INSIGHT ENGINEERING CO.

STORMWATER SITE PLAN

For
Smokey Point Ridge

Prepared for
City of Arlington
238 N. Olympic Ave
Arlington, WA 98223
360.403.3500

Project Site Location:
19402 Smokey Point Blvd
Arlington, WA 98223

Applicant:
Peak to Peak Development LLC
PO Box 12867
Mill Creek, WA 98082
206-571-2834

Contact:
IECO
P.O. Box 1478
Everett, WA 98206
425-303-9363

Tax Id's: 31051700400600
IECO Project: 22-1220

Certified Erosion and Sedimentation Control Lead:
To be named by contractor

Stormwater Site Plan Prepared By:

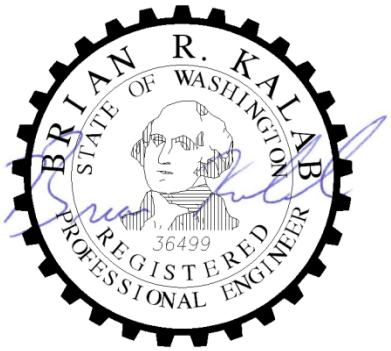
Shilpa Xavier, E. I. T.

Stormwater Site Plan Preparation Date:

May 20, 2024

Approximate Construction Date:

May 1, 2025



07/03/2024

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♦ info@insightengineering.net

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Acronyms and Abbreviations

BMP	Best Management Practices
DOE	Department of Ecology
EDDS	Engineering Design and Development Standards
ESC	Erosion and Sediment Control
IECO	Insight Engineering Company
MR	Minimum Requirement
SWPPP	Stormwater Pollution Prevention Plan
SWMMWW	Stormwater Management Manual for Western Washington
TESC	Temporary Erosion and Sediment Control
WWHM	Western Washington Hydrology Model

1.0 Executive Summary

The proposed project ***Smokey Point Ridge*** is located at 19402 Smokey Point Blvd Arlington, Washington. More generally, the site is located in Section 17, Township 31 North, and Range 5 East of the Willamette Meridian in Snohomish County, Washington. Please refer to the Vicinity Map attached later in the section. This report follows the requirements defined in the SWMMWW 2019 and the City of Arlington Requirements.

The project site contains approximately 7.82 Acres. The existing site is currently partly developed with an existing house and a gravel driveway from Smokey Point Blvd. The existing site contains one drainage basin that slopes to the west. Based on the topographic survey of the site, the upstream flows are minimal. Please refer to the upstream and downstream analysis for more details. Per NRCS survey of Snohomish County, the project site contains Everett type soils that have a hydrologic classification of Type "A". Please refer to the soils map and descriptions attached later in this report for more details.

The site is zoned CC. The clearing area for the proposed development contains 8.23 Acres. The proposal is to construct ten residential buildings, eight mixed-use buildings and access roads with associated utilities. The access to the site will be from Smokey Point Blvd. The roads will be constructed per the city of Arlington standards.

Per Figure 2.2, (flow chart for new development requirements) Volume I Snohomish County Drainage Manual, Minimum requirements #1 through 9 shall apply for this project. See the Minimum Requirements Summary included later in this report. Flow control requirements will be met by providing infiltration trenches. An infiltration rate of 5-in/hour was assumed per the Geotech Report attached under Section 6 appendix B. The trenches volume was calculated in WWHM 2012, refer to section 5.0 for the hydraulic analysis. Water quality for the site will be provided by filters located upstream of each infiltration trench.

Per Minimum Requirement #5 (Section 2.5.5 of the SWMMWW), the following NPGIS BMPs shall be applied to provide onsite stormwater management and must be considered in the following order per List #2: Full Dispersion, Infiltration, Bioretention, Basic Dispersion, and then Perforated Stub-Out Connections. The runoff from the roof will be directed to infiltration trenches through catch basins. Refer to the geotechnical report located within Section 6 for more information. The following BMPs shall be applied to the other hard surfaces: Full dispersion, Permeable Pavement, Bioretention, and then Sheet flow Dispersion. The runoff from the road and driveways will be directed to the infiltration trenches through catch basins. Post-Construction Soil Quality and Depth BMP T.5.13 is proposed to provide onsite stormwater management for the pervious areas of the site.

Figure 1 - Minimum Requirements (MR's) for New Development Projects

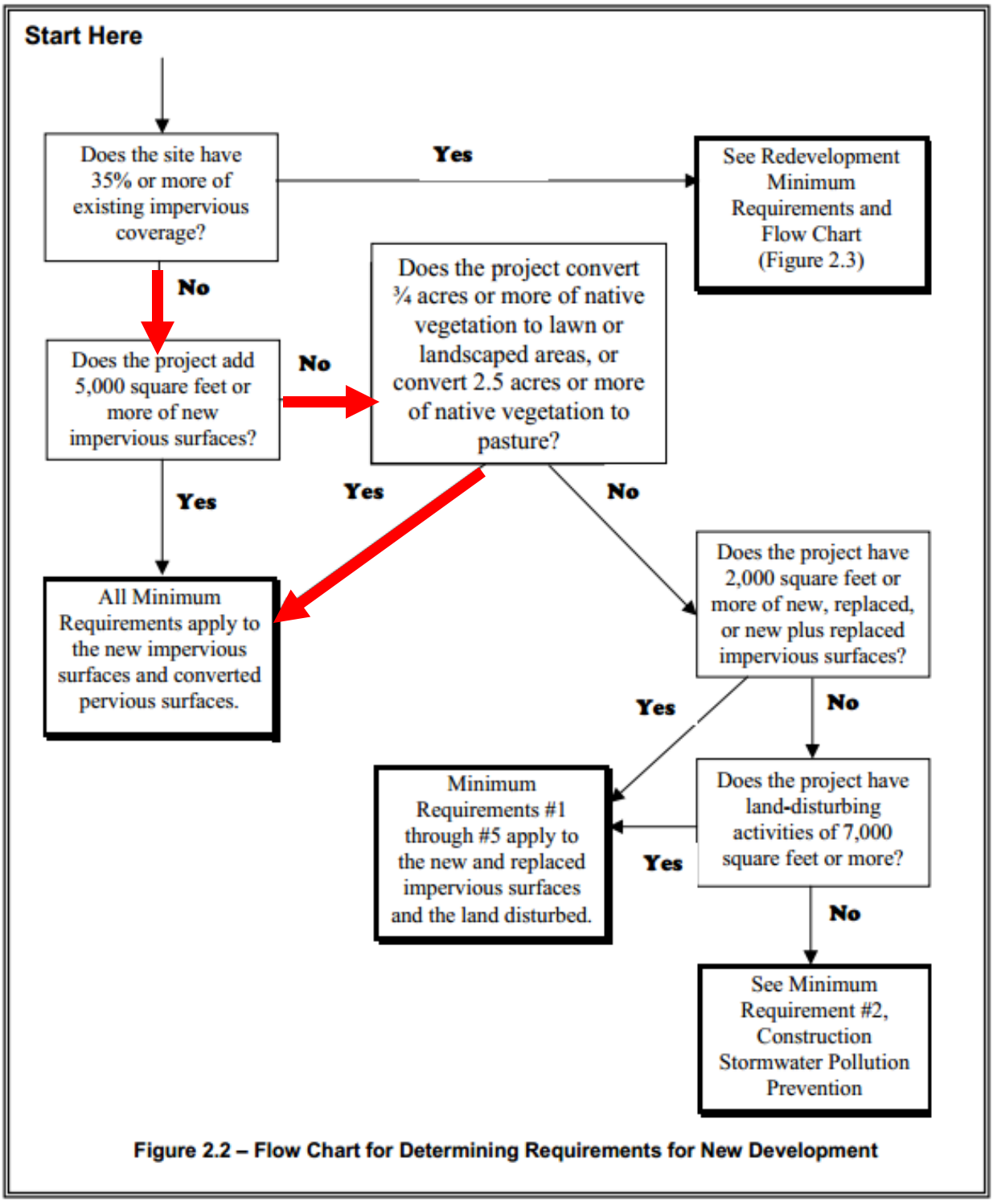


Figure 2.2 – Flow Chart for Determining Requirements for New Development

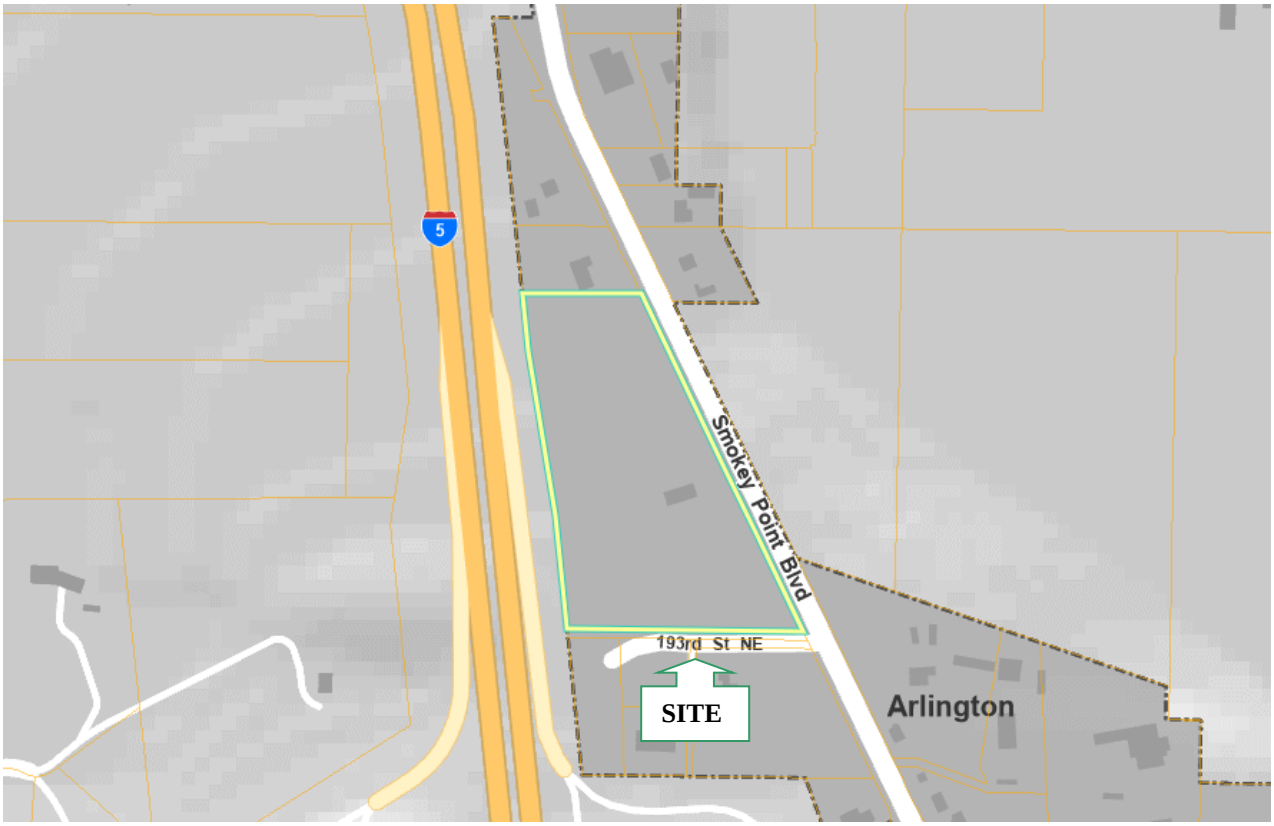
1.1 Drainage Information Summary

Project Name: **Smokey Point Ridge** Project Engineer: **INSIGHT ENGINEERING COMPANY** Project Applicant: **Peak to Peak Development LLC** Total Site Area**: 7.82 Ac** Project Development Area: **8.45 Ac**	Number of Units: **18 buildings**

Summary Table

Drainage Basin Information		*Individual Basin Designation*			
		A	*B*	*C*	*D*
On-site Sub-basin Area (Acres)		**7.82**			
Type of Storage Proposed		**Infiltration Trench**			
Approximate Storage Volume (CF)		**NA**			
Soil types (Natural Resource Conservation Service)		**Everett (Type A)**			
Pre-developed Runoff Rate					
Q (cfs)	2-year	**NA**			
	10-year	**NA**			
	50-year	**NA**			
Post-developed Runoff Rate (without quantity controls)					
Q (cfs)	2-year	**NA**			
	10 year	**NA**			
	50 year	**NA**			
Post-developed Runoff Rate (with quantity controls)					
Q (cfs)	2-year	**NA**			
	10 year	**NA**			
	50 year	**NA**			
Offsite Upstream Area					
Number of acres		**7.82**			
Offsite Downstream Flow		*NA*			
Q (cfs)	*50 yr*	**NA**			

FIGURE 2. VICINITY MAP



TAKEN FROM THE PDS Portal MAPS

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Figure 2 -Vicinity Map
Smokey Point Ridge
Arlington, Washington

SCALE: NTS	**DATE:** 7/3/24	**JOB #:** 22-1220
BY: SX	**FILE NAME:** 22-1220/doc/Stormwater Site Plan	

1.2 Minimum Requirements Summary

MR : Minimum Requirement

SWPPP : Stormwater Pollution Prevention Plan

MR #1 Stormwater Site Plan Narrative: The Stormwater Site Plan preparation follows the City of Arlington requirements and in accordance with DOE's 2019 SWMMWW. Refer to the executive summary within Section 1.0.

MR #2 SWPPP Narrative: A SWPPP has been included in the Appendix A under Section 6.

MR #3 Water Pollution Source Control for New Development: No source control pollutants pertain to the proposed project.

MR #4 Preservation of Natural Drainage Systems and Outfalls: As infiltration is proposed no runoff is expected to leave the site.

MR #5 Onsite Stormwater Management: Per Minimum Requirement #5 (Section 2.5.5 of the SWMMWW), the following NPGIS BMPs shall be applied to provide onsite stormwater management and must be considered in the following order per List #2: Full Dispersion, Infiltration, Bioretention, Basic Dispersion, and then Perforated Stub-Out Connections. The runoff from the roof will be directed to infiltration trenches through catch basins. Refer to the geotechnical report located within Section 6 for more information. The following BMPs shall be applied to the other hard surfaces: Full dispersion, Permeable Pavement, Bioretention, and then Sheet flow Dispersion. The runoff from the road and driveways will be directed to the infiltration trenches through catch basins. Post-Construction Soil Quality and Depth BMP T.5.13 is proposed to provide onsite stormwater management for the pervious areas of the site.

MR #6 Runoff Treatment: Water quality for the site will be provided by filters located upstream of each infiltration trench.

MR #7 Flow Control: Flow control requirements will be met by providing infiltration trenches. An infiltration rate of 5-in/hour was assumed per the Geotech Report attached under Section 6 appendix B. The trenches volume was calculated in WWHM 2012. Refer to section 5.0 for the hydraulic analysis.

MR #8 Wetlands protection: There are no wetlands in this project.

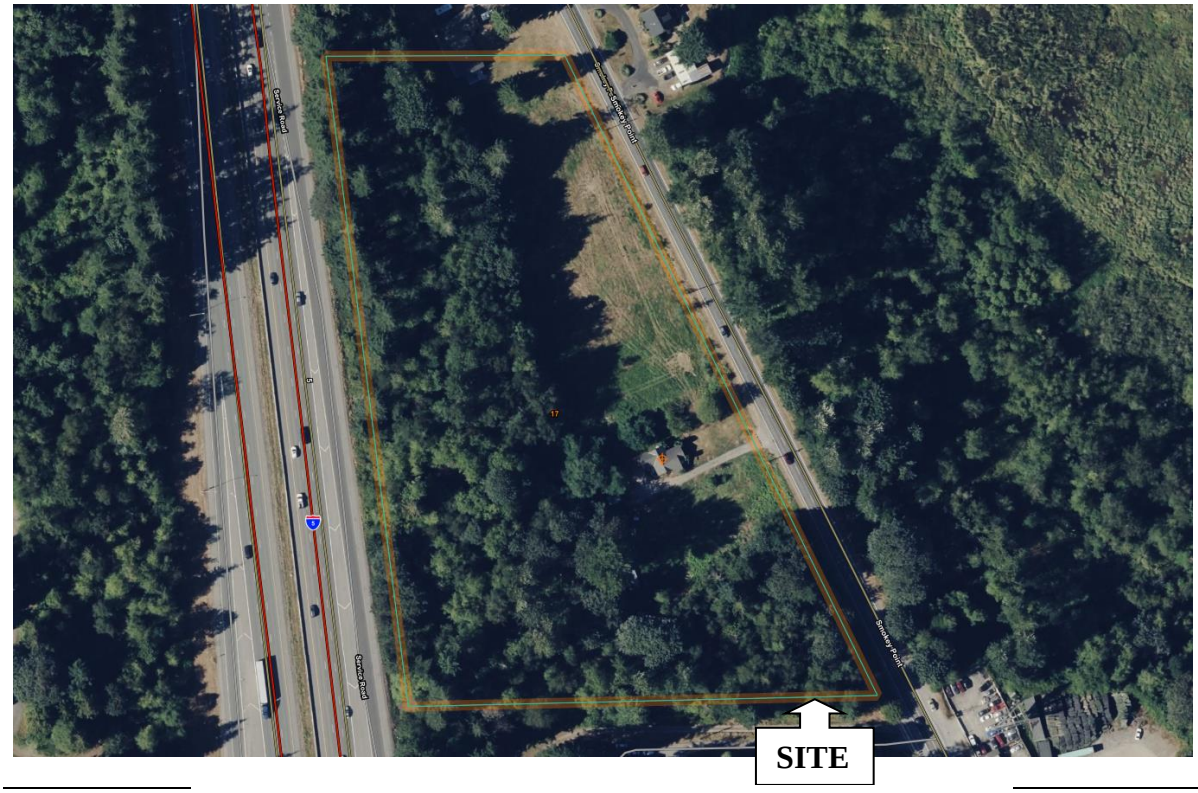
MR #9 Operations and Maintenance: An Operations and Maintenance Manual is provided under Section 6 Appendix C.

2.0 Existing Conditions

The proposed project ***Smokey Point Ridge*** is located at 19402 Smokey Point Blvd Arlington, Washington. More generally, the site is located in Section 17, Township 31 North, and Range 5 East of the Willamette Meridian in Snohomish County, Washington.

The project site contains approximately 7.82 Acres. The existing site is currently partly developed with an existing house and a gravel driveway from Smokey Point Blvd. The existing site contains one drainage basin that slopes to the west. Based on the topographic survey of the site, the upstream flows are minimal. Please refer to the upstream and downstream analysis for more details. Per NRCS survey of Snohomish County, the project site contains Everett type soils that have a hydrologic classification of Type “A”. Please refer to the soils map and descriptions attached later in this report for more details.

FIGURE 3. SOIL MAP



SOILS LEGEND

17-Everett very gravelly sandy loam, 0 to 8 percent slopes

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Figure 3 - Soil Map
Smokey Point Ridge
Arlington, Washington

SCALE: NONE	**DATE:** 7/3/24	**JOB #:** 22-1220
BY: SX	**FILE NAME:** 22-1220/doc/Stormwater Site Plan	

Snohomish County Area, Washington

17—Everett very gravelly sandy loam, 0 to 8 percent slopes

Map Unit Setting

- *National map unit symbol:* 2t629
- *Elevation:* 30 to 900 feet
- *Mean annual precipitation:* 35 to 91 inches
- *Mean annual air temperature:* 48 to 52 degrees F
- *Frost-free period:* 180 to 240 days
- *Farmland classification:* Farmland of statewide importance

Map Unit Composition

- *Everett and similar soils:* 80 percent
- *Minor components:* 20 percent
- *Estimates are based on observations, descriptions, and transects of the mapunit.*

Description of Everett

Setting

- *Landform:* Kames, moraines, eskers
- *Landform position (two-dimensional):* Summit, shoulder
- *Landform position (three-dimensional):* Interfluve, crest
- *Down-slope shape:* Convex
- *Across-slope shape:* Convex
- *Parent material:* Sandy and gravelly glacial outwash

Typical profile

- *Oi - 0 to 1 inches:* slightly decomposed plant material
- *A - 1 to 3 inches:* very gravelly sandy loam
- *Bw - 3 to 24 inches:* very gravelly sandy loam
- *C1 - 24 to 35 inches:* very gravelly loamy sand
- *C2 - 35 to 60 inches:* extremely cobbly coarse sand

Properties and qualities

- *Slope:* 0 to 8 percent
- *Depth to restrictive feature:* More than 80 inches
- *Drainage class:* Somewhat excessively drained
- *Capacity of the most limiting layer to transmit water (Ksat):* High (1.98 to 5.95 in/hr)
- *Depth to water table:* More than 80 inches
- *Frequency of flooding:* None
- *Frequency of ponding:* None
- *Available water supply, 0 to 60 inches:* Low (about 3.2 inches)

Interpretive groups

- *Land capability classification (irrigated):* None specified
- *Land capability classification (nonirrigated):* 4s
- *Hydrologic Soil Group:* A
- *Ecological site:* F002XA004WA - Puget Lowlands Forest

- *Forage suitability group:* Droughty Soils (G002XN402WA), Droughty Soils (G002XF403WA), Droughty Soils (G002XS401WA)
- *Other vegetative classification:* Droughty Soils (G002XN402WA), Droughty Soils (G002XF403WA), Droughty Soils (G002XS401WA)
- *Hydric soil rating:* No

Minor Components

Alderwood

- *Percent of map unit:* 10 percent
- *Landform:* Hills, ridges
- *Landform position (two-dimensional):* Summit
- *Landform position (three-dimensional):* Crest, talf
- *Down-slope shape:* Convex, linear
- *Across-slope shape:* Convex
- *Hydric soil rating:* No

Indianola

- *Percent of map unit:* 10 percent
- *Landform:* Terraces, kames, eskers
- *Landform position (three-dimensional):* Tread
- *Down-slope shape:* Linear
- *Across-slope shape:* Linear
- *Hydric soil rating:* No

3.0 Offsite Analysis

A site reconnaissance was performed by Brian R. Kalab of Insight engineering on October 17, 2023, to verify the downstream flow paths and observe any drainage problems downstream of the site. The sky was cloudy overcast with a temperature of 59 degrees.

The project site contains approximately 7.82 Acres. The existing site is currently partly developed with an existing house and a gravel driveway from Smokey Point Blvd. The existing site contains one drainage basin that slopes to the northwest. Based on the topographic survey of the site, the upstream flows are minimal. Please refer to the upstream and downstream analysis for more details. No visible on-site drainage problems were observed at the time of field investigations.

3.1 Upstream Analysis

Upstream flows entering the site will be minimal as it will be infiltrated.

3.2 Downstream Analysis

The existing site contains one drainage basin that slopes to the west. There will be no runoff from the site as most of it will be infiltrated. This is where the 1-mile downstream analysis was completed. There do not appear to be any restrictions or erosion problems within 1 mile of the site.

FIGURE 4. DOWNSTREAM ANALYSIS MAP

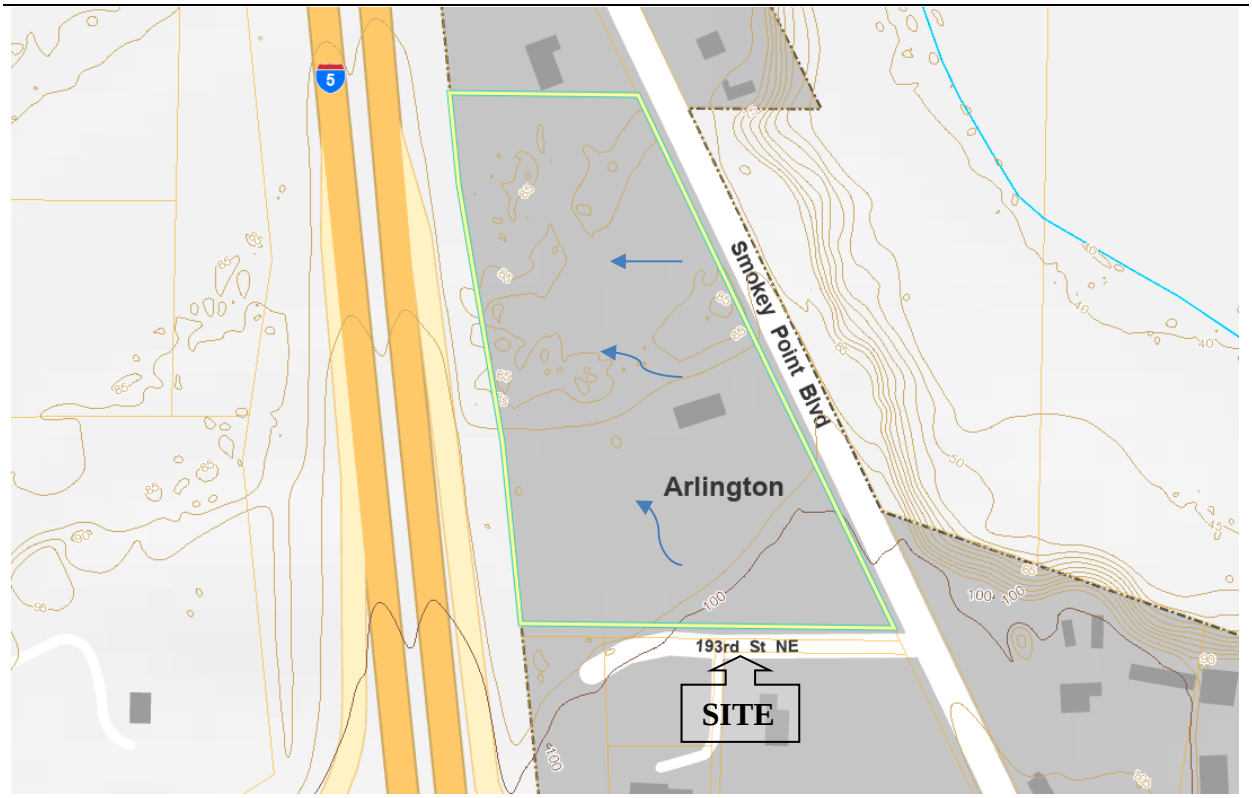

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Figure 4 - Downstream Analysis Map
Smokey Point Ridge
Arlington, Washington

SCALE: NONE	**DATE:** 7/3/24	**JOB #:** 22-1220
BY: SX	**FILE NAME:** 22-1220\docs\drainage report	

4.0 Developed Conditions

The proposed project ***Smokey Point Ridge*** is located at 19402 Smokey Point Blvd Arlington, Washington. More generally, the site is located in Section 17, Township 31 North, and Range 5 East of the Willamette Meridian in Snohomish County, Washington. Per NRCS survey of Snohomish County, the project site contains Everett type soils that have a hydrologic classification of Type "A".

The site is zoned CC. The clearing area for the proposed development contains 8.23 Acres. The proposal is to construct ten residential buildings, eight mixed-use buildings and access roads with associated utilities. The access to the site will be from Smokey Point Blvd. The roads will be constructed per the city of Arlington standards.

Per Figure 2.2, (flow chart for new development requirements) Volume I Snohomish County Drainage Manual, Minimum requirements #1 through 9 shall apply for this project. See the Minimum Requirements Summary included later in this report. Flow control requirements will be met by providing infiltration trenches. An infiltration rate of 5-in/hour was assumed per the Geotech Report attached under Section 6 appendix B. The trenches volume was calculated in WWHM 2012, refer to section 5.0 for the hydraulic analysis. Enhanced Water quality for the site will be provided by filters located upstream of each infiltration trench.

Per Minimum Requirement #5 (Section 2.5.5 of the SWMMWW), the following NPGIS BMPs shall be applied to provide onsite stormwater management and must be considered in the following order per List #2: Full Dispersion, Infiltration, Bioretention, Basic Dispersion, and then Perforated Stub-Out Connections. The runoff from the roof will be directed to infiltration trenches through catch basins. Refer to the geotechnical report located within Section 6 for more information. The following BMPs shall be applied to the other hard surfaces: Full dispersion, Permeable Pavement, Bioretention, and then Sheet flow Dispersion. The runoff from the road and driveways will be directed to the infiltration trenches through catch basins. Post-

Construction Soil Quality and Depth BMP T.5.13 is proposed to provide onsite stormwater management for the pervious areas of the site.

5.0 Site Hydraulic Conditions

Per NRCS survey of Snohomish County, the project site contains Everett type soils that have a hydrologic classification of Type "A".

Site Area	= 7.82 Acres
Clearing Area	= 8.23 Acres
Area Included in the analysis	= 8.45 Acres

Basin-1	= 0.94 Acres
Basin-2	= 0.93 Acres
Basin-3	= 1.74 Acres
Basin-4	= 1.39 Acres
Basin-5	= 3.11 Acres
Basin-6	= 0.34 Acres
Area Included in the analysis	***= 8.45 Acres***

5.1 Basin-1 Summary

Existing Basin-1

Basin-1 Area = 0.94 Acres

The entire basin was modeled as forested.

Refer to the Existing Basin Map and WWHM report for more details.

Developed Basin-1

Basin-1 Area = 0.94 Acres

Site Impervious:

Road	= 0.39 Acres (16,854 SF)
Roof	= 0.27 Acres (11,920 SF)
Sidewalk	= 0.07 Acres (2,970 SF)

Total Impervious = 0.73 Acres (31,744 SF)

Site Pervious:

Pervious Area (Lawn) = 0.94 - 0.73 = 0.21 Acres

Refer to the Developed Basin Map and WWHM report for more details.

Infiltration Volume Required: 1,767 CF

Infiltration Volume Provided: 1,797 CF

The flow control will be met by Infiltration Trench-1. This trench was modelled as an equivalent gravel trench element in the WWHM (4.2.19). The total volume for the trench is 1,797 CF for a surface area of 2,245 SF and depth of 2-ft. The porosity is 0.40. The designed gravel trench has 1,797 CF for a surface area of 2,245 SF and depth of 2-ft. The volume for the infiltration trench is greater than the designed gravel trench.

5.2 Basin-2 Summary

Existing Basin-2

Basin-2 Area = 0.93 Acres

The entire basin was modeled as forested.

Refer to the Existing Basin Map and WWHM report for more details.

Developed Basin-2

Basin-2 Area = 0.93 Acres

Site Impervious:

Road	= 0.47 Acres (20,399 SF)
Frontage Road	= 0.20 Acres (8,668 SF)
Existing Road	= 0.05 Acres (2,109 SF)
Roof	= 0.26 Acres (11,525 SF)
Frontage Sidewalk	= 0.03 Acres (1,316 SF)
Sidewalk	= 0.06 Acres (2,601 SF)
Total Impervious	= 0.82 Acres (35,841 SF)

Site Pervious:

Pervious Area (Lawn) = 0.93 - 0.82 = 0.11 Acres

Refer to the Developed Basin Map and WWHM report for more details.

Infiltration Volume Required: 1,921 CF

Infiltration Volume Provided: 1,972 CF

The flow control will be met by Infiltration Trench-2. This trench was modelled as an equivalent gravel trench element in the WWHM (4.2.19). The total volume for the trench is 1,972 CF for a surface area of 2,465 SF and depth of 2-ft. The porosity is 0.40. The designed gravel trench has 1,921 CF for a surface area of 2,401 SF and depth of 2-ft. The volume for the infiltration trench is greater than the designed gravel trench.

5.3 Basin-3 Summary

Existing Basin-3

Basin-3 Area = 1.74 Acres

The entire basin was modeled as forested.

Refer to the Existing Basin Map and WWHM report for more details.

Developed Basin-3

Basin-3 Area = 1.74 Acres

Site Impervious:

Road	= 0.28 Acres (12,116 SF)
Frontage Road	= 0.24 Acres (10,651 SF)
Existing Road	= 0.05 Acres (2,332 SF)
Roof	= 0.61 Acres (26,582 SF)
Frontage Sidewalk	= 0.02 Acres (1,076 SF)
Sidewalk	= 0.11 Acres (4,837 SF)
Total Impervious	= 1.33 Acres (57,594 SF)

Site Pervious:

Pervious Area (Lawn) = 1.74 – 1.35 = 0.41 Acres

Refer to the Developed Basin Map and WWHM report for more details.

Infiltration Volume Required: 3,328 CF

Infiltration Volume Provided: 3,330 CF

The flow control will be met by Infiltration Trench-3. This trench was modelled as an equivalent gravel trench element in the WWHM (4.2.19). The total volume for the trench is 3,330 CF for a surface area of 4,226 SF and depth of 2-ft. The porosity is 0.40. The designed gravel trench has 3,328 CF for a surface area of 4,160 SF and depth of 2-ft. The volume for the infiltration trench is greater than the designed gravel trench.

5.4 Basin-4 Summary

Existing Basin-4

Basin-4 Area = 1.39 Acres

The entire basin was modeled as forested.

Refer to the Existing Basin Map and WWHM report for more details.

Developed Basin-4

Basin-4 Area = 1.39 Acres

Site Impervious:

Road	= 0.53 Acres (22,898 SF)
Roof	= 0.49 Acres (21,546 SF)
Sidewalk	= 0.11 Acres (3,123 SF)
Total Impervious	= 1.09 Acres (47,567 SF)

Site Pervious:

Pervious Area (Lawn) = 1.39 – 1.09 = 0.30 Acres

Refer to the Developed Basin Map and WWHM report for more details.

Infiltration Volume Required: 2,599 CF

Infiltration Volume Provided: 2,641 CF

The flow control will be met by Infiltration Trench-4. This trench was modelled as an equivalent gravel trench element in the WWHM (4.2.19). The total volume for the trench is 2,641 CF for a surface area of 3,308 SF and depth of 2-ft. The porosity is 0.40. The designed gravel trench has 2,599 CF for a surface area of 3,249 SF and depth of 2-ft. The volume for the infiltration trench is greater than the designed gravel trench.

5.5 Basin-5 Summary

Existing Basin-5

Basin-5 Area = 3.11 Acres

The entire basin was modeled as forested.

Refer to the Existing Basin Map and WWHM report for more details.

Developed Basin-5

Basin-5 Area = 3.11 Acres

Site Impervious:

Frontage Road	= 0.28 Acres (12,196 SF)
Existing Road	= 0.09 Acres (3,880 SF)
Road	= 0.70 Acres (30,660 SF)
Roof	= 0.82 Acres (35,528 SF)
Frontage Sidewalk	= 0.06 Acres (2,472 SF)
Sidewalk	= 0.20 Acres (8,616 SF)
Total Impervious	= 2.14 Acres (93,352 SF)

Site Pervious:

Pervious Area (Lawn) = 3.11 – 2.14 = 0.97 Acres

Refer to the Developed Basin Map and WWHM report for more details.

