BARGHAUSEN

PRELIMINARY STORMWATER SITE PLAN

Mullan Short Plat

808 14th Street S.W.
Puyallup, Washington 98371

City File No. P-21-0067

January 11, 2022

Our Job No. 22001

01/11/22

BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH KENT, WA 98032 P) 425.251.6222 F) 425.251.8782
BRANCH OFFICES: TUMWATER, WA KLAMATH FALLS, OR LONG BEACH, CA RICHLAND, WA ROSEVILLE, CA

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8.0 OTHER PERMITS

9.0 OPERATIONS AND MAINTENANCE MANUAL

10.0 BOND QUANTITIES WORKSHEET

Tab 1.0

1.0 PROJECT OVERVIEW

The Mullan Short Plat project is a proposed two-lot development in which the existing property will be subdivided to create an additional lot for a single-family residence. The 0.93 acre site is located on 808 14th St SW in the City of Puyallup. The project will construct a shared access driveway, utility extensions and eventually a single family residence on the southern portion property. A carport building will also be constructed on the existing lot near the northern portion of the site. The property is located within a portion of Section 28, Township 20, Range 4 East, Willamette Meridian, in the City of Puyallup, Washington and occupies Tax Parcel No. 5505300831. A Vicinity Map (Figure 1.0.1) has been included in this section for reference.

The property consists of mostly cleared lawn area with an existing two-story residence, garage and office building located near the northeast corner of the property. There is also an existing gravel road used to access the existing home from 14th St SW located directly east of the site. The site consists of a single drainage basin with topography sloping in a southeast manner at a relatively flat grade.

The USDA Web Soil Survey for this area shown in Figure 3.0. indicates that the on-site soils are considered Sultan Silt Loam. The Geotechnical Evaluation prepared by Earth Solutions NW identified the underlying native soil as silty sand and sandy silt.

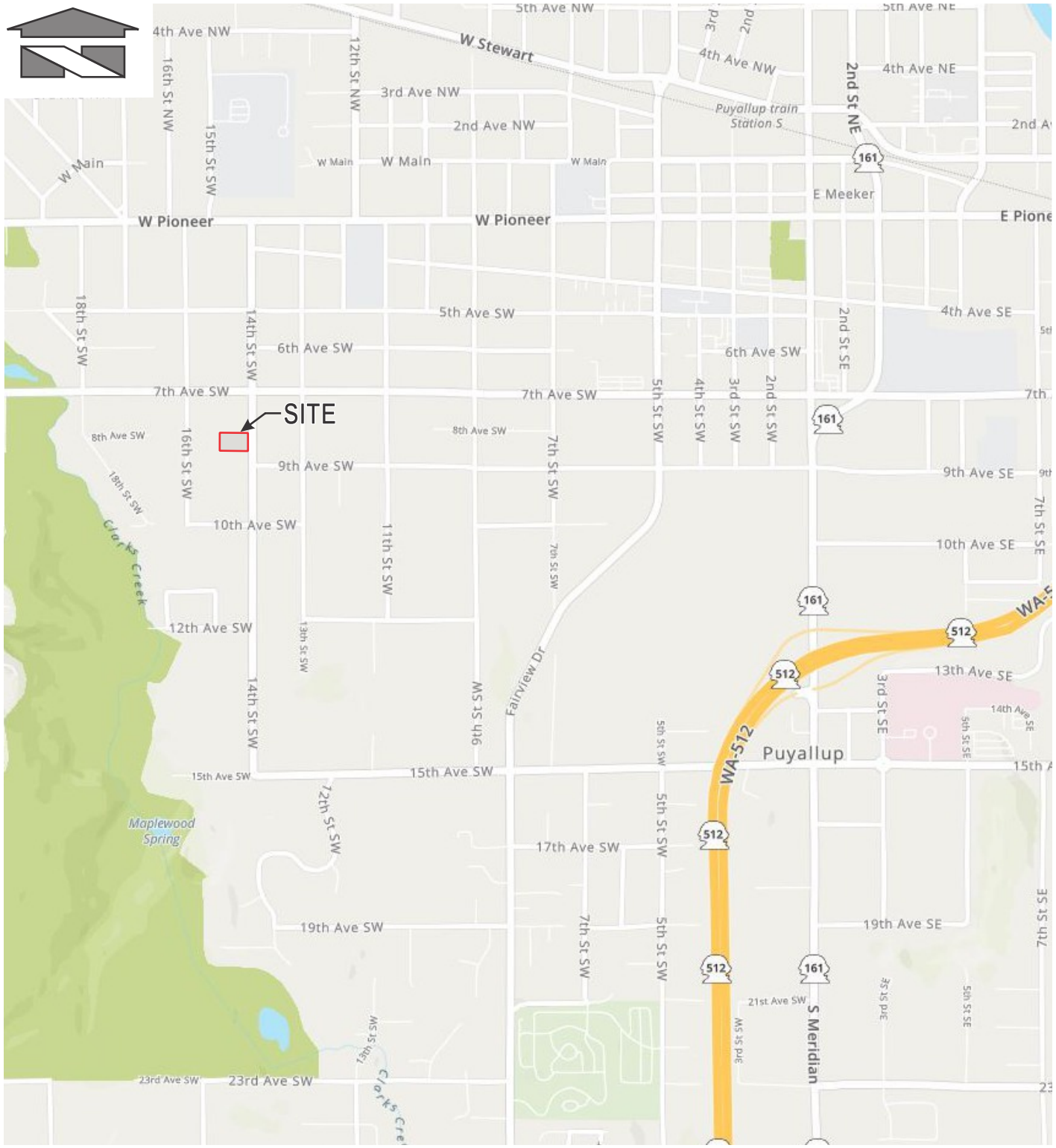
Stormwater runoff generated by the on-site shared access driveway, single-family residence and shop building will be collected by a tightlined conveyance system and routed to the on-site catch basin near the southeast property corner which conveys runoff to the existing public conveyance system along 14th St SW. Impervious roof runoff from the proposed carport building will be dispersed on-site using splash blocks. A portion of the on-site shared access driveway will also be dispersed through sheet flow dispersion.

It is important to note that groundwater monitoring is currently being performed for this development. If the groundwater levels below the proposed road section meet the requirements set forth in the 2014 SWMMWW, the Permeable Pavement BMP will be implemented for the on-site access driveway to infiltrate stormwater runoff. If the Permeable Pavement BMP is implemented, the Downspout Dispersion and Sheet Flow Dispersion BMP's described above will not be required for this development.

As shown in the FEMA map (Figure 3.0.2), the project site is located in the Zone AE Special Flood Hazard Area (100-year floodplain) tributary to Clarks Creek to the southwest of the site. Any fill within the existing flood hazard area will be mitigated by providing on-site compensatory storage. According to the Critical Area Assessment prepared by Habitat Technologies, there will not be any adverse effects to the floodplain functions during construction and post construction of the single-family residence.

Site drainage designs are based on the 2012 Stormwater Management Manual for Western Washington (2014 SWMMWW), as Amended in December 2014. Please refer to Section 5.5 of this Stormwater Site Plan for further details.

Figure 1.0.1



REFERENCE: MapQuest (2021)

Scale:
Horizontal: **N.T.S.** Vertical: **N/A**

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18215 72nd Avenue South
Kent, WA 98032
425.251.6222 **barghausen.com**

For:
Mullan Short Plat
Puyallup, Washington

Title:
VICINITY MAP

Job Number
22001

DATE: 10/28/21

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Tab 2.0

2.0 CONDITIONS AND REQUIREMENTS SUMMARY

This section contains the following information:

2.1 Analysis of the Minimum Requirements

2.1 Analysis of the Minimum Requirements

Minimum Requirements	How Project Has Addressed Requirement
No. 1: Preparation of Stormwater Site Plans	This Minimum Requirement has been fulfilled by the preparation and completion of this Stormwater Site Plan.
No. 2: Construction Stormwater Pollution Prevention (SWPP)	A completed Construction Stormwater Pollution Prevention Plan (SWPPP) will be submitted under a separate cover.
No. 3: Source Control of Pollution	The project is not classified as a high-use site, and no hazardous materials requiring source control BMPs are proposed to be stored on-site.
No. 4: Preservation of Natural Drainage Systems and Outfalls	The existing site topography slopes southeast at a relatively flat grade. Due to the properties of the existing soils, the majority of stormwater runoff from the existing site is infiltrated into the native soil. Any excess runoff flows to the southeast and is collected by an existing catch basin near the southeast property corner. In the developed condition, runoff from the proposed access driveway, single-family residence and shop building will be conveyed to the existing catch basin located at the natural discharge location of the site near the southeast property corner. Roof runoff from the proposed carport building and a portion of the shared access driveway will be dispersed on-site. The flowpaths for these dispersion devices are positioned so runoff will flow towards the southeast corner of the site, thus maintaining existing natural outfall conditions. The existing road named 14th St SW directly east of the site provides the necessary road section required by the City Standards. Because of this, there will not be any frontage improvements required as part of this development and no additional runoff will be created along the frontage of the project site.
No. 5: On-site Stormwater Management	The developer has opted not to meet the LID Performance Standard for Flow Control, therefore the project will be providing the individual lot BMPs found in List #2 of the 2014 SWMMWW. Roof runoff from the proposed carport building will be dispersed using splash blocks following the Downspout Dispersion BMP at different locations near the building. Runoff tributary to a portion of the shared access driveway will be dispersed using sheet flow dispersion. Please note that groundwater monitoring is currently being performed for the subject property. If the groundwater levels below the proposed road section meet the requirements set forth in the 2014 SWMMWW, the Permeable Pavement BMP will be implemented for the on-site access driveway to infiltrate stormwater runoff. If the Permeable Pavement BMP is implemented, the Downspout Dispersion BMP and Sheet Flow Dispersion BMP will not be required for this development.

No. 6: Runoff Treatment	According to the 2014 SWMMWW, roof runoff from the proposed single-family residence, carport and shop building is not considered pollution-generating. The approximate total area of the shared access driveway consists of 4,800 square feet. According to the 2014 SWMMWW, a stormwater treatment facility is not required for projects where less than 5,000 square feet of pollution-generating impervious surface is generated. Because of this, a stormwater treatment facility is not required for this project.
No. 7: Flow Control	According to the 2014 SWMMWW, the flow control requirement is met if the developed site does not increase the existing 100-year peak flow by more than 0.15 cfs using 15-minute time steps in the WWHM2012 model. The developed site conditions were modeled in WWHM2012 and the existing 100-year peak flow was not increased by more than 0.15 cfs. Please refer to Section 5.5 for further detail on these calculations.
No. 8: Wetlands Protection	According to the Sensitive Areas Map and the Critical Areas Assessment, there are no wetland or wetland buffers present on-site. As shown in the FEMA Map a portion of the site is located within the 100-year floodplain tributary to Clarks Creek to the southwest of the site. Compensatory storage area will be provided on-site for any fill within the floodplain that will occur as part of the development.
No. 9: Operation and Maintenance	An Operations and Maintenance Manual is not required for this project as it consists of a private two-lot short plat.

According to the submitted critical area assessment, an off-site wetland was found to the south of this project. Minimum requirement 8 must be evaluated for this project. [prelim storm report, pg 10]

The project is proposing to construct greater than 5,000SF of new plus replaced hard surfaces. Minimum requirement 9 must be addressed as part of this project. An O&M manual can be submitted at the time of civil. For now, reference that MR 9 will be addressed at the time of civil application. [prelim storm report, pg 10]

Tab 3.0

3.0 EXISTING CONDITIONS SUMMARY

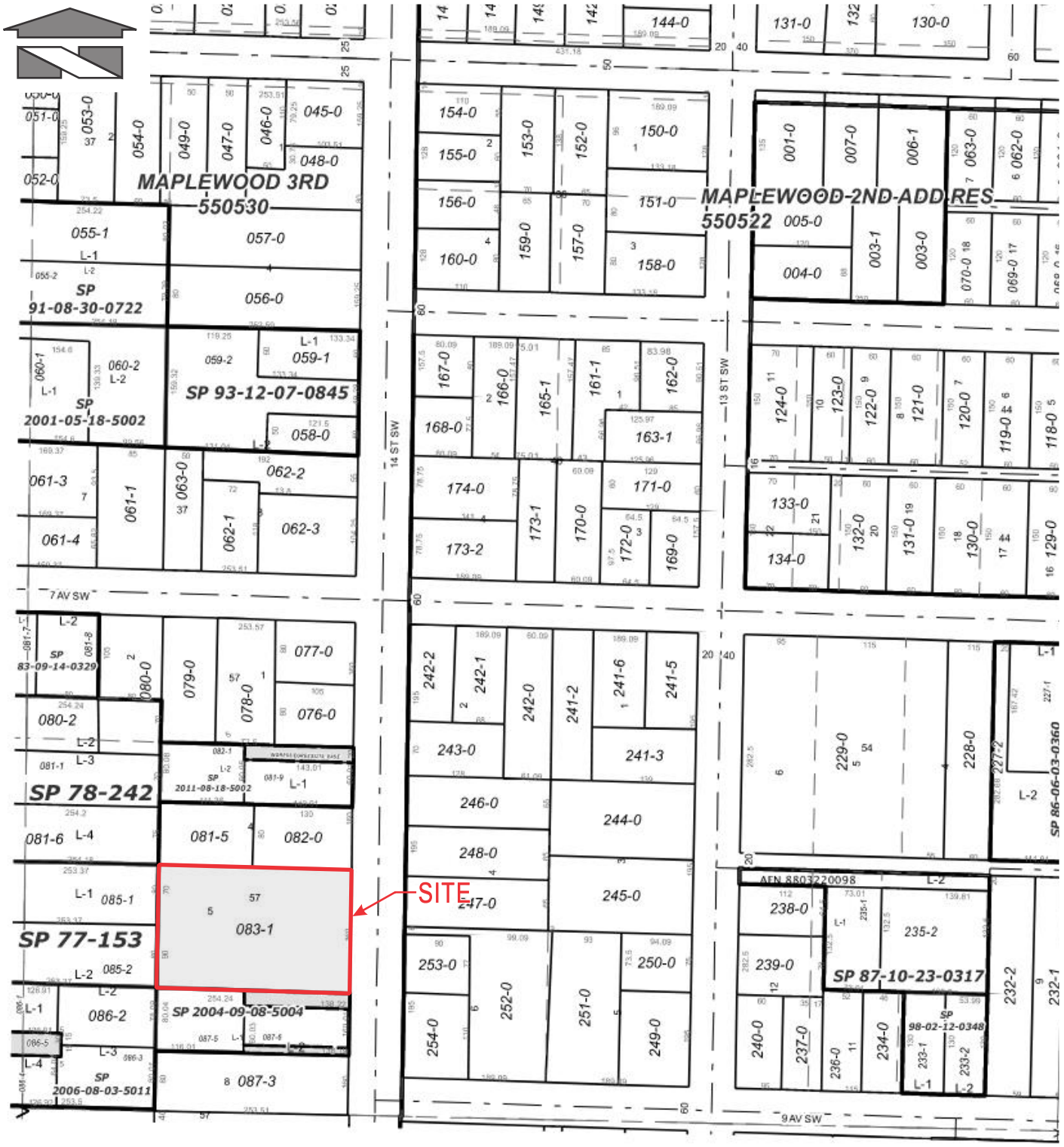
The Mullan Short Plat project is a proposed two-lot development in which the existing property will be subdivided to create an additional lot for a single-family residence. An Assessor's Map (Figure 3.0.1) has been included within this section for visual reference of the parcels around the site. The property is located within a portion of Section 28, Township 20, Range 4 East, Willamette Meridian, in the City of Puyallup, Washington and occupies Tax Parcel No. 5505300831. Please refer to the Vicinity Map (Figure 1.0.1) included in Section 1.0 of this report for a visualization of the exact location of the project site.

The site consists of mostly cleared lawn area with an existing two-story residence, garage and office building located near the northeast corner of the property. There is also an existing gravel road used to access the existing home from 14th St SW located directly east of the site. The site slopes in a southeast manner with relatively flat slopes throughout the property. The site is bounded to the north, south and west by existing homes and lawns.

The USDA Web Soil Survey for this area shown in Figure 3.0.3 indicates that the on-site soils are considered Sultan Silt Loam. The Geotechnical Evaluation prepared by Earth Solutions NW identified the underlying native soil as silty sand and sandy silt.

According to the FEMA Map (Figure 3.0.2), the site is located in the Zone AE Special Flood Hazard Area (100-year floodplain) tributary to Clarks Creek to the southwest.

Figure 3.0.1



REFERENCE: Pierce County Department of Assessments (Feb. 2021)

Scale: Horizontal: **N.T.S.** Vertical: **N/A**	*For:* Mullan Short Plat Puyallup, Washington	Job Number 22001
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 **barghausen.com**	*Title:* ASSESSOR MAP	DATE: 10/28/21

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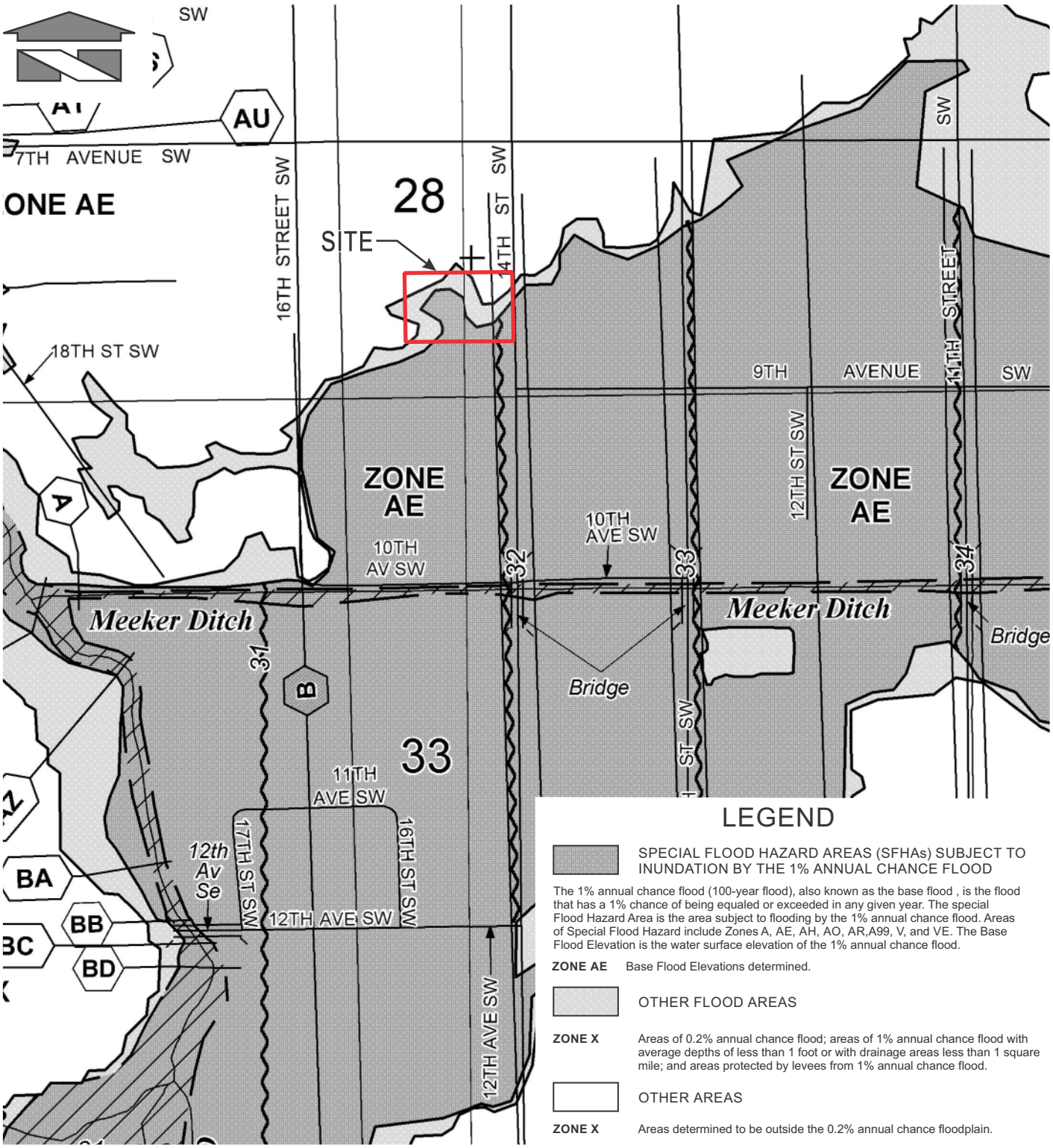
Figure 3.0.2



REFERENCE: Federal Emergency Management Agency (Portion of Map 53053C0126E, March 2017)

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Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 **barghausen.com**

For:
Mullan Short Plat
Puyallup, Washington

Title:
FEMA MAP

Job Number
22001

DATE: 10/28/21

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Figure 3.0.3

REFERENCE: USDA, Natural Resources Conservation Service

LEGEND:	HSG
42A = Sultan silt loam	C/D

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18215 72nd Avenue South
Kent, WA 98032
425.251.6222 barghausen.com

For:
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Puyallup, Washington

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SOIL SURVEY MAP

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22001

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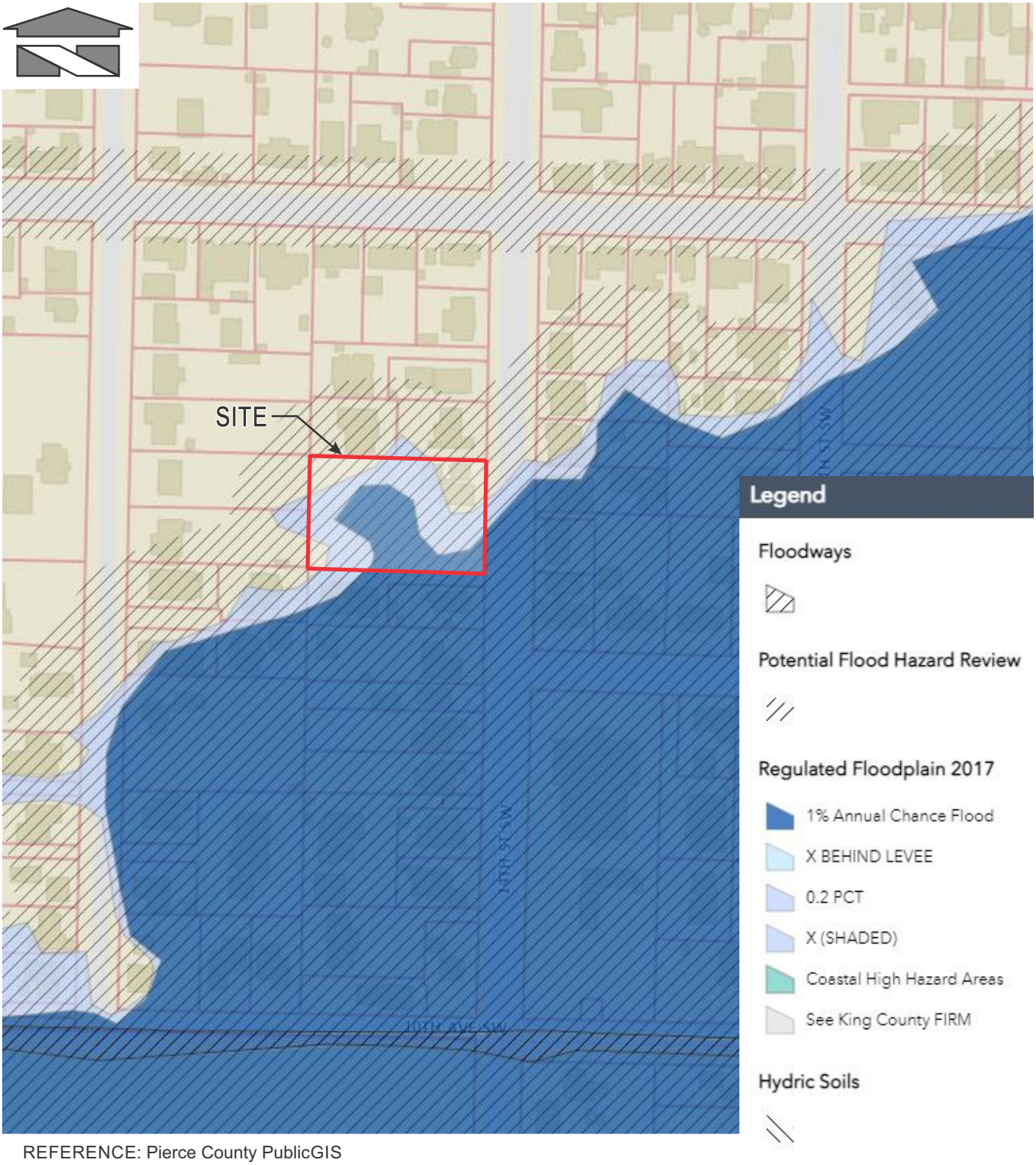
Figure 3.0.4



REFERENCE: Pierce County PublicGIS

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Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 **barghausen.com**

For:
Mullan Short Plat
Puyallup, Washington

Job Number
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Title:
SENSITIVE AREAS MAP

DATE: 10/28/21

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Tab 4.0

4.0 OFF-SITE ANALYSIS REPORT

The project is subject to the provisions of the City of Puyallup design and development standards, as well as the 2012 Stormwater Management Manual for Western Washington as amended in 2014, issued by the Washington State Department of Ecology. This report and accompanying plans are intended to satisfy the site plan preparation requirements outlined in the regulatory documents listed above. The DOE Stormwater Manual requires completion of the following four tasks as part of the site plan preparation process:

Task 1: Define and map the study area

The project study area includes the project site itself and a downstream flowpath for a distance of one-quarter mile.

