

Exhibit "B"
Storm Water Calculations

SW GALBREATH DRIVE INDUSTRIAL BUILDING SITE

Sherwood, OR

Developer: RA Gray Construction

J.O. SGL 20-067

March 7, 2022

STORMWATER CALCULATIONS



EXPIRES: 6/30/

SISUL ENGINEERING

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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 700, 1050, and 1351 located in T2S, R1W, Section 28B, W.M. Washington County. The site is located on the eastern side of Galbreath Drive.

For this development, a 29,500-square foot building will be added and 74,830 square feet of concrete or asphalt paving. The roof drains will be conveyed across Galbreath and into a detention pond. The concrete and asphalt runoff will be conveyed to two catch basins with oil traps and into a detention pond.

Hydromodification Assessment Analysis:

The sites hydromodification analysis will be designed to meet current version of CWS R&O 19-22 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.

Per the Hydromodification Map, the point of discharge is Rock Creek. This is a risk level of Low. It is also a developed area, and this is a project size Large (80,000 square feet and larger) with the post developed impervious area being 104,330.

Per table 4-2 of Hydromodification approach we fall under Category 2. Onsite detention ponds will be used to meet CWS stormwater requirements for hydromodification, water quality, and detention.

Soil:

According to NRCS, the site has both Hillsboro Loam and Quatama Loam. Table 4-5 in the CWS Design Standards considers Hillsboro Loam to have an infiltration rate of 2 inches per hour. This soil exists where the detention pond for the roof runoff will be. The Standards consider Quatama Loam to have an infiltration rate of 0.5 inches per hour. This soil exists where the detention pond for the parking lot runoff will be.

Requirements:

Water Quality Calculations

The development water quality treatment will be designed to meet current version of CWS R&O 19-22 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:

Pre-Developed Area Breakdown:

Pervious area = 104,330sf – 2.40 acres

Total area = 104,330sf – 2.40 acres

Post Developed Area Breakdown:

Impervious area = 104,330sf – 2.40 acres

Total area = 104,330sf – 2.40 acres

We are planning on meeting stormwater requirements through two detention ponds. One with an outlet to the storm system north of it, in the street, and the other

Water Quality Flow:

The water quality volumes and flows calculated below are defined in R&O 19-22 section 4.08.2 & 4.08.5. Per CWS, the water quality storm event is 0.36 inches in 4 hours.

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

$$\text{WQV} = \frac{(0.36 \text{ in}) \times (74,830 \text{ SF})}{(12 \text{ in/ft})} \rightarrow \underline{\text{WQV} = 2245 \text{ CF}}$$

Water Quality Flow for Parking Area Runoff = $\frac{\text{WQV}}{(14,400 \text{ sec.})}$

$$\text{WQF} = \frac{2245 \text{ (CF)}}{(14,400 \text{ sec})} \rightarrow \underline{\text{WQF} = 0.156 \text{ CFS}}$$

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

$$\text{WQV} = \frac{(0.36 \text{ in}) \times (29,500 \text{ SF})}{(12 \text{ in/ft})} \rightarrow \underline{\text{WQV} = 885 \text{ CF}}$$

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

$$\text{WQF} = \frac{885 \text{ (CF)}}{(14,400 \text{ sec})} \rightarrow \underline{\text{WQF} = 0.061 \text{ CFS}}$$

WQ Summary:

Water quality will be met through a detention within the pond. Both ponds detain the water quality volume for more than 4 hours and do not release the runoff faster than the water quality flow value.

