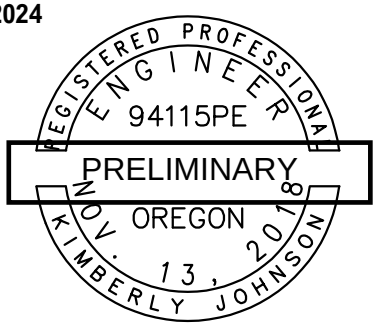
PRELIMINARY STORMWATER MANAGEMENT REPORT

FOR

THE SUBDIVISION
at
6225 McLeod Lane NE
Keizer, OR.

January 19, 2024



PREPARED BY:

7 OAKS ENGINEERING, INC.
Kim Johnson, P.E.
345 Westfield St. #107
Silverton, Or. 97381
503.308.8554
kim@7oaksengineering.com

Contents

APPENDICES

I. PURPOSE OF REPORT

This report describes the proposed improvements compliance with the City of Keizer's Design Standards (February 2023)-Chapter 400.

II. PROJECT DESCRIPTION

The site is located at 6255 Mcleod Lane NE in Keizer. The property by McLeod Lane NE to the East, and private property to the north, south, and west.

A. EXISTING CONDITION

The existing site is currently developed with what appears to be an abandoned single-family home.

The existing site is not located within a FEMA flood zone per FEMA flood map 41047C0194G, effective 1/19/2000.

B. PROPOSED CONDITION

The proposed development includes a 6-lot subdivision and a lot for the private access street. This application is for the subdivision only and infrastructure improvements only. The proposed residential structures will be part of a future application, however, the stormwater design has been master planned for the entire residential site development.

The proposed site will need to alter the natural drainage pattern slightly to direct runoff towards the proposed stormwater planters. Ultimately the runoff will discharge to McLeod public storm drain main.

GEOTECHNICAL FINDINGS

Based on the Geotechnical Report from GeoPacific Project No. 23-6474 on January 16, 2024, groundwater was not encountered at a depth of 10 however, depths of groundwater have been recorded from 15 to 30 feet. Infiltration rate were tested at depth of 4.5-ft at a rate of 0.0 in/hr and a depth of 9-ft at a rate of 0.48 in/hr.

For the purposes of this stormwater report, infiltration was not a viable solution, given the depth to a low permeability soil, as well as the provided groundwater table.

III. METHODOLOGY

The City of Keizer's Design Standards (February 2023)-Chapter 400 were implemented for the design of the onsite stormwater system, as follows:

Projects greater than 5,000 square feet of new or replaced impervious surface are required to meet the full requirements for treatment, flow control, and retention of stormwater as provided below. This proposed project exceeds this new or replaced 5,000 square foot of impervious area.

Stormwater Treatment

The entire WQE will be required to retain and treat and shall conform to NPDES, TMDL and WPCF requirements and reduce the discharge of the listed pollutants to the Waters of the State. All treatment facilities will be designed to utilize the GSI to the MEF.

Stormwater Retention

The hierarchy to be followed in determining project specific appliable facility retention requirements based on the Design Infiltration Rates for the site or the Point of Connection as follows;

1. Design Infiltration Rate greater than 2 inches per hour:

The project facility shall retain and treat the entire WQE. The project facility shall retain all stormwater runoff up to and including the 100-year design storm event with no release allowed.

2. Project is located in an Unserved Stormwater Area (regardless of design infiltration rate):

The project facility shall retain and treat the entire WQE. The project facility shall retain all stormwater runoff from design storm events up to and including the 100-year design storm event with no release allowed.

3. Design Infiltration Rate between 0.75 inches and 2 inches per hour:

The facility shall retain and treat the entire WQE. In addition, the facility shall retain stormwater runoff for the 5-year, 10-year, 25-year design storm events with an allowable release rate up to the predeveloped 5-year design storm event. Runoff for the 50-year and 100-year design storm events shall be retained with an allowable release rate up to the predeveloped 25-year design storm event.

4. Design Infiltration Rate less than 0.75 inches per hour:

The facility shall retain and treat the entire WQE to the MEF. The facility shall also retain stormwater runoff for the 5-year, 10-year, 25-year, 50-year, and 100-year design storm events, not allowing any increase in runoff for all storm events listed.

5. "Critical Basin" Point of Connection (regardless of design infiltration rate):

The facility shall retain and treat the entire WQE to the MEF. The facility shall also retain stormwater runoff for the 2-year, 5-year, 10-year, 25- year, 50-year, and 100-year design storm events, not allowing any increase in runoff all storm events listed.

Based on the infiltration rate listed above, **Item 4** is applicable to our site.

IV. CALCULATIONS

Two methods for sizing stormwater facilities may be used;
1. The Simplified Method, and
2. The Engineered Method.

Due to the overall site area constraints for the stormwater design, the Engineered Method was utilized for the sizing of the infiltration unit, as demonstrated below.

Method: Santa Barbara Urban Hydrograph (SBUH) Method
Program: HydroCAD 10.20-2g
Storm Event: Type 1-A 24-Hour Rainfall Distribution:

Water Quality Event: 1.38 inches
2-year Event: 2.20 inches
5-year Event: 2.70 inches
10-year Event: 3.20 inches
25-year Event: 3.60 inches
50-year Event: 4.10 inches
100-year Event: 4.40 inches

Tc: Minimum 5 Min
Soil Group: G*roup D*

Curve Number:

Land Cover Category	Curve Numbers for Hydrologic Soil Group			
	A	B	C	D
Impervious Surface	**98**	**98**	**98**	**98**
Pervious Land Cover				
Pre-developed	35	58	72	79
Unamended Soils	72	82	87	89
Amended Soils	39	61	74	80

V. SUMMARY

Planter strip swales are proposed at the east side of the property. The proposed site will be raised slightly to direct runoff towards the proposed planter strip swales, that treat and store the required runoff while slowly releasing into the existing city storm drain main in McLeod.

Below is a summary of the calculations.

CATCHMENT AND FACILITY TABLE						
CATCHMENT/ FACILITY ID	**TOTAL AREA (SF)/(AC.)**	**IMPERVIOUS AREA (SF)**	**PERVIOUS AREA (SF)**	**OWNERSHIP (PRIVATE/ PUBLIC)**	**FACILITY TYPE**	**FACILITY SIZE**
A	41,839	28,416	13,423	PRIVATE	Planter Strip Swale	1,500

*Impervious Improvements + (60% Impervious of Each Lot)

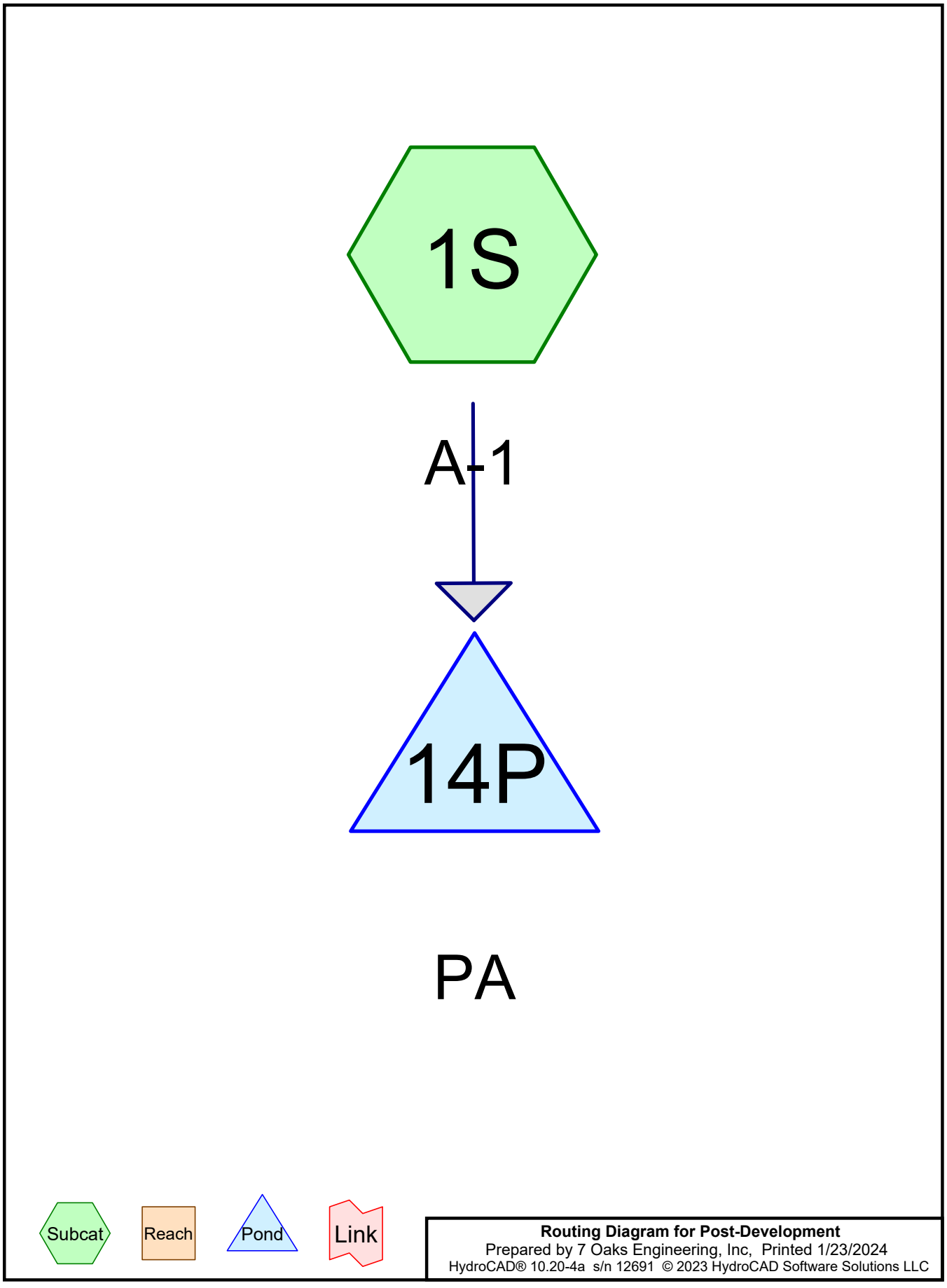
PRE VS. POST CONSTRUCTION FLOW RATES												
FACILITY ID	**PEAK FLOW RATE (CFS)**											
	2-YEAR STORM		**5 YEAR STORM**		**10 YEAR STORM**		**25 YEAR STORM**		**50 YEAR STORM**		**100 YEAR STORM**	
PROJECT SITE	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST
A	0.08	0.08	0.14	0.12	0.21	0.2	0.28	0.25	0.36	0.3	0.41	0.32

WATER QUALITY TREATMENT REQUIREMENTS				
CATCHMENT/ FACILITY ID	**WQV (IN)**	**WQV (CF)**	**80% OF WQV**	**RAIN GARDEN ALLOWABLE VOLUME**
A	1.38	3,006	2,405	3,277

APPENDIX A – MAPS

APPENDIX B – CALCULATIONS

POST DEVELOPMENT



Routing Diagram for Post-Development
Prepared by 7 Oaks Engineering, Inc, Printed 1/23/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr	Type IA 24-hr		Default	24.00	1	2.20	2
2	5-YR	Type IA 24-hr		Default	24.00	1	2.70	2
3	10-Yr	Type IA 24-hr		Default	24.00	1	3.20	2
4	25-YR	Type IA 24-hr		Default	24.00	1	3.60	2
5	50-YR	Type IA 24-hr		Default	24.00	1	4.10	2
6	100-Yr	Type IA 24-hr		Default	24.00	1	4.40	2
7	WQV	Type IA 24-hr		Default	24.00	1	1.38	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.652	98	(1S)
0.308	80	(1S)
0.960	**92**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.960	Other	1S
0.960		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	0.960	0.960		1S
0.000	**0.000**	**0.000**	**0.000**	**0.960**	**0.960**	**TOTAL AREA**	

Time span=0.10-96.00 hrs, dt=0.05 hrs, 1919 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: A-1 Runoff Area=41,839 sf 67.92% Impervious Runoff Depth=1.56"
Tc=5.0 min CN=80/98 Runoff=0.36 cfs 0.125 af

Pond 14P: PA Peak Elev=102.82' Storage=1,771 cf Inflow=0.36 cfs 0.125 af
Primary=0.08 cfs 0.125 af Secondary=0.00 cfs 0.000 af Outflow=0.08 cfs 0.125 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.125 af Average Runoff Depth = 1.56"
32.08% Pervious = 0.308 ac 67.92% Impervious = 0.652 ac

Summary for Subcatchment 1S: A-1

[49] Hint: Tc<2dt may require smaller dt

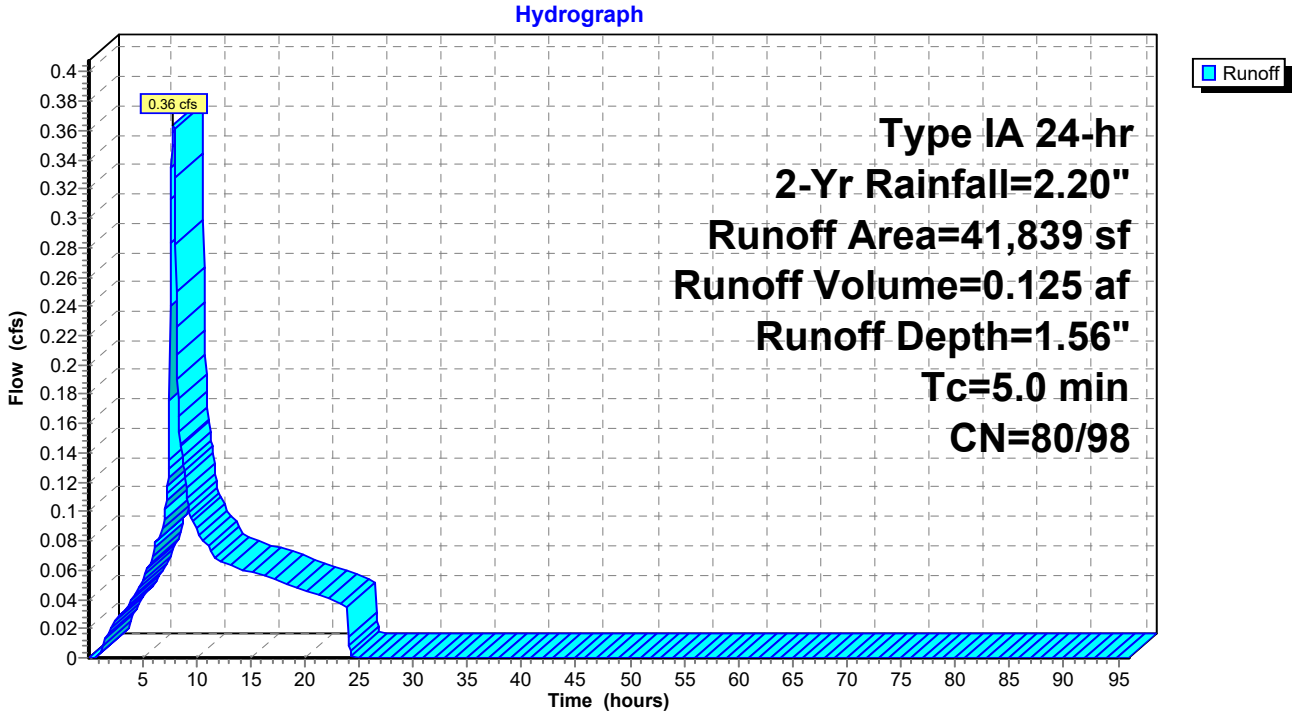
Runoff = 0.36 cfs @ 7.92 hrs, Volume= 0.125 af, Depth= 1.56"
Routed to Pond 14P : PA

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Yr Rainfall=2.20"

	Area (sf)	CN	Description
	28,416	98	
*	13,423	80	
	41,839	92	Weighted Average
	13,423	80	32.08% Pervious Area
	28,416	98	67.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: A-1



Summary for Pond 14P: PA

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.960 ac, 67.92% Impervious, Inflow Depth = 1.56" for 2-Yr event
Inflow = 0.36 cfs @ 7.92 hrs, Volume= 0.125 af
Outflow = 0.08 cfs @ 10.27 hrs, Volume= 0.125 af, Atten= 77%, Lag= 140.8 min
Primary = 0.08 cfs @ 10.27 hrs, Volume= 0.125 af
Secondary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 102.82' @ 10.27 hrs Surf.Area= 1,500 sf Storage= 1,771 cf
Flood Elev= 104.00' Surf.Area= 1,500 sf Storage= 3,277 cf

Plug-Flow detention time= 404.2 min calculated for 0.125 af (100% of inflow)
Center-of-Mass det. time= 404.9 min (1,110.1 - 705.2)

Volume	Invert	Avail.Storage	Storage Description
#1	99.68'	3,277 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

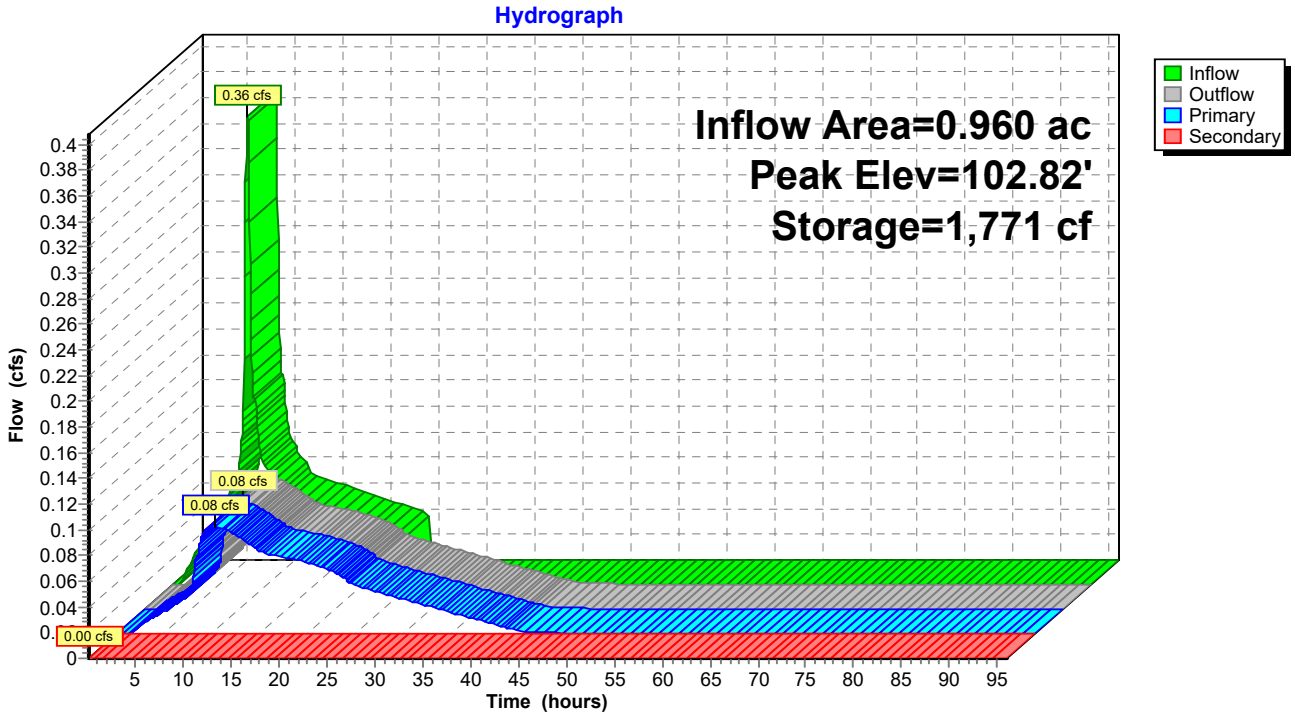
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
99.68	1,500	300.0	0.0	0	0	1,500
101.00	1,500	300.0	40.0	792	792	1,896
101.33	1,500	300.0	40.0	198	990	1,995
102.83	1,500	300.0	35.0	788	1,777	2,445
103.83	1,500	300.0	100.0	1,500	3,277	2,745

Device	Routing	Invert	Outlet Devices
#1	Primary	99.68'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	103.83'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	102.00'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	102.50'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	103.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.08 cfs @ 10.27 hrs HW=102.82' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 8.47 fps)
- **3=Orifice/Grate** (Orifice Controls 0.02 cfs @ 4.24 fps)
- **4=Orifice/Grate** (Orifice Controls 0.01 cfs @ 2.53 fps)
- **5=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.10 hrs HW=99.68' (Free Discharge)
- **2=Orifice/Grate** (Controls 0.00 cfs)

Pond 14P: PA


Hydrograph
Inflow Area=0.960 ac
Peak Elev=102.82'
Storage=1,771 cf
Inflow
Outflow
Primary
Secondary
0.36 cfs
0.08 cfs
0.08 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Time span=0.10-96.00 hrs, dt=0.05 hrs, 1919 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: A-1 Runoff Area=41,839 sf 67.92% Impervious Runoff Depth=2.01"
Tc=5.0 min CN=80/98 Runoff=0.47 cfs 0.161 af

Pond 14P: PA Peak Elev=103.12' Storage=2,212 cf Inflow=0.47 cfs 0.161 af
Primary=0.12 cfs 0.161 af Secondary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.161 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.161 af Average Runoff Depth = 2.01"
32.08% Pervious = 0.308 ac 67.92% Impervious = 0.652 ac

Summary for Subcatchment 1S: A-1

[49] Hint: Tc<2dt may require smaller dt

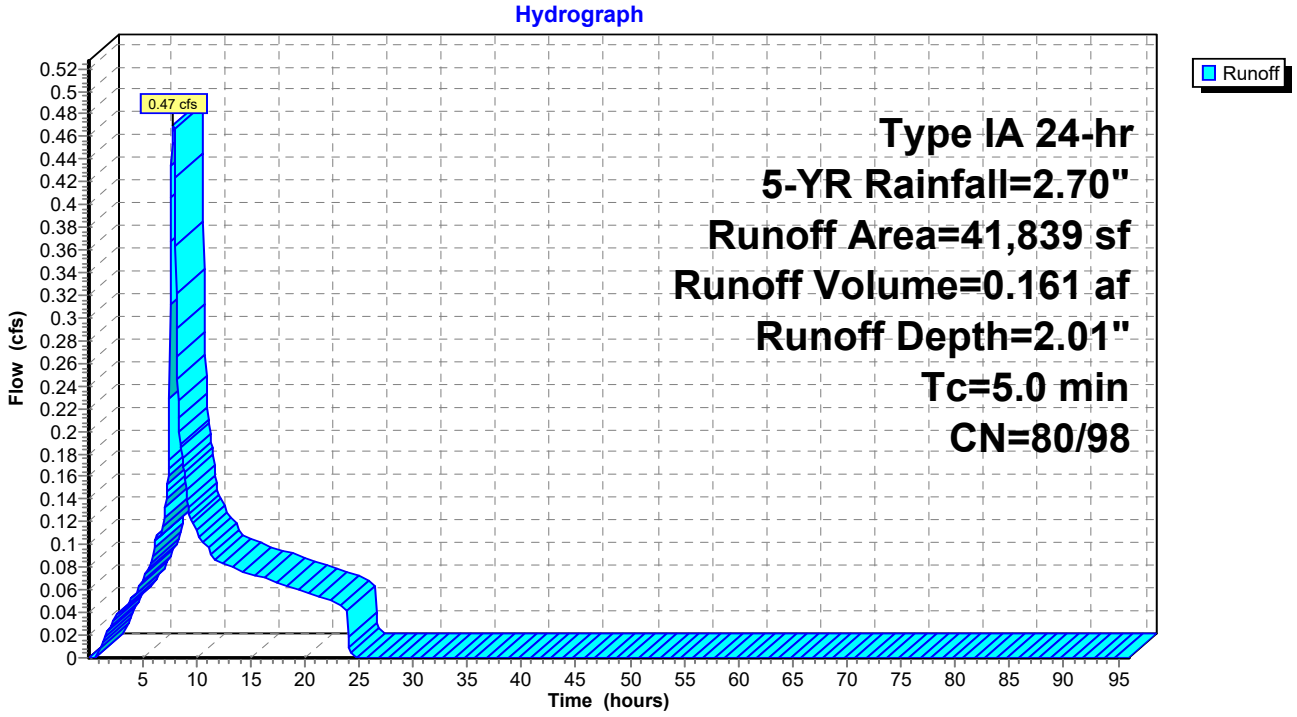
Runoff = 0.47 cfs @ 7.92 hrs, Volume= 0.161 af, Depth= 2.01"
Routed to Pond 14P : PA

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 5-YR Rainfall=2.70"

	Area (sf)	CN	Description
	28,416	98	
*	13,423	80	
	41,839	92	Weighted Average
	13,423	80	32.08% Pervious Area
	28,416	98	67.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: A-1



Summary for Pond 14P: PA

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.960 ac, 67.92% Impervious, Inflow Depth = 2.01" for 5-YR event
Inflow = 0.47 cfs @ 7.92 hrs, Volume= 0.161 af
Outflow = 0.12 cfs @ 9.46 hrs, Volume= 0.161 af, Atten= 74%, Lag= 92.1 min
Primary = 0.12 cfs @ 9.46 hrs, Volume= 0.161 af
Secondary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 103.12' @ 9.46 hrs Surf.Area= 1,500 sf Storage= 2,212 cf
Flood Elev= 104.00' Surf.Area= 1,500 sf Storage= 3,277 cf

Plug-Flow detention time= 373.5 min calculated for 0.161 af (100% of inflow)
Center-of-Mass det. time= 372.9 min (1,072.4 - 699.4)

Volume	Invert	Avail.Storage	Storage Description
#1	99.68'	3,277 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