Task 2: Review all available information on the study area

- **Critical Drainage Area Map**

According to the Sensitive Areas Map and the Critical Areas Assessment, there are no wetland or wetland buffers present on-site.

- **Floodplain/Floodway (FEMA) Map**

Referencing Figure 3.0.2 - FEMA Map located in Section 3.0 of the report shows that a portion of the project site is located within the 100-year floodplain tributary to Clarks Creek to the southwest of the site.

- **Offsite Analysis Reports**

The City of Puyallup Public Data Viewer Database was used to identify existing drainage structures/facilities surrounding the site.

- **Basin Plans**

The project site drains to the Clarks Creek Drainage Basin. Stormwater tributary to this basin feeds into Clarks Creek which eventually connects to the Lower Puyallup River.

- **Sensitive Area Information**

The Sensitive Areas Map (Figure 3.0.4) shows that a portion of the site is located within the 1% Annual Chance Floodplain tributary to Clarks Creek.

- **Drainage Complaints**

There were no drainage complaints found near the project site according to the City of Puyallup Public Data Viewer.

- **Soils Map**

NRCS soil survey identifies the underlying soils as Sultan Silt Loam, which is common throughout the region. This type of soil is typically silty sand and has moderate permeability. For further information please see Figure 3.0.3 - Soil Survey Map provided in Section 3.0.

Task 3: Field inspect the study area

The on-site and downstream drainage analyses for the site are presented in this section. The site consists of a single drainage basin tributary to Clarks Creek which eventually drains into the Lower Puyallup River. The drainage course from the site was assessed on November 17, 2021 with weather conditions being cloudy and damp.

On-site Drainage

The topography of the site is mostly flat with a gentle slope towards the southeast corner of the property. The site consists of mostly cleared lawn area with an existing two-story residence, garage and office building located near the northeast corner of the property. There is also an existing gravel road used to access the existing home from 14th St SW located directly east of the site. Rooftop runoff from the existing structures is dispersed into the native soils through the use of splash blocks. Due to the infiltration capabilities of the native soil, it is reasonable to assume that most of the on-site runoff is infiltrated into the on-site native soil. Any additional runoff that is not infiltrated is collected by an existing catch basin located near the southeast corner of the site.

Downstream Drainage Course

The downstream conveyance system is described below and illustrated in Figure 4.0.1 –Downstream Basin Map. In addition, a series of photos taken during the site visit with a detailed description of the downstream flowpath are shown below:

The above photo (looking east) shows the existing catch basin located near the southeast corner of the site. Any runoff that does not infiltrate into the on-site native soil is collected by this catch basin and conveyed southward along 14th St SW for approximately 170 feet before reaching the intersection of 14th St SW and 9th Ave SW.

The above photos show the downstream catch basin at the intersection of 14th St SW and 9th Ave SW. Once runoff reaches this catch basin, it begins to flow east along 9th Ave SW for approximately 250 feet. The above right picture shows the catch basin looking east towards 9th Ave SW.

The above left photo shows the existing storm manhole located on 9th Ave SW approximately 250 feet east of the intersection. Once runoff reaches this manhole, it begins to flow south for approximately 500 feet through an existing public storm easement running along the Puyallup Community Baptist Church property. Runoff then flows westward for approximately 80 feet and enters the existing pump station shown in the above right photo.

Once runoff enters the pump station, it is slowly released to Meeker Creek located approximately 50 feet to the south. The controlled discharge is shown in the above left photo. Runoff will continue to flow westward along Meeker Creek and eventually reach 1/4 mile downstream of the project site.

Conclusions

There were no flooding or overtopping issues observed on the existing conveyance system and Meeker Creek. In addition, there were no capacity deficiencies observed in the existing conveyance system. Because of this, it can be confidently determined that the development of this project will not impact the downstream system.

Tab 5.0

5.0 PERMANENT STORMWATER CONTROL PLAN

This section contains the following information:

5.1 Existing Site Hydrology

5.2 Developed Site Hydrology

5.3 Performance Standards and Goals

5.4 Low Impact Development Features

5.5 Flow Control System

5.6 Water Quality System

5.7 Conveyance System Analysis and Design

5.1 Existing Site Hydrology

The existing conditions of the project site consist of mostly open space lawn area with an existing home, garage and office building located near the northeast corner of the property. There is also an existing gravel road used to access the existing home from 14th St SW located directly east of the site. The site consists of a single drainage basin with topography sloping in a southeast manner at a relatively flat grade. According to the Geotechnical Report prepared by Earth Solutions NW, the on-site native soil was identified as silty sand and sandy silt. This matches the soil classification indicated in the USDA Web Soil Survey (Figure 3.0.3) which identifies the native soils as Sultan Silt Loam.

Due to the existing native soil, it is reasonable to assume that most of the runoff tributary to the on-site landscaped areas is infiltrated into the native soil. In addition, the existing buildings located near the northeast corner of the property have splash pads at the downspout locations to disperse roof runoff into the on-site native soil.

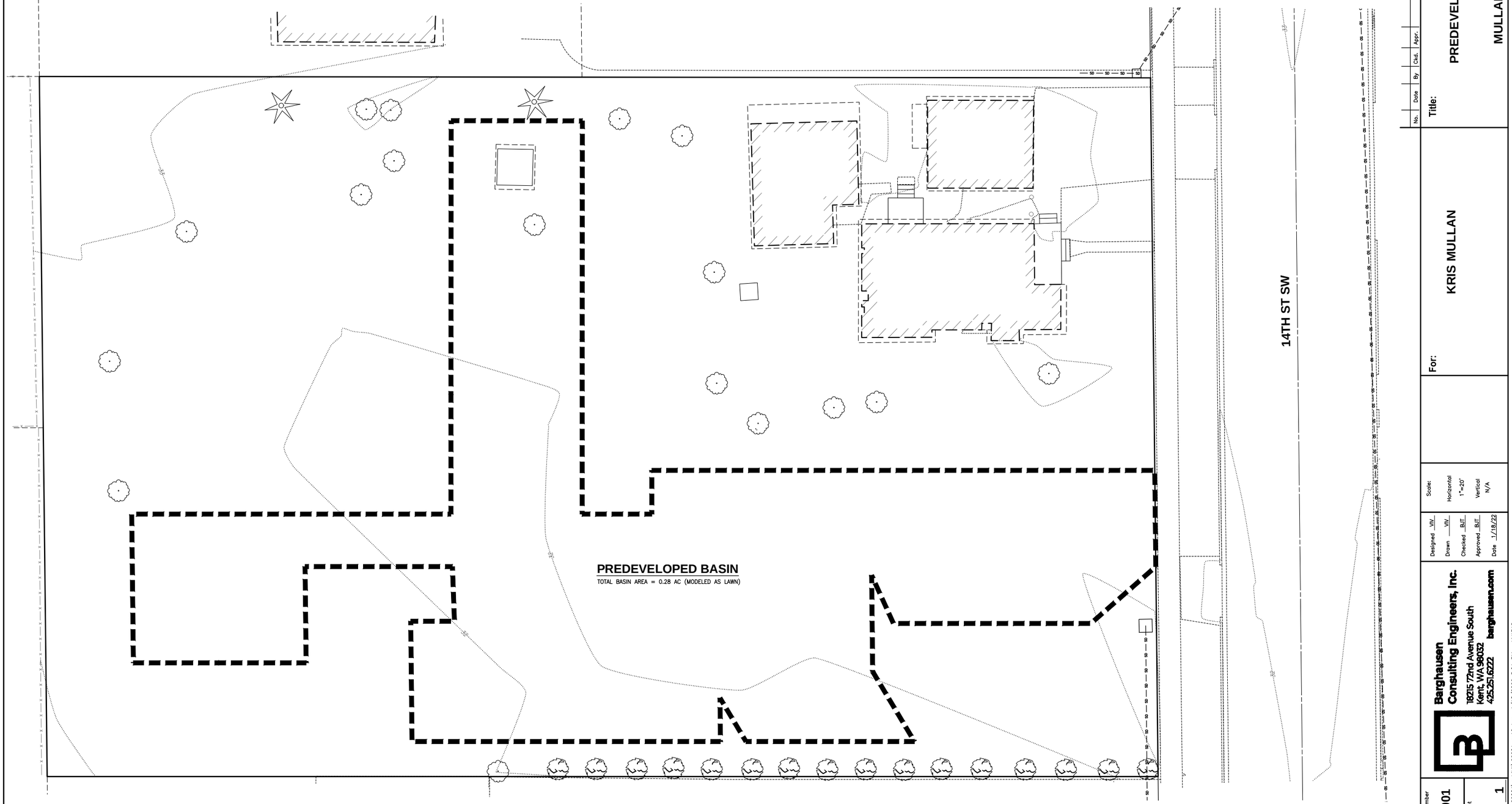
According to the FEMA Map (Figure 3.0.4), the site is located in the Zone AE Special Flood Hazard Area (100-year floodplain) tributary to Clarks Creek to the southwest. Compensatory storage area will be provided on-site for fill within the floodplain that will occur as part of the development. According to the Critical Area Assessment prepared by Habitat Technologies, there will not be any adverse effects to the floodplain functions during construction and post construction of the single-family residence and access driveway.

PREDEVELOPED BASIN MAP
FOR
MULLAN SHORT PLAT
A PORTION OF SECTION 28, TOWNSHIP 20 N., RANGE 04 E., W.M.
CITY OF PUYALLUP, PIERCE COUNTY. WASHINGTON

Figure 5.1.1

N

0 10' 20' 40'
SCALE: 1"=20'



No.	Date	By	Ckd.	Appr.	Revision

Title: PREDEVELOPED BASIN MAP FOR MULLAN SHORT PLAT

For: KRIS MULLAN

Scale: Horizontal 1"=20' Vertical N/A

Designed VW Drawn VW Checked BJT Approved BJT Date 1/18/22

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 barghausen.com

Job Number 22001

Sheet 1 of 1

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5.2 Developed Site Hydrology

When completed, the Mullan Short Plat project will subdivide the existing property into two single-family lots. Lot 1 will consist of the existing buildings, driveways, fence and landscaped areas that will not be altered during construction. Lot 1 will also contain a portion of the shared access driveway and storm system and a new carport building. Lot 2 will contain a portion of the shared access driveway and storm system, new single-family house, new shop building and proposed utilities to serve the home.

The On-Site Drainage basin consists of the shared access driveway, building areas for each of the proposed buildings, and lawn areas created by the development. The table below shows an area breakdown for the Developed Drainage Basin. For further detail, please refer to the Developed Basin Map (Figure 5.2.1) included in this section.

Developed Drainage Basin	
Land Cover	**Area**
Shared Access Driveway	0.11 Ac(1)
Shop	0.02 Ac
Carport	0.03 Ac(2)
Single-family Residence	0.06 Ac
Lawn Area	0.06 Ac

Notes:
1. Modeled as 100% Impervious
2. Modeled as Pervious Lawn because Downspout Dispersion BMP's are used to disperse rooftop runoff

Please refer to Section 5.5 for further detail on meeting the flow control requirements for the site in the developed condition.

DEVELOPED BASIN MAP
FOR
MULLAN SHORT PLAT
A PORTION OF SECTION 28, TOWNSHIP 20 N., RANGE 04 E., W.M.
CITY OF PUYALLUP, PIERCE COUNTY. WASHINGTON

Figure 5.2.1

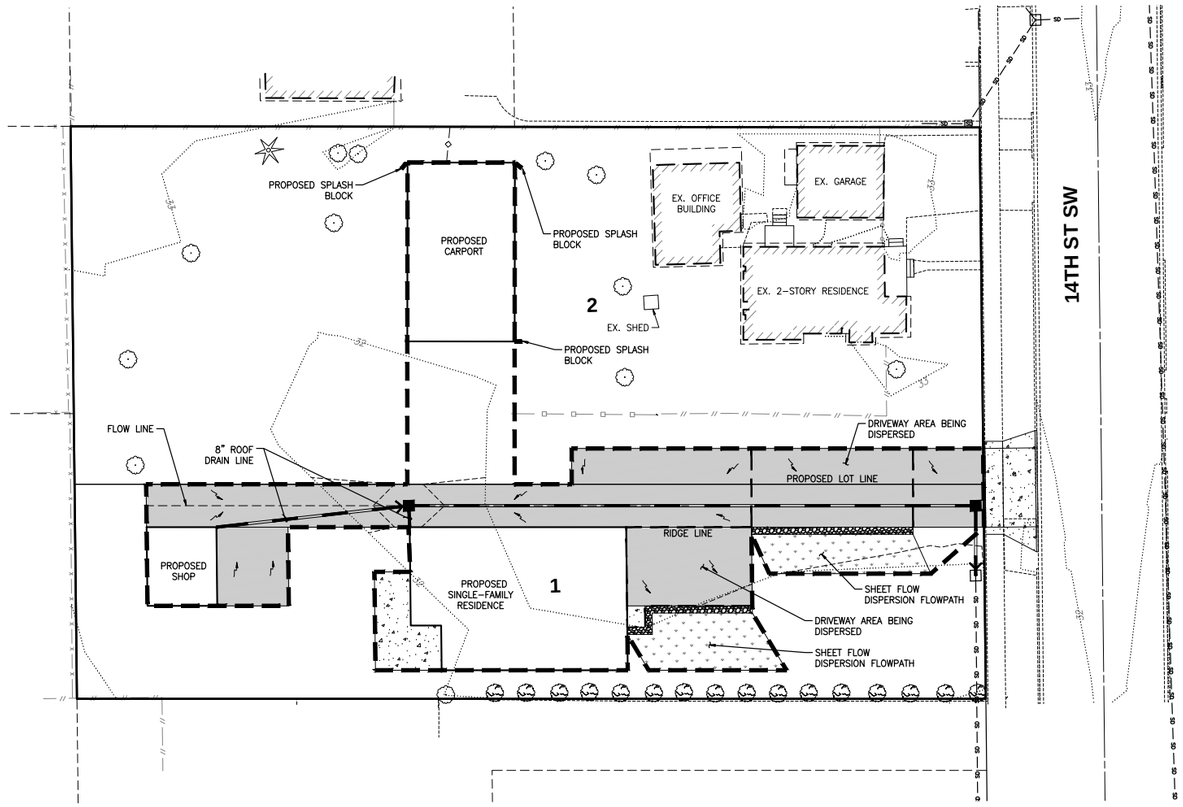
N

0 10' 20' 40'
SCALE: 1"=20'

DEVELOPED BASIN

TOTAL BASIN AREA = 0.28 AC

SHARED ACCESS DRIVEWAY AREA (MODELED AS IMPERVIOUS ROAD) = 0.07 AC
SHOP ROOFTOP AREA (MODELED AS IMPERVIOUS ROOF) = 0.02 AC
SINGLE-FAMILY RESIDENCE ROOFTOP AREA (MODELED AS IMPERVIOUS ROOF) = 0.06 AC
CARPORT ROOFTOP AREA (DISPERSED BY SPLASHBLOCKS) = 0.03 AC
SHARED ACCESS DRIVEWAY AREA (DISPERSED BY SHEET FLOW) = 0.04
LAWN AREA (MODELED AS PERVIOUS LAWN) = 0.06 AC



The WWHM calculation on page 36 speaks to a bypass basin. Show this on the basin map. [prelim drainage plan, pg 27]

No.	Date	By	Ckd.	Appr.	Revision

Title: DEVELOPED BASIN MAP FOR MULLAN SHORT PLAT

For: KRIS MULLAN

Scale: Horizontal 1"=20' Vertical N/A

Designed VW Drawn VW Checked BJT Approved BJT Date 1/18/22

Barghausen Consulting Engineers, Inc.
18215 72nd Avenue South
Kent, WA 98032
425.251.6222 barghausen.com

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Sheet 1 of 1

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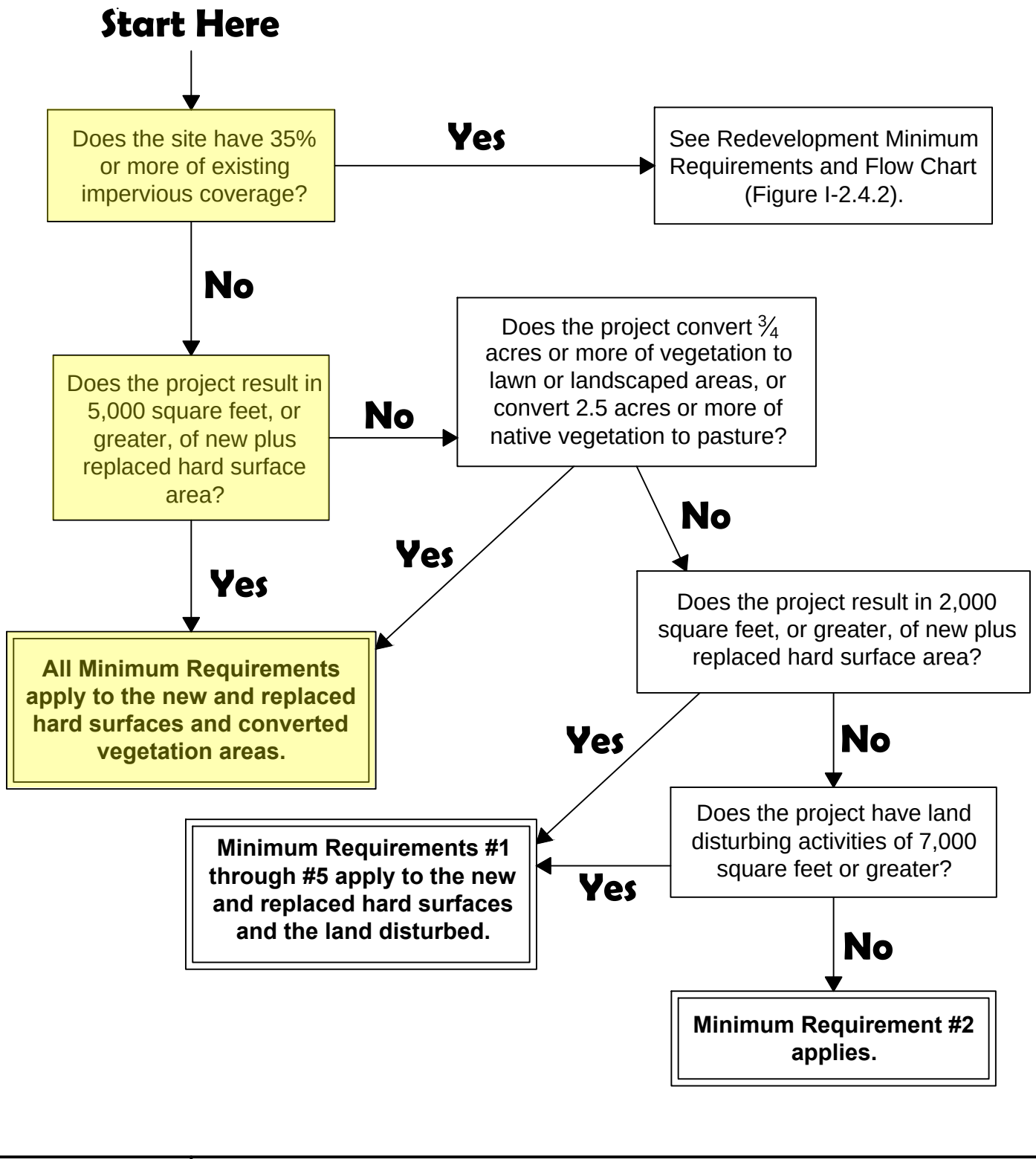
5.3 Performance Standards and Goals

The project is subject to the provisions of the Stormwater Management Manual for Western Washington (2014 SWMMWW), as Amended in December 2014, by the Washington State Department of Ecology. This report, along with the accompanying plans, are intended to satisfy the Stormwater Site Plan preparation requirements outlined in the regulatory documents listed above.

Hydrologic modeling was performed using the 2012 Western Washington Hydrology Model hence forth referred to as WWHM 2012. WWHM 2012 is a locally calibrated continuous simulation model developed by the Washington State Department of Ecology. The model evaluates several decades of hydrologic data to derive peak flow rate and duration information.

This project has opted to use the List #2 per the Flow Chart for Determining LID MR #5 Requirements (Figure 5.3.2), located within this section of the report. In order to meet the requirements for List #2, the project will incorporate the Downspout Dispersion Systems BMP and Sheet Flow Dispersion BMP to disperse impervious runoff from the carport building and a portion of the shared access driveway.

