

STORM DRAINAGE REPORT

FOR

**Olson Brothers Storage
Puyallup, Washington**

**Revised March 2024
Revised December 2022
February 2021**

**Prepared for:
Mike Grit
Grit 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

	PAGE
STORM DRAINAGE	1
1. PROJECT OVERVIEW	1
2. EXISTING CONDITIONS SUMMARY	2
3. OFF-SITE ANALYSIS REPORT	3
4. PERMANENT STORMWATER CONTROL PLAN	4
5. DISCUSSION OF MINIMUM REQUIREMENTS.....	7
6. OTHER PERMITS	10
 <i>Appendix A</i> General Exhibits	
Vicinity Map	A-1
Soils Map	A-2
 <i>Appendix B</i> Maps	
Pre-Developed Bain Map.....	B-1
Post Developed Basin Map.....	B-2
FIRM Panel 53053C0334E.....	B-3
Downstream Drainage Map	B-4
 <i>Appendix C</i> Computer Modelling Results	
 <i>Appendix D</i> Geotechnical Engineer's Report	

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.

Parcel C, TPN. 2105200180

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 33,628 sq.ft. of paving, that does not include overlaying the existing asphalt, across onsite and offsite improvements and 14,113 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.

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 1.096 acres C, Forest, Flat. The following is a summary of the pre-developed site flows:

2-year.....	0.025-cfs
10-year.....	0.046-cfs
50-year.....	0.060-cfs
100-year.....	0.064-cfs

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 33,628 sq.ft. of paving, that does not include overlaying the existing asphalt, across onsite and offsite improvements and 14,113 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) To permeable pavement	C, Pasture, Flat	0.194
Onsite B	Curbing To permeable pavement	Roadway, Flat	0.011
Onsite C	Permeable Pavement	C, Lawn, Flat	0.641
Bypass A	Frontage Improvements Roadway/Sidewalk	Roadway, Flat	0.084
Bypass B	Onsite Paving	Roadway, Flat	0.036
Bypass C	Landscaping Planters	C, Pastures, Flat	0.130
Total			1.096

Table 1 – Post Developed Basin

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

2-year.....0.045-cfs
10-year.....0.071-cfs
50-year.....0.099-cfs
100-year.....0.112-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	0.194
Onsite B	Curbing	Roadway, Flat	0.011
Onsite C	Permeable Pavement	Permeable Pavement WWHM Element	0.641
Total			0.846

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.

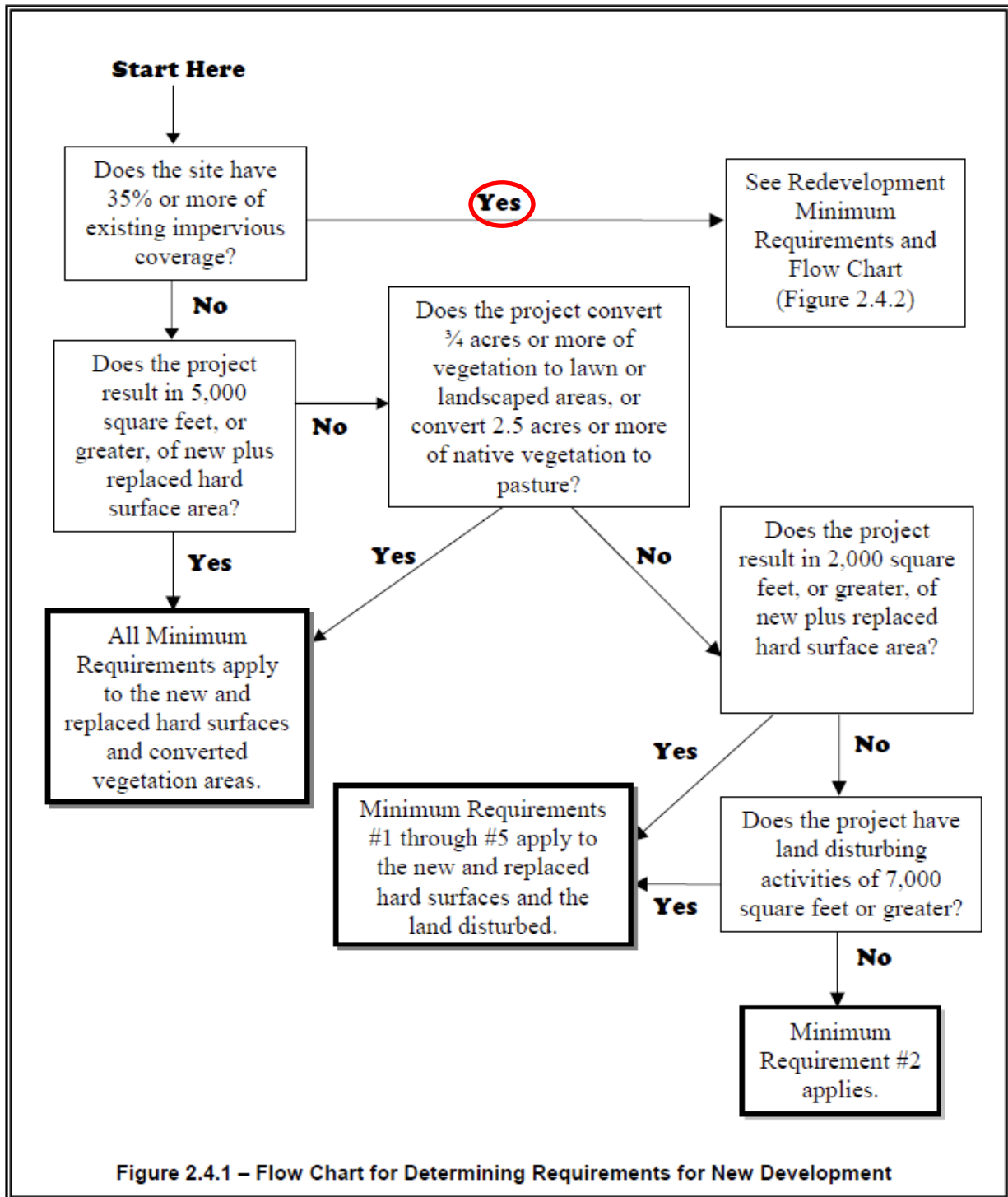
Conveyance Calculations

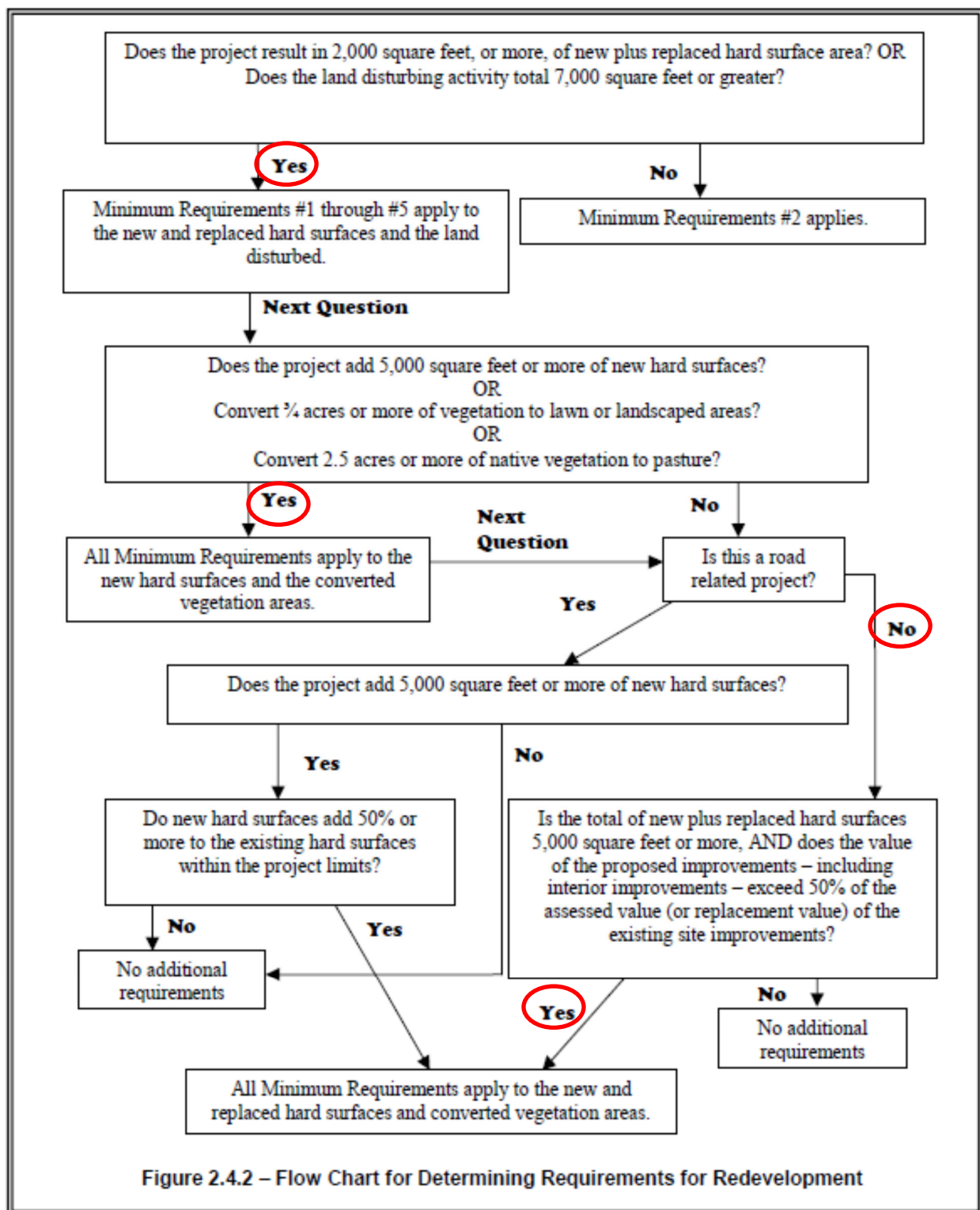
The project proposes an extension of the existing conveyance system within Inter Ave to an onsite overflow conveyance system. This system is comprised of catch basins, PVC pipes and ductile iron pipe. The shallowest pipe is analyzed to demonstrate that the system's ability to convey the site's overflow 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.





