APPENDIX C

ADDITIONAL REPORTS

- Hydrologic and Hydraulic Analysis Report
- Geotechnical Assessment
- Wetland and Stream Delineation Report

Hydrologic and Hydraulic Analysis Report
35th Avenue SE Reconstruction Project
(144th Street SE to 141st Street SE)
Mill Creek, Washington

July 2, 2014

SHANNON & WILSON, INC.

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21-1-21948-003

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HYDROLOGIC AND HYDRAULIC ANALYSIS REPORT
35TH AVENUE 35TH SE RECONSTRUCTION PROJECT
(144TH STREET SE TO 141ST STREET SE)
MILL CREEK, WASHINGTON

1.0 HYDROLOGIC AND HYDRAULIC ANALYSIS

This report outlines the hydrologic and hydraulic assessment of the 35th Avenue SE roadway reconstruction project. 35th Avenue SE is located in the City of Mill Creek (the City) (Figure 1). The City is interested in raising the road, or making other drainage modifications, to reduce Penny Creek flooding near the outlet of Thomas Lake between 141st Street SE and 144th Street SE. Two 54-inch culverts are located beneath 35th Avenue SE at the Thomas Lake outlet.

2.0 SNOHOMISH COUNTY DRAINAGE NEEDS REPORT (DNR) HYDROLOGIC AND HYDRAULIC MODELS

Hydrologic and hydraulic information reviewed included the Snohomish County (County), North Creek, DNR, and relevant Penny Creek data regarding hydrologic and hydraulic modeling near 35th Avenue SE, provided by the County (Snohomish County, 2002). The DNR provides information on Penny Creek flood flows, flood water surface elevations, and information on Penny Creek culvert capacity underneath 35th Avenue SE.

The County DNR report presents Hydrologic Simulation Program Fortran (HSPF) modeling outputs for the Penny Creek basin. Flows from the HSPF model were used as input for a Hydrologic Engineering Center's River Analysis System (HEC-RAS) model. The model includes steady-state simulations for flood flow frequencies of 2-, 10-, 25-, and 100-year flows (Table A-1). It is important to note that the DNR report and modeling studies use the North American Vertical Datum of 1988 (NAVD88) vertical survey datum and the 35th Avenue SE plan drawings use the National Geodetic Vertical Datum of 1929 (NGVD29) survey datum. The difference between the two datum according to National Geodetic Survey Height Conversion Methodology is calculated as follows:

$$NGVD29 = NAVD88 - 3.66$$

The 35th Avenue roadway elevation surveyed at the nearest catch basins ranges between 390.11 and 390.41 feet. Figure 2 shows the water surface elevations from HEC-RAS model.

The modeling-predicted flood elevations indicate that 35th Avenue would not overtop for the 100-year flood flow for existing conditions, and would overtop for future build-out conditions at approximately the 100-year flood event. This is contrary to other available information and observations discussed below. From the data presented in the DNR and hydraulic modeling, it appears that flooding at the 35th Avenue culvert is caused by insufficient conveyance capacity caused by undersized culverts, poor entrance conditions, and downstream hydraulic controls. The HEC-RAS model shows that there is flow constriction at the 35th Avenue culvert for the 2- and 10-year flood frequency flows.

It is important to note that the hydrologic and hydraulic model reviewed have a few limitations. The hydrological model constructed in HSPF software did not utilize Light Detection and Ranging data for subbasin delineation. The model does not specifically represent current conditions, land use changes, and development activities, such as the County detention pond along 35th Avenue SE, north of the State Route 96 interchange. The HEC-RAS model of Penny Creek downstream of 25th Avenue SE through the area of interest has not been updated since the DNR (Snohomish County, 2002). The model is also not geo-referenced to reflect the location of cross sections on the creek.

3.0 REVIEW OF FEDERAL EMERGENCY MANAGEMENT AGENCY (FEMA) FLOODPLAIN MAP ELEVATIONS

The review of the floodplain elevation from the current effective FEMA Flood Insurance Rate Maps (53061C1040F and 53061C1045F) indicate that 35th Avenue SE is outside the mapped FEMA Zone A, and the low-lying areas east and west of the roadway lie within Zone A. Zone A boundaries are approximate and the maps do not have a designated base flood elevation. Historical flood observations indicate that the base flood elevation for that area is 392 feet, which is above the road profile elevation. Although the FEMA flood map Zone A does not currently show the road in the floodplain boundary, the road has been inundated at a flood elevation of 392 feet. Proposed roadway modifications can avoid floodplain effects as discussed further below.

4.0 MARCH 2014 SITE VISIT, HYDROLOGIC MONITORING DATA, AND OTHER FIELD FLOOD OBSERVATIONS

Water level data loggers are located on the east and west sides of the 54-inch culverts extending below 35th Avenue SE. The loggers recorded the water levels on the both ends of the culvert in the period between December 13, 2013, and March 27, 2014 (Figure 3). Thus, they were able to capture several storm events that contributed to flooding of 35th Avenue SE this past winter.

Figure 3 illustrates data collected from the March 2014 storm event. The measured water elevation was up to 391 feet and overtopped the road. A photograph taken during the storm event, Figure 4, shows the roadway top-of-road elevation at about 390.5 feet and the storm on Friday, March 10, 2014, prior to the peak.

Figure 5 shows a picture taken during a recent flooding of the 35th Avenue SE crossing by the City staff. During this flooding event, the City Engineer, Scott Smith, observed that the inundation levels came up to about 392 feet, with the water surface leveling out just below the 141st Street intersection roadway elevation.

5.0 RECOMMENDED ROADWAY DESIGN ELEVATIONS

Different sources of data were used to look at flood elevations around the area of interest on 35th Avenue SE between 144th Street SE and 141st Street SE. These included the DNR by the County, the HEC-RAS model, field observation data, and anecdotal information from City staff (Table 2 and Figure 2). The DNR report and HEC-RAS data did not provide conclusive numbers for estimating accurate flood elevations considering the recent roadway overtopping with storms much less than the 100-year event. Field observations and photographic recordings from previous storms show greater inundation of the roadway than predicted by the HEC-RAS model.

Based on the highest observed inundation level during a storm event, in which the water level encroached on the 141st Street intersection, a minimum design roadway (flow line) elevation of 393.5 feet is recommended. This top-of-road elevation would provide 1.5 feet freeboard from the highest observed flooding elevation of the 35th Avenue crossing. It would also account for factors and uncertainties that would cause higher flood elevations, such as increased runoff from development, clogging and lack of maintenance of culverts, beaver dams, and backwater effects from downstream structures.

The addition of a 24-inch pipe to the culvert system on the 35th Avenue crossing would eliminate potential increases in the base flood water surface elevation resulting from raising the road. Adding the pipe would provide no rise in the base flood elevation and improve flood conveyance in the system.

6.0 REFERENCES

Snohomish County Public Works Surface Water Management Division, 2002, North Creek drainage needs report: Everett, Wash., Snohomish County DNR no. 10, 1 v., available: http://snohomishcountywa.gov/1079/Urban-Drainage

TABLE 1
SNOHOMISH COUNTY DRAINGE NEEDS REPORT – HYDROLOGIC AND HYDRAULIC MODELING OUTPUT FOR PENNY CREEK AT 35TH AVENUE SE (NGVD29)

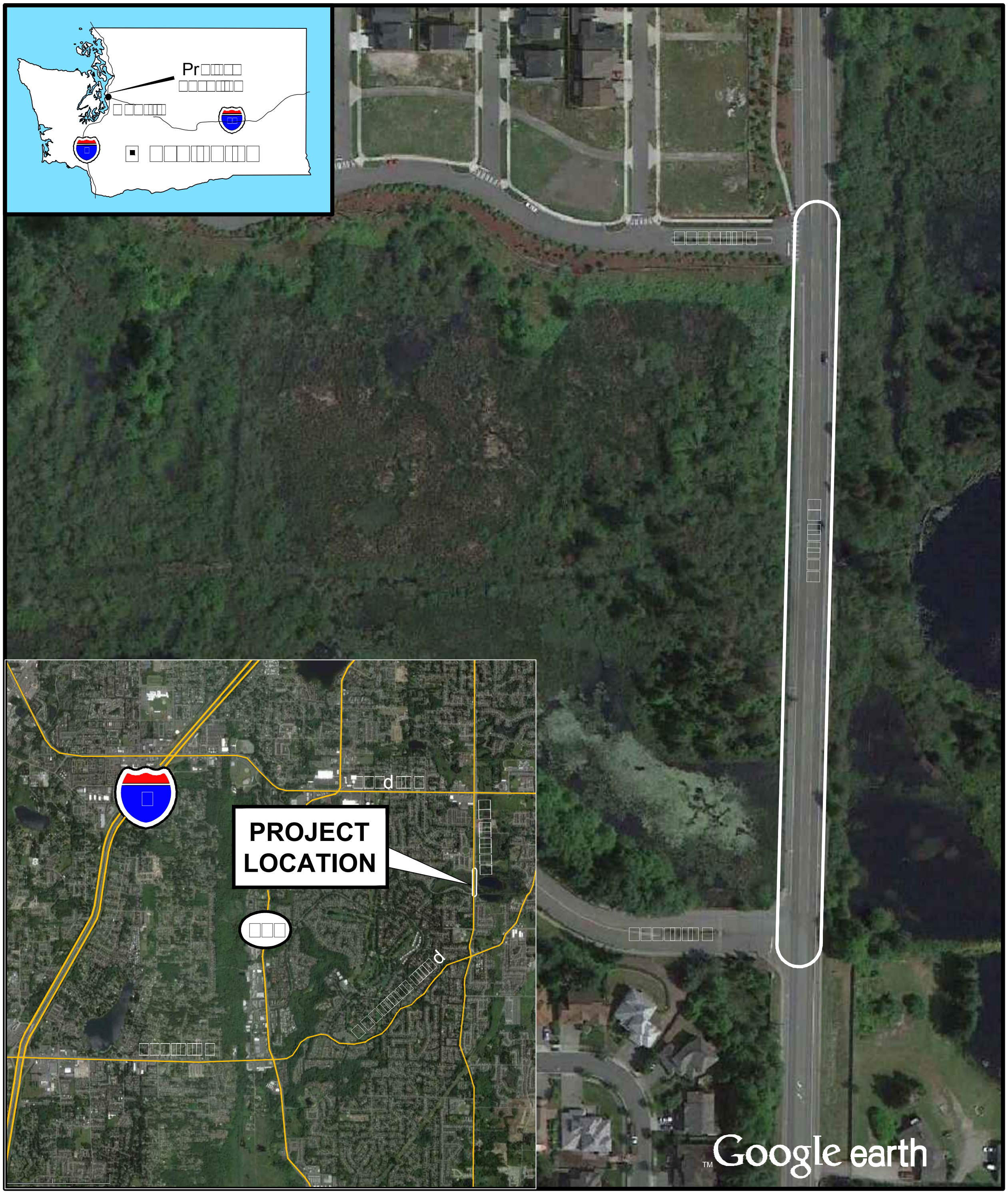
Recurrence Interval Flood	Existing Conditions Flood Flows (cfs)	Existing Conditions Flood Elevation (ft) (NGVD29)	Future Conditions Flood Flows (cfs)	Future Conditions Flood Elevation (ft) (NGVD29)
2 Year	45.4	387.75	45.7	387.77
10 Year	70.3	388.60	72.1	388.74
25 Year	98.1	389.06	107.8	389.28
100 Year	151.7	389.82	176.7	390.21

Notes:
Existing roadway flow line (gutter) elevations range from 390.1 to 390.4 feet.
cfs = cubic feet per second
DNR = Drainage Needs Report
ft = feet
NGVD29 = National Geodetic Vertical Datum of 1929

TABLE 2
BASE FLOOD ELEVATIONS FROM ALL SOURCES (NGVD29)

Source of Data	Measurements	Base Flood Elevation (ft)
DNR	Water Surface Elevation from DNR (ft)	389.80
HEC-RAS	Existing 100-year Water Surface Elevation	390.01
	Proposed 100-year Water Surface Elevation	390.34
Observed Data	Level Loggers on 35th Avenue SE Culvert	391.00
	Photographs from March 10, 2014, Storm Event (Figure 3)	391.00
	Photographs from a Previous Storm Event (Figure 4)	392.00

Notes:
DNR = Drainage Needs Report
ft = feet
HEC-RAS = Hydrologic Engineering Center's River Analysis System
NGVD29 = National Geodetic Vertical Datum of 1929



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VICINITY MAP

June

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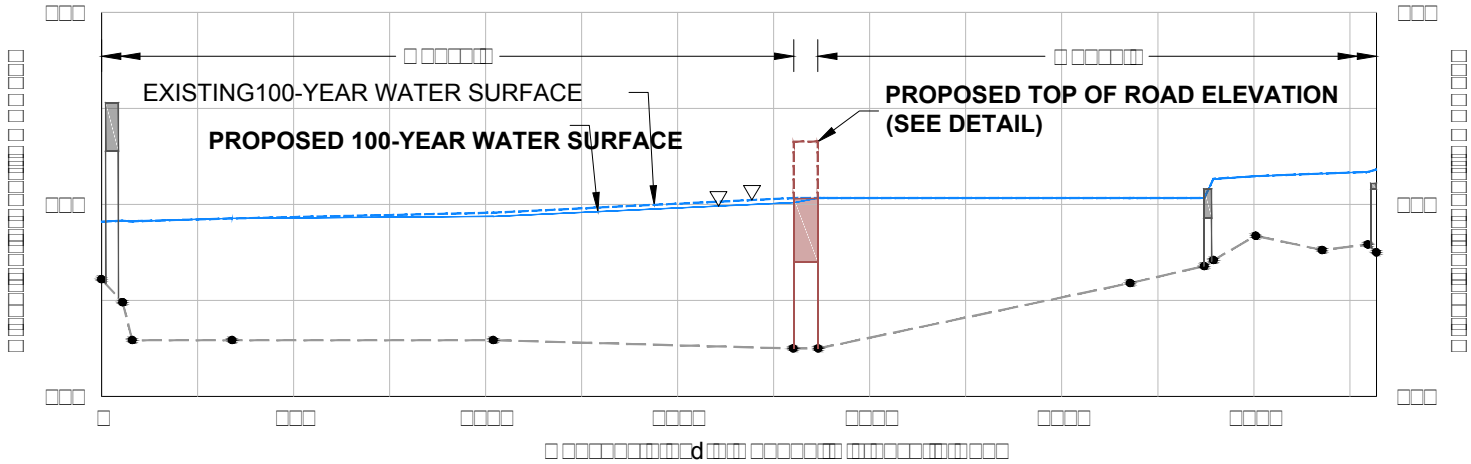
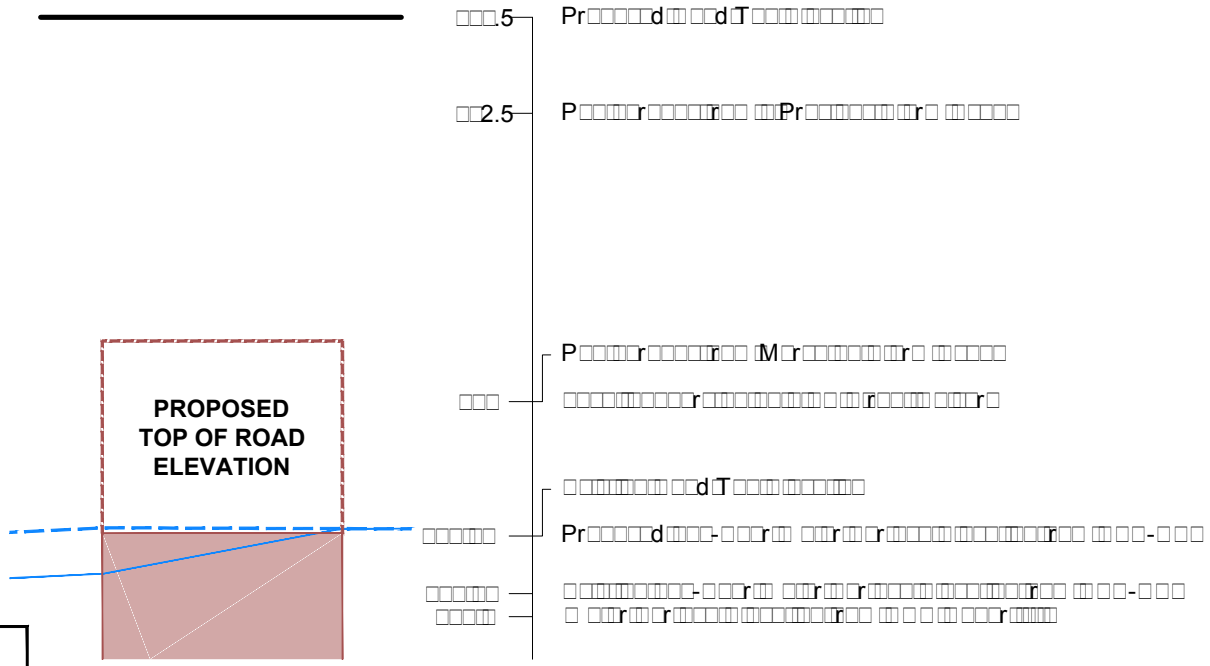
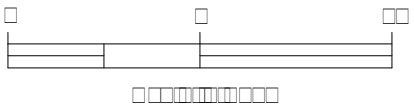
FIG. 1





