BARGHAUSEN

PLPMP20220090
1st Review
June 2022

PRELIMINARY STORMWATER REPORT

Normandy Heights

2007 Shaw Road
Puyallup, WA 98374

Prepared for:
RM Homes
2913 5th Ave. NE
Suite 201
Puyallup, WA 98372

5/25/22

May 25, 2022
Our Job No. 12663

BARGHAUSEN CONSULTING ENGINEERS, INC.
18215 72ND AVENUE SOUTH KENT, WA 98032 P) 425-251-6222 F) 425-251-8782
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7.1 "Geotechnical Engineering Study Proposed Normandy Heights" prepared by Earth Solutions NW LLC, Dated May 03, 2022

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7.3 "Normandy Retention Tree Assessment" Prepared by Sound Urban Forestry LLC, dated May 16, 2022

8.0 OTHER PERMITS

9.0 OPERATIONS AND MAINTENANCE MANUAL

10.0 CONSTRUCTION COST ESTIMATE

Tab 1.0

Verify-8.2 acres per GIS and the project limits must include the converted areas of Shaw Road. [Storm Report; Pg 5 of 211]

1.0 PROJECT OVERVIEW

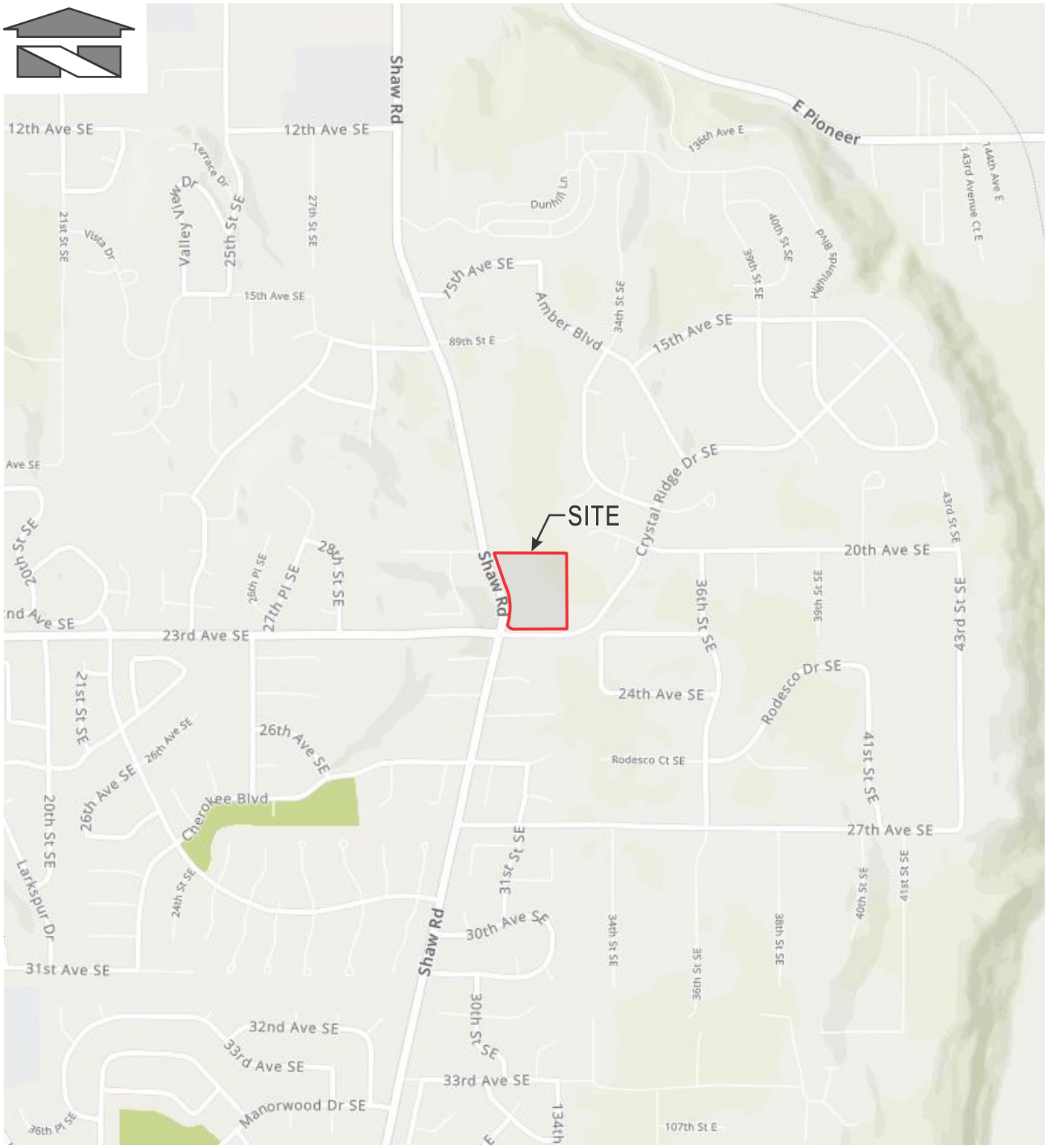
The project site is located at the Northwest corner of the Shaw Road and Crystal Ridge Drive intersection at 2007 Shaw Road, within the City of Puyallup, WA; which is in the SW 1/4 of the SE 1/4 of Section 35, Township 20 N, Range 4 E, see Figure 1: Vicinity Map.

The project site currently consists of a single parcel totaling approximately 320,127 square feet (7.35 acres) and is currently zoned RS-10, low urban density, single family residential. The site currently contains a dilapidated single-family house with associated hardscapes and outbuildings, the remaining ground cover of the site consists of dense vegetation and moderate tree cover. All existing buildings and hardscapes are to be removed as a part of this project. Site topography is generally moderate to steep with 86 feet of vertical relief sloping from the southwest corner to the northeast corner at a grades ranging from 2 percent to 40 percent. Onsite elevations range from 368 to 282. The project site is bound by Shaw Road East to the west, Crystal Ridge Drive to the south, single family residences to the east and a wetland that partially crosses into to the subject property and continues offsite to the north.

The NRCS classifies onsite soils as Indianola loamy sand, 5-15% slopes as seen in Figure 2: Soils Map. This is consistent with the findings of Earth Solutions Northwest which describe the site soils dense silty sand with gravel consistent with glacial till.

The proposal is to subdivide the parcel into 20 lots for single family residences. The project proposes to construct a single public access road with dedicated right-of-way in the center of the site, and two access tracts branching from the proposed road. Supporting infrastructure including catch basins, sanitary sewer manholes, stormwater detention vault, Stormfilter, and dry utilities will be installed with site development. Low Impact Development (LID) Best Management Practices (BMPs) were evaluated for this project, but none were determined to be feasible as described in Section 2 of this report.

Site drainage design is in accordance with the 2012 Department of Ecology Stormwater Management Manual for Western as Amended in December 2014 (2014SWMMWW). Detention and water quality treatment facilities are proposed for mitigation of stormwater runoff from the site. Refer to Section 5.0 of this report for further information.



REFERENCE: MapQuest (2022)

Scale: Horizontal: **N.T.S.** Vertical: **N/A**	For: Normandy Heights Puyallup, Washington	Job Number 12663
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 barghausen.com	Title: VICINITY MAP	FIGURE 1
		DATE: 04/19/22

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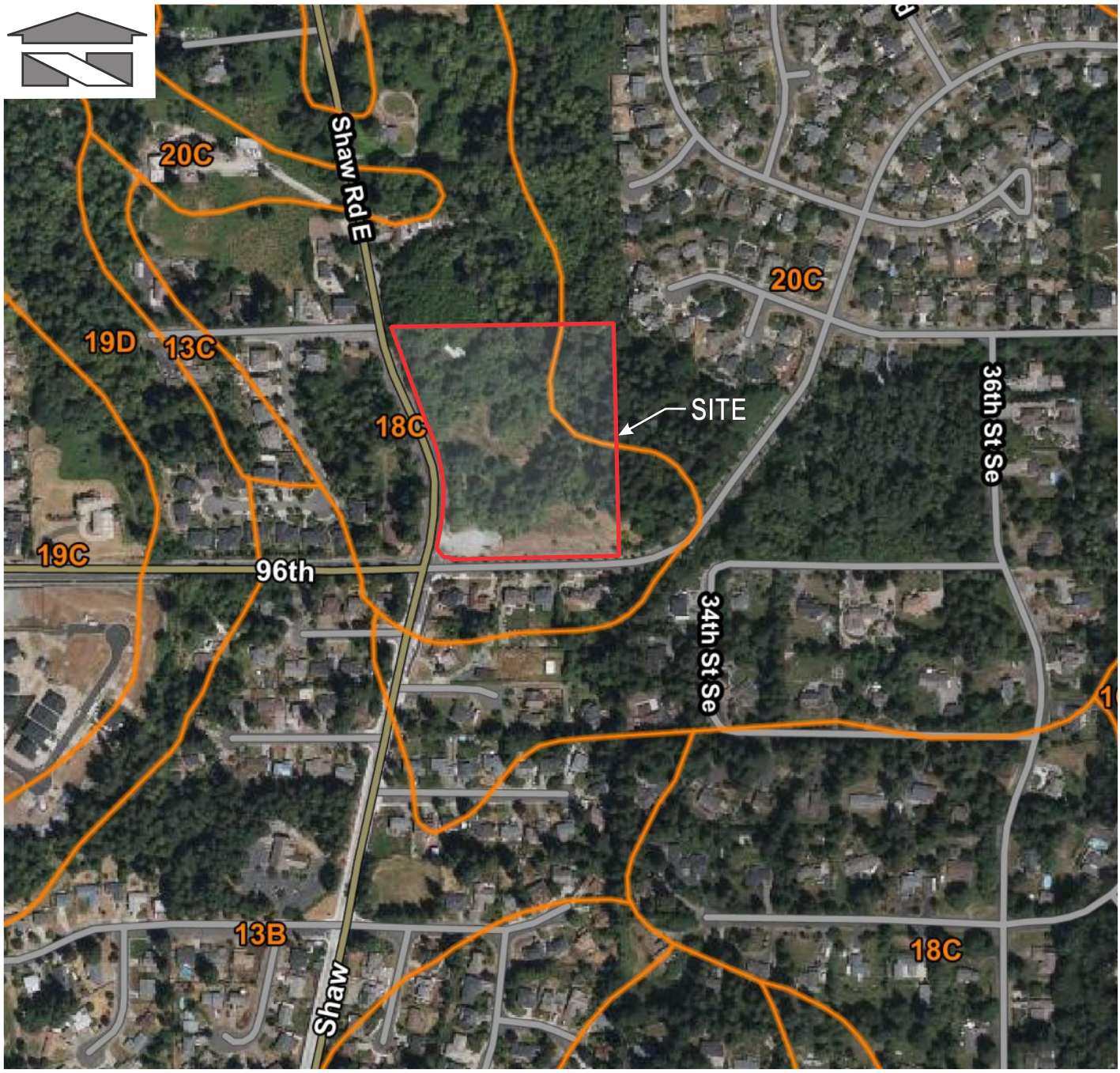

REFERENCE: USDA, Natural Resources Conservation Service

LEGEND:	HSG
18C = Indianola loamy sand, 5-15% slopes	A
20C = Kitsap silt loam, 8-15% slopes	C/D

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

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Title:
SOIL SURVEY MAP

FIGURE 2

DATE: 04/19/22

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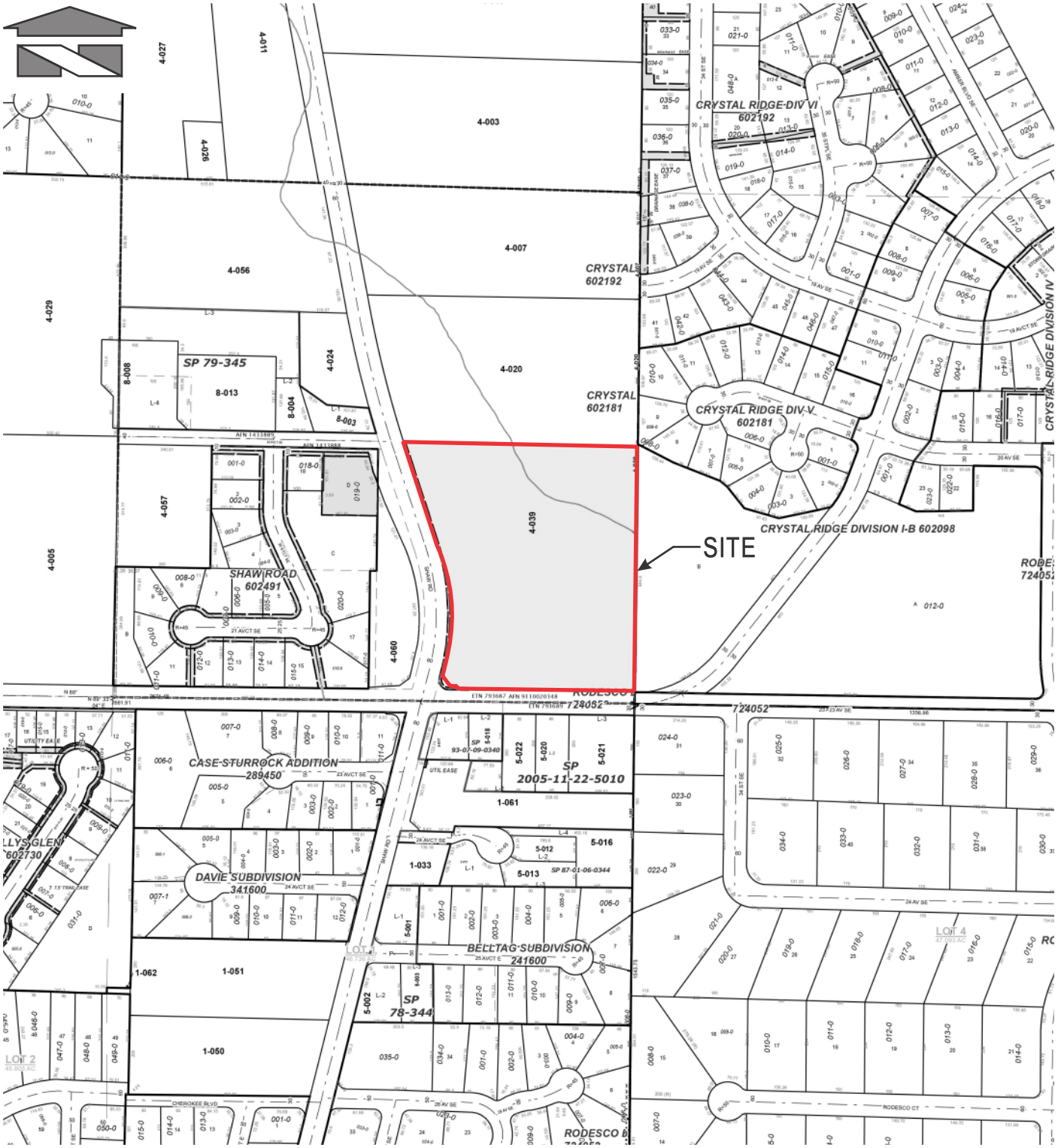

REFERENCE: Pierce County Department of Assessments (Feb. 2021)

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Title:
ASSESSOR MAP

FIGURE 3

DATE: 04/19/22

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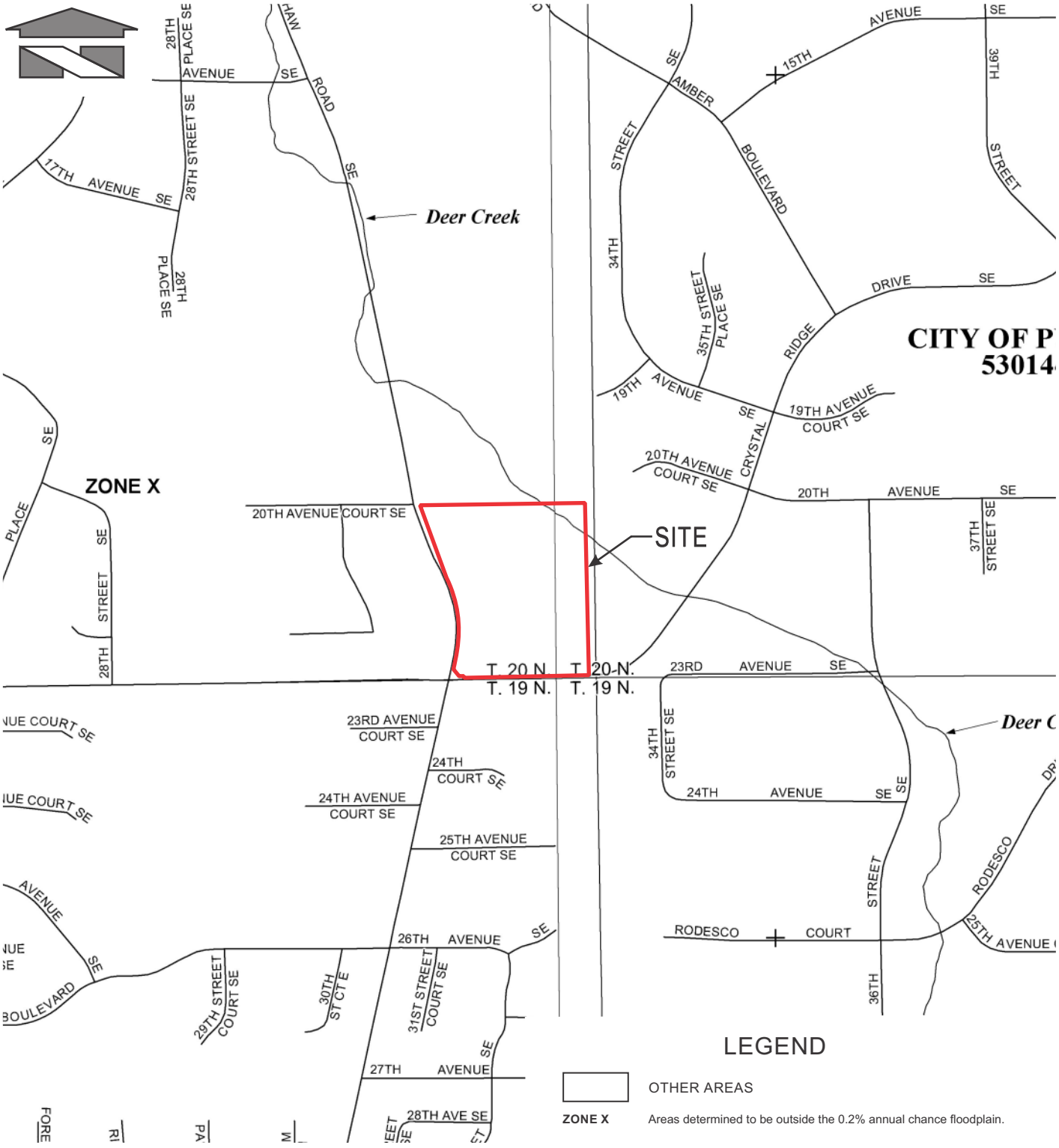

REFERENCE: Federal Emergency Management Agency (Portion of Map 53053C0342E, March 2017)

Scale: Horizontal: N.T.S. Vertical: N/A	For: Normandy Heights Puyallup, Washington	Job Number 12663
Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 barghausen.com	Title: FEMA MAP	FIGURE 4
		DATE: 04/19/22

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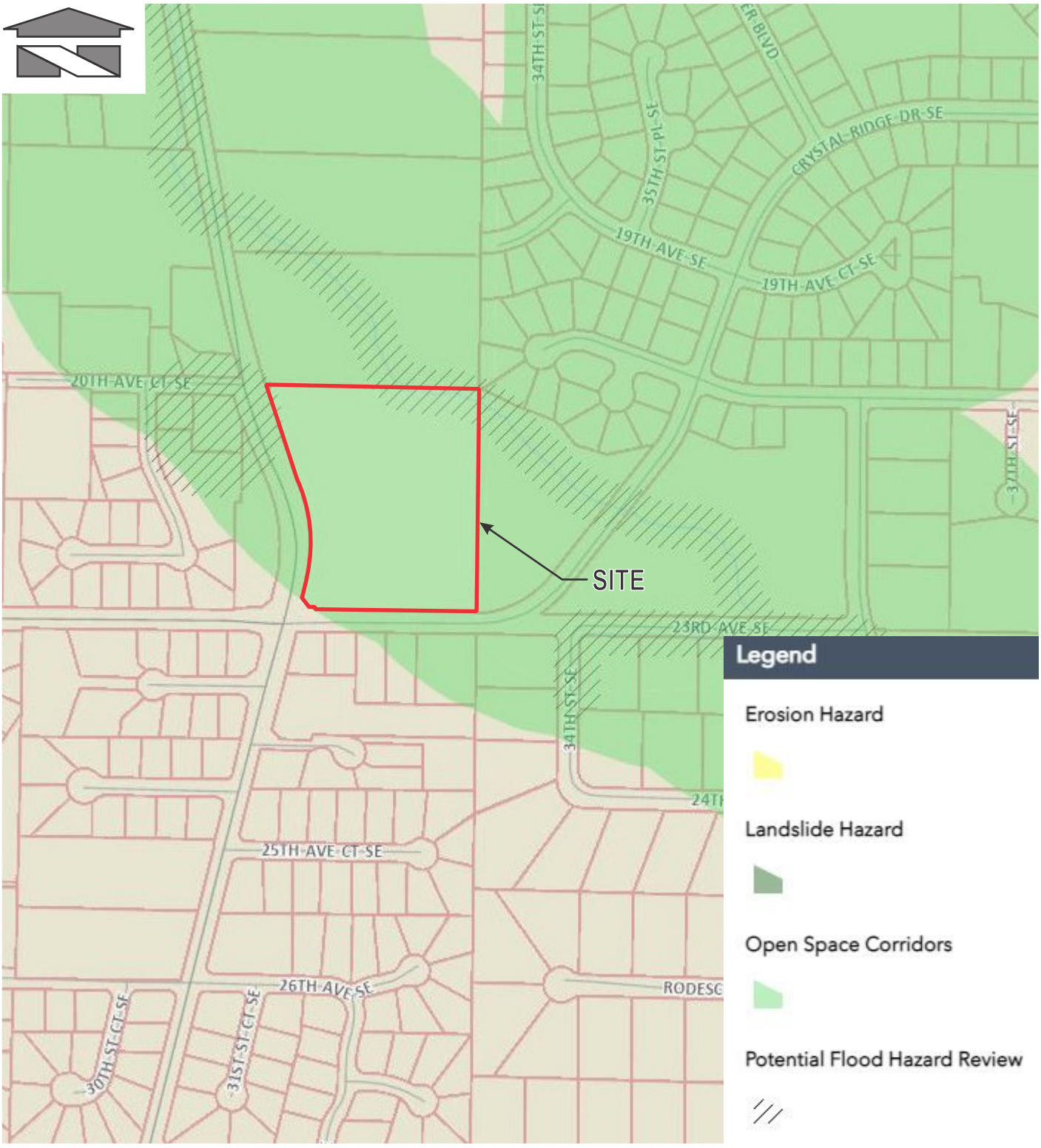

REFERENCE: Pierce County PublicGIS

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

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Puyallup, Washington

Title:
SENSITIVE AREAS MAP

Job Number
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FIGURE 5

DATE: 04/19/22

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Tab 2.0

Verify-Min. Reqts 1-9? [Storm Report; Pg 12 of 211]

2.0 ANALYSIS OF THE MINIMUM REQUIREMENTS

Summary of compliance with Minimum Requirements of the 2014SWMMWW. The developed project will add over 5,000 square feet of new impervious surfacing, therefore minimum requirements #1-#12 apply.

***Minimum Requirement No. 1**: Preparation of Stormwater Site Plans.*

Drainage Plan Description: Full drainage plans and drainage report will be provided during final engineering to satisfy Minimum Requirement No. 1.

***Minimum Requirement No. 2**: Construction Stormwater Pollution Prevention (SWPP)*

A construction Stormwater Pollution Prevention Plan (SWPPP) will be prepared during final engineering and incorporated into the construction plans. Because the amount of land disturbance is larger than one acre, a NPDES permit is required for this project.

The following is a list of the 12 SWPPP elements and how they have been addressed for this project:

Element #1 - Preserve Vegetation / Mark Clearing Limits: Clearing Limits and tree protection fencing will be delineated on the engineering plans and will be flagged in the field.

Element #2 - Establish Construction Access: A stabilized gravel construction entrance will be shown on the engineering plans.

Element #3 - Control Flow Rates: A sediment pond or trap will be designed and detailed on the plans during final engineering.

Element #4 - Install Sediment Controls: Silt fence will be shown on the engineering plans for perimeter protection.

Element #5 - Stabilize Soils: Cover measures will be addressed in the TESC notes on the engineering plans.

Element #6 - Protect Slopes: While there are existing steep slopes on site, they are proposed to be removed during mass grading operations, and will not require additional measures beyond the soil stabilization measures to be shown on the engineering plans.

Element #7 - Protect Permanent Drain Inlets: A detail for catch basin inserts will be shown on the final engineering plans along with a note specifying that they be installed once the permanent storm system is completed. A note will also be included that the contractor shall keep public roadways clear of dirt and debris.

Element #8 - Stabilize Channels and Outlets: T.E.S.C. facility outlets will be protected from erosion.

Element #9 - Control Pollutants: A note will be added to the engineering plans that the contractor shall dispose of all pollutants and waste materials in a safe and timely manner.

Element #10 - Control Dewatering: Turbid de-watering water will be routed to on site T.E.S.C. sedimentation facilities prior to release into the on-site wetland.

Element #11 - Maintain Best Management Practices: Once the engineering plans are completed the contractor shall maintain all erosion control measures in accordance with Department of Ecology and manufactures recommendations. In addition, the contractor shall maintain a stockpile of erosion control materials onsite.

Element #12 - Manage the Project: Once the engineering plans are completed, the clearing, grading, and seasonal work shall be performed in accordance with Department of Ecology. The contractor shall inspect, maintain, and repair all BMPs as needed to assure continued performance of their intended function.

In addition to the engineering plans the contractor will be required to follow and maintain the Construction SWPPP which will be prepared in accordance with Department of Ecology requirements. For further detail please refer to Section 6 of this report.

***Minimum Requirement No. 3**: Water Pollution Source Control for New Development.*

There are no identified source control activities that will need to be addressed as a part of this project.

***Minimum Requirement No. 4**: Preservation of natural drainage systems and outfalls, and provisions of off-site mitigation.*

The developed site will be installing a detention facility to match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The pre-developed condition to be matched is the forested land cover. The detention facility will drain to the on-site wetland.

This section should include similar commentary to that contained in Section 5.1 regarding the site containing two subbasins and a single TDA. [Storm Report; Pg 13 of 211]

***Minimum Requirement No. 5**: On-site Stormwater Management.*

The project is providing a detention facility to fulfill flow control requirements. It has been determined through soils testing that the project cannot feasibly infiltrate stormwater runoff or provide dispersion systems due to the developed constraints of the site. See Minimum Requirement No. 7: Flow Control. See chart below and recommendation found in the Geotechnical Report attached in Section 7.1.

Table 2.1: Normandy Heights BMP Evaluation

BMP	Feasible?	Infeasibility Criteria
T5.13: Post-Construction Soil Quality and Depth	Yes	Post construction soils will implement this BMP.
T5.10A: Downspout Full Infiltration	No	Due to the nature of the soils, downspout infiltration is not feasible.
T5.10B: Downspout Dispersion Systems	No	Due to the constrained nature of the site, a 50 ft. vegetated flow path is infeasible. Page 906 of the 2014 DOE SMMWM
T5.10C: Perforated Stub-out Connections	Yes	Detention is provided and downspout attachment to the stormwater conveyance system will be via perforated stub-out connections.
T5.11: Concentrated Flow Dispersion	No	Due to the constrained nature of the site, a 50 ft. vegetated flow path is infeasible. Page 906 of the 2014 DOE SMMWM
T5.12: Sheet Flow Dispersion	No	Due to the constrained nature of the site, 12' of runout adjacent to the drive isles is infeasible. Page 908 of the 2014 DOE SMMWM
T5.15: Permeable Pavements	No	Due to the nature of the soils, permeable pavement is not feasible for this site.
T5.30: Full Dispersion	No	Due to the constrained nature of the site, the required native vegetated flow path is not feasible. Page 940 of the 2014 DOE SMMWM
T7.30: Bioretention Cells, Swales, and Planter Boxes	No	Lack of usable space, Page 966 of the 2014 DOE SMMWM

Further clarification is needed here. It appears that the geotechnical engineer only investigated the existing native soils. The existing site is being substantially regraded and filled, up to 32ft deep. Is it not possible to construct permeable pavement(s) on the imported fill considering the Ecology Manual allows a minimum feasiblility infiltration rate of 0.3 in/hr? However, there may be other BMP infeasibility criteria outlined in the Ecology Manual that would prevent the use of permeable pavement. For example, downstream impacts associated with lateral flow, or potential erosion hazards, and/ or slope stability concerns due to infiltrated stormwater, but the current application materials do not appear sufficient to support a definitive project-wide infeasibility determination for the use of permeable pavement on the imported fill. [Storm Report; Pg 14 of 211]

The discharge location is the upper reach of Deer Creek, a stream known to have aquatic life, so Enhanced Treatment required. [Storm Report; Pg 15 of 211]

***Minimum Requirement No. 6**: Run-off Treatment Requirements.*

The project is a residential project creating more than 5,000 square feet of pollution generating hard surfaces and is not subject to phosphorous control, therefore basic water quality treatment is required.

***Minimum Requirement No. 7**: Flow Control.*

Per the 2014SWMMWW, Volume I, Sec I-2.5.7, the project is subject to flow control requirements. The project will be providing a detention facility to match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The pre-developed condition to be matched is the forested land cover.

***Minimum Requirement No. 8**: Wetlands Protection.*
Wetlands will be hydrologically protected in accordance with the provisions of Minimum Requirement No. 8.

***Minimum Requirement No. 9**: Operations and Maintenance Manual.*

Operations and Maintenance manuals will be included during final engineering for the various stormwater elements in Section 9.0

Provide preliminary MR8 analysis to ensure the project will not negatively affect the existing wetland. [Storm Report; Pg 15 of 211]

Tab 3.0

3.0 EXISTING CONDITIONS

Verify-8.2 acres per GIS and the project limits must include the converted areas of Shaw Road. [Storm Report; Pg 17 of 211]

The project site currently consists of a single parcel roughly rectangular in shape totaling approximately 320,127 square feet (7.35 acres) and is currently zoned RS-10, low urban density, single family residential. The site currently contains a dilapidated single-family house with associated hardscapes and outbuildings, the remaining ground cover of the site consists of dense vegetation and moderate tree cover. Approximately 10,700 aquare feet gravel parking lot exists on the SW corner of the subject property. No stormwater features or facilities are observable adjacent to the parking lot or structures. All existing buildings and hardscapes are to be removed as a part of this project.

Site topography is generally moderate to steep with 86 feet of vertical relief sloping from the southwest corner to the northeast corner at grades ranging from 2% to 40%. Onsite elevations range from 368 to 282. The project site is bounded by Shaw Road East to the west, Crystal Ridge Drive to the south, single family residences to the east and a Category III wetland that partially crosses into to the subject property and continues offsite to the north. The Category III wetland is associated with Upper Deer Creek, which partially crosses into the subject property at the NE corner before continuing offsite.

The National Resource Conservation Service (NRCS) Web Soil Survey identifies onsite soils as Indianola loamy sand, 5 to 15 percent slopes (Map Unit 18C) and Kitsap silt loam, 8 to 15 percent slopes (Map Unit 20C) which are consistent with soil conditions encountered during geotechnical fieldwork. Test pits generally encountered approximately 7-12 inches of topsoil underlain by a layer of medium dense, poorly graded sand and gravel. Several test sites were further underlain by dense silty sand with gravel glacial till deposits. Groundwater seepage was not observed at the time of fieldwork.

Tab 4.0

4.0 OFFSITE ANALYSIS

4.1 Upstream Analysis

The project site does not appear to receive notable stormwater runoff from any off-site upstream drainage areas based on the topographic survey prepared for the project and Pierce County GIS. The eastern half of Shaw Road currently drains into the subject site and subsequently into the on-site wetland.

Crystal Ridge Drive contains a conveyance system within the roadway which captures stormwater runoff, all other abutting properties are either down gradient of the subject site or graded away from the subject site.

4.2 Downstream Analysis

The project lies within the Shaw Road Drainage Basin, a drainage basin of the White / Puyallup Watershed as delineated by the City of Puyallup. The City of Puyallup Drainage Basin Map has been added in the following pages.

Stormwater runoff of the site discharges from the site as sheet flow to the on-site wetland in the northeast section of the project site, whereupon stormwater immediately enters Upper Deer Creek. Upper Deer Creek meanders northerly roughly following Shaw Road through green space and man-made ditches for approximately two miles before reaching the Puyallup River. See the Downstream Conveyance Exhibit in the following pages.

At time of civil application, clarify this section. The first sentence states that the project essentially does not receive offsite surface runoff, but the second sentence states that Shaw Road drains onto the property. Also, in the post-devloped condition, Shaw Road will no longer discharge to the property, raising concerns about maintaining the wetland hydroperiod (MR8). [Storm Report; Pg 19 of 211]

City of Puyallup Drainage Basins

Legend

Drainage Basins

- Clarks Creek
- Pothole
- Puyallup River North
- Puyallup River South
- Shaw Road
- State Highway

Wetlands

- Field-verified
- Unverified
- Buffer
- Mitigation Site

- City Limits
- Waterbodies
- Streams

City of Puyallup drainage data provided as part of the November 2011 Comprehensive Stormwater Plan developed by Brown and Caldwell.
Edited by City of Puyallup Collections Division.

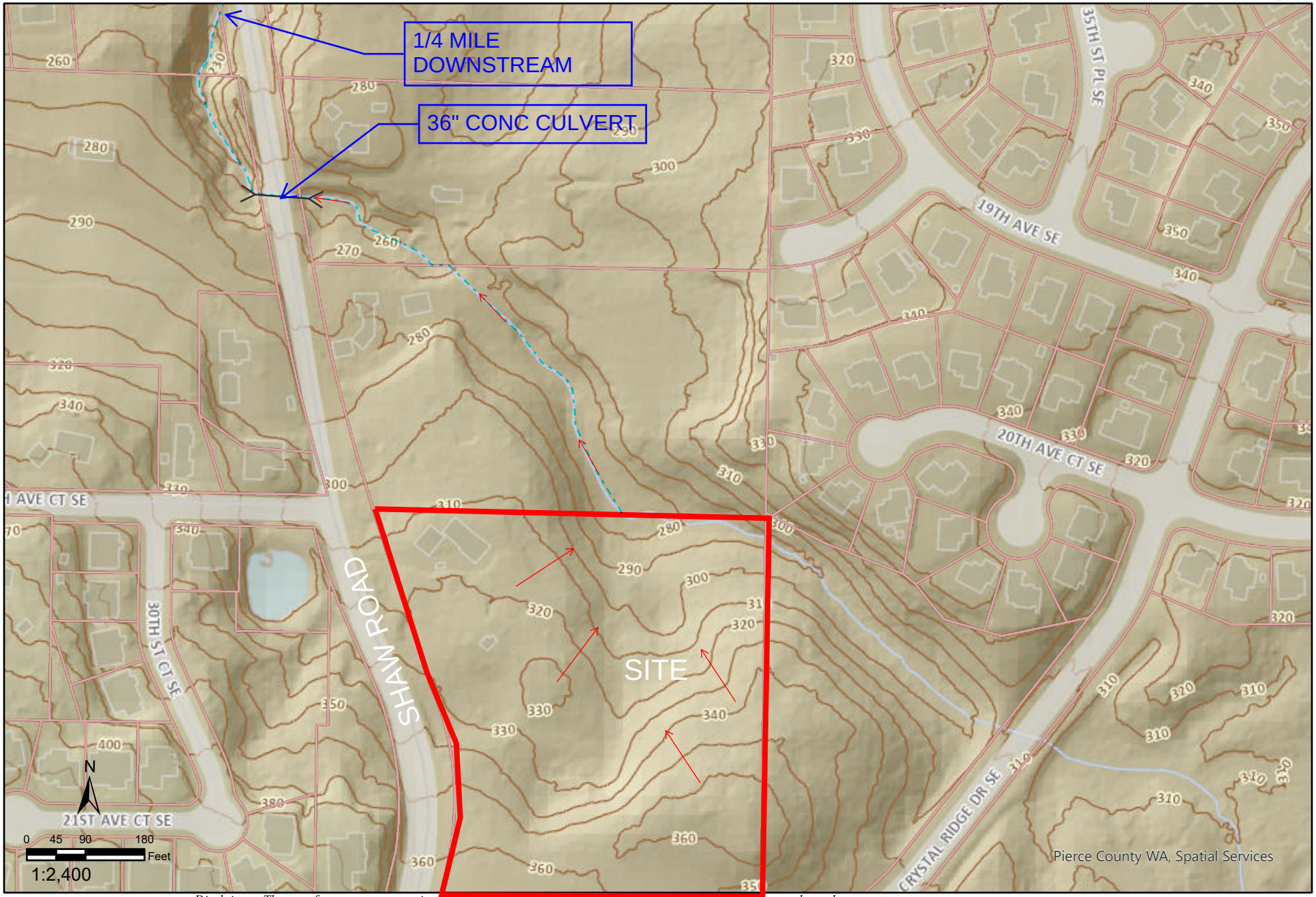
0 1,500 3,000 6,000
Feet

Date: 1/2/2020

File Name: jgrbich/COP Website/Drainage Basins.mxd (PDF)

DOWNSTREAM MAP

Normandy Heights Downstream Map



Disclaimer: The map features are approximate and have not been surveyed. Additional features not yet mapped may be present.
Pierce County assumes no liability for variations ascertained by formal survey.

