STORMWATER CALCULATIONS

Prepared For:

Studio 3 Architecture

275 Court St. NE

Salem, OR 97301

Project:

Fairview Apartments Mixed Development

2110 Strong Rd SE

Salem, OR 97302

Prepared By:

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February 2024

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PROJECT OVERVIEW & DESCRIPTION

1.1 SIZE & LOCATION OF PROJECT

The proposed commercial development project is located on a 0.81-acre lot. The property is located at the intersection of Strong Rd SE and Lindburg Road SE, in Salem, Oregon. Refer to the Civil Drawings for a site map of the project area.

1.2 BRIEF DESCRIPTION OF PROJECT SCOPE AND PROPOSED IMPROVEMENTS

The project scope is to develop the vacant lot for a mixed-use retail and apartment building as well as a parking lot. The project includes site preparation and construction of the facilities.

1.3 DESCRIPTION OF SIZE OF WATERSHED DRAINING TO THE SITE

The proposed stormwater facilities receive runoff from the 0.81-acre area which includes all proposed impervious and pervious improvements on-site. Refer to the Basin Map in Appendix A for details.

1.4 DESCRIPTION OF THE EXISTING SITE CONDITIONS, TREES & NATIVE VEGETATION, CONSTRAINTS, SENSITIVE AREAS & WATERWAYS

The existing site is completely undeveloped covered in a mixture of short grasses and brush. The existing site does not contain any trees. Stormwater from the site will drain to the proposed two Green Stormwater Infrastructures (GSI).

1.5 SUMMARY OF GREEN STORMWATER INFRASTRUCTURE

Per Appendix 4E of the City of Salem (COS) Design Standards, a large project will be considered to have met the maximum extent feasible (MEF) requirement when the stormwater runoff from the total amount of new plus replaced impervious surfaces flows into an area set aside for GSI that is at least 10% of the total area of the new plus replaced impervious surfaces or at least 80% of all impervious area must be treated by GSI. This design implements GSI for the entire project impervious area and therefore meets MEF for GSI. See the civil Drawings for more details.

1.6 REGULATORY PERMITS REQUIRED

City of Salem permits are required. The disturbed area is less than 1-acre, so a DEQ 1200-C permit is not required. No other permits are required for this project.

1.7 100 YEAR STORM ESCAPE ROUTES

Flows exceeding the 100-year storm (emergency overflow) will be routed through the 32-inch-wide grate opening in the top of the Type III Flow Control Catch Basin.

METHODOLOGY

2.1 DEPTH TO GROUNDWATER

No Geotechnical Report has been provided, so initial values were concretively assumed to show proof of concept. The proposed stormwater rain garden has drain rock to an elevation of 250 ft.

2.2 MAXIMUM INFILTRATION AND VEGETATIVE TREATMENT

An ultimate infiltration rate of 0.1 inches per hour was assumed until a geotechnical report is provided. This is a very conservative analysis, so that the GSI is shown to work with any result the geotechnical report brings forth.

2.3 SOIL INFORMATION

The pre-developed project site contains hydrologic soil group C soil. Refer to the Soils Report in Appendix B for more details.

2.4 HAZARDOUS MATERIAL

The owner is not aware of any hazardous material contamination onsite.

ANALYSIS

3.1 METHODS & SOFTWARE USED

HydroCAD modeling software was used to size the stormwater facilities. The Santa Barbara Unit Hydrograph Type 1A storm was used to model the required design storms. Per the City of Salem Design Standards, the design storms used were the water quality storm, (1.38-inch in 24-hours) half the 2-year, 24-hour, the 10-year, 24-hour, the 25-year, 24-hour, and the 100-year, 24-hour storm events.

Table 1 | City of Salem 24-hour Design Storms

	24-Hour Rainfall Depths for Salem, OR						
Recurrence Interval, Years	WQ	2	5	10	25	50	100
24-Hour Depths, Inches	1.38	2.2	2.7	3.2	3.6	4.1	4.4

Source: City of Salem Administrative Rules Chapter 109 – Division 004 Appendix D

3.2 CURVE NUMBER AND TIME OF CONCENTRATION CALCULATIONS

Per the COS Design Standards, the pre-developed site was covered in a combination of short grasses and brush, which corresponds to a pre-developed curve number of 72 for hydrologic soil group C-rated soils.

The developed impervious area was assigned curve numbers of 98 which corresponds to paved areas. The developed pervious area was assigned curve numbers of 74 which corresponds to landscaped areas.

Time of concentration (Tc) for the pre-developed conditions was calculated using sheet flow calculations. The pre-developed time of concentrations used for design were 17.2 and 20.8 minutes for Basins 1 and 2, respectively. See the Pre-Developed Basin Map in Appendix A for the flow path used and refer to the HydroCAD Summaries in Appendix C for calculations. A minimum time of concentration (Tc) of 5 minutes is applied to the developed basins due to the minimum time-step used by the HydroCAD modeling software.

3.3 TREATMENT & FLOW CONTROL SIZING CALCULATIONS

The existing site drainage and developed site drainage were analyzed as two (2) basins for the stormwater calculations. General basin characteristics of both pre-developed and developed conditions are listed in Table 2. For more detail refer to the Basin Maps in Appendix A and the Civil Drawings.

Table 2 | General Basin Characteristics

Basin ID	Source (Roof/Road/ Other)	Impervious Area (sf)	Pervious Area (sf)	Design Storms				CN[1]	Tc (min)
				½ 2 Year (cfs)	10 Year (cfs)	25 Year (cfs)	100 Year (cfs)		
Predeveloped Basin 1	Native	-	21,323	0.01	0.06	0.09	0.15	72	17.2
Predeveloped Basin 2	Native	-	14,080	0.01	0.04	0.05	0.09	72	20.8
Developed Basin 1	Paved/ Landscape	15,520	5,904	0.09	0.29	0.33	0.42	98/74	5.0
Developed Basin 2	Paved	10,448	3,632	0.06	0.19	0.22	0.28	98/74	5.0

[1] Curve number (CN) Impervious/Pervious.

Stormwater is released from RG 1 by exfiltration into the subsoils and a Flow Control Manhole. See Table 3 below for a summary of facility release rates for RG 1. Refer to the Civil Drawings for details.

Table 3 | Summary of Facility Outlet Sizing and Release Rates – RG 1

Outlet ID/ Storm Event	Orifice Size (in)	Orifice Elevation (ft)	Release Rate (cfs)	Peak WSE[1] (ft)	Overflow Elevation (ft)	Infiltration Rate (in/hr)
Half 2 Year	0.6	244.40	0.01	246.14	250.0	0.10
WQ	-	-	-	249.22	250.0	0.10
10 Year	0.9	246.16	0.06	249.40	250.0	0.10
25 Year	-	-	0.06	249.80	250.0	0.10
100 Year[2]	6.4	249.82	0.15	250.00	250.0	0.10

[1] WSE = water surface elevation
[2] Flow Control provided by 6.4-inch overflow in a Beehive Inlet Control.

RG 1 has been sized to drain the water quality storm below the growing media in 42 hours from the start of the event, which is less than the required 54 hours per the COS Design Standards. See the HydroCAD Summaries in Appendix C for drain time during the water quality storm.

A summary of the overall developed release from the site compared to the allowed release is provided in Table 4 below.

Table 4 | Summary of Developed Release Rates – RG 1

Outlet ID/ Storm Event	Release Rate (cfs)	Allowed Release (cfs)	Infiltration Rate (in/hr)
Half 2 Year	0.01	0.01	0.10
10 Year	0.06	0.06	0.10
25 Year	0.06	0.09	0.10
100 Year	0.15	0.15	0.10

As noted above the developed release from the site is less than or equal to that of the predeveloped release for all design storms.

Stormwater is released from RG 2 by exfiltration into the subsoils and a Flow Control Manhole. See Table 5 below for a summary of facility release rates for RG 2. Refer to the Civil Drawings for details.

Table 5 | Summary of Facility Outlet Sizing and Release Rates – RG 2

Outlet ID/ Storm Event	Orifice Size (in)	Orifice Elevation (ft)	Release Rate (cfs)	Peak WSE[1] (ft)	Overflow Elevation (ft)	Infiltration Rate (in/hr)
Half 2 Year	0.7	244.65	0.01	245.56	252.0	0.10
WQ	-	-	-	251.65	252.0	0.10
10 Year	0.6	245.58	0.04	248.88	252.0	0.10
25 Year	-	-	0.05	249.51	252.0	0.10
100 Year[2]	1.8	249.53	0.09	249.87	252.0	0.10

[1] WSE = water surface elevation
[2] Flow Control provided by 1.8-inch overflow in a Beehive Inlet Control.

RG 2 has been sized to drain the water quality storm below the growing media in 36 hours from the start of the event, which is less than the required 54 hours per the COS Design Standards. See the HydroCAD Summaries in Appendix C for drain time during the water quality storm.

A summary of the overall developed release from the site compared to the allowed release is provided in Table 6 below.

Table 6 | Summary of Developed Release Rates – RG 2

Outlet ID/ Storm Event	Release Rate (cfs)	Allowed Release (cfs)	Infiltration Rate (in/hr)
Half 2 Year	0.01	0.01	0.10
10 Year	0.04	0.04	0.10
25 Year	0.05	0.05	0.10
100 Year	0.09	0.09	0.10

As noted above the developed release from the site is less than or equal to that of the predeveloped release for all design storms.

A summary of the rain garden geometry provided in Table 7 below.

Table 7 | Facility Sizing Summary – RG 1 + RG 2

Facility ID[1]	Facility Elevations[2] (ft)		Facility Surface Area[2] (SF)		Depth of Drain Rock (in)
	Top	Bottom	Top	Bottom	
RG 1	250.0	248.0	850	68	22
RG 2	250.0	248.0	518	1	19

[1] All facilities are privately owned and maintained stormwater GSI facilities.
[2] The top facility elevation and corresponding square footage area refer to the top of the 3:1 slope. The bottom elevation and corresponding square footage area refer to the bottom of the 3:1 slope.

The HydroCAD modeled release rates and water surface elevations (WSE) shown in Tables 3 and 5 assume free-flow though the rain garden growing media. Release from the rain garden facility can also be controlled by the filtration capacity of the growing media. To verify the entire WQ storm event is filtered through the growing media for treatment, the rain garden hydraulics were also modeled at the facility surface with an assumed filtration rate of 2 in/hr per COS Design Standards. The surface tests were calculated using Darcy's Law of hydraulic conductivity with the groundwater elevation set 1.5 feet below the surface to represent the 1.5 feet (18 inches) of growing media thickness per COS Design Standards. The rain gardens provide treatment for the entire developed basin. See the HydroCAD analysis in Appendix C for surface test calculations.

Table 8 | Surface Filtration Test Summary – WQ Storm

Facility ID[1]	Facility Bottom Elevation (ft)	Max. Treatment Elevation[2]	WSE (ft)
RG 1	250.0	248.0	252.22
RG 2	250.0	248.0	251.60

[1] The facility is a privately owned and maintained rain garden.
[2] Elevation of the top of the rain garden.

3.4 CONVEYANCE CAPACITY CALCULATIONS

The outlet pipe from the development was designed to convey the developed 100-year, 24-hour storm. Stormwater runoff is conveyed from the RG by a 6-inch pipe. See the Civil Drawings for more detail. The 6-inch pipe has a minimum slope of 0.5% and Manning's n of 0.013.

3.5 SUMMARY

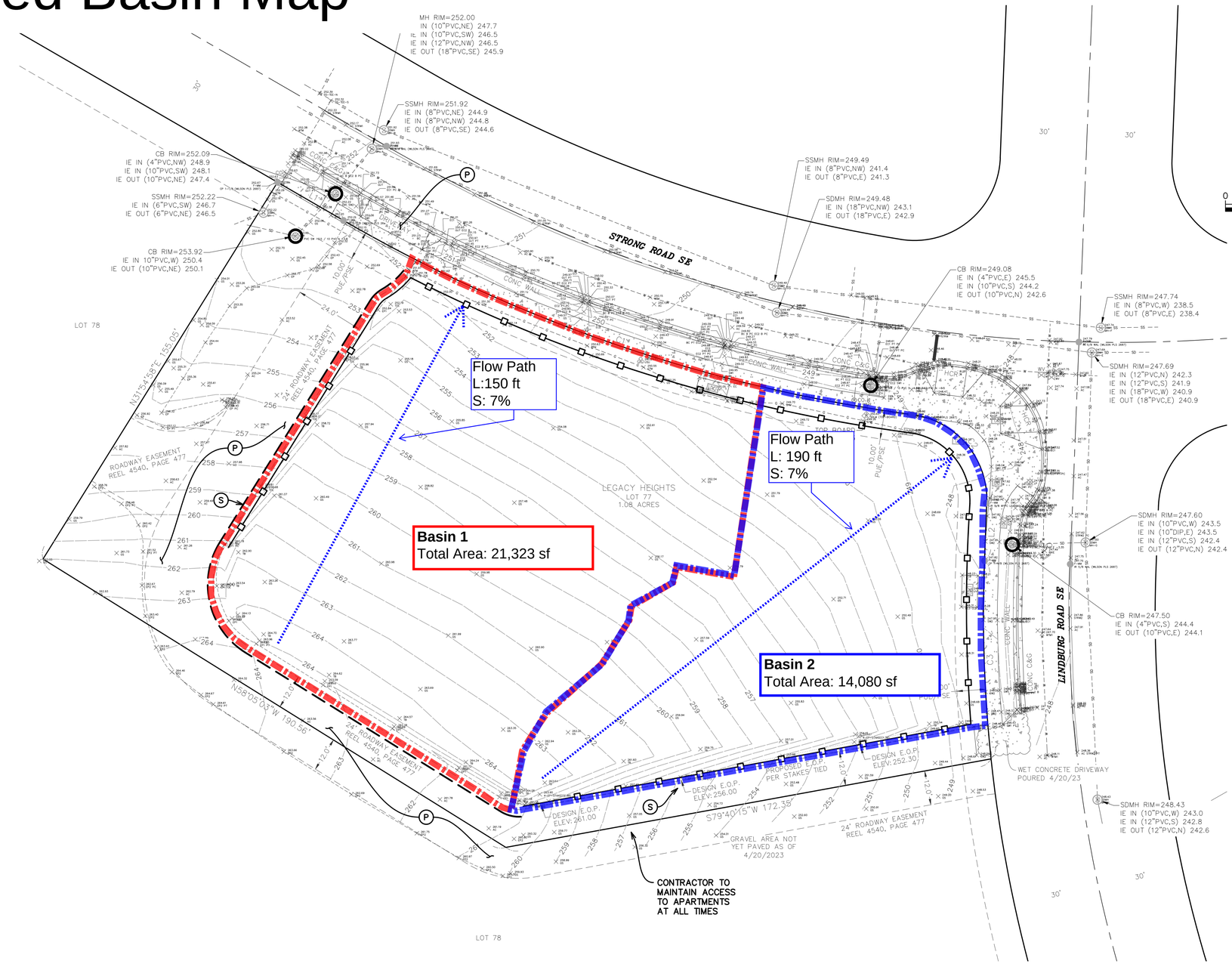
The stormwater system has been designed to release half the 2-year, 24-hour, the 10-year, 24-hour, the 25-year, 24-hour, and the 100-year, 24-hour storm events at rates less than their respective pre-developed storm for the Developed Basin. The proposed design also treats the water quality storm in less than the required 54 hours from the start of the storm event. Therefore, the project meets the flow control and treatment requirements as set forth in Administrative Rule 109 Division 004 - Stormwater System.

APPENDIX A

BASIN MAPS

Predeveloped Basin Map

EROSION CONTROL LEGEND
SILT SACK
SILT FENCE
DEMOLITION LEGEND
(P) PROTECT
(S) SAWCUT
(R) REMOVE
NOTES
1. NO CONCRETE WASHOUT ALLOWED ON SITE
2. NO STOCKPILING ALLOWED ON SITE



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OREGON
NOV. 12, 2008
WILLIAM J. WELLS
RENEWS: 6/30/2024

REVIEW

IN THE EVENT CONFLICTS ARE DISCOVERED BETWEEN THE ORIGINAL SIGNED AND SEALED DOCUMENTS PREPARED BY THE ARCHITECTS AND/OR THEIR CONSULTANTS, AND ANY COPY OF THE DOCUMENTS TRANSMITTED BY MAIL, FAX, ELECTRONICALLY OR OTHERWISE, THE ORIGINAL SIGNED AND SEALED DOCUMENTS SHALL GOVERN.

PROJECT #3492.0000.0
DATE: 01/24
DRAWN BY: AK
CHECKED BY: JW

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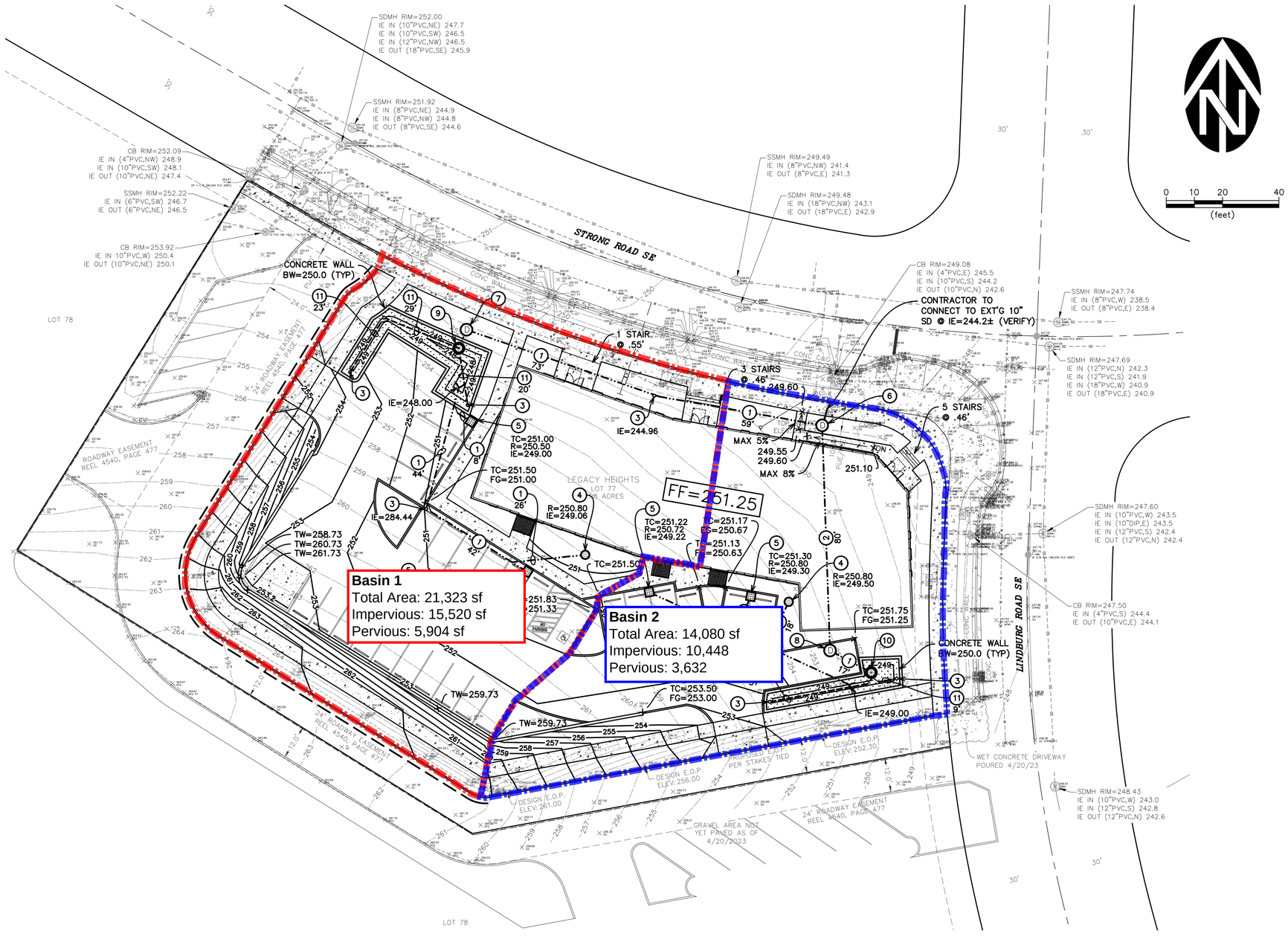
NEW RETAIL BUILDING:

