STORM DRAINAGE REPORT

FOR

Olson Brothers Storage
Puyallup, Washington

Revised July 2022
February 2021

Prepared for:
Mike Grimit
Grimit Architecture

Prepared by:
Daniel Smith, P.E., Project Manager

Approved By:

Daniel Smith, P.E., Project Manager

REPORT #20083

"I hereby state that this Drainage and Erosion/Sediment Control Plan for the Olson Brothers Storage project 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 of professional engineers. I understand that City of Puyallup does not and will not assume liability for the sufficiency, suitability or performance of drainage facilities prepared by me."

This analysis is based on data and records either supplied to, or obtained by, C.E.S. NW, Inc. 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

STORM DRAINAGE

1. Project Overview

This report accompanies the civil engineering plans as submitted to the City of Puyallup for review and approval. This document provides site information, and the analysis used to prepare the storm drainage design. The *Washington State Department of Ecology Stormwater Management Manual for Western Washington, 2014 (Manual),* and the City of Puyallup's modifications to that document establishes the methodology and design criteria used for this project.

The Olson Brothers Storage project proposes the remodel of an existing commercial industrial building and portable building on a 1.86-acre site comprised of three parcels (2105200180, 2105200191 and 2105200192) zoned Limited Manufacturing (ML). The site is accessed from Inter Ave with a new commercial driveway approach. The project is located in the Puyallup River Water Resources Inventory Area (WRIA 10). The Vicinity Map has been included in Appendix 'A' of this report. A project summary is as follows:

Permit Applied for – Building Permit and Site Development
Address – 2511 Inter Ave Puyallup, WA 98372
Parcel Numbers – 2105200180, 2105200192 and 2105200192
Legal description – Parcel A, TPN. 2105200191

The west 85 feet of the south 120 feet of the west half of tract 10 of Ackerson's Second Addition to Puyallup, according to the map thereof recorded in volume 8 of plats, page 25, records of Pierce County, Washington.

Parcel B, TPN. 2105200192

The west half of Block 10 of Ackerson's Second Addition to Puyallup, according to the plat thereof recorded in Volume 8 of Plats, page 25, records of Pierce County, Washington.

Except the south 120 feet of the west 85 feet thereof.

The east one-half of Block 10 of Ackerson's Second Addition to Puyallup, according to the plat thereof recorded in Volume 8 of Plats, page 25, records of Pierce County, Washington.

All situate in the County of Pierce, State of Washington.

The project site has historically been used as a commercial property with an converted single family residence, storage building, portable building and existing gravel lot as depicted on the pre-developed basin map (Appendix 'B'). The existing site is to be redeveloped with landscaping and pave the existing gravel parking with permeable pavement (BMP T5.15) when construction permits are approved. The property has frontage along Inter Ave which provides access with a new commercial driveway approach. Improvements are proposed along Inter Ave which include curb, gutter and sidewalk extended across the property's frontage. The project site proposes approximately 31,632 sq.ft. of paving, that does not include overlaying the existing asphalt, across onsite and offsite improvements and 10,432 sq.ft. of landscaping; therefore, according to Figure 2.4.1 and 2.4.2 of Volume I of the Manual, the project must evaluate all minimum requirements for the new and replaced surfaces; see Section 5 of this report for a detailed discussion of the minimum requirements. The project proposes permeable pavement for flow control of the newly paved and landscaped surfaces. Runoff treatment is provided by the native soils underlying the permeable pavement since they meet the CEC and organic requirements of Section 4.4.2 of Volume V of the Manual. All disturbed areas which are not converted to impervious surface will apply soil amendments per BMP T5.13.

Certification by a soils testing laboratory that the organic content and CEC criteria of the native soils meets standards shall be submitted. [R2-03 - 20083 Storm Drainage Report, Page 4/100]

2. Existing Conditions Summary

The existing site's current use is a commercially converted single family residence, commercial storage building and gravel paved storage yard. The site is relatively flat between elevations 61-62 (NAVD 88) which gradually slopes towards Inter Avenue. Stormwater runoff from this site is currently collected by an onsite closed conveyance system that outfalls into Inter Avenue's public closed conveyance system. This public closed conveyance system is comprised of 12-inch concrete pipes and flows west approximately 1,500-feet towards offsite wetlands and Upper Deer Creek. The site is accessed by an existing gravel driveway from Inter Avenue.

Onsite soils have been identified as Briscot loam (6A a Type D soil) determined by the USDA SCS maps of Pierce County, Washington. A description of the USDA soils and a copy of the soil map for this portion of Pierce County have been included in Appendix 'A' of this report. A draft geotechnical engineer's report has been prepared by GeoResources, dated January 21, 2021, with an addendum, dated February 14, 2022, where they documented 0.5-feet to 1.0-feet of topsoil over silty alluvium. Mottling was observed at a depth 0.5 to 1.0-feet with groundwater observed at a depth of 0.5-feet. An EPA falling head test and small-scale PIT was performed within the native alluvium soils and a 0.6-inch per hour infiltration design rate is provided. Although, the permeable pavement is sized with an infiltration rate of 0.1-inches per hour. A copy of the geotechnical report is included in Appendix 'D'. Permeable ballast fill is proposed in the paving area so the permeable pavement storage reservoir course meets the separation requirements from the seasonal high groundwater table.

There is an existing gravity sewer main in Inter Avenue which currently serves the property. There are no known aquifer recharge or wellhead protection areas that affect this property. There are no known well or septic systems onsite. If a septic system or well is discovered onsite during construction, it will be decommissioned per Tacoma-Pierce County Health Department standards. The parcel and all the proposed improvements are located within Zone X, which is considered outside of the 100-year floodplain, per FEMA Map # 53053C0334E. A copy of the FIRM Panel map can be found in Appendix 'B' of this report.

3. Off-site Analysis Report

A quarter mile downstream analysis is required by the City of Puyallup. The project proposes permeable pavement for flow control. The overflow from the permeable pavement is collected and conveyed to the existing public closed conveyance system in Inter Avenue. Based on a field survey and public GIS information, the runoff is conveyed west within Inter Avenue's closed conveyance system towards Upper Deer Creek. The ¼ mile drainage path ends at the outfall to Upper Deer Creek. Existing wetlands are located at the outfall to Upper Deer Creek. The runoff ultimately outfalls to the Puyallup River which is located approximately 0.9-miles downstream located northwest of the project site. A downstream map is included in Appendix 'B'. No adverse

impacts are anticipated to the downstream system as a result of the development due to the proposed detention tank and bio-swale.

4. Permanent Stormwater Control Plan

Existing Site Hydrology

The existing site is collected by an existing closed conveyance system that outfalls to the public storm system in Inter Avenue. The existing site is analyzed to demonstrate that the project meets both the flow control and LID performance standards. The pre-developed basin is 0.997-acres C, Forest, Flat. The following is a summary of the pre-developed site flows:

2-year.....0.024-cfs
10-year.....0.045-cfs
50-year.....0.059-cfs
100-year.....0.063-cfs

Update area totals throughout report to 1.082 acres in order to match model and pre-developed basin. [R2-03 - 20083 Storm Drainage Report. Page 6/100]

Please refer to the Pre-Developed Basin Map in Appendix 'B' and the WWHM computer results in Appendix 'C'.

Developed Site Hydrology

Under the developed condition, the project site proposes 31,632 sq.ft. of paving, that does not include overlaying the existing asphalt, across onsite and offsite improvements and 10,432 sq.ft. of landscaping. The landscape and yard areas can be modeled as "pasture" due to soil amendment per Ecology BMP T5.13. For the purpose of sizing the overflow conveyance system the permeable pavement is modelled as C, Lawn, Flat with the WWHM computer program. The post developed basin is summarized in the below:

Sub-Basin	Land-use	WWHM Description	Area (ac)
Onsite A	Yards and Landscape (Amended Soils)	C, Pasture, Flat	0.174
Onsite B	Curbing	Roadway, Flat	0.012
Onsite C	Permeable Pavement	C, Lawn, Flat	0.600
Bypass A	Frontage Improvements Roadway/Sidewalk	Roadway, Flat	0.054
Bypass B	Onsite Paving	Roadway, Flat	0.060
Bypass C	Landscaping Planters	C, Pastures, Flat	0.097
Total			**0.997**

Table 1 – Post Developed Basin

The following is a summary of the post developed site flows:

2-year.....0.078-cfs
10-year.....0.162-cfs
50-year.....0.272-cfs
100-year.....0.331-cfs

Please refer to the Post Developed Basin Map in Appendix 'B' and the WWHM computer results in Appendix 'C'.

Facility Sizing

The project proposes permeable pavement to control the runoff from the newly paved parking lot area. Additionally, planters are constructed as part of the parking lot improvements which are to have their soils amended per BMP T5.13. The areas of the site that are modified as part of this permit are modelled with WWHM computer program to demonstrate the project's compliance with both the flow control and LID performance standards. The permeable pavement's subbasin is summarized in Table 2 below:

Sub-Basin	Land-use	WWHM Description	Area (ac)
Onsite A	Yards and Landscape (Amended Soils)	C, Pasture, Flat	0.174
Onsite B	Curbing	Roadway, Flat	0.012
Onsite C	Permeable Pavement	Permeable Pavement WWHM Element	0.600
Total			**0.786**

Table 2 – Permeable Pavement Basin

As a factor of safety, the permeable pavement is modelled with an infiltration rate of 0.1 inches per hour and 0.5 effective volume factor. As computed by WWHM, a pavement section comprised of 6.5-inch thick permeable asphalt over 2.5-inches of permeable ballast can fully infiltrate the basin summarized in Table 2. Any additional permeable ballast placed below the pavement is for structural purposes and is not needed for stormwater storage. The underlying soils meet the CEC and organic content requirements of Section 4.4.2 of Volume V of the Manual so runoff treatment is provided for the permeable pavement area. The portions of the site that are being improved the project meets the flow control and LID performance standards. A copy of the WWHM computer report is included in Appendix C.

Conveyance Calculations

The project proposes an extension of the existing conveyance system within Inter Ave to an onsite overflow conveyance system. This system is comprised of catch basins, PVC pipes and ductile iron pipe. The shallowest pipe is analyzed to demonstrate that the system's ability to convey the site's overflow 100-year event as calculated by the WWHM computer program. Computer modeling results are provided in Appendix 'C'. A summary of the calculations is provided below:

- Pipe Reach Name: **DIP**
- Structure Tributary Area: **0.997-ac**
- Pipe Diameter (in): **12-in**
- Pipe Length (ft): **NA**
- Pipe Slope (%): **0.50%**
- Manning's Coefficient (n): **0.012 (DIP)**
- Design Flow (cfs): **0.33-cfs (100-year)**
- Pipe-Full Flow (cfs): **2.73-cfs**
- Water Depth at Design Flow (in): **2.88-in**
- Critical Depth (in): **2.88-in**
- Velocity at Design Flow (fps): **2.28-fps**
- Velocity at Pipe-Full Flow (fps): **3.47-fps**
- Percent full at Design Flow (%): **24%**
- HGL for each Pipe Reach (elev): **0.24-ft**

5. Discussion of Minimum Requirements

The project is the redevelopment of two parcels that proposes more than 5,000 sq.ft. of new plus replaced hard surfaces; therefore, as required by Figure 2.4.1 and 2.4.2 of Volume I of the Manual all minimum requirement applies to the new and replaced surfaces.

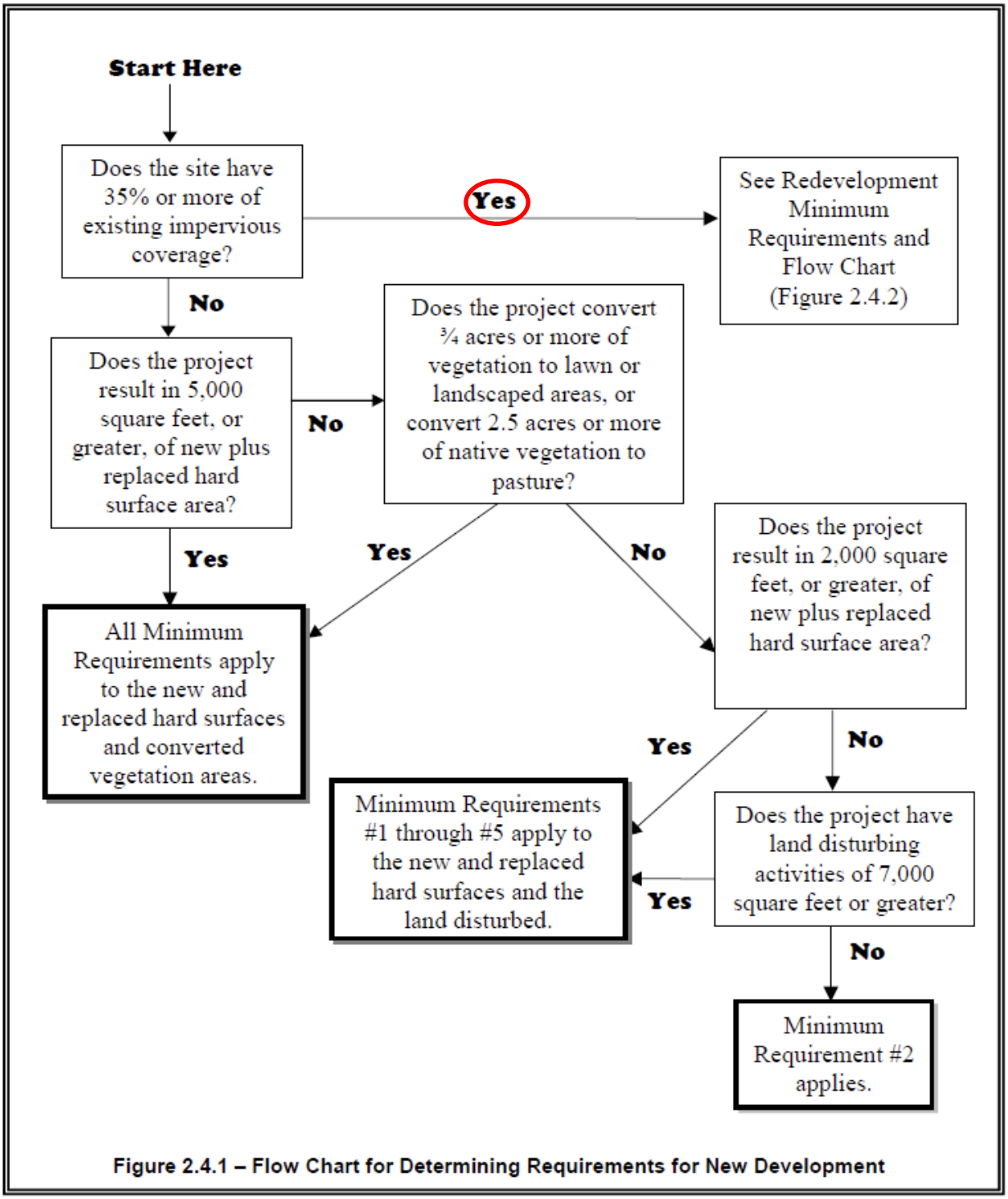


Figure 2.4.1 – Flow Chart for Determining Requirements for New Development

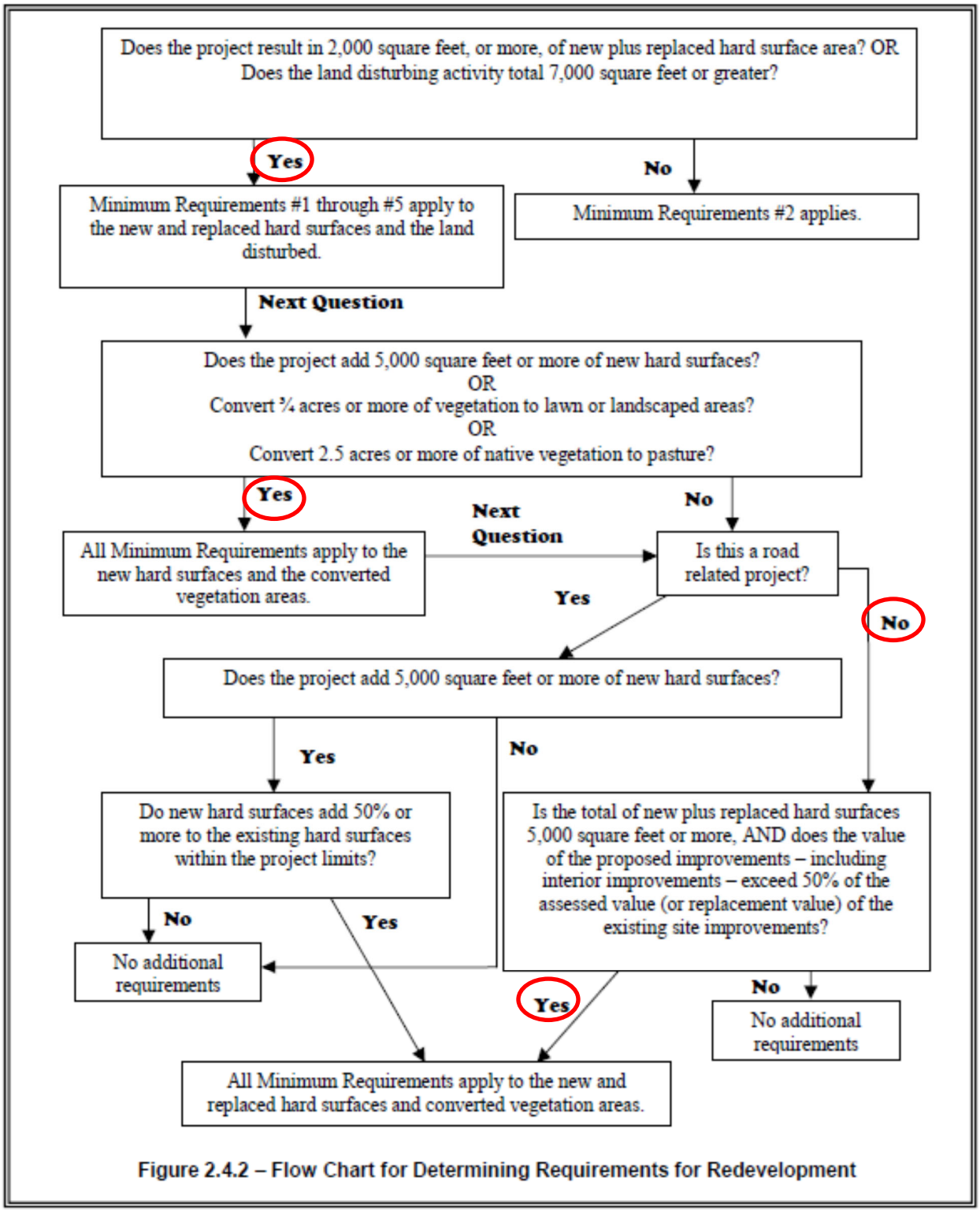


Figure 2.4.2 – Flow Chart for Determining Requirements for Redevelopment

The following is a summary of the minimum requirements as described in Chapter 2 of Volume I of the Manual.

5.1 Minimum Requirement #1: Preparation of a Stormwater Site Plan

The Stormwater Site Plan is prepared and is provided with this document.

5.2 Minimum Requirement #2: Construction Stormwater Pollution Prevention (SWPP)

A SWPP Plan has been prepared. It is submitted alongside this report as the erosion control report.

5.3 Minimum Requirement #3: Source Control of Pollution

Permanent source control BMPs are required for the development's daily operations as described in the Pollution Source Control Manual for Commercial/Industrial Activities included as a separate document.