Figure 5.3.1

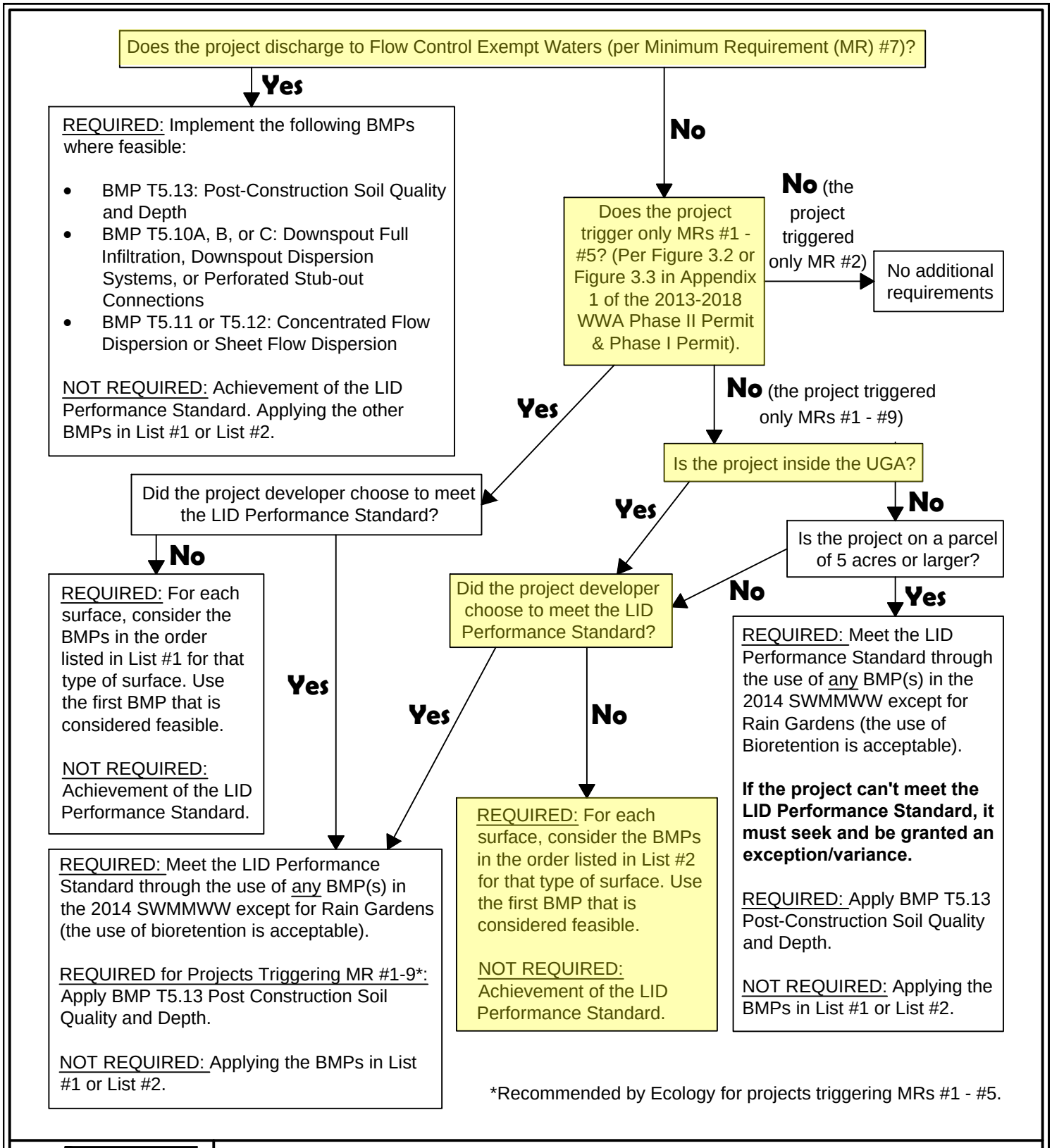


DEPARTMENT OF ECOLOGY
State of Washington

Figure I-2.4.1
Flow Chart for Determining Requirements for New Development

Revised June 2015

Figure 5.3.2



DEPARTMENT OF ECOLOGY
State of Washington

Figure I-2.5.1
Flow Chart for Determining LID MR #5 Requirements

Revised June 2015

5.4 Low Impact Development Features

The Mullan Short Plat project is subject to Low Impact Development performance standard requiring the analysis of List #1 and #2 per the 2014 SWMMWW. List #1 requires matching developed discharged durations to pre-developed durations for the range of pre-developed discharge rates from 8% of the 2-year peak flow to 50% of the 2-year peak flow. List #1 becomes unpractical when developing a small site. Therefore, this project has opted to use List #2 per the Flow Chart for Determining LID Requirements (Figure 5.3.2), located within Section 5.3 of this report. In order to meet the requirements for List #2, the proposed improvements will incorporate several BMPs. The Downspout Dispersion Systems BMP will be implemented to disperse stormwater runoff for carport building. The Sheet Flow Dispersion BMP will be implemented to disperse stormwater runoff for a portion of the shared access driveway. The sizing procedures for each of these BMP's are outlined below.

Please note that groundwater monitoring is currently being performed for the subject property. If the groundwater levels below the proposed road section meet the requirements set forth in the 2014 SWMMWW, the Permeable Pavement BMP will be implemented for the on-site access driveway to infiltrate stormwater runoff. If the Permeable Pavement BMP is implemented, the Downspout Dispersion BMP and Sheet Flow Dispersion BMP will not be required for this development.

Downspout Dispersion Systems BMP

This BMP will be used to disperse roof runoff from the carport building by using splash blocks at several locations adjacent to the building. As outlined in the 2014 SWMMWW, a maximum of 700 square feet of rooftop area may drain to each splash block. Using this requirement, three splash blocks will be provided for the carport building.

Sheet Flow Dispersion BMP

This BMP will be used to disperse runoff tributary to a portion of the shared access driveway. The driveway areas being dispersed and their associated dispersion flowpath are shown in the Developed Basin Map (Figure 5.2.1) in Section 5.2. Both of the impervious driveway areas being dispersed have a width of 20 feet. Using the guidelines for Sheet Flow Dispersion found in the 2014 SWMMWW, a 2-foot wide gravel pad and 10-foot lawn area will be provided adjacent to these driveway areas to adequately disperse their associated runoff.

Provide a section discussing the following:How will the project deal with Lawn and Landscaped areas? Soil amendment.The proposed SFR and future shop may not just connect into the city storm system without evaluating List #2. If all BMP's are infeasible, the project may connect into the city storm system. prelim drainage report, pg 31

5.5 Flow Control System

This project is required to meet the flow control requirement as detailed in the 2014 SWMMWW. This requirement specifies that developed discharge durations must match predeveloped durations for the range of predeveloped discharge rates from 50 percent of the 2-year peak flow up to the full 50-year peak flow.

The 2014 SWMMWW states that the flow control requirement is met if the 100-year peak flow rate for the existing on-site drainage basin is not increased by more than 0.15 cfs in the developed condition using an approved continuation simulation model and 15-minute time steps. This condition was met by the proposed development as shown in the Flow Control Calculations included as Figure 5.5.1. A breakdown of the developed basin areas modeled in WWHM is shown in Section 5.2.

As noted in Section 5.2, the carport building area was modeled as pervious lawn because a 50-foot vegetated flowpath will be provided for the downspout dispersion splash blocks adjacent to the building. In addition, a total of approximately 0.04 acres of impervious area tributary to the shared access driveway will be dispersed using Sheet Flow Dispersion. This area was modeled as a Lateral Impervious Basin Area as required by the 2014 SWMMWW and is shown in the Flow Control Calculations (Figure 5.5.1) included in this section.

WWHM2012

PROJECT REPORT

Figure 5.5.1

General Model Information

Project Name:	Bypass
Site Name:	
Site Address:	
City:	
Report Date:	1/11/2022
Gage:	42 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2019/09/13
Version:	4.2.17

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Lawn, Flat	0.28
Pervious Total	0.28

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.28

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
A B, Lawn, Flat	0.07
Pervious Total	0.07

Impervious Land Use	acre
ROADS FLAT	0.07
ROOF TOPS FLAT	0.08
Impervious Total	0.15
Basin Total	0.22

Element Flows To:

Surface	Interflow	Groundwater

Lateral I Basin 1

Bypass:	No
Impervious Land Use	acre
ROADS FLAT LAT	0.04

Element Flows To:

Outlet 1	Outlet 2
Lateral Basin 1	

Lateral Basin 1

Bypass: No

GroundWater: No

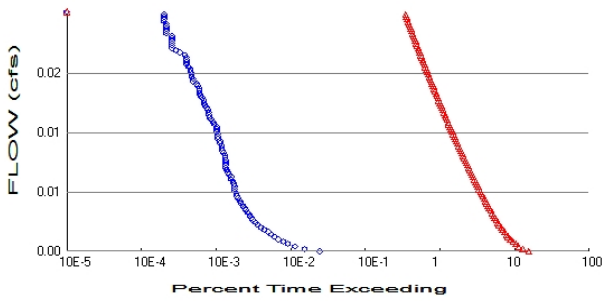
Pervious Land Use	acre
A B, Lawn, Flat	.02

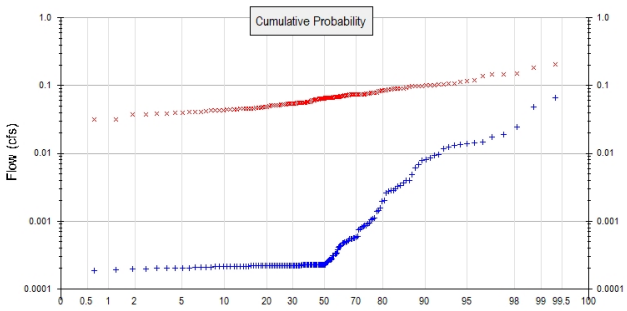
Element Flows To:

Surface	Interflow	Groundwater

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.28
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.09
Total Impervious Area: 0.19

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.000462
5 year	0.001726
10 year	0.003914
25 year	0.010393
50 year	0.020704
100 year	0.040055

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.063345
5 year	0.085543
10 year	0.10142
25 year	0.122864
50 year	0.139868
100 year	0.157776

100-year peak flow does not increase by more than 0.15 cfs in developed condition

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.000	0.065
1903	0.000	0.072
1904	0.001	0.102
1905	0.000	0.041
1906	0.000	0.042
1907	0.000	0.070
1908	0.000	0.054
1909	0.001	0.057
1910	0.002	0.067
1911	0.000	0.070

1912	0.066	0.147
1913	0.001	0.044
1914	0.000	0.207
1915	0.000	0.043
1916	0.000	0.070
1917	0.000	0.031
1918	0.001	0.055
1919	0.000	0.039
1920	0.001	0.052
1921	0.001	0.048
1922	0.004	0.073
1923	0.003	0.056
1924	0.000	0.079
1925	0.000	0.038
1926	0.000	0.064
1927	0.000	0.058
1928	0.000	0.051
1929	0.005	0.095
1930	0.000	0.090
1931	0.001	0.046
1932	0.000	0.054
1933	0.000	0.051
1934	0.019	0.089
1935	0.000	0.041
1936	0.001	0.061
1937	0.001	0.074
1938	0.000	0.044
1939	0.000	0.047
1940	0.000	0.087
1941	0.000	0.084
1942	0.000	0.075
1943	0.000	0.074
1944	0.000	0.107
1945	0.000	0.078
1946	0.000	0.064
1947	0.000	0.046
1948	0.000	0.065
1949	0.000	0.089
1950	0.000	0.050
1951	0.000	0.073
1952	0.024	0.114
1953	0.007	0.101
1954	0.000	0.056
1955	0.000	0.043
1956	0.000	0.039
1957	0.000	0.052
1958	0.017	0.075
1959	0.012	0.075
1960	0.000	0.048
1961	0.013	0.150
1962	0.000	0.059
1963	0.000	0.039
1964	0.000	0.121
1965	0.008	0.066
1966	0.000	0.052
1967	0.000	0.074
1968	0.000	0.056
1969	0.000	0.057

1970	0.001	0.066
1971	0.003	0.067
1972	0.004	0.183
1973	0.004	0.099
1974	0.010	0.086
1975	0.003	0.097
1976	0.001	0.097
1977	0.000	0.037
1978	0.013	0.078
1979	0.000	0.068
1980	0.000	0.068
1981	0.000	0.065
1982	0.000	0.052
1983	0.002	0.077
1984	0.000	0.074
1985	0.000	0.085
1986	0.000	0.043
1987	0.000	0.063
1988	0.000	0.045
1989	0.000	0.039
1990	0.000	0.055
1991	0.001	0.074
1992	0.006	0.067
1993	0.001	0.072
1994	0.001	0.063
1995	0.000	0.044
1996	0.009	0.066
1997	0.000	0.055
1998	0.001	0.068
1999	0.000	0.060
2000	0.000	0.066
2001	0.000	0.046
2002	0.003	0.100
2003	0.000	0.052
2004	0.000	0.079
2005	0.014	0.138
2006	0.000	0.060
2007	0.000	0.082
2008	0.001	0.063
2009	0.000	0.046
2010	0.000	0.065
2011	0.000	0.053
2012	0.000	0.066
2013	0.000	0.056
2014	0.000	0.049
2015	0.000	0.104
2016	0.000	0.051
2017	0.000	0.098
2018	0.015	0.065
2019	0.014	0.090
2020	0.001	0.076
2021	0.003	0.062
2022	0.000	0.088
2023	0.001	0.105
2024	0.048	0.146
2025	0.000	0.054
2026	0.003	0.071
2027	0.000	0.067

2028	0.000	0.026
2029	0.003	0.055
2030	0.008	0.092
2031	0.000	0.032
2032	0.000	0.045
2033	0.000	0.057
2034	0.000	0.045
2035	0.001	0.070
2036	0.000	0.046
2037	0.000	0.060
2038	0.002	0.073
2039	0.000	0.117
2040	0.000	0.056
2041	0.000	0.068
2042	0.000	0.077
2043	0.001	0.074
2044	0.009	0.062
2045	0.000	0.052
2046	0.000	0.055
2047	0.000	0.055
2048	0.000	0.045
2049	0.000	0.068
2050	0.000	0.062
2051	0.001	0.091
2052	0.000	0.054
2053	0.000	0.045
2054	0.000	0.108
2055	0.000	0.062
2056	0.000	0.073
2057	0.000	0.041
2058	0.000	0.068
2059	0.013	0.085

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	**Predeveloped**	**Mitigated**
1	0.0660	0.2067
2	0.0480	0.1830
3	0.0244	0.1504
4	0.0190	0.1468
5	0.0172	0.1463
6	0.0146	0.1376
7	0.0144	0.1214
8	0.0137	0.1169
9	0.0135	0.1143
10	0.0133	0.1077
11	0.0125	0.1072
12	0.0116	0.1052
13	0.0095	0.1038
14	0.0095	0.1020
15	0.0085	0.1005
16	0.0081	0.1000
17	0.0079	0.0986
18	0.0069	0.0980
19	0.0062	0.0974
20	0.0049	0.0972
21	0.0040	0.0946
22	0.0040	0.0925

23	0.0036	0.0908
24	0.0034	0.0902
25	0.0033	0.0898
26	0.0030	0.0893
27	0.0029	0.0891
28	0.0028	0.0876
29	0.0028	0.0872
30	0.0026	0.0858
31	0.0020	0.0846
32	0.0020	0.0846
33	0.0016	0.0839
34	0.0014	0.0821
35	0.0014	0.0789
36	0.0011	0.0786
37	0.0011	0.0782
38	0.0010	0.0776
39	0.0009	0.0772
40	0.0009	0.0769
41	0.0009	0.0755
42	0.0009	0.0750
43	0.0008	0.0749
44	0.0008	0.0748
45	0.0008	0.0744
46	0.0007	0.0744
47	0.0006	0.0739
48	0.0006	0.0738
49	0.0006	0.0737
50	0.0006	0.0736
51	0.0005	0.0734
52	0.0005	0.0734
53	0.0005	0.0734
54	0.0005	0.0727
55	0.0005	0.0723
56	0.0005	0.0723
57	0.0005	0.0713
58	0.0005	0.0705
59	0.0005	0.0702
60	0.0004	0.0699
61	0.0004	0.0698
62	0.0004	0.0684
63	0.0004	0.0681
64	0.0004	0.0681
65	0.0003	0.0681
66	0.0003	0.0680
67	0.0003	0.0679
68	0.0003	0.0673
69	0.0003	0.0670
70	0.0003	0.0670
71	0.0003	0.0667
72	0.0003	0.0663
73	0.0003	0.0663
74	0.0003	0.0659
75	0.0003	0.0657
76	0.0002	0.0657
77	0.0002	0.0654
78	0.0002	0.0653
79	0.0002	0.0651
80	0.0002	0.0651

81	0.0002	0.0647
82	0.0002	0.0642
83	0.0002	0.0640
84	0.0002	0.0635
85	0.0002	0.0634
86	0.0002	0.0633
87	0.0002	0.0621
88	0.0002	0.0620
89	0.0002	0.0618
90	0.0002	0.0618
91	0.0002	0.0605
92	0.0002	0.0605
93	0.0002	0.0602
94	0.0002	0.0597
95	0.0002	0.0591
96	0.0002	0.0579
97	0.0002	0.0569
98	0.0002	0.0567
99	0.0002	0.0566
100	0.0002	0.0560
101	0.0002	0.0559
102	0.0002	0.0558
103	0.0002	0.0555
104	0.0002	0.0555
105	0.0002	0.0553
106	0.0002	0.0552
107	0.0002	0.0551
108	0.0002	0.0548
109	0.0002	0.0546
110	0.0002	0.0546
111	0.0002	0.0543
112	0.0002	0.0542
113	0.0002	0.0537
114	0.0002	0.0536
115	0.0002	0.0528
116	0.0002	0.0522
117	0.0002	0.0519
118	0.0002	0.0519
119	0.0002	0.0519
120	0.0002	0.0516
121	0.0002	0.0516
122	0.0002	0.0513
123	0.0002	0.0508
124	0.0002	0.0505
125	0.0002	0.0496
126	0.0002	0.0486
127	0.0002	0.0484
128	0.0002	0.0481
129	0.0002	0.0474
130	0.0002	0.0464
131	0.0002	0.0464
132	0.0002	0.0462
133	0.0002	0.0459
134	0.0002	0.0455
135	0.0002	0.0454
136	0.0002	0.0452
137	0.0002	0.0451
138	0.0002	0.0450

139	0.0002	0.0449
140	0.0002	0.0445
141	0.0002	0.0444
142	0.0002	0.0437
143	0.0002	0.0435
144	0.0002	0.0429
145	0.0002	0.0426
146	0.0002	0.0417
147	0.0002	0.0411
148	0.0002	0.0406
149	0.0002	0.0405
150	0.0002	0.0393
151	0.0002	0.0391
152	0.0002	0.0389
153	0.0002	0.0388
154	0.0002	0.0376
155	0.0002	0.0372
156	0.0002	0.0317
157	0.0002	0.0312
158	0.0002	0.0261

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

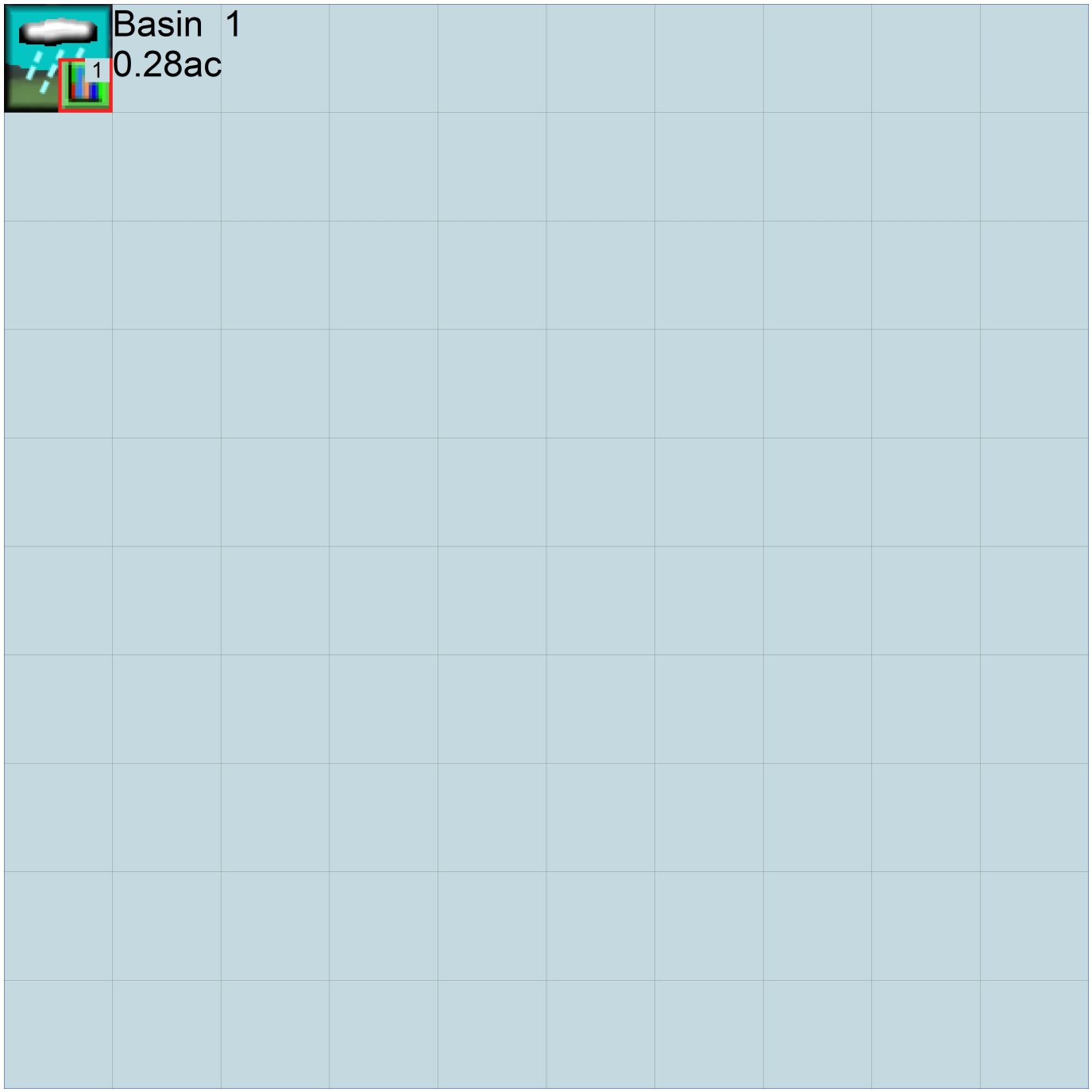
No PERLND changes have been made.

IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic

Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Bypass.wdm
MESSU       25   PreBypass.MES
            27   PreBypass.L61
            28   PreBypass.L62
            30   POCBypass1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       7
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                     1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                       in  out           ***
    7     A/B, Lawn, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    7         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    7         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    7         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    7               0         5       0.8       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    7              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    7          0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    7              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                      in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1
```

```
END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND   7                        0.28     COPY   501     12
PERLND   7                        0.28     COPY   501     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                 ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                          in  out                            ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections *****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                      ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *        *  *  *  *  *        ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                         ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit       for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
```

```
WDM      1 EVAP     ENGL    1             PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1             IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   Bypass.wdm
MESSU       25   MitBypass.MES
            27   MitBypass.L61
            28   MitBypass.L62
            30   POCBypass1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       7
      IMPLND       1
      IMPLND       4
      IMPLND      22
      PERLND      45
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Lateral Basin  1            MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out            ***
    7     A/B, Lawn, Flat         1    1    1    1   27    0
   45     A/B, Lawn, Flat         1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    7         0    0    1    0    0    0    0    0    0    0    0    0
   45         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    7         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   45         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    7         0    0    0    0    0    0    0    0    0    0    0
   45         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    7              0         5       0.8       400      0.05       0.3     0.996
   45              0         5       0.8       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    7              0         0         2         2         0         0         0
   45              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    7            0.1       0.5      0.25         0       0.7      0.25
   45            0.1       0.5      0.25         0       0.7      0.25
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    7              0         0         0         0         3         1         0
   45              0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    1      ROADS/FLAT             1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
   22     ROADS/FLAT LAT          1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    4         0    0    1    0    0    0
   22         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    0    1    9
    4         0    0    4    0    0    0    1    9
   22         0    0    4    0    0    0    1    9
  END PRINT-INFO
```

```
  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
    4         0    0    0    0    0
   22         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    4            400      0.01       0.1       0.1
   22            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    4              0         0
   22              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
   22              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Lateral I Basin  1***
IMPLND  22                         2     PERLND  45     50
Basin  1***
PERLND   7                      0.07     COPY   501     12
PERLND   7                      0.07     COPY   601     12
PERLND   7                      0.07     COPY   501     13
PERLND   7                      0.07     COPY   601     13
IMPLND   1                      0.07     COPY   501     15
IMPLND   1                      0.07     COPY   601     15
IMPLND   4                      0.08     COPY   501     15
IMPLND   4                      0.08     COPY   601     15
Lateral Basin  1***
PERLND  45                      0.02     COPY   501     12
PERLND  45                      0.02     COPY   501     13

******Routing******
IMPLND  22                      0.04     COPY     1     15
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
```

```
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG            ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                     ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1             PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1             IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1             PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1             IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
COPY   601 OUTPUT MEAN   1 1     48.4      WDM    901 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
```

```
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       50
IMPLND     IWATER SURO                     PERLND         EXTNL  SURLI
  END MASS-LINK   50