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

This requirement is not applicable to the project since the closest wetland is more than ¼ mile downstream of the site at Inter Ave's outfall to Upper Deer Creek.

5.9 Minimum Requirement #9: Operation and Maintenance

An Operation and Maintenance Manual is submitted alongside this report.

6. Other Permits

Other necessary permits and approvals include:

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

APPENDIX A

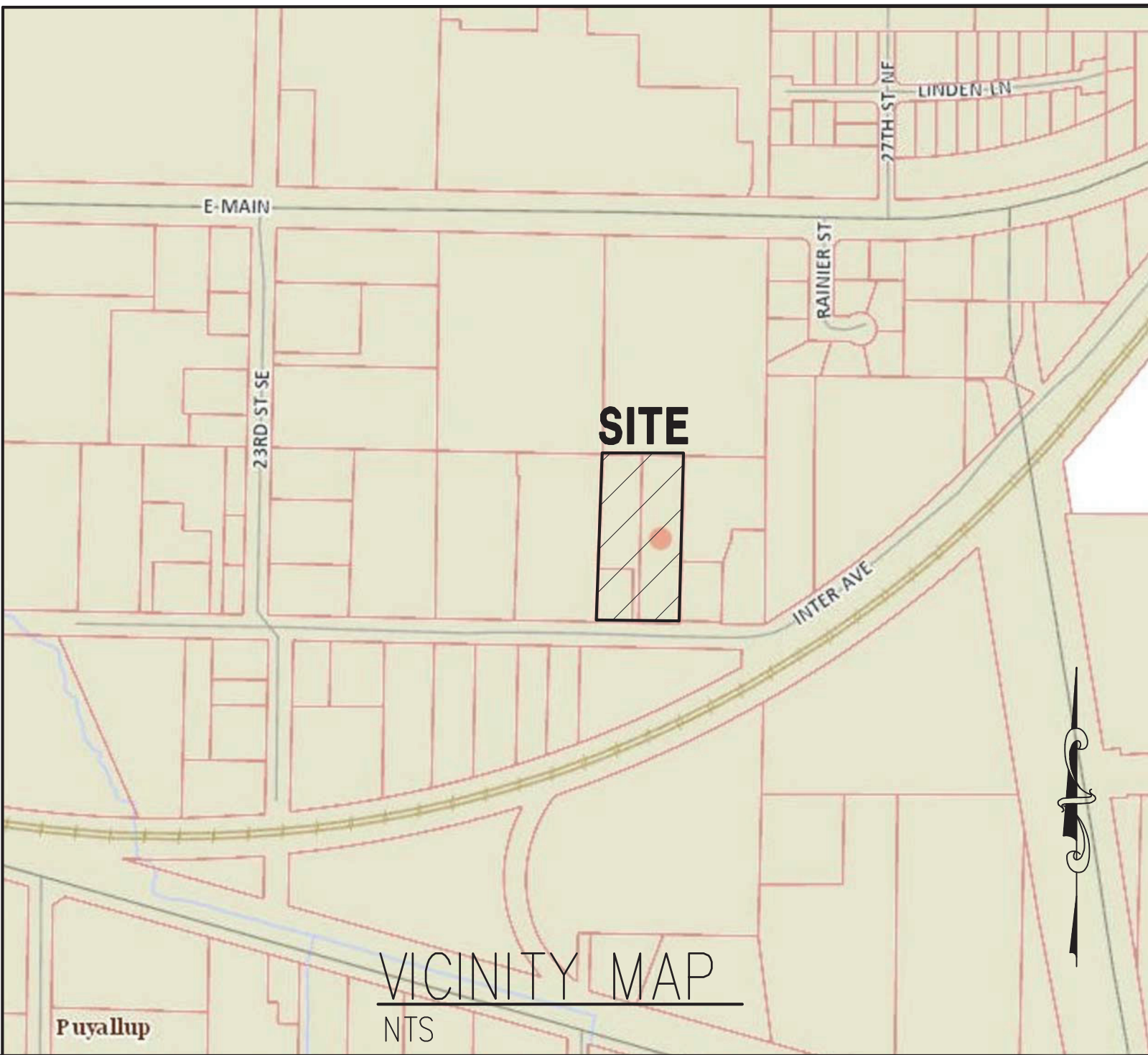
General Exhibits

Vicinity Map

A-1

Soils Map and Description (NRCS)

A-2



Puyallup

VICINITY MAP
NTS

Soil Map—Pierce County Area, Washington



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

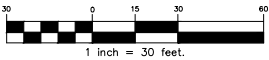
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
6A	Briscot loam	2.4	100.0%
Totals for Area of Interest		2.4	100.0%

APPENDIX B

Basin Exhibits

Predeveloped Basin Map	B-1
Post Developed Basin Map	B-2
FIRM Panel (#53053C0334E)	B-3
Downstream Drainage Map	B-4

OLSON BROTHERS STORAGE
A PORTION OF NW1/4 OF THE SE1/4 OF SEC. 28, T20N, R04E
WILLAMETTE MERIDIAN, PIERCE COUNTY, WASHINGTON