Infiltration Volume Required: 6,055 CF

Infiltration Volume Provided: 7,667 CF

The flow control will be met by Infiltration Trench-5. This trench was modelled as an equivalent gravel trench element in the WWHM (4.2.19). The total volume for the trench is 6,055 CF for a surface area of 7,590 SF and depth of 2-ft. The porosity is 0.40. The designed

gravel trench has 6,055 CF for a surface area of 7,569 SF and depth of 2-ft. The volume for the infiltration trench is greater than the designed gravel trench.

5.6 Basin-6 Summary

Existing Basin-6

Basin-6 Area = 0.34 Acres

The entire basin was modeled as forested.

Refer to the Existing Basin Map and WWHM report for more details.

Developed Basin-6

Basin-6 Area = 0.34 Acres

Site Impervious:

Frontage Road	= 0.04 Acres (1,740 SF)
Existing Road	= 0.03 Acres (1,412 SF)
Road	= 0.14 Acres (6,193 SF)
Frontage Sidewalk	= 0.01 Acres (343 SF)
Sidewalk	= 0.03 Acres (1,300 SF)
Total Impervious	= 0.25 Acres (10,988 SF)

Site Pervious:

Pervious Area (Lawn) = 0.34 – 0.25 = 0.11 Acres

Refer to the Developed Basin Map and WWHM report for more details.

Bioretention Area Required: 350 SF

Bioretention Area Provided: 370 SF

The flow control will be met by Bioretention 1. This was modelled as an equivalent rain garden element in the WWHM (4.2.19). The bioretention has been designed to have a total depth of 2½-ft:1 ½ -ft for the bioretention soils, ½-ft of ponding depth, and 1/2 –ft of freeboard. The bottom dimensions of the bioretention has been designed to be 18.7-ft long by 18.70-ft wide with 3:1 side slopes. A designed infiltration rate of 5-in/hr per geotechnical recommendations was used in the analysis. A bioretention of 370 SF is provided on the northern side of the project.

EXISTING BASIN MAP

DV BASIN-1
(0.94 AC)

DV BASIN-6
(0.34 AC)

DV BASIN-2
(0.93 AC)

DV BASIN-3
(1.74 AC)

DV BASIN-4
(1.39 AC)

DV BASIN-5
(3.11 AC)

SCALE: 1" = 100'

0 50 100

DEVELOPED BASIN MAP

WWHM2012
PROJECT REPORT

Project Name: Smokey Point Ridge
Site Name: Smokey Point Ridge
Site Address: 19402 Smokey Point Blvd
City : Arlington
Report Date: 11/2/2023
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.20
Version Date: 2023/01/27
Version : 4.2.19

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin-1
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	.94
Pervious Total	0.94

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.94

Element Flows To:

Surface	Interflow	Groundwater

Name : Basin-2
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	.93
Pervious Total	0.93

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.93

Element Flows To:

Surface	Interflow	Groundwater

Name : Basin-3
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	1.74
Pervious Total	1.74

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.74

Element Flows To:

Surface	Interflow	Groundwater

Name : Basin-4
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	1.39
Pervious Total	1.39

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.39

Element Flows To:

Surface	Interflow	Groundwater

Name : Basin-5
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	3.11
Pervious Total	3.11

Impervious Land Use	acre
Impervious Total	0
Basin Total	3.11

Element Flows To:

Surface	Interflow	Groundwater

Name : Basin-6
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	.34
Pervious Total	0.34

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.34

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Basin-1
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	.21
Pervious Total	0.21

Impervious Land Use	acre
ROADS FLAT	0.39
ROOF TOPS FLAT	0.27
SIDEWALKS FLAT	0.07
Impervious Total	0.73
Basin Total	0.94

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 1	Gravel Trench Bed 1	

Name : Basin-2
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	.11
Pervious Total	0.11

Impervious Land Use	acre
ROADS FLAT	0.47
ROOF TOPS FLAT	0.26
SIDEWALKS FLAT	0.09

Impervious Total	**0.82**
Basin Total	**0.93**

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 2	Gravel Trench Bed 2	

Name : Basin-3
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	.41
Pervious Total	**0.41**

Impervious Land Use	acre
ROADS FLAT	0.58
ROOF TOPS FLAT	0.61
SIDEWALKS FLAT	0.14
Impervious Total	**1.33**
Basin Total	**1.74**

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 3	Gravel Trench Bed 3	

Name : Basin-4
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	.3
Pervious Total	**0.3**

Impervious Land Use	acre
ROADS FLAT	0.53
ROOF TOPS FLAT	0.49
SIDEWALKS FLAT	0.07

Impervious Total	**1.09**
Basin Total	**1.39**

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 4	Gravel Trench Bed 4	

Name : Basin-5
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Lawn, Flat	.97
Pervious Total	**0.97**

Impervious Land Use	acre
ROADS FLAT	1.07
ROOF TOPS FLAT	0.82
SIDEWALKS FLAT	0.25
Impervious Total	**2.14**
Basin Total	**3.11**

Element Flows To:

Surface	Interflow	Groundwater
Gravel Trench Bed 5	Gravel Trench Bed 5	

Name : Gravel Trench Bed 1
Bottom Length: 47.00 ft.
Bottom Width: 47.00 ft.
Trench bottom slope 1: 0 To 1
Trench Left side slope 0: 0 To 1
Trench right side slope 2: 0 To 1
Material thickness of first layer: 2
Pour Space of material for first layer: 0.4
Material thickness of second layer: 0
Pour Space of material for second layer: 0
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On

Infiltration rate: 5
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 141.256
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 141.256
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.050	0.000	0.000	0.000
0.0222	0.050	0.000	0.000	0.255
0.0444	0.050	0.000	0.000	0.255
0.0667	0.050	0.001	0.000	0.255
0.0889	0.050	0.001	0.000	0.255
0.1111	0.050	0.002	0.000	0.255
0.1333	0.050	0.002	0.000	0.255
0.1556	0.050	0.003	0.000	0.255
0.1778	0.050	0.003	0.000	0.255
0.2000	0.050	0.004	0.000	0.255
0.2222	0.050	0.004	0.000	0.255
0.2444	0.050	0.005	0.000	0.255
0.2667	0.050	0.005	0.000	0.255
0.2889	0.050	0.005	0.000	0.255
0.3111	0.050	0.006	0.000	0.255
0.3333	0.050	0.006	0.000	0.255
0.3556	0.050	0.007	0.000	0.255
0.3778	0.050	0.007	0.000	0.255
0.4000	0.050	0.008	0.000	0.255
0.4222	0.050	0.008	0.000	0.255
0.4444	0.050	0.009	0.000	0.255
0.4667	0.050	0.009	0.000	0.255
0.4889	0.050	0.009	0.000	0.255
0.5111	0.050	0.010	0.000	0.255
0.5333	0.050	0.010	0.000	0.255
0.5556	0.050	0.011	0.000	0.255
0.5778	0.050	0.011	0.000	0.255
0.6000	0.050	0.012	0.000	0.255
0.6222	0.050	0.012	0.000	0.255
0.6444	0.050	0.013	0.000	0.255
0.6667	0.050	0.013	0.000	0.255
0.6889	0.050	0.014	0.000	0.255
0.7111	0.050	0.014	0.000	0.255
0.7333	0.050	0.014	0.000	0.255

0.7556	0.050	0.015	0.000	0.255
0.7778	0.050	0.015	0.000	0.255
0.8000	0.050	0.016	0.000	0.255
0.8222	0.050	0.016	0.000	0.255
0.8444	0.050	0.017	0.000	0.255
0.8667	0.050	0.017	0.000	0.255
0.8889	0.050	0.018	0.000	0.255
0.9111	0.050	0.018	0.000	0.255
0.9333	0.050	0.018	0.000	0.255
0.9556	0.050	0.019	0.000	0.255
0.9778	0.050	0.019	0.000	0.255
1.0000	0.050	0.020	0.000	0.255
1.0222	0.050	0.020	0.000	0.255
1.0444	0.050	0.021	0.000	0.255
1.0667	0.050	0.021	0.000	0.255
1.0889	0.050	0.022	0.000	0.255
1.1111	0.050	0.022	0.000	0.255
1.1333	0.050	0.023	0.000	0.255
1.1556	0.050	0.023	0.000	0.255
1.1778	0.050	0.023	0.000	0.255
1.2000	0.050	0.024	0.000	0.255
1.2222	0.050	0.024	0.000	0.255
1.2444	0.050	0.025	0.000	0.255
1.2667	0.050	0.025	0.000	0.255
1.2889	0.050	0.026	0.000	0.255
1.3111	0.050	0.026	0.000	0.255
1.3333	0.050	0.027	0.000	0.255
1.3556	0.050	0.027	0.000	0.255
1.3778	0.050	0.027	0.000	0.255
1.4000	0.050	0.028	0.000	0.255
1.4222	0.050	0.028	0.000	0.255
1.4444	0.050	0.029	0.000	0.255
1.4667	0.050	0.029	0.000	0.255
1.4889	0.050	0.030	0.000	0.255
1.5111	0.050	0.030	0.000	0.255
1.5333	0.050	0.031	0.000	0.255
1.5556	0.050	0.031	0.000	0.255
1.5778	0.050	0.032	0.000	0.255
1.6000	0.050	0.032	0.000	0.255
1.6222	0.050	0.032	0.000	0.255
1.6444	0.050	0.033	0.000	0.255
1.6667	0.050	0.033	0.000	0.255
1.6889	0.050	0.034	0.000	0.255
1.7111	0.050	0.034	0.000	0.255
1.7333	0.050	0.035	0.000	0.255
1.7556	0.050	0.035	0.000	0.255
1.7778	0.050	0.036	0.000	0.255
1.8000	0.050	0.036	0.000	0.255
1.8222	0.050	0.037	0.000	0.255
1.8444	0.050	0.037	0.000	0.255
1.8667	0.050	0.037	0.000	0.255
1.8889	0.050	0.038	0.000	0.255
1.9111	0.050	0.038	0.000	0.255
1.9333	0.050	0.039	0.000	0.255
1.9556	0.050	0.039	0.000	0.255

1.9778	0.050	0.040	0.000	0.255
2.0000	0.050	0.040	0.000	0.255

Name : Gravel Trench Bed 2
Bottom Length: 49.00 ft.
Bottom Width: 49.00 ft.
Trench bottom slope 1: 0 To 1
Trench Left side slope 0: 0 To 1
Trench right side slope 2: 0 To 1
Material thickness of first layer: 2
Pour Space of material for first layer: 0.4
Material thickness of second layer: 0
Pour Space of material for second layer: 0
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 5
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 158.612
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 158.612
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.055	0.000	0.000	0.000
0.0222	0.055	0.000	0.000	0.277
0.0444	0.055	0.001	0.000	0.277
0.0667	0.055	0.001	0.000	0.277
0.0889	0.055	0.002	0.000	0.277
0.1111	0.055	0.002	0.000	0.277
0.1333	0.055	0.002	0.000	0.277
0.1556	0.055	0.003	0.000	0.277
0.1778	0.055	0.003	0.000	0.277
0.2000	0.055	0.004	0.000	0.277
0.2222	0.055	0.004	0.000	0.277
0.2444	0.055	0.005	0.000	0.277
0.2667	0.055	0.005	0.000	0.277
0.2889	0.055	0.006	0.000	0.277
0.3111	0.055	0.006	0.000	0.277
0.3333	0.055	0.007	0.000	0.277
0.3556	0.055	0.007	0.000	0.277

0.3778	0.055	0.008	0.000	0.277
0.4000	0.055	0.008	0.000	0.277
0.4222	0.055	0.009	0.000	0.277
0.4444	0.055	0.009	0.000	0.277
0.4667	0.055	0.010	0.000	0.277
0.4889	0.055	0.010	0.000	0.277
0.5111	0.055	0.011	0.000	0.277
0.5333	0.055	0.011	0.000	0.277
0.5556	0.055	0.012	0.000	0.277
0.5778	0.055	0.012	0.000	0.277
0.6000	0.055	0.013	0.000	0.277
0.6222	0.055	0.013	0.000	0.277
0.6444	0.055	0.014	0.000	0.277
0.6667	0.055	0.014	0.000	0.277
0.6889	0.055	0.015	0.000	0.277
0.7111	0.055	0.015	0.000	0.277
0.7333	0.055	0.016	0.000	0.277
0.7556	0.055	0.016	0.000	0.277
0.7778	0.055	0.017	0.000	0.277
0.8000	0.055	0.017	0.000	0.277
0.8222	0.055	0.018	0.000	0.277
0.8444	0.055	0.018	0.000	0.277
0.8667	0.055	0.019	0.000	0.277
0.8889	0.055	0.019	0.000	0.277
0.9111	0.055	0.020	0.000	0.277
0.9333	0.055	0.020	0.000	0.277
0.9556	0.055	0.021	0.000	0.277
0.9778	0.055	0.021	0.000	0.277
1.0000	0.055	0.022	0.000	0.277
1.0222	0.055	0.022	0.000	0.277
1.0444	0.055	0.023	0.000	0.277
1.0667	0.055	0.023	0.000	0.277
1.0889	0.055	0.024	0.000	0.277
1.1111	0.055	0.024	0.000	0.277
1.1333	0.055	0.025	0.000	0.277
1.1556	0.055	0.025	0.000	0.277
1.1778	0.055	0.026	0.000	0.277
1.2000	0.055	0.026	0.000	0.277
1.2222	0.055	0.026	0.000	0.277
1.2444	0.055	0.027	0.000	0.277
1.2667	0.055	0.027	0.000	0.277
1.2889	0.055	0.028	0.000	0.277
1.3111	0.055	0.028	0.000	0.277
1.3333	0.055	0.029	0.000	0.277
1.3556	0.055	0.029	0.000	0.277
1.3778	0.055	0.030	0.000	0.277
1.4000	0.055	0.030	0.000	0.277
1.4222	0.055	0.031	0.000	0.277
1.4444	0.055	0.031	0.000	0.277
1.4667	0.055	0.032	0.000	0.277
1.4889	0.055	0.032	0.000	0.277
1.5111	0.055	0.033	0.000	0.277
1.5333	0.055	0.033	0.000	0.277
1.5556	0.055	0.034	0.000	0.277
1.5778	0.055	0.034	0.000	0.277

1.6000	0.055	0.035	0.000	0.277
1.6222	0.055	0.035	0.000	0.277
1.6444	0.055	0.036	0.000	0.277
1.6667	0.055	0.036	0.000	0.277
1.6889	0.055	0.037	0.000	0.277
1.7111	0.055	0.037	0.000	0.277
1.7333	0.055	0.038	0.000	0.277
1.7556	0.055	0.038	0.000	0.277
1.7778	0.055	0.039	0.000	0.277
1.8000	0.055	0.039	0.000	0.277
1.8222	0.055	0.040	0.000	0.277
1.8444	0.055	0.040	0.000	0.277
1.8667	0.055	0.041	0.000	0.277
1.8889	0.055	0.041	0.000	0.277
1.9111	0.055	0.042	0.000	0.277
1.9333	0.055	0.042	0.000	0.277
1.9556	0.055	0.043	0.000	0.277
1.9778	0.055	0.043	0.000	0.277
2.0000	0.055	0.044	0.000	0.277

Name : Gravel Trench Bed 3
Bottom Length: 64.50 ft.
Bottom Width: 64.50 ft.
Trench bottom slope 1: 0 To 1
Trench Left side slope 0: 0 To 1
Trench right side slope 2: 0 To 1
Material thickness of first layer: 2
Pour Space of material for first layer: 0.4
Material thickness of second layer: 0
Pour Space of material for second layer: 0
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 5
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 257.673
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 257.673
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)

0.0000	0.095	0.000	0.000	0.000
0.0222	0.095	0.000	0.000	0.481
0.0444	0.095	0.001	0.000	0.481
0.0667	0.095	0.002	0.000	0.481
0.0889	0.095	0.003	0.000	0.481
0.1111	0.095	0.004	0.000	0.481
0.1333	0.095	0.005	0.000	0.481
0.1556	0.095	0.005	0.000	0.481
0.1778	0.095	0.006	0.000	0.481
0.2000	0.095	0.007	0.000	0.481
0.2222	0.095	0.008	0.000	0.481
0.2444	0.095	0.009	0.000	0.481
0.2667	0.095	0.010	0.000	0.481
0.2889	0.095	0.011	0.000	0.481
0.3111	0.095	0.011	0.000	0.481
0.3333	0.095	0.012	0.000	0.481
0.3556	0.095	0.013	0.000	0.481
0.3778	0.095	0.014	0.000	0.481
0.4000	0.095	0.015	0.000	0.481
0.4222	0.095	0.016	0.000	0.481
0.4444	0.095	0.017	0.000	0.481
0.4667	0.095	0.017	0.000	0.481
0.4889	0.095	0.018	0.000	0.481
0.5111	0.095	0.019	0.000	0.481
0.5333	0.095	0.020	0.000	0.481
0.5556	0.095	0.021	0.000	0.481
0.5778	0.095	0.022	0.000	0.481
0.6000	0.095	0.022	0.000	0.481
0.6222	0.095	0.023	0.000	0.481
0.6444	0.095	0.024	0.000	0.481
0.6667	0.095	0.025	0.000	0.481
0.6889	0.095	0.026	0.000	0.481
0.7111	0.095	0.027	0.000	0.481
0.7333	0.095	0.028	0.000	0.481
0.7556	0.095	0.028	0.000	0.481
0.7778	0.095	0.029	0.000	0.481
0.8000	0.095	0.030	0.000	0.481
0.8222	0.095	0.031	0.000	0.481
0.8444	0.095	0.032	0.000	0.481
0.8667	0.095	0.033	0.000	0.481
0.8889	0.095	0.034	0.000	0.481
0.9111	0.095	0.034	0.000	0.481
0.9333	0.095	0.035	0.000	0.481
0.9556	0.095	0.036	0.000	0.481
0.9778	0.095	0.037	0.000	0.481
1.0000	0.095	0.038	0.000	0.481
1.0222	0.095	0.039	0.000	0.481
1.0444	0.095	0.039	0.000	0.481
1.0667	0.095	0.040	0.000	0.481
1.0889	0.095	0.041	0.000	0.481
1.1111	0.095	0.042	0.000	0.481
1.1333	0.095	0.043	0.000	0.481
1.1556	0.095	0.044	0.000	0.481
1.1778	0.095	0.045	0.000	0.481
1.2000	0.095	0.045	0.000	0.481

1.2222	0.095	0.046	0.000	0.481
1.2444	0.095	0.047	0.000	0.481
1.2667	0.095	0.048	0.000	0.481
1.2889	0.095	0.049	0.000	0.481
1.3111	0.095	0.050	0.000	0.481
1.3333	0.095	0.050	0.000	0.481
1.3556	0.095	0.051	0.000	0.481
1.3778	0.095	0.052	0.000	0.481
1.4000	0.095	0.053	0.000	0.481
1.4222	0.095	0.054	0.000	0.481
1.4444	0.095	0.055	0.000	0.481
1.4667	0.095	0.056	0.000	0.481
1.4889	0.095	0.056	0.000	0.481
1.5111	0.095	0.057	0.000	0.481
1.5333	0.095	0.058	0.000	0.481
1.5556	0.095	0.059	0.000	0.481
1.5778	0.095	0.060	0.000	0.481
1.6000	0.095	0.061	0.000	0.481
1.6222	0.095	0.062	0.000	0.481
1.6444	0.095	0.062	0.000	0.481
1.6667	0.095	0.063	0.000	0.481
1.6889	0.095	0.064	0.000	0.481
1.7111	0.095	0.065	0.000	0.481
1.7333	0.095	0.066	0.000	0.481
1.7556	0.095	0.067	0.000	0.481
1.7778	0.095	0.067	0.000	0.481
1.8000	0.095	0.068	0.000	0.481
1.8222	0.095	0.069	0.000	0.481
1.8444	0.095	0.070	0.000	0.481
1.8667	0.095	0.071	0.000	0.481
1.8889	0.095	0.072	0.000	0.481
1.9111	0.095	0.073	0.000	0.481
1.9333	0.095	0.073	0.000	0.481
1.9556	0.095	0.074	0.000	0.481
1.9778	0.095	0.075	0.000	0.481
2.0000	0.095	0.076	0.000	0.481

Name : Gravel Trench Bed 4
Bottom Length: 57.00 ft.
Bottom Width: 57.00 ft.
Trench bottom slope 1: 0 To 1
Trench Left side slope 0: 0 To 1
Trench right side slope 2: 0 To 1
Material thickness of first layer: 2
Pour Space of material for first layer: 0.4
Material thickness of second layer: 0
Pour Space of material for second layer: 0
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 5
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 211.074
Total Volume Through Riser (ac-ft.): 0

Total Volume Through Facility (ac-ft.): 211.074
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.074	0.000	0.000	0.000
0.0222	0.074	0.000	0.000	0.376
0.0444	0.074	0.001	0.000	0.376
0.0667	0.074	0.002	0.000	0.376
0.0889	0.074	0.002	0.000	0.376
0.1111	0.074	0.003	0.000	0.376
0.1333	0.074	0.004	0.000	0.376
0.1556	0.074	0.004	0.000	0.376
0.1778	0.074	0.005	0.000	0.376
0.2000	0.074	0.006	0.000	0.376
0.2222	0.074	0.006	0.000	0.376
0.2444	0.074	0.007	0.000	0.376
0.2667	0.074	0.008	0.000	0.376
0.2889	0.074	0.008	0.000	0.376
0.3111	0.074	0.009	0.000	0.376
0.3333	0.074	0.009	0.000	0.376
0.3556	0.074	0.010	0.000	0.376
0.3778	0.074	0.011	0.000	0.376
0.4000	0.074	0.011	0.000	0.376
0.4222	0.074	0.012	0.000	0.376
0.4444	0.074	0.013	0.000	0.376
0.4667	0.074	0.013	0.000	0.376
0.4889	0.074	0.014	0.000	0.376
0.5111	0.074	0.015	0.000	0.376
0.5333	0.074	0.015	0.000	0.376
0.5556	0.074	0.016	0.000	0.376
0.5778	0.074	0.017	0.000	0.376
0.6000	0.074	0.017	0.000	0.376
0.6222	0.074	0.018	0.000	0.376
0.6444	0.074	0.019	0.000	0.376
0.6667	0.074	0.019	0.000	0.376
0.6889	0.074	0.020	0.000	0.376
0.7111	0.074	0.021	0.000	0.376
0.7333	0.074	0.021	0.000	0.376
0.7556	0.074	0.022	0.000	0.376
0.7778	0.074	0.023	0.000	0.376
0.8000	0.074	0.023	0.000	0.376
0.8222	0.074	0.024	0.000	0.376

0.8444	0.074	0.025	0.000	0.376
0.8667	0.074	0.025	0.000	0.376
0.8889	0.074	0.026	0.000	0.376
0.9111	0.074	0.027	0.000	0.376
0.9333	0.074	0.027	0.000	0.376
0.9556	0.074	0.028	0.000	0.376
0.9778	0.074	0.029	0.000	0.376
1.0000	0.074	0.029	0.000	0.376
1.0222	0.074	0.030	0.000	0.376
1.0444	0.074	0.031	0.000	0.376
1.0667	0.074	0.031	0.000	0.376
1.0889	0.074	0.032	0.000	0.376
1.1111	0.074	0.033	0.000	0.376
1.1333	0.074	0.033	0.000	0.376
1.1556	0.074	0.034	0.000	0.376
1.1778	0.074	0.035	0.000	0.376
1.2000	0.074	0.035	0.000	0.376
1.2222	0.074	0.036	0.000	0.376
1.2444	0.074	0.037	0.000	0.376
1.2667	0.074	0.037	0.000	0.376
1.2889	0.074	0.038	0.000	0.376
1.3111	0.074	0.039	0.000	0.376
1.3333	0.074	0.039	0.000	0.376
1.3556	0.074	0.040	0.000	0.376
1.3778	0.074	0.041	0.000	0.376
1.4000	0.074	0.041	0.000	0.376
1.4222	0.074	0.042	0.000	0.376
1.4444	0.074	0.043	0.000	0.376
1.4667	0.074	0.043	0.000	0.376
1.4889	0.074	0.044	0.000	0.376
1.5111	0.074	0.045	0.000	0.376
1.5333	0.074	0.045	0.000	0.376
1.5556	0.074	0.046	0.000	0.376
1.5778	0.074	0.047	0.000	0.376
1.6000	0.074	0.047	0.000	0.376
1.6222	0.074	0.048	0.000	0.376
1.6444	0.074	0.049	0.000	0.376
1.6667	0.074	0.049	0.000	0.376
1.6889	0.074	0.050	0.000	0.376
1.7111	0.074	0.051	0.000	0.376
1.7333	0.074	0.051	0.000	0.376
1.7556	0.074	0.052	0.000	0.376
1.7778	0.074	0.053	0.000	0.376
1.8000	0.074	0.053	0.000	0.376
1.8222	0.074	0.054	0.000	0.376
1.8444	0.074	0.055	0.000	0.376
1.8667	0.074	0.055	0.000	0.376
1.8889	0.074	0.056	0.000	0.376
1.9111	0.074	0.057	0.000	0.376
1.9333	0.074	0.057	0.000	0.376
1.9556	0.074	0.058	0.000	0.376
1.9778	0.074	0.059	0.000	0.376
2.0000	0.074	0.059	0.000	0.376

Name : Gravel Trench Bed 5
Bottom Length: 87.00 ft.
Bottom Width: 87.00 ft.
Trench bottom slope 1: 0 To 1
Trench Left side slope 0: 0 To 1
Trench right side slope 2: 0 To 1
Material thickness of first layer: 2
Pour Space of material for first layer: 0.4
Material thickness of second layer: 0
Pour Space of material for second layer: 0
Material thickness of third layer: 0
Pour Space of material for third layer: 0
Infiltration On
Infiltration rate: 5
Infiltration safety factor: 1
Total Volume Infiltrated (ac-ft.): 415.104
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 415.104
Percent Infiltrated: 100
Total Precip Applied to Facility: 0
Total Evap From Facility: 0
Discharge Structure
Riser Height: 0 ft.
Riser Diameter: 0 in.

Element Flows To:
Outlet 1 **Outlet 2**

Gravel Trench Bed Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.173	0.000	0.000	0.000
0.0222	0.173	0.001	0.000	0.876
0.0444	0.173	0.003	0.000	0.876
0.0667	0.173	0.004	0.000	0.876
0.0889	0.173	0.006	0.000	0.876
0.1111	0.173	0.007	0.000	0.876
0.1333	0.173	0.009	0.000	0.876
0.1556	0.173	0.010	0.000	0.876
0.1778	0.173	0.012	0.000	0.876
0.2000	0.173	0.013	0.000	0.876
0.2222	0.173	0.015	0.000	0.876
0.2444	0.173	0.017	0.000	0.876
0.2667	0.173	0.018	0.000	0.876
0.2889	0.173	0.020	0.000	0.876
0.3111	0.173	0.021	0.000	0.876
0.3333	0.173	0.023	0.000	0.876
0.3556	0.173	0.024	0.000	0.876
0.3778	0.173	0.026	0.000	0.876
0.4000	0.173	0.027	0.000	0.876
0.4222	0.173	0.029	0.000	0.876
0.4444	0.173	0.030	0.000	0.876

0.4667	0.173	0.032	0.000	0.876
0.4889	0.173	0.034	0.000	0.876
0.5111	0.173	0.035	0.000	0.876
0.5333	0.173	0.037	0.000	0.876
0.5556	0.173	0.038	0.000	0.876
0.5778	0.173	0.040	0.000	0.876
0.6000	0.173	0.041	0.000	0.876
0.6222	0.173	0.043	0.000	0.876
0.6444	0.173	0.044	0.000	0.876
0.6667	0.173	0.046	0.000	0.876
0.6889	0.173	0.047	0.000	0.876
0.7111	0.173	0.049	0.000	0.876
0.7333	0.173	0.051	0.000	0.876
0.7556	0.173	0.052	0.000	0.876
0.7778	0.173	0.054	0.000	0.876
0.8000	0.173	0.055	0.000	0.876
0.8222	0.173	0.057	0.000	0.876
0.8444	0.173	0.058	0.000	0.876
0.8667	0.173	0.060	0.000	0.876
0.8889	0.173	0.061	0.000	0.876
0.9111	0.173	0.063	0.000	0.876
0.9333	0.173	0.064	0.000	0.876
0.9556	0.173	0.066	0.000	0.876
0.9778	0.173	0.068	0.000	0.876
1.0000	0.173	0.069	0.000	0.876
1.0222	0.173	0.071	0.000	0.876
1.0444	0.173	0.072	0.000	0.876
1.0667	0.173	0.074	0.000	0.876
1.0889	0.173	0.075	0.000	0.876
1.1111	0.173	0.077	0.000	0.876
1.1333	0.173	0.078	0.000	0.876
1.1556	0.173	0.080	0.000	0.876
1.1778	0.173	0.081	0.000	0.876
1.2000	0.173	0.083	0.000	0.876
1.2222	0.173	0.084	0.000	0.876
1.2444	0.173	0.086	0.000	0.876
1.2667	0.173	0.088	0.000	0.876
1.2889	0.173	0.089	0.000	0.876
1.3111	0.173	0.091	0.000	0.876
1.3333	0.173	0.092	0.000	0.876
1.3556	0.173	0.094	0.000	0.876
1.3778	0.173	0.095	0.000	0.876
1.4000	0.173	0.097	0.000	0.876
1.4222	0.173	0.098	0.000	0.876
1.4444	0.173	0.100	0.000	0.876
1.4667	0.173	0.101	0.000	0.876
1.4889	0.173	0.103	0.000	0.876
1.5111	0.173	0.105	0.000	0.876
1.5333	0.173	0.106	0.000	0.876
1.5556	0.173	0.108	0.000	0.876
1.5778	0.173	0.109	0.000	0.876
1.6000	0.173	0.111	0.000	0.876
1.6222	0.173	0.112	0.000	0.876
1.6444	0.173	0.114	0.000	0.876
1.6667	0.173	0.115	0.000	0.876

1.6889	0.173	0.117	0.000	0.876
1.7111	0.173	0.118	0.000	0.876
1.7333	0.173	0.120	0.000	0.876
1.7556	0.173	0.122	0.000	0.876
1.7778	0.173	0.123	0.000	0.876
1.8000	0.173	0.125	0.000	0.876
1.8222	0.173	0.126	0.000	0.876
1.8444	0.173	0.128	0.000	0.876
1.8667	0.173	0.129	0.000	0.876
1.8889	0.173	0.131	0.000	0.876
1.9111	0.173	0.132	0.000	0.876
1.9333	0.173	0.134	0.000	0.876
1.9556	0.173	0.135	0.000	0.876
1.9778	0.173	0.137	0.000	0.876
2.0000	0.173	0.139	0.000	0.876

Name : Basin 6
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Lawn, Flat	**.09**
Pervious Total	**0.09**

Impervious Land Use	**acre**
ROADS FLAT	**0.21**
SIDEWALKS FLAT	**0.04**
Impervious Total	**0.25**
Basin Total	**0.34**

Element Flows To:

Surface	**Interflow**	**Groundwater**
Surface retention 1	Surface retention 1	

Name : Bioretention 1
Bottom Length: 18.70 ft.
Bottom Width: 18.70 ft.
Material thickness of first layer: 1.5
Material type for first layer: SMMWW 12 in/hr
Material thickness of second layer: 0
Material type for second layer: Sand
Material thickness of third layer: 0
Material type for third layer: GRAVEL
Infiltration On
Infiltration rate: 5

Infiltration safety factor: 1
Wetted surface area On
Total Volume Infiltrated (ac-ft.): 49.35
Total Volume Through Riser (ac-ft.): 0
Total Volume Through Facility (ac-ft.): 49.35
Percent Infiltrated: 100
Total Precip Applied to Facility: 1.824
Total Evap From Facility: 0.997
Underdrain not used
Discharge Structure
Riser Height: 0.5 ft.
Riser Diameter: 12 in.

