Greenline Business Park

Preliminary Technical Information Report

September 20, 2017

Prepared for

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Section 1

1. Project Overview

The purpose of this report is to encapsulate the documents and analysis required by the Drainage Review in the 2016 King County Surface Water Design Manual (SWDM).

Existing Site:

The proposed Greenline Business Park project site is located in the NE and SE quarters of Section 16, Township 21 North, Range 04 East, W.M. in the City of Federal Way, WA. More specifically, the project site is located on the west side of Weyerhaeuser Way S between S 336th Street & S 323rd Street. The project will include 4 parcels on approximately 146 acres (162104-9030, 162104-9013, 162104-9056, and 152104-9178) zoned as CP-1 and will be developed in accordance with the applicable City of Federal Way code. Additionally, the property is subject to the Concomitant Pre-Annexation Zoning Agreement dated August 23, 1994. See Figure 1.1 for a vicinity map and Figure 1.2 for a visual representation of the existing site conditions.

Existing Site Hydrology:

The existing site is partially developed with a commercial building and associated parking lots, outbuildings, paved driveways, and landscaped areas. The remainder of the site is predominantly forest with some pasture. The property slopes gently to the south and east at 0 - 8%. Stormwater runoff generally drains south to S 336th Street and into the existing stormwater drainage system. A portion of the site drains to the Weyerhaeuser Way S and is estimated to outfall to North Lake. The site is located in the Hylebos Creek drainage basin (WRIA number: 10). See Section 3 for more information.

Proposed Site Improvements:

The proposed development includes the demolition of existing parking lots, clearing, grading, and the construction of 3 new commercial buildings with parking lots, access roads, utility services, and stormwater facilities on approximately 78 acres as well as the associated frontage improvements along Weyerhaeuser Way S. Figure 1.3 illustrates the Proposed Site Conditions and Section 4 describes in more detail the proposed developed areas.

Proposed Site Hydrology:

The proposed onsite stormwater conveyance system will collect and convey runoff from the developed project site to the stormwater drainage system in the Right-of-Way (ROW) of S 336th Street and Weyerhaeuser Way S. The developed project site will drain to the south and east boundaries of the site, discharging to the Weyerhaeuser Pond and North Lake respectively, which are the natural discharge locations for the site. See Sections 4 and 5 of this report for more information.

Stormwater Runoff Mitigation Standard:

As detailed in the pre-application meeting notes, the proposed development will comply with Level 2 Flow Control, Basic and Enhanced Water Quality Treatment per the SWDM. See Section 4 for more information.

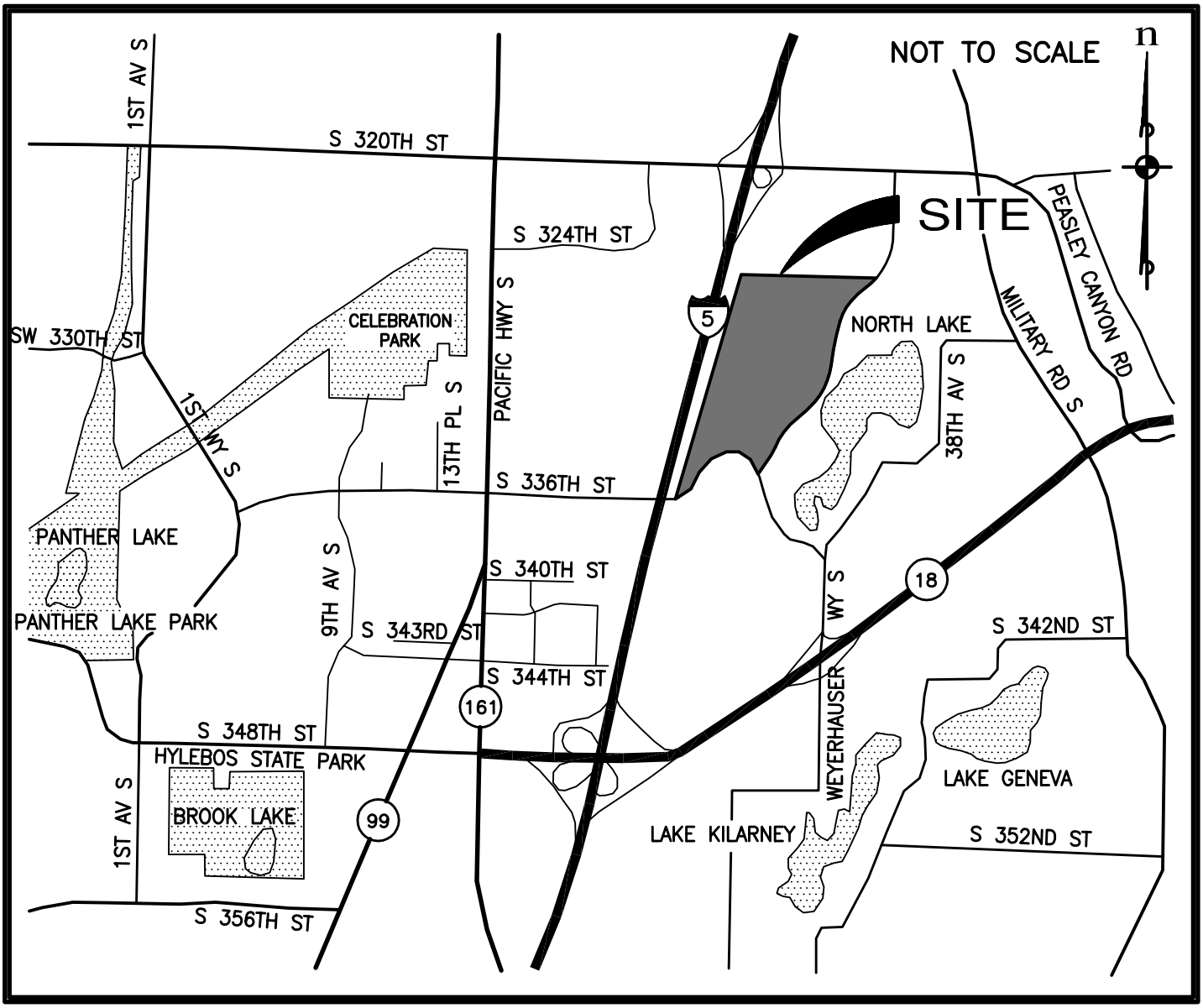
Soils on the Project Site:

The Soils Map and Geotechnical Engineering Report indicate the soils onsite include Alderwood gravely sandy loam, 0 - 8% slopes. See Figure 1.4 and the Geotechnical Engineering Report included under separate cover for more information.

Flow Control BMP's:

All applicable Flow Control BMP's are listed and explained in Section 4 of this report.

Figure 1.1
Vicinity Map



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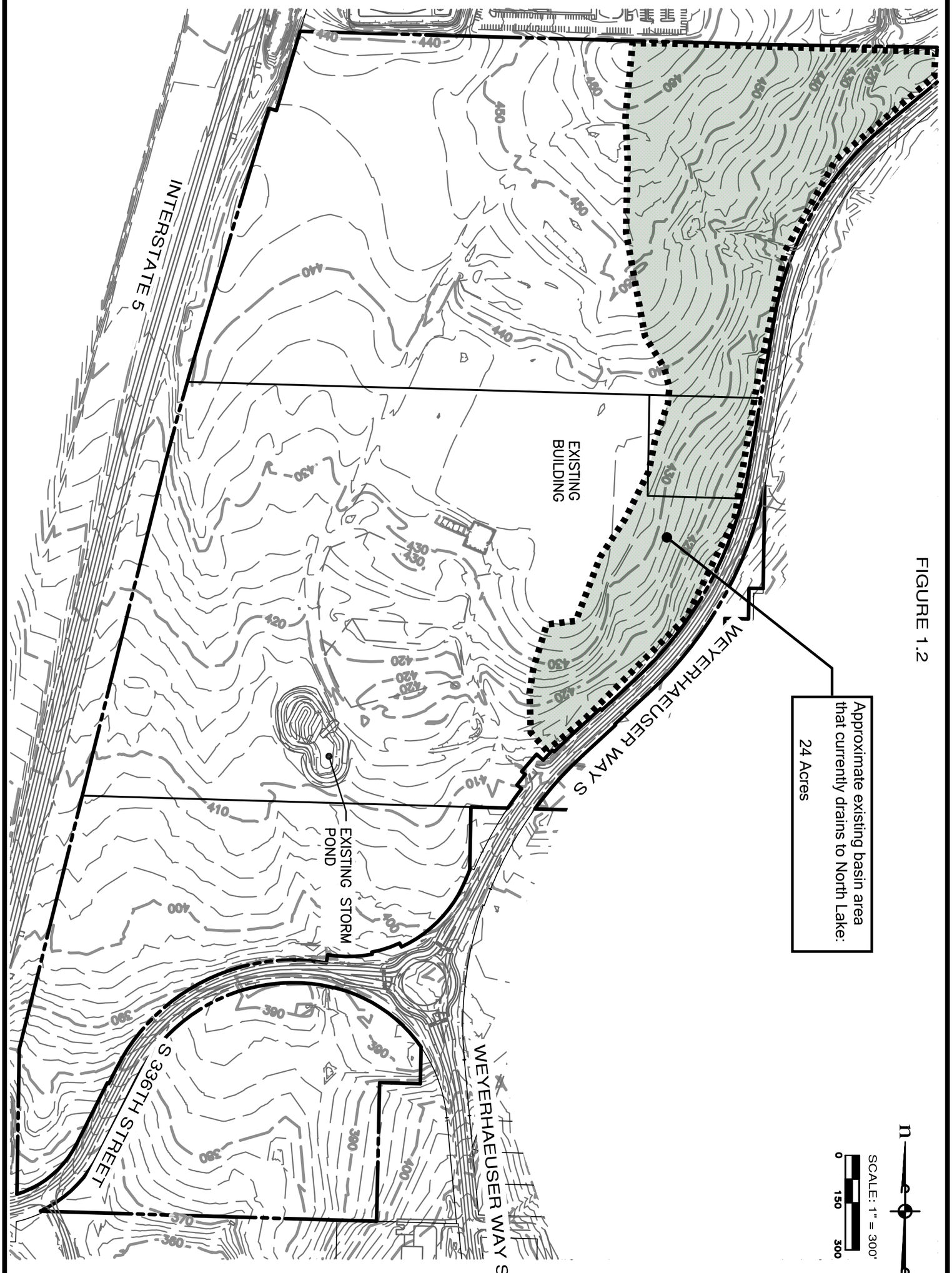

FIGURE 1.2

DRAWING: EN-03

ESM CONSULTING ENGINEERS LLC
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Public Works | Project Management | Landscape Architecture

JOB NO. 1886-001-016-0010 DATE: 10/07/2016
DRAWN: JJH SHEET 1 OF 1

FEDERAL WAY CAMPUS, LLC

FWC BUSINESS PARK

EXISTING CONDITIONS

SCALE: 1" = 100'

100 50 0 100 200

LEGEND

- STORM DRAINAGE
- SANITARY SEWER
- WATER
- ROOF DRAIN LINE
- FIRE HYDRANT
- SANITARY SEWER MANHOLE
- CATCH BASIN

POND 1 DETENTION

MODULAR WETLANDS STORMWATER BIOFILTRATION SYSTEM OR APPROVED EQUAL

30' SETBACK

9' RIGHT-OF-WAY DEDICATION

WEYERHAEUSER WAY S.

BUILDING "A"
638,000 SF
FF=VARIES
442.37-448.87

EXISTING WTC BUILDING
FF=437.00

4' TRUCK DOCK WALL

BUILDING "B"
282,500 SF
FF=VARIES
420.00-424.75

BUILDING "C"
147,500 SF
FF=VARIES
422.00-424.5

EX SSMH
N=114127.17
E=1277501.66
RIM=402.06
IE IN=376.05, 8"ø NW

73 LF, 8"ø PVC SS @ S=39.40%

SSMH #1, TYPE 1-48"ø
N=114172.48
E=1277444.08
RIM=416.17
IE IN=404.91, 8"ø W
IE OUT=404.81, 8"ø SE

136 LF, 8"ø PVC SS @ S=0.50%

SSMH #2, TYPE 1-48"ø
N=114131.07
E=1277314.01
RIM=416.17
IE IN=405.69, 8"ø NW
IE OUT=405.59, 8"ø E

289 LF, 8"ø PVC SS @ S=0.50%

POND 5 DETENTION

POND 4 DETENTION

SSMH #3, TYPE 1-48"ø
N=114263.08
E=1277058.33
RIM=417.95
IE IN=407.24, 8"ø NE
IE OUT=407.14, 8"ø SE

POND 2 DETENTION

POND 3 DETENTION

SWALE TO PROVIDE POSITIVE DRAINAGE BETWEEN WETLAND AV AND WETLAND BB

INTERSTATE 5

S 336TH ST

REVISIONS

NO.	DESCRIPTION/DATE	BY

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FEDERAL WAY CAMPUS, LLC

GREENLINE BUSINESS PARK

PROPOSED SITE CONDITIONS

CITY OF FEDERAL WAY WASHINGTON

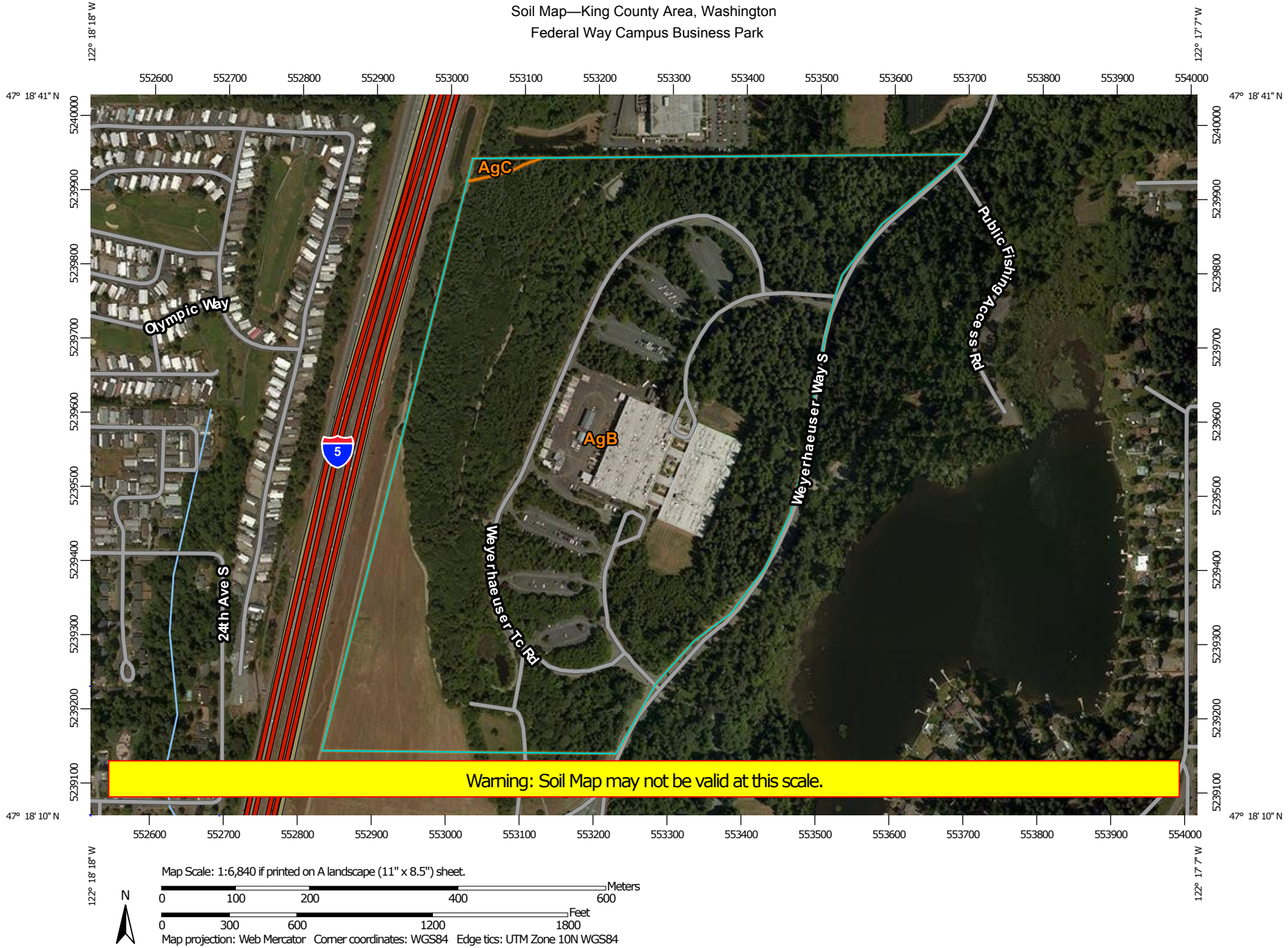
JOB NO.	1886-001-016
DWG. NAME	EN-06
DESIGNED BY:	LGB
DRAWN BY:	JJH
CHECKED BY:	
DATE:	11/02/2017

FIG 1.3

1 OF 1 SHEETS

File: \\Esm0\engr\ESM-JOBS\1886\001\016-2016\exhibits\EN-06.dwg
Plotted: 11/2/2017 9:44 AM
Plotted By: Tony Alderson

Soil Map—King County Area, Washington
Federal Way Campus Business Park



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: http://websoilsurvey.nrcs.usda.gov
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: King County Area, Washington
Survey Area Data: Version 11, Sep 14, 2015

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

Date(s) aerial images were photographed: Jul 8, 2014—Jul 15, 2014

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

King County Area, Washington (WA633)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
AgB	Alderwood gravelly sandy loam, 0 to 8 percent slopes	104.7	99.6%
AgC	Alderwood gravelly sandy loam, 8 to 15 percent slopes	0.4	0.4%
Totals for Area of Interest		**105.1**	**100.0%**

Section 2

2. Conditions and Requirements Summary

Review of the 9 Core Requirements and 5 Special Requirements

This section describes how the project will meet the SWDM Core and Special Requirements.

Core Requirement No. 1 Discharge at the Natural Location

Stormwater runoff generated from the developed project site is estimated to drain south and east to the S 336th Street and Weyerhaeuser Way S, respectively. Thence runoff is conveyed to North Lake and to Stream AC, which continues south to the Weyerhaeuser Pond. Both are the natural discharge locations for the site.

Core Requirement No. 2 Off-site Analysis

The off-site and downstream analyses are documented in Section 3 of this report.

Core Requirement No. 3 Flow Control

Level 2 Flow Control is required per the pre-application meeting notes for this project, which will be met by proposed detention ponds and storage in the existing Weyerhaeuser Pond. See Section 4 of this report for more information.

Core Requirement No. 4 Conveyance System

Stormwater conveyance will be provided for the proposed and existing conveyance systems per Section 5 of the SWDM. Calculations will be provided in the final TIR.

Core Requirement No. 5 Erosion and Sediment Control

Erosion and sediment controls to prevent the transport of sediment from the project site to downstream drainage facilities, water resources, and adjacent properties will be provided on the construction plans.

Core Requirement No. 6 Maintenance and Operations

The Operations and Maintenance manual will be included with the final TIR.

Core Requirement No. 7 Financial Guarantees and Liability

All drainage facilities constructed or modified for projects will comply with the financial guarantee requirements as provided in the King County Bond Quantities Worksheet. Bond Quantities will be provided in the final TIR.

Core Requirement No. 8 Water Quality

Basic and Enhanced Water Quality Treatment is required per the pre-application meeting notes and will be provided as described in Section 4.

Core Requirement No. 9 Flow Control BMP's

All applicable Flow Control BMP's are listed and discussed in Section 4 of this report.

Special Requirement No. 1 Other Adopted Area-Specific Requirements

There are no master drainage plans, basin plans, salmon conservation plans, stormwater compliance plans, flood hazard reduction plan updates, or shared facility drainage plans for this project. Special Requirement No. 1 does not apply.

Special Requirement No. 2 Flood Hazard Area Delineation

The developed project site location is not in a 100-year floodplain. Special Requirement No. 2 does not apply.

Special Requirement No. 3 Flood Protection Facilities

The developed project site is not protected by an existing flood protection facility. The proposed site improvements do not include the modification of an existing flood protection facility. Special Requirement No. 3 does not apply.

Special Requirement No. 4 Source Control

The project will follow the King County Stormwater Pollution Prevention Manual and King County Code 9.12 to identify and implement source controls as needed. Due to the proposed use of the project site, source control is not required; therefore, Special Requirement No. 4 does not apply.

Special Requirement No. 5 Oil Control

The proposed development is commercial and (according to the definition provided in the SWDM), portions of the project site qualify as a “high-use site” due to vehicle fleet size; therefore, Special Requirement No. 5 does apply. Implementation details regarding oil control will be provided in the final TIR.

Section 3

3. Off-Site Analysis

A Level 1 downstream analysis has been performed for the site.

Task 1: Study Area Definition and Maps

The study area consists of the project site and 1/4 mile downstream flow path for runoff released from the existing site. See Figure 1.2 and Figure 3.2 for the Existing Site Conditions and Downstream Analysis Flow Path exhibits.

Task 2: Resource Review

Flow Control Map

According to the pre-application meeting notes, the project is required to comply with Level 2 Flow Control criteria.

Soil Survey Map

Web Soil Survey maps the soils onsite include Alderwood gravely sandy loam, 0 - 8% slopes. Refer to the Geotechnical Engineering Report attached under separate cover for more detail.

King County iMap

According to iMap, the project site is NOT mapped in any of the following areas:

- Landslide Hazard area
- Coal Mine Hazard Areas
- Erosion Hazard area
- 100 Year Floodplains
- Critical Aquifer Recharge Area
- Seismic Hazard area

King County iMap and the Pre-Application Conference Notes

The project site has the following areas mapped onsite and nearby:

- Streams & Wetlands

See Figure 3.1 for more information regarding the environmental hazards near the project site.

Road Drainage Problems

None noted

Wetlands Inventory

According to iMap, the Critical Areas Review, and the 1990 King County Wetlands Inventory Notebooks there are no recorded wetlands on the existing project site. However, the wetland biologist has located onsite wetland areas and there are wetland areas downstream of the developed project site. See Figure 1.2 for Existing Site Conditions and the wetland report for more information.

Migrating River Study

None noted

Downstream Drainage Complaints

According to iMap, there are no relevant downstream drainage complaints within the scope of this project.

