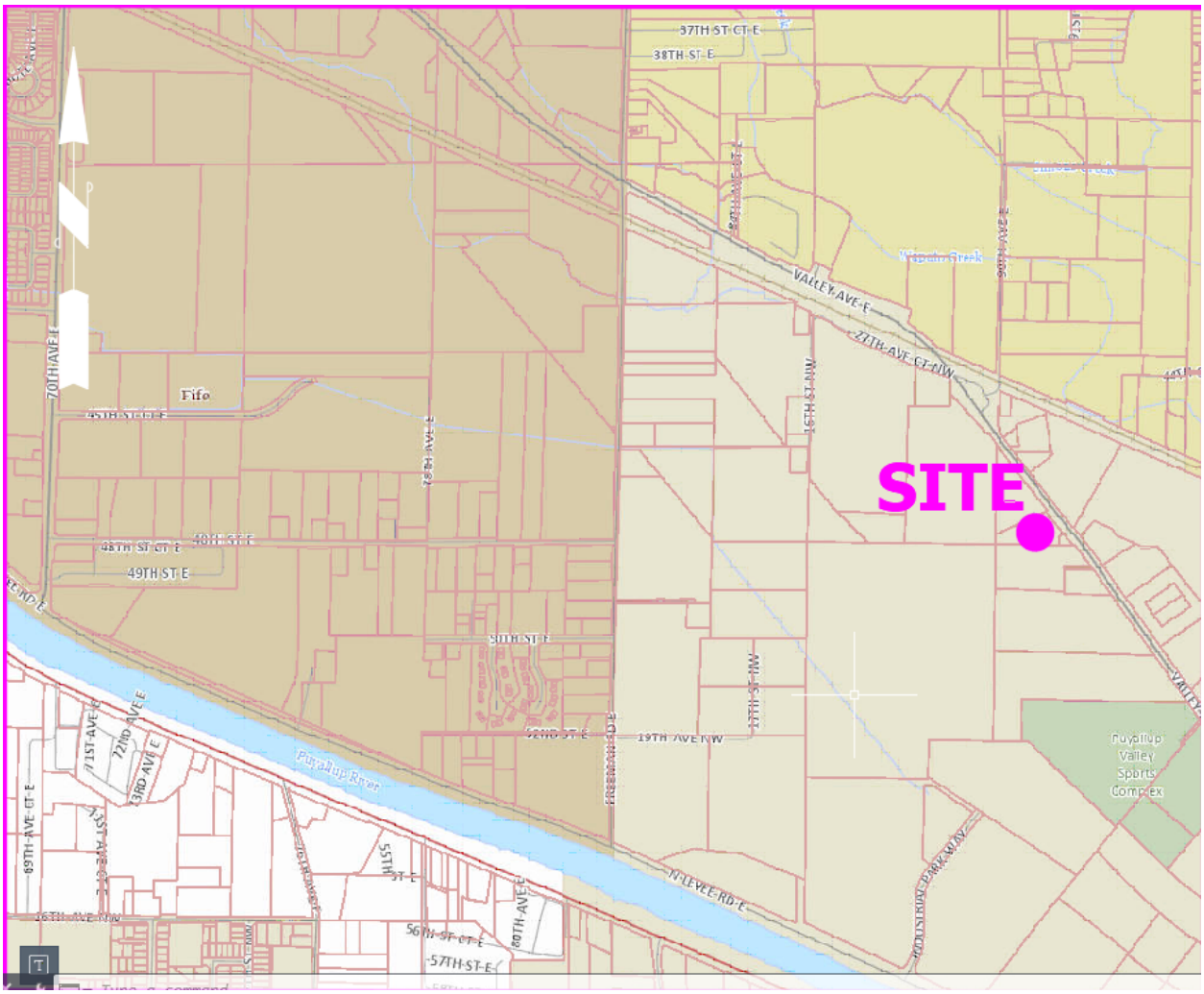
3. *Sheet Flow Dispersion (BMP T5.11) or Concentrated Flow Dispersion (BMP T5.11)*

   Sheet Flow Dispersion and Concentrated Flow Dispersion are not feasible due to the lack of space for the necessary vegetated flowpath lengths.

   The project proposes to centralize flow control and water quality treatment in order to ensure downstream properties are protected.

APPENDIX A

General Exhibits



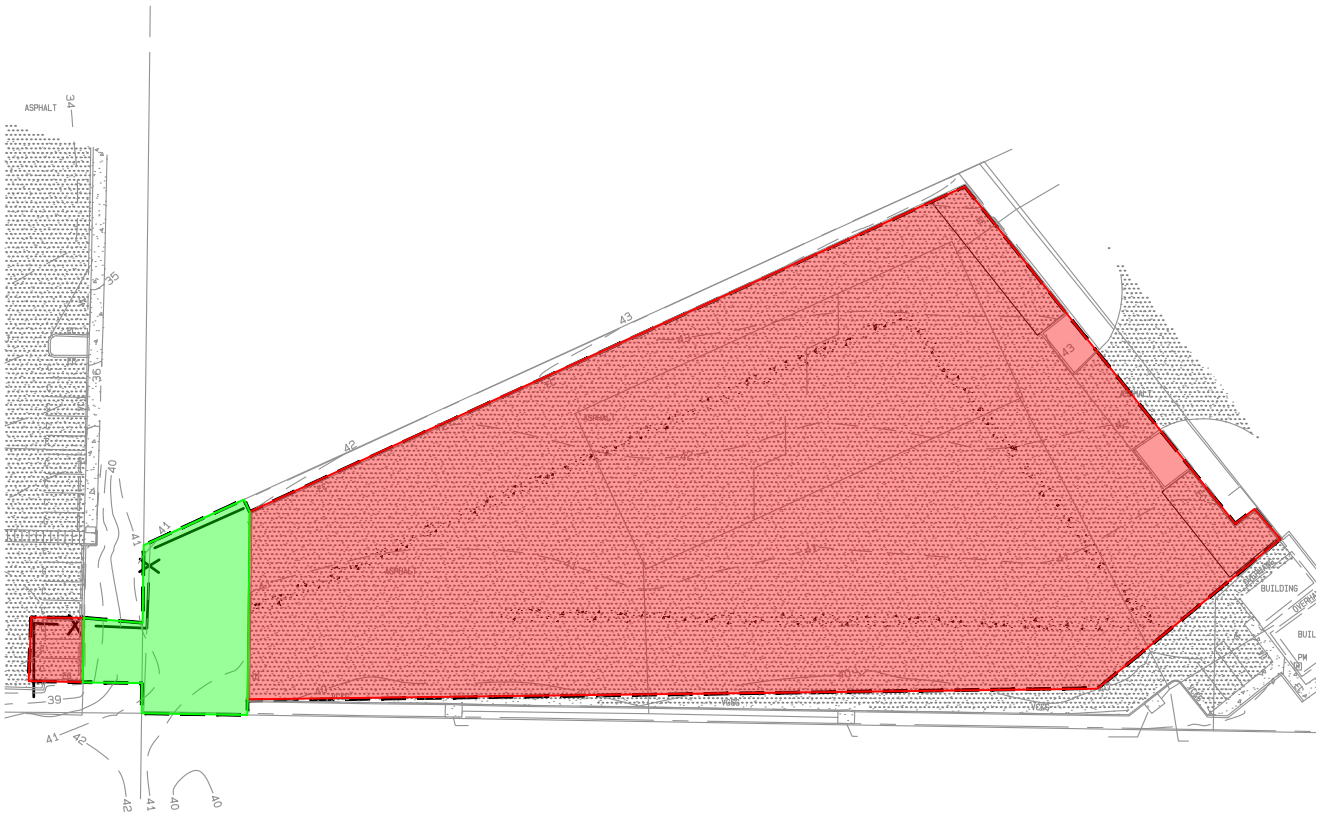
Vicinity Map

GRAPHIC SCALE

0 40 80 160

1 INCH = 80 FEET (8.5x11)

BASIN MAP			
COLOR/PATTERN	LANDUSE	AREA (SF)	AREA (AC)
	PERVIOUS	4,204	0.09
	PGHS	58,186	1.34
TOTAL		62,390	1.43



PRE-DEVELOPED BASIN

1212, 1042 & 1036 VALLEY AVE NW
CITY OF PUYALLUP, WASHINGTON

PHYSICAL ADDRESS: 4706 97TH ST NW, SUITE 100
GIG HARBOR, WA 98332
MAILING ADDRESS: P.O. BOX 949,
GIG HARBOR, WA 98335
PHONE: (253) 857-5454

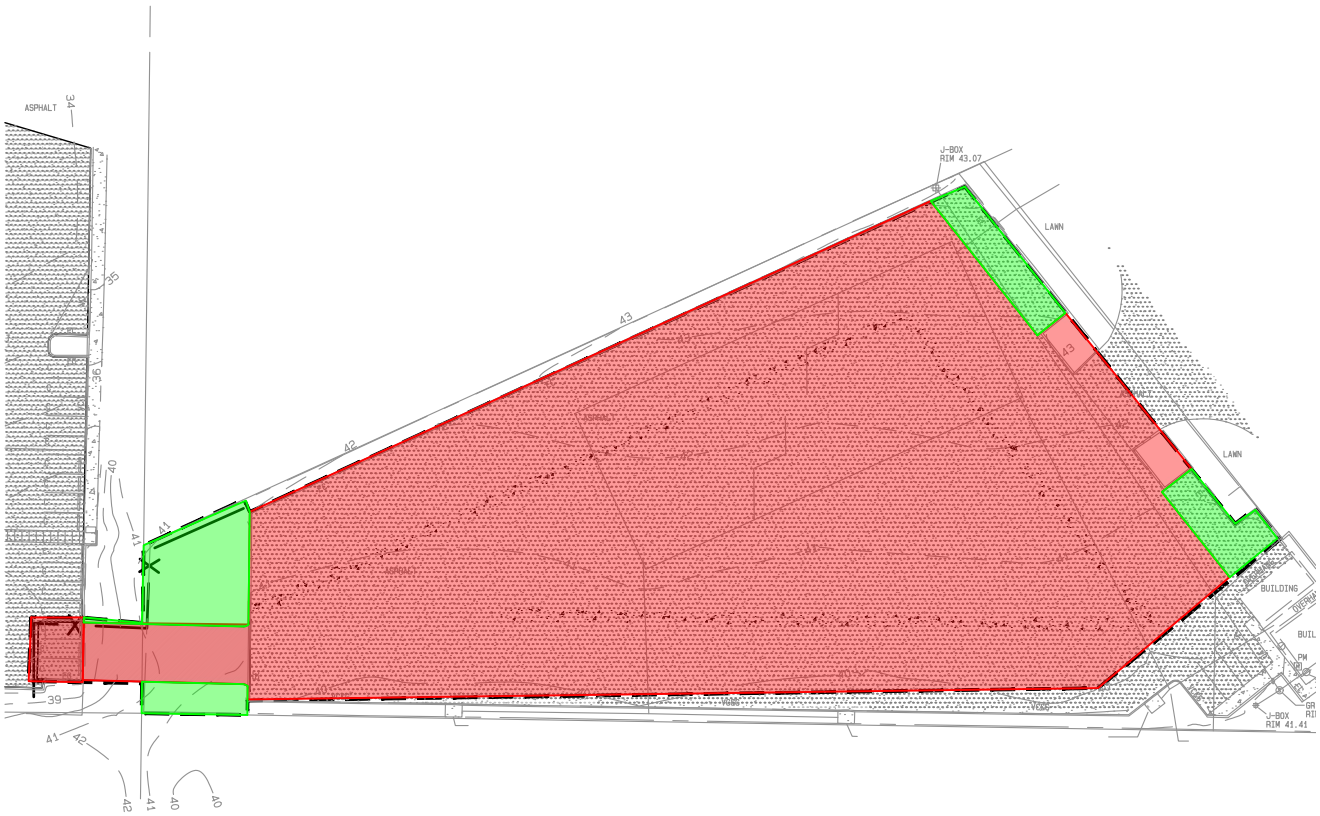
DRAWN BY:	O. KROKHALEVA
PROJECT:	25-026
DATE:	2025.09.10
EXHIBIT NO.	1

GRAPHIC SCALE

0 40 80 160

1 INCH = 80 FEET (8.5x11)

BASIN MAP			
COLOR/PATTERN	LANDUSE	AREA (SF)	AREA (AC)
	PERVIOUS	4,526	0.10
	PGHS	57,864	1.33
TOTAL		62,390	1.43



DEVELOPED BASIN

1212, 1042 & 1036 VALLEY AVE NW
CITY OF PUYALLUP, WASHINGTON

PHYSICAL ADDRESS: 4706 97TH ST NW, SUITE 100
GIG HARBOR, WA 98332
MAILING ADDRESS: P.O. BOX 949,
GIG HARBOR, WA 98335
PHONE: (253) 857-5454

