6234

PRELIMINARY DRAINAGE REPORT
FOR

Coburn Grand View Estates
Salem, Oregon

Prepared For:
Westwood Homes, LLC
12700 NW Cornell Road
Portland, Oregon 97229

April 9, 2021

MULTI/TECH
ENGINEERING SERVICES, INC.

1155 13th Street SE
Salem OR 97302

PHONE: (503) 363-9227
FAX: (503) 364-1260
EMAIL: mhendrick@mtengineering.net

Contents

INTRODUCTION

The Coburn Grand View Estates development is a 212-lot subdivision approved under the City of Salem Planning Case No. SUB-ADJ19-08. A Subdivision Modification has been submitted for a portion of the site, Basin #1, to allow for a multi-family development and reduce the initial lot quantity to approximately 177 lots. The site is located north of Kuebler Blvd and east of Reed Road SE & Battle Creek Road SE. The parcel of land to be developed is Tax Lots 100, 200, 400 & 601 of Marion County Assessor's Map 08 3W 11D and Tax Lots 1600 & 1700 of Marion County Assessor's Map 08 3W 12B. A vicinity map and supporting maps are in Appendix A of this report.

Project Site

Green Stormwater Infrastructure (GSI) to the Maximum Extent Feasible (MEF) is being used per City of Salem Administrative Rules, Chapter 109, Division 004, Stormwater System, Appendix 4E (Standards) and Ordinance No. 8-20. All facilities will be constructed to meet the appropriate City of Salem standards.

Existing Conditions

The 45.4-acre site is irregular in the shape. Surface conditions consists of grass, brush and minimal trees. There are no identified wetlands or sensitive areas located on the property. The West Middle Fork of Pringle Creek runs through the western portion of Tax Lot 200. A topographical high point ridge is located on the easterly side of the site. Drainage from this high point flows northerly and westerly. The maximum relief is approximately 132-feet with a high point elevation of 418. The abutting properties are zoned single family residential, residential agriculture, commercial retail, public health and mixed use with public improvements that include storm water conveyance systems. Appendix A contains multiple maps of the site.

Soils

The Natural Resources Conservation Service (NRCS) Soil Resource Report for Marion County was used to determine a Hydrological Soil Group classification for runoff calculations. The report identifies the site soils to be McAlpin, Nekia and Silverton soils. All the soils are in the hydrologic soil group C. The report is in Appendix B.

Infiltration

An infiltration test was performed at the site to determine percolation rate of the soil. Test results indicate rates below 0.5 inches. Appendix B contains an excerpt from the geotechnical report with recommended infiltration rates.

Water Quality Methodology

Because of the poor percolation rates of the soils and natural steep slopes that dominate the site, green stormwater facilities are designed as volume control facilities with filtration for all sections.

Water Quality Analysis

Water quality flow rates will be calculated with HydroCAD 10.00. The SCS TR-20 Unit Hydrograph method will be used to generate the hydrographs. A Type 1A storm and a 24-hour rainfall depth of 1.38 inches per hour will be used to determine the water quality flow rate.

Water Quality Design

The proposed combination facilities will provide water quality treatment by allowing for the removal of pollutants through sedimentation, adsorption onto surrounding vegetation, filtration and biological uptake. The planters will be designed per the City of Salem designed standards.

STORMWATER QUANTITY ANALYSIS – BASINS 2 & 3

Stormwater quantity (Flow Control) is proposed to be handled by on-site detention. Runoff from the developed basins will be routed to the facilities that ultimately controls runoff to pre-developed flow rates. It should be noted that the site currently has two independent drainage basins but were analyzed as a single basin because the ultimate outlet is the nearby West Middle Fork of Pringle Creek.

Per Subsection 4.2(p)(3)(A) of the standards and Ordinance No. 8-20, one-half of the post development peak runoff rate of the two-year storm must be equal to or less than one-half of the peak runoff rate of the pre-developed two-year, 24-hour storm. This also applies to the 10, 25 and 100-year, 24-hour storm events.

The pre-developed flow rates were calculated using HydroCAD 10.00. Table 1 below lists the 24-hour rainfall depths used for the analysis of each storm event. Please note that the 2-year event was halved and then analyzed.

Table 1

Storm Event	24-hour Rainfall Depth (in)
2	2.2
10	3.2
25	3.6
100	4.4

For the pre-developed conditions, a time of concentration of 17.4 minutes was calculated for the Basin. The time of concentration data is in Appendix C. The calculations are incorporated in the HydroCAD output located in Appendix D. The entire area was classified as "City of Salem Pre-Development, HSG C" with a Curve Number (CN) of 72. A pre-developed basin map is in Appendix A.

The SCS TR-20 Unit Hydrograph method was used to generate the hydrographs. A Type 1A rainfall distribution was used with the above rainfall depths. Table 2 below identifies the allowable pre-developed release rate for each storm event.

Table 2

Storm Event	Basin #2 Allowable Release Rate (cfs)	Basin #3 Allowable Release Rate (cfs
Half of 2-year	0.05	0.04
10-year	2.58	2.12
25-year	3.66	3.01
100-year	6.09	5.01

The post-developed flow rates were calculated using HydroCAD 10.00. A time of concentration of 10 minutes was assumed for all basins. The calculations are incorporated in the HydroCAD output located in Appendix D. Each basin was classified as 60 percent "Impervious, HSG C" with a CN of 98 and 40 percent "> 75% Grass cover, HSG C" with a CN of 74. This was based on code setback requirements, City street section standards and developer design input on housing size. Table 3 below lists the CN values for the developed areas that will contribute storm water runoff to the detention systems. A developed basin map is in Appendix A.

Table 3

Basin	Impervious Area (Ac) CN = 98	Landscape Area (Ac) CN = 74	TOTAL Area (Ac)	Composite CN
Basin B2	10.49	6.99	17.48	88
Basin B3	8.63	5.75	14.38	88

Table 4 below identifies the calculated detention volume requirements for each storm event. The required detention was determined by using HydroCAD.

