PRELIMINARY STORM WATER ANALYSIS AND FACILITY DESIGN

FOR

MOORE PROJECT

20865 SW 105TH Avenue
TUALATIN, OREGON 97062

J.O. SGL 18-033

December 20, 2019
Revised December 17, 2020

SISUL ENGINEERING
A Division of Sisul Enterprises, Inc.
375 Portland Avenue
Gladstone, OR 97027
phone: (503) 657-0188
fax: (503) 657-5779

Narrative:

The goal of this storm report is to demonstrate that stormwater treatment and detention can be provided per the current Clean Water Services (CWS) rules and regulations.

Our project site is Tax Lot 501, located in T2S, R1W, Section 27, W.M. Washington County . The site is located on the western side of SW 105th Avenue approximately 150 feet south of SW Siletz Drive. The site is a 0.52-acre undeveloped commercial lot.

Stormwater drainage for the site appears to flow from SW 105th Avenue towards the northwestern corner following existing grade contours. Terrain drops off around 3.5 percent on average heading away from SW 105th Avenue.

SW 105th is partially developed with the eastern half having a 20-foot wide paved width and a curb tight sidewalk. Stormwater drainage on the eastern half enters a public storm system. The western half has a paved width of approximately 9.5 feet, with a vegetated shoulder. Stormwater drainage on the western half flows into the vegetated shoulders primarily composed of grass. Drainage appears to work its way north following 105th Avenue.

For this development we are going to add a 3,754-sf building and 8,821 sf parking lot. The building will have a wraparound walking path composed of pervious pavers and an access path to 105th Avenue right of way. The parking lot will provide 14 onsite parking spots which includes 1 ADA. The parking lot will be graded to drain to northeast corner into a water quality and detention facility. The proposed buildings stormwater runoff will be collected and piped to the same stormwater facility.

Stormwater from the site will be discharge into a private stormwater lateral that flows north for 134 feet before turning east and connecting into an existing public storm manhole at SW Siletz Drive. The private stormwater lateral will be located, in a 15-foot private stormwater easement, as it crosses the two northern tax lots. The stormwater lateral will exceed CWS standard length of 100 feet. However there no other logical solutions because the existing public storm line on the east side of 105th Avenue is to shallow to connect to. The proposal for a private storm line to the west, likely crossing other lots, is most reasonable in conformance with current code without adversely affecting surrounding and existing developments flows releasing to the public system in adjacent streets.

Street improvement are required for 105th Avenue, but the city did provide an option to pay a fee in lieu of the improvements. A 7-foot-wide dedication will be provided to widen the half street right of way width to 37 feet. In addition, an 8-foot public utility easement will be added for future developments. We anticipate our client paying a fee to avoid further street improvements except minor grading. If a fee isn't paid than we anticipate the street improvement work to include widening the paved width to be 25 feet and adding a 12-foot pedestrian corridor. The pedestrian corridor would be comprised of 0.5-foot curb, 5.5-foot planter, and 6-foot sidewalk. Stormwater detention and treatment would be proposed through vegetated stormwater facilities.

Upstream Analysis:

Per Clean Water Services drainage reports must including an upstream drainage analysis. The upstream analysis must meet the requirements of Section 2.04.2.m and section 5.05.03. This upstream analysis will examine the neighboring properties and public streets to determine if any neighboring properties are contributing any significant stormwater runoff to our project site.

20865 SW 105th Avenue is bordered by 105th Avenue on the east side and developed properties on the north, south, and west. Based upon the provided topographic survey the properties on the west and north are at a lower elevation than our site. Neither property can provide stormwater runoff to our site. Both properties appear to be collecting stormwater runoff from our site. The developed condition should reduce the stormwater runoff impact on these two properties.

The property to the south is developed and at a higher elevation. This property has a driveway and parking lot along the southern property line. The most western part of the parking lot appears supported by a concrete retaining wall. Stormwater from the driveway appears to flow towards SW 105th Avenue. Stormwater run-off from the parking lot appears to be flowing onto our site. Once on our site stormwater runoff from the southern property follows contours to the west. Our developments proposed building is set near the southern property line at an angle. The proposed building does not appear to block existing flow paths. The impact of stormwater runoff from southern property is believed to be minor.

Drainage paths from SW 105th are anticipated to remain intact and not be significantly modified by this development. Stormwater runoff from SW 105th western half's existing paved width will continue shedding into the landscaped shoulder. We anticipate the landscape shoulder will be regarded as necessary to continue passing stormwater runoff to the north following the existing landscaped shoulder. The right of way to the north already contains a depression that appears capable of collecting and disposing stormwater runoff.

This upstream analysis covered the properties on all sides of our project site. None of the surrounding parcel or public right of way appear to be contributing any significant stormwater runoff to our site.

Hydromodification Assessment Analysis

The sites hydromodification analysis will be designed to meet current version of CWS R&O 19-5 code section 4.03. Current code requires Hydromodification Assessment analysis for developments that create or modify 1,000 square feet or greater of impervious surface that increase the amount or rate of surface water leaving a site.

Subsection 4.03.2 provide Hydromodification Assessment requirement exemptions relieving follow code requirement of subsection 4.03.1. Subsection 4.03.2.a notes the projects that result in the addition and/or modification of less than 12,000 square feet or impervious surface are exempt. Our current site plan increases the impervious area by 12,575 square feet and thus does not qualifies for the exemption from this subsection.

Per the Hydromodification Map, we can track 105th Avenue stormwater path to a wet pond located at SW 95th Avenue and SW Tualatin Sherwood Road. From the wet pond stormwater than appears to be conveyed to SW 90th Avenue where it is discharged into Hedges Creek Wetland, the point of discharge. Stormwater will then travel 1/4 mile towards SW Tualatin Road through the Hedges Wetlands towards Hedges Creek main channel. Both the Hedges Wetlands and Hedges Creek are classified with low hydromod risk levels.

Hedges Wetland the receiving body and has a noted elevation of 124 at the point of discharge. At 1/4 mile downstream where stormwater flow combines with Hedges Creek the Hydromodification map notes an elevation of 118. An approximant longitudinal slope of 0.5 percent for the receiving reach. Risk level appear to remain low.

Per Hydromodification Map the site is in a developed area, but no date is provided. Based upon impervious area of 12,575 square feet the project size falls in the medium category, which covers an area range from 12,000 to 80,000 square feet.

Per table 4-2 of Hydromodification approach we fall under category 2 with a medium project size and low developed risk range. A combination of connected onsite detention ponds will be used to meet CWS stormwater requirements for hydromodification, water quality, and detention. In our case we are in category 2 and will modify the detention requirements from CWS table 4-6 to CWS table 4-7 which requires the 2-year, 24-hour post developed storm event meet 50% of the 2-year, 24-hour predeveloped storm event.

Water Quality Calculations

The development water quality treatment will be designed to meet current version of CWS R&O 19-5 code section 4.04. Current code requires water quality treatment for developments that create or modify 1,000 square feet or greater of impervious surface or increase the amount or rate of surface water leaving a site.

Area:

Post Developed Area Breakdown:

Pervious area	= 9,925 sf – 0.23 acres
Impervious area	= 12,575 sf – 0.29 acres
Total area	= 22,500 sf – 0.52 acres

We are planning on meeting stormwater requirements through a single detention pond. The sites infiltration rate is extremely low, and the stormwater connection point is shallow. A Lida facility was not feasible as topsoil and rock depths would place the discharge elevation below the elevation of the outlet storm line.

Water Quality Flow:

The water quality volumes and flows calculated below are defined in R&O 19-05 section 4.08.2. Per CWS, the water quality storm event is 0.36 inches in 4 hours.

$$\textbf{Water Quality Volume} = \frac{(0.36 \text{ in}) \times (\text{Impervious Area})}{(12 \text{ in/ft})}$$

$$WQV = \frac{(0.36 \text{ in}) \times (12{,}575 \text{ SF})}{(12 \text{ in/ft})} \rightarrow \textbf{WQV = 377.25 CF}$$

$$\textbf{Water Quality Flow} = \frac{WQV}{(14{,}400 \text{ sec.})}$$

$$WQF = \frac{(377.25 \text{ CF})}{(14{,}400 \text{ sec})} \rightarrow \textbf{WQF = 0.026 CFS}$$

Per Clean Water Service Design Standards R&O 19-5 section 4.09.5, the detention pond shall have a minimum water quality detention volume of 1.0 x Water Quality Volume (WQV). Therefor the water quality detention volume must be at least 377.25 cubic feet. The actual dead storage volume in the pond was calculated at 54.31 cubic feet at a 0.2 tenth depth. The designated Water quality volume is 378.14 cubic feet at 0.91 foot depth.

Orifice size (per 4.09.5.b.5, R&O 19-5)

The hydraulic design criteria for a water quality event is to detain and release the stormwater runoff over a 48-hour time span allowing sediment to fall out. Per CWS section 4.09.5.b.4 the water quality orifice size shall be designed per the following equation to produce a 48-hour drawdown time.

$D = 24 * [Q/(C [2gH]^{0.5}) / 3.14]^{0.5}$

D = diameter of orifice
Q = WQV / (48*60*60) = 0.0022 cfs
C = 0.62 (constant)
G = 32.2 ft/S^2
H (ft) = 2/3 Detention Height = (2/3) (2.15) = 1.43 ft

Temporary H = Pond Height – Minus Free Board
Temporary H = 3.25 ft – 1 ft = 2.25 feet

$D = 24 * [0.0022/(0.62 [2*(32.2) *1.43]^{0.5}) / 3.14]^{0.5} = 0.26$ inches

Use Minimum ***D = 0.26 inches***

Extended dry basin requirements for water quality treatment is found in section 4.09.5, R&O 19-5. Those requirements are below along with actual detention pond values for demonstrating CWS requirements are met.

CWS requirements	Actual Pond Values	
Permanent Pool Depth = 0.2'	Actual Perm. Poll Depth = 0.20'	O.K.
Minimum Storage = 377.25 cu. ft.	Actual storage = 378.14 cu. ft.	O.K.
Maximum Depth = 4'	Actual Depth = 3.25'	O.K.
Minimum bottom width = 4'	Actual bottom Width = 15.93	O.K.
Maximum 3:1 side slope	Actual Side slope 3:1 max	O.K.
Minimum Freeboard = 1'	Actual Freeboard 1.04'	O.K.

Lynch Catchbasin Pretreatment Sizing Calculations:
A Lynch catchbasin with trap is proposed for pretreatment of the parking lots impervious area. The proposed catchbasin is 2 feet wide and 2-feet long with a 3-foot sump.

(2' x 2' x 3' sump) = 12 cubic feet

Per the detention calculations the post developed runoff rate from a 25-year storm event is 0.36 cfs. The required sump volume is calculated below using the detained value:

0.36 cfs* (20 cf /1.0 cfs) = 7.2 cubic feet

The required sump volume for the Lynch Catchbasin is 7.2 cubic feet.

Therefore, a Lynch Catchbasin with a 3-foot sump providing 12 cubic feet is adequate.

WQ Summary:
A detention pond implementing an extended dry basin water quality application will be used to meet CWS water quality requirements. Stormwater runoff from a water quality

event will be detained and released over a 48-hour time frame through a 0.26-inch orifice. Pretreatment will be provided in Lynch catchbasin.

Detention Calculations:

In the existing condition the entire site is pervious, and stormwater is not detained. Stormwater runoff appears to follow contours leading towards northern and western properties.

Our project site will be filled and graded to redirect stormwater runoff to a new water quality and detention stormwater facility located in the northeastern corner of the property near 105th Avenue at the lowest stormwater connection point.

We will begin by determining the sites pre-and post-developed flow rate for a 2 through 25-year storm event. Below is an area break down for existing and proposed development.