Task 3: Field Inspection (Level 1 Inspection)

A Level 1 Downstream Analysis was completed by ESM Consulting Engineers, LLC in the early afternoon on October 5, 2016, when it was sunny and 65°F. During the inspection it was found that the project site has no apparent upstream offsite areas draining to the property. Stormwater runoff from the existing site's lawn, vegetated areas, roof, roads, access ways, and parking lot is estimated to flow across the property to the south and east boundaries of the site and drain to the public right-of-way. From there, stormwater runoff south of the site's existing south entrance is collected in the gutter along the west side of Weyerhaeuser Way S and continues south to S 336th Street. The runoff is conveyed in a piped system or via roadside ditch in the area near the roundabout. Once past the roundabout, the runoff crosses under S 336th Street in two 12 inch diameter concrete culverts and continues to the Weyerhaeuser Pond via established drainage paths. Stormwater runoff north of the site's existing south entrance is estimated to be collected in a road side ditch and conveyed east under Weyerhaeuser Way S to North Lake via two culvert pipes. There did not appear to be any flooding issues over any of the roadways adjacent to, and downstream of, the project site. See Figure 3.2 Downstream Analysis Flowpath for further information and the approximate existing basin area draining to North Lake.

The site was revisited around noon on January 18, 2017, when it was heavily raining. Following the flow of stormwater south of S 336th Street, stormwater was routed in a drainage ditch with no apparent restrictions on its way to the Weyerhaeuser Pond. The flow increased significantly once it was joined with the outflow from North Lake. At that point it appeared that the capacity of the drainage ditch was increased sufficiently to convey the stormwater runoff.

Task 4: Drainage Description and Problem Descriptions

According to iMap, the project site is in the Hylebos Creek (King County WRIA number: 10) drainage basin. Hylebos Creek is located approximately 0.3 miles to the west of the project and separated by I-5. No drainage problems are known to exist in the site's present condition.

There is an existing Sphagnum Bog located adjacent to the northwest corner of the project site (parcel 215465-0170). However, it is not part of the existing or developed drainage basin, and no associated drainage problems are known.

Task 5: Mitigation of Existing or Potential Problems

No existing or potential problems were observed with the existing drainage system within the scope of the downstream analysis. Therefore, no further mitigation is proposed.

King County

King County Districts and Development Conditions for parcel 1621049030

Parcel number	**1621049030**	Drainage Basin	**Hylebos Creek**
Address	**Not Available**	Watershed	**Puyallup River**
Jurisdiction	**Federal Way**	WRIA	**Puyallup-White (10)**
Zipcode	**98001**	PLSS	**SE - 16 - 21 - 4**
Kroll Map page	**727**	Latitude	**47.30692**
Thomas Guide page	**745**	Longitude	**-122.29257**

Electoral Districts

Voting district	**FED 30-3289**
King County Council district	**District 7, Pete von Reichbauer (206) 477-1007**
Congressional district	**9**
Legislative district	**30**
School district	**Federal Way #210**
Seattle school board district	**does not apply (not in Seattle)**
District Court electoral district	**Southwest**

Fire district	**South King Fire and Rescue**
Water district	**does not apply**
Sewer district	**does not apply**
Water & Sewer district	**Lakehaven Utility District**
Parks & Recreation district	**does not apply**
Hospital district	**does not apply**
Rural library district	**Rural King County Library System**
Tribal Lands?	**No**

King County planning and critical areas designations

King County zoning	**NA, check with jurisdiction**
Development conditions	**None**
Comprehensive Plan	**does not apply**
Urban Growth Area	**Urban**
Community Service Area	**does not apply**
Community Planning Area	**Federal Way**
Coal mine hazards?	**None mapped**
Erosion hazards?	**None mapped**
Landslide hazards?	**None mapped**
Seismic hazards?	**None mapped**

Potential annexation area	**does not apply**
Rural town?	**No**
Water service planning area	**does not apply**
Roads MPS zone	**255 *and* 258**
Transportation Concurrency Management	**does not apply**
Forest Production district?	**No**
Agricultural Production district?	**No**
Critical aquifer recharge area?	**None mapped**
100-year flood plain?	**None mapped**
Wetlands at this parcel?	**None mapped**
Within the Tacoma Smelter Plume?	**Under 20 ppm** Estimated Arsenic Concentration in Soil

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Contact us at giscenter@kingcounty.gov.

King County

King County Districts and Development Conditions for parcel 1621049056

Parcel number	**1621049056**	Drainage Basin	**Hylebos Creek**
Address	**Not Available**	Watershed	**Puyallup River**
Jurisdiction	**Federal Way**	WRIA	**Puyallup-White (10)**
Zipcode	**98001**	PLSS	**NE - 16 - 21 - 4**
Kroll Map page	**727 *and* 728**	Latitude	**47.31048**
Thomas Guide page	**745**	Longitude	**-122.29031**

Electoral Districts

Voting district	**FED 30-3289**
King County Council district	**District 7, Pete von Reichbauer (206) 477-1007**
Congressional district	**9**
Legislative district	**30**
School district	**Federal Way #210**
Seattle school board district	**does not apply (not in Seattle)**
District Court electoral district	**Southwest**

Fire district	**South King Fire and Rescue**
Water district	**does not apply**
Sewer district	**does not apply**
Water & Sewer district	**Lakehaven Utility District**
Parks & Recreation district	**does not apply**
Hospital district	**does not apply**
Rural library district	**Rural King County Library System**
Tribal Lands?	**No**

King County planning and critical areas designations

King County zoning	**NA, check with jurisdiction**
Development conditions	**None**
Comprehensive Plan	**does not apply**
Urban Growth Area	**Urban**
Community Service Area	**does not apply**
Community Planning Area	**Federal Way**
Coal mine hazards?	**None mapped**
Erosion hazards?	**None mapped**
Landslide hazards?	**None mapped**
Seismic hazards?	**None mapped**

Potential annexation area	**does not apply**
Rural town?	**No**
Water service planning area	**does not apply**
Roads MPS zone	**255 *and* 258**
Transportation Concurrency Management	**does not apply**
Forest Production district?	**No**
Agricultural Production district?	**No**
Critical aquifer recharge area?	**None mapped**
100-year flood plain?	**None mapped**
Wetlands at this parcel?	**None mapped**
Within the Tacoma Smelter Plume?	**Under 20 ppm** Estimated Arsenic Concentration in Soil

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King County

King County Districts and Development Conditions for parcel 1621049013

Parcel number	**1621049013**	Drainage Basin	**Hylebos Creek**
Address	**32901 WEYERHAEUSER WAY S**	Watershed	**Puyallup River**
Jurisdiction	**Federal Way**	WRIA	**Puyallup-White (10)**
Zipcode	**98001**	PLSS	**SE - 16 - 21 - 4**
Kroll Map page	**727**	Latitude	**47.30677**
Thomas Guide page	**745**	Longitude	**-122.2923**

Electoral Districts

Voting district	**FED 30-3289**	Fire district	**South King Fire and Rescue**
King County Council district	**District 7, Pete von Reichbauer (206) 477-1007**	Water district	**does not apply**
		Sewer district	**does not apply**
Congressional district	**9**	Water & Sewer district	**Lakehaven Utility District**
Legislative district	**30**	Parks & Recreation district	**does not apply**
School district	**Federal Way #210**	Hospital district	**does not apply**
Seattle school board district	**does not apply (not in Seattle)**	Rural library district	**Rural King County Library System**
District Court electoral district	**Southwest**	Tribal Lands?	**No**

King County planning and critical areas designations

King County zoning	**NA, check with jurisdiction**	Potential annexation area	**does not apply**
Development conditions	**None**	Rural town?	**No**
Comprehensive Plan	**does not apply**	Water service planning area	**does not apply**
Urban Growth Area	**Urban**	Roads MPS zone	**255 *and* 258**
Community Service Area	**does not apply**	Transportation Concurrency Management	**does not apply**
Community Planning Area	**Federal Way**	Forest Production district?	**No**
Coal mine hazards?	**None mapped**	Agricultural Production district?	**No**
Erosion hazards?	**None mapped**	Critical aquifer recharge area?	**None mapped**
Landslide hazards?	**None mapped**	100-year flood plain?	**None mapped**
Seismic hazards?	**None mapped**	Wetlands at this parcel?	**ID = 2407 Rating = 2**
		Within the Tacoma Smelter Plume?	**Under 20 ppm** Estimated Arsenic Concentration in Soil

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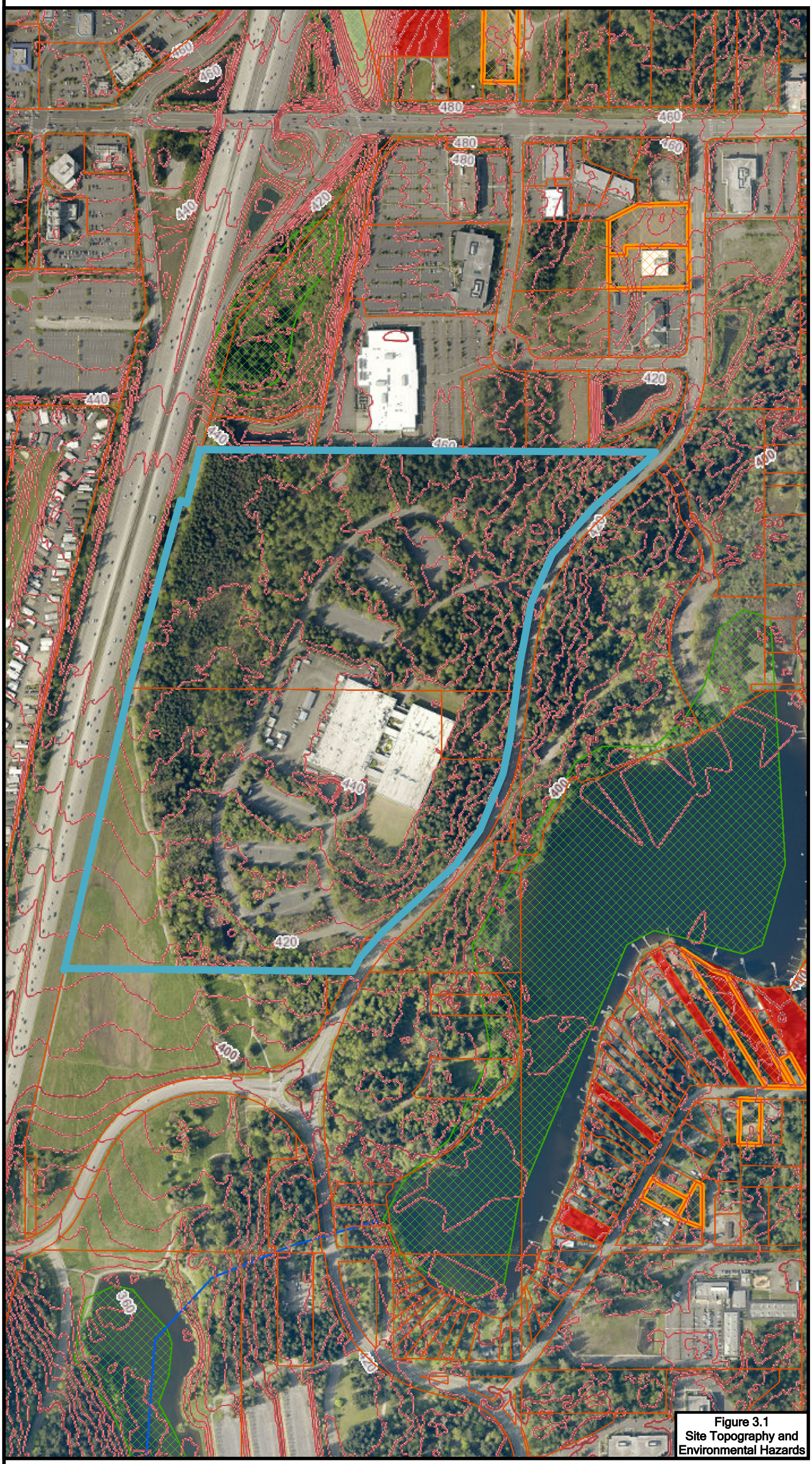
Figure 3.1 - Site Topography and Environmental Hazards



Legend

- Parcels
- Bonded
- Commercial-MF
- Commercial-SF
- Construction
- DOT
- FMD
- Regional
- Residential
- Drainage complaints
- Potential landslide hazard areas (2016, see explanation--->)
- Potential steep slope hazard areas (2016, see explanation--->)
- Erosion hazard (1990 SAO)
- Seismic hazard (1990 SAO)
- Coal mine hazard (1990 SAO)
- class 1
- class 2 perennial
- class 2 salmonid
- class 3
- unclassified
- Wetland (1990 SAO)
- Sensitive area notice on title

Figure 3.1
Site Topography and Environmental Hazards

Date: 10/7/2016

Notes:

King County
GIS Center

95 Acre Short Plat

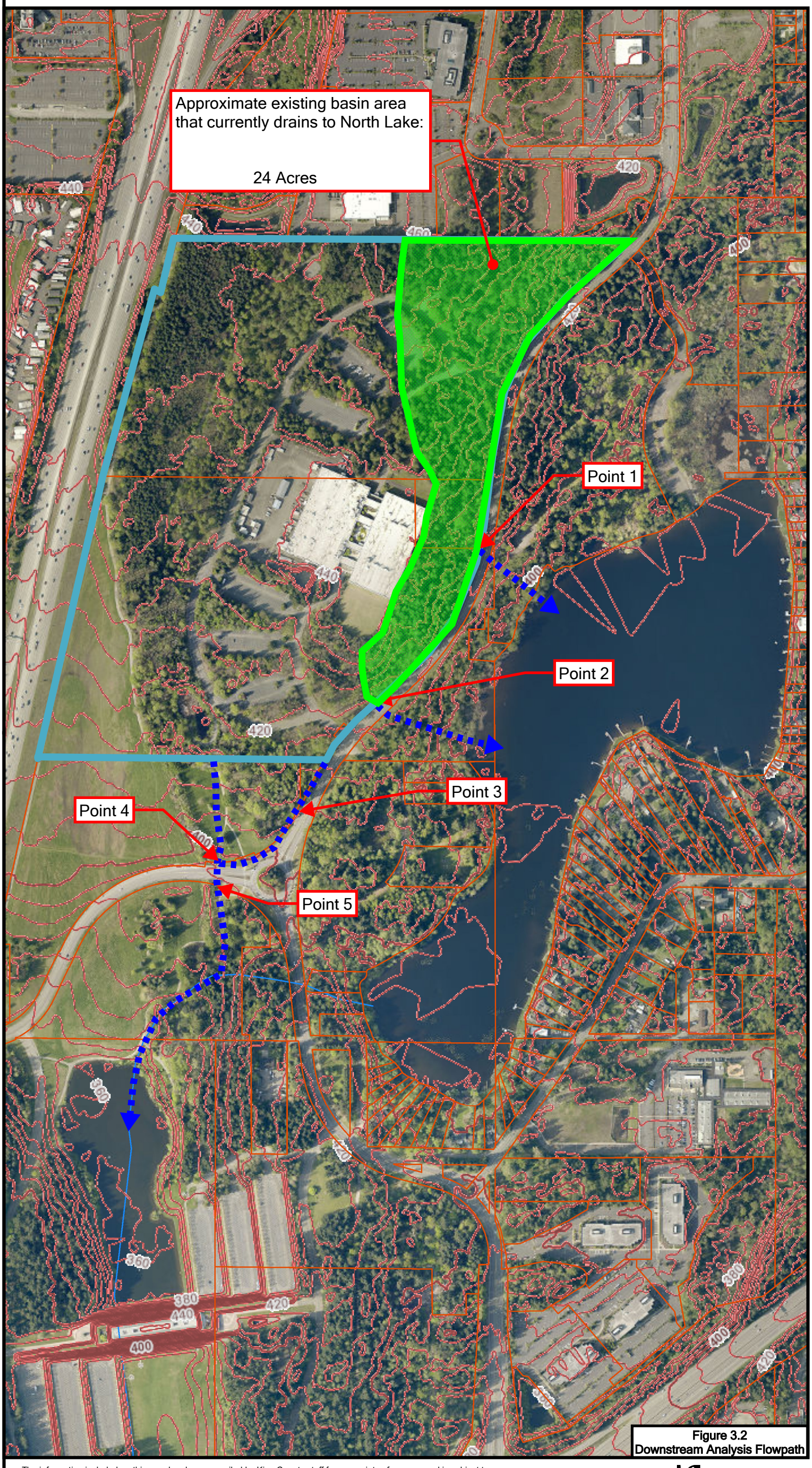


Figure 3.2
Downstream Analysis Flowpath

Date: 10/5/2016

Notes:

King County
GIS Center

Point 1:

Looking south, east (across the road), and at the culvert inlet.

Stormwater collected in the roadside ditch is conveyed to this culvert on the west side of Weyerhaeuser Way SW where it crosses the road and continues east to North Lake.

Point 2:

Looking south on the west side of Weyerhaeuser Way SW

Water from the site that flows to Weyerhaeuser Way SW is routed to this culvert via roadside ditch and continues east.

Looking north on the east side of Weyerhaeuser Way SW

Point 3:

Looking north on the west side of Weyerhaeuser Way SW.

Stormwater runoff south of the south entrance to the existing site is collected by this roadside ditch.

Point 3:

Looking south on the west side of Weyerhaeuser Way SW.

From the ditch, stormwater enters the existing stormwater conveyance system in this culvert.

Point 3:

Looking south toward the roundabout.

Stormwater runoff not collect further north is collected by this ditch along the south boundary of the site and drains to Point 4.

Point 4:

Looking south at the inlet of the pipes crossing S 336th Street.

Point 5:

Looking west on the south side of S 336th Street where the stormwater runoff from the project site crosses and drains to Weyerhaeuser Pond.

Section 4

4. Flow Control & Water Quality Facility Analysis and Design

Existing Site Hydrology:

The existing site is partially developed with a commercial building and associated parking lots, outbuildings, paved driveways, and landscaped areas. The remainder of the site is predominantly forest with some pasture. The property slopes gently to the south and east at 0 - 8%. Stormwater runoff generally drains south to the S 336th Street public ROW and into the existing stormwater drainage system. A small portion of the site drains east to the Weyerhaeuser Way S and is estimated to outfall to North Lake. The site is located in the Hylebos Creek drainage basin (WRIA number: 10). See Section 3 for more information.

Due to the topography of the project site, the existing 5 onsite basins shown in Figure 1.3 drain to the south and east borders, which are the Points of Compliance. From there, stormwater runoff is conveyed to North Lake (Basin 1) and Weyerhaeuser Pond (Basins 2-5). As required by the SWDM, the existing basins have been modeled as pre-developed forested, and the areas are described in Table 4.0 below (totaling 78.22 acres).

Table 4.0

Land Use (Acres)	Basin 1	Basin 2	Basin 3	Basin 4	Basin 5
C, Forest	11.48	44.33	4.96	5.82	11.63

Developed Site Hydrology:

The developed Basins 1-5 (totaling 78.22 acres) are generally described below, shown in Table 4.1, and illustrated on the Developed Basin Map in Appendix A.

Basin 1

The proposed drainage Basin 1 consists of 11.48 acres of developed area. This area discharges in the same direction as the existing 24 acre drainage basin that drains to the wetlands and associated buffers on the east side of Weyerhaeuser Way S and continues to North Lake, which is the natural discharge location for the basin. The developed area includes the eastern portion of the proposed Building A, associated standard parking and landscaped areas, and the proposed Pond 1 area.

Basin 2

The proposed drainage Basin 2 consists of 43.94 acres of developed area. This area discharges to the wetlands and associated buffers on the east side of Interstate 5 and continues to Stream AC, which continues south to the Weyerhaeuser Pond, which is the natural discharge location for the basin. The developed area includes the western portion of the proposed Building A, associated truck and standard parking lot areas, relocated Tech Center parking lot areas, landscaped parking lot areas, and the proposed Pond 2 area. A small 0.39 acre portion of Basin 2 drains directly to Weyerhaeuser Way S and will bypass Pond 2, which has been modeled as bypass in WWHM.

Basin 3

The proposed drainage Basin 3 consists of 4.96 acres of developed area. This area discharges to Stream AC, which continues south to the Weyerhaeuser Pond, which is the natural discharge location for the basin. The developed area includes Building C clean roof runoff as well as the proposed Pond 3 area.

Basin 4
The proposed drainage Basin 4 consists of 5.82 acres of developed area. This area discharges to Stream AC, which continues south to the Weyerhaeuser Pond, which is the natural discharge location for the basin. The developed area includes truck and standard parking lot areas associated with Building C, landscaped parking lot areas and the proposed Pond 4 area.

Basin 5
The proposed drainage Basin 5 consists of 11.06 acres of developed area. This area discharges to Stream AC, which continues south to the Weyerhaeuser Pond, which is the natural discharge location for the basin. The developed area includes Building B, associated truck and standard parking lot areas, landscaped parking lot areas, and the proposed Pond 5 area. A small 0.57 acre portion of Basin 5 drains directly to Weyerhaeuser Way S and will bypass Pond 5, which has been modeled as bypass in WWHM.

Table 4.1

Land Use (Acres)	Basin 1	Basin 2		Basin 3	Basin 4	Basin 5	
	Developed	Developed	By pass	Developed	Developed	Developed	By pass
C, Lawn	2.41	7.50	0.02	1.51	1.26	1.54	0.06
Road and Parking	1.82	21.54	0.37	0.00	4.12	2.66	0.51
Roof	7.02	13.13	0.00	3.31	0.00	6.49	0.00
Sidewalk	0.20	1.63	0.00	0.00	0.39	0.33	0.00
Pond Access	0.03	0.14	0.00	0.14	0.05	0.04	0.00
Impervious Total	9.07	36.44	0.37	3.45	4.56	9.52	0.51
Basin Total	**11.48**	**43.94**	**0.39**	**4.96**	**5.82**	**11.06**	**0.57**

The frontage improvements along the majority of both sides of Weyerhaeuser Way S consist of approximately 5.5 acres of ROW dedication, 2.4 acres of asphalt pavement, 1.7 acres of sidewalk, and 1.4 acres of landscaping. The northern portion of the existing roadway and associated frontage improvements discharges in the same direction as the existing 24 acre drainage basin that drains to the wetlands and associated buffers on the east side of Weyerhaeuser Way S and continues to North Lake. The remaining portion of the existing roadway and associated frontage improvements flows southeast to the Weyerhaeuser Pond, which is the natural discharge location for the basin.