Table 4

Storm Event	Basin B2 Detention Volume (cf)	Basin B3 Detention Volume (cf)
Half of 2-year	17,100	14,150
10-year	34,600	28,450
25-year	40,900	33,800
100-year	49,850	45,100

The proposed detention systems will be detention pond facilities located near the lowest point in each basin to maximize the capture of runoff. A basin map has been provided in Appendix A showing the locations of the detention ponds.

STORMWATER QUANTITY ANALYSIS – BASIN 1

Stormwater quantity (Flow Control) is proposed to be handled by on-site detention. Runoff from the developed basins will be routed to the facilities that ultimately controls runoff to pre-developed flow rates.

Per Subsection 4.2(p)(3)(A) of the standards and Ordinance No. 8-20, one-half of the post development peak runoff rate of the two-year storm must be equal to or less than one-half of the peak runoff rate of the pre-developed two-year, 24-hour storm. This also applies to the 10, 25 and 100-year, 24-hour storm events.

The pre-developed flow rates were calculated using HydroCAD 10.00. Table 5 below lists the 24-hour rainfall depths used for the analysis of each storm event. Please note that the 2-year event was halved and then analyzed.

Table 5

Storm Event	24-hour Rainfall Depth (in)
2	2.2
10	3.2
25	3.6
100	4.4

For the pre-developed conditions, a time of concentration of 17.4 minutes was calculated for the Basin. The time of concentration data is in Appendix C. The calculations are incorporated in the HydroCAD output located in Appendix D. The entire area was classified as "City of Salem Pre-Development, HSG C" with a Curve Number (CN) of 72. A pre-developed basin map is in Appendix A.

The SCS TR-20 Unit Hydrograph method was used to generate the hydrographs. A Type 1A rainfall distribution was used with the above rainfall depths. Table 6 below identifies the allowable pre-developed release rate for each storm event.

Table 6

Storm Event	Basin #1 Allowable Release Rate (cfs)
1/2 of 2-year	0.04
10-year	2.00
25-year	2.84
100-year	4.73

The post-developed flow rates were calculated using HydroCAD 10.00. A time of concentration of 15 minutes was assumed for all basins. The calculations are incorporated in the HydroCAD output located in Appendix D. Each basin was classified as 60 percent "Impervious, HSG C" with a CN of 98 and 40 percent “> 75% Grass cover, HSG C” with a CN of 74. This was based on code setback requirements and City street section standards. Table 7 below lists the CN values for the developed areas that will contribute storm water runoff to the detention systems. A developed basin map is in Appendix A.

Table 7

Basin	Impervious Area (Ac) CN = 98	Landscape Area (Ac) CN = 74	TOTAL Area (Ac)	Composite CN
Basin B1	8.15	5.43	13.58	88

Table 8 below identifies the calculated detention volume requirements for each storm event. The required detention was determined by using HydroCAD.

Table 8

Storm Event	Basin B2 Detention Volume (cf)
1/2 of 2-year	13,400
10-year	27,500
25-year	31,750
100-year	38,350

The proposed detention systems will be detention pond facilities located near the lowest point in each basin to maximize the capture of runoff. A basin map has been provided in Appendix A showing the locations of the detention ponds.

STORMWATER QUALITY ANALYSIS

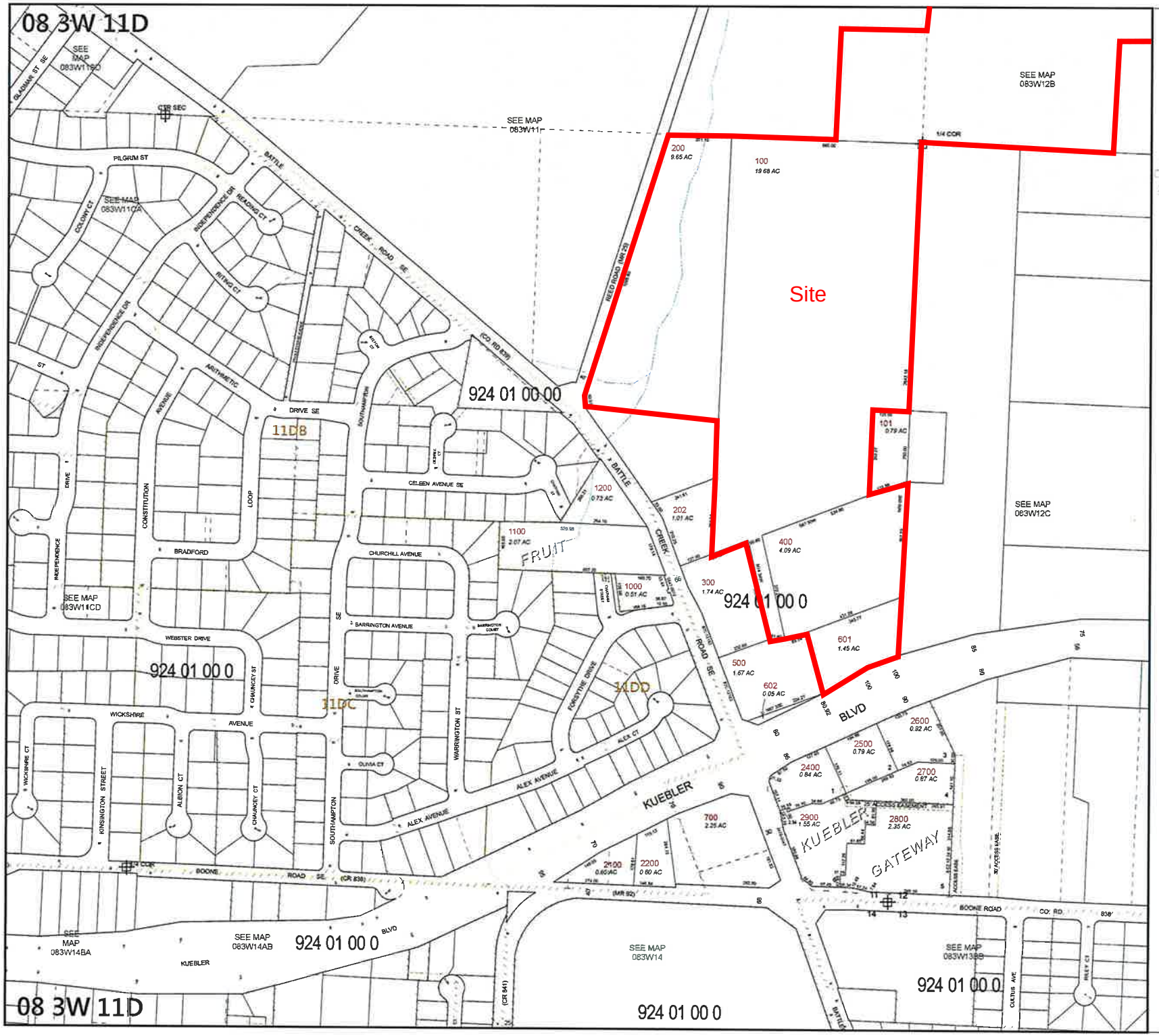
Water quality flow rates were calculated using HydroCAD 10.00. The SCS TR-20 Unit Hydrograph method was used to generate the hydrographs. A Type 1A rainfall distribution was used with a 1.38 rainfall depth. Appendix E contains the analysis.

