PRELIMINARY DRAINAGE ANALYSIS
FOR

Compass Points Apartments
Salem, Oregon

September 20, 2024

MULTI/TECH
ENGINEERING SERVICES, INC.

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Salem OR 97302
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INTRODUCTION

The Compass Point Apartments is a 120 unit multi-family development project located at 1709 Baxter Road. The parcel of land to be developed includes Tax Lot 200 and 100 of Marion County Assessor's Map 08 3W 14BD. The project site area is approximately 5.04 acres in size. The property is bound by Baxter Road to the south, with Abbie Ave, Mac Street, and Snowball Ave all stubbing to the property boundaries on the west and east. An aerial image can be seen below, with the approximate project area outlined in ORANGE.

Figure 1: Project Site

Green Stormwater Infrastructure (GSI) to the Maximum Extent Feasible (MEF) will be used for the new developed areas per City of Salem Administrative Rules, Chapter 109, Division 004, Stormwater System, (Standards). All facilities will be constructed to meet the City of Salem standards.

EXISTING CONDITIONS

The portion of the property to be developed is roughly square in shape. The property is bound by Baxter Road to the south. Surface conditions consist of lawn, with the property having one residential home and

three additional out-buildings. The topographical high point of the property is at the approximate location of the residential home, with the property sloping away in all directions. The average slope across the property ranges from 3 to 6%. There are no offsite properties draining to or through the subject property.

Given the topography, this property drains to two different drainage basins. The majority of the property drains to the east, with a smaller portion draining to the west. The attached Existing Conditions map shows the area that drains to the west, measuring to be 56,632 square feet. This design considers the development of the multi-family project as well as the accompanying public improvements. For this reason, the area used for the total site in this analysis is 5.21 acres (226,914 square feet). The portion draining to the west is approximately 3.91 acres (170,282 square feet).

There are some existing trees on the property. The majority of the significant trees are in the location of proposed public improvements and will need to be removed.

Time of concentration was calculated separately for the property draining to the east and the west. The worksheets can be found in Appendix C.

Table 1: Pre-developed Drainage Basin Summary

Basin	Contributing Area (ft^2)			CN	Tc (min)
	Impervious CN = 98	Pervious CN = 74	Predeveloped CN = 72		
West			56,632	72	26.45
East			170,282	72	30.35

SOILS

The preliminary soils information was obtained from the National Resource Conservation Services Web Soil Survey. The soil map and accompanying information can be found in Appendix B. The soils on the site consists of Nekia Silty Clay which is classified as hydrologic soil group C. As required by the City of Salem Stormwater Standards, the existing conditions curve number of HSG C of 72 is used for the analysis.

A geotechnical investigation has not been formalized at this time. For the purposes of preliminary design, it will be assumed that the soil does not allow for infiltration. As such, the facility will not include an output for natural infiltration and the sizing of the facility will be conservative. An percolation test will be conducted and used for the final design.

DEVELOPED CONDITIONS

The multi-family project will consist of 120 living units, varying from 1 bedroom/1 bathroom units to 3 bedroom/2 bathroom units. Additional structures included in the project are a recreation building,

pavilion, covered mail area, and a pump house. A total of 167 parking stalls are proposed as well as 120 bike parking stalls.

The development of the site also includes the construction of Snowline Street around the project, connecting Mac Street to Baxter Road. Abbie Ave will also have a cul-de-sac constructed.

The table below summaries the impervious and pervious surface totals. For this analysis, a curve number of 98 is used for the impervious surfaces and a curve number of 74 is used for the pervious surfaces, which consist of landscaping. A time of concentration of 5 was used for both basins.

Table 2: Developed Drainage Basin Summary

Basin	Contributing Area (ft^2)			CN	Tc (min)
	Impervious CN = 98	Pervious CN = 74	TOTAL		
West	23613	12981	36594	89	5
East	135350	54,970	190,320	91	5

The total area draining to the west does not equal the predeveloped area draining to the west. This will be discussed in the next section, but is a function of grading the total site for accessibility.

EXPLANATION OF DESIGN

The propose site straddles two drainage basins, with a portion draining to the west while the majority drains to the east. The proposed design takes a portion of the proposed project to a facility located in the southwest corner of the property to be treated, detained and outlet to the west. Areas draining to the west include the cul-de-sac, pavilion, Buildings B, C, D, the walkways in front of Building D, and the landscaped area surrounding Buildings C and D. The remaining portion of the property will be routed to a stormwater facility to be located east of Snowline Street.

Because the proposed design is rerouting runoff that historically flows to the west to a different drainage basin, the east facility will be oversized to ensure the flowrate out does not exceed the predeveloped rate for the east basin.

The east facility will be design for this project, including the construction of Snowline Street. Plans for the development of the remaining property are not known at this time. Because of this, the facility is design for this project only. However, the facility could be expanded with a new flow control structure in the future to be used for future development.

Both the east and west facilities will be designed as combination facilities, with the treatment of the stormwater being achieved through the filtration through the growing media. The facilities will use above

ground detention and a flow control structure to restrict the flow to less than or equal to the predeveloped rate for each basin.

STORMWATER ANALYSIS

Stormwater analysis was conducted using HydroCAD 10.20 and the Santa Barbara Unit Hydrograph. This analysis considers the water quality event as well as controlling the ½ the 2, 10, 25, and 100 year storm events to their predeveloped rates. Based on the region, these storms are modeled with the NRCS Type 1A rainfall distribution. The precipitation depths listed in the table below come from the City of Salem Stormwater Design Standards.

Table 3: City of Salem 24-hour Rainfall Depths (in)

Storm Event	24-hour Rainfall Depth (in)
Water Quality	1.38
1/2 - 2 year	1.1
10 year	3.2
25 year	3.6
100 year	4.4

Analysis was done for the west and east basins independently. The flow from each facility is designed to not exceed the predeveloped rate. Because infiltration is not considered in the preliminary design and to provide the most conservative preliminary design, storage is only considered above the growing media.

The table below shows the predeveloped flowrates calculated for both the west and east basins. Please note that these values are based on only the area impacted by this project. This means that the area of property left undeveloped has not been included in any of the analysis and is not artificially inflating the allowable runoff rate.

Table 4: Allowable Predeveloped Flowrate (cfs)

Storm Event	Basin	
	West	East
1/2 - 2 year	0.003	0.014
10 year	0.134	0.698
25 year	0.189	0.984
100 year	0.312	1.621

WATER QUALITY ANALYSIS

For the analysis of the water quality storm, treatment is assumed to be achieved to the City of Salem standards once the water infiltrates through the growing media. The infiltration rate through the growing media is assumed to be 2 inches per hour.

The east facility is modeled in the preliminary phase as 1,200 square feet, with the growing media at an elevation of 502.00. The west facility is modeled in the preliminary phase as 7,000 square feet, with the growing media at an elevation of 482.00. These elevations are preliminary and subject to change during the final design phase. It is likely that the east facility will require retaining walls do to the topography sloping down in this area. The west facility will likely need some retaining walls as well for the same reason. The slope in both of these areas exceeds 5% for the west and 8% to the east. These are the low points in both directions.

The table below gives a summary of the proposed facilities and the water depth modeled.

Table 5: Water Quality Summary

Basin	Facility Size (ft^2)	Growing Media Elevation	WQ Water Depth (feet)
West	1200	502.00	0.96
East	7000	482.00	0.33

Both facilities are able to treat the stormwater through the growing media.

WATER QUANTITY ANALYSIS

The west and east facilities are both design to detain the stormwater to the predeveloped rate for each basin. The east facility is designed for only the runoff generated from this project. The table below summarizes the facilities.

Table 6: Flow Control Summary

		Storm Event	Predeveloped Flowrate (cfs)	Orifice #	Orifice Diameter	Orifice Elevation	Developed Flowrate (cfs)	Water Depth (ft)
Basin	West	1/2 - 2 year	0.003	1	0.3	502.00	0.003	1.37
		10 year	0.134	2	3.7	504.00	0.134	2.28
		25 year	0.189	2	3.7	504.00	0.184	2.41
		100 year	0.312	2	3.7	504.00	0.288	2.78
	East	1/2 - 2 year	0.014	1	0.3	482.00	0.003	1.44
		10 year	0.698	2	12	485.00	0.408	3.31
		25 year	0.984	2	12	485.00	0.527	3.36
		100 year	1.621	2	12	485.00	0.92	3.49

The maximum water depth for both facilities is less than 3.5 feet. The flows are able to be controlled to at or below the predeveloped flowrates for each basin. The east basin overdetains to allow for some of the area that historically drains to the west to flow to the east, without increasing the overall flowrate into the east basin.

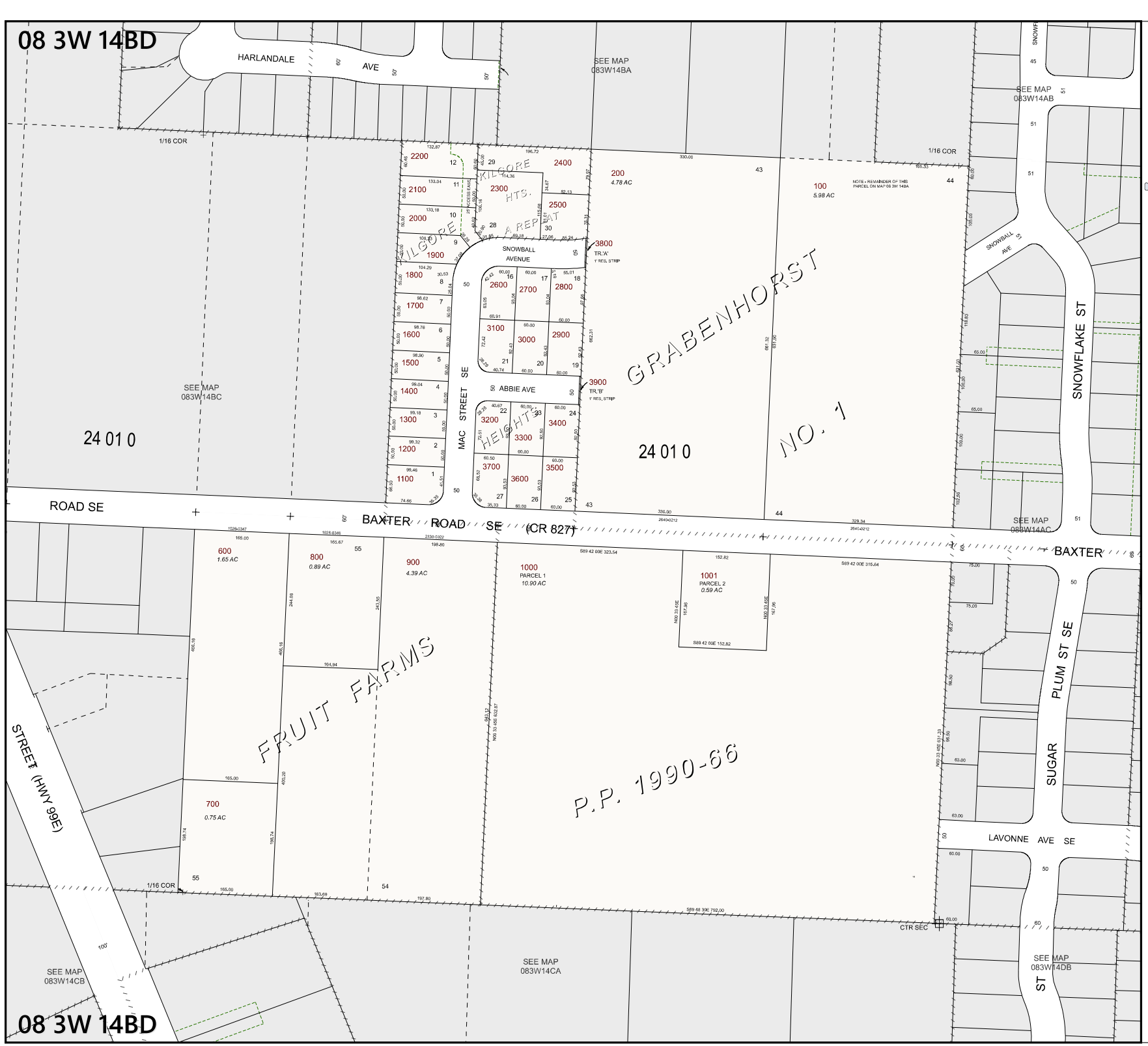
Operation and Maintenance

Both facilities would include public stormwater and therefore would be the responsibility of the City of Salem to maintain. The facilities will be placed in easements for the City to access for maintenance. In the future, the east facility could be placed on its own parcel, but that is not proposed at this time, since the facility may be used in the future for additional stormwater and may need to get larger.

Conclusions

This report demonstrates a preliminary feasibility for the Compass Point Apartments. Additional design work will need to be done during the final design phase in order to more fulling comply with the City of Salem Design Standards. This will likely include acquiring design exceptions for the retaining walls that will likely be needed in the stormwater facilities and for redirecting some of the flow from the west basin to the east. If there are any questions, please contact Natalie Janney at NJanney@mtengineering.net.

APPENDIX A: MAPS



08 3W 14BD
SALEM

MARION COUNTY, OREGON

SE1/4 NW1/4 SEC14 T8S R3W W.M.

SCALE 1" = 100'

LEGEND

LINE TYPES

- Taxlot Boundary
- Historical Boundary
- Road Right-of-Way
- Easement
- Railroad Right-of-Way
- Railroad Centerline
- Private Road ROW
- Taxcode Line
- Subdivision/Plat Bndry
- Map Boundary
- Waterline - Taxlot Bndry
- Waterline - Non Bndry

CORNER TYPES

- 1/16TH Section Cor.
- 1/4 Section Cor.
- DLC Corner
- Section Corner (16, 15, 21, 22)

NUMBERS

Tax Code Number

00 00 0

Acreage

0.25 AC

All acres listed are Net Acres, excluding any portions of the taxlot within public ROWs

NOTES

Tick Marks: A tick mark in the road indicates that the labeled dimension extends into the public ROW

200.00
175.00

CANCELLED NUMBERS

300
400
500
601
801

DISCLAIMER: THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSES ONLY

Assessors Office
Cartography Dept

FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT
www.co.marion.or.us

PLOT DATE: 10/16/2020

SALEM
08 3W 14BD

Predeveloped Basin Map

Basin	Contributing Area (ft^2)			CN	Tc (min)
	Impervious CN = 98	Pervious CN = 74	Predeveloped CN = 72		
West			56,632	72	26.45
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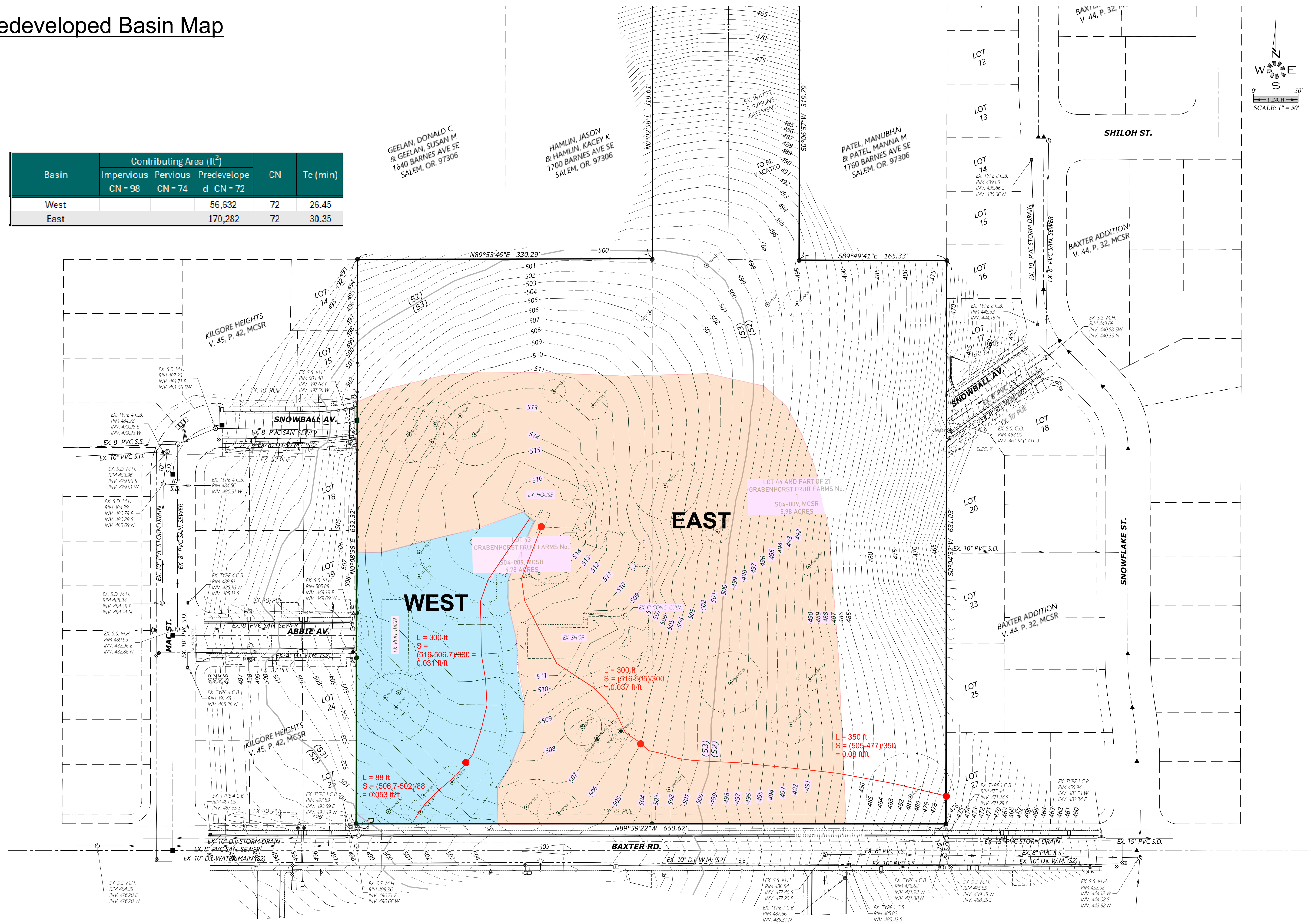

EXISTING CONDITIONS PLAN

COMPASS POINTS MULTI-FAMILY HOUSING

MULTI/TECH ENGINEERING SERVICES, INC.