Tab 5.0

The road widening of Shaw Road (converted surface) must be included in the thresholds and accounted for in the sizing of the stormwater facilities. [Storm Report; Pg 24 of 211]

5.0 PERMANENT STORMWATER CONTROL PLAN

The proposed development includes the construction of a 28-foot-wide public road, two private access tracts, 20 single family residences, a stormwater detention vault, and a Stormfilter. Frontage improvements are not proposed as a part of this project, however, a 10-foot right of way dedication is proposed along Shaw Rd East. A stormwater conveyance system located within the right of way and access tracts of the plat will collect and convey stormwater runoff to an on-site stormwater detention vault. Roof drainage will be tight lined to this stormwater conveyance system.

The proposed development creates a total effective impervious surface area of over 10,000 square feet, per Sec. I-2.5.7 of the 2014SWMMWW the Standard Flow Control Requirement must be met. The standard flow control requirement dictates that stormwater discharges shall match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow.

The project will be providing a stormwater detention vault with an appropriately sized control structure to meet the Standard Flow Control Requirement. The detention facility and control structure were sized using WWHM2012.

Please refer to the post developed drainage basin map and WWHM2012 Hydrology calculations attached at the end of this section.

Based on the Basin Map, it does not appear that this area includes the Shaw Road tributary area.[Storm Report; Pg 24 of 211]

5.1 Existing Site Hydrology

Per Sec I-2.5.7 of the 2014SWMMWW, the pre-developed condition to be matched shall be a forested land cover.

Site topography suggests a ridge line in the SE quadrant of the project site divides the site into two subbasins. Basin 1 is approximately 5.77 acres and contains the majority of the site to be developed, Basin 1 sheet flows to the NE quadrant of the project site to the Category III wetland and Upper Deer Creek.

Basin 2 is the approximately 0.94 ac, SE quadrant of the project site. This basin sheet flows to the east into a green space tract of the Crystal Ridge plat. Stormwater runoff entering this tract then sheet flows northerly before reaching Upper Deer Creek, which is the discharge point of Basin 1. As the downstream combination point between stormwater runoff from Basin 1 and Basin 2 is within a quarter mile of the subject property, these basins are not separate threshold discharge areas and can be combined into a single basin for modelling purposes. Per Sec I-2.5.7 of the 2014SWMMWW pre-developed conditions are to be modeled as forested.

The impervious surface area of Shaw Road East is modeled as impervious in both developed and proposed conditions as it is not a part of the proposed development, yet is tributary to the project site.

Should be identified on the predeveloped and post-developed basin maps. Note: the road widening should be modeled as Forest (converted surface area) in the predeveloped condition. In the post-developed condition, only a portion of the public ROW is tributary to the project site due to installation of the retaining wall.[Storm Report; Pg 24 of 211]

5.2 Developed Site Hydrology

The completed Normandy Heights project will create 20 new single-family residences. New impervious surfaces will include roadways, sidewalks, driveways, patios and roof areas. The project will provide landscaped pervious areas, open space and a single drainage facility. The existing Category III wetland is proposed to remain undisturbed.

A conveyance system consisting of catch basins and storm pipes will be constructed in the roadways to collect drainage from impervious surfaces and lots, and will direct stormwater runoff to the detention facility in Tract C. The detention facility is proposed to be a combined detention facility and a Stormfilter post detention providing Basic Water Quality Treatment.

Post treatment, stormwater will be released via a flow spreader into the Category III wetland and Upper Deer Creek.

Clarification needed. [Storm Report; Pg 25 of 211]

Western Washington Hydrology Model (WWHM)

All lots are assumed to contain 40% impervious surface per City of Puyallup Municipal Code Sec 20.20.020. Per the Geotechnical Report attached in Sec 7.1 and The National Resource Conservation Service (NRCS) Web Soil Survey, on site soils are consistent with hydrologic soil group C, till. Lawns are modeled as till grass. No upstream areas were identified as tributary to the subject site. No areas are proposed to be bypassed. The resulting project areas are summarized below.

See comments, Section 4.1. [Storm Report; Pg 26 of 211]

Table 5.2: Developed Conditions Ground Cover Table

Cover	Impervious (ac)	Grass (ac)	Total (ac)
Road A ROW	0.81	0	0.81
Tract A	0.06	0	0.06
Tract B	0.20	0	0.20
Tract C	0	0.33	0.33
20th Ave E ROW	0.10	0	0.10
Lots	2.08	3.13	5.21
Total	3.15	3.56	6.71

At time of civil application, it is likely that the Shaw Road converted surfaces will be bypassed. Also, large areas of Lots 7, 8, and 10 as well as Tract C are not captured by the onsite conveyance system and bypass the detention facility. [Storm Report; Pg 26 of 211]

At time of civil application, clarify how the planter strips associated with the road sections is being accounted for. [Storm Report; Pg 26 of 211]

5.3 Water Quality Analysis

This project generates greater than 5,000 square feet of pollution generating hard surfaces (PGHS) and is therefore required to construct a stormwater treatment facility. Because the project site is not a high use site subject to oil control, does not discharge to a waterbody regulated for phosphorus control, and is a single-family residential site, the site is subject to the Basic Treatment Menu. Please see the treatment facility flow chart on the following page.

Per the City of Puyallup Comprehensive Storm Drainage Plan and Department of Ecology 303d listings attached in Section 7.3 of this report, Deer Creek regularly exceeds the Total Maximum Daily Load (TMDL) of fecal coliforms. As this project does not propose the installation of septic drainfields, the TMLD of fecal coliforms to Deer Creek is not expected to be impacted as a result of this project.

A Stormfilter proprietary treatment facility has been selected to provide treatment for stormwater runoff post detention. Stormfilter's GULD approval has been included in this report and can be seen as Section 7.4.

The discharge location is the upper reach of Deer Creek, a stream known to have aquatic life, so Enhanced Treatment required. [Storm Report; Pg 27 of 211]

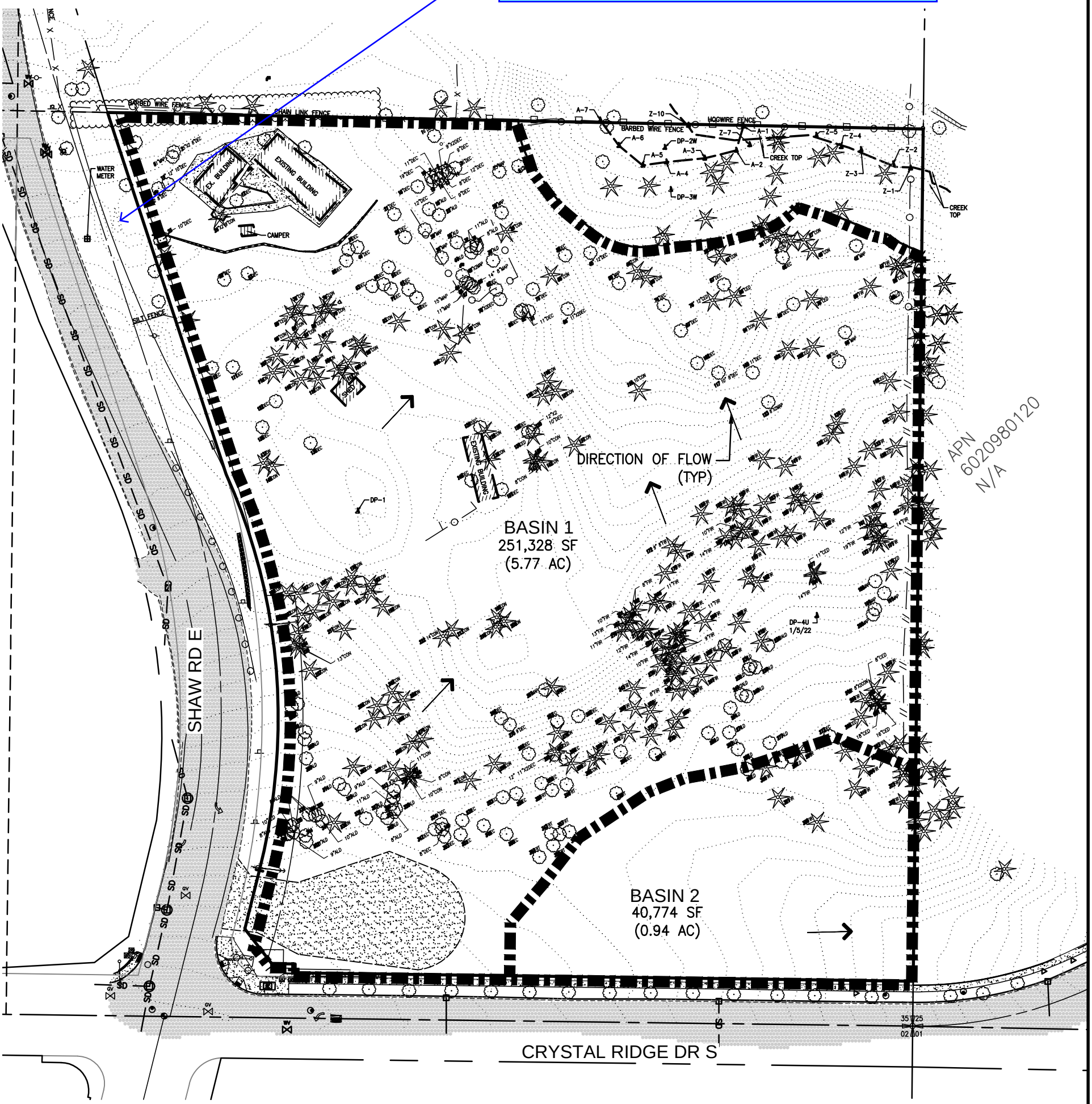
Section 5.2 references a "combined detention" facility and the Treatment Facility Selection Flow Chart (pg. 68) indicates a wetvault, but the preliminary grading plan calls out a downstream stormfilter structure. Revise accordingly.[Storm Report; Pg 27 of 211]

5.4 Conveyance System Analysis

The project will be collecting the developed drainage from the roadway and rooftops in catch basins and convey the flows directly to the detention vault. The detention system was sized to match developed discharge durations to pre-developed durations for the range of pre-developed discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow. The pre-developed condition to be matched is the forested land cover. A tightline conveyance system outletting to a flow-spreader is proposed to serve as an outfall and emergency overflow route to the existing onsite wetland. Conveyance system analysis will be provided during final engineering.

PREDEVELOPED BASIN MAP

The road widening of Shaw Road (converted surface) must be included in the project thresholds and accounted for in the sizing of the stormwater facilities. [Storm Report; Pg 30 of 211]



No.	Date	By	Ckd.	Appr.	Revision

Job Number 12663	Barghausen Consulting Engineers, Inc. 18215 72nd Avenue South Kent, WA 98032 425.251.6222 barghausen.com	Designed MSC Drawn MSC Checked CMV Approved CMV Date 3/16/22	Scale: Horizontal 1"=80 Vertical N/A	Title: **EXISTING BASIN MAP** For: *NORMANDY HEIGHTS*
Sheet 1 of 1				

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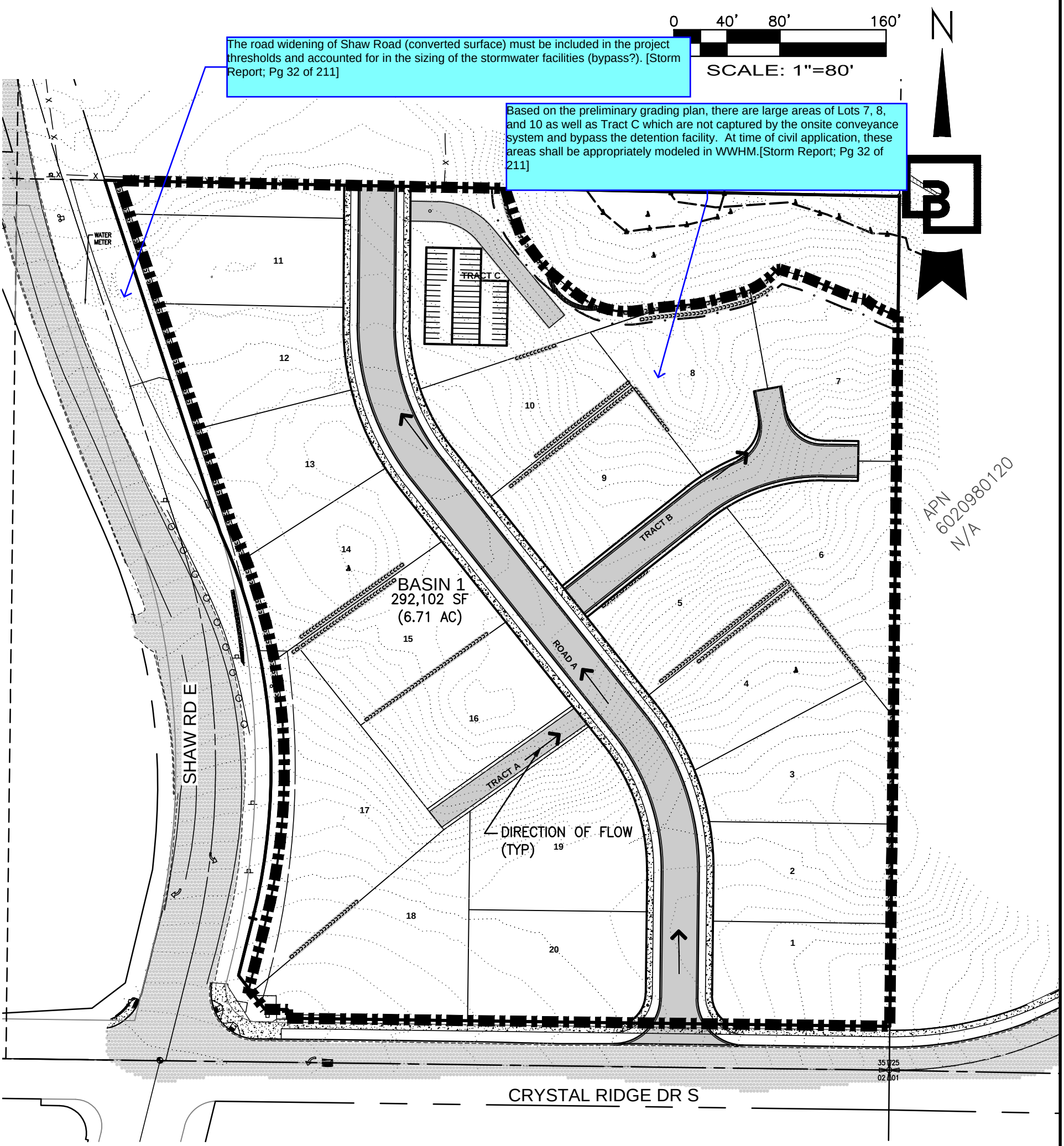
DEVELOPED BASIN MAP

The road widening of Shaw Road (converted surface) must be included in the project thresholds and accounted for in the sizing of the stormwater facilities (bypass?). [Storm Report; Pg 32 of 211]

Based on the preliminary grading plan, there are large areas of Lots 7, 8, and 10 as well as Tract C which are not captured by the onsite conveyance system and bypass the detention facility. At time of civil application, these areas shall be appropriately modeled in WWHM.[Storm Report; Pg 32 of 211]



	IMPERVIOUS	GRASS	TOTAL
ROAD A ROW	0.81	0	0.81
TRACT A	0.06	0	0.06
TRACT B	0.20	0	0.20
TRACT C	0	0.33	0.33
20TH AVE SE ROW	0	0.10	0.10
LOTS	2.08	3.13	5.21
TOTAL	3.15	3.56	6.71

No.	Date	By	Ckd.	Appr.	Revision

Job Number 12663

Sheet 1 of 1

Barghausen Consulting Engineers, Inc.
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Kent, WA 98032
425.251.6222 barghausen.com

Designed MSC
Drawn MSC
Checked CMV
Approved CMV
Date 3/16/22

Scale:
Horizontal 1"=80
Vertical N/A

Title: **DEVELOPED BASIN MAP**

For: *NORMANDY HEIGHTS*

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DETENTION FACILITY SIZING

WWHM2012

PROJECT REPORT

Provide preliminary MR8 analysis to ensure the project will not negatively affect the existing wetland. [Storm Report; Pg 34 of 211]

General Model Information

Project Name:	Normandy Heights Prelim
Site Name:	Normandy Heights
Site Address:	
City:	Puyallup
Report Date:	4/25/2022
Gage:	40 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

Based on the Basin Map, it does not appear that this area includes the Shaw Road tributary area.[Storm Report; Pg 36 of 211]

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Steep	6.71
Pervious Total	6.71
Impervious Land Use	acre
Impervious Total	0
Basin Total	6.71

Element Flows To:

Surface	Interflow	Groundwater

See commens on the Post-developed basin exhibit.[Storm Report; Pg 37 of 211]

Verify-there are a number of areas on the preliminary grading plan that exceed the "flat" slope criteria (0-5%). These areas should be accounted for in the preliminary modeling. See Road A planter strips, perimeter slopes, as well as the slope areas associated with Lots 7, 8, and 10 as well as Tract C. At time of civil application, these areas shall be appropriately modeled in WWHM.[Storm Report; Pg 37 of 211]

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	3.56
Pervious Total	3.56

Impervious Land Use	acre
ROADS MOD	1.07
ROOF TOPS FLAT	2.08
Impervious Total	3.15
Basin Total	6.71

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Routing Elements
Predeveloped Routing

Mitigated Routing

Vault 1

Width: 20 ft.
Length: 188 ft.
Depth: 14.5 ft.
Discharge Structure
Riser Height: 14 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 1.25 in. Elevation:0 ft.
Orifice 2 Diameter: 1.3 in. Elevation:7.25 ft.
Orifice 3 Diameter: 1.8 in. Elevation:9 ft.
Element Flows To:
Outlet 1 Outlet 2

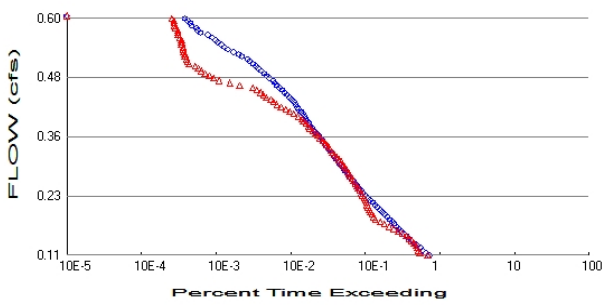
Vault Hydraulic Table

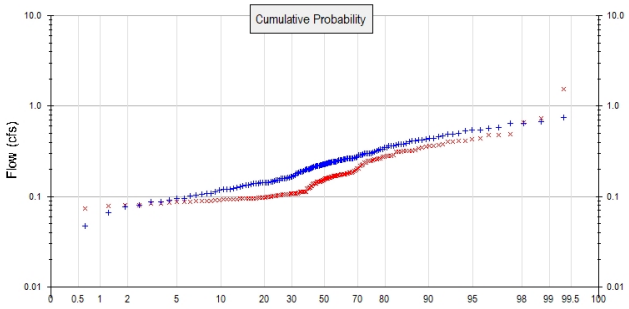
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.086	0.000	0.000	0.000
0.1611	0.086	0.013	0.017	0.000
0.3222	0.086	0.027	0.024	0.000
0.4833	0.086	0.041	0.029	0.000
0.6444	0.086	0.055	0.034	0.000
0.8056	0.086	0.069	0.038	0.000
0.9667	0.086	0.083	0.041	0.000
1.1278	0.086	0.097	0.045	0.000
1.2889	0.086	0.111	0.048	0.000
1.4500	0.086	0.125	0.051	0.000
1.6111	0.086	0.139	0.053	0.000
1.7722	0.086	0.153	0.056	0.000
1.9333	0.086	0.166	0.059	0.000
2.0944	0.086	0.180	0.061	0.000
2.2556	0.086	0.194	0.063	0.000
2.4167	0.086	0.208	0.065	0.000
2.5778	0.086	0.222	0.068	0.000
2.7389	0.086	0.236	0.070	0.000
2.9000	0.086	0.250	0.072	0.000
3.0611	0.086	0.264	0.074	0.000
3.2222	0.086	0.278	0.076	0.000
3.3833	0.086	0.292	0.078	0.000
3.5444	0.086	0.305	0.079	0.000
3.7056	0.086	0.319	0.081	0.000
3.8667	0.086	0.333	0.083	0.000
4.0278	0.086	0.347	0.085	0.000
4.1889	0.086	0.361	0.086	0.000
4.3500	0.086	0.375	0.088	0.000
4.5111	0.086	0.389	0.090	0.000
4.6722	0.086	0.403	0.091	0.000
4.8333	0.086	0.417	0.093	0.000
4.9944	0.086	0.431	0.094	0.000
5.1556	0.086	0.445	0.096	0.000
5.3167	0.086	0.458	0.097	0.000
5.4778	0.086	0.472	0.099	0.000
5.6389	0.086	0.486	0.100	0.000
5.8000	0.086	0.500	0.102	0.000
5.9611	0.086	0.514	0.103	0.000

6.1222	0.086	0.528	0.104	0.000
6.2833	0.086	0.542	0.106	0.000
6.4444	0.086	0.556	0.107	0.000
6.6056	0.086	0.570	0.109	0.000
6.7667	0.086	0.584	0.110	0.000
6.9278	0.086	0.598	0.111	0.000
7.0889	0.086	0.611	0.112	0.000
7.2500	0.086	0.625	0.114	0.000
7.4111	0.086	0.639	0.133	0.000
7.5722	0.086	0.653	0.142	0.000
7.7333	0.086	0.667	0.149	0.000
7.8944	0.086	0.681	0.156	0.000
8.0556	0.086	0.695	0.161	0.000
8.2167	0.086	0.709	0.166	0.000
8.3778	0.086	0.723	0.171	0.000
8.5389	0.086	0.737	0.176	0.000
8.7000	0.086	0.751	0.180	0.000
8.8611	0.086	0.764	0.184	0.000
9.0222	0.086	0.778	0.201	0.000
9.1833	0.086	0.792	0.229	0.000
9.3444	0.086	0.806	0.247	0.000
9.5056	0.086	0.820	0.262	0.000
9.6667	0.086	0.834	0.274	0.000
9.8278	0.086	0.848	0.286	0.000
9.9889	0.086	0.862	0.297	0.000
10.150	0.086	0.876	0.307	0.000
10.311	0.086	0.890	0.317	0.000
10.472	0.086	0.903	0.326	0.000
10.633	0.086	0.917	0.335	0.000
10.794	0.086	0.931	0.343	0.000
10.956	0.086	0.945	0.351	0.000
11.117	0.086	0.959	0.359	0.000
11.278	0.086	0.973	0.367	0.000
11.439	0.086	0.987	0.374	0.000
11.600	0.086	1.001	0.381	0.000
11.761	0.086	1.015	0.388	0.000
11.922	0.086	1.029	0.395	0.000
12.083	0.086	1.043	0.402	0.000
12.244	0.086	1.056	0.409	0.000
12.406	0.086	1.070	0.415	0.000
12.567	0.086	1.084	0.422	0.000
12.728	0.086	1.098	0.428	0.000
12.889	0.086	1.112	0.434	0.000
13.050	0.086	1.126	0.440	0.000
13.211	0.086	1.140	0.446	0.000
13.372	0.086	1.154	0.452	0.000
13.533	0.086	1.168	0.458	0.000
13.694	0.086	1.182	0.463	0.000
13.856	0.086	1.196	0.469	0.000
14.017	0.086	1.209	0.509	0.000
14.178	0.086	1.223	1.662	0.000
14.339	0.086	1.237	3.431	0.000
14.500	0.086	1.251	5.130	0.000
14.661	0.086	1.221	6.225	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 6.71
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 3.56
Total Impervious Area: 3.15

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.22595
5 year	0.346307
10 year	0.426651
25 year	0.527263
50 year	0.601056
100 year	0.673632

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.153867
5 year	0.254244
10 year	0.34354
25 year	0.488151
50 year	0.623051
100 year	0.785064

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.198	0.171
1903	0.138	0.101
1904	0.303	0.111
1905	0.125	0.157
1906	0.077	0.074
1907	0.377	0.249
1908	0.255	0.106
1909	0.263	0.145
1910	0.377	0.161
1911	0.220	0.141

1912	0.755	0.193
1913	0.306	0.322
1914	0.087	0.084
1915	0.145	0.167
1916	0.210	0.147
1917	0.095	0.096
1918	0.217	0.248
1919	0.166	0.178
1920	0.231	0.141
1921	0.253	0.238
1922	0.264	0.261
1923	0.197	0.188
1924	0.121	0.095
1925	0.139	0.099
1926	0.225	0.101
1927	0.174	0.108
1928	0.178	0.113
1929	0.381	0.172
1930	0.225	0.106
1931	0.231	0.103
1932	0.200	0.113
1933	0.189	0.175
1934	0.442	0.348
1935	0.227	0.219
1936	0.198	0.166
1937	0.350	0.150
1938	0.201	0.168
1939	0.034	0.078
1940	0.217	0.236
1941	0.143	0.083
1942	0.301	0.362
1943	0.159	0.113
1944	0.423	0.405
1945	0.247	0.159
1946	0.170	0.089
1947	0.121	0.098
1948	0.496	0.325
1949	0.427	0.417
1950	0.137	0.095
1951	0.141	0.096
1952	0.651	1.557
1953	0.569	0.429
1954	0.222	0.177
1955	0.180	0.096
1956	0.086	0.080
1957	0.266	0.182
1958	0.531	0.476
1959	0.331	0.377
1960	0.108	0.098
1961	0.375	0.367
1962	0.238	0.140
1963	0.112	0.093
1964	0.138	0.105
1965	0.413	0.354
1966	0.134	0.109
1967	0.192	0.107
1968	0.227	0.182
1969	0.205	0.103

1970	0.291	0.194
1971	0.456	0.341
1972	0.297	0.227
1973	0.345	0.374
1974	0.225	0.145
1975	0.490	0.437
1976	0.240	0.147
1977	0.109	0.086
1978	0.443	0.283
1979	0.121	0.098
1980	0.215	0.161
1981	0.221	0.182
1982	0.117	0.088
1983	0.365	0.318
1984	0.237	0.126
1985	0.243	0.222
1986	0.219	0.166
1987	0.409	0.414
1988	0.286	0.168
1989	0.244	0.151
1990	0.270	0.172
1991	0.236	0.113
1992	0.302	0.206
1993	0.300	0.172
1994	0.465	0.313
1995	0.103	0.112
1996	0.417	0.407
1997	0.219	0.093
1998	0.278	0.149
1999	0.066	0.087
2000	0.161	0.183
2001	0.123	0.080
2002	0.324	0.158
2003	0.258	0.275
2004	0.259	0.131
2005	0.424	0.109
2006	0.147	0.091
2007	0.142	0.154
2008	0.233	0.168
2009	0.158	0.106
2010	0.153	0.253
2011	0.132	0.093
2012	0.302	0.135
2013	0.143	0.094
2014	0.102	0.095
2015	0.241	0.103
2016	0.095	0.097
2017	0.360	0.283
2018	0.541	0.663
2019	0.671	0.492
2020	0.213	0.102
2021	0.315	0.250
2022	0.128	0.090
2023	0.254	0.161
2024	0.652	0.122
2025	0.240	0.206
2026	0.361	0.322
2027	0.153	0.125

2028	0.130	0.089
2029	0.260	0.146
2030	0.489	0.315
2031	0.153	0.089
2032	0.091	0.086
2033	0.141	0.094
2034	0.160	0.108
2035	0.540	0.736
2036	0.264	0.175
2037	0.079	0.096
2038	0.286	0.259
2039	0.048	0.069
2040	0.159	0.109
2041	0.183	0.106
2042	0.582	0.478
2043	0.262	0.320
2044	0.323	0.274
2045	0.211	0.176
2046	0.240	0.262
2047	0.188	0.122
2048	0.272	0.158
2049	0.255	0.175
2050	0.202	0.098
2051	0.335	0.287
2052	0.145	0.130
2053	0.262	0.280
2054	0.251	0.316
2055	0.160	0.088
2056	0.106	0.094
2057	0.166	0.113
2058	0.187	0.145
2059	0.389	0.263

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.7547	1.5575
2	0.6707	0.7361
3	0.6519	0.6626
4	0.6512	0.4922
5	0.5818	0.4785
6	0.5688	0.4761
7	0.5409	0.4371
8	0.5403	0.4292
9	0.5307	0.4174
10	0.4956	0.4142
11	0.4897	0.4068
12	0.4886	0.4051
13	0.4649	0.3767
14	0.4559	0.3743
15	0.4428	0.3673
16	0.4420	0.3625
17	0.4268	0.3543
18	0.4239	0.3476
19	0.4228	0.3411
20	0.4175	0.3246
21	0.4132	0.3221
22	0.4087	0.3220

23	0.3890	0.3199
24	0.3807	0.3176
25	0.3772	0.3164
26	0.3766	0.3148
27	0.3753	0.3127
28	0.3649	0.2871
29	0.3607	0.2834
30	0.3598	0.2830
31	0.3502	0.2804
32	0.3448	0.2746
33	0.3352	0.2738
34	0.3313	0.2635
35	0.3242	0.2625
36	0.3233	0.2610
37	0.3149	0.2589
38	0.3059	0.2527
39	0.3033	0.2501
40	0.3025	0.2487
41	0.3021	0.2483
42	0.3009	0.2376
43	0.2999	0.2362
44	0.2969	0.2266
45	0.2907	0.2221
46	0.2861	0.2194
47	0.2859	0.2064
48	0.2780	0.2064
49	0.2720	0.1942
50	0.2700	0.1934
51	0.2665	0.1879
52	0.2645	0.1833
53	0.2640	0.1825
54	0.2631	0.1819
55	0.2622	0.1817
56	0.2619	0.1783
57	0.2599	0.1772
58	0.2585	0.1755
59	0.2582	0.1754
60	0.2552	0.1751
61	0.2550	0.1751
62	0.2538	0.1722
63	0.2531	0.1719
64	0.2510	0.1717
65	0.2472	0.1711
66	0.2444	0.1682
67	0.2431	0.1681
68	0.2412	0.1677
69	0.2404	0.1674
70	0.2401	0.1665
71	0.2396	0.1656
72	0.2381	0.1613
73	0.2373	0.1613
74	0.2362	0.1612
75	0.2331	0.1589
76	0.2311	0.1585
77	0.2306	0.1580
78	0.2269	0.1568
79	0.2267	0.1537
80	0.2252	0.1506

81	0.2252	0.1503
82	0.2248	0.1494
83	0.2217	0.1475
84	0.2206	0.1470
85	0.2200	0.1463
86	0.2188	0.1449
87	0.2186	0.1448
88	0.2175	0.1446
89	0.2171	0.1409
90	0.2146	0.1409
91	0.2125	0.1402
92	0.2111	0.1351
93	0.2103	0.1309
94	0.2050	0.1297
95	0.2023	0.1260
96	0.2011	0.1252
97	0.1999	0.1223
98	0.1984	0.1221
99	0.1982	0.1131
100	0.1974	0.1130
101	0.1922	0.1127
102	0.1894	0.1127
103	0.1878	0.1126
104	0.1867	0.1123
105	0.1832	0.1107
106	0.1802	0.1090
107	0.1783	0.1089
108	0.1743	0.1087
109	0.1703	0.1085
110	0.1664	0.1079
111	0.1657	0.1071
112	0.1606	0.1065
113	0.1602	0.1061
114	0.1596	0.1059
115	0.1593	0.1057
116	0.1592	0.1053
117	0.1581	0.1031
118	0.1534	0.1030
119	0.1530	0.1025
120	0.1527	0.1016
121	0.1471	0.1012
122	0.1450	0.1007
123	0.1447	0.0994
124	0.1433	0.0985
125	0.1431	0.0983
126	0.1418	0.0976
127	0.1414	0.0975
128	0.1412	0.0969
129	0.1394	0.0964
130	0.1385	0.0959
131	0.1383	0.0956
132	0.1367	0.0956
133	0.1336	0.0953
134	0.1325	0.0948
135	0.1304	0.0947
136	0.1278	0.0942
137	0.1249	0.0936
138	0.1226	0.0935

139	0.1214	0.0935
140	0.1212	0.0926
141	0.1208	0.0925
142	0.1167	0.0907
143	0.1122	0.0904
144	0.1087	0.0894
145	0.1078	0.0890
146	0.1057	0.0890
147	0.1028	0.0885
148	0.1021	0.0877
149	0.0954	0.0868
150	0.0948	0.0864
151	0.0905	0.0859
152	0.0873	0.0841
153	0.0865	0.0830
154	0.0795	0.0801
155	0.0766	0.0800
156	0.0655	0.0777
157	0.0476	0.0742
158	0.0343	0.0691

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1130	39783	38005	95	Pass
0.1179	36005	29828	82	Pass
0.1228	32764	28576	87	Pass
0.1278	29994	27457	91	Pass
0.1327	27457	26437	96	Pass
0.1376	25135	24864	98	Pass
0.1426	23085	23157	100	Pass
0.1475	21324	21241	99	Pass
0.1524	19628	19335	98	Pass
0.1573	18144	17329	95	Pass
0.1623	16803	15329	91	Pass
0.1672	15595	13496	86	Pass
0.1721	14509	11573	79	Pass
0.1771	13451	10005	74	Pass
0.1820	12709	8825	69	Pass
0.1869	11723	7573	64	Pass
0.1919	10903	7185	65	Pass
0.1968	10072	6781	67	Pass
0.2017	9363	6454	68	Pass
0.2066	8665	6238	71	Pass
0.2116	8033	6061	75	Pass
0.2165	7485	5895	78	Pass
0.2214	6953	5706	82	Pass
0.2264	6438	5539	86	Pass
0.2313	5989	5365	89	Pass
0.2362	5590	5126	91	Pass
0.2412	5218	4882	93	Pass
0.2461	4876	4680	95	Pass
0.2510	4563	4439	97	Pass
0.2559	4322	4253	98	Pass
0.2609	4062	4046	99	Pass
0.2658	3825	3831	100	Pass
0.2707	3565	3682	103	Pass
0.2757	3387	3513	103	Pass
0.2806	3189	3329	104	Pass
0.2855	2993	3184	106	Pass
0.2905	2840	3051	107	Pass
0.2954	2673	2909	108	Pass
0.3003	2515	2754	109	Pass
0.3052	2379	2608	109	Pass
0.3102	2247	2445	108	Pass
0.3151	2140	2285	106	Pass
0.3200	2048	2125	103	Pass
0.3250	1964	1998	101	Pass
0.3299	1853	1906	102	Pass
0.3348	1737	1803	103	Pass
0.3398	1637	1699	103	Pass
0.3447	1555	1593	102	Pass
0.3496	1476	1494	101	Pass
0.3546	1388	1376	99	Pass
0.3595	1305	1275	97	Pass
0.3644	1218	1180	96	Pass
0.3693	1146	1095	95	Pass

0.3743	1084	1010	93	Pass
0.3792	1026	950	92	Pass
0.3841	974	885	90	Pass
0.3891	920	820	89	Pass
0.3940	881	780	88	Pass
0.3989	844	699	82	Pass
0.4039	803	606	75	Pass
0.4088	761	534	70	Pass
0.4137	708	479	67	Pass
0.4186	675	412	61	Pass
0.4236	642	362	56	Pass
0.4285	604	328	54	Pass
0.4334	564	301	53	Pass
0.4384	532	258	48	Pass
0.4433	497	240	48	Pass
0.4482	458	220	48	Pass
0.4532	425	195	45	Pass
0.4581	390	171	43	Pass
0.4630	357	115	32	Pass
0.4679	339	85	25	Pass
0.4729	321	61	19	Pass
0.4778	288	51	17	Pass
0.4827	261	45	17	Pass
0.4877	244	39	15	Pass
0.4926	224	35	15	Pass
0.4975	201	32	15	Pass
0.5025	187	29	15	Pass
0.5074	173	24	13	Pass
0.5123	156	23	14	Pass
0.5172	145	22	15	Pass
0.5222	123	21	17	Pass
0.5271	110	21	19	Pass
0.5320	95	20	21	Pass
0.5370	80	20	25	Pass
0.5419	71	20	28	Pass
0.5468	65	19	29	Pass
0.5518	59	19	32	Pass
0.5567	54	19	35	Pass
0.5616	49	18	36	Pass
0.5665	43	17	39	Pass
0.5715	34	17	50	Pass
0.5764	31	17	54	Pass
0.5813	30	16	53	Pass
0.5863	26	15	57	Pass
0.5912	25	15	60	Pass
0.5961	23	15	65	Pass
0.6011	21	14	66	Pass

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Vault 1 POC	☐	1842.21			☐	0.00			
Total Volume Infiltrated		1842.21	0.00	0.00		0.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

Verify-this makes no sense.[Storm Report; Pg 51 of 211]

Model Default Modifications

Total of 0 changes have been made.