END MASS-LINK

END RUN
```

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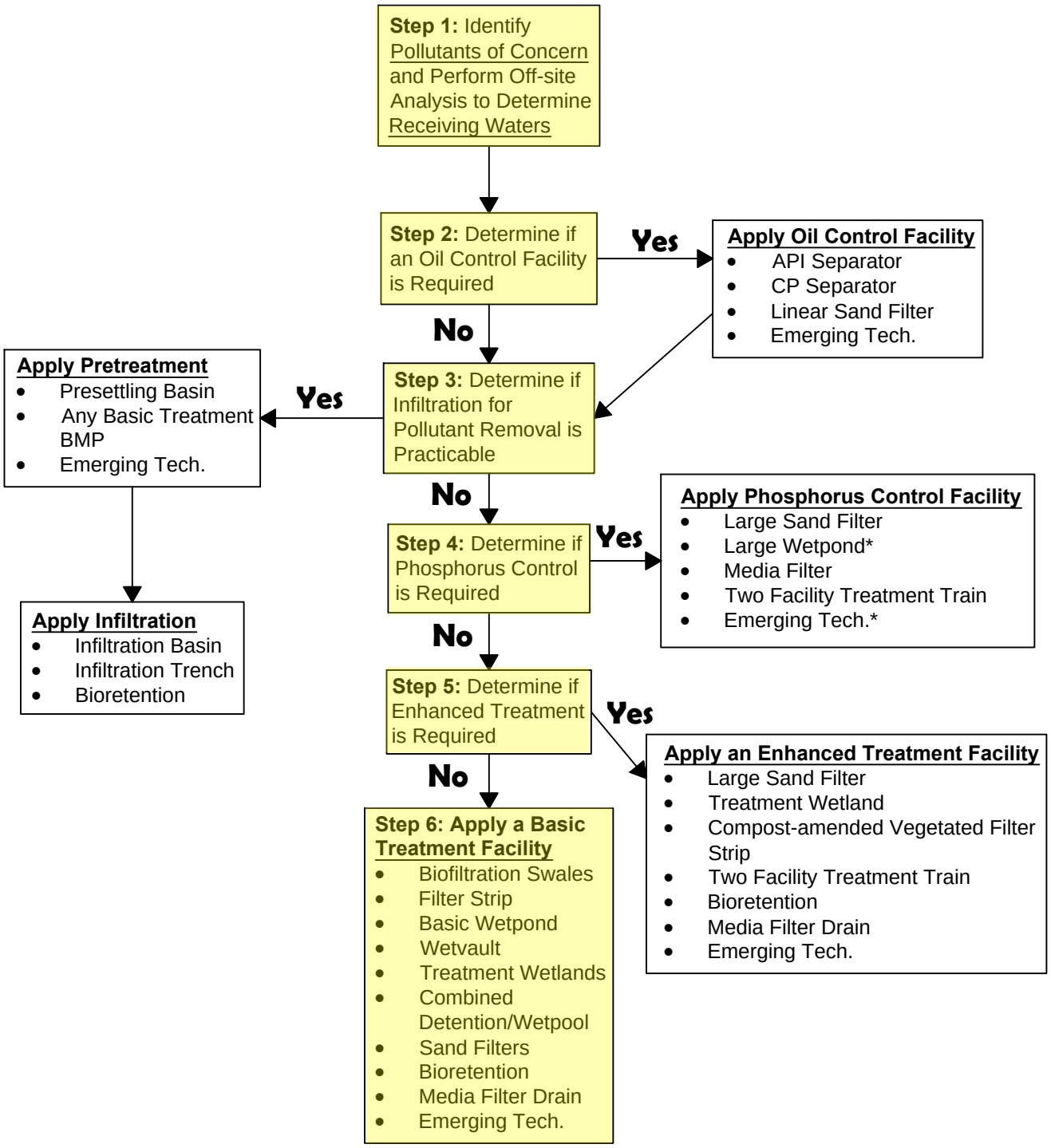
Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

5.6 Water Quality System

As detailed in the 2014 SWMMWW this project is required to meet the 2014 SWMMWW requirement for Basic Water Quality. According to the manual, runoff tributary to the rooftop areas of the single-family residence, carport and shop buildings is not considered pollution-generating. In addition, the shared access driveway consists of approximately 4,800 square feet of pollution-generating impervious surface. The 2014 SWMMWW states that a project is exempt from the construction of a stormwater treatment facility when less than 5,000 square feet of pollution-generating impervious surface will be created. Because of this, no stormwater treatment facility is required for this development.

Figure 5.6.1



*When **Phosphorus Control and Enhanced** treatment are required, the Large Wetpond and certain types of emerging technologies will not meet both types of treatment requirements. A different or an additional treatment facility will be required to meet Enhanced treatment.

DEPARTMENT OF ECOLOGY
State of Washington

Figure V-2.1.1
Treatment Facility Selection Flow Chart

Revised December 2015

5.7 Conveyance System Analysis and Design

The on-site conveyance system will consist of a tightlined system to convey runoff from the proposed shared access driveway, shop building and single-family residence. This system will convey runoff to the existing on-site catch basin near the southeast property corner. Because the proposed development consists of a two-lot short plat, conveyance calculations are not required for the proposed on-site conveyance system.

Tab 6.0

6.0 CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

The following is a list of the thirteen SWPPP elements and how they will be addressed for this project:

Element #1 - Preserve Vegetation / Mark Clearing Limits: Clearing Limits will be flagged in the field during construction.

Element #2 - Establish Construction Access: A stabilized gravel construction entrance will be provided during construction.

Element #3 - Control Flow Rates: Flow rates will be controlled during construction using hydroseeding and a sediment trap, if necessary.

Element #4 - Install Sediment Controls: A silt fence will be provided as necessary to prevent transport of sediment offsite.

Element #5 - Stabilize Soils: Cover measures such as plastic coverings will be provided as necessary to protect any soil from erosive forces.

Element #6 - Protect Slopes: There are no significant slopes onsite, existing or proposed that require additional measures beyond the soil stabilization measures such as hydroseeding.

Element #7 - Protect Permanent Drain Inlets: Existing permanent drain inlets will be protected during construction using catch basin inserts.

Element #8 - Stabilize Channels and Outlets: There are no existing or proposed channels and outfalls for this project.

Element #9 - Control Pollutants: The contractor will dispose of all pollutants and waste materials in a safe and timely manner.

Element #10 - Control Dewatering: Any water in underground utility trenches or low spots will be routed to the on-site discharge point.

Element #11 - Maintain Best Management Practices: The contractor will maintain and repair all proposed BMP's to ensure continued performance of their intended function.

Element #12 - Manage the Project: The contractor will be required to follow and maintain the Construction SWPPP throughout all construction activities.

Element #13 - Protect Low Impact Development BMPs: Contractor shall keep all heavy equipment off all permanent BMP's

Tab 7.0

7.0 SPECIAL REPORTS AND STUDIES

This section contains the following information:

7.1 Geotechnical Evaluation, prepared by Earth Solutions NW dated December 17, 2021

7.2 Critical Area Assessment – Biological Evaluation, prepared by Habitat Technologies dated October 18, 2021

7.1 Geotechnical Evaluation, prepared by Earth Solutions NW LLC dated December 17, 2021

Earth Solutions NW LLC
Geotechnical Engineering, Construction
Observation/Testing and Environmental Services

December 17, 2021
ES-8181

Mr. Kris Mullan
808 – 14th Street Southwest
Puyallup, Washington 98371

Subject: **Geotechnical Evaluation**
Proposed Single-Family Residence
808 – 14th Street Southwest
Puyallup, Washington

Reference: Puyallup Municipal Code (PMC) Chapter 21.06: Critical Areas

J.E. Schuster et al.
Geologic Map of the Tacoma 1:100,000-scale Quadrangle, Washington, 2015

Stephen P. Palmer et al.
Liquefaction Susceptibility Map of Pierce County, Washington, 2004

United States Department of Agriculture (USDA)
Natural Resources Conservation Service (NRCS)
Online Web Soil Survey (WSS) resource

Washington State Department of Ecology
2014 Stormwater Management Manual for Western Washington

Dear Mr. Mullan:

As requested, Earth Solutions NW, LLC (ESNW) has prepared this letter for the proposed project. The letter was prepared in general accordance with the scope of services outlined in the October 2021 Change Order to our original proposal, which was authorized by you. A summary of the subsurface exploration on site and preliminary geotechnical recommendations to aid with the site design are provided in this letter.

Project Description

We understand the subject site will be subdivided (creating a two-lot short plat), and one new single-family residence will be constructed. The proposal will also include construction of a new driveway, utility improvements, and outbuildings. Infiltration and other flow control stormwater Best Management Practices (BMPs) must be utilized to the extent practical. At the time of this letter, the proposal included construction of a porous driveway.

Surface Conditions

The subject site is located on the west side of 14th Street Southwest, about 400 feet south of the intersection with 7th Avenue Southwest, in Puyallup, Washington. The approximate location of the property is illustrated on Plate 1 (Vicinity Map). The site consists of one tax parcel (Pierce County Parcel No. 5505300831), totaling about 0.93 acres. The site is surrounded to the west, south, and north by residential structures and to the east by 14th Street Southwest.

Subsurface Conditions

An ESNW representative observed, logged, and sampled five test pits on October 7, 2021. Five additional test pits, three of which had piezometers installed for seasonal groundwater monitoring purposes, were completed on November 2, 2021. The test pits were excavated within accessible site areas, using a mini trackhoe and operator retained by ESNW. The test pits were completed to evaluate and classify site soils, characterize groundwater conditions within accessible site areas, and perform in-situ infiltration testing.

The approximate locations of the test pits are depicted on Plate 2 (Test Pit Location Plan). Please refer to the attached test pit logs for a more detailed description of subsurface conditions. Representative soil samples collected at the test pit locations were analyzed in general accordance with both Unified Soil Classification System (USCS) and USDA methods and procedures.

Topsoil and Fill

Where encountered at surface grades, the topsoil was about 6 to 12 inches thick. The topsoil was characterized by the observed dark brown hue, the presence of fine organics, and small root intrusions.

Fill was encountered at test pit locations TP-3, TP-6, TP-8, TP-9, and TP-10 to depths of about one-and-one-half to two-and-one-half feet below the existing ground surface (bgs). The fill was characterized as silty sand, in a loose to medium dense and damp to moist condition. Small pieces of asphalt, brick, and plastic were observed in the fill.

Native Soil

Underlying the topsoil and fill, the native soil consisted primarily of silty sand and sandy silt (USCS: SM and ML, respectively). The in-situ density of the native soil was characterized primarily as “medium dense” at each test location, and the in-situ moisture content was characterized as damp to wet condition at the time of exploration depending on the presence of groundwater. The maximum exploration depth was approximately nine-and-one-half feet bgs.

Geologic Setting

The referenced geologic map resource identifies alluvium (Qa) as the primary native soil unit underlying the subject site and proximate areas. As reported on the geologic map resource, alluvium is typified by well-rounded and moderately to well-sorted beds of fluvial silt, sand, and gravel. The referenced WSS resource identifies Sultan silt loam as the primary soil unit underlying the subject development area. The Sultan series was formed in stratified alluvial deposits as a result of the Mount Rainier watershed. Based on our field observations, the on-site native soil is consistent with the local geologic mapping of alluvium.

Groundwater

Groundwater was encountered at the test locations at varying depths during the October and November 2021 fieldwork, ranging from about three to eight-and-one-half feet bgs. As previously mentioned, ESNW installed a series of standpipe piezometers in select test locations and is performing groundwater monitoring over the course of the 2021–2022 wet season. An opinion of the seasonal high groundwater table elevation can be provided at the conclusion of the wet season based on review of groundwater information collected by the in-place dataloggers.

It should be noted that seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater flow rates are higher during the winter, spring, and early summer months.

Geologically Hazardous Areas

We reviewed the referenced PMC chapter to determine the presence of geologically hazardous areas on site. Based on our review, the subject site may be considered within a seismic hazard area. The three remaining geologically hazardous areas recognized by the PMC—erosion hazard area, landslide hazard area, and volcanic hazard area—are not applicable to the subject site.

According to PMC 21.06.1210(3)(c), seismic hazard areas are defined as “areas subject to severe risk of damage as a result of earthquake-induced ground shaking, slope failure, settlement or subsidence, soil liquefaction, or tsunamis.” The referenced liquefaction susceptibility map indicates the site and surrounding areas possess high liquefaction susceptibility. Based on our field observations, it is our opinion the risk of liquefaction during a seismic event can generally be considered low. This opinion is based primarily on the significant percentage of fines (material passing the Number 200 sieve) inherent to the native soil; predominantly silty soils are typically not susceptible to liquefaction during a seismic event. On this basis, it is our opinion the site is not at severe risk of damage during a seismic event and does not meet the PMC definition of a seismic hazard area.

Preliminary Geotechnical Recommendations

The primary geotechnical considerations for the proposal are associated with structural fill placement and compaction, earthwork and grading activities, foundation support, and stormwater management. Based on our field observations and our understanding of the proposed development, pertinent geotechnical recommendations and design parameters are provided below.

In-situ and Imported Soil

The native alluvium is moisture sensitive, and successful use of the native alluvium as structural fill will largely be dictated by the moisture content at the time of placement and compaction. If the native alluvium cannot be successfully compacted, the use of an imported soil may be necessary.

Performing grading activities during summer months of relatively low rainfall activity is recommended to minimize site degradation. In our opinion, a contingency should be provided in the project budget for the export of soil that cannot be successfully compacted as structural fill, particularly if grading activities take place during periods of extended rainfall activity. In general, soil with an appreciable fines content (greater than 5 percent) typically degrades rapidly when exposed to periods of rainfall.

Imported soil intended for use as structural fill should be evaluated by ESNW during construction. The imported soil must be able to achieve the necessary moisture content, as determined by the Modified Proctor Method (ASTM D1557), at the time of placement and compaction. During wet weather conditions, imported soil intended for use as structural fill should consist of a well-graded, granular soil with a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction).

Structural Fill

Structural fill is defined as compacted soil placed in foundation, slab-on-grade, roadway, permanent slope, retaining wall, and utility trench backfill areas. Structural fill placed and compacted during site grading activities should meet the following specifications:

- Structural fill material — Granular soil*****
- Moisture content — At or slightly above optimum†
- Relative compaction (minimum) — 95 percent (Modified Proctor)
- Loose lift thickness (maximum) — 12 inches

* *The existing soil may not be suitable for use as structural fill unless the soil is at (or slightly above) the optimum moisture content at the time of placement and compaction.*

† *Soil shall not be placed dry of optimum and should be evaluated by ESNW during construction.*

Foundations

The proposed residential structures may be supported on conventional continuous and spread footing foundations bearing on either compact structural fill or competent native soil. In general, competent native soil for foundation support should be encountered beginning at a depth of roughly two to three feet bgs. Existing fill intended for reuse as structural fill must be free of debris and should be evaluated by ESNW prior to use. In general, if loose or unsuitable soil conditions are exposed at foundation subgrade elevations, additional mechanical compactive effort or overexcavation and replacement with suitable structural fill will likely be necessary.

Provided foundations will be supported as prescribed, the following parameters may be used for design:

- Allowable soil bearing capacity 2,000 psf
- Passive earth pressure 250 pcf (equivalent fluid)
- Coefficient of friction 0.35

A one-third increase in the allowable soil bearing capacity may be assumed for short-term wind and seismic loading conditions. The above passive pressure and friction values include a factor-of-safety of 1.5. With structural loading as expected, about one inch of total static settlement and about one-half inch of differential static settlement is anticipated. Most of the anticipated settlement should occur during construction when dead loads are applied.

Seismic Design

The 2018 International Building Code (2018 IBC) recognizes the most recent edition of the Minimum Design Loads for Buildings and Other Structures manual (ASCE 7-16) for seismic design, specifically with respect to earthquake loads. Based on the soil conditions encountered at the test pit locations, the parameters and values provided below are recommended for seismic design per the 2018 IBC.

Parameter	Value
Site Class	D*
Mapped short period spectral response acceleration, S_S (*g*)	1.278
Mapped 1-second period spectral response acceleration, S_1 (*g*)	0.440
Short period site coefficient, F_a	1.0
Long period site coefficient, F_v	1.860†
Adjusted short period spectral response acceleration, S_{MS} (*g*)	1.278
Adjusted 1-second period spectral response acceleration, S_{M1} (*g*)	0.818†
Design short period spectral response acceleration, S_{DS} (*g*)	0.852
Design 1-second period spectral response acceleration, S_{D1} (*g*)	0.546†

* *Assumes medium dense native soil conditions, encountered to a maximum depth of 9.5 feet bgs during the October and November 2021 field explorations, remain dense to at least 100 feet bgs.*

† *Values assume F_v may be determined using linear interpolation per Table 11.4-2 in ASCE 7-16.*

Please refer to the *Geologically Hazardous Areas* section of this letter for evaluation of site-specific seismic risk and liquefaction susceptibility.

Slab-on-Grade Floors

Slab-on-grade floors for the proposed residential structure should be supported on firm and unyielding subgrades comprised of competent native soil, compacted structural fill, or new structural fill. Unstable or yielding subgrade areas should be recompacted or overexcavated and replaced with suitable structural fill prior to slab construction.

A capillary break, consisting of at least four inches of free-draining crushed rock or gravel, should be placed below each slab. The free-draining material should have a fines content of 5 percent or less (where the fines content is defined as the percent passing the Number 200 sieve, based on the minus three-quarter-inch fraction). In areas where slab moisture is undesirable, installation of a vapor barrier below each slab should be considered. If a vapor barrier is to be utilized, it should be a material specifically designed for use as a vapor barrier and should be installed in accordance with the specifications of the manufacturer.

Retaining Walls

Retaining walls must be designed to resist earth pressures and applicable surcharge loads. The following parameters may be used for design:

- Active earth pressure (unrestrained condition) — 40 pcf (equivalent fluid)
- At-rest earth pressure (restrained condition) — 60 pcf
- Traffic surcharge* (passenger vehicles) — 70 psf (rectangular distribution)
- Passive earth pressure — 250 pcf (equivalent fluid)
- Coefficient of friction — 0.35
- Seismic surcharge — 8H psf†

* *Where applicable.*
† *Where H equals the retained height (in feet).*

The above design parameters are based on a level backfill condition and level grade at the wall toe under the assumption that native soil will be retained. If a significant zone of imported structural fill will be retained directly behind the wall, less stringent design parameters can be provided. Revised design values will be necessary if sloping grades are to be used above or below retaining walls. Additional surcharge loading from adjacent foundations, sloped backfill, or other relevant loads should be included in the retaining wall design.

Retaining walls should be backfilled with free-draining material that extends along the height of the wall and a distance of at least 18 inches behind the wall. The upper 12 inches of the wall backfill may consist of a less permeable soil if desired. A perforated drainpipe should be placed along the base of the wall and connected to an approved discharge location. A typical retaining wall drainage detail is provided on Plate 3. If drainage is not provided, hydrostatic pressures should be included in the wall design.

Drainage

Groundwater will likely be encountered in site excavations. Temporary measures to control surface water runoff and groundwater during construction would likely involve interceptor trenches and sumps. ESNW should be consulted during preliminary grading to both identify areas of seepage and provide recommendations to reduce the potential for seepage-related instability.

Finish grades must be designed to direct surface drain water away from structures and slopes. Water must not be allowed to pond adjacent to structures. In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 4.

Infiltration Evaluation