DRAWN BY:	O. KROKHALEVA
PROJECT:	25-026
DATE:	2025.09.10
EXHIBIT NO.	2

Map Scale: 1:2,460 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features

- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 20, Aug 27, 2024

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Jul 31, 2022—Aug 8, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Briscot loam	6.6	44.8%
42A	Sultan silt loam	8.1	55.2%
Totals for Area of Interest		**14.6**	**100.0%**

Pierce County Area, Washington

6A—Briscot loam

Map Unit Setting

National map unit symbol: 2hrc
Elevation: 20 to 250 feet
Mean annual precipitation: 30 to 55 inches
Mean annual air temperature: 48 to 50 degrees F
Frost-free period: 160 to 210 days
Farmland classification: Prime farmland if drained

Map Unit Composition

Briscot, drained, and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Briscot, Drained

Setting

Landform: Flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 11 inches: loam
H2 - 11 to 38 inches: stratified fine sand to silt loam
H3 - 38 to 60 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: About 12 to 35 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Ecological site: F002XA007WA - Puget Lowlands Wet Forest
Forage suitability group: Seasonally Wet Soils (G002XN202WA)
Other vegetative classification: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: Yes

Minor Components

Briscot, undrained

Percent of map unit: 5 percent
Landform: Flood plains
Other vegetative classification: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 20, Aug 27, 2024

Pierce County Area, Washington

42A—Sultan silt loam

Map Unit Setting

National map unit symbol: 2hqx
Elevation: 0 to 200 feet
Mean annual precipitation: 35 to 55 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 150 to 200 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sultan and similar soils: 85 percent
Minor components: 8 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sultan

Setting

Landform: Flood plains
Parent material: Alluvium

Typical profile

H1 - 0 to 14 inches: ashy silt loam
H2 - 14 to 23 inches: silt loam
H3 - 23 to 60 inches: stratified sand to silty clay loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: About 18 to 24 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3w
Hydrologic Soil Group: C/D
Ecological site: F002XA008WA - Puget Lowlands Riparian Forest
Forage suitability group: Seasonally Wet Soils (G002XN202WA)
Other vegetative classification: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: No

Minor Components

Briscot, undrained

Percent of map unit: 6 percent
Landform: Depressions
Other vegetative classification: Seasonally Wet Soils (G002XN202WA)
Hydric soil rating: Yes

Puget

Percent of map unit: 2 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Data Source Information

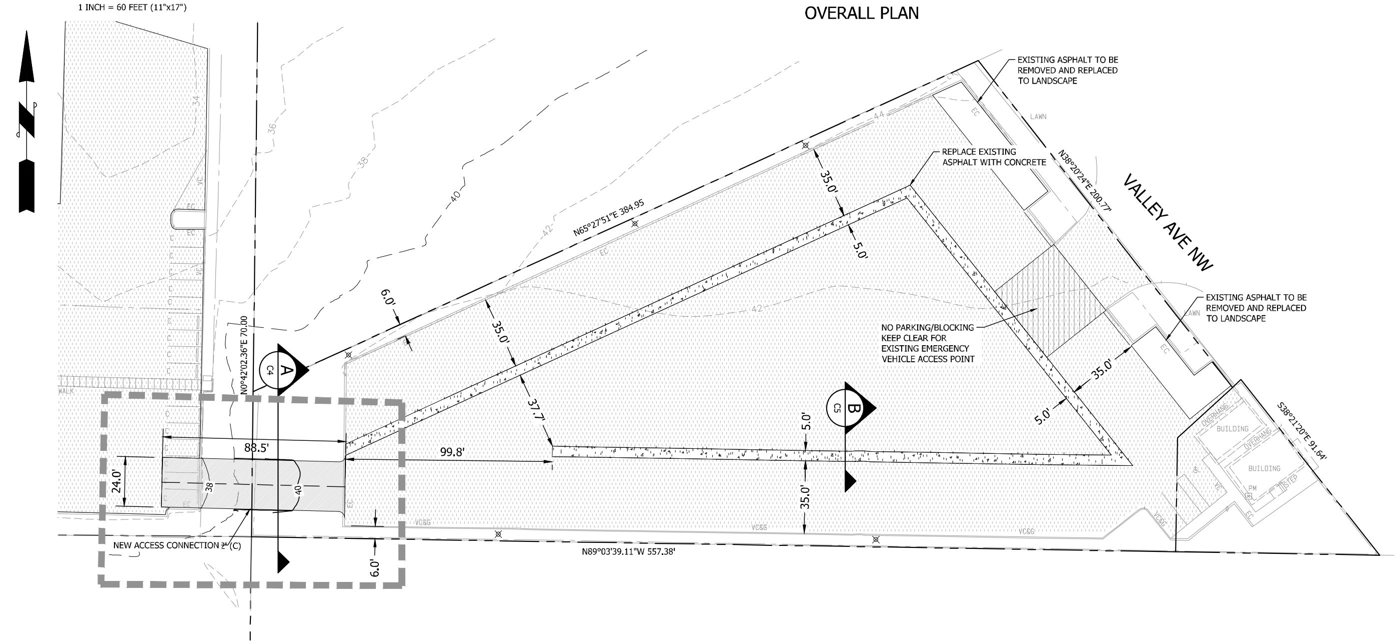
Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 20, Aug 27, 2024

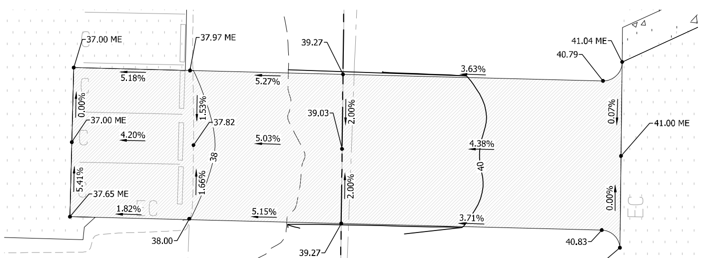
APPENDIX B

Plan Exhibits

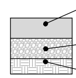
BASS PROP SHOPS WAREHOUSE - ACCESS CONNECTION
A PORTION OF SECTION 16, TOWNSHIP 20, RANGE 04, W.M.,
CITY OF PUYALLUP, WASHINGTON
OVERALL PLAN

GRAPHIC SCALE
0 30 60
1 INCH = 30 FEET (22"x34")
1 INCH = 60 FEET (11"x17")





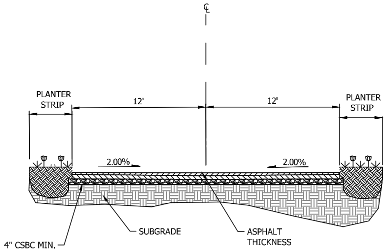
1 ACCESS CONNECTION GRADING DETAIL
1 INCH = 10 FEET



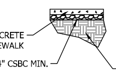
STANDARD ASPHALT PAVEMENT SECTION

PAVEMENT SECTION MAY BE ALTERED AS DIRECTED BY OWNER.

2 PAVEMENT SECTION
NOT TO SCALE



A ACCESS CONECTION CROSS-SECTION
NOT TO SCALE



B CONCRETE CROSS-SECTION
NOT TO SCALE

GRADING QUANTITIES

TOTAL CUT = 60 CU. YD.± *
TOTAL FILL = 0.00 CU. YD.± **
NET = 60.00 CU. YD.± (CUT)

THIS CALCULATION IS FOR REVIEW AND PERMITTING PURPOSES ONLY. THE NUMBERS SHOWN ARE GENERATED FROM THE FINISHED GROUND SURFACE TO THE EXISTING GROUND PROVIDED BY THE SURVEY. CONTRACTOR SHALL DO THEIR OWN CALCULATION BASED ON THE INFORMATION PROVIDED WITHIN THESE PLANS

ACRONYMS

ME	MATCH EXISTING
EG	EXISTING GRADE
FG	FINISH GRADE
PC	POINT OF CURVATURE
PT	POINT OF TANGENCY
MP	MID POINT
FL	FLOWLINE
TC	TOP OF CURB
BC	BOTTOM OF CURB
TW	TOP OF WALL
BW	BOTTOM OF WALL
CL	CENTERLINE
ROW	RIGHT OF WAY

APPROVED

BY ____________
CITY OF PUYALLUP DEVELOPMENT ENGINEERING

DATE ____________

NOTE: THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE. THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS. FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE DEVELOPMENT ENGINEERING MANAGER.

VERIFICATION NOTE

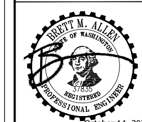
ALL EXISTING UTILITIES IN THE CONSTRUCTION AREA SHALL BE IDENTIFIED AND VERIFIED FOR DEPTH AND LOCATION PRIOR TO ANY CONSTRUCTION ACTIVITIES SO TO IDENTIFY ANY POTENTIAL CONFLICTS WITH PROPOSED CONSTRUCTION. CONTACT PROJECT ENGINEER IMMEDIATELY IF ANY CONFLICTS ARE IDENTIFIED.

PRIOR TO ANY CONSTRUCTION ACTIVITIES, VERIFY EXISTING TOPOGRAPHY IS CONSISTENT WITH WHAT IS SHOWN ON PLANS AND IF THERE ARE ANY POTENTIAL CONFLICTS WITH PROPOSED CONSTRUCTION ACTIVITIES. CONTACT PROJECT ENGINEER IMMEDIATELY IF ANY CONFLICTS ARE IDENTIFIED.

CALL 811 AT LEAST 48 HOURS BEFORE YOU DIG

REVISION	DESCRIPTION	DATE	BY

CONTOUR ENGINEERING • LLC
CIVIL ENGINEERS ~ SURVEYORS ~ LAND PLANNERS
Phone: 253-857-5454 ~ Fax: 253-509-0044 ~ info@contourpllc.com
Mailing Address: P.O. Box 949, Gig Harbor, WA 98335
Physical Address: 4706 97th Street NW, Suite 100, Gig Harbor, WA 98332



October 14, 2025

SHEET TITLE: OVERALL PLAN

CLIENT: DAVID GOUVION
2500 E KEARNEY ST
SPRINGFIELD, MO 65898

CONTACT: DAVID GOUVION PHONE: (417) 873-4368

DESIGNER: K. ROSE
ENGINEER: B. ALLEN
DRAWN: O. KROKHALEVA
S 16 T 20 N R 04E WM
DATE: 2025.10.14
REVISED:

PROJECT: 25-026
DWG NAME: 25-026-C

SHEET	REV.
C4	△
4 OF 4	

APPENDIX C

Applicable Source Control BMPs

IV-1 Source Control BMPs Applicable to All Sites

S410 BMPs for Correcting Illicit Discharges to Storm Drains

Description of Pollutant Sources: Illicit discharges are unpermitted sanitary or process wastewater discharges to a storm sewer or to surface water, rather than to a sanitary sewer, industrial process wastewater, or other appropriate treatment. They can also include swimming pool water, filter backwash, cleaning solutions/washwaters, cooling water, etc. Experience has shown that illicit discharges are common, particularly in older buildings.

Pollutant Control Approach: Identify and eliminate unpermitted discharges or obtain an NPDES permit, where necessary, particularly at industrial and commercial facilities.

Applicable Operational BMPs:

- For all real properties, responsible parties must examine their plumbing systems to identify any potential illicit discharges. Review site plans, engineering drawings, or other sources of information for the plumbing systems on the property.
- If an illicit discharge is suspected, trace the source using an appropriate method such as visual reconnaissance, smoke test, flow test, dye test with a nontoxic dye, or closed circuit television (CCTV) inspection. These tests are to be performed by qualified personnel such as a plumbing contractor. Note: Contact Ecology prior to performing a dye test which may result in a discharge to a receiving water.
- If illicit connections are found, permanently plug or disconnect the connections.
- Eliminate prohibited discharges to storm sewer, ground water, or surface water.
- Convey unpermitted discharges to a sanitary sewer if allowed by the local sewer authority, or to other approved treatment.
- Obtain all necessary permits for altering or repairing side sewers and plumbing fixtures. Restrictions on certain types of discharges, particularly industrial process waters, may require pretreatment of discharges before they enter the sanitary sewer. It is the responsibility of the property owner or business operator to obtain the necessary permits and to replace the connection.
- Obtain appropriate state and local permits for these discharges.