Area:

Existing Area Breakdown:

Pervious area	= 22,500 sf - 0.52 acres
Impervious area	= 0,000 sf - 0.00 acres
Total area	= 22,500 sf - 0.52 acres

Post Developed Area Breakdown:

Pervious area	= 9,925 sf - 0.23 acres
**Impervious area	= 12,575 sf - 0.29 acres
Total area	= 22,500 sf - 0.52 acres

** Note: The impervious area listed represents both the asphalt, rooftop, and the pervious pavers. Pervious Paver were counted as impervious area due to extremely low infiltration rate. The pervious pavers compose 816 sf or 0.02 acres of noted impervious area.

Runoff Curve Numbers:

Geo Pacific Engineering performed a geotechnical engineering study of the site that included soil analysis and infiltration testing. The infiltration tests results indicated this site has a very poor infiltration rate. For additional information see the included geotechnical engineering report, dated October 2019 in the supporting datum.

Infiltration Rate = 0 inches per hour

NRCS soils indicates our site is mostly comprised of pits and Hillsboro Loam. Per the NRCS datum Hillsboro Loam falls in Hydrologic Soil group 'B'.

Impervious Surfaces	Hydrologic Group 'B' => 98
Pervious Surface grass	Hydrologic Group 'B' => 79

Rainfall Distribution: (See attached CWS Drawing No. 1280)

2 yr, 24-hour storm event	Total depth = 2.50 inches
5 yr, 24-hour storm event	Total depth = 3.10 inches
10 yr, 24-hour storm event	Total depth = 3.45 inches
25 yr, 24-hour storm event	Total depth = 3.90 inches

Pre-developed Time of Concentration:

For these calculations we follow the hydrologically longest path from the southeastern corner northwest towards the northern property line following contour faces.

Sites flow path = 50 feet (western side)

Site slope = (213.70 – 210.98) / 50 = 0.0544

Sheet Flow1: $T_1 = \frac{0.42\,(n_s L)^{0.8}}{(P_2)^{0.5} * (s_o)^{0.4}} = 4.27$ min.

$L = 50.0$ ft.

$P_2 = 2.5$ in.

$S_o = 0.054$ ft./ft.

$n_s = 0.15$ short grass

$T_1 = 4.27$ min.

Sheet flow limited to 50 feet per CWS subsection 5.05.2.f

Shallow Concentrated Flow: $T_2 = \frac{L}{60 * k_s * (S_o)^{0.5}} = 1.56$ min.

$L = 126$ ft.

$S_{o2} = 0.015$ (210.98-209.10) / 126 = 0.015

$K_s = 11$ (Short grass)

$T_c = T_1 + T_2 = 4.27 + 1.56 =$ **5.83 min**

Post-developed Time of Concentration:

$T_c =$ **5.0 min**

Hydrographs:

HydroCAD 10.00-25 was used to model the existing and proposed storm events. HydroCAD printouts can be found in the supporting datum subsection. The table on the next page shows the existing, developed, and target release rate for each perspective storm event. Due to Hydromodification requirements the 2-year event was designed to detain to ½ the predeveloped 2-year flow rate.

Sites Release Rate Table

Storm Event	Predeveloped Flow Rate (CFS)	Post developed Flow Rate (CFS)	Target Release Rate (CFS)
2	0.08	0.20	0.04
5	0.14	0.27	0.11
10	0.17	0.31	0.17
25	0.22	0.36	0.22

The additional flow added by this development is the difference between post developed condition and pre-developed conditions.

Detention Routing Data

This development will meet detention requirements through a proposed onsite detention pond. A flow control manhole downstream of the pond will be used to reduce the sites release rate. The flow control manhole is prosed with 12-inch riser containing three separate orifices. The bottom orifice will be 0.26 inch in diameter and set at the bottom of the riser, plan elevation 206.99. This orifice will not activate until stormwater rises to invert elevation of the 12-inch outlet. The 12" outlets plan elevation is 207.49 and is referred to in the calculations as stage 0. The bottom orifice is designed to control release of the water quality event.

The middle orifice is added to control the release rate of the 2-year, 24-hour storm event. This orifice will be 1 3/16" diameter set in an endcap of a 4-inch down turned elbow. The middle orifice is set at the top the water quality storage which is plan elevation 208.41 (stage 0.91).

The top orifice is designed to control the 5 through 25-year storm events. It is proposed as a rectangular orifice that is 7-inches wide and 1.7-inches tall, set just above the 2-year storm events peak stage, plan elevation 209.44 (peak stage 1.95 feet).

The riser is proposed to stop at 1-foot below the top of pond. This elevation is 209.24 or stage elevation 2.25. The riser top will be open and act as a weir overflow device.

See the attached pond routing data sheet in supplemental data for detention ponds storage volume. Please note orifice details are shown on the routing data sheet. The routing data sheet only accurately display circular orifices (bottom and middle). See Hydrocad printouts for full orifice datum.

Hydrographs:

HydroCAD 10.00-25 was used to route the proposed storm events through the detention pond. The ponds storage volume from the excel spread sheet was inserted into HydroCAD.

Below is the routed release rate table showing the predeveloped, post developed and routed release rate for the respective storm events.

Routed Release Rate Table

Storm Event	Predeveloped Flow Rate (CFS)	Post developed Flow Rate (CFS)	Target Release Rate (CFS)	Actual Release Rate
2	0.08	0.20	0.04	0.04
5	0.14	0.27	0.14	0.10
10	0.17	0.31	0.17	0.16
25	0.22	0.36	0.22	0.22

The post developed release rates form the detained portion of the site have been reduced to or below the target release rates (predeveloped flows).

Detention Summary

The post developed storm events will be detained and released at or below preexisting flow rates. The proposed detention pond is capable of meeting both the water quality and detention requirements. Stormwater will exist the pond through an outlet structure and flow to a flow control structure. The flow control manhole will have a 12-inch riser with 3 orifices controlling the release rate. The peak elevation of 25-year event 1.04 feet below the top of the pond.

Downstream Analysis Calculations:

Per section 2.04.2.m.3 of CWS R&0 19-05 each development constructing new impervious surface of greater than 5,280 square feet, or collecting and discharging greater than 5,280 square feet of impervious area, except for the construction of a detached single family dwelling the design engineer shall perform a capacity and condition analysis of the existing downstream storm facilities and conveyance elements receiving flow from the proposed development

CWS subsection 2.04.2.m.3.b notes the downstream analysis shall extend downstream to a point in the drainage system where the additional flow from proposed development site constitutes 10 percent or less of the total tributary. Once we are less than 10 percent of the total tributary, we must carry the downstream analysis 1/4 mile or until the additional flow constitutes less than 5 percent of the total tributary drainage flow.

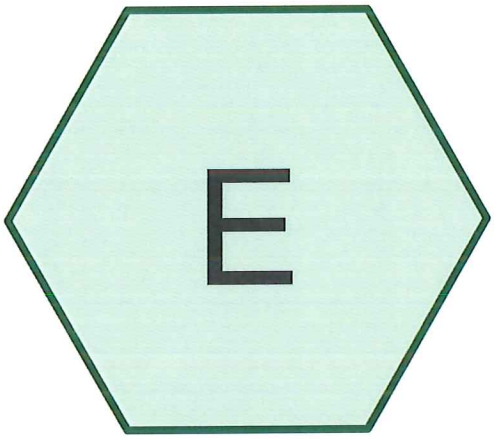
Our site will drain into a private stormwater line that runs north 134 feet through private property before crossing 105th Avenue at Siletz Drive into an existing storm manhole. Stormwater than continues north in an existing 18-inch storm main for 182 feet. At this point it enters another storm manhole before continuing north under 105th Avenue

through a 21-inch storm line for an approximate distance 96 feet. At the 96-foot mark stormwater travel under 105th Avenue to the west side street and travels through a series of smaller pipe up to Avery street.

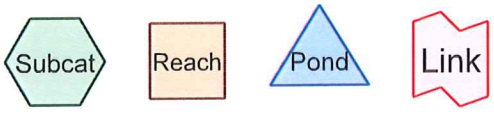
At Avery Street stormwater heads west to existing railroad tracks (SW Cahalin Street). Storm water is discharge into an open ditch draining north along the east side of the railroad tracks working its way northeast towards SW 95th Avenue.

Our site is detaining storm flow to preexisting rates for 2 to ½ to the 2 and matching the 5-25-year storm event. The increase change in stormwater runoff from our is estimated to be minimal to the public storm system.

SUPPORTING DATA



Existing Conditions



Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.517	79	Pervious Area (E)
0.517	**79**	**TOTAL AREA**

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE: Existing Conditions Runoff Area=22,500 sf 0.00% Impervious Runoff Depth>0.83"
Tc=5.8 min CN=79/0 Runoff=0.08 cfs 0.036 af

Total Runoff Area = 0.517 ac Runoff Volume = 0.036 af Average Runoff Depth = 0.83"
100.00% Pervious = 0.517 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E: Existing Conditions

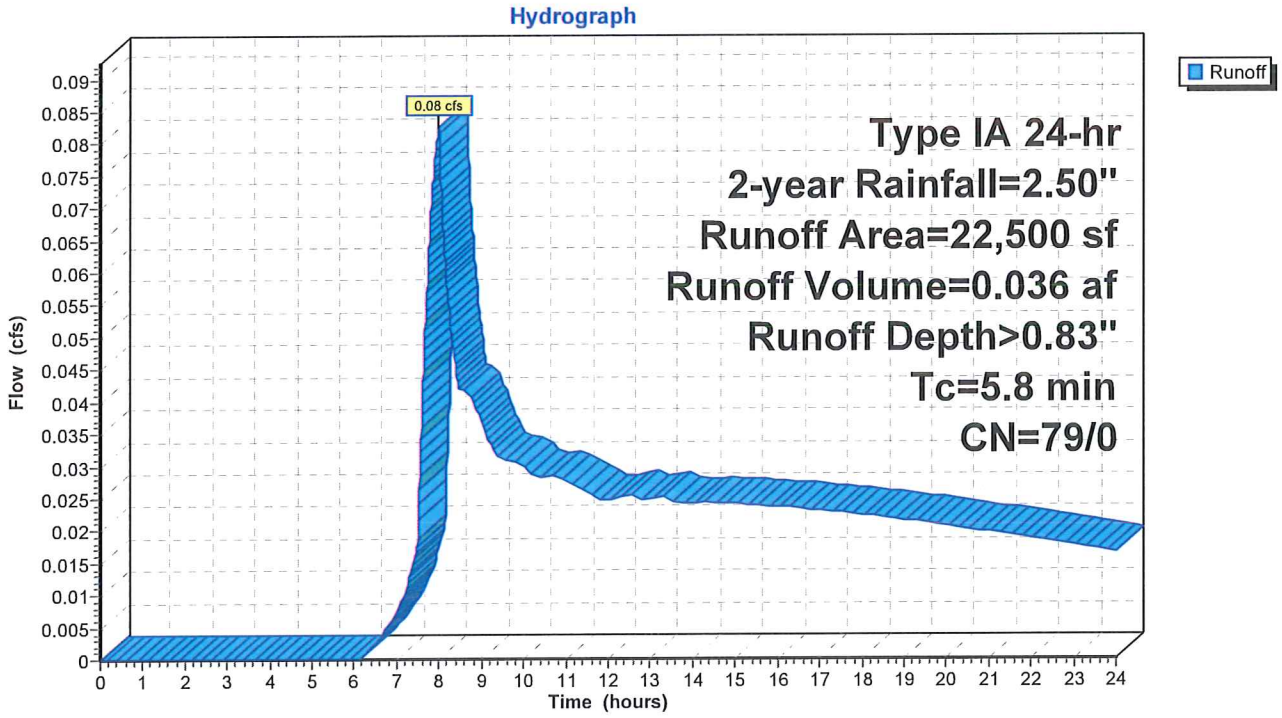
Runoff = 0.08 cfs @ 8.00 hrs, Volume= 0.036 af, Depth> 0.83"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-year Rainfall=2.50"

