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Stormwater Site Plan/Report

PUYALLUP MEDICAL OFFICES

1617 S Merdian

Puyallup, WA 98371 – City of Puyallup

Permit #:

Parcel #7790000140

For: Dr. Fadi Alhafez

Courtesy of: PFHC Puyallup, LLC

April 24, 2023

Revised: 6/11/2024

Prepared by: R. Elliott, E.I.T.

Revised by: J. Vidal, E.I.T.

FES Project #23062

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1.0 PROJECT OVERVIEW

This project proposes the construction of a new five-story medical building on a 30,513 sf (0.780 ac) parcel (no. 7790000140) located at 1617 S Meridian, Puyallup, WA 98371. This parcel is located in City of Puyallup Zone CG – General Commercial; the development standards for this zone may be found in Puyallup Municipal Code (PMC) 20.30.030. The site is bordered to the east and south by commercial properties; to the north, by 17th Ave SE; and to the west by S Meridian. Currently, the site is undeveloped, with a gravel driveway entrance along 17th Ave SE. The topography generally slopes down from southeast to northwest, at rates of approximately 8%.

Per the US Natural Resources Conservation Services (NRCS) Web Soil Survey, the site is generally underlain by Kapowsin gravelly ashy loam and Kitsap silt loam. The water table may be expected to lie approximately 16 – 23 inches below the surface. Therefore, infiltration is not considered feasible on this project. Vegetation generally consists of a mixture of hardwood and deciduous trees, shrubs, and groundcover.

Currently, stormwater runoff sheet-flows northwest towards S Meridian and enters into the City of Puyallup municipal storm system through a catch basin. Flows are conveyed north and discharged to a vegetated slope across S Meridian, eventually flowing into Meeker Creek. Under the developed condition, site stormwater runoff will be collected into a vault and discharged via pump station through a StormFilter manhole into the municipal storm system, following the existing pattern.

Onsite Stormwater Management BMPs/LIDs will be evaluated and used to the maximum extent feasible. Proposed stormwater mitigation will comply with Puyallup Municipal Code (PMC) and the 2019 Department of Ecology (DOE) Stormwater Management Manual for Western Washington (SWMMWW), which has been adopted as the governing manual within the City.

VICINITY MAP

500 250 0 500 1000

SCALE: 1 INCH = 500 FEET

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2.0 CONDITIONS AND REQUIREMENTS SUMMARY

This project is considered New Development, as the existing impervious area is less than 35% of the total parcel area; see Table 1, below.

Existing Conditions	Area		
	SF	AC	
Parcel area	30,513	0.780	
Hard surface coverage	29	0.001	0.1%
Pervious (LS)	34,500	34,500	

Table 1: Existing hard surface coverage.

Therefore, the flowchart for New Development (below) will be used to determine the applicability of the Minimum Requirements to this project.

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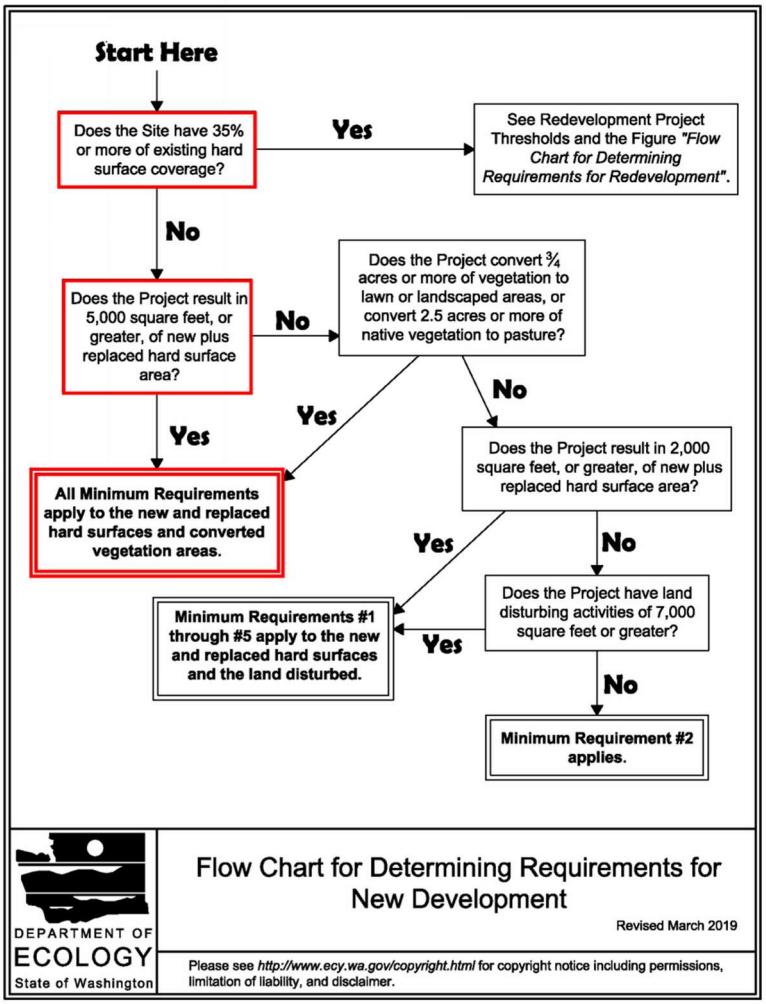
Figure I-3.1: Flow Chart for Determining Requirements for New Development



Therefore, all Minimum Requirements apply to all new and replaced hard surfaces and vegetation areas, as this project will result in 5,000 sf or greater of new and replaced hard surface area. See Section 4.2: Developed Site Hydrology.

2.1 ANALYSIS OF THE MINIMUM REQUIREMENTS

2.1.1 MR #1: Preparation of Stormwater Site Plans

This report will serve as the Stormwater Site Plan, prepared per Puyallup Municipal Code and the SWMMWW.

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2.1.2 MR #2: Construction Stormwater Pollution Prevention

Construction Stormwater Pollution Prevention Plans are prepared per 2019 SWMMWW and City of Puyallup Stormwater Management Standards to address the 13 elements. A SWPPP will be provided as a separate document for approval.

2.1.3 MR #3: Source Control of Pollution

Per SWMMWW Volume II, Section 3.2, the following Construction Source Control BMPs will be used as necessary:

BMP C103	High-Visibility Fence
BMP C105	Stabilized Construction Access
BMP C120	Temporary and Permanent Seeding
BMP C121	Mulching
BMP C122	Nets and Blankets
BMP C123	Plastic Covering
BMP C125	Topsoiling/Composting
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 C162	Scheduling

2.1.4 MR #4: Preservation of Natural Drainage Systems and Outfalls

This project comprises a single threshold discharge area (TDA) within the State Highway Drainage Basin, which currently drains to the NW corner and discharges into the municipal storm system in S Meridian. Under the developed condition, stormwater will be conveyed north and into the municipal storm system. Therefore, the existing drainage pattern will be maintained.

2.1.5 MR #5: On-site Stormwater Management

Table I-2.5.1 from the SWMMWW (Figure 1, below) was used to determine the onsite stormwater management requirements for this project. Because this project is considered new development, and is situated on a parcel within the urban growth area (UGA), List #2 will be evaluated for feasibility.

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Table I-2.5.1 On-Site Stormwater Management Requirements for Projects Triggering Minimum Requirements #1 - #9

Project Type and Location	Requirement
New development on any parcel inside the UGA, or new development outside the UGA on a parcel less than 5 acres	Low Impact Development Performance Standard and BMP T5.13: Post-Construction Soil Quality and Depth (p.911); or List #2 (applicant option).
New development outside the UGA on a parcel of 5 acres or larger	Low Impact Development Performance Standard and BMP T5.13: Post-Construction Soil Quality and Depth (p.911).
Redevelopment on any parcel inside the UGA, or redevelopment outside the UGA on a parcel less than 5 acres	Low Impact Development Performance Standard and BMP T5.13: Post-Construction Soil Quality and Depth (p.911); or List #2 (applicant option).
Redevelopment outside the UGA on a parcel of 5 acres or larger	Low Impact Development Performance Standard and BMP T5.13: Post-Construction Soil Quality and Depth (p.911).
Note: This table refers to the Urban Growth Area (UGA) as designated under the Growth Management Act (GMA) (Chapter 36.70A RCW) of the State of Washington. If the Permittee is located in a county that is not subject to planning under the GMA, the city limits shall be used.	

Figure 1: Table I-2.5.1 from the SWMMWW

2.1.5(a) List #2: Onsite Stormwater Management BMPs for Projects Triggering Minimum Requirements #1 through #9

For each surface consider the BMPs in the order listed for that type of surface. Use the first BMP that is considered feasible. No other onsite stormwater management BMP is necessary for that surface. Feasibility shall be determined by evaluation against:

- Design criteria, limitations, and infeasibility criteria identified for each BMP in the SWMMWW; and
- Competing Needs Criteria listed in Chapter V-5 of the SWMMWW.

Lawn and landscaped areas:

- **Post-Construction Soil Quality and Depth in accordance with BMP T5.13: Post-Construction Soil Quality and Depth**
  This BMP will be implemented to the maximum extent feasible.

Roofs:

1. **Full Dispersion in accordance with BMP T5.30: Full Dispersion; or**
   This project does not meet the 65% minimum requirement for native growth protection area (NGPA) for full dispersion.

   Downspout Full Infiltration Systems in accordance with BMP T5.10A: Downspout Full Infiltration.
   Infiltration BMPs are not proposed due to the high water table.

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2. **Bioretention (BMP T5.30: Bioretention Cells, Swales, and Planter Boxes) facilities that have a minimum horizontally projected surface area below the overflow which is at least 5% of the total surface area draining to it.**
   The area and setback requirements of this BMP cannot be met.

3. **Downspout Dispersion Systems in accordance with BMP T5.10: Downspout Dispersion Systems.**
   The minimum required flowpath for this BMP cannot be met.

4. **Perforated Stub-out Connections in accordance with BMP T5.10C: Perforated Stub-out Connections.**
   Perforated connections will not be used due to the high water table.

Other Hard Surfaces:

1. **Full Dispersion in accordance with BMP T.30: Full Dispersion**
   This project does not meet the 65% minimum requirement for native growth protection area (NGPA) for full dispersion.

2. **Permeable Pavement in accordance with BMP T5.15: Permeable Pavements**
   This BMP will not be used due to the high water table.

3. **Sheet Flow Dispersion in accordance with BMP T5.12: Sheet Flow Dispersion; or Concentrated Flow Dispersion in accordance with BMP T5.11: Concentrated Flow Dispersion**
   The minimum required vegetated flow path for dispersion BMPs cannot be met.

2.1.6 MR #6: Runoff Treatment

Runoff treatment is required, as this project exceeds the requirements for the construction of stormwater facilities, as shown in Table 2, below:

Criteria	Threshold	Project
Pollution-generating hard surface	≥5,000 sf	**11,637 sf**
Pollution-generating pervious surface (not including permeable pavements) from which there will be a surface discharge in a natural or man-made conveyance from the site	≥0.75 ac	**0 ac**

Table 2: Analysis of thresholds requiring runoff treatment.

Water quality treatment shall be provided by a detention/wetvault and a StormFilter Manhole; see Section 4.2.2: Water Quality Treatment.

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2.1.7 MR #7: Flow control

Flow control is required, as this project does exceed any of the thresholds requiring achievement of the standard flow control requirement for western Washington, summarized in Table 3, below:

Criteria	Threshold	Project
Total effective impervious surface in a threshold discharge area	≥10,000 sf	**28,794 sf**
Vegetation converted to lawn or landscape	≥0.75 ac	**0.119 ac**
Native vegetation converted to pasture in a threshold discharge area, from which there is a surface discharge in a natural or manmade conveyance system from the site	≥2.5 ac	**0 ac**
Increase in 100-year flow frequency from threshold discharge area, resulting from a combination of effective hard surfaces and converted vegetation area*	≥0.15 cfs	**0.54 cfs**
*Modelled in WWHM using 15-minute timesteps; see Section 4.2: Developed Site Hydrology.		

Table 3: Analysis of thresholds requiring runoff treatment.

The required level of flow control shall be provided by a combined detention/wetvault; see Section 4.2.1: Flow Control.

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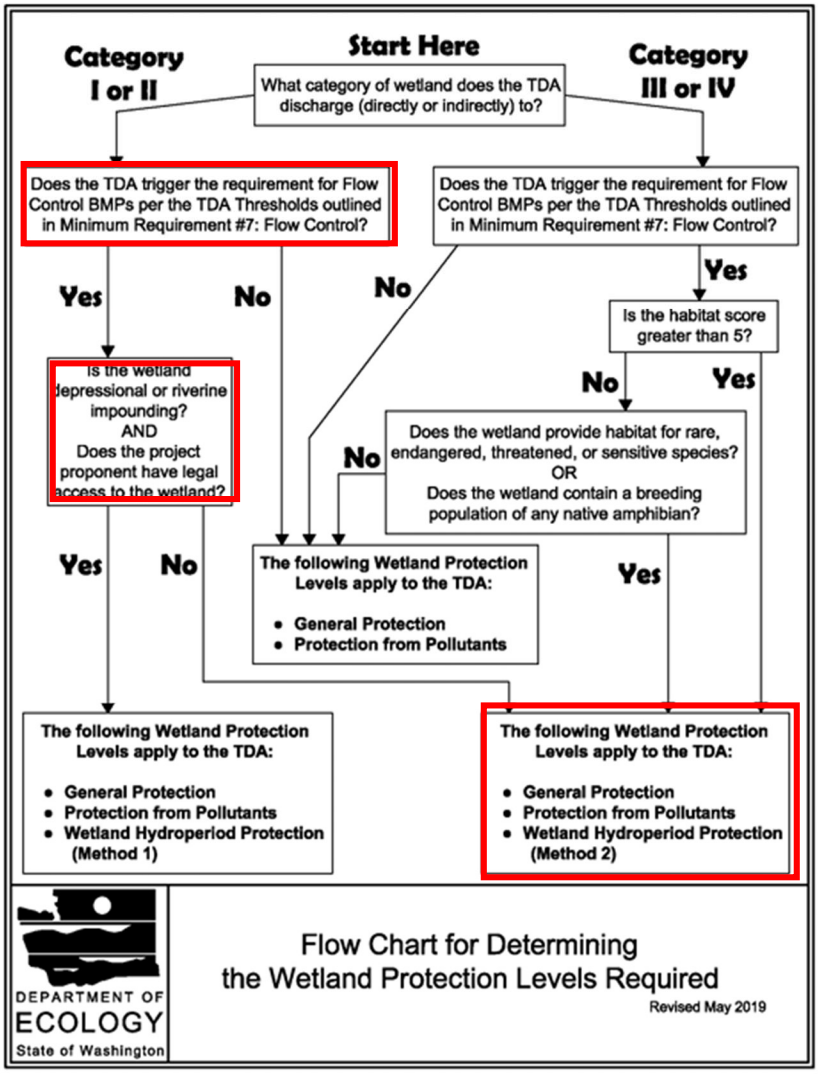
2.1.8 MR #8: Wetlands Protection

This project discharges to a Cat. II wetland west of the site. The flow control and water quality provided by the vault and StormFilter manhole will be sufficient to ensure protection of this wetland. Wetland hydroperiod modeled in WWHM2012, see section 4.3

Figure I-3.5: Flow Chart for Determining Wetland Protection Level Requirements



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2.1.9 MR #9: Operation and Maintenance

Operation and Maintenance guidelines from the SWMMWW will be included in Section 9.0 of this report.

2.2 Financial Liability

A bond quantities worksheet for construction and landscaping will be provided, if required.

2.3 Conditions of Approval

Reserved.