All detention facilities will incorporate filtration sections and will be constructed per City of Salem standards.

CONCLUSION

Based on the presented information, the proposed design will meet the water quality and quantity standards. If there are any questions regarding this analysis or the design, please contact Matthew Hendrick at Multi/Tech Engineering by phone at (503) 363-9227 or via e-mail at mhendrick@mtengineering.net.

Appendix A



08 3W 11D
SALEM

MARION COUNTY, OREGON
SE1/4 SEC11 T8S R3W W.M.
SCALE 1" = 200'

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)

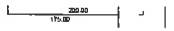
NUMBERS

Tax Code Number
000 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



CANCELLED NUMBERS

201	1400	2302
301	1500	2303
501	1600	
502	1601	
600	1700	
603	1800	
700A1	1801	
701	1900	
702	1901	
703	2000	
800	2001	
801	2002	
900	2101	
901	2102	
902	2201	
1001	2300	
1300	2301	

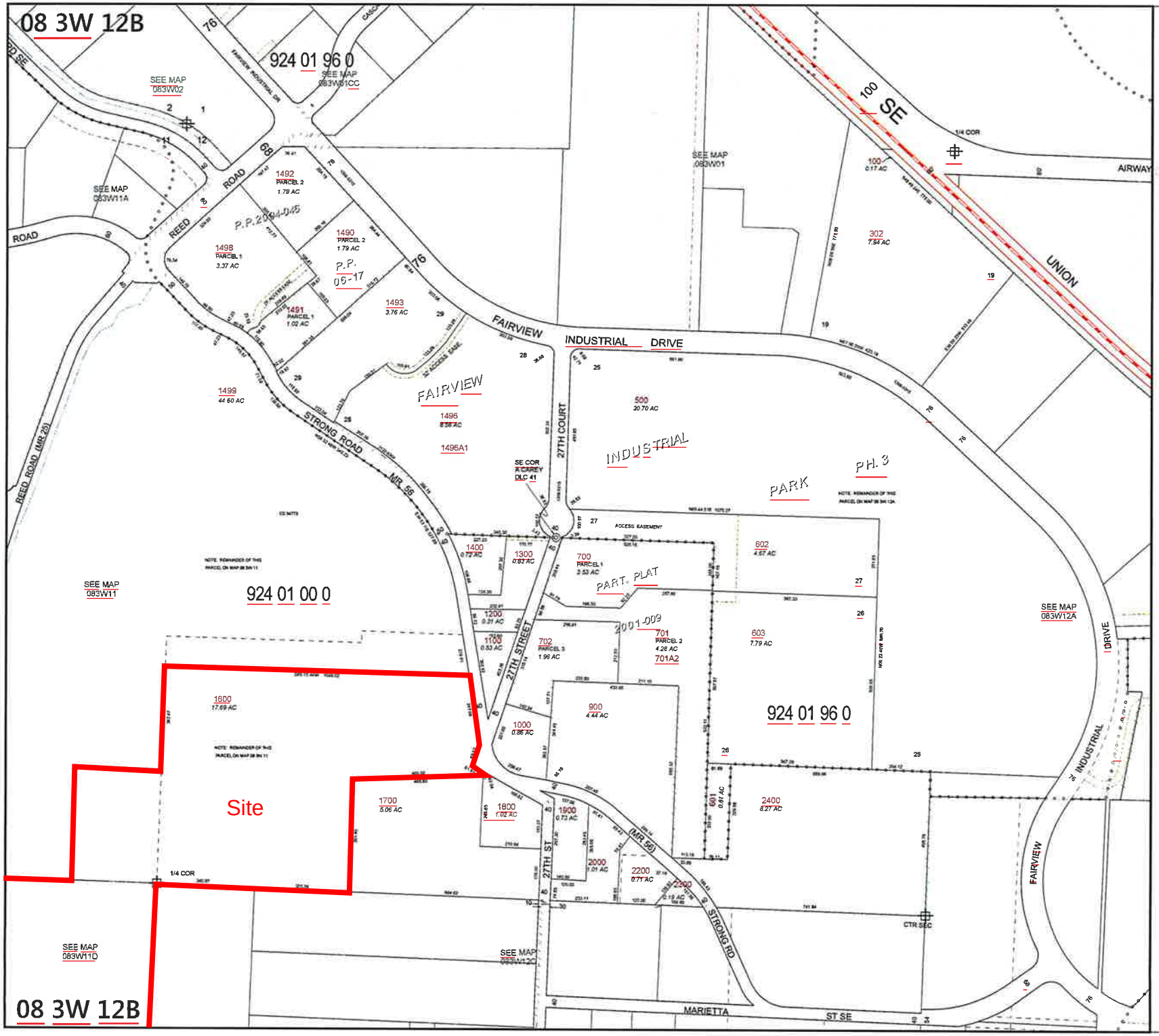
DISCLAIMER: THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSES ONLY

Assessors Office Cartography Dept

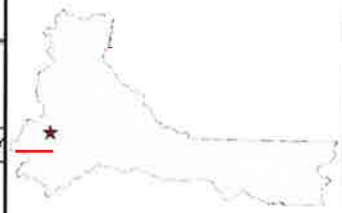
FOR ADDITIONAL MAPS VISIT OUR WEBSITE AT www.co.marion.or.us

PLOT DATE: 1/24/2018

SALEM
08 3W 11D



08 3W 12B
SALEM



MARION COUNTY, OREGON

NW1/4 SEC12 T8S R3W W.M.

