# Drube Short Plat

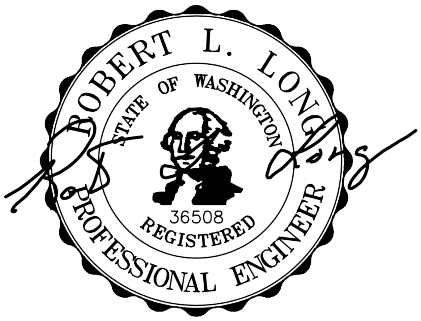
5830 186th Place SW
Lynnwood, WA 98037

PRO-000 _____ -2021

## Storm Drainage Report

Prepared for:
Mietzner Brothers Properties, LLC

Date: July 16, 2021




7/16/2021

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Job No. 20-029

# *Drube Short Plat*

Project Owner/Applicant: Mietzner Brothers Properties, LLC
11611 Airport Road, Suite B-1
Everett, WA 98204

Site Address: 5830 186th Place SW, Lynnwood, WA 98037

Tax Parcel No.: 00374300500803

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## *A. PROJECT SUMMARY:*

This report provides engineering information for the Drube Short Plat, a 4-lot single family short plat. The project is located at 5830 186th St SW in the City of Lynnwood. The applicant, Mietzner Brothers Properties, LLC proposes to remove the existing residences and construct four new single family residence on the site. This report provides the evaluation for the proposed 4-lot short subdivision.

***Existing Conditions*.** The total site consists of one tax parcel totaling 29,282 sf (0.67 acres). The site is currently occupied by one existing single-family residence with an access driveways off 186th St SW. The existing house is surrounded by a detached garage, shop, mature trees, grass lawn and landscape areas. The site is surrounded by single family residences to the west, south and east; and 186th St SW to the north (see attached aerial photo- section D).

The site generally slopes in the westerly direction; a majority of the site's drainage runoff sheet flows westerly across neighboring private property to the roadside stormwater conveyance system in 60th Ave W. There are no known wetland or critical areas on or adjacent to the site. Stormwater runoff collected in the 60th Ave W stormwater system flows south and easterly and eventually discharges to Scriber Creek 4,400 feet from the site. Additional discussion of the local drainage basin and downstream path is discussed in section F of this report.

**Developed Conditions.** The proposed project includes the construction four single residence and associated driveway and utilities. All four lots will utilize a new onsite private road for access, no lot will directly access 186th St SW. All existing structures onsite will be removed/replaced with the site development; landscaping and grass lawn around the new residence will stabilize the site upon building construction. New infrastructure improvements include a stormwater collection and conveyance; stormwater detention tank system; water; sewer; power; and communications utility connections for each residence. The total impervious surface for the project is estimated to create/replace 17,880 sf, exceeding the 10,000 sf threshold for flow control. Additionally, basic water quality treatment (permanent storage in the detention tank) will be provided due to the estimated 9,080 sf of pollution generating hard surface of road and driveway areas add by the project. All disturbed pervious (lawn and landscape) areas will preserve or restore the health and water-holding capacity of the soils by compost-amending (Per DOE BMP T5.13: Post-Construction Soil Quality and Depth). A full overview of the proposed storm drainage control facilities, offsite/downstream analysis and grading and erosion control measures are discussed in the following sections of this report.

**Summary of Minimum Requirements:** The following section summarizes compliance with the City's drainage manual, the current Department of Ecology stormwater manual, 2012 Stormwater Management Manual for Western Washington, as Amended in December 2014 (The 2014 SWMMWW):

***Minimum Requirement #1 – Preparation of Stormwater Site Plan.*** The proposed site development consists of developing a 0.67 acres property and creating/replacing about 17,880 sf (0.410 ac.) of hard surface area. The civil site development plans and this report have been prepared to address the projects impacts. An evaluation of all nine minimum requirements of the stormwater manual is provided below.

***Minimum Requirement #2 – Construction Stormwater Pollution Prevention.*** A construction Stormwater Pollution Prevention Plan (SWPPP) has been incorporated into the site development plans. A summary

of the site's erosion control measures is included in section *G.* The total site disturbance area of the project is greater less than one acre, thus a formal Department of Ecology *Notice of Intent* application for NPDES coverage is not required for the project. A separate full SWPPP report (based on the DOE template) has been prepared for the project; it includes the project's construction erosion control BMP selection and design, and an evaluation of the DOE standard 13 Elements of a SWPPP. Prior to start of construction, a NPDES notice of intent (NOI) application will be submitted to Department of Ecology (DOE) by the applicant.

***Minimum Requirement #3 – Source Control of Pollution.*** Specific source controls are not required for single family residential sites. General requirements for these sites include preventing the discharge of pollutants to the City's storm drainage system per Lynnwood City Code Chapter 13.45.025 (Illicit Discharges). This includes common household items such as pesticides, herbicides, fertilizers, detergents and fluids from vehicle maintenance.

Single family residences shall incorporate DOE's S411 BMPs for landscape and lawn vegetation management. Lawn and vegetation management can include control of objectionable weeds, insects, mold, bacteria, and other pests with pesticides. Examples include weed control on golf course lawns, access roads, and utility corridors and during landscaping; sap stain and insect control on lumber and logs; rooftop moss removal; killing nuisance rodents; fungicide application to patio decks, and residential lawn/plant care. It is possible to release toxic pesticides such as pentachlorophenol, carbamates, and organometallics to the environment by leaching and dripping from treated parts, container leaks, product misuse, and outside storage of pesticide contaminated materials and equipment. Poor management of the vegetation and poor application of pesticides or fertilizers can cause appreciable stormwater contamination.

***Minimum Requirement #4 – Preservation of Natural Drainage Systems and Outfalls.*** The site generally slopes and sheet-flows runoff in a westerly direction. Stormwater runoff eventually collects and enters the roadside ditch, pipe and catch basin system along the easterly side of 60$^{th}$ Ave W west of the site. IN the developed conditions, stormwater runoff from the site will be collected and routed to the stormwater detention tank system; the stormwater detention tank system will discharge to the pipe and catch basin system in 186$^{th}$ St SW that flows to the 60$^{th}$ Ave W roadside stormwater conveyance system about 380 feet from the site. The merge point 380 feet from the site is well within the same ¼ mile threshold discharge basin and maintains the site's discharge outfall to the 60$^{th}$ Ave W stormwater system. The 60$^{th}$ Ave W stormwater system routes stormwater south and east to Scriber Creek about 4,400 feet downstream of the site (see section F).

***Minimum Requirement #5 – Onsite Stormwater Management.*** Due to existing dense unweathered till (hard pan) soils observed at relatively shallow depths (exhibit poor soil infiltration characteristics) and lack of minimum flow path lengths, no infiltration or dispersion BMPs are proposed. See further discussion of the soil conditions and recommendations include in the project's Geotechnical Evaluation letter by Cobalt Geosciences. All disturbed pervious (lawn and landscape) areas will preserve or restore the health and water-holding capacity of the soils by compost-amending (Per DOE BMP T5.13: Post-Construction Soil Quality and Depth). See civil site development plans and section E for additional details.

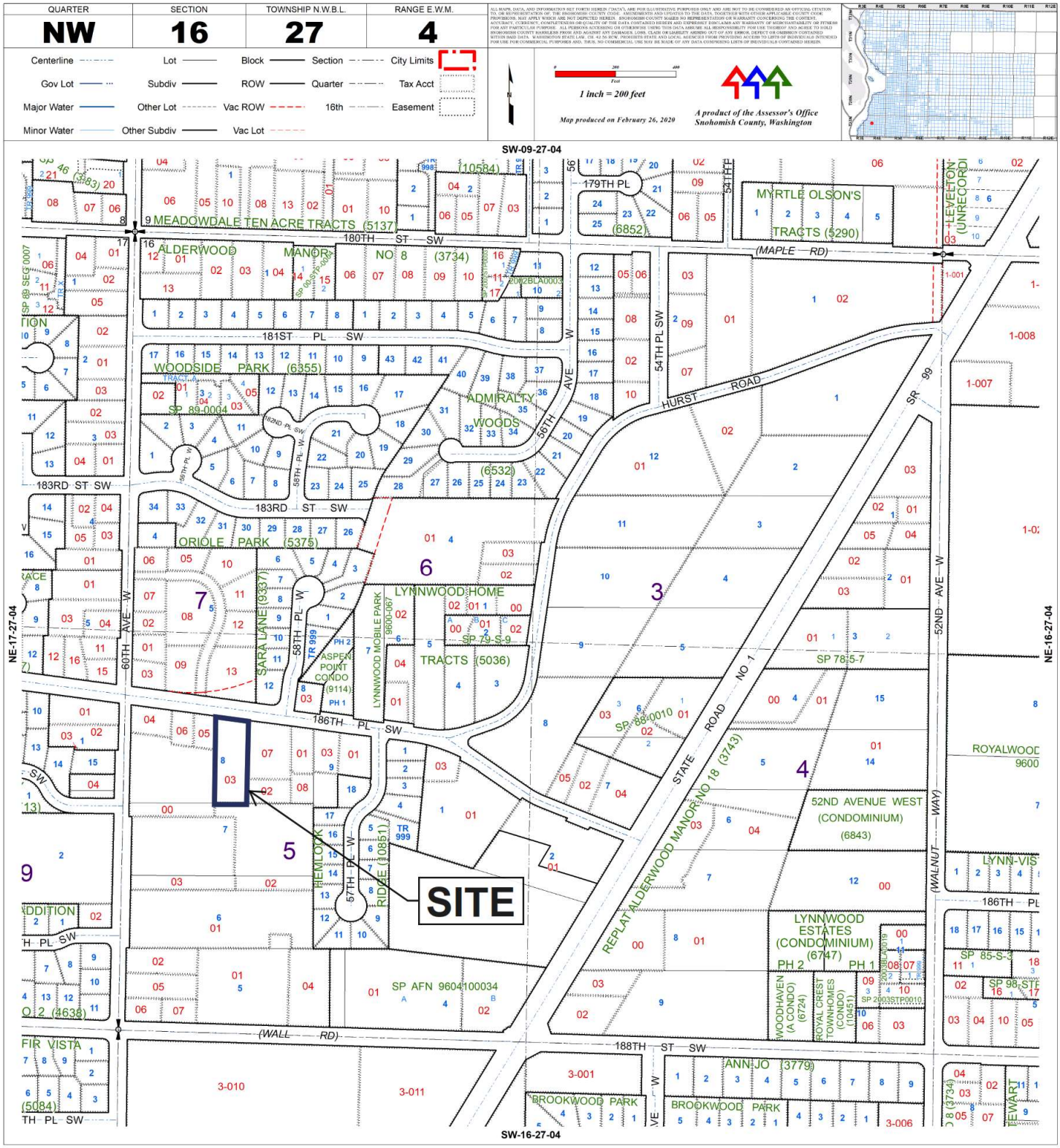
***5.6 Minimum Requirement #6 – Runoff Treatment.*** The project proposes to create/replace about 9,080 sf of pollution-generation impervious surface onsite (private road and driveways); thus, exceeding the 5,000 sf threshold to provide basic water quality treatment. Therefore, the project is proposing to provide additional permanent storage in detention tank system to provide basic water quality treatment. A full summary of the stormwater quality treatment design is included in Section E below.