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3.0 OFF-SITE ANALYSIS

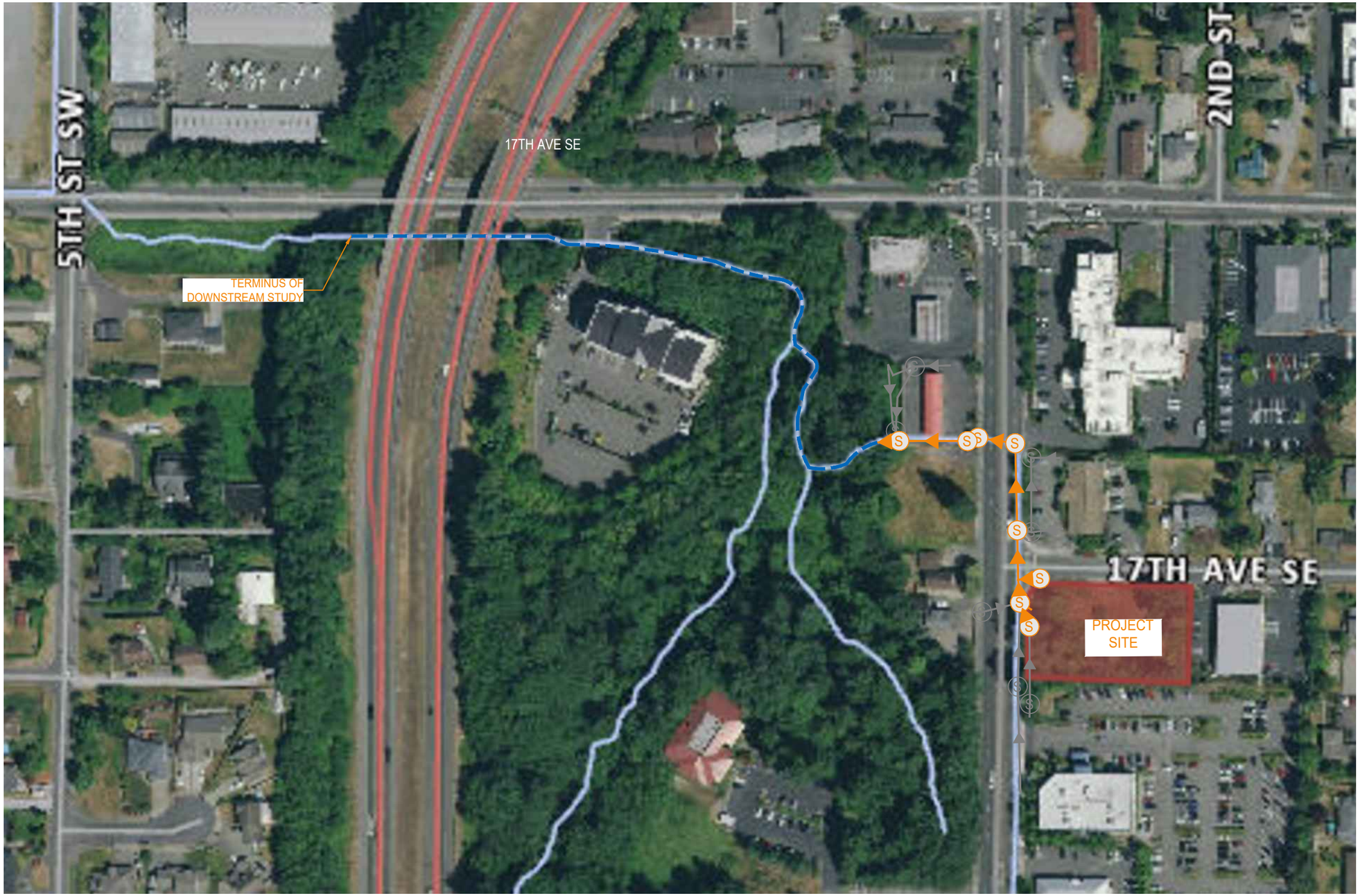
3.1 UPSTREAM TRIBUTARY AREA

This site may receive run-on from upstream properties to the east that is not captured by those properties storm management systems; these amounts are unlikely to contribute significantly to site runoff.

3.2 DOWNSTREAM ANALYSIS

In the existing condition, stormwater from the site generally sheet-flows northwest into a catch basin on S Meridian and enters the municipal storm system. Flows are conveyed north, then west across S Meridian, discharging onto a vegetated slope and eventually entering into Meeker Creek and its associated wetland. Under the developed condition, stormwater will generally follow this same pattern.

Review of City of Puyallup GIS assets shows that the municipal storm system to which this site drains discharges to a wetland approximately 400 ft. downstream; see Appendix B: Critical Areas Maps.



S STORM STRUCTURE

STORM PIPE

150 75 0 150 300

SCALE: 1 INCH = 150 FEET

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STORM ANALYSIS
PUYALLUP MEDICAL OFFICES
DEVELOPED CONDITIONS

By: RCE

Date: 6/11/2024

FES Project No: 23062

Reference Sheet:

Drawing No:

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4.0 FLOW CONTROL AND WATER QUALITY FACILITY ANALYSIS AND DESIGN

The City of Puyallup has adopted the 2019 SWMMWW as the governing document for stormwater management within the city. Drainage review requires preparation of engineering site improvement plans, a Technical Information Report, and Erosion/Sedimentation Controls and related information.

Review of NRCS Web Soil Survey (See Appendix A) suggests a shallow water table, generally 11 to 24 inches below the surface; therefore, infiltration is not considered feasible on this site. Onsite stormwater management shall be provided by a combination detention/wetvault.

4.1 Existing Site Hydrology

Currently, the site is undeveloped, with vegetation consisting of evergreen and deciduous trees, shrubs, grasses, and groundcover. The topography generally slopes down from southeast to northwest at rates of approximately 8%. Offsite improvements will be included as a part of this project in order to provide sidewalk improvements along S Meridian and 17th Ave SE.

Table 4, below, shows a breakdown of the existing site area:

EXISTING CONDITIONS	sf	ac
PARCEL AREA	**30,513**	**0.700**
DISTURBED AREA	**33,994**	**0.780**
ON-SITE	**30,513**	**0.700**
OFF-SITE	**3,481**	**0.080**
ON-SITE	sf	ac
IMPERVIOUS	**29**	**0.001**
GRAVEL	29	0.001
PERVIOUS (LS)	**30,484**	**0.700**
OFF-SITE	sf	ac
IMPERVIOUS	**880**	**0.020**
GRAVEL	880	0.020
CONCRETE SIDEWALK	184	0.004
PERVIOUS (LS)	**2,601**	**0.060**

Table 4: Existing conditions area breakdown.

See the Existing Conditions Exhibit at the end of this section.

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4.2 Developed Site Hydrology

This project proposes the construction of a medical building and associated parking, driveways, walkways, utilities, etc.; Table 5, below, shows a breakdown of the developed areas.

PROPOSED ON-SITE DEVELOPED	sf	ac
PARCEL AREA	**30,513**	**0.700**
DISTURBED AREA	30,513	0.700
IMPERVIOUS	**26,470**	**0.608**
TAL PGHS	**10,392**	**0.239**
BUILDING ROOF	12,481	0.287
WALKWAYS	3,596	0.083
ASPHALT DRIVEWAY	471	0.011
ASPHALT PARKING (PGHS)	9,921	0.228
PERVIOUS (LS)	**4,044**	**0.093**
PROP. OFF-SITE DEVELOPMENT	sf	ac
DISTURBED AREA	3,481	0.080
IMPERVIOUS	**2,088**	**0.048**
TOTAL PGHS	**1,008**	**0.023**
ASPHALT ROADWAY/GUTTER (PGHS)	708	0.016
CONCRETE SIDEWALK	1,080	0.025
ASPHALT DRIVEWAY (PGHS)	300	0.007
PERVIOUS (LS)	**1,393**	**0.032**

Table 5: Developed conditions area breakdown.

Include a bypass basin for the frontage improvements along 17th Ave SE. [drainage report, pg 17]

The post-developed conditions for the map on page 17 state the pervious area is 0.262 acres. Revise accordingly. [drainage report, pg 17]

Stormwater runoff shall be conveyed into a combined detention/wetvault onsite and discharged through a StormFilter manhole into the municipal storm system via pump station, following the same pattern as under the existing condition. An equivalent area from the crown of 17th Ave to the property line will be collected by a catch basin on 17th Ave Se and directed to the detention/wetvault to mitigate offsite improvements.

The site was modelled in WWHM using the inputs in Table 6, below. The predeveloped condition was modelled as “forest,” and hydrologic soil group “C” was used.

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WWHM INPUTS - MITIGATED	ac
PREDEVELOPED	0.780
C, FOREST, MOD	0.780
DEVELOPED	0.780
C PASTURE, FLAT	0.1248
ROOF TOPS/FLAT	0.2865
SIDEWALKS/MOD	0.0248
SIDEWALKS/FLAT	0.0826
DRIVEWAY/FLAT	0.0177
ROADS/MOD	0.0162
PARKING/FLAT	0.2278

Table 6: WWHM inputs.

The following flow rates were calculated:

Flow Frequency	Flow (cfs)		
	0501 Predeveloped	0701 Developed, Unmitigated	0801 Developed, Mitigated
2-year	0.0166	0.2223	0.0081
5-year	0.0260	0.3112	0.0141
10-year	0.0311	0.3702	0.0203
25-year	0.0363	0.4497	0.0315
50-year	0.0394	0.5135	0.0431
100-year	0.0419	0.5814	0.0585
	ΔQ_{100} =	0.5395	

Table 7: Calculated flow rates.

4.2.2 Flow Control

Flow control will be provided by a combined detention/wetvault. WWHM modelling was used to verify determine that 16,128 cf of live storage vault with the dimensions of 96'x24'x7' will be adequate; see section 4.4.1.

4.2.3 Water Quality

Water quality will be provided by a combined detention/wetvault and by a StormFilter manhole. The auto-vault feature was used in WWHM to determine that 3,197 cf of dead storage with a depth of 4 feet will be required; see Appendix C: StormFilter detail.

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4.2.4 Pump System

Due to the topography of the site and the location of the proposed detention system beneath the lowest parking level, a pump system will be required to discharge runoff from the vault up to a catch basin and into the municipal storm system.

The proposed pump system shall consist of a Goulds WE05HH pumps and be housed within a 60" manhole. Pump sizing was performed based upon the performance curve supplied by the manufacturer; see Appendix D: WE Series Model 3885 Brochure.

Peak averaging was used to determine average flow rates through the pump system. Table 8, below, summarizes the peak averaging calculations:

Storm Event	(a) Restricted Flowrate	(b) Pump Drawdown Flowrate	(c) Pump Drawdown Time	(d) Wet well Fill Time	(e) Cycle Time	(f) Avg. Flow Rate at Discharge Point Over Cycle Time
	gpm	gpm	min	min	min	gpm
2 year	3.64	49.36	4.46	60.60	109.97	2.00
5 year	6.33	46.67	4.72	34.81	81.49	2.70
10 year	9.11	43.89	5.02	24.18	68.07	3.24
25 year	14.14	38.86	5.67	15.58	54.45	4.05
50 year	19.34	33.66	6.55	11.39	45.04	4.89
100 year	26.26	26.74	8.24	8.39	35.13	6.27
(g) Pump Flowrate (gpm)				53.0		
(h) Wet Well Volume (gal)				220.3		

Table 8: Peak averaging design calculations.

Values in the table were calculated as follows:

a. **Restricted flow rate:** mitigated (801) flowrates calculated using WWHM in gpm.
b. **Pump drawdown flow rate:** (g)-(a)
c. **Pump drawdown time:** (h)/(b)
d. **Wet well fill time:** (h)/(a)
e. **Cycle time:** (c) + (d)
f. **Avg. flow rate at discharge point over cycle time:** [(b)*(c)]/(e)
g. **Pump flow rate:** derived from manufacturer's performance curve based upon calculated head; see Appendix D: WE Series Model 3885 Brochure and Appendix D: Pump Calculations.
h. **Wet well volume:** see Appendix D: Pump calculations.

Since I've been here with the city, no project has been able to use continuous simulation modeling to pump from the outlet of a stormwater control structure to the downstream drainage system and meet the flow control standard. The WWHM modeling will need to show the developed discharge matches the pre-developed conditions for the actual flows, not an average. To pass, the pump must be the mechanism modeled in WWHM. Revise accordingly. [site plan, pg 19]

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4.3 Wetland Hydroperiods

The proposed development's impact on the downstream wetland was modeled in WWHM 2012. A basin draining into the category 2 wetland around Meeker Creek was estimated using USGS Topographic Map of Puyallup Quadrangle 7.5-Minute Series; see Figure 2 below. This basin encompasses 557.26 ac. An average slope across the basin was estimated by taking the elevation distance between the high point at the south eastern corner, 460', and the low point in the north western corner, 50', and dividing that by the linear distance between them, 5500', resulting in an average slope of 7.5%. This slope was considered when developing WWHM inputs.

Using the City of Puyallup's zoning map, it was determined that the basin is comprised of roughly 6% RS-6 SFR zone, 27% RS-10 SFR zone, 26% RM-20 MFR zone, 6% MED zone, 7% GC zone, and 28% road. Assuming max allowable coverage for each zone, and 100% coverage for roadways, an average of 64% impervious area within the basin was determined as the predeveloped condition. Impervious area was modeled as ROADS/MOD.

For the developed condition, the inputs from Table 6 were subtracted from the pervious surface total and added as additional impervious surface.

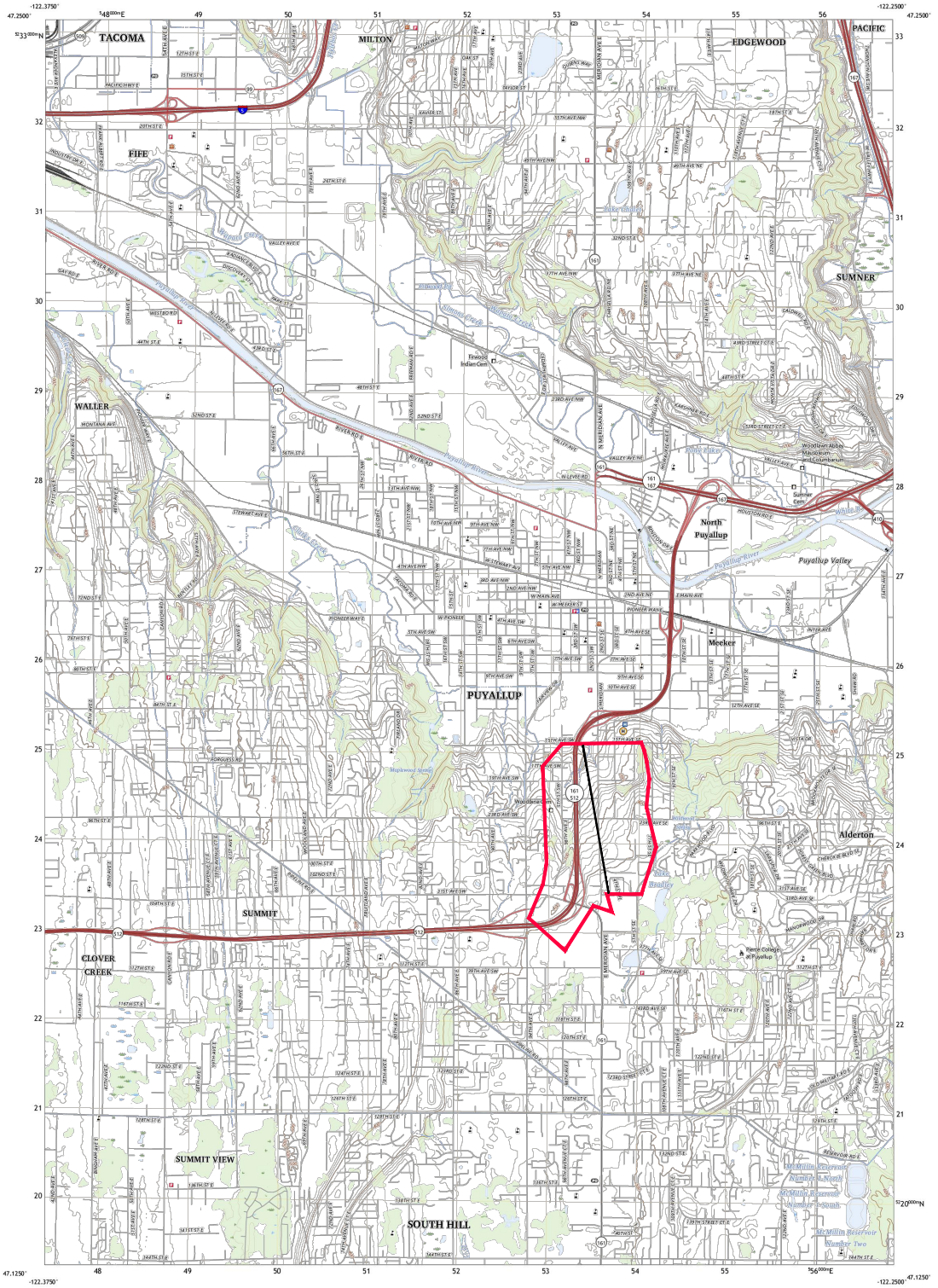
WWHM INPUTS - BASIN	ac
PREDEVELOPED	557.260
C, PASTURE, MOD	200.610
ROADS/MOD	356.650
DEVELOPED	557.260
C PASTURE, MOD	199.94
ROOF TOPS/FLAT	0.29
SIDEWALKS/MOD	0.11
DRIVEWAY/FLAT	0.01
ROADS/MOD	356.67
PARKING/FLAT	0.24

Table 9: Basin WWHM Inputs

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map US Topo

PUYALLUP QUADRANGLE
WASHINGTON - PIERCE COUNTY
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 10T
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery	NAIP, August 2017 - November 2017	
Roads	U.S. Census Bureau,	2016
Names	GNIS, 1979 -	2023
Hydrography	National Hydrography Dataset, 2004 -	2023
Contours	National Elevation Dataset,	2021
Boundaries	Multiple sources; see metadata file	2021 - 2022
Public Land Survey System	BLM,	2019
Wetlands	FWS National Wetlands Inventory 1980 -	1981

UTM GRID AND 2023 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

U.S. National Grid
100,000- m Square ID
ET
Grid Zone Designation
10T

SCALE 1:24 000

1 0.5 0 KILOMETERS 1 2
1000 500 0 METERS 1000 2000
1 0.5 0 MILES
1000 0 1000 2000 3000 4000 5000 6000 7000 8000 9000 10000 FEET

CONTOUR INTERVAL 20 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard.