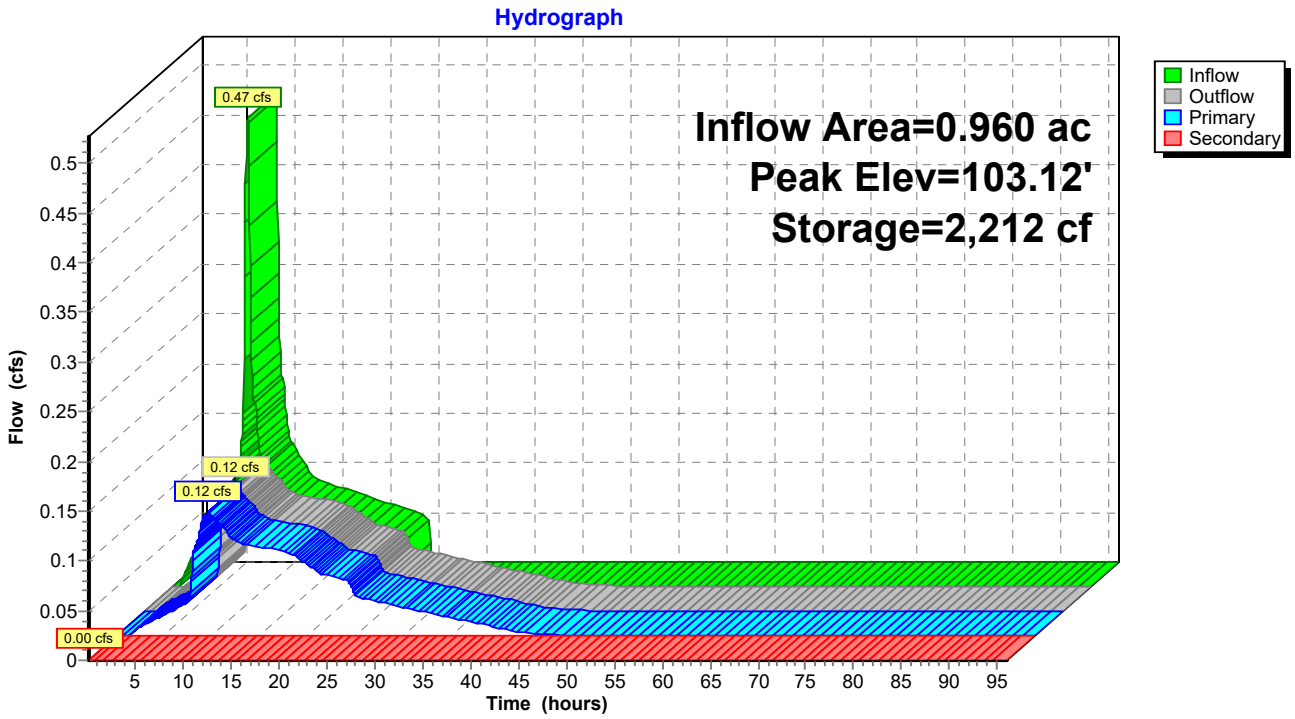
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
99.68	1,500	300.0	0.0	0	0	1,500
101.00	1,500	300.0	40.0	792	792	1,896
101.33	1,500	300.0	40.0	198	990	1,995
102.83	1,500	300.0	35.0	788	1,777	2,445
103.83	1,500	300.0	100.0	1,500	3,277	2,745

Device	Routing	Invert	Outlet Devices
#1	Primary	99.68'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	103.83'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	102.00'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	102.50'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	103.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.12 cfs @ 9.46 hrs HW=103.12' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 8.88 fps)
- **3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.00 fps)
- **4=Orifice/Grate** (Orifice Controls 0.02 cfs @ 3.66 fps)
- **5=Orifice/Grate** (Orifice Controls 0.03 cfs @ 1.18 fps)

Secondary OutFlow Max=0.00 cfs @ 0.10 hrs HW=99.68' (Free Discharge)
- **2=Orifice/Grate** (Controls 0.00 cfs)

Pond 14P: PA


Hydrograph
Inflow Area=0.960 ac
Peak Elev=103.12'
Storage=2,212 cf
Inflow
Outflow
Primary
Secondary
0.47 cfs
0.12 cfs
0.12 cfs
0.00 cfs
Flow (cfs)
Time (hours)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95

Time span=0.10-96.00 hrs, dt=0.05 hrs, 1919 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: A-1 Runoff Area=41,839 sf 67.92% Impervious Runoff Depth=2.47"
Tc=5.0 min CN=80/98 Runoff=0.58 cfs 0.197 af

Pond 14P: PA Peak Elev=103.31' Storage=2,490 cf Inflow=0.58 cfs 0.197 af
Primary=0.20 cfs 0.197 af Secondary=0.00 cfs 0.000 af Outflow=0.20 cfs 0.197 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.197 af Average Runoff Depth = 2.47"
32.08% Pervious = 0.308 ac 67.92% Impervious = 0.652 ac

Summary for Subcatchment 1S: A-1

[49] Hint: Tc<2dt may require smaller dt

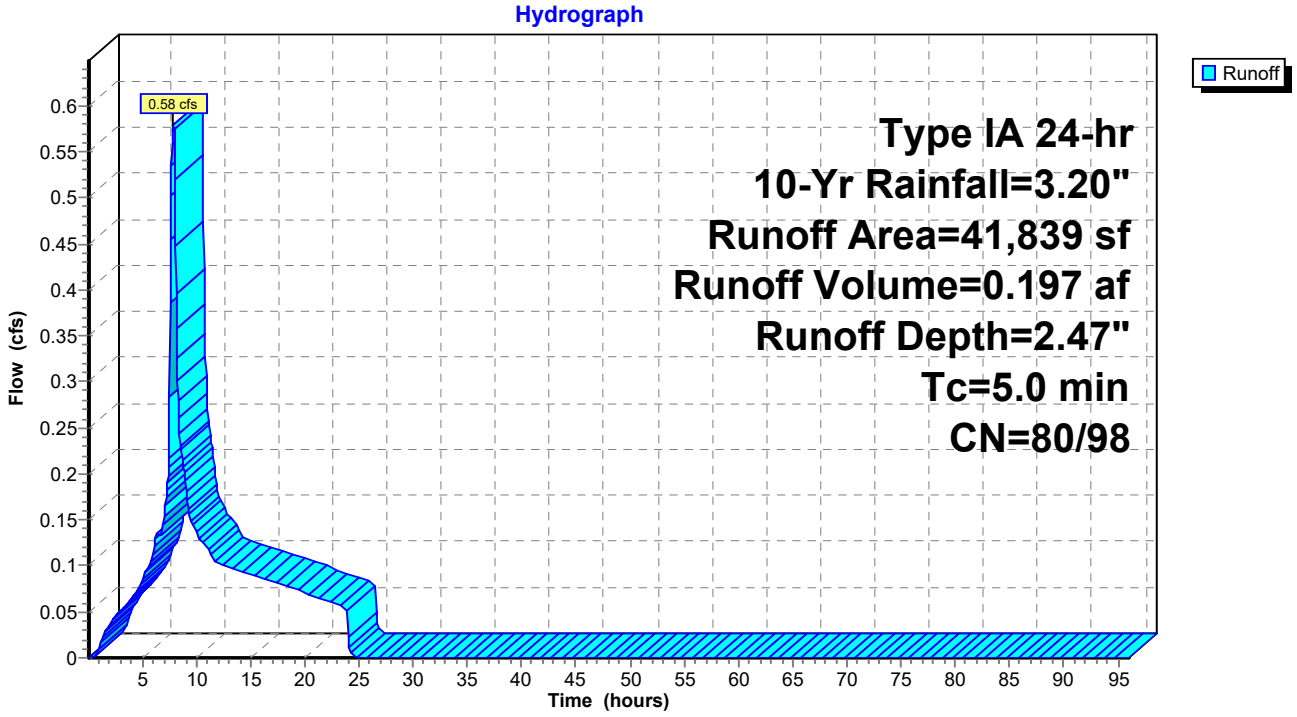
Runoff = 0.58 cfs @ 7.92 hrs, Volume= 0.197 af, Depth= 2.47"
Routed to Pond 14P : PA

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Yr Rainfall=3.20"

	Area (sf)	CN	Description
	28,416	98	
*	13,423	80	
	41,839	92	Weighted Average
	13,423	80	32.08% Pervious Area
	28,416	98	67.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: A-1



Summary for Pond 14P: PA

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.960 ac, 67.92% Impervious, Inflow Depth = 2.47" for 10-Yr event
Inflow = 0.58 cfs @ 7.92 hrs, Volume= 0.197 af
Outflow = 0.20 cfs @ 8.89 hrs, Volume= 0.197 af, Atten= 65%, Lag= 58.3 min
Primary = 0.20 cfs @ 8.89 hrs, Volume= 0.197 af
Secondary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 103.31' @ 8.89 hrs Surf.Area= 1,500 sf Storage= 2,490 cf
Flood Elev= 104.00' Surf.Area= 1,500 sf Storage= 3,277 cf

Plug-Flow detention time= 335.8 min calculated for 0.197 af (100% of inflow)
Center-of-Mass det. time= 336.5 min (1,031.3 - 694.8)

Volume	Invert	Avail.Storage	Storage Description
#1	99.68'	3,277 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

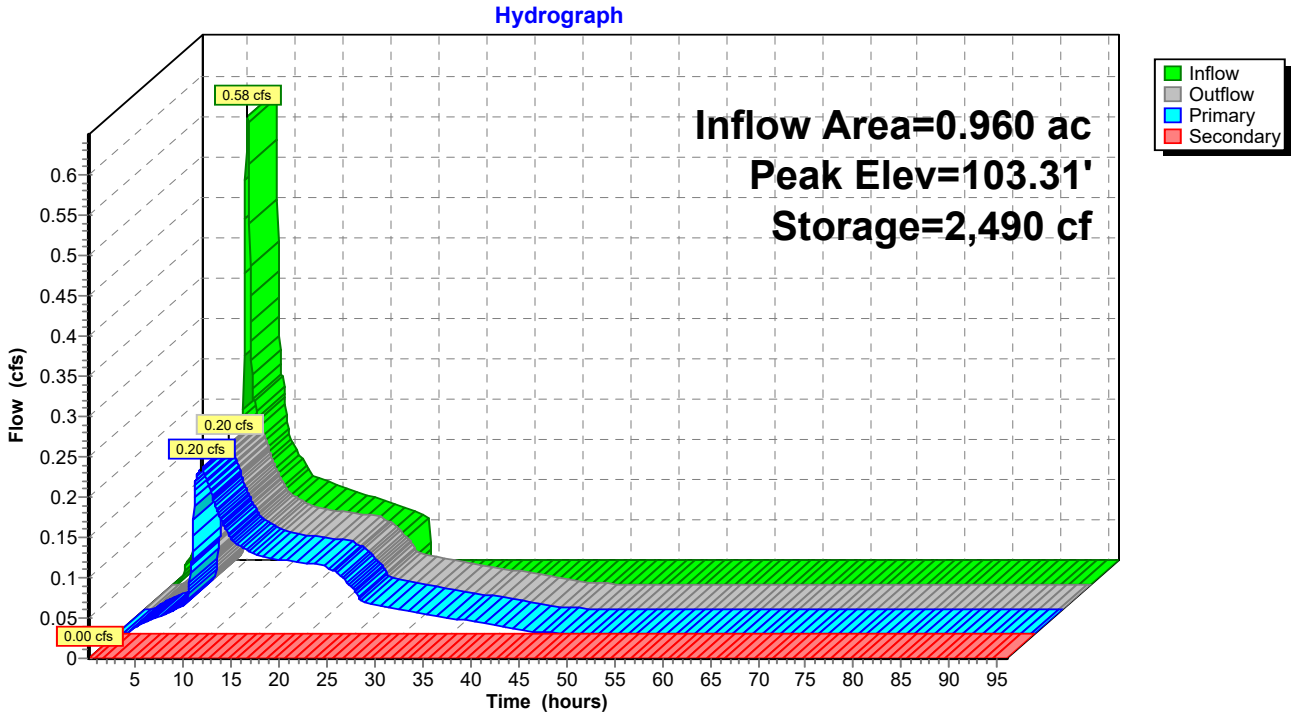
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
99.68	1,500	300.0	0.0	0	0	1,500
101.00	1,500	300.0	40.0	792	792	1,896
101.33	1,500	300.0	40.0	198	990	1,995
102.83	1,500	300.0	35.0	788	1,777	2,445
103.83	1,500	300.0	100.0	1,500	3,277	2,745

Device	Routing	Invert	Outlet Devices
#1	Primary	99.68'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	103.83'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	102.00'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	102.50'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	103.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.20 cfs @ 8.89 hrs HW=103.31' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.11 fps)
- **3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.41 fps)
- **4=Orifice/Grate** (Orifice Controls 0.02 cfs @ 4.21 fps)
- **5=Orifice/Grate** (Orifice Controls 0.10 cfs @ 2.04 fps)

Secondary OutFlow Max=0.00 cfs @ 0.10 hrs HW=99.68' (Free Discharge)
- **2=Orifice/Grate** (Controls 0.00 cfs)

Pond 14P: PA


Hydrograph
Inflow Area=0.960 ac
Peak Elev=103.31'
Storage=2,490 cf
0.58 cfs
0.20 cfs
0.20 cfs
0.00 cfs
Inflow
Outflow
Primary
Secondary
Flow (cfs)
Time (hours)
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0.45
0.5
0.55
0.6
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95

Time span=0.10-96.00 hrs, dt=0.05 hrs, 1919 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: A-1 Runoff Area=41,839 sf 67.92% Impervious Runoff Depth=2.84"
Tc=5.0 min CN=80/98 Runoff=0.67 cfs 0.227 af

Pond 14P: PA Peak Elev=103.49' Storage=2,766 cf Inflow=0.67 cfs 0.227 af
Primary=0.25 cfs 0.227 af Secondary=0.00 cfs 0.000 af Outflow=0.25 cfs 0.227 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.227 af Average Runoff Depth = 2.84"
32.08% Pervious = 0.308 ac 67.92% Impervious = 0.652 ac

Summary for Subcatchment 1S: A-1

[49] Hint: Tc<2dt may require smaller dt

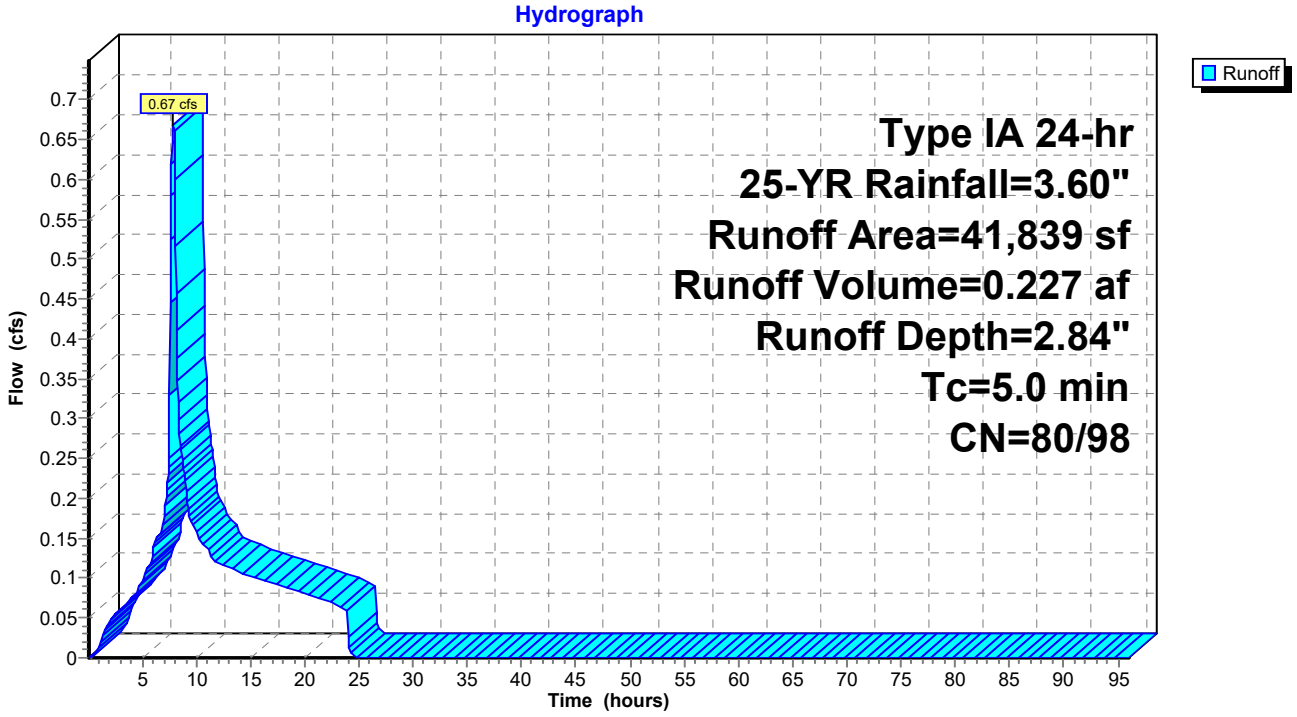
Runoff = 0.67 cfs @ 7.92 hrs, Volume= 0.227 af, Depth= 2.84"
Routed to Pond 14P : PA

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.60"

	Area (sf)	CN	Description
	28,416	98	
*	13,423	80	
	41,839	92	Weighted Average
	13,423	80	32.08% Pervious Area
	28,416	98	67.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: A-1



Summary for Pond 14P: PA

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.960 ac, 67.92% Impervious, Inflow Depth = 2.84" for 25-YR event
Inflow = 0.67 cfs @ 7.92 hrs, Volume= 0.227 af
Outflow = 0.25 cfs @ 8.75 hrs, Volume= 0.227 af, Atten= 63%, Lag= 50.3 min
Primary = 0.25 cfs @ 8.75 hrs, Volume= 0.227 af
Secondary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 103.49' @ 8.75 hrs Surf.Area= 1,500 sf Storage= 2,766 cf
Flood Elev= 104.00' Surf.Area= 1,500 sf Storage= 3,277 cf

Plug-Flow detention time= 313.9 min calculated for 0.227 af (100% of inflow)
Center-of-Mass det. time= 314.6 min (1,006.3 - 691.6)

Volume	Invert	Avail.Storage	Storage Description
#1	99.68'	3,277 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

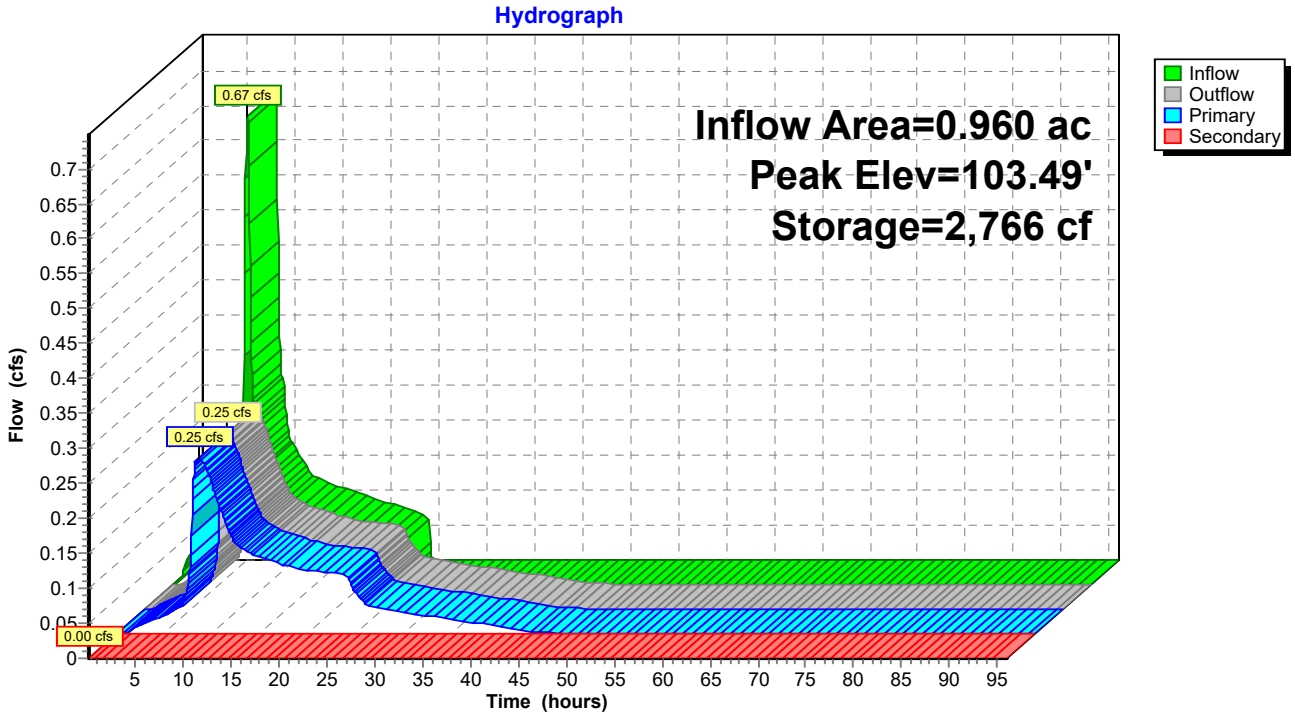
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
99.68	1,500	300.0	0.0	0	0	1,500
101.00	1,500	300.0	40.0	792	792	1,896
101.33	1,500	300.0	40.0	198	990	1,995
102.83	1,500	300.0	35.0	788	1,777	2,445
103.83	1,500	300.0	100.0	1,500	3,277	2,745

Device	Routing	Invert	Outlet Devices
#1	Primary	99.68'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	103.83'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	102.00'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	102.50'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	103.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.25 cfs @ 8.75 hrs HW=103.49' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.35 fps)
- **3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.79 fps)
- **4=Orifice/Grate** (Orifice Controls 0.03 cfs @ 4.69 fps)
- **5=Orifice/Grate** (Orifice Controls 0.14 cfs @ 2.90 fps)

Secondary OutFlow Max=0.00 cfs @ 0.10 hrs HW=99.68' (Free Discharge)
- **2=Orifice/Grate** (Controls 0.00 cfs)

Pond 14P: PA


Hydrograph
Inflow Area=0.960 ac
Peak Elev=103.49'
Storage=2,766 cf
Inflow
Outflow
Primary
Secondary
0.67 cfs
0.25 cfs
0.25 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Time span=0.10-96.00 hrs, dt=0.05 hrs, 1919 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: A-1 Runoff Area=41,839 sf 67.92% Impervious Runoff Depth=3.31"
Tc=5.0 min CN=80/98 Runoff=0.78 cfs 0.265 af

Pond 14P: PA Peak Elev=103.74' Storage=3,141 cf Inflow=0.78 cfs 0.265 af
Primary=0.30 cfs 0.265 af Secondary=0.00 cfs 0.000 af Outflow=0.30 cfs 0.265 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.265 af Average Runoff Depth = 3.31"
32.08% Pervious = 0.308 ac 67.92% Impervious = 0.652 ac

Summary for Subcatchment 1S: A-1

[49] Hint: Tc<2dt may require smaller dt

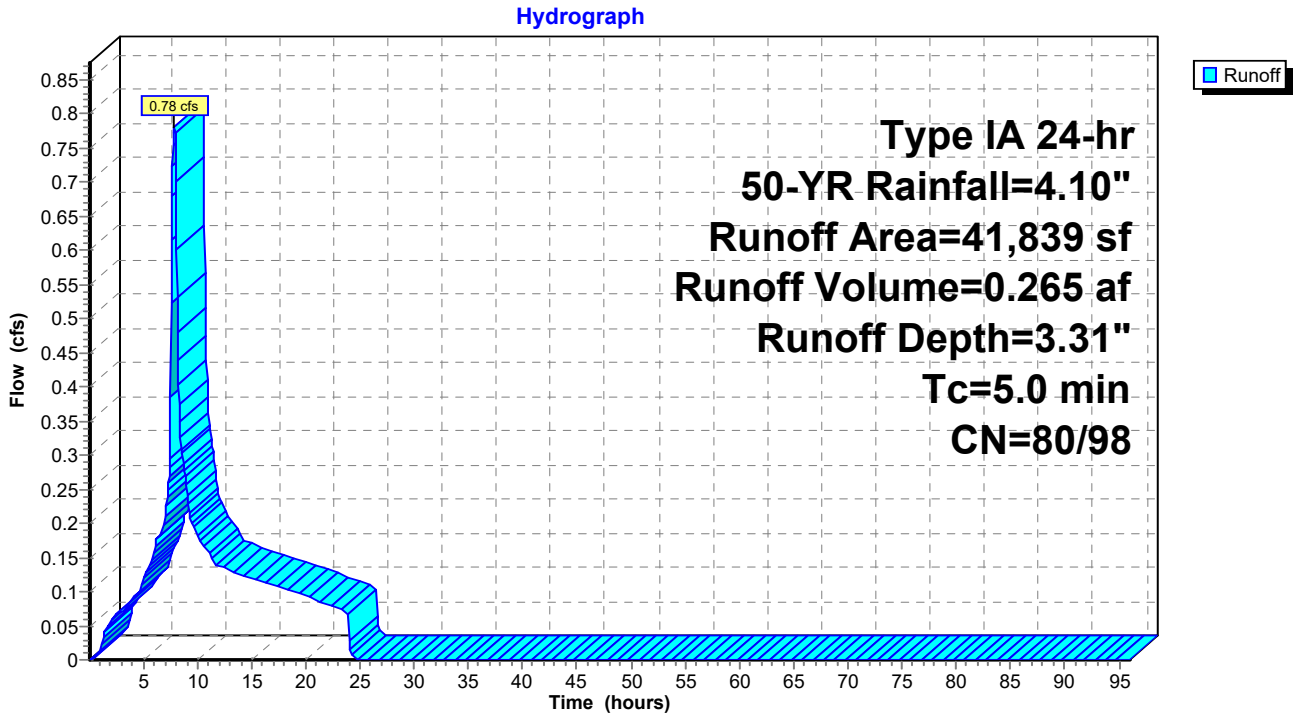
Runoff = 0.78 cfs @ 7.92 hrs, Volume= 0.265 af, Depth= 3.31"
Routed to Pond 14P : PA

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 50-YR Rainfall=4.10"

	Area (sf)	CN	Description
	28,416	98	
*	13,423	80	
	41,839	92	Weighted Average
	13,423	80	32.08% Pervious Area
	28,416	98	67.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: A-1



Summary for Pond 14P: PA

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.960 ac, 67.92% Impervious, Inflow Depth = 3.31" for 50-YR event
Inflow = 0.78 cfs @ 7.92 hrs, Volume= 0.265 af
Outflow = 0.30 cfs @ 8.69 hrs, Volume= 0.265 af, Atten= 61%, Lag= 46.3 min
Primary = 0.30 cfs @ 8.69 hrs, Volume= 0.265 af
Secondary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 103.74' @ 8.69 hrs Surf.Area= 1,500 sf Storage= 3,141 cf
Flood Elev= 104.00' Surf.Area= 1,500 sf Storage= 3,277 cf

Plug-Flow detention time= 292.1 min calculated for 0.265 af (100% of inflow)
Center-of-Mass det. time= 291.5 min (979.7 - 688.2)

Volume	Invert	Avail.Storage	Storage Description
#1	99.68'	3,277 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