ROAD DETAIL



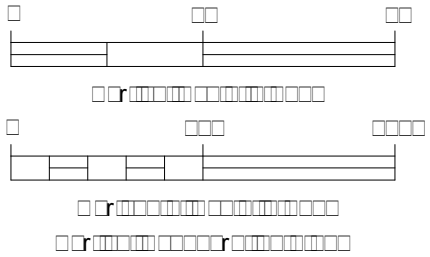


FIG. 2

WATER SURFACE PROFILE ALONG PENNY CREEK

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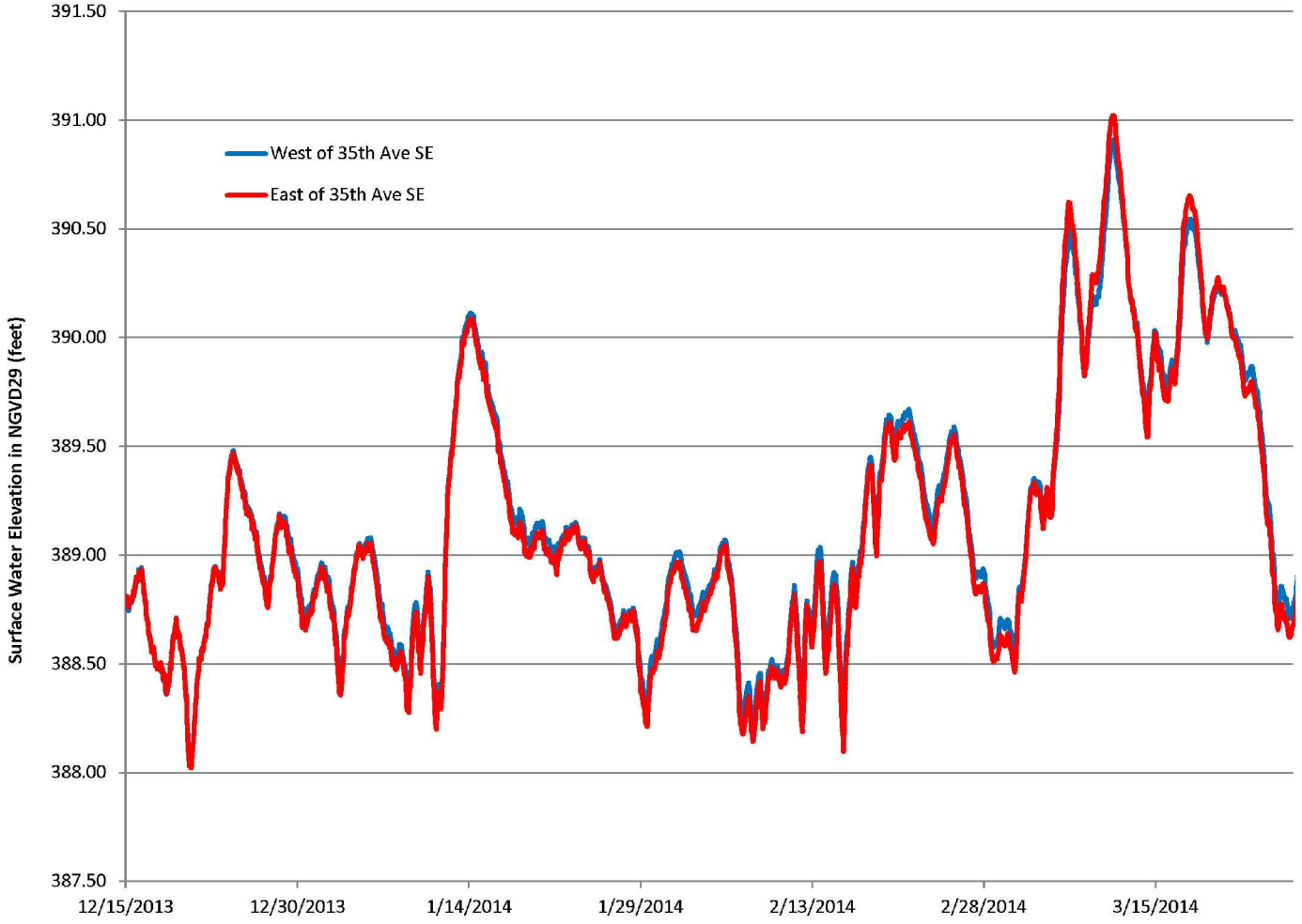
FIG. 2



WATER LEVEL DATA-LOGGER RECORDING ON CULVERT BELOW 35TH AVENUE SE

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FIG. 3

FIG. 3

[illegible]

M[illegible]

FLOODING OF 35TH AVENUE SE DURING THE MARCH 10TH STORM EVENT

June [illegible]

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FIG. 4

FIG. 4

FIG. 5

FLOODING OF 35TH AVENUE SE DURING A RECENTLY RECORDED STORM

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FIG. 5

Concept Level Geotechnical Study
35th Avenue SE Regrading
Station 12+00 to 20+00
Mill Creek, Washington

March 21, 2013

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C Important Information About Your Geotechnical/Environmental Report

CONCEPT LEVEL GEOTECHNICAL STUDY
35TH AVENUE SE REGRADING
STATION 12+00 TO 20+00
MILL CREEK, WASHINGTON

1.0 INTRODUCTION

This report presents our concept level geotechnical engineering studies for the 35th Avenue SE regrading project in the City of Mill Creek (the City), Washington. The City desires to raise the elevation of 35th Avenue because of flooding from about 144th Street to 141st Street (see Figure 1 for site location). This study addresses preliminary design of concepts to raise the roadway section from 144th Street, about Station 12+00, to 141st Street, about Station 20+00, as shown in Figures 2 and 3. The regraded section will begin and end at Stations 12+00 and 20+00, respectively, and match the current elevation of 392.5 feet. Regrading will include a vertical curve with a point of tangent intersection at Station 15+00 at elevation 393.5 feet.

Explorations performed by Snohomish County Public Works (SCPW) and AGRA Earth and Environmental (AGRA) encountered peat and organic silt up to 40 feet below the existing ground surface along this section of the alignment. Utilities located under the road include primarily storm drainage, which was reworked in 2009 because of settlement-related problems. The City engaged Shannon & Wilson to evaluate road construction alternatives that would reduce settlement and provide geotechnical recommendations for the City selected preferred alternative.

We performed preliminary analyses for and evaluated the feasibility of the following embankment alternatives:

- Lightweight fill (expanded polystyrene [EPS] and cellular concrete)
- Pile-supported roadway

This report presents our assessment of these alternatives. We understand that the City considered preloading the roadway with a heavy surcharge (5 to 10 feet of soil); however, because of the thickness of the peat and excessive duration required to effectively preload it, the City has eliminated this alternative.

Our services were authorized by Mr. Scott Smith of the City of Mill Creek under our On-Call Services Agreement.

2.0 SITE DESCRIPTION

35th Avenue SE is a three-lane paved arterial located with bike lanes and sidewalks in Mill Creek, Washington, as shown in Figure 1. The road is about 56 feet wide and crosses the Thomas Lake area and Penny Creek. Wetlands are located on either side of the roadway at the project site. A culvert located under the road at Penny Creek hydraulically connects the wetlands. We understand that during heavy rain events and following periods of continuous precipitation the roadway has been flooded with observed water depths around 2 or 3 feet above the existing pavement surface.

35th Avenue SE was reconstructed in 2002 and 2003 by SCPW as a road widening project. At the time it was known that the alignment was underlain by compressible peat deposits of varying thickness. A geotechnical design report was commissioned and completed by AGRA (1996).[1] Lightweight fill consisting of wood debris and chips (hog fuel) was recommended and selected by SCPW. Hog fuel is a mixture of wood debris that generally has a moist unit weight of about 35 to 60 pounds per cubic foot (pcf). The lightweight fill was recommended to reduce the stress increase on the compressible peat while building up the road, thereby reducing settlement.

Based on the SCPW field inspection reports, the existing road was excavated down to the groundwater level and backfilled with geogrid reinforced hog fuel and imported gravel borrow. Additionally, a preload of about 2 feet was placed over the roadway to shorten the time required for the peat to consolidate. Settlement monitoring plates were installed to measure the rate of preload settlement. When the Contractor reached the low point in the road (about Station 14+82 to 16+80), hog fuel was not placed because the groundwater was too high. Gravel borrow was placed in this area and it is in this area the settlement has been the greatest. In the area of flooding, the roadway appears to have settled about 2 feet in the past 10 to 12 years since the reconstruction.

During the widening of 35th Avenue SE, two 4-foot-diameter culverts were installed at the Penny Creek crossing. In 2003, Hayward Baker was commissioned to perform ground improvement by installing grout columns adjacent to and below the culverts to mitigate continued settlement.

Shannon & Wilson, Inc. has been monitoring settlement data collected by Roth Hill for 35th Avenue SE since 2009 at the request of the City. We have observed up to 2 inches of settlement at the points being monitored.

---

[1] AGRA Earth and Environmental (AGRA), 1996, Geotechnical engineering report, 35th Avenue SE Widening, Seattle Hill Road to 132nd Street SE, Snohomish County, WA, 11-10487-60, May.

3.0 SUBSURFACE EXPLORATIONS

SCPW and AGRA performed geologic studies for 35th Avenue SE in 1993 and 1996, respectively (AGRA, 1996). These studies included 11 soil borings and 9 peat probes. Of these 20 subsurface explorations, 6 are within the currently proposed project limits. Probes P-1 and P-2 and borings by SCPW and B-1, B-3, B-6 and boring B-6 by AGRA were used for our current study. The depths of the soil borings and probes ranged from 25.5 to 42 feet and from 7 to greater than 8 feet, respectively. The site plan show the subsurface exploration locations and the explorations logs prepared by AGRA are included in Appendix A.

Shannon & Wilson did not conduct subsurface explorations as part of our current services.

4.0 SUBSURFACE CONDITIONS

4.1 Soil

Our interpretation of the subsurface conditions is based on existing boring logs, observations at the site, and a review of the geotechnical site investigation prepared by AGRA. This includes profile A-A' (Figure 3) illustrating the interpretation of the subsurface conditions in the vicinity of the peat affected area. The geologic units referenced in this report are based on AGRA's geologic classifications presented in their May 1996 report (AGRA, 1996).

Between 144th Street and 141st Street, Stations 12+00 and 20+00, explorations revealed 1.5 to more than 10 feet of road fill underlain by up to 30 feet of very soft to soft, saturated peat and organic silt. Advanced outwash sand and gravel (Qva) was encountered below the peat.

4.2 Groundwater

The explorations at the site encountered groundwater. Standing water was also observed in the wetlands adjacent to the roadway. Based on these observations, the field explorations, and the SCPW Geologic Investigation, we anticipate that the groundwater elevation will fluctuate seasonally but will generally be located at about elevation 389.0 feet in the dry season and up to elevation 392.0 feet in the wet season.

5.0 GEOTECHNICAL ANALYSES AND RECOMMENDATIONS

Placing new fill on the road where peat is present would cause increased settlement that could result in continued flooding in the future. We performed preliminary analyses for three construction alternatives to raise the road profile while limiting settlement where the road is

underlain by peat. The assumed geometry and subgrade soils are shown in Figure 2. Raising the road surface by 3 feet at Station 13+00 will require retaining walls on both sides of 35th Avenue SE to avoid building wider shoulders into adjacent wetlands. Retaining walls could consist of cast-in-place concrete walls structurally tied to the load distribution slab or mechanically stabilized earth walls. The following sections present a brief discussion of the alternatives considered, their relative advantages and disadvantages, and our preliminary construction cost and schedule estimates for geotechnical items.

We performed preliminary analyses for and evaluated the feasibility of three alternatives. The City will likely consider the overall construction cost and construction schedule in selecting the preferred alternative.

The following sections briefly summarize each alternative and discuss their relative advantages and disadvantages and the estimated cost and construction time. The estimates should be considered preliminary and are based on our experience with similar projects, cost data provided by the City for similar projects and project cost data from Washington State Department of Transportation projects with similar quantities. Data and quantities used for the estimates are provided in Appendix B.

5.1 Expanded Polystyrene (EPS) Geofoam Fill

EPS geofoam is a lightweight fill material (about 1 to 3 pcf) that could be used to construct embankments on compressible soil. This method would involve removing the existing pavement and excavating to the peat deposit to remove existing fill. The next steps include installing EPS geofoam blocks, casting a load distribution slab over the EPS and then constructing a new pavement section. EPS geofoam is well suited for embankments on compressible soil because the additional weight imposed by new road fill could be counterbalanced by first excavating existing fill and replacing it with lighter weight EPS. Preliminary analyses indicated that the required overexcavation depth would be about 3.5 to 4.5 feet. Some dewatering could be required during construction. We anticipate that surface water could be controlled using sump pumps but excavations below the groundwater table would likely require a significant dewatering system and possibly shoring, the design of which is beyond the scope of this report. A preliminary profile for the EPS option is provided in Figure 2.

We estimate that geotechnical items for this option could cost about $1,035,000 to $1,600,000, as shown in Appendix B. In our opinion, this alternative is feasible and could be constructed within about 4-8 weeks depending on the Contractor selected.

5.2 Cellular Concrete Fill

Cellular concrete is a lightweight fill material composed of foam cement. The main principle behind using this material is the same as for the EPS geofoam alternative described above, i.e., decrease loads imposed on the compressible soil. Cellular concrete is about 10 to 40 times heavier by volume than EPS (about 20 to 35 pcf). Therefore, the required excavation depth to counterbalance the new embankment loads is about two times greater than the excavation required for EPS. Preliminary calculations indicated that the required depth of excavation would likely require excavation below the water table and potentially significant dewatering and shoring. This option does not require a distribution slab. A preliminary profile is provided in Figure 3.

We estimate that geotechnical items for this option could cost about $710,000 to $1,200,000, as shown in Appendix B. In our opinion, this alternative is feasible and could be constructed within about 4 to 8 weeks depending on the Contractor selected.

5.3 Pin Pile-supported Roadway

This alternative involves supporting a structural concrete slab with small-diameter (4- to 6-inch) steel pipe piles (pin piles). The pin piles would be driven through the peat deposit and into the underlying dense to very dense sand and gravel. The pile tops would be structurally connected to a concrete slab poured near the existing ground surface. Fill and the roadway pavement section would be constructed above the concrete slab. The piles would transfer the embankment and traffic loads to the dense to very dense soils below the peat. Less excavation would be required than if the embankment was constructed using lightweight fill, and some of the existing roadway could be left in place. Dewatering would likely not be required during construction. A preliminary profile is provided in Figure 3.

We estimate that geotechnical items for this option could cost about $1,325,000 to $1,860,000, as shown in Appendix B. In our opinion, this alternative is feasible and could be constructed within about 6-12 weeks depending on the Contractor selected.

6.0 PRELIMINARY RECOMMENDATIONS

In our opinion, each of the three options presented is feasible and would achieve the regrading of 35th Avenue SE. The lightweight fill option appears to be less expensive and would likely be faster to construct. The lightweight fill will not significantly reduce the stress on the peat. It will allow for the grade to be raised without significantly increasing the stress on the peat, however,

because of this we do expect total settlement to continue in this area as has occurred since 2009. The use of a load distribution slab will help control differential settlement.

The cellular concrete appears to be the less expensive of the two lightweight fill options and may reduce construction time although the likelihood of dewatering is greater than with the EPS because of the increased excavation depths required to balance the loads. If lightweight fill is chosen as the preferred alternative, we recommend groundwater management issues be evaluated to determine the need for and design of a dewatering system.

While the pile-supported embankment option is a more time-consuming method and may be more costly, it does have significantly lower risk for future settlement of the roadway, both total and differential. Because the loads from the roadway would be transferred to the dense sand and gravel below the peat, settlement of the peat could occur below the roadway without causing pavement settlement. In addition, this option would not require overexcavation and export of the subgrade or dewatering if constructed at low groundwater.

7.0 LIMITATIONS

The analyses, conclusions, and recommendations contained in this report are based on site conditions as they presently exist, and further assume that the explorations performed by SCPW and AGRA are representative of the subsurface conditions. The primary assumption is that the subsurface conditions everywhere are not significantly different from those disclosed by the reconnaissance and previous explorations. Within the limitations of the scope, schedule, and budget, the analyses, conclusions, and recommendations presented in this report were prepared in accordance with generally accepted professional geotechnical engineering and engineering geology principles and practices in this area at the time this report was prepared. We make no other warranty, either express or implied.

If, during construction, subsurface conditions different from those encountered thus far are observed or appear to be present, we may reconsider our recommendations. If there is substantial lapse of time between the submission of this report and additional phases of work, or if conditions change because of natural forces or construction operations at or adjacent to the site, we recommend that this report be reviewed. This review should be performed to determine the applicability of the conclusions and recommendations concerning the changed conditions or the time lapse.

This report was prepared for the exclusive use of the City of Mill Creek. It should be made available to prospective contractors and/or the Contractor for information on factual data only,

and not as a warranty of subsurface conditions such as those interpreted from the subsurface profile and presented in the discussion of subsurface conditions. Unanticipated soil conditions are commonly encountered and cannot fully be determined by merely taking soil samples from test borings. Such unexpected conditions frequently require that additional expenditures are made to attain properly constructed projects. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

Shannon & Wilson has prepared a document entitled, "Important Information About Your Geotechnical Report," which is enclosed as Appendix C with this report. Please review this document for information describing the use and limitations of this report.