SCALE 1" = 200'

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

NUMBERS

Tax Code Number

000 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

CANCELLED NUMBERS

200	1498A1
201	1498A2
202	1498A3
300	1500
301	1601
400	2100
401	
402	
501	
502	
503	
600	
700A1	
701A1	
800	
1494	
1497	

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: 1/24/2018

SALEM
08 3W 12B

COBURN GRAND VIEW ESTATES

T. 8 S., R. 3 W., Willamette Meridian
Sec. 11D Tax Lots 100, 200, 400 & 601 - Sec. 12B Tax Lot 1600
City Of Salem, Marion County, Oregon

Owner / Developer:

WESTWOOD HOMES LLC

12700 NW CORNELL RD.
PORTLAND, OREGON 97229

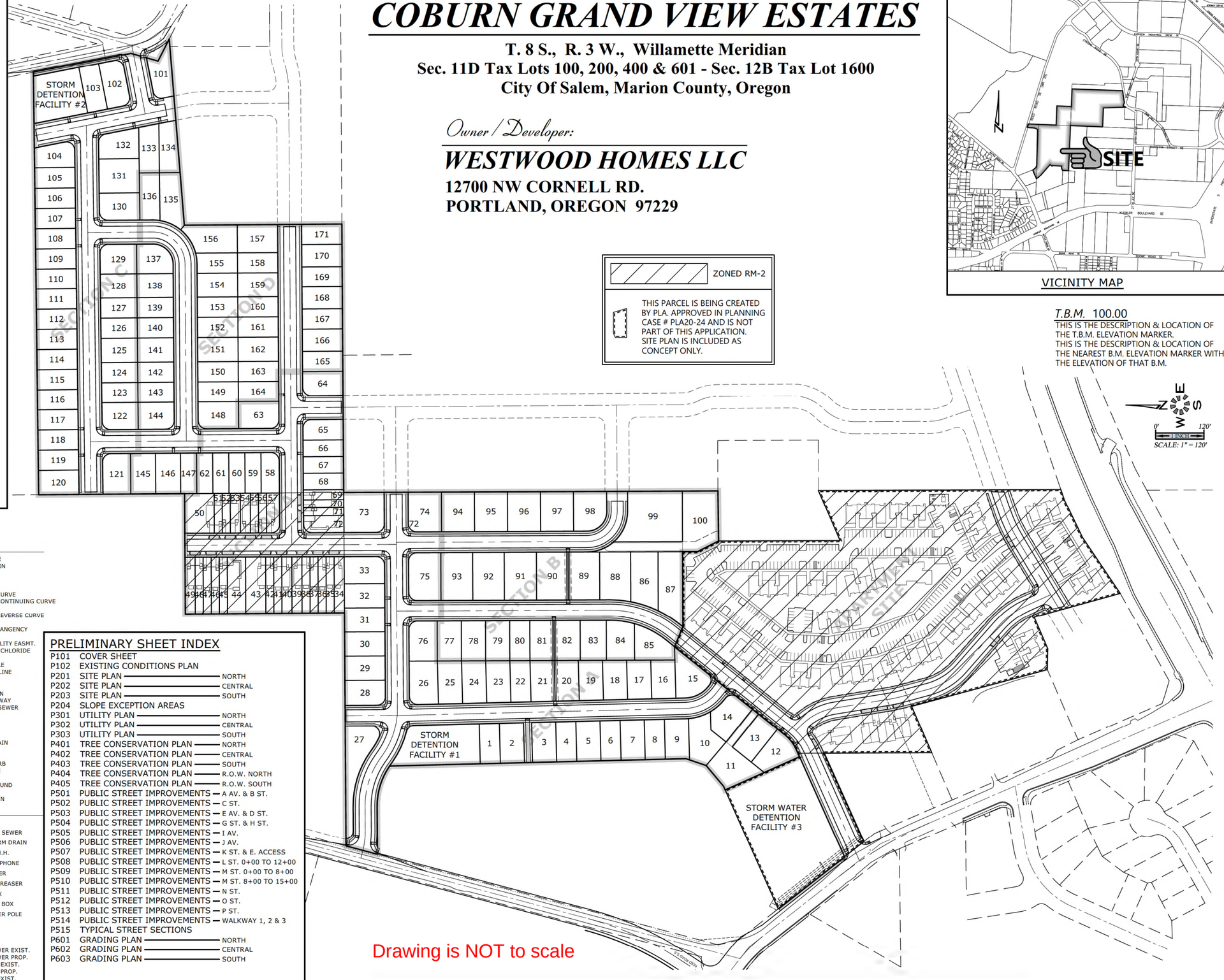
TOTAL PARCEL SIZE:
DEVELOPABLE AREA — 32.545 Ac.
NUMBER OF UNITS — 170
DENSITY — 4.51 UNITS/Ac.
LARGEST LOT — 13,195 S.F.
SMALLEST LOT — 5,500 S.F.
AVERAGE — 6,753 S.F.