***5.7 Minimum Requirement #7 – Flow Control.*** The developed site conditions include new/replaced hard surface for the private road, frontage improvements, roof tops, driveways, sidewalks, walkway/patio areas. The project development proposes to construct four single family lots and creating/replacing about 17,880 sf (0.410 ac). The project will exceed the 10,000 sf hard surface threshold to require flow control per the City's drainage manual. See full evaluation of the stormwater flow control facilities provided in Section E below.

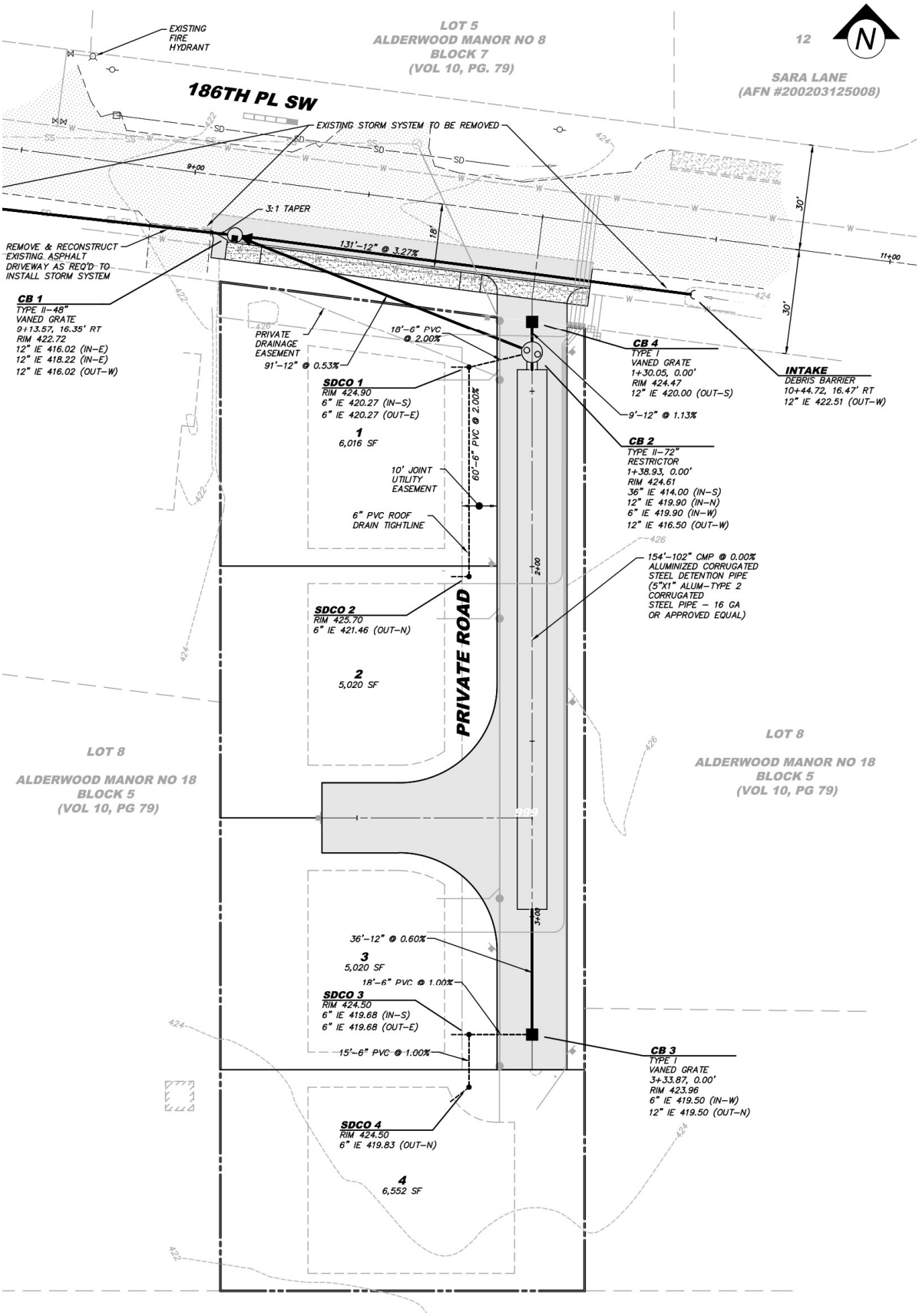
***5.8 Minimum Requirement #8 – Wetland Protection.*** There are no known wetlands on or adjacent to the project site.

***5.9 Minimum Requirement #9 – Operation and Maintenance.*** An operation and maintenance summary is provided in section H.

## B. PARCEL (VICINITY) MAP



## C. SITE PLAN:


EXISTING FIRE HYDRANT
LOT 5
ALDERWOOD MANOR NO 8
BLOCK 7
(VOL 10, PG. 79)
12
N
SARA LANE
(AFN #200203125008)
186TH PL SW
EXISTING STORM SYSTEM TO BE REMOVED
9+00
3:1 TAPER
18'
131'-12" @ 3.27%
30'
30'
11+00
REMOVE & RECONSTRUCT EXISTING ASPHALT DRIVEWAY AS REQ'D TO INSTALL STORM SYSTEM
CB 1
TYPE II-48"
VANED GRATE
9+13.57, 16.35' RT
RIM 422.72
12" IE 416.02 (IN-E)
12" IE 418.22 (IN-E)
12" IE 416.02 (OUT-W)
PRIVATE DRAINAGE EASEMENT
91'-12" @ 0.53%
18'-6" PVC @ 2.00%
CB 4
TYPE I
VANED GRATE
1+30.05, 0.00'
RIM 424.47
12" IE 420.00 (OUT-S)
INTAKE
DEBRIS BARRIER
10+44.72, 16.47' RT
12" IE 422.51 (OUT-W)
SDCO 1
RIM 424.90
6" IE 420.27 (IN-S)
6" IE 420.27 (OUT-E)
1
6,016 SF
60'-6" PVC @ 2.00%
9'-12" @ 1.13%
CB 2
TYPE II-72"
RESTRICTOR
1+38.93, 0.00'
RIM 424.61
36" IE 414.00 (IN-S)
12" IE 419.90 (IN-N)
6" IE 419.90 (IN-W)
12" IE 416.50 (OUT-W)
10' JOINT UTILITY EASEMENT
6" PVC ROOF DRAIN TIGHTLINE
2+00
154'-102" CMP @ 0.00%
ALUMINIZED CORRUGATED STEEL DETENTION PIPE
(5"X1" ALUM-TYPE 2 CORRUGATED STEEL PIPE - 16 GA OR APPROVED EQUAL)
SDCO 2
RIM 425.70
6" IE 421.46 (OUT-N)
2
5,020 SF
PRIVATE ROAD
LOT 8
ALDERWOOD MANOR NO 18
BLOCK 5
(VOL 10, PG 79)
LOT 8
ALDERWOOD MANOR NO 18
BLOCK 5
(VOL 10, PG 79)
3+00
36'-12" @ 0.60%
3
5,020 SF
18'-6" PVC @ 1.00%
SDCO 3
RIM 424.50
6" IE 419.68 (IN-S)
6" IE 419.68 (OUT-E)
15'-6" PVC @ 1.00%
CB 3
TYPE I
VANED GRATE
3+33.87, 0.00'
RIM 423.96
6" IE 419.50 (IN-W)
12" IE 419.50 (OUT-N)
SDCO 4
RIM 424.50
6" IE 419.83 (OUT-N)
4
6,552 SF

