CIVIL ENGINEERING ◊ SURVEYING ◊ LAND PLANNING
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TECHNICAL INFORMATION REPORT

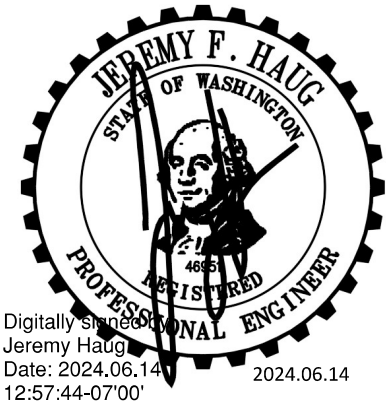
FOR

BRADBURY PLACE TOWNHOMES

CITY OF PUYALLUP, WASHINGTON

JUNE 2024

Prepared For:
Bradbury Place LLC
7809 Pacific Ave
Tacoma, WA 98408
(253) 318-5711



Digitally signed by Jeremy Haug
Date: 2024.06.14 12:57:44-07'00'

2024.06.14

Prepared By:
Rex Henretta, E.I.T., Design Engineer

Approved By:
Jeremy Haug, P.E., Project Engineer

Project # 20-223

*I hereby state that this Stormwater Site Plan for **Bradbury Place Apartments** has been prepared by me or under my supervision and meets the standard of care and expertise which is usual and customary in this community for professional engineers. I understand that Pierce County does not and will not assume liability for the sufficiency, suitability or performance of drainage facilities prepared by Contour Engineering LLC. This analysis is based on data and records either supplied to, or obtained by, Contour Engineering, LLC. These documents are referenced within the text of the analysis. The analysis has been prepared utilizing procedures and practices within the standard accepted practices of the industry.*

TABLE OF CONTENTS

1.0 PROJECT OVERVIEW

Purpose and Scope

This Technical Information Report accompanies the on-site storm drainage plans for the proposed construction of 43 multi-family residences. See Appendix A for a Vicinity Map.

The *2019 Stormwater Management Manual for Western Washington* and the requirements of the City of Puyallup will establish the methodology and design criteria used for this project.

Project Description

The site consists of two parcels totaling 2.65 acres, which will consist of 43 multi-family residences. On-site impervious surface area will be infiltrated through the use of an infiltration pond. Access will be provided by extending the existing right-of-way (ROW) of 5th Street SE to the end of the property line. Utilities including sewer, water, storm, and dry utilities will be extended along the proposed aisles. Sewer will service all proposed buildings and extend down 5th Street SE and connect to the existing sewer system located in 27th Ave SE. Additionally, the proposed sewer improvements will require to remove existing sewer pipe located in 27th Ave SE and be replaced. Water will service all buildings on the site and connect to the existing water line located in 5th Street SE. Storm will collect and convey stormwater throughout the site and be routed to stormwater manholes with BayFilter cartridges for treatment, then discharge to the proposed infiltration pond.

Parcel #: 0419036002
0419036003
Address: XXX 5th Street SE, Puyallup, WA 98374
Owner: Bradbury Place LLC

2.0 EXISTING CONDITIONS

Topography, Ground Cover, and Native Soils

The project site has moderate slopes from the southeast to northwest portions of the site. The site is forested with overgrown grass and bushes, additionally the site is undeveloped with no existing buildings or structures.

The USDA Natural Resource Conservation Service (NRCS) Web Soil Survey maps the project site and surrounding area as being underlain with Everett very gravelly sandy loam. (13B). A geotechnical assessment was prepared for this project by Georesorces dated May 24, 2019, followed by a Groundwater Monitoring addendum on August 18, 2022 and a Mounding Analysis addendum on February 9, 2023 and can be found in Appendix C. Per the geotechnical report, the existing soils are suitable for infiltration. Based on tests and analysis, an infiltration rate of 6.6 inches per hour is recommended by the Geotechnical Engineer for designing infiltration facilities in the upper gravelly soils. Below is the test pit information, conducted by Georesorces, of the area where the proposed infiltration pond is located.

Test Pit #1:

0′ – 0.3′	-> Topsoil
0.3′ – 2.0′	->Reddish brown sandy SILT with gravel (loose, moist)
2.0′ – 3.5′	-> Reddish brown poorly graded GRAVEL with sand and silt
3.5′ – 5.0′	-> Grey silty SAND with gravel and cobbles (very dense, moist)
5.0′+	-> Glacial till Layer

Predeveloped Areas

Onsite:

Pervious area:	115,560 SF	2.82 AC
Impervious area:	315 SF	0.01 AC

Adjacent Land Uses

North:	Office Building – Commercial Use
South:	Existing Single-Family Residence – Zoned Single-Family Dwelling
East:	Office Building – Commercial Use
West:	5th Street SE ROW

Drainage Patterns

Drainage from the site currently follows the site topography from southeast to northwest. Approximately 7,300 SF of offsite inflow enters the site from the north property. Due to the infiltration rates for the site (measured between 7 and 27 inches per hour) we can assume that any stormwater that enters the site will be infiltrated. Any stormwater that does leave the site will follow the natural topography to the ROW

of 5th Street SE and enter a private stormwater system. For further discussion of the drainage patterns of the site see Section 3.0.

Critical and Sensitive Areas

There are no known critical or sensitive areas, or associated buffers, on or adjacent to the site, per Pierce County GIS.

Other Existing Site Information

There are no known underground tanks or septic systems on or adjacent to the site.

3.0 OFFSITE ANALYSIS

Qualitative Analysis

The project site has moderate slopes from the southeast to northwest portions of the site.

There were no problems observed on the site. This includes no potential constrictions or capacity deficiencies in the drainage system, no existing or potential flooding problems and no existing or potential overtopping, scouring, bank sloughing or sedimentation. The area is relatively flat therefore there is no known risk of upland erosion impact or landslide hazards. There was no known destruction of aquatic habitat on or downstream of the existing site.

There are no known streams in the immediate vicinity of the site, the closest body of water is Bradley Lake that is over a quarter mile to the south. 5th Street SE is half developed and the proposed improvements will dedicate 30' to the ROW to build out the other half of the street. This proposed street will capture any runoff leaving the project site. Based on the design infiltration rate (between 7 and 27 in/hr) all stormwater on site will be infiltrated, any stormwater overflow leaving the site will enter the ROW of 5th Street SE and enter a downstream private stormwater system. Stormwater is ultimately infiltrated into the natural soils onsite. See Appendix A – General Exhibits for Basin Map and Downstream Flow Maps.

There are no known existing or predicted problems with the drainage system from the project site.

Quantitative Analysis

This project proposes 74,457 square feet of new or replaced impervious surfaces.

All runoff from the roofs will be collected and conveyed to the infiltration pond. Roof drains have been sized according to each roof system the drain is servicing. All

stormwater will be contained onsite from roof drains, therefore no further analysis is required. See Exhibit #6 – Roof Drain Analysis for roof area details.

To service the site a grade break was inserted that splits some of the stormwater flows from onsite to offsite. All onsite flows shall be contained onsite and infiltrated into the natural soils. Offsite flows that are produced will flow to the flow line of 5th street SE and enter a Contech Steel catch basin for treatment. Once the stormwater is treated the stormwater will enter an infiltration trench that will infiltrate the stormwater into the natural soils. As the infiltration trench was sized to infiltrate 100% of the stormwater runoff for Basin #3 (see Appendix B for basin maps), no further analysis is required. Overflow, if any, will be conveyed to the downstream private storm system west of 5th St SE. See Appendix D for WWHM calculation and Appendix E for Design calculations.

4.0 HYDROLOGIC & HYDRAULIC ANALYSIS

Developed Areas

Onsite:		
Pervious area:	45,596 SF	1.07 AC
Impervious area:		
Roof Area:	26,553 SF	0.61 AC
PGHS Area:	36,591 SF	0.84 AC
Pond Area:	2,898 SF	0.07 AC
Offsite:		
Pervious Area:	1,342 SF	0.03 AC
Impervious Area:	9,297 SF	0.21 AC
Replaced PGHS (Grind & Overlay):	7,510 SF	0.17 AC

Pre-Developed Site Hydrology

The total existing basin area contributing to the site is 2.80 acres. All the existing basin is covered with trees and overgrown shrubs and grass. Pre-Developed flows have been calculated using WWHM, this analysis report can be referenced in Appendix D of this report. The soil type is part of hydraulic soils group A per the georeport in Appendix E.

Drainage from the site currently follows the site topography flowing from southeast to the northwest corner of the site. The northwest corner is where stormwater exits the site, as it is the lowest elevation. It then enters the ROW of 5th Street SE and flows to a catch basin located in the ROW where it is routed to a private downstream stormwater system. Any flows that do not exit the site will be naturally infiltrated as the infiltration rate is 6.6 in/hr.

Developed Site Hydrology

The developed site will match the existing site hydrology by infiltrating all stormwater runoff and runon on-site through the use of an infiltration pond.

The proposed site developments consist of developing 43 multifamily accessed by three proposed aisles. The lot will be graded such that all stormwater drains to the proposed private aisles to the maximum extent feasible. These aisles will be graded to storm water filter catch basins that will treat stormwater prior to it being discharged to the proposed infiltration pond. The offsite inflow to the north and east of the property will be captured by yard drains and conveyed directly to the infiltration pond.

Onsite stormwater that cannot be conveyed to the infiltration pond due to grading restrictions will enter an infiltration trench located at the west end of the property along 5th St SE and from there be conveyed to the storm main system on 5th St SE. The pond has been sized to be able to receive all onsite runoff, including the area between the ROW and grade break that will be routed to the infiltration trench.

Developed flows have been calculated using WWHM, this analysis report can be referenced in Appendix D of this report.

The onsite soils will be maintained as hydraulic soils group A as discussed in the Georeport found in Appendix E.

Performance Goals and Standards

See Appendix A for applicable threshold flowcharts.

As per the flow charts mentioned above, the site will be required to adhere to Minimum Requirements #1-9.

Basin-specific requirements include compliance with Minimum Requirement #5 Onsite Stormwater Management, Minimum Requirement #6, Water Quality, and Minimum Requirement #7 Flow Control with Standard Requirement.

On site Stormwater Management

Per Project threshold flowcharts this project requires compliance with Minimum Requirements #1-#9; therefore, onsite stormwater management BMPs from List #2 per Volume 1, §3.4.5 apply for all surfaces within each type of surface in List #2; or demonstrate compliance with the LID Performance Standard per Volume 1, §3.4.5. This project will comply with the LID Performance Standard.

Per the SWMM: Using an Ecology approved continuous simulation model (assuming a 15-minute timestep) for design, stormwater discharges shall match developed discharge durations to predeveloped discharge durations for the range of predeveloped discharge

rates from 8% of the 2-year return period flowrate to 50% of the 2-year return period flowrate. Projects required to comply with Minimum Requirement #7 must match developed discharge durations to predeveloped discharge durations for the range of predeveloped discharge rates from 8% of the 2-year return period flowrate up to the full 50-year return period flowrate.

Since all stormwater will be infiltrated onsite, this project meets the LID Performance standard. See WWHM calculations in Appendix D for more information.

BMP T.513 Post Construction Soil Quality and Depth will be utilized for all lawn and landscaping surfaces.

Flow Control

The site has been graded such that there is a grade break approximately 60' from the center of 5th Street SE. At this grade break is where the portion of the site splits flows from onsite and offsite. Below the first paragraph will describe how Flow Control is met for all onsite flows and the second paragraph will be for all offsite flows.

Onsite:
Since the total new and/or replaced impervious surface areas is greater than 10,000 square feet, Flow Control is required. The project will infiltrate 100% of the generated runoff through the implementation of an infiltration pond, meeting the requirements of Flow Control. WWHM was used to ensure that the proposed pond can infiltrate 100% of the onsite stormwater, including the portion that will be routed to the offsite infiltration trench. Since 100% of the stormwater is infiltrated, flow control requirements are achieved. See Appendix D for WWHM calculations and report.

Offsite:
Since the total new and/or replaced impervious surface areas is greater than 10,000 square feet, Flow Control is required. The project will infiltrate 100% of the generated runoff through the implementation of an infiltration trench, meeting the requirements of Flow control. WWHM was used to ensure that the proposed infiltration trench could infiltrate 100% of the stormwater. A bypass pipe will connect to an existing storm catch basin within 5th St SE in the event of overflow. Since the infiltration trench infiltrated 100% of the stormwater, Flow Control is achieved.

Due to both systems passing with 100% infiltration, Flow Control is achieved.

Water Quality

Since this project will add more than 5,000 square feet of pollution-generating hard surface (PGHS), water quality treatment is required. The proposed improvements include extending the existing road of 5th Street SE by dedicating 30' to the ROW. Three aisles will be extended off 5th street that will provide access to all the proposed buildings.

The site has been graded such that all on site flows from driveways, roads, sidewalks, and lawn areas flow into one of three water quality treatment devices proposed. Within the site there is a grade break in which a portion of the site flows offsite to 5th Street SE. Below will be two separate paragraphs describing each case for the onsite and offsite basins.

Onsite:
Water quality will be achieved by having all onsite stormwater, except for roof stormwater, flow to two storm drain manholes with ADS BayFilter 522 cartridges. These manholes have been placed is such that all driveway, sidewalk, lawn, and road stormwater will flow to these catch basins for treatment. While onsite Basins #4 and #5 stormwater will flow to the offsite infiltration trench, they are included in the WWHM calculations for the onsite BayFilter catch basins. See Appendix A for Basin map areas. Below is a description of each basin.

Basin #1 & Basin #4

Pervious Area:	0.21 AC
Impervious Area:	0.47 AC
100-year Flow Rate:	0.4198 CFS
Offline Flow Rate:	0.0414 CFS
BayFilter 522 capacity:	0.05 CFS

Basin#2 & Basin #5

Pervious Area:	0.21 AC
Impervious Area:	0.37 AC
100-year Flow Rate:	0.3305 CFS
Offline Flow Rate:	0.0326 CFS
BayFilter 522 capacity:	0.05 CFS

Offsite:
The offsite basin will flow to the proposed steel catch basin within the ROW of 5th Street SE and route the stormwater to an infiltration trench. This trench will also receive and treat flows from onsite Basins #4 and #5 and has been sized accordingly and placed under the north driveway entrance. See Appendix D for the calculations on the sizing of the infiltration trench and sizing of the Catch basin. See Appendix A for Basin Map areas.

Basin #3 & Basin #4 & Basin #5

Pervious Area:	0.2 AC
Impervious Area:	0.28 AC
100-year Flow Rate:	0.2501 CFS
Offline Flow Rate:	0.0247 CFS
Required Contech Storm Filter:	0.0334 CFS

Conveyance Capacity

The stormwater infrastructure within Aisles A and B were analyzed for the collection and conveyance of runoff from the road, sidewalks, driveways, and landscaped areas onsite. Roof runoff is proposed to be routed separately and directly discharged into the infiltration pond. The stormwater mains consist of 8 inch and 12 inch pipes using either ADS N-12 or Ductile Iron (DI) pipes, both with a Manning Coefficient *n* of 0.012.

The onsite basin was analyzed through the SBUH method to determine demand for the most constrained pipe. The most constrained pipe is identified as the 179 linear-foot, 8-inch DI pipe sloped at 1 percent in Aisle A which discharges into SDMH#25 at the east invert elevation. The results of these calculations are summarized below:

Onsite basin: 1.05 acres pervious (all landscaped areas)
0.91 acres impervious (all onsite non-roof hard surfaces)
1.046 cfs (peak runoff for 100-year storm)
1.31 cfs (capacity of 8-inch DI pipe at 1% slope)

As capacity exceeds demand, the proposed stormwater system is considered to have sufficient conveyance capacity. Please note that the pipe capacity is compared against all of the onsite pervious areas and non-roof impervious areas. The actual areas tributary to this pipe are likely to be much less than those shown above.

5.0 DISCUSSION OF MINIMUM REQUIREMENTS

This project must meet Minimum Requirements #1 through #9, as set forth by the *2019 Stormwater Management Manual for Western Washington.* They are discussed below:

#1 - Preparation of Stormwater Site Plans
This storm water site plan satisfies this requirement.

#2 - Construction Stormwater Pollution Prevention Plan (SWPPP)
A Construction Stormwater Pollution Prevention Plan is included with this submittal.

#3 - Source Control of Pollution
Applicable Source Control BMPs will be employed as needed. Source Control BMPs that could be needed for this project can be found in Volume 4 of the 2019 Stormwater Management Manual for Western Washington. Construction BMPs will be employed as needed and are located within the Construction SWPPP for the project.

#4 - Preservation of Natural Drainage Systems and Outfalls
Natural drainage systems and outfalls are being maintained to the maximum extent possible. In the existing state, stormwater will follow the natural topography and flow from the southeast corner to the northwest corner of the site. All stormwater will be

infiltrated to the natural soils, any stormwater leaving the site is small and negligible. The proposed storm drainage system will collect surface stormwater through site grading and steel storm drain catch basins. The stormwater will be routed to water quality catch basins before it is discharged into the proposed infiltration pond.

#5 - On-site Stormwater Management
The storm system is outlined in the section DEVELOPED SITE HYDROLOGY. See Section 4.0 within this report.

#6 – Runoff Treatment
Water quality will be achieved through two storm drain manholes with ADS BayFilter 522 cartridges. See SECTION 4.0 – Water Quality for details.

#7 – Flow Control
Flow Control will be met through infiltration. See SECTION 4.0 – Flow Control for details.

#8 – Wetlands Protection
No wetlands or other critical areas were identified within the project area.

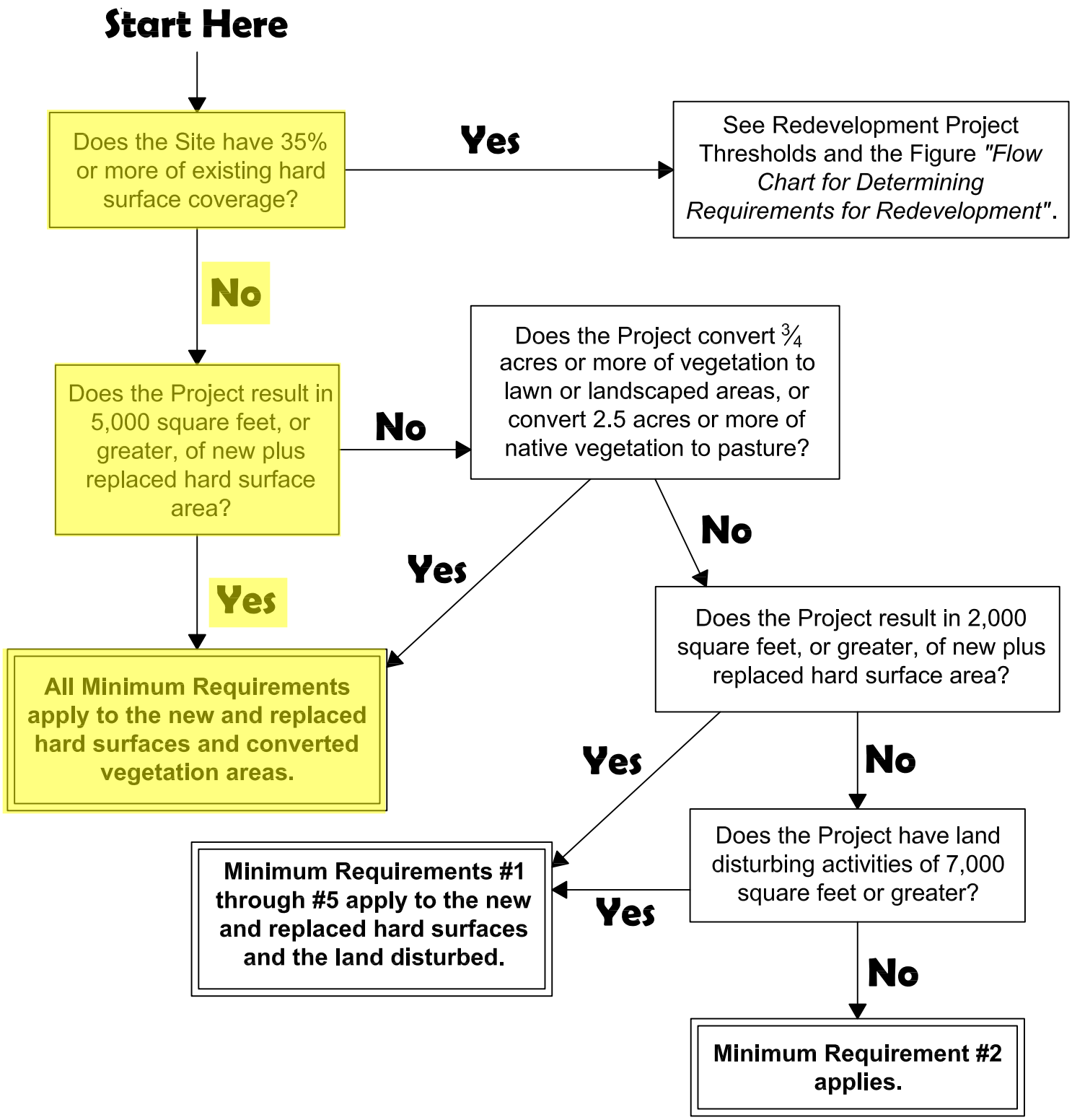
#9 – Operation and Maintenance
An operations and Maintenance Manual is included with this submittal.

APPENDIX A

General Exhibits

VICINITY MAP

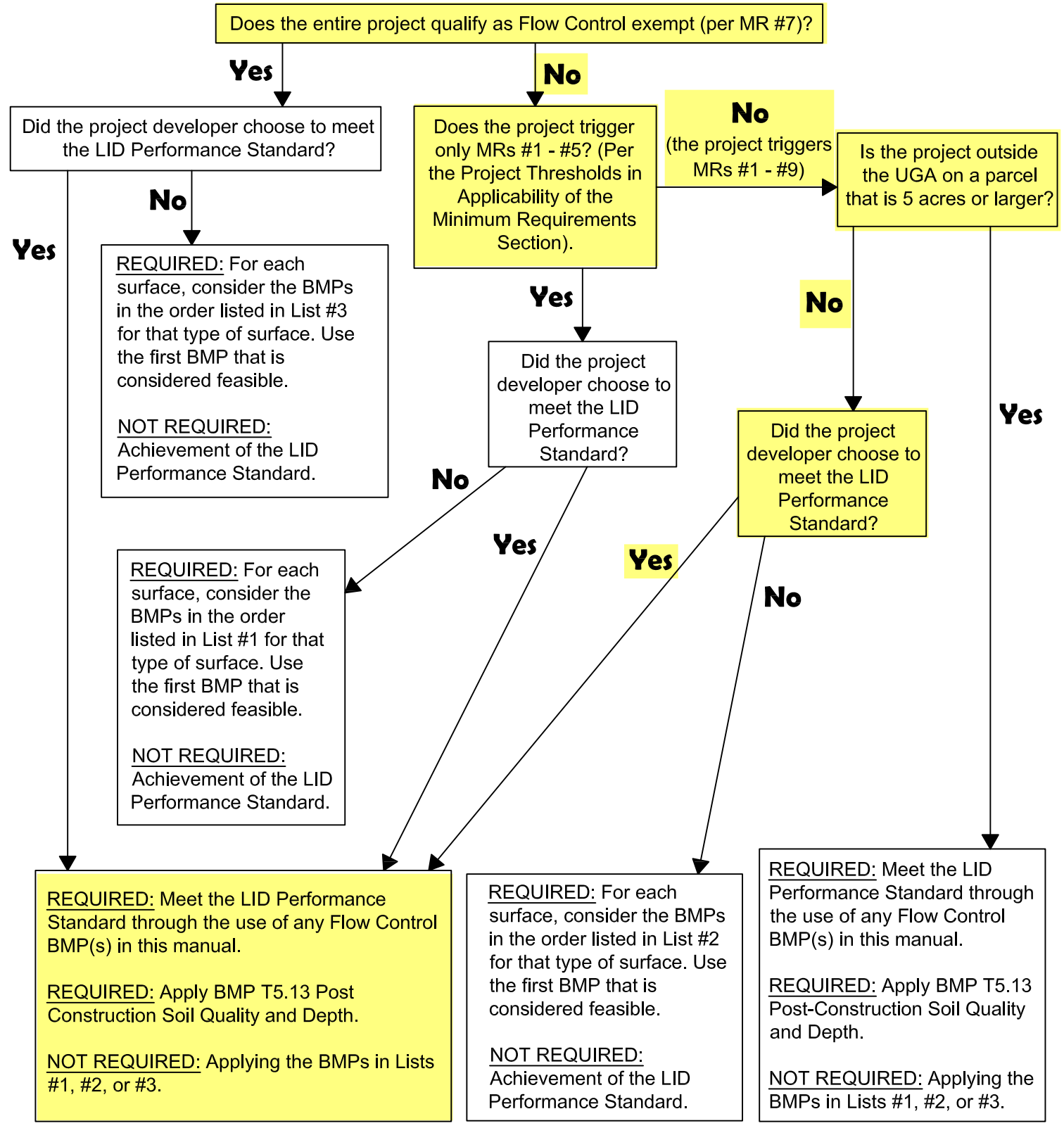
NOT TO SCALE



DEPARTMENT OF ECOLOGY
State of Washington

Flow Chart for Determining Requirements for New Development

Revised March 2019

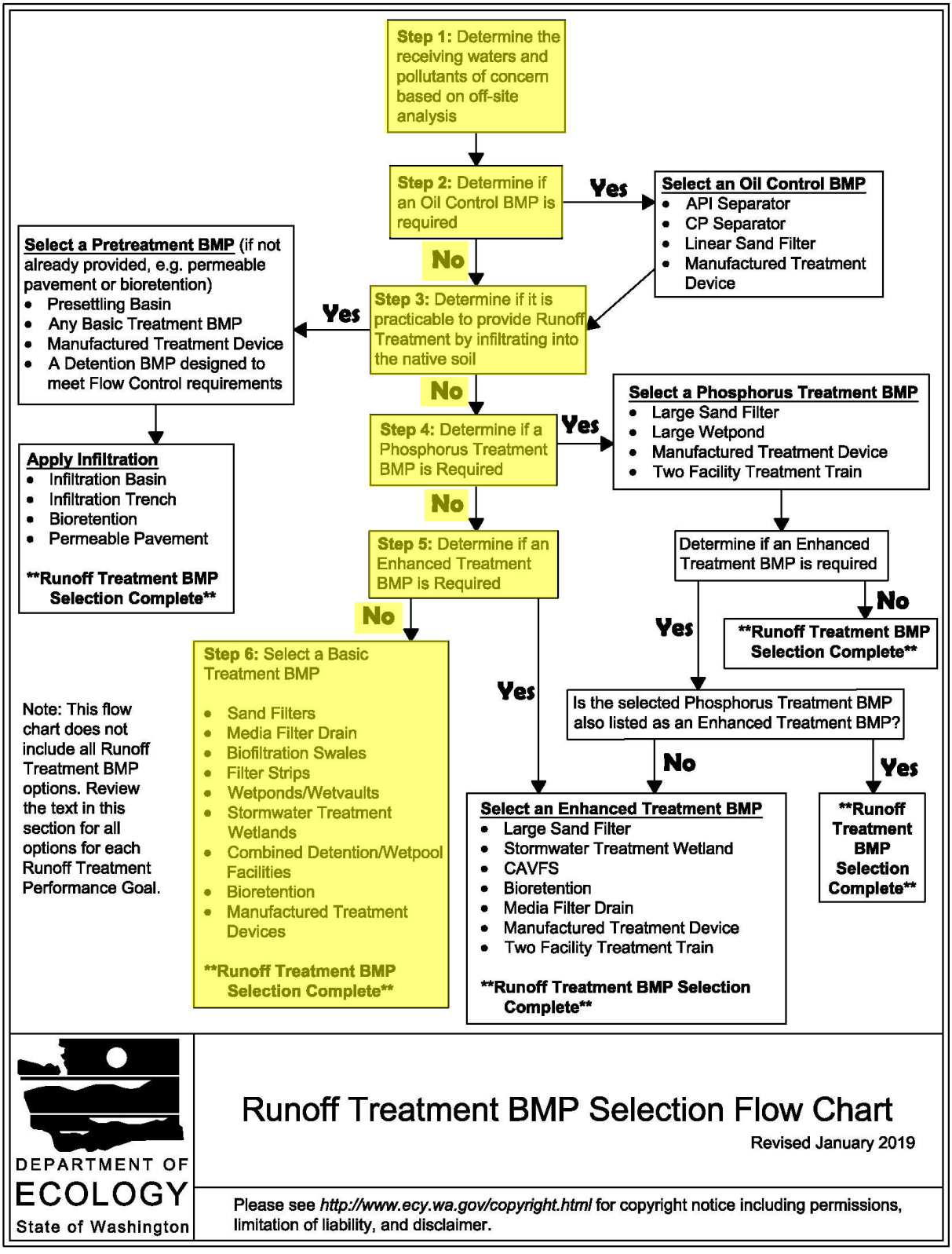


DEPARTMENT OF ECOLOGY
State of Washington

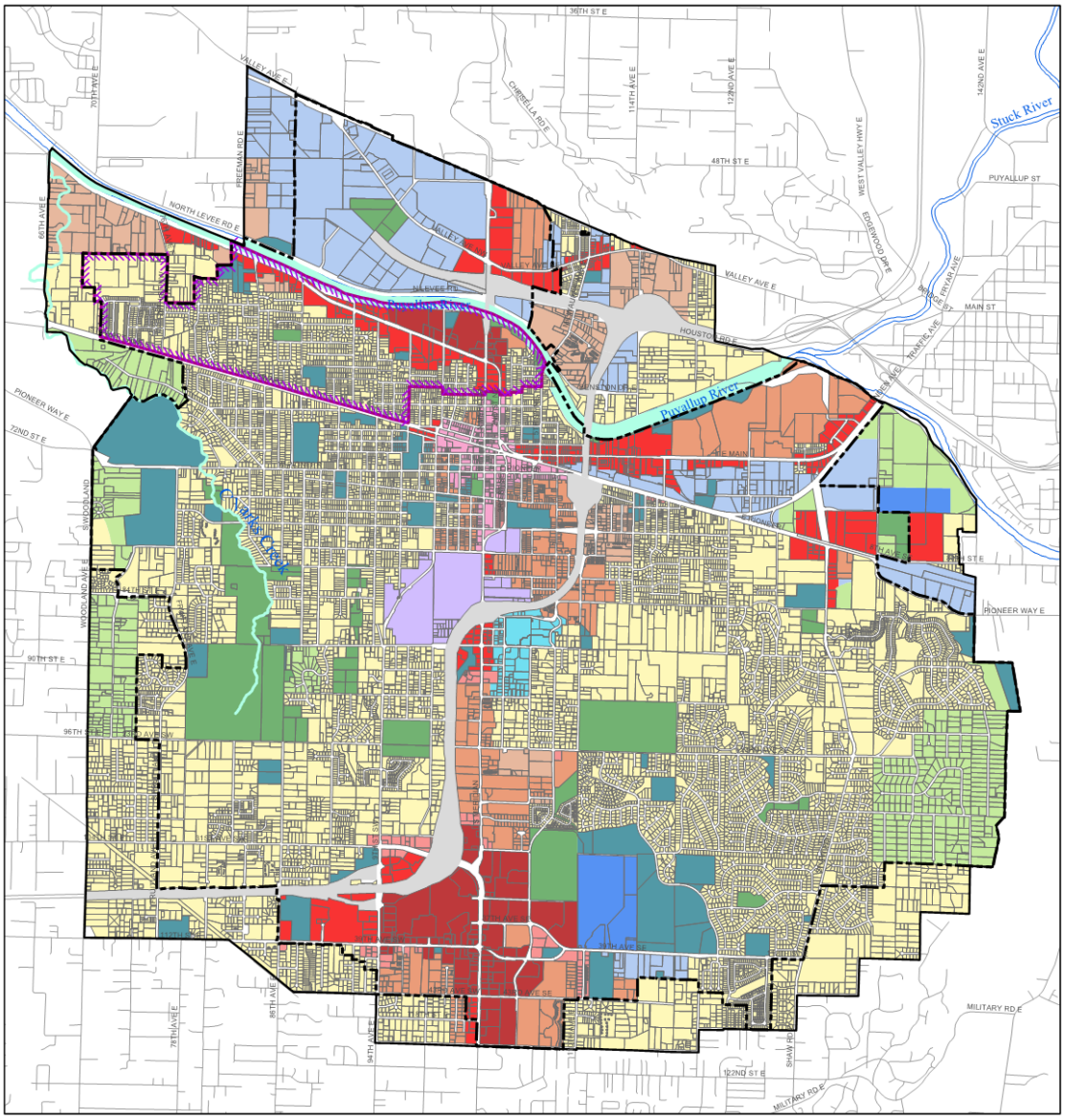
Flow Chart for Determining MR #5 Requirements

Revised March 2019

Figure III-1.1: Runoff Treatment BMP Selection Flow Chart



Map 3-2: City of Puyallup Future Land Use Map



NOTES TO USERS

This map is for use in administering the National Flood Insurance Program. It does not necessarily identify all areas subject to flooding, particularly from local drainage sources of small size. The **community map repository** should be consulted for possible updated or additional flood hazard information.

To obtain more detailed information in areas where **Base Flood Elevations** (BFEs) and/or **floodways** have been determined, users are encouraged to consult the Flood Profiles and Floodway Data and/or Summary of Stillwater Elevations tables contained within the Flood Insurance Study (FIS) Report that accompanies this FIRM. Users should be aware that BFEs shown on the FIRM represent rounded whole-foot elevations. These BFEs are intended for flood insurance rating purposes only and should not be used as the sole source of flood elevation information. Accordingly, flood elevation data presented in the FIS Report should be utilized in conjunction with the FIRM for purposes of construction and/or floodplain management.