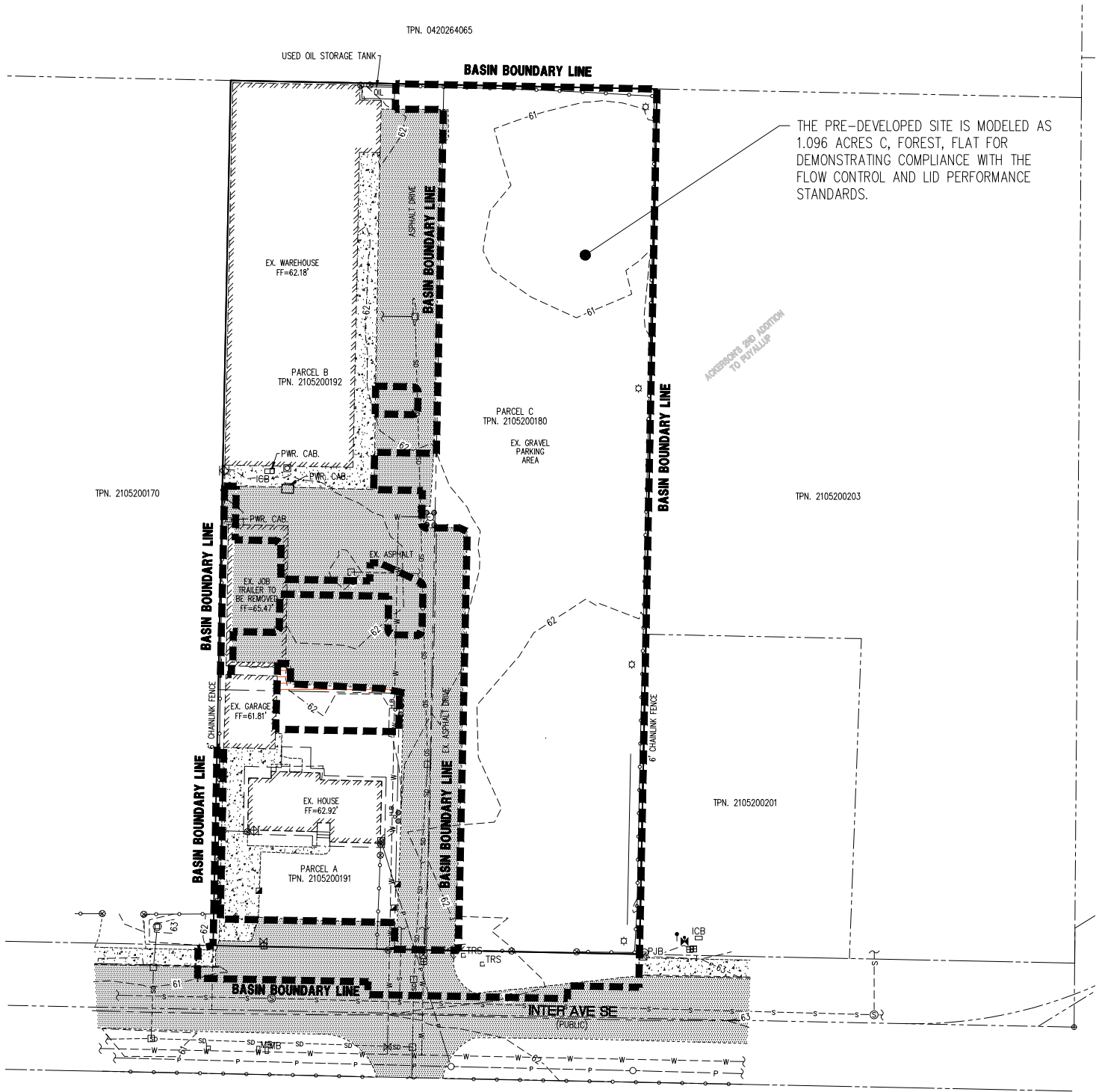
APPROVED

BY: CITY OF PUYALLUP
ENGINEERING SERVICES

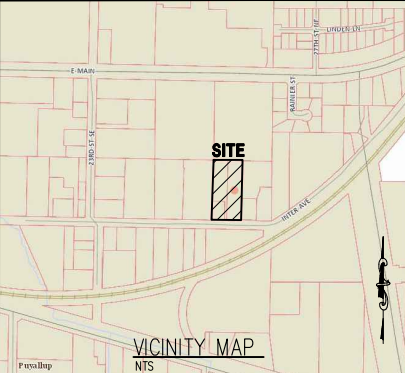
DATE:

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:	Date:



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	---
---	CONTOURS	---
⊕	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	⊕



CALL 48 HOURS
BEFORE YOU DIG
DIAL 811

C.E.S. NW INC.
CIVIL ENGINEERING & SURVEYING

409 - 30TH ST. NE, SUITE D
PUYALLUP, WA 98372
PH: (253) 848-4982
cesnw@cesnwinc.com

**OLSON BROTHERS STORAGE
PRE-DEVELOPED BASIN MAP**

Client: GIMTARCHITECTURECENTURYLINK.NET

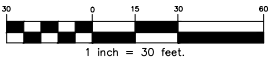
Designed: DPS
Drawn: JEH
Checked: CAD

Scale: 1"=30'
Date: 3/15/24
Job No.: 20083

Sheet No.: **B1**
1 of 2 Sheets

MIKE GRIMIT

OLSON BROTHERS STORAGE
A PORTION OF NW1/4 OF THE SE1/4 OF SEC. 28, T20N, R04E
WILLAMETTE MERIDIAN, PIERCE COUNTY, WASHINGTON



APPROVED

BY: CITY OF PUYALLUP
ENGINEERING SERVICES

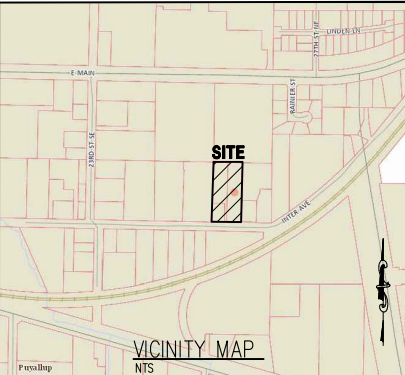
DATE:

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.

Sub-Basin	Land-use	WWHM Description	Area (ac)
Onsite A	Yards and Landscape (Amended Soils) To permeable pavement	C, Pasture, Flat	0.194
Onsite B	Curbing To permeable pavement	Roadway, Flat	0.011
Onsite C	Permeable Pavement	C, Lawn, Flat	0.641
Bypass A	Frontage Improvements Roadway/Sidewalk	Roadway, Flat	0.084
Bypass B	Onsite Paving	Roadway, Flat	0.036
Bypass C	Landscaping Planters	C, Pastures, Flat	0.130
Total			1.096

POST DEVELOPED BASIN

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	---
---	CONTOURS	---
---	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	---



CALL 48 HOURS
BEFORE YOU DIG
DIAL 811

C.E.S. NW INC.
CIVIL ENGINEERING & SURVEYING

409 - 30TH ST. NE, SUITE D
PUYALLUP, WA 98372
PH: (253) 848-4982
cesnw@cesnwinc.com