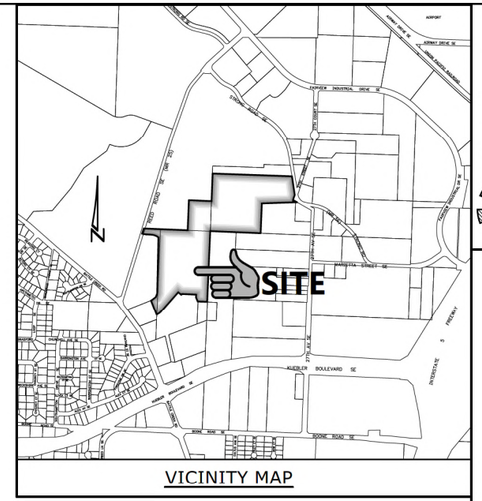
SECTION A:
DEVELOPABLE AREA — 13.492 Ac.
NUMBER OF UNITS — 76
DENSITY — 5.63 UNITS/Ac.
LARGEST LOT — 10,658 S.F.
SMALLEST LOT — 1,982 S.F.
AVERAGE — 5,038 S.F.

SECTION B:
DEVELOPABLE AREA — 6.068 Ac.
NUMBER OF UNITS — 24
DENSITY — 3.96 UNITS/Ac.
LARGEST LOT — 17,940 S.F.
SMALLEST LOT — 4,951 S.F.
AVERAGE — 8,559 S.F.

SECTION C:
DEVELOPABLE AREA — 6.828 Ac.
NUMBER OF UNITS — 34
DENSITY — 4.98 UNITS/Ac.
LARGEST LOT — 10,658 S.F.
SMALLEST LOT — 4,484 S.F.
AVERAGE — 5,499 S.F.

SECTION D:
DEVELOPABLE AREA — 6.155 Ac.
NUMBER OF UNITS — 36
DENSITY — 5.85 UNITS/Ac.
LARGEST LOT — 8,353 S.F.
SMALLEST LOT — 4,001 S.F.
AVERAGE — 5,492 S.F.





T.B.M. 100.00
THIS IS THE DESCRIPTION & LOCATION OF THE T.B.M. ELEVATION MARKER.
THIS IS THE DESCRIPTION & LOCATION OF THE NEAREST B.M. ELEVATION MARKER WITH THE ELEVATION OF THAT B.M.

N
W E
S
0' 120'
1 INCH
SCALE: 1" = 120'

PRELIMINARY SHEET INDEX

ABBREVIATIONS

A.C.	ASPHALTIC CONCRETE	L.P.	LIGHT POLE
ACMP	ALUMINIZED CMP	M	METER, MAIN
ASSY.	ASSEMBLY	M.H.	MANHOLE
B.O.	BLOW OFF	MTL.	METAL
B.F.V.	BUTTERFLY VALVE	O.H.	OVERHEAD
C & G	CURB & GUTTER	PC	POINT OF CURVE
CATV	CABLE TELEVISION	PCC	POINT OF CONTINUING CURVE
C.B.	CATCH BASIN	PED.	PEDESTAL
C.B.C.O.	CATCH BASIN CLEANOUT	PRC	POINT OF REVERSE CURVE
C.B.I.	CATCH BASIN INLET	PROP.	PROPOSED
C.L.	CENTERLINE	PT	POINT OF TANGENCY
CMP	CORRUGATED METAL PIPE	PUB.	PUBLIC
C.O.	CLEANOUT	PUE	PUBLIC UTILITY EASMT.
CONC.	CONCRETE	PVC	POLYVINYL CHLORIDE
CONST.	CONSTRUCT	PVT.	PRIVATE
D.I.	DUCTILE IRON	P.P.	POWER POLE
DIA.	DIAMETER	P.L.	PROPERTY LINE
DWG.	DRAWING	R	RADIUS
EASMT.	EASEMENT	R-	RIM
E.G.	EXIST. GRADE / GROUND	RD	ROOF DRAIN
EOP, E.P.	EDGE OF PAVEMENT	R.O.W.	RIGHT-OF-WAY
ELEC.	ELECTRIC	SAN.S. or S.S.	SANITARY SEWER
ELEV. or EL.	ELEVATION	S	SLOPE
EX. or EXIST.	EXISTING	STA.	STATION
F.I.	FELT	STD.	STANDARD
F.F.	FINISH FLOOR	STL.	STEEL
F.G.	FINISH GRADE	STM.DRN. or S.D.	STORM DRAIN
F.H.	FIRE HYDRANT	SVC.	SERVICE
F.M.	FORCE MAIN	SW	SIDEWALK
GUT. or GTR.	GUTTER	T.C.	TOP OF CURB
G.V.	GATE VALVE	TEL.	TELEPHONE
IMP.	IMPROVEMENT	TYP.	TYPICAL
INST.	INSERT	U.G.	UNDERGROUND
INV. or I-	INVERT	VLT.	VAULT
L	LENGTH, LINE	W.M.	WATER MAIN

SYMBOLS

EXIST.	PROP.		EXIST.	PROP.	
⊖	◓	BLOW OFF ASSY.	Ⓢ	Ⓢ	MANHOLE SAN. SEWER
▥	▥	CATCH BASIN	Ⓓ	Ⓓ	MANHOLE STORM DRAIN
▣	■	CATCH BASIN CLEANOUT	②	②	2' DIA. C.O. / M.H.
▣	▣	CATCH BASIN INLET	Ⓣ	Ⓣ	MANHOLE TELEPHONE
△	▲	CATV PED. / BOX	Ⓦ	Ⓦ	MANHOLE WATER
○	●	CLEANOUT	▷	▶	REDUCER / INCREASER
▨	▨	ELEC. PED. / BOX	▣	▣	TEL. PED. / BOX
⛑	⛑	FIRE HYDRANT	▭	▭	TRAFFIC PED. / BOX
⊛	⊛	GAS LOCATION MARKER			UTILITY / POWER POLE
⋈	⋈	GAS VALVE		■	WATER METER
▭	◧	MAIL BOX	⊗	⊗	WATER VALVE

CABLE TELEVISION	SANITARY SEWER EXIST.
CENTERLINE	SANITARY SEWER PROP.
DITCH C.L.	STORM DRAIN EXIST.
ELECTRICAL LINE	STORM DRAIN PROP.
GAS MAIN	WATER MAIN EXIST.
TELEPHONE LINE	WATER MAIN PROP.