Recommended Additional Operational BMPs:

At commercial and industrial facilities, conduct a survey of wastewater discharge connections to storm drains and to surface water as follows:

- Conduct a field survey of buildings, particularly older buildings, and other industrial areas to locate storm drains from buildings and paved surfaces. Note where these discharge.
- During non-stormwater conditions, inspect each storm drain for non-stormwater discharges. Record the locations of all non-stormwater discharges. Include all permitted discharges.
- If useful, prepare a map of each area. Show on the map the known location of storm sewers, sanitary sewers, and permitted and unpermitted discharges. Aerial photos may be useful. Check records such as piping schematics to identify known side sewer connections and show these on the map. Consider using smoke, dye, or chemical analysis tests to detect connections between two conveyance systems (e.g., process water and stormwater). If desirable, conduct TV inspections of the storm drains and record the footage on videotape.
- Compare the observed locations of connections with the information on the map and revise the map accordingly. Note suspect connections that are inconsistent with the field survey.
- Identify all connections to storm sewers or to surface water and take the actions specified above as applicable BMPs.

S453 BMPs for Formation of a Pollution Prevention Team

The pollution prevention team should be responsible for implementing and maintaining all BMPs and treatment for the site. This team should be able to address any corrective actions needed on site to mitigate potential stormwater contamination. The team members should:

- Consist of those people who are familiar with the facility and its operations.
- Possess the knowledge and skills to assess conditions and activities that could impact stormwater quality at your facility, and who can evaluate the effectiveness of control measures.
- Assign pollution prevention team staff to be on duty on a daily basis to cover applicable permittee facilities when those facilities are in operation.
- Have the primary responsibility for developing and overseeing facility activities necessary to comply with stormwater requirements.
- Have access to all applicable permit, monitoring, SWPPP, and other records.
- Be trained in the operation, maintenance and inspections of all BMPs and reporting procedures.
- Establish responsibilities for inspections, operation, maintenance, and emergencies.
- Regularly meet to review overall facility operations and BMP effectiveness.

S454 BMPs for Preventive Maintenance / Good Housekeeping

Preventative maintenance and good housekeeping practices reduce the potential for stormwater to come into contact with pollutants and can reduce maintenance intervals for the drainage system and sewer system.

Applicable BMPs:

- Prevent the discharge of unpermitted liquid or solid wastes, process wastewater, and sewage to ground or surface water, or to storm drains that discharge to surface water, or to the ground. Conduct all oily parts cleaning, steam cleaning, or pressure washing of equipment or containers inside a building, or on an impervious contained area, such as a concrete pad. Direct contaminated stormwater from such an area to a sanitary sewer where allowed by local sewer authority, or to other approved treatment.
- Promptly contain and clean up solid and liquid pollutant leaks and spills including oils, solvents, fuels, and dust from manufacturing operations on an exposed soil, vegetation, or paved area.
- If a contaminated surface must be pressure washed, collect the resulting washwater for proper disposal (usually involves plugging storm drains, or otherwise preventing discharge and pumping or vactoring up washwater, for discharge to sanitary sewer or for vactor truck transport to a waste water treatment plant for disposal).
- Do not hose down pollutants from any area to the ground, storm drains, conveyance ditches, or receiving water. Convey pollutants before discharge to a treatment system approved by the local jurisdiction.
- Sweep all appropriate surfaces with vacuum sweepers quarterly, or more frequently as needed, for the collection and disposal of dust and debris that could contaminate stormwater. Use mechanical sweepers, and manual sweeping as necessary to access areas that a vacuum sweeper can't reach to ensure that all surface contaminants are routinely removed.
- Do not pave over contaminated soil unless it has been determined that ground water has not been and will not be contaminated by the soil. Call Ecology for assistance.
- Construct impervious areas that are compatible with the materials handled. Portland cement concrete, asphalt, or equivalent material may be considered.
- Use drip pans to collect leaks and spills from industrial/commercial equipment such as cranes at ship/boat building and repair facilities, log stackers, industrial parts, trucks and other vehicles stored outside.
- At industrial and commercial facilities, drain oil and fuel filters before disposal. Discard empty oil and fuel filters, oily rags, and other oily solid waste into appropriately closed and properly labeled containers, and in compliance with the Uniform Fire Code or International Building Code.
- For the storage of liquids use containers, such as steel and plastic drums, that are rigid and

durable, corrosion resistant to the weather and fluid content, non-absorbent, water tight, rodent-proof, and equipped with a close fitting cover.

- For the temporary storage of solid wastes contaminated with liquids or other potential polluted materials use dumpsters, garbage cans, drums, and comparable containers, which are durable, corrosion resistant, non-absorbent, non-leaking, and equipped with either a solid cover or screen cover to prevent littering. If covered with a screen, the container must be stored under a roof or other form of adequate cover.
- Where exposed to stormwater, use containers, piping, tubing, pumps, fittings, and valves that are appropriate for their intended use and for the contained liquid.
- Clean oils, debris, sludge, etc. from all stormwater facilities regularly, including catch basins, settling/detention basins, oil/water separators, boomed areas, and conveyance systems to prevent the contamination of stormwater. Refer to Ecology Requirements for Generators of Dangerous Wastes in I-2.15 Other Requirements for references to assist in handling potentially dangerous waste.
- Promptly repair or replace all substantially cracked or otherwise damaged paved secondary containment, high-intensity parking, and any other drainage areas, subjected to pollutant material leaks or spills. Promptly repair or replace all leaking connections, pipes, hoses, valves, etc., which can contaminate stormwater.
- Do not connect floor drains in potential pollutant source areas to storm drains, surface water, or to the ground.

Recommended BMPs:

- Where feasible, store potential stormwater pollutant materials inside a building or under a cover and/or containment.
- Minimize use of toxic cleaning solvents, such as chlorinated solvents, and other toxic chemicals.
- Use environmentally safe raw materials, products, additives, etc. such as substitutes for zinc used in rubber production.
- Recycle waste materials such as solvents, coolants, oils, degreasers, and batteries to the maximum extent feasible. Contact Ecology's *Hazardous Waste & Toxics Reduction Program* at https://ecology.wa.gov/About-us/Get-to-know-us/Our-Programs/Hazardous-Waste-Toxics-Reduction for recommendations on recycling or disposal of vehicle waste liquids and other waste materials.
- Empty drip pans immediately after a spill or leak is collected in an uncovered area.
- Stencil warning signs at stormwater catch basins and drains, e.g., “Dump no waste – Drains to waterbody”.
- Use solid absorbents, e.g., clay and peat absorbents and rags for cleanup of liquid spills/leaks, where practicable.
- Promptly repair/replace/reseal damaged paved areas at industrial facilities.

- Recycle materials, such as oils, solvents, and wood waste, to the maximum extent practicable.

Note: Evidence of stormwater contamination by oils and grease can include the presence of visible sheen, color, or turbidity in the runoff, or present or historical operational problems at the facility. Operators can use simple pH tests, for example with litmus or pH paper. These tests can screen for high or low pH levels (anything outside a 6.5-8.5 range) due to contamination in stormwater.

S455 BMPs for Spill Prevention and Cleanup

Description of Pollutant Sources: Spills and leaks can damage public infrastructure, interfere with sewage treatment, and cause a threat to human health or the environment. Spills are often preventable if appropriate chemical and waste handling techniques are practiced effectively and the spill response plan is immediately implemented. Additional spill control requirements may be required based on the specific activity occurring on site.

Applicable BMPs:

Spill Prevention

- Clearly label or mark all containers that contain potential pollutants.
- Store and transport liquid materials in appropriate containers with tight-fitting lids.
- Place drip pans underneath all containers, fittings, valves, and where materials are likely to spill or leak.
- Use tarpaulins, ground cloths, or drip pans in areas where materials are mixed, carried, and applied to capture any spilled materials.
- Train employees on the safe techniques for handling materials used on the site and to check for leaks and spills.

Spill Plan

- Develop and implement a spill plan and update it annually or whenever there is a change in activities or staff responsible for spill cleanup. Post a written summary of the plan at areas with a high potential for spills, such as loading docks, product storage areas, waste storage areas, and near a phone. The spill plan may need to be posted at multiple locations. Describe the facility, including the owner's name, address, and telephone number; the nature of the facility activity; and the general types of chemicals used at the facility.
- Designate spill response employees to be on-site during business activities. Provide a current list of the names and telephone numbers (home and office) of designated spill response employees who are responsible for implementing the spill plan.
- Provide a site plan showing the locations of storage areas for chemicals, inlets/catch basins, spill kits and other relevant infrastructure or materials information.
- Describe the emergency cleanup and disposal procedures. Note the location of all spill kits in

the spill plan.

- List the names and telephone numbers of public agencies to contact in the event of a spill.

Spill Cleanup Kits

- Store all cleanup kits near areas with a high potential for spills so that they are easily accessible in the event of a spill. The contents of the spill kit must be appropriate to the types and quantities of materials stored or otherwise used at the facility, and refilled when the materials are used. Spill kits must be located within 25 feet of all fueling/fuel transfer areas, including onboard mobile fuel trucks.

  Note: Ecology recommends that the kit(s) include salvage drums or containers, such as high density polyethylene, polypropylene or polyethylene sheet-lined steel; polyethylene or equivalent disposal bags; an emergency response guidebook; safety gloves/clothes/equipment; shovels or other soil removal equipment; and oil containment booms and absorbent pads; all stored in an impervious container.

Spill Cleanup and Proper Disposal of Waste

- Stop, contain, and clean up all spills immediately upon discovery.
- Implement the spill plan immediately.
- Contact the designated spill response employees.
- Block off and seal nearby inlets/catch basins to prevent materials from entering the drainage system or combined sewer.
- Use the appropriate material to clean up the spill.
- Do not use emulsifiers or dispersants such as liquid detergents or degreasers unless disposed of proplerly. Emulsifiers and dispersants are not allowed to be used on surface water, or in a place where they may enter storm drains, surface waters, treatments systems, or sanitary sewers.
- Immediately notify Ecology and the local jurisdiction if a spill has reached or may reach a sanitary or storm sewer, ground water, or surface water. Notification must comply with state and federal spill reporting requirements.
- Do not wash absorbent material into interior floor drains or inlets/catch basins.
- Place used spill control materials in appropriate containers and dispose of according to regulations.

S456 BMPs for Employee Training

Train all employees that work in pollutant source areas about the following topics:

- Identifying Pollution Prevention Team Members.
- Identifying pollutant sources.

- Understanding pollutant control measures.
- Spill prevention and response.
- Emergency response procedures.
- Handling practices that are environmentally acceptable. Particularly those related to vehicle/equipment liquids such as fuels, and vehicle/equipment cleaning.

Additional specialized training may be needed for staff who will be responsible for handling hazardous materials.

S457 BMPS for Inspections

Qualified personnel shall conduct inspections monthly. Make and maintain a record of each inspection on-site. The following requirements apply to inspections:

- Be conducted by someone familiar with the facility's site, operations, and BMPs.
- Verify the accuracy of the pollutant source descriptions in the SWPPP.
- Assess all BMPs that have been implemented for effectiveness and needed maintenance and locate areas where additional BMPs are needed.
- Reflect current conditions on the site.
- Include written observations of the presence of floating materials, suspended solids, oil and grease, discoloration, turbidity and odor in the stormwater discharges; in outside vehicle maintenance/repair; and liquid handling, and storage areas. In areas where acid or alkaline materials are handled or stored use a simple litmus or pH paper to identify those types of stormwater contaminants where needed.
- Eliminate or obtain a permit for unpermitted non-stormwater discharges to storm drains or receiving waters, such as process wastewater and vehicle/equipment washwater.
- Identify actions to address inspection deficiencies.

S458 BMPs for Record Keeping

See the applicable permit for specific record-keeping requirements and retention schedules for the following reports. At a minimum, retain the following reports for five years:

- Inspection reports which should include:
    - Time and date of the inspection
    - Locations inspected
    - Statement on status of compliance with the permit
    - Summary report of any remediation activities required
    - Name, title, and signature of person conducting the inspection

- Reports on spills of oil or hazardous substances in greater than Reportable Quantities (Code of Federal Regulations Title 40 Parts 302.4 and 117). Report spills of the following: antifreeze, oil, gasoline, or diesel fuel, that cause:
    - A violation of the State of Washington's Water Quality Standards.
    - A film or sheen upon or discoloration of the waters of the State or adjoining shorelines.
    - A sludge or emulsion to be deposited beneath the surface of the water or upon adjoining shorelines.