Coastal Base Flood Elevations shown on this map apply only landward of 0.0' North American Vertical Datum of 1988 (NAVD 88). Users of this FIRM should be aware that coastal flood elevations are also provided in the Summary of Stillwater Elevations table in the Flood Insurance Study Report for this jurisdiction. Elevations shown in the Summary of Stillwater Elevations table should be used for construction and/or floodplain management purposes when they are higher than the elevations shown on this FIRM.

Boundaries of the **floodways** were computed at cross sections and interpolated between cross sections. The floodways were based on hydraulic considerations with regard to requirements of the National Flood Insurance Program. Floodway widths and other pertinent floodway data are provided in the Flood Insurance Study Report for this jurisdiction.

Certain areas not in Special Flood Hazard Areas may be protected by **flood control structures**. Refer to Section 2.4 "Flood Protection Measures" of the Flood Insurance Study Report for information on flood control structures for this jurisdiction.

The **projection** used in the preparation of this map was Universal Transverse Mercator (UTM) zone 10. The **horizontal datum** was NAD 83, GRS 1980 spheroid. Differences in datum, spheroid, projection or UTM zones used in the production of FIRMs for adjacent jurisdictions may result in slight positional differences in map features across jurisdiction boundaries. These differences do not affect the accuracy of this FIRM.

Flood elevations on this map are referenced to the North American Vertical Datum of 1988. These flood elevations must be compared to structure and ground elevations referenced to the same **vertical datum**. For information regarding conversion between the National Geodetic Vertical Datum of 1929 and the North American Vertical Datum of 1988, visit the National Geodetic Survey website at http://www.ngs.noaa.gov or contact the National Geodetic Survey at the following address:

NGS Information Services
NOAA, N/NGS12
National Geodetic Survey
SSMC-3, #9202
1315 East-West Highway
Silver Spring, Maryland 20910-3282
(301) 713-3242

To obtain current elevation, description, and/or location information for **bench marks** shown on this map, please contact the Information Services Branch of the National Geodetic Survey at **(301) 713- 3242**, or visit its website at http://www.ngs.noaa.gov.

Base map information shown on this FIRM was derived from multiple sources. Base map files were provided in digital format by Pierce County GIS, WA DNR, WSDOT, USFWS, Washington State Department of Ecology, and Puget Sound Regional Council. This information was compiled at scales of 1:1,200 to 1:24,000 during the time period 1996-2012.

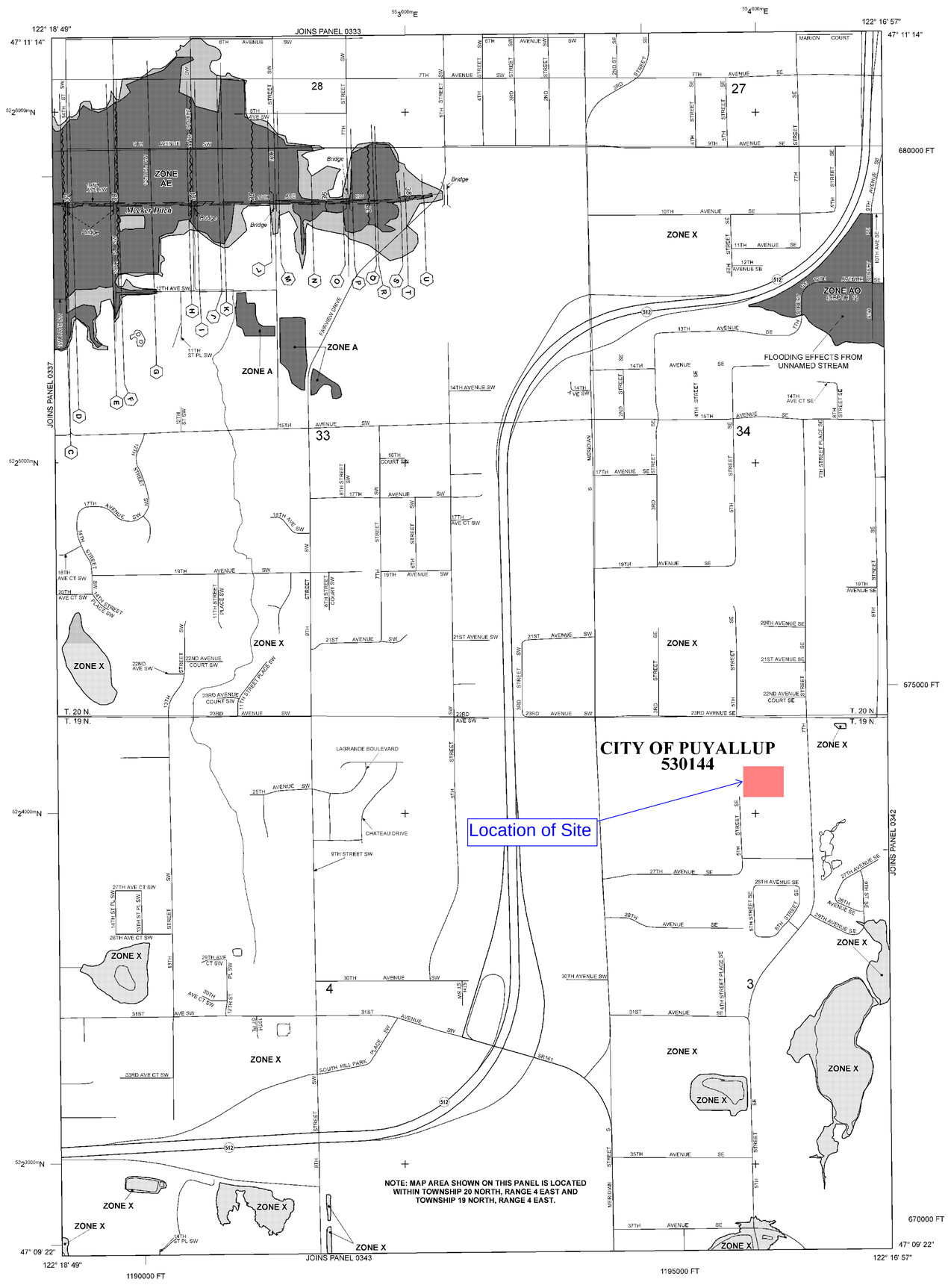
The **profile baselines** depicted on this map represent the hydraulic modeling baselines that match the flood profiles in the FIS report. As a result of improved topographic data, the **profile baseline**, in some cases, may deviate significantly from the channel centerline or appear outside the SFHA.

Corporate limits shown on this map are based on the best data available at the time of publication. Because changes due to annexations or de-annexations may have occurred after this map was published, map users should contact appropriate community officials to verify current corporate limit locations.

Please refer to the separately printed **Map Index** for an overview map of the county showing the layout of map panels; community map repository addresses; and a Listing of Communities table containing National Flood Insurance Program dates for each community as well as a listing of the panels on which each community is located.

For information on available products associated with this FIRM visit the **Map Service Center (MSC)** website at http://msc.fema.gov. Available products may include previously issued Letters of Map Change, a Flood Insurance Study Report, and/or digital versions of this map. Many of these products can be ordered or obtained directly from the MSC website.

If you have **questions about this map,** how to order products, or the National Flood Insurance Program in general, please call the **FEMA Map Information eXchange (FMIX)** at **1-877-FEMA-MAP** (1-877-336-2627) or visit the FEMA website at http://www.fema.gov/business/nfip.



LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

	1% Annual Chance Floodplain Boundary
	0.2% Annual Chance Floodplain Boundary
	Floodway boundary
	Zone D boundary
	CBRS and OPA boundary
	Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.
513	Base Flood Elevation line and value; elevation in feet*
(EL 987)	Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A A	Cross section line
23 23	Transect line
	Culvert
	Bridge
45° 02' 08", 93° 02' 12"	Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere
4989000m N	1000-meter Universal Transverse Mercator grid values, zone 10
DX5510 ×	Bench mark (see explanation in Notes to Users section of this FIRM panel)
M1.5	River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
March 7, 2017

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL

For community map revision history prior to countywide mapping, refer to the Community Map History table located in the Flood Insurance Study report for this jurisdiction.

To determine if flood insurance is available in this community, contact your insurance agent or call the National Flood Insurance Program at 1-800-638-6620.

MAP SCALE 1" = 500'
250 0 500 1000 FEET
150 0 150 300 METERS

NFIP
MAP ACCEPTED FOR PARTICIPATION IN THE NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0341E

FIRM

FLOOD INSURANCE RATE MAP

PIERCE COUNTY, WASHINGTON AND INCORPORATED AREAS

PANEL 341 OF 1375
(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

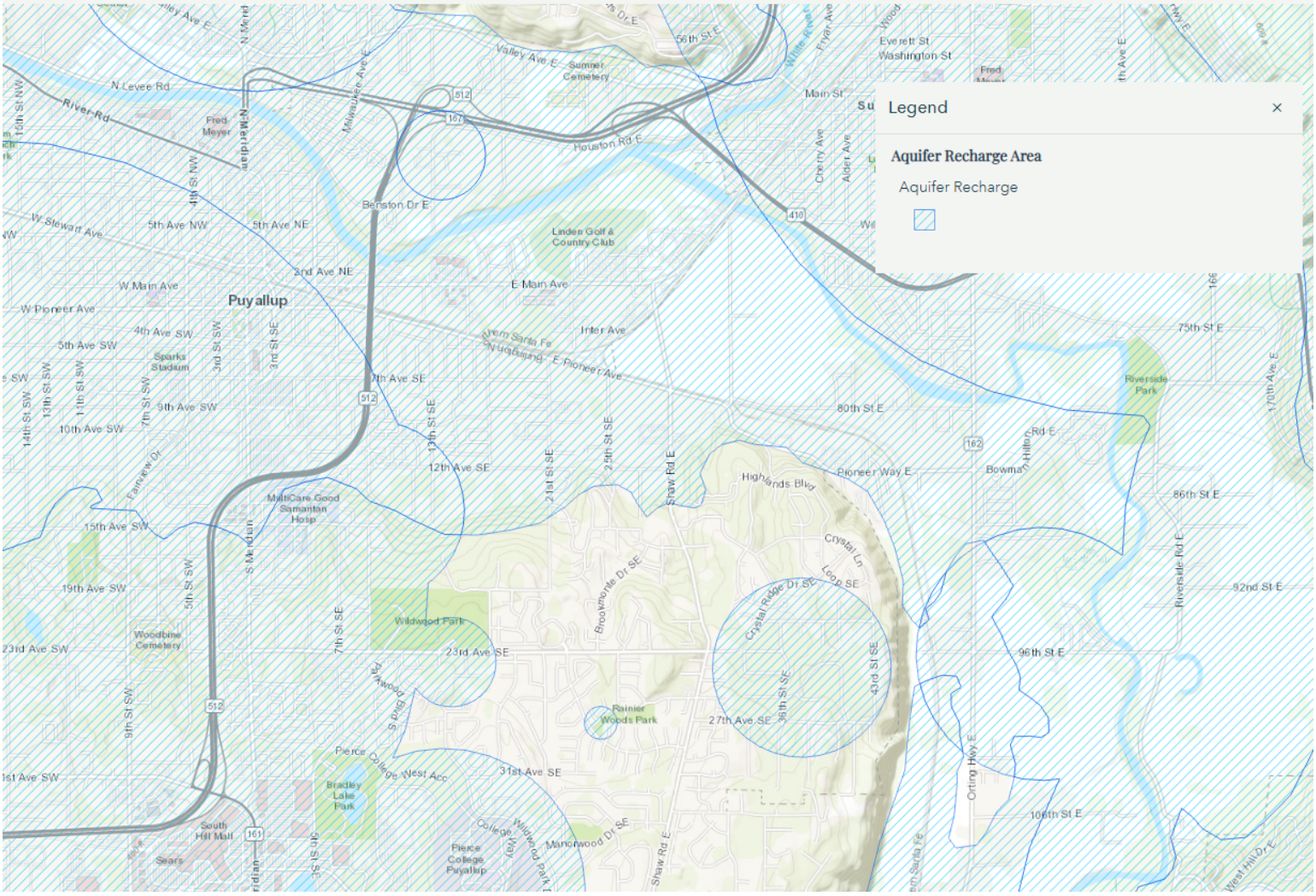
COMMUNITY	NUMBER	PANEL	SUFFIX
PUYALLUP, CITY OF	530144	0341	E

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
53053C0341E
EFFECTIVE DATE
MARCH 7, 2017

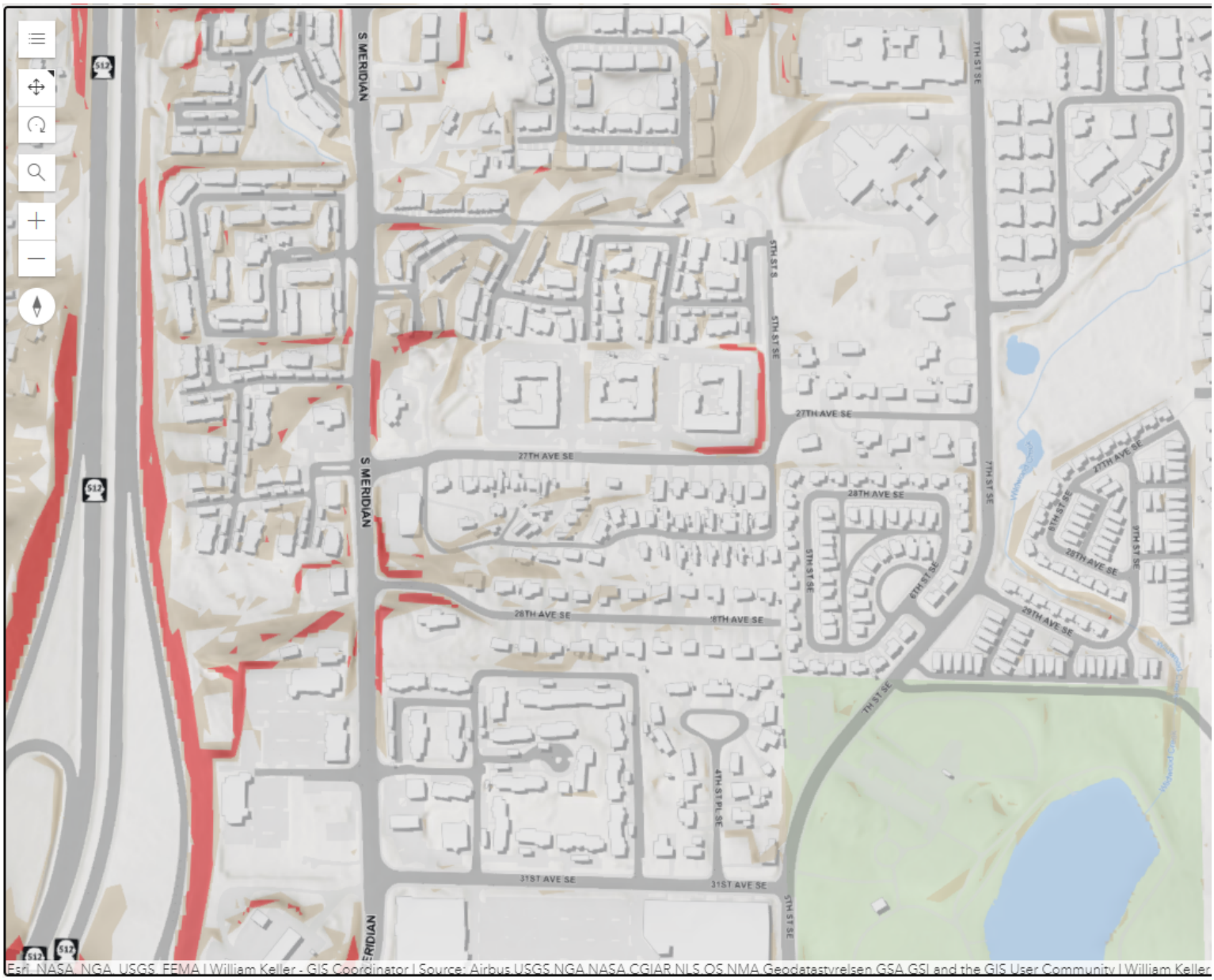
Federal Emergency Management Agency

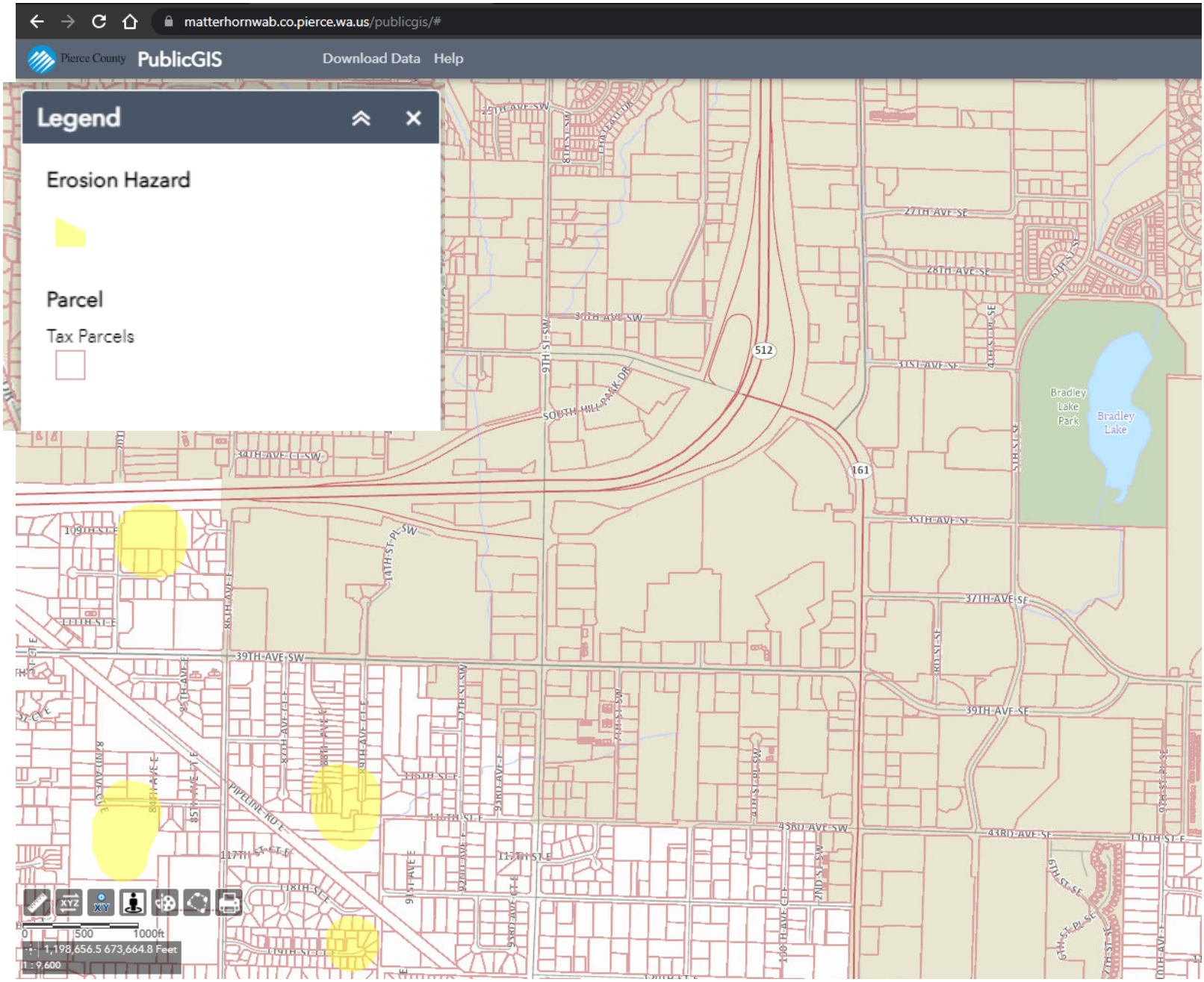
AQUIFER RECHARGE AREA PER CITY OF PUYALLUP CRITICAL AREAS GIS MAP



PUYALLUP
WASHINGTON

Landslide Hazards

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Download Data
Help
Legend
Erosion Hazard
Parcel
Tax Parcels
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Bradley Lake
512
161
39TH AVE SW
39TH AVE SE
37TH AVE SE
35TH AVE SE
31ST AVE SE
27TH AVE SE
28TH AVE SE
43RD AVE SW
43RD AVE SE
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500
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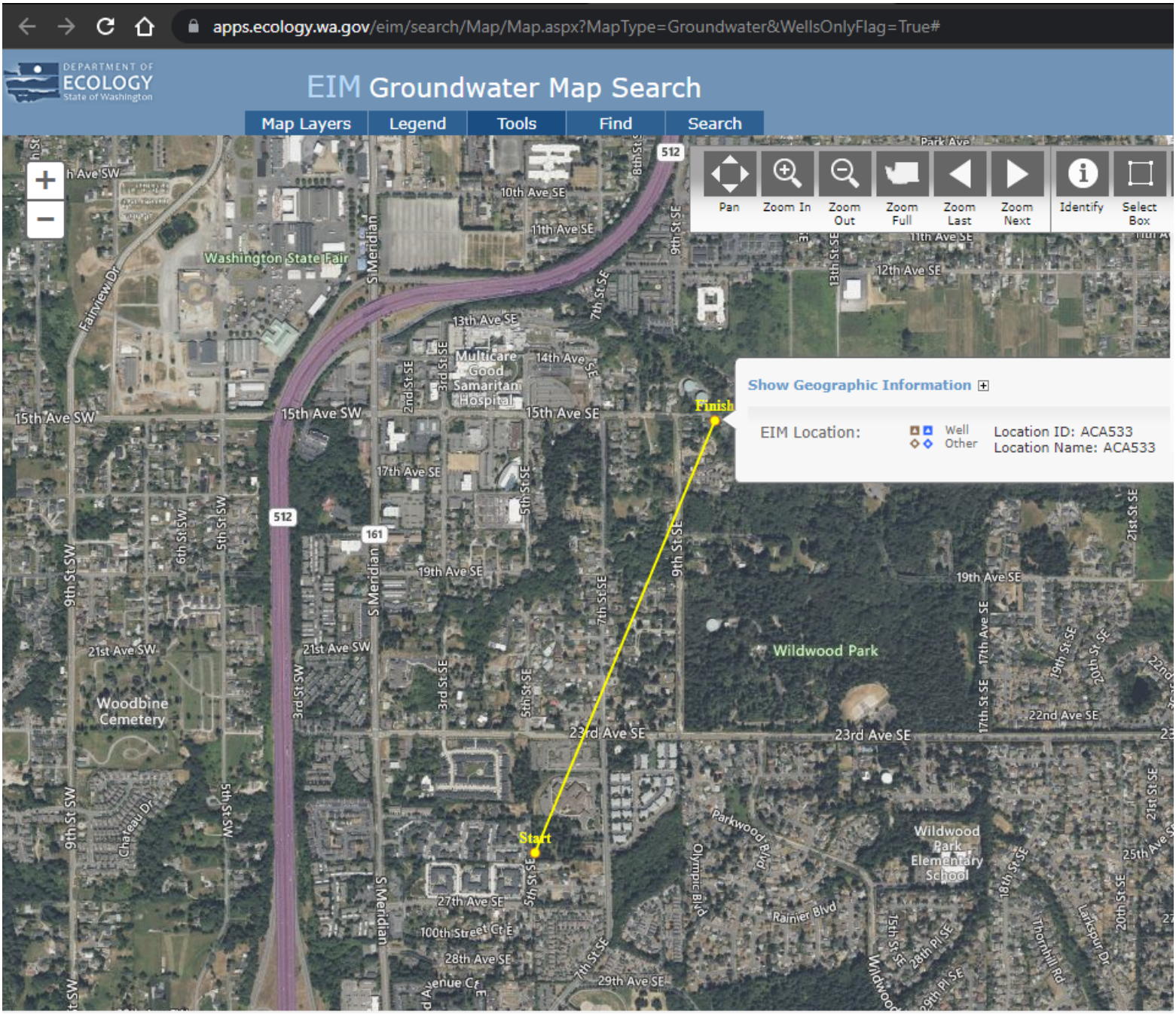
1,198,656.5 673,664.8 Feet
1 : 9,600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DEPARTMENT OF ECOLOGY State of Washington
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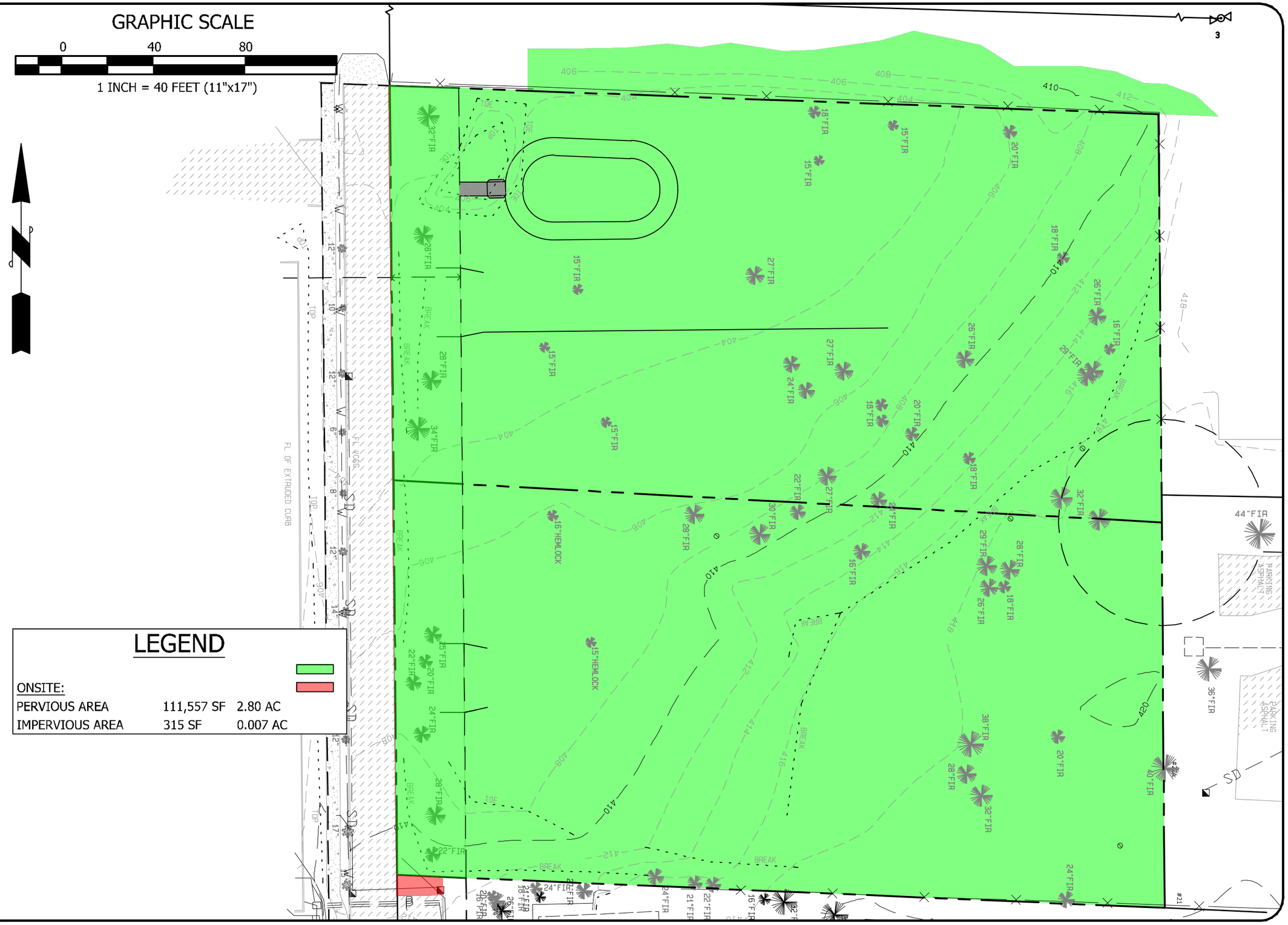
Map Layers
Legend
Tools
Find
Search
Pan
Zoom In
Zoom Out
Zoom Full
Zoom Last
Zoom Next
Identify
Select Box
Show Geographic Information
EIM Location:
Well
Other
Location ID: ACA533
Location Name: ACA533
Finish
Start
Washington State Fair
Multicare Good Samaritan Hospital
Wildwood Park
Woodbine Cemetery
Wildwood Park Elementary School
Fairview Dr
S Meridian
15th Ave SW
15th Ave SE
23rd Ave SE
21st Ave SW
19th Ave SE
17th Ave SE
13th Ave SE
10th Ave SE
11th Ave SE
12th Ave SE
22nd Ave SE
27th Ave SE
28th Ave SE
29th Ave SE
Parkwood Blvd
Olympic Blvd
Rainier Blvd
100th Street Ct E
512
161
9th St SW
6th St SW
5th St SW
3rd St SW
2nd St SE
3rd St SE
5th St SE
7th St SE
9th St SE
13th St SE
14th Ave SE
17th St SE
19th St SE
20th St SE
21st St SE
18th St SE
15th St SE
28th Pl SE
29th Pl SE
Thornhill Rd
Larkspur Dr
Chateau Dr

GRAPHIC SCALE

0 40 80

1 INCH = 40 FEET (11"x17")



LEGEND

ONSITE:		
PERVIOUS AREA	111,557 SF	2.80 AC
IMPERVIOUS AREA	315 SF	0.007 AC

CONTOUR ENGINEERING · LLC
CIVIL ENGINEERS~SURVEYORS~LAND PLANNERS
P.O. Box 949, Gig Harbor, WA 98335
Phone: 253-857-5454 ~ Fax: 253-509-0044 ~ info@contourpllc.com

PRE-DEVELOPED BASIN MAP

BRADBURY PLACE APARTMENTS
PUYALLUP, WA

BY:	R. HENRETTA
PROJECT:	20-223
DATE:	2024.06.06
EXHIBIT NO.	1

GRAPHIC SCALE

0 40 80

1 INCH = 40 FEET (11"x17")

LEGEND

ONSITE TRIBUTARY TO POND:			
PERVIOUS AREA	38,578 SF	0.89 AC	
IMPERVIOUS AREA			
ROOF AREA	26,553 SF	0.61 AC	
PGHS AREA	33,551 SF	0.77 AC	
POND AREA	2,898 SF	0.07 AC	
ONSITE TRIBUTARY TO TRENCH:			
PERVIOUS AREA	7,018 SF	0.16 AC	
IMPERVIOUS AREA (PGHS)	3,040 SF	0.07 AC	
OFFSITE:			
PERVIOUS AREA	1,342 SF	0.03 AC	
IMPERVIOUS AREA (PGHS)	9,297 SF	0.21 AC	
REPLACED PGHS	7,510 SF	0.17 AC	SAWCUT

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Phone: 253-857-5454 ~ Fax: 253-509-0044 ~ info@contourpllc.com

DEVELOPED BASIN MAP

BRADBURY PLACE APARTMENTS
PUYALLUP, WA

BY: R. HENRETTA
PROJECT: 20-223
DATE: 2024.06.06
EXHIBIT NO. 2

GRAPHIC SCALE

0 40 80

1 INCH = 40 FEET (11"x17")

INFILTRATION POND

SFCB#40
STORMFILTER

SDMH#25
BAYFILTER 522

SDCB#10
BAYFILTER 522

BASIN #1

BASIN #2

BASIN #3

BASIN #4

BASIN #5

BASIN #4 AND #5 ARE ONSITE AREAS TO BE INCLUDED IN BASIN #1 AND #2 WQ CALCULATIONS, RESPECTIVELY, BUT ARE TO BE ROUTED TO SFCB#40 AND INCLUDED IN BASIN #3 CALCULATIONS ALSO

ROOF AND YARD RUNOFF ROUTED DIRECTLY TO INFIL POND (TYP)

LEGEND

BASIN #1:		
PERVIOUS AREA	5,228 SF	0.12 AC
IMPERVIOUS AREA	19,314 SF	0.44 AC
BASIN #2:		
PERVIOUS AREA	5,592 SF	0.13 AC
IMPERVIOUS AREA	14,237 SF	0.33 AC
BASIN #3:		
PERVIOUS AREA	1,343 SF	0.03 AC
IMPERVIOUS AREA	9,297 SF	0.21 AC
BASIN #4		
PERVIOUS AREA	3,721 SF	0.09 AC
IMPERVIOUS AREA	1,427 SF	0.03 AC
BASIN#5		
PERVIOUS AREA	3,579 SF	0.08 AC
IMPERVIOUS AREA	1,613 SF	0.04 AC

FOR WWHM CALCS :

POC 1	BASIN 1+4	0.0414 CFS
POC 2	BASIN 2+5	0.0326 CFS
POC 3	BASIN 3+4+5	0.0247 CFS

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Phone: 253-857-5454 ~ Fax: 253-509-0044 ~ info@contourpllc.com

WATER QUALITY BASIN MAP

BRADBURY PLACE APARTMENTS
PUYALLUP, WA

BY:	R. HENRETTA
PROJECT:	20-223
DATE:	2024.06.06
EXHIBIT NO.	3

APPENDIX B

Plans Exhibits

Appendix C

Geotech Report

GEORESOURCES
earth science & geotechnical engineering
5007 Pacific Hwy E., Suite 16 | Fife, WA 98424 | 253.896.1011 | www.georesources.rocks

May 24, 2019

Eagle Works LLC
2504 – 43rd Street East
Puyallup, WA 98374
rick@harvestrealtyinc.com

Soils Report: Infiltration Feasibility
Proposed Multi-Family Development
xxx – 5th Street Southeast
Puyallup, Washington
PN: 0419036002, -6003
Doc ID: EagleWorksLLC.5thStreetSE.SR

INTRODUCTION

This soils report addresses the feasibility of the site soils to support the infiltration of stormwater runoff generated by the proposed residential development to be constructed at xxx – 5th Street in the City of Puyallup located in Pierce County, Washington. The general site location is shown on the Site Location Map, Figure 1.