	Area (sf)	CN	Description
*	22,500	79	Pervious Area
	22,500	79	100.00% Pervious Area

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

Subcatchment E: Existing Conditions



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE: Existing Conditions Runoff Area=22,500 sf 0.00% Impervious Runoff Depth>1.26"
Tc=5.8 min CN=79/0 Runoff=0.14 cfs 0.054 af

Total Runoff Area = 0.517 ac Runoff Volume = 0.054 af Average Runoff Depth = 1.26"
100.00% Pervious = 0.517 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E: Existing Conditions

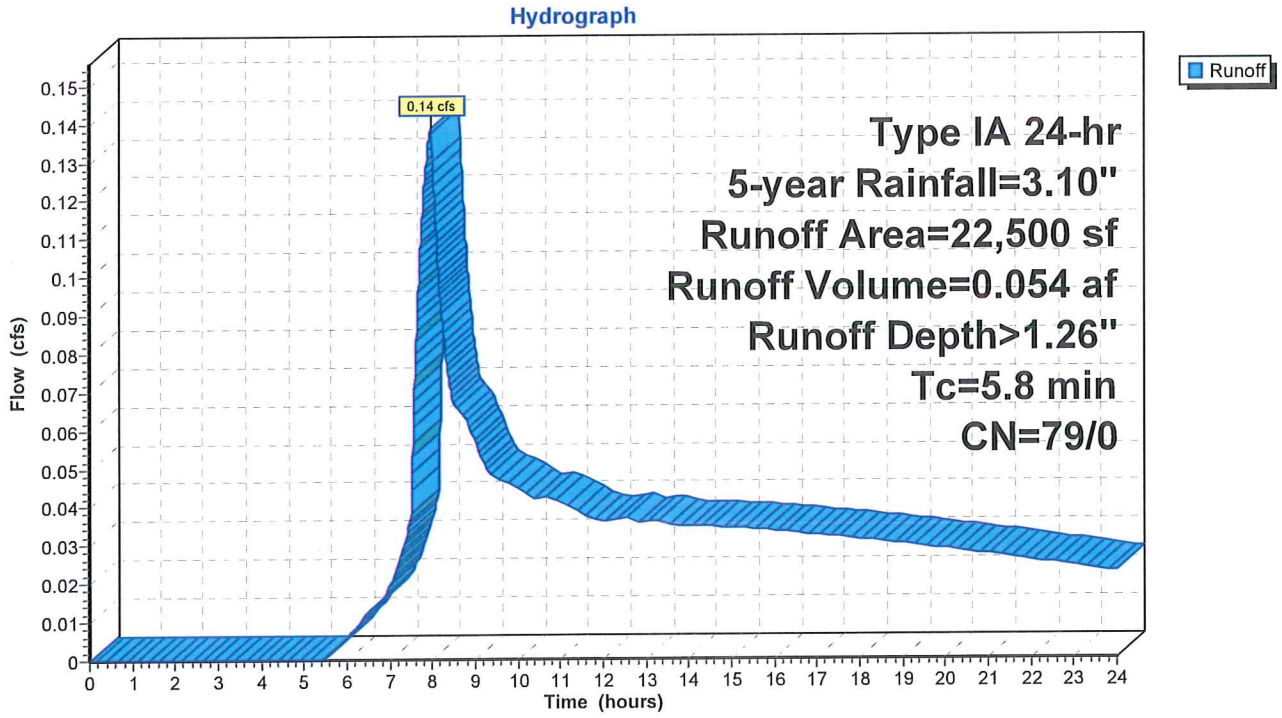
Runoff = 0.14 cfs @ 8.00 hrs, Volume= 0.054 af, Depth> 1.26"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 5-year Rainfall=3.10"

	Area (sf)	CN	Description
*	22,500	79	Pervious Area
	22,500	79	100.00% Pervious Area

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

Subcatchment E: Existing Conditions



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE: Existing Conditions Runoff Area=22,500 sf 0.00% Impervious Runoff Depth>1.52"
Tc=5.8 min CN=79/0 Runoff=0.17 cfs 0.066 af

Total Runoff Area = 0.517 ac Runoff Volume = 0.066 af Average Runoff Depth = 1.52"
100.00% Pervious = 0.517 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E: Existing Conditions

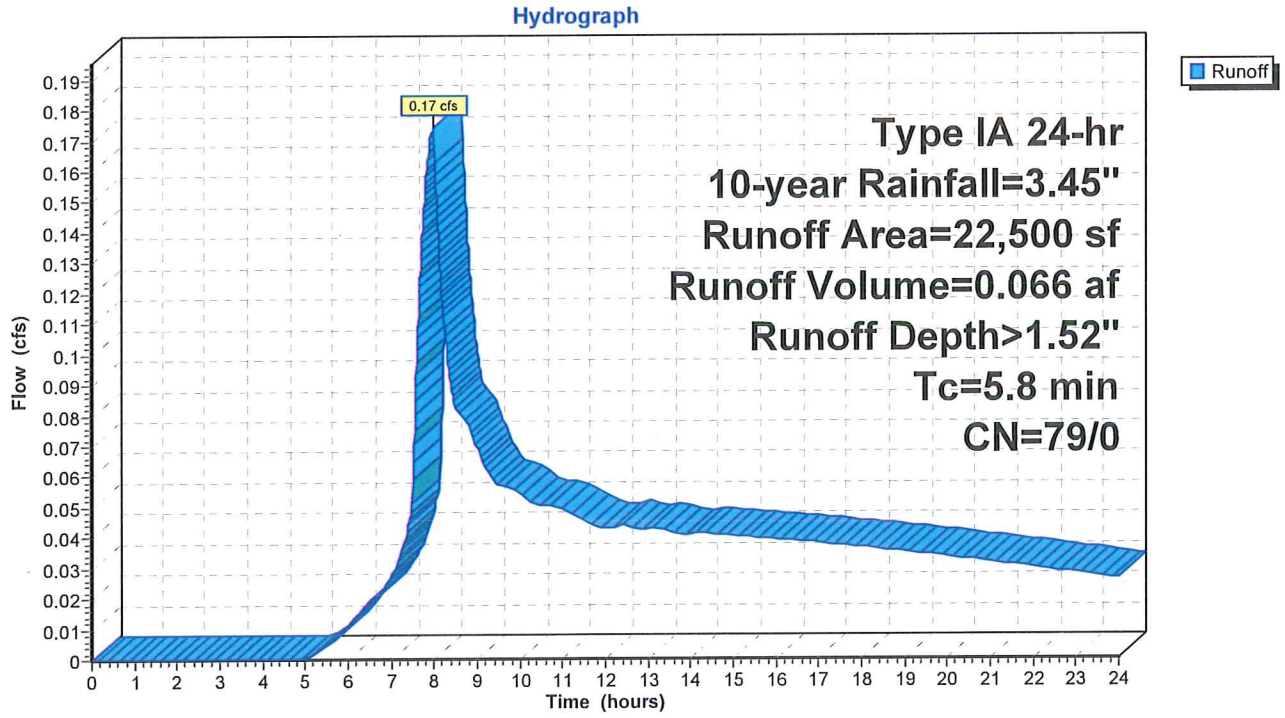
Runoff = 0.17 cfs @ 8.00 hrs, Volume= 0.066 af, Depth> 1.52"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-year Rainfall=3.45"

	Area (sf)	CN	Description
*	22,500	79	Pervious Area
	22,500	79	100.00% Pervious Area

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

Subcatchment E: Existing Conditions



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE: Existing Conditions Runoff Area=22,500 sf 0.00% Impervious Runoff Depth>1.88"
Tc=5.8 min CN=79/0 Runoff=0.22 cfs 0.081 af

Total Runoff Area = 0.517 ac Runoff Volume = 0.081 af Average Runoff Depth = 1.88"
100.00% Pervious = 0.517 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment E: Existing Conditions

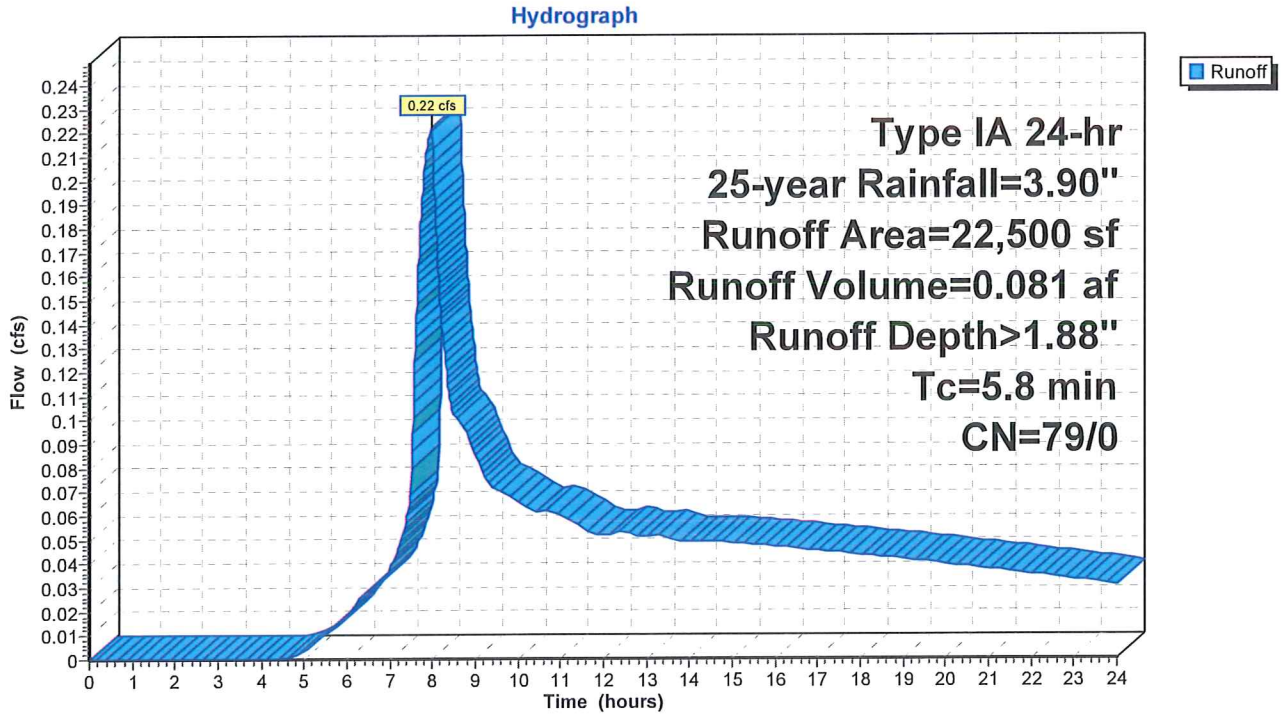
Runoff = 0.22 cfs @ 7.99 hrs, Volume= 0.081 af, Depth> 1.88"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-year Rainfall=3.90"