MULTI/TECH
ENGINEERING SERVICES, INC.
1155 13th ST. S.E. SALEM, OR. 97302
PH. (503) 363-9227 FAX (503) 364-1260
www.mtengineering.net office@mtengineering.net

PRELIMINARY PLAN
COVER SHEET

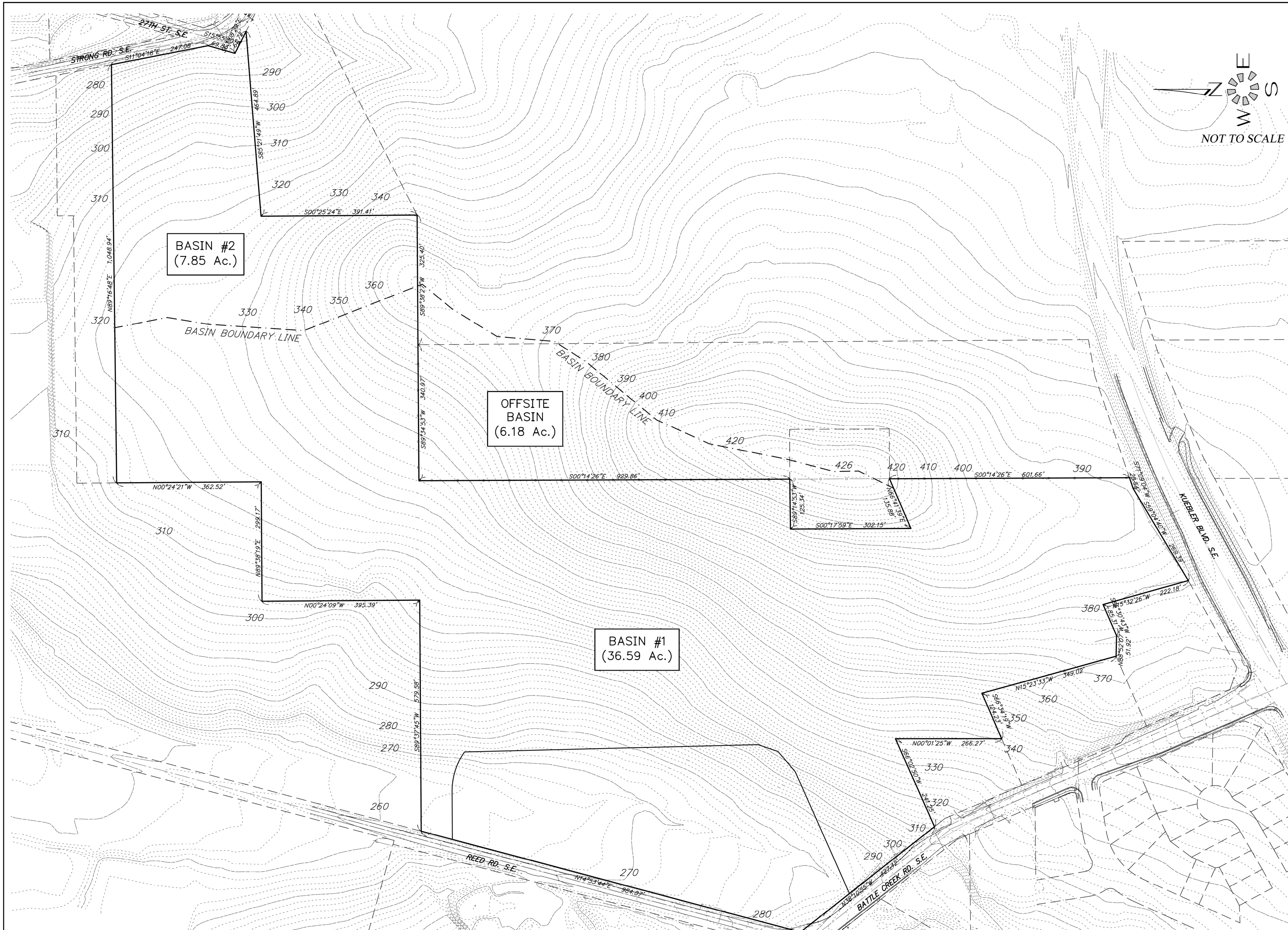
COBURN GRAND VIEW ESTATES

Design: M.D.G.
Drawn: P.H.S.
Checked: J.J.G.
Date: JUNE 2018
Scale: AS SHOWN
As-Built: ---

REGISTERED PROFESSIONAL ENGINEER
OREGON
JUNE 14, 1978
MARK D. GRENZ
EXPIRES: 06-30-2021

JOB # 6234

P101



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EXISTING CONDITIONS BASIN MAP

COBURN GRAND VIEW ESTATES

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: P.H.S.
Checked: J.J.G.
Date: JUNE 2018
Scale: AS SHOWN

JOB # 6234

SITE AREA: 45.44 Ac.
✱CITY OF SALEM PRE-DEVELOPED, HSG C, CN=79

27TH ST. S.E.

STRONG RD. S.E.

KUEBLER BLVD. S.E.

BATTLE CREEK RD. S.E.

REED RD. S.E.

PRE DEVELOPED PLAN

MULTI/TECH

ENGINEERING SERVICES, INC.

1155 13th ST. S.E. SALEM, OR. 97302

PH. (503) 363 - 9227 FAX (503) 364-1260

www.mtengineering.net office@mtengineering.net

6234p.dwg-01ExhPre

DRAINAGE BASIN AREAS	
B1	13.58 Ac.
B2	17.48 Ac.
B3	14.38 Ac.

SITE AREA: 45.44 Ac.		
✱ 60% IMPERVIOUS,	HSG C,	CN=98
✱ 40% LANDSCAPE,	HSG C,	CN=74
COMPOSITE,	HSC C,	CN=88

27TH ST. S.E.