Our understanding of the project is based on our conversations with you, our review of available published geologic literature for the site area, our March 13, 2019 site visit and subsurface explorations, our understanding of City of Puyallup development requirements, and our experience in the area. We understand that the site is currently undeveloped and that you propose to construct a 46-unit multi-family apartment complex at the site that likely would include driveways, parking lots and associated utilities. A site plan was not provided to us at the time of this report.

Because of the proposed amount of new hard surface, the City of Puyallup is requiring that a site-specific soils report be prepared in accordance with the 2012 Stormwater Management Manual for Western Washington (SWMMWW) with the 2014 Amendments.

SCOPE

The purpose of our services was to evaluate the surface and subsurface conditions at the site as a basis for providing our opinion on the feasibility of infiltration for the proposed development in order to satisfy the City of Puyallup requirements. Specifically, our scope of services for the project included the following:

1. Conducting a geologic reconnaissance of the site area;
2. Reviewing the available geotechnical, geologic and hydrogeologic data for the site area;
3. Observing the excavation of 9 test pit explorations, and sampling the observed soils for subsequent laboratory testing, as deemed necessary;
4. Performing up to 2 grain size analysis on representative select soil samples from the explorations;
5. Determining a preliminary infiltration rate based on the grain size analysis, if appropriate;

6. Preparing this *Soils Report* summarizing our site observations and conclusions, along with the supporting data.

The above scope of work was completed in accordance with our *Proposal for Services* dated March 13, 2019. We received notice to proceed on the same day.

Site Conditions

As stated, the site is located at xxx – 5th Street Southeast in the City of Puyallup of Pierce County, Washington, within an area of existing residential and commercial development. The site consists of two parcels that when combined are generally rectangular in shape, measures about 340 feet deep (north to south) by 330 feet wide (east to west) and encompasses about 2.68 acres. The site is bounded by an office building to the north, a parking lot and office building to the east, an apartment complex to the west, and residential development to the south. As previously stated, the site is currently undeveloped.

The site is located on the north margin of the Puyallup-South Hill glacial upland area. Based on information obtained from Pierce County PublicGIS and our site observations, the site slopes up towards the southeast, generally getting steeper towards the southeast portion. The northwest to southwest portion of the site is flat to gently sloping up towards the southeast at less than 3 percent. The slopes in the southeastern portion slope up at a steeper inclination of 10 to 14 percent before transitioning to about 4 to 6 percent in the southeastern corner. The total topographic relief across the parcel is on the order of about 15 feet. The existing site configuration and topography is shown on the Site and Exploration Map, Figure 2.

Vegetation at the site consists of immature growth forestland, primarily maple to douglas fir trees with an understory of blackberries, ferns, and smaller saplings. No surface erosion, seeps, springs, or evidence of slope instability was observed at the time of our site visit.

Site Soils

The USDA Natural Resource Conservation Service (NRCS) Web Soil Survey maps the site and surrounding areas as being underlain by Everett very gravelly sandy loam (13B) soils. The Everett soils are derived from sandy and gravelly glacial outwash and are included in hydrologic soils group A. The 13B soil type forms on slopes of 0 to 8 percent and have a "slight" erosion hazard when exposed. Our subsurface explorations generally confirm the NRCS map for the site. A copy of the NRCS Soil Survey Map for the site and surrounding area is included as Figure 3.

Geologic Conditions

The draft *Geologic Map of the Puyallup 7.5-Minute Quadrangle, Washington* (Troost et Al.) maps the site as being underlain by recessional outwash ($Qvsb_4$). These glacial outwash soils were generally deposited during the Vashon stage of the Fraser Glaciation, some 12,000 to 15,000 years ago. The recessional deposits typically consist of a poorly-sorted, lightly-stratified mixture of sand and gravel that may locally contain silt and clay that were deposited by meltwater streams issuing from the retreating ice mass. The $Qvsb_4$ deposits are part of the Bradley Channel, a subunit of Steilacoom gravel, outwash flood channel deposits. The recessional outwash is considered to be normally consolidated and generally exhibits moderate strength and compressibility characteristics where undisturbed. An excerpt of the above referenced geologic map is included as Figure 4.

Subsurface Explorations

On March 13, 2019, a representative from GeoResources, LLC (GeoResources) visited the site and observed two groundwater monitoring ports and seven previously excavated test pits to depths of approximately 5 to 10 feet below the existing ground surface, logged the subsurface conditions encountered in each test pit, and obtained representative soil samples. The test pits and the groundwater monitoring ports were excavated by a licensed operator on a small track-mounted excavator working for you. Table 1, below, summarizes the approximate locations, surface elevations, and termination depths of the test pits and groundwater monitoring ports.

TABLE 1:
APPROXIMATE LOCATIONS, ELEVATIONS, AND DEPTHS OF EXPLORATIONS

Test Pit/ Monitoring Port Number	Functional Location	Surface Elevation[1] (feet)	Termination Depth (feet)	Termination Elevation (feet)
MP-1	Northwestern portion of site	410	10	400
MP-2	Northwestern portion of site	410	10	400
TP-1	Northeastern portion of site	410	5	405
TP-2	Middle of site	410	5	405
TP-3	Northwestern portion of site	410	5	405
TP-4	North central portion of site	410	5	410
TP-5	Northeast portion of site	415	5	410
TP-6	Northeast portion of site	415	5	410
TP-7	Southeast portion of site	418	5	413

Notes:
Elevation datum: Pierce County GIS (NAVD 88)

The specific number, locations, and depths of the explorations were selected by you. Representative soil samples obtained from the test pits and groundwater monitoring ports were placed in sealed plastic bags and then taken to a laboratory for further examination and testing as deemed necessary.

The subsurface explorations excavated as part of this evaluation indicate the subsurface conditions at specific locations only, as actual subsurface conditions can vary across the site. Furthermore, the nature and extent of such variation would not become evident until additional explorations are performed or until construction activities have begun.

The approximate locations and numbers of our test pits are shown on the attached Site and Exploration Map, Figure 2. The soils encountered were visually classified in general accordance with the Unified Soil Classification System (USCS) and ASTM D: 2488. The USCS is included in Appendix A as Figure A-1, while the descriptive logs of our test pits are included as Figure A-2 through A-6.

Subsurface Conditions

Our test pits and the monitoring ports encountered relatively uniform subsurface conditions that generally confirmed the mapped stratigraphy at the site. Our test pit explorations encountered

0.3 to 2 feet of gravelly black topsoil over 0.8 to 4 feet of reddish-brown to gray, poorly to well-graded gravel with variable amounts of sand and cobbles, that appeared to be in a medium dense, moist condition. We interpret these surficial soils as recessional glacial outwash deposits. At depths of 2.5 to 5 feet in monitoring ports MP-1, MP-2, test pits TP-1, TP-5, TP-6, and TP-7, a dense to very grey silty sand with gravel and cobbles that appeared consistent with glacial till was encountered underlying the shallow recessional outwash. Although not encountered in all test pit explorations, we anticipate the glacial till underlies the outwash deposits across the site. It also appears that the glacial till is encountered at shallower depths towards the upslope, southeast direction.

Monitoring Port MP-1, test pit TP-1, and TP-2 encountered about 0.5 to 1.7 feet of reddish-brown sandy silt with gravel that we interpret to be undocumented fill. The fill was generally encountered in the central portion of the site. The soils appeared to be in a loose, moist condition. Table 2, below, summarizes the approximate thicknesses, depths, and elevations of selected soil layers.

TABLE 2:
APPROXIMATE THICKNESS, DEPTHS, AND ELEVATION OF SOIL TYPES ENCOUNTERED IN EXPLORATIONS

Exploration Number	Thickness of Topsoil (feet)	Thickness of Recessional Outwash (feet)	Thickness of Weathered Glacial Till (feet)	Depth to Undisturbed Glacial Till (feet)	Elevation of Undisturbed Glacial Till (feet)
MP-1	2	3	N/E	5	405
MP-2	½	3½	N/E	5	405
TP-1	¼	1½	N/E	3½	406½
TP-2	½	3½	N/E	N/E	N/E
TP-3	½	4½	N/E	N/E	N/E
TP-4	1	4	N/E	N/E	N/E
TP-5	1	1½	N/E	2½	412½
TP-6	½	¾	N/E	1¼	413¾
TP-7	½	1½	N/E	2	416

Groundwater Conditions

We observed mottling in the lower portion of the shallow recessional outwash deposits, and significant mottling of the upper portion of the glacial till deposits. Mottling is generally indicative of a seasonal or fluctuating high perched groundwater table that typically develops when the vertical infiltration of precipitation through a more permeable soil is slowed at depth by a deeper, denser, less permeable soil type, such as glacial till. We anticipate fluctuations in the local groundwater levels will occur in response to precipitation patterns, off-site construction activities, and site utilization. Table 3 summarizes the approximate depths and elevations of groundwater and mottling observed at the time of our explorations.

TABLE 3:
APPROXIMATE DEPTHS, AND ELEVATION OF GROUNDWATER ENCOUNTERED IN EXPLORATIONS

Exploration Number	Depth to Mottling (feet)	Depth to Groundwater (feet)	Elevation of Groundwater (feet)	Dated Encountered
MP-1	5	N/E	N/E	ATD (5/11/2019)
MP-2	5	N/E	N/E	ATD (5/11/2019)
TP-1	3½	N/E	N/E	ATD (5/11/2019)
TP-2	4	N/E	N/E	ATD (5/11/2019)
TP-3	N/E	N/E	N/E	ATD (5/11/2019)
TP-4	N/E	N/E	N/E	ATD (5/11/2019)
TP-5	1	N/E	N/E	ATD (5/11/2019)
TP-6	½	N/E	N/E	ATD (5/11/2019)
TP-7	½	N/E	N/E	ATD (5/11/2019)

Notes: Elevation datum: Pierce County GIS data N/E: Not encountered
ATD = At time of drilling/digging

Laboratory Testing

Geotechnical laboratory tests were performed on select samples retrieved from the test pits to determine soil index and engineering properties encountered. Laboratory testing included visual soil classification per ASTM D: 2488 and grain size analyses per ASTM D: 422 standard procedures. The results of the laboratory tests are included in Appendix B.

CONCLUSIONS AND RECOMMENDATIONS

Based on the results of our site reconnaissance, subsurface explorations and laboratory test results, the use of downspout infiltration, bioretention, or permeable pavement BMP's to address stormwater runoff and flow control generated by the proposed development is feasible, provided adequate separation from the underlying glacial till and seasonal high groundwater can be maintained. The deeper glacial till (hardpan) underlying the site at depth will not support infiltration.

Downspout Infiltration

Based on our site observations and subsurface explorations, it is our opinion that stormwater infiltration via a trench type system is feasible within the northwestern and southwestern portions of the site. Per the Volume 3.1.1 of the 2012 SWMMWW, downspout infiltration is considered feasible on lots or sites if 3 feet or more of permeable soil from the proposed final grade to the seasonal high ground water table exists and at least 1 foot of clearance from the expected bottom elevation of the infiltration trench or dry well to the seasonal high ground water table can be met. Given that a typical downspout trench depth is 2 feet below the existing ground surface, the minimum separation between the bottom of the infiltration facility and seasonal high groundwater or impermeable layer can be met in the northwest to southwest portions; therefore, onsite infiltration of stormwater is feasible in the

northwest to southwest portions. A basin type system may be feasible within the northwestern to southwestern portions with a mounding analysis. Per Volume 3.3.7 of the 2012 SWMMWW, basins require 5 feet of separate, or 3 feet with a mounding analysis. As stated previously, glacial till was encountered at 5 feet below existing grade in the northwestern portion of the site. Based on the subsurface conditions encountered in the vicinity of the test pits TP-5, TP-6 and TP-7, the minimum separation requirements cannot be met. We recommend alternative stormwater management options such as dispersion be considered in the northeast to southeast portions.

All appropriate and pertinent setback criteria per the 2012 SWMMWW should be considered prior to the selection of a stormwater management BMP.

Permeable Pavement

Per Volume V BMP T5.15, permeable pavement is not feasible if seasonal high ground water or an underlying impermeable/low permeable layer would create saturated conditions within 1-foot of the bottom of the storage course. The granular nature of the upper surficial soils in the northwestern and southwestern portion allow for the support of permeable pavement.

Soil Grain Size Analysis Method

Since the soils are part of the Steilacoom Gravel, the use of the Grain Size method per the 2012 SWMMWW, Volume III 3.3.6 used by the City of Puyallup may be used to determine infiltration rates.

Based on our grain size analysis and in accordance with the 2012 SWMMWW, we recommend a long-term design infiltration rate of 7 inches per hour be used to design infiltration facilities in the upper gravelly soils where infiltration is feasible. Appropriate correction factors for test method and plugging have been applied to these values, but the project civil engineer should include a correction factor for geometry.

We recommend that a representative from our firm be onsite at the time of excavation of the proposed infiltration facilities to verify that the soils encountered during construction are consistent with the soils observed in our subsurface explorations, and if the vertical separation requirements could be met. In-situ infiltration testing should also be performed at the time of construction to verify the recommended infiltration rate per the 2012 SWMMWW.

Appropriate design, construction and maintenance measures will be required to ensure the infiltration rate can be effectively maintained over time. It should be noted that special care is required during the grading and construction periods to avoid fine sediment contamination of the infiltration system. This may be accomplished by using an alternative storm water management location during construction or leaving the bottom of the systems 1 to 2 feet high, and subsequently excavating to the finished grade once the driveways are paved and landscaping is installed. All contractors working on the site (builders and subcontractors) should be advised to avoid “dirty” stormwater flowing to the site’s stormwater system during construction and landscaping. No concrete trucks should be washed or cleaned on-site.

Suspended solids could clog the underlying soil and reduce the infiltration rate. To reduce potential clogging of the infiltration systems, the infiltration system should not be connected to the stormwater runoff system until after construction is complete and the site area is landscaped, paved or otherwise protected. Temporary systems may be utilized through construction. Periodic sweeping of the paved areas will help extend the life of the infiltration system.

All proposed infiltration facilities should be designed and constructed in accordance with the 2012 SWMMWW. All minimum separation, setback requirements and infeasibility criteria per 2012 SWMMWW should be considered prior to the selection, design and location of any stormwater facility for the proposed development.

LIMITATIONS

We have prepared this report for use by Eagle Works LLC and other members of the design team for use in the design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on our subsurface explorations, data from others and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. Our recommendations are not intended to direct the contractor's methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design.

If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

◆ ◆ ◆

We have appreciated the opportunity to be of service to you on this project. If you have any questions or comments, please do not hesitate to call at your earliest convenience.

Respectfully submitted,
GeoResources, LLC

Erik Fina, GIT
Staff Geologist in Training

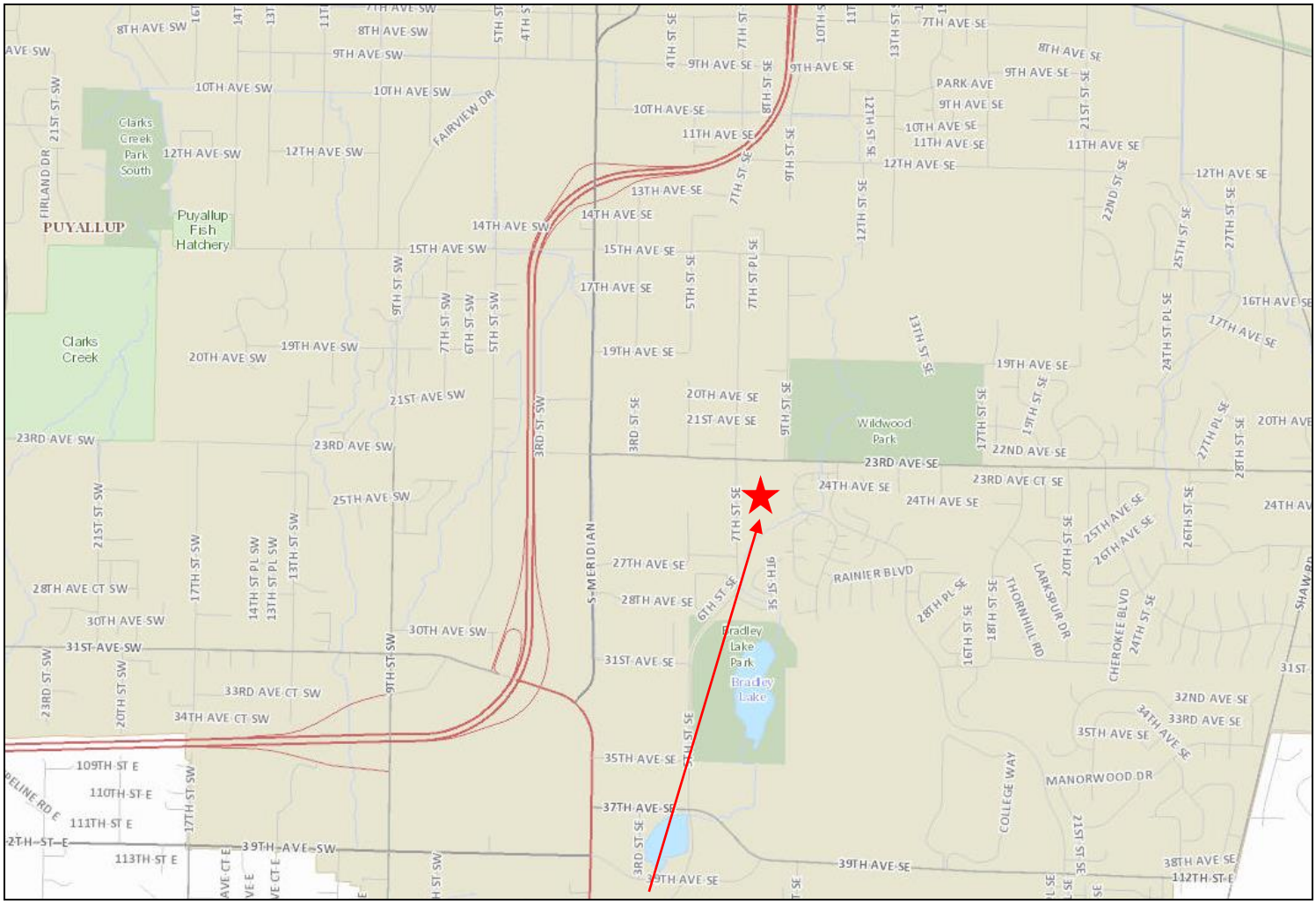
State of Washington
Engineering Geologist
925
Licensed Geologist
5/24/2019
KEITH SCOTT SCHEMBS

Keith S. Schembs, LEG
Principal

NEIL ANDREW FERGUSON
STATE OF WASHINGTON
56951
REGISTERED
PROFESSIONAL ENGINEER
5/24/2019

Neil A. Ferguson, PE
Project Engineer

EJF:KSS:NAF/ejf
Doc ID: EagleWorksLLC.5thStSE.SR
Attachments:
Figure 1: Site Location Map
Figure 2: Site and Exploration Map
Figure 3: NRCS Soils Map
Figure 4: USGS Geologic Map
Appendix A: Subsurface Explorations
Appendix B: Laboratory Results



Approximate Site Location

Map created from Pierce County Public GIS (https://matterhornwab.co.pierce.wa.us/publicgis/)

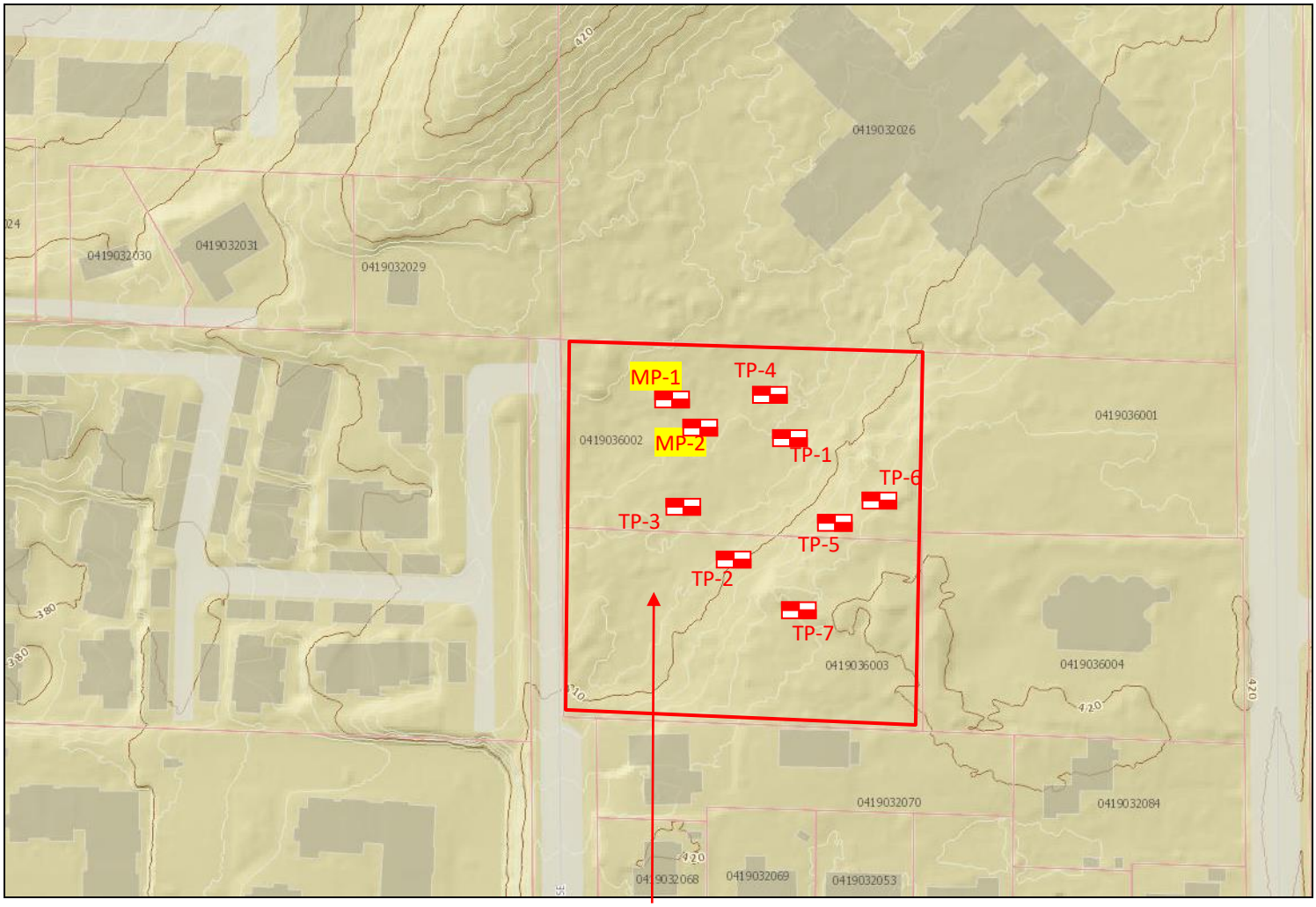
Not to Scale

GEORESOURCES
earth science & geotechnical engineering
5007 Pacific Hwy E., Suite 16 | Fife, WA 98424 | 253.896.1011 | www.georesources.rocks

Site Location Map

Proposed Single Family Residence
xxx – 5th Street Southeast
Puyallup, WA
PN: 041903-6002, -6003

DocID: EagleWorksLLC.5thStSE	May 2019	Figure 1



Approximate Site Location

Map created from Pierce County Public GIS (https://matterhornwab.co.pierce.wa.us/publicgis/)

Approximate location and number of test pit

N W E S

Not to Scale

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Site & Exploration Map

Proposed Single Family Residence
xxx – 5th Street Southeast
Puyallup, WA
PN: 041903-6002, -6003

DocID: EagleWorksLLC.5thStSE	May 2019	Figure 2

Approximate Site Location

Map created from Web Soil Survey (http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx)

Soil Type	Soil Name	Parent Material	Slopes (%)	Erosion Hazard	Hydrologic Soils Group
13B	Everett very gravelly sandy loam	Sandy and gravelly glacial outwash	0 to 8	Slight	A
13C			8 to 15	Slight to Moderate	
20B	Kitsap silt loam	Glaciolacustrine deposits	2 to 8	Slight	C/D

N W E S

Not to Scale

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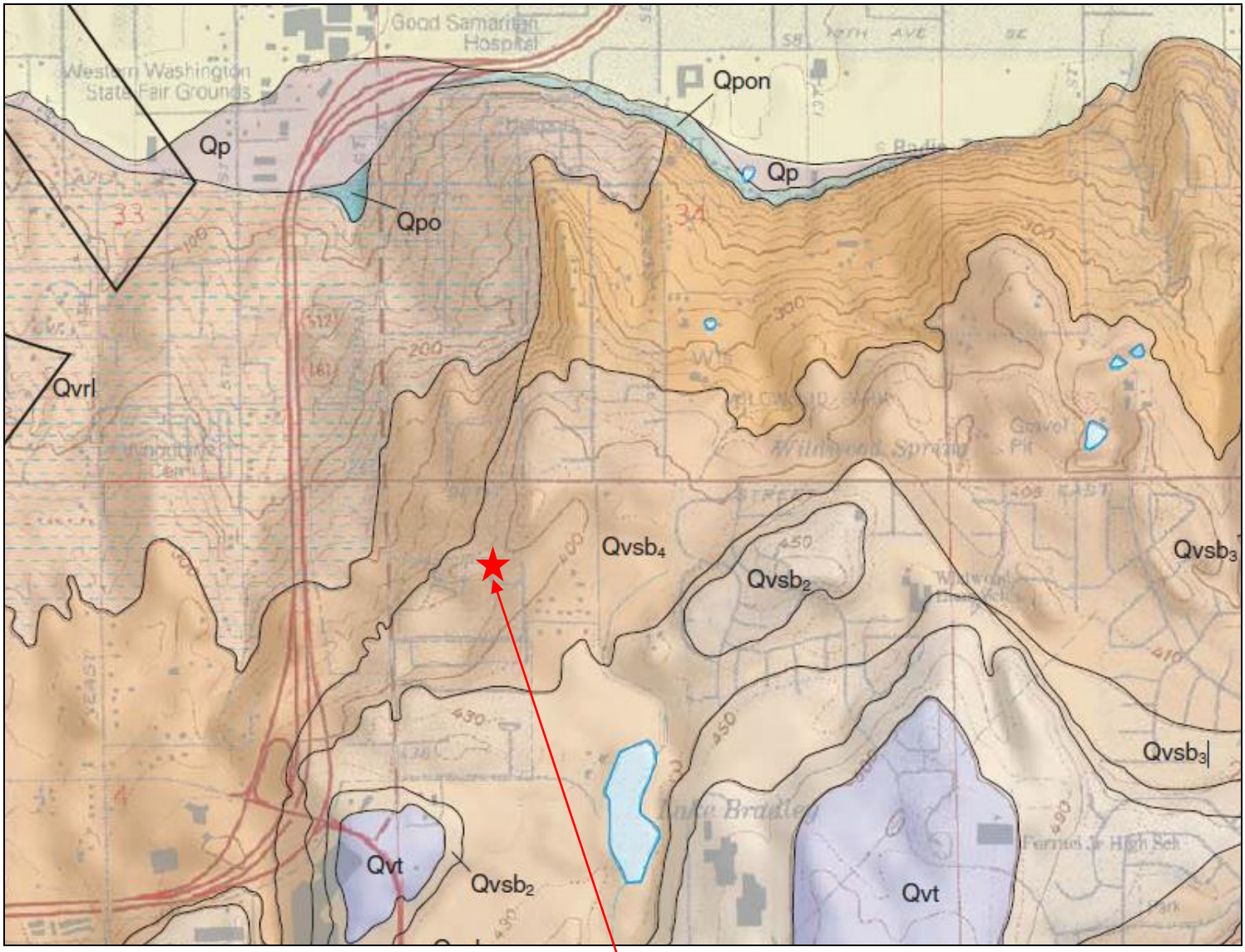
NRCS Soils Map

Proposed Single Family Residence
xxx – 5th Street Southeast
Puyallup, WA
PN: 041903-6002, -6003

DocID: EagleWorksLLC.5thStSE	May 2019	Figure 3



Approximate Site Location

An excerpt from the draft *Geologic Map of the Puyallup 7.5-minute Quadrangle, Washington*, by Troost, K.G.

$Qvsb_4$	Steilacoom Gravel – Bradley Channel
$Qvsb_3$	Steilacoom Gravel – Bradley Channel
$Qvsb_2$	Steilacoom Gravel – Bradley Channel
Qvt	Vashon glacial till

Not to Scale

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USGS Geologic Map

Proposed Single Family Residence
xxx – 5th Street Southeast
Puyallup, WA
PN: 041903-6002, -6003

DocID: EagleWorksLLC.5thStSE	May 2019	Figure 4

Appendix A

Subsurface Explorations

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More than 50% Retained on No. 200 Sieve	GRAVEL More than 50% Of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More than 50% Of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or more	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D2487-90.
3. Description of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and or test data.

SOIL MOISTURE MODIFIERS:

Dry- Absence of moisture, dry to the touch

Moist- Damp, but no visible water

Wet- Visible free water or saturated, usually soil is obtained from below water table

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Unified Soils Classification System

Proposed Single Family Residence
xxx – 5th Street Southeast
Puyallup, WA
PN: 041903-6002, -6003

GW Monitoring Port MP-1

Location: Northwestern portion
Approximate Elevation: 410'

Depth (ft)			Soil Type	Soil Description
0	-	2.0	-	Dark brown topsoil
2.0	-	5.0	GP-GM	Reddish brown poorly graded GRAVEL with sand and silt, roots, light iron-oxide staining/discoloration (loose to medium dense, moist) (Weathered Recessional Outwash - Steilacoom Gravel)
5.0	-	10.0	SM	Dark grey silty SAND with gravel and cobbles, iron-oxide staining/discoloration at contact (dense to very dense, moist) (Undisturbed Glacial Till)

Terminated at 10.0 feet below ground surface.
Mottling observed at 5.0 feet at time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed.

GW Monitoring Port MP-2

Location: Northwestern portion
Approximate Elevation: 410'

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Black topsoil
0.5	-	1.5	ML	Reddish brown sandy SILT with gravel (loose, moist) (Undocumented Fill?)
1.5	-	5.0	GP	Brown poorly graded GRAVEL with sand and cobbles (medium dense, moist) (Recessional Outwash - Steilacoom Gravel)
5.0	-	10.0	SM	Dark grey silty SAND with gravel and cobbles, iron-oxide staining/discoloration at contact (very dense, moist) (Undisturbed Glacial Till)

Terminated at 10.0 feet below ground surface.
Mottling observed at 5.0 feet at time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed.

Logged by: EJF **Excavated on: March 13, 2019**

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Groundwater Monitoring Port Logs
Proposed Single Family Residence
xxx – 5th Street Southeast
Puyallup, WA
PN: 041903-6002, -6003

Test Pit TP-1

Location: Northeastern portion
Approximate Elevation: 410'

Depth (ft)			Soil Type	Soil Description
0		0.3	-	Black topsoil, mantled by forest duff
0.3	-	2.0	ML	Reddish brown sandy SILT with gravel (loose, moist) (Undocumented Fill?)
2.0	-	3.5	GP-GM	Reddish brown poorly graded GRAVEL with sand and silt, roots, light iron oxide staining/discoloration (loose to medium dense, moist) (Weathered Recessional Outwash - Steilacoom Gravel)
3.5	-	5.0	SM	Grey silty SAND with gravel and cobbles (very dense, moist) (Undisturbed Glacial Till)

Terminated at 5.0 feet below ground surface.
Mottling observed from 3.5 to 5.0 feet at time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed.

Test Pit TP-2

Location: Southwestern portion
Approximate Elevation: 410'

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Black topsoil
0.5	-	1.0	ML	Reddish brown sandy SILT with gravel (loose, moist) (Undocumented Fill?)
1.5	-	5.0	GW	Reddish brown well graded GRAVEL with sand and cobbles, light iron oxide staining/discoloration (medium dense, moist) (Weathered Recessional Outwash - Steilacoom Gravel)

Terminated at 5.0 feet below ground surface.
Mottling observed from 4.0 to 5.0 feet at time of excavation.
No caving observed at the time of excavation.
Static groundwater levels observed at 2 feet below ground surface.

Logged by: EJF **Excavated on: March 13, 2019**

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Test Pit Logs
Proposed Single Family Residence
xxx – 5th Street Southeast
Puyallup, WA
PN: 041903-6002, -6003

Test Pit TP-3

Location: Northwestern portion
Approximate Elevation: 410'

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Dark brown topsoil
0.5	-	1.0	SP	Reddish brown poorly graded GRAVEL with sand and cobbles, roots, light iron-oxide staining/discoloration (loose to medium dense, moist) (Weathered Recessional Outwash - Steilacoom Gravel)
1.0	-	5.0	SM	Grey poorly graded GRAVEL with sand and cobbles (medium dense, moist) (Recessional Outwash - Steilacoom Gravel)

Terminated at 5.0 feet below ground surface.
No mottling observed at time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed.