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

DIMENSIONS & NOTES TAKE PRECEDENCE OVER GRAPHICAL REPRESENTATION.

Design: M.D.G.
Drawn: J.P.H.
Checked: B.M.G.
Issue Date: 9/13/24
Scale: AS SHOWN
As-Built:

EXPIRES: 06-30-2025

JOB # 7707

SDR2

Developed Basin Map

Basin	Contributing Area (ft²)			CN	Tc (min)
	Impervious CN = 98	Pervious CN = 74	TOTAL		
West	23613	12981	36594	89	5
East	135350	54,970	190,320	91	5

Basin		Storm Event	Predeveloped Flowrate (cfs)	Orifice #	Orifice Diameter	Orifice Elevation	Developed Flowrate (cfs)	Water Depth (ft)
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		25 year	0.189	2	3.7	504.00	0.184	2.41
		100 year	0.312	2	3.7	504.00	0.288	2.78
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		25 year	0.984	2	12	485.00	0.527	3.36
		100 year	1.621	2	12	485.00	0.92	3.49

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PRIVATE STORM DRAIN PLAN

COMPASS POINTS MULTI-FAMILY HOUSING

Design: M.D.G.
Drawn: I.P.H.
Checked: B.M.G.
Issue Date: 9/20/24
Scale: AS SHOWN

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 14, 1978
MARK D. GRENZ
EXPIRES: 06-30-2025

JOB # 7707

SDR8

APPENDIX B: SOIL INFORMATION

Map Scale: 1:1,670 if printed on A landscape (11" x 8.5") sheet.

N

Meters
0 20 40 80 120

Feet
0 50 100 200 300

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: May 17, 2023—Jun 3, 2023

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
NeB	Nekia silty clay loam, 2 to 7 percent slopes	3.9	41.0%
NeC	Nekia silty clay loam, 7 to 12 percent slopes	5.7	59.0%
Totals for Area of Interest		**9.6**	**100.0%**

Marion County Area, Oregon

NeB—Nekia silty clay loam, 2 to 7 percent slopes

Map Unit Setting

National map unit symbol: 24qt
Elevation: 300 to 1,000 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 190 to 210 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Nekia and similar soils: 85 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nekia

Setting

Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from tuffs and basalt

Typical profile

H1 - 0 to 9 inches: silty clay loam
H2 - 9 to 36 inches: clay
H3 - 36 to 40 inches: unweathered bedrock

Properties and qualities

Slope: 2 to 7 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R002XC012OR - Red Hill Group
Forage suitability group: Well drained < 15% Slopes (G002XY002OR)

Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

Minor Components

Aquults
Percent of map unit: 2 percent
Landform: Hills
Hydric soil rating: Yes

Data Source Information

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

Marion County Area, Oregon

NeC—Nekia silty clay loam, 7 to 12 percent slopes

Map Unit Setting

National map unit symbol: 24qv
Elevation: 300 to 1,000 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 52 to 54 degrees F
Frost-free period: 190 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Nekia and similar soils: 86 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Nekia

Setting

Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Residuum weathered from tuffs and basalt

Typical profile

H1 - 0 to 9 inches: silty clay loam
H2 - 9 to 36 inches: clay
H3 - 36 to 40 inches: unweathered bedrock

Properties and qualities

Slope: 7 to 12 percent
Depth to restrictive feature: 20 to 40 inches to lithic bedrock
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 5.2 inches)

Interpretive groups

Land capability classification (irrigated): 3e
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: C
Ecological site: R002XC012OR - Red Hill Group
Forage suitability group: Well drained < 15% Slopes (G002XY002OR)

Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)
Hydric soil rating: No

Minor Components

Aquults
Percent of map unit: 2 percent
Landform: Hills
Hydric soil rating: Yes

Data Source Information

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

APPENDIX C: TIME OF CONCENTRATION

Worksheet 3: Time of Concentration (T_c) or travel time (T_t)

Project	By	Date
Compass Points Apartments	N. Janney	9/16/2024
Location	**Checked**	**Date**
Baxter Road, Salem, Oregon		

Check one: [X] Present [ ] Developed

Check one: [X] T_c [ ] T_t through subarea

Notes: Space for as many as two segments per flow type can be used for each worksheet. Include a map, schematic, or description of flow segments.

Sheet flow (Applicable to T_c only)

Segment ID	East	West	
1. Surface description (table 3-1)	Pre-developed	Pre-developed	
2. Manning's roughness coefficient, n (table 3-1)	0.15	0.15	
3. Flow length, L (total L † 300 ft) ..... ft	300	300	
4. Two-year 24-hour rainfall, P_2 ..... in	2.2	2.2	
5. Land slope, s ..... ft/ft	0.037	0.031	
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t ..... hr	0.370	0.398	=

Shallow concentrated flow

Segment ID	East	West	
7. Surface description (paved or unpaved)	Pre-developed	Pre-developed	
8. Flow length, L .....ft	350	88	
9. Watercourse slope, s ..... ft/ft	0.080	0.053	
10. Average velocity, V (figure 3-1) ..... ft/s	0.72	0.57	
11. $T_t = \frac{L}{3600\ V}$ Compute T_t ..... hr	0.135	0.042	=

Channel flow

Segment ID			
12. Cross sectional flow area, a ..... ft^2			
13. Wetted perimeter, p_w ..... ft			
14. Hydraulic radius, $r = \frac{a}{p_w}$ Compute r ..... ft			
15 Channel slope, s ..... ft/ft			
16. Manning's roughness coefficient, n			
17. $V = \frac{1.49\ r^{2/3}\ s^{1/2}}{n}$ Compute V .....ft/s			
18. ~~Flow~~ length, L ..... ft			
19. $T_t = \frac{L}{3600\ V}$ Compute T_t ..... hr		+	=
20. Watershed or subarea T_c or T_t (add T_t in steps 6, 11, and 19) ..... Hr			

T(east) = 0.370 + 0.135 = 0.505 hours = 30.35 min

T(west) = 0.398 + 0.0.42 = 0.0.440 hours = 26.45 min

APPENDIX D: WATER QUALITY HYDROGRAPHS

Subcat Reach Pond Link

Routing Diagram for Prelim Hydrographs
Prepared by Multi/Tech Engineering Service, Printed 9/20/2024

Summary for Subcatchment E: East - POST

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

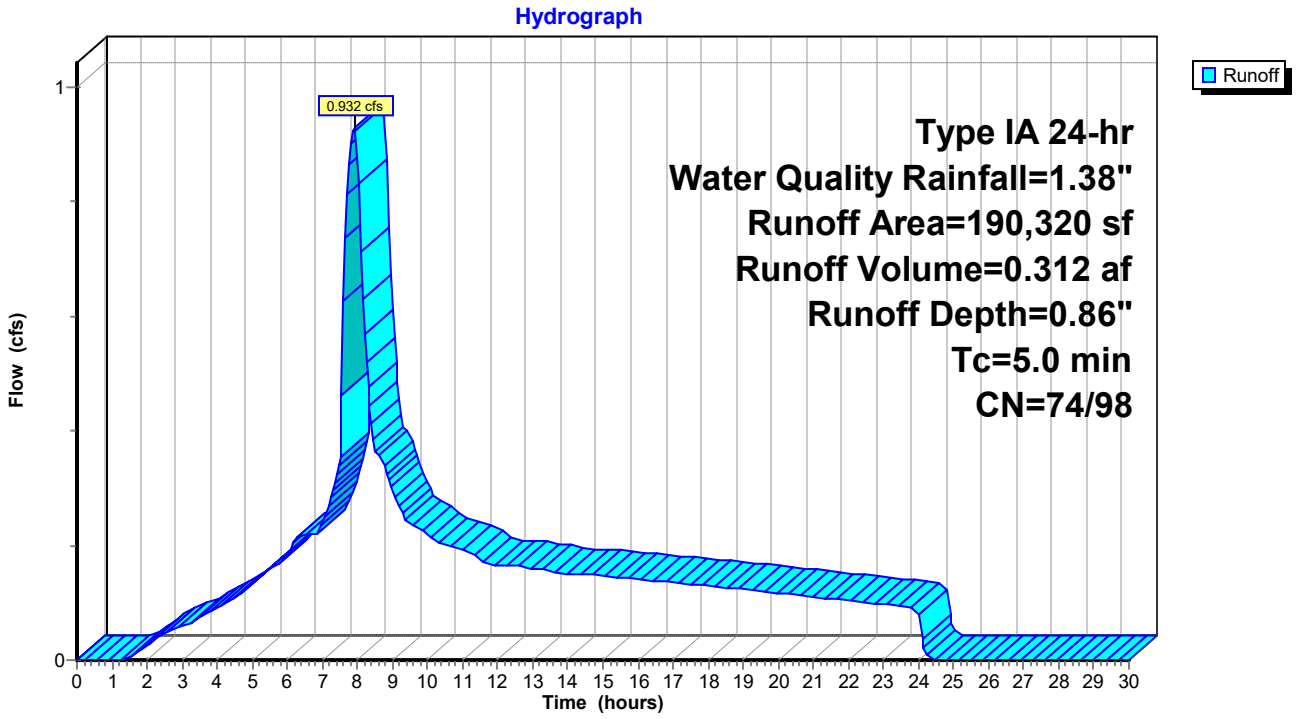
Runoff = 0.932 cfs @ 7.91 hrs, Volume= 0.312 af, Depth= 0.86"
Routed to Pond E-WQ : West - WQ

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Water Quality Rainfall=1.38"

Area (sf)	CN	Description
135,350	98	Roofs, HSG C
54,970	74	>75% Grass cover, Good, HSG C
190,320	91	Weighted Average
54,970	74	28.88% Pervious Area
135,350	98	71.12% Impervious Area

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

Subcatchment E: East - POST



Summary for Pond E-WQ: West - WQ

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

Inflow Area = 4.369 ac, 71.12% Impervious, Inflow Depth = 0.86" for Water Quality event
Inflow = 0.932 cfs @ 7.91 hrs, Volume= 0.312 af
Outflow = 0.324 cfs @ 7.85 hrs, Volume= 0.312 af, Atten= 65%, Lag= 0.0 min
Discarded = 0.324 cfs @ 7.85 hrs, Volume= 0.312 af
Primary = 0.000 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 482.33' @ 8.86 hrs Surf.Area= 7,000 sf Storage= 2,336 cf

Plug-Flow detention time= 83.7 min calculated for 0.312 af (100% of inflow)
Center-of-Mass det. time= 83.8 min (794.0 - 710.2)

Volume	Invert	Avail.Storage	Storage Description
#1	482.00'	28,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

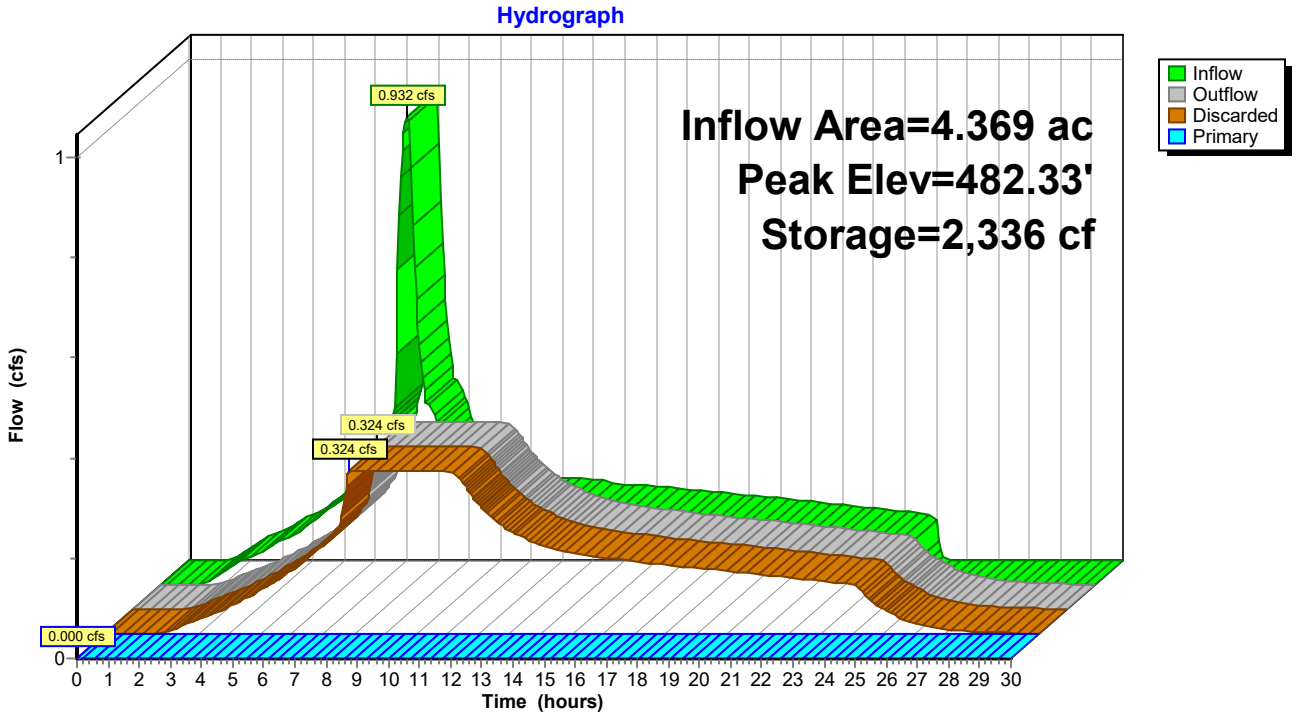
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.00	7,000	0	0
486.00	7,000	28,000	28,000

Device	Routing	Invert	Outlet Devices
#1	Discarded	482.00'	**2.000 in/hr Exfiltration over Surface area**
#2	Primary	503.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.324 cfs @ 7.85 hrs HW=482.22' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.324 cfs)

Primary OutFlow Max=0.000 cfs @ 0.00 hrs HW=482.00' (Free Discharge)
↑**2=Orifice/Grate** (Controls 0.000 cfs)