STRONG RD SE
SALEM, OR
STRONG RD SE & LINDBURG RD SE

SHEET:
C1.0
EROSION CONTROL PLAN - DEMOLITION & CLEARING

Developed Basin Map

DRAINAGE KEY CALLOUTS
(1) 6"SD, L=SEE PLAN, S=1% MIN
(2) 8"SD, L=SEE PLAN, S=0.5% MIN
(3) SDCO, IE=SEE PLAN
(4) AREA DRAIN, SEE PLAN FOR INFO
(5) SDCB, SEE PLAN FOR INFO
(6) SDMH R=249.20 8" IE IN (S)=244.37 6" IE IN (W)=244.37 10" IE OUT (N)=244.27
(7) SDMH R=251.30 6" IE IN (SW)=245.79 6" IE OUT (SE)=245.69
(8) SDMH R=251.50 6" IE IN (SE)=244.60 8" IE OUT (N)=244.58
(9) BEEHIVE FLOW CONTROL #1 R=250.90 6" IE OUT (N)=244.40
(10) BEEHIVE FLOW CONTROL #2 R=250.90 6" IE OUT (SE)=244.65
(11) 6" PERF PIPE, L=SEE PLAN



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NEW RETAIL BUILDING:

STRONG RD SE
SALEM, OR
STRONG RD SE & LINDBURG RD SE

SHEET:
C2.0
GRADING & DRAINAGE PLAN

APPENDIX B
NRCS SOIL REPORT

Map Scale: 1:531 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

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: Marion County Area, Oregon
Survey Area Data: Version 21, Sep 8, 2023

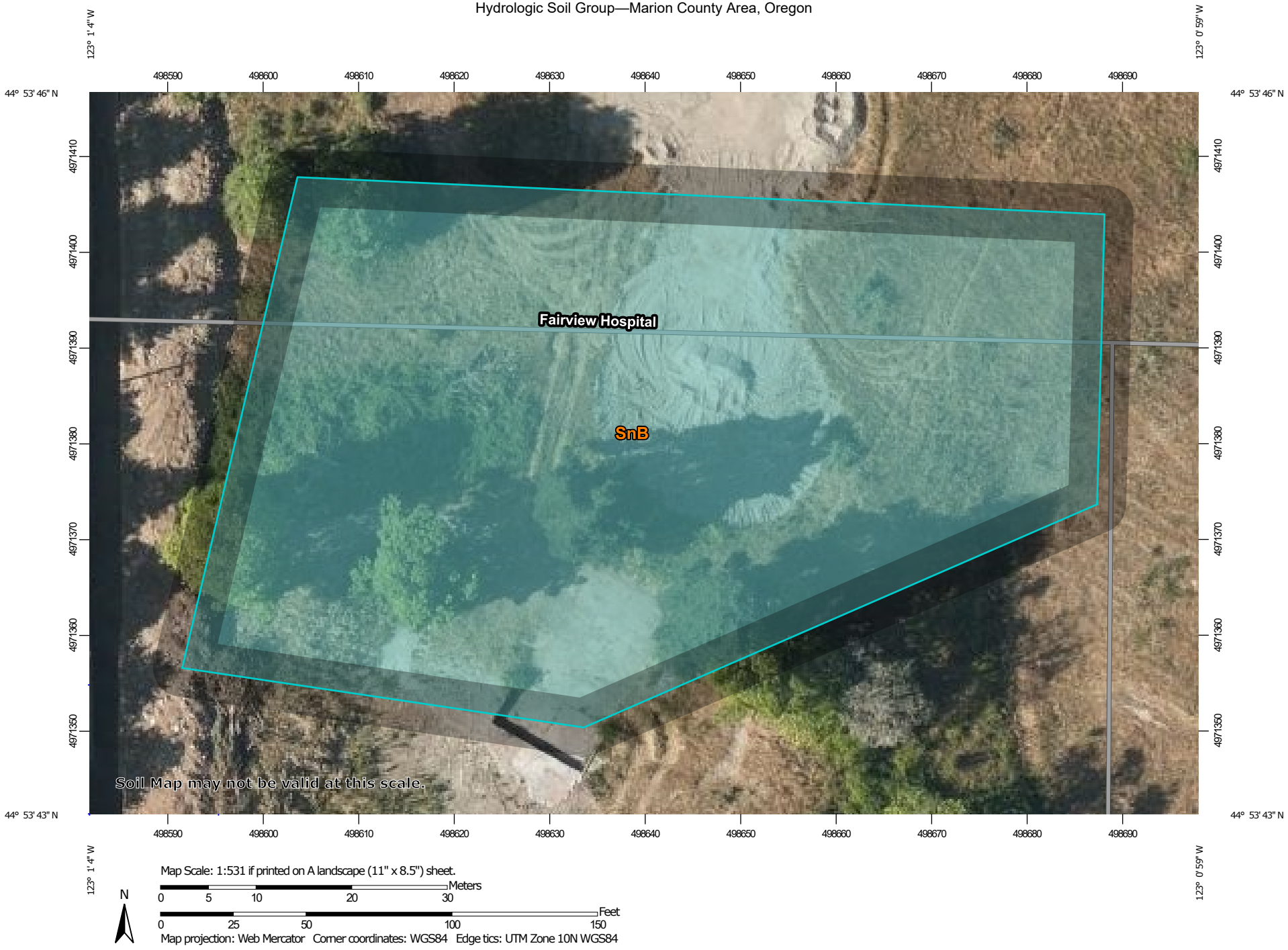
Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Aug 1, 2018—Aug 31, 2018

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
SnB	Santiam silt loam, 3 to 6 percent slopes	1.1	100.0%
Totals for Area of Interest		**1.1**	**100.0%**



Map Scale: 1:531 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 5 10 20 30

Feet
0 25 50 100 150

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 Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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.

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Date(s) aerial images were photographed: Aug 1, 2018—Aug 31, 2018

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Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
SnB	Santiam silt loam, 3 to 6 percent slopes	C	1.1	100.0%
Totals for Area of Interest			**1.1**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX C

HYDROCAD SUMMARIES

Predeveloped Basin 1 WEST

Predeveloped Basin 1

Subcat Reach Pond Link

Routing Diagram for Fairview Retail
Prepared by Westech Engineering Inc, Printed 1/31/2024

Summary for Subcatchment 64S: Predeveloped Basin 1

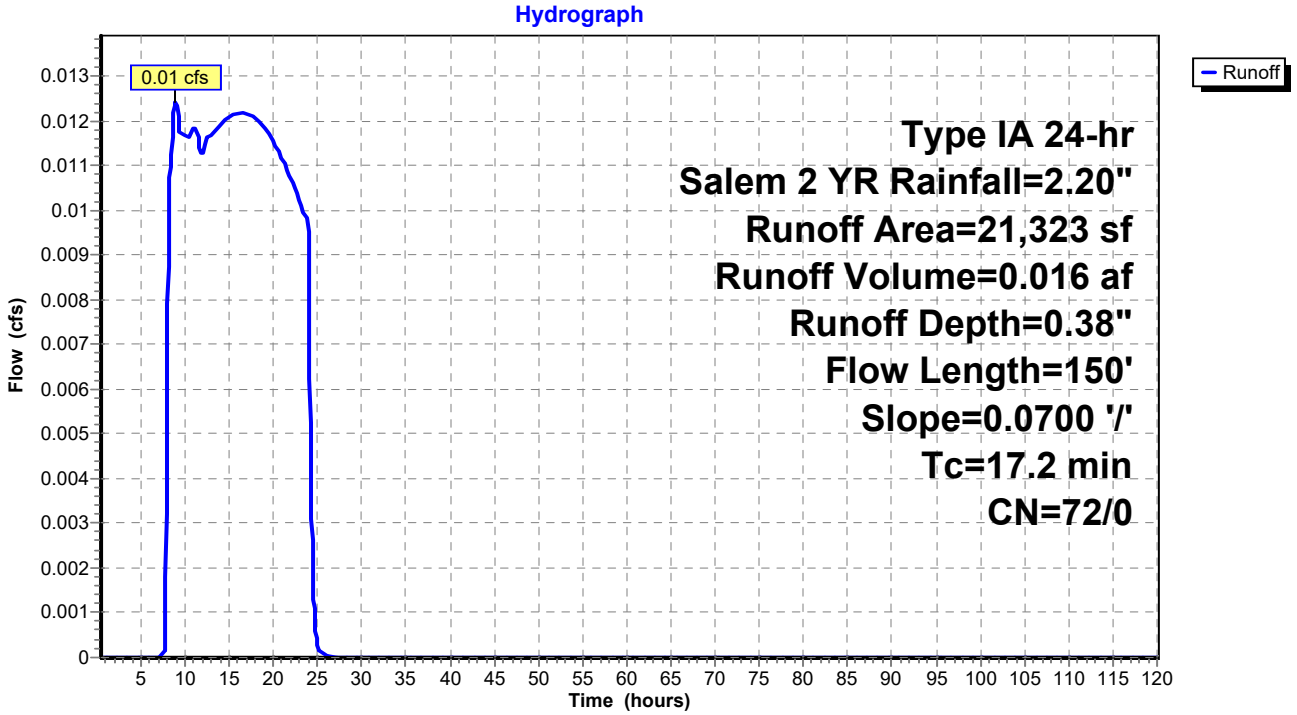
Runoff = 0.01 cfs @ 8.95 hrs, Volume= 0.016 af, Depth= 0.38"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 2 YR Rainfall=2.20"

	Area (sf)	CN	Description
*	21,323	72	Predeveloped
	21,323		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.2	150	0.0700	0.15		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment 64S: Predeveloped Basin 1



Summary for Subcatchment 64S: Predeveloped Basin 1

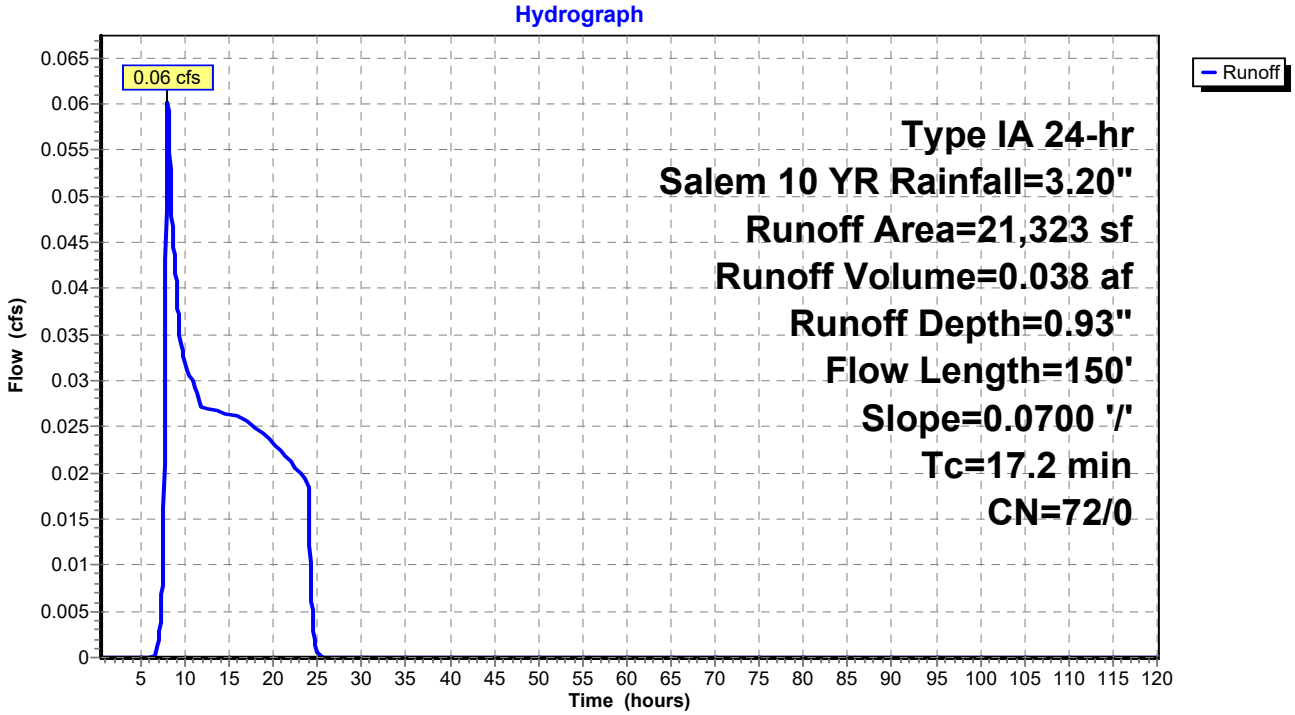
Runoff = 0.06 cfs @ 8.06 hrs, Volume= 0.038 af, Depth= 0.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

	Area (sf)	CN	Description
*	21,323	72	Predeveloped
	21,323		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.2	150	0.0700	0.15		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment 64S: Predeveloped Basin 1



Summary for Subcatchment 64S: Predeveloped Basin 1

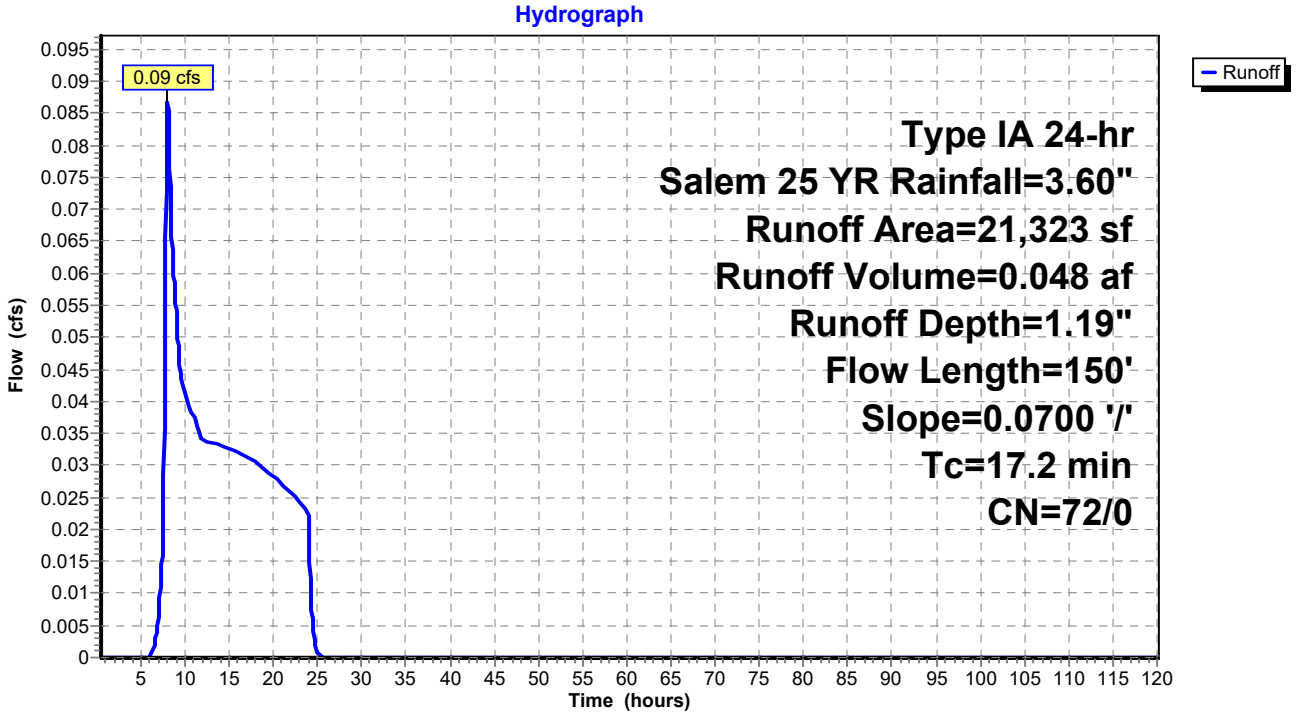
Runoff = 0.09 cfs @ 8.05 hrs, Volume= 0.048 af, Depth= 1.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

	Area (sf)	CN	Description
*	21,323	72	Predeveloped
	21,323		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.2	150	0.0700	0.15		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment 64S: Predeveloped Basin 1



Summary for Subcatchment 64S: Predeveloped Basin 1

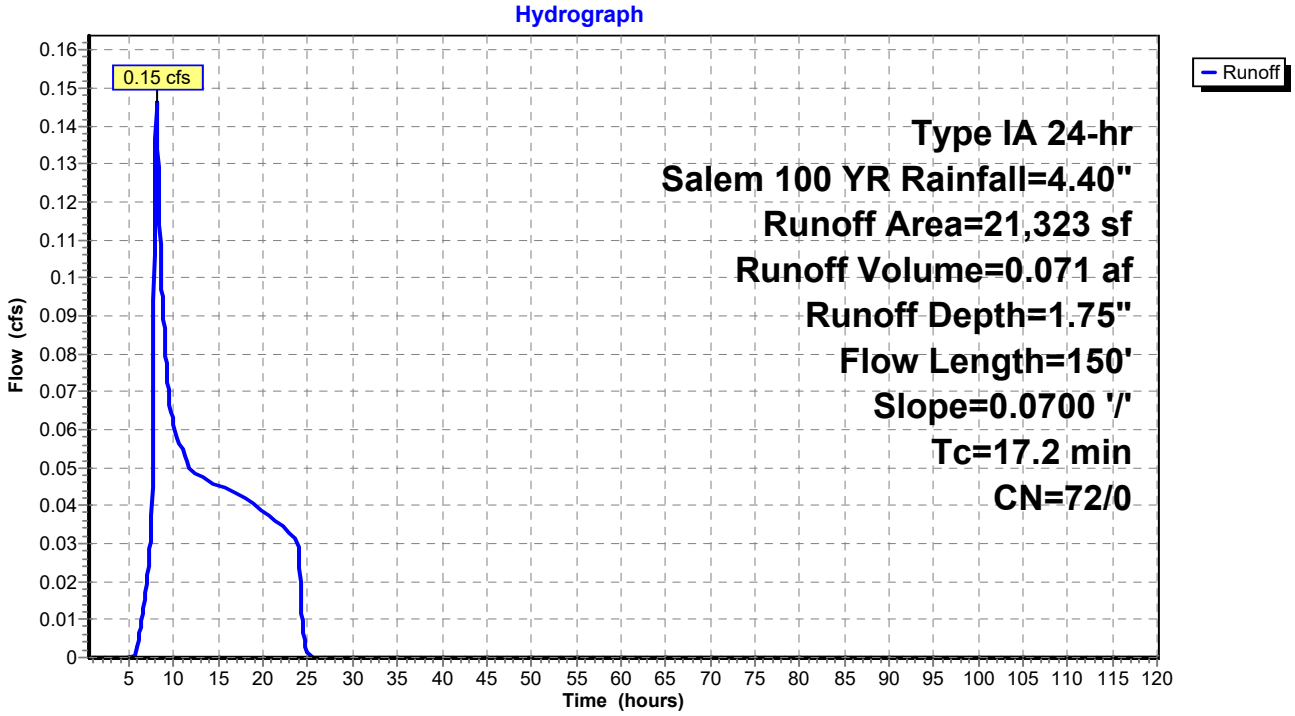
Runoff = 0.15 cfs @ 8.04 hrs, Volume= 0.071 af, Depth= 1.75"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

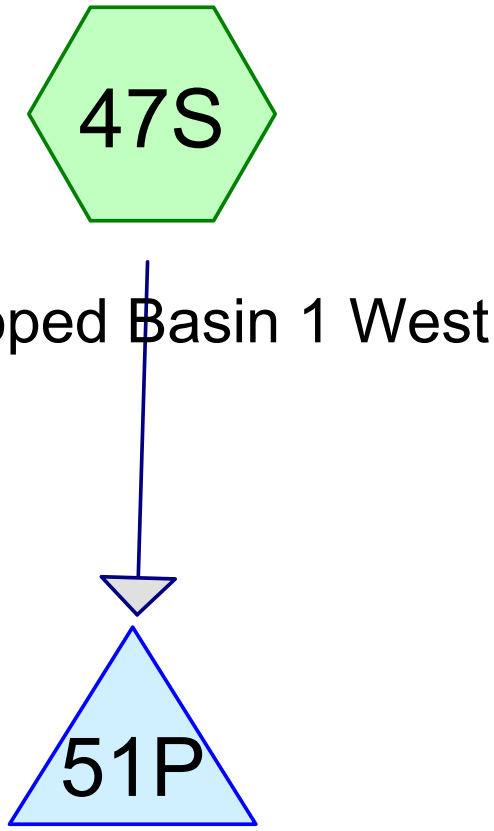
	Area (sf)	CN	Description
*	21,323	72	Predeveloped
	21,323		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.2	150	0.0700	0.15		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment 64S: Predeveloped Basin 1