Test Pit TP-4

Location: Northern portion
Approximate Elevation: 410'

Depth (ft)			Soil Type	Soil Description
0	-	1.0	-	Black topsoil
1.0	-	2.5	SP	Reddish brown poorly graded GRAVEL with sand, silt and cobbles, roots, light iron-oxide staining/discoloration (loose to medium dense, moist) (Weathered Recessional Outwash - Steilacoom Gravel)
2.5	-	5.0	SM	Grey poorly graded GRAVEL with sand and cobbles (medium dense, moist) (Recessional Outwash - Steilacoom Gravel)

Terminated at 5.0 feet below ground surface.
No mottling observed at time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed.

Logged by: EJF **Excavated on: March 13, 2019**

Test Pit TP-5

Location: Northeastern portion
Approximate Elevation: 415’

Depth (ft)			Soil Type	Soil Description
0	-	1.0	-	Black topsoil
1.0	-	2.5	GP	Reddish brown poorly graded GRAVEL with sand, silt and cobbles, roots, light iron-oxide staining/discoloration (medium dense, moist) (Weathered Recessional Outwash - Steilacoom Gravel)
2.5	-	5.0	SM	Grey silty SAND with gravel and cobbles, iron-oxide staining/discoloration (dense, moist) (Glacial Till)

Terminated at 5.0 feet below ground surface.
Mottling observed from 1.0 to 5.0 feet at time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed.

Test Pit TP-6

Location: Northeastern portion
Approximate Elevation: 415’

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Black topsoil
0.5	-	1.2	GP	Reddish brown poorly graded GRAVEL with sand, silt and cobbles, roots, light iron-oxide staining/discoloration (medium dense, moist) (Weathered Recessional Outwash - Steilacoom Gravel)
1.2	-	5.0	SM	Grey silty SAND with gravel and cobbles, iron-oxide staining/discoloration (dense, moist) (Glacial Till)

Terminated at 5.0 feet below ground surface.
Mottling observed from 0.5 to 5.0 feet at time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed.

Logged by: EJF **Excavated on: March 13, 2019**

Test Pit TP-7

Location: Southeastern portion
Approximate Elevation: 418'

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Black topsoil
0.5	-	2.0	GP	Reddish brown poorly graded GRAVEL with sand, silt and cobbles, roots, light iron-oxide staining/discoloration (medium dense, moist) (Weathered Recessional Outwash - Steilacoom Gravel)
2.0	-	5.0	SM	Grey silty SAND with gravel and cobbles, iron-oxide staining/discoloration (dense, moist) (Glacial Till)

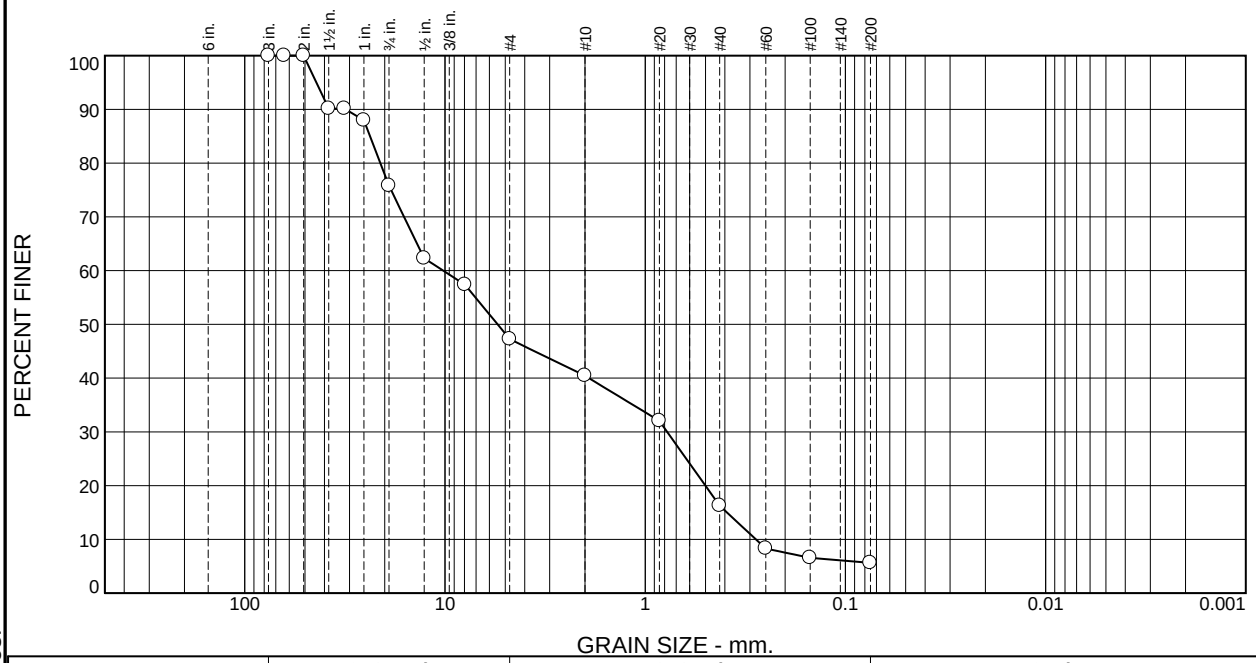
Terminated at 5.0 feet below ground surface.
Mottling observed from 0.5 to 5.0 feet at time of excavation.
No caving observed at the time of excavation.
No groundwater seepage observed.

Logged by: EJF **Excavated on: March 13, 2019**

Appendix B

Laboratory Results

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	24.2	28.5	6.9	24.1	10.7	5.6	

Test Results (ASTM D 422 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3.0	100.0		
2.5	100.0	100.0	
2.0	100.0	75.0 - 100.0	
1.5	90.1		
1.25	90.1		
1	88.0		
.75	75.8		
.5	62.3		
.3125	57.4		
#4	47.3	22.0 - 100.0	
#10	40.4		
#20	32.0		
#40	16.3		
#60	8.3		
#100	6.6		
#200	5.6	0.0 - 10.0	

* Pierce County Trench Backfill

Material Description

poorly graded gravel with silt and sand

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= GP-GM **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 31.2741 D_{85}= 23.6789 D_{60}= 10.2112
D_{50}= 5.4615 D_{30}= 0.7768 D_{15}= 0.3905
D_{10}= 0.2801 C_u= 36.46 C_c= 0.21

Remarks

Date Received: 03/13/2019 **Date Tested:** 03/28/2019

Tested By: EJF

Checked By:

Title:

Location: GW Monitoring Port MP-1/S-1 **Date Sampled:** 03/13/2019
Sample Number: 097147 **Depth:** 3'-4'

GeoResources, LLC

Fife, WA

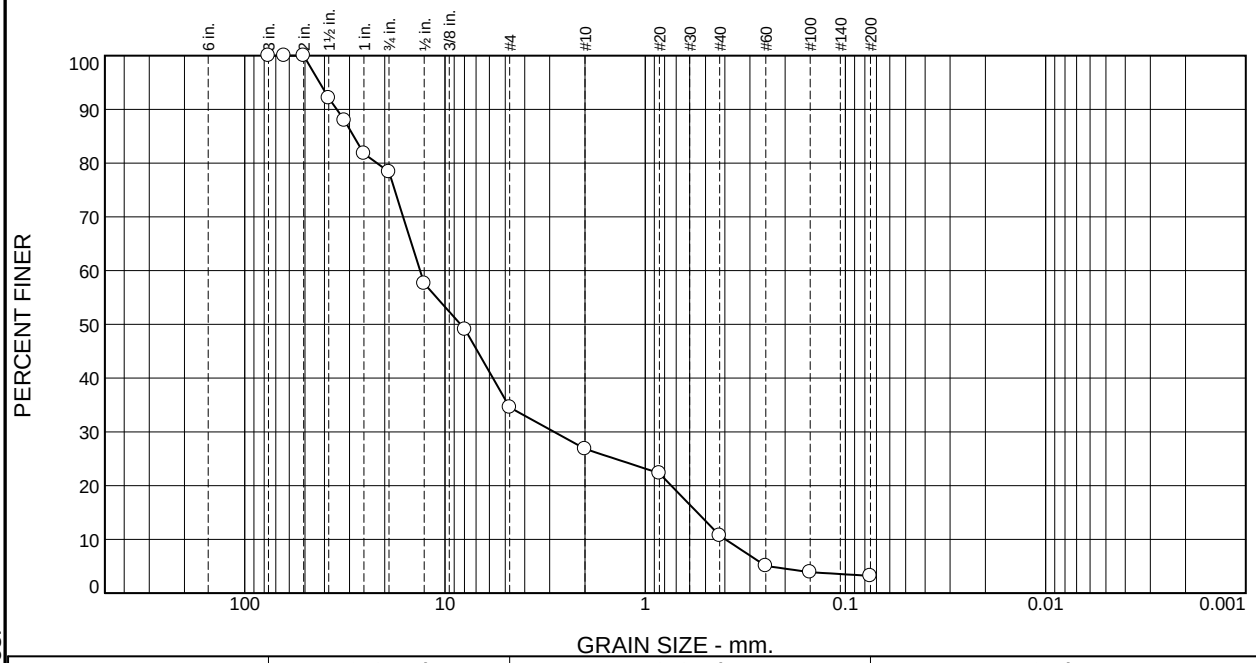
Client: Eagle Works LLC
Project: EagleworksLLC.5thStSE

Project No: **Figure** B-1

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ **Checked By:** _____

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	21.6	43.9	7.7	16.1	7.5	3.2	

Test Results (ASTM D 422 & ASTM C 117)

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
3.0	100.0		
2.5	100.0	100.0	
2.0	100.0	75.0 - 100.0	
1.5	92.1		
1.25	87.9		
1	81.8		
.75	78.4		
.5	57.6		
.3125	49.1		
#4	34.5	22.0 - 100.0	
#10	26.8		
#20	22.3		
#40	10.7		
#60	5.1		
#100	3.9		
#200	3.2	0.0 - 10.0	

* Pierce County Trench Backfill

Material Description

well-graded gravel with sand

Atterberg Limits (ASTM D 4318)

PL= NP **LL=** NV **PI=** NP

Classification

USCS (D 2487)= GW **AASHTO (M 145)=** A-1-a

Coefficients

D_{90}= 34.7418 D_{85}= 28.5504 D_{60}= 13.3087
D_{50}= 8.3629 D_{30}= 2.8524 D_{15}= 0.5493
D_{10}= 0.3977 C_u= 33.46 C_c= 1.54

Remarks

Date Received: 03/13/2019 **Date Tested:** 03/28/2019

Tested By: EJF

Checked By:

Title:

Location: Test Pit TP-2/S-1 **Date Sampled:** 03/13/2019
Sample Number: 097153 **Depth:** 3'-5'

GeoResources, LLC

Fife, WA

Client: Eagle Works LLC
Project: EagleworksLLC.5thStSE

Project No: **Figure** B-2

These results are for the exclusive use of the client for whom they were obtained. They apply only to the samples tested and are not indicitive of apparently identical samples.

Tested By: _____ **Checked By:** _____

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August 18, 2022

Eagle Works, LLC
2504 – 43rd Street East
Puyallup, Washington 98374
rick@harvestrealtyinc.com

Soils Report Addendum:
Groundwater Monitoring
Proposed Multi-Family Development
xxx – 5th Street Southeast
Puyallup, Washington
PN: 0419036002, -6003
Doc ID: EagleWorksLLC.5thStSE.SRa

INTRODUCTION & SCOPE

This *Soils Report Addendum* is for a proposed multi-family development be located at an unaddressed parcel on 5th Street Southeast in Puyallup, Washington. We have prepared a *Soils Report* for this multi-family development dated May 24, 2019. This *Addendum* summarizes the results of site groundwater monitoring during the most recent wet season (defined per the Washington State Department of Ecology 2019 Stormwater Management Manual for Western Washington as October 1st to April 30th).

The purpose of our services was to monitor groundwater levels at the site during the 2021 to 2022 wet season. Specifically, our scope of services for the groundwater monitoring included the following:

1. Reviewing the available geotechnical, geologic and hydrogeologic data for the site area;
2. Installing three monitoring ports at select locations across the site;
3. Completing bi-monthly groundwater monitoring at the site for the duration of the most recent wet season; and,
4. Preparing this *Soils Report Addendum* summarizing the site groundwater conditions, along with the supporting data.

CONCLUSIONS & MONITORING RESULTS

Three monitoring ports were installed to a depth of about 10 feet below the existing grade; named MP-1, MP-2, and MP-3. No groundwater was measured in the monitoring ports during the 2021 to 2022 wet season. The locations are labeled on the attached Figure 1.

Two of the groundwater monitoring ports (MP-1 and MP-2) were installed to about elevation 402 feet during the test pits excavated on March 13, 2019. The third monitoring port (MP-3) was installed at an undetermined date, with a measured bottom depth of about elevation 410 feet. Table 1 summarizes the measurement dates and observed groundwater readings for the 2021 to 2022 wet season.

TABLE 1:
GROUNDWATER MONITORING RESULTS FOR 2021-2022 WET SEASON

Date	Monitoring Port MP-1		Monitoring Port MP-2		Monitoring Port MP-3	
	Measured Depth to Groundwater	Groundwater Elevation[1]	Measured Depth to Groundwater	Groundwater Elevation	Measured Depth to Groundwater	Groundwater Elevation[1]
12/28/2021	NE	>402 feet	NE	>402 feet	NE	>410 feet
01/12/2022	NE	>402 feet	NE	>402 feet	NE	>410 feet
01/28/2022	NE	>402 feet	NE	>402 feet	NE	>410 feet
02/11/2022	NE	>402 feet	NE	>402 feet	NE	>410 feet
02/23/2022	NE	>402 feet	NE	>402 feet	NE	>410 feet
03/01/2022	NE	>402 feet	NE	>402 feet	NE	>410 feet
03/09/2022	NE	>402 feet	NE	>402 feet	NE	>410 feet
03/21/2022	NE	>402 feet	NE	>402 feet	NE	>410 feet
04/26/2022	NE	>402 feet	NE	>402 feet	NE	>410 feet

Notes: NE = Not Encountered, no groundwater observed during measurement date
[1] = Vertical Datum NAVD88 Geoid 12B

No groundwater was observed from our about bi-weekly readings completed during the 2021 to 2022 wet season. Based on our wet season monitoring, it appears that seasonal high groundwater occurs at a minimum below an elevation of 402 feet (Vertical Datum NAVD88) at monitoring port MP-1 and MP-2 and elevation 410 feet (Vertical Datum NAVD88) at monitoring port MP-3.

LIMITATIONS

We have prepared this report for use by Eagle Works, LLC and other members of the design team, for use in the design of a portion of this project. The data used in preparing this report and this report should be provided to prospective contractors for their bidding or estimating purposes only. Our report, conclusions and interpretations are based on our subsurface explorations, data from others and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

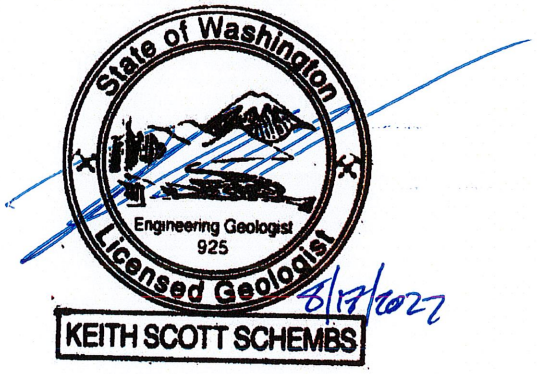
The scope of our services does not include services related to environmental remediation and construction safety precautions. Our recommendations are not intended to direct the contractor's methods, techniques, sequences or procedures, except as specifically described in our report for consideration in design.

If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

◆ ◆ ◆

We have appreciated working for you on this project. Please do not hesitate to call at your earliest convenience if you have any questions or comments.

Respectfully submitted,
GeoResources, LLC



Erik Fina, GIT
Senior Staff Geologist

Keith S. Schembs, LEG
Principal

EJF:KSS:KEB/ejf
Doc ID: EagleWorksLLC.5thStSE.SRa
Attachments: Figure 1: Site & Exploration Map

Legend

Project Site Monitoring Ports

0 25 50 100 150 200 Feet

N W E S

Coordinate System: NAD 1983 HARN
StatePlane Washington South FIPS 4602 Feet
Projection: Lambert Conformal Conic
Datum: North American 1983 HARN

Aerial from the Pierce County orthoimagery
Topo from Pierce County 1:600 offline terrain basemap

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Site & Exploration Map

Proposed Multi-Family Development
xxxx - 5th Street Southeast
Puyallup, Washington
PN: 041903-6002, -6003

Doc ID: EagleWorksLLC.5thStSE.F1	August 2022	Figure 1

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February 9, 2023

Bradbury Place LLC
7809 Pacific Ave
Tacoma, WA 98408

Attn: Ken Rody
kgrody54@gmail.com

Soils Report Addendum:
Infiltration Testing & Mounding Analysis
Proposed Multi-Family Development
xxx – 5th Street Southeast
Puyallup, Washington
PN: 0419036002, -6003
Doc ID: EagleWorksLLC.5thStSE.SRa2

INTRODUCTION & SCOPE

This *Soils Report Addendum* is for the proposed multi-family development be located at an unaddressed parcel on 5th Street Southeast in Puyallup, Washington. We have prepared a *Soils Report* for this multi-family development dated May 24, 2019 and an *Addendum* to the *Soils Report* summarizing our seasonal groundwater monitoring dated August 18, 2022. This *Addendum* summarizes the results of our in-situ infiltration testing and mounding analysis for a proposed infiltration trench and pond. The City of Puyallup has adopted the Washington State Department of Ecology 2019 version of the *Stormwater Management Manual for Western Washington* (2019 SWMMWW) for use in stormwater design and management.

We were provided with a preliminary site plan for the stormwater management of the development by Contour Engineering dated February 3, 2023. An infiltration pond with a bottom area of 2,702ft^2 is proposed in the northwest corner of the development. A 42ft (length) x 8ft (width) x 1.5ft (depth) infiltration trench is proposed near the western boundary of the development. The locations of the proposed infiltration facilities are shown on the attached Site & Exploration Plan, Figure 1. Our scope of services included the following:

1. Returning to the site and performing two small scale Pilot Infiltration Tests (small-scale PIT) in accordance with the City of Puyallup adopted stormwater manual 2019 SWMMWW;
2. Competition of a mounding analysis of the infiltration pond using the software MODRET version 6.1, and;
3. Preparing this *Soils Report Addendum* that satisfies the 2019 SWMMWW requirements and summarizes our site observations and conclusions, and our geotechnical recommendations, along with the supporting data.

Subsurface Explorations

On January 19, 2023, a field representative from GeoResources visited the site and monitored the excavation of three test pits to depths of about 9.3 to 10.0 feet below the existing grades, logged

the subsurface conditions encountered in each test pit, and obtained representative soil samples. Two of the test pits were used for small-scale PITs and were over-excavated to the final depth following completion of the tests. The test pits were excavated by a small track-mounted excavator operated by a licensed operator working under subcontract for you. The soil densities presented on the logs were based on the difficulty of excavation and our experience. The number and location of the test pits were selected in the field based on the preliminary location of infiltration facilities for the development provided by the project civil. Following excavation, each test pit was backfilled with the excavated soils and bucket tamped, but not otherwise compacted.

The subsurface explorations excavated as part of this evaluation indicate the subsurface conditions at specific locations only, as actual subsurface conditions can vary across the site. Furthermore, the nature and extent of such variation would not become evident until additional explorations are performed or until construction activities have begun. Based on our experience in the area and extent of prior explorations for this site, it is our opinion that the soils encountered in the explorations are generally representative of the soils at the site.

The soils encountered were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM D2488. The approximate locations of our test pits are labeled on the attached Figure 1. The USCS is included in Appendix A as Figure A-1, while the descriptive logs of our test pits are included as Figures A-2 and A-3. The locations of each test pit and final depth and elevations are summarized in Table 1.

TABLE 1:
APPROXIMATE LOCATIONS, ELEVATIONS, AND DEPTHS OF EXPLORATIONS

Test Pit	Functional Location	Surface Elevation (feet)	Termination Depth (feet)	Termination Elevation (feet)
TP-101	Infiltration Trench Footprint	404	10.0	394.0
TP-102	Infiltration Pond Footprint	403	8.5	394.5
TP-103	Infiltration Trench Footprint	402	9.3	392.7
Notes:				

Subsurface Conditions

At the locations of our test pits, we encountered relatively uniform subsurface conditions that generally confirmed the mapped stratigraphy and the encountered soils in our previously excavated test pits for this project. Table 2 summarizes observed soil layers and elevations of select soil layers encountered in our test pit explorations.

Topsoil: We encountered about 0.5 to 1.5 feet of brown, dark brown, to black topsoil at all test pit locations.

Weathered Recessional Outwash – Steilacoom Gravel: Mantling the topsoil at all test pit locations, we encountered a loose to medium dense poorly graded gravel with minor to some sand and trace silt to a gravelly sand with some silt in a moist condition. We interpret this soil layer to be weathered recessional outwash, and the soil layer was observed to be about 2.5 feet to 4.0 feet thick.

Undisturbed Recessional Outwash – Steilacoom Gravel: Underlying the weathered recessional outwash soils at all test pit locations was medium dense poorly graded gravel with some sand and trace silt in a moist to wet condition. We interpret this deeper soil layer to be undisturbed recessional outwash, and this soil layer was encountered to the full depth explored at all test pits.

TABLE 2:
APPROXIMATE THICKNESS, DEPTHS, AND ELEVATION OF SOIL TYPES ENCOUNTERED IN EXPLORATIONS

Test Pit	Thickness		Elevation to Undisturbed Recessional Outwash (feet)
	Topsoil (feet)	Weathered Recessional Outwash (feet)	
TP-101	1.5	2.5	400
TP-102	0.5	4.0	398.5
TP-103	0.5	3.5	497.5
Notes:			

Groundwater Conditions

During over-excavation of the small-scale PIT completed in the footprint of the infiltration pond, we observed groundwater seepage at 6.5 feet below the existing grade. A confining layer (glacial till) was originally observed beneath the gravelly recessional outwash in test pits completed within the footprint of the pond. We anticipate that water from the test was perching on the glacial till layer underneath the pond footprint. This glacial till layer was not observed to the full over-excavation depth.

Small-Scale Pilot Infiltration Tests

We performed two small-scale PITs in accordance with the 2019 SWMMWW. The tests were performed within the footprint of a proposed infiltration trench and pond. See the attached Figure 2 for the location of the tests. The geometry of the test pit for the small-scale PIT in the pond footprint (small-scale PIT-1) was measured as 5ft (length) x 4ft (width) x 3 ft (depth) with an area encompassing about 20 square feet. The geometry of the test pit for the small-scale PIT in the trench footprint (small-scale PIT-2) was measured as 4ft (length) x 4ft (width) x 2.8ft (depth) with an area encompassing about 16 square feet. A pre-soak period of 6 hours was performed prior to a water level depth of at least 12 inches being maintained for the steady state period. During the steady state period, we recorded the cumulative volume and instantaneous flow rate necessary to maintain the water level at the same point for 1 hour. After the steady state period, we turned off the water and recorded the rate of infiltration every 15 minutes in inches per hour using a vertical measuring rod. Table 3 summarizes the measurements collected during the falling head period of the tests.

During the falling head period of the small-scale PIT-1 and small-scale PIT-2, we measured a saturated hydraulic conductivity ($K_{sat,\ Measured}$) of **14.7 inches per hour and 60.0 inches per hour**, respectively. See the attached Appendix A for the soil logs associated with the tests. Table 3 summarizes the measured infiltration rate for both tests.

TABLE 3:
MEASURED INFILTRATION RATES FOR FALLING HEAD PERIOD

Test Number	Soil Type at Approximate Bottom of Infiltration Test	Measured Infiltration Rate (in/hr)
Small PIT-1	GP	14.7
Small PIT-2	SP-SM	60.0

Design Infiltration Rate

We applied appropriate correction factors to the measured K_{sat} for site variability (CF_v of 1.0), testing method (CF_t of 0.5 for small-scale PIT), and maintenance (CF_m of 0.9 for siltation biofouling). The resulting design infiltration rate is **27.0 inches per hour for the infiltration trench and 6.6 inches per hour for the infiltration pond**.

We recommend that a representative from our firm be onsite at the time of excavation of the proposed infiltration BMPs used in the stormwater management design to verify that the soils encountered during construction are consistent with the soils observed in our subsurface explorations.

Mounding Analysis

We analyzed the groundwater mounding potential the proposed infiltration pond using software program MODRET groundwater modeling V6.1.4. MODRET uses a finite-difference method to model groundwater flow. The input parameters for the MODRET infiltration module used in the analysis were selected based on the civil design of the infiltration pond and the completion of the small-scale PIT in the footprint of the pond. We determined that using the seepage elevation observed during the over-excavation of the small-scale PIT in the pond was the best estimation of seasonal high groundwater within the footprint of the pond, as no groundwater was recorded during our wet-season groundwater monitoring. As such, the effective aquifer base was lowered to the final depth of the over-excavation.

Data Inputs for MODRET

Precipitation values for a 50-year storm event was used to build a hydrograph input for runoff data, with SCS Type IA (24hr) selected for rainfall distribution. The SCS curve number was selected as 54, corresponding to an impervious area of ½ acre for hydrologic soils group A. The other input parameters for the hydrograph were provided by the project civil. The hydrograph curve is included in Appendix B.

A saturated analysis was completed for this model, as the runoff hydrograph data file automatically incorporates the unsaturated volume and effective time. Below is a list of the parameters used with source of data provided in parentheses.

- Area of Starting Water Level: 2,072ft^2 (provided by the project civil)
- Pond Volume between bottom and DHWL: 7,588.14ft^3 (provided by the project civil)
- Pond Length to Width Ratio: 1.72 (calculated using the pond length and width dimensions)
- Elevation of Effective Aquifer Base: 394.5 ft (from total depth of test pit used for the small-scale PIT-1)

- Elevation of Seasonal High Groundwater Table: 396.5ft (from seepage observed during over-excavation of the small-scale PIT-1)
- Elevation of Pond Bottom: 401.65ft (provided by the project civil)
- Design High Water Level Elevation: 404.5ft (provided by the project civil)
- Unsaturated Vertical Hydraulic Conductivity: 29.4 ft/day (from the measured rate collected from the small-scale PIT-1)
- Factor of Safety: 1 (no adjustment to the measured rate from the small-scale PIT-1)
- Saturated Horizontal Hydraulic Conductivity: 29.4 ft/day (assumed isotropic soil conditions for the pond)
- Average Effective Storage Coefficient for Saturated Analysis: 0.4 (determined from logged site soils from test pits in and around the footprint of the pond)

Results of Mounding Analysis for Pond

The analysis resulted in a high-water elevation mark of 403.71 feet at the 24-hour mark of the 50-year storm event. A maximum infiltration rate of 5.596 ft/day was determined by the model (this rate is influenced by the storage coefficient), and the total volume infiltrated was 19,592ft^3. The high-water elevation mark is below the design high water elevation for the infiltration pond during a 50-year storm event. Based on our analyses, we do not anticipate any adverse effects to adjacent structures or properties because of groundwater mounding at the infiltration pond. The result of the analysis is provided in Appendix B.

LIMITATIONS

We have prepared this report for use by Bradbury Place LLC and other members of the design team, for use in the design of a portion of this project. The data used in preparing this addendum should be provided to prospective contractors for their bidding or estimating purposes only. Our addendum conclusions and interpretations are based on our subsurface explorations, data from others and limited site reconnaissance, and should not be construed as a warranty of the subsurface conditions.

Variations in subsurface conditions are possible between the explorations and may also occur with time. A contingency for unanticipated conditions should be included in the budget and schedule. Sufficient monitoring, testing and consultation should be provided by our firm during construction to confirm that the conditions encountered are consistent with those indicated by the explorations, to provide recommendations for design changes should the conditions revealed during the work differ from those anticipated, and to evaluate whether earthwork and foundation installation activities comply with contract plans and specifications.

The scope of our services does not include services related to environmental remediation and construction safety precautions. Our recommendations are not intended to direct the contractor's methods, techniques, sequences, or procedures, except as specifically described in our report for consideration in design.

If there are any changes in the loads, grades, locations, configurations or type of facilities to be constructed, the conclusions and recommendations presented in this report may not be fully applicable. If such changes are made, we should be given the opportunity to review our recommendations and provide written modifications or verifications, as appropriate.

◆ ◆ ◆

We have appreciated working for you on this project. Please do not hesitate to call at your earliest convenience if you have any questions or comments.

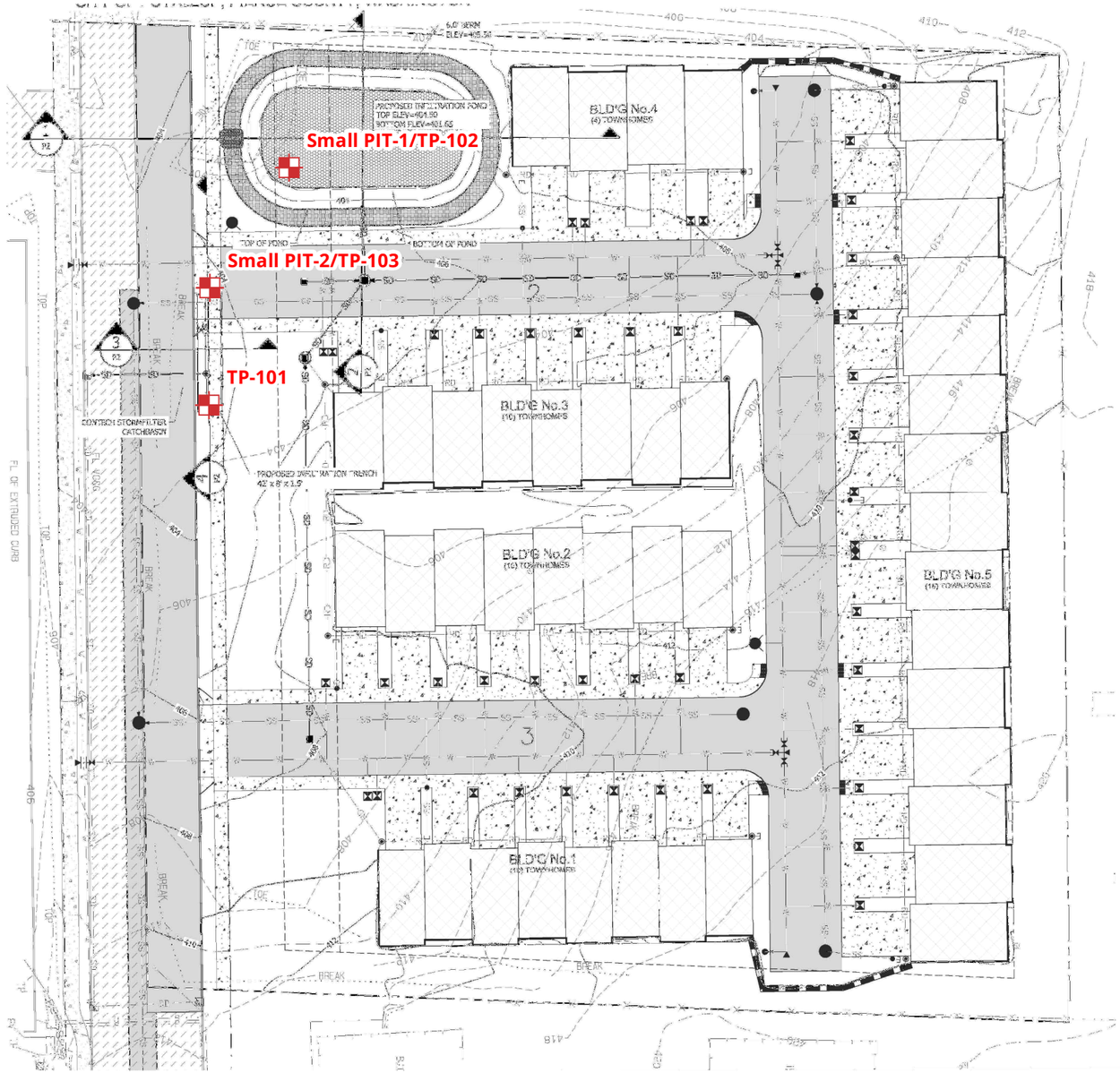
Respectfully submitted,
GeoResources, LLC

Erik Fina, GIT
Senior Staff Geologist

State of Washington
Engineering Geologist
3237
Licensed Geologist
2.9.23
Seth Taylor Mattos

Seth T. Mattos, LEG
Associate

EJF:KSS:EWH/ejf
Doc ID: EagleWorksLLC.5thStSE.SRa2
Attachments: Figure 1: Site & Exploration Plan
Appendix A – Supplemental Subsurface Explorations
Appendix B – Mounding Analysis for Infiltration Pond



Legend

Test Pit/Small PIT Locations

0 20 40 80 120 160 Feet

Excerpt from the preliminary site plan
for Bradbury Place by Contour Engineering
dated February 3, 2023

N
W E
S

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Site & Exploration Plan

Proposed Multi-Family Development
xxxx - 5th Street Southeast
Puyallup, Washington
PN: 041903-6002, -6003

Doc ID: EagleWorksLLC.5thStSE.F1	February 2023	Figure 1

Appendix A

Supplemental Subsurface Explorations

SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GROUP SYMBOL	GROUP NAME
COARSE GRAINED SOILS More than 50% Retained on No. 200 Sieve	GRAVEL More than 50% Of Coarse Fraction Retained on No. 4 Sieve	CLEAN GRAVEL	GW	WELL-GRADED GRAVEL, FINE TO COARSE GRAVEL
			GP	POORLY-GRADED GRAVEL
		GRAVEL WITH FINES	GM	SILTY GRAVEL
			GC	CLAYEY GRAVEL
	SAND More than 50% Of Coarse Fraction Passes No. 4 Sieve	CLEAN SAND	SW	WELL-GRADED SAND, FINE TO COARSE SAND
			SP	POORLY-GRADED SAND
		SAND WITH FINES	SM	SILTY SAND
			SC	CLAYEY SAND
FINE GRAINED SOILS More than 50% Passes No. 200 Sieve	SILT AND CLAY Liquid Limit Less than 50	INORGANIC	ML	SILT
			CL	CLAY
		ORGANIC	OL	ORGANIC SILT, ORGANIC CLAY
	SILT AND CLAY Liquid Limit 50 or more	INORGANIC	MH	SILT OF HIGH PLASTICITY, ELASTIC SILT
			CH	CLAY OF HIGH PLASTICITY, FAT CLAY
		ORGANIC	OH	ORGANIC CLAY, ORGANIC SILT
HIGHLY ORGANIC SOILS			PT	PEAT

NOTES:

1. Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
2. Soil classification using laboratory tests is based on ASTM D6913.
3. Description of soil density or consistency are based on interpretation of blow count data, visual appearance of soils, and or test data.