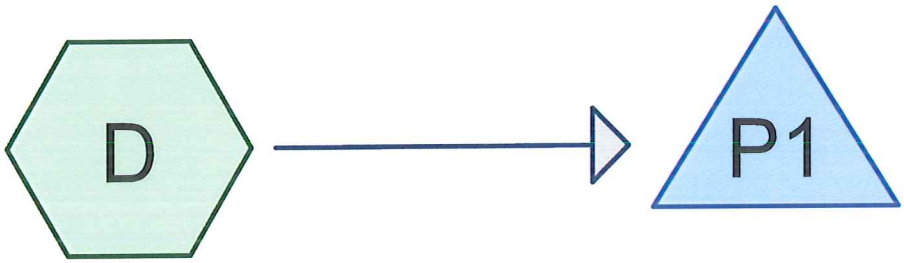
	Area (sf)	CN	Description
*	22,500	79	Pervious Area
	22,500	79	100.00% Pervious Area

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

Subcatchment E: Existing Conditions



Developed Conditions / Pond Routing



Post Developed Condition

Site Layout 3 - Trial 1

Subcat Reach Pond Link

Routing Diagram for SGL 18-033 Storm Calculations
Prepared by {enter your company name here}, Printed 12/17/2020

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.289	98	Impervious (D)
0.228	79	Pervious (D)
0.517	**90**	**TOTAL AREA**

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	P1	0.00	-0.67	134.0	0.0050	0.013	12.0	0.0	0.0

Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentD: Post Developed Runoff Area=22,500 sf 55.89% Impervious Runoff Depth>1.64"
Tc=5.0 min CN=79/98 Runoff=0.20 cfs 0.070 af

Pond P1: Site Layout 3 - Trial 1 Peak Elev=1.94' Storage=1,096 cf Inflow=0.20 cfs 0.070 af
Outflow=0.04 cfs 0.053 af

Total Runoff Area = 0.517 ac Runoff Volume = 0.070 af Average Runoff Depth = 1.64"
44.11% Pervious = 0.228 ac 55.89% Impervious = 0.289 ac

Summary for Subcatchment D: Post Developed Condition

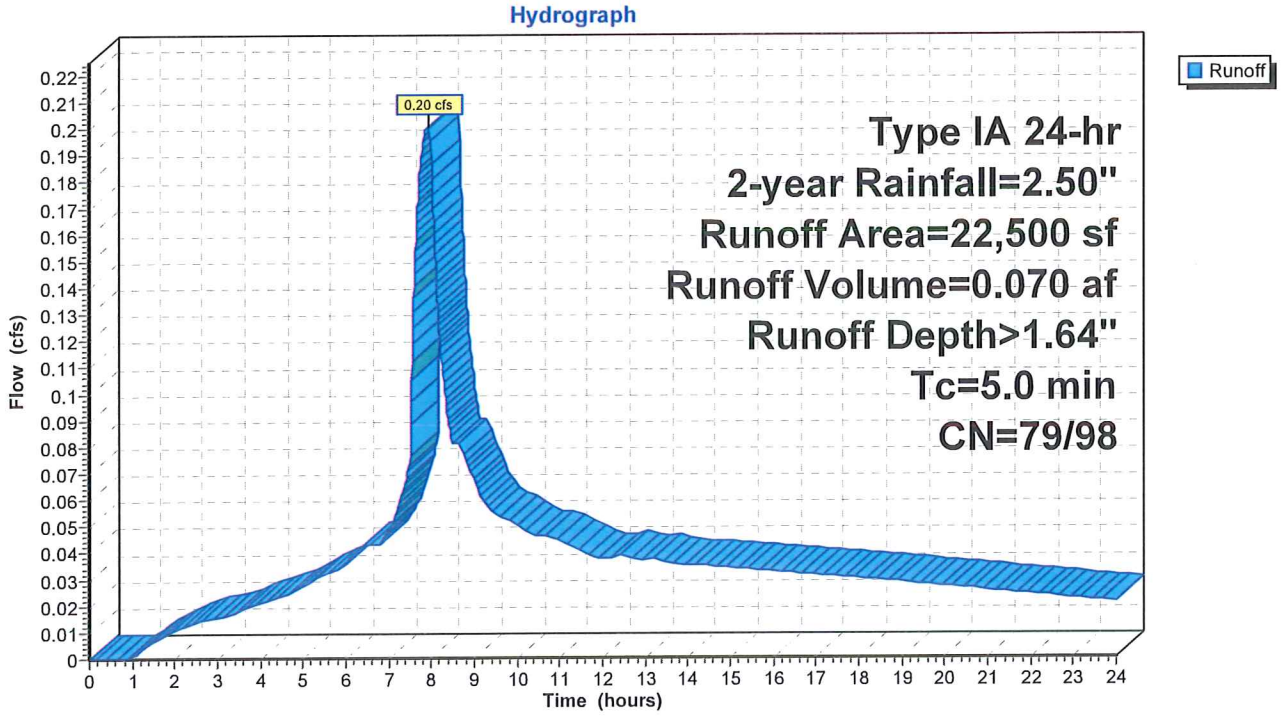
Runoff = 0.20 cfs @ 7.92 hrs, Volume= 0.070 af, Depth> 1.64"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 2-year Rainfall=2.50"

	Area (sf)	CN	Description
*	9,925	79	Pervious
*	12,575	98	Impervious
	22,500	90	Weighted Average
	9,925	79	44.11% Pervious Area
	12,575	98	55.89% Impervious Area

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

Subcatchment D: Post Developed Condition



Summary for Pond P1: Site Layout 3 - Trial 1

Inflow Area = 0.517 ac, 55.89% Impervious, Inflow Depth > 1.64" for 2-year event
Inflow = 0.20 cfs @ 7.92 hrs, Volume= 0.070 af
Outflow = 0.04 cfs @ 11.50 hrs, Volume= 0.053 af, Atten= 80%, Lag= 215.3 min
Primary = 0.04 cfs @ 11.50 hrs, Volume= 0.053 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 1.94' @ 11.50 hrs Surf.Area= 0 sf Storage= 1,096 cf

Plug-Flow detention time= 364.9 min calculated for 0.053 af (75% of inflow)
Center-of-Mass det. time= 205.4 min (918.5 - 713.1)

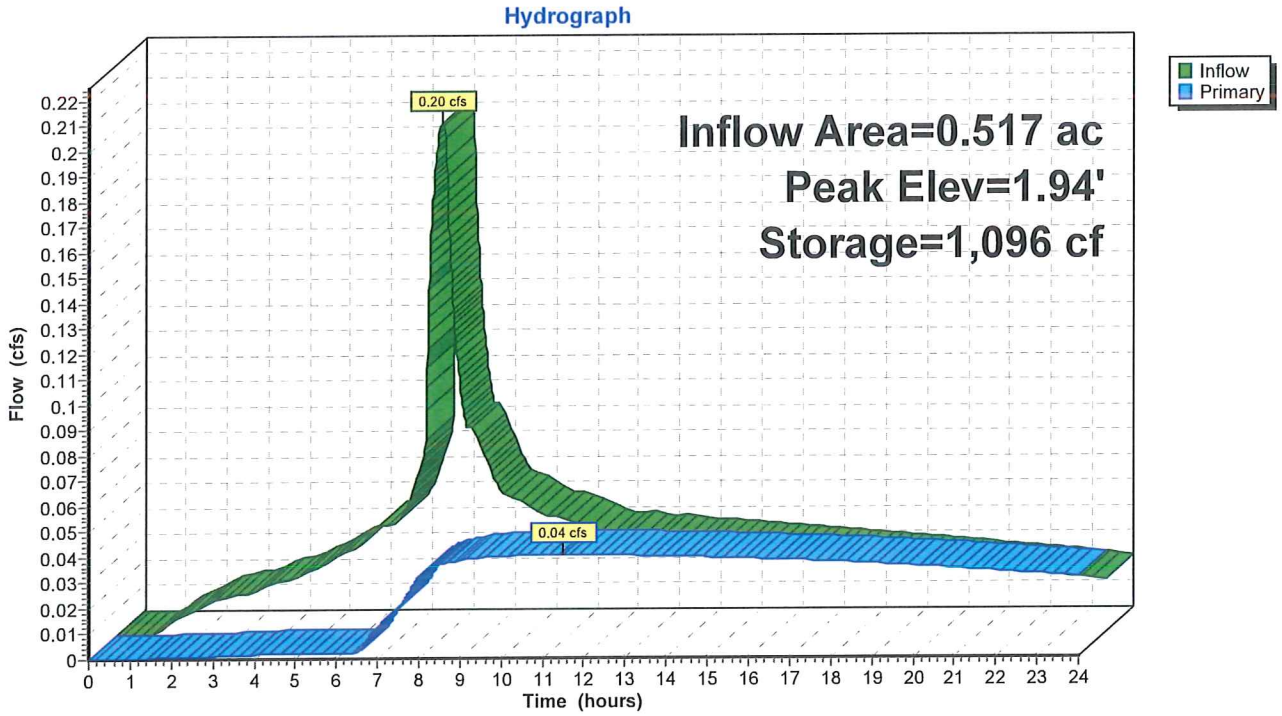
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	5,050 cf	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (cubic-feet)
0.00	0
0.25	83
0.50	109
0.75	296
1.00	428
1.25	578
1.50	747
1.75	937
2.00	1,149
2.25	1,383
2.50	1,642
2.75	1,927
3.00	3,689
3.24	5,046
3.25	5,050

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**12.0" Round Culvert** L= 134.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 0.00' / -0.67' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	0.00'	**0.3" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	0.91'	**1.2" Vert. Orifice/Grate** C= 0.600
#4	Device 1	1.95'	**7.0" W x 1.7" H Vert. Orifice/Grate** C= 0.600
#5	Device 1	2.25'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.04 cfs @ 11.50 hrs HW=1.94' (Free Discharge)
└**1=Culvert** (Passes 0.04 cfs of 3.35 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.00 cfs @ 6.70 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.04 cfs @ 4.76 fps)
  ├**4=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Orifice/Grate** (Controls 0.00 cfs)

Pond P1: Site Layout 3 - Trial 1



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentD: Post Developed Runoff Area=22,500 sf 55.89% Impervious Runoff Depth>2.16"
Tc=5.0 min CN=79/98 Runoff=0.27 cfs 0.093 af

Pond P1: Site Layout 3 - Trial 1 Peak Elev=2.05' Storage=1,196 cf Inflow=0.27 cfs 0.093 af
Outflow=0.10 cfs 0.071 af

Total Runoff Area = 0.517 ac Runoff Volume = 0.093 af Average Runoff Depth = 2.16"
44.11% Pervious = 0.228 ac 55.89% Impervious = 0.289 ac