Per the requirements of the referenced 2014 Stormwater Management Manual for Western Washington (2014 SWMMWW), one small-scale Pilot Infiltration Test (PIT) was completed during the November 2021 fieldwork. The PIT was completed at TP-10 and at an approximate depth of two-and-one-half feet bgs. The following test results and correction factors were used to determine the calculated (long-term) infiltration rate:

- K_{sat} initial (measured infiltration rate; TP-10) 1.2 inches per hour (in/hr)
- Site variability and number of tests (CF_v) 0.75
- Test method (CF_t) 0.5 (small-scale PIT)
- Degree of influent control (CF_m) 0.9
- K_{sat} design (calculated infiltration rate; TP-10) 0.4 in/hr

Use of the above infiltration rate is considered acceptable near the location and elevation of the PIT. Should different locations of the site be pursued for infiltration, ESNW should be contacted to review the applicability of the above infiltration rate. Supplementary testing may be warranted as project plans develop. In addition, as mentioned in the *Groundwater* section of this letter, ESNW is currently providing groundwater monitoring services during the 2021–2022 wet season. The seasonal high groundwater table elevation may impact infiltration feasibility and should be discussed further as monitoring data becomes available.

ESNW should be contacted to review stormwater management plans if infiltration is used in the final design. Where infiltration facilities are incorporated into construction, ESNW should be contacted to observe installation of infiltration facilities and provide supplementary recommendations, as necessary.

Permeable Pavement Considerations

We understand permeable pavement is being considered as part of the project design. Per the 2014 SWMMWW, the native soil underneath the permeable pavement surface must meet minimum cation exchange capacity (CEC) and organic content (OC) values of 5 meq/100 g and 1.0 percent, respectively, for water quality purposes. Based on the laboratory CEC and OC analysis results (attached to this letter for reference), the native underlying soil is generally expected to meet the minimum CEC and OC requirements. The ability of the proposed permeable pavement to meet the required minimum vertical separation from the seasonal high groundwater table elevation is also an important geotechnical consideration, which is being evaluated by ESNW over the course of the 2021–2022 wet season.

Limitations

This letter has been prepared for the exclusive use of Mr. Kris Mullan and his representatives. No warranty, express or implied, is made. The recommendations and conclusions provided in this letter are professional opinions consistent with the level of care and skill that is typical of other members in the profession currently practicing under similar conditions in this area. Variations in the soil and groundwater conditions encountered at the test pit locations may exist and may not become evident until construction. ESNW should reevaluate the contents of this letter if variations are encountered.

We trust this letter meets your current needs. Please call if you have any questions about this letter or if we can be of further assistance.

Sincerely,

EARTH SOLUTIONS NW, LLC

12/17/2021

Steven K. Hartwig, G.I.T.
Staff Geologist

Keven D. Hoffmann, P.E.
Geotechnical Engineering Services Manager

Attachments: Plate 1 – Vicinity Map
Plate 2 – Test Pit Location Plan
Plate 3 – Retaining Wall Drainage Detail
Plate 4 – Footing Drain Detail
Test Pit Logs
Laboratory Data

cc: Barghausen Consulting Engineers, Inc.
Attention: Mr. Vicente Varas (Email only)
Mr. Barry Talkington, P.E. (Email only)

Reference:
Pierce County, Washington
OpenStreetMap.org

NORTH

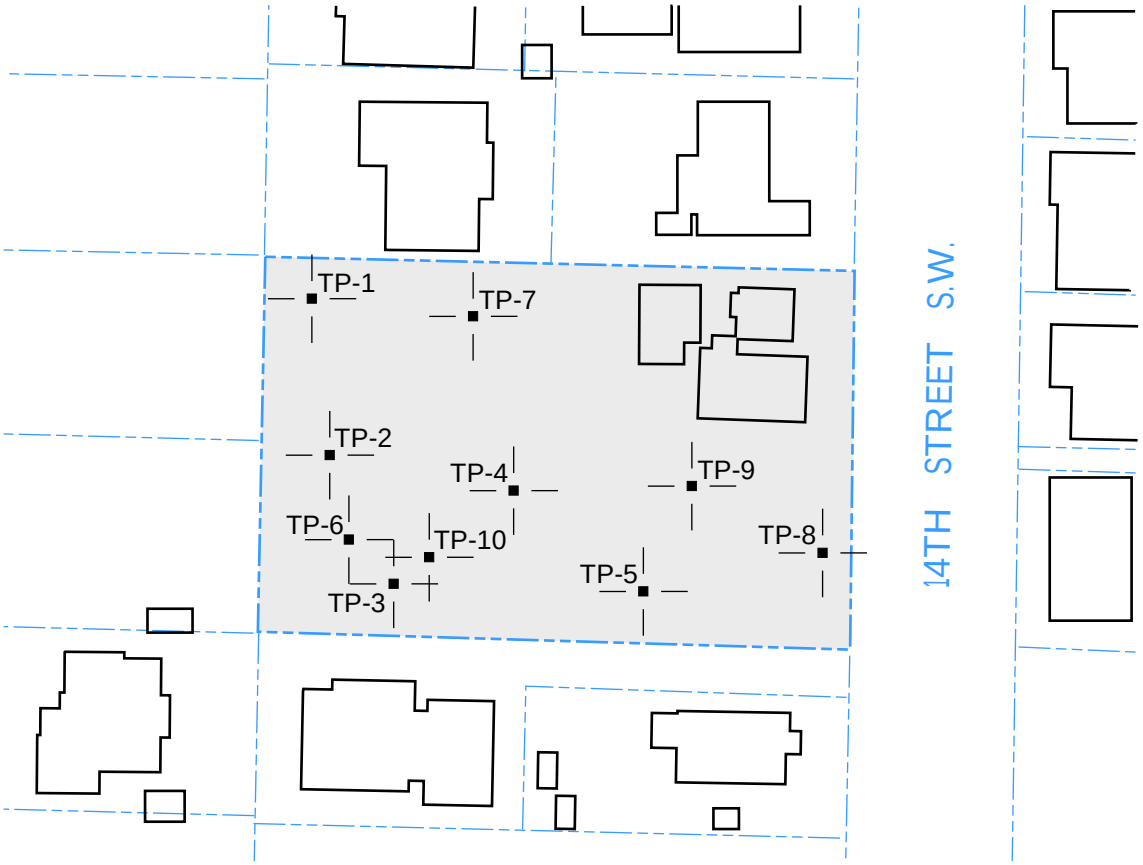
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Vicinity Map
Mullan Short Plat
Puyallup, Washington

Drwn. MRS	Date 11/04/2021	Proj. No. 8181
Checked SKH	Date Nov. 2021	Plate 1



LEGEND

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-8181, Oct./Nov. 2021

Subject Site

Existing Building

NORTH

1"=80'

0 40 80 160

Scale in Feet

NOTE: The graphics shown on this plate are not intended for design purposes or precise scale measurements, but only to illustrate the approximate test locations relative to the approximate locations of existing and / or proposed site features. The information illustrated is largely based on data provided by the client at the time of our study. ESNW cannot be responsible for subsequent design changes or interpretation of the data by others.

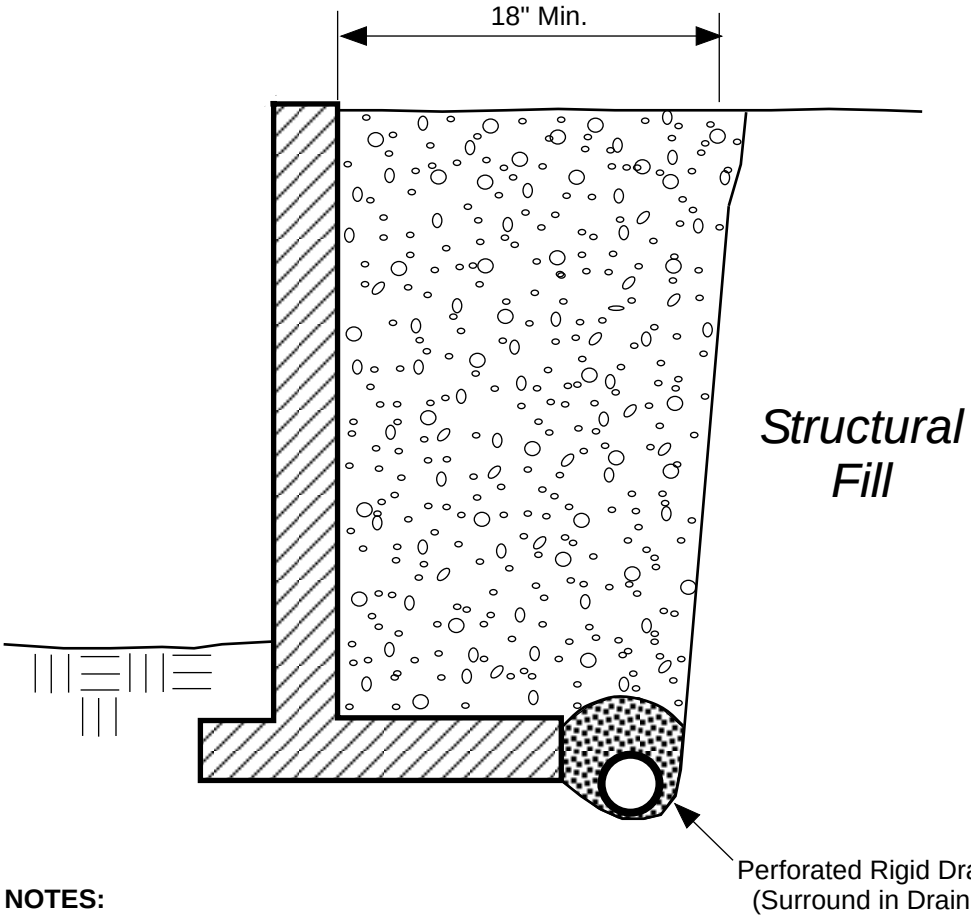
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Test Pit Location Plan
Mullan Short Plat
Puyallup, Washington

Drwn. MRS	Date 12/14/2021	Proj. No. 8181
Checked SKH	Date Dec. 2021	Plate 2



NOTES:

- Free-draining Backfill should consist of soil having less than 5 percent fines. Percent passing No. 4 sieve should be 25 to 75 percent.
- Sheet Drain may be feasible in lieu of Free-draining Backfill, per ESNW recommendations.
- Drain Pipe should consist of perforated, rigid PVC Pipe surrounded with 1-inch Drain Rock.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

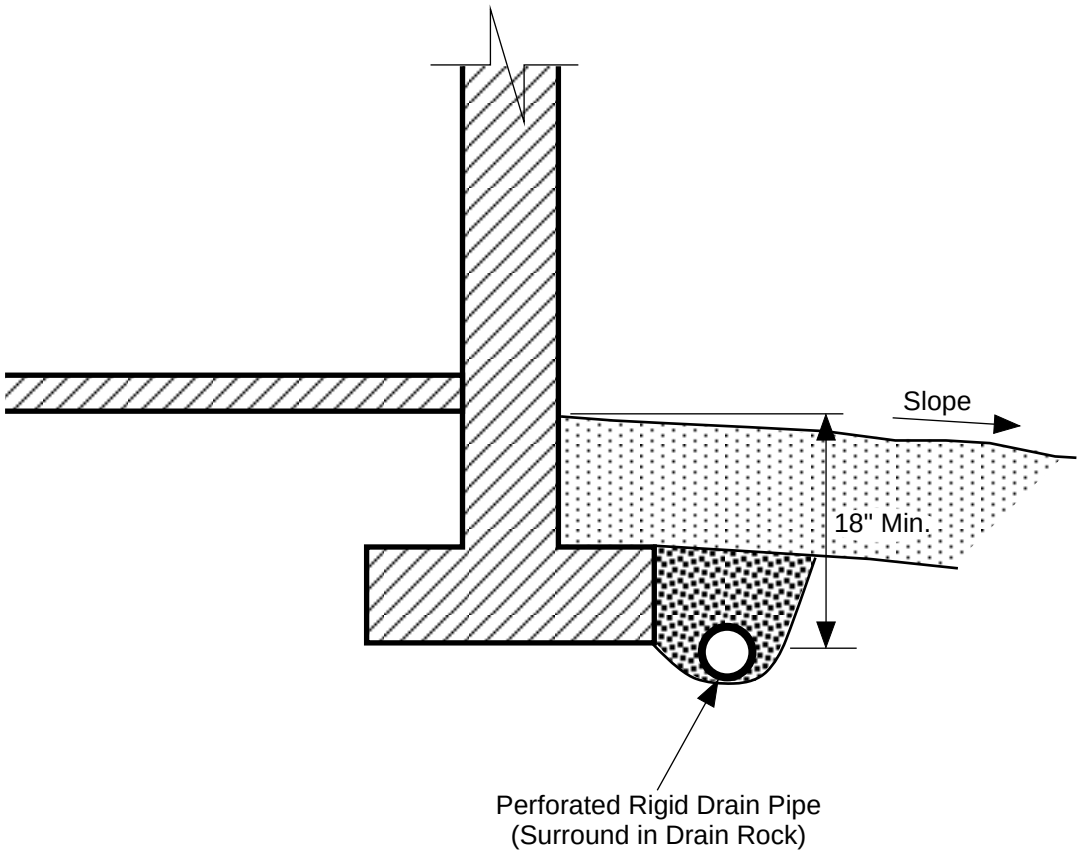
Free-draining Structural Backfill

1-inch Drain Rock

Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Retaining Wall Drainage Detail
Mullan Short Plat
Puyallup, Washington

Drwn. MRS	Date 11/04/2021	Proj. No. 8181
Checked SKH	Date Nov. 2021	Plate 3



NOTES:

- Do NOT tie roof downspouts to Footing Drain.
- Surface Seal to consist of 12" of less permeable, suitable soil. Slope away from building.

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING

LEGEND:

Surface Seal: native soil or other low-permeability material.

1-inch Drain Rock

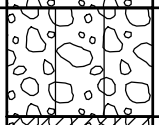
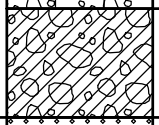
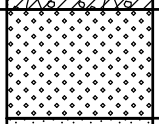
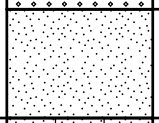
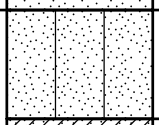
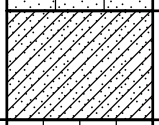
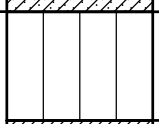
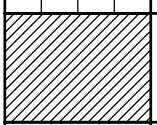
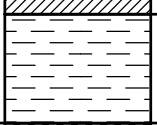
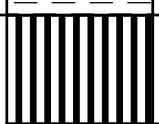
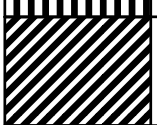
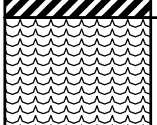
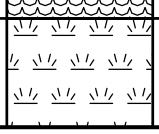
Earth Solutions NW LLC
Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Footing Drain Detail
Mullan Short Plat
Puyallup, Washington

Drwn. MRS	Date 11/04/2021	Proj. No. 8181
Checked SKH	Date Nov. 2021	Plate 4

Earth Solutions NW LLC

SOIL CLASSIFICATION CHART

MAJOR DIVISIONS			SYMBOLS		TYPICAL DESCRIPTIONS
			GRAPH	LETTER	
COARSE GRAINED SOILS MORE THAN 50% OF MATERIAL IS LARGER THAN NO. 200 SIEVE SIZE	GRAVEL AND GRAVELLY SOILS MORE THAN 50% OF COARSE FRACTION RETAINED ON NO. 4 SIEVE	CLEAN GRAVELS (LITTLE OR NO FINES)		GW	WELL-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
				GP	POORLY-GRADED GRAVELS, GRAVEL - SAND MIXTURES, LITTLE OR NO FINES
		GRAVELS WITH FINES (APPRECIABLE AMOUNT OF FINES)		GM	SILTY GRAVELS, GRAVEL - SAND - SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL - SAND - CLAY MIXTURES
	SAND AND SANDY SOILS MORE THAN 50% OF COARSE FRACTION PASSING ON NO. 4 SIEVE	CLEAN SANDS (LITTLE OR NO FINES)		SW	WELL-GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES
				SP	POORLY-GRADED SANDS, GRAVELLY SAND, LITTLE OR NO FINES
		SANDS WITH FINES (APPRECIABLE AMOUNT OF FINES)		SM	SILTY SANDS, SAND - SILT MIXTURES
				SC	CLAYEY SANDS, SAND - CLAY MIXTURES
FINE GRAINED SOILS MORE THAN 50% OF MATERIAL IS SMALLER THAN NO. 200 SIEVE SIZE	SILTS AND CLAYS	LIQUID LIMIT LESS THAN 50		ML	INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY OR CLAYEY FINE SANDS OR CLAYEY SILTS WITH SLIGHT PLASTICITY
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, GRAVELLY CLAYS, SANDY CLAYS, SILTY CLAYS, LEAN CLAYS
				OL	ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS	LIQUID LIMIT GREATER THAN 50		MH	INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS FINE SAND OR SILTY SOILS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY
				OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY, ORGANIC SILTS
HIGHLY ORGANIC SOILS				PT	PEAT, HUMUS, SWAMP SOILS WITH HIGH ORGANIC CONTENTS

DUAL SYMBOLS are used to indicate borderline soil classifications.

The discussion in the text of this report is necessary for a proper understanding of the nature of the material presented in the attached logs.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-1

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat
DATE STARTED 10/7/21 **COMPLETED** 10/7/21 **GROUND ELEVATION** 35 ft
EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.18528 **LONGITUDE** -122.31428
EXCAVATION METHOD **GROUND WATER LEVEL:**
LOGGED BY SKH **CHECKED BY** KDH ▽ **AT TIME OF EXCAVATION**
NOTES Depth of Topsoil & Sod 10": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, minor root intrusions to 1'
					1.0 — 34.0
		MC = 12.5%	SM		Brown silty SAND, loose to medium dense, damp -becomes gray, trace iron oxide staining
5		MC = 24.8% Fines = 22.9%			-becomes blue-gray [USDA Classification: fine sandy LOAM] -becomes moist
					7.0 — 28.0
		MC = 44.9%	ML		Gray silty SAND, medium dense, wet -light groundwater seepage -organic debris
					8.0 — 27.0
					Test pit terminated at 8.0 feet below existing grade. Groundwater encountered at 7.5 feet during excavation. No caving observed.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-2

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat

DATE STARTED 10/7/21 **COMPLETED** 10/7/21 **GROUND ELEVATION** 35 ft

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.1851 **LONGITUDE** -122.31418

EXCAVATION METHOD **GROUND WATER LEVEL:**

LOGGED BY SKH **CHECKED BY** KDH ▽ **AT TIME OF EXCAVATION**

NOTES Depth of Topsoil & Sod 6": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL	
				0.5		34.5
		MC = 12.2%	SM		Brown silty SAND, loose to medium dense, damp -becomes gray, light iron oxide staining	
				3.5		31.5
5		MC = 33.9% Fines = 98.4%	ML		Gray SILT, medium dense, moist [USDA Classification: LOAM] -organic debris -becomes wet -light groundwater seepage	
		MC = 55.6%		8.0		27.0

Test pit terminated at 8.0 feet below existing grade. Groundwater encountered at 7.5 feet during excavation. No caving observed.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-3

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat
DATE STARTED 10/7/21 **COMPLETED** 10/7/21 **GROUND ELEVATION** 35 ft
EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.18495 **LONGITUDE** -122.31412
EXCAVATION METHOD **GROUND WATER LEVEL:**
LOGGED BY SKH **CHECKED BY** KDH ▽ **AT TIME OF EXCAVATION**
NOTES Depth of Topsoil & Sod 6": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL	
				0.5		34.5
			SM		Brown silty SAND with gravel, medium dense, damp (Fill)	
					-asphalt debris	
				2.0		33.0
		MC = 50.0% Fines = 93.2%			Gray SILT, medium dense, wet	
					[USDA Classification: LOAM]	
					-organic debris, light iron oxide staining	
5						
			ML			
		MC = 41.6%			-light groundwater seepage, moderate organics	
					-light groundwater seepage	
		MC = 52.4%		9.5		25.5

Test pit terminated at 9.5 feet below existing grade. Groundwater encountered at 6.5 and 8.0 feet during excavation. No caving observed.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-4

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat

DATE STARTED 10/7/21 **COMPLETED** 10/7/21 **GROUND ELEVATION** 35 ft

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.18508 **LONGITUDE** -122.31391

EXCAVATION METHOD **GROUND WATER LEVEL:**

LOGGED BY SKH **CHECKED BY** KDH ▽ **AT TIME OF EXCAVATION**

NOTES Depth of Topsoil & Sod 10": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0			TPSL		Dark brown TOPSOIL, minor roots to 12"
					1.0 34.0
		MC = 12.8% Fines = 32.9%	SM		Brown silty SAND, loose to medium dense, damp [USDA Classification: sandy LOAM] -becomes gray, light iron oxide staining
					4.0 31.0
5		MC = 52.3%	ML		Gray SILT, medium dense, moist to wet -trace organics debris -light groundwater seepage
		MC = 35.2%			-light groundwater seepage
		MC = 32.7%			9.5 25.5

Test pit terminated at 9.5 feet below existing grade. Groundwater encountered at 6.5 and 8.5 feet during excavation. No caving observed.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-5

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat

DATE STARTED 10/7/21 **COMPLETED** 10/7/21 **GROUND ELEVATION** 35 ft

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.18493 **LONGITUDE** -122.31369

EXCAVATION METHOD **GROUND WATER LEVEL:**

LOGGED BY SKH **CHECKED BY** KDH ▽ **AT TIME OF EXCAVATION**

NOTES Depth of Topsoil & Sod 8": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL	
0.5						34.5
		MC = 10.2%	SM		Brown silty SAND, loose to medium dense, damp to moist	
2.5						32.5
		MC = 35.0% LL = 44 PL = 35 Fines = 81.1%			Gray SILT with sand, medium dense, moist to wet	
5						
			ML		-light groundwater seepage, slight caving at seepage point	
		MC = 43.7%			-light groundwater seepage	
9.0		MC = 36.9%				26.0

Test pit terminated at 9.0 feet below existing grade. Groundwater encountered at 5.0 and 7.5 feet during excavation. Caving observed at 5.0 feet.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-6

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat

DATE STARTED 11/2/21 **COMPLETED** 11/2/21 **GROUND ELEVATION** 35 ft

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.18498 **LONGITUDE** -122.31417

EXCAVATION METHOD **GROUND WATER LEVEL:**

LOGGED BY SKH **CHECKED BY** KDH ▽ **AT TIME OF EXCAVATION**

NOTES Depth of Topsoil & Sod 6": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION	
0			TPSL		0.5	Dark brown TOPSOIL, root to 1.5'	34.5
			SM		2.0	Brown silty SAND, loose to medium dense, damp (Fill) -asphalt debris	33.0
		MC = 42.8%	SP-SM		3.5	Brown poorly graded SAND with silt, medium dense, wet -becomes gray, groundwater seepage, moderate iron oxide staining	31.5

Test pit terminated at 3.5 feet below existing grade. Groundwater encountered at 3.0 feet during excavation. No caving observed.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-7

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat

DATE STARTED 11/2/21 **COMPLETED** 11/2/21 **GROUND ELEVATION** 35 ft

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.18518 **LONGITUDE** -122.31399

EXCAVATION METHOD **GROUND WATER LEVEL:**

LOGGED BY SKH **CHECKED BY** KDH ▽ **AT TIME OF EXCAVATION**

NOTES Depth of Topsoil & Sod 12": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL, roots to 1.5'	
					1.0	34.0
		MC = 16.6% Fines = 26.2%	SM		Brown silty SAND, loose to medium dense, moist [USDA Classification: slightly gravelly loamy SAND] -moderate caving to BOH -groundwater	
					4.5	30.5
5			ML		Gray SILT, medium dense, wet -becomes saturated	
		MC = 40.4%				
		MC = 50.1%			9.0	26.0

Test pit terminated at 9.0 feet below existing grade. Groundwater encountered at 4.0 feet during excavation. Caving observed from 4.0 feet to BOH.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-8

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat

DATE STARTED 11/2/21 **COMPLETED** 11/2/21 **GROUND ELEVATION** 35 ft

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.18494 **LONGITUDE** -122.31338

EXCAVATION METHOD **GROUND WATER LEVEL:**

LOGGED BY SKH **CHECKED BY** KDH ▽ **AT TIME OF EXCAVATION**

NOTES Depth of Topsoil & Sod 6": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL	0.5	Dark brown TOPSOIL, roots	34.5
		MC = 39.6%	SM	2.5	Brown silty SAND, loose to medium dense, damp (Fill) -asphalt debris, plastic debris	32.5
		MC = 37.5% CEC = 14.0 meq/100g OC = 2.7%	ML		Gray SILT, medium dense, wet -moderate iron oxide staining at contact	
		MC = 43.8%		4.5	-groundwater	30.5

Test pit terminated at 4.5 feet below existing grade. Groundwater encountered at 4.0 feet during excavation. No caving observed.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-9

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat

DATE STARTED 11/2/21 **COMPLETED** 11/2/21 **GROUND ELEVATION** 35 ft

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.18506 **LONGITUDE** -122.31362

EXCAVATION METHOD **GROUND WATER LEVEL:**

LOGGED BY SKH **CHECKED BY** KDH ▽ **AT TIME OF EXCAVATION**

NOTES Depth of Topsoil & Sod 6": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0			TPSL		Dark brown TOPSOIL, roots to 6"	34.5
		MC = 6.7%	SM		Brown silty SAND with gravel, loose to medium dense, damp to moist (Fill)	
2.0					-asphalt debris, brick debris	33.0
		MC = 60.7% CEC = 15.0 meq/100g OC = 4.7% MC = 63.2%	ML		Brown SILT with sand, medium dense, saturated -becomes gray, moderate to severe iron oxide staining	
4.0					-groundwater	31.0

Test pit terminated at 4.0 feet below existing grade. Groundwater encountered at 3.5 feet during excavation. No caving observed.

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

TEST PIT NUMBER TP-10

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat

DATE STARTED 11/2/21 **COMPLETED** 11/2/21 **GROUND ELEVATION** 35 ft

EXCAVATION CONTRACTOR NW Excavating **LATITUDE** 47.18493 **LONGITUDE** -122.31403

EXCAVATION METHOD **GROUND WATER LEVEL:**

LOGGED BY SKH **CHECKED BY** KDH ▽ **AT TIME OF EXCAVATION**

NOTES Depth of Topsoil & Sod 6": grass

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG		MATERIAL DESCRIPTION	
0			TPSL		0.5	Dark brown TOPSOIL, roots to 8"	34.5
			SM		1.5	Brown silty SAND, loose to medium dense, moist (Fill) -asphalt debris	33.5
			GM		2.5	Brown silty GRAVEL with sand, medium dense, moist -becomes gray, infiltration test [USDA Classification: very gravelly LOAM]	32.5
		MC = 20.9% Fines = 38.6%					

Test pit terminated at 2.5 feet below existing grade. No groundwater encountered during excavation. No caving observed.

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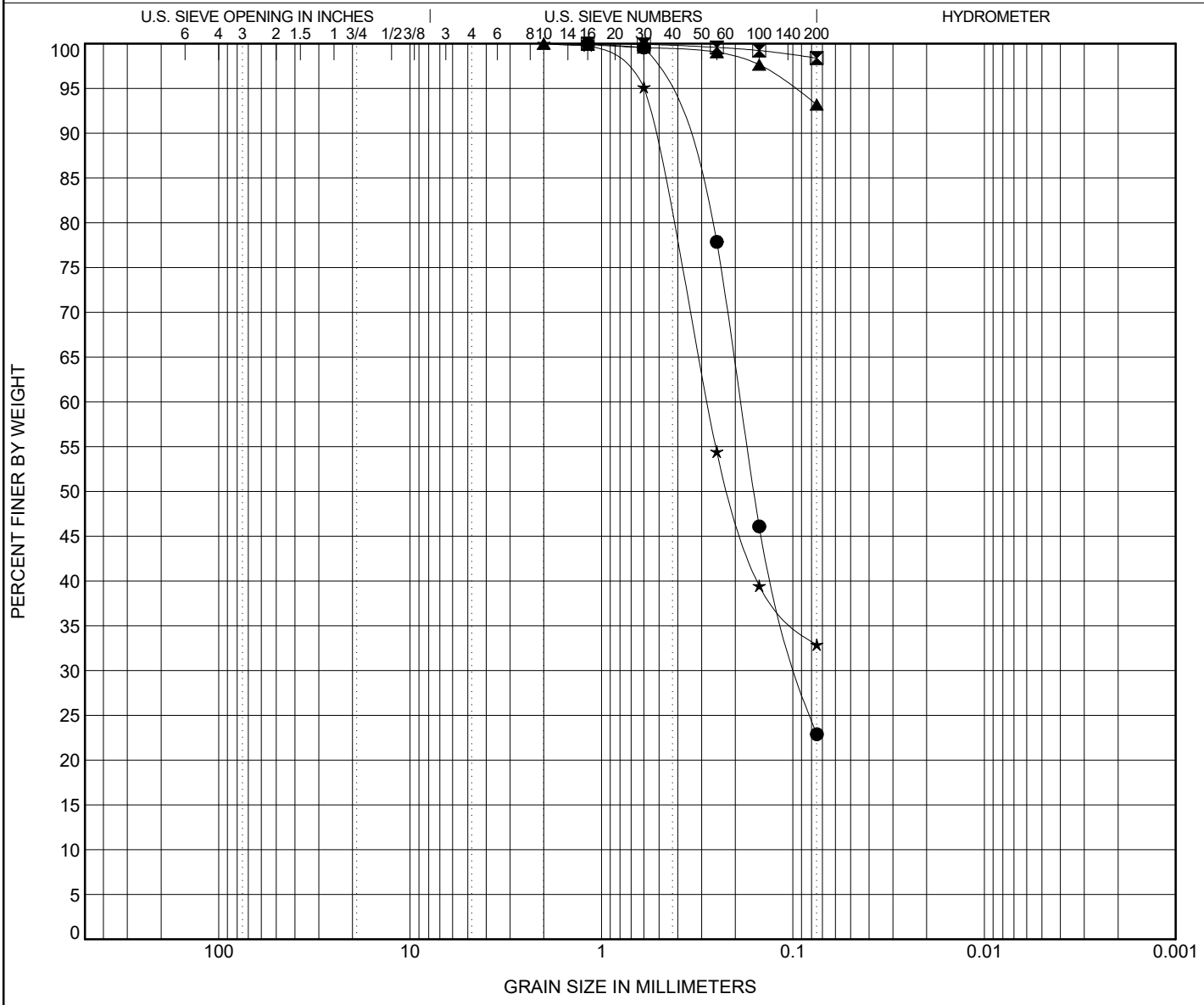
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	Cc	Cu
●	**TP-01**	**5.00ft.**	**USDA: Blue-Gray Fine Sandy Loam. USCS: SM.**		
⧓	**TP-02**	**4.00ft.**	**USDA: Gray Loam. USCS: ML.**		
▲	**TP-03**	**2.50ft.**	**USDA: Gray Loam. USCS: ML.**		
★	**TP-04**	**1.50ft.**	**USDA: Brown Sandy Loam. USCS: SM.**		

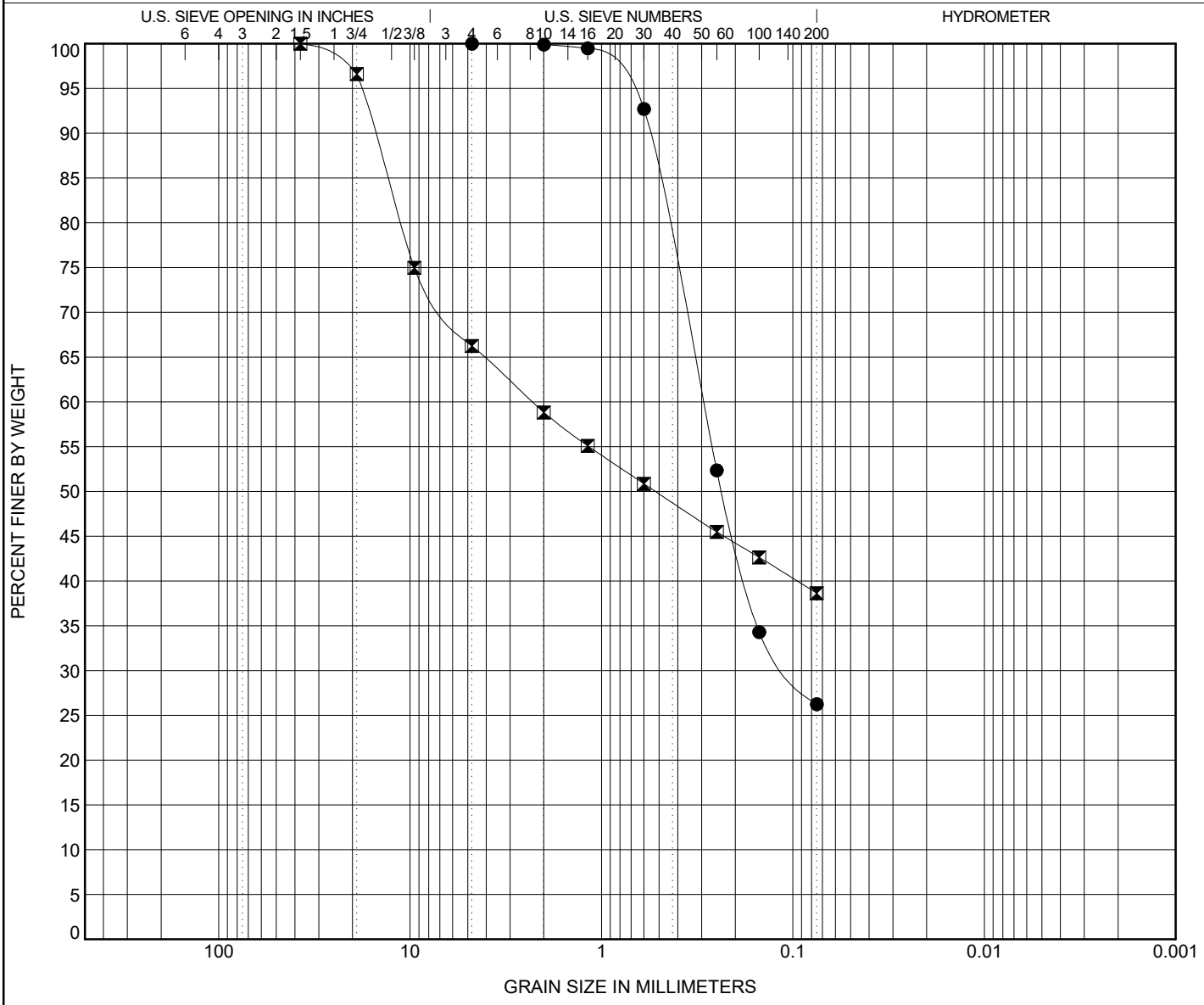
Specimen Identification			D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	**TP-01**	**5.0ft.**	**1.18**	**0.188**	**0.093**					**22.9**	
⧓	**TP-02**	**4.0ft.**	**1.18**							**98.4**	
▲	**TP-03**	**2.5ft.**	**2**							**93.2**	
★	**TP-04**	**1.5ft.**	**2**	**0.282**						**32.9**	

GRAIN SIZE USDA ES-8181 MULLAN SHORT PLAT.GPJ GINT US LAB.GDT 10/22/21

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	Cc	Cu
●	**TP-07**	**2.00ft.**	**USDA: Brown Slightly Gravelly Loamy Sand. USCS: SM.**		
⊠	**TP-10**	**2.50ft.**	**USDA: Gray Very Gravelly Loam. USCS: GM with Sand.**		

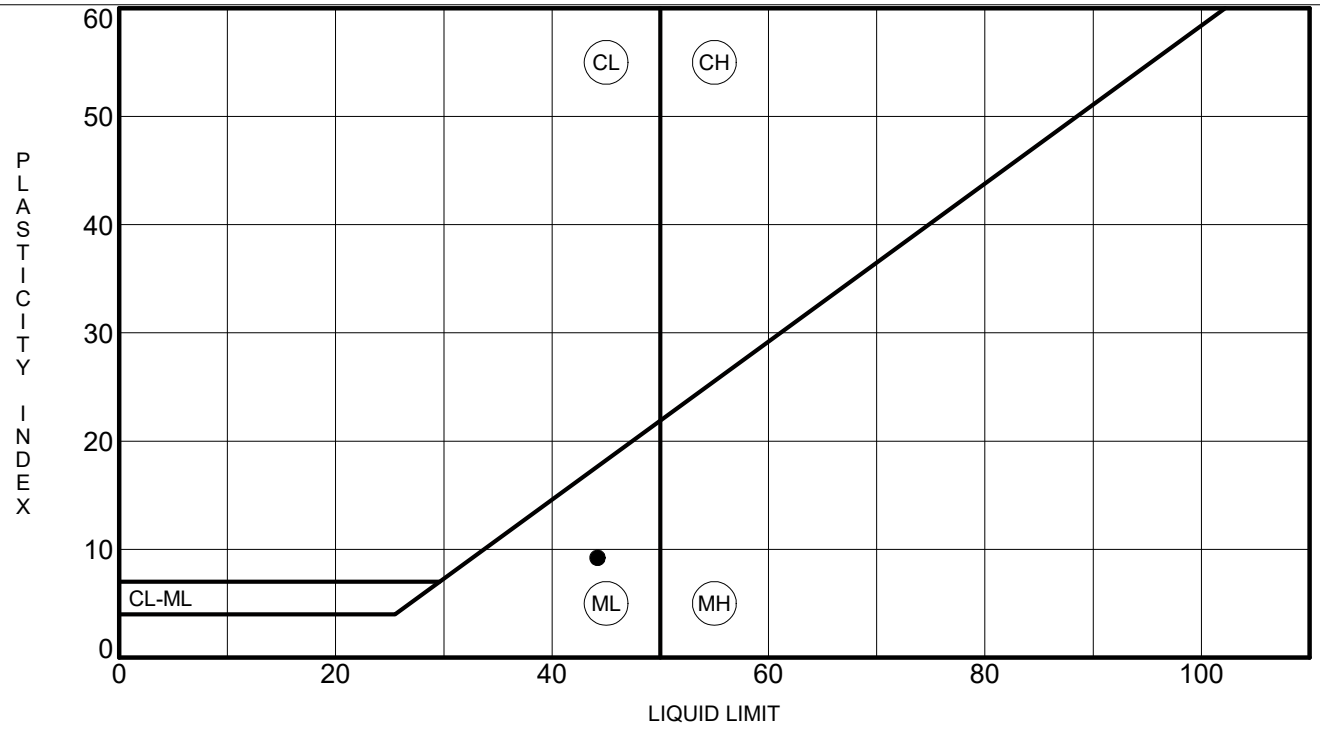
Specimen Identification			D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	**TP-07**	**2.0ft.**	**4.75**	**0.295**	**0.104**					**26.2**	
⊠	**TP-10**	**2.5ft.**	**37.5**	**2.294**						**38.6**	

GRAIN SIZE USDA ES-8181 MULLAN SHORT PLAT.GPJ GINT US LAB.GDT 11/19/21

Earth Solutions NW, LLC
15365 N.E. 90th Street, Suite 100
Redmond, Washington 98052
Telephone: 425-449-4704
Fax: 425-449-4711

ATTERBERG LIMITS' RESULTS

PROJECT NUMBER ES-8181 **PROJECT NAME** Mullan Short Plat



	Specimen Identification		LL	PL	PI	Fines	Classification
●	**TP-05**	**3.0**	**44**	**35**	**9**	**81.1**	**Gray SILT with Sand, ML**

Am Test Inc.
13600 NE 126TH PL
Suite C
Kirkland, WA 98034
(425) 885-1664