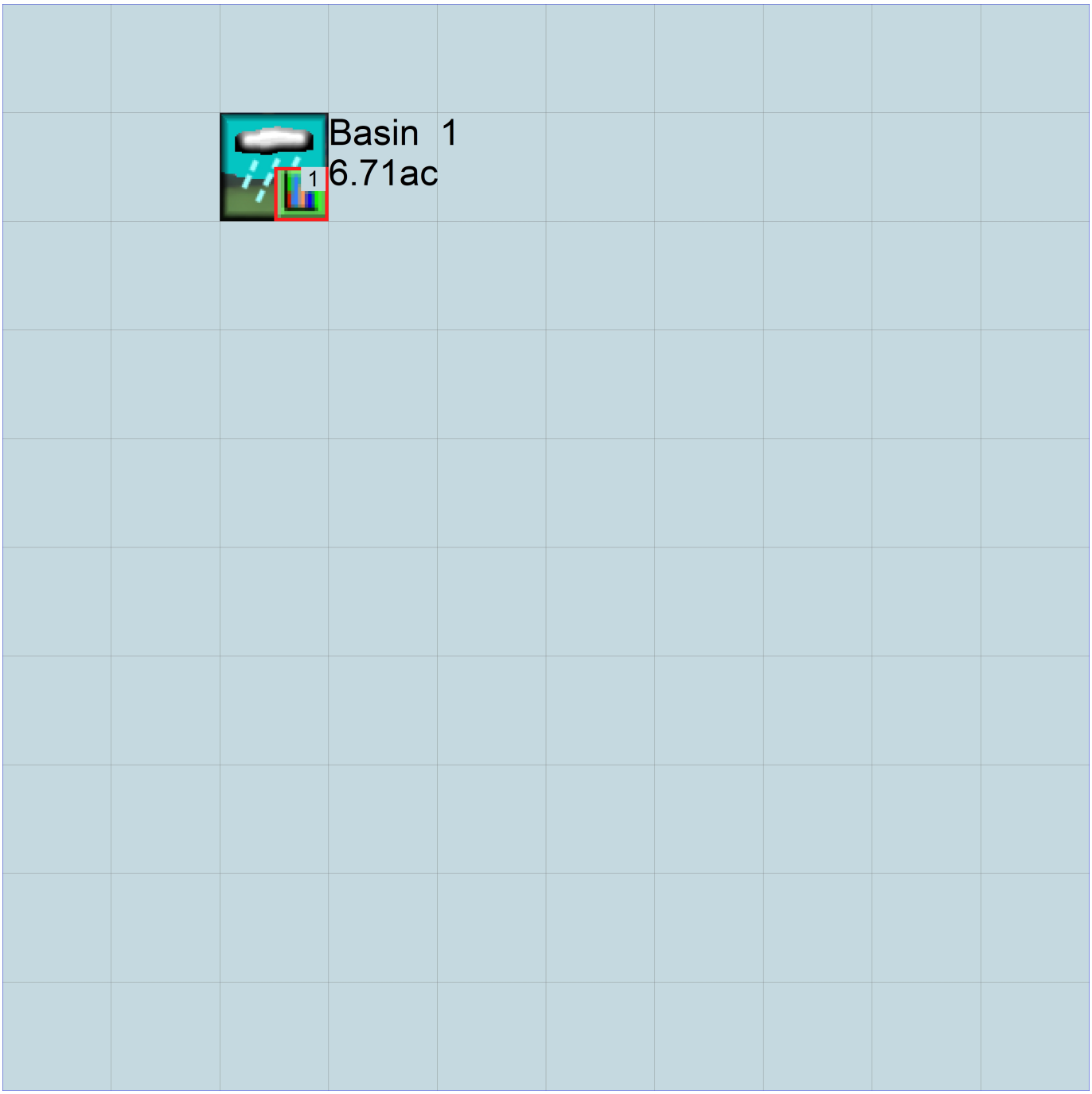
PERLND Changes

No PERLND changes have been made.

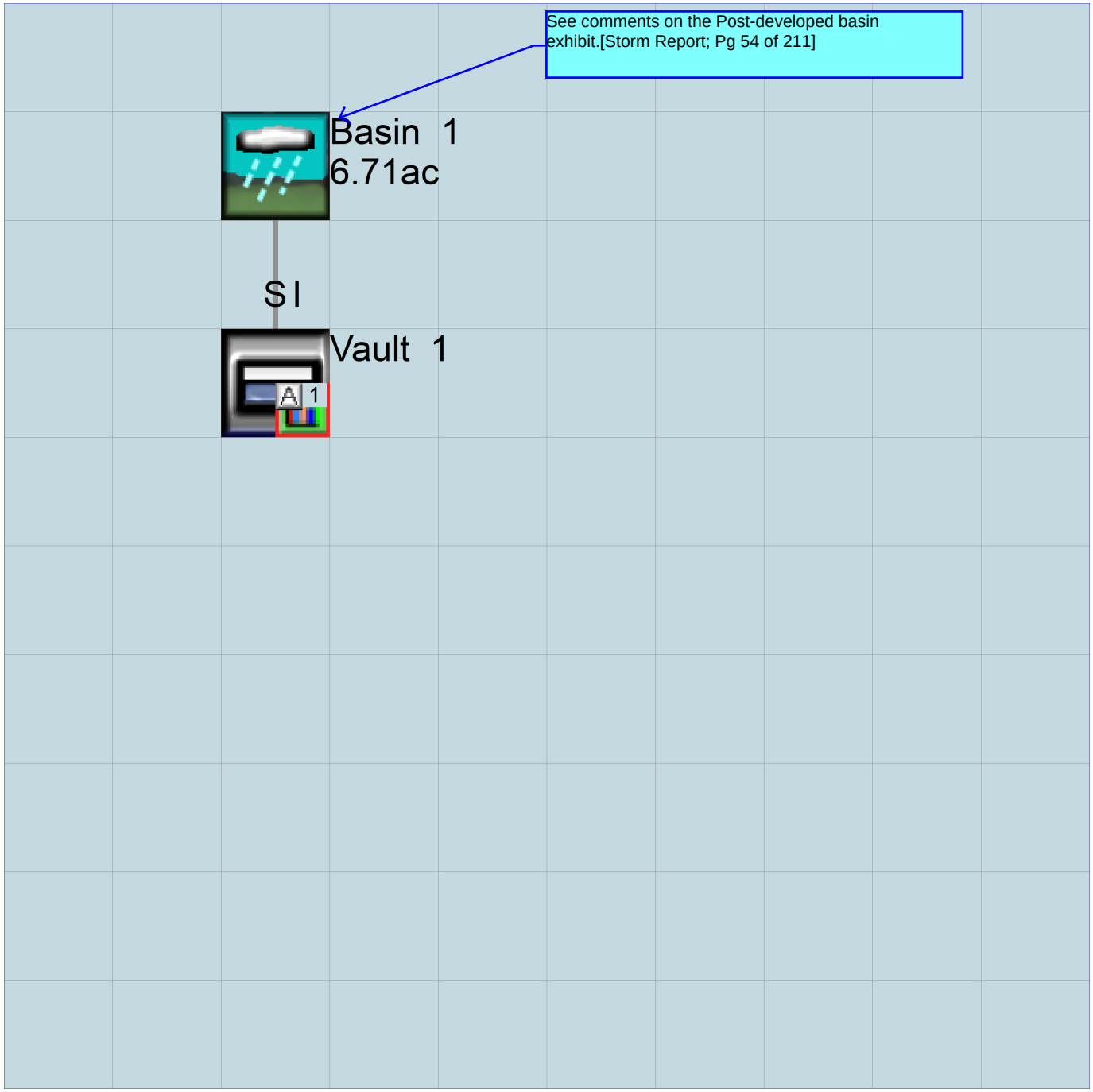
IMPLND Changes

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   Normandy Heights Prelim.wdm
MESSU       25   PreNormandy Heights Prelim.MES
            27   PreNormandy Heights Prelim.L61
            28   PreNormandy Heights Prelim.L62
            30   POCNormandy Heights Prelim1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      12
      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           ***
   12     C, Forest, Steep        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 ***
   12         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  *********
   12         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 ***
   12         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
   12              0       4.5      0.08       400      0.15       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   12             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   12           0.2       0.3      0.35         6       0.3       0.7
  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
   12             0         0         0         0       2.5         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  12                        6.71     COPY   501     12
PERLND  12                        6.71     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   Normandy Heights Prelim.wdm
MESSU       25   MitNormandy Heights Prelim.MES
            27   MitNormandy Heights Prelim.L61
            28   MitNormandy Heights Prelim.L62
            30   POCNormandy Heights Prelim1.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND      16
      IMPLND       2
      IMPLND       4
      RCHRES       1
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Vault  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           ***
   16     C, 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 ***
   16         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  *********
   16         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 ***
   16         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
   16             0       4.5      0.03       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   16             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   16           0.1      0.25      0.25         6       0.5      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
   16             0         0         0         0       2.5          1          0
  END PWAT-STATE1

END PERLND

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

  ACTIVITY
    <PLS > ************* Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    2         0    0    1    0    0    0
    4         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    2         0    0    4    0    0    0    1    9
    4         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     ***
    2         0    0    0    0    0
    4         0    0    0    0    0
  END IWAT-PARM1