Summary for Subcatchment D: Post Developed Condition

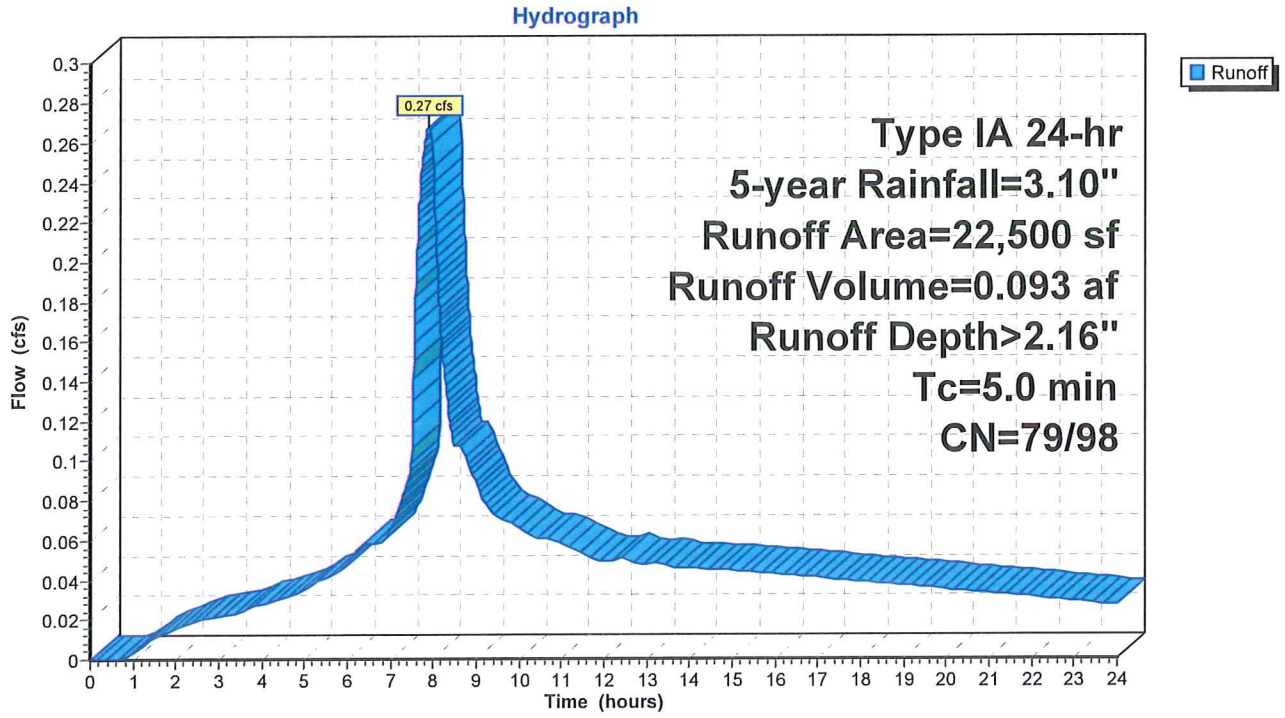
Runoff = 0.27 cfs @ 7.91 hrs, Volume= 0.093 af, Depth> 2.16"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 5-year Rainfall=3.10"

	Area (sf)	CN	Description
*	9,925	79	Pervious
*	12,575	98	Impervious
	22,500	90	Weighted Average
	9,925	79	44.11% Pervious Area
	12,575	98	55.89% Impervious Area

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

Subcatchment D: Post Developed Condition



Summary for Pond P1: Site Layout 3 - Trial 1

Inflow Area = 0.517 ac, 55.89% Impervious, Inflow Depth > 2.16" for 5-year event
Inflow = 0.27 cfs @ 7.91 hrs, Volume= 0.093 af
Outflow = 0.10 cfs @ 8.76 hrs, Volume= 0.071 af, Atten= 62%, Lag= 50.7 min
Primary = 0.10 cfs @ 8.76 hrs, Volume= 0.071 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 2.05' @ 8.76 hrs Surf.Area= 0 sf Storage= 1,196 cf

Plug-Flow detention time= 306.0 min calculated for 0.071 af (76% of inflow)
Center-of-Mass det. time= 153.9 min (861.2 - 707.3)

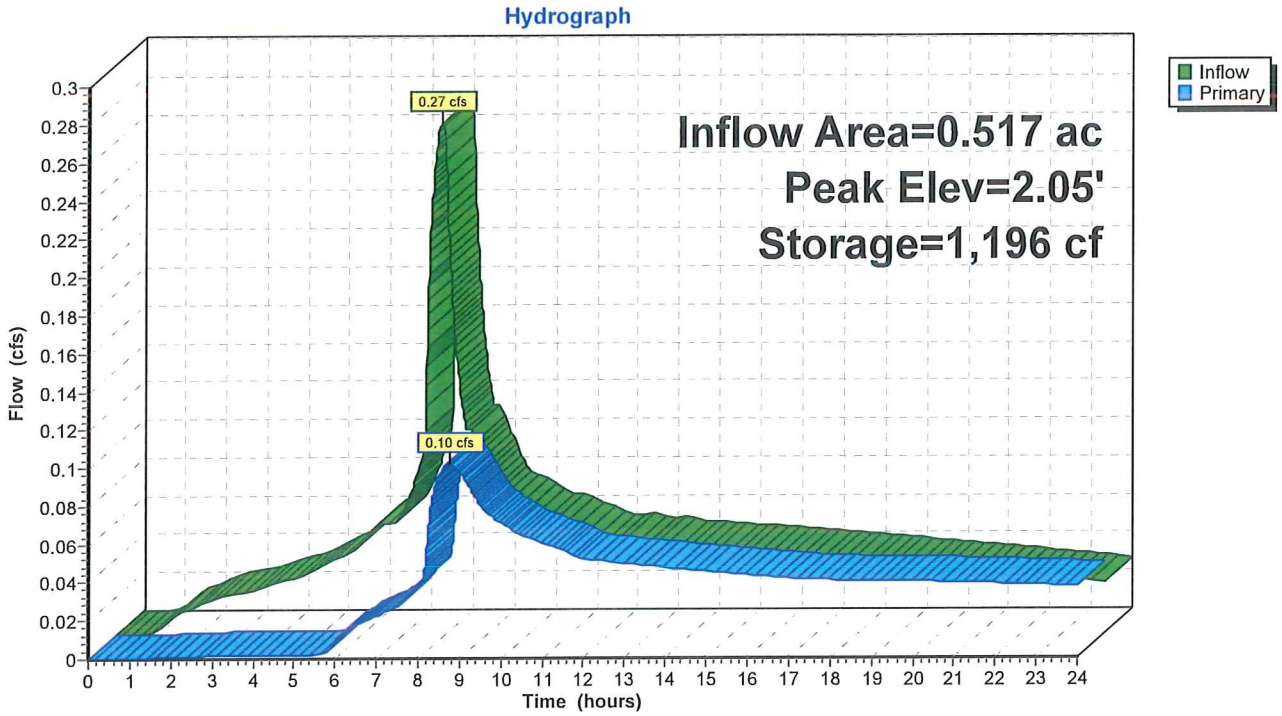
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	5,050 cf	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (cubic-feet)
0.00	0
0.25	83
0.50	109
0.75	296
1.00	428
1.25	578
1.50	747
1.75	937
2.00	1,149
2.25	1,383
2.50	1,642
2.75	1,927
3.00	3,689
3.24	5,046
3.25	5,050

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**12.0" Round Culvert** L= 134.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 0.00' / -0.67' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	0.00'	**0.3" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	0.91'	**1.2" Vert. Orifice/Grate** C= 0.600
#4	Device 1	1.95'	**7.0" W x 1.7" H Vert. Orifice/Grate** C= 0.600
#5	Device 1	2.25'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.10 cfs @ 8.76 hrs HW=2.05' (Free Discharge)
└**1=Culvert** (Passes 0.10 cfs of 3.46 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.00 cfs @ 6.89 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.04 cfs @ 5.03 fps)
  ├**4=Orifice/Grate** (Orifice Controls 0.06 cfs @ 1.02 fps)
  └**5=Orifice/Grate** (Controls 0.00 cfs)

Pond P1: Site Layout 3 - Trial 1



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentD: Post Developed Runoff Area=22,500 sf 55.89% Impervious Runoff Depth>2.47"
Tc=5.0 min CN=79/98 Runoff=0.31 cfs 0.106 af

Pond P1: Site Layout 3 - Trial 1 Peak Elev=2.11' Storage=1,250 cf Inflow=0.31 cfs 0.106 af
Outflow=0.16 cfs 0.082 af

Total Runoff Area = 0.517 ac Runoff Volume = 0.106 af Average Runoff Depth = 2.47"
44.11% Pervious = 0.228 ac 55.89% Impervious = 0.289 ac

Summary for Subcatchment D: Post Developed Condition

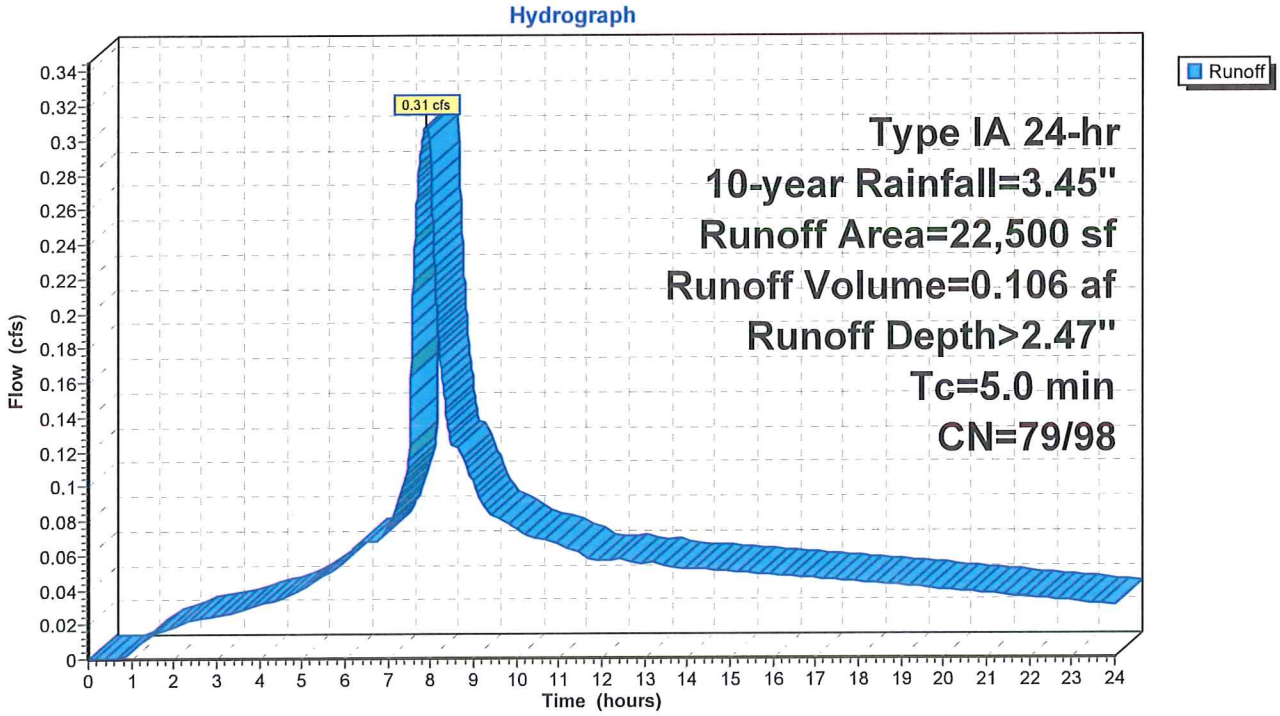
Runoff = 0.31 cfs @ 7.91 hrs, Volume= 0.106 af, Depth> 2.47"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-year Rainfall=3.45"

	Area (sf)	CN	Description
*	9,925	79	Pervious
*	12,575	98	Impervious
	22,500	90	Weighted Average
	9,925	79	44.11% Pervious Area
	12,575	98	55.89% Impervious Area

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

Subcatchment D: Post Developed Condition



Summary for Pond P1: Site Layout 3 - Trial 1

Inflow Area = 0.517 ac, 55.89% Impervious, Inflow Depth > 2.47" for 10-year event
Inflow = 0.31 cfs @ 7.91 hrs, Volume= 0.106 af
Outflow = 0.16 cfs @ 8.30 hrs, Volume= 0.082 af, Atten= 49%, Lag= 23.6 min
Primary = 0.16 cfs @ 8.30 hrs, Volume= 0.082 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 2.11' @ 8.30 hrs Surf.Area= 0 sf Storage= 1,250 cf

Plug-Flow detention time= 272.8 min calculated for 0.082 af (78% of inflow)
Center-of-Mass det. time= 129.0 min (833.3 - 704.3)

