

JACKSON PARK III
PRELIMINARY TECHNICAL INFORMATION
REPORT (TIR)
NOVEMBER 2021



DESIGN → PERMIT → MANAGE

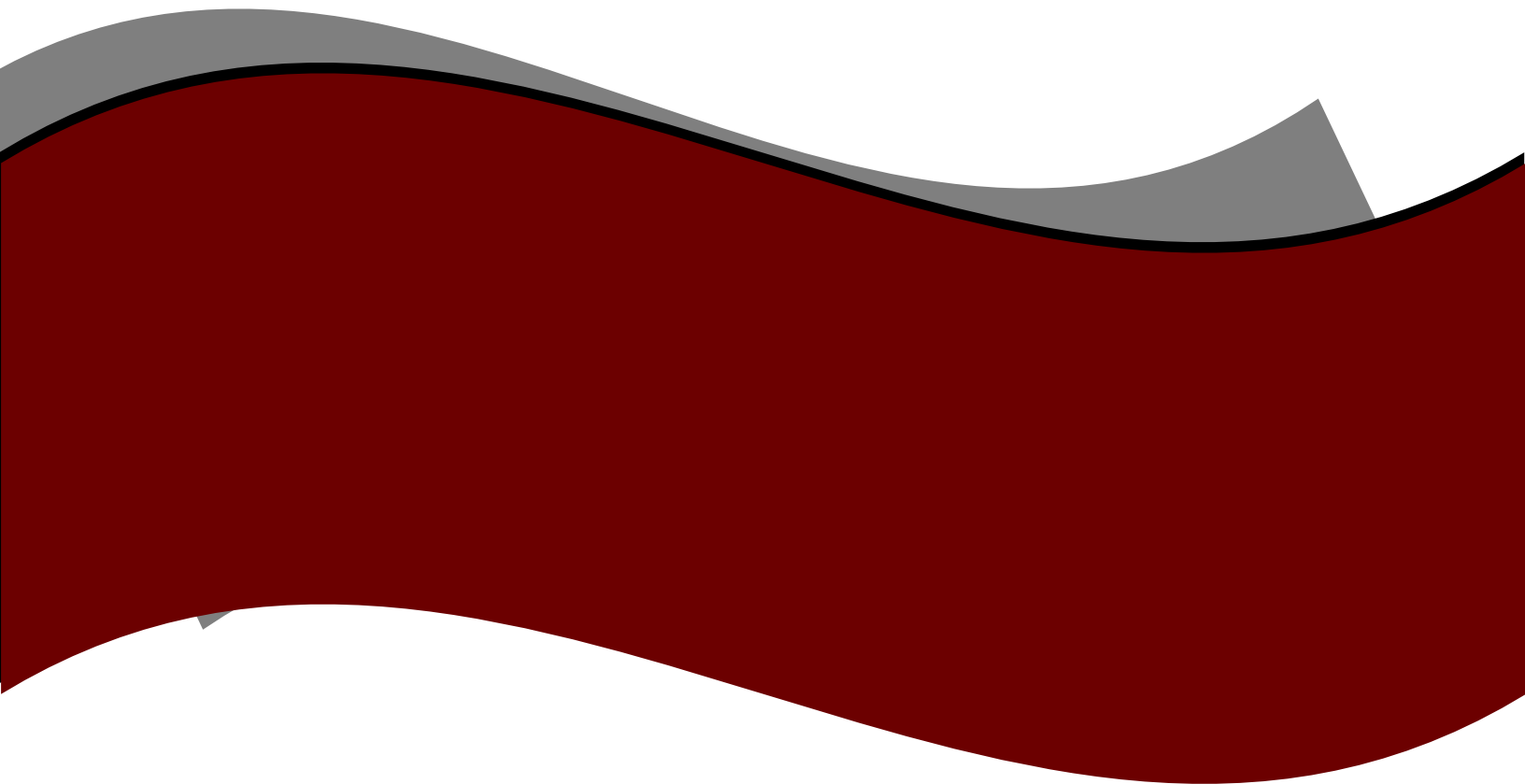


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Project Engineer

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Reference: City of Chehalis 1991 Stormwater
Management Plan

Project Engineer's Certification

"I hereby certify that this Drainage and Erosion Control Plan for **Jackson Park III** has been prepared by me or under my supervision and meets minimum standards the **Stormwater Management for City of Chehalis** and normal standards of engineering practice. I hereby acknowledge and agree that the jurisdiction does not and will not assume liability for the sufficiency, suitability, or performance of drainage facilities designed by me."

Project Engineer's Stamp



SECTION 1 – PROJECT OVERVIEW

Permit Requested:	Drainage and Grading
Other Permits Required:	Building Permit, NPDES Construction Permit SEPA Checklist Grading/Earthwork Permit Zoning Change
Agency Permit No.:	Pending
Site Address:	0 SW 21 st St Chehalis, WA 98532
Total Site Area:	5.10 Acres
Zoning:	Current is R1 Single Family Proposed R4 Multi-Family
WaterShed:	WRIA 23 – Upper Chehalis https://waecy.maps.arcgis.com/apps/webappviewer/index.html?id=996e6b21ae394cc3a3b63c6da0c3aa0a

Project Overall Description

Construction of 68 units in five multi-family buildings, a 40'x60' maintenance building and surface and garage parking. The project will provide site lighting, landscaping, concrete walks for pedestrian connectivity and a small community shelter and play area. Connection to existing City water and sewer utilities are also proposed.

Proposed Flow Control Improvements

The flow control facilities proposed for this project were designed and modeled using the latest edition of the Western Washington Hydrology Manual Continuous Simulation Program. The site will utilize a detention pond for the developments flow control.

Proposed Water Quality Improvements

The water quality improvements for the project site runoff consist of Wetpond for the developments Water Quality Control

Proposed Conveyance System

The proposed conveyance systems will consist of concrete catch basins and PVC pipe in various sizes to collect and convey stormwater to the proposed water quality and flow control ponds. Roof runoff will be tightlined to nearby catch basins for discharge to the stormwater ponds. The proposed conveyance system will be sized to accommodate a minimum of the 25-year storm event.

Proposed Discharge Location

The project site will discharge runoff from the developed areas to a stormwater treatment and detention pond located at the southwest end of the property. Stormwater will pass through a flow control device prior to being discharged to the existing drainage ditch along the south property line at the predeveloped rate.

Downstream Condition

The natural drainage leaving the site flows east to west in an existing drainage ditch along the southern property line.

Onsite Soils and Geology

An onsite soils report will be completed for this project site. A copy of that report is included in Appendix 3 of the final drainage report.

NRCS Soil Survey

RBE staff reviewed the onsite soils information provided by NRCS. Appendix 3 includes copies of the site map and soil descriptions that make up the property geology. In addition to the NRCS information,

Hydrologic Soil Group: (MIA) Lacamas silt loam, 0 to 3% Slope – Class C/D Soils

Project Topography

Based on the site topography, the project site is generally flat with maximum slopes of 2 to 3%.

Land Use and Ground Cover

The existing land use is vacant and covered with field grasses.

Natural Drainage Patterns

The site has natural drainage that flows north to south then east to west.

Tributary and Discharge Points of Flow

The site has tributary areas to the NE that discharge water onto the NE property line. That runoff flows SE and is collected in the ditch system along the southern property line. This offsite tributary runoff will bypass the onsite storm system and continue to flow in its current path through the site.

Existing Utilities (Storm, Sewer, Water)

The existing utilities available to the site include sanitary sewer, water, gas, power and phone services.

Erosion Potential

The site has a **medium** erosion potential based on the NRCS Soil Survey. As part of the development plans a detailed Erosion Control Plan and Storm Water Pollution Prevention Plan will be prepared for use during site construction to minimize erosion and migration of sediment within and off the site. A NPDES Stormwater Construction Permit is required by WSDOE for this project. Application will be made with the DOE at the start of final design plans.

Critical Areas Onsite

The site **has** been identified as having wetlands onsite. A critical area report was prepared by Ecological Land Services. A copy of the critical area report is included in Appendix 3.

Existing Fuel Storage Tanks

Review of the onsite parcels resulted in no evidence of existing fuel storage tanks above or below ground for this property.

Groundwater Wells

The property does not include any onsite ground water wells.

Septic Systems

No existing onsite septic system have been identified on the site.

Aquifer Recharge Area

The site **is not** located in an aquifer recharge area.

Wellhead Protection Area

The site **is not** within any wellhead protection areas.

100-Year Flood Plain

The site **is not** within any flood plains.

Section 2 – APPLICABLE MINIMUM REQUIREMENTS

Manual Exemptions

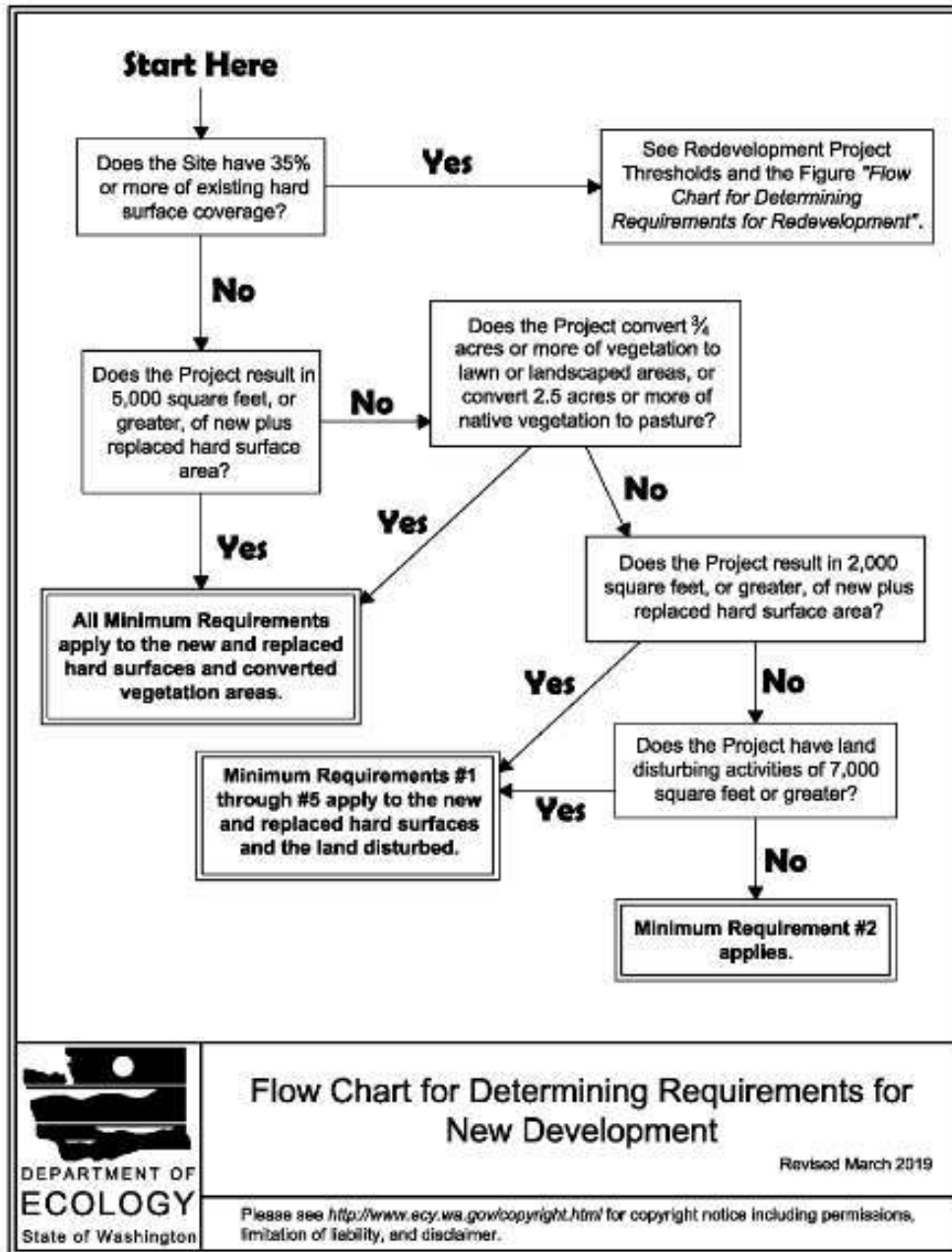
Exemptions	Applicable to Project
Forest Practices (Title 222 WAC)	No
Commercial Agriculture	No
Oil & Gas Field Activities or Operations	No
Pavement Maintenance	No
Underground Utility Projects	No

New Development and Re-Development Review

The minimum requirements for stormwater development and redevelopment sites are listed in Volume I of the 2019 SMMWW. Not all minimum requirements of this section apply to all projects. Determination of applicable minimum requirements is also based in part on Section 1-3 of the Manual. See detailed area calculations in Section 5 of this report.

Applicable Criteria	Areas
Total Land Area	5.1 AC
Existing Site Impervious Coverage	0.08 AC
New Plus Replaced Impervious Surface	1.94 AC
Vegetation Area Converted to Lawn or Landscaped Area	3.96 AC
Land Disturbing Area	3.96 AC
Percent of Existing Impervious Surface	1.6 %

Figure I-3.1: Flow Chart for Determining Requirements for New Development



Section 2.1 – Minimum Requirements

Based on the thresholds given in Figures 1-3.1 and/or 1-3.2 of Volume I of the Manual, the proposed project must address or comment on **Minimum Requirements #1 through #9**. These requirements as they apply to the project are discussed in more detail below.

Minimum Requirement (MR) #1 – Stormwater Site Plans:

The proposed project will create over 5,000 square feet of new impervious surfacing, and therefore a Stormwater Site Plan complying with minimum requirements #1 through #9 is required.

MR #2 – Construction Storm Water Pollution Prevention Plan:

The proposed project exceeds the thresholds of Section 2.5 and therefore a Construction Storm Water Pollution Prevention Plan is required for this project. The site **does** disturb more than 1 acre of land and discharges to waters of the state. Therefore, a NPDES stormwater construction permit **is** required. A SWPPP has been created as a standalone document for this project and included in Appendix 6 of this TIR.

MR #3 – Source Control of Pollution:

All known, available and reasonable source control BMPs shall be applied to the project to limit pollutants coming in contact with stormwater. The Source Control BMPs for this project will be incorporated into the project's Final Operation and Maintenance Plan.

MR #4 – Preservation of Natural Drainage Systems/Outfalls:

Proposed stormwater discharges from the project site shall be treated and detained and then released to the original natural drainage location. The natural site drainage outfall will be maintained but will have a reduced flow due to the onsite drainage design facility.

MR #5 – On-Site Stormwater Management:

This project will develop a site stormwater management plan as part of the development plan.

MR #6 – Runoff Treatment:

The following Water Quality Facility will be utilized for this project.

Basin ID	BMP Used	Treatment Level
D1	Wetpond Treatment	Basic

MR #7 – Flow Control:

The following flow control detention facility is planned for this project. The facility will be constructed in the wetland buffer onsite as allowed by City Code.

Basin ID	BMP Used	Effective Impervious Surface Area
D1	Detention Pond	Basic

MR #8 – Wetlands Protection:

Wetlands have been identified onsite. A copy of the wetland report is included in Appendix 3 of this TIR. The onsite wetlands will be protected from pollutants and sediment during construction via the erosion control plan for the site.

MR #9 – Operation & Maintenance:

A Stormwater Maintenance Agreement and Operation and Maintenance Manual will be prepared as part of the final drainage report.

Section 2.2 - Additional Protective Measures (APM)

Facility agreements and financial guarantees when required will be reviewed by the applicant and executed at the appropriate time determined by the reviewing agency.

APM1 - Financial Liability

Performance Bonding for this project’s stormwater facility improvements is **not** required by the jurisdiction.

APM2 – Offsite Analysis and Mitigation

Qualitative Analysis

Basin D1 – Developed Basin

The stormwater runoff from the offsite adjacent properties to the NE currently sheet flow and direct discharge onto this project site. This runoff is currently collected onsite and conveyed to the existing ditch along the southern property line. The beginning of this conveyance ditch line is at the eastern corner of the property. This ditch runs east to west on the southern border of the large adjacent parcel. This ditch is 520 feet long and has a 2-foot bottom width, 3-foot depth and 2:1 slide slope. At the intersection with SW 21st Street, the ditch enters a 24-inch diameter cross culvert that continues west under SW 21st Street. The discharge side of SW 21st Street includes dual 24-inch culverts. One is a discharge for the storm main in SW 21st and one is the cross culvert. These two culverts discharge into a grass swale that has a 4-foot bottom width, 4-foot depth and 2:1 slide slopes. This swale continues west and eventually connects to the City stormwater system in SW 20th Street.

Below is a table showing the maximum flow calculations we performed on the downstream conveyance system. With an onsite detention system, the new project will discharge water at the current pre-developed rates of the 2, 10 and 100-year storm events. Runoff will be discharged into an armored dispersal pad and then discharge at the natural location on the adjacent parcel and sheet flow to the existing conveyance ditch. The flow rate impact of the project on each segment downstream is listed below. Due to the low percentage of impact to the overall capacity of the downstream conveyance, a full basin analysis was deemed un-necessary. Below are the pre-developed and mitigated flow rates for the developed site. They show that the 100 year flow rate from pre to post development is reduced by 50%. So there is not adverse impact to the existing conveyance system.

Flow Frequency
Flow(cfs) 0501 15m Pre-developed Flow Rates
 2 Year = 0.1812
 5 Year = 0.3807
 10 Year = 0.5129
 25 Year = 0.6633
 50 Year = 0.7601
 100 Year = 0.8435

Flow Frequency
Flow(cfs) 0801 15m Mitigated Flow Rates0.2
 2 Year = 0.0919
 5 Year = 0.1463
 10 Year = 0.1934
 25 Year = 0.2678
 50 Year = 0.3357
 100 Year = 0.4159

Segment	Maximum Capacity (cfs)	Site Percent of Flow (%)
Swale A	202.4	0.2
24" Culvert	23.1	1.8
Swale B	508.6	0.08

Solution:

$$Q = \frac{1.49}{\eta} * A * R^{2/3} * S^{1/2}$$

$Q = 453.89$ Discharge (cfs)
 $\eta = 0.026$ Mannings Number (Roughness Coefficient)
 $A = 44.00$ Area (ft²)
 $w = 3$ (ft)
 $d = 4.00$ (ft)
 $Z = 2 : 1$
 $P = 20.89$ Wetted Perimeter (ft)
 $R = 2.11$ Hydraulic Radius (ft)
 $S = 0.0120$ Slope (ft/ft)

Swale B:

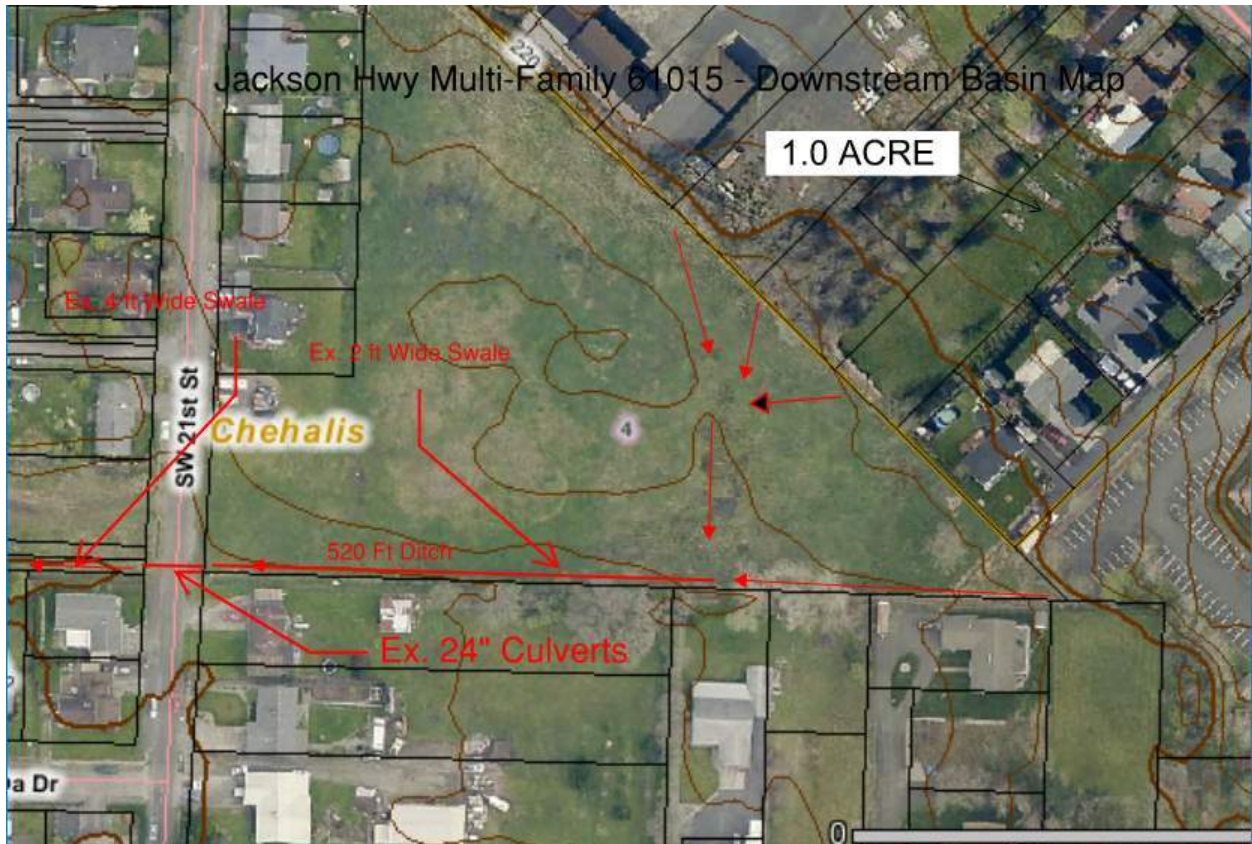
$Q = 508.6$ Discharge (cfs)
 $\eta = 0.026$ Mannings Number (Roughness Coefficient)
 $A = 48.00$ Area (ft²)
 $w = 4$ (ft)
 $d = 4.00$ (ft)
 $Z = 2 : 1$
 $P = 21.89$ Wetted Perimeter (ft)
 $R = 2.19$ Hydraulic Radius (ft)
 $S = 0.0120$ Slope (ft/ft)

24-Inch Culvert**Inputs:**

Pipe Diameter, d _o	2.000	ft
Manning Roughness, n ?	0.014	
Pressure slope (possibly equal to pipe slope), S _o	0.012	rise/run
Percent of (or ratio to) full depth (100% or 1 if flowing full)	1.000	fraction

Results:

Full Flow, Q	23.073	ft ³ /s
Velocity, v	7.344	ft/s
Velocity head, hv	0.838	ft
Flow Area, A	3.142	ft ² /s
Wetted Perimeter, P	6.283	ft
Hydraulic Radius	0.500	ft



Mitigation Measures

The offsite analysis for this project **did not** yield any mitigation for this project. The onsite storm system will be designed with the latest WWHM modeling software which reduces the flow impacts to the cities drainage system.

Section 2.3 – Adjustments and Exceptions/Variations to the MRs

Adjustments:

No adjustments have been requested for this project.

Exceptions and Variations:

No exceptions or variations have been requested for this project.

SECTION 6 – SOURCE CONTROL BMPS

The following permanent source control BMPs that apply to all sites:

IV – 1 Source Control BMPs Applicable to All Sites:

S410 BMPs for Correcting Illicit Discharges to Storm Drains.
S453 BMPs for Formation of a Pollution Prevention Team.
S545 BMPs for Preventive Maintenance / Good Housekeeping.
S455 BMPs for Spill Prevention and Cleanup.
S457 BMPs for Inspections.
S458 BMPs for Record Keeping – Vol. IV – Page 503.

The following permanent source control BMPs will be utilized for this project and will be included in the final Operation and Maintenance Manual submitted prior to final project acceptance by the Review Agency.

IV-2 – Cleaning or Washing Source Control BMPs

S410 BMPs for Correcting Illicit Discharges to Storm Drains.

IV-3 – Roads, Ditches, and Parking Lot Source Control BMP's

S417 BMPs for Maintenance of Stormwater Drainage and Treatment Systems.

IV-4 – Soil Erosion, Sediment Control and Landscaping

S411 BMPs for Landscaping and Lawn/Vegetation Management.

SECTION 4 – SITE SUITABILITY CRITERIA (SSC)

This section outlines the criteria used to help select the stormwater type of flow control and treatment facility for this project. Based on our review of the criteria below we have selected the following type of facilities for this project.

Basin ID / TDA	Flow Control	Water Quality
D1	Detain and Release	Filtration

SSC Review if Applicable

SSC – 1 Setback Criteria

Setback requirements for this project for the following stormwater facilities that include retention, treatment and detention facilities are:

Facility Id	Foundation	Property Line	Water Well	Septic Drain Field	Right of Way / Easement
Detention Pond	20 ft	20 ft	100 ft	100 ft	20 ft
Wetpond	20 ft	20 ft	100 ft	100 ft	10 ft

SSC – 2 Ground Water Protection Areas

Critical Aquifer Recharge Area

This Project site **is not** within a Critical Aquifer Recharge Area

Wellhead Protection Area

The site **is not** within any wellhead protection areas for public utilities.

SSC – 3 High Vehicle Traffic Areas

This project **does not** require an oil control facility based on the analysis below.

Oil Control Determination Chart	
ADT 100 Vehicles or Greater per 1000 SF Building Area	Yes or No
Site Subject to Petroleum Storage or Transfer Greater than 1500 Gallons per year.	Yes or No
Site have Parking, Storage or maintenance of 25 or more vehicles over 25 Tons gross weight. (Trucks, Buses, Trains, Heavy Equipment)	Yes or No
Road Intersection with measured ADT of 25000 vehicles or more on main roadway and 15000 vehicles or more on intersection roadway.	Yes or No

SSC – 4 Soil Infiltration Rate / Drawdown Time

Infiltration Rates

The following information was taken from the project geotechnical report in Appendix 3 and used in the project modeling. All applicable correction factors (CF) were applied to the testing results.

SSC – 5 Depth to Bedrock, Water Table, or Impermeable Layer

Per review of the NRCS Soil Survey of the project site, the anticipated depth to seasonal high water mark or design restrictive layer 12” to 18” below grade. Based on the NRCS data it was determined that infiltration is not feasible for this project site and detain and release will be utilized.

SSC – 6 Soil Physical and Chemical Suitability for Treatment

Because the site soils are not conducive to infiltration onsite, the soil physical suitability for treatment was not pursued for this project.

SSC – 7 Seepage Analysis and Control

Based on the sites pour infiltrating soils and required setbacks, there will be no adverse effects caused by seepage zones on nearby building foundations, basement, roads parking lots or sloping sites.

SSC – 8 Cold Climate and Impact of Roadway Deicers

This project is not a public road project that could have possible use of deicers.

SECTION 5 – PERMANENT STORMWATER CONTROL PLAN

Existing Site Hydrology

Existing site hydrology is based on our site investigation, field topographic survey, aerial topographic mapping and completed soils review for the subject project. The site consists of the basins outlined below.

Pre-developed Basin (P1)

The pre-developed basin has a small impervious gravel area near 21st. Street and the remaining land is field grass.

Current Land Use: Vacant Land

Modeled Land Use: Forested

TDA No. 1 Basin ID	Land Use Assumptions and Site Parameters				
	Land Use Cover	Slope	Acres	Hydrologic Group	Comments
P1	Forested	Flat	3.96	C/D	

Developed Site Hydrology (D1)

The post developed site will keep the wetland area north of the project developed in native land use and the new development will add impervious roof and asphalt parking area.

Basin Summary

Proposed and Modeled Land Use: Multi - Family

TDA No. 1 Basin ID	Land Use Assumptions and Site Parameters				
	Land Use Cover	Slope	Acres	Hydrologic Group	Comments
	Lawn	Flat	2.02	C/D	
	Roof	Flat	0.93		
	Parking	Flat	1.01		
Total Area			3.96		

Basin Maps

The following figures are included in Appendix 1 of the TIR.

Pre-Developed and Post Developed Map

SECTION 5.1 – FLOW CONTROL

Flow Control System Design & Analysis

The proposed stormwater facility was designed using the latest version of the WWHM stormwater model created for WSDOE. A copy of the WWHM Data Output Report is included in Appendix 2 of this TIR.

Flow Control for TDA No. 1

Basin D1 - Detention Pond (DP) DP No. 1

The auto-pond function in WWHM was used to size the detention pond facility. That model passed resulted in the following pond parameters:

Bottom Pond Area Required (sf)	Pond Storage Depth (ft)	Free Board Provided (ft)	Side Slopes	Control Structure Type
13066	2	1 ft	3:1	Wier/Orifice

The following detention pond facility designed meets or exceeds the modeled pond parameters:

Bottom Pond Area Provided (sf)	Pond Storage Depth (ft)	Free Board Provided (ft)	Side Slopes	Control Structure Type
14,347	2	1 ft	3:1	Wier/Orifice

Detention Pond Stage Storage Summary

Pond Stage Storage	Elevation (ft)	Detention Volume (ac-ft)
Emergency Overflow	215.5	
Design Water Surface	215	0.77 ac-ft
Bottom Live Storage	213	0 ac-ft
WWHM Required Storage		0.69 ac-ft

The new pond will be constructed with an impervious clay or synthetic membrane liner to prevent infiltration in the pond.

SECTION 5.2 – WATER QUALITY DESIGN

Water Quality System Design & Analysis

The drainage basins delineated for this project will have openly exposed pollution generating impervious surfaces. These tributary areas will be treated using the following treatment technology listed under the associated drainage basin.

TDA No. 1

Basin DX - BMP T10.10 – Wetpond - Basic and Large

RBE has selected this treatment method for water quality control for the new PGIS associated with the project. Below is the copy of the water quality results from the WWHM model. The required wetpond volume is 0.2901 ac-ft or 12,637 CF. The proposed wetpond volume is shown below and exceeds the modeled volume.

Wetpond Stage Storage Summary

Wetpond Stage Storage	Elevation (ft)	Detention Volume (ac-ft)
Wetpond Design Water Surface	213	15,856 CF
Bottom Wetpond	209	0 ac-ft
WWHM Required Volume		12,637 CF

Analysis

Water Quality

On-Line BMP

24 hour Volume (ac-ft) 0.2901

Standard Flow Rate (cfs) 0.3119

Off-Line BMP

Standard Flow Rate (cfs) 0.1757

Stream Protection Duration LID Duration Flow Frequency Water Quality Hydrograph

Wetland Input Volumes LID Report Recharge Duration Recharge Predeveloped Recharge Mitigated

Analyze datasets Compact WDM Delete Selected Monthly FF [Dropdown]

1 PUYALLUP DAILY EVAP W/JENSEN-HAIS
 2 Olympia Airport
 501 POC 1 Predeveloped flow
 701 Inflow to POC 1 Mitigated
 801 POC 1 Mitigated flow
 1000 Trapezoidal Pond 1 ALL OUTLETS Mitigated
 1001 Trapezoidal Pond 1 STAGE Mitigated

All Datasets Flow Stage Precip

Evap POC 1 POC 2

Flood Frequency Method

- Log Pearson Type III 17B
- Weibull
- Cunnane
- Gringorten

SECTION 5.3 – CONVEYANCE SYSTEM DESIGN

Pipe Conveyance Design

All onsite storm conveyance systems will be sized to accommodate the 25-year storm flows. All proposed onsite storm drainpipe will vary from 12 to 18 inches in diameter and the minimum slope shall not be less than 0.5%. The minimum required pipe size at 0.5% slope to convey the 25-year event for the onsite developed area is 12-inch pipe per Field's Hydraulic Calculator.

WWHM Un-Mitigated Flow Rates for Basin D1

Listed below are the flow frequency data generated by WWHM for the developed basin D1.

Flow Frequency		Un-mitigated Inflow
Flow (cfs)	0701 15m	
2 Year	=	0.7103
5 Year	=	0.9156
10 Year	=	1.0485
25 Year	=	1.2142
50 Year	=	1.3365
100 Year	=	1.4581

Overflow Spillway Design

The flow control facility has been outfitted with an emergency overflow spillway per the construction and sizing requirements of *Section 3.2.1, Volume III of the WSDOE Stormwater Management Manual for Western Washington, 2012*. The spillway will be set at one half foot above the design water surface elevation providing one foot of freeboard in the pond. WWHM modeling's 100-year peak (unmitigated) flow rate were calculated for use in sizing the spillway. See the civil construction plans for design full details.

Structure ID	25 Year Unmitigated Flow (cfs)	100 Year Unmitigated Flow (cfs)	Overflow Spillway Width (ft)
DP-1	1.21	1.45	4 ft – Use Min 6 foot.

Sediment Pond Sizing

Listed below is the minimum sediment pond size per the WSDOE stormwater manual.

Structure ID	2 Year Unmitigated Flow (cfs)	Required Sediment Pond Surface Area (sf)
Sediment Pond D1	0.7	2163 SF with 1" Orifice and 3" Standpipe

APPENDIX 1 – MAP SUBMITTALS

TDA No. 1

Pre and Post-Developed Basin Map

APPENDIX 2 – DRAINAGE DESIGN CALCULATIONS AND MODELING

Basin D1 WWHM Flow Control and Water Quality Modeling

**WWHM2012
PROJECT REPORT**

Project Name: 21011 Jackson Park III
Site Name: 21st Street Chehalis
Site Address:
City :
Report Date: 11/20/2021
Gage : Olympia
Data Start : 1955/10/01
Data End : 2008/09/30
Precip Scale: 0.80
Version Date: 2019/09/13
Version : 4.2.17

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

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin P1
Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
SAT, Forest, Flat	3.96

Pervious Total	3.96
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<u>Impervious Land Use</u>	<u>acre</u>
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Impervious Total	0
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Basin Total	3.96
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Element Flows To:

Surface	Interflow	Groundwater
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MITIGATED LAND USE

Name : Basin D1
Bypass: No

GroundWater: No

<u>Pervious Land Use</u>	<u>acre</u>
SAT, Lawn, Flat	2.02
Pervious Total	2.02
<u>Impervious Land Use</u>	<u>acre</u>
ROOF TOPS FLAT	0.93
DRIVEWAYS FLAT	1.01
Impervious Total	1.94
Basin Total	3.96

Element Flows To:
Surface **Interflow** **Groundwater**
Trapezoidal Pond 1 Trapezoidal Pond 1

Name : Trapezoidal Pond 1
Bottom Length: 278.75 ft.
Bottom Width: 46.46 ft.
Depth: 3 ft.
Volume at riser head: 0.6864 acre-feet.
Side slope 1: 3 To 1
Side slope 2: 3 To 1
Side slope 3: 3 To 1
Side slope 4: 3 To 1
Discharge Structure
Riser Height: 2 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 0.170 ft.
Notch Height: 0.750 ft.
Orifice 1 Diameter: 1.727 in. **Elevation:** 0 ft.