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

```
    2            400      0.05       0.1      0.08
    4            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    2              0         0
    4              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    2              0         0
    4              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND  16                        3.56     RCHRES   1      2
PERLND  16                        3.56     RCHRES   1      3
IMPLND   2                        1.07     RCHRES   1      5
IMPLND   4                        2.08     RCHRES   1      5

******Routing******
PERLND  16                        3.56     COPY     1     12
IMPLND   2                        1.07     COPY     1     15
IMPLND   4                        2.08     COPY     1     15
PERLND  16                        3.56     COPY     1     13
RCHRES   1                           1     COPY   501     16
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                             ***
    1     Vault  1                1    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
  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
            *  *  *  *    *  *  *  *  *      *  *  *  *  *         ***
    1       0  1  0  0    4  0  0  0  0       0  0  0  0  0         2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.04       0.0       0.0       0.5       0.0
  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
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1           0         4.0  0.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   91    4
     Depth      Area    Volume  Outflow1 Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.086318  0.000000  0.000000
  0.161111  0.086318  0.013907  0.017019
  0.322222  0.086318  0.027813  0.024069
  0.483333  0.086318  0.041720  0.029478
  0.644444  0.086318  0.055627  0.034039
  0.805556  0.086318  0.069534  0.038056
  0.966667  0.086318  0.083440  0.041689
  1.127778  0.086318  0.097347  0.045029
  1.288889  0.086318  0.111254  0.048138
  1.450000  0.086318  0.125161  0.051058
  1.611111  0.086318  0.139067  0.053820
  1.772222  0.086318  0.152974  0.056447
  1.933333  0.086318  0.166881  0.058957
  2.094444  0.086318  0.180788  0.061364
  2.255556  0.086318  0.194694  0.063680
  2.416667  0.086318  0.208601  0.065915
  2.577778  0.086318  0.222508  0.068077
  2.738889  0.086318  0.236415  0.070172
  2.900000  0.086318  0.250321  0.072207
  3.061111  0.086318  0.264228  0.074185
  3.222222  0.086318  0.278135  0.076113
  3.383333  0.086318  0.292042  0.077992
  3.544444  0.086318  0.305948  0.079828
  3.705556  0.086318  0.319855  0.081622
  3.866667  0.086318  0.333762  0.083377
  4.027778  0.086318  0.347669  0.085096
  4.188889  0.086318  0.361575  0.086782
  4.350000  0.086318  0.375482  0.088435
  4.511111  0.086318  0.389389  0.090058
  4.672222  0.086318  0.403296  0.091652
  4.833333  0.086318  0.417202  0.093219
  4.994444  0.086318  0.431109  0.094759
  5.155556  0.086318  0.445016  0.096276
  5.316667  0.086318  0.458923  0.097768
  5.477778  0.086318  0.472829  0.099239
  5.638889  0.086318  0.486736  0.100687
  5.800000  0.086318  0.500643  0.102116
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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
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RCHRES   1 HYDR   STAGE  1 1        1      WDM   1001 STAG     ENGL      REPL
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
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  END MASS-LINK     2

  MASS-LINK         3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK     3

  MASS-LINK         5
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK     5

  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        16
RCHRES     ROFLOW                          COPY           INPUT  MEAN
  END MASS-LINK    16


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

Legal Notice

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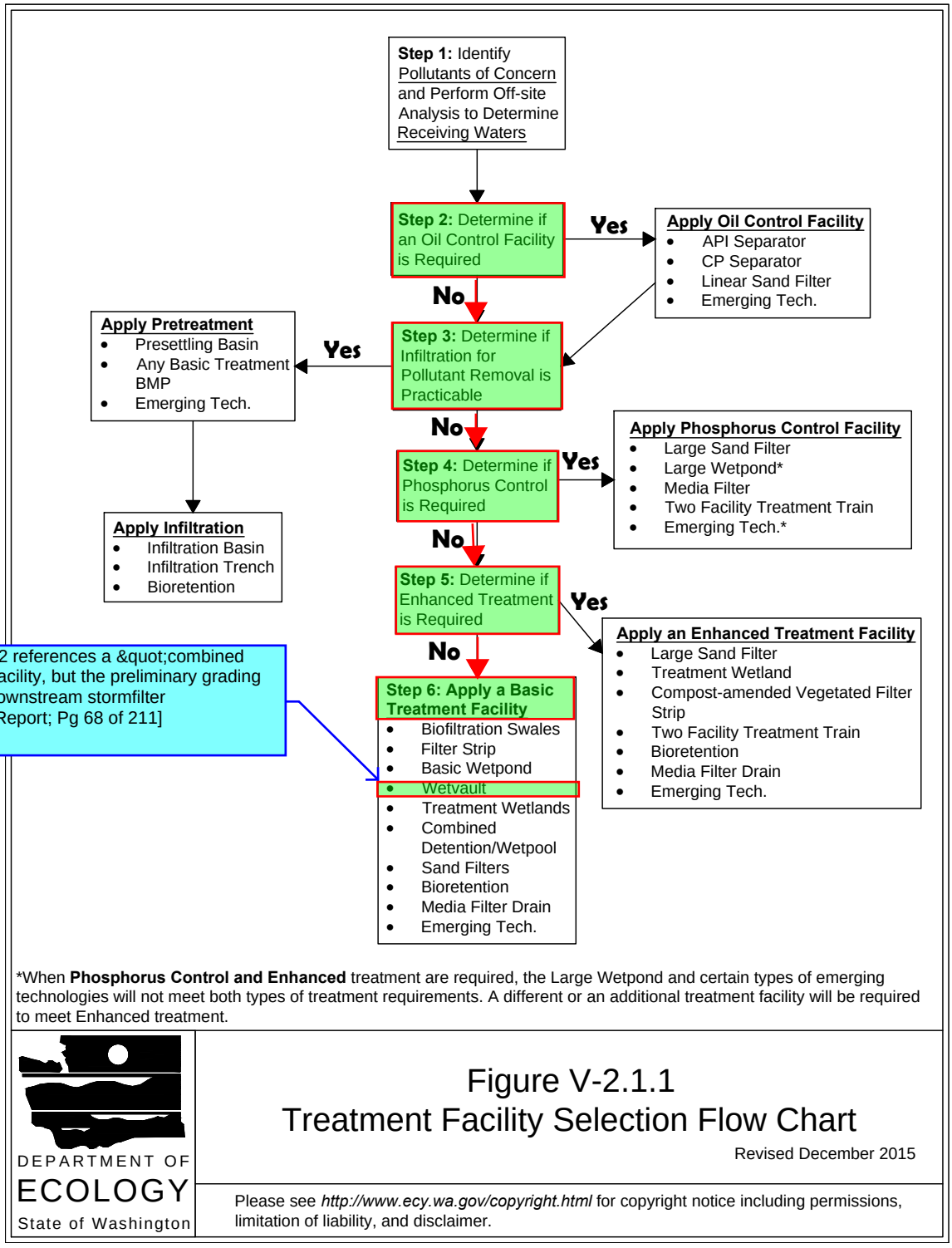
Figure V-2.1.1 Treatment Facility Selection Flow Chart



Tab 6.0

6.0 CONSTRUCTION STORMWATER POLLUTION PREVENTION PLAN

The required SWPPP will be prepared in advance of construction plan approval. As the total disturbed area is greater than one acre, a NPDES permit is required for this project.

Tab 7.0

7.0 SPECIAL REPORTS AND STUDIES

The following special reports and studies are included:

7.1 "Geotechnical Engineering Study Proposed Normandy Heights" prepared by Earth Solutions NW LLC, Dated May 03, 2022

7.2 “Wetland and Fish and Wildlife Habitat Assessment Report” prepared by Soundview Consultants LLC, dated February 24, 2022

7.3 "Normandy Retention Tree Assessment" Prepared by Sound Urban Forestry LLC, dated May 16, 2022

6.1 Geotechnical Engineering Study prepared by Earth Solutions Northwest, LLC dated May 3, 2022

Earth Solutions NW LLC

Geotechnical Engineering
Construction Observation/Testing
Environmental Services

UPDATED GEOTECHNICAL ENGINEERING STUDY
PROPOSED NORMANDY HEIGHTS
2007 SHAW ROAD
PUYALLUP, WASHINGTON

ES-0593

15365 N.E. 90th Street, Suite 100 Redmond, WA 98052
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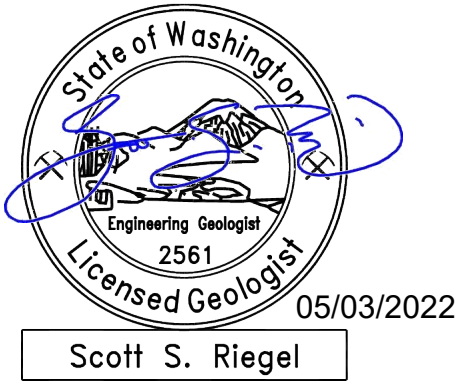
www.earthsolutionsnw.com

PREPARED FOR

RM HOMES, LLC

November 9, 2006
Updated May 3, 2022

Chase G. Halsen, L.G.
Senior Project Geologist



Scott S. Riegel, L.G., L.E.G.
Associate Principal Geologist

UPDATED GEOTECHNICAL ENGINEERING STUDY
PROPOSED NORMANDY HEIGHTS
2007 SHAW ROAD
PUYALLUP, WASHINGTON

ES-0593

Earth Solutions NW, LLC
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Redmond, Washington 98052
Phone: 425-449-4704 | Fax: 425-449-4711
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Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept*

responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are not final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are Not Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will not of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are not building-envelope or mold specialists.***

GEOPROFESSIONAL BUSINESS ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

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

November 9, 2006
Updated May 3, 2022
ES-0593

RM Homes, LLC
2913 – 5th Avenue Northeast, Suite 201
Puyallup, Washington 98372

Attention: Mr. James Kerby

Greetings, Mr. Kerby:

Earth Solutions NW, LLC (ESNW) is pleased to present this updated geotechnical engineering report in support of the proposed residential development. We understand the project is pursuing construction of a residential plat and associated infrastructure improvements. This updated report provides additional subsurface exploration and an updated site layout plan. From a geotechnical standpoint, development as currently proposed is feasible. Based on the conditions encountered during our subsurface exploration, the site is underlain medium dense to dense sand and silt deposits with variable fines contents.

In our opinion, the proposed residential structures can be constructed on conventional continuous and spread foundations bearing on competent native soil, recompacted native soil, or new structural fill placed directly on competent native soils. Native soils considered capable for support of the proposed residences are anticipated to be encountered beginning at depths of about two to four feet below existing grades. Where loose or otherwise unsuitable soil conditions are encountered at foundation subgrades, additional compaction efforts or overexcavation and restoration with structural fill will likely be necessary.

We understand the site is will pursue conventional detention designs as means of stormwater management. From a geotechnical standpoint, the use of infiltration on this site is not recommended given the variable soil conditions and existing slope features across the site.

We appreciate the opportunity to be of service to you on this project. If you have any questions regarding the content of this geotechnical engineering study, please call.

Further clarification is needed here. It appears that ESNW was simply informed that detention will be used rather than a geotechnical recommendation addressing the feasibility of Onsite BMPs per the Ecology Manual, Minimum Requirement 5. This sentence seems to only address the existing native soils. The existing site is being substantially regraded and filled, up to 32ft deep. Is it not possible to construct permeable pavement(s) on the imported fill considering the Ecology Manual allows a minimum feasiblility infiltration rate of 0.3 in/hr? However, there may be other BMP infeasibility criteria outlined in the Ecology Manual that would prevent the use of permeable pavement. For example, downstream impacts associated with lateral flow, or potential erosion hazards, and/ or slope stability concerns due to infiltrated stormwater, but the current application materials do not appear sufficient to support a definitive project-wide infeasibility determination for the use of permeable pavement on the imported fill. [Storm Report; Pg 78 of 211]

Sincerely,

EARTH SOLUTIONS NW, LLC

Chase G. Halsen, L.G.
Senior Project Geologist

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ES-0593

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Cont'd

ES-0593

UPDATED GEOTECHNICAL ENGINEERING STUDY
PROPOSED NORMANDY HEIGHTS
2007 SHAW ROAD
PUYALLUP, WASHINGTON

ES-0593

INTRODUCTION

General

This geotechnical engineering study was updated for the proposed residential short plat to be constructed at 2007 Shaw Road East, in Puyallup, Washington. The purpose of this study was to provide geotechnical recommendations for the proposed development and included the following geotechnical services:

- Test pits to characterize site soil and groundwater conditions.
- Laboratory testing of representative soil samples collected at the test pit locations.
- Engineering analyses.
- Preparation of this geotechnical engineering study.

No reference to Ecology Manual? [Storm Report; Pg 81 of 211]

The following documents and resources were reviewed as part of our report preparation:

- Concept Site Plan II, undated.
- Puyallup Municipal Code, Chapter 21.06.
- PublicGIS application, maintained by Pierce County, Washington.
- Hazard Map GIS application, maintained by the City of Puyallup, Washington.
- Geologic Information Portal, maintained by Washington State Department of Natural Resources.
- Geologic Map of the Tacoma Quadrangle, prepared by J. Eric Schuster et al., November 2015.
- Surficial Geologic Map and Section of the Lake Tapps Quadrangle (Tapps), Washington, Crandell, 1963.
- Online Web Soil Survey (WSS) resource, maintained by the Natural Resources Conservation Service under the United States Department of Agriculture (USDA).

There are proposed fills up to 32ft deep. Provide geotechnical confirmation that the proposed fills meet the intent of this report. [Storm Report; Pg 82 of 211]

Project Description

We understand the project is pursuing construction of a residential plat consisting of 20 home building sites and associated infrastructure improvements. At the time of report submission, specific grading plans and building load plans were not available for review. Based on our experience with similar developments, the proposed residential structures will likely be two to three stories each and constructed using relatively lightly loaded wood framing supported on conventional foundations. Perimeter footing loads will likely be about 2 to 3 kips per lineal foot. Slab-on-grade loading is anticipated to be approximately 150 pounds per square foot (psf). We anticipate a combination of grade modifications (cuts or fills) of about 5 to 10 feet will likely be required to establish building pad and roadway elevations. Deeper excavations will likely be necessary to install utilities and construct the stormwater pond.

If the above design assumptions either change or are incorrect, ESNW should be contacted to review the recommendations provided in this report. ESNW should review final designs to confirm that appropriate geotechnical recommendations have been incorporated into the plans.

SITE CONDITIONS

Verify-northeast? [Storm Report; Pg 82 of 211]

Surface

The subject site is located at the northeast corner of the intersection between Shaw Road East and Crystal Ridge Drive, in Puyallup, Washington. The approximate site location is depicted on Plate 1 (Vicinity Map). The site area consists of Pierce County parcel number 042035-4039 totaling about 8.20 acres. Topography descends to the northwest with about 90 feet of elevation change occurring within the confines of the property. In general, site topography descends from the roadways and includes a vague bench area before descending to the east toward a natural drainage ravine and stream. The site is developed with a single-family residence and associated improvements within the northwestern site area and a gravel pad in the southwestern site area. Remaining portions of the site are surfaced with forested growth and/or brush and brambles.

Subsurface

An ESNW representative observed, logged, and sampled the excavation of eight test pits on October 23, 2006 and three borings near the proposed stormwater facility on February 8, 2022. Both explorations were completed with machinery and operators retained by our firm. The borings were installed to monitor groundwater conditions near the proposed stormwater facility under a separate project phase (ES-593.03). The approximate locations of the explorations are depicted on Plate 2 (Subsurface Exploration Plan). Representative soil samples collected at the test pit and boring locations were analyzed in general accordance with Unified Soil Classification System (USCS) and USDA methods and procedures.

The following sections provide a generalized characterization of the encountered subsurface conditions. Please refer to the test pit logs provided in Appendix A for a more detailed description of subsurface conditions.

Topsoil and Fill

Topsoil was encountered in the upper approximate 7 to 12 inches of existing grades at the test pit locations. The topsoil was characterized by a dark brown color, trace organic matter, and root inclusions. Fill was not encountered at the test pit locations but may be present in proximity existing site structures.

Native Soil

Underlying topsoil, native soils were characterized primarily as poorly graded sand with variable gravel and fines contents and poorly graded gravel with variable fines contents (USCS: SP, SP-SM, GP, and GP-GM) throughout out the majority of the site. At the boring locations completed near the proposed stormwater facility, silty sand (USCS: SM) and silt dominated soils (USCS: ML) were encountered. Native soils were encountered in a loose to medium dense and moist condition, extending to the terminus of each test pit location, and conditions ranged from loose to dense at the boring locations, which were advanced to a maximum depth of 21.5 feet below the ground surface (bgs).

Geologic Setting

The referenced geologic map identifies ice-contact deposits (Qgo_i) as underlying the site and surrounding areas. The outwash deposits described in the referenced geologic map are characterized as sand, gravel, silt and clay in a loose and well sorted condition. The referenced Tapps geologic map resource further refines this geologic setting as Lacustrine sand (Qil) and describes the Lacustrine sand as a somewhat chaotic or random assemblage of lacustrine sand and silt with abundant large boulders that do not correlate well with present topography. The referenced WSS resource identifies Indianola loamy sand (Map Unit Symbol: 18C) as underlying the site and surrounding areas. This soil series is associated with terrace, kames, and esker landforms and formed in sandy glacial outwash. Based on our field exploration, encountered native soils correlate with local geologic mapping designations of ice-contact deposits.

Groundwater

Groundwater was not encountered at the test pit locations during the October 2006 exploration. Groundwater seepage rates and elevations fluctuate depending on many factors, including precipitation duration and intensity, the time of year, and soil conditions. In general, groundwater elevations and flow rates are higher during the winter, spring, and early summer months.

To assist with stormwater management designs, targeted groundwater monitoring was performed from February 2022 through the end of April 2022. The monitoring was focused in the proposed stormwater tract and targeted to the proposed design elevation of the facility. Groundwater was not observed at any of the well locations over the course of the monitoring period. While there is a seasonal stream located at the base of the adjacent natural ravine slope, it does not appear that to be fed by a local groundwater regime associated with the site.

Critical Areas Review

Based on review of readily available topographic data, most of the site contains slopes with gradients less than 40 percent. However, isolated and discontinuous slopes of 40 percent or greater may be present. Further topographic evaluation and delineation of slopes is currently underway. Once the final topographic data is made available to ESNW, further discussion and evaluations of potential critical areas and mitigation recommendations will be provided.

DISCUSSION AND RECOMMENDATIONS

General

Based on the results of our investigation, construction of the proposed residential plat is feasible from a geotechnical standpoint. The primary geotechnical considerations for the proposal are in reference to structural fill placement and compaction, foundation design, and stormwater management.

Site Preparation and Earthwork

Initial site preparation activities will consist of installing temporary erosion control measures, establishing grading limits, and site demolition and clearing activities. Subsequent earthwork activities will involve mass excavation, foundation subgrade preparation activities, and related infrastructure installations.

Temporary Erosion Control

The following temporary erosion and sediment control (TESC) Best Management Practices (BMPs) should be considered:

- Silt fencing should be placed around the site perimeter, where appropriate.

- Temporary construction entrances and drive lanes should be constructed with at least six inches of quarry spalls to minimize off-site soil tracking and provide a stable access entrance surface. A woven geotextile fabric may be placed underneath the quarry spalls to provide greater stability, if needed.

- When not in use, soil stockpiles should be covered or otherwise protected. Soil stockpiles should never be placed near the top of a slope.

- Temporary measures for controlling surface water runoff, such as interceptor trenches, sumps, or interceptor swales, should be installed prior to beginning earthwork activities.

- Dry soils disturbed during construction should be wetted to minimize dust.

Additional TESC BMPs, as specified by the project design team and indicated on the plans, should be incorporated into construction activities. TESC measures must be actively monitored and modified during construction as site conditions require, as approved by the site erosion control Lead to ensure proper performance is maintained.

Excavations and Slopes

Based on the soil conditions observed at the test locations, the following allowable temporary slope inclinations, as a function of horizontal to vertical (H:V) inclination, may be used. The applicable Federal Occupation Safety and Health Administration (OSHA) and Washington Industrial Safety and Health Act (WISHA) soil classifications are also provided:

- Loose to medium dense soil — 1.5H:1V (Type C)
- Areas exposing groundwater — 1.5H:1V (Type C)
- Dense native soil — 1H:1V (Type B)

Steeper temporary slope inclinations within undisturbed, very dense native soil may be feasible based on the soil and groundwater conditions exposed within the excavations. If pursued, ESNW can evaluate the feasibility of utilizing steeper temporary slopes on a case-by-case basis at the time of construction. In any case, an ESNW representative should observe temporary slopes to confirm inclinations are suitable for the exposed soil conditions and to provide additional excavation and slope stability recommendations, as necessary. If the recommended temporary slope inclinations cannot be achieved, temporary shoring may be necessary to support excavations. Permanent slopes should be graded to 2H:1V (or flatter) and planted with vegetation to enhance stability and minimize erosion potential. Permanent slopes should be observed by ESNW prior to vegetating and landscaping.

In-situ and Imported Soil

Based on the conditions observed during our subsurface exploration, site soils will exhibit a high sensitivity to moisture and are not suitable for use as structural fill unless the moisture content is at or slightly above optimum (determined using modified Proctor ASTM D-1557) prior to placement and compaction. Successful use of on-site soil as structural fill will largely be dictated by the moisture content at the time of placement and compaction. Depending on the time of year construction occurs, remedial measures (such as soil aeration) may be necessary as part of site grading and earthwork activities. If the on-site soil cannot be successfully compacted, the use of an imported soil may be necessary.

In our opinion, a contingency should be provided in the project budget for 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, soils with fines contents greater than 5 percent typically degrade rapidly when exposed to periods of rainfall.

Imported structural fill soil should consist of a well-graded, granular soil that can achieve a suitable working moisture content. 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 slab-on-grade, roadway, permanent slope, retaining wall, and utility trench backfill areas. The following recommendations are provided for soils intended for use as structural fill:

- Moisture content — At or slightly above optimum
- Relative compaction (minimum) — 95 percent (Modified Proctor)
- Loose lift thickness (maximum) — 12 inches

The on-site soil may not be suitable for use as structural fill unless a suitable moisture content is achieved at the time of placement and compaction. If the on-site soil cannot achieve the above specifications, use of an imported structural fill material will likely be necessary. With respect to underground utility installations and backfill, local jurisdictions will likely dictate soil type(s) and compaction requirements.

Slope Fill

Structural fill within unregulated sloping areas on this site should be placed on a level bench as depicted on Plate 3 (Slope Fill Detail). Benches must be “keyed” into the slope, and subsequently filled and compacted with suitable structural fill before continuing to the next bench. Sloping finish grades should be “overbuilt” using a bench-style fill and cut to the design gradient to ensure a compacted slope face is maintained. ESNW should review the final grading plans to confirm the recommendations in this report have been incorporated. ESNW should observe structural fill placement to confirm subgrade conditions and provide additional drainage recommendations, as necessary.

Subgrade Preparation

Foundation and slab subgrade surfaces should consist of competent, undisturbed native soil or structural fill placed and compacted directly on a competent native soil subgrade. ESNW should observe subgrade areas prior to placing formwork. Supplementary recommendations for subgrade improvement may be provided at the time of construction; such recommendations would likely include further mechanical compaction effort or overexcavation and replacement with suitable structural fill. It is imperative that all foundation elements associated within previous site structures be removed and any resulting voids be filled in accordance with the *Structural Fill* section of this report.

Wet Season Grading

Earthwork activities that occur during wet weather conditions may require additional measures to protect structural subgrades and soils intended for use as structural fill. Site-specific recommendations can be provided at the time of construction and may include leaving cut areas several inches above design elevations, covering working surfaces with crushed rock, protecting structural fill soils from adverse moisture conditions, and additional TESC recommendations. ESNW can also assist in obtaining a wet season grading permit or extension, where appropriate, if required by the presiding jurisdiction.

Foundations

Based on the conditions encountered during our fieldwork, in our opinion, the proposed residences can be constructed on conventional continuous and spread foundations bearing on competent native soil, recompacted native soil, or new structural fill placed directly on competent native soils. Native soils considered capable for support of the proposed residences are anticipated to be first encountered at depths of about two to four feet bgs. Where loose or otherwise unsuitable soil conditions are encountered at foundation subgrades, additional compaction efforts or overexcavation and restoration with structural fill will likely be necessary.

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

- Allowable soil bearing capacity — 2,500 psf
- Passive earth pressure* — 300 pcf (equivalent fluid)
- Coefficient of friction — 0.40

* *Assumes sides of the foundation will be backfilled with compacted structural fill.*

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, total settlement in the range of one inch and differential settlement of about one-half inch is anticipated. Most 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*)	1.249
Mapped 1-second period spectral response acceleration, S_1 (*g*)	0.430
Short period site coefficient, F_a	1.001
Long period site coefficient, F_v	1.870†
Adjusted short period spectral response acceleration, S_{MS} (*g*)	1.249
Adjusted 1-second period spectral response acceleration, S_{M1} (*g*)	0.804†
Design short period spectral response acceleration, S_{DS} (*g*)	0.833
Design 1-second period spectral response acceleration, S_{D1} (*g*)	0.539†

* *Assumes dense native soil conditions, encountered to a maximum depth of 21.5 feet bgs during the February 2022 field exploration, remain at least medium 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.*

As indicated in the table footnote, several of the seismic design values provided above are dependent on the assumption that site-specific ground motion analysis (per Section 11.4.8 of ASCE 7-16) will not be required for the subject project. ESNW recommends the validity of this assumption be confirmed at the earliest available opportunity during the planning and early design stages of the project. Further discussion between the project structural engineer, the project owner, and ESNW may be prudent to determine the possible impacts to the structural design due to increased earthquake load requirements under the 2018 IBC. ESNW can provide additional consulting services to aid with design efforts, including supplementary geotechnical and geophysical investigation, upon request.

Liquefaction is a phenomenon where saturated or loose soil suddenly loses internal strength and behaves as a fluid. This behavior is in response to increased pore water pressures resulting from an earthquake or another intense ground shaking. In our opinion, site susceptibility to liquefaction may be considered low. The depth of the regional groundwater table and the relatively medium dense characteristics of the native soil were the primary bases for this opinion.

Slab-on-Grade Floors

Slab-on-grade floors for the proposed structures should be supported on competent, well-compacted, firm, and unyielding subgrades. 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 the slab should be considered. The vapor barrier 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) — 35 pcf (equivalent fluid)
- At-rest earth pressure (restrained condition) — 55 pcf
- Traffic surcharge* (passenger vehicles) — 70 psf (rectangular distribution)
- Passive earth pressure — 300 pcf (equivalent fluid)
- Allowable soil bearing capacity — 2,500 psf
- Coefficient of friction — 0.40
- Seismic surcharge — 8H psf**

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

Additional surcharge loading from foundations, sloped backfill, or other loading should be included in the retaining wall design, as appropriate. Drainage should be provided behind retaining walls such that hydrostatic pressures do not develop. If drainage is not provided, hydrostatic pressures should be included in the wall design, as appropriate. ESNW should review retaining wall designs to verify that appropriate earth pressure values have been incorporated into the design and to provide additional recommendations, as necessary.

Retaining walls should be backfilled with free-draining material that extends along the height of the wall and a distance of at least 12 inches behind the wall. The upper one foot of the wall backfill may consist of a less permeable (surface seal) soil, if desired. In lieu of free-draining backfill, use of an approved sheet drain material may also be considered, based on the observed subsurface and groundwater conditions. ESNW should review conditions at the time of construction and provide recommendations for sheet drain material, as appropriate. A perforated drainpipe should be placed along the base of the wall and connected to an appropriate discharge location. A typical retaining wall drainage detail is illustrated on Plate 4.

Drainage

Surface grades must be designed to direct water away from the buildings to the extent practical. The grade adjacent to the buildings should be sloped away at a gradient of at least 2 percent for a horizontal distance of at least 10 feet (or as building and property setbacks allow). In no instance should water be allowed to collect, pond, or flow uncontrolled above and over sloping areas.

Groundwater seepage zones may be encountered during construction, depending on the time of year grading operations take place. Temporary measures to control surface water runoff and groundwater seepage during construction would likely involve interceptor trenches and sumps. ESNW should be consulted during preliminary grading and excavation activities to identify areas of seepage and to provide recommendations to reduce the potential for seepage-related instability. In our opinion, foundation drains should be installed along building perimeter footings. A typical foundation drain detail is provided on Plate 5.

Preliminary Stormwater Management Considerations

We understand the project will utilize detention (stormwater pond or stormwater vault) within the north central site area. Preliminary designs suggest a bottom of facility elevation at about 290 feet. As such, minimal to no excavations would be required within the easternmost area of the facility footprint while excavations up to about 20 feet may be required within the central and western half of the facility footprint. From a geotechnical standpoint, construction of a pond or vault in the area is feasible. ESNW should have the opportunity to review grading plans and the site topographic survey once they become available to provide additional recommendations relating to stormwater facility designs.

Given the exposed in-situ conditions, the project must be prepared to install a liner if a stormwater pond will be constructed. The pond liner should consist of a placed and compacted till or clay liner, or geomembrane, in accordance with the governing jurisdictional requirements. ESNW can assist in further evaluating appropriate liner material and construction methods, as requested. Pond berm walls must be placed and compacted to the specifications provided in the *Structural Fill* section of this report. It is possible that onsite soils will not meet the gradation and permeability requirements to use as berm fill. As such, a contingency should be added to the project budge in the case imported material is required for such use. Given the current positioning of the proposed stormwater facility in relation to existing site slope, global slope stability analysis should be considered once grading plans and the site topographic survey has been completed.

At time of civil application, provide geotech confirmation of slope stability at the location of the proposed stormwater facility. [Storm Report; Pg 90 of 211]

Preliminary Pavement Sections