Summary for Pond 7P: New Pond to treat Parking Area Runoff

Inflow = 0.16 cfs @ 0.00 hrs, Volume= 13,853 cf, Incl. 0.16 cfs Base Flow
 Outflow = 0.16 cfs @ 24.00 hrs, Volume= 12,204 cf, Atten= 0%, Lag= 1,440.0 min
 Discarded = 0.01 cfs @ 24.00 hrs, Volume= 703 cf
 Primary = 0.15 cfs @ 24.00 hrs, Volume= 11,501 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 146.35' @ 23.40 hrs Surf.Area= 735 sf Storage= 1,649 cf

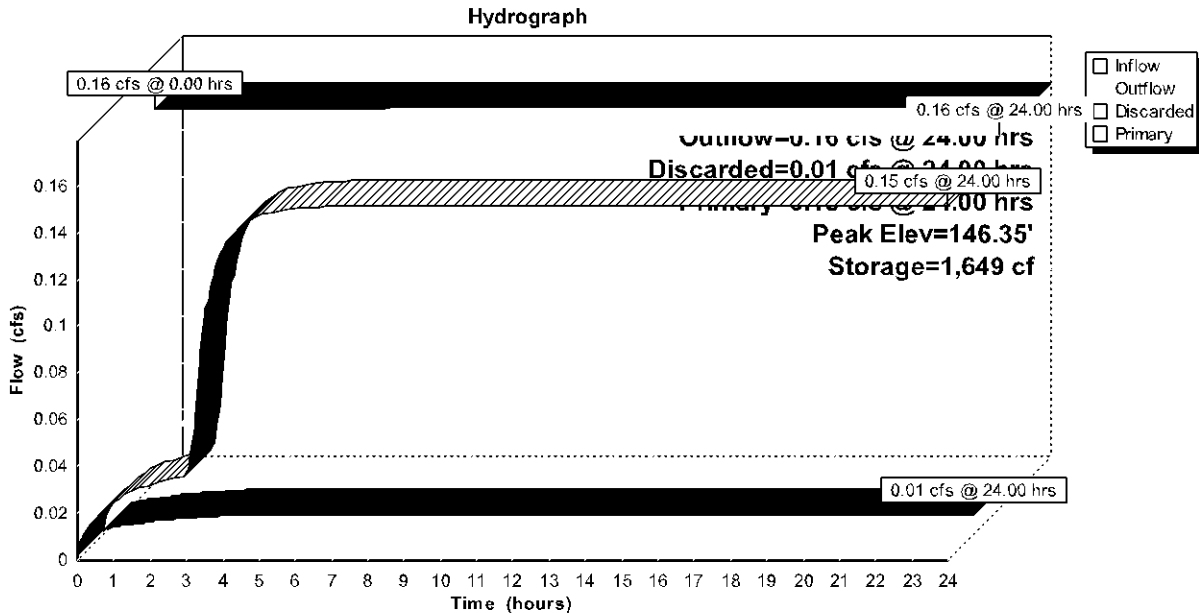
Plug-Flow detention time= 170.5 min calculated for 12,165 cf (88% of inflow)
 Center-of-Mass det. time= 83.0 min (803.0 - 720.0)

Volume	Invert	Avail.Storage	Storage Description
#1	143.00'	6,923 cf	Custom Stage Data (Prismatic) Listed below
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
143.00	218	0	0
145.00	514	732	732
147.00	841	1,355	2,087
149.00	1,201	2,042	4,129
151.00	1,593	2,794	6,923

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.00'	0.500 in/hr Exfiltration over Surface area
#2	Primary	143.00'	0.9" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	146.00'	3.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 24.00 hrs HW=146.35' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.15 cfs @ 24.00 hrs HW=146.35' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.04 cfs @ 8.77 fps)
 ↑3=Orifice/Grate (Orifice Controls 0.11 cfs @ 2.30 fps)



Summary for Pond 8P: New Pond to Treat Roof Runoff

Inflow = 0.06 cfs @ 0.00 hrs, Volume= 5,195 cf, Incl. 0.06 cfs Base Flow
 Outflow = 0.06 cfs @ 24.00 hrs, Volume= 4,190 cf, Atten= 3%, Lag= 1,440.0 min
 Discarded = 0.06 cfs @ 24.00 hrs, Volume= 4,190 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 155.31' @ 24.00 hrs Surf.Area= 1,252 sf Storage= 1,004 cf