Developed Basin 1 west



Subcat Reach Pond Link

Routing Diagram for Fairview Retail
Prepared by Westech Engineering Inc, Printed 1/31/2024

Summary for Subcatchment 47S: Developed Basin 1 West

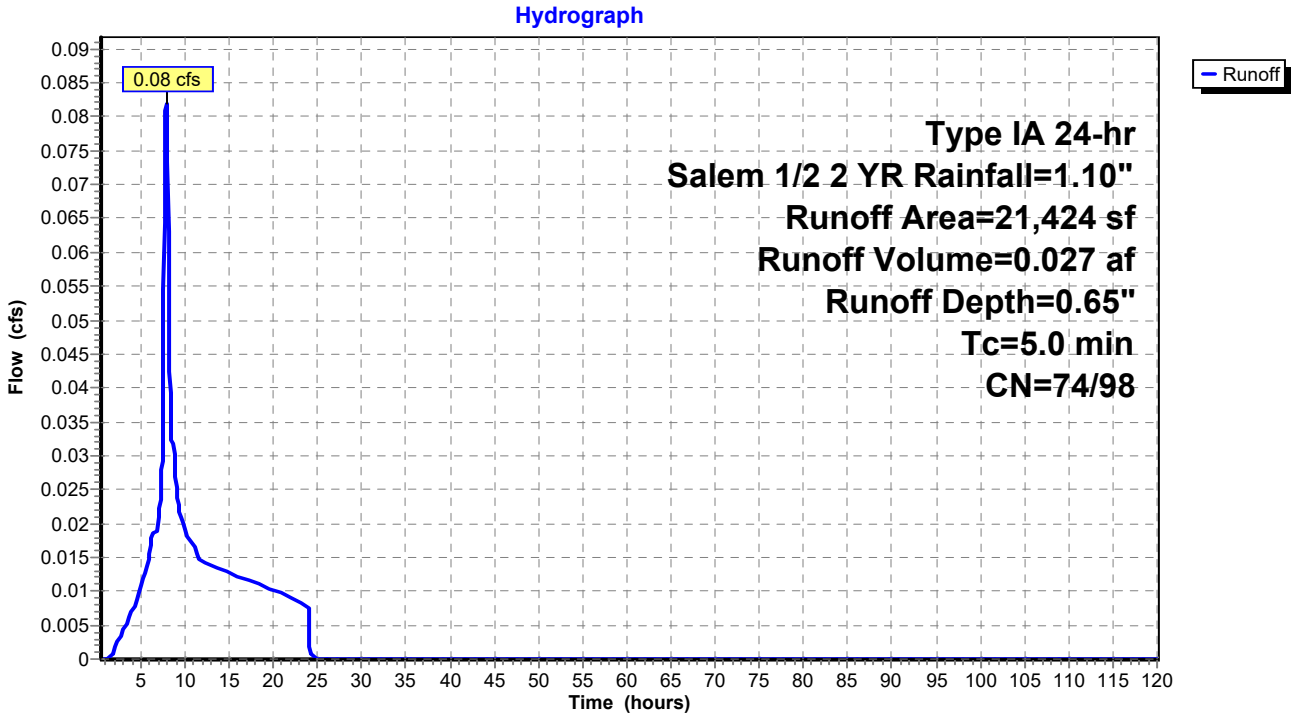
Runoff = 0.08 cfs @ 7.92 hrs, Volume= 0.027 af, Depth= 0.65"
Routed to Pond 51P : New Rain Garden 1

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

	Area (sf)	CN	Description
	15,520	98	Unconnected roofs, HSG A
*	5,904	74	>75% Grass cover, Good, HSG D
	21,424	91	Weighted Average
	5,904		27.56% Pervious Area
	15,520		72.44% Impervious Area

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

Subcatchment 47S: Developed Basin 1 West



Summary for Pond 51P: New Rain Garden 1

Inflow Area = 0.492 ac, 72.44% Impervious, Inflow Depth = 0.65" for Salem 1/2 2 YR event
Inflow = 0.08 cfs @ 7.92 hrs, Volume= 0.027 af
Outflow = 0.01 cfs @ 11.62 hrs, Volume= 0.027 af, Atten= 82%, Lag= 222.5 min
Discarded = 0.00 cfs @ 11.62 hrs, Volume= 0.005 af
Primary = 0.01 cfs @ 11.62 hrs, Volume= 0.022 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 246.14' @ 11.62 hrs Surf.Area= 535 sf Storage= 372 cf

Plug-Flow detention time= 340.6 min calculated for 0.027 af (100% of inflow)
Center-of-Mass det. time= 340.8 min (1,056.7 - 715.9)

Volume	Invert	Avail.Storage	Storage Description
#1	244.40'	1,776 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

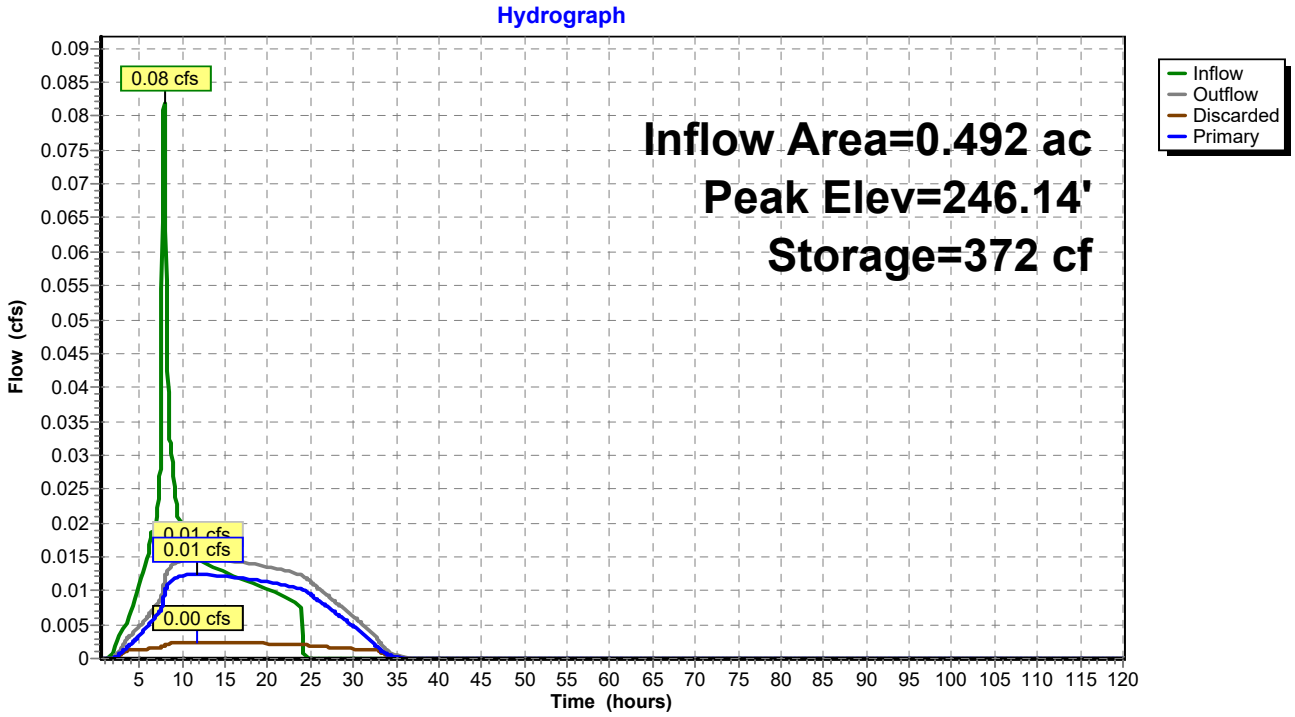
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
244.40	535	0.0	0	0
246.25	535	40.0	396	396
246.50	535	40.0	54	449
248.00	89	100.0	468	917
249.00	389	100.0	239	1,156
250.00	850	100.0	620	1,776

Device	Routing	Invert	Outlet Devices
#1	Discarded	244.40'	**0.100 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 242.50'
#2	Primary	244.40'	**0.6" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	246.16'	**0.9" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	249.82'	**6.4" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 11.62 hrs HW=246.14' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.01 cfs @ 11.62 hrs HW=246.14' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 6.31 fps)
├**3=Orifice/Grate** (Controls 0.00 cfs)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 51P: New Rain Garden 1



Summary for Subcatchment 47S: Developed Basin 1 West

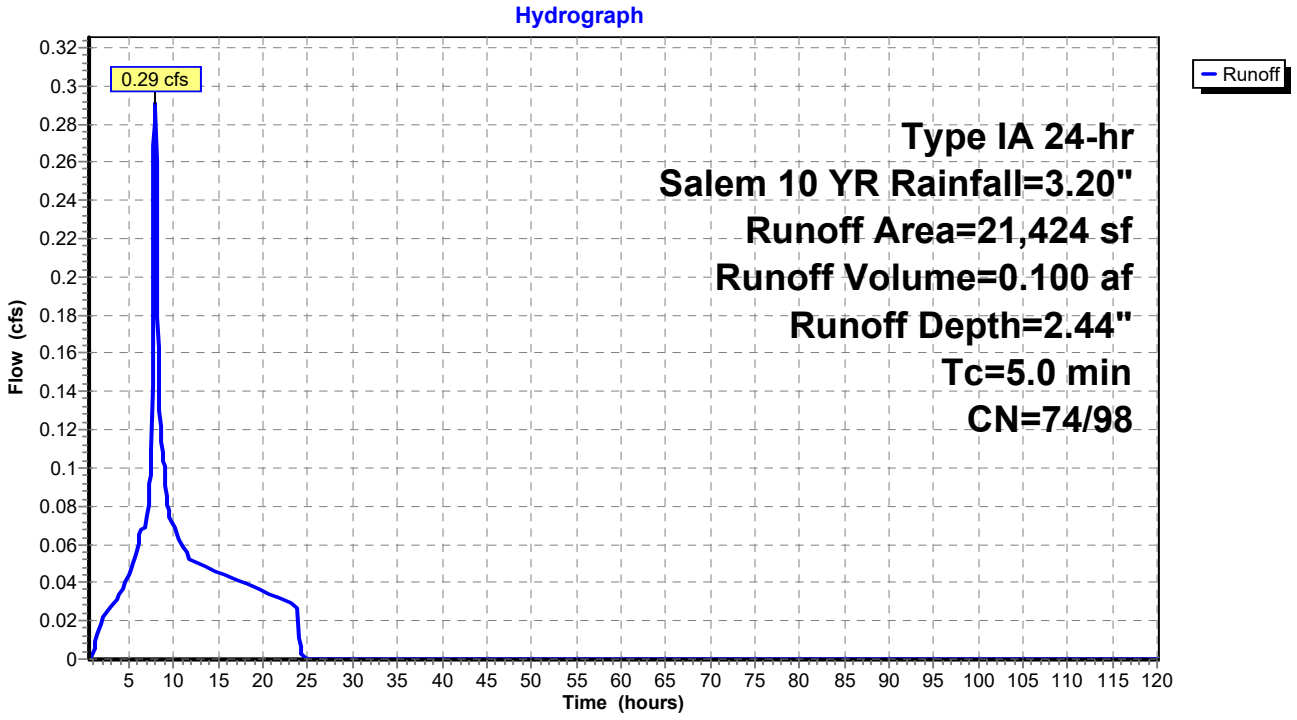
Runoff = 0.29 cfs @ 7.92 hrs, Volume= 0.100 af, Depth= 2.44"
Routed to Pond 51P : New Rain Garden 1

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

	Area (sf)	CN	Description
	15,520	98	Unconnected roofs, HSG A
*	5,904	74	>75% Grass cover, Good, HSG D
	21,424	91	Weighted Average
	5,904		27.56% Pervious Area
	15,520		72.44% Impervious Area

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

Subcatchment 47S: Developed Basin 1 West



Summary for Pond 51P: New Rain Garden 1

Inflow Area = 0.492 ac, 72.44% Impervious, Inflow Depth = 2.44" for Salem 10 YR event
Inflow = 0.29 cfs @ 7.92 hrs, Volume= 0.100 af
Outflow = 0.06 cfs @ 10.26 hrs, Volume= 0.100 af, Atten= 78%, Lag= 140.6 min
Discarded = 0.01 cfs @ 10.26 hrs, Volume= 0.010 af
Primary = 0.06 cfs @ 10.26 hrs, Volume= 0.090 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 249.40' @ 10.26 hrs Surf.Area= 573 sf Storage= 1,348 cf

Plug-Flow detention time= 312.9 min calculated for 0.100 af (100% of inflow)
Center-of-Mass det. time= 313.2 min (1,002.9 - 689.7)

Volume	Invert	Avail.Storage	Storage Description
#1	244.40'	1,776 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

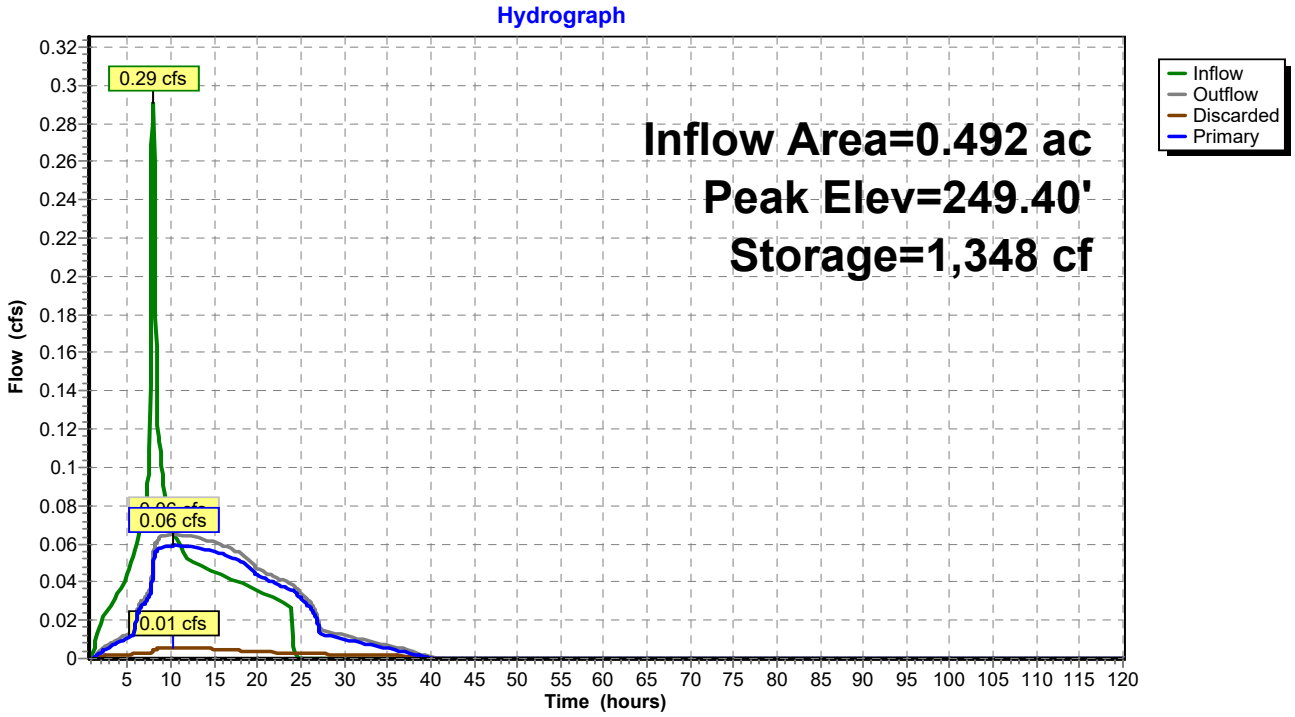
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
244.40	535	0.0	0	0
246.25	535	40.0	396	396
246.50	535	40.0	54	449
248.00	89	100.0	468	917
249.00	389	100.0	239	1,156
250.00	850	100.0	620	1,776

Device	Routing	Invert	Outlet Devices
#1	Discarded	244.40'	**0.100 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 242.50'
#2	Primary	244.40'	**0.6" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	246.16'	**0.9" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	249.82'	**6.4" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 10.26 hrs HW=249.40' (Free Discharge)
└**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.06 cfs @ 10.26 hrs HW=249.40' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 10.74 fps)
├**3=Orifice/Grate** (Orifice Controls 0.04 cfs @ 8.61 fps)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 51P: New Rain Garden 1



Summary for Subcatchment 47S: Developed Basin 1 West

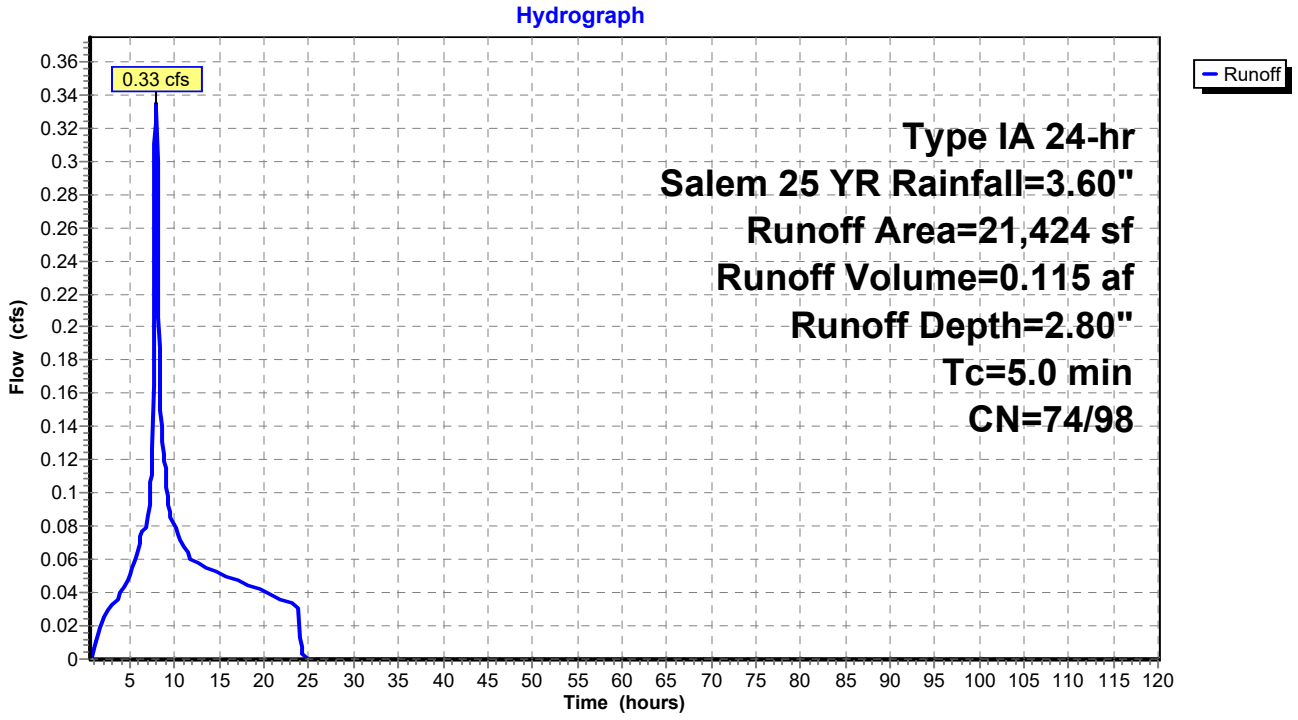
Runoff = 0.33 cfs @ 7.92 hrs, Volume= 0.115 af, Depth= 2.80"
Routed to Pond 51P : New Rain Garden 1

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

	Area (sf)	CN	Description
	15,520	98	Unconnected roofs, HSG A
*	5,904	74	>75% Grass cover, Good, HSG D
	21,424	91	Weighted Average
	5,904		27.56% Pervious Area
	15,520		72.44% Impervious Area

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

Subcatchment 47S: Developed Basin 1 West



Summary for Pond 51P: New Rain Garden 1

Inflow Area = 0.492 ac, 72.44% Impervious, Inflow Depth = 2.80" for Salem 25 YR event
Inflow = 0.33 cfs @ 7.92 hrs, Volume= 0.115 af
Outflow = 0.07 cfs @ 11.02 hrs, Volume= 0.115 af, Atten= 79%, Lag= 186.1 min
Discarded = 0.01 cfs @ 11.02 hrs, Volume= 0.011 af
Primary = 0.06 cfs @ 11.02 hrs, Volume= 0.103 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 249.80' @ 11.02 hrs Surf.Area= 756 sf Storage= 1,612 cf