Pond E-WQ: West - WQ



Summary for Subcatchment W: West - POST

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

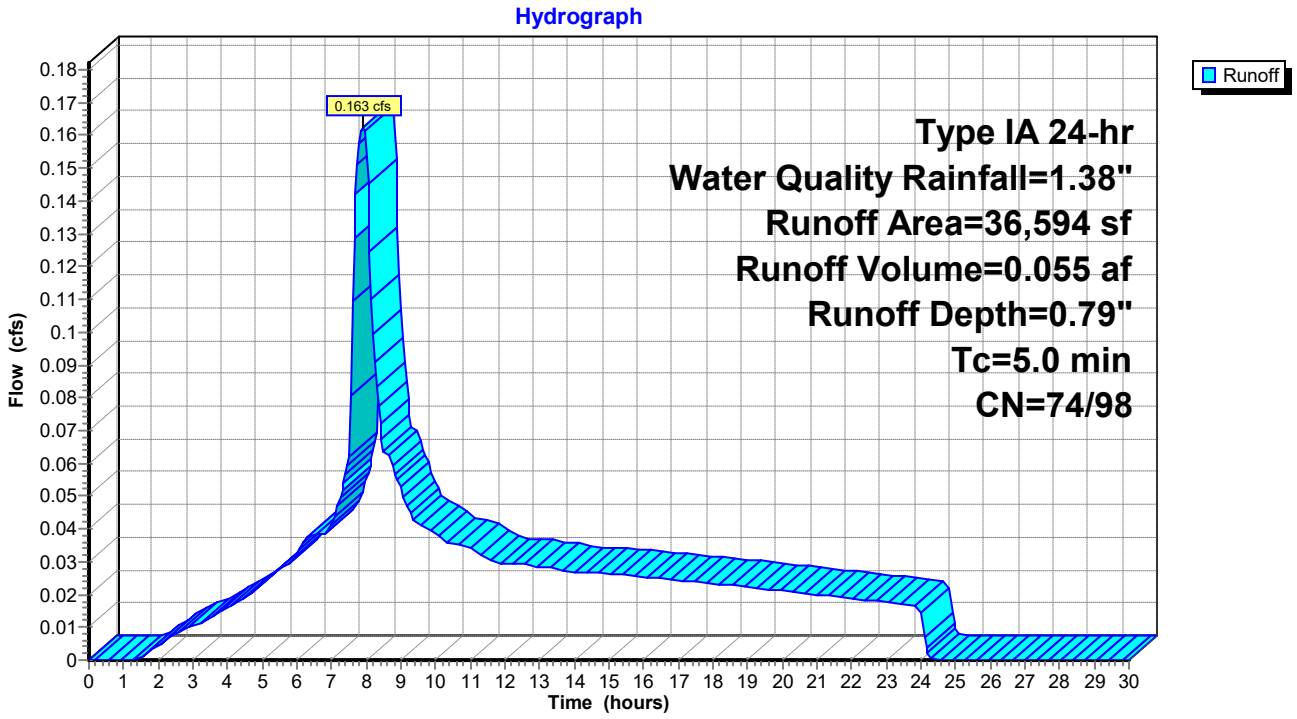
Runoff = 0.163 cfs @ 7.91 hrs, Volume= 0.055 af, Depth= 0.79"
Routed to Pond W-WQ : West - WQ

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr Water Quality Rainfall=1.38"

Area (sf)	CN	Description
23,613	98	Roofs, HSG C
12,981	74	>75% Grass cover, Good, HSG C
36,594	89	Weighted Average
12,981	74	35.47% Pervious Area
23,613	98	64.53% Impervious Area

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

Subcatchment W: West - POST



Summary for Pond W-WQ: West - WQ

Inflow Area = 0.840 ac, 64.53% Impervious, Inflow Depth = 0.79" for Water Quality event
Inflow = 0.163 cfs @ 7.91 hrs, Volume= 0.055 af
Outflow = 0.028 cfs @ 5.75 hrs, Volume= 0.055 af, Atten= 83%, Lag= 0.0 min
Discarded = 0.028 cfs @ 5.75 hrs, Volume= 0.055 af
Primary = 0.000 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 502.96' @ 13.51 hrs Surf.Area= 600 sf Storage= 577 cf

Plug-Flow detention time= 228.5 min calculated for 0.055 af (100% of inflow)
Center-of-Mass det. time= 228.5 min (943.0 - 714.5)

Volume	Invert	Avail.Storage	Storage Description
#1	502.00'	1,800 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

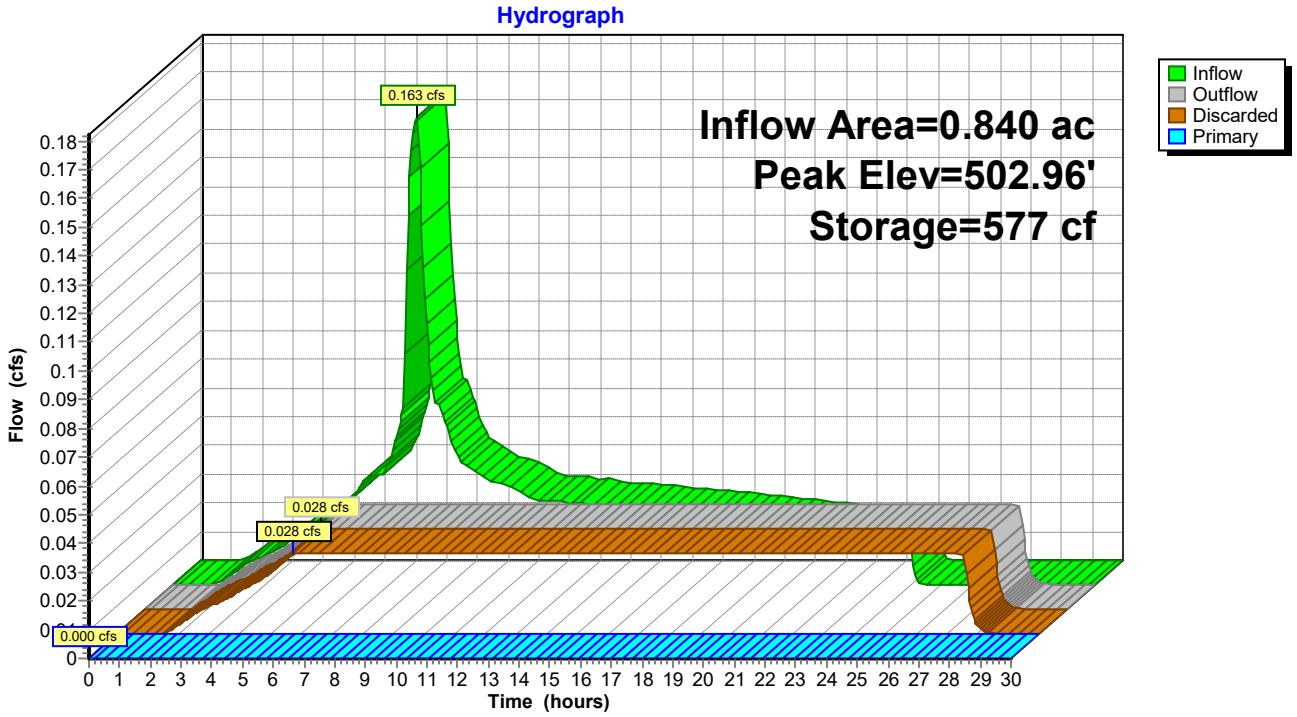
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.00	600	0	0
505.00	600	1,800	1,800

Device	Routing	Invert	Outlet Devices
#1	Discarded	502.00'	**2.000 in/hr Exfiltration over Surface area**
#2	Primary	503.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

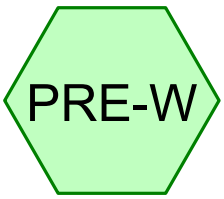
Discarded OutFlow Max=0.028 cfs @ 5.75 hrs HW=502.03' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.028 cfs)

Primary OutFlow Max=0.000 cfs @ 0.00 hrs HW=502.00' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.000 cfs)

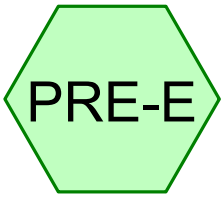
Pond W-WQ: West - WQ



APPENDIX E: PREDEVELOPED HYDROGRAPHS



West - PRE



East - PRE

Subcat Reach Pond Link

Routing Diagram for Prelim Hydrographs
Prepared by Multi/Tech Engineering Service, Printed 9/20/2024

Summary for Subcatchment PRE-E: East - PRE

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

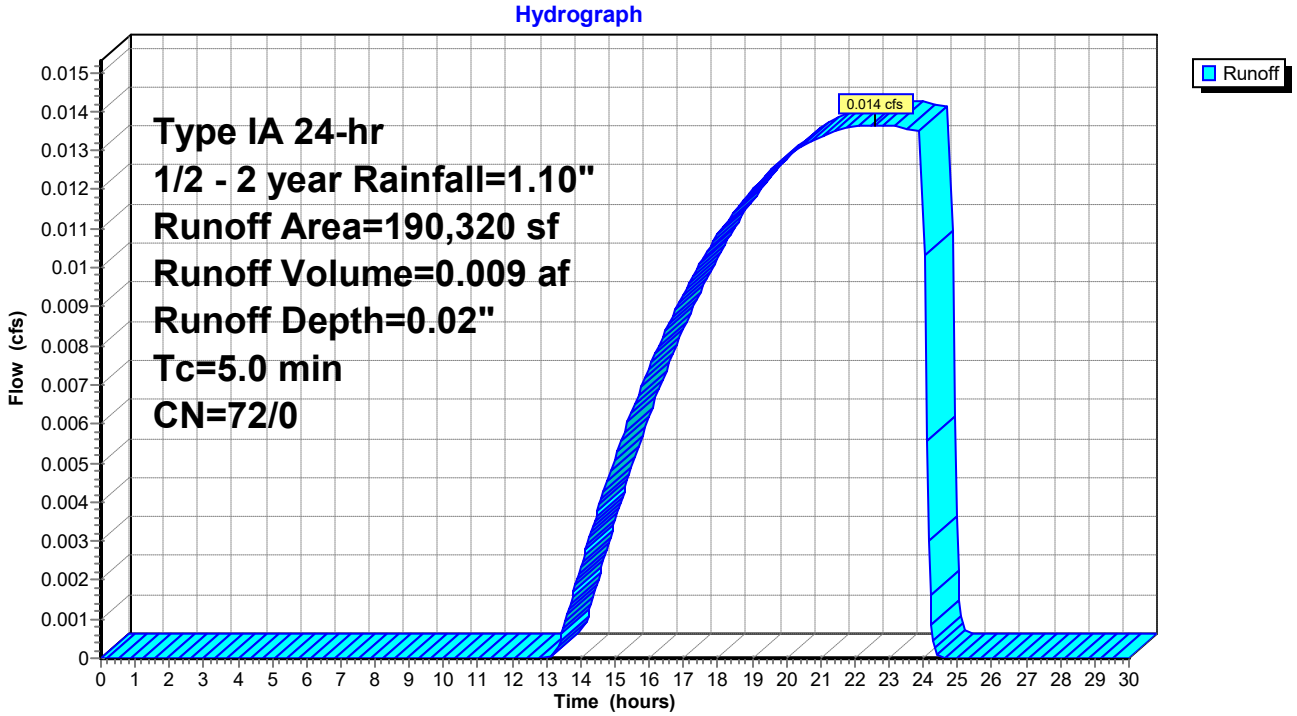
Runoff = 0.014 cfs @ 22.60 hrs, Volume= 0.009 af, Depth= 0.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 1/2 - 2 year Rainfall=1.10"

	Area (sf)	CN	Description
*	190,320	72	City of Salem, Predeveloped HSG C
	190,320	72	100.00% Pervious Area

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

Subcatchment PRE-E: East - PRE



Summary for Subcatchment PRE-W: West - PRE

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

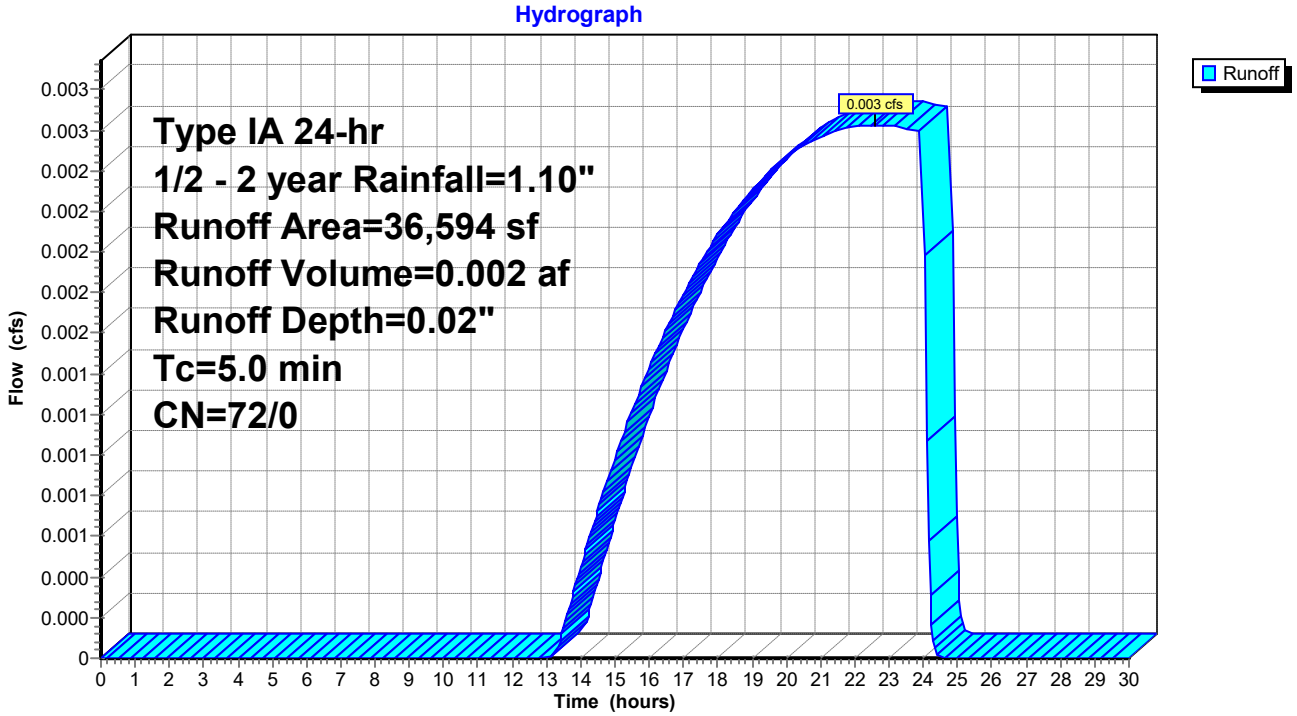
Runoff = 0.003 cfs @ 22.60 hrs, Volume= 0.002 af, Depth= 0.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 1/2 - 2 year Rainfall=1.10"

	Area (sf)	CN	Description
*	36,594	72	City of Salem, Predeveloped HSG C
	36,594	72	100.00% Pervious Area

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

Subcatchment PRE-W: West - PRE



Summary for Subcatchment PRE-E: East - PRE

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

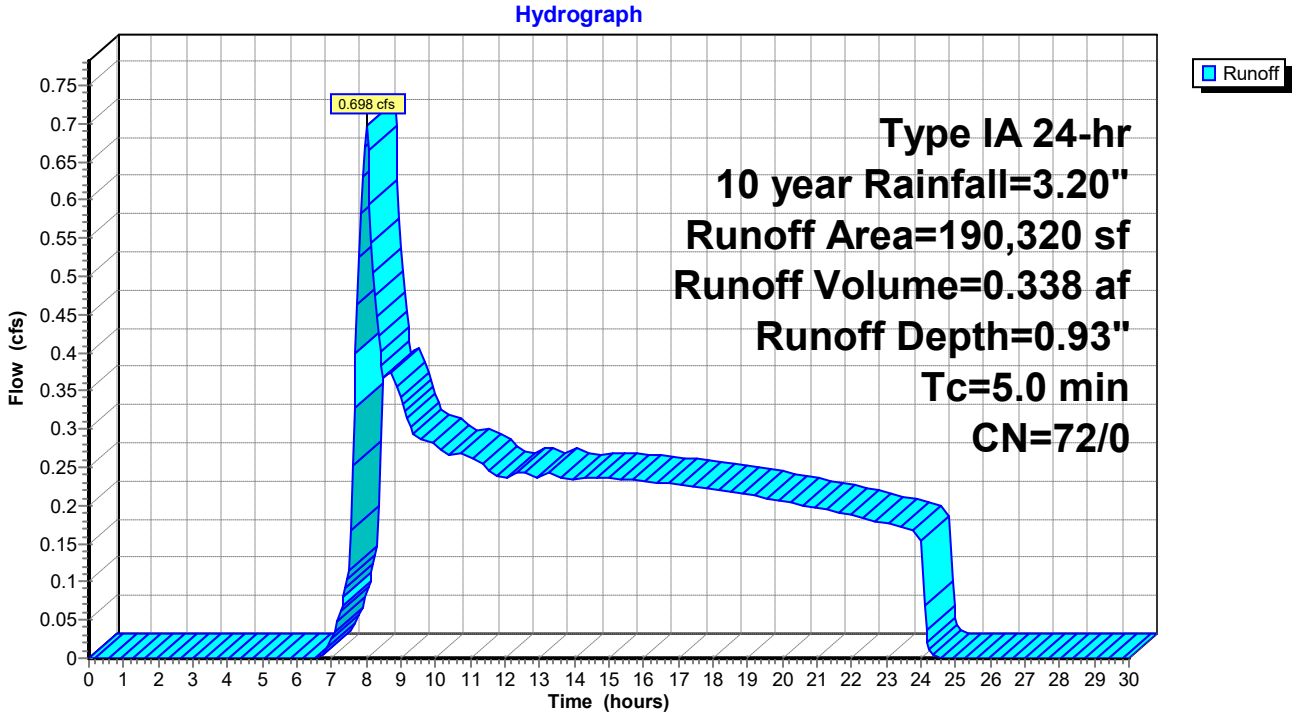
Runoff = 0.698 cfs @ 8.00 hrs, Volume= 0.338 af, Depth= 0.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 year Rainfall=3.20"