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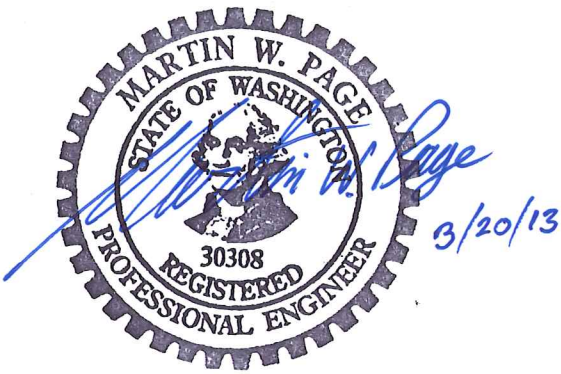

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Senior Associate

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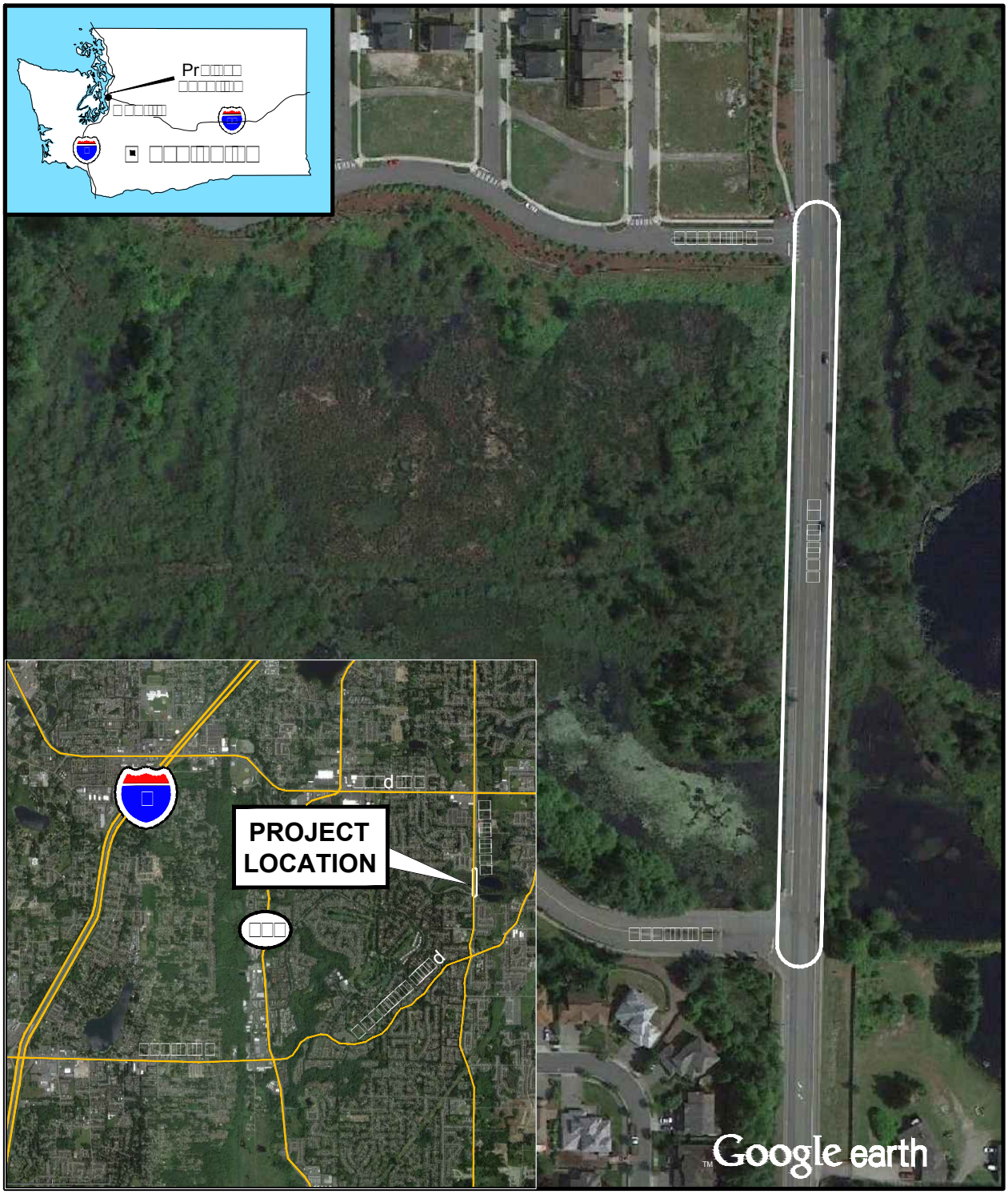

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VICINITY MAP

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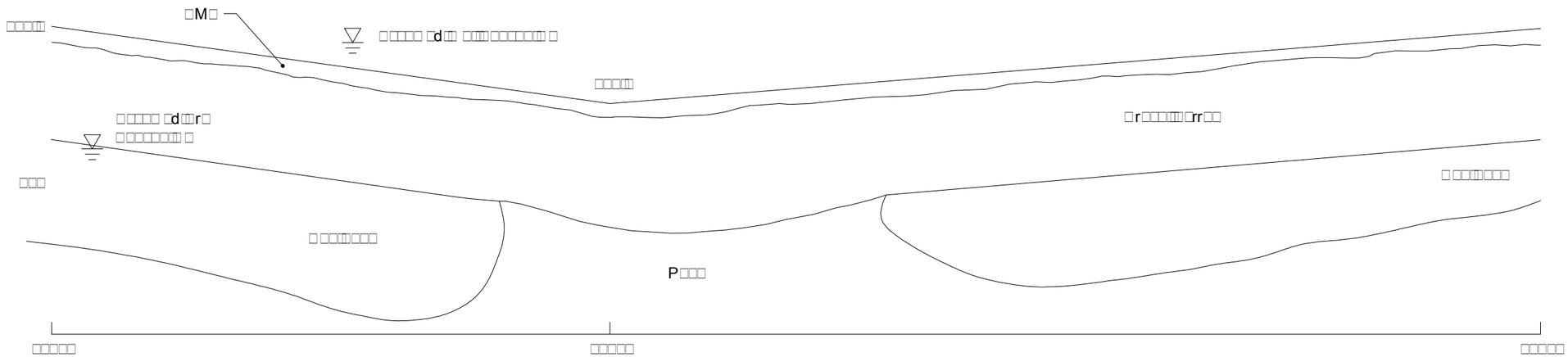
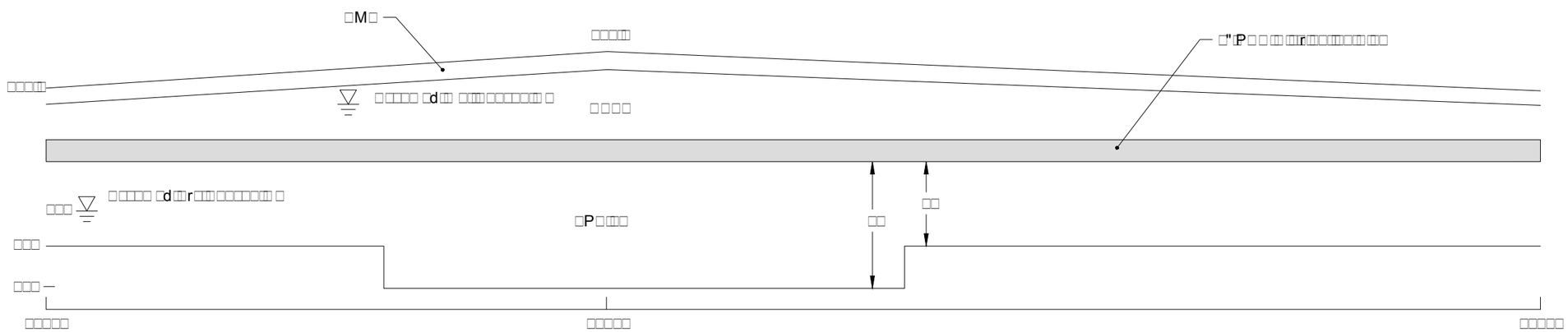
Geotechnical and Environmental Consultants

FIG. 1

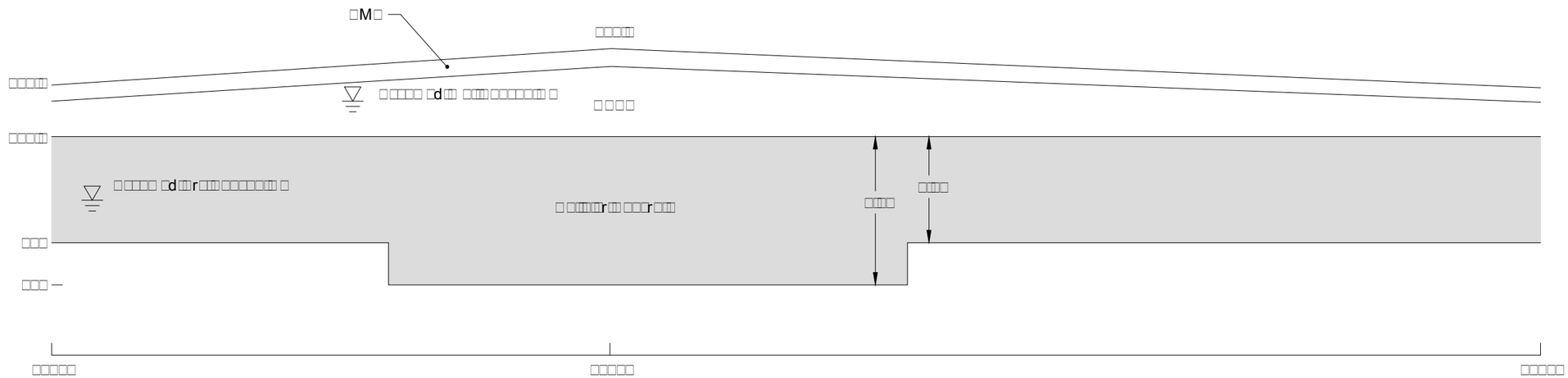


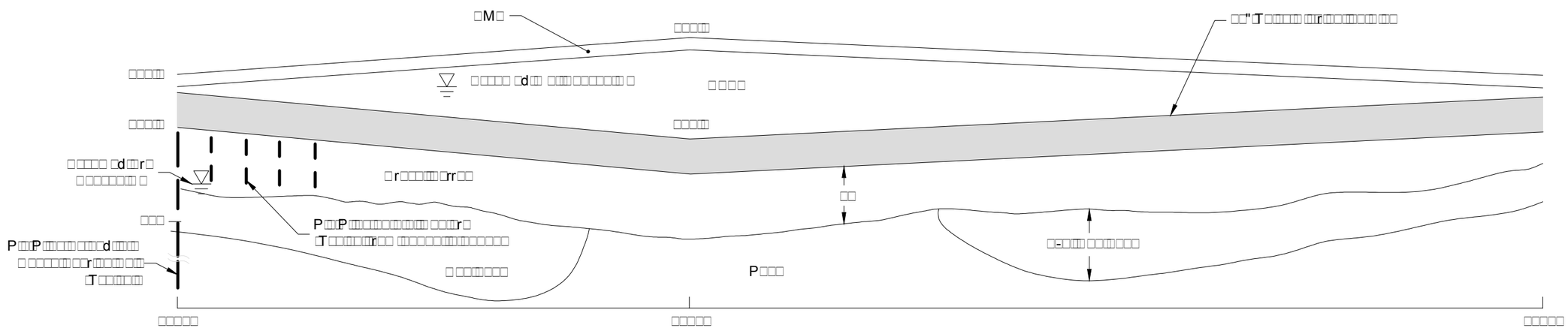


EXISTING AND LIGHTWEIGHT FILL EMBANKMENT (EPS) CROSS SECTIONS

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 2





P P PP T M M T

M r d
r d
M r

LIGHTWEIGHT FILL EMBANKMENT (CELLULAR CONCRETE) AND PIN PILE SUPPORTED CROSS SECTIONS

M r

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

FIG. 3

APPENDIX A

PREVIOUS BORING LOGS, SITE PLAN, AND GEOLOGIC CROSS SECTION

148th STREET S.E.

144th STREET S.E.

PROPOSED SWALE

EXISTING EDGE OF ROADWAY

PROPOSED SLOPE EASEMENT

PROPOSED R/W

80+00

85+00

90+00

B-3(AEE)

HA-1(SC)

P-1(SC)

EXISTING EDGE OF ROADWAY

PROPOSED R/W

PROPOSED CONSTRUCTION CENTERLINE

PROPOSED MEDIAN SWALE
STA. 95+50 TO 97+40

PROPOSED MEDIAN SWALE
97+70 TO 102+50

PROPOSED WIDENING

PROPOSED R/W

PROPOSED DETENTION POND

PROPOSED DRIVEWAY

B-6(AEE)

A

P-2(SC)

95+00

B-6(SC)

B-3(SC)

B-1(SC)

100+00

B

B-5(AEE)

B-2(SC)

PROPOSED CONSTRUCTION CENTERLINE

B-5(SC)

105+00

A'

PROPOSED WIDENING

EXISTING CULVERT
(TO BE REPLACED)

PENNY CREEK

PROPOSED R/W

B'

RHOD-AZALEA DRIVEWAY

A-1

NOTE: SEE FIGURE 2A FOR NOTES & LEGEND.

0 100 200
SCALE IN FEET

PLAN BASED ON DESIGN REPORT BY SNOHOMISH COUNTY DEPARTMENT OF PUBLIC WORKS

AGRA Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington, U.S.A. 98034-6918

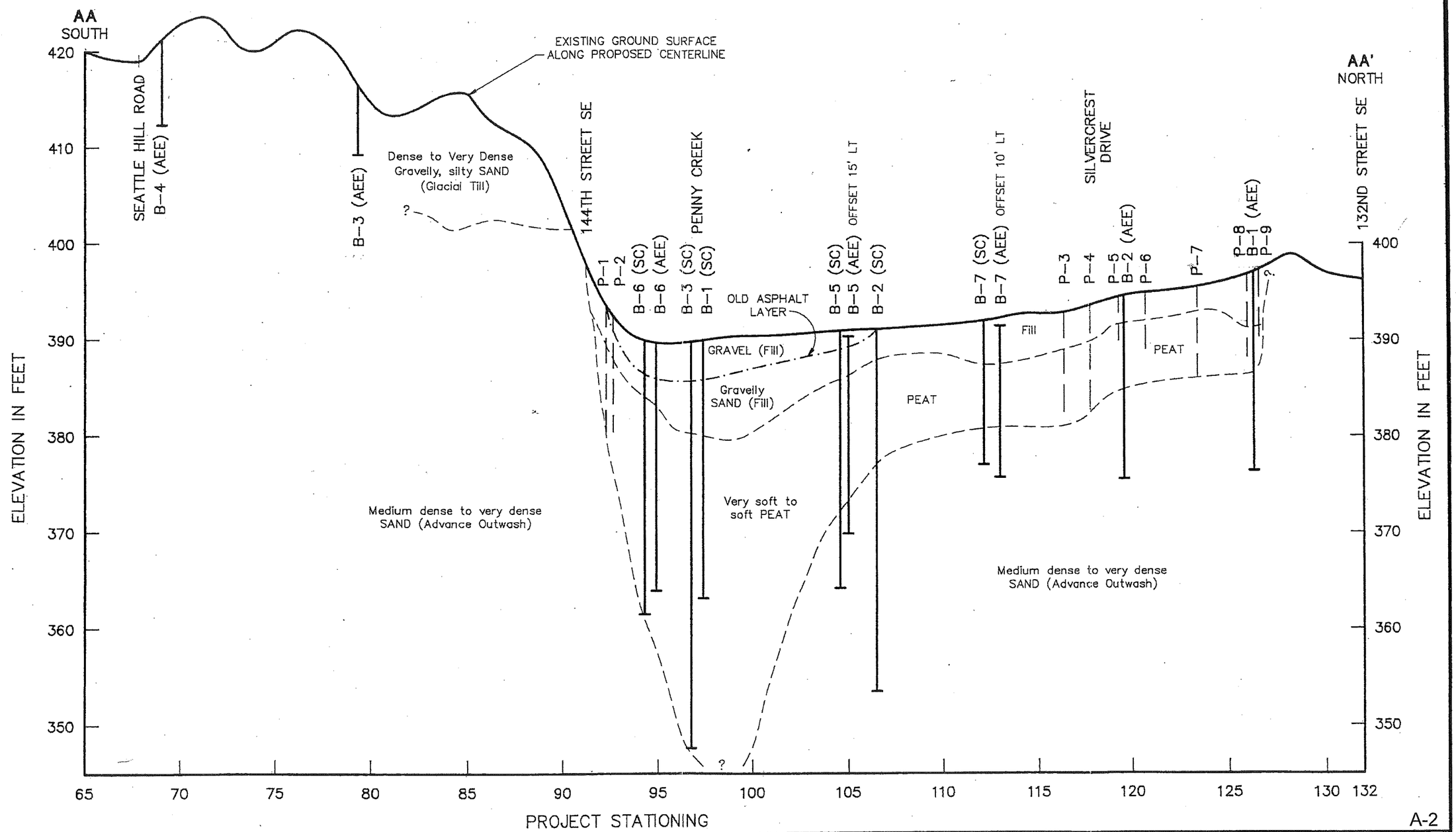
W.O.	11-10487
DESIGN	JMB
DRAWN	DMW
DATE	OCT 1995
SCALE	NOTED

35th AVENUE S.E. WIDENING
SNOHOMISH COUNTY, WASHINGTON

SITE & EXPLORATION PLAN

FIGURE 2B

AGRA Earth & Environmental, Inc.



A-2

SCALE

HORIZONTAL 1"=500'
VERTICAL 1"=10'

AGRA
Earth & Environmental
11335 N.E. 122nd Way, Suite 100
Kirkland, WA, U.S.A. 98034-6918

W.O.	11-10487-00
DESIGN	TDW
DRAWN	JMR
DATE	NOV 1995
SCALE	NOTED

35th AVENUE S.E. WIDENING
SNOHOMISH COUNTY, WASHINGTON

GEOLOGIC PROFILE AA-AA'

FIGURE 5

AGRA EARTH & ENVIRONMENTAL, INC. DRAWING NO. \11\10487\PROFILE.DWG

PROJECT: *35th Avenue SE Widening* W.O. *11-10487-00* BORING NO. *B-6*

Page 1 of 1

SOIL DESCRIPTION

Location: *94+75, 30 feet LT, Off Shoulder*

Approximate ground surface elevation: *390 feet*

DEPTH (feet)	SOIL DESCRIPTION	SAMPLE TYPE	SAMPLE NUMBER	GROUND WATER	PENETRATION RESISTANCE (Standard ▲, Other △; Blows per foot 0–50)	TESTING
0	*Very soft, moist to wet, reddish brown, fine fibrous PEAT*					
5			S-1		915	
	10" recovery		P-1			
	Becomes saturated			ATD		
10	*24" recovery*		P-2		960 to 1039	TV=0.75 tsf, γ=59 pcf
15						
	Becomes brown, silty		S-2			
	Medium stiff, saturated, blue-gray, sandy SILT					
20			S-3			
	Very dense, gray, fine to medium SAND with some silt (Advance Outwash)					
25			S-4		57	
	Boring terminated at approximately 25.5 feet					
30						

MOISTURE CONTENT: Plastic limit — Natural — Liquid limit (0, 20, 40, 60, 80, 100)

A-3

LEGEND

- 2.00-inch OD split-spoon sample
- 3.00-inch OD Shelby tube sample
- Sample not recovered
- Grab sample
- N/E — No groundwater encountered
- ATD — Groundwater level at time of drilling
- Grain size analysis
- Consolidation test
- CBR — California bearing ratio test

AGRA Earth & Environmental
11335 NE 122nd Way, Suite 100
Kirkland, Washington 98034-6918

Drilling method: *HSA* Hammer type: *Cathead* Date drilled: *28 September 1995* Logged by: *TDW*

AGRA Earth and Environmental, Inc.