The performance of site pavements is largely related to the condition of the underlying subgrade. To ensure adequate pavement performance, the subgrade should be in a firm and unyielding condition when subjected to proofrolling with a loaded dump truck. Structural fill in pavement areas should be compacted to the specifications previously detailed in this report. Soft, wet, or otherwise unsuitable subgrade areas may still exist after base grading activities. Areas containing unsuitable or yielding subgrade conditions will require remedial measures, such as overexcavation and replacement with crushed rock or structural fill, prior to pavement. If roadway areas will be designed with an inverted crown, additional drainage measures may be recommended at the time of construction to help maintain subgrade stability and pavement performance.

For lightly loaded pavement areas subjected primarily to passenger vehicles, the following preliminary pavement sections may be considered:

- A minimum of two inches of hot-mix asphalt (HMA) placed over four inches of crushed rock base (CRB).

- A minimum of two inches of HMA placed over three inches of asphalt-treated base (ATB).

Heavier traffic areas generally require thicker pavement sections depending on site usage, pavement life expectancy, and site traffic. For preliminary design purposes, the following pavement sections for occasional truck traffic and access roadways areas may be considered:

- Three inches of HMA placed over six inches of CRB.

- Three inches of HMA placed over four-and-one-half inches of ATB.

The HMA, ATB, and CRB materials should conform to the specifications of the governing jurisdiction. All soil base material should be compacted to at least 95 percent of the maximum dry density. Final pavement design recommendations can be provided once final traffic loading has been determined. Governing jurisdictional standards may supersede the recommendations provided in this report.

Utility Support and Trench Backfill

In our opinion, native soils will generally be competent for support of utilities. In general, native soils may be suitable for use as structural backfill throughout utility trench excavations, provided the soils are at (or slightly above) the optimum moisture content at the time of placement and compaction. Structural trench backfill should not be placed dry of the optimum moisture content. Each section of the site utility lines must be adequately supported in appropriate bedding material. Utility trench backfill should be placed and compacted to the specifications of structural fill (as previously detailed in this report) or to the applicable specifications of the presiding jurisdiction.

LIMITATIONS

This study has been prepared for the exclusive use of RM Homes, LLC and its representatives. No warranty, express or implied, is made. The recommendations and conclusions provided in this geotechnical engineering study 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 observed at the test pit locations may exist and may not become evident until construction. ESNW should reevaluate the conclusions provided in this geotechnical engineering study if variations are encountered.

Additional Services

ESNW should have an opportunity to review the final design with respect to the geotechnical recommendations provided in this report. ESNW should also be retained to provide testing and consultation services during construction.

Reference:
Pierce County, Washington
OpenStreetMap.org

NORTH

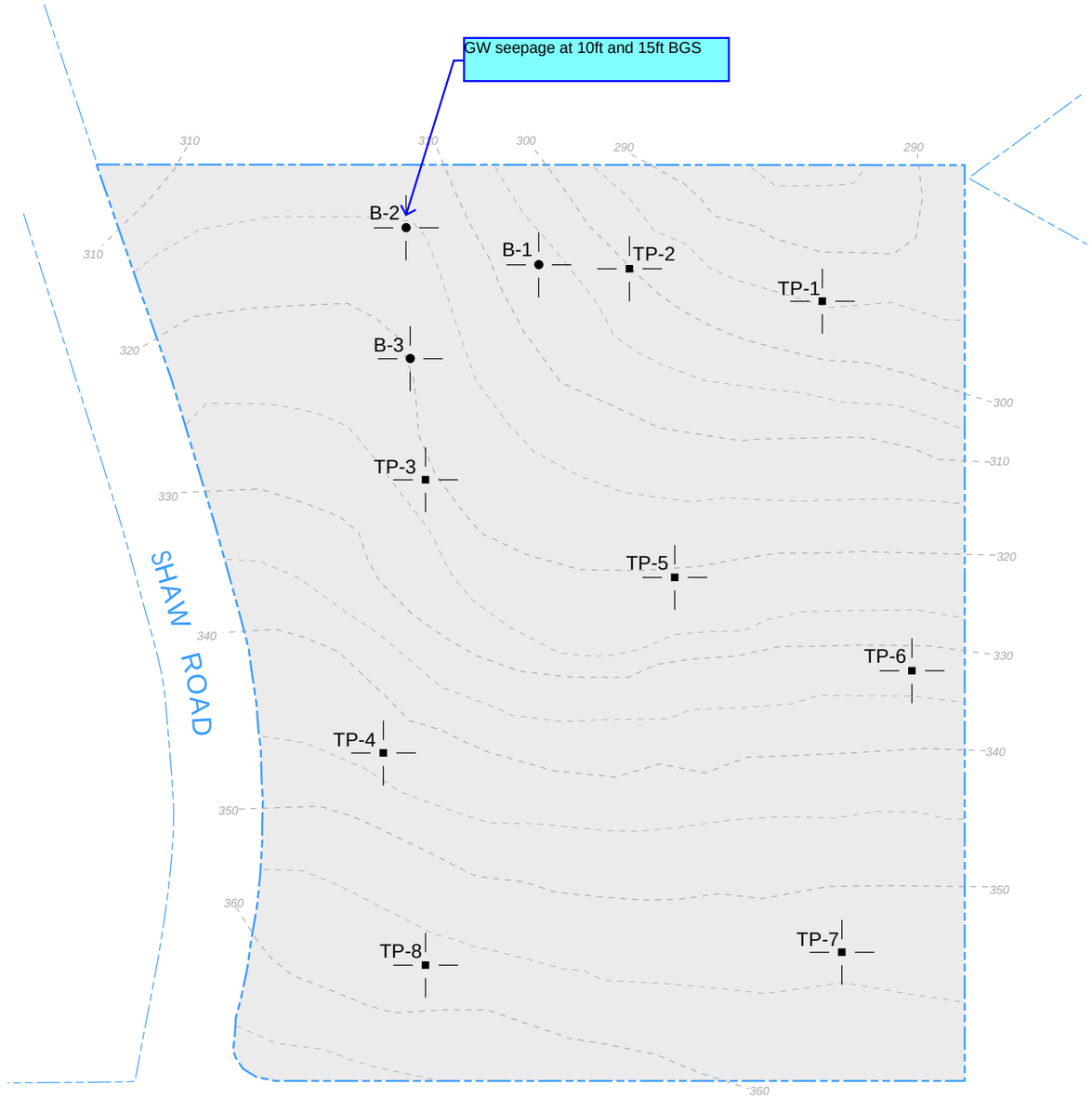
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Vicinity Map
Normandy Heights
Puyallup, Washington

Drwn. MRS	Date 05/02/2022	Proj. No. 0593
Checked CGH	Date May 2022	Plate 1



LEGEND

B-1 — Approximate Location of ESNW Boring, Proj. No. ES-0593.03, Feb. 2022

TP-1 — Approximate Location of ESNW Test Pit, Proj. No. ES-0593, Oct. 2006

Subject Site

NORTH

0 50 100 200

1"=100'

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.

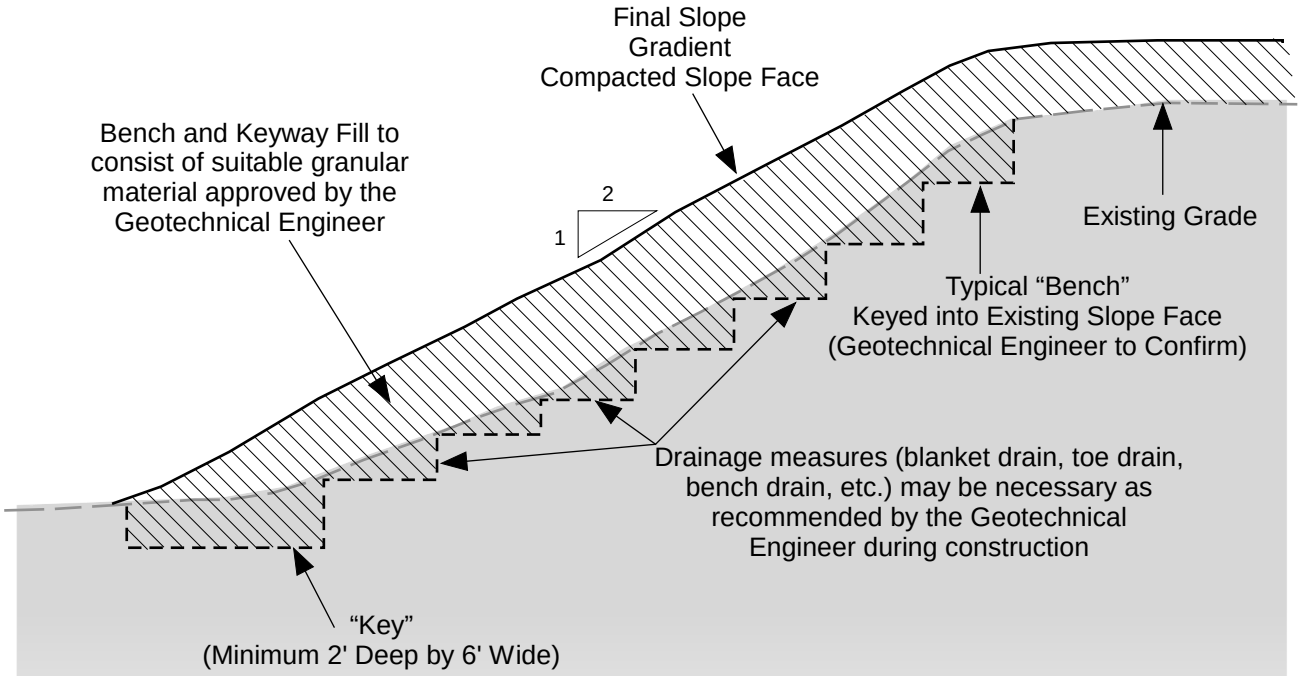
NOTE: This plate may contain areas of color. ESNW cannot be responsible for any subsequent misinterpretation of the information resulting from black & white reproductions of this plate.

Subsurface Exploration Plan
Normandy Heights
Puyallup, Washington

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

Drwn. By	MRS
Checked By	CGH
Date	05/02/2022
Proj. No.	0593
Plate	2

SCHEMATIC ONLY - NOT TO SCALE
NOT A CONSTRUCTION DRAWING



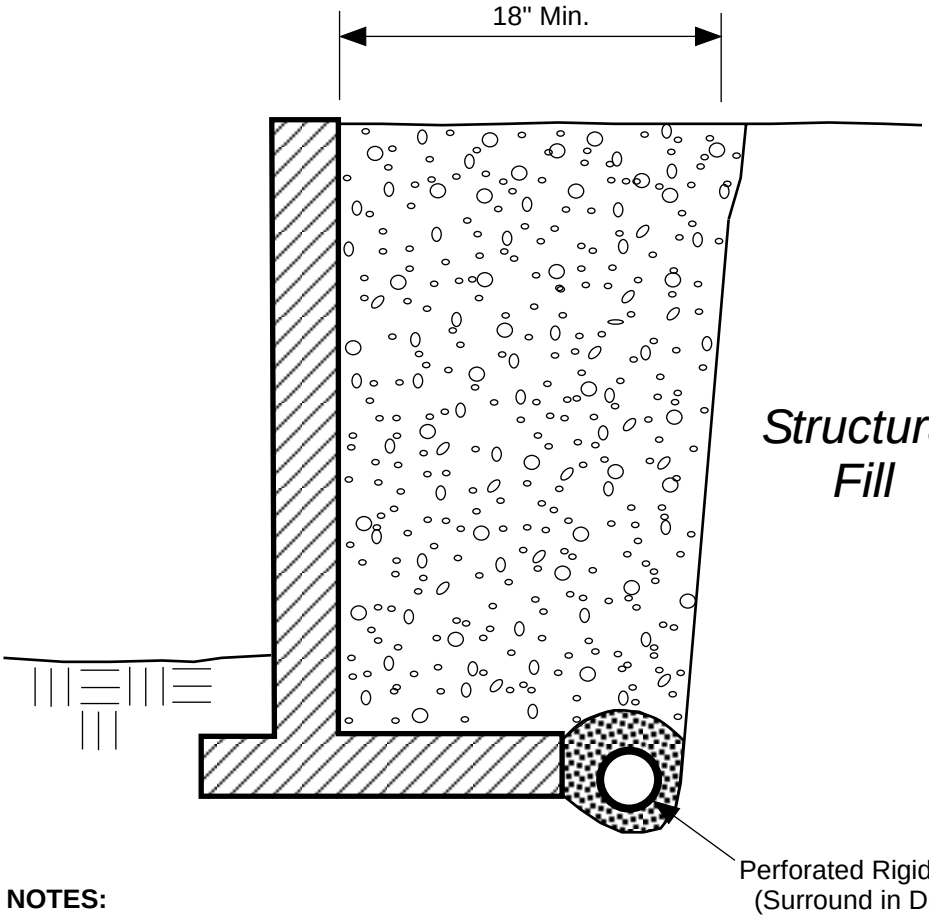
NOTES:

- Slope should be stripped of topsoil and unsuitable materials prior to excavating Keyway or benches.
- Benches will typically be equal to a bulldozer blade width of approximately 8 feet but shall be at least 4 feet.
- Final slope gradient should be 2H : 1V.
- Final slope face should be densified by over-building with compacted fill and trimming back to shape or by compaction with a bulldozer or vibratory drum roller.
- Planting or hydroseeding slope face with a rapid growth deep-rooted vegetative mat will reduce erosion potential of slope area.
- Use of pegged-in-place jute matting or geotechnical fabric will help maintain the seed and mulch in place until the root system has an opportunity to germinate.
- Structural fill should be placed in thin loose lifts not exceeding 12 inches in thickness. Each lift should be compacted to no less than the degree specified in the "Site Preparation and Earthwork" section of this report. No additional lift should be placed until compaction is achieved.

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

Slope Fill Detail
Normandy Heights
Puyallup, Washington

Drwn. MRS	Date 05/02/2022	Proj. No. 0593
Checked SSR	Date May 2022	Plate 3



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

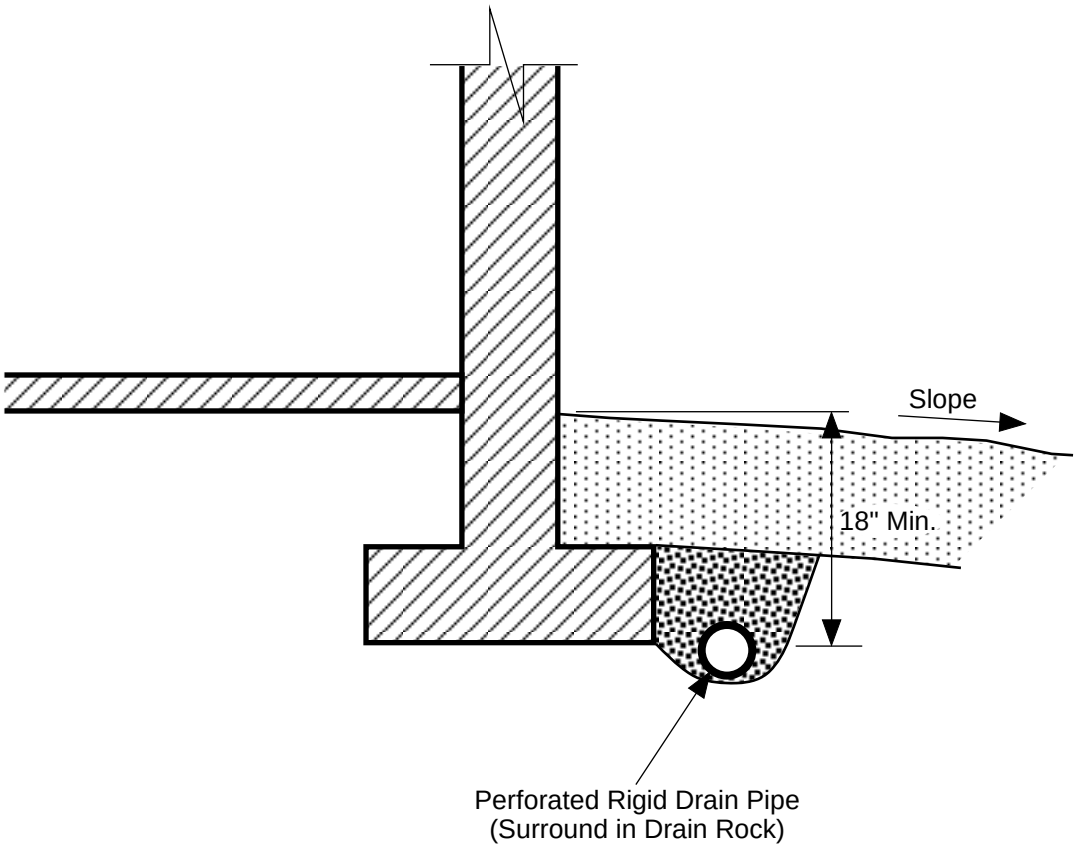
1-inch Drain Rock

Earth Solutions NW LLC

Geotechnical Engineering, Construction Observation/Testing and Environmental Services

Retaining Wall Drainage Detail
Normandy Heights
Puyallup, Washington

Drwn. MRS	Date 05/02/2022	Proj. No. 0593
Checked SSR	Date May 2022	Plate 4



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
Normandy Heights
Puyallup, Washington

Drwn. MRS	Date 05/02/2022	Proj. No. 0593
Checked SSR	Date May 2022	Plate 5

Appendix A

Subsurface Exploration
Boring and Test Pit Logs

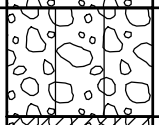
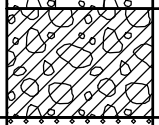
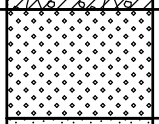
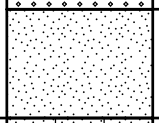
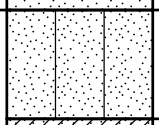
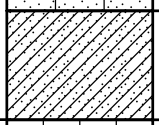
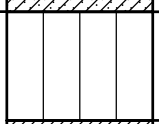
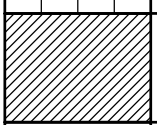
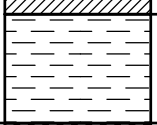
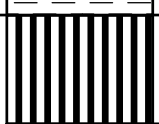
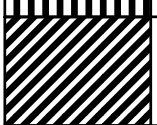
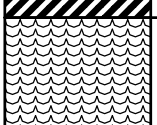
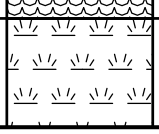
ES-0593

An ESNW representative observed, logged, and sampled eight test pits on October 23, 2006 and three borings on February 8, 2022. The explorations were completed in accessible site areas using exploratory equipment and operators retained by our firm. The test pits were excavated to a maximum exploration depth of about 17 feet bgs and the borings were advanced to a maximum depth of about 21.5 feet bgs. The approximate locations of the test pits and borings are depicted on Plate 2 (Subsurface Exploration Plan). The test pit and boring logs are provided in this Appendix.

The final logs represent the interpretations of the field logs and the results of laboratory analyses. The stratification lines on the logs represent the approximate boundaries between soil types. In actuality, the transitions may be more gradual.

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.

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BORING NUMBER B-1

PROJECT NUMBER ES-0593.03 **PROJECT NAME** Normandy Heights

DATE STARTED 2/8/22 **COMPLETED** 2/8/22 **GROUND ELEVATION**

DRILLING CONTRACTOR Boretec1, Inc. **LATITUDE** 47.17139 **LONGITUDE** -122.25172

DRILLING METHOD HSA **GROUND WATER LEVEL:**

LOGGED BY CGH **CHECKED BY** SSR ▽ **AT TIME OF DRILLING**

NOTES Surface Conditions: drill-pad

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0							
					SM		Brown silty SAND, loose, moist (Drill Pad Fill)
2.5							
	SS	67	1-3-5 (8)	MC = 30.5%			
3.5							
							Brown SILT, loose, moist
5.0							
	SS	67	2-4-5 (9)	MC = 30.7% Fines = 85.5%			-trace iron oxide staining
							[USDA Classification: LOAM]
7.5					ML		
	SS	100	5-6-7 (13)	MC = 30.0%			-becomes medium dense, wet
							-~3" sand lens
10.0							
10.0							Gray poorly graded SAND with silt, medium dense, moist
	SS	67	6-8-11 (19)	MC = 12.0%			
12.5					SP-SM		
15.0							
15.0							

(Continued Next Page)

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BORING NUMBER B-1

PROJECT NUMBER ES-0593.03 **PROJECT NAME** Normandy Heights

DATE STARTED 2/8/22 **COMPLETED** 2/8/22 **GROUND ELEVATION**

DRILLING CONTRACTOR Boretec1, Inc. **LATITUDE** 47.17139 **LONGITUDE** -122.25172

DRILLING METHOD HSA **GROUND WATER LEVEL:**

LOGGED BY CGH **CHECKED BY** SSR ▽ **AT TIME OF DRILLING**

NOTES Surface Conditions: drill-pad

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
15.0							
	SS	67	8-8-12 (20)	MC = 21.8% Fines = 51.7%	ML		Gray sandy SILT, medium dense, moist [USDA Classification: LOAM]
16.5							

Boring terminated at 16.5 feet below existing grade. No groundwater encountered during drilling. 2" PVC standpipe installed to bottom of boring. Lower 10.0 feet slotted. Well ID: B95510. Boring backfilled with sand/bentonite.

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BORING NUMBER B-2

PROJECT NUMBER ES-0593.03 **PROJECT NAME** Normandy Heights
DATE STARTED 2/8/22 **COMPLETED** 2/8/22 **GROUND ELEVATION**
DRILLING CONTRACTOR Boretec1, Inc. **LATITUDE** 47.17148 **LONGITUDE** -122.25214
DRILLING METHOD HSA **GROUND WATER LEVEL:**
LOGGED BY CGH **CHECKED BY** SSR ▽ **AT TIME OF DRILLING**
NOTES Surface Conditions: cleared brush

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0							Brown SILT, loose, moist
2.5							
5.0	SS	100	1-3-4 (7)	MC = 28.5%			-becomes moist to wet
7.5					ML		
10.0	SS	100	1-3-4 (7)	MC = 33.4% Fines = 90.6%			-very minor perched groundwater seepage -zones of heavy iron oxide staining [USDA Classification: slightly gravelly LOAM]
12.5							
15.0							

GENERAL BH / TP / WELL - 0593-3.GPJ - GRAPHICS TEMPLATE WITH LAT AND LONG.GDT - 5/3/22

(Continued Next Page)

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BORING NUMBER B-2

PROJECT NUMBER ES-0593.03 **PROJECT NAME** Normandy Heights
DATE STARTED 2/8/22 **COMPLETED** 2/8/22 **GROUND ELEVATION**
DRILLING CONTRACTOR Boretec1, Inc. **LATITUDE** 47.17148 **LONGITUDE** -122.25214
DRILLING METHOD HSA **GROUND WATER LEVEL:**
LOGGED BY CGH **CHECKED BY** SSR ▽ **AT TIME OF DRILLING**
NOTES Surface Conditions: cleared brush

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
15.0							
	SS	100	3-5-7 (12)	MC = 29.5%	ML		Brown SILT, loose, moist *(continued)* -becomes medium dense, wet -minor perched groundwater seepage
17.5							
20.0							20.0
	SS	67	8-12-15 (27)	MC = 3.7% Fines = 5.4%	SP-SM		Gray poorly graded SAND, medium dense, moist [USDA Classification: slightly gravelly SAND]
							21.5

Boring terminated at 21.5 feet below existing grade. Groundwater seepage encountered at 10.0 and 15.0 feet during drilling. 2" PVC standpipe installed to bottom of boring. Lower 10.0 feet slotted. Well ID: BM5511. Boring backfilled with sand/bentonite.

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BORING NUMBER B-3

PROJECT NUMBER ES-0593.03 **PROJECT NAME** Normandy Heights
DATE STARTED 2/8/22 **COMPLETED** 2/8/22 **GROUND ELEVATION**
DRILLING CONTRACTOR Boretec1, Inc. **LATITUDE** 47.17121 **LONGITUDE** -122.25216
DRILLING METHOD HSA **GROUND WATER LEVEL:**
LOGGED BY CGH **CHECKED BY** SSR ▽ **AT TIME OF DRILLING**
NOTES Surface Conditions: brush

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0							Brown silty SAND, loose, moist
2.5					SM		
5.0							5.0
	SS	100	4-5-6 (11)	MC = 5.0%			Gray poorly graded SAND, medium dense, moist
7.5					SP		
10.0							10.0
	SS	100	4-6-8 (14)	MC = 11.1% Fines = 15.4%			Gray silty SAND, medium dense, moist [USDA Classification: loamy fine SAND]
12.5					SM		
15.0							15.0

(Continued Next Page)

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BORING NUMBER B-3

PROJECT NUMBER ES-0593.03 **PROJECT NAME** Normandy Heights

DATE STARTED 2/8/22 **COMPLETED** 2/8/22 **GROUND ELEVATION**

DRILLING CONTRACTOR Boretec1, Inc. **LATITUDE** 47.17121 **LONGITUDE** -122.25216

DRILLING METHOD HSA **GROUND WATER LEVEL:**

LOGGED BY CGH **CHECKED BY** SSR ▽ **AT TIME OF DRILLING**

NOTES Surface Conditions: brush

DEPTH (ft)	SAMPLE TYPE NUMBER	RECOVERY %	BLOW COUNTS (N VALUE)	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
15.0	SS	67	6-9-10 (19)	MC = 12.0%	SP-SM		Gray poorly graded SAND with silt and gravel, medium dense, moist
17.5							
20.0	SS	67	18-30-11 (41)	MC = 4.1%			-becomes dense
							21.5

Boring terminated at 21.5 feet below existing grade. No groundwater encountered during drilling. 2" PVC standpipe installed to bottom of boring. Lower 10.0 feet slotted. Well ID: BM5512. Boring backfilled with sand/bentonite.

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TEST PIT NUMBER TP-1

PROJECT NUMBER 0593 **PROJECT NAME** Normandy Heights

DATE STARTED 10/23/06 **COMPLETED** 10/23/06 **GROUND ELEVATION** 295 ft

EXCAVATION CONTRACTOR Aikins Excavating **LATITUDE** _____ **LONGITUDE** _____

EXCAVATION METHOD _____ **GROUND WATER LEVEL:**

LOGGED BY WLR **CHECKED BY** WLR ▽ **AT TIME OF EXCAVATION** _____

NOTES Depth of Topsoil & Sod 12": forest duff

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Light brown to brown poorly graded GRAVEL with sand, loose to medium dense, moist
2.5		MC = 2.5%			
5.0		MC = 2.0%	GP-GM		
7.5					
					9.0 286.0
10.0		MC = 3.9% Fines = 1.5%	SP		Brown poorly graded SAND with gravel;, medium dense, moist
12.5					
					14.0 281.0
15.0			GP		Brown poorly graded GRAVEL with sand, medium dense, moist

GENERAL BH / TP / WELL - 0593.GPJ - GRAPHICS TEMPLATE WITH LAT AND LONG.GDT - 5/3/22

(Continued Next Page)

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TEST PIT NUMBER TP-1

PROJECT NUMBER 0593 **PROJECT NAME** Normandy Heights

DATE STARTED 10/23/06 **COMPLETED** 10/23/06 **GROUND ELEVATION** 295 ft

EXCAVATION CONTRACTOR Aikins Excavating **LATITUDE** _____ **LONGITUDE** _____

EXCAVATION METHOD _____ **GROUND WATER LEVEL:**

LOGGED BY WLR **CHECKED BY** WLR ▽ **AT TIME OF EXCAVATION** _____

NOTES Depth of Topsoil & Sod 12": forest duff

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
15.0		MC = 2.6%	GP		Brown poorly graded GRAVEL with sand, medium dense, moist *(continued)*
		MC = 2.9% Fines = 1.3%		17.0	278.0 Test pit terminated at 17.0 feet below existing grade. No groundwater encountered during excavation.

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TEST PIT NUMBER TP-2

PROJECT NUMBER 0593 **PROJECT NAME** Normandy Heights

DATE STARTED 10/23/06 **COMPLETED** 10/23/06 **GROUND ELEVATION** 300 ft

EXCAVATION CONTRACTOR Aikins Excavating **LATITUDE** _____ **LONGITUDE** _____

EXCAVATION METHOD _____ **GROUND WATER LEVEL:**

LOGGED BY WLR **CHECKED BY** WLR ▽ **AT TIME OF EXCAVATION** _____

NOTES Depth of Topsoil & Sod 8": forest duff

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
		MC = 6.9%	SM		Light brown silty SAND, medium dense, moist	
2.5						
					3.0	297.0
		MC = 4.8%			Brown poorly graded SAND with silt, medium dense, moist	
5.0						
			SP-SM			
7.5		MC = 4.8% Fines = 6.1%				
10.0						
		MC = 2.8% Fines = 2.2%			11.0	289.0
			GP		Gray poorly graded GRAVEL with sand, medium dense, moist	
12.5						
					13.0	287.0
			SM		Gray silty SAND, medium dense, moist	
15.0		MC = 9.3% Fines = 34.8%			15.0	285.0

Test pit terminated at 15.0 feet below existing grade. No groundwater encountered during excavation.

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TEST PIT NUMBER TP-3

PROJECT NUMBER 0593 **PROJECT NAME** Normandy Heights

DATE STARTED 10/23/06 **COMPLETED** 10/23/06 **GROUND ELEVATION** 320 ft

EXCAVATION CONTRACTOR Aikins Excavating **LATITUDE** _____ **LONGITUDE** _____

EXCAVATION METHOD _____ **GROUND WATER LEVEL:**

LOGGED BY WLR **CHECKED BY** WLR ▽ **AT TIME OF EXCAVATION** _____

NOTES Depth of Topsoil & Sod 7"

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Light brown to gray poorly graded SAND, medium dense, moist
2.5		MC = 2.7% Fines = 2.2%	SP		
5.0		MC = 4.8%			
7.5					
10.0		MC = 6.3%		10.0	310.0
					Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation.

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TEST PIT NUMBER TP-4

PROJECT NUMBER 0593 **PROJECT NAME** Normandy Heights

DATE STARTED 10/23/06 **COMPLETED** 10/23/06 **GROUND ELEVATION** 345 ft

EXCAVATION CONTRACTOR Aikins Excavating **LATITUDE** _____ **LONGITUDE** _____

EXCAVATION METHOD _____ **GROUND WATER LEVEL:**

LOGGED BY WLR **CHECKED BY** WLR ▽ **AT TIME OF EXCAVATION** _____

NOTES Depth of Topsoil & Sod 8"

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Gray poorly graded SAND with gravel, medium dense, moist
2.5		MC = 2.4%			
5.0		MC = 2.9% Fines = 1.6%	SP		
7.5		MC = 2.5%			
10.0		MC = 3.7%		10.0	335.0
					Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation.

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TEST PIT NUMBER TP-5

PROJECT NUMBER 0593 **PROJECT NAME** Normandy Heights

DATE STARTED 10/23/06 **COMPLETED** 10/23/06 **GROUND ELEVATION** 320 ft

EXCAVATION CONTRACTOR Aikins Excavating **LATITUDE** _____ **LONGITUDE** _____

EXCAVATION METHOD _____ **GROUND WATER LEVEL:**

LOGGED BY WLR **CHECKED BY** WLR ▽ **AT TIME OF EXCAVATION** _____

NOTES Depth of Topsoil & Sod 10"

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Light brown poorly graded SAND with silt, loose to medium dense, moist
2.5		MC = 4.6%	SP		
5.0		MC = 4.7%			
6.0					314.0
7.5		MC = 3.0%	GP		Gray poorly graded GRAVEL with sand, medium dense, moist
10.0		MC = 6.0%			310.0
					Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation.

Earth Solutions NW, LLC
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TEST PIT NUMBER TP-6

PROJECT NUMBER 0593 **PROJECT NAME** Normandy Heights

DATE STARTED 10/23/06 **COMPLETED** 10/23/06 **GROUND ELEVATION** 335 ft

EXCAVATION CONTRACTOR Aikins Excavating **LATITUDE** _____ **LONGITUDE** _____

EXCAVATION METHOD _____ **GROUND WATER LEVEL:**

LOGGED BY WLR **CHECKED BY** WLR ▽ **AT TIME OF EXCAVATION** _____

NOTES Depth of Topsoil & Sod 12"

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Gray poorly graded GRAVEL with sand, medium dense, moist
		MC = 1.7%	GP		
2.5					2.0 333.0 Brown poorly graded SAND with gravel, medium dense, moist
		MC = 3.1% Fines = 0.8%			
5.0					
			SP		
7.5		MC = 2.4%			
10.0		MC = 2.3%			10.0 325.0 Test pit terminated at 10.0 feet below existing grade. No groundwater encountered during excavation.

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TEST PIT NUMBER TP-7

PROJECT NUMBER 0593 **PROJECT NAME** Normandy Heights

DATE STARTED 10/23/06 **COMPLETED** 10/23/06 **GROUND ELEVATION** 350 ft

EXCAVATION CONTRACTOR Aikins Excavating **LATITUDE** _____ **LONGITUDE** _____

EXCAVATION METHOD _____ **GROUND WATER LEVEL:**

LOGGED BY WLR **CHECKED BY** WLR ▽ **AT TIME OF EXCAVATION** _____

NOTES Depth of Topsoil & Sod 6"

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION	
0.0						
		MC = 2.0%	GP		Light brown to gray poorly graded GRAVEL with sand, loose to medium dense, moist	
2.5						
					3.0	347.0
		MC = 3.6% Fines = 1.0%	SP		Gray poorly graded SAND, medium dense, moist	
5.0		MC = 2.9%			5.0	345.0
			GP		Gray poorly graded GRAVEL with sand, medium dense, moist	
					7.0	343.0
7.5			SP		Gray poorly graded SAND with gravel, medium dense, moist	
		MC = 6.2%			8.0	342.0
					Test pit terminated at 8.0 feet below existing grade. No groundwater encountered during excavation.	

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TEST PIT NUMBER TP-8

PROJECT NUMBER 0593 **PROJECT NAME** Normandy Heights

DATE STARTED 10/23/06 **COMPLETED** 10/23/06 **GROUND ELEVATION** 355 ft

EXCAVATION CONTRACTOR Aikins Excavating **LATITUDE** _____ **LONGITUDE** _____

EXCAVATION METHOD _____ **GROUND WATER LEVEL:**

LOGGED BY WLR **CHECKED BY** WLR ▽ **AT TIME OF EXCAVATION** _____

NOTES _____

DEPTH (ft)	SAMPLE TYPE NUMBER	TESTS	U.S.C.S.	GRAPHIC LOG	MATERIAL DESCRIPTION
0.0					Light brown to gray poorly graded SAND with silt, medium dense, moist
		MC = 8.1%	SP-SM		
2.5					
		MC = 6.1%			
					4.0 351.0
					Gray poorly graded SAND, medium dense, moist
5.0					
7.5		MC = 5.1% Fines = 1.6%	SP		
10.0					
		MC = 4.7%			12.0 343.0
					Test pit terminated at 12.0 feet below existing grade. No groundwater encountered during excavation.

Appendix B

Laboratory Test Results

ES-0593

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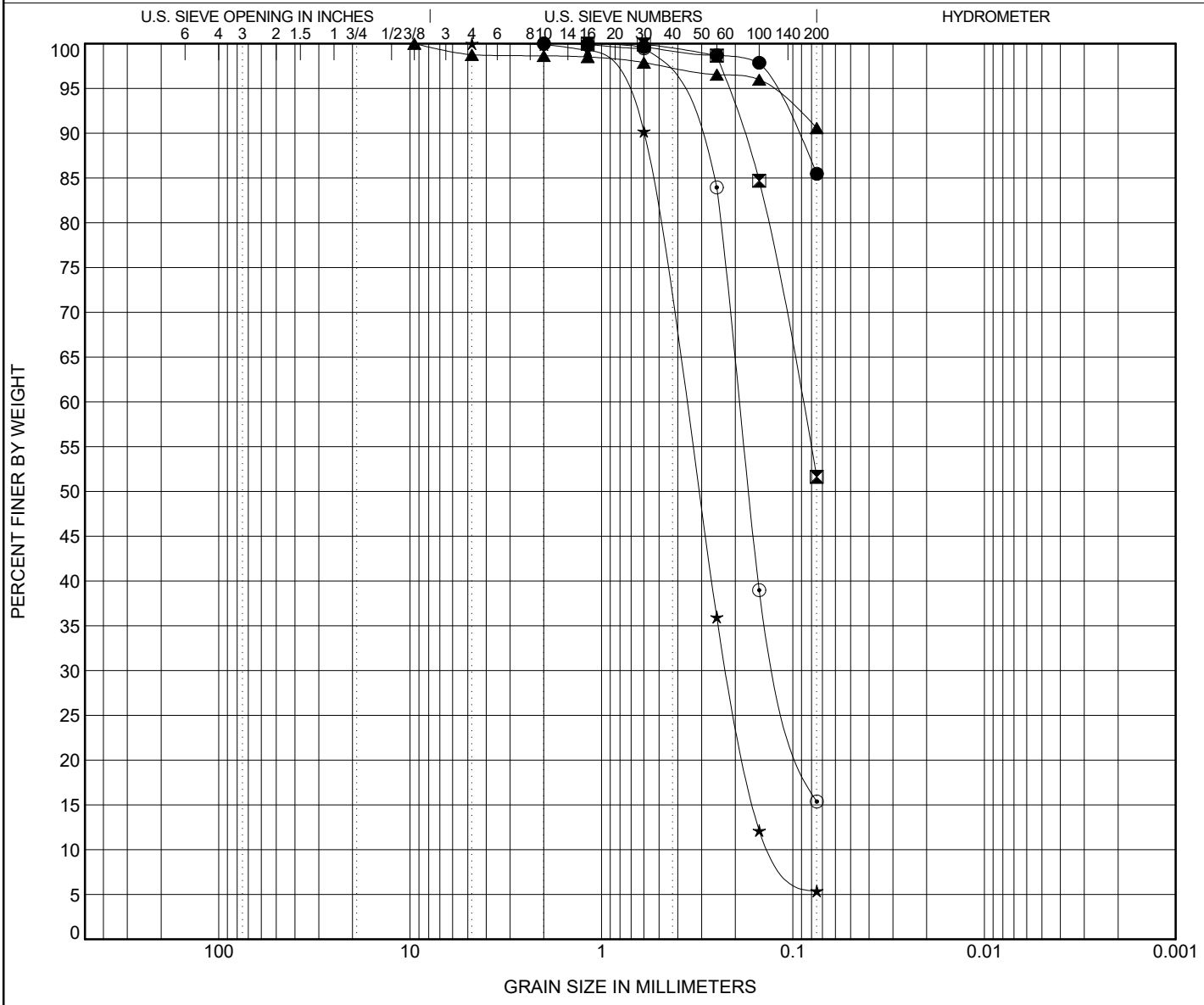
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-0593.03 **PROJECT NAME** Normandy Heights



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	Cc	Cu
●	B-01	5.00ft.	USDA: Brown Loam. USCS: ML.		
⊠	B-01	15.00ft.	USDA: Gray Loam. USCS: Sandy ML.		
▲	B-02	10.00ft.	USDA: Brown Slightly Gravelly Loam. USCS: ML.		
★	B-02	20.00ft.	USDA: Gray Slightly Gravelly Sand. USCS: SP-SM.	1.09	3.06
⊙	B-03	10.00ft.	USDA: Gray Loamy Fine Sand. USCS: SM.		

Specimen Identification			D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	B-01	5.0ft.	2							85.5	
⊠	B-01	15.0ft.	1.18	0.089						51.7	
▲	B-02	10.0ft.	9.5							90.6	
★	B-02	20.0ft.	4.75	0.368	0.22	0.12				5.4	
⊙	B-03	10.0ft.	2	0.19	0.115					15.4	

GRAIN SIZE USDA ES-0593.03 NORMANDY HEIGHTS.GPJ GINT US LAB.GDT 3/3/22

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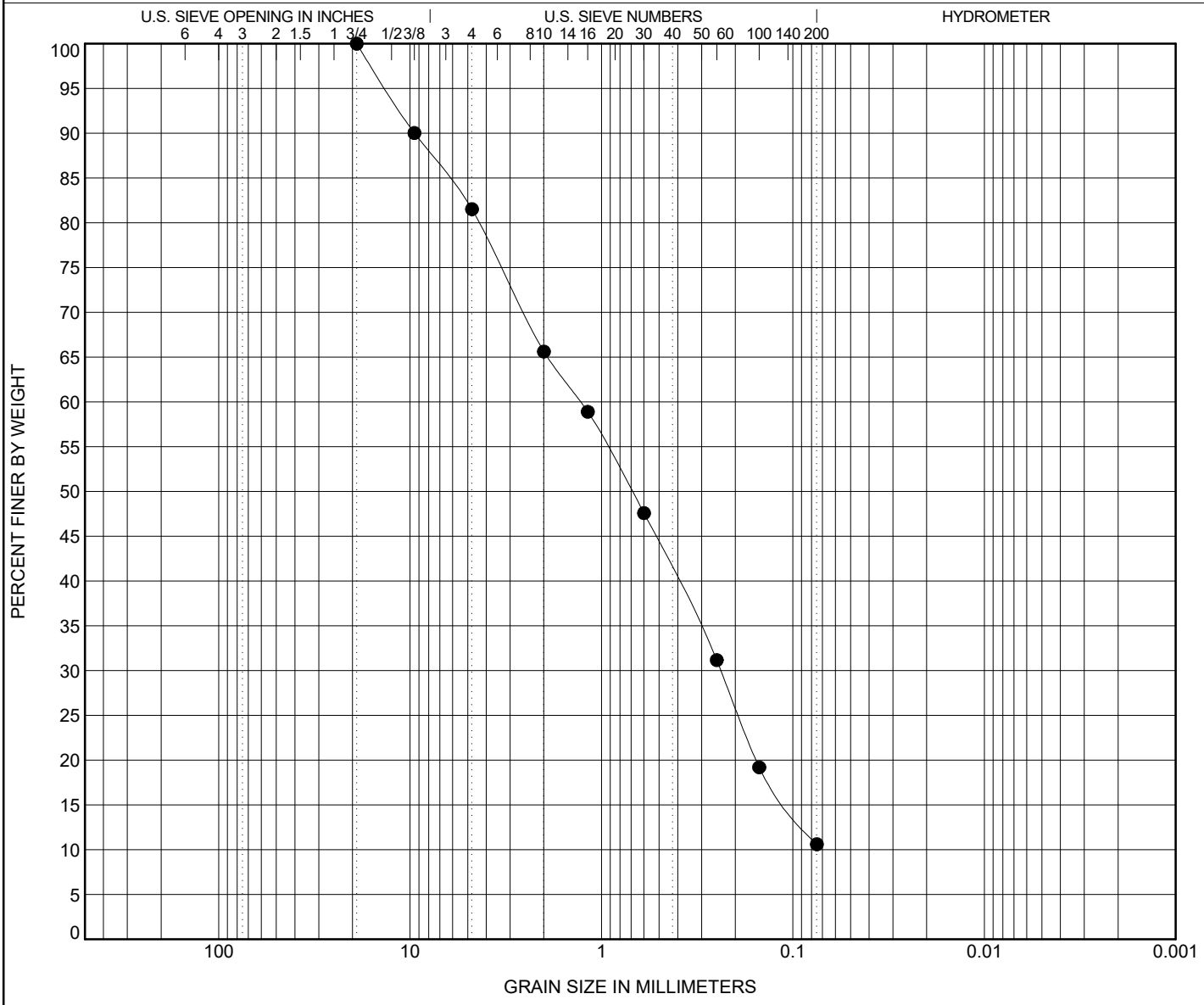
GRAIN SIZE DISTRIBUTION

PROJECT NUMBER ES-0593.03 **PROJECT NAME** Normandy Heights



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	Cc	Cu
●	**B-03**	**20.00ft.**	**USDA: Gray Gravelly Loamy Coarse Sand. USCS: SP-SM with Gravel.**	**0.62**	**18.02**

	Specimen Identification		D100	D60	D30	D10	LL	PL	PI	%Silt	%Clay
●	**B-03**	**20.0ft.**	**19**	**1.286**	**0.238**					**10.6**	

GRAIN SIZE USDA ES-0593.03 NORMANDY HEIGHTS.GPJ GINT US LAB.GDT 3/3/22

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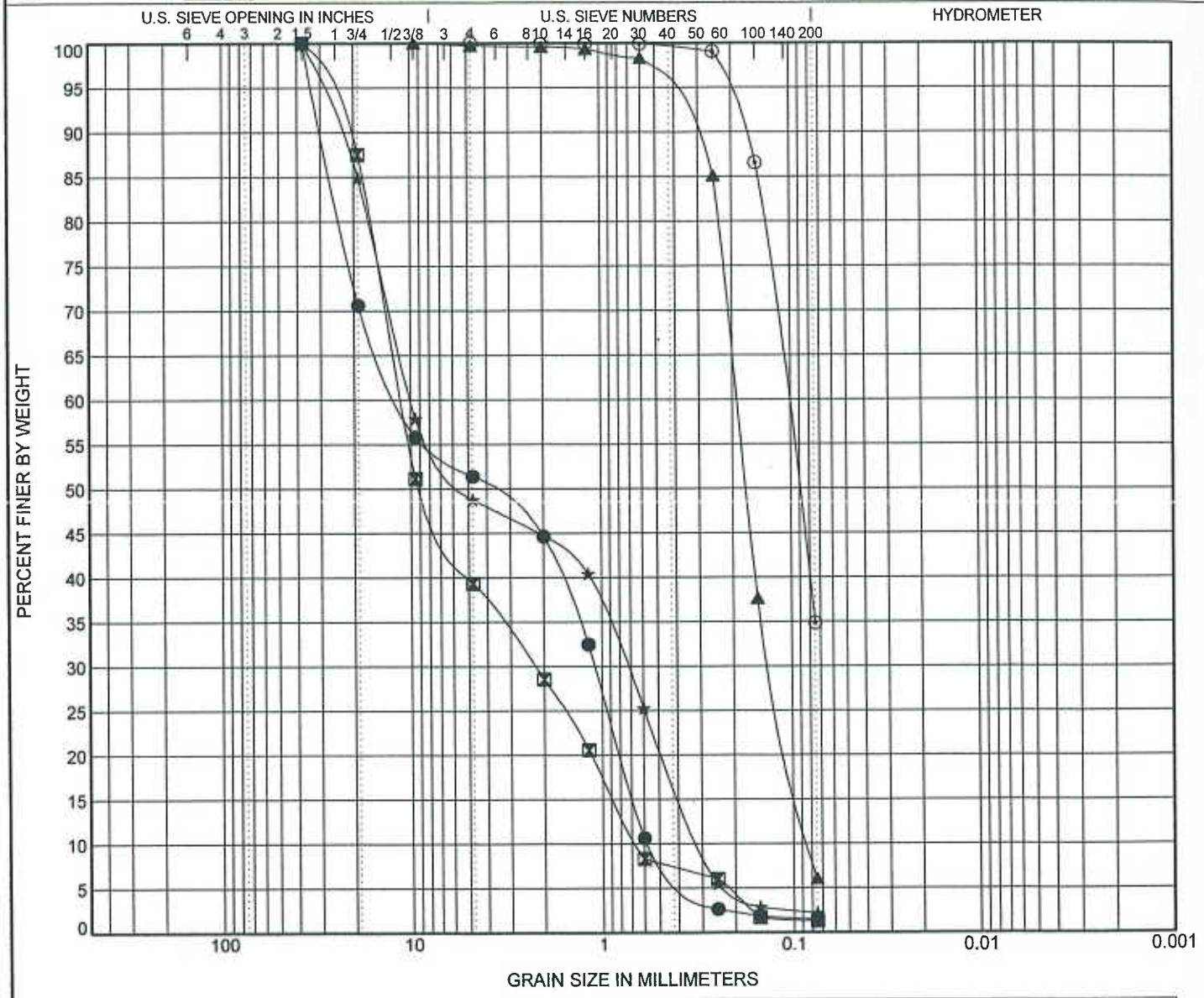
GRAIN SIZE DISTRIBUTION

CLIENT Trinity Land Development **PROJECT NAME** Normandy Heights

PROJECT NUMBER ES-593 **PROJECT LOCATION** Puyallup



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

	Specimen Identification		Classification	LL	PL	PI	Cc	Cu
●	TP-01	10.0ft.	USDA: Brown very gravelly coarse sand, USCS: SP				0.18	20.63
⊠	TP-01	17.0ft.	USDA: Light brown extremely gravelly coarse sand, USCS: GP				0.68	17.06
▲	TP-02	8.0ft.	USDA: Light brown fine sand, USCS: SP-SM				1.03	2.33
★	TP-02	11.0ft.	USDA: Gray very gravelly coarse sand, USCS: GP				0.18	32.81
⊙	TP-02	15.0ft.	USDA: Gray fine sandy loam, USCS: SM					

	Specimen Identification		D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-01	10.0ft.	37.5	11.554	1.093	0.56	48.6	49.9	1.5	
⊠	TP-01	17.0ft.	37.5	11.246	2.248	0.659	60.7	38.1	1.3	
▲	TP-02	8.0ft.	9.5	0.191	0.127	0.082	0.3	93.7	6.1	
★	TP-02	11.0ft.	37.5	10.02	0.741	0.305	51.2	46.6	2.2	
⊙	TP-02	15.0ft.	4.75	0.105			0.0	65.2	34.8	

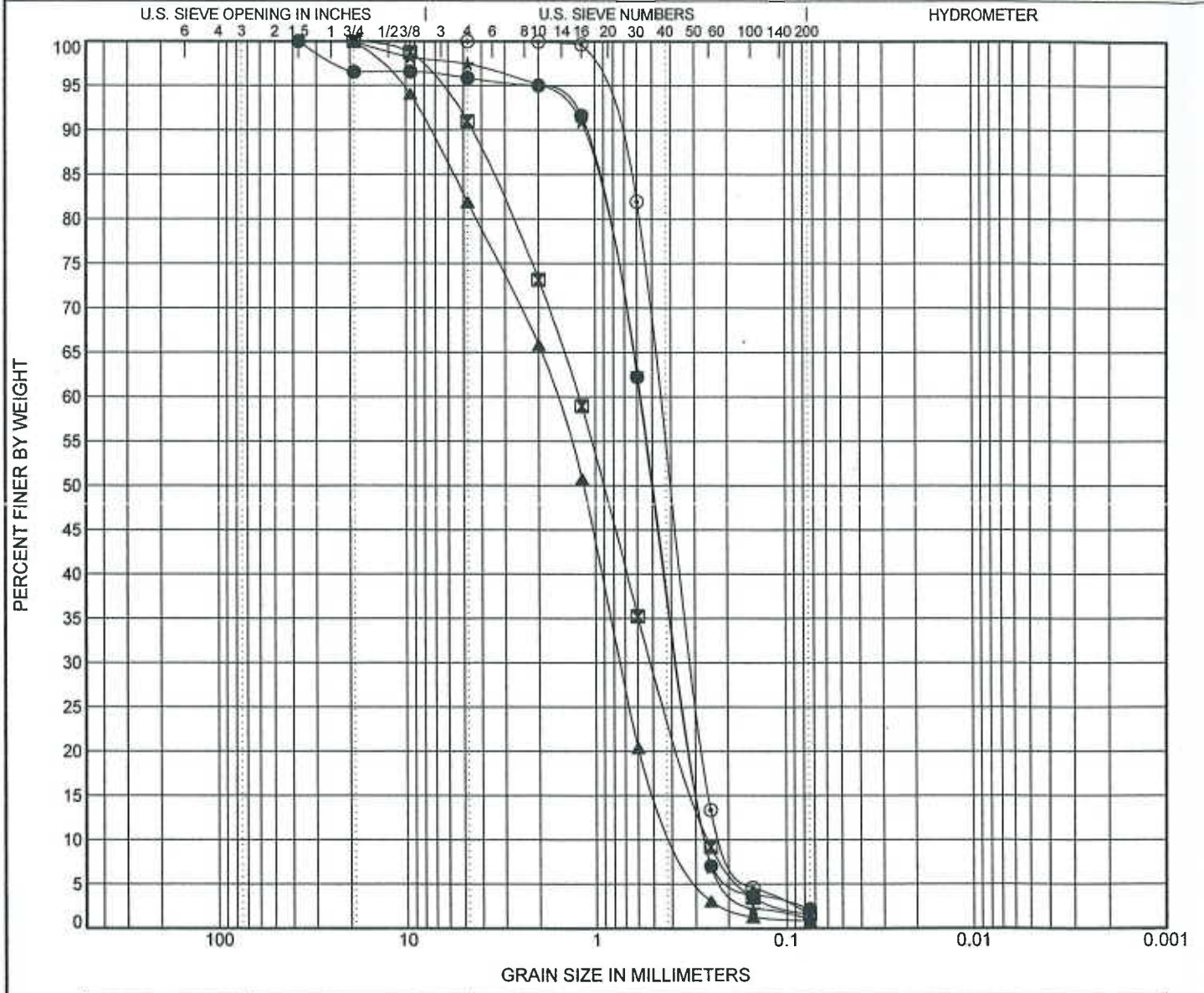
GRAIN SIZE ES-593.GPJ GINT US LAB.GDT 10/30/06

Earth Solutions NW, LLC
2881 152nd Avenue N.E.
Redmond, WA 98052
Telephone: (425) 284-3300
Fax: (425) 284-2855

GRAIN SIZE DISTRIBUTION

CLIENT Trinity Land Development **PROJECT NAME** Normandy Heights

PROJECT NUMBER ES-593 **PROJECT LOCATION** Puyallup



COBBLES	GRAVEL		SAND			SILT OR CLAY
	coarse	fine	coarse	medium	fine	

Specimen Identification			Classification	LL	PL	PI	Cc	Cu
●	TP-03	3.0ft.	USDA: Light brown sand, USCS: SP				0.85	2.21
⊠	TP-04	4.0ft.	USDA: Brown gravelly coarse sand, USCS: SP				0.80	4.77
▲	TP-06	4.0ft.	USDA: Light brown gravelly coarse sand, USCS: SP				0.95	4.59
★	TP-07	4.0ft.	USDA: Brown sand, USCS: SP				0.85	2.19
⊙	TP-08	8.0ft.	USDA: Gray sand, USCS: SP				1.03	2.21

Specimen Identification			D100	D60	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	TP-03	3.0ft.	37.5	0.579	0.36	0.262	4.1	93.7	2.2	
⊠	TP-04	4.0ft.	19	1.226	0.503	0.257	9.0	89.4	1.6	
▲	TP-06	4.0ft.	19	1.631	0.743	0.355	18.1	81.1	0.8	
★	TP-07	4.0ft.	19	0.575	0.359	0.263	2.6	96.4	1.0	
⊙	TP-08	8.0ft.	4.75	0.453	0.309	0.205	0.0	98.4	1.6	

GRAIN SIZE ES-593.GPJ GINT US LAB.GDT 10/30/06

Report Distribution

ES-0593

EMAIL ONLY

RM Homes, LLC
2913 – 5th Avenue Northeast, Suite 201
Puyallup, Washington 98372

Attention: Mr. James Kerby

6.2 Wetland and Fish and Wildlife Assessment prepared by Soundview Consultants dated February 2022

WETLAND AND FISH AND WILDLIFE HABITAT ASSESSMENT REPORT

DEER CREEK

FEBRUARY 2022

Soundview Consultants
Environmental Assessment
Planning + Land Use Solutions

WETLAND AND FISH AND WILDLIFE HABITAT ASSESSMENT REPORT

DEER CREEK

FEBRUARY 24, 2022

PROJECT LOCATION
2007 SHAW ROAD
PUYALLUP, WASHINGTON 98372

PREPARED FOR
RM HOMES
2913 5TH AVENUE NORTHEAST, SUITE 201
PUYALLUP, WASHINGTON 98092

PREPARED BY
SOUNDVIEW CONSULTANTS LLC
2907 HARBORVIEW DRIVE
GIG HARBOR, WASHINGTON 98335
(253) 514-8952

Soundview Consultants
Environmental Assessment
Planning + Land Use Solutions

Executive Summary

Soundview Consultants LLC (SVC) has been supporting RM Homes (Applicant) with a wetland and fish and wildlife habitat assessment for proposed residential plat development of an approximately 28.2-acre property located at 2007 Shaw Road in the City of Puyallup, Washington. The subject property consists of one parcel situated in the Southeast ¼ of Section 35, Township 20 North, Range 04 East, W.M. (Pierce County Tax Parcel Number 0420354039).

SVC investigated the subject property for the presence of potentially regulated wetlands, waterbodies, or other fish and wildlife habitat in November of 2021 and January of 2022. Using current methodology, the site investigations identified one potentially regulated wetland (Wetland A) and one stream (Stream Z, locally known as Upper Deer Creek) on the northeastern portion of the subject property. Additionally, one potential offsite wetland (Wetland 1) was identified offsite to the west of the subject property across Shaw Road East. Wetland A is classified as a Category III wetland with a low habitat score of 4 points, which is subject to a standard 80-foot buffer based on the proposed high intensity land use per Puyallup Municipal Code (PMC) 21.06.930(2)(d). Offsite Wetland 1 is classified as a Category IV wetland with a low habitat score of 4 points, which is subject to a standard 50-foot buffer that does not project onto the subject property. Stream Z is considered a perennial, non-fish bearing (Type III) stream and is subject to a 50-foot buffer per PMC 21.06.1050(2)(c). An additional 10-foot building setback is required from the outer edge of all critical area buffers per PMC 21.06.840(1). No other potentially regulated wetlands, waterbodies, or other fish and wildlife habitat were observed on or within 300 feet of the subject property.

The summary table below identifies the potential regulatory status of the identified critical areas by local, state, and federal agencies.

Feature Name	Size (Onsite)	Category/ Type[1]	Regulated Under PMC 21.06	Regulated Under RCW 90.48	Regulated Under Section 404 of the Clean Water Act
Wetland A	~2,020 SF	III	Yes	Yes	Likely
Wetland 1	N/A - offsite	IV	Yes	Yes	Not Likely
Stream Z	~200 LF	Type III	Yes	Yes	Likely

Notes:

1. Current Washington State Department of Ecology (WSDOE) wetland rating system (Hruby, 2014) per PMC 21.06.910(3) and DNR Water Typing system per PMC 21.06.1010(3)(a).

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Figures

Tables

Appendices

Chapter 1. Introduction

Soundview Consultants LLC (SVC) has been supporting RM Homes (Applicant) with a wetland and fish and wildlife habitat assessment for proposed residential development of an approximately 28.2-acre property located at 2007 Shaw Road in the City of Puyallup, Washington. The subject property consists of one parcel situated in the Southeast ¼ of Section 35, Township 20 North, Range 04 East, W.M. (Pierce County Tax Parcel Number 0420354039).

The purpose of this assessment is to identify the presence of potentially regulated wetlands, waterbodies, or other fish and wildlife habitat located on or near the subject property.

This report provides conclusions and recommendations regarding:

- Site description and area of assessment;
- Background research and identification of potentially-regulated critical areas within the vicinity of the proposed project;
- Identification and assessment of potentially-regulated wetlands and other aquatic features;
- Identification and assessment of potentially-regulated fish and wildlife habitat;
- Existing conditions site map detailing identified critical areas, standard buffers, and setbacks; and
- Supplemental information necessary for local regulatory review.

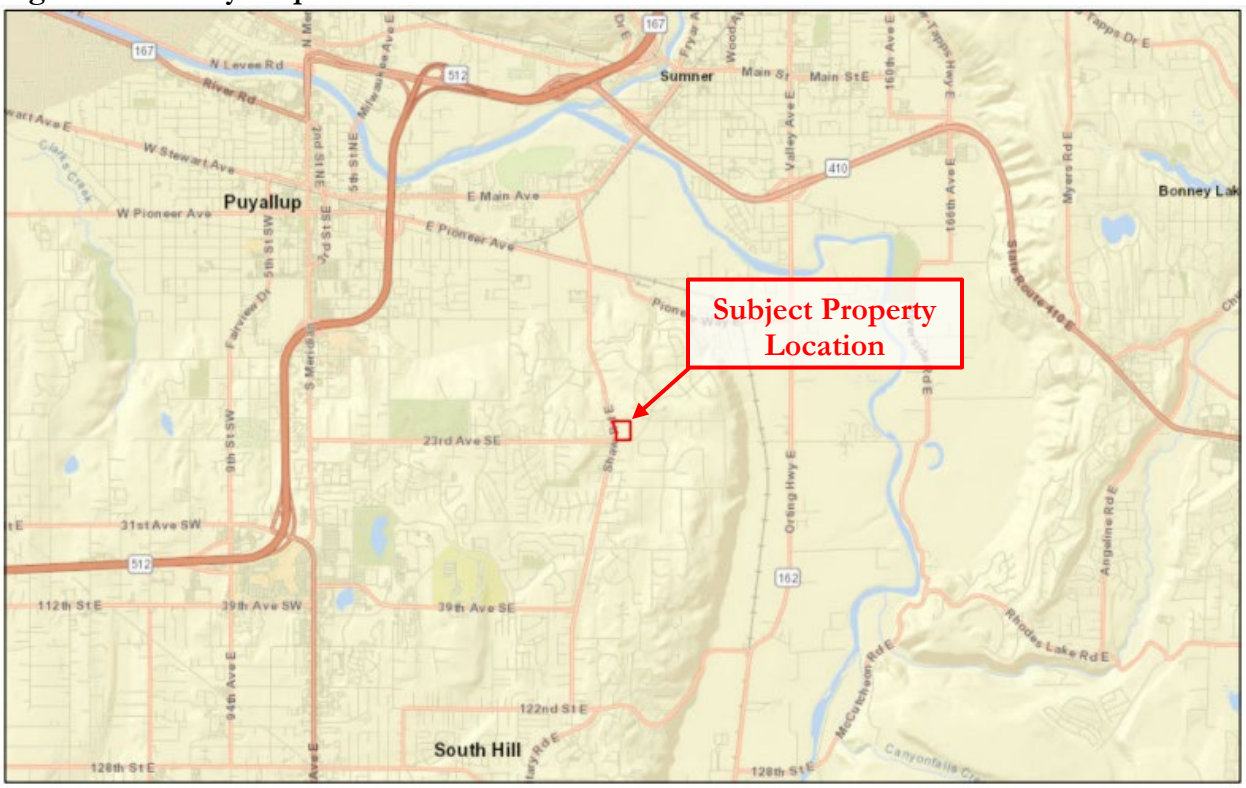
Chapter 2. Proposed Project Location

2.1 Project Location

The subject property consists of an approximately 28.2-acre site located at 2007 Shaw Road in the City of Puyallup, Washington. The subject property consists of one parcel situated in the Southeast ¼ of Section 35, Township 20 North, Range 04 East, W.M. (Pierce County Tax Parcel Number 0420354039).

To access the subject site from Interstate-5 South in the Tacoma area, take exit 127 for Washington-512 East toward Portland and turn left onto Washington-512 East (signs for Puyallup). After 8.5 miles, take the Washington-161 South Exit toward Eatonville and continue onto Washington-161 South/31st Avenue Southwest South for 0.1 mile. Use the left two lanes to turn left onto South Meridian and after 0.7 mile turn right onto 23rd Avenue Southeast. After 1.9 miles, turn left onto Shaw Road East, where the subject property will be located on the right.

Figure 1. Vicinity Map.



Chapter 3. Methods

SVC investigated wetlands, waterbodies, and other potentially-regulated fish and wildlife habitat on and within 300 feet of the subject property in November of 2021 and January of 2022. All determinations were made using observable vegetation, hydrology, and soils in conjunction with data from the U.S. Geological Survey (USGS) topographic map, the Natural Resource Conservation Service (NRCS) Soil Survey, City of Puyallup and Pierce County Geographic Information Systems (GIS) data, U.S. Fish and Wildlife (USFWS) National Wetland Inventory (NWI), Washington Department of Fish and Wildlife (WDFW) Priority Habitats and Species (PHS) and SalmonScape mapping tools, Washington Department of Natural Resources (DNR) Water Typing Map, and various orthophotographic resources. Appendix A contains further details for the methods and tools used to prepare this report.

Wetlands, waterbodies, and select fish and wildlife habitat and species are regulated features per Puyallup Municipal Code (PMC) Title 21.06– Critical Areas, and subject to restricted uses/activities under the same title. Wetland boundaries were determined using the routine approach outlined in the U.S. Army Corps of Engineers' *Wetlands Delineation Manual* (Environmental Laboratory, 1987) and modified according to the guidelines established in the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region, Version 2.0* (USACE, 2010) and *Field Indicators of Hydric Soils in the United States* (NRCS, 2018). Qualified wetland scientists marked the boundary of the wetland onsite with orange surveyor's flagging labeled alpha-numerically and tied to 3-foot lath or vegetation along the wetland boundary. Pink surveyor's flagging was labeled numerically and tied to 3-foot lath or vegetation at formal sampling locations to mark the points where detailed data was collected (DP-1 to DP-4). Additional tests pits were excavated at regular intervals inside and outside of the wetland boundary to further confirm the delineation. Offsite critical areas were not flagged but rather estimated based on visual observations, aerial imagery, and topography, and features are labeled numerically beginning with 1. Please refer to Appendix D for site photographs.

Wetlands were classified using both the hydrogeomorphic (Brinson, 1993) and Cowardin (Cowardin, 1979) classification systems. Following classification and assessment, wetlands were rated and categorized using the *Washington State Wetlands Rating System for Western Washington—Washington Department of Ecology, 2014, Publication No. 04-06-029* (Hruby, 2014) and guidelines established in PMC 21.06.910(3).