Plug-Flow detention time= 218.4 min calculated for 4,177 cf (80% of inflow)
 Center-of-Mass det. time= 77.5 min (797.5 - 720.0)

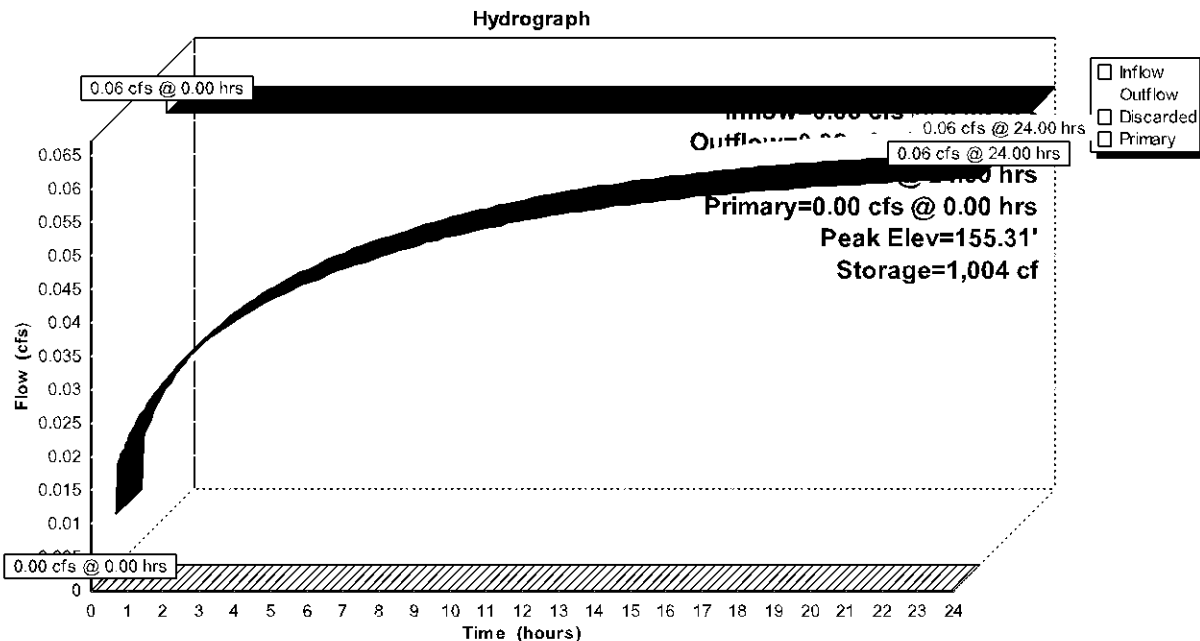
Volume	Invert	Avail.Storage	Storage Description
#1	154.00'	3,850 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
154.00	300	0	0
155.00	1,000	650	650
156.00	1,800	1,400	2,050
157.00	1,800	1,800	3,850

Device	Routing	Invert	Outlet Devices
#1	Discarded	154.00'	2.000 in/hr Exfiltration over Surface area
#2	Primary	155.82'	12.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.06 cfs @ 24.00 hrs HW=155.31' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=154.02' (Free Discharge)
 ↑2=Orifice/Grate (Controls 0.00 cfs)



Infiltration Calculations

Infiltration facilities shall be designed to manage the 10-year, 24-hour storm, and infiltrate this in 36 hours (per 4.08.5.b.1.A). Infiltration will not be used due to it being a disturbed site.

Detention Calculations

Since there will not be enough infiltration, detention will be used. Per the CWS Design Standards Table 4-6 and 4-7, the post developed peak runoff rate must match 50% of the 2-year pre-developed peak runoff rate. The post developed peak runoff rate must also match the pre-developed peak runoff rate for the 5-year, 10-year, and 25-year storms.