PROJECT:	35th Ave 132nd to Seattle Hill Road Snohomish County	BORING NO.:	B-1
		DRILLER:	Snohomish County
		DRILL TYPE:	Simco 2400 sk-1
C.R.P.#:	CRP# 92-971 DATE: 8/3/88	AUGER TYPE:	hollow auger
LOCATION:	(see "notes" below)	FLUID:	none
GEO./ENGR.:	J.Jones ELEV.: 389.50	TOTAL DEPTH:	26.50

SAMPLE INTERVAL	SAMPLE #	SPT BLOWS/FT	STRATA	DEPTH	SOIL DESCRIPTION	NOTES
					ASPHALT CONCRETE	
					FILL; SAND and GRAVEL, gray, trace to little silt oiled, dense, damp. (FILL)	Sampling performed in accordance with ASTM D-1586-84 test method.
X	1	55/12"			FILL; SAND and GRAVEL, gray, trace to little silt, dense, wet. (FILL)	
X	2	39		5	Trace organics at 5.0'	
					Rock at 8'	
					ORGANIC SILT / PEAT; Brown, locally fibrous, soft, wet. (PT / OL)	
X	3	3		10		
X	4	2		15		
X	5	2		20		
X	6	0		25		
					TD = 26.5 feet	

NOTES: Location: 3430'S., 6'E. of intersection with 132nd Street SE.

A-4

Snohomish County
Public Works

TEST BORING LOG B-1

PROJECT:	35th Ave 132nd to Seattle Hill Road Snohomish County	BORING NO.:	B-3
		DRILLER:	SNOHOMISH CO.PUB.WX.
		DRILL TYPE:	Simco 2400
C.R.P.#:	CRP# 92-971 DATE: 5/13/93	AUGER TYPE:	Solid stem auger
LOCATION:	3475'S.,6'W of int. 132nd	FLUID:	none
GEO./ENGR.:	J.Jones ELEV.: 389.00	TOTAL DEPTH:	42.00

SAMPLE INTERVAL	SAMPLE #	SPT BLOWS/FT	STRATA	DEPTH	SOIL DESCRIPTION	NOTES
					ASPHALT; 0.35'	
					PERMEABLE BASE; 0.65'	
					GRAVEL BORROW; Brown sandy gravel, trace silt, gravel rounded to 2.5", wet, medium dense. (GW)	
					ASPHALT; 0.5' including gravel base.	Hard, smooth surface at 3 feet.
				5	GRAVELLY SAND; Gray-brown, fine to medium grained, wet, medium dense to dense. (SP)	
					LOGS; puncheon mat from original road construction.	Hard drilling on logs at 8.0 feet.
				10	PEAT; Red-brown, fibrous, occasional gravel and sand lenses, saturated, very soft. (PT)	
				15		
				20		
				25		

NOTES: Original boring located 15 feet south of Penny Creek culvert, terminated on puncheon log mat at 8 feet. This boring was located 10 feet south of original and completed at 42 feet.

A-5

Snohomish County Public Works

TEST BORING LOG B-3

PROJECT:	35th Ave 132nd to Seattle Hill Road Snohomish County	BORING NO.:	B-3
		DRILLER:	SNOHOMISH CO.PUB.WX.
		DRILL TYPE:	Simco 2400
C.R.P.#:	CRP# 92-971 DATE: 5/13/93	AUGER TYPE:	Solid stem auger
LOCATION:	3475'S.,6'W of int. 132nd	FLUID:	none
GEO./ENGR.:	J.Jones ELEV.: 389.00	TOTAL DEPTH:	42.00

SAMPLE INTERVAL	SAMPLE #	SPT BLOWS/FT	STRATA	DEPTH	SOIL DESCRIPTION	NOTES
					continued from previous page	
				35		
				40		Gravelly hard drilling.
					GRAVELLY SAND; Very dense (not observed).	
					T.D. = 42 feet	

NOTES: Original boring located 15 feet south of Penny Creek culvert, terminated on puncheon log mat at 8 feet. This boring was located 10 feet south of original and completed at 42 feet.

A-6

Snohomish County Public Works

TEST BORING LOG B-3

PROJECT:	35th Ave 132nd to Seattle Hill Road Snohomish County	BORING NO.:	B-6
		DRILLER:	SNOHOMISH CO PUB WX
		DRILL TYPE:	Simco 2400
C.R.P.#:	CRP# 92-971 DATE: 6/23/93	AUGER TYPE:	Hollow stem auger
LOCATION:	3700'S.,6'W. of int.132nd	FLUID:	none
GEO./ENGR.:	J.Jones ELEV.: 389.00	TOTAL DEPTH:	29.00

SAMPLE INTERVAL	SAMPLE #	SPT BLOWS/FT	STRATA	DEPTH	SOIL DESCRIPTION	NOTES
					ASPHALT; 0.35'.	
					PERMEABLE GRAVEL BASE; Lightly asphalt-treated, 1.25" minus crushed gravel.(FILL)	
					GRAVEL BORROW; Interbedded with gravelly sand, some oil-treated layers, wet, medium dense. (FILL)	
				5		
					PEAT; Reddish brown, some rootlets, decomposed, wet, very soft. (PT)	
					Becomes fibrous	
				10		
				15		
				20	Becomes yellow-tan, non-fibrous, fine textured.	
				25	CLAYEY SILT; Light gray, plastic, some organic interbeds, wet, soft. (MH)	
X	1	63			GRAVELLY SAND; Gray, fine grained, some silt, poorly graded, very moist to wet, very dense. (SP)	
					T.D. = 29 feet	

NOTES: Boring completed at 29 feet in native gravelly sand.

A-7

Snohomish County Public Works

TEST BORING LOG B-6

PEAT PROBE RESULTS - 35TH Avenue SE

Probe Number	Location (from 132nd St.)	Elevation	Depth to Base
P-1	3915' S.,15' E.	391'	7'
P-2	3880' S.,15' W.	391'	8'+
P-3	1530' S.,40' W.	390'	8'+
P-4	1375' S.,20' E.	392'	8'
P-5	1235' S.,16' W.	394'	4'
P-6	1110' S.,20' W.	393'	4'
P-7	825' S.,14' E.	394'	8'
P-8	580' S.,25' E.	392'	4.5'
P-9	550' S.,18' W	394'	4.5'

APPENDIX B

CONSTRUCTION COST ESTIMATES

Construction Cost Estimate

Cell-Crete							
No.	**Item**	**Quantity**	**Unit**	**Low Cost**	**High Cost**	**Low Total**	**High Total**
1	HMA Pavement	1120	TON	$120	$170	$134,400	$190,400
2	CSBC	4500	TON	$25	$40	$112,500	$180,000
3	Export	7000	CY	$15	$30	$105,000	$210,000
5	Cell-crete (28 pcf)	5000	CY	$60	$80	$300,000	$400,000
6	Dewatering	1	LS	$50,000	$200,000	$50,000	$200,000
					Totals:	$701,900	$1,180,400

EPS Geofoam							
No.	**Item**	**Quantity**	**Unit**	**Low Cost**	**High Cost**	**Low Total**	**High Total**
1	HMA Pavement	1120	TON	$120	$170	$134,400	$190,400
2	CSBC	6000	TON	$25	$40	$150,000	$240,000
3	Export	6400	CY	$15	$30	$96,000	$192,000
4	Distribution Slab, 6"	850	CY	$250	$400	$212,500	$340,000
5	EPS, 22	4000	CY	$100	$115	$400,000	$460,000
6	Dewatering	1	LS	$40,000	$175,000	$40,000	$175,000
					Totals:	$1,032,900	$1,597,400

Pin Piles							
No.	**Item**	**Quantity**	**Unit**	**Low Cost**	**High Cost**	**Low Total**	**High Total**
1	HMA Pavement	1120	TON	$120	$170	$134,400	$190,400
2	CSBC	3650	TON	$25	$40	$91,250	$146,000
3	Export	1700	CY	$15	$30	$25,500	$51,000
4	Distribution Slab, 12"	1700	CY	$250	$400	$425,000	$680,000
5	Piles, 6" (~800 piles on 7.5 foot centers)	36000	LF	$18	$22	$648,000	$792,000
					Totals:	$1,324,150	$1,859,400

Notes:
CY = cubic yard
LS = lump sum
LF = lineal feet
Ton = 2,000 pounds

APPENDIX C

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

IMPORTANT INFORMATION ABOUT YOUR GEOTECHNICAL/ENVIRONMENTAL REPORT

CONSULTING SERVICES ARE PERFORMED FOR SPECIFIC PURPOSES AND FOR SPECIFIC CLIENTS.

Consultants prepare reports to meet the specific needs of specific individuals. A report prepared for a civil engineer may not be adequate for a construction contractor or even another civil engineer. Unless indicated otherwise, your consultant prepared your report expressly for you and expressly for the purposes you indicated. No one other than you should apply this report for its intended purpose without first conferring with the consultant. No party should apply this report for any purpose other than that originally contemplated without first conferring with the consultant.

THE CONSULTANT'S REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

A geotechnical/environmental report is based on a subsurface exploration plan designed to consider a unique set of project-specific factors. Depending on the project, these may include: the general nature of the structure and property involved; its size and configuration; its historical use and practice; the location of the structure on the site and its orientation; other improvements such as access roads, parking lots, and underground utilities; and the additional risk created by scope-of-service limitations imposed by the client. To help avoid costly problems, ask the consultant to evaluate how any factors that change subsequent to the date of the report may affect the recommendations. Unless your consultant indicates otherwise, your report should not be used: (1) when the nature of the proposed project is changed (for example, if an office building will be erected instead of a parking garage, or if a refrigerated warehouse will be built instead of an unrefrigerated one, or chemicals are discovered on or near the site); (2) when the size, elevation, or configuration of the proposed project is altered; (3) when the location or orientation of the proposed project is modified; (4) when there is a change of ownership; or (5) for application to an adjacent site. Consultants cannot accept responsibility for problems that may occur if they are not consulted after factors which were considered in the development of the report have changed.

SUBSURFACE CONDITIONS CAN CHANGE.

Subsurface conditions may be affected as a result of natural processes or human activity. Because a geotechnical/environmental report is based on conditions that existed at the time of subsurface exploration, construction decisions should not be based on a report whose adequacy may have been affected by time. Ask the consultant to advise if additional tests are desirable before construction starts; for example, groundwater conditions commonly vary seasonally.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or groundwater fluctuations may also affect subsurface conditions and, thus, the continuing adequacy of a geotechnical/environmental report. The consultant should be kept apprised of any such events, and should be consulted to determine if additional tests are necessary.

MOST RECOMMENDATIONS ARE PROFESSIONAL JUDGMENTS.

Site exploration and testing identifies actual surface and subsurface conditions only at those points where samples are taken. The data were extrapolated by your consultant, who then applied judgment to render an opinion about overall subsurface conditions. The actual interface between materials may be far more gradual or abrupt than your report indicates. Actual conditions in areas not sampled may differ from those predicted in your report. While nothing can be done to prevent such situations, you and your consultant can work together to help reduce their impacts. Retaining your consultant to observe subsurface construction operations can be particularly beneficial in this respect.

A REPORT'S CONCLUSIONS ARE PRELIMINARY.

The conclusions contained in your consultant's report are preliminary because they must be based on the assumption that conditions revealed through selective exploratory sampling are indicative of actual conditions throughout a site. Actual subsurface conditions can be discerned only during earthwork; therefore, you should retain your consultant to observe actual conditions and to provide conclusions. Only the consultant who prepared the report is fully familiar with the background information needed to determine whether or not the report's recommendations based on those conclusions are valid and whether or not the contractor is abiding by applicable recommendations. The consultant who developed your report cannot assume responsibility or liability for the adequacy of the report's recommendations if another party is retained to observe construction.

THE CONSULTANT'S REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when other design professionals develop their plans based on misinterpretation of a geotechnical/environmental report. To help avoid these problems, the consultant should be retained to work with other project design professionals to explain relevant geotechnical, geological, hydrogeological, and environmental findings, and to review the adequacy of their plans and specifications relative to these issues.

BORING LOGS AND/OR MONITORING WELL DATA SHOULD NOT BE SEPARATED FROM THE REPORT.

Final boring logs developed by the consultant are based upon interpretation of field logs (assembled by site personnel), field test results, and laboratory and/or office evaluation of field samples and data. Only final boring logs and data are customarily included in geotechnical/environmental reports. These final logs should not, under any circumstances, be redrawn for inclusion in architectural or other design drawings, because drafters may commit errors or omissions in the transfer process.

To reduce the likelihood of boring log or monitoring well misinterpretation, contractors should be given ready access to the complete geotechnical engineering/environmental report prepared or authorized for their use. If access is provided only to the report prepared for you, you should advise contractors of the report's limitations, assuming that a contractor was not one of the specific persons for whom the report was prepared, and that developing construction cost estimates was not one of the specific purposes for which it was prepared. While a contractor may gain important knowledge from a report prepared for another party, the contractor should discuss the report with your consultant and perform the additional or alternative work believed necessary to obtain the data specifically appropriate for construction cost estimating purposes. Some clients hold the mistaken impression that simply disclaiming responsibility for the accuracy of subsurface information always insulates them from attendant liability. Providing the best available information to contractors helps prevent costly construction problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because geotechnical/environmental engineering is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in their contracts, reports and other documents. These responsibility clauses are not exculpatory clauses designed to transfer the consultant's liabilities to other parties; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

The preceding paragraphs are based on information provided by the
ASFE/Association of Engineering Firms Practicing in the Geosciences, Silver Spring, Maryland

Wetland and Stream Delineation Report
35th Avenue SE Reconstruction Project
Mill Creek, Washington

June 19, 2014

SHANNON & WILSON, INC.

GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

Excellence. Innovation. Service. Value.

Since 1954.

Submitted To:
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By:
Shannon & Wilson, Inc.
400 N 34th Street, Suite 100
Seattle, Washington 98103

21-1-21948-004

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3.0 DOCUMENT REVIEW 2

4.0 WETLAND DELINEATION 2
- 4.1 Wetland A 3
- 4.2 Uplands 3

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FIGURES

1 Vicinity Map
2 Site Plan

APPENDICES

A Wetland Delineation Methodology
B Wetland Determination Data Forms – Western Mountains, Valleys, and Coast Region
C Wetland Rating Forms
D Important Information About Your Wetland Delineation/Mitigation and/or Stream Classification Report

WETLAND AND STREAM DELINEATION REPORT
35TH AVENUE SE RECONSTRUCTION PROJECT
MILL CREEK, WASHINGTON

1.0 INTRODUCTION

Shannon & Wilson, Inc. conducted a wetland and stream delineation along the 35th Avenue SE Reconstruction Project corridor in Mill Creek, Washington (Figure 1). The project corridor includes 35th Avenue NE between 141st Street SE and 144th Street SE, and is located in the SE ¼ of Section 32 and the SW ¼ of Section 33 in Township 28N, Range 5E of the Willamette Meridian (Figure 2).

It is our understanding that the City of Mill Creek (hereafter referred to as "the City") is considering alternatives to either raise the elevation of the roadway or to build levees on both sides to mitigate flooding of the road in the project corridor. The purpose of our wetland and stream delineation is to provide baseline wetland and stream conditions for the project. The scope of services for our wetland and stream delineation was limited to the following tasks:

- Conduct a background review of information relating to the site.
- Complete a wetland delineation of the project corridor and categorize the site wetland using the Washington State Wetland Rating System for Western Washington.
- Delineate the ordinary high water mark (OHWM) of Penny Creek in the project corridor.
- Complete a wetland and stream delineation report describing our findings including wetland and stream categories and standard buffer widths.

2.0 METHODS

Potential wetlands were identified using methods described in the Washington State Department of Ecology's (Ecology's) 1997 *Washington State Wetland Identification and Delineation Manual*, U.S. Army Corps of Engineers' (Corps') 1987 *Wetland Delineation Manual*, and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region Version 2.0* (May 2010).

Potential wetland areas were determined using the triple-parameter approach, which considers vegetation types, soil conditions, and hydrologic conditions. For an area to be considered wetland, it must display each of the following: (a) dominant plant species that are considered

hydrophytic by the accepted classification indicators, (b) soils that are considered hydric under federal definition, and (c) indications of wetland hydrology, in accordance with federal definition. Appendix A provides a detailed description of methodology used.

The OHWM of Penny Creek was delineated using the methodology in the Ecology technical report, *Determining the Ordinary High Water Mark on Streams in Washington State*. The OHWM of Penny Creek and wetland data plot locations were flagged with orange flagging. The wetland boundary was flagged with pink "wetland boundary" flagging.

3.0 DOCUMENT REVIEW

Prior to conducting fieldwork, we reviewed the following background information:

- U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Web Soil Survey interactive mapping system (2014)
- U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) Wetlands Mapper interactive mapping system (2014)
- Washington State Department of Fish and Wildlife SalmonScape mapping system (2014)

The NRCS web soil survey identifies the site soils in the project corridor predominantly as Mukilteo muck; Alderwood gravelly sandy loam is mapped on the southwest corner of the site, just north of 144th Street SE. Of these soil series, Mukilteo muck is identified as a hydric soil in Washington.

The USFWS NWI online mapper identifies a large emergent/scrub-shrub palustrine wetland associated with Penny Creek.

The SalmonScape mapping system indicates that Penny Creek begins at Thomas Lake, which is located west of 35th Avenue SE, and flows to the southeast where it flows into North Creek. Although a total blockage fish barrier is mapped in the Mill Creek Country Club golf course, just over a mile downstream of the project corridor, Coho salmon have been documented in Penny Creek through the project corridor.

4.0 WETLAND DELINEATION

Shannon & Wilson, Inc. conducted the wetland delineation fieldwork on March 7, 2014. Due to heavy recent rains, the project area was flooded and one lane was closed and under water.