Plug-Flow detention time= 334.9 min calculated for 0.115 af (100% of inflow)
Center-of-Mass det. time= 335.2 min (1,022.4 - 687.2)

Volume	Invert	Avail.Storage	Storage Description
#1	244.40'	1,776 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

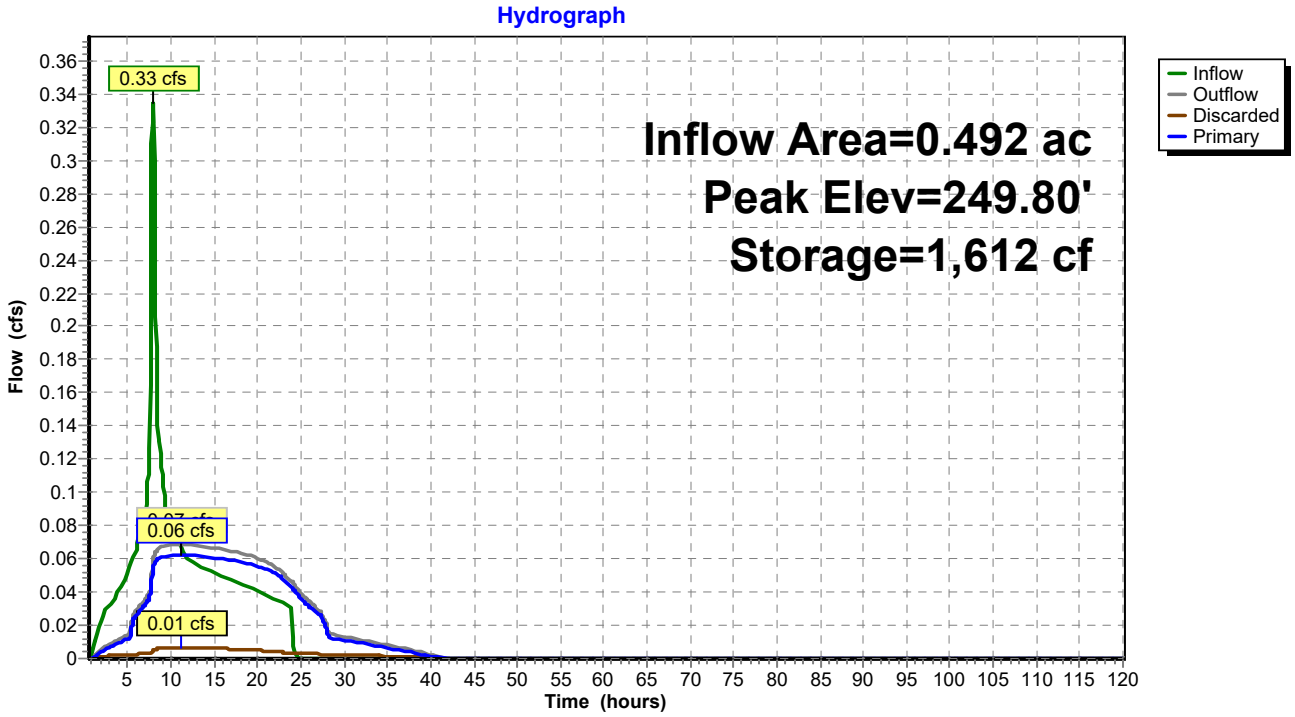
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
244.40	535	0.0	0	0
246.25	535	40.0	396	396
246.50	535	40.0	54	449
248.00	89	100.0	468	917
249.00	389	100.0	239	1,156
250.00	850	100.0	620	1,776

Device	Routing	Invert	Outlet Devices
#1	Discarded	244.40'	**0.100 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 242.50'
#2	Primary	244.40'	**0.6" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	246.16'	**0.9" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	249.82'	**6.4" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.01 cfs @ 11.02 hrs HW=249.80' (Free Discharge)
└**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.06 cfs @ 11.02 hrs HW=249.80' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 11.16 fps)
├**3=Orifice/Grate** (Orifice Controls 0.04 cfs @ 9.13 fps)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 51P: New Rain Garden 1



Summary for Subcatchment 47S: Developed Basin 1 West

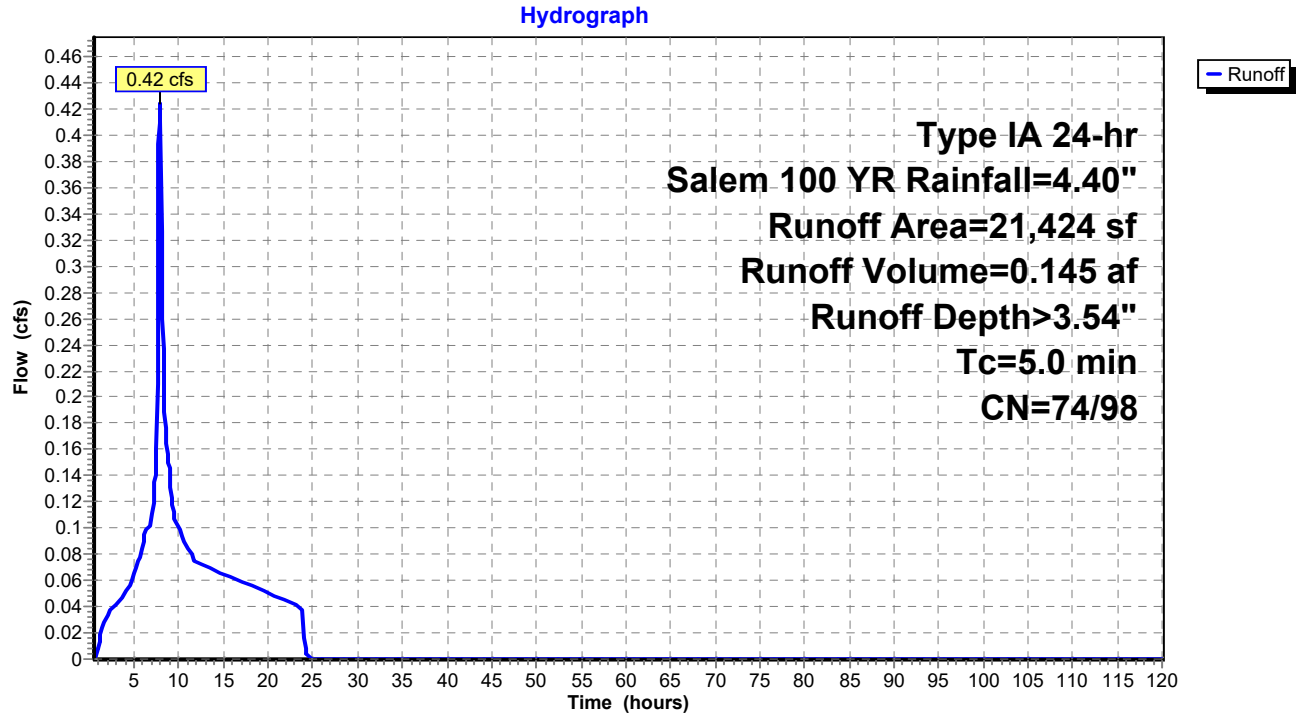
Runoff = 0.42 cfs @ 7.91 hrs, Volume= 0.145 af, Depth> 3.54"
Routed to Pond 51P : New Rain Garden 1

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

	Area (sf)	CN	Description
	15,520	98	Unconnected roofs, HSG A
*	5,904	74	>75% Grass cover, Good, HSG D
	21,424	91	Weighted Average
	5,904		27.56% Pervious Area
	15,520		72.44% Impervious Area

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

Subcatchment 47S: Developed Basin 1 West



Summary for Pond 51P: New Rain Garden 1

Inflow Area = 0.492 ac, 72.44% Impervious, Inflow Depth > 3.54" for Salem 100 YR event
Inflow = 0.42 cfs @ 7.91 hrs, Volume= 0.145 af
Outflow = 0.16 cfs @ 8.70 hrs, Volume= 0.145 af, Atten= 62%, Lag= 47.4 min
Discarded = 0.01 cfs @ 8.70 hrs, Volume= 0.013 af
Primary = 0.15 cfs @ 8.70 hrs, Volume= 0.132 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 250.00' @ 8.70 hrs Surf.Area= 848 sf Storage= 1,772 cf

Plug-Flow detention time= 320.2 min calculated for 0.145 af (100% of inflow)
Center-of-Mass det. time= 319.8 min (1,002.9 - 683.1)

Volume	Invert	Avail.Storage	Storage Description
#1	244.40'	1,776 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

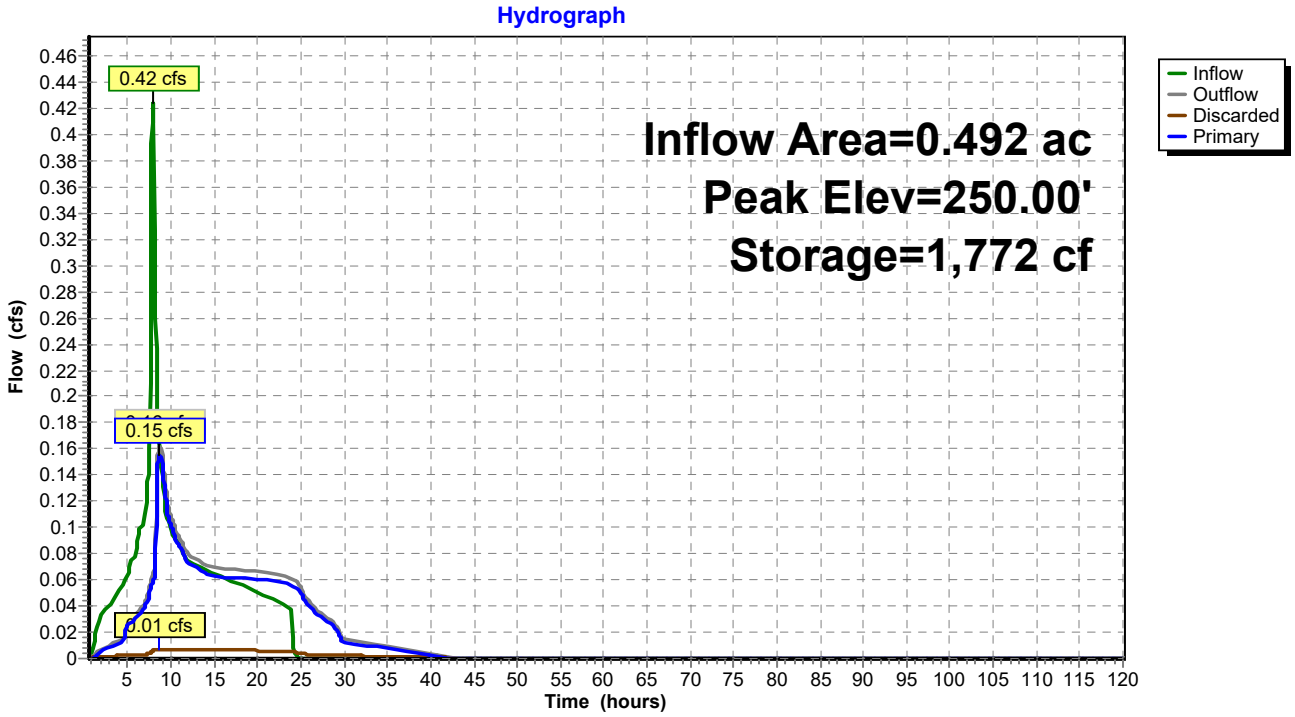
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
244.40	535	0.0	0	0
246.25	535	40.0	396	396
246.50	535	40.0	54	449
248.00	89	100.0	468	917
249.00	389	100.0	239	1,156
250.00	850	100.0	620	1,776

Device	Routing	Invert	Outlet Devices
#1	Discarded	244.40'	**0.100 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 242.50'
#2	Primary	244.40'	**0.6" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	246.16'	**0.9" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	249.82'	**6.4" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

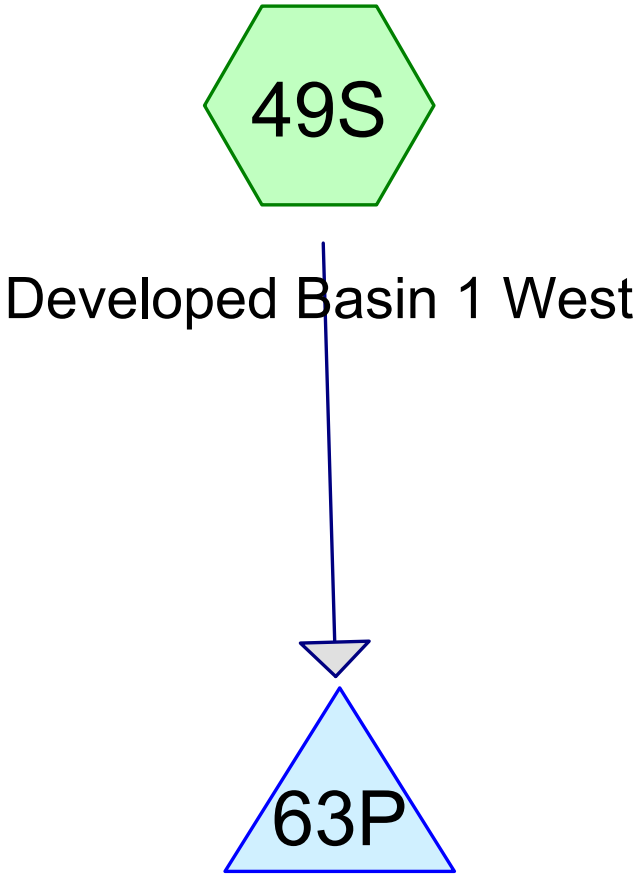
Discarded OutFlow Max=0.01 cfs @ 8.70 hrs HW=250.00' (Free Discharge)
└**1=Exfiltration** (Controls 0.01 cfs)

Primary OutFlow Max=0.15 cfs @ 8.70 hrs HW=250.00' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.02 cfs @ 11.36 fps)
├**3=Orifice/Grate** (Orifice Controls 0.04 cfs @ 9.38 fps)
└**4=Orifice/Grate** (Orifice Controls 0.09 cfs @ 1.42 fps)

Pond 51P: New Rain Garden 1



WQ Surface Test West



Subcat Reach Pond Link

Routing Diagram for Fairview Retail
Prepared by Westech Engineering Inc, Printed 1/31/2024

Summary for Subcatchment 49S: Developed Basin 1 West

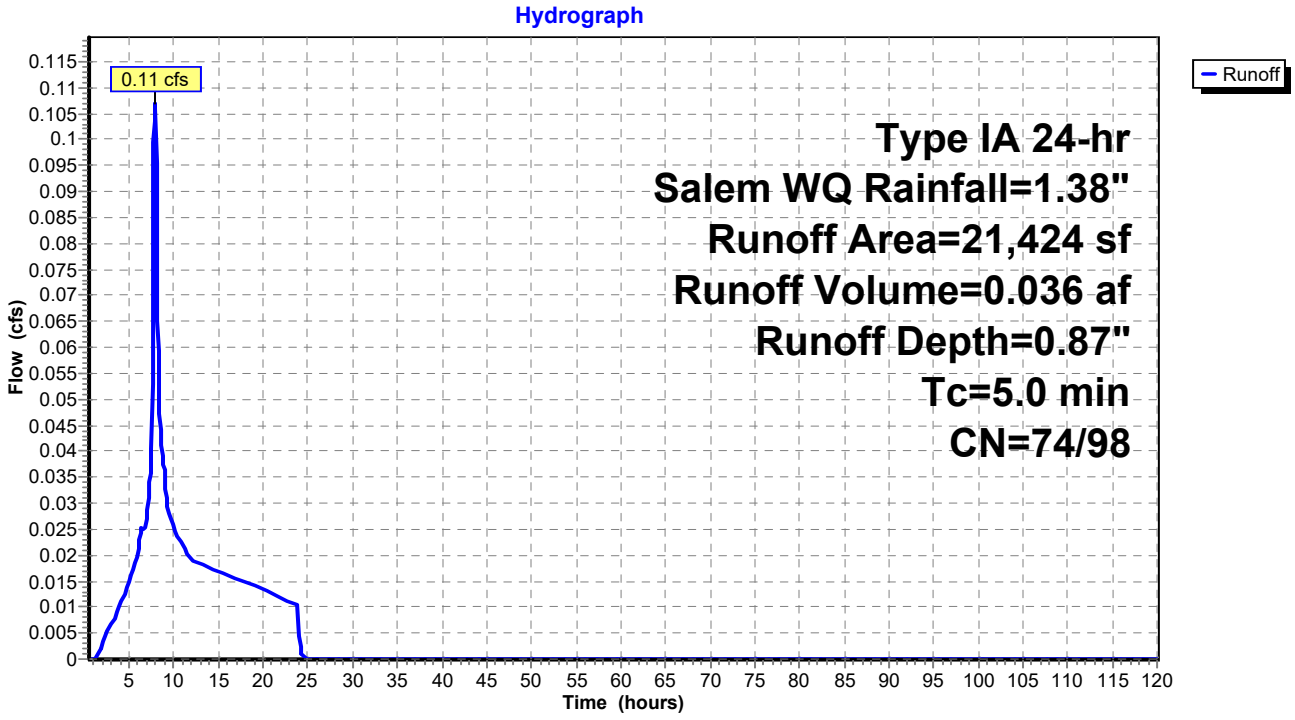
Runoff = 0.11 cfs @ 7.91 hrs, Volume= 0.036 af, Depth= 0.87"
Routed to Pond 63P : New Rain Garden 1

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

	Area (sf)	CN	Description
	15,520	98	Unconnected roofs, HSG A
*	5,904	74	>75% Grass cover, Good, HSG D
	21,424	91	Weighted Average
	5,904		27.56% Pervious Area
	15,520		72.44% Impervious Area

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

Subcatchment 49S: Developed Basin 1 West



Summary for Pond 63P: New Rain Garden 1

Inflow Area = 0.492 ac, 72.44% Impervious, Inflow Depth = 0.87" for Salem WQ event
Inflow = 0.11 cfs @ 7.91 hrs, Volume= 0.036 af
Outflow = 0.03 cfs @ 9.14 hrs, Volume= 0.036 af, Atten= 71%, Lag= 73.6 min
Discarded = 0.03 cfs @ 9.14 hrs, Volume= 0.036 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 249.22' @ 9.14 hrs Surf.Area= 490 sf Storage= 335 cf

Plug-Flow detention time= 137.2 min calculated for 0.036 af (100% of inflow)
Center-of-Mass det. time= 137.2 min (846.6 - 709.4)

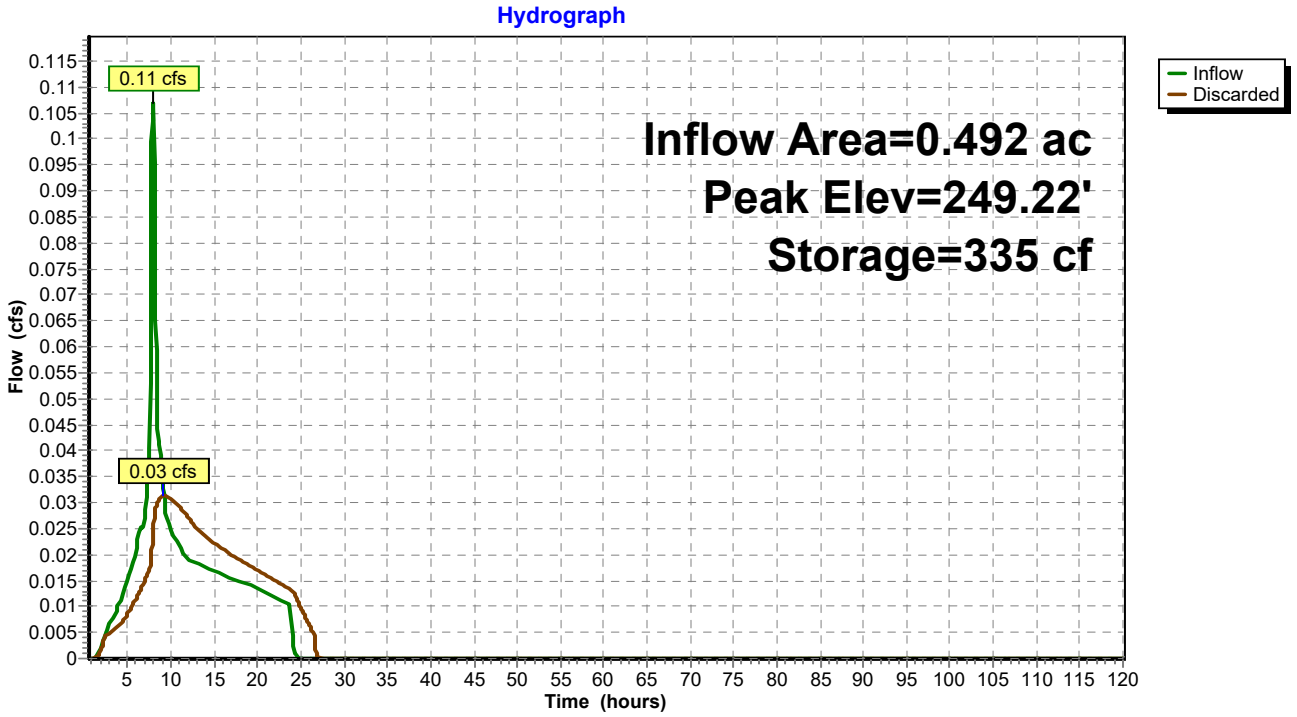
Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	859 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	89	0.0	0	0
249.00	389	100.0	239	239
250.00	850	100.0	620	859