The ordinary high water (OHW) mark determination were made using the WSDOE's method detailed in *Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State* (Anderson et al, 2016) and the definitions established in the Shoreline Management Act under the Revised Code of Washington (RCW) 90.58.030(2)(b) and Washington Administrative Code (WAC) 173-22-030(11). Streams were classified using the Washington Department of Natural Resources Water Typing System as outlined in WAC 222-16-030 per PMC 21.06.1010(3)(a).

The fish and wildlife habitat assessment was conducted during the same site visits by qualified fish and wildlife biologists. The experienced biologists made visual observations using stationary and walking survey methods for both aquatic and upland habitats noting any special habitat features or signs of fish and wildlife activity.

Chapter 4. Existing Conditions

4.1 Landscape Setting

The subject property is located in a residential setting within the City of Puyallup's urban growth area (Figure 2). The subject property is currently developed with a single-family residence and associated infrastructure in the northwest portion of the subject property and a gravel parking area on the southwest corner; the remainder of the site is otherwise undeveloped forest with an unmaintained field located in the central portion of the subject property. The subject property abuts undeveloped forest to the north and east, Shaw Road East to the west, and Crystal Ridge Drive Southeast to the south. Topography onsite slopes moderately downward from the southwest to the to the northeast, with elevations ranging from approximately 280 feet above mean sea level (amsl) to approximately 360 asml. A Pierce County contours map is provided in Appendix B1. The subject property is located within Water Resource Inventory Area (WRIA) 10 – Puyallup-White.

Figure 2. Aerial Photograph of Subject Property.

4.2 Soils

The NRCS Soil Survey of Pierce County, Washington, identifies two soil series present on the subject property: Indianola loamy sand, 5 to 15 percent slopes and Kitsap silt loam, 8 to 15 percent slopes. A soil survey map is provided in Appendix B2.

Indianola loamy sand, 5 to 15 percent slopes (18C)
According to the survey, Indianola loamy sand, 6 to 15 percent slopes, is a somewhat excessively drained soil formed in sandy glacial outwash on broad uplands. In a typical profile, the surface layer is dark brown loamy sand to a depth of 7 inches. The underlying material to a depth of 60 inches is dark yellowish brown, brown, or olive brown sand. Some areas of this soil series are known to rest on unstable lake sediments, and be adjacent to areas of a soil that is deep, loose, and gravelly. Roots extend to a depth of more than 60 inches. Indianola loamy sand, 6 to 15 percent slopes, is listed as non-hydric, but as much as 2 percent of the mapped soil unit may contain hydric inclusions of Norma soils associated with depressions (NRCS, n.d).

Kitsap silt loam, 8 to 15 percent slopes (20C)
According to the survey, Kitsap silt loam, 8 to 15 percent slopes, is moderately well drained soil derived from glaciolacustrine deposits on remnant terraces along Puget Sound and major drainageways. In a typical profile, the surface layer is very dark grayish brown and dark brown ashy silt loam to a depth of 10 inches. The upper layer of the subsoil is brown silty clay loam to a depth of 7 inches. The lower layer is mottled, grayish brown silty clay loam to approximately 15 inches thick. The substratum to a depth of 60 inches is stratified, mottled, light olive brown silt loam and silty clay loam. Kitsap silt loam, 8 to 15 percent slopes is listed as non-hydric, but as much as 2 percent of the mapped soil unit may contain hydric inclusions Bellingham soils associated with depressions (NRCS, n.d.).

4.3 Vegetation

General upland forested vegetation in the southern portion of the subject property consists of a canopy dominated by Douglas fir (*Pseudotsuga menziesii*) and western red cedar (*Thuja plicata*) with an understory of vine maple (*Acer circinatum*), salmonberry (*Rubus spectabilis*), hazelnut (*Corylus cornuta*), non-native invasive Himalayan blackberry (*Rubus armeniacus*), and swordfern (*Polystichum munitum*). The upland forest canopy transitions into a more mixed evergreen/deciduous canopy on the northern portion of the subject property and is dominated by western red cedar, western hemlock (*Tsuga heterophylla*), black cottonwood (*Populus balsamifera*), and bigleaf maple (*Acer macrophyllum*). The unmaintained field on the central portion of the subject property is dominated by non-native invasive scotch broom (*Cytisus scoparius*), bracken fern (*Pteridium aquilinum*), orchards grass (*Dactylus glomerata*), colonial bentgrass (*Agrostis capillaris*), and trailing blackberry (*Rubus ursinus*).

4.4 Critical Area Inventories

The City of Puyallup Stream and Wetland Inventory (Appendix B3), Pierce County Stream and Wetland Inventory (Appendix B4), USFWS NWI map (Appendix B5), and WDFW PHS map (Appendix B6) do not identify any potential wetlands on the subject property but do identify a potential stream feature (Upper Deer Creek) on the northeast portion of the subject property. Additionally, the Puyallup Stream and Wetland Inventory identifies a potential offsite wetland feature to the west across Shaw Road East within 300 feet of the site. The WDFW SalmonScape map (Appendix B7) does not identify any salmonids or fish presence on or near the subject property. The DNR stream typing map (Appendix B8) classifies Upper Deer Creek as a non-fish bearing (Type N) stream. No other potential wetlands, waterbodies, or fish and wildlife habitat areas are documented on or within 300 feet of the subject property.

4.5 Precipitation

Precipitation data was obtained from the National Oceanic and Atmospheric Administration (NOAA) station at Seattle-Tacoma (SeaTac) International Airport in order to obtain percent of normal precipitation for the general Puget Sound region during and preceding the investigations. A summary of data collected is provided in Table 1.

Table 1. Precipitation Summary[1]

Date	Day of	Day Before	1 Week Prior	2 Weeks Prior	30 Days Prior (Observed/Normal)	Year to Date (Observed/Normal)[2]	Percent of Normal[3]
11/16/2021	0.00	0.20	4.67	6.95	11.68/5.60	12.85/7.22	209/178
1/5/2022	0.33	0.22	1.96	3.30	5.33/5.73	21.93/16.90	93/130

Notes:

1. Precipitation levels provided in inches. Data obtained from NOAA (http://w2.weather.gov/climate/xmacis.php?wfo=sew) for SeaTac International Airport. Precipitation data is missing for the following dates and may skew calculations for percent of normal: 12/18, 12/28, and 12/30.
2. Year-to-date precipitation is for the 2021/2022 water year from October 1 to the onsite date(s).
3. Percent of normal is shown for the last 30 days and water year to date.

Precipitation levels during the November 2021 site investigation were elevated above the statistical normal range for both the prior 30 days (209 percent of normal) and the 2021/2022 water year (178 percent of normal). While heavy rainfall is common during the wet season, the abnormally high rainfall for both the 30 days prior and the water year suggest hydrologic conditions onsite may have been exaggerated and areas that are not typically wet may have been saturated or inundated during the November 2021 site investigation. Precipitation levels during the January 2022 site investigation were within the statistical normal range for both the prior 30 days (93 percent of normal) and the 2021/2022 water year (130 percent of normal). This precipitation data suggests that hydrological conditions were relatively normal during the January 2022 site investigation. Such conditions were considered in making professional wetland determinations.

Chapter 5. Results

SVC's site investigations in November of 2021 and January of 2022 identified one potentially regulated wetland (Wetland A) and one stream (Stream Z, locally known as Upper Deer Creek) on the northeastern portion of the subject property. Additionally, one potential offsite wetland (Wetland 1) was identified offsite to the west of the subject property across Shaw Road East. No other potentially regulated wetlands, waterbodies, or other fish and wildlife habitat were observed on or within 300 feet of the subject property.

5.1 Wetlands

5.1.1 Overview

The identified wetlands contained a predominance of hydrophytic vegetation, indicators of hydric soils (assumed for offsite wetland), and wetland hydrology according to current wetland delineation methodology. Data forms are provided in Appendix E; wetland rating forms are provided in Appendix F; and wetland rating maps are provided in Appendix G. Table 2 summarizes the wetlands identified during the site investigations.

Table 2. Wetland Summary Table

Wetland	Predominant Wetland Classification / Rating				Size Onsite (SF)	Buffer Width[5] (feet)
	Cowardin[1]	HGM[2]	WSDOE[3]	City of Puyallup[4]		
A	PSSB	Depressional	III	III	2,020	80
1	PFOB	Slope	IV	IV	N/A	50

Notes:
1. Cowardin et al. (1979); Federal Geographic Data Committee (2013); class based on vegetation: PFO = Palustrine Forested, PSS = Palustrine Scrub-Shrub. Modifiers for Water Regime or Special Situations: B = Seasonally Saturated.
2. Brinson, M. M. (1993).
3. Current WSDOE rating (Hruby, 2014).
4. PMC 21.06.910(3) wetland rating designation.
5. PMC 21.06.930(2) wetland buffer standards based on high intensity land use.

Wetland A

Wetland A is approximately 2,020 square feet (0.05 acre) in size onsite and is located on the northeastern portion of the subject property, extending further offsite to the north. Stream Z flows through the wetland; however, no evidence of overbank flooding was observed. Hydrology for Wetland A is provided primarily by a seasonally high groundwater table, direct precipitation, and surface sheet flow from adjacent uplands. Wetland vegetation is dominated by salmonberry (*Rubus spectabilis*), vine maple, youth on age (*Tolmiea menziesii*) and creeping buttercup (*Ranunculus repens*). Wetland A is a Palustrine Scrub-Shrub, Seasonally Saturated (PSSB) wetland. Per PMC 21.06.930(2)(c)(d), Wetland A is classified as a Category III depressional wetland with a habitat score of 4 points. Table 3 provides a detailed summary of Wetland A.

Wetland 1

Wetland 1 is located approximately 90 feet offsite to the west across Shaw Road East. Hydrology for Wetland 1 is provided primarily by a seasonally high groundwater table, direct precipitation, and surface sheet flow from adjacent uplands. Wetland vegetation is dominated by a canopy of Western red cedar, black cottonwood, and red alder (*Alnus rubra*) with an understory dominated by salmonberry and non-native invasive Himalayan blackberry. Wetland A is a Palustrine Forested, Seasonally Saturated (PFOB) wetland. Per PMC 21.06.930(2)(e), Wetland A is classified as a Category IV slope wetland with a habitat score of 4 points. As Wetland 1 is located entirely offsite, no detailed summary table is provided.

Table 3. Wetland A Summary

WETLAND A – INFORMATION SUMMARY		
Location:	Located in the northern portion of the subject property.	
	**Local Jurisdiction**	City of Puyallup
	WRIA	10 – Puyallup - White
	WSDOE 2014 Rating	III
	City of Puyallup rating	III
	Standard Buffer Width	80 feet
	Wetland Size	2,020 square feet
	Cowardin Classification	PSSAB
	HGM Classification	Depressional
	Wetland Data Sheet	DP-2W
	Upland Data Sheet	DP-3U
	Boundary Flag color	Orange
Dominant Vegetation	Wetland vegetation is dominated salmonberry, vine maple, youth on age, and buttercup.	
Soils	Hydric soil indicator A11 (Depleted Below Dark Surface) was observed.	
Hydrology	Hydrology for Wetland A is provided primarily by a seasonally high groundwater table, direct precipitation, and surface sheet flow from surrounding uplands. No evidence of overbank flooding from Stream Z was observed.	
Rationale for Delineation	Wetland boundaries were determined by a topographic drop, and the combined presence of hydric soils and hydrophytic vegetation.	
Rationale for Local Rating	Wetland rating based on the current WSDOE wetland rating system for Western Washington (Hruby, 2014) per PMC 21.06.910(3).	
Wetland Functions Summary		
Water Quality	Wetland A has moderate potential to improve water quality due to the presence of persistent, ungrazed plants in 95 percent of the unit., the presence of septic systems within 250 feet of the wetland, and the presence of a TMDL in the watershed. However, water quality functions are limited due to the permanently flowing outlet, lack of seasonal ponding, and the wetland does not discharge into impaired waters. Wetland A's score for Water Quality Functions is moderate (7).	
Hydrologic	Wetland A has low potential to provide hydrologic functions due to its small contribution of storage capacity within the contributing basin, lack of storage during wet periods, and lack of stormwater discharges or sources of runoff. However, the wetland provides some functions due to at least 25 percent intensive land uses within the contributing basin and presence of flooding downgradient. Wetland A's score for Hydrologic Functions is moderate (5).	
Habitat	Wetland A provides limited habitat functions due to the presence of one Cowardin class and hydroperiod, lack of habitat interspersion, and large portions of accessible habitat due to surrounding high intensity land use. Wetland A's score for Habitat Functions is low (4).	
Buffer Condition	The onsite buffer is relatively intact with native vegetation but contains small amounts of non-native invasive Himalayan blackberry and English holly.	

5.2 Stream Z (Upper Deer Creek)

Stream Z was identified on the northeastern corner of the subject property, flowing southwest for approximately 200 linear feet onsite and through Wetland A. The onsite channel of Stream Z was approximately under 2 feet wide on average with areas of pooling approximately 5 feet wide on average. Substrate within the stream consists of an unconsolidated silt bottom with patches of some sand and gravel. No fish were observed during the site investigation. Based on the amount of surface flow and WDFW does not identify any fish or salmonid presence on or in the vicinity of the subject property, and DNR identifies the stream as a non-fish (Type N) water. In addition, five total fish passage barriers (i.e. culverts and one dam) are documented along Stream Z downgradient of the site (site ids 920402, 920401, 920188, 920406, 105 R041222A), thus preventing fish passage to the segment of Stream Z onsite. Due to the lack of documented fish use or direct observations and documented fish passage barriers downgradient, Stream Z is classified as a Type III stream per PMC 21.06.1010(3). Table 4 provides a detailed summary of Stream Z.

Table 4. Stream Z Summary

<table>
<tr><th colspan="3">STREAM Z – INFORMATION SUMMARY</th></tr>
<tr><td colspan="2" rowspan="7">  </td><td>Feature Name</td><td>Stream Z</td></tr>
<tr><td>WRIA</td><td>10 – Puyallup - White</td></tr>
<tr><td>Local Jurisdiction</td><td>City of Puyallup</td></tr>
<tr><td>DNR Stream Type</td><td>Type N</td></tr>
<tr><td>Snohomish County Stream Rating</td><td>Type III</td></tr>
<tr><td>Standard Buffer Width</td><td>50 feet</td></tr>
<tr><td>Documented Fish Use</td><td>None</td></tr>
<tr><td>Location of Feature</td><td colspan="2">Stream Z is located on the northeast corner of the subject property.</td></tr>
<tr><td>Connectivity (where water flows from/to)</td><td colspan="2">Based on local mapping inventories, Stream Z appears to begin approximately 0.5 linear mile upgradient of the site, to the south of 27th Avenue Southeast. The stream flows in a southwesterly direction on the northeast portion of the site for approximately 200 linear feet and through Wetland A. The stream continues offsite to the north through several documented fish passage barriers before discharging into the Puyallup River 1.95 miles northwest of the site.</td></tr>
<tr><td>Riparian/Buffer Condition</td><td colspan="2">The onsite buffer is relatively intact with native vegetation but contains small amounts of non-native invasive Himalayan blackberry and English holly.</td></tr>
</table>

Chapter 6. Regulatory Considerations

SVC's site investigations in November of 2021 and January of 2022 identified one potentially regulated wetland (Wetland A) and one stream (Stream Z, locally known as Upper Deer Creek) on the northeastern portion of the subject property. Additionally, one potential offsite wetland (Wetland 1) was identified offsite to the west of the subject property across Shaw Road East. No other potentially regulated wetlands, waterbodies, or other fish and wildlife habitat were observed on or within 300 feet of the subject property.

6.1 Local Considerations

6.1.1 Standard Buffer Requirements

PMC 19.37.090.C has adopted the current wetland rating system used by WSDOE (Hruby, 2014). Category III wetlands generally provide a moderate level of function, have usually been disturbed in some way, and are often less diverse and/or more isolated in the landscape than Category II wetlands. Category III wetlands score between 16 and 19 points on the *Revised Washington State Wetland Rating System for Western Washington* (Hruby, 2014). Category IV wetlands generally provide low levels of function; they are often heavily disturbed, smaller, and/or more isolated in the landscape than Category I, II, or III wetlands. Category IV wetlands provide low levels of functions and score less than 16 points.

Wetland A is classified as a Category III wetland with a low habitat score of 4 points, which is subject to a standard 80-foot buffer based on the proposed high intensity land use per PMC 21.06.930(2)(d). Offsite Wetland 1 is classified as a Category IV wetland with a low habitat score of 4 points, which is subject to a standard 50-foot buffer that does not project onsite, especially given the functional interruption from Shaw Road East. Stream Z is considered a perennial, non-fish bearing (Type III) stream and is subject to a 50-foot buffer per PMC 21.06.1050(2)(c). An additional 10-foot building setback is required from the outer edge of all critical area buffers per PMC 21.06.840(1).

6.2 State and Federal Considerations

In a December 2, 2008 memorandum from the Environmental Protection Agency (EPA) and USACE, joint guidance is provided that describes waters that are to be regulated under Section 404 of the Clean Water Act (CWA) (USACE, 2008). This memorandum was amended on February 2, 2012 where the EPA and USACE issued a final guidance letter on waters protected by the CWA.

The 2012 guidance describes the following waters where jurisdiction would be asserted: 1) traditional navigable waters, 2) interstate waters, 3) wetlands adjacent to traditional navigable waters, 4) non-navigable tributaries of traditional navigable waters that are relatively permanent meaning they contain water at least seasonally (e.g. typically three months and does not include ephemeral waters), and 5) wetlands that directly abut permanent waters. The regulated waters are those associated with naturally occurring waters and water courses and not artificial waters (i.e. stormwater pond outfalls).

The 2012 memorandum further goes on to describe waters where jurisdiction would likely require further analysis: 1) Tributaries to traditional navigable waters or interstate waters, 2) Wetlands adjacent to jurisdictional tributaries to traditional navigable waters or interstate waters, and 3) Waters that fall under the "other waters" category of the regulations.

Stream Z is likely a tributary to the Puyallup River, a traditionally navigable water; as such, Stream Z is likely regulated by USACE under Section 404 of the CWA. Wetland A is likely a jurisdictional water due to its direct hydrological connection to Stream Z. Offsite Wetland 1 appears isolated in upland areas with no surface water connections and/or potential significant nexus to jurisdictional waters; as such, Wetland 1 is likely not regulated by the USACE. However, the identified wetlands and stream are considered natural waters that are regulated by the WSDOE through the Revised Code of Washington (RCW) 90.48.

Chapter 7. Closure

The findings and conclusions documented in this report have been prepared for specific application to this project. They have been developed in a manner consistent with that level of care and skill normally exercised by members of the environmental science profession currently practicing under similar conditions in the area. Our work was also performed in accordance with the terms and conditions set forth in our proposal. The conclusions and recommendations presented in this report are professional opinions based on an interpretation of information currently available to us and are made within the operation scope, budget, and schedule of this project. No warranty, expressed or implied, is made. In addition, changes in government codes, regulations, or laws may occur. Due to such changes, our observations and conclusions applicable to this project may need to be revised wholly or in part.

Wetland and OHW status and boundaries identified by SVC are based on conditions present at the time of the site visit and considered preliminary until the flagged wetland and OHW boundaries are validated by the jurisdictional agencies. Validation of the wetland and OHW boundaries and jurisdictional status of such features by the regulatory agencies provides a certification, usually written, that the wetland determination and boundaries verified are the units that will be regulated by the agencies until a specific date or until the regulations are modified. Only the regulatory agencies can provide this certification.

As wetlands and waterbodies are dynamic communities affected by both natural and human activities, changes in boundaries may be expected; therefore, delineations cannot remain valid for an indefinite period of time. Regulatory agencies typically recognize the validity of wetland and OHW delineations for a period of 5 years after completion of an assessment report. Development activities on a site five years after the completion of this assessment report may require reassessment of the wetland and OHW boundaries. In addition, changes in government codes, regulations, or laws may occur. Due to such changes, our observations and conclusions applicable to this site may need to be revised wholly or in part.

Chapter 8. References

Anderson, P.S., S. Meyer, P. Olson, and E. Stockdale. 2016. *Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State*. Publication No. 16-06-029. Final Review Draft. Shorelands and Environmental Assistance Program, Washington State Department of Ecology. Olympia, Washington.

Brinson, M. M. 1993. *A hydrogeomorphic classification for wetlands, Technical Report WRP-DE-4*. U.S. Army Engineer Waterways Experiment Station. Vicksburg, Mississippi.

Cowardin, L.M. V. Carter, F. Golet, and E.T. LaRoe. 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. U.S. Fish and Wildlife Service. Washington D.C.

Environmental Laboratory. 1987. *Corps of Engineers Wetlands Delineation Manual*. Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.

Federal Geographic Data Committee. 2013. *Classification of wetlands and deepwater habitats of the United States. FGDC-STD-004-2013. Second Edition*. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC.

Hitchcock, C.L. & A. Cronquist, Ed. by D. Giblin, B. Ledger, P. Zika, and R. Olmstead. 2018. Flora of the Pacific Northwest, 2nd Edition. U.W. Press and Burke Museum. Seattle, Washington.

Hruby, T. 2014. *Washington State Wetland Rating System for Western Washington: 2014 Update*. (Publication #14-06-029). Olympia, WA: Washington Department of Ecology.

Munsell® Color, 2000. *Munsell® Soil Color Charts*. New Windsor, New York.

Natural Resources Conservation Services (NRCS). N.d. *Soil Data Access Hydric Soils List (Soil Data Access Live)*. Website: https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd1316620.html

NRCS. 2018. *Field Indicators of Hydric Soils in the United States, Version 8.2*. L.M. Vasilas, G.W. Hurt, and J.F. Berkowitz (eds.). USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.

Puyallup Municipal Code (PMC). 2021 *Chapter 21.06 – Critical Areas*. Current through December 7, 2021.

Sheldon, D., T. Hruby, P. Johnson, K. Harper, A. McMillan, T. Granger, S. Stanley, and E. Stockdale. 2005. *Wetlands in Washington State - Volume 1: A Synthesis of the Science*. Washington State Department of Ecology. Publication #05-06-006. Olympia, Washington. March 2005.

U. S. Army Corps of Engineers (USACE). 2008. *Clean Water Act Jurisdiction Following the U.S. Supreme Court's Decision in Rapanos v. United States & Carabell v. United States*. EPA/USACE. December 2, 2008.

USACE. 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0*), ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-3. Vicksburg, MS: U.S. Army Engineer Research and Development Center. Vicksburg, Mississippi.

USACE and Environmental Protection Agency (EPA). 2012. *Guidance on Identifying Waters Protected by the Clean Water Act*. EPA/USACE. February 17, 2012

USACE. 2018. *National Wetland Plant List, version 3.4*. http://wetland-plants.usace.army.mil/.

Zulauf, A.S. 1979. *Soil Survey of Pierce County Area, Washington*. Natural Resource Conservation Service. Washington D.C.

Appendix A — Methods and Tools

Table A1. Methods and tools used to prepare the report.

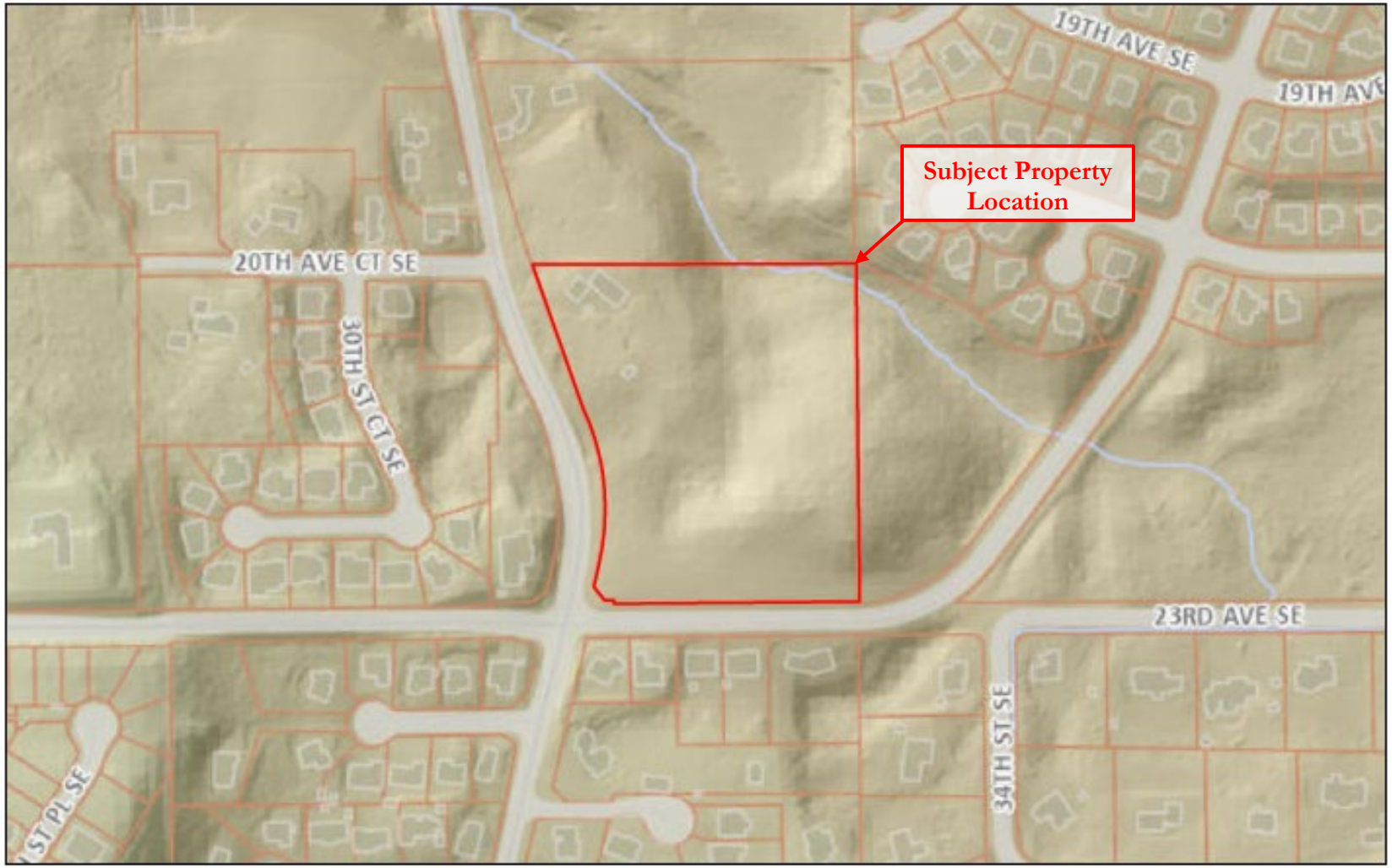
Parameter	Method or Tool	Website	Reference
Wetland Delineation	USACE 1987 Wetland Delineation Manual	http://el.erdc.usace.army.mil/elpubs/pdf/wlman87.pdf	**Environmental Laboratory.** 1987. Corps of Engineers Wetlands Delineation Manual. Technical Report Y-87-1, US Army Engineer Waterways Experiment Station, Vicksburg, Mississippi.
	Western Mountains, Valleys, and Coast Region Regional Supplement	http://www.usace.army.mil/Portals/2/docs/civilworks/regulatory/reg_supp/west_mt_finalsupp.pdf	**U.S. Army Corps of Engineers.** 2010. *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)*, ed. J. S. Wakeley, R. W. Lichvar, and C. V. Noble. ERDC/EL TR-10-3. Vicksburg, MS: U.S. Army Engineer Research and Development Center.
Wetland Classification	USFWS / Cowardin Classification System	http://www.fws.gov/wetlands/Documents/Classification-of-Wetlands-and-Deepwater-Habitats-of-the-United-States.pdf https://www.fgdc.gov/standards/projects/wetlands/nvcs-2013	**Cowardin**, L. M., V. Carter, F. C. Golet, E. T. LaRoe. 1979. Classification of wetlands and deepwater habitats of the United States. Government Printing Office, Washington, D.C. **Federal Geographic Data Committee.** 2013. Classification of Wetlands and Deepwater Habitats of the United States. FGDC-STD-004-2013. Second Edition. Wetlands Subcommittee, Federal Geographic Data Committee and U.S. Fish and Wildlife Service, Washington, DC.
	Hydrogeomorphic Classification (HGM) System	http://el.erdc.usace.army.mil/wetlands/pdfs/wrpde4.pdf	**Brinson**, M. M. (1993). "A hydrogeomorphic classification for wetlands," Technical Report WRP-DE-4, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
Wetland Rating	Washington State Wetland Rating System	http://www.ecy.wa.gov/biblio/0406025.html	**Hruby, T**. 2014. Washington State wetland rating system for western Washington –Revised. Publication # 04-06-025.
Wetland Indicator Status	2016 National Wetland Plant List	https://www.fws.gov/wetlands/documents/National-Wetland-Plant-List-2016-Wetland-Ratings.pdf	**U.S. Army Corps of Engineers.** 2018. National Wetland Plant List, version 3.4**.**
Stream Classification	Department of Natural Resources (DNR) Water Typing System	http://www.stage.dnr.wa.gov/forestpractices/watertyping/	Washington Administrative Code (WAC) 222-16-030. DNR Water typing system.
Stream Delineation	Determining the OHW	https://fortress.wa.gov/ecy/publications/documents/1606029.pdf	**Anderson**, P.S., S. Meyer, P. Olson, and E. Stockdale. 2016. Determining the Ordinary High Water Mark for Shoreline Management Act Compliance in Washington State. Publication No. 16-06-029. Final Review Draft. Shorelands and Environmental Assistance Program, Washington State Department of Ecology. Olympia, Washington.
Plant Names and Identification	USDA Plant Database	http://plants.usda.gov/	Website.
	Flora of the Pacific Northwest	http://www.pnwherbaria.org/florapnw.php	**Hitchcock**, C.L. & A. Cronquist, Ed. by D. Giblin, B. Ledger, P. Zika, and R. Olmstead. 2018. Flora of the Pacific Northwest, 2nd Edition. U.W. Press and Burke Museum. Seattle, Washington.

Parameter	Method or Tool	Website	Reference
Soils Data	NRCS Soil Survey	http://websoilsurvey.nrcs.usda.gov/app/	Website GIS data based upon: **Debose A., and Klungland, M.W.** 1983. Soil Survey of Snohomish County Area, Washington. United States Department of Agriculture, Soil Conservation Service in cooperation with Washington State Department of Natural Resources, and Washington State University, Agriculture Research Center. Washington, D.C.
	Soil Data Access Hydric Soils List	https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcseprd1316620.html	**Natural Resources Conservation Service.** N.d. Soil Data Access Hydric Soils List (Soil Data Access Live).
	Soil Color Charts		**Munsell®** Color. 2000. Munsell® Soil Color Charts. New Windsor, New York.
	Field Indicators of Hydric Soils	https://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_053171.pdf	**NRCS.** 2018. *Field Indictors of Hydric Soils in the United States, Version 8.2. L.M. Vasialas, G.W. Hurt, and C.V. Noble (eds.).* USDA, NRCS, in cooperation with the National Technical Committee for Hydric Soils.
Threatened and Endangered Species	Washington Natural Heritage Program	http://data-wadnr.opendata.arcgis.com/datasets/wnhp-current-element-occurrences	**Washington Natural Heritage Program**. Endangered, threatened, and sensitive plants of Washington. Washington State Department of Natural Resources, Washington Natural Heritage Program, Olympia, WA
	Washington Priority Habitats and Species	http://wdfw.wa.gov/hab/phspage.htm	**Priority Habitats and Species (PHS) Program** Map of priority habitats and species in project vicinity. Washington Department of Fish and Wildlife.
Species of Local Importance	WDFW GIS Data	http://wdfw.wa.gov/mapping/salmonscape/	Website
Report Preparation	Puyallup Municipal Code	http://www.codepublishing.com/WA/Puyallup/	PMC Chapter 21.06 – Critical Areas

Appendix B — Background Information

This appendix includes a Pierce County Contours Map (B1); NRCS Soil Survey Map (B2); City of Puyallup Stream and Wetland Inventory (B3); Pierce County Stream and Wetland Inventory (B4); USFWS NWI Map (B5); WDFW PHS Map (B6); WDFW SalmonScape Map (B7); and DNR Stream Typing Map (B8).

Appendix B1 — Pierce County Contours Map



Appendix B2 — NRCS Soil Survey Map

11/8/2021, 9:10:37 AM

Pierce - Parcels _Query result

USA Soils Map Units

18C: Indianola loamy sand, 5 to 15 percent slopes

20C: Kitsap silt loam, 8 to 15 percent slopes

1:4,514

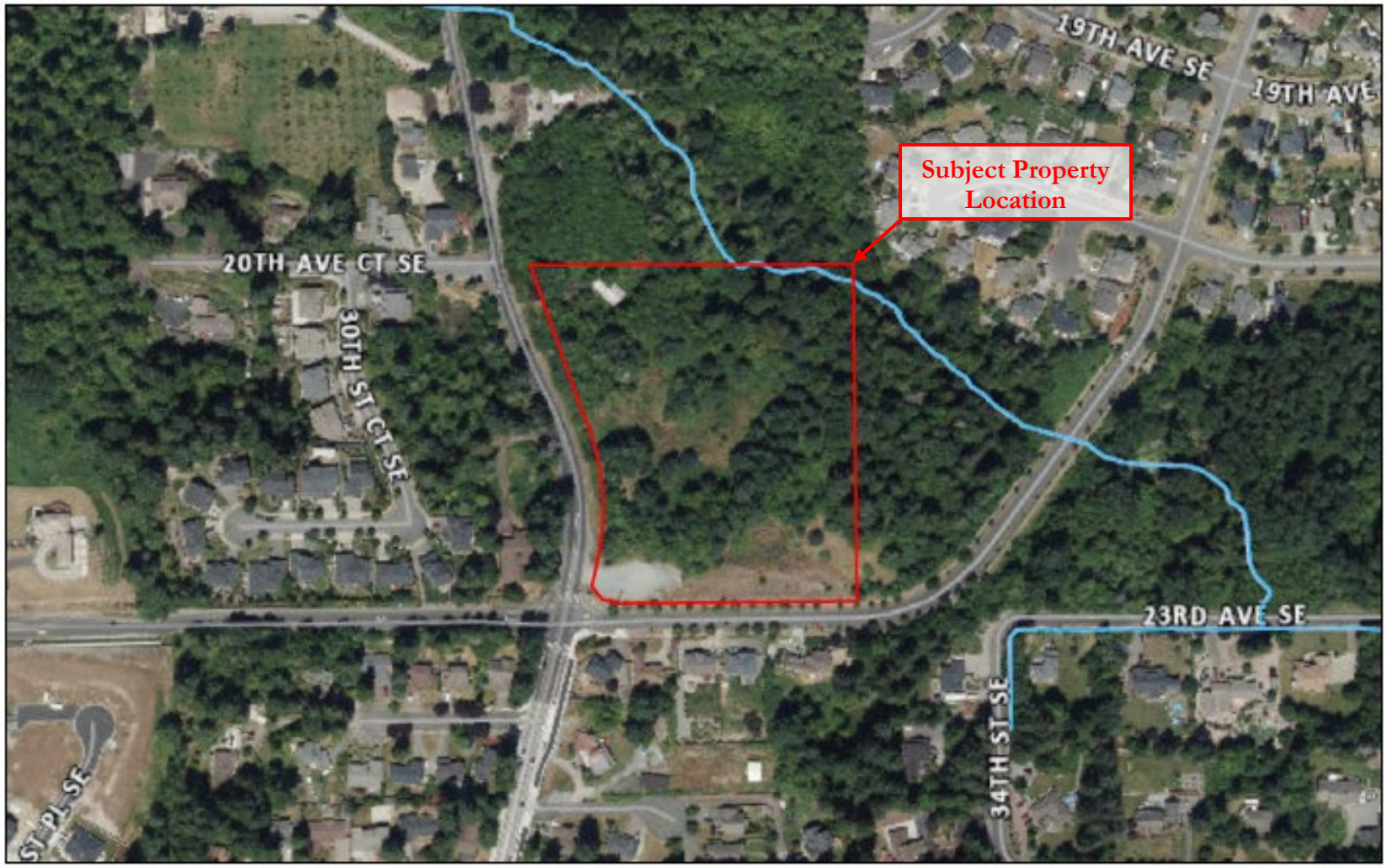
0 140 280 560 ft

0 40 80 160 m

County of King, Bureau of Land Management, Esri Canada, Esri, HERE,

Appendix B3 — City of Puyallup Stream and Wetland Inventory

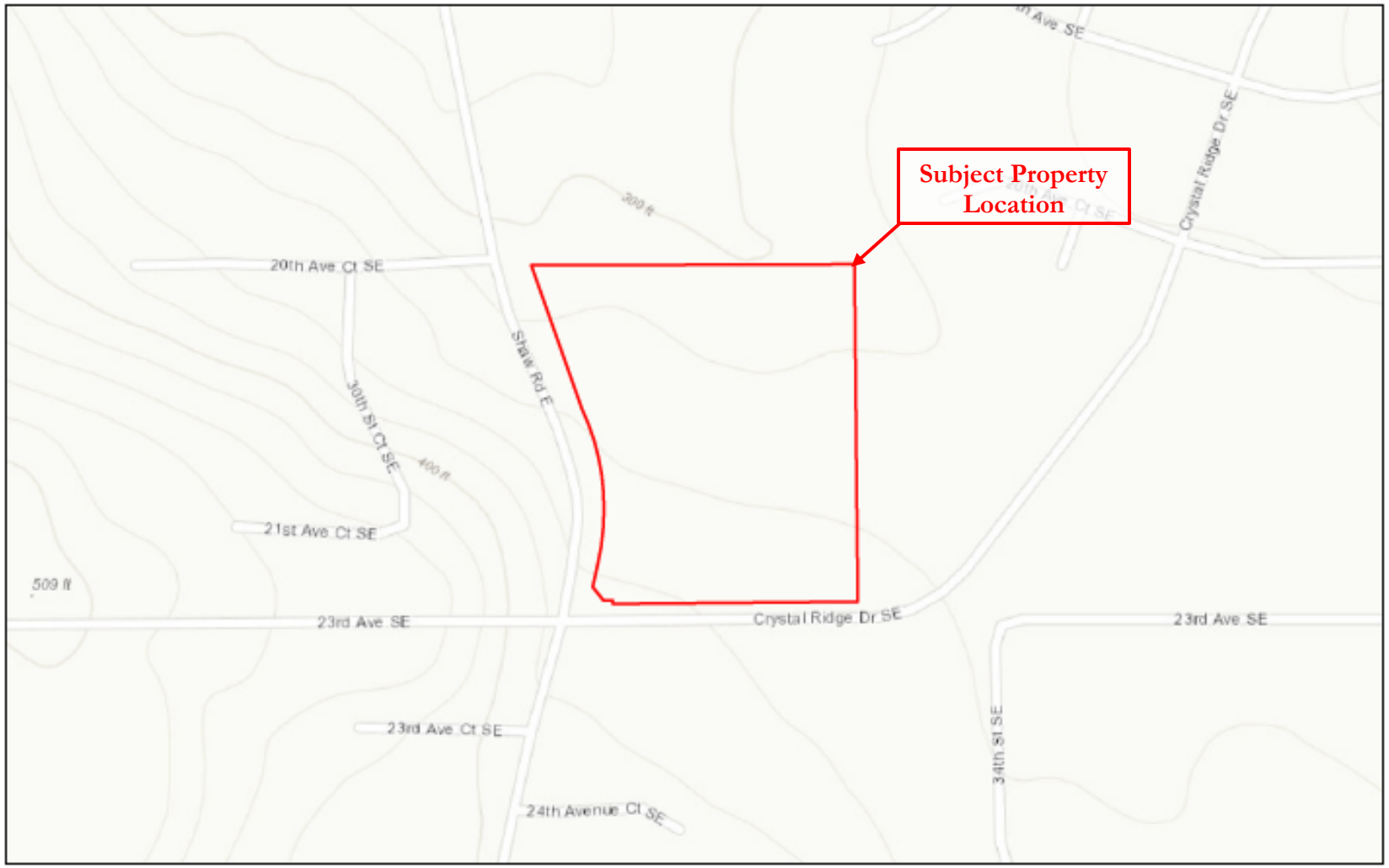
Appendix B4 — Pierce County Stream and Wetland Inventory



Appendix B5 — USFWS NWI Map

Appendix B6 — WDFW PHS Map

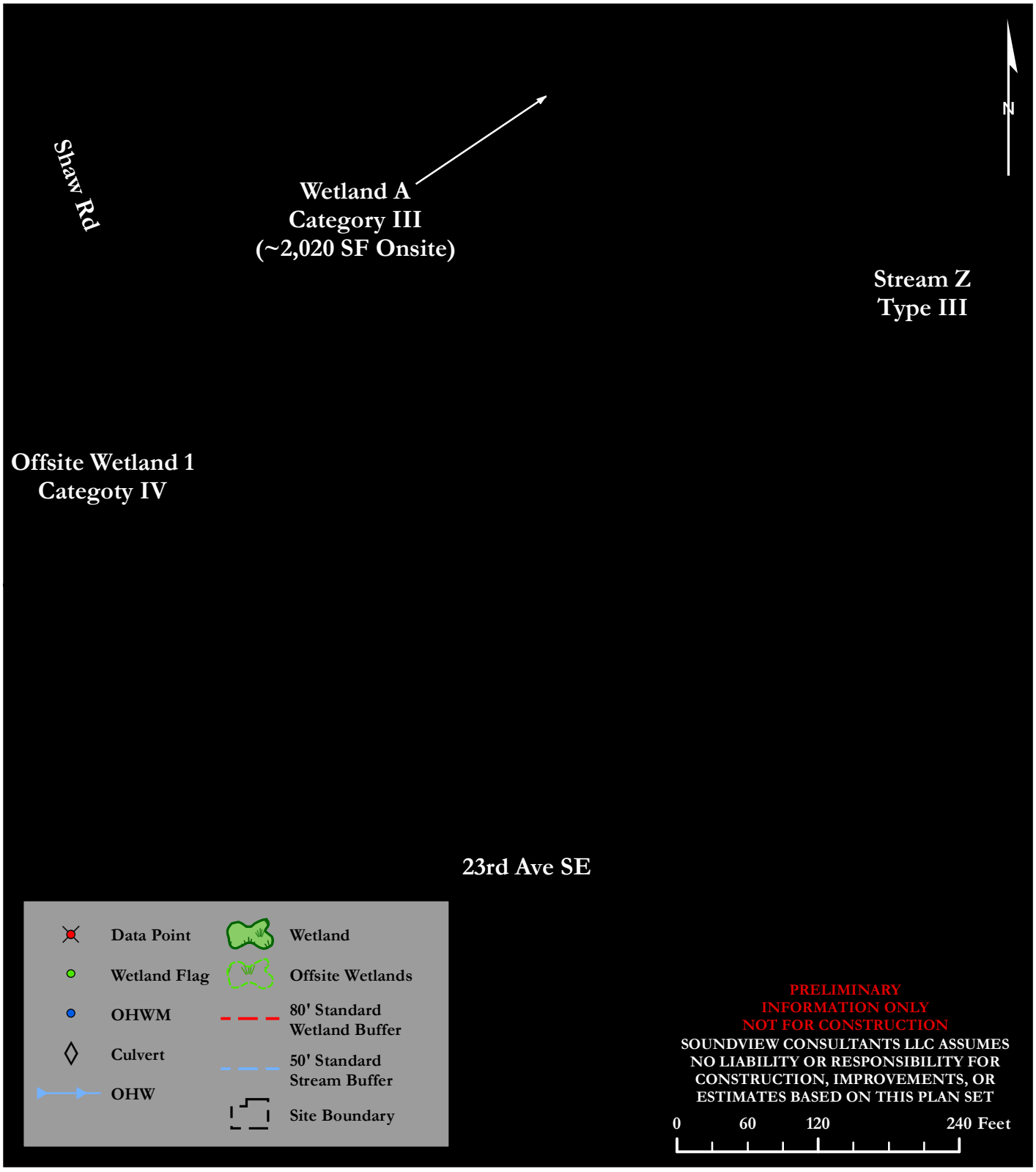
Appendix B7 — WDFW SalmonScape Map



Appendix B8 — DNR Stream Typing Map

Appendix C — Existing Conditions Exhibit

DEER CREEK - EXISTING CONDITIONS MAP



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DEER CREEK

2007 SHAW RD
PUYALLUP, WA 98372

PIERCE COUNTY PARCEL NUMBERS:
0420354039

DATE:	1/10/2022
JOB:	1273.0009
BY:	DDS
SCALE:	1 " = 120 '
FIGURE NO.	1

Appendix D — Site Photographs

Photo 1: General upland conditions on the central portion of the subject property, facing north.

Photo 2: General upland conditions on the northern portion of the subject property, facing east.

Photo 3: Wetland A, facing north.

Photo 4: Stream Z, facing west.

Photo 5: Soil profile at DP-1.

Photo 6: Soil profile at DP-2.

Photo 7: Soil profile at DP-3

Photo 8: Soil profile at DP-4.

Appendix E — Data Forms

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 1273.0009 - Deer Creek City/County: Puyallup/Pierce Sampling Date: 1/5/22

Applicant/Owner: RM Homes State: WA Sampling Point: DP-1U

Investigator(s): Ryan Krapp and Mae Ancheta Section, Township, Range: 35, 20 North, 04 East

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRR): A2 Lat: 47.170783 Long: -122.25236993 Datum: WGS 84

Soil Map Unit Name: Indianola loamy sand, 5 to 15 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks:
Not all three wetland criteria met; only hydrophytic vegetation present. Data was collected in the west-central portion of the subject property in a low topographic depression.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Cytisus scoparius	10	Yes	FACU