QUADRANGLE LOCATION

ADJOINING QUADRANGLES
1 Tacoma North
2 Poverty Bay
3 Auburn
4 Tacoma South
5 Sumner
6 Spanaway
7 Fredericksen
8 Orting

ROAD CLASSIFICATION
Expressway
Secondary Hwy
Ramp
Local Connector
Local Road
4WD
Interstate Route
US Route
State Route

PUYALLUP, WA
2023

ISBN 978-1-4951-6402-448
NGA REF NO. USGSX24K36708

Zoning

- ARO - Agriculture, Recreation and Open Space
- CB - Community Business
- CBD - Central Business District
- CBD-CORE - Central Business District Core
- CCX - Community Commercial Mixed Use
- CG - General Commercial
- CL - Limited Commercial
- CMX - Shaw-Pioneer Community Mixed Use
- FAIR - Fair
- LMX - Limited Mixed Use
- MED - Medical
- ML - Limited Manufacturing
- MP - Business Park
- OP - Professional Office
- PF - Public Facilities
- RM-10 - Medium Density Multiple-Family Residential
- RM-20 - High Density Multiple-Family Residential
- RM-CORE - Regional Growth Center Oriented Multi-Family Residential
- RMX - River Road Mixed Use
- RS-04 - High Urban Density Single-Family Residential
- RS-06 - Urban Density Single-Family Residential
- RS-08 - Medium Density Single-Family Residential
- RS-10 - Low Urban Density Single-Family Residential
- RS-35 - Very Low Density Single-Family Residential
- UCX - Urban Center Mixed Use

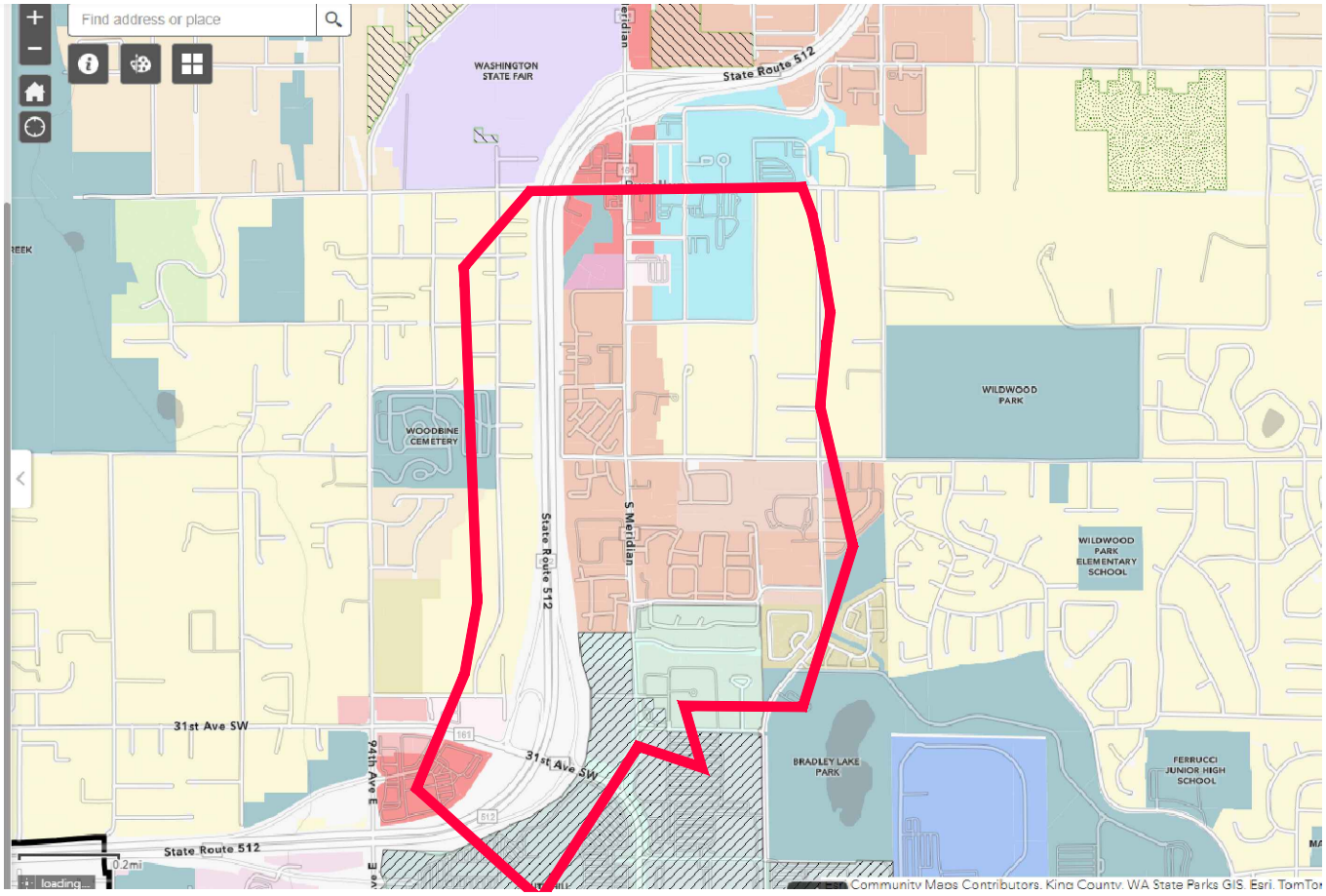
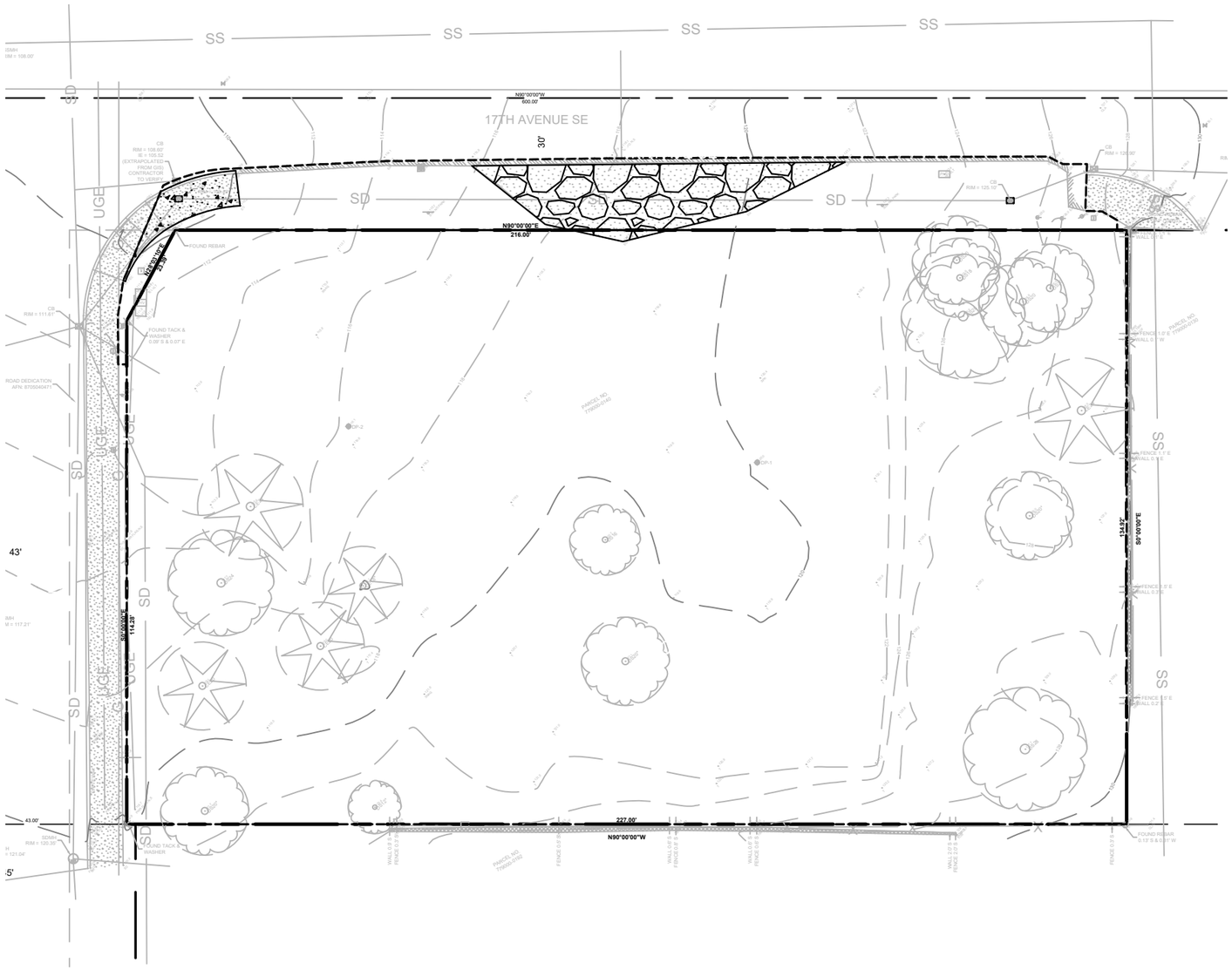


Figure 3 Zoning Map



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EXISTING CONDITIONS	sf	ac
PARCEL AREA	**30,513**	**0.700**
DISTURBED AREA	**33,994**	**0.780**
ON-SITE	**30,513**	**0.700**
OFF-SITE	**3,481**	**0.080**
ON-SITE	sf	ac
IMPERVIOUS	**29**	**0.001**
GRAVEL	29	0.001
PERVIOUS (LS)	**30,484**	**0.700**
OFF-SITE	sf	ac
IMPERVIOUS	**880**	**0.020**
GRAVEL	880	0.020
CONCRETE SIDEWALK	184	0.004
PERVIOUS (LS)	**2,601**	**0.060**

STORM ANALYSIS
PUYALLUP MEDICAL OFFICES
EXISTING CONDITIONS

LEGEND - EXISTING

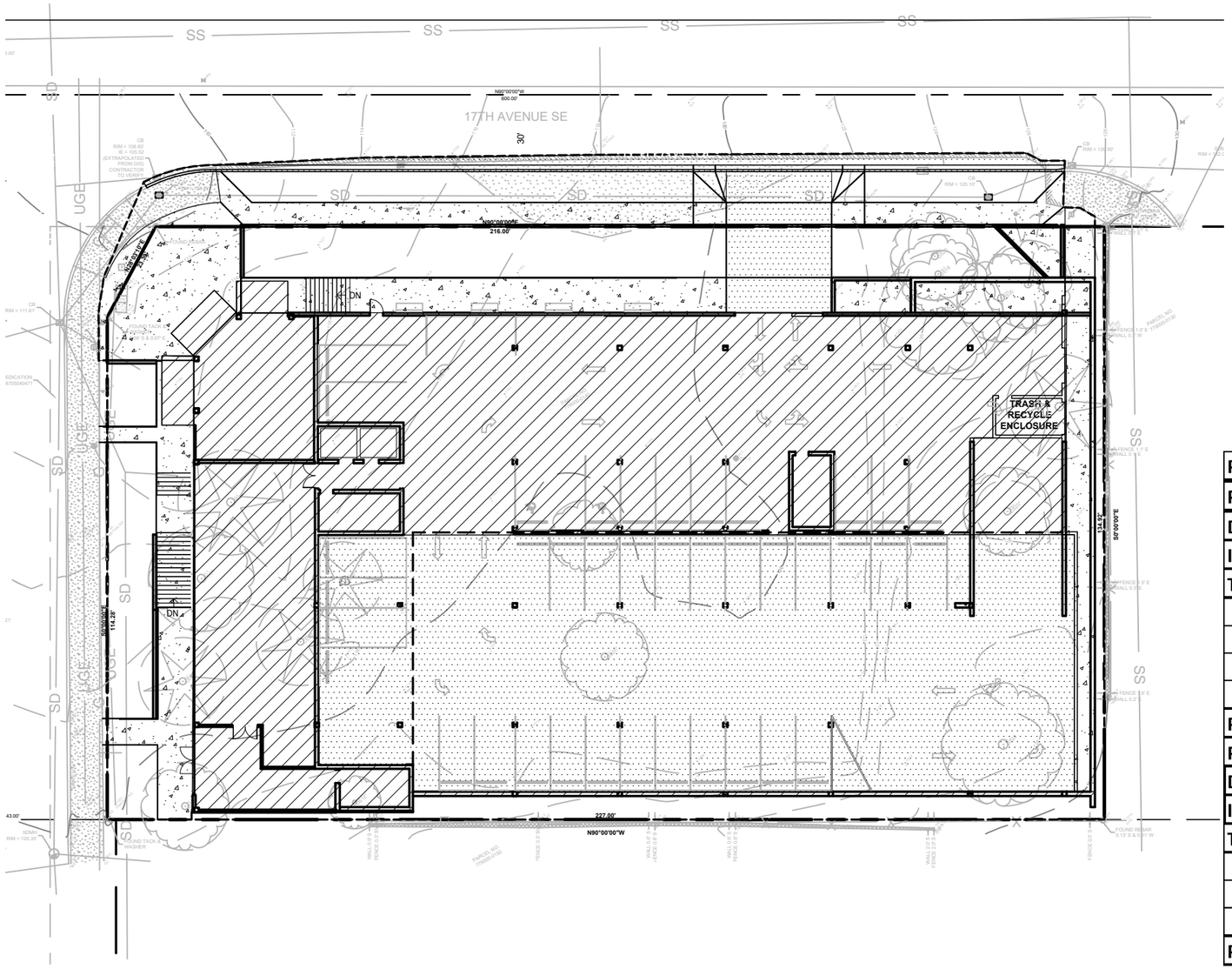
- CONCRETE (OFFSITE)
- GRAVEL (OFFSITE)
- DISTURBED AREA

811 Know what's below. Call before you dig.

30 15 0 30 60

SCALE: 1 INCH = 30 FEET

By: JV
Date: 6/11/2024
FES Project No: 23062
Reference Sheet:
Drawing No:



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STORM ANALYSIS
PUYALLUP MEDICAL OFFICES
DEVELOPED CONDITIONS

PROPOSED ON-SITE DEVELOPED	sf	ac
PARCEL AREA	**30,513**	**0.700**
DISTURBED AREA	30,513	0.700
IMPERVIOUS	**26,470**	**0.608**
TOTAL PGHS	**10,392**	**0.239**
BUILDING ROOF	12,481	0.287
WALKWAYS	3,596	0.083
ASPHALT DRIVEWAY	471	0.011
ASPHALT PARKING (PGHS)	9,921	0.228
PERVIOUS (LS)	**4,044**	**0.093**
PROP. OFF-SITE DEVELOPMENT	sf	ac
DISTURBED AREA	3,481	0.080
IMPERVIOUS	**2,088**	**0.048**
TOTAL PGHS	**1,008**	**0.023**
ASPHALT ROADWAY/GUTTER (PGHS)	708	0.016
CONCRETE SIDEWALK	1,080	0.025
ASPHALT DRIVEWAY (PGHS)	300	0.007
PERVIOUS (LS)	**1,393**	**0.032**

LEGEND - DEVELOPED

- ROOF
- CONCRETE (ONSITE)
- ASPHALT (ONSITE)
- DISTURBED AREA
- CONCRETE (OFFSITE)
- ASPHALT (OFFSITE)
- CONCRETE (OFFSITE)

811 Know what's below. Call before you dig.

N

30 15 0 30 60

SCALE: 1 INCH = 30 FEET

By: JV
Date: 6/11/2024
FES Project No: 23062
Reference Sheet:
Drawing No:

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4.4 WWHM Reports

4.4.1 Vault Modeling

WWHM2012
PROJECT REPORT

Project Name: 23062 - vault
Site Name: Puyallup Medical Center
Site Address: 1617 S Meridian
City : Puyallup, WA 98371
Report Date: 5/29/2024
Gage : 38 IN CENTRAL
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version Date: 2021/08/18
Version : 4.2.18

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

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Mod	.78
Pervious Total	0.78

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.78

Element Flows To:

Surface	Interflow	Groundwater

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MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Flat	.124
Pervious Total	**0.124**

Impervious Land Use	acre
ROADS MOD	0.016
ROOF TOPS FLAT	0.286
DRIVEWAYS FLAT	0.018
SIDEWALKS FLAT	0.083
SIDEWALKS MOD	0.025
PARKING FLAT	0.228
Impervious Total	**0.656**
Basin Total	**0.78**

Element Flows To:

Surface	Interflow	Groundwater
Vault 1	Vault 1	

Name : Vault 1
Width : 24 ft.
Length : 96 ft.
Depth: 8 ft.
Discharge Structure
Riser Height: 7 ft.
Riser Diameter: 18 in.
Notch Type: Rectangular
Notch Width: 0.010 ft.
Notch Height: 1.105 ft.
Orifice 1 Diameter: 0.375 in. **Elevation:** 0 ft.

Element Flows To:

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Outlet 1 **Outlet 2**

Vault Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.052	0.000	0.000	0.000
0.0889	0.052	0.004	0.001	0.000
0.1778	0.052	0.009	0.001	0.000
0.2667	0.052	0.014	0.002	0.000
0.3556	0.052	0.018	0.002	0.000
0.4444	0.052	0.023	0.002	0.000
0.5333	0.052	0.028	0.002	0.000
0.6222	0.052	0.032	0.003	0.000
0.7111	0.052	0.037	0.003	0.000
0.8000	0.052	0.042	0.003	0.000
0.8889	0.052	0.047	0.003	0.000
0.9778	0.052	0.051	0.003	0.000
1.0667	0.052	0.056	0.003	0.000
1.1556	0.052	0.061	0.004	0.000
1.2444	0.052	0.065	0.004	0.000
1.3333	0.052	0.070	0.004	0.000
1.4222	0.052	0.075	0.004	0.000
1.5111	0.052	0.079	0.004	0.000
1.6000	0.052	0.084	0.004	0.000
1.6889	0.052	0.089	0.005	0.000
1.7778	0.052	0.094	0.005	0.000
1.8667	0.052	0.098	0.005	0.000
1.9556	0.052	0.103	0.005	0.000
2.0444	0.052	0.108	0.005	0.000
2.1333	0.052	0.112	0.005	0.000
2.2222	0.052	0.117	0.005	0.000
2.3111	0.052	0.122	0.005	0.000
2.4000	0.052	0.126	0.005	0.000
2.4889	0.052	0.131	0.006	0.000
2.5778	0.052	0.136	0.006	0.000
2.6667	0.052	0.141	0.006	0.000
2.7556	0.052	0.145	0.006	0.000
2.8444	0.052	0.150	0.006	0.000
2.9333	0.052	0.155	0.006	0.000
3.0222	0.052	0.159	0.006	0.000
3.1111	0.052	0.164	0.006	0.000
3.2000	0.052	0.169	0.006	0.000
3.2889	0.052	0.174	0.006	0.000
3.3778	0.052	0.178	0.007	0.000
3.4667	0.052	0.183	0.007	0.000
3.5556	0.052	0.188	0.007	0.000
3.6444	0.052	0.192	0.007	0.000
3.7333	0.052	0.197	0.007	0.000

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3.8222	0.052	0.202	0.007	0.000
3.9111	0.052	0.206	0.007	0.000
4.0000	0.052	0.211	0.007	0.000
4.0889	0.052	0.216	0.007	0.000
4.1778	0.052	0.221	0.007	0.000
4.2667	0.052	0.225	0.007	0.000
4.3556	0.052	0.230	0.008	0.000
4.4444	0.052	0.235	0.008	0.000
4.5333	0.052	0.239	0.008	0.000
4.6222	0.052	0.244	0.008	0.000
4.7111	0.052	0.249	0.008	0.000
4.8000	0.052	0.253	0.008	0.000
4.8889	0.052	0.258	0.008	0.000
4.9778	0.052	0.263	0.008	0.000
5.0667	0.052	0.268	0.008	0.000
5.1556	0.052	0.272	0.008	0.000
5.2444	0.052	0.277	0.008	0.000
5.3333	0.052	0.282	0.008	0.000
5.4222	0.052	0.286	0.008	0.000
5.5111	0.052	0.291	0.009	0.000
5.6000	0.052	0.296	0.009	0.000
5.6889	0.052	0.300	0.009	0.000
5.7778	0.052	0.305	0.009	0.000
5.8667	0.052	0.310	0.009	0.000
5.9556	0.052	0.315	0.009	0.000
6.0444	0.052	0.319	0.011	0.000
6.1333	0.052	0.324	0.013	0.000
6.2222	0.052	0.329	0.015	0.000
6.3111	0.052	0.333	0.017	0.000
6.4000	0.052	0.338	0.020	0.000
6.4889	0.052	0.343	0.023	0.000
6.5778	0.052	0.347	0.026	0.000
6.6667	0.052	0.352	0.029	0.000
6.7556	0.052	0.357	0.031	0.000
6.8444	0.052	0.362	0.035	0.000
6.9333	0.052	0.366	0.038	0.000
7.0222	0.052	0.371	0.093	0.000
7.1111	0.052	0.376	0.628	0.000
7.2000	0.052	0.380	1.445	0.000
7.2889	0.052	0.385	2.416	0.000
7.3778	0.052	0.390	3.427	0.000
7.4667	0.052	0.394	4.367	0.000
7.5556	0.052	0.399	5.138	0.000
7.6444	0.052	0.404	5.690	0.000
7.7333	0.052	0.409	6.055	0.000
7.8222	0.052	0.413	6.467	0.000
7.9111	0.052	0.418	6.806	0.000
8.0000	0.052	0.423	7.128	0.000
8.0889	0.052	0.427	7.436	0.000
8.1778	0.000	0.000	7.732	0.000

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ANALYSIS RESULTS

Stream Protection Duration

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

Mitigated Landuse Totals for POC #1
Total Pervious Area:0.124
Total Impervious Area:0.656

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.016598
5 year	0.025961
10 year	0.031067
25 year	0.036275
50 year	0.039375
100 year	0.041926

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.00807
5 year	0.014142
10 year	0.020293
25 year	0.031493
50 year	0.043142
100 year	0.058485

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

Year	Predeveloped	Mitigated
1902	0.012	0.008
1903	0.010	0.006
1904	0.019	0.007
1905	0.008	0.008
1906	0.004	0.005
1907	0.025	0.007
1908	0.019	0.007
1909	0.018	0.008

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1910	0.025	0.007
1911	0.017	0.007
1912	0.063	0.008
1913	0.026	0.009
1914	0.006	0.005
1915	0.011	0.009
1916	0.016	0.007
1917	0.005	0.006
1918	0.018	0.021
1919	0.013	0.007
1920	0.017	0.007
1921	0.019	0.008
1922	0.019	0.007
1923	0.015	0.009
1924	0.007	0.007
1925	0.009	0.006
1926	0.016	0.007
1927	0.010	0.007
1928	0.013	0.008
1929	0.027	0.009
1930	0.017	0.007
1931	0.016	0.008
1932	0.012	0.008
1933	0.012	0.008
1934	0.034	0.135
1935	0.016	0.014
1936	0.014	0.008
1937	0.023	0.007
1938	0.014	0.007
1939	0.001	0.006
1940	0.015	0.008
1941	0.007	0.005
1942	0.023	0.032
1943	0.012	0.008
1944	0.023	0.009
1945	0.019	0.008
1946	0.011	0.006
1947	0.006	0.006
1948	0.035	0.008
1949	0.030	0.009
1950	0.009	0.007
1951	0.011	0.006
1952	0.047	0.009
1953	0.042	0.026
1954	0.015	0.008
1955	0.012	0.006
1956	0.006	0.006
1957	0.021	0.009
1958	0.044	0.086
1959	0.027	0.064

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1960	0.007	0.005
1961	0.028	0.027
1962	0.015	0.008
1963	0.007	0.006
1964	0.008	0.006
1965	0.031	0.070
1966	0.009	0.007
1967	0.014	0.006
1968	0.014	0.008
1969	0.014	0.007
1970	0.021	0.008
1971	0.033	0.018
1972	0.022	0.008
1973	0.028	0.009
1974	0.016	0.007
1975	0.035	0.044
1976	0.019	0.008
1977	0.006	0.005
1978	0.031	0.030
1979	0.009	0.007
1980	0.018	0.007
1981	0.017	0.008
1982	0.007	0.006
1983	0.028	0.008
1984	0.011	0.007
1985	0.018	0.007
1986	0.016	0.008
1987	0.032	0.021
1988	0.020	0.009
1989	0.018	0.007
1990	0.020	0.007
1991	0.016	0.008
1992	0.023	0.026
1993	0.022	0.007
1994	0.033	0.008
1995	0.006	0.007
1996	0.037	0.034
1997	0.014	0.006
1998	0.016	0.007
1999	0.001	0.007
2000	0.013	0.008
2001	0.006	0.005
2002	0.026	0.007
2003	0.020	0.008
2004	0.019	0.008
2005	0.039	0.008
2006	0.010	0.007
2007	0.010	0.008
2008	0.017	0.007
2009	0.012	0.007

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2010	0.010	0.008
2011	0.008	0.007
2012	0.012	0.007
2013	0.009	0.005
2014	0.007	0.006
2015	0.013	0.007
2016	0.005	0.007
2017	0.025	0.009
2018	0.047	0.074
2019	0.045	0.038
2020	0.014	0.007
2021	0.023	0.009
2022	0.009	0.006
2023	0.019	0.008
2024	0.046	0.007
2025	0.017	0.008
2026	0.028	0.009
2027	0.010	0.007
2028	0.009	0.006
2029	0.019	0.009
2030	0.035	0.009
2031	0.011	0.006
2032	0.006	0.006
2033	0.010	0.006
2034	0.010	0.007
2035	0.039	0.062
2036	0.021	0.008
2037	0.005	0.006
2038	0.017	0.009
2039	0.002	0.005
2040	0.009	0.007
2041	0.012	0.006
2042	0.039	0.028
2043	0.018	0.009
2044	0.025	0.009
2045	0.017	0.009
2046	0.020	0.035
2047	0.015	0.008
2048	0.019	0.007
2049	0.017	0.008
2050	0.012	0.007
2051	0.018	0.008
2052	0.010	0.008
2053	0.018	0.029
2054	0.023	0.009
2055	0.007	0.006
2056	0.008	0.006
2057	0.012	0.008
2058	0.016	0.009
2059	0.028	0.009

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

Rank	Predeveloped	Mitigated
1	0.0627	0.1346
2	0.0467	0.0856
3	0.0466	0.0740
4	0.0460	0.0695
5	0.0449	0.0639
6	0.0444	0.0620
7	0.0416	0.0438
8	0.0393	0.0380
9	0.0392	0.0352
10	0.0386	0.0341
11	0.0368	0.0319
12	0.0353	0.0298
13	0.0349	0.0293
14	0.0348	0.0285
15	0.0344	0.0274
16	0.0333	0.0265
17	0.0330	0.0257
18	0.0319	0.0215
19	0.0312	0.0210
20	0.0309	0.0183
21	0.0303	0.0143
22	0.0278	0.0094
23	0.0276	0.0092
24	0.0276	0.0091
25	0.0276	0.0091
26	0.0276	0.0091
27	0.0275	0.0091
28	0.0267	0.0090
29	0.0262	0.0090
30	0.0259	0.0089
31	0.0254	0.0089
32	0.0253	0.0089
33	0.0252	0.0088
34	0.0248	0.0088
35	0.0230	0.0087
36	0.0230	0.0087
37	0.0228	0.0087
38	0.0227	0.0087
39	0.0226	0.0087
40	0.0225	0.0087
41	0.0220	0.0086
42	0.0216	0.0085
43	0.0213	0.0085
44	0.0212	0.0085
45	0.0207	0.0085

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46	0.0202	0.0084
47	0.0199	0.0084
48	0.0199	0.0084
49	0.0198	0.0084
50	0.0193	0.0083
51	0.0192	0.0083
52	0.0189	0.0082
53	0.0188	0.0082
54	0.0187	0.0082
55	0.0187	0.0082
56	0.0187	0.0081
57	0.0187	0.0081
58	0.0186	0.0081
59	0.0185	0.0081
60	0.0185	0.0081
61	0.0184	0.0081
62	0.0183	0.0080
63	0.0181	0.0079
64	0.0179	0.0079
65	0.0177	0.0079
66	0.0176	0.0079
67	0.0176	0.0079
68	0.0174	0.0078
69	0.0174	0.0078
70	0.0169	0.0077
71	0.0169	0.0077
72	0.0169	0.0077
73	0.0169	0.0077
74	0.0168	0.0076
75	0.0167	0.0076
76	0.0166	0.0076
77	0.0165	0.0076
78	0.0164	0.0076
79	0.0164	0.0076
80	0.0163	0.0076
81	0.0161	0.0075
82	0.0160	0.0075
83	0.0158	0.0075
84	0.0157	0.0075
85	0.0155	0.0074
86	0.0151	0.0074
87	0.0150	0.0074
88	0.0150	0.0074
89	0.0148	0.0074
90	0.0146	0.0074
91	0.0140	0.0074
92	0.0139	0.0073
93	0.0138	0.0073
94	0.0136	0.0073
95	0.0136	0.0073