OLSON BROTHERS STORAGE
POST DEVELOPED BASIN MAP

Client: GIMTARCHITECTURECENTURYLINK.NET

Designed: DPS
Drawn: JEH
Checked: CAD

Scale: 1"=30'
Date: 3/15/24
Job No.: 20083

Sheet No.: **B2**
2 of 2 Sheets

MIKE GRIMIT

Legend

**SPECIAL FLOW
HAZARD AREA**

OTHER AREAS
FLOOD HAZA

OTHER ARE

GENEF

STRUCTUR

OTHER FEATURES

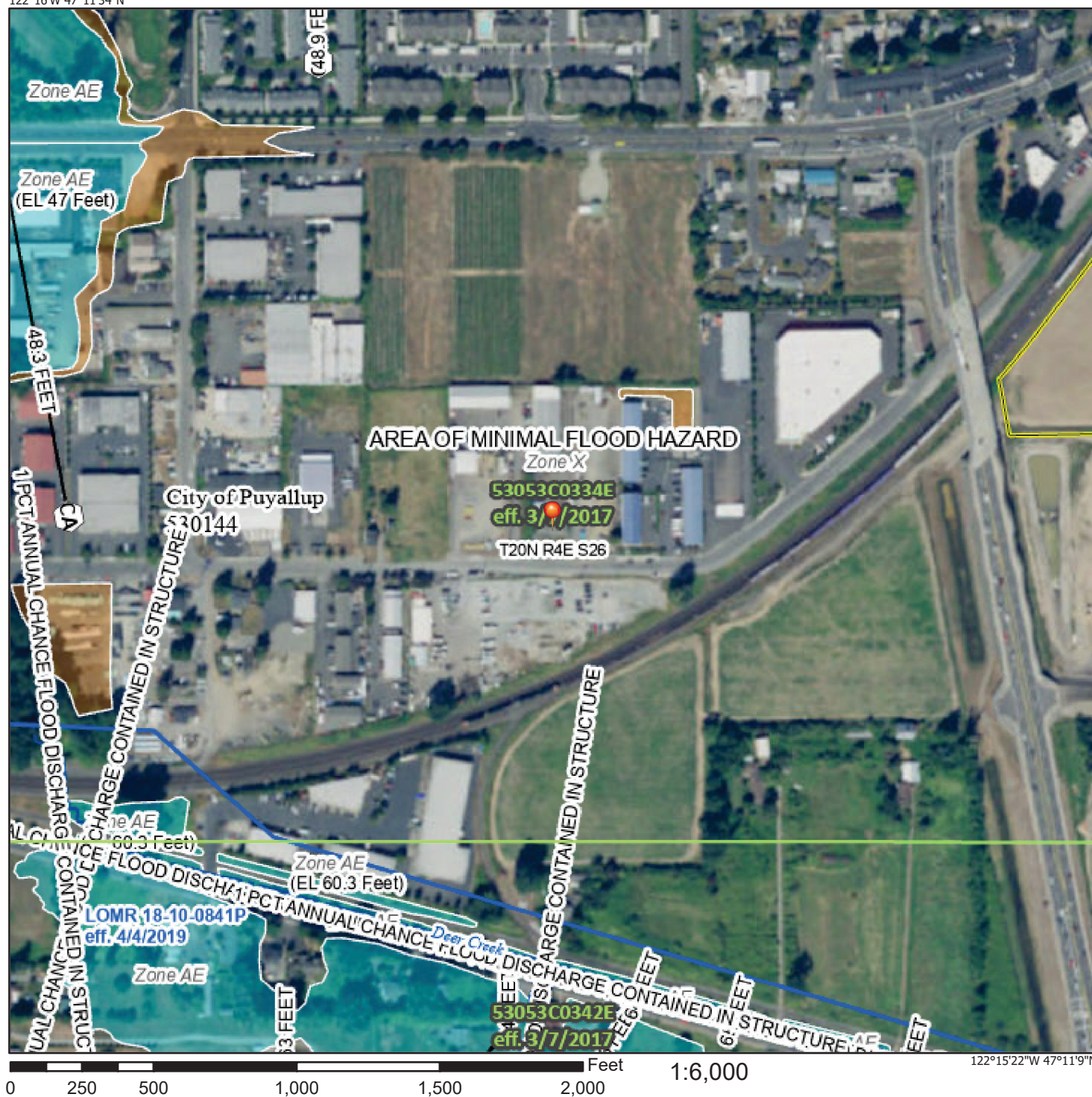
MAP PAN



This map
digital floo
The basen
accuracy s

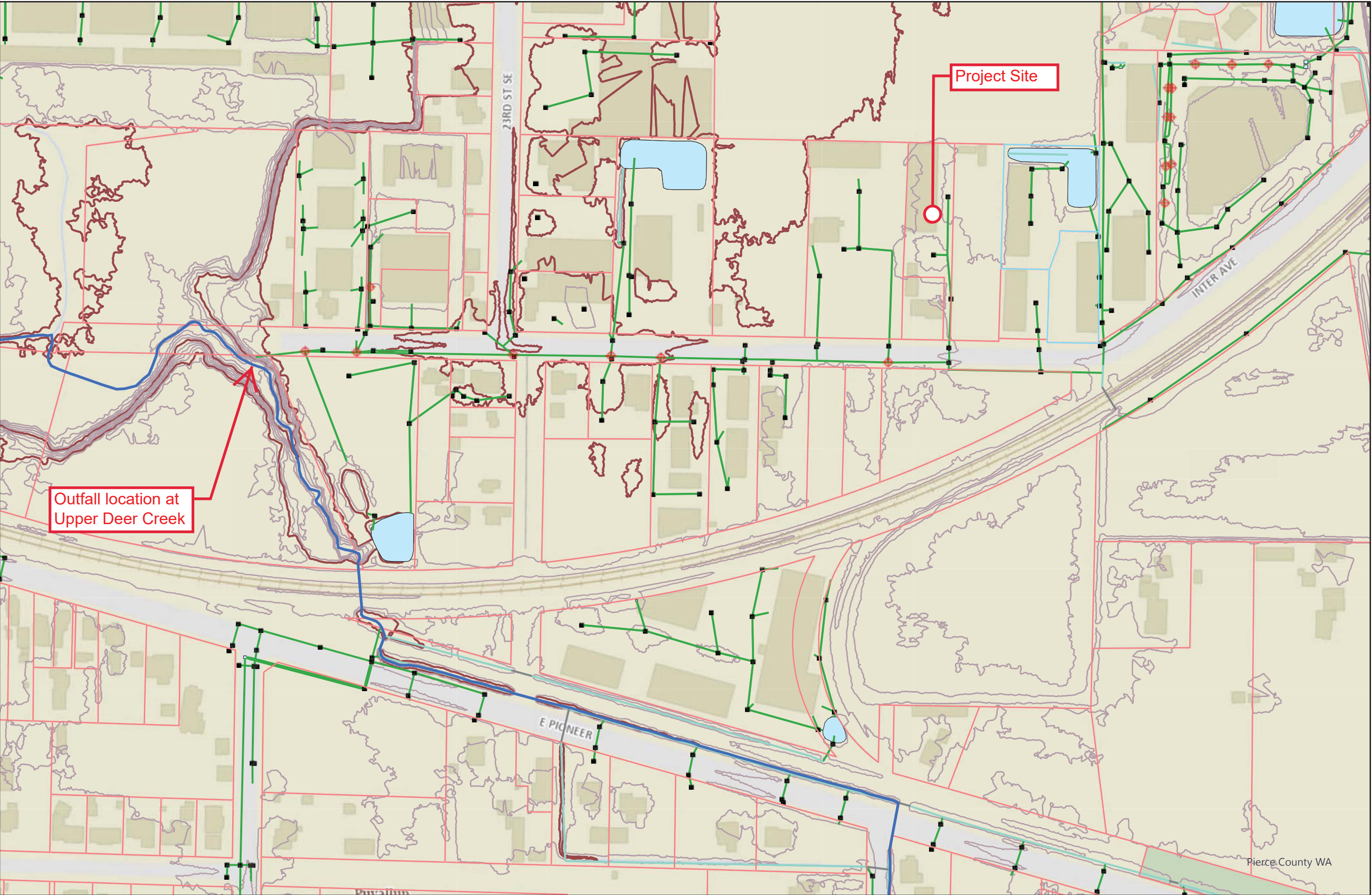
The flood
authoritat
was expos
reflect cha
time. The
become s

This map
elements
legend, so
FIRM pan
unmappe
regulatory



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

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

CES • NW
INCORPORATED
CIVIL ENGINEERING & SURVEYING
429 29th St NE, Suite D - Puyallup, WA 98372
PH: 253.848.4282
www.cesnwinc.com

APPENDIX C

Computer Modelling Results

WWHM2012
PROJECT REPORT

General Model Information

WWHM2012 Project Name: 20083 Permeable Pavement2024.03

Site Name: Olson Bros
Site Address: 2511 Inter Ave
City: Puyallup, WA
Report Date: 3/19/2024
Gage: 40 IN EAST
Data Start: 10/01/1901
Data End: 09/30/2059
Timestep: 15 Minute
Precip Scale: 1.000
Version Date: 2023/01/27
Version: 4.2.19

POC Thresholds

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

Landuse Basin Data

Predeveloped Land Use

Pre-Dev

Bypass:	No
GroundWater:	No
Pervious Land Use	acre
C, Forest, Flat	1.096
Pervious Total	1.096
Impervious Land Use	acre
Impervious Total	0
Basin Total	1.096

Mitigated Land Use

Bypass

Bypass: Yes

GroundWater: No

Pervious Land Use acre
C, Pasture, Flat 0.13

Pervious Total 0.13

Impervious Land Use acre
ROADS FLAT 0.084
PARKING FLAT 0.036

Impervious Total 0.12

Basin Total 0.25

Landscaping

Bypass: No

GroundWater: No

Pervious Land Use
C, Pasture, Flat acre
.194

Curbing

Bypass:

Impervious Land Use

ROADS FLAT LAT

No

acre

0.011

Routing Elements

Predeveloped Routing

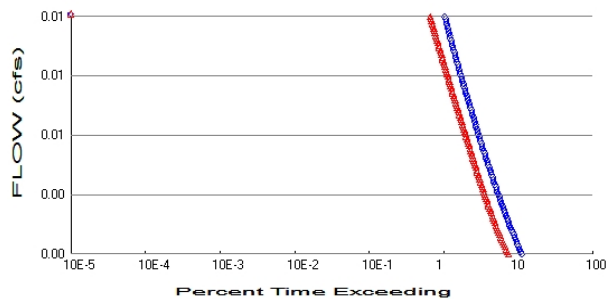
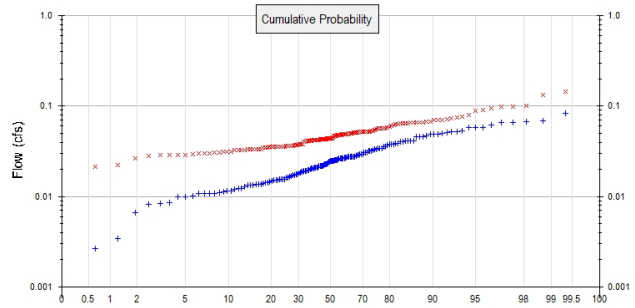
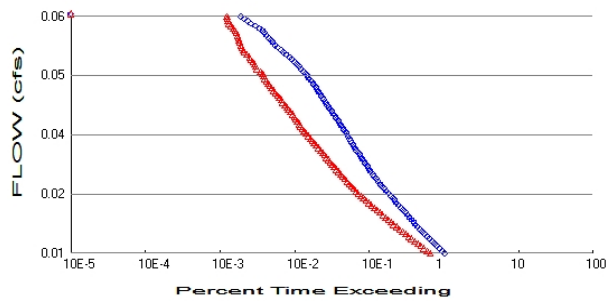
Mitigated Routing

Permeable Parkling Lot

Pavement Area:	0.6410 acre.	Pavement Length:	167.10 ft.
Pavement Width:	167.10 ft.	Pavement slope	1:0.05 To 1
Pavement thickness:	0.54		
Pour Space of Pavement:	0.3		
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.):	276.822		
Total Volume Through Riser (ac-ft.):	0		
Total Volume Through Facility (ac-ft.):	276.822		
Percent Infiltrated:	100		
Total Precip Applied to Facility:	0		
Total Evap From Facility:	24.299		