5.4 Minimum Requirement #4: Preservation of Natural Drainage System and Outfalls

Under existing conditions, stormwater runoff is collected onsite and discharged into the public conveyance system in Inter Avenue south of the site.

5.5 Minimum Requirement #5: Onsite Stormwater Management

This project must meet minimum requirements 1-9; therefore, this project must either evaluate List 2 for onsite stormwater management compliance or meet the LID Performance Standard. The project meets the LID Performance Standard with the use of permeable pavement (BMP T5.15) and soil preservation and amendment (Ecology BMP T5.13).

5.6 Minimum Requirement #6: Runoff Treatment

The project provides runoff treatment with the permeable pavement. The underlying soils meet the CEC and organic requirements of Section 4.4.2 of Volume V of the Manual.

5.7 Minimum Requirement #7: Flow Control

The project meets the Flow Control Performance Standard with the use of permeable pavement (BMP T5.15) and soil amendments. (BMP T5.13)

5.8 Minimum Requirement #8: Wetlands Protection

An offsite wetland exists about 1,500-feet downstream of the site at Inter Ave's outfall to Upper Deer Creek. A wetland recharge analysis is performed between the basin summarized in Table 1

of this report. The actual pre-developed land use cover (0.997-acres, Parking Lot, Flat) is used to complete this analysis. Since the project is proposing permeable pavement to mitigate the proposed parking lot improvements the project provides less volume downstream each month of the year. A copy of the analysis is provided in Appendix "C" of this report.

5.9 Minimum Requirement #9: Operation and Maintenance

An Operation and Maintenance Manual is submitted alongside this report.

Operation and Maintenance Manual not found in submittal. Include in resubmittal. [R2-03 - 20083-Storm Drainage Report, Page 12/100]

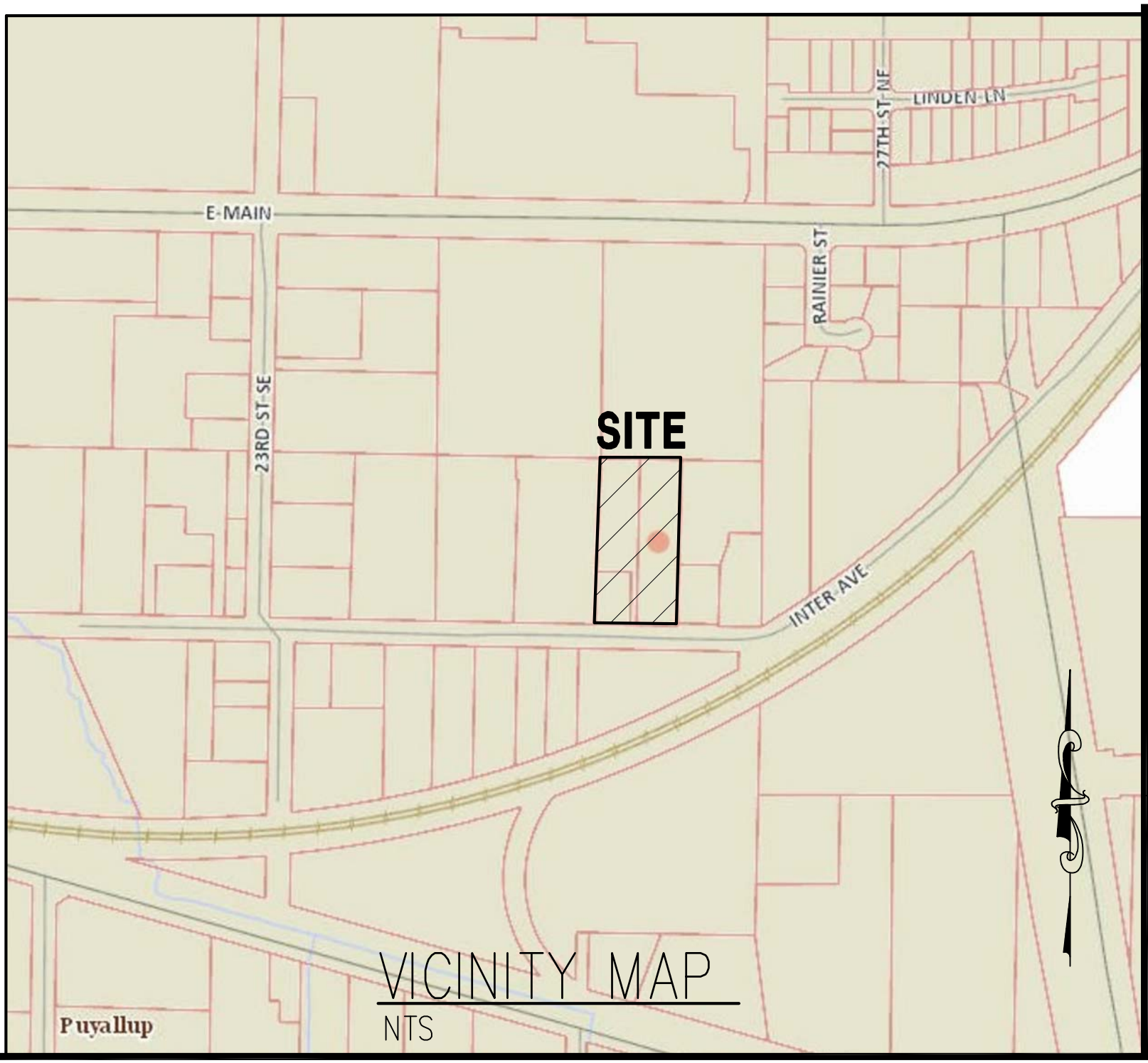
6. Other Permits

Other necessary permits and approvals include:

- Right of Way
- Sanitary Side Sewer Permits
- Building Remodel Permits

APPENDIX A

General Exhibits



VICINITY MAP

NTS

Map Scale: 1:826 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 10 20 40 60

Feet
0 40 80 160 240

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 10N WGS84

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Pierce County Area, Washington
Survey Area Data: Version 16, Jun 4, 2020

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

Date(s) aerial images were photographed: Jul 29, 2018—Jul 22, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Briscot loam	2.4	100.0%
Totals for Area of Interest		**2.4**	**100.0%**

APPENDIX B

Basin Exhibits

OLSON BROTHERS STORAGE

A PORTION OF NW1/4 OF THE SE1/4 OF SEC. 26, T20N, R04E
WILLAMETTE MERIDIAN, PIERCE COUNTY, WASHINGTON

30 0 15 30 60
1 inch = 30 feet.

APPROVED

BY _____
CITY OF PUYALLUP
ENGINEERING SERVICES

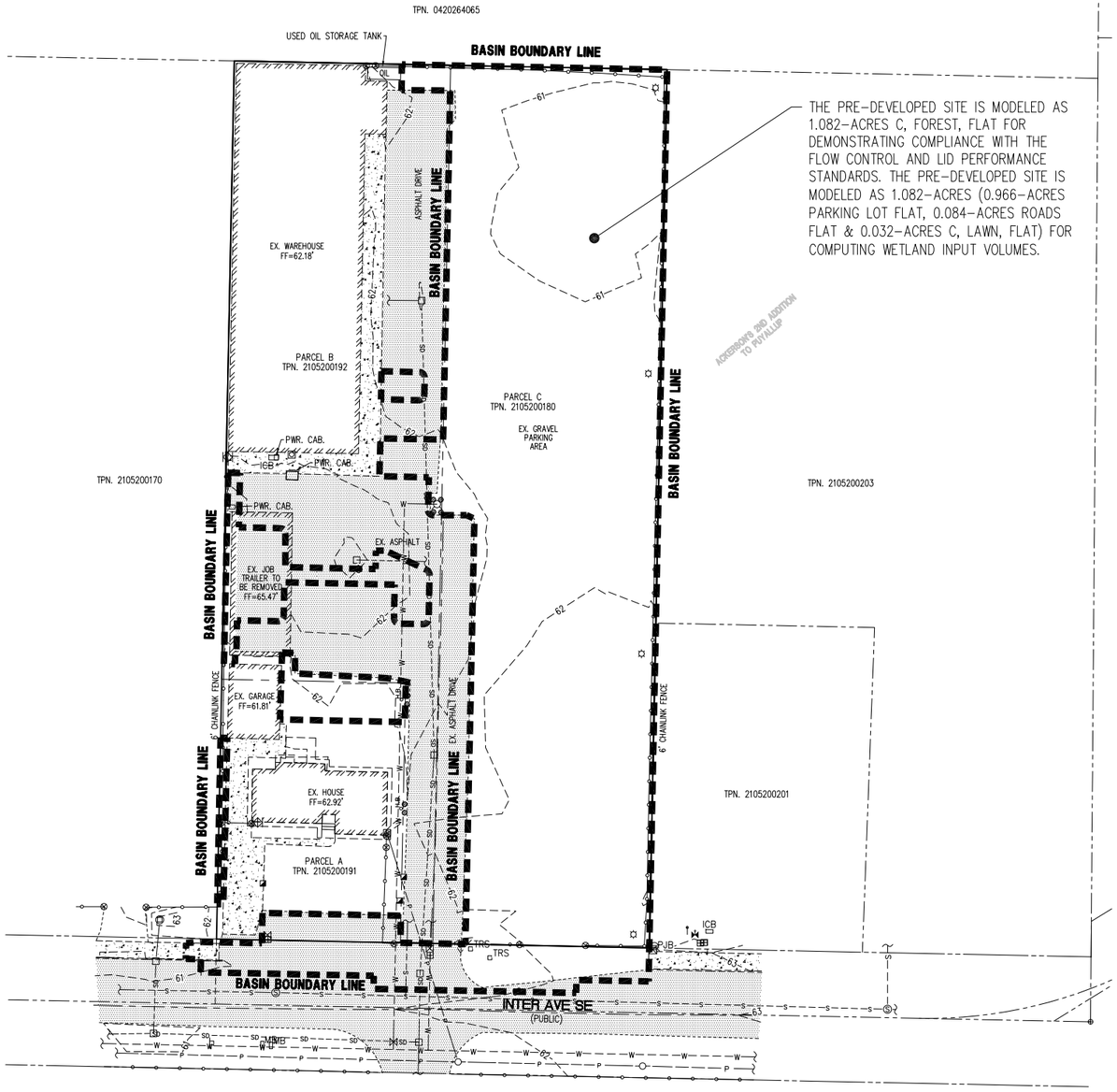
DATE _____

NOTE:
THIS APPROVAL IS VOID AFTER 180 DAYS FROM APPROVAL DATE.

THE CITY WILL NOT BE RESPONSIBLE FOR ERRORS AND/OR OMISSIONS ON THESE PLANS.

FIELD CONDITIONS MAY DICTATE CHANGES TO THESE PLANS AS DETERMINED BY THE CITY ENGINEER.

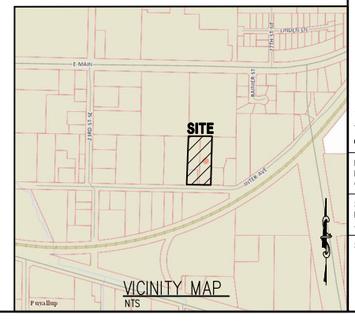
No.	Revision:	Int.	Date:



THE PRE-DEVELOPED SITE IS MODELED AS 1.082-ACRES C, FOREST, FLAT FOR DEMONSTRATING COMPLIANCE WITH THE FLOW CONTROL AND LID PERFORMANCE STANDARDS. THE PRE-DEVELOPED SITE IS MODELED AS 1.082-ACRES (0.966-ACRES PARKING LOT FLAT, 0.084-ACRES ROADS FLAT & 0.032-ACRES C, LAWN, FLAT) FOR COMPUTING WETLAND INPUT VOLUMES.

LEGEND

EXISTING	DESCRIPTION	PROPOSED
⊕	MONUMENT	⊕
	MONUMENT LINE	
	PROPERTY LINE	
	RIGHT OF WAY LINE	
	EASEMENT LINE	
	BUILDING SETBACK LINE	
	CHAIN LINK FENCE	
	WOOD FENCE	
	CURB & GUTTER	
	EDGE OF PAVEMENT	
300	CONTOURS	300
	STREET SIGN	
	STORM DRAIN CATCH BASIN	
	STORM DRAIN MANHOLE	
	STORM DRAIN CLEANOUT	
SD	STORM DRAIN LINE	SD
RD	ROOF DRAIN LINE	RD
	SANITARY SEWER MANHOLE	
	SANITARY SEWER CLEANOUT	
S	SANITARY SEWER LINE	S
SS	SANITARY SEWER STUB	SS
	FIRE HYDRANT	
	WATER VALVE	
	WATER METER	
	THRUST BLOCKING	
W	WATER MAIN	W
	LUMINAIRE	
	POWER/UTILITY POLE	
	GUY WIRE	
	SAWCUT LINE	
	ASPHALT CONCRETE	
	CEMENT CONCRETE	
	GRAVEL	
	LANDSCAPE AREAS	



DANIEL PAUL SMITH
STATE OF WASHINGTON
47023
REGISTERED
PROFESSIONAL ENGINEER

C.E.S. NW INC.
CIVIL ENGINEERING & SURVEYING
429 - 29TH ST. NE, SUITE D
PUYALLUP, WA 98372
PH: (253) 848-4282
cesrvices@cesnwinc.com

OLSON BROTHERS STORAGE
PRE-DEVELOPED BASIN MAP

Project:

Client: MIKE GRIMIT
GIMITARCHITECTUREMCENTURYLINK.NET

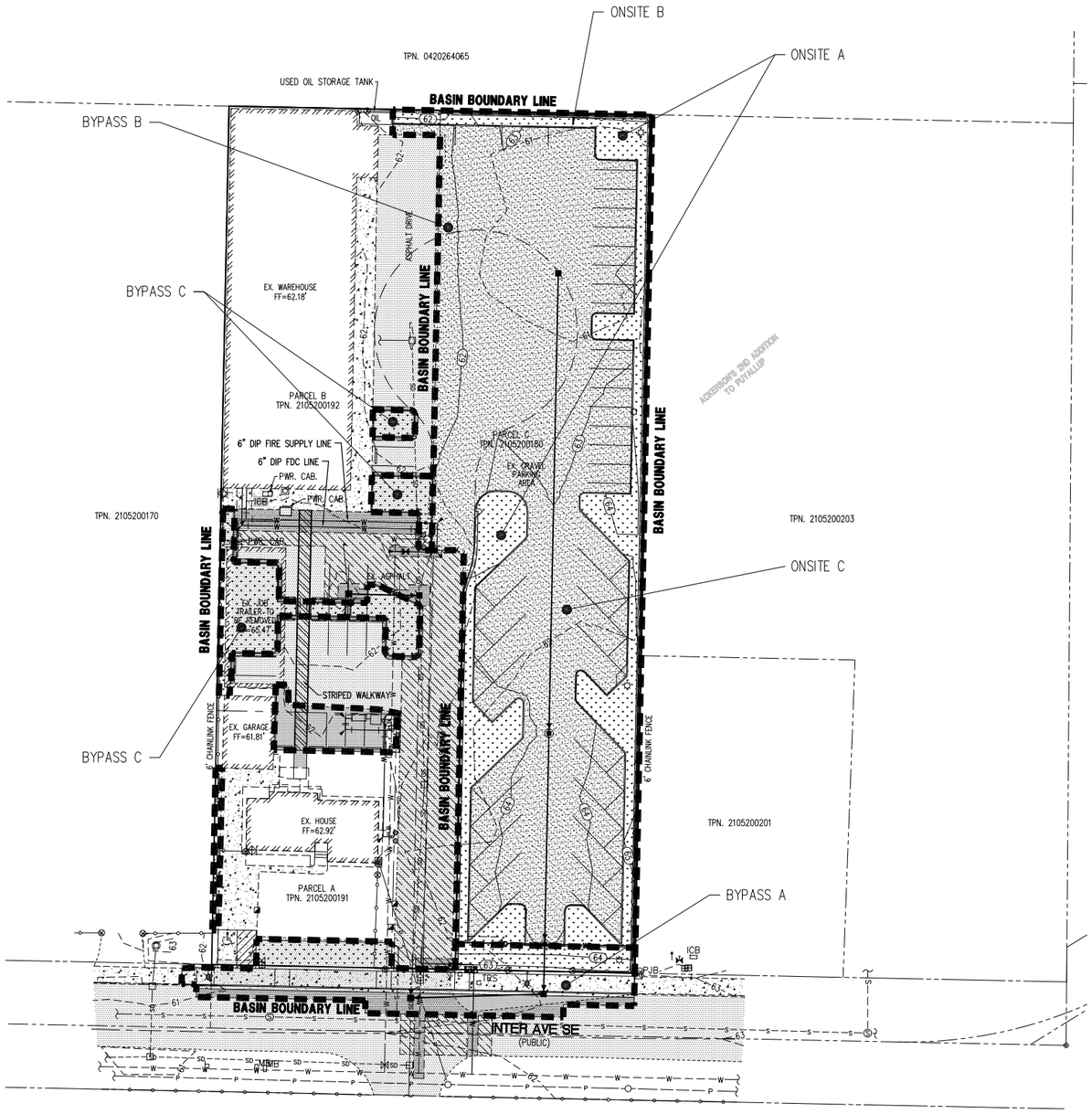
Designed:	DPS
Drawn:	JEH
Checked:	CAD
Scale:	1"=30'
Date:	07/20/22
Job No.:	20083

Sheet No.:
B1
1 of 2 Sheets

CALL 48 HOURS BEFORE YOU DIG DIAL 811

OLSON BROTHERS STORAGE

A PORTION OF NW1/4 OF THE SE1/4 OF SEC. 26, T20N, R04E
WILLAMETTE MERIDIAN, PIERCE COUNTY, WASHINGTON



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30 0 15 30 60
1 inch = 30 feet.