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96	0.0135	0.0073
97	0.0135	0.0073
98	0.0133	0.0072
99	0.0130	0.0072
100	0.0127	0.0072
101	0.0125	0.0072
102	0.0124	0.0071
103	0.0123	0.0071
104	0.0122	0.0071
105	0.0121	0.0071
106	0.0121	0.0071
107	0.0121	0.0071
108	0.0120	0.0070
109	0.0119	0.0070
110	0.0117	0.0070
111	0.0116	0.0069
112	0.0115	0.0069
113	0.0115	0.0069
114	0.0113	0.0069
115	0.0106	0.0069
116	0.0106	0.0068
117	0.0103	0.0068
118	0.0102	0.0067
119	0.0102	0.0067
120	0.0102	0.0066
121	0.0101	0.0066
122	0.0101	0.0066
123	0.0100	0.0065
124	0.0099	0.0065
125	0.0099	0.0065
126	0.0094	0.0065
127	0.0093	0.0065
128	0.0090	0.0065
129	0.0087	0.0065
130	0.0086	0.0065
131	0.0086	0.0064
132	0.0086	0.0064
133	0.0085	0.0063
134	0.0082	0.0062
135	0.0080	0.0062
136	0.0079	0.0062
137	0.0078	0.0062
138	0.0073	0.0061
139	0.0071	0.0061
140	0.0071	0.0060
141	0.0071	0.0060
142	0.0069	0.0060
143	0.0069	0.0059
144	0.0069	0.0058
145	0.0064	0.0057

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146	0.0064	0.0057
147	0.0064	0.0057
148	0.0063	0.0056
149	0.0062	0.0055
150	0.0062	0.0055
151	0.0060	0.0054
152	0.0055	0.0054
153	0.0053	0.0054
154	0.0049	0.0053
155	0.0035	0.0053
156	0.0016	0.0053
157	0.0013	0.0053
158	0.0008	0.0048

Stream Protection Duration
POC #1
The Facility PASSED

The Facility PASSED.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0083	53118	51229	96	Pass
0.0086	49091	32315	65	Pass
0.0089	45489	19224	42	Pass
0.0092	42265	10155	24	Pass
0.0096	39246	8953	22	Pass
0.0099	36470	8055	22	Pass
0.0102	33972	7679	22	Pass
0.0105	31639	7318	23	Pass
0.0108	29379	6992	23	Pass
0.0111	27396	6681	24	Pass
0.0114	25628	6415	25	Pass
0.0118	24005	6183	25	Pass
0.0121	22570	5956	26	Pass
0.0124	21230	5762	27	Pass
0.0127	19922	5518	27	Pass
0.0130	18736	5296	28	Pass
0.0133	17623	5079	28	Pass
0.0136	16554	4905	29	Pass
0.0139	15468	4748	30	Pass
0.0143	14537	4580	31	Pass
0.0146	13673	4415	32	Pass
0.0149	12881	4266	33	Pass
0.0152	12099	4125	34	Pass
0.0155	11401	3987	34	Pass
0.0158	10692	3866	36	Pass
0.0161	10066	3736	37	Pass
0.0165	9451	3612	38	Pass
0.0168	8914	3487	39	Pass

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0.0171	8388	3371	40	Pass
0.0174	7889	3258	41	Pass
0.0177	7485	3154	42	Pass
0.0180	7053	3045	43	Pass
0.0183	6615	2944	44	Pass
0.0187	6271	2877	45	Pass
0.0190	5961	2794	46	Pass
0.0193	5695	2711	47	Pass
0.0196	5418	2633	48	Pass
0.0199	5174	2545	49	Pass
0.0202	4906	2464	50	Pass
0.0205	4668	2389	51	Pass
0.0209	4481	2306	51	Pass
0.0212	4303	2233	51	Pass
0.0215	4118	2158	52	Pass
0.0218	3913	2083	53	Pass
0.0221	3710	2015	54	Pass
0.0224	3528	1936	54	Pass
0.0227	3371	1884	55	Pass
0.0231	3210	1829	56	Pass
0.0234	3094	1768	57	Pass
0.0237	2982	1709	57	Pass
0.0240	2878	1648	57	Pass
0.0243	2757	1573	57	Pass
0.0246	2614	1510	57	Pass
0.0249	2503	1450	57	Pass
0.0252	2399	1387	57	Pass
0.0256	2302	1329	57	Pass
0.0259	2197	1264	57	Pass
0.0262	2074	1211	58	Pass
0.0265	1995	1156	57	Pass
0.0268	1898	1100	57	Pass
0.0271	1808	1047	57	Pass
0.0274	1718	996	57	Pass
0.0278	1637	945	57	Pass
0.0281	1585	894	56	Pass
0.0284	1502	851	56	Pass
0.0287	1428	800	56	Pass
0.0290	1359	745	54	Pass
0.0293	1285	691	53	Pass
0.0296	1229	662	53	Pass
0.0300	1175	636	54	Pass
0.0303	1112	613	55	Pass
0.0306	1066	589	55	Pass
0.0309	1018	565	55	Pass
0.0312	973	537	55	Pass
0.0315	929	513	55	Pass
0.0318	877	471	53	Pass
0.0322	819	452	55	Pass
0.0325	780	432	55	Pass

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0.0328	736	410	55	Pass
0.0331	691	394	57	Pass
0.0334	635	374	58	Pass
0.0337	597	354	59	Pass
0.0340	553	331	59	Pass
0.0344	509	307	60	Pass
0.0347	471	291	61	Pass
0.0350	423	270	63	Pass
0.0353	392	253	64	Pass
0.0356	361	242	67	Pass
0.0359	337	227	67	Pass
0.0362	312	213	68	Pass
0.0365	297	198	66	Pass
0.0369	274	182	66	Pass
0.0372	254	169	66	Pass
0.0375	240	153	63	Pass
0.0378	221	135	61	Pass
0.0381	207	120	57	Pass
0.0384	194	119	61	Pass
0.0387	176	116	65	Pass
0.0391	156	115	73	Pass
0.0394	142	112	78	Pass

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.0734 **acre-feet**
On-line facility target flow: 0.0969 **cfs.**
Adjusted for 15 min: 0.0969 **cfs.**
Off-line facility target flow: 0.0557 **cfs.**
Adjusted for 15 min: 0.0557 **cfs.**

LID Report

LID Technique	Used for Treatment?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft.)	Cumulative Infiltration Credit	Percent Water Quality Treated	Percent Water Quality Infiltrated	Comment
Vault 1 POC	N	252.02			N	0.00		
Total Volume Infiltrated		252.02	0.00	0.00		0.00	0.00	
Compliance with LID Standard Duration Analysis Result = Passed						8		No Treat. Credit

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Perlnd and Implnd Changes

No changes have been made.

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4.4.2 Wetlands Modeling

WWHM2012
PROJECT REPORT

Project Name: 23062 - wetlands
Site Name:
Site Address: 1617 S. Meridian
City : Puyallup
Report Date: 6/4/2024
Gage : 38 IN CENTRAL
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version Date: 2021/08/18
Version : 4.2.18

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

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Mod	200.61
Pervious Total	200.61

Impervious Land Use	acre
ROADS MOD	356.65

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Impervious Total	**356.65**
Basin Total	**557.26**

Element Flows To:

Surface	**Interflow**	**Groundwater**

MITIGATED LAND USE

Name : Basin 1
Bypass: No

GroundWater: No

Pervious Land Use	**acre**
C, Pasture, Mod	**200.013**
Pervious Total	**200.013**

Impervious Land Use	**acre**
ROADS MOD	**356.662**
ROOF TOPS FLAT	**0.301**
SIDEWALKS MOD	**0.156**
PARKING MOD	**0.128**
Impervious Total	**357.247**
Basin Total	**557.26**

Element Flows To:

Surface	**Interflow**	**Groundwater**

ANALYSIS RESULTS

Stream Protection Duration

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Predeveloped Landuse Totals for POC #1
Total Pervious Area:200.61
Total Impervious Area:356.65

Mitigated Landuse Totals for POC #1
Total Pervious Area:200.013
Total Impervious Area:357.247

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	141.737865
5 year	194.267147
10 year	233.866522
25 year	289.696614
50 year	335.710024
100 year	385.700953

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	141.946328
5 year	194.548924
10 year	234.202942
25 year	290.109351
50 year	336.185131
100 year	386.243359

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

Year	Predeveloped	Mitigated
1902	159.645	159.902
1903	174.824	175.107
1904	209.829	210.118
1905	96.153	96.300
1906	108.799	108.968
1907	134.189	134.378
1908	109.392	109.559
1909	134.685	134.894
1910	137.936	138.117
1911	146.997	147.224
1912	284.893	285.212
1913	132.978	133.163
1914	512.016	512.732
1915	90.245	90.383
1916	177.910	178.174

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1917	77.365	77.475
1918	134.249	134.467
1919	89.092	89.221
1920	127.513	127.693
1921	97.720	97.855
1922	159.995	160.218
1923	105.130	105.279
1924	191.072	191.358
1925	82.836	82.961
1926	153.084	153.327
1927	139.896	140.092
1928	94.517	94.655
1929	187.985	188.291
1930	208.016	208.336
1931	102.872	103.026
1932	113.623	113.788
1933	107.788	107.939
1934	169.867	170.108
1935	88.799	88.927
1936	129.522	129.721
1937	196.320	196.629
1938	98.445	98.576
1939	112.512	112.687
1940	226.664	227.002
1941	226.116	226.454
1942	151.121	151.343
1943	142.680	142.909
1944	217.246	217.562
1945	153.143	153.397
1946	143.257	143.446
1947	96.012	96.162
1948	130.980	131.193
1949	200.387	200.716
1950	132.931	133.133
1951	236.884	237.220
1952	225.857	226.141
1953	187.364	187.616
1954	109.450	109.615
1955	137.689	137.869
1956	117.102	117.276
1957	108.064	108.216
1958	160.793	161.002
1959	160.706	160.909
1960	116.884	117.064
1961	329.802	330.313
1962	141.405	141.620
1963	95.895	96.051
1964	357.819	358.330
1965	151.135	151.343
1966	103.384	103.546

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1967	156.196	156.395
1968	136.221	136.428
1969	110.362	110.530
1970	133.020	133.214
1971	126.365	126.537
1972	466.724	467.393
1973	242.243	242.631
1974	169.466	169.734
1975	178.906	179.149
1976	191.471	191.750
1977	88.383	88.516
1978	147.011	147.209
1979	142.430	142.661
1980	161.097	161.324
1981	152.083	152.299
1982	114.656	114.835
1983	150.028	150.237
1984	145.520	145.742
1985	193.551	193.799
1986	94.421	94.550
1987	156.026	156.273
1988	88.914	89.041
1989	98.796	98.924
1990	119.350	119.516
1991	205.196	205.482
1992	208.554	208.847
1993	167.170	167.446
1994	123.838	124.018
1995	94.416	94.560
1996	134.481	134.669
1997	118.824	118.991
1998	136.344	136.539
1999	174.132	174.387
2000	124.338	124.525
2001	130.956	131.141
2002	194.382	194.632
2003	144.075	144.257
2004	165.124	165.379
2005	403.628	404.205
2006	146.453	146.688
2007	166.662	166.924
2008	136.289	136.496
2009	105.210	105.355
2010	134.165	134.375
2011	144.315	144.515
2012	123.435	123.627
2013	129.256	129.451
2014	133.065	133.266
2015	209.670	209.964
2016	150.166	150.365

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2017	186.553	186.863
2018	153.317	153.483
2019	193.376	193.606
2020	141.376	141.587
2021	119.758	119.932
2022	199.439	199.765
2023	269.426	269.808
2024	323.401	323.790
2025	150.709	150.914
2026	231.457	231.762
2027	166.543	166.808
2028	59.767	59.866
2029	101.526	101.676
2030	212.339	212.632
2031	65.246	65.346
2032	124.029	124.200
2033	140.653	140.879
2034	104.364	104.536
2035	138.327	138.507
2036	113.942	114.106
2037	182.448	182.714
2038	140.233	140.432
2039	307.855	308.296
2040	114.165	114.333
2041	134.687	134.906
2042	158.031	158.287
2043	175.623	175.907
2044	122.467	122.658
2045	95.295	95.442
2046	115.837	116.012
2047	126.830	127.041
2048	108.750	108.922
2049	160.837	161.099
2050	124.648	124.825
2051	170.323	170.572
2052	154.837	155.065
2053	112.205	112.386
2054	232.554	232.897
2055	142.368	142.568
2056	192.976	193.253
2057	86.530	86.666
2058	205.773	206.073
2059	226.723	227.073

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

Rank	Predeveloped	Mitigated
1	512.0160	512.7320
2	466.7240	467.3930

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3	403.6280	404.2050
4	357.8190	358.3300
5	329.8020	330.3130
6	323.4010	323.7900
7	307.8550	308.2960
8	284.8930	285.2120
9	269.4260	269.8080
10	242.2430	242.6310
11	236.8840	237.2200
12	232.5540	232.8970
13	231.4570	231.7620
14	226.7230	227.0730
15	226.6640	227.0020
16	226.1160	226.4540
17	225.8570	226.1410
18	217.2460	217.5620
19	212.3390	212.6320
20	209.8290	210.1180
21	209.6700	209.9640
22	208.5540	208.8470
23	208.0160	208.3360
24	205.7730	206.0730
25	205.1960	205.4820
26	200.3870	200.7160
27	199.4390	199.7650
28	196.3200	196.6290
29	194.3820	194.6320
30	193.5510	193.7990
31	193.3760	193.6060
32	192.9760	193.2530
33	191.4710	191.7500
34	191.0720	191.3580
35	187.9850	188.2910
36	187.3640	187.6160
37	186.5530	186.8630
38	182.4480	182.7140
39	178.9060	179.1490
40	177.9100	178.1740
41	175.6230	175.9070
42	174.8240	175.1070
43	174.1320	174.3870
44	170.3230	170.5720
45	169.8670	170.1080
46	169.4660	169.7340
47	167.1700	167.4460
48	166.6620	166.9240
49	166.5430	166.8080
50	165.1240	165.3790
51	161.0970	161.3240
52	160.8370	161.0990

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53	160.7930	161.0020
54	160.7060	160.9090
55	159.9950	160.2180
56	159.6450	159.9020
57	158.0310	158.2870
58	156.1960	156.3950
59	156.0260	156.2730
60	154.8370	155.0650
61	153.3170	153.4830
62	153.1430	153.3970
63	153.0840	153.3270
64	152.0830	152.2990
65	151.1350	151.3430
66	151.1210	151.3430
67	150.7090	150.9140
68	150.1660	150.3650
69	150.0280	150.2370
70	147.0110	147.2240
71	146.9970	147.2090
72	146.4530	146.6880
73	145.5200	145.7420
74	144.3150	144.5150
75	144.0750	144.2570
76	143.2570	143.4460
77	142.6800	142.9090
78	142.4300	142.6610
79	142.3680	142.5680
80	141.4050	141.6200
81	141.3760	141.5870
82	140.6530	140.8790
83	140.2330	140.4320
84	139.8960	140.0920
85	138.3270	138.5070
86	137.9360	138.1170
87	137.6890	137.8690
88	136.3440	136.5390
89	136.2890	136.4960
90	136.2210	136.4280
91	134.6870	134.9060
92	134.6850	134.8940
93	134.4810	134.6690
94	134.2490	134.4670
95	134.1890	134.3780
96	134.1650	134.3750
97	133.0650	133.2660
98	133.0200	133.2140
99	132.9780	133.1630
100	132.9310	133.1330
101	130.9800	131.1930
102	130.9560	131.1410

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103	129.5220	129.7210
104	129.2560	129.4510
105	127.5130	127.6930
106	126.8300	127.0410
107	126.3650	126.5370
108	124.6480	124.8250
109	124.3380	124.5250
110	124.0290	124.2000
111	123.8380	124.0180
112	123.4350	123.6270
113	122.4670	122.6580
114	119.7580	119.9320
115	119.3500	119.5160
116	118.8240	118.9910
117	117.1020	117.2760
118	116.8840	117.0640
119	115.8370	116.0120
120	114.6560	114.8350
121	114.1650	114.3330
122	113.9420	114.1060
123	113.6230	113.7880
124	112.5120	112.6870
125	112.2050	112.3860
126	110.3620	110.5300
127	109.4500	109.6150
128	109.3920	109.5590
129	108.7990	108.9680
130	108.7500	108.9220
131	108.0640	108.2160
132	107.7880	107.9390
133	105.2100	105.3550
134	105.1300	105.2790
135	104.3640	104.5360
136	103.3840	103.5460
137	102.8720	103.0260
138	101.5260	101.6760
139	98.7962	98.9235
140	98.4452	98.5755
141	97.7195	97.8553
142	96.1529	96.2998
143	96.0121	96.1618
144	95.8949	96.0509
145	95.2953	95.4423
146	94.5165	94.6551
147	94.4205	94.5599
148	94.4162	94.5496
149	90.2451	90.3834
150	89.0918	89.2213
151	88.9140	89.0413
152	88.7985	88.9270

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153	88.3833	88.5164
154	86.5300	86.6662
155	82.8363	82.9611
156	77.3652	77.4751
157	65.2463	65.3459
158	59.7669	59.8660

Stream Protection Duration
POC #1
The Facility FAILED

Facility FAILED duration standard for 1+ flows.