  To report a spill or to determine if a spill is a substance of a Reportable Quantity, call the Ecology regional office and ask for an oil spill operations or a dangerous waste specialist:

    - Northwest Region (425)649-7000
    - Southwest Region (360)407-6300
    - Eastern Region (509)329-3400
    - Central Region (509) 575-2490

  In addition, call the Washington Emergency Management Division at 1-800-258-5990 or 1-800-OILS-911 AND the National Response Center at 1-800-424-8802.

  Also, refer to *Focus on Emergency Spill Response* (Ecology, 2009).

The following is additional recommended record keeping:

Maintain records of all related pollutant control and pollutant generating activities such as training, materials purchased, material use and disposal, maintenance performed, etc.

IV-3 Roads, Ditches, and Parking Lot Source Control BMPs

S405 BMPs for Deicing and Anti-Icing Operations for Airports

Refer to 40 CFR Part 449 for EPA effluent limitations guidelines and new source performance standards to control discharges of pollutants from airport deicing operations.

Description of Pollutant Sources: Operators use deicing and/or apply anti-icing compounds on airport runways, taxiways, and on aircraft to control ice and snow. Typically, ethylene glycol and propylene glycol are deicers used on aircraft. Deicers commonly used on runways, taxiways, and other hard surfaces include calcium magnesium acetate (CMA), calcium chloride, magnesium chloride, sodium chloride, urea, and potassium acetate. The deicing and anti-icing compounds become pollutants when conveyed to storm drains or to surface water after application. Leaks and spills of these chemicals can also occur during their handling and storage.

Pollutant Control Approach for Aircraft: Spent glycol discharges in aircraft application areas are regulated process wastewaters under Ecology's Industrial Stormwater General Permit. BMPs for aircraft de/anti-icers must be consistent with aviation safety and the operational needs of the aircraft operator.

Applicable BMPs for Aircraft:

- Conduct aircraft deicing or anti-icing applications in impervious containment areas. Collect aircraft deicer or anti-icer spent chemicals, such as glycol, draining from aircraft in deicing or anti-icing application areas and convey to a sanitary sewer, treatment, or other approved disposal or recovery method. Divert deicing runoff from paved gate areas to appropriate collection areas or conveyances for proper treatment or disposal.
- Do not discharge spent deicer or anti-icer chemicals or stormwater contaminated with aircraft deicer or anti-icer chemicals from application areas, including gate areas into storm drains. No discharge to surface water, or ground water, directly or indirectly should occur.
- Transfer deicing and anti-icing chemicals on an impervious containment pad, or equivalent spill/leak containment area, and store in secondary containment areas. (See S428 BMPs for Storage of Liquids in Permanent Aboveground Tanks).

  Note this applicable containment BMP of aircraft de/anti-icing applications, and applicable treatment BMPs for de/anti-icer spent chemicals such as glycols.

Recommended Additional BMPs for Aircraft:

- Establish a centralized aircraft de/anti-icing facility, if practicable, or in designated areas of the tarmac equipped with separate collection drains for the spent deicer liquids.

- Consider installing an aircraft de/anti-icing chemical recovery system, or contract with a chemical recycler.

Applicable BMPs for Airport Runways/Taxiways:

- Avoid excessive application of all de/anti-icing chemicals, which could contaminate stormwater.
- Store and transfer de/anti-icing materials on an impervious containment pad or an equivalent containment area and/or under cover in accordance with S429 BMPs for Storage or Transfer (Outside) of Solid Raw Materials, Byproducts, or Finished Products. Consider other material storage and transfer approaches only if the de/anti-icer material will not contaminate stormwater.

Recommended Additional BMPs for Airport Runways/Taxiways:

- Include limits on toxic materials and phosphorous in the specifications for de/anti-icers, where applicable.
- Consider using anti-icing materials rather than deicers if it will result in less adverse environmental impact.
- Select cost-effective de/anti-icers that cause the least adverse environmental impact.

S406 BMPs for Streets and Highways

Description of Pollutant Sources: These BMPs apply to the maintenance and deicing/anti-icing of streets and highways. Deicing products can be conveyed during storm events to inlets/catch basins or to receiving waters after application. Leaks and spills of these products can also occur during their handling and storage. Equipment and processes using during maintenance can contribute pollutants such as oil and grease, suspended solids, turbidity, high pH, and metals.

Pollutant Control Approach: Apply good housekeeping practices, preventative maintenance, properly train employees, and use materials that cause less adverse effects on the environment.

Applicable BMPs:

Deicing and Anti-Icing Operations

- Adhere to manufacturer's guidelines and industry standards of use and application.
- Store and transfer de and anti-icing materials on impervious containment pads, or an equivalent spill/leak containment area in accordance with S429 BMPs for Storage or Transfer (Outside) of Solid Raw Materials, Byproducts, or Finished Products.
- Sweep/clean up accumulated de and anti-icing materials and grit from roads as soon as possible after the road surface clears.
- Minimize use in areas where runoff or spray from the roadway immediately enters sensitive areas such as fish-bearing streams.

Maintenance Operations

- Use drip pans or absorbents wherever concrete, asphalt, asphalt emulsion, paint product, and drips are likely to spill, such as beneath discharge points from equipment.
- Cover and contain nearby storm drains to keep runoff from entering the drainage system.
- Collect and contain all solids, slurry, and rinse water. Do not allow these to enter gutters, storm drains, or drainage ditches or onto the paved surface of a roadway or driveway.
- Designate an area onsite for washing hand tools and collect that water for disposal.
- Conduct all fueling of equipment in accordance with S419 BMPs for Mobile Fueling of Vehicles and Heavy Equipment.
- Do not use diesel fuel for cleaning or prepping asphalt tools and equipment.
- Sweep areas as frequently as needed. Collect all loose aggregate and dust for disposal. Do not hose down areas into storm drains.
- Store all fuel, paint, and other products on secondary containment.
- Conduct paint striping operations during dry weather.

Recommended Additional BMPs:

- Where feasible and practicable, use roadway deicing chemicals that cause the least adverse environmental impact. Apply only as needed using minimum quantities. Consider the Pacific Northwest Snowfighters Qualified Products List when selecting roadway de-icers and anti-icers.
- Intensify roadway and drainage structure cleaning in early spring to help remove particulates from road surfaces.
- Include limits on toxic metals in the specifications for de/anti-icers.
- Install catch basin inserts to collect excess sediment and debris as necessary. Inspect and maintain catch basin inserts to ensure they are working correctly.
- Research admixtures (e.g. corrosion inhibitors, surfactants) to determine what additional pollutants may be an issue. Verify with the local jurisdiction if there are any restrictions on admixtures.

S415 BMPs for Maintenance of Public and Private Utility Corridors and Facilities

Description of Pollutant Sources: Corridors and facilities at petroleum product pipelines, natural gas pipelines, water pipelines, electrical power transmission corridors, and rights-of-way can be sources of pollutants such as herbicides used for vegetation management, and eroded soil particles from unpaved access roads. At pump stations, waste materials generated during maintenance activities may be temporarily stored outside. Additional potential pollutant sources include the leaching of

preservatives from wood utility poles, PCBs in older transformers, water removed from underground transformer vaults, and leaks/spills from petroleum pipelines. The following are potential pollutants: oil and grease, TSS, BOD, organics, PCBs, pesticides, and heavy metals.

Pollutant Control Approach: Implementation of spill control plans as well as control of fertilizer and pesticide applications, soil erosion, and site debris that can contaminate stormwater.

Applicable Operational BMPs:

- Minimize the amount of herbicides and other pesticides used to maintain access roads and facilities.
- Implement S411 BMPs for Landscaping and Lawn / Vegetation Management.
- Comply with WSDA Pesticide Regulations (see I-2.15 Other Requirements).
- When removing water or sediments from electric transformer vaults, determine the presence of contaminants before disposing of the water and sediments.
    - This includes inspecting for the presence of oil or sheen, and determining from records or testing if the transformers contain PCBs.
    - If records or tests indicate that the sediments or water are contaminated above applicable levels, manage these media in accordance with applicable federal and state regulations, including the federal PCB rules (40 CFR 761) and the state MTCA cleanup regulations (Chapter 173-340 WAC).
    - Water removed from the vaults can be discharged in accordance with the federal 40 CFR 761.79, and state regulations (Chapter 173-201A WAC and Chapter 173-200 WAC), or via the sanitary sewer if the requirements, including applicable permits, for such a discharge are met. (See also Requirements for Stormwater Discharges to Public Sanitary Sewers, Septic Systems, Dead-End Sumps, and Industrial Waste Treatment Systems and Ecology Requirements for Generators of Dangerous Wastes in I-2.15 Other Requirements).
- Stabilize access roads or areas of bare ground with gravel, crushed rock, or another method to prevent erosion. Use and manage vegetation to minimize bare ground/soils that may be susceptible to erosion.
- Provide maintenance practices to prevent stormwater from accumulating and draining across and/or onto roadways. Convey stormwater through roadside ditches and culverts. The road should be crowned, outsloped, water barred, or otherwise left in a condition not conducive to erosion. Appropriately maintaining grassy roadside ditches discharging to surface waters is an effective way of removing some pollutants associated with sediments carried by stormwater.
- Maintain ditches and culverts at an appropriate frequency to ensure that plugging and flooding across the roadbed, with resulting overflow erosion, does not occur.
- Apply the appropriate BMPs in this Volume for the storage of waste materials that can contaminate stormwater.

Recommended Operational BMPs:

- When selecting utility poles for a specific location, consider the potential environmental effects of the pole or poles during storage, handling, and end-use, as well as its cost, safety, efficacy, and expected life. Use wood products treated with chemical preservatives made in accordance with generally accepted industry standards such as the American Wood Preservers Association Standards (see http://www.awpa.com/standards/). Consider alternative materials or technologies if placing poles in or near an environmentally sensitive area, such as a wetland or a drinking water well. Alternative technologies include poles constructed with material (s) other than wood such as fiberglass composites, metal, or concrete. Consider other technologies and materials, such as sleeves or caissons for wood poles, when they are determined to be practicable and available.
- As soon as practicable remove all litter from wire cutting/replacing operations.
- Implement temporary erosion and sediment control in areas cleared of trees and vegetation and during the construction of new roads.

S416 BMPs for Maintenance of Roadside Ditches

Description of Pollutant Sources: Common road debris including eroded soil, oils, vegetative particles, and heavy metals can be sources of stormwater pollutants.

Pollutant Control Approach: Maintain roadside ditches to preserve the condition and capacity for which they were originally constructed, and to minimize bare or thinly vegetated ground surfaces. Maintenance practices should provide for erosion and sediment control (see S411 BMPs for Landscaping and Lawn / Vegetation Management).

Additional Regulations: Note that work in wet areas may be regulated by local, state, or federal regulations that impose additional obligations on the responsible party. Check with the appropriate authorities prior to beginning work in those areas.

Applicable Operational BMPs:

- Inspect roadside ditches regularly to identify sediment accumulations and localized erosion.
- Clean ditches on a regular basis, as needed. Keep ditches free of rubbish and debris.
- Vegetation in ditches often prevents erosion and cleanses runoff waters. Remove vegetation only when flow is blocked or excess sediments have accumulated. Conduct ditch maintenance (seeding, fertilizer application, harvesting) in late spring and/or early fall, where possible. This allows re-establishment of vegetative cover by the next wet season thereby minimizing erosion of the ditch as well as making the ditch effective as a biofilter.
- Do not apply fertilizer unless needed to maintain vegetative growth.
- In the area between the edge of the pavement and the bottom of the ditch, commonly known as the “bare earth zone,” use grass vegetation, wherever possible. Establish vegetation from the edge of the pavement, if possible, or at least from the top of the slope of the ditch.
- Maintain diversion ditches on top of cut slopes constructed to prevent slope erosion by

APPENDIX D

Geotechnical Engineering Report prepared by
GeoResources, LLC dated July 13, 2022

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July 13, 2022

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Updated Stormwater Feasibility Soils Report
Proposed Contractor's Yard
1036 – 1106 Valley Avenue NW
Puyallup, Washington
PN: 042016-3042, -3041, & -3040
Doc ID: NWC.ValleyAveNW.SRu

INTRODUCTION

This *Updated Soils Report* addresses the feasibility of the site soils to support the infiltration of stormwater runoff generated by the proposed contractor's yard to be constructed at 1036 – 1106 Valley Ave NW in Puyallup, Washington. The location of the project site is shown on the attached Site Location Map, Figure 1.