Performance Standards:

Stormwater systems onsite are to be designed to mitigate runoff generated from the project per the requirements of the SWDM, specifically the Level 2 Flow Control standards per the Pre-application meeting notes for this project. The existing building and areas to remain will be retrofitted to meet the Level 2 Flow Control standard. The facility size is required to be determined by an approved hydrology model per the SWDM.

Flow Control System:

The approved hydrology model used to size the detention portion of Ponds 1-5 was the Western Washington Hydrology Model (WWHM) version 2012. The default sizing from that software complies with the Level 2 Flow Control standards. As modeled in WWHM, Basins 2 and 5 mitigated developed flows include flows bypassing the stormwater facilities.

The pre-developed and developed project site mitigated flow rates are given in Table 4.2 and comply with the Level 2 Flow Control standards. The estimated volumes required and provided are given in Table 4.3. The WWHM output is provided in Appendix B.

Table 4.2

Peak Flows (cfs)	Basin 1		Basin 2		Basin 3		Basin 4		Basin 5	
Return Period	Pre	Dev Mit	Pre	Dev Mit	Pre	Dev Mit	Pre	Dev Mit	Pre	Dev Mit
2 Year	0.34	0.18	1.30	0.71	0.15	0.09	0.17	0.10	0.34	0.80
5 Year	0.53	0.27	2.05	0.98	0.23	0.14	0.27	0.16	0.54	1.56
10 Year	0.64	0.34	2.47	1.18	0.28	0.19	0.32	0.21	0.65	2.34
25 Year	0.75	0.44	2.91	1.45	0.33	0.25	0.38	0.28	0.76	3.75
50 Year	0.83	0.52	3.19	1.67	0.36	0.30	0.42	0.35	0.84	5.20
100 Year	0.89	0.61	3.43	1.91	0.38	0.36	0.45	0.42	0.90	7.09

Table 4.3

Stormwater Detention Volume (acre-feet)	Pond 1	Pond 2	Pond 3	Pond 4	Pond 5
Required	5.37	19.03	1.71	2.44	4.88*
Provided	5.78	19.33	2.05	3.37	1.45
Safety Factor	8%	2%	20%	38%	N/A

* 3.43 acre-feet to Weyerhaeuser Pond.

The Weyerhaeuser Pond's headworks were modified and approved in July of 2004 to increase the live storage by 200,000 cubic feet (4.59 acre-feet). The pond's weir was adjusted to obtain this additional live storage. This project preliminarily proposes to discharge 3.43 acre-feet of additional live storage from Pond 5 to the Weyerhaeuser Pond, to use the available additional live storage.

Flow control for the proposed frontage improvements will be provided in relocated roadside swales, matching the drainage flow paths for the existing pavement, with additional detention capacity in the Weyerhaeuser Pond. Detailed flow control analysis will be completed with the final frontage improvement plans, which will also require relocating existing utility infrastructure, extending existing culverts, as well as new pavement channelization.

Water Quality System:

The approved hydrology model used to size the Ponds 1-5 was WWHM version 2012.

Basin 1 consists of the eastern portion of Building A and standard parking areas. A Modular Wetlands filter vault (or approved equivalent) will be placed before detention; therefore, it will be sized with the WWHM water quality flow rate and meet Basic Water Quality Treatment.

A Modular Wetlands filter vault (or approved equivalent) sized with the WWHM 2-year mitigated flow rate will be provided for Basins 2, 4, and 5 to meet the Enhanced Water Quality Treatment standards in Section 1.2.8 of the SWDM.

The eastern portion of Building A in Basin 1, the western portion of Building A in Basin 2, and Building B in Basin 5's roof runoff is considered clean, thus not requiring water quality treatment, and will be conveyed directly into their respective detention Ponds 1, 2, and 5.

Basin 3 only consists of clean roof runoff from Building C and therefore does not require water quality treatment.

The roof material to be used on the proposed Buildings A, B, and C will be TOP and is considered to be non-leaching which complies with the requirements specified in Section 1.2.8 of the SWDM.

Oil control is required for the parking lot areas and implementation details will be provided in the final TIR.

The required and provided treatment rates are given in Table 4.5. The WWHM output is provided in Appendix B.

Table 4.5

Water Quality Flow Rate (cfs)	Basin 1	Basin 2	Basin 4	Basin 5
Required	0.31	0.71*	0.10*	0.80*

* 2 year mitigated flow rate for Enhanced Water Quality Treatment.

Water quality for the asphalt pavement portion of the proposed frontage improvements will be provided in relocated roadside swales, matching the drainage flow paths for the existing pavement. Detailed flow control analysis will be completed with the final frontage improvement plans, which will also require relocating existing utility infrastructure, extending existing culverts, as well as new pavement channelization.

Flow Control BMPs

Flow control BMPs have been preliminarily evaluated for the project site as outlined in the SWDM under Section 1.2.9.2.2 – Large Lot BMP Requirements. These BMP's are described below in the required order, with feasibility determined and the portion of applicable area credited as mitigated, which should be no less than 10% of the total site area – 7.82 acres.

Full Dispersion

There are multiple native vegetated areas surrounding the project site that will be left undisturbed. The areas on the east side of the project site are not large enough to accommodate a minimum flowpath of 100 feet in length. The areas on the west side of the project site consist mostly of wetlands, streams and associated buffers and are not feasible for full dispersion. The areas on the north side of the project site are upstream, thus also not feasible for full dispersion. In summary, Full Dispersion is deemed to be infeasible for this project site.

Full Infiltration

The Geotechnical Engineering Report states that "*…there is very limited infiltration potential at this site. Because of these factors we recommend that stormwater detention be used for site development.*" Because of this recommendation, Full Infiltration (specified in Section C.2.2.2.1) minimum requirements cannot be met; hence, Full Infiltration is infeasible for this project site.

Limited Infiltration

Limited Infiltration (specified in Section C.2.3) has the same minimum design requirements as Full Infiltration. Since Full Infiltration has been deemed infeasible, Limited Infiltration is also infeasible for this project site.

Bioretention

Bioretention (specified in Section C2.6) may be feasible, using raingardens pending further geotechnical field investigation (to be completed with final design).

Permeable Pavement,

Permeable Pavement (specified in Section C2.7) may be feasible for the onsite and frontage non-pollution generating impervious concrete sidewalk, pending further geotechnical field investigation (to be completed with final design).

Basic Dispersion

As discussed above for Full Dispersion, the native vegetated areas deemed to be infeasible for Basic Dispersion.

If the impervious area credited as mitigated is less than the threshold specified in Flow Control BMPs above, then (according to Section 1.2.9.2.2.5 of the SWDM) a fee in lieu must be paid OR one or more the following BMPs must be implemented to achieve compliance:

Reduced Impervious Surface Credit

This project is larger than 250,000 square feet (Section C.2.9.2), cannot use wheel strip driveways (Section C.2.9.3) due to the proposed parking layout, cannot implement a minimum disturbance foundation (Section C.2.9.4) due to the building type, and open grid decking over pervious surface (Section C.2.9.5) is not applicable. Therefore, minimum design requirement #1 (specified in Section C.2.9.1) cannot be met; hence, the Reduced Impervious Surface Credit cannot be claimed for the proposed site improvements.

Native Growth Retention Credit

The minimum design requirement that any area of target impervious surface credited as mitigated by this credit must be directed to vegetated pervious areas on the site or discharged through a perforated pipe connection in accordance with Section C.2.11. While it is not feasible to direct stormwater runoff to those surfaces due to the elevation difference of the applicable vegetated pervious areas, the perforated pipe connection will be provided to the roof downspouts for the three proposed buildings.

Out of the total parcel area (146 acres), the undisturbed native vegetation area of 56.9 acres mitigates for 16.26 acres of impervious area, which is equivalent to 21% of the total project site area (78.22 acres) and 25% of the total impervious area (63.98 acres).

The native vegetated area used for this credit requires specific covenants, per SWDM, and these requirements have been preliminarily compared with the Weyerhaeuser Company Concomitant Pre-Annexation Zoning Agreement (CZA). The requirements in the SWDM appear to not conflict with the CZA, therefore, native growth retention appears to be feasible for the project site and will be confirmed with final design.

Soil Amendment Minimum Requirement #6

All new pervious surfaces will be amended per Section 1.2.9.2.2.6 of the SWDM to satisfy the requirements specified therein (notes will be added on the final landscape plans).

Roof Downspout Minimum Requirement #7

All roof downspouts will be shown on the final construction plans to connect to the storm system via Perforated Pipe Connection (as specified in Section C.2.11 of the SWDM).

In summary, the project site will implement the following flow control BMPs, if determined feasible during final design: Bioretention and Permeable Pavement for the project site and frontage improvements, pending further geotechnical field investigation. If the impervious area credited as mitigated is not sufficient, a fee in lieu will be paid, or the Native Growth Retention Credit will be implemented. Additionally, the project will amend soils and use perforated pipe connections for downspouts.

Section 5

5. Conveyance System Analysis and Design

Onsite Conveyance System:

Runoff from the developed project site will be collected by the onsite conveyance system. The proposed stormwater drainage system is composed of catch basin structures with pipes. The proposed stormwater drainage system will be designed to convey the 25-year peak flow rate generated by the developed tributary basin as required by the SWDM. The system will contain the 100-year flow within the catch basins without any backwater issues. A conveyance and backwater analysis will be completed to verify the capacity of the critical pipes in the system with the final TIR.

Outlet Conveyance System:

The proposed detention Pond 1 will discharge pre-developed forested stormwater runoff to the existing wetland buffers and continues to North Lake for an estimated maximum 100 year flow of 0.61 cfs, which is less than the 100 year flow of 1.87 cfs for the estimated 24 acre forested basin that currently drains in the same direction.

The proposed water quality and detention Ponds 2 – 4 will match pre-developed conditions and discharge pre-developed forested stormwater runoff to Stream AC, which continues south to the Weyerhaeuser Pond for a combined 100 year discharged flow rate of 2.69 cfs.

Furthermore, the existing forested and pasture areas that flow to Stream AC amount to approximately 14 acres and an associated 100 year flow rate of 1.58 cfs.

In addition, Pond 5 will discharge 3.34 acre-feet of additional live storage to Weyerhaeuser Pond, to use the available additional live storage, which results in a 100 year discharged flow rate of 7.09 cfs.

The total stormwater runoff to this location is 11.36 cfs (2.69 + 1.58 + 7.09), which is less than the existing culverts preliminary calculated flow capacity of 12.84 cfs, using a Manning's n of 0.013. Conveyance and backwater calculations will be provided with the final TIR.

Section 6

6. Special Reports and Studies

The Critical Areas Report and Conceptual Mitigation Plan by Talasaea Consultants, Inc, (dated September 20, 2017) are included under separate cover.

The Geotechnical Engineering Report by GeoEngineers, (dated September 19, 2017) is included under separate cover.

Section 7

7. Other Permits

Building and NPDES permits will be required for this project, together with permits for utility connections. These will be applied for and provided at a later date.

Section 8

8. ESC Analysis and Design

The Erosion and Sedimentation Control calculations will be provided with the final TIR.

Section 9

9. Bond Quantities, Facility Summaries, and Declaration of Covenant

The Bond Quantities worksheet will be provided with the final TIR. The Facilities Summaries and Declaration of Covenant will be evaluated with final design to determine if applicable.

Section 10

10. Operations and Maintenance

The Operations and Maintenance manual will be provided with the final TIR.

Appendix A

Appendix A
Developed Basin Map

11/2/2017

SCALE: 1" = 100'

Cover Type (Acres)	Basin 1	Basin 2	Basin 2 Bypass	Basin 3	Basin 4	Basin 5	Basin 5 Bypass	Total
C, Lawn	2.41	7.50	0.02	1.51	1.26	1.54	0.06	14.30
Road & Parking Lot	1.82	21.54	0.37	0.00	4.12	2.66	0.51	31.02
Roof	7.02	13.13	0.00	3.31	0.00	6.49	0.00	29.95
Sidewalk	0.20	1.63	0.00	0.00	0.39	0.33	0.00	2.55
Pond Access	0.03	0.14	0.00	0.14	0.05	0.04	0.00	0.40
Total	11.48	43.94	0.39	4.96	5.82	11.06	0.57	78.22

Detention Volume (Ac-Ft)	Pond 1	Pond 2	Pond 3	Pond 4	Pond 5
Required	5.37	19.03	1.71	2.44	4.88*
Provided	5.78	19.33	2.05	3.37	1.45
Safety Factor	8%	2%	20%	38%	N/A

* 3.43 AC-FT stored in Weyerhaeuser Pond

Water Quality Flow Rate (CFS)	Pond 1	Pond 2	Pond 3	Pond 4	Pond 5
Required	0.31	0.71*	N/A	0.10*	0.80*

* 2 year mitigated flow rate for Enhanced Water Quality Treatment

POND 1
BASIN 1
BASIN 2
BASIN 2 BYPASS
BASIN 5 BYPASS
WEYERHAEUSER WAY S.
EXISTING WTC BUILDING FF=437.00
BUILDING "A" 638,000 SF FF=VARIES 442.37-448.87
BUILDING "B" 282,500 SF FF=VARIES 420.00-424.75
BUILDING "C" 147,500 SF FF=VARIES 422.00-424.5
BASIN 3
BASIN 4
BASIN 5
POND 2
POND 3
POND 4
POND 5
INTERSTATE 5
S 336TH ST

REVISIONS

NO.	DESCRIPTION/DATE	BY

CONSULTING ENGINEERS LLC
33400 8th Ave S, Suite 205
Federal Way, WA 98003
FEDERAL WAY (253) 838-6113
OLYMPIA (360) 357-3500
www.esmcivil.com
ESM
Civil Engineering
Public Works
Land Surveying
Project Management
Land Planning
Landscape Architecture

FEDERAL WAY CAMPUS, LLC

GREENLINE BUSINESS PARK

DEVELOPED BASIN MAP

CITY OF FEDERAL WAY

WASHINGTON

JOB NO.	1886-001-016
DWG. NAME	EN-03
DESIGNED BY:	LGB
DRAWN BY:	TMA
CHECKED BY:	
DATE:	11/02/2017

EN-03

1 OF 1 SHEETS

File: \\Esm8\proje\ESM-JOBS\1886\001\016-001\6\sht\EN-03.dwg
Revised: 11/2/2017 9:39 AM
Plotted By: Tony Alderson

Appendix B

Appendix B
Hydrology Model Output

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	Pond 1
Site Name:	
Site Address:	
City:	
Report Date:	10/24/2017
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/04/14
Version:	4.2.13

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	11.48
Pervious Total	11.48
Impervious Land Use	acre
Impervious Total	0
Basin Total	11.48

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	2.41
Pervious Total	2.41

Impervious Land Use	acre
ROADS FLAT	1.82
ROOF TOPS FLAT	7.02
SIDEWALKS FLAT	0.2
POND	0.03
Impervious Total	9.07
Basin Total	11.48

Element Flows To:

Surface	Interflow	Groundwater
Pond 1	Pond 1	

Mitigated Routing

Pond 1

Bottom Length: 250.00 ft.
Bottom Width: 200.00 ft.
Depth: 5 ft.
Volume at riser head: 5.3675 acre-feet. ← Pond 1 Detention Volume
Side slope 1: 4 To 1
Side slope 2: 4 To 1
Side slope 3: 4 To 1
Side slope 4: 4 To 1
Discharge Structure
Riser Height: 4 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 1.9 in. Elevation:0 ft.
Orifice 2 Diameter: 2.2 in. Elevation:2.25 ft.
Orifice 3 Diameter: 2.6 in. Elevation:3 ft.
Element Flows To:
Outlet 1 Outlet 2

Pond Hydraulic Table

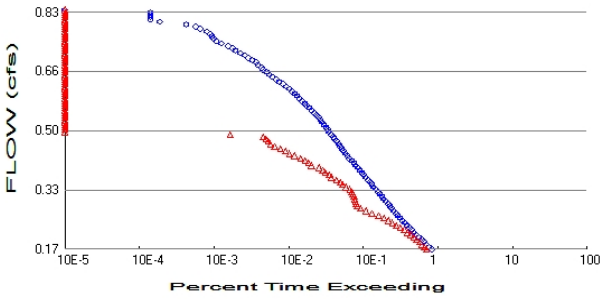
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	1.147	0.000	0.000	0.000
0.0556	1.152	0.063	0.023	0.000
0.1111	1.157	0.128	0.032	0.000
0.1667	1.161	0.192	0.040	0.000
0.2222	1.166	0.257	0.046	0.000
0.2778	1.170	0.322	0.051	0.000
0.3333	1.175	0.387	0.056	0.000
0.3889	1.180	0.452	0.061	0.000
0.4444	1.184	0.518	0.065	0.000
0.5000	1.189	0.584	0.069	0.000
0.5556	1.194	0.650	0.073	0.000
0.6111	1.198	0.717	0.076	0.000
0.6667	1.203	0.783	0.080	0.000
0.7222	1.208	0.850	0.083	0.000
0.7778	1.213	0.918	0.086	0.000
0.8333	1.217	0.985	0.089	0.000
0.8889	1.222	1.053	0.092	0.000
0.9444	1.227	1.121	0.095	0.000
1.0000	1.232	1.189	0.098	0.000
1.0556	1.236	1.258	0.100	0.000
1.1111	1.241	1.327	0.103	0.000
1.1667	1.246	1.396	0.105	0.000
1.2222	1.251	1.465	0.108	0.000
1.2778	1.255	1.535	0.110	0.000
1.3333	1.260	1.605	0.113	0.000
1.3889	1.265	1.675	0.115	0.000
1.4444	1.270	1.745	0.117	0.000
1.5000	1.275	1.816	0.120	0.000
1.5556	1.280	1.887	0.122	0.000
1.6111	1.284	1.958	0.124	0.000
1.6667	1.289	2.030	0.126	0.000
1.7222	1.294	2.101	0.128	0.000
1.7778	1.299	2.174	0.130	0.000

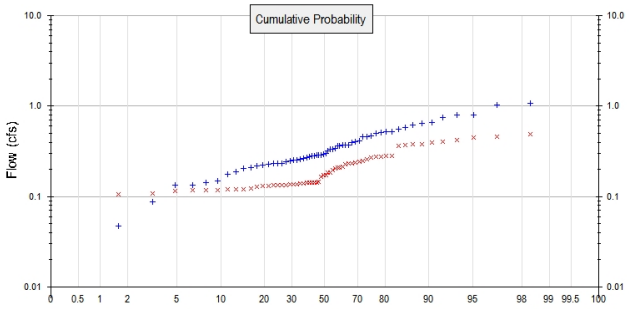
1.8333	1.304	2.246	0.132	0.000
1.8889	1.309	2.318	0.134	0.000
1.9444	1.314	2.391	0.136	0.000
2.0000	1.319	2.464	0.138	0.000
2.0556	1.323	2.538	0.140	0.000
2.1111	1.328	2.612	0.142	0.000
2.1667	1.333	2.686	0.144	0.000
2.2222	1.338	2.760	0.146	0.000
2.2778	1.343	2.834	0.169	0.000
2.3333	1.348	2.909	0.187	0.000
2.3889	1.353	2.984	0.200	0.000
2.4444	1.358	3.059	0.211	0.000
2.5000	1.363	3.135	0.220	0.000
2.5556	1.368	3.211	0.229	0.000
2.6111	1.373	3.287	0.237	0.000
2.6667	1.378	3.364	0.244	0.000
2.7222	1.383	3.440	0.251	0.000
2.7778	1.388	3.517	0.258	0.000
2.8333	1.393	3.595	0.265	0.000
2.8889	1.398	3.672	0.271	0.000
2.9444	1.403	3.750	0.277	0.000
3.0000	1.409	3.828	0.283	0.000
3.0556	1.414	3.907	0.332	0.000
3.1111	1.419	3.985	0.355	0.000
3.1667	1.424	4.064	0.375	0.000
3.2222	1.429	4.144	0.391	0.000
3.2778	1.434	4.223	0.407	0.000
3.3333	1.439	4.303	0.421	0.000
3.3889	1.444	4.383	0.434	0.000
3.4444	1.449	4.464	0.447	0.000
3.5000	1.455	4.544	0.459	0.000
3.5556	1.460	4.625	0.471	0.000
3.6111	1.465	4.706	0.482	0.000
3.6667	1.470	4.788	0.493	0.000
3.7222	1.475	4.870	0.504	0.000
3.7778	1.481	4.952	0.514	0.000
3.8333	1.486	5.034	0.524	0.000
3.8889	1.491	5.117	0.534	0.000
3.9444	1.496	5.200	0.543	0.000
4.0000	1.501	5.283	0.553	0.000
4.0556	1.507	5.367	0.770	0.000
4.1111	1.512	5.451	1.159	0.000
4.1667	1.517	5.535	1.654	0.000
4.2222	1.523	5.620	2.225	0.000
4.2778	1.528	5.704	2.845	0.000
4.3333	1.533	5.789	3.487	0.000
4.3889	1.538	5.875	4.123	0.000
4.4444	1.544	5.960	4.725	0.000
4.5000	1.549	6.046	5.268	0.000
4.5556	1.554	6.132	5.734	0.000
4.6111	1.560	6.219	6.113	0.000
4.6667	1.565	6.306	6.407	0.000
4.7222	1.570	6.393	6.634	0.000
4.7778	1.576	6.480	6.917	0.000
4.8333	1.581	6.568	7.144	0.000
4.8889	1.587	6.656	7.363	0.000
4.9444	1.592	6.744	7.576	0.000
5.0000	1.597	6.833	7.783	0.000

5.0556	1.603	6.922	7.984	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 11.48
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 2.41
Total Impervious Area: 9.07

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.337522
5 year	0.530091
10 year	0.639223
25 year	0.754839
50 year	0.826383
100 year	0.887234

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.183778
5 year	0.272424
10 year	0.340504
25 year	0.437789
50 year	0.51883
100 year	0.607548

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.332	0.129
1950	0.413	0.214
1951	0.743	0.448
1952	0.234	0.118
1953	0.189	0.210
1954	0.291	0.136
1955	0.464	0.133
1956	0.369	0.275
1957	0.298	0.135
1958	0.336	0.145