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
70.8689	3965	3985	100	Pass
73.5441	3394	3414	100	Pass
76.2193	2938	2960	100	Pass
78.8944	2637	2641	100	Pass
81.5696	2346	2359	100	Pass
84.2447	2087	2100	100	Pass
86.9199	1881	1893	100	Pass
89.5951	1686	1697	100	Pass
92.2702	1505	1509	100	Pass
94.9454	1323	1331	100	Pass
97.6206	1175	1183	100	Pass
100.2957	1070	1077	100	Pass
102.9709	986	993	100	Pass
105.6460	882	886	100	Pass
108.3212	809	812	100	Pass
110.9964	724	729	100	Pass
113.6715	655	660	100	Pass
116.3467	594	598	100	Pass
119.0219	547	550	100	Pass
121.6970	498	504	101	Fail
124.3722	445	447	100	Pass
127.0473	401	403	100	Pass
129.7225	366	368	100	Pass
132.3977	330	331	100	Pass
135.0728	297	299	100	Pass
137.7480	269	270	100	Pass
140.4232	241	243	100	Pass
143.0983	216	218	100	Pass
145.7735	204	207	101	Pass
148.4486	192	193	100	Pass
151.1238	181	181	100	Pass
153.7990	161	161	100	Pass
156.4741	151	151	100	Pass
159.1493	143	143	100	Pass
161.8245	128	128	100	Pass

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164.4996	124	124	100	Pass
167.1748	113	113	100	Pass
169.8499	103	103	100	Pass
172.5251	99	99	100	Pass
175.2003	96	96	100	Pass
177.8754	92	93	101	Pass
180.5506	88	88	100	Pass
183.2258	79	79	100	Pass
185.9009	76	76	100	Pass
188.5761	70	70	100	Pass
191.2512	67	68	101	Pass
193.9264	62	62	100	Pass
196.6016	57	59	103	Pass
199.2767	53	54	101	Pass
201.9519	49	49	100	Pass
204.6271	49	49	100	Pass
207.3022	43	43	100	Pass
209.9774	37	39	105	Pass
212.6525	35	36	102	Pass
215.3277	35	35	100	Pass
218.0029	32	32	100	Pass
220.6780	32	32	100	Pass
223.3532	32	32	100	Pass
226.0284	30	31	103	Pass
228.7035	25	27	108	Pass
231.3787	24	24	100	Pass
234.0538	22	22	100	Pass
236.7290	22	22	100	Pass
239.4042	20	20	100	Pass
242.0793	19	19	100	Pass
244.7545	18	18	100	Pass
247.4297	18	18	100	Pass
250.1048	16	16	100	Pass
252.7800	16	16	100	Pass
255.4551	16	16	100	Pass
258.1303	16	16	100	Pass
260.8055	16	16	100	Pass
263.4806	16	16	100	Pass
266.1558	16	16	100	Pass
268.8310	14	15	107	Pass
271.5061	12	12	100	Pass
274.1813	12	12	100	Pass
276.8564	11	11	100	Pass
279.5316	11	11	100	Pass
282.2068	11	11	100	Pass
284.8819	11	11	100	Pass
287.5571	10	10	100	Pass
290.2323	10	10	100	Pass
292.9074	10	10	100	Pass
295.5826	10	10	100	Pass

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298.2577	10	10	100	Pass
300.9329	10	10	100	Pass
303.6081	10	10	100	Pass
306.2832	10	10	100	Pass
308.9584	9	9	100	Pass
311.6336	9	9	100	Pass
314.3087	9	9	100	Pass
316.9839	9	9	100	Pass
319.6590	9	9	100	Pass
322.3342	9	9	100	Pass
325.0094	8	8	100	Pass
327.6845	8	8	100	Pass
330.3597	6	8	133	Fail
333.0349	6	6	100	Pass
335.7100	6	6	100	Pass

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

Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0 **acre-feet**
On-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**
Off-line facility target flow: 0 **cfs.**
Adjusted for 15 min: 0 **cfs.**

LID Report

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

Compliance with LID Standard 8
Duration Analysis Result = Failed

Perlnd and Implnd Changes

No changes have been made.

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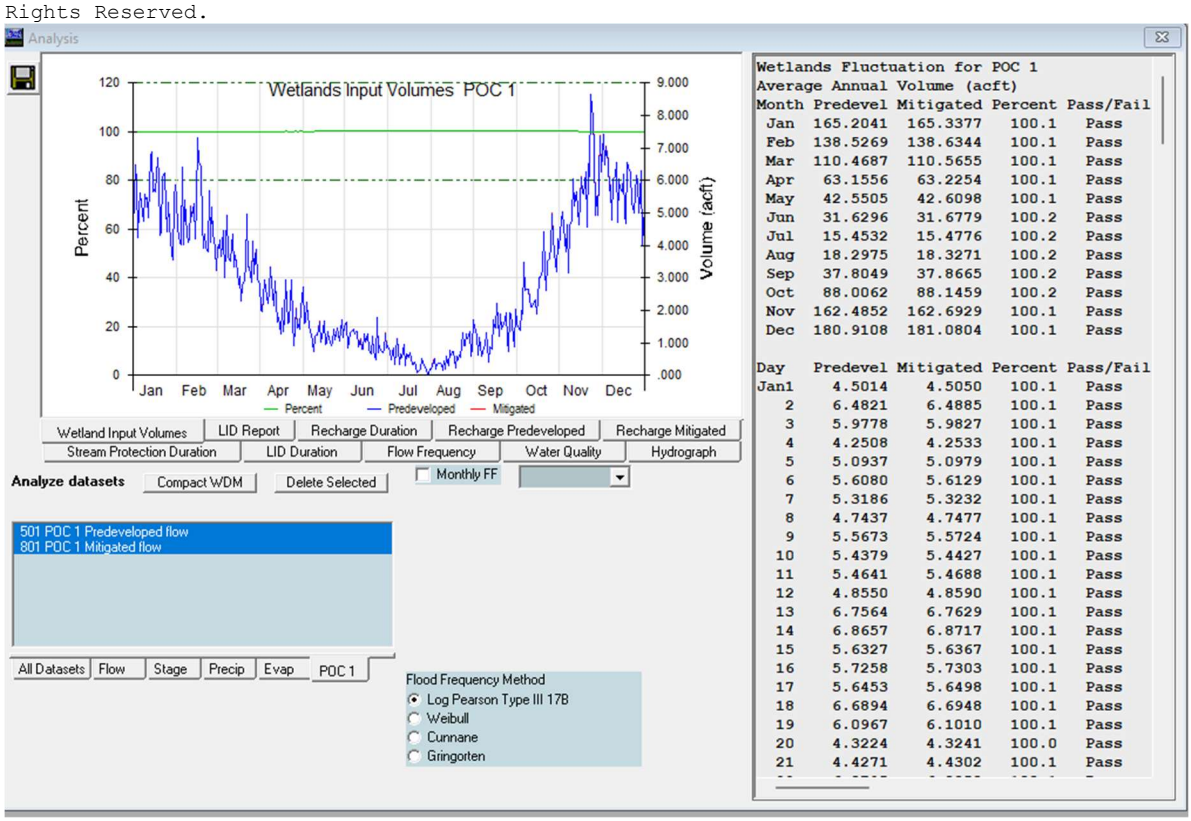

Wetlands Fluctuation for POC 1
Average Annual Volume (acft)

Month	Predevel	Mitigated	Percent	Pass/Fail
Jan	165.2041	165.3377	100.1	Pass
Feb	138.5269	138.6344	100.1	Pass
Mar	110.4687	110.5655	100.1	Pass
Apr	63.1556	63.2254	100.1	Pass
May	42.5505	42.6098	100.1	Pass
Jun	31.6296	31.6779	100.2	Pass
Jul	15.4532	15.4776	100.2	Pass
Aug	18.2975	18.3271	100.2	Pass
Sep	37.8049	37.8665	100.2	Pass
Oct	88.0062	88.1459	100.2	Pass
Nov	162.4852	162.6929	100.1	Pass
Dec	180.9108	181.0804	100.1	Pass

Day	Predevel	Mitigated	Percent	Pass/Fail
Jan1	4.5014	4.5050	100.1	Pass
2	6.4821	6.4885	100.1	Pass
3	5.9778	5.9827	100.1	Pass
4	4.2508	4.2533	100.1	Pass
5	5.0937	5.0979	100.1	Pass
6	5.6080	5.6129	100.1	Pass
7	5.3186	5.3232	100.1	Pass
8	4.7437	4.7477	100.1	Pass
9	5.5673	5.5724	100.1	Pass
10	5.4379	5.4427	100.1	Pass
11	5.4641	5.4688	100.1	Pass
12	4.8550	4.8590	100.1	Pass
13	6.7564	6.7629	100.1	Pass
14	6.8657	6.8717	100.1	Pass
15	5.6327	5.6367	100.1	Pass
16	5.7258	5.7303	100.1	Pass
17	5.6453	5.6498	100.1	Pass
18	6.6894	6.6948	100.1	Pass
19	6.0967	6.1010	100.1	Pass
20	4.3224	4.3241	100.0	Pass
21	4.4271	4.4302	100.1	Pass

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5.0 SPECIAL REPORTS AND STUDIES

Geotechnical Report: Proposed Medical Building 11504 NE 21st St. Bellevue WA, by PanGeo Inc., dated September 9, 2020, File No. 20-294

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6.0 OTHER PERMITS

Grading Permit

Building Permit

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7.0 ESC ANALYSIS AND DESIGN

SWPPP is submitted under separate cover.

Design of the ESC plan was completed in conformance with Core Requirement per the 2019 SMMWW. Compliance with the 13 minimum requirements is summarized below.

1. Clearing Limits: Clearing limits have been delineated BMP C233 on sheets of the civil plans.
2. Construction Access: An armored construction entrance BMP C105 is shown on the plan.
3. Control Flow Rates: Silt Fence will be used to reduce the flow.
4. Install Sediment Controls: A construction entrance will be installed at the entrance to the project site. See TESC plan for location of construction entrance and detail.
5. Stabilize Soils: The proposed sediment ponds will be used for sediment retention. Sediment retention will be designed per the stormwater manual.
6. Protect Slopes: Not Required for this project.
7. Protect Drain Inlets: Inlets are sufficiently far away from the construction and don't need protection.
8. Stabilize Channels and Outlets: There are no channels or outlets.
9. Control Pollutants: Flow Control: BMP C151, BMP C152, BMP C153 and BMP C154.
10. Control Dewatering: Dewatering is not expected for this project
11. Maintain BMP's: CESCL
12. Manage the Project: CESCL
13. Protect LID BMP's: Silt Fence will be placed around the infiltration areas to protect them from compaction.

During the wet season (October 1 to April 30) any site with exposed soils shall be subject to the "Wet Season Requirements" contained in the ESC Standards. In addition to the ESC cover measures, these provisions include covering any newly-seeded areas with mulch and seeding as much disturbed area as possible during the first week of October to provide grass cover for the wet season.

Prior to obtaining final construction approval, the site shall be stabilized, structural ESC measures (such as silt fences and sediment traps) shall be removed, and drainage facilities shall be cleaned as specified in the ESC Standards.

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8.0 BOND QUANTITIES

To be provided at final approval if required

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9.0 OPERATIONS AND MAINTENANCE MANUAL

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

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

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

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

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

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is Performed
Manhole	Cover Not in Place	Cover is missing or only partially in place. Any open manhole requires maintenance.	Manhole is closed.
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread (may not apply to self-locking lids).	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. Intent is to keep cover from sealing off access to maintenance.	Cover can be removed and reinstalled by one maintenance person.
	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, misalignment, not securely attached to structure wall, rust, or cracks.	Ladder meets design standards. Allows maintenance person safe access.
Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.4: Maintenance Standards - Control Structure/Flow Restrictor

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
General	Trash and Debris (Includes Sediment)	Material exceeds 25% of sump depth or 1 foot below orifice plate.	Control structure orifice is not blocked. All trash and debris removed.
	Structural Damage	Structure is not securely attached to manhole wall. Structure is not in upright position (allow up to 10% from plumb). Connections to outlet pipe are not watertight and show signs of rust. Any holes - other than designed holes - in the structure.	Structure securely attached to wall and outlet pipe. Structure in correct position. Connections to outlet pipe are water tight; structure repaired or replaced and works as designed. Structure has no holes other than designed holes.
Cleanout Gate	Damaged or Missing	Cleanout gate is not watertight or is missing. Gate cannot be moved up and down by one maintenance person. Chain/rod leading to gate is missing or damaged. Gate is rusted over 50% of its surface area.	Gate is watertight and works as designed. Gate moves up and down easily and is watertight. Chain is in place and works as designed. Gate is repaired or replaced to meet design standards.
Orifice Plate	Damaged or Missing	Control device is not working properly due to missing, out of place, or bent orifice plate.	Plate is in place and works as designed.
	Obstructions	Any trash, debris, sediment, or vegetation blocking the plate.	Plate is free of all obstructions and works as designed.
Overflow Pipe	Obstructions	Any trash or debris blocking (or having the potential of blocking) the overflow pipe.	Pipe is free of all obstructions and works as designed.
Manhole	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)	See Table V-A.3: Maintenance Standards - Closed Detention Systems (Tanks/Vaults)
Catch Basin	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins	See Table V-A.5: Maintenance Standards - Catch Basins

Table V-A.5: Maintenance Standards - Catch Basins

Maintenance Component	Defect	Conditions When Maintenance is Needed	Results Expected When Maintenance is performed
General	Trash & Debris	Trash or debris which is located immediately in front of the catch basin opening or is blocking inletting capacity of the basin by more than 10%. Trash or debris (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of six inches clearance from the debris surface to the invert of the lowest pipe. Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height. Dead animals or vegetation that could generate odors that could cause complaints or dangerous gases (e.g., methane).	No Trash or debris located immediately in front of catch basin or on grate opening. No trash or debris in the catch basin. Inlet and outlet pipes free of trash or debris. No dead animals or vegetation present within the catch basin.
	Sediment	Sediment (in the basin) that exceeds 60 percent of the sump depth as measured from the bottom of basin to invert of the lowest pipe into or out of the basin, but in no case less than a minimum of 6 inches clearance from the sediment surface to the invert of the lowest pipe.	No sediment in the catch basin
	Structure Damage to Frame and/or Top Slab	Top slab has holes larger than 2 square inches or cracks wider than 1/4 inch. (Intent is to make sure no material is running into basin). Frame not sitting flush on top slab, i.e., separation of more than 3/4 inch of the frame from the top slab. Frame not securely attached	Top slab is free of holes and cracks. Frame is sitting flush on the riser rings or top slab and firmly attached.
	Fractures or Cracks in Basin Walls/ Bottom	Maintenance person judges that structure is unsound. Grout fillet has separated or cracked wider than 1/2 inch and longer than 1 foot at the joint of any inlet/outlet pipe or any evidence of soil particles entering catch basin through cracks.	Basin replaced or repaired to design standards. Pipe is regrouted and secure at basin wall.
	Settlement/ Misalignment	If failure of basin has created a safety, function, or design problem.	Basin replaced or repaired to design standards.
	Vegetation	Vegetation growing across and blocking more than 10% of the basin opening. Vegetation growing in inlet/outlet pipe joints that is more than six inches tall and less than six inches apart.	No vegetation blocking opening to basin. No vegetation or root growth present.
	Contamination and Pollution	See Table V-A.1: Maintenance Standards - Detention Ponds	No pollution present.
Catch Basin Cover	Cover Not in Place	Cover is missing or only partially in place. Any open catch basin requires maintenance.	Cover/grate is in place, meets design standards, and is secured
	Locking Mechanism Not Working	Mechanism cannot be opened by one maintenance person with proper tools. Bolts into frame have less than 1/2 inch of thread.	Mechanism opens with proper tools.
	Cover Difficult to Remove	One maintenance person cannot remove lid after applying normal lifting pressure. (Intent is keep cover from sealing off access to maintenance.)	Cover can be removed by one maintenance person.
Ladder	Ladder Rungs Unsafe	Ladder is unsafe due to missing rungs, not securely attached to basin wall, misalignment, rust, cracks, or sharp edges.	Ladder meets design standards and allows maintenance person safe access.
Metal Grates (If Applicable)	Grate opening Unsafe	Grate with opening wider than 7/8 inch.	Grate opening meets design standards.
	Trash and Debris	Trash and debris that is blocking more than 20% of grate surface inletting capacity.	Grate free of trash and debris.
	Damaged or Missing.	Grate missing or broken member(s) of the grate.	Grate is in place, meets the design standards, and is installed and aligned with the flow path.