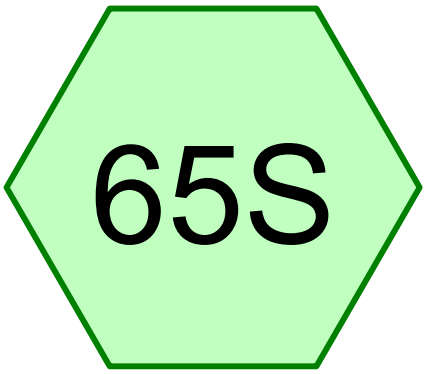
Device	Routing	Invert	Outlet Devices
#1	Discarded	248.00'	**2.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 246.50'

Discarded OutFlow Max=0.03 cfs @ 9.14 hrs HW=249.22' (Free Discharge)
1=Exfiltration (Controls 0.03 cfs)

Pond 63P: New Rain Garden 1



Predeveloped Basin 2 EAST



Predeveloped Basin 2

Subcat Reach Pond Link

Routing Diagram for Fairview Retail
Prepared by Westech Engineering Inc, Printed 1/31/2024

Summary for Subcatchment 65S: Predeveloped Basin 2

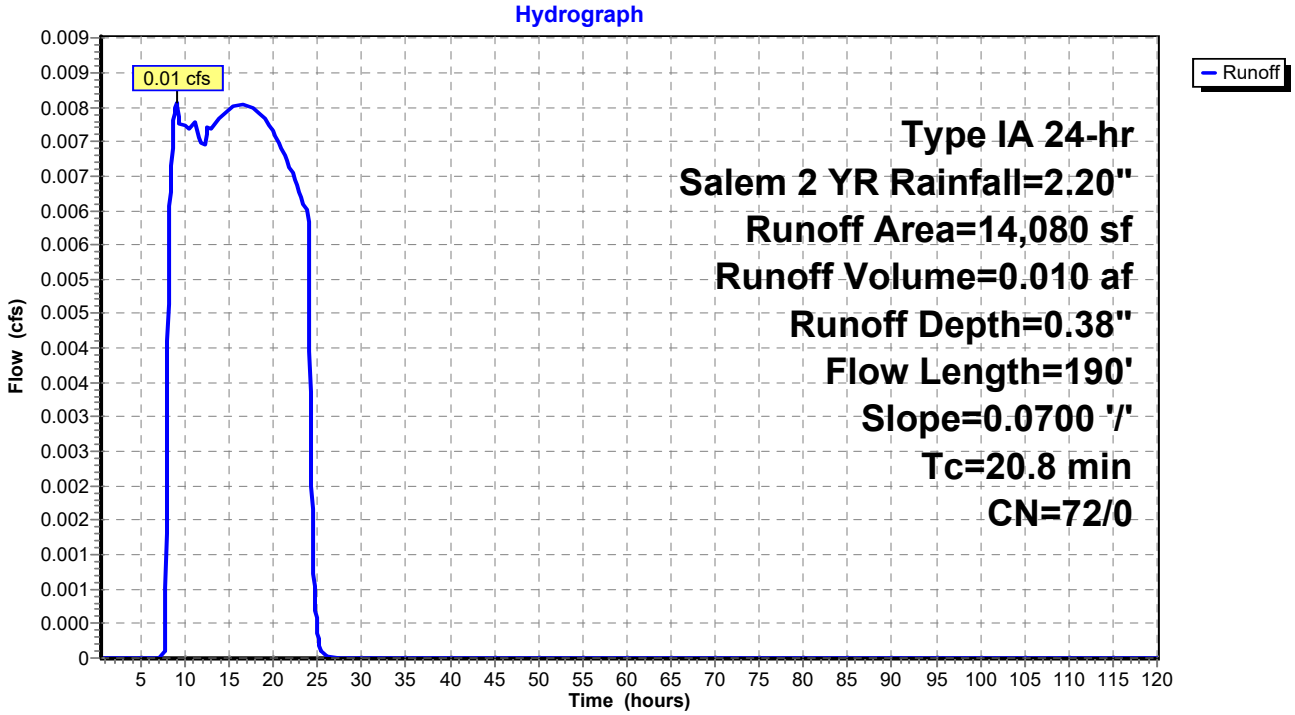
Runoff = 0.01 cfs @ 9.01 hrs, Volume= 0.010 af, Depth= 0.38"
Routed to nonexistent node 2L

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 2 YR Rainfall=2.20"

	Area (sf)	CN	Description
*	14,080	72	Predeveloped
	14,080		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	190	0.0700	0.15		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment 65S: Predeveloped Basin 2



Summary for Subcatchment 65S: Predeveloped Basin 2

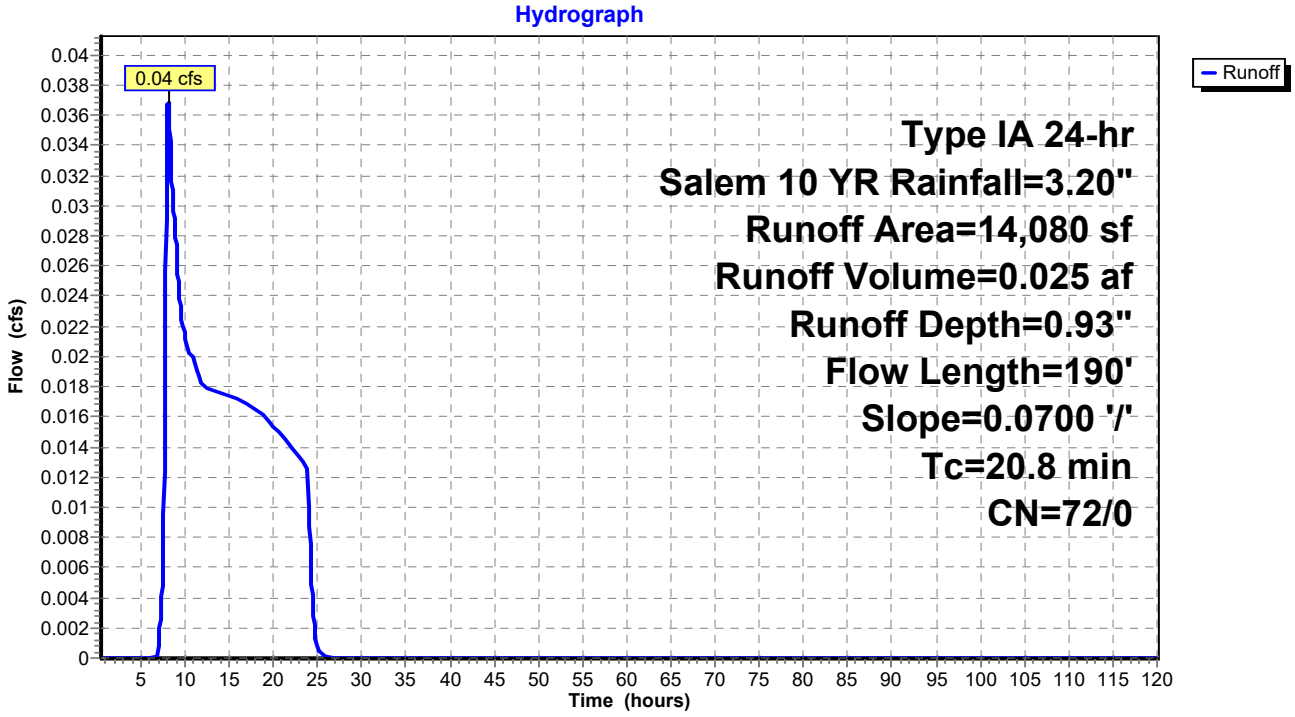
Runoff = 0.04 cfs @ 8.10 hrs, Volume= 0.025 af, Depth= 0.93"
Routed to nonexistent node 2L

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

	Area (sf)	CN	Description
*	14,080	72	Predeveloped
	14,080		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	190	0.0700	0.15		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment 65S: Predeveloped Basin 2



Summary for Subcatchment 65S: Predeveloped Basin 2

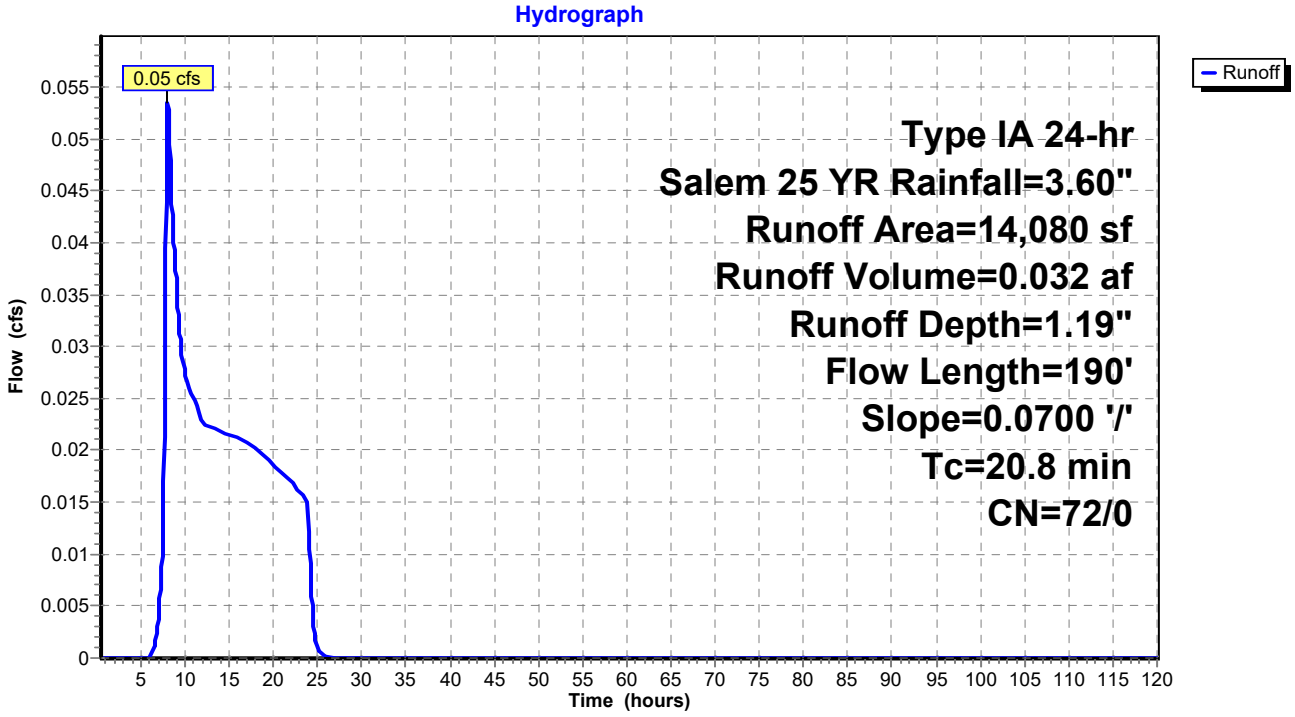
Runoff = 0.05 cfs @ 8.07 hrs, Volume= 0.032 af, Depth= 1.19"
Routed to nonexistent node 2L

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

	Area (sf)	CN	Description
*	14,080	72	Predeveloped
	14,080		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	190	0.0700	0.15		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment 65S: Predeveloped Basin 2



Summary for Subcatchment 65S: Predeveloped Basin 2

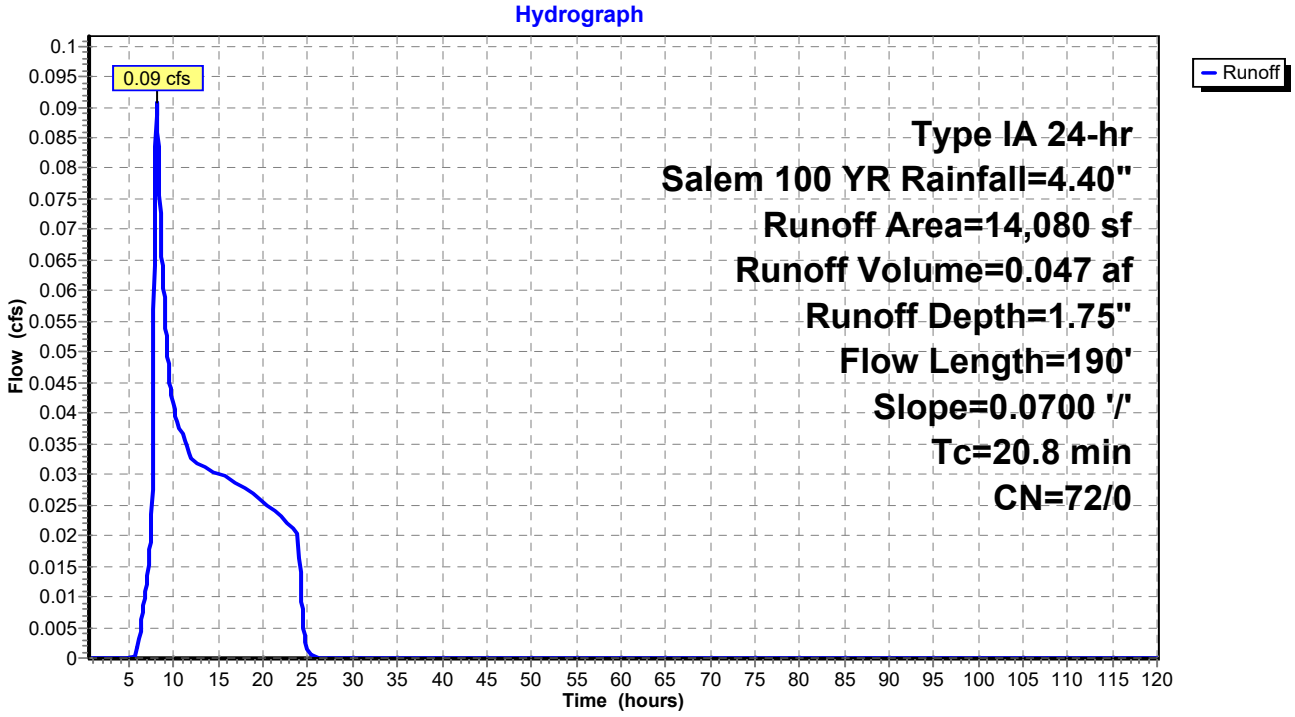
Runoff = 0.09 cfs @ 8.06 hrs, Volume= 0.047 af, Depth= 1.75"
Routed to nonexistent node 2L

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

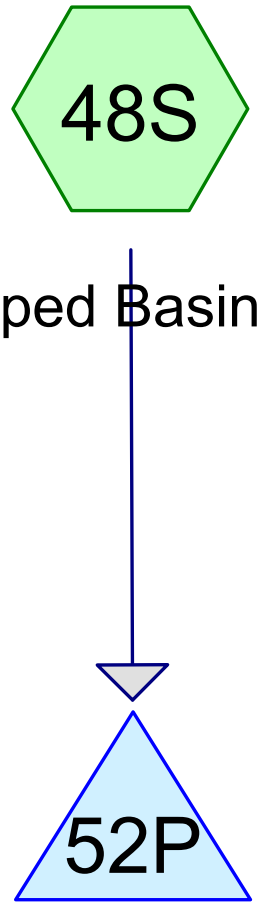
	Area (sf)	CN	Description
*	14,080	72	Predeveloped
	14,080		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.8	190	0.0700	0.15		**Sheet Flow,** n= 0.300 P2= 2.20"

Subcatchment 65S: Predeveloped Basin 2



Developed Basin 2 east



Subcat Reach Pond Link

Routing Diagram for Fairview Retail
Prepared by Westech Engineering Inc, Printed 1/31/2024

Summary for Subcatchment 48S: Developed Basin 2 East

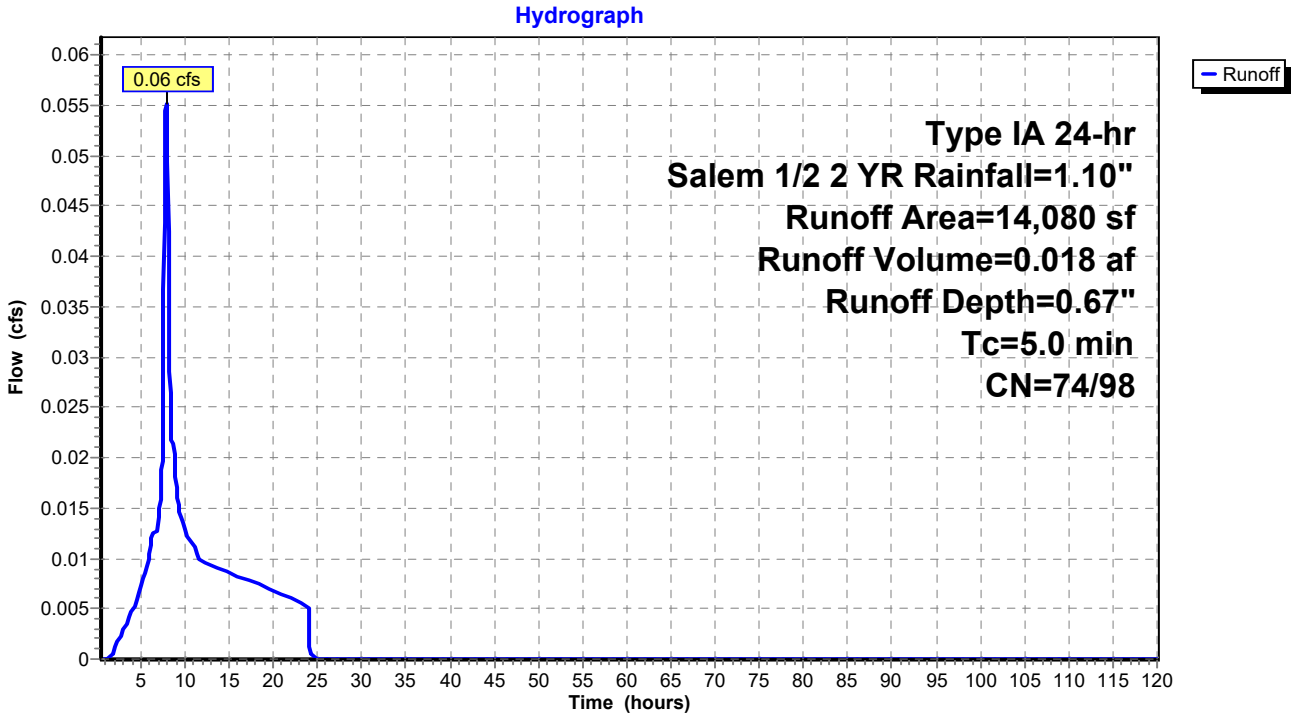
Runoff = 0.06 cfs @ 7.92 hrs, Volume= 0.018 af, Depth= 0.67"
Routed to Pond 52P : New Rain Garden 2

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 1/2 2 YR Rainfall=1.10"

	Area (sf)	CN	Description
	10,448	98	Paved parking, HSG A
*	3,632	74	>75% Grass cover, Good, HSG D
	14,080	92	Weighted Average
	3,632		25.80% Pervious Area
	10,448		74.20% Impervious Area