We observed and delineated one wetland (identified as Wetland A) on both sides of the project corridor (Figure 2). Descriptions of the wetland and adjoining uplands follow. Vegetation is described below by common name, with the scientific name and indicator status in parentheses. Soils are described with the associated Munsell® Color Charts color. See Appendix B for Wetland Data Forms.

4.1 Wetland A

Wetland A is a large palustrine/riverine wetland system (over 50 acres in size) associated with Penny Creek. Wetland A consists of a mixture of aquatic bed, emergent, scrub-shrub, and forested plant communities. The dominant vegetation observed in Wetland A included red alder (*Alnus rubra*, FAC), willow (Salix spp.), salmonberry (*Rubus spectabilis*, FAC), spirea (*Spiraea douglasii*, FACW), reed canarygrass (*Phalaris arundinacea*, FACW), and cattail (*Typha latifolia*, OBL). No aquatic vegetation was observed; however, we assume that the large ponds within Wetland A likely contain aquatic vegetation later in the growing season.

Wetland soils were difficult to observe due to at least a foot of flooding in the project area. Soils observed on the south boundary of Wetland A consisted of 6 inches of black (10 YR 2/1), silty muck over gray (5 Y 6/1) silt loam. Soils were saturated to the surface and were covered with at least 16 inches of water. Wetland hydrology is likely a combination of a seasonally high groundwater table and overbank flooding from Penny Creek.

4.2 Uplands

Uplands in the project area included the 35th Avenue SE roadbed and lawn and landscaped areas around residential developments to the north and south. Vegetation observed along the roadbed consisted of reed canarygrass (Phalaris arundinacea, FACW), Bohemian knotweed (Polygonum bohemicum, NL), Robert's geranium (Geranium robertianum, FACU), cleaver bedstraw (Galium aparine, FACU), and bentgrass (Agrostis spp.).

A small island of upland was also observed west of 35th Avenue SE. The island was dominated by native species, including shore pine (Pinus contorta, FAC), western hemlock (*Tsuga heterophylla*, FAC), salal (*Gaultheria shallon*, FACU), and bracken fern (*Pteridium aquilinum*, FACU).

Upland soils consisted of 5 inches of very dark brown (10 YR 2/2) loam over dark brown (10 YR 3/3), gravelly, sandy loam. Closer to the wetland boundary, upland soils consisted of 4 inches of black (7.5 YR 2.5/1) silt loam over very dark gray (10 YR 3/1) to dark gray (10 YR 4/1),

gravelly, sandy loam; redoximorphic concentrations were observed at a depth of 6 inches below ground surface. Observed upland soils were dry to slightly moist.

5.0 STREAM DELINEATION

The OHWM of Penny Creek was identified based on visual observations of vegetation breaks and racking as well as anecdotal flooding information from City staff. Based on this information, the OHWM of Penny Creek in the project area coincides with Wetland A's wetland boundary.

6.0 REGULATIONS

Several local, state, and federal regulations apply to development proposals in and/or near wetlands and streams. A summary of applicable regulatory implications is given below.

6.1 City of Mill Creek (City)

The City regulates wetlands under Chapter 18.06 (Environmentally Critical Areas) of the Mill Creek Municipal Code (MCMC) (2013).

The MCMC requires applicants to use the Wetland Rating System for Western Washington (Ecology Publication No. 04-06-014), or as amended. The rating system was first published in 1991. The latest revision was published in 2004 and a draft amendment is currently being peer reviewed and is expected to be published in June 2014.

Tom Rogers, the City's Planning Director, indicated that Wetland A was previously categorized as a Category I wetland in 2001. Using the current (2004) rating system, Wetland A rated as a Category II wetland based on its water quality, hydrologic, and habitat function scores (Appendix C). Using the draft Wetland Rating System for Western Washington that is currently under review, Wetland A would be rated a Category I wetland due to its high water quality, hydrologic, and habitat function scoring (Appendix C).

Based on the results from the proposed rating system and the 2001 rating of the site wetland, we recommend that the City continue to regulate Wetland A as a Category I wetland.

6.1.1 Wetland Buffers

The MCMC requires a 200- to 300-foot buffer around Category I wetlands, depending on the potential impact of the adjacent land use (low or high). The roadway would likely be

considered a high impact land use since it is a pollution-generating impervious surface. Therefore, the City would likely require a 300-foot buffer on the site if future development is proposed.

The MCMC allows for buffer averaging where a qualified professional demonstrates to the director's satisfaction that: (a) the total area contained in the buffer area after averaging is no less than that which would be contained within the standard buffer; (b) the buffer averaging does not reduce the functions or values of the wetland; (c) the portion of the buffer reduced through buffer averaging is less than 25 percent of the total buffer length on a project site; (d) the wetland contains variations in sensitivity due to existing physical characteristics or the character of the buffer varies in slope, soils, or vegetation; and (e) the buffer width is not reduced to less than 50 percent of the standard width, except that no buffer dimension shall be less than 25 feet. However, since the road right-of-way is all wetland buffer, buffer averaging is likely not feasible for this project.

6.1.2 Wetland Mitigation

Impacts to wetlands and buffers are allowable where avoidance and minimization measures cannot avoid all impacts. No wetland impacts are currently proposed for the 35th Avenue SE Reconstruction Project; however, selection of the preferred alternative will determine the extent of impacts, if any.

If the project will result in wetland impacts, compensatory mitigation for impacts will be required. Wetland acreage replacement ratios for Category I wetlands are determined by the Planning Director on a case-by-case basis and would be greater than those required for Category II wetlands (3-to-1 ratio for wetland creation or re-establishment, 12-to-1 ratio for wetland enhancement).

6.1.3 Streams and Stream Buffers

The MCMC requires a 75-foot buffer along all streams (except North Creek and Tambark Creek). No stream impacts are currently proposed for the 35th Avenue SE Reconstruction Project. Buffer impacts would be limited to grading/filling on the existing fill slope of the roadway. As with wetlands, the MCMC allows for stream buffer averaging, but buffer averaging is not feasible since the entire project corridor is likely regulated as a buffer.

6.2 State Regulations

6.2.1 Department of Ecology (Ecology)

Ecology has been designated by the U.S. Environmental Protection Agency (EPA) to implement Section 401 of the federal Clean Water Act (CWA) in Washington State for most projects that require a permit under CWA Section 404 (see Section 6.3). Ecology also regulates all waters of the State, including wetlands, through the Water Pollution Control Act (Revised Code of Washington, Chapter 90.48) and associated water quality regulations (Washington Administrative Code, Chapter 173-201A).

For the 35th Avenue SE Reconstruction Project, no work is anticipated below the OHWM of Penny Creek and/or within Wetland A; however, selection of the preferred alternative will determine the extent of impacts, if any. If work is proposed in the wetland or stream, permits from Ecology would be required. Compensatory mitigation for unavoidable wetland impacts would likely be required by Ecology in accordance with their joint guidance with EPA and the Corps in *Wetland Mitigation in Washington State, Part 1: Agency Policies and Guidance* (Ecology, 2006). Recommended mitigation ratio options for impacts to Category I wetlands (based on score for functions) include:

- Re-establishment or Creation at a 4-to-1 ratio, or
- Rehabilitation at an 8-to-1 ratio, or
- Re-establishment or Creation at a 1-to-1 ratio plus Rehabilitation at a 6-to-1 ratio, or
- Re-establishment or Creation at a 1-to-1 ratio plus Enhancement at a 12-to-1 ratio, or
- Enhancement at a 16-to-1 ratio.

6.2.2 Department of Fish and Wildlife (WDFW)

The WDFW issues Hydraulic Project Approval (HPA) permits for construction activities that occur in or over the OHWM of waters of the state, including streams and headwater wetlands. This permit allows construction activities to occur, provided they comply with conditions within the permit, which may include in-water work windows and other minimization measures. Although the project does not include in-water work or replacement of the existing culverts, an HPA will likely be required since it crosses over Penny Creek.

6.3 Federal Regulations

The Corps' CWA Section 404 review process is required for projects involving discharges of dredge or fill materials into the waters of the United States, including non-isolated wetlands and streams. Wetland A likely would not be considered isolated since it is connected to Penny Creek.

For the 35th Avenue SE Reconstruction Project, no work is anticipated below the OHWM of Penny Creek and/or within Wetland A. If the project changes and work is proposed in the wetland or stream, a CWA Section 404 permit from the Corps would be required. Compensatory mitigation for impacts to jurisdictional wetlands is typically required by the Corps in accordance with their joint guidance with the State of Washington and EPA (see Section 6.2).

7.0 CLOSURE

The findings and conclusions documented in this report have been prepared for specific application to this project, and 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, and in accordance with the terms and conditions set forth in our agreement. The conclusions and recommendations presented in this report are professional opinions based on interpretation of information currently available to us, and are made within the operational scope, budget, and schedule constraints of this project. No warranty, express or implied, is made.

Shannon & Wilson, Inc. has prepared Appendix D, "Important Information About Your Wetland Delineation/Mitigation and/or Stream Classification Report," to assist you and others in understanding the use and limitations of our reports.

SHANNON & WILSON, INC.

Becki Kniveton, P.W.S.
Senior Principal Biologist

BSK:KLW/bsk

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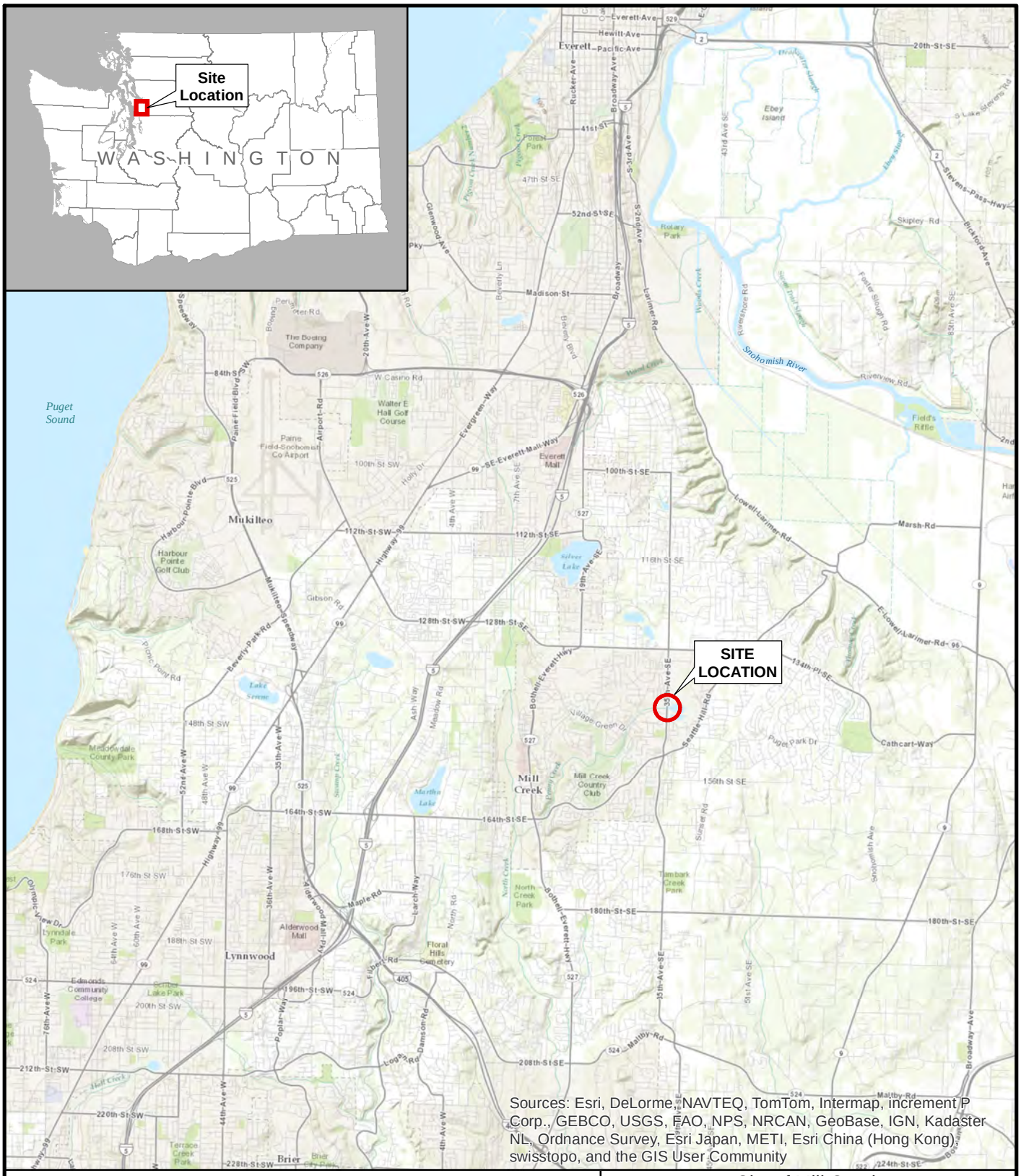

N
W E
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0 2 4
Miles

City of Mill Creek
35th Avenue SE Reconstruction Project
Mill Creek, Washington

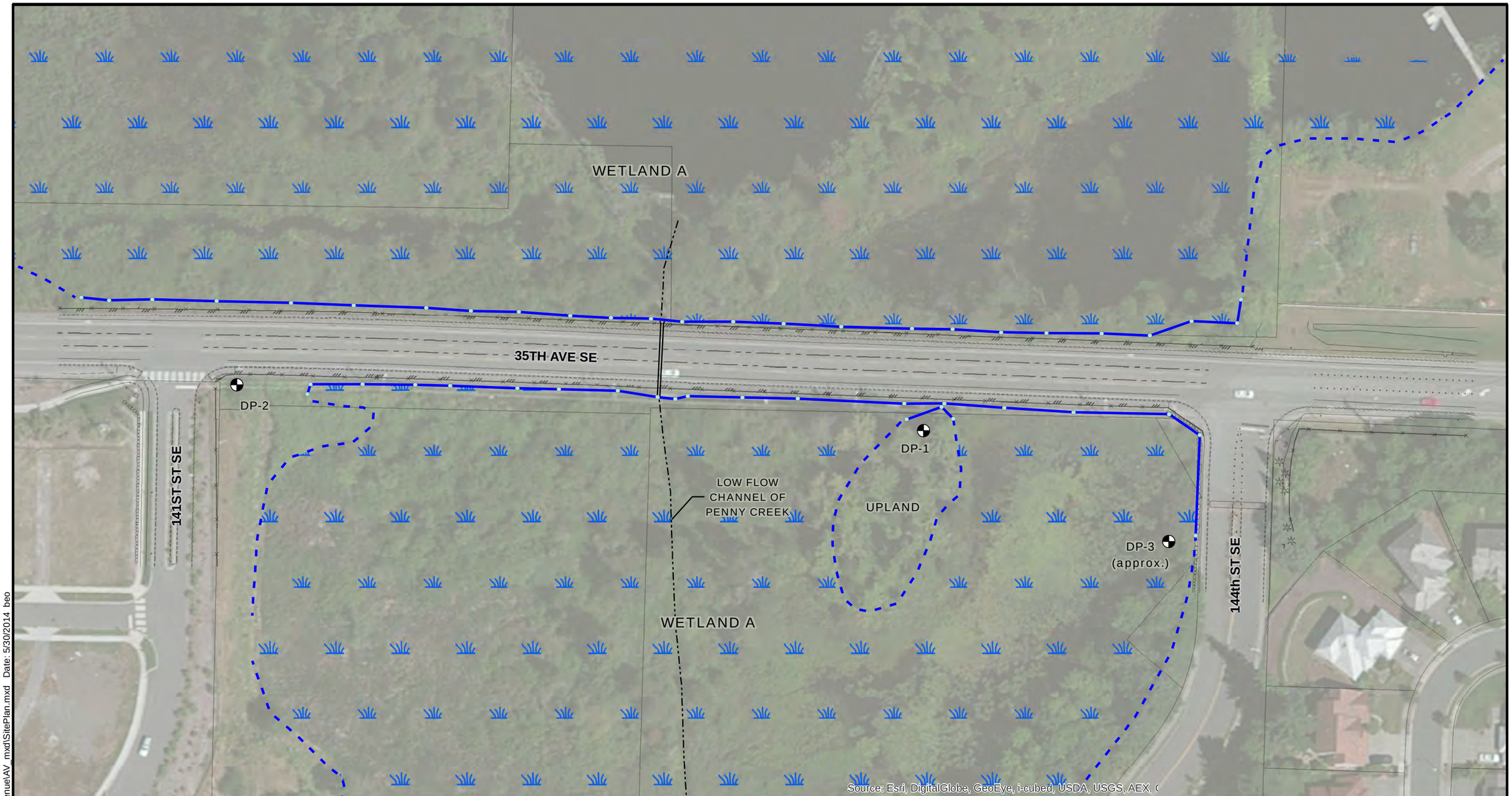
VICINITY MAP

May 2014 21-1-21948-004

SHANNON & WILSON, INC.
GEOTECHNICAL AND ENVIRONMENTAL CONSULTANTS

FIG. 1

Filename: T:\Project\21-1\21948_35th_Avenue\AV_mxd\VicinityMap.mxd Date: 5/30/2014 beo



LEGEND

Data Plot (DP)

Delineated Wetland Boundary

Approximated Wetland Boundary
(based on aerial photo review)

N

0 80 160
Feet

City of Mill Creek
35th Avenue SE Reconstruction Project
Mill Creek, Washington

SITE PLAN

May 2014 21-1-21948-004

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FIG. 2

Filename: T:\Project\21-1\21948_35th_Avenue\AV_mxd\SitePlan.mxd Date: 5/30/2014 beo

APPENDIX A

WETLAND DELINEATION METHODOLOGY

APPENDIX A

WETLAND DELINEATION METHODOLOGY

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APPENDIX A

WETLAND DELINEATION METHODOLOGY

The triple-parameter approach, as required in the Washington State Department of Ecology's (Ecology's) 1997 *Washington State Wetlands Identification and Delineation Manual*, the United States Army Corps of Engineers' (the Corps') 1987 *Corps of Engineers Wetland Delineation Manual*, and the Corps' 2010 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* was used to identify and delineate the wetlands on the site described in this report. The triple-parameter approach requires that vegetation, soils, and hydrology are each evaluated to determine the presence or absence of wetlands. An area is considered to be a wetland if each of the following is met: (a) dominant hydrophytic vegetation is present in the area, (b) the soils in the area are hydric, and (c) the necessary hydrologic conditions within the area are met.