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

Sites Release Rate Table- Parking Area

Storm Event	Predeveloped Flow Rate (CFS)	Post developed Flow Rate (CFS)	Target Release Rate (CFS)
2	0.15	1.00	0.08
5	0.31	1.26	0.31
10	0.41	1.41	0.41
25	0.55	1.60	0.55

Detention Routing Data

A detention pond will be used. There will be infiltration at the bottom of the pond. There will be a 12" overflow at 148.60.

Routing Data – 2-Year Event

Summary for Pond 4P: New Pond to treat Parking Area Runoff

Inflow Area = 74,830 sf, 91.21% Impervious, Inflow Depth > 2.25" for 2-Year event
 Inflow = 1.00 cfs @ 7.81 hrs, Volume= 14,045 cf
 Outflow = 0.08 cfs @ 23.45 hrs, Volume= 5,359 cf, Atten= 92%, Lag= 938.5 min
 Discarded = 0.02 cfs @ 23.45 hrs, Volume= 1,495 cf
 Primary = 0.06 cfs @ 23.45 hrs, Volume= 3,865 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 150.48' @ 23.45 hrs Surf.Area= 2,082 sf Storage= 8,688 cf

Plug-Flow detention time= 501.3 min calculated for 5,359 cf (38% of inflow)
 Center-of-Mass det. time= 201.3 min (872.5 - 671.2)

Volume	Invert	Avail.Storage	Storage Description
#1	143.00'	9,804 cf	3.15'W x 100.00'L x 8.00'H Prismatic Z=1.0

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.00'	0.500 in/hr Exfiltration over Surface area
#2	Primary	143.00'	0.9" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	150.48'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 23.45 hrs HW=150.48' (Free Discharge)
 ↳1=**Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.06 cfs @ 23.45 hrs HW=150.48' (Free Discharge)
 ↳2=**Orifice/Grate** (Orifice Controls 0.06 cfs @ 13.14 fps)
 ↳3=**Orifice/Grate** (Weir Controls 0.00 cfs @ 0.11 fps)

Routing Data – 5-Year Event

Summary for Pond 4P: New Pond to treat Parking Area Runoff

Inflow Area = 74,830 sf, 91.21% Impervious, Inflow Depth > 2.85" for 5-Year event
 Inflow = 1.26 cfs @ 7.81 hrs, Volume= 17,764 cf
 Outflow = 0.21 cfs @ 11.50 hrs, Volume= 9,058 cf, Atten= 83%, Lag= 221.7 min
 Discarded = 0.02 cfs @ 11.50 hrs, Volume= 1,613 cf
 Primary = 0.19 cfs @ 11.50 hrs, Volume= 7,445 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 150.53' @ 11.50 hrs Surf.Area= 2,096 sf Storage= 8,792 cf

Plug-Flow detention time= 491.5 min calculated for 9,058 cf (51% of inflow)
 Center-of-Mass det. time= 229.3 min (893.7 - 664.4)

Volume	Invert	Avail.Storage	Storage Description
#1	143.00'	9,804 cf	3.15'W x 100.00'L x 8.00'H Prismatic Z=1.0

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.00'	0.500 in/hr Exfiltration over Surface area
#2	Primary	143.00'	0.9" Vert. Orifice/Gate C= 0.600 Limited to weir flow at low heads
#3	Primary	150.48'	12.0" Horiz. Orifice/Gate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 11.50 hrs HW=150.53' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.18 cfs @ 11.50 hrs HW=150.53' (Free Discharge)
 ↑ **2=Orifice/Gate** (Orifice Controls 0.06 cfs @ 13.18 fps)
 ↓ **3=Orifice/Gate** (Weir Controls 0.12 cfs @ 0.74 fps)