1959	0.288	0.134
1960	0.503	0.279
1961	0.284	0.230
1962	0.176	0.119
1963	0.242	0.166
1964	0.319	0.231
1965	0.228	0.244
1966	0.219	0.143
1967	0.459	0.209
1968	0.286	0.139
1969	0.280	0.140
1970	0.231	0.184
1971	0.247	0.143
1972	0.553	0.377
1973	0.251	0.247
1974	0.273	0.143
1975	0.370	0.131
1976	0.267	0.138
1977	0.032	0.117
1978	0.235	0.194
1979	0.142	0.107
1980	0.525	0.400
1981	0.210	0.142
1982	0.403	0.259
1983	0.361	0.142
1984	0.223	0.121
1985	0.132	0.121
1986	0.585	0.171
1987	0.517	0.268
1988	0.204	0.133
1989	0.133	0.121
1990	1.082	0.283
1991	0.651	0.369
1992	0.251	0.185
1993	0.262	0.116
1994	0.088	0.105
1995	0.375	0.232
1996	0.791	0.425
1997	0.661	0.457
1998	0.150	0.124
1999	0.620	0.379
2000	0.261	0.171
2001	0.047	0.096
2002	0.286	0.205
2003	0.365	0.135
2004	0.472	0.402
2005	0.339	0.132
2006	0.400	0.275
2007	0.803	0.493
2008	1.036	0.360
2009	0.509	0.235

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.0819	0.4933
2	1.0360	0.4570
3	0.8031	0.4482

4	0.7909	0.4253
5	0.7432	0.4018
6	0.6611	0.3999
7	0.6515	0.3792
8	0.6200	0.3772
9	0.5850	0.3687
10	0.5535	0.3599
11	0.5245	0.2833
12	0.5175	0.2795
13	0.5087	0.2754
14	0.5026	0.2753
15	0.4724	0.2677
16	0.4638	0.2592
17	0.4589	0.2472
18	0.4134	0.2443
19	0.4032	0.2352
20	0.3996	0.2322
21	0.3753	0.2308
22	0.3697	0.2295
23	0.3691	0.2138
24	0.3648	0.2103
25	0.3615	0.2094
26	0.3389	0.2045
27	0.3356	0.1942
28	0.3315	0.1847
29	0.3188	0.1844
30	0.2979	0.1712
31	0.2909	0.1709
32	0.2878	0.1663
33	0.2863	0.1449
34	0.2860	0.1435
35	0.2835	0.1434
36	0.2801	0.1427
37	0.2729	0.1420
38	0.2673	0.1418
39	0.2617	0.1403
40	0.2610	0.1394
41	0.2514	0.1379
42	0.2512	0.1358
43	0.2470	0.1352
44	0.2422	0.1349
45	0.2345	0.1338
46	0.2342	0.1330
47	0.2310	0.1328
48	0.2283	0.1321
49	0.2231	0.1314
50	0.2195	0.1293
51	0.2096	0.1238
52	0.2042	0.1214
53	0.1894	0.1209
54	0.1764	0.1207
55	0.1495	0.1185
56	0.1417	0.1175
57	0.1332	0.1173
58	0.1324	0.1155
59	0.0879	0.1075
60	0.0468	0.1055
61	0.0318	0.0961

Duration Flows

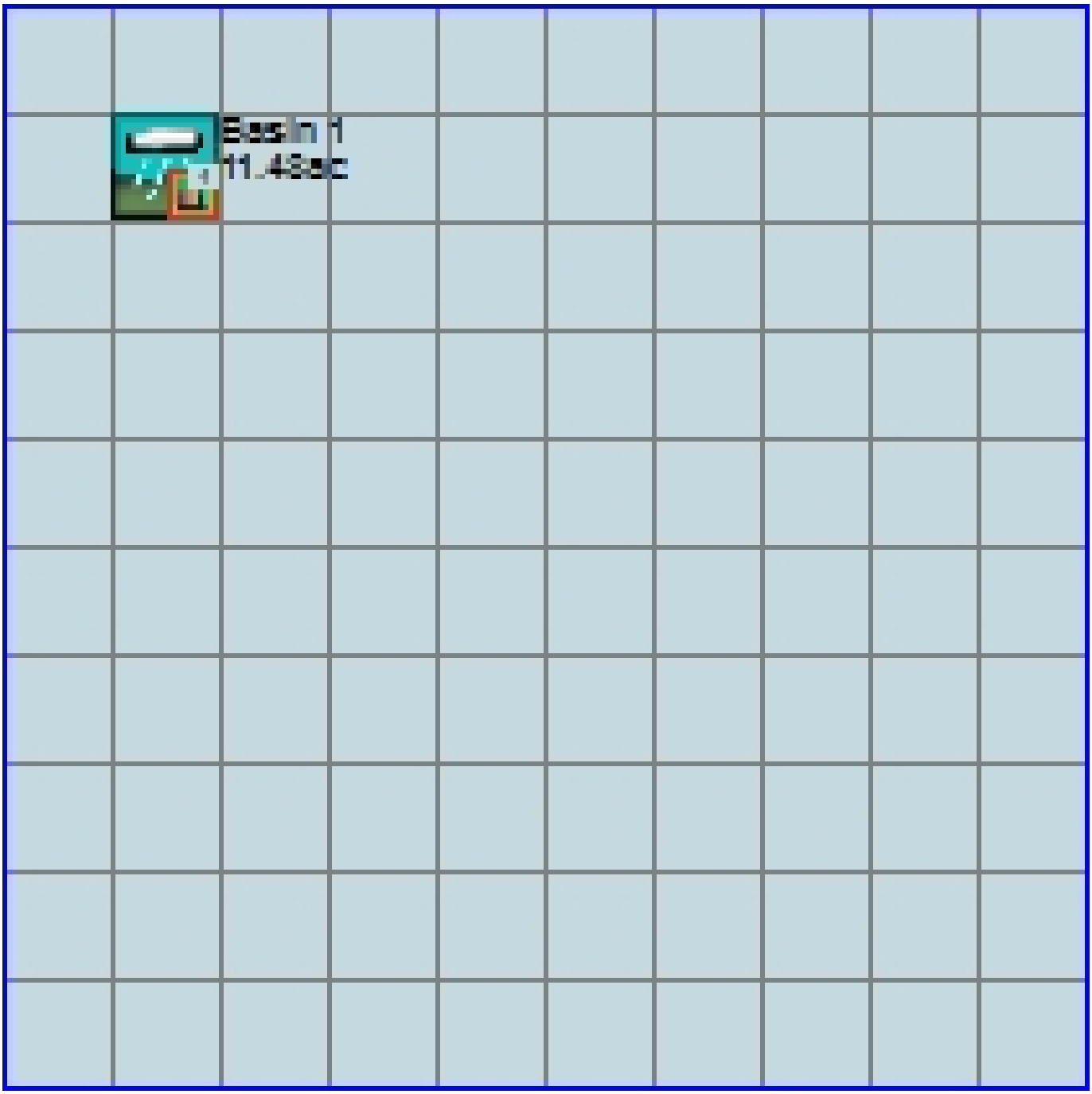
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1688	17736	14940	84	Pass
0.1754	16232	13975	86	Pass
0.1820	14970	12912	86	Pass
0.1887	13941	12112	86	Pass
0.1953	12857	10964	85	Pass
0.2020	11952	10160	85	Pass
0.2086	10970	9266	84	Pass
0.2153	10143	8365	82	Pass
0.2219	9467	7597	80	Pass
0.2285	8787	6678	75	Pass
0.2352	8164	5873	71	Pass
0.2418	7659	5221	68	Pass
0.2485	7099	4629	65	Pass
0.2551	6594	4021	60	Pass
0.2618	6188	3433	55	Pass
0.2684	5792	2802	48	Pass
0.2750	5431	2321	42	Pass
0.2817	5142	1945	37	Pass
0.2883	4819	1761	36	Pass
0.2950	4564	1723	37	Pass
0.3016	4271	1680	39	Pass
0.3083	4023	1635	40	Pass
0.3149	3816	1600	41	Pass
0.3215	3559	1542	43	Pass
0.3282	3341	1492	44	Pass
0.3348	3157	1408	44	Pass
0.3415	2960	1242	41	Pass
0.3481	2787	1125	40	Pass
0.3548	2618	1042	39	Pass
0.3614	2453	930	37	Pass
0.3680	2304	796	34	Pass
0.3747	2171	738	33	Pass
0.3813	2032	661	32	Pass
0.3880	1917	611	31	Pass
0.3946	1798	545	30	Pass
0.4013	1694	434	25	Pass
0.4079	1605	395	24	Pass
0.4145	1489	354	23	Pass
0.4212	1382	308	22	Pass
0.4278	1301	257	19	Pass
0.4345	1225	218	17	Pass
0.4411	1155	192	16	Pass
0.4478	1102	166	15	Pass
0.4544	1050	138	13	Pass
0.4610	997	121	12	Pass
0.4677	933	114	12	Pass
0.4743	884	106	11	Pass
0.4810	843	97	11	Pass
0.4876	790	35	4	Pass
0.4943	743	0	0	Pass
0.5009	719	0	0	Pass
0.5075	673	0	0	Pass
0.5142	633	0	0	Pass

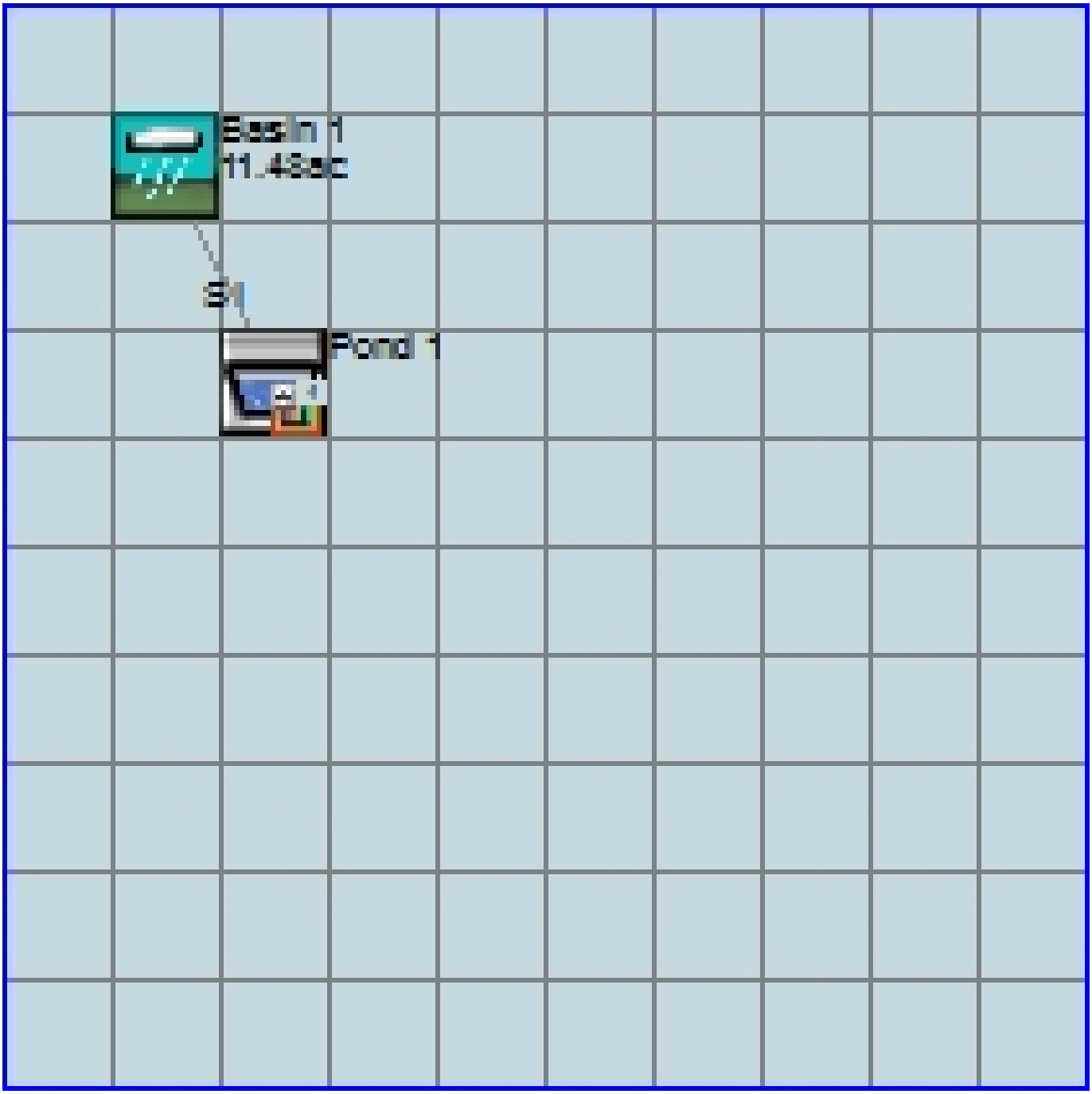
0.5208	600	0	0	Pass
0.5275	569	0	0	Pass
0.5341	539	0	0	Pass
0.5407	501	0	0	Pass
0.5474	475	0	0	Pass
0.5540	434	0	0	Pass
0.5607	403	0	0	Pass
0.5673	370	0	0	Pass
0.5740	351	0	0	Pass
0.5806	325	0	0	Pass
0.5872	296	0	0	Pass
0.5939	277	0	0	Pass
0.6005	257	0	0	Pass
0.6072	235	0	0	Pass
0.6138	218	0	0	Pass
0.6205	198	0	0	Pass
0.6271	180	0	0	Pass
0.6337	158	0	0	Pass
0.6404	145	0	0	Pass
0.6470	129	0	0	Pass
0.6537	119	0	0	Pass
0.6603	109	0	0	Pass
0.6670	97	0	0	Pass
0.6736	92	0	0	Pass
0.6802	82	0	0	Pass
0.6869	78	0	0	Pass
0.6935	69	0	0	Pass
0.7002	61	0	0	Pass
0.7068	55	0	0	Pass
0.7135	48	0	0	Pass
0.7201	41	0	0	Pass
0.7267	38	0	0	Pass
0.7334	33	0	0	Pass
0.7400	27	0	0	Pass
0.7467	23	0	0	Pass
0.7533	21	0	0	Pass
0.7600	20	0	0	Pass
0.7666	19	0	0	Pass
0.7732	17	0	0	Pass
0.7799	14	0	0	Pass
0.7865	12	0	0	Pass
0.7932	9	0	0	Pass
0.7998	4	0	0	Pass
0.8065	3	0	0	Pass
0.8131	3	0	0	Pass
0.8197	3	0	0	Pass
0.8264	3	0	0	Pass

Appendix

Predeveloped Schematic



Mitigated Schematic



Mitigated Land Use

Basin 1 Without Roof

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	1.91
Pervious Total	1.91

Impervious Land Use	acre
ROADS FLAT	1.82
SIDEWALKS FLAT	0.2
Impervious Total	2.02
Basin Total	3.93

Element Flows To:

Surface	Interflow	Groundwater
Water Quality Node	Water Quality Node	

Water Quality

Water Quality BMP Flow and Volume for POC #2

On-line facility volume:	0.3052 acre-feet
On-line facility target flow:	0.3247 cfs.
Adjusted for 15 min:	0.3247 cfs.
Off-line facility target flow:	0.1807 cfs.
Adjusted for 15 min:	0.1807 cfs.

Pond 1 Flow for Basic Water Quality Treatment

General Model Information

Project Name:	Pond 2
Site Name:	
Site Address:	
City:	
Report Date:	10/24/2017
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/04/14
Version:	4.2.13

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	44.33
Pervious Total	44.33
Impervious Land Use	acre
Impervious Total	0
Basin Total	44.33

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	7.5
Pervious Total	7.5

Impervious Land Use	acre
ROADS FLAT	21.54
ROOF TOPS FLAT	13.13
SIDEWALKS FLAT	1.63
POND	0.14
Impervious Total	36.44
Basin Total	43.94

Element Flows To:

Surface	Interflow	Groundwater
Pond 2	Pond 2	

Basin 2 Bypass

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.02
Pervious Total	0.02

Impervious Land Use	acre
ROADS FLAT	0.37
Impervious Total	0.37
Basin Total	0.39

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Routing

Pond 2

Bottom Length: 310.00 ft.
Bottom Width: 350.00 ft.
Depth: 8 ft.
Volume at riser head: 19.0278 acre-feet. ← Pond 2 Detention Volume
Side slope 1: 2 To 1
Side slope 2: 2 To 1
Side slope 3: 2 To 1
Side slope 4: 2 To 1
Discharge Structure
Riser Height: 7 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 3.25 in. Elevation:0 ft.
Orifice 2 Diameter: 3.75 in. Elevation:4.5 ft.
Orifice 3 Diameter: 4.25 in. Elevation:6.625 ft.
Element Flows To:
Outlet 1 Outlet 2

Pond Hydraulic Table

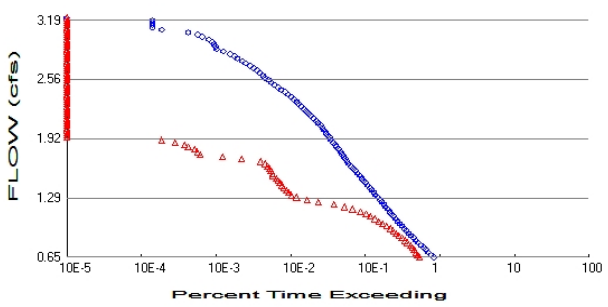
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	2.490	0.000	0.000	0.000
0.0889	2.496	0.221	0.085	0.000
0.1778	2.501	0.443	0.120	0.000
0.2667	2.507	0.666	0.148	0.000
0.3556	2.512	0.889	0.170	0.000
0.4444	2.517	1.113	0.191	0.000
0.5333	2.523	1.337	0.209	0.000
0.6222	2.528	1.561	0.226	0.000
0.7111	2.534	1.786	0.241	0.000
0.8000	2.539	2.012	0.256	0.000
0.8889	2.545	2.238	0.270	0.000
0.9778	2.550	2.464	0.283	0.000
1.0667	2.555	2.691	0.296	0.000
1.1556	2.561	2.918	0.308	0.000
1.2444	2.566	3.146	0.319	0.000
1.3333	2.572	3.375	0.331	0.000
1.4222	2.577	3.604	0.341	0.000
1.5111	2.583	3.833	0.352	0.000
1.6000	2.588	4.063	0.362	0.000
1.6889	2.594	4.293	0.372	0.000
1.7778	2.599	4.524	0.382	0.000
1.8667	2.605	4.755	0.391	0.000
1.9556	2.610	4.987	0.400	0.000
2.0444	2.616	5.220	0.409	0.000
2.1333	2.621	5.452	0.418	0.000
2.2222	2.627	5.686	0.427	0.000
2.3111	2.632	5.919	0.435	0.000
2.4000	2.638	6.154	0.444	0.000
2.4889	2.643	6.389	0.452	0.000
2.5778	2.649	6.624	0.460	0.000
2.6667	2.655	6.860	0.468	0.000
2.7556	2.660	7.096	0.475	0.000
2.8444	2.666	7.333	0.483	0.000

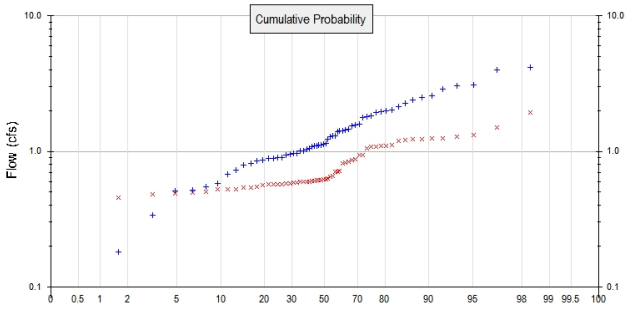
2.9333	2.671	7.570	0.490	0.000
3.0222	2.677	7.808	0.498	0.000
3.1111	2.682	8.046	0.505	0.000
3.2000	2.688	8.284	0.512	0.000
3.2889	2.694	8.524	0.519	0.000
3.3778	2.699	8.763	0.526	0.000
3.4667	2.705	9.004	0.533	0.000
3.5556	2.710	9.244	0.540	0.000
3.6444	2.716	9.486	0.547	0.000
3.7333	2.722	9.727	0.553	0.000
3.8222	2.727	9.970	0.560	0.000
3.9111	2.733	10.21	0.566	0.000
4.0000	2.739	10.45	0.573	0.000
4.0889	2.744	10.70	0.579	0.000
4.1778	2.750	10.94	0.585	0.000
4.2667	2.756	11.18	0.592	0.000
4.3556	2.761	11.43	0.598	0.000
4.4444	2.767	11.68	0.604	0.000
4.5333	2.773	11.92	0.680	0.000
4.6222	2.778	12.17	0.749	0.000
4.7111	2.784	12.42	0.797	0.000
4.8000	2.790	12.66	0.837	0.000
4.8889	2.795	12.91	0.871	0.000
4.9778	2.801	13.16	0.903	0.000
5.0667	2.807	13.41	0.932	0.000
5.1556	2.813	13.66	0.959	0.000
5.2444	2.818	13.91	0.985	0.000
5.3333	2.824	14.16	1.010	0.000
5.4222	2.830	14.41	1.033	0.000
5.5111	2.836	14.66	1.056	0.000
5.6000	2.841	14.92	1.078	0.000
5.6889	2.847	15.17	1.099	0.000
5.7778	2.853	15.42	1.120	0.000
5.8667	2.859	15.68	1.140	0.000
5.9556	2.864	15.93	1.159	0.000
6.0444	2.870	16.19	1.178	0.000
6.1333	2.876	16.44	1.197	0.000
6.2222	2.882	16.70	1.215	0.000
6.3111	2.887	16.95	1.233	0.000
6.4000	2.893	17.21	1.251	0.000
6.4889	2.899	17.47	1.268	0.000
6.5778	2.905	17.73	1.285	0.000
6.6667	2.911	17.98	1.401	0.000
6.7556	2.917	18.24	1.495	0.000
6.8444	2.922	18.50	1.563	0.000
6.9333	2.928	18.76	1.622	0.000
7.0222	2.934	19.02	1.727	0.000
7.1111	2.940	19.28	2.310	0.000
7.2000	2.946	19.55	3.172	0.000
7.2889	2.952	19.81	4.185	0.000
7.3778	2.957	20.07	5.237	0.000
7.4667	2.963	20.33	6.216	0.000
7.5556	2.969	20.60	7.025	0.000
7.6444	2.975	20.86	7.613	0.000
7.7333	2.981	21.13	8.013	0.000
7.8222	2.987	21.39	8.459	0.000
7.9111	2.993	21.66	8.831	0.000
8.0000	2.999	21.92	9.186	0.000

8.0889	3.005	22.19	9.526	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 44.33
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 7.52
Total Impervious Area: 36.81

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	1.303339
5 year	2.046945
10 year	2.468359
25 year	2.91481
50 year	3.191076
100 year	3.426052