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

Subcatchment 48S: Developed Basin 2 East



Summary for Pond 52P: New Rain Garden 2

Inflow Area = 0.323 ac, 74.20% Impervious, Inflow Depth = 0.67" for Salem 1/2 2 YR event
Inflow = 0.06 cfs @ 7.92 hrs, Volume= 0.018 af
Outflow = 0.01 cfs @ 9.78 hrs, Volume= 0.018 af, Atten= 75%, Lag= 111.5 min
Discarded = 0.00 cfs @ 9.78 hrs, Volume= 0.003 af
Primary = 0.01 cfs @ 9.78 hrs, Volume= 0.015 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 245.56' @ 9.78 hrs Surf.Area= 518 sf Storage= 188 cf

Plug-Flow detention time= 171.7 min calculated for 0.018 af (100% of inflow)
Center-of-Mass det. time= 171.7 min (887.1 - 715.3)

Volume	Invert	Avail.Storage	Storage Description
#1	244.65'	1,182 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

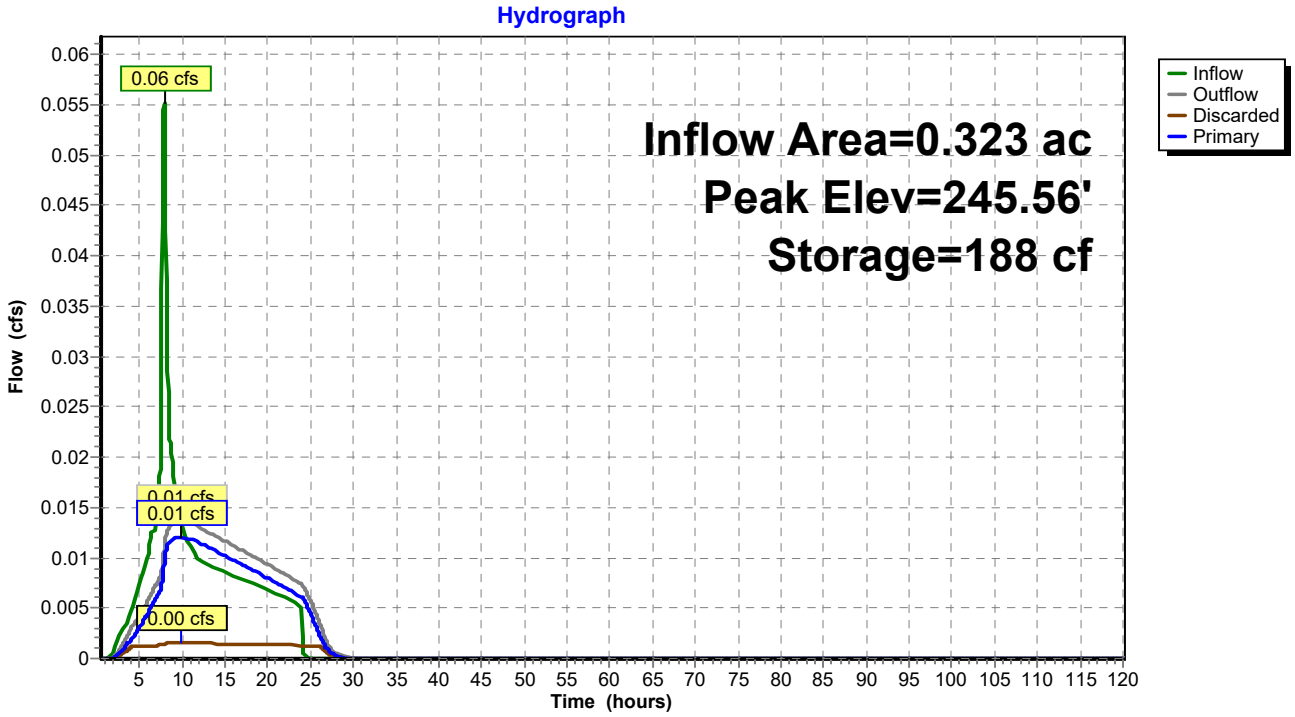
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
244.65	518	0.0	0	0
246.25	518	40.0	332	332
246.50	518	40.0	52	383
248.00	1	100.0	389	773
249.00	150	100.0	76	848
250.00	518	100.0	334	1,182

Device	Routing	Invert	Outlet Devices
#1	Discarded	244.65'	**0.100 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 241.50'
#2	Primary	244.65'	**0.7" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	245.58'	**0.6" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	249.53'	**1.8" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 9.78 hrs HW=245.56' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.01 cfs @ 9.78 hrs HW=245.56' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 4.51 fps)
├**3=Orifice/Grate** (Controls 0.00 cfs)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 52P: New Rain Garden 2



Summary for Subcatchment 48S: Developed Basin 2 East

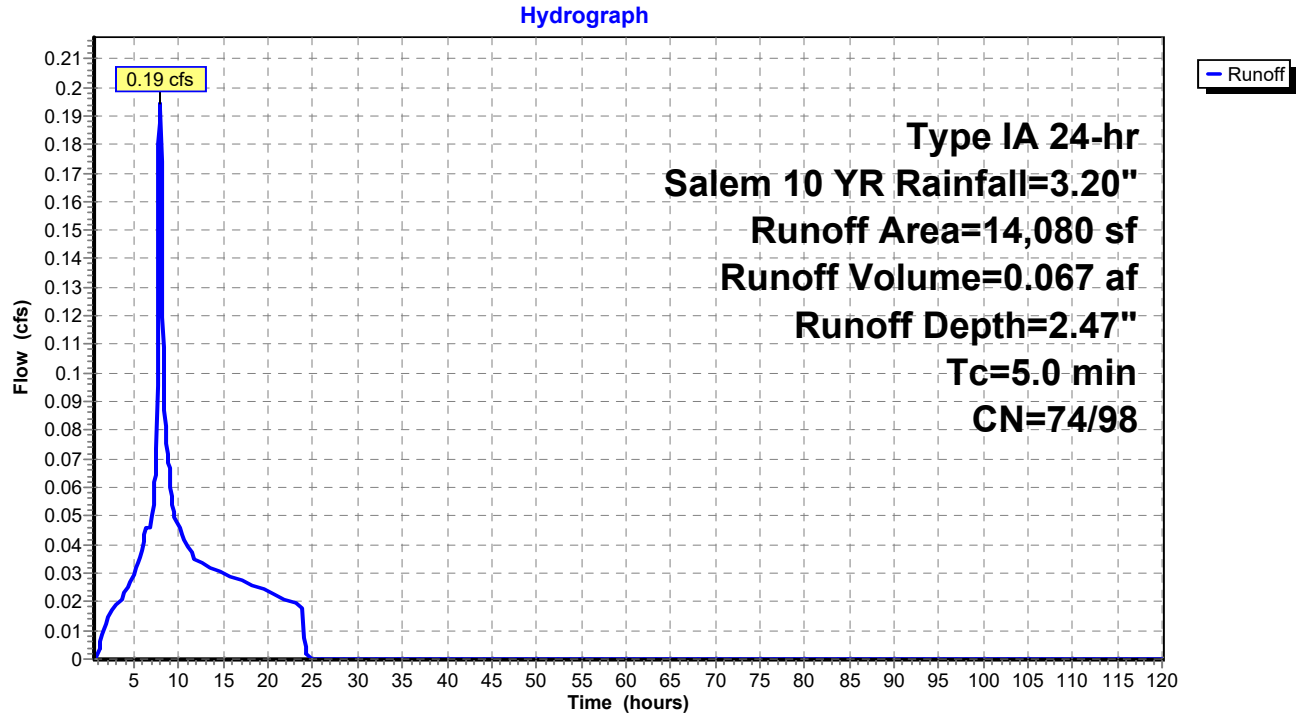
Runoff = 0.19 cfs @ 7.92 hrs, Volume= 0.067 af, Depth= 2.47"
Routed to Pond 52P : New Rain Garden 2

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 10 YR Rainfall=3.20"

	Area (sf)	CN	Description
	10,448	98	Paved parking, HSG A
*	3,632	74	>75% Grass cover, Good, HSG D
	14,080	92	Weighted Average
	3,632		25.80% Pervious Area
	10,448		74.20% Impervious Area

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

Subcatchment 48S: Developed Basin 2 East



Summary for Pond 52P: New Rain Garden 2

Inflow Area = 0.323 ac, 74.20% Impervious, Inflow Depth = 2.47" for Salem 10 YR event
Inflow = 0.19 cfs @ 7.92 hrs, Volume= 0.067 af
Outflow = 0.05 cfs @ 9.95 hrs, Volume= 0.067 af, Atten= 76%, Lag= 121.8 min
Discarded = 0.00 cfs @ 9.95 hrs, Volume= 0.005 af
Primary = 0.04 cfs @ 9.95 hrs, Volume= 0.061 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 248.88' @ 9.95 hrs Surf.Area= 132 sf Storage= 831 cf

Plug-Flow detention time= 275.1 min calculated for 0.066 af (100% of inflow)
Center-of-Mass det. time= 275.3 min (963.2 - 687.9)

Volume	Invert	Avail.Storage	Storage Description
#1	244.65'	1,182 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

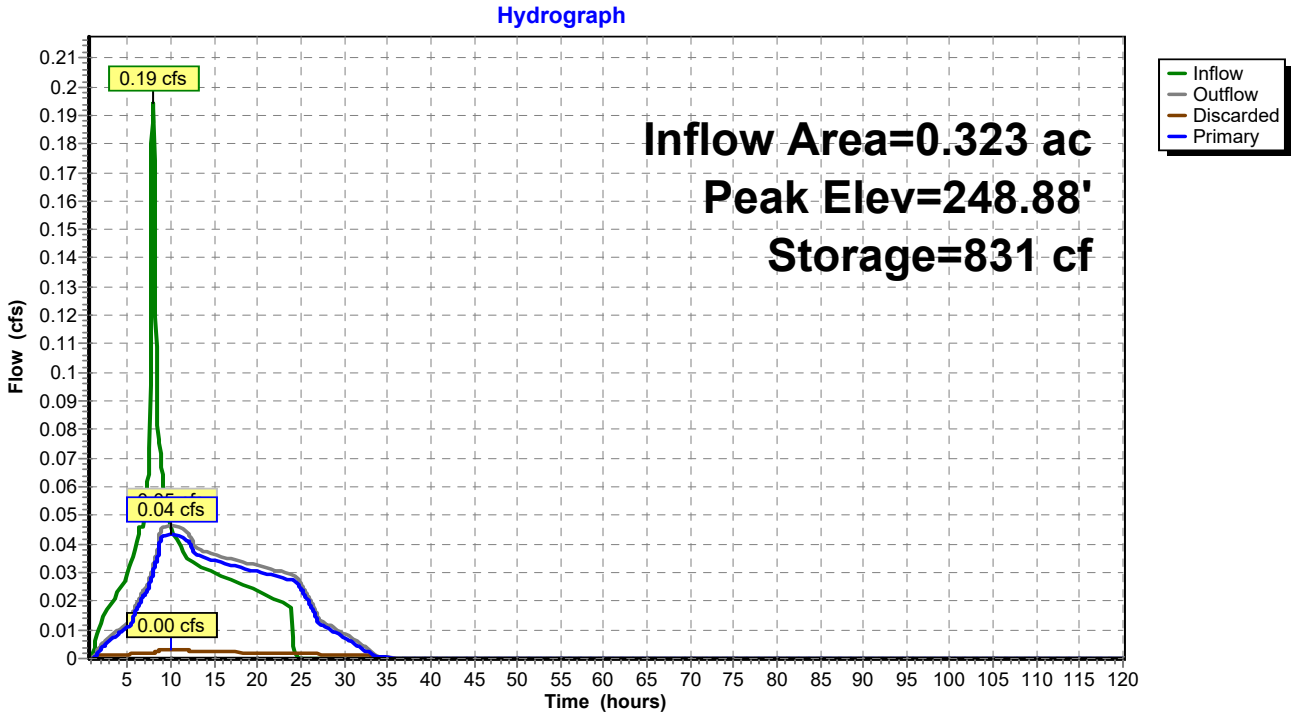
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
244.65	518	0.0	0	0
246.25	518	40.0	332	332
246.50	518	40.0	52	383
248.00	1	100.0	389	773
249.00	150	100.0	76	848
250.00	518	100.0	334	1,182

Device	Routing	Invert	Outlet Devices
#1	Discarded	244.65'	**0.100 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 241.50'
#2	Primary	244.65'	**0.7" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	245.58'	**0.6" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	249.53'	**1.8" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 9.95 hrs HW=248.88' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.04 cfs @ 9.95 hrs HW=248.88' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 9.86 fps)
├**3=Orifice/Grate** (Orifice Controls 0.02 cfs @ 8.71 fps)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 52P: New Rain Garden 2



Summary for Subcatchment 48S: Developed Basin 2 East

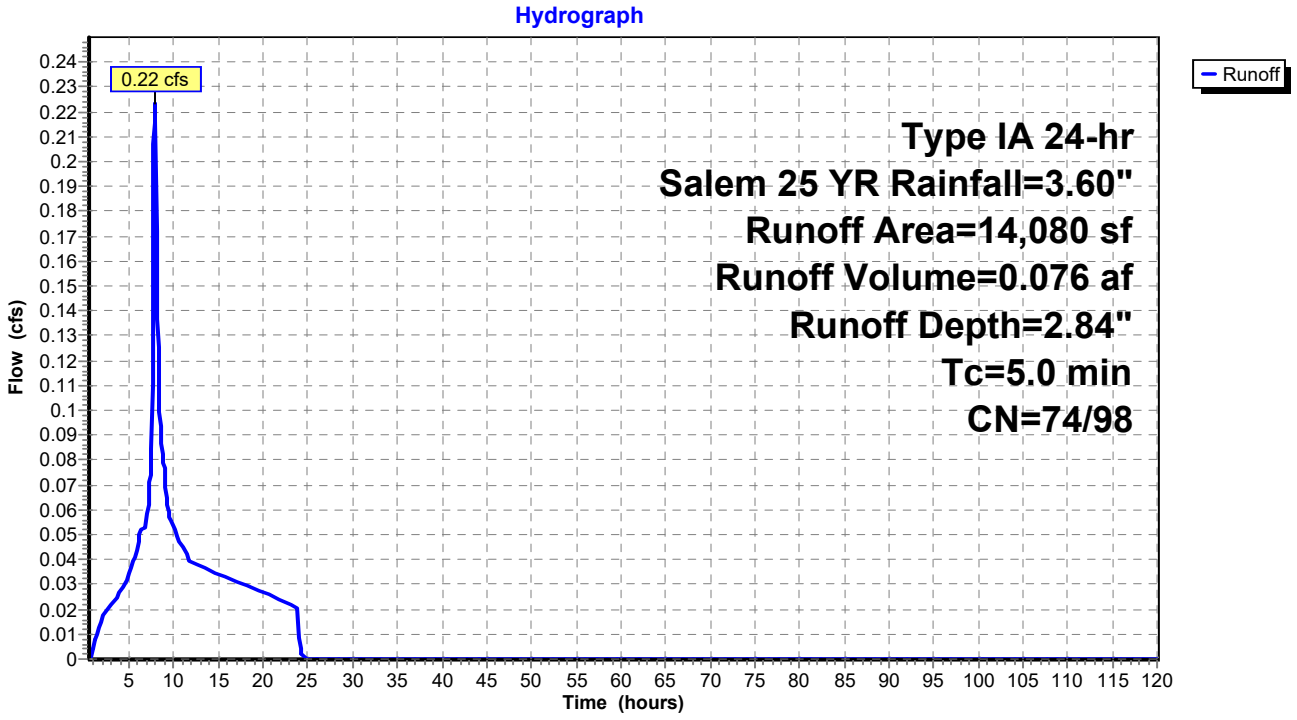
Runoff = 0.22 cfs @ 7.91 hrs, Volume= 0.076 af, Depth= 2.84"
Routed to Pond 52P : New Rain Garden 2

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 25 YR Rainfall=3.60"

	Area (sf)	CN	Description
	10,448	98	Paved parking, HSG A
*	3,632	74	>75% Grass cover, Good, HSG D
	14,080	92	Weighted Average
	3,632		25.80% Pervious Area
	10,448		74.20% Impervious Area

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

Subcatchment 48S: Developed Basin 2 East



Summary for Pond 52P: New Rain Garden 2

Inflow Area = 0.323 ac, 74.20% Impervious, Inflow Depth = 2.84" for Salem 25 YR event
Inflow = 0.22 cfs @ 7.91 hrs, Volume= 0.076 af
Outflow = 0.05 cfs @ 10.13 hrs, Volume= 0.076 af, Atten= 77%, Lag= 132.8 min
Discarded = 0.00 cfs @ 10.13 hrs, Volume= 0.006 af
Primary = 0.05 cfs @ 10.13 hrs, Volume= 0.070 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 249.51' @ 10.13 hrs Surf.Area= 337 sf Storage= 972 cf

Plug-Flow detention time= 282.6 min calculated for 0.076 af (100% of inflow)
Center-of-Mass det. time= 282.8 min (968.2 - 685.4)

Volume	Invert	Avail.Storage	Storage Description
#1	244.65'	1,182 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

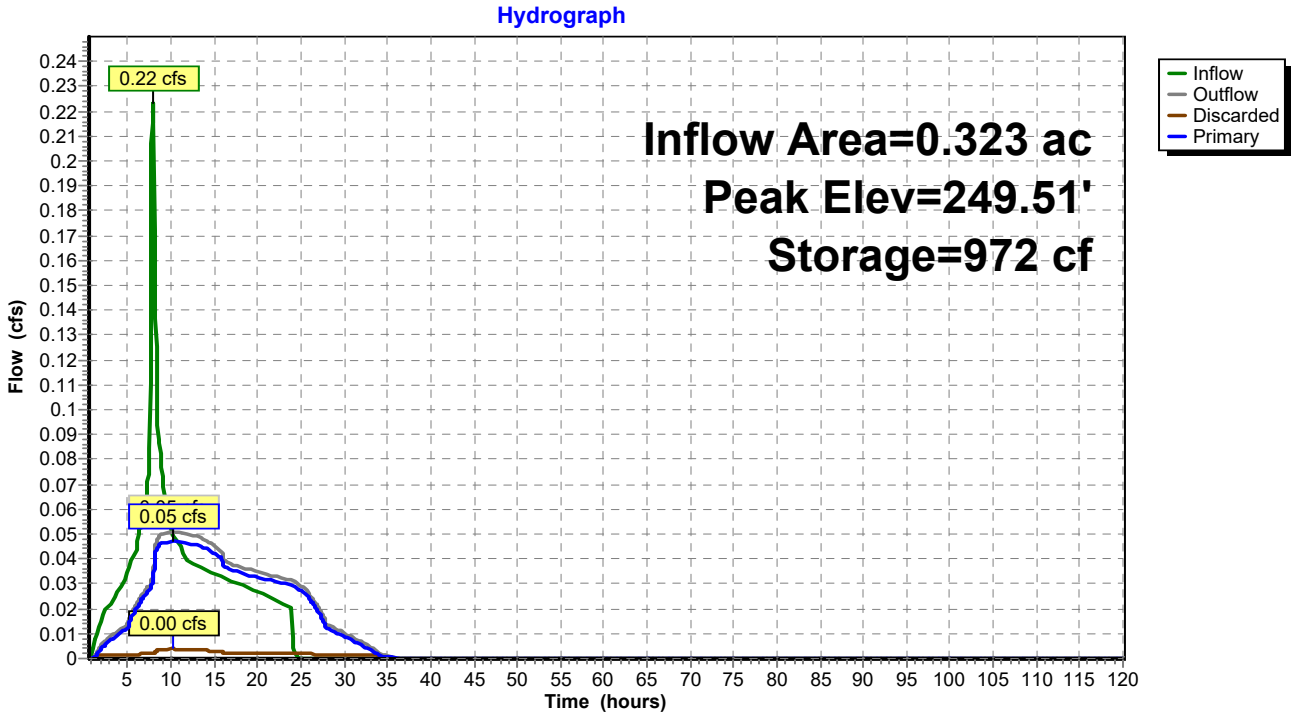
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
244.65	518	0.0	0	0
246.25	518	40.0	332	332
246.50	518	40.0	52	383
248.00	1	100.0	389	773
249.00	150	100.0	76	848
250.00	518	100.0	334	1,182

Device	Routing	Invert	Outlet Devices
#1	Discarded	244.65'	**0.100 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 241.50'
#2	Primary	244.65'	**0.7" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	245.58'	**0.6" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	249.53'	**1.8" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 10.13 hrs HW=249.51' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.05 cfs @ 10.13 hrs HW=249.51' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 10.58 fps)
├**3=Orifice/Grate** (Orifice Controls 0.02 cfs @ 9.51 fps)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Pond 52P: New Rain Garden 2