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

Pond Hydraulic Table

<u>Stage(feet)</u>	<u>Area(ac.)</u>	<u>Volume(ac-ft.)</u>	<u>Discharge(cfs)</u>	<u>Infilt(cfs)</u>
0.0000	0.297	0.000	0.000	0.000
0.0333	0.298	0.009	0.014	0.000
0.0667	0.300	0.019	0.020	0.000
0.1000	0.301	0.030	0.025	0.000
0.1333	0.303	0.040	0.029	0.000
0.1667	0.304	0.050	0.033	0.000
0.2000	0.306	0.060	0.036	0.000
0.2333	0.307	0.070	0.039	0.000
0.2667	0.309	0.080	0.041	0.000

0.3000	0.310	0.091	0.044	0.000
0.3333	0.312	0.101	0.046	0.000
0.3667	0.313	0.112	0.049	0.000
0.4000	0.315	0.122	0.051	0.000
0.4333	0.316	0.133	0.053	0.000
0.4667	0.318	0.143	0.055	0.000
0.5000	0.319	0.154	0.057	0.000
0.5333	0.321	0.165	0.059	0.000
0.5667	0.323	0.175	0.060	0.000
0.6000	0.324	0.186	0.062	0.000
0.6333	0.326	0.197	0.064	0.000
0.6667	0.327	0.208	0.066	0.000
0.7000	0.329	0.219	0.067	0.000
0.7333	0.330	0.230	0.069	0.000
0.7667	0.332	0.241	0.070	0.000
0.8000	0.333	0.252	0.072	0.000
0.8333	0.335	0.263	0.073	0.000
0.8667	0.336	0.274	0.075	0.000
0.9000	0.338	0.285	0.076	0.000
0.9333	0.339	0.297	0.078	0.000
0.9667	0.341	0.308	0.079	0.000
1.0000	0.342	0.320	0.080	0.000
1.0333	0.344	0.331	0.082	0.000
1.0667	0.346	0.342	0.083	0.000
1.1000	0.347	0.354	0.084	0.000
1.1333	0.349	0.366	0.086	0.000
1.1667	0.350	0.377	0.087	0.000
1.2000	0.352	0.389	0.088	0.000
1.2333	0.353	0.401	0.089	0.000
1.2667	0.355	0.413	0.092	0.000
1.3000	0.356	0.425	0.098	0.000
1.3333	0.358	0.436	0.106	0.000
1.3667	0.360	0.448	0.116	0.000
1.4000	0.361	0.460	0.127	0.000
1.4333	0.363	0.473	0.139	0.000
1.4667	0.364	0.485	0.152	0.000
1.5000	0.366	0.497	0.166	0.000
1.5333	0.367	0.509	0.180	0.000
1.5667	0.369	0.521	0.195	0.000
1.6000	0.371	0.534	0.211	0.000
1.6333	0.372	0.546	0.227	0.000
1.6667	0.374	0.559	0.244	0.000
1.7000	0.375	0.571	0.261	0.000
1.7333	0.377	0.584	0.278	0.000
1.7667	0.379	0.596	0.296	0.000
1.8000	0.380	0.609	0.314	0.000
1.8333	0.382	0.622	0.332	0.000
1.8667	0.383	0.634	0.350	0.000
1.9000	0.385	0.647	0.369	0.000
1.9333	0.387	0.660	0.388	0.000
1.9667	0.388	0.673	0.407	0.000
2.0000	0.390	0.686	0.427	0.000
2.0333	0.391	0.699	0.524	0.000
2.0667	0.393	0.712	0.702	0.000
2.1000	0.395	0.725	0.932	0.000
2.1333	0.396	0.738	1.202	0.000
2.1667	0.398	0.752	1.506	0.000

2.2000	0.399	0.765	1.837	0.000
2.2333	0.401	0.778	2.189	0.000
2.2667	0.403	0.792	2.558	0.000
2.3000	0.404	0.805	2.936	0.000
2.3333	0.406	0.819	3.318	0.000
2.3667	0.408	0.832	3.698	0.000
2.4000	0.409	0.846	4.070	0.000
2.4333	0.411	0.860	4.427	0.000
2.4667	0.412	0.873	4.765	0.000
2.5000	0.414	0.887	5.079	0.000
2.5333	0.416	0.901	5.365	0.000
2.5667	0.417	0.915	5.620	0.000
2.6000	0.419	0.929	5.844	0.000
2.6333	0.421	0.943	6.036	0.000
2.6667	0.422	0.957	6.199	0.000
2.7000	0.424	0.971	6.338	0.000
2.7333	0.425	0.985	6.460	0.000
2.7667	0.427	0.999	6.652	0.000
2.8000	0.429	1.014	6.786	0.000
2.8333	0.430	1.028	6.918	0.000
2.8667	0.432	1.042	7.046	0.000
2.9000	0.434	1.057	7.173	0.000
2.9333	0.435	1.071	7.297	0.000
2.9667	0.437	1.086	7.419	0.000
3.0000	0.439	1.100	7.539	0.000
3.0333	0.440	1.115	7.657	0.000

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:3.96
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:2.02
Total Impervious Area:1.94

Flow Frequency Return Periods for Predeveloped. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
2 year	0.181176
5 year	0.3807
10 year	0.512888
25 year	0.663347
50 year	0.760062
100 year	0.843538

Flow Frequency Return Periods for Mitigated. POC #1

<u>Return Period</u>	<u>Flow(cfs)</u>
----------------------	------------------

2 year	0.091863
5 year	0.146296
10 year	0.193358
25 year	0.267754
50 year	0.335681
100 year	0.415852

Stream Protection Duration

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1956	0.255	0.092
1957	0.310	0.136
1958	0.154	0.056
1959	0.092	0.079
1960	0.320	0.160
1961	0.262	0.088
1962	0.013	0.058
1963	0.336	0.101
1964	0.424	0.088
1965	0.451	0.071
1966	0.091	0.057
1967	0.221	0.084
1968	0.111	0.074
1969	0.081	0.060
1970	0.130	0.079
1971	0.179	0.133
1972	0.572	0.251
1973	0.111	0.081
1974	0.214	0.075
1975	0.135	0.064
1976	0.205	0.107
1977	0.028	0.056
1978	0.111	0.079
1979	0.351	0.075
1980	0.111	0.081
1981	0.349	0.088
1982	0.322	0.092
1983	0.067	0.087
1984	0.441	0.085
1985	0.050	0.065
1986	0.268	0.224
1987	0.593	0.152
1988	0.020	0.073
1989	0.015	0.071
1990	0.140	0.099
1991	0.409	0.327
1992	0.060	0.067
1993	0.022	0.056
1994	0.009	0.052
1995	0.173	0.111
1996	0.459	0.317
1997	0.327	0.090
1998	0.403	0.079
1999	0.328	0.150
2000	0.082	0.105
2001	0.015	0.053

2002	0.366	0.164
2003	0.093	0.061
2004	0.224	0.104
2005	0.183	0.079
2006	0.362	0.137
2007	0.364	0.255
2008	0.617	0.559

Stream Protection Duration

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.6171	0.5588
2	0.5927	0.3267
3	0.5720	0.3170
4	0.4588	0.2550
5	0.4511	0.2510
6	0.4410	0.2237
7	0.4242	0.1637
8	0.4091	0.1601
9	0.4028	0.1517
10	0.3659	0.1496
11	0.3644	0.1374
12	0.3618	0.1361
13	0.3505	0.1330
14	0.3489	0.1107
15	0.3359	0.1069
16	0.3282	0.1049
17	0.3267	0.1037
18	0.3218	0.1006
19	0.3196	0.0995
20	0.3097	0.0923
21	0.2676	0.0917
22	0.2619	0.0900
23	0.2548	0.0880
24	0.2241	0.0880
25	0.2206	0.0879
26	0.2138	0.0867
27	0.2047	0.0854
28	0.1831	0.0844
29	0.1793	0.0812
30	0.1731	0.0808
31	0.1541	0.0791
32	0.1404	0.0791
33	0.1351	0.0789
34	0.1299	0.0787
35	0.1114	0.0786
36	0.1112	0.0752
37	0.1108	0.0748
38	0.1107	0.0737
39	0.0930	0.0732
40	0.0917	0.0714
41	0.0908	0.0711
42	0.0821	0.0672
43	0.0814	0.0652
44	0.0668	0.0641
45	0.0596	0.0606

46	0.0500	0.0603
47	0.0282	0.0581
48	0.0223	0.0574
49	0.0197	0.0565
50	0.0153	0.0560
51	0.0150	0.0558
52	0.0129	0.0527
53	0.0093	0.0519

Stream Protection Duration

POC #1

The Facility PASSED

The Facility PASSED.

Flow(cfs) Predev Mit Percentage Pass/Fail

0.0906	2210	2050	92	Pass
0.0974	1948	1477	75	Pass
0.1041	1737	1222	70	Pass
0.1109	1581	1076	68	Pass
0.1176	1390	942	67	Pass
0.1244	1268	839	66	Pass
0.1312	1116	754	67	Pass
0.1379	1027	690	67	Pass
0.1447	936	634	67	Pass
0.1514	860	567	65	Pass
0.1582	791	522	65	Pass
0.1650	747	482	64	Pass
0.1717	685	459	67	Pass
0.1785	632	434	68	Pass
0.1853	582	404	69	Pass
0.1920	534	366	68	Pass
0.1988	495	336	67	Pass
0.2055	466	315	67	Pass
0.2123	431	284	65	Pass
0.2191	397	251	63	Pass
0.2258	371	218	58	Pass
0.2326	351	194	55	Pass
0.2394	324	155	47	Pass
0.2461	309	131	42	Pass
0.2529	287	115	40	Pass
0.2596	275	103	37	Pass
0.2664	250	100	40	Pass
0.2732	232	90	38	Pass
0.2799	215	85	39	Pass
0.2867	201	79	39	Pass
0.2935	188	75	39	Pass
0.3002	174	69	39	Pass
0.3070	162	63	38	Pass
0.3137	152	55	36	Pass
0.3205	139	46	33	Pass
0.3273	124	38	30	Pass
0.3340	115	37	32	Pass
0.3408	106	37	34	Pass
0.3476	103	35	33	Pass
0.3543	92	34	36	Pass

0.3611	85	32	37	Pass
0.3678	76	31	40	Pass
0.3746	72	29	40	Pass
0.3814	66	28	42	Pass
0.3881	60	26	43	Pass
0.3949	54	25	46	Pass
0.4017	50	23	46	Pass
0.4084	47	21	44	Pass
0.4152	42	19	45	Pass
0.4219	39	17	43	Pass
0.4287	36	17	47	Pass
0.4355	34	15	44	Pass
0.4422	31	15	48	Pass
0.4490	29	14	48	Pass
0.4558	27	14	51	Pass
0.4625	22	14	63	Pass
0.4693	19	13	68	Pass
0.4760	17	12	70	Pass
0.4828	14	12	85	Pass
0.4896	11	11	100	Pass
0.4963	11	10	90	Pass
0.5031	11	10	90	Pass
0.5099	9	9	100	Pass
0.5166	9	7	77	Pass
0.5234	7	6	85	Pass
0.5301	7	5	71	Pass
0.5369	6	5	83	Pass
0.5437	4	4	100	Pass
0.5504	4	3	75	Pass
0.5572	4	1	25	Pass
0.5640	4	0	0	Pass
0.5707	3	0	0	Pass
0.5775	2	0	0	Pass
0.5842	2	0	0	Pass
0.5910	2	0	0	Pass
0.5978	1	0	0	Pass
0.6045	1	0	0	Pass
0.6113	1	0	0	Pass
0.6181	0	0	0	Pass
0.6248	0	0	0	Pass
0.6316	0	0	0	Pass
0.6383	0	0	0	Pass
0.6451	0	0	0	Pass
0.6519	0	0	0	Pass
0.6586	0	0	0	Pass
0.6654	0	0	0	Pass
0.6722	0	0	0	Pass
0.6789	0	0	0	Pass
0.6857	0	0	0	Pass
0.6924	0	0	0	Pass
0.6992	0	0	0	Pass
0.7060	0	0	0	Pass
0.7127	0	0	0	Pass
0.7195	0	0	0	Pass
0.7263	0	0	0	Pass
0.7330	0	0	0	Pass
0.7398	0	0	0	Pass

0.7465	0	0	0	Pass
0.7533	0	0	0	Pass
0.7601	0	0	0	Pass

Water Quality BMP Flow and Volume for POC #1

On-line facility volume: 0.2901 acre-feet

On-line facility target flow: 0.3119 cfs.

Off-line facility target flow: 0.1757 cfs.

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

No changes have been made.

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APPENDIX 3 – SPECIAL REPORTS AND STUDIES

1. NRCS Soil Survey Data
2. Critical Area Report – Loowit

Hydrologic Soil Group—Lewis County Area, Washington
(21011)


































Soil Map may not be valid at this scale.

Map Scale: 1:1,500 if printed on A landscape (11" x 8.5") sheet.



MAP LEGEND

Area of Interest (AOI)		 C
Area of Interest (AOI)		 C/D
		 D
		 Not rated or not available
Soils		
Soil Rating Polygons		
 A		
 A/D		
 B		
 B/D		
 C		
 C/D		
 D		
 Not rated or not available		
Soil Rating Lines		
 A		
 A/D		
 B		
 B/D		
 C		
 C/D		
 D		
 Not rated or not available		
Soil Rating Points		
 A		
 A/D		
 B		
 B/D		
Water Features		
 Streams and Canals		
Transportation		
 Rails		
 Interstate Highways		
 US Routes		
 Major Roads		
 Local Roads		
Background		
 Aerial Photography		

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Lewis County Area, Washington
Survey Area Data: Version 20, Jun 4, 2020

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

Date(s) aerial images were photographed: Mar 30, 2019—May 10, 2019

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
118	Lacamas silt loam, 0 to 3 percent slopes	C/D	4.6	100.0%
Totals for Area of Interest			4.6	100.0%

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Lewis County Area, Washington

118—Lacamas silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2h8l

Elevation: 250 to 1,200 feet

Mean annual precipitation: 40 to 70 inches

Mean annual air temperature: 48 to 50 degrees F

Frost-free period: 125 to 200 days

Farmland classification: Prime farmland if drained

Map Unit Composition

Lacamas, drained, and similar soils: 60 percent

Lacamas, undrained, and similar soils: 30 percent

Minor components: 10 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Lacamas, Drained

Setting

Landform: Terraces, flood plains

Typical profile

H1 - 0 to 7 inches: silt loam

H2 - 7 to 17 inches: silt loam

H3 - 17 to 27 inches: silty clay

H4 - 27 to 60 inches: clay

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Very low
(0.00 in/hr)

Depth to water table: About 12 to 18 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w

Hydrologic Soil Group: C/D

Forage suitability group: Seasonally Wet Soils (G002XV202WA)

Other vegetative classification: Seasonally Wet Soils
(G002XV202WA)

Hydric soil rating: Yes

Description of Lacamas, Undrained

Setting

Landform: Flood plains, terraces

Typical profile

H1 - 0 to 7 inches: silt loam

H2 - 7 to 17 inches: silt loam

H3 - 17 to 27 inches: silty clay

H4 - 27 to 60 inches: clay

Properties and qualities

Slope: 0 to 3 percent

Depth to restrictive feature: More than 80 inches

Drainage class: Very poorly drained

Capacity of the most limiting layer to transmit water (Ksat): Very low
(0.00 in/hr)

Depth to water table: About 0 to 6 inches

Frequency of flooding: None

Frequency of ponding: None

Available water capacity: Moderate (about 6.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 5w

Hydrologic Soil Group: C/D

Forage suitability group: Seasonally Wet Soils (G002XV202WA)

Other vegetative classification: Seasonally Wet Soils
(G002XV202WA)

Hydric soil rating: Yes

Minor Components

Klaber

Percent of map unit: 5 percent

Landform: Depressions

Hydric soil rating: Yes

Prather

Percent of map unit: 3 percent

Hydric soil rating: No

Scamman

Percent of map unit: 2 percent

Landform: Terraces

Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Lewis County Area, Washington

Survey Area Data: Version 20, Jun 4, 2020



CRITICAL AREAS REPORT

October 9, 2020



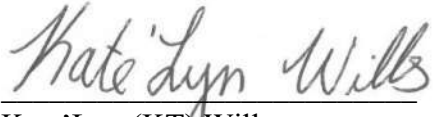
Herb Johnson Delineation *Chehalis, Washington*

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SIGNATURE PAGE

The information and data in this report was compiled and prepared under the supervision and direction of the undersigned.

A handwritten signature in cursive script that reads "Kate'Lyn Wills". The signature is written in black ink and is positioned above a horizontal line.

Kate'Lyn (KT) Wills
Biologist/Environmental Scientist IV

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Appendix A:

Wetland Determination Data Forms

Appendix B:

Wetland Rating Forms

INTRODUCTION

Ecological Land Services, Inc. (ELS) has completed this critical areas report on behalf of the applicant, Herb Johnson. The site consists of Lewis County Parcel Number 005604183244, located at 870 SW 21st Street in Chehalis, Washington, within a portion of Section 4, Township 13 North, and Range 2 West of the Willamette Meridian (Figure 1). This report summarizes the findings of critical areas onsite in accordance with the *Chehalis Municipal Code (CMC), Chapter 17.21 Critical Areas* (2020).

SITE DESCRIPTION

The approximately 5.1-acre site is zoned as residential and is currently vacant except for a small gravel parking area in the southwestern corner of the property (Figure 2). The rest of the site has been mowed regularly for the past 10 years. The site is generally level with a low point in the northern corner. Access to the site is located just south of 870 SW 21st Street. The triangular shaped site is fenced on all three sides and surrounded by high intensity single-family homes with commercial uses just to the north.

METHODOLOGY

The wetland delineation followed the Routine Determination Method according to the *Corps of Engineers Wetland Delineation Manual* (Environmental Laboratory 1987) and the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)* (U.S. Army Corps of Engineers 2010).

The Routine Determination Method examines three parameters—vegetation, soils, and hydrology—to determine if wetlands exist in a given area. Hydrology is critical in determining what is wetland, but is often difficult to assess because hydrologic conditions can change periodically (hourly, daily, or seasonally). Consequently, it is necessary to determine if hydrophytic vegetation and hydric soils are present, which would indicate that water is present for long enough duration to support a wetland plant community. By definition, wetlands are those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands are regulated as “Waters of the United States” by the U.S. Army Corps of Engineers (USACE), as “Waters of the State” by the Washington Department of Ecology (Ecology), and locally by the City of Chehalis (City).

ELS biologists conducted a reconnaissance of the property on August 27, 2020 to determine the presence or absence of any wetlands, streams, and other critical areas on the site and map their approximate locations. Prior to conducting the site visit, an ELS biologist reviewed current and historic aerial photographs dating back to 1990 and reviewed the Lewis County GIS database information regarding soils, topography, wetlands, and habitat conservation areas. One depressional wetland (Wetland A) was located within the northern corner of the site and (Figure 2). Vegetation, soil, and hydrology information was collected from eight test plots to determine the location and extent of the wetland onsite. Data sheets can be found in Appendix A. Test plot locations and the wetland boundary were flagged with consecutively numbered pink pin flags and GPS coordinates taken with a handheld GPS unit with sub meter accuracy. Additionally, the

location, approximate diameter at breast height (dbh), and approximate canopy area of three adjacent Oregon white oak (*Quercus garryana*) trees were recorded and mapped.

VEGETATION

Wetlands

Vegetation found in the wetland test plot consists primarily of **herbs**: reed canarygrass (*Phalaris arundinacea*, FACW), and creeping buttercup (*Ranunculus repens*, FACW).

Uplands

Vegetation found in the upland test plots is dominated by **herbs**: Fuller's teasel (*Dipsacus fullonum*, FAC), Queen Anne's lace (*Daucus carota*, FACU), hairy cat's ear (*Hypochaeris radicata*, FACU), red clover (*Trifolium pratense*, FACU) and reed canarygrass.

The indicator status, following the scientific names, indicates the likelihood of the species to be found in wetlands. Listed from most likely to least likely to be found in wetlands, the indicator status categories are:

- **OBL** (obligate wetland) - occur almost always under natural conditions in wetlands.
- **FACW** (facultative wetland) - usually occur in wetlands, but occasionally found in non-wetlands.
- **FAC** (facultative) - equally likely to occur in wetlands or non-wetlands.
- **FACU** (facultative upland) - usually occur in non-wetlands, but occasionally found in wetlands.
- **UPL** (obligate upland) - occur almost always under natural conditions in non-wetlands.
- **NI** (no indicator) - insufficient data to assign to an indicator category.

SOILS

Soils onsite are mapped as Lacamas silt loam, 0 to 3 percent slopes (118), as referenced on the Natural Resources Conservation Service (NRCS) Web Soil Survey website (NRCS 2020) (Figure 3). Lacamas silt loam is characterized as a poorly drained soil with an approximate depth to water table of about 12 to 18 inches below ground surface (BGS). This soil is generally found on floodplains and terraces. Soil within the wetland test plots consisted of silty clay loam with a depleted matrix and at least 5 percent redoximorphic concentrations found in pore linings meeting both or either of the hydric soil indicators; Depleted Matrix (F3) or Redox Dark Surface (F6). Specific soil information is recorded on the attached wetland determination data forms (Appendix A).

Lacamas silt loam is listed as a hydric soil (NRCS 2020). Mapped hydric soils do not necessarily mean that the area is a wetland—hydrology, wetland vegetation, and hydric soils must all be present to classify an area as a wetland. Conversely, wetlands may be found in areas where the soils are not mapped as hydric. ELS does not generally agree with NRCS mapped hydric soils, as wetlands were found in mapped non-hydric soil areas, and conversely, uplands were found in mapped hydric soil areas.

HYDROLOGY

Wetland A is located in a shallow depression within the northern corner of the site. Hydrology sources include a shallow groundwater table, runoff, and precipitation. The wetland has two hydroperiods; seasonally flooded and saturated only. It provides flood storage and delay, and groundwater recharge functions. No surface water or saturation was present in the wetland during the site visit; however, the primary hydrology indicator Oxidized Rhizospheres along Living Roots (C3) were present within the wetland test plots. The wetland test plots also met the following secondary indicators; Water Stained Leaves (B9), Geomorphic Position (D2), and a positive FAC-Neutral Test (D5). The upland test plots did not meet any hydrology indicators. Test plot data sheets can be found in Appendix A.

WETLAND INVENTORIES

The National Wetlands Inventory Map (NWI) indicated the presence of a Palustrine, emergent, persistent, scrub-shrub, and seasonally flooded wetland covering the site (Figure 4). ELS' findings differed from the NWI as only a 0.49-acre wetland was delineated in the northern corner of the site and the remainder of the site consisted of uplands. Maps from the NWI should be used with discretion as they are typically used to gather wetland information about a region and, because of the large scale necessary for regional mapping, are limited in accuracy for localized analyses.

CRITICAL AREAS SUMMARY

Wetland

One emergent and depressional wetland (Wetland A) was delineated in a shallow depression with no outlet in the northern corner of the site. The wetland boundary was bordered by an obvious change in elevation and vegetation. The wetland area is dominated by reed canarygrass and creeping buttercup. Hydrology sources include a shallow groundwater table, runoff, and precipitation. The wetland has two hydroperiods; seasonally flooded and saturated only. The wetland provides flood storage and delay, and groundwater recharge functions. According to the *Washington State Wetland Rating System for Western Washington: 2014 Update* (Rating System); Wetland A is a Category IV wetland scoring a total of 15 points, with 6 points for water quality functions, 5 points for hydrologic functions, and 4 points for habitat functions (Hruby 2014). The wetland rating form can be found in Appendix B. Standard wetland buffers are based on wetland category in conjunction with the habitat function score from the Rating Form. Wetland A is a Category IV wetland with a habitat score of 4 making the standard buffer width 50 feet according to *CMC 17.23.030(C) Buffers*. Table 2 below summarizes the wetland.

Table 2. Summary of Wetland Onsite.

Wetland Area	Area Onsite (acres)	Cowardin ¹ /HGM ²	Category ³	Standard Buffer Width ⁴ (feet)
Wetland A	0.49	Emergent/Depressional	Category IV	50

¹Cowardin et al. 1979

²NRCS 2008

³Hruby 2014

⁴CMC 17.23.030(C)

Oregon White Oak

In urban or urbanizing areas west of the Cascades, WDFW defines priority oak habitat as single oaks, or stands of pure oak, or oak/conifer associations, 1 acre or greater in size. WDFW may also consider individual Oregon white oak trees a priority habitat when found to be particularly valuable to wildlife (i.e., contains many cavities, has a large diameter at breast height (DBH), is used by priority species, or has a large canopy) (Larsen and Morgan 1998). The project site is within an urban growth boundary. WDFW recommendation is that in urban and urbanizing areas, single trees should be maintained if they are deemed important to species highly associated with Oregon white oak. Oaks and their associated floras comprise distinct woodland ecosystems with various plant communities providing valuable habitat that contributes to wildlife diversity; Oak woodlands provide a mix of feeding, resting, and breeding habitat for many wildlife species (Larsen and Morgan 1998).

Three Oregon white oak trees measuring approximately 24 to 36 inches DBH were mapped just offsite. Two are located south of the southcentral site boundary and one is located just northeast of Wetland A (Figure 2). If removal of oak trees cannot be avoided, a mitigation plan shall be written to address and mitigate all impacts.

LIMITATIONS

ELS bases the above listed determinations and conclusions on standard scientific methodology and best professional judgment. In our opinion, the conclusions should agree with local, state, and federal regulatory agencies. However, this should be considered a preliminary jurisdictional determination and should be used at your own risk until it has been reviewed and approved in writing by the appropriate regulatory agencies.

REFERENCES

- Cowardin, L.M., C. Carter, F.C. Golet, and E.T. LaRoe (Cowardin et. al.). 1979. *Classification of Wetlands and Deepwater Habitats of the United States*. FWS/OBS-78/31. U.S. Department of the Interior, Fish and Wildlife Service, Office of Biological Services, Washington D.C.
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- Larsen, Eric M. and Morgan, John T (Larson and Morgan). 1998. *Management Recommendations for Washington's Priority Habitats Oregon White Oak Woodlands*. Washington Department of Fish and Wildlife (WDFW). January 1998.
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- Natural Resources Conservation Service (NRCS). December 2015. *Washington State Hydric Soils List*. Accessed online October 2020. <http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx>.
- U.S. Army Corps of Engineers (Corps). 2010. *Final Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Western Mountains, Valleys, and Coast Region (Version 2.0)*, ed. J.S. Wakeley, R.W. Lichvar, and C.V. Noble. ERDC/EL TR-08-13. Vicksburg, Mississippi: U.S. Army Engineer Research and Development Center.
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FIGURES & PHOTOPLATES

WASHINGTON



Latitude: 46.6445°
Longitude: -122.9369°

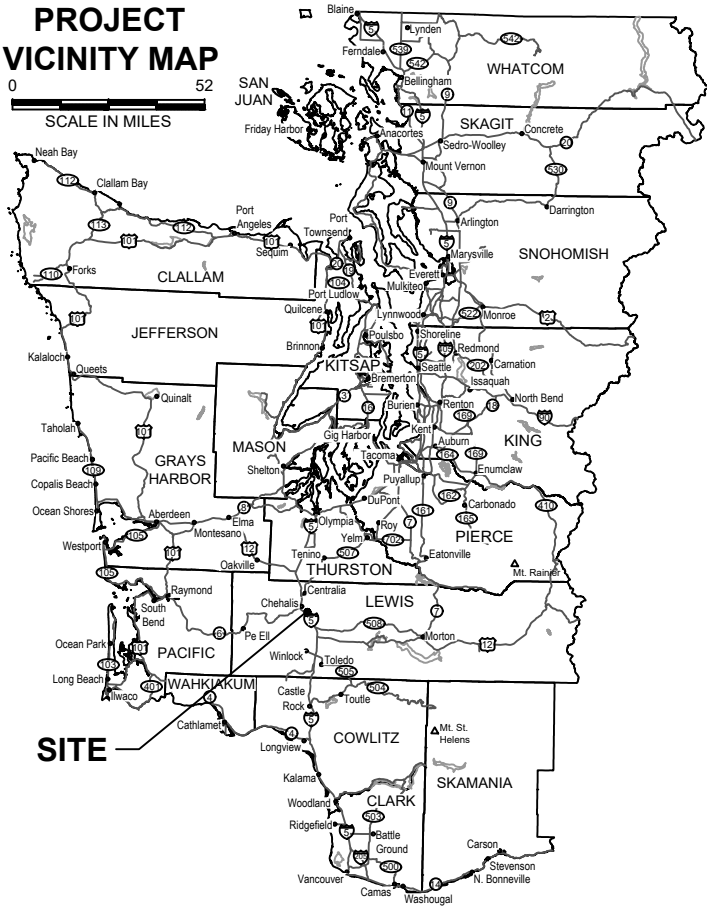
LOCATION MAP

R 2 W

6	4	1
31		36

T
13
N

PROJECT VICINITY MAP



SITE

NOTE:

Quadrangle topographic map from USGS.

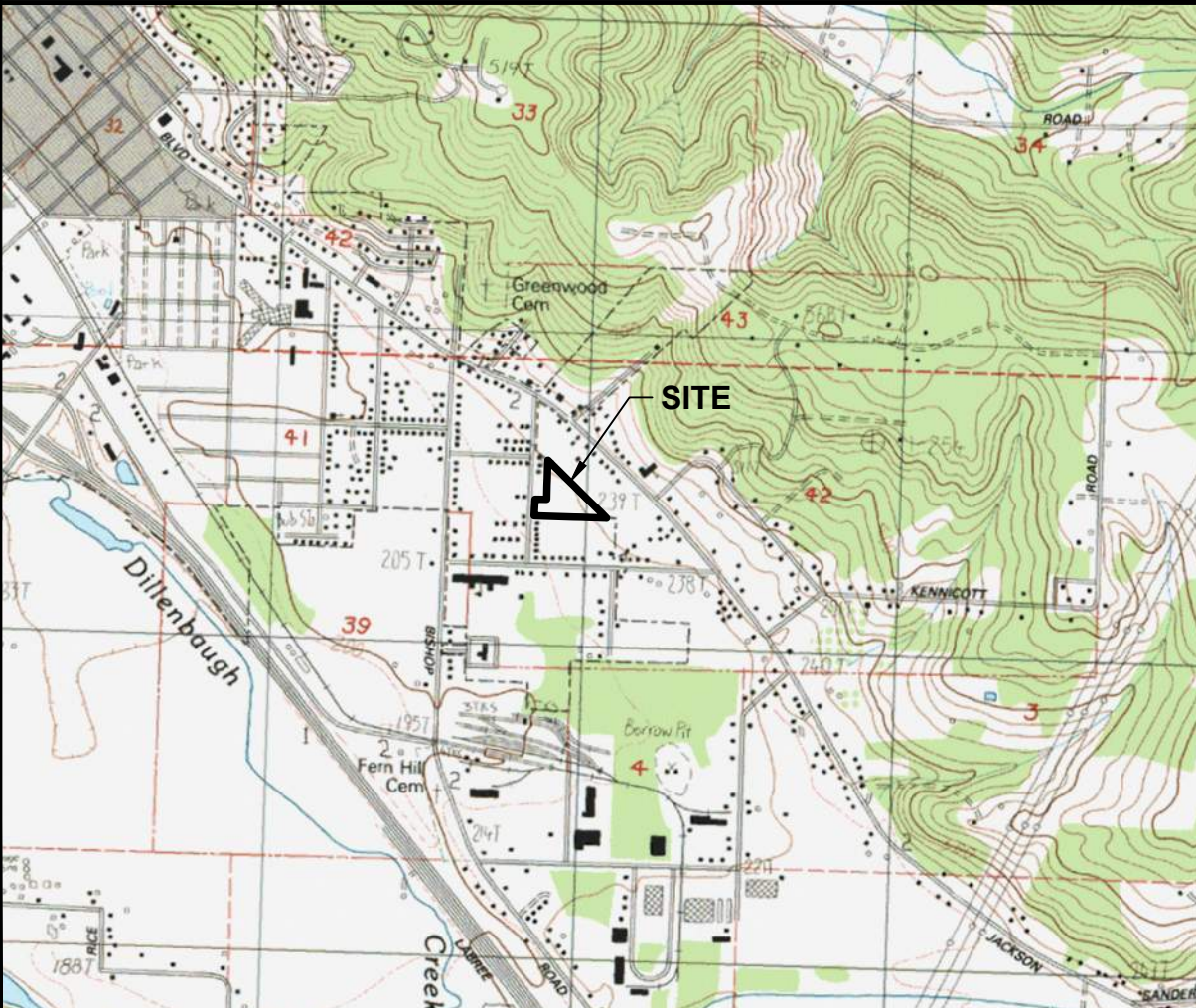
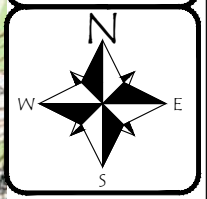
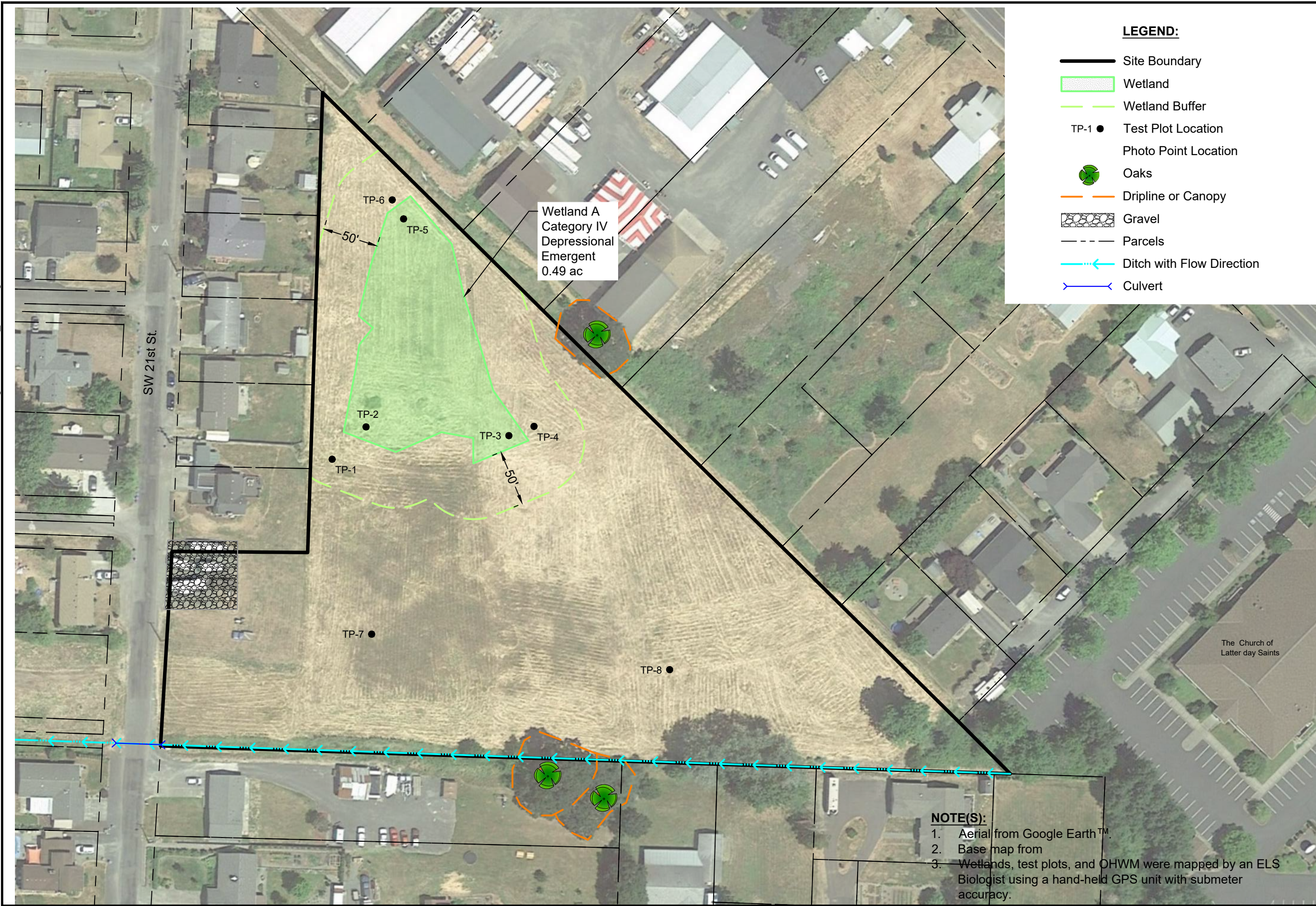


Figure 1
VICINITY MAP
HJ Delineation
Herb Johnson
City of Chehalis, Lewis County, Washington
Section 4, Township 13N, Range 2W, W.M.

DATE: 10/9/20
DWN: CDP
REQ. BY: SG
PRJ. MGR: KT
CHK:
PROJECT NO: 3286.01

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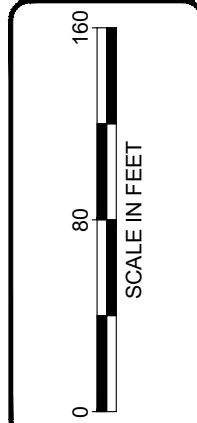
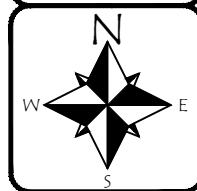


Wetland A
Category IV
Depressional
Emergent
0.49 ac

LEGEND:

- Site Boundary
- Wetland
- Wetland Buffer
- TP-1 ● Test Plot Location
- Photo Point Location
- Oaks
- Dripline or Canopy
- Gravel
- Parcels
- Ditch with Flow Direction
- Culvert

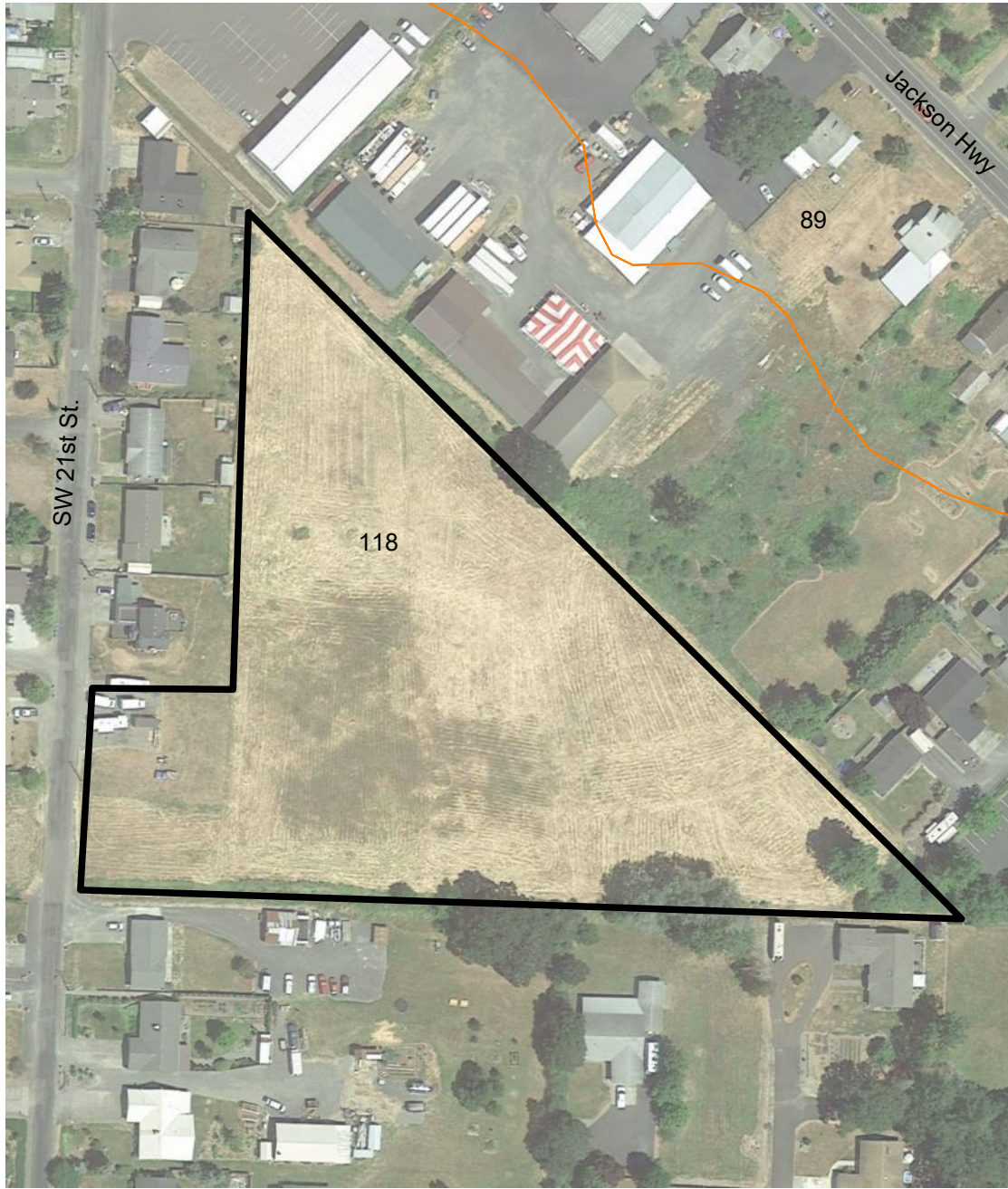
NOTE(S):
 1. Aerial from Google Earth™.
 2. Base map from
 3. Wetlands, test plots, and OHWM were mapped by an ELS Biologist using a hand-held GPS unit with submeter accuracy.




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Figure 2
EXISTING CONDITIONS SITE MAP
 HJ Delineation
 Herb Johnson
 City of Chehalis, Lewis County, Washington
 Section 4, Township 13N, Range 2W, W.M.

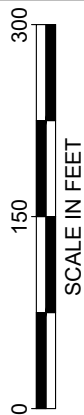


LEGEND:

-  Site Boundary
- 118** Lacamas silt loam, 0 to 3 percent slopes. Hydric.

NOTE(S):

1. Map provided online by NRCS at web address:
<https://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey>



SCALE IN FEET



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 3286.01

Figure 3
 NRCS SOIL SURVEY MAP
 HJ Delineation
 Herb Johnson
 City of Chehalis, Lewis County, Washington
 Section 4, Township 13N, Range 2W, W.M.



Mapped wetlands indicated onsite by US Fish & Wildlife Service.

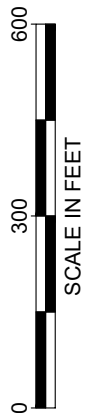
LEGEND:

-  Site Boundary
-  Freshwater Emergent Wetland
-  Freshwater Forested/Shrub Wetland
-  Riverine

- PEM1/SSC** Palustrine, emergent, persistent, scrub-shrub, seasonally flooded.
- R5UBH** Riverine, unknown perennial, unconsolidated bottom, permanently flooded.