	Area (sf)	CN	Description
*	190,320	72	City of Salem, Predeveloped HSG C
	190,320	72	100.00% Pervious Area

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

Subcatchment PRE-E: East - PRE



Summary for Subcatchment PRE-W: West - PRE

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

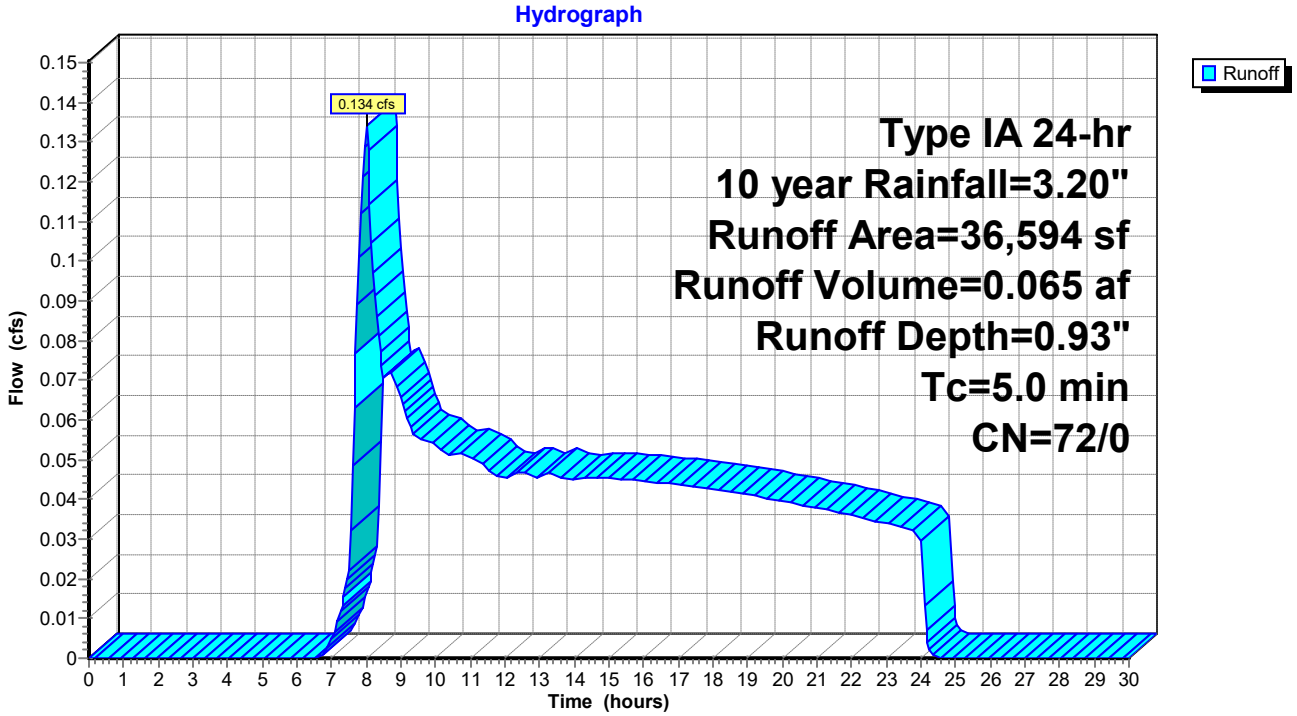
Runoff = 0.134 cfs @ 8.00 hrs, Volume= 0.065 af, Depth= 0.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 year Rainfall=3.20"

	Area (sf)	CN	Description
*	36,594	72	City of Salem, Predeveloped HSG C
	36,594	72	100.00% Pervious Area

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

Subcatchment PRE-W: West - PRE



Summary for Subcatchment PRE-E: East - PRE

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

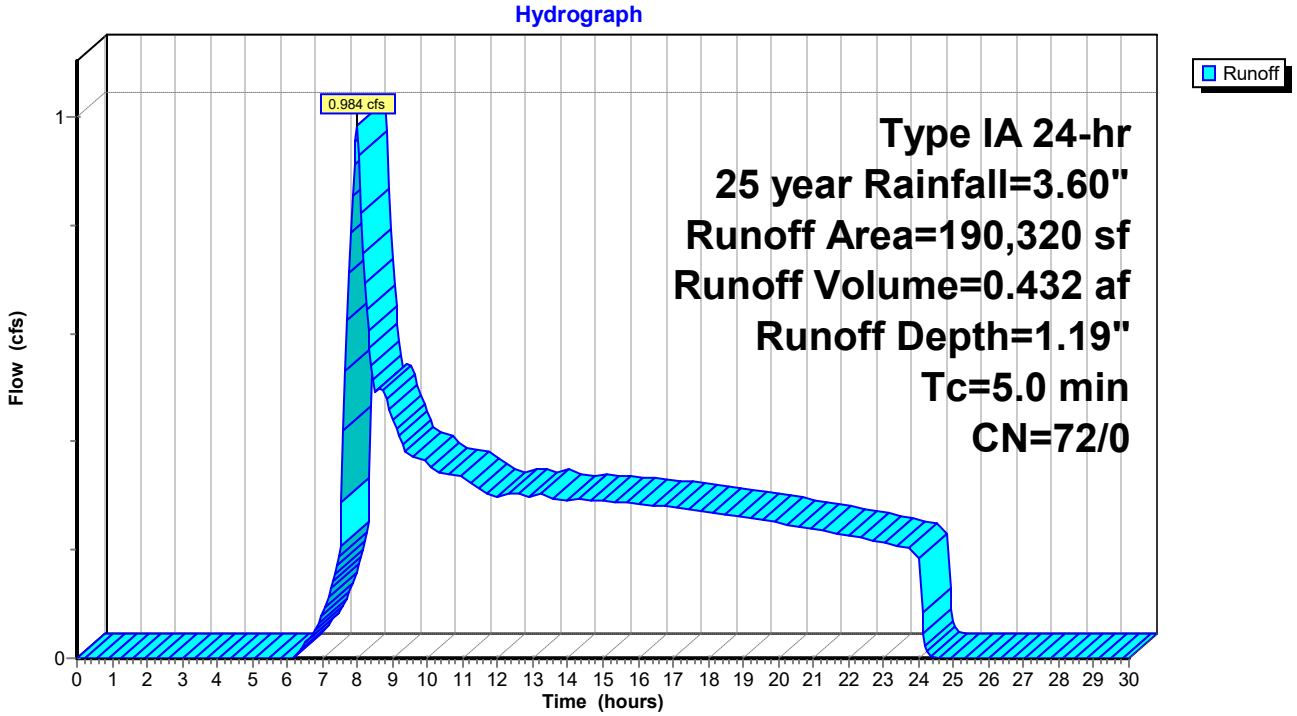
Runoff = 0.984 cfs @ 7.99 hrs, Volume= 0.432 af, Depth= 1.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25 year Rainfall=3.60"

	Area (sf)	CN	Description
*	190,320	72	City of Salem, Predeveloped HSG C
	190,320	72	100.00% Pervious Area

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

Subcatchment PRE-E: East - PRE



Summary for Subcatchment PRE-W: West - PRE

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

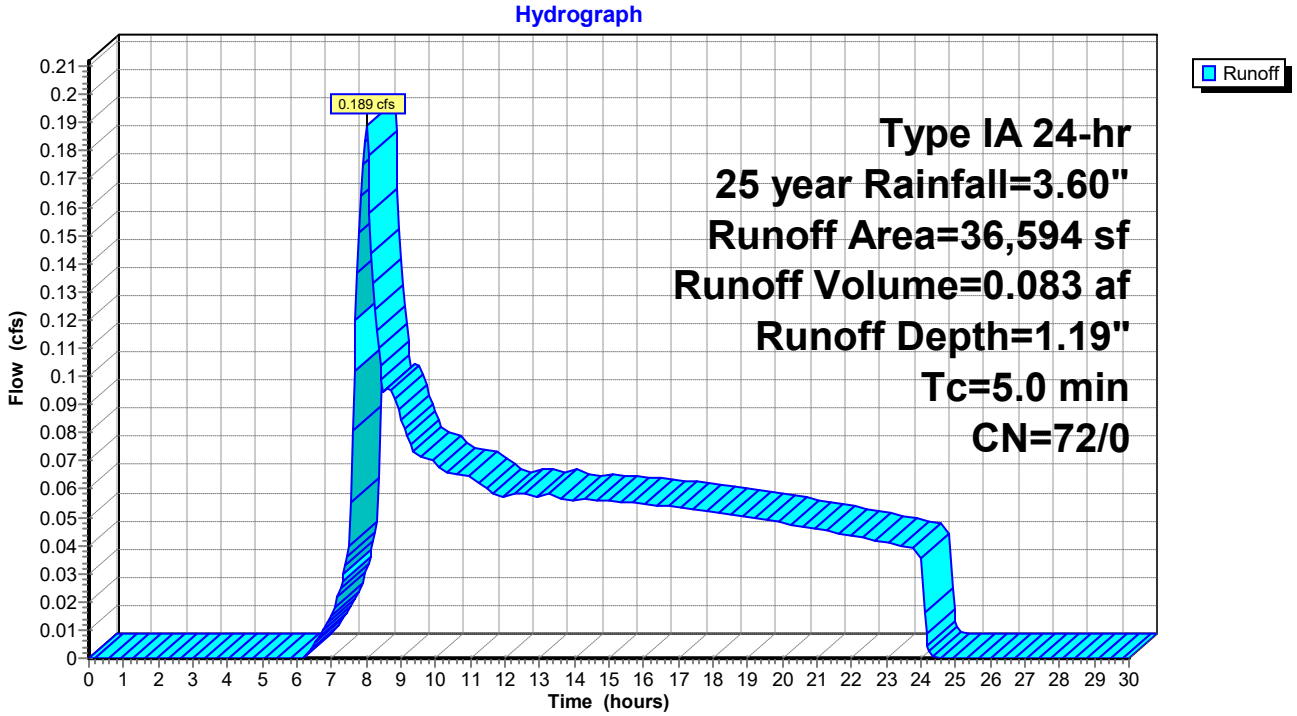
Runoff = 0.189 cfs @ 7.99 hrs, Volume= 0.083 af, Depth= 1.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25 year Rainfall=3.60"

	Area (sf)	CN	Description
*	36,594	72	City of Salem, Predeveloped HSG C
	36,594	72	100.00% Pervious Area

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

Subcatchment PRE-W: West - PRE



Summary for Subcatchment PRE-E: East - PRE

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

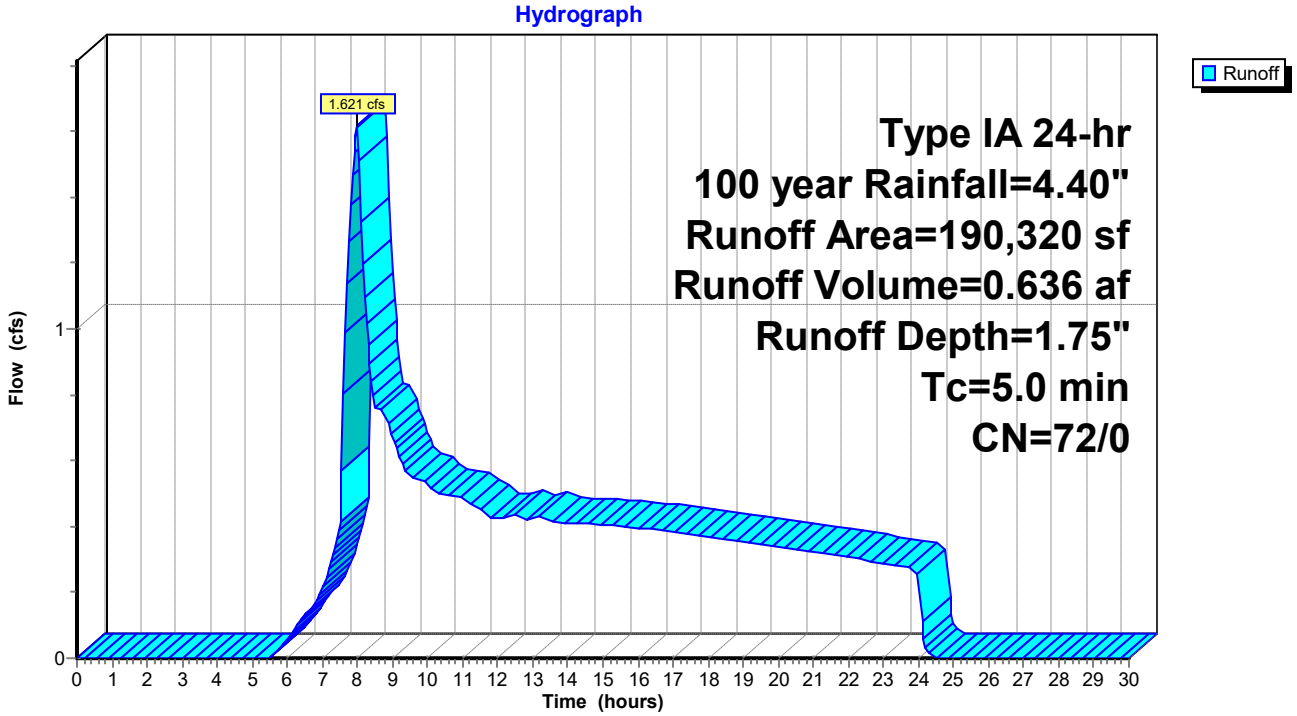
Runoff = 1.621 cfs @ 7.99 hrs, Volume= 0.636 af, Depth= 1.75"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 year Rainfall=4.40"

	Area (sf)	CN	Description
*	190,320	72	City of Salem, Predeveloped HSG C
	190,320	72	100.00% Pervious Area