SOIL MOISTURE MODIFIERS:

Dry- Absence of moisture, dry to the touch

Moist- Damp, but no visible water

Wet- Visible free water or saturated, usually soil is obtained from below water table

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Unified Soils Classification System

Proposed Multi-Family Development
xxx – 5th Street Southeast
Puyallup, WA
PN: 041903-6002, -6003

Test Pit TP-101

Location: Proposed Infiltration Trench
Approximate Elevation: 404 feet (Vertical Datum NAVD88 Geoid 12B)

Depth (ft)			Soil Type	Soil Description
0	-	1.5	-	Brown to black topsoil
1.5	-	4.0	GP	Reddish brown poorly graded GRAVEL with some sand and trace silt, roots (loose, moist) (Weathered Recessional Outwash - Steilacoom Gravel)
4.0	-	10.0	GP	Grey poorly graded GRAVEL with some sand and trace silt, stratified sand and gravel (loose to medium dense, moist) (Recessional Outwash – Steilacoom Gravel)
				Terminated at 10.0 feet below ground surface. No mottling observed. No caving observed during excavation. No groundwater seepage observed at time of excavation.

Test Pit TP-102/Small PIT-1

Location: Proposed Infiltration Pond
Approximate Elevation: 403 feet (Vertical Datum NAVD88 Geoid 12B)

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Dark brown topsoil
0.5	-	4.5	GP	Reddish brown to grey sandy poorly graded GRAVEL with trace silt, roots, light iron-oxide staining/discoloration (loose to medium dense, moist) (Weathered Recessional Outwash - Steilacoom Gravel)
4.5	-	8.5	GP	Dark grey poorly graded GRAVEL with some sand and silt (medium dense, moist to wet) (Recessional Outwash – Steilacoom Gravel)
				Terminated at 8.5 feet below ground surface. Light mottling observed at 0.5 to 1.5 feet BGS. Slight caving observed at 6.5 feet BGS. Moderate groundwater seepage observed at 6.5 feet BGS following over-excavation of Small PIT.

Logged by: MMM/EJF **Excavated on: January 20, 2023**

Test Pit TP-103/Small PIT-2

Location: Proposed Infiltration Trench
Approximate Elevation: 402 feet (Vertical Datum NAVD88 Geoid 12B)

Depth (ft)			Soil Type	Soil Description
0	-	1.0	-	Dark brown topsoil
1.0	-	2.5	SM	Reddish brown silty SAND with gravel (loose, dry to moist) (Weathered Recessional Outwash)
2.5	-	4.5	SP-SM	Brown gravelly SAND with some silt and cobbles (loose to medium dense, moist) (Weathered Recessional Outwash - Steilacoom Gravel)
4.5	-	9.3	GP	Dark grey poorly graded GRAVEL with some sand and trace silt (medium dense, moist) (Recessional Outwash – Steilacoom Gravel)
				Terminated at 9.25 feet below ground surface.
				No mottling observed at time of excavation.
				Moderate caving observed at 7.5 feet BGS.
				No groundwater seepage observed.

Logged by: MMM **Excavated on: January 20, 2023**

Appendix B

Mounding Results for Infiltration Pond

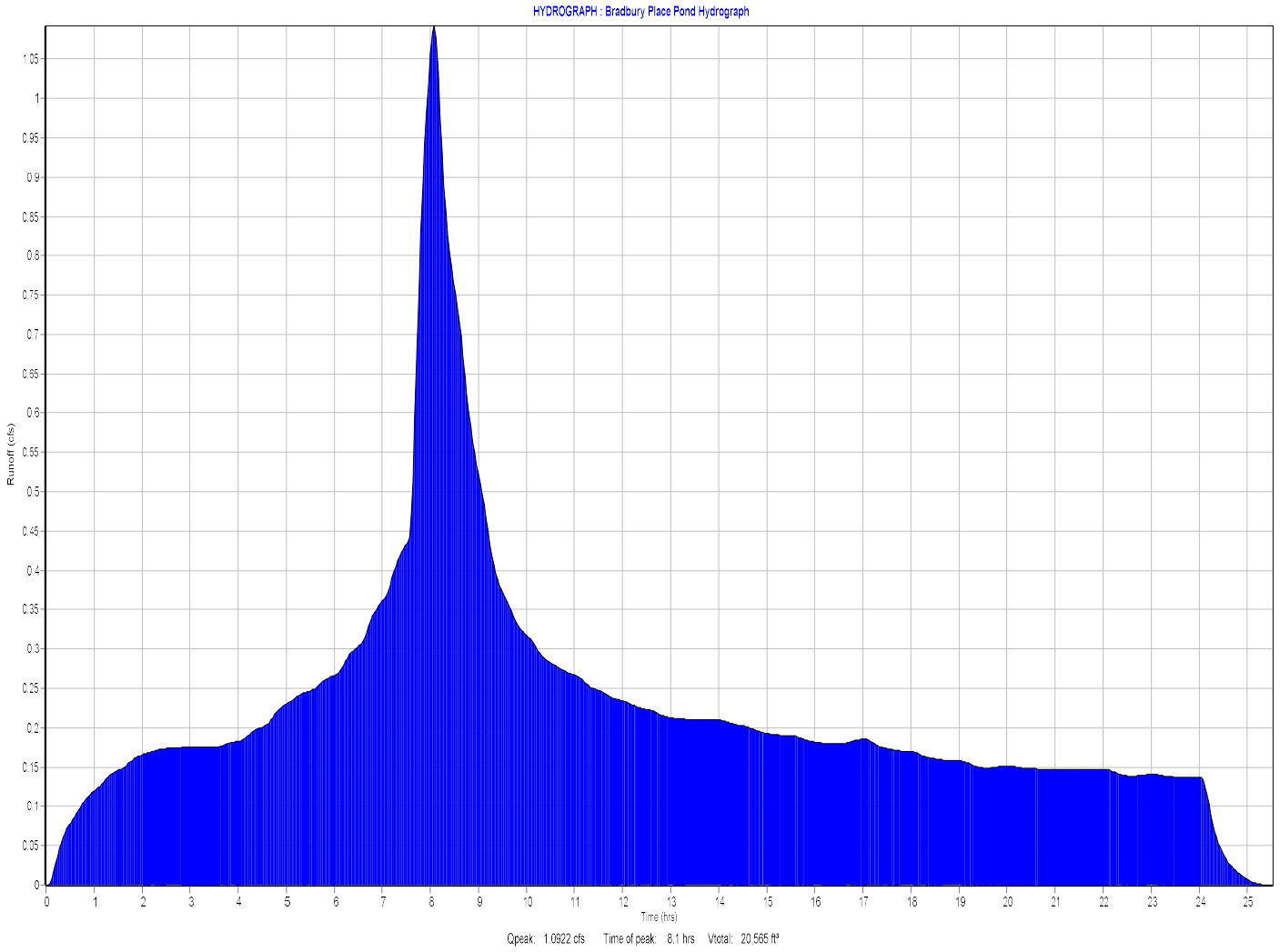
MODRET

HYDROGRAPH DATA INPUT - SCS UNIT METHOD

Project Name : Bradbury Place Pond Hydrograph
Rainfall Distribution : SCS Type IA (24 hrs)

Contributing Basin Area	2.20 ac.
SCS Curve Number	54.00
Time of Concentration	13.90 min.
Rainfall Depth	3.50 in.
Shape Factor	256
Percent DCIA	71.00 %

Analysis Date: 2/6/2023


HYDROGRAPH : Bradbury Place Pond Hydrograph
Runoff (cfs)
Time (hrs)
Qpeak: 1.0922 cfs Time of peak: 8.1 hrs Vtotal: 20.565 ft³

MODRET

SUMMARY OF UNSATURATED & SATURATED INPUT PARAMETERS

PROJECT NAME : Bradbury Infiltration Pond
HYDROGRAPH RUNOFF DATA USED
UNSATURATED ANALYSIS EXCLUDED

Pond Bottom Area	2,702.00 ft²
Pond Volume between Bottom & DHWL	7,588.14 ft³
Pond Length to Width Ratio (L/W)	1.72
Elevation of Effective Aquifer Base	394.50 ft
Elevation of Seasonal High Groundwater Table	396.50 ft
Elevation of Starting Water Level	401.65 ft
Elevation of Pond Bottom	401.65 ft
Design High Water Level Elevation	404.50 ft
Avg. Effective Storage Coefficient of Soil for Unsaturated Analysis	0.40
Unsaturated Vertical Hydraulic Conductivity	29.40 ft/d
Factor of Safety	1.00
Saturated Horizontal Hydraulic Conductivity	29.40 ft/d
Avg. Effective Storage Coefficient of Soil for Saturated Analysis	0.40
Avg. Effective Storage Coefficient of Pond/Exfiltration Trench	1.00
Time Increment During Storm Event	24.00 hrs
Time Increment After Storm Event	24.00 hrs
Total Number of Increments After Storm Event	14.00

Runoff Hydrograph File Name: Bradbury Place Pond 2.SCS

Time of Peak Runoff: 8.08 hrs

Rate of Peak Runoff: 1.09 cfs

Hydraulic Control Features:

	Top	Bottom	Left	Right
Groundwater Control Features - Y/N	N	N	N	N
Distance to Edge of Pond	0.00	0.00	0.00	0.00
Elevation of Water Level	0.00	0.00	0.00	0.00
Impervious Barrier - Y/N	N	N	N	N
Elevation of Barrier Bottom	0.00	0.00	0.00	0.00

Analysis Date: 2/8/2023

MODRET

SUMMARY OF RESULTS

PROJECT NAME : Bradbury Infiltration Pond

CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft^3)
00.00 - 0.04	396.500	0.000 *		
			0.00000	
0.04	396.500	0.23153		
			0.17245	
24.04	403.710	0.11338		0.00
			0.05430	
48.04	401.948	0.02715		0.00
			0.00000	
72.04	401.028	0.00000		0.00
			0.00000	
96.04	400.433	0.00000		0.00
			0.00000	
120.04	400.006	0.00000		0.00
			0.00000	
144.04	399.679	0.00000		0.00
			0.00000	
168.04	399.417	0.00000		0.00
			0.00000	
192.04	399.202	0.00000		0.00
			0.00000	
216.04	399.023	0.00000		0.00
			0.00000	
240.04	398.869	0.00000		0.00
			0.00000	
264.04	398.736	0.00000		0.00
			0.00000	
288.04	398.618	0.00000		0.00
			0.00000	
312.04	398.513	0.00000		0.00

Analysis Date: 2/8/2023

MODRET

SUMMARY OF RESULTS

PROJECT NAME : Bradbury Infiltration Pond

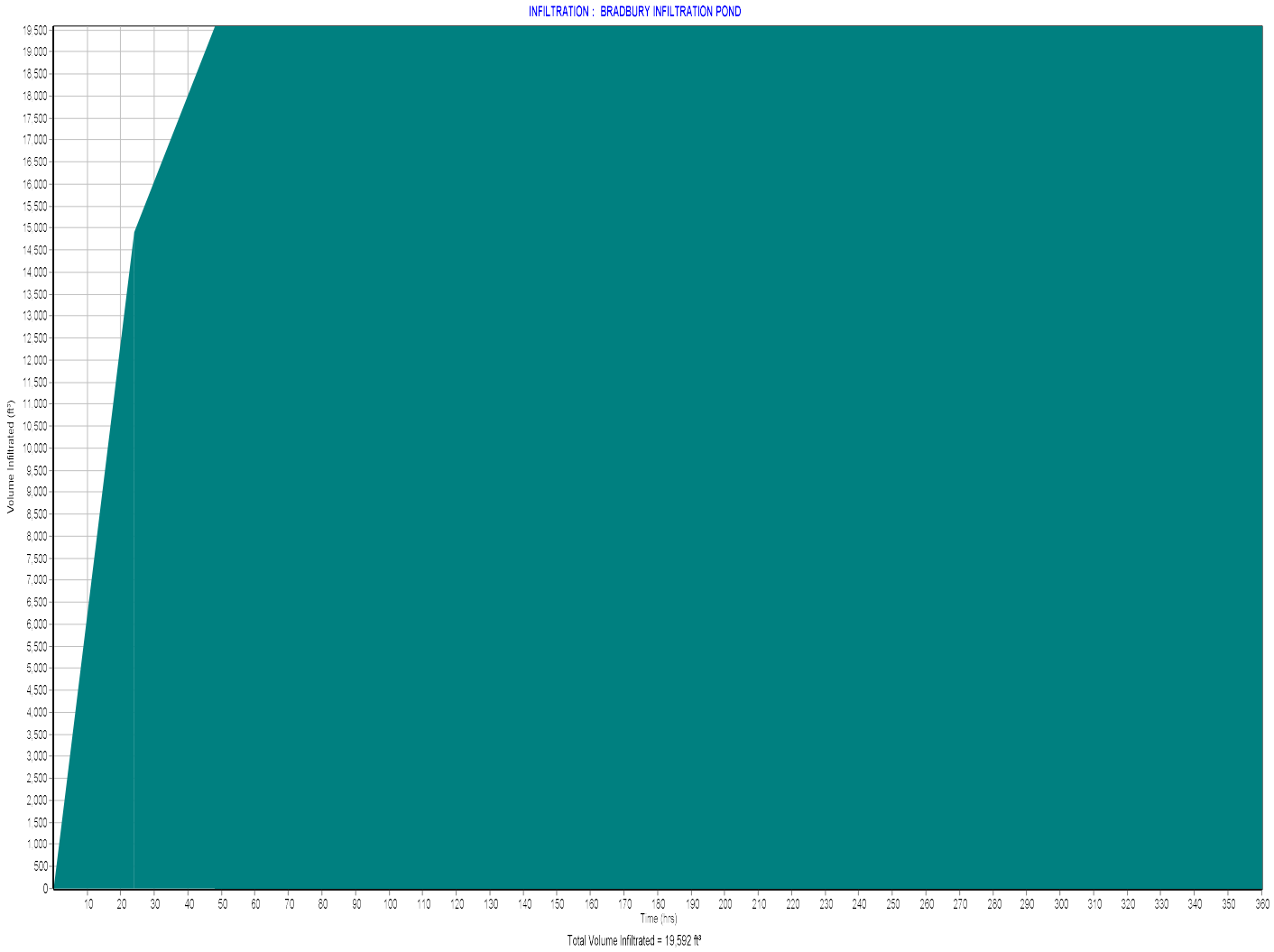
CUMULATIVE TIME (hrs)	WATER ELEVATION (feet)	INSTANTANEOUS INFILTRATION RATE (cfs)	AVERAGE INFILTRATION RATE (cfs)	CUMULATIVE OVERFLOW (ft^3)
			0.00000	
336.04	398.420	0.00000		0.00
			0.00000	
360.04	398.335			0.00

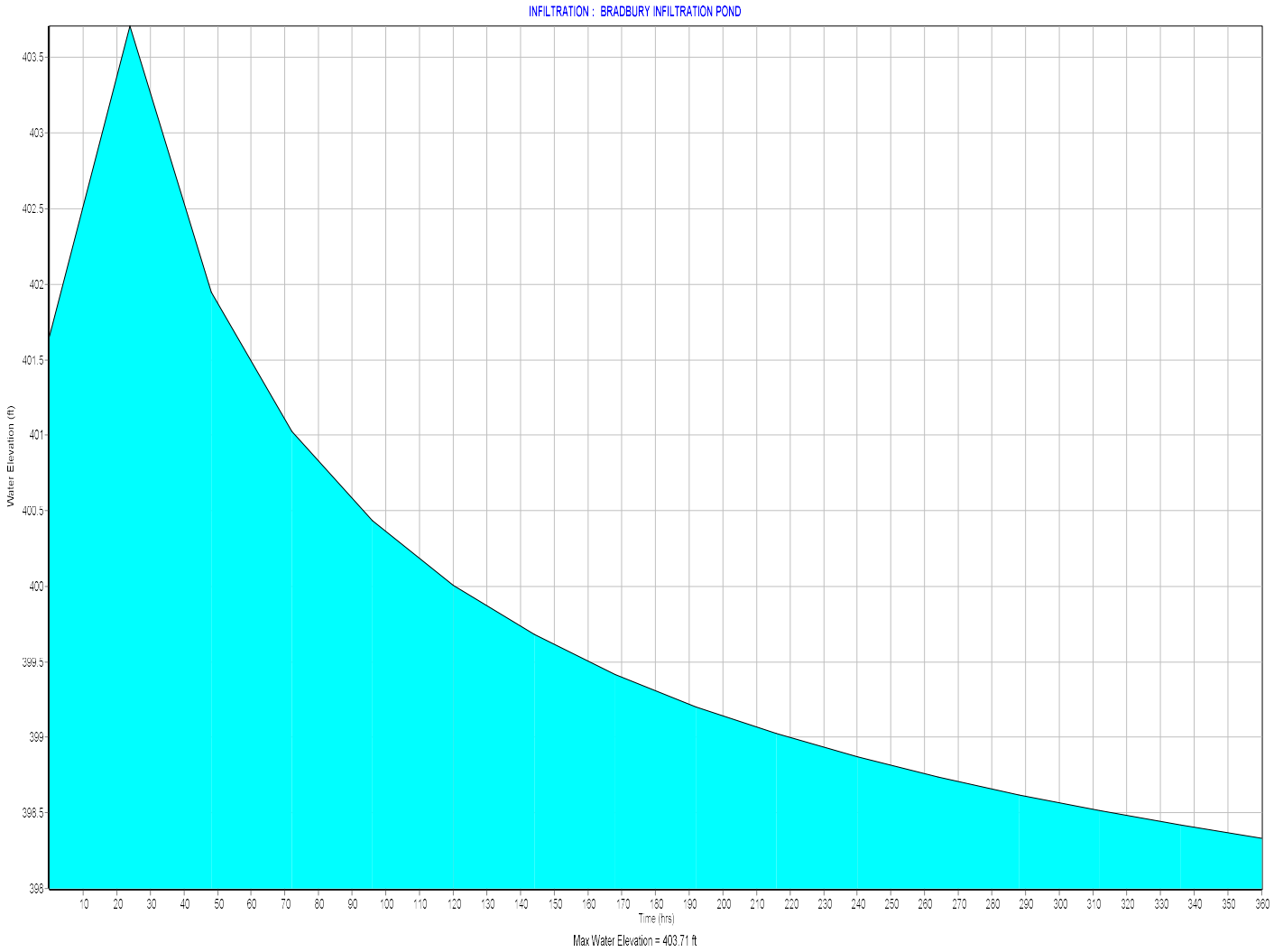
Maximum Water Elevation: 403.710 feet @ 24.04 hours Recovery @ 288.040 hours

* Time increment when there is no runoff

Maximum Infiltration Rate: 5.596 ft/day

Analysis Date: 2/8/2023


INFILTRATION : BRADBURY INFILTRATION POND
Volume Infiltrated (ft³)
19,500
19,000
18,500
18,000
17,500
17,000
16,500
16,000
15,500
15,000
14,500
14,000
13,500
13,000
12,500
12,000
11,500
11,000
10,500
10,000
9,500
9,000
8,500
8,000
7,500
7,000
6,500
6,000
5,500
5,000
4,500
4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360
Time (hrs)
Total Volume Infiltrated = 19,592 ft³


INFILTRATION : BRADBURY INFILTRATION POND
Water Elevation (ft)
403.5
403
402.5
402
401.5
401
400.5
400
399.5
399
398.5
398
10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300 310 320 330 340 350 360
Time (hrs)
Max Water Elevation = 403.71 ft

APPENDIX D

WWHM

WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: default
Site Name:
Site Address:
City:

Report Date:	5/30/2024
Gage:	40 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2023/01/27
Version:	4.2.19

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
A B, Forest, Flat	2.56
Pervious Total	2.56
Impervious Land Use	acre
Impervious Total	0
Basin Total	2.56

Basin 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Forest, Flat	0.46
Pervious Total	0.46

Impervious Land Use	acre
ROADS FLAT	0.01
Impervious Total	0.01
Basin Total	0.47

Mitigated Land Use

Onsite

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Pasture, Flat	1.06
Pervious Total	1.06

Impervious Land Use	acre
ROADS FLAT	0.82
ROOF TOPS FLAT	0.61
POND	0.07
Impervious Total	1.5
Basin Total	2.56

Basin 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Pasture, Flat	0.21
Pervious Total	0.21

Impervious Land Use	acre
ROADS FLAT	0.26
Impervious Total	0.26
Basin Total	0.47

Mitigated Routing

Infiltration Pond

Bottom Length:	39.00 ft.	
Bottom Width:	39.00 ft.	
Depth:	3.85 ft.	
Volume at riser head:	0.1324 acre-feet.	
Infiltration On		
Infiltration rate:	6.6	
Infiltration safety factor:	1	
Total Volume Infiltrated (ac-ft.):		641.467
Total Volume Through Riser (ac-ft.):		0.023
Total Volume Through Facility (ac-ft.):		641.49
Percent Infiltrated:		100
Total Precip Applied to Facility:		0
Total Evap From Facility:		0
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:	2.85 ft.	
Riser Diameter:	12 in.	
Element Flows To:		
Outlet 1	Outlet 2	

Pond Hydraulic Table

Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
401.65	0.034	0.000	0.000	0.000
401.69	0.035	0.001	0.000	0.232
401.74	0.035	0.003	0.000	0.232
401.78	0.035	0.004	0.000	0.232
401.82	0.036	0.006	0.000	0.232
401.86	0.036	0.007	0.000	0.232
401.91	0.036	0.009	0.000	0.232
401.95	0.037	0.010	0.000	0.232
401.99	0.037	0.012	0.000	0.232
402.04	0.037	0.014	0.000	0.232
402.08	0.038	0.015	0.000	0.232
402.12	0.038	0.017	0.000	0.232
402.16	0.038	0.018	0.000	0.232
402.21	0.039	0.020	0.000	0.232
402.25	0.039	0.022	0.000	0.232
402.29	0.039	0.023	0.000	0.232
402.33	0.040	0.025	0.000	0.232
402.38	0.040	0.027	0.000	0.232
402.42	0.040	0.029	0.000	0.232
402.46	0.041	0.030	0.000	0.232
402.51	0.041	0.032	0.000	0.232
402.55	0.041	0.034	0.000	0.232
402.59	0.042	0.036	0.000	0.232
402.63	0.042	0.037	0.000	0.232
402.68	0.042	0.039	0.000	0.232
402.72	0.043	0.041	0.000	0.232
402.76	0.043	0.043	0.000	0.232

402.81	0.043	0.045	0.000	0.232
402.85	0.044	0.047	0.000	0.232
402.89	0.044	0.049	0.000	0.232
402.93	0.044	0.051	0.000	0.232
402.98	0.045	0.052	0.000	0.232
403.02	0.045	0.054	0.000	0.232
403.06	0.045	0.056	0.000	0.232
403.10	0.046	0.058	0.000	0.232
403.15	0.046	0.060	0.000	0.232
403.19	0.046	0.062	0.000	0.232
403.23	0.047	0.064	0.000	0.232
403.28	0.047	0.066	0.000	0.232
403.32	0.047	0.068	0.000	0.232
403.36	0.048	0.070	0.000	0.232
403.40	0.048	0.072	0.000	0.232
403.45	0.049	0.075	0.000	0.232
403.49	0.049	0.077	0.000	0.232
403.53	0.049	0.079	0.000	0.232
403.58	0.050	0.081	0.000	0.232
403.62	0.050	0.083	0.000	0.232
403.66	0.050	0.085	0.000	0.232
403.70	0.051	0.087	0.000	0.232
403.75	0.051	0.090	0.000	0.232
403.79	0.051	0.092	0.000	0.232
403.83	0.052	0.094	0.000	0.232
403.87	0.052	0.096	0.000	0.232
403.92	0.053	0.099	0.000	0.232
403.96	0.053	0.101	0.000	0.232
404.00	0.053	0.103	0.000	0.232
404.05	0.054	0.105	0.000	0.232
404.09	0.054	0.108	0.000	0.232
404.13	0.054	0.110	0.000	0.232
404.17	0.055	0.112	0.000	0.232
404.22	0.055	0.115	0.000	0.232
404.26	0.056	0.117	0.000	0.232
404.30	0.056	0.120	0.000	0.232
404.35	0.056	0.122	0.000	0.232
404.39	0.057	0.125	0.000	0.232
404.43	0.057	0.127	0.000	0.232
404.47	0.058	0.129	0.000	0.232
404.52	0.058	0.132	0.021	0.232
404.56	0.058	0.134	0.151	0.232
404.60	0.059	0.137	0.341	0.232
404.64	0.059	0.140	0.572	0.232
404.69	0.060	0.142	0.828	0.232
404.73	0.060	0.145	1.094	0.232
404.77	0.060	0.147	1.354	0.232
404.82	0.061	0.150	1.593	0.232
404.86	0.061	0.152	1.799	0.232
404.90	0.062	0.155	1.963	0.232
404.94	0.062	0.158	2.086	0.232
404.99	0.062	0.160	2.178	0.232
405.03	0.063	0.163	2.291	0.232
405.07	0.063	0.166	2.382	0.232
405.12	0.064	0.169	2.470	0.232
405.16	0.064	0.171	2.554	0.232
405.20	0.065	0.174	2.636	0.232
405.24	0.065	0.177	2.715	0.232

405.29	0.065	0.180	2.792	0.232
405.33	0.066	0.183	2.867	0.232
405.37	0.066	0.185	2.940	0.232
405.41	0.067	0.188	3.011	0.232
405.46	0.067	0.191	3.081	0.232
405.50	0.067	0.194	3.149	0.232

Gravel Trench Bed 1

Bottom Length:	42.00 ft.
Bottom Width:	8.50 ft.
Trench bottom slope 1:	0 To 1
Trench Left side slope 0:	0 To 1
Trench right side slope 2:	0 To 1
Material thickness of first layer:	1.5
Pour Space of material for first layer:	0.4
Material thickness of second layer:	0
Pour Space of material for second layer:	0
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	27
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	107.567
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	107.567
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	0
Discharge Structure	
Riser Height:	1.5 ft.
Riser Diameter:	10 in.
Element Flows To:	
Outlet 1	Outlet 2

Gravel Trench Bed Hydraulic Table

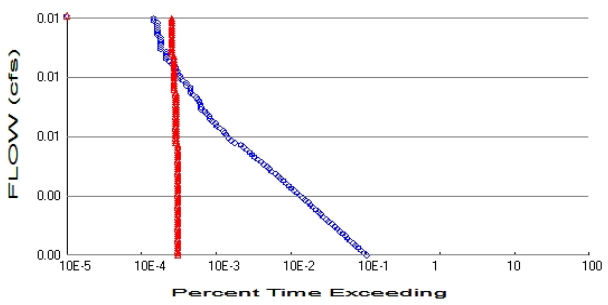
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.008	0.000	0.000	0.000
0.0167	0.008	0.000	0.000	0.223
0.0333	0.008	0.000	0.000	0.223
0.0500	0.008	0.000	0.000	0.223
0.0667	0.008	0.000	0.000	0.223
0.0833	0.008	0.000	0.000	0.223
0.1000	0.008	0.000	0.000	0.223
0.1167	0.008	0.000	0.000	0.223
0.1333	0.008	0.000	0.000	0.223
0.1500	0.008	0.000	0.000	0.223
0.1667	0.008	0.000	0.000	0.223
0.1833	0.008	0.000	0.000	0.223
0.2000	0.008	0.000	0.000	0.223
0.2167	0.008	0.000	0.000	0.223
0.2333	0.008	0.000	0.000	0.223
0.2500	0.008	0.000	0.000	0.223
0.2667	0.008	0.000	0.000	0.223
0.2833	0.008	0.000	0.000	0.223
0.3000	0.008	0.001	0.000	0.223
0.3167	0.008	0.001	0.000	0.223
0.3333	0.008	0.001	0.000	0.223
0.3500	0.008	0.001	0.000	0.223
0.3667	0.008	0.001	0.000	0.223
0.3833	0.008	0.001	0.000	0.223
0.4000	0.008	0.001	0.000	0.223
0.4167	0.008	0.001	0.000	0.223

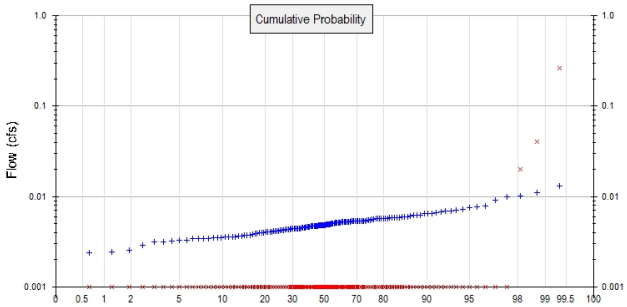
0.4333	0.008	0.001	0.000	0.223
0.4500	0.008	0.001	0.000	0.223
0.4667	0.008	0.001	0.000	0.223
0.4833	0.008	0.001	0.000	0.223
0.5000	0.008	0.001	0.000	0.223
0.5167	0.008	0.001	0.000	0.223
0.5333	0.008	0.001	0.000	0.223
0.5500	0.008	0.001	0.000	0.223
0.5667	0.008	0.001	0.000	0.223
0.5833	0.008	0.001	0.000	0.223
0.6000	0.008	0.002	0.000	0.223
0.6167	0.008	0.002	0.000	0.223
0.6333	0.008	0.002	0.000	0.223
0.6500	0.008	0.002	0.000	0.223
0.6667	0.008	0.002	0.000	0.223
0.6833	0.008	0.002	0.000	0.223
0.7000	0.008	0.002	0.000	0.223
0.7167	0.008	0.002	0.000	0.223
0.7333	0.008	0.002	0.000	0.223
0.7500	0.008	0.002	0.000	0.223
0.7667	0.008	0.002	0.000	0.223
0.7833	0.008	0.002	0.000	0.223
0.8000	0.008	0.002	0.000	0.223
0.8167	0.008	0.002	0.000	0.223
0.8333	0.008	0.002	0.000	0.223
0.8500	0.008	0.002	0.000	0.223
0.8667	0.008	0.002	0.000	0.223
0.8833	0.008	0.002	0.000	0.223
0.9000	0.008	0.003	0.000	0.223
0.9167	0.008	0.003	0.000	0.223
0.9333	0.008	0.003	0.000	0.223
0.9500	0.008	0.003	0.000	0.223
0.9667	0.008	0.003	0.000	0.223
0.9833	0.008	0.003	0.000	0.223
1.0000	0.008	0.003	0.000	0.223
1.0167	0.008	0.003	0.000	0.223
1.0333	0.008	0.003	0.000	0.223
1.0500	0.008	0.003	0.000	0.223
1.0667	0.008	0.003	0.000	0.223
1.0833	0.008	0.003	0.000	0.223
1.1000	0.008	0.003	0.000	0.223
1.1167	0.008	0.003	0.000	0.223
1.1333	0.008	0.003	0.000	0.223
1.1500	0.008	0.003	0.000	0.223
1.1667	0.008	0.003	0.000	0.223
1.1833	0.008	0.003	0.000	0.223
1.2000	0.008	0.003	0.000	0.223
1.2167	0.008	0.004	0.000	0.223
1.2333	0.008	0.004	0.000	0.223
1.2500	0.008	0.004	0.000	0.223
1.2667	0.008	0.004	0.000	0.223
1.2833	0.008	0.004	0.000	0.223
1.3000	0.008	0.004	0.000	0.223
1.3167	0.008	0.004	0.000	0.223
1.3333	0.008	0.004	0.000	0.223
1.3500	0.008	0.004	0.000	0.223
1.3667	0.008	0.004	0.000	0.223
1.3833	0.008	0.004	0.000	0.223

1.4000	0.008	0.004	0.000	0.223
1.4167	0.008	0.004	0.000	0.223
1.4333	0.008	0.004	0.000	0.223
1.4500	0.008	0.004	0.000	0.223
1.4667	0.008	0.004	0.000	0.223
1.4833	0.008	0.004	0.000	0.223
1.5000	0.008	0.004	0.000	0.223

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 3.02
Total Impervious Area: 0.01

Mitigated Landuse Totals for POC #1
Total Pervious Area: 1.27
Total Impervious Area: 1.76

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.004788
5 year	0.006037
10 year	0.00685
25 year	0.007869
50 year	0.008625
100 year	0.009381

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0
5 year	0
10 year	0
25 year	0
50 year	0
100 year	0

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	**Predeveloped**	**Mitigated**
1902	0.005	0.000
1903	0.005	0.000
1904	0.006	0.000
1905	0.004	0.000
1906	0.003	0.000
1907	0.005	0.000
1908	0.005	0.000
1909	0.005	0.000
1910	0.005	0.000
1911	0.006	0.000