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.71474
5 year	0.980593
10 year	1.1771
25 year	1.449717
50 year	1.671145
100 year	1.908881

Pond 2 Mitigated Flow for Enhanced Water Quality Treatment

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	1.280	0.542
1950	1.596	0.708
1951	2.870	1.322
1952	0.904	0.504
1953	0.731	0.811
1954	1.123	0.572
1955	1.791	0.593
1956	1.425	1.097
1957	1.150	0.571
1958	1.296	0.606

1959	1.112	0.592
1960	1.941	1.094
1961	1.095	0.829
1962	0.681	0.488
1963	0.935	0.627
1964	1.231	0.861
1965	0.881	0.933
1966	0.847	0.602
1967	1.772	0.708
1968	1.105	0.595
1969	1.082	0.578
1970	0.892	0.612
1971	0.954	0.626
1972	2.137	1.222
1973	0.971	0.939
1974	1.054	0.615
1975	1.428	0.599
1976	1.032	0.565
1977	0.123	0.544
1978	0.906	0.652
1979	0.547	0.442
1980	2.026	1.244
1981	0.810	0.582
1982	1.557	1.088
1983	1.396	0.587
1984	0.862	0.525
1985	0.511	0.527
1986	2.259	0.656
1987	1.998	1.046
1988	0.789	0.585
1989	0.514	0.525
1990	4.178	1.106
1991	2.516	1.207
1992	0.970	0.623
1993	1.011	0.479
1994	0.340	0.457
1995	1.449	0.843
1996	3.054	1.278
1997	2.553	1.509
1998	0.577	0.539
1999	2.394	1.226
2000	1.008	0.611
2001	0.181	0.493
2002	1.104	0.722
2003	1.409	0.571
2004	1.824	1.248
2005	1.309	0.571
2006	1.543	1.090
2007	3.101	1.933
2008	4.000	1.198
2009	1.964	0.874

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	4.1779	1.9330
2	4.0004	1.5089
3	3.1012	1.3216

4	3.0539	1.2781
5	2.8701	1.2481
6	2.5529	1.2444
7	2.5156	1.2260
8	2.3940	1.2215
9	2.2590	1.2066
10	2.1373	1.1983
11	2.0255	1.1064
12	1.9982	1.0968
13	1.9642	1.0935
14	1.9406	1.0896
15	1.8241	1.0877
16	1.7912	1.0464
17	1.7722	0.9391
18	1.5964	0.9333
19	1.5569	0.8743
20	1.5432	0.8607
21	1.4490	0.8425
22	1.4278	0.8288
23	1.4253	0.8108
24	1.4088	0.7215
25	1.3959	0.7084
26	1.3086	0.7079
27	1.2958	0.6565
28	1.2803	0.6521
29	1.2311	0.6271
30	1.1502	0.6262
31	1.1233	0.6226
32	1.1115	0.6151
33	1.1055	0.6120
34	1.1043	0.6106
35	1.0948	0.6060
36	1.0815	0.6025
37	1.0538	0.5995
38	1.0322	0.5947
39	1.0105	0.5926
40	1.0077	0.5921
41	0.9709	0.5875
42	0.9702	0.5854
43	0.9538	0.5820
44	0.9352	0.5784
45	0.9057	0.5716
46	0.9044	0.5711
47	0.8918	0.5709
48	0.8815	0.5706
49	0.8617	0.5650
50	0.8475	0.5438
51	0.8095	0.5424
52	0.7885	0.5395
53	0.7315	0.5271
54	0.6812	0.5254
55	0.5775	0.5253
56	0.5472	0.5038
57	0.5145	0.4933
58	0.5113	0.4875
59	0.3396	0.4793
60	0.1807	0.4566
61	0.1229	0.4424

Duration Flows

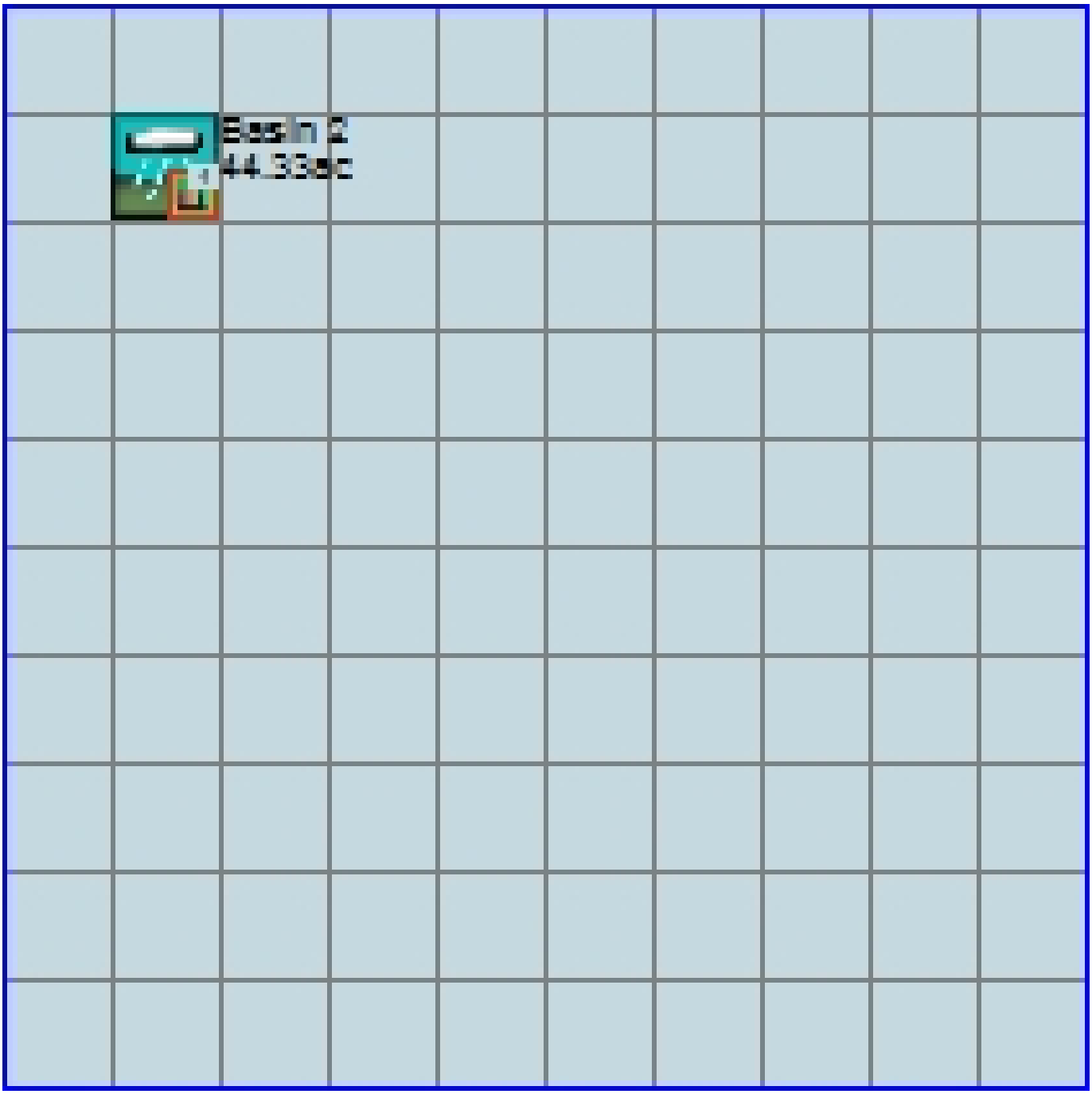
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.6517	17603	11400	64	Pass
0.6773	16174	10684	66	Pass
0.7030	15002	10162	67	Pass
0.7286	13873	9657	69	Pass
0.7543	12818	9165	71	Pass
0.7799	11845	8590	72	Pass
0.8056	10910	7884	72	Pass
0.8312	10121	7261	71	Pass
0.8569	9407	6611	70	Pass
0.8825	8746	6042	69	Pass
0.9082	8147	5495	67	Pass
0.9338	7612	5084	66	Pass
0.9595	7071	4601	65	Pass
0.9851	6590	4117	62	Pass
1.0108	6158	3643	59	Pass
1.0364	5781	3221	55	Pass
1.0621	5431	2870	52	Pass
1.0877	5108	2481	48	Pass
1.1134	4808	2180	45	Pass
1.1390	4522	1839	40	Pass
1.1647	4259	1447	33	Pass
1.1903	4017	1120	27	Pass
1.2160	3794	816	21	Pass
1.2416	3551	504	14	Pass
1.2673	3339	356	10	Pass
1.2929	3140	257	8	Pass
1.3186	2954	219	7	Pass
1.3442	2787	200	7	Pass
1.3699	2603	186	7	Pass
1.3955	2449	172	7	Pass
1.4212	2304	163	7	Pass
1.4468	2162	154	7	Pass
1.4725	2027	145	7	Pass
1.4981	1898	137	7	Pass
1.5238	1790	125	6	Pass
1.5494	1689	121	7	Pass
1.5751	1585	116	7	Pass
1.6007	1483	111	7	Pass
1.6264	1381	105	7	Pass
1.6520	1292	97	7	Pass
1.6777	1222	84	6	Pass
1.7033	1155	47	4	Pass
1.7290	1098	26	2	Pass
1.7546	1049	13	1	Pass
1.7803	997	12	1	Pass
1.8059	930	11	1	Pass
1.8316	884	9	1	Pass
1.8572	837	8	0	Pass
1.8829	790	6	0	Pass
1.9085	743	4	0	Pass
1.9342	713	0	0	Pass
1.9598	670	0	0	Pass
1.9855	632	0	0	Pass

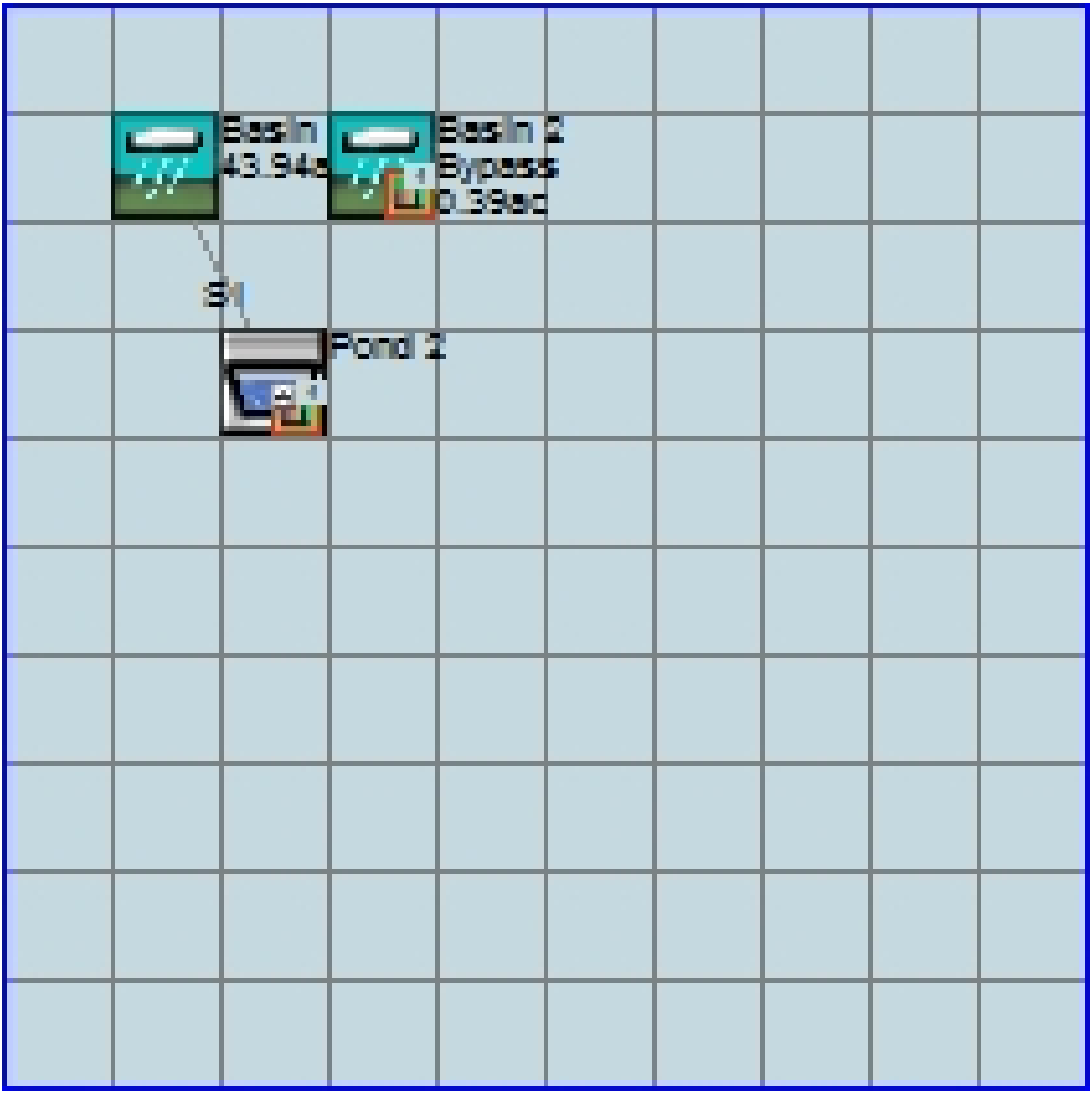
2.0111	595	0	0	Pass
2.0368	567	0	0	Pass
2.0625	539	0	0	Pass
2.0881	496	0	0	Pass
2.1138	473	0	0	Pass
2.1394	434	0	0	Pass
2.1651	399	0	0	Pass
2.1907	369	0	0	Pass
2.2164	348	0	0	Pass
2.2420	323	0	0	Pass
2.2677	296	0	0	Pass
2.2933	272	0	0	Pass
2.3190	256	0	0	Pass
2.3446	235	0	0	Pass
2.3703	217	0	0	Pass
2.3959	198	0	0	Pass
2.4216	180	0	0	Pass
2.4472	158	0	0	Pass
2.4729	145	0	0	Pass
2.4985	129	0	0	Pass
2.5242	119	0	0	Pass
2.5498	109	0	0	Pass
2.5755	97	0	0	Pass
2.6011	91	0	0	Pass
2.6268	82	0	0	Pass
2.6524	76	0	0	Pass
2.6781	68	0	0	Pass
2.7037	61	0	0	Pass
2.7294	54	0	0	Pass
2.7550	48	0	0	Pass
2.7807	41	0	0	Pass
2.8063	38	0	0	Pass
2.8320	33	0	0	Pass
2.8576	27	0	0	Pass
2.8833	22	0	0	Pass
2.9089	21	0	0	Pass
2.9346	20	0	0	Pass
2.9602	19	0	0	Pass
2.9859	17	0	0	Pass
3.0115	14	0	0	Pass
3.0372	12	0	0	Pass
3.0628	9	0	0	Pass
3.0885	4	0	0	Pass
3.1141	3	0	0	Pass
3.1398	3	0	0	Pass
3.1654	3	0	0	Pass
3.1911	3	0	0	Pass

Appendix

Predeveloped Schematic



Mitigated Schematic



General Model Information

Project Name:	Pond 3
Site Name:	
Site Address:	
City:	
Report Date:	10/24/2017
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/04/14
Version:	4.2.13

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	4.96
Pervious Total	4.96
Impervious Land Use	acre
Impervious Total	0
Basin Total	4.96

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 3

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	1.51
Pervious Total	1.51

Impervious Land Use	acre
ROOF TOPS FLAT	3.31
POND	0.14
Impervious Total	3.45
Basin Total	4.96

Element Flows To:

Surface	Interflow	Groundwater
Pond 3	Pond 3	

Mitigated Routing

Pond 3

Bottom Length: 185.00 ft.
Bottom Width: 185.00 ft.
Depth: 3 ft.
Volume at riser head: 1.7112 acre-feet. ← Pond 3 Detention Volume
Side slope 1: 4 To 1
Side slope 2: 4 To 1
Side slope 3: 4 To 1
Side slope 4: 4 To 1
Discharge Structure
Riser Height: 2 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 1.58 in. Elevation:0 ft.
Orifice 2 Diameter: 1.45 in. Elevation:1.13 ft.
Orifice 3 Diameter: 2.14 in. Elevation:1.33 ft.
Element Flows To:
Outlet 1 Outlet 2

Pond Hydraulic Table

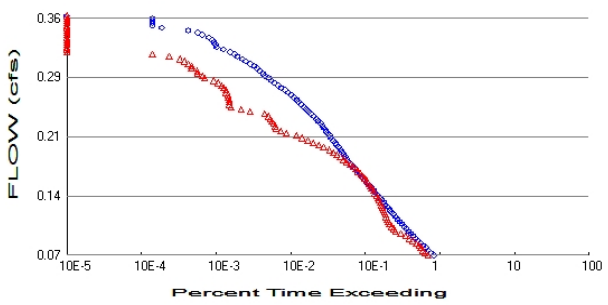
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.785	0.000	0.000	0.000
0.0333	0.788	0.026	0.012	0.000
0.0667	0.790	0.052	0.017	0.000
0.1000	0.792	0.078	0.021	0.000
0.1333	0.794	0.105	0.024	0.000
0.1667	0.797	0.131	0.027	0.000
0.2000	0.799	0.158	0.030	0.000
0.2333	0.801	0.185	0.032	0.000
0.2667	0.803	0.211	0.035	0.000
0.3000	0.806	0.238	0.037	0.000
0.3333	0.808	0.265	0.039	0.000
0.3667	0.810	0.292	0.041	0.000
0.4000	0.813	0.319	0.042	0.000
0.4333	0.815	0.346	0.044	0.000
0.4667	0.817	0.374	0.046	0.000
0.5000	0.820	0.401	0.047	0.000
0.5333	0.822	0.428	0.049	0.000
0.5667	0.824	0.456	0.051	0.000
0.6000	0.827	0.483	0.052	0.000
0.6333	0.829	0.511	0.053	0.000
0.6667	0.831	0.539	0.055	0.000
0.7000	0.834	0.566	0.056	0.000
0.7333	0.836	0.594	0.058	0.000
0.7667	0.838	0.622	0.059	0.000
0.8000	0.841	0.650	0.060	0.000
0.8333	0.843	0.678	0.061	0.000
0.8667	0.845	0.706	0.063	0.000
0.9000	0.848	0.735	0.064	0.000
0.9333	0.850	0.763	0.065	0.000
0.9667	0.852	0.791	0.066	0.000
1.0000	0.855	0.820	0.067	0.000
1.0333	0.857	0.848	0.068	0.000
1.0667	0.859	0.877	0.070	0.000

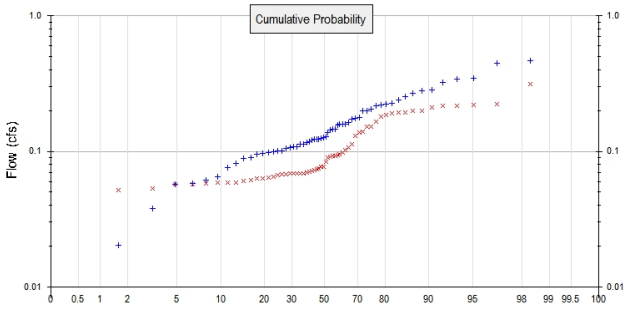
1.1000	0.862	0.906	0.071	0.000
1.1333	0.864	0.934	0.075	0.000
1.1667	0.867	0.963	0.084	0.000
1.2000	0.869	0.992	0.089	0.000
1.2333	0.871	1.021	0.093	0.000
1.2667	0.874	1.050	0.097	0.000
1.3000	0.876	1.079	0.100	0.000
1.3333	0.878	1.109	0.111	0.000
1.3667	0.881	1.138	0.130	0.000
1.4000	0.883	1.167	0.142	0.000
1.4333	0.886	1.197	0.152	0.000
1.4667	0.888	1.227	0.161	0.000
1.5000	0.890	1.256	0.168	0.000
1.5333	0.893	1.286	0.176	0.000
1.5667	0.895	1.316	0.183	0.000
1.6000	0.898	1.346	0.189	0.000
1.6333	0.900	1.376	0.195	0.000
1.6667	0.903	1.406	0.201	0.000
1.7000	0.905	1.436	0.207	0.000
1.7333	0.907	1.466	0.212	0.000
1.7667	0.910	1.496	0.217	0.000
1.8000	0.912	1.527	0.222	0.000
1.8333	0.915	1.557	0.227	0.000
1.8667	0.917	1.588	0.232	0.000
1.9000	0.920	1.618	0.237	0.000
1.9333	0.922	1.649	0.241	0.000
1.9667	0.925	1.680	0.246	0.000
2.0000	0.927	1.711	0.250	0.000
2.0333	0.929	1.742	0.351	0.000
2.0667	0.932	1.773	0.533	0.000
2.1000	0.934	1.804	0.765	0.000
2.1333	0.937	1.835	1.038	0.000
2.1667	0.939	1.866	1.345	0.000
2.2000	0.942	1.898	1.679	0.000
2.2333	0.944	1.929	2.035	0.000
2.2667	0.947	1.961	2.406	0.000
2.3000	0.949	1.992	2.788	0.000
2.3333	0.952	2.024	3.173	0.000
2.3667	0.954	2.056	3.555	0.000
2.4000	0.957	2.088	3.930	0.000
2.4333	0.959	2.120	4.290	0.000
2.4667	0.962	2.152	4.630	0.000
2.5000	0.964	2.184	4.947	0.000
2.5333	0.967	2.216	5.235	0.000
2.5667	0.969	2.248	5.493	0.000
2.6000	0.972	2.281	5.719	0.000
2.6333	0.974	2.313	5.914	0.000
2.6667	0.977	2.346	6.079	0.000
2.7000	0.979	2.378	6.220	0.000
2.7333	0.982	2.411	6.345	0.000
2.7667	0.984	2.444	6.539	0.000
2.8000	0.987	2.477	6.676	0.000
2.8333	0.990	2.510	6.810	0.000
2.8667	0.992	2.543	6.941	0.000
2.9000	0.995	2.576	7.070	0.000
2.9333	0.997	2.609	7.196	0.000
2.9667	1.000	2.642	7.320	0.000
3.0000	1.002	2.676	7.442	0.000

3.0333	1.005	2.709	7.562	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 4.96
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.51
Total Impervious Area: 3.45

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.145828
5 year	0.229029
10 year	0.27618
25 year	0.326133
50 year	0.357043
100 year	0.383335