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

Subcatchment PRE-E: East - PRE



Summary for Subcatchment PRE-W: West - PRE

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

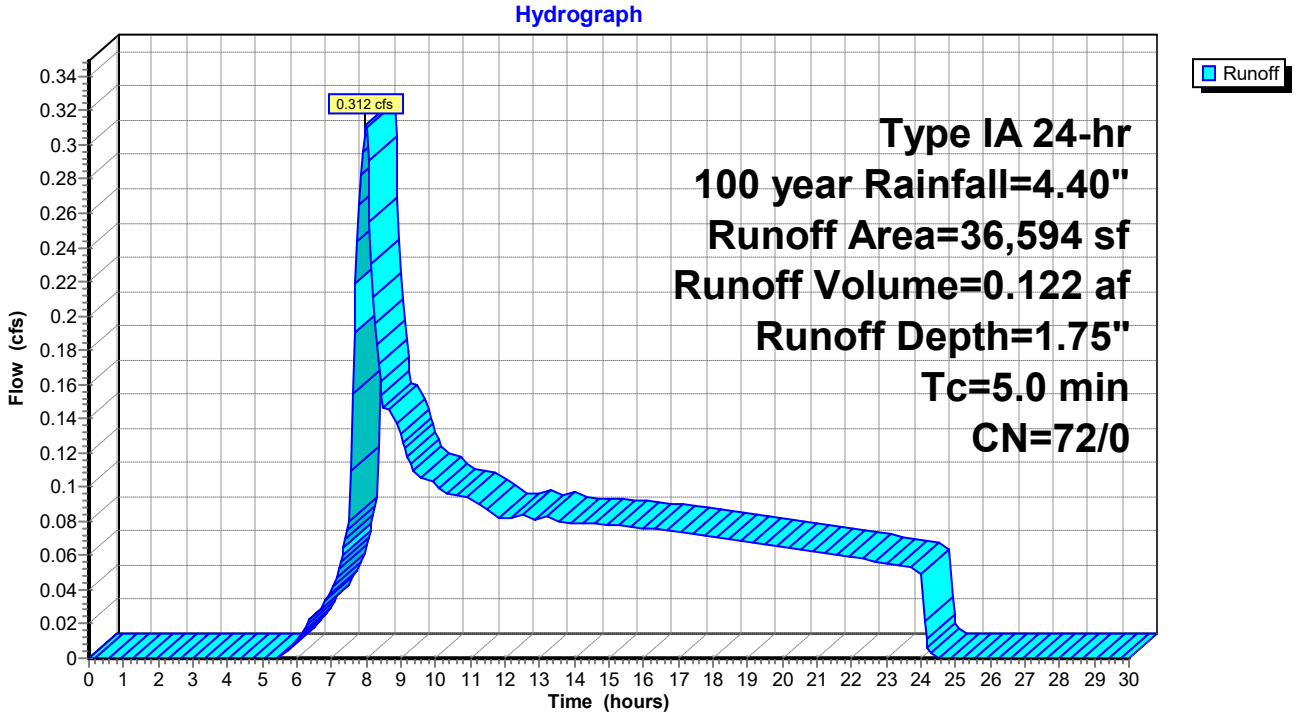
Runoff = 0.312 cfs @ 7.99 hrs, Volume= 0.122 af, Depth= 1.75"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 year Rainfall=4.40"

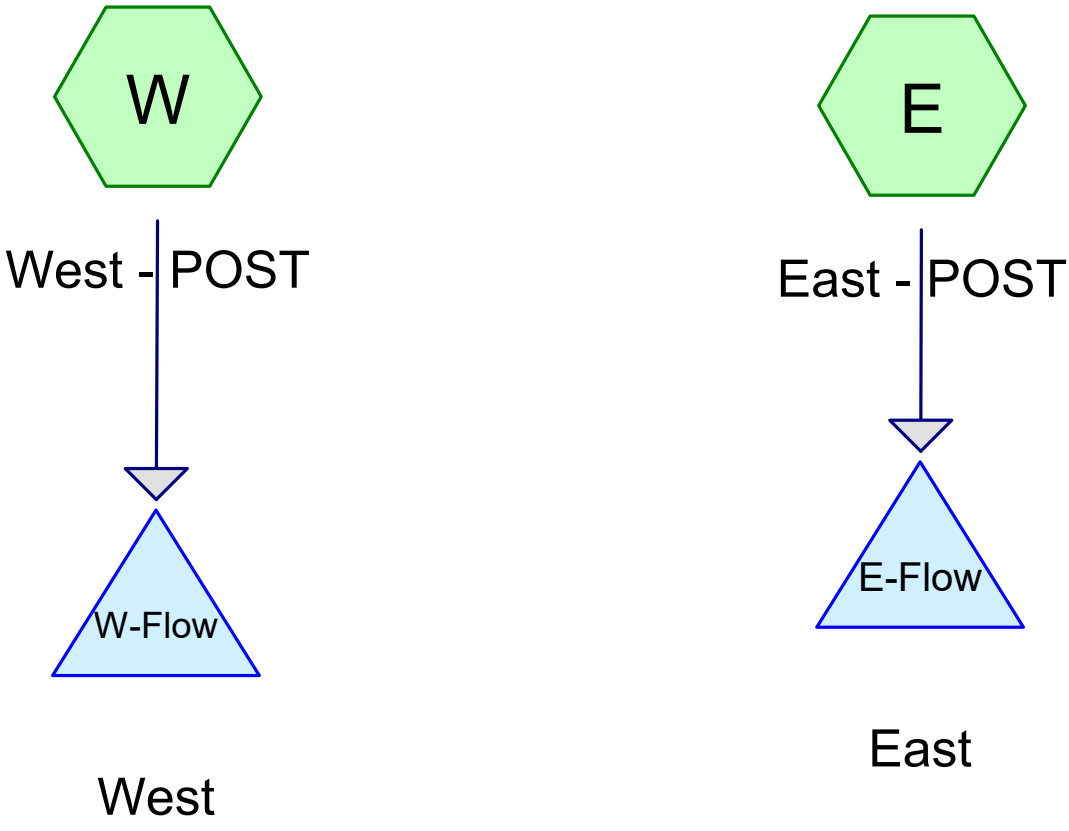
	Area (sf)	CN	Description
*	36,594	72	City of Salem, Predeveloped HSG C
	36,594	72	100.00% Pervious Area

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

Subcatchment PRE-W: West - PRE



APPENDIX F: WATER QUANTITY HYDROGRAPHS



Subcat Reach Pond Link

Routing Diagram for Prelim Hydrographs
Prepared by Multi/Tech Engineering Service, Printed 9/20/2024

Summary for Subcatchment E: East - POST

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

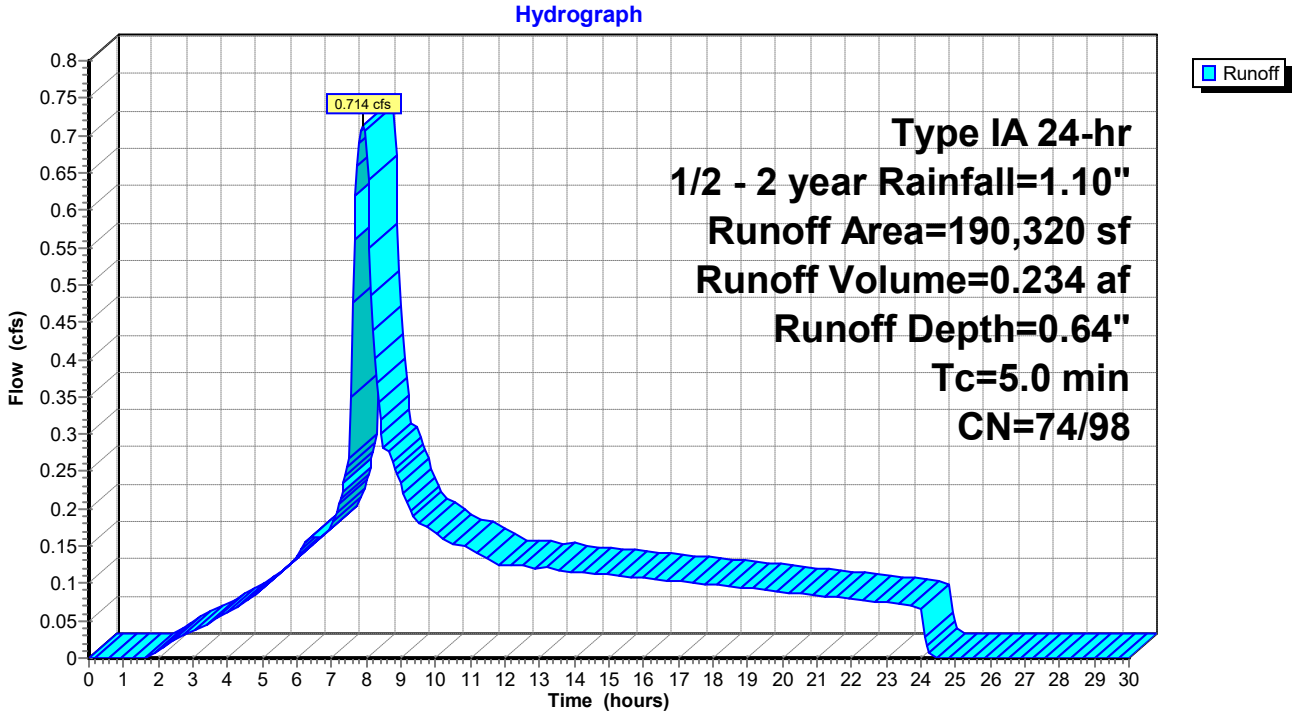
Runoff = 0.714 cfs @ 7.92 hrs, Volume= 0.234 af, Depth= 0.64"
Routed to Pond E-Flow : East

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 1/2 - 2 year Rainfall=1.10"

Area (sf)	CN	Description
135,350	98	Roofs, HSG C
54,970	74	>75% Grass cover, Good, HSG C
190,320	91	Weighted Average
54,970	74	28.88% Pervious Area
135,350	98	71.12% Impervious Area

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

Subcatchment E: East - POST



Summary for Pond E-Flow: East

Inflow Area = 4.369 ac, 71.12% Impervious, Inflow Depth = 0.64" for 1/2 - 2 year event
Inflow = 0.714 cfs @ 7.92 hrs, Volume= 0.234 af
Outflow = 0.003 cfs @ 24.29 hrs, Volume= 0.005 af, Atten= 100%, Lag= 982.6 min
Primary = 0.003 cfs @ 24.29 hrs, Volume= 0.005 af
Secondary = 0.000 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 483.44' @ 24.29 hrs Surf.Area= 7,000 sf Storage= 10,046 cf

Plug-Flow detention time= 951.3 min calculated for 0.005 af (2% of inflow)
Center-of-Mass det. time= 417.2 min (1,133.7 - 716.4)

Volume	Invert	Avail.Storage	Storage Description
#1	482.00'	28,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

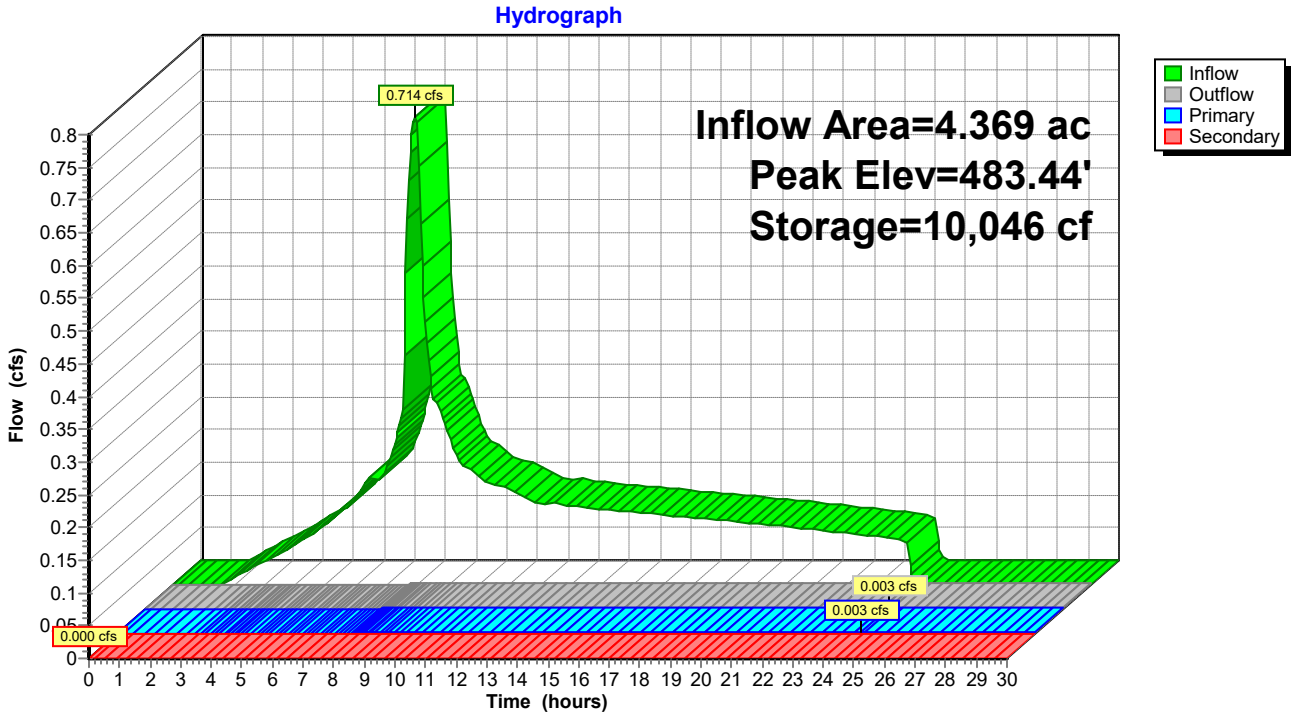
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.00	7,000	0	0
486.00	7,000	28,000	28,000

Device	Routing	Invert	Outlet Devices		
#1	Primary	482.00'	**0.3" Horiz. Orifice/Grate**	C= 0.600	Limited to weir flow at low heads
#2	Secondary	485.00'	**12.0" Vert. Orifice/Grate**	C= 0.600	Limited to weir flow at low heads

Primary OutFlow Max=0.003 cfs @ 24.29 hrs HW=483.44' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.003 cfs @ 5.77 fps)

Secondary OutFlow Max=0.000 cfs @ 0.00 hrs HW=482.00' (Free Discharge)
↑—**2=Orifice/Grate** (Controls 0.000 cfs)

Pond E-Flow: East



Summary for Subcatchment W: West - POST

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

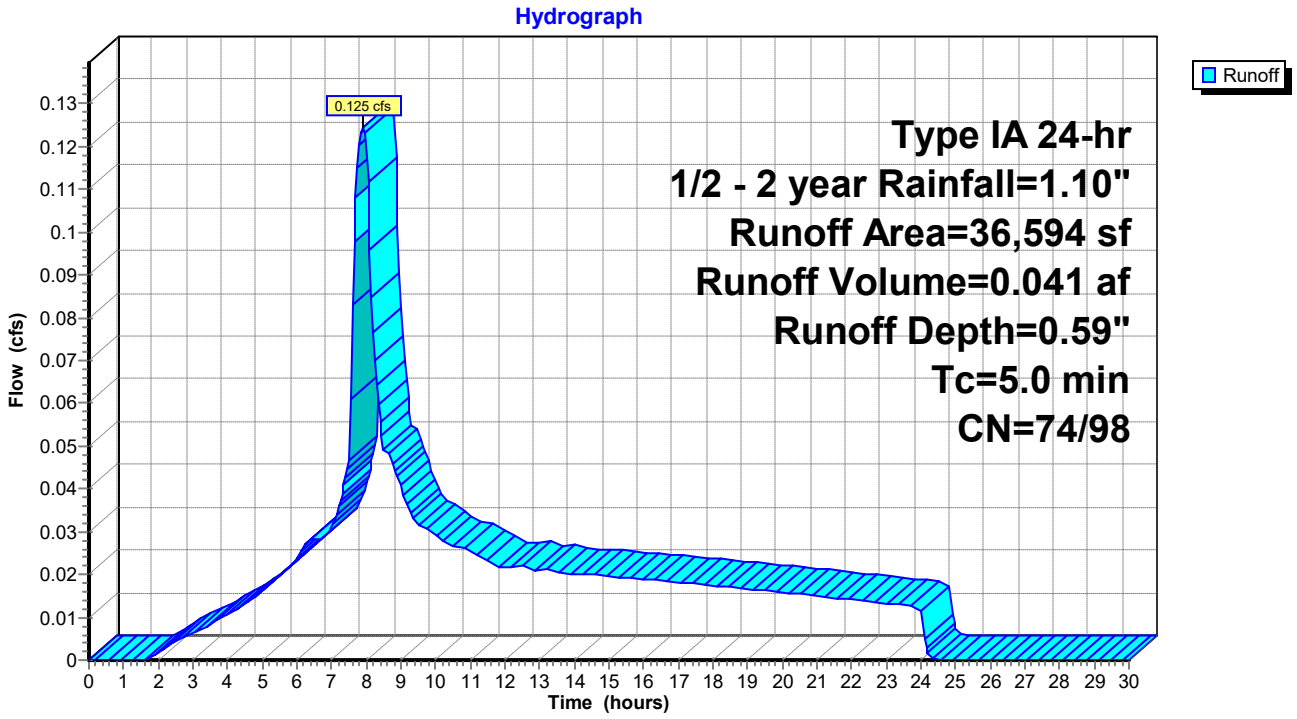
Runoff = 0.125 cfs @ 7.92 hrs, Volume= 0.041 af, Depth= 0.59"
Routed to Pond W-Flow : West