A determination of wetland presence was made by conducting a Routine Delineation. Corresponding upland and wetland plots were recorded to characterize surface and subsurface conditions and more accurately determine the boundaries of on-site wetlands.

A.1 WETLAND VEGETATION

Hydrophytic plants are plant species specially adapted for saturated and/or anaerobic conditions. These species can be found in areas where there is a significant duration and frequency of inundation, which produces permanently or periodically saturated soils. Hydrophytic species, due to morphological, physiological, and reproductive adaptations, have the ability to grow, effectively compete, reproduce, and thrive in anaerobic soil. Indicators of hydrophytic vegetation are based on the wetland indicator status of plant species on the national wetland plant list (Lichvar, 2012). Plants are categorized as Obligate (OBL), Facultative Wetland (FACW), Facultative (FAC), Facultative Upland (FACU), or Upland (UPL). Species in the facultative categories (FACW, FAC, and FACU) are recognized as occurring in both wetlands and non-wetlands to varying degrees. Most wetlands are dominated mainly by species rated as OBL, FACW, or FAC (Table A-1).

TABLE A-1
PLANT INDICATOR STATUS GROUPS

Plant Indicator Status Categories
Obligate Wetland (**OBL**) – Plants that almost always occur in wetlands.
Facultative Wetland (**FACW**) – Plants that usually occur in wetlands, but may occur in non-wetlands.
Facultative (**FAC**) – Plants that occur in wetlands or non-wetlands.
Facultative Upland (**FACU**) – Plants that usually occur in non-wetlands, but may occur in wetlands.
Obligate Upland (**UPL**) – Plants that almost never occur in wetlands.

(Lichvar, 2012)

The approximate percentage of absolute cover for each of the different plant species occurring within the tree, sapling/shrub, woody vine, and herbaceous strata was determined. Trees within a 30-foot radius; sapling/shrubs and woody vines within a 15-foot radius; and herbaceous species within a 5-foot radius of each data point were identified and noted. However, where site conditions merited it, the dimensions of the tree, sapling/shrub, woody vine, and herbaceous strata were modified.

The dominance test is the primary hydrophytic vegetation indicator and it is used in all wetland delineations. Dominant plant species are considered to be those that, when cumulatively totaled in descending order of absolute percent cover, exceed 50 percent of the total absolute cover for each vegetative stratum. Any additional species individually representing 20 percent or greater of the total absolute cover for each vegetative strata are also considered dominant. Hydrophytic vegetation is considered to be present when greater than 50 percent of the dominant plant species within the area had an indicator status of OBL, FACW, or FAC.

If a plant community does not meet the dominance test in areas where hydric soils and wetland hydrology are present, vegetation is reevaluated using the prevalence index, plant morphological adaptations for living in wetlands, and/or abundance of bryophytes (e.g., mosses) adapted to living in wetlands. The prevalence index is a weighted average that takes into account the abundance of all plant species within the sampling area to determine if hydrophytic vegetation is more or less prevalent. Using the prevalence index, all plants within the sampling area are grouped by wetland indicator status and absolute percent cover is summed for each group. Total cover for each indicator status group is weighted by the following multipliers: OBL=1, FACW=2, FAC=3, FACU=4, UPL=5. The prevalence index is calculated by dividing the sum of the weighted totals by the sum of total cover in the sampling area. A prevalence index of 3.0 or less indicates that hydrophytic vegetation is present.

A.2 HYDRIC SOILS

Hydric soils are defined as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part (USDA SCS, 1994). Repeated periods of saturation and inundation for more than a few days, in combination with soil microbial activity, causes depletion in oxygen (anaerobic conditions) and results in delayed decomposition of organic matter and reduction of iron, manganese, and sulfur elements. As a result of these processes, most hydric soils develop distinctive characteristics observable in the field during both wet and dry periods. (USDA NRCS, 2010). These characteristics may be exhibited as an accumulation of organic matter; bluish-gray, green-gray, or low chroma and high value soil colors; mottling or other concentrations of iron and manganese; and/or hydrogen sulfide odor similar to a rotten egg smell.

The USDA Natural Resources Conservation Service (NRCS) has developed official hydric soil indicators as summarized in *Field Indicators of Hydric Soils in the United States* (USDA NRCS, 2010). These indicators were developed to assist in delineation of hydric soils and are based predominantly on hydric soils near the margins of wetlands. Some hydric soils, including soils within the wettest parts of wetlands, may lack any of the approved hydric soil indicators. If a hydric soil indicator is present, the soil is determined to be hydric. If no hydric soil indicator is present, additional site information is used to assess whether the soil meets the definition of hydric soil.

Identification of hydric soils was aided through observation of surface hydrologic characteristics and indicators of wetland hydrology (e.g., drainage patterns). Soil characteristics were observation at several data points, placed both inside and outside the wetland. Holes were dug with a shovel to the depth needed to document an indicator or to confirm the absence of hydric soil indicators. Soil organic content was estimated visually and texturally. Soil colors were examined in the field immediately after sampling. Dry soils were moistened. Soil colors were determined through analysis of the hue, value, and chroma best represented in the Munsell® Soil Color Chart.

A.3 WETLAND HYDROLOGY

Wetland hydrology is determined by observable evidence that inundation or soil saturation have occurred during a significant portion of the growing season repeatedly over a period of years so that wet condition have been sufficient to produce wetland vegetation and hydric soils. Wetland hydrology indicators give evidence of a continuing wetland hydrologic regime. Wetland hydrology criteria were considered to be satisfied if it appeared that wetland hydrology was

present for at least 5 to 12.5 percent (12 to 31 days) of the growing season. The growing season in western Washington is typically considered to be from March 1 to October 31 (244 days). However, the growing season is considered to have begun when: (a) evidence of plant growth has begun on two non-evergreen vascular plants, and (b) the soil reaches a temperature of 41 degrees Fahrenheit at 12 inches. The Seattle District Corps of Engineers requires 14 consecutive days of inundation or saturation for a wetland hydrology to be considered present.

Wetland hydrology was evaluated by direct visual observation of surface inundation or soil saturation in data plots. The area near each data point was examined for indicators of wetland hydrology. Wetland hydrology indicators are categorized as primary or secondary based on their estimated reliability. Wetland hydrology was considered present if there was evidence of one primary indicator or at least two secondary indicators.

Some primary indicators include surface water, a shallow water table or saturated soils observed within 12 inches of the surface, dried watermarks, drift lines, sediment deposits, water-stained leaves, and algal mat/crust. Some secondary indicators include a water table within 12 to 24 inches of the surface during the dry season; drainage patterns; a landscape position in a depression, drainage, or fringe of a water body; and a shallow restrictive layer capable of perching water within 12 inches of the surface.

A.4 DISCLAIMER

This methodology was prepared for reference use only and is not intended to replace Ecology's 1997 *Washington State Wetlands Identification and Delineation Manual*, the 1987 *Corps of Engineers Wetland Delineation Manual*, or the Corps' 2010 *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region* (Version 2.0).

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APPENDIX B

WETLAND DETERMINATION DATA FORMS – WESTERN MOUNTAINS VALLEYS, AND COAST REGION

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

Project/Site: 35th Ave City/County: Mill Creek Sampling Date: 3/7/14

Applicant/Owner: Mill Creek State: WA Sampling Point: DP 1

Investigator(s): BSK, SCC Section, Township, Range: _____

Landform (hillslope, terrace, etc.): small upland island Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	Is the Sampled Area within a Wetland? Yes _____ No X
Hydric Soil Present?	Yes _____	No _____	
Wetland Hydrology Present?	Yes _____	No X	

Remarks: wettest spring on record

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus contorta	5		
2. Tsuga heterophylla	20	Y	FAC
3. Tsuga ?	20	Y	≥FAC
4.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size: _____)			
1. Tsuga heterophylla saplings	5		
2. Sal al	40	Y	FACU?
3.			
4.			
5.			
	= Total Cover		

Herb Stratum (Plot size: _____)			
1. bracken fern	20	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	= Total Cover		

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____

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:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - 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 X

Remarks:

SOIL

Sampling Point: DP-1

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 %	Type[1]	Loc[2]	Texture	Remarks
0-3	10YR 2/2	100%					partially decomposed organics w/ loam	
3-13	10YR 2/1	100%					organic silt	
13+	2.5YR 3/3	100%					fibrous peat	

[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: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

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): _____

Water Table Present? Yes X No ___ Depth (inches): 11

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 4

Wetland Hydrology Present? Yes ___ No X

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

Remarks: not saturated to surface during a flood event

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

Project/Site: 25th City/County: Mill Creek Sampling Date: 3/7/14

Applicant/Owner: City of Mill Creek State: _____ Sampling Point: DP-2

Investigator(s): BSK, SCC Section, Township, Range: _____

Landform (hillslope, terrace, etc.): roadside ditch Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 _____	Is the Sampled Area within a Wetland? Yes _____ No X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	

Remarks: wettest spring on record

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1.			
2.			
3.			
4.			
	_____ = Total Cover		

Sapling/Shrub Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
	_____ = Total Cover		

Herb Stratum (Plot size: _____)			
1. Phalaris arund.	100	Y	FACW
2. Polygonum (hybrid) bohemicum	40	Y	NL (UPL)
3. Herb Robert	5		
4. Galium (6)	5		
5. Agrostis	10		
6.			
7.			
8.			
9.			
10.			
11.			
	_____ = Total Cover		

Woody Vine Stratum (Plot size: _____)			
1. HBB	10	N	
2.			
	_____ = Total Cover		

% Bare Ground in Herb Stratum _____

growing from upslope

Dominance Test worksheet:

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

Total Number of Dominant Species Across All Strata: 2 (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:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- ___ 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - 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 X

Remarks:

SOIL

Sampling Point: DP2

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 %	Type[1]	Loc[2]	Texture	Remarks
0-17	10YR 2/2	100%					gravelly loamy silt	

[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: ___

Depth (inches): ___

Hydric Soil Present? Yes ___ No X

Remarks:

road fill/compacted material @ 17"

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): ___

Water Table Present? Yes X No ___ Depth (inches): 12

Saturation Present? (includes capillary fringe) Yes X No ___ Depth (inches): 6

Wetland Hydrology Present? Yes ___ No X

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

Remarks:

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

Project/Site: 35th City/County: _____ Sampling Date: 3/7/14

Applicant/Owner: Mill Creek State: _____ Sampling Point: DP3

Investigator(s): BSK, SCC Section, Township, Range: _____

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

Subregion (LRR): _____ Lat: _____ Long: _____ Datum: _____

Soil Map Unit Name: _____ NWI classification: _____

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

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes X 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 X	No _____	Is the Sampled Area within a Wetland? Yes X No _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	

Remarks: wettest spring on record

VEGETATION – Use scientific names of plants.

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. Alnus rubra	80	Y	FAC
2. Salix sp.	80	Y	≥FAC
3.			
4.			
	= Total Cover		

Sapling/Shrub Stratum (Plot size: _____)			
1. salmonberry	25	Y	FAC
2.			
3.			
4.			
5.			
	= Total Cover		

Herb Stratum (Plot size: _____)			
1.			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
	= Total Cover		

Woody Vine Stratum (Plot size: _____)			
1.			
2.			
	= Total Cover		

% Bare Ground in Herb Stratum _____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

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

Percent of Dominant Species That Are OBL, FACW, or FAC: 100% (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:

- ___ 1 - Rapid Test for Hydrophytic Vegetation
- X 2 - Dominance Test is >50%
- ___ 3 - Prevalence Index is ≤3.0[1]
- ___ 4 - Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ 5 - 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 X No _____

Remarks: no other veg visible

SOIL

Sampling Point: DP3

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 %	Type[1]	Loc[2]	Texture	Remarks
0-6	10YR	100%					silty muck	
6+	5YG 6/1						silt	
	~~10YR 4/1~~						~~silt~~	

[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)
- X 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: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No _____

Remarks:

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 X No _____ Depth (inches): 16"

Water Table Present? Yes X No _____ Depth (inches): _____

Saturation Present? (includes capillary fringe) Yes X No _____ Depth (inches): _____

Wetland Hydrology Present? Yes X No _____

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

Remarks:

APPENDIX C

WETLAND RATING FORMS

35th Ave Project

Wetland name or number A

WETLAND RATING FORM – WESTERN WASHINGTON
Version 2 - Updated July 2006 to increase accuracy and reproducibility among users
Updated Oct 2008 with the new WDFW definitions for priority habitats

Name of wetland (if known): 35th Ave SE Date of site visit: 3/17/14

Rated by BSL Trained by Ecology? Yes X No___ Date of training 8/2004

SEC: ___ TWNSHP: ____ RNGE: ____ Is S/T/R in Appendix D? Yes___ No___

Map of wetland unit: Figure ____ Estimated size _____

SUMMARY OF RATING

Category based on FUNCTIONS provided by wetland

I___ II X III___ IV___

Category I = Score >=70
Category II = Score 51-69
Category III = Score 30-50
Category IV = Score < 30

	Dep
Score for Water Quality Functions	20
Score for Hydrologic Functions	16
Score for Habitat Functions	25
TOTAL score for Functions	61

Category based on SPECIAL CHARACTERISTICS of wetland

I___ II___ Does not Apply X

Final Category (choose the "highest" category from above) II

Summary of basic information about the wetland unit

Wetland Unit has Special Characteristics		Wetland HGM Class used for Rating	
Estuarine		**Depressional**	X
Natural Heritage Wetland		**Riverine**	X
Bog		**Lake-fringe**	
Mature Forest		**Slope**	
Old Growth Forest		**Flats**	
Coastal Lagoon		**Freshwater Tidal**	
Interdunal			
None of the above	X	Check if unit has multiple HGM classes present	

Wetland name or number A

Does the wetland unit being rated meet any of the criteria below?

If you answer YES to any of the questions below you will need to protect the wetland according to the regulations regarding the special characteristics found in the wetland.

Check List for Wetlands That May Need Additional Protection (in addition to the protection recommended for its category)	YES	NO
SP1. *Has the wetland unit been documented as a habitat for any Federally listed Threatened or Endangered* ***animal or plant*** *species (T/E species)?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state or federal database.		
SP2. *Has the wetland unit been documented as habitat for any State listed Threatened or Endangered* ***animal*** *species?* For the purposes of this rating system, "documented" means the wetland is on the appropriate state database. Note: Wetlands with State listed plant species are categorized as Category I Natural Heritage Wetlands (see p. 19 of data form).		
SP3. *Does the wetland unit contain individuals of Priority species listed by the WDFW for the state?*		
SP4. *Does the wetland unit have a local significance in addition to its functions*? For example, the wetland has been identified in the Shoreline Master Program, the Critical Areas Ordinance, or in a local management plan as having special significance.		

To complete the next part of the data sheet you will need to determine the Hydrogeomorphic Class of the wetland being rated.

The hydrogeomorphic classification groups wetlands into those that function in similar ways. This simplifies the questions needed to answer how well the wetland functions. The Hydrogeomorphic Class of a wetland can be determined using the key below. See p. 24 for more detailed instructions on classifying wetlands.

Wetland name or number _____

Classification of Wetland Units in Western Washington

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 (i.e. except during floods)?
NO – go to 2 **YES** – the wetland class is **Tidal Fringe**

If yes, is the salinity of the water during periods of annual low flow below 0.5 ppt (parts per thousand)? **YES – Freshwater Tidal Fringe NO – Saltwater Tidal Fringe (Estuarine)**

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 rated as an* ***Estuarine*** *wetland.* Wetlands that were called estuarine in the first and second editions of the rating system are called Salt Water Tidal Fringe in the Hydrogeomorphic Classification. Estuarine wetlands were categorized separately in the earlier editions, and this separation is being kept in this revision. To maintain consistency between editions, the term "Estuarine" wetland is kept. Please note, however, that the characteristics that define Category I and II estuarine wetlands have changed (see p.).

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 both** of the following criteria?
___The vegetated part of the wetland is on the shores of a body of permanent open water (without any vegetation on the surface) at least 20 acres (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**?
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 <3ft diameter and less than 1 foot deep).*
NO - go to 5 **YES** – The wetland class is **Slope**

Wetland name or number A

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 two years.