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.092665
5 year	0.143907
10 year	0.185566
25 year	0.247985
50 year	0.302238
100 year	0.363709

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.143	0.063
1950	0.179	0.094
1951	0.321	0.224
1952	0.101	0.057
1953	0.082	0.076
1954	0.126	0.068
1955	0.200	0.067
1956	0.159	0.152
1957	0.129	0.068
1958	0.145	0.084

1959	0.124	0.063
1960	0.217	0.195
1961	0.122	0.107
1962	0.076	0.057
1963	0.105	0.072
1964	0.138	0.095
1965	0.099	0.139
1966	0.095	0.069
1967	0.198	0.090
1968	0.124	0.069
1969	0.121	0.068
1970	0.100	0.077
1971	0.107	0.075
1972	0.239	0.192
1973	0.109	0.131
1974	0.118	0.074
1975	0.160	0.065
1976	0.115	0.070
1977	0.014	0.059
1978	0.101	0.092
1979	0.061	0.053
1980	0.227	0.200
1981	0.091	0.070
1982	0.174	0.166
1983	0.156	0.073
1984	0.096	0.058
1985	0.057	0.061
1986	0.253	0.098
1987	0.224	0.181
1988	0.088	0.064
1989	0.058	0.061
1990	0.467	0.201
1991	0.281	0.185
1992	0.109	0.093
1993	0.113	0.058
1994	0.038	0.052
1995	0.162	0.102
1996	0.342	0.218
1997	0.286	0.218
1998	0.065	0.058
1999	0.268	0.192
2000	0.113	0.092
2001	0.020	0.049
2002	0.124	0.114
2003	0.158	0.067
2004	0.204	0.220
2005	0.146	0.069
2006	0.173	0.152
2007	0.347	0.315
2008	0.448	0.212
2009	0.220	0.138

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.4675	0.3149
2	0.4476	0.2237
3	0.3470	0.2201

4	0.3417	0.2182
5	0.3211	0.2181
6	0.2856	0.2116
7	0.2815	0.2005
8	0.2679	0.2003
9	0.2528	0.1947
10	0.2391	0.1922
11	0.2266	0.1919
12	0.2236	0.1847
13	0.2198	0.1814
14	0.2171	0.1663
15	0.2041	0.1525
16	0.2004	0.1523
17	0.1983	0.1391
18	0.1786	0.1375
19	0.1742	0.1310
20	0.1727	0.1136
21	0.1621	0.1066
22	0.1598	0.1021
23	0.1595	0.0982
24	0.1576	0.0953
25	0.1562	0.0938
26	0.1464	0.0930
27	0.1450	0.0923
28	0.1432	0.0916
29	0.1377	0.0902
30	0.1287	0.0835
31	0.1257	0.0770
32	0.1244	0.0764
33	0.1237	0.0748
34	0.1236	0.0740
35	0.1225	0.0725
36	0.1210	0.0719
37	0.1179	0.0704
38	0.1155	0.0696
39	0.1131	0.0690
40	0.1128	0.0690
41	0.1086	0.0687
42	0.1086	0.0685
43	0.1067	0.0685
44	0.1046	0.0675
45	0.1013	0.0674
46	0.1012	0.0667
47	0.0998	0.0649
48	0.0986	0.0642
49	0.0964	0.0634
50	0.0948	0.0633
51	0.0906	0.0615
52	0.0882	0.0606
53	0.0818	0.0586
54	0.0762	0.0584
55	0.0646	0.0584
56	0.0612	0.0580
57	0.0576	0.0572
58	0.0572	0.0572
59	0.0380	0.0534
60	0.0202	0.0521
61	0.0137	0.0488

Duration Flows

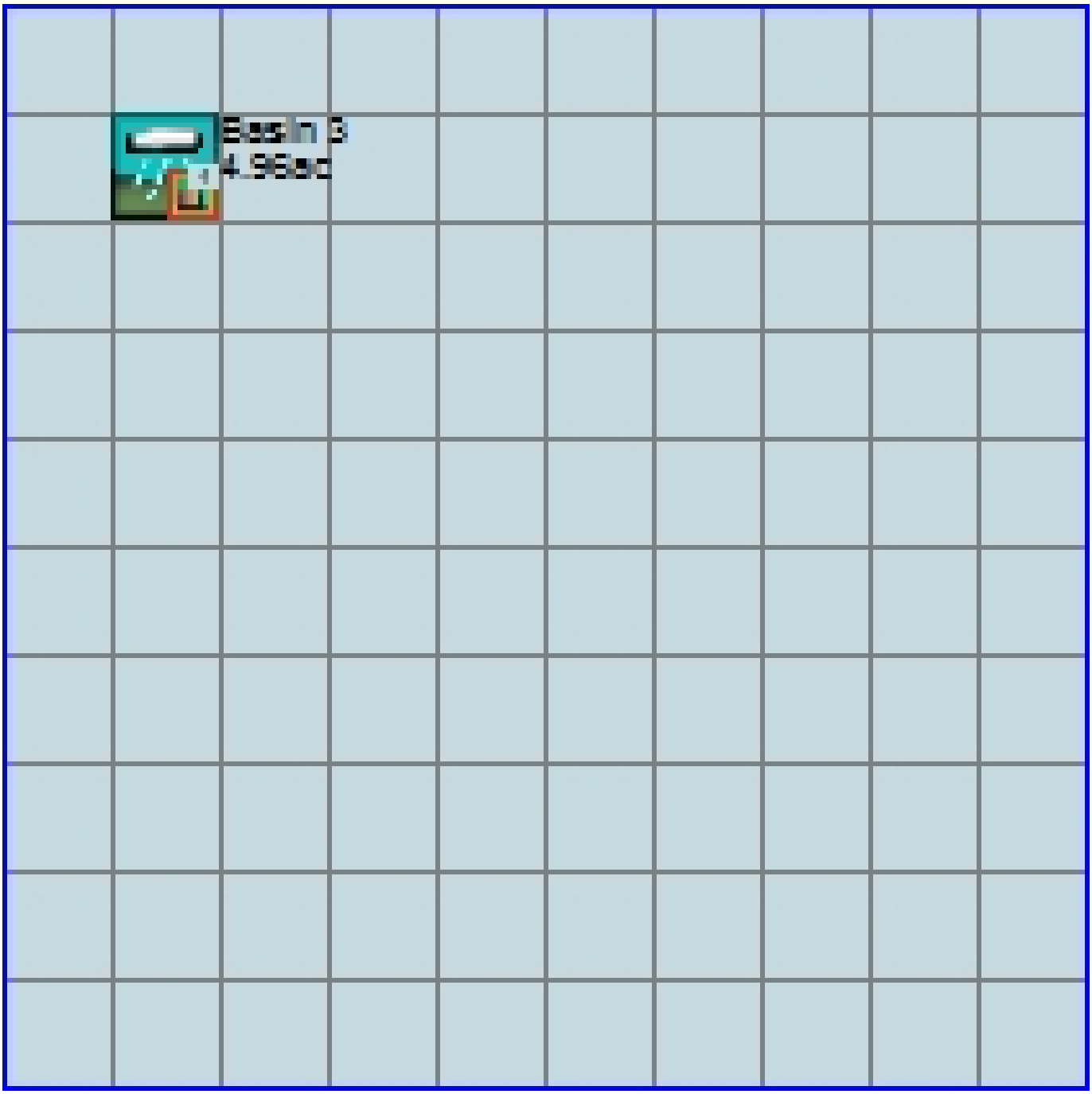
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0729	17550	14775	84	Pass
0.0758	16164	13327	82	Pass
0.0787	14964	12592	84	Pass
0.0815	13851	11914	86	Pass
0.0844	12810	11248	87	Pass
0.0873	11809	10230	86	Pass
0.0901	10898	9210	84	Pass
0.0930	10119	8241	81	Pass
0.0959	9383	7401	78	Pass
0.0987	8729	6370	72	Pass
0.1016	8147	5452	66	Pass
0.1045	7610	5118	67	Pass
0.1074	7071	4823	68	Pass
0.1102	6590	4519	68	Pass
0.1131	6160	4336	70	Pass
0.1160	5784	4220	72	Pass
0.1188	5435	4087	75	Pass
0.1217	5097	3972	77	Pass
0.1246	4815	3850	79	Pass
0.1274	4528	3715	82	Pass
0.1303	4252	3625	85	Pass
0.1332	4021	3499	87	Pass
0.1361	3784	3377	89	Pass
0.1389	3548	3255	91	Pass
0.1418	3341	3155	94	Pass
0.1447	3138	3027	96	Pass
0.1475	2954	2896	98	Pass
0.1504	2785	2770	99	Pass
0.1533	2599	2614	100	Pass
0.1561	2449	2479	101	Pass
0.1590	2304	2370	102	Pass
0.1619	2162	2239	103	Pass
0.1648	2027	2113	104	Pass
0.1676	1898	1986	104	Pass
0.1705	1790	1854	103	Pass
0.1734	1689	1701	100	Pass
0.1762	1587	1586	99	Pass
0.1791	1483	1465	98	Pass
0.1820	1382	1330	96	Pass
0.1848	1292	1195	92	Pass
0.1877	1218	1098	90	Pass
0.1906	1155	984	85	Pass
0.1935	1098	884	80	Pass
0.1963	1048	794	75	Pass
0.1992	997	706	70	Pass
0.2021	930	591	63	Pass
0.2049	883	507	57	Pass
0.2078	837	427	51	Pass
0.2107	789	362	45	Pass
0.2135	743	304	40	Pass
0.2164	713	253	35	Pass
0.2193	670	186	27	Pass
0.2222	631	157	24	Pass

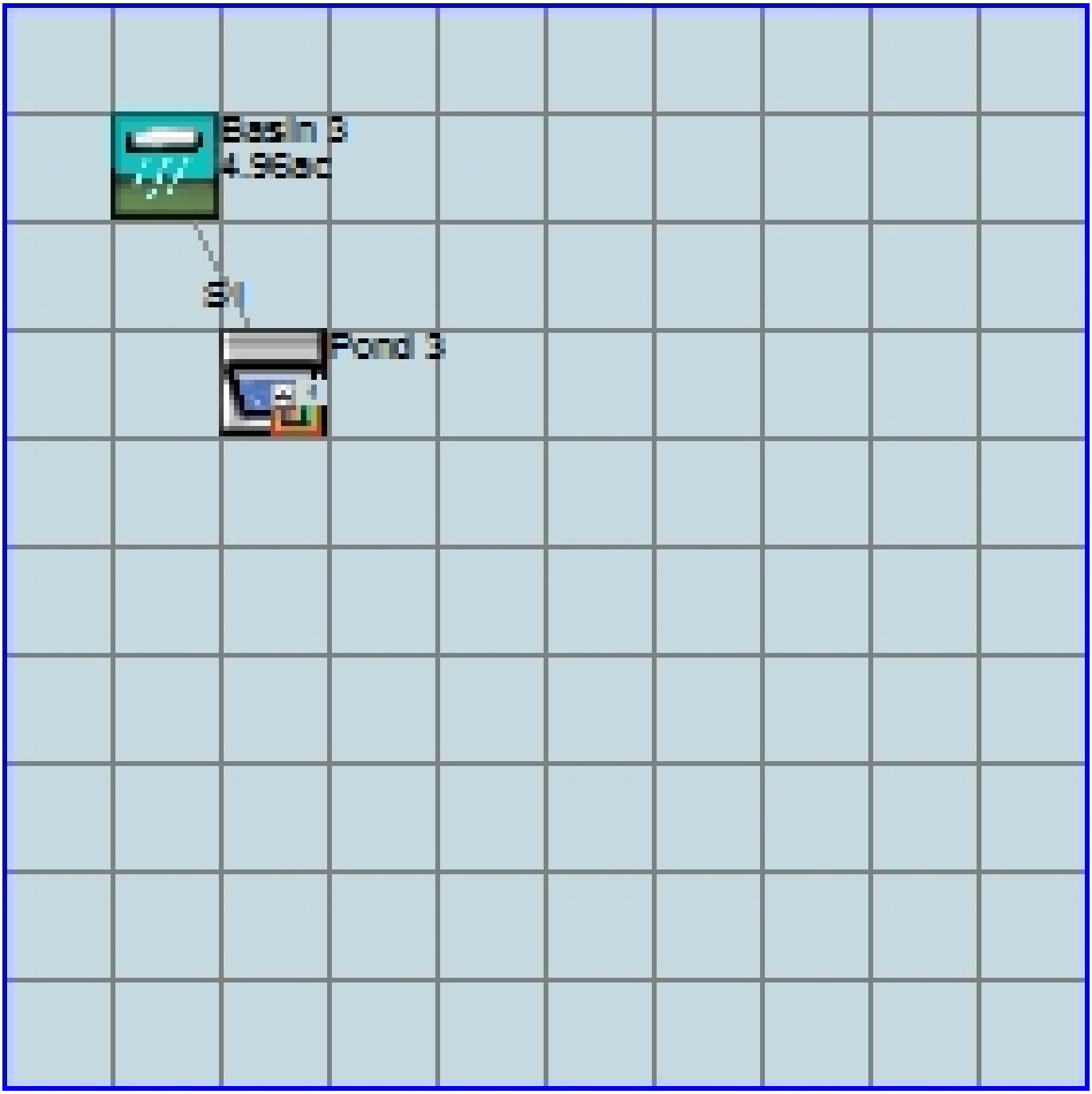
0.2250	596	137	22	Pass
0.2279	567	132	23	Pass
0.2308	539	126	23	Pass
0.2336	497	119	23	Pass
0.2365	473	114	24	Pass
0.2394	435	107	24	Pass
0.2422	399	95	23	Pass
0.2451	366	61	16	Pass
0.2480	348	46	13	Pass
0.2509	323	34	10	Pass
0.2537	296	32	10	Pass
0.2566	273	32	11	Pass
0.2595	256	32	12	Pass
0.2623	235	31	13	Pass
0.2652	217	31	14	Pass
0.2681	197	29	14	Pass
0.2709	180	29	16	Pass
0.2738	158	27	17	Pass
0.2767	145	25	17	Pass
0.2796	129	23	17	Pass
0.2824	119	20	16	Pass
0.2853	109	15	13	Pass
0.2882	97	14	14	Pass
0.2910	91	12	13	Pass
0.2939	82	12	14	Pass
0.2968	76	10	13	Pass
0.2996	69	10	14	Pass
0.3025	61	9	14	Pass
0.3054	54	8	14	Pass
0.3083	48	7	14	Pass
0.3111	41	5	12	Pass
0.3140	38	3	7	Pass
0.3169	33	0	0	Pass
0.3197	27	0	0	Pass
0.3226	22	0	0	Pass
0.3255	21	0	0	Pass
0.3283	20	0	0	Pass
0.3312	19	0	0	Pass
0.3341	17	0	0	Pass
0.3370	14	0	0	Pass
0.3398	12	0	0	Pass
0.3427	9	0	0	Pass
0.3456	4	0	0	Pass
0.3484	3	0	0	Pass
0.3513	3	0	0	Pass
0.3542	3	0	0	Pass
0.3570	3	0	0	Pass

Appendix

Predeveloped Schematic



Mitigated Schematic



General Model Information

Project Name:	Pond 4
Site Name:	
Site Address:	
City:	
Report Date:	10/24/2017
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/04/14
Version:	4.2.13

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 4

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	5.82
Pervious Total	5.82
Impervious Land Use	acre
Impervious Total	0
Basin Total	5.82

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 4

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	1.26
Pervious Total	1.26

Impervious Land Use	acre
ROADS FLAT	4.12
SIDEWALKS FLAT	0.39
POND	0.05
Impervious Total	4.56
Basin Total	5.82

Element Flows To:

Surface	Interflow	Groundwater
Pond 4	Pond 4	

Mitigated Routing

Pond 4

Bottom Length:	75.00 ft.	
Bottom Width:	75.00 ft.	
Depth:	12 ft.	
Volume at riser head:	2.4385 acre-feet.	← Pond 4 Detention Volume
Side slope 1:	2 To 1	
Side slope 2:	2 To 1	
Side slope 3:	2 To 1	
Side slope 4:	2 To 1	
Discharge Structure		
Riser Height:	11 ft.	
Riser Diameter:	18 in.	
Orifice 1 Diameter:	1.1 in.	Elevation:0 ft.
Orifice 2 Diameter:	0.75 in.	Elevation:7 ft.
Orifice 3 Diameter:	2 in.	Elevation:7.75 ft.
Element Flows To:		
Outlet 1	Outlet 2	

Pond Hydraulic Table

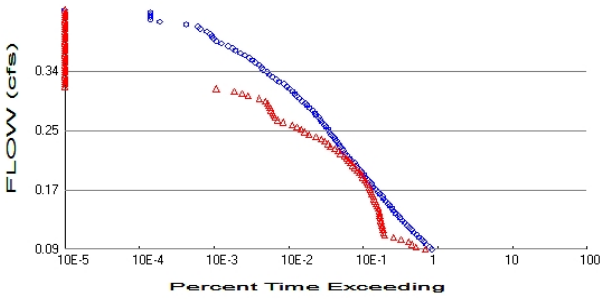
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.129	0.000	0.000	0.000
0.1333	0.131	0.017	0.012	0.000
0.2667	0.132	0.034	0.017	0.000
0.4000	0.134	0.052	0.020	0.000
0.5333	0.136	0.070	0.024	0.000
0.6667	0.138	0.089	0.026	0.000
0.8000	0.140	0.107	0.029	0.000
0.9333	0.142	0.126	0.031	0.000
1.0667	0.144	0.145	0.033	0.000
1.2000	0.146	0.165	0.036	0.000
1.3333	0.148	0.184	0.037	0.000
1.4667	0.150	0.204	0.039	0.000
1.6000	0.152	0.224	0.041	0.000
1.7333	0.154	0.245	0.043	0.000
1.8667	0.156	0.265	0.044	0.000
2.0000	0.158	0.286	0.046	0.000
2.1333	0.160	0.308	0.048	0.000
2.2667	0.162	0.329	0.049	0.000
2.4000	0.164	0.351	0.050	0.000
2.5333	0.166	0.373	0.052	0.000
2.6667	0.168	0.395	0.053	0.000
2.8000	0.170	0.418	0.054	0.000
2.9333	0.172	0.441	0.056	0.000
3.0667	0.174	0.464	0.057	0.000
3.2000	0.177	0.487	0.058	0.000
3.3333	0.179	0.511	0.059	0.000
3.4667	0.181	0.535	0.061	0.000
3.6000	0.183	0.559	0.062	0.000
3.7333	0.185	0.584	0.063	0.000
3.8667	0.187	0.609	0.064	0.000
4.0000	0.190	0.634	0.065	0.000
4.1333	0.192	0.660	0.066	0.000
4.2667	0.194	0.685	0.067	0.000

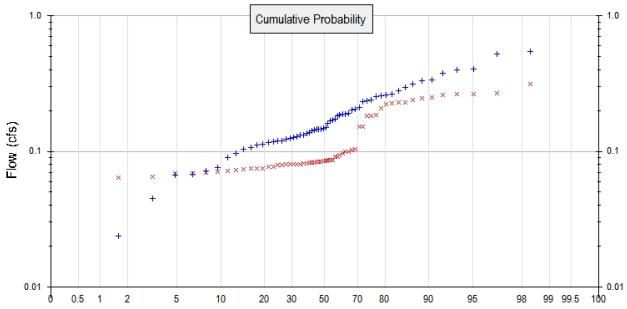
4.4000	0.196	0.711	0.068	0.000
4.5333	0.199	0.738	0.069	0.000
4.6667	0.201	0.765	0.070	0.000
4.8000	0.203	0.792	0.071	0.000
4.9333	0.206	0.819	0.072	0.000
5.0667	0.208	0.847	0.073	0.000
5.2000	0.210	0.874	0.074	0.000
5.3333	0.213	0.903	0.075	0.000
5.4667	0.215	0.931	0.076	0.000
5.6000	0.217	0.960	0.077	0.000
5.7333	0.220	0.989	0.078	0.000
5.8667	0.222	1.019	0.079	0.000
6.0000	0.225	1.049	0.080	0.000
6.1333	0.227	1.079	0.081	0.000
6.2667	0.229	1.109	0.082	0.000
6.4000	0.232	1.140	0.083	0.000
6.5333	0.234	1.171	0.083	0.000
6.6667	0.237	1.203	0.084	0.000
6.8000	0.239	1.235	0.085	0.000
6.9333	0.242	1.267	0.086	0.000
7.0667	0.244	1.299	0.091	0.000
7.2000	0.247	1.332	0.094	0.000
7.3333	0.249	1.365	0.097	0.000
7.4667	0.252	1.399	0.100	0.000
7.6000	0.255	1.433	0.102	0.000
7.7333	0.257	1.467	0.104	0.000
7.8667	0.260	1.501	0.143	0.000
8.0000	0.262	1.536	0.162	0.000
8.1333	0.265	1.571	0.177	0.000
8.2667	0.268	1.607	0.189	0.000
8.4000	0.270	1.643	0.200	0.000
8.5333	0.273	1.679	0.210	0.000
8.6667	0.276	1.716	0.220	0.000
8.8000	0.278	1.753	0.229	0.000
8.9333	0.281	1.790	0.237	0.000
9.0667	0.284	1.828	0.245	0.000
9.2000	0.286	1.866	0.252	0.000
9.3333	0.289	1.904	0.260	0.000
9.4667	0.292	1.943	0.267	0.000
9.6000	0.295	1.982	0.274	0.000
9.7333	0.298	2.022	0.280	0.000
9.8667	0.300	2.062	0.286	0.000
10.000	0.303	2.102	0.293	0.000
10.133	0.306	2.143	0.299	0.000
10.267	0.309	2.184	0.305	0.000
10.400	0.312	2.225	0.310	0.000
10.533	0.315	2.267	0.316	0.000
10.667	0.317	2.309	0.321	0.000
10.800	0.320	2.352	0.327	0.000
10.933	0.323	2.395	0.332	0.000
11.067	0.326	2.438	0.611	0.000
11.200	0.329	2.482	1.747	0.000
11.333	0.332	2.526	3.230	0.000
11.467	0.335	2.570	4.678	0.000
11.600	0.338	2.615	5.758	0.000
11.733	0.341	2.661	6.376	0.000
11.867	0.344	2.706	6.964	0.000
12.000	0.347	2.752	7.458	0.000

12.133	0.350	2.799	7.920	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 5.82
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.26
Total Impervious Area: 4.56

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.171113
5 year	0.268739
10 year	0.324066
25 year	0.38268
50 year	0.41895
100 year	0.4498