Routing Data – 10-Year Event

Summary for Pond 4P: New Pond to treat Parking Area Runoff

Inflow Area = 74,830 sf, 91.21% Impervious, Inflow Depth > 3.20" for 10-Year event
 Inflow = 1.41 cfs @ 7.81 hrs, Volume= 19,937 cf
 Outflow = 0.31 cfs @ 9.87 hrs, Volume= 11,219 cf, Atten= 78%, Lag= 123.8 min
 Discarded = 0.02 cfs @ 9.87 hrs, Volume= 1,646 cf
 Primary = 0.29 cfs @ 9.87 hrs, Volume= 9,573 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 150.55' @ 9.87 hrs Surf.Area= 2,102 sf Storage= 8,841 cf

Plug-Flow detention time= 449.9 min calculated for 11,219 cf (56% of inflow)
 Center-of-Mass det. time= 205.4 min (866.7 - 661.4)

Volume	Invert	Avail.Storage	Storage Description
#1	143.00'	9,804 cf	3.15'W x 100.00'L x 8.00'H Prismatic Z=1.0

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.00'	0.500 in/hr Exfiltration over Surface area
#2	Primary	143.00'	0.9" Vert. Orifice/Gate C= 0.600 Limited to weir flow at low heads
#3	Primary	150.48'	12.0" Horiz. Orifice/Gate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 9.87 hrs HW=150.55' (Free Discharge)
 ↑ **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.27 cfs @ 9.87 hrs HW=150.55' (Free Discharge)
 ↑ **2=Orifice/Gate** (Orifice Controls 0.06 cfs @ 13.20 fps)
 ↓ **3=Orifice/Gate** (Weir Controls 0.21 cfs @ 0.89 fps)

Routing Data – 25-Year Event

Summary for Pond 4P: New Pond to treat Parking Area Runoff

Inflow Area = 74,830 sf, 91.21% Impervious, Inflow Depth > 3.65" for 25-Year event
 Inflow = 1.60 cfs @ 7.80 hrs, Volume= 22,734 cf
 Outflow = 0.53 cfs @ 8.79 hrs, Volume= 14,000 cf, Atten= 67%, Lag= 59.3 min
 Discarded = 0.02 cfs @ 8.79 hrs, Volume= 1,678 cf
 Primary = 0.50 cfs @ 8.79 hrs, Volume= 12,323 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 150.60' @ 8.79 hrs Surf.Area= 2,115 sf Storage= 8,943 cf

Plug-Flow detention time= 402.3 min calculated for 13,971 cf (61% of inflow)
 Center-of-Mass det. time= 178.4 min (836.5 - 658.2)

Volume	Invert	Avail.Storage	Storage Description
#1	143.00'	9,804 cf	3.15'W x 100.00'L x 8.00'H Prismaoid Z=1.0

Device	Routing	Invert	Outlet Devices
#1	Discarded	143.00'	0.500 in/hr Exfiltration over Surface area
#2	Primary	143.00'	0.9" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads
#3	Primary	150.48'	12.0" Horiz. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.02 cfs @ 8.79 hrs HW=150.60' (Free Discharge)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.50 cfs @ 8.79 hrs HW=150.60' (Free Discharge)
 ↳ **2=Orifice/Grate** (Orifice Controls 0.06 cfs @ 13.24 fps)
 ↳ **3=Orifice/Grate** (Weir Controls 0.44 cfs @ 1.15 fps)

Routed Release Rate Table – Parking Area

Storm Event	Target Release Rate (CFS)	Post developed Flow Rate (CFS)	Actual Release Rate (CFS)
2	0.08	1.00	0.08
5	0.31	1.26	0.21
10	0.41	1.41	0.31
25	0.55	1.60	0.53

The post developed release rates from 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 pre-existing flow rates.

The flow control structure will have a 12-inch riser with an orifice controlling the release rate. A 0.9-inch orifice set at 143.00 and will control the 2-year storm event.

The 5-year, 10-year, and 25-year storms will be controlled with the top of the riser at 150.48.