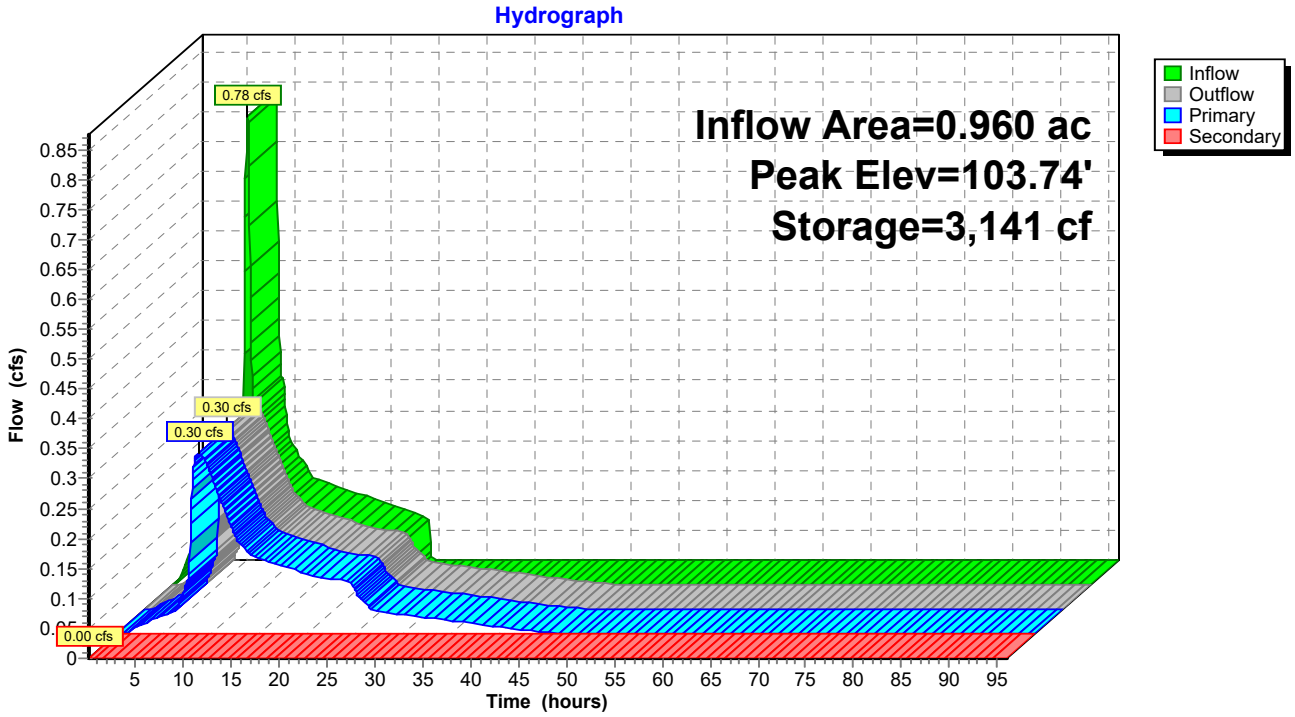
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
99.68	1,500	300.0	0.0	0	0	1,500
101.00	1,500	300.0	40.0	792	792	1,896
101.33	1,500	300.0	40.0	198	990	1,995
102.83	1,500	300.0	35.0	788	1,777	2,445
103.83	1,500	300.0	100.0	1,500	3,277	2,745

Device	Routing	Invert	Outlet Devices
#1	Primary	99.68'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	103.83'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	102.00'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	102.50'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	103.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.30 cfs @ 8.69 hrs HW=103.74' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.65 fps)
- **3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 6.27 fps)
- **4=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.27 fps)
- **5=Orifice/Grate** (Orifice Controls 0.19 cfs @ 3.77 fps)

Secondary OutFlow Max=0.00 cfs @ 0.10 hrs HW=99.68' (Free Discharge)
- **2=Orifice/Grate** (Controls 0.00 cfs)

Pond 14P: PA


Hydrograph
Inflow Area=0.960 ac
Peak Elev=103.74'
Storage=3,141 cf
Inflow
Outflow
Primary
Secondary
0.78 cfs
0.30 cfs
0.30 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Time span=0.10-96.00 hrs, dt=0.05 hrs, 1919 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: A-1 Runoff Area=41,839 sf 67.92% Impervious Runoff Depth=3.59"
Tc=5.0 min CN=80/98 Runoff=0.85 cfs 0.287 af

Pond 14P: PA Peak Elev=103.84' Storage=3,277 cf Inflow=0.85 cfs 0.287 af
Primary=0.32 cfs 0.285 af Secondary=0.01 cfs 0.000 af Outflow=0.32 cfs 0.285 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.287 af Average Runoff Depth = 3.59"
32.08% Pervious = 0.308 ac 67.92% Impervious = 0.652 ac

Summary for Subcatchment 1S: A-1

[49] Hint: Tc<2dt may require smaller dt

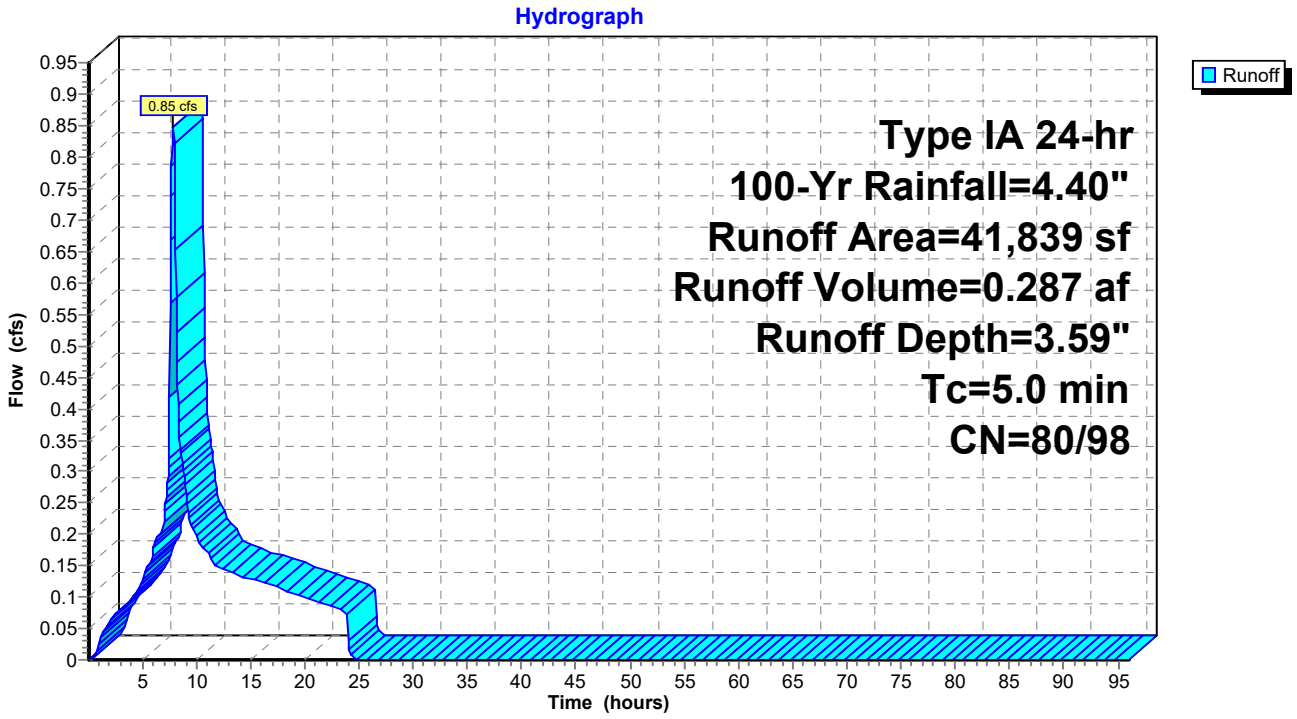
Runoff = 0.85 cfs @ 7.91 hrs, Volume= 0.287 af, Depth= 3.59"
Routed to Pond 14P : PA

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Yr Rainfall=4.40"

	Area (sf)	CN	Description
	28,416	98	
*	13,423	80	
	41,839	92	Weighted Average
	13,423	80	32.08% Pervious Area
	28,416	98	67.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: A-1



Summary for Pond 14P: PA

[92] Warning: Device #2 is above defined storage
[93] Warning: Storage range exceeded by 0.01'

Inflow Area = 0.960 ac, 67.92% Impervious, Inflow Depth = 3.59" for 100-Yr event
Inflow = 0.85 cfs @ 7.91 hrs, Volume= 0.287 af
Outflow = 0.32 cfs @ 8.61 hrs, Volume= 0.285 af, Atten= 62%, Lag= 41.9 min
Primary = 0.32 cfs @ 8.61 hrs, Volume= 0.285 af
Secondary = 0.01 cfs @ 8.61 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 103.84' @ 8.61 hrs Surf.Area= 1,500 sf Storage= 3,277 cf
Flood Elev= 104.00' Surf.Area= 1,500 sf Storage= 3,277 cf

Plug-Flow detention time= 288.4 min calculated for 0.285 af (99% of inflow)
Center-of-Mass det. time= 282.4 min (968.8 - 686.4)

Volume	Invert	Avail.Storage	Storage Description
#1	99.68'	3,277 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

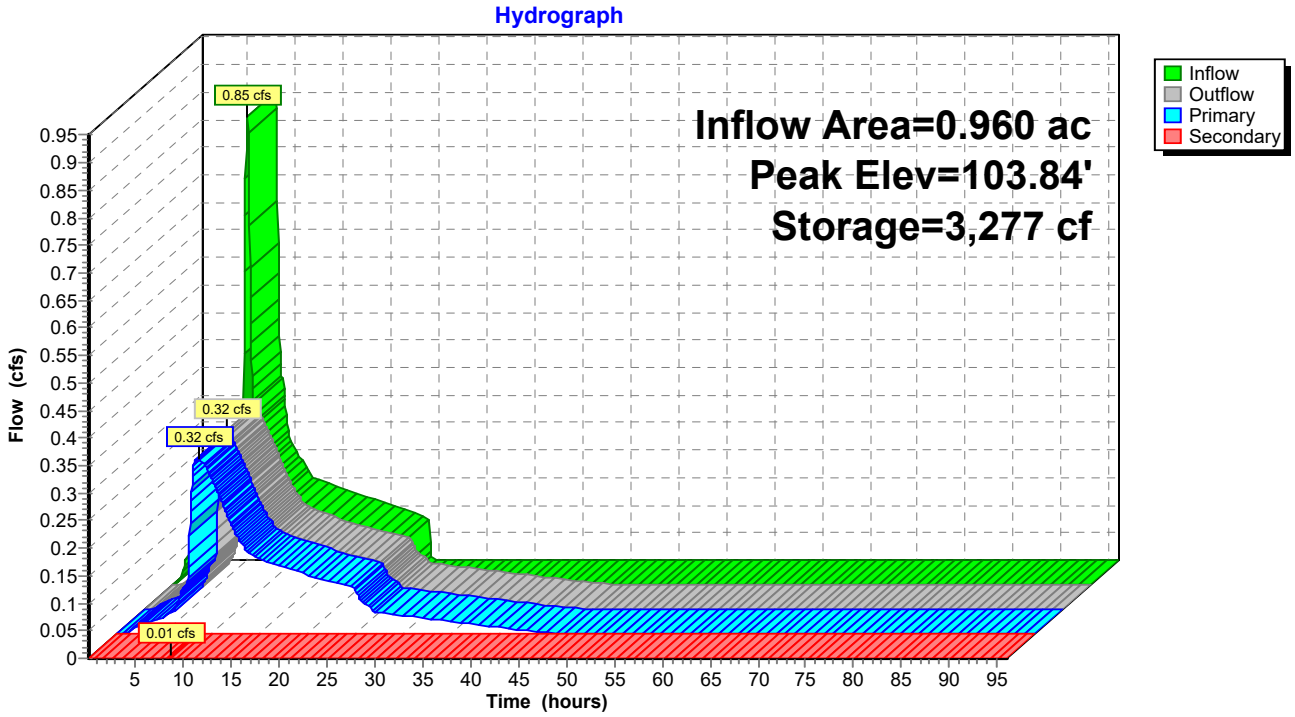
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
99.68	1,500	300.0	0.0	0	0	1,500
101.00	1,500	300.0	40.0	792	792	1,896
101.33	1,500	300.0	40.0	198	990	1,995
102.83	1,500	300.0	35.0	788	1,777	2,445
103.83	1,500	300.0	100.0	1,500	3,277	2,745

Device	Routing	Invert	Outlet Devices
#1	Primary	99.68'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	103.83'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	102.00'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	102.50'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	103.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.32 cfs @ 8.61 hrs HW=103.84' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.77 fps)
- **3=Orifice/Grate** (Orifice Controls 0.04 cfs @ 6.45 fps)
- **4=Orifice/Grate** (Orifice Controls 0.03 cfs @ 5.48 fps)
- **5=Orifice/Grate** (Orifice Controls 0.20 cfs @ 4.06 fps)

Secondary OutFlow Max=0.00 cfs @ 8.61 hrs HW=103.84' (Free Discharge)
- **2=Orifice/Grate** (Weir Controls 0.00 cfs @ 0.25 fps)

Pond 14P: PA


Hydrograph
Inflow Area=0.960 ac
Peak Elev=103.84'
Storage=3,277 cf
Inflow
Outflow
Primary
Secondary
0.85 cfs
0.32 cfs
0.32 cfs
0.01 cfs
Flow (cfs)
Time (hours)

Time span=0.10-96.00 hrs, dt=0.05 hrs, 1919 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: A-1 Runoff Area=41,839 sf 67.92% Impervious Runoff Depth=0.86"
Tc=5.0 min CN=80/98 Runoff=0.20 cfs 0.069 af

Pond 14P: PA Peak Elev=101.44' Storage=1,047 cf Inflow=0.20 cfs 0.069 af
Primary=0.03 cfs 0.069 af Secondary=0.00 cfs 0.000 af Outflow=0.03 cfs 0.069 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.069 af Average Runoff Depth = 0.86"
32.08% Pervious = 0.308 ac 67.92% Impervious = 0.652 ac

Summary for Subcatchment 1S: A-1

[49] Hint: Tc<2dt may require smaller dt

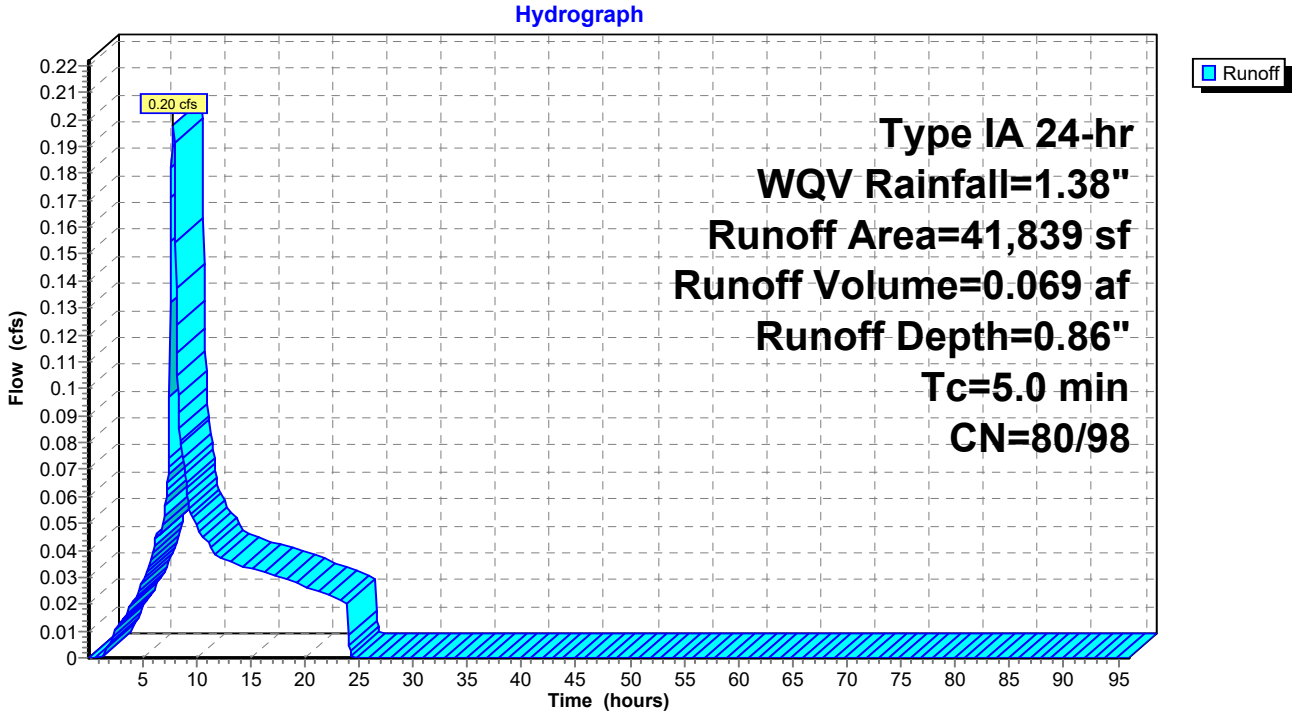
Runoff = 0.20 cfs @ 7.93 hrs, Volume= 0.069 af, Depth= 0.86"
Routed to Pond 14P : PA

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-96.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQV Rainfall=1.38"

	Area (sf)	CN	Description
	28,416	98	
*	13,423	80	
	41,839	92	Weighted Average
	13,423	80	32.08% Pervious Area
	28,416	98	67.92% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry,**

Subcatchment 1S: A-1



Summary for Pond 14P: PA

[92] Warning: Device #2 is above defined storage

Inflow Area = 0.960 ac, 67.92% Impervious, Inflow Depth = 0.86" for WQV event
Inflow = 0.20 cfs @ 7.93 hrs, Volume= 0.069 af
Outflow = 0.03 cfs @ 13.82 hrs, Volume= 0.069 af, Atten= 83%, Lag= 353.2 min
Primary = 0.03 cfs @ 13.82 hrs, Volume= 0.069 af
Secondary = 0.00 cfs @ 0.10 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.10-96.00 hrs, dt= 0.05 hrs / 2
Peak Elev= 101.44' @ 13.82 hrs Surf.Area= 1,500 sf Storage= 1,047 cf
Flood Elev= 104.00' Surf.Area= 1,500 sf Storage= 3,277 cf

Plug-Flow detention time= 424.3 min calculated for 0.069 af (100% of inflow)
Center-of-Mass det. time= 425.0 min (1,144.0 - 719.0)

Volume	Invert	Avail.Storage	Storage Description
#1	99.68'	3,277 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

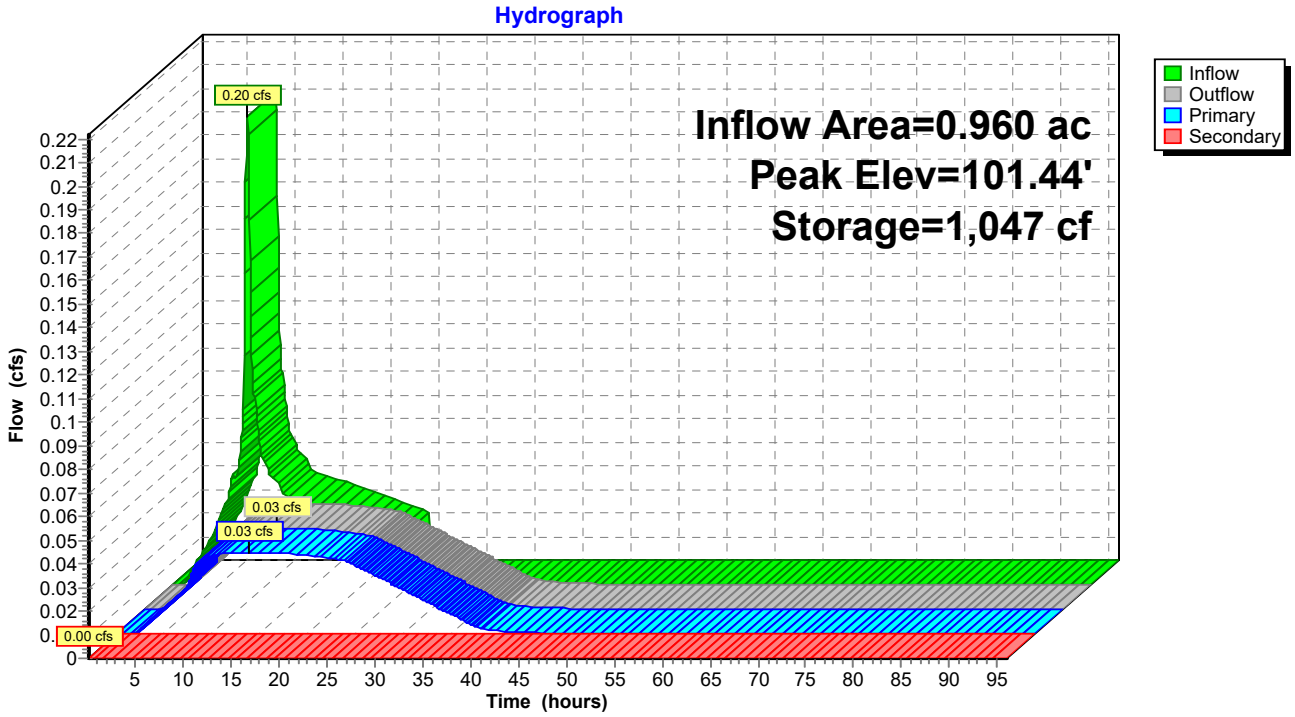
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
99.68	1,500	300.0	0.0	0	0	1,500
101.00	1,500	300.0	40.0	792	792	1,896
101.33	1,500	300.0	40.0	198	990	1,995
102.83	1,500	300.0	35.0	788	1,777	2,445
103.83	1,500	300.0	100.0	1,500	3,277	2,745

Device	Routing	Invert	Outlet Devices
#1	Primary	99.68'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	103.83'	**6.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	102.00'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	102.50'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Primary	103.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

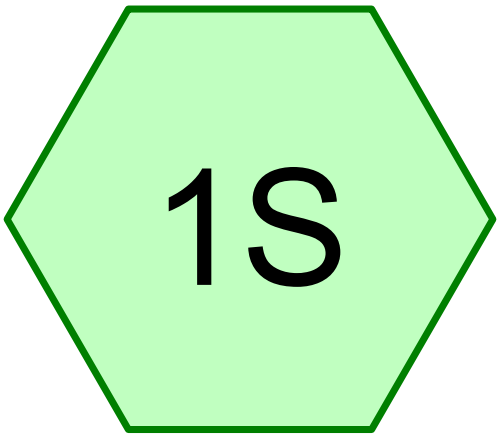
Primary OutFlow Max=0.03 cfs @ 13.82 hrs HW=101.44' (Free Discharge)
- **1=Orifice/Grate** (Orifice Controls 0.03 cfs @ 6.31 fps)
- **3=Orifice/Grate** (Controls 0.00 cfs)
- **4=Orifice/Grate** (Controls 0.00 cfs)
- **5=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.10 hrs HW=99.68' (Free Discharge)
- **2=Orifice/Grate** (Controls 0.00 cfs)

Pond 14P: PA


Hydrograph
Inflow Area=0.960 ac
Peak Elev=101.44'
Storage=1,047 cf
Inflow
Outflow
Primary
Secondary
0.20 cfs
0.03 cfs
0.03 cfs
0.00 cfs
Flow (cfs)
Time (hours)

PRE DEVELOPMENT



EX-1

Subcat Reach Pond Link

Routing Diagram for Pre-Development
Prepared by 7 Oaks Engineering, Inc, Printed 1/23/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr	Type IA 24-hr		Default	24.00	1	2.20	2
2	5-YR	Type IA 24-hr		Default	24.00	1	2.70	2
3	10-Yr	Type IA 24-hr		Default	24.00	1	3.20	2
4	25-YR	Type IA 24-hr		Default	24.00	1	3.60	2
5	50-YR	Type IA 24-hr		Default	24.00	1	4.10	2
6	100-Yr	Type IA 24-hr		Default	24.00	1	4.40	2
7	WQV	Type IA 24-hr		Default	24.00	1	1.38	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.960	79	(1S)
0.960	**79**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.960	Other	1S
0.960		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	0.000	0.000	0.960	0.960		1S
0.000	**0.000**	**0.000**	**0.000**	**0.960**	**0.960**	**TOTAL AREA**	

Time span=0.10-48.00 hrs, dt=0.05 hrs, 959 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX-1 Runoff Area=41,839 sf 0.00% Impervious Runoff Depth=0.64"
Flow Length=120' Slope=0.0070 '/' Tc=20.8 min CN=79/0 Runoff=0.08 cfs 0.051 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.051 af Average Runoff Depth = 0.64"
100.00% Pervious = 0.960 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: EX-1

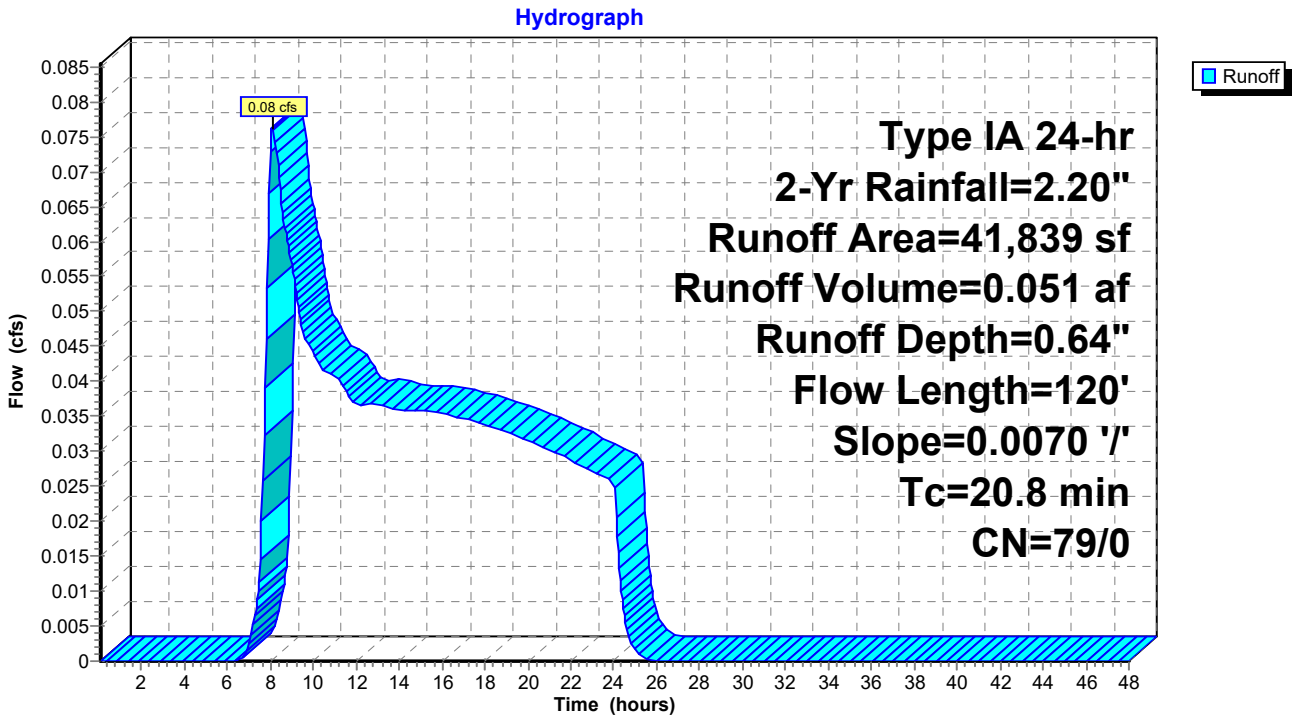
Runoff = 0.08 cfs @ 8.10 hrs, Volume= 0.051 af, Depth= 0.64"
Routed to nonexistent node 14P