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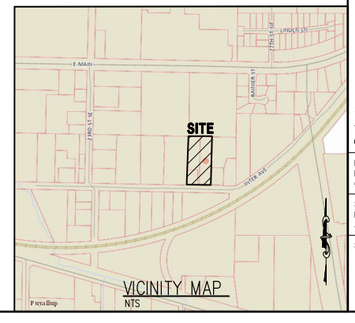
Bypass A	Frontage Improvements Roadway/Sidewalk	Roadway, Flat	0.054
Bypass B	Onsite Paving	Roadway, Flat	0.060
Bypass C	Landscaping Planters	C, Pastures, Flat	0.097
Total			**0.997**

POST DEVELOPED BASIN

LEGEND

EXISTING	DESCRIPTION	PROPOSED
⊕	MONUMENT	⊕
	MONUMENT LINE	
	PROPERTY LINE	
	RIGHT OF WAY LINE	
	EASEMENT LINE	
	BUILDING SETBACK LINE	
	CHAIN LINK FENCE	
	WOOD FENCE	
	CURB & GUTTER	
	EDGE OF PAVEMENT	
300	CONTOURS	300
	STREET SIGN	
	STORM DRAIN CATCH BASIN	
	STORM DRAIN MANHOLE	
	STORM DRAIN CLEANOUT	
SD	STORM DRAIN LINE	SD
RD	ROOF DRAIN LINE	RD
	SANITARY SEWER MANHOLE	
	SANITARY SEWER CLEANOUT	
S	SANITARY SEWER LINE	S
SS	SANITARY SEWER STUB	SS
	FIRE HYDRANT	
	WATER VALVE	
	WATER METER	
	THRUST BLOCKING	
W	WATER MAIN	W
	LUMINAIRE	
	POWER/UTILITY POLE	
	GUY WIRE	
	SAWCUT LINE	
	ASPHALT CONCRETE	
	CEMENT CONCRETE	
	GRAVEL	
	LANDSCAPE AREAS	



No.	Revision:	Int.	Date:

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PUYALLUP, WA 98372
PH: (253) 848-4282
cesrvices@cesnwinc.com

Project: **OLSON BROTHERS STORAGE**
POST DEVELOPED BASIN MAP

Client: **MIKE GRIMIT**
GIMITARCHITECTURE@CENTURYLINK.NET

Designed: DPS
Drawn: JEH
Checked: CAD

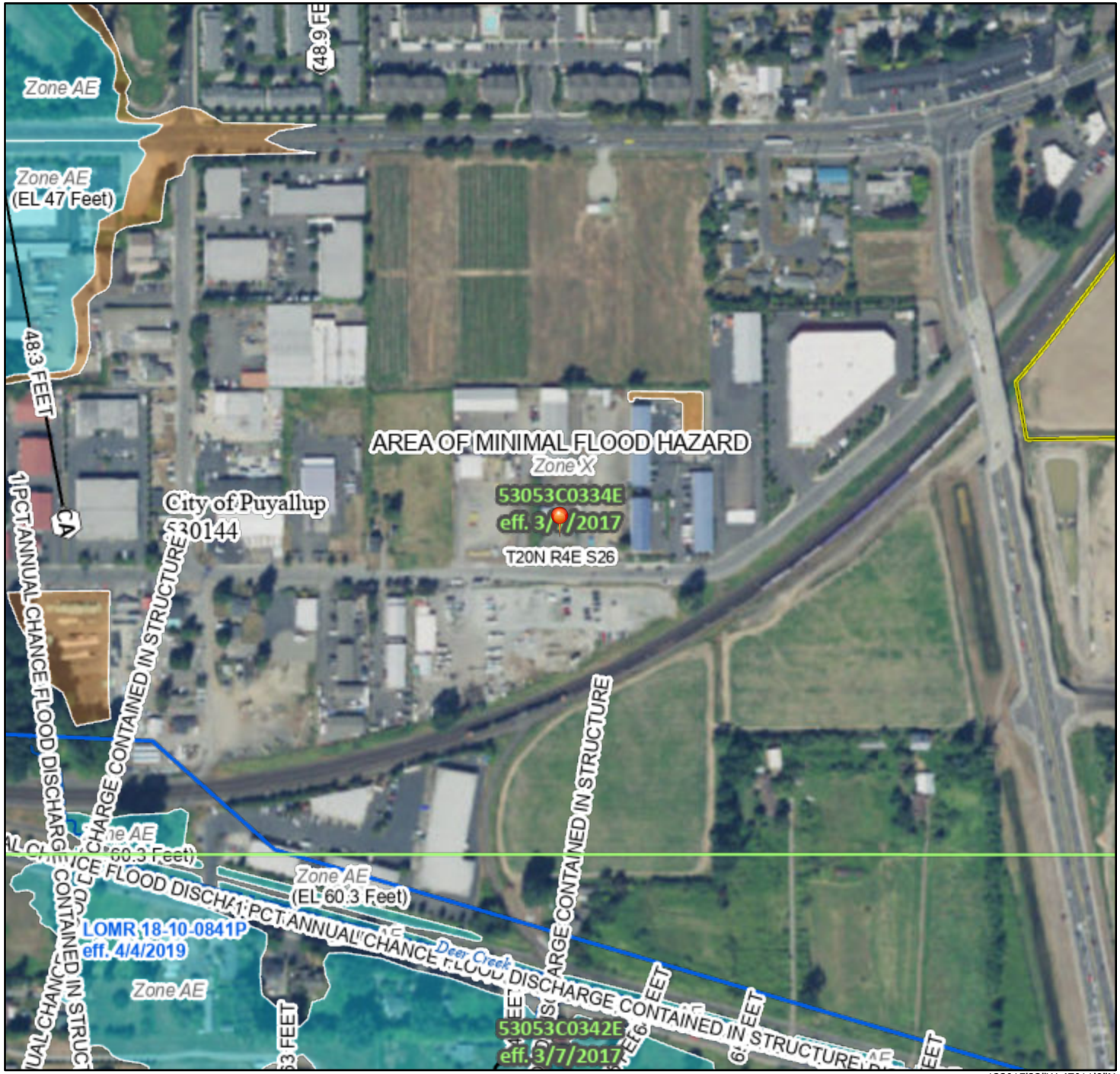
Scale: 1"=30'
Date: 07/20//22
Job No.: 20083

Sheet No.:
B2
2 of 2 Sheets

National Flood Hazard Layer FIRMette

FEMA

122°16'W 47°11'34"N



122°15'22"W 47°11'9"N

Feet

0 250 500 1,000 1,500 2,000

1:6,000

Basemap: USGS National Map: Orthoimagery: Data refreshed October, 2020

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- 20.2 / 17.5 Cross Sections with 1% Annual Chance / Water Surface Elevation
- Coastal Transect
- Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

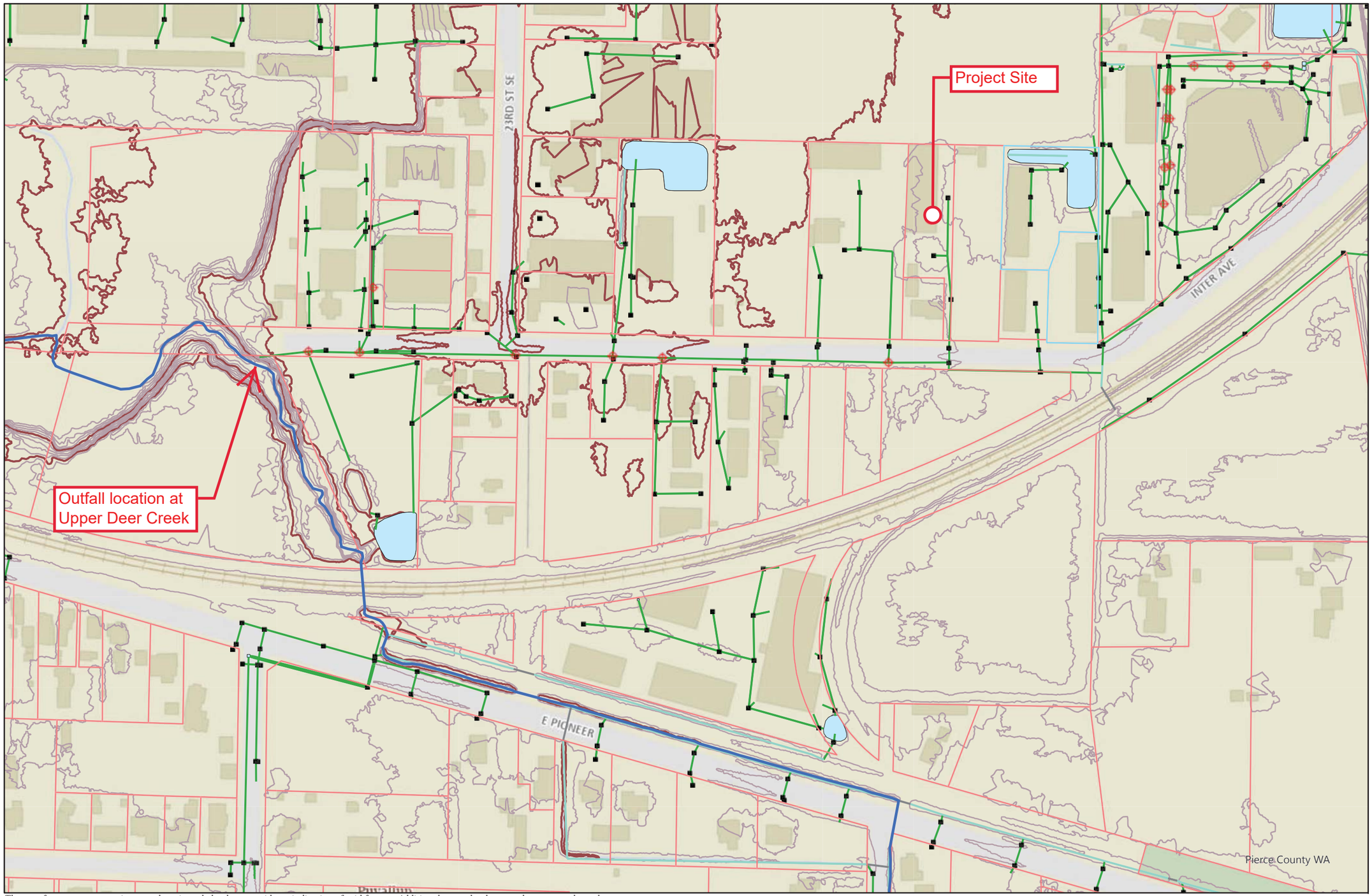
The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 2/1/2021 at 1:21 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

Downstream Map



Legend

- Streams - Puyallup

Tax Parcels

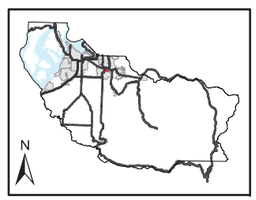
- Base Parcel
- Condominium
- Drainage - Manholes - Puyallup
- Drainage - Inlets - Puyallup
- Drainage - Culverts - Puyallup
- Drainage - Channels - Puyallup
- Drainage - Pipes - Puyallup
- Drainage - Stormwater Facilities - Puyallup

Contours - 2017

- 10' Contour Line
- 2' Contour Line

Hydro - Centerline Labels

- Hydro - Centerline Labels



0 45 90 180 Feet

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Date: 2/1/2021 12:34 PM

APPENDIX C

Computer Modelling Results

WWHM2012

PROJECT REPORT

General Model Information

Project Name:	20083 Permeable Pavement
Site Name:	Olson Bros
Site Address:	2511 Inter Ave
City:	Puyallup, WA
Report Date:	7/18/2022
Gage:	40 IN EAST
Data Start:	10/01/1901
Data End:	09/30/2059
Timestep:	15 Minute
Precip Scale:	1.000
Version Date:	2021/08/18
Version:	4.2.18

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

Pre-Dev

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	1.082
Pervious Total	1.082
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.082

Element Flows To:

Surface	Interflow	Groundwater

Mitigated Land Use

Bypass

Bypass:	Yes
GroundWater:	No

Pervious Land Use	acre
C, Pasture, Flat	0.123
Pervious Total	0.123

Impervious Land Use	acre
ROADS FLAT	0.084
PARKING FLAT	0.029
Impervious Total	0.113
Basin Total	0.236

Element Flows To:

Surface	Interflow	Groundwater

Landscaping

Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Flat	.174

Element Flows To:

Surface	Interflow	Groundwater
Permeable Parkling Lot	Permeable Parkling Lot	

Curbing

Bypass:	No
Impervious Land Use	acre
ROADS FLAT LAT	0.012

Element Flows To:

Outlet 1	Outlet 2
Permeable Parkling Lot	

Routing Elements
Predeveloped Routing

Mitigated Routing

Permeable Parkling Lot

Pavement Area:0.6600 acre.Pavement Length:169.56 ft.

Pavement Width:	169.56 ft.
	Pavement slope 1:0.05 To 1
Pavement thickness:	0.54
Pour Space of Pavement:	0.5
Material thickness of second layer:	0.21
Pour Space of material for second layer:	0.3
Material thickness of third layer:	0
Pour Space of material for third layer:	0
Infiltration On	
Infiltration rate:	0.1
Infiltration safety factor:	1
Total Volume Infiltrated (ac-ft.):	282.888
Total Volume Through Riser (ac-ft.):	0
Total Volume Through Facility (ac-ft.):	282.888
Percent Infiltrated:	100
Total Precip Applied to Facility:	0
Total Evap From Facility:	24.471

Element Flows To:
Outlet 1 Outlet 2

Pour Space of Pavement is in the model as 0.5. Is this to mean 50%? Generally pervious concrete has voids in the neighborhood of 15-35%. Is this 0.5 also the same as the Effective Volume Factor reported on page 6 of the Storm Drainage Report? Clarify Pour Space or Effective Volume Factor and justify using 0.5. [R2-03 - 20083-Storm Drainage Report. Page 31/100]

Permeable Pavement Hydraulic Table

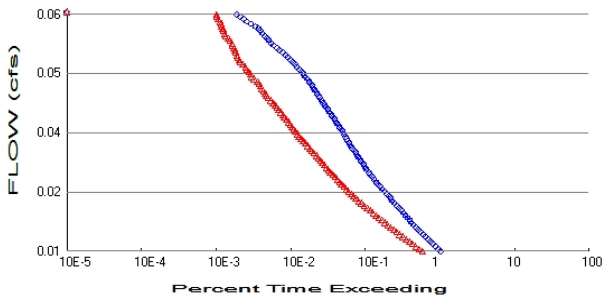
Stage(feet)	Area(ac.)	Volume(ac-ft.)	Discharge(cfs)	Infilt(cfs)
0.0000	0.660	0.000	0.000	0.000
0.0194	0.660	0.003	0.000	0.066
0.0389	0.660	0.007	0.000	0.066
0.0583	0.660	0.011	0.000	0.066
0.0778	0.660	0.015	0.000	0.066
0.0972	0.660	0.019	0.000	0.066
0.1167	0.660	0.023	0.000	0.066
0.1361	0.660	0.027	0.000	0.066
0.1556	0.660	0.030	0.000	0.066
0.1750	0.660	0.034	0.000	0.066
0.1944	0.660	0.038	0.000	0.066
0.2139	0.660	0.044	0.000	0.066
0.2333	0.660	0.051	0.000	0.066
0.2528	0.660	0.057	0.000	0.066
0.2722	0.660	0.064	0.000	0.066
0.2917	0.660	0.070	0.000	0.066
0.3111	0.660	0.077	0.000	0.066
0.3306	0.660	0.083	0.000	0.066
0.3500	0.660	0.089	0.000	0.066
0.3694	0.660	0.096	0.000	0.066
0.3889	0.660	0.102	0.000	0.066
0.4083	0.661	0.109	0.000	0.066
0.4278	0.661	0.115	0.000	0.066
0.4472	0.661	0.122	0.000	0.066
0.4667	0.661	0.128	0.000	0.066
0.4861	0.661	0.134	0.000	0.066
0.5056	0.661	0.141	0.000	0.066
0.5250	0.661	0.147	0.000	0.066
0.5444	0.661	0.154	0.000	0.066

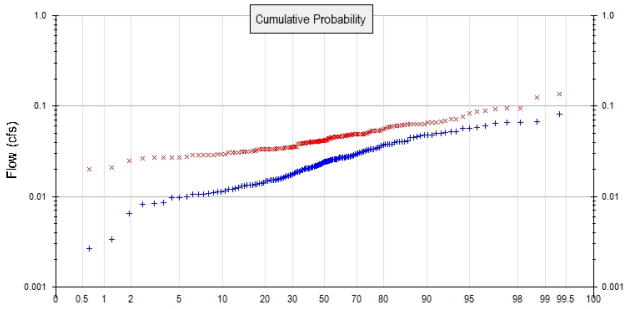
0.5639	0.661	0.160	0.000	0.066
0.5833	0.661	0.167	0.000	0.066
0.6028	0.661	0.173	0.000	0.066
0.6222	0.661	0.179	0.000	0.066
0.6417	0.661	0.186	0.000	0.066
0.6611	0.661	0.192	0.000	0.066
0.6806	0.661	0.199	0.000	0.066
0.7000	0.661	0.205	0.000	0.066
0.7194	0.661	0.212	0.000	0.066
0.7389	0.661	0.218	0.000	0.066
0.7583	0.661	0.231	0.000	0.066
0.7778	0.661	0.244	0.000	0.066
0.7972	0.661	0.257	0.000	0.066
0.8167	0.661	0.270	0.000	0.066
0.8361	0.662	0.282	0.000	0.066
0.8556	0.662	0.295	0.000	0.066
0.8750	0.662	0.308	0.000	0.066
0.8944	0.662	0.321	0.000	0.066
0.9139	0.662	0.334	0.000	0.066
0.9333	0.662	0.347	0.000	0.066
0.9528	0.662	0.360	0.000	0.066
0.9722	0.662	0.373	0.000	0.066
0.9917	0.662	0.385	0.000	0.066
1.0111	0.662	0.398	0.066	0.066
1.0306	0.662	0.411	0.301	0.066
1.0500	0.662	0.424	0.631	0.066
1.0694	0.662	0.437	1.033	0.066
1.0889	0.662	0.450	1.496	0.066
1.1083	0.662	0.463	2.013	0.066
1.1278	0.662	0.476	2.579	0.066
1.1472	0.662	0.488	3.189	0.066
1.1667	0.662	0.501	3.841	0.066
1.1861	0.662	0.514	4.533	0.066
1.2056	0.662	0.527	5.262	0.066
1.2250	0.662	0.540	6.026	0.066
1.2444	0.662	0.553	6.824	0.066
1.2639	0.663	0.566	7.654	0.066
1.2833	0.663	0.579	8.515	0.066
1.3028	0.663	0.592	9.407	0.066
1.3222	0.663	0.604	10.32	0.066
1.3417	0.663	0.617	11.27	0.066
1.3611	0.663	0.630	12.25	0.066
1.3806	0.663	0.643	13.25	0.066
1.4000	0.663	0.656	14.28	0.066
1.4194	0.663	0.669	15.33	0.066
1.4389	0.663	0.682	16.41	0.066
1.4583	0.663	0.695	17.52	0.066
1.4778	0.663	0.708	18.64	0.066
1.4972	0.663	0.721	19.79	0.066
1.5167	0.663	0.733	20.96	0.066
1.5361	0.663	0.746	22.16	0.066
1.5556	0.663	0.759	23.38	0.066
1.5750	0.663	0.772	24.61	0.066
1.5944	0.663	0.785	25.87	0.066
1.6139	0.663	0.798	27.15	0.066
1.6333	0.663	0.811	28.45	0.066
1.6528	0.663	0.824	29.77	0.066
1.6722	0.663	0.837	31.12	0.066

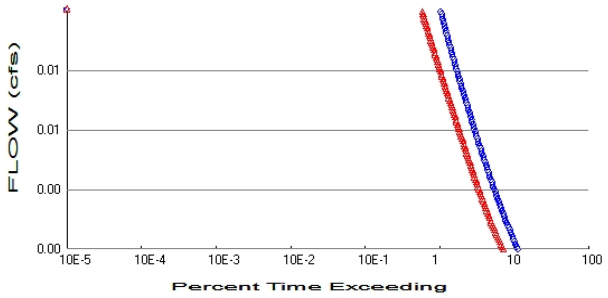
1.6917	0.664	0.850	32.48	0.066
1.7111	0.664	0.863	33.85	0.066
1.7306	0.664	0.875	35.25	0.066
1.7500	0.664	0.888	36.67	0.066

Analysis Results

POC 1







\+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1
Total Pervious Area: 1.082
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1
Total Pervious Area: 0.297
Total Impervious Area: 0.785023

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	**Flow(cfs)**
2 year	0.024447
5 year	0.037615
10 year	0.045226
25 year	0.05347
50 year	0.058773
100 year	0.063374

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	**Flow(cfs)**
2 year	0.042113
5 year	0.056588
10 year	0.067116
25 year	0.081535
50 year	0.093114
100 year	0.105434