Sites Release Rate Table – Roof Runoff

Storm Event	Predeveloped Flow Rate (CFS)	Post developed Flow Rate (CFS)	Target Release Rate (CFS)
2	0.15	1.00	0.08
5	0.31	1.26	0.31
10	0.41	1.41	0.41
25	0.55	1.60	0.55

Detention Routing Data

A detention pond will be used. There will be infiltration at the bottom of the pond. There will be a 12" overflow at 155.82.

Routing Data – 2-Year Event

Summary for Pond 2P: New Pond to Treat Roof Runoff

Inflow Area = 29,500 sf, 100.00% Impervious, Inflow Depth > 2.27" for 2-Year event
 Inflow = 0.40 cfs @ 7.81 hrs, Volume= 5,582 cf
 Outflow = 0.08 cfs @ 10.84 hrs, Volume= 4,704 cf, Atten= 81%, Lag= 181.7 min
 Discarded = 0.08 cfs @ 10.84 hrs, Volume= 4,704 cf
 Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 155.82' @ 10.84 hrs Surf.Area= 1,654 sf Storage= 1,735 cf

Plug-Flow detention time= 277.6 min calculated for 4,704 cf (84% of inflow)
 Center-of-Mass det. time= 169.9 min (838.7 - 668.8)

Volume	Invert	Avail.Storage	Storage Description
#1	154.00'	3,850 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
154.00	300	0	0
155.00	1,000	650	650
156.00	1,800	1,400	2,050
157.00	1,800	1,800	3,850

Device	Routing	Invert	Outlet Devices
#1	Discarded	154.00'	2.000 in/hr Exfiltration over Surface area
#2	Primary	155.82'	12.0" Vert. Orifice/Gate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.08 cfs @ 10.84 hrs HW=155.82' (Free Discharge)
 ↑1=**Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=154.00' (Free Discharge)
 ↑2=**Orifice/Gate** (Controls 0.00 cfs)

Routing Data – 5-Year Event

Summary for Pond 2P: New Pond to Treat Roof Runoff

Inflow Area = 29,500 sf, 100.00% Impervious, Inflow Depth > 2.87" for 5-Year event
 Inflow = 0.50 cfs @ 7.81 hrs, Volume= 7,050 cf
 Outflow = 0.17 cfs @ 8.74 hrs, Volume= 5,866 cf, Atten= 66%, Lag= 55.9 min
 Discarded = 0.08 cfs @ 8.74 hrs, Volume= 5,196 cf
 Primary = 0.09 cfs @ 8.74 hrs, Volume= 670 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 155.96' @ 8.74 hrs Surf.Area= 1,770 sf Storage= 1,982 cf

Plug-Flow detention time= 258.7 min calculated for 5,853 cf (83% of inflow)
 Center-of-Mass det. time= 144.2 min (806.5 - 662.3)

Volume	Invert	Avail.Storage	Storage Description
#1	154.00'	3,850 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
154.00	300	0	0
155.00	1,000	650	650
156.00	1,800	1,400	2,050
157.00	1,800	1,800	3,850

Device	Routing	Invert	Outlet Devices
#1	Discarded	154.00'	2.000 in/hr Exfiltration over Surface area
#2	Primary	155.82'	12.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.08 cfs @ 8.74 hrs HW=155.96' (Free Discharge)
 ↑1=**Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.09 cfs @ 8.74 hrs HW=155.96' (Free Discharge)
 ↑2=**Orifice/Grate** (Orifice Controls 0.09 cfs @ 1.28 fps)

Routing Data – 10-Year Event

Summary for Pond 2P: New Pond to Treat Roof Runoff

Inflow Area = 29,500 sf, 100.00% Impervious, Inflow Depth > 3.22" for 10-Year event
 Inflow = 0.56 cfs @ 7.80 hrs, Volume= 7,908 cf
 Outflow = 0.26 cfs @ 8.25 hrs, Volume= 6,574 cf, Atten= 54%, Lag= 26.7 min
 Discarded = 0.08 cfs @ 8.05 hrs, Volume= 5,386 cf
 Primary = 0.17 cfs @ 8.25 hrs, Volume= 1,189 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 156.02' @ 8.25 hrs Surf.Area= 1,800 sf Storage= 2,089 cf