Analysis Results

POC 1



+ Predeveloped x Mitigated

Predeveloped Landuse Totals for POC #1

Total Pervious Area: 1.096
Total Impervious Area: 0

Mitigated Landuse Totals for POC #1

Total Pervious Area: 0.324
Total Impervious Area: 0.77201

Flow Frequency Method: Log Pearson Type III 17B

Flow Frequency Return Periods for Predeveloped. POC #1

Return Period	Flow(cfs)
2 year	0.024764
5 year	0.038101
10 year	0.045811
25 year	0.054161
50 year	0.059533
100 year	0.064194

Flow Frequency Return Periods for Mitigated. POC #1

Return Period	Flow(cfs)
2 year	0.044713
5 year	0.060081
10 year	0.071259
25 year	0.086568
50 year	0.09886
100 year	0.11194

Annual Peaks

Annual Peaks for Predeveloped and Mitigated. POC #1

Year	Predeveloped	Mitigated
1902	0.020	0.051
1903	0.015	0.056
1904	0.026	0.071
1905	0.013	0.029
1906	0.007	0.033
1907	0.038	0.048
1908	0.028	0.037
1909	0.027	0.043
1910	0.038	0.044
1911	0.025	0.048
1912	0.083	0.095
1913	0.039	0.033
1914	0.010	0.144
1915	0.016	0.031
1916	0.025	0.054
1917	0.008	0.021
1918	0.026	0.043
1919	0.021	0.029
1920	0.025	0.038
1921	0.027	0.034
1922	0.028	0.052
1923	0.022	0.035
1924	0.011	0.063
1925	0.014	0.028
1926	0.024	0.051
1927	0.018	0.044
1928	0.019	0.033
1929	0.038	0.062
1930	0.025	0.065
1931	0.023	0.032
1932	0.018	0.035
1933	0.020	0.036
1934	0.050	0.059
1935	0.023	0.029
1936	0.021	0.041
1937	0.033	0.052
1938	0.021	0.030
1939	0.002	0.036
1940	0.023	0.065
1941	0.014	0.071
1942	0.034	0.051
1943	0.017	0.049
1944	0.036	0.070
1945	0.027	0.052
1946	0.016	0.043
1947	0.011	0.031
1948	0.053	0.044
1949	0.046	0.066
1950	0.013	0.037
1951	0.017	0.057
1952	0.068	0.073
1953	0.062	0.067
1954	0.022	0.037
1955	0.019	0.033
1956	0.010	0.030
1957	0.033	0.036

1958	0.066	0.048
1959	0.041	0.049
1960	0.012	0.035
1961	0.041	0.098
1962	0.022	0.042
1963	0.011	0.031
1964	0.011	0.092
1965	0.046	0.044
1966	0.014	0.035
1967	0.021	0.051
1968	0.022	0.041
1969	0.021	0.038
1970	0.032	0.044
1971	0.049	0.044
1972	0.032	0.132
1973	0.042	0.076
1974	0.023	0.057
1975	0.052	0.065
1976	0.028	0.066
1977	0.012	0.026
1978	0.046	0.050
1979	0.013	0.048
1980	0.027	0.049
1981	0.024	0.044
1982	0.012	0.036
1983	0.041	0.051
1984	0.019	0.050
1985	0.030	0.058
1986	0.025	0.030
1987	0.047	0.049
1988	0.029	0.031
1989	0.027	0.029
1990	0.031	0.038
1991	0.025	0.052
1992	0.032	0.050
1993	0.033	0.056
1994	0.049	0.042
1995	0.011	0.031
1996	0.053	0.043
1997	0.022	0.037
1998	0.026	0.047
1999	0.003	0.049
2000	0.020	0.043
2001	0.011	0.033
2002	0.035	0.066
2003	0.030	0.037
2004	0.027	0.052
2005	0.049	0.101
2006	0.016	0.047
2007	0.016	0.053
2008	0.026	0.043
2009	0.017	0.033
2010	0.015	0.042
2011	0.014	0.044
2012	0.021	0.043
2013	0.016	0.040
2014	0.011	0.038
2015	0.021	0.067

2016	0.009	0.041
2017	0.038	0.063
2018	0.067	0.046
2019	0.066	0.067
2020	0.021	0.049
2021	0.034	0.042
2022	0.014	0.064
2023	0.029	0.081
2024	0.058	0.100
2025	0.026	0.042
2026	0.041	0.048
2027	0.015	0.052
2028	0.013	0.020
2029	0.028	0.036
2030	0.051	0.070
2031	0.017	0.022
2032	0.010	0.035
2033	0.015	0.044
2034	0.015	0.034
2035	0.058	0.050
2036	0.031	0.035
2037	0.008	0.047
2038	0.025	0.049
2039	0.003	0.089
2040	0.015	0.037
2041	0.019	0.045
2042	0.058	0.052
2043	0.028	0.057
2044	0.037	0.040
2045	0.025	0.033
2046	0.029	0.036
2047	0.022	0.043
2048	0.029	0.035
2049	0.026	0.053
2050	0.018	0.041
2051	0.026	0.060
2052	0.016	0.043
2053	0.027	0.036
2054	0.034	0.076
2055	0.014	0.041
2056	0.012	0.057
2057	0.019	0.028
2058	0.023	0.053
2059	0.040	0.067

Ranked Annual Peaks

Ranked Annual Peaks for Predeveloped and Mitigated. POC #1

Rank	Predeveloped	Mitigated
1	0.0833	0.1437
2	0.0682	0.1322
3	0.0672	0.1014
4	0.0664	0.0996
5	0.0659	0.0979
6	0.0619	0.0951
7	0.0584	0.0916
8	0.0578	0.0888
9	0.0575	0.0806
10	0.0534	0.0759

11	0.0527	0.0757
12	0.0518	0.0735
13	0.0508	0.0712
14	0.0505	0.0705
15	0.0490	0.0705
16	0.0489	0.0696
17	0.0488	0.0674
18	0.0472	0.0668
19	0.0463	0.0666
20	0.0458	0.0666
21	0.0455	0.0665
22	0.0415	0.0664
23	0.0413	0.0657
24	0.0413	0.0650
25	0.0412	0.0650
26	0.0409	0.0646
27	0.0403	0.0643
28	0.0388	0.0630
29	0.0384	0.0626
30	0.0383	0.0617
31	0.0383	0.0601
32	0.0376	0.0594
33	0.0372	0.0577
34	0.0356	0.0572
35	0.0353	0.0567
36	0.0342	0.0567
37	0.0341	0.0565
38	0.0341	0.0565
39	0.0335	0.0558
40	0.0333	0.0541
41	0.0328	0.0531
42	0.0323	0.0530
43	0.0320	0.0525
44	0.0318	0.0525
45	0.0309	0.0522
46	0.0308	0.0520
47	0.0304	0.0519
48	0.0295	0.0518
49	0.0295	0.0517
50	0.0292	0.0517
51	0.0287	0.0515
52	0.0286	0.0510
53	0.0280	0.0509
54	0.0277	0.0508
55	0.0277	0.0506
56	0.0277	0.0503
57	0.0276	0.0497
58	0.0275	0.0497
59	0.0274	0.0496
60	0.0274	0.0489
61	0.0271	0.0489
62	0.0270	0.0488
63	0.0269	0.0488
64	0.0265	0.0487
65	0.0264	0.0485
66	0.0264	0.0485
67	0.0264	0.0484
68	0.0261	0.0483

69	0.0261	0.0482
70	0.0257	0.0477
71	0.0255	0.0475
72	0.0254	0.0468
73	0.0252	0.0466
74	0.0251	0.0466
75	0.0249	0.0459
76	0.0248	0.0449
77	0.0247	0.0445
78	0.0246	0.0443
79	0.0245	0.0442
80	0.0242	0.0441
81	0.0240	0.0440
82	0.0233	0.0438
83	0.0233	0.0437
84	0.0229	0.0436
85	0.0229	0.0436
86	0.0227	0.0434
87	0.0224	0.0433
88	0.0220	0.0431
89	0.0220	0.0431
90	0.0219	0.0430
91	0.0218	0.0428
92	0.0216	0.0427
93	0.0211	0.0426
94	0.0210	0.0425
95	0.0210	0.0423
96	0.0207	0.0423
97	0.0207	0.0423
98	0.0206	0.0420
99	0.0206	0.0420
100	0.0205	0.0414
101	0.0201	0.0414
102	0.0198	0.0413
103	0.0197	0.0409
104	0.0194	0.0409
105	0.0192	0.0404
106	0.0192	0.0400
107	0.0189	0.0381
108	0.0187	0.0379
109	0.0183	0.0378
110	0.0178	0.0377
111	0.0176	0.0373
112	0.0175	0.0369
113	0.0173	0.0368
114	0.0172	0.0367
115	0.0168	0.0366
116	0.0165	0.0365
117	0.0162	0.0364
118	0.0162	0.0362
119	0.0156	0.0359
120	0.0156	0.0359
121	0.0155	0.0358
122	0.0155	0.0357
123	0.0153	0.0357
124	0.0153	0.0355
125	0.0152	0.0355
126	0.0149	0.0354