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	0.020	0.048
1903	0.015	0.053
1904	0.026	0.066
1905	0.013	0.027
1906	0.007	0.031
1907	0.038	0.045
1908	0.027	0.035
1909	0.027	0.041
1910	0.038	0.042
1911	0.024	0.045
1912	0.082	0.090
1913	0.038	0.032
1914	0.010	0.135
1915	0.016	0.029
1916	0.024	0.051
1917	0.008	0.020
1918	0.026	0.041
1919	0.020	0.027
1920	0.025	0.035
1921	0.027	0.032
1922	0.027	0.049
1923	0.022	0.033
1924	0.011	0.059
1925	0.013	0.026
1926	0.024	0.048
1927	0.017	0.041
1928	0.019	0.031
1929	0.038	0.058
1930	0.024	0.061
1931	0.023	0.031
1932	0.018	0.033
1933	0.019	0.034
1934	0.050	0.056
1935	0.023	0.028
1936	0.021	0.039
1937	0.033	0.049
1938	0.020	0.029
1939	0.002	0.034
1940	0.022	0.061
1941	0.014	0.067
1942	0.034	0.048
1943	0.017	0.046
1944	0.035	0.066
1945	0.027	0.049
1946	0.016	0.040
1947	0.011	0.030
1948	0.052	0.041
1949	0.045	0.063
1950	0.013	0.035
1951	0.017	0.053
1952	0.067	0.069
1953	0.061	0.063
1954	0.022	0.035
1955	0.019	0.031
1956	0.010	0.029
1957	0.032	0.034

1958	0.065	0.046
1959	0.041	0.046
1960	0.012	0.033
1961	0.041	0.092
1962	0.022	0.040
1963	0.011	0.029
1964	0.011	0.086
1965	0.046	0.042
1966	0.013	0.033
1967	0.020	0.048
1968	0.022	0.039
1969	0.020	0.036
1970	0.031	0.042
1971	0.048	0.041
1972	0.032	0.124
1973	0.041	0.071
1974	0.023	0.054
1975	0.051	0.061
1976	0.027	0.062
1977	0.012	0.025
1978	0.045	0.047
1979	0.013	0.045
1980	0.026	0.046
1981	0.024	0.041
1982	0.011	0.034
1983	0.041	0.048
1984	0.018	0.047
1985	0.029	0.054
1986	0.024	0.029
1987	0.047	0.046
1988	0.029	0.029
1989	0.027	0.027
1990	0.031	0.036
1991	0.025	0.049
1992	0.032	0.047
1993	0.033	0.053
1994	0.048	0.040
1995	0.011	0.029
1996	0.053	0.040
1997	0.022	0.035
1998	0.026	0.044
1999	0.003	0.046
2000	0.019	0.040
2001	0.011	0.031
2002	0.035	0.063
2003	0.030	0.034
2004	0.027	0.049
2005	0.048	0.095
2006	0.015	0.044
2007	0.016	0.050
2008	0.026	0.041
2009	0.017	0.031
2010	0.015	0.040
2011	0.014	0.041
2012	0.020	0.041
2013	0.015	0.038
2014	0.011	0.036
2015	0.021	0.063

2016	0.009	0.039
2017	0.037	0.059
2018	0.066	0.043
2019	0.066	0.064
2020	0.021	0.046
2021	0.034	0.040
2022	0.014	0.061
2023	0.028	0.076
2024	0.057	0.094
2025	0.025	0.040
2026	0.040	0.045
2027	0.015	0.049
2028	0.013	0.019
2029	0.027	0.034
2030	0.050	0.066
2031	0.017	0.021
2032	0.010	0.033
2033	0.015	0.042
2034	0.015	0.032
2035	0.057	0.047
2036	0.030	0.033
2037	0.008	0.044
2038	0.025	0.046
2039	0.003	0.084
2040	0.014	0.034
2041	0.019	0.042
2042	0.058	0.049
2043	0.028	0.053
2044	0.037	0.038
2045	0.025	0.032
2046	0.029	0.034
2047	0.021	0.041
2048	0.028	0.033
2049	0.025	0.049
2050	0.018	0.039
2051	0.026	0.057
2052	0.015	0.040
2053	0.027	0.034
2054	0.034	0.071
2055	0.014	0.039
2056	0.012	0.053
2057	0.019	0.027
2058	0.023	0.050
2059	0.040	0.063

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0822	0.1353
2	0.0673	0.1245
3	0.0663	0.0954
4	0.0656	0.0939
5	0.0650	0.0922
6	0.0611	0.0897
7	0.0577	0.0863
8	0.0571	0.0836
9	0.0568	0.0759
10	0.0527	0.0714

11	0.0520	0.0713
12	0.0511	0.0692
13	0.0501	0.0670
14	0.0498	0.0665
15	0.0484	0.0664
16	0.0483	0.0655
17	0.0482	0.0635
18	0.0466	0.0629
19	0.0457	0.0628
20	0.0452	0.0628
21	0.0449	0.0626
22	0.0410	0.0626
23	0.0407	0.0619
24	0.0407	0.0612
25	0.0407	0.0612
26	0.0403	0.0608
27	0.0398	0.0605
28	0.0383	0.0594
29	0.0379	0.0589
30	0.0378	0.0581
31	0.0378	0.0566
32	0.0371	0.0559
33	0.0367	0.0543
34	0.0351	0.0539
35	0.0348	0.0534
36	0.0338	0.0534
37	0.0337	0.0532
38	0.0336	0.0532
39	0.0331	0.0525
40	0.0329	0.0510
41	0.0324	0.0500
42	0.0319	0.0499
43	0.0316	0.0495
44	0.0314	0.0494
45	0.0305	0.0492
46	0.0304	0.0490
47	0.0300	0.0489
48	0.0291	0.0488
49	0.0291	0.0487
50	0.0288	0.0487
51	0.0283	0.0485
52	0.0283	0.0480
53	0.0276	0.0479
54	0.0274	0.0479
55	0.0274	0.0477
56	0.0273	0.0474
57	0.0273	0.0468
58	0.0271	0.0468
59	0.0271	0.0467
60	0.0270	0.0461
61	0.0268	0.0460
62	0.0267	0.0460
63	0.0265	0.0459
64	0.0262	0.0459
65	0.0261	0.0457
66	0.0261	0.0457
67	0.0260	0.0456
68	0.0258	0.0454

69	0.0258	0.0454
70	0.0253	0.0449
71	0.0252	0.0448
72	0.0251	0.0440
73	0.0249	0.0439
74	0.0248	0.0439
75	0.0245	0.0432
76	0.0245	0.0423
77	0.0244	0.0419
78	0.0243	0.0418
79	0.0242	0.0416
80	0.0239	0.0415
81	0.0237	0.0414
82	0.0230	0.0413
83	0.0230	0.0412
84	0.0226	0.0410
85	0.0226	0.0410
86	0.0224	0.0408
87	0.0221	0.0408
88	0.0217	0.0406
89	0.0217	0.0406
90	0.0216	0.0405
91	0.0215	0.0403
92	0.0213	0.0402
93	0.0208	0.0401
94	0.0207	0.0401
95	0.0207	0.0399
96	0.0205	0.0399
97	0.0205	0.0398
98	0.0204	0.0396
99	0.0203	0.0396
100	0.0203	0.0390
101	0.0198	0.0390
102	0.0195	0.0389
103	0.0194	0.0385
104	0.0191	0.0385
105	0.0190	0.0380
106	0.0189	0.0377
107	0.0187	0.0359
108	0.0185	0.0356
109	0.0180	0.0356
110	0.0176	0.0355
111	0.0174	0.0351
112	0.0172	0.0348
113	0.0170	0.0347
114	0.0170	0.0346
115	0.0165	0.0345
116	0.0163	0.0344
117	0.0160	0.0343
118	0.0160	0.0340
119	0.0154	0.0338
120	0.0154	0.0338
121	0.0153	0.0337
122	0.0153	0.0336
123	0.0151	0.0336
124	0.0151	0.0334
125	0.0150	0.0334
126	0.0147	0.0333

127	0.0143	0.0332
128	0.0139	0.0331
129	0.0139	0.0331
130	0.0137	0.0329
131	0.0136	0.0318
132	0.0133	0.0318
133	0.0133	0.0315
134	0.0132	0.0315
135	0.0132	0.0314
136	0.0131	0.0313
137	0.0125	0.0309
138	0.0122	0.0307
139	0.0121	0.0307
140	0.0120	0.0305
141	0.0115	0.0296
142	0.0113	0.0293
143	0.0112	0.0293
144	0.0110	0.0290
145	0.0108	0.0289
146	0.0106	0.0286
147	0.0106	0.0285
148	0.0106	0.0285
149	0.0100	0.0277
150	0.0098	0.0272
151	0.0098	0.0271
152	0.0085	0.0269
153	0.0083	0.0268
154	0.0081	0.0263
155	0.0065	0.0247
156	0.0033	0.0209
157	0.0026	0.0202
158	0.0017	0.0190

LID Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0020	613285	393566	64	Pass
0.0021	592787	378663	63	Pass
0.0022	573397	364869	63	Pass
0.0023	555114	351960	63	Pass
0.0024	537719	339717	63	Pass
0.0025	520988	328470	63	Pass
0.0026	505088	317778	62	Pass
0.0027	490019	307751	62	Pass
0.0028	475448	298222	62	Pass
0.0029	461543	289081	62	Pass
0.0030	448025	280438	62	Pass
0.0031	435061	271962	62	Pass
0.0032	422430	263873	62	Pass
0.0033	410242	256283	62	Pass
0.0034	398552	249137	62	Pass
0.0035	387250	242156	62	Pass
0.0036	376503	235508	62	Pass
0.0037	366198	229082	62	Pass
0.0038	356337	222766	62	Pass
0.0039	346697	216783	62	Pass
0.0040	337390	210910	62	Pass
0.0041	328470	205481	62	Pass
0.0042	319828	199996	62	Pass
0.0043	311407	194733	62	Pass
0.0044	303263	189692	62	Pass
0.0045	295396	184761	62	Pass
0.0047	287806	180052	62	Pass
0.0048	280438	175454	62	Pass
0.0049	273513	171077	62	Pass
0.0050	266643	166756	62	Pass
0.0051	259940	162490	62	Pass
0.0052	253569	158501	62	Pass
0.0053	247253	154568	62	Pass
0.0054	241214	150801	62	Pass
0.0055	235342	147144	62	Pass
0.0056	229691	143598	62	Pass
0.0057	223985	140164	62	Pass
0.0058	218500	136673	62	Pass
0.0059	213237	133294	62	Pass
0.0060	208029	130136	62	Pass
0.0061	202988	126978	62	Pass
0.0062	198113	123931	62	Pass
0.0063	193404	121050	62	Pass
0.0064	188750	118170	62	Pass
0.0065	184263	115400	62	Pass
0.0066	180052	112630	62	Pass
0.0067	175952	109915	62	Pass
0.0068	171908	107311	62	Pass
0.0069	167975	104763	62	Pass
0.0070	164152	102270	62	Pass
0.0071	160496	99832	62	Pass
0.0072	156895	97450	62	Pass
0.0073	153404	95123	62	Pass

0.0075	149970	92796	61	Pass
0.0076	146590	90635	61	Pass
0.0077	143266	88475	61	Pass
0.0078	140164	86425	61	Pass
0.0079	137006	84431	61	Pass
0.0080	133903	82492	61	Pass
0.0081	130967	80663	61	Pass
0.0082	128031	78724	61	Pass
0.0083	125150	76951	61	Pass
0.0084	122380	75123	61	Pass
0.0085	119665	73406	61	Pass
0.0086	116951	71688	61	Pass
0.0087	114347	70082	61	Pass
0.0088	111854	68364	61	Pass
0.0089	109416	66813	61	Pass
0.0090	107034	65317	61	Pass
0.0091	104763	63822	60	Pass
0.0092	102491	62381	60	Pass
0.0093	100331	60941	60	Pass
0.0094	98170	59500	60	Pass
0.0095	96120	58115	60	Pass
0.0096	94015	56730	60	Pass
0.0097	92076	55401	60	Pass
0.0098	90137	54232	60	Pass
0.0099	88309	53041	60	Pass
0.0100	86536	51883	59	Pass
0.0101	84763	50764	59	Pass
0.0103	82824	49567	59	Pass
0.0104	81217	48470	59	Pass
0.0105	79500	47318	59	Pass
0.0106	77949	46287	59	Pass
0.0107	76397	45240	59	Pass
0.0108	74791	44116	58	Pass
0.0109	73295	43135	58	Pass
0.0110	71965	42199	58	Pass
0.0111	70470	41157	58	Pass
0.0112	69085	40265	58	Pass
0.0113	67644	39340	58	Pass
0.0114	66370	38509	58	Pass
0.0115	65151	37656	57	Pass
0.0116	63877	36764	57	Pass
0.0117	62714	35938	57	Pass
0.0118	61550	35174	57	Pass
0.0119	60276	34321	56	Pass
0.0120	59168	33573	56	Pass
0.0121	58060	32869	56	Pass
0.0122	56896	32121	56	Pass

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0122	56896	32121	56	Pass
0.0127	52442	28980	55	Pass
0.0132	48387	26227	54	Pass
0.0136	44636	23689	53	Pass
0.0141	41240	21473	52	Pass
0.0146	38260	19429	50	Pass
0.0150	35501	17634	49	Pass
0.0155	32980	16011	48	Pass
0.0160	30537	14543	47	Pass
0.0165	28448	13219	46	Pass
0.0169	26509	12050	45	Pass
0.0174	24759	11014	44	Pass
0.0179	23141	10066	43	Pass
0.0183	21689	9185	42	Pass
0.0188	20332	8410	41	Pass
0.0193	19080	7690	40	Pass
0.0197	17867	7030	39	Pass
0.0202	16731	6399	38	Pass
0.0207	15617	5856	37	Pass
0.0212	14626	5372	36	Pass
0.0216	13728	4925	35	Pass
0.0221	12892	4529	35	Pass
0.0226	12105	4153	34	Pass
0.0230	11396	3814	33	Pass
0.0235	10670	3562	33	Pass
0.0240	10000	3315	33	Pass
0.0244	9368	3067	32	Pass
0.0249	8759	2860	32	Pass
0.0254	8205	2658	32	Pass
0.0259	7734	2496	32	Pass
0.0263	7246	2340	32	Pass
0.0268	6798	2178	32	Pass
0.0273	6426	2033	31	Pass
0.0277	6111	1886	30	Pass
0.0282	5828	1763	30	Pass
0.0287	5551	1662	29	Pass
0.0292	5265	1559	29	Pass
0.0296	5003	1457	29	Pass
0.0301	4782	1385	28	Pass
0.0306	4531	1302	28	Pass
0.0310	4338	1220	28	Pass
0.0315	4154	1134	27	Pass
0.0320	3937	1052	26	Pass
0.0324	3713	991	26	Pass
0.0329	3536	940	26	Pass
0.0334	3361	870	25	Pass
0.0339	3227	815	25	Pass
0.0343	3083	765	24	Pass
0.0348	2965	717	24	Pass
0.0353	2850	684	24	Pass
0.0357	2738	638	23	Pass
0.0362	2600	607	23	Pass
0.0367	2477	576	23	Pass

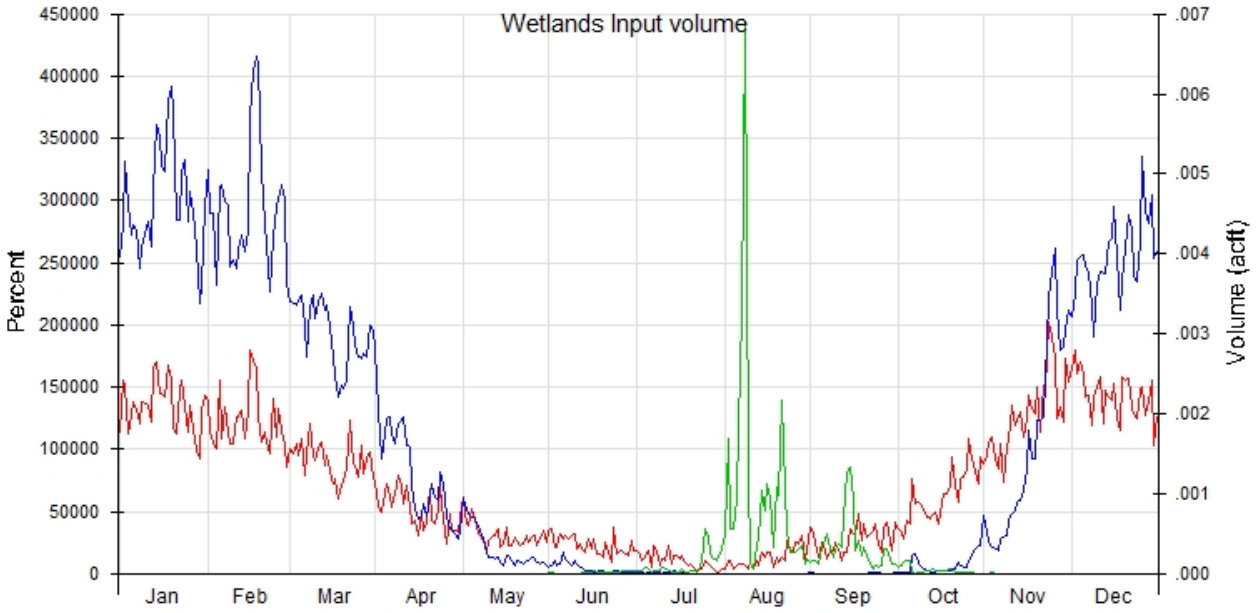
0.0371	2356	548	23	Pass
0.0376	2266	517	22	Pass
0.0381	2159	485	22	Pass
0.0386	2057	457	22	Pass
0.0390	1947	433	22	Pass
0.0395	1837	409	22	Pass
0.0400	1749	381	21	Pass
0.0404	1659	362	21	Pass
0.0409	1578	344	21	Pass
0.0414	1510	322	21	Pass
0.0418	1442	301	20	Pass
0.0423	1367	276	20	Pass
0.0428	1296	260	20	Pass
0.0433	1241	252	20	Pass
0.0437	1182	240	20	Pass
0.0442	1129	227	20	Pass
0.0447	1080	218	20	Pass
0.0451	1026	209	20	Pass
0.0456	979	198	20	Pass
0.0461	922	179	19	Pass
0.0465	871	166	19	Pass
0.0470	819	159	19	Pass
0.0475	771	153	19	Pass
0.0480	718	143	19	Pass
0.0484	668	138	20	Pass
0.0489	629	126	20	Pass
0.0494	588	116	19	Pass
0.0498	549	113	20	Pass
0.0503	507	108	21	Pass
0.0508	473	105	22	Pass
0.0512	428	101	23	Pass
0.0517	392	99	25	Pass
0.0522	363	96	26	Pass
0.0527	329	93	28	Pass
0.0531	300	91	30	Pass
0.0536	281	85	30	Pass
0.0541	264	81	30	Pass
0.0545	248	74	29	Pass
0.0550	233	72	30	Pass
0.0555	218	69	31	Pass
0.0560	205	68	33	Pass
0.0564	186	66	35	Pass
0.0569	162	65	40	Pass
0.0574	142	62	43	Pass
0.0578	129	59	45	Pass
0.0583	117	56	47	Pass
0.0588	105	56	53	Pass

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.