D. **AERIAL PHOTO** (Snohomish County GIS, 2020 photo)

## E. STORMWATER CONTROL SUMMARY:

The proposed development will create and/or replace about 17,880 sf (0.410 ac) of hard (impervious) surface on-site, thus meeting the 10,000 sf threshold for flow control. An underground detention pipe system under the project's private road will provide flow control detention onsite. The detention pipe consists of 154 feet of 8.6 ft diameter pipe and provides 8,734 sf of storage volume. Most of the new/replaced impervious surface onsite consist of the project's private road, frontage improvements, building/roof, sidewalk/walkway, and patio areas. The detention pipe will include 2.5 feet of permanent dead storage that will provide basic water quality treatment of the stormwater runoff (see water quality calculations below). The following sections summarizes the project areas and flow control design and calculations for the proposed site redevelopment.

| **Flow Control Summary Table:** | |
|---|---|
| Total Site / Redevelopment Area =<br>Collected Site Area =<br>By-pass Frontage Area = | 0.708 Acres<br>0.672 Acres<br>0.036 Acres |
| Type of Storage Proposed | Detention Pipe: 154' of 8.5 ft diameter pipe |
| Total Detention Storage Volume =<br>Active Storage Volume =<br>Water Quality/Dead Storage = | 8,734 cf<br>2,145 cf<br>6,589 cf |
| Soil Type(s) (see Geotechnical Report) | Alderwood Till- Type C |
| **Pre-developed Runoff Rates** | |
| Q (cfs.) 2 yr. | 0.015 cfs |
| 50 yr. | 0.039 cfs |
| 100 yr. | 0.044 cfs |
| **Post-development Runoff Rates (without quantity controls)** | |
| Q (cfs.) 2 yr. | 0.163 cfs |
| 50 yr. | 0.373 cfs |
| 100 yr. | 0.425 cfs |
| **Post-development Runoff Rates (with quantity controls)** | |
| Q (cfs.) 2 yr. | 0.020 cfs |
| 50 yr. | 0.083 cfs |
| 100 yr. | 0.105 cfs |

The Drube Short Plat site consists of a gross site area of 0.672 acers and an additional 1,560 sf (0.036 ac.) of redevelopment area within 186th Pl SW right-of-way. The frontage redevelopment area along

186th St SW (1,560 sf, 0.036 ac.) will by-pass the stormwater collection system of the project's stormwater detention pipe system; the non-collected by-pass area are included in the stormwater modeling as by-pass. Below is a summary of the project site and by-pass areas.

***Project Area Summary:***

| | | |
|---|---|---|
| Durbe Short Plat Site Area | | + 0.672 acres |
| 186th Pl SW Redevelopment Area | | + 0.036 acres |
| | Net Development Area = | 0.708 acres |
| 186th Pl SW Redevelopment By-pass Area | | 0.036 acres |
| Detention System Collection (Development Area less By-pass) | | 0.672 acres |

**Existing Conditions Hydrologic Model:**

The following summary is a breakdown of the existing conditions modeled in the stormwater evaluation:

| Existing Conditions: | | | |
|---|---|---|---|
| Detention System Collection Area = | | 29,282 sf | 0.672 ac |
| Net By-pass Area | = | 1,560 sf | 0.036 ac |
| | Total = | 30,842 sf | 0.708 ac |

All Existing Condition Areas modeled as Forested, pre-existing condition.

**Developed Conditions Hydrologic Model:**

Below is a summary of the developed conditions areas for the proposed site redevelopment.

| Developed Conditions: | Total | Collected | By-Pass |
|---|---|---|---|
| Hard Surface (Impervious) Road = | 0.156 ac | 0.129 ac | 0.027 ac |
| Hard Surface (Impervious) Building/Roof = | 0.174 ac | 0.174 ac | 0.000 ac |
| Hard Surface (Impervious) Driveways = | 0.053 ac | 0.053 ac | 0.000 ac |
| Hard Surface (Impervious) Sidewalk/patio = | 0.027 ac | 0.018 ac | 0.009 ac |
| Hard Surface Sub-Total = | 0.410 ac | 0.374 ac | 0.036 ac |
| Pervious Lawn and landscape = | 0.298 ac | 0.298 ac | 0.000 ac |
| Total = | 0.708 ac | 0.672 ac | 0.036 ac |

**Flow Control Analysis and Design:**

An underground detention pipe will be installed under the private road along the site's easterly boundary; the detention pipe will provide flow control of the project's stormwater runoff (Minimum Requirement #7). The hydrologic analysis uses WWHM2012 software to model historical storm events in the existing and proposed developed conditions. Per the City's drainage manual, the project shall

meet the site discharge duration for half the 2-year to 50-year storm events using a continuous storm event model (WWHM).

All disturbed pervious (lawn and landscape) areas will preserve or restore the health and water-holding capacity of the soils by compost-amending (Per DOE BMP T5.13: Post-Construction Soil Quality and Depth). Per the stormwater manual, pervious areas compost-amended per BMP T5.13 can be modeled as “pasture”; thus, the following stormwater calculations will include “pasture” as the developed pervious area conditions. Onsite soils are modeled as Hydrologic Soil Group C (Alderwood till soils).

Attached is the stormwater analysis documentation output from the Washington State Department of Ecology’s WWHM2012 stormwater modeling software. The below documentation demonstrates that the project will meet the City’s stormwater flow control criteria.

```
                        WWHM2012 PROJECT REPORT
_____________________________________________________________________

Project Name: 20-029 Drube Tank
Site Name: Drube SP
Site Address: 20-029
City     :
Report Date: 6/29/2021
Gage     : Everett
Data Start : 1948/10/01
Data End : 2009/09/30
Precip Scale: 1.00
Version Date: 2019/09/13
Version : 4.2.17
_____________________________________________________________________

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


PREDEVELOPED LAND USE

Name   : Basin  1
Bypass: No
GroundWater: No

Pervious Land Use           acre
 C, Forest, Flat              .708
Pervious Total                0.708

Impervious Land Use         acre
Impervious Total              0

Basin Total                   0.708

_____________________________________________________________________
Element Flows To:
Surface               Interflow               Groundwater
_____________________________________________________________________
```

MITIGATED LAND USE

Name : Basin 1
Bypass: No
GroundWater: No

| Pervious Land Use | acre |
|---|---|
| C, Pasture, Flat | .298 |
| Pervious Total | 0.298 |

| Impervious Land Use | acre |
|---|---|
| ROADS FLAT | 0.129 |
| ROOF TOPS FLAT | 0.174 |
| DRIVEWAYS FLAT | 0.053 |
| SIDEWALKS FLAT | 0.018 |
| Impervious Total | 0.374 |

| | |
|---|---|
| Basin Total | 0.672 |

---

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|
| Tank 1 | Tank 1 | |

---

Name : Basin 2- Bypass
Bypass: Yes
GroundWater: No

| Pervious Land Use | acre |
|---|---|
| Pervious Total | 0 |

| Impervious Land Use | acre |
|---|---|
| ROADS FLAT | 0.027 |
| SIDEWALKS FLAT | 0.009 |
| Impervious Total | 0.036 |

| | |
|---|---|
| Basin Total | 0.036 |

---

Element Flows To:

| Surface | Interflow | Groundwater |
|---|---|---|

---

Name : Tank 1
Tank Name: Tank 1

Dimensions
Depth: 8.5 ft.
Tank Type : Circular
Diameter : 8.5 ft.
Length : 154 ft.
Discharge Structure
Riser Height: 7.9 ft.
Riser Diameter: 12 in.
Orifice 1 Diameter: 0.354 in. Elevation: 2.5 ft.
Orifice 2 Diameter: 0.5 in. Elevation: 6 ft.
Orifice 3 Diameter: 0.5 in. Elevation: 7 ft.