NOTE(S):

1. Map provided online by US Fish & Wildlife Service at web address:
<https://www.fws.gov/wetlands/data/Mapper.html>




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PROJECT NO:
3286.01

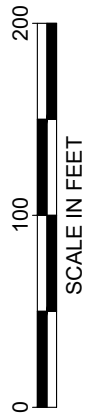
Figure 4
NATIONAL WETLANDS INVENTORY MAP
HJ Delineation
Herb Johnson
City of Chehalis, Lewis County, Washington
Section 4, Township 13N, Range 2W, W.M.



- LEGEND:**
- Site Boundary
 - Wetland Unit Boundary
 - Hydroperiod Division
 - 150' Wetland Offset
 - Pollutants/Runoff - 84.7%

- Hydroperiods:**
- SF** Seasonally flooded or inundated
 - SO** Saturated only

NOTE: Aerial photo provided by Google Earth™.



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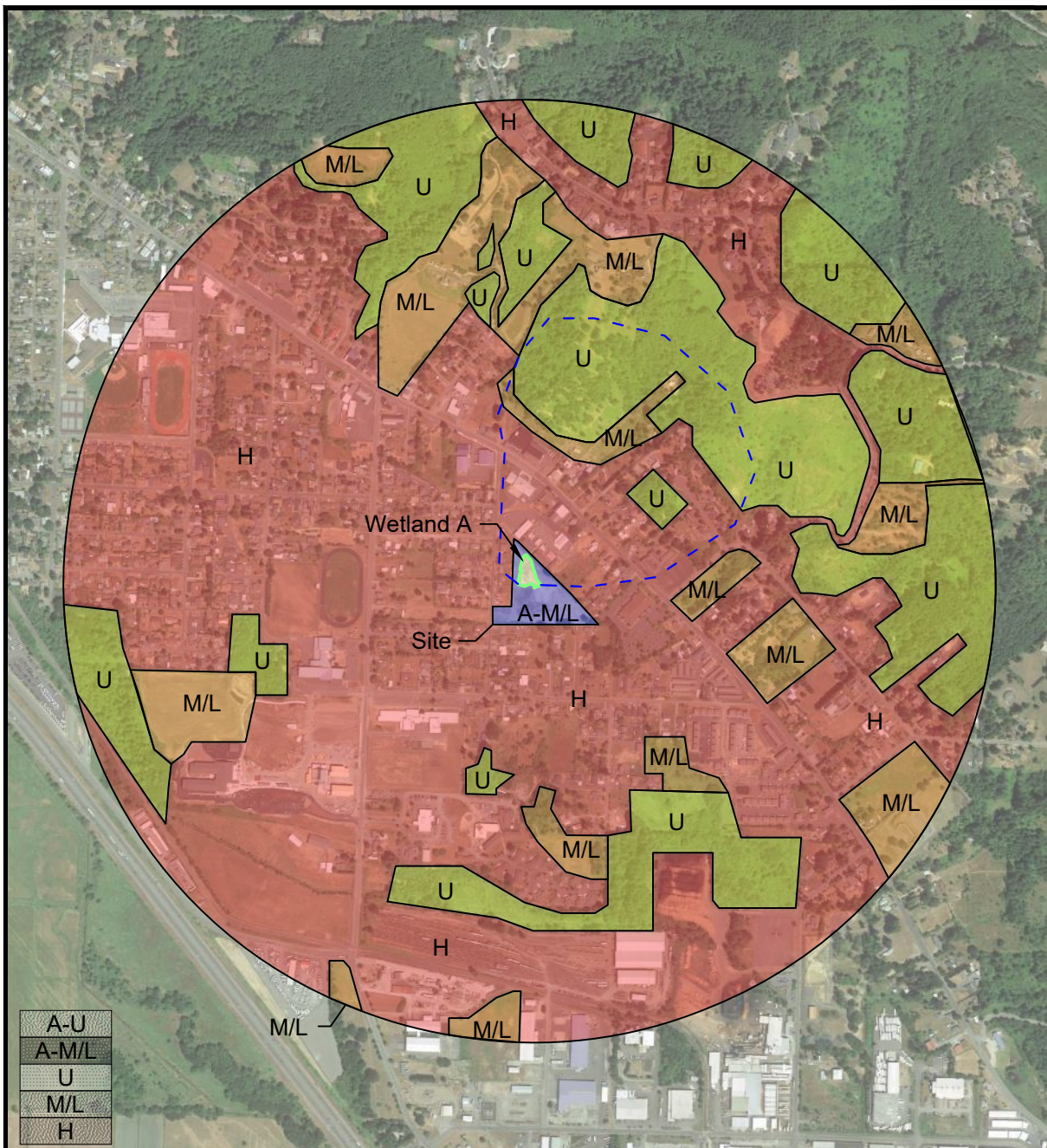
DATE: 10/9/20
 DWN: CDP
 REQ. BY: SG
 PRJ. MGR: KT
 CHK:
 PROJECT NO:
 3286.01

Figure 5
 150' OFFSET WETLAND RATING FIGURE
 HJ Delineation
 Herb Johnson
 City of Chehalis, Lewis County, Washington
 Section 4, Township 13N, Range 2W, W.M.

Figure 6
 1 KM OFFSET WETLAND RATING FIGURE
 HJ Delineation
 Herb Johnson
 City of Chehalis, Lewis County, Washington
 Section 4, Township 13N, Range 2W, W.M.

DATE: 10/9/20
 DWN: CDP
 REQ. BY: SG
 PRJ. MGR: KT
 CHK:
 PROJECT NO:
 3286.01

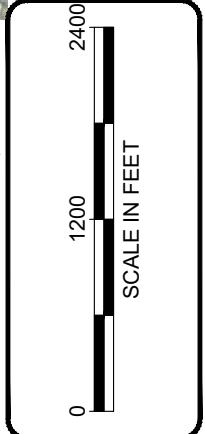
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A-U
A-M/L
U
M/L
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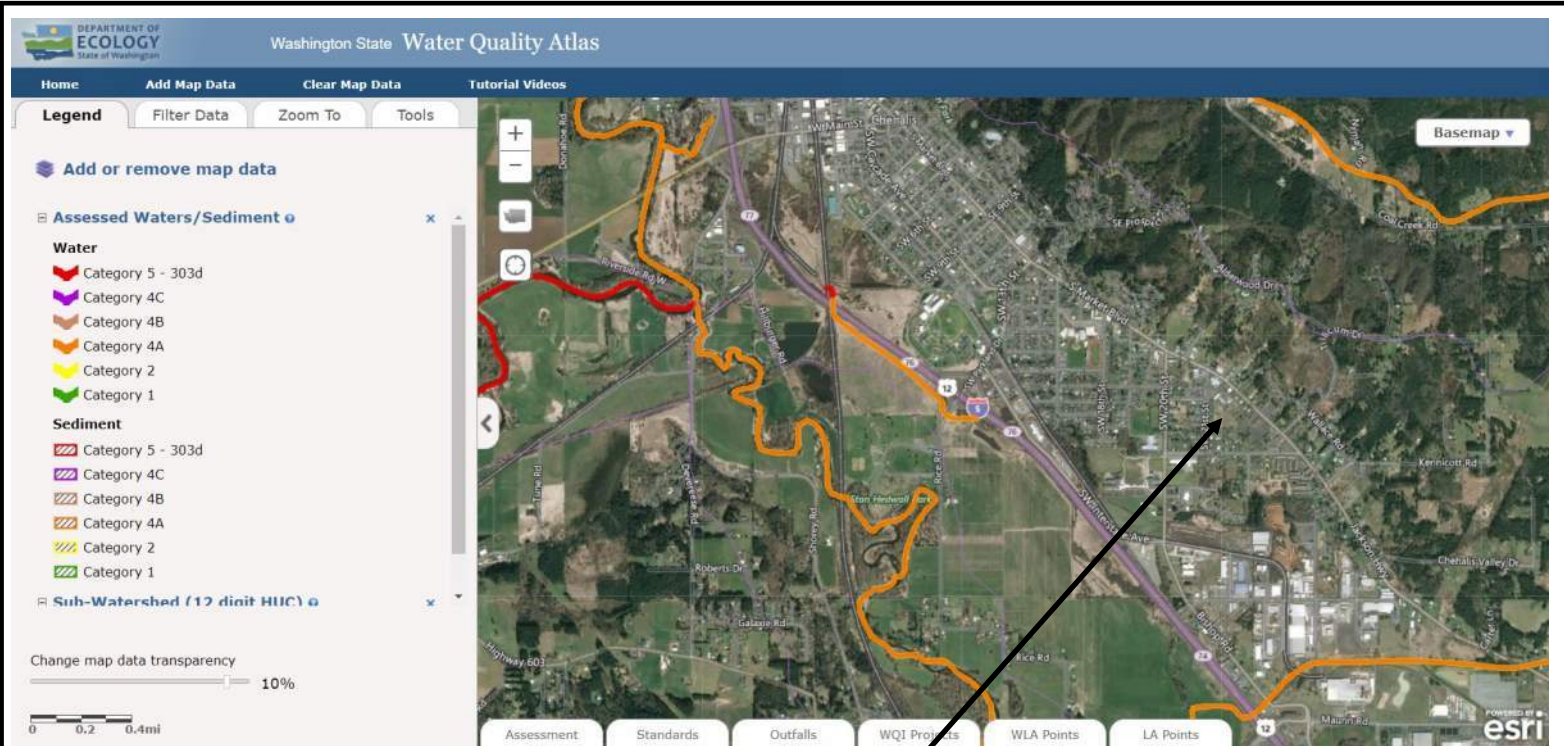
NOTE: Aerial photo provided by Google Earth™.

LEGEND: Wetland Unit Boundary Contributing Basin (100.0x area of wetland)	H2.1 Accessible Habitat		H2.2 Undisturbed Habitat	
	A-U	A-U (0.0%)	U	U (23.5%)
	A-M/L	A-M/L (0.5%)	M/L	M/L (10.5%)
	H2.3 Land Use Intensity			
	H	H (65.5%)		

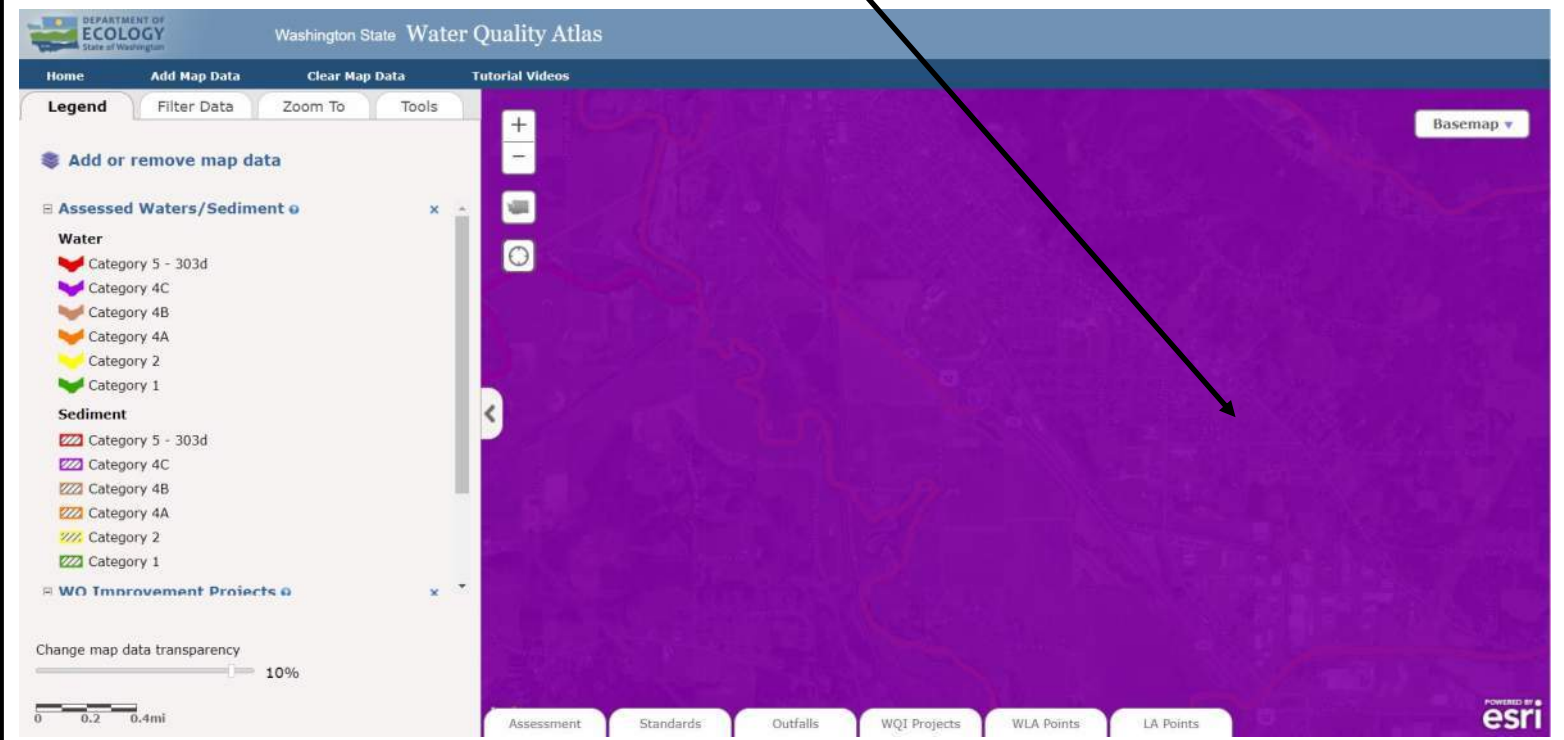


H 2.1. Accessible Habitat Equation
 $0.0\% \text{ A-U} \text{ habitat} + [(0.5\% \text{ A-M/L} \text{ intensity land uses})/2] \text{ } = 0.25\%$

H 2.2. Total Undisturbed Habitat Equation
 $0.0\% \text{ A-U} + 23.5\% \text{ U} \text{ habitat} + [(0.5\% \text{ A-M/L} + 10.5\% \text{ M/L} \text{ land uses})/2] \text{ } = 29.0\%$



Study Area



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PRJ. MGR: KT
PROJ #: 3286.01

Figure 7
303(d) List & TMDLs
HJ Delienation
Herb Johnson
Chehalis, Washington
Section 4, Township 13N, Range 2W, W.M.



Photo 1

Photo was taken from the southwestern property boundary facing north.



Photo 2

Photo was taken from Test Plot 2 facing north east across the wetland area.



Photo 3

Photo was taken from the same location as Photo 1 facing south.



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DATE: 10/2/20
DWN: KT
PRJ. MGR: KT
PROJ.#: 3286.01

Photoplate 1
Site Photos
HJ Delineation
Herb Johnson
Chehalis, Washington

APPENDIX A: WETLAND DETERMINATION DATA FORMS

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

Project/Site: HJ Delineation City/County: Chehalis/Lewis Sampling Date: 8/27/2020
 Applicant/Owner: Herb Johnson State: WA Sampling Point: TP-1
 Investigator(s): Wills, KT Section, Township, Range: 4, 13N, 2W
 Landform (hillslope, terrace, etc.): Terrace Local relief: Convex Slope (%): <3%
 Subregion (LRR): A2 Lat: 46.644825 Long: -122.937547 Datum: NAD83
 Soil Map Unit Name: Lacamas silt loam, 0 to 3 percent slopes NWI classification: PEM1/SSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Area "Normal Circumstances" present? Yes No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Hydric Soils Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Remarks: This test plot was located along the western site boundary, just southwest of Wetland A. The vegetation in this test plot consisted of herbaceous species only. This test plot met only one wetland indicator for vegetation with 100 percent of the dominant vegetation being hydrophytic; therefore it does not meet the criteria of being wetland. The majority of the site, wetlands and uplands, was vegetated by reed canarygrass (<i>Phalaris arundinacea</i>).	

VEGETATION (Use scientific names)

	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet
Tree Stratum (Plot size: <u>30</u> ft radius)				Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
1. _____	%			
2. _____	%			
3. _____	%			
4. _____	%			
Total Cover:	%			
Sapling/Shrub Stratum (Plot size: <u>5</u> ft. radius)				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= _____
1. _____	%			
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
Total Cover:	%			
Herb Stratum (Plot size: <u>5</u> ft radius)				Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 – Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 – Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data In Remarks or on a separate sheet) <input type="checkbox"/> Wetland Non-Vascular Plants ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
1. <i>Phalaris arundinacea</i>	65%	yes	FACW	
2. <i>Hypochaeris radicata</i>	15%	no	FACU	
3. <i>Dipsacus fullonum</i>	10%	no	FAC	
4. <i>Daucus carota</i>	5%	no	FACU	
5. <i>Trifolium pratense</i>	5%	no	FACU	
6. _____	%			
7. _____	%			
8. _____	%			
Total Cover:	100%			
Woody Vine Stratum (Plot size: <u>30</u> ft radius)				¹ Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.
1. _____	%			
2. _____	%			
Total Cover:	%			
% Bare Ground in Herb Stratum <u>0%</u>				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

Remarks: The hydrophytic vegetation criterion is met due to 100% of the dominant vegetation within the test plot having either OBL, FACW, or FAC indicator statuses.

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

Project/Site: HJ Delineation City/County: Chehalis/Lewis Sampling Date: 8/27/2020
 Applicant/Owner: Herb Johnson State: WA Sampling Point: TP-2
 Investigator(s): 7Wills, KT Section, Township, Range: 4, 13N, 2W
 Landform (hillslope, terrace, etc.): Terrace Local relief: Concave Slope (%): <3%
 Subregion (LRR): A2 Lat: 46.644928 Long: -122.937431 Datum: NAD83

Soil Map Unit Name: Lacamas silt loam, 0 to 3 percent slopes NWI classification: PEM1/SSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Area "Normal Circumstances" present? Yes No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soils Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Remarks: This test plot was located in the western portion of the site, within the southwestern portion of Wetland A. The vegetation in this test plot consisted of herbaceous species only. This test plot met all three wetland indicators with 100 percent hydrophytic vegetation, soils with a Depleted Matrix (F3), and the presence of hydrologic indicators; Water Stained Leaves (B9), Geomorphic Position (D2), and a positive FAC-Neutral Test (D5). The majority of the site, wetlands and uplands, was vegetated by reed canarygrass (<i>Phalaris arundinacea</i>).	

VEGETATION (Use scientific names)

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30</u> ft radius)				Dominance Test Worksheet Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
1. _____	%			
2. _____	%			
3. _____	%			
4. _____	%			
Total Cover:	%			
Sapling/Shrub Stratum (Plot size: <u>5</u> ft. radius)				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= _____
1. _____	%			
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
Total Cover:	%			
Herb Stratum (Plot size: <u>5</u> ft radius)				Hydrophytic Vegetation Indicators: <input checked="" type="checkbox"/> 1 – Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 – Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data In Remarks or on a separate sheet) <input type="checkbox"/> Wetland Non-Vascular Plants ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
1. <u><i>Phalaris arundinacea</i></u>	100%	yes	FACW	
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
6. _____	%			
7. _____	%			
8. _____	%			
Total Cover:	100%			
Woody Vine Stratum (Plot size: <u>30</u> ft radius)				¹ Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.
1. _____	%			
2. _____	%			
Total Cover:	%			
% Bare Ground in Herb Stratum <u>0%</u>				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

Remarks: The hydrophytic vegetation criterion is met due to 100% of the vegetation within the test plot having FACW indicator statuses.

SOIL

Sampling Point: TP-2

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features			Texture	Remarks	
	Color (moist)	%	Color (moist)	%	Type ¹			
0-2	10YR3/2	100%		%		loam		
2-16	10YR4/2	90%	10YR4/6	10%	C	loamy clay		
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)		Indicators for Problematic Hydric Soils
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> 2 cm Muck (A10)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Stripped Matrix (S6)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Loamy Mucky Mineral (F1) (except MLRA 1)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input checked="" type="checkbox"/> Depleted Matrix (F3)	
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Dark Surface (F6)	
<input type="checkbox"/> Sandy Mucky Minerals (S1)	<input type="checkbox"/> Depleted Dark Surface (F7)	
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Redox Depressions (F8)	

³Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):	Hydric Soil Present?
Type: _____	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Depth (inches): _____	

Remarks: The hydric soil indicator Depleted Matrix (F3) was met due to a matrix value of 4 and a chroma of 1 with more than 2 percent redox concentrations found in pore linings.

HYDROLOGY

Wetland Hydrology Indicators:	Secondary Indicators (2 or more required)
Primary Indicators (min. of one required; check all that apply)	
<input type="checkbox"/> Surface Water (A1)	<input checked="" type="checkbox"/> Water Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Salt Crust (B11)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Aquatic Invertebrates (B13)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres along Living Roots (C3)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)
<input type="checkbox"/> Algal Mat or crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Stunted or Stressed Plants (D1) (LRR A)
<input type="checkbox"/> Surface Soil Cracks (B6)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Drainage Patterns (B10)
	<input type="checkbox"/> Dry-Season Water Table (C2)
	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
	<input checked="" type="checkbox"/> Geomorphic Position (D2)
	<input type="checkbox"/> Shallow Aquitard (D3)
	<input checked="" type="checkbox"/> FAC-Neutral Test (D5)
	<input type="checkbox"/> Raised Ant Mounds (D6) (LRR A)
	<input type="checkbox"/> Frost-Heave Hummocks (D4)

Field Observations:	Wetland Hydrology Present?
Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____	
Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____	

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

Remarks: The hydrology indicator, Water Stained Seaves (B9) were found on the surface of the ground within the test plot. Additionally, the test plot was located in a depression (Geomorphic Position D2) and had a positive FAC-Neutral Test (D5).

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

Project/Site: HJ Delineation City/County: Chehalis/Lewis Sampling Date: 8/27/2020
 Applicant/Owner: Herb Johnson State: WA Sampling Point: TP-3
 Investigator(s): 7Wills, KT Section, Township, Range: 4, 13N, 2W
 Landform (hillslope, terrace, etc.): Terrace Local relief: Concave Slope (%): <3%
 Subregion (LRR): A2 Lat: 46.644928 Long: -122.936961 Datum: NAD83
 Soil Map Unit Name: Lacamas silt loam, 0 to 3 percent slopes NWI classification: PEM1/SSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Area "Normal Circumstances" present? Yes No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soils Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Remarks: This test plot was located in the central portion of the site, within the southeastern portion of Wetland A. The vegetation in this test plot consisted of herbaceous species only. This test plot met all three wetland indicators with 100 percent hydrophytic vegetation, soils with a Depleted Matrix (F3), and the presence of hydrologic indicators; Water Stained Leaves (B9), Geomorphic Position (D2), and a positive FAC-Neutral Test (D5). The majority of the site, wetlands and uplands, was vegetated by reed canarygrass (<i>Phalaris arundinacea</i>).	

VEGETATION (Use scientific names)

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30</u> ft radius)				Dominance Test Worksheet
1. _____	%			Number of Dominant Species That Are OBL, FACW, or FAC: <u>2</u> (A)
2. _____	%			Total Number of Dominant Species Across All Strata: <u>2</u> (B)
3. _____	%			
4. _____	%			Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
Total Cover: _____	%			Prevalence Index worksheet
Sapling/Shrub Stratum (Plot size: <u>5</u> ft. radius)				Total % Cover of: _____ Multiply by: _____
1. _____	%			OBL species _____ x 1= _____
2. _____	%			FACW species _____ x 2= _____
3. _____	%			FAC species _____ x 3= _____
4. _____	%			FACU species _____ x 4= _____
5. _____	%			UPL species _____ x 5= _____
Total Cover: _____	%			Column Totals: _____ (A) _____ (B)
Herb Stratum (Plot size: <u>5</u> ft radius)				Prevalence Index = B/A = _____
1. <i>Phalaris arundinacea</i>	65%	yes	FACW	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 – Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 – Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data In Remarks or on a separate sheet) <input type="checkbox"/> Wetland Non-Vascular Plants ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
2. <i>Ranunculus repens</i>	35%	yes	FAC	
3. _____	%			
4. _____	%			
5. _____	%			
6. _____	%			
7. _____	%			
8. _____	%			
Total Cover: _____	100%			
Woody Vine Stratum (Plot size: <u>30</u> ft radius)				¹ Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.
1. _____	%			
2. _____	%			
Total Cover: _____	%			Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
% Bare Ground in Herb Stratum <u>0%</u>				

Remarks: The hydrophytic vegetation criterion is met due to 100% of the vegetation within the test plot having either OBL, FACW, or FAC indicator statuses.

SOIL

Sampling Point: TP-3

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹		
0-3	10YR3/2	100%		%		loam	
3-16	10YR4/2	90%	10YR4/6	10%	C	loamy clay	
		%		%			
		%		%			
		%		%			
		%		%			
		%		%			
		%		%			

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)		Indicators for Problematic Hydric Soils
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> 2 cm Muck (A10)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Stripped Matrix (S6)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Loamy Mucky Mineral (F1) (except MLRA 1)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input checked="" type="checkbox"/> Depleted Matrix (F3)	
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Dark Surface (F6)	
<input type="checkbox"/> Sandy Mucky Minerals (S1)	<input type="checkbox"/> Depleted Dark Surface (F7)	
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Redox Depressions (F8)	

³Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):	Hydric Soil Present?
Type: _____	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Depth (inches): _____	

Remarks: The hydric soil indicator Depleted Matrix (F3) was met due to a matrix value of 4 and a chroma of 1 with more than 2 percent redox concentrations found in pore linings.

HYDROLOGY

Wetland Hydrology Indicators:	Secondary Indicators (2 or more required)
Primary Indicators (min. of one required; check all that apply)	
<input type="checkbox"/> Surface Water (A1)	<input checked="" type="checkbox"/> Water Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Salt Crust (B11)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Aquatic Invertebrates (B13)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres along Living Roots (C3)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)
<input type="checkbox"/> Algal Mat or crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Stunted or Stressed Plants (D1) (LRR A)
<input type="checkbox"/> Surface Soil Cracks (B6)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Drainage Patterns (B10)
	<input type="checkbox"/> Dry-Season Water Table (C2)
	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
	<input checked="" type="checkbox"/> Geomorphic Position (D2)
	<input type="checkbox"/> Shallow Aquitard (D3)
	<input checked="" type="checkbox"/> FAC-Neutral Test (D5)
	<input type="checkbox"/> Raised Ant Mounds (D6) (LRR A)
	<input type="checkbox"/> Frost-Heave Hummocks (D4)

Field Observations:	Wetland Hydrology Present?
Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____	
Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____	

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

Remarks: The hydrology indicator, Water Stained Seaves (B9) were found on the surface of the ground within the test plot. Additionally, the test plot was located in a depression (Geomorphic Position D2) and had a positive FAC-Neutral Test (D5).

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

Project/Site: HJ Delineation City/County: Chehalis/Lewis Sampling Date: 8/27/2020
 Applicant/Owner: Herb Johnson State: WA Sampling Point: TP-4
 Investigator(s): 7Wills, KT Section, Township, Range: 4, 13N, 2W
 Landform (hillslope, terrace, etc.): Terrace Local relief: Convex Slope (%): <3%
 Subregion (LRR): A2 Lat: 46.644978 Long: -122.936975 Datum: NAD83

Soil Map Unit Name: Lacamas silt loam, 0 to 3 percent slopes NWI classification: PEM1/SSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Area "Normal Circumstances" present? Yes No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Hydric Soils Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Remarks: This test plot was located in the central portion of the site, just east of Wetland A. The vegetation in this test plot consisted of herbaceous species only. This test plot met only one wetland indicator for vegetation with 100 percent of the dominant vegetation being hydrophytic; therefore it does not meet the criteria of being wetland. The majority of the site, wetlands and uplands, was vegetated by reed canarygrass (<i>Phalaris arundinacea</i>).	

VEGETATION (Use scientific names)

	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet
Tree Stratum (Plot size: <u>30</u> ft radius)				
1. _____	%			Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
2. _____	%			
3. _____	%			
4. _____	%			
Total Cover:	%			
Sapling/Shrub Stratum (Plot size: <u>5</u> ft. radius)				
1. _____	%			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= _____
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
Total Cover:	%			
Herb Stratum (Plot size: <u>5</u> ft radius)				
1. <i>Phalaris arundinacea</i>	55%	yes	FACW	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 – Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 – Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ 4 - Morphological Adaptations ¹ (Provide supporting data In Remarks or on a separate sheet) <input type="checkbox"/> Wetland Non-Vascular Plants ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
2. <i>Dipsacus fullonum</i>	15%	no	FAC	
3. <i>Daucus carota</i>	10%	no	FACU	
4. <i>Hypochaeris radicata</i>	10%	no	FACU	
5. <i>Trifolium pratense</i>	10%	no	FACU	
6. _____	%			
7. _____	%			
8. _____	%			
Total Cover:	100%			
Woody Vine Stratum (Plot size: <u>30</u> ft radius)				
1. _____	%			¹ Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.
2. _____	%			
Total Cover:	%			
% Bare Ground in Herb Stratum <u>0%</u>				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Remarks: The hydrophytic vegetation criterion is met due to 100% of the dominant vegetation within the test plot having either OBL, FACW, or FAC indicator statuses.				

SOIL

Sampling Point: TP-4

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-11	10YR3/3	100%		%			loam	
11-16	10YR4/2	98%	10YR4/6	2%	C	PL	loamy clay	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)			Indicators for Problematic Hydric Soils		
<input type="checkbox"/> Histosol (A1) <input type="checkbox"/> Histic Epipedon (A2) <input type="checkbox"/> Black Histic (A3) <input type="checkbox"/> Hydrogen Sulfide (A4) <input type="checkbox"/> Depleted Below Dark Surface (A11) <input type="checkbox"/> Thick Dark Surface (A12) <input type="checkbox"/> Sandy Mucky Minerals (S1) <input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Sandy Redox (S5) <input type="checkbox"/> Stripped Matrix (S6) <input type="checkbox"/> Loamy Mucky Mineral (F1) (except MLRA 1) <input type="checkbox"/> Loamy Gleyed Matrix (F2) <input type="checkbox"/> Depleted Matrix (F3) <input type="checkbox"/> Redox Dark Surface (F6) <input type="checkbox"/> Depleted Dark Surface (F7) <input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> 2 cm Muck (A10) <input type="checkbox"/> Red Parent Material (TF2) <input type="checkbox"/> Very Shallow Dark Surface (TF12) <input type="checkbox"/> Other (Explain in Remarks)			

³Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present): Type: _____ Depth (inches): _____	Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Remarks: There was no evidence of hydric soils within this test plot.

HYDROLOGY

Wetland Hydrology Indicators:	Secondary Indicators (2 or more required)
Primary Indicators (min. of one required; check all that apply)	
<input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Water Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B) <input type="checkbox"/> Salt Crust (B11) <input type="checkbox"/> Aquatic Invertebrates (B13) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Oxidized Rhizospheres along Living Roots (C3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Stunted or Stressed Plants (D1) (LRR A) <input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Water Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> FAC-Neutral Test (D5) <input type="checkbox"/> Raised Ant Mounds (D6) (LRR A) <input type="checkbox"/> Frost-Heave Hummocks (D4)	

Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____ Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____ Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____ (Includes Capillary fringe)	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: There was no evidence of hydrology within this test plot.

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

Project/Site: HJ Delineation City/County: Chehalis/Lewis Sampling Date: 8/27/2020
 Applicant/Owner: Herb Johnson State: WA Sampling Point: TP-5
 Investigator(s): 7Wills, KT Section, Township, Range: 4, 13N, 2W
 Landform (hillslope, terrace, etc.): Terrace Local relief: Concave Slope (%): <3%
 Subregion (LRR): A2 Lat: 46.645353 Long: -122.937408 Datum: NAD83
 Soil Map Unit Name: Lacamas silt loam, 0 to 3 percent slopes NWI classification: PEM1/SSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Area "Normal Circumstances" present? Yes No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Hydric Soils Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Remarks: This test plot was located in the central portion of the site, within the southeastern portion of Wetland A. The vegetation in this test plot consisted of herbaceous species only. This test plot met all three wetland indicators with 100 percent hydrophytic vegetation, soils with a Depleted Matrix (F3), and the presence of hydrologic indicators; Water Stained Leaves (B9), Geomorphic Position (D2), and a positive FAC-Neutral Test (D5). The majority of the site, wetlands and uplands, was vegetated by reed canarygrass (<i>Phalaris arundinacea</i>).	

VEGETATION (Use scientific names)

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30</u> ft radius)				Dominance Test Worksheet
1. _____	%			Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A)
2. _____	%			Total Number of Dominant Species Across All Strata: <u>1</u> (B)
3. _____	%			
4. _____	%			
Total Cover: _____	%			Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
Sapling/Shrub Stratum (Plot size: <u>5</u> ft. radius)				Prevalence Index worksheet
1. _____	%			Total % Cover of: _____ Multiply by: _____
2. _____	%			OBL species _____ x 1= _____
3. _____	%			FACW species _____ x 2= _____
4. _____	%			FAC species _____ x 3= _____
5. _____	%			FACU species _____ x 4= _____
Total Cover: _____	%			UPL species _____ x 5= _____
Herb Stratum (Plot size: <u>5</u> ft radius)				Column Totals: _____ (A) _____ (B)
1. <i>Phalaris arundinacea</i>	85%	yes	FACW	Prevalence Index = B/A = _____
2. <i>Ranunculus repens</i>	15%	no	FAC	
3. _____	%			Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 – Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 – Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data In Remarks or on a separate sheet) <input type="checkbox"/> Wetland Non-Vascular Plants ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
4. _____	%			
5. _____	%			
6. _____	%			
7. _____	%			
8. _____	%			
Total Cover: _____	100%			
Woody Vine Stratum (Plot size: <u>30</u> ft radius)				
1. _____	%			¹ Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.
2. _____	%			
Total Cover: _____	%			
% Bare Ground in Herb Stratum <u>0%</u>				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>

Remarks: The hydrophytic vegetation criterion is met due to 100% of the vegetation within the test plot having either OBL, FACW, or FAC indicator statuses.

SOIL

Sampling Point: TP-5

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)							
Depth (inches)	Matrix		Redox Features			Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹		
0-3	10YR3/2	100%		%		loam	
3-16	10YR4/2	90%	10YR4/6	10%	C	loamy clay	
		%		%			
		%		%			
		%		%			
		%		%			
		%		%			
		%		%			

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)		Indicators for Problematic Hydric Soils
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> 2 cm Muck (A10)
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Stripped Matrix (S6)	<input type="checkbox"/> Red Parent Material (TF2)
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Loamy Mucky Mineral (F1) (except MLRA 1)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input checked="" type="checkbox"/> Depleted Matrix (F3)	
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Dark Surface (F6)	
<input type="checkbox"/> Sandy Mucky Minerals (S1)	<input type="checkbox"/> Depleted Dark Surface (F7)	
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Redox Depressions (F8)	

³Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):	Hydric Soil Present?
Type: _____	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Depth (inches): _____	

Remarks: The hydric soil indicator Depleted Matrix (F3) was met due to a matrix value of 4 and a chroma of 1 with more than 2 percent redox concentrations found in pore linings.

HYDROLOGY

Wetland Hydrology Indicators:	Secondary Indicators (2 or more required)
Primary Indicators (min. of one required; check all that apply)	
<input type="checkbox"/> Surface Water (A1)	<input checked="" type="checkbox"/> Water Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Salt Crust (B11)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Aquatic Invertebrates (B13)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Hydrogen Sulfide Odor (C1)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Oxidized Rhizospheres along Living Roots (C3)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Presence of Reduced Iron (C4)
<input type="checkbox"/> Algal Mat or crust (B4)	<input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Stunted or Stressed Plants (D1) (LRR A)
<input type="checkbox"/> Surface Soil Cracks (B6)	<input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Drainage Patterns (B10)
	<input type="checkbox"/> Dry-Season Water Table (C2)
	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
	<input checked="" type="checkbox"/> Geomorphic Position (D2)
	<input type="checkbox"/> Shallow Aquitard (D3)
	<input checked="" type="checkbox"/> FAC-Neutral Test (D5)
	<input type="checkbox"/> Raised Ant Mounds (D6) (LRR A)
	<input type="checkbox"/> Frost-Heave Hummocks (D4)

Field Observations:	Wetland Hydrology Present?
Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____	
Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____	
(Includes Capillary fringe)	

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

Remarks: The hydrology indicator, Water Stained Seaves (B9) were found on the surface of the ground within the test plot. Additionally, the test plot was located in a depression (Geomorphic Position D2) and had a positive FAC-Neutral Test (D5).

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

Project/Site: HJ Delineation City/County: Chehalis/Lewis Sampling Date: 8/27/2020
 Applicant/Owner: Herb Johnson State: WA Sampling Point: TP-6
 Investigator(s): 7Wills, KT Section, Township, Range: 4, 13N, 2W
 Landform (hillslope, terrace, etc.): Terrace Local relief: Convex Slope (%): <3%
 Subregion (LRR): A2 Lat: 46.645411 Long: -122.9375 Datum: NAD83

Soil Map Unit Name: Lacamas silt loam, 0 to 3 percent slopes NWI classification: PEM1/SSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Area "Normal Circumstances" present? Yes No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Hydric Soils Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Remarks: This test plot was located in the northern portion of the site, just west of Wetland A. The vegetation in this test plot consisted of herbaceous species only. This test plot met only one wetland indicator for vegetation with 100 percent of the dominant vegetation being hydrophytic; therefore it does not meet the criteria of being wetland. The majority of the site, wetlands and uplands, was vegetated by reed canarygrass (<i>Phalaris arundinacea</i>).	

VEGETATION (Use scientific names)

	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet
Tree Stratum (Plot size: <u>30</u> ft radius)				
1. _____	%			Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
2. _____	%			
3. _____	%			
4. _____	%			
Total Cover:	%			
Sapling/Shrub Stratum (Plot size: <u>5</u> ft. radius)				
1. _____	%			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= _____
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
Total Cover:	%			
Herb Stratum (Plot size: <u>5</u> ft radius)				
1. <i>Phalaris arundinacea</i>	65%	yes	FACW	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 – Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 – Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data In Remarks or on a separate sheet) <input type="checkbox"/> Wetland Non-Vascular Plants ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
2. <i>Dipsacus fullonum</i>	5%	no	FAC	
3. <i>Daucus carota</i>	10%	no	FACU	
4. <i>Hypochaeris radicata</i>	10%	no	FACU	
5. <i>Trifolium pratense</i>	10%	no	FACU	
6. _____	%			
7. _____	%			
8. _____	%			
Total Cover:	100%			
Woody Vine Stratum (Plot size: <u>30</u> ft radius)				
1. _____	%			¹ Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.
2. _____	%			
Total Cover:	%			
% Bare Ground in Herb Stratum <u>0%</u>				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Remarks: The hydrophytic vegetation criterion is met due to 100% of the dominant vegetation within the test plot having either OBL, FACW, or FAC indicator statuses.				