1912	0.009	0.000
1913	0.004	0.000
1914	0.013	0.000
1915	0.004	0.000
1916	0.005	0.000
1917	0.002	0.000
1918	0.004	0.000
1919	0.004	0.000
1920	0.004	0.000
1921	0.004	0.000
1922	0.004	0.000
1923	0.005	0.000
1924	0.005	0.000
1925	0.003	0.000
1926	0.005	0.000
1927	0.004	0.000
1928	0.004	0.000
1929	0.007	0.000
1930	0.006	0.000
1931	0.005	0.000
1932	0.004	0.000
1933	0.005	0.000
1934	0.005	0.000
1935	0.003	0.000
1936	0.005	0.000
1937	0.006	0.000
1938	0.004	0.000
1939	0.003	0.000
1940	0.007	0.000
1941	0.006	0.000
1942	0.005	0.000
1943	0.005	0.000
1944	0.008	0.000
1945	0.006	0.000
1946	0.005	0.000
1947	0.003	0.000
1948	0.005	0.000
1949	0.006	0.000
1950	0.004	0.000
1951	0.005	0.000
1952	0.005	0.263
1953	0.006	0.000
1954	0.005	0.000
1955	0.003	0.000
1956	0.003	0.000
1957	0.004	0.000
1958	0.005	0.000
1959	0.005	0.000
1960	0.005	0.000
1961	0.010	0.000
1962	0.005	0.000
1963	0.003	0.000
1964	0.008	0.000
1965	0.006	0.000
1966	0.004	0.000
1967	0.005	0.000
1968	0.005	0.000
1969	0.005	0.000

1970	0.005	0.000
1971	0.005	0.000
1972	0.011	0.000
1973	0.007	0.000
1974	0.007	0.000
1975	0.006	0.000
1976	0.005	0.000
1977	0.004	0.000
1978	0.005	0.000
1979	0.005	0.000
1980	0.005	0.000
1981	0.005	0.000
1982	0.004	0.000
1983	0.006	0.000
1984	0.006	0.000
1985	0.004	0.000
1986	0.004	0.000
1987	0.005	0.000
1988	0.004	0.000
1989	0.004	0.000
1990	0.004	0.000
1991	0.005	0.000
1992	0.005	0.000
1993	0.005	0.000
1994	0.005	0.000
1995	0.003	0.000
1996	0.006	0.000
1997	0.004	0.000
1998	0.006	0.000
1999	0.004	0.000
2000	0.005	0.000
2001	0.003	0.000
2002	0.005	0.000
2003	0.004	0.000
2004	0.006	0.000
2005	0.010	0.000
2006	0.004	0.000
2007	0.006	0.000
2008	0.006	0.000
2009	0.004	0.000
2010	0.005	0.000
2011	0.004	0.000
2012	0.005	0.000
2013	0.005	0.000
2014	0.004	0.000
2015	0.005	0.000
2016	0.004	0.000
2017	0.006	0.000
2018	0.005	0.000
2019	0.005	0.041
2020	0.004	0.000
2021	0.005	0.000
2022	0.005	0.000
2023	0.007	0.000
2024	0.007	0.000
2025	0.004	0.000
2026	0.005	0.000
2027	0.005	0.000

2028	0.002	0.000
2029	0.005	0.000
2030	0.006	0.000
2031	0.002	0.000
2032	0.004	0.000
2033	0.004	0.000
2034	0.005	0.000
2035	0.006	0.000
2036	0.004	0.000
2037	0.005	0.000
2038	0.005	0.000
2039	0.008	0.000
2040	0.004	0.000
2041	0.005	0.000
2042	0.006	0.020
2043	0.005	0.000
2044	0.005	0.000
2045	0.004	0.000
2046	0.004	0.000
2047	0.005	0.000
2048	0.004	0.000
2049	0.005	0.000
2050	0.005	0.000
2051	0.005	0.000
2052	0.004	0.000
2053	0.003	0.000
2054	0.006	0.000
2055	0.005	0.000
2056	0.006	0.000
2057	0.003	0.000
2058	0.004	0.000
2059	0.007	0.000

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0130	0.2631
2	0.0110	0.0405
3	0.0101	0.0201
4	0.0099	0.0000
5	0.0091	0.0000
6	0.0078	0.0000
7	0.0077	0.0000
8	0.0075	0.0000
9	0.0073	0.0000
10	0.0070	0.0000
11	0.0069	0.0000
12	0.0069	0.0000
13	0.0068	0.0000
14	0.0067	0.0000
15	0.0065	0.0000
16	0.0065	0.0000
17	0.0065	0.0000
18	0.0062	0.0000
19	0.0062	0.0000
20	0.0062	0.0000
21	0.0061	0.0000
22	0.0060	0.0000

23	0.0059	0.0000
24	0.0059	0.0000
25	0.0059	0.0000
26	0.0059	0.0000
27	0.0059	0.0000
28	0.0058	0.0000
29	0.0058	0.0000
30	0.0057	0.0000
31	0.0057	0.0000
32	0.0057	0.0000
33	0.0057	0.0000
34	0.0057	0.0000
35	0.0057	0.0000
36	0.0057	0.0000
37	0.0056	0.0000
38	0.0056	0.0000
39	0.0055	0.0000
40	0.0055	0.0000
41	0.0054	0.0000
42	0.0054	0.0000
43	0.0054	0.0000
44	0.0054	0.0000
45	0.0054	0.0000
46	0.0054	0.0000
47	0.0053	0.0000
48	0.0053	0.0000
49	0.0053	0.0000
50	0.0053	0.0000
51	0.0053	0.0000
52	0.0053	0.0000
53	0.0053	0.0000
54	0.0052	0.0000
55	0.0052	0.0000
56	0.0052	0.0000
57	0.0052	0.0000
58	0.0052	0.0000
59	0.0052	0.0000
60	0.0052	0.0000
61	0.0052	0.0000
62	0.0052	0.0000
63	0.0052	0.0000
64	0.0052	0.0000
65	0.0051	0.0000
66	0.0051	0.0000
67	0.0051	0.0000
68	0.0051	0.0000
69	0.0050	0.0000
70	0.0050	0.0000
71	0.0050	0.0000
72	0.0050	0.0000
73	0.0050	0.0000
74	0.0049	0.0000
75	0.0049	0.0000
76	0.0049	0.0000
77	0.0049	0.0000
78	0.0049	0.0000
79	0.0048	0.0000
80	0.0048	0.0000

81	0.0048	0.0000
82	0.0048	0.0000
83	0.0048	0.0000
84	0.0048	0.0000
85	0.0048	0.0000
86	0.0048	0.0000
87	0.0047	0.0000
88	0.0047	0.0000
89	0.0047	0.0000
90	0.0047	0.0000
91	0.0047	0.0000
92	0.0047	0.0000
93	0.0047	0.0000
94	0.0047	0.0000
95	0.0047	0.0000
96	0.0047	0.0000
97	0.0046	0.0000
98	0.0046	0.0000
99	0.0046	0.0000
100	0.0046	0.0000
101	0.0045	0.0000
102	0.0045	0.0000
103	0.0045	0.0000
104	0.0045	0.0000
105	0.0045	0.0000
106	0.0045	0.0000
107	0.0044	0.0000
108	0.0044	0.0000
109	0.0044	0.0000
110	0.0044	0.0000
111	0.0044	0.0000
112	0.0044	0.0000
113	0.0043	0.0000
114	0.0043	0.0000
115	0.0043	0.0000
116	0.0043	0.0000
117	0.0043	0.0000
118	0.0042	0.0000
119	0.0041	0.0000
120	0.0041	0.0000
121	0.0041	0.0000
122	0.0041	0.0000
123	0.0041	0.0000
124	0.0041	0.0000
125	0.0041	0.0000
126	0.0040	0.0000
127	0.0040	0.0000
128	0.0039	0.0000
129	0.0039	0.0000
130	0.0039	0.0000
131	0.0039	0.0000
132	0.0038	0.0000
133	0.0037	0.0000
134	0.0037	0.0000
135	0.0037	0.0000
136	0.0036	0.0000
137	0.0036	0.0000
138	0.0036	0.0000

139	0.0036	0.0000
140	0.0036	0.0000
141	0.0035	0.0000
142	0.0035	0.0000
143	0.0035	0.0000
144	0.0035	0.0000
145	0.0034	0.0000
146	0.0034	0.0000
147	0.0034	0.0000
148	0.0034	0.0000
149	0.0033	0.0000
150	0.0033	0.0000
151	0.0032	0.0000
152	0.0032	0.0000
153	0.0031	0.0000
154	0.0029	0.0000
155	0.0025	0.0000
156	0.0025	0.0000
157	0.0024	0.0000
158	0.0020	0.0000

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0024	5767	17	0	Pass
0.0025	5266	17	0	Pass
0.0025	4860	17	0	Pass
0.0026	4477	17	0	Pass
0.0026	4109	17	0	Pass
0.0027	3788	17	0	Pass
0.0028	3467	17	0	Pass
0.0028	3220	17	0	Pass
0.0029	2967	17	0	Pass
0.0030	2730	17	0	Pass
0.0030	2519	17	0	Pass
0.0031	2335	17	0	Pass
0.0031	2153	17	0	Pass
0.0032	1970	17	0	Pass
0.0033	1803	17	0	Pass
0.0033	1659	17	1	Pass
0.0034	1515	17	1	Pass
0.0035	1403	17	1	Pass
0.0035	1292	17	1	Pass
0.0036	1201	17	1	Pass
0.0037	1110	17	1	Pass
0.0037	1020	17	1	Pass
0.0038	949	17	1	Pass
0.0038	869	17	1	Pass
0.0039	799	17	2	Pass
0.0040	734	17	2	Pass
0.0040	671	17	2	Pass
0.0041	617	17	2	Pass
0.0042	561	17	3	Pass
0.0042	523	17	3	Pass
0.0043	478	17	3	Pass
0.0043	442	17	3	Pass
0.0044	408	17	4	Pass
0.0045	375	17	4	Pass
0.0045	344	17	4	Pass
0.0046	309	17	5	Pass
0.0047	284	17	5	Pass
0.0047	269	17	6	Pass
0.0048	241	17	7	Pass
0.0048	222	17	7	Pass
0.0049	203	17	8	Pass
0.0050	180	17	9	Pass
0.0050	168	17	10	Pass
0.0051	157	17	10	Pass
0.0052	143	17	11	Pass
0.0052	130	17	13	Pass
0.0053	118	17	14	Pass
0.0054	99	16	16	Pass
0.0054	89	16	17	Pass
0.0055	81	16	19	Pass
0.0055	76	16	21	Pass
0.0056	71	16	22	Pass
0.0057	69	16	23	Pass
0.0057	62	16	25	Pass

0.0058	57	16	28	Pass
0.0059	54	16	29	Pass
0.0059	49	16	32	Pass
0.0060	46	16	34	Pass
0.0060	45	16	35	Pass
0.0061	41	16	39	Pass
0.0062	39	16	41	Pass
0.0062	35	16	45	Pass
0.0063	35	16	45	Pass
0.0064	34	16	47	Pass
0.0064	33	16	48	Pass
0.0065	31	16	51	Pass
0.0065	30	16	53	Pass
0.0066	27	16	59	Pass
0.0067	25	16	64	Pass
0.0067	25	15	60	Pass
0.0068	25	15	60	Pass
0.0069	22	15	68	Pass
0.0069	22	15	68	Pass
0.0070	20	15	75	Pass
0.0071	18	15	83	Pass
0.0071	18	15	83	Pass
0.0072	17	15	88	Pass
0.0072	17	15	88	Pass
0.0073	16	15	93	Pass
0.0074	15	15	100	Pass
0.0074	14	15	107	Pass
0.0075	13	15	115	Fail
0.0076	12	15	125	Fail
0.0076	12	15	125	Fail
0.0077	12	14	116	Fail
0.0077	12	14	116	Fail
0.0078	10	14	140	Fail
0.0079	10	14	140	Fail
0.0079	10	14	140	Fail
0.0080	10	14	140	Fail
0.0081	10	14	140	Fail
0.0081	10	14	140	Fail
0.0082	9	14	155	Fail
0.0082	9	14	155	Fail
0.0083	9	14	155	Fail
0.0084	9	14	155	Fail
0.0084	9	14	155	Fail
0.0085	9	14	155	Fail
0.0086	8	14	175	Fail
0.0086	8	14	175	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.

Water Quality

Water Quality BMP Flow and Volume for POC #1

On-line facility volume:	0 acre-feet
On-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.
Off-line facility target flow:	0 cfs.
Adjusted for 15 min:	0 cfs.

LID Report

LID Technique	Used for Treatment ?	Total Volume Needs Treatment (ac-ft)	Volume Through Facility (ac-ft)	Infiltration Volume (ac-ft)	Cumulative Volume Infiltration Credit	Percent Volume Infiltrated	Water Quality	Percent Water Quality Treated	Comment
Infiltration Pond POC	☐	583.76			☐	100.00			
Gravel Trench Bed 1 POC	☐	97.89			☐	100.00			
Total Volume Infiltrated		681.64	0.00	0.00		100.00	0.00	0%	No Treat. Credit
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Failed

POC 2

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

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

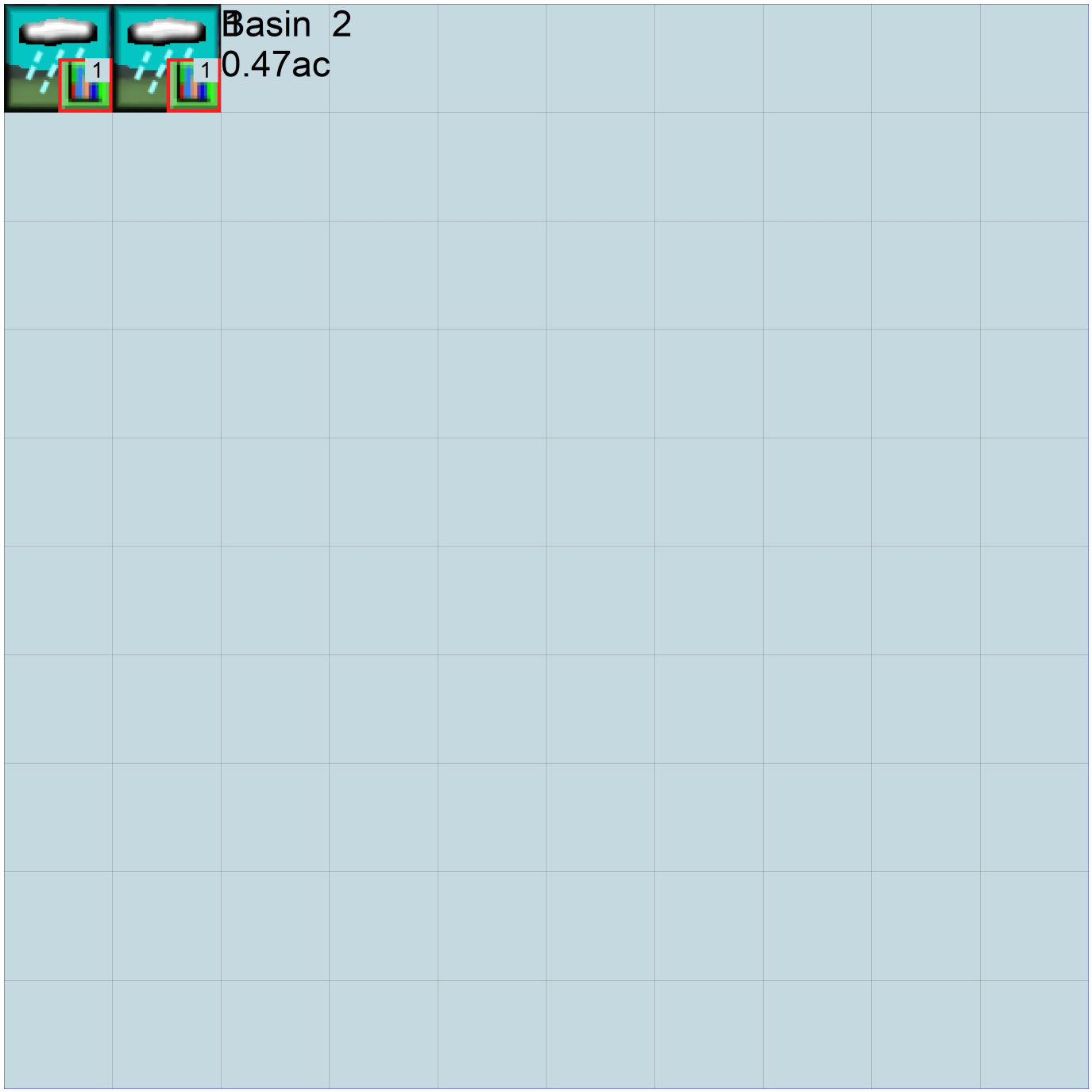
No PERLND changes have been made.

IMPLND Changes

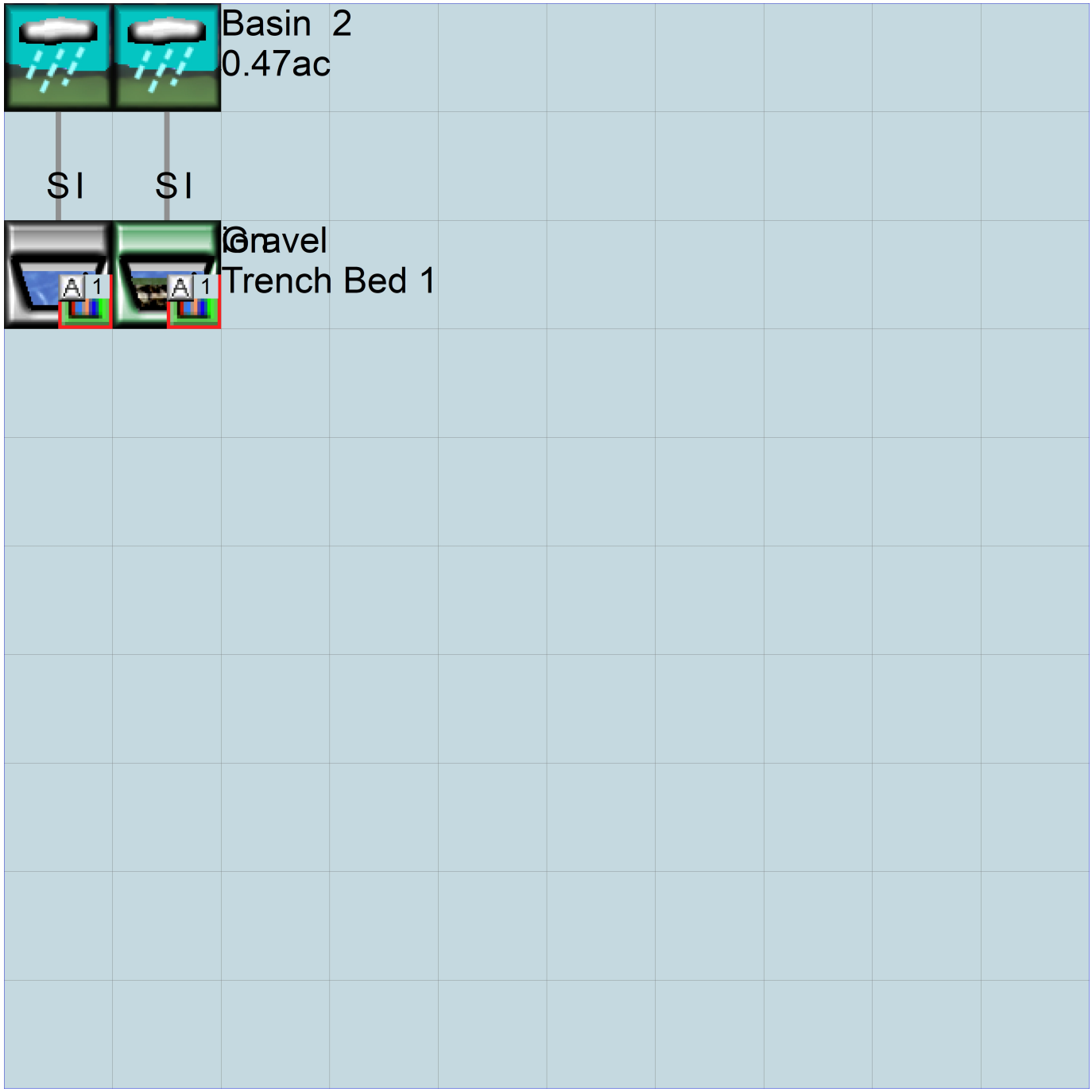
No IMPLND changes have been made.

Appendix

Predeveloped Schematic



Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   default.wdm
MESSU       25   Predefault.MES
            27   Predefault.L61
            28   Predefault.L62
            30   POCdefault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       1
      IMPLND       1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out            ***
    1     A/B, Forest, Flat       1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    1         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    1         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO
```

```
  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    1         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    1             0         5         2       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    1             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    1          0.2       0.5      0.35         0       0.7       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
             ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    1             0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    1      ROADS/FLAT             1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    4    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1           400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1             0         0
```

```
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND   1                        2.56     COPY   501     12
PERLND   1                        2.56     COPY   501     13
Basin  2***
PERLND   1                        0.46     COPY   501     12
PERLND   1                        0.46     COPY   501     13
IMPLND   1                        0.01     COPY   501     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<----------------><---> User T-series  Engl Metr LKFG             ***
                                      in  out                               ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                 ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><--------->      ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                    ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><---->
  END HYDR-INIT
```

```
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>            <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   default.wdm
MESSU       25   Mitdefault.MES
            27   Mitdefault.L61
            28   Mitdefault.L62
            30   POCdefault1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND       4
      IMPLND       1
      IMPLND       4
      IMPLND      14
      RCHRES       1
      RCHRES       2
      COPY         1
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Infiltration Pond           MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
    4     A/B, Pasture, Flat      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    4         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY
```

```
  PRINT-INFO
    <PLS > ***************** Print-flags ***************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    4         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    4         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    4              0         5       1.5       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    4              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                                  ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    4          0.15       0.5       0.3         0       0.7       0.4
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS       AGWS      GWVS
    4              0         0         0         0         3          1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    1      ROADS/FLAT             1    1    1   27    0
    4      ROOF TOPS/FLAT         1    1    1   27    0
   14      POND                   1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ******************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
    4         0    0    1    0    0    0
   14         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    4    1    9
    4         0    0    4    0    0    0    1    9
   14         0    0    4    0    0    0    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
    4         0    0    0    0    0
```

```
   14         0    0    0    0    0
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
    4            400      0.01       0.1       0.1
   14            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
    4              0         0
   14              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
    4              0         0
   14              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Onsite***
PERLND   4                        1.06     RCHRES   1      2
PERLND   4                        1.06     RCHRES   1      3
IMPLND   1                        0.82     RCHRES   1      5
IMPLND   4                        0.61     RCHRES   1      5
IMPLND  14                        0.07     RCHRES   1      5
Basin  2***
PERLND   4                        0.21     RCHRES   2      2
PERLND   4                        0.21     RCHRES   2      3
IMPLND   1                        0.26     RCHRES   2      5

******Routing******
PERLND   4                        1.06     COPY     1     12
IMPLND   1                        0.82     COPY     1     15
IMPLND   4                        0.61     COPY     1     15
IMPLND  14                        0.07     COPY     1     15
PERLND   4                        1.06     COPY     1     13
PERLND   4                        0.21     COPY     1     12
IMPLND   1                        0.26     COPY     1     15
PERLND   4                        0.21     COPY     1     13
RCHRES   1                           1     COPY   501     17
RCHRES   2                           1     COPY   501     17
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
```

```
    # -  #<------------------><---> User T-series  Engl Metr LKFG            ***
                                          in  out                            ***
    1     Infiltration Pon-011    2    1    1    1   28    0    1
    2     Gravel Trench Be-012    2    1    1    1   28    0    1
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
    1         1    0    0    0    0    0    0    0    0    0
    2         1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
    1         4    0    0    0    0    0    0    0    0    0    1    9
    2         4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
          FG FG FG FG  possible  exit  *** possible  exit      possible  exit
           *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
    1      0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
    2      0  1  0  0    4  5  0  0  0       0  0  0  0  0       2  2  2  2  2
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1              1      0.01       0.0    401.65       0.5       0.0
    2              2      0.01       0.0       0.0       0.5       0.0
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
         *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
    1            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
    2            0         4.0  5.0  0.0  0.0  0.0       0.0  0.0  0.0  0.0  0.0
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE      1
   90    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.034917  0.000000  0.000000  0.000000
  0.042778  0.035224  0.001500  0.000000  0.232375
  0.085556  0.035533  0.003014  0.000000  0.232375
  0.128333  0.035843  0.004540  0.000000  0.232375
  0.171111  0.036154  0.006080  0.000000  0.232375
  0.213889  0.036466  0.007633  0.000000  0.232375
  0.256667  0.036780  0.009200  0.000000  0.232375
  0.299444  0.037095  0.010780  0.000000  0.232375
  0.342222  0.037412  0.012374  0.000000  0.232375
  0.385000  0.037729  0.013981  0.000000  0.232375
  0.427778  0.038049  0.015602  0.000000  0.232375
  0.470556  0.038369  0.017236  0.000000  0.232375
  0.513333  0.038691  0.018885  0.000000  0.232375
  0.556111  0.039014  0.020547  0.000000  0.232375
  0.598889  0.039339  0.022222  0.000000  0.232375
  0.641667  0.039665  0.023912  0.000000  0.232375
  0.684444  0.039992  0.025616  0.000000  0.232375
```

0.727222	0.040320	0.027334	0.000000	0.232375
0.770000	0.040650	0.029066	0.000000	0.232375
0.812778	0.040982	0.030812	0.000000	0.232375
0.855556	0.041314	0.032572	0.000000	0.232375
0.898333	0.041648	0.034346	0.000000	0.232375
0.941111	0.041983	0.036135	0.000000	0.232375
0.983889	0.042320	0.037938	0.000000	0.232375
1.026667	0.042658	0.039756	0.000000	0.232375
1.069444	0.042997	0.041588	0.000000	0.232375
1.112222	0.043338	0.043435	0.000000	0.232375
1.155000	0.043680	0.045296	0.000000	0.232375
1.197778	0.044023	0.047172	0.000000	0.232375
1.240556	0.044368	0.049062	0.000000	0.232375
1.283333	0.044714	0.050968	0.000000	0.232375
1.326111	0.045062	0.052888	0.000000	0.232375
1.368889	0.045410	0.054823	0.000000	0.232375
1.411667	0.045760	0.056773	0.000000	0.232375
1.454444	0.046112	0.058738	0.000000	0.232375
1.497222	0.046465	0.060718	0.000000	0.232375
1.540000	0.046819	0.062713	0.000000	0.232375
1.582778	0.047174	0.064724	0.000000	0.232375
1.625556	0.047531	0.066749	0.000000	0.232375
1.668333	0.047889	0.068790	0.000000	0.232375
1.711111	0.048249	0.070847	0.000000	0.232375
1.753889	0.048610	0.072918	0.000000	0.232375
1.796667	0.048972	0.075006	0.000000	0.232375
1.839444	0.049335	0.077108	0.000000	0.232375
1.882222	0.049700	0.079226	0.000000	0.232375
1.925000	0.050066	0.081360	0.000000	0.232375
1.967778	0.050434	0.083510	0.000000	0.232375
2.010556	0.050803	0.085675	0.000000	0.232375
2.053333	0.051173	0.087856	0.000000	0.232375
2.096111	0.051545	0.090053	0.000000	0.232375
2.138889	0.051918	0.092266	0.000000	0.232375
2.181667	0.052292	0.094495	0.000000	0.232375
2.224444	0.052668	0.096740	0.000000	0.232375
2.267222	0.053044	0.099001	0.000000	0.232375
2.310000	0.053423	0.101279	0.000000	0.232375
2.352778	0.053802	0.103572	0.000000	0.232375
2.395556	0.054183	0.105882	0.000000	0.232375
2.438333	0.054566	0.108208	0.000000	0.232375
2.481111	0.054950	0.110550	0.000000	0.232375
2.523889	0.055335	0.112909	0.000000	0.232375
2.566667	0.055721	0.115284	0.000000	0.232375
2.609444	0.056109	0.117676	0.000000	0.232375
2.652222	0.056498	0.120085	0.000000	0.232375
2.695000	0.056888	0.122510	0.000000	0.232375
2.737778	0.057280	0.124952	0.000000	0.232375
2.780556	0.057673	0.127411	0.000000	0.232375
2.823333	0.058067	0.129886	0.000000	0.232375
2.866111	0.058463	0.132379	0.021702	0.232375
2.908889	0.058860	0.134888	0.151371	0.232375
2.951667	0.059259	0.137414	0.341799	0.232375
2.994444	0.059659	0.139958	0.572643	0.232375
3.037222	0.060060	0.142519	0.828609	0.232375
3.080000	0.060462	0.145096	1.094372	0.232375
3.122778	0.060866	0.147692	1.354264	0.232375
3.165556	0.061271	0.150304	1.593332	0.232375
3.208333	0.061678	0.152934	1.799094	0.232375
3.251111	0.062086	0.155581	1.963769	0.232375
3.293889	0.062495	0.158246	2.086878	0.232375
3.336667	0.062906	0.160928	2.178164	0.232375
3.379444	0.063318	0.163628	2.291763	0.232375
3.422222	0.063731	0.166345	2.382549	0.232375
3.465000	0.064146	0.169080	2.470001	0.232375
3.507778	0.064561	0.171833	2.554460	0.232375
3.550556	0.064979	0.174604	2.636215	0.232375
3.593333	0.065397	0.177392	2.715510	0.232375
3.636111	0.065817	0.180199	2.792554	0.232375
3.678889	0.066239	0.183023	2.867528	0.232375

```
3.721667  0.066661  0.185866  2.940592  0.232375
3.764444  0.067085  0.188727  3.011884  0.232375
3.807222  0.067511  0.191606  3.081527  0.232375
END FTABLE  1
FTABLE      2
 92    5
   Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
    (ft)   (acres) (acre-ft)   (cfs)     (cfs)   (ft/sec)    (Minutes)***
0.000000  0.008196  0.000000  0.000000  0.000000
0.016667  0.008196  0.000055  0.000000  0.223125
0.033333  0.008196  0.000109  0.000000  0.223125
0.050000  0.008196  0.000164  0.000000  0.223125
0.066667  0.008196  0.000219  0.000000  0.223125
0.083333  0.008196  0.000273  0.000000  0.223125
0.100000  0.008196  0.000328  0.000000  0.223125
0.116667  0.008196  0.000382  0.000000  0.223125
0.133333  0.008196  0.000437  0.000000  0.223125
0.150000  0.008196  0.000492  0.000000  0.223125
0.166667  0.008196  0.000546  0.000000  0.223125
0.183333  0.008196  0.000601  0.000000  0.223125
0.200000  0.008196  0.000656  0.000000  0.223125
0.216667  0.008196  0.000710  0.000000  0.223125
0.233333  0.008196  0.000765  0.000000  0.223125
0.250000  0.008196  0.000820  0.000000  0.223125
0.266667  0.008196  0.000874  0.000000  0.223125
0.283333  0.008196  0.000929  0.000000  0.223125
0.300000  0.008196  0.000983  0.000000  0.223125
0.316667  0.008196  0.001038  0.000000  0.223125
0.333333  0.008196  0.001093  0.000000  0.223125
0.350000  0.008196  0.001147  0.000000  0.223125
0.366667  0.008196  0.001202  0.000000  0.223125
0.383333  0.008196  0.001257  0.000000  0.223125
0.400000  0.008196  0.001311  0.000000  0.223125
0.416667  0.008196  0.001366  0.000000  0.223125
0.433333  0.008196  0.001421  0.000000  0.223125
0.450000  0.008196  0.001475  0.000000  0.223125
0.466667  0.008196  0.001530  0.000000  0.223125
0.483333  0.008196  0.001584  0.000000  0.223125
0.500000  0.008196  0.001639  0.000000  0.223125
0.516667  0.008196  0.001694  0.000000  0.223125
0.533333  0.008196  0.001748  0.000000  0.223125
0.550000  0.008196  0.001803  0.000000  0.223125
0.566667  0.008196  0.001858  0.000000  0.223125
0.583333  0.008196  0.001912  0.000000  0.223125
0.600000  0.008196  0.001967  0.000000  0.223125
0.616667  0.008196  0.002022  0.000000  0.223125
0.633333  0.008196  0.002076  0.000000  0.223125
0.650000  0.008196  0.002131  0.000000  0.223125
0.666667  0.008196  0.002185  0.000000  0.223125
0.683333  0.008196  0.002240  0.000000  0.223125
0.700000  0.008196  0.002295  0.000000  0.223125
0.716667  0.008196  0.002349  0.000000  0.223125
0.733333  0.008196  0.002404  0.000000  0.223125
0.750000  0.008196  0.002459  0.000000  0.223125
0.766667  0.008196  0.002513  0.000000  0.223125
0.783333  0.008196  0.002568  0.000000  0.223125
0.800000  0.008196  0.002623  0.000000  0.223125
0.816667  0.008196  0.002677  0.000000  0.223125
0.833333  0.008196  0.002732  0.000000  0.223125
0.850000  0.008196  0.002787  0.000000  0.223125
0.866667  0.008196  0.002841  0.000000  0.223125
0.883333  0.008196  0.002896  0.000000  0.223125
0.900000  0.008196  0.002950  0.000000  0.223125
0.916667  0.008196  0.003005  0.000000  0.223125
0.933333  0.008196  0.003060  0.000000  0.223125
0.950000  0.008196  0.003114  0.000000  0.223125
0.966667  0.008196  0.003169  0.000000  0.223125
0.983333  0.008196  0.003224  0.000000  0.223125
1.000000  0.008196  0.003278  0.000000  0.223125
1.016667  0.008196  0.003333  0.000000  0.223125
```