Wetland Input Volumes



- Percent - Predeveloped - Mitigated

Wetlands Input Volume for POC 1
Average Annual Volume (acft)
Series 1: 501 POC 1 Predeveloped flow
Series 2: 801 POC 1 Mitigated flow

Month	Series 1	Series 2	Percent	Pass/Fail
Jan	0.1433	0.0647	45.1	Fail
Feb	0.1308	0.0551	42.1	Fail
Mar	0.0940	0.0438	46.6	Fail
Apr	0.0381	0.0241	63.3	Fail
May	0.0097	0.0151	154.6	Fail
Jun	0.0021	0.0108	502.7	Fail
Jul	0.0002	0.0051	2226.5	Fail
Aug	0.0000	0.0061	24603.9	Fail
Sep	0.0001	0.0126	13033.3	Fail
Oct	0.0030	0.0296	974.1	Fail
Nov	0.0465	0.0590	126.9	Fail
Dec	0.1218	0.0695	57.1	Fail

Day	Predevel	Mitigated	Percent	Pass/Fail
Jan1	0.0040	0.0018	44.8	Fail
2	0.0044	0.0024	55.3	Fail
3	0.0052	0.0024	45.6	Fail
4	0.0046	0.0018	38.0	Fail
5	0.0042	0.0020	46.7	Fail
6	0.0044	0.0021	48.9	Fail
7	0.0043	0.0021	48.1	Fail
8	0.0038	0.0019	48.9	Fail
9	0.0041	0.0021	52.3	Fail
10	0.0042	0.0021	50.1	Fail
11	0.0044	0.0021	47.7	Fail
12	0.0041	0.0019	46.5	Fail
13	0.0048	0.0026	53.6	Fail
14	0.0056	0.0027	47.4	Fail

15	0.0055	0.0023	41.3	Fail
16	0.0051	0.0023	44.3	Fail
17	0.0050	0.0022	44.1	Fail
18	0.0059	0.0026	44.1	Fail
19	0.0061	0.0024	39.6	Fail
20	0.0058	0.0018	31.8	Fail
21	0.0044	0.0017	39.5	Fail
22	0.0044	0.0023	51.8	Fail
23	0.0050	0.0024	48.2	Fail
24	0.0052	0.0021	40.8	Fail
25	0.0044	0.0018	40.2	Fail
26	0.0048	0.0021	43.9	Fail
27	0.0045	0.0018	40.3	Fail
28	0.0041	0.0015	38.0	Fail
29	0.0034	0.0014	42.0	Fail
30	0.0036	0.0020	56.3	Fail
31	0.0046	0.0022	48.9	Fail
Feb1	0.0051	0.0022	42.9	Fail
2	0.0045	0.0018	39.5	Fail
3	0.0045	0.0016	36.5	Fail
4	0.0036	0.0016	43.6	Fail
5	0.0048	0.0024	50.3	Fail
6	0.0049	0.0017	34.6	Fail
7	0.0047	0.0021	44.9	Fail
8	0.0046	0.0018	38.4	Fail
9	0.0038	0.0016	42.3	Fail
10	0.0039	0.0016	41.7	Fail
11	0.0038	0.0020	51.8	Fail
12	0.0041	0.0020	48.3	Fail
13	0.0042	0.0020	48.2	Fail
14	0.0040	0.0017	42.0	Fail
15	0.0043	0.0020	47.7	Fail
16	0.0057	0.0028	49.0	Fail
17	0.0063	0.0027	42.4	Fail
18	0.0065	0.0026	40.0	Fail
19	0.0064	0.0020	31.3	Fail
20	0.0051	0.0016	32.4	Fail
21	0.0044	0.0018	40.5	Fail
22	0.0041	0.0016	39.6	Fail
23	0.0035	0.0015	42.9	Fail
24	0.0042	0.0022	51.6	Fail
25	0.0046	0.0017	37.0	Fail
26	0.0047	0.0021	44.1	Fail
27	0.0049	0.0018	36.7	Fail
28	0.0047	0.0016	34.8	Fail
29	0.0036	0.0013	36.7	Fail
Mar1	0.0034	0.0016	45.8	Fail
2	0.0034	0.0015	44.6	Fail
3	0.0034	0.0016	48.6	Fail
4	0.0034	0.0015	42.9	Fail
5	0.0035	0.0017	48.6	Fail
6	0.0031	0.0012	39.3	Fail
7	0.0027	0.0015	55.2	Fail
8	0.0033	0.0019	56.6	Fail
9	0.0035	0.0015	42.6	Fail
10	0.0032	0.0014	44.5	Fail
11	0.0034	0.0016	45.9	Fail
12	0.0035	0.0017	47.1	Fail

13	0.0033	0.0014	41.0	Fail
14	0.0034	0.0015	44.5	Fail
15	0.0031	0.0013	42.1	Fail
16	0.0027	0.0011	41.7	Fail
17	0.0025	0.0012	47.9	Fail
18	0.0022	0.0009	42.4	Fail
19	0.0024	0.0011	47.2	Fail
20	0.0023	0.0011	49.6	Fail
21	0.0024	0.0013	54.1	Fail
22	0.0033	0.0019	57.8	Fail
23	0.0031	0.0014	44.2	Fail
24	0.0029	0.0014	47.7	Fail
25	0.0027	0.0012	44.3	Fail
26	0.0027	0.0016	59.6	Fail
27	0.0028	0.0013	45.5	Fail
28	0.0027	0.0014	52.8	Fail
29	0.0031	0.0015	49.5	Fail
30	0.0030	0.0012	39.7	Fail
31	0.0028	0.0011	40.7	Fail
Apr1	0.0021	0.0009	41.4	Fail
2	0.0014	0.0008	53.0	Fail
3	0.0016	0.0009	56.2	Fail
4	0.0019	0.0011	57.8	Fail
5	0.0020	0.0010	49.5	Fail
6	0.0018	0.0008	47.3	Fail
7	0.0016	0.0010	61.3	Fail
8	0.0019	0.0012	66.0	Fail
9	0.0019	0.0011	58.4	Fail
10	0.0020	0.0009	45.1	Fail
11	0.0016	0.0011	68.1	Fail
12	0.0016	0.0009	54.3	Fail
13	0.0011	0.0006	57.2	Fail
14	0.0008	0.0007	82.6	Pass
15	0.0007	0.0005	69.3	Fail
16	0.0007	0.0008	107.7	Pass
17	0.0009	0.0005	60.1	Fail
18	0.0007	0.0006	88.2	Pass
19	0.0009	0.0011	111.9	Pass
20	0.0011	0.0007	59.7	Fail
21	0.0010	0.0006	65.1	Fail
22	0.0009	0.0008	89.9	Pass
23	0.0013	0.0011	84.9	Pass
24	0.0011	0.0007	61.4	Fail
25	0.0007	0.0004	52.0	Fail
26	0.0006	0.0007	133.5	Fail
27	0.0006	0.0005	93.7	Pass
28	0.0005	0.0005	107.8	Pass
29	0.0004	0.0005	120.8	Fail
30	0.0005	0.0007	139.1	Fail
May1	0.0009	0.0010	103.2	Pass
2	0.0008	0.0006	75.6	Fail
3	0.0007	0.0006	80.4	Pass
4	0.0007	0.0008	116.9	Pass
5	0.0007	0.0007	98.8	Pass
6	0.0006	0.0005	85.9	Pass
7	0.0005	0.0005	87.9	Pass
8	0.0004	0.0004	90.6	Pass
9	0.0003	0.0003	99.7	Pass

10	0.0002	0.0004	193.6	Fail
11	0.0002	0.0005	211.8	Fail
12	0.0002	0.0005	260.3	Fail
13	0.0002	0.0006	270.7	Fail
14	0.0002	0.0003	215.9	Fail
15	0.0001	0.0004	351.5	Fail
16	0.0002	0.0006	266.0	Fail
17	0.0002	0.0004	154.5	Fail
18	0.0002	0.0003	214.4	Fail
19	0.0001	0.0005	414.9	Fail
20	0.0002	0.0004	236.1	Fail
21	0.0001	0.0003	238.7	Fail
22	0.0001	0.0004	278.4	Fail
23	0.0002	0.0005	286.5	Fail
24	0.0002	0.0004	241.4	Fail
25	0.0002	0.0005	225.1	Fail
26	0.0002	0.0005	251.8	Fail
27	0.0001	0.0004	242.2	Fail
28	0.0001	0.0004	379.9	Fail
29	0.0001	0.0005	366.9	Fail
30	0.0001	0.0004	363.7	Fail
31	0.0001	0.0005	625.3	Fail
Jun1	0.0001	0.0006	504.6	Fail
2	0.0002	0.0003	203.5	Fail
3	0.0001	0.0003	302.8	Fail
4	0.0001	0.0005	408.2	Fail
5	0.0003	0.0004	173.0	Fail
6	0.0002	0.0005	252.3	Fail
7	0.0001	0.0004	303.8	Fail
8	0.0001	0.0005	416.6	Fail
9	0.0002	0.0005	282.3	Fail
10	0.0001	0.0003	230.3	Fail
11	0.0001	0.0004	408.9	Fail
12	0.0001	0.0003	552.4	Fail
13	0.0000	0.0003	672.0	Fail
14	0.0000	0.0004	1439.0	Fail
15	0.0000	0.0003	1254.6	Fail
16	0.0000	0.0004	1850.3	Fail
17	0.0000	0.0003	1367.2	Fail
18	0.0000	0.0002	712.9	Fail
19	0.0000	0.0002	737.1	Fail
20	0.0000	0.0004	1780.0	Fail
21	0.0000	0.0003	1191.0	Fail
22	0.0000	0.0002	1081.3	Fail
23	0.0000	0.0006	1828.2	Fail
24	0.0000	0.0003	653.6	Fail
25	0.0000	0.0003	1223.6	Fail
26	0.0000	0.0003	1843.5	Fail
27	0.0000	0.0002	2298.0	Fail
28	0.0000	0.0002	2535.8	Fail
29	0.0000	0.0004	2973.6	Fail
30	0.0000	0.0003	2325.5	Fail
Jul1	0.0000	0.0003	2615.8	Fail
2	0.0000	0.0002	2882.6	Fail
3	0.0000	0.0002	3028.4	Fail
4	0.0000	0.0002	4925.2	Fail
5	0.0000	0.0003	4015.5	Fail
6	0.0000	0.0001	1753.0	Fail

7	0.0000	0.0004	2834.6	Fail
8	0.0000	0.0003	2914.3	Fail
9	0.0000	0.0001	2089.3	Fail
10	0.0000	0.0002	4795.2	Fail
11	0.0000	0.0002	3231.7	Fail
12	0.0000	0.0003	2349.4	Fail
13	0.0000	0.0001	949.0	Fail
14	0.0000	0.0002	661.9	Fail
15	0.0000	0.0002	1098.8	Fail
16	0.0000	0.0002	1726.9	Fail
17	0.0000	0.0002	3767.9	Fail
18	0.0000	0.0001	801.1	Fail
19	0.0000	0.0001	1220.0	Fail
20	0.0000	0.0001	2884.3	Fail
21	0.0000	0.0001	2508.1	Fail
22	0.0000	0.0000	1520.5	Fail
23	0.0000	0.0001	4866.2	Fail
24	0.0000	0.0001	10892.2	Fail
25	0.0000	0.0002	36437.3	Fail
26	0.0000	0.0001	30675.5	Fail
27	0.0000	0.0001	15668.7	Fail
28	0.0000	0.0000	12434.5	Fail
29	0.0000	0.0000	10027.1	Fail
30	0.0000	0.0000	13800.8	Fail
31	0.0000	0.0001	20376.1	Fail
Aug1	0.0000	0.0001	32581.0	Fail
2	0.0000	0.0002	109093.5	Fail
3	0.0000	0.0002	36233.0	Fail
4	0.0000	0.0001	36089.2	Fail
5	0.0000	0.0001	59739.0	Fail
6	0.0000	0.0001	119021.3	Fail
7	0.0000	0.0001	209502.0	Fail
8	0.0000	0.0001	444201.9	Fail
9	0.0000	0.0001	82307.2	Fail
10	0.0000	0.0002	9365.2	Fail
11	0.0000	0.0001	3720.2	Fail
12	0.0000	0.0002	22007.4	Fail
13	0.0000	0.0001	27570.0	Fail
14	0.0000	0.0003	66802.2	Fail
15	0.0000	0.0002	51013.7	Fail
16	0.0000	0.0003	71684.9	Fail
17	0.0000	0.0003	61477.0	Fail
18	0.0000	0.0001	21906.1	Fail
19	0.0000	0.0002	69569.2	Fail
20	0.0000	0.0002	63425.4	Fail
21	0.0000	0.0002	138838.1	Fail
22	0.0000	0.0002	70073.8	Fail
23	0.0000	0.0004	34280.0	Fail
24	0.0000	0.0003	16765.7	Fail
25	0.0000	0.0003	17632.1	Fail
26	0.0000	0.0004	17263.4	Fail
27	0.0000	0.0004	20034.0	Fail
28	0.0000	0.0005	22806.5	Fail
29	0.0000	0.0002	7890.0	Fail
30	0.0000	0.0003	11835.6	Fail
31	0.0000	0.0006	9798.2	Fail
Sep1	0.0000	0.0005	10333.5	Fail
2	0.0000	0.0004	10582.4	Fail

3	0.0000	0.0002	8293.5	Fail
4	0.0000	0.0004	21895.6	Fail
5	0.0000	0.0003	28241.2	Fail
6	0.0000	0.0002	32605.1	Fail
7	0.0000	0.0003	20227.3	Fail
8	0.0000	0.0003	12579.7	Fail
9	0.0000	0.0004	20286.8	Fail
10	0.0000	0.0003	23423.3	Fail
11	0.0000	0.0002	20872.0	Fail
12	0.0000	0.0003	45050.1	Fail
13	0.0000	0.0003	81676.7	Fail
14	0.0000	0.0006	85293.6	Fail
15	0.0000	0.0005	60850.7	Fail
16	0.0000	0.0005	18628.4	Fail
17	0.0000	0.0007	27181.0	Fail
18	0.0000	0.0004	14046.8	Fail
19	0.0000	0.0006	21134.7	Fail
20	0.0000	0.0004	14421.3	Fail
21	0.0000	0.0005	9127.6	Fail
22	0.0000	0.0005	4393.3	Fail
23	0.0000	0.0006	6386.7	Fail
24	0.0000	0.0004	5712.7	Fail
25	0.0000	0.0003	6790.6	Fail
26	0.0000	0.0006	19377.1	Fail
27	0.0000	0.0007	19844.9	Fail
28	0.0000	0.0004	11484.7	Fail
29	0.0000	0.0003	7777.2	Fail
30	0.0000	0.0007	8165.5	Fail
Oct1	0.0000	0.0006	5676.4	Fail
2	0.0000	0.0005	6766.6	Fail
3	0.0000	0.0004	8577.2	Fail
4	0.0000	0.0007	10351.4	Fail
5	0.0000	0.0006	10894.8	Fail
6	0.0002	0.0012	508.8	Fail
7	0.0003	0.0009	345.3	Fail
8	0.0001	0.0009	604.7	Fail
9	0.0001	0.0009	913.0	Fail
10	0.0001	0.0008	1434.6	Fail
11	0.0000	0.0007	1976.2	Fail
12	0.0000	0.0007	2951.7	Fail
13	0.0000	0.0007	4340.0	Fail
14	0.0000	0.0008	3078.5	Fail
15	0.0000	0.0006	1917.7	Fail
16	0.0000	0.0008	2245.3	Fail
17	0.0000	0.0010	3037.5	Fail
18	0.0000	0.0010	2699.5	Fail
19	0.0000	0.0011	3255.6	Fail
20	0.0001	0.0015	2722.7	Fail
21	0.0001	0.0011	1644.4	Fail
22	0.0001	0.0009	664.9	Fail
23	0.0001	0.0012	1185.7	Fail
24	0.0001	0.0012	1328.9	Fail
25	0.0001	0.0013	1733.7	Fail
26	0.0002	0.0017	1034.4	Fail
27	0.0002	0.0014	617.6	Fail
28	0.0003	0.0013	405.0	Fail
29	0.0004	0.0011	322.1	Fail
30	0.0004	0.0014	410.0	Fail

31	0.0007	0.0014	190.4	Fail
Nov1	0.0005	0.0015	280.4	Fail
2	0.0004	0.0017	403.1	Fail
3	0.0003	0.0017	512.2	Fail
4	0.0003	0.0014	445.1	Fail
5	0.0003	0.0013	443.4	Fail
6	0.0004	0.0016	377.5	Fail
7	0.0005	0.0011	251.1	Fail
8	0.0005	0.0016	337.9	Fail
9	0.0007	0.0017	248.2	Fail
10	0.0007	0.0021	282.6	Fail
11	0.0008	0.0019	230.3	Fail
12	0.0009	0.0019	212.4	Fail
13	0.0009	0.0020	218.3	Fail
14	0.0011	0.0017	160.8	Fail
15	0.0013	0.0019	146.8	Fail
16	0.0018	0.0022	124.4	Fail
17	0.0014	0.0021	144.5	Fail
18	0.0014	0.0020	141.0	Fail
19	0.0019	0.0023	121.6	Fail
20	0.0019	0.0018	92.7	Pass
21	0.0020	0.0024	119.3	Pass
22	0.0024	0.0023	95.2	Pass
23	0.0035	0.0032	91.4	Pass
24	0.0038	0.0030	78.7	Fail
25	0.0041	0.0027	66.6	Fail
26	0.0033	0.0019	58.7	Fail
27	0.0028	0.0021	74.3	Fail
28	0.0028	0.0019	66.7	Fail
29	0.0030	0.0027	88.7	Pass
30	0.0033	0.0024	72.4	Fail
Dec1	0.0032	0.0026	79.7	Fail
2	0.0035	0.0028	79.3	Fail
3	0.0039	0.0025	63.9	Fail
4	0.0040	0.0026	66.7	Fail
5	0.0040	0.0025	63.1	Fail
6	0.0038	0.0022	57.6	Fail
7	0.0038	0.0022	59.3	Fail
8	0.0033	0.0018	55.2	Fail
9	0.0030	0.0022	74.6	Fail
10	0.0036	0.0023	64.3	Fail
11	0.0038	0.0025	65.4	Fail
12	0.0038	0.0019	50.0	Fail
13	0.0038	0.0023	61.0	Fail
14	0.0042	0.0022	53.3	Fail
15	0.0042	0.0022	51.6	Fail
16	0.0046	0.0024	51.5	Fail
17	0.0040	0.0019	49.1	Fail
18	0.0033	0.0018	54.8	Fail
19	0.0037	0.0025	67.4	Fail
20	0.0041	0.0024	59.2	Fail
21	0.0045	0.0024	54.5	Fail
22	0.0043	0.0021	48.1	Fail
23	0.0037	0.0020	53.8	Fail
24	0.0037	0.0019	53.2	Fail
25	0.0042	0.0023	55.3	Fail
26	0.0052	0.0023	44.6	Fail
27	0.0045	0.0020	43.8	Fail

28	0.0044	0.0021	48.9	Fail
29	0.0047	0.0024	51.4	Fail
30	0.0040	0.0016	40.6	Fail
31	0.0040	0.0020	49.0	Fail

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
Permeable Parkling Lot POC	☑	257.43	282.89	282.89	☑	100.00	282.89	100.00	Treat. Credit
Total Volume Infiltrated		257.43	282.89	282.89		100.00	282.89	283 / 283 = 100%	Treat. Credit = 100%
Compliance with LID Standard 8% of 2-yr to 50% of 2-yr									Duration Analysis Result = Passed

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.