Element Flows To:
Outlet 1 Outlet 2

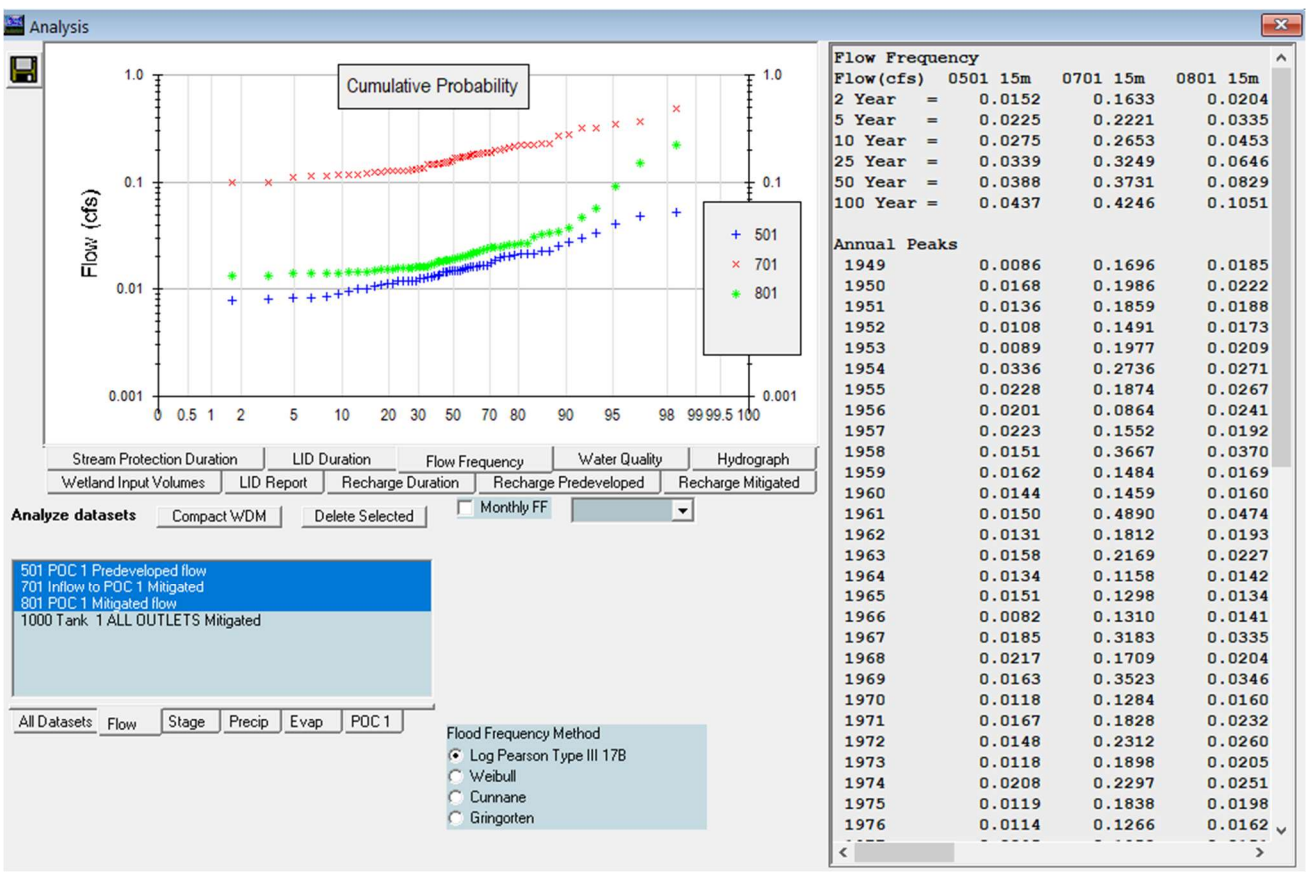
Tank Hydraulic Table

| Stage(feet) | Area(ac.) | Volume(ac-ft.) | Discharge(cfs) | Infilt(cfs) |
|---|---|---|---|---|
| 414.00 | 0.000 | 0.000 | 0.000 | 0.000 |
| 414.09 | 0.006 | 0.000 | 0.000 | 0.000 |
| 414.19 | 0.008 | 0.001 | 0.000 | 0.000 |
| 414.28 | 0.010 | 0.002 | 0.000 | 0.000 |
| 414.38 | 0.012 | 0.003 | 0.000 | 0.000 |
| 414.47 | 0.013 | 0.004 | 0.000 | 0.000 |
| 414.57 | 0.015 | 0.005 | 0.000 | 0.000 |
| 414.66 | 0.016 | 0.007 | 0.000 | 0.000 |
| 414.76 | 0.017 | 0.008 | 0.000 | 0.000 |
| 414.85 | 0.018 | 0.010 | 0.000 | 0.000 |
| 414.94 | 0.018 | 0.012 | 0.000 | 0.000 |
| 415.04 | 0.019 | 0.014 | 0.000 | 0.000 |
| 415.13 | 0.020 | 0.015 | 0.000 | 0.000 |
| 415.23 | 0.021 | 0.017 | 0.000 | 0.000 |
| 415.32 | 0.021 | 0.019 | 0.000 | 0.000 |
| 415.42 | 0.022 | 0.022 | 0.000 | 0.000 |
| 415.51 | 0.023 | 0.024 | 0.000 | 0.000 |
| 415.61 | 0.023 | 0.026 | 0.000 | 0.000 |
| 415.70 | 0.024 | 0.028 | 0.000 | 0.000 |
| 415.79 | 0.024 | 0.030 | 0.000 | 0.000 |
| 415.89 | 0.025 | 0.033 | 0.000 | 0.000 |
| 415.98 | 0.025 | 0.035 | 0.000 | 0.000 |
| 416.08 | 0.025 | 0.038 | 0.000 | 0.000 |
| 416.17 | 0.026 | 0.040 | 0.000 | 0.000 |
| 416.27 | 0.026 | 0.042 | 0.000 | 0.000 |
| 416.36 | 0.026 | 0.045 | 0.000 | 0.000 |
| 416.46 | 0.027 | 0.048 | 0.000 | 0.000 |
| 416.55 | 0.027 | 0.050 | 0.000 | 0.000 |
| 416.64 | 0.027 | 0.053 | 0.001 | 0.000 |
| 416.74 | 0.028 | 0.055 | 0.001 | 0.000 |
| 416.83 | 0.028 | 0.058 | 0.002 | 0.000 |
| 416.93 | 0.028 | 0.061 | 0.002 | 0.000 |
| 417.02 | 0.028 | 0.063 | 0.002 | 0.000 |
| 417.12 | 0.029 | 0.066 | 0.002 | 0.000 |
| 417.21 | 0.029 | 0.069 | 0.002 | 0.000 |
| 417.31 | 0.029 | 0.072 | 0.003 | 0.000 |
| 417.40 | 0.029 | 0.074 | 0.003 | 0.000 |
| 417.49 | 0.029 | 0.077 | 0.003 | 0.000 |
| 417.59 | 0.029 | 0.080 | 0.003 | 0.000 |
| 417.68 | 0.029 | 0.083 | 0.003 | 0.000 |
| 417.78 | 0.029 | 0.086 | 0.003 | 0.000 |
| 417.87 | 0.029 | 0.089 | 0.004 | 0.000 |
| 417.97 | 0.030 | 0.091 | 0.004 | 0.000 |

| | | | | |
|---|---|---|---|---|
| 418.06 | 0.030 | 0.094 | 0.004 | 0.000 |
| 418.16 | 0.030 | 0.097 | 0.004 | 0.000 |
| 418.25 | 0.030 | 0.100 | 0.004 | 0.000 |
| 418.34 | 0.030 | 0.103 | 0.004 | 0.000 |
| 418.44 | 0.030 | 0.106 | 0.004 | 0.000 |
| 418.53 | 0.030 | 0.108 | 0.004 | 0.000 |
| 418.63 | 0.029 | 0.111 | 0.005 | 0.000 |
| 418.72 | 0.029 | 0.114 | 0.005 | 0.000 |
| 418.82 | 0.029 | 0.117 | 0.005 | 0.000 |
| 418.91 | 0.029 | 0.120 | 0.005 | 0.000 |
| 419.01 | 0.029 | 0.122 | 0.005 | 0.000 |
| 419.10 | 0.029 | 0.125 | 0.005 | 0.000 |
| 419.19 | 0.029 | 0.128 | 0.005 | 0.000 |
| 419.29 | 0.029 | 0.131 | 0.005 | 0.000 |
| 419.38 | 0.029 | 0.134 | 0.005 | 0.000 |
| 419.48 | 0.028 | 0.136 | 0.005 | 0.000 |
| 419.57 | 0.028 | 0.139 | 0.006 | 0.000 |
| 419.67 | 0.028 | 0.142 | 0.006 | 0.000 |
| 419.76 | 0.028 | 0.144 | 0.006 | 0.000 |
| 419.86 | 0.027 | 0.147 | 0.006 | 0.000 |
| 419.95 | 0.027 | 0.150 | 0.006 | 0.000 |
| 420.04 | 0.027 | 0.152 | 0.007 | 0.000 |
| 420.14 | 0.026 | 0.155 | 0.009 | 0.000 |
| 420.23 | 0.026 | 0.157 | 0.009 | 0.000 |
| 420.33 | 0.026 | 0.160 | 0.010 | 0.000 |
| 420.42 | 0.025 | 0.162 | 0.011 | 0.000 |
| 420.52 | 0.025 | 0.165 | 0.011 | 0.000 |
| 420.61 | 0.025 | 0.167 | 0.012 | 0.000 |
| 420.71 | 0.024 | 0.169 | 0.012 | 0.000 |
| 420.80 | 0.024 | 0.172 | 0.013 | 0.000 |
| 420.89 | 0.023 | 0.174 | 0.013 | 0.000 |
| 420.99 | 0.023 | 0.176 | 0.014 | 0.000 |
| 421.08 | 0.022 | 0.178 | 0.016 | 0.000 |
| 421.18 | 0.021 | 0.180 | 0.017 | 0.000 |
| 421.27 | 0.021 | 0.182 | 0.018 | 0.000 |
| 421.37 | 0.020 | 0.184 | 0.019 | 0.000 |
| 421.46 | 0.019 | 0.186 | 0.020 | 0.000 |
| 421.56 | 0.018 | 0.188 | 0.021 | 0.000 |
| 421.65 | 0.018 | 0.190 | 0.021 | 0.000 |
| 421.74 | 0.017 | 0.191 | 0.022 | 0.000 |
| 421.84 | 0.016 | 0.193 | 0.023 | 0.000 |
| 421.93 | 0.015 | 0.194 | 0.088 | 0.000 |
| 422.03 | 0.013 | 0.196 | 0.503 | 0.000 |
| 422.12 | 0.012 | 0.197 | 1.071 | 0.000 |
| 422.22 | 0.010 | 0.198 | 1.624 | 0.000 |
| 422.31 | 0.008 | 0.199 | 2.022 | 0.000 |
| 422.41 | 0.006 | 0.200 | 2.266 | 0.000 |
| 422.50 | 0.000 | 0.200 | 2.467 | 0.000 |
| 422.59 | 0.000 | 0.000 | 2.652 | 0.000 |

```
                    ANALYSIS RESULTS
                Stream Protection Duration
_____________________________________________________________
Predeveloped Landuse Totals for POC #1
Total Pervious Area:0.708
Total Impervious Area:0.000
_____________________________________________________________
Mitigated Landuse Totals for POC #1
Total Pervious Area:0.298
Total Impervious Area:0.410
_____________________________________________________________
Flow Frequency Return Periods for Predeveloped.  POC #1
Return Period         Flow(cfs)
2 year                  0.015177
5 year                  0.022464
10 year                 0.027453
25 year                 0.033887
50 year                 0.038755
100 year                0.043676

Flow Frequency Return Periods for Mitigated.  POC #1
Return Period         Flow(cfs)
2 year                  0.020442
5 year                  0.033498
10 year                 0.045282
25 year                 0.064624
50 year                 0.082903
100 year                0.1051
_____________________________________________________________
```