```
  1.033333  0.008196  0.003388  0.000000  0.223125
  1.050000  0.008196  0.003442  0.000000  0.223125
  1.066667  0.008196  0.003497  0.000000  0.223125
  1.083333  0.008196  0.003551  0.000000  0.223125
  1.100000  0.008196  0.003606  0.000000  0.223125
  1.116667  0.008196  0.003661  0.000000  0.223125
  1.133333  0.008196  0.003715  0.000000  0.223125
  1.150000  0.008196  0.003770  0.000000  0.223125
  1.166667  0.008196  0.003825  0.000000  0.223125
  1.183333  0.008196  0.003879  0.000000  0.223125
  1.200000  0.008196  0.003934  0.000000  0.223125
  1.216667  0.008196  0.003989  0.000000  0.223125
  1.233333  0.008196  0.004043  0.000000  0.223125
  1.250000  0.008196  0.004098  0.000000  0.223125
  1.266667  0.008196  0.004152  0.000000  0.223125
  1.283333  0.008196  0.004207  0.000000  0.223125
  1.300000  0.008196  0.004262  0.000000  0.223125
  1.316667  0.008196  0.004316  0.000000  0.223125
  1.333333  0.008196  0.004371  0.000000  0.223125
  1.350000  0.008196  0.004426  0.000000  0.223125
  1.366667  0.008196  0.004480  0.000000  0.223125
  1.383333  0.008196  0.004535  0.000000  0.223125
  1.400000  0.008196  0.004590  0.000000  0.223125
  1.416667  0.008196  0.004644  0.000000  0.223125
  1.433333  0.008196  0.004699  0.000000  0.223125
  1.450000  0.008196  0.004753  0.000000  0.223125
  1.466667  0.008196  0.004808  0.000000  0.223125
  1.483333  0.008196  0.004863  0.000000  0.223125
  1.500000  0.008196  0.004917  0.000000  0.223125
  1.516667  0.008196  0.005054  0.019025  0.223125
  END FTABLE  2
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1             PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1             IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1             PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1             IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
RCHRES   1 HYDR   RO     1 1        1      WDM   1000 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      1 1        1      WDM   1001 FLOW     ENGL      REPL
RCHRES   1 HYDR   O      2 1        1      WDM   1002 FLOW     ENGL      REPL
RCHRES   1 HYDR   STAGE  1 1        1      WDM   1003 STAG     ENGL      REPL
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
RCHRES   2 HYDR   RO     1 1        1      WDM   1004 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      1 1        1      WDM   1005 FLOW     ENGL      REPL
RCHRES   2 HYDR   O      2 1        1      WDM   1006 FLOW     ENGL      REPL
RCHRES   2 HYDR   STAGE  1 1        1      WDM   1007 STAG     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK        2
PERLND     PWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    2

  MASS-LINK        3
PERLND     PWATER IFWO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    3

  MASS-LINK        5
```

```
IMPLND     IWATER SURO       0.083333      RCHRES         INFLOW IVOL
  END MASS-LINK    5

  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15

  MASS-LINK       17
RCHRES     OFLOW  OVOL   1                 COPY           INPUT  MEAN
  END MASS-LINK   17


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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Local (360)943-0304

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WWHM2012

PROJECT REPORT

General Model Information

WWHM2012 Project Name: WQ
Site Name:
Site Address:
City:

Report Date:	6/6/2024
Gage:	40 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	0.000 (adjusted)
Version Date:	2023/01/27
Version:	4.2.19

POC Thresholds

Low Flow Threshold for POC1:	50 Percent of the 2 Year
High Flow Threshold for POC1:	50 Year
Low Flow Threshold for POC2:	50 Percent of the 2 Year
High Flow Threshold for POC2:	50 Year
Low Flow Threshold for POC3:	50 Percent of the 2 Year
High Flow Threshold for POC3:	50 Year

Landuse Basin Data

Predeveloped Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.68
Pervious Total	0.68
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.68

Basin 2

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.58
Pervious Total	0.58
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.58

Basin 3

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Forest, Flat	0.48
Pervious Total	0.48
Impervious Land Use	acre
Impervious Total	0
Basin Total	0.48

Mitigated Land Use

Basin 1

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
A B, Pasture, Flat	0.21
Pervious Total	0.21
Impervious Land Use	acre
ROADS FLAT	0.47
Impervious Total	0.47
Basin Total	0.68

Basin 2

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Pasture, Flat	0.21
Pervious Total	0.21

Impervious Land Use	acre
ROADS FLAT	0.37
Impervious Total	0.37
Basin Total	0.58

Basin 3

Bypass:	No
GroundWater:	No

Pervious Land Use	acre
A B, Pasture, Flat	0.2
Pervious Total	0.2

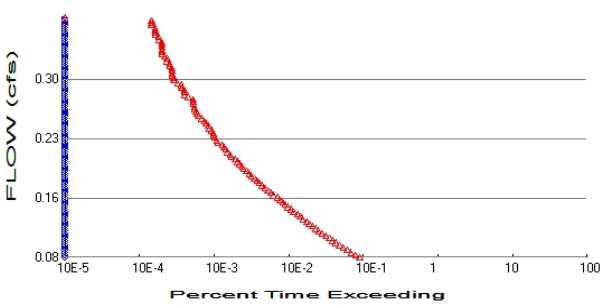
Impervious Land Use	acre
ROADS FLAT	0.28
Impervious Total	0.28
Basin Total	0.48

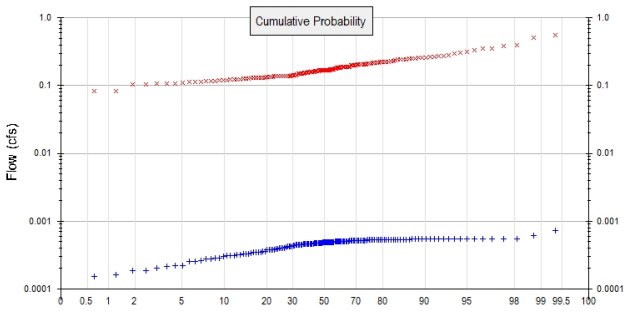
Routing Elements
Predeveloped Routing

Mitigated Routing

Analysis Results

POC 1





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 0.68
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.21
Total Impervious Area: 0.47

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.000454
5 year	0.000553
10 year	0.000599
25 year	0.000641
50 year	0.000665
100 year	0.000683

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.168604
5 year	0.22616
10 year	0.267969
25 year	0.325166
50 year	0.371052
100 year	0.419837

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	0.000	0.200
1903	0.000	0.221
1904	0.000	0.250
1905	0.000	0.112
1906	0.000	0.127
1907	0.000	0.167
1908	0.000	0.138
1909	0.000	0.170
1910	0.001	0.162
1911	0.001	0.183

1912	0.001	0.303
1913	0.001	0.131
1914	0.000	0.561
1915	0.000	0.114
1916	0.000	0.212
1917	0.000	0.084
1918	0.001	0.169
1919	0.000	0.106
1920	0.000	0.139
1921	0.000	0.119
1922	0.001	0.186
1923	0.001	0.129
1924	0.000	0.245
1925	0.000	0.103
1926	0.001	0.199
1927	0.001	0.170
1928	0.000	0.121
1929	0.000	0.241
1930	0.000	0.254
1931	0.000	0.122
1932	0.000	0.131
1933	0.000	0.130
1934	0.001	0.211
1935	0.000	0.115
1936	0.001	0.156
1937	0.001	0.205
1938	0.001	0.115
1939	0.000	0.141
1940	0.001	0.255
1941	0.001	0.278
1942	0.000	0.188
1943	0.000	0.186
1944	0.001	0.268
1945	0.000	0.202
1946	0.001	0.158
1947	0.000	0.123
1948	0.001	0.168
1949	0.000	0.260
1950	0.000	0.144
1951	0.000	0.222
1952	0.000	0.250
1953	0.001	0.231
1954	0.001	0.136
1955	0.000	0.128
1956	0.000	0.119
1957	0.000	0.136
1958	0.001	0.169
1959	0.001	0.169
1960	0.001	0.137
1961	0.001	0.382
1962	0.001	0.164
1963	0.000	0.122
1964	0.000	0.352
1965	0.001	0.164
1966	0.000	0.133
1967	0.000	0.187
1968	0.001	0.157
1969	0.001	0.141

1970	0.001	0.159
1971	0.001	0.156
1972	0.000	0.514
1973	0.001	0.297
1974	0.001	0.217
1975	0.001	0.223
1976	0.000	0.238
1977	0.000	0.103
1978	0.001	0.172
1979	0.000	0.187
1980	0.001	0.179
1981	0.000	0.171
1982	0.000	0.137
1983	0.000	0.186
1984	0.001	0.184
1985	0.000	0.210
1986	0.000	0.106
1987	0.000	0.191
1988	0.000	0.112
1989	0.000	0.111
1990	0.000	0.136
1991	0.001	0.205
1992	0.001	0.197
1993	0.001	0.218
1994	0.001	0.150
1995	0.000	0.116
1996	0.001	0.156
1997	0.000	0.140
1998	0.001	0.167
1999	0.000	0.191
2000	0.001	0.158
2001	0.000	0.130
2002	0.000	0.232
2003	0.000	0.134
2004	0.000	0.203
2005	0.001	0.395
2006	0.000	0.182
2007	0.000	0.204
2008	0.001	0.168
2009	0.000	0.128
2010	0.000	0.164
2011	0.000	0.171
2012	0.001	0.160
2013	0.000	0.151
2014	0.000	0.148
2015	0.000	0.242
2016	0.000	0.160
2017	0.001	0.247
2018	0.001	0.147
2019	0.001	0.219
2020	0.001	0.180
2021	0.001	0.151
2022	0.000	0.251
2023	0.001	0.315
2024	0.000	0.330
2025	0.000	0.165
2026	0.000	0.187
2027	0.000	0.203

2028	0.000	0.079
2029	0.000	0.130
2030	0.001	0.276
2031	0.000	0.082
2032	0.000	0.138
2033	0.000	0.174
2034	0.001	0.132
2035	0.001	0.167
2036	0.000	0.137
2037	0.000	0.183
2038	0.000	0.173
2039	0.000	0.347
2040	0.000	0.136
2041	0.000	0.173
2042	0.001	0.202
2043	0.000	0.222
2044	0.001	0.152
2045	0.000	0.123
2046	0.001	0.137
2047	0.001	0.169
2048	0.000	0.138
2049	0.000	0.205
2050	0.001	0.154
2051	0.001	0.216
2052	0.000	0.167
2053	0.000	0.140
2054	0.001	0.276
2055	0.000	0.158
2056	0.000	0.221
2057	0.001	0.106
2058	0.001	0.208
2059	0.001	0.262

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0007	0.5612
2	0.0006	0.5143
3	0.0005	0.3951
4	0.0005	0.3818
5	0.0005	0.3516
6	0.0005	0.3473
7	0.0005	0.3298
8	0.0005	0.3152
9	0.0005	0.3034
10	0.0005	0.2971
11	0.0005	0.2785
12	0.0005	0.2760
13	0.0005	0.2756
14	0.0005	0.2684
15	0.0005	0.2617
16	0.0005	0.2603
17	0.0005	0.2547
18	0.0005	0.2544
19	0.0005	0.2514
20	0.0005	0.2497
21	0.0005	0.2495
22	0.0005	0.2467

23	0.0005	0.2451
24	0.0005	0.2419
25	0.0005	0.2406
26	0.0005	0.2381
27	0.0005	0.2318
28	0.0005	0.2308
29	0.0005	0.2233
30	0.0005	0.2223
31	0.0005	0.2220
32	0.0005	0.2214
33	0.0005	0.2209
34	0.0005	0.2190
35	0.0005	0.2180
36	0.0005	0.2174
37	0.0005	0.2156
38	0.0005	0.2117
39	0.0005	0.2111
40	0.0005	0.2103
41	0.0005	0.2075
42	0.0005	0.2053
43	0.0005	0.2050
44	0.0005	0.2045
45	0.0005	0.2036
46	0.0005	0.2033
47	0.0005	0.2029
48	0.0005	0.2024
49	0.0005	0.2024
50	0.0005	0.1996
51	0.0005	0.1990
52	0.0005	0.1969
53	0.0005	0.1911
54	0.0005	0.1911
55	0.0005	0.1878
56	0.0005	0.1874
57	0.0005	0.1867
58	0.0005	0.1866
59	0.0005	0.1862
60	0.0005	0.1861
61	0.0005	0.1857
62	0.0005	0.1844
63	0.0005	0.1833
64	0.0005	0.1827
65	0.0005	0.1821
66	0.0005	0.1797
67	0.0005	0.1789
68	0.0005	0.1741
69	0.0005	0.1732
70	0.0005	0.1729
71	0.0005	0.1723
72	0.0005	0.1712
73	0.0005	0.1705
74	0.0005	0.1703
75	0.0005	0.1697
76	0.0005	0.1691
77	0.0005	0.1688
78	0.0005	0.1686
79	0.0005	0.1686
80	0.0005	0.1685

81	0.0005	0.1676
82	0.0005	0.1675
83	0.0005	0.1674
84	0.0005	0.1669
85	0.0005	0.1665
86	0.0005	0.1655
87	0.0005	0.1642
88	0.0005	0.1641
89	0.0005	0.1640
90	0.0005	0.1624
91	0.0005	0.1605
92	0.0005	0.1601
93	0.0005	0.1589
94	0.0005	0.1585
95	0.0005	0.1584
96	0.0005	0.1582
97	0.0005	0.1572
98	0.0005	0.1563
99	0.0005	0.1559
100	0.0005	0.1555
101	0.0005	0.1537
102	0.0005	0.1519
103	0.0005	0.1514
104	0.0005	0.1510
105	0.0004	0.1503
106	0.0004	0.1483
107	0.0004	0.1472
108	0.0004	0.1439
109	0.0004	0.1415
110	0.0004	0.1414
111	0.0004	0.1404
112	0.0004	0.1398
113	0.0004	0.1390
114	0.0004	0.1385
115	0.0004	0.1380
116	0.0004	0.1375
117	0.0004	0.1375
118	0.0004	0.1375
119	0.0004	0.1368
120	0.0004	0.1366
121	0.0004	0.1365
122	0.0004	0.1362
123	0.0004	0.1360
124	0.0004	0.1358
125	0.0004	0.1343
126	0.0004	0.1327
127	0.0004	0.1321
128	0.0004	0.1312
129	0.0003	0.1310
130	0.0003	0.1302
131	0.0003	0.1301
132	0.0003	0.1297
133	0.0003	0.1294
134	0.0003	0.1283
135	0.0003	0.1278
136	0.0003	0.1274
137	0.0003	0.1231
138	0.0003	0.1228

139	0.0003	0.1223
140	0.0003	0.1219
141	0.0003	0.1208
142	0.0003	0.1190
143	0.0003	0.1188
144	0.0003	0.1164
145	0.0003	0.1153
146	0.0003	0.1150
147	0.0003	0.1138
148	0.0003	0.1123
149	0.0003	0.1119
150	0.0002	0.1112
151	0.0002	0.1062
152	0.0002	0.1061
153	0.0002	0.1057
154	0.0002	0.1033
155	0.0002	0.1025
156	0.0002	0.0840
157	0.0002	0.0824
158	0.0001	0.0788

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0002	0	4932	n/a	Fail
0.0002	0	4348	n/a	Fail
0.0002	0	3802	n/a	Fail
0.0002	0	3363	n/a	Fail
0.0002	0	2985	n/a	Fail
0.0002	0	2658	n/a	Fail
0.0003	0	2376	n/a	Fail
0.0003	0	2125	n/a	Fail
0.0003	0	1933	n/a	Fail
0.0003	0	1722	n/a	Fail
0.0003	0	1539	n/a	Fail
0.0003	0	1397	n/a	Fail
0.0003	0	1267	n/a	Fail
0.0003	0	1141	n/a	Fail
0.0003	0	1046	n/a	Fail
0.0003	0	963	n/a	Fail
0.0003	0	862	n/a	Fail
0.0003	0	790	n/a	Fail
0.0003	0	731	n/a	Fail
0.0003	0	641	n/a	Fail
0.0003	0	591	n/a	Fail
0.0003	0	540	n/a	Fail
0.0003	0	494	n/a	Fail
0.0003	0	462	n/a	Fail
0.0003	0	424	n/a	Fail
0.0003	0	391	n/a	Fail
0.0003	0	346	n/a	Fail
0.0003	0	317	n/a	Fail
0.0004	0	291	n/a	Fail
0.0004	0	266	n/a	Fail
0.0004	0	242	n/a	Fail
0.0004	0	222	n/a	Fail
0.0004	0	208	n/a	Fail
0.0004	0	192	n/a	Fail
0.0004	0	175	n/a	Fail
0.0004	0	163	n/a	Fail
0.0004	0	150	n/a	Fail
0.0004	0	138	n/a	Fail
0.0004	0	130	n/a	Fail
0.0004	0	123	n/a	Fail
0.0004	0	115	n/a	Fail
0.0004	0	105	n/a	Fail
0.0004	0	94	n/a	Fail
0.0004	0	91	n/a	Fail
0.0004	0	84	n/a	Fail
0.0004	0	79	n/a	Fail
0.0004	0	75	n/a	Fail
0.0004	0	71	n/a	Fail
0.0004	0	62	n/a	Fail
0.0004	0	60	n/a	Fail
0.0004	0	56	n/a	Fail
0.0005	0	54	n/a	Fail
0.0005	0	54	n/a	Fail

0.0005	0	52	n/a	Fail
0.0005	0	48	n/a	Fail
0.0005	0	46	n/a	Fail
0.0005	0	43	n/a	Fail
0.0005	0	41	n/a	Fail
0.0005	0	38	n/a	Fail
0.0005	0	34	n/a	Fail
0.0005	0	33	n/a	Fail
0.0005	0	32	n/a	Fail
0.0005	0	30	n/a	Fail
0.0005	0	30	n/a	Fail
0.0005	0	29	n/a	Fail
0.0005	0	29	n/a	Fail
0.0005	0	29	n/a	Fail
0.0005	0	25	n/a	Fail
0.0005	0	22	n/a	Fail
0.0005	0	22	n/a	Fail
0.0005	0	22	n/a	Fail
0.0005	0	20	n/a	Fail
0.0005	0	20	n/a	Fail
0.0005	0	18	n/a	Fail
0.0006	0	16	n/a	Fail
0.0006	0	16	n/a	Fail
0.0006	0	15	n/a	Fail
0.0006	0	15	n/a	Fail
0.0006	0	15	n/a	Fail
0.0006	0	15	n/a	Fail
0.0006	0	14	n/a	Fail
0.0006	0	14	n/a	Fail
0.0006	0	13	n/a	Fail
0.0006	0	13	n/a	Fail
0.0006	0	12	n/a	Fail
0.0006	0	11	n/a	Fail
0.0006	0	11	n/a	Fail
0.0006	0	11	n/a	Fail
0.0006	0	11	n/a	Fail
0.0006	0	11	n/a	Fail
0.0006	0	11	n/a	Fail
0.0006	0	10	n/a	Fail
0.0006	0	10	n/a	Fail
0.0006	0	9	n/a	Fail
0.0006	0	9	n/a	Fail
0.0006	0	9	n/a	Fail
0.0007	0	9	n/a	Fail
0.0007	0	8	n/a	Fail
0.0007	0	8	n/a	Fail
0.0007	0	8	n/a	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.

Water Quality

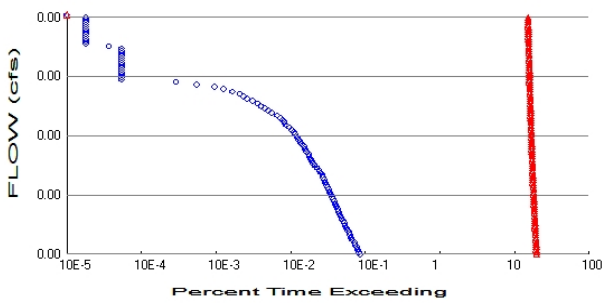
Water Quality BMP Flow and Volume for POC #1

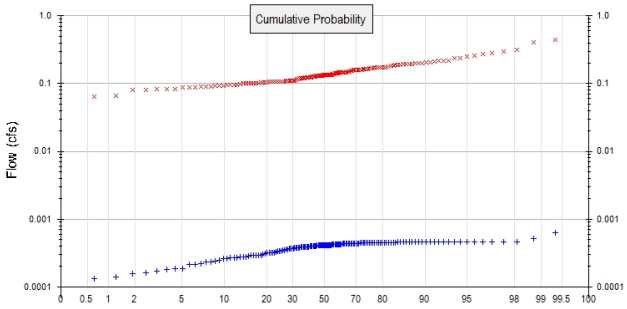
On-line facility volume:	0.0514 acre-feet
On-line facility target flow:	0.0713 cfs.
Adjusted for 15 min:	0.0713 cfs.
Off-line facility target flow:	0.0414 cfs.
Adjusted for 15 min:	0.0414 cfs.

LID Report

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

POC 2





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #2
Total Pervious Area: 0.58
Total Impervious Area: 0

Mitigated Landuse Totals for POC #2
Total Pervious Area: 0.21
Total Impervious Area: 0.37

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #2

Return Period	**Flow(cfs)**
2 year	0.000388
5 year	0.000472
10 year	0.000511
25 year	0.000547
50 year	0.000567
100 year	0.000583

Flow Frequency Return Periods for Mitigated. POC #2

Return Period	**Flow(cfs)**
2 year	0.132743
5 year	0.178054
10 year	0.210968
25 year	0.255995
50 year	0.292117
100 year	0.330522

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #2

Year	**Predeveloped**	**Mitigated**
1902	0.000	0.157
1903	0.000	0.174
1904	0.000	0.197
1905	0.000	0.088
1906	0.000	0.100
1907	0.000	0.132
1908	0.000	0.109
1909	0.000	0.134
1910	0.000	0.128
1911	0.000	0.144
1912	0.001	0.239

1913	0.000	0.103
1914	0.000	0.442
1915	0.000	0.090
1916	0.000	0.167
1917	0.000	0.066
1918	0.000	0.133
1919	0.000	0.084
1920	0.000	0.109
1921	0.000	0.094
1922	0.000	0.146
1923	0.000	0.102
1924	0.000	0.193
1925	0.000	0.081
1926	0.000	0.157
1927	0.000	0.134
1928	0.000	0.095
1929	0.000	0.189
1930	0.000	0.200
1931	0.000	0.096
1932	0.000	0.103
1933	0.000	0.103
1934	0.000	0.166
1935	0.000	0.091
1936	0.000	0.123
1937	0.000	0.161
1938	0.000	0.091
1939	0.000	0.111
1940	0.000	0.201
1941	0.000	0.219
1942	0.000	0.148
1943	0.000	0.147
1944	0.000	0.211
1945	0.000	0.159
1946	0.000	0.125
1947	0.000	0.097
1948	0.000	0.133
1949	0.000	0.205
1950	0.000	0.113
1951	0.000	0.175
1952	0.000	0.196
1953	0.000	0.182
1954	0.000	0.107
1955	0.000	0.101
1956	0.000	0.093
1957	0.000	0.107
1958	0.000	0.133
1959	0.000	0.133
1960	0.000	0.108
1961	0.000	0.301
1962	0.000	0.129
1963	0.000	0.096
1964	0.000	0.277
1965	0.000	0.129
1966	0.000	0.104
1967	0.000	0.147
1968	0.000	0.124
1969	0.000	0.111
1970	0.000	0.125

1971	0.000	0.122
1972	0.000	0.405
1973	0.000	0.234
1974	0.000	0.171
1975	0.000	0.176
1976	0.000	0.187
1977	0.000	0.081
1978	0.000	0.136
1979	0.000	0.148
1980	0.000	0.141
1981	0.000	0.135
1982	0.000	0.108
1983	0.000	0.146
1984	0.000	0.145
1985	0.000	0.166
1986	0.000	0.084
1987	0.000	0.150
1988	0.000	0.088
1989	0.000	0.088
1990	0.000	0.107
1991	0.000	0.161
1992	0.000	0.155
1993	0.000	0.172
1994	0.000	0.118
1995	0.000	0.092
1996	0.000	0.123
1997	0.000	0.110
1998	0.000	0.131
1999	0.000	0.150
2000	0.000	0.125
2001	0.000	0.102
2002	0.000	0.182
2003	0.000	0.106
2004	0.000	0.160
2005	0.000	0.311
2006	0.000	0.143
2007	0.000	0.160
2008	0.000	0.132
2009	0.000	0.101
2010	0.000	0.129
2011	0.000	0.134
2012	0.000	0.126
2013	0.000	0.119
2014	0.000	0.117
2015	0.000	0.190
2016	0.000	0.126
2017	0.000	0.194
2018	0.000	0.116
2019	0.000	0.172
2020	0.000	0.141
2021	0.000	0.119
2022	0.000	0.198
2023	0.000	0.248
2024	0.000	0.260
2025	0.000	0.130
2026	0.000	0.147
2027	0.000	0.160
2028	0.000	0.062

2029	0.000	0.102
2030	0.000	0.217
2031	0.000	0.065
2032	0.000	0.108
2033	0.000	0.137
2034	0.000	0.104
2035	0.000	0.132
2036	0.000	0.108
2037	0.000	0.144
2038	0.000	0.136
2039	0.000	0.273
2040	0.000	0.107
2041	0.000	0.136
2042	0.000	0.159
2043	0.000	0.175
2044	0.000	0.120
2045	0.000	0.097
2046	0.000	0.108
2047	0.000	0.133
2048	0.000	0.109
2049	0.000	0.162
2050	0.000	0.121
2051	0.000	0.170
2052	0.000	0.131
2053	0.000	0.111
2054	0.000	0.217
2055	0.000	0.125
2056	0.000	0.174
2057	0.000	0.083
2058	0.000	0.163
2059	0.001	0.206

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #2

Rank	Predeveloped	Mitigated
1	0.0006	0.4418
2	0.0005	0.4049
3	0.0005	0.3111
4	0.0005	0.3006
5	0.0005	0.2768
6	0.0005	0.2734
7	0.0005	0.2596
8	0.0005	0.2482
9	0.0005	0.2392
10	0.0005	0.2339
11	0.0005	0.2192
12	0.0005	0.2173
13	0.0005	0.2170
14	0.0005	0.2113
15	0.0005	0.2060
16	0.0005	0.2049
17	0.0005	0.2005
18	0.0005	0.2003
19	0.0005	0.1979
20	0.0005	0.1966
21	0.0005	0.1965
22	0.0005	0.1942
23	0.0005	0.1930

24	0.0005	0.1904
25	0.0005	0.1894
26	0.0005	0.1874
27	0.0005	0.1825
28	0.0005	0.1817
29	0.0005	0.1758
30	0.0005	0.1750
31	0.0005	0.1748
32	0.0005	0.1743
33	0.0004	0.1739
34	0.0004	0.1724
35	0.0004	0.1716
36	0.0004	0.1711
37	0.0004	0.1697
38	0.0004	0.1667
39	0.0004	0.1662
40	0.0004	0.1655
41	0.0004	0.1634
42	0.0004	0.1616
43	0.0004	0.1614
44	0.0004	0.1610
45	0.0004	0.1603
46	0.0004	0.1601
47	0.0004	0.1597
48	0.0004	0.1594
49	0.0004	0.1593
50	0.0004	0.1571
51	0.0004	0.1567
52	0.0004	0.1550
53	0.0004	0.1505
54	0.0004	0.1504
55	0.0004	0.1478
56	0.0004	0.1476
57	0.0004	0.1470
58	0.0004	0.1469
59	0.0004	0.1466
60	0.0004	0.1465
61	0.0004	0.1462
62	0.0004	0.1452
63	0.0004	0.1443
64	0.0004	0.1439
65	0.0004	0.1434
66	0.0004	0.1415
67	0.0004	0.1408
68	0.0004	0.1370
69	0.0004	0.1364
70	0.0004	0.1361
71	0.0004	0.1357
72	0.0004	0.1348
73	0.0004	0.1342
74	0.0004	0.1340
75	0.0004	0.1336
76	0.0004	0.1331
77	0.0004	0.1329
78	0.0004	0.1328
79	0.0004	0.1327
80	0.0004	0.1326
81	0.0004	0.1319

82	0.0004	0.1318
83	0.0004	0.1318
84	0.0004	0.1314
85	0.0004	0.1311
86	0.0004	0.1303
87	0.0004	0.1293
88	0.0004	0.1292
89	0.0004	0.1291
90	0.0004	0.1279
91	0.0004	0.1264
92	0.0004	0.1260
93	0.0004	0.1251
94	0.0004	0.1248
95	0.0004	0.1247
96	0.0004	0.1246
97	0.0004	0.1238
98	0.0004	0.1230
99	0.0004	0.1228
100	0.0004	0.1224
101	0.0004	0.1210
102	0.0004	0.1196
103	0.0004	0.1192
104	0.0004	0.1189
105	0.0004	0.1183
106	0.0004	0.1168
107	0.0004	0.1159
108	0.0004	0.1133
109	0.0004	0.1114
110	0.0004	0.1113
111	0.0004	0.1105
112	0.0004	0.1101
113	0.0004	0.1094
114	0.0004	0.1090
115	0.0004	0.1086
116	0.0003	0.1083
117	0.0003	0.1083
118	0.0003	0.1083
119	0.0003	0.1077
120	0.0003	0.1075
121	0.0003	0.1075
122	0.0003	0.1072
123	0.0003	0.1071
124	0.0003	0.1069
125	0.0003	0.1058
126	0.0003	0.1045
127	0.0003	0.1040
128	0.0003	0.1033
129	0.0003	0.1031
130	0.0003	0.1025
131	0.0003	0.1024
132	0.0003	0.1021
133	0.0003	0.1018
134	0.0003	0.1010
135	0.0003	0.1006
136	0.0003	0.1003
137	0.0003	0.0969
138	0.0003	0.0967
139	0.0003	0.0963

140	0.0003	0.0960
141	0.0003	0.0951
142	0.0003	0.0937
143	0.0002	0.0935
144	0.0002	0.0916
145	0.0002	0.0908
146	0.0002	0.0905
147	0.0002	0.0896
148	0.0002	0.0884
149	0.0002	0.0881
150	0.0002	0.0876
151	0.0002	0.0836
152	0.0002	0.0835
153	0.0002	0.0832
154	0.0002	0.0814
155	0.0002	0.0807
156	0.0001	0.0661
157	0.0001	0.0649
158	0.0001	0.0621

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0002	4678	1093609	23377	Fail
0.0002	4554	1089731	23929	Fail
0.0002	4376	1084745	24788	Fail
0.0002	4183	1079758	25813	Fail
0.0002	4008	1074772	26815	Fail
0.0002	3900	1071448	27473	Fail
0.0002	3722	1067016	28667	Fail
0.0002	3575	1062584	29722	Fail
0.0002	3451	1058152	30662	Fail
0.0002	3363	1054828	31365	Fail
0.0002	3225	1050950	32587	Fail
0.0002	3083	1046518	33944	Fail
0.0002	2935	1042640	35524	Fail
0.0002	2873	1039316	36175	Fail
0.0002	2772	1035438	37353	Fail
0.0003	2662	1031560	38751	Fail
0.0003	2576	1027682	39894	Fail
0.0003	2474	1023804	41382	Fail
0.0003	2401	1021034	42525	Fail
0.0003	2341	1017710	43473	Fail
0.0003	2262	1014386	44844	Fail
0.0003	2190	1010508	46141	Fail
0.0003	2138	1007738	47134	Fail
0.0003	2055	1004414	48876	Fail
0.0003	1972	1001090	50765	Fail
0.0003	1896	997766	52624	Fail
0.0003	1848	995550	53871	Fail
0.0003	1795	992225	55277	Fail
0.0003	1738	985023	56675	Fail
0.0003	1678	982253	58537	Fail
0.0003	1599	978929	61221	Fail
0.0003	1550	976713	63013	Fail
0.0003	1507	973389	64591	Fail
0.0003	1466	970619	66208	Fail
0.0003	1399	967849	69181	Fail
0.0003	1323	965633	72988	Fail
0.0003	1241	962863	77587	Fail
0.0003	1163	960093	82553	Fail
0.0003	1097	957323	87267	Fail
0.0003	1054	955107	90617	Fail
0.0003	1015	952337	93826	Fail
0.0003	973	949567	97591	Fail
0.0004	948	946797	99873	Fail
0.0004	900	944027	104891	Fail
0.0004	866	942365	108818	Fail
0.0004	829	939595	113340	Fail
0.0004	773	937379	121265	Fail
0.0004	737	934609	126812	Fail
0.0004	701	932947	133088	Fail
0.0004	670	930177	138832	Fail
0.0004	628	927961	147764	Fail
0.0004	606	925745	152763	Fail
0.0004	564	923529	163746	Fail
0.0004	534	921313	172530	Fail

0.0004	480	919097	191478	Fail
0.0004	454	916881	201956	Fail
0.0004	432	915219	211856	Fail
0.0004	400	913003	228250	Fail
0.0004	364	910787	250216	Fail
0.0004	307	908570	295951	Fail
0.0004	278	906354	326026	Fail
0.0004	251	904692	360435	Fail
0.0004	220	902476	410216	Fail
0.0004	198	900260	454676	Fail
0.0004	172	898044	522118	Fail
0.0004	144	896382	622487	Fail
0.0004	129	894166	693151	Fail
0.0004	115	892504	776090	Fail
0.0005	91	890288	978338	Fail
0.0005	69	888626	1287863	Fail
0.0005	53	886964	1673516	Fail
0.0005	30	884748	2949160	Fail
0.0005	16	883086	5519287	Fail
0.0005	3	880870	29362333	Fail
0.0005	3	879208	29306933	Fail
0.0005	3	877546	29251533	Fail
0.0005	3	875884	29196133	Fail
0.0005	3	873668	29122266	Fail
0.0005	3	872560	29085333	Fail
0.0005	3	870344	29011466	Fail
0.0005	3	868682	28956066	Fail
0.0005	3	867020	28900666	Fail
0.0005	3	865358	28845266	Fail
0.0005	3	863696	28789866	Fail
0.0005	3	862034	28734466	Fail
0.0005	3	860372	28679066	Fail
0.0005	3	858156	28605200	Fail
0.0005	2	857048	42852400	Fail
0.0005	1	855386	85538600	Fail
0.0005	1	853724	85372400	Fail
0.0005	1	852062	85206200	Fail
0.0005	1	850400	85040000	Fail
0.0005	1	848738	84873800	Fail
0.0005	1	847630	84763000	Fail
0.0005	1	845968	84596800	Fail
0.0006	1	844306	84430600	Fail
0.0006	1	842644	84264400	Fail
0.0006	1	840982	84098200	Fail
0.0006	1	839320	83932000	Fail
0.0006	1	838212	83821200	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.