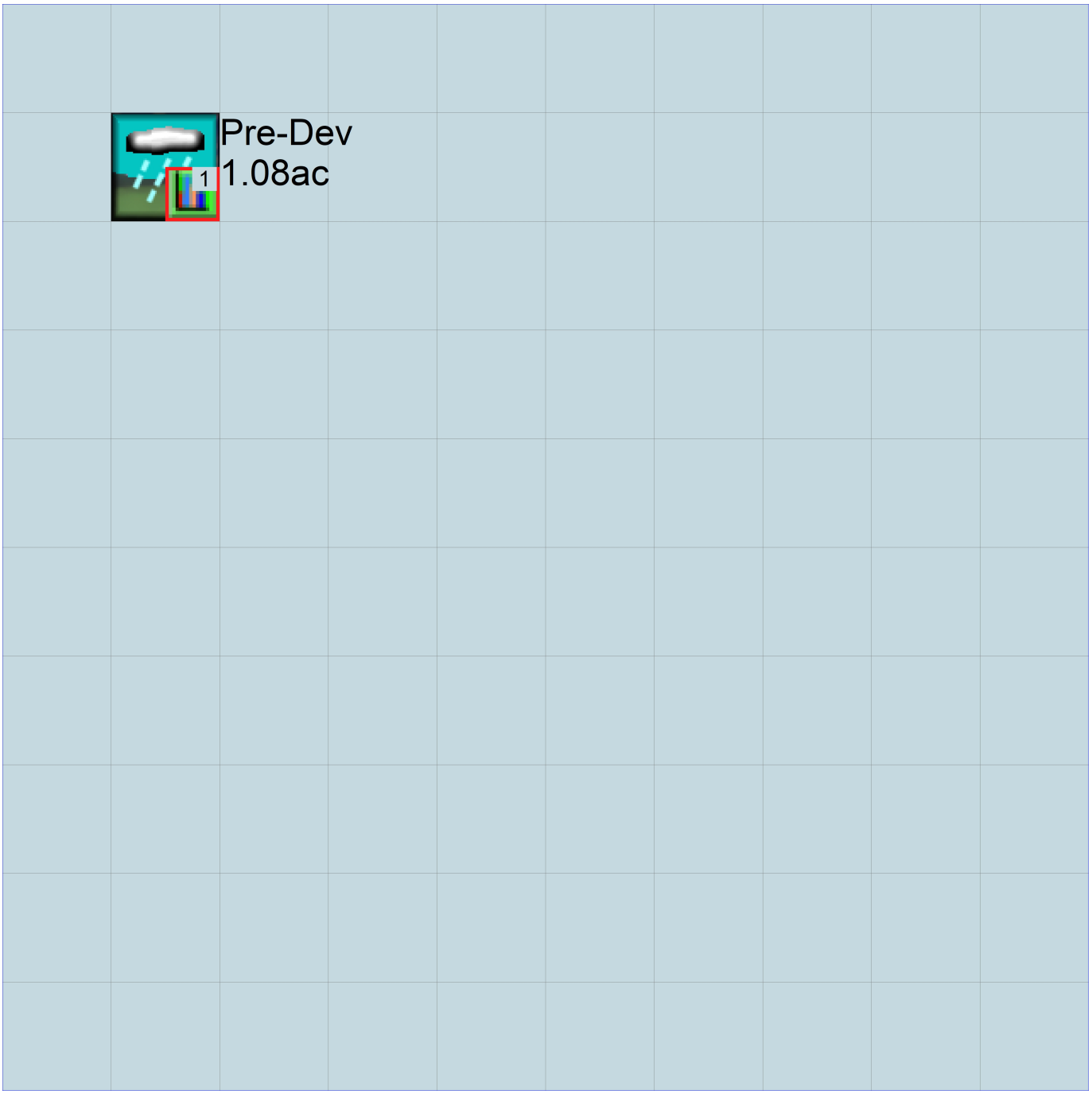
PERLND Changes

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   20083 Permeable Pavement.wdm
MESSU       25   Pre20083 Permeable Pavement.MES
            27   Pre20083 Permeable Pavement.L61
            28   Pre20083 Permeable Pavement.L62
            30   POC20083 Permeable Pavement1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      10
      COPY       501
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Pre-Dev                    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           ***
   10     C, 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 ***
   10         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  *********
   10         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 ***
   10         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
   10             0       4.5      0.08       400      0.05       0.5     0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   10             0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                              ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   10           0.2       0.5      0.35         6       0.5       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
   10             0         0         0         0       2.5         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#   ***
Pre-Dev***
PERLND  10                       1.082     COPY   501     12
PERLND  10                       1.082     COPY   501     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



<-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


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   20083 Permeable Pavement.wdm
MESSU       25   Mit20083 Permeable Pavement.MES
            27   Mit20083 Permeable Pavement.L61
            28   Mit20083 Permeable Pavement.L62
            30   POC20083 Permeable Pavement1.dat
END FILES

OPN SEQUENCE
    INGRP              INDELT 00:15
      PERLND      13
      IMPLND       1
      IMPLND      11
      PERLND      38
      IMPLND      17
      IMPLND      16
      RCHRES       1
      COPY         1
      COPY       501
      COPY       601
      DISPLY       1
    END INGRP
END OPN SEQUENCE
DISPLY
  DISPLY-INFO1
    # -  #<----------Title----------->***TRAN PIVL DIG1 FIL1  PYR DIG2 FIL2 YRND
    1        Permeable Parkling Lot      MAX                    1    2   30    9
  END DISPLY-INFO1
END DISPLY
COPY
  TIMESERIES
    # -  #  NPT  NMN ***
    1         1    1
  501         1    1
  601         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           ***
   13     C, Pasture, Flat        1    1    1    1   27    0
   38     C, 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 ***
   13         0    0    1    0    0    0    0    0    0    0    0    0
   38         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  *********
   13         0    0    4    0    0    0    0    0    0    0    0    0    1    9
   38         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 ***
   13         0    0    0    0    0    0    0    0    0    0    0
   38         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
   13              0       4.5      0.06       400      0.05        0.5      0.996
   38              0       4.5      0.06       400      0.05        0.5      0.996
  END PWAT-PARM2

  PWAT-PARM3
    <PLS >      PWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN    INFEXP    INFILD    DEEPFR    BASETP    AGWETP
   13              0         0         2         2         0         0         0
   38              0         0         2         2         0         0         0
  END PWAT-PARM3
  PWAT-PARM4
    <PLS >     PWATER input info: Part 4                            ***
    # -  #     CEPSC      UZSN      NSUR     INTFW       IRC     LZETP ***
   13           0.15       0.4       0.3         6       0.5       0.4
   38           0.15       0.4       0.3         6       0.5       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
   13              0         0         0         0       2.5          1         0
   38              0         0         0         0       2.5          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
   11      PARKING/FLAT           1    1    1   27    0
   17     ROADS/FLAT LAT          1    1    1   27    0
   16      Porous Pavement        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
   11         0    0    1    0    0    0
   17         0    0    1    0    0    0
   16         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    0    1    9
   11         0    0    4    0    0    0    1    9
   17         0    0    4    0    0    0    1    9
   16         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
   11         0    0    0    0    0
   17         0    0    0    0    0
   16         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
   11            400      0.01       0.1       0.1
   17            400      0.01       0.1       0.1
   16            400      0.01       0.1       0.1
  END IWAT-PARM2

  IWAT-PARM3
    <PLS >      IWATER input info: Part 3         ***
    # -  # ***PETMAX    PETMIN
    1              0         0
   11              0         0
   17              0         0
   16              0         0
  END IWAT-PARM3

  IWAT-STATE1
    <PLS > *** Initial conditions at start of simulation
    # -  # ***  RETS      SURS
    1              0         0
   11              0         0
   17              0         0
   16              0         0
  END IWAT-STATE1

END IMPLND

SCHEMATIC
<-Source->                 <--Area-->     <-Target->   MBLK   ***
<Name>   #                 <-factor->     <Name>   #   Tbl#   ***
Landscaping***
PERLND  38                     0.2636     IMPLND  16     54
PERLND  38                     0.2636     IMPLND  16     55
Curbing***
IMPLND  17                     0.0182     IMPLND  16     53
IMPLND  16                       0.66     RCHRES   1      5
Bypass***
PERLND  13                      0.123     COPY   501     12
PERLND  13                      0.123     COPY   601     12
PERLND  13                      0.123     COPY   501     13
PERLND  13                      0.123     COPY   601     13
IMPLND   1                      0.084     COPY   501     15
IMPLND   1                      0.084     COPY   601     15
IMPLND  11                      0.029     COPY   501     15
IMPLND  11                      0.029     COPY   601     15

******Routing******
PERLND  38                      0.174     COPY     1     12
PERLND  38                      0.174     COPY     1     13
IMPLND  17                      0.012     COPY     1     15
```

```
RCHRES   1                           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     Permeable Parkli-010    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
  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
  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
  END HYDR-PARM1

  HYDR-PARM2
    # -  #    FTABNO       LEN     DELTH     STCOR        KS      DB50       ***
  <------><--------><--------><--------><--------><--------><-------->       ***
    1             1      0.03       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
  END HYDR-INIT
END RCHRES

SPEC-ACTIONS
END SPEC-ACTIONS
FTABLES
  FTABLE       1
   91    5
     Depth      Area    Volume  Outflow1  Outflow2  Velocity  Travel Time***
      (ft)   (acres) (acre-ft)   (cfs)      (cfs)   (ft/sec)    (Minutes)***
  0.000000  0.660023  0.000000  0.000000  0.000000
  0.019444  0.660023  0.001925  0.000000  0.066552
  0.038889  0.660023  0.003850  0.000000  0.066552
  0.058333  0.660023  0.005775  0.000000  0.066552
  0.077778  0.660023  0.007700  0.000000  0.066552
  0.097222  0.660023  0.009625  0.000000  0.066552
```

0.116667	0.660023	0.011550	0.000000	0.066552
0.136111	0.660023	0.013475	0.000000	0.066552
0.155556	0.660023	0.015401	0.000000	0.066552
0.175000	0.660023	0.017326	0.000000	0.066552
0.194444	0.660023	0.019251	0.000000	0.066552
0.213889	0.660023	0.022459	0.000000	0.066552
0.233333	0.660023	0.025668	0.000000	0.066552
0.252778	0.660023	0.028876	0.000000	0.066552
0.272222	0.660023	0.032084	0.000000	0.066552
0.291667	0.660023	0.035293	0.000000	0.066552
0.311111	0.660023	0.038501	0.000000	0.066552
0.330556	0.660023	0.041710	0.000000	0.066552
0.350000	0.660023	0.044918	0.000000	0.066552
0.369444	0.660023	0.048127	0.000000	0.066552
0.388889	0.660023	0.051335	0.000000	0.066552
0.408333	0.660023	0.054544	0.000000	0.066552
0.427778	0.660023	0.057752	0.000000	0.066552
0.447222	0.660023	0.060960	0.000000	0.066552
0.466667	0.660023	0.064169	0.000000	0.066552
0.486111	0.660023	0.067377	0.000000	0.066552
0.505556	0.660023	0.070586	0.000000	0.066552
0.525000	0.660023	0.073794	0.000000	0.066552
0.544444	0.660023	0.077003	0.000000	0.066552
0.563889	0.660023	0.080211	0.000000	0.066552
0.583333	0.660023	0.083420	0.000000	0.066552
0.602778	0.660023	0.086628	0.000000	0.066552
0.622222	0.660023	0.089836	0.000000	0.066552
0.641667	0.660023	0.093045	0.000000	0.066552
0.661111	0.660023	0.096253	0.000000	0.066552
0.680556	0.660023	0.099462	0.000000	0.066552
0.700000	0.660023	0.102670	0.000000	0.066552
0.719444	0.660023	0.105879	0.000000	0.066552
0.738889	0.660023	0.109087	0.000000	0.066552
0.758333	0.660023	0.121921	0.000000	0.066552
0.777778	0.660023	0.134755	0.000000	0.066552
0.797222	0.660023	0.147588	0.000000	0.066552
0.816667	0.660023	0.160422	0.000000	0.066552
0.836111	0.660023	0.173256	0.000000	0.066552
0.855556	0.660023	0.186090	0.000000	0.066552
0.875000	0.660023	0.198924	0.000000	0.066552
0.894444	0.660023	0.211757	0.000000	0.066552
0.913889	0.660023	0.224591	0.000000	0.066552
0.933333	0.660023	0.237425	0.000000	0.066552
0.952778	0.660023	0.250259	0.000000	0.066552
0.972222	0.660023	0.263092	0.000000	0.066552
0.991667	0.660023	0.275926	0.000000	0.066552
1.011111	0.660023	0.288760	0.066131	0.066552
1.030556	0.660023	0.301594	0.301580	0.066552
1.050000	0.660023	0.314428	0.631281	0.066552
1.069444	0.660023	0.327261	1.033294	0.066552
1.088889	0.660023	0.340095	1.496370	0.066552
1.108333	0.660023	0.352929	2.013311	0.066552
1.127778	0.660023	0.365763	2.578996	0.066552
1.147222	0.660023	0.378596	3.189537	0.066552
1.166667	0.660023	0.391430	3.841853	0.066552
1.186111	0.660023	0.404264	4.533421	0.066552
1.205556	0.660023	0.417098	5.262129	0.066552
1.225000	0.660023	0.429932	6.026171	0.066552
1.244444	0.660023	0.442765	6.823982	0.066552
1.263889	0.660023	0.455599	7.654191	0.066552
1.283333	0.660023	0.468433	8.515578	0.066552
1.302778	0.660023	0.481267	9.407054	0.066552
1.322222	0.660023	0.494100	10.32763	0.066552
1.341667	0.660023	0.506934	11.27643	0.066552
1.361111	0.660023	0.519768	12.25262	0.066552
1.380556	0.660023	0.532602	13.25546	0.066552
1.400000	0.660023	0.545436	14.28426	0.066552
1.419444	0.660023	0.558269	15.33837	0.066552
1.438889	0.660023	0.571103	16.41722	0.066552
1.458333	0.660023	0.583937	17.52023	0.066552

```
  1.477778  0.660023  0.596771  18.64690  0.066552
  1.497222  0.660023  0.609604  19.79673  0.066552
  1.516667  0.660023  0.622438  20.96927  0.066552
  1.536111  0.660023  0.635272  22.16409  0.066552
  1.555556  0.660023  0.648106  23.38077  0.066552
  1.575000  0.660023  0.660940  24.61894  0.066552
  1.594444  0.660023  0.673773  25.87823  0.066552
  1.613889  0.660023  0.686607  27.15828  0.066552
  1.633333  0.660023  0.699441  28.45877  0.066552
  1.652778  0.660023  0.712275  29.77938  0.066552
  1.672222  0.660023  0.725108  31.11981  0.066552
  1.691667  0.660023  0.737942  32.47977  0.066552
  1.711111  0.660023  0.750776  33.85898  0.066552
  1.730556  0.660023  0.763610  35.25718  0.066552
  1.750000  0.660023  0.776444  36.67411  0.066552
  END FTABLE  1
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
WDM      1 EVAP     ENGL    1              RCHRES   1     EXTNL  POTEV

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   601 OUTPUT MEAN   1 1     48.4      WDM    901 FLOW     ENGL      REPL
END EXT TARGETS

MASS-LINK
<Volume>   <-Grp> <-Member-><--Mult-->     <Target>       <-Grp> <-Member->***
<Name>             <Name> # #<-factor->     <Name>                <Name> # #***
  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