2. Rubus armeniacus	5	Yes	FAC
3.			
4.			
5.			
	15	= Total Cover	
Herb Stratum (Plot size: 10 ft)			
1. Agrostis capillaris	70	Yes	FAC
2. Rubus ursinus	15	No	FACU
3. Dactylis glomerata	10	No	FACU
4. Cirsium arvense	3	No	FAC
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	98	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 2

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? **Yes ☒ No ☐**

Remarks:
Hydrophytic vegetation criteria met through the Dominance Test due to the presence of FAC species typical of upland areas.

SOIL

Sampling Point: DP-1U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 10	10YR 3/2	100	-	-	-	-	SaLo	Sandy loam
10 - 15+	10YR 3/3	100	-	-	-	-	SaLo	Sandy loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): --

Hydric Soil Present? Yes ☐ No ☒

Remarks:

No hydric soil criteria met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): None

Water Table Present? Yes ☐ No ☒ Depth (inches): None

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): None

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No wetland hydrology criteria met. Soil pit left open for 20 minutes.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 1273.0009 - Deer Creek City/County: Puyallup/Pierce Sampling Date: 1/5/22

Applicant/Owner: RM Homes State: WA Sampling Point: DP-2W

Investigator(s): Ryan Krapp and Mae Ancheta Section, Township, Range: 35, 20 North, 04 East

Landform (hillslope, terrace, etc.): Depression Local relief (concave, convex, none): Concave Slope (%): 2

Subregion (LRR): A2 Lat: 47.171534 Long: -122.25149739 Datum: WGS 84

Soil Map Unit Name: Indianola loamy sand, 5 to 15 percent slopes NWI classification: N/A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☒ No ☐ Hydric Soil Present? Yes ☒ No ☐ Wetland Hydrology Present? Yes ☒ No ☐	**Is the Sampled Area within a Wetland?** Yes ☒ No ☐

Remarks:
All three wetland criteria met. Data was collected in Wetland A.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	0 = Total Cover		
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Acer circinatum	40	Yes	FACU
2. Rubus armeniacus	30	Yes	FAC
3. Rubus spectabilis	10	No	FAC
4.			
5.			
	80 = Total Cover		
Herb Stratum (Plot size: 10 ft)			
1. Ranunculus repens	10	Yes	FAC
2. Tolmiea menziesii	10	No	FACU
3. Equisetum arvense	5	No	FACU
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	25 = Total Cover		
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0 = Total Cover		

% Bare Ground in Herb Stratum 75

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 67% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 =
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☒ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☒ No ☐

Remarks:
Hydrophytic vegetation criteria met through the Dominance Test.

SOIL

Sampling Point: DP-2W

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 10	10YR 2/2	100	-	-	-	-	SaLo	Sandy loam
10 - 16+	2.5YR 4/1	97	7.5YR 4/4	3	C	M/PL	Sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☒ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): --

Hydric Soil Present? Yes ☒ No ☐

Remarks:

Hydric soil criteria met through indicator A11.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☒ High Water Table (A2)
- ☒ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): None

Water Table Present? Yes ☒ No ☐ Depth (inches): 1

Saturation Present? (includes capillary fringe) Yes ☒ No ☐ Depth (inches): Surface

Wetland Hydrology Present? Yes ☒ No ☐

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Wetland hydrology criteria met through primary indicators A2 and A3.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 1273.0009 - Deer Creek City/County: Puyallup/Pierce Sampling Date: 1/5/22

Applicant/Owner: RM Homes State: WA Sampling Point: DP-3U

Investigator(s): Ryan Krapp and Mae Ancheta Section, Township, Range: 35, 20 North, 04 East

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): None Slope (%): 5

Subregion (LRR): A2 Lat: 47.171488 Long: -122.25153126 Datum: WGS 84

Soil Map Unit Name: Indianola loamy sand, 5 to 15 percent slopes NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☐ No ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks:
No wetland criteria met. Data was collected approximately 15 feet upslope to the south of Wetland A.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga heterophylla	70	Yes	FACU
2. Alnus rubra	10	No	FAC
3. Thuja plicata	10	No	FAC
4.			
	90	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Acer circinatum	20	Yes	FAC
2. Ilex aquifolium	5	No	FACU
3. Rubus spectabilis	5	No	FAC
4.			
5.			
	30	= Total Cover	
Herb Stratum (Plot size: 10 ft)			
1. Polystichum munitum	10	Yes	FACU
2. Rubus ursinus	5	Yes	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	15	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 85

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 25% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☐ No ☒

Remarks:
No hydrophytic vegetation present; did not meet the dominance test. Prevalence index not warranted due to combined lack of hydric soils and wetland hydrology.

SOIL

Sampling Point: DP-3U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 3	10YR 3/1	100	-	-	-	-	SaLo	Sandy loam
3 - 7	10YR 3/2	100	-	-	-	-	SaLo	Sandy loam
7 - 14	10YR 4/3	100	-	-	-	-	SaLo	Sandy loam

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): --

Hydric Soil Present? Yes ☐ No ☒

Remarks:

No hydric soil criteria met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): None

Water Table Present? Yes ☐ No ☒ Depth (inches): None

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): None

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No wetland hydrology criteria met. Soil pit left open for 20 minutes.

WETLAND DETERMINATION DATA FORM – Western Mountains, Valleys, and Coast Region

Project/Site: 1273.0009 - Deer Creek City/County: Puyallup/Pierce Sampling Date: 1/5/22

Applicant/Owner: RM Homes State: WA Sampling Point: DP-4U

Investigator(s): Ryan Krapp and Mae Ancheta Section, Township, Range: 35, 20 North, 04 East

Landform (hillslope, terrace, etc.): Hillslope Local relief (concave, convex, none): Convex Slope (%): 8

Subregion (LRR): A2 Lat: 47.170590 Long: -122.25106019 Datum: WGS 84

Soil Map Unit Name: Indianola loamy sand, 5 to 15 percent slopes NWI classification: N//A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ☒ No ☐ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ☒ No ☐

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes ☐ No ☒ Hydric Soil Present? Yes ☐ No ☒ Wetland Hydrology Present? Yes ☐ No ☒	**Is the Sampled Area within a Wetland?** Yes ☐ No ☒

Remarks:
No wetland criteria met. Data was collected in the east-central portion of the subject property.

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: 30 ft)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	30	Yes	FAC
2. Pseudotsuga menziesii	10	No	FACU
3.			
4.			
	40	= Total Cover	
Sapling/Shrub Stratum (Plot size: 30 ft)			
1. Rubus armeniacus	70	Yes	FAC
2. Acer macrophyllum	20	Yes	FACU
3. Holodiscus discolor	10	No	FACU
4.			
5.			
	100	= Total Cover	
Herb Stratum (Plot size: 10 ft)			
1. Rubus ursinus	70	Yes	FACU
2. Polystichum munitum	10	No	FACU
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	80	= Total Cover	
Woody Vine Stratum (Plot size: 30 ft)			
1.			
2.			
	0	= Total Cover	

% Bare Ground in Herb Stratum 20

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 50% (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- ☐ Rapid Test for Hydrophytic Vegetation
- ☐ Dominance Test is >50%
- ☐ Prevalence Index is ≤3.0[1]
- ☐ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ☐ Wetland Non-Vascular Plants[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Hydrophytic Vegetation Present? Yes ☐ No ☒

Remarks:
No hydrophytic vegetation present; did not meet the dominance test. Prevalence index not warranted due to combined lack of hydric soils and wetland hydrology.

SOIL

Sampling Point: DP-4U

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0 - 5	10YR 3/1	100	-	-	-	-	SaLo	Sandy loam w/ gravel
5 - 14+	10YR 4/4	100	-	-	-	-	SaLo	Sandy loam w/ gravel

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Sandy Mucky Mineral (S1)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Loamy Mucky Mineral (F1) (**except MLRA 1**)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ☐ 2 cm Muck (A10)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if present):

Type: None

Depth (inches): --

Hydric Soil Present? Yes ☐ No ☒

Remarks:

No hydric soil criteria met.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Surface Soil Cracks (B6)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Water-Stained Leaves (B9) (**except MLRA 1, 2, 4A, and 4B**)
- ☐ Salt Crust (B11)
- ☐ Aquatic Invertebrates (B13)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Stunted or Stressed Plants (D1) (**LRR A**)
- ☐ Other (Explain in Remarks)

Secondary Indicators (2 or more required)

- ☐ Water-Stained Leaves (B9) (**MLRA 1, 2, 4A, and 4B**)
- ☐ Drainage Patterns (B10)
- ☐ Dry-Season Water Table (C2)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☐ FAC-Neutral Test (D5)
- ☐ Raised Ant Mounds (D6) (**LRR A**)
- ☐ Frost-Heave Hummocks (D7)

Field Observations:

Surface Water Present? Yes ☐ No ☒ Depth (inches): None

Water Table Present? Yes ☐ No ☒ Depth (inches): None

Saturation Present? (includes capillary fringe) Yes ☐ No ☒ Depth (inches): None

Wetland Hydrology Present? Yes ☐ No ☒

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

No wetland hydrology criteria met. Soil pit left open for 20 minutes.

Appendix F — Wetland Rating Forms

Wetland name or number Wetland A

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland A Date of site visit: 11/16/21, 1/5/2.

Rated by Kyla Caddey/Ryan Krapp Trained by Ecology? ✔ Yes ___No Date of training 11/16 & 10/18

HGM Class used for rating Depressional Wetland has multiple HGM classes? ✔ Y ____N

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.
Source of base aerial photo/map ESRI ArcGIS

OVERALL WETLAND CATEGORY ____ III____ (based on functions ✔ or special characteristics___)

1. Category of wetland based on FUNCTIONS

_____**Category I** – Total score = 23 - 27

_____**Category II** – Total score = 20 - 22

___X___**Category III** – Total score = 16 - 19

_____**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
		Circle the appropriate ratings		
Site Potential	M	L	L	
Landscape Potential	M	M	L	
Value	H	M	M	TOTAL
Score Based on Ratings	7	5	4	16

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	**I II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I II**
Interdunal	**I II III IV**
None of the above	N/A

Wetland name or number Wetland A

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	
Hydroperiods	D 1.4, H 1.2	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 4.3, D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number Wetland A

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

☒ NO – go to 2 ☐ **YES** – the wetland class is **Tidal Fringe** – go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

☐ **NO – Saltwater Tidal Fringe (Estuarine)** ☐ **YES – Freshwater Tidal Fringe**

*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☒ NO – go to 3 ☐ **YES** – The wetland class is **Flats**

*If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?

☐ The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;

☐ At least 30% of the open water area is deeper than 6.6 ft (2 m).

☒ NO – go to 4 ☐ **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?

☒ The wetland is on a slope (*slope can be very gradual*),

☒ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,

☒ The water leaves the wetland **without being impounded**.

☐ NO – go to 5 ☒ **YES –** The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?

☐ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,

☐ The overbank flooding occurs at least once every 2 years.

Wetland name or number Wetland A

☒ NO – go to 6 ☐ **YES** – The wetland class is **Riverine**

NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO – go to 7 ☒ **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☐ NO – go to 8 ☐ **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

   NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

*If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number Wetland A

DEPRESSIONAL AND FLATS WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	1
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions).* Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > $^1/_{10}$ of area points = 1 Wetland has persistent, ungrazed plants < $^1/_{10}$ of area points = 0	5
D 1.4. Characteristics of seasonal ponding or inundation: *This is the area that is ponded for at least 2 months. See description in manual.* Area seasonally ponded is > ½ total area of wetland points = 4 Area seasonally ponded is > ¼ total area of wetland points = 2 Area seasonally ponded is < ¼ total area of wetland points = 0	0
Total for D 1 Add the points in the boxes above	6

Rating of Site Potential If score is: ___ **12-16 = H** _X_ **6-11 = M** ___ **0-5 = L** *Record the rating on the first page*

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges? Yes = 1 No = 0	0
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants? Yes = 1 No = 0	0
D 2.3. Are there septic systems within 250 ft of the wetland? Yes = 1 No = 0	1
D 2.4. Are there other sources of pollutants coming into the wetland that are not listed in questions D 2.1-D 2.3? Source_____ Yes = 1 No = 0	0
Total for D 2 Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **3 or 4 = H** _X_ **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 3.0. Is the water quality improvement provided by the site valuable to society?	
D 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
D 3.2. Is the wetland in a basin or sub-basin where an aquatic resource is on the 303(d) list? Yes = 1 No = 0	1
D 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality (*answer YES if there is a TMDL for the basin in which the unit is found*)? Yes = 2 No = 0	2
Total for D 3 Add the points in the boxes above	3

Rating of Value If score is: _X_ **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

NOTES and FIELD OBSERVATIONS:

Wetland name or number Wetland A

DEPRESSIONAL AND FLATS WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream degradation

D 4.0. Does the site have the potential to reduce flooding and erosion?	
D 4.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression with no surface water leaving it (no outlet) points = 4 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet points = 2 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch points = 1 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 0	0
D 4.2. Depth of storage during wet periods: *Estimate the height of ponding above the bottom of the outlet. For wetlands with no outlet, measure from the surface of permanent water or if dry, the deepest part.* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 Marks of ponding between 2 ft to < 3 ft from surface or bottom of outlet points = 5 Marks are at least 0.5 ft to < 2 ft from surface or bottom of outlet points = 3 The wetland is a "headwater" wetland points = 3 Wetland is flat but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft (6 in) points = 0	0
D 4.3. Contribution of the wetland to storage in the watershed: *Estimate the ratio of the area of upstream basin contributing surface water to the wetland to the area of the wetland unit itself.* The area of the basin is less than 10 times the area of the unit points = 5 The area of the basin is 10 to 100 times the area of the unit points = 3 The area of the basin is more than 100 times the area of the unit points = 0 Entire wetland is in the Flats class points = 5	0
Total for D 4 Add the points in the boxes above	0

Rating of Site Potential If score is: ___ **12-16 = H** ___ **6-11 = M** X **0-5 = L** *Record the rating on the first page*

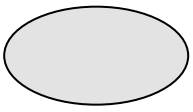
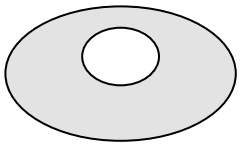
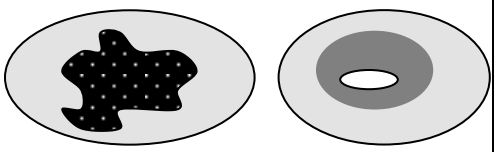
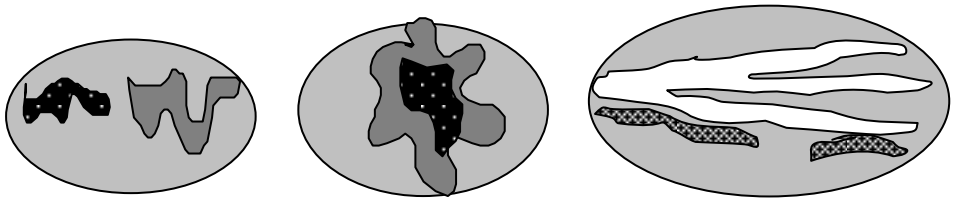
D 5.0. Does the landscape have the potential to support hydrologic functions of the site?	
D 5.1. Does the wetland receive stormwater discharges? Yes = 1 No = 0	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff? Yes = 1 No = 0	0
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)? Yes = 1 No = 0	1
Total for D 5 Add the points in the boxes above	1

Rating of Landscape Potential If score is: ___ **3 = H** X **1 or 2 = M** ___ **0 = L** *Record the rating on the first page*

D 6.0. Are the hydrologic functions provided by the site valuable to society?	
D 6.1. The unit is in a landscape that has flooding problems. *Choose the description that best matches conditions around the wetland unit being rated. Do not add points. Choose the highest score if more than one condition is met.* The wetland captures surface water that would otherwise flow down-gradient into areas where flooding has damaged human or natural resources (e.g., houses or salmon redds): • Flooding occurs in a sub-basin that is immediately down-gradient of unit. points = 2 • Surface flooding problems are in a sub-basin farther down-gradient. points = 1 Flooding from groundwater is an issue in the sub-basin. points = 1 The existing or potential outflow from the wetland is so constrained by human or natural conditions that the water stored by the wetland cannot reach areas that flood. *Explain why* _____ points = 0 _____ There are no problems with flooding downstream of the wetland. points = 0	1
D 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for D 6 Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** X **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number Wetland A

These questions apply to wetlands of all HGM classes. **HABITAT FUNCTIONS** - Indicators that site functions to provide important habitat	
H 1.0. Does the site have the potential to provide habitat?	
H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.* ____Aquatic bed — 4 structures or more: points = 4 ____Emergent — 3 structures: points = 2 _×_Scrub-shrub (areas where shrubs have > 30% cover) — 2 structures: points = 1 ____Forested (areas where trees have > 30% cover) — 1 structure: points = 0 *If the unit has a Forested class, check if:* ____The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon	0
H 1.2. Hydroperiods Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*). ____Permanently flooded or inundated — 4 or more types present: points = 3 ____Seasonally flooded or inundated — 3 types present: points = 2 ____Occasionally flooded or inundated — 2 types present: points = 1 _×_Saturated only — 1 type present: points = 0 ____Permanently flowing stream or river in, or adjacent to, the wetland ____Seasonally flowing stream in, or adjacent to, the wetland ____**Lake Fringe wetland** — **2 points** ____**Freshwater tidal wetland** — **2 points**	0
H 1.3. Richness of plant species Count the number of plant species in the wetland that cover at least 10 ft^2. *Different patches of the same species can be combined to meet the size threshold and you do not have to name the species.* ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle*** If you counted: > 19 species — points = 2 5 - 19 species — points = 1 < 5 species — points = 0	1
H 1.4. Interspersion of habitats Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*  **None** = 0 points  **Low** = 1 point  **Moderate** = 2 points All three diagrams in this row are **HIGH** = 3points 	0

Wetland name or number Wetland A

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* __×__Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). __×__Standing snags (dbh > 4 in) within the wetland __×__Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed)* ____At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	3
Total for H 1 Add the points in the boxes above	4

Rating of Site Potential If score is:___**15-18 = H** ___**7-14 = M** _X_**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* [0.00] % undisturbed habitat **+** [(% moderate and low intensity land uses) [4.55] /2] **=** 2.275 % If total accessible habitat is: > 1/3 (33.3%) of 1 km Polygon points = 3 20-33% of 1 km Polygon points = 2 10-19% of 1 km Polygon points = 1 < 10% of 1 km Polygon points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* [4.24] % undisturbed habitat **+** [(% moderate and low intensity land uses) [25.15] /2] **=** 16.81 % Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10-50% and in 1-3 patches points = 2 Undisturbed habitat 10-50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	1
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	-2
Total for H 2 Add the points in the boxes above	-1

Rating of Landscape Potential If score is:___**4-6 = H** ___**1-3 = M** _X_**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 — It has 3 or more priority habitats within 100 m (see next page) — It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) — It is mapped as a location for an individual WDFW priority species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan × Site has 1 or 2 priority habitats (listed on next page) within 100 m points = 1 Site does not meet any of the criteria above points = 0	1

Rating of Value If score is:___**2 = H** _X_**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number Wetland A

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

— **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

X **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

X **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

— **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

Wetland name or number Wetland A

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt ☐ Yes –Go to **SC 1.1** ☒ No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐ Yes = **Category I** ☐ No - Go to **SC 1.2**	
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. ☐ Yes = **Category I** ☐ No = **Category II**	
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes **– Go to SC 2.2** ☒ No **– Go to SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes **= Category I** ☒ No **= Not a WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes **– Contact WNHP/WDNR and go to SC 2.4** ☒ No **= Not a WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes **= Category I** ☒ No **= Not a WHCV**	
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? ☐ Yes – Go to **SC 3.3** ☒ No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? ☐ Yes – Go to **SC 3.3** ☒ No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? ☐ Yes = **Is a Category I bog** ☐ No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? ☐ Yes = **Is a Category I bog** ☐ No **= Is not a bog**	

Wetland name or number Wetland A

SC 4.0. Forested Wetlands

Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.***

- **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more.
- **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm).

☐Yes **= Category I** ☒No **= Not a forested wetland for this section**

SC 5.0. Wetlands in Coastal Lagoons

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

- The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks
- The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)*

☐Yes – Go to **SC 5.1** ☒No = **Not a wetland in a coastal lagoon**

SC 5.1. Does the wetland meet all of the following three conditions?

- The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100).
- At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.
- The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2)

☐Yes = **Category I** ☐No = **Category II**

SC 6.0. Interdunal Wetlands

Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.***

In practical terms that means the following geographic areas:

- Long Beach Peninsula: Lands west of SR 103
- Grayland-Westport: Lands west of SR 105
- Ocean Shores-Copalis: Lands west of SR 115 and SR 109

☐Yes – Go to **SC 6.1** ☒No = **not an interdunal wetland for rating**

SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? ☐Yes = **Category I** ☐No – Go to **SC 6.2**

SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger?

☐Yes = **Category II** ☐No – Go to **SC 6.3**

SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac?

☐Yes = **Category III** ☐No = **Category IV**

Category of wetland based on Special Characteristics

If you answered No for all types, enter "Not Applicable" on Summary Form

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Wetland name or number Off

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Offsite 1 Date of site visit: 1/5/22

Rated by Ryan Krapp Trained by Ecology? ✔ Yes ___No Date of training 10/18

HGM Class used for rating Slope Wetland has multiple HGM classes? ___Y ✔ N

NOTE: **Form is not complete without the figures requested** *(figures can be combined)*.

Source of base aerial photo/map ESRI ArcGIS

OVERALL WETLAND CATEGORY IV (based on functions ✔ or special characteristics___)

1. Category of wetland based on FUNCTIONS

_____**Category I** – Total score = 23 - 27

_____**Category II** – Total score = 20 - 22

_____**Category III** – Total score = 16 - 19

__X__**Category IV** – Total score = 9 - 15

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
		Circle the appropriate ratings		
Site Potential	L	L	L	
Landscape Potential	M	M	L	
Value	H	M	M	TOTAL
Score Based on Ratings	6	5	4	15

Score for each function based on three ratings *(order of ratings is not important)*

9 = H,H,H
8 = H,H,M
7 = H,H,L
7 = H,M,M
6 = H,M,L
6 = M,M,M
5 = H,L,L
5 = M,M,L
4 = M,L,L
3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

CHARACTERISTIC	CATEGORY
Estuarine	**I II**
Wetland of High Conservation Value	**I**
Bog	**I**
Mature Forest	**I**
Old Growth Forest	**I**
Coastal Lagoon	**I II**
Interdunal	**I II III IV**
None of the above	N/A

Wetland name or number Off

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	
Hydroperiods	D 1.4, H 1.2	
Location of outlet (*can be added to map of hydroperiods)*	D 1.1, D 4.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	D 2.2, D 5.2	
Map of the contributing basin	D 4.3, D 5.3	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	

Riverine Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Ponded depressions	R 1.1	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	R 2.4	
Plant cover of trees, shrubs, and herbaceous plants	R 1.2, R 4.2	
Width of unit vs. width of stream *(can be added to another figure)*	R 4.1	
Map of the contributing basin	R 2.2, R 2.3, R 5.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	R 3.1	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	R 3.2, R 3.3	

Lake Fringe Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	L 1.1, L 4.1, H 1.1, H 1.4	
Plant cover of trees, shrubs, and herbaceous plants	L 1.2	
Boundary of area within 150 ft of the wetland *(can be added to another figure)*	L 2.2	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	L 3.1, L 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	L 3.3	

Slope Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	H 1.1, H 1.4	
Hydroperiods	H 1.2	
Plant cover of **dense** trees, shrubs, and herbaceous plants	S 1.3	
Plant cover of **dense, rigid** trees, shrubs, and herbaceous plants (*can be added to figure above)*	S 4.1	
Boundary of 150 ft buffer (can be added to another figure)	S 2.1, S 5.1	
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	S 3.1, S 3.2	
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	S 3.3	

Wetland name or number Off

HGM Classification of Wetlands in Western Washington

For questions 1-7, the criteria described must apply to the entire unit being rated.

If the hydrologic criteria listed in each question do not apply to the entire unit being rated, you probably have a unit with multiple HGM classes. In this case, identify which hydrologic criteria in questions 1-7 apply, and go to Question 8.

1. Are the water levels in the entire unit usually controlled by tides except during floods?

☒ NO – go to 2 ☐ **YES** – the wetland class is **Tidal Fringe** – go to 1.1

1.1 Is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)?

☐ **NO – Saltwater Tidal Fringe (Estuarine)** ☐ **YES – Freshwater Tidal Fringe**

*If your wetland can be classified as a Freshwater Tidal Fringe use the forms for **Riverine** wetlands. If it is Saltwater Tidal Fringe it is an **Estuarine** wetland and is not scored. This method **cannot** be used to score functions for estuarine wetlands.*

2. The entire wetland unit is flat and precipitation is the only source (>90%) of water to it. Groundwater and surface water runoff are NOT sources of water to the unit.

☒ NO – go to 3 ☐ **YES** – The wetland class is **Flats**

*If your wetland can be classified as a Flats wetland, use the form for **Depressional** wetlands.*

3. Does the entire wetland unit **meet all** of the following criteria?

☐ The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;

☐ At least 30% of the open water area is deeper than 6.6 ft (2 m).

☒ NO – go to 4 ☐ **YES –** The wetland class is **Lake Fringe** (Lacustrine Fringe)

4. Does the entire wetland unit **meet all** of the following criteria?

☒ The wetland is on a slope (*slope can be very gradual*),

☒ The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,

☒ The water leaves the wetland **without being impounded**.

☐ NO – go to 5 ☒ **YES –** The wetland class is **Slope**

NOTE: Surface water does not pond in these type of wetlands except occasionally in very small and shallow depressions or behind hummocks (depressions are usually <3 ft diameter and less than 1 ft deep).

5. Does the entire wetland unit **meet all** of the following criteria?

☐ The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,

☐ The overbank flooding occurs at least once every 2 years.

Wetland name or number Off

☐ NO – go to 6 ☐ **YES** – The wetland class is **Riverine**
NOTE: The Riverine unit can contain depressions that are filled with water when the river is not flooding

6. Is the entire wetland unit in a topographic depression in which water ponds, or is saturated to the surface, at some time during the year? *This means that any outlet, if present, is higher than the interior of the wetland.*

☐ NO – go to 7 ☐ **YES** – The wetland class is **Depressional**

7. Is the entire wetland unit located in a very flat area with no obvious depression and no overbank flooding? The unit does not pond surface water more than a few inches. The unit seems to be maintained by high groundwater in the area. The wetland may be ditched, but has no obvious natural outlet.

☐ NO – go to 8 ☐ **YES** – The wetland class is **Depressional**

8. Your wetland unit seems to be difficult to classify and probably contains several different HGM classes. For example, seeps at the base of a slope may grade into a riverine floodplain, or a small stream within a Depressional wetland has a zone of flooding along its sides. GO BACK AND IDENTIFY WHICH OF THE HYDROLOGIC REGIMES DESCRIBED IN QUESTIONS 1-7 APPLY TO DIFFERENT AREAS IN THE UNIT (make a rough sketch to help you decide). Use the following table to identify the appropriate class to use for the rating system if you have several HGM classes present within the wetland unit being scored.

   NOTE: Use this table only if the class that is recommended in the second column represents 10% or more of the total area of the wetland unit being rated. If the area of the HGM class listed in column 2 is less than 10% of the unit; classify the wetland using the class that represents more than 90% of the total area.

HGM classes within the wetland unit being rated	HGM class to use in rating
Slope + Riverine	Riverine
Slope + Depressional	Depressional
Slope + Lake Fringe	Lake Fringe
Depressional + Riverine along stream within boundary of depression	Depressional
Depressional + Lake Fringe	Depressional
Riverine + Lake Fringe	Riverine
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE

*If you are still unable to determine which of the above criteria apply to your wetland, or if you have **more than 2 HGM classes** within a wetland boundary, classify the wetland as Depressional for the rating.*

Wetland name or number Off

SLOPE WETLANDS

Water Quality Functions - Indicators that the site functions to improve water quality

S 1.0. Does the site have the potential to improve water quality?	
S 1.1. Characteristics of the average slope of the wetland: *(a 1% slope has a 1 ft vertical drop in elevation for every 100 ft of horizontal distance*) Slope is 1% or less points = 3 Slope is > 1%-2% points = 2 Slope is > 2%-5% points = 1 Slope is greater than 5% points = 0	0
S 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic *(use NRCS definitions)*: Yes = 3 No = 0	0