SOIL

Sampling Point: TP-6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-11	10YR3/3	100%		%			loam	
11-16	10YR4/2	98%	10YR4/6	2%	C	PL	loamy clay	
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)			Indicators for Problematic Hydric Soils		
<input type="checkbox"/> Histosol (A1) <input type="checkbox"/> Histic Epipedon (A2) <input type="checkbox"/> Black Histic (A3) <input type="checkbox"/> Hydrogen Sulfide (A4) <input type="checkbox"/> Depleted Below Dark Surface (A11) <input type="checkbox"/> Thick Dark Surface (A12) <input type="checkbox"/> Sandy Mucky Minerals (S1) <input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Sandy Redox (S5) <input type="checkbox"/> Stripped Matrix (S6) <input type="checkbox"/> Loamy Mucky Mineral (F1) (except MLRA 1) <input type="checkbox"/> Loamy Gleyed Matrix (F2) <input type="checkbox"/> Depleted Matrix (F3) <input type="checkbox"/> Redox Dark Surface (F6) <input type="checkbox"/> Depleted Dark Surface (F7) <input type="checkbox"/> Redox Depressions (F8)	<input type="checkbox"/> 2 cm Muck (A10) <input type="checkbox"/> Red Parent Material (TF2) <input type="checkbox"/> Very Shallow Dark Surface (TF12) <input type="checkbox"/> Other (Explain in Remarks)			

³Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present): Type: _____ Depth (inches): _____	Hydric Soil Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Remarks: There was no evidence of hydric soils within this test plot.

HYDROLOGY

Wetland Hydrology Indicators:	Secondary Indicators (2 or more required)
Primary Indicators (min. of one required; check all that apply)	
<input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Algal Mat or crust (B4) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<input type="checkbox"/> Water Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B) <input type="checkbox"/> Salt Crust (B11) <input type="checkbox"/> Aquatic Invertebrates (B13) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Oxidized Rhizospheres along Living Roots (C3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Stunted or Stressed Plants (D1) (LRR A) <input type="checkbox"/> Other (Explain in Remarks)
<input type="checkbox"/> Water Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> FAC-Neutral Test (D5) <input type="checkbox"/> Raised Ant Mounds (D6) (LRR A) <input type="checkbox"/> Frost-Heave Hummocks (D4)	

Field Observations: Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____ Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____ Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches): _____ (Includes Capillary fringe)	Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
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Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: There was no evidence of hydrology within this test plot.

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

Project/Site: HJ Delineation City/County: Chehalis/Lewis Sampling Date: 8/27/2020
 Applicant/Owner: Herb Johnson State: WA Sampling Point: TP-7
 Investigator(s): 7Wills, KT Section, Township, Range: 4, 13N, 2W
 Landform (hillslope, terrace, etc.): Terrace Local relief: Convex Slope (%): <3%
 Subregion (LRR): A2 Lat: 46.644389 Long: -122.937322 Datum: NAD83

Soil Map Unit Name: Lacamas silt loam, 0 to 3 percent slopes NWI classification: PEM1/SSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Area "Normal Circumstances" present? Yes No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Hydric Soils Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Remarks: This test plot was located in the southwestern portion of the site, south of Wetland A. The vegetation in this test plot consisted of herbaceous species only. This test plot met only one wetland indicator for vegetation with 100 percent of the dominant vegetation being hydrophytic; therefore it does not meet the criteria of being wetland. The majority of the site, wetlands and uplands, was vegetated by reed canarygrass (<i>Phalaris arundinacea</i>).	

VEGETATION (Use scientific names)

	Absolute % Cover	Dominant Species?	Indicator Status	Dominance Test Worksheet
Tree Stratum (Plot size: <u>30</u> ft radius)				
1. _____	%			Number of Dominant Species That Are OBL, FACW, or FAC: <u>1</u> (A) Total Number of Dominant Species Across All Strata: <u>1</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
2. _____	%			
3. _____	%			
4. _____	%			
Total Cover:	%			
Sapling/Shrub Stratum (Plot size: <u>5</u> ft. radius)				
1. _____	%			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= _____
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
Total Cover:	%			
Herb Stratum (Plot size: <u>5</u> ft radius)				
1. <i>Phalaris arundinacea</i>	65%	yes	FACW	Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 – Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 – Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data In Remarks or on a separate sheet) <input type="checkbox"/> Wetland Non-Vascular Plants ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
2. <i>Dipsacus fullonum</i>	5%	no	FAC	
3. <i>Daucus carota</i>	10%	no	FACU	
4. <i>Hypochaeris radicata</i>	10%	no	FACU	
5. <i>Trifolium pratense</i>	10%	no	FACU	
6. _____	%			
7. _____	%			
8. _____	%			
Total Cover:	100%			
Woody Vine Stratum (Plot size: <u>30</u> ft radius)				
1. _____	%			¹ Indicators of hydric soil and wetland hydrology Must be present, unless disturbed or problematic.
2. _____	%			
Total Cover:	%			
% Bare Ground in Herb Stratum <u>0%</u>				Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Remarks: The hydrophytic vegetation criterion is met due to 100% of the dominant vegetation within the test plot having either OBL, FACW, or FAC indicator statuses.				

SOIL

Sampling Point: TP-7

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-5	10YR3/3	100%		%			gravelly loam	See Remarks Below
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

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

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)		Indicators for Problematic Hydric Soils	
<input type="checkbox"/> Histosol (A1)	<input type="checkbox"/> Sandy Redox (S5)	<input type="checkbox"/> 2 cm Muck (A10)	
<input type="checkbox"/> Histic Epipedon (A2)	<input type="checkbox"/> Stripped Matrix (S6)	<input type="checkbox"/> Red Parent Material (TF2)	
<input type="checkbox"/> Black Histic (A3)	<input type="checkbox"/> Loamy Mucky Mineral (F1) (except MLRA 1)	<input type="checkbox"/> Very Shallow Dark Surface (TF12)	
<input type="checkbox"/> Hydrogen Sulfide (A4)	<input type="checkbox"/> Loamy Gleyed Matrix (F2)	<input type="checkbox"/> Other (Explain in Remarks)	
<input type="checkbox"/> Depleted Below Dark Surface (A11)	<input type="checkbox"/> Depleted Matrix (F3)		
<input type="checkbox"/> Thick Dark Surface (A12)	<input type="checkbox"/> Redox Dark Surface (F6)		
<input type="checkbox"/> Sandy Mucky Minerals (S1)	<input type="checkbox"/> Depleted Dark Surface (F7)		
<input type="checkbox"/> Sandy Gleyed Matrix (S4)	<input type="checkbox"/> Redox Depressions (F8)		

³Indicators of hydrophytic vegetation and Wetland hydrology must be present

Restrictive Layer (if present):	Hydric Soil Present?
Type: <u>Hard pan</u>	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Depth (inches): <u>5</u>	

Remarks: The soil consisted of historic compacted fill material and gravel. There was no evidence of hydric soils within this test plot.

HYDROLOGY

Wetland Hydrology Indicators:	Secondary Indicators (2 or more required)
Primary Indicators (min. of one required; check all that apply)	
<input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, & 4B)	<input type="checkbox"/> Water Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B)
<input type="checkbox"/> High Water Table (A2)	<input type="checkbox"/> Drainage Patterns (B10)
<input type="checkbox"/> Saturation (A3)	<input type="checkbox"/> Dry-Season Water Table (C2)
<input type="checkbox"/> Water Marks (B1)	<input type="checkbox"/> Saturation Visible on Aerial Imagery (C9)
<input type="checkbox"/> Sediment Deposits (B2)	<input type="checkbox"/> Geomorphic Position (D2)
<input type="checkbox"/> Drift Deposits (B3)	<input type="checkbox"/> Shallow Aquitard (D3)
<input type="checkbox"/> Algal Mat or crust (B4)	<input type="checkbox"/> FAC-Neutral Test (D5)
<input type="checkbox"/> Iron Deposits (B5)	<input type="checkbox"/> Raised Ant Mounds (D6) (LRR A)
<input type="checkbox"/> Surface Soil Cracks (B6)	<input type="checkbox"/> Frost-Heave Hummocks (D4)
<input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	

Field Observations:	Wetland Hydrology Present?
Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches):	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches):	
Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches):	
(Includes Capillary fringe)	

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

Remarks: There was no evidence of hydrology within this test plot.

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

Project/Site: HJ Delineation City/County: Chehalis/Lewis Sampling Date: 8/27/2020
 Applicant/Owner: Herb Johnson State: WA Sampling Point: TP-8
 Investigator(s): Wills, KT Section, Township, Range: 4, 13N, 2W
 Landform (hillslope, terrace, etc.): Terrace Local relief: Convex Slope (%): <3%
 Subregion (LRR): A2 Lat: 46.644369 Long: -122.936464 Datum: NAD83
 Soil Map Unit Name: Lacamas silt loam, 0 to 3 percent slopes NWI classification: PEM1/SSC

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No (If no, explain Remarks.)
 Are Vegetation , Soil , or Hydrology significantly disturbed? Area "Normal Circumstances" present? Yes No
 Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

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

Hydrophytic Vegetation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Hydric Soils Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Wetland Hydrology Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Is the Sampled Area within a Wetland? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>
Remarks: This test plot was located in the southeastern portion of the site, southeast of Wetland A. The vegetation in this test plot consisted of herbaceous species only. This test plot met only one wetland indicator for vegetation with 100 percent of the dominant vegetation being hydrophytic; therefore it does not meet the criteria of being wetland. The majority of the site, wetlands and uplands, was vegetated by reed canarygrass (<i>Phalaris arundinacea</i>).	

VEGETATION (Use scientific names)

	Absolute % Cover	Dominant Species?	Indicator Status	
Tree Stratum (Plot size: <u>30</u> ft radius)				Dominance Test Worksheet Number of Dominant Species That Are OBL, FACW, or FAC: <u>2</u> (A) Total Number of Dominant Species Across All Strata: <u>2</u> (B) Percent of Dominant Species That Are OBL, FACW, or FAC: <u>100</u> (A/B)
1. _____	%			
2. _____	%			
3. _____	%			
4. _____	%			
Total Cover:	%			
Sapling/Shrub Stratum (Plot size: <u>5</u> ft. radius)				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= _____
1. _____	%			
2. _____	%			
3. _____	%			
4. _____	%			
5. _____	%			
Total Cover:	%			
Herb Stratum (Plot size: <u>5</u> ft radius)				Hydrophytic Vegetation Indicators: <input type="checkbox"/> 1 – Rapid Test for Hydrophytic Vegetation <input checked="" type="checkbox"/> 2 – Dominance Test is >50% <input type="checkbox"/> 3 - Prevalence Index is ≤3.0 ¹ <input type="checkbox"/> 4 - Morphological Adaptations ¹ (Provide supporting data In Remarks or on a separate sheet) <input type="checkbox"/> Wetland Non-Vascular Plants ¹ <input type="checkbox"/> Problematic Hydrophytic Vegetation ¹ (Explain)
1. <i>Phalaris arundinacea</i>	50%	yes	FACW	
2. <i>Dipsacus fullonum</i>	25%	yes	FAC	
3. <i>Daucus carota</i>	15%	no	FACU	
4. <i>Hypochaeris radicata</i>	5%	no	FACU	
5. <i>Trifolium pratense</i>	5%	no	FACU	
6. _____	%			
7. _____	%			
8. _____	%			
Total Cover:	100%			
Woody Vine Stratum (Plot size: <u>30</u> ft radius)				
1. _____	%			
2. _____	%			
Total Cover:	%			
% Bare Ground in Herb Stratum <u>0%</u>				

Remarks: The hydrophytic vegetation criterion is met due to 100% of the dominant vegetation within the test plot having either OBL, FACW, or FAC indicator statuses.

SOIL

Sampling Point: TP-8

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)								
Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-7	10YR3/3	100%		%			gravelly loam	See Remarks Below
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				
		%		%				

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

<p>Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)</p> <input type="checkbox"/> Histosol (A1) <input type="checkbox"/> Sandy Redox (S5) <input type="checkbox"/> Histic Epipedon (A2) <input type="checkbox"/> Stripped Matrix (S6) <input type="checkbox"/> Black Histic (A3) <input type="checkbox"/> Loamy Mucky Mineral (F1) (except MLRA 1) <input type="checkbox"/> Hydrogen Sulfide (A4) <input type="checkbox"/> Loamy Gleyed Matrix (F2) <input type="checkbox"/> Depleted Below Dark Surface (A11) <input type="checkbox"/> Depleted Matrix (F3) <input type="checkbox"/> Thick Dark Surface (A12) <input type="checkbox"/> Redox Dark Surface (F6) <input type="checkbox"/> Sandy Mucky Minerals (S1) <input type="checkbox"/> Depleted Dark Surface (F7) <input type="checkbox"/> Sandy Gleyed Matrix (S4) <input type="checkbox"/> Redox Depressions (F8)	<p>Indicators for Problematic Hydric Soils</p> <input type="checkbox"/> 2 cm Muck (A10) <input type="checkbox"/> Red Parent Material (TF2) <input type="checkbox"/> Very Shallow Dark Surface (TF12) <input type="checkbox"/> Other (Explain in Remarks)
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³Indicators of hydrophytic vegetation and Wetland hydrology must be present

<p>Restrictive Layer (if present):</p> <p>Type: <u>Hard pan</u></p> <p>Depth (inches): 7</p>	<p>Hydric Soil Present?</p> <p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>
---	---

Remarks: The soil consisted of historic compacted fill material and gravel. There was no evidence of hydric soils within this test plot.

HYDROLOGY

<p>Wetland Hydrology Indicators:</p> <p>Primary Indicators (min. of one required; check all that apply)</p> <input type="checkbox"/> Surface Water (A1) <input type="checkbox"/> Water-Stained Leaves (B9) (except MLRA 1, 2, 4A, & 4B) <input type="checkbox"/> High Water Table (A2) <input type="checkbox"/> Salt Crust (B11) <input type="checkbox"/> Saturation (A3) <input type="checkbox"/> Aquatic Invertebrates (B13) <input type="checkbox"/> Water Marks (B1) <input type="checkbox"/> Hydrogen Sulfide Odor (C1) <input type="checkbox"/> Sediment Deposits (B2) <input type="checkbox"/> Oxidized Rhizospheres along Living Roots (C3) <input type="checkbox"/> Drift Deposits (B3) <input type="checkbox"/> Presence of Reduced Iron (C4) <input type="checkbox"/> Algal Mat or crust (B4) <input type="checkbox"/> Recent Iron Reduction in Tilled Soils (C6) <input type="checkbox"/> Iron Deposits (B5) <input type="checkbox"/> Stunted or Stressed Plants (D1) (LRR A) <input type="checkbox"/> Surface Soil Cracks (B6) <input type="checkbox"/> Other (Explain in Remarks) <input type="checkbox"/> Inundation Visible on Aerial Imagery (B7)	<p>Secondary Indicators (2 or more required)</p> <input type="checkbox"/> Water Stained Leaves (B9) (MLRA 1, 2, 4A, and 4B) <input type="checkbox"/> Drainage Patterns (B10) <input type="checkbox"/> Dry-Season Water Table (C2) <input type="checkbox"/> Saturation Visible on Aerial Imagery (C9) <input type="checkbox"/> Geomorphic Position (D2) <input type="checkbox"/> Shallow Aquitard (D3) <input type="checkbox"/> FAC-Neutral Test (D5) <input type="checkbox"/> Raised Ant Mounds (D6) (LRR A) <input type="checkbox"/> Frost-Heave Hummocks (D4)
--	---

<p>Field Observations:</p> <p>Surface Water Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches):</p> <p>Water Table Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches):</p> <p>Saturation Present? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> Depth (Inches):</p> <p>(Includes Capillary fringe)</p>	<p>Wetland Hydrology Present?</p> <p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p>
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Describe Recorded Data (Stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks: There was no evidence of hydrology within this test plot.

APPENDIX B: WETLAND RATING FORM

Wetland name or number A

RATING SUMMARY – Western Washington

Name of wetland (or ID #): Wetland A Date of site visit: August 27, 2020

Rated by KT Wills Trained by Ecology? Yes Date of training 9/2016

HGM Class used for rating Depressional Wetland has multiple HGM classes? X Y N

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

Source of base aerial photo/map Google Earth

OVERALL WETLAND CATEGORY IV (based on functions X or special characteristics)

1. Category of wetland based on FUNCTIONS

 Category I – Total score = 23 – 27

 Category II – Total score = 20 – 22

 Category III – Total score = 16 – 19

X Category IV – Total score = 9 – 15

FUNCTION	Improving Water Quality			Hydrologic			Habitat			
<i>Circle the appropriate ratings</i>										
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	
Score Based on Ratings	6			5			4			TOTAL 15

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

9 = H,H,H

8 = H,H,M

7 = H,H,L

7 = H,M,M

6 = H,M,L

6 = M,M,M

5 = H,L,L

5 = M,M,L

4 = M,L,L

3 = L,L,L

2. Category based on SPECIAL CHARACTERISTICS of wetland

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

Wetland name or number A

Maps and figures required to answer questions correctly for Western Washington

Depressional Wetlands

Map of:	To answer questions:	Figure #
Cowardin plant classes	D 1.3, H 1.1, H 1.4	5
Hydroperiods	D 1.4, H 1.2	5
Location of outlet (<i>can be added to map of hydroperiods</i>)	D 1.1, D 4.1	5
Boundary of area within 150 ft of the wetland (<i>can be added to another figure</i>)	D 2.2, D 5.2	5
Map of the contributing basin	D 4.3, D 5.3	6
1 km Polygon: Area that extends 1 km from entire wetland edge - including polygons for accessible habitat and undisturbed habitat	H 2.1, H 2.2, H 2.3	6
Screen capture of map of 303(d) listed waters in basin (from Ecology website)	D 3.1, D 3.2	7
Screen capture of list of TMDLs for WRIA in which unit is found (from web)	D 3.3	7

Riverine Wetlands

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

Lake Fringe Wetlands

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

Slope Wetlands

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

HGM Classification of Wetlands in Western Washington

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

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

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

NO – go to 2

YES – the wetland class is **Tidal Fringe** – go to 1.1

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

NO – **Saltwater Tidal Fringe (Estuarine)**

YES – **Freshwater Tidal Fringe**

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

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

NO – go to 3

YES – The wetland class is **Flats**

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

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

- The vegetated part of the wetland is on the shores of a body of permanent open water (without any plants on the surface at any time of the year) at least 20 ac (8 ha) in size;
 At least 30% of the open water area is deeper than 6.6 ft (2 m).

NO – go to 4

YES – The wetland class is **Lake Fringe** (Lacustrine Fringe)

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

- The wetland is on a slope (*slope can be very gradual*),
 The water flows through the wetland in one direction (unidirectional) and usually comes from seeps. It may flow subsurface, as sheetflow, or in a swale without distinct banks,
 The water leaves the wetland **without being impounded**.

NO – go to 5

YES – The wetland class is **Slope**

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

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

- The unit is in a valley, or stream channel, where it gets inundated by overbank flooding from that stream or river,
 The overbank flooding occurs at least once every 2 years.

Wetland name or number A

NO – go to 6

YES – The wetland class is **Riverine**

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

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

NO – go to 7

YES – The wetland class is **Depressional**

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

NO – go to 8

YES – The wetland class is **Depressional**

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

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

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

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

Wetland name or number A

DEPRESSIONAL AND FLATS WETLANDS	
Water Quality Functions - Indicators that the site functions to improve water quality	
D 1.0. Does the site have the potential to improve water quality?	
D 1.1. Characteristics of surface water outflows from the wetland: Wetland is a depression or flat depression (QUESTION 7 on key) with no surface water leaving it (no outlet). points = 3 Wetland has an intermittently flowing stream or ditch, OR highly constricted permanently flowing outlet. points = 2 Wetland has an unconstricted, or slightly constricted, surface outlet that is permanently flowing points = 1 Wetland is a flat depression (QUESTION 7 on key), whose outlet is a permanently flowing ditch. points = 1	3
D 1.2. The soil 2 in below the surface (or duff layer) is true clay or true organic (use NRCS definitions). Yes = 4 No = 0	0
D 1.3. Characteristics and distribution of persistent plants (Emergent, Scrub-shrub, and/or Forested Cowardin classes): Wetland has persistent, ungrazed, plants > 95% of area points = 5 Wetland has persistent, ungrazed, plants > ½ of area points = 3 Wetland has persistent, ungrazed plants > 1/10 of area points = 1 Wetland has persistent, ungrazed plants < 1/10 of area points = 0	0
D 1.4. Characteristics of seasonal ponding or inundation: <i>This is the area that is ponded for at least 2 months. See description in manual.</i> Area seasonally ponded is > ¾ 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	2
Total for D 1	5

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

D 2.0. Does the landscape have the potential to support the water quality function of the site?	
D 2.1. Does the wetland unit receive stormwater discharges?	Yes = 1 <u>No = 0</u>
D 2.2. Is > 10% of the area within 150 ft of the wetland in land uses that generate pollutants?	<u>Yes = 1</u> No = 0
D 2.3. Are there septic systems within 250 ft of the wetland?	Yes = 1 <u>No = 0</u>
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?	Yes = 1 <u>No = 0</u>
Total for D 2	1

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

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

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

Wetland name or number A

DEPRESSIONAL AND FLATS WETLANDS

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

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

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

D 5.0. Does the landscape have the potential to support hydrologic functions of the site?		
D 5.1. Does the wetland receive stormwater discharges?	Yes = 1 <u>No = 0</u>	0
D 5.2. Is >10% of the area within 150 ft of the wetland in land uses that generate excess runoff?	<u>Yes = 1</u> No = 0	1
D 5.3. Is more than 25% of the contributing basin of the wetland covered with intensive human land uses (residential at >1 residence/ac, urban, commercial, agriculture, etc.)?	<u>Yes = 1</u> No = 0	1
Total for D 5	Add the points in the boxes above	2

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

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

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

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

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

- Aquatic bed 4 structures or more: points = 4
 - Emergent 3 structures: points = 2
 - Scrub-shrub (areas where shrubs have > 30% cover) 2 structures: points = 1
 - Forested (areas where trees have > 30% cover) 1 structure: points = 0
- If the unit has a Forested class, check if:*
- The Forested class has 3 out of 5 strata (canopy, sub-canopy, shrubs, herbaceous, moss/ground-cover) that each cover 20% within the Forested polygon

0

H 1.2. Hydroperiods

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

- Permanently flooded or inundated 4 or more types present: points = 3
- Seasonally flooded or inundated 3 types present: points = 2
- Occasionally flooded or inundated 2 types present: points = 1
- Saturated only 1 type present: points = 0
- Permanently flowing stream or river in, or adjacent to, the wetland
- Seasonally flowing stream in, or adjacent to, the wetland
- Lake Fringe wetland** 2 points
- Freshwater tidal wetland** 2 points

1

H 1.3. Richness of plant species

Count the number of plant species in the wetland that cover at least 10 ft².

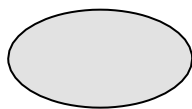
Different patches of the same species can be combined to meet the size threshold and you do not have to name the species. Do not include Eurasian milfoil, reed canarygrass, purple loosestrife, Canadian thistle

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

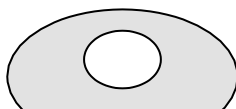
1

H 1.4. Interspersion of habitats

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



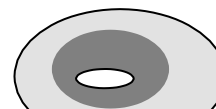
None = 0 points



Low = 1 point

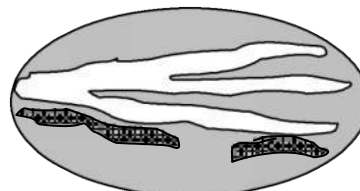
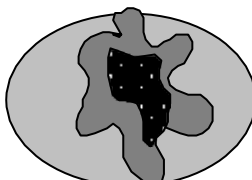
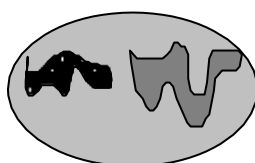


Moderate = 2 points



0

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



Wetland name or number A

<p>H 1.5. Special habitat features: Check the habitat features that are present in the wetland. <i>The number of checks is the number of points.</i> <input type="checkbox"/> Large, downed, woody debris within the wetland (> 4 in diameter and 6 ft long). <input type="checkbox"/> Standing snags (dbh > 4 in) within the wetland <input type="checkbox"/> Undercut banks are present for at least 6.6 ft (2 m) and/or overhanging plants extends at least 3.3 ft (1 m) over a stream (or ditch) in, or contiguous with the wetland, for at least 33 ft (10 m) <input type="checkbox"/> Stable steep banks of fine material that might be used by beaver or muskrat for denning (> 30 degree slope) OR signs of recent beaver activity are present (<i>cut shrubs or trees that have not yet weathered where wood is exposed</i>) <input type="checkbox"/> At least ¼ ac of thin-stemmed persistent plants or woody branches are present in areas that are permanently or seasonally inundated (<i>structures for egg-laying by amphibians</i>) <input type="checkbox"/> Invasive plants cover less than 25% of the wetland area in every stratum of plants (<i>see H 1.1 for list of strata</i>)</p>	<p>0</p>
<p>Total for H 1 Add the points in the boxes above</p>	<p>2</p>

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

<p>H 2.0. Does the landscape have the potential to support the habitat functions of the site?</p>	
<p>H 2.1. Accessible habitat (include <i>only habitat that directly abuts wetland unit</i>). <i>Calculate:</i> % undisturbed habitat $0 + [(\% \text{ moderate and low intensity land uses})0.5/2] 0.25 = \mathbf{0.25\%}$ If total accessible habitat is: > 1/3 (33.3%) of 1 km Polygon points = 3 20-33% of 1 km Polygon points = 2 10-19% of 1 km Polygon points = 1 < 10% of 1 km Polygon points = 0</p>	<p>0</p>
<p>H 2.2. Undisturbed habitat in 1 km Polygon around the wetland. <i>Calculate:</i> % undisturbed habitat $23.5 + [(\% \text{ moderate and low intensity land uses})11/2] 5.5 = \mathbf{29\%}$ Undisturbed habitat > 50% of Polygon points = 3 Undisturbed habitat 10-50% and in 1-3 patches points = 2 Undisturbed habitat 10-50% and > 3 patches points = 1 Undisturbed habitat < 10% of 1 km Polygon points = 0</p>	<p>1</p>
<p>H 2.3. Land use intensity in 1 km Polygon: If > 50% of 1 km Polygon is high intensity land use points = (- 2) ≤ 50% of 1 km Polygon is high intensity points = 0</p>	<p>-2</p>
<p>Total for H 2 Add the points in the boxes above</p>	<p>-1</p>

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

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

Rating of Value If score is: 2 = H X 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> or access the list from here: <http://wdfw.wa.gov/conservation/phs/list/>)

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Wetland name or number A

CATEGORIZATION BASED ON SPECIAL CHARACTERISTICS

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

Wetland name or number A

<p>SC 4.0. Forested Wetlands</p> <p>Does the wetland have at least <u>1 contiguous acre</u> of forest that meets one of these criteria for the WA Department of Fish and Wildlife's forests as priority habitats? <i>If you answer YES you will still need to rate the wetland based on its functions.</i></p> <ul style="list-style-type: none"> — Old-growth forests (west of Cascade crest): Stands of at least two tree species, forming a multi-layered canopy with occasional small openings; with at least 8 trees/ac (20 trees/ha) that are at least 200 years of age OR have a diameter at breast height (dbh) of 32 in (81 cm) or more. — Mature forests (west of the Cascade Crest): Stands where the largest trees are 80- 200 years old OR the species that make up the canopy have an average diameter (dbh) exceeding 21 in (53 cm). <p style="text-align: right;">Yes = Category I No = Not a forested wetland for this section</p>	<p>Cat. I</p>
<p>SC 5.0. Wetlands in Coastal Lagoons</p> <p>Does the wetland meet all of the following criteria of a wetland in a coastal lagoon?</p> <ul style="list-style-type: none"> — 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 (<i>needs to be measured near the bottom</i>) <p style="text-align: right;">Yes – Go to SC 5.1 No = Not a wetland in a coastal lagoon</p> <p>SC 5.1. Does the wetland meet all of the following three conditions?</p> <ul style="list-style-type: none"> — The wetland is relatively undisturbed (has no diking, ditching, filling, cultivation, grazing), and has less than 20% cover of aggressive, opportunistic plant species (see list of species on p. 100). — At least ¾ of the landward edge of the wetland has a 100 ft buffer of shrub, forest, or un-grazed or un-mowed grassland. — The wetland is larger than 1/10 ac (4350 ft²) <p style="text-align: right;">Yes = Category I No = Category II</p>	<p>Cat. I</p> <p>Cat. II</p>
<p>SC 6.0. Interdunal Wetlands</p> <p>Is the wetland west of the 1889 line (also called the Western Boundary of Upland Ownership or WBUO)? <i>If you answer yes you will still need to rate the wetland based on its habitat functions.</i></p> <p>In practical terms that means the following geographic areas:</p> <ul style="list-style-type: none"> — 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 <p style="text-align: right;">Yes – Go to SC 6.1 No = not an interdunal wetland for rating</p> <p>SC 6.1. Is the wetland 1 ac or larger and scores an 8 or 9 for the habitat functions on the form (rates H,H,H or H,H,M for the three aspects of function)? Yes = Category I No – Go to SC 6.2</p> <p>SC 6.2. Is the wetland 1 ac or larger, or is it in a mosaic of wetlands that is 1 ac or larger? Yes = Category II No – Go to SC 6.3</p> <p>SC 6.3. Is the unit between 0.1 and 1 ac, or is it in a mosaic of wetlands that is between 0.1 and 1 ac? Yes = Category III No = Category IV</p>	<p>Cat I</p> <p>Cat. II</p> <p>Cat. III</p> <p>Cat. IV</p>
<p>Category of wetland based on Special Characteristics</p> <p>If you answered No for all types, enter "Not Applicable" on Summary Form</p>	<p>N/A</p>

Wetland name or number A

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APPENDIX 4 – OPERATION AND MAINTENANCE MANUAL

The following O&M Plan will be prepared for the final TIR report.

APPENDIX 5 – CONSTRUCTION SWPPP

All new development and redevelopment shall comply with Construction SWPPP Elements #1 through #12 outlined in the Manual. The project's SWPPP is a standalone document included in this appendix.

CONSTRUCTION SWPPP

All new development and redevelopment shall comply with Construction SWPPP Elements #1 through #12 listed below. The suggested BMPs underlined and in **bold** are proposed for use in all phases of construction. Copies of the details for each of the recommended BMPs are included.

Element 1: Mark Clearing Limits

- Prior to beginning land disturbing activities, including clearing and grading, clearly mark all clearing limits, sensitive areas and their buffers, and trees that are to be preserved within the construction area. These shall be clearly marked, both in the field and on the plans, to prevent damage and offsite impacts.
- Plastic, metal, or stake wire fence may be used to mark the clearing limits.
- Suggested BMPs:

BMP C101: Preserving Natural Vegetation

BMP C102: Buffer Zones

BMP C103: High-Visibility Fence

BMP C233: Silt Fence

Element 2: Establish Construction Access

- Construction vehicle access and exit shall be limited to one route if possible, or two for linear projects such as roadways where one access is necessary for large equipment maneuvering.
- Access points shall be stabilized with quarry spall or crushed rock to minimize the tracking of sediment onto public roads.
- Wheel wash or tire baths should be located onsite, if applicable.
- Roads shall be cleaned thoroughly at the end of each day. Sediment shall be removed from roads by shoveling or pickup sweeping and shall be transported to a controlled sediment disposal area. Street washing will be allowed only after sediment is removed in this manner.
- Street wash wastewater shall be controlled by pumping back onsite or otherwise be prevented from discharging into systems tributary to state surface waters.

- Construction access restoration shall be equal to or better than the pre-construction condition.
- Suggested BMPs:

BMP C105: Stabilized Construction Access

BMP C106: Wheel Wash

BMP C107: Construction Road/Parking Area Stabilization

Element 3: Control Flow Rates

- Properties and waterways downstream from development sites shall be protected from erosion due to increases in the volume, velocity, and peak flow rate of stormwater runoff from the project site, as required by local plan approval authority.
- Downstream analysis is necessary if changes in offsite flows could impair or alter conveyance systems, streambanks, bed sediment, or aquatic habitat.
- Where necessary to comply with Minimum Requirement #7, stormwater detention facilities shall be constructed as one of the first steps in grading. Detention facilities shall be functional prior to construction of site improvements (e.g. impervious surfaces).
- Suggested BMPs:

BMP C203: Water Bars

BMP C207: Check Dams

BMP C209: Outlet Protection

BMP C235: Wattles

BMP C240: Sediment Trap

BMP C241: Sediment Pond (Temporary)

See *also*, V-12 Detention BMPs

Element 4: Install Sediment Controls

- The duff layer, native top soil, and natural vegetation shall be retained in an undisturbed state to the maximum extent practicable.
- Prior to leaving a construction site or prior to discharge to an infiltration facility, stormwater runoff from disturbed areas shall pass through a sediment pond or other appropriate sediment removal BMP. Runoff from fully stabilized areas may be discharged without a sediment removal BMP, but must meet the flow control performance standard of Element #3, bullet #1. Full stabilization means concrete or asphalt paving; quarry spalls used as ditch lining; or the use of rolled erosion products, a bonded fiber matrix product, or vegetative cover in a manner that will fully prevent soil erosion. The local permitting authority shall inspect and approve areas fully stabilized by means other than pavement or quarry spalls.
- BMPs intended to trap sediment on site shall be constructed as one of the first steps in grading. These BMPs shall be functional before other land disturbing activities take place.
- Earthen structures such as dams, dikes, and diversions shall be seeded and mulched according to the timing indicated in Element #5.

- BMPs intended to trap sediment on site must be located in a manner to avoid interference with the movement of juvenile salmonids attempting to enter off-channel areas or drainages, often during non-storm events, in response to rain event changes in stream elevation or wetted area.

- Suggested BMPs

BMP C231: Brush Barrier

BMP C232: Gravel Filter Berm

BMP C233: Silt Fence

BMP C234: Vegetated Strip

BMP C235: Wattles

BMP C240: Sediment Trap

BMP C241: Sediment Pond (Temporary)

BMP C250: Construction Stormwater Chemical Treatment

BMP C251: Construction Stormwater Filtration

Element 5: Stabilize Soils

- Exposed and unworked soils shall be stabilized by application of effective BMPs that protect the soil from the erosive forces of raindrops, flowing water, and wind.
- From October 1 through April 30, no soils shall remain exposed and unworked for more than 2 days. From May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days. This stabilization requirement applies to all soils on site, whether at final grade or not. These time limits may be adjusted by the local permitting authority if it can be shown that the average time between storm events justifies a different standard.
- Soils shall be stabilized at the end of the shift before a holiday or weekend if needed based on the weather forecast.
- Applicable practices include, but are not limited to, temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics and matting, soil application of polyacrylamide (PAM), the early application of gravel base on areas to be paved, and dust control.
- Selected soil stabilization measures shall be appropriate for the time of year, site conditions, estimated duration of use, and the water quality impacts that stabilization agents may have on downstream waters or ground water.
- Soil stockpiles must be stabilized and protected with sediment trapping measures.
- Linear construction activities such as right-of-way and easement clearing, roadway development, pipelines, and trenching for utilities, shall be conducted to meet the soil stabilization requirement. Contractors shall install the bedding materials, roadbeds, structures, pipelines, or utilities and re-stabilize the disturbed soils so that:
 - from October 1 through April 30 no soils shall remain exposed and unworked for more than 2 days and
 - from May 1 to September 30, no soils shall remain exposed and unworked for more than 7 days.

- Suggested BMPs:

BMP C120: Temporary and Permanent Seeding

BMP C121: Mulching

BMP C122: Nets and Blankets

BMP C123: Plastic Covering

BMP C124: Sodding

BMP C125: Topsoiling / Composting

BMP C126: Polyacrylamide (PAM) for Soil Erosion Protection

BMP C130: Surface Roughening

BMP C131: Gradient Terraces

BMP C140: Dust Control

Element 6: Protect Slopes

- Design, construct, and phase cut and fill slopes in a manner that will minimize erosion.
- Consider soil type and its potential for erosion.
- Reduce slope runoff velocities by reducing continuous length of slope with terracing and diversions, reduce slope steepness, and roughen slope surface.
- Divert upslope drainage and run-on waters with interceptors at top of slope. Stormwater from off site should be handled separately from stormwater generated on the site. Diversion of offsite stormwater around the site may be a viable option. Diverted flows shall be redirected to the natural drainage location at or before the property boundary.
- Contain downslope collected flows in pipes, slope drains, or protected channels. Check dams shall be used within channels that are cut down a slope.
- Provide drainage to remove ground water intersecting the slope surface of exposed soil areas.
- Excavated material shall be placed on the uphill side of trenches, consistent with safety and space considerations.
- Stabilize soils on slopes, as specified in Element #5.
- Suggested BMPs

BMP C120: Temporary and Permanent Seeding

BMP C121: Mulching

BMP C122: Nets and Blankets

BMP C123: Plastic Covering

BMP C124: Sodding

BMP C130: Surface Roughening

BMP C131: Gradient Terraces

BMP C200: Interceptor Dike and Swale

BMP C201: Grass-Lined Channels

BMP C203: Water Bars

BMP C204: Pipe Slope Drains

BMP C205: Subsurface Drains
BMP C206: Level Spreader
BMP C207: Check Dams
BMP C208: Triangular Silt Dike (TSD)

Element 7: Protect Drain Inlets

- Storm drain inlets operable during construction shall be protected so that stormwater runoff does not enter the conveyance system without first being filtered or treated to remove sediment.
- Approach roads shall be kept clean. Sediment and street wash water shall not be allowed to enter storm drains without prior and adequate treatment unless treatment is provided before the storm drain discharges to waters of the state.
- Inlets should be inspected weekly at a minimum and daily during storm events. Inlet protection devices should be cleaned or removed and replaced before six inches of sediment can accumulate.
- Suggested BMPs:

BMP C220: Inlet Protection

Element 8: Stabilize Channels and Outlets

- Temporary onsite conveyance channels shall be designed, constructed, and stabilized to prevent erosion from the expected flow velocity of a 2-year, 24-hour frequency storm for the developed condition.
- Stabilization, including armoring material, adequate to prevent erosion of outlets, adjacent streambanks, slopes, and downstream reaches shall be provided at the outlets of all conveyance systems.
- Suggested BMPs:

BMP C122: Nets and Blankets
BMP C202: Riprap Channel Lining
BMP C207: Check Dams

BMP C209: Outlet Protection

Element 9: Control Pollutants

- All pollutants, including waste materials and demolition debris, that occur on site during construction shall be handled and disposed of in a manner that does not cause contamination of stormwater. Woody debris may be chopped and spread on site.
- Cover, containment, and protection from vandalism shall be provided for all chemicals, liquid products, petroleum products, and non-inert wastes present on the site (see Chapter 173-304 WAC for the definition of inert waste).