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

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

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 clases. 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 your wetland. 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 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	Depressional
Depressional + Lake-fringe	Depressional
Salt Water Tidal Fringe and any other class of freshwater wetland	Treat as ESTUARINE under wetlands with special characteristics

If you are unable still 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 A

D	**Depressional and Flats Wetlands** **WATER QUALITY FUNCTIONS** - Indicators that the wetland unit functions to improve water quality	**Points** (only 1 score per box)
D	**D 1. Does the wetland unit have the potential to improve water quality?**	*(see p.38)*
D	D 1.1 Characteristics of surface water flows out of the wetland: Unit is a depression with no surface water leaving it (no outlet) points = 3 Unit has an intermittently flowing, OR highly constricted permanently flowing outlet points = 2 Unit has an unconstricted, or slightly constricted, surface outlet (*permanently flowing*) points = 1 Unit is a "flat" depression (Q. 7 on key), or in the Flats class, with permanent surface outflow **and no obvious natural outlet** and/or outlet is a man-made ditch points = 1 (*If ditch is not permanently flowing treat unit as "intermittently flowing"*) Provide photo or drawing	Figure ___ 1
D	S 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions)* YES points = 4 NO points = 0	4
D	D 1.3 Characteristics of persistent vegetation (emergent, shrub, and/or forest Cowardin class) Wetland has persistent, ungrazed, vegetation > = 95% of area points = 5 Wetland has persistent, ungrazed, vegetation > = 1/2 of area points = 3 Wetland has persistent, ungrazed vegetation > = 1/10 of area points = 1 Wetland has persistent, ungrazed vegetation <1/10 of area points = 0 Map of Cowardin vegetation classes	Figure ___ 3
D	D1.4 Characteristics of seasonal ponding or inundation. *This is the area of the wetland unit that is ponded for at least 2 months, but dries out sometime during the year. Do not count the area that is permanently ponded. Estimate area as the average condition 5 out of 10 yrs.* 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 (open water/aquatic accounts for > 5% of wetland) Map of Hydroperiods	Figure ___ 2
D	**Total for D 1** *Add the points in the boxes above*	10
D	**D 2. Does the wetland unit have the opportunity to improve water quality?** Answer YES if you know or believe there are pollutants in groundwater or surface water coming into the wetland that would otherwise reduce water quality in streams, lakes or groundwater downgradient from the wetland. *Note which of the following conditions provide the sources of pollutants. A unit may have pollutants coming from several sources, but any single source would qualify as opportunity.* — Grazing in the wetland or within 150 ft X Untreated stormwater discharges to wetland — Tilled fields or orchards within 150 ft of wetland X A stream or culvert discharges into wetland that drains developed areas, residential areas, farmed fields, roads, or clear-cut logging — Residential, urban areas, golf courses are within 150 ft of wetland — Wetland is fed by groundwater high in phosphorus or nitrogen — Other_____ **YES** multiplier is 2 **NO** multiplier is 1	*(see p. 44)* multiplier 2
D	**TOTAL - Water Quality Functions** Multiply the score from D1 by D2 ***Add score to table on p. 1***	20

Wetland name or number A

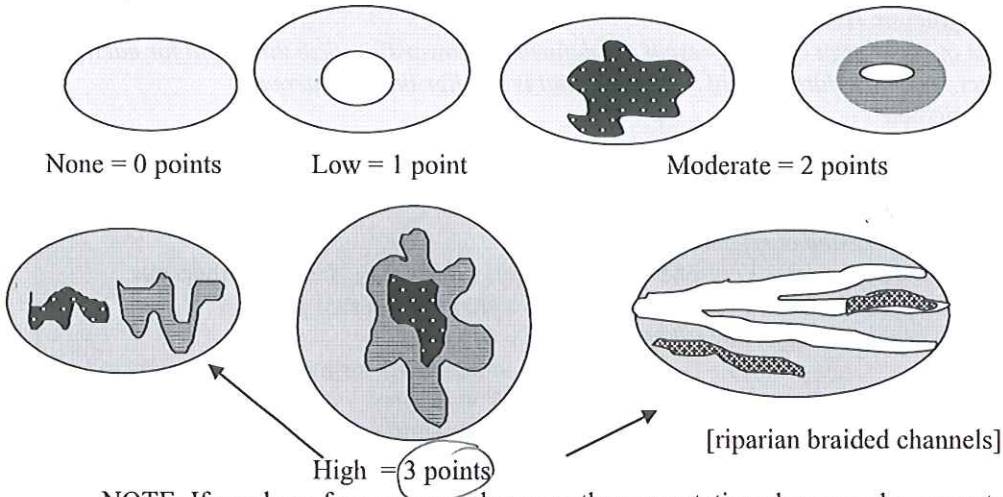
D	**Depressional and Flats Wetlands** HYDROLOGIC FUNCTIONS - Indicators that the wetland unit functions to reduce flooding and stream degradation	**Points** (only 1 score per box)
	D 3. Does the wetland unit have the <u>potential</u> to reduce flooding and erosion?	*(see p.46)*
D	D 3.1 Characteristics of surface water flows out of the wetland unit Unit is a depression with no surface water leaving it (no outlet) points = 4 Unit has an intermittently flowing, OR highly constricted permanently flowing outlet points = 2 Unit is a "flat" depression (Q. 7 on key), or in the Flats class, with permanent surface outflow **and no obvious natural outlet** and/or outlet is a man-made ditch points = 1 *(If ditch is not permanently flowing treat unit as "intermittently flowing")* Unit has an unconstricted, or slightly constricted, surface outlet (*permanently flowing*) points = 0	0
D	D 3.2 Depth of storage during wet periods *Estimate the height of ponding above the bottom of the outlet. For units with no outlet measure from the surface of permanent water or deepest part (if dry).* Marks of ponding are 3 ft or more above the surface or bottom of outlet points = 7 The wetland is a "headwater" wetland" points = 5 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 Unit is flat (yes to Q. 2 or Q. 7 on key) but has small depressions on the surface that trap water points = 1 Marks of ponding less than 0.5 ft points = 0	5
D	D 3.3 Contribution of wetland unit 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 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 unit is in the FLATS class points = 5	3
D	**Total for D 3** *Add the points in the boxes above*	8
D	**D 4. Does the wetland unit have the <u>opportunity</u> to reduce flooding and erosion?** Answer YES if the unit is in a location in the watershed where the flood storage, or reduction in water velocity, it provides helps protect downstream property and aquatic resources from flooding or excessive and/or erosive flows. Answer NO if the water coming into the wetland is controlled by a structure such as flood gate, tide gate, flap valve, reservoir etc. OR you estimate that more than 90% of the water in the wetland is from groundwater in areas where damaging groundwater flooding does not occur. *Note which of the following indicators of opportunity apply.* — Wetland is in a headwater of a river or stream that has flooding problems X Wetland drains to a river or stream that has flooding problems X Wetland has no outlet and impounds surface runoff water that might otherwise flow into a river or stream that has flooding problems — Other_____ **YES** multiplier is **2** **NO** multiplier is **1**	*(see p. 49)* multiplier 2
D	**TOTAL - Hydrologic Functions** Multiply the score from D 3 by D 4 ***Add score to table on p. 1***	16

Wetland name or number A

These questions apply to wetlands of all HGM classes. HABITAT FUNCTIONS - Indicators that unit functions to provide important habitat	**Points** (only 1 score per box)
H 1. Does the wetland unit have the potential to provide habitat for many species?	
H 1.1 Vegetation structure ***(see p. 72)*** *Check the types of vegetation classes present (as defined by Cowardin)- Size threshold for each class is ¼ acre or more than 10% of the area if unit is smaller than 2.5 acres.* ✓ Aquatic bed ✓ Emergent plants ✓ Scrub/shrub (areas where shrubs have >30% cover) ✓ Forested (areas where trees have >30% cover) *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 *Add the number of vegetation structures that qualify. If you have:* 4 structures or more — points = 4 3 structures — points = 2 2 structures — points = 1 1 structure — points = 0 Map of Cowardin vegetation classes	Figure ___ 4
H 1.2. Hydroperiods ***(see p. 73)*** *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 acre 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 — point = 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** Map of hydroperiods	Figure ___ 2
H 1.3. Richness of Plant Species ***(see p. 75)*** 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)* *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 *List species below if you want to:*	2

Total for page 8

Wetland name or number A

	Figure ___
H 1.4. Interspersion of habitats *(see p. 76)* Decide from the diagrams below whether interspersion between Cowardin vegetation classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.  None = 0 points Low = 1 point Moderate = 2 points [riparian braided channels] High = 3 points NOTE: If you have four or more classes or three vegetation classes and open water the rating is always "high". Use map of Cowardin vegetation classes	3
H 1.5. Special Habitat Features: *(see p. 77)* *Check the habitat features that are present in the wetland. The number of checks is the number of points you put into the next column.* ✓ Large, downed, woody debris within the wetland (>4in. diameter and 6 ft long). ✓ Standing snags (diameter at the bottom > 4 inches) in the wetland ___ Undercut banks are present for at least 6.6 ft (2m) and/or overhanging vegetation extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m) ✓ Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30degree slope) OR signs of recent beaver activity are present *(cut shrubs or trees that have not yet turned grey/brown)* ___ At least ¼ acre of thin-stemmed persistent vegetation 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 each stratum of plants *NOTE: The 20% stated in early printings of the manual on page 78 is an error.*	4
H 1. TOTAL Score - potential for providing habitat *Add the scores from H1.1, H1.2, H1.3, H1.4, H1.5*	15

Comments

Wetland name or number A

H 2. Does the wetland unit have the opportunity to provide habitat for many species?	
H 2.1 Buffers *(see p. 80)* *Choose the description that best represents condition of buffer of wetland unit. The highest scoring criterion that applies to the wetland is to be used in the rating. See text for definition of "undisturbed."* — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% of circumference. No structures are within the undisturbed part of buffer. (relatively undisturbed also means no-grazing, no landscaping, no daily human use) **Points = 5** — 100 m (330 ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 50% circumference. **Points = 4** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water >95% circumference. **Points = 4** — 100 m (330ft) of relatively undisturbed vegetated areas, rocky areas, or open water > 25% circumference, . **Points = 3** — 50 m (170ft) of relatively undisturbed vegetated areas, rocky areas, or open water for > 50% circumference. **Points = 3** **If buffer does not meet any of the criteria above** — No paved areas (except paved trails) or buildings within 25 m (80ft) of wetland > 95% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — No paved areas or buildings within 50m of wetland for >50% circumference. Light to moderate grazing, or lawns are OK. **Points = 2** — Heavy grazing in buffer. **Points = 1** — Vegetated buffers are <2m wide (6.6ft) for more than 95% of the circumference (e.g. tilled fields, paving, basalt bedrock extend to edge of wetland **Points = 0.** X Buffer does not meet any of the criteria above. **Points = 1** Aerial photo showing buffers	Figure ___ 1
H 2.2 Corridors and Connections *(see p. 81)* H 2.2.1 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 150 ft wide, has at least 30% cover of shrubs, forest or native undisturbed prairie, that connects to estuaries, other wetlands or undisturbed uplands that are at least 250 acres in size? (*dams in riparian corridors, heavily used gravel roads, paved roads, are considered breaks in the corridor*). YES = **4 points** (*go to H 2.3*) NO = go to H 2.2.2 H 2.2.2 Is the wetland part of a relatively undisturbed and unbroken vegetated corridor (either riparian or upland) that is at least 50ft wide, has at least 30% cover of shrubs or forest, and connects to estuaries, other wetlands or undisturbed uplands that are at least 25 acres in size? **OR** a **Lake-fringe** wetland, if it does not have an undisturbed corridor as in the question above? YES = **2 points** (*go to H 2.3*) NO = H 2.2.3 H 2.2.3 Is the wetland: within 5 mi (8km) of a brackish or salt water estuary OR within 3 mi of a large field or pasture (>40 acres) OR within 1 mi of a lake greater than 20 acres? YES = **1 point** NO = **0 points**	2

the east side of wetland A is > 25 acres

Total for page 3

Wetland name or number A

H 2.3 Near or adjacent to other priority habitats listed by WDFW ***(see new and complete descriptions of WDFW priority habitats, and the counties in which they can be found, in the PHS report http://wdfw.wa.gov/hab/phslist.htm)*** Which of the following priority habitats are within 330ft (100m) of the wetland unit? *NOTE: the connections do not have to be relatively undisturbed.* ____**Aspen Stands:** Pure or mixed stands of aspen greater than 0.4 ha (1 acre). ____**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 p. 152*). ____**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 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. (Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; crown cover may be less that 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:** Woodlands 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*). ✓ **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*). ✓ **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: pp. 167-169 and glossary in Appendix A).* ____**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 7.6 m (25 ft) high and occurring below 5000 ft. ____**Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), 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 > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) long. If wetland has **3 or more** priority habitats = **4 points** If wetland has **2** priority habitats = **3 points** If wetland has **1** priority habitat = **1 point** No habitats = 0 points *Note: All vegetated wetlands are by definition a priority habitat but are not included in this list. Nearby wetlands are addressed in question H 2.4)*	4

Wetland name or number A

H 2.4 Wetland Landscape *(choose the **one** description of the landscape around the wetland that best fits)* ***(see p. 84)*** There are at least 3 other wetlands within ½ mile, and the connections between them are relatively undisturbed (light grazing between wetlands OK, as is lake shore with some boating, but connections should NOT be bisected by paved roads, fill, fields, or other development. points = 5 The wetland is Lake-fringe on a lake with little disturbance and there are 3 other lake-fringe wetlands within ½ mile points = 5 There are at least 3 other wetlands within ½ mile, BUT the connections between them are disturbed points = 3 The wetland is Lake-fringe on a lake **with** disturbance and there are 3 other lake-fringe wetland within ½ mile points = 3 There is at least 1 wetland within ½ mile. points = 2 There are no wetlands within ½ mile. points = 0	3
H 2. TOTAL Score - opportunity for providing habitat *Add the scores from H2.1,H2.2, H2.3, H2.4*	10
TOTAL for H 1 from page 14	15
Total Score for Habitat Functions – add the points for H 1, H 2 and record the result on p. 1	25

Wetland name or number A

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

Please determine if the wetland meets the attributes described below and circle the appropriate answers and Category.

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 ***(see p. 86)*** Does the wetland unit 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 X	
SC 1.1 Is the wetland unit 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	**Cat. I**
SC 1.2 Is the wetland unit at least 1 acre in size and meets at least two of the following three conditions? YES = Category I NO = Category II — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing, and has less than 10% cover of non-native plant species. If the non-native *Spartina* spp. are the only species that cover more than 10% of the wetland, then the wetland should be given a dual rating (I/II). The area of Spartina would be rated a Category II while the relatively undisturbed upper marsh with native species would be a Category I. Do not, however, exclude the area of Spartina in determining the size threshold of 1 acre. — 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 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II** **Dual rating I/II**

Wetland name or number A

SC 2.0 Natural Heritage Wetlands ***(see p. 87)*** Natural Heritage wetlands have been identified by the Washington Natural Heritage Program/DNR as either high quality undisturbed wetlands or wetlands that support state Threatened, Endangered, or Sensitive plant species. SC 2.1 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? *(this question is used to screen out most sites before you need to contact WNHP/DNR)* S/T/R information from Appendix D X or accessed from WNHP/DNR web site ___ YES____ – contact WNHP/DNR (see p. 79) and go to SC 2.2 NO X SC 2.2 Has DNR identified the wetland as a high quality undisturbed wetland or as or as a site with state threatened or endangered plant species? YES = Category I NO ____not a Heritage Wetland	**Cat. I**
SC 3.0 Bogs ***(see p. 87)*** Does the wetland unit (**or any part of the unit**) meet both the criteria for soils and vegetation in bogs? *Use the key below to identify if the wetland is a bog.* ***If you answer yes you will still need to rate the wetland based on its functions.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils)? Yes - go to Q. 3 No - go to Q. 2 2. Does the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? Yes - go to Q. 3 No - Is not a bog for purpose of rating 3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? Yes – Is a bog for purpose of rating No - go to Q. 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" deep. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. *1.* Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* 2. YES = Category I No X Is not a bog for purpose of rating	**Cat. I**

Wetland name or number A

SC 4.0 Forested Wetlands ***(see p. 90)*** Does the wetland unit have at least 1 acre of forest that meet one of these criteria for the 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/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (81 cm) or more. NOTE: The criterion for dbh is based on measurements for upland forests. Two-hundred year old trees in wetlands will often have a smaller dbh because their growth rates are often slower. The DFW criterion is and "OR" so old-growth forests do not necessarily have to have trees of this diameter. — **Mature forests**: (west of the Cascade Crest) Stands where the largest trees are 80 – 200 years old OR have average diameters (dbh) exceeding 21 inches (53cm); crown cover may be less that 100%; decay, decadence, numbers of snags, and quantity of large downed material is generally less than that found in old-growth. YES = Category I NO X not a forested wetland with special characteristics	**Cat. I**
SC 5.0 Wetlands in Coastal Lagoons ***(see p. 91)*** 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 surface 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 X not a wetland in a coastal lagoon SC 5.1 Does the wetland meets 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 invasive plant species (see list of invasive species on p. 74). — 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 acre (4350 square feet) YES = Category I NO = Category II	**Cat. I** **Cat. II**

Wetland name or number A

SC 6.0 Interdunal Wetlands *(see p. 93)* Is the wetland unit west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? YES - go to SC 6.1 NO X not an interdunal wetland for rating ***If you answer yes you will still need to rate the wetland based on its 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 SC 6.1 Is the wetland one acre or larger, or is it in a mosaic of wetlands that is once acre or larger? YES = Category II NO – go to SC 6.2 SC 6.2 Is the unit between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? YES = Category III	**Cat. II** **Cat. III**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on p.1	N/A

Wetland name or number A

SUMMARY

Name of wetland (or ID #): 35th Ave SE Date of site visit: 3/17/14

Rated by BSK Trained by Ecology? Yes__No___ Date of training_____

HGM Class Used for Rating depressional Unit has multiple HGM classes? X Y ____N

NOTE: Form is not complete without the figures requested. # of figures included_____
[Depressional (7 figures) Riverine (8 figures) Lake-fringe (7 figures) Slope (5 figures)]

OVERALL WETLAND CATEGORY I (based on functions X or special characteristics___)

1. Category of wetland based on FUNCTIONS

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

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

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

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

FUNCTION	Improving Water Quality	Hydrologic	Habitat	
	Circle the	*appropriate*	*ratings*	
Site Potential	H (M) L	H (M) L	(H) M L	
Landscape Potential	H (M) L	(H) M L	H (M) L	
Value	(H) M L	(H) M L	(H) M L	**TOTAL**
Score Based on Ratings	7(D)	8(D)	8	23

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 with 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	X

Wetland name or number A

Wetland name or number 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)?

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

*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 acres (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 two years.