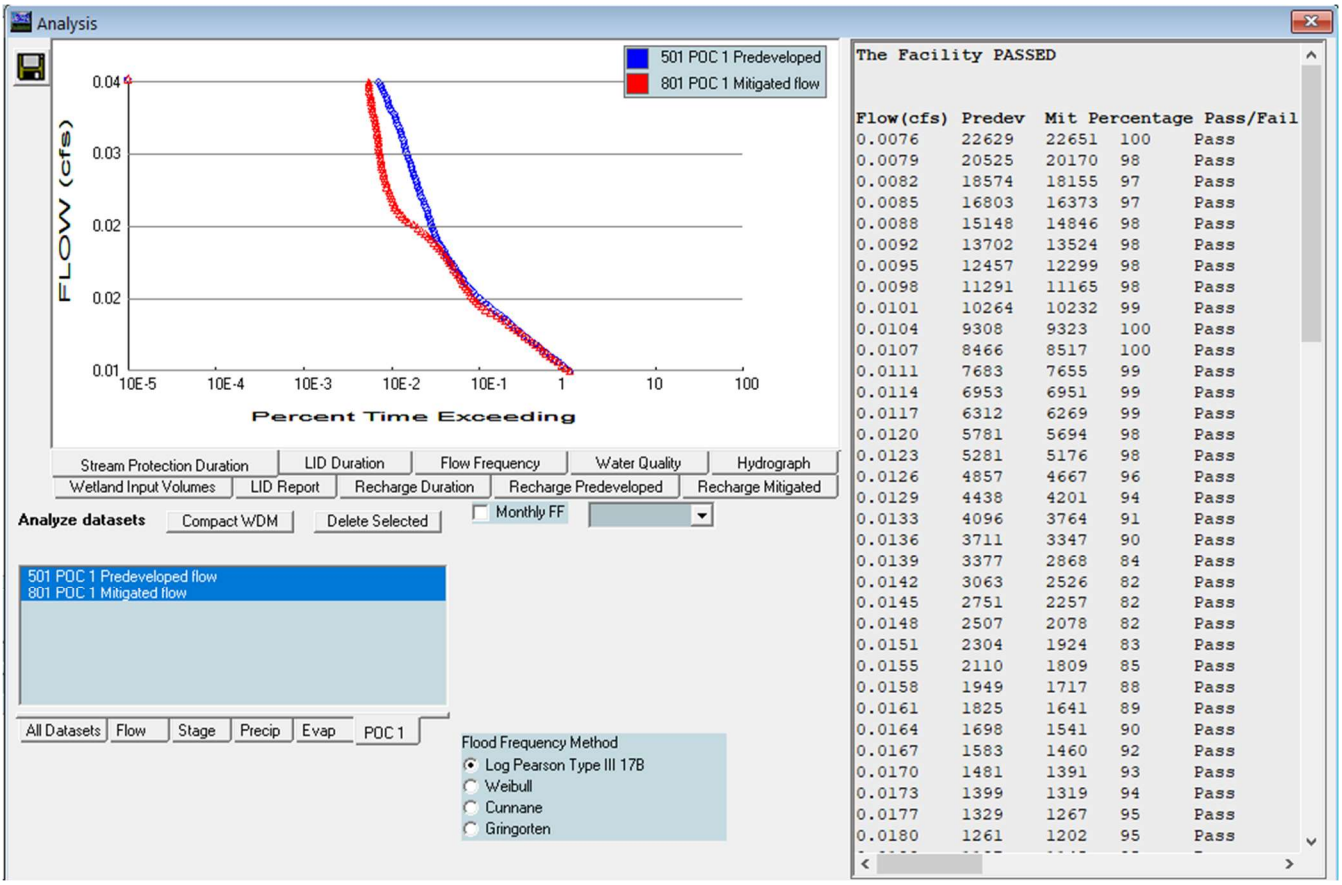
Stream Protection Duration
Annual Peaks for Predeveloped and Mitigated. POC #1

| Year | Predeveloped | Mitigated |
|---|---|---|
| 1949 | 0.009 | 0.018 |
| 1950 | 0.017 | 0.022 |
| 1951 | 0.014 | 0.019 |
| 1952 | 0.011 | 0.017 |
| 1953 | 0.009 | 0.021 |
| 1954 | 0.034 | 0.027 |
| 1955 | 0.023 | 0.027 |
| 1956 | 0.020 | 0.024 |
| 1957 | 0.022 | 0.019 |
| 1958 | 0.015 | 0.037 |
| 1959 | 0.016 | 0.017 |
| 1960 | 0.014 | 0.016 |
| 1961 | 0.015 | 0.047 |
| 1962 | 0.013 | 0.019 |
| 1963 | 0.016 | 0.023 |
| 1964 | 0.013 | 0.014 |
| 1965 | 0.015 | 0.013 |
| 1966 | 0.008 | 0.014 |
| 1967 | 0.019 | 0.034 |
| 1968 | 0.022 | 0.020 |
| 1969 | 0.016 | 0.035 |
| 1970 | 0.012 | 0.016 |
| 1971 | 0.017 | 0.023 |
| 1972 | 0.015 | 0.026 |
| 1973 | 0.012 | 0.021 |
| 1974 | 0.021 | 0.025 |
| 1975 | 0.012 | 0.020 |
| 1976 | 0.011 | 0.016 |
| 1977 | 0.010 | 0.015 |
| 1978 | 0.012 | 0.014 |
| 1979 | 0.021 | 0.024 |
| 1980 | 0.013 | 0.014 |
| 1981 | 0.011 | 0.014 |
| 1982 | 0.014 | 0.015 |
| 1983 | 0.020 | 0.020 |
| 1984 | 0.015 | 0.025 |
| 1985 | 0.020 | 0.024 |
| 1986 | 0.049 | 0.153 |
| 1987 | 0.022 | 0.057 |
| 1988 | 0.012 | 0.016 |
| 1989 | 0.010 | 0.019 |
| 1990 | 0.016 | 0.014 |
| 1991 | 0.017 | 0.016 |
| 1992 | 0.013 | 0.016 |
| 1993 | 0.008 | 0.013 |
| 1994 | 0.008 | 0.015 |
| 1995 | 0.016 | 0.016 |
| 1996 | 0.028 | 0.018 |
| 1997 | 0.053 | 0.224 |
| 1998 | 0.010 | 0.022 |
| 1999 | 0.015 | 0.013 |
| 2000 | 0.008 | 0.032 |
| 2001 | 0.003 | 0.014 |
| 2002 | 0.015 | 0.018 |
| 2003 | 0.011 | 0.016 |
| 2004 | 0.018 | 0.030 |
| 2005 | 0.013 | 0.015 |
| 2006 | 0.030 | 0.026 |
| 2007 | 0.026 | 0.021 |
| 2008 | 0.041 | 0.090 |
| 2009 | 0.013 | 0.018 |

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

| Rank | Predeveloped | Mitigated |
|---|---|---|
| 1 | 0.0530 | 0.2241 |
| 2 | 0.0486 | 0.1527 |
| 3 | 0.0406 | 0.0903 |
| 4 | 0.0336 | 0.0565 |
| 5 | 0.0300 | 0.0474 |
| 6 | 0.0278 | 0.0370 |
| 7 | 0.0255 | 0.0346 |
| 8 | 0.0228 | 0.0335 |
| 9 | 0.0223 | 0.0322 |
| 10 | 0.0217 | 0.0304 |
| 11 | 0.0216 | 0.0271 |
| 12 | 0.0214 | 0.0267 |
| 13 | 0.0208 | 0.0260 |
| 14 | 0.0203 | 0.0259 |
| 15 | 0.0201 | 0.0251 |
| 16 | 0.0197 | 0.0248 |
| 17 | 0.0185 | 0.0243 |
| 18 | 0.0176 | 0.0243 |
| 19 | 0.0168 | 0.0241 |
| 20 | 0.0167 | 0.0232 |
| 21 | 0.0167 | 0.0227 |
| 22 | 0.0163 | 0.0222 |
| 23 | 0.0162 | 0.0221 |
| 24 | 0.0160 | 0.0209 |
| 25 | 0.0158 | 0.0205 |
| 26 | 0.0157 | 0.0205 |
| 27 | 0.0153 | 0.0204 |
| 28 | 0.0151 | 0.0198 |
| 29 | 0.0151 | 0.0198 |
| 30 | 0.0150 | 0.0193 |
| 31 | 0.0149 | 0.0192 |
| 32 | 0.0148 | 0.0188 |
| 33 | 0.0146 | 0.0185 |
| 34 | 0.0144 | 0.0185 |
| 35 | 0.0144 | 0.0180 |
| 36 | 0.0136 | 0.0180 |
| 37 | 0.0134 | 0.0179 |
| 38 | 0.0134 | 0.0173 |
| 39 | 0.0131 | 0.0169 |
| 40 | 0.0129 | 0.0163 |
| 41 | 0.0128 | 0.0162 |
| 42 | 0.0127 | 0.0160 |
| 43 | 0.0119 | 0.0160 |
| 44 | 0.0119 | 0.0159 |
| 45 | 0.0119 | 0.0159 |
| 46 | 0.0118 | 0.0158 |
| 47 | 0.0118 | 0.0157 |
| 48 | 0.0114 | 0.0152 |
| 49 | 0.0112 | 0.0152 |
| 50 | 0.0109 | 0.0151 |
| 51 | 0.0108 | 0.0149 |
| 52 | 0.0101 | 0.0145 |
| 53 | 0.0100 | 0.0145 |
| 54 | 0.0095 | 0.0145 |
| 55 | 0.0089 | 0.0142 |
| 56 | 0.0086 | 0.0142 |
| 57 | 0.0083 | 0.0141 |
| 58 | 0.0082 | 0.0140 |
| 59 | 0.0080 | 0.0134 |
| 60 | 0.0078 | 0.0133 |
| 61 | 0.0026 | 0.0131 |