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 1/2 - 2 year Rainfall=1.10"

Area (sf)	CN	Description
23,613	98	Roofs, HSG C
12,981	74	>75% Grass cover, Good, HSG C
36,594	89	Weighted Average
12,981	74	35.47% Pervious Area
23,613	98	64.53% Impervious Area

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

Subcatchment W: West - POST



Summary for Pond W-Flow: West

Inflow Area = 0.840 ac, 64.53% Impervious, Inflow Depth = 0.59" for 1/2 - 2 year event
Inflow = 0.125 cfs @ 7.92 hrs, Volume= 0.041 af
Outflow = 0.003 cfs @ 24.16 hrs, Volume= 0.005 af, Atten= 98%, Lag= 974.4 min
Primary = 0.003 cfs @ 24.16 hrs, Volume= 0.005 af
Secondary = 0.000 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 503.37' @ 24.16 hrs Surf.Area= 1,200 sf Storage= 1,639 cf

Plug-Flow detention time= 832.6 min calculated for 0.005 af (12% of inflow)
Center-of-Mass det. time= 409.6 min (1,128.7 - 719.1)

Volume	Invert	Avail.Storage	Storage Description
#1	502.00'	3,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

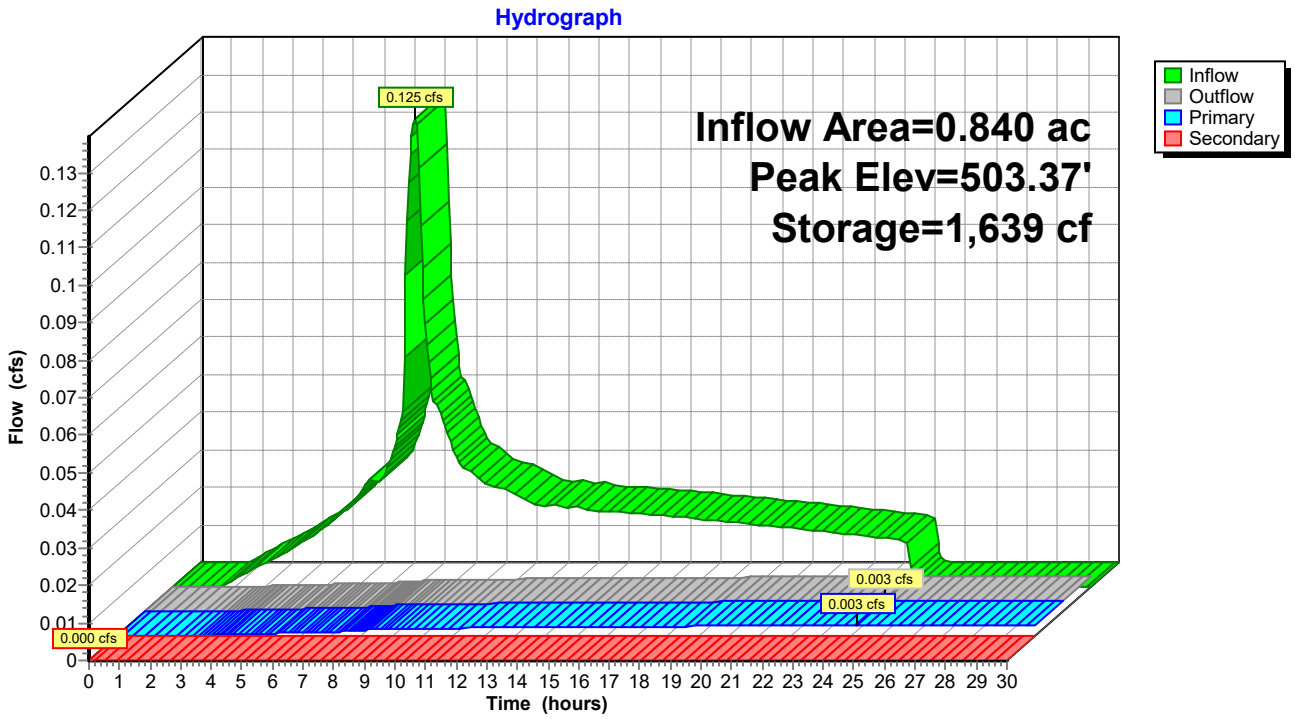
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.00	1,200	0	0
505.00	1,200	3,600	3,600

Device	Routing	Invert	Outlet Devices
#1	Primary	502.00'	**0.3" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	504.00'	**3.7" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.003 cfs @ 24.16 hrs HW=503.37' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.003 cfs @ 5.63 fps)

Secondary OutFlow Max=0.000 cfs @ 0.00 hrs HW=502.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.000 cfs)

Pond W-Flow: West



Summary for Subcatchment E: East - POST

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

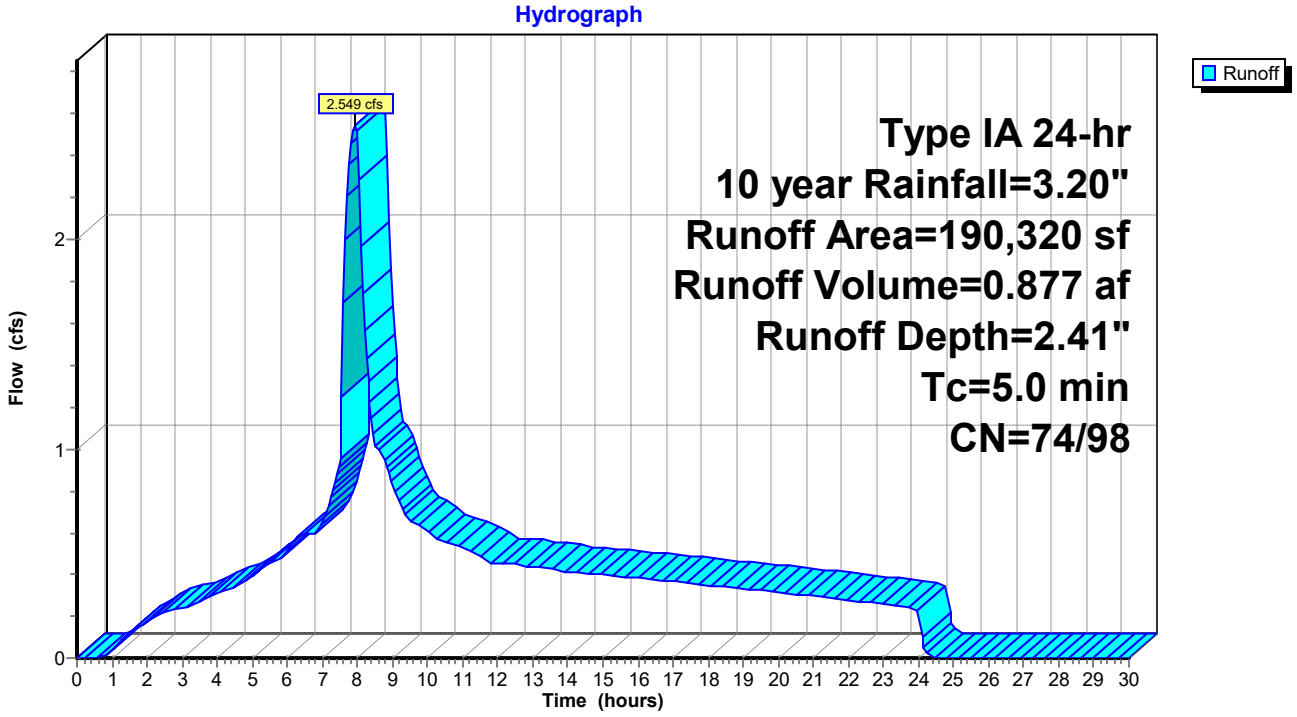
Runoff = 2.549 cfs @ 7.92 hrs, Volume= 0.877 af, Depth= 2.41"
Routed to Pond E-Flow : East

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 year Rainfall=3.20"

Area (sf)	CN	Description
135,350	98	Roofs, HSG C
54,970	74	>75% Grass cover, Good, HSG C
190,320	91	Weighted Average
54,970	74	28.88% Pervious Area
135,350	98	71.12% Impervious Area

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

Subcatchment E: East - POST



Summary for Pond E-Flow: East

Inflow Area = 4.369 ac, 71.12% Impervious, Inflow Depth = 2.41" for 10 year event
Inflow = 2.549 cfs @ 7.92 hrs, Volume= 0.877 af
Outflow = 0.408 cfs @ 14.40 hrs, Volume= 0.387 af, Atten= 84%, Lag= 388.9 min
Primary = 0.004 cfs @ 14.40 hrs, Volume= 0.008 af
Secondary = 0.404 cfs @ 14.40 hrs, Volume= 0.379 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 485.31' @ 14.40 hrs Surf.Area= 7,000 sf Storage= 23,200 cf

Plug-Flow detention time= 690.9 min calculated for 0.387 af (44% of inflow)
Center-of-Mass det. time= 398.6 min (1,089.6 - 691.0)

Volume	Invert	Avail.Storage	Storage Description
#1	482.00'	28,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

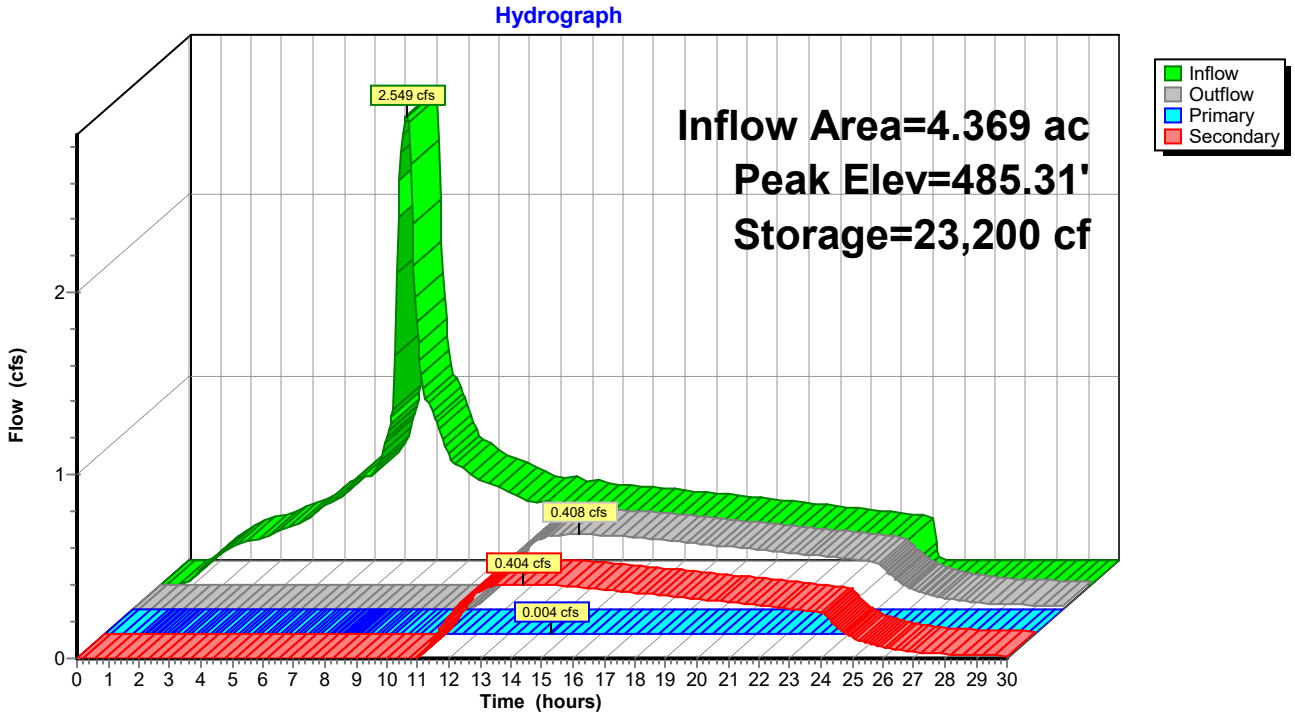
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.00	7,000	0	0
486.00	7,000	28,000	28,000

Device	Routing	Invert	Outlet Devices		
#1	Primary	482.00'	**0.3" Horiz. Orifice/Grate**	C= 0.600	Limited to weir flow at low heads
#2	Secondary	485.00'	**12.0" Vert. Orifice/Grate**	C= 0.600	Limited to weir flow at low heads

Primary OutFlow Max=0.004 cfs @ 14.40 hrs HW=485.31' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.004 cfs @ 8.77 fps)

Secondary OutFlow Max=0.404 cfs @ 14.40 hrs HW=485.31' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 0.404 cfs @ 1.91 fps)

Pond E-Flow: East



Summary for Subcatchment W: West - POST

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

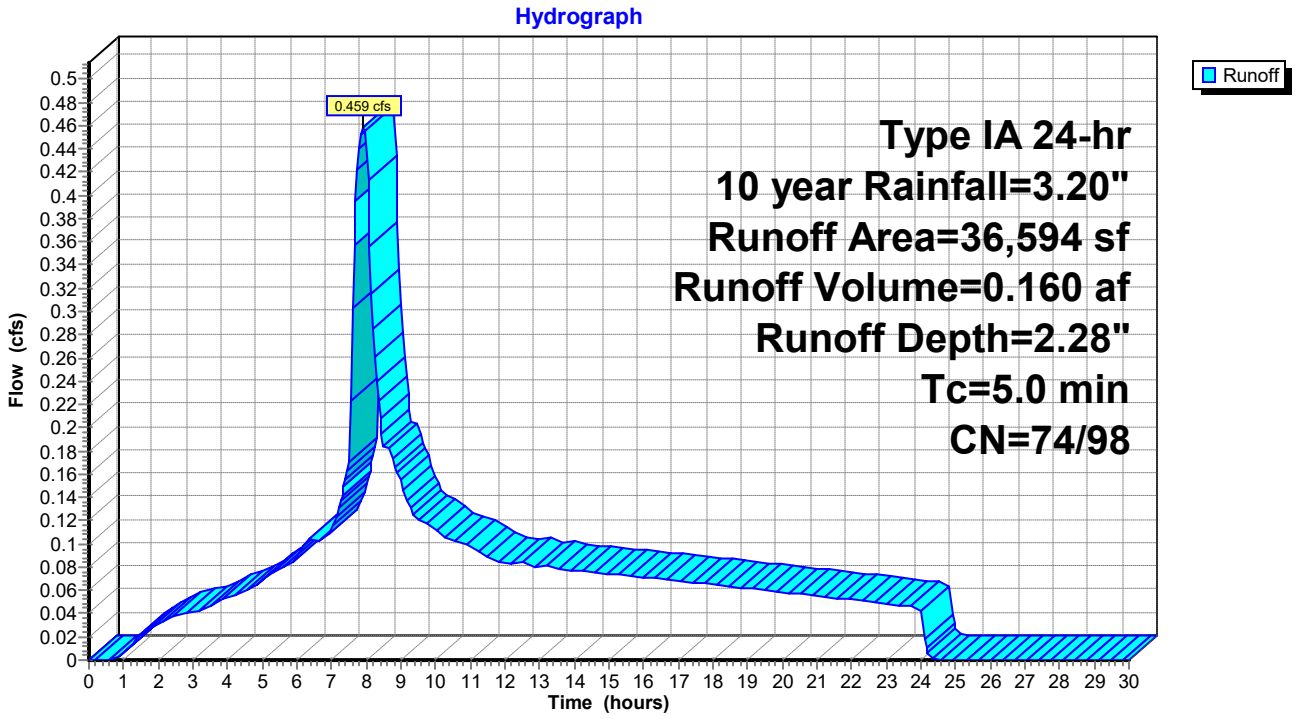
Runoff = 0.459 cfs @ 7.92 hrs, Volume= 0.160 af, Depth= 2.28"
Routed to Pond W-Flow : West

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 year Rainfall=3.20"

Area (sf)	CN	Description
23,613	98	Roofs, HSG C
12,981	74	>75% Grass cover, Good, HSG C
36,594	89	Weighted Average
12,981	74	35.47% Pervious Area
23,613	98	64.53% Impervious Area

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

Subcatchment W: West - POST



Summary for Pond W-Flow: West

Inflow Area = 0.840 ac, 64.53% Impervious, Inflow Depth = 2.28" for 10 year event
Inflow = 0.459 cfs @ 7.92 hrs, Volume= 0.160 af
Outflow = 0.134 cfs @ 9.23 hrs, Volume= 0.105 af, Atten= 71%, Lag= 78.1 min
Primary = 0.004 cfs @ 9.23 hrs, Volume= 0.007 af
Secondary = 0.130 cfs @ 9.23 hrs, Volume= 0.098 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 504.28' @ 9.23 hrs Surf.Area= 1,200 sf Storage= 2,741 cf