www.amtestlab.com

Professional Analytical Services

ANALYSIS REPORT

EARTH SOLUTIONS NW
1805 136TH PL NE
BELLEVUE, WA 98005
Attention: KEVEN HOFFMAN
Project Name: MULLAN SHORT PLAT
All results reported on an as received basis.

Date Received: 11/08/21
Date Reported: 11/23/21

AMTEST Identification Number **21-A017058**
Client Identification **TP-8, 3.5'**
Sampling Date

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Cation Exchange Capacity	14.	meq/100g		0.5	SW-846 9081	JDR	11/18/21

AMTEST Identification Number **21-A017059**
Client Identification **TP-9, 3'**
Sampling Date

Conventionals

PARAMETER	RESULT	UNITS	Q	D.L.	METHOD	ANALYST	DATE
Cation Exchange Capacity	15.	meq/100g		0.5	SW-846 9081	JDR	11/18/21

Kathy Fugiel
President

7.2 Critical Area Assessment – Biological Evaluation, prepared by Habitat Technologies dated October 18, 2021

HABITAT TECHNOLOGIES

October 18, 2021

Kristian and Joann Mullan
808 – 14th Street SW
Puyallup, Washington 98371
e-mail kjmullan@yahoo.com

cc. Ms. Cheryl Ebsworth, Senior Planner
@ Barghausen Consulting Engineers, Inc.
18215 – 72nd Avenue South
Kent, Washington 98032
e-mail cebsworth@Barghausen.com

RE: Critical Areas Assessment - Biological Evaluation
Parcel 5505300831, 808 – 14th Street SW, City of Puyallup

Dear Kristian and Joann Mullan,

As initially proposed, the overall action would divide an existing approximately 0.93-acre parcel into two (2) generally equal sized new parcels. Following this proposed division of land the existing single-family homesite would be retained within one of the newly created parcels and the second newly created parcel would be suitable for the development of a new single-family homesite consistent with the community. The project site (Parcel 5505300831) was located at 808 – 14th Street SW within the City of Puyallup, Pierce County, Washington (Figure 1).

PROJECT SITE DESCRIPTION

The project area is rectangular in shape, approximately 0.93-acres in size, and located within a well urbanized portion of the City of Puyallup that is well served by existing public roadways along with public and private public utilities. The project site is surrounded by existing single-family homesites, managed yards, a public roadway, and church/religious facilities. Seasonal stormwater runoff from the project site along with this portion of the City of Puyallup that does not infiltrate within managed yards and landscaping enters a City of Puyallup stormwater system located within 14th Street SW adjacent to the eastern boundary of the project site. This City stormwater system leads generally southerly within a City of Puyallup stormwater collection and conveyance system to enter Meeker Ditch approximately 600 feet offsite to the south of the project site. Meeker Ditch is an open City managed ditch within the unimproved 10th Avenue SW Corridor that conveys both a remnant stream and directed stormwater from well-urbanized areas generally to the west to eventually enter Clarks Creek, a tributary to the Lower Puyallup River well offsite to the north of the project site.

BACKGROUND INFORMATION

A review of both the *Nation Wetland Inventory* prepared by the U.S. Fish and Wildlife Service (USFWS) (Figure 2) and the *Priority Habitats and Species Mapping* prepared by the Washington Department of Fish and Wildlife (WDFW) (Figure 3) did not identify any wetlands or surface water drainages within or immediately adjacent to the project site. A review of the Washington Department of Fish and Wildlife (WDFW) SalmonScape mapping (Figure 4) identified both Meeker Ditch offsite to the south and Clarks Creek offsite to the west as providing habitats for salmonid fish species (genus Oncorhynchus). The *Water Type Mapping* (Figure 5) prepared by the Washington Department of Natural Resources (WDNR) identified Meeker Ditch offsite to the south as a Type U Water (unknown) and Clarks Creek offsite to the west as a Type S Water (shoreline of the state). The *Critical Areas Mapping* (Figure 6) prepared by the City of Puyallup identified a wetland offsite to the south of the project site along with Meeker Ditch offsite to the south and Clarks Creek offsite to the west. The *Flood Plain Mapping* (Figure 6A) prepared by the City of Puyallup identified that the central and southeastern portions of the project site were overlain by an area exhibiting a 1% annual chance of flooding. The *Soil Survey Mapping* (Figure 7) prepared by the Natural Resource Conservation Service identified the soil through out the project site as Sultan silt loam – moderately well drained, formed in alluvium, not listed as a “hydric” soil.

Meeker Ditch has been documented to provide habitats for coho salmon (*Oncorhynchus kisutch*), cutthroat trout (*Oncorhynchus clarkii*), and chum salmon (*Oncorhynchus keta*). Clarks Creek has been the subject of State of Washington, Puyallup Tribal, and private enhancement programs and has been documented to provide habitats for coho salmon, Chinook salmon (*Oncorhynchus tshawytscha*), chum salmon, cutthroat trout, and steelhead/rainbow trout (*Oncorhynchus mykiss*). Meeker Ditch has been defined by the City of Puyallup as a Type 2 Stream (fish bearing). Clarks Creek has also been defined as WDNR Type S Water (shoreline of the state) and as a City of Puyallup Type 1 Stream (state shoreline).

PLANT COMMUNITIES, SOILS, AND HYDROLOGY

Project Site: The project site was generally flat and dominated by an existing single-family homesite within the northeastern portion with the remainder of the project site generally managed as lawn. The lawn portions of the project site also includes areas graveled for vehicle/equipment parking, areas of managed gardens, and a scattering of trees/grape vines (see Photos).

As documented at representative sample plots within the project site that soil exhibited characteristics typical of the Sultan silt loam soil series. The surface soil had been somewhat modified by prior leveling actions and exhibited a very dark graying brown (10YR 3/2) coloration to a depth of six to 14 inches and a silty loam texture. The subsoil to a depth of approximately 24 inches exhibited a brown (10YR 4/3) coloration, the

presence of less than 2% matrix depletions, and a silty loam texture. This soil did not exhibit prominent field indicators of hydric soils. The project site also did not exhibit prominent field indicators of wetland hydrology patters.

Adjacent Properties: As noted above, the project site was located within a well-urbanized portion of the City of Puyallup. Adjacent properties were dominated by a mixture of single-family homesite on small to moderately sized lots and local church/religious facilities. These offsite areas were generally dominated by managed yards, managed landscaping, and small gardens/orchard associated with this existing land uses.

FISH AND WILDLIFE SPECIES AND HABITATS

The project area was located within a well-urbanized portion of the City of Puyallup. The project area and adjacent parcels were dominated by existing managed single-family homesites, public roadways, public utilities, and church/religious facilities. Based on direct observations, prior observations within the project area, and a review of existing onsite and adjacent habitats wildlife species that were observed or that would be expected within the project site include American crow (*Corvus brachynchos*), rock dove (*Columbia livia*), mourning dove (*Zenaida macroura*), violet green swallow (*Tachycineta thallassina*), song sparrow (*Melospiza melodia*), American robin (*Turdus migratorius*), dark eyed junco (*Junco hyemalis*), Steller's jay (*Cyanocitta stelleri*), starling (*Sturnus vulgaris*), house sparrow (*Passer domesticus*), purple finch (*Carpodacus purpureus*), Anna's hummingbird (Calypte anna), rufous hummingbird (*Selasphorus rufus*), red tailed hawk (*Buteo jamaicensis*), coyote (*Canis latrans*), raccoon (*Procyon lotor*), striped skunk (*Mephitis mephitis*), opossum (*Didelphis virginianus*), deer mouse (*Peromyscus maniculatus*), vole (*Microtus* spp.), mole (*Scapanus* spp.), bats (*Myotis* spp.), Norway rat (*Rattus norvegicus*), eastern cottontail (*Sylvilagus floridanus*), and common garter snake (*Thamnophis sirtalis*). The majority of these species would also utilize the managed habitats associated with adjacent parcels and in particular those areas where bird-feeders are available.

The project site was not observed and has not been documented to provide spawning or rearing habitats for amphibian. The project site was also not observed and has not been documented to provide direct habitats for fish species.

Both Meeker Ditch and Clarks Creek well offsite have been documented to provide habitats for a variety of fish and wildlife species. Meeker Ditch has been documented to provide habitats for coho salmon (*Oncorhynchus kisutch*), cutthroat trout (*Oncorhynchus clarkii*), and chum salmon (*Oncorhynchus keta*). Clarks Creek has been the subject of State of Washington, Puyallup Tribal, and private enhancement programs and has been documented to provide habitats for coho salmon, Chinook salmon (*Oncorhynchus tshawytscha*), chum salmon, cutthroat trout, and steelhead/rainbow trout (*Oncorhynchus mykiss*). Addition, non-salmonid fish species within these surface water corridors include sculpin (*Cottus* spp.), threespine stickleback (*Gasterosteus*

acluleatus), sucker (*Catostomus* spp.), Western brook lamprey (*Lampetra richardsoni*), bullhead (*Ameiurus* spp.), and sunfish (*Lepomis* spp.).

- **State Priority Species**

A very limited number of species identified by the State of Washington as "Priority Species" were observed onsite or potentially may utilize the habitats provided within the project site. Priority species require protective measures for their survival due to their population status, sensitivity to habitat alteration, and/or recreational, commercial, or tribal importance.

> **Game Species:** Species identified by the State of Washington as "game species" are regulated by the State of Washington through recreational hunting bag limits, harvest seasons, and harvest area restrictions. A single "game species" – mourning dove - may use the habitats provided by the project area.
>
> **State Candidate:** State Candidate species are presently under review by the State of Washington Department of Fish and Wildlife (WDFW) for possible listing as endangered, threatened, or sensitive. No State Candidate species were observed or have been documented to use the habitats provided within the project site.
>
> **State Threatened:** State Threatened species are native to the state of Washington and are likely to become an endangered species within the foreseeable future throughout a significant portion of its range within the state without cooperative management or removal of threats. The project site did not provide and has not been documented to provide direct critical habitats for State Threatened species.
>
> **State Endangered:** State endangered species means any species native to the state of Washington that is seriously threatened with extinction throughout all or a significant portion of its range within the state. The project site did not provide and has not been documented to provide direct critical habitats for State Endangered species.

- **Federally Listed Species**

The project site did not provide and has not been documented to provide direct critical habitats for federally listed endangered, threatened, or candidate species. Clarks Creek offsite to the west has been documented to provide habitats for Puget Sound Chinook salmon and Puget Sound Steelhead trout – both federally listed threatened species. Both Clarks Creek and Meeker Ditch have been documented to provide habitats for coho salmon – a federally listed "species of concern." In addition, the Clarks Creek Corridor, along with the Puyallup River and local lakes, has been documented to provide habitats for bald eagle (Haliaeetus leucocephalus) – a federally listed "species of concern."

PROPOSED ACTION

As noted above, the initially proposed action is the division of the existing approximately 0.93-acre parcel into two (2) generally equal sized new parcels. This initial proposed action would not involve the manipulation or modification of the project site. Following this proposed division of land the existing onsite single-family homesite would be retained within one of the newly created parcels and a new single-family homesite consistent with the community would be constructed within the second newly created parcel.

The project site, along with adjacent properties, had been greatly modified since the late 1800s initially for agricultural crop production and then urbanization to establish a residential community. This residential community generally focused on the development and management of single-family homesites, the development and management of public roadways, the development and management of public and private utilities, the development and management of church/religious facilities, and the development and management of a City of Puyallup stormwater capture and conveyance facilities. While the general area of the project site had been modified through prior and ongoing urbanization and well served by City of Puyallup stormwater facilities a portion of the project site has been identified as within the regulated base flood elevation (BFE) for the AE Zone (100-year floodplain) at 32 feet. As presently defined by survey the BFE covers approximately 7,576 square feet of the project site primarily within the central and central-western portion of the project site.

New Single-Family Homesite Construction: Following the issuance of required environmental and construction permits from the City of Puyallup for new single-family homesite construction within the new second parcel, onsite actions would initially define the required work areas and a working schedule. Initial onsite actions would focus on the clear identification of work and staging areas, the placement of protective construction fencing, the placement of protective security fencing, and the placement of protective erosion controls as required. A small to medium sized excavator would then remove only those onsite soils required for the placement of the homesite foundation, associated structures, and utilities. Removed soils not required onsite for replacement would be placed within a dump truck for export to an offsite approved disposal site.

New homesite construction would not modify the majority of the newly created parcel. In addition, the new homesite construction actions would utilize the existing stormwater systems within and adjacent to the project site within the 14th Street SW Corridor. Best Management Practices for noise, dust, and water quality protections would also be followed during new homesite construction.

As noted above, new homesite construction shall implement a variety of impact avoidance and minimization strategies. These strategies include site preparation and foundation work during the dry season or periods of dry weather; the control and treatment of potential stormwater runoff from the work area; a spill prevention and

pollution control program; and the proper short-term storage, staging, inspection, and refueling of equipment. All equipment shall be properly maintained to limit noise and the proposed staging and equipment work areas shall be primarily along the northern/northwestern side of the new homesite foundation. Since the new homesite is generally located approximately 600 feet north of Meeker Ditch and over 1,400 feet east of Clarks Creek, it is expected that noise associated with the new homesite construction would not adversely impact offsite aquatic habitats. In addition, the new homesite construction sequence shall focus initially on the development of the foundation, exterior walls, and roof structures such that the majority of the noise generally associated with this project would be internalized within the homesite.

DETRIMENTAL IMPACT AVOIDANCE METHODS

Following the initial action to divide an existing parcel into two new parcels the overall action proposes the construction a new single-family homesite within the second of the two newly created parcels. As noted above, the first newly created parcel would retain the existing single-family homesite and managed yard. The new single-family homesite would be consistent with neighborhood and would not require any adverse impacts or modifications to identified critical areas (i.e. wetlands, streams, critical habitats, riparian corridors, or existing vegetated buffers) within or immediately adjacent to the project site. In addition, the construction a new single-family homesite would not alter the existing City of Puyallup stormwater facilities within the general area of the project site. Best Management Practices shall be followed during single-family homesite construction to avoid potential adverse impacts associated with the overall site development actions.

SUMMARY OF POTENTIAL EFFECTS

- **Potential Direct or Indirect Effects**

The initial action to divide an existing parcel into two new parcels would not require site modifications and would have no potential direct or indirect effects.

New single-family homesite construction within the second of the newly created parcels would **not** require any adverse impacts or modification to identified critical areas (i.e. wetlands, streams, critical habitats, riparian corridors, or existing vegetated buffers) associated with offsite aquatic corridors. In particular, the project site is separated from Meeker Ditch approximately 600 feet to the south and from Clarks Creek by well over 1,400 feet to the west. The areas between the project site and these offsite aquatic corridors are well established by a variety of residential developments, church/religious facilities, public roadways, and both public and private utilities.

FACTOR	EFFECTS DISCUSSION	EFFECTS DETERMINATION
New single-family homesite construction potential to impact the primary constituent elements for a listed species.	The proposed single-family homesite construction would be completed well outside both the Meeker Ditch and Clarks Creek Corridors and would not require any adverse impacts or modification to identified critical areas (wetlands, streams, critical habitats, riparian corridors, or existing vegetated buffers). In addition, the areas between the project site and these offsite aquatic corridors are well established by a variety of generally residential urban developments and public roadways. Best Management Practices shall also be followed during single-family homesite construction to avoid potential adverse impacts associated with the overall site development actions.	No adverse effects.
Essential fish habitat	The combination of distance away from offsite aquatic areas, the urbanized character of the area of the project site, the avoidance/ minimization elements to be implemented, and the utilization of Best Management Practices the proposed action is not expected to result in direct or indirect adverse impacts to listed EFH.	No adverse effects.
Fish and wildlife conservation areas	The combination of distance away from offsite aquatic areas, the urbanized character of the area of the project site, the avoidance/ minimization elements to be implemented, and the utilization of Best Management Practices the proposed action is not expected to result in direct or indirect adverse impacts to fish and wildlife conservation areas.	No adverse effects.