- Maintenance and repair of heavy equipment and vehicles involving oil changes, hydraulic system drain down, solvent and de-greasing cleaning operations, fuel tank drain down and removal, and other activities which may result in discharge or spillage of pollutants to the ground or into stormwater runoff must be conducted using spill prevention measures, such as drip pans. Contaminated surfaces shall be cleaned immediately following any discharge or spill incident. Emergency repairs may be performed onsite using temporary plastic placed beneath and, if raining, over the vehicle.
- Wheel wash or tire bath wastewater shall be discharged to a separate onsite treatment system or to the sanitary sewer.
- Application of agricultural chemicals including fertilizers and pesticides shall be conducted in a manner and at application rate that will not result in loss of chemicals to stormwater runoff. Manufacturer recommendations for application rates and procedures shall be followed.
- BMPs shall be used to prevent or treat contamination of stormwater runoff by pH modifying sources. These sources include bulk cement, cement kiln dust, fly ash, new concrete washing and curing waters, waste streams generated from concrete grinding and sawing, exposed aggregate processes, and concrete pumping and mixer washout waters. Stormwater discharges shall not cause a violation of the water quality standard for pH in the receiving water.
- Suggested BMPs:

BMP C151: Concrete Handling

BMP C152: Sawcutting and Surfacing Pollution Prevention

BMP C153: Material Delivery, Storage, and Containment

BMP C154: Concrete Washout Area

BMP C250: Construction Stormwater Chemical Treatment

BMP C251: Construction Stormwater Filtration

BMP C252: Treating and Disposing of High pH Water

Also see, the Source Control BMPs detailed in Volume IV

Element 10: Control De-Watering

- Foundation, vault, and trench de-watering water shall be discharged into a controlled conveyance system prior to discharge to a sediment pond. Channels must be stabilized, as specified in Element #8.
- Clean, non-turbid de-watering water, such as well-point ground water, can be discharged to systems tributary to state surface waters, as specified in Element #8, provided the de-watering flow does not cause erosion or flooding of receiving waters. These clean waters should not be routed through stormwater sediment ponds.
- Highly turbid or contaminated dewatering water from construction equipment operation, clamshell digging, concrete tremie pour, or work inside a cofferdam shall be handled separately from stormwater.
- Other disposal options, depending on site constraints, may include:
 1. infiltration,

2. transport off site in vehicle, such as a vacuum flush truck, for legal disposal in a manner that does not pollute state waters,
3. onsite treatment using chemical treatment or other suitable treatment technologies,
4. sanitary sewer discharge with local sewer district approval, or
5. use of a sedimentation bag with outfall to a ditch or swale for small volumes of localized dewatering.

- Suggested BMPs:

BMP C203: Water Bars

BMP C236: Vegetative Filtration

Element 11: Maintain BMPs

- Temporary and permanent erosion and sediment control BMPs shall be maintained and repaired as needed to assure continued performance of their intended function. Maintenance and repair shall be conducted in accordance with BMPs.
- Sediment control BMPs shall be inspected weekly or after a runoff-producing storm event during the dry season and daily during the wet season. The inspection frequency for stabilized, inactive sites shall be determined by the local permitting authority based on the level of soil stability and potential for adverse environmental impacts.
- Temporary erosion and sediment control BMPs shall be removed within 30 days after final site stabilization is achieved or after the temporary BMPs are no longer needed. Trapped sediment shall be removed or stabilized on site. Disturbed soil resulting from removal of BMPs or vegetation shall be permanently stabilized.
- Suggested BMPs:

BMP C150: Materials on Hand

BMP C160: Certified Erosion and Sediment Control Lead

Element 12: Manage the Project

- Phasing of Construction

Development projects shall be phased where feasible in order to prevent, to the maximum extent practicable, the transport of sediment from the development site during construction. Revegetation of exposed areas and maintenance of that vegetation shall be an integral part of the clearing activities for any phase.

Clearing and grading activities for development shall be permitted only if conducted pursuant to an approved site development plan (e.g., subdivision approval) that establishes permitted areas of clearing, grading, cutting, and filling. When establishing these permitted clearing and grading areas, consideration should be given to minimizing removal of existing trees and minimizing disturbance and compaction of native soils except as needed for building purposes. These permitted clearing and grading areas and any other areas required to preserve critical or sensitive areas, buffers, native growth protection easements,

or tree retention areas as may be required by local jurisdictions, shall be delineated on the site plans and the development site.

- Seasonal Work Limitations

From October 1 through April 30, clearing, grading, and other soil disturbing activities shall only be permitted if shown to the satisfaction of the local permitting authority that the transport of sediment from the construction site to receiving waters will be prevented through a combination of the following:

1. Site conditions including existing vegetative coverage, slope, soil type, and proximity to receiving waters; and
2. Limitations on activities and the extent of disturbed areas; and
3. Proposed erosion and sediment control measures.

Based on the information provided and local weather conditions, the local permitting authority may expand or restrict the seasonal limitation on site disturbance. The local permitting authority shall take enforcement action - such as a notice of violation, administrative order, penalty, or stop-work order under the following circumstances:

- If, during the course of any construction activity or soil disturbance during the seasonal limitation period, sediment leaves the construction site causing a violation of the surface water quality standard; or
- If clearing and grading limits or erosion and sediment control measures shown in the approved plan are not maintained.

Local governments may restrict clearing and grading activities where site conditions may present a significant risk of impact to property or critical areas. Contact the local government permitting authority for information on specific site restrictions.

The following activities are exempt from the seasonal clearing and grading limitations:

1. Routine maintenance and necessary repair of erosion and sediment control BMPs,
2. Routine maintenance of public facilities or existing utility structures that do not expose the soil or result in the removal of the vegetative cover to soil, and
3. Activities where there is one hundred percent infiltration of surface water runoff within the site in approved and installed erosion and sediment control facilities.

- Coordination with Utilities and Other Contractors

The primary project proponent shall evaluate, with input from utilities and other contractors, the stormwater management requirements for the entire project, including the utilities, when preparing the Construction SWPPP.

- Inspection and Monitoring

All BMPs shall be inspected, maintained, and repaired as needed to assure continued performance of their intended function.

A certified professional in erosion and sediment control shall be identified in the Construction SWPPP and shall be onsite or on-call at all times.

Sampling and analysis of the stormwater discharges from a construction site may be necessary on a case-by-case basis to ensure compliance with standards. The local permitting authority may establish monitoring and reporting requirements when necessary.

Whenever inspection and/or monitoring reveals that the BMPs identified in the Construction SWPPP are inadequate, due to the actual discharge of or potential to discharge a significant amount of any pollutant, the SWPPP shall be modified, as appropriate, in a timely manner.

- Maintenance of the Construction SWPPP

The Construction SWPPP shall be retained onsite or within reasonable access to the site. The Construction SWPPP shall be modified whenever there is a significant change in the design, construction, operation, or maintenance of any BMP.

- Suggested BMPs:

BMP C150: Materials on Hand

BMP C160: Certified Erosion and Sediment Control Lead

BMP C162: Scheduling

Element #13: Protect Low Impact Development BMPs

Municipal Stormwater Permits Requirements

Protect all Bioretention and Rain Garden BMPs from sedimentation through installation and maintenance of erosion and sediment control BMPs on portions of the site that drain into the Bioretention and/or Rain Garden BMPs. Restore the BMP so their fully functioning condition if they accumulate sediment during construction. Re-storing the BMP must include removal of sediment and any sediment-laden Bioretention/rain garden soils, and replacing the removed soils with soils meeting the design specification.

Prevent compacting Bioretention and rain garden BMPs by excluding construction equipment and foot traffic. Protect completed lawn and landscaped areas from compaction due to construction equipment.

Control erosion and avoid introducing sediment from surrounding land uses onto permeable pavements. Do not allow muddy construction equipment on the base material or pavement. Do not allow sediment-laden runoff onto permeable pavements.

Pavements fouled with sediments or no longer passing an initial infiltration test must be cleaned using procedures from the local stormwater manual or the manufacturer's procedures.

Keep all heavy equipment off existing soils under LID facilities that have been excavated

to final grade to retain the infiltration rate of the soils.

Additional Guidance

See Chapter 5: Precision Site Preparation, Construction & Inspection of LID Facilities in the LID Technical Guidance Manual for Puget Sound (2012) for more detail on protecting LID integrated management practices.

Note that the LID Technical Guidance Manual for Puget Sound (2012) is for additional informational purposes only. You must follow the guidance within this manual if there are any discrepancies between this manual and the LID Technical Guidance Manual for Puget Sound (2012).

- Suggested BMPs:

- BMP C102: Buffer Zones
- BMP C103: High-Visibility Fence
- BMP C200: Interceptor Dike and Swale
- BMP C201: Grass-Lined Channels
- BMP C207: Check Dams
- BMP C208: Triangular Silt Dike (TSD)
- BMP C231: Brush Barrier
- BMP C233: Silt Fence
- BMP C234: Vegetated Strip

Project Specific Construction BMPs

List the suggested BMPs underlined and in **bold** from above. Insert copies of the details next.

BMP C101: Preserving Natural Vegetation
BMP C102: Buffer Zones
BMP C103: High-Visibility Fence
BMP C105: Stabilized Construction Access
BMP C120: Temporary and Permanent Seeding
BMP C130: Surface Roughening
BMP C140: Dust Control
BMP C150: Materials on Hand
BMP C151: Concrete Handling
BMP C152: Sawcutting and Surfacing Pollution Prevention
BMP C153: Material Delivery, Storage, and Containment
BMP C154: Concrete Washout Area
BMP C160: Certified Erosion and Sediment Control Lead
BMP C200: Interceptor Dike and Swale
BMP C209: Outlet Protection
BMP C220: Inlet Protection
BMP C233: Silt Fence
BMP C241: Sediment Pond (Temporary)

BMP C101: Preserving Natural Vegetation

Purpose

The purpose of preserving natural vegetation is to reduce erosion wherever practicable. Limiting site disturbance is the single most effective method for reducing erosion. For example, conifers can hold up to about 50 percent of all rain that falls during a storm. Up to 20-30 percent of this rain may never reach the ground but is taken up by the tree or evaporates. Another benefit is that the rain held in the tree can be released slowly to the ground after the storm.

Conditions of Use

Natural vegetation should be preserved on steep slopes, near perennial and intermittent water- courses or swales, and on building sites in wooded areas.

- As required by local governments.
- Phase construction to preserve natural vegetation on the project site for as long as possible during the construction period.

Design and Installation Specifications

Natural vegetation can be preserved in natural clumps or as individual trees, shrubs and vines.

The preservation of individual plants is more difficult because heavy equipment is generally used to remove unwanted vegetation. The points to remember when attempting to save individual plants are:

- Is the plant worth saving? Consider the location, species, size, age, vigor, and the work involved. Local governments may also have ordinances to save natural vegetation and trees.
- Fence or clearly mark areas around trees that are to be saved. It is preferable to keep ground disturbance away from the trees at least as far out as the dripline.

Plants need protection from three kinds of injuries:

- *Construction Equipment* - This injury can be above or below the ground level. Damage results from scarring, cutting of roots, and compaction of the soil. Placing a fenced buffer zone around plants to be saved prior to construction can prevent construction equipment injuries.
- *Grade Changes* - Changing the natural ground level will alter grades, which affects the plant's ability to obtain the necessary air, water, and minerals. Minor fills usually do not cause problems although sensitivity between species does vary and should be checked. Trees can typically tolerate fill of 6 inches or less. For shrubs and other plants, the fill should be less.

When there are major changes in grade, it may become necessary to supply air to the roots of plants. This can be done by placing a layer of gravel and a tile system over the roots before the fill is made. The tile system should be laid out on the original grade leading from a dry well

around the tree trunk. The system should then be covered with small stones to allow air to circulate over the root area.

Lowering the natural ground level can seriously damage trees and shrubs. The highest percentage of the plant roots are in the upper 12 inches of the soil and cuts of only 2-3 inches can cause serious injury. To protect the roots it may be necessary to terrace the immediate area around the plants to be saved. If roots are exposed, construction of retaining walls may be needed to keep the soil in place. Plants can also be preserved by leaving them on an undisturbed, gently sloping mound. To increase the chances for survival, it is best to limit grade changes and other soil disturbances to areas outside the dripline of the plant.

- *Excavations* - Protect trees and other plants when excavating for drainfields, power, water, and sewer lines. Where possible, the trenches should be routed around trees and large shrubs. When this is not possible, it is best to tunnel under them. This can be done with hand tools or with power augers. If it is not possible to route the trench around plants to be saved, then the following should be observed:
 - Cut as few roots as possible. When you have to cut, cut clean. Paint cut root ends with a wood dressing like asphalt base paint if roots will be exposed for more than 24-hours.
 - Backfill the trench as soon as possible.
 - Tunnel beneath root systems as close to the center of the main trunk to preserve most of the important feeder roots.

Some problems that can be encountered with a few specific trees are:

- Maple, Dogwood, Red alder, Western hemlock, Western red cedar, and Douglas fir do not readily adjust to changes in environment and special care should be taken to protect these trees.
- The windthrow hazard of Pacific silver fir and madrona is high, while that of Western hemlock is moderate. The danger of windthrow increases where dense stands have been thinned. Other species (unless they are on shallow, wet soils less than 20 inches deep) have a low windthrow hazard.
- Cottonwoods, maples, and willows have water-seeking roots. These can cause trouble in sewer lines and infiltration fields. On the other hand, they thrive in high moisture conditions that other trees would not.
- Thinning operations in pure or mixed stands of Grand fir, Pacific silver fir, Noble fir, Sitka spruce, Western red cedar, Western hemlock, Pacific dogwood, and Red alder can cause serious disease problems. Disease can become established through damaged limbs, trunks, roots, and freshly cut stumps. Diseased and weakened trees are also susceptible to insect attack.

Maintenance Standards

Inspect flagged and/or fenced areas regularly to make sure flagging or fencing has not been removed or damaged. If the flagging or fencing has been damaged or visibility reduced, it shall be

repaired or replaced immediately and visibility restored.

If tree roots have been exposed or injured, “prune” cleanly with an appropriate pruning saw or loppers directly above the damaged roots and recover with native soils. Treatment of sap flowing trees (fir, hemlock, pine, soft maples) is not advised as sap forms a natural healing barrier.

BMP C102: Buffer Zones

Purpose

Creation of an undisturbed area or strip of natural vegetation or an established suitable planting that will provide a living filter to reduce soil erosion and stormwater runoff velocities.

Conditions of Use

Buffer zones are used along streams, wetlands and other bodies of water that need protection from erosion and sedimentation. Contractors can use vegetative buffer zone BMPs to protect natural swales and they can incorporate them into the natural landscaping of an area.

Do not use critical-areas buffer zones as sediment treatment areas. These areas shall remain completely undisturbed. The local permitting authority may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

The types of buffer zones can change the level of protection required as shown below:

Designated Critical Area Buffers - buffers that protect Critical Areas, as defined by the Washington State Growth Management Act, and are established and managed by the local permitting authority. These should not be disturbed and must be protected with sediment control BMPs to prevent impacts. The local permitting authority may expand the buffer widths temporarily to allow the use of the expanded area for removal of sediment.

Vegetative Buffer Zones - areas that may be identified in undisturbed vegetation areas or managed vegetation areas that are outside any Designated Critical Area Buffer. They may be utilized to provide an additional sediment control area and/or reduce runoff velocities. If being used for preservation of natural vegetation, they should be arranged in clumps or strips. They can be used to protect natural swales and incorporated into the natural landscaping area.

Design and Installation Specifications

- Preserving natural vegetation or plantings in clumps, blocks, or strips is generally the easiest and most successful method.
- Leave all unstable steep slopes in natural vegetation.
- Mark clearing limits and keep all equipment and construction debris out of the natural areas and buffer zones. Steel construction fencing is the most effective method to protect sensitive areas and buffers. Alternatively, wire-backed silt fence on steel posts is marginally effective. Flagging alone is typically not effective.
- Keep all excavations outside the dripline of trees and shrubs.

- Do not push debris or extra soil into the buffer zone area because it will cause damage by burying and smothering vegetation.
- Vegetative buffer zones for streams, lakes or other waterways shall be established by the local permitting authority or other state or federal permits or approvals.

Maintenance Standards

Inspect the area frequently to make sure flagging remains in place and the area remains undisturbed. Replace all damaged flagging immediately. Remove all materials located in the buffer area that may impede the ability of the vegetation to act as a filter.

BMP C103: High-Visibility Fence

Purpose

High-visibility fencing is intended to:

- Restrict clearing to approved limits.
- Prevent disturbance of sensitive areas, their buffers, and other areas required to be left undisturbed.
- Limit construction traffic to designated construction entrances, exits, or internal roads.
- Protect areas where marking with survey tape may not provide adequate protection.

Conditions of Use

To establish clearing limits plastic, fabric, or metal fence may be used:

- At the boundary of sensitive areas, their buffers, and other areas required to be left uncleared.
- As necessary to control vehicle access to and on the site.

Design and Installation Specifications

High-visibility plastic fence shall be composed of a high-density polyethylene material and shall be at least four feet in height. Posts for the fencing shall be steel or wood and placed every 6 feet on center (maximum) or as needed to ensure rigidity. The fencing shall be fastened to the post every six inches with a polyethylene tie. On long continuous lengths of fencing, a tension wire or rope shall be used as a top stringer to prevent sagging between posts. The fence color shall be high-visibility orange. The fence tensile strength shall be 360 lbs/ft using the ASTM D4595 testing method.

If appropriate install fabric silt fence in accordance with [BMP C233: Silt Fence](#) to act as high-visibility fence. Silt fence shall be at least 3 feet high and must be highly visible to meet the requirements of this BMP.

Metal fences shall be designed and installed according to the manufacturer's specifications.

Metal fences shall be at least 3 feet high and must be highly visible.

Fences shall not be wired or stapled to trees.

Maintenance Standards

If the fence has been damaged or visibility reduced, it shall be repaired or replaced immediately and visibility restored.

BMP C105: Stabilized Construction Access

Purpose

Stabilized construction accesses are established to reduce the amount of sediment transported onto paved roads outside the project site by vehicles or equipment. This is done by constructing a stabilized pad of quarry spalls at entrances and exits for project sites.

Conditions of Use

Construction accesses shall be stabilized wherever traffic will be entering or leaving a construction site if paved roads or other paved areas are within 1,000 feet of the site.

For residential subdivision construction sites, provide a stabilized construction access for each residence, rather than only at the main subdivision entrance. Stabilized surfaces shall be of sufficient length/width to provide vehicle access/parking, based on lot size and configuration.

On large commercial, highway, and road projects, the designer should include enough extra materials in the contract to allow for additional stabilized accesses not shown in the initial Construction SWPPP. It is difficult to determine exactly where access to these projects will take place; additional materials will enable the contractor to install them where needed.

Design and Installation Specifications

See [Figure II-3.1: Stabilized Construction Access](#) for details. Note: the 100' minimum length of the access shall be reduced to the maximum practicable size when the size or configuration of the site does not allow the full length (100').

Construct stabilized construction accesses with a 12-inch thick pad of 4-inch to 8-inch quarry spalls, a 4-inch course of asphalt treated base (ATB), or use existing pavement. Do not use crushed concrete, cement, or calcium chloride for construction access stabilization because these products raise pH levels in stormwater and concrete discharge to waters of the State is prohibited.

A separation geotextile shall be placed under the spalls to prevent fine sediment from pumping up into the rock pad. The geotextile shall meet the standards listed in [Table II-3.2: Stabilized Construction Access Geotextile Standards](#).

Table II-3.2: Stabilized Construction Access Geotextile Standards

Geotextile Property	Required Value
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Grab Tensile Strength (ASTM D4751)	200 psi min.
Grab Tensile Elongation (ASTM D4632)	30% max.
Mullen Burst Strength (ASTM D3786-80a)	400 psi min.
AOS (ASTM D4751)	20-45 (U.S. standard sieve size)

- Consider early installation of the first lift of asphalt in areas that will be paved; this can be used as a stabilized access. Also consider the installation of excess concrete as a stabilized access. During large concrete pours, excess concrete is often available for this purpose.
- Fencing (see [BMP C103: High-Visibility Fence](#)) shall be installed as necessary to restrict traffic to the construction access.
- Whenever possible, the access shall be constructed on a firm, compacted subgrade. This can substantially increase the effectiveness of the pad and reduce the need for maintenance.
- Construction accesses should avoid crossing existing sidewalks and back of walk drains if at all possible. If a construction access must cross a sidewalk or back of walk drain, the full length of the sidewalk and back of walk drain must be covered and protected from sediment leaving the site.

Alternative Material Specification

WSDOT has raised safety concerns about the Quarry Spall rock specified above. WSDOT observes that the 4-inch to 8-inch rock sizes can become trapped between Dually truck tires, and then released off-site at highway speeds. WSDOT has chosen to use a modified specification for the rock while continuously verifying that the Stabilized Construction Access remains effective. To remain effective, the BMP must prevent sediment from migrating off site. To date, there has been no performance testing to verify operation of this new specification. Jurisdictions may use the alternative specification, but must perform increased off-site inspection if they use, or allow others to use, it.

Stabilized Construction Accesses may use material that meets the requirements of WSDOT's *Standard Specifications for Road, Bridge, and Municipal Construction* Section 9-03.9(1) ([WSDOT, 2016](#)) for ballast except for the following special requirements.

The grading and quality requirements are listed in [Table II-3.3: Stabilized Construction Access Alternative Material Requirements](#).

**Table II-3.3: Stabilized Construction Access
Alternative Material Requirements**

Sieve Size	Percent Passing
2½"	99-100
2"	65-100
¾"	40-80
No. 4	5 max.

No. 100	0-2
% Fracture	75 min.

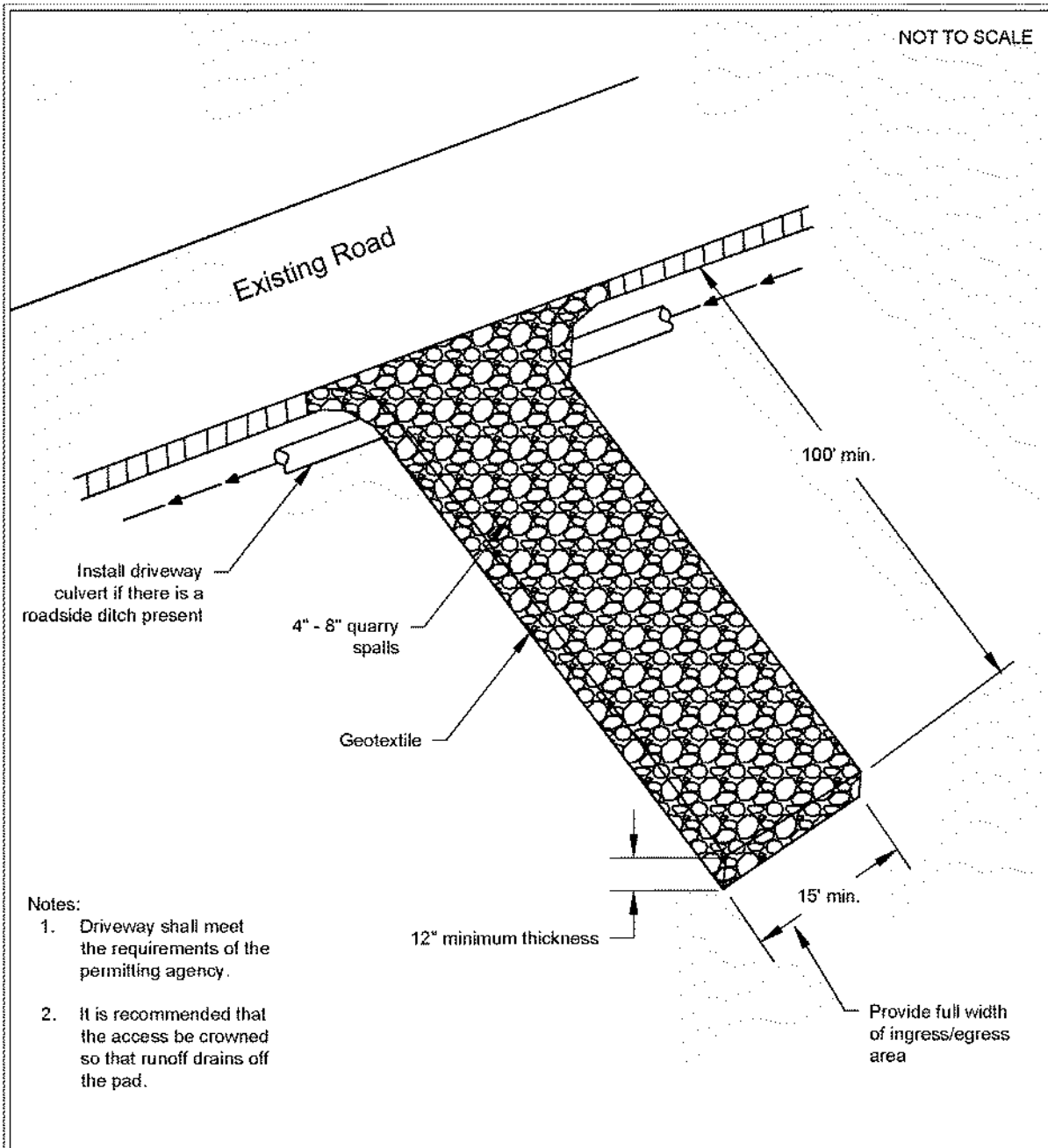
- All percentages are by weight.
- The sand equivalent value and dust ratio requirements do not apply.
- The fracture requirement shall be at least one fractured face and will apply the combined aggregate retained on the No. 4 sieve in accordance with FOP for AASHTO T 335.

Maintenance Standards

Quarry spalls shall be added if the pad is no longer in accordance with the specifications.

- If the access is not preventing sediment from being tracked onto pavement, then alternative measures to keep the streets free of sediment shall be used. This may include replacement/cleaning of the existing quarry spalls, street sweeping, an increase in the dimensions of the access, or the installation of [BMP C106: Wheel Wash](#).
- Any sediment that is tracked onto pavement shall be removed by shoveling or street sweeping. The sediment collected by sweeping shall be removed or stabilized on site. The pavement shall not be cleaned by washing down the street, except when high efficiency sweeping is ineffective and there is a threat to public safety. If it is necessary to wash the streets, the construction of a small sump to contain the wash water shall be considered. The sediment would then be washed into the sump where it can be controlled.
- Perform street sweeping by hand or with a high efficiency sweeper. Do not use a non-high efficiency mechanical sweeper because this creates dust and throws soils into storm systems or conveyance ditches.
- Any quarry spalls that are loosened from the pad, which end up on the roadway shall be removed immediately.
- If vehicles are entering or exiting the site at points other than the construction access(es), [BMP C103: High-Visibility Fence](#) shall be installed to control traffic.
- Upon project completion and site stabilization, all construction accesses intended as permanent access for maintenance shall be permanently stabilized.

Figure II-3.1: Stabilized Construction Access



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State of Washington

Stabilized Construction Access

Revised June 2018

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Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

BMP C120: Temporary and Permanent Seeding

Purpose

Seeding reduces erosion by stabilizing exposed soils. A well-established vegetative cover is one of the most effective methods of reducing erosion.

Conditions of Use

Use seeding throughout the project on disturbed areas that have reached final grade or that will remain unworked for more than 30 days.

The optimum seeding windows for western Washington are April 1 through June 30 and September 1 through October 1.

Between July 1 and August 30 seeding requires irrigation until 75 percent grass cover is established.

Between October 1 and March 30 seeding requires a cover of mulch or an erosion control blanket until 75 percent grass cover is established.

Review all disturbed areas in late August to early September and complete all seeding by the end of September. Otherwise, vegetation will not establish itself enough to provide more than average protection.

Mulch is required at all times for seeding because it protects seeds from heat, moisture loss, and transport due to runoff. Mulch can be applied on top of the seed or simultaneously by hydroseeding. See [BMP C121: Mulching](#) for specifications.

Seed and mulch all disturbed areas not otherwise vegetated at final site stabilization. Final stabilization means the completion of all soil disturbing activities at the site and the establishment of a permanent vegetative cover, or equivalent permanent stabilization measures (such as pavement, riprap, gabions, or geotextiles) which will prevent erosion. See [BMP T5.13: Post-Construction Soil Quality and Depth](#).

Design and Installation Specifications

General

- Install channels intended for vegetation before starting major earthwork and hydroseed with a Bonded Fiber Matrix. For vegetated channels that will have high flows, install erosion control blankets over the top of hydroseed. Before allowing water to flow in vegetated channels, establish 75 percent vegetation cover. If vegetated channels cannot be established by seed before water flow; install sod in the channel bottom — over top of hydromulch and erosion control blankets.
- Confirm the installation of all required surface water control measures to prevent seed from washing away.
- Hydroseed applications shall include a minimum of 1,500 pounds per acre of mulch with 3 per-

cent tackifier. See [BMP C121: Mulching](#) for specifications.

- Areas that will have seeding only and not landscaping may need compost or meal-based mulch included in the hydroseed in order to establish vegetation. Re-install native topsoil on the disturbed soil surface before application. See [BMP T5.13: Post-Construction Soil Quality and Depth](#).
- When installing seed via hydroseeding operations, only about 1/3 of the seed actually ends up in contact with the soil surface. This reduces the ability to establish a good stand of grass quickly. To overcome this, consider increasing seed quantities by up to 50 percent.
- Enhance vegetation establishment by dividing the hydromulch operation into two phases:
 - Phase 1- Install all seed and fertilizer with 25-30 percent mulch and tackifier onto soil in the first lift.
 - Phase 2- Install the rest of the mulch and tackifier over the first lift.

Or, enhance vegetation by:

- Installing the mulch, seed, fertilizer, and tackifier in one lift.
- Spread or blow straw over the top of the hydromulch at a rate of 800-1000 pounds per acre.
- Hold straw in place with a standard tackifier.

Both of these approaches will increase cost moderately but will greatly improve and enhance vegetative establishment. The increased cost may be offset by the reduced need for:

- Irrigation.
- Reapplication of mulch.
- Repair of failed slope surfaces.

This technique works with standard hydromulch (1,500 pounds per acre minimum) and Bonded Fiber Matrix/ Mechanically Bonded Fiber Matrix (BFM/MBFMs) (3,000 pounds per acre minimum).

- Seed may be installed by hand if:
 - Temporary and covered by straw, mulch, or topsoil.
 - Permanent in small areas (usually less than 1 acre) and covered with mulch, topsoil, or erosion blankets.
- The seed mixes listed in [Table II-3.4: Temporary and Permanent Seed Mixes](#) include recommended mixes for both temporary and permanent seeding.
- Apply these mixes, with the exception of the wet area seed mix, at a rate of 120 pounds per acre. This rate can be reduced if soil amendments or slow-release fertilizers are used. Apply the wet area seed mix at a rate of 60 pounds per acre.
- Consult the local suppliers or the local conservation district for their recommendations. The

appropriate mix depends on a variety of factors, including location, exposure, soil type, slope, and expected foot traffic. Alternative seed mixes approved by the local authority may be used, depending on the soil type and hydrology of the area.

Table II-3.4: Temporary and Permanent Seed Mixes

Common Name	Latin Name	% Weight	% Purity	% Germination
Temporary Erosion Control Seed Mix				
A standard mix for areas requiring a temporary vegetative cover.				
Chewings or annual blue grass	<i>Festuca rubra</i> var. <i>commutata</i> or <i>Poa annua</i>	40	98	90
Perennial rye	<i>Lolium perenne</i>	50	98	90
Redtop or colonial bentgrass	<i>Agrostis alba</i> or <i>Agrostis tenuis</i>	5	92	85
White dutch clover	<i>Trifolium repens</i>	5	98	90
Landscaping Seed Mix				
A recommended mix for landscaping seed.				
Perennial rye blend	<i>Lolium perenne</i>	70	98	90
Chewings and red fescue blend	<i>Festuca rubra</i> var. <i>commutata</i> or <i>Festuca rubra</i>	30	98	90
Low-Growing Turf Seed Mix				
A turf seed mix for dry situations where there is no need for watering. This mix requires very little maintenance.				
Dwarf tall fescue (several varieties)	<i>Festuca arundinacea</i> var.	45	98	90
Dwarf perennial rye (Barclay)	<i>Lolium perenne</i> var. <i>barclay</i>	30	98	90
Red fescue	<i>Festuca rubra</i>	20	98	90
Colonial bentgrass	<i>Agrostis tenuis</i>	5	98	90
Bioswale Seed Mix				
A seed mix for bioswales and other intermittently wet areas.				
Tall or meadow fescue	<i>Festuca arundinacea</i> or <i>Festuca elatior</i>	75-80	98	90

Seaside/Creeping bentgrass	<i>Agrostis palustris</i>	10-15	92	85
Redtop bentgrass	<i>Agrostis alba</i> or <i>Agrostis gigantea</i>	5-10	90	80
Wet Area Seed Mix				
A low-growing, relatively non-invasive seed mix appropriate for very wet areas that are not regulated wetlands. Consult Hydraulic Permit Authority (HPA) for seed mixes if applicable.				

Table II-3.4: Temporary and Permanent Seed Mixes (continued)

Common Name	Latin Name	% Weight	% Purity	% Germination
Tall or meadow fescue	<i>Festuca arundinacea</i> or <i>Festuca elatior</i>	60-70	98	90
Seaside/Creeping bentgrass	<i>Agrostis palustris</i>	10-15	98	85
Meadow foxtail	<i>Alepocurus pratensis</i>	10-15	90	80
Alsike clover	<i>Trifolium hybridum</i>	1-6	98	90
Redtop bentgrass	<i>Agrostis alba</i>	1-6	92	85
Meadow Seed Mix				
A recommended meadow seed mix for infrequently maintained areas or non-maintained areas where colonization by native plants is desirable. Likely applications include rural road and utility right-of-way. Seeding should take place in September or very early October in order to obtain adequate establishment prior to the winter months. Consider the appropriateness of clover, a fairly invasive species, in the mix. Amending the soil can reduce the need for clover.				
Redtop or Oregon bentgrass	<i>Agrostis alba</i> or <i>Agrostis oregonensis</i>	20	92	85
Red fescue	<i>Festuca rubra</i>	70	98	90
White dutch clover	<i>Trifolium repens</i>	10	98	90

Roughening and Rototilling

- The seedbed should be firm and rough. Roughen all soil no matter what the slope. Track walk slopes before seeding if engineering purposes require compaction. Backblading or smoothing of slopes greater than 4H:1V is not allowed if they are to be seeded.
 - Restoration-based landscape practices require deeper incorporation than that provided by a simple single-pass rototilling treatment. Wherever practical, initially rip the subgrade to improve long-term permeability, infiltration, and water inflow qualities. At a minimum, permanent areas shall use soil amendments to achieve organic matter and

permeability performance defined in engineered soil/landscape systems. For systems that are deeper than 8 inches complete the rototilling process in multiple lifts, or prepare the engineered soil system per specifications and place to achieve the specified depth.

Fertilizers

- Conducting soil tests to determine the exact type and quantity of fertilizer is recommended. This will prevent the over-application of fertilizer.
- Organic matter is the most appropriate form of fertilizer because it provides nutrients (including nitrogen, phosphorus, and potassium) in the least water-soluble form.
- In general, use 10-4-6 N-P-K (nitrogen-phosphorus-potassium) fertilizer at a rate of 90 pounds per acre. Always use slow-release fertilizers because they are more efficient and have fewer environmental impacts. Do not add fertilizer to the hydromulch machine, or agitate, more than 20 minutes before use. Too much agitation destroys the slow-release coating.
- There are numerous products available that take the place of chemical fertilizers. These include several with seaweed extracts that are beneficial to soil microbes and organisms. If 100 percent cottonseed meal is used as the mulch in hydroseed, chemical fertilizer may not be necessary. Cottonseed meal provides a good source of long-term, slow-release, available nitrogen.

Bonded Fiber Matrix and Mechanically Bonded Fiber Matrix

- On steep slopes use Bonded Fiber Matrix (BFM) or Mechanically Bonded Fiber Matrix (MBFM) products. Apply BFM/MBFM products at a minimum rate of 3,000 pounds per acre with approximately 10 percent tackifier. Achieve a minimum of 95 percent soil coverage during application. Numerous products are available commercially. Most products require 24-36 hours to cure before rainfall and cannot be installed on wet or saturated soils. Generally, products come in 40-50 pound bags and include all necessary ingredients except for seed and fertilizer.
- Install products per manufacturer's instructions.
- BFMs and MBFMs provide good alternatives to blankets in most areas requiring vegetation establishment. Advantages over blankets include:
 - BFM and MBFMs do not require surface preparation.
 - Helicopters can assist in installing BFM and MBFMs in remote areas.
 - On slopes steeper than 2.5H:1V, blanket installers may require ropes and harnesses for safety.
 - Installing BFM and MBFMs can save at least \$1,000 per acre compared to blankets.

Maintenance Standards

Reseed any seeded areas that fail to establish at least 75 percent cover (100 percent cover for areas that receive sheet or concentrated flows). If reseeding is ineffective, use an alternate method such

as sodding, mulching, nets, or blankets.

- Reseed and protect by mulch any areas that experience erosion after achieving adequate cover. Reseed and protect by mulch any eroded area.
- Supply seeded areas with adequate moisture, but do not water to the extent that it causes runoff.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

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BMP C130: Surface Roughening

Purpose

Surface roughening aids in the establishment of vegetative cover, reduces runoff velocity, increases infiltration, and provides for sediment trapping through the provision of a rough soil surface. Horizontal depressions are created by operating a tiller or other suitable equipment on the contour or by leaving slopes in a roughened condition by not fine grading them.

Use this BMP in conjunction with other BMPs such as [BMP C120: Temporary and Permanent Seeding](#), [BMP C121: Mulching](#), or [BMP C124: Sodding](#).

Conditions for Use

- All slopes steeper than 3H:1V and greater than 5 vertical feet require surface roughening to a depth of 2 to 4 inches prior to seeding.
- Areas that will not be stabilized immediately may be roughened to reduce runoff velocity until seeding takes place.
- Slopes with a stable rock face do not require roughening.
- Slopes where mowing is planned should not be excessively roughened.

Design and Installation Specifications

There are different methods for achieving a roughened soil surface on a slope, and the selection of an appropriate method depends upon the type of slope. Roughening methods include stair-step grading, grooving, contour furrows, and tracking. See [Figure II-3.5: Surface Roughening by Tracking and Contour Furrows](#). Factors to be considered in choosing a roughening method are slope steepness, mowing requirements, and whether the slope is formed by cutting or filling.