Plug-Flow detention time= 431.9 min calculated for 0.105 af (66% of inflow)
Center-of-Mass det. time= 223.6 min (921.9 - 698.3)

Volume	Invert	Avail.Storage	Storage Description
#1	502.00'	3,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

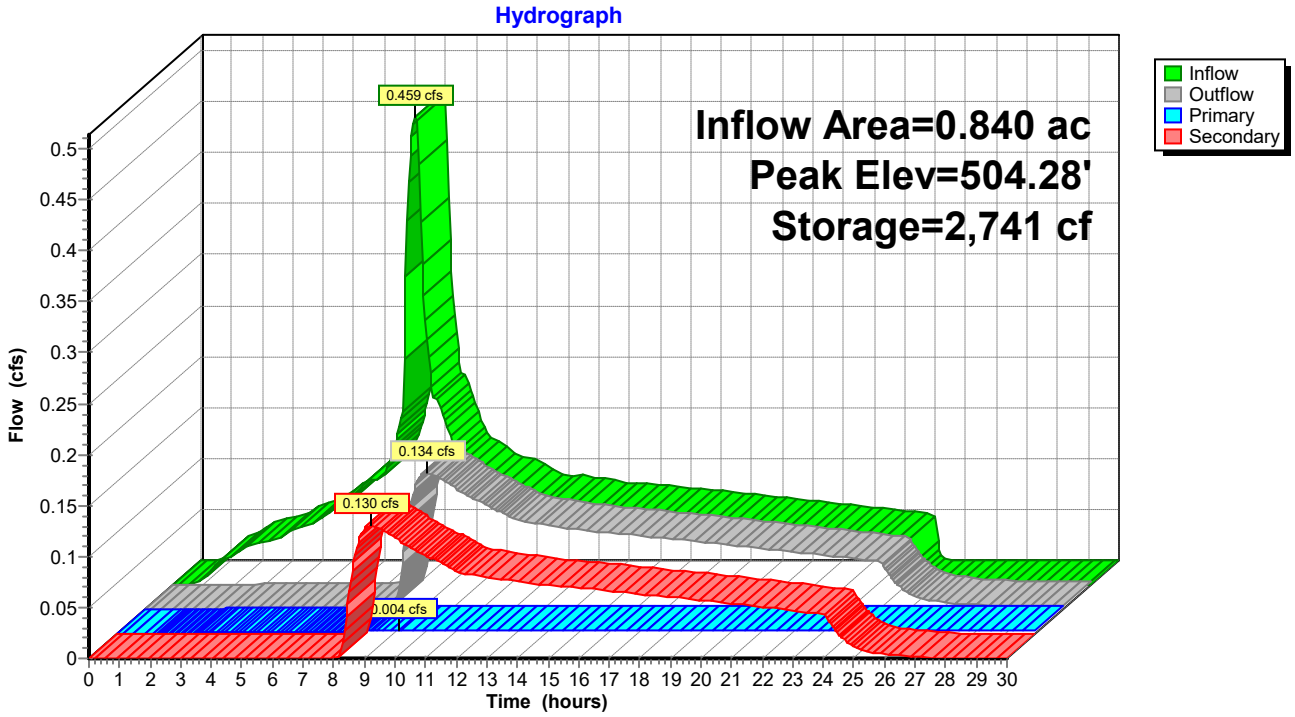
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.00	1,200	0	0
505.00	1,200	3,600	3,600

Device	Routing	Invert	Outlet Devices
#1	Primary	502.00'	**0.3" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	504.00'	**3.7" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.004 cfs @ 9.23 hrs HW=504.28' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.004 cfs @ 7.28 fps)

Secondary OutFlow Max=0.131 cfs @ 9.23 hrs HW=504.28' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 0.131 cfs @ 1.81 fps)

Pond W-Flow: West



Summary for Subcatchment E: East - POST

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

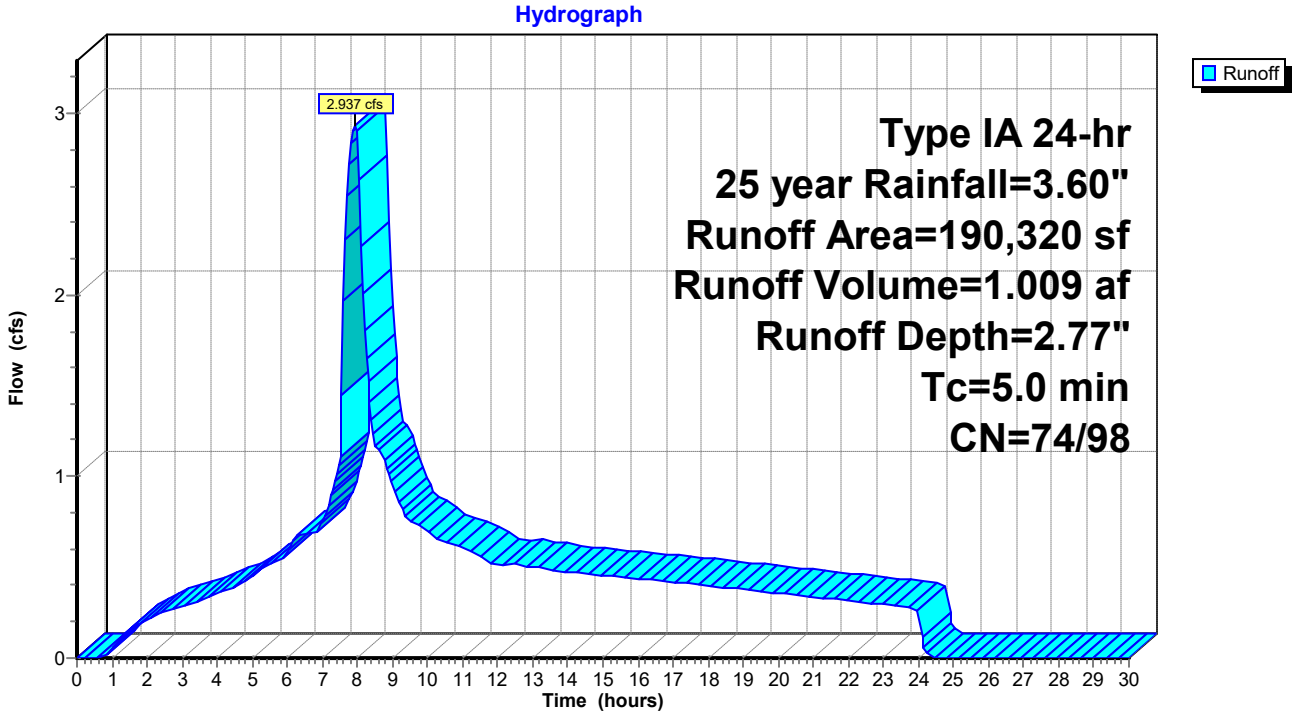
Runoff = 2.937 cfs @ 7.92 hrs, Volume= 1.009 af, Depth= 2.77"
Routed to Pond E-Flow : East

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25 year Rainfall=3.60"

Area (sf)	CN	Description
135,350	98	Roofs, HSG C
54,970	74	>75% Grass cover, Good, HSG C
190,320	91	Weighted Average
54,970	74	28.88% Pervious Area
135,350	98	71.12% Impervious Area

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

Subcatchment E: East - POST



Summary for Pond E-Flow: East

Inflow Area = 4.369 ac, 71.12% Impervious, Inflow Depth = 2.77" for 25 year event
Inflow = 2.937 cfs @ 7.92 hrs, Volume= 1.009 af
Outflow = 0.527 cfs @ 11.72 hrs, Volume= 0.519 af, Atten= 82%, Lag= 228.5 min
Primary = 0.004 cfs @ 11.72 hrs, Volume= 0.009 af
Secondary = 0.523 cfs @ 11.72 hrs, Volume= 0.510 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 485.36' @ 11.72 hrs Surf.Area= 7,000 sf Storage= 23,528 cf

Plug-Flow detention time= 604.5 min calculated for 0.518 af (51% of inflow)
Center-of-Mass det. time= 337.8 min (1,026.4 - 688.6)

Volume	Invert	Avail.Storage	Storage Description
#1	482.00'	28,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

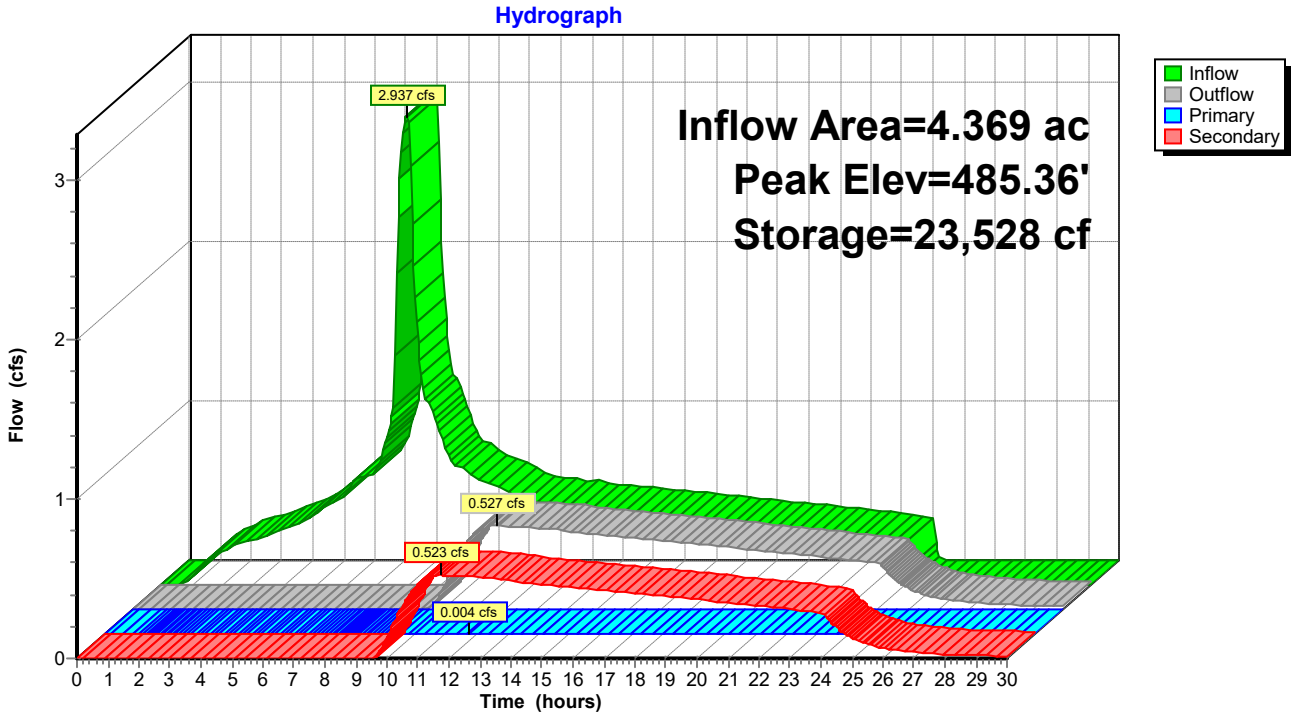
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.00	7,000	0	0
486.00	7,000	28,000	28,000

Device	Routing	Invert	Outlet Devices		
#1	Primary	482.00'	**0.3" Horiz. Orifice/Grate**	C= 0.600	Limited to weir flow at low heads
#2	Secondary	485.00'	**12.0" Vert. Orifice/Grate**	C= 0.600	Limited to weir flow at low heads

Primary OutFlow Max=0.004 cfs @ 11.72 hrs HW=485.36' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.004 cfs @ 8.83 fps)

Secondary OutFlow Max=0.523 cfs @ 11.72 hrs HW=485.36' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 0.523 cfs @ 2.05 fps)

Pond E-Flow: East



Summary for Subcatchment W: West - POST

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

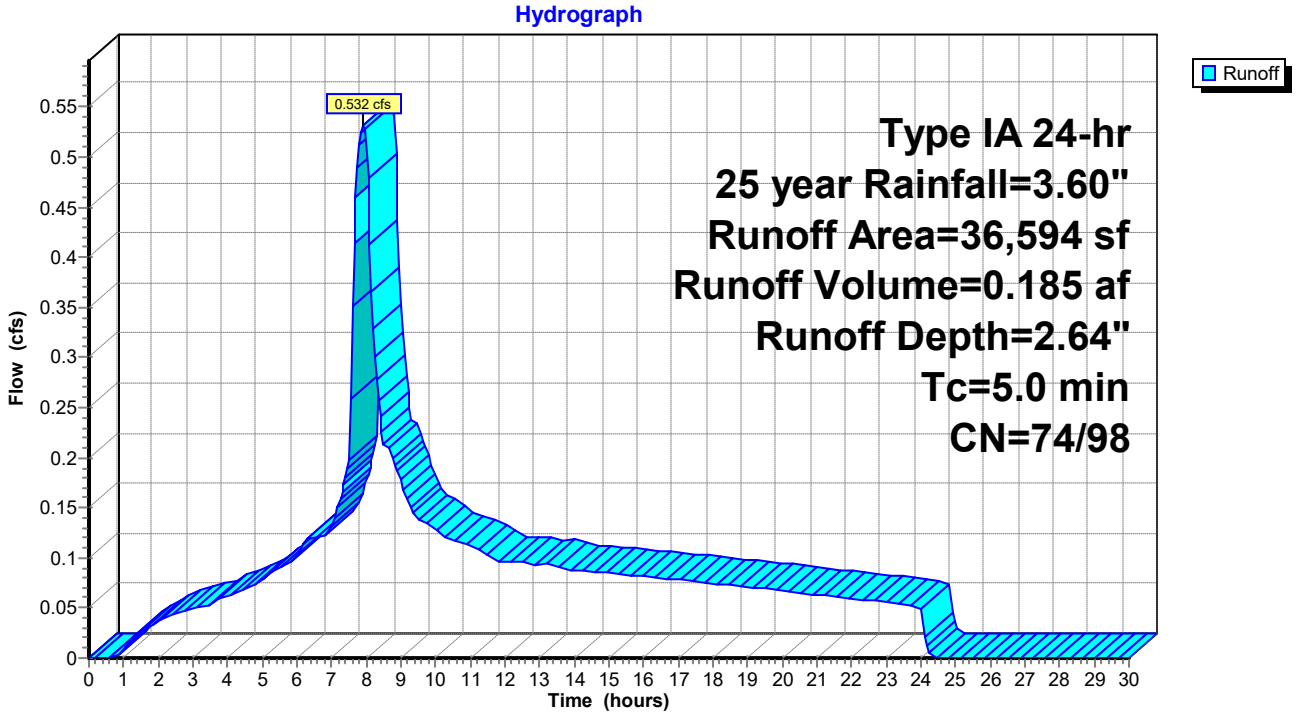
Runoff = 0.532 cfs @ 7.92 hrs, Volume= 0.185 af, Depth= 2.64"
Routed to Pond W-Flow : West

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25 year Rainfall=3.60"

Area (sf)	CN	Description
23,613	98	Roofs, HSG C
12,981	74	>75% Grass cover, Good, HSG C
36,594	89	Weighted Average
12,981	74	35.47% Pervious Area
23,613	98	64.53% Impervious Area

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

Subcatchment W: West - POST



Summary for Pond W-Flow: West

Inflow Area = 0.840 ac, 64.53% Impervious, Inflow Depth = 2.64" for 25 year event
Inflow = 0.532 cfs @ 7.92 hrs, Volume= 0.185 af
Outflow = 0.184 cfs @ 8.92 hrs, Volume= 0.130 af, Atten= 65%, Lag= 59.9 min
Primary = 0.004 cfs @ 8.92 hrs, Volume= 0.007 af
Secondary = 0.181 cfs @ 8.92 hrs, Volume= 0.123 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 504.41' @ 8.92 hrs Surf.Area= 1,200 sf Storage= 2,889 cf

Plug-Flow detention time= 380.7 min calculated for 0.130 af (70% of inflow)
Center-of-Mass det. time= 195.2 min (891.2 - 696.0)

Volume	Invert	Avail.Storage	Storage Description
#1	502.00'	3,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