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2-Yr Rainfall=2.20"

	Area (sf)	CN	Description
*	41,839	79	
	41,839	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	120	0.0070	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.20"

Subcatchment 1S: EX-1



Time span=0.10-48.00 hrs, dt=0.05 hrs, 959 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX-1 Runoff Area=41,839 sf 0.00% Impervious Runoff Depth=0.97"
Flow Length=120' Slope=0.0070 '/' Tc=20.8 min CN=79/0 Runoff=0.14 cfs 0.078 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.078 af Average Runoff Depth = 0.97"
100.00% Pervious = 0.960 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: EX-1

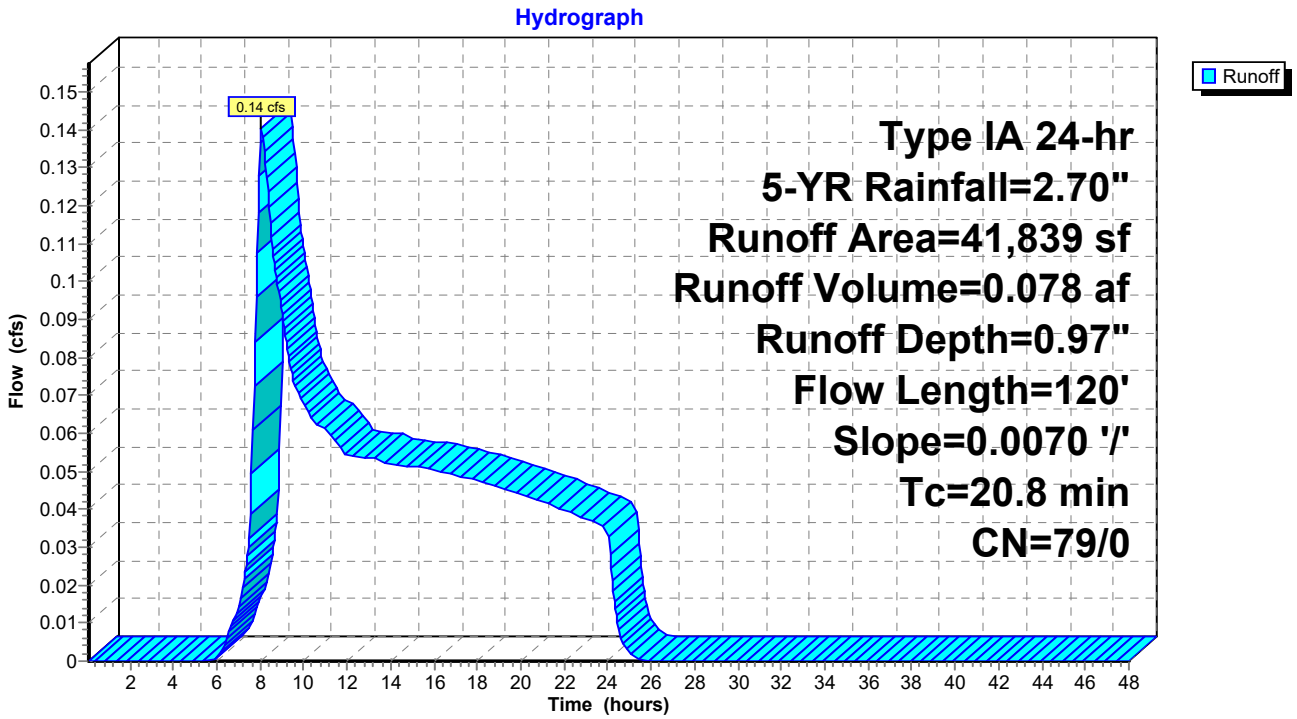
Runoff = 0.14 cfs @ 8.06 hrs, Volume= 0.078 af, Depth= 0.97"
Routed to nonexistent node 14P

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 5-YR Rainfall=2.70"

	Area (sf)	CN	Description
*	41,839	79	
	41,839	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	120	0.0070	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.20"

Subcatchment 1S: EX-1



Time span=0.10-48.00 hrs, dt=0.05 hrs, 959 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX-1 Runoff Area=41,839 sf 0.00% Impervious Runoff Depth=1.34"
Flow Length=120' Slope=0.0070 '/' Tc=20.8 min CN=79/0 Runoff=0.21 cfs 0.107 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.107 af Average Runoff Depth = 1.34"
100.00% Pervious = 0.960 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: EX-1

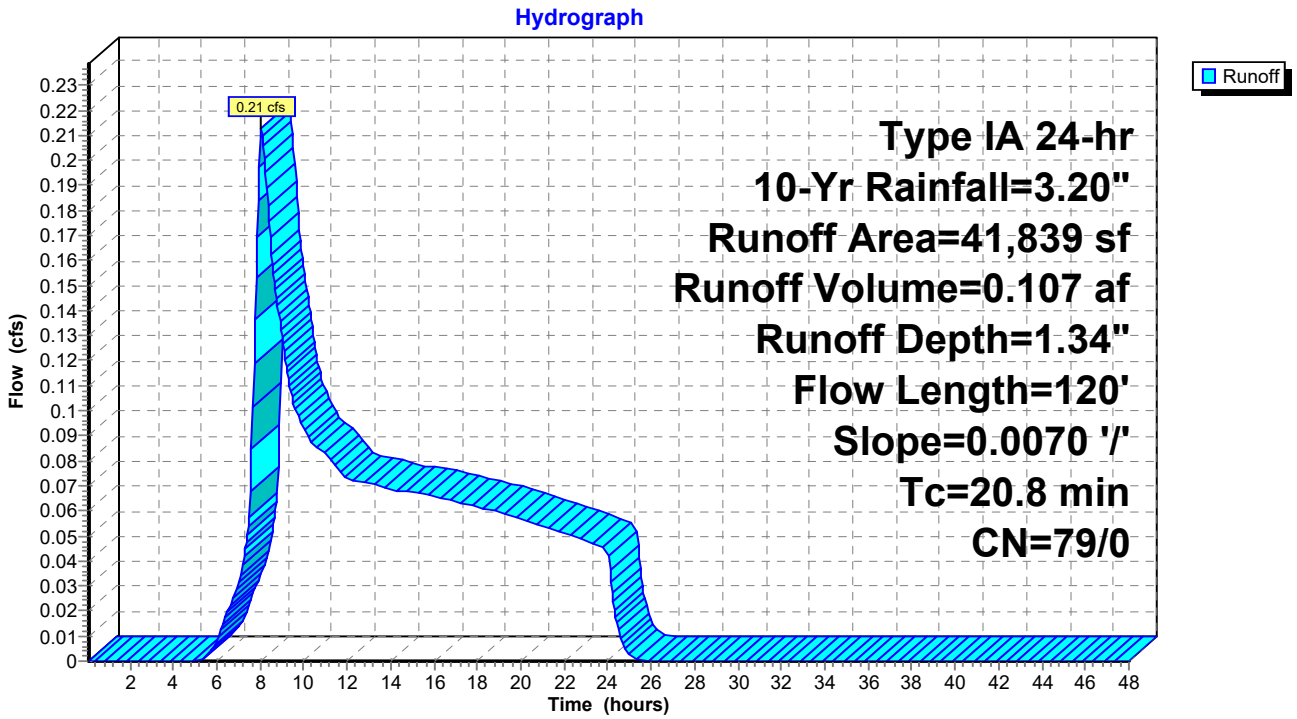
Runoff = 0.21 cfs @ 8.05 hrs, Volume= 0.107 af, Depth= 1.34"
Routed to nonexistent node 14P

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10-Yr Rainfall=3.20"

	Area (sf)	CN	Description
*	41,839	79	
	41,839	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	120	0.0070	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.20"

Subcatchment 1S: EX-1



Time span=0.10-48.00 hrs, dt=0.05 hrs, 959 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX-1 Runoff Area=41,839 sf 0.00% Impervious Runoff Depth=1.64"
Flow Length=120' Slope=0.0070 '/' Tc=20.8 min CN=79/0 Runoff=0.28 cfs 0.132 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.132 af Average Runoff Depth = 1.64"
100.00% Pervious = 0.960 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: EX-1

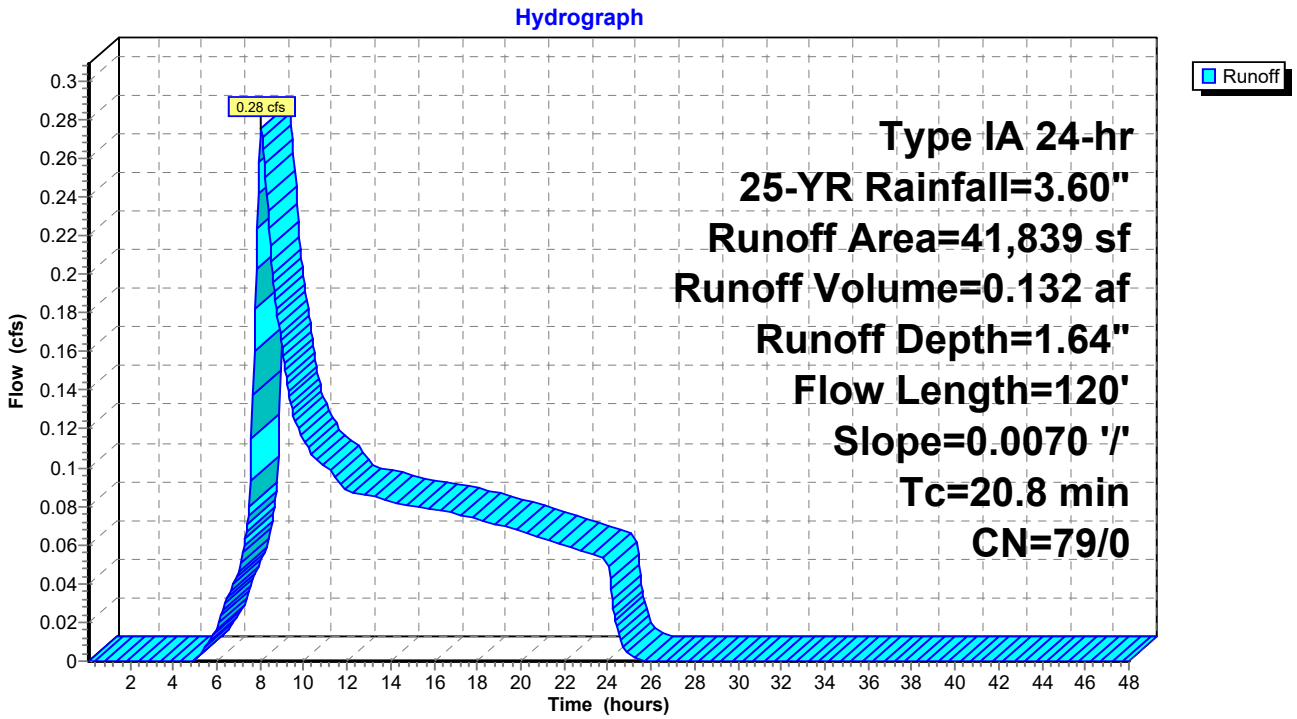
Runoff = 0.28 cfs @ 8.05 hrs, Volume= 0.132 af, Depth= 1.64"
Routed to nonexistent node 14P

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25-YR Rainfall=3.60"

	Area (sf)	CN	Description
*	41,839	79	
	41,839	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	120	0.0070	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.20"

Subcatchment 1S: EX-1



Time span=0.10-48.00 hrs, dt=0.05 hrs, 959 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX-1 Runoff Area=41,839 sf 0.00% Impervious Runoff Depth=2.04"
Flow Length=120' Slope=0.0070 '/' Tc=20.8 min CN=79/0 Runoff=0.36 cfs 0.164 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.164 af Average Runoff Depth = 2.04"
100.00% Pervious = 0.960 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: EX-1

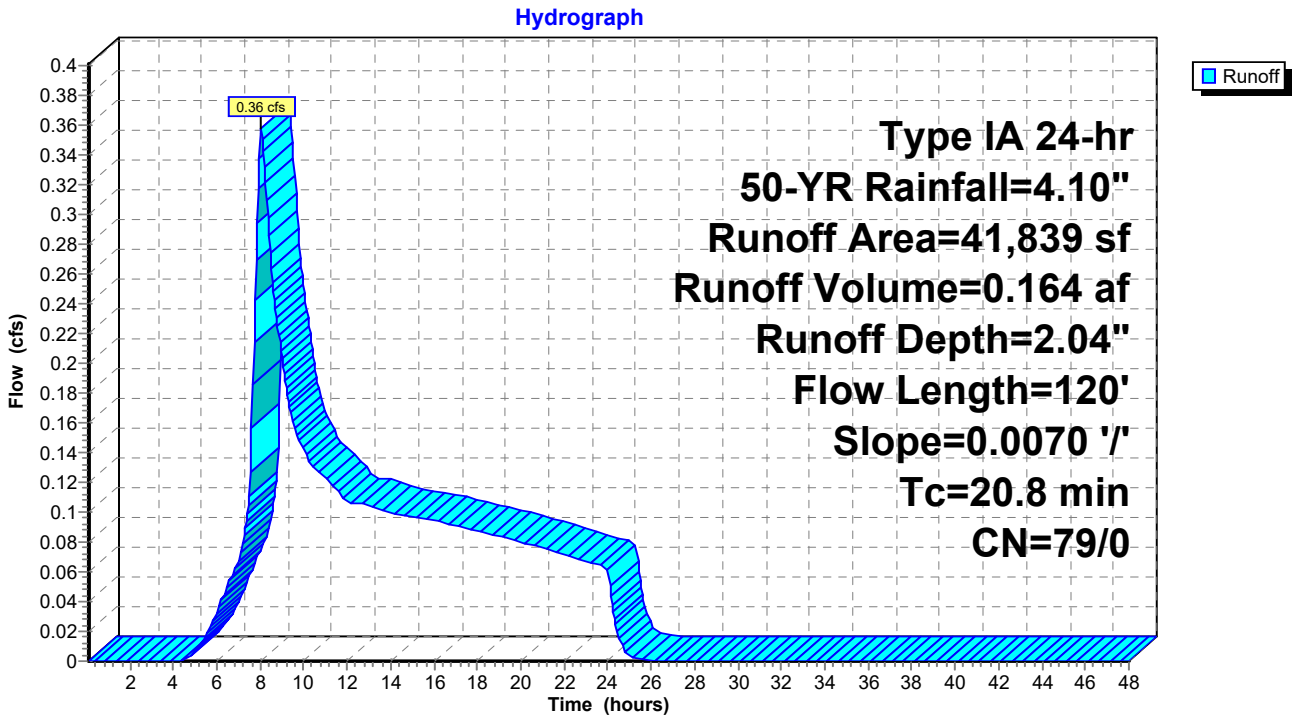
Runoff = 0.36 cfs @ 8.04 hrs, Volume= 0.164 af, Depth= 2.04"
Routed to nonexistent node 14P

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 50-YR Rainfall=4.10"

	Area (sf)	CN	Description
*	41,839	79	
	41,839	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	120	0.0070	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.20"

Subcatchment 1S: EX-1



Time span=0.10-48.00 hrs, dt=0.05 hrs, 959 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX-1 Runoff Area=41,839 sf 0.00% Impervious Runoff Depth=2.29"
Flow Length=120' Slope=0.0070 '/' Tc=20.8 min CN=79/0 Runoff=0.41 cfs 0.184 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.184 af Average Runoff Depth = 2.29"
100.00% Pervious = 0.960 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: EX-1

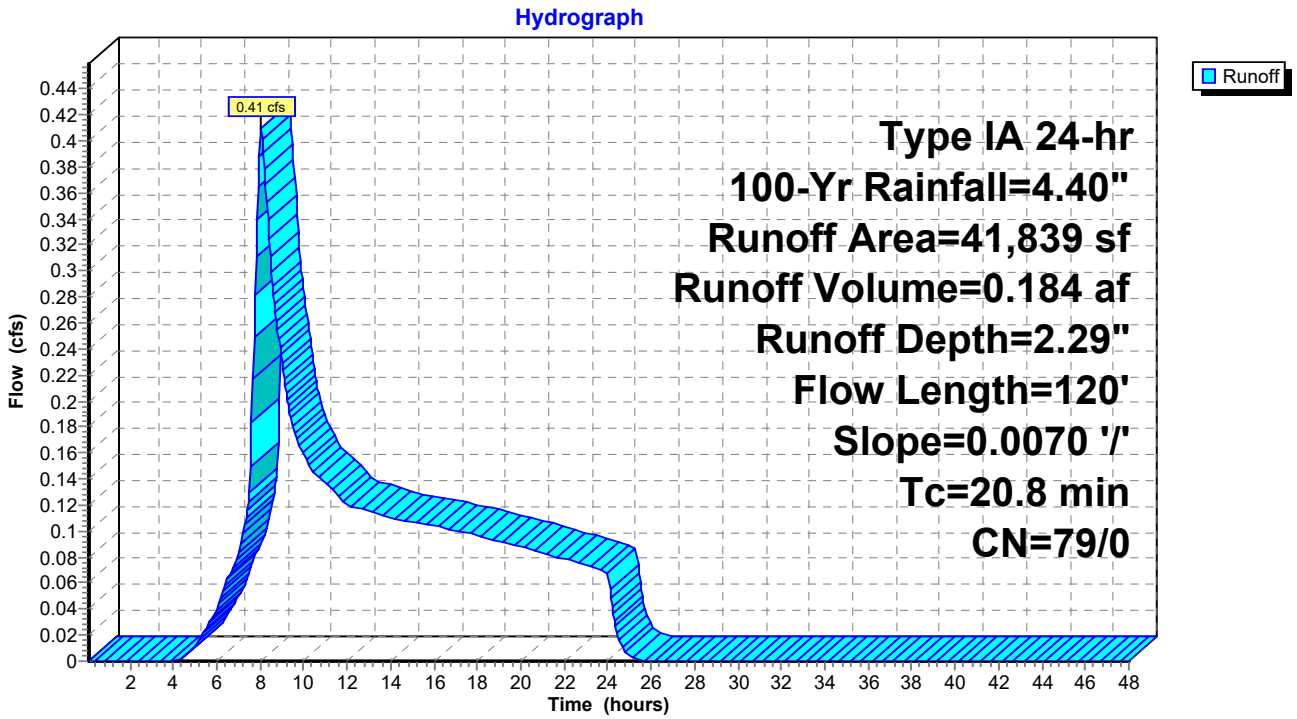
Runoff = 0.41 cfs @ 8.04 hrs, Volume= 0.184 af, Depth= 2.29"
Routed to nonexistent node 14P

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100-Yr Rainfall=4.40"

	Area (sf)	CN	Description
*	41,839	79	
	41,839	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	120	0.0070	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.20"

Subcatchment 1S: EX-1



Time span=0.10-48.00 hrs, dt=0.05 hrs, 959 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: EX-1 Runoff Area=41,839 sf 0.00% Impervious Runoff Depth=0.21"
Flow Length=120' Slope=0.0070 '/' Tc=20.8 min CN=79/0 Runoff=0.01 cfs 0.016 af

Total Runoff Area = 0.960 ac Runoff Volume = 0.016 af Average Runoff Depth = 0.21"
100.00% Pervious = 0.960 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1S: EX-1

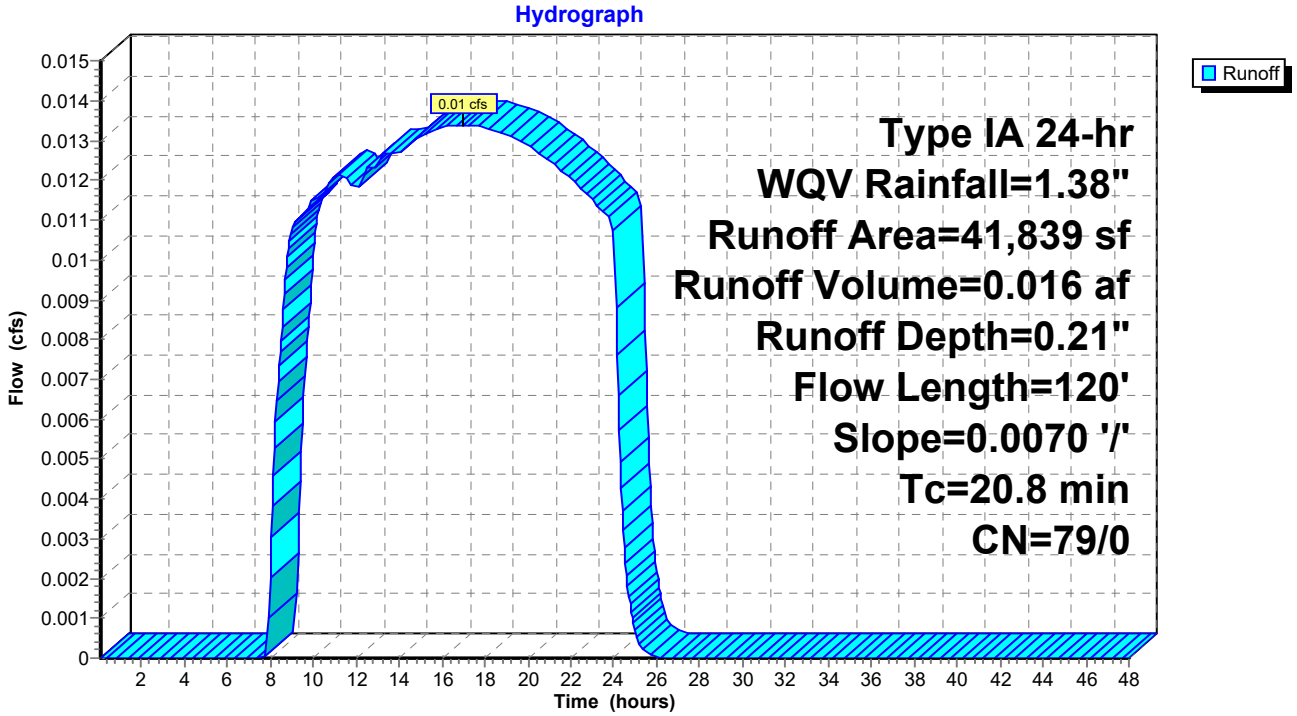
Runoff = 0.01 cfs @ 17.00 hrs, Volume= 0.016 af, Depth= 0.21"
Routed to nonexistent node 14P

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.10-48.00 hrs, dt= 0.05 hrs
Type IA 24-hr WQV Rainfall=1.38"

	Area (sf)	CN	Description
*	41,839	79	
	41,839	79	100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	120	0.0070	0.10		**Sheet Flow,** Grass: Short n= 0.150 P2= 2.20"

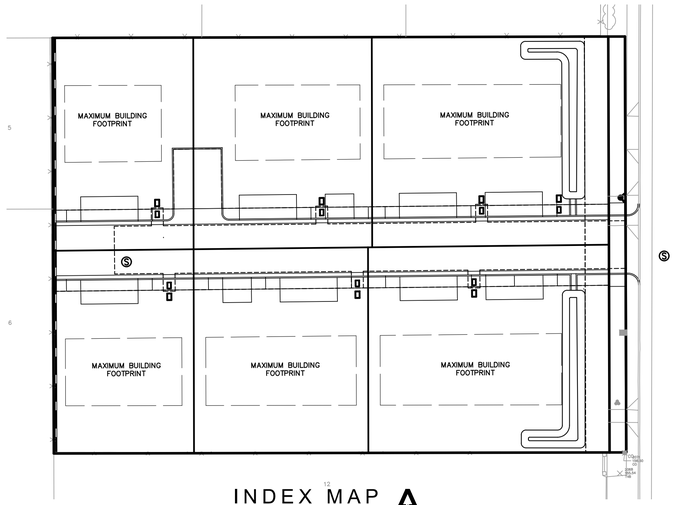
Subcatchment 1S: EX-1



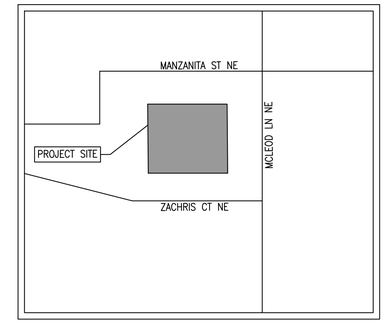
APPENDIX C – PLANS

PRELIMINARY SUDIVISION PLANS

AT 6255 MCLEOD
KEIZER, OR.



INDEX MAP
SCALE:1":30'



VICINITY MAP
NTS

GENERAL NOTES:

1. ALL CONSTRUCTION, MATERIALS, AND WORKMANSHIP SHALL CONFORM TO THE LATEST STANDARDS AND PRACTICES OF THE CITY OF KEIZER, THE OREGON STRUCTURAL SPECIALITY CODE (BUILDING CODE), OREGON PLUMBING SPECIALITY (PLUMBING CODE), AND THE OREGON FIRE CODE (FIRE CODE), LATEST EDITIONS.
2. ALL PERMIT AND LICENSES NECESSARY FOR THE EXECUTION AND COMPLETION OF THE WORK SHALL BE SECURED BY THE CONTRACTOR PRIOR TO COMMENCING CONSTRUCTION.
3. ALL EXCAVATORS MUST COMPLY WITH THE RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER, INCLUDING NOTIFICATION OF ALL OWNERS OF UNDERGROUND UTILITIES AT LEAST 48 BUSINESS HOURS, BUT NOT MORE THAN 10 BUSINESS DAYS, BEFORE COMMENCING AN EXCAVATION. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH OAR 952-001-0090 AND ORS 757.541 TO 757.57. THE TELEPHONE NUMBER FOR THE OREGON UTILITY NOTIFICATION CENTER IS 503.232.1987 AND THE LOCAL "CALL 48 HOURS BEFORE YOU DIG NUMBER" IS 503.246.6699.
4. THE LOCATION OF EXISTING UNDERGROUND UTILITIES SHOWN ON THE PLAN IS FOR INFORMATION ONLY AND IS NOT GUARANTEED TO BE ACCURATE. CONTRACTOR SHALL VERIFY ELEVATIONS OF ALL UNDERGROUND UTILITY CONNECTION POINTS PRIOR TO COMMENCING WITH CONSTRUCTION AND SHALL BRING ANY DISCREPANCIES TO THE ATTENTION OF 7 OAKS ENGINEERING, INC. POTHOLE ALL CROSSINGS AS NECESSARY BEFORE CONSTRUCTION TO PREVENT GRADE AND ALIGNMENT CONFLICTS.
5. 7 OAKS ENGINEERING, INC. ASSUMES NO RESPONSIBILITY FOR ANY DISCREPANCIES ENCOUNTERED BETWEEN THE CURRENT FIELD CONDITIONS AND THE INFORMATION SHOWN ON THE SURVEY MAP (PERFORMED BY FORTY FIVE NORTH SURVEYING, LLC). THE CONTRACTOR IS RESPONSIBLE FOR REPORTING ANY DISCREPANCIES TO THE OWNER'S REPRESENTATIVE.