Vegetation communities and habitat structures	The proposed action would be completed within an existing managed project site dominated by regularly mowed grasses and herbs. The proposed action would not be reasonably expected to impact existing vegetation communities or habitat structures associated with offsite wetlands, streams, critical habitats, riparian corridors, or existing vegetated buffers associated with either the offsite Meeker Ditch or Clarks Creek Corridors.	No adverse effects.

Water quality	The proposed action would be completed within an existing managed project site dominated by regularly mowed grasses and herbs, and would not alter the existing City of Puyallup surface water management facilities associated with the general area of the project site. Seasonal surface water runoff from impermeable homesite areas would be directed via splash blocks and topography into vegetated lawn and landscaped areas onsite for biofiltration and infiltration.	No adverse effects.
Water quantity, including flood and low flow depths, volumes and velocities	Seasonal stormwater runoff from impermeable homesite areas would be directed via splash blocks and topography into vegetated lawn and landscaped areas onsite for biofiltration and infiltration. This action would not alter the existing City of Puyallup stormwater facilities within the general area of the project site. The proposed action would not be reasonably expected to impact existing water quality, including flood and low flow depths, volumes, or velocities associated with either the offsite Meeker Ditch or Clarks Creek Corridors.	No adverse effects.
The channel's natural planform pattern and migration processes.	The proposed action would not be reasonably expected to impact channel planform patterns or migration processes associated with either the offsite Meeker Ditch or Clarks Creek Corridors.	No adverse effects.
Spawning substrate.	The proposed action would not be reasonably expected to impact spawning substrates associated with either the offsite Meeker Ditch or Clarks Creek Corridors.	No adverse effects.
Floodplain refugia.	The proposed action would not be reasonably expected to impact floodplain refugia associated with either the offsite Meeker Ditch or Clarks Creek Corridors.	No adverse effects.

Direct effects generally occur at or very close to the time of the proposed action. Because the proposed action would be completed within the onsite area previously leveled and presently managed as lawn, would implement a variety avoidance/ minimization strategies, would implement a variety of Best Management Practices, and would provide biofiltration and infiltration for stormwater associated with impermeable homesite areas the proposed single-family homesite construction would not be reasonable expected to stream channel or associated side channel areas, would not require stream bank stabilization, would not remove of change large woody debris, and

would not result in a change to the hydrologic or sediment within either the offsite Meeker Ditch or Clarks Creek Corridors.

Indirect effects are also a direct result of the proposed actions but are likely to occur later in time. These indirect effects may occur within the area of the proposed action or may occur outside the area directly affected by the proposed action. Because the proposed action would be completed within the general location onsite of a prior single-family homesite and would not be reasonably expected to alter existing seasonal stormwater runoff patterns within the general area of the project site the proposed new single-family homesite construction would not result in adverse impacts to modifications to high or low stream flows, modifications to stormwater runoff, the contribution of sediments that impact aquatic substrates, the blocking of connective corridors within habitat areas, an increase in instream water temperatures, the degradation of chemical or biological water quality parameters, the disturbance of riparian vegetation, the modification of large woody debris, the destabilization of stream channels or channel forming processes, or the degradation of wetlands associated with aquatic drainage corridors within either the offsite Meeker Ditch or Clarks Creek Corridors.

- **Potential Interrelated Effects**

Following the new single-family homesite construction and associated yard establishment no further actions are presently proposed. The new single-family homesite would be occupied and managed in a similar manner as the prior onsite homesite and shall be consistent with the other residents within this portion of the City of Puyallup. Best Management Practices shall be implemented during and following homesite construction activities to ensure protection of local water quality and identified offsite aquatic habitats. No interrelated effects have been identified for this new single-family homesite construction.

- **Potential Interdependent Effects**

The proposed new single-family homesite construction would be completed within an area that has previously been leveled and managed as a part of the adjacent single-family homesite. Seasonal stormwater from the new homesite would be directed via splash blocks and topography into vegetated lawn and landscaped areas onsite for biofiltration and infiltration. As such, the proposed homesite construction would not cause a measurable adverse impact to existing habitats within or adjacent to the project area. No interdependent effects have been identified for this new single-family homesite construction.

- **Potential Cumulative Effects**

The project area is located within an existing, well-urbanized portion of the City of Puyallup. The proposed action would construct a new single-family homesite in an area that has previously been leveled and managed as a part of the adjacent single-family homesite. Upon the completion of the new single-family homesite construction the

project site would be consistent with the neighborhood. As such, the new homesite construction would not be to result in adverse impacts associated with traffic, lighting, and noise within the project area, adjacent public roadways, and adjacent urbanized areas. In addition, new homesite development would not be reasonably expected to adversely impact downstream water quality as a result of onsite infiltration of stormwater from new impervious surfaces, or any critical habitats within offsite Meeker Ditch, Clarks Creek, or Lower Puyallup River Corridors.

FLOODPLAIN FUNCTIONS EFFECTS DETERMINATION

The purpose of the *Floodplain Functions Analysis* is to define whether or not a proposed action would potentially result in adverse impacts on the existing floodplain functions. As noted above, the presently proposed action is the construction of a new single-family homesite within the area of a prior single-family homesite. This construction of a new single-family homesite would **not** require any adverse impacts or modification to identified critical areas (wetlands, streams, critical habitats, riparian corridors, or existing vegetated buffers) within or immediately adjacent to the project site. Potential impact avoidance/minimization strategies associated with this new homesite construction include implementation of a variety of Best Management Practices associated with dust, noise, water quality, and potential erosion controls; the biofiltration and infiltration of seasonal stormwater runoff from impermeable onsite surfaces; and a limited footprint of area modification onsite.

FLOODPLAIN FUNCTIONS	PROPOSED PROJECT ELEMENTS	DETERMINATION
Water quantity and quality within adjacent aquatic system.	The proposed action would utilize onsite biofiltration and infiltration of seasonal stormwater runoff from impermeable surfaces. In addition, Best Management Practices shall be implemented. As such, the pre-construction water patterns shall be substantially the same as the post-construction water patterns.	No effects on these floodplain functions.
Flood velocities and volumes.	The proposed action would utilize onsite biofiltration and infiltration of seasonal stormwater runoff from impermeable surfaces. In addition, Best Management Practices shall be implemented. As such, the pre-construction water patterns shall be substantially the same as the post-construction water patterns.	No effects on these floodplain functions.

Flood storage capacity	The proposed action would utilize onsite biofiltration and infiltration of seasonal stormwater runoff from impermeable surfaces. In addition, Best Management Practices shall be implemented. As such, the pre-construction flood storage capacity shall be substantially the same as the post-construction water patterns.	No effects on these floodplain functions.
Riparian vegetation	The project site is separated from the Meeker Ditch and Clarks Creek Corridors by existing urbanization. In addition, Best Management Practices shall be implemented. As such, the pre-construction riparian vegetation along these corridors shall not be altered and would be substantially the same as the post-construction riparian vegetation.	No effects on these floodplain functions.
Aquatic habitat forming processes	The project site is separated from the Meeker Ditch and Clarks Creek Corridors by existing urbanization. In addition, Best Management Practices shall be implemented. As such, the pre-construction aquatic habitat forming processes along these corridors shall not be altered and would be substantially the same as the post-construction aquatic habitat forming processes.	No effects on these floodplain functions.
Refuge from higher velocity floodwaters.	The project site is separated from the Meeker Ditch and Clarks Creek Corridors by existing urbanization. In addition, Best Management Practices shall be implemented. As such, the pre-construction refuge processes forming processes along these corridors shall not be altered and would be substantially the same as the post-construction aquatic habitat forming processes.	No effects on these floodplain functions.
Spawning substrate.	The proposed action would utilize onsite biofiltration and infiltration of seasonal stormwater runoff from impermeable surfaces. In addition, Best Management Practices shall be implemented. As such, the pre-construction spawning substrate along these offsite corridors shall be substantially the same as the post-construction spawning substrate.	No effects on these floodplain functions.

Habitat isolation, channel modifications, sediment inputs, construction noise.	The project site is separated from the Meeker Ditch and Clarks Creek Corridors by existing urbanization. In addition, Best Management Practices shall be implemented. As such, the pre-construction habitat, channel, and sediment forming processes along these offsite corridors shall not be altered and would be substantially the same as the post-construction forming processes. Best Management Practices shall ensure the construction noise, dust, or water quality do not adversely impact these offsite corridors.	No effects on these floodplain functions.

EFFECT DETERMINATION

The overall purpose of the *Habitat Assessment* (HA) program is to provide a detailed analysis of the potential project related impacts (the development of a new single-family homesite within the second of the newly created parcels) on federally listed salmonid species and orcas generally associated with the Puyallup River Corridor and Puget Sound.

- Puget Sound Chinook salmon (*Oncorhynchus tshawytscha*) – ESA threatened
- Puget Sound steelhead trout (*Oncorhynchus mykiss*) – ESA threatened
- Bull trout - native char (*Salvelinus confluentus*) – ESA threatened
- Coho salmon (*Oncorhynchus kisutch*) – ESA species of concern
- Pink salmon (*Oncorhynchus gorbuscha*) – EFH listed
- Southern resident Orcas (*Orcinus orca*) – ESA endangered

The effects determination is defined as follows:

- **No Effect (NE):** The project will have no effect whatsoever on listed species and designated floodplain functions. An insignificant or discountable affect is not the same as no effect. If work affects any item evaluated in the HA, even insignificantly, an NE determination is typically not appropriate.

- **May Affect, Not Likely to Adversely Affect (NLAA):** The appropriate conclusion when effects on the species of floodplain functions that support these species are expected to be beneficial, discountable, or insignificant – even when considering direct, indirect, and cumulative impacts. Beneficial effects are positive impacts without and adverse effects on fish or habitats. Insignificant effects refer to the size of the impact and discountable effects are those extremely unlikely to occur due to timing. Based on best judgement, a person cannot meaningfully measure, detect, or evaluated insignificant effects or expect

discountable effects to occur. The term “negligible” means the same as “insignificant.”

- **Likely to Adversely Affect (LAA):** The effect of the project is likely to result in a short or long-term adverse effect on listed species or floodplain functions.

PROPOSED ACTION EFFECTS DETERMINATION

As outlined above, the proposed construction of a new single-family homesite within the second of the newly created parcels would not require any adverse impacts or modification to identified critical areas (wetlands, streams, critical habitats, riparian corridor, or existing vegetated buffers) or to the physical and biological processed that support and form this critical areas within or immediately adjacent to the project area. In addition, the proposed action would not impact existing floodplain functions within or adjacent to the project area. As such, a **No Effect** is appropriate for the proposed new single-family homesite construction action.

Thank you for allowing Habitat Technologies the opportunity to assist with your proposed project. Please contact us with any questions or need to discuss the results of the *Habitat Assessment* further.

Sincerely,

Bryan W. Peck
Wetland Biologist

Thomas D. Deming, SPWS
Habitat Technologies

FIGURES

Figure 1 Site Vicinity

Habitat Technologies
P.O.Box 1088
Puyallup, WA 98371
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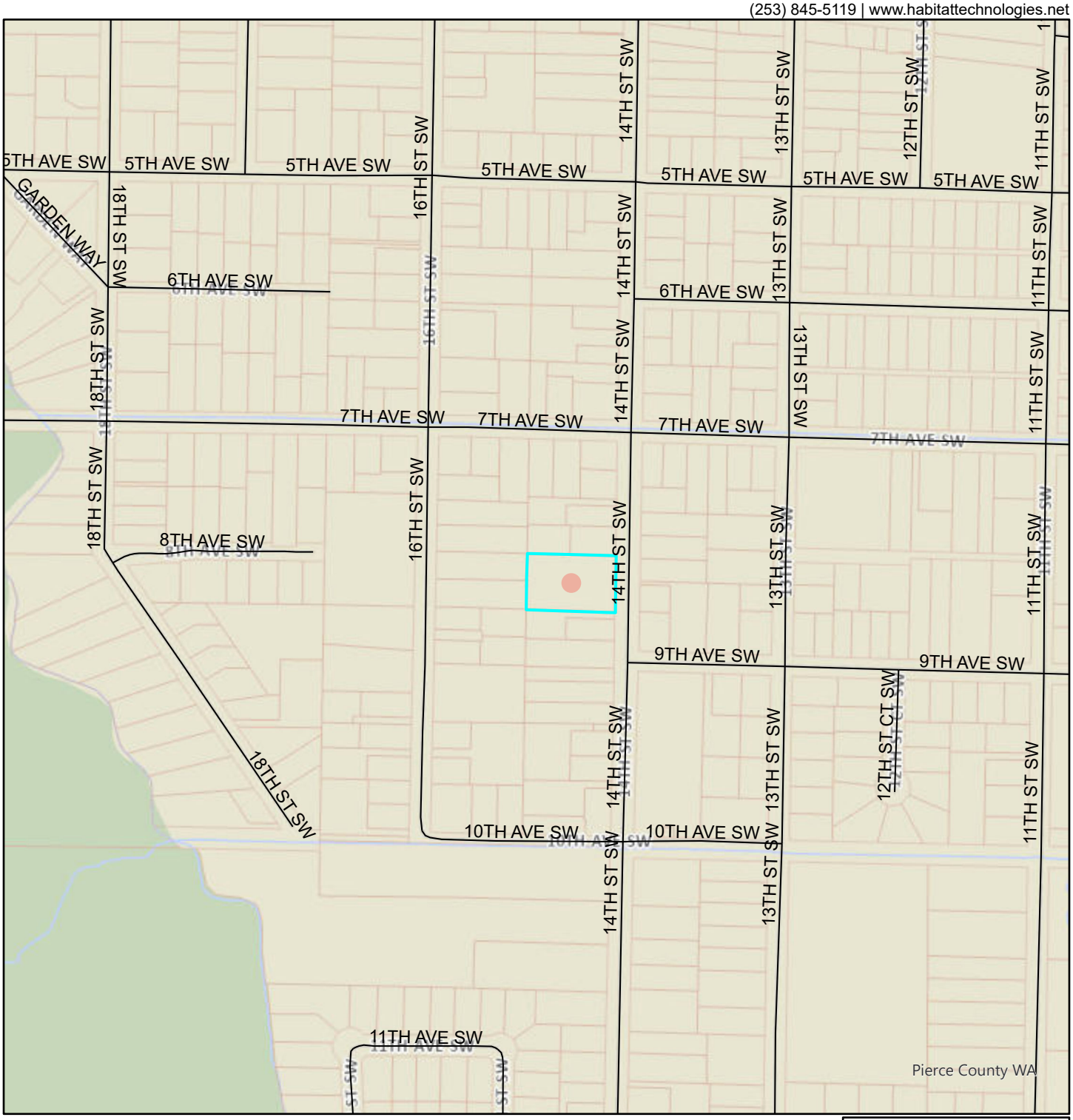

Legend

- Roads
- Priority Habitat and Species

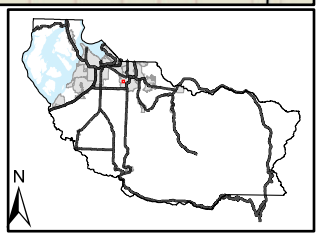

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Figure 2 NWI Mapping

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Legend

- Roads
- National Wetlands Inventory

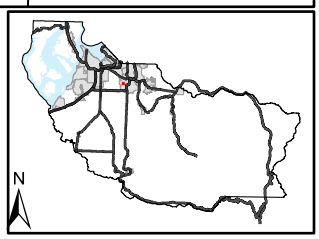

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Figure 3 PHS Mapping

Habitat Technologies
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Puyallup, WA 98371
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Legend

- Roads
- Priority Habitat and Species

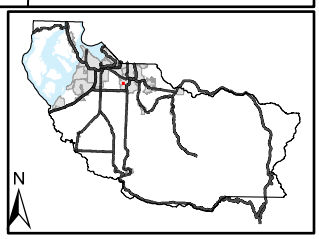

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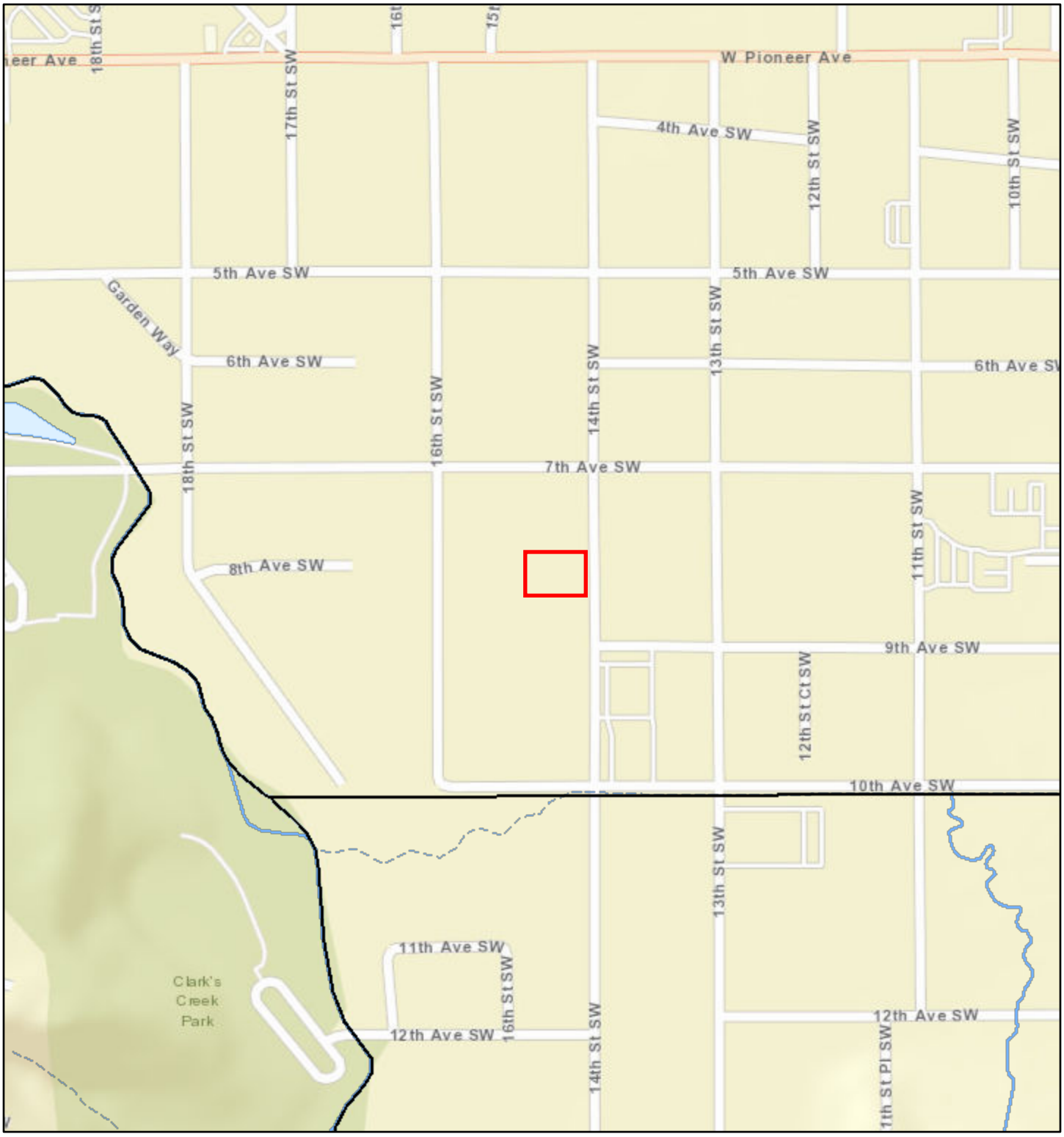
Figure 4 WDFW Salmonscape Mapping



October 27, 2021

1:9,028

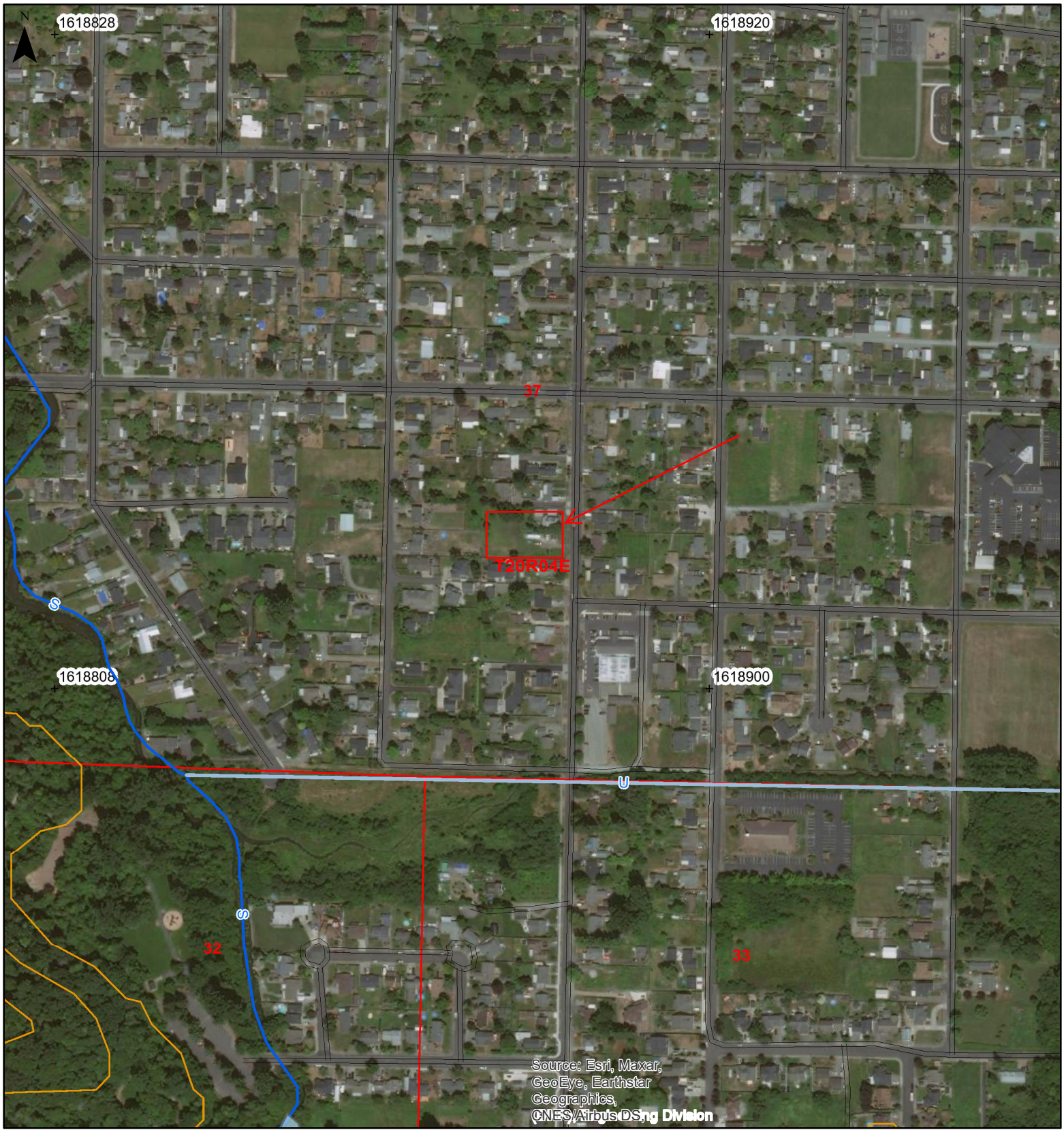
All SalmonScape Species

0 0.05 0.1 0.2 mi

0 0.07 0.15 0.3 km

Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community, USGS/NHD, Dale Gombert (WDFW), WDFW

Figure 5 Forest Practices Water Type Map



Map Symbols

- New Stream
- Proposed Water Type
- Stream Removal
- Break between water types
- Start and End Point of Surveyed Reach
- Natural Fish Barrier
- Manmade Barrier
- End of Fish or Last Fish

Additional Information

Legal Description

S37 T20.0N R04.0E, S33 T20.0N R04.0E
S32 T20.0N R04.0E

WASHINGTON STATE DEPARTMENT OF NATURAL RESOURCES

Extreme care was used during the compilation of this map to ensure its accuracy. However, due to changes in data and the need to rely on outside information, the Department of Natural Resources cannot accept responsibility for errors or omissions, and therefore, there are no warranties that accompany this material.

0 0.1 Miles

Date: 10/27/2021 Time: 10:26:35 AM

Figure 6 City of Puyallup Mapping

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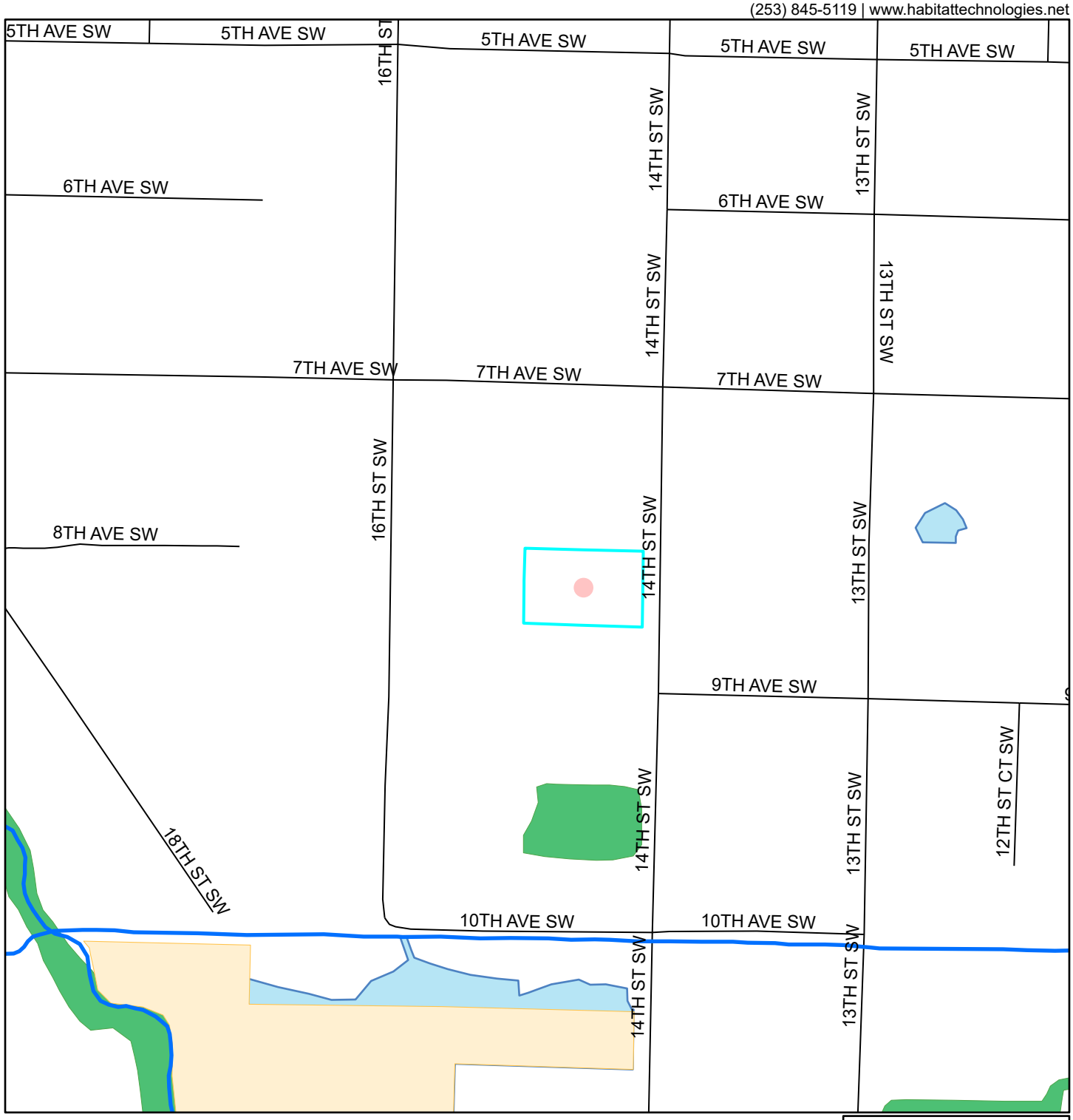
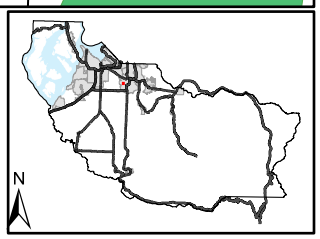


Legend

- Streams - Puyallup
- Roads
- Wetlands - Puyallup
  - Field-verified Delineated
  - Field-verified
  - Unverified
  - Unverified
  - Unverified
  - Buffer
  - Mitigation Site



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The map features are approximate and are intended only to provide an indication of said feature. Additional areas that have not been mapped may be present. This is not a survey. Orthophotos and other data may not align. The County assumes no liability for variations ascertained by actual survey. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. The County makes no warranty of fitness for a particular purpose.

Date: 10/27/2021 10:10 AM

Figure 6A Flood Plain Mapping

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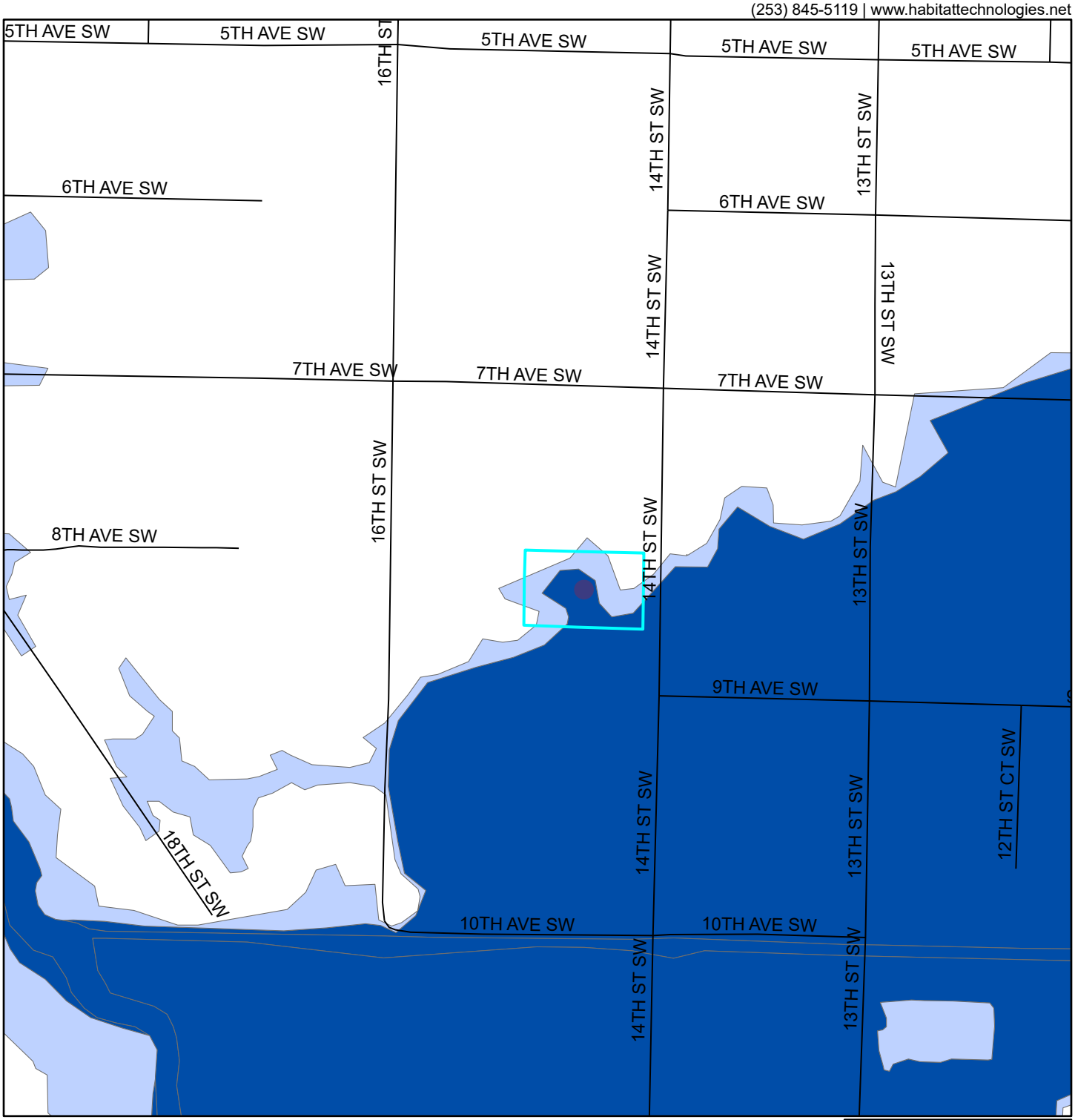


Legend

Roads

Regulated Floodplain 2017 - New

1% Annual Chance Flood

1% Annual Chance Flood

1% Annual Chance Flood

1% Annual Chance Flood

X BEHIND LEVEE

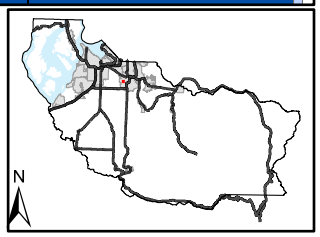
0.2 PCT

X (SHADED)

Coastal High Hazard Areas

Coastal High Hazard Areas

See King County FIRM



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The map features are approximate and are intended only to provide an indication of said feature. Additional areas that have not been mapped may be present. This is not a survey. Orthophotos and other data may not align. The County assumes no liability for variations ascertained by actual survey. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. The County makes no warranty of fitness for a particular purpose.

Date: 10/27/2021 10:12 AM

Figure 7 Soils Mapping

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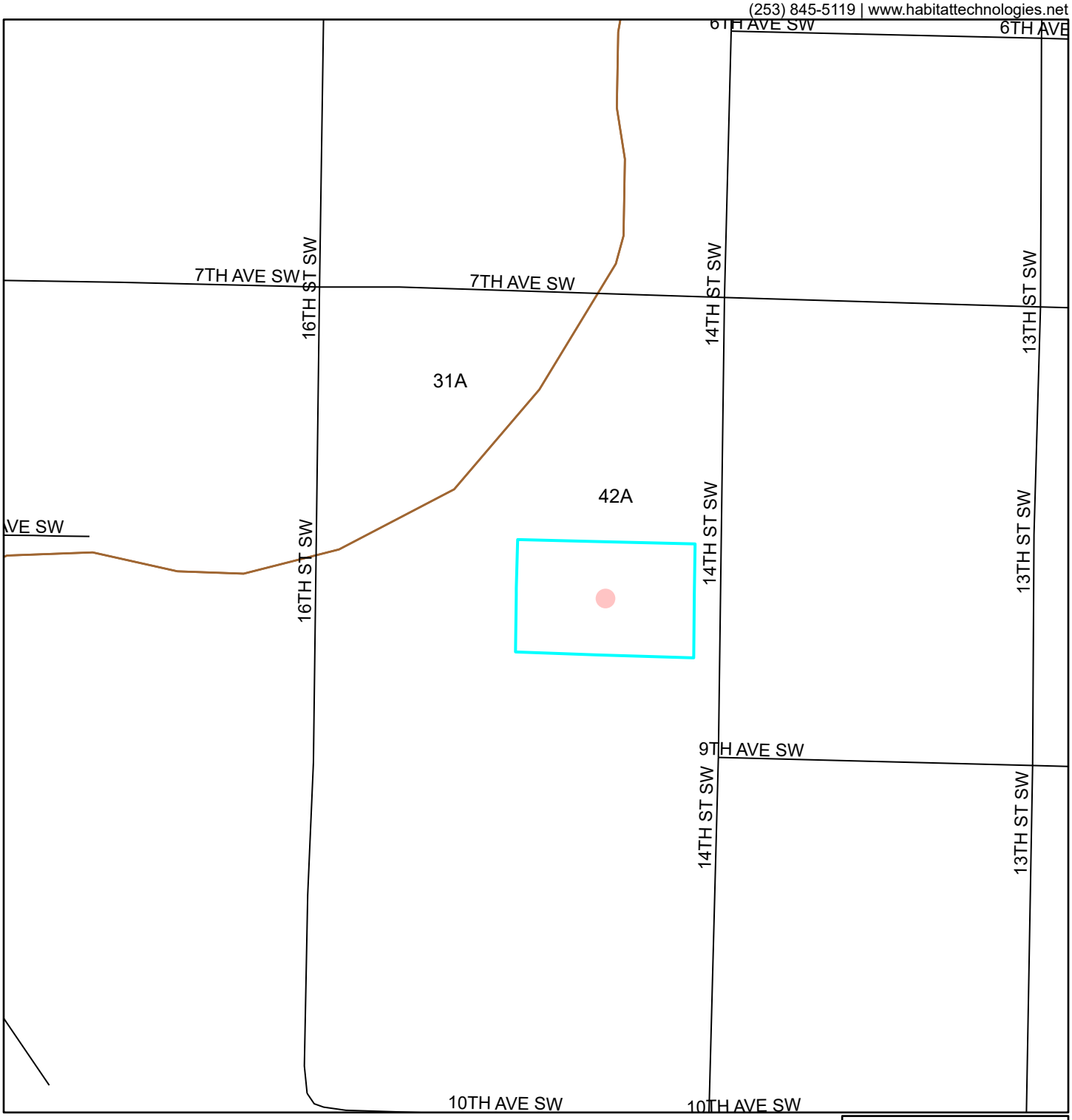
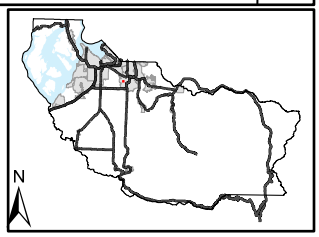


Legend

- Roads
- Soils
- Priority Habitat and Species



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The map features are approximate and are intended only to provide an indication of said feature. Additional areas that have not been mapped may be present. This is not a survey. Orthophotos and other data may not align. The County assumes no liability for variations ascertained by actual survey. ALL DATA IS EXPRESSLY PROVIDED 'AS IS' AND 'WITH ALL FAULTS'. The County makes no warranty of fitness for a particular purpose.

Date: 10/27/2021 10:15 AM

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PHOTOS

View northeasterly from the southwestern corner. The existing homesite shown in this photo will be retained in the first of the newly created parcels.

View easterly from the southwestern corner of the project site. The proposed new homesite would likely be located in the eastern portion of the new parcel.

View westerly from the eastern boundary of the project site at the likely location for the new single family homesite.

Tab 8.0

8.0 OTHER PERMITS

Any permits required for this development will be acquired at a later date.

Tab 9.0

9.0 OPERATIONS AND MAINTENANCE MANUAL

The proposed development consists of a private two-lot short plat. Because of this, an operations and maintenance manual is not required.

Tab 10.0

10.0 BOND QUANTITIES WORKSHEET

The proposed development consists of a private two-lot short plat. Because of this, a bond quantity worksheet is not required.