STRONG RD. S.E.

N E S W

BASIN 3

BASIN 2

BASIN 1

KUEBLER BLVD. S.E.

BATTLE CREEK RD. S.E.

REED RD. S.E.

POST DEVELOPED PLAN

6234p2020.dwg-Exh02

MULTI/TECH

ENGINEERING SERVICES, INC.

1155 13th ST. S.E. SALEM, OR. 97302

PH. (503) 363 - 9227 FAX (503) 364-1260

www.mtengineering.net office@mtengineering.net

J:\62xx\6234-ReedRoad\Dwg v20\6234p2020.dwg, EXH02, 2/4/2021 3:25:44 PM, PSaunders

DRAINAGE BASIN AREAS	
B1	13.58 Ac.
B2	17.48 Ac.
B3	14.38 Ac.

DETENTION FACILITY VOLUMES	
No. 1	61,700 C.F.
No. 2	59,400 C.F.
No. 3	52,000 C.F.

27TH ST. S.E.

STRONG RD. S.E.

FACILTY No. 3

N E S W

BASIN 3

BASIN 2

BASIN 1

KUEBLER BLVD. S.E.

BATTLE CREEK RD. S.E.

FACILTY No. 2

FACILTY No. 1

REED RD. S.E.

WATER QUALITY AND DETENTION FACILITY PLAN

6234p2020.dwg-EXH03

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1155 13th ST. S.E. SALEM, OR. 97302
PH. (503) 363 - 9227 FAX (503) 364-1260
www.mtengineering.net office@mtengineering.net

Appendix B

United States Department of Agriculture

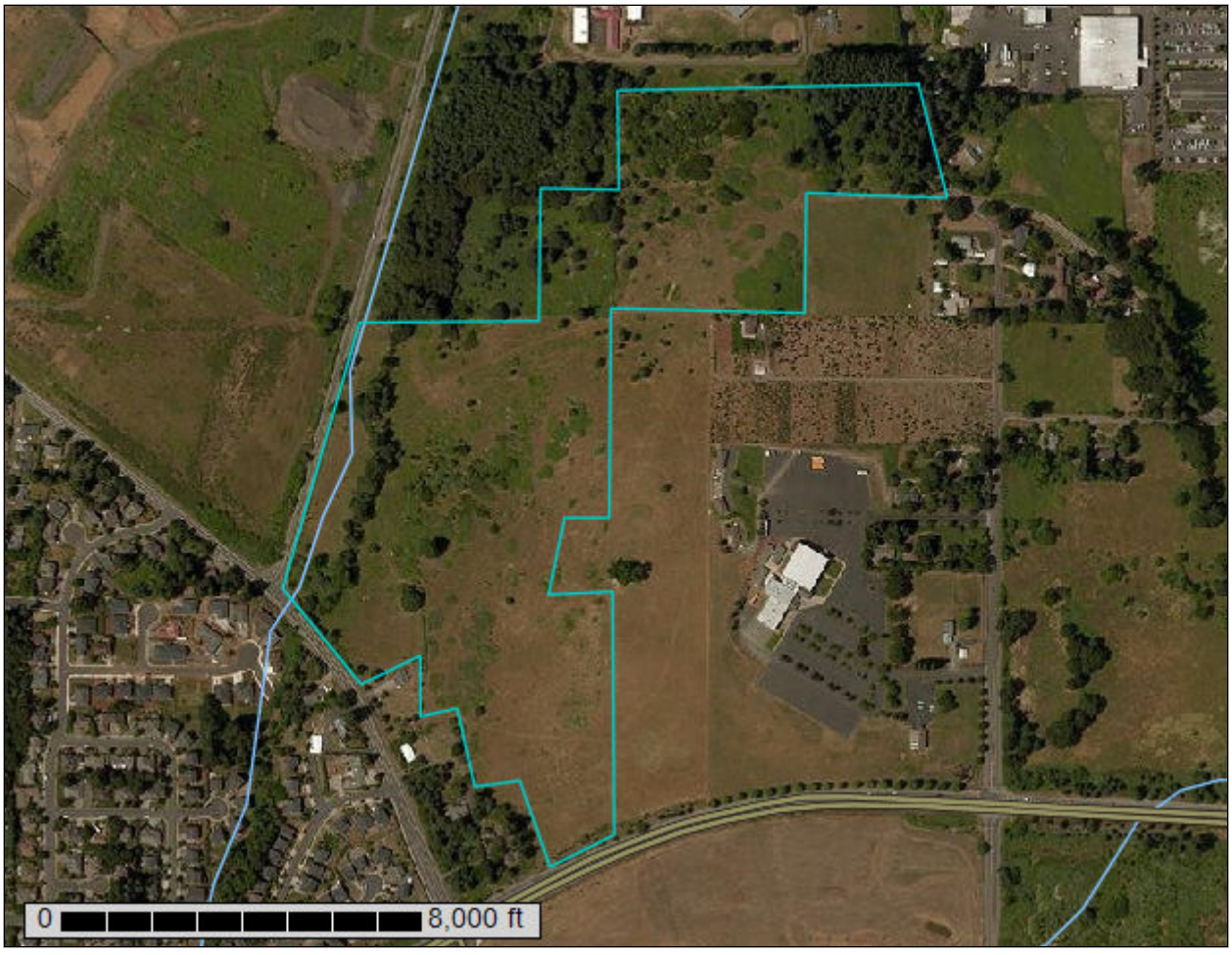
NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