127	0.0145	0.0353
128	0.0141	0.0352
129	0.0141	0.0351
130	0.0138	0.0349
131	0.0138	0.0338
132	0.0135	0.0338
133	0.0135	0.0335
134	0.0134	0.0335
135	0.0134	0.0333
136	0.0133	0.0333
137	0.0127	0.0328
138	0.0123	0.0326
139	0.0123	0.0325
140	0.0121	0.0324
141	0.0116	0.0314
142	0.0114	0.0311
143	0.0113	0.0311
144	0.0111	0.0308
145	0.0109	0.0307
146	0.0108	0.0303
147	0.0108	0.0303
148	0.0107	0.0303
149	0.0101	0.0294
150	0.0099	0.0289
151	0.0099	0.0287
152	0.0086	0.0286
153	0.0084	0.0285
154	0.0082	0.0279
155	0.0066	0.0262
156	0.0034	0.0222
157	0.0027	0.0215
158	0.0017	0.0202

LID Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0020	613285	406751	66	Pass
0.0021	592787	391738	66	Pass
0.0022	573397	377611	65	Pass
0.0023	555114	364592	65	Pass
0.0024	537663	352182	65	Pass
0.0025	520988	340492	65	Pass
0.0026	505143	329745	65	Pass
0.0027	489963	319495	65	Pass
0.0028	475448	309690	65	Pass
0.0029	461543	300604	65	Pass
0.0030	448025	291906	65	Pass
0.0031	435061	283374	65	Pass
0.0032	422430	275175	65	Pass
0.0033	410297	267419	65	Pass
0.0035	398552	259884	65	Pass
0.0036	387195	252959	65	Pass
0.0037	376447	246090	65	Pass
0.0038	366143	239608	65	Pass
0.0039	356282	233347	65	Pass
0.0040	346642	227198	65	Pass
0.0041	337390	221381	65	Pass
0.0042	328415	215675	65	Pass
0.0043	319772	210135	65	Pass
0.0044	311462	204927	65	Pass
0.0045	303208	199775	65	Pass
0.0046	295396	194733	65	Pass
0.0047	287806	189913	65	Pass
0.0048	280493	185204	66	Pass
0.0049	273513	180717	66	Pass
0.0050	266643	176285	66	Pass
0.0051	259995	172074	66	Pass
0.0052	253569	167975	66	Pass
0.0053	247198	163820	66	Pass
0.0054	241159	159942	66	Pass
0.0056	235342	156119	66	Pass
0.0057	229636	152518	66	Pass
0.0058	223985	149028	66	Pass
0.0059	218500	145482	66	Pass
0.0060	213182	142213	66	Pass
0.0061	208029	138889	66	Pass
0.0062	202988	135621	66	Pass
0.0063	198113	132352	66	Pass
0.0064	193404	129416	66	Pass
0.0065	188750	126480	67	Pass
0.0066	184263	123599	67	Pass
0.0067	180052	120773	67	Pass
0.0068	175952	118114	67	Pass
0.0069	171964	115400	67	Pass
0.0070	167975	112740	67	Pass
0.0071	164152	110136	67	Pass
0.0072	160496	107699	67	Pass
0.0073	156895	105317	67	Pass
0.0074	153349	102824	67	Pass

0.0075	149970	100497	67	Pass
0.0077	146590	98225	67	Pass
0.0078	143321	96009	66	Pass
0.0079	140164	93793	66	Pass
0.0080	137006	91633	66	Pass
0.0081	133903	89638	66	Pass
0.0082	130967	87588	66	Pass
0.0083	128031	85649	66	Pass
0.0084	125150	83766	66	Pass
0.0085	122380	81938	66	Pass
0.0086	119610	80165	67	Pass
0.0087	116951	78337	66	Pass
0.0088	114347	76619	67	Pass
0.0089	111854	74902	66	Pass
0.0090	109416	73240	66	Pass
0.0091	107034	71633	66	Pass
0.0092	104763	70082	66	Pass
0.0093	102491	68475	66	Pass
0.0094	100331	66924	66	Pass
0.0095	98170	65594	66	Pass
0.0097	96120	64099	66	Pass
0.0098	94015	62714	66	Pass
0.0099	92076	61329	66	Pass
0.0100	90137	59943	66	Pass
0.0101	88309	58614	66	Pass
0.0102	86536	57395	66	Pass
0.0103	84597	56010	66	Pass
0.0104	82879	54902	66	Pass
0.0105	81162	53733	66	Pass
0.0106	79555	52620	66	Pass
0.0107	77893	51462	66	Pass
0.0108	76397	50370	65	Pass
0.0109	74735	49262	65	Pass
0.0110	73350	48232	65	Pass
0.0111	71855	47151	65	Pass
0.0112	70525	46176	65	Pass
0.0113	69029	45113	65	Pass
0.0114	67755	44149	65	Pass
0.0115	66370	43118	64	Pass
0.0116	65151	42237	64	Pass
0.0118	63877	41251	64	Pass
0.0119	62714	40415	64	Pass
0.0120	61495	39528	64	Pass
0.0121	60331	38764	64	Pass
0.0122	59112	37861	64	Pass
0.0123	58004	37130	64	Pass
0.0124	56841	36276	63	Pass

Duration Flows

The Facility PASSED

Flow(cfs)	Predev	Mit	Percentage	Pass/Fail
0.0124	56841	36276	63	Pass
0.0129	52475	32914	62	Pass
0.0133	48392	29833	61	Pass
0.0138	44609	27052	60	Pass
0.0143	41268	24615	59	Pass
0.0148	38249	22371	58	Pass
0.0152	35523	20387	57	Pass
0.0157	32980	18520	56	Pass
0.0162	30526	16903	55	Pass
0.0167	28459	15429	54	Pass
0.0171	26509	14061	53	Pass
0.0176	24747	12825	51	Pass
0.0181	23146	11762	50	Pass
0.0186	21684	10792	49	Pass
0.0190	20349	9922	48	Pass
0.0195	19080	9091	47	Pass
0.0200	17856	8343	46	Pass
0.0205	16731	7673	45	Pass
0.0210	15612	7036	45	Pass
0.0214	14620	6426	43	Pass
0.0219	13728	5911	43	Pass
0.0224	12881	5451	42	Pass
0.0229	12094	5006	41	Pass
0.0233	11396	4611	40	Pass
0.0238	10659	4241	39	Pass
0.0243	10000	3930	39	Pass
0.0248	9357	3649	38	Pass
0.0252	8753	3419	39	Pass
0.0257	8205	3176	38	Pass
0.0262	7723	2965	38	Pass
0.0267	7241	2773	38	Pass
0.0271	6792	2583	38	Pass
0.0276	6415	2429	37	Pass
0.0281	6111	2282	37	Pass
0.0286	5834	2137	36	Pass
0.0291	5551	2004	36	Pass
0.0295	5271	1870	35	Pass
0.0300	5005	1751	34	Pass
0.0305	4782	1654	34	Pass
0.0310	4532	1557	34	Pass
0.0314	4339	1462	33	Pass
0.0319	4157	1390	33	Pass
0.0324	3937	1310	33	Pass
0.0329	3713	1229	33	Pass
0.0333	3537	1150	32	Pass
0.0338	3364	1073	31	Pass
0.0343	3227	1009	31	Pass
0.0348	3088	956	30	Pass
0.0352	2965	899	30	Pass
0.0357	2851	840	29	Pass
0.0362	2738	783	28	Pass
0.0367	2599	743	28	Pass
0.0371	2477	699	28	Pass

0.0376	2357	664	28	Pass
0.0381	2263	635	28	Pass
0.0386	2159	598	27	Pass
0.0391	2056	567	27	Pass
0.0395	1949	546	28	Pass
0.0400	1837	515	28	Pass
0.0405	1748	485	27	Pass
0.0410	1659	453	27	Pass
0.0414	1578	433	27	Pass
0.0419	1510	410	27	Pass
0.0424	1443	383	26	Pass
0.0429	1367	364	26	Pass
0.0433	1297	347	26	Pass
0.0438	1241	326	26	Pass
0.0443	1182	305	25	Pass
0.0448	1129	288	25	Pass
0.0452	1079	269	24	Pass
0.0457	1026	255	24	Pass
0.0462	979	244	24	Pass
0.0467	922	231	25	Pass
0.0471	872	220	25	Pass
0.0476	819	213	26	Pass
0.0481	771	206	26	Pass
0.0486	718	193	26	Pass
0.0491	668	174	26	Pass
0.0495	629	165	26	Pass
0.0500	588	159	27	Pass
0.0505	549	152	27	Pass
0.0510	507	142	28	Pass
0.0514	472	138	29	Pass
0.0519	427	126	29	Pass
0.0524	392	116	29	Pass
0.0529	363	113	31	Pass
0.0533	329	108	32	Pass
0.0538	300	105	35	Pass
0.0543	281	101	35	Pass
0.0548	264	99	37	Pass
0.0552	248	97	39	Pass
0.0557	233	95	40	Pass
0.0562	218	91	41	Pass
0.0567	205	88	42	Pass
0.0572	186	83	44	Pass
0.0576	163	78	47	Pass
0.0581	142	73	51	Pass
0.0586	129	70	54	Pass
0.0591	117	69	58	Pass
0.0595	105	68	64	Pass