Our understanding of the project is based on our conversations with you; our review of the provided *Site Survey* prepared by Contour Engineering; our December 10, 2021 site visit and subsurface explorations; our understanding of the City of Puyallup (the City) development requirements; and our experience in the site area. The site consists of three adjacent tax parcels, each of which is currently developed with an existing single-family residence, driveway, and associated utilities. We understand that you propose to demolish the existing structures and develop the site as a contractor's yard. We were not provided with a site plan prior to the preparation of this document, but a copy of the recent survey prepared by Contour Engineering is attached as Figure 2.

PURPOSE & SCOPE

The purpose of our services was to evaluate the surface and subsurface conditions at the site as a basis for providing our opinion on the feasibility of infiltration of stormwater and monitoring the groundwater levels during the wet season to observe if infiltration is feasible at the site for the proposed development in order to satisfy the City of Puyallup requirements. Specifically, our scope of services for the project included the following:

1. Reviewing the available geologic, hydrogeologic, and geotechnical data for the site area;
2. Exploring the surface and subsurface conditions by reconnoitering the site and monitoring the drilling of two hollow-stem auger borings to depths of 16.5 feet each, completed as groundwater observation wells;
3. Describing surface and subsurface conditions, including soil type, depth to groundwater, if encountered, and an estimate of seasonal high groundwater levels;

4. Providing our opinion about the feasibility of onsite stormwater infiltration in accordance with the 2014 SWMMWW, including a preliminary design infiltration rate based on grain size analysis; and,
5. Preparing this *Soils Report* that satisfies the 2014 SWMMWW requirements and summarizes our site observations and conclusions, our geotechnical recommendations and design criteria, along with the supporting data.

The above scope of work was completed in accordance with our *Proposal for Services* dated November 28, 2021. We received written notice to proceed on December 3, 2021.

SITE CONDITIONS

Surface Conditions

The site consists of three adjacent tax parcels located at 1036 – 1106 Valley Avenue NW in Puyallup, Washington, within an area of existing commercial development. The parcels, when combined, form an irregular shaped site that generally measures about 80 to 315 feet wide (northwest to southeast), by about 80 to 450 feet long (northeast to southwest), and encompass approximately 1.93 acres. The site is bounded by existing warehouse and light industrial development to the north, west, and south, and by Valley Avenue NW to the east.

The site is located in the Puyallup River valley and is generally flat. According to topographic information obtained from the Pierce County Public GIS website and as generally confirmed in the field, the site slopes down from Valley Avenue to the southwest at about 0 to 3 percent to a wide shallow depression located in the central portion of the site. The western portion of the site then slopes back up to the southwest at about 0 to 3 percent. The total topographic relief across the site is on the order of 6 feet. The existing site configuration and topography is shown on the attached Site & Exploration Map, Figure 3.

Vegetation across the site generally consists of pasture grasses with ornamental trees, plants, and shrubs surrounding the residence. No evidence of seeps, springs, or soil erosion was observed at the time of our site visit. However, standing water was observed in the stormwater pond located on the adjacent property near the southwest corner of the site.

Site Soils

The Natural Resources Conservation Survey (NRCS) Web Soil Survey maps the site as Briscot loam (6A) soils. An NRCS soils map for the site area is included as Figure 4.

- *Briscot Loam (6A):* These soils are derived from alluvium and form on slopes of 0 to 2 percent. The Briscot Loam soils have a "slight" erosion hazard when exposed and are included in hydrologic soils group B/D.

Site Geology

The draft *Geologic Map of the Puyallup 7.5-minute Quadrangle, Pierce County, Washington* (Troost et al, in review) maps the site as being underlain by alluvium (Qal). No geologic formations or deposits that could potentially adversely affect the development of the site such as landslides, areas of mass wasting, or alluvial fans are mapped within 300 feet of the site. An excerpt of the above referenced map is included as Figure 5.

- *Alluvium (Qal):* Alluvium generally consists of fluvial sediments deposited during the late Pleistocene to Holocene epochs, and typically consists of loose and stratified, fluvial silt, sand, and gravel, and is typically well rounded and well sorted and locally includes sandy to silty estuarine deposits. Because the alluvium was not overridden by the continental ice mass, it is considered normally consolidated. The infiltration potential of alluvium is highly variable, depending on the grain size distribution of the soil.

Subsurface Explorations

On December 10, 2021, we visited the site and monitored the drilling of two hollow-stem auger borings to depths of about 16½ feet below the existing ground surface, logged the subsurface conditions encountered in each boring, and obtained representative soil samples. The borings were drilled using a small track-mounted drill rig operated by a licensed drilling contractor working for GeoResources. Table 1, below, summarizes the approximate functional locations, surface elevations, and termination depths of our test pits explorations.

TABLE 1:
APPROXIMATE LOCATIONS, ELEVATIONS, AND DEPTHS OF EXPLORATIONS

Boring Number	Functional Location	Surface Elevation (feet)	Termination Depth (feet)	Termination Elevation[1] (feet)
B-1/MW-1	End of driveway at 1106 Valley Ave NW	40.23	16.5	23.7
B-2/MW-2	Field in front of 1106 Valley Ave NW	38.77	16.5	22.3

Notes:
1 = Surface elevation estimated from the *Site Survey* prepared by Contour Engineering (NAVD 88)

The specific locations, and depths of our borings were selected based on the configuration of the proposed development and were adjusted in the field based on considerations for underground utilities, existing site conditions, site access limitations, and encountered stratigraphy. Representative soil samples obtained from the borings were placed in sealed plastic bags and then taken to our laboratory for further examination and testing as deemed necessary. The borings were completed as groundwater monitoring wells per WA State regulations.

During drilling, soil samples were obtained at 2½ and 5 foot depth intervals in accordance with Standard Penetration Test (SPT) as per the test method outlined by ASTM D1586. The SPT method consists of driving a standard 2 inch-diameter split-spoon sampler 18 inches into the soil with a 140-pound hammer. The number of blows required to drive the sampler through each 6-inch interval is counted, and the total number of blows struck during the final 12 inches is recorded as the Standard Penetration Resistance, or "SPT blow count". If a total of 50 blows for any 6-inch interval is reached, refusal is called and the blow counts are recorded as 50 for the actual depth driven. The resulting Standard Penetration Resistance values indicate the relative density of granular soils and the relative consistency of cohesive soils.

The subsurface explorations completed as part of this evaluation indicates the subsurface conditions at specific locations only, as actual subsurface conditions can vary across the site.

Furthermore, the nature and extent of such variation would not become evident until additional explorations are performed or until construction activities have begun.

The approximate locations and numbers of our borings/wells are shown on the attached Site Survey, Figure 2 and the Site & Exploration Map, Figure 3. The indicated locations were determined by taping or pacing from existing site features and reference points; as such, the locations should only be considered as accurate as implied by the measurement method. The soils encountered were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM D2488. The USCS is included in Appendix A as Figure A-1, while the descriptive logs of our borings are included as Figures A-2 and A-3.

Subsurface Conditions

At the locations of our explorations we encountered relatively uniform subsurface conditions that, in our opinion, generally confirmed the mapped stratigraphy within the site vicinity. Boring B-1 encountered about ½ foot of dark brown topsoil in a loose, moist to wet condition overlying grey-brown silty gravelly sand in a loose to medium dense, moist condition. We interpret these soils to be consistent with undocumented fill soils. Underlying the fill in boring B-1 and at the surface of boring B-2, our explorations encountered mottled grey-brown sand with silt interbeds in a very loose to loose, moist to wet condition. These soils were encountered to the full depth explored in boring B-1. Underlying these soils in boring B-2, our exploration encountered black silty sand in a loose to medium dense, wet condition to the full depth explored. We interpret these soils encountered in our borings to be consistent with alluvium. Table 2 below summarizes the soils encountered in our borings.

TABLE 2:
APPROXIMATE THICKNESS, DEPTHS, AND ELEVATION OF ENCOUNTERESOIL TYPES

Boring Number	Thickness of Topsoil (Feet)	Thickness of Fill (feet)	Thickness of Loose Silt SAND (feet)	Depth to Loose SAND (feet)	Elevation[1] of Loose SAND (feet)
B-1/MW-1	0.5	1.5	8.0	10.0	30.2
B-2/MW-2	0.5	0.0	9.8	10.3	28.5

Notes:
1 = Surface elevation estimated from the *Site Survey* prepared by Contour Engineering (NAVD 88)

Laboratory Testing

Geotechnical laboratory tests were performed on select samples retrieved from the test pits to estimate index engineering properties of the soils encountered. Laboratory testing included visual soil classification per ASTM D2488 and ASTM D2487, moisture content determinations per ASTM D2216, and grain size analyses per ASTM D6913 standard procedures.

We returned to the site on May 27, 2022 to collect shallow subsurface samples adjacent to each boring exploration. Cat-ion exchange capacity (CEC) and organic content testing were performed by an independent laboratory to evaluate the treatment capacity of the shallow onsite soils for LID methods. The results of the laboratory tests are summarized below in Table 3 and graphical outputs are included in Appendix B.

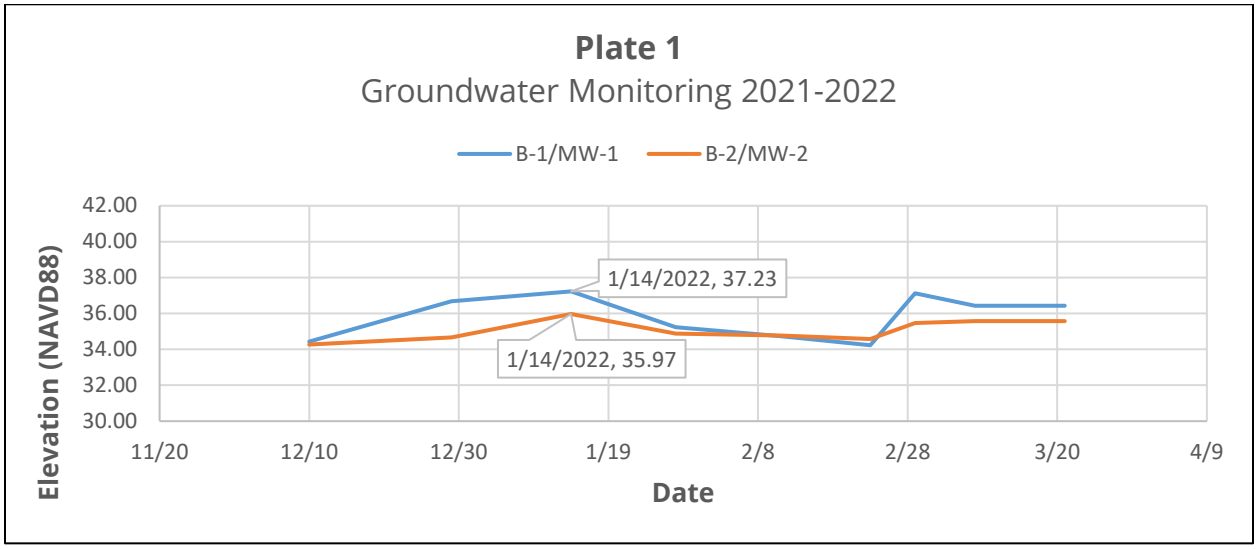
TABLE 3:
LABORATORY TEST RESULTS FOR ON-SITE SOILS

Sample	Soil Type	Lab ID	Gravel Content (percent)	Sand Content (percent)	Silt/Clay Content (percent)	D10 Ratio (mm)
B-1, S-1a, 2½'	SM	102783	0.1	87.8	12.1	>0.075
B-2, S-1, 2'	SM	102784	0.0	52.4	47.6	>0.075

Groundwater Conditions

Groundwater monitoring wells were installed at the site on December 10, 2021. The locations of the observation wells are shown on the Site & Exploration Map, Figure 2. At the time of drilling, groundwater was encountered at about 4.5 to 5.8 feet below the ground surface (Elevation 34.3 to 34.4 feet). Groundwater readings for the observation wells were manually measured on a bi-monthly basis from December 10, 2021 to March 21, 2022.

Based on our wet season monitoring, it appears that seasonal high groundwater occurs at about Elevation 35.97 to 37.23 feet (NAVD 88) at the locations monitored, approximately 2.80 to 3.00 feet below the ground surface. These levels were recorded on January 14, 2022. Plate 1, below, summarizes the groundwater levels recorded as part of our groundwater monitoring program during our monitoring period.



We anticipate fluctuations in the local groundwater levels will occur in response to precipitation patterns, off site construction activities, and site utilization and will in general be similar to the water surface elevation of the adjacent river. As such, water level observations made at the time of our field investigation may vary from those encountered during the construction phase. Analysis or modeling of anticipated groundwater levels during construction is beyond the scope of this report.