Element Flows To:
Outlet 1 **Outlet 2**

Bioretention 1 Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.0176	0.0000	0.0000	0.0000
0.0275	0.0175	0.0001	0.0000	0.0000
0.0549	0.0173	0.0002	0.0000	0.0000
0.0824	0.0171	0.0003	0.0000	0.0000
0.1099	0.0169	0.0004	0.0000	0.0000
0.1374	0.0167	0.0005	0.0000	0.0000
0.1648	0.0165	0.0006	0.0000	0.0005
0.1923	0.0163	0.0008	0.0000	0.0007
0.2198	0.0161	0.0009	0.0000	0.0010
0.2473	0.0159	0.0010	0.0000	0.0014
0.2747	0.0157	0.0011	0.0000	0.0018
0.3022	0.0155	0.0012	0.0000	0.0023
0.3297	0.0153	0.0013	0.0000	0.0028
0.3571	0.0151	0.0015	0.0000	0.0035
0.3846	0.0149	0.0016	0.0000	0.0043
0.4121	0.0147	0.0017	0.0000	0.0051
0.4396	0.0145	0.0019	0.0000	0.0061
0.4670	0.0143	0.0020	0.0000	0.0072
0.4945	0.0141	0.0021	0.0000	0.0084
0.5220	0.0139	0.0023	0.0000	0.0097
0.5495	0.0137	0.0024	0.0000	0.0112
0.5769	0.0136	0.0025	0.0000	0.0128
0.6044	0.0134	0.0027	0.0000	0.0146
0.6319	0.0132	0.0028	0.0000	0.0165
0.6593	0.0130	0.0030	0.0000	0.0186
0.6868	0.0128	0.0031	0.0000	0.0208
0.7143	0.0127	0.0033	0.0000	0.0233
0.7418	0.0125	0.0034	0.0000	0.0259
0.7692	0.0123	0.0036	0.0000	0.0287
0.7967	0.0121	0.0037	0.0000	0.0318
0.8242	0.0120	0.0039	0.0000	0.0350
0.8516	0.0118	0.0041	0.0000	0.0385
0.8791	0.0116	0.0042	0.0000	0.0423

0.9066	0.0114	0.0044	0.0000	0.0462
0.9341	0.0113	0.0046	0.0000	0.0504
0.9615	0.0111	0.0047	0.0000	0.0549
0.9890	0.0109	0.0049	0.0000	0.0597
1.0165	0.0108	0.0051	0.0000	0.0647
1.0440	0.0106	0.0053	0.0000	0.0701
1.0714	0.0105	0.0054	0.0000	0.0731
1.0989	0.0103	0.0056	0.0000	0.0740
1.1264	0.0101	0.0058	0.0000	0.0750
1.1538	0.0100	0.0060	0.0000	0.0760
1.1813	0.0098	0.0062	0.0000	0.0770
1.2088	0.0097	0.0064	0.0000	0.0780
1.2363	0.0095	0.0066	0.0000	0.0790
1.2637	0.0094	0.0068	0.0000	0.0799
1.2912	0.0092	0.0070	0.0000	0.0810
1.3187	0.0090	0.0072	0.0000	0.0820
1.3462	0.0089	0.0074	0.0000	0.0830
1.3736	0.0088	0.0076	0.0000	0.0840
1.4011	0.0086	0.0078	0.0000	0.0850
1.4286	0.0085	0.0080	0.0000	0.0861
1.4560	0.0083	0.0082	0.0000	0.0871
1.4835	0.0082	0.0084	0.0000	0.0882
1.5000	0.0080	0.0086	0.0000	0.0888

Surface retention 1 Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	To Amended(cfs)	Wetted Surface
1.5000	0.0176	0.0086	0.0000	0.0971	0.0011
1.5275	0.0178	0.0091	0.0000	0.0971	0.0021
1.5549	0.0180	0.0096	0.0000	0.1007	0.0032
1.5824	0.0182	0.0101	0.0000	0.1025	0.0043
1.6099	0.0185	0.0106	0.0000	0.1043	0.0054
1.6374	0.0187	0.0111	0.0000	0.1060	0.0065
1.6648	0.0189	0.0116	0.0000	0.1078	0.0076
1.6923	0.0191	0.0121	0.0000	0.1096	0.0087
1.7198	0.0193	0.0126	0.0000	0.1114	0.0098
1.7473	0.0196	0.0132	0.0000	0.1131	0.0109
1.7747	0.0198	0.0137	0.0000	0.1149	0.0120
1.8022	0.0200	0.0143	0.0000	0.1167	0.0131
1.8297	0.0202	0.0148	0.0000	0.1185	0.0143
1.8571	0.0204	0.0154	0.0000	0.1203	0.0154
1.8846	0.0207	0.0159	0.0000	0.1220	0.0166
1.9121	0.0209	0.0165	0.0000	0.1238	0.0177
1.9396	0.0211	0.0171	0.0000	0.1256	0.0189
1.9670	0.0214	0.0177	0.0000	0.1274	0.0200
1.9945	0.0216	0.0183	0.0000	0.1292	0.0212
2.0220	0.0218	0.0189	0.0346	0.1295	0.0224
2.0495	0.0221	0.0195	0.1165	0.1295	0.0236
2.0769	0.0223	0.0201	0.2257	0.1295	0.0248
2.1044	0.0225	0.0207	0.3555	0.1295	0.0260
2.1319	0.0228	0.0213	0.5015	0.1295	0.0272
2.1593	0.0230	0.0219	0.6597	0.1295	0.0284
2.1868	0.0232	0.0226	0.8261	0.1295	0.0296
2.2143	0.0235	0.0232	0.9966	0.1295	0.0308
2.2418	0.0237	0.0239	1.1671	0.1295	0.0321
2.2692	0.0240	0.0245	1.3333	0.1295	0.0333

2.2967	0.0242	0.0252	1.4914	0.1295	0.0345
2.3242	0.0245	0.0258	1.6378	0.1295	0.0358
2.3516	0.0247	0.0265	1.7695	0.1295	0.0370
2.3791	0.0250	0.0272	1.8845	0.1295	0.0383
2.4066	0.0252	0.0279	1.9818	0.1295	0.0396
2.4341	0.0255	0.0286	2.0620	0.1295	0.0408
2.4615	0.0257	0.0293	2.1274	0.1295	0.0421
2.4890	0.0260	0.0300	2.1826	0.1295	0.0426
2.5000	0.0261	0.0303	2.2635	0.1295	0.0000

Name : Surface retention 1

Element Flows To:

Outlet 1	**Outlet 2**
Bioretention 1	

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:8.45
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:2.09
Total Impervious Area:6.36

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.010882
5 year	0.026456
10 year	0.045498
25 year	0.086268
50 year	0.135027
100 year	0.206897

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1949	0.007	0.000
1950	0.028	0.000
1951	0.020	0.000
1952	0.007	0.000
1953	0.007	0.000
1954	0.065	0.000
1955	0.048	0.000
1956	0.007	0.000
1957	0.007	0.000
1958	0.007	0.000
1959	0.021	0.000
1960	0.017	0.000
1961	0.043	0.012
1962	0.007	0.000
1963	0.007	0.000
1964	0.030	0.000
1965	0.007	0.000
1966	0.007	0.000
1967	0.018	0.000
1968	0.007	0.000
1969	0.007	0.000
1970	0.007	0.000
1971	0.046	0.000
1972	0.007	0.000
1973	0.007	0.000
1974	0.025	0.000
1975	0.006	0.000
1976	0.021	0.000
1977	0.007	0.000
1978	0.009	0.000
1979	0.021	0.000
1980	0.007	0.000
1981	0.007	0.000
1982	0.014	0.000
1983	0.007	0.000
1984	0.007	0.000
1985	0.016	0.000
1986	0.083	0.000
1987	0.056	0.000
1988	0.007	0.000
1989	0.007	0.000
1990	0.007	0.000
1991	0.007	0.000
1992	0.007	0.000
1993	0.007	0.000
1994	0.007	0.000
1995	0.011	0.000
1996	0.116	0.000
1997	0.271	0.000
1998	0.007	0.000
1999	0.007	0.000

2000	0.018	0.000
2001	0.006	0.000
2002	0.007	0.000
2003	0.005	0.000
2004	0.007	0.000
2005	0.007	0.000
2006	0.310	0.000
2007	0.007	0.000
2008	0.014	0.000
2009	0.007	0.000

Stream Protection Duration
Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.3102	0.0125
2	0.2713	0.0000
3	0.1160	0.0000
4	0.0828	0.0000
5	0.0646	0.0000
6	0.0559	0.0000
7	0.0478	0.0000
8	0.0457	0.0000
9	0.0433	0.0000
10	0.0301	0.0000
11	0.0276	0.0000
12	0.0252	0.0000
13	0.0214	0.0000
14	0.0214	0.0000
15	0.0209	0.0000
16	0.0196	0.0000
17	0.0184	0.0000
18	0.0176	0.0000
19	0.0173	0.0000
20	0.0158	0.0000
21	0.0143	0.0000
22	0.0141	0.0000
23	0.0112	0.0000
24	0.0090	0.0000
25	0.0068	0.0000
26	0.0068	0.0000
27	0.0068	0.0000
28	0.0068	0.0000
29	0.0068	0.0000
30	0.0068	0.0000
31	0.0068	0.0000
32	0.0068	0.0000
33	0.0068	0.0000
34	0.0068	0.0000
35	0.0068	0.0000
36	0.0068	0.0000
37	0.0068	0.0000
38	0.0067	0.0000
39	0.0067	0.0000
40	0.0067	0.0000

41	0.0067	0.0000
42	0.0067	0.0000
43	0.0067	0.0000
44	0.0067	0.0000
45	0.0067	0.0000
46	0.0067	0.0000
47	0.0067	0.0000
48	0.0067	0.0000
49	0.0067	0.0000
50	0.0067	0.0000
51	0.0067	0.0000
52	0.0066	0.0000
53	0.0066	0.0000
54	0.0066	0.0000
55	0.0066	0.0000
56	0.0066	0.0000
57	0.0065	0.0000
58	0.0065	0.0000
59	0.0062	0.0000
60	0.0059	0.0000
61	0.0047	0.0000

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0054	1652	1	0	Pass
0.0067	242	1	0	Pass
0.0081	151	1	0	Pass
0.0094	128	1	0	Pass
0.0107	112	1	0	Pass
0.0120	99	1	1	Pass
0.0133	81	0	0	Pass
0.0146	69	0	0	Pass
0.0159	61	0	0	Pass
0.0172	58	0	0	Pass
0.0185	53	0	0	Pass
0.0198	50	0	0	Pass
0.0211	49	0	0	Pass
0.0225	45	0	0	Pass
0.0238	42	0	0	Pass
0.0251	38	0	0	Pass
0.0264	36	0	0	Pass
0.0277	33	0	0	Pass
0.0290	31	0	0	Pass
0.0303	29	0	0	Pass
0.0316	29	0	0	Pass
0.0329	29	0	0	Pass
0.0342	26	0	0	Pass
0.0355	26	0	0	Pass
0.0369	26	0	0	Pass

0.0382	24	0	0	Pass
0.0395	23	0	0	Pass
0.0408	23	0	0	Pass
0.0421	23	0	0	Pass
0.0434	22	0	0	Pass
0.0447	20	0	0	Pass
0.0460	19	0	0	Pass
0.0473	18	0	0	Pass
0.0486	16	0	0	Pass
0.0499	16	0	0	Pass
0.0513	16	0	0	Pass
0.0526	15	0	0	Pass
0.0539	15	0	0	Pass
0.0552	15	0	0	Pass
0.0565	14	0	0	Pass
0.0578	13	0	0	Pass
0.0591	13	0	0	Pass
0.0604	13	0	0	Pass
0.0617	13	0	0	Pass
0.0630	13	0	0	Pass
0.0643	13	0	0	Pass
0.0657	11	0	0	Pass
0.0670	11	0	0	Pass
0.0683	11	0	0	Pass
0.0696	11	0	0	Pass
0.0709	11	0	0	Pass
0.0722	11	0	0	Pass
0.0735	11	0	0	Pass
0.0748	11	0	0	Pass
0.0761	11	0	0	Pass
0.0774	11	0	0	Pass
0.0787	11	0	0	Pass
0.0801	11	0	0	Pass
0.0814	11	0	0	Pass
0.0827	11	0	0	Pass
0.0840	10	0	0	Pass
0.0853	9	0	0	Pass
0.0866	9	0	0	Pass
0.0879	9	0	0	Pass
0.0892	9	0	0	Pass
0.0905	9	0	0	Pass
0.0918	9	0	0	Pass
0.0931	9	0	0	Pass
0.0944	8	0	0	Pass
0.0958	7	0	0	Pass
0.0971	7	0	0	Pass
0.0984	7	0	0	Pass
0.0997	7	0	0	Pass
0.1010	7	0	0	Pass
0.1023	7	0	0	Pass
0.1036	7	0	0	Pass
0.1049	7	0	0	Pass
0.1062	7	0	0	Pass
0.1075	7	0	0	Pass
0.1088	7	0	0	Pass

0.1102	7	0	0	Pass
0.1115	7	0	0	Pass
0.1128	7	0	0	Pass
0.1141	7	0	0	Pass
0.1154	7	0	0	Pass
0.1167	6	0	0	Pass
0.1180	6	0	0	Pass
0.1193	6	0	0	Pass
0.1206	6	0	0	Pass
0.1219	6	0	0	Pass
0.1232	6	0	0	Pass
0.1246	6	0	0	Pass
0.1259	6	0	0	Pass
0.1272	6	0	0	Pass
0.1285	5	0	0	Pass
0.1298	5	0	0	Pass
0.1311	5	0	0	Pass
0.1324	5	0	0	Pass
0.1337	5	0	0	Pass
0.1350	5	0	0	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.1187 **acre-feet**
On-line facility target flow: 0.1904 **cfs.**
Adjusted for 15 min: 0.1904 **cfs.**
Off-line facility target flow: 0.1078 **cfs.**
Adjusted for 15 min: 0.1078 **cfs.**

LID Report

LID Technique	Used for Water Quality	Total Volume Percent Treatment Needs (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated
Gravel Trench Bed 1 POC	N	128.54			N	100.00
Gravel Trench Bed 2 POC	N	144.34			N	100.00
Gravel Trench Bed 3 POC	N	234.48			N	100.00
Gravel Trench Bed 4 POC	N	192.08			N	100.00
Gravel Trench Bed 5 POC	N	377.74			N	100.00
retention 1 POC	N	44.91			N	100.00
Total Volume Infiltrated		1122.09	0.00	0.00		100.00
0.00	0%	No Treat. Credit				

Compliance with LID Standard 8
Duration Analysis Result = Passed

POC #2 was not reported because POC must exist in both scenarios and both scenarios must have been run. POC #3 was not reported because POC must exist in both scenarios and both scenarios must have been run. POC #4 was not reported because POC must exist in both scenarios and both scenarios must have been run. POC #5 was not reported because POC must exist in both scenarios and both scenarios must have been run. POC #6 was not reported because POC must exist in both scenarios and both scenarios must have been run.**Perlnd and Implnd Changes**

No changes have been made.

5.7 Water Quality

Water quality for the site will be provided by filters located upstream of each infiltration trench.

WQ-1

WQ-1 Area = 0.78 Acres

Site Impervious:

Road	= 0.39 Acres (16,854 SF)
Roof	= 0.11 Acres (4,992 SF)
Sidewalk	= 0.07 Acres (2,970 SF)
Total Impervious	= 0.57 Acres (24,816 SF)

Site Pervious:

Pervious Area (Lawn) = 0.78 - 0.57 = 0.21 Acres

WQ-2

WQ-2 Area = 0.53 Acres

Site Impervious:

Road	= 0.22 Acres (9,586 SF)
Roof	= 0.18 Acres (7,675 SF)
Sidewalk	= 0.06 Acres (2,709 SF)
Total Impervious	= 0.46 Acres (19,970 SF)

Site Pervious:

Pervious Area (Lawn) = 0.53 - 0.46 = 0.07 Acres

WQ-3

WQ-3 Area = 0.31 Acres

Site Impervious:

Road	= 0.25 Acres (10,813 SF)
Sidewalk	= 0.03 Acres (1,208 SF)
Total Impervious	= 0.28 Acres (12,021 SF)

Site Pervious:

Pervious Area (Lawn) = 0.31 - 0.28 = 0.03 Acres

WQ-4

WQ-4 Area = 0.43 Acres

Site Impervious:

Road	= 0.13 Acres (5,598 SF)
Sidewalk	= 0.06 Acres (2,782 SF)
Total Impervious	= 0.19 Acres (8,380 SF)

Site Pervious:

Pervious Area (Lawn) = 0.43 - 0.19= 0.24 Acres

WQ-5

WQ-5 Area = 0.81 Acres

Site Impervious:

Road	= 0.45 Acres (19,501 SF)
Roof	= 0.13 Acres (5,783 SF)
Sidewalk	= 0.07 Acres (3,13 SF)
Total Impervious	= 0.65 Acres (28,415 SF)

Site Pervious:

Pervious Area (Lawn) = 0.81 - 0.65 = 0.16 Acres

WQ-6

WQ-6 Area = 1.07 Acres

Site Impervious:

Road	= 0.53 Acres (22,898 SF)
Roof	= 0.17 Acres (7,571 SF)
Sidewalk	= 0.07 Acres (3,123 SF)
Total Impervious	= 0.77 Acres (33,592 SF)

Site Pervious:

Pervious Area (Lawn) = 1.07 – 0.77 = 0.30 Acres

WQ-7

WQ-7 Area = 1.94 Acres

Site Impervious:

Road	= 0.52 Acres (22,728 SF)
Roof	= 0.32 Acres (13,974 SF)
Sidewalk	= 0.21 Acres (8,946 SF)
Total Impervious	= 1.05 Acres (86,365 SF)

Site Pervious:

Pervious Area (Lawn) = 1.94 – 1.05 = 0.89 Acres

WQ-8

WQ-8 Area = 0.87 Acres

Site Impervious:

Road	= 0.55 Acres (24,008 SF)
Roof	= 0.17 Acres (7,579 SF)
Sidewalk	= 0.05 Acres (2,142 SF)
Total Impervious	= 0.77 Acres (33,729 SF)

Site Pervious:

Pervious Area (Lawn) = 0.87 - 0.77 = 0.10 Acres

WWHM2012
PROJECT REPORT

Project Name: Smokey Point
Site Name: Smokey Point Mixed Use
Site Address: 19402 Smokey Point Blvd
City : Arlington
Report Date: 6/28/2024
Gage : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.20
Version Date: 2023/01/27
Version : 4.2.19

Low Flow Threshold for POC 1 : 50 Percent of the 2 Year

High Flow Threshold for POC 1: 50 year

Low Flow Threshold for POC 2 : 50 Percent of the 2 Year

High Flow Threshold for POC 2: 50 year

Low Flow Threshold for POC 3 : 50 Percent of the 2 Year

High Flow Threshold for POC 3: 50 year

Low Flow Threshold for POC 4 : 50 Percent of the 2 Year

High Flow Threshold for POC 4: 50 year

Low Flow Threshold for POC 5 : 50 Percent of the 2 Year

High Flow Threshold for POC 5: 50 year

Low Flow Threshold for POC 6 : 50 Percent of the 2 Year

High Flow Threshold for POC 6: 50 year

Low Flow Threshold for POC 7 : 50 Percent of the 2 Year

High Flow Threshold for POC 7: 50 year

Low Flow Threshold for POC 8 : 50 Percent of the 2 Year

High Flow Threshold for POC 8: 50 year

PREDEVELOPED LAND USE

Name : WQ-1
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	.78
Pervious Total	0.78

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.78

Element Flows To:

Surface	Interflow	Groundwater

Name : WQ-2
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	.53
Pervious Total	0.53

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.53

Element Flows To:
Surface **Interflow** **Groundwater**

Name : WQ-3
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Forest, Mod	**.31**
Pervious Total	**0.31**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**0.31**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : WQ-5
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
A B, Forest, Mod	**.81**
Pervious Total	**0.81**

Impervious Land Use	**acre**
Impervious Total	**0**
Basin Total	**0.81**

Element Flows To:
Surface **Interflow** **Groundwater**

Name : WQ-6
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	1.07
Pervious Total	1.07

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.07

Element Flows To:

Surface	Interflow	Groundwater

Name : WQ-4
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	.43
Pervious Total	0.43

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.43

Element Flows To:

Surface	Interflow	Groundwater

Name : WQ-7
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	1.18
Pervious Total	1.18

Impervious Land Use	acre
Impervious Total	0
Basin Total	1.18

Element Flows To:

Surface	Interflow	Groundwater

Name : WQ-8
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Forest, Mod	.96
Pervious Total	0.96

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.96

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : WQ-1
Bypass: No

GroundWater: No

Pervious Land Use	acre

A B, Pasture, Flat	.21
Pervious Total	0.21

Impervious Land Use	acre
ROADS FLAT	0.39
ROOF TOPS FLAT	0.11
SIDEWALKS FLAT	0.07
Impervious Total	0.57
Basin Total	0.78

Element Flows To:

Surface	Interflow	Groundwater

Name : WQ-2
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Pasture, Flat	.07
Pervious Total	0.07

Impervious Land Use	acre
ROADS FLAT	0.22
ROOF TOPS FLAT	0.18
SIDEWALKS FLAT	0.06
Impervious Total	0.46
Basin Total	0.53

Element Flows To:

Surface	Interflow	Groundwater

Name : WQ-3
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Pasture, Flat	.31
Pervious Total	0.31

Impervious Land Use	acre
ROADS FLAT	0.25
SIDEWALKS FLAT	0.03
Impervious Total	0.28
Basin Total	0.59

Element Flows To:
Surface **Interflow** **Groundwater**

Name : WQ-4
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Pasture, Flat	.24
Pervious Total	0.24

Impervious Land Use	acre
ROOF TOPS FLAT	0.13
SIDEWALKS FLAT	0.06
Impervious Total	0.19
Basin Total	0.43

Element Flows To:
Surface **Interflow** **Groundwater**

Name : WQ-5
Bypass: No

GroundWater: No

Pervious Land Use	acre

A B, Pasture, Flat	.16
Pervious Total	0.16

Impervious Land Use	acre
ROADS FLAT	0.45
ROOF TOPS FLAT	0.13
SIDEWALKS FLAT	0.07
Impervious Total	0.65
Basin Total	0.81

Element Flows To:

Surface	Interflow	Groundwater

Name : WQ-6
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Pasture, Flat	.3
Pervious Total	0.3

Impervious Land Use	acre
ROADS FLAT	0.53
ROOF TOPS FLAT	0.17
SIDEWALKS FLAT	0.07
Impervious Total	0.77
Basin Total	1.07

Element Flows To:

Surface	Interflow	Groundwater

Name : WQ-7
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Pasture, Flat	.63
Pervious Total	0.63

Impervious Land Use	acre
ROADS FLAT	0.42
SIDEWALKS FLAT	0.13
Impervious Total	0.55
Basin Total	1.18

Element Flows To:
Surface **Interflow** **Groundwater**

Name : WQ-8
Bypass: No

GroundWater: No

Pervious Land Use	acre
A B, Pasture, Flat	.24
Pervious Total	0.24

Impervious Land Use	acre
ROADS FLAT	0.65
SIDEWALKS FLAT	0.07
Impervious Total	0.72
Basin Total	0.96

Element Flows To:
Surface **Interflow** **Groundwater**

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:0.78
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:0.21
Total Impervious Area:0.57

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.001004
5 year	0.002442
10 year	0.0042
25 year	0.007963
50 year	0.012464
100 year	0.019098

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.303683
5 year	0.409615
10 year	0.486894
25 year	0.592978
50 year	0.678344
100 year	0.769322

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.0689 **acre-feet**
On-line facility target flow: 0.1104 **cfs.**
Adjusted for 15 min: 0.1104 **cfs.**
Off-line facility target flow: 0.0624 **cfs.**
Adjusted for 15 min: 0.0624 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Water Quality Volume	Percent Comment Treated
Total Volume Infiltrated		0.00	0.00	0.00			

0.00 0.00 0% No Treat. Credit
Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #2
Total Pervious Area:0.53
Total Impervious Area:0

Mitigated Landuse Totals for POC #2
Total Pervious Area:0.07
Total Impervious Area:0.46

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	Flow(cfs)
2 year	0.000683
5 year	0.001659
10 year	0.002854
25 year	0.005411
50 year	0.008469
100 year	0.012977

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	Flow(cfs)
2 year	0.244822
5 year	0.330201
10 year	0.392482
25 year	0.477976
50 year	0.54677
100 year	0.620085

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #2
On-line facility volume: 0.0556 **acre-feet**
On-line facility target flow: 0.089 **cfs.**
Adjusted for 15 min: 0.089 **cfs.**
Off-line facility target flow: 0.0504 **cfs.**
Adjusted for 15 min: 0.0504 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Water Quality Volume	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0%	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #3
Total Pervious Area:0.31
Total Impervious Area:0

Mitigated Landuse Totals for POC #3
Total Pervious Area:0.31
Total Impervious Area:0.28

Flow Frequency Return Periods for Predeveloped. POC #3

Return Period	Flow(cfs)
2 year	0.000399
5 year	0.000971
10 year	0.001669
25 year	0.003165
50 year	0.004954
100 year	0.00759

Flow Frequency Return Periods for Mitigated. POC #3

Return Period	Flow(cfs)
2 year	0.149686
5 year	0.202007
10 year	0.240192
25 year	0.292628
50 year	0.334834
100 year	0.379826

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #3
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0.0002 **cfs.**
Adjusted for 15 min: 0.0002 **cfs.**
Off-line facility target flow: 0.0001 **cfs.**
Adjusted for 15 min: 0.0001 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Infiltration Volume	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00			
0.00	0.00	0%	No Treat. Credit				

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #4
Total Pervious Area:0.43
Total Impervious Area:0

Mitigated Landuse Totals for POC #4
Total Pervious Area:0.24
Total Impervious Area:0.19

Flow Frequency Return Periods for Predeveloped. POC #4

Return Period	Flow(cfs)
2 year	0.000554
5 year	0.001346
10 year	0.002315
25 year	0.00439
50 year	0.006871
100 year	0.010529

Flow Frequency Return Periods for Mitigated. POC #4

Return Period	Flow(cfs)
2 year	0.101643
5 year	0.137194
10 year	0.163143
25 year	0.19878
50 year	0.227467
100 year	0.25805

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #4
On-line facility volume: 0.023 **acre-feet**
On-line facility target flow: 0.0368 **cfs.**
Adjusted for 15 min: 0.0368 **cfs.**
Off-line facility target flow: 0.0208 **cfs.**
Adjusted for 15 min: 0.0208 **cfs.**

LID Report

LID Technique	Used for Water Quality Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Infiltrated	Percent Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #5
Total Pervious Area:0.81
Total Impervious Area:0

Mitigated Landuse Totals for POC #5
Total Pervious Area:0.16
Total Impervious Area:0.65

Flow Frequency Return Periods for Predeveloped. POC #5

Return Period	Flow(cfs)
2 year	0.001043
5 year	0.002536
10 year	0.004361
25 year	0.008269
50 year	0.012943
100 year	0.019833

Flow Frequency Return Periods for Mitigated. POC #5

Return Period	Flow(cfs)
2 year	0.346103
5 year	0.466811
10 year	0.554867
25 year	0.675743
50 year	0.773009
100 year	0.876667

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #5
On-line facility volume: 0.0786 **acre-feet**
On-line facility target flow: 0.1258 **cfs.**
Adjusted for 15 min: 0.1258 **cfs.**
Off-line facility target flow: 0.0712 **cfs.**
Adjusted for 15 min: 0.0712 **cfs.**

LID Report

LID Technique	Used for Water Quality	Total Volume Percent Treatment?	Volume Needs Treatment (ac-ft)	Infiltration Through Facility (ac-ft)	Cumulative Volume Infiltration (ac-ft.)	Percent Volume Infiltrated	Water Quality Treated	Comment
Total Volume Infiltrated			0.00	0.00	0.00	0.00	0.00	0% No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #6
Total Pervious Area:1.07
Total Impervious Area:0

Mitigated Landuse Totals for POC #6
Total Pervious Area:0.3
Total Impervious Area:0.77

Flow Frequency Return Periods for Predeveloped. POC #6

Return Period	Flow(cfs)
2 year	0.001378
5 year	0.00335
10 year	0.005761
25 year	0.010924
50 year	0.017098
100 year	0.026199

Flow Frequency Return Periods for Mitigated. POC #6

Return Period	Flow(cfs)
2 year	0.41028
5 year	0.5534
10 year	0.657809
25 year	0.801137
50 year	0.916473
100 year	1.039392

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #6
On-line facility volume: 0.0931 **acre-feet**
On-line facility target flow: 0.1491 **cfs.**
Adjusted for 15 min: 0.1491 **cfs.**
Off-line facility target flow: 0.0844 **cfs.**
Adjusted for 15 min: 0.0844 **cfs.**

LID Report

LID Technique	Used for Water Quality?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Infiltration Credit	Percent Volume Infiltrated	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00		0.00	0.00	No Treat. Credit

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #7
Total Pervious Area:1.18

Total Impervious Area:0

Mitigated Landuse Totals for POC #7
Total Pervious Area:0.63
Total Impervious Area:0.55

Flow Frequency Return Periods for Predeveloped. POC #7

Return Period	Flow(cfs)
2 year	0.00152
5 year	0.003694
10 year	0.006354
25 year	0.012047
50 year	0.018856
100 year	0.028892

Flow Frequency Return Periods for Mitigated. POC #7

Return Period	Flow(cfs)
2 year	0.294076
5 year	0.396883
10 year	0.471916
25 year	0.574953
50 year	0.657892
100 year	0.746306

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #7
On-line facility volume: 0.0666 **acre-feet**
On-line facility target flow: 0.1066 **cfs.**
Adjusted for 15 min: 0.1066 **cfs.**
Off-line facility target flow: 0.0603 **cfs.**
Adjusted for 15 min: 0.0603 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Volume Infiltration Credit	Percent Water Quality	Percent Water Quality Treated	Comment
Total Volume Infiltrated		0.00	0.00	0.00				
0.00	0.00	0%	No Treat. Credit					

Compliance with LID Standard 8
Duration Analysis Result = Failed

Stream Protection Duration

Predeveloped Landuse Totals for POC #8
Total Pervious Area:0.96
Total Impervious Area:0

Mitigated Landuse Totals for POC #8
Total Pervious Area:0.24
Total Impervious Area:0.72

Flow Frequency Return Periods for Predeveloped. POC #8

Return Period	Flow(cfs)
2 year	0.001236
5 year	0.003006
10 year	0.005169
25 year	0.009801
50 year	0.01534
100 year	0.023505

Flow Frequency Return Periods for Mitigated. POC #8

Return Period	Flow(cfs)
2 year	0.383536
5 year	0.517314
10 year	0.614908
25 year	0.748877
50 year	0.856681
100 year	0.971572

The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Water Quality BMP Flow and Volume for POC #8
On-line facility volume: 0.0871 **acre-feet**
On-line facility target flow: 0.1394 **cfs.**
Adjusted for 15 min: 0.1394 **cfs.**
Off-line facility target flow: 0.0789 **cfs.**
Adjusted for 15 min: 0.0789 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs	Volume Through	Infiltration Volume	Cumulative Volume	Percent Water Quality	Percent	Comment

Volume	Water Quality				
		Treatment	Facility	(ac-ft.)	Infiltration
Infiltrated	Treated				
		(ac-ft)	(ac-ft)		Credit
Total Volume Infiltrated		0.00	0.00	0.00	
0.00 0.00	0%	No Treat. Credit			

Compliance with LID Standard 8
Duration Analysis Result = Failed

Perlnd and Implnd Changes

No changes have been made.

5.8 Conveyance Analysis and Design

A detailed conveyance analysis and design will be provided for the construction submittal.

6.0 Appendix

A. Stormwater Pollution Prevention Plan

B. Geotechnical Engineering Report

C. Operation and Maintenance Manual

A. STORMWATER POLLUTION PREVENTION PLAN

Construction Stormwater General Permit

Stormwater Pollution Prevention Plan (SWPPP)

for

Smokey Point Ridge

Prepared for:

The Washington State Department of Ecology
Northwest Regional Office
3190 – 160th Avenue SE
Bellevue, WA 98008

Permittee / Owner	Developer	Operator / Contractor
Peak to Peak Development LLC	Peak to Peak Development LLC	To be determined
PO Box 12867	PO Box 12867	
Mill Creek, WA 98082	Mill Creek, WA 98082	

Project Site Location

19402 Smokey Point BLVD
Arlington, WA 98223

Certified Erosion and Sediment Control Lead (CESCL)

Name	Organization	Contact Phone Number
Brian R. Kalab, P. E.	Insight Engineering	425-303-9363

SWPPP Prepared By

Name	Organization	Contact Phone Number
Shilpa Xavier, E.I. T	Insight Engineering	425-303-9363

SWPPP Preparation Date

July 3, 2024

Project Construction Dates

Activity / Phase	Start Date	End Date
Construction Duration	July 1, 2025	August 10, 2026

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List of Acronyms and Abbreviations

Acronym / Abbreviation	Explanation
303(d)	Section of the Clean Water Act pertaining to Impaired Waterbodies
BFO	Bellingham Field Office of the Department of Ecology
BMP(s)	Best Management Practice(s)
CESCL	Certified Erosion and Sediment Control Lead
CO_2	Carbon Dioxide
CRO	Central Regional Office of the Department of Ecology
CSWGP	Construction Stormwater General Permit
CWA	Clean Water Act
DMR	Discharge Monitoring Report
DO	Dissolved Oxygen
Ecology	Washington State Department of Ecology
EPA	United States Environmental Protection Agency
ERO	Eastern Regional Office of the Department of Ecology
ERTS	Environmental Report Tracking System
ESC	Erosion and Sediment Control
GULD	General Use Level Designation
NPDES	National Polluant Discharge Elimination System
NTU	Nephelometric Turbidity Units
NWRO	Northwest Regional Office of the Department of Ecology
pH	Power of Hydrogen
RCW	Revised Code of Washington
SPCC	Spill Prevention, Control, and Countermeasure
su	Standard Units
SWMMEW	Stormwater Management Manual for Eastern Washington
SWMMWW	Stormwater Management Manual for Western Washington
SWPPP	Stormwater Pollution Prevention Plan
TESC	Temporary Erosion and Sediment Control
SWRO	Southwest Regional Office of the Department of Ecology
TMDL	Total Maximum Daily Load
VFO	Vancouver Field Office of the Department of Ecology
WAC	Washington Administrative Code
WSDOT	Washington Department of Transportation
WWHM	Western Washington Hydrology Model

1 Project Information

Project/Site Name: Smokey Point Ridge
Street/Location: 19402 Smokey Point Blvd
City: Arlington State: WA Zip code: 98223
Subdivision:
Receiving waterbody: Portage Creek

1.1 Existing Conditions

Total acreage (including support activities such as off-site equipment staging yards, material storage areas, borrow areas).

Total acreage: 7.83 acres
Disturbed acreage: 7.83 acres
Existing structures: 0.09 acres
Landscape topography: Flat
Drainage patterns: Sheet Flow
Existing Vegetation: Second growth forest.
Critical Areas (wetlands, streams, high erosion risk, steep or difficult to stabilize slopes): N/A

List of known impairments for 303(d) listed or Total Maximum Daily Load (TMDL) for the receiving waterbody:

Table 1 includes a list of suspected and/or known contaminants associated with the construction activity.

Constituent (Pollutant)	Location	Depth	Concentration
NA	NA	NA	NA

1.2 Proposed Construction Activities

1.3 Proposed Construction Activities

Description of site development (example: subdivision):
The proposal is to clear and grade the site for an upcoming Townhome development The access to the project site will be from Smokey Pt Blvd.

Description of construction activities (example: site preparation, demolition, excavation):
Prepare the site for construction by the installation of the indicated BMP's. Excavate the site for the new townhomes.

Description of site drainage including flow from and onto adjacent properties. Must be consistent with Site Map in Appendix A:

The proposal is to construct ten residential buildings, eight mixed-use buildings and access roads with associated utilities. Flow control requirements will be met by providing infiltration trenches.

Description of final stabilization (example: extent of revegetation, paving, landscaping):
The access to the project site will be from Smokey Pt Blvd. Typical residential landscaping within the clearing limit to provide final stabilization.