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.103586
5 year	0.16094
10 year	0.20858
25 year	0.281333
50 year	0.345702
100 year	0.419723

Pond 4 Mitigated Flow for Enhanced Water Quality Treatment

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.168	0.075
1950	0.210	0.086
1951	0.377	0.266
1952	0.119	0.068
1953	0.096	0.085
1954	0.147	0.080
1955	0.235	0.079
1956	0.187	0.183
1957	0.151	0.080
1958	0.170	0.085

1959	0.146	0.075
1960	0.255	0.229
1961	0.144	0.100
1962	0.089	0.069
1963	0.123	0.083
1964	0.162	0.094
1965	0.116	0.151
1966	0.111	0.081
1967	0.233	0.086
1968	0.145	0.081
1969	0.142	0.079
1970	0.117	0.084
1971	0.125	0.084
1972	0.281	0.239
1973	0.127	0.152
1974	0.138	0.083
1975	0.187	0.077
1976	0.136	0.081
1977	0.016	0.072
1978	0.119	0.087
1979	0.072	0.065
1980	0.266	0.248
1981	0.106	0.082
1982	0.204	0.183
1983	0.183	0.083
1984	0.113	0.070
1985	0.067	0.074
1986	0.297	0.096
1987	0.262	0.209
1988	0.104	0.077
1989	0.068	0.073
1990	0.549	0.230
1991	0.330	0.223
1992	0.127	0.091
1993	0.133	0.070
1994	0.045	0.064
1995	0.190	0.099
1996	0.401	0.259
1997	0.335	0.264
1998	0.076	0.071
1999	0.314	0.226
2000	0.132	0.091
2001	0.024	0.062
2002	0.145	0.102
2003	0.185	0.080
2004	0.239	0.267
2005	0.172	0.081
2006	0.203	0.185
2007	0.407	0.312
2008	0.525	0.252
2009	0.258	0.104

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.5485	0.3125
2	0.5252	0.2674
3	0.4071	0.2660

4	0.4009	0.2639
5	0.3768	0.2595
6	0.3352	0.2515
7	0.3303	0.2477
8	0.3143	0.2393
9	0.2966	0.2301
10	0.2806	0.2289
11	0.2659	0.2261
12	0.2623	0.2230
13	0.2579	0.2086
14	0.2548	0.1853
15	0.2395	0.1832
16	0.2352	0.1830
17	0.2327	0.1525
18	0.2096	0.1512
19	0.2044	0.1042
20	0.2026	0.1024
21	0.1902	0.0998
22	0.1875	0.0990
23	0.1871	0.0961
24	0.1850	0.0943
25	0.1833	0.0913
26	0.1718	0.0910
27	0.1701	0.0867
28	0.1681	0.0864
29	0.1616	0.0863
30	0.1510	0.0852
31	0.1475	0.0845
32	0.1459	0.0843
33	0.1451	0.0836
34	0.1450	0.0833
35	0.1437	0.0830
36	0.1420	0.0829
37	0.1383	0.0821
38	0.1355	0.0812
39	0.1327	0.0809
40	0.1323	0.0807
41	0.1275	0.0806
42	0.1274	0.0802
43	0.1252	0.0801
44	0.1228	0.0798
45	0.1189	0.0790
46	0.1187	0.0788
47	0.1171	0.0771
48	0.1157	0.0770
49	0.1131	0.0751
50	0.1113	0.0748
51	0.1063	0.0743
52	0.1035	0.0732
53	0.0960	0.0723
54	0.0894	0.0712
55	0.0758	0.0702
56	0.0718	0.0699
57	0.0675	0.0690
58	0.0671	0.0685
59	0.0446	0.0650
60	0.0237	0.0640
61	0.0161	0.0618

Duration Flows

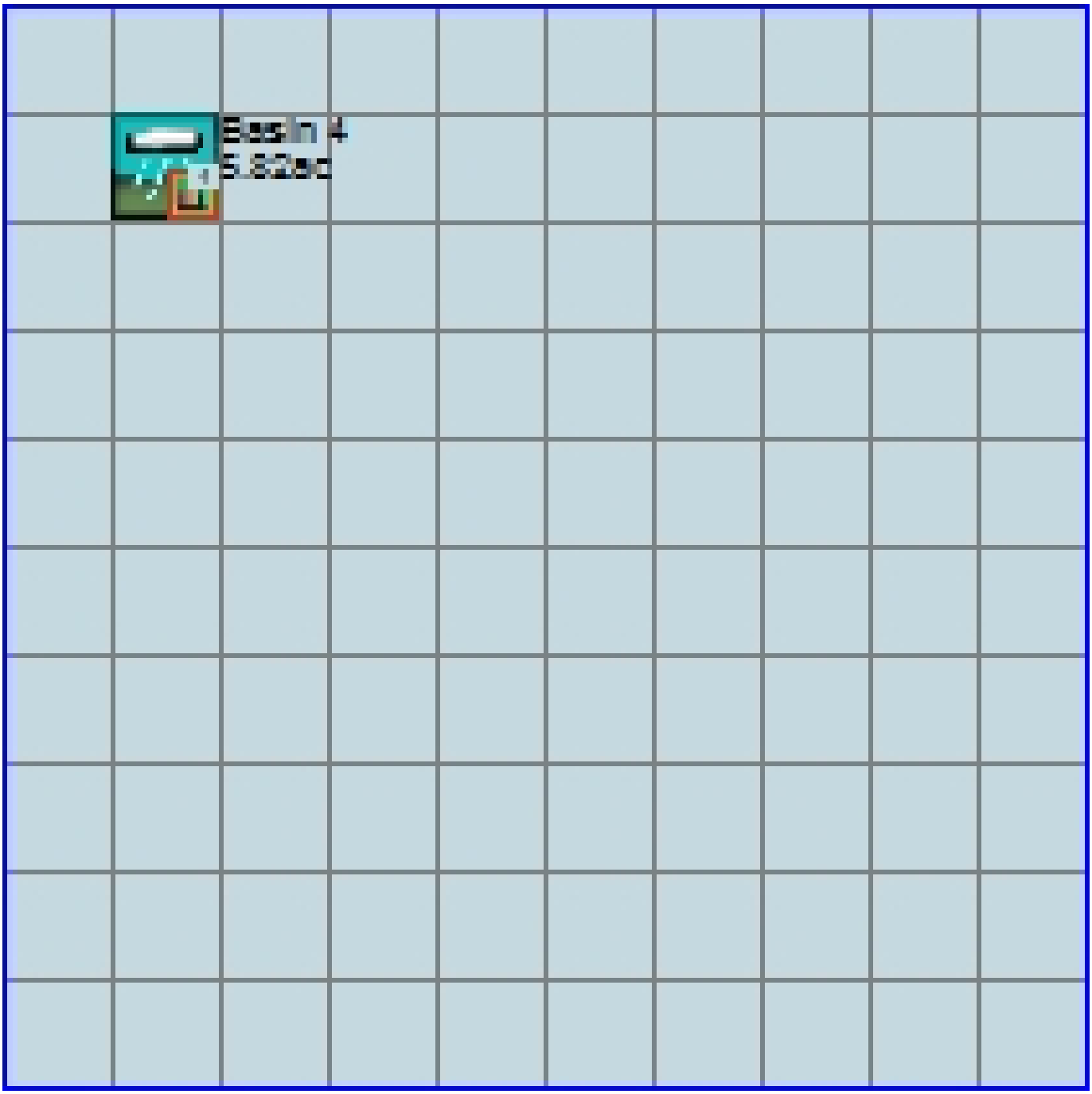
The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0856	17802	14491	81	Pass
0.0889	16514	10868	65	Pass
0.0923	15049	9561	63	Pass
0.0957	14050	8611	61	Pass
0.0990	12816	6806	53	Pass
0.1024	11929	5452	45	Pass
0.1058	11101	4128	37	Pass
0.1091	10143	4004	39	Pass
0.1125	9475	3931	41	Pass
0.1159	8883	3865	43	Pass
0.1192	8181	3786	46	Pass
0.1226	7687	3732	48	Pass
0.1260	7204	3670	50	Pass
0.1293	6622	3604	54	Pass
0.1327	6228	3563	57	Pass
0.1361	5781	3503	60	Pass
0.1394	5473	3452	63	Pass
0.1428	5183	3388	65	Pass
0.1462	4819	3268	67	Pass
0.1495	4569	3172	69	Pass
0.1529	4329	3086	71	Pass
0.1563	4036	2973	73	Pass
0.1596	3829	2911	76	Pass
0.1630	3546	2802	79	Pass
0.1664	3360	2714	80	Pass
0.1697	3176	2650	83	Pass
0.1731	2954	2537	85	Pass
0.1765	2802	2443	87	Pass
0.1798	2642	2372	89	Pass
0.1832	2453	2231	90	Pass
0.1866	2331	2126	91	Pass
0.1900	2194	2039	92	Pass
0.1933	2042	1904	93	Pass
0.1967	1927	1786	92	Pass
0.2001	1790	1641	91	Pass
0.2034	1709	1535	89	Pass
0.2068	1615	1447	89	Pass
0.2102	1486	1345	90	Pass
0.2135	1391	1268	91	Pass
0.2169	1311	1189	90	Pass
0.2203	1225	1061	86	Pass
0.2236	1168	973	83	Pass
0.2270	1114	886	79	Pass
0.2304	1053	771	73	Pass
0.2337	1006	714	70	Pass
0.2371	930	645	69	Pass
0.2405	890	581	65	Pass
0.2438	848	496	58	Pass
0.2472	790	398	50	Pass
0.2506	747	350	46	Pass
0.2539	723	313	43	Pass
0.2573	673	276	41	Pass
0.2607	639	236	36	Pass

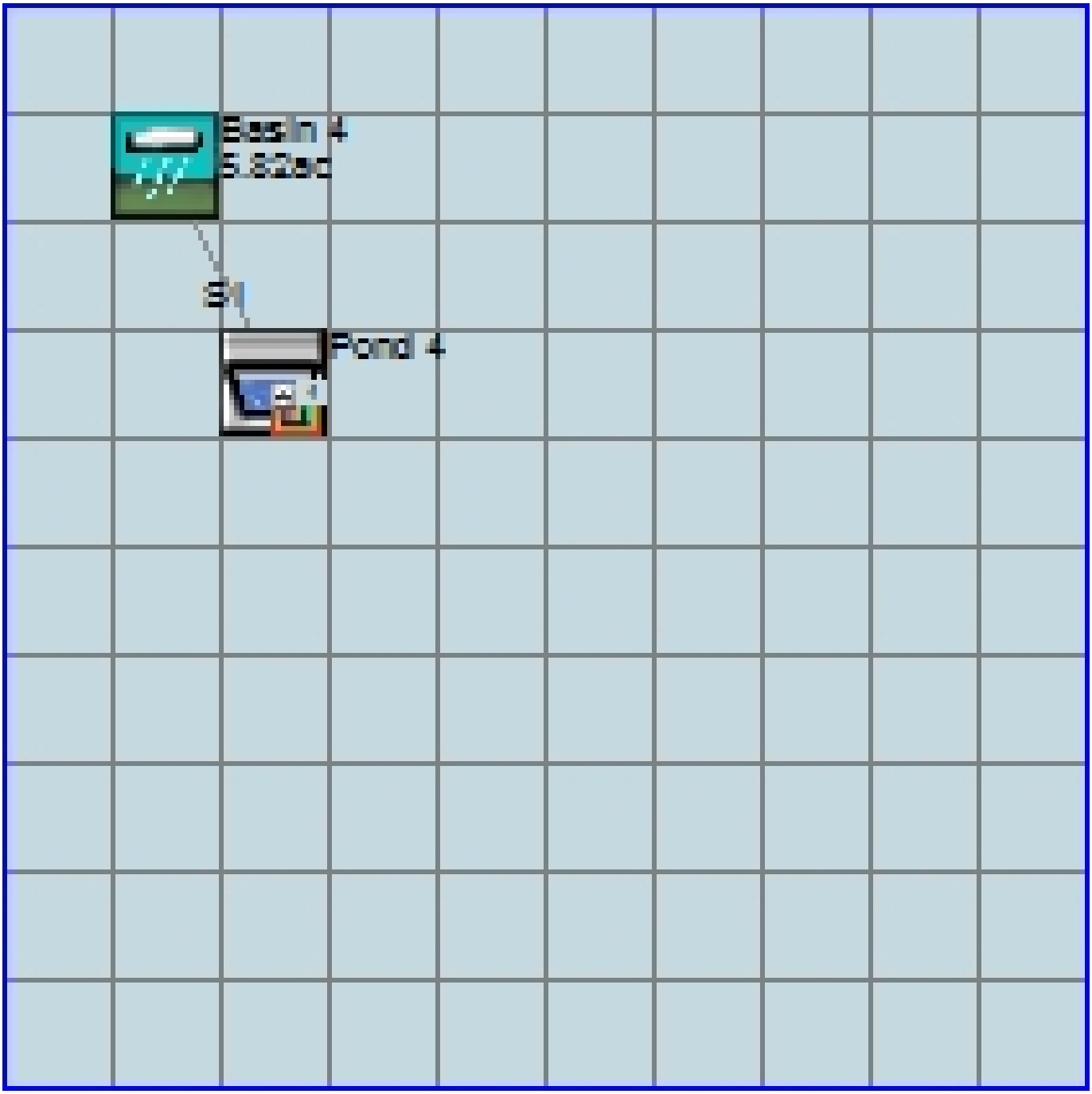
0.2640	596	181	30	Pass
0.2674	569	152	26	Pass
0.2708	543	140	25	Pass
0.2741	497	135	27	Pass
0.2775	477	130	27	Pass
0.2809	445	125	28	Pass
0.2842	402	120	29	Pass
0.2876	376	115	30	Pass
0.2910	353	111	31	Pass
0.2943	325	103	31	Pass
0.2977	301	86	28	Pass
0.3011	272	61	22	Pass
0.3045	258	51	19	Pass
0.3078	239	40	16	Pass
0.3112	218	23	10	Pass
0.3146	202	0	0	Pass
0.3179	186	0	0	Pass
0.3213	158	0	0	Pass
0.3247	146	0	0	Pass
0.3280	129	0	0	Pass
0.3314	119	0	0	Pass
0.3348	110	0	0	Pass
0.3381	97	0	0	Pass
0.3415	93	0	0	Pass
0.3449	87	0	0	Pass
0.3482	76	0	0	Pass
0.3516	69	0	0	Pass
0.3550	63	0	0	Pass
0.3583	55	0	0	Pass
0.3617	48	0	0	Pass
0.3651	41	0	0	Pass
0.3684	38	0	0	Pass
0.3718	33	0	0	Pass
0.3752	27	0	0	Pass
0.3785	23	0	0	Pass
0.3819	21	0	0	Pass
0.3853	20	0	0	Pass
0.3886	19	0	0	Pass
0.3920	17	0	0	Pass
0.3954	14	0	0	Pass
0.3987	13	0	0	Pass
0.4021	9	0	0	Pass
0.4055	4	0	0	Pass
0.4088	3	0	0	Pass
0.4122	3	0	0	Pass
0.4156	3	0	0	Pass
0.4190	3	0	0	Pass

Appendix

Predeveloped Schematic



Mitigated Schematic



General Model Information

Project Name:	Pond 5
Site Name:	
Site Address:	
City:	
Report Date:	10/24/2017
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/04/14
Version:	4.2.13

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 5

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	11.63
Pervious Total	11.63
Impervious Land Use	acre
Impervious Total	0
Basin Total	11.63

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Basin 5

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	1.54
Pervious Total	1.54

Impervious Land Use	acre
ROADS FLAT	2.66
ROOF TOPS FLAT	6.49
SIDEWALKS FLAT	0.33
POND	0.04
Impervious Total	9.52
Basin Total	11.06

Element Flows To:

Surface	Interflow	Groundwater
Pond 5	Pond 5	

Basin 5 Bypass

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
C, Lawn, Flat	0.06
Pervious Total	0.06

Impervious Land Use	acre
ROADS FLAT	0.51
Impervious Total	0.51
Basin Total	0.57

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Routing

Pond 5

Bottom Length: 100.00 ft.
Bottom Width: 100.00 ft.
Depth: 7 ft.
Volume at riser head: 1.7580 acre-feet. ← Pond 5 Detention Volume
Side slope 1: 2 To 1
Side slope 2: 2 To 1
Side slope 3: 2 To 1
Side slope 4: 2 To 1
Discharge Structure
Riser Height: 6 ft.
Riser Diameter: 18 in.
Orifice 1 Diameter: 1.75 in. Elevation:0 ft.
Orifice 2 Diameter: 2.125 in. Elevation:2.75 ft.
Orifice 3 Diameter: 2.75 in. Elevation:3.75 ft.
Element Flows To:
Outlet 1 Outlet 2

Pond Hydraulic Table

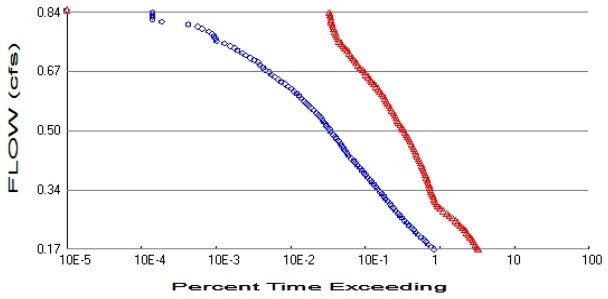
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.229	0.000	0.000	0.000
0.0778	0.231	0.017	0.023	0.000
0.1556	0.232	0.035	0.032	0.000
0.2333	0.233	0.054	0.040	0.000
0.3111	0.235	0.072	0.046	0.000
0.3889	0.236	0.090	0.051	0.000
0.4667	0.238	0.109	0.056	0.000
0.5444	0.239	0.127	0.061	0.000
0.6222	0.241	0.146	0.065	0.000
0.7000	0.242	0.165	0.069	0.000
0.7778	0.244	0.184	0.073	0.000
0.8556	0.245	0.203	0.076	0.000
0.9333	0.247	0.222	0.080	0.000
1.0111	0.248	0.241	0.083	0.000
1.0889	0.250	0.261	0.086	0.000
1.1667	0.251	0.280	0.089	0.000
1.2444	0.253	0.300	0.092	0.000
1.3222	0.254	0.319	0.095	0.000
1.4000	0.256	0.339	0.098	0.000
1.4778	0.257	0.359	0.101	0.000
1.5556	0.259	0.379	0.103	0.000
1.6333	0.260	0.400	0.106	0.000
1.7111	0.262	0.420	0.108	0.000
1.7889	0.263	0.440	0.111	0.000
1.8667	0.265	0.461	0.113	0.000
1.9444	0.266	0.482	0.115	0.000
2.0222	0.268	0.502	0.118	0.000
2.1000	0.269	0.523	0.120	0.000
2.1778	0.271	0.544	0.122	0.000
2.2556	0.272	0.565	0.124	0.000
2.3333	0.274	0.587	0.126	0.000
2.4111	0.276	0.608	0.129	0.000
2.4889	0.277	0.630	0.131	0.000

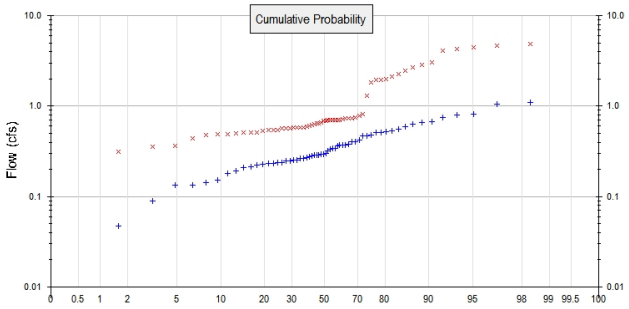
2.5667	0.279	0.651	0.133	0.000
2.6444	0.280	0.673	0.135	0.000
2.7222	0.282	0.695	0.137	0.000
2.8000	0.283	0.717	0.166	0.000
2.8778	0.285	0.739	0.184	0.000
2.9556	0.287	0.761	0.198	0.000
3.0333	0.288	0.784	0.210	0.000
3.1111	0.290	0.806	0.220	0.000
3.1889	0.291	0.829	0.229	0.000
3.2667	0.293	0.852	0.238	0.000
3.3444	0.295	0.875	0.246	0.000
3.4222	0.296	0.898	0.254	0.000
3.5000	0.298	0.921	0.261	0.000
3.5778	0.300	0.944	0.268	0.000
3.6556	0.301	0.967	0.275	0.000
3.7333	0.303	0.991	0.282	0.000
3.8111	0.304	1.015	0.339	0.000
3.8889	0.306	1.038	0.371	0.000
3.9667	0.308	1.062	0.396	0.000
4.0444	0.309	1.086	0.417	0.000
4.1222	0.311	1.110	0.437	0.000
4.2000	0.313	1.135	0.455	0.000
4.2778	0.314	1.159	0.472	0.000
4.3556	0.316	1.184	0.488	0.000
4.4333	0.318	1.208	0.503	0.000
4.5111	0.319	1.233	0.518	0.000
4.5889	0.321	1.258	0.532	0.000
4.6667	0.323	1.283	0.545	0.000
4.7444	0.325	1.309	0.558	0.000
4.8222	0.326	1.334	0.571	0.000
4.9000	0.328	1.359	0.583	0.000
4.9778	0.330	1.385	0.595	0.000
5.0556	0.331	1.411	0.607	0.000
5.1333	0.333	1.437	0.618	0.000
5.2111	0.335	1.463	0.630	0.000
5.2889	0.337	1.489	0.641	0.000
5.3667	0.338	1.515	0.651	0.000
5.4444	0.340	1.541	0.662	0.000
5.5222	0.342	1.568	0.672	0.000
5.6000	0.343	1.595	0.682	0.000
5.6778	0.345	1.621	0.692	0.000
5.7556	0.347	1.648	0.702	0.000
5.8333	0.349	1.675	0.712	0.000
5.9111	0.351	1.703	0.721	0.000
5.9889	0.352	1.730	0.731	0.000
6.0667	0.354	1.758	1.013	0.000
6.1444	0.356	1.785	1.618	0.000
6.2222	0.358	1.813	2.395	0.000
6.3000	0.359	1.841	3.268	0.000
6.3778	0.361	1.869	4.162	0.000
6.4556	0.363	1.897	5.000	0.000
6.5333	0.365	1.926	5.717	0.000
6.6111	0.367	1.954	6.269	0.000
6.6889	0.368	1.983	6.658	0.000
6.7667	0.370	2.011	7.023	0.000
6.8444	0.372	2.040	7.338	0.000
6.9222	0.374	2.069	7.640	0.000
7.0000	0.376	2.098	7.929	0.000