Table V-A.12: Maintenance Standards - Wetvaults (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
		and non-floatables).	
	Sediment Accumulation in Vault	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches.	Remove sediment from vault.
	Damaged Pipes	Inlet/outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened or removed, especially by one person.	Cover repaired or replaced to proper working specifications.
	Ventilation	Ventilation area blocked or plugged.	Blocking material removed or cleared from ventilation area. A specified % of the vault surface area must provide ventilation to the vault interior (see design specifications).
	Vault Structure Damage - Includes Cracks in Walls Bottom, Damage to Frame and/or Top Slab	Maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection staff.	Baffles repaired or replaced to specifications.
	Access Ladder Damage	Ladder is corroded or deteriorated, not functioning properly, not attached to structure wall, missing rungs, has cracks and/or misaligned. Confined space warning sign missing.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel. Replace sign warning of confined space entry requirements. Ladder and entry notification complies with OSHA standards.

Table V-A.13: Maintenance Standards - Sand Filters (Above Ground/Open)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Above Ground (open sand filter)	Sediment Accumulation on top layer	Sediment depth exceeds 1/2-inch.	No sediment deposit on grass layer of sand filter that would impede permeability of the filter section.
	Trash and Debris Accumulations	Trash and debris accumulated on sand filter bed.	Trash and debris removed from sand filter bed.
	Sediment/ Debris in Clean-Outs	When the clean-outs become full or partially plugged with sediment and/or debris.	Sediment removed from clean-outs.
	Sand Filter Media	Drawdown of water through the sand filter media takes longer than 24-hours, and/or flow through the overflow pipes occurs frequently.	Top several inches of sand are scraped. May require replacement of entire sand filter depth depending on extent of plugging (a sieve analysis is helpful to determine if the lower sand has too high a proportion of fine material).
	Prolonged Flows	Sand is saturated for prolonged periods of time (several weeks) and does not dry out between storms due to continuous base flow or prolonged flows from detention facilities.	Low, continuous flows are limited to a small portion of the facility by using a low wooden divider or slightly depressed sand surface.
	Short Circuiting	When flows become concentrated over one section of the sand filter rather than dispersed.	Flow and percolation of water through sand filter is uniform and dispersed across the entire filter area.
	Erosion Damage to Slopes	Erosion over 2-inches deep where cause of damage is prevalent or potential for continued erosion is evident.	Slopes stabilized using proper erosion control measures.
	Rock Pad Missing or Out of Place	Soil beneath the rock is visible.	Rock pad replaced or rebuilt to design specifications.

Table V-A.13: Maintenance Standards - Sand Filters (Above Ground/Open) (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
	Flow Spreader	Flow spreader uneven or clogged so that flows are not uniformly distributed across sand filter.	Spreader leveled and cleaned so that flows are spread evenly over sand filter.
	Damaged Pipes	Any part of the piping that is crushed or deformed more than 20% or any other failure to the piping.	Pipe repaired or replaced.

Table V-A.14: Maintenance Standards - Sand Filters (Below Ground/Enclosed)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground Vault.	Sediment Accumulation on Sand Media Section	Sediment depth exceeds 1/2-inch.	No sediment deposits on sand filter section that which would impede permeability of the filter section.
	Sediment Accumulation in Pre-Settling Portion of Vault	Sediment accumulation in vault bottom exceeds the depth of the sediment zone plus 6-inches.	No sediment deposits in first chamber of vault.
	Trash/Debris Accumulation	Trash and debris accumulated in vault, or pipe inlet/outlet, floatables and non-floatables.	Trash and debris removed from vault and inlet/outlet piping.
	Sediment in Drain Pipes/Cleanouts	When drain pipes, cleanouts become full with sediment and/or debris.	Sediment and debris removed.
	Short Circuiting	When seepage/flow occurs along the vault walls and corners. Sand eroding near inflow area.	Sand filter media section re-laid and compacted along perimeter of vault to form a semi-seal. Erosion protection added to dissipate force of incoming flow and curtail erosion.
	Damaged Pipes	Inlet or outlet piping damaged or broken and in need of repair.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened, corrosion/deformation of cover. Maintenance person cannot remove cover using normal lifting pressure.	Cover repaired to proper working specifications or replaced.
	Ventilation	Ventilation area blocked or plugged	Blocking material removed or cleared from ventilation area. A specified % of the vault surface area must provide ventilation to the vault interior (see design specifications).
	Vault Structure Damaged; Includes Cracks in Walls, Bottom, Damage to Frame and/or Top Slab.	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles/Internal walls	Baffles or walls corroding, cracking, warping and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired to specifications, and is safe to use as determined by inspection personnel.

Table V-A.15: Maintenance Standards - Manufactured Media Filters

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Below Ground	Sediment Accumulation on Media.	Sediment depth exceeds 0.25-inches.	No sediment deposits which would impede permeability of the

Table V-A.15: Maintenance Standards - Manufactured Media Filters (continued)

Maintenance Component	Defect	Condition When Maintenance is Needed	Results Expected When Maintenance is Performed
Vault			compost media.
	Sediment Accumulation in Vault	Sediment depth exceeds 6-inches in first chamber.	No sediment deposits in vault bottom of first chamber.
	Trash/Debris Accumulation	Trash and debris accumulated on compost filter bed.	Trash and debris removed from the compost filter bed.
	Sediment in Drain Pipes/Clean-Outs	When drain pipes, clean-outs, become full with sediment and/or debris.	Sediment and debris removed.
	Damaged Pipes	Any part of the pipes that are crushed or damaged due to corrosion and/or settlement.	Pipe repaired and/or replaced.
	Access Cover Damaged/Not Working	Cover cannot be opened; one person cannot open the cover using normal lifting pressure, corrosion/deformation of cover.	Cover repaired to proper working specifications or replaced.
	Vault Structure Includes Cracks in Wall, Bottom, Damage to Frame and/or Top Slab	Cracks wider than 1/2-inch or evidence of soil particles entering the structure through the cracks, or maintenance/inspection personnel determine that the vault is not structurally sound. Cracks wider than 1/2-inch at the joint of any inlet/outlet pipe or evidence of soil particles entering through the cracks.	Vault replaced or repairs made so that vault meets design specifications and is structurally sound. Vault repaired so that no cracks exist wider than 1/4-inch at the joint of the inlet/outlet pipe.
	Baffles	Baffles corroding, cracking warping, and/or showing signs of failure as determined by maintenance/inspection person.	Baffles repaired or replaced to specifications.
	Access Ladder Damaged	Ladder is corroded or deteriorated, not functioning properly, not securely attached to structure wall, missing rungs, cracks, and misaligned.	Ladder replaced or repaired and meets specifications, and is safe to use as determined by inspection personnel.
Below Ground Cartridge Type	Media	Drawdown of water through the media takes longer than 1 hour, and/or overflow occurs frequently.	Media cartridges replaced.
	Short Circuiting	Flows do not properly enter filter cartridges.	Filter cartridges replaced.

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APPENDIX A: NRCS WEB SOIL SURVEY


122° 18' 9" W
122° 16' 43" W
47° 10' 50" N
47° 10' 13" N
552900
553000
553100
553200
553300
553400
553500
553600
553700
553800
553900
554000
554100
554200
554300
554400
554500
554600
5225400
5225300
5225200
5225100
5225000
5224900
5224800
5224700
5224600
5224500
5224400
512
161
5th St Sw
6th St Sw
S Meridian
15th Ave Se
17th Ave Se
9th St Se
31A
37A
19D
38A
20D
20C
13C
19C
13D
13B
Soil Map may not be valid at this scale.
Map Scale: 1:8,250 if printed on A landscape (11" x 8.5") sheet.
N
0 100 200 400 600 Meters
0 400 800 1600 2400 Feet
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

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: Pierce County Area, Washington
Survey Area Data: Version 18, Sep 8, 2022

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

Date(s) aerial images were photographed: Jul 31, 2022—Aug 8, 2022

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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
13B	Everett very gravelly sandy loam, 0 to 8 percent slopes	27.4	9.5%
13C	Everett very gravelly sandy loam, 8 to 15 percent slopes	23.8	8.3%
13D	Everett very gravelly sandy loam, 15 to 30 percent slopes	14.6	5.1%
19C	Kapowsin gravelly ashy loam, 6 to 15 percent slopes	17.0	5.9%
19D	Kapowsin gravelly ashy loam, 15 to 30 percent slopes	25.9	9.0%
20C	Kitsap silt loam, 8 to 15 percent slopes	70.4	24.5%
20D	Kitsap silt loam, 15 to 30 percent slopes	70.2	24.4%
31A	Puyallup fine sandy loam	17.1	6.0%
37A	Semiahmoo muck	2.1	0.7%
38A	Shalcar muck	19.0	6.6%
Totals for Area of Interest		**287.5**	**100.0%**

Pierce County Area, Washington

19D—Kapowsin gravelly ashy loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2t61y
Elevation: 50 to 900 feet
Mean annual precipitation: 30 to 50 inches
Mean annual air temperature: 48 to 52 degrees F
Frost-free period: 150 to 220 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kapowsin and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kapowsin

Setting

Landform: Moraines
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Volcanic ash mixed with glacial drift over dense glaciomarine deposits

Typical profile

Ap - 0 to 7 inches: gravelly ashy loam
Bhs - 7 to 11 inches: gravelly ashy loam
Bs1 - 11 to 15 inches: gravelly ashy loam
2Bs2 - 15 to 25 inches: loam
3Bstm - 25 to 29 inches: loam
3Cd - 29 to 59 inches: gravelly loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches; More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: About 11 to 24 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e

Hydrologic Soil Group: B
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Limited Depth Soils (G002XF303WA)
Other vegetative classification: Limited Depth Soils (G002XF303WA)
Hydric soil rating: No

Minor Components

Alderwood

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

Barneston

Percent of map unit: 5 percent
Landform: Moraines, eskers, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Data Source Information

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 18, Sep 8, 2022

Pierce County Area, Washington

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

Map Unit Setting

National map unit symbol: 2hpv
Elevation: 0 to 590 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kitsap and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kitsap

Setting

Landform: Terraces
Parent material: Glaciolacustrine deposits

Typical profile

H1 - 0 to 10 inches: ashy silt loam
H2 - 10 to 32 inches: silty clay loam
H3 - 32 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 16 to 23 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: C/D
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Soils with Moderate Limitations (G002XS601WA)
Other vegetative classification: Soils with Moderate Limitations (G002XS601WA)
Hydric soil rating: No

Minor Components

Bellingham

Percent of map unit: 2 percent
Landform: Depressions
Other vegetative classification: Wet Soils (G002XN102WA)
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 18, Sep 8, 2022

Pierce County Area, Washington

20D—Kitsap silt loam, 15 to 30 percent slopes

Map Unit Setting

National map unit symbol: 2hpw
Elevation: 0 to 660 feet
Mean annual precipitation: 37 inches
Mean annual air temperature: 50 degrees F
Frost-free period: 160 to 200 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Kitsap and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Kitsap

Setting

Landform: Terraces
Parent material: Glaciolacustrine deposits

Typical profile

H1 - 0 to 10 inches: ashy silt loam
H2 - 10 to 32 inches: silty clay loam
H3 - 32 to 60 inches: stratified silt to silty clay loam

Properties and qualities

Slope: 15 to 30 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 16 to 23 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 11.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C/D
Ecological site: F002XA004WA - Puget Lowlands Forest
Forage suitability group: Sloping to Steep Soils (G002XN702WA)
Other vegetative classification: Sloping to Steep Soils (G002XN702WA)
Hydric soil rating: No

Minor Components

Bow variant

Percent of map unit: 2 percent
Landform: Depressions
Other vegetative classification: Sloping to Steep Soils (G002XN702WA)
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 18, Sep 8, 2022