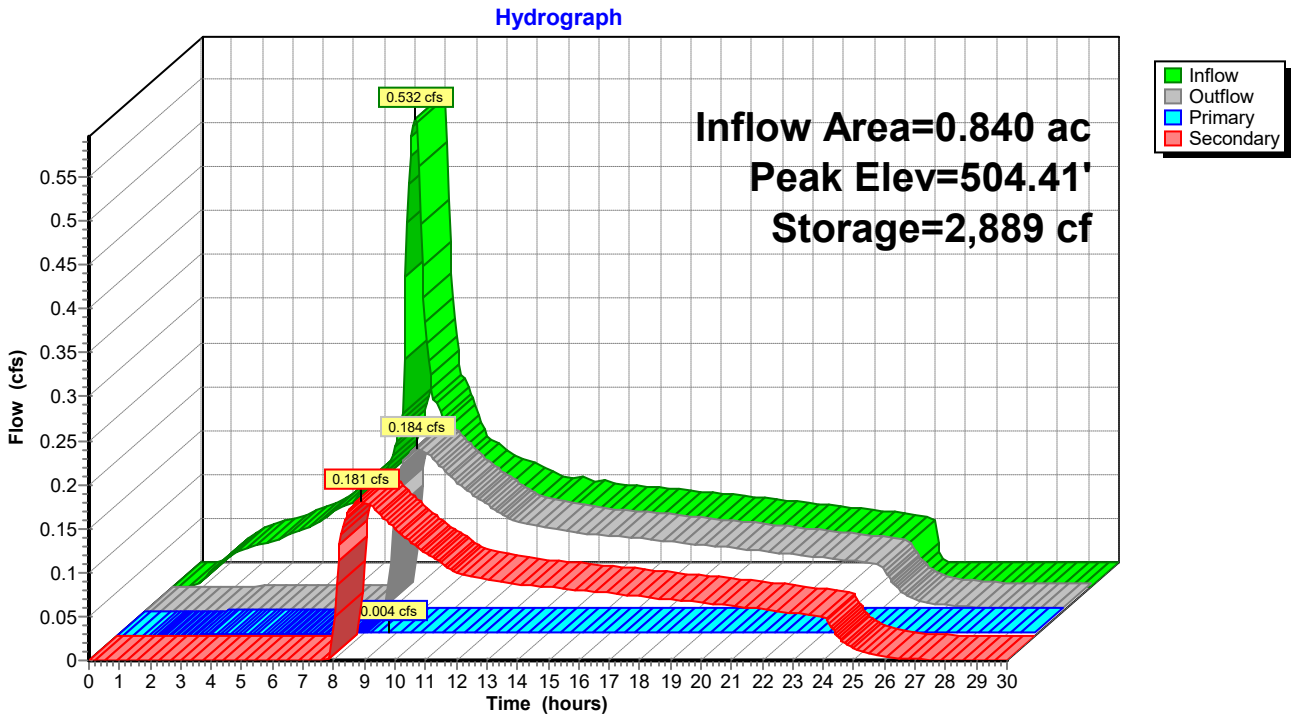
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.00	1,200	0	0
505.00	1,200	3,600	3,600

Device	Routing	Invert	Outlet Devices
#1	Primary	502.00'	**0.3" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	504.00'	**3.7" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.004 cfs @ 8.92 hrs HW=504.41' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.004 cfs @ 7.47 fps)

Secondary OutFlow Max=0.181 cfs @ 8.92 hrs HW=504.41' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.181 cfs @ 2.42 fps)

Pond W-Flow: West



Summary for Subcatchment E: East - POST

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

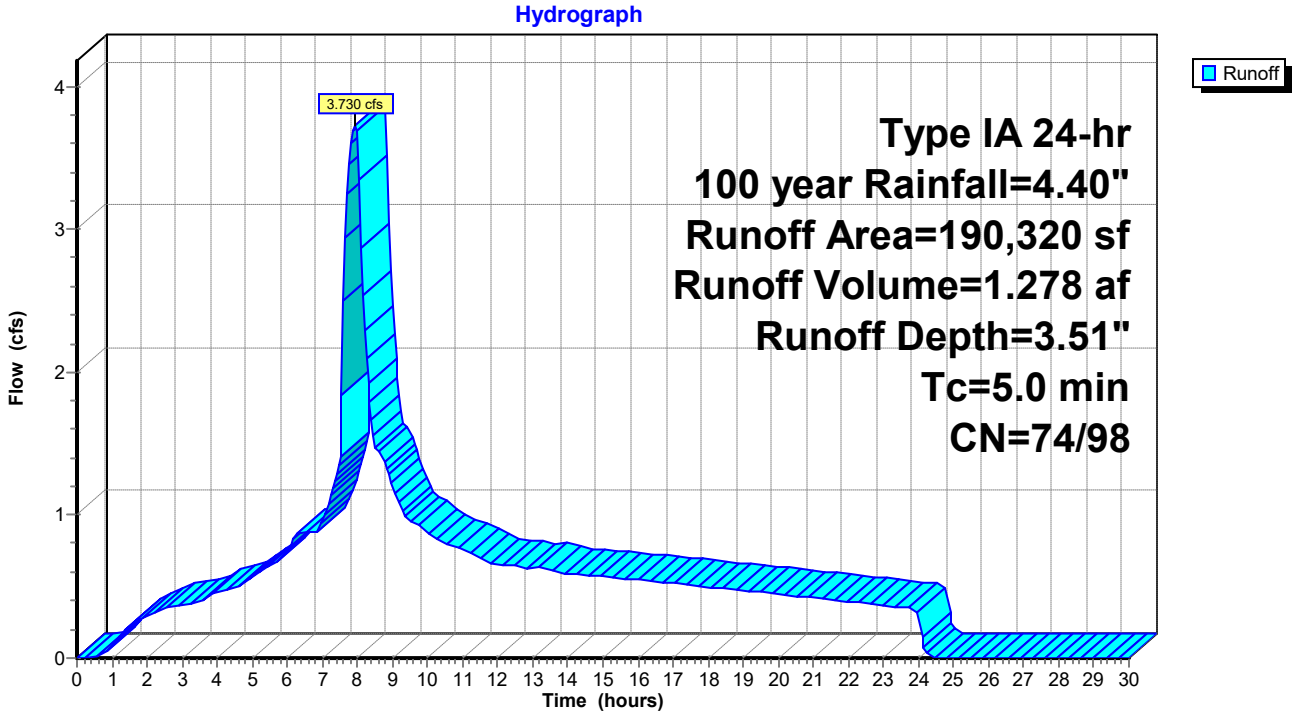
Runoff = 3.730 cfs @ 7.91 hrs, Volume= 1.278 af, Depth= 3.51"
Routed to Pond E-Flow : East

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 year Rainfall=4.40"

Area (sf)	CN	Description
135,350	98	Roofs, HSG C
54,970	74	>75% Grass cover, Good, HSG C
190,320	91	Weighted Average
54,970	74	28.88% Pervious Area
135,350	98	71.12% Impervious Area

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

Subcatchment E: East - POST



Summary for Pond E-Flow: East

Inflow Area = 4.369 ac, 71.12% Impervious, Inflow Depth = 3.51" for 100 year event
Inflow = 3.730 cfs @ 7.91 hrs, Volume= 1.278 af
Outflow = 0.920 cfs @ 9.79 hrs, Volume= 0.787 af, Atten= 75%, Lag= 112.8 min
Primary = 0.004 cfs @ 9.79 hrs, Volume= 0.009 af
Secondary = 0.916 cfs @ 9.79 hrs, Volume= 0.778 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 485.49' @ 9.79 hrs Surf.Area= 7,000 sf Storage= 24,436 cf

Plug-Flow detention time= 487.1 min calculated for 0.787 af (62% of inflow)
Center-of-Mass det. time= 259.9 min (944.4 - 684.5)

Volume	Invert	Avail.Storage	Storage Description
#1	482.00'	28,000 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

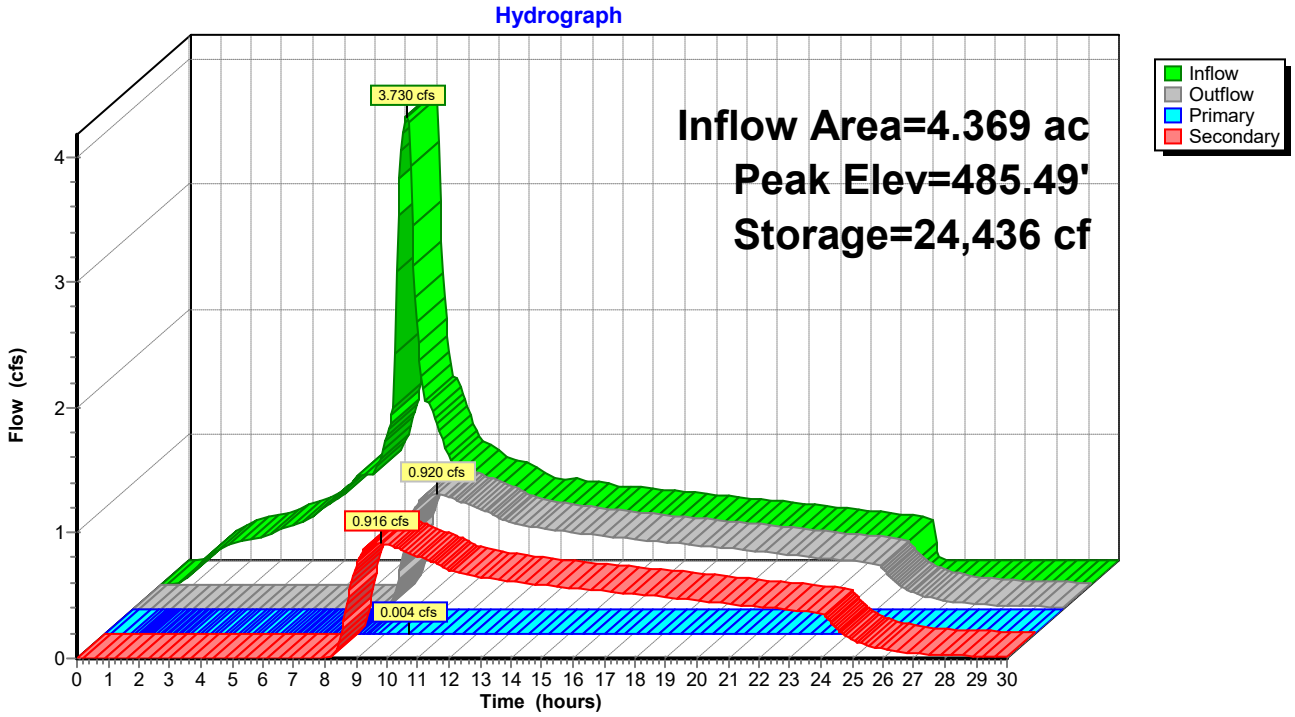
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
482.00	7,000	0	0
486.00	7,000	28,000	28,000

Device	Routing	Invert	Outlet Devices		
#1	Primary	482.00'	**0.3" Horiz. Orifice/Grate**	C= 0.600	Limited to weir flow at low heads
#2	Secondary	485.00'	**12.0" Vert. Orifice/Grate**	C= 0.600	Limited to weir flow at low heads

Primary OutFlow Max=0.004 cfs @ 9.79 hrs HW=485.49' (Free Discharge)
↑—**1=Orifice/Grate** (Orifice Controls 0.004 cfs @ 9.00 fps)

Secondary OutFlow Max=0.915 cfs @ 9.79 hrs HW=485.49' (Free Discharge)
↑—**2=Orifice/Grate** (Orifice Controls 0.915 cfs @ 2.39 fps)

Pond E-Flow: East



Summary for Subcatchment W: West - POST

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

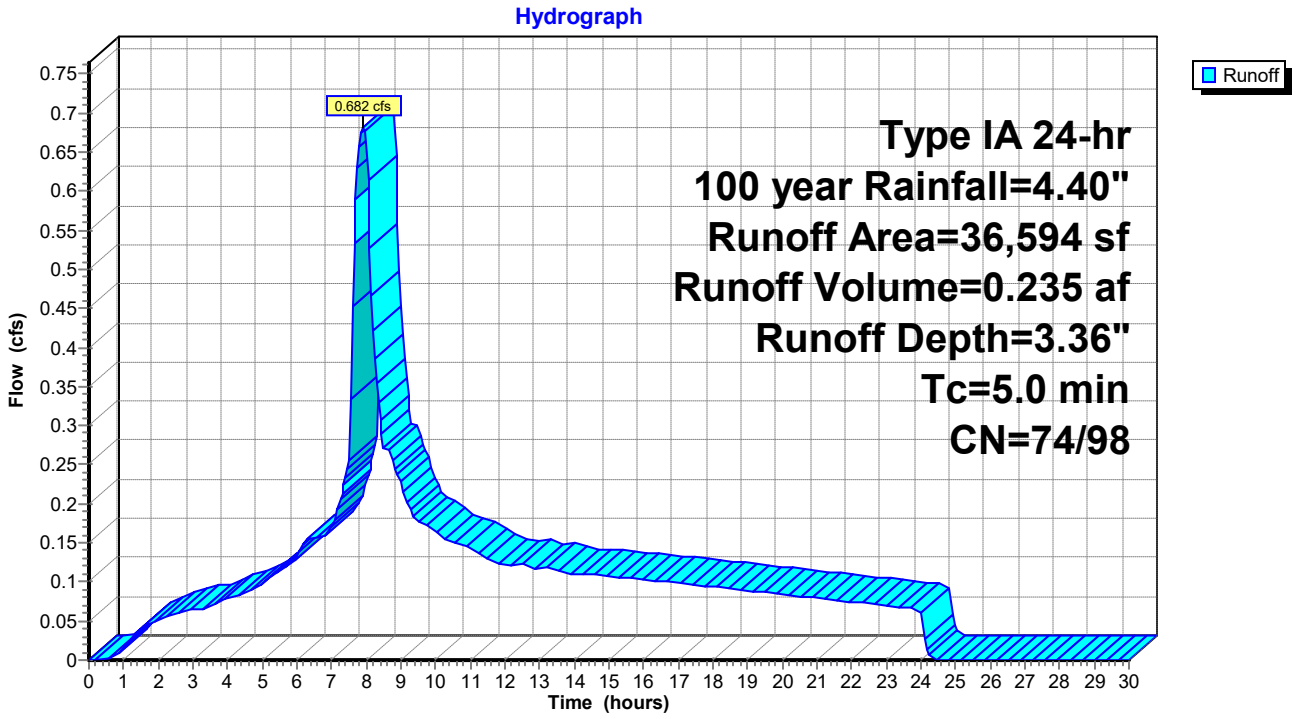
Runoff = 0.682 cfs @ 7.92 hrs, Volume= 0.235 af, Depth= 3.36"
Routed to Pond W-Flow : West

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 year Rainfall=4.40"

Area (sf)	CN	Description
23,613	98	Roofs, HSG C
12,981	74	>75% Grass cover, Good, HSG C
36,594	89	Weighted Average
12,981	74	35.47% Pervious Area
23,613	98	64.53% Impervious Area

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

Subcatchment W: West - POST



Summary for Pond W-Flow: West

Inflow Area = 0.840 ac, 64.53% Impervious, Inflow Depth = 3.36" for 100 year event
Inflow = 0.682 cfs @ 7.92 hrs, Volume= 0.235 af
Outflow = 0.288 cfs @ 8.45 hrs, Volume= 0.180 af, Atten= 58%, Lag= 31.9 min
Primary = 0.004 cfs @ 8.45 hrs, Volume= 0.008 af
Secondary = 0.285 cfs @ 8.45 hrs, Volume= 0.173 af

Routing by Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 504.78' @ 8.45 hrs Surf.Area= 1,200 sf Storage= 3,337 cf

Plug-Flow detention time= 313.7 min calculated for 0.180 af (77% of inflow)
Center-of-Mass det. time= 163.1 min (854.9 - 691.8)

Volume	Invert	Avail.Storage	Storage Description
#1	502.00'	3,600 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.00	1,200	0	0
505.00	1,200	3,600	3,600

Device	Routing	Invert	Outlet Devices
#1	Primary	502.00'	**0.3" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Secondary	504.00'	**3.7" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.004 cfs @ 8.45 hrs HW=504.78' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.004 cfs @ 8.03 fps)

Secondary OutFlow Max=0.285 cfs @ 8.45 hrs HW=504.78' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.285 cfs @ 3.81 fps)

Pond W-Flow: West