Summary for Subcatchment 48S: Developed Basin 2 East

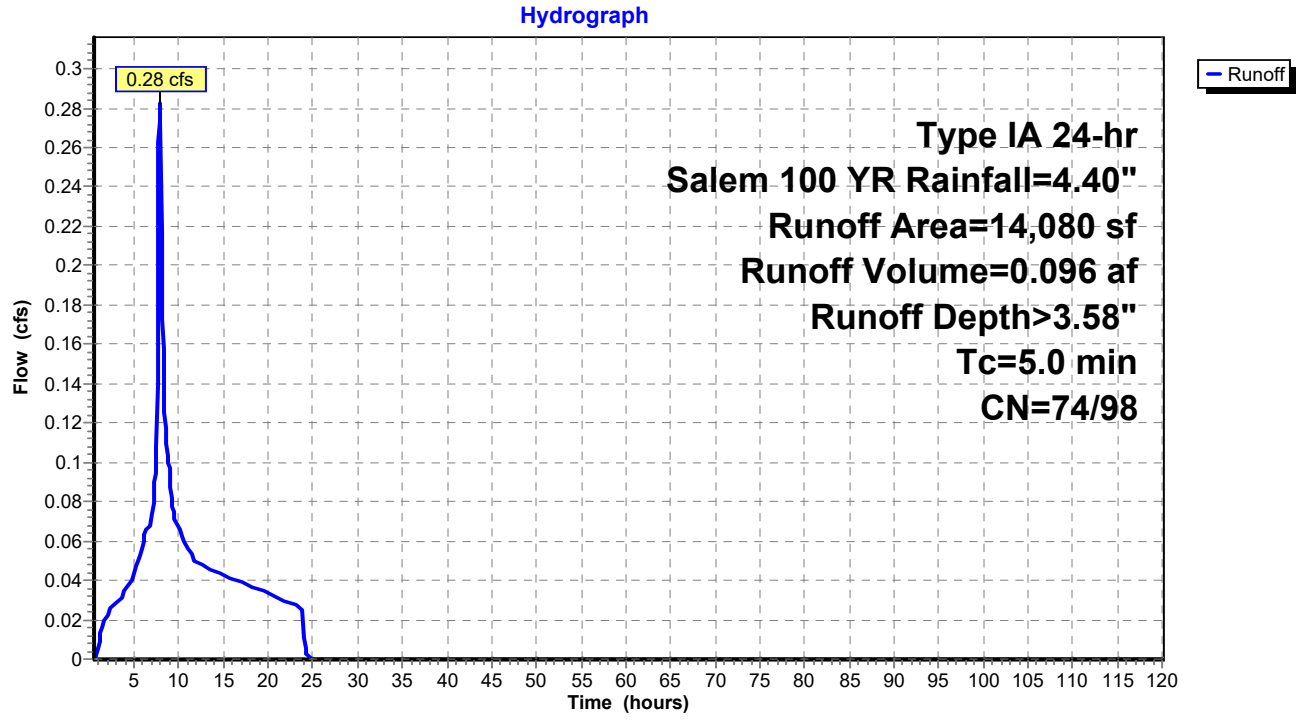
Runoff = 0.28 cfs @ 7.91 hrs, Volume= 0.096 af, Depth> 3.58"
Routed to Pond 52P : New Rain Garden 2

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem 100 YR Rainfall=4.40"

	Area (sf)	CN	Description
	10,448	98	Paved parking, HSG A
*	3,632	74	>75% Grass cover, Good, HSG D
	14,080	92	Weighted Average
	3,632		25.80% Pervious Area
	10,448		74.20% Impervious Area

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

Subcatchment 48S: Developed Basin 2 East



Summary for Pond 52P: New Rain Garden 2

Inflow Area = 0.323 ac, 74.20% Impervious, Inflow Depth > 3.58" for Salem 100 YR event
Inflow = 0.28 cfs @ 7.91 hrs, Volume= 0.096 af
Outflow = 0.10 cfs @ 8.89 hrs, Volume= 0.096 af, Atten= 66%, Lag= 58.5 min
Discarded = 0.00 cfs @ 8.89 hrs, Volume= 0.007 af
Primary = 0.09 cfs @ 8.89 hrs, Volume= 0.089 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 249.87' @ 8.89 hrs Surf.Area= 472 sf Storage= 1,120 cf

Plug-Flow detention time= 266.7 min calculated for 0.096 af (100% of inflow)
Center-of-Mass det. time= 266.4 min (947.7 - 681.2)

Volume	Invert	Avail.Storage	Storage Description
#1	244.65'	1,182 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

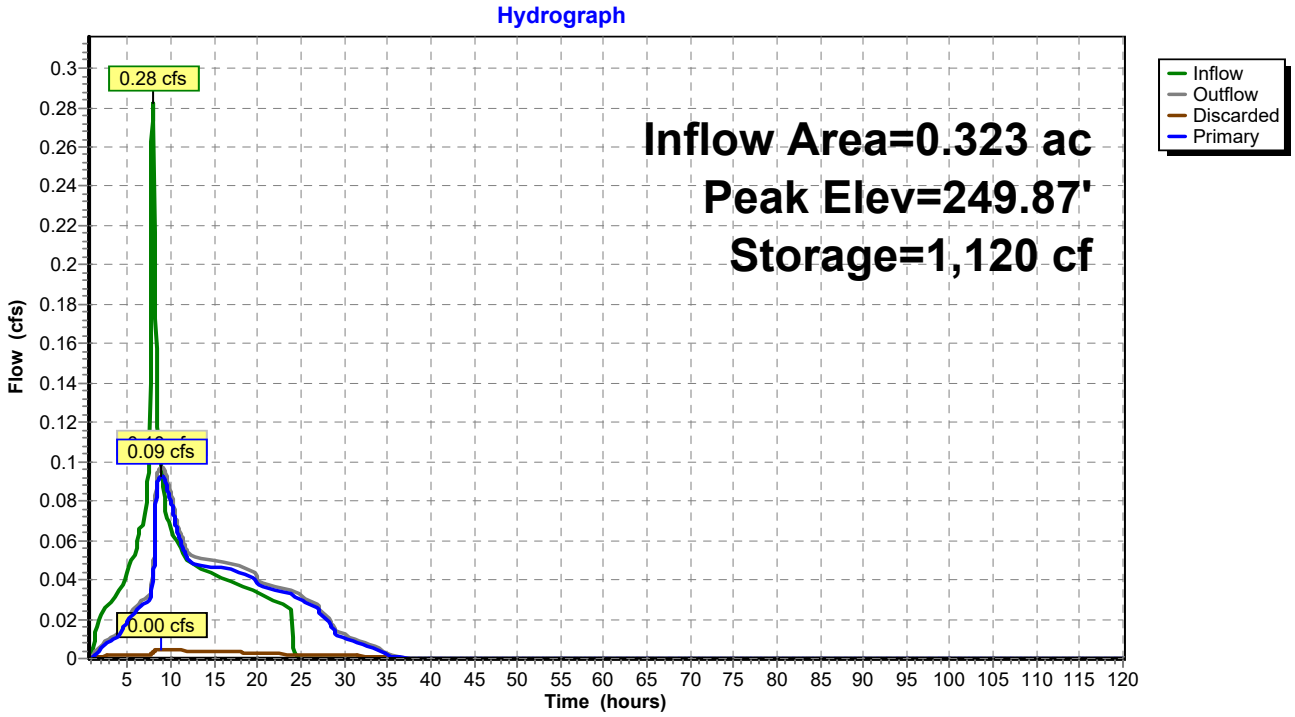
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
244.65	518	0.0	0	0
246.25	518	40.0	332	332
246.50	518	40.0	52	383
248.00	1	100.0	389	773
249.00	150	100.0	76	848
250.00	518	100.0	334	1,182

Device	Routing	Invert	Outlet Devices
#1	Discarded	244.65'	**0.100 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 241.50'
#2	Primary	244.65'	**0.7" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	245.58'	**0.6" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	249.53'	**1.8" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

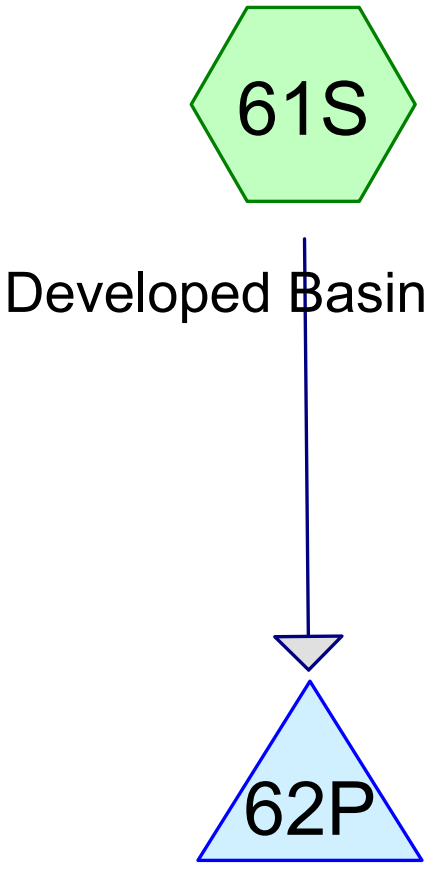
Discarded OutFlow Max=0.00 cfs @ 8.89 hrs HW=249.87' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Primary OutFlow Max=0.09 cfs @ 8.89 hrs HW=249.87' (Free Discharge)
├**2=Orifice/Grate** (Orifice Controls 0.03 cfs @ 10.97 fps)
├**3=Orifice/Grate** (Orifice Controls 0.02 cfs @ 9.95 fps)
└**4=Orifice/Grate** (Orifice Controls 0.04 cfs @ 2.50 fps)

Pond 52P: New Rain Garden 2



WQ Surface Test East



Subcat Reach Pond Link

Routing Diagram for Fairview Retail
Prepared by Westech Engineering Inc, Printed 1/31/2024

Summary for Subcatchment 61S: Developed Basin 2 East

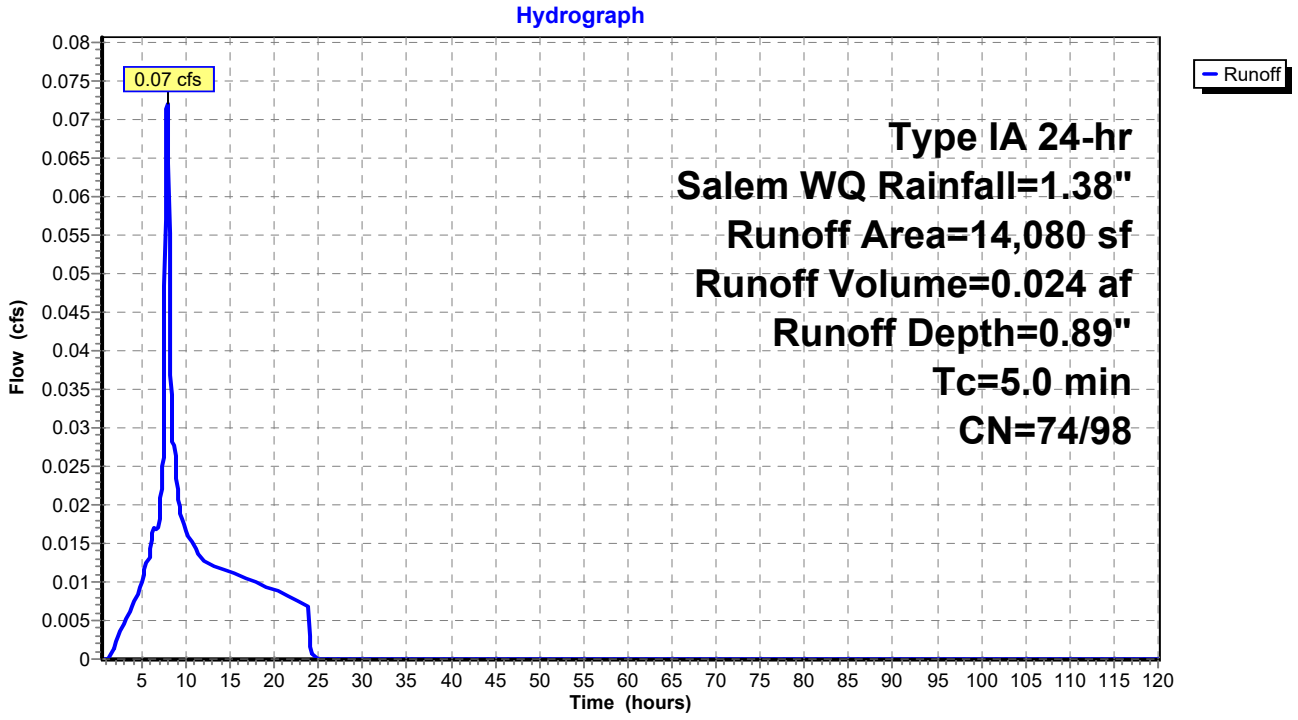
Runoff = 0.07 cfs @ 7.91 hrs, Volume= 0.024 af, Depth= 0.89"
Routed to Pond 62P : New Rain Garden 2

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Type IA 24-hr Salem WQ Rainfall=1.38"

	Area (sf)	CN	Description
	10,448	98	Paved parking, HSG A
*	3,632	74	>75% Grass cover, Good, HSG D
	14,080	92	Weighted Average
	3,632		25.80% Pervious Area
	10,448		74.20% Impervious Area

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

Subcatchment 61S: Developed Basin 2 East



Summary for Pond 62P: New Rain Garden 2

Inflow Area = 0.323 ac, 74.20% Impervious, Inflow Depth = 0.89" for Salem WQ event
Inflow = 0.07 cfs @ 7.91 hrs, Volume= 0.024 af
Outflow = 0.02 cfs @ 9.23 hrs, Volume= 0.024 af, Atten= 72%, Lag= 79.3 min
Discarded = 0.02 cfs @ 9.23 hrs, Volume= 0.024 af

Routing by Stor-Ind method, Time Span= 0.50-120.00 hrs, dt= 0.05 hrs
Peak Elev= 249.65' @ 9.23 hrs Surf.Area= 390 sf Storage= 252 cf

Plug-Flow detention time= 173.9 min calculated for 0.024 af (100% of inflow)
Center-of-Mass det. time= 174.0 min (882.4 - 708.4)

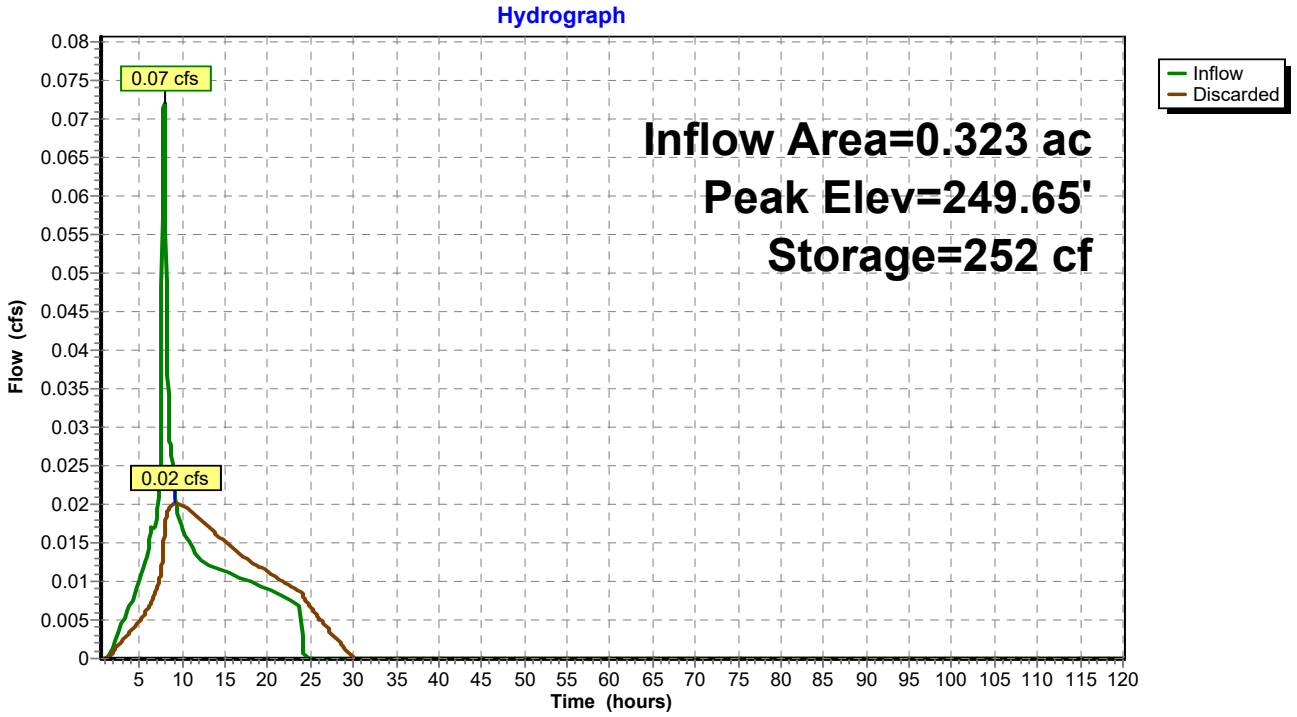
Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	410 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	1	0.0	0	0
249.00	150	100.0	76	76
250.00	518	100.0	334	410

Device	Routing	Invert	Outlet Devices
#1	Discarded	248.00'	**2.000 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 243.15'

Discarded OutFlow Max=0.02 cfs @ 9.23 hrs HW=249.65' (Free Discharge)
1=Exfiltration (Controls 0.02 cfs)

Pond 62P: New Rain Garden 2



APPENDIX D

GEOTECHNICAL REPORT

APPENDIX E

OPERATIONS AND MAINTENANCE

Appendix B to 109-011 – Facility Maintenance Forms

2. Rain Garden

A rain garden is a **vegetated infiltration basin** or depression created by excavation, berms, or small dams to provide for short-term ponding of surface water until it percolates into the soil. The basin should infiltrate stormwater within 24 hours.

Inspections

All facility components and vegetation shall be inspected for proper operations and structural stability. *These inspections shall occur, at a minimum, quarterly for the first two years from the date of installation, and two times per year thereafter.* It is recommended that a visual inspection be made within 48 hours after each major storm event to ensure proper function. The facility owner must keep a log, recording all inspection dates, observations, and maintenance activities. The following items shall be inspected and maintained as stated:

Date: ____/____/_____ Inspector's Name: _____

Basin inlet shall ensure unrestricted stormwater flow to the vegetated basin.

- □ Sources of erosion shall be identified and controlled when native soil is exposed or erosion channels are present.
- □ Inlet shall be kept clear at all times.
- □ Rock splash pads shall be replenished to prevent erosion.

Inspection Comments: _____

Embankment, dikes, berms, and side slopes retain water in the infiltration basin.

- □ Structural deficiencies shall be corrected upon discovery.
- □ Slopes shall be stabilized using appropriate erosion control measures when soil is exposed/flow channels are forming.
- □ Sources of erosion damage shall be identified and controlled.

Inspection Comments: _____

Overflow or emergency spillway conveys flow exceeding reservoir capacity to an approved stormwater receiving system.

- □ Overflow shall be kept clear at all times.
- □ Sources of erosion damage shall be identified and controlled when soil is exposed.
- □ Rocks or other armament shall be replaced when only one layer of rock exists.

Inspection Comments: _____

Amended soils shall allow stormwater to percolate uniformly through the infiltration basin. If water remains 36 hours after a storm, sources of possible clogging shall be identified and corrected.

- □ Basin shall be raked and, if necessary, soil shall be excavated and cleaned or replaced.

Inspection Comments: _____

Appendix B to 109-011 – Facility Maintenance Forms

2. Rain Garden (continued)

Sediment/Basin debris management shall prevent loss of infiltration basin volume caused by sedimentation.

- □ Sediment exceeding 3 inches in depth, or so thick as to damage or kill vegetation, shall be removed.
- □ Sediment accumulation shall be hand-removed with minimum damage to vegetation using proper erosion control measures.

Inspection Comments: _____

Debris and litter shall be removed to ensure stormwater infiltration and to prevent clogging of overflow drains and interference with plant growth.

- □ Restricted sources of sediment and debris, such as discarded lawn clippings, shall be identified and prevented.

Inspection Comments: _____

Vegetation shall be healthy and dense enough to provide filtering while protecting underlying soils from erosion. Proper horticultural practices shall be employed to ensure that plants are vigorous and healthy.