- Disturbed areas that will not require mowing may be stair-step graded, grooved, or left rough after filling.
- Stair-step grading is particularly appropriate in soils containing large amounts of soft rock. Each "step" catches material that sloughs from above, and provides a level site where vegetation can become established. Stairs should be wide enough to work with standard earth moving equipment. Stair steps must be on contour or gullies will form on the slope.
- Areas that will be mowed (these areas should have slopes less steep than 3H:1V) may have small furrows left by disking, harrowing, raking, or seed-planting machinery operated on the contour.
- Graded areas with slopes steeper than 3H:1V but less than 2H:1V should be roughened before seeding. This can be accomplished in a variety of ways, including "track walking," or

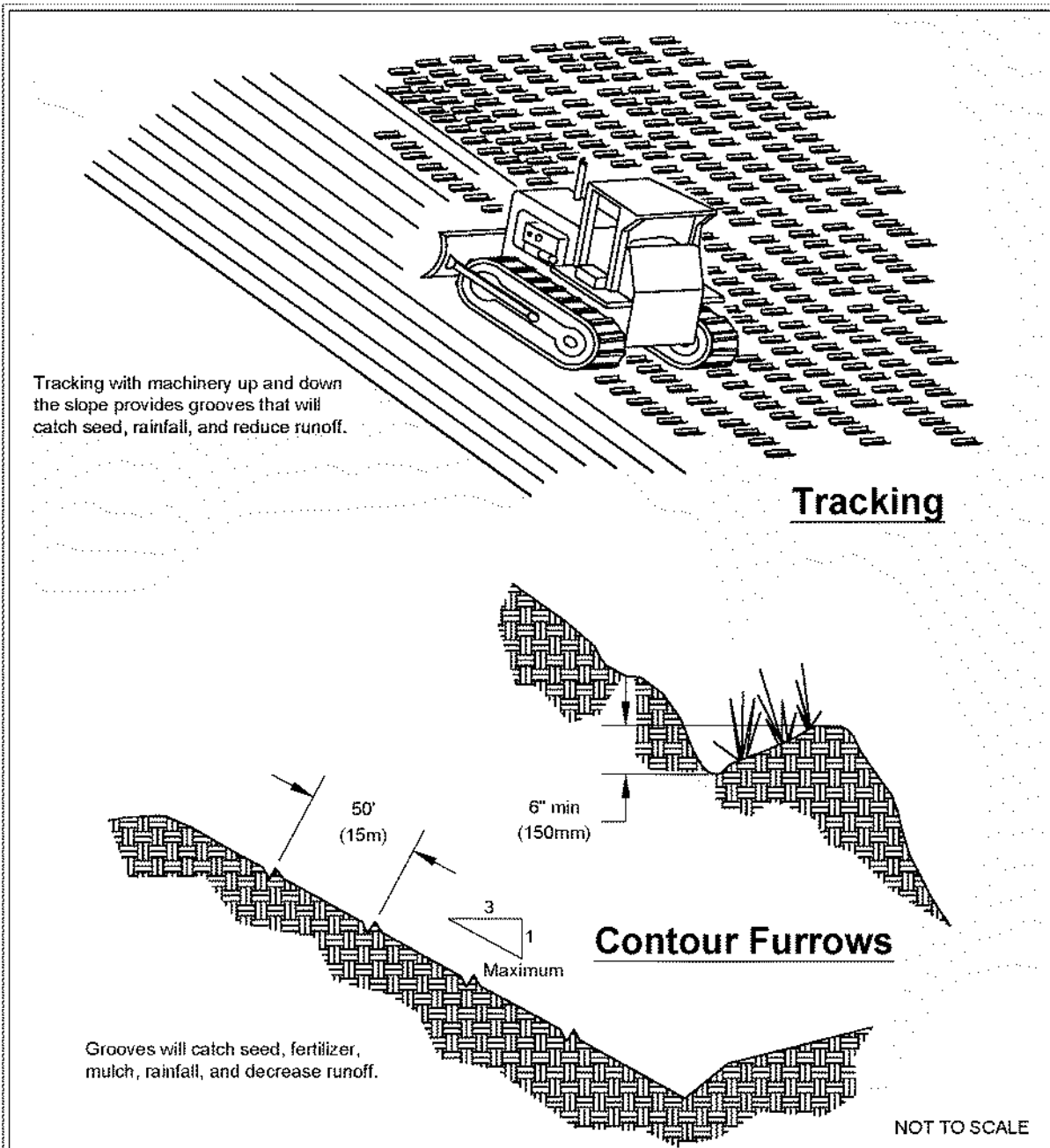
driving a crawler tractor up and down the slope, leaving a pattern of cleat imprints parallel to slope contours.

- Tracking is done by operating equipment up and down the slope to leave horizontal depressions in the soil.

Maintenance Standards

- Areas that are surface roughened should be seeded as quickly as possible.
- Regular inspections should be made of the area. If rills appear, they should be re-roughened and re-seeded immediately.

Figure II-3.5: Surface Roughening by Tracking and Contour Furrows



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Surface Roughening by Tracking and Contour Furrows

Revised June 2016

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BMP C140: Dust Control

Purpose

Dust control prevents wind transport of dust from disturbed soil surfaces onto roadways, drainage ways, and surface waters.

Conditions of Use

Use dust control in areas (including roadways) subject to surface and air movement of dust where on-site or off-site impacts to roadways, drainage ways, or surface waters are likely.

Design and Installation Specifications

- Vegetate or mulch areas that will not receive vehicle traffic. In areas where planting, mulching, or paving is impractical, apply gravel or landscaping rock.
- Limit dust generation by clearing only those areas where immediate activity will take place, leaving the remaining area(s) in the original condition. Maintain the original ground cover as long as practical.
- Construct natural or artificial windbreaks or windscreens. These may be designed as enclosures for small dust sources.
- Sprinkle the site with water until the surface is wet. Repeat as needed. To prevent carryout of mud onto the street, refer to [BMP C105: Stabilized Construction Access](#) and [BMP C106: Wheel Wash](#).
- Irrigation water can be used for dust control. Irrigation systems should be installed as a first step on sites where dust control is a concern.
- Spray exposed soil areas with a dust palliative, following the manufacturer's instructions and cautions regarding handling and application. Used oil is prohibited from use as a dust suppressant. Local governments may approve other dust palliatives such as calcium chloride or PAM.
- PAM ([BMP C126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#)) added to water at a rate of 0.5 pounds per 1,000 gallons of water per acre and applied from a water truck is more effective than water alone. This is due to increased infiltration of water into the soil and reduced evaporation. In addition, small soil particles are bonded together and are not as easily transported by wind. Adding PAM may reduce the quantity of water needed for dust control. Note that the application rate specified here applies to this BMP, and is not the same application rate that is specified in [BMP C126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#), but the downstream protections still apply.

Refer to [BMP C126: Polyacrylamide \(PAM\) for Soil Erosion Protection](#) for conditions of use. PAM shall not be directly applied to water or allowed to enter a water body.

- Contact your local Air Pollution Control Authority for guidance and training on other dust con-

trol measures. Compliance with the local Air Pollution Control Authority constitutes compliance with this BMP.

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

Maintenance Standards

Respray area as necessary to keep dust to a minimum.

BMP C150: Materials on Hand

Purpose

Keep quantities of erosion prevention and sediment control materials on the project site at all times to be used for regular maintenance and emergency situations such as unexpected heavy rains. Having these materials on-site reduces the time needed to replace existing or implement new BMPs when inspections indicate that existing BMPs are not meeting the Construction SWPPP requirements. In addition, contractors can save money by buying some materials in bulk and storing them at their office or yard.

Conditions of Use

- Construction projects of any size or type can benefit from having materials on hand. A small commercial development project could have a roll of plastic and some gravel available for immediate protection of bare soil and temporary berm construction. A large earthwork project, such as highway construction, might have several tons of straw, several rolls of plastic, flexible pipe, sandbags, geotextile fabric and steel “T” posts.
- Materials should be stockpiled and readily available before any site clearing, grubbing, or earthwork begins. A large contractor or project proponent could keep a stockpile of materials that are available for use on several projects.
- If storage space at the project site is at a premium, the contractor could maintain the materials at their office or yard. The office or yard must be less than an hour from the project site.

Design and Installation Specifications

Depending on project type, size, complexity, and length, materials and quantities will vary. A good minimum list of items that will cover numerous situations includes:

- Clear Plastic, 6 mil
- Drainpipe, 6 or 8 inch diameter
- Sandbags, filled
- Straw Bales for mulching
- Quarry Spalls
- Washed Gravel
- Geotextile Fabric
- Catch Basin Inserts
- Steel "T" Posts
- Silt fence material

- Straw Wattles

Maintenance Standards

- All materials with the exception of the quarry spalls, steel “T” posts, and gravel should be kept covered and out of both sun and rain.
- Re-stock materials as needed.

BMP C151: Concrete Handling

Purpose

Concrete work can generate process water and slurry that contain fine particles and high pH, both of which can violate water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate concrete, concrete process water, and concrete slurry from entering waters of the State.

Conditions of Use

Any time concrete is used, utilize these management practices. Concrete construction project components include, but are not limited to:

- Curbs
- Sidewalks
- Roads
- Bridges
- Foundations
- Floors
- Runways

Disposal options for concrete, in order of preference are:

1. Off-site disposal
2. Concrete wash-out areas (see [BMP C154: Concrete Washout Area](#))
3. De minimus washout to formed areas awaiting concrete

Design and Installation Specifications

- Wash concrete truck drums at an approved off-site location or in designated concrete washout areas only. Do not wash out concrete trucks onto the ground (including formed areas awaiting concrete), or into storm drains, open ditches, streets, or streams. Refer to [BMP C154: Concrete Washout Area](#) for information on concrete washout areas.
 - Return unused concrete remaining in the truck and pump to the originating batch plant for recycling. Do not dump excess concrete on site, except in designated concrete washout areas as allowed in [BMP C154: Concrete Washout Area](#).

- Wash small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheelbarrows) into designated concrete washout areas or into formed areas awaiting concrete pour.
- At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow washwater from areas, such as concrete aggregate driveways, to drain directly (without detention or treatment) to natural or constructed stormwater conveyances.
- Contain washwater and leftover product in a lined container when no designated concrete washout areas (or formed areas, allowed as described above) are available. Dispose of contained concrete and concrete washwater (process water) properly.
- Always use forms or solid barriers for concrete pours, such as pilings, within 15-feet of surface waters.
- Refer to [BMP C252: Treating and Disposing of High pH Water](#) for pH adjustment requirements.
- Refer to the Construction Stormwater General Permit (CSWGP) for pH monitoring requirements if the project involves one of the following activities:
 - Significant concrete work (as defined in the CSWGP).
 - The use of soils amended with (but not limited to) Portland cement-treated base, cement kiln dust or fly ash.
 - Discharging stormwater to segments of water bodies on the 303(d) list (Category 5) for high pH.

Maintenance Standards

Check containers for holes in the liner daily during concrete pours and repair the same day.

BMP C152: Sawcutting and Surfacing Pollution Prevention

Purpose

Sawcutting and surfacing operations generate slurry and process water that contains fine particles and high pH (concrete cutting), both of which can violate the water quality standards in the receiving water. Concrete spillage or concrete discharge to waters of the State is prohibited. Use this BMP to minimize and eliminate process water and slurry created through sawcutting or surfacing from entering waters of the State.

Conditions of Use

Utilize these management practices anytime sawcutting or surfacing operations take place. Sawcutting and surfacing operations include, but are not limited to:

- Sawing
- Coring
- Grinding
- Roughening
- Hydro-demolition
- Bridge and road surfacing

Design and Installation Specifications

- Vacuum slurry and cuttings during cutting and surfacing operations.
- Slurry and cuttings shall not remain on permanent concrete or asphalt pavement overnight.
- Slurry and cuttings shall not drain to any natural or constructed drainage conveyance including stormwater systems. This may require temporarily blocking catch basins.
- Dispose of collected slurry and cuttings in a manner that does not violate ground water or surface water quality standards.
- Do not allow process water generated during hydro-demolition, surface roughening or similar operations to drain to any natural or constructed drainage conveyance including stormwater systems. Dispose of process water in a manner that does not violate ground water or surface water quality standards.
- Handle and dispose of cleaning waste material and demolition debris in a manner that does not cause contamination of water. Dispose of sweeping material from a pick-up sweeper at an appropriate disposal site.

Maintenance Standards

Continually monitor operations to determine whether slurry, cuttings, or process water could enter waters of the state. If inspections show that a violation of water quality standards could occur, stop operations and immediately implement preventive measures such as berms, barriers, secondary containment, and/or vacuumtrucks.

BMP C153: Material Delivery, Storage, and Containment

Purpose

Prevent, reduce, or eliminate the discharge of pollutants to the stormwater system or watercourses from material delivery and storage. Minimize the storage of hazardous materials on-site, store materials in a designated area, and install secondary containment.

Conditions of Use

Use at construction sites with delivery and storage of the following materials:

- Petroleum products such as fuel, oil and grease
- Soil stabilizers and binders (e.g., Polyacrylamide)
- Fertilizers, pesticides and herbicides
- Detergents
- Asphalt and concrete compounds
- Hazardous chemicals such as acids, lime, adhesives, paints, solvents, and curing compounds
- Any other material that may be detrimental if released to the environment

Design and Installation Specifications

- The temporary storage area should be located away from vehicular traffic, near the construction entrance(s), and away from waterways or storm drains.
- Safety Data Sheets (SDS) should be supplied for all materials stored. Chemicals should be kept in their original labeled containers.
- Hazardous material storage on-site should be minimized.
- Hazardous materials should be handled as infrequently as possible.
- During the wet weather season (Oct 1 – April 30), consider storing materials in a covered area.
- Materials should be stored in secondary containments, such as an earthen dike, horse trough, or even a children's wading pool for non-reactive materials such as detergents, oil, grease, and paints. Small amounts of material may be secondarily contained in "bus boy" trays or concrete mixing trays.

- Do not store chemicals, drums, or bagged materials directly on the ground. Place these items on a pallet and, when possible, within secondary containment.
- If drums must be kept uncovered, store them at a slight angle to reduce ponding of rainwater on the lids to reduce corrosion. Domed plastic covers are inexpensive and snap to the top of drums, preventing water from collecting.
- Liquids, petroleum products, and substances listed in 40 CFR Parts 110, 117, or 302 shall be stored in approved containers and drums and shall not be overfilled. Containers and drums shall be stored in temporary secondary containment facilities.
- Temporary secondary containment facilities shall provide for a spill containment volume able to contain 10% of the total enclosed container volume of all containers, or 110% of the capacity of the largest container within its boundary, whichever is greater.
- Secondary containment facilities shall be impervious to the materials stored therein for a minimum contact time of 72 hours.
- Sufficient separation should be provided between stored containers to allow for spill cleanup and emergency response access.
- During the wet weather season (Oct 1 – April 30), each secondary containment facility shall be covered during non-working days, prior to and during rain events.
- Keep material storage areas clean, organized and equipped with an ample supply of appropriate spill clean-up material (spill kit).
- The spill kit should include, at a minimum:
 - 1-Water Resistant Nylon Bag
 - 3-Oil Absorbent Socks 3"x 4'
 - 2-Oil Absorbent Socks 3"x 10'
 - 12-Oil Absorbent Pads 17"x19"
 - 1-Pair Splash Resistant Goggles
 - 3-Pair Nitrile Gloves
 - 10-Disposable Bags with Ties
 - Instructions

Maintenance Standards

- Secondary containment facilities shall be maintained free of accumulated rainwater and spills. In the event of spills or leaks, accumulated rainwater and spills shall be collected and placed into drums. These liquids shall be handled as hazardous waste unless testing determines them to be non-hazardous.
- Re-stock spill kit materials as needed.

BMP C154: Concrete Washout Area

Purpose

Prevent or reduce the discharge of pollutants from concrete waste to stormwater by conducting washout off-site, or performing on-site washout in a designated area.

Conditions of Use

Concrete washout areas are implemented on construction projects where:

- Concrete is used as a construction material
- It is not possible to dispose of all concrete wastewater and washout off-site (ready mix plant, etc.).
- Concrete truck drums are washed on-site.

Note that auxiliary concrete truck components (e.g. chutes and hoses) and small concrete handling equipment (e.g. hand tools, screeds, shovels, rakes, floats, trowels, and wheel- barrows) may be washed into formed areas awaiting concrete pour.

At no time shall concrete be washed off into the footprint of an area where an infiltration feature will be installed.

Design and Installation Specifications

Implementation

- Perform washout of concrete truck drums at an approved off-site location or in designated concrete washout areas only.
- Do not wash out concrete onto non-formed areas, or into storm drains, open ditches, streets, or streams.
- Wash equipment difficult to move, such as concrete paving machines, in areas that do not directly drain to natural or constructed stormwater conveyance or potential infiltration areas.
- Do not allow excess concrete to be dumped on-site, except in designated concrete washout areas as allowed above.
- Concrete washout areas may be prefabricated concrete washout containers, or self-installed structures (above-grade or below-grade).
- Prefabricated containers are most resistant to damage and protect against spills and leaks. Companies may offer delivery service and provide regular maintenance and disposal of solid and liquid waste.
- If self-installed concrete washout areas are used, below-grade structures are preferred over

above-grade structures because they are less prone to spills and leaks.

- Self-installed above-grade structures should only be used if excavation is not practical.
- Concrete washout areas shall be constructed and maintained in sufficient quantity and size to contain all liquid and concrete waste generated by washout operations.

Education

- Discuss the concrete management techniques described in this BMP with the ready-mix concrete supplier before any deliveries are made.
- Educate employees and subcontractors on the concrete waste management techniques described in this BMP.
- Arrange for the contractor's superintendent or Certified Erosion and Sediment Control Lead (CESCL) to oversee and enforce concrete waste management procedures.
- A sign should be installed adjacent to each concrete washout area to inform concrete equipment operators to utilize the proper facilities.

Contracts

Incorporate requirements for concrete waste management into concrete supplier and subcontractor agreements.

Location and Placement

- Locate concrete washout areas at least 50 feet from sensitive areas such as storm drains, open ditches, water bodies, or wetlands.
- Allow convenient access to the concrete washout area for concrete trucks, preferably near the area where the concrete is being poured.
- If trucks need to leave a paved area to access the concrete washout area, prevent track-out with a pad of rock or quarry spalls (see [BMP C105: Stabilized Construction Access](#)). These areas should be far enough away from other construction traffic to reduce the likelihood of accidental damage and spills.
- The number of concrete washout areas you install should depend on the expected demand for storage capacity.
- On large sites with extensive concrete work, concrete washout areas should be placed in multiple locations for ease of use by concrete truck drivers.

Concrete Truck Washout Procedures

- Washout of concrete truck drums shall be performed in designated concrete washout areas only.

- Concrete washout from concrete pumper bins can be washed into concrete pumper trucks and discharged into designated concrete washout areas or properly disposed of off-site.

Concrete Washout Area Installation

- Concrete washout areas should be constructed as shown in the figures below, with a recommended minimum length and minimum width of 10 ft, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations.
- Plastic lining material should be a minimum of 10 mil polyethylene sheeting and should be free of holes, tears, or other defects that compromise the impermeability of the material.
- Lath and flagging should be commercial type.
- Liner seams shall be installed in accordance with manufacturers' recommendations.
- Soil base shall be prepared free of rocks or other debris that may cause tears or holes in the plastic lining material.

Maintenance Standards

Inspection and Maintenance

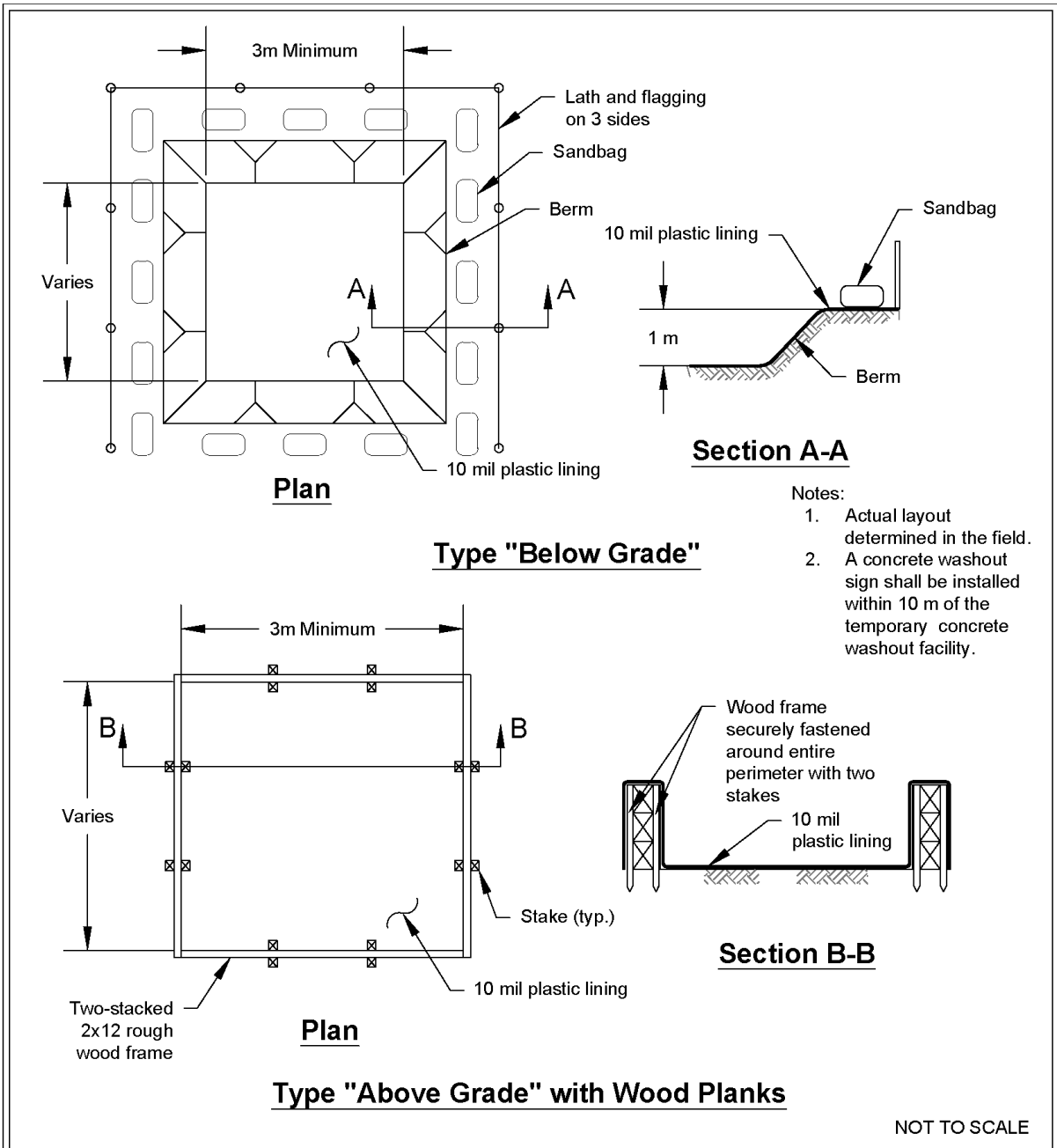
- Inspect and verify that concrete washout areas are in place prior to the commencement of concrete work.
- Once concrete wastes are washed into the designated washout area and allowed to harden, the concrete should be broken up, removed, and disposed of per applicable solid waste regulations. Dispose of hardened concrete on a regular basis.
- During periods of concrete work, inspect the concrete washout areas daily to verify continued performance.
 - Check overall condition and performance.
 - Check remaining capacity (% full).
 - If using self-installed concrete washout areas, verify plastic liners are intact and side-walls are not damaged.
 - If using prefabricated containers, check for leaks.
- Maintain the concrete washout areas to provide adequate holding capacity with a minimum freeboard of 12 inches.
- Concrete washout areas must be cleaned, or new concrete washout areas must be constructed and ready for use once the concrete washout area is 75% full.
- If the concrete washout area is nearing capacity, vacuum and dispose of the waste material in an approved manner.
 - Do not discharge liquid or slurry to waterways, storm drains or directly onto ground.

- Do not discharge to the sanitary sewer without local approval.
- Place a secure, non-collapsing, non-water collecting cover over the concrete washout area prior to predicted wet weather to prevent accumulation and overflow of precipitation.
- Remove and dispose of hardened concrete and return the structure to a functional condition. Concrete may be reused on-site or hauled away for disposal or recycling.
- When you remove materials from a self-installed concrete washout area, build a new structure; or, if the previous structure is still intact, inspect for signs of weakening or damage, and make any necessary repairs. Re-line the structure with new plastic after each cleaning.

Removal of Concrete Washout Areas

- When concrete washout areas are no longer required for the work, the hardened concrete, slurries and liquids shall be removed and properly disposed of.
- Materials used to construct concrete washout areas shall be removed from the site of the work and disposed of or recycled.
- Holes, depressions or other ground disturbance caused by the removal of the concrete washout areas shall be backfilled, repaired, and stabilized to prevent erosion.

Figure II-3.7: Concrete Washout Area with Wood Planks

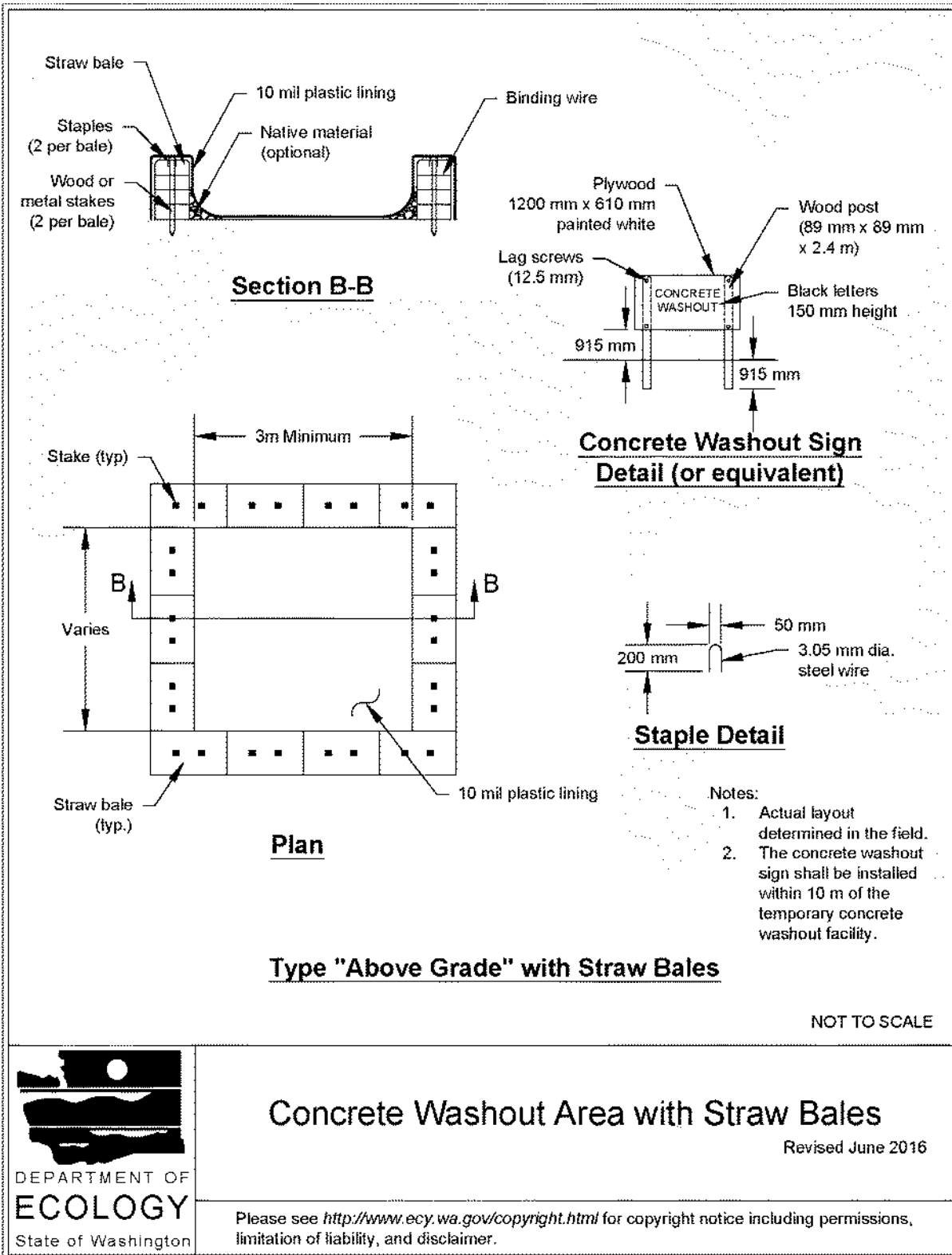


Concrete Washout Area with Wood Planks

Revised June 2016

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Figure II-3.8: Concrete Washout Area with Straw Bales

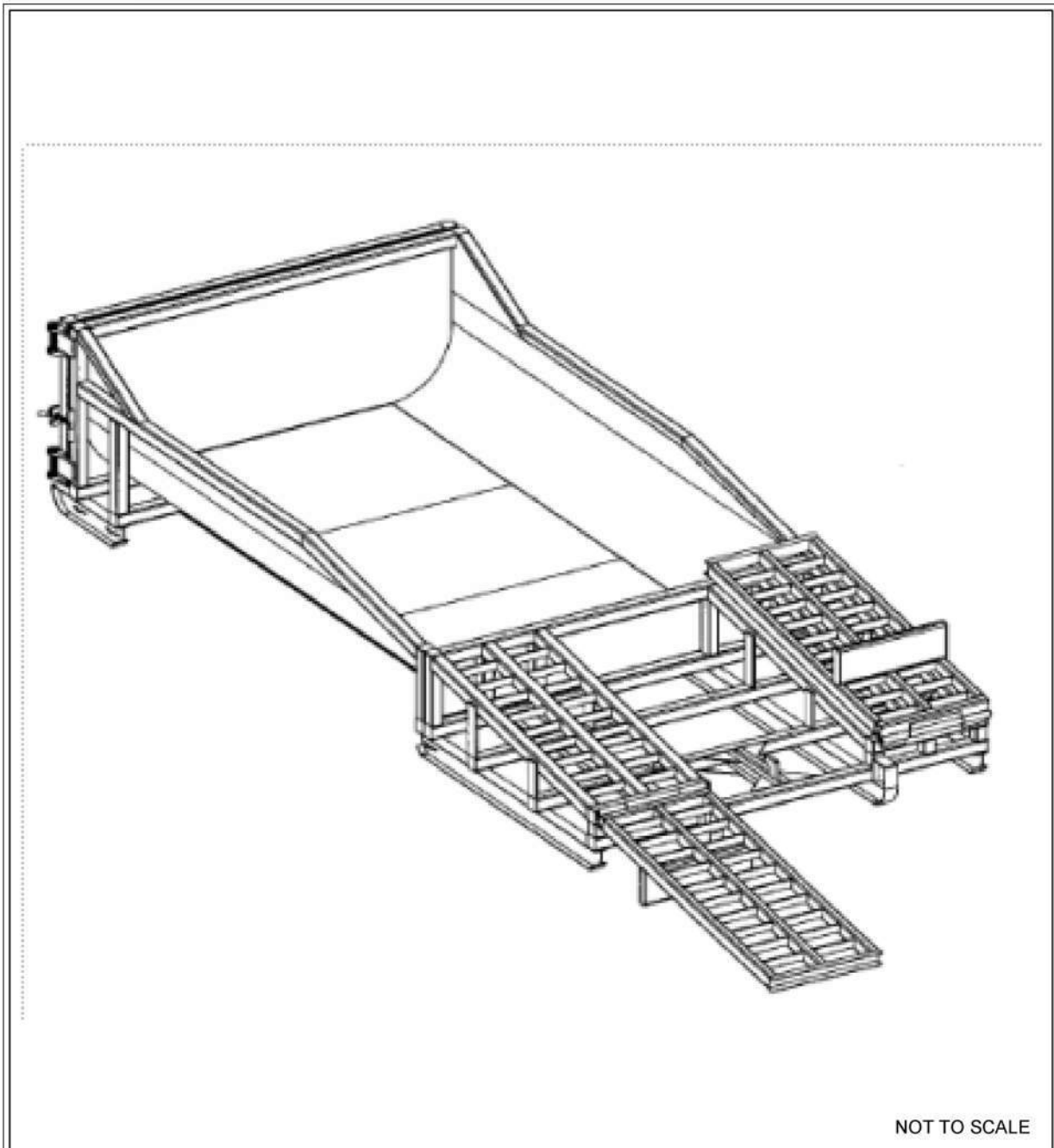


Concrete Washout Area with Straw Bales

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Figure II-3.9: Prefabricated Concrete Washout Container w/Ramp



Prefabricated Concrete Washout Container w/Ramp

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BMP C160: Certified Erosion and Sediment Control Lead

Purpose

The project proponent designates at least one person as the responsible representative in charge of erosion and sediment control (ESC), and water quality protection. The designated person shall be responsible for ensuring compliance with all local, state, and federal erosion and sediment control and water quality requirements. Construction sites one acre or larger that discharge to waters of the State must designate a Certified Erosion and Sediment Control Lead (CESCL) as the responsible representative.

Conditions of Use

A CESCL shall be made available on projects one acre or larger that discharge stormwater to surface waters of the state. Sites less than one acre may have a person without CESCL certification conduct inspections.

The CESCL shall:

- Have a current certificate proving attendance in an erosion and sediment control training course that meets the minimum ESC training and certification requirements established by Ecology.

Ecology has provided the minimum requirements for CESCL course training, as well as a list of ESC training and certification providers at:

<https://ecology.wa.gov/Regulations-Permits/Permits-certifications/Certified-erosion-sediment-control>

OR

- Be a Certified Professional in Erosion and Sediment Control (CPESC). For additional information go to:

<http://www.envirocertintl.org/cpesc/>

Specifications

- CESCL certification shall remain valid for three years.
- The CESCL shall have authority to act on behalf of the contractor or project proponent and shall be available, or on-call, 24 hours per day throughout the period of construction.
- The Construction SWPPP shall include the name, telephone number, fax number, and address of the designated CESCL. See [II-2 Construction Stormwater Pollution Prevention Plans \(Construction SWPPPs\)](#).
- A CESCL may provide inspection and compliance services for multiple construction projects

SWPPP

in the same geographic region, but must be on site whenever earthwork activities are occurring that could generate release of turbid water.

- Duties and responsibilities of the CESCL shall include, but are not limited to the following:
 - Maintaining a permit file on site at all times which includes the Construction SWPPP and any associated permits and plans.
 - Directing BMP installation, inspection, maintenance, modification, and removal.
 - Updating all project drawings and the Construction SWPPP with changes made.
 - Completing any sampling requirements including reporting results using electronic Discharge Monitoring Reports (WebDMR).
 - Facilitate, participate in, and take corrective actions resulting from inspections performed by outside agencies or the owner.
 - Keeping daily logs, and inspection reports. Inspection reports should include:
 - Inspection date/time.
 - Weather information; general conditions during inspection and approximate amount of precipitation since the last inspection.
 - Visual monitoring results, including a description of discharged stormwater. The presence of suspended sediment, turbid water, discoloration, and oil sheen shall be noted, as applicable.
 - Any water quality monitoring performed during inspection.
 - General comments and notes, including a brief description of any BMP repairs, maintenance or installations made as a result of the inspection.
 - A summary or list of all BMPs implemented, including observations of all erosion/sediment control structures or practices. The following shall be noted:
 1. Locations of BMPs inspected.
 2. Locations of BMPs that need maintenance.
 3. Locations of BMPs that failed to operate as designed or intended.
 4. Locations of where additional or different BMPs are required.

BMP C220: Inlet Protection

Purpose

Inlet protection prevents coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.

Conditions of Use

Use inlet protection at inlets that are operational before permanent stabilization of the disturbed areas that contribute runoff to the inlet. Provide protection for all storm drain inlets downslope and within 500 feet of a disturbed or construction area, unless those inlets are preceded by a sediment trapping BMP.

Also consider inlet protection for lawn and yard drains on new home construction. These small and numerous drains coupled with lack of gutters can add significant amounts of sediment into the roof drain system. If possible, delay installing lawn and yard drains until just before landscaping, or cap these drains to prevent sediment from entering the system until completion of landscaping. Provide 18-inches of sod around each finished lawn and yard drain.

[Table II-3.10: Storm Drain Inlet Protection](#) lists several options for inlet protection. All of the methods for inlet protection tend to plug and require a high frequency of maintenance. Limit contributing drainage areas for an individual inlet to one acre or less. If possible, provide emergency overflows with additional end-of-pipe treatment where stormwater ponding would cause a hazard.

Table II-3.10: Storm Drain Inlet Protection

Type of Inlet Protection	Emergency Overflow	Applicable for Paved/ Earthen Surfaces	Conditions of Use
Drop Inlet Protection			
Excavated drop inlet protection	Yes, temporary flooding may occur	Earthen	Applicable for heavy flows. Easy to maintain. Large area requirement: 30'x30'/acre
Block and gravel drop inlet protection	Yes	Paved or Earthen	Applicable for heavy concentrated flows. Will not pond.
Gravel and wire drop inlet protection	No	Paved or Earthen	Applicable for heavy concentrated flows. Will pond. Can withstand traffic.
Catch basin filters	Yes	Paved or Earthen	Frequent maintenance required.
Curb Inlet Protection			
Curb inlet protection with wooden weir	Small capacity overflow	Paved	Used for sturdy, more compact installation.
Block and gravel curb inlet protection	Yes	Paved	Sturdy, but limited filtration.
Culvert Inlet Protection			
Culvert inlet sediment trap	N/A	N/A	18 month expected life.

Design and Installation Specifications

Excavated Drop Inlet Protection

Excavated drop inlet protection consists of an excavated impoundment around the storm drain inlet. Sediment settles out of the stormwater prior to entering the storm drain. Design and installation specifications for excavated drop inlet protection include:

- Provide a depth of 1-2 ft as measured from the crest of the inlet structure.
- Slope sides of excavation should be no steeper than 2H:1V.
- Minimum volume of excavation is 35 cubic yards.
- Shape the excavation to fit the site, with the longest dimension oriented toward the longest inflow area.
- Install provisions for draining to prevent standing water.