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

Wetland name or number A

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 _____

DEPRESSIONAL AND FLATS WETLANDS

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

D 1.0 Does the wetland unit have the potential to improve water quality?	
D 1.1 Characteristics of surface water flows out of the wetland: *Provide photo or drawing* Unit is a depression or "flat depression" (Q. 7 on key) with no surface water leaving it (no outlet) points =3 Unit has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet points = 2 Unit has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Unit is a "flat" depression (Q. 7 on key), whose outlet is a permanently flowing ditch. points = 1	Figure ___ 1
D 1.2 The soil 2 inches below the surface (or duff layer) is clay or organic *(use NRCS definitions)* YES: points = 4 NO: points = 0	4
D 1.3 Characteristics of persistent plants (emergent, shrub, and/or forest Cowardin class) *Provide map of plant classes* Unit has persistent, ungrazed, plants ≥ 95% of area points = 5 Unit has persistent, ungrazed, plants ≥ 1/2 of area points = 3 Unit has persistent, ungrazed plants ≥ 1/10 of area points = 1 Unit has persistent, ungrazed plants <1/10 of area points = 0	Figure__ 3
D 1.4 Characteristics of seasonal ponding or inundation. *Provide map of hydroperiods* *This is the area of the wetland unit 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	Figure ___ 2
Total for D 1 Add the points in the boxes above	10

Rating of Site Potential If score is: **12 – 16 = H** **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 at the site?	
D 2.1 Does the Wetland unit receive stormwater discharges? Yes = 1 No = 0	1
D 2.2 Is more than 10% of the buffer within 150 ft of wetland unit in land use generating pollutants Yes = 1 No = 0	1
D 2.3 Are there septic systems within 250 ft of the wetland unit? Yes = 1 No = 0	0
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	2

Rating of Landscape Potential If score is: **3 or 4 = H** **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 unit discharge directly (i.e.. within 1 mile) to a stream, river, or lake that is on the 303d list? Yes = 1 No = 0	0
D 3.2 Is the unit in a basin or sub-basin where an aquatic resource is on the 303(d) list? North Creek 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 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: **2-4 = H** **1 = M** **0 = L** *Record the rating on the first page*

Wetland name or number A

DEPRESSIONAL AND FLATS WETLANDS

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

D 4. 0 Does the wetland unit have the potential to reduce flooding and erosion?		
D 4.1 Characteristics of surface water flows out of the wetland: *Provide photo or drawing*		Figure ___
Unit is a depression or "flat depression" (Q. 7 on key) with no surface water leaving it (no outlet)	points =4	0
Unit has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet	points = 2	
Unit is a "flat" depression (Q. 7 on key), whose outlet is a permanently flowing ditch.	points = 1	
Unit has an unconstricted, or slightly constricted, surface outlet that is permanently flowing	points = 0	
D 4.2 Depth of storage during wet periods *Estimate the height of ponding above the bottom of the outlet. For units with no outlet measure from the surface of permanent water or if dry, the deepest part.*		3
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	
Unit is flat (yes to Q. 2 or Q. 7 on key) but has small depressions on the surface that trap water	points = 1	
Marks of ponding less than 0.5 ft (6 inches)	points = 0	
D 4.3 Contribution of unit 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. Provide map of contributing basin*		Figure ___ 3
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 unit is in the FLATS class	points = 5	
Total for D 4	Add the points in the boxes above	6

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

D 5.0 Does the landscape have the potential to support hydrologic functions at the site?		
D 5.1 Does the unit receive any stormwater discharges?	Yes = 1 No = 0	1
D5.2 Is >10% of the land use within 150 ft of the wetland in a land use that generates runoff?	Yes = 1 No = 0	1
D 5.3 Is more than 25% of the contributing basin of the wetland unit covered with intensive human land uses (residential at >1 residence/acre, urban, commercial, agriculture, etc.)?	Yes = 1 No = 0	1
Total for D 5	Add the points in the boxes above	3

Rating of Landscape Potential If score is: **3 = H** **1,2 = 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.*		2
• The site has been identified as important for flood reduction in a regional flood control plan.	points = 2.	
• The wetland captures surface water that would otherwise flow downgradient into areas where flooding has damaged human or natural resources (e.g., salmon redds),		
o Damage occurs in sub-basin that is immediately down-gradient of unit. (35th Ave SE)	points = 2	
o Damage occurs in a sub-basin further 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 unit.	points = 0	

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

Wetland name or number A

These questions apply to wetlands of all HGM classes.

HABITAT FUNCTIONS - Indicators that site functions to provide important habitat.

H 1. Does the wetland unit have the potential to provide habitat for many species?

H 1.1 Structure of plant community – *indicators are Cowardin classes and layers in forest.* Check the Cowardin plant classes in unit – *Polygons for each class must total ¼ acre, or more than 10% of the unit if it is smaller than 2.5 acres.*

Add the number of structures checked. *Provide map of Cowardin plant classes*

✓ Aquatic bed	4 structures or more	points = 4
✓ Emergent plants	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

Figure__ 4

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 acre to count (*see text for descriptions of hydroperiods*).

Provide map of polygons with different 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

Figure__ 2

H 1.3. Richness of Plant Species

Count the number of plant species in the wetland unit 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

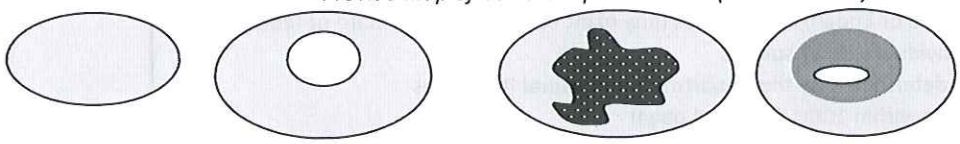
2

H 1.4. Interspersion of habitats

Decide from the diagrams below whether interspersion between Cowardin plants classes (described in H 1.1), or the classes and unvegetated areas (can include open water or mudflats) is high, medium, low, or none.

Provide map of Cowardin plant classes (same as H1.1)

NOTE: If you have four or more classes or three plants 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**

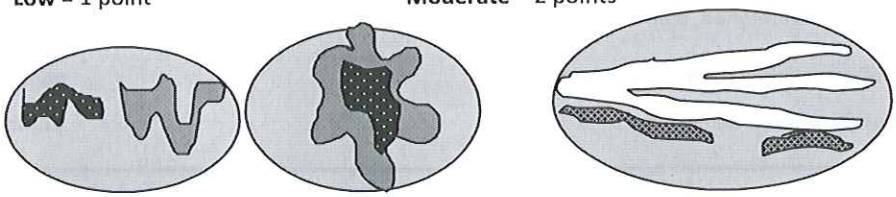


Figure__ 3

Wetland name or number 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 unit (>4 inches diameter and 6 ft long). ✓ Standing snags (diameter at the bottom > 4 inches) within the unit ____ Undercut banks are present for at least 6.6 ft (2m) **and/or** overhanging plants extends at least 3.3 ft (1m) over a stream (or ditch) in, or contiguous with the unit, for at least 33 ft (10m) ✓ Stable steep banks of fine material that might be used by beaver or muskrat for denning (>30degree 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 acre 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*)	4
H 1. TOTAL Score - potential for providing habitat	15

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

H 2.0 Does the landscape have the potential to support habitat at the site?	
H 2.1 Accessible habitat (include *only habitat that directly abuts wetland unit*). *Calculate:* % undisturbed habitat + [(% moderate and low intensity land uses)/2] = _____ *Provide map* If total accessible habitat is: > 1/3 (33.3%) of 1 km circle *(~100 hectares or 250 acres)* points = 3 20 - 33% of 1 km circle points = 2 10 - 19% of 1 km circle points = 1 <10% of 1 km circle points = 0	Figure__ 1
H 2.2 Undisturbed habitat in 1 km circle around unit. Undisturbed habitat > 50% of circle 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 circle points = 0	2
H 2.3 Land use intensity in 1 km circle. If: > 50% of circle is high intensity land use points = (- 2) < =50% of circle 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** **< 1 = L** *Record the rating on the first page*

H 3.0 Is the Habitat provided by the site valuable to society?	
H3.1Does the site provides habitat for species valued in laws, regulations or policies? *(choose only the highest score)* Site meets ANY of the following criteria: points = 2 • It provides habitat for Threatened or Endangered species (any plant or animal on the state or federal lists) • It is a "priority area" for an individual WDFW species • It is a Natural Heritage Site as determined by the Department of Natural Resources → • It has 3 or more priority habitats within 100m (see next page) • 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 within 100m (see next page) points = 1 Site does not meet any of the criteria above points = 0	2

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

Wetland name or number 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)

Count how many of the following priority habitats are within 330 ft (100m) 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 0.4 ha (1 acre).

___**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 p. 152*).

___**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 20 trees/ha (8 trees/acre) > 81 cm (32 in) dbh or > 200 years of age. (Mature forests) Stands with average diameters exceeding 53 cm (21 in) dbh; crown cover may be less that 100%; crown cover may be less that 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:** Woodlands 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 7.6 m (25 ft) high and occurring below 5000 ft.

___**Talus:** Homogenous areas of rock rubble ranging in average size 0.15 - 2.0 m (0.5 - 6.5 ft), 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 > 51 cm (20 in) in western Washington and are > 2 m (6.5 ft) in height. Priority logs are > 30 cm (12 in) in diameter at the largest end, and > 6 m (20 ft) 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 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 unit 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 unit 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**	**Cat. I**
SC 1.2 Is the wetland unit at least 1 acre in size and meets at least two of the following three conditions? **YES = Category I** **NO = Category II** — 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 21) — 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 2 of the following features: tidal channels, depressions with open water, or contiguous freshwater wetlands.	**Cat. I** **Cat. II**
SC 2.0 Wetlands with High Conservation Value (WHCV) SC 2.1 Has the Department of Natural Resources updated their web site to include the list of Wetlands with High Conservation Value? **YES - Go to SC 2.2** **NO – Go to SC 2.3** SC 2.2 Is the wetland unit you are rating listed on the DNR database as having a High Conservation Value? **YES = Category I** **NO = not a WHCV** SC 2.3 Is the wetland unit being rated in a Section/Township/Range that contains a Natural Heritage wetland? http://www1.dnr.wa.gov/nhp/refdesk/datasearch/wnhpwetlands.pdf **YES – contact WNHP/DNR and go to SC 2.4** **NO = not a WHCV** SC 2.4 Has DNR identified the wetland within the S/T/R as a wetland with High Conservation value and is listed on their web site? **YES = Category I** **NO = not an WHCV**	**Cat. I**
SC 3.0 Bogs *(see p. 87)* Does the wetland unit (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.*** 1. Does the unit have organic soil horizons (i.e. layers of organic soil), either peats or mucks, that compose 16 inches or more of the first 32 inches of the soil profile? (See Appendix B for a field key to identify organic soils)? **Yes - go to Q. 3** **No - go to Q. 2** 2. Does the unit have organic soils, either peats or mucks that are less than 16 inches deep over bedrock, or an impermeable hardpan such as clay or volcanic ash, or that are floating on a lake or pond? **Yes - go to Q. 3** **No - Is not a bog for purpose of rating** 3. Does the unit have more than 70% cover of mosses at ground level, AND other plants, if present, consist of the "bog" species listed in Table 3 as a significant component of the vegetation (more than 30% of the total shrub and herbaceous cover consists of species in Table 3)? **Yes – Is a bog for purpose of rating** **No - go to Q. 4** NOTE: You may substitute this criterion by measuring the pH of the water seeping into a 16" hole. If the pH is less than 5.0 and the "bog" plant species in Table 3 are present, the wetland is a bog. 4. Is the unit forested (> 30% cover) with sitka spruce, subalpine fir, western red cedar, western hemlock, lodgepole pine, quaking aspen, Englemann's spruce, or western white pine, WITH any of the species (or combination of species) on the bog species plant list in Table 3 as a significant component of the ground cover *(> 30% coverage of the total shrub/herbaceous cover)?* **YES = Category I** **No___ Is not a bog for purpose of rating**	**Cat. I**

Wetland name or number A

SC 4.0 Forested Wetlands Does the wetland unit have at least 1 contiguous acre of forest that meet one of these criteria for the 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/acre (20 trees/hectare) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 inches (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 inches (53cm). **YES = Category I** **NO ___not a forested wetland for this section**	**Cat. I**
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 meets 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 invasive plant species (see list of invasive species on p. 74). — 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 acre (4350 square feet) **YES = Category I** **NO = Category II**	**Cat. I** **Cat. II**
SC 6.0 Interdunal Wetlands Is the wetland unit west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? **YES - go to SC 6.1** **NO __ not an interdunal wetland for rating** ***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 **SC 6.1** Is the wetland one acre 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 one acre or larger, or is it in a mosaic of wetlands that is once acre or larger? **YES = Category II** **NO – go to SC 6.3** **SC 6.3** Is the unit between 0.1 and 1 acre, or is it in a mosaic of wetlands that is between 0.1 and 1 acre? **YES = Category III** **NO – Category IV**	**Cat I** **Cat. II** **Cat. III** **Cat. IV**
Category of wetland based on Special Characteristics *Choose the "highest" rating if wetland falls into several categories, and record on p. 1.* If you answered NO for all types enter "Not Applicable" on Summary Form	

APPENDIX D

IMPORTANT INFORMATION ABOUT YOUR WETLAND DELINEATION/MITIGATION AND/OR STREAM CLASSIFICATION REPORT

SHANNON & WILSON, INC.
Geotechnical and Environmental Consultants

Attachment to and part of Report 21-1-21948-004

Date: June 19, 2014
To: Mr. Pat Sloan
KPFF Consulting Engineers

IMPORTANT INFORMATION ABOUT YOUR WETLAND DELINEATION/MITIGATION AND/OR STREAM CLASSIFICATION REPORT

A WETLAND/STREAM REPORT IS BASED ON PROJECT-SPECIFIC FACTORS.

Wetland delineation/mitigation and stream classification reports are based on a unique set of project-specific factors. These typically include the general nature of the project and property involved, its size, and its configuration; historical use and practice; the location of the project on the site and its orientation; and the level of additional risk the client assumed by virtue of limitations imposed upon the exploratory program. The jurisdiction of any particular wetland/stream is determined by the regulatory authority(s) issuing the permit(s). As a result, one or more agencies will have jurisdiction over a particular wetland or stream with sometimes confusing regulations. It is necessary to involve a consultant who understands which agency(s) has jurisdiction over a particular wetland/stream and what the agency(s) permitting requirements are for that wetland/stream. To help reduce or avoid potential costly problems, have the consultant determine how any factors or regulations (which can change subsequent to the report) may affect the recommendations.

Unless your consultant indicates otherwise, your report should not be used:

- If the size or configuration of the proposed project is altered.
- If the location or orientation of the proposed project is modified.
- If there is a change of ownership.
- For application to an adjacent site.
- For construction at an adjacent site or on site.
- Following floods, earthquakes, or other acts of nature.

Wetland/stream consultants cannot accept responsibility for problems that may develop if they are not consulted after factors considered in their reports have changed. Therefore, it is incumbent upon you to notify your consultant of any factors that may have changed prior to submission of our final report.

Wetland boundaries identified and stream classifications made by Shannon & Wilson are considered preliminary until validated by the U.S. Army Corps of Engineers (Corps) and/or the local jurisdictional agency. Validation by the regulating agency(s) provides a certification, usually written, that the wetland boundaries verified are the boundaries that will be regulated by the agency(s) until a specified date, or until the regulations are modified, and that the stream has been properly classified. Only the regulating agency(s) can provide this certification.

MOST WETLAND/STREAM "FINDINGS" ARE PROFESSIONAL ESTIMATES.

Site exploration identifies wetland/stream conditions at only those points where samples are taken and when they are taken, but the physical means of obtaining data preclude the determination of precise conditions. Consequently, the information obtained is intended to be sufficiently accurate for design, but is subject to interpretation. Additionally, data derived through sampling and subsequent laboratory testing are extrapolated by the consultant who then renders an opinion about overall conditions, the likely reaction to proposed construction activity, and/or appropriate design. Even under optimal circumstances, actual conditions may differ from those thought to exist because no consultant, no matter how qualified, and no exploration program, no matter how comprehensive, can reveal what is hidden by earth, rock, and time. Nothing can be done to prevent the unanticipated, but steps can be taken to help reduce their impacts. For this reason, most experienced owners retain their consultants through the construction or wetland mitigation/stream classification stage to identify variances, to conduct additional evaluations that may be needed, and to recommend solutions to problems encountered on site.

WETLAND/STREAM CONDITIONS CAN CHANGE.

Since natural systems are dynamic systems affected by both natural processes and human activities, changes in wetland boundaries and stream conditions may be expected. Therefore, delineated wetland boundaries and stream classifications cannot remain valid for an indefinite period of time. The Corps typically recognizes the validity of wetland delineations for a period of five years after completion. Some city and county agencies recognize the validity of wetland delineations for a period of two years. If a period of years have passed since the wetland/stream report was completed, the owner is advised to have the consultant reexamine the wetland/stream to determine if the classification is still accurate.

Construction operations at or adjacent to the site and natural events such as floods, earthquakes, or water fluctuations may also affect conditions and, thus, the continuing adequacy of the wetland/stream report. The consultant should be kept apprised of any such events and should be consulted to determine if additional evaluation is necessary.

THE WETLAND/STREAM REPORT IS SUBJECT TO MISINTERPRETATION.

Costly problems can occur when plans are developed based on misinterpretation of a wetland/stream report. To help avoid these problems, the consultant should be retained to work with other appropriate professionals to explain relevant wetland, stream, geological, and other findings, and to review the adequacy of plans and specifications relative to these issues.

DATA FORMS SHOULD NOT BE SEPARATED FROM THE REPORT.

Final data forms are developed by the consultant based on interpretation of field sheets (assembled by site personnel) and laboratory evaluation of field samples. Only final data forms customarily are included in a report. These data forms should not, under any circumstances, be drawn for inclusion in other drawings because drafters may commit errors or omissions in the transfer process. Although photographic reproduction eliminates this problem, it does nothing to reduce the possibility of misinterpreting the forms. When this occurs, delays, disputes, and unanticipated costs are frequently the result.

To reduce the likelihood of data form misinterpretation, contractors, engineers, and planners should be given ready access to the complete report. Those who do not provide such access may proceed under the mistaken impression that simply disclaiming responsibility for the accuracy of information always insulates them from attendant liability. Providing the best available information to contractors, engineers, and planners helps prevent costly problems and the adversarial attitudes that aggravate them to a disproportionate scale.

READ RESPONSIBILITY CLAUSES CLOSELY.

Because a wetland delineation/stream classification is based extensively on judgment and opinion, it is far less exact than other design disciplines. This situation has resulted in wholly unwarranted claims being lodged against consultants. To help prevent this problem, consultants have developed a number of clauses for use in written transmittals. These are not exculpatory clauses designed to foist the consultant's liabilities onto someone else; rather, they are definitive clauses that identify where the consultant's responsibilities begin and end. Their use helps all parties involved recognize their individual responsibilities and take appropriate action. Some of these definitive clauses are likely to appear in your report, and you are encouraged to read them closely. Your consultant will be pleased to give full and frank answers to your questions.

THERE MAY BE OTHER STEPS YOU CAN TAKE TO REDUCE RISK.

Your consultant will be pleased to discuss other techniques or designs that can be employed to mitigate the risk of delays and to provide a variety of alternatives that may be beneficial to your project.

Contact your consultant for further information.