Stream Protection Duration
POC #1
The Facility PASSED




| Flow(cfs) | Predev | Mit | Percentage | Pass/Fail |
|---|---|---|---|---|
| 0.0076 | 22629 | 22651 | 100 | Pass |
| 0.0079 | 20525 | 20170 | 98 | Pass |
| 0.0082 | 18574 | 18155 | 97 | Pass |
| 0.0085 | 16803 | 16373 | 97 | Pass |
| 0.0088 | 15148 | 14846 | 98 | Pass |
| 0.0092 | 13702 | 13524 | 98 | Pass |
| 0.0095 | 12457 | 12299 | 98 | Pass |
| 0.0098 | 11291 | 11165 | 98 | Pass |
| 0.0101 | 10264 | 10232 | 99 | Pass |
| 0.0104 | 9308 | 9323 | 100 | Pass |
| 0.0107 | 8466 | 8517 | 100 | Pass |
| 0.0111 | 7683 | 7655 | 99 | Pass |
| 0.0114 | 6953 | 6951 | 99 | Pass |
| 0.0117 | 6312 | 6269 | 99 | Pass |
| 0.0120 | 5781 | 5694 | 98 | Pass |
| 0.0123 | 5281 | 5176 | 98 | Pass |
| 0.0126 | 4857 | 4667 | 96 | Pass |
| 0.0129 | 4438 | 4201 | 94 | Pass |
| 0.0133 | 4096 | 3764 | 91 | Pass |
| 0.0136 | 3711 | 3347 | 90 | Pass |
| 0.0139 | 3377 | 2868 | 84 | Pass |
| 0.0142 | 3063 | 2526 | 82 | Pass |
| 0.0145 | 2751 | 2257 | 82 | Pass |
| 0.0148 | 2507 | 2078 | 82 | Pass |
| 0.0151 | 2304 | 1924 | 83 | Pass |

| | | | | |
|---|---|---|---|---|
| 0.0155 | 2110 | 1809 | 85 | Pass |
| 0.0158 | 1949 | 1717 | 88 | Pass |
| 0.0161 | 1825 | 1641 | 89 | Pass |
| 0.0164 | 1698 | 1541 | 90 | Pass |
| 0.0167 | 1583 | 1460 | 92 | Pass |
| 0.0170 | 1481 | 1391 | 93 | Pass |
| 0.0173 | 1399 | 1319 | 94 | Pass |
| 0.0177 | 1329 | 1267 | 95 | Pass |
| 0.0180 | 1261 | 1202 | 95 | Pass |
| 0.0183 | 1197 | 1145 | 95 | Pass |
| 0.0186 | 1138 | 1100 | 96 | Pass |
| 0.0189 | 1081 | 1047 | 96 | Pass |
| 0.0192 | 1025 | 994 | 96 | Pass |
| 0.0196 | 952 | 947 | 99 | Pass |
| 0.0199 | 915 | 897 | 98 | Pass |
| 0.0202 | 879 | 845 | 96 | Pass |
| 0.0205 | 846 | 797 | 94 | Pass |
| 0.0208 | 807 | 748 | 92 | Pass |
| 0.0211 | 767 | 700 | 91 | Pass |
| 0.0214 | 731 | 644 | 88 | Pass |
| 0.0218 | 700 | 598 | 85 | Pass |
| 0.0221 | 676 | 554 | 81 | Pass |
| 0.0224 | 655 | 512 | 78 | Pass |
| 0.0227 | 639 | 463 | 72 | Pass |
| 0.0230 | 620 | 421 | 67 | Pass |
| 0.0233 | 605 | 382 | 63 | Pass |
| 0.0236 | 588 | 333 | 56 | Pass |
| 0.0240 | 573 | 302 | 52 | Pass |
| 0.0243 | 560 | 281 | 50 | Pass |
| 0.0246 | 551 | 263 | 47 | Pass |
| 0.0249 | 539 | 246 | 45 | Pass |
| 0.0252 | 523 | 233 | 44 | Pass |
| 0.0255 | 510 | 228 | 44 | Pass |
| 0.0258 | 496 | 224 | 45 | Pass |
| 0.0262 | 473 | 213 | 45 | Pass |
| 0.0265 | 458 | 209 | 45 | Pass |
| 0.0268 | 448 | 204 | 45 | Pass |
| 0.0271 | 438 | 199 | 45 | Pass |
| 0.0274 | 426 | 187 | 43 | Pass |
| 0.0277 | 417 | 186 | 44 | Pass |
| 0.0281 | 402 | 182 | 45 | Pass |
| 0.0284 | 396 | 178 | 44 | Pass |
| 0.0287 | 385 | 174 | 45 | Pass |
| 0.0290 | 374 | 173 | 46 | Pass |
| 0.0293 | 362 | 168 | 46 | Pass |
| 0.0296 | 355 | 165 | 46 | Pass |
| 0.0299 | 349 | 163 | 46 | Pass |
| 0.0303 | 338 | 162 | 47 | Pass |
| 0.0306 | 329 | 160 | 48 | Pass |
| 0.0309 | 320 | 157 | 49 | Pass |
| 0.0312 | 310 | 156 | 50 | Pass |
| 0.0315 | 306 | 152 | 49 | Pass |
| 0.0318 | 301 | 152 | 50 | Pass |
| 0.0321 | 296 | 151 | 51 | Pass |
| 0.0325 | 288 | 150 | 52 | Pass |
| 0.0328 | 283 | 149 | 52 | Pass |
| 0.0331 | 276 | 148 | 53 | Pass |
| 0.0334 | 270 | 147 | 54 | Pass |
| 0.0337 | 260 | 145 | 55 | Pass |
| 0.0340 | 252 | 142 | 56 | Pass |
| 0.0343 | 245 | 140 | 57 | Pass |
| 0.0347 | 239 | 139 | 58 | Pass |
| 0.0350 | 234 | 136 | 58 | Pass |
| 0.0353 | 227 | 134 | 59 | Pass |

```
0.0356    215     130    60     Pass
0.0359    205     128    62     Pass
0.0362    200     128    64     Pass
0.0366    194     125    64     Pass
0.0369    188     124    65     Pass
0.0372    184     123    66     Pass
0.0375    176     122    69     Pass
0.0378    170     119    70     Pass
0.0381    165     118    71     Pass
0.0384    158     117    74     Pass
0.0388    152     117    76     Pass
```

---

```
Water Quality BMP Flow and Volume for POC #1
On-line facility volume: 0.0425 acre-feet
On-line facility target flow: 0.0569 cfs.
Adjusted for 15 min: 0.0569 cfs.
Off-line facility target flow: 0.0322 cfs.
Adjusted for 15 min: 0.0322 cfs.
```

---

LID Report

LID Report

POC 1

| LID Technique | Used for Treatment ? | Total Volume Needs Treatment (ac-ft) | Volume Through Facility (ac-ft) | Infiltration Volume (ac-ft) | Cumulative Volume Infiltration Credit | Percent Volume Infiltrated | Water Quality | Percent Water Quality Treated | Comment |
|---|---|---|---|---|---|---|---|---|---|
| Tank 1 POC | ☐ | 65.97 | | | ☐ | 0.00 | | | |
| Total Volume Infiltrated | | 65.97 | 0.00 | 0.00 | | 0.00 | 0.00 | 0% | No Treat. Credit |
| Compliance with LID Standard 8% of 2-yr to 50% of 2-yr | | | | | | | | | Duration Analysis Result = Failed |