Contaminated Site Information:
Proposed activities regarding contaminated soils or groundwater (example: on-site treatment system, authorized sanitary sewer discharge):
Water quality for the site will be provided by filters located upstream of each infiltration trench.

2 Construction Stormwater Best Management Practices (BMPs)

The SWPPP is a living document reflecting current conditions and changes throughout the life of the project. These changes may be informal (i.e., hand-written notes and deletions). Update the SWPPP when the CESCL or local agency has noted a deficiency in BMPs or deviation from original design.

2.1 The 13 Elements

2.1.1 Element 1: Preserve Vegetation / Mark Clearing Limits

To protect adjacent properties and to reduce the area of soil exposed to construction, the limits of construction will be clearly marked before land-disturbing activities begin. Trees that are to be preserved, as well as all sensitive areas and their buffers, shall be clearly delineated, both in the field and on the plans. In general, natural vegetation and native topsoil shall be retained in an undisturbed state to the maximum extent possible.

A protective barrier shall be placed around the protected trees prior to land preparation or construction activities, and shall remain in place until all construction activity is terminated. No equipment, chemicals, soil deposits or construction materials shall be placed within the protective barriers. Any landscaping activities subsequent to the removal of the barriers shall be accomplished with light machinery or hand labor. (LMC 17.15.160 B1)

List and describe BMPs:

- High Visibility Plastic or Metal Fence (BMP C103)

Install orange barrier fencing along the clearing limits, according to the approved construction plans, prior to any construction activities. Maintain until all construction activities are completed.

Installation Schedules: The limits of construction will be clearly marked before land-disturbing activities begin.
Inspection and Maintenance plan: Site inspections will be conducted at least once a week and within 24 hours following any rainfall event which causes a discharge of stormwater from the site. For sites with temporary stabilization measures, the site inspection frequency can be reduced to once every month.

Responsible Staff: Permittee shall take immediate action(s) to: stop, contain, and clean up the unauthorized discharges, or otherwise stop the noncompliance; correct the problem(s); implement appropriate Best Management Practices (BMPs), and/or conduct maintenance of existing BMPs; and achieve compliance with all applicable standards and permit conditions. In addition, if the noncompliance causes a threat to human health or the environment, the Permittee shall comply with the Noncompliance Notification requirements in Special Condition S5.F of the permit.

Element 2: Establish Construction Access

Construction access or activities occurring on unpaved areas shall be minimized, yet where necessary, access points shall be stabilized to minimize the tracking of sediment onto public roads, street sweeping, and street cleaning shall be employed to prevent sediment from entering state waters.

List and describe BMPs: Stabilized Construction Entrance (BMP C105)

Installation Schedules: Install the temporary construction entrance, according to the approved construction plans, prior to any clearing or grading activities

Inspection and Maintenance plan: Maintain until the access road is paved.

Responsible Staff: Contractor.

2.1.2 Element 3: Control Flow Rates

In order to protect the properties and waterways downstream of the project site, stormwater discharges from the site will be controlled. In general, discharge rates of stormwater from the site will be controlled where increases in impervious area or soil compaction during construction could lead to downstream erosion, or where necessary to meet local agency stormwater discharge requirements (e.g. discharge to combined sewer systems).

Will you construct stormwater retention and/or detention facilities?

☒ Yes ☐ No

Will you use permanent infiltration ponds or other low impact development (example: rain gardens, bio-retention, porous pavement) to control flow during construction?

☒ Yes ☐ No

List and describe BMPs: Mulching (BMP C121)

Responsible Staff: Contractor

2.1.3 Element 4: Install Sediment Controls

Whenever possible, sediment laden water shall be discharged into onsite, relatively level, vegetated areas (BMP C240 paragraph 5, page 4-102).

In some cases, sediment discharge in concentrated runoff can be controlled using permanent stormwater BMPs (e.g., infiltration swales, ponds, trenches). Sediment loads can limit the effectiveness of some permanent stormwater BMPs, such as those used for infiltration or bio-filtration; however, those BMPs designed to remove solids by settling (wet ponds or detention ponds) can be used during the construction phase. When permanent stormwater BMPs will be used to control sediment discharge during construction, the structure will be protected from excessive sedimentation with adequate erosion and sediment control BMPs. Any accumulated sediment shall be removed after construction is complete and the permanent stormwater BMP will be re-stabilized with vegetation per applicable design requirements once the remainder of the site has been stabilized.

The following BMP will be implemented as end-of-pipe sediment controls as required to meet permitted turbidity limits in the site discharge(s). Prior to the implementation of these technologies, sediment sources and erosion control and soil stabilization BMP efforts will be maximized to reduce the need for end-of-pipe sedimentation controls. In addition, sediment will be removed from paved areas in and adjacent to construction work areas manually or using mechanical sweepers, as needed, to minimize tracking of sediments on vehicle tires away from the site and to minimize wash-off of sediments from adjacent streets in runoff.

List and describe BMPs:

- Silt Fence (BMP C233)
- Storm Drain Inlet Protection (BMP C220)
- Mulching (BMP C121)

Installation Schedules: Install silt fencing, according to the approved plans, prior to any clearing or grading activities. Install catch basin filters, according to the approved construction plans, as catch basins are installed and become operable.

Inspection and Maintenance plan: Maintain Silt Fence and Storm Drain Inlet Protection until all construction activities are completed.

Responsible Staff: Contractor.

2.1.4 Element 5: Stabilize Soils

The project site is located west of the Cascade Mountain Crest. As such, no soils shall remain exposed and unworked for more than 7 days during the dry season (May 1 to September 30) and 2 days during the wet season (October 1 to April 30). Regardless of the time of year, all soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on weather forecasts.

In general, cut and fill slopes will be stabilized as soon as possible and soil stockpiles will be temporarily covered with plastic sheeting. All stockpiled soils shall be stabilized from erosion, protected with sediment trapping measures, and where possible, be located away from storm drain inlets, waterways, and drainage channels.

West of the Cascade Mountains Crest

Season	Dates	Number of Days Soils Can be Left Exposed
During the Dry Season	May 1 – September 30	7 days
During the Wet Season	October 1 – April 30	2 days

Soils must be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.

Anticipated project dates: Start date: July 1, 2025 End date: August 10, 2026

Will you construct during the wet season?
☐ Yes ☒ No

List and describe BMPs:
Exposed and un-worked soils shall be stabilized with the application of effective BMPs to prevent erosion throughout the life of the project. The specific BMPs for soil stabilization that shall be used on this project include:

- Temporary and Permanent Seeding (BMP C120)

Installation Schedules:
Apply temporary hydro-seed to exposed and un-worked soils, according to the approved construction plans, as needed to prevent erosion during site grading.
Inspection and Maintenance plan:
Apply permanent hydro-seed to areas at final grade as site grading is completed.

- Mulching (BMP C121)

Installation Schedules:
Apply mulching to exposed and un-worked soils, according to the approved construction plans, as needed to prevent erosion during site grading.
Inspection and Maintenance plan:
Maintain until site grading is completed and permanent hydro-seed is applied.

- Plastic Covering (BMP C123)

Installation Schedules:
Cover stockpiles with plastic sheeting, according to the approved construction plans, as needed to prevent erosion during site grading.

Inspection and Maintenance plan:
Maintain until stockpiles are removed from site.

- Dust Control (BMP C140)

Installation Schedules and Inspection and Maintenance plan:

 Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
 Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition. Maintain the original ground cover as long as practical.
 Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
 Sprinkle the site with water until surface is wet. Repeat as needed. To prevent carryout of mud onto street, refer to Stabilized Construction Entrance (BMP C105).
 Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
 Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
 PAM (BMP C126) added to water at a rate of 0.5 lbs. per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may actually reduce the quantity of water needed for dust control. Use of PAM could be a cost-effective dust control method.

Techniques that can be used for unpaved roads and lots include:

 Lower speed limits. High vehicle speed increases the amount of dust stirred up from unpaved roads and lots.
 Upgrade the road surface strength by improving particle size, shape, and mineral types that make up the surface and base materials.
 Add surface gravel to reduce the source of dust emission. Limit the amount of fine particles (those smaller than .075 mm) to 10 to 20 percent.
 Use geotextile fabrics to increase the strength of new roads or roads undergoing reconstruction.
 Encourage the use of alternate, paved routes, if available.
 Restrict use of paved roadways by tracked vehicles and heavy trucks to prevent damage to road surface and base.
 Apply chemical dust suppressants using the admix method, blending the product with the top few inches of surface material. Suppressants may also be applied as surface treatments.
 Pave unpaved permanent roads and other trafficked areas.
 Use vacuum street sweepers.
 Remove mud and other dirt promptly so it does not dry and then turn into dust.
 Limit dust-causing work on windy days.

 Contact your local Air Pollution Control Authority for guidance and training on other dust control measures. Compliance with the local Air Pollution Control Authority constitutes compliance with this BMP.

- Early application of gravel base on areas to be paved

Place gravel base on roadways, according to the approved construction plans, after roadways are graded to sub-grade. Maintain until roads are paved.

Responsible Staff: Contractor.

2.1.5 Element 6: Protect Slopes

All cut and fill slopes will be designed, constructed, and protected in a manner than minimizes erosion. The following specific BMPs will be used to protect slopes for this project:

Will steep slopes be present at the site during construction?
☒ Yes ☐ No

List and describe BMPs: Temporary and Permanent Seeding (BMP C120)

Installation Schedules: Apply temporary hydro-seed to cut and fill slopes, according to the approved construction plans, as needed to minimize erosion during site grading.
Inspection and Maintenance plan: Apply permanent hydro-seed to cut and fill slopes at final grade as site grading is completed.

Responsible Staff: Contractor

2.1.6 Element 7: Protect Drain Inlets

All storm drain inlets and culverts made operable during construction shall be protected to prevent unfiltered or untreated water from entering the drainage conveyance system. However, the first priority is to keep all access roads clean of sediment and keep street wash water separate from entering storm drains until treatment can be provided. Storm Drain Inlet Protection (BMP C220) will be implemented for all drainage inlets and culverts that could potentially be impacted by sediment-laden runoff on and near the project site.
List and describe BMPs:

- Storm Drain Inlet Protection (BMP C220)

Installation Schedules: Install catch basin filters, according to the approved construction plans, as catch basins become operable.

Inspection and Maintenance plan: Maintain until all construction activities are completed.

Responsible Staff: Contractor

2.1.7 Element 8: Stabilize Channels and Outlets

No site runoff is to be conveyed into channels, or discharged to a stream or some other natural drainage point.— The onsite flowrates will be minimal therefore no BMP's are proposed Stabilize Channels and Outlets.

If any BMP's are provided, the project site is located west of the Cascade Mountain Crest. As such, all temporary on-site conveyance channels shall be designed, constructed, and stabilized to prevent erosion from the expected peak 10 minute velocity of flow from a Type 1A, 10-year, 24-hour recurrence interval storm for the developed condition. Alternatively, the 10-year, 1-hour peak flow rate indicated by an approved continuous runoff simulation model, increased by a factor of 1.6, shall be used. Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches shall be provided at the outlets of all conveyance systems.

List and describe BMPs:

- Outlet Protection (BMP C209)

Installation Schedules: Install rip-raps, according to the approved construction plans.

Inspection and Maintenance plan: Maintain until all construction activities are completed.

Responsible Staff: Contractor

Provide stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes, and downstream reaches, will be installed at the outlets of all conveyance systems.

2.1.8 Element 9: Control Pollutants

The following pollutants are anticipated to be present on-site:

Table 2 – Pollutants

Pollutant (List pollutants and source, if applicable)
petroleum products
chemicals stored in the construction areas
Dust released from demolished sidewalks
Solid waste

All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well organized, and free of debris. If required, BMPs to be implemented to control specific sources of pollutants are discussed below.

Vehicles, construction equipment, and/or petroleum product storage/dispensing:

☒ All vehicles, equipment, and petroleum product storage/dispensing areas will be inspected regularly to detect any leaks or spills, and to identify maintenance needs to prevent leaks or spills.

☐ On-site permanent fueling tanks and petroleum product storage containers shall include secondary containment.

☐ Spill prevention measures, such as drip pans, will be used when conducting maintenance and repair of vehicles or equipment.

☐ In order to perform emergency repairs on site, temporary plastic will be placed beneath and, if raining, over the vehicle.

☐ Contaminated surfaces shall be cleaned immediately following any discharge or spill incident.

Chemical storage:

☐ Any chemicals stored in the construction areas will conform to the appropriate source control BMPs listed in Volume IV of the Ecology stormwater manual. In Western WA, all chemicals shall have cover, containment, and protection provided on site, per BMP C153 for Material Delivery, Storage and Containment in SWMMWW 2005

Excavation and tunneling spoils dewatering waste:

☐ Dewatering BMPs and BMPs specific to the excavation and tunneling (including handling of contaminated soils) are discussed under Element 10.

Demolition:

☐ Dust released from demolished sidewalks, buildings, or structures will be controlled using Dust Control measures (BMP C140).

☐ Storm drain inlets vulnerable to stormwater discharge carrying dust, soil, or debris will be protected using Storm Drain Inlet Protection (BMP C220 as described above for Element 7).

 Process water and slurry resulting from saw-cutting and surfacing operations will be prevented from entering the waters of the State by implementing Saw-cutting and Surfacing Pollution Prevention measures (BMP C152).

Concrete and grout:

 Process water and slurry resulting from concrete work will be prevented from entering the waters of the State by implementing Concrete Handling measures (BMP C151).

Sanitary wastewater:

 Portable sanitation facilities will be firmly secured, regularly maintained, and emptied when necessary.

Solid Waste:

 Solid waste will be stored in secure, clearly marked containers.

Other:

 Other BMPs will be administered as necessary to address any additional pollutant sources on site.

A SPCC plan is not required for this site.

As per the Federal regulations of the Clean Water Act (CWA) and according to Final Rule 40 CFR Part 112, as stated in the National Register, a Spill Prevention, Control, and Countermeasure (SPCC) Plan is required for construction activities. A SPCC Plan has been prepared to address an approach to prevent, respond to, and report spills or releases to the environment that could result from construction activities. This Plan must:

 Be well thought out in accordance with good engineering;

List and describe BMPs: BMP C151, BMP C153, BMP C140 and BMP C220.

Installation Schedules:

Inspection and Maintenance plan: All pollutants, including waste materials and demolition debris, that occur onsite shall be handled and disposed of in a manner that does not cause contamination of stormwater. Good housekeeping and preventative measures will be taken to ensure that the site will be kept clean, well organized, and free of debris.

Achieve three objectives - prevent spills, contain a spill that occurs, and clean up the spill;

 Identify the name, location, owner, and type of facility;
 Include the date of initial operation and oil spill history;
 Name the designated person responsible;
 Show evidence of approval and certification by the person in authority; and
 Contain a facility analysis.

Responsible Staff: Contractor.

Will maintenance, fueling, and/or repair of heavy equipment and vehicles occur on-site?

☐ Yes☒ No

Will wheel wash or tire bath system BMPs be used during construction?

☒ Yes☐ No

Will pH-modifying sources be present on-site?

☒ Yes☐ No

Table 3 – pH-Modifying Sources

☐	None
☒	Bulk cement
☒	Cement kiln dust
☒	Fly ash
☒	Other cementitious materials
☒	New concrete washing or curing waters
☒	Waste streams generated from concrete grinding and sawing
☒	Exposed aggregate processes
☒	Dewatering concrete vaults
☐	Concrete pumping and mixer washout waters
☐	Recycled concrete
☐	Recycled concrete stockpiles
☐	Other (i.e., calcium lignosulfate) [please describe:]

Stormwater runoff will be monitored for pH starting on the first day of any activity that includes more than 40 yards of poured or recycled concrete, or after the application of "Engineered Soils" such as, Portland cement treated base, cement kiln dust, or fly ash. This does not include fertilizers. For concrete work, pH monitoring will start the first day concrete is poured and continue until 3 weeks after the last pour. For engineered soils, the pH monitoring period begins when engineered soils are first exposed to precipitation and continue until the area is fully stabilized.

Stormwater samples will be collected daily from all points of discharge from the site and measured for pH using a calibrated pH meter, pH test kit, or wide range pH indicator paper. If the measured pH is 8.5 or greater, the following steps will be conducted:

1. Prevent the high pH water from entering storm drains or surface water.

2. Adjust or neutralize the high pH water if necessary using appropriate technology such as CO_2 sparging (liquid or dry ice).

3. Contact Ecology if chemical treatment other than CO_2 sparging is planned.

Concrete trucks must not be washed out onto the ground, or into storm drains, open ditches, streets, or streams. Excess concrete must not be dumped on-site, except in designated concrete washout areas with appropriate BMPs installed. Excess concrete must be returned to the plant for recycling if there are no concrete washout areas with appropriate BMPs installed.

Will uncontaminated water from water-only based shaft drilling for construction of building, road, and bridge foundations be infiltrated provided the wastewater is managed in a way that prohibits discharge to surface waters?

☒ Yes ☐ No

2.1.9 Element 10: Control Dewatering

No dewatering is proposed for the development. If dewatering is needed, Transport. off-site in a vehicle (vacuum truck for legal disposal).

Table 4 – Dewatering BMPs

☐	Infiltration
☒	Transport off-site in a vehicle (vacuum truck for legal disposal)
☐	Ecology-approved on-site chemical treatment or other suitable treatment technologies
☐	Sanitary or combined sewer discharge with local sewer district approval (last resort)
☐	Use of sedimentation bag with discharge to ditch or swale (small volumes of localized dewatering)

2.1.10 Element 11: Maintain BMPs

All temporary and permanent Erosion and Sediment Control (ESC) BMPs shall be maintained and repaired as needed to ensure continued performance of their intended function.
Maintenance and repair shall be conducted in accordance with each particular BMP specification (see *Volume II of the SWMMWW or Chapter 7 of the SWMMEW*).
Visual monitoring of all BMPs installed at the site will be conducted at least once every calendar week and within 24 hours of any stormwater or non-stormwater discharge from the site. If the site becomes inactive and is temporarily stabilized, the inspection frequency may be reduced to once every calendar month.
All temporary ESC BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed.
Trapped sediment shall be stabilized on-site or removed. Disturbed soil resulting from removal of either BMPs or vegetation shall be permanently stabilized.
Additionally, protection must be provided for all BMPs installed for the permanent control of stormwater from sediment and compaction. BMPs that are to remain in place following completion of construction shall be examined and restored to full operating condition. If sediment enters these BMPs during construction, the sediment shall be removed and the facility shall be returned to conditions specified in the construction documents.

List and describe BMPs :

- Scheduling BMP (C162)

2.1.11 Element 12: Manage the Project

The project will be managed based on the following principles:

- Projects will be phased to the maximum extent practicable and seasonal work limitations will be taken into account.
- Inspection and monitoring:
    - Inspection, maintenance and repair of all BMPs will occur as needed to ensure performance of their intended function.
    - Site inspections and monitoring will be conducted in accordance with Special Condition S4 of the CSWGP. Sampling locations are indicated on the Site Map. Sampling station(s) are located in accordance with applicable requirements of the CSWGP.
- Maintain an updated SWPPP.
    - The SWPPP will be updated, maintained, and implemented in accordance with Special Conditions S3, S4, and S9 of the CSWGP.

As site work progresses the SWPPP will be modified routinely to reflect changing site conditions. The SWPPP will be reviewed monthly to ensure the content is current.

Table 5 – Management

☒	Design the project to fit the existing topography, soils, and drainage patterns
☒	Emphasize erosion control rather than sediment control
☒	Minimize the extent and duration of the area exposed
☒	Keep runoff velocities low
☒	Retain sediment on-site
☒	Thoroughly monitor site and maintain all ESC measures
☒	Schedule major earthwork during the dry season
☐	Other (please describe)

List and describe BMPs : CESC Lead BMP (C160)

Table 6 – BMP Implementation Schedule

Phase of Construction Project	Stormwater BMPs	Date	Wet/Dry Season
Mark Clearing Limits	High Visibility Plastic or Metal Fence (BMP C103)	06/01/2025	Dry
Mobilize equipment on site	Construction Road/Parking area stabilization (BMP C107)	06/01/2025	Dry
Mobilize and store all ESC and soil stabilization products	Sediment Trap (BMP C240) Silt Fence (BMP C233) Storm Drain Inlet Protection (BMP C220) Plastic Covering (BMP C123) Surface roughening (BMP C130)	06/01/2025	Dry
Install ESC measures	Silt Fence (BMP C233) Storm Drain Inlet Protection (BMP C220)	06/01/2025	Dry
Implement Element #12 BMPs and manage site to minimize soil disturbance during the wet season	Scheduling (BMP C162) CESC Lead (BMP C160)	06/01/2025	Dry
Begin clearing and grubbing	Dust Control (BMP C140)	06/15/2025	Dry
Site grading begins	Dust Control (BMP C140)	06/27/2025	Dry
Grade road and stabilize with gravel base	Dust Control (BMP C140)	06/27/2024	Dry
Begin excavation for new utilities and services		06/01/2025	Dry
Soil stabilization on excavated side slopes (in idle, no work areas)	Mulching (BMP C121) Dust Control (BMP C140) Plastic Covering (BMP C123) Nets and Blankets (BMP C122)	09/05/2025	Dry
Temporary erosion control measures (hydro-seeding)	Temporary Seeding (BMP C120)	10/01/2025	Wet
Site grading ends		10/15/2025	Wet

Begin pouring concrete curbs & sidewalks and implement	BMP C151 Concrete Handling (BMP C151) Sawcutting and Surfacing Pollution Prevention (BMP C152)	11/01/2025	Wet
Pave asphalt roads		12/05/2025	Wet
Final landscaping and planting begins		06/02/2026	Dry
Permanent erosion control measures (hydro-seeding)	Permanent Seeding (BMP C120)	06/01/2026	Dry

2.1.12 Element 13: Protect Low Impact Development (LID) BMPs

On-site stormwater management BMPs used for runoff from roofs and other hard surfaces include: full dispersion, roof downspout full infiltration or dispersion systems, perforated stubout connections, rain gardens, bioretention systems, permeable pavement, sheetflow dispersion, and concentrated flow dispersion. The areas on the site to be used for these BMPs shall be protected from siltation and compaction during construction by sequencing the construction in a fashion to install these BMPs at the latter part of the construction grading operations, by excluding equipment from the BMPS and the associated areas, and by using the erosion and sedimentation control BMPs listed below. Additional requirements for protecting these BMPs during the construction process, testing functionality, and restoring functionality are needed at the final stage of the construction process.

Relevant BMPs

Post-Construction Soil Quality and Depth BMP T.5.13 is proposed to provide onsite stormwater management for the pervious areas of the site. Maintain the infiltration capabilities of LID BMPs by protecting against compaction by construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment.

3 Pollution Prevention Team

Table 7 – Team Information

Title	Name(s)	Phone Number
Certified Erosion and Sediment Control Lead (CESCL)	Brian Kalab	425-303-9363
Resident Engineer	Brian Kalab / Insight Engineering	425-303-9363
Emergency Ecology Contact	Tracy Walters	425-649-7000
Emergency Permittee/ Owner Contact	Peak to Peak Development LLC	206-571-2834
Non-Emergency Owner Contact	Peak to Peak Development LLC	206-571-2834
Monitoring Personnel	TBD	
Ecology Regional Office	Northwest Regional Office	425-649-7000

4 Monitoring and Sampling Requirements

Monitoring includes visual inspection, sampling for water quality parameters of concern, and documentation of the inspection and sampling findings in a site log book. A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Stormwater sampling data

The site log book must be maintained on-site within reasonable access to the site and be made available upon request to Ecology or the local jurisdiction.

Numeric effluent limits may be required for certain discharges to 303(d) listed waterbodies. See CSWGP Special Condition S8 and Section 5 of this template.

The receiving waterbody, Swamp Creek, is impaired for: Bacteria, Bioassessment, DO. pH and Temp. All stormwater and dewatering discharges from the site are subject to an **effluent limit** of 8.5 su for pH and/or 25 NTU for turbidity.

4.1 Site Inspection

Site inspections will be conducted at least once every calendar week and within 24 hours following any discharge from the site. For sites that are temporarily stabilized and inactive, the required frequency is reduced to once per calendar month.
The discharge point(s) are indicated on the Site Map (see Appendix A) and in accordance with the applicable requirements of the CSWGP.

4.2 Stormwater Quality Sampling

4.2.1 Turbidity Sampling

Requirements include calibrated turbidity meter or transparency tube to sample site discharges for compliance with the CSWGP. Sampling will be conducted at all discharge points at least once per calendar week.
Method for sampling turbidity:

Table 8 – Turbidity Sampling Method

☒	Turbidity Meter/Turbidimeter (required for disturbances 5 acres or greater in size)
☐	Transparency Tube (option for disturbances less than 1 acre and up to 5 acres in size)

The limit for turbidity value is 25 nephelometric turbidity units (NTU) and a transparency less than 33 centimeters.
If the discharge's turbidity is 26 to 249 NTU **or** the transparency is less than 33 cm but equal to or greater than 6 cm, the following steps will be conducted:

1. Stop effluent discharge to receiving waterbody immediately. If discharge continues, this will be a direct violation of the SWPPP and CSWGP. Implement baker tanks to prevent discharge from entering reciving water body. Replace/repair BMP's if not functioning properly. Do not discharge runoff until the turbidity value is 25 nephelometric turbidity units (NTU) or less and a transparency less than 33 centimeters.

2. Review the SWPPP for compliance with Special Condition S9. Make appropriate revisions within 7 days of the date the discharge exceeded the limit.
3. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the limit. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period.
4. Document BMP implementation and maintenance in the site log book.

If the turbidity exceeds 250 NTU **or** the transparency is 6 cm or less at any time, the following steps will be conducted:

1. Telephone or submit an electronic report to the applicable Ecology Region's Environmental Report Tracking System (ERTS) within 24 hours.
    - **Central Region** (Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima): (509) 575-2490 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/CRO_nerts_online.html
    - **Eastern Region** (Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman): (509) 329-3400 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/ERO_nerts_online.html
    - **Northwest Region** (King, Kitsap, Island, San Juan, Skagit, Snohomish, Whatcom): (425) 649-7000 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/NWRO_nerts_online.html
    - **Southwest Region** (Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, Wahkiakum,): (360) 407-6300 or http://www.ecy.wa.gov/programs/spills/forms/nerts_online/SWRO_nerts_online.html
2. Immediately begin the process to fully implement and maintain appropriate source control and/or treatment BMPs as soon as possible. Address the problems within 10 days of the date the discharge exceeded the limit. If installation of necessary treatment BMPs is not feasible within 10 days, Ecology may approve additional time when the Permittee requests an extension within the initial 10-day response period
3. Document BMP implementation and maintenance in the site log book.
4. Continue to sample discharges daily until one of the following is true:
    - Turbidity is 25 NTU (or lower).
    - Transparency is 33 cm (or greater).
    - Compliance with the water quality limit for turbidity is achieved.
        - 1 - 5 NTU over background turbidity, if background is less than 50 NTU
        - 1% - 10% over background turbidity, if background is 50 NTU or greater
    - The discharge stops or is eliminated.

4.2.2 pH Sampling

pH monitoring is required for "Significant concrete work" (i.e., greater than 1000 cubic yards poured concrete over the life of the project). The use of recycled concrete or engineered soils (soil amendments including but not limited to Portland cement-treated base [CTB], cement kiln dust [CKD] or fly ash) also requires pH monitoring.

For significant concrete work, pH sampling will start the first day concrete is poured and continue until it is cured, typically three (3) weeks after the last pour.

For engineered soils and recycled concrete, pH sampling begins when engineered soils or recycled concrete are first exposed to precipitation and continues until the area is fully stabilized.

If the measured pH is 8.5 or greater, the following measures will be taken:

1. Prevent high pH water from entering storm sewer systems or surface water.
2. Adjust or neutralize the high pH water to the range of 6.5 to 8.5 su using appropriate technology such as carbon dioxide (CO_2) sparging (liquid or dry ice).
3. Written approval will be obtained from Ecology prior to the use of chemical treatment other than CO_2 sparging or dry ice.

Method for sampling pH:

Table 9 – pH Sampling Method

☒	pH meter
☐	pH test kit
☐	Wide range pH indicator paper

5 Discharges to 303(d) or Total Maximum Daily Load (TMDL) Waterbodies

5.1 303(d) Listed Waterbodies

Is the receiving water 303(d) (Category 5) listed for turbidity, fine sediment, phosphorus, or pH?
☐ Yes ☒ No
List the impairment(s):

Describe the method(s) for 303(d) compliance:
NA

List and describe BMPs:

5.2 TMDL Waterbodies

Waste Load Allocation for CWSGP discharges:
List and describe BMPs:
List and describe BMPs:
Concrete Handling (BMP C151)

Sawcutting and Surfacing Pollution Prevention (BMP C152)

Outlet Protection (BMP C209)

Mulching (BMP C121)
Temporary and Permanent Seeding (BMP C120)
Dust Control (BMP C140)

Discharges to TMDL receiving waterbodies will meet in-stream water quality criteria at the point of discharge.

The Construction Stormwater General Permit Proposed New Discharge to an Impaired Water Body form is included in Appendix F.

6 Reporting and Record Keeping

6.1 Record Keeping

6.1.1 Site Log Book

A site log book will be maintained for all on-site construction activities and will include:

- A record of the implementation of the SWPPP and other permit requirements
- Site inspections
- Sample logs

6.1.2 Records Retention

Records will be retained during the life of the project and for a minimum of three (3) years following the termination of permit coverage in accordance with Special Condition S5.C of the CSWGP.

Permit documentation to be retained on-site:

- CSWGP
- Permit Coverage Letter
- SWPPP
- Site Log Book

Permit documentation will be provided within 14 days of receipt of a written request from Ecology. A copy of the SWPPP or access to the SWPPP will be provided to the public when requested in writing in accordance with Special Condition S5.G.2.b of the CSWGP.

6.1.3 Updating the SWPPP

The SWPPP will be modified if:

- Found ineffective in eliminating or significantly minimizing pollutants in stormwater discharges from the site.
- There is a change in design, construction, operation, or maintenance at the construction site that has, or could have, a significant effect on the discharge of pollutants to waters of the State.

The SWPPP will be modified within seven (7) days if inspection(s) or investigation(s) determine additional or modified BMPs are necessary for compliance. An updated timeline for BMP implementation will be prepared.

6.2 Reporting

6.2.1 Discharge Monitoring Reports

Cumulative soil disturbance is one (1) acre or larger; therefore, Discharge Monitoring Reports (DMRs) will be submitted to Ecology monthly. If there was no discharge during a given

monitoring period the DMR will be submitted as required, reporting "No Discharge". The DMR due date is fifteen (15) days following the end of each calendar month.
DMRs will be reported online through Ecology's WQWebDMR System.

6.2.2 Notification of Noncompliance

If any of the terms and conditions of the permit is not met, and the resulting noncompliance may cause a threat to human health or the environment, the following actions will be taken:

1. Ecology will be notified within 24-hours of the failure to comply by calling the applicable Regional office ERTS phone number (Regional office numbers listed below).
2. Immediate action will be taken to prevent the discharge/pollution or otherwise stop or correct the noncompliance. If applicable, sampling and analysis of any noncompliance will be repeated immediately and the results submitted to Ecology within five (5) days of becoming aware of the violation.
3. A detailed written report describing the noncompliance will be submitted to Ecology within five (5) days, unless requested earlier by Ecology.

Anytime turbidity sampling indicates turbidity is 250 NTUs or greater, or water transparency is 6 cm or less, the Ecology Regional office will be notified by phone within 24 hours of analysis as required by Special Condition S5.A of the CSWGP.

- **Central Region** at (509) 575-2490 for Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, or Yakima County
- **Eastern Region** at (509) 329-3400 for Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, or Whitman County
- **Northwest Region** at (425) 649-7000 for Island, King, Kitsap, San Juan, Skagit, Snohomish, or Whatcom County
- **Southwest Region** at (360) 407-6300 for Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Lewis, Mason, Pacific, Pierce, Skamania, Thurston, or Wahkiakum

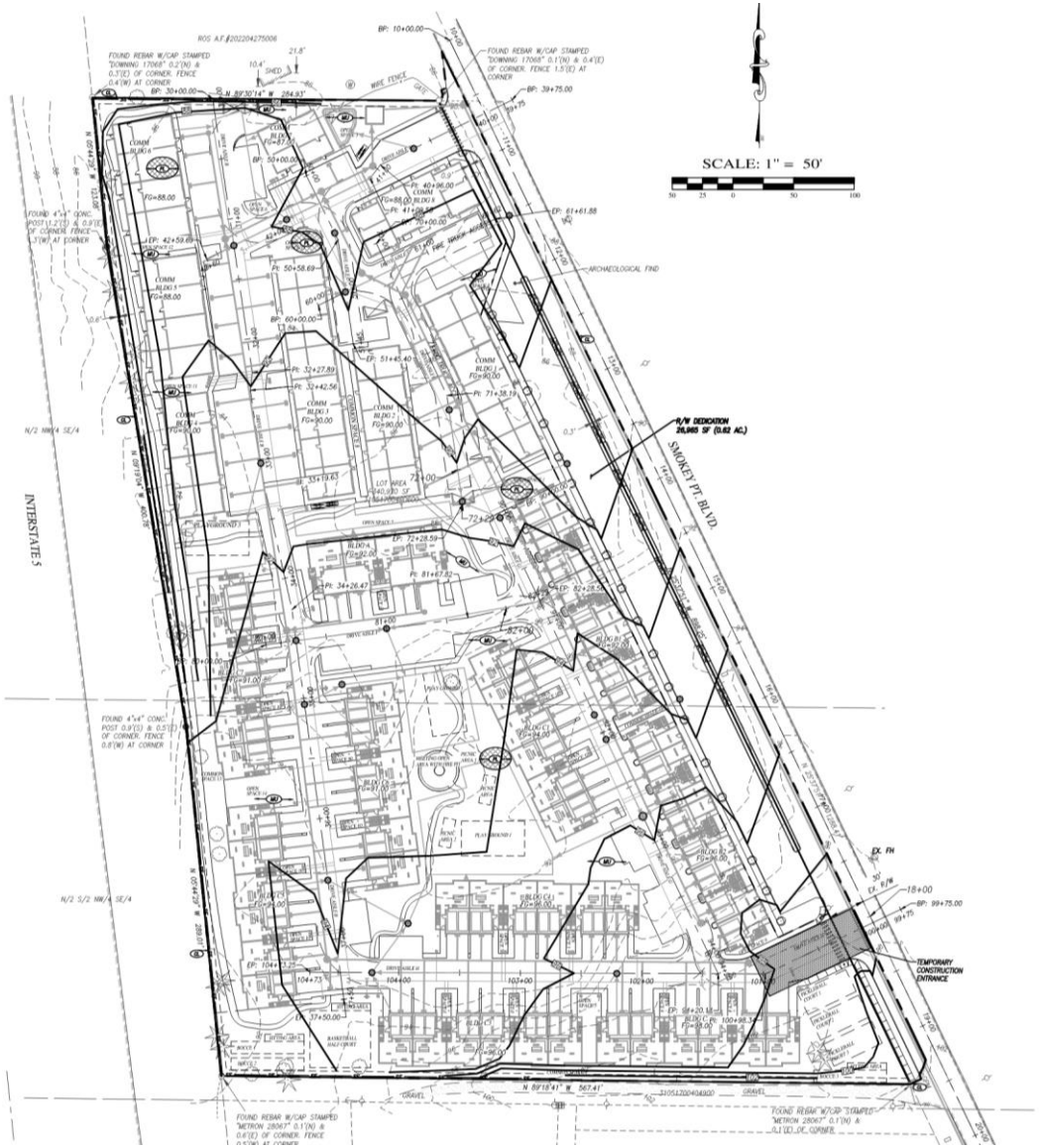
Include the following information:

1. Your name and / Phone number
2. Permit number
3. City / County of project
4. Sample results
5. Date / Time of call
6. Date / Time of sample
7. Project name

In accordance with Special Condition S4.D.5.b of the CSWGP, the Ecology Regional office will be notified if chemical treatment other than CO_2 sparging is planned for adjustment of high pH water.