CONCLUSIONS

Based on the results of our site reconnaissance and subsurface explorations, it is our opinion that conventional infiltration using a pond or gallery is likely not feasible given the shallow depth to groundwater, but the use of low-impact development (LID) Best Management Practices (BMPs) per the Puyallup stormwater manual does appear feasible.

Infiltration Recommendations

Based on our subsurface explorations and groundwater monitoring, it is our opinion that stormwater infiltration via a shallow trench or basin type system, and permeable pavement is feasible at the site, provided the bottom of the facility is located above elevation 37 feet (NAVD88). This elevation is based on the results of our winter season groundwater monitoring and topographic information obtained from the Pierce County Public GIS and should be surveyed in the field.

Per Volume III Section 3.1.1 of the 2014 SWMMWW, downspout infiltration is considered feasible if there is at least 1 foot of clearance from the expected bottom elevation of the infiltration facility to the seasonal high ground water table. Infiltration facilities for flow control and treatment, Volume III Section 3.3.7 *Site Suitability Criteria (SSC) 5 Depth to Bedrock, Water Table, or Impermeable Layer*, requires that the base of all infiltration basins or trench system be greater than or equal to 5 feet above the seasonal high water mark, bedrock (or hardpan), or other low permeability layer. The vertical separation may be reduced to 3 feet as recommended by the site professional. For the purposes of this infiltration feasibility evaluation, we have assumed that, at a minimum, the standard infiltration trench section (6 inches of topsoil over a 2 foot deep trench) would be used. Based on the above, there is not sufficient separation from seasonal high groundwater to the bottom of an infiltration trench.

Volume III Section 3.4.2 of the 2014 SWMMWW requires at least 1 foot of separation from the bottoms of rain gardens and permeable pavement to seasonal high groundwater. A 1 foot or 3 foot minimum separation from the bottom of bioretention is required depending upon the drainage area. For the purposes of this evaluation, a standard permeable pavement section (6 inches of pavement over 6 inches of storage course) would be used. Based on the above, shallow infiltration facilities such as rain gardens, bioretention, and permeable pavement appear to be feasible. Deeper trenches and thicker storage courses may be designed by a civil engineer where the vertical separation requirements can be met.

Infiltration Rate

We completed soil gradation analyses on two representative soil samples from the site per the 2014 SWMMWW, Volume III, Section 3.3.6, Method 3 (Massman, 2003) and in accordance with ASTM D6913. Based on our gradation analyses, we recommend a preliminary design infiltration rate of 1 inch per hour be used for the alluvium soils encountered at the site. Appropriate correction factors have been applied to these values in accordance with the 2014 SWMMWW, Volume III, Section 3.3.6, Table 3.3.1, including correction factors for site variability ($F_{variability}$), testing method ($F_{testing}$) and maintenance for situation biofouling ($F_{maintenance}$). Our calculations are included in Appendix C.

All proposed infiltration facilities should be designed and constructed in accordance with the 2014 SWMMWW. All minimum separations, setback requirements, and infeasibility criteria per 2014 SWMMWW should be considered prior to the selection, design and location of any stormwater facility for the proposed development.

Feasibility of the Native Soils for Water Quality Treatment

Volume III, Section 3.3.7 SSC-6 *Soil Physical and Chemical Suitability for Treatment* of the 2014 SWMMWW requires treatment soils to have at least 5mEq/100g of cation exchange capacity (CEC) and 1 percent by weight organic content. Cation exchange capacity and organic content testing was performed by a third party independent laboratory. The organic content of the site soils were determined to be about 1.12 to 11.1 percent per ASTM D2974-13, with a cation exchange capacity of 15.4 to 16.7 milliequivalents per 100 grams as determined by SW-846 Test Method 9081. Based on the results of the soil testing, the soils meet the minimum requirements for water quality treatment via infiltration; therefore, the subgrade soils should provide adequate treatment of stormwater runoff generated by the proposed pollution generating impervious surface.

Construction Considerations

Appropriate design, construction and maintenance measures will be required to ensure the infiltration rate can be effectively maintained over time. Stormwater Best Management Practices (BMPs) in accordance with the 2014 SWMMWW should be included in the project plans and specifications to minimize the potential for fines contamination of Low Impact Development BMPs utilized at the site.

We recommend that a representative from our firm be onsite at the time of excavation of the proposed infiltration facilities to verify that the soils encountered during construction are consistent with the soils observed in our subsurface explorations. In-situ infiltration testing should be performed at the time of construction to verify the recommended infiltration rate and to determine if a different site specific infiltration rate would be more appropriate for the site.

Suspended solids could clog the underlying soil and reduce the infiltration rate of the facilities. To reduce potential clogging of the infiltration systems, the infiltration system should not be connected to the stormwater runoff system until after construction is complete and the site area is landscaped, paved or otherwise protected. Temporary systems may be utilized throughout construction. Periodic sweeping of the paved areas will help extend the life of the infiltration system.

Additional measures may also be taken during construction to minimize the potential of fines contamination of the proposed infiltration system, such as utilizing an alternative storm water management location during construction or leaving the bottom of the permanent systems 1 to 2 feet high, and subsequently excavating to the finished grade once the site soils have been stabilized. All contractors working on the site (builders and subcontractors) should divert sediment laden stormwater away from proposed infiltration facilities during construction and landscaping activities. No concrete trucks should be washed or cleaned, and washout areas should not be within the vicinity of the proposed infiltration facilities. After construction activities have been completed, periodic sweeping of the paved areas will help extend the life of the infiltration system.

LIMITATIONS

We have prepared this report for use by Neil Walter Company and members of the design team, for use in the design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on our subsurface explorations, published geologic information, and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. Our recommendations are not intended to direct the contractor's methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design.

If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

◆ ◆ ◆

We have appreciated the opportunity to be of service to you on this project. If you have any questions or comments, please do not hesitate to call at your earliest convenience.

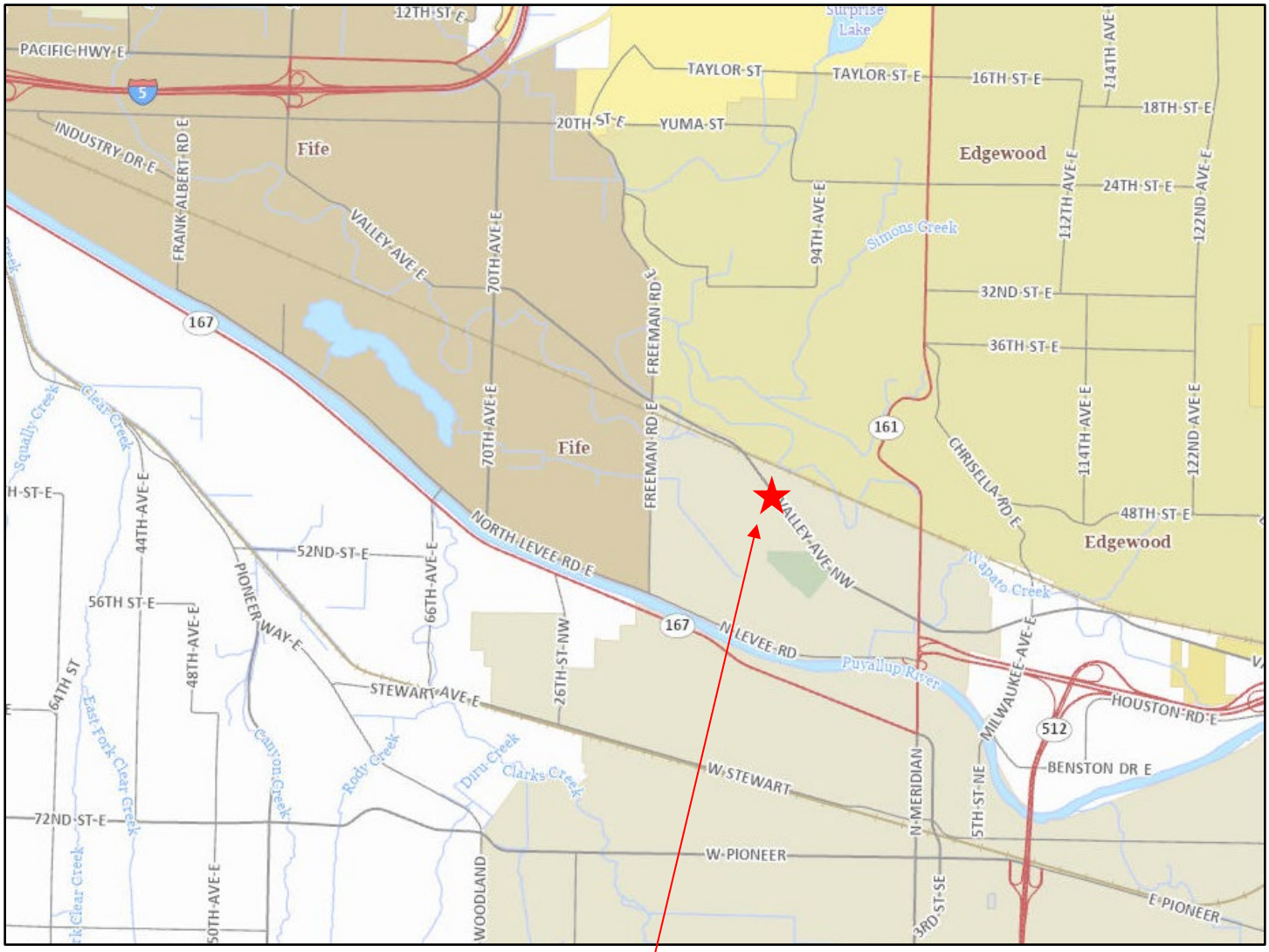
Respectfully submitted,
GeoResources, LLC

Jordan L. Kovash, LG
Project Geologist

Keith S. Schembs, LEG
Principal

Eric W. Heller, PE, LG
Senior Geotechnical Engineer

JLK:KSS:EWH/jlk
Doc ID: NWC.ValleyAveNW.SR
Attachments: Figure 1: Site Location Map
Figure 2: Site Survey
Figure 3: Site & Exploration Map
Figure 4: NRCS Soils Map
Figure 5: Geologic Map
Appendix A – Subsurface Explorations
Appendix B – Laboratory Test Results
Appendix C – Massman Calculations



Approximate Site Location

Map created from Pierce County WA GIS (https://matterhornwab.co.pierce.wa.us/publicgis/)

N
W
E
S

Not to Scale

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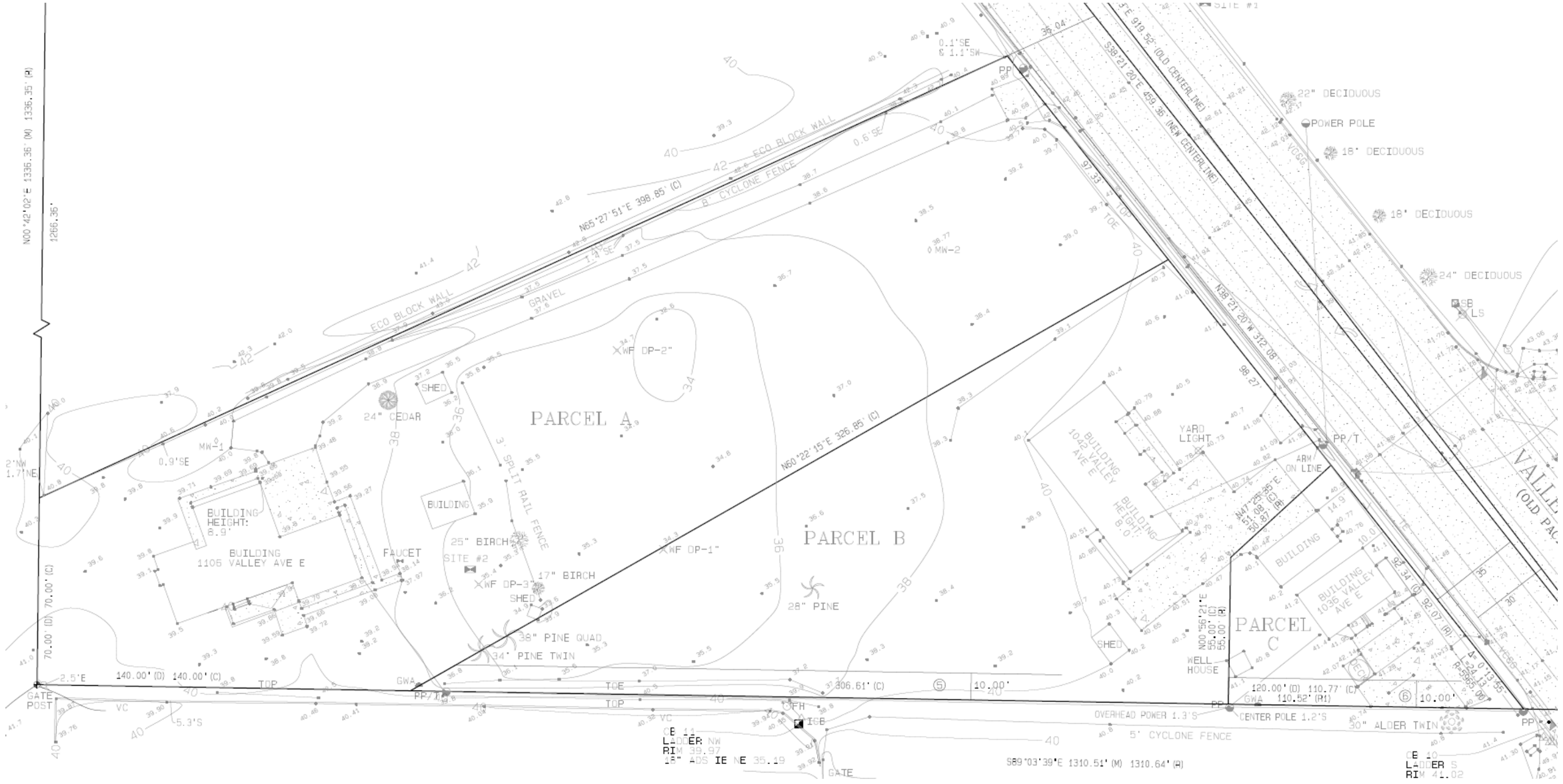
Site Location Map