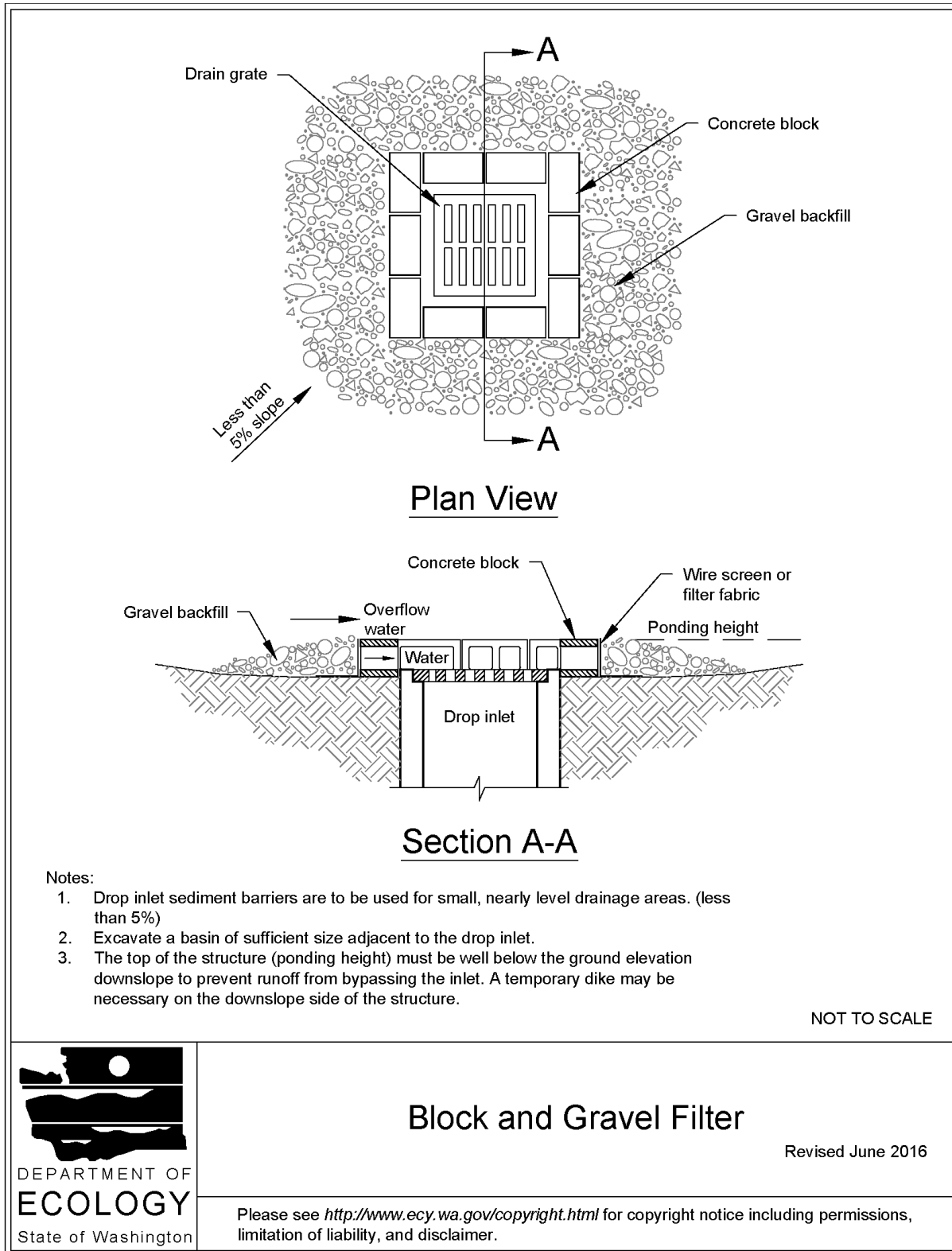
- Clear the area of all debris.
- Grade the approach to the inlet uniformly.
- Drill weep holes into the side of the inlet.
- Protect weep holes with screen wire and washed aggregate.
- Seal weep holes when removing structure and stabilizing area.
- Build a temporary dike, if necessary, to the down slope side of the structure to prevent bypass flow.

Block and Gravel Filter

A block and gravel filter is a barrier formed around the inlet with standard concrete blocks and gravel. See [Figure II-3.17: Block and Gravel Filter](#). Design and installation specifications for block gravel filters include:

- Provide a height of 1 to 2 feet above the inlet.
- Recess the first row of blocks 2-inches into the ground for stability.
- Support subsequent courses by placing a pressure treated wood 2x4 through the block opening.
- Do not use mortar.
- Lay some blocks in the bottom row on their side to allow for dewatering the pool.
- Place hardware cloth or comparable wire mesh with ½-inch openings over all block openings.
- Place gravel to just below the top of blocks on slopes of 2H:1V or flatter.
- An alternative design is a gravel berm surrounding the inlet, as follows:
 - Provide a slope of 3H:1V on the upstream side of the berm.
 - Provide a slope of 2H:1V on the downstream side of the berm.
 - Provide a 1-foot wide level stone area between the gravel berm and the inlet.
 - Use stones 3 inches in diameter or larger on the upstream slope of the berm.
 - Use gravel ½- to ¾-inch at a minimum thickness of 1-foot on the downstream slope of the berm.

Figure II-3.17: Block and Gravel Filter



Gravel and Wire Mesh Filter

Gravel and wire mesh filters are gravel barriers placed over the top of the inlet. This method does not provide an overflow. Design and installation specifications for gravel and wire mesh filters include:

- Use a hardware cloth or comparable wire mesh with ½-inch openings.
 - Place wire mesh over the drop inlet so that the wire extends a minimum of 1-foot beyond each side of the inlet structure.
 - Overlap the strips if more than one strip of mesh is necessary.
- Place coarse aggregate over the wire mesh.
 - Provide at least a 12-inch depth of aggregate over the entire inlet opening and extend at least 18-inches on all sides.

Catch Basin Filters

Catch basin filters are designed by manufacturers for construction sites. The limited sediment storage capacity increases the amount of inspection and maintenance required, which may be daily for heavy sediment loads. To reduce maintenance requirements, combine a catch basin filter with another type of inlet protection. This type of inlet protection provides flow bypass without overflow and therefore may be a better method for inlets located along active rights-of-way. Design and installation specifications for catch basin filters include:

- Provides 5 cubic feet of storage.
- Requires dewatering provisions.
- Provides a high-flow bypass that will not clog under normal use at a construction site.
- Insert the catch basin filter in the catch basin just below the grating.

Curb Inlet Protection with Wooden Weir

Curb inlet protection with wooden weir is an option that consists of a barrier formed around a curb inlet with a wooden frame and gravel. Design and installation specifications for curb inlet protection with wooden weirs include:

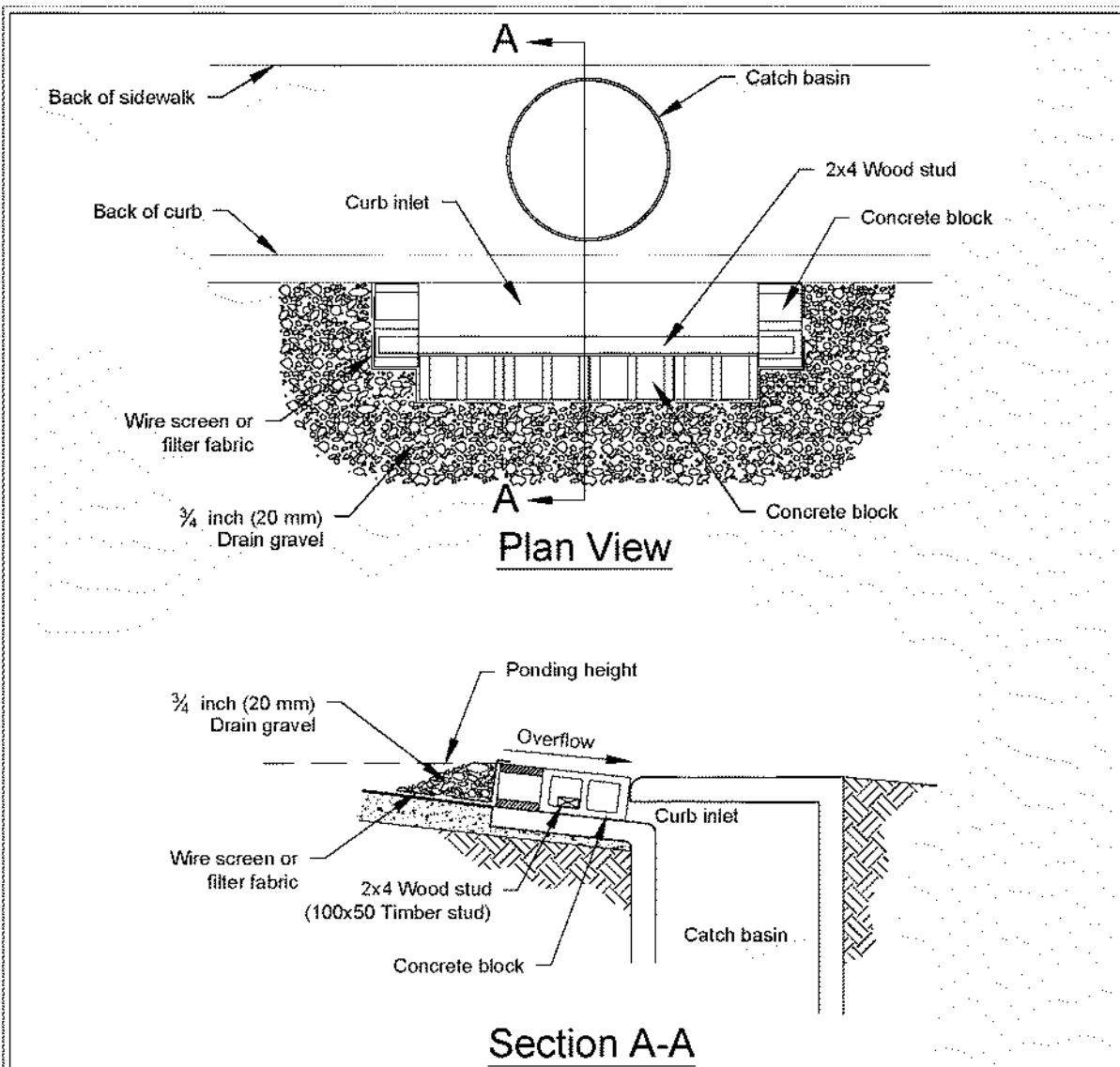
- Use wire mesh with ½-inch openings.
- Use extra strength filter cloth.
- Construct a frame.
- Attach the wire and filter fabric to the frame.
- Pile coarse washed aggregate against the wire and fabric.
- Place weight on the frame anchors.

Block and Gravel Curb Inlet Protection

Block and gravel curb inlet protection is a barrier formed around a curb inlet with concrete blocks and gravel. See [Figure II-3.18: Block and Gravel Curb Inlet Protection](#). Design and installation specifications for block and gravel curb inlet protection include:

- Use wire mesh with ½-inch openings.
- Place two concrete blocks on their sides abutting the curb at either side of the inlet opening. These are spacer blocks.
- Place a 2x4 stud through the outer holes of each spacer block to align the front blocks.
- Place blocks on their sides across the front of the inlet and abutting the spacer blocks.
- Place wire mesh over the outside vertical face.
- Pile coarse aggregate against the wire to the top of the barrier.

Figure II-3.18: Block and Gravel Curb Inlet Protection



Notes:

1. Use block and gravel type sediment barrier when curb inlet is located in gently sloping street segment, where water can pond and allow sediment to separate from runoff.
2. Barrier shall allow for overflow from severe storm event.
3. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE



Block and Gravel Curb Inlet Protection

Revised June 2016

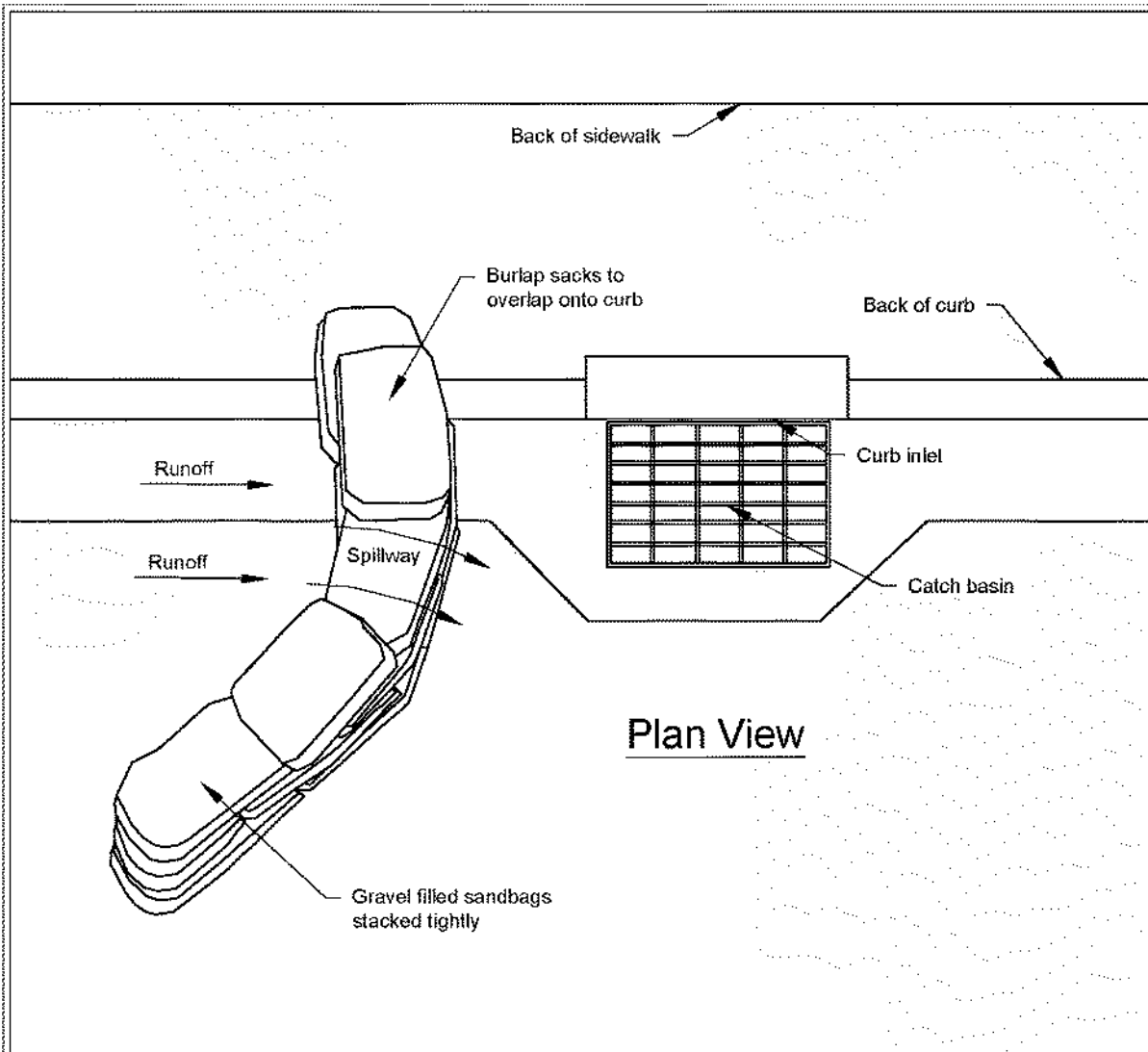
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Curb and Gutter Sediment Barrier

Curb and gutter sediment barrier is a sandbag or rock berm (riprap and aggregate) 3 feet high and 3 feet wide in a horseshoe shape. See [Figure II-3.19: Curb and Gutter Barrier](#). Design and installation specifications for curb and gutter sediment barrier include:

- Construct a horseshoe shaped berm, faced with coarse aggregate if using riprap, 3 feet high and 3 feet wide, at least 2 feet from the inlet.
- Construct a horseshoe shaped sedimentation trap on the upstream side of the berm. Size the trap to sediment trap standards for protecting a culvert inlet.

Figure II-3.19: Curb and Gutter Barrier



Notes:

1. Place curb type sediment barriers on gently sloping street segments, where water can pond and allow sediment to separate from runoff.
2. Sandbags of either burlap or woven 'geotextile' fabric, are filled with gravel, layered and packed tightly.
3. Leave a one sandbag gap in the top row to provide a spillway for overflow.
4. Inspect barriers and remove sediment after each storm event. Sediment and gravel must be removed from the traveled way immediately.

NOT TO SCALE



Curb and Gutter Barrier

Revised June 2016

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Maintenance Standards

- Inspect all forms of inlet protection frequently, especially after storm events. Clean and replace clogged catch basin filters. For rock and gravel filters, pull away the rocks from the inlet and clean or replace. An alternative approach would be to use the clogged rock as fill and put fresh rock around the inlet.
- Do not wash sediment into storm drains while cleaning. Spread all excavated material evenly over the surrounding land area or stockpile and stabilize as appropriate.

Approved as Functionally Equivalent

Ecology has approved products as able to meet the requirements of this BMP. The products did not pass through the Technology Assessment Protocol – Ecology (TAPE) process. Local jurisdictions may choose not to accept these products, or may require additional testing prior to consideration for local use. Products that Ecology has approved as functionally equivalent are available for review on Ecology's website at:

<https://ecology.wa.gov/Regulations-Permits/Guidance-technical-assistance/Stormwater-permittee-guidance-resources/Emerging-stormwater-treatment-technologies>

BMP C233: Silt Fence

Purpose

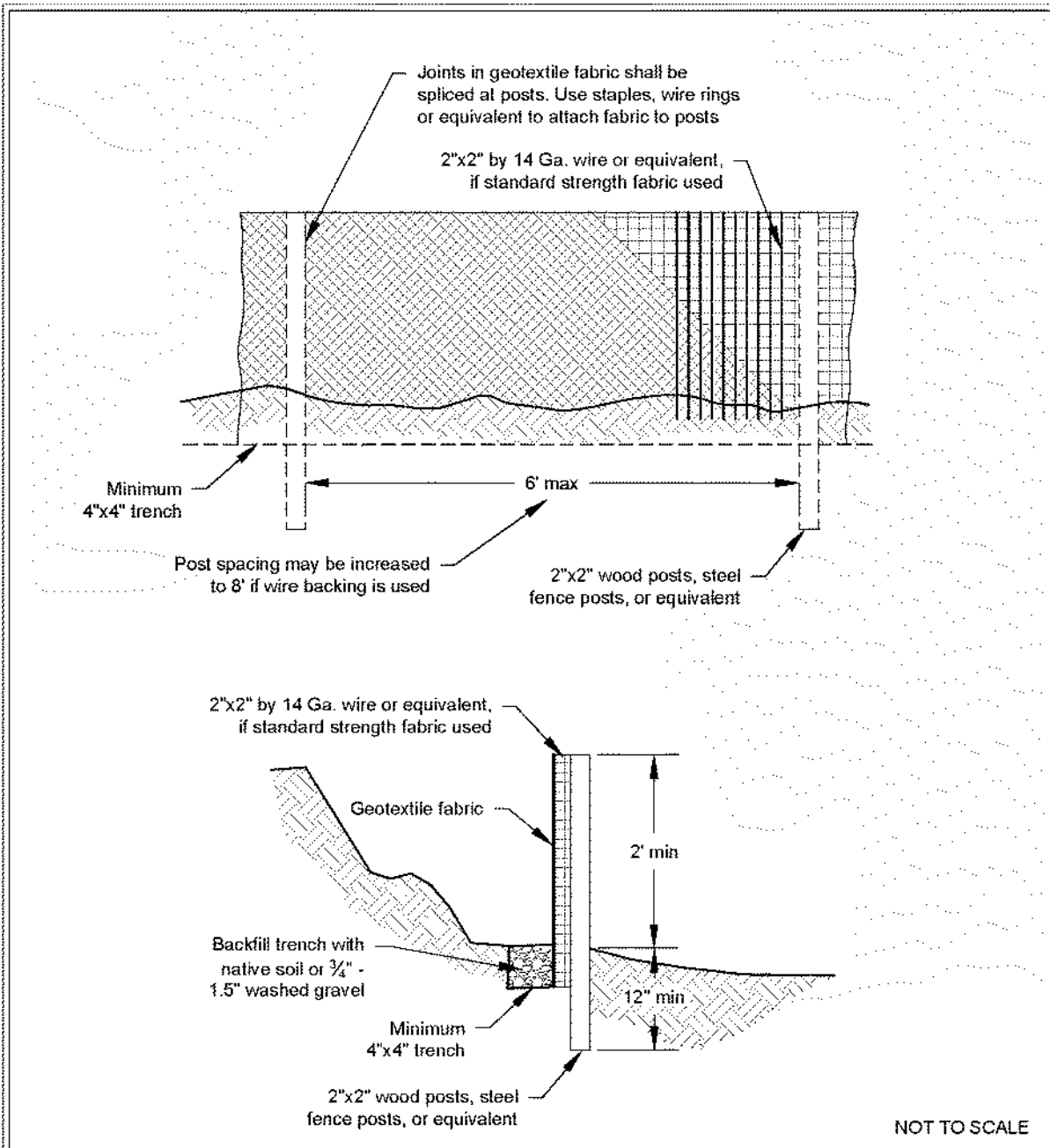
Silt fence reduces the transport of coarse sediment from a construction site by providing a temporary physical barrier to sediment and reducing the runoff velocities of overland flow.

Conditions of Use

Silt fence may be used downslope of all disturbed areas.

- Silt fence shall prevent sediment carried by runoff from going beneath, through, or over the top of the silt fence, but shall allow the water to pass through the fence.
- Silt fence is not intended to treat concentrated flows, nor is it intended to treat substantial amounts of overland flow. Convey any concentrated flows through the drainage system to a sediment trapping BMP.
- Do not construct silt fences in streams or use in V-shaped ditches. Silt fences do not provide an adequate method of silt control for anything deeper than sheet or overland flow.

Figure II-3.22: Silt Fence



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Silt Fence

Revised July 2017

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Design and Installation Specifications

- Use in combination with other construction stormwater BMPs.
- Maximum slope steepness (perpendicular to the silt fence line) 1H:1V.
- Maximum sheet or overland flow path length to the silt fence of 100 feet.
- Do not allow flows greater than 0.5 cfs.
- Use geotextile fabric that meets the following standards. All geotextile properties listed below are minimum average roll values (i.e., the test result for any sampled roll in a lot shall meet or exceed the values shown in [Table II-3.11: Geotextile Fabric Standards for Silt Fence](#)):

Table II-3.11: Geotextile Fabric Standards for Silt Fence

Geotextile Property	Minimum Average Roll Value
Polymeric Mesh AOS (ASTM D4751)	0.60 mm maximum for slit film woven (#30 sieve). 0.30 mm maximum for all other geotextile types (#50 sieve). 0.15 mm minimum for all fabric types (#100 sieve).
Water Permittivity (ASTM D4491)	0.02 sec ⁻¹ minimum
Grab Tensile Strength (ASTM D4632)	180 lbs. Minimum for extra strength fabric. 100 lbs minimum for standard strength fabric.
Grab Tensile Strength (ASTM D4632)	30% maximum
Ultraviolet Resistance (ASTM D4355)	70% minimum

- Support standard strength geotextiles with wire mesh, chicken wire, 2-inch x 2-inch wire, safety fence, or jute mesh to increase the strength of the geotextile. Silt fence materials are available that have synthetic mesh backing attached.
- Silt fence material shall contain ultraviolet ray inhibitors and stabilizers to provide a minimum of six months of expected usable construction life at a temperature range of 0°F to 120°F.
- One-hundred percent biodegradable silt fence is available that is strong, long lasting, and can be left in place after the project is completed, if permitted by the local jurisdiction.
- Refer to [Figure II-3.22: Silt Fence](#) for standard silt fence details. Include the following Standard Notes for silt fence on construction plans and specifications:
 1. The Contractor shall install and maintain temporary silt fences at the locations shown in the Plans.
 2. Construct silt fences in areas of clearing, grading, or drainage prior to starting those

activities.

3. The silt fence shall have a 2-foot min. and a 2½-foot max. height above the original ground surface.
4. The geotextile fabric shall be sewn together at the point of manufacture to form fabric lengths as required. Locate all sewn seams at support posts. Alternatively, two sections of silt fence can be overlapped, provided that the overlap is long enough and that the adjacent silt fence sections are close enough together to prevent silt laden water from escaping through the fence at the overlap.
5. Attach the geotextile fabric on the up-slope side of the posts and secure with staples, wire, or in accordance with the manufacturer's recommendations. Attach the geotextile fabric to the posts in a manner that reduces the potential for tearing.
6. Support the geotextile fabric with wire or plastic mesh, dependent on the properties of the geotextile selected for use. If wire or plastic mesh is used, fasten the mesh securely to the up-slope side of the posts with the geotextile fabric up-slope of the mesh.
7. Mesh support, if used, shall consist of steel wire with a maximum mesh spacing of 2-inches, or a prefabricated polymeric mesh. The strength of the wire or polymeric mesh shall be equivalent to or greater than 180 lbs. grab tensile strength. The polymeric mesh must be as resistant to the same level of ultraviolet radiation as the geotextile fabric it supports.
8. Bury the bottom of the geotextile fabric 4-inches min. below the ground surface. Backfill and tamp soil in place over the buried portion of the geotextile fabric, so that no flow can pass beneath the silt fence and scouring cannot occur. When wire or polymeric back-up support mesh is used, the wire or polymeric mesh shall extend into the ground 3-inches min.
9. Drive or place the silt fence posts into the ground 18-inches min. A 12-inch min. depth is allowed if topsoil or other soft subgrade soil is not present and 18-inches cannot be reached. Increase fence post min. depths by 6 inches if the fence is located on slopes of 3H:1V or steeper and the slope is perpendicular to the fence. If required post depths cannot be obtained, the posts shall be adequately secured by bracing or guying to prevent overturning of the fence due to sediment loading.
10. Use wood, steel or equivalent posts. The spacing of the support posts shall be a maximum of 6-feet. Posts shall consist of either:
 - Wood with minimum dimensions of 2 inches by 2 inches by 3 feet. Wood shall be free of defects such as knots, splits, or gouges.
 - No. 6 steel rebar or larger.
 - ASTM A 120 steel pipe with a minimum diameter of 1-inch.
 - U, T, L, or C shape steel posts with a minimum weight of 1.35 lbs./ft.
 - Other steel posts having equivalent strength and bending resistance to the post

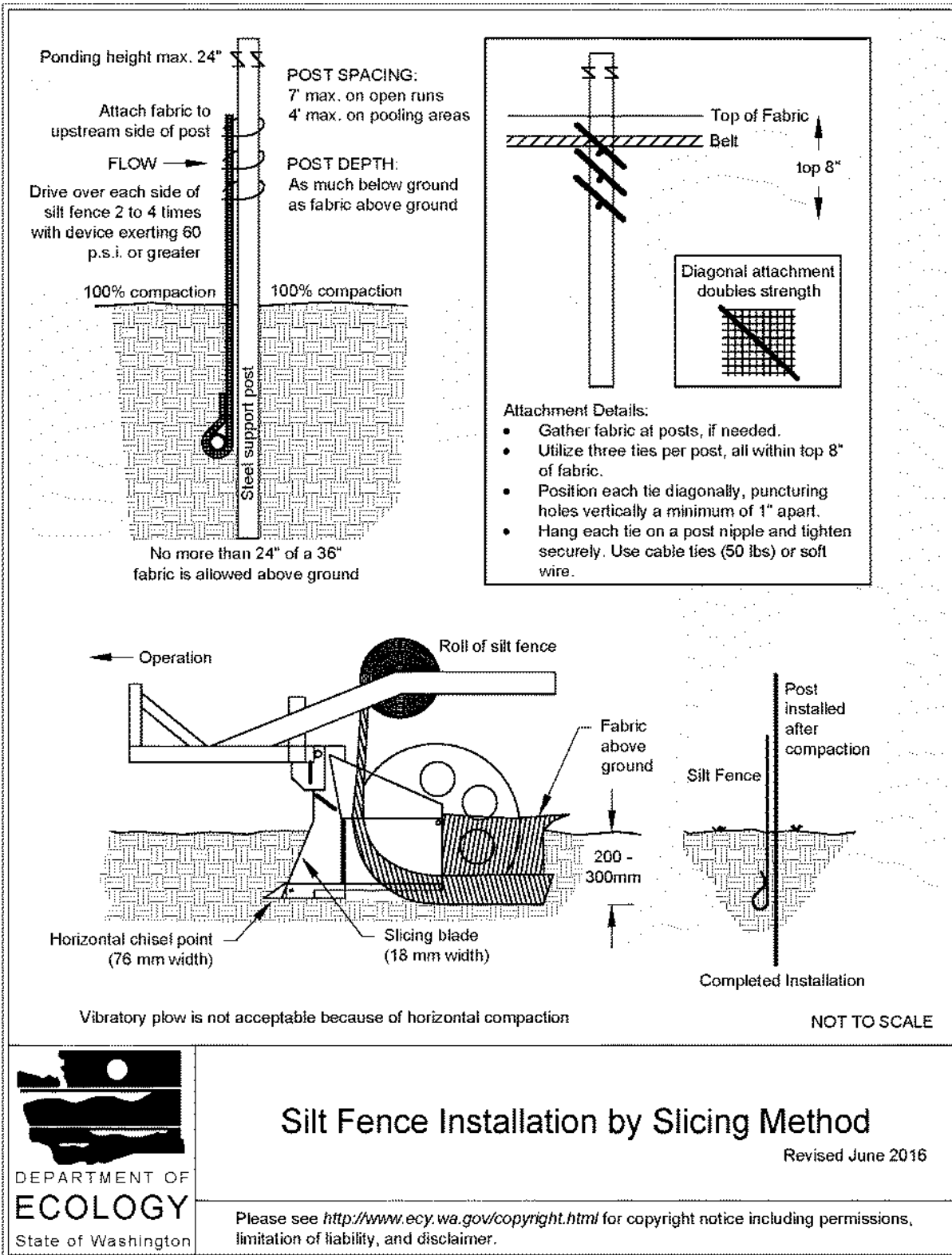
sizes listed above.

11. Locate silt fences on contour as much as possible, except at the ends of the fence, where the fence shall be turned uphill such that the silt fence captures the runoff water and prevents water from flowing around the end of the fence.

12. If the fence must cross contours, with the exception of the ends of the fence, place check dams perpendicular to the back of the fence to minimize concentrated flow and erosion. The slope of the fence line where contours must be crossed shall not be steeper than 3H:1V.

- Check dams shall be approximately 1-foot deep at the back of the fence. Check dams shall be continued perpendicular to the fence at the same elevation until the top of the check dam intercepts the ground surface behind the fence.
 - Check dams shall consist of crushed surfacing base course, gravel backfill for walls, or shoulder ballast. Check dams shall be located every 10 feet along the fence where the fence must cross contours.
- Refer to [Figure II-3.23: Silt Fence Installation by Slicing Method](#) for slicing method details. The following are specifications for silt fence installation using the slicing method:
 1. The base of both end posts must be at least 2- to 4-inches above the top of the geotextile fabric on the middle posts for ditch checks to drain properly. Use a hand level or string level, if necessary, to mark base points before installation.
 2. Install posts 3- to 4-feet apart in critical retention areas and 6- to 7-feet apart in standard applications.
 3. Install posts 24-inches deep on the downstream side of the silt fence, and as close as possible to the geotextile fabric, enabling posts to support the geotextile fabric from upstream water pressure.
 4. Install posts with the nipples facing away from the geotextile fabric.
 5. Attach the geotextile fabric to each post with three ties, all spaced within the top 8-inches of the fabric. Attach each tie diagonally 45 degrees through the fabric, with each puncture at least 1-inch vertically apart. Each tie should be positioned to hang on a post nipple when tightening to prevent sagging.
 6. Wrap approximately 6-inches of the geotextile fabric around the end posts and secure with 3 ties.
 7. No more than 24-inches of a 36-inch geotextile fabric is allowed above ground level.
 8. Compact the soil immediately next to the geotextile fabric with the front wheel of the tractor, skid steer, or roller exerting at least 60 pounds per square inch. Compact the upstream side first and then each side twice for a total of four trips. Check and correct the silt fence installation for any deviation before compaction. Use a flat-bladed shovel to tuck the fabric deeper into the ground if necessary.

Figure II-3.23: Silt Fence Installation by Slicing Method



Maintenance Standards

- Repair any damage immediately.
- Intercept and convey all evident concentrated flows uphill of the silt fence to a sediment trapping BMP.
- Check the uphill side of the silt fence for signs of the fence clogging and acting as a barrier to flow and then causing channelization of flows parallel to the fence. If this occurs, replace the fence and remove the trapped sediment.
- Remove sediment deposits when the deposit reaches approximately one-third the height of the silt fence, or install a second silt fence.
- Replace geotextile fabric that has deteriorated due to ultraviolet breakdown.

BMP C241: Sediment Pond (Temporary)

Purpose

Sediment ponds are temporary ponds used during construction to remove sediment from runoff originating from disturbed areas of the project site. Sediment ponds are typically designed to remove sediment no smaller than medium silt (0.02 mm). Consequently, they usually reduce turbidity only slightly.

Conditions of Use

- Use a sediment pond where the contributing drainage area to the pond is 3 acres or more. Ponds must be used in conjunction with other Construction Stormwater BMPs to reduce the amount of sediment flowing into the pond.
- Do not install sediment ponds on sites where failure of the BMP would result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities. Also, sediment ponds are attractive to children and can be dangerous. Compliance with local ordinances regarding health and safety must be addressed. If fencing of the pond is required, show the type of fence and its location on the drawings in the Construction SWPPP.
- Sediment ponds that can impound 10 acre-ft (435,600 cu-ft, or 3.26 million gallons) or more, or have an embankment of more than 6 feet, are subject to the Washington Dam Safety Regulations ([Chapter 173-175 WAC](#)). See [BMP D.1: Detention Ponds](#) for more information regarding dam safety considerations for detention ponds.
- Projects that are constructing permanent Flow Control BMPs or Runoff Treatment BMPs that use ponding for treatment may use the rough-graded or final-graded permanent BMP footprint for the temporary sediment pond. When permanent BMP footprints are used as temporary sediment ponds, the surface area requirement of the temporary sediment pond must be met. If the surface area requirement of the sediment pond is larger than the surface area of the permanent BMP, then the sediment pond shall be enlarged beyond the permanent BMP footprint to comply with the surface area requirement.

The permanent control structure must be temporarily replaced with a control structure that only allows water to leave the temporary sediment pond from the surface or by pumping. Alternatively, the permanent control structure may be used if it is temporarily modified by plugging any outlet holes below the riser. The permanent control structure must be installed as part of the permanent BMP after the site is fully stabilized.

Design and Installation Specifications

General

- See [Figure II-3.28: Sediment Pond Plan View](#), [Figure II-3.29: Sediment Pond Cross Section](#), and [Figure II-3.30: Sediment Pond Riser Detail](#) for details.
- Use of permanent infiltration BMP footprints for temporary sediment ponds during

construction tends to clog the soils and reduce their capacity to infiltrate. If permanent infiltration BMP footprints are used, the sides and bottom of the temporary sediment pond must only be rough excavated to a minimum of 2 feet above final grade of the permanent infiltration BMP. Final grading of the permanent infiltration BMP shall occur only when all contributing drainage areas are fully stabilized. Any proposed permanent pretreatment BMP prior to the infiltration BMP should be fully constructed and used with the temporary sediment pond to help prevent clogging of the soils. See [Element 13: Protect Low Impact Development BMPs](#) for more information about protecting permanent infiltration BMPs.

- The pond shall be divided into two roughly equal volume cells by a permeable divider that will reduce turbulence while allowing movement of water between the cells. The divider shall be at least one-half the height of the riser, and at least one foot below the top of the riser. Wire-backed, 2- to 3-foot high, high strength geotextile fabric supported by treated 4"x4"s can be used as a divider. Alternatively, staked straw bales wrapped with geotextile fabric may be used. If the pond is more than 6 feet deep, a different divider design must be proposed. A riprap embankment is one acceptable method of separation for deeper ponds. Other designs that satisfy the intent of this provision are allowed as long as the divider is permeable, structurally sound, and designed to prevent erosion under and around the divider.
- The most common structural failure of sediment ponds is caused by piping. Piping refers to two phenomena: (1) water seeping through fine-grained soil, eroding the soil grain by grain and forming pipes or tunnels; and, (2) water under pressure flowing upward through a granular soil with a head of sufficient magnitude to cause soil grains to lose contact and capability for support.

The most critical construction practices to prevent piping are:

- Tight connections between the riser and outlet pipe, and other pipe connections.
- Adequate anchoring of the riser.
- Proper soil compaction of the embankment and riser footing.
- Proper construction of anti-seep devices.

Sediment Pond Geometry

To determine the sediment pond geometry, first calculate the design surface area (SA) of the pond, measured at the top of the riser pipe. Use the following equation:

$$SA = 2 \times Q_2 / 0.00096$$

or

$$2080 \text{ square feet per cfs of inflow}$$

See [BMP C240: Sediment Trap](#) for more information on the above equation.

The basic geometry of the pond can now be determined using the following design criteria:

- Required surface area SA (from the equation above) at the top of the riser.

- Minimum 3.5-foot depth from the top of the riser to the bottom of the pond.
- Maximum 3H:1V interior side slopes and maximum 2H:1V exterior slopes. The interior slopes can be increased to a maximum of 2H:1V if fencing is provided at or above the maximum water surface.
- One foot of freeboard between the top of the riser and the crest of the emergency spillway.
- Flat bottom.
- Minimum 1-foot deep spillway.
- Length-to-width ratio between 3:1 and 6:1.

Sediment Pond Discharge

The outlet for the pond consists of a combination of principal and emergency spillways. These outlets must pass the peak runoff expected from the contributing drainage area for a 100-year storm. If, due to site conditions and basin geometry, a separate emergency spillway is not feasible, the principal spillway must pass the entire peak runoff expected from the 100-year storm. However, an attempt to provide a separate emergency spillway should always be made. Base the runoff calculations on the site conditions during construction. The flow through the dewatering orifice cannot be utilized when calculating the 100-year storm elevation because of its potential to become clogged; therefore, available spillway storage must begin at the principal spillway riser crest.

The principal spillway designed by the procedures described below will result in some reduction in the peak rate of runoff. However, the design will not control the discharge flow rates to the extent required to comply with [I-3.4.7 MR7: Flow Control](#). The size of the contributing basin, the expected life of the construction project, the anticipated downstream effects, and the anticipated weather conditions during construction should be considered to determine the need for additional discharge control.

Principal Spillway: Determine the required diameter for the principal spillway (riser pipe). The diameter shall be the minimum necessary to pass the peak volumetric flow rate using a 15-minute time step from a Type 1A, 10-year, 24-hour frequency storm for the developed condition. Use [Figure II- 3.31: Riser Inflow Curves](#) to determine the riser diameter.

To aid in determining sediment depth, one-foot intervals shall be prominently marked on the riser.