Appendix/Glossary

A. Site Map


SCALE: 1" = 50'
INTERSTATE 5
SMOKEY PT. BLVD.
R/W DEDICATION
20,965 SF (0.62 AC.)
TEMPORARY CONSTRUCTION ENTRANCE
ARCHAEOLOGICAL FIND
FOUND REBAR W/CAP STAMPED "DOWNING 17068" 0.2'(N) & 0.7'(E) OF CORNER, FENCE 0.4'(W) AT CORNER
FOUND REBAR W/CAP STAMPED "DOWNING 17068" 0.1'(N) & 0.4'(E) OF CORNER, FENCE 1.5'(E) AT CORNER
FOUND 4"x4" CONC. POST 0.9'(S) & 0.5'(E) OF CORNER, FENCE 0.6'(W) AT CORNER
FOUND REBAR W/CAP STAMPED "METRON 28067" 0.1'(N) & 0.1'(E) OF CORNER
N 89°30'14" W 264.93'
N 89°18'41" W 567.41'
BP: 10+00.00
BP: 30+00.00
BP: 39+75.00
BP: 50+00.00
BP: 60+00.00
BP: 99+75.00
EP: 42+59.69
EP: 51+45.40
EP: 61+61.88
EP: 72+28.59
EP: 104+73.25
Pt: 32+27.89
Pt: 32+42.56
Pt: 34+26.47
Pt: 50+58.69
Pt: 71+38.19
Pt: 81+67.52
Pt: 40+96.00
72+00
81+00
104+00
107+00
18+00
EX. FH
EX. R/W
GRAVEL
N/2 NW/4 SE/4
N/2 S/2 NW/4 SE/4

B. BMP Detail

Element #1 - Mark Clearing Limits

- Preserving Natural Vegetation (BMP C101)
- High Visibility Plastic or Metal Fence (BMP C103)

Element #2 - Establish Construction Access

- Stabilized Construction Entrance (BMP C105)

Element #3 - Control Flow Rates

- Temporary Sediment Pond (BMP C 241)

Element #4 – Install Sediment Controls

- Silt Fence (BMP C233)
- Temporary Sediment Pond (BMP C 241)

Element #5 - Stabilize Soils

- Mulching (BMP C121)
- Temporary and Permanent Seeding (BMP C120)
- Plastic Covering (BMP C123)
- Dust Control (BMP C140)

Element #6 - Protect Slopes

- Plastic Covering (BMP C123)

Element #7 - Protect Drain Inlets

- Storm Drain Inlet Protection (BMP C220)

Element #8 - Stabilize Channels and Outlets

- Outlet Protection (BMP C209)

Element #9 – Control Pollutants

- Concrete Handling (BMP C151)
- Material, Delivery, Storage and Containment (BMP C153)

Element #10 - Control Dewatering

- Additional Advanced BMPs to Control Dewatering:

Element #11 – Maintain BMP's

- Scheduling (BMP C162)

Element #12 – Manage the Project

- CESC Lead (BMP C160)

Element #13 – Protect On-site Stormwater Management BMPs for Runoff from Roofs and Other Hard Surfaces

- NA

C. Correspondence

Ecology
EPA
Local Government

D. Site Inspection Form

Construction Stormwater Site Inspection Form

Project Name _____ Permit # _____ Inspection Date _____ Time _____

Name of Certified Erosion Sediment Control Lead (CESCL) or qualified inspector if *less than one acre*
Print Name: _____

Approximate rainfall amount since the last inspection (in inches): _____

Approximate rainfall amount in the last 24 hours (in inches): _____

Current Weather Clear ☐ Cloudy ☐ Mist ☐ Rain ☐ Wind ☐ Fog ☐

A. Type of inspection: Weekly ☐ Post Storm Event ☐ Other ☐

B. Phase of Active Construction (*check all that apply*):

Pre Construction/installation of erosion/sediment controls	☐	Clearing/Demo/Grading	☐	Infrastructure/storm/roads	☐
Concrete pours	☐	Vertical Construction/buildings	☐	Utilities	☐
Offsite improvements	☐	Site temporary stabilized	☐	Final stabilization	☐

C. Questions:

1. Were all areas of construction and discharge points inspected? Yes ___ No ___
2. Did you observe the presence of suspended sediment, turbidity, discoloration, or oil sheen Yes ___ No ___
3. Was a water quality sample taken during inspection? (*refer to permit conditions S4 & S5*) Yes ___ No ___
4. Was there a turbid discharge 250 NTU or greater, or Transparency 6 cm or less?* Yes ___ No ___
5. If yes to #4 was it reported to Ecology? Yes ___ No ___
6. Is pH sampling required? pH range required is 6.5 to 8.5. Yes ___ No ___

If answering yes to a discharge, describe the event. Include when, where, and why it happened; what action was taken, and when.

_____

_____

_____

_____

*If answering yes to # 4 record NTU/Transparency with continual sampling daily until turbidity is 25 NTU or less/ transparency is 33 cm or greater.

Sampling Results: Date: _____

Parameter	Method (circle one)	Result			Other/Note
		NTU	cm	pH	
Turbidity	tube, meter, laboratory				
pH	Paper, kit, meter				

Construction Stormwater Site Inspection Form

D. Check the observed status of all items. Provide "Action Required "details and dates.

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
1 Clearing Limits	Before beginning land disturbing activities are all clearing limits, natural resource areas (streams, wetlands, buffers, trees) protected with barriers or similar BMPs? (high visibility recommended)						
2 Construction Access	Construction access is stabilized with quarry spalls or equivalent BMP to prevent sediment from being tracked onto roads?						
	Sediment tracked onto the road way was cleaned thoroughly at the end of the day or more frequent as necessary.						
3 Control Flow Rates	Are flow control measures installed to control stormwater volumes and velocity during construction and do they protect downstream properties and waterways from erosion?						
	If permanent infiltration ponds are used for flow control during construction, are they protected from siltation?						
4 Sediment Controls	All perimeter sediment controls (e.g. silt fence, wattles, compost socks, berms, etc.) installed, and maintained in accordance with the Stormwater Pollution Prevention Plan (SWPPP).						
	Sediment control BMPs (sediment ponds, traps, filters etc.) have been constructed and functional as the first step of grading.						
	Stormwater runoff from disturbed areas is directed to sediment removal BMP.						
5 Stabilize Soils	Have exposed un-worked soils been stabilized with effective BMP to prevent erosion and sediment deposition?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
5 Stabilize Soils Cont.	Are stockpiles stabilized from erosion, protected with sediment trapping measures and located away from drain inlet, waterways, and drainage channels?						
	Have soils been stabilized at the end of the shift, before a holiday or weekend if needed based on the weather forecast?						
6 Protect Slopes	Has stormwater and ground water been diverted away from slopes and disturbed areas with interceptor dikes, pipes and or swales?						
	Is off-site storm water managed separately from stormwater generated on the site?						
	Is excavated material placed on uphill side of trenches consistent with safety and space considerations?						
	Have check dams been placed at regular intervals within constructed channels that are cut down a slope?						
7 Drain Inlets	Storm drain inlets made operable during construction are protected.						
	Are existing storm drains within the influence of the project protected?						
8 Stabilize Channel and Outlets	Have all on-site conveyance channels been designed, constructed and stabilized to prevent erosion from expected peak flows?						
	Is stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent stream banks, slopes and downstream conveyance systems?						
9 Control Pollutants	Are waste materials and demolition debris handled and disposed of to prevent contamination of stormwater?						
	Has cover been provided for all chemicals, liquid products, petroleum products, and other material?						
	Has secondary containment been provided capable of containing 110% of the volume?						
	Were contaminated surfaces cleaned immediately after a spill incident?						
	Were BMPs used to prevent contamination of stormwater by a pH modifying sources?						

Construction Stormwater Site Inspection Form

Element #	Inspection	BMPs Inspected			BMP needs maintenance	BMP failed	Action required (describe in section F)
		yes	no	n/a			
9 Cont.	Wheel wash wastewater is handled and disposed of properly.						
10 Control Dewatering	Concrete washout in designated areas. No washout or excess concrete on the ground.						
	Dewatering has been done to an approved source and in compliance with the SWPPP.						
	Were there any clean non turbid dewatering discharges?						
11 Maintain BMP	Are all temporary and permanent erosion and sediment control BMPs maintained to perform as intended?						
12 Manage the Project	Has the project been phased to the maximum degree practicable?						
	Has regular inspection, monitoring and maintenance been performed as required by the permit?						
	Has the SWPPP been updated, implemented and records maintained?						
13 Protect LID	Is all Bioretention and Rain Garden Facilities protected from sedimentation with appropriate BMPs?						
	Is the Bioretention and Rain Garden protected against over compaction of construction equipment and foot traffic to retain its infiltration capabilities?						
	Permeable pavements are clean and free of sediment and sediment laden-water runoff. Muddy construction equipment has not been on the base material or pavement.						
	Have soiled permeable pavements been cleaned of sediments and pass infiltration test as required by stormwater manual methodology?						
	Heavy equipment has been kept off existing soils under LID facilities to retain infiltration rate.						

E. Check all areas that have been inspected. ✔

All in place BMPs ☐ All disturbed soils ☐ All concrete wash out area ☐ All material storage areas ☐
All discharge locations ☐ All equipment storage areas ☐ All construction entrances/exits ☐

F. Elements checked "Action Required" (section D) describe corrective action to be taken. List the element number; be specific on location and work needed. Document, initial, and date when the corrective action has been completed and inspected.

Element #	Description and Location	Action Required	Completion Date	Initials

Attach additional page if needed

Sign the following certification:

"I certify that this report is true, accurate, and complete, to the best of my knowledge and belief"

Inspected by: (print) _____ (Signature) _____ Date: _____

Title/Qualification of Inspector: _____

E. Construction Stormwater General Permit (CSWGP)

STATE OF WASHINGTON
DEPARTMENT OF ECOLOGY
PO Box 47600, Olympia, WA 98504-7600 • 360-407-6000

March 25, 2024

Mike Weeks
Peak to Peak Development LLC
PO Box 13528
Mill Creek, WA 98082

RE: Coverage under the Construction Stormwater General Permit

Permit number:	**WAR313250**
Site Name:	**Smokey Point Ridge**
Location:	**19402 Smokey Point Blvd**
	Arlington **County: Snohomish**
Disturbed Acres:	**7.83**

Dear Mike Weeks:

The Washington State Department of Ecology (Ecology) received your Notice of Intent for coverage under Ecology's Construction Stormwater General Permit (CSWGP). This is your permit coverage letter. Your permit coverage is effective March 25, 2024.

Retain this letter as an official record of permit coverage for your site. You may keep your records in electronic format if you can easily access them from your construction site. You can get the CSWGP, permit forms, and other information at Ecology's CSWGP eCoverage Packet webpage[1]. Contact your Permit Administrator, listed below, if you want a copy of the CSWGP mailed to you. Please read the permit and contact Ecology if you have any questions.

Electronic Discharge Monitoring Reports (WQWebDMR)
This permit requires you to submit monthly discharge monitoring reports (DMRs) for the full duration of permit coverage (from the first full month of coverage to termination). Your first sampling and reporting period will be for the month of **April, 2024** and your first DMR must be submitted by **May 15, 2024**.

You must submit your DMRs electronically using Ecology's secure online system, WQWebDMR. To sign up for WQWebDMR go to Ecology's WQWebPortal guidance webpage[2]. If you have

[1] http://www.ecology.wa.gov/eCoverage-packet
[2] https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Water-quality-permits-guidance/WQWebPortal-guidance

questions, contact the portal staff at (360) 407-7097 (Olympia area), or (800) 633-6193/Option 3, or email WQWebPortal@ecy.wa.gov.

Appeal Process
You have a right to appeal coverage under the general permit to the Pollution Control Hearing Board (PCHB). Appeals must be filed within 30 days of the date of receipt of this letter. Any appeal is limited to the general permit's applicability or non-applicability to a specific discharger. The appeal process is governed by chapter 43.21B RCW and chapter 371-08 WAC. "Date of receipt" is defined in RCW 43.21B.001(2). For more information regarding your right to appeal, please reference Ecology's Focus Sheet: *Appeal of General Permit Coverage*[3].

Annual Permit Fees
RCW 90.48.465 requires Ecology to recover the costs of managing the permit program. Permit fees are invoiced annually until the permit is terminated. Termination conditions are described in the permit. For permit fee related questions, please contact the Water Quality Fee Unit at wqfeeunit@ecy.wa.gov or (800) 633-6193/Option 2. You can also visit Water Quality Permit Fees Webpage[4] for more information.

Ecology Field Inspector Assistance
If you have questions regarding stormwater management at your construction site, please contact your Regional Inspector, Megan Junod of Ecology's Northwest Regional Office in Shoreline at megan.junod@ecy.wa.gov or (425) 758-7775.

Questions or Additional Information
Ecology is here to help. Please review our Construction Stormwater General Permit webpage[5] for more information. If you have questions about the Construction Stormwater General Permit, please contact your Permit Administrator, Alyssa Brewer at alyssa.brewer@ecy.wa.gov or (564) 669-4922.

Sincerely,

Jeff Killelea, Manager
Permit and Technical Services Section
Water Quality Program

[3] https://apps.ecology.wa.gov/publications/summarypages/1710007.html
[4] https://ecology.wa.gov/Water-Shorelines/Water-quality/Water-quality-permits/Fees
[5] www.ecology.wa.gov/constructionstormwaterpermit

F. 303(d) List Waterbodies / TMDL Waterbodies Information

G. Contaminated Site Information

The soil profile is provided under Section 6A of the Drainage Report.

H. Engineering Calculations

TESC Pond sizing calculations

The total contributing area to the proposed sediment pond is approximately 8.45 acres.
The sediment pond is sized for the developed 10-year / 24-hour design storm

1. Discharge rate

Q 10yr/24hr = 5.43 cfs

Surface Area (SA)

SA = 2 X Q10yr/24hr / Vsed

SA = 2 X 5.4 / 0.00096

Where Vsed is the settling velocity.

= 11,313 Sqft

2. Sizing the De-watering Mechanism:

Principal Spillway (Riser pipe)

The diameter shall be the minimum necessary to pass the developed 10-yr/24-hr design storm. Use Figure II.4.30 Riser inflow curves (DOE) to determine this diameter
(h = 1 foot)

Q (10yr/24hr dev) = 5.43 cfs x1.6 = 8.688 cfs

Per figure II.4.30 of the DOE manual, the minimum riser diameter is 18 inches to convey this flow rate.

Emergency Overflow Spillway

The emergency overflow spillway shall convey the 100yr/24hr developed design storm.

Q 100yr/24hr = 8.58 cfs

H = 0.5 ft

Length (L) = Q 100yr/24hr - 2.4 (H)

$$\text{Length (L)} = \frac{3.21\ (H)^{3/2}}{8.58\ 3.21\ (0.5)^{3/2}} - 1.2 \text{ feet} = 6.36 \text{ feet}.$$

Use the minimum length of 6.0 feet. **proposed 6.5 feet**

De-Watering
Orifice:
Size the de-watering orifice (1" minimum diameter) per the following equation:

$$Ao = \frac{As}{(2H)^{1/2}\ 0.6 \times 3600\ Tg^{1/2}}$$

where Ao = Orifice area in square feet
As = Pond surface area in square feet
H = Head above the Orifice (height of riser in pipe=2.5-ft)
T = De-watering Time (T = 24 hours)
g = Acceleration due to gravity

$$Ao = \frac{11{,}31\ 3\ (2H)^{1/2}}{0.6 \times 3600\ (24)\ (32.2)^{1/2}}$$

$$Ao = 0.08599 \text{ Sqft}$$

Convert Ao to Diameter (D) in inches

$$D = 24 \times (Ao / 3.14)^{1/2}$$

$$D = 3.97 \text{ inches.}$$

(Use 1" minimum) Per the DOE design standards;
the perforated pipe shall be a minimum of two inches larger than the orifice sizes.
Use 4-inch diameter for the perforated pipe.

Refer to the construction plans for more details.

* Sediment pond shall be a minimum of 3.5-ft deep, which includes 1-ft towards free board, 1-ft towards settling depth and 1.5-ft towards sediment storage. Refer to the construction plans for more details.

B. GEOTECHNICAL ENGINEERING REPORT

Geotechnical Engineering Report

The Point
19402 Smokey Point Boulevard
Arlington, WA

Prepared For:

Northwest Land Development, LLC
P.O. Box 12867
Mill Creek, WA

Attn: Mr. Michael Weeks

GEOTEST
1.888.257.5776
Bellingham | Arlington | Oak Harbor
www.geotest-inc.com

1.888.251.5276
Bellingham | Arlington | Oak Harbor
www.geotest-inc.com

September 16, 2022
Project No. 22-0727

Northwest Land Development, LLC
P.O. Box 12867
Mill Creek, WA

Attention: Mr. Michael Weeks

Regarding: Geotechnical Engineering Report
The Point
19402 Smokey Point Boulevard
Arlington, WA
(Parcel No. 31051700400600)

Dear Michael,

As requested, GeoTest Services, Inc. [GeoTest] is pleased to submit the following report summarizing the results of our geotechnical engineering evaluation for The Point project located at the above referenced address in Arlington, WA (see *Vicinity Map*, Figure 1). This report has been prepared in general accordance with the terms and conditions established in our services agreement dated August 5, 2022 and authorized by yourself.

GeoTest appreciates the opportunity to provide geotechnical services on this project and look forward to assisting you during the construction phase. Should you have any further questions regarding the information contained within the report, or if we may be of service in other regards, please contact the undersigned.

Respectfully,
GeoTest Services, Inc.

EDWARDO A. GARCIA
STATE OF WASHINGTON
40819
REGISTERED
PROFESSIONAL ENGINEER
09-16-22

Tristan A. Coragiulo, G.I.T.
Geotechnical Project Manager

Edwardo Garcia, P.E.
Geotechnical Department Manager

Enclosure: Geotechnical Engineering Report

TABLE OF CONTENTS

PURPOSE AND SCOPE OF SERVICES

The purpose of this evaluation is to establish general subsurface conditions beneath the site from which conclusions and recommendations pertaining to the project design can be formulated. Our scope of services includes the following tasks:

- Explore soil and groundwater conditions underlying the site by excavating ten test pits with a client-provided tracked excavator.
- Perform laboratory testing on representative samples to classify and evaluate the engineering characteristics of the soils encountered and to assess on-site infiltration capability.
- Provide a written report containing a description of subsurface conditions and exploration logs. The findings and recommendations in this report pertain to site preparation and earthwork, fill and compaction, seismic design, foundation recommendations, concrete slab-on-grade construction, foundation and site drainage, infiltration feasibility, utilities, temporary and permanent slopes, pavement structures, geotechnical consultation, and construction monitoring.
- Assess Geologically Hazardous Areas (if present) per Arlington Municipal Code (AMC).

PROJECT DESCRIPTION

GeoTest understands that the subject property will be developed to include a new multi-use complex that will include multi-family housing, retail buildings, and townhome-style residential structures. It is expected that much of the approximately 8-acre site will be paved or covered by roof area/hardscape surfaces. GeoTest understands that the planned buildings will be one to 3 stories in height, will utilize wood-frame construction, and will likely include slab-on-grade floors. The structural loads have not been provided but are expected to be light to moderate.

GeoTest generally anticipates that information regarding infiltration feasibility will be needed for the property. The use of Low Impact Development coupled with shallow infiltration facilities are strategies that are expected for the management of stormwater on this site.

SITE CONDITIONS

This section includes a description of the general surface and subsurface conditions observed at the project site during the time of our field investigation. Interpretations of site conditions are based on the results and review of available information, site reconnaissance, subsurface explorations, laboratory testing, and previous experience in the project vicinity.

Surface Conditions

The proposed project area is located within a trapezoidal shaped parcel west of Smokey Point Boulevard in Arlington, WA and is approximately 8 acres in size. Interstate 5 also borders the parcel to the west behind coniferous foliage which roughly comprises the western half of the subject property. Underbrush and other deciduous forest canopy also exist within the proposed project area, as well as an open grass field in the parcel's northeastern quadrant. A single-family residence also resides within the upper, southern half of the project area.

The parcel gently terraces and slopes up in elevation from north to south, with approximately 15 feet of vertical relief. Just east of the property and Smokey Point Boulevard is the Stillaguamish River floodplain, approximately 40 feet below the grade of the project site. For purposes of this report, we split the subject property into both an "upper half" and "lower half," as depicted in *Topographic Bare Earth Imagery Plan* attached at the end of this report (Figure 5).

Images 1 and 2. A southwestern view of the upper portion of the property and the single-family residence on site (Image 1), as well as a northwestern view of the lower portion of the subject parcel (Image 2).

Subsurface Soil Conditions

Subsurface conditions were explored by advancing ten test pits (TP-1 through TP-10) on August 11, 2022. The explorations were each advanced to an approximate depth of 8 to 10 feet below ground surface (BGS) using a track-mounted excavator. Approximate locations of these explorations have been plotted on the *Site and Exploration Plan* (Figure 2).

The test pits encountered similar subsurface conditions. In general, our explorations exhibited approximately 0.5 to 1.5 feet of topsoil overlying native soils throughout the proposed development area. The topsoil is comprised of loose, dark brown to black, dry, slightly silty, very gravelly sand with abundant organics. These surficial organic soils are underlain by native, medium dense, tan, dry to damp, silty to poorly graded sands and gravels. In general, these sands and gravels were siltier at higher elevations, and graded into less silty, both well and poorly

graded soils with depth. It should also be noted that Test Pit TP-3 exhibited a medium stiff, tan, dry, very sandy silt underlying the topsoil, further implying the higher silt contents of near surface, native soils throughout the project area. GeoTest interprets these granular soils as the Marysville Sand member of the Recessional Outwash mapped in the area (Minard, 1985). The Marysville Sand was encountered to the maximum explored depth of most of our explorations.

Within a few of our test pit explorations at depths ranging between 7 and 9.5 feet BGS (Test Pits TP-2 – TP-4, and TP-6), GeoTest also observed a gray, stiff, damp, slightly clayey, very sandy silt with trace gravel. Based on its existence, coupled with both the presence of perched groundwater observed in other exploration locations (refer to the *Groundwater* section of this report for more information) as well as the site's elevation above the Stillaguamish floodplain, it appears that this silt unit is present within the upper 10 to 15 feet of the site grade within the lower half of the proposed development area. Based on regional mapping, we interpret these soils to be that of the Clay Member of the Recessional Outwash unit mapped in the area (Minard, 1985).

For the purposes of this report, we refer to the Marysville Sand member of the Recessional Outwash as "Marysville Sand," and the Clay Member of the Recessional Outwash as the "Clay Member." More detailed logs of the subsurface conditions encountered within our explorations are presented in the enclosed *Test Pit Logs* attached to the end of this report.

Image 3. Subsurface soil conditions within test pit TP-3, exhibiting granular outwash overlying slightly clayey, very sandy silt at depth, with perched groundwater atop these finer soils.

General Geologic Conditions

Geologic information for the project site was obtained from the *Geologic map of the Arlington West 7.5-minute quadrangle, Snohomish County, Washington* (Minard, 1985) published by the U.S. Geological Survey. This map indicates that the project site is underlain by Vashon Drift Recessional Outwash consisting of the Marysville Sand Member (map unit Qvrm) and the Clay Member (map unit Qvrc), with alluvium also mapped nearby but at lower elevations off site.

Alluvium is located within the Stillaguamish River floodplain east of and topographically below the proposed development area. This unit generally consists of stratified gravels, sands, and silts within floodplains, active channels, and historic fluvial basins at elevations near the water table.

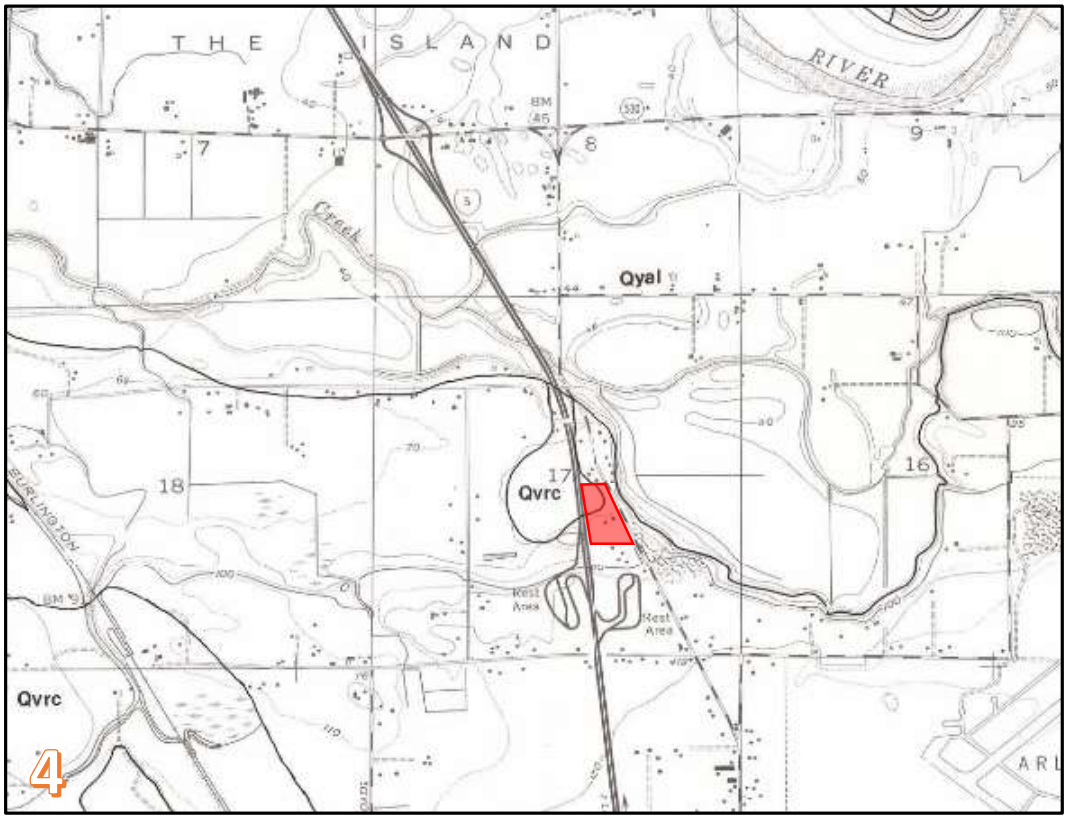


Image 4. Mapped geologic units within the vicinity of the project site (shown in red), as mapped by Minard, illustrating the presence of alluvium (map unit Qyal), Marysville Sand (map unit Qvrm), and the Clay Member (map unit Qvrc) in the area.

The Marysville Sand Member of the Recessional Outwash consists of mostly well-drained, outwash sand with minor amounts of gravel. The Clay Member is comprised of gray, olive gray, mottled, massive clay to silt and is associated with the Marysville Sand Member, such that it grades into and interfingers laterally with the Marysville Sand member. Recessional outwash deposits such as these were deposited as valley fill by meltwater flowing south from the stagnating and receding Vashon Glacier during the Pleistocene Epoch. Glaciofluvial environments

deposited different sediments depending on the depositional environments and energy levels. More granular outwash is representative of higher energy, glacial river environments, while silts and clays were likely deposited in lower energy fluvial and glaciolacustrine environments.

Our on-site explorations indicate that the encountered subsurface soil conditions are generally in accordance with the Marysville Sand and Clay Member soil units. For the purposes of this geotechnical report, we have referred to the Marysville Sand Member of the Recessional outwash as 'Marysville Sand'.

Groundwater

Groundwater seepage was encountered within test pits TP-1, TP-2, TP-4 – TP-6, TP-8, and TP-10 at the time of our investigation on August 11, 2022. The depth of observed seepage ranged between approximately 5 and 9 feet BGS, with shallower seepage observed within the sites lower half and the center portion of the subject property. GeoTest interprets the seepage as a perched groundwater horizon, in which groundwater is perched atop the silt exposed at depth within a few test pits. We also make this inference due to the proximity of floodplain to the east, which is approximately 40 to 50 feet lower in elevation, where a regional groundwater condition likely exists.

Perched water is not representative of a widespread, regional aquifer. Rather, it is representative of surface water and near-surface interflow that collects over denser or siltier soils with reduced hydraulic conductivities. Perched water is typically less than a few feet in thickness and is typically present during extended periods of wet weather.

The groundwater conditions reported on the exploration logs are for the specific locations and dates indicated, and therefore may not be indicative of other locations and/or times. Groundwater levels are variable and groundwater conditions fluctuate depending on local subsurface conditions, precipitation, and changes in on-site and off-site use.

GEOLOGIC HAZARDS

As the subject property is located within the City of Arlington, GeoTest reviewed Chapter 20.93.600 (Geologically Hazardous Areas) of the AMC. Because the subject property is relatively flat, it is GeoTest's opinion that the subject property does not contain hazards pertaining to erosion, landslides, or steep slopes (i.e., not an Erosion Hazard, Landslide Hazard, or Steep Slope Hazard). However, the subject property is mapped as having a low to moderate susceptibility to liquefaction and is discussed in the next section of this report.

Seismic and Liquefaction Hazards

AMC 20.93.600(4) defines "Seismic Hazard Areas" as "areas subject to severe risk of earthquake damage as a result of seismic induced settlement, shaking, slope failure or soil liquefaction. These conditions occur in areas underlain by cohesion less soils of low density usually in association with a shallow groundwater table."

Based on a review of information obtained from the Washington State Department of Natural Resources *Geologic Information Portal*, there are no mapped seismic features within the local vicinity of the proposed development area. The subject site is also classified as having a low to moderate liquefaction susceptibility. However, this map only provides an estimate of the likelihood that the soil will liquefy as a result of an earthquake and is meant as a general guide to delineate areas prone to liquefaction.

Liquefaction is defined as a significant rise in porewater pressure within a soil mass caused by earthquake-induced cyclic shaking. The shear strength of liquefiable soils is reduced during large and/or long duration earthquakes as the soil consistency approaches that of semi-solid slurry. Liquefaction can result in significant and widespread structural damage if not properly mitigated. Deposits of loose, granular soil below the groundwater table are most susceptible to liquefaction. Damage caused by foundation rotation, lateral spreading, and other ground movements can result from soil liquefaction.

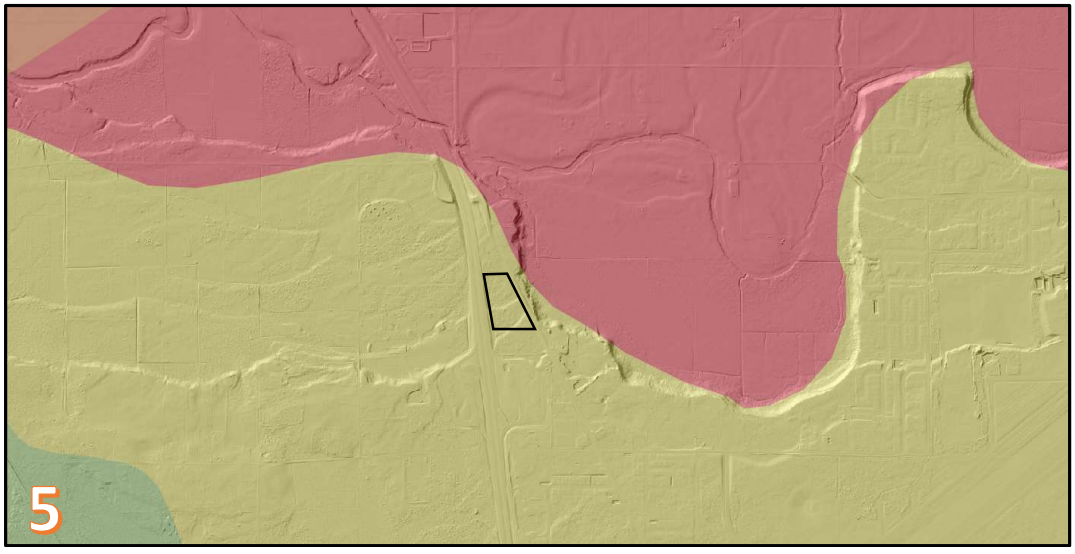


Image 5. Map showing liquefaction hazard susceptibility within the proposed development area shown in black. Yellow depicts "low to moderate" susceptibility in the vicinity of subject property (Data source: Washington Geologic Information Portal).