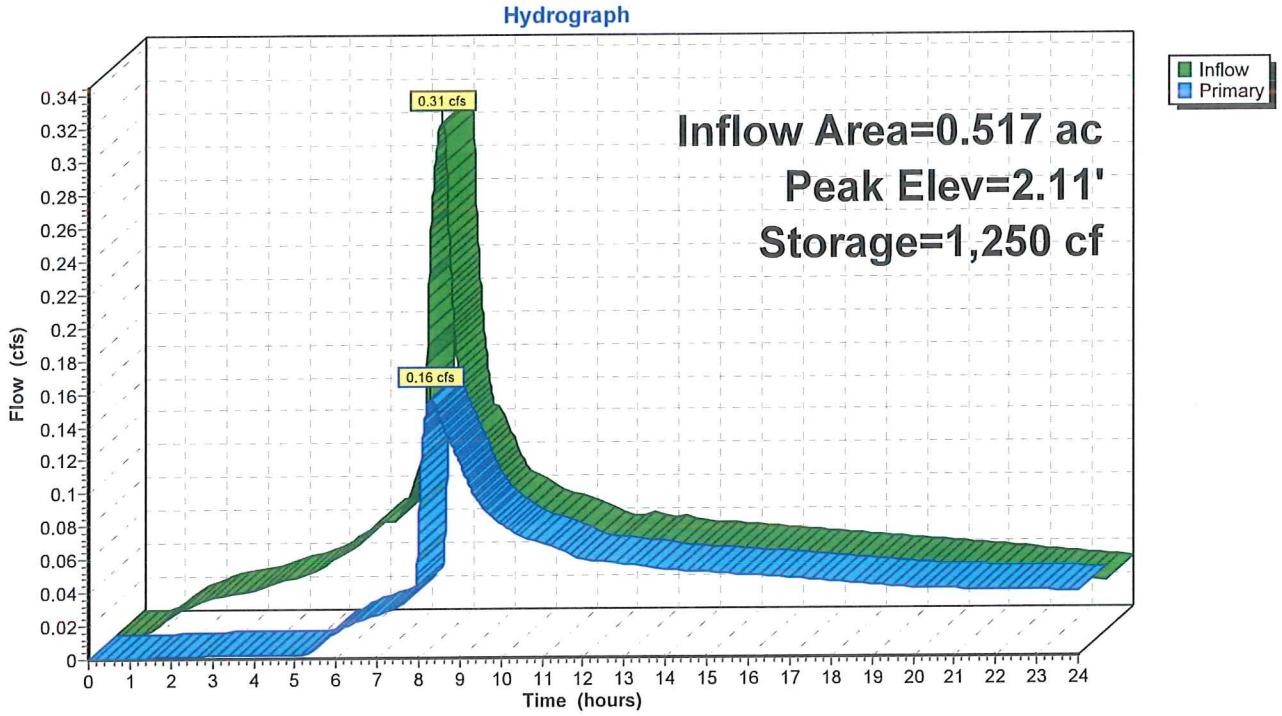
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	5,050 cf	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (cubic-feet)
0.00	0
0.25	83
0.50	109
0.75	296
1.00	428
1.25	578
1.50	747
1.75	937
2.00	1,149
2.25	1,383
2.50	1,642
2.75	1,927
3.00	3,689
3.24	5,046
3.25	5,050

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**12.0" Round Culvert** L= 134.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 0.00' / -0.67' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	0.00'	**0.3" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	0.91'	**1.2" Vert. Orifice/Grate** C= 0.600
#4	Device 1	1.95'	**7.0" W x 1.7" H Vert. Orifice/Grate** C= 0.600
#5	Device 1	2.25'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.16 cfs @ 8.30 hrs HW=2.11' (Free Discharge)
└**1=Culvert** (Passes 0.16 cfs of 3.52 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.00 cfs @ 6.99 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.04 cfs @ 5.16 fps)
  ├**4=Orifice/Grate** (Orifice Controls 0.11 cfs @ 1.38 fps)
  └**5=Orifice/Grate** (Controls 0.00 cfs)

Pond P1: Site Layout 3 - Trial 1



Time span=0.00-24.00 hrs, dt=0.01 hrs, 2401 points
Runoff by SBUH method, Split Pervious/Imperv.
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentD: Post Developed Runoff Area=22,500 sf 55.89% Impervious Runoff Depth>2.87"
Tc=5.0 min CN=79/98 Runoff=0.36 cfs 0.124 af

Pond P1: Site Layout 3 - Trial 1 Peak Elev=2.21' Storage=1,346 cf Inflow=0.36 cfs 0.124 af
Outflow=0.22 cfs 0.099 af

Total Runoff Area = 0.517 ac Runoff Volume = 0.124 af Average Runoff Depth = 2.87"
44.11% Pervious = 0.228 ac 55.89% Impervious = 0.289 ac

Summary for Subcatchment D: Post Developed Condition

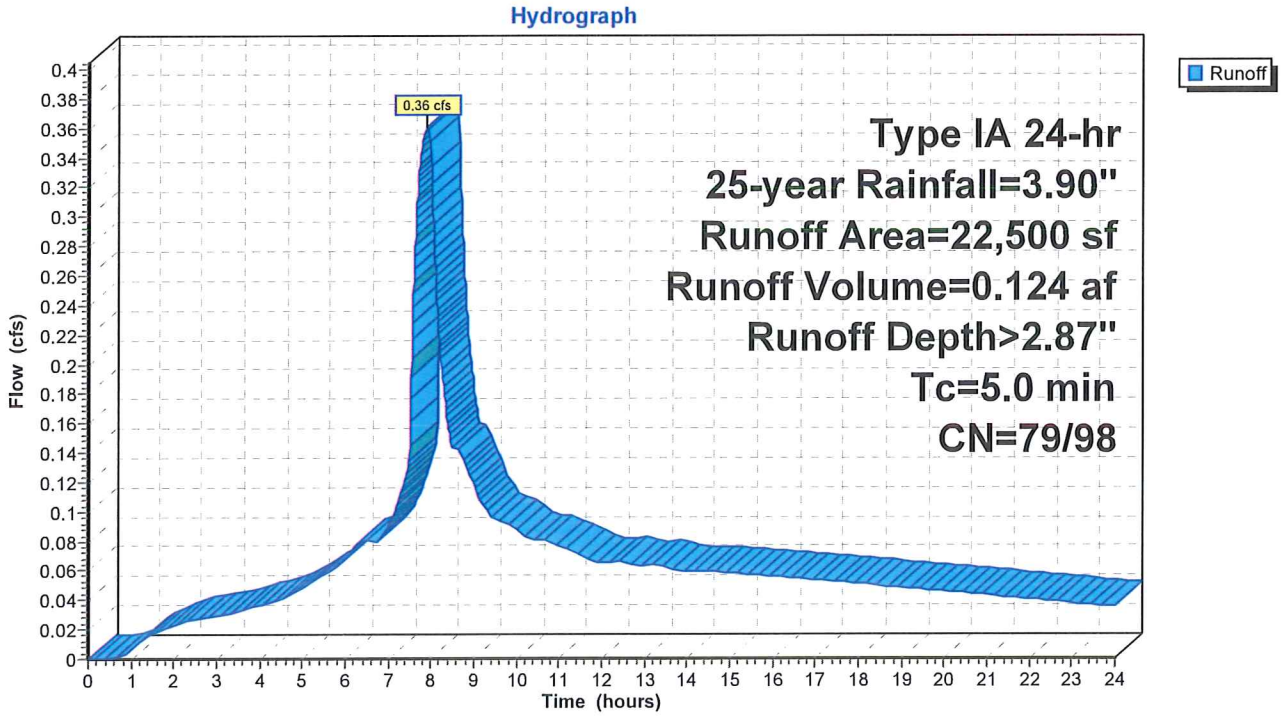
Runoff = 0.36 cfs @ 7.91 hrs, Volume= 0.124 af, Depth> 2.87"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-year Rainfall=3.90"

	Area (sf)	CN	Description
*	9,925	79	Pervious
*	12,575	98	Impervious
	22,500	90	Weighted Average
	9,925	79	44.11% Pervious Area
	12,575	98	55.89% Impervious Area

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

Subcatchment D: Post Developed Condition



Summary for Pond P1: Site Layout 3 - Trial 1

Inflow Area = 0.517 ac, 55.89% Impervious, Inflow Depth > 2.87" for 25-year event
Inflow = 0.36 cfs @ 7.91 hrs, Volume= 0.124 af
Outflow = 0.22 cfs @ 8.20 hrs, Volume= 0.099 af, Atten= 40%, Lag= 17.4 min
Primary = 0.22 cfs @ 8.20 hrs, Volume= 0.099 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 2.21' @ 8.20 hrs Surf.Area= 0 sf Storage= 1,346 cf

Plug-Flow detention time= 239.7 min calculated for 0.099 af (80% of inflow)
Center-of-Mass det. time= 108.1 min (808.9 - 700.8)

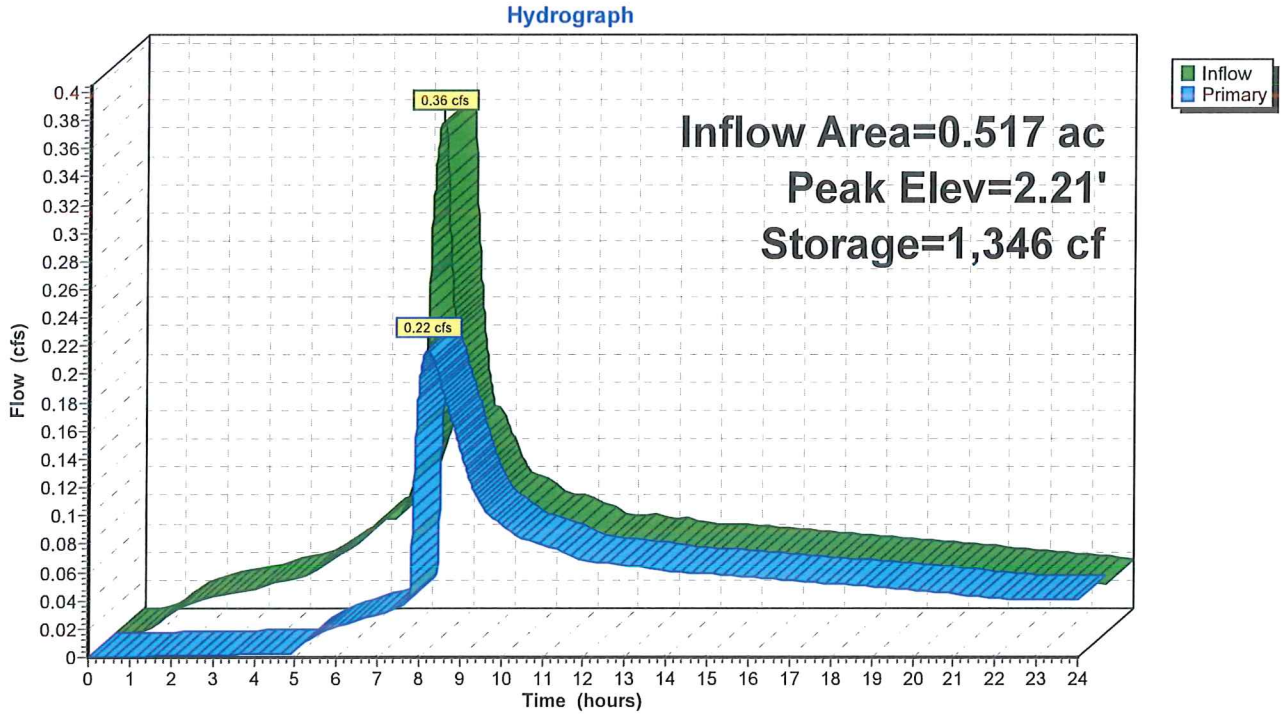
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	5,050 cf	**Custom Stage Data**Listed below