S 1.3. Characteristics of the plants in the wetland that trap sediments and pollutants: Choose the points appropriate for the description that best fits the plants in the wetland. *Dense means you have trouble seeing the soil surface (>75% cover), and uncut means not grazed or mowed and plants are higher than 6 in.* Dense, uncut, herbaceous plants > 90% of the wetland area points = 6 Dense, uncut, herbaceous plants > ½ of area points = 3 Dense, woody, plants > ½ of area points = 2 Dense, uncut, herbaceous plants > ¼ of area points = 1 Does not meet any of the criteria above for plants points = 0	2
Total for S 1 Add the points in the boxes above	2

Rating of Site Potential If score is: ___ **12 = H** ___ **6-11 = M** X **0-5 = L** *Record the rating on the first page*

S 2.0. Does the landscape have the potential to support the water quality function of the site?	
S 2.1. Is > 10% of the area within 150 ft on the uphill side of the wetland in land uses that generate pollutants? Yes = 1 No = 0	1
S 2.2. Are there other sources of pollutants coming into the wetland that are not listed in question S 2.1? Other sources _____ Yes = 1 No = 0	0
Total for S 2 Add the points in the boxes above	1

Rating of Landscape Potential If score is: X **1-2 = M** **0 = L** *Record the rating on the first page*

S 3.0. Is the water quality improvement provided by the site valuable to society?	
S 3.1. Does the wetland discharge directly (i.e., within 1 mi) to a stream, river, lake, or marine water that is on the 303(d) list? Yes = 1 No = 0	0
S 3.2. Is the wetland in a basin or sub-basin where water quality is an issue? *At least one aquatic resource in the basin is on the 303(d) list*. Yes = 1 No = 0	1
S 3.3. Has the site been identified in a watershed or local plan as important for maintaining water quality? *Answer YES if there is a TMDL for the basin in which unit is found.* Yes = 2 No = 0	2
Total for S 3 Add the points in the boxes above	3

Rating of Value If score is: X **2-4 = H** ___ **1 = M** ___ **0 = L** *Record the rating on the first page*

Wetland name or number Off

SLOPE WETLANDS

Hydrologic Functions - Indicators that the site functions to reduce flooding and stream erosion

S 4.0. Does the site have the potential to reduce flooding and stream erosion?	
S 4.1. Characteristics of plants that reduce the velocity of surface flows during storms: Choose the points appropriate for the description that best fits conditions in the wetland. *Stems of plants should be thick enough (usually > 1/8 in), or dense enough, to remain erect during surface flows.* Dense, uncut, **rigid** plants cover > 90% of the area of the wetland points = 1 All other conditions points = 0	0

Rating of Site Potential If score is: ___ **1 = M** X **0 = L** *Record the rating on the first page*

S 5.0. Does the landscape have the potential to support the hydrologic functions of the site?	
S 5.1. Is more than 25% of the area within 150 ft upslope of wetland in land uses or cover that generate excess surface runoff? Yes = 1 No = 0	1

Rating of Landscape Potential If score is: X **1 = M** ___ **0 = L** *Record the rating on the first page*

S 6.0. Are the hydrologic functions provided by the site valuable to society?	
S 6.1. Distance to the nearest areas downstream that have flooding problems: The sub-basin immediately down-gradient of site has flooding problems that result in damage to human or natural resources (e.g., houses or salmon redds) points = 2 Surface flooding problems are in a sub-basin farther down-gradient points = 1 No flooding problems anywhere downstream points = 0	1
S 6.2. Has the site been identified as important for flood storage or flood conveyance in a regional flood control plan? Yes = 2 No = 0	0
Total for S 6 Add the points in the boxes above	1

Rating of Value If score is: ___ **2-4 = H** X **1 = M** ___ **0 = L** *Record the rating on the first page*

NOTES and FIELD OBSERVATIONS:

Wetland name or number Offsi

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat

H 1.0. Does the site have the potential to provide habitat?

H 1.1. Structure of plant community: *Indicators are Cowardin classes and strata within the Forested class.* Check the Cowardin plant classes in the wetland. *Up to 10 patches may be combined for each class to meet the threshold of ¼ ac or more than 10% of the unit if it is smaller than 2.5 ac. Add the number of structures checked.*

____Aquatic bed	4 structures or more: points = 4
____Emergent	3 structures: points = 2
____Scrub-shrub (areas where shrubs have > 30% cover)	2 structures: points = 1
_×_Forested (areas where trees have > 30% cover)	1 structure: points = 0

If the unit has a Forested class, check if:

_×_The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

1

H 1.2. Hydroperiods

Check the types of water regimes (hydroperiods) present within the wetland. The water regime has to cover more than 10% of the wetland or ¼ ac to count (*see text for descriptions of hydroperiods*).

____Permanently flooded or inundated	4 or more types present: points = 3
____Seasonally flooded or inundated	3 types present: points = 2
____Occasionally flooded or inundated	2 types present: points = 1
_×_Saturated only	1 type present: points = 0
____Permanently flowing stream or river in, or adjacent to, the wetland	
____Seasonally flowing stream in, or adjacent to, the wetland	
____**Lake Fringe wetland**	**2 points**
____**Freshwater tidal wetland**	**2 points**

0

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft^2.

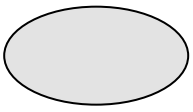
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. ***Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle***

If you counted: > 19 species	points = 2
5 - 19 species	points = 1
< 5 species	points = 0

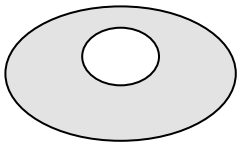
1

H 1.4. Interspersion of habitats

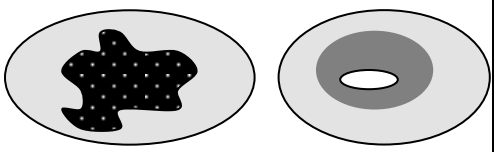
Decide from the diagrams below whether interspersion among Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, moderate, low, or none. *If you have four or more plant classes or three classes and open water, the rating is always high.*



None = 0 points

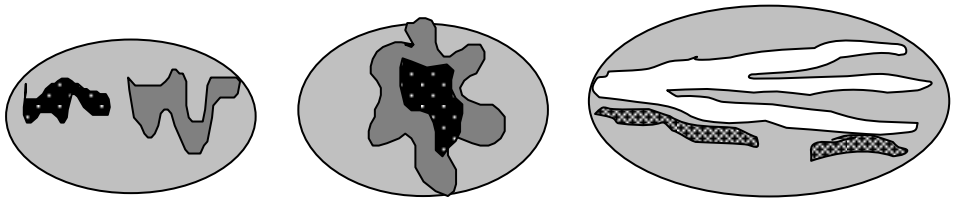


Low = 1 point



Moderate = 2 points

All three diagrams in this row are **HIGH** = 3points



0

Wetland name or number Offsite 1

H 1.5. Special habitat features: Check the habitat features that are present in the wetland. *The number of checks is the number of points.* __×__Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). __×__Standing snags (dbh > 4 in) within the wetland ____Undercut banks are present for at least 6.6 ft (2 m) **and/or** overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) ____Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet weathered where wood is exposed)* ____At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated *(structures for egg-laying by amphibians)* ____Invasive plants cover less than 25% of the wetland area in every stratum of plants (*see H 1.1 for list of strata*)	2
Total for H 1 Add the points in the boxes above	4

Rating of Site Potential If score is:___**15-18 = H** ___**7-14 = M** _X_**0-6 = L** *Record the rating on the first page*

H 2.0. Does the landscape have the potential to support the habitat functions of the site?	
H 2.1. Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* [0.00] % undisturbed habitat **+** [(% moderate and low intensity land uses) [0.00] /2] **=** 0 % If total accessible habitat is: > 1/3 (33.3%) of 1 km Polygon points = 3 20-33% of 1 km Polygon points = 2 10-19% of 1 km Polygon points = 1 < 10% of 1 km Polygon points = 0	0
H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. *Calculate:* [4.24] % undisturbed habitat **+** [(% moderate and low intensity land uses) [25.15] /2] **=** 16.81 % Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10-50% and in 1-3 patches points = 2 Undisturbed habitat 10-50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0	1
H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0	-2
Total for H 2 Add the points in the boxes above	-1

Rating of Landscape Potential If score is:___**4-6 = H** ___**1-3 = M** _X_**< 1 = L** *Record the rating on the first page*

H 3.0. Is the habitat provided by the site valuable to society?	
H 3.1. Does the site provide habitat for species valued in laws, regulations, or policies? *Choose only the highest score that applies to the wetland being rated.* Site meets ANY of the following criteria: points = 2 — It has 3 or more priority habitats within 100 m (see next page) — It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) — It is mapped as a location for an individual WDFW priority species — It is a Wetland of High Conservation Value as determined by the Department of Natural Resources — It has been categorized as an important habitat site in a local or regional comprehensive plan, in a Shoreline Master Plan, or in a watershed plan × Site has 1 or 2 priority habitats (listed on next page) within 100 m points = 1 Site does not meet any of the criteria above points = 0	1

Rating of Value If score is:___**2 = H** _X_**1 = M** ___**0 = L** *Record the rating on the first page*

Wetland name or number Off

WDFW Priority Habitats

Priority habitats listed by WDFW (see complete descriptions of WDFW priority habitats, and the counties in which they can be found, in: Washington Department of Fish and Wildlife. 2008. Priority Habitat and Species List. Olympia, Washington. 177 pp. http://wdfw.wa.gov/publications/00165/wdfw00165.pdf or access the list from here: http://wdfw.wa.gov/conservation/phs/list/)

Count how many of the following priority habitats are within 330 ft (100 m) of the wetland unit: ***NOTE:*** *This question is independent of the land use between the wetland unit and the priority habitat.*

— **Aspen Stands:** Pure or mixed stands of aspen greater than 1 ac (0.4 ha).

— **Biodiversity Areas and Corridors**: Areas of habitat that are relatively important to various species of native fish and wildlife (*full descriptions in WDFW PHS report*).

— **Herbaceous Balds:** Variable size patches of grass and forbs on shallow soils over bedrock.

— **Old-growth/Mature forests:** Old-growth west of Cascade crest – Stands of at least 2 tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) > 32 in (81 cm) dbh or > 200 years of age. Mature forests – Stands with average diameters exceeding 21 in (53 cm) dbh; crown cover may be less than 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth; 80-200 years old west of the Cascade crest.

— **Oregon White Oak:** Woodland stands of pure oak or oak/conifer associations where canopy coverage of the oak component is important (*full descriptions in WDFW PHS report p. 158 – see web link above*).

— **Riparian**: The area adjacent to aquatic systems with flowing water that contains elements of both aquatic and terrestrial ecosystems which mutually influence each other.

— **Westside Prairies:** Herbaceous, non-forested plant communities that can either take the form of a dry prairie or a wet prairie (*full descriptions in WDFW PHS report p. 161 – see web link above*).

— **Instream:** The combination of physical, biological, and chemical processes and conditions that interact to provide functional life history requirements for instream fish and wildlife resources.

— **Nearshore**: Relatively undisturbed nearshore habitats. These include Coastal Nearshore, Open Coast Nearshore, and Puget Sound Nearshore. (*full descriptions of habitats and the definition of relatively undisturbed are in WDFW report – see web link on previous page).*

— **Caves:** A naturally occurring cavity, recess, void, or system of interconnected passages under the earth in soils, rock, ice, or other geological formations and is large enough to contain a human.

— **Cliffs:** Greater than 25 ft (7.6 m) high and occurring below 5000 ft elevation.

— **Talus:** Homogenous areas of rock rubble ranging in average size 0.5 - 6.5 ft (0.15 - 2.0 m), composed of basalt, andesite, and/or sedimentary rock, including riprap slides and mine tailings. May be associated with cliffs.

X **Snags and Logs:** Trees are considered snags if they are dead or dying and exhibit sufficient decay characteristics to enable cavity excavation/use by wildlife. Priority snags have a diameter at breast height of > 20 in (51 cm) in western Washington and are > 6.5 ft (2 m) in height. Priority logs are > 12 in (30 cm) in diameter at the largest end, and > 20 ft (6 m) long.

Note: All vegetated wetlands are by definition a priority habitat but are not included in this list because they are addressed elsewhere.

Wetland name or number Off

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Wetland Type *Check off any criteria that apply to the wetland. Circle the category when the appropriate criteria are met.*	**Category**
SC 1.0. Estuarine wetlands Does the wetland meet the following criteria for Estuarine wetlands? ☐ The dominant water regime is tidal, ☐ Vegetated, and ☐ With a salinity greater than 0.5 ppt ☐ Yes –Go to **SC 1.1** ☒ No= **Not an estuarine wetland**	
SC 1.1. Is the wetland within a National Wildlife Refuge, National Park, National Estuary Reserve, Natural Area Preserve, State Park or Educational, Environmental, or Scientific Reserve designated under WAC 332-30-151? ☐ Yes = **Category I** ☐ No - Go to **SC 1.2**	
SC 1.2. Is the wetland unit at least 1 ac in size and meets at least two of the following three conditions? ☐ The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. (If non-native species are *Spartina*, see page 25) ☐ At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. ☐ The wetland has at least two of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands. ☐ Yes = **Category I** ☐ No = **Category II**	
SC 2.0. Wetlands of High Conservation Value (WHCV) SC 2.1. Has the WA Department of Natural Resources updated their website to include the list of Wetlands of High Conservation Value? ☐ Yes **– Go to SC 2.2** ☒ No **– Go to SC 2.3** SC 2.2. Is the wetland listed on the WDNR database as a Wetland of High Conservation Value? ☐ Yes **= Category I** ☒ No **= Not a WHCV** SC 2.3. Is the wetland in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf ☐ Yes **– Contact WNHP/WDNR and go to SC 2.4** ☒ No **= Not a WHCV** SC 2.4. Has WDNR identified the wetland within the S/T/R as a Wetland of High Conservation Value and listed it on their website? ☐ Yes **= Category I** ☒ No **= Not a WHCV**	
SC 3.0. Bogs Does the wetland (or any part of the unit) meet both the criteria for soils and vegetation in bogs? *Use the key below.* ***If you answer YES you will still need to rate the wetland based on its functions.*** SC 3.1. Does an area within the wetland unit have organic soil horizons, either peats or mucks, that compose 16 in or more of the first 32 in of the soil profile? ☐ Yes – Go to **SC 3.3** ☒ No – Go to **SC 3.2** SC 3.2. Does an area within the wetland unit have organic soils, either peats or mucks, that are less than 16 in deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on top of a lake or pond? ☐ Yes – Go to **SC 3.3** ☒ No = **Is not a bog** SC 3.3. Does an area with peats or mucks have more than 70% cover of mosses at ground level, AND at least a 30% cover of plant species listed in Table 4? ☐ Yes = **Is a Category I bog** ☐ No – Go to **SC 3.4** **NOTE:** If you are uncertain about the extent of mosses in the understory, you may substitute that criterion by measuring the pH of the water that seeps into a hole dug at least 16 in deep. If the pH is less than 5.0 and the plant species in Table 4 are present, the wetland is a bog. SC 3.4. Is an area with peats or mucks forested (> 30% cover) with Sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Engelmann spruce, or western white pine, AND any of the species (or combination of species) listed in Table 4 provide more than 30% of the cover under the canopy? ☐ Yes = **Is a Category I bog** ☐ No **= Is not a bog**	

Wetland name or number Off

SC 4.0. Forested Wetlands

Does the wetland have at least 1 contiguous acre of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? ***If you answer YES you will still need to rate the wetland based on its functions.***

- **Old-growth forests** (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more.
- **Mature forests** (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm).

☐Yes **= Category I** ☒No **= Not a forested wetland for this section**

SC 5.0. Wetlands in Coastal Lagoons

Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?

- The wetland lies in a depression adjacent to marine waters that is wholly or partially separated from marine waters by sandbanks, gravel banks, shingle, or, less frequently, rocks
- The lagoon in which the wetland is located contains ponded water that is saline or brackish (> 0.5 ppt) during most of the year in at least a portion of the lagoon *(needs to be measured near the bottom)*

☐Yes – Go to **SC 5.1** ☒No = **Not a wetland in a coastal lagoon**

SC 5.1. Does the wetland meet all of the following three conditions?

- The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100).
- At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland.
- The wetland is larger than $^{1}/_{10}$ ac (4350 ft^2)

☐Yes = **Category I** ☐No = **Category II**

SC 6.0. Interdunal Wetlands

Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? ***If you answer yes you will still need to rate the wetland based on its habitat functions.***

In practical terms that means the following geographic areas:

- Long Beach Peninsula: Lands west of SR 103
- Grayland-Westport: Lands west of SR 105
- Ocean Shores-Copalis: Lands west of SR 115 and SR 109

☐Yes – Go to **SC 6.1** ☒No = **not an interdunal wetland for rating**

SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? ☐Yes = **Category I** ☐No – Go to **SC 6.2**

SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger?

☐Yes = **Category II** ☐No – Go to **SC 6.3**

SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac?

☐Yes = **Category III** ☐No = **Category IV**

Category of wetland based on Special Characteristics

If you answered No for all types, enter "Not Applicable" on Summary Form

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Appendix G — Wetland Rating Maps

DEER CREEK - COWARDIN MAP

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Environmental Assessment • Planning • Land Use Solutions
2907 Harborview Dr., Suite D, Gig Harbor, WA 98335
Phone: (253) 514-8952 Fax: (253) 514-8954
www.soundviewconsultants.com

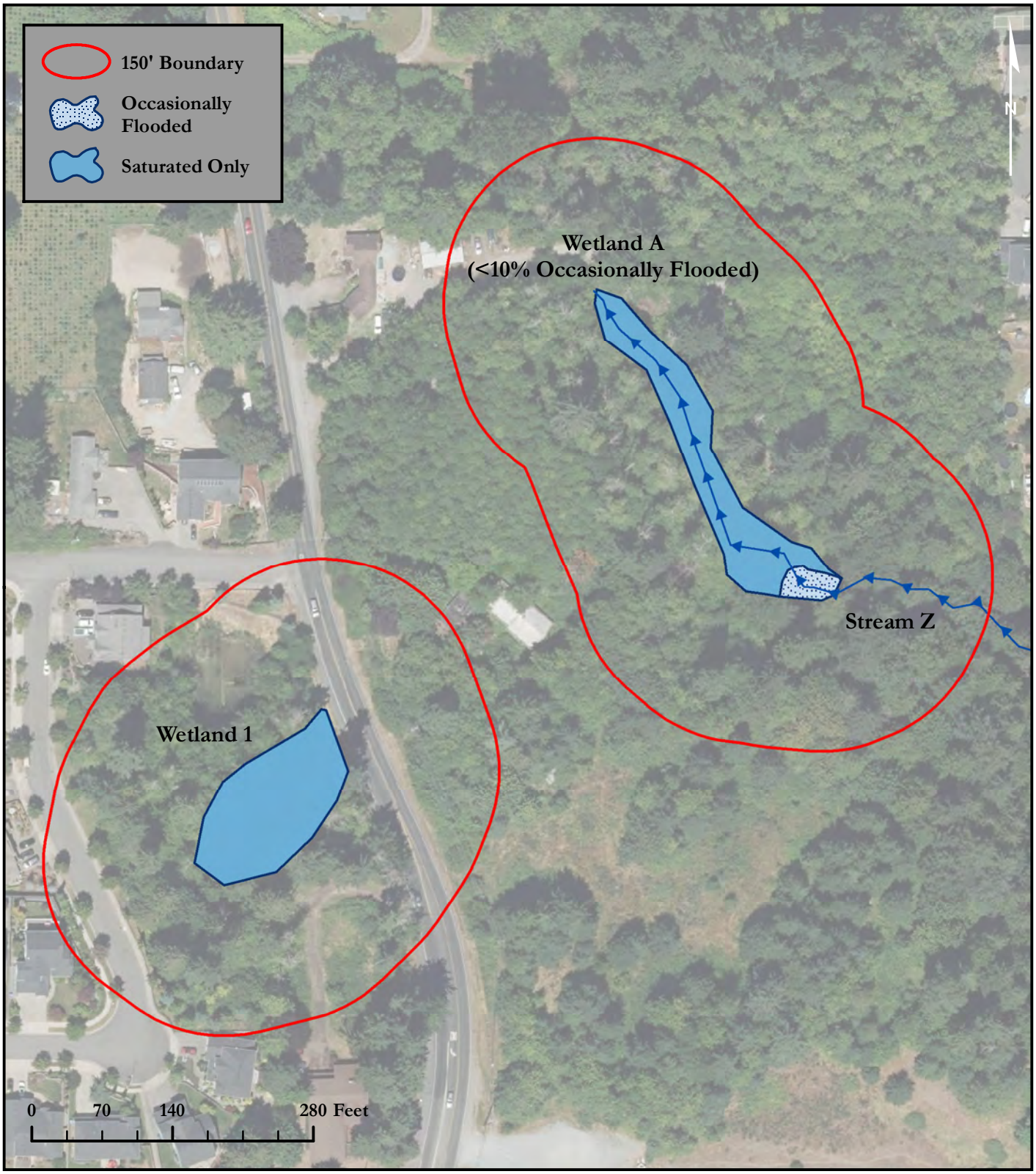
DEER CREEK

2007 SHAW RD
PUYALLUP, WA 98372

PIERCE COUNTY PARCEL NUMBERS:
0420354039

DATE:	1/10/2022
JOB:	1273.0009
BY:	DDS
SCALE:	1 " = 200 '
FIGURE NO.	1 of 5

DEER CREEK - HYDROPERIOD MAP



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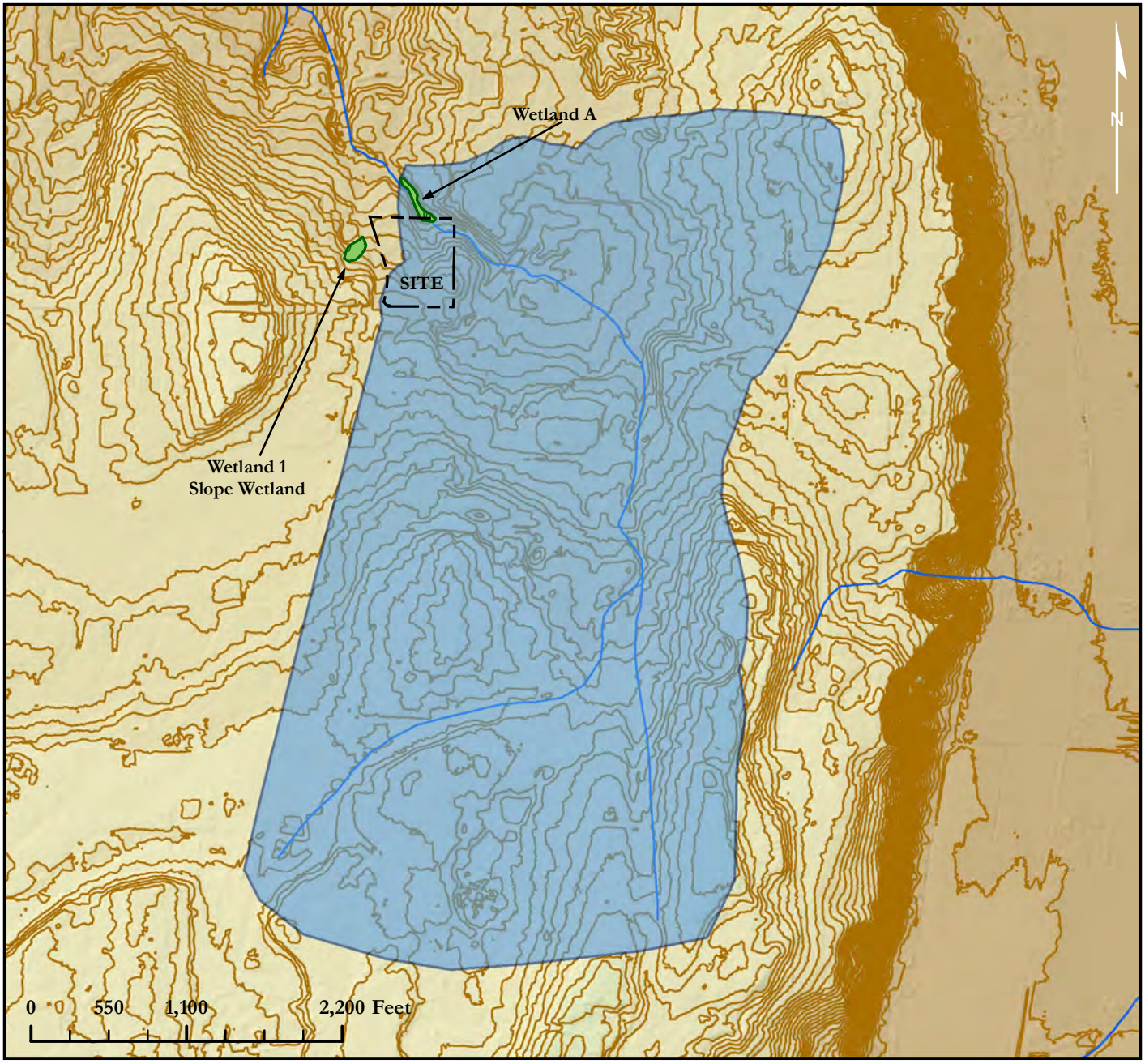
2007 SHAW RD
PUYALLUP, WA 98372

PIERCE COUNTY PARCEL NUMBERS:
0420354039

DATE:	1/10/2022
JOB:	1273.0009
BY:	DDS
SCALE:	1 " = 140 '
FIGURE NO.	2 of 5

DEER CREEK - CONTRIBUTING BASIN MAP



D.4.0		
D.4.3		
	Area of Contributing Basin (SF)	17,784,895
	Area of Wetland A (SF)	15,732
	Percent of Wetland A within Contributing Basin	**0.088%**
D.5.0		
D.5.3		
	Is more than 25% of the Contributing Basin covered in Intensive Land Use?	**YES**

Contributing Basin

Wetlands

Site Boundary

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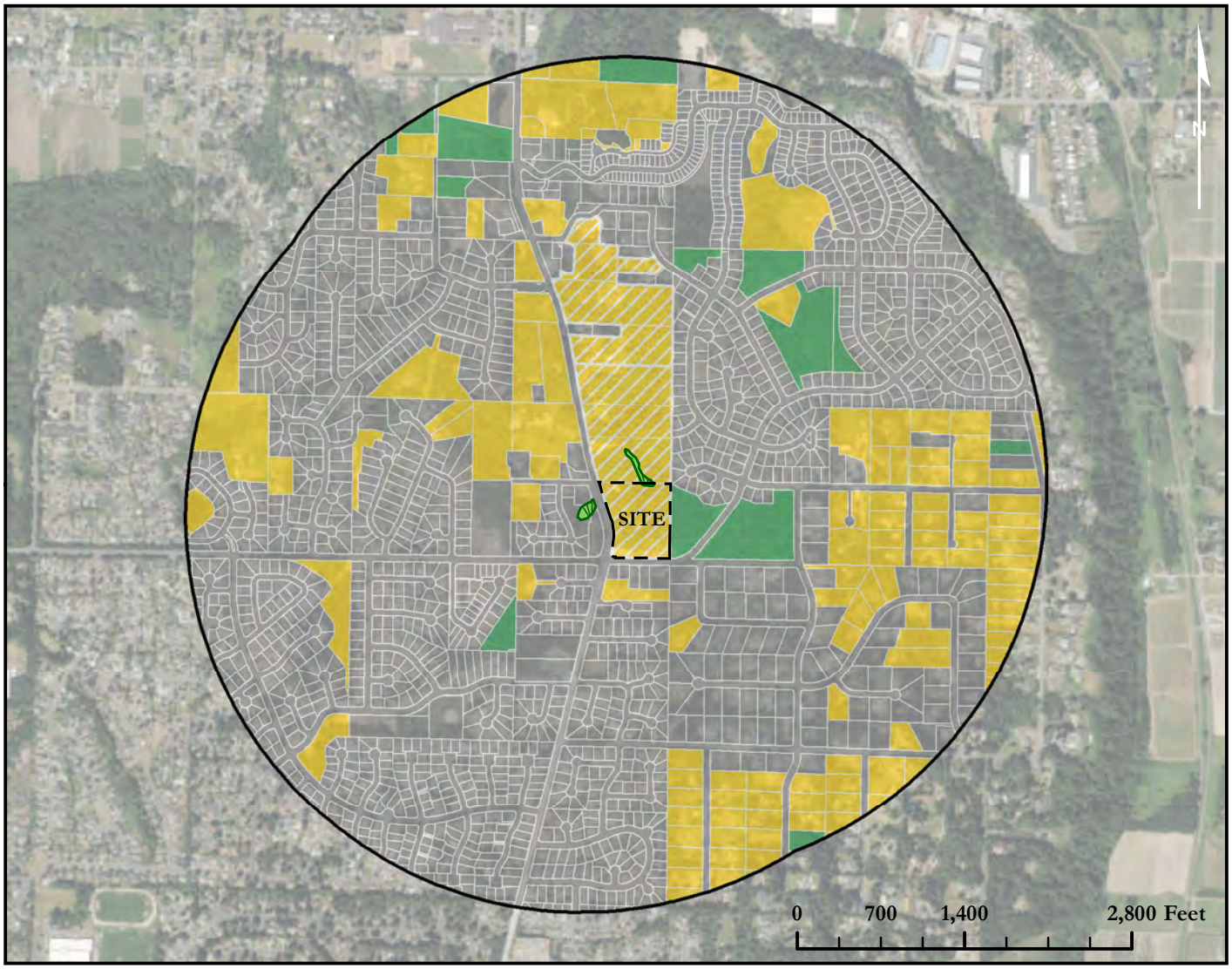
DEER CREEK

2007 SHAW RD
PUYALLUP, WA 98372

PIERCE COUNTY PARCEL NUMBERS:
0420354039

DATE: 1/10/2022
JOB: 1273.0009
BY: DDS
SCALE: 1 " = 1,100
FIGURE NO. 3 of 5

DEER CREEK - HABITAT MAP



H.2.0 Wetland A		
H.2.1		
	Abutting Undisturbed Habitat	0.00%
	Abutting Moderate & Low Intensity Land Uses	4.55%
	Accessible Habitat	**2.27%**
H.2.0 Wetland 1		
H.2.1		
	Abutting Undisturbed Habitat	0.00%
	Abutting Moderate & Low Intensity Land Uses	0.00%
	Accessible Habitat	**0.00%**
H.2.2		
	Undisturbed Habitat	4.24%
	Moderate & Low Intensity Land Uses	25.15%
	Undisturbed Habitat in 1 KM Polygon	**16.82%**
H.2.3		
	High Intensity Land Use in 1 KM Polygon	**70.61%**

- **1 KM Polygon**
- **Accessible Habitat**
- **High Intensity Land Use**
- **Moderate & Low Intensity Land Use**
- **Undisturbed Habitat**

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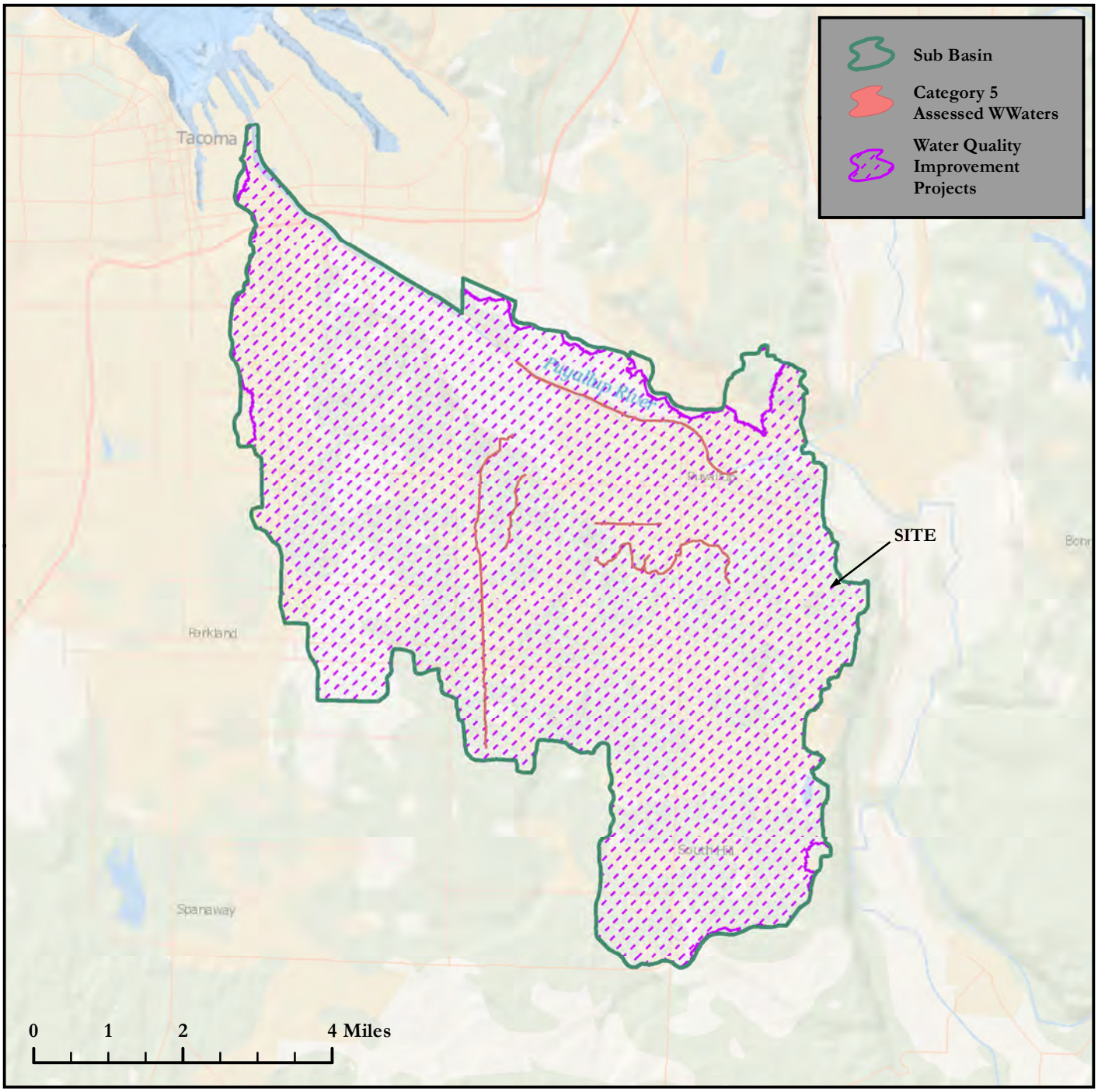
DEER CREEK

2007 SHAW RD
PUYALLUP, WA 98372

PIERCE COUNTY PARCEL NUMBERS:
0420354039

DATE: 1/10/2022
JOB: 1273.0009
BY: DDS
SCALE: 1 " = 1,400 '
FIGURE NO. 4 of 5

DEER CREEK - 303(D) MAP



Name	Pollutants	TMDL ID	WRIA	Year Approved
Puyallup River Bacteria TMDL	Bacteria	109	10	2011
Puyallup River Multiparameter TMDL	BOD5, Ammonia-N, Chlorine, Dissolved Oxygen	19	10	1994
Commencement Bay Dioxin TMDL	Dioxin	2	10	1992
Clarks Creek Watershed Bacteria TMDL	Bacteria	88	10	2008

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DEER CREEK

2007 SHAW RD
PUYALLUP, WA 98372

PIERCE COUNTY PARCEL NUMBERS:
0420354039

DATE: 1/10/2022
JOB: 1273.0009
BY: DDS
SCALE: 1 " = 2 mi
FIGURE NO. 5 of 5

Appendix H — Qualifications

All field inspections, habitat assessments, wetland and OHW delineations, and supporting documentation, including this ***Wetland and Fish and Wildlife Habitat Assessment Report*** prepared for the ***Deer Creek*** property were prepared by, or under the direction of Jon Pickett of SVC. In addition, the field investigations were performed primarily by Ryan Krapp, Kyla Caddey and Mae Ancheta, report preparation was completed by Mae Ancheta, and additional project oversight and final quality assurance/quality control was completed by Kyla Caddey.

Jon Pickett

Associate Principal
Professional Experience: 10+ years

Jon Pickett is an Associate Principal and Senior Scientist with a diverse background in environmental and shoreline compliance and permitting, wetland and stream ecology, fish and wildlife biology, mitigation compliance and design, and environmental planning and land use due diligence. Jon oversees a wide range of large-scale industrial, commercial, and multi-family residential projects throughout Western Washington, providing environmental permitting and regulatory compliance assistance for land use entitlement projects from feasibility through mitigation compliance. Jon performs wetland, stream, and shoreline delineations and fish & wildlife habitat assessments; conducts code and regulation analysis and review; prepares reports and permit applications and documents; provides environmental compliance recommendation; and provides restoration and mitigation design.

Jon earned a Bachelor of Science degree in Natural Resource Sciences from Washington State University and Bachelor of Science and Minor in Forestry from Washington State University. Jon has received 40-hour wetland delineation training (Western Mountains, Valleys, & Coast and Arid West Regional Supplements) and regularly performs wetland, stream, and shoreline delineations. Jon is a Whatcom County Qualified Wetland Specialist and Wildlife Biologist and is a Pierce County Qualified Wetland Specialist. He has been formally trained by WSDOE in the use of the Washington State Wetland Rating System 2014, How to Determine the Ordinary High-Water Mark (Freshwater and Marine), Using Field Indicators for Hydric Soils, and the Using the Credit-Debit Method for Estimating Mitigation Needs.

Ryan Krapp

Environmental Scientist / Field Lead
Professional Experience: 10+ years

Ryan Krapp is an Environmental Scientist and Field Lead with a background in conducting wetland delineations, habitat assessments, botanical surveys, avian surveys, threatened & endangered species surveys, and fisheries studies. He has considerable experience in production of Environmental Assessments and Biological Assessments and Evaluations under NEPA guidelines for projects regulated by the U.S. Forest Service, U.S. Army Corps of Engineers, and Bureau of Indian Affairs as well as leading Section 7 ESA consultation with the U.S. Fish and Wildlife Service. Project planning, permitting, and compliance are all part of his professional experiences and practices at SVC.

Ryan has managed environmental investigation projects including wetlands, streams, and critical habitats data collection on large pipeline corridors, overhead electrical transmission corridors, and oil/natural gas drilling development. He has extensive experience in utilizing GIS to collect, manage, and analyze large volumes of spatial and temporal field data to aide in project management,

monitoring, analysis, and mapping. In addition, he is a FAA trained recreational pilot and a PADI certified SCUBA diver with fresh and saltwater diving experience. Ryan is a USFWS-approved Mazama pocket gopher survey biologist.

Kyla Caddey, PWS, Certified Ecologist

Senior Environmental Scientist
Professional Experience: 7 years

Kyla Caddey is a Senior Environmental Scientist with a diverse background in stream and wetland ecology, wildlife ecology and conservation, wildlife and natural resource assessments and monitoring, and riparian habitat restoration at various public and private entities. Kyla has field experience performing in-depth studies in both the Pacific Northwest and Central American ecosystems which included various environmental science research and statistical analysis. Kyla has advanced expertise in federal- and state-listed endangered, threatened, and sensitive species surveys and assessment of aquatic and terrestrial systems throughout the Puget Sound region. She has completed hundreds of wetland delineations and has extensive knowledge and interest in hydric soil identification. As the senior writer, she provides informed project oversight and performs final quality assurance / quality control on various types of scientific reports for agency submittal, including: Biological Assessments/Evaluations; Wetland, Shoreline, and Fish and Wildlife Habitat Assessments; Mitigation Plans, and Mitigation Monitoring Reports. She currently performs wetland, stream, and shoreline delineations and fish and wildlife habitat assessments; prepares scientific reports; and provides environmental permitting and regulatory compliance assistance to support a wide range of commercial, industrial, and multi-family residential land use projects.

Kyla earned a Bachelor of Science degree in Environmental Science and Resource Management from the University of Washington, Seattle with a focus in Wildlife Conservation and a minor in Quantitative Science. She has also completed additional coursework in Comprehensive Bird Biology from Cornell University. Ms. Caddey is a Certified Professional Wetland Scientist (PWS #3479) through the Society of Wetland Scientists and Certified Ecologist through the Ecological Society of America. She has received 40-hour wetland delineation training (Western Mtns, Valleys, & Coast and Arid West Regional Supplement), is a Pierce County Qualified Wetland Specialist and Wildlife Biologist, and is a USFWS-approved Mazama pocket gopher survey biologist. Kyla has been formally trained through the Washington State Department of Ecology, Coastal Training Program, and the Washington Native Plant Society in winter twig and grass, sedge, and rush identification for Western WA; Using the Credit-Debit Method in Estimating Wetland Mitigation Needs; How to Determine the Ordinary High Water Mark; Using Field Indicators for Hydric Soils; How to Administer Development Permits in Washington Shorelines; Puget Sound Coastal Processes; and Forage Fish Survey Techniques. Additionally, she has received formal training in preparing WSDOT Biological Assessments.

Megan Mae Ancheta

Staff Scientist
Professional Experience: 2 years

Megan (Mae) Ancheta is a Staff Scientist with a background in wildlife and conservation biology in Washington state. Mae earned her Bachelor of Science degree in Environmental Science with a focus in Conservation Biology and Ecology and a certificate in Restoration Ecology from University of Washington, Tacoma. There she gained extensive, hands-on experience working in lab and field

settings, and studying socio-ecological restoration and wildlife conservation in old growth forests, historic Puget lowland prairies, and wetland and riparian areas. Mae has applied her studies working in the local government at the city and county level as well as within federal entities conducting wetland mitigation planning, stream habitat monitoring, habitat restoration for federally listed species, and thorough site analyses for natural resource management utilizing ArcGIS and model analyses.

Mae currently assists in wetland, stream, and shoreline delineations and fish and wildlife habitat assessments; conducts environmental code analysis; and prepares environmental assessment and mitigation reports, biological evaluations, and permit applications to support clients through the regulatory and planning process for various land use projects.

6.3 Tree Retention Assessment prepared by Sound Urban Forestry dated May 16, 2022.

SUF

S O U N D U R B A N F O R E S T R Y, LLC

Appraisals ~ Site Planning ~ Urban Landscape Design and Management
Environmental Education ~ Environmental Restoration

5/16/2022

RM Homes
C/o: James Kerby
2913 5th Ave NE, Ste. 201
Puyallup, WA 98372

Re: Normandy Retention Tree Assessment

Mr. Kerby:

Upon your request and as a requirement of the City of Puyallup, I have conducted an assessment of the trees marked for retention within and adjacent to the site of the proposed Normandy residential project at 2007 Shaw Road. I visited the site on April 26, 2022. The following presents my findings and recommendations.

Retain Trees

A total of 31 trees were assessed as identified on the boundary and topographic survey provided by Cara Visintainer with Barghausen Consulting Engineers, Inc. Please reference the attached diagram for the numbered locations marked in green.

Table 1. Trees Identified for Retention

ID#	Species	DBH	Height	Live Canopy Ratio	Condition/ Risk Rating	Comments
1	Douglas Fir	36”	130’	25%	Good/Low	
2	Western Hemlock	12”	40’	20%	Fair/Low	
3	Western Hemlock	16”	45’	20%	Good/Low	
4	Western Red Cedar	38”	100’	25%	Good/Low	
5	Western Hemlock	24”	110’	25%	Good/Low	
6	Western Red Cedar	36”	105’	30%	Good/Low	
7	Western Red Cedar	34”	100’	30%	Good/Low	
8	Western Red Cedar	41”	110’	35%	Good/Low	
9	Western Red Cedar	34”	105’	37%	Good/Low	
10	Western Red Cedar	12”	30’	10%	Fair/Low	
11	Douglas Fir	22”	105’	20%	Good/Low	
12	Douglas Fir	37”	125’	25%	Good/Low	
13	Douglas Fir	24”	105’	15%	Fair/Low	
14	Cottonwood	55”	160’	30%	Fair/High	Dead & damaged limbs overhanging wetland edge. Risk will reduce to moderate if pruned.
15	Western Hemlock	30”	105’	25”	Fair/Low	
16	Douglas Fir	40”	155’	30%	Good/Low	
17	Red Alder	10”	50’	0	Dead/Moderate	
18	Western Hemlock	30”	110’	20%	Fair/Low	
19	Western Hemlock	21”	100’	25%	Good/Low	
20	Douglas Fir	29”	115’	20%	Good/Low	

ID#	Species	DBH	Height	Live Canopy Ratio	Condition/ Risk Rating	Comments
21	Western Hemlock	21”	80’	35%	Fair/Low	
22	Western Hemlock	16”	35’	40%	Fair/Low	
23	Cottonwood	45”	175’	30%	Good/Low	Remove ivy.
24	Cottonwood	45”	170’	30%	Fair/Low	
25	Purple Plum	24”	27’	40%	Poor/Moderate	Previously topped.
26	Red Alder	12”	40’	25%	Fair/Low	
27	Red Alder	10”	30’	20”	Fair/Low	
28	Japanese Umbrella Pine	10”	18’	20%	Fair/Low	
29	Red Alder	11”	30’	20%	Poor/Moderate	Previously topped for line clearance.
30	Red Alder	9”	25’	10%	Poor/Moderate	Previously topped for line clearance.
31	Giant Sequoia	55”	160’	50%	Good/Low	

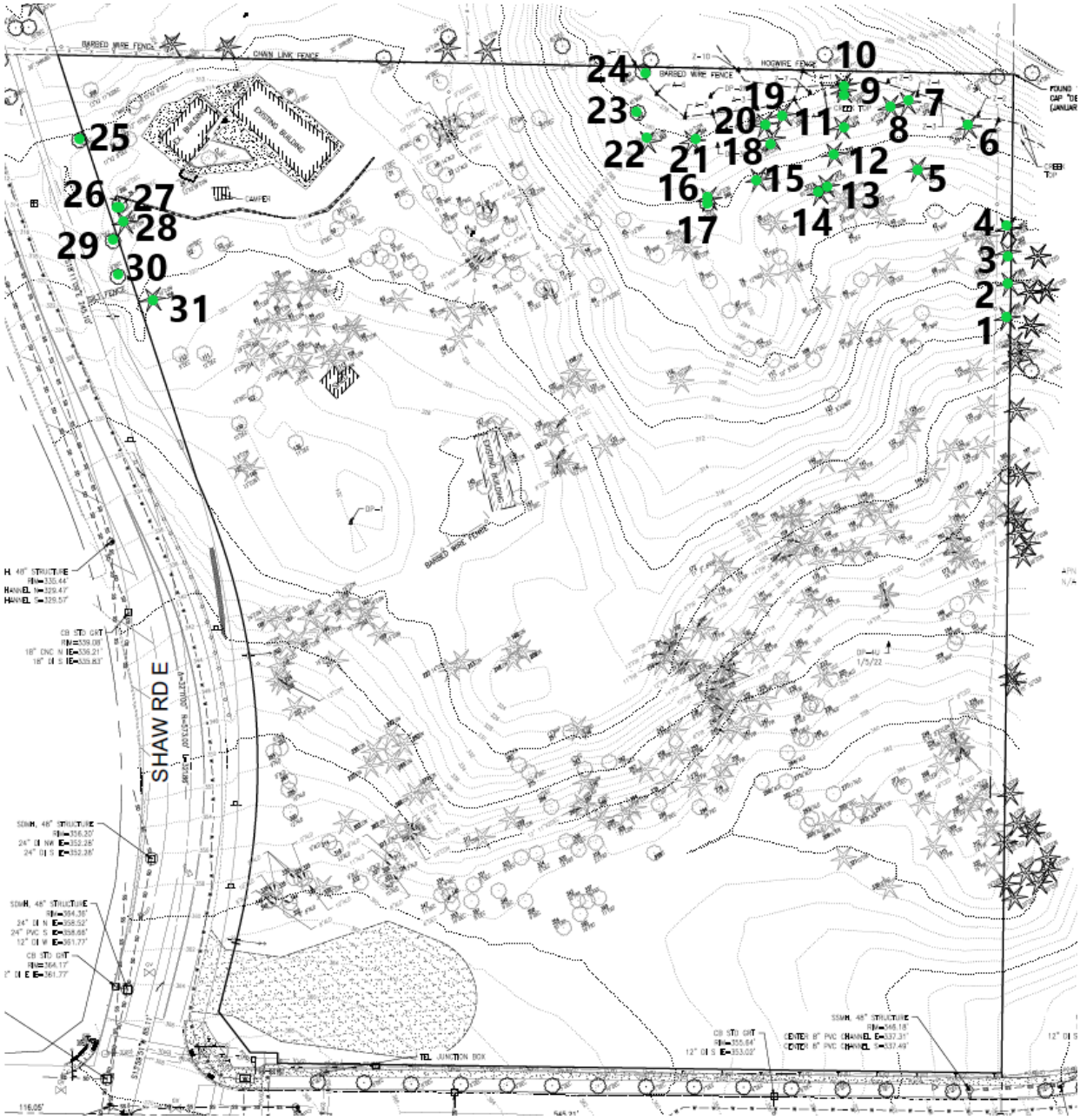
Adjacent Trees

There are many off-site trees along the eastern perimeter that may potentially be impacted by the project. Based on my assessments, I have concluded that these trees are windfirm and the removal of the nearby trees within the project site will not result in sudden exposure or associated instability.

Please contact me should you have any questions.
Professionally Submitted,

Kevin M. McFarland, Principal
Consulting Urban Forester
ISA Certified Arborist PN-0373 & ISA Tree Risk Assessment Qualified
Sound Urban Forestry, LLC
P.O. Box 489
Tahuya, WA 98588
360-870-2511

Locations of Assessed Retain Trees



Tab 8.0

8.0 OTHER PERMITS

The following are a list of permits that will need to be obtained prior or concurrent with construction:

NPDES Permit (Department of Ecology)

Right-of-Way Use Permit (City of Puyallup)

Mailbox Location Approval (USPS)

Fire Hydrant Location Approval

Forestry Practices Application (Department of Natural Resources)

Tab 9.0

9.0 OPERATIONS AND MAINTENANCE MANUAL

An Operations and Maintenance Manual of stormwater facilities will be provided during final engineering.

Tab 10.0

10.0 CONSTRUCTION COST ESTIMATE

A City of Puyallup cost estimate worksheet will be completed and submitted during final engineering.