Based on our subsurface explorations, the site is underlain by native, medium dense, sandy soils with varying amounts of gravel. Groundwater seepage was encountered within medium dense, native soils. Due to these factors, it is GeoTest's opinion that the potential for liquefaction

underlying the subject property is generally low. For structures three stories tall or less, it is our opinion that no additional mitigations are required to address liquefaction for the proposed development. Should the development plan include structures for four stories or greater, GeoTest reserves the right to re-evaluate the liquefaction potential for the site.

Potential Volcanic Hazards

Based on a review of information obtained from the *Geologic Information Portal*, the project area is located approximately 750 feet from a mapped Volcanic Hazard Area (Lahar Hazard). The AMC does not define volcanic hazards; thus, no volcanic hazards exist on this property per AMC. However, the project's vicinity to a lateral perimeter of a mapped "volcanic hazard," as mapped by the Department of Nature Resources, should be noted.

It is GeoTest's opinion that the level of risk is not sufficient to prevent development of the subject property as proposed due to the elevation above the Stillaguamish River floodplain. No lahar mitigations are expected as part of site development.

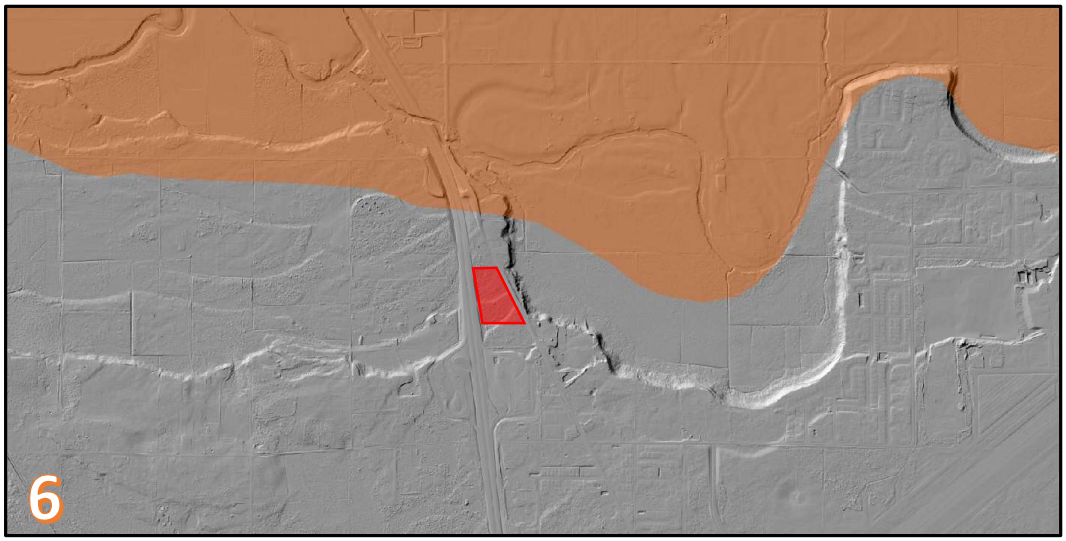


Image 6. Map showing the proposed development in red and its vicinity to a potential lahar flow path from a Glacier Peak volcanic event in orange (Data source: Washington Geologic Information Portal).

CONCLUSIONS AND RECOMMENDATIONS

Based on the evaluation of the data collected during this investigation, it is GeoTest's opinion that the subsurface conditions at the site are suitable for the proposed development, provided the recommendations contained herein are incorporated into the project design.

The subsurface explorations that were performed for this study generally encountered native, non-organic, medium dense, Marysville Sand within approximately 0.5 to 1.5 feet of existing grade. We recommend that the loose, near-surface topsoil be removed from the building

footprints, roadways, and parking lot areas down to the native Marysville Sand. Once stripping is completed, the subgrade should then be compacted to a firm and unyielding condition. GeoTest personnel should be on site to observe the excavation and confirm that adequate native subgrade has been exposed. The proposed buildings can then be constructed with conventional continuous or individual spread foundations bearing directly on firm and unyielding native soil, or on compacted structural fill placed atop firm and unyielding soils. Further recommendations regarding the placement and compaction of structural fill can be found in the *Fill and Compaction* section of this report.

Based on the native soils encountered in the test pits, it appears that the subject site is suitable for stormwater infiltration. The native Marysville Sand encountered in our explorations was medium dense and composed of sand with varying amounts of gravel. Perched groundwater seepage was observed at depths ranging between 5 and 9 feet BGS throughout various portions of the proposed development area. Perched groundwater seepage was specifically observed atop the Clay Member within the lower half of the proposed development area. This will present challenges associated with the placement, design, and implementation of infiltration facilities given the lower site elevations and the reduced amount of separation that will exist between facility bottoms and perched groundwater conditions. Our preliminary stormwater infiltration recommendations are presented in the *Stormwater Infiltration Potential* section of this report. It should be noted that Pilot Infiltration Testing and/or groundwater monitoring may be required by the City of Arlington, both of which are outside the scope of this report.

Site Preparation and Earthwork

The portions of the site proposed for foundations, floor slabs, pavements, and sidewalks should be prepared by removing existing topsoil, loose fill (if present), deleterious material, and significant accumulations of organics. GeoTest anticipates between 0.5 and 1.5 feet of removal as part of site stripping activities. Prior to placement of any foundation elements or structural fill, the exposed subgrade under all areas to be occupied by soil-supported floor slabs, spread, or continuous foundations should be recompacted to a firm and unyielding condition. Verification of compaction should be performed by qualified geotechnical personnel. The purpose of this effort is to identify loose or soft soil deposits so that, if feasible, the soil distributed during site work can be recompacted.

Proof rolling should be carefully observed by qualified geotechnical personnel. Areas exhibiting significant deflection, pumping, or over-saturation that cannot be readily compacted should be overexcavated to firm soil. Overexcavated areas should be backfilled with compacted granular material placed in accordance with subsequent recommendations for structural fill. During periods of wet weather, proof rolling could damage the exposed subgrade. Under these conditions, qualified geotechnical personnel should observe subgrade conditions to determine if proof rolling is feasible.

Fill and Compaction

Structural fill used to obtain final elevations for footings and soil-supported floor slabs must be properly placed and compacted. In most cases, suitable, non-organic, predominantly granular soil may be used for fill material provided the material is properly moisture conditioned prior to placement and compaction, and the specified degree of compaction is obtained. Material containing topsoil, wood, trash, organic material, or construction debris is not suitable for reuse as structural fill and should be properly disposed off-site or placed in nonstructural areas.

Soils containing more than approximately five percent fines are considered moisture sensitive and are difficult to compact to a firm and unyielding condition when over the optimum moisture content by more than approximately two percent. The optimum moisture content is that which allows the greatest dry density to be achieved at a given level of compactive effort.

Reuse of On-Site Soil

The on-site, non-organic, Marysville Sand is suitable for reuse as structural fill when placed at or near optimum moisture contents, as determined by ASTM D1557, and if allowed for in the project plans and specifications. The near-surface soils contain elevated silt contents and are expected to be difficult to use during periods of wet weather. The Clay Member deposits found at depth throughout the site may also be re-used in the same manner, but will be very moisture sensitive.

The Contractor and Owner should be prepared to manage over-optimum moisture content soils. Moisture content of the site soils may be difficult to control during periods of wet weather.

Imported Structural Fill

GeoTest recommends that imported structural fill consist of clean, well-graded sandy gravel, gravelly sand, or other approved naturally occurring granular material (pit run) with at least 30 percent retained on the No. 4 sieve, or a well-graded crushed rock. Structural fill for dry weather construction may contain up to 10 percent fines (that portion passing the U.S. No. 200 sieve) based on the portion passing the U.S. No. 4 sieve. The use of an imported fill having more than 10 percent fines may be feasible, but the use of these soils should generally be reviewed by the design team prior to the start of construction.

Imported structural fill with less than five percent fines should be used during wet weather conditions. Due to wet site conditions, soil moisture contents could be high enough that it may be difficult to compact even clean imported select granular fill to a firm and unyielding condition. Soils with an over-optimum moisture content should be scarified and dried back to a suitable moisture content during periods of dry weather or removed/replaced with drier structural fill.

Backfill and Compaction

Structural fill should be placed in horizontal lifts. The structural fill must measure 8 to 10 inches in loose thickness and be thoroughly compacted. All structural fill placed under load bearing areas should be compacted to at least 95 percent of the maximum dry density, as determined using test method ASTM D1557. The top of the compacted structural fill should extend outside all foundations and other structural improvements a minimum distance equal to the thickness of the fill. We recommend that compaction be tested after placement of each lift in the fill pad.

Wet Weather Earthwork

If construction takes place during wet weather, GeoTest recommends that structural fill consist of imported, clean, well-graded sand, or sand and gravel as described above. If fill is to be placed or earthwork is to be performed in wet conditions, the contractor may reduce soil disturbance by:

- Limiting the size of areas that are stripped of topsoil and left exposed
- Accomplishing earthwork in small sections
- Limiting construction traffic over unprotected soil
- Sloping excavated surfaces to promote runoff
- Limiting the size and type of construction equipment used
- Providing gravel 'working mats' over areas of prepared subgrade
- Removing wet surficial soil prior to commencing fill placement each day
- Sealing the exposed ground surface by rolling with a smooth drum compactor or rubber-tired roller at the end of each working day
- Providing up-gradient perimeter ditches or low earthen berms and using temporary sumps to collect runoff and prevent water from ponding and damaging exposed subgrades

Seismic Design Considerations

The Pacific Northwest is seismically active, and the site could be subject to movement from a moderate or major earthquake. Consequently, moderate levels of seismic shaking should be accounted for during the design life of the project, and the proposed structure should be designed to resist earthquake loading using appropriate design methodology.

For structures designed using the seismic design provisions of the 2018 International Building Code, the medium dense Marysville Sand is classified as Site Class D, according to ASCE 7-16. The structural engineer should select the appropriate design response spectrum based on Site Class D soil and the geographical location of the proposed construction.

Foundation Support

Foundation support for the proposed development can be established via continuous or isolated spread footings founded on firm and unyielding native soils (Marysville Sand or Clay Member), or on properly compacted structural fill placed directly over firm and unyielding native soil. GeoTest expects that at least 0.5 to 1.5 feet of excavation will be required to remove organic topsoil and loose fill soils (if present) and reveal competent bearing soils beneath foundation areas. GeoTest recommends that qualified geotechnical personnel confirm that suitable bearing conditions have been reached prior to placement of structural fill or foundation formwork.

To provide proper support, GeoTest recommends that existing topsoil, existing fill (if present), and/or loose upper portions of the native soil be removed from beneath the building foundation areas. If footings or structural fill will be placed atop the native Marysville Sand, the surface should be compacted to a firm and unyielding condition with a smooth-drum roller, hoe-pack, or a similar piece of construction equipment. Once suitable bearing conditions have been confirmed by the Geotechnical Engineer or their representative, then foundations can bear directly on native soils or on properly compacted structural fill as described in the *Fill and Compaction* section of this report.

Continuous and isolated spread footings should be founded 18 inches, minimum, below the lowest adjacent final grade for freeze/thaw protection. The footings should be sized in accordance with the structural engineer's prescribed design criteria and seismic considerations.

Allowable Bearing Capacity

Assuming the above foundation support criteria are satisfied, continuous or isolated spread footings founded directly on remedially compacted, firm, and unyielding native soil (Marysville Sand or Clay Member), or on compacted structural fill placed directly atop these native soils may be proportioned using a net allowable soil bearing pressure of 2,500 pounds per square foot (psf). The 'net allowable bearing pressure' refers to the pressure that can be imposed on the soil at foundation level. This pressure includes all dead loads, live loads, the weight of the footing, and any backfill placed above the footing. The net allowable bearing pressure may be increased by one-third for transient wind or seismic loads.

The 'net allowable bearing pressure' refers to the pressure that can be imposed on the soil at foundation level. This pressure includes all dead loads, live loads, the weight of the footing, and any backfill placed above the footing. The net allowable bearing pressure may be increased by one-third for transient wind or seismic loads.

Foundation Settlement

Settlement of shallow foundations depends on foundation size and bearing pressure, as well as the strength and compressibility characteristics of the underlying soil. If construction is accomplished as recommended and at the maximum allowable soil bearing pressure, GeoTest estimates the total settlement of building foundations to be less than one inch. Differential settlement between two adjacent load-bearing components supported on competent soil is estimated to be less than one half the total settlement.

Floor Support

Floor slabs for the proposed buildings can be supported on firm and unyielding, properly prepared native subgrade or on properly placed and compacted structural fill placed over firm and unyielding native soil. The native subgrade should be proof rolled as recommended in the *Site Preparation and Earthwork* section of this report.

GeoTest recommends that concrete slab-on-grade floors be underlain with at least 6 inches of clean, compacted, free-draining gravel. The gravel should contain less than 3 percent passing the U.S. Standard No. 200 sieve (based on a wet sieve analysis of that portion passing the U.S. Standard No. 4 sieve). The purpose of this gravel layer is to provide uniform support for the slab, provide a capillary break, and act as a drainage layer. If water vapor migration through concrete slabs is a concern, a continuous 10-mil minimum thick polyethylene sheet with tape-sealed joints should be installed below the slab to serve as an impermeable vapor barrier. The vapor barrier should be installed and sealed in accordance with the manufacturer's instructions.

A Subgrade Modulus (k) of 200 pounds per cubic inch (pci) is recommended for use in design of concrete slab elements placed on firm and unyielding native soil or on properly placed structural fill over remedially compacted existing site soils. These values assume site preparations prior to slab installation follow the minimum soil preparation measures recommended above.

Exterior concrete slabs-on-grade, such as for parking and sidewalks, may be supported directly on properly prepared native soils or existing fill soils; however, long-term performance will be enhanced if exterior slabs are placed on a layer of clean, durable, well-draining granular material as recommended herein.

Foundation and Site Drainage

Positive surface gradients should be provided adjacent to new foundation areas to direct surface water away from the building and toward suitable drainage facilities. Roof drainage should not be introduced into the perimeter footing drains but should be separately discharged directly to the stormwater collection system or similar municipality-approved outlet. Pavement and sidewalk areas, if present, should be sloped and drainage gradients should be maintained to carry

surface water away from foundation areas towards an approved stormwater collection system. Surface water should not be allowed to pond and soak into the ground surface near buildings or paved areas during or after construction. Construction excavations should be sloped to drain to sumps where water from seepage, rainfall, and runoff can be collected and pumped to a suitable discharge facility.

To reduce the potential for groundwater and surface water to seep into interior spaces, GeoTest recommends that an exterior footing drain system be constructed around the perimeter of new foundations as shown in the *Conceptual Footing and Wall Drain Section* (Figure 6) of this report. The drain should consist of a perforated pipe measuring 4 inches in diameter at minimum, surrounded by at least 12 inches of filtering media. The pipe should be sloped to carry water to an approved collection system.

The filtering media may consist of open-graded drain rock wrapped in a nonwoven geotextile fabric such as Mirafi 140N (or equivalent) or wrapped with a graded sand and gravel filter. For foundations supporting retaining walls, drainage backfill should be carried up the back of the wall and be at least 12 inches wide. The drainage backfill should extend from the foundation drain to within approximately 1 foot of the finished grade and consist of open-graded drain rock containing less than 3 percent fines by weight passing the U.S. Standard No. 200 sieve (based on a wet sieve analysis of that portion passing the U.S. Standard No. 4 sieve). The invert of the footing drainpipe should be placed at approximately the same elevation as the bottom of the footing or 12 inches below the adjacent concrete slab grade (whichever is deeper) so that water will be contained. This process prevents water from seeping through walls or floor slabs. The drain system should include cleanouts to allow for periodic maintenance and inspection.

Please understand that the above recommendations are intended to assist the design engineer and/or architect in development of foundation and site drainage parameters and are based on our experience with similar projects in the area. The final foundation and site drainage plan that will be incorporated into the project plans is to be determined by the design team.

Resistance to Lateral Loads

The lateral earth pressures that develop against retaining walls will depend on the method of backfill placement, degree of compaction, slope of backfill, type of backfill material, provisions for drainage, magnitude and location of any adjacent surcharge loads, and the degree to which the wall can yield laterally during or after placement of backfill. If the wall is allowed to rotate or yield so the top of the wall moves an amount equal to or greater than about 0.001 to 0.002 times its height (a yielding wall), the soil pressure exerted comprises the active soil pressure. When a wall is restrained against lateral movement or tilting (a nonyielding wall), the soil pressure exerted comprises the at rest soil pressure. Wall restraint may develop if a rigid structural network is constructed prior to backfilling or if the wall is inherently stiff.

GeoTest recommends that yielding walls under drained conditions be designed for an equivalent fluid density of 40 pounds per cubic foot (pcf) for structural fill in active soil conditions. Nonyielding walls under drained conditions should be designed for an equivalent fluid density of 60 pcf for structural fill in at-rest conditions. Design of walls should include appropriate lateral pressures caused by surcharge loads located within a horizontal distance equal to or less than the height of the wall. For uniform surcharge pressures, a uniformly distributed lateral pressure equal to 35 percent and 50 percent of the vertical surcharge pressure should be added to the lateral soil pressures for yielding and nonyielding walls, respectively.

For structures designed using the seismic design provisions of the International Building Code, GeoTest recommends that retaining walls include a seismic surcharge in addition to the equivalent fluid densities presented above. We recommend that a seismic surcharge of approximately 8H (where H is the height of the wall) be used for design purposes. This surcharge assumes that the wall is allowed to rotate or yield. If the wall is restrained, GeoTest should be contacted so that we can provide a revised seismic surcharge pressure.

Passive earth pressures developed against the sides of building foundations, in conjunction with friction developed between the base of the footings and the supporting subgrade, will resist lateral loads transmitted from the structure to its foundation. For design purposes, the passive resistance of well-compacted fill placed against the sides of foundations is equivalent to a fluid with a density of 275 pcf. The recommended value includes a safety factor of about 1.5 and is based on the assumption that the ground surface adjacent to the structure is level in the direction of movement for a distance equal to or greater than twice the embedment depth. The recommended value also assumes drained conditions that will prevent the buildup of hydrostatic pressure in the compacted fill. Retaining walls should include a drain system constructed in general accordance with the recommendations presented in the *Foundation and Site Drainage* section of this report. In design computations, the upper 12 inches of passive resistance should be neglected if the soil is not covered by concrete slabs or pavement. If future plans call for the removal of the soil providing resistance, the passive resistance should not be considered.

An allowable coefficient of base friction of 0.35, applied to vertical dead loads only, may be used between the underlying imported granular structural fill and the base of the footing. If passive and frictional resistance are considered together, one half the recommended passive soil resistance value should be used since larger strains are required to mobilize the passive soil resistance as compared to frictional resistance. A safety factor of about 1.5 is included in the base friction design value. GeoTest does not recommend increasing the coefficient of friction to resist seismic or wind loads.

Buoyant Forces

Buoyant forces develop when a submerged structural element is placed below a water table, with the resultant force having the potential to “float” the structure. Buoyant forces are likely to

develop if structural elements are included in the design that are more than about 5 to 9 feet below existing site grades. Below grade elements such as vaults and elevator pits that extend below the water table should be designed to resist buoyant forces. GeoTest also recommends that, where appropriate, submerged elements have adequate water stops and waterproofing to resist the intrusion of water into the structural element.

GeoTest recommends that additional information be provided for our review once a construction plan has been developed so that we can get a better understanding of where buoyant forces may develop. GeoTest should be allowed to revise our recommendations if submerged structural elements are included in the final design.

Temporary and Permanent Slopes

The contractor is responsible for construction slope configurations and maintaining safe working conditions, including temporary excavation stability. All applicable local, state, and federal safety codes should be followed. All open cuts should be monitored during and after excavation for any evidence of instability. If instability is detected, the contractor should flatten the side slopes or install temporary shoring.

Temporary excavations in excess of 4 feet should be shored or sloped in accordance with Safety Standards for Construction Work Part N, WAC 296-155-66403.

Temporary unsupported excavations in the native soils encountered at the project site are classified as a Type B soil according to WAC 296-155-66401 and may be sloped as steep as 1H: 1V (Horizontal: Vertical). All soils encountered are classified as Type C soil in the presence of groundwater seepage and may be sloped as steep as 1.5:1. Flatter slopes or temporary shoring may be required in areas where groundwater flow is present and unstable conditions develop.

Temporary slopes and excavations should be protected as soon as possible using appropriate methods to prevent erosion from occurring during periods of wet weather.

GeoTest recommends that permanent cut or fill slopes be designed for inclinations of 2H: 1V or flatter. Permanent cuts or fills used in earth slopes intended to hold water should be 3H: 1V or flatter. All permanent slopes should be vegetated or otherwise protected to limit the potential for erosion as soon as practical after construction.

Utilities

Utility trenches must be properly backfilled and compacted to reduce cracking or localized loss of foundation, slab, or pavement support. Excavations for new shallow underground utilities are expected to be placed within native Marysville Sand and/or Clay Member soils.

Trench backfill in improved areas (beneath structures, pavements, sidewalks, etc.) should consist of structural fill as defined in the *Fill and Compaction* section of this report. Outside of improved areas, trench backfill may consist of reused native material provided the backfill can be compacted to project specifications. Trench backfill should be placed and compacted in general accordance with the recommendations presented in the *Fill and Compaction* section of this report.

Surcharge loads on trench support systems due to construction equipment, stockpiled material, and vehicle traffic should be included in the design of any anticipated shoring system. The contractor should implement measures to prevent surface water runoff from entering trenches and excavations. In addition, vibration as a result of construction activity and traffic may cause caving of trench walls.

The contractor is responsible for trench configurations. All applicable local, state, and federal safety codes should be followed. All open cuts should be monitored by the contractor during excavation for any evidence of instability. If instability is detected, the contractor should flatten the side slopes or install temporary shoring. If groundwater or groundwater seepage is present, and the trench is not properly dewatered, the soil within the trench zone may be prone to caving, channeling, and running. Trench widths may be substantially wider than under dewatered conditions.

Stormwater Infiltration Potential

Based on the presence of predominantly granular materials, it is our opinion that the on-site infiltration of stormwater is feasible for this project site. However, both slightly clayey, very sandy silt at depth and a perched groundwater horizon that will make the design of infiltration systems challenging. These conditions may present challenges with infiltration due to stipulations referenced in the 2019 Washington State Department of Ecology *Stormwater Management Manual for Western Washington* [Manual], which has been adopted by the City of Arlington, per AMC 13.28.060.

The Manual has requirements and limitations for the design of stormwater facilities when shallow restriction layers exist below a facility. Stormwater management strategies that include elements of Low Impact Development (LID) may be feasible but should have a fundamental expectation that there will be some areas where shallow restriction layers are present that might influence the overall design of stormwater systems.

Perched groundwater was observed at depths ranging between 5 and 9 feet BGS within the proposed development area (approximate elevations of 77 to 80 feet above mean sea level [MSL] in lower half and 86 feet MSL in upper half). For these reasons, it is our opinion that the infiltration of stormwater is more favorable in the upper half of the proposed development area. Infiltration within the lower half of the project site is not infeasible but will be more challenging

due to there being less vertical spacing between the surface, silty soils, and/or perched groundwater. It should also be noted that the groundwater conditions are variable and may fluctuate depending on local subsurface conditions, precipitation, and changes in on-site and off-site use.

Test Pit Gradation Results

From the explorations excavated in the areas of interest, 13 representative soil samples were selected and mechanically tested for grain size distribution and calculation according to the soil grain size analysis method per the Manual. A summary of these results has been broken into two sections between both halves of the property and reproduced in Tables 1 and 2 below. Refer to the *Topographic Bare Earth Imagery Plan* for a representation of these two areas.

The rates presented in Tables 1 and 2 are representative of loose soil conditions and do not take the relative density of the soil into account. Stormwater infiltration potential is a function of the relatively permeability of the site soils, and the separation between the base of the proposed stormwater facility and the groundwater table.

Table 1
Preliminary Infiltration Results Based on Grain Size Analysis
Lower Half of Property

Test Pit ID & Depth	Approximate Elevation (ft MSL)	Geologic Unit	Corrected K_{sat} Infiltration Rate [in/hr]
TP-2 (1.3 ft)	83.7	Marysville Sand	1.6
TP-2 (3.3ft)	81.7	Marysville Sand	5*
TP-2 (8.0 ft)	77.0	Marysville Sand	5*
TP-2 (10.0 ft)	75.0	Clay Member	0.1
TP-3 (1.5 ft)	83.5	Marysville Sand	0.3
TP-6 (1.7 ft)	85.3	Marysville Sand	3.2
TP-6 (4.0 ft)	83.0	Marysville Sand	5*
TP-6 (6.0 ft)	81.0	Marysville Sand	5*

Notes:
-Ksat = Initial Saturated Hydraulic Conductivity
-Correction Factors Used: CFv = 0.5, CFt = 0.40, CFm =0.9, CFg = 0.5**
-Total Correction Factor = 0.09
* GeoTest recommends utilizing a preliminary infiltration rate that is less than 5 inches per hour for preliminary design purposes.
** GeoTest has applied an additional variability factor due to the varied profile of perched groundwater and silty soils observed throughout the subsurface of the site.

GeoTest assumes that the base of infiltration facilities will be at a depth of at least 3 feet BGS following site grading activities. For facilities based in clean Marysville Sand within the lower half of the site and at depths greater than about 3 feet BGS (approximately 82 feet MSL), we recommend a preliminary design infiltration rate of 5 inches per hour, with the assumption that

at least 5 vertical feet of separation exists between the bottom of proposed facilities and seasonal groundwater.

Table 2
Preliminary Infiltration Results Based on Grain Size Analysis
Upper Half of Property

Test Pit ID & Depth	Approximate Elevation (ft MSL)	Geologic Unit	Corrected K_{sat} Infiltration Rate [in/hr]
TP-8 (6.0 ft)	89.0	Marysville Sand	0.6
TP-9 (1.5 ft)	100.5	Marysville Sand	1.9
TP-9 (2.5 ft)	99.5	Marysville Sand	5*
TP-9 (6.0 ft)	96.0	Marysville Sand	5*
TP-9 (9.0 ft)	93.0	Marysville Sand	5*

Notes:
-Ksat = Initial Saturated Hydraulic Conductivity
-Correction Factors Used: CFv = 0.5, CFt = 0.40, CFm =0.9, CFg = 0.5**
-Total Correction Factor = 0.09
* GeoTest recommends utilizing a preliminary infiltration rate that is less than 5 inches per hour for preliminary design purposes.
** GeoTest has applied an additional variability factor due to the varied profile of perched groundwater and silty soils observed throughout the subsurface of the site.

For facilities based in clean Marysville Sand within the upper half of the site and at depths greater than about 3 feet BGS (approximately 92 feet MSL), we recommend a preliminary design infiltration rate of 5 inches per hour, with the assumption that at least 5 vertical feet of separation exists between the bottom of proposed facilities and seasonal groundwater.

It should be noted that adequate separation between the bottom of the facility and groundwater may not be feasible given that the shallowest groundwater was encountered at or near elevations 77 to 80 feet MSL in the lower half of site and approximately 86 feet MSL in its upper half, during our August 2022 field investigation. If facilities are designed with less than 5 vertical feet of separation between the bottom of the facility and groundwater, it seems likely that additional studies would be needed to confirm the design.

At the time of this report, GeoTest is not aware of a specific stormwater plan, nor is GeoTest aware of the depths of proposed facilities. The final design is likely to require a collaborative effort between GeoTest and the Civil designer. Should stormwater facilities be designed with less than 5 feet of separation, GeoTest recommends that a Pilot Infiltration Test be performed to confirm the infiltration rate. Both pilot infiltration testing and seasonal groundwater monitoring services are currently outside the scope of this report.

If a greater rate is desired for design purposes in this area, GeoTest recommends that a pilot infiltration test be conducted in accordance with Manual to verify its infiltration potential. This is

due to the proximity of perched groundwater and/or silty soils at varying depths throughout the project site.

Stormwater Treatment

The on-site stormwater facilities may require some form of pollutant pretreatment with an amended soil prior to on-site infiltration or off-site discharge. The reuse of on-site topsoil is often the most sustainable and cost-effective method for pollutant treatment purposes. Cation exchange capacities, organic contents, and pH of site subsurface soils were also tested to determine possible pollutant treatment suitability.

Cation exchange capacity, organic content, and pH tests were performed (by Northwest Agricultural Consultants) on eight soil samples collected from the explorations performed for this project. A summary of the laboratory test results is presented in Table 3 below:

Table 3
Cation Exchange Capacity, Organic Content, and pH Laboratory Test Results

Test Pit ID	Sample Depth (ft)	Geologic Unit	Cation Exchange Capacity (meq/100 grams)	Organic Content (%)	pH
TP-1	0.3	Topsoil	20.9	9.33	5.3
TP-1	1.4	Marysville Sand	14.6	5.45	5.8
TP-1	2.7	Marysville Sand	5.5	1.40	5.9
TP-1	8.6	Marysville Sand	4.3	1.19	6.0
TP-7	0.5	Topsoil	41.8	29.05	4.3
TP-7	1.5	Marysville Sand	15.3	5.00	5.2
TP-7	4.0	Marysville Sand	6.0	1.91	5.4
TP-7	6.0	Marysville Sand	5.9	1.50	6.0

Suitability for on-site pollutant treatment is determined in accordance with SSC-6 of the Manual. Soils with an organic content of greater than or equal to 1 percent and a cation exchange capacity of greater than or equal to 5 meq/100 grams are characterized as suitable for stormwater treatment. Based on the results shown in Table 3, soils within the upper 6 feet of the proposed development area (Topsoil and Marysville Sand) are suitable for stormwater treatment. The Marysville Sand found at depths greater than 6 feet BGS are not suitable for stormwater treatment.

On-site soils can be amended by mixing higher silt content soils or adding mulch (or other admixtures) to elevate the cation exchange capacity and organic contents. This would result in slower infiltration rates due to the higher silt content. On-site amended soil requires additional testing to confirm compliance with ecological regulations. GeoTest is available to perform additional laboratory testing as part of an expanded scope of services if the soil is to be amended.

Alternatively, the Owner may elect to import amended soils with the desired properties for planned treatment facilities.

Geotechnical Consultation and Construction Monitoring

GeoTest recommends that we be involved in the project design review process. The purpose of the review is to verify that the recommendations presented in this report are understood and incorporated in the design and specifications.

We also recommend that geotechnical construction monitoring services be provided. These services should include observation by GeoTest personnel during structural fill placement, compaction activities, and subgrade preparation operations to confirm that design subgrade conditions are obtained beneath the areas of improvement.

Periodic field density testing should be performed to verify that the appropriate degree of compaction is obtained. The purpose of these services is to observe compliance with the design concepts, specifications, and recommendations of this report. In the event that subsurface conditions differ from those anticipated before the start of construction, GeoTest Services, Inc. would be pleased to provide revised recommendations appropriate to the conditions revealed during construction.

GeoTest is available to provide a full range of materials testing and special inspection during construction as required by the local building department and the International Building Code. This may include specific construction inspections on materials such as reinforced concrete, reinforced masonry, wood framing, and structural steel. These services are supported by our fully accredited materials testing laboratories.

USE OF THIS REPORT

GeoTest Services, Inc. has prepared this report for the exclusive use of Northwest Land Development, LLC and their design consultants for specific application to the design of The Point development located at 19402 Smokey Point Boulevard in Arlington, WA. Use of this report by others is at the user's sole risk. This report is not applicable to other site locations. Our services are conducted in accordance with accepted practices of the geotechnical engineering profession; no other warranty, express or implied, is made as to the professional advice included in this report.

Our site explorations indicate subsurface conditions at the dates and locations indicated. It is not warranted that these conditions are representative of conditions at other locations and times. The analyses, conclusions, and recommendations contained in this report are based on site conditions to the limited depth and time of our explorations, a geological reconnaissance of the area, and a review of previously published geological information for the site. If variations in

subsurface conditions are encountered during construction that differ from those contained within this report, GeoTest should be allowed to review the recommendations contained in this report and, if necessary, make revisions. If there is a substantial lapse of time between submission of this report and the start of construction, or if conditions change due to construction operations at or adjacent to the project site, we recommend that we review this report to determine the applicability of the conclusions and recommendations contained herein.

The earthwork contractor is responsible to perform all work in conformance with all applicable WISHA/OSHA regulations. GeoTest Services, Inc. is not responsible for job site safety on this project; this responsibility is specifically disclaimed.