  MASS-LINK       53
IMPLND     IWATER SURO                     IMPLND         EXTNL  SURLI
  END MASS-LINK   53

  MASS-LINK       54
PERLND     PWATER SURO                     IMPLND         EXTNL  SURLI
  END MASS-LINK   54

  MASS-LINK       55
PERLND     PWATER IFWO                     IMPLND         EXTNL  SURLI
```

```
  END MASS-LINK   55

END MASS-LINK

END RUN
```

Predeveloped HSPF Message File

Mitigated HSPF Message File

Disclaimer

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Local (360)943-0304

www.clearcreeksolutions.com

WWHM2012
PROJECT REPORT

Project Name: 20083 Conveyance
Site Name: Olson Bros
Site Address: 2511 Inter Ave
City : Puyallup, WA
Report Date: 2/14/2022
Gage : 40 IN EAST
Data Start : 10/01/1901
Data End : 09/30/2059
Precip Scale: 1.00
Version Date: 2021/08/18
Version : 4.2.18

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

High Flow Threshold for POC 1: 50 year

PREDEVELOPED LAND USE

Name : Pre-Dev
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Forest, Flat	.997
Pervious Total	0.997

Impervious Land Use	acre
Impervious Total	0
Basin Total	0.997

Element Flows To:

Surface	Interflow	Groundwater

MITIGATED LAND USE

Name : Post Dev
Bypass: No

GroundWater: No

Pervious Land Use	acre
C, Pasture, Flat	.271
C, Lawn, Flat	.6
Pervious Total	0.871

Impervious Land Use	acre
ROADS FLAT	0.126
Impervious Total	0.126
Basin Total	0.997

Element Flows To:
Surface Interflow Groundwater

ANALYSIS RESULTS

Stream Protection Duration

Predeveloped Landuse Totals for POC #1
Total Pervious Area:0.997
Total Impervious Area:0

Mitigated Landuse Totals for POC #1
Total Pervious Area:0.871
Total Impervious Area:0.126

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.022527
5 year	0.03466
10 year	0.041673
25 year	0.049269
50 year	0.054155
100 year	0.058395

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.077541
5 year	0.123703
10 year	0.162009
25 year	0.220373
50 year	0.271852
100 year	0.330863

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

No changes have been made.

Channel Report

Hydraflow Express Extension for Autodesk® Civil 3D® by Autodesk, Inc. Monday, Feb 14 2022

100-year 12-inch DIP @ 0.50%

Circular

Diameter (ft)	= 1.00
Invert Elev (ft)	= 1.00
Slope (%)	= 0.50
N-Value	= 0.012

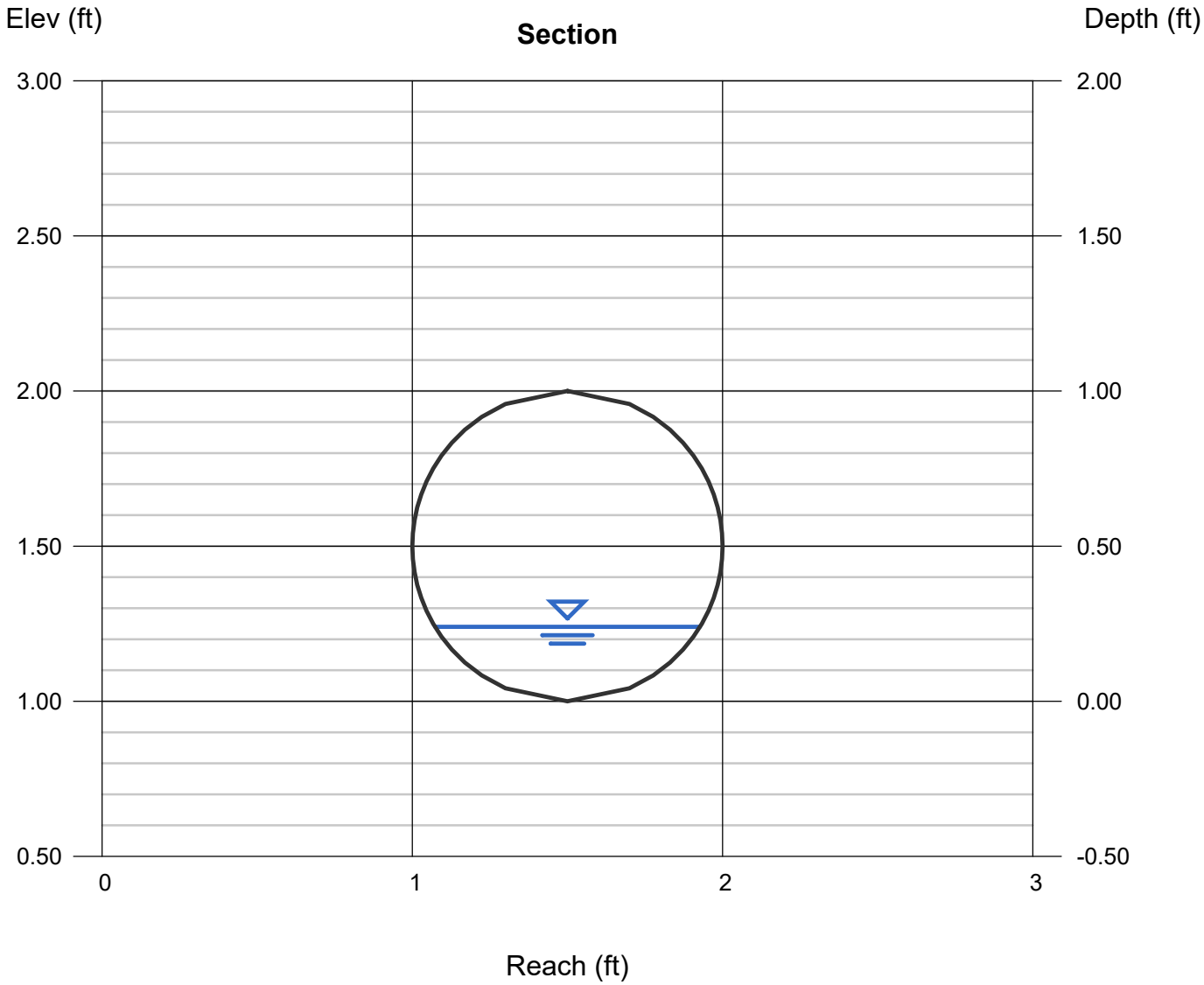
Calculations

Compute by:	Known Q
Known Q (cfs)	= 0.33

100-year flow rate

Highlighted

Depth (ft)	= 0.24
Q (cfs)	= 0.331
Area (sqft)	= 0.15
Velocity (ft/s)	= 2.28
Wetted Perim (ft)	= 1.02
Crit Depth, Yc (ft)	= 0.24
Top Width (ft)	= 0.85
EGL (ft)	= 0.32



APPENDIX D

Geotechnical Engineer's Report

GEORESOURCES
earth science & geotechnical engineering
4809 Pacific Hwy. E. | Fife, Washington 98424 | 253.896.1011 | www. georesources.rocks

December 10, 2021

Olson Brothers Pro Vac, LLC
c/o C.E.S. NW, Inc.
310 – 29th Street NE, Suite 101
Puyallup, Washington 98372
(253) 848-4282

Attn: Mr. Craig Deaver
cdeaver@cesnwinc.com

Stormwater Soils Report: Infiltration Feasibility
Proposed Permeable Pavement
2511 Inter Avenue
Puyallup, Washington
PN: 2105200-180, -192
Doc ID: CES.ProVac.InterAve.SR

INTRODUCTION

This *soils report* evaluates the feasibility of the site soils to support shallow infiltration of stormwater runoff from the proposed new hard surfacing to be installed at 2511 Inter Avenue in Puyallup, Washington. The site is currently a gravel surfaced contractor's yard. The approximate site location is shown on the attached Site Location Map, Figure 1.

Our understanding of the project is based on our email correspondence with Mr. Craig Deaver of C.E.S. NW, our review of the provided Cover Sheet by C.E.S NW Inc. dated October 21, 2020 our review of the available geologic and soils data, our December 9, 2020 site visit and subsurface explorations, our groundwater monitoring throughout the 2020/21 wet season, our understanding of the City of Puyallup development codes, and our experience in the area.

We understand the site consists of two separate tax parcels that are currently developed with an existing repair shop, paved and gravel parking areas, and utilities. We further understand that you would like to place an additional 8,771 square feet of new asphalt pavement at the site.

Because of the amount of proposed hard surfacing associated with the project, we understand the City of Puyallup is requiring a *Soils Report* be prepared in accordance with the 2014 Stormwater Management Manual for Western Washington (SWMMWW), which includes in-situ infiltration testing and wet season groundwater monitoring.

SCOPE

The purpose of our services was to evaluate the surface and subsurface conditions at the site as a basis for determining the feasibility for onsite stormwater infiltration and providing pertinent conclusions and recommendations relative to stormwater management for the proposed permeable pavement. Specifically, our scope of services for the project included the following:

1. Reviewing the available geologic, hydrogeologic, and geotechnical data for the site area;

2. Exploring surface and subsurface conditions by reconnoitering the site and monitoring the excavation of two test pits to depths of 5.0 feet below existing grades at select locations across the site, and installing two shallow piezometers in each test pit;
3. Performing one EPA falling test in-situ infiltration test;
4. Describing surface and subsurface conditions, including soil type, depth to groundwater, and an estimate of seasonal high groundwater levels;
5. Monitoring groundwater levels at the site during the prescriptive wet season;
6. Providing our opinion about the feasibility of onsite infiltration in accordance with the 2014 SWMMWW, including a preliminary design infiltration rate based on grain size analysis and in-situ testing, as applicable;
7. Preparing this written *Soils Report* summarizing our site observations and conclusions, and our geotechnical recommendations and design criteria, along with the supporting data; and
8. Preparing a written *Addendum Report* following the groundwater monitoring period, which ends in April.

The above scope of work was completed in accordance with our *Proposal for Geotechnical Engineering Services* dated November 18, 2020. We received written authorization to proceed from you on November 19, 2020.

SITE CONDITIONS

Surface Conditions

The site consists of two contiguous parcels located at 2511 Inter Avenue within the City of Puyallup, Washington, within an area of existing residential and commercial development. Based on the information provided the Cover Sheet prepared by C.E.S. NW and Pierce County GIS, the west parcel is generally flagpole in shape, and the east parcel is generally rectangular in shape. When combined, these parcels form an irregularly shaped site. The full site measures approximately 115 to 195 feet wide (east to west) by about 408 feet long (north to south) and encompasses about 1.59 acres. The site is bounded by Inter Avenue to the south, by existing commercial development to the east and west, and by land being developed to the north.

The site is generally level, with a slight slope of about 1 percent down to the north. A large office and repair shop building is located in the northwest portion of the site, and the rest of the site is developed with gravel parking stalls for the ProVac trucks and paved or concrete parking stalls for automobiles. Total topographic relief across the site is on the order of about 1 to 2 feet.

Vegetation across the site generally was generally cleared, except for typical landscaping grass lawn surrounding the residence located southwest and adjacent to the site. Standing water was observed throughout the gravel parking area.

Site Soils

The USDA Natural Resources Conservation Service (NRCS) Web Soil Survey maps the site as being underlain by Briscot silt loam (6A) soils. A copy of the NRCS soils map for the site area is included as Figure 3.

- *Briscot silt loam (6A)*: The Briscot soils are derived from alluvium and are included in hydrologic soils group B/D. These soils typically form on slopes of 0 to 2 percent and are listed as having a "slight" erosion hazard when exposed.

Site Geology

The draft *Geologic Map of the Puyallup 7.5-minute Quadrangle, Washington* by K.G. Troost maps the site as being underlain by alluvium (Qal). An excerpt of the above referenced geologic map is included as Figure 4.

- *Alluvium (Qal)*: Alluvial soils generally consist of normally consolidated, stratified deposits of sand, silt, clay, and occasional peat that were deposited along the Puyallup River channel. The existing topography, as well as the surficial and shallow soils in the area, are the result of fluvial action, including down-cutting by the river, channel meandering and migration, and flood deposits. Alluvium typically offers unfavorable infiltration characteristics because of the silty nature of the soils.

Subsurface Explorations

On December 9, 2020, a representative from GeoResources, LLC (GeoResources) visited the site and monitored the excavation of two test pits at selected locations across the site to depths of about 5.0 feet below the existing ground surface. The test pits were excavated by a licensed earthwork contractor under contract to GeoResources. Piezometers were installed at the termination depth of each test pit.

The specific number, locations, and depths of our explorations were selected based on the configuration of the proposed development and were adjusted in the field based on consideration for underground utilities, existing site conditions, site access limitations, and encountered stratigraphy. Test pit TP-1 was excavated on the adjacent property to the proposed project site because no other areas on the site were clear of utilities. The densities presented in the logs were based on the difficulty of excavation and our experience. Representative soil samples obtained from the test pits were placed in sealed plastic bags then taken to a laboratory for further examination and testing as deemed necessary. The test pits were then backfilled with the excavated soils and bucket tamped, but not otherwise compacted.

The subsurface explorations 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, it is our opinion that the soils encountered in the explorations are generally representative of the soils at the site.

The approximate locations and numbers of our explorations are shown on the attached Site & Exploration Plan, Figure 2. The soils encountered were visually classified in accordance with the Unified Soil Classification System (USCS) and ASTM D2488. The USCS is included in Appendix A as Figure A-1, while the descriptive logs of our explorations are included as Figure A-2.

Subsurface Conditions

Our explorations encountered relatively uniform subsurface conditions that, in our opinion, generally confirmed the mapped stratigraphy. Our test pits generally encountered about ½-foot of dark-colored topsoil with roots or 1 foot of crushed rock and reddish brown silty sand with gravel,

consistent with fill. Beneath the topsoil and fill, we observed about 0.8 feet of medium dense brown, orange iron stained silty sand or sandy silt in a moist to wet condition, mantling about 2.5 to 2.8 feet of soft gray, orange iron oxide stained silt in a moist condition. Medium dense gray orange iron oxide stained fine sand with silt was observed beneath the surficial soils to the termination depth of each test pit. We interpret these soils to be consistent with native alluvium soils. Table 1, below, summarizes the approximate thicknesses, depths, and elevations of selected soil layers.

TABLE 1:
APPROXIMATE THICKNESS, DEPTHS, AND ELEVATION OF SOIL TYPES ENCOUNTERED IN EXPLORATIONS

Exploration Number	Thickness of Topsoil/Fill (feet)	Thickness of Silty Alluvium (feet)	Depth to Mottling (feet)	Depth to Groundwater (feet)	Elevation of Sandy Alluvium (feet)
TP-1	0.5	3.3	0.5	2.0(perched)/5.0	57.2
TP-2	1.0	3.5	1.0	N/E	57.5

Notes: Elevation datum: Provided *Cover Sheet* by CES NW Inc dated October 21, 2020 N/E: Not encountered

Groundwater Conditions

Perched groundwater was encountered at the time of excavation in TP-1 at a depth of 2.0 feet below the existing ground surface on top of the gray, orange iron oxide stained sandy silt alluvium. Additional groundwater seepage was observed at about 5 feet below existing grades in the sandy alluvium. No groundwater seepage was observed in test pit TP-2 at the time of excavation; however, an old drainage pipe with washed rock was encountered in the western portion of the test pit during the over dig of the infiltration test. Orange iron oxide staining, a form of mottling was observed throughout the soils in each of our test pit explorations. Mottling can be indicative of a seasonal or fluctuating groundwater table. We anticipate fluctuations in the local groundwater levels may occur in response to season, precipitation patterns, off-site construction activities, and site utilization.

We returned to the site throughout the prescriptive wet season observe the depth to groundwater within the piezometers installed in each test pit. Both piezometers had seasonal high groundwater at about 0.5 feet below existing grades. Table 2 summarizes the approximate depths and elevations of groundwater and mottling observed at the time of our explorations and our subsequent readings in both piezometers. We were unable to record groundwater levels during some days in TP-2 because a car had parked over the piezometer. The measurements from our groundwater monitoring are attached in Appendix B.

TABLE 2:
APPROXIMATE DEPTHS, AND ELEVATION OF GROUNDWATER ENCOUNTERED IN EXPLORATIONS

Exploration Number	Depth to Groundwater (feet)	Elevation of Groundwater (feet)	Dated Measured
TP-1	2(perched), 5	59(perched), 56	12/9/2020
	0.5	60.5	12/21/2020
	0.5	60.5	12/31/2020
	0.5	60.5	1/8/2021
	0.5	60.5	1/14/2021
	1.1	59.9	1/29/2021
	1.8	59.2	2/5/2021
	1.7	59.3	2/12/2021
	0.5	60.5	2/16/2021
	1.5	59.5	3/5/2021
	2.4	58.6	3/12/2021
	2.4	58.6	3/19/2021
	1.7	59.3	3/26/2021
	2.1	58.9	4/1/2021
TP-2	NE	NE	12/9/2020
	0.5	61.5	12/21/2020