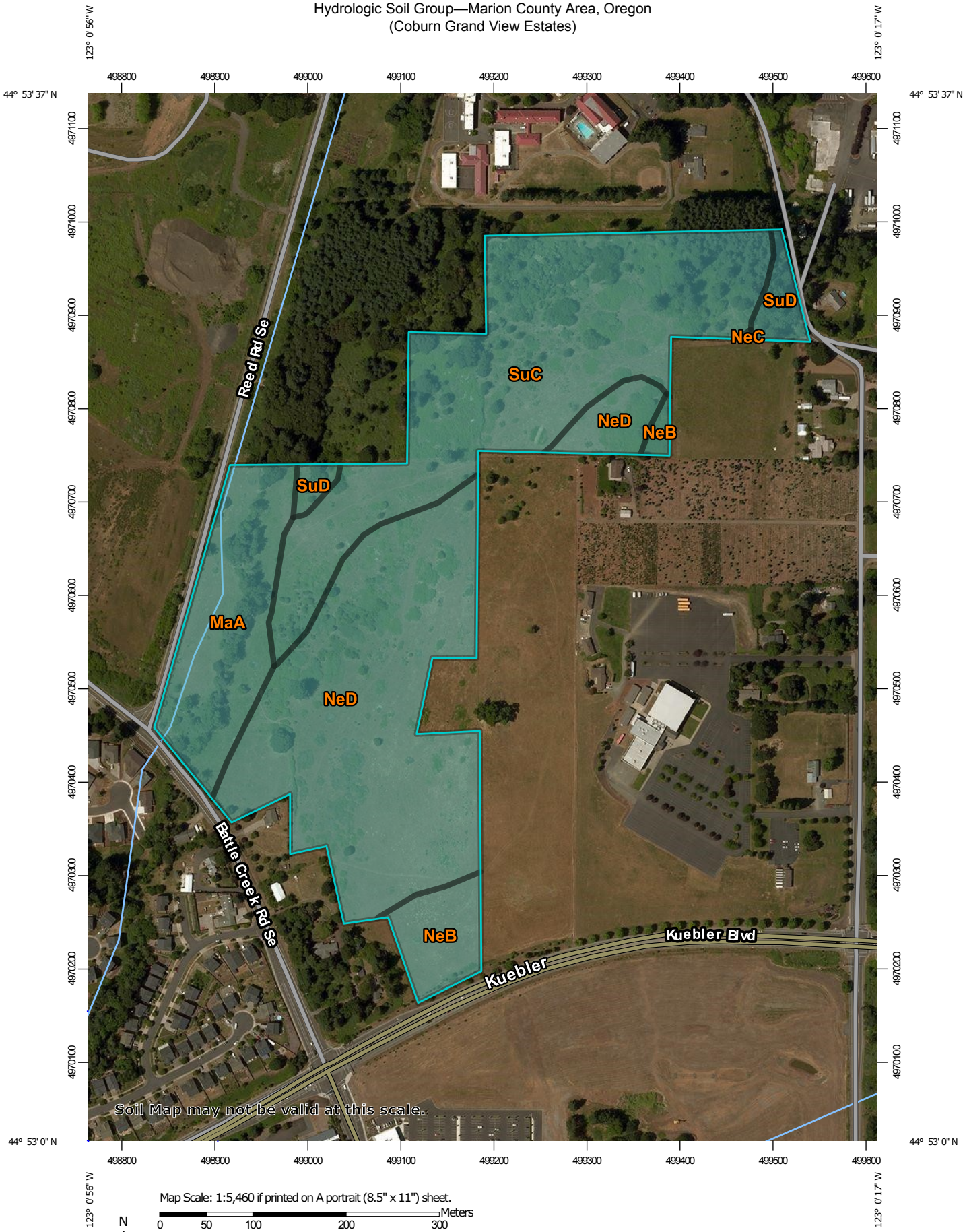
Custom Soil Resource Report for Marion County Area, Oregon

Coburn Grand View Estates



October 1, 2018

Hydrologic Soil Group—Marion County Area, Oregon
(Coburn Grand View Estates)



Map Scale: 1:5,460 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 250 500 1000 1500

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.

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 15, Sep 18, 2018

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

Date(s) aerial images were photographed: Jun 15, 2015—Jun 23, 2015

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
MaA	McAlpin silty clay loam, 0 to 3 percent slopes	C	7.2	13.8%
NeB	Nekia silty clay loam, 2 to 7 percent slopes	C	2.7	5.1%
NeC	Nekia silty clay loam, 7 to 12 percent slopes	C	0.0	0.1%
NeD	Nekia silty clay loam, 12 to 20 percent slopes	C	21.3	40.8%
SuC	Silverton silt loam, 2 to 12 percent slopes	C	19.6	37.4%
SuD	Silverton silt loam, 12 to 20 percent slopes	C	1.5	2.8%
Totals for Area of Interest			**52.2**	**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

Surface Drainage/Groundwater

We recommend that positive measures be taken to properly finish grade the site so that drainage waters from the residential structures and landscaping areas as well as adjacent properties or buildings are directed away from the new residential structures foundations and/or floor slabs. All roof drainage should be directed into conduits that carry runoff water away from the residential structures to a suitable outfall. Roof downspouts should not be connected to foundation drains. A minimum ground slope of about 2 percent is generally recommended in unpaved areas around the proposed new residential structures.

Groundwater was not encountered at the site in any of the exploratory test pits (TH-#1 through TH-#11) at the time of excavation to depths of at least 7 feet beneath existing site grades. However, the northwesterly and/or westerly portion(s) of the site contains an existing seasonal drainage basin feature. Additionally, groundwater elevations in the area and/or across the subject property may fluctuate seasonally and may temporarily pond/perch near the ground surface during periods of prolonged rainfall.

As such, based on our current understand of the possible site grading required to bring the subject site and/or residential lots to finish design grade(s), we are of the opinion that an underslab drainage system is not required for the proposed single-family residential structures. However, a perimeter foundation drain is recommended for any perimeter footings and/or below grade retaining walls. A typical recommended perimeter footing/retaining wall drain detail is shown on Figure No. 4. Further, due to our understanding that various surface infiltration ditches and/or swales may be utilized for the project as well as the relatively low infiltration rates of the near surface clayey, sandy silt and/or silty sand subgrade soils anticipated within and/or near to the foundation bearing level of the proposed residential structures, we are generally of the opinion that storm water detention and/or disposal systems should not be utilized within the residential lots and/or around the proposed residential structures unless approved by the Geotechnical Engineer.