Emergency Overflow Spillway: Size the emergency overflow spillway for the peak volumetric flow rate using a 10-minute time step from a Type 1A, 100-year, 24-hour frequency storm for the developed condition. See [BMP D.1: Detention Ponds](#) for additional guidance for Emergency Overflow Spillway design

Dewatering Orifice: Size of the dewatering orifice(s) (minimum 1-inch diameter) using a modified version of the discharge equation for a vertical orifice and a basic equation for the area of a circular orifice. Determine the required area of the orifice with the following equation:

$$A_o = \frac{A_g(2h)^{0.5}}{0.6 \times 3600Tg^{0.5}}$$

where

A_o = orifice area (square feet)

A_S = pond surface area (square feet)

h = head of water above orifice (height of riser in feet) T

= dewatering time (24 hours)

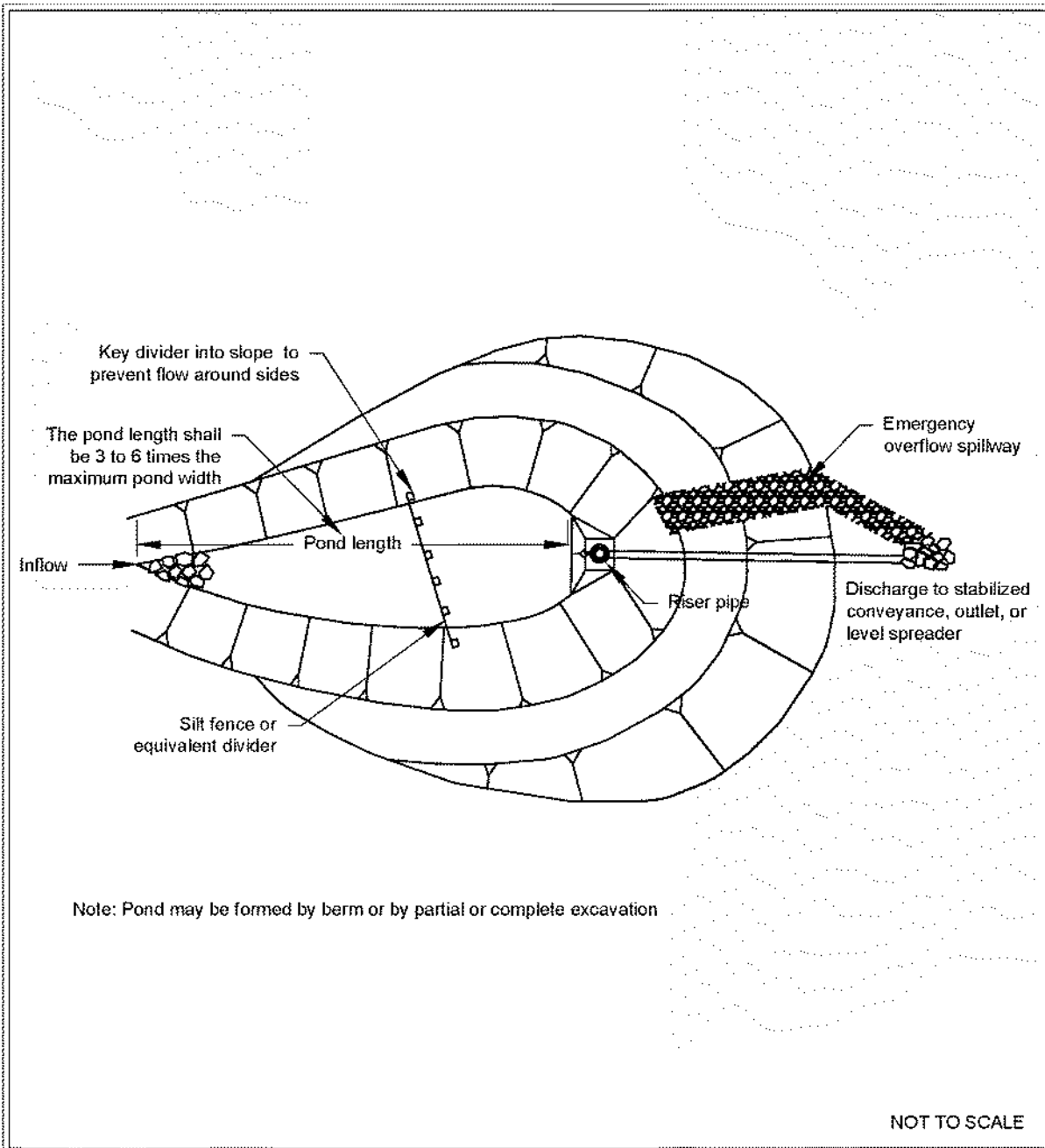
g = acceleration of gravity (32.2 feet/second²)

Convert the orifice area (in square feet) to the orifice diameter D (in inches):

$$D = 24 \times \sqrt{\frac{A_o}{\pi}} = 13.54 \times \sqrt{A_o}$$

The vertical, perforated tubing connected to the dewatering orifice must be at least 2 inches larger in diameter than the orifice to improve flow characteristics. The size and number of perforations in the tubing should be large enough so that the tubing does not restrict flow. The orifice should control the flow rate.

Figure II-3.28: Sediment Pond Plan View

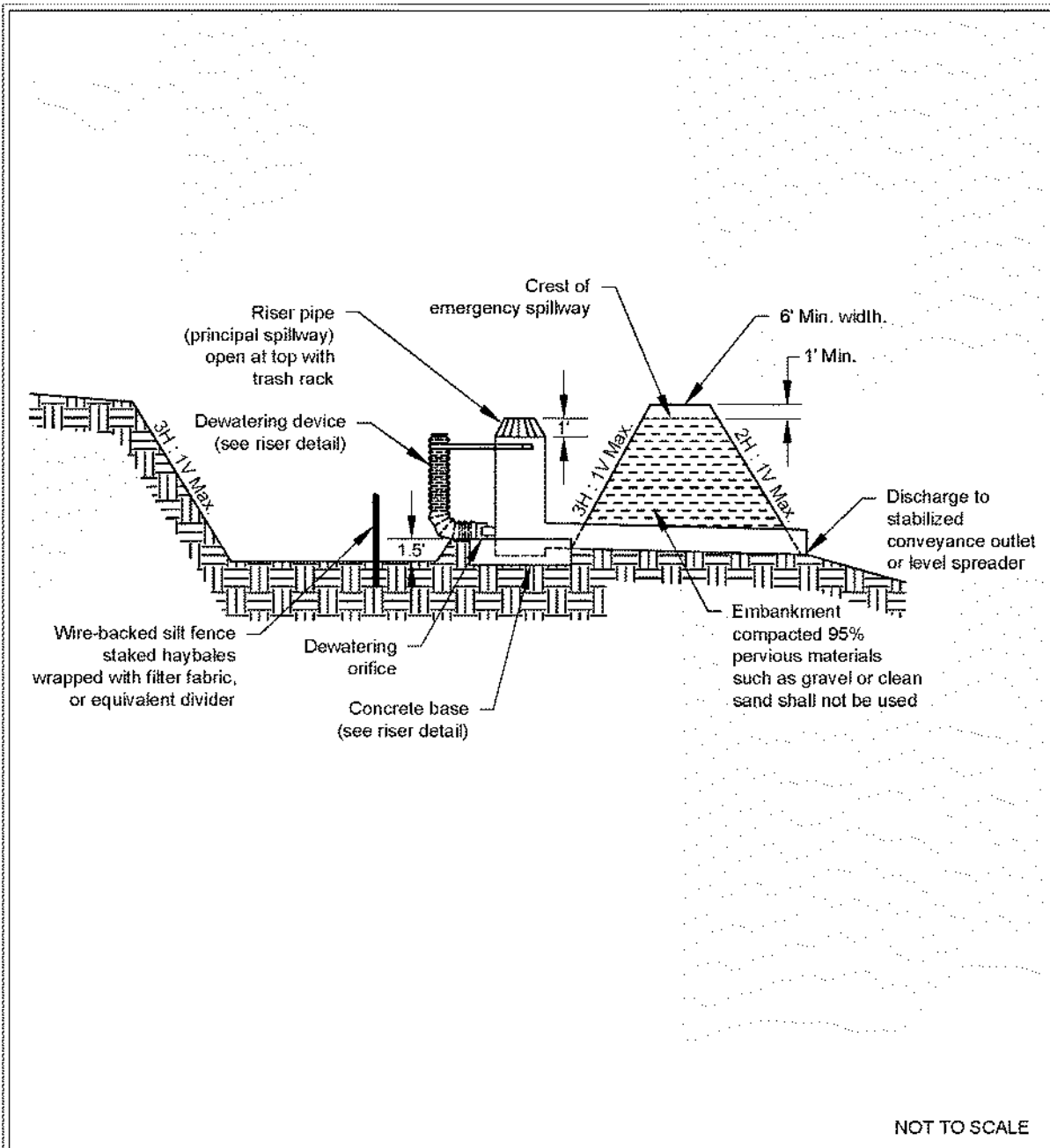


Sediment Pond Plan View

Revised June 2016

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Figure II-3.29: Sediment Pond Cross Section

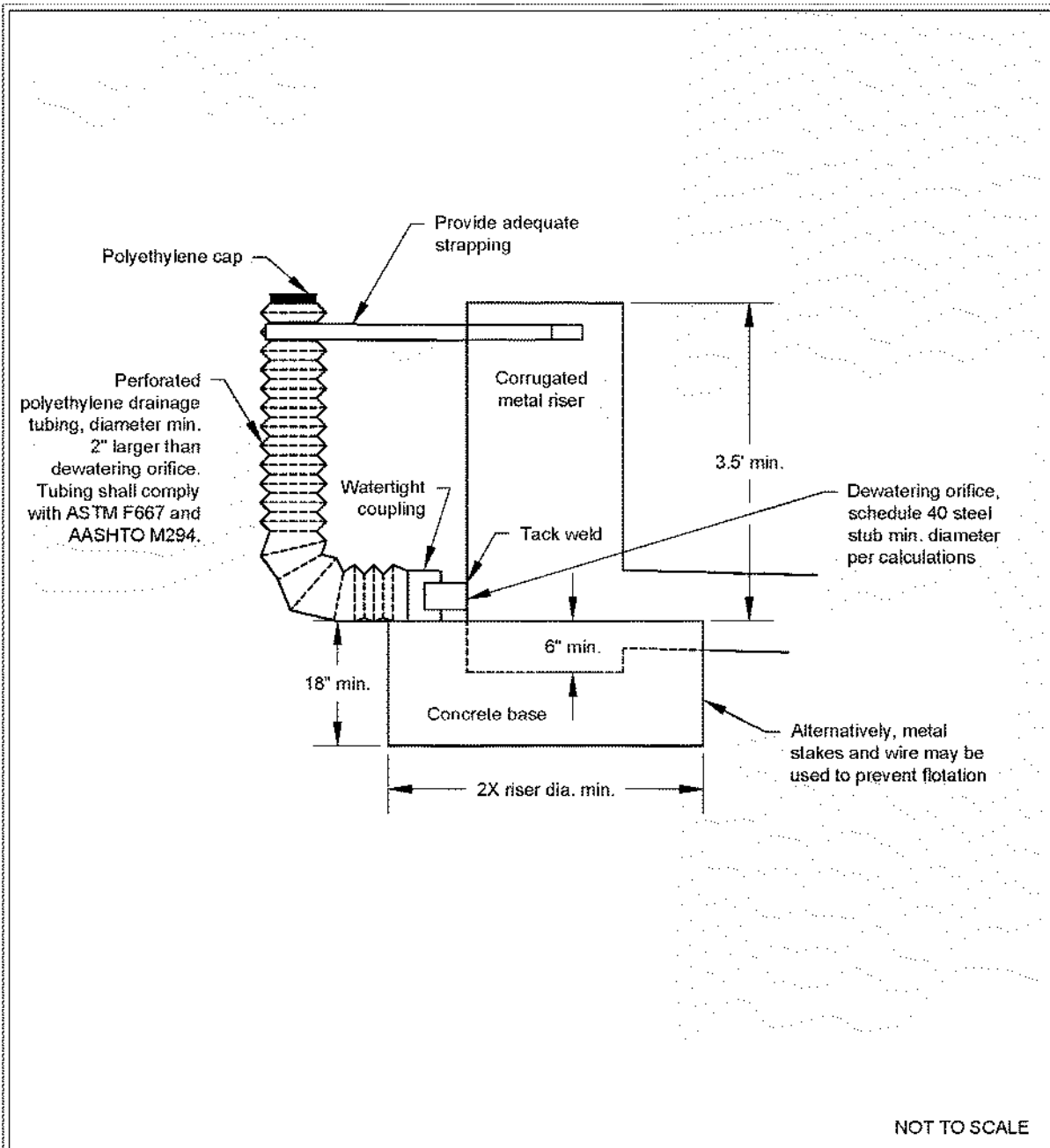


Sediment Pond Cross Section

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Figure II-3.30: Sediment Pond Riser Detail

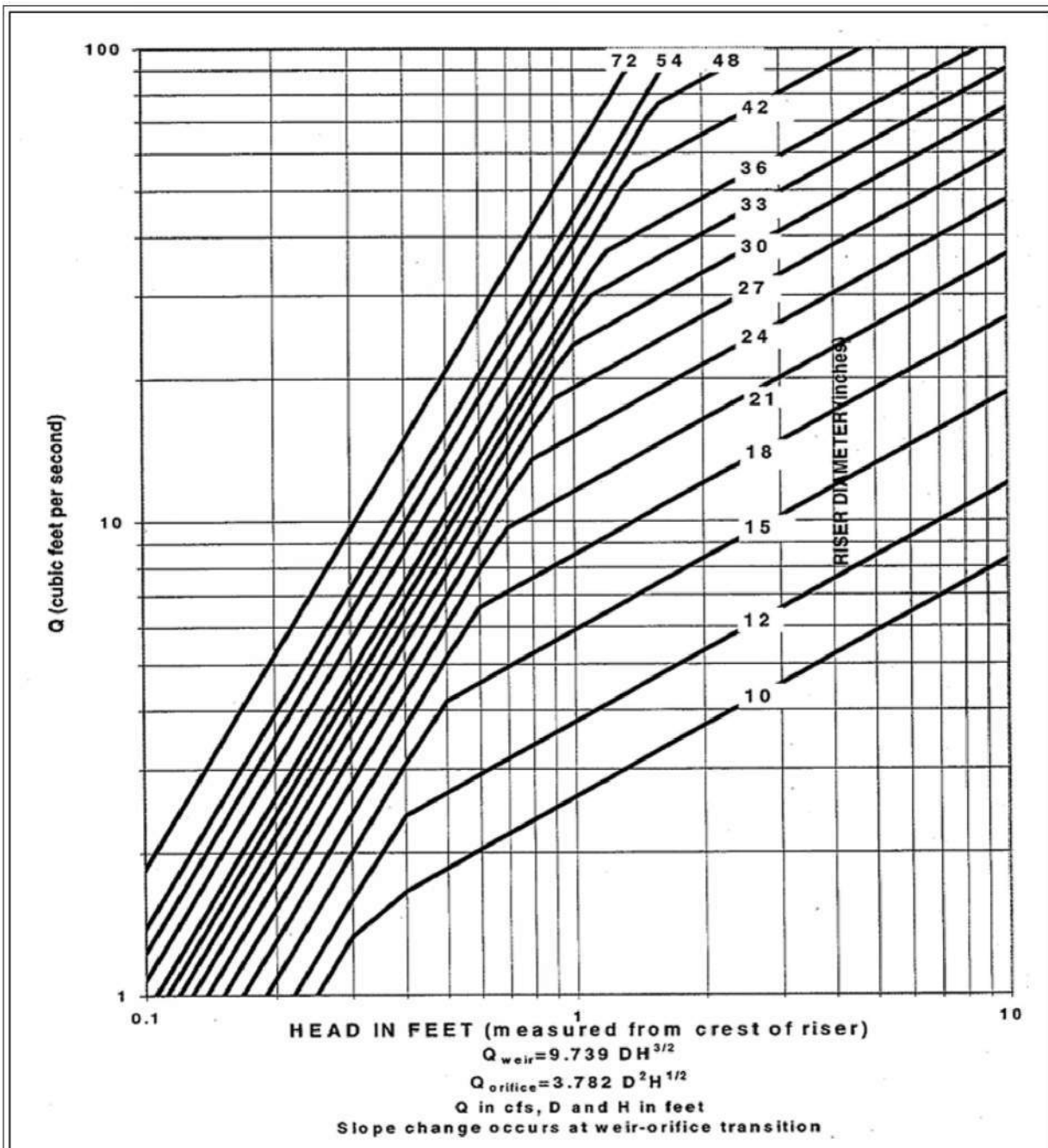


Sediment Pond Riser Detail

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Figure II-3.31: Riser Inflow Curves



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Riser Inflow Curves

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Maintenance Standards

- Remove sediment from the pond when it reaches 1 foot in depth.
- Repair any damage to the pond embankments or slopes.

APPENDIX 6 – DRAINAGE AND TESC PLANS

JACKSON PARK III

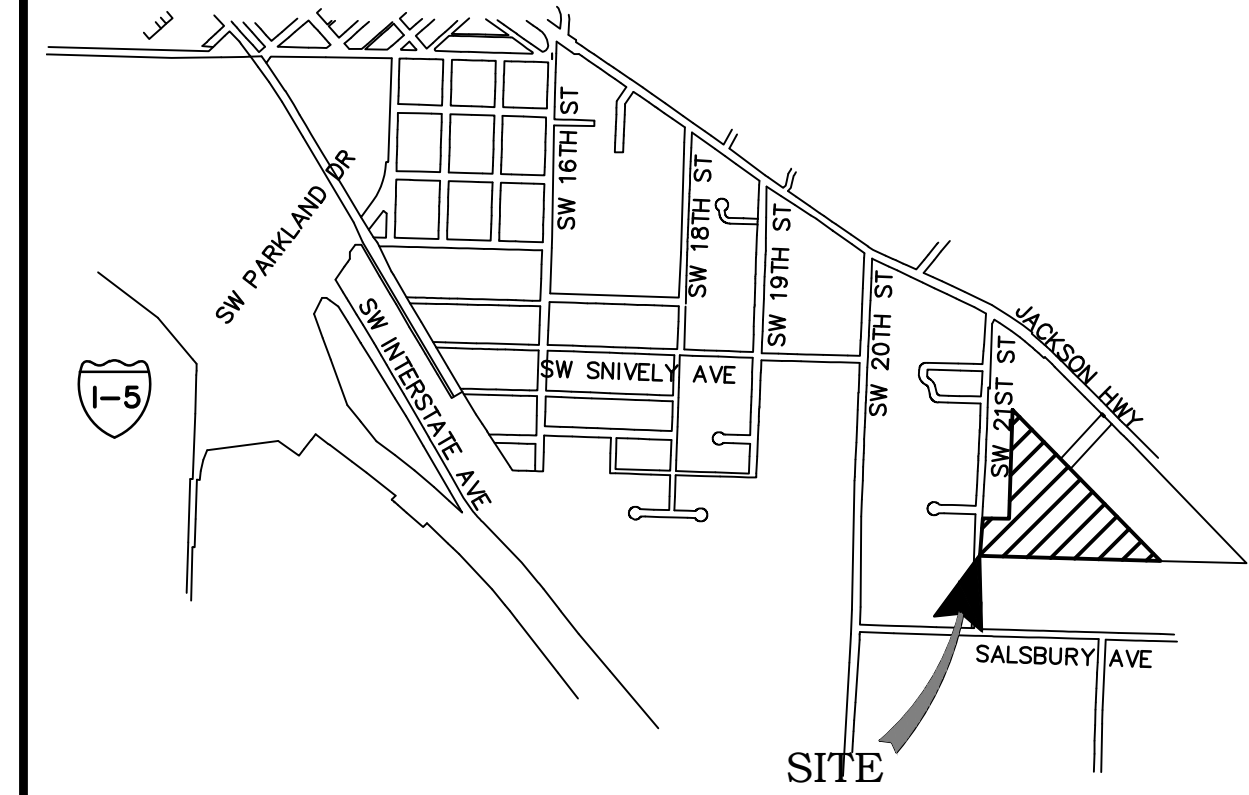
SECTION 4, TOWNSHIP 13 NORTH, RANGE 2 WEST, W.M.
"CHEHALIS", WASHINGTON



SCALE: 1"=40 FEET
0 20 40 80

VICINITY MAP

N.T.S.



NO.	DATE	REVISION
DESIGNED BY:	CA	
DRAWN BY:	ALE	
CHECKED BY:	RWB	
DATE:	7/9/2021	
SCALE:	1" = 40'	

PROJECT INFORMATION

APPLICANT/OWNER: K&W PROPERTIES LLC.
ATTN: STEPHANIE & KARL WERNER
148 ROSEWOOD DR.
CHEHALIS, WA 98532
(360) 520-4080
STEPHANIEWERNER@MSN.COM

PARCEL NO: 005604183244

SITE ADDRESS: "0" SW 21ST STREET
CHEHALIS, WA. 98532

ZONING: R4 - MULTI-FAMILY, HIGH DENSITY

SITE AREA: TOTAL = 5.1 AC
WETLAND = 0.56 AC
NET = 4.54 AC

DENSITY: 13.3 (GROSS)
15.0 (NET)

PARKING - REQUIRED: 136 STALLS (2 PER UNIT)
PROVIDED: 126 STD./RESERVED
3 ADA
16 GARAGES
145 TOTAL STALLS

SOILS: GALVIN SILT LOAM, LACAMAS SILT LOAM

WATER: CITY OF CHEHALIS

SEWER: CITY OF CHEHALIS

FIRE DISTRICT: FIRE DISTRICT 6

BUILDING SETBACKS: FRONT YARD = 20'
ADJACENT PARCELS = 5'

JACKSON PARK III
CHEHALIS, WA 98532

LEWIS COUNTY WA.

PRELIMINARY SITE PLAN



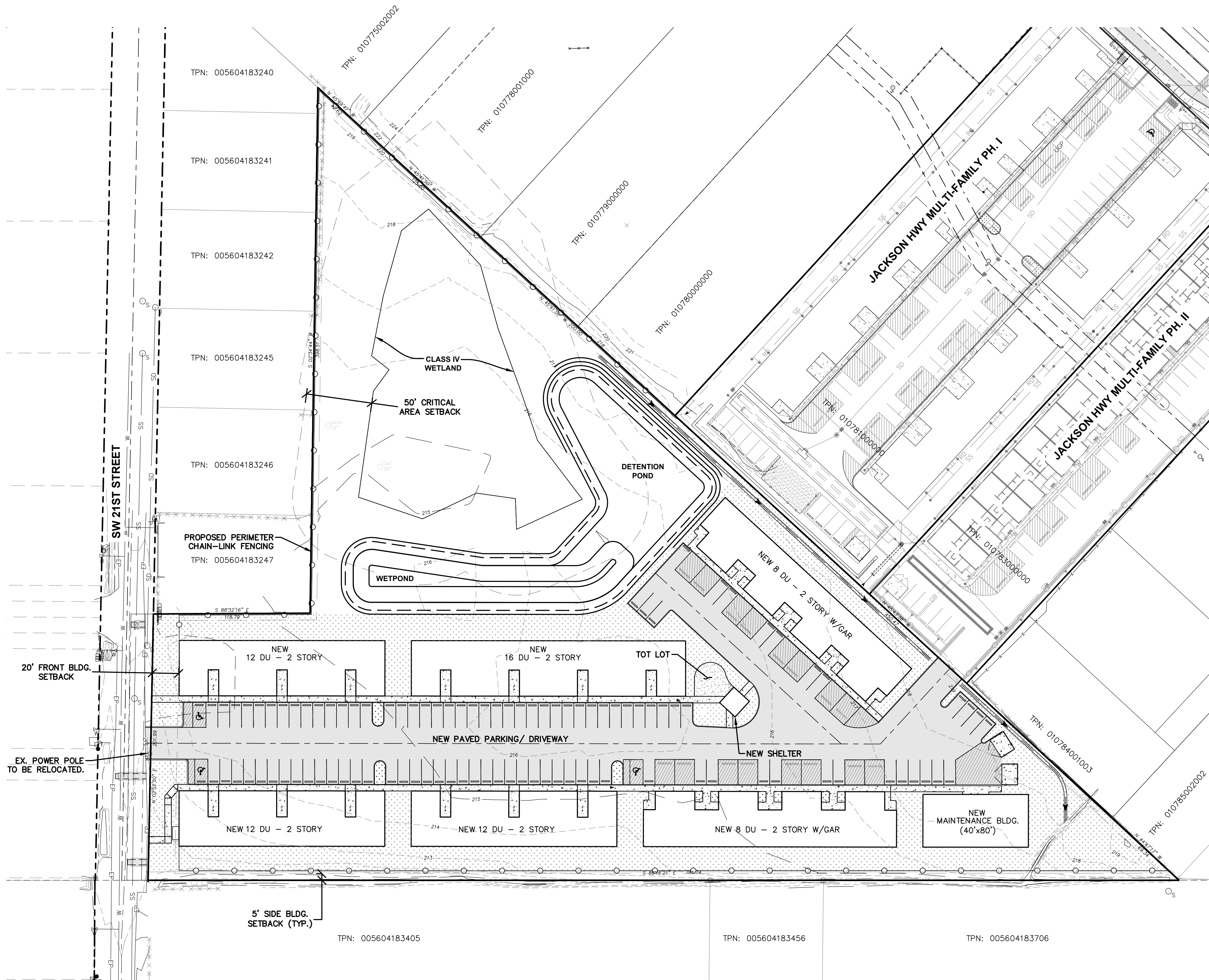
RB Engineering
DESIGN - PERMIT - MANAGE
P.O. Box 923
CHEHALIS, WA 98532
OFF: (360) 740-8819
EMAIL: info@rbengineers.com

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JOB NUMBER
21011
DRAWING NAME
21011_PSP

C1.0

1 OF 4

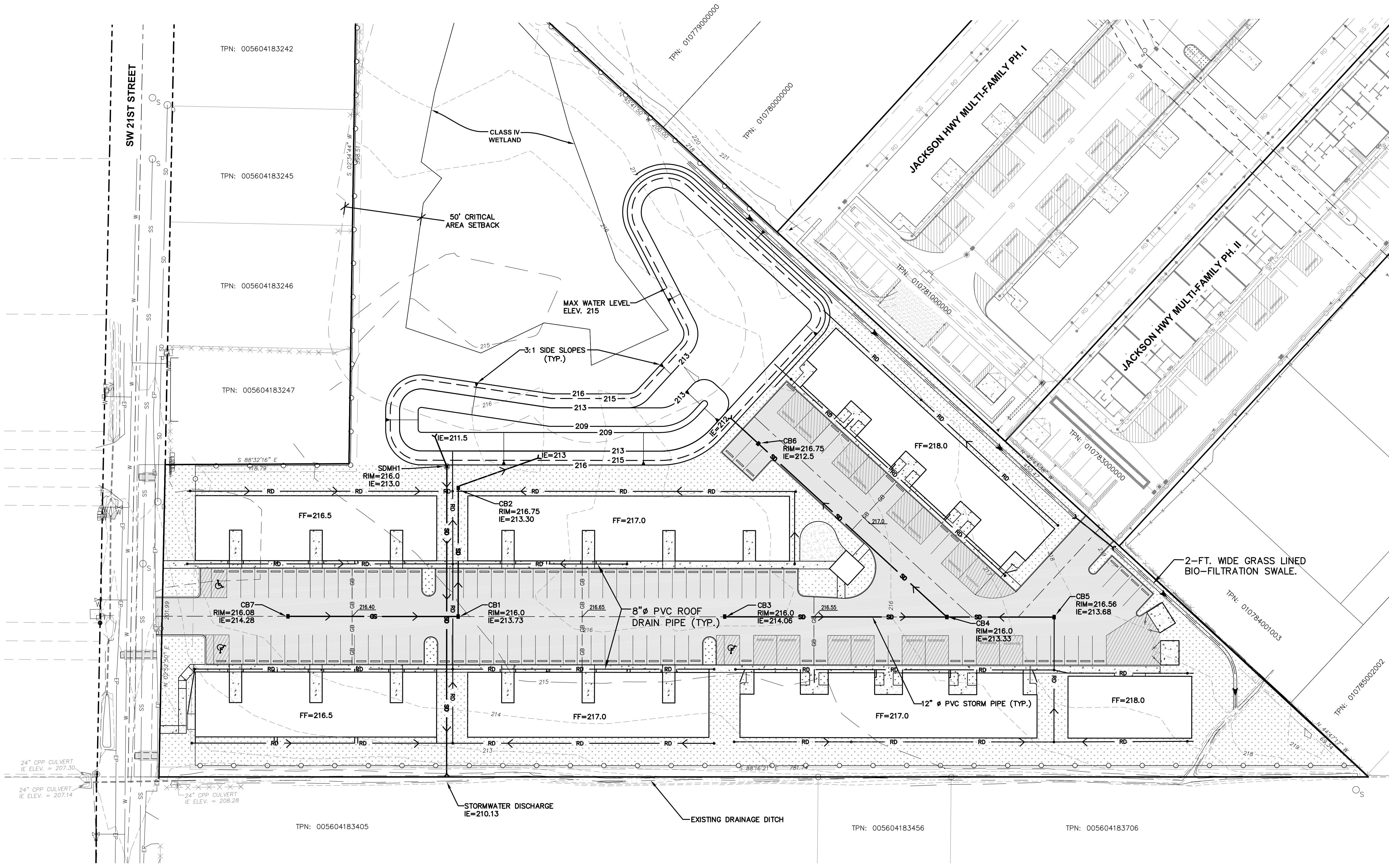


LEGEND

EXISTING	PROPOSED	
W	W	WATER MAIN
SS	SS	SANITARY SEWER MAIN
FM	FM	FORCE MAIN
SD	SD	STORM MAIN
RD	RD	ROOF DRAIN
	FD	FOOTING DRAIN
G	G	GAS LINE
UGP	UGP	POWER LINE
T	T	TELEPHONE LINE
TV	CATV	CABLE TV LINE
		ROADWAY CENTERLINE
		RIGHT-OF-WAY LINE
		EASEMENT LINE
		FRONT/BACK OF CURB
		EDGE OF GRAVEL SHOULDER
EP		EDGE OF PAVEMENT



SCALE: 1"=30 FEET
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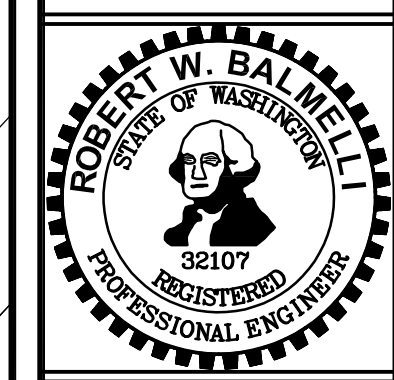


NO.	DATE	REVISION

DESIGNED BY: CA
 DRAWN BY: ALE
 CHECKED BY: RWB
 DATE: 6/3/2021
 SCALE: 1" = 40'

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 CHEHALIS, WA 98532
 LEWIS COUNTY WA.

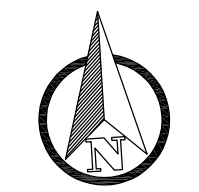
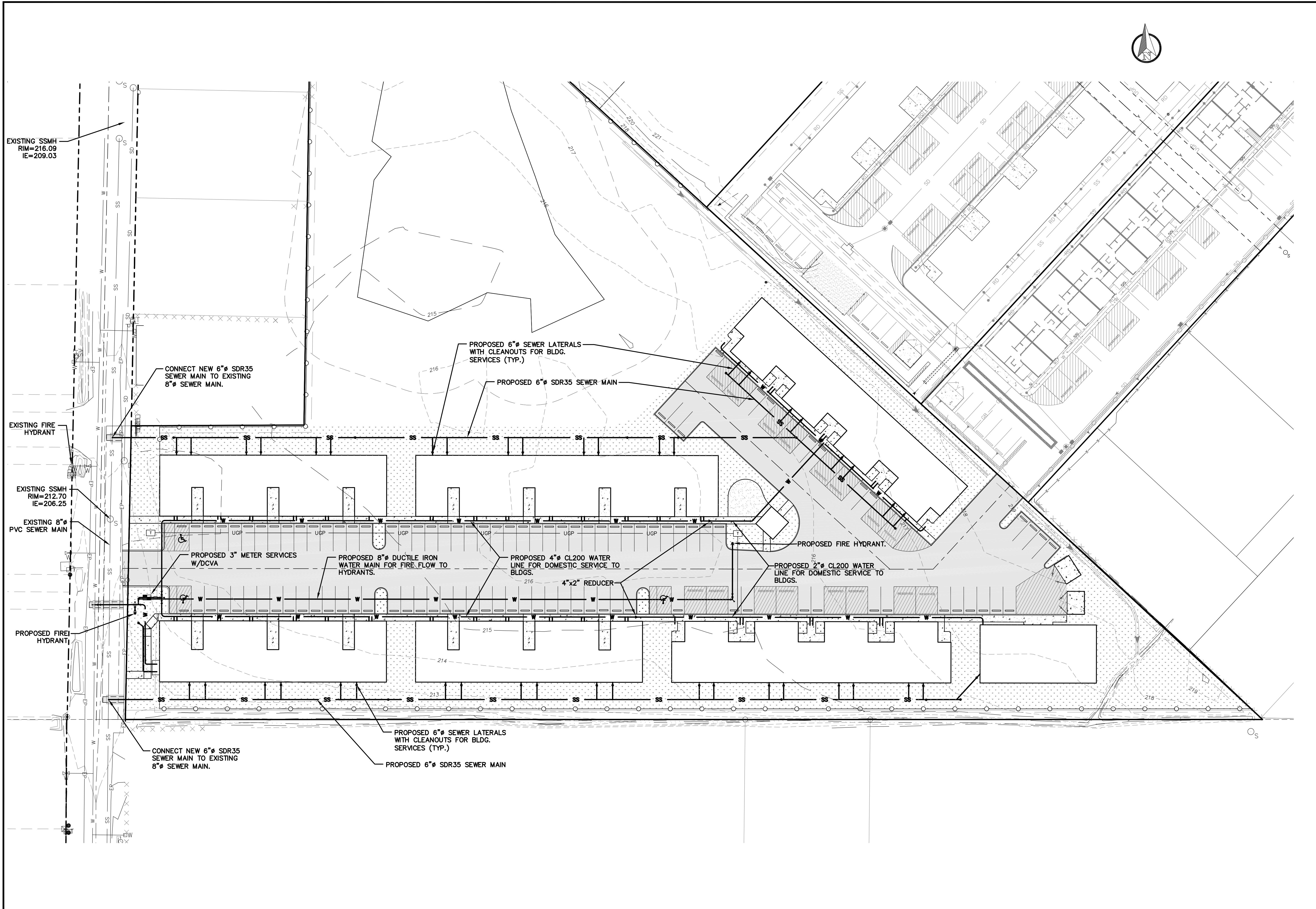
PRELIMINARY GRADING AND DRAINAGE PLAN



RB Engineering
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 CHEHALIS, WA 98532
 OFF: (360) 746-8919
 EMAIL: Cba@rbengr.com

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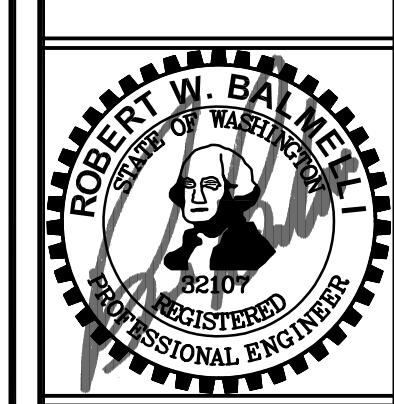
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 2 OF 4



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PRELIMINARY UTILITY PLAN

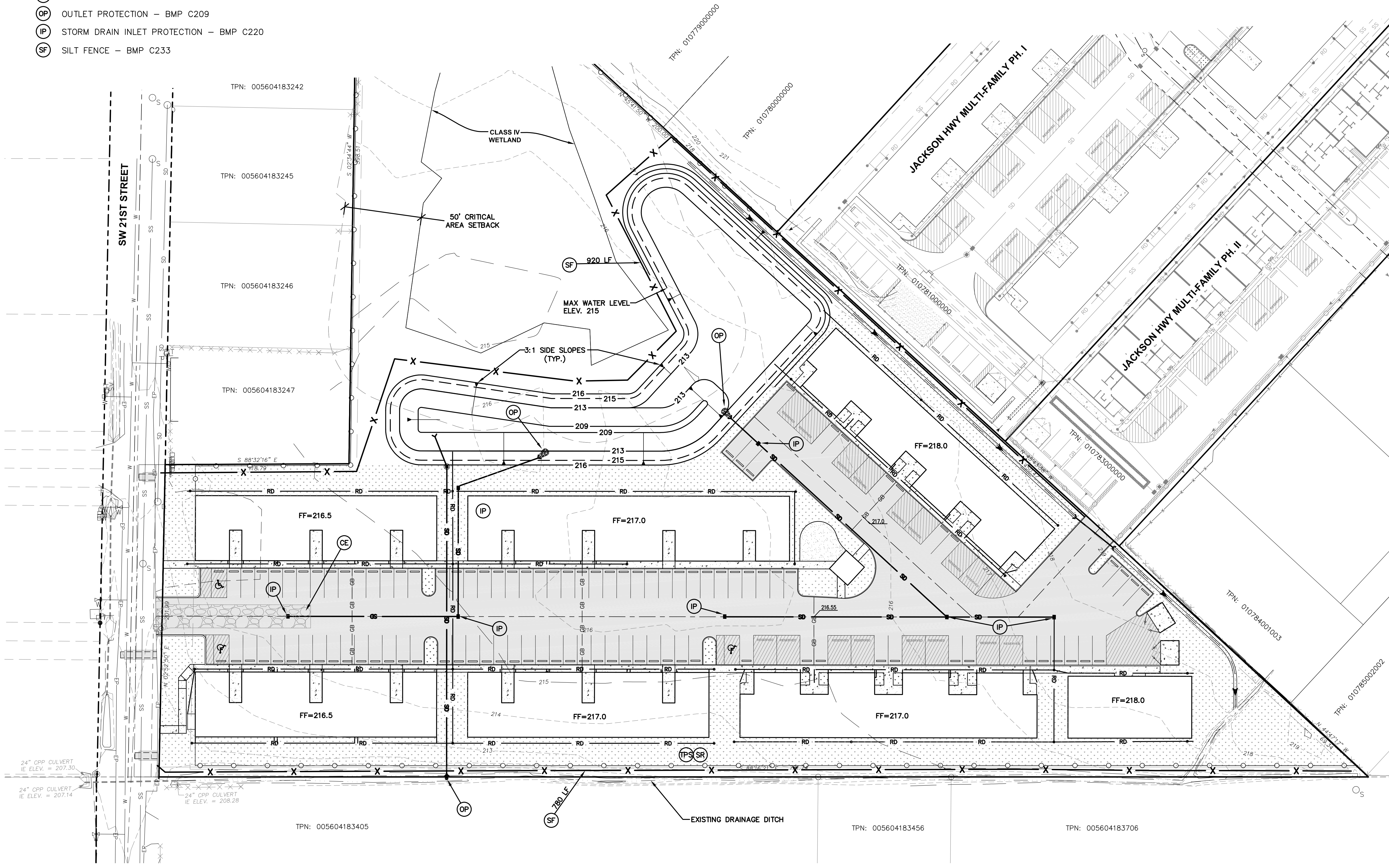
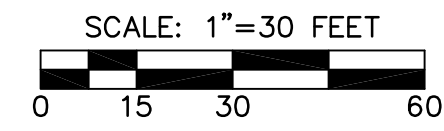


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 JOB NUMBER: 21011
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C1.2
 3 OF 4

WSDOE BMP LIST:

- (CE) STABILIZED CONSTRUCTION ENTRANCE-EXIT – BMP C105
- (TPS) TEMPORARY AND PERMANENT SEEDING – BMP C120
- (SR) SURFACE ROUGHENING – BMP C
- (OP) OUTLET PROTECTION – BMP C209
- (IP) STORM DRAIN INLET PROTECTION – BMP C220
- (SF) SILT FENCE – BMP C233



REVISION	
NO.	DATE
DESIGNED BY: CA	DRAWN BY: ALE
CHECKED BY: RWB	DATE: 6/3/2021
SCALE: 1" = 40'	WA.
JACKSON PARK III	
CHEHALIS, WA 98532	
LEWIS COUNTY	
T.E.S.C. PLAN	
RB Engineering DESIGN → PERMIT → MANAGE P.O. Box 923 CHEHALIS, WA 98532 OFF: (360) 746-8919 EMAIL: info@rbengr.com	
JOB NUMBER: 21011 DRAWING NAME: 21011_T.E.S.C. C1.3 4 OF 4	