---

```
Perlnd and Implnd Changes
 No changes have been made.
```

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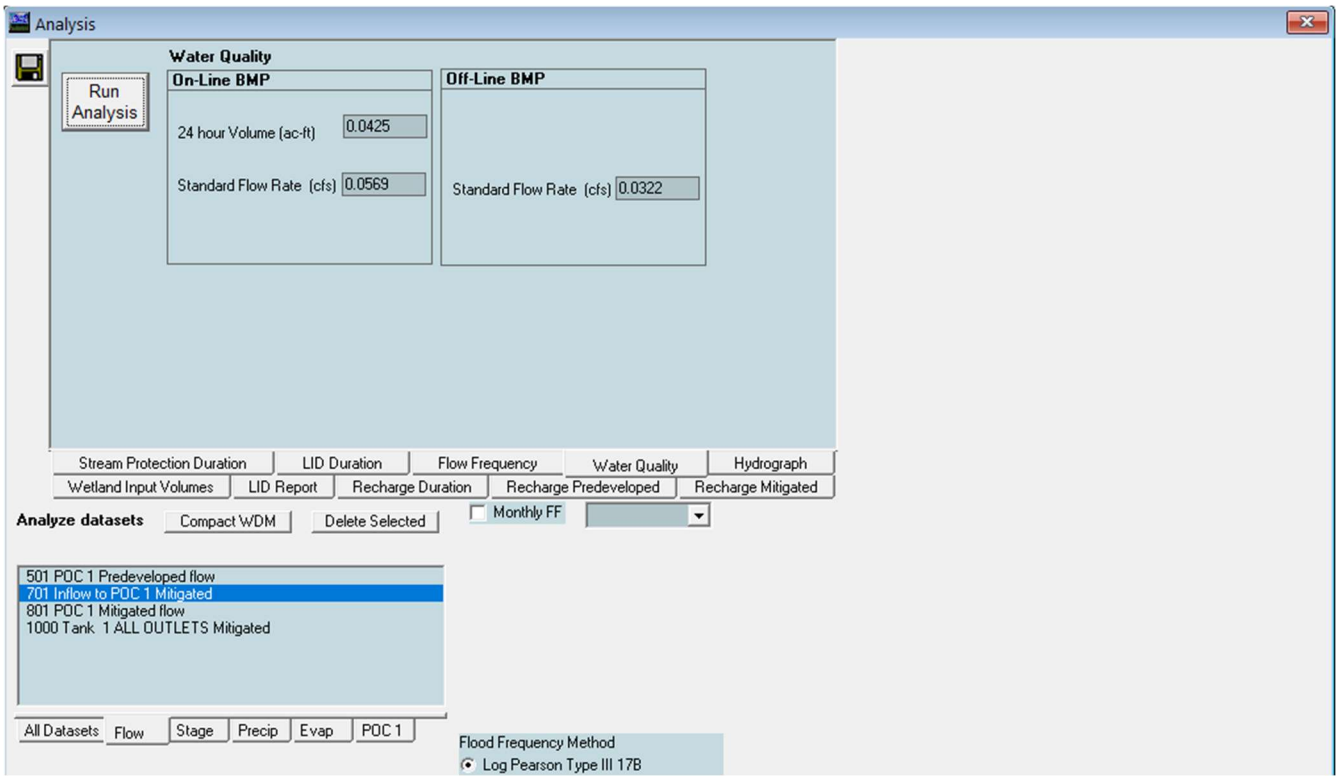
**Water Quality Calculations:**

The Drube Short Plat project will create about 9,080 sf of pollution generation impervious/hard surfaces (road and driveway areas). Due to the fact the pollution generation hard surfaces exceed 5,000 sf, basic water quality treatment will be provided. To meet the requirements of stormwater runoff treatment (minimum requirement #6) the proposed stormwater detention tank system will be constructed as a wet-tank with a permanent ("dead water") storage component that will provide water quality treatment within the detention vault. Per the WWMH2012 modeling (see below), the minimum required volume for treatment is 1,851 cf (0.0425 acre-feet) for the proposed on-line detention tank system. The control tee outfall has been designed 2.5 feet higher than the base of the tank and will create permanent storage in the base of the tank. The 2.5 feet of permanent storage in the 154 ft of 8.5 ft diameter tank will provide 2,145 cf of storage and exceed the minimum required 1,851 cf.

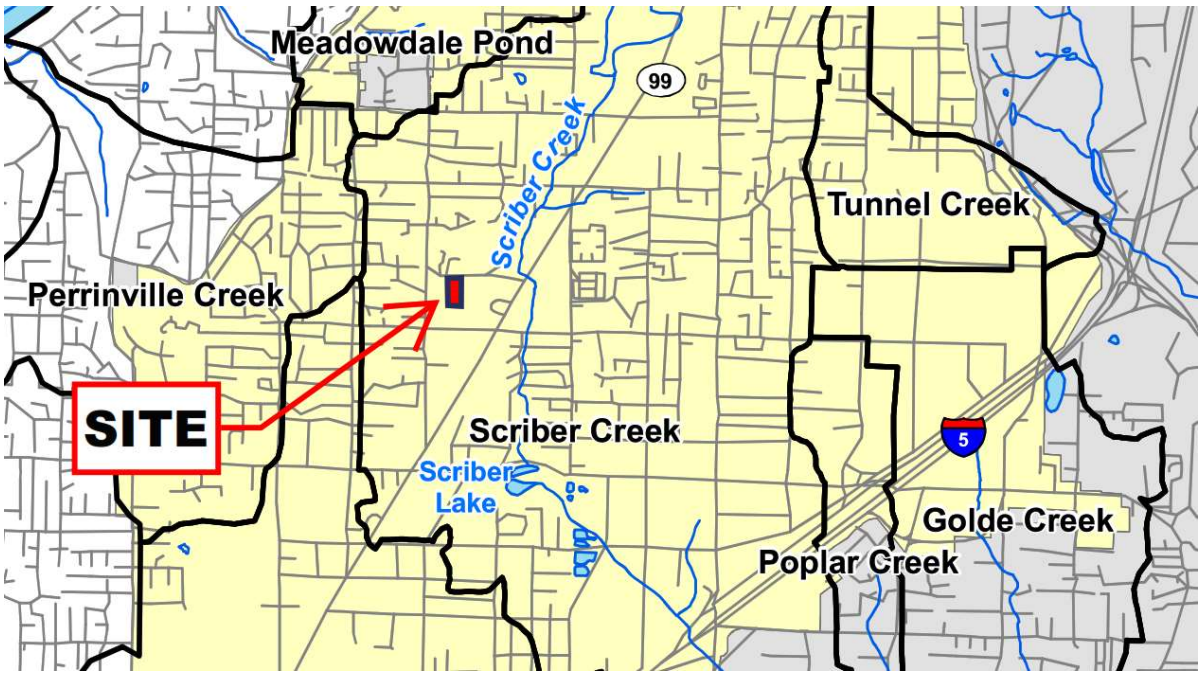


## *F.* DRAINAGE BASIN DESCRIPTION:

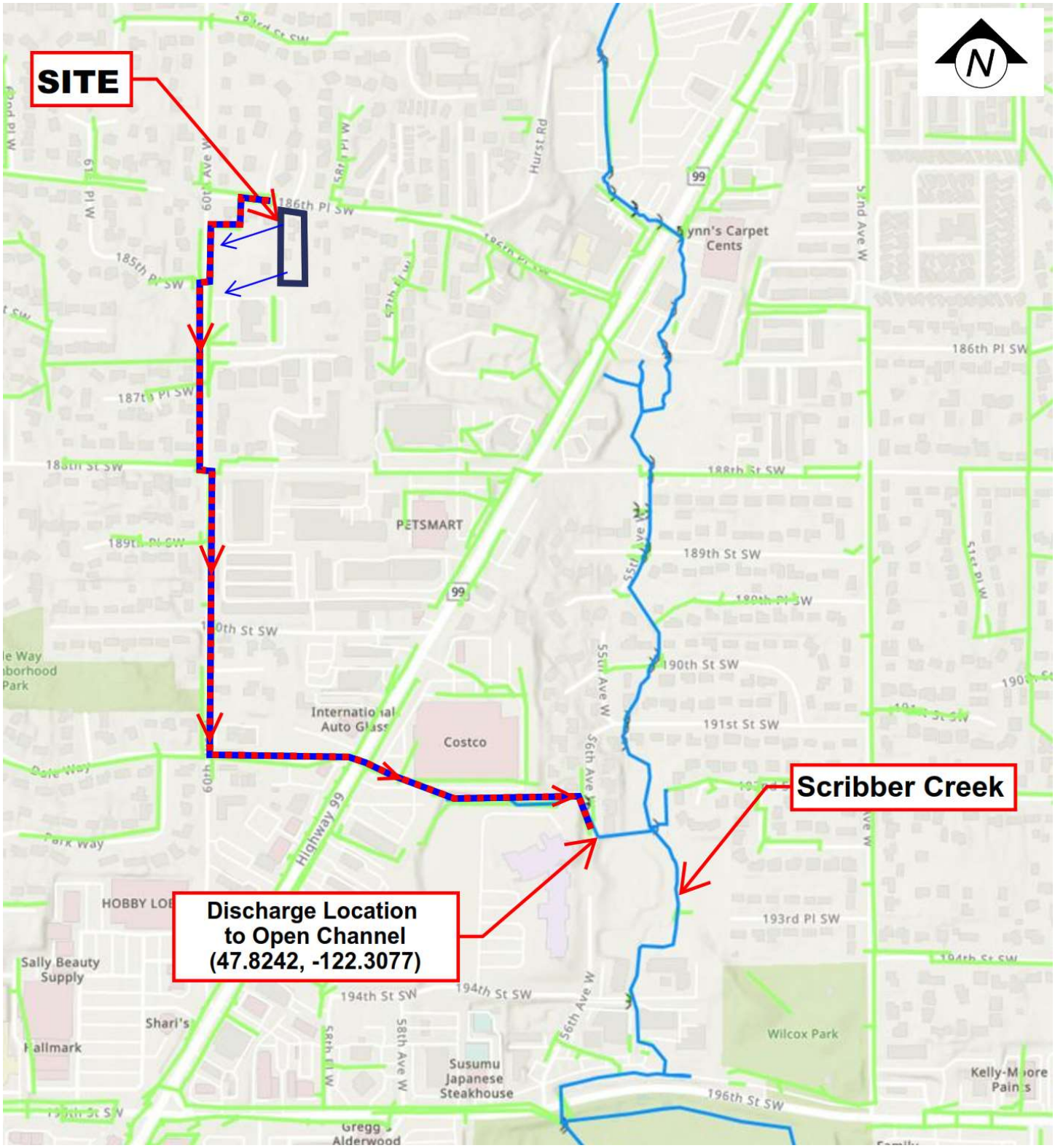
The site is located within the City of Lynnwood Upper Scriber Creek watershed basin. The Scriber Creek basin is a centralized urban basin that collects stormwater runoff from primarily residential areas and the Highway 99 corridor in the City Lynnwood (see attached drainage basin map).