Elevation (feet)	Cum.Store (cubic-feet)
0.00	0
0.25	83
0.50	109
0.75	296
1.00	428
1.25	578
1.50	747
1.75	937
2.00	1,149
2.25	1,383
2.50	1,642
2.75	1,927
3.00	3,689
3.24	5,046
3.25	5,050

Device	Routing	Invert	Outlet Devices
#1	Primary	0.00'	**12.0" Round Culvert** L= 134.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 0.00' / -0.67' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	0.00'	**0.3" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	0.91'	**1.2" Vert. Orifice/Grate** C= 0.600
#4	Device 1	1.95'	**7.0" W x 1.7" H Vert. Orifice/Grate** C= 0.600
#5	Device 1	2.25'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.22 cfs @ 8.20 hrs HW=2.21' (Free Discharge)
└**1=Culvert** (Passes 0.22 cfs of 3.62 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.00 cfs @ 7.16 fps)
  ├**3=Orifice/Grate** (Orifice Controls 0.04 cfs @ 5.38 fps)
  ├**4=Orifice/Grate** (Orifice Controls 0.17 cfs @ 2.08 fps)
  └**5=Orifice/Grate** (Controls 0.00 cfs)

Pond P1: Site Layout 3 - Trial 1



Pond ROUTING DATA 20865 105th Ave. - New Pond
Moore Project
Job: SGL 18-033

Given:

Pipe Diameter:	12.0	inches	Orifice #3 Width:	6	inches
Pipe Inv. Elev:	0.00	feet	Orifice #3 Elevation:	1.95	feet
Orifice #1 Diameter:	0.26	inches			
Orifice #1 Elevation:	0.00	inches	Orifice #4 Diameter:	0	inches
Orifice #2 Width:	1 3/16	inches	Orifice #4 Elevation:	2.25	feet
Orifice #2 Elevation:	0.91	feet			

	B	C	D1	E		F	G	H	I	J	K
	Stage	Elevation (ft)	Surface Area (sq.ft)	Storage Volume (cu.ft.)	Outfall Max. Capacity	Pipe Capacity (cfs)	Orifice #1 Discharge (cfs)	Orifice #2 Discharge (cfs)	Orifice #3 Discharge (cfs)	Orifice #4 Discharge (cfs)	Actual Discharge (cfs)
Dead.	1	0.20	242.63	0.00							
Storage	2	0.40	300.42	54.31							
WQ	1	0.00	300.42	0.00	6.28	0.000	0.0000	0.000	0.000	0.000	0.000
	2	0.25	359.55	82.50	6.28	1.377	0.0009	0.000	0.000	0.000	0.001
	3	0.50	425.70	180.65	6.28	1.948	0.0013	0.000	0.000	0.000	0.001
Storage	4	0.75	493.64	295.57	6.28	2.386	0.0016	0.000	0.000	0.000	0.002
	5	0.91	538.45	378.14	6.28	2.628	0.0017	0.000	0.000	0.000	0.002
	5	1.00	564.29	427.76	6.28	2.755	0.0018	0.000	0.000	0.000	0.002
	6	1.25	638.48	578.11	6.28	3.080	0.0021	0.022	0.000	0.000	0.024
	7	1.50	716.20	747.44	6.28	3.374	0.0022	0.029	0.000	0.000	0.031
	8	1.75	801.03	937.10	6.28	3.644	0.0024	0.035	0.000	0.000	0.037
Pond	9	2.00	891.51	1148.66	6.28	3.896	0.0026	0.039	0.218	0.000	0.260
	10	2.25	986.25	1383.38	6.28	4.132	0.0028	0.044	0.535	0.000	0.581
	11	2.50	1085.25	1642.32	6.28	4.355	0.0029	0.047	0.725	0.000	0.775
	12	2.75	1188.51	1926.54	6.28	4.568	0.0030	0.051	0.874	0.000	0.928
	13	3.00	12907.07	3688.49	6.28	4.771	0.0032	0.054	1.001	0.000	1.059
	14	3.25	1404.36	5477.42	6.28	4.966	0.0033	0.058	1.114	0.000	1.175

Dead strorage elevation =0.00 = Plan elevation 207.20
Pond Elevation (water quality) =0.0 = plan elevation 207.60
Detention Elevation =0.5 = plan elevation 208
Orifice Elevations area based upon deteniton elevation with elevation 0.00 = plan elevation 207.49

B Stage Number
C Water Surface Elevation.
D Water Surface Area @ given Elevation
E Storage Volume = [(Average Area) x (d Elevation)] of each pond+ Previous Volume

ORIFCE $Q = 0.62 \times (\text{area}) \times (2 \times g \times h)^{1/2}$ Circle
F Capacity of Discharge Pipe
G Q = Orifice Eq. Circle
H Q = Orifice Eq. Square
I Q = Orifice Eq. Square
J Q = Orifice Eq. Circle
K Less of => columns F or columns G + H

Soil Map—Washington County, Oregon

Map Scale: 1:410 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 5 10 20 30

Feet: 0 15 30 60 90

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

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

Special Point Features

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

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

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

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

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

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

Soil Survey Area: Washington County, Oregon
Survey Area Data: Version 17, Sep 10, 2019

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

Date(s) aerial images were photographed: Aug 1, 2019—Sep 12, 2019

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
21A	Hillsboro loam, 0 to 3 percent slopes	0.8	100.0%
Totals for Area of Interest		**0.8**	**100.0%**

Washington County, Oregon

21A—Hillsboro loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 21y5
Elevation: 160 to 240 feet
Mean annual precipitation: 40 to 50 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 165 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Hillsboro and similar soils: 90 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hillsboro

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Silty and loamy old alluvium

Typical profile

H1 - 0 to 15 inches: loam
H2 - 15 to 48 inches: loam
H3 - 48 to 57 inches: fine sandy loam
H4 - 57 to 81 inches: fine sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): 1
Land capability classification (nonirrigated): 1
Hydrologic Soil Group: B

Hydric soil rating: No

Data Source Information

Soil Survey Area: Washington County, Oregon
Survey Area Data: Version 17, Sep 10, 2019

PIAZZA LIVING TRUST

August 19, 2021

Mr. Tony Doran, Engineering Associate, Engineering Division/Public Works
Erin Engman, Associate Planner, City of Tualatin
City of Tualatin – Planning Division/Community Development
18880 SW Martinazzi Avenue
Tualatin, Oregon 97062

File: AR21-0007, WIMSCO Office Building
Site: 20865 SW 105th Avenue (Tax Map 2S127A Lot 501)
Submitted: April 8, 2021

Re: Stormwater, Public Easement, Private Easement and Fee-In Lieu

Ladies and Gentlemen,

I am reaching out to you to discuss the cost and options available for connecting the proposed building at 20865 SW 105th to the existing storm line.

It is my understanding, based on calculations and documentation provided by Sisul Engineering, that the project located at 20865 SW 105th is unable to connect directly to the existing storm line in the street (105th) because of insufficient capacity.

The connection options presented are to either replace the existing line in the street, or construction of a private easement. The proposed private easement would create a new line running parallel with 105th, to a point directly across from the manhole in Siletz. Completion of the connection would include a new storm drain, a public easement of approximately 15' x 15' around the new storm drain, and new line crossing 105th to the existing storm drain in the Siletz roadway. See attached Sisul Engineering drawings C1 and C4.

Previously, Sisul Engineering provided a letter with an estimated cost for half street improvements for the project so that we could discuss bonding that portion of the project in lue of construction with the City of Tualatin.

The additional cost of connecting to the city storm sewer should be part of our discussion with the city related to half street improvement cost. It is our intent to seek a reduction in fees in our submittals to the City of Tualatin and investigate any TDT credits available for the project. I would like the additional cost of connection of our storm drain to apply as a deposit for bonding in lieu of construction of the ½ street improvement.

Sincerely,
Stephen Piazza
Trustee

Office: 503-692-4994
Mobile: 503-201-3006
Email to : stevepiazza@willamettemfg.com

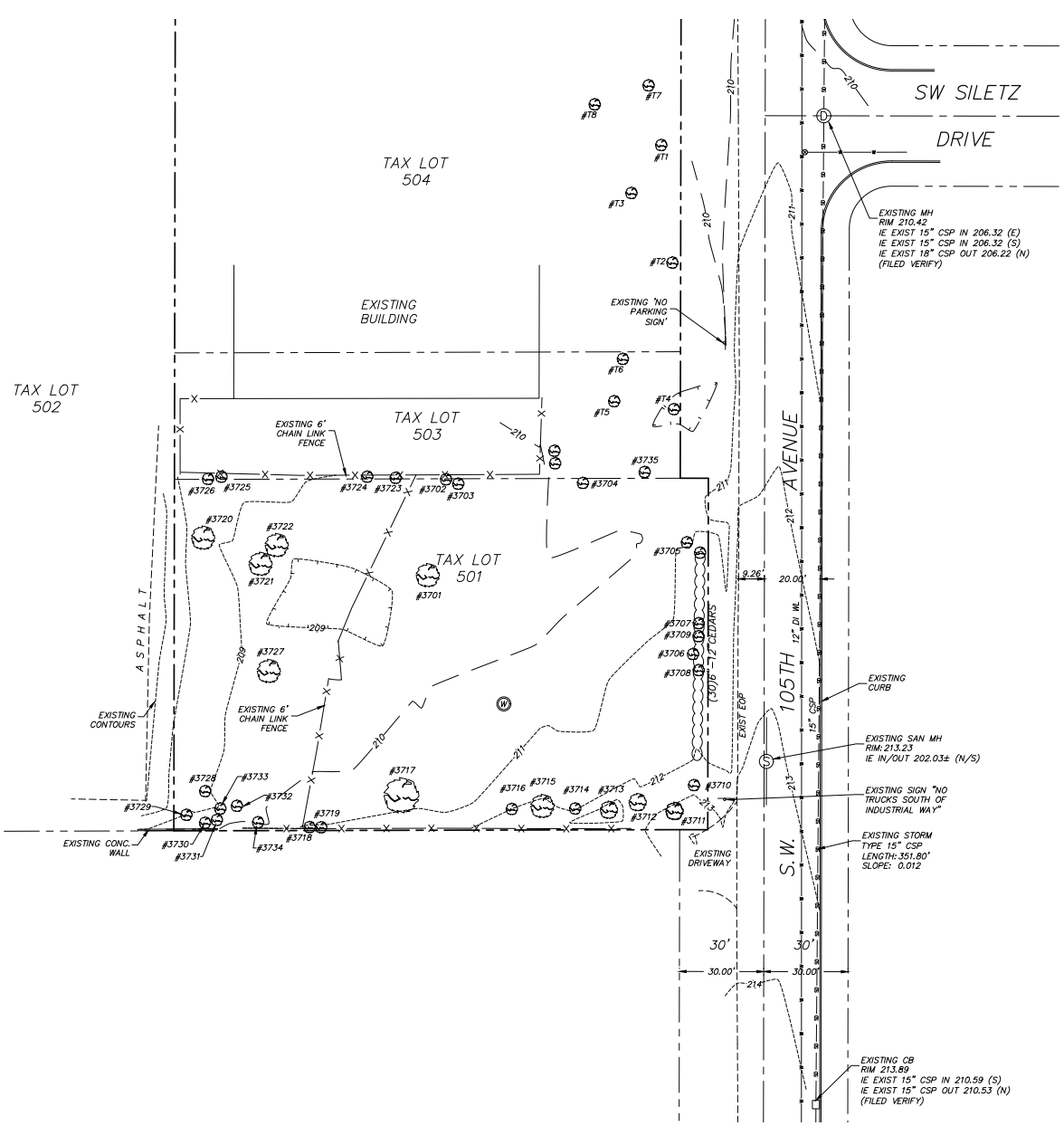
ARBORIST'S TREE LEGEND

3701 36" PONDEROSA PINE
3702 25" BIG LEAF MAPLE
3703 12" PORT ORFORD CEDAR
3704 22" SWEET CHERRY
3705 20" BLUE SPRUCE
3706 9" BIG LEAF MAPLE
3707 14" SWEET CHERRY
3708 15" SPANISH WALNUT
3709 8" EASTERN ARBORVITAE
3710 9" BIG LEAF MAPLE
3711 56" DEODAR CEDAR
3712 29" DEODAR CEDAR
3713 36" DEODAR CEDAR
3713 36" DEODAR CEDAR
3714 29" DEODAR CEDAR
3715 43" DEODAR CEDAR
3716 28" PORT ORFORD CEDAR
3717 60" DOUGLAS FIR
3718 13" SWEET CHERRY
3719 12" SWEET CHERRY
3720 46" PONDEROSA PINE
3721 46" DOUGLAS FIR
3722 42" DOUGLAS FIR
3723 14" BIG LEAF MAPLE
3724 18" BIG LEAF MAPLE
3725 14" BIG LEAF MAPLE
3726 17" BIG LEAF MAPLE
3727 36" BIG LEAF MAPLE
3728 18" SWEET CHERRY
3729 14" SWEET CHERRY
3730 18" SWEET CHERRY
3731 13" SWEET CHERRY
3732 12" SWEET CHERRY
3733 9" CRABAPPLE
3734 12" SWEET CHERRY
3735 33" BIG LEAF MAPLE