Attachments:	Figure 1	Vicinity Map
	Figure 2	Site and Exploration Plan
	Figure 3	Global Bare Earth Imagery Plan
	Figure 4	Bare Earth Exploration Plan
	Figure 5	Topographic Bare Earth Imagery Plan
	Figure 6	Conceptual Footing and Wall Drain Section
	Figure 7	Soil Classification System and Key
	Figures 8 – 17	Test Pit Logs
	Figures 18 – 20	Grain Size Test Data
	Attached	Northwest Agricultural Consultants Results
	Attached	Report Limitations and Guidelines for its Use

REFERENCES

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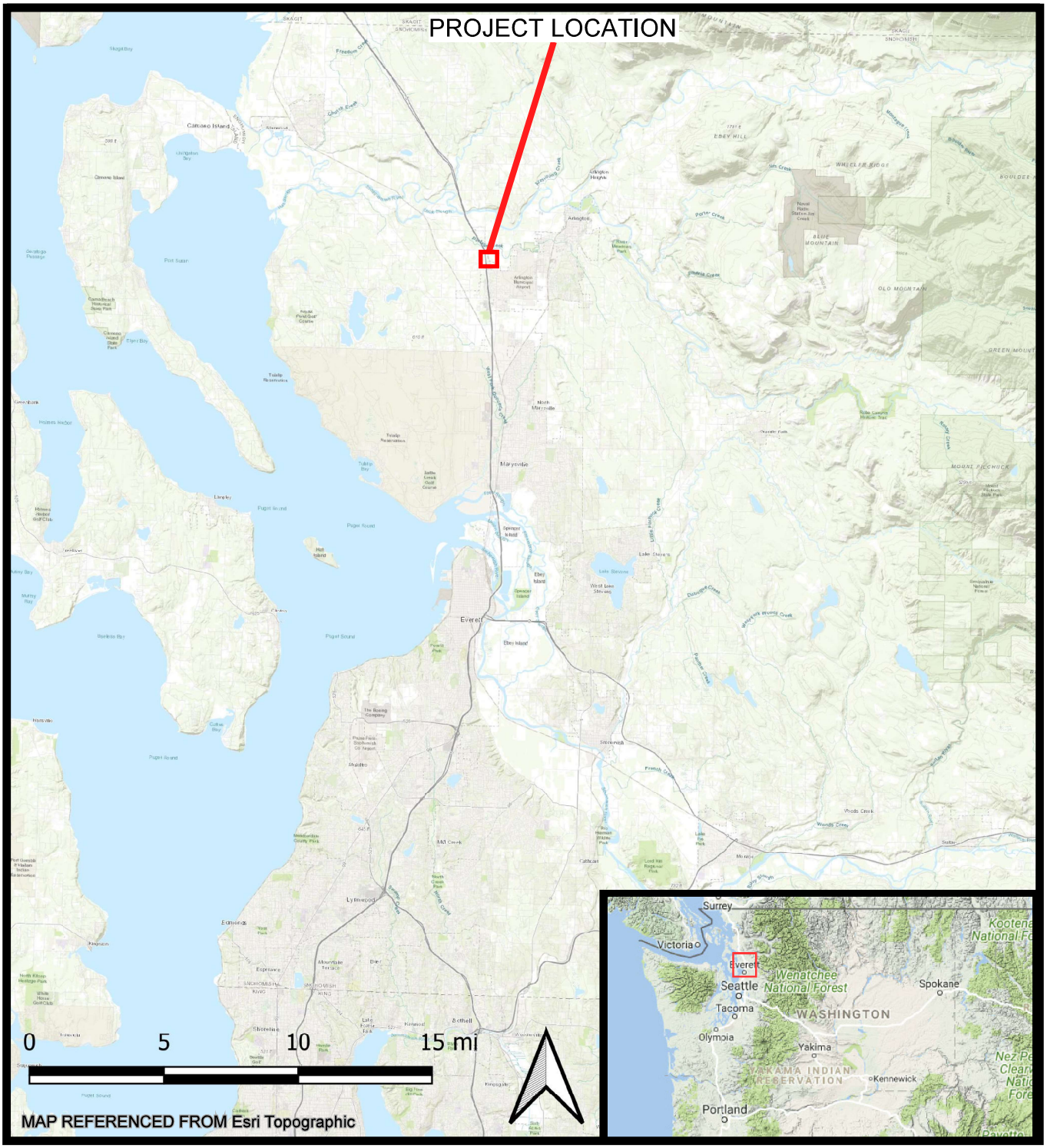
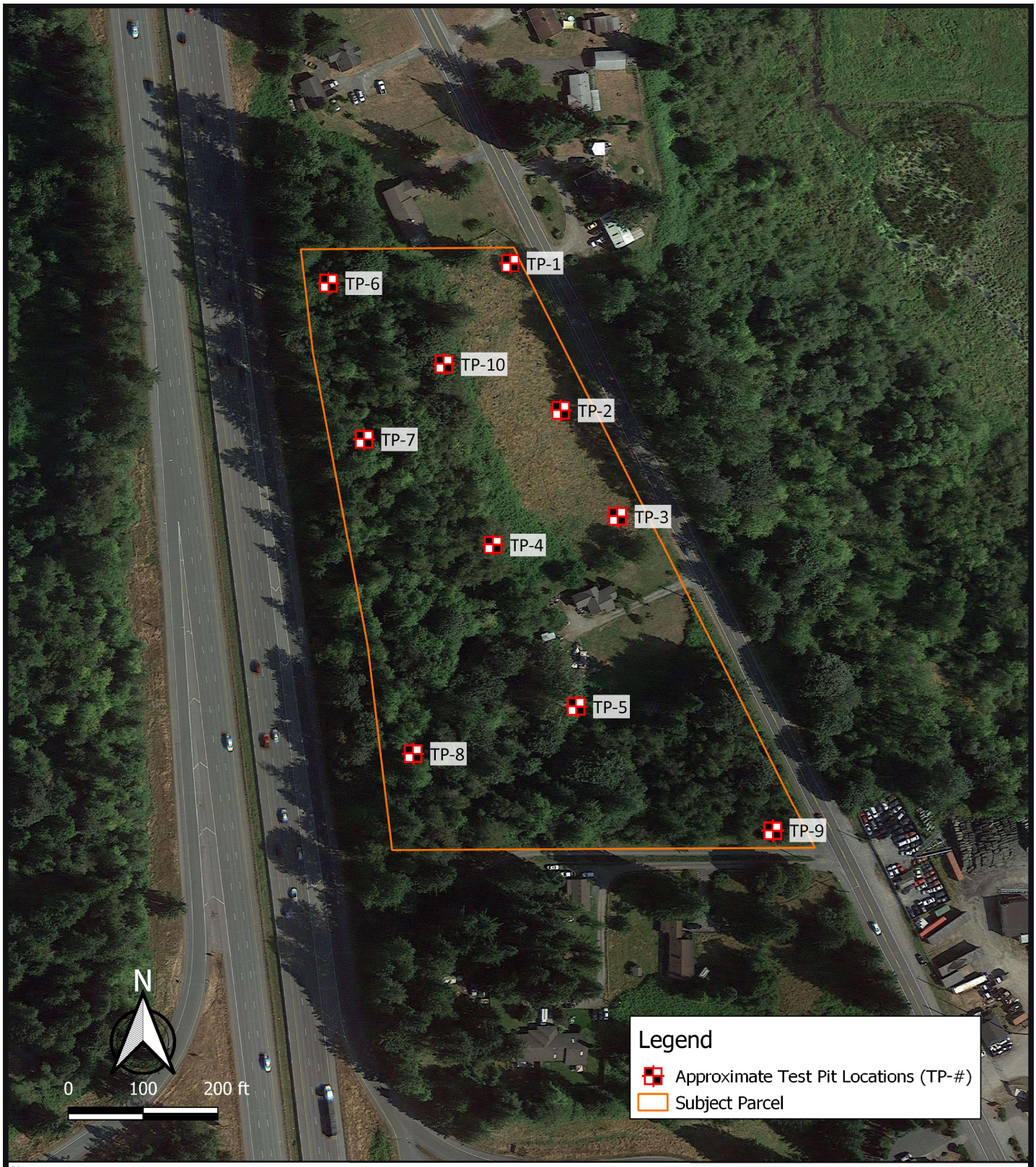


GEOTEST

Date: 8-22-2022	By: TAC	Scale: As Shown	Project 22-0727

VICINITY MAP
THE POINT
19402 SMOKEY POINT BOULEVARD
ARLINGTON, WA

Figure 1



Notes:

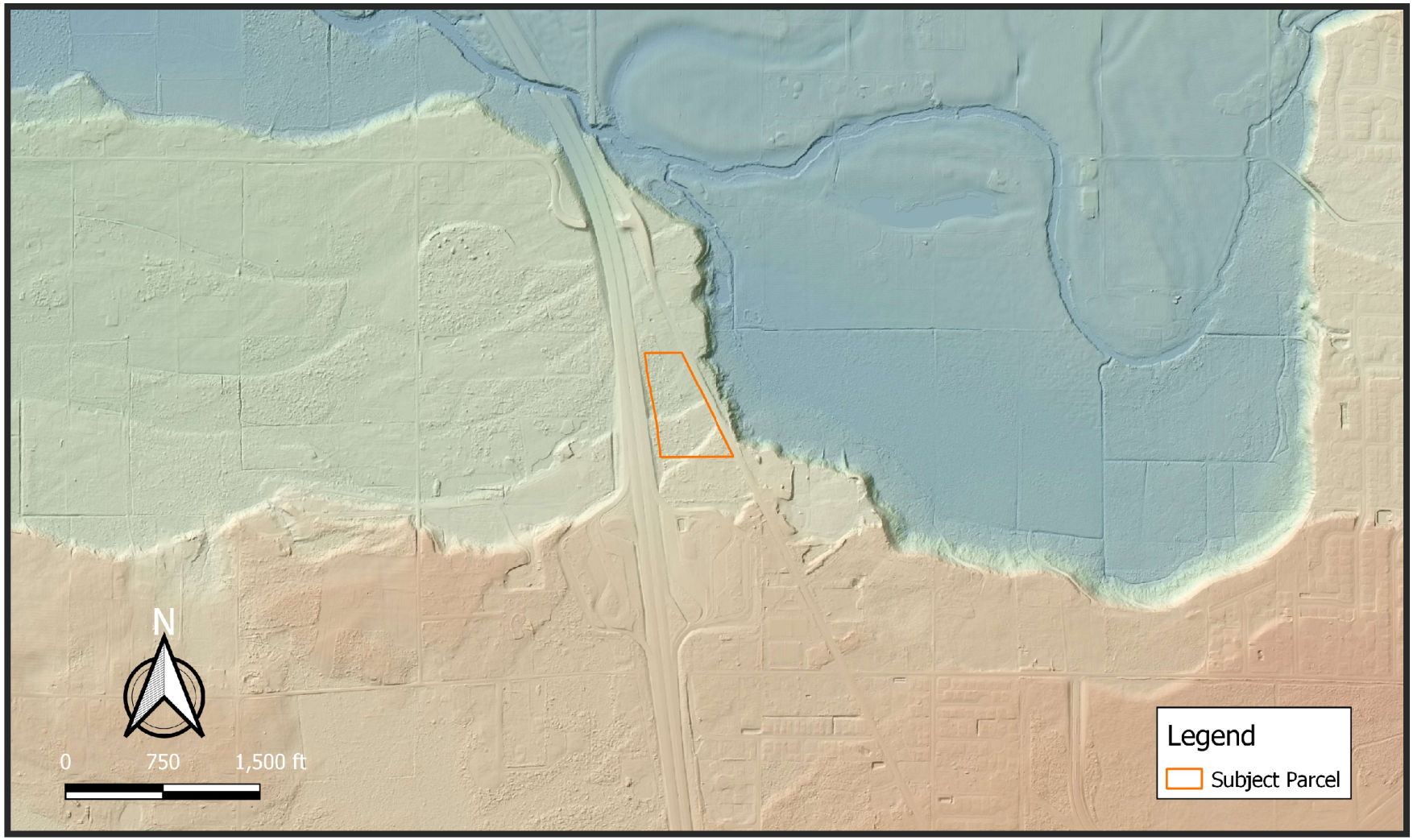
1) Parcel shapefile sourced from Snohomish County's PDS Map Portal
2) Scale, north arrow, and site plan referencing North Puget 2017 digital elevation model (sourced from Washington Lidar Portal)
3) Map image created using QGIS 3.22.6 and Google Earth aerial imagery

GEOTEST	Date: 8-23-2022	By: TAC	Scale: As Shown

SITE AND EXPLORATION PLAN
THE POINT
19402 SMOKEY POINT BOULEVARD
ARLINGTON, WA

Project
22-0727

Figure
2



Notes:

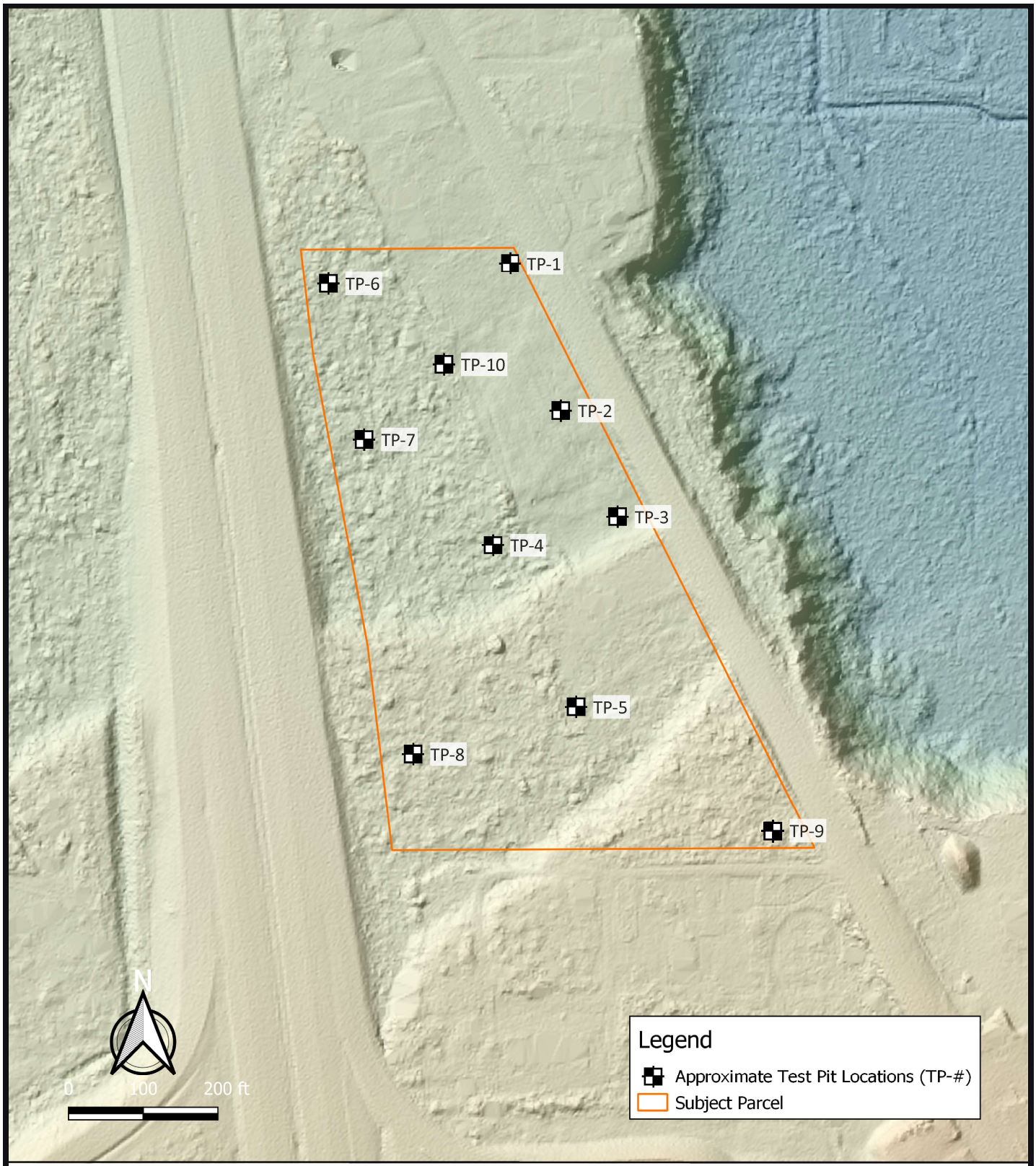
1) Parcel shapefile sourced from Snohomish County's *PDS Map Portal*
2) Scale, north arrow, digital elevation model, and hillshade created using North Puget 2017 digital elevation model (*sourced from Washington Lidar Portal*)
3) Map image created using *QGIS 3.22.6*

GEOTEST

Date: 8-23-2022	By: TAC	Scale: As Shown	Project 22-0727

GLOBAL BARE EARTH IMAGERY PLAN
THE POINT
19402 SMOKEY POINT BOULEVARD
ARLINGTON, WA

Figure 3



Notes:

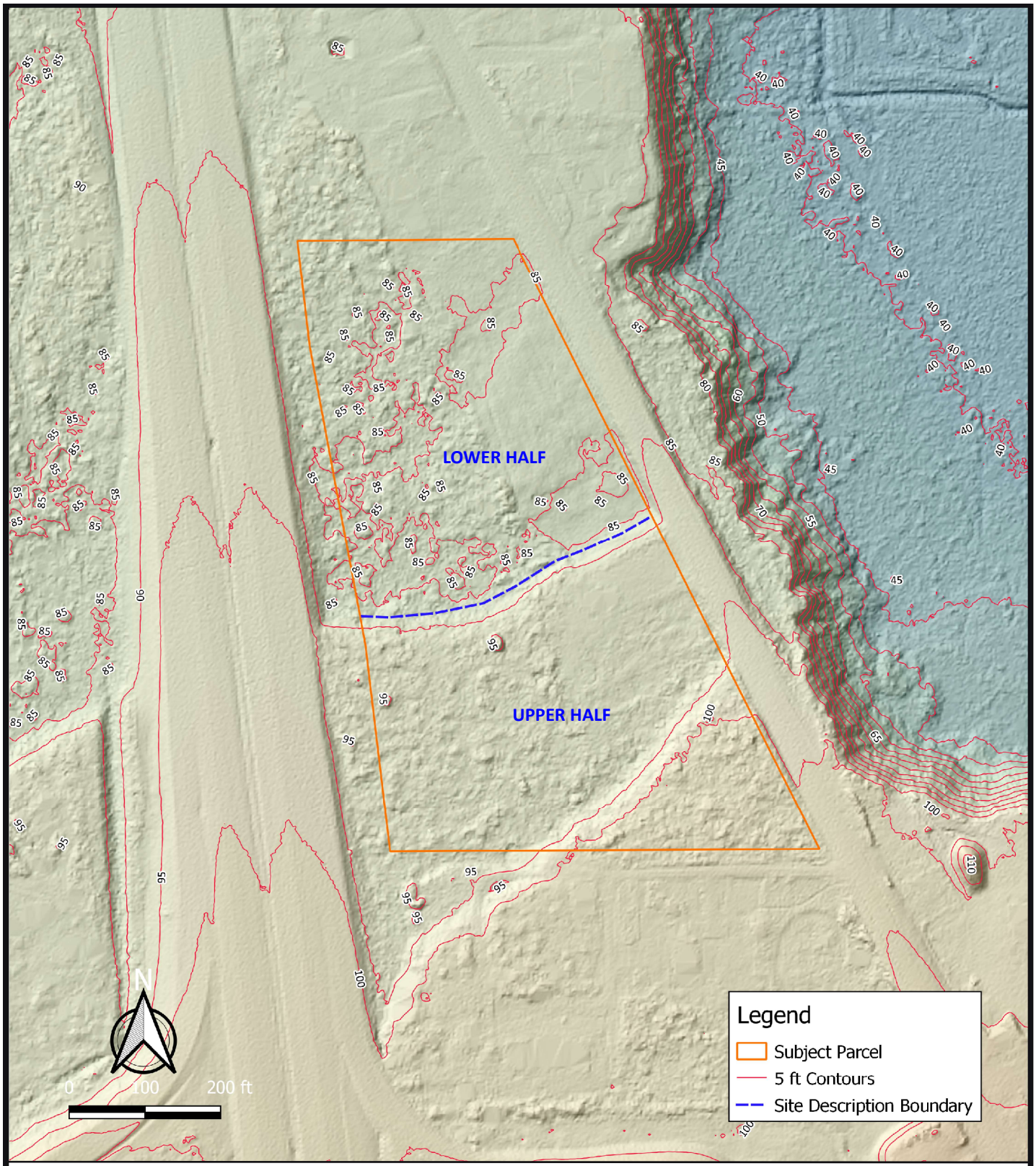
1) Parcel shapefile sourced from Snohomish County's PDS Map Portal
2) Scale, north arrow, digital elevation model, and hillshade created using North Puget 2017 digital elevation model (sourced from Washington Lidar Portal)
3) Map image created using QGIS 3.22.6

GEOTEST

Date: 8-23-2022	By: TAC	Scale: As Shown	Project 22-0727

BARE EARTH EXPLORATION PLAN
THE POINT
19402 SMOKEY POINT BOULEVARD
ARLINGTON, WA

Figure 4



Notes:

1) Parcel shapefile sourced from Snohomish County's PDS Map Portal
2) Scale, north arrow, digital elevation model, hillshade, and contours created using North Puget 2017 digital elevation model (Washington Lidar Portal)
3) Map image created using QGIS 3.22.6

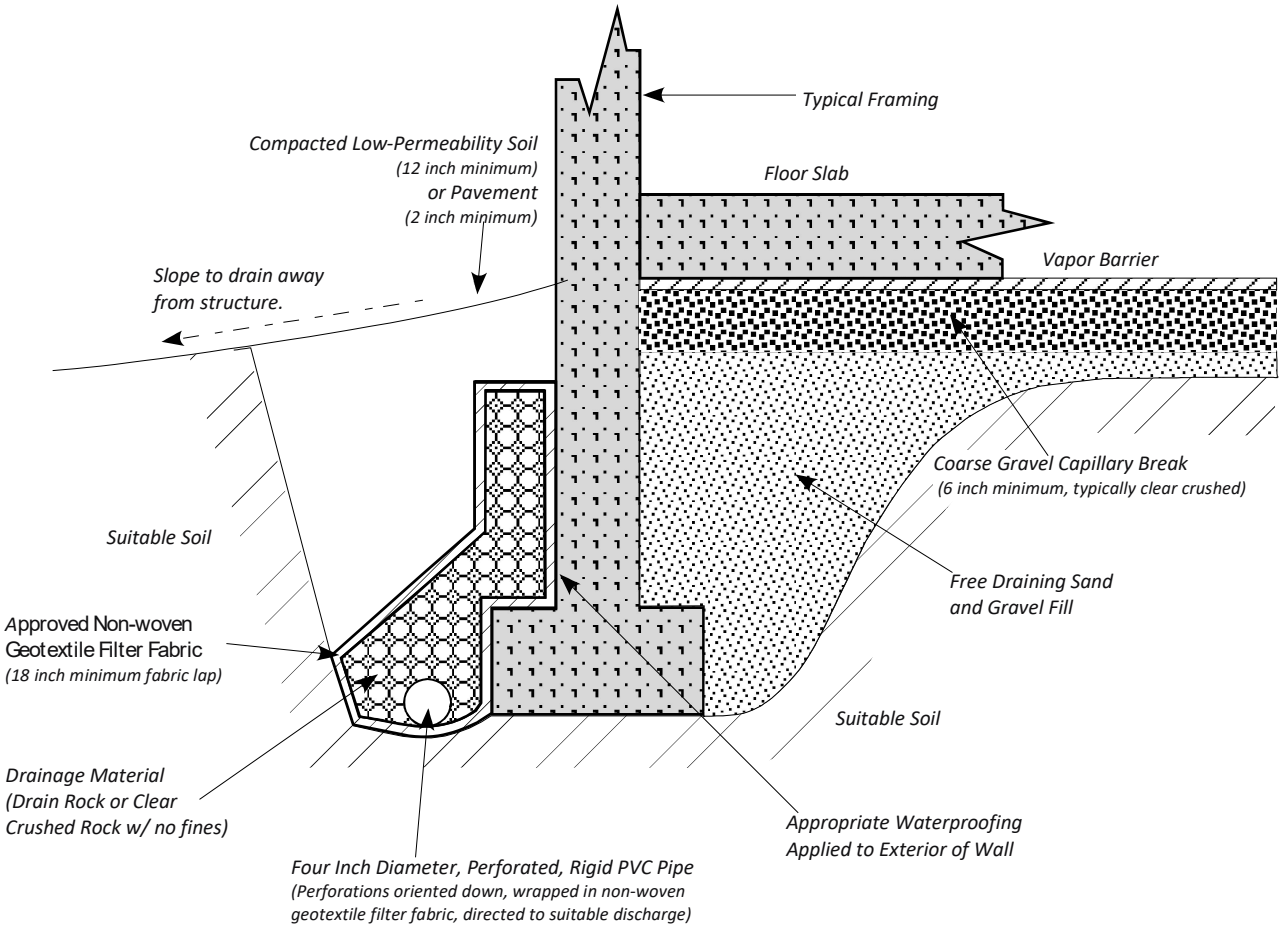
GEOTEST

Date: 8-23-2022	By: TAC	Scale: As Shown	Project 22-0727

TOPOGRAPHIC BARE EARTH IMAGERY PLAN
THE POINT
19402 SMOKEY POINT BOULEVARD
ARLINGTON, WA

Figure 5

CONCEPTUAL FOOTINGS WITH INTERIOR SLAB-ON-GRADE



Notes:

Footings should be properly buried for frost protection in accordance with International Building Code or local building codes (Typically 18 inches below exterior finished grades).

This figure is not intended to be representative of a design. This figure is intended to present concepts that can be incorporated into a functional foundation drain designed by a Civil Engineer. In all cases, refer to the Civil plan sheet for drain details and elevations.

GEOTEST	Date: 8-23-2022	By: TAC	Scale: None	Project 22-0727
	CONCEPTUAL FOOTING & WALL DRAIN SECTION **THE POINT** **19402 SMOKEY POINT BOULEVARD** **ARLINGTON, WA**			Figure 6

Soil Classification System

MAJOR DIVISIONS			GRAPHIC SYMBOL	USCS LETTER SYMBOL	TYPICAL DESCRIPTIONS[1][2]
COARSE-GRAINED SOIL (More than 50% of material is larger than No. 200 sieve size)	GRAVEL AND GRAVELLY SOIL (More than 50% of coarse fraction retained on No. 4 sieve)	CLEAN GRAVEL (Little or no fines)		GW	Well-graded gravel; gravel/sand mixture(s); little or no fines
				GP	Poorly graded gravel; gravel/sand mixture(s); little or no fines
		GRAVEL WITH FINES (Appreciable amount of fines)		GM	Silty gravel; gravel/sand/silt mixture(s)
				GC	Clayey gravel; gravel/sand/clay mixture(s)
	SAND AND SANDY SOIL (More than 50% of coarse fraction passed through No. 4 sieve)	CLEAN SAND (Little or no fines)		SW	Well-graded sand; gravelly sand; little or no fines
				SP	Poorly graded sand; gravelly sand; little or no fines
		SAND WITH FINES (Appreciable amount of fines)		SM	Silty sand; sand/silt mixture(s)
				SC	Clayey sand; sand/clay mixture(s)
FINE-GRAINED SOIL (More than 50% of material is smaller than No. 200 sieve size)	SILT AND CLAY (Liquid limit less than 50)			ML	Inorganic silt and very fine sand; rock flour; silty or clayey fine sand or clayey silt with slight plasticity
				CL	Inorganic clay of low to medium plasticity; gravelly clay; sandy clay; silty clay; lean clay
				OL	Organic silt; organic, silty clay of low plasticity
	SILT AND CLAY (Liquid limit greater than 50)			MH	Inorganic silt; micaceous or diatomaceous fine sand
				CH	Inorganic clay of high plasticity; fat clay
				OH	Organic clay of medium to high plasticity; organic silt
	HIGHLY ORGANIC SOIL			PT	Peat; humus; swamp soil with high organic content

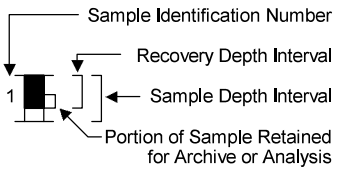
OTHER MATERIALS	GRAPHIC SYMBOL	LETTER SYMBOL	TYPICAL DESCRIPTIONS
PAVEMENT		AC or PC	Asphalt concrete pavement or Portland cement pavement
ROCK		RK	Rock (See Rock Classification)
WOOD		WD	Wood, lumber, wood chips
DEBRIS		DB	Construction debris, garbage

Notes:
1. Soil descriptions are based on the general approach presented in the *Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)*, as outlined in ASTM D 2488. Where laboratory index testing has been conducted, soil classifications are based on the *Standard Test Method for Classification of Soils for Engineering Purposes*, as outlined in ASTM D 2487.
2. Soil description terminology is based on visual estimates (in the absence of laboratory test data) of the percentages of each soil type and is defined as follows:

Primary Constituent: > 50% - "GRAVEL," "SAND," "SILT," "CLAY," etc.
Secondary Constituents: > 30% and ≤ 50% - "very gravelly," "very sandy," "very silty," etc.
> 12% and ≤ 30% - "gravelly," "sandy," "silty," etc.
Additional Constituents: > 5% and ≤ 12% - "slightly gravelly," "slightly sandy," "slightly silty," etc.
≤ 5% - "trace gravel," "trace sand," "trace silt," etc., or not noted.

Drilling and Sampling Key

SAMPLE NUMBER & INTERVAL



SAMPLER TYPE

Code	Description
a	3.25-inch O.D., 2.42-inch I.D. Split Spoon
b	2.00-inch O.D., 1.50-inch I.D. Split Spoon
c	Shelby Tube
d	Grab Sample
e	Other - See text if applicable
1	300-lb Hammer, 30-inch Drop
2	140-lb Hammer, 30-inch Drop
3	Pushed
4	Other - See text if applicable

Groundwater

▽ ATD — Approximate water elevation at time of drilling (ATD) or on date noted. Groundwater levels can fluctuate due to precipitation, seasonal conditions, and other factors.

Field and Lab Test Data

Code	Description
PP = 1.0	Pocket Penetrometer, tsf
TV = 0.5	Torvane, tsf
PID = 100	Photoionization Detector VOC screening, ppm
W = 10	Moisture Content, %
D = 120	Dry Density, pcf
-200 = 60	Material smaller than No. 200 sieve, %
GS	Grain Size - See separate figure for data
AL	Atterberg Limits - See separate figure for data
GT	Other Geotechnical Testing
CA	Chemical Analysis

GEOTEST

The Point
19402 Smokey Point Blvd.
Arlington, WA

Soil Classification System and Key

Figure 7

TEST PIT LOG

Test Pit No. TP-1

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 85'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA **PERCHED WATER:** ▼ 8 **CAVING** C 9

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA			USCS SYMBOL	SOIL PROFILE DESCRIPTION
85 — 0	1	d	GT	SP-SM	Dark brown, loose, dry, slightly silty, very gravelly SAND, poorly graded, rootlets (Topsoil)
1				GP-GM	Tan, medium dense, dry, slightly silty, very sandy GRAVEL, poorly graded, rootlets (Marysville Sand)
83 — 2	2	d	GT		
				SP	Gray, loose, damp, gravelly SAND, trace silt, poorly graded (Marysville Sand)
3	3	d	GT		
	4	d			
81 — 4					
5	5	d			
79 — 6	6	d			
7				GW	Gray, medium dense, wet, sandy GRAVEL, trace silt, well-graded (Marysville Sand)
77 — 8	7	d			Minor seepage @ 8' BGS
	8	d	GT		
9	9	d			Terminated @ 9' BGS due to caving

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-1 was terminated at 9 ft below site grades on 8/11/22

Figure: 8

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

TEST PIT LOG

Test Pit No. TP-2

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 85'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA **PERCHED WATER:** ▼ 8 **CAVING** ☾ NA

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA			USCS SYMBOL	SOIL PROFILE DESCRIPTION
	SAMPLE & TEST DATA				
85 / 0	10	d	W = 5.6 GS	SP-SM	Dark brown, loose, dry, slightly silty, very gravelly SAND, poorly graded, rootlets (Topsoil)
1				GP-GM	Tan, organic, medium dense, slightly silty, very sandy GRAVEL, poorly graded (Marysville Sand)
	11	d	W = 5.3 GS		
83 / 2				SP	Gray, medium dense, dry, gravelly SAND, trace silt, poorly graded (Marysville Sand)
3	12	d	W = 3.6 GS		Damp @ 6' BGS
81 / 4	13	d			
5					
79 / 6	14	d			
7					
77 / 8	15	d	W = 5.9 GS	GW	Wet, medium dense, gray, sandy GRAVEL, trace silt, well-graded (Marysville Sand)
9					Perched seepage observed @ 8' BGS
				ML	Gray, stiff, damp, slightly sandy SILT, trace gravel (Clay Member)
75 / 10	16	d	W = 35.2 GS		

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-2 was terminated at 10 ft below site grades on 8/11/22

Figure: 9

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

TEST PIT LOG

Test Pit No. TP-3

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 85'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: NA **PERCHED WATER:** NA **CAVING** NA

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA			SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
85 / 0	17	d		SP-SM	Dark brown, loose, dry, slightly silty, very gravelly SAND, poorly graded, rootlets (Topsoil)
1				ML	Tan, dry, medium dense, slightly clayey, very sandy SILT, trace gravel, rootlets (Marysville Sand)
83 / 2	18	d	GS GT		
	19	d		SP	Gray, medium dense, dry, gravelly SAND, trace silt, poorly graded (Marysville Sand)
3					
81 / 4	20	d			Damp @ 4.5' BGS
5					
79 / 6	21	d			
7	22	d		ML	Gray, stiff, damp, slightly clayey, very sandy SILT, trace gravel (Clay Member)
77 / 8					Becomes coarser w/ depth
9					
75 / 10	23	d			

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-3 was terminated at 10 ft below site grades on 8/11/22

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

Figure: 10

TEST PIT LOG

Test Pit No. TP-4

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 85'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: NA **PERCHED WATER:** 5 **CAVING** NA

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA	SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
85 / 0	24 d	SP-SM	Black, loose, dry, slightly silty, very gravelly SAND, poorly graded, organics (Topsoil)
1	25 d	SP-SM	Tan, loose, dry, slightly silty, slightly gravelly SAND, poorly graded (Marysville Sand)
83 / 2		SP	Gray, medium dense, dry, very gravelly SAND, trace silt, poorly graded (Marysville Sand)
3	26 d		
81 / 4	27 d		Seepage observed @ 5' BGS
5			
79 / 6	28 d		
7			
77 / 8		ML	Gray, stiff, damp, slightly sandy SILT, trace gravel (Clay Member)
	29 d		

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-4 was terminated at 8.5 ft below site grades on 8/11/22

Figure: 11

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

TEST PIT LOG

Test Pit No. TP-5

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 95'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA **PERCHED WATER:** ▼ 9 **CAVING** ℄ 9.6

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA	SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
95 / 0	30 d	SP-SM	Dark brown, loose, dry, slightly silty, slightly gravelly SAND, poorly graded, roots, rootlets (Topsoil)
93 / 2	31 d	SP	Tan, medium dense, dry, very gravelly SAND, trace silt, poorly graded (Marysville Sand)
91 / 4	32 d	GP	Gray to tan, medium dense, dry, very sandy GRAVEL, trace silt, poorly graded (Marysville Sand)
89 / 6	33 d		
87 / 8	34 d		Becomes damp @ 8' BGS Seepage @ 9' BGS Caving @ 9.6' BGS
85 / 10			

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-5 was terminated at 10 ft below site grades on 8/11/22

Figure: 12

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

TEST PIT LOG

Test Pit No. TP-6

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 87'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA **PERCHED WATER:** ▼ 8.5 **CAVING** ⊂ NA