The site generally slopes and directs runoff westerly towards 60th Ave W. The public drainage system in 60th Ave W directs runoff in a southerly direction in a collection of pipes, catch basins and ditches along 60th Ave W. About 2,400 feet downstream/south of the site at the intersection of 60th Ave W and Dale Way, the public stormwater system turns east and is directed across SR-99 and along the south side of Costco. The system continues easterly and daylights to an open channel ditch just east of 56th Ave W (47.8242, -122.3077). The open channel flows east and discharges to the main channel of Scriber Creek about 4,400 feet from the site. Scriber Creek generally flows in a southerly direction and ultimately discharges to Lake Washington about 9.5 miles downstream of the site. No apparent flooding or system inadequacies within a ¼ mile downstream of the site were discovered during site visits or research of the downstream system.

**F-2. Drainage Basin Map** (City of Lynnwood Compressive Drainage Basin Map)



**F-3. Downstream Drainage System (City of Lynnwood GIS)**



## G. GRADING and EROSION CONTROL SUMMARY:

The project will require grading to construct the proposed roads, building pads and utilities (including the stormwater detention system). Standard erosion control measures are proposed to be used during construction. The primary erosion and sediment control BMP during construction will be proper soil stabilization methods and control of the dewatering measures.

Exposed soils shall be stabilized by application of effective BMPs that protect the soil from the erosive forces of raindrops, flowing water, and wind. Applicable practices include, but not limited to, temporary and permanent seeding, sodding, mulching, plastic covering, erosion control fabrics, matting, and dust control. The contractor shall select a soil stabilization method best suited for the situation. Stockpiles must be stabilized and protected with sediment trapping measures. In addition, site containment of exposed soils shall be sustained by using silt fence barriers along the down-slope boundaries of the site's disturbance areas. See the site development plan for details.

Construction Stormwater Pollution Prevention Plan (SWPPP): The project SWPPP plan and report have been prepared to help prevent erosion and discharge of sediment and other pollutants into receiving waters during construction. A full SWPPP report using the DOE standard template has been prepared for the project (under separate cover). The full SWPPP report includes the project's construction erosion control BMP selection and design, and an evaluation of the DOE standard 13 Elements of a SWPPP. Due to the fact the project site is less than one acre, a Department of Ecology *Construction Stormwater General Permit* is not a requirement of the project.

Soils: The underlying soils found on site are listed as Alderwood-Urban land complex, ranging from 2% to 8% slope (glacial till soils). USDA Natural Resource Soil Conservation Service (NRCS) Web Soil Survey soils map is included at the end of this section. The project's site specific geotechnical evaluation by Cobalt Geosciences (dated April 5, 2021) confirms the site underlying soils as glacial till and gives an evaluation of the site's soil conditions (included in permit application materials under separate cover).

Conclusion: The final site development construction plans include specific grading and drainage improvement notes and details. The project should have minimal impact to the surrounding environment with proper installation, maintenance, inspection and reporting of the proposed construction activities.

**Soils Map:**

## Map Unit Legend

| Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI |
|---|---|---|---|
| 5 | Alderwood-Urban land complex, 2 to 8 percent slopes | 0.7 | 100.0% |
| **Totals for Area of Interest** | | **0.7** | **100.0%** |

## H. OPERATION AND MAINTENANCE GUIDELINES:

These guidelines are intended to provide operation and maintenance instructions for the project's storm drainage control facilities. The owner is responsible for maintenance of storm drainage facilities within the property (private property owner system); the owner is not responsible for maintenance within the public right-of-way (City system). Private property owners are responsible for properly maintaining the stormwater infrastructure on their property to ensure it operates as designed.

This manual is not comprehensive; although it explains the intended operation of the various components of the drainage system, and suggests a routine of inspection and maintenance, it cannot anticipate every problem. Once a historical record of maintenance is established, it may be prudent to alter the routine. It is recommended that maintenance records be kept, and that the records be reviewed periodically.

The project detention tank system, control structure, and storm filters are to be privately maintained by the project residences. Maintenance shall include the removal of sediment from the detention tank system, using a vactor truck or equally effective method. Regular inspections of the control structure within the catch basin shall be conducted to detect if non-routine maintenance is required due to sediment or debris blocking or clogging the fixed orifice or standpipe inlet. Regular inspection and maintenance of the system should occur according to the attached maintenance tables from the Washington State Department of Ecology Stormwater Manual (Volume V).

Semi-annual inspections shall be conducted to ensure proper operations of the drainage system. The inspections should occur prior to the winter rain season (Oct/Nov), leaving sufficient time to correct any detected maintenance problems, and at the end of the season (April/May) to determine the effect of the season's runoff. Once a historical basis is developed the frequency of inspection may be modified as necessary. Sediment can build up inside control structures and catch basins, blocking or restricting flow to the inlet. To prevent this problem, these structures should be routinely cleaned. Regular inspections of control structures should be conducted to detect the need for non-routine cleanout.

The following pages outline standard general maintenance criteria for the project's drainage facilities. For additional and updated maintenance information visit the Washington State Department of Ecology's web-site at: http://www.ecy.wa.gov/programs/wq/wqhome.html

## Appendix V-A: BMP Maintenance Tables

Ecology intends the facility-specific maintenance standards contained in this section to be conditions for determining if maintenance actions are required as identified through inspection. Recognizing that Permittees have limited maintenance funds and time, Ecology does not require that a Permittee perform all these maintenance activities on all their stormwater BMPs. We leave the determination of importance of each maintenance activity and its priority within the stormwater program to the Permittee. We do expect, however, that sufficient maintenance will occur to ensure that the BMPs continue to operate as designed to protect ground and surface waters.

Ecology doesn't intend that these measures identify the facility's required condition at all times between inspections. In other words, exceedance of these conditions at any time between inspections and/or maintenance does not automatically constitute a violation of these standards. However, based upon inspection observations, the Permittee shall adjust inspection and maintenance schedules to minimize the length of time that a facility is in a condition that requires a maintenance action.

**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.<br><br>(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.<br><br>(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.<br><br>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.<br><br>No cracks more than 1/4-inch wide at the joint of the inlet/outlet pipe. |
| 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.<br><br>Structure is not in upright position (allow up to 10% from plumb).<br><br>Connections to outlet pipe are not watertight and show signs of rust.<br><br>Any holes - other than designed holes - in the structure. | Structure securely attached to wall and outlet pipe.<br><br>Structure in correct position.<br><br>Connections to outlet pipe are water tight; structure repaired or replaced and works as designed.<br><br>Structure has no holes other than designed holes. |
| Cleanout Gate | Damaged or Missing | Cleanout gate is not watertight or is missing.<br><br>Gate cannot be moved up and down by one maintenance person.<br><br>Chain/rod leading to gate is missing or damaged.<br><br>Gate is rusted over 50% of its surface area. | Gate is watertight and works as designed.<br><br>Gate moves up and down easily and is watertight.<br><br>Chain is in place and works as designed.<br><br>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. |

| Table V-A.4: Maintenance Standards - Control Structure/Flow Restrictor | | | |
|---|---|---|---|
| **Maintenance Component** | **Defect** | **Condition When Maintenance is Needed** | **Results Expected When Maintenance is Performed** |
| 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%.<br><br>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.<br><br>Trash or debris in any inlet or outlet pipe blocking more than 1/3 of its height.<br><br>Dead animals or vegetation that could generate odors that could cause | No Trash or debris located immediately in front of catch basin or on grate opening.<br><br>No trash or debris in the catch basin.<br><br>Inlet and outlet pipes free of trash or debris.<br><br>No dead animals or vegetation present within the catch basin. |

| Table V-A.5: Maintenance Standards - Catch Basins | | | |
|---|---|---|---|
| **Maintenance Component** | **Defect** | **Conditions When Maintenance is Needed** | **Results Expected When Maintenance is performed** |
| | | complaints or dangerous gases (e.g., methane). | |
| | 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).<br><br>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.<br><br>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.<br><br>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.<br><br>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.<br><br>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.<br><br>No vegetation or root growth present. |

| Table V-A.5: Maintenance Standards - Catch Basins | | | |
|---|---|---|---|
| **Maintenance Component** | **Defect** | **Conditions When Maintenance is Needed** | **Results Expected When Maintenance is performed** |
| | 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.<br><br>(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. |

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