Proposed Contractor's Yard
1036 – 1106 Valley Avenue NW
Puyallup, Washington
PN: 042016-3040, 3041, 3042

Doc ID: NWC.ValleyAve.Fu	July 2022	Figure 1



Notes:
Site Survey prepared by Contour Engineering
Not to Scale

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Site Survey Map

Proposed Contractor's Yard
1036 – 1106 Valley Avenue NW
Puyallup, Washington
PN: 042016-3040, 3041, 3042

Doc ID: NWC.ValleyAve.F2	July 2022	Figure 2

Approximate Site Location

Map created from Pierce County WA GIS (https://matterhornwab.co.pierce.wa.us/publicgis/)

B/MW Exploration number and approximate location (GeoResources 2021)

Not to Scale

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Site & Exploration Map

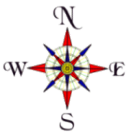
Proposed Contractor's Yard
1036 – 1106 Valley Avenue NW
Puyallup, Washington
PN: 042016-3040, 3041, 3042

Doc ID: NWC.ValleyAve.Fu	July 2022	Figure 3

Approximate Site Location

Map created from Web Soil Survey (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Soil Type	Soil Name	Parent Material	Slopes	Erosion Hazard	Hydrologic Soils Group
6A	Briscot Loam	Alluvium	0 to 2	Slight	B/D
30A	Puget silty clay loam	Alluvium	0 to 2	None	C/D
31A	Puyallup fine sandy loam	Alluvium	0 to 3	Slight	A
42A	Sultan silt loam	Alluvium	0 to 2	Slight	C/D



Not to Scale

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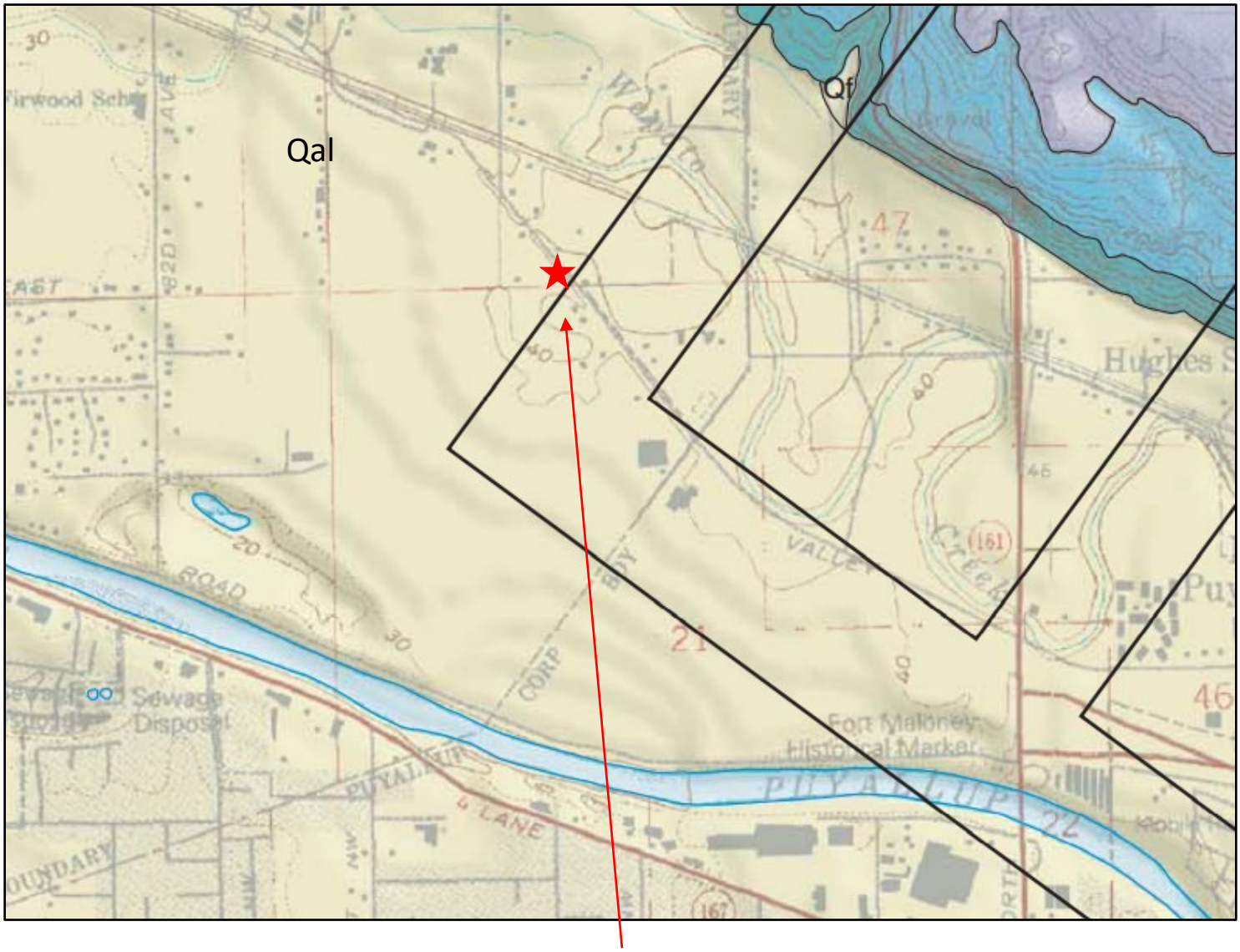
NRCS Soils Map

Proposed Contractor's Yard
1036 – 1106 Valley Avenue NW
Puyallup, Washington
PN: 042016-3040, 3041, 3042

Doc ID: NWC.ValleyAve.Fu	July 2022	Figure 4



Approximate Site Location

An excerpt from the draft *Geologic Map of the Puyallup 7.5-minute Quadrangle, Pierce County, Washington* by Troost et. al.

Qal	Alluvium

Not to Scale

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Geologic Map

Proposed Industrial Development
25491 WA -3
Mason County, Washington
PN: 12321-1400040, 14-00041, 75-00030

Doc ID: NWC.ValleyAve.Fu	July 2022	Figure 5

Appendix A

Subsurface Explorations

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More than 50% Retained on No. 200 Sieve	GRAVEL More than 50% Of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More than 50% Of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or more	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D2487-90.
3. Description of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and or test data.

SOIL MOISTURE MODIFIERS:

Dry- Absence of moisture, dry to the touch

Moist- Damp, but no visible water

Wet- Visible free water or saturated, usually soil is obtained from below water table

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Unified Soils Classification System

Proposed Contractor's Yard
1036 – 1106 Valley Avenue NW
Puyallup, Washington
PN: 042016-3040, 3041, 3042

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LOG OF BORING B-1/MW-1

Proposed Contractor's Yard
1106 - 1036 Valley Ave NW
Puyallup, Washington

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company:	Boretec 1, Inc.	**Logged By:**	JLK
Drilling Method:	HSA	**Drilling Date:**	12/10/2021
Drilling Rig:	EC 95 Track Drill	**Datum:**	NAVD88
Sampler Type:	split spoon	**Elevation:**	40
Hammer Type:	cat head	**Termination Depth:**	16.5
Hammer Weight:	140 lbs	**Latitude:**	
		Longitude:	

Notes: End of driveway, just north of house at 1106 Valley Ave NW

Depth (feet)	Elevation (feet)	Soil description	STP Blowcounts
0	40	Dark brown silty SAND (loose to medium dense, moist) (Topsoil) (SM)	
		Grey-brown silty SAND with gravel (loose to medium dense, moist) (Fill) (SM)	
2.5	37.5	Mottled grey-brown sandy SILT (medium stiff, moist) (Alluvium) (ML)	3
		Grey-brown silty SAND (loose, moist) (SM)	3
		Brown silty SAND (loose, moist) (SM)	4
5	35	(very loose, wet)	1
			2
		Mottled grey-brown silty SAND, small rootlets/organics (very loose, moist to wet) (SM)	2
7.5	32.5		
10	30	Grey-brown silty SAND with silt interbeds (loose, wet) (Alluvium) (SM)	2
			4
			5
12.5	27.5		
15	25		2
			4
			6

Test Results: Plastic Limit — Liquid Limit; % Fines (<0.075mm) ◇; % Water Content ●; Penetration - ▲ (blows per foot) 10 20 30 40 50

Groundwater: ATD

Description not given for: "OT" | Silty sand | Silt

JOB: NeilWalterCompany.ValleyAveNW

FIG. A-2

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LOG OF BORING B-1/MW-1

Proposed Contractor's Yard
1106 - 1036 Valley Ave NW
Puyallup, Washington

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company:	Boretec 1, Inc.	**Logged By:**	JLK
Drilling Method:	HSA	**Drilling Date:**	12/10/2021
Drilling Rig:	EC 95 Track Drill	**Datum:**	NAVD88
Sampler Type:	split spoon	**Elevation:**	40
Hammer Type:	cat head	**Termination Depth:**	16.5
Hammer Weight:	140 lbs	**Latitude:**	
		Longitude:	

Notes: End of driveway, just north of house at 1106 Valley Ave NW

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	STP Blowcounts	Sampler	Symbol	Test Results	Groundwater
							Plastic Limit — Liquid Limit; % Fines (<0.075mm) ◇; % Water Content ●	
							Penetration - ▲ (blows per foot) 10 20 30 40 50	
			(Termination Depth - 12/10/2021)					
17.5	22.5							
20	20							
22.5	17.5							
25	15							
27.5	12.5							
30	10							

Description not given for: "0T" | Silty sand | Silt

JOB: NeilWalterCompany.ValleyAveNW

FIG. A-2

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LOG OF BORING B-2/MW-2

Proposed Contractor's Yard
1106 - 1036 Valley Ave NW
Puyallup, Washington

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company:	Boretec 1, Inc.	**Logged By:**	JLK
Drilling Method:	HSA	**Drilling Date:**	12/10/2021
Drilling Rig:	EC 95 Track Drill	**Datum:**	NAVD88
Sampler Type:	split spoon	**Elevation:**	39
Hammer Type:	cat head	**Termination Depth:**	16.5
Hammer Weight:	140 lbs	**Latitude:**	
		Longitude:	

Notes: Field in front of 1106 Valley Ave NW

Depth (feet)	Elevation (feet)	Soil description	STP Blowcounts
0	37.5	Mottled grey-brown silty SAND (loose, moist) (Alluvium) (SM)	1 3 5
5	32.5	(very loose, wet)	1 1 1
10	27.5	Black SAND (loose, wet) (Alluvium) (SP)	4 4 4
15	25	(medium dense, wet)	2 5 6

Exploration notes

Sampler

Symbol

Test Results
Plastic Limit — Liquid Limit
% Fines (<0.075mm) ◇
% Water Content ●
Penetration - ▲ (blows per foot)
10 20 30 40 50