ELEVATION/ DEPTH	SAMPLE & TEST DATA			USCS SYMBOL	SOIL PROFILE DESCRIPTION
87 — 0	35	d		SP-SM	Dark brown, dry, loose, slightly silty, very gravelly SAND, poorly graded, roots, rootlets (Topsoil)
1				SP-SM	Tan, dry, medium dense, slightly silty, slightly gravelly SAND, poorly graded (Marysville Sand)
85 — 2	36	d	W = 27.3 GS		
3				SP	Gray, dry, medium dense, very gravelly SAND, trace silt, poorly graded (Marysville Sand)
	37	d			
83 — 4	38	d	W = 2.9 GS		Cobbles @ 5' BGS
5					
81 — 6	39	d	W = 4 GS	GP	Gray, damp, medium dense, very sandy GRAVEL, trace silt, poorly graded (Marysville Sand)
7					Seepage observed @ 8.5' BGS
79 — 8	40	d			
9	41	d		ML	Gray to tan, stiff, damp, slightly sandy SILT, trace gravel (Clay Member)

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-6 was terminated at 9.5 ft below site grades on 8/11/22

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

Figure: 13

TEST PIT LOG

Test Pit No. TP-7

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 85'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA **PERCHED WATER:** ▼ 5.5 **CAVING** ℄ NA

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA			SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
85 — 0					
	42	d	GT	SP-SM	Dark brown, very loose, damp, slightly gravelly, silty SAND, roots (Topsoil)
1				SP-SM	Tan, medium dense, damp, slightly silty, slightly gravelly SAND, poorly graded (Marysville Sand)
83 — 2	43	d	GT	SP	Gray, dry, medium dense, very gravelly SAND, trace silt, poorly graded (Marysville Sand)
3	44	d			
81 — 4	45	d	GT	GP	Gray, medium dense, damp, very sandy GRAVEL, trace silt, poorly graded (Marysville Sand)
5					Seepage @ 5.5' BGS
79 — 6	46	d	GT		
7					
77 — 8	47	d			

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-7 was terminated at 8 ft below site grades on 8/11/22

Figure: 14

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

TEST PIT LOG

Test Pit No. TP-8

PROJECT: The Point | **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA | **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator | **ELEVATION:** 95'
CONTRACTOR/DRILLER: Mike Weeks | **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA | **PERCHED WATER:** ▽ 9 | **CAVING** C NA

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA			SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
95 / 0	48	d		SM	Loose, dark brown, dry, slightly gravelly, silty SAND, poorly graded, organics (Topsoil)
1				SP	Tan, medium dense, dry, gravelly SAND, trace silt, poorly graded (Marysville Sand)
93 / 2	49	d			
3				SM	Gray, dry, medium dense, gravelly, very silty SAND, rootlets (Marysville Sand)
91 / 4	50	d			
5					
89 / 6	51	d	W = 12 GS		
7					
87 / 8	52	d		GW	Gray, medium dense, damp, very sandy GRAVEL, trace silt, well-graded (Marysville Sand) Wet @ 9' BGS Seepage @ 9.5'BGS
9	53	d			

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-8 was terminated at 9.5 ft below site grades on 8/11/22

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

Figure: 15

TEST PIT LOG

Test Pit No. TP-9

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 102'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: ▽ NA **PERCHED WATER:** ▼ NA **CAVING** C 5

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA			SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
102 / 0				SM	Loose, dark brown, dry, slightly gravelly, silty SAND, poorly graded, organics (Topsoil)
1	54	d	W = 14.6 GS	SM	Tan, dry, medium dense, slightly gravelly, silty SAND, roots (Marysville Sand)
100 / 2	55	d	W = 4.3 GS	SP	Gray, dry, loose, gravelly SAND, trace silt, poorly graded (Marysville Sand)
3	56	d	W = 1.8 GS		Caving @ 5 moderate
98 / 4	57	d			
5					
96 / 6	58	d	W = 2.5 GS	GW	Gray, dry, medium dense, very sandy GRAVEL, trace silt, well-graded (Marysville Sand)
7					
94 / 8	59	d		SP	Gray, dry, medium dense, very gravelly SAND, trace silt, poorly graded (Marysville Sand)
9	60	d	W = 2.7 GS		

Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-9 was terminated at 9.5 ft below site grades on 8/11/22

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

Figure: 16

TEST PIT LOG

Test Pit No. TP-10

PROJECT: The Point **PROJECT NO.:** 22-0727
LOCATION: 19402 Smokey Point Boulevard, Arlington, WA **DATE:** 8/11/22
EXPLORATION METHOD: Tracked Excavator **ELEVATION:** 85'
CONTRACTOR/DRILLER: Mike Weeks **LOGGED BY:** SEM
DEPTH TO WATER TABLE: NA **PERCHED WATER:** 7 **CAVING** NA

ELEVATION/ DEPTH	SOIL SAMPLE AND TEST DATA: SAMPLE & TEST DATA	SOIL SAMPLE AND TEST DATA: USCS SYMBOL	SOIL PROFILE DESCRIPTION
85 / 0			
	61 d	SP-SM	Loose, dark brown, dry, slightly silty, very gravelly SAND, poorly graded, organics (Topsoil)
1			
	62 d	GP-GM	Tan, medium dense, dry, slightly silty, very sandy GRAVEL, poorly graded (Marysville Sand)
83 / 2			
	63 d	SP	Gray, medium dense, dry, gravelly SAND, trace silt, poorly graded (Marysville Sand)
3			
81 / 4	64 d		
5			
79 / 6	65 d		
7		GW	Gray, medium dense, wet, sandy GRAVEL, trace silt, well-graded Seepage @ 7' BGS
77 / 8			

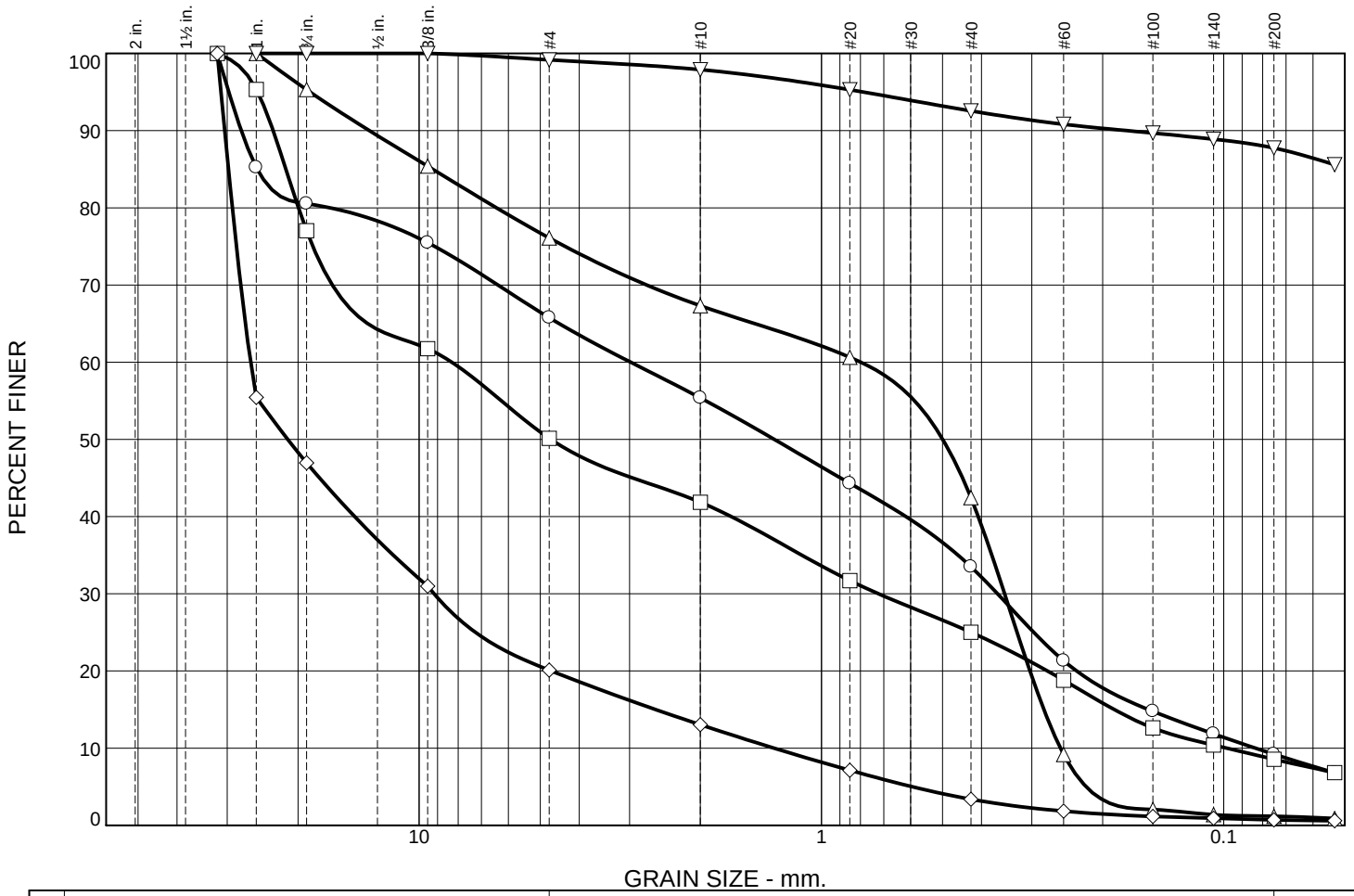
Reference Notes:
1. Stratigraphic contacts are based on field interpretations and are approximate.
2. Reference to the text of this report is necessary for a proper understanding of subsurface conditions.
3. Refer to "Soil Classification System and Key' figure for an explanation of the graphics/symbols used.

Test Pit TP-10 was terminated at 8 ft below site grades on 8/11/22

Figure: 17

Notes: Elevations are approximate and based on the North Puget 2017 digital elevation model (source: Washington Lidar Portal).

Sieve Analysis Test Report - ASTM C136/C117



	% +3"	% Gravel		% Sand			% Fines
		Coarse	Fine	Coarse	Medium	Fine	Silt
○	0	19	15	11	22	24	9
□	0	23	27	8	17	16	9
△	0	5	19	9	25	41	1
◇	0	53	27	7	10	2	1
▽	0	0	1	1	5	5	88

SOIL DATA

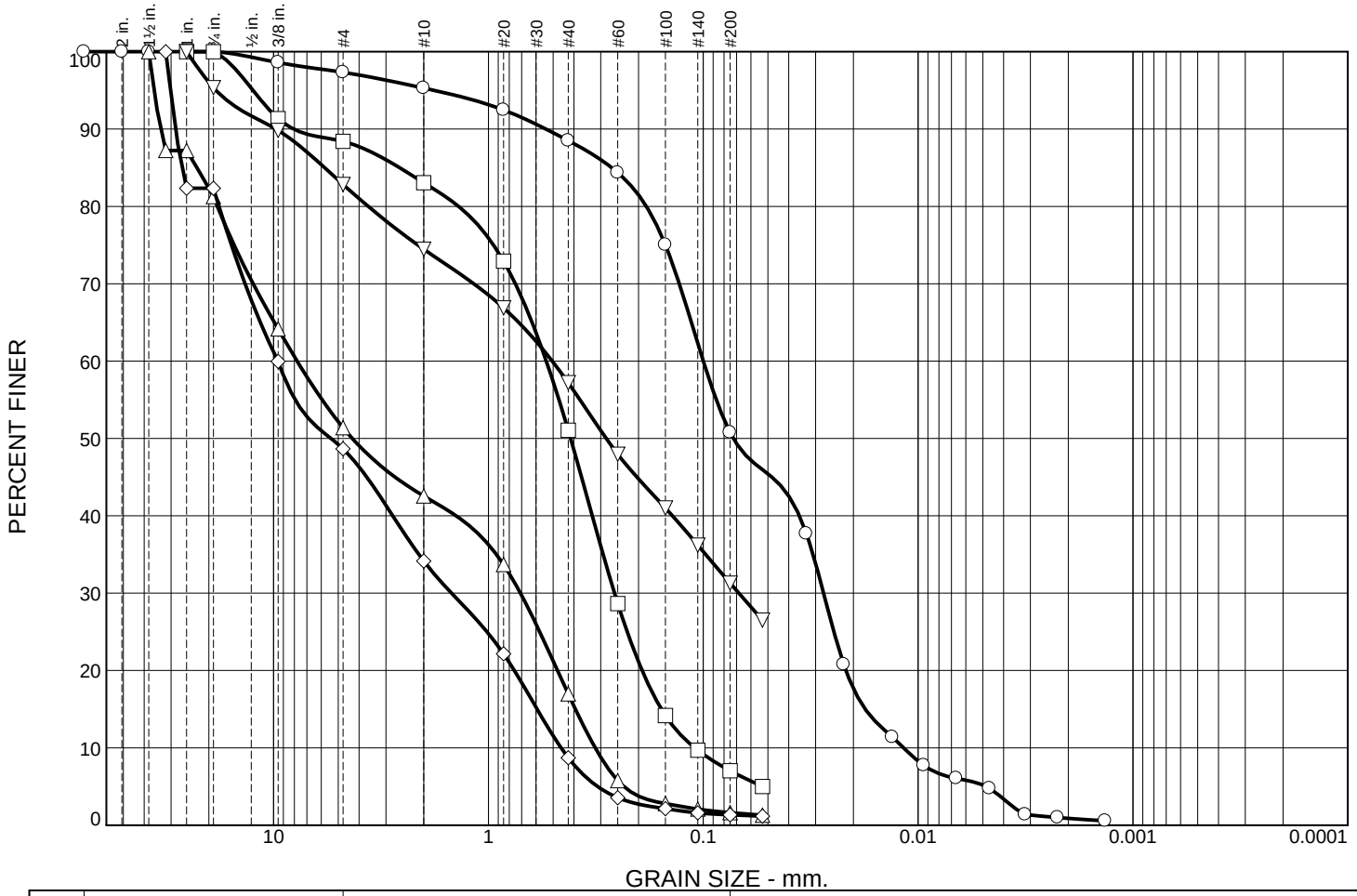
SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP-2	10	0.2	Slightly silty, very gravelly SAND, poorly graded	SP-SM
□	TP-2	11	1.3	Slightly silty, very sandy GRAVEL, poorly graded	GP-GM
△	TP-2	12	3.3	Gravelly SAND, trace silt, poorly graded	SP
◇	TP-2	15	8.0	Sandy GRAVEL, trace silt, well-graded	GW
▽	TP-2	16	10.0	Slightly sandy SILT, trace gravel	ML

GEOTEST
1.888.251.5276
Bellingham | Arlington | Oak Harbor
www.geotest-inc.com

Client: Northwest Land Development. LLC
Project: The Point
Project No.: 22-0727 **Figure** 18

Tested By: MFP **Checked By:** TAC

Sieve Analysis Test Report - ASTM C136/C117



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	3	2	6	38	46	5
□	0	0	12	5	32	44	7	
△	0	19	30	8	26	15	2	
◇	0	18	33	15	25	8	1	
▽	0	5	12	9	17	26	31	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP-3	18	1.5	Slightly clayey, very sandy SILT, trace gravel	ML
□	TP-6	36	1.7	Slightly silty, slightly gravelly SAND, poorly graded	SP-SM
△	TP-6	38	4.0	Very gravelly SAND, trace silt, poorly graded	SP
◇	TP-6	39	6.0	Very sandy GRAVEL, trace silt, poorly graded	GP
▽	TP-8	51	6.0	Gravelly, very silty SAND	SM

GEOTEST
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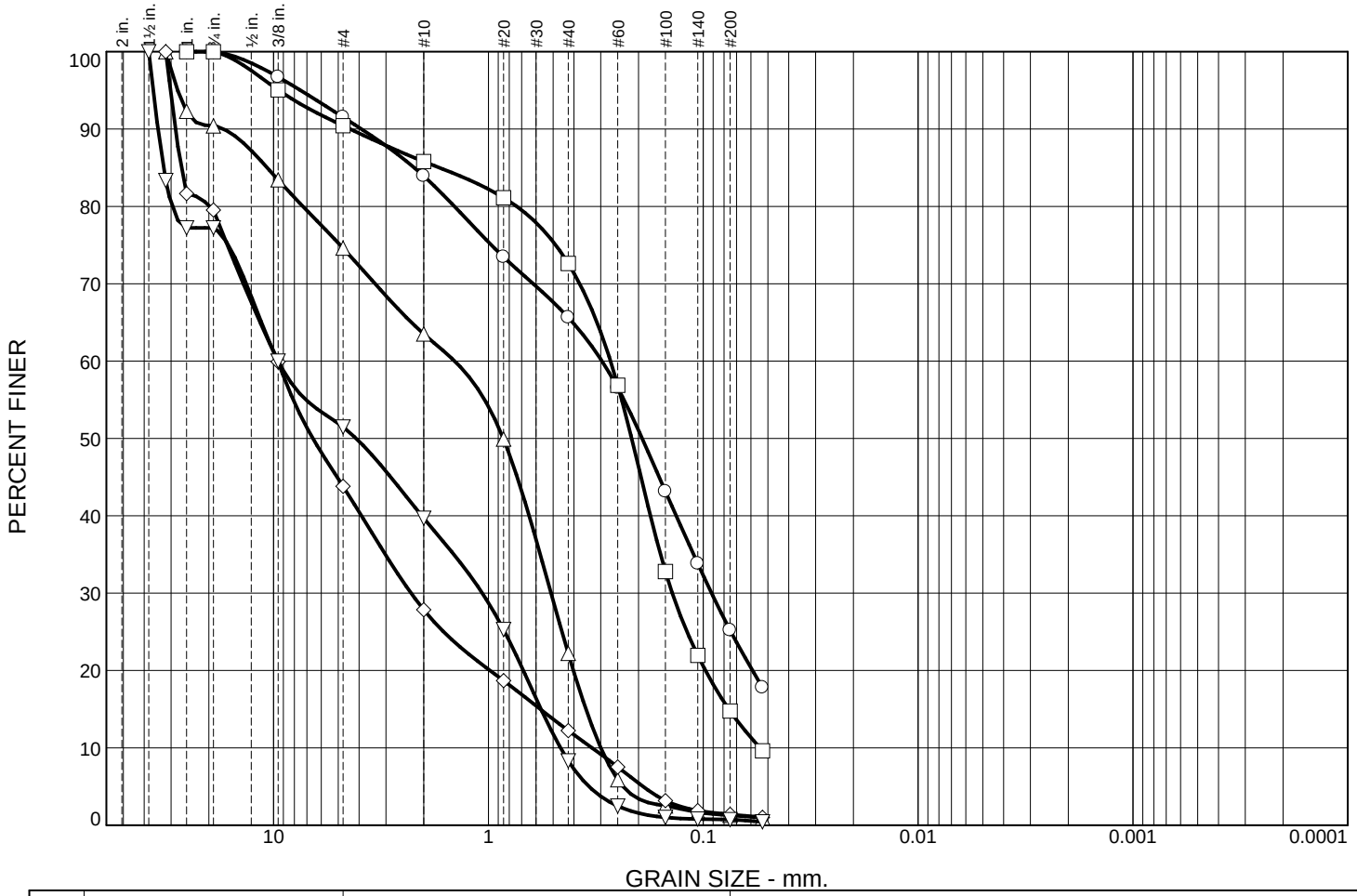
www.geotest-inc.com

Client: Northwest Land Development. LLC
Project: The Point
Project No.: 22-0727 **Figure** 19

Tested By: ○ CD/BF □ MFP △ MFP ◇ MFP ▽ MFP **Checked By:** TAC

Sieve Analysis Test Report - ASTM C136/C117



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0	0	8	8	18	41	25	
□	0	0	10	4	13	58	15	
△	0	10	15	11	42	21	1	
◇	0	20	36	16	16	11	1	
▽	0	23	26	11	32	7	1	

SOIL DATA

SYMBOL	SOURCE	SAMPLE NO.	DEPTH (ft.)	Material Description	USCS
○	TP-9	54	0.7	Slightly gravelly, silty SAND	SM
□	TP-9	55	1.5	Slightly gravelly, silty SAND	SM
△	TP-9	56	2.5	Gravelly SAND, trace silt, poorly graded	SP
◇	TP-9	58	6.0	Very sandy GRAVEL, trace silt, well graded	GW
▽	TP-9	60	9.0	Very gravelly SAND, trace silt, poorly graded	SP

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Client: Northwest Land Development. LLC
Project: The Point
Project No.: 22-0727 **Figure** 20

Tested By: MFP **Checked By:** TAC

Northwest Agricultural Consultants

2545 W Falls Avenue
Kennewick, WA 99336
509.783.7450
www.nwag.com
lab@nwag.com

PAP-Accredited
NAPT

GeoTest Services Inc.
741 Marine Drive
Bellingham, WA 98225

Report: 60347-1-1
Date: August 23, 2022
Project No: 22-0727
Project Name:

Sample ID	pH	Organic Matter	Cation Exchange Capacity
TP-1 @ 0.3’	5.3	9.33%	20.9 meq/100g
TP-1 @ 1.4’	5.8	5.45%	14.6 meq/100g
TP-1 @ 2.7’	5.9	1.40%	5.5 meq/100g
TP-1 @ 8.6’	6.0	1.19%	4.3 meq/100g
TP-7 @ 0.5’	4.3	29.05%	41.8 meq/100g
TP-7 @ 1.5’	5.2	5.00%	15.3 meq/100g
TP-7 @ 4.0’	5.4	1.91%	6.0 meq/100g
TP-7 @ 6.0’	6.0	1.50%	5.9 meq/100g
Method	**SM 4500-H^+ B**	**ASTM D2974**	**EPA 9081**

REPORT LIMITATIONS AND GUIDELINES FOR ITS USE[1]

Subsurface issues may cause construction delays, cost overruns, claims, and disputes. While you cannot eliminate all such risks, you can manage them. The following information is provided to help:

Geotechnical Services are Performed for Specific Purposes, Persons, and Projects

At GeoTest our geotechnical engineers and geologists structure their services to meet specific needs of our clients. A geotechnical engineering study conducted for a civil engineer may not fulfill the needs of an owner, a construction contractor or even another civil engineer. Because each geotechnical engineering study is unique, each geotechnical engineering report is unique, prepared solely for the client. No one except you should rely on your geotechnical engineer who prepared it. And no one – not even you – should apply the report for any purpose or project except the one originally contemplated.

Read the Full Report

Serious problems have occurred because those relying on a geotechnical engineering report did not read it all. Do not rely on an executive summary. Do not read selected elements only.

A Geotechnical Engineering Report is Based on a Unique Set of Project-Specific Factors

GeoTest's geotechnical engineers consider a number of unique, project-specific factors when establishing the scope of a study. Typical factors include: the clients goals, objectives, and risk management preferences; the general nature of the structure involved its size, and configuration; the location of the structure on the site; and other planned or existing site improvements, such as access roads, parking lots, and underground utilities. Unless GeoTest, who conducted the study specifically states otherwise, do not rely on a geotechnical engineering report that was:

- not prepared for you,
- not prepared for your project,
- not prepared for the specific site explored, or
- completed before important project changes were made.

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Typical changes that can erode the reliability of an existing geotechnical engineering report include those that affect:

- the function of the proposed structure, as when it's changed, for example, from a parking garage to an office building, or from a light industrial plant to a refrigerated warehouse,
- elevation, configuration, location, orientation, or weight of the proposed construction,
- alterations in drainage designs; or
- composition of the design team; the passage of time; man-made alterations and construction whether on or adjacent to the site; or by natural alterations and events, such as floods, earthquakes or groundwater fluctuations; or project ownership.

Always inform GeoTest's geotechnical engineer of project changes – even minor ones – and request an assessment of their impact. Geotechnical engineers cannot accept responsibility or liability for problems that occur because their reports do not consider developments of which they were not informed.

Subsurface Conditions Can Change

This geotechnical or geologic report is based on conditions that existed at the time the study was performed. Do not rely on the findings and conclusions of this report, whose adequacy may have been affected by: the passage of time; by man-made events, such as construction on or adjacent to the site; or by natural events, such as floods, earthquakes, or groundwater fluctuations. Always contact GeoTest before applying the report to determine if it is still relevant. A minor amount of additional testing or analysis will help determine if the report remains applicable.

Most Geotechnical and Geologic Findings are Professional Opinions

Our site exploration identifies subsurface conditions only at those points where subsurface tests are conducted or samples are taken. GeoTest's engineers and geologists review field and laboratory data and then apply their professional judgment to render an opinion about subsurface conditions throughout the site. Actual subsurface conditions may differ – sometimes significantly – from those indicated in your report. Retaining GeoTest who developed this report to provide construction observation is the most effective method of managing the risks associated with anticipated or unanticipated conditions.

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A Report's Recommendations are Not Final

Do not over-rely on the construction recommendations included in this report. Those recommendations are not final, because geotechnical engineers or geologists develop them principally from judgment and opinion. GeoTest's geotechnical engineers or geologists can finalize their recommendations only by observing actual subsurface conditions revealed during construction. GeoTest cannot assume responsibility or liability for the report's recommendations if our firm does not perform the construction observation.

A Geotechnical Engineering or Geologic Report may be Subject to Misinterpretation

Misinterpretation of this report by other design team members can result in costly problems. Lower that risk by having GeoTest confer with appropriate members of the design team after submitting the report. Also, we suggest retaining GeoTest to review pertinent elements of the design teams plans and specifications. Contractors can also misinterpret a geotechnical engineering report. Reduce that risk by having GeoTest participate in pre-bid and preconstruction conferences, and by providing construction observation.

Do not Redraw the Exploration Logs

Our geotechnical engineers and geologists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors of omissions, the logs included in this report should never be redrawn for inclusion in architectural or other design drawings. Only photographic or electronic reproduction is acceptable; but recognizes that separating logs from the report can elevate risk.

Give Contractors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can make contractors liable for unanticipated subsurface conditions by limiting what they provide for bid preparation. To help prevent costly problems, give contractors the complete geotechnical engineering report, but preface it with a clearly written letter of transmittal. In that letter, consider advising the contractors that the report was not prepared for purposes of bid development and that the report's accuracy is limited; encourage them to confer with GeoTest and/or to conduct additional study to obtain the specific types of information they need or prefer. A pre-bid conference can also be valuable. Be sure contractors have sufficient time to perform additional study. Only then might you be in a position to give contractors the best information available, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions.

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In addition, it is recommended that a contingency for unanticipated conditions be included in your project budget and schedule.

Read Responsibility Provisions Closely

Some clients, design professionals, and contractors do not recognize that geotechnical engineering or geology is far less exact than other engineering disciplines. This lack of understanding can create unrealistic expectations that can lead to disappointments, claims, and disputes. To help reduce risk, GeoTest includes an explanatory limitations section in our reports. Read these provisions closely. Ask questions and we encourage our clients or their representative to contact our office if you are unclear as to how these provisions apply to your project.

Environmental Concerns Are Not Covered in this Geotechnical or Geologic Report

The equipment, techniques, and personnel used to perform an environmental study differ significantly from those used to perform a geotechnical or geologic study. For that reason, a geotechnical engineering or geologic report does not usually relate any environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated containments, etc. If you have not yet obtained your own environmental information, ask your geotechnical consultant for risk management guidance. Do not rely on environmental report prepared for some one else.

Obtain Professional Assistance to Deal with Biological Pollutants

Diverse strategies can be applied during building design, construction, operation, and maintenance to prevent significant amounts biological pollutants from growing on indoor surfaces. Biological pollutants includes but is not limited to molds, fungi, spores, bacteria and viruses. To be effective, all such strategies should be devised for the express purpose of prevention, integrated into a comprehensive plan, and executed with diligent oversight by a professional biological pollutant prevention consultant. Because just a small amount of water or moisture can lead to the development of severe biological infestations, a number of prevention strategies focus on keeping building surfaces dry. While groundwater, water infiltration, and similar issues may have been addressed as part of this study, the geotechnical engineer or geologist in charge of this project is not a biological pollutant prevention consultant; none of the services preformed in connection with this geotechnical engineering or geological study were designed or conducted for the purpose of preventing biological infestations.

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C. OPERATION AND MAINTENANCE MANUAL

Table V-A.1: Maintenance Standards - Detention Ponds (continued)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
	Liner (if Applicable)	Liner is visible and has more than three 1/4-inch holes in it.	Liner repaired or replaced. Liner is fully covered.
Ponds Berms (Dikes)	Settlements	Any part of berm which has settled 4 inches lower than the design elevation If settlement is apparent, measure berm to determine amount of settlement Settling can be an indication of more severe problems with the berm or outlet works. A licensed engineer in the state of Washington should be consulted to determine the source of the settlement.	Dike is built back to the design elevation.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Goethechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/ Spillway and Berms over 4 feet in height	Tree Growth	Tree growth on emergency spillways creates blockage problems and may cause failure of the berm due to uncontrolled overtopping. Tree growth on berms over 4 feet in height may lead to piping through the berm which could lead to failure of the berm.	Trees should be removed. If root system is small (base less than 4 inches) the root system may be left in place. Otherwise the roots should be removed and the berm restored. A licensed engineer in the state of Washington should be consulted for proper berm/spillway restoration.
	Piping	Discernable water flow through pond berm. Ongoing erosion with potential for erosion to continue. (Recommend a Geotechnical engineer be called in to inspect and evaluate condition and recommend repair of condition.	Piping eliminated. Erosion potential resolved.
Emergency Overflow/Spillway	Emergency Overflow/Spillway	Only one layer of rock exists above native soil in area five square feet or larger, or any exposure of native soil at the top of out flow path of spillway. (Rip-rap on inside slopes need not be replaced.)	Rocks and pad depth are restored to design standards.
	Erosion	See "Side Slopes of Pond"	

Table V-A.2: Maintenance Standards - Infiltration

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
General	Trash & Debris	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Poisonous/Noxious Vegetation	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Contaminants and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Rodent Holes	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Storage Area	Sediment	Water ponding in infiltration pond after rainfall ceases and appropriate time allowed for infiltration. Treatment basins should infiltrate Water Quality Design Storm Volume within 48 hours, and empty within 24 hours after cessation of most rain events.	Sediment is removed and/or facility is cleaned so that infiltration system works according to design.

Table V-A.2: Maintenance Standards - Infiltration (continued)

Maintenance Component	Defect	Conditions When Maintenance Is Needed	Results Expected When Maintenance Is Performed
		(A percolation test pit or test of facility indicates facility is only working at 90% of its designed capabilities. Test every 2 to 5 years. If two inches or more sediment is present, remove).	
Filter Bags (if applicable)	Filled with Sediment and Debris	Sediment and debris fill bag more than 1/2 full.	Filter bag is replaced or system is redesigned.
Rock Filters	Sediment and Debris	By visual inspection, little or no water flows through filter during heavy rain storms.	Gravel in rock filter is replaced.
Side Slopes of Pond	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway and Berms over 4 feet in height.	Tree Growth	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Piping	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Emergency Overflow Spillway	Rock Missing	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
	Erosion	See Table V-A.1: Maintenance Standards - Detention Ponds	See Table V-A.1: Maintenance Standards - Detention Ponds
Pre-settling Ponds and Vaults	Facility or sump filled with Sediment and/or debris	6" or designed sediment trap depth of sediment.	Sediment is removed.

Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Storage Area	Plugged Air Vents	One-half of the cross section of a vent is blocked at any point or the vent is damaged.	Vents open and functioning.
	Debris and Sediment	Accumulated sediment depth exceeds 10% of the diameter of the storage area for 1/2 length of storage vault or any point depth exceeds 15% of diameter. (Example: 72-inch storage tank would require cleaning when sediment reaches depth of 7 inches for more than 1/2 length of tank.)	All sediment and debris removed from storage area.
	Joints Between Tank/Pipe Section	Any openings or voids allowing material to be transported into facility. (Will require engineering analysis to determine structural stability).	All joint between tank/pipe sections are sealed.
	Tank Pipe Bent Out of Shape	Any part of tank/pipe is bent out of shape more than 10% of its design shape. (Review required by engineer to determine structural stability).	Tank/pipe repaired or replaced to design.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch and any evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determines that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or any evidence of soil particles entering the vault through the walls.	Vault replaced or repaired to design specifications and is structurally sound. No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe.

Table V-A.17: Maintenance Standards - Coalescing Plate Oil/Water Separators

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Monitoring	Inspection of discharge water for obvious signs of poor water quality.	Effluent discharge from vault should be clear with no thick visible sheen.
	Sediment Accumulation	Sediment depth in bottom of vault exceeds 6-inches in depth and/or visible signs of sediment on plates.	No sediment deposits on vault bottom and plate media, which would impede flow through the vault and reduce separation efficiency.
	Trash and Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault, and inlet/outlet piping.
	Oil Accumulation	Oil accumulation that exceeds 1-inch at the water surface.	Oil is extracted from vault using vactoring methods. Coalescing plates are cleaned by thoroughly rinsing and flushing. Should be no visible oil depth on water.
	Damaged Coalescing Plates	Plate media broken, deformed, cracked and/or showing signs of failure.	A portion of the media pack or the entire plate pack is replaced depending on severity of failure.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and or replaced.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Vault Structure Damage - Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.

Table V-A.18: Maintenance Standards - Catch Basin Inserts

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Sediment Accumulation	When sediment forms a cap over the insert media of the insert and/or unit.	No sediment cap on the insert media and its unit.
	Trash and Debris Accumulation	Trash and debris accumulates on insert unit creating a blockage/restriction.	Trash and debris removed from insert unit. Runoff freely flows into catch basin.
	Media Insert Not Removing Oil	Effluent water from media insert has a visible sheen.	Effluent water from media insert is free of oils and has no visible sheen.
	Media Insert Water Saturated	Catch basin insert is saturated with water and no longer has the capacity to absorb.	Remove and replace media insert
	Media Insert-Oil Saturated	Media oil saturated due to petroleum spill that drains into catch basin.	Remove and replace media insert.
	Media Insert Use Beyond Product Life	Media has been used beyond the typical average life of media insert product.	Remove and replace media at regular intervals, depending on insert product.

Table V-A.19: Maintenance Standards - Media Filter Drain (MFD)

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Sediment accumulation on grass filter strip	Sediment depth exceeds 2 inches or creates uneven grading that interferes with sheet flow.	Remove sediment deposits on grass treatment area of the embankment. When finished, embankment should be level from side to side and drain freely toward the toe of the embankment slope. There should be no areas of standing water once inflow has ceased.
	No-vegetation	Flow spreader is uneven or clogged so that flows are not uniformly distributed over entire embankment width.	Level the spreader and clean to spread flows evenly over entire embankment width.