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 Parking Lot POC	☒	251.91	276.82	276.82	☒	100.00	276.82	100.00	Treat. Credit
Total Volume Infiltrated		251.91	276.82	276.82		100.00	276.82	277 / 277 = 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



Pre-Dev
1.10ac

Mitigated Schematic



Predeveloped UCI File

RUN

GLOBAL

```
WWM4 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 Pavement2024.03.wdm
MESSU    25      Pre20083 Permeable Pavement2024.03.MES
          27      Pre20083 Permeable Pavement2024.03.L61
          28      Pre20083 Permeable Pavement2024.03.L62
          30      POC20083 Permeable Pavement2024.031.dat
```

END FILES

OPN SEQUENCE

INGRP INDELT 00:15

```
PERLND    10
COPY      501
DISPLY     1
```

END INGRP

END OPN SEQUENCE

DISPLY

DISPLY-INF01

```
# - #<-----Title----->***TRAN PIVL DIG1 FIL1 PYR DIG2 FIL2 YRND
1      Pre-Dev      MAX      1      2      30      9
```

END DISPLY-INF01

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 ***
```

```
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
```

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      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 KVARV 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		1.096		COPY 501	12	
PERLND 10		1.096		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	***	ODGTFG for each	***	FUNCT for each	***
# - #	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
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	IFW0		0.083333	COPY	INPUT	MEAN
END MASS-LINK		13					

END MASS-LINK

END RUN

Mitigated UCI File

RUN

GLOBAL

WWM4 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 Pavement2024.03.wdm
MESSU 25 Mit20083 Permeable Pavement2024.03.MES
27 Mit20083 Permeable Pavement2024.03.L61
28 Mit20083 Permeable Pavement2024.03.L62
30 POC20083 Permeable Pavement2024.031.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-INF01

- #<-----Title----->***TRAN PIVL DIG1 FIL1 PYR DIG2 FIL2 YRND
1 Permeable Parkling Lot MAX 1 2 30 9

END DISPLY-INF01

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	*****	PIVL	PYR
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      4      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          0.3026      IMPLND  16      54
PERLND  38          0.3026      IMPLND  16      55
Curbing***
IMPLND  17          0.0172      IMPLND  16      53
IMPLND  16          0.641       RCHRES   1      5
Bypass***
PERLND  13          0.13        COPY    501     12
PERLND  13          0.13        COPY    601     12
PERLND  13          0.13        COPY    501     13
PERLND  13          0.13        COPY    601     13
IMPLND   1          0.084       COPY    501     15
IMPLND   1          0.084       COPY    601     15
IMPLND  11          0.036       COPY    501     15
IMPLND  11          0.036       COPY    601     15

*****Routing*****
PERLND  38          0.194       COPY     1      12
PERLND  38          0.194       COPY     1      13
IMPLND  17          0.011       COPY     1      15