Water Quality

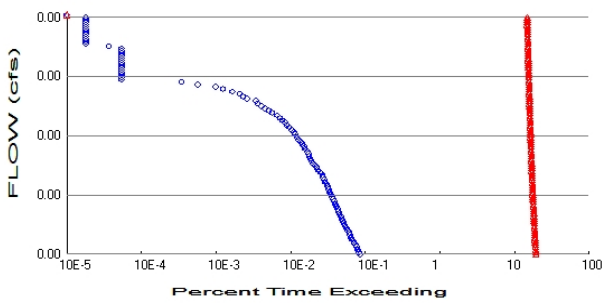
Water Quality BMP Flow and Volume for POC #2

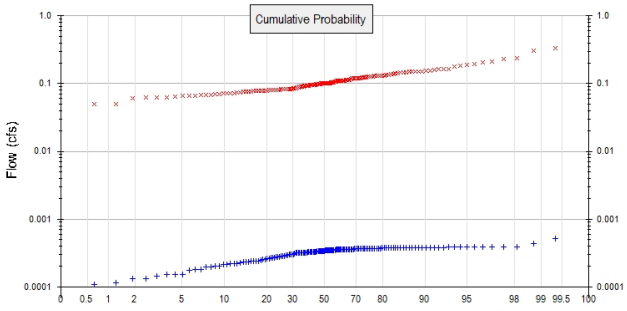
On-line facility volume:	0.0404 acre-feet
On-line facility target flow:	0.0561 cfs.
Adjusted for 15 min:	0.0561 cfs.
Off-line facility target flow:	0.0326 cfs.
Adjusted for 15 min:	0.0326 cfs.

LID Report

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

POC 3





\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #3
Total Pervious Area: 0.48
Total Impervious Area: 0

Mitigated Landuse Totals for POC #3
Total Pervious Area: 0.2
Total Impervious Area: 0.28

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #3

Return Period	**Flow(cfs)**
2 year	0.000321
5 year	0.000391
10 year	0.000423
25 year	0.000452
50 year	0.000469
100 year	0.000482

Flow Frequency Return Periods for Mitigated. POC #3

Return Period	**Flow(cfs)**
2 year	0.100465
5 year	0.134756
10 year	0.159664
25 year	0.193738
50 year	0.221073
100 year	0.250135

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #3

Year	**Predeveloped**	**Mitigated**
1902	0.000	0.119
1903	0.000	0.132
1904	0.000	0.149
1905	0.000	0.067
1906	0.000	0.076
1907	0.000	0.100
1908	0.000	0.082
1909	0.000	0.101
1910	0.000	0.097
1911	0.000	0.109
1912	0.000	0.181

1913	0.000	0.078
1914	0.000	0.334
1915	0.000	0.068
1916	0.000	0.126
1917	0.000	0.050
1918	0.000	0.100
1919	0.000	0.063
1920	0.000	0.083
1921	0.000	0.071
1922	0.000	0.111
1923	0.000	0.077
1924	0.000	0.146
1925	0.000	0.062
1926	0.000	0.119
1927	0.000	0.101
1928	0.000	0.072
1929	0.000	0.143
1930	0.000	0.152
1931	0.000	0.073
1932	0.000	0.078
1933	0.000	0.078
1934	0.000	0.126
1935	0.000	0.069
1936	0.000	0.093
1937	0.000	0.122
1938	0.000	0.069
1939	0.000	0.084
1940	0.000	0.152
1941	0.000	0.166
1942	0.000	0.112
1943	0.000	0.111
1944	0.000	0.160
1945	0.000	0.121
1946	0.000	0.094
1947	0.000	0.073
1948	0.000	0.100
1949	0.000	0.155
1950	0.000	0.086
1951	0.000	0.132
1952	0.000	0.149
1953	0.000	0.138
1954	0.000	0.081
1955	0.000	0.076
1956	0.000	0.071
1957	0.000	0.081
1958	0.000	0.101
1959	0.000	0.101
1960	0.000	0.082
1961	0.000	0.227
1962	0.000	0.098
1963	0.000	0.073
1964	0.000	0.209
1965	0.000	0.098
1966	0.000	0.079
1967	0.000	0.111
1968	0.000	0.094
1969	0.000	0.084
1970	0.000	0.095

1971	0.000	0.093
1972	0.000	0.306
1973	0.000	0.177
1974	0.000	0.130
1975	0.000	0.133
1976	0.000	0.142
1977	0.000	0.061
1978	0.000	0.103
1979	0.000	0.112
1980	0.000	0.107
1981	0.000	0.102
1982	0.000	0.082
1983	0.000	0.111
1984	0.000	0.110
1985	0.000	0.125
1986	0.000	0.063
1987	0.000	0.114
1988	0.000	0.067
1989	0.000	0.066
1990	0.000	0.081
1991	0.000	0.122
1992	0.000	0.117
1993	0.000	0.130
1994	0.000	0.090
1995	0.000	0.069
1996	0.000	0.093
1997	0.000	0.083
1998	0.000	0.099
1999	0.000	0.114
2000	0.000	0.094
2001	0.000	0.078
2002	0.000	0.138
2003	0.000	0.080
2004	0.000	0.121
2005	0.000	0.235
2006	0.000	0.109
2007	0.000	0.121
2008	0.000	0.100
2009	0.000	0.076
2010	0.000	0.098
2011	0.000	0.102
2012	0.000	0.096
2013	0.000	0.090
2014	0.000	0.088
2015	0.000	0.144
2016	0.000	0.095
2017	0.000	0.147
2018	0.000	0.088
2019	0.000	0.130
2020	0.000	0.107
2021	0.000	0.090
2022	0.000	0.150
2023	0.000	0.188
2024	0.000	0.196
2025	0.000	0.099
2026	0.000	0.111
2027	0.000	0.121
2028	0.000	0.047

2029	0.000	0.077
2030	0.000	0.164
2031	0.000	0.049
2032	0.000	0.082
2033	0.000	0.104
2034	0.000	0.079
2035	0.000	0.100
2036	0.000	0.081
2037	0.000	0.109
2038	0.000	0.103
2039	0.000	0.207
2040	0.000	0.081
2041	0.000	0.103
2042	0.000	0.121
2043	0.000	0.132
2044	0.000	0.091
2045	0.000	0.073
2046	0.000	0.081
2047	0.000	0.100
2048	0.000	0.083
2049	0.000	0.122
2050	0.000	0.092
2051	0.000	0.128
2052	0.000	0.099
2053	0.000	0.084
2054	0.000	0.164
2055	0.000	0.094
2056	0.000	0.132
2057	0.000	0.063
2058	0.000	0.124
2059	0.001	0.156

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #3

Rank	Predeveloped	Mitigated
1	0.0005	0.3344
2	0.0004	0.3064
3	0.0004	0.2354
4	0.0004	0.2275
5	0.0004	0.2095
6	0.0004	0.2069
7	0.0004	0.1965
8	0.0004	0.1878
9	0.0004	0.1814
10	0.0004	0.1770
11	0.0004	0.1659
12	0.0004	0.1644
13	0.0004	0.1642
14	0.0004	0.1599
15	0.0004	0.1559
16	0.0004	0.1551
17	0.0004	0.1518
18	0.0004	0.1516
19	0.0004	0.1498
20	0.0004	0.1487
21	0.0004	0.1487
22	0.0004	0.1470
23	0.0004	0.1461

24	0.0004	0.1441
25	0.0004	0.1434
26	0.0004	0.1418
27	0.0004	0.1381
28	0.0004	0.1375
29	0.0004	0.1330
30	0.0004	0.1324
31	0.0004	0.1323
32	0.0004	0.1319
33	0.0004	0.1316
34	0.0004	0.1305
35	0.0004	0.1299
36	0.0004	0.1295
37	0.0004	0.1285
38	0.0004	0.1261
39	0.0004	0.1258
40	0.0004	0.1253
41	0.0004	0.1237
42	0.0004	0.1223
43	0.0004	0.1222
44	0.0004	0.1219
45	0.0004	0.1213
46	0.0004	0.1212
47	0.0004	0.1209
48	0.0004	0.1206
49	0.0004	0.1206
50	0.0004	0.1189
51	0.0004	0.1186
52	0.0004	0.1173
53	0.0004	0.1139
54	0.0004	0.1139
55	0.0004	0.1119
56	0.0004	0.1117
57	0.0004	0.1112
58	0.0004	0.1112
59	0.0004	0.1110
60	0.0004	0.1109
61	0.0004	0.1107
62	0.0004	0.1099
63	0.0004	0.1092
64	0.0004	0.1089
65	0.0004	0.1085
66	0.0004	0.1071
67	0.0004	0.1066
68	0.0003	0.1037
69	0.0003	0.1033
70	0.0003	0.1030
71	0.0003	0.1027
72	0.0003	0.1020
73	0.0003	0.1016
74	0.0003	0.1014
75	0.0003	0.1011
76	0.0003	0.1007
77	0.0003	0.1006
78	0.0003	0.1005
79	0.0003	0.1004
80	0.0003	0.1004
81	0.0003	0.0998

82	0.0003	0.0998
83	0.0003	0.0997
84	0.0003	0.0994
85	0.0003	0.0992
86	0.0003	0.0986
87	0.0003	0.0979
88	0.0003	0.0978
89	0.0003	0.0977
90	0.0003	0.0968
91	0.0003	0.0957
92	0.0003	0.0954
93	0.0003	0.0946
94	0.0003	0.0944
95	0.0003	0.0944
96	0.0003	0.0943
97	0.0003	0.0937
98	0.0003	0.0931
99	0.0003	0.0929
100	0.0003	0.0927
101	0.0003	0.0916
102	0.0003	0.0905
103	0.0003	0.0902
104	0.0003	0.0900
105	0.0003	0.0895
106	0.0003	0.0884
107	0.0003	0.0877
108	0.0003	0.0858
109	0.0003	0.0843
110	0.0003	0.0842
111	0.0003	0.0837
112	0.0003	0.0833
113	0.0003	0.0828
114	0.0003	0.0825
115	0.0003	0.0822
116	0.0003	0.0820
117	0.0003	0.0820
118	0.0003	0.0819
119	0.0003	0.0815
120	0.0003	0.0814
121	0.0003	0.0813
122	0.0003	0.0811
123	0.0003	0.0810
124	0.0003	0.0809
125	0.0003	0.0801
126	0.0003	0.0791
127	0.0003	0.0787
128	0.0003	0.0782
129	0.0002	0.0780
130	0.0002	0.0776
131	0.0002	0.0775
132	0.0002	0.0773
133	0.0002	0.0771
134	0.0002	0.0764
135	0.0002	0.0761
136	0.0002	0.0759
137	0.0002	0.0734
138	0.0002	0.0732
139	0.0002	0.0729

140	0.0002	0.0726
141	0.0002	0.0720
142	0.0002	0.0709
143	0.0002	0.0708
144	0.0002	0.0694
145	0.0002	0.0687
146	0.0002	0.0685
147	0.0002	0.0678
148	0.0002	0.0669
149	0.0002	0.0667
150	0.0002	0.0663
151	0.0002	0.0633
152	0.0002	0.0632
153	0.0001	0.0630
154	0.0001	0.0616
155	0.0001	0.0611
156	0.0001	0.0501
157	0.0001	0.0491
158	0.0001	0.0470

Duration Flows

The Duration Matching Failed

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0002	4714	1072556	22752	Fail
0.0002	4554	1067570	23442	Fail
0.0002	4391	1063138	24211	Fail
0.0002	4217	1058706	25105	Fail
0.0002	4057	1054828	26000	Fail
0.0002	3866	1048734	27127	Fail
0.0002	3714	1044856	28132	Fail
0.0002	3577	1040978	29101	Fail
0.0002	3460	1037100	29973	Fail
0.0002	3362	1033222	30732	Fail
0.0002	3239	1029344	31779	Fail
0.0002	3108	1025466	32994	Fail
0.0002	2958	1022142	34555	Fail
0.0002	2857	1017156	35602	Fail
0.0002	2753	1013832	36826	Fail
0.0002	2660	1009954	37968	Fail
0.0002	2586	1006630	38926	Fail
0.0002	2479	1003306	40472	Fail
0.0002	2401	999982	41648	Fail
0.0002	2346	996658	42483	Fail
0.0002	2274	993333	43682	Fail
0.0002	2206	989455	44852	Fail
0.0002	2123	982253	46267	Fail
0.0002	2049	979483	47802	Fail
0.0002	1972	976159	49500	Fail
0.0002	1902	973389	51177	Fail
0.0002	1846	970065	52549	Fail
0.0002	1798	967295	53798	Fail
0.0002	1743	964525	55337	Fail
0.0003	1686	961755	57043	Fail
0.0003	1612	958985	59490	Fail
0.0003	1548	955107	61699	Fail
0.0003	1506	952337	63236	Fail
0.0003	1470	950121	64634	Fail
0.0003	1406	947351	67379	Fail
0.0003	1320	944581	71559	Fail
0.0003	1245	941811	75647	Fail
0.0003	1176	939595	79897	Fail
0.0003	1109	936825	84474	Fail
0.0003	1045	933501	89330	Fail
0.0003	1012	931285	92024	Fail
0.0003	973	929069	95484	Fail
0.0003	952	926299	97300	Fail
0.0003	915	924083	100992	Fail
0.0003	867	921867	106328	Fail
0.0003	831	919651	110667	Fail
0.0003	793	916881	115621	Fail
0.0003	749	914665	122118	Fail
0.0003	700	911895	130270	Fail
0.0003	668	909679	136179	Fail
0.0003	630	907462	144041	Fail
0.0003	608	905246	148889	Fail
0.0003	564	903030	160111	Fail
0.0003	535	900814	168376	Fail

0.0003	489	899152	183875	Fail
0.0003	461	896936	194563	Fail
0.0003	426	894166	209898	Fail
0.0003	398	891950	224108	Fail
0.0003	364	890288	244584	Fail
0.0003	311	888072	285553	Fail
0.0003	281	885856	315251	Fail
0.0004	251	884194	352268	Fail
0.0004	223	881978	395505	Fail
0.0004	198	880316	444604	Fail
0.0004	189	878100	464603	Fail
0.0004	142	875884	616819	Fail
0.0004	127	873668	687927	Fail
0.0004	115	872006	758266	Fail
0.0004	92	870344	946026	Fail
0.0004	68	868682	1277473	Fail
0.0004	54	866466	1604566	Fail
0.0004	31	864804	2789690	Fail
0.0004	19	863142	4542852	Fail
0.0004	3	861480	28716000	Fail
0.0004	3	858710	28623666	Fail
0.0004	3	857048	28568266	Fail
0.0004	3	855386	28512866	Fail
0.0004	3	853724	28457466	Fail
0.0004	3	852062	28402066	Fail
0.0004	3	850400	28346666	Fail
0.0004	3	848738	28291266	Fail
0.0004	3	847076	28235866	Fail
0.0004	3	844860	28162000	Fail
0.0004	3	843198	28106600	Fail
0.0004	3	841536	28051200	Fail
0.0004	3	839874	27995800	Fail
0.0004	3	838766	27958866	Fail
0.0004	2	837104	41855200	Fail
0.0004	1	835442	83544200	Fail
0.0004	1	833780	83378000	Fail
0.0004	1	832118	83211800	Fail
0.0004	1	830456	83045600	Fail
0.0004	1	828794	82879400	Fail
0.0005	1	827132	82713200	Fail
0.0005	1	826024	82602400	Fail
0.0005	1	824362	82436200	Fail
0.0005	1	822700	82270000	Fail
0.0005	1	821591	82159100	Fail
0.0005	1	819929	81992900	Fail
0.0005	1	818267	81826700	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.

Water Quality

Water Quality BMP Flow and Volume for POC #3

On-line facility volume:	0.0306 acre-feet
On-line facility target flow:	0.0425 cfs.
Adjusted for 15 min:	0.0425 cfs.
Off-line facility target flow:	0.0247 cfs.
Adjusted for 15 min:	0.0247 cfs.

LID Report

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

Model Default Modifications

Total of 0 changes have been made.

PERLND Changes

No PERLND changes have been made.

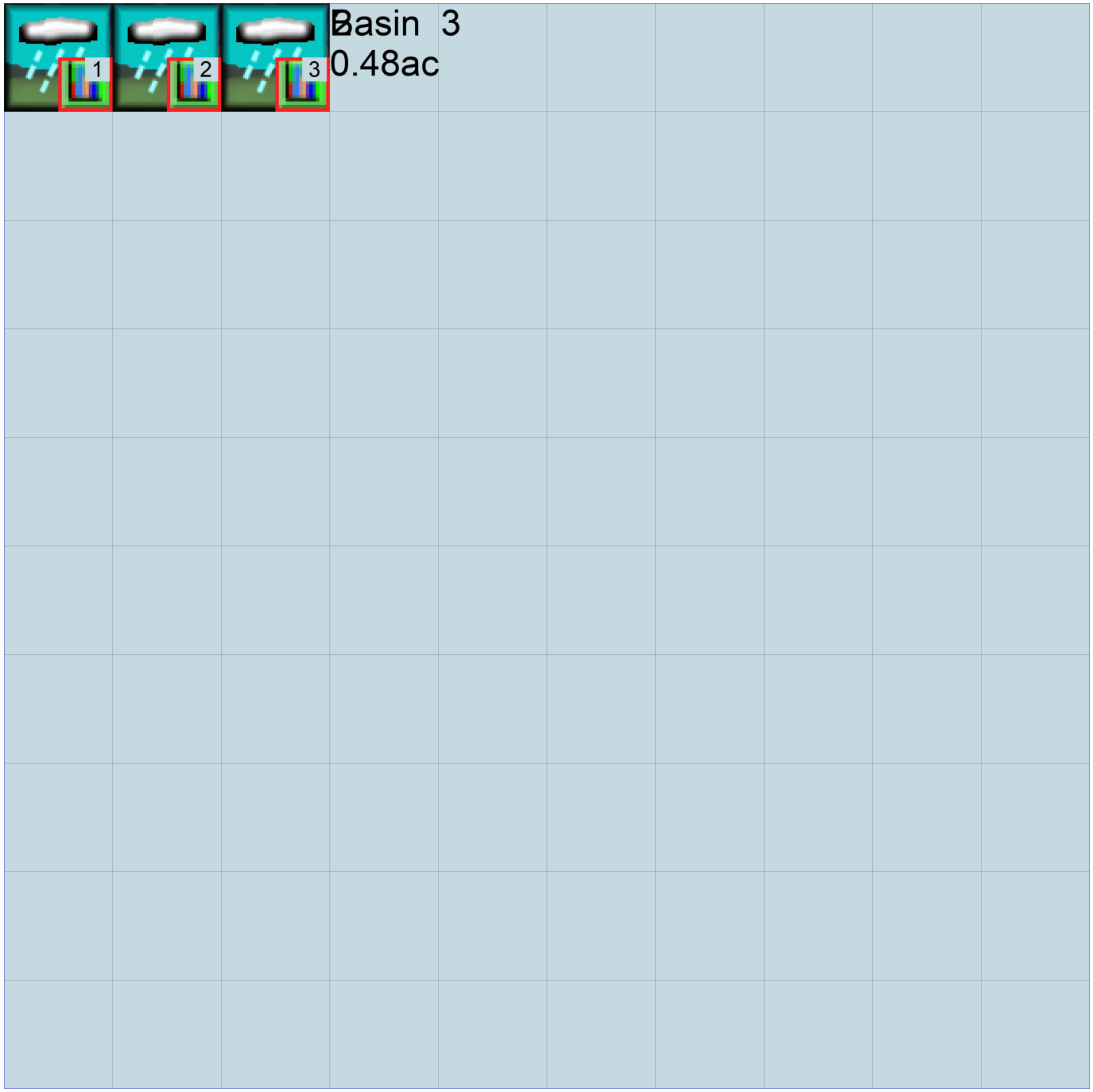
IMPLND Changes

No IMPLND changes have been made.

Appendix

Predeveloped Schematic

Mitigated Schematic



Predeveloped UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                   UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM         26   WQ.wdm
MESSU       25   PreWQ.MES
            27   PreWQ.L61
            28   PreWQ.L62
            30   POCWQ1.dat
            31   POCWQ2.dat
            32   POCWQ3.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND       1
      COPY       501
      COPY       502
      COPY       503
      DISPLY       1
      DISPLY       2
      DISPLY       3
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title---------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                  MAX                    1    2   30    9
    2        Basin  2                  MAX                    1    2   31    9
    3        Basin  3                  MAX                    1    2   32    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  502         1    1
  503         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
    1     A/B, Forest, Flat       1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
```

```
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    1         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    1         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    1         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    1               0         5         2       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    1               0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    1          0.2       0.5      0.35         0       0.7       0.7
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    1               0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
  END IWAT-PARM1

  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
  END IWAT-PARM2
```

```
  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                  <--Area-->     <-Target->   MBLK   ***
<Name>   #                  <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND   1                        0.68     COPY   501     12
PERLND   1                        0.68     COPY   501     13
Basin  2***
PERLND   1                        0.58     COPY   502     12
PERLND   1                        0.58     COPY   502     13
Basin  3***
PERLND   1                        0.48     COPY   503     12
PERLND   1                        0.48     COPY   503     13

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     INPUT  TIMSER 1
COPY   503 OUTPUT MEAN   1 1   48.4        DISPLY   3     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************ Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ****************** PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO

  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                  ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
            FG FG FG FG  possible  exit  *** possible  exit      possible  exit
             *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->      ***
  END HYDR-PARM2
```

```
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                        ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    501 FLOW     ENGL      REPL
COPY   502 OUTPUT MEAN   1 1     48.4      WDM    502 FLOW     ENGL      REPL
COPY   503 OUTPUT MEAN   1 1     48.4      WDM    503 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13


END MASS-LINK

END RUN
```

Mitigated UCI File

```
RUN

GLOBAL
  WWHM4 model simulation
  START       1901 10 01        END    2059 09 30
  RUN INTERP OUTPUT LEVEL    3    0
  RESUME     0 RUN     1                    UNIT SYSTEM     1
END GLOBAL

FILES
<File>  <Un#>   <-----------File Name------------------------------>***
<-ID->                                                              ***
WDM        26   WQ.wdm
MESSU      25   MitWQ.MES
           27   MitWQ.L61
           28   MitWQ.L62
           30   POCWQ1.dat
           31   POCWQ2.dat
           32   POCWQ3.dat
END FILES

OPN SEQUENCE
    INGRP               INDELT 00:15
      PERLND       4
      IMPLND       1
      COPY       501
      COPY       502
      COPY       503
      DISPLY       1
      DISPLY       2
      DISPLY       3
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Basin  1                   MAX                    1    2   30    9
    2        Basin  2                   MAX                    1    2   31    9
    3        Basin  3                   MAX                    1    2   32    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  502         1    1
  503         1    1
  END TIMESERIES
END COPY
GENER
  OPCODE
    #    # OPCD ***
  END OPCODE
  PARM
    #    #         K ***
  END PARM
END GENER
PERLND
  GEN-INFO
    <PLS ><-------Name------->NBLKS   Unit-systems   Printer ***
    # -  #                          User  t-series Engl Metr ***
                                          in  out           ***
    4     A/B, Pasture, Flat      1    1    1    1   27    0
  END GEN-INFO
  *** Section PWATER***

  ACTIVITY
```

```
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC ***
    4         0    0    1    0    0    0    0    0    0    0    0    0
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags **************************** PIVL  PYR
    # -  # ATMP SNOW PWAT  SED  PST  PWG PQAL MSTL PEST NITR PHOS TRAC  *********
    4         0    0    4    0    0    0    0    0    0    0    0    0    1    9
  END PRINT-INFO

  PWAT-PARM1
    <PLS >  PWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP UZFG  VCS  VUZ  VNN VIFW VIRC  VLE INFC  HWT ***
    4         0    0    0    0    0    0    0    0    0    0    0
  END PWAT-PARM1

  PWAT-PARM2
    <PLS >      PWATER input info: Part 2         ***
    # -  # ***FOREST      LZSN    INFILT      LSUR     SLSUR     KVARY     AGWRC
    4               0         5       1.5       400      0.05       0.3     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
    4               0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
    4          0.15       0.5       0.3         0       0.7       0.4
  END PWAT-PARM4

  PWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
               ran from 1990 to end of 1992 (pat 1-11-95) RUN 21 ***
    # -  # ***  CEPS      SURS       UZS      IFWS       LZS      AGWS      GWVS
    4               0         0         0         0         3         1         0
  END PWAT-STATE1

END PERLND

IMPLND
  GEN-INFO
    <PLS ><-------Name------->   Unit-systems   Printer ***
    # -  #                     User  t-series Engl Metr ***
                                     in  out           ***
    1      ROADS/FLAT             1    1    1   27    0
  END GEN-INFO
  *** Section IWATER***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL   ***
    1         0    0    1    0    0    0
  END ACTIVITY

  PRINT-INFO
    <ILS > ******** Print-flags ******** PIVL  PYR
    # -  # ATMP SNOW IWAT  SLD  IWG IQAL    *********
    1         0    0    4    0    0    4    1    9
  END PRINT-INFO

  IWAT-PARM1
    <PLS >  IWATER variable monthly parameter value flags  ***
    # -  # CSNO RTOP  VRS  VNN RTLI     ***
    1         0    0    0    0    0
  END IWAT-PARM1
```

```
  IWAT-PARM2
    <PLS >      IWATER input info: Part 2         ***
    # -  # ***  LSUR     SLSUR      NSUR     RETSC
    1            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1             0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Basin  1***
PERLND   4                       0.21     COPY   501     12
PERLND   4                       0.21     COPY   501     13
IMPLND   1                       0.47     COPY   501     15
Basin  2***
PERLND   4                       0.21     COPY   502     12
PERLND   4                       0.21     COPY   502     13
IMPLND   1                       0.37     COPY   502     15
Basin  3***
PERLND   4                        0.2     COPY   503     12
PERLND   4                        0.2     COPY   503     13
IMPLND   1                       0.28     COPY   503     15

******Routing******
END SCHEMATIC

NETWORK
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
COPY   501 OUTPUT MEAN   1 1   48.4        DISPLY   1     INPUT  TIMSER 1
COPY   502 OUTPUT MEAN   1 1   48.4        DISPLY   2     INPUT  TIMSER 1
COPY   503 OUTPUT MEAN   1 1   48.4        DISPLY   3     INPUT  TIMSER 1



<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   #        <Name> # #<-factor->strg <Name>   #   #        <Name> # #  ***
END NETWORK

RCHRES
  GEN-INFO
    RCHRES       Name        Nexits   Unit Systems   Printer                ***
    # -  #<------------------><---> User T-series  Engl Metr LKFG           ***
                                       in  out                              ***
  END GEN-INFO
  *** Section RCHRES***

  ACTIVITY
    <PLS > ************* Active Sections ****************************
    # -  # HYFG ADFG CNFG HTFG SDFG GQFG OXFG NUFG PKFG PHFG ***
  END ACTIVITY

  PRINT-INFO
    <PLS > ***************** Print-flags ******************* PIVL  PYR
    # -  # HYDR ADCA CONS HEAT  SED  GQL OXRX NUTR PLNK PHCB PIVL  PYR  *********
  END PRINT-INFO
```

```
  HYDR-PARM1
    RCHRES  Flags for each HYDR Section                                    ***
    # -  #  VC A1 A2 A3  ODFVFG for each *** ODGTFG for each     FUNCT  for each
           FG FG FG FG  possible  exit  *** possible  exit      possible  exit
            *  *  *  *    *  *  *  *  *       *  *  *  *  *         ***
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
  END HYDR-PARM2
  HYDR-INIT
    RCHRES  Initial conditions for each HYDR section                       ***
    # -  # ***   VOL     Initial  value  of COLIND     Initial  value  of OUTDGT
          *** ac-ft     for each possible exit        for each possible exit
  <------><-------->     <---><---><---><---><---> *** <---><---><---><---><--->
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
END FTABLES

EXT SOURCES
<-Volume-> <Member> SsysSgap<--Mult-->Tran <-Target vols> <-Grp> <-Member->  ***
<Name>   # <Name> # tem strg<-factor->strg <Name>   #   #        <Name> # #  ***
WDM      2 PREC     ENGL    1              PERLND   1 999 EXTNL  PREC
WDM      2 PREC     ENGL    1              IMPLND   1 999 EXTNL  PREC
WDM      1 EVAP     ENGL    1              PERLND   1 999 EXTNL  PETINP
WDM      1 EVAP     ENGL    1              IMPLND   1 999 EXTNL  PETINP

END EXT SOURCES

EXT TARGETS
<-Volume-> <-Grp> <-Member-><--Mult-->Tran <-Volume-> <Member> Tsys Tgap Amd ***
<Name>   #        <Name> # #<-factor->strg <Name>   # <Name>    tem strg strg***
COPY     1 OUTPUT MEAN   1 1     48.4      WDM    701 FLOW     ENGL      REPL
COPY   501 OUTPUT MEAN   1 1     48.4      WDM    801 FLOW     ENGL      REPL
COPY     2 OUTPUT MEAN   1 1     48.4      WDM    702 FLOW     ENGL      REPL
COPY   502 OUTPUT MEAN   1 1     48.4      WDM    802 FLOW     ENGL      REPL
COPY     3 OUTPUT MEAN   1 1     48.4      WDM    703 FLOW     ENGL      REPL
COPY   503 OUTPUT MEAN   1 1     48.4      WDM    803 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>           <Name> # #<-factor->     <Name>                <Name> # #***
  MASS-LINK       12
PERLND     PWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   12

  MASS-LINK       13
PERLND     PWATER IFWO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   13

  MASS-LINK       15
IMPLND     IWATER SURO       0.083333      COPY           INPUT  MEAN
  END MASS-LINK   15


END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

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APPENDIX E

Design Calculations

Appended on: 16:14:14 Thursday, June 06, 2024

ALL ONSITE Event Summary

Event	Peak Q (cfs)	Peak T (hrs)	Hyd Vol (acft)	Area (ac)	Method	Raintype
2 year	0.4607	8.00	0.1819	1.9600	SBUH	TYPE1A
10 year	0.6634	8.00	0.2472	1.9600	SBUH	TYPE1A
25 year	0.8780	8.00	0.3158	1.9600	SBUH	TYPE1A
100 year	1.1008	8.00	0.3868	1.9600	SBUH	TYPE1A

Peak runoff for storm main

Record Id: ALL ONSITE

Design Method	SBUH	**Rainfall type**	TYPE1A
Hyd Intv	10.00 min	**Peaking Factor**	484.00
		Abstraction Coeff	0.20
Pervious Area (AMC 2)	1.96 ac	**DCIA**	0.00 ac
Pervious CN	83.96	**DC CN**	0.00
Pervious TC	6.30 min	**DC TC**	0.00 min

Pervious CN Calc

Description	SubArea	Sub cn
Roads (hard surface - includes right of way)	0.91 ac	92.00
Open spaces, lawns, parks (50-75% grass)	1.05 ac	77.00
Pervious Composited CN (AMC 2)		83.96

Pervious TC Calc

Type	Description	Length	Slope	Coeff	Misc	TT
Fixed	Basins 1, 2, and 3 per Exhibit 3					6.30 min
Pervious TC						6.30 min

8 Inch Pipe

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Roughness Coefficient	0.012	
Channel Slope	1.00000	%
Normal Depth	8.00	in
Diameter	8.00	in

Results

Discharge	1.31	ft³/s	>1.008 cfs, therefore capacity meets demand
Flow Area	0.35	ft²	
Wetted Perimeter	2.09	ft	
Hydraulic Radius	2.00	in	
Top Width	0.00	ft	
Critical Depth	0.54	ft	
Percent Full	100.0	%	
Critical Slope	0.01021	ft/ft	
Velocity	3.75	ft/s	
Velocity Head	0.22	ft	
Specific Energy	0.89	ft	
Froude Number	0.00		
Maximum Discharge	1.41	ft³/s	
Discharge Full	1.31	ft³/s	
Slope Full	0.01000	ft/ft	
Flow Type	SubCritical		

GVF Input Data

Downstream Depth	0.00	in
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	in
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

8 Inch Pipe

GVF Output Data

Upstream Velocity	Infinity	ft/s
Normal Depth	8.00	in
Critical Depth	0.54	ft
Channel Slope	1.00000	%
Critical Slope	0.01021	ft/ft