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APPENDIX B: CITY OF PUYALLUP CRITICAL AREA MAPS

PUYALLUP
WASHINGTON

City of Puyallup - Critical Areas App

Earthquake Hazard

PUYALLUP
WASHINGTON

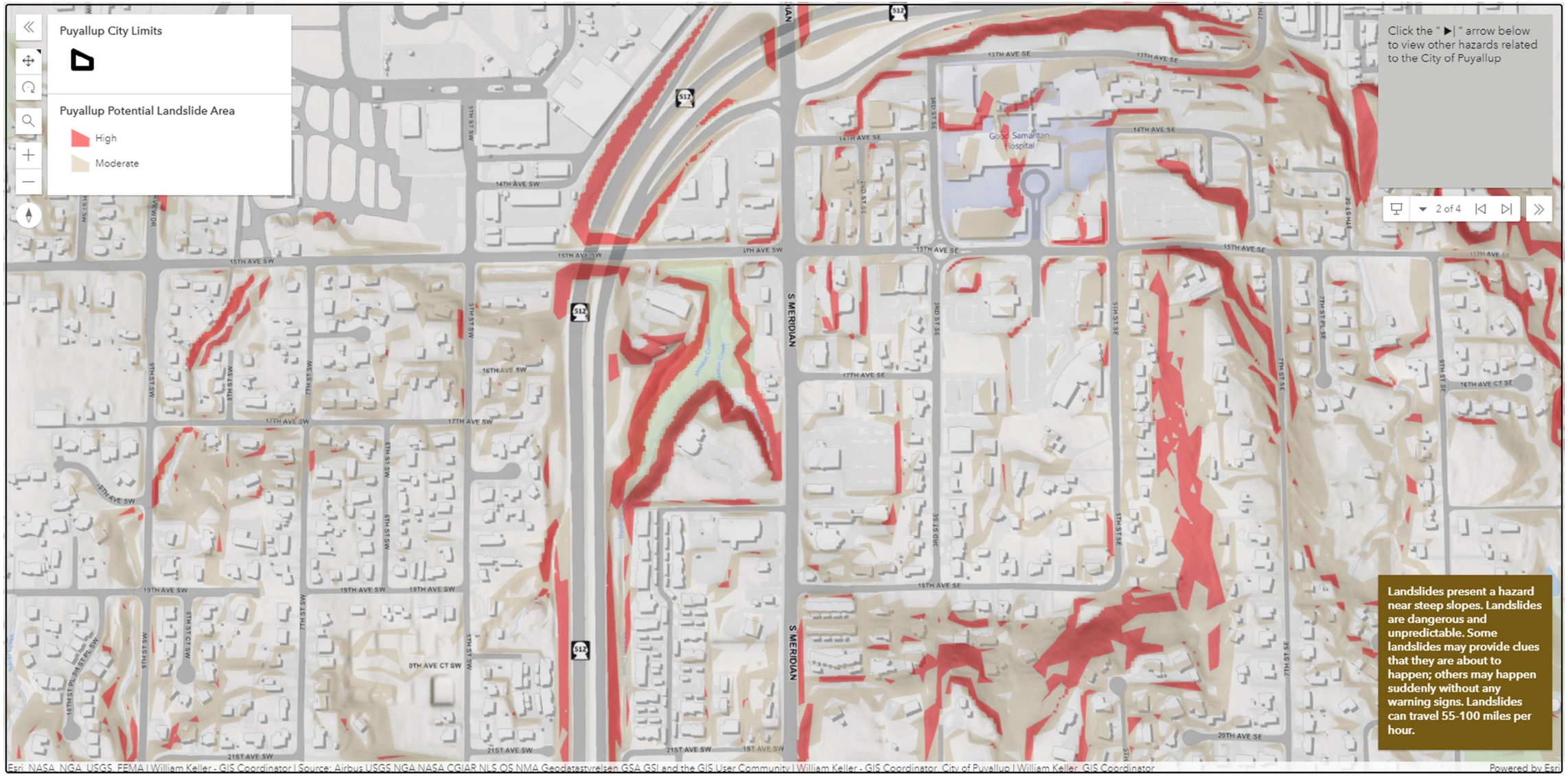
City of Puyallup - Critical Areas App

Lahar Hazards

PUYALLUP
WASHINGTON

City of Puyallup - Critical Areas App

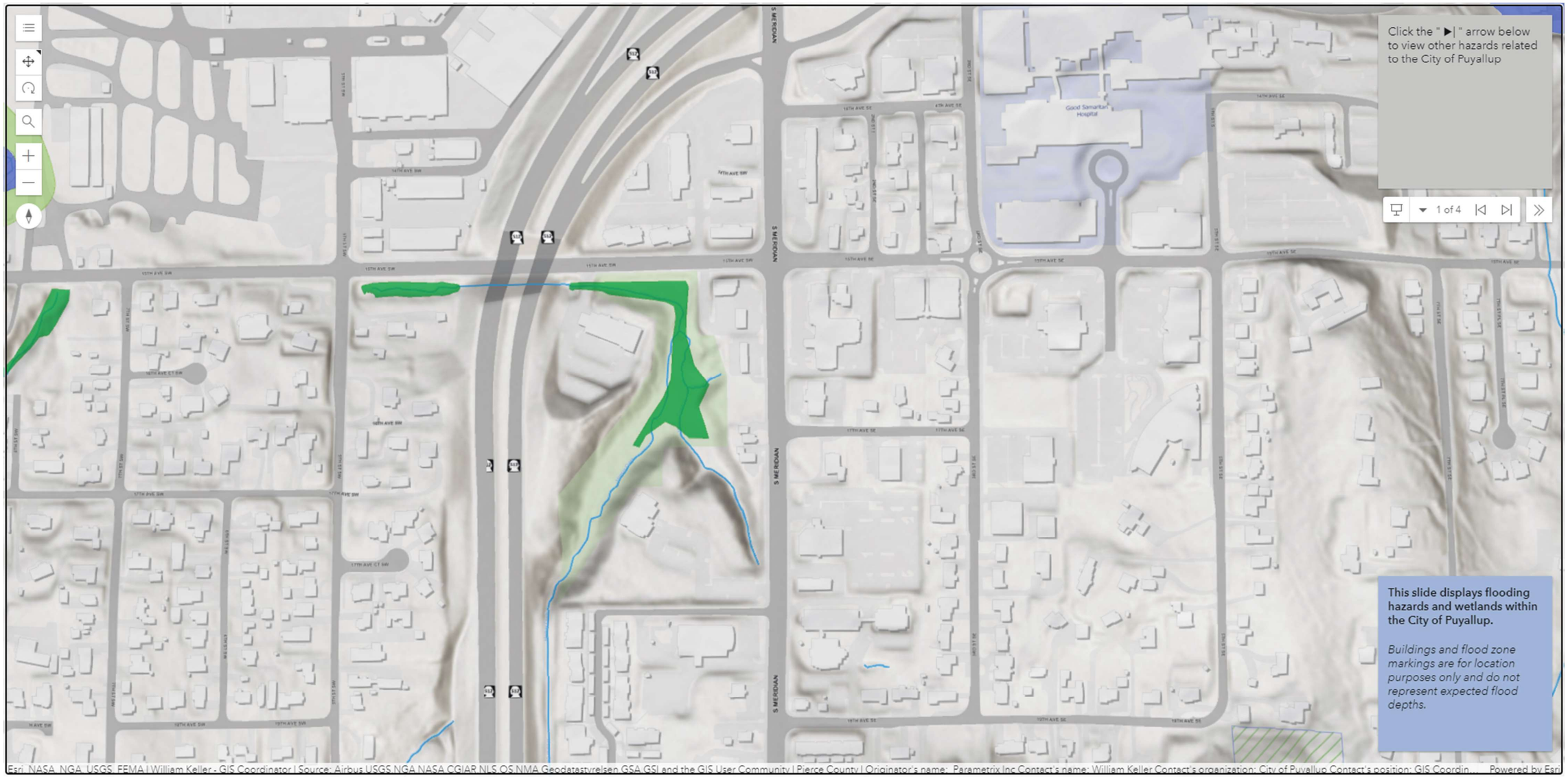
Landslide Hazards



PUYALLUP
WASHINGTON

City of Puyallup - Critical Areas App

Flooding



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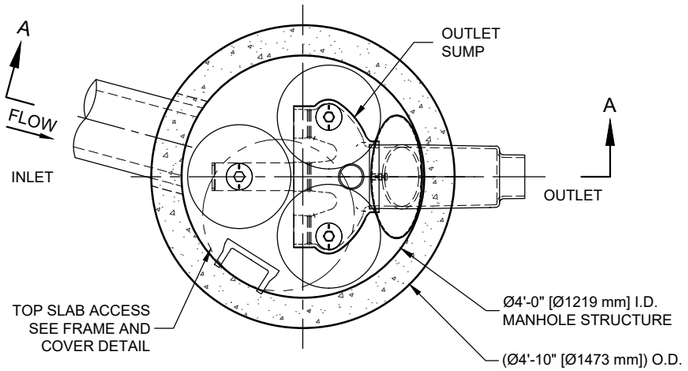
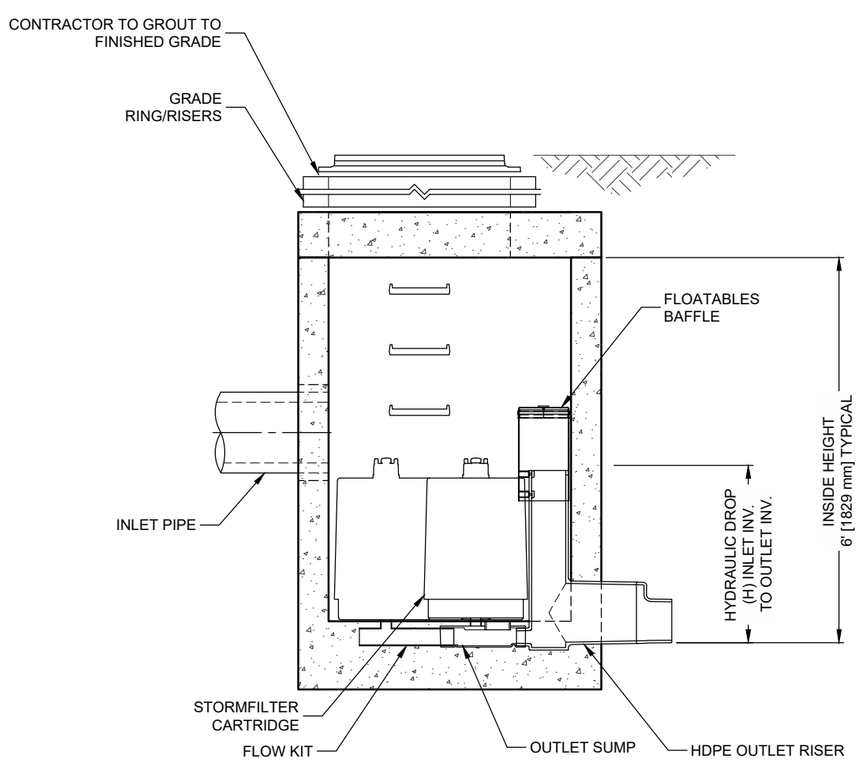
APPENDIX C: STORMFILTER DETAIL



PLAN VIEW

STANDARD OUTLET RISER
FLOWKIT: 40A



SECTION A-A

The Stormwater Management StormFilter®

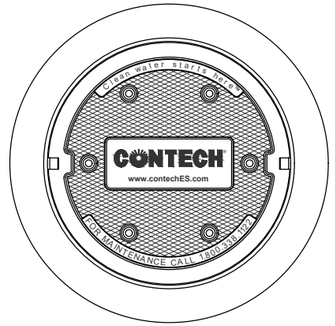
STORMFILTER DESIGN NOTES

STORMFILTER TREATMENT CAPACITY IS A FUNCTION OF THE CARTRIDGE SELECTION AND THE NUMBER OF CARTRIDGES. THE STANDARD MANHOLE STYLE IS SHOWN WITH THE MAXIMUM NUMBER OF CARTRIDGES (3). VOLUME SYSTEM IS ALSO AVAILABLE WITH MAXIMUM 3 CARTRIDGES.
Ø4 [1219 mm] MANHOLE STORMFILTER PEAK HYDRAULIC CAPACITY IS 1.0 CFS [28.3 L/s] . IF THE SITE CONDITIONS EXCEED 1.0 CFS [28.3 L/s] AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

CARTRIDGE SELECTION

CARTRIDGE HEIGHT	27" [686 mm]			18" [458 mm]			LOW DROP		
RECOMMENDED HYDRAULIC DROP (H)	3.05' [930 mm]			2.3' [700 mm]			1.8' [550 mm]		
SPECIFIC FLOW RATE (gpm/sf) [L/s/m^2]	2 [1.30]	1.67* [1.08]	1 [0.65]	2 [1.30]	1.67* [1.08]	1 [0.65]	2 [1.30]	1.67* [1.08]	1 [0.65]
CARTRIDGE FLOW RATE (gpm) [L/s]	22.5 [1.42]	18.79 [1.19]	11.25 [0.71]	15 [0.95]	12.53 [0.79]	7.5 [0.44]	10 [0.63]	8.35 [0.54]	5 [0.32]

* 1.67 gpm/sf [1.08 L/s/m^2] SPECIFIC FLOW RATE IS APPROVED WITH PHOSPHOSORB® (PSORB) MEDIA ONLY



FRAME AND COVER

(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*
WATER QUALITY FLOW RATE (cfs) [L/s]	*
PEAK FLOW RATE (cfs) [L/s]	*
RETURN PERIOD OF PEAK FLOW (yrs)	*
CARTRIDGE HEIGHT (SEE TABLE ABOVE)	*
NUMBER OF CARTRIDGES REQUIRED	*
CARTRIDGE FLOW RATE	*
MEDIA TYPE (PERLITE, ZPG, PSORB)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE #1	*	*	*
INLET PIPE #2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR SITE SPECIFIC DRAWINGS WITH DETAILED VAULT DIMENSIONS AND WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. STORMFILTER WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS-20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 5' [1524 mm] AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO.
6. FILTER CARTRIDGES SHALL BE MEDIA-FILLED, PASSIVE, SIPHON ACTUATED, RADIAL FLOW, AND SELF CLEANING. RADIAL MEDIA DEPTH SHALL BE 7-INCHES [178 mm]. FILTER MEDIA CONTACT TIME SHALL BE AT LEAST 38 SECONDS.
7. SPECIFIC FLOW RATE IS EQUAL TO THE FILTER TREATMENT CAPACITY (gpm) [L/s] DIVIDED BY THE FILTER CONTACT SURFACE AREA (sq ft)[m^2].
8. STORMFILTER STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STORMFILTER STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET PIPE(S).
E. CONTRACTOR TO PROVIDE AND INSTALL CONNECTOR TO THE OUTLET RISER STUB. STORMFILTER EQUIPPED WITH A DUAL DIAMETER HDPE OUTLET STUB AND SAND COLLAR. IF OUTLET PIPE IS LARGER THAN 8 INCHES [200 mm], CONTRACTOR TO REMOVE THE 8 INCH [200 mm] OUTLET STUB AT MOLDED-IN CUT LINE. COUPLING BY FERNCO OR EQUAL AND PROVIDED BY CONTRACTOR.
F. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT CARTRIDGES FROM CONSTRUCTION-RELATED EROSION RUNOFF.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

SFMH48
STORMFILTER
STANDARD DETAIL

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APPENDIX D: PUMP CALCULATIONS

Pump: Gould's WE Series Model 3885	WE05HH		
Peak Wet Weather Flow (gpm)	**53.0**		
Force Main size (inches)	2		
Peak Wet Weather Flow (cfs)	0.12		
Peak Velocity (fps)	5.41	okay	between 2 - 8 fps
receiving MH invert	105.96		
wet well invert	99.73		
static head	6.23		
force main length	87.8		
Minor Losses equivalent length	46.0		
total equivalent length	133.8		
dynamic head	9.100599		
total head	**15.3306**		
Q_{in} (100-year flow rate, 0801) [cfs]	0.0585		
T_{min} (cycle time between pump starts) [sec]	390		
n (starts per hour)	8		
c (min. cycle time) [sec]	60		
V_{min} (volume of wetwell) [cf]	29.45241		
A (cross-sectional area of wetwell) [sf]	19.63494		
60" type 2			

H_{min} (distance between pumps OFF and lead pump ON) [ft]	3
H_{lag} (difference between lag pump ON and lead pump OFF) [ft]	0.5
H_{res} (difference between inlet invert elevation and lag pump ON) [ft]	1

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Minor losses	number	eq L ft	sum eq L
regular 90 elbow	0	13	0.0
long radius 90 elbow	0	4.6	0.0
regular 45 elbow	1	5.5	5.5
tee, flow through line (run)	0	17	0.0
tee, flow through stem	0	21	0.0
180 return bend	0	13	0.0
globe valve	0	110	0.0
gate valve	1	2.5	2.5
angle valve	0	18	0.0
swing check valve	1	38	38.0
coupling or union	0	0.65	0.0
			46.0

pumps off depth (ft)	1.5
pumps off elevation	95.23
lead pump ON elevation	98.23
lag pump ON elevation	98.73
inlet invert elevation	99.73

pump flow rate (gpm)

53.0

wet cell volume
29.45241 cf
220.3193 gal

1 cf = 7.48052

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Storm Event	(a) Restricted Flowrate	(b) Pump Drawdown Flowrate	(c) Pump Drawdown Time	(d) Wet well Fill Time	(e) Cycle Time	(f) Avg. Flow Rate at Discharge Point Over Cycle Time
	gpm	gpm	min	min	min	gpm
2 year	3.64	49.36	4.46	60.60	109.97	2.00
5 year	6.33	46.67	4.72	34.81	81.49	2.70
10 year	9.11	43.89	5.02	24.18	68.07	3.24
25 year	14.14	38.86	5.67	15.58	54.45	4.05
50 year	19.34	33.66	6.55	11.39	45.04	4.89
100 year	26.26	26.74	8.24	8.39	35.13	6.27

(g) Pump Flowrate (gpm)	53.0
(h) Wet Well Volume (gal)	220.3

(a) **Restricted Flow Rate:** Mitigated (801) flowrates calculated using WWHM converted to gpm
(b) **Pump Drawdown Flow Rate:** (g)-(a)
(c) **Pump Drawdown Time:** (h)/(b)
(d) **Wet Well Fill Time:** (h)/(a)
(e) **Cycle Time:** (c)+(d)
(f) **Avg. Flow Rate at Discharge Point Over Cycle Time:** [(b)*(c)]/(e)
(g) **Pump Flow Rate:** derived from manufacturer's performance curve based on calculated head
(h) **Wet Well Volume:** *V=hπr^2 = 29.45 cf = 220.32 gal*
h= 1.5 ft
r= 5ft

flow frequency (cfs)	flow (cfs)		
	501	701	801
2 year	0.0166	0.2323	0.0081
5 year	0.0260	0.3122	0.0141
10 year	0.0311	0.3702	0.0203
25 year	0.0363	0.4497	0.0315
50 year	0.0394	0.5135	0.0431
100 year	0.0419	0.5814	0.0585

1cfs = 448.831175 gpm