Groundwater
ATD

Description not given for: "OT" | Silty sand | Silt | Poorly graded sand

JOB: NeilWalterCompany.ValleyAveNW

FIG. A-3

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LOG OF BORING B-2/MW-2

Proposed Contractor's Yard
1106 - 1036 Valley Ave NW
Puyallup, Washington

1. Refer to log key for definition of symbols, abbreviations, and codes
2. USCS disination is based on visual manual classification and selected lab testing
3. Groundwater level, if indicated, is for the date shown and may vary
4. NE = Not Encountered
5. ATD = At Time of Drilling
6. HWM = Highest Groundwater Level

Drilling Company:	Boretec 1, Inc.	**Logged By:**	JLK
Drilling Method:	HSA	**Drilling Date:**	12/10/2021
Drilling Rig:	EC 95 Track Drill	**Datum:**	NAVD88
Sampler Type:	split spoon	**Elevation:**	39
Hammer Type:	cat head	**Termination Depth:**	16.5
Hammer Weight:	140 lbs	**Latitude:**	
		Longitude:	

Notes: Field in front of 1106 Valley Ave NW

Depth (feet)	Elevation (feet)	Exploration notes	Soil description	STP Blowcounts	Sampler	Symbol	Test Results	Groundwater
	22.5						Plastic Limit — Liquid Limit; % Fines (<0.075mm) ◇; % Water Content ●	
			(Termination Depth - 12/10/2021)				Penetration - ▲ (blows per foot) 10 20 30 40 50	
17.5	20							
20	17.5							
22.5	15							
25	12.5							
27.5	10							
30	7.5							

Description not given for: "0T" | Silty sand | Silt | Poorly graded sand

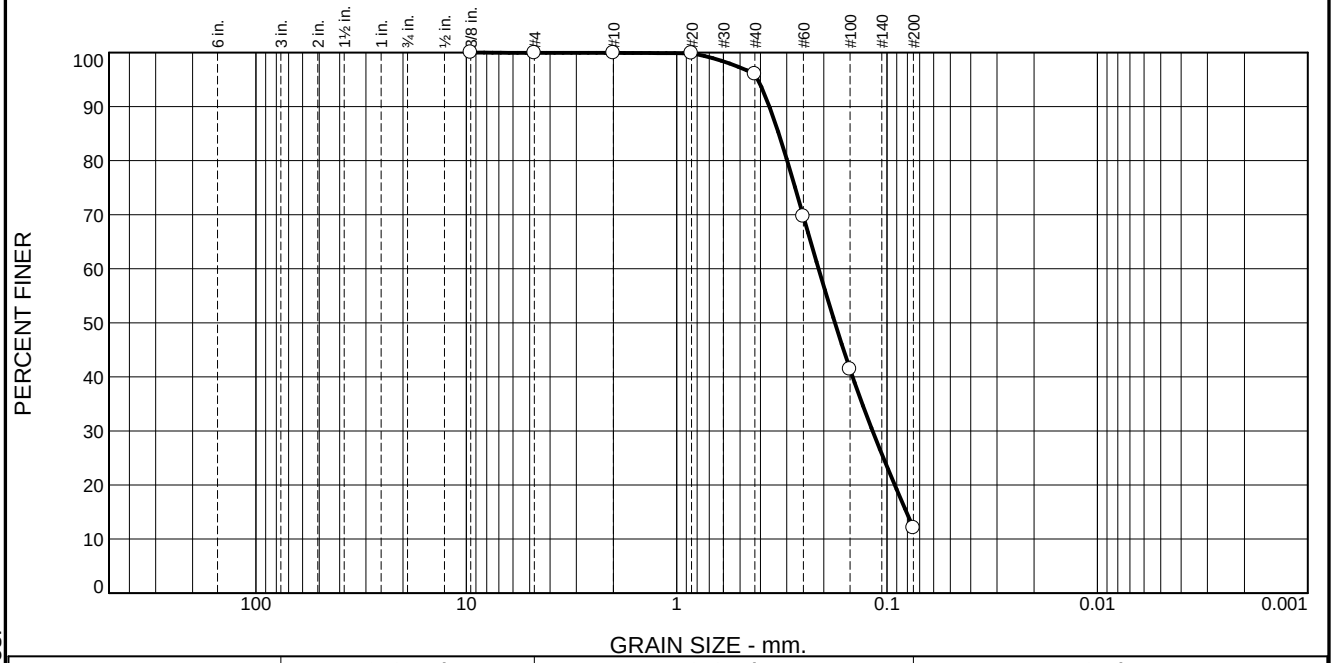
JOB: NeilWalterCompany.ValleyAveNW

FIG. A-3

Appendix B

Laboratory Test Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.1	0.0	3.9	83.9	12.1	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
0.375	100.0		
#4	99.9		
#10	99.9		
#20	99.9		
#40	96.0		
#60	69.7		
#100	41.4		
#200	12.1		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-2-4(0)

Coefficients

D_{90}= 0.3626 D_{85}= 0.3273 D_{60}= 0.2116
D_{50}= 0.1770 D_{30}= 0.1172 D_{15}= 0.0809
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 21.8%

Date Received: 12/10/21 **Date Tested:** 12/21/21

Tested By: MAW

Checked By: KSS

Title: PM

Source of Sample: B-1/MW-1 **Depth:** 2.5

Sample Number: 1a

Date Sampled: 12/10/21

GeoResources, LLC

Fife, WA

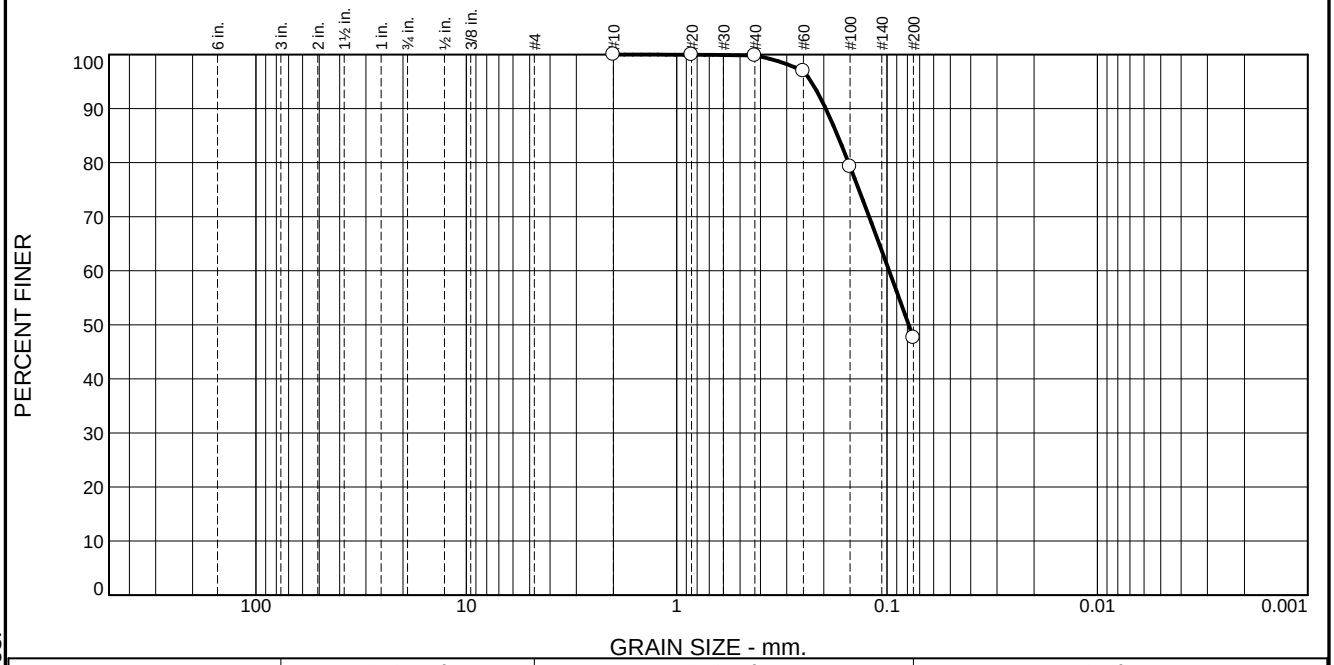
Client: Neil Walter Company

Project: Proposed Contractor's Yard

Project No: NeilWalterCompany.ValleyAveNW **Figure** B-1

Tested By: _____ **Checked By:** _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	0.2	52.2	47.6	

Test Results (ASTM D 6913 & ASTM D 1140)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
#10	100.0		
#20	100.0		
#40	99.8		
#60	97.0		
#100	79.3		
#200	47.6		

* (no specification provided)

Material Description

Silty SAND (SM)

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= SM **AASHTO (M 145)=** A-4(0)

Coefficients

D_{90}= 0.1956 D_{85}= 0.1718 D_{60}= 0.0978
D_{50}= 0.0789 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Natural Moisture: 27.6%

Date Received: 12/10/21 **Date Tested:** 12/21/21

Tested By: MAW

Checked By: KSS

Title: PM

Source of Sample: B-2/MW-2 **Depth:** 2.5
Sample Number: 1

Date Sampled: 12/10/21

GeoResources, LLC

Fife, WA

Client: Neil Walter Company
Project: Proposed Contractor's Yard

Project No: NeilWalterCompany.ValleyAveNW **Figure** B-2

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ **Checked By:** _____

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Analytical Report

Geo Resources, LLC
4809 Pacific Hwy E
Fife, WA 98424

Project NWC.Valley Ave
PO Number
Date Received 05/27/2022

Client ID: 103272 (HA-1, S-1) **Lab No: 302271-01** **Sample Date: 05/27/22 12:30**

Analyte	Method	Result	Units	PQL	Qualifiers	Analysis Date	Analyst
Cation Echange Capcity	SW 9081	16.7	Na, mEq/100g	---	---	6/29/2022	KLH
Organic Matter	ASTM D-2974-13	1.12	wt. % Dry	0.005	---	6/23/2022	KLH

Client ID: 103273 (HA-2, S-2) **Lab No: 302271-02** **Sample Date: 05/27/22 12:45**

Analyte	Method	Result	Units	PQL	Qualifiers	Analysis Date	Analyst
Organic Matter	ASTM D-2974-13	11.1	wt. % Dry	0.005	---	6/23/2022	KLH
Cation Echange Capcity	SW 9081	15.4	Na, mEq/100g	---	---	6/29/2022	KLH

Lab Qualifiers Comments:

Appendix C

Massman Calculations

City of Puyallup - 2014 SWMMWW

NeilWalterCompany.ValleyAveNW

Puyallup, Washington

Massman Calculation Sheet

Soil Grain Size Analysis Method

Procudure based on 2014 SWMMWW, Volume III

$K_{sat} = 10^{(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines})}$ (provides Ksat in cm/s)

$K_{sat} = [10^{(-1.57 + 1.90D_{10} + 0.015D_{60} - 0.013D_{90} - 2.08F_{fines})}]*1417$ (provides Ksat in in/hr)

Sample Information				Sieve Data				Unfactored Rate	
I.D.	Test Pit	Depth (ft)	Layer Thickness (ft)	D_{10}	D_{60}	D_{90}	F_{fines}	Individual K_{sat} (cm/s)	Equivalent K_{sat} (in/hr)
102783	B-1	2.5'	15'+	0.07	0.2116	0.3626	0.121	0.020	28.917
102784	B-2	2.5'	15'+	0.030	0.0978	0.1956	0.476	0.003	4.438

Effective Average Hydraulic Conductivity, K_{equiv}

Based on either:

1) Average K_{sat} determined using harmonic mean
2) Lowest conductive layer, if within 5ft of bottom of pond

k_{equiv}=	16.678	Average
	4.438	Lowest
	4.438	To Use

Site Variability & number of location tested (CF_v)

	0.33 to 1.0

Factor to use for calculations: 0.75

Test Method (CF_t)

	0.4 to 0.75
Large-scale PIT	0.75
Small-scale PIT	0.5
Other small-scale (e.g. Double ring, falling head)	0.4
Grain Size Method	0.4

Factor to use for calculations: 0.4

Degree of influent control to prevent siltation and bio-buildup (CF_m)

	0.90

Factor to use for calculations: 0.9

$I_{design} = I_{measured} * F_{testing} * F_{geometry} * F_{plugging}$: **1.20** in/hr

Design Value: 1.00 in/hr

GEORESOURCES
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Infiltration Analysis

Proposed Contractor's Yard
1036-1106 Valley Avenue NW
Puyallup, Washington
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