```

RCHRES 1
END SCHEMATIC

1 COPY 501 17

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 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 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 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 0.641010 0.000000 0.000000 0.000000  
0.019444 0.641010 0.001870 0.000000 0.064635  
0.038889 0.641010 0.003739 0.000000 0.064635  
0.058333 0.641010 0.005609 0.000000 0.064635  
0.077778 0.641010 0.007478 0.000000 0.064635  
0.097222 0.641010 0.009348 0.000000 0.064635
```

0.116667	0.641010	0.011218	0.000000	0.064635
0.136111	0.641010	0.013087	0.000000	0.064635
0.155556	0.641010	0.014957	0.000000	0.064635
0.175000	0.641010	0.016827	0.000000	0.064635
0.194444	0.641010	0.018696	0.000000	0.064635
0.213889	0.641010	0.020566	0.000000	0.064635
0.233333	0.641010	0.022435	0.000000	0.064635
0.252778	0.641010	0.024305	0.000000	0.064635
0.272222	0.641010	0.026175	0.000000	0.064635
0.291667	0.641010	0.028044	0.000000	0.064635
0.311111	0.641010	0.029914	0.000000	0.064635
0.330556	0.641010	0.031783	0.000000	0.064635
0.350000	0.641010	0.033653	0.000000	0.064635
0.369444	0.641010	0.035523	0.000000	0.064635
0.388889	0.641010	0.037392	0.000000	0.064635
0.408333	0.641010	0.039262	0.000000	0.064635
0.427778	0.641010	0.041131	0.000000	0.064635
0.447222	0.641010	0.043001	0.000000	0.064635
0.466667	0.641010	0.044871	0.000000	0.064635
0.486111	0.641010	0.046740	0.000000	0.064635
0.505556	0.641010	0.048610	0.000000	0.064635
0.525000	0.641010	0.050480	0.000000	0.064635
0.544444	0.641010	0.052349	0.000000	0.064635
0.563889	0.641010	0.054219	0.000000	0.064635
0.583333	0.641010	0.056088	0.000000	0.064635
0.602778	0.641010	0.057958	0.000000	0.064635
0.622222	0.641010	0.059828	0.000000	0.064635
0.641667	0.641010	0.061697	0.000000	0.064635
0.661111	0.641010	0.063567	0.000000	0.064635
0.680556	0.641010	0.065436	0.000000	0.064635
0.700000	0.641010	0.067306	0.000000	0.064635
0.719444	0.641010	0.069176	0.000000	0.064635
0.738889	0.641010	0.071045	0.000000	0.064635
0.758333	0.641010	0.083509	0.000000	0.064635
0.777778	0.641010	0.095973	0.000000	0.064635
0.797222	0.641010	0.108438	0.000000	0.064635
0.816667	0.641010	0.120902	0.000000	0.064635
0.836111	0.641010	0.133366	0.000000	0.064635
0.855556	0.641010	0.145830	0.000000	0.064635
0.875000	0.641010	0.158294	0.000000	0.064635
0.894444	0.641010	0.170758	0.000000	0.064635
0.913889	0.641010	0.183222	0.000000	0.064635
0.933333	0.641010	0.195686	0.000000	0.064635
0.952778	0.641010	0.208150	0.000000	0.064635
0.972222	0.641010	0.220614	0.000000	0.064635
0.991667	0.641010	0.233078	0.000000	0.064635
1.011111	0.641010	0.245543	0.065171	0.064635
1.030556	0.641010	0.258007	0.297205	0.064635
1.050000	0.641010	0.270471	0.622122	0.064635
1.069444	0.641010	0.282935	1.018303	0.064635
1.088889	0.641010	0.295399	1.474660	0.064635
1.108333	0.641010	0.307863	1.984101	0.064635
1.127778	0.641010	0.320327	2.541579	0.064635
1.147222	0.641010	0.332791	3.143263	0.064635
1.166667	0.641010	0.345255	3.786115	0.064635
1.186111	0.641010	0.357719	4.467650	0.064635
1.205556	0.641010	0.370183	5.185785	0.064635
1.225000	0.641010	0.382648	5.938742	0.064635
1.244444	0.641010	0.395112	6.724979	0.064635
1.263889	0.641010	0.407576	7.543143	0.064635
1.283333	0.641010	0.420040	8.392033	0.064635
1.302778	0.641010	0.432504	9.270575	0.064635
1.322222	0.641010	0.444968	10.17780	0.064635
1.341667	0.641010	0.457432	11.11283	0.064635
1.361111	0.641010	0.469896	12.07486	0.064635
1.380556	0.641010	0.482360	13.06315	0.064635
1.400000	0.641010	0.494824	14.07702	0.064635
1.419444	0.641010	0.507288	15.11584	0.064635
1.438889	0.641010	0.519753	16.17903	0.064635
1.458333	0.641010	0.532217	17.26604	0.064635

1.477778	0.641010	0.544681	18.37636	0.064635
1.497222	0.641010	0.557145	19.50952	0.064635
1.516667	0.641010	0.569609	20.66504	0.064635
1.536111	0.641010	0.582073	21.84253	0.064635
1.555556	0.641010	0.594537	23.04156	0.064635
1.575000	0.641010	0.607001	24.26177	0.064635
1.594444	0.641010	0.619465	25.50278	0.064635
1.613889	0.641010	0.631929	26.76427	0.064635
1.633333	0.641010	0.644393	28.04589	0.064635
1.652778	0.641010	0.656858	29.34734	0.064635
1.672222	0.641010	0.669322	30.66832	0.064635
1.691667	0.641010	0.681786	32.00855	0.064635
1.711111	0.641010	0.694250	33.36775	0.064635
1.730556	0.641010	0.706714	34.74566	0.064635
1.750000	0.641010	0.719178	36.14203	0.064635

END FTABLE 1
END FTABLES

EXT SOURCES

<-Volume-> <Name>	<Member> #	SsysSgap #	<-Mult-->Tran strg	<-Target <Name>	vols #	<-Grp> #	<-Member-> <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-> <Name>	<-Grp> #	<-Member-> <Name>	<-Mult-->Tran #	<-Volume-> <Name>	<Member> #	Tsys #	Tgap #	Amd strg	*** strg
COPY	1	OUTPUT	MEAN 1 1	WDM	701	FLOW	ENGL	REPL	
COPY	501	OUTPUT	MEAN 1 1	WDM	801	FLOW	ENGL	REPL	
COPY	601	OUTPUT	MEAN 1 1	WDM	901	FLOW	ENGL	REPL	

END EXT TARGETS

MASS-LINK

<Volume> <Name>	<-Grp> #	<-Member-> <Name>	<-Mult--> #	<Target> <Name>	<-Grp> #	<-Member-> <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	IFW0	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	IFW0		IMPLND	EXTNL	SURLI	

END MASS-LINK 55

END MASS-LINK

END RUN

Predeveloped HSPF Message File

Disclaimer

Legal Notice

This program and accompanying documentation are provided 'as-is' without warranty of any kind. The entire risk regarding the performance and results of this program is assumed by End User. Clear Creek Solutions Inc. and the governmental licensee or sublicensees disclaim all warranties, either expressed or implied, including but not limited to implied warranties of program and accompanying documentation. In no event shall Clear Creek Solutions Inc. be liable for any damages whatsoever (including without limitation to damages for loss of business profits, loss of business information, business interruption, and the like) arising out of the use of, or inability to use this program even if Clear Creek Solutions Inc. or their authorized representatives have been advised of the possibility of such damages. Software Copyright © by : Clear Creek Solutions, Inc. 2005-2024; All Rights Reserved.

Clear Creek Solutions, Inc.
6200 Capitol Blvd. Ste F
Olympia, WA. 98501
Toll Free 1(866)943-0304
Local (360)943-0304

www.clearcreeksolutions.com

Channel Report

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

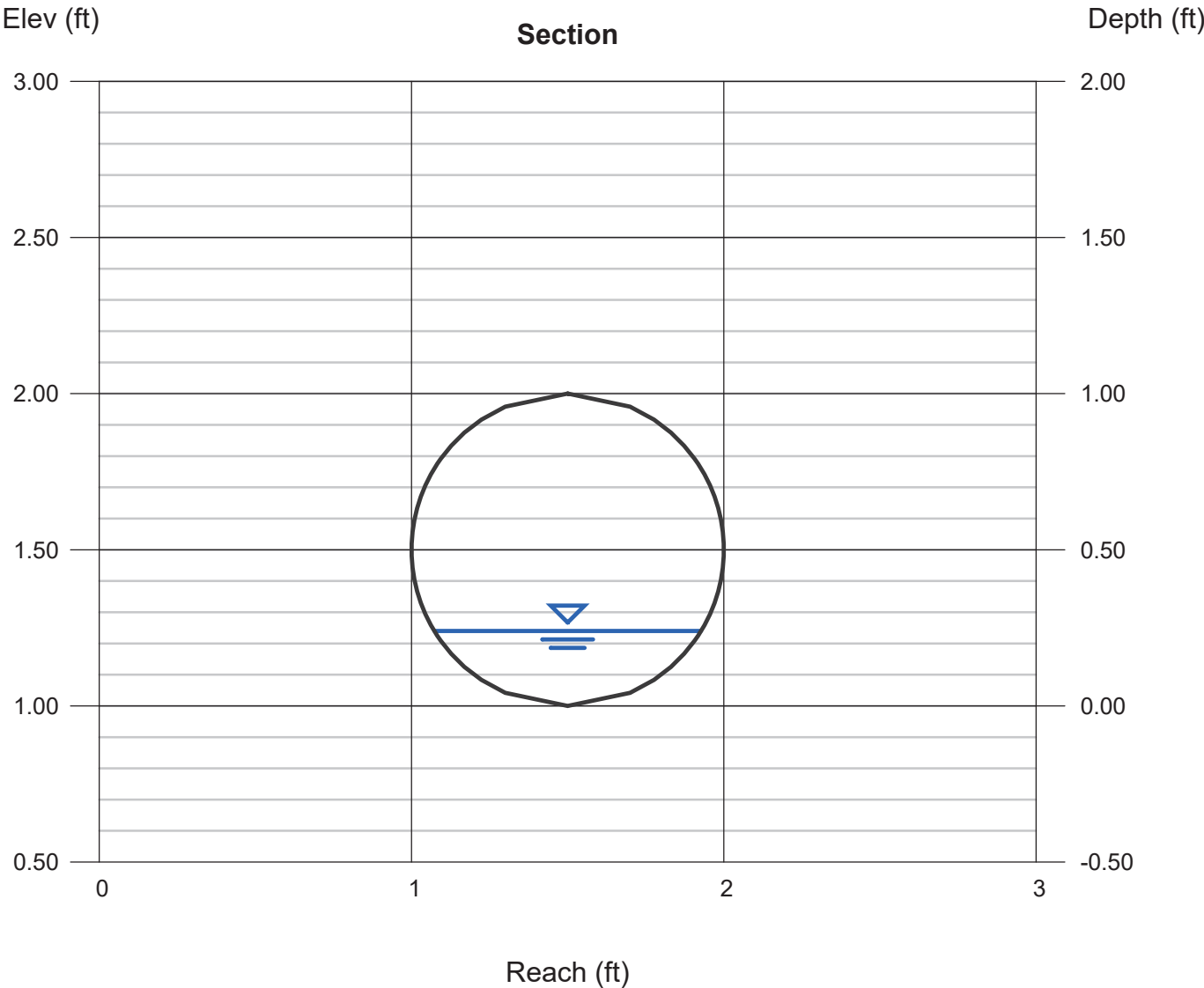
Velocity (ft/s) = 2.28

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

SOIL CLASSIFICATION SYSTEM

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

NOTES:

- Field classification is based on visual examination of soil in general accordance with ASTM D2488-90.
- Soil classification using laboratory tests is based on ASTM D2487-90.
- 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



4809 Pacific Hwy. E. | Fife, WA 98424 | 253.896.1011 | www.georesources.rocks

Unified Soils Classification System

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

DocID: CES.ProVac.InterAve.F

December 2021

Figure A-1

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



4809 Pacific Hwy. E. | Fife, WA 98424 | 253.896.1011 | www.georesources.rocks

Test Pit Logs

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

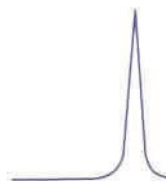
DocID: CES.ProVac.InterAve.F

December 2021

Figure A-2

Appendix B

Laboratory Results



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

<u>Client ID</u>	<u>Spectra #</u>	<u>Analyte</u>	<u>Result</u>	<u>Units</u>	<u>Method</u>	<u>Analyzed</u>
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

Appendix C

Groundwater Monitoring Logs

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

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	Unaccessible

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

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

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

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	Unaccessible

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 was 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

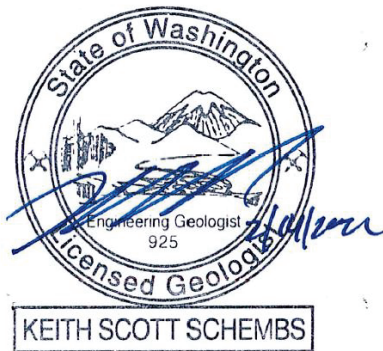
We trust that this is sufficient for your needs. If you have any questions regarding the content of this letter, please call.

Yours very truly

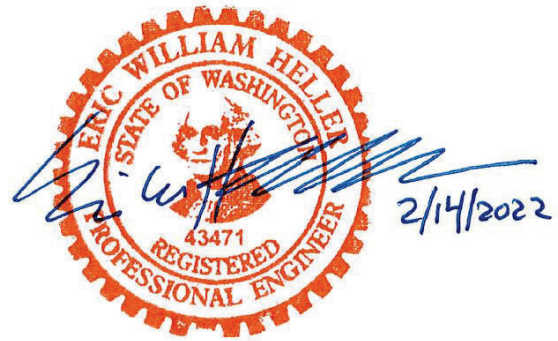
GeoResources, LLC



Andrew Schnitger, EIT
Engineer in Training



Keith Schembs, LEG
Principal



Eric W. Heller, PE, LG
Senior Geotechnical Engineer