Plug-Flow detention time= 242.7 min calculated for 6,561 cf (83% of inflow)
 Center-of-Mass det. time= 127.5 min (787.0 - 659.4)

Volume	Invert	Avail.Storage	Storage Description
#1	154.00'	3,850 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
154.00	300	0	0
155.00	1,000	650	650
156.00	1,800	1,400	2,050
157.00	1,800	1,800	3,850

Device	Routing	Invert	Outlet Devices
#1	Discarded	154.00'	2.000 in/hr Exfiltration over Surface area
#2	Primary	155.82'	12.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.08 cfs @ 8.05 hrs HW=156.00' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.17 cfs @ 8.25 hrs HW=156.02' (Free Discharge)
 ↑2=Orifice/Grate (Orifice Controls 0.17 cfs @ 1.53 fps)

Routing Data – 25-Year Event

Summary for Pond 2P: New Pond to Treat Roof Runoff

Inflow Area = 29,500 sf, 100.00% Impervious, Inflow Depth > 3.67" for 25-Year event
 Inflow = 0.63 cfs @ 7.80 hrs, Volume= 9,011 cf
 Outflow = 0.42 cfs @ 8.06 hrs, Volume= 7,521 cf, Atten= 34%, Lag= 15.3 min
 Discarded = 0.08 cfs @ 7.85 hrs, Volume= 5,573 cf
 Primary = 0.34 cfs @ 8.06 hrs, Volume= 1,948 cf

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
 Peak Elev= 156.10' @ 8.06 hrs Surf.Area= 1,800 sf Storage= 2,239 cf

Plug-Flow detention time= 223.3 min calculated for 7,505 cf (83% of inflow)
 Center-of-Mass det. time= 109.8 min (766.2 - 656.3)

Volume	Invert	Avail.Storage	Storage Description
#1	154.00'	3,850 cf	Custom Stage Data (Prismatic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
154.00	300	0	0
155.00	1,000	650	650
156.00	1,800	1,400	2,050
157.00	1,800	1,800	3,850

Device	Routing	Invert	Outlet Devices
#1	Discarded	154.00'	2.000 in/hr Exfiltration over Surface area
#2	Primary	155.82'	12.0" Vert. Orifice/Grate C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.08 cfs @ 7.85 hrs HW=156.01' (Free Discharge)
 ↑1=**Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=0.33 cfs @ 8.06 hrs HW=156.10' (Free Discharge)
 ↑2=**Orifice/Grate** (Orifice Controls 0.33 cfs @ 1.81 fps)

Routed Release Rate Table – Roof Runoff

Storm Event	Target Release Rate (CFS)	Post developed Flow Rate (CFS)	Actual Release Rate (CFS)
2	0.08	1.00	0.08
5	0.31	1.26	0.17
10	0.41	1.41	0.26
25	0.55	1.60	0.42

The post developed release rates from 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 pre-existing flow rates. The earthen berm will capture the runoff, and ditch inlets and pipes will convey the runoff to flow splitter manhole, which releases to the water quality manhole and the sedimentation manhole. These flows tee back together to enter the detention chambers. Exiting the chambers, there will be a flow control manhole, that controls the release rates out of the chambers to the Southwest corner of the site.

The flow control manhole will have a 12-inch riser with 2 orifices controlling the release rate. A 1.6-inch orifice set at 229.75 and will control the 2-year storm event.

The 5-year, 10-year, and 25-year storms will be controlled with a 6.7-inch orifice at 234.69. The riser top will be set at 235.13, the peak elevation in the chambers, to allow stormwater to by-pass the orifice in failed state.

Detention Summary

The post developed storm events will be detained and released at or below pre-existing flow rates.

The 2-year storm event is controlled by infiltration only.

The 5-year, 10-year, and 25-year storms will be controlled with a 12" orifice at 155.82.