7.0778	0.378	2.128	8.207	0.000

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 11.63
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.6
Total Impervious Area: 10.03

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.341932
5 year	0.537017
10 year	0.647575
25 year	0.764702
50 year	0.83718
100 year	0.898827

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.797759
5 year	1.564348
10 year	2.342229
25 year	3.751659
50 year	5.203809
100 year	7.094559

Pond 5 Mitigated Flow for Enhanced Water Quality Treatment

Pond 5 Maximum Release Rate

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.336	0.580
1950	0.419	0.702
1951	0.753	1.935
1952	0.237	0.363
1953	0.192	0.567
1954	0.295	0.593
1955	0.470	0.775
1956	0.374	0.707
1957	0.302	0.706
1958	0.340	0.694

1959	0.292	0.641
1960	0.509	2.488
1961	0.287	0.687
1962	0.179	0.287
1963	0.245	0.627
1964	0.323	0.549
1965	0.231	0.651
1966	0.222	0.493
1967	0.465	0.715
1968	0.290	0.601
1969	0.284	0.581
1970	0.234	0.508
1971	0.250	0.730
1972	0.561	0.818
1973	0.255	0.614
1974	0.276	0.572
1975	0.375	0.757
1976	0.271	0.583
1977	0.032	0.515
1978	0.238	0.581
1979	0.144	0.353
1980	0.531	1.291
1981	0.212	0.539
1982	0.408	4.495
1983	0.366	0.706
1984	0.226	0.475
1985	0.134	0.567
1986	0.593	2.000
1987	0.524	2.679
1988	0.207	0.489
1989	0.135	0.498
1990	1.096	4.253
1991	0.660	3.075
1992	0.255	0.531
1993	0.265	0.516
1994	0.089	0.315
1995	0.380	0.731
1996	0.801	2.892
1997	0.670	2.274
1998	0.152	0.664
1999	0.628	1.832
2000	0.264	0.704
2001	0.047	0.442
2002	0.290	2.143
2003	0.370	0.543
2004	0.479	4.901
2005	0.343	0.700
2006	0.405	0.740
2007	0.814	4.098
2008	1.050	4.716
2009	0.515	1.947

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	1.0961	4.9007
2	1.0495	4.7159
3	0.8136	4.4953

4	0.8012	4.2528
5	0.7530	4.0985
6	0.6697	3.0748
7	0.6600	2.8923
8	0.6281	2.6792
9	0.5927	2.4879
10	0.5607	2.2740
11	0.5314	2.1435
12	0.5242	1.9997
13	0.5153	1.9472
14	0.5091	1.9349
15	0.4785	1.8319
16	0.4699	1.2907
17	0.4649	0.8180
18	0.4188	0.7746
19	0.4085	0.7570
20	0.4049	0.7397
21	0.3802	0.7306
22	0.3746	0.7302
23	0.3739	0.7147
24	0.3696	0.7067
25	0.3662	0.7060
26	0.3433	0.7057
27	0.3400	0.7045
28	0.3359	0.7021
29	0.3230	0.7003
30	0.3018	0.6942
31	0.2947	0.6873
32	0.2916	0.6643
33	0.2900	0.6511
34	0.2897	0.6410
35	0.2872	0.6266
36	0.2837	0.6137
37	0.2765	0.6013
38	0.2708	0.5934
39	0.2651	0.5833
40	0.2644	0.5814
41	0.2547	0.5806
42	0.2545	0.5798
43	0.2502	0.5716
44	0.2454	0.5672
45	0.2376	0.5672
46	0.2373	0.5485
47	0.2340	0.5432
48	0.2313	0.5394
49	0.2261	0.5306
50	0.2223	0.5163
51	0.2124	0.5146
52	0.2069	0.5080
53	0.1919	0.4978
54	0.1787	0.4932
55	0.1515	0.4892
56	0.1436	0.4751
57	0.1350	0.4424
58	0.1341	0.3630
59	0.0891	0.3527
60	0.0474	0.3151
61	0.0322	0.2869

Duration Flows

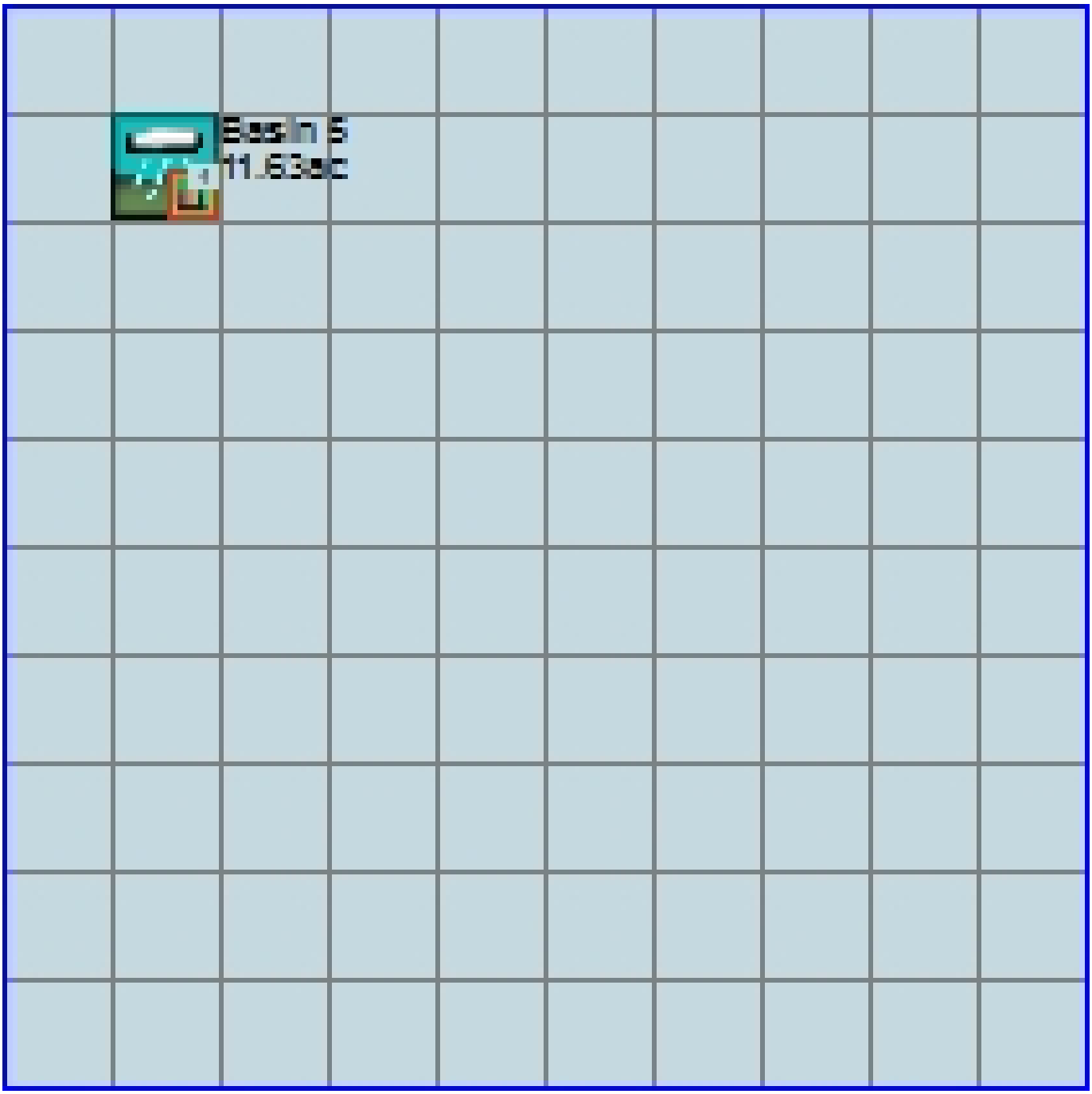
Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.1710	17774	69556	391	Fail
0.1777	16296	66113	405	Fail
0.1844	15028	63118	420	Fail
0.1912	13873	60167	433	Fail
0.1979	12942	57536	444	Fail
0.2046	11905	54477	457	Fail
0.2113	10938	51355	469	Fail
0.2181	10121	48339	477	Fail
0.2248	9465	45686	482	Fail
0.2315	8787	42500	483	Fail
0.2383	8166	39527	484	Fail
0.2450	7672	37024	482	Fail
0.2517	7112	34137	479	Fail
0.2584	6609	31356	474	Fail
0.2652	6156	28640	465	Fail
0.2719	5818	26372	453	Fail
0.2786	5463	23742	434	Fail
0.2854	5120	21410	418	Fail
0.2921	4808	19937	414	Fail
0.2988	4556	19090	419	Fail
0.3056	4271	18320	428	Fail
0.3123	4025	17646	438	Fail
0.3190	3782	17111	452	Fail
0.3257	3566	16732	469	Fail
0.3325	3352	16309	486	Fail
0.3392	3140	15939	507	Fail
0.3459	2973	15620	525	Fail
0.3527	2796	15218	544	Fail
0.3594	2603	14840	570	Fail
0.3661	2449	14433	589	Fail
0.3728	2325	14055	604	Fail
0.3796	2169	13687	631	Fail
0.3863	2032	13327	655	Fail
0.3930	1898	12953	682	Fail
0.3998	1800	12604	700	Fail
0.4065	1698	12198	718	Fail
0.4132	1590	11755	739	Fail
0.4200	1497	11396	761	Fail
0.4267	1387	11011	793	Fail
0.4334	1295	10652	822	Fail
0.4401	1221	10269	841	Fail
0.4469	1161	9935	855	Fail
0.4536	1101	9554	867	Fail
0.4603	1049	9180	875	Fail
0.4671	997	8795	882	Fail
0.4738	937	8508	908	Fail
0.4805	885	8194	925	Fail
0.4872	839	7820	932	Fail
0.4940	794	7497	944	Fail
0.5007	745	7146	959	Fail
0.5074	718	6819	949	Fail
0.5142	670	6517	972	Fail
0.5209	634	6265	988	Fail
0.5276	599	5970	996	Fail

0.5344	567	5711	1007	Fail
0.5411	539	5488	1018	Fail
0.5478	501	5289	1055	Fail
0.5545	475	5071	1067	Fail
0.5613	436	4853	1113	Fail
0.5680	399	4629	1160	Fail
0.5747	371	4425	1192	Fail
0.5815	348	4239	1218	Fail
0.5882	323	4057	1256	Fail
0.5949	299	3899	1304	Fail
0.6016	275	3707	1348	Fail
0.6084	257	3518	1368	Fail
0.6151	235	3313	1409	Fail
0.6218	218	3159	1449	Fail
0.6286	200	2956	1478	Fail
0.6353	180	2789	1549	Fail
0.6420	158	2612	1653	Fail
0.6488	146	2496	1709	Fail
0.6555	130	2353	1810	Fail
0.6622	119	2201	1849	Fail
0.6689	110	2083	1893	Fail
0.6757	97	1943	2003	Fail
0.6824	91	1810	1989	Fail
0.6891	82	1677	2045	Fail
0.6959	78	1602	2053	Fail
0.7026	69	1518	2200	Fail
0.7093	61	1424	2334	Fail
0.7161	54	1364	2525	Fail
0.7228	48	1304	2716	Fail
0.7295	41	1214	2960	Fail
0.7362	38	1139	2997	Fail
0.7430	33	1077	3263	Fail
0.7497	28	1009	3603	Fail
0.7564	22	953	4331	Fail
0.7632	21	909	4328	Fail
0.7699	20	879	4395	Fail
0.7766	19	853	4489	Fail
0.7833	17	828	4870	Fail
0.7901	14	808	5771	Fail
0.7968	12	790	6583	Fail
0.8035	9	771	8566	Fail
0.8103	4	754	18850	Fail
0.8170	3	740	24666	Fail
0.8237	3	729	24300	Fail
0.8305	3	717	23900	Fail
0.8372	3	703	23433	Fail

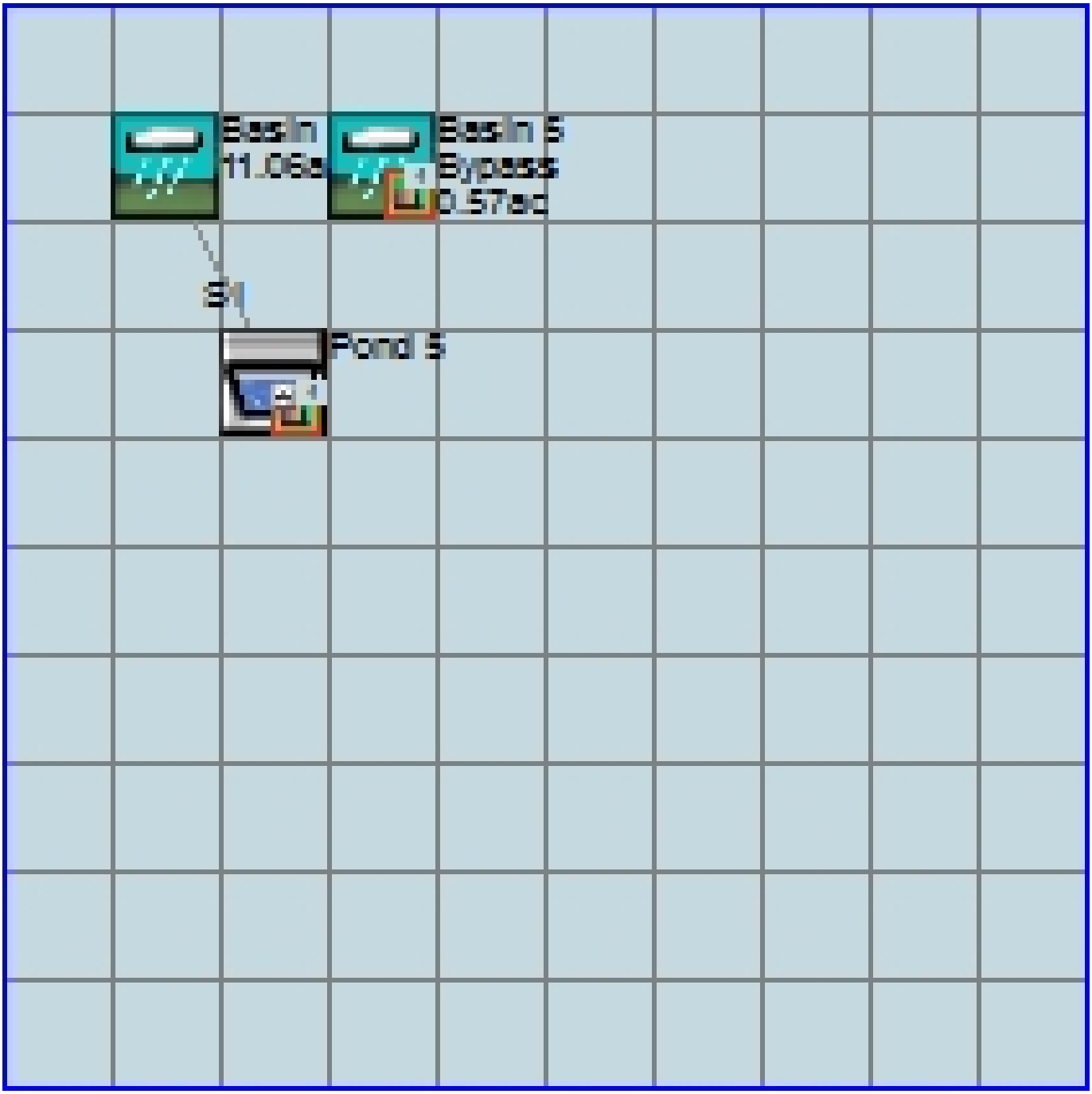
The development has an increase in flow durations from 1/2 Predeveloped 2 year flow to the 2 year flow or more than a 10% increase from the 2 year to the 50 year flow.
The development has an increase in flow durations for more than 50% of the flows for the range of the duration analysis.

Appendix

Predeveloped Schematic



Mitigated Schematic



General Model Information

Project Name:	Basin 1
Site Name:	
Site Address:	
City:	
Report Date:	9/21/2017
Gage:	Seatac
Data Start:	1948/10/01
Data End:	2009/09/30
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2017/04/14
Version:	4.2.13

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

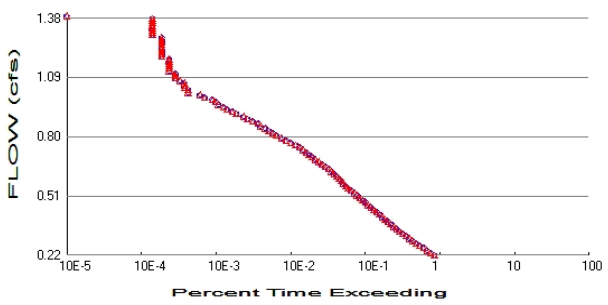
Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	7.56
C, Pasture, Flat	6.18
Pervious Total	13.74
Impervious Land Use	acre
Impervious Total	0
Basin Total	13.74

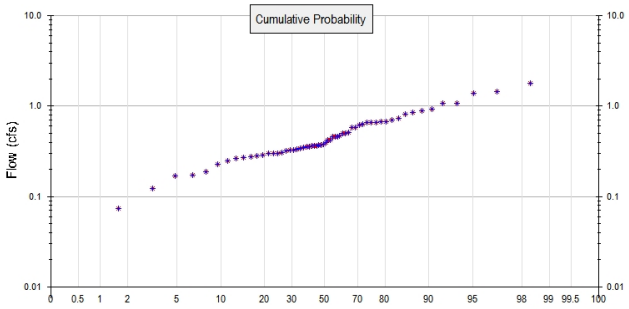
Element Flows To:

Surface	Interflow	Groundwater

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 13.74
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 13.74
Total Impervious Area: 0

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.432826
5 year	0.718229
10 year	0.919879
25 year	1.182478
50 year	1.381222
100 year	1.581181

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.432826
5 year	0.718229
10 year	0.919879
25 year	1.182478
50 year	1.381222
100 year	1.581181

← Forest and Meadow Maximum Release Rate to Stream AC

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.510	0.510
1950	0.619	0.619
1951	0.920	0.920
1952	0.298	0.298
1953	0.246	0.246
1954	0.368	0.368
1955	0.578	0.578
1956	0.467	0.467
1957	0.394	0.394
1958	0.423	0.423

Landuse Basin Data

Predeveloped Land Use

Basin 1

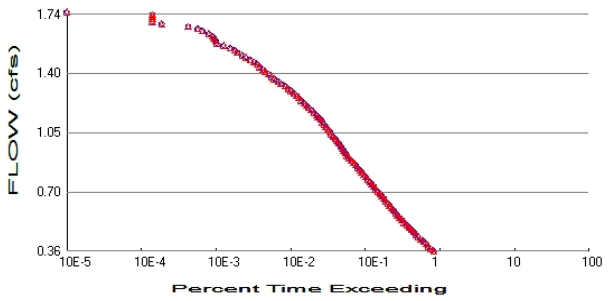
Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	24.21
Pervious Total	24.21
Impervious Land Use	acre
Impervious Total	0
Basin Total	24.21

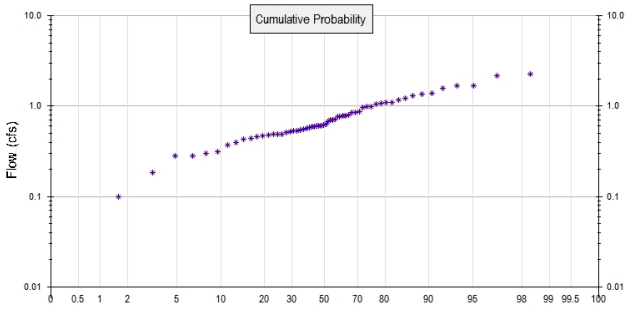
Element Flows To:

Surface	Interflow	Groundwater

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 24.21
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 24.21
Total Impervious Area: 0

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.711794
5 year	1.117901
10 year	1.348048
25 year	1.591869
50 year	1.742746
100 year	1.871074

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.711794
5 year	1.117901
10 year	1.348048
25 year	1.591869
50 year	1.742746
100 year	1.871074

← Forest Maximum Release Rate to North Lake

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1949	0.699	0.699
1950	0.872	0.872
1951	1.567	1.567
1952	0.494	0.494
1953	0.399	0.399
1954	0.613	0.613
1955	0.978	0.978
1956	0.778	0.778
1957	0.628	0.628
1958	0.708	0.708

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Local (360)943-0304

www.clearcreeksolutions.com

12" Culvert #1

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.03200	ft/ft
Normal Depth	1.00	ft
Diameter	1.00	ft

Results

Discharge	6.37	ft^3/s
Flow Area	0.79	ft^2
Wetted Perimeter	3.14	ft
Hydraulic Radius	0.25	ft
Top Width	0.00	ft
Critical Depth	0.96	ft
Percent Full	100.0	%
Critical Slope	0.02798	ft/ft
Velocity	8.11	ft/s
Velocity Head	1.02	ft
Specific Energy	2.02	ft
Froude Number	0.00	
Maximum Discharge	6.86	ft^3/s
Discharge Full	6.37	ft^3/s
Slope Full	0.03200	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

12" Culvert #1

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.00	ft
Critical Depth	0.96	ft
Channel Slope	0.03200	ft/ft
Critical Slope	0.02798	ft/ft

12" Culvert #2

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.013	
Channel Slope	0.03300	ft/ft
Normal Depth	1.00	ft
Diameter	1.00	ft

Results

Discharge	6.47	ft³/s
Flow Area	0.79	ft²
Wetted Perimeter	3.14	ft
Hydraulic Radius	0.25	ft
Top Width	0.00	ft
Critical Depth	0.97	ft
Percent Full	100.0	%
Critical Slope	0.02892	ft/ft
Velocity	8.24	ft/s
Velocity Head	1.06	ft
Specific Energy	2.06	ft
Froude Number	0.00	
Maximum Discharge	6.96	ft³/s
Discharge Full	6.47	ft³/s
Slope Full	0.03300	ft/ft
Flow Type	SubCritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Average End Depth Over Rise	0.00	%
Normal Depth Over Rise	100.00	%
Downstream Velocity	Infinity	ft/s

12" Culvert #2

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	1.00	ft
Critical Depth	0.97	ft
Channel Slope	0.03300	ft/ft
Critical Slope	0.02892	ft/ft