	1.0	61.0	12/31/2020
	0.7	61.3	1/8/2021
	0.5	61.5	1/14/2021
	1.9	60.1	1/29/2021
	1.2	60.8	2/5/2021
	2.3	59.7	2/12/2021
	Inaccessible	-	2/16/2021
	Inaccessible	-	3/5/2021
	Inaccessible	-	3/12/2021
	Inaccessible	-	3/19/2021
	2.2	59.8	3/26/2021
	Inaccessible	-	4/1/2021

Laboratory Testing

Geotechnical laboratory tests were performed on selected samples retrieved from the test pits to estimate index engineering properties of the soils encountered. Laboratory testing included visual soil classification per ASTM D2488 and ASTM D2487. We also submitted representative samples to an independent analytical laboratory for determination of organic content and cation exchange capacity. Organic content was determined per ASTM D2974 and cation exchange capacity was determined per SW846 9081. Test results are included in Appendix B.

CONCLUSIONS AND RECOMMENDATIONS

Based on our site reconnaissance and subsurface explorations, it is our opinion that the infiltration of stormwater runoff generated onsite by the proposed development is not feasible for the site.

Infiltration Recommendations

Mottled silty sand was encountered near the surface in both of our subsurface explorations, and groundwater was observed at about 0.5 feet below existing grades during our December 21, 2020 site visit to check the groundwater levels in each piezometer.

The City of Puyallup uses the 2012 *Stormwater Management Manual for Western Washington, with 2014 updates* (2014 SWMMWW). Per the 2014 SWMMWW, Volume V, BMP T5.15, a minimum of 1 foot of separation is required between the bottom of the storage course for permeable pavement and the top of an impermeable layer, such as mottling, or the sandy silt soils encountered at the site. Based on the conditions encountered, permeable pavement appears to be infeasible. We performed an EPA falling head test in the brown mottled silty sand in test pit TP-2 and measured an initial rate of 0.6 inches per hour. An EPA falling head test was chosen for this project because the use of a PIT would interfere with the function of the ProVac yard for that day, and in our opinion, would give an inaccurate rate for the soils encountered in our test pits. Based on the above, a long-term design rate of 0.04 inches per hour is applicable for this project, if the site grades can be adjusted to meet the required vertical separation to the seasonal high groundwater. This would require site grades to be raised on the order of 2 to 3 feet.

Per the 2014 SWMMWW, minimum cation exchange capacity of 5 milliequivalents per 100 milligrams of soil and 1 percent organic content is required for soils to provide adequate water quality treatment to the stormwater. Testing was conducted on the shallow soils at the site located at about 2 feet below existing grades by a third party laboratory. The organic content of the site soils were determined to be 5.79 and 9.94 percent per ASTM D: 2974-13, with a cation exchange capacity of 18.0 and 17.6 milliequivalents per 100 grams as determined by SW-846 Test Method 9081. The shallow onsite soils have the required treatment capacity per the 2014 SWMMWW.

Alternative stormwater management methods, such as detention or dispersion, should be considered for this project in accordance with the 2014 SWMMWW. All minimum setback requirements and infeasibility criteria per the 2014 SWMMWW should be considered prior to the selection of any stormwater facility for the proposed development.

LIMITATIONS

We have prepared this report for use by CES NW Inc, 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

Andrew Schnitger, EIT
Engineer in Training

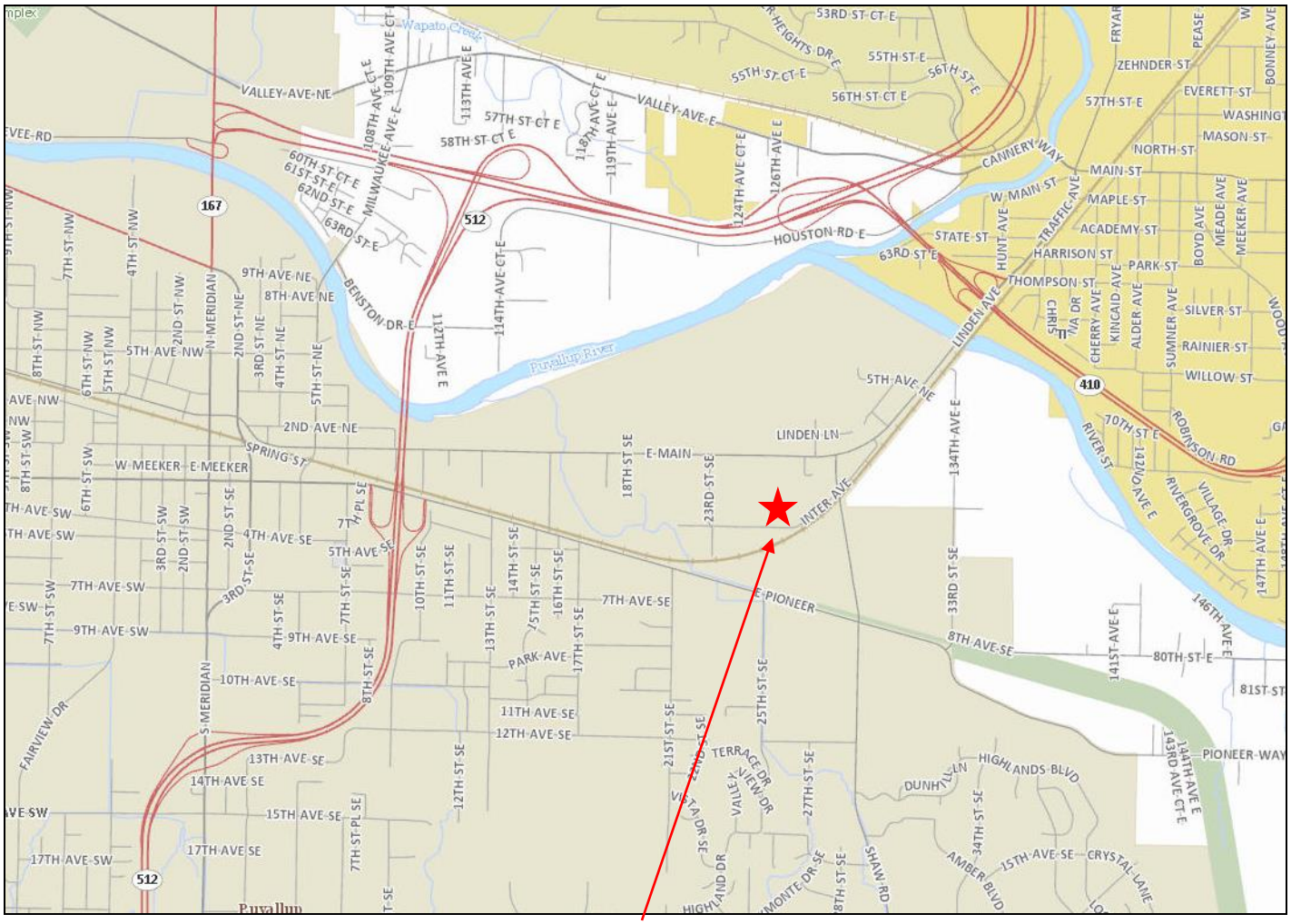
State of Washington
Engineering Geologist
925
Licensed Geologist
12/10/2021
KEITH SCOTT SCHEMBS

Keith S. Schembs, LEG
Principal

ERIC WILLIAM HELLER
STATE OF WASHINGTON
43471
REGISTERED
PROFESSIONAL ENGINEER
12/10/2021

Eric W. Heller, PE, LG
Senior Geotechnical Engineer

AES:KSS:KEB/aes
DocID: CES.ProVac.InterAve.SR
Attachments: Figure 1: Site Location Map
Figure 2: Site & Exploration Plan
Figure 3: NRCS Soils Map
Figure 4: USGS Geologic Map
Appendix A – Subsurface Explorations
Appendix B – Laboratory Test Results



Approximate Site Location

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

Not to Scale

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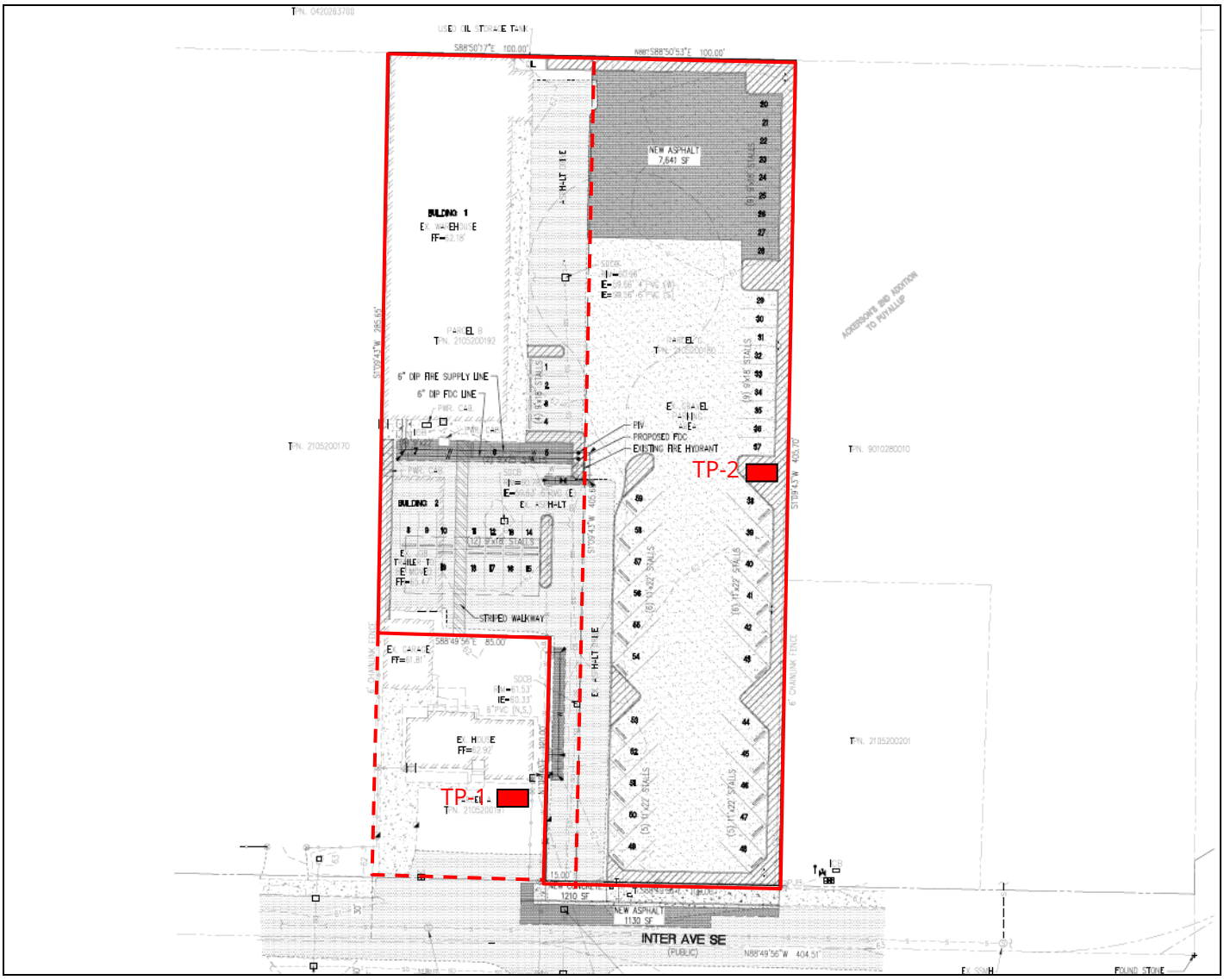
Site Location Map

Olson Brothers Storage
2511 Inter Avenue
Puyallup, Washington
PN: 2105200-180, -192

DocID: CES.ProVac.InterAve.F	December 2021	Figure 1



Approximate Site Location

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

- Approximate test pit and piezometer location
- Approximate site boundary
- Approximate locations of property lines

Not to Scale

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Site & Exploration Plan

Olson Brothers Storage
2511 Inter Avenue
Puyallup, Washington
PN: 2105200-180, -192

DocID: CES.ProVac.InterAve.F	December 2021	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
6A	Briscot silt loam	Alluvium	0 to 2	Slight	B/D

Not to Scale

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NRCS Soils Map

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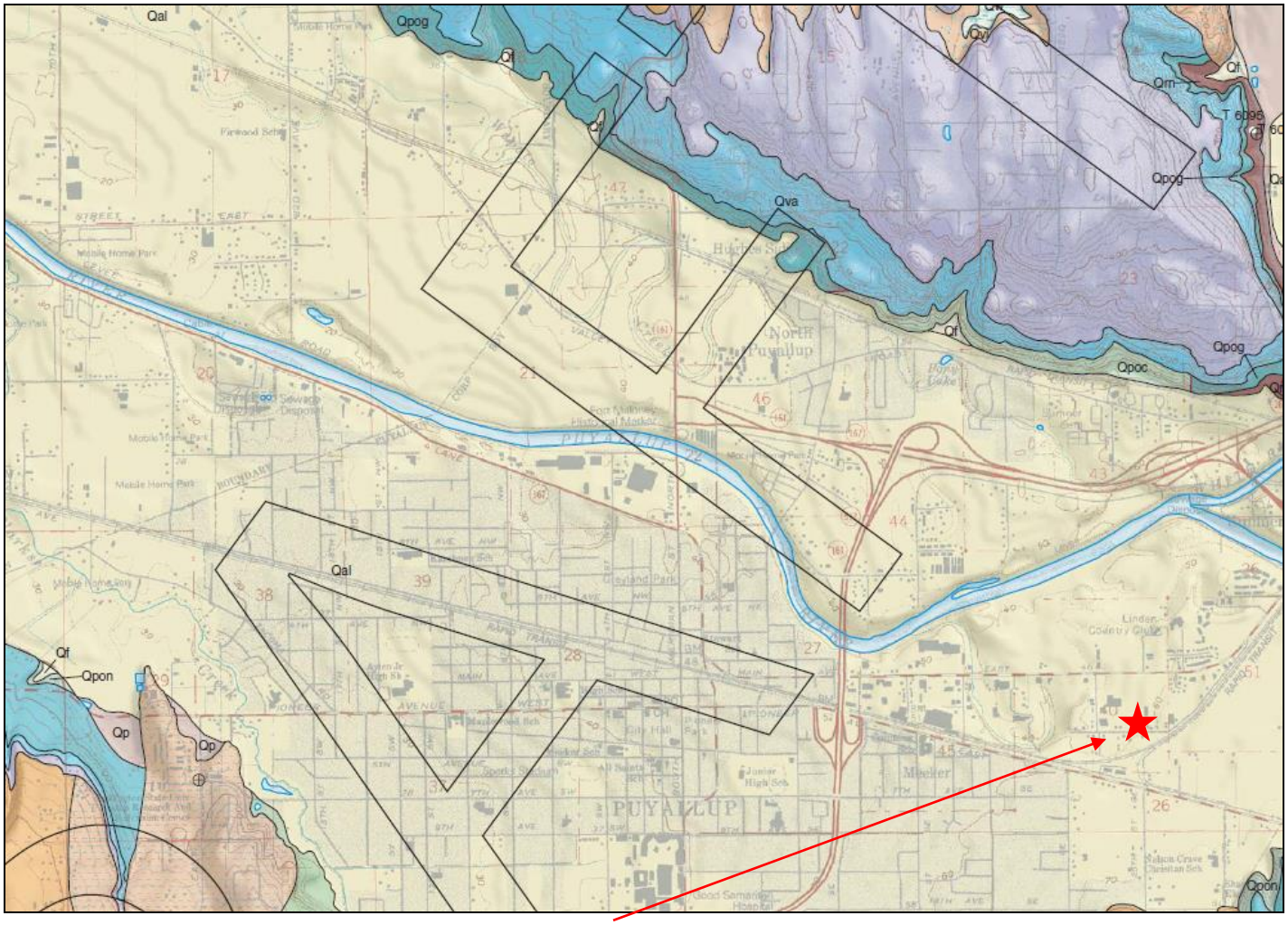
PN: 2105200-180, -192



Approximate Site Location

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

Qal	Alluvium

Not to Scale

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USGS Geologic Map

Olson Brothers Storage
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Puyallup, Washington
PN: 2105200-180, -192

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

Olson Brothers Storage
2511 Inter Avenue
Puyallup, Washington
PN: 2105200-180, -192

Test Pit TP-1

Location: South of existing residence, off of proposed permeable area
Approximate Elevation: 61’

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Topsoil
0.5	-	1.3	SM	Brown, orange iron oxide stained silty fine SAND (loose, moist) (alluvium)
1.3	-	3.8	SM	Gray, orange iron oxide stained silty fine SAND (loose, moist) (alluvium)
3.8	-	5.0	SP-SM	Gray, orange iron oxide stained fine SAND with some silt (medium dense, moist) (alluvium)

Terminated at 5.0 feet below ground surface.
Caving observed 2 feet below existing ground surface.
Perched groundwater observed at 2 feet below existing grades, fast groundwater seepage observed at termination depth of test pit.
Mottling observed throughout entire excavation.

Test Pit TP-2

Location: Central portion of site, near eastern site boundary
Approximate Elevation: 62’

Depth (ft)			Soil Type	Soil Description
0	-	0.5	-	Crushed rock (dense, moist) (fill)
0.5	-	1.0	SM	Reddish brown silty SAND with gravel (dense, moist) (fill)
1.0	-	1.7	SM	Brown, orange iron oxide stained silty SAND (loose, moist) (alluvium)
1.7	-	4.5	ML	Gray, orange iron oxide stained SILT (soft, moist) (alluvium) (drainage pipe encountered during overdig at about 3 feet)
4.5	-	5.0	SP-SM	Gray, orange iron oxide stained fine SAND with some silt (medium dense, moist) (alluvium)

Terminated at 5.5 feet below ground surface.
No caving observed at the time of excavation.
No groundwater seepage observed at time of excavation.
Mottling observed throughout entire excavation.
Infiltration test performed at about 1.5 feet below existing grades.

Logged by: AES **Excavated on: December 9, 2020**

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Test Pit Logs
Olson Brothers Storage
2511 Inter Avenue
Puyallup, Washington
PN: 2105200-180, -192

Appendix B

Laboratory Results

SPECTRA Laboratories ...Where experience matters

2221 Ross Way • Tacoma, WA 98421 • (253) 272-4850 • Fax (253) 572-9838 • www.spectra-lab.com

11/18/2021

GeoResources, LLC
4809 Pacific Hwy E
Fife, WA 98424

Project: CES.Provac
Sample Matrix: Soil
Date Sampled: 11/12/2021
Date Received: 11/15/2021
Spectra Project: 2021110413
Rush

Client ID	Spectra #	Analyte	Result	Units	Method	Analyzed
TP-1, 1'	1	Organic Matter	5.79	wt. % Dry	ASTM D-2974-13	11/17/2021
TP-1, 1'	1	Cation Exchange Capacity	18.0	Na, mEq/ 100g	SW846 9081	11/18/2021
TP-2, 1'	2	Organic Matter	9.94	wt. % Dry	ASTM D-2974-13	11/17/2021
TP-2, 1'	2	Cation Exchange Capacity	17.6	Na, mEq/ 100g	SW846 9081	11/18/2021

SPECTRA LABORATORIES

Ben Frans, Laboratory Manager

a7/scj

SPECTRA Laboratories

2221 Ross Way, Tacoma, WA 98421
(253) 272-4850 Fax (253) 572-9838
www.spectra-lab.com info@spectra-lab.com

SPECIAL INSTRUCTIONS/COMMENTS:

CHAIN OF CUSTODY

SPECTRA PROJECT # 2021110413

Return Samples: Y N Page _____ of _____ STANDARD ☐ RUSH ☑

CLIENT: GeoResources ADDRESS: 4809 Pacific Hwy E, Fife WA ADDRESS CHANGE ☐

PROJECT: CES. Provac

CONTACT: Andrews

SAMPLED BY: Andrews

PHONE: 253 896 1004 FAX:

e-MAIL: Andrews@Georesources.y Prefer FAX ☐ or e-MAIL ☑

PURCHASE ORDER #

SAMPLE ID	DATE SAMPLED	TIME SAMPLED	MATRIX	NUMBER OF CONTAINERS	HYDROCARBONS: NWTPH-HCID	BTEX	BTEX/NWTPH-G	NWTPH-G	NWTPH-Dx	1664 SGT-HEM (TPH)	1664 HEM (FOG)	ORGANICS: 8260/624 VOA	8260 CHLOR SOLVENTS	8270-625 SEMI VOA	8270 PAH/PNA	8082/608 PCB	METALS: TOTAL METALS RCRA 8	TOTAL METALS (SPECIFY)	TCLP METALS RCRA 8	TCLP METALS (SPECIFY)	OTHER: PH 9040/9045	TX/TOX/EOX	TURBIDITY	FLASH POINT	BOD	SOLIDS (SPECIFY)	Cation Exchange	organic content
1 TP-1, 1'	11/12/21	1700	Soil	1																							X	X
2 TP-2, 1'	11/12/21	1705	Soil	1																							X	X
3																												
4																												
5																												
6																												
7																												
8																												
9																												
10																												

LAB USE ONLY

	SIGNATURE	PRINTED NAME	COMPANY	DATE	TIME
RELINQUISHED BY	Andrew	Andrew Schmitger	GeoResources	11/15/21	1058
RECEIVED BY	Taylor Burkhart	Taylor Burkhart	Spectra	11/15/21	1058
RELINQUISHED BY					
RECEIVED BY					

Payment Terms: Net 30 days. Past due accounts subject to 1 1/2% per month interest. Customer agrees to pay all costs of collection including reasonable attorney's fees and all other costs of collection regardless of whether suit is filed in Pierce Co., WA venue. *Spectra Laboratories, LLC*

Appendix C

Groundwater Monitoring Logs

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MONITORING WELL LOGS

Project ID: CES.ProVac.InterAve

*****Depths are in reference with ground surface*****

Date:	12/9/2020 (ATD)
Field Tech:	AES
Well #	**Depth** (ft)
1	2 (perched), 5
2	NE

Date:	12/21/2020
Field Tech:	AES
Well #	**Depth** (ft)
1	0.5
2	0.5

Date:	12/31/2020
Field Tech:	AES
Well #	**Depth** (ft)
1	0.5
2	1.0

Date:	1/8/2021
Field Tech:	AES
Well #	**Depth** (ft)
1	0.5
2	0.7

Date:	1/14/2021
Field Tech:	AES
Well #	**Depth** (ft)
1	0.5
2	0.5

Date:	1/29/2021
Field Tech:	AES
Well #	**Depth** (ft)
1	1.1
2	1.9

Date:	2/5/2021
Field Tech:	AES
Well #	**Depth** (ft)
1	1.8
2	1.2

Date:	2/12/2021
Field Tech:	AES
Well #	**Depth** (ft)
1	1.7
2	2.3

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MONITORING WELL LOGS

Project ID: CES.ProVac.InterAve

*****Depths are in reference with ground surface*****

Date:	2/16/2021
Field Tech:	AES
Well #	**Depth** (ft)
1	0.5
2	Unaccessable

Date:	3/5/2021
Field Tech:	AES
Well #	**Depth** (ft)
1	1.5
2	Unaccessable

Date:	3/12/2021
Field Tech:	CB
Well #	**Depth** (ft)
1	2.4
2	Unaccessable

Date:	3/19/2021
Field Tech:	CB
Well #	**Depth** (ft)
1	2.4
2	Unaccessable

Date:	3/26/2021
Field Tech:	CB
Well #	**Depth** (ft)
1	1.7
2	2.2

Date:	4/1/2021
Field Tech:	CB
Well #	**Depth** (ft)
1	2.1
2	Unaccessable

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February 14, 2022

Olson Brothers Pro Vac, LLC
c/o C.E.S. NW, Inc.
310 – 29th Street NE, Suite 101
Puyallup, Washington 98372
(253) 848-4282

Attn: Mr. Craig Deaver
cdeaver@cesnwinc.com

Soils Report Addendum: Supplemental Infiltration Testing
Proposed Permeable Pavement
2511 Inter Avenue
Puyallup, Washington
PN: 2105200-180, -192
Doc: CES.ProVac.InterAve.SRa.rev2

INTRODUCTION

We are pleased to submit this addendum to our previously prepared *soils report* dated December 10, 2021. On December 21, 2021, we returned to the site to perform one Pilot Infiltration Test (PIT) in the green space on the southern portion of the site, in the front yard of the existing residence. The bottom of the PIT was excavated approximately 1 foot below the existing grades. The soils at the bottom of the PIT were consistent with the native alluvium soils described in our original report of a medium dense brown, orange iron stained silty sand or sandy silt that was in a moist to wet condition.

At the time of our testing, water was being pumped out from beneath the crawl space of the existing residence, and the surface water ponding on the gravel surface and adjacent sod area was flowing towards our PIT. No groundwater was encountered in our PIT, but the surface water was flowing into our PIT. Our excavation slowly started to fill in as the rate of inflow as greater than the infiltration rate of the soils. During the limited time of our testing prior to surface water inflow, the measured rate appeared consistent with the rates provided in our December 2021 report, and those rates are still appropriate. We also monitored groundwater during the winter of 2020/2021. The results of our groundwater monitoring and original infiltration testing are summarized in our December 10, 2021 report.

Based on the Paving & Utility Plan by C.E.S. NW Inc., dated February 9, 2022, the grades at the site will be raised by 2 feet to meet the vertical separation requirements for permeable pavement. Catch basins and overflows will also be implemented. It is our opinion that vertical separation requirements can be met at the site once the site grades have been raised, and permeable pavement would therefore be feasible for this project.

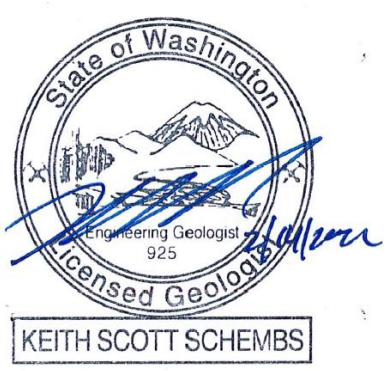
◆ ◆ ◆

CLOSURE

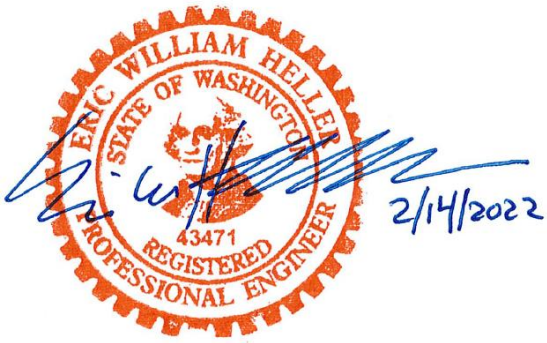
We trust that this is sufficient for your needs. If you have any questions regarding the content of this letter, please call.

Yours very truly
GeoResources, LLC

Andrew Schnitger, EIT
Engineer in Training



Keith Schembs, LEG
Principal



Eric W. Heller, PE, LG
Senior Geotechnical Engineer

AES:KSS:EWH/aes
DocID: CES.ProVac.InterAve.SRa.rev2