GRADING AND PAVING NOTES:

1. ALL SURFACES SHALL HAVE A MINIMUM 1.0% SLOPE UNLESS OTHERWISE NOTED ON THE PLANS. ALL SURFACES SHALL MEET EXISTING GRADES SMOOTHLY AND EVENLY AND MAINTAIN CONSTANT SLOPES UNLESS OTHERWISE NOTED ON THE PLANS.
2. THE CONTRACTOR SHALL NOTIFY 7 OAKS ENGINEERING, INC. IF THE GRADING PLAN DOES NOT PROVIDE POSITIVE DRAINAGE OR IF SLOPE CALLOUTS DO NOT MATCH SPOT GRADES.
3. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING EXISTING SITE AND DRAINAGE PATTERNS AND THE PROTECTION OF EXISTING ENGINEERED DRAINAGE FACILITIES.
4. THE CONTRACTOR SHALL REPLACE AND RESTORE AREAS NOT SCHEDULED FOR CONSTRUCTION TO THEIR ORIGINAL CONDITION AND TO THE APPROVAL OF THE OWNERS REPRESENTATIVE.
5. THE CONTRACTOR SHALL EXERCISE EXTREME CAUTION WHEN WORKING IN AREAS ADJACENT TO EXISTING TREES IN ORDER TO MINIMIZE DISTURBANCES TO THE ROOTS. THE CONTRACTOR SHALL INSTALL TREE PROTECTION FENCING PER CITY OF SALEM TREE CODE. NO PARKING VEHICLES UNDER TREES.
6. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DEMOLITION AND DISPOSAL OF EXISTING AC, CURBS, SIDEWALKS, AND OTHER SITE ELEMENTS WITHIN THE LIMITS OF DEMOLITION., UNLESS OTHERWISE NOTED ON PLANS. DISPOSE OF DEMOLISHED ITEMS OFF-SITE IN A LEGAL MANNER.
7. ACTUAL LINES AND GRADES OF EXCAVATION SHALL BE STAKED BY A QUALIFIED SURVEYOR. BASED ON THE INFORMATION SHOWN ON THE PLANS, THE CONTRACTOR SHALL RETAIN A SURVEYOR LICENSED IN OREGON.
8. ADJUST ALL INCIDENTAL STRUCTURES, MANHOLE LIDS, VALVE BOXES, ETC. TO FINISH GRADE.
9. PAVING WILL NOT BE ALLOWED DURING WET OR COLD WEATHER.
10. ALL CONSTRUCTION WITHIN THE CITY RIGHT-OF-WAY SHALL HAVE AN APPROVED TRAFFIC CONTROL PLAN.
11. ALL CONSTRUCTION WITHIN THE CITY RIGHT-OF-WAY SHALL BE PERMITTED UNDER SEPARATE PERMIT.
12. PRIOR TO THE PLACEMENT OF AGGREGATE BASE MATERIALS RELATED TO SITE PAVING, A GEOTECHNICAL ENGINEER SHOULD BE PRESENT TO OBSERVE AND EVALUATE THE SUBGRADE SOIL CONDITIONS, AS OUTLINED IN THE GEOTECHNICAL REPORT.

UTILITY NOTES:

1. MATERIALS SHALL BE NEW. THE USE OF MANUFACTURER'S NAMES, MODELS, AND NUMBERS IS INTENDED TO ESTABLISH STYLE, QUALITY, APPEARANCE, AND USEFULNESS. PROPOSED SUBSTITUTIONS WILL REQUIRE WRITTEN APPROVAL FROM CITY ENGINEER PRIOR TO INSTALLATION.
2. ALL TRENCH BACKFILL SHALL BE SHOWN ON THE PIPE BEDDING AND BACKFILL DETAIL. FLOODING OR JETTING THE BACKFILLED TRENCHES WITH WATER IS NOT PERMITTED.
3. CONNECTIONS TO EXISTING UTILITIES SHALL CONFORM WITH THE CITY'S ENGINEERING DESIGN MANUAL AND STANDARD PLANS.
4. ALL WATER AND FIRE PROTECTION PIPE SHALL HAVE A MINIMUM 36-INCH COVER TO FINISHED GRADE.
5. ALL WATER LINES SHALL BE THOROUGHLY FLUSHED, CHLORINATED AND TESTED IN ACCORDANCE WITH OREGON STATE HEALTH DEPARTMENT PRIOR TO ANY METER HOOK-UP SERVICE.
6. BEGIN LAYING STORM AND SANITARY SEWER PIPE AT THE LOW POINT OF THE SYSTEM TRUE TO GRADE AND ALIGNMENT INDICATED WITH UNBROKEN CONTINUITY OF INVERT. ESTABLISH LINE AND GRADE FOR THE STORM AND SANITARY SEWER PIPE BY USE OF A LASER.
7. CONTRACTOR SHALL MAINTAIN A MINIMUM 5' HORIZONTAL AND 18" VERTICAL SEPARATION BETWEEN ALL EXISTING AND PROPOSED WATER AND SANITARY SEWER LINES.
8. FOR CROSSINGS OF WATER LINES AND SANITARY SEWER LINES, THE OREGON STATE HEALTH DEPARTMENT CRITERIA SHALL APPLY.
9. EXISTING STORM OR SANITARY LATERALS TO BE UTILIZED FOR NEW SYSTEM MUST BE VIDEO INSPECTED WITH CITY INSPECTOR PRESENT PRIOR TO CONNECTION.
10. ALL NEW DRYWELLS MUST BE ACCESSIBLE PER OREGON DEPARTMENT OF ENVIRONMENTAL SERVICES QUALITY REQUIREMENTS.
11. THE CONTRACTOR SHALL VACUUM OUT ALL TRAPPED INLETS, MANHOLES, AND DRYWELLS AT THE END OF CONSTRUCTION.
12. CONTRACTOR SHALL EXERCISE CARE IN ALL OPERATIONS TO PROTECT EXISTING UNDERGROUND UTILITIES, ANY DAMAGE RESULTING FROM THIS WORK MUST BE RESTORED AT THE CONTRACTOR'S EXPENSE TO THE APPROVAL OF THE OWNER'S REPRESENTATIVE.

BASIS OF BEARINGS:

BASIS OF BEARINGS AND COORDINATE SYSTEM IS BASED ON OREGON STATE PLANE NORTH ZONE, NAD83(2011), EPOCH 2010.00. ALL DISTANCE SHOWN HEREON ARE GROUND DISTANCE.

BENCH MARK:

ELEVATIONS WERE ESTABLISHED BY GPS RTK OBSERVATIONS TO CITY OF SALEM BENCHMARK "KSUN". MARK IS AN ALUMINUM DISK IN A CONCRETE UTILITY PAD ON THE NORTH SIDE OF SUNSET AVENUE N, APPROXIMATELY 100 FEET WEST OF RIVER ROAD N. ELEVATION = 134.38' (CITY OF SALEM DATUM, NGVD 29).

ABBREVIATIONS:

PL	PROPERTY LINE	TYP.	TYPICAL
FF	FINISHED FLOOR	MIN.	MINIMUM
TC	TOP OF CURB	SS	SANITARY SEWER
FS	FINISHED SURFACE	SD	STORM DRAIN
FL	FLOW LINE	CF	CURB FACE
FG	FINISHED GRADE	WM	WATER METER
GB	GRADE BREAK	FDC	FIRE DEPARTMENT CONNECTION
CL	CENTERLINE	APN	ACCESSOR'S PARCEL MAP
R	RIDGE LINE	SQ.FT	SQUARE FEET
R/W	RIGHT OF WAY	INV.	INVERT
WV	WATER VALVE	BF	BACKFLOW
PR.	PROPOSED	CFS	CUBIC FEET PER SECOND
NAP	NOT A PART	SCH.	SCHEDULE
FT	FEET	PVC	POLYVINYL CHLORIDE
EV	ELECTRIC VEHICLE	SDR	SPECIAL DRAWING RIGHT
CAV	CLEAN AIR VEHICLE	PSI	POUNDS PER SQUARE INCH
STD.	STANDARD	NFPA	NATIONAL FIRE PREVENTION ASSOCIATION
AC.	ACRES	CB	CATCH BASIN
CUP	CONDITIONAL USE PERMIT	D	DIAMETER
EX.	EXISTING	VCP	VITRIFIED CLAY PIPE

SHEET INDEX:

PROJECT DIRECTORY:

ARCHITECT:
GEOFFREY JAMES ARCHITECT
GJAMESARCHITECT@GMAIL.COM
503.931.4120

CIVIL ENGINEER:
7 OAKS ENGINEERING, INC.
KIM JOHNSON, P.E.
345 WESTFIELD ST. #107
SILVERTON, OR. 97381
503.308.8554
KIM@7OAKSENGINEERING.COM

SURVEY:
FORTY FIVE NORTH SURVEYING, LLC
7320 3RD STREET SE #145
TURNER, OR. 97392
503.558.3330

UTILITY PURVEYORS:

WATER:
CITY OF KEIZER
930 CHEMAWA RD.
KEIZER, OR. 97303

STORM DRAIN:
CITY OF KEIZER-PUBLIC WORKS
930 CHEMAWA RD.
KEIZER, OR. 97303

SEWER:
CITY OF SALEM
555 LIBERTY STREET SE
SALEM, OREGON.
503.588.6311

FIRE:
CITY OF KEIZER
930 CHEMAWA RD.
KEIZER, OR. 97303

ELECTRIC:
PORTLAND GENERAL ELECTRIC
KEN SPENCER
KENNETH.SPENCER@PGN.COM
503.970.7200

NATURAL GAS:
NORTHWEST NATURAL GAS COMPANY
3123 BROADWAY ST NE
SALEM, OR. 97303
503.585.6611

ROADWAYS:
CITY OF KEIZER-PUBLIC WORKS
930 CHEMAWA RD.
KEIZER, OR. 97303

NOTICE TO EXCAVATORS:

ATTENTION: OREGON LAW REQUIRES YOU TO FOLLOW RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH OAR 952-001-0090. YOU MAY OBTAIN COPIES OF THE RULES BY CALLING THE CENTER.
(NOTE: THE TELEPHONE NUMBER FOR THE OREGON UTILITY NOTIFICATION CENTER IS 503-232-1987).

POTENTIAL UNDERGROUND FACILITY OWNERS

Dig Safely.

Call the Oregon One-Call Center
DIAL 811 or 1-800-332-2344

ENGINEER'S NOTICE TO CONTRACTOR:

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN IN THESE PLANS ARE OBTAINED BY A SEARCH OF AVAILABLE RECORDS, AND TO THE BEST OF OUR KNOWLEDGE, THERE ARE NOT EXISTING UTILITIES EXCEPT THOSE SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE ALL PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN, AND ANY OTHER LINES OR STRUCTURES NOT SHOWN ON THESE PLANS, AND IS RESPONSIBLE FOR THE PROTECTION OF ANY DAMAGE TO THESE LINES OR STRUCTURES.

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION FOR THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENTS SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY, AND HOLD HARMLESS THE CITY, ITS EMPLOYEES, AND AGENTS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT.

THE CONTRACTOR SHALL BE RESPONSIBLE TO REPORT DISCREPANCIES IN PLANS AND/OR FIELD CONDITIONS IMMEDIATELY TO THE DESIGN ENGINEER FOR RESOLUTION PRIOR TO CONSTRUCTION, AND SHALL BE RESPONSIBLE FOR DISCREPANCIES NOT SO REPORTED AND RESOLVED.

7OAKS ENGINEERING
345 WESTFIELD ST. #107
SILVERTON, OR. 97381
503.308.8554
ADMIN@7OAKSENGINEERING.COM

STAMP:

REGISTERED PROFESSIONAL ENGINEER
94115PE
PRELIMINARY
OREGON
NOV 13, 2018
KIMBERLY JOHNSON

NO	DATE	ISSUE DESCRIPTION

QC BY: DRAWN BY:

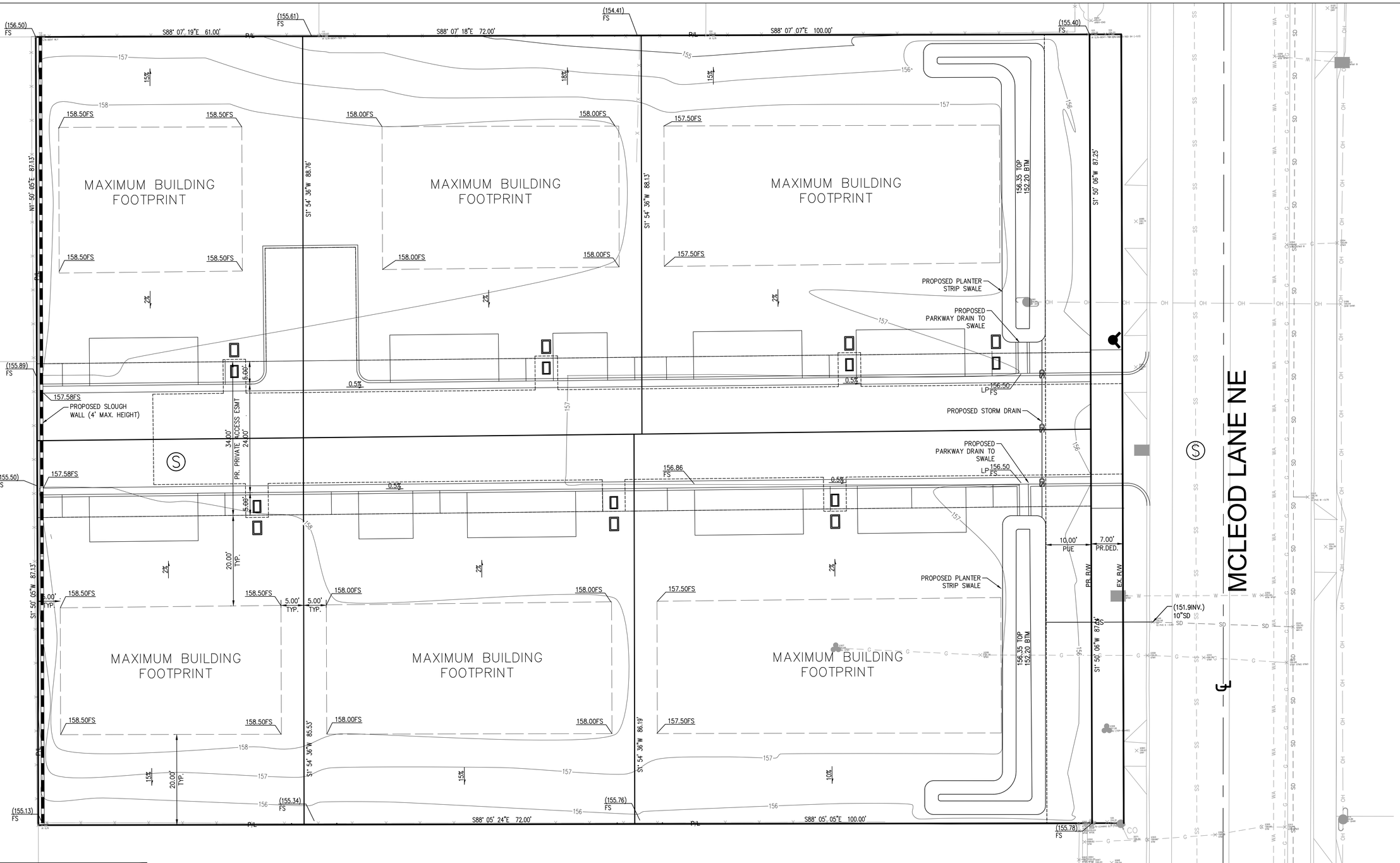
PROJECT NAME: MCLEOD SUBDIVISION
PROJECT ADDRESS: 6255 MCLEOD KEIZER, OR.

SHEET TITLE: TITLE SHEET

DATE: 02/20/2024

SHEET NUMBER: 1

JOB #00309



NOTICE TO EXCAVATORS:

ATTENTION: OREGON LAW REQUIRES YOU TO FOLLOW RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH OAR 952-001-0090. YOU MAY OBTAIN COPIES OF THE RULES BY CALLING THE CENTER.
(NOTE: THE TELEPHONE NUMBER FOR THE OREGON UTILITY NOTIFICATION CENTER IS 503-232-1987).

POTENTIAL UNDERGROUND FACILITY OWNERS

Dig Safely.

Call the Oregon One-Call Center
DIAL 811 or 1-800-332-2344

ENGINEER'S NOTICE TO CONTRACTOR:

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN IN THESE PLANS ARE OBTAINED BY A SEARCH OF AVAILABLE RECORDS, AND TO THE BEST OF OUR KNOWLEDGE, THERE ARE NOT EXISTING UTILITIES EXCEPT THOSE SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE ALL PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN, AND ANY OTHER LINES OR STRUCTURES NOT SHOWN ON THESE PLANS, AND IS RESPONSIBLE FOR THE PROTECTION OF ANY DAMAGE TO THESE LINES OR STRUCTURES.

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION FOR THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENTS SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY, AND HOLD HARMLESS THE CITY, ITS EMPLOYEES, AND AGENTS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT.

THE CONTRACTOR SHALL BE RESPONSIBLE TO REPORT DISCREPANCIES IN PLANS AND/OR FIELD CONDITIONS IMMEDIATELY TO THE DESIGN ENGINEER FOR RESOLUTION PRIOR TO CONSTRUCTION, AND SHALL BE RESPONSIBLE FOR DISCREPANCIES NOT SO REPORTED AND RESOLVED.

N

10 5 0 10 20

SCALE: 1"=10'

7OAKS ENGINEERING
345 WESTFIELD ST. #107
SILVERTON, OR. 97381
503.308.8554
ADMIN@7OAKSENGINEERING.COM

STAMP:

REGISTERED PROFESSIONAL ENGINEER
94115PE
PRELIMINARY
NOV 13, 2018
KIMBERLY JOHNSON
OREGON

NO	DATE	ISSUE DESCRIPTION

NO CHANGES, MODIFICATIONS OR REPRODUCTIONS TO BE MADE TO THESE DRAWINGS WITHOUT WRITTEN AUTHORIZATION FROM THE DESIGN ENGINEER.

DIMENSIONS AND NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

THESE DRAWINGS MAY HAVE BEEN REDUCED IN SIZE DIFFERENTLY THAN ORIGINALLY DRAWN. OWNER AND ENGINEER ASSUME NO RESPONSIBILITY FOR USE OF INCORRECT SCALE.

CONTRACTOR SHALL VERIFY ALL EXISTING CONDITIONS PRIOR TO PROCEEDING WITH CONSTRUCTION AND NOTIFY ARCHITECT IMMEDIATELY OF ANY DISCREPANCIES OR CONFLICTS.

QC BY: DRAWN BY:

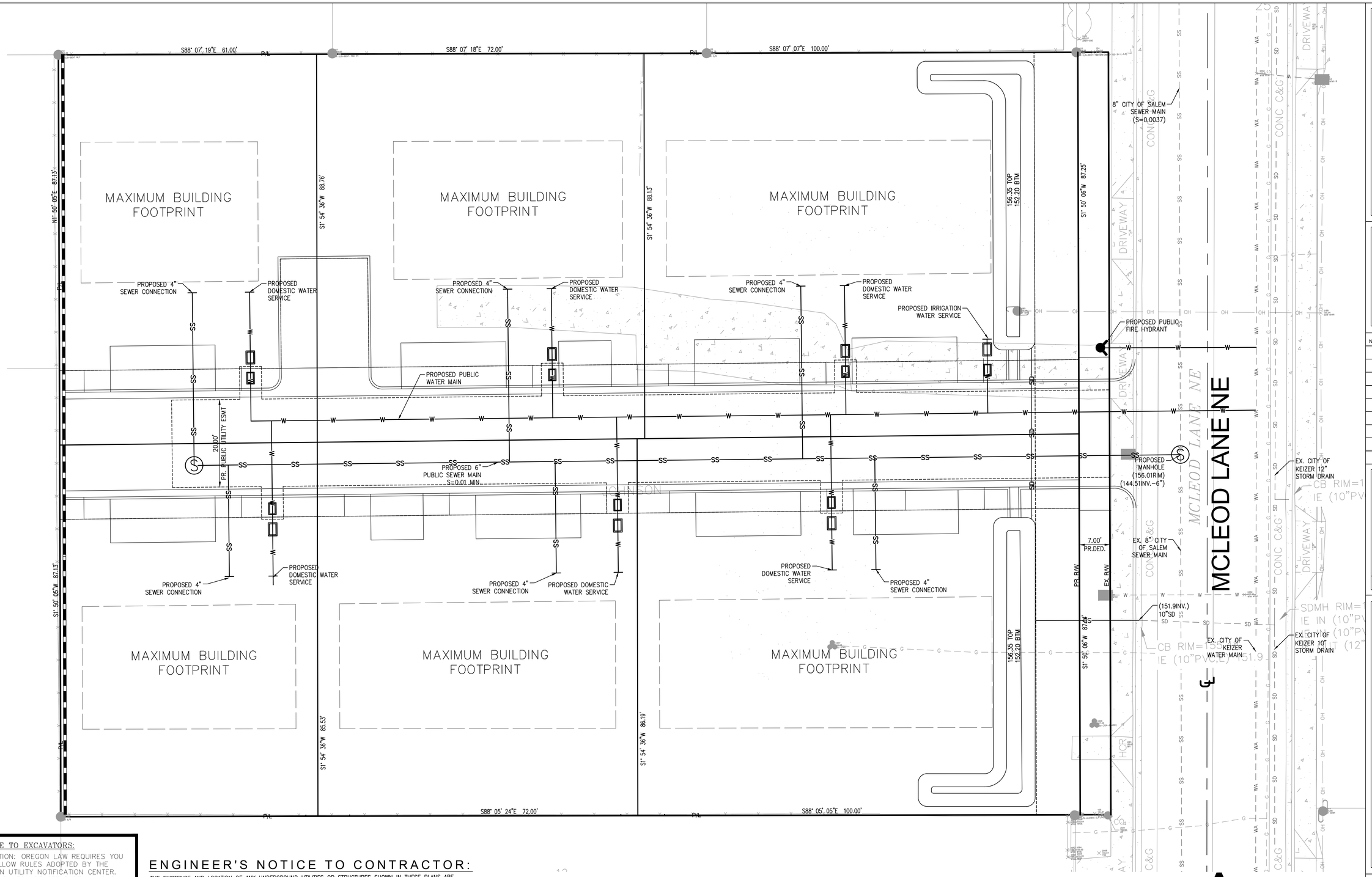
PROJECT NAME: MCLEOD SUBDIVISION
PROJECT ADDRESS: 6255 MCLEOD KEIZER, OR.

SHEET TITLE: PRELIMINARY GRADING PLAN

DATE: 02/20/2024

SHEET NUMBER: 2

JOB #00309



SCALE: 1"=10'

NOTICE TO EXCAVATORS:

ATTENTION: OREGON LAW REQUIRES YOU TO FOLLOW RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH OAR 952-001-0090. YOU MAY OBTAIN COPIES OF THE RULES BY CALLING THE CENTER.
(NOTE: THE TELEPHONE NUMBER FOR THE OREGON UTILITY NOTIFICATION CENTER IS 503-232-1987).

POTENTIAL UNDERGROUND FACILITY OWNERS

Dig Safely.

Call the Oregon One-Call Center
DIAL 811 or 1-800-332-2344

ENGINEER'S NOTICE TO CONTRACTOR:

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN IN THESE PLANS ARE OBTAINED BY A SEARCH OF AVAILABLE RECORDS, AND TO THE BEST OF OUR KNOWLEDGE, THERE ARE NOT EXISTING UTILITIES EXCEPT THOSE SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE ALL PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN, AND ANY OTHER LINES OR STRUCTURES NOT SHOWN ON THESE PLANS, AND IS RESPONSIBLE FOR THE PROTECTION OF ANY DAMAGE TO THESE LINES OR STRUCTURES.

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION FOR THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENTS SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY, AND HOLD HARMLESS THE CITY, ITS EMPLOYEES, AND AGENTS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT.

THE CONTRACTOR SHALL BE RESPONSIBLE TO REPORT DISCREPANCIES IN PLANS AND/OR FIELD CONDITIONS IMMEDIATELY TO THE DESIGN ENGINEER FOR RESOLUTION PRIOR TO CONSTRUCTION, AND SHALL BE RESPONSIBLE FOR DISCREPANCIES NOT SO REPORTED AND RESOLVED.

7OAKS ENGINEERING
345 WESTFIELD ST. #107
SILVERTON, OR. 97381
503.308.8554
ADMIN@7OAKSENGINEERING.COM

STAMP:

REGISTERED PROFESSIONAL ENGINEER
94115PE
PRELIMINARY
OREGON
NOV 13, 2015
KIMBERLY JOHNSON

NO	DATE	ISSUE DESCRIPTION

QC BY: DRAWN BY:

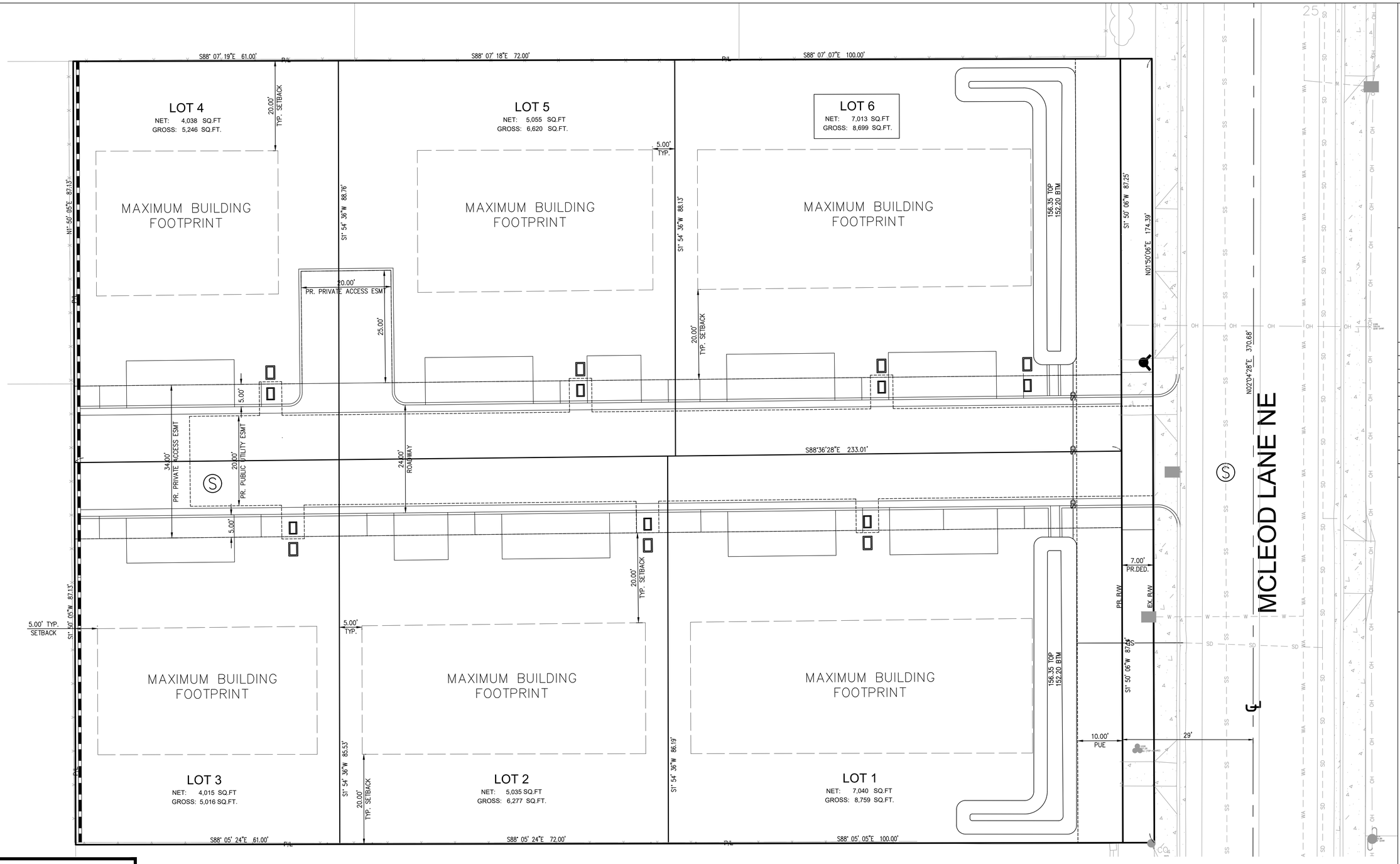
PROJECT NAME: MCLEOD SUBDIVISION
PROJECT ADDRESS: 6255 MCLEOD KEIZER, OR.

SHEET TITLE: PRELIMINARY UTILITY PLAN

DATE: 02/20/2024

SHEET NUMBER: 3

JOB #00309



NOTICE TO EXCAVATORS:

ATTENTION: OREGON LAW REQUIRES YOU TO FOLLOW RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH OAR 952-001-0090. YOU MAY OBTAIN COPIES OF THE RULES BY CALLING THE CENTER.
(NOTE: THE TELEPHONE NUMBER FOR THE OREGON UTILITY NOTIFICATION CENTER IS 503-232-1987).

POTENTIAL UNDERGROUND FACILITY OWNERS

Dig Safely.

Call the Oregon One-Call Center
DIAL 811 or 1-800-332-2344

ENGINEER'S NOTICE TO CONTRACTOR:

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN IN THESE PLANS ARE OBTAINED BY A SEARCH OF AVAILABLE RECORDS, AND TO THE BEST OF OUR KNOWLEDGE, THERE ARE NOT EXISTING UTILITIES EXCEPT THOSE SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE ALL PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN, AND ANY OTHER LINES OR STRUCTURES NOT SHOWN ON THESE PLANS, AND IS RESPONSIBLE FOR THE PROTECTION OF ANY DAMAGE TO THESE LINES OR STRUCTURES.

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION FOR THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENTS SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY, AND HOLD HARMLESS THE CITY, ITS EMPLOYEES, AND AGENTS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT.

THE CONTRACTOR SHALL BE RESPONSIBLE TO REPORT DISCREPANCIES IN PLANS AND/OR FIELD CONDITIONS IMMEDIATELY TO THE DESIGN ENGINEER FOR RESOLUTION PRIOR TO CONSTRUCTION, AND SHALL BE RESPONSIBLE FOR DISCREPANCIES NOT SO REPORTED AND RESOLVED.

N

10 5 0 10 20

SCALE: 1"=10'

7OAKS ENGINEERING
345 WESTFIELD ST. #107
SILVERTON, OR. 97381
503.308.8554
ADMIN@7OAKSENGINEERING.COM

STAMP:

REGISTERED PROFESSIONAL ENGINEER
94115PE
PRELIMINARY
NOV 13, 2024
KIMBERLY JOHNSON
OREGON

NO	DATE	ISSUE DESCRIPTION

QC BY: DRAWN BY:

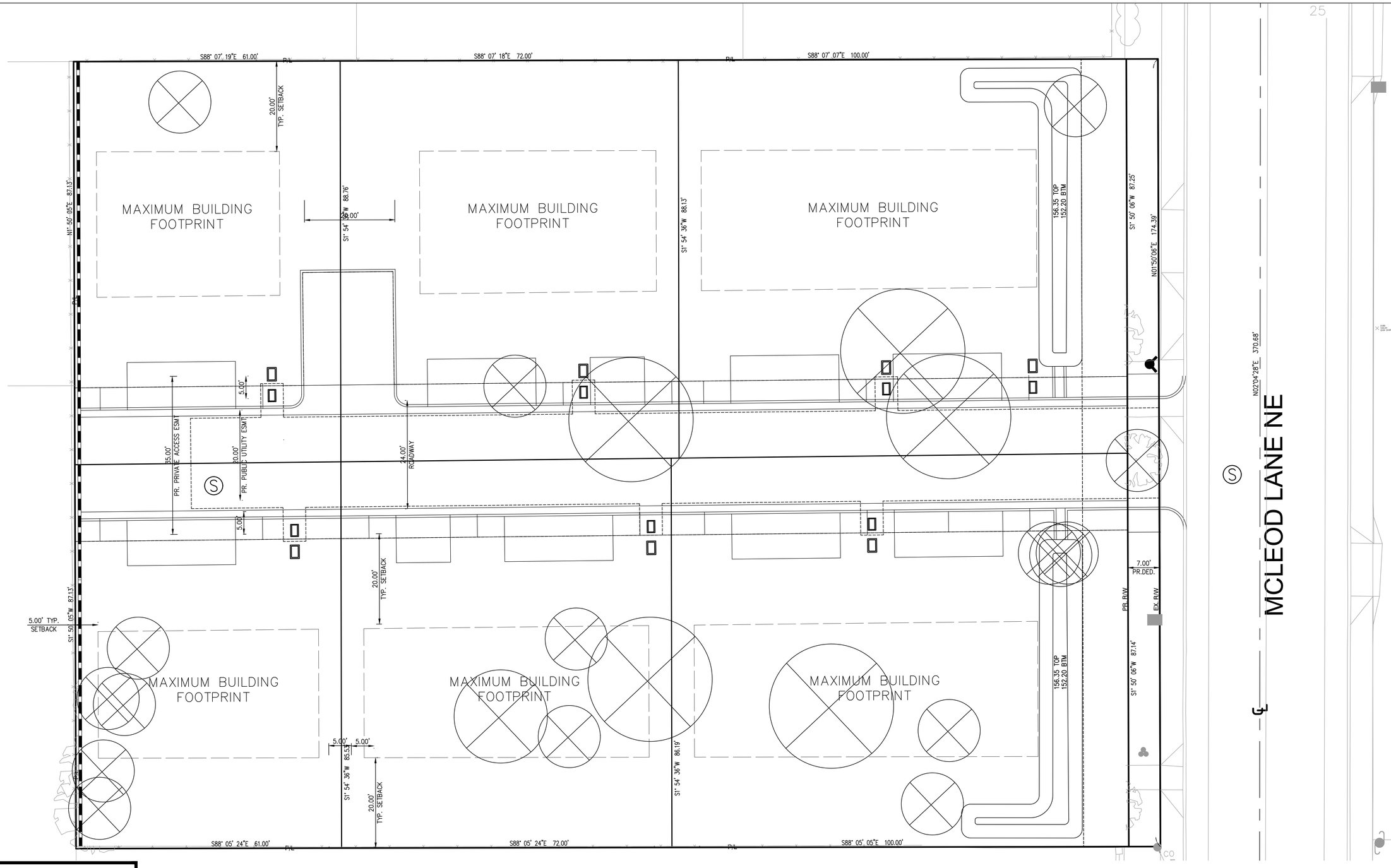
PROJECT NAME: MCLEOD SUBDIVISION
PROJECT ADDRESS: 6255 MCLEOD
KEIZER, OR.

SHEET TITLE: PRELIMINARY SUBDIVISION PLAN

DATE: 02/20/2024

SHEET NUMBER: 4

JOB #00309



NOTICE TO EXCAVATORS:

ATTENTION: OREGON LAW REQUIRES YOU TO FOLLOW RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH OAR 952-001-0090. YOU MAY OBTAIN COPIES OF THE RULES BY CALLING THE CENTER.
(NOTE: THE TELEPHONE NUMBER FOR THE OREGON UTILITY NOTIFICATION CENTER IS 503-232-1987).

POTENTIAL UNDERGROUND FACILITY OWNERS

Dig Safely.

Call the Oregon One-Call Center
DIAL 811 or 1-800-332-2344

ENGINEER'S NOTICE TO CONTRACTOR:

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN IN THESE PLANS ARE OBTAINED BY A SEARCH OF AVAILABLE RECORDS, AND TO THE BEST OF OUR KNOWLEDGE, THERE ARE NOT EXISTING UTILITIES EXCEPT THOSE SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE ALL PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN, AND ANY OTHER LINES OR STRUCTURES NOT SHOWN ON THESE PLANS, AND IS RESPONSIBLE FOR THE PROTECTION OF ANY DAMAGE TO THESE LINES OR STRUCTURES.

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION FOR THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENTS SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY, AND HOLD HARMLESS THE CITY, ITS EMPLOYEES, AND AGENTS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT.

THE CONTRACTOR SHALL BE RESPONSIBLE TO REPORT DISCREPANCIES IN PLANS AND/OR FIELD CONDITIONS IMMEDIATELY TO THE DESIGN ENGINEER FOR RESOLUTION PRIOR TO CONSTRUCTION, AND SHALL BE RESPONSIBLE FOR DISCREPANCIES NOT SO REPORTED AND RESOLVED.

LEGEND:

TREE REMOVAL

N

10 5 0 10 20

SCALE: 1"=10'

7OAKS ENGINEERING
345 WESTFIELD ST. #107
SILVERTON, OR. 97381
503.308.8554
ADMIN@7OAKSENGINEERING.COM

STAMP:

REGISTERED PROFESSIONAL ENGINEER
94115PE
PRELIMINARY
OREGON
NOV 13, 2018
KIMBERLY JOHNSON

NO	DATE	ISSUE DESCRIPTION

QC BY: DRAWN BY:

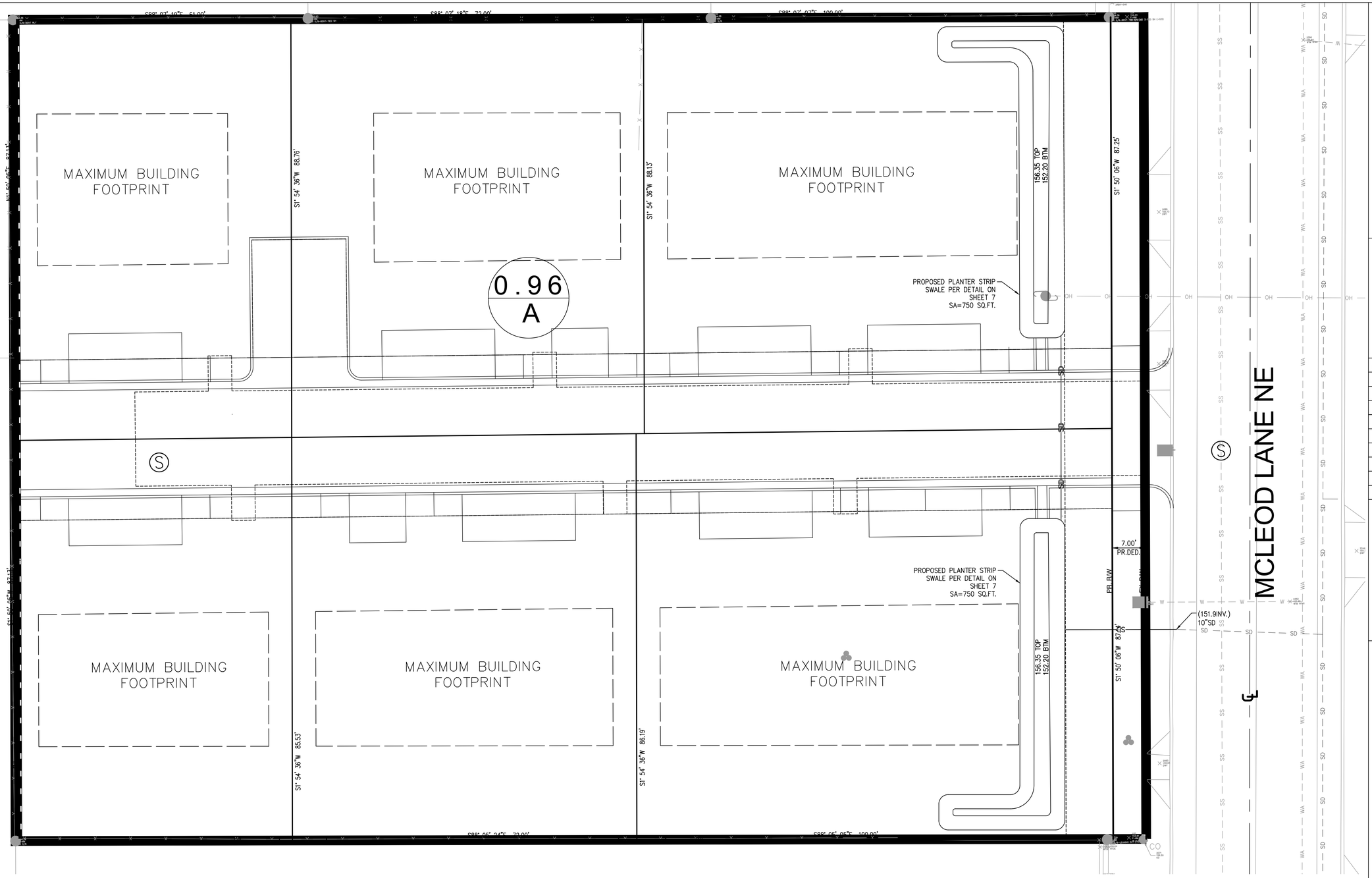
PROJECT NAME: MCLEOD SUBDIVISION
PROJECT ADDRESS: 6255 MCLEOD
KEIZER, OR.

SHEET TITLE: TREE PRESERVATION PLAN

DATE: 02/20/2024

SHEET NUMBER: 5

JOB #00309



7OAKS
ENGINEERING
345 WESTFIELD ST. #107
SILVERTON, OR. 97381
503.308.8554
ADMIN@7OAKSENGINEERING.COM

STAMP:

REGISTERED PROFESSIONAL ENGINEER
94115PE
PRELIMINARY
OREGON
NOV 13, 2018
KIMBERLY JOHNSON

NO	DATE	ISSUE DESCRIPTION

QC BY: DRAWN BY:

PROJECT NAME: MCLEOD SUBDIVISION
PROJECT ADDRESS: 6255 MCLEOD KEIZER, OR.

SHEET TITLE: STORMWATER PLAN

DATE: 02/20/2024

SHEET NUMBER: 6

JOB #00309

NOTICE TO EXCAVATORS:

ATTENTION: OREGON LAW REQUIRES YOU TO FOLLOW RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH OAR 952-001-0090. YOU MAY OBTAIN COPIES OF THE RULES BY CALLING THE CENTER.
(NOTE: THE TELEPHONE NUMBER FOR THE OREGON UTILITY NOTIFICATION CENTER IS 503-232-1987).

POTENTIAL UNDERGROUND FACILITY OWNERS

Dig Safely.
Call the Oregon One-Call Center
DIAL 811 or 1-800-332-2344

ENGINEER'S NOTICE TO CONTRACTOR:

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN IN THESE PLANS ARE OBTAINED BY A SEARCH OF AVAILABLE RECORDS, AND TO THE BEST OF OUR KNOWLEDGE, THERE ARE NOT EXISTING UTILITIES EXCEPT THOSE SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE ALL PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN, AND ANY OTHER LINES OR STRUCTURES NOT SHOWN ON THESE PLANS, AND IS RESPONSIBLE FOR THE PROTECTION OF ANY DAMAGE TO THESE LINES OR STRUCTURES.

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION FOR THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENTS SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY, AND HOLD HARMLESS THE CITY, ITS EMPLOYEES, AND AGENTS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT.

THE CONTRACTOR SHALL BE RESPONSIBLE TO REPORT DISCREPANCIES IN PLANS AND/OR FIELD CONDITIONS IMMEDIATELY TO THE DESIGN ENGINEER FOR RESOLUTION PRIOR TO CONSTRUCTION, AND SHALL BE RESPONSIBLE FOR DISCREPANCIES NOT SO REPORTED AND RESOLVED.

PRE VS. POST CONSTRUCTION FLOW RATES

FACILITY ID	PEAK FLOW RATE (CFS)											
	2-YEAR STORM		5 YEAR STORM		10 YEAR STORM		25 YEAR STORM		50 YEAR STORM		100 YEAR STORM	
PROJECT SITE	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST	PRE	POST
A	0.08	0.08	0.14	0.12	0.21	0.2	0.28	0.25	0.36	0.3	0.41	0.32

CATCHMENT AND FACILITY TABLE

CATCHMENT/ FACILITY ID	TOTAL AREA (SF)/(AC.)	IMPERVIOUS AREA (SF)	PERVIOUS AREA (SF)	OWNERSHIP (PRIVATE/ PUBLIC)	FACILITY TYPE	FACILITY SIZE
A	41,839	28,416	13,423	PRIVATE	Planter Strip Swale	1,500

N

10 5 0 10 20

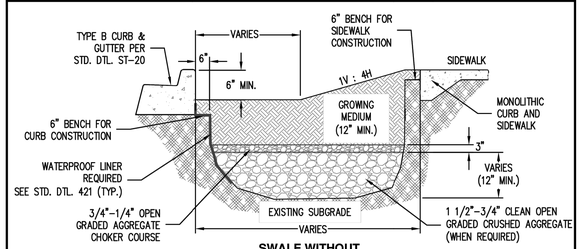
SCALE: 1"=10'

LEGEND:

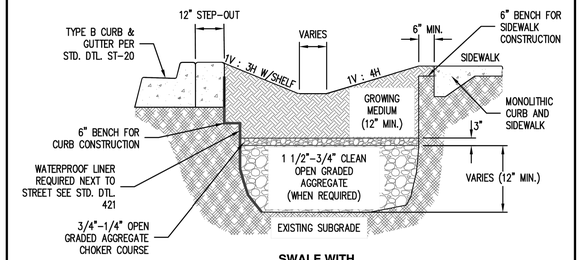
HYDROLOGY SUBAREA BOUNDARY LINE

XX / AC. — DISTURBED AREA LABEL

PLANTER STRIP INFILTRATION SWALE - SECTION VIEWS 423



SWALE WITHOUT ON STREET PARKING



SWALE WITH ON STREET PARKING

NOTES:
1. SCARIFY THE NATIVE SOIL FOLLOWING THE INITIAL EXCAVATION AND BEFORE INSTALLING TOPSOIL OR ROCK.
2. AMENDED SOIL MAY BE USED IN PLACE OF GROWING MEDIUM AS APPROVED BY THE DIRECTOR.

ISSUED: 05/04/2023	CITY OF KEIZER | Public Works Department STANDARD DETAILS *STORMWATER MANAGEMENT*
REVISED:_____	
DRAWING NOT TO SCALE	

NOTICE TO EXCAVATORS:

ATTENTION: OREGON LAW REQUIRES YOU TO FOLLOW RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR 952-001-0010 THROUGH OAR 952-001-0090. YOU MAY OBTAIN COPIES OF THE RULES BY CALLING THE CENTER.
(NOTE: THE TELEPHONE NUMBER FOR THE OREGON UTILITY NOTIFICATION CENTER IS 503-232-1987).

POTENTIAL UNDERGROUND FACILITY OWNERS

Dig Safely.

Call the Oregon One-Call Center
DIAL 811 or 1-800-332-2344

ENGINEER'S NOTICE TO CONTRACTOR:

THE EXISTENCE AND LOCATION OF ANY UNDERGROUND UTILITIES OR STRUCTURES SHOWN IN THESE PLANS ARE OBTAINED BY A SEARCH OF AVAILABLE RECORDS, AND TO THE BEST OF OUR KNOWLEDGE, THERE ARE NOT EXISTING UTILITIES EXCEPT THOSE SHOWN ON THESE PLANS. THE CONTRACTOR IS REQUIRED TO TAKE ALL PRECAUTIONARY MEASURES TO PROTECT THE UTILITIES SHOWN, AND ANY OTHER LINES OR STRUCTURES NOT SHOWN ON THESE PLANS, AND IS RESPONSIBLE FOR THE PROTECTION OF ANY DAMAGE TO THESE LINES OR STRUCTURES.

CONSTRUCTION CONTRACTOR AGREES THAT IN ACCORDANCE WITH GENERALLY ACCEPTED CONSTRUCTION PRACTICES, CONSTRUCTION CONTRACTOR WILL BE REQUIRED TO ASSUME SOLE AND COMPLETE RESPONSIBILITY FOR JOB SITE CONDITIONS DURING THE COURSE OF CONSTRUCTION FOR THE PROJECT, INCLUDING SAFETY OF ALL PERSONS AND PROPERTY; THAT THIS REQUIREMENTS SHALL BE MADE TO APPLY CONTINUOUSLY AND NOT BE LIMITED TO NORMAL WORKING HOURS, AND CONSTRUCTION CONTRACTOR FURTHER AGREES TO DEFEND, INDEMNIFY, AND HOLD HARMLESS THE CITY, ITS EMPLOYEES, AND AGENTS FROM ANY AND ALL LIABILITY, REAL OR ALLEGED, IN CONNECTION WITH THE PERFORMANCE OF WORK ON THIS PROJECT.

THE CONTRACTOR SHALL BE RESPONSIBLE TO REPORT DISCREPANCIES IN PLANS AND/OR FIELD CONDITIONS IMMEDIATELY TO THE DESIGN ENGINEER FOR RESOLUTION PRIOR TO CONSTRUCTION, AND SHALL BE RESPONSIBLE FOR DISCREPANCIES NOT SO REPORTED AND RESOLVED.

7OAKS ENGINEERING
345 WESTFIELD ST. #107
SILVERTON, OR. 97381
503.308.8554
ADMIN@7OAKSENGINEERING.COM

STAMP:

REGISTERED PROFESSIONAL ENGINEER
94115PE
PRELIMINARY
OREGON
NOV 13, 2015
KIMBERLY JOHNSON

NO	DATE	ISSUE DESCRIPTION

QC BY: DRAWN BY:

PROJECT NAME: MCLEOD SUBDIVISION
PROJECT ADDRESS: 6255 MCLEOD
KEIZER, OR.

SHEET TITLE: STORMWATER DETAILS

DATE: 02/20/2024

SHEET NUMBER: 7

JOB #00309

APPENDIX D – GEOTECHNICAL REPORT

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

Preliminary Geotechnical Engineering Report

Project Information:	**McLeod Subdivision** **GeoPacific Project № 23-6474** **January 16, 2024**
Site Location:	**6255 McLeod Lane** **Keizer, Oregon** **Marion County** **Tax Map 06 3W 36BB Lot 3700**
Client:	**Orreo LLC.** **P.O. Box 2717** **Salem, Oregon 97308** **Attn: Charles Weathers** **Email: orreoproperties@gmail.com**

14835 SW 72nd Avenue
Portland, Oregon 97224
Tel (503) 598-8445
Fax (503) 941-9281

TABLE OF CONTENTS

APPENDIX

List of Appendices

List of Figures

1.0 PROJECT INFORMATION

This report presents the results of a preliminary geotechnical engineering study conducted by GeoPacific Engineering, Inc. (GeoPacific) for the above-referenced project. The purpose of our investigation was to evaluate subsurface conditions at the site, assess potential geologic hazards at the property, and to provide geotechnical recommendations for construction of an addition to the existing home. This geotechnical study was performed in accordance with GeoPacific Proposal № P-8601, dated October 20, 2023, and your subsequent authorization of our proposal and *General Conditions for Geotechnical Services*.

2.0 SITE AND PROJECT DESCRIPTION

The subject site is located at 6255 McLeod Lane NE, in Keizer, Oregon, approximately 200 feet south of the intersection of Manzanita Street NE and McLeod Lane NE. The property is a rectangular residential neighborhood lot of approximately 2.48-acres in size and is identified as Lot 3700 on Marion County tax map 063W36BB. A residential home was located near the center of the site and was recently demolished. At the time of our investigation, we observed compacted gravel in the footprint of the previous home. Vegetation consists primarily of grass lawn and small to large trees. The site is bordered by McLeod Lane NE to the east and by residential lots in all other directions. Site topography relatively level, with elevations ranging from 158 to 160 feet above mean sea level (amsl). The site latitude and longitude are 45.010776, -123.007420, and the legal description is the NW ¼ of the NW ¼ of Section 36, T6S, R3E, Willamette Meridian.

GeoPacific understands that development at the site will include construction of a subdivision creating new building lots for residential homes, new local public streets, a stormwater retention facility and associated underground utilities. We expect the homes to be constructed with typical spread foundations incorporating continuous strip footings, and square column footings, with post and beam wood-framing above. A grading plan has not been provided for our review.

3.0 REGIONAL GEOLOGIC SETTING

Regionally, the subject site lies within the Willamette Valley/Puget Sound lowland, a broad structural depression situated between the Coast Range on the west and the Cascade Range on the east. A series of discontinuous faults subdivide the Willamette Valley into a mosaic of fault-bounded, structural blocks (Yeats et al., 1996). Uplifted structural blocks form bedrock highlands, while down-warped structural blocks form sedimentary basins.

Geologic mapping indicates that the subject site is underlain by Quaternary age sediments (approximately 2.6 million years ago to present) of silt, sand, and gravel. The Quaternary sediments include alluvium and glaciofluvial sediment from the Cascade Range produced during Pleistocene glaciations (approximately 2.6 million to 12,000 years ago), and fine (Qff) and coarse (Qfc) grained catastrophic flood deposits. The catastrophic flood deposits were the result of repeated outburst of glacial Lake Missoula in western Montana approximately 15,000 to 13,000 years ago. The catastrophic floods transported sediments from western Washington to the Willamette Valley (Gannet and Caldwell, 1998; O'Conner et al., 2001). The catastrophic flood deposits in the

Willamette valley may be up to 100 feet in thickness and may display rhythmic bedding from several inches to several feet in thickness (O'Conner et al., 2001).

Soils to the west of the site are mapped as silt, sand, and gravel alluvium of the Willamette River (Qalc) and larger tributaries. To the north of the site lies the Lake Labish Ditch, a small tributary of the Willamette River, that is mapped with alluvium of smaller Willamette River tributaries (Qalf) (O'Conner et al., 2001). As shown on Figure A, below, geologic mapping by O'Conner et al. in 2001 differentiates the Missoula Flood deposits into a main body (Qff2) and a younger member (Qff1). The subject site is located in an area mapped as the younger member (Qff1). The younger member (Qff1) consists of catastrophic flood deposits that flank the Willamette River and its tributaries and possibly includes deposits of Qalf and Qalc.

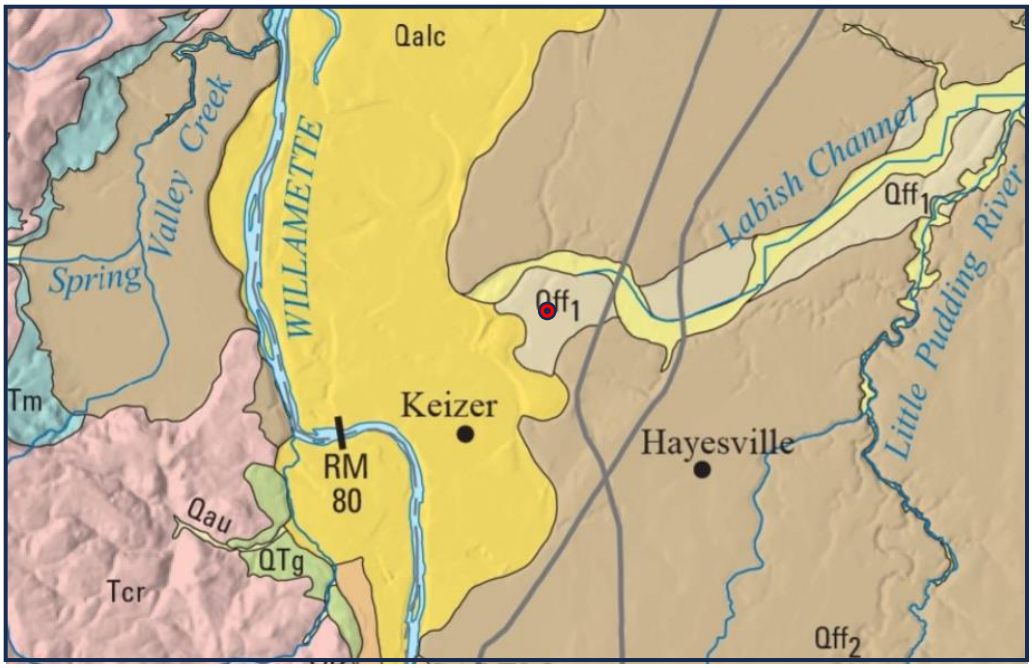


Figure A - Excerpt of *Origin, extent, and thickness of Quaternary geologic units in the Willamette Valley, Oregon* (O'Connor et al., 2001). Site Location = ⊙

4.0 REGIONAL SEISMIC SETTING

According to the United States Geological Survey's Earthquake Hazards Program at least one major fault zone capable of generating damaging earthquakes is thought to exist in the vicinity of the subject site, the Cascadia Subduction Zone.

4.1 Cascadia Subduction Zone

The Cascadia Subduction Zone is a 680-mile-long zone of active tectonic convergence where oceanic crust of the Juan de Fuca Plate is subducting beneath the North American continent at a rate of 4 cm per year (Goldfinger et al., 1996). A growing body of geologic evidence suggests that prehistoric subduction zone earthquakes have occurred (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). This evidence includes: (1) buried tidal marshes recording

episodic, sudden subsidence along the coast of northern California, Oregon, and Washington, (2) burial of subsided tidal marshes by tsunami wave deposits, (3) paleoliquefaction features, and (4) geodetic uplift patterns on the Oregon coast. Radiocarbon dates on buried tidal marshes indicate a recurrence interval for major subduction zone earthquakes of 250 to 650 years with the last event occurring 300 years ago (Atwater, 1992; Carver, 1992; Peterson et al., 1993; Geomatrix Consultants, 1995). The inferred seismogenic portion of the plate interface lies approximately along the Oregon Coast at depths of between 20 and 40 kilometers below the surface.

5.0 FIELD EXPLORATION AND SUBSURFACE CONDITIONS

Our subsurface explorations for this report were conducted on November 27, 2023. A total of five exploratory test pits (TP-1 through TP-5) were excavated at the site to maximum depths of 10 feet below existing ground surface (bgs) using a medium sized track hoe. Explorations were conducted under the full-time observation of a GeoPacific geologist. During the explorations, pertinent information including soil sample depths, stratigraphy, soil engineering characteristics, and groundwater occurrence were recorded. At the completion of each test, the test pits were loosely backfilled with onsite soils. Soils were classified in accordance with the Unified Soil Classification System (USCS).

It should be noted that our explorations were located in the field by pacing or taping distances from apparent property corners and other site features shown on the plans provided. As such, the locations of the explorations should be considered approximate. Summary exploration logs are attached. The stratigraphic contacts shown on the individual test pit logs represent the approximate boundaries between soil types. The actual transitions may be more gradual. The soil and groundwater conditions depicted are only for the specific dates and locations reported, and therefore, are not necessarily representative of other locations and times. Soil and groundwater conditions encountered in the explorations are summarized in the following *Soil Descriptions* section.

5.1 Soil Descriptions

Topsoil: At the ground surface of all of our test pit explorations, we encountered a soft, dark brown, organic SILT (OL) topsoil layer that was very moist and contained fine grass roots. The topsoil layer extends to approximately 8 to 12 inches beneath the surface, with up to 18 inches of topsoil in the vicinity of test pit TP-5 at the center of the site.

Flood Deposits: Beneath the topsoil in all of our test pit explorations, we found soft to medium stiff moist, light brown lean CLAY (CL) that was homogenous and plastic. At approximately 2 to 3 feet the lean CLAY (CL) transitions to a stiff to very stiff consistency, with black stained particles and faint bedding of fines. This material was interpreted to be catastrophic flood deposits from glacial Lake Missoula, possibly mixed with alluvium due to close proximity to the Willamette River flood plain. The flood deposits extended beyond the 10 feet maximum depth of our explorations onsite.

Laboratory testing conducted on a representative sample obtained from test pit TP-2 at a depth of 9 feet (elevation of infiltration testing) indicated approximately 88.4 percent by weight passing the U.S. No. 200 sieve, and a moisture content of 24.5 percent. Atterberg limit testing indicated a liquid limit

of 40, and a plasticity index of 18. The soil type is classified as lean CLAY (CL) according to the USCS soil classification system, and as A-6(168) according to AASHTO standards.

Laboratory testing conducted on a representative sample obtained from test pit TP-2 at a depth of 4 feet found approximately 90.7 percent by weight passing the U.S. No. 200 sieve, and a moisture content ranging from 22.5 percent. Laboratory testing conducted on a representative sample obtained from test pit TP-4 at a depth of 9 feet found approximately 89.1 percent by weight passing the U.S. No. 200 sieve, and a moisture content ranging from 24.3 percent.

5.2 Shrink-Swell Potential

Soft to very stiff, lean CLAY (CL) was encountered within our test pit explorations conducted at the site to depths of 10 feet. Based upon the results of our investigation and our local experience with the soil layers in the vicinity of the subject site, the plasticity of the soils is low, and the shrink-swell potential of the soil types is considered to be low. Special design measures are not considered necessary to minimize the risk of uncontrolled damage of foundations as a result of potential soil expansion at this site.

5.3 Groundwater and Soil Moisture

On November 27, 2023, observed soil moisture conditions were generally damp to moist. Groundwater seepage was not encountered within our test pit explorations to depths of 10 feet. Based on our review of available well logs from the *Oregon Water Resource Department, Groundwater information Mapping tool* (Oregon.gov, 2024), we understand that the depth to groundwater has been recorded at depths ranging from 15 to 30 feet bgs in the vicinity of the site. It is anticipated that groundwater conditions will vary depending on the season, local subsurface conditions, changes in site utilization, and other factors. Perched groundwater may be encountered in localized areas. Seeps and springs may exist in areas not explored and may become evident during site grading.

5.4 Infiltration Testing

Soil infiltration testing was performed using the encased falling-head method in test pit exploration TP-1 at depths of 4.5 and 6 feet bgs. The approximate locations of subsurface explorations are indicated in Figures 2 & 3. The water level was measured to the nearest 0.1 inch from a fixed point and the change in water level was recorded at regular intervals until three successive measurements showing a consistent infiltration rate were achieved. Table 1 summarizes the results of the encased falling-head infiltration tests. Infiltration rates have been reported without applying a factor of safety. Soils at the test locations were observed and sampled in order to characterize the subsurface profile.

Table 1 - Summary of Infiltration Test Results

Test Location	Depth (feet)	Soil Type	Infiltration Rate (in/hr)	Hydraulic Head Range (inches)
TP-2	4.5	Lean CLAY (CL)	0	14.5
TP-2	9	SILT (ML)	0.48	25.5-27

6.0 PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

Our site investigation indicates that the proposed construction appears to be geotechnically feasible, provided that the recommendations of this report are incorporated into the design and construction phases of the project. The primary geotechnical concern associated with the site development is the presence of low permeability soils. Encased falling head infiltration testing was conducted in test pit exploration TP-2, in the northwest corner of the site. Measurable infiltration was not observed during the testing at a depth of 4.5 feet. Infiltration at a rate of approximately 0.48 inches per hour was observed in test pit TP-2 at a depth of 9 feet. Care should be taken in designing the storm water retention system.

Our geotechnical report is considered preliminary until we have reviewed a finalized grading plan for the project. GeoPacific may be contacted to revise the report once plans are available.

6.1 Site Preparation Recommendations

Areas of proposed buildings, pavements, and areas to receive fill should be cleared of vegetation and any organic and inorganic debris. Existing structures should be demolished and any cavities structurally backfilled. Inorganic debris should be removed from the site. Organic materials from clearing should either be removed from the site or placed as landscape fill in areas not planned for structures. The final depth of soil removal will be determined on the basis of a site inspection after the stripping/excavation has been performed.

Organic-rich topsoil should then be stripped from construction areas of the site or where engineered fill is to be placed. The estimated average necessary depth of removal of moderately to highly organic soils is 8 to 12 inches. Deeper stripping to remove large tree roots or other organics may be necessary in localized areas. Organic soils were observed to a depth of approximately 18 inches in test pit TP-5, the exploration closest to the large trees at the center of the site. The final depth of soil removal will be determined on the basis of a site inspection after the stripping/excavation has been performed. Stripped topsoil should be stockpiled only in designated areas and stripping operations should be observed and documented by the geotechnical engineer or his representative.

In the influence zones of the proposed building and other settlement-sensitive structures, undocumented fills, buried topsoil, and subsurface structures (tile drains, basements, driveway and landscaping fill, old utility lines, cisterns, septic leach fields, etc.) should be removed and the excavations backfilled with engineered fill.

Exposed subgrade soils should be evaluated by the geotechnical engineer. For large areas, this evaluation is normally performed by proof-rolling the exposed subgrade with a fully loaded scraper or dump truck. For smaller areas where access is restricted, the subgrade should be evaluated by probing the soil with a steel probe. Soft/loose soils identified during subgrade preparation should be compacted to a firm and unyielding condition, over-excavated and replaced with engineered fill (as described below) or stabilized with rock prior to placement of engineered fill. The depth of over-excavation, if required, should be evaluated by the geotechnical engineer at the time of construction.

6.2 Engineered Fill

All grading for the proposed construction should be performed as engineered grading in accordance with the applicable building code at the time of construction with the exceptions and additions noted herein. Areas proposed for fill placement should be prepared as described in the Site Preparation Recommendations section. Surface soils should then be scarified and recompacted prior to placement of structural fill. Proper test frequency and earthwork documentation usually requires daily observation and testing during stripping, rough grading, and placement of engineered fill. Imported fill material must be approved by the geotechnical engineer prior to being imported to the site. Oversize material greater than 6 inches in size should not be used within 3 feet of foundation footings, and material greater than 12 inches in diameter should not be used in engineered fill.

Engineered fill should be compacted in horizontal lifts not exceeding 12 inches using standard compaction equipment. We recommend that engineered fill be compacted to at least 95 percent of the maximum dry density determined by ASTM D698 (Standard Proctor) or equivalent. Soils should be moisture conditioned to within two percent of optimum moisture. Field density testing should conform to ASTM D2922 and D3017, or D1556. All engineered fill should be observed and tested by the project geotechnical engineer or his representative. Typically, one density test is performed for at least every 2 vertical feet of fill placed or every 500 yd^3, whichever requires more testing. Because testing is performed on an on-call basis, we recommend that the earthwork contractor be held contractually responsible for test scheduling and frequency.

Site earthwork may be impacted by perched groundwater, soil moisture and wet weather conditions. Earthwork in wet weather would likely require extensive use of additional crushed aggregate, cement or lime treatment, or other special measures, at considerable additional cost compared to earthwork performed under dry-weather conditions.

6.3 Excavating Conditions and Utility Trench Backfill

We anticipate that onsite soils can generally be excavated using conventional heavy equipment. These deposits are not cohesive and may exhibit sidewall collapse during deep trenching. Maintenance of safe working conditions, including temporary excavation stability, is the responsibility of the contractor. Actual slope inclinations at the time of construction should be determined based on safety requirements and actual soil and groundwater conditions. All temporary cuts in excess of 4 feet in height should be sloped in accordance with U.S. Occupational Safety and Health Administration (OSHA) regulations (29 CFR Part 1926) or be shored. The native clay and silt soils classify as Type B Soil and temporary excavation side slope inclinations as steep as 1H:1V may be assumed for planning purposes. These cut slope inclinations are applicable to excavations above the water table only, where seepage is not encountered.

Vibrations created by traffic and construction equipment may cause some caving and raveling of excavation walls. In such an event, lateral support for the excavation walls should be provided by the contractor to prevent loss of ground support and possible distress to existing or previously constructed structural improvements.

Underground utility pipes should be installed in accordance with the procedures specified in ASTM D2321 and applicable city and county standards. We recommend that structural trench backfill be compacted to at least 95 percent of the maximum dry density obtained by the Standard Proctor (ASTM D698, AASHTO T-99) or equivalent. Initial backfill lift thicknesses for a ¾"-0 crushed aggregate base may need to be as great as 4 feet to reduce the risk of flattening underlying flexible pipe. Subsequent lift thickness should not exceed 1 foot. If imported granular fill material is used, then the lifts for large vibrating plate-compaction equipment (e.g. hoe compactor attachments) may be up to 2 feet, provided that proper compaction is being achieved and each lift is tested. Use of large vibrating compaction equipment should be carefully monitored near existing structures and improvements due to the potential for vibration-induced damage.

Adequate density testing should be performed during construction to verify that the recommended relative compaction is achieved. Typically, at least one density test is taken for every 4 vertical feet of backfill on each 100-lineal-foot section of trench.

6.4 Erosion Control Considerations

During our field exploration program, we did not observe soil and topographic conditions which are considered highly susceptible to erosion. In our opinion, the primary concern regarding erosion potential will occur during construction in areas that have been stripped of vegetation. Erosion at the site during construction can be minimized by implementing the project erosion control plan, which should include judicious use of straw wattles, fiber rolls, and silt fences. If used, these erosion control devices should remain in place throughout site preparation and construction.

Erosion and sedimentation of exposed soils can also be minimized by quickly re-vegetating exposed areas of soil, and by staging construction such that large areas of the project site are not denuded and exposed at the same time. Areas of exposed soil requiring immediate and/or temporary protection against exposure should be covered with either mulch or erosion control netting/blankets. Areas of exposed soil requiring permanent stabilization should be seeded with an approved grass seed mixture, or hydroseeded with an approved seed-mulch-fertilizer mixture.

6.5 Wet Weather Earthwork

Soils underlying the site are likely to be moisture sensitive and will be difficult to handle or traverse with construction equipment during periods of wet weather. Earthwork is typically most economical when performed under dry weather conditions. Earthwork performed during the wet-weather season will require expensive measures such as cement treatment or imported granular material to compact areas where fill may be proposed to the recommended engineering specifications. If earthwork is to be performed or fill is to be placed in wet weather or under wet conditions when soil moisture content is difficult to control, the following recommendations should be incorporated into the contract specifications.

- Earthwork should be performed in small areas to minimize exposure to wet weather. Excavation or the removal of unsuitable soils should be followed promptly by the placement and compaction of clean engineered fill. The size and type of construction equipment used

may have to be limited to prevent soil disturbance. Under some circumstances, it may be necessary to excavate soils with a backhoe to minimize subgrade disturbance caused by equipment traffic;

- The ground surface within the construction area should be graded to promote run-off of surface water and to prevent the ponding of water;
- Material used as engineered fill should consist of clean, granular soil containing less than 5 percent passing the No. 200 sieve. The fines should be non-plastic. Alternatively, cement treatment of on-site soils may be performed to facilitate wet weather placement;
- The ground surface within the construction area should be sealed by a smooth drum vibratory roller, or equivalent, and under no circumstances should be left uncompacted and exposed to moisture. Soils which become too wet for compaction should be removed and replaced with clean granular materials;
- Excavation and placement of fill should be observed by the geotechnical engineer to verify that all unsuitable materials are removed and suitable compaction and site drainage is achieved; and
- Geotextile silt fences, straw wattles, and fiber rolls should be strategically located to control erosion.

If cement or lime treatment is used to facilitate wet weather construction, GeoPacific should be contacted to provide additional recommendations and field monitoring.

6.6 Spread Foundations

A grading plan for the project has not been provided at this time. However, based on communication with the client, we anticipate cut and fill on the order of 6 feet or less. The proposed residential homes will likely be constructed on typical spread foundations with square column footings, continuous strip footings, and crawl spaces. We anticipate wood-framed construction above the foundations with maximum structural loading on column footings and continuous strip footings on the order of 10 to 35 kips, and 2 to 7 kips respectively.

Residential structures may be supported on shallow foundations bearing on competent undisturbed, native soils and/or engineered fill, appropriately designed and constructed as recommended in this report. Areas where homes are to be constructed where no engineered fill will be placed should either be prepared as recommended for roadway areas; or the foundation envelopes of the proposed homes should be over-excavated to expose native soils on a lot-by-lot basis (see *Site Preparation Recommendations* section).

Foundation design, construction, and setback requirements should conform to the applicable building code at the time of construction. For maximization of bearing strength and protection against frost heave, spread footings should be embedded at a minimum depth of 12 inches below exterior grade except where footing-to-slope setbacks require deeper embedment. The recommended minimum widths for continuous footings supporting wood-framed walls without masonry are 12 inches for single-story, 15 inches for two-story, and 18 inches for three-story structures. Minimum

foundation reinforcement should consist of a No. 4 bar at the top of stem walls, and a No. 4 bar at the bottom of the footings. Concrete slab-on-grade reinforcement should consist of No. 4 bars placed on 24-inch centers in a grid pattern.

The anticipated allowable soil bearing pressure is 1,500 lbs/ft^2 for footings bearing on competent, low expansivity, native soil and/or engineered fill. A maximum chimney and column load of 40 kips is recommended for the site. The recommended maximum allowable bearing pressure may be increased by 1/3 for short-term transient conditions such as wind and seismic loading. For heavier loads, the geotechnical engineer should be consulted. The coefficient of friction between on-site soil and poured-in-place concrete may be taken as 0.42, which includes no factor of safety. The maximum anticipated total and differential footing movements (generally from soil expansion and/or settlement) are 1 inch and ¾ inch over a span of 20 feet, respectively. We anticipate that the majority of the estimated settlement will occur during construction, as loads are applied. Excavations near structural footings should not extend within a 1H:1V plane projected downward from the bottom edge of footings.

Footing excavations should penetrate through topsoil, undocumented fill, and any loose soil to competent subgrade that is suitable for bearing support. All footing excavations should be trimmed neat, and all loose or softened soil should be removed from the excavation bottom prior to placing reinforcing steel bars. Due to the moisture sensitivity of on-site native soils, foundations constructed during the wet weather season may require over-excavation of footings and backfill with compacted, crushed aggregate.

Our recommendations are for house construction incorporating raised wood floors and conventional spread footing foundations. If living space of the structures incorporate basements, a geotechnical engineer should be consulted to make additional recommendations for retaining walls, water-proofing, underslab drainage and wall subdrains. After site development, a Final Soil Engineer's Report should either confirm or modify the above recommendations.

6.7 Concrete Slabs-on-Grade

Preparation of areas beneath concrete slab-on-grade floors should be performed as described in the Site *Preparation Recommendations* and *Spread Foundations* sections of this report. Care should be taken during excavation for foundations and floor slabs, to avoid disturbing subgrade soils. If subgrade soils have been adversely impacted by wet weather or otherwise disturbed, the surficial soils should be scarified to a minimum depth of 8 inches, moisture conditioned to within about 3 percent of optimum moisture content and compacted to engineered fill specifications. Alternatively, disturbed soils may be removed, and the removal zone backfilled with additional crushed rock.

For evaluation of the concrete slab-on-grade floors using the beam on elastic foundation method, a modulus of subgrade reaction of 150 kcf (87 pci) should be assumed for the stiff, fine -grained soils anticipated to be present at foundation subgrade elevation following adequate site preparation as described above. This value assumes the concrete slab system is designed and constructed as recommended herein, with a minimum thickness of 8 inches of 1½"-0 crushed aggregate beneath the slab. The total thickness of crushed aggregate will be dependent on the subgrade conditions at

the time of construction and should be verified visually by proof-rolling. Under-slab aggregate should be compacted to at least 95 percent of its maximum dry density as determined by ASTM D698 (Standard Proctor) or equivalent.

In areas where moisture will be detrimental to floor coverings or equipment inside the proposed structure, appropriate vapor barrier and damp-proofing measures should be implemented. Appropriate design professionals should be consulted regarding vapor barrier and damp proofing systems, ventilation, building material selection and mold prevention issues, which are outside GeoPacific's area of expertise.

6.8 Footing and Roof Drains

The outside edge of perimeter footings should be provided with a drainage system consisting of 3-inch diameter, slotted, flexible plastic pipe embedded in a minimum of 1 ft^3 per lineal foot of clean, free-draining gravel or 1 1/2" - 3/4" drain rock. The drain pipe and surrounding drain rock should be wrapped in non-woven geotextile (Mirafi 140N, or approved equivalent) to minimize the potential for clogging and/or ground loss due to piping. Water collected from the footing drains should be directed into the local storm drain system or other suitable outlet. A minimum 0.5 percent fall should be maintained throughout the drain and non-perforated pipe outlet. Down spouts and roof drains should not be connected to the foundation drains in order to reduce the potential for clogging. The footing drains should include clean-outs to allow periodic maintenance and inspection. Grades around the proposed structure should be sloped such that surface water drains away from the building.

Footing drains are recommended to prevent detrimental effects of surface water runoff on foundations – not to dewater groundwater. Footing drains should not be expected to eliminate all potential sources of water entering a basement or beneath a slab-on-grade. An adequate grade to a low point outlet drain in the crawlspace, if utilized, is required by code.

7.0 SEISMIC DESIGN

The Oregon Department of Geology and Mineral Industries (DOGAMI), Oregon HazVu: 2023 Statewide GeoHazards Viewer indicates that the site is in an area where *severe* ground shaking is anticipated during an earthquake. Structures should be designed to resist earthquake loading in accordance with the methodology described in the 2021 International Building Code (IBC) with applicable Oregon Structural Specialty Code (OSSC) revisions (current 2022). We recommend Site Class D be used for design as defined in ASCE 7-16, Chapter 20, and Table 20.3-1. Design values determined for the site using the ATC Hazards by Location 2023 Seismic Design Maps Summary Report are summarized in Table 2 and are based upon observed existing soil conditions.

Table 2 - Recommended Earthquake Ground Motion Parameters (ASCE-7-16)

Parameter	Value
Location (Lat, Long), degrees	45.0170259, -123.0073176
Risk-Targeted Maximum Considered Earthquake Design Parameters, 2% Exceedance in 50 years (MCE_R):	
Site Modified Peak Ground Acceleration PGA_M	0.466 g
Short Period, S_s	0.826 g
1.0 Sec Period, S_1	0.410 g
Soil Factors for Site Class D:	
F_a	1.170
* F_v	1.890
$SD_s = 2/3 \times F_a \times S_s$	0.644 g
$*SD_1 = 2/3 \times F_v \times S_1$	0.516 g
Seismic Design Category	D (D_0 per 2021 IRC)

* F_v value reported in the above table is a straight-line interpolation of mapped spectral response acceleration at 1-second period, S_1 per Table 1613.2.3(2) of OSSC 2019 with the assumption that Exception 2 of ASCE 7-16 Chapter 11.4.8 is met per the Structural Engineer. If Exception 2 is not met, and the long-period site coefficient (F_v) is required for design, GeoPacific Engineering can be consulted to provide a site-specific procedure as per ASCE 7-16, Chapter 21.

7.1 Soil Liquefaction

The Oregon Department of Geology and Mineral Industries (DOGAMI), Oregon HazVu: 2023 Statewide GeoHazards Viewer indicates that the site is mapped as being at a *low* risk of soil liquefaction during an earthquake. Soil liquefaction is a phenomenon wherein saturated soil deposits temporarily lose strength and behave as a liquid in response to ground shaking caused by strong earthquakes. Soil liquefaction is generally limited to loose sands and granular soils located below the water table, and fine-grained soils with a plasticity index less than 15. The subsurface profile observed within our explorations and our experience with geologic conditions in the site vicinity indicate that the site is underlain by soft to very stiff clay flood deposits. Based on available well log data, static groundwater is expected to be present at depths of 15 to 30 feet bgs in the vicinity of the site. Based on the results of our subsurface investigation and our understanding of the geologic conditions in the site vicinity, it is our opinion that the risk of liquefaction on the site is low.

For construction of single family structures, special design or construction measures are not required by code to mitigate the effects of liquefaction. An in-depth analysis of seismic hazards is beyond the scope of this study. However, if additional information is desired regarding the potential for soil liquefaction during a seismic event, GeoPacific may be consulted to perform additional subsurface explorations, consisting of soil borings and/or CPT testing, and to perform a quantitative liquefaction analysis. If multi-family residential, high occupancy, or critical structures were to be incorporated into plans for site development, further study and evaluation of seismic hazards would be required by code to more fully evaluate the potential adverse effects due to liquefaction, such as vertical settlement, lateral deformation, and lateral spreading.

8.0 UNCERTAINTIES AND LIMITATIONS

We have prepared this report for the owner and their consultants for use in design of this project only. This report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented in this report should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, GeoPacific should be notified for review of the recommendations of this report, and revision of such if necessary.

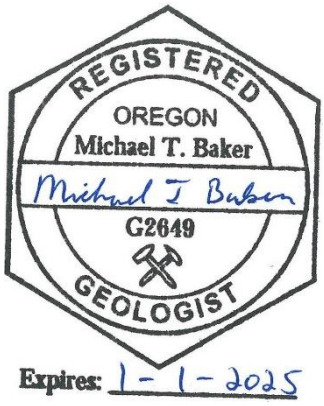
Sufficient geotechnical monitoring, testing and consultation should be provided during construction to confirm that the conditions encountered are consistent with those indicated by explorations. The checklist attached to this report outlines recommended geotechnical observations and testing for the project. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated, and to verify that the geotechnical aspects of construction comply with the contract plans and specifications.

Within the limitations of scope, schedule and budget, GeoPacific attempted to execute these services in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology at the time the report was prepared. No warranty, expressed or implied, is made. The scope of our work did not include environmental assessments or evaluations regarding the presence or absence of wetlands or hazardous or toxic substances in the soil, surface water, or groundwater at this site.

We appreciate this opportunity to be of service.

Sincerely,

GEOPACIFIC ENGINEERING, INC.



Michael T. Baker, R.G.
Staff Geologist

Benjamin G. Anderson, P.E.
Associate Engineer

REFERENCES

ATC Hazards by Location, (https://hazards.atcouncil.org).

Atwater, B.F., 1992, Geologic evidence for earthquakes during the past 2,000 years along the Copalis River, southern coastal Washington: Journal of Geophysical Research, v. 97, p. 1901-1919.

Carver, G.A., 1992, Late Cenozoic tectonics of coastal northern California: American Association of Petroleum Geologists-SEPM Field Trip Guidebook, 1992.

Gannet, Marshall W., and Caldwell, Rodney R., Generalized Geologic Map of the Willamette Lowland, U.S. Department of the interior, U.S. Geological Survey, 1998.

Goldfinger, C., Kulm, L.D., Yeats, R.S., Appelgate, B, MacKay, M.E., and Cochrane, G.R., 1996, Active strike-slip faulting and folding of the Cascadia Subduction-Zone plate boundary and forearc in central and northern Oregon: in Assessing earthquake hazards and reducing risk in the Pacific Northwest, v. 1: U.S. Geological Survey Professional Paper 1560, p. 223-256

Geomatrix Consultants, 1995, Seismic Design Mapping, State of Oregon: unpublished report prepared for Oregon Department of Transportation, Personal Services Contract 11688, January 1995.

O'Connor, J.E., Sarna-Wojcicki, A., Wozniak, K.C., Polette, D.J., and Fleck, R.J., 2001, Origin, extent, and thickness of Quaternary geologic units in the Willamette Valley, Oregon: U.S. Geological Survey, Professional Paper 1620, scale 1:250,000.

Oregon Department of Geology and Mineral Industries, Statewide Geohazards Viewer, www.oregongeology.org/hazvu, 2023.

Oregon Water Resources Department, 2023, Well Report Query: https://apps.wrd.state.or.us/apps/gw/well_log/

Peterson, C.D., Darioenzo, M.E., Burns, S.F., and Burris, W.K., 1993, Field trip guide to Cascadia paleoseismic evidence along the northern California coast: evidence of subduction zone seismicity in the central Cascadia margin: Oregon Geology, v. 55, p. 99-144.

United States Geological Survey, USGS Earthquake Hazards Program Website (earthquake.usgs.gov), 2023.

Yeats, R.S., Graven, E.P., Werner, K.S., Goldfinger, C., and Popowski, T., 1996, Tectonics of the Willamette Valley, Oregon: in Assessing earthquake hazards and reducing risk in the Pacific Northwest, v. 1: U.S. Geological Survey Professional Paper 1560, P. 183-222, 5 plates, scale 1:100,000.

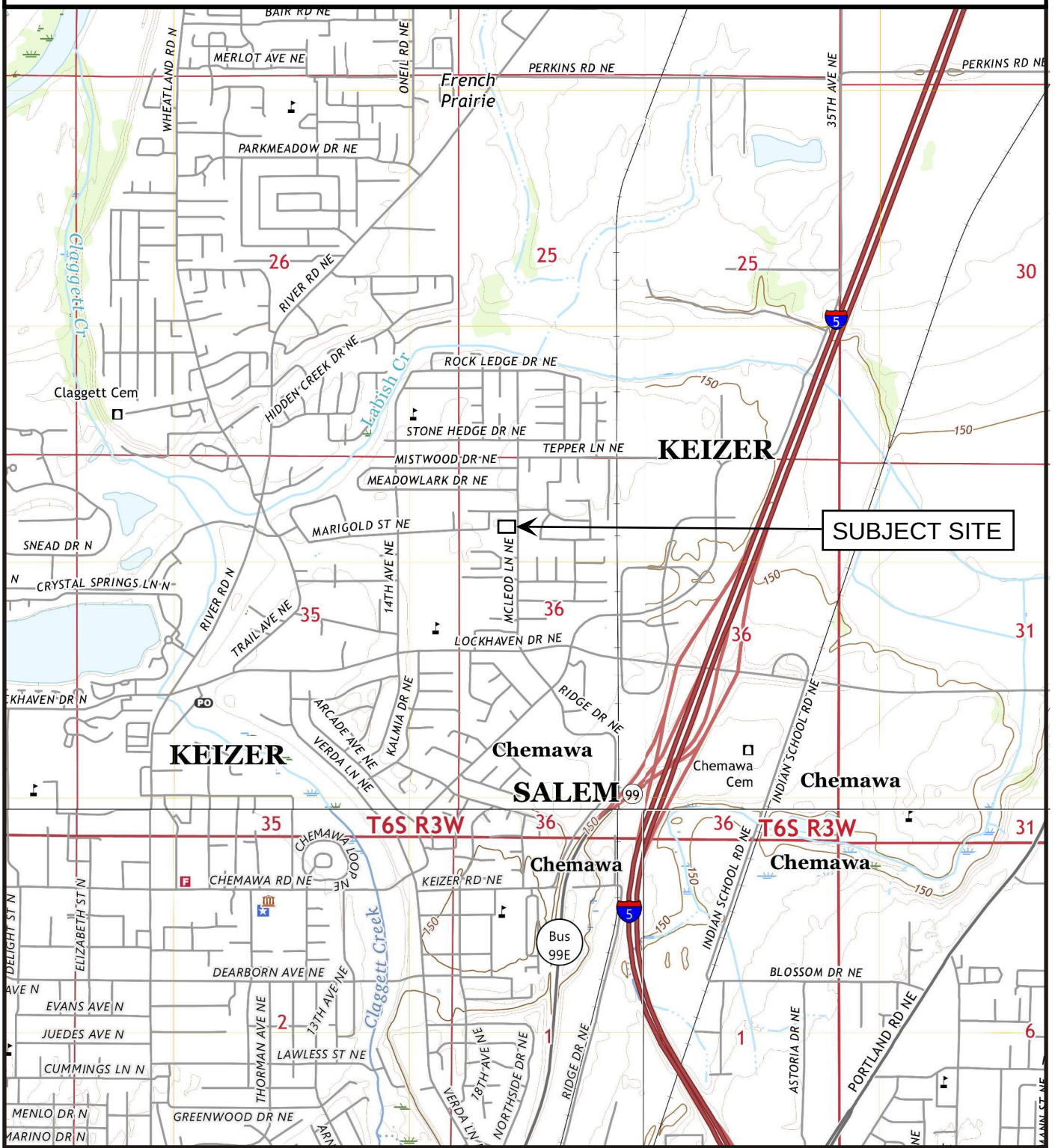
CHECKLIST OF RECOMMENDED GEOTECHNICAL TESTING AND OBSERVATION

Item No.	Procedure	Timing	By Whom	Done
1	Preconstruction meeting	Prior to beginning site work	Contractor, Developer, Civil and Geotechnical Engineers	
2	Fill removal from site or sorting and stockpiling	Prior to mass stripping	Soil Technician/ Geotechnical Engineer	
3	Stripping, aeration, and root-picking operations	During stripping	Soil Technician	
4	Compaction testing of engineered fill (95% of Standard Proctor)	During filling, tested every 2 vertical feet	Soil Technician	
5	Foundation Subgrade Compaction (95% of Modified Proctor)	During Foundation Preparation, Prior to Placement of Reinforcing Steel	Soil Technician/ Geotechnical Engineer	
6	Compaction testing of trench backfill (95% of Standard Proctor)	During backfilling, tested every 4 vertical feet for every 200 linear feet	Soil Technician	
7	Street Subgrade Inspection (95% of Standard Proctor or Equivalent)	Prior to placing base course	Soil Technician	
8	Base course compaction (95% of Modified Proctor)	Prior to paving, tested every 200 linear feet	Soil Technician	
9	Asphalt Compaction (92% Rice Value)	During paving, tested every 100 linear feet	Soil Technician	
10	Final Geotechnical Engineer's Report	Completion of project	Geotechnical Engineer	

FIGURES

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445

VICINITY MAP



Legend

Approximate Scale 1 in = 2,000 ft

Drawn by: MTB

Date: 12.8.2023

Base maps: U.S. Geological Survey 7.5 minute Topographic Map Series, Mission Bottom, Gervais & Salem East, Oregon Quadrangle, 2020 and Salem West, Oregon Quadrangle, 2023.

North

Project:	Project No.	
Mcleod Subdivision Keizer, Oregon	23-6474	FIGURE 1

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Tel: (503) 598-8445

SITE PLAN AND EXPLORATION LOCATIONS

Legend

TP-1
Test Pit Designation and Approximate Location

Site Boundary

0 40'
APPROXIMATE SCALE 1"=40'

North

Drawn by: MTB
Date: 12.8.2023

Project: McLeod Subdivision
Keizer, Oregon

Project No. 23-6474

FIGURE 2

EXPLORATION LOGS

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Office: 503-598-8445

TEST PIT LOG

Project: Mcleod Subdivision
Keizer, Oregon

Project No. 23-6474

Exploration No. **TP-1**

Depth (ft)	Sample Type	tons/sq.ft.	Moisture Content (%)	Water Bearing Zone	Material Description
					Organic SILT (OL), dark brown, fine roots, soft, moist [Topsoil]
1		1.0			Lean CLAY (CL), light brown, subtle orange and gray mottling, low to moderate plasticity, homogenous, moist, soft to medium stiff [Flood Deposits]
2		1.5			
3		3.5			Grades to light brown to tan, faint gray mottling, low to moderate plasticity, homogenous, blocky, micaceous, black stained particles, faint bedding of varying fines concentration, damp to moist, stiff [Flood Deposits]
4		3.0			
5					
6					
7					
8					
9					
10					Exploration terminated at 10 feet.
11					Groundwater not encountered.

LEGEND

Bag Sample


Split-Spoon

Shelby Tube Sample


Seepage

Static Water Table


Water Bearing Zone

Date Excavated: 11.27.2023
Logged By: MTB
Surface Elevation: 159 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Office: 503-598-8445

TEST PIT LOG

Project: Mcleod Subdivision
Keizer, Oregon

Project No. 23-6474

Exploration No. **TP-2**

Depth (ft)	Sample Type	tons/sq.ft.	Moisture Content (%)	Water Bearing Zone	Material Description
					Organic SILT (OL), dark brown, fine roots, soft, moist [Topsoil]
1		1.0			Lean CLAY (CL), brown, subtle orange and gray mottling, low to moderate plasticity, homogenous, moist, soft to medium stiff [Flood Deposits]
2		2.0			
3		4.0			Grades to light brown to tan, subtle orange and gray gray mottling, low to moderate plasticity, faint bedding of varying fines concentration, blocky, micaceous, black stained particles, damp to moist, stiff [Flood Deposits]
4	100 to 1,000 g	4.5	22.5		[Percent passing the # 200 sieve = 90.7 percent]
5					
6					
7					
8					
9	100 to 1,000 g		24.5		[Percent passing the # 200 sieve = 88.4 percent]
10					Exploration terminated at 10 feet.
11					Groundwater not encountered.

LEGEND

Bag Sample


Split-Spoon

Shelby Tube Sample


Seepage

Static Water Table


Water Bearing Zone

Date Excavated: 11.27.2023
Logged By: MTB
Surface Elevation: 160 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Office: 503-598-8445

TEST PIT LOG

Project: Mcleod Subdivision
Keizer, Oregon

Project No. 23-6474

Exploration No. **TP-3**

Depth (ft)	Sample Type	tons/sq.ft.	Moisture Content (%)	Water Bearing Zone	Material Description
0					Organic SILT (OL), dark brown, fine roots, soft, moist [Topsoil]
1		1.0			Lean CLAY (CL), light brown, subtle orange and gray mottling, low to moderate plasticity, homogenous, moist, soft to medium stiff [Flood Deposits]
2		1.0			
3		4.0			
4		4.5			Grades to light brown to tan, faint gray mottling, low to moderate plasticity, homogenous, blocky, micaceous, black stained particles, faint bedding of varying fines concentration, damp to moist, stiff [Flood Deposits]
5					
6					
7					
8					
9					
10					Exploration terminated at 10 feet. Groundwater not encountered.
11					

LEGEND

Bag Sample


Split-Spoon

Shelby Tube Sample


Seepage

Static Water Table


Water Bearing Zone

Date Excavated: 11.27.2023
Logged By: MTB
Surface Elevation: 159 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Office: 503-598-8445

TEST PIT LOG

Project: Mcleod Subdivision
Keizer, Oregon

Project No. 23-6474

Exploration No. **TP-4**

Depth (ft)	Sample Type	tons/sq.ft.	Moisture Content (%)	Water Bearing Zone	Material Description
0					Organic SILT (OL) with gravel, dark brown, fine roots, concrete fragments, soft, moist [Topsoil/Fill]
1		1.5			Lean CLAY (CL), light brown, subtle orange and gray mottling, low to moderate plasticity, homogenous, moist, soft to medium stiff [Flood Deposits]
2		4.5			
3		3.5			Grades to light brown to tan, faint gray mottling, low to moderate plasticity, homogenous, blocky, micaceous, black stained particles, faint bedding of varying fines concentration, damp to moist, stiff [Flood Deposits]
4		4.0			
5					
6					
7					
8					
9	100 to 1,000 g		24.3		[Percent passing the # 200 sieve = 89.1 percent]
10					Exploration terminated at 10 feet.
11					Groundwater not encountered.

LEGEND

100 to 1,000 g — Bag Sample; Split-Spoon; Shelby Tube Sample; Seepage; Static Water Table; Water Bearing Zone

Date Excavated: 11.27.2023
Logged By: MTB
Surface Elevation: 160 Feet

GEOPACIFIC
14835 SW 72nd Avenue
Portland, Oregon 97224
Office: 503-598-8445

TEST PIT LOG

Project: Mcleod Subdivision
Keizer, Oregon

Project No. 23-6474

Exploration No. **TP-5**

Depth (ft)	Sample Type	tons/sq.ft.	Moisture Content (%)	Water Bearing Zone	Material Description
1		1.5			Organic SILT (OL), dark brown, numerous tree roots, soft, moist [Topsoil]
2		4.0			Lean CLAY (CL), light brown, subtle orange and gray mottling, low to moderate plasticity, homogenous, moist, soft to medium stiff [Flood Deposits]
3		4.5			Grades to light brown to tan, faint gray mottling, low to moderate plasticity, homogenous, blocky, micaceous, black stained particles, faint bedding of varying fines concentration, damp to moist, stiff [Flood Deposits]
4		4.5			
5					
6					
7					
8					
9					
10					Exploration terminated at 10 feet. Groundwater not encountered.
11					

LEGEND

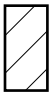
Bag Sample


Split-Spoon

Shelby Tube Sample


Seepage

Static Water Table


Water Bearing Zone

Date Excavated: 11.27.2023
Logged By: MTB
Surface Elevation: 159 Feet

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

LABORATORY RESULTS

S23-221,223 Moisture Contents and #200 Wash

GEOPACIFIC

Project Name:	Mcleod Subdivision	Project #:	23-6474
Date Sampled:	11.27.2023	Date Tested:	11.28.2023
Sampled By:	MTB	Tested By:	MTB/DPM

Moisture Content

Sample ID:	S23-221
Exploration & Depth:	TP-2 4ft
Tare #:	53
Tare (g):	156.1
Tare + Wet (g):	700.7
Tare + Dry (g):	600.7
Moisture (%):	22.5

#200 Wet Sieve

Sample ID:	S23-221
Exploration & Depth:	TP-2 4ft
Tare #:	53
Tare (g):	156.1
Tare + Prewash (g):	600.7
Tare + Washed (g):	197.5
Passing #200 (%):	90.7

Moisture Content

Sample ID:	S23-223
Exploration & Depth:	TP-4 9ft
Tare #:	50
Tare (g):	156.7
Tare + Wet (g):	605.0
Tare + Dry (g):	517.3
Moisture (%):	24.3

#200 Wet Sieve

Sample ID:	S23-223
Exploration & Depth:	TP-4 9ft
Tare #:	50
Tare (g):	156.7
Tare + Prewash (g):	517.3
Tare + Washed (g):	195.9
Passing #200 (%):	89.1

Moisture Content

Sample ID:	
Exploration & Depth:	
Tare #:	
Tare (g):	
Tare + Wet (g):	
Tare + Dry (g):	
Moisture (%):	#DIV/0!

#200 Wet Sieve

Sample ID:	
Exploration & Depth:	
Tare #:	
Tare (g):	
Tare + Prewash (g):	
Tare + Washed (g):	
Passing #200 (%):	#DIV/0!

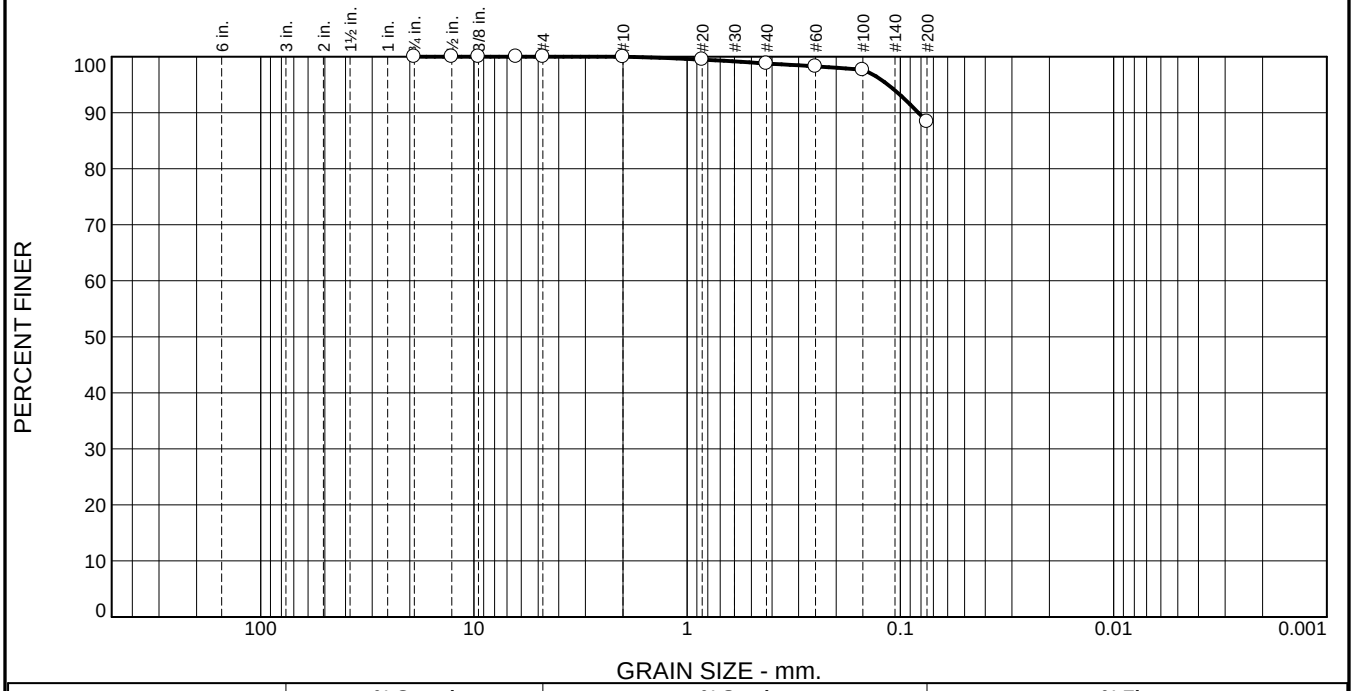
Moisture Content

Sample ID:	
Exploration & Depth:	
Tare #:	
Tare (g):	
Tare + Wet (g):	
Tare + Dry (g):	
Moisture (%):	#DIV/0!

#200 Wet Sieve

Sample ID:	
Exploration & Depth:	
Tare #:	
Tare (g):	
Tare + Prewash (g):	
Tare + Washed (g):	
Passing #200 (%):	#DIV/0!

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	0.0	0.0	1.2	10.4	88.4	

TEST RESULTS

Opening Size	Percent Finer	Spec.* (Percent)	Pass? (X=Fail)
.75	100.0		
.5	100.0		
.375	100.0		
.25	100.0		
#4	100.0		
#10	100.0		
#20	99.5		
#40	98.8		
#60	98.3		
#100	97.7		
#200	88.4		

* (no specification provided)

Material Description

Lean CLAY

Atterberg Limits (ASTM D 4318)

PL= 22 **LL=** 40 **PI=** 18

Classification

USCS (D 2487)= CL **AASHTO (M 145)=** A-6(16)

Coefficients

D_{90}= 0.0824 D_{85}= D_{60}=
D_{50}= D_{30}= D_{15}=
D_{10}= C_u= C_c=

Remarks

Moisture Content = 24.5 percent

Date Received: **Date Tested:** 11.28.2023

Tested By: DPM/MTB

Checked By:

Title:

Location: TP-2
Sample Number: S23-222 **Depth:** 9ft

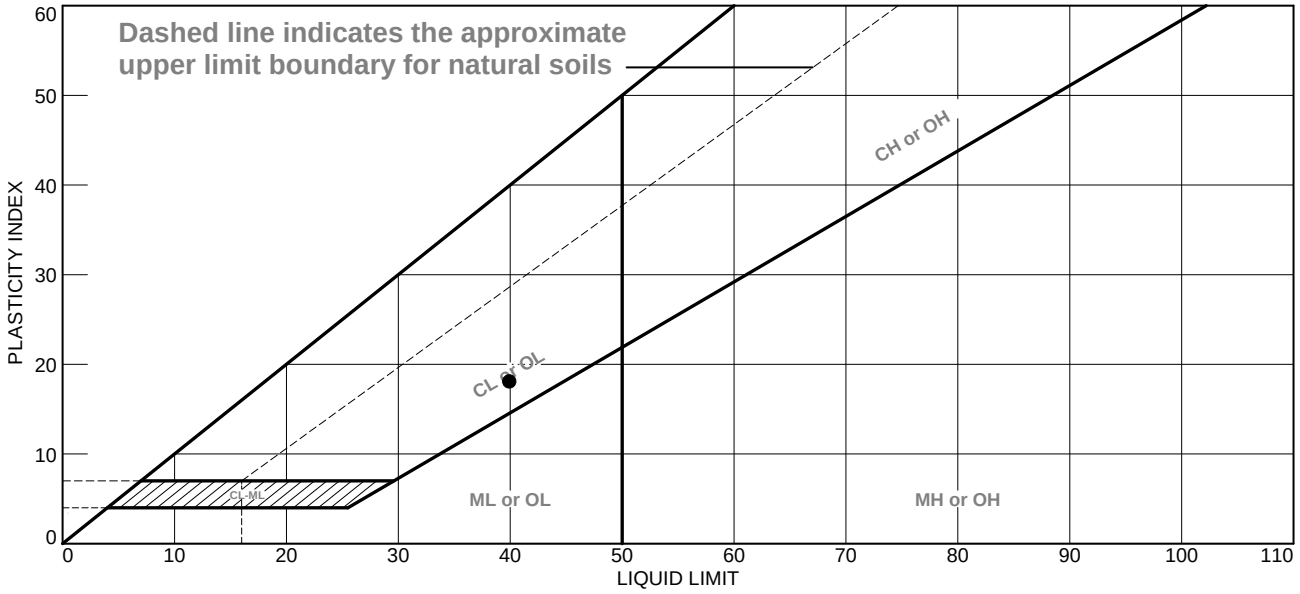
Date Sampled: 11.27.2023

GEOPACIFIC ENGINEERING, INC.

Client: Oreo LLC
Project: Mcleod Subdivision

Project No: 23-6474 **Figure**

LIQUID AND PLASTIC LIMITS TEST REPORT



	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Lean CLAY	40	22	18	98.8	88.4	CL

Project No. 23-6474 **Client:** Oreo LLC

Project: Mcleod Subdivision

Location: TP-2
Sample Number: S23-222 **Depth:** 9ft

Remarks:

GEOPACIFIC ENGINEERING, INC.

Figure

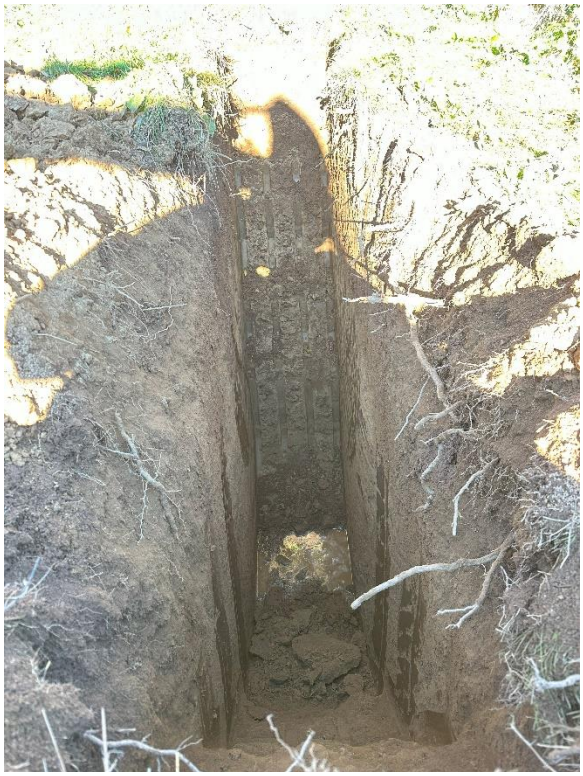
Tested By: DPM/MTB

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

PHOTOGRAPHIC LOG

Test Pit TP-1

Real-World Geotechnical Solutions
Investigation • Design • Construction Support



Test Pit TP-2

Real-World Geotechnical Solutions
Investigation • Design • Construction Support

Test Pit TP-3

Test Pit TP-4

Test Pit TP-5