OFFSITE TREES

T1 14" WESTERN RED CEDAR
T2 19" WESTERN RED CEDAR
T3 18" WESTERN RED CEDAR
T4 22" WESTERN RED CEDAR
T5 14" WESTERN RED CEDAR
T6 20" WESTERN RED CEDAR
T7 22" WESTERN RED CEDAR
T8 17" AMERICAN SWEETGUM

NOTE: LOCATION FOR OFFSITE TREES T1-T3 & T6-T8 ARE ESTIMATED. LOCATION FOR TREES T2 AND T3 DETERMINED BY SURVEY. TREE SIZES DETERMINED BY ARBORIST.



SURVEY DATUM PROVIDE BY:

GRIFFIN LAND SURVEYING INC.
6107 SW MURRAY BLVD. #409
BEAVERTON, OR. 97008
(503) 201-3116

CONSULTING ARBORIST:

PORTLAND TREE CONSULTANCY
4541 NE 20TH AVE.
PORTLAND, OREGON. 97211
(573) 999-3886

General Notes:

1. UTILITY AND SITE INFORMATION SHOWN ON THIS MAP IS BASED UPON A COMBINATION OF THE SURVEYED INFORMATION FROM GRIFFIN LAND SURVEYING, DERIVED INFORMATION FROM RECORD DRAWINGS, AND FIELD VERIFICATION FROM SISUL ENGINEERING. NO WARRANTIES ARE MADE WITH REGARDS TO THE ACCURACY OR COMPLETENESS OF THE INFORMATION SHOWN. ADDITIONAL UTILITIES MAY EXIST. INTERESTED PARTIES ARE HEREBY ADVISED THAT ALL UTILITY LOCATIONS SHOULD BE VERIFIED PRIOR TO DESIGN OR CONSTRUCTION OF ANY CRITICAL ITEMS. CONTACT UTILITY OWNERS AND LOCATORS REGARDING PUBLIC UTILITY LINES ON THIS PROJECT:
PGE (503-255-4634)
COMCAST CABLE (801-364-1063)
FRONTIER COMMUNICATIONS (800-778-9140)
NW NATURAL GAS (503-220-2415)
CITY OF TUALATIN (503-691-3091)
WASHINGTON COUNTY LUT (503-846-7950)

2. VERTICAL DATUM: WASHINGTON COUNTY BENCHMARK 102.
ELEVATION = 157.296

3. CONTOUR INTERVALS: ARE SHOWN AT 1' INTERVALS

REGISTERED PROFESSIONAL ENGINEER
72761PE
OREGON
JUNE 2, 2010
JAMES M. FOX
PRELIMINARY
EXPIRES: 12/31/2021

REVISIONS	BY
11/16/19 AR REVIEW	JMF
12/16/20 SITE PLAN REV.	JMF
01/14/21 ARBORIST REV.	JMF
02/04/21 ARBORIST REV.	JJM
04/01/21 WALL ADDITION	JMF

20865 SW 105TH AVE
Moore Project

Existing Conditions Plan

SISUL ENGINEERING
375 PORTLAND AVENUE
GLADSTONE, OREGON 97027
(503) 657-0188

DRAWING SIZE: 18-033-EXISTING CONDITION.DWG

DATE 11-19
SCALE AS NOTED
DRAWN JMF
JOB 18-033
SHEET C1
OF C8 SHEETS

NOTE: THE EXISTING UNDERGROUND UTILITIES SHOWN ON THESE PLANS ARE FROM UTILITY LOCATE PAINT MARKS AND AS BUILT PLANS. ACTUAL LOCATION AND DEPTH SHALL BE FIELD VERIFIED PRIOR TO CONSTRUCTION AND CONNECTION TO THE EXISTING UTILITIES. CONTACT CIVIL ENGINEER IF PLAN MODIFICATION ARE REQUIRED.

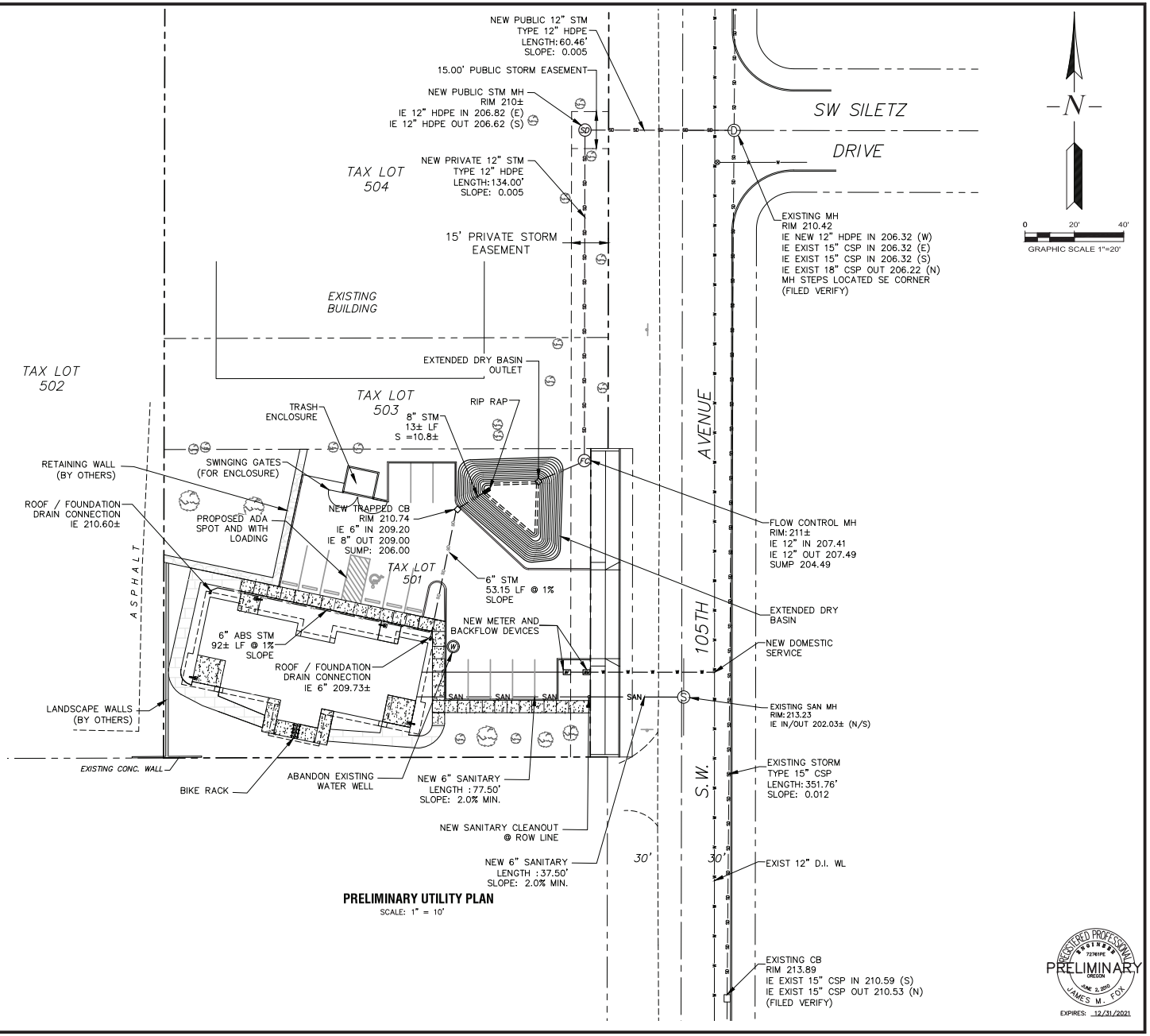
ATTENTION: OREGON LAW REQUIRES YOU TO FOLLOW THE RULES ADOPTED BY THE OREGON UTILITY NOTIFICATION CENTER. THOSE RULES ARE SET FORTH IN OAR-952-001-0010 THROUGH OAR-952-001-0090. YOU MAY OBTAIN COPIES OF THE RULES BY CALLING THE CENTER. (NOTE: THE NUMBER FOR THE OREGON UTILITY NOTIFICATION CENTER IS (503)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

OWNERSHIP EASEMENT NOTES:
LOTS 503 AND 504, ARE UNDER COMMON OWNERSHIP WITH LOT 501. OWNERSHIP AGREES TO EXECUTE A PRIVATE EASEMENT OVER LOTS 503 AND 504 TO CONSTRUCT A STORM DRAIN LINE TO A PUBLIC FACILITY FOR THE BENEFIT OF LOT 501

OWNERSHIP ALSO AGREES TO EXECUTE A PUBLIC EASEMENT OF AN AREA NTE 15'x15' AROUND THE STORM DRAIN MANHOLE AT 90° CONNECTION OF THE LINE ATTACHING THE PRIVATE LINE TO PUBLIC STORM SEWER.

FOR SUPPORTING DOCUMENTS OF OWNERSHIP SEE TITLE REPORT ADDRESSING PROPERTIES, I, II, AND III.

PUBLIC TRENCHES NOTE:
ALL TRENCH BACKFILL IN THE PUBLIC RIGHT OF WAY SHALL CONFORM WITH CITY STD DETAIL 241, FOUND ON SHEET C7



PRELIMINARY UTILITY PLAN
SCALE: 1" = 10'

REGISTERED PROFESSIONAL ENGINEER
OREGON
72761PE
JUNE 2, 2010
JAMES M. FOX
PRELIMINARY
EXPIRES: 12/31/2021

REVISIONS	BY
11/16/19 AR REVIEW	JMF
12/16/20 SITE PLAN REV.	JMF
01/14/21 ARBORIST REV.	JMF
02/04/21 ARBORIST REV.	JJM
04/01/21 WALL ADDITION	JMF
5/27/21 OWNER CLARIFICATION	JMF

20865 SW 105TH AVE

Moore Project

Preliminary Utility Plan

Private Option

SISUL ENGINEERING
375 PORTLAND AVENUE
GLADSTONE, OREGON 97027
(503) 657-0188
DRAWING SOU 18-033-Utility.DWG

DATE 11-19
SCALE AS NOTED
DRAWN JMF
JOB 18-033
SHEET C4
OF C8 SHEETS