- □ Mulch shall be replenished as needed, but not inhibiting water flow.
- □ Vegetation, large shrubs, or trees that interfere with rain garden operation shall be pruned.
- □ Fallen leaves and debris from deciduous plant foliage shall be raked and removed.
- □ Nuisance or prohibited vegetation from the City of Salem Non-Native Invasive Plant list shall be removed when discovered. Invasive vegetation shall be removed immediately upon discovery.
- □ Dead vegetation shall be removed upon discovery.
- □ Vegetation shall be replaced as soon as possible to maintain cover density and control erosion where soils are exposed.

Inspection Comments: _____

Spill prevention measures shall be exercised when handling substances that contaminate stormwater.

- □ Releases of pollutants shall be corrected as soon as identified.

Inspection Comments: _____

Training and/or written guidance information for operating and maintaining vegetated infiltration basins shall be provided to all property owners and tenants. This Facility Maintenance Form can be used to meet this requirement.

Inspection Comments: _____

Access to the infiltration basin shall be safe and efficient. Egress and ingress routes shall be maintained to design standards. Roadways shall be maintained to accommodate size and weight of vehicles, if applicable.

- □ Obstacles preventing maintenance personnel and/or equipment access to the infiltration basin shall be removed.
- □ Gravel or ground cover shall be added if erosion has occurred.

Inspection Comments: _____

2. Rain Garden (continued)

Nuisance insects and rodents shall not be harbored in the infiltration basin. Pest control measures shall be taken when nuisance insects/rodents are found to be present.

- □ Holes in the ground located in and around the infiltration basin shall be filled.

Inspection Comments: _____

_____

If used at this site, the following will be applicable:

Fences shall be maintained to preserve their functionality and appearance.

- □ Collapsed fences shall be restored to an upright position.
- □ Jagged edges and damaged fences shall be repaired or replaced.

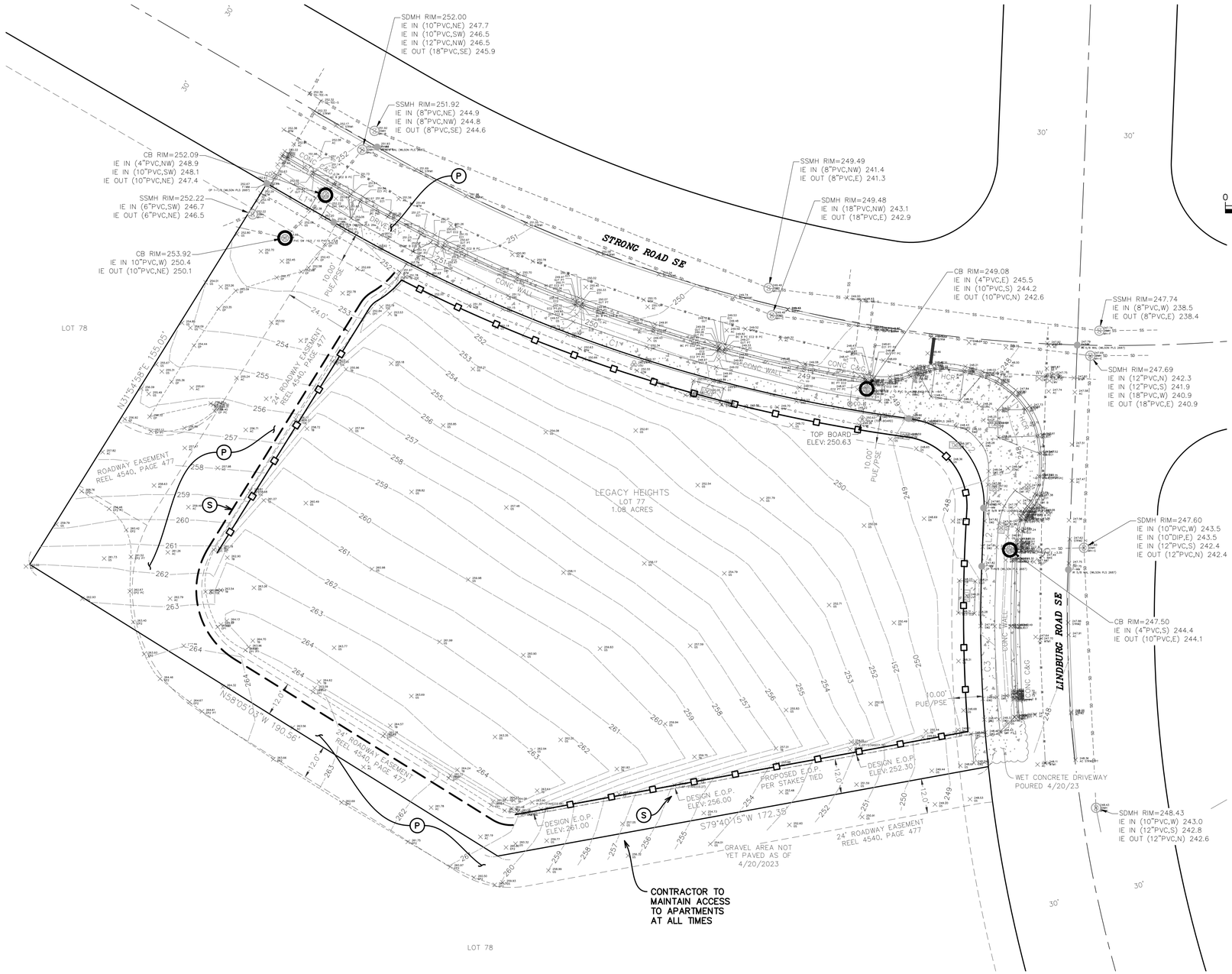
Inspection Comments: _____

_____

APPENDIX F

CIVIL DRAWINGS

EROSION CONTROL LEGEND
SILT SACK
SILT FENCE
DEMOLITION LEGEND
(P) PROTECT
(S) SAWCUT
(R) REMOVE
NOTES
1. NO CONCRETE WASHOUT ALLOWED ON SITE
2. NO STOCKPILING ALLOWED ON SITE



STUDIO 3 ARCHITECTURE INCORPORATED

222 COMMERCIAL ST. NE
SALEM, OR 97301-3410
P: 503.390.6500
F: 503.390.6501
www.studio3architecture.com

REGISTERED PROFESSIONAL ENGINEER
OREGON
NOV. 12, 2008
WILLIAM J. WELLS

REVIEW

RENEWS: 6/30/2024

PROJECT #3492.0000.0
DATE: 01/24
DRAWN BY: AK
CHECKED BY: JW

REVISIONS:
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WESTECH ENGINEERING, INC.
CONSULTING ENGINEERS AND PLANNERS
3841 Fairview Industrial Dr. S.E., Suite 100, Salem, OR 97302
Phone: (503) 585-2474 Fax: (503) 585-3986
E-mail: westech@westech-eng.com

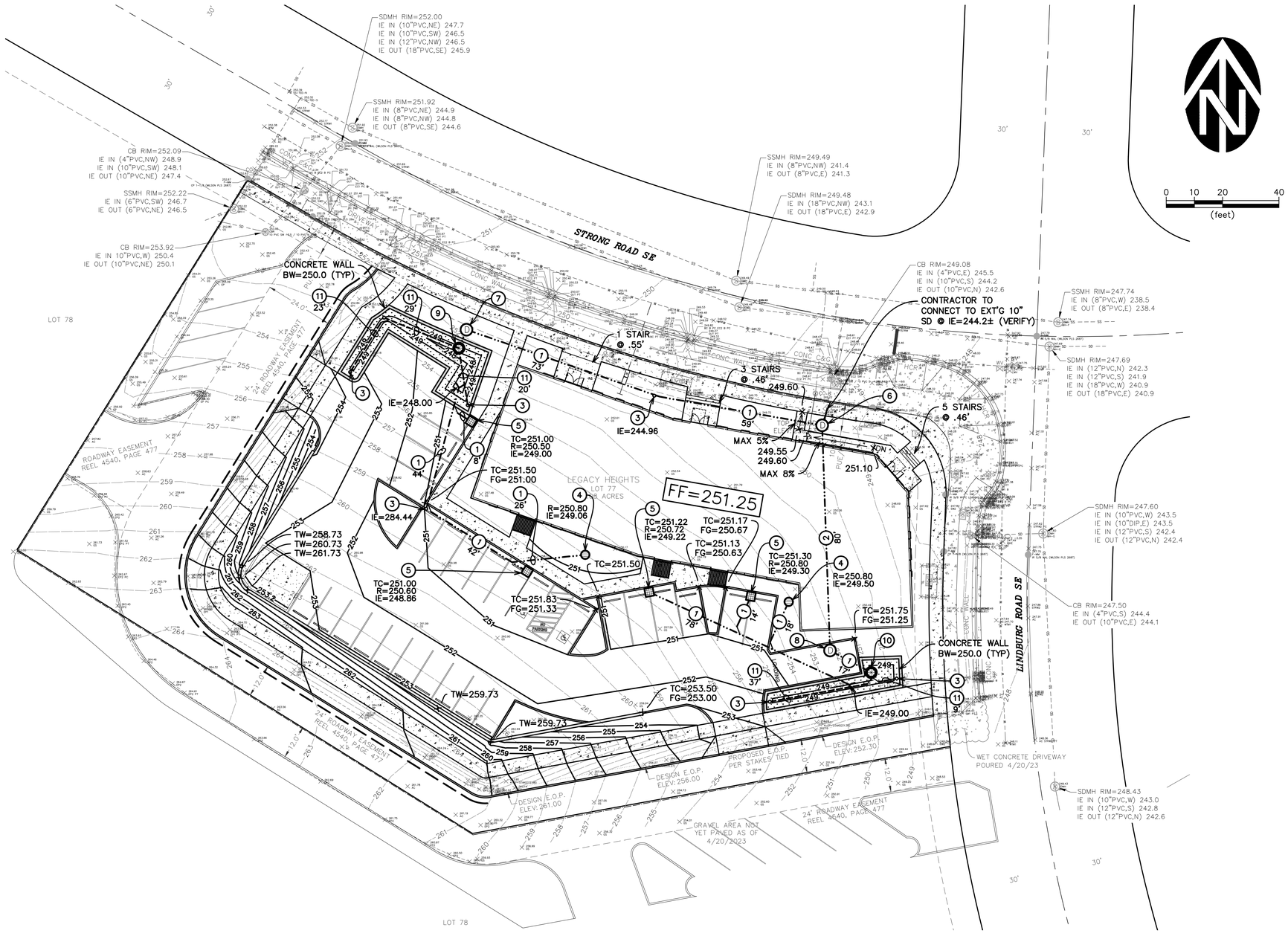
NEW RETAIL BUILDING:

STRONG RD SE
SALEM, OR
STRONG RD SE & LINDBURG RD SE

SHEET:
C1.0
EROSION CONTROL PLAN - DEMOLITION & CLEARING

DRAINAGE KEY CALLOUTS

(1)	6"SD, L=SEE PLAN, S=1% MIN
(2)	8"SD, L=SEE PLAN, S=0.5% MIN
(3)	SDCO, IE=SEE PLAN
(4)	AREA DRAIN, SEE PLAN FOR INFO
(5)	SDCB, SEE PLAN FOR INFO
(6)	SDMH R=249.20 8" IE IN (S)=244.37 6" IE IN (W)=244.37 10" IE OUT (N)=244.27
(7)	SDMH R=251.30 6" IE IN (SW)=245.79 6" IE OUT (SE)=245.69
(8)	SDMH R=251.50 6" IE IN (SE)=244.60 8" IE OUT (N)=244.58
(9)	BEEHIVE FLOW CONTROL #1 SEE C6.0 R=250.90 6" IE OUT (N)=244.40
(10)	BEEHIVE FLOW CONTROL #2 SEE C6.0 R=250.90 6" IE OUT (SE)=244.65
(11)	6" PERF PIPE, L=SEE PLAN



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STRONG RD SE
SALEM, OR
STRONG RD SE & LINDBURG RD SE

SHEET:
C2.0
GRADING & DRAINAGE PLAN

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ARCHITECTURE
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NEW RETAIL BUILDING:

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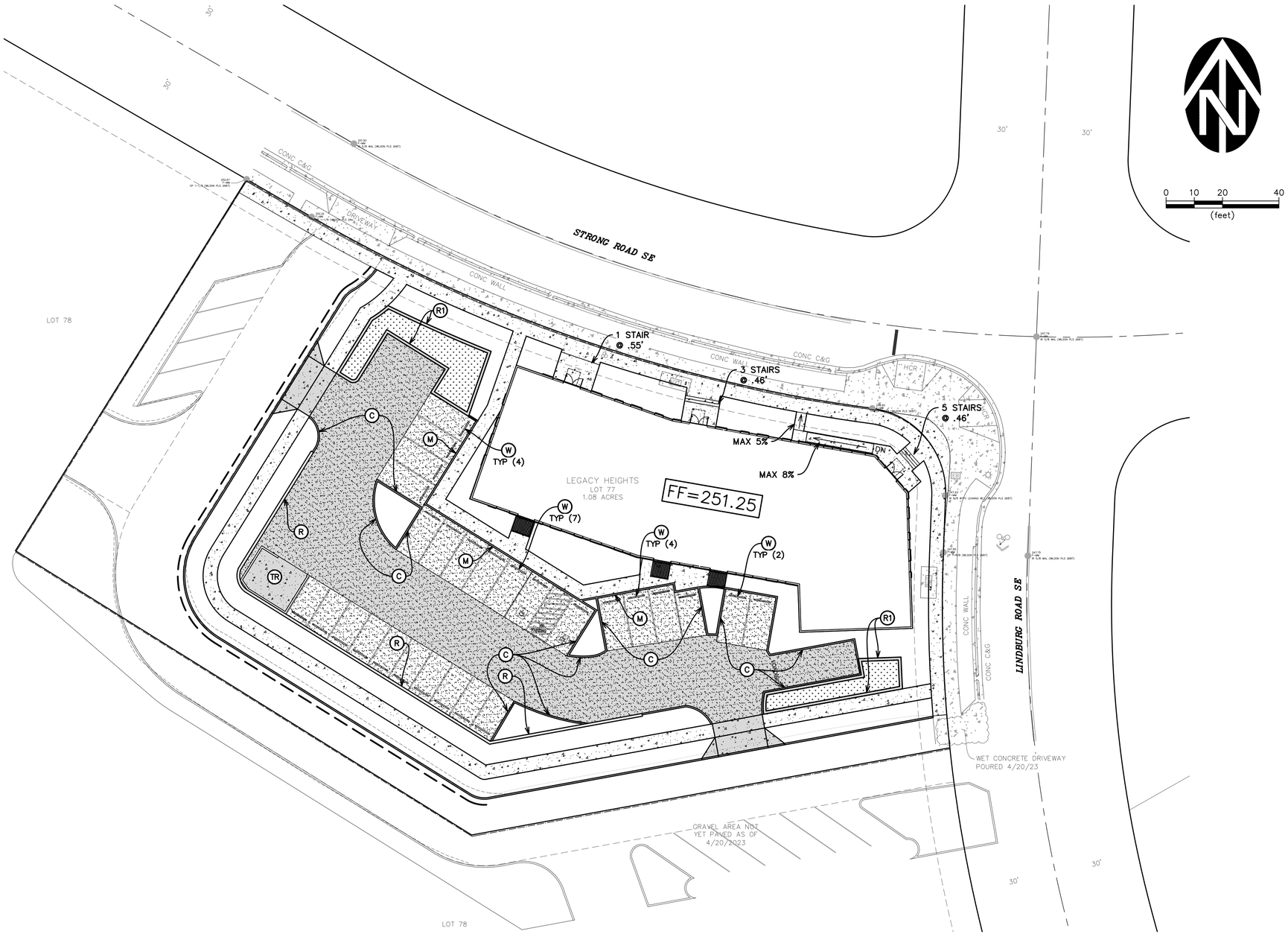
STRONG RD SE & LINDBURG RD SE

SHEET:
C3.0
UTILITY PLAN

SURFACING LEGEND

	LIGHT DUTY ASPHALT 3" OF DENSE LEVEL II HMAC OVER 9" OF COMPACTED 1"–0 OVER APPROVED SUBGRADE
	HEAVY DUTY ASPHALT 4" OF DENSE LEVEL II HMAC OVER 12" OF COMPACTED 1"–0 OVER APPROVED SUBGRADE
	PEDESTRIAN CONCRETE 4" OF PCC OVER 2" OF COMPACTED 1"–0 OVER APPROVED SUBGRADE
	HEAVY DUTY CONCRETE 8" OF PCC OVER 4" OF COMPACTED 1"–0 OVER APPROVED SUBGRADE
(C)	TYPE 'C' CURB
(M)	MONOLITHIC CURB & SIDEWALK
(R)	RETAINING WALL, SEE STRUCTURAL PLANS
(R1)	CAST IN PLACE CONCRETE RETAINING WALL SEE STRUCTURAL PLANS
(T)	TRUNCATED DOMES
(TR)	TRASH AREA, SEE ARCH FOR DETAILS
(W)	WHEELSTOPS



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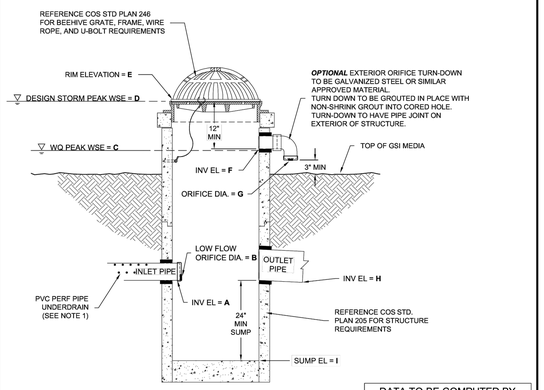
NEW RETAIL BUILDING:

STRONG RD SE
SALEM, OR
STRONG RD SE & LINDBURG RD SE

SHEET:
C4.0
SURFACING PLAN



TYPICAL SECTION
NTS

DATA TO BE COMPUTED BY DESIGN ENGINEER
A= 248.00
B= 6"
C= 249.22
D= 249.80
E= 250.00
F= 246.16
G= 0.9"
H= 244.40
I= 242.40

#1

GENERAL NOTES

1. A CAPPED, SOLID WALL, PVC CLEANOUT SHALL BE PLACED AT THE END OF THE UNDERDRAIN. OVERFLOWS SHALL NOT DRAIN VIA THE UNDERDRAIN.
2. REFERENCE ORIFICE MEASUREMENT TABLE ON COS STANDARD PLAN 251E FOR ORIFICE SIZE REQUIREMENTS.

CITY OF SALEM
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN
BEEHIVE INLET CONTROL

CHANGES			

APPROVED	CITY ENGINEER	6/8/2021 DATE	DRAWN BY	KLA	4/2021	**NO.251D**
			CHECKED BY	JDL	4/2021	

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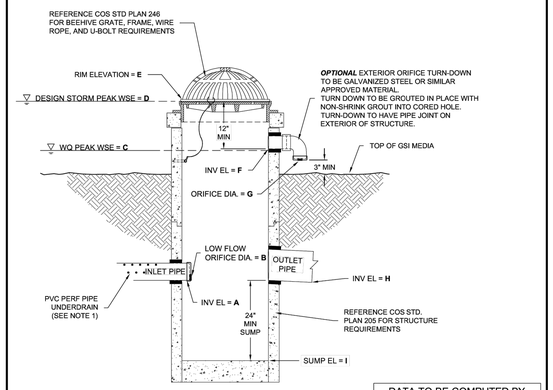

TYPICAL SECTION
NTS

DATA TO BE COMPUTED BY DESIGN ENGINEER
A= 249.00
B= 6"
C= 251.65
D= 249.87
E= 249.89
F= 245.58
G= 0.6"
H= 244.65
I= 242.40

#2

GENERAL NOTES

1. A CAPPED, SOLID WALL, PVC CLEANOUT SHALL BE PLACED AT THE END OF THE UNDERDRAIN. OVERFLOWS SHALL NOT DRAIN VIA THE UNDERDRAIN.
2. REFERENCE ORIFICE MEASUREMENT TABLE ON COS STANDARD PLAN 251E FOR ORIFICE SIZE REQUIREMENTS.

CITY OF SALEM
DEPARTMENT OF PUBLIC WORKS

STANDARD PLAN
BEEHIVE INLET CONTROL

CHANGES			

APPROVED	CITY ENGINEER	6/8/2021 DATE	DRAWN BY	KLA	4/2021	**NO.251D**
			CHECKED BY	JDL	4/2021	

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REVIEW

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NEW RETAIL BUILDING:
STRONG RD SE
SALEM, OR
STRONG RD SE & LINDBURG RD SE

SHEET:
C6.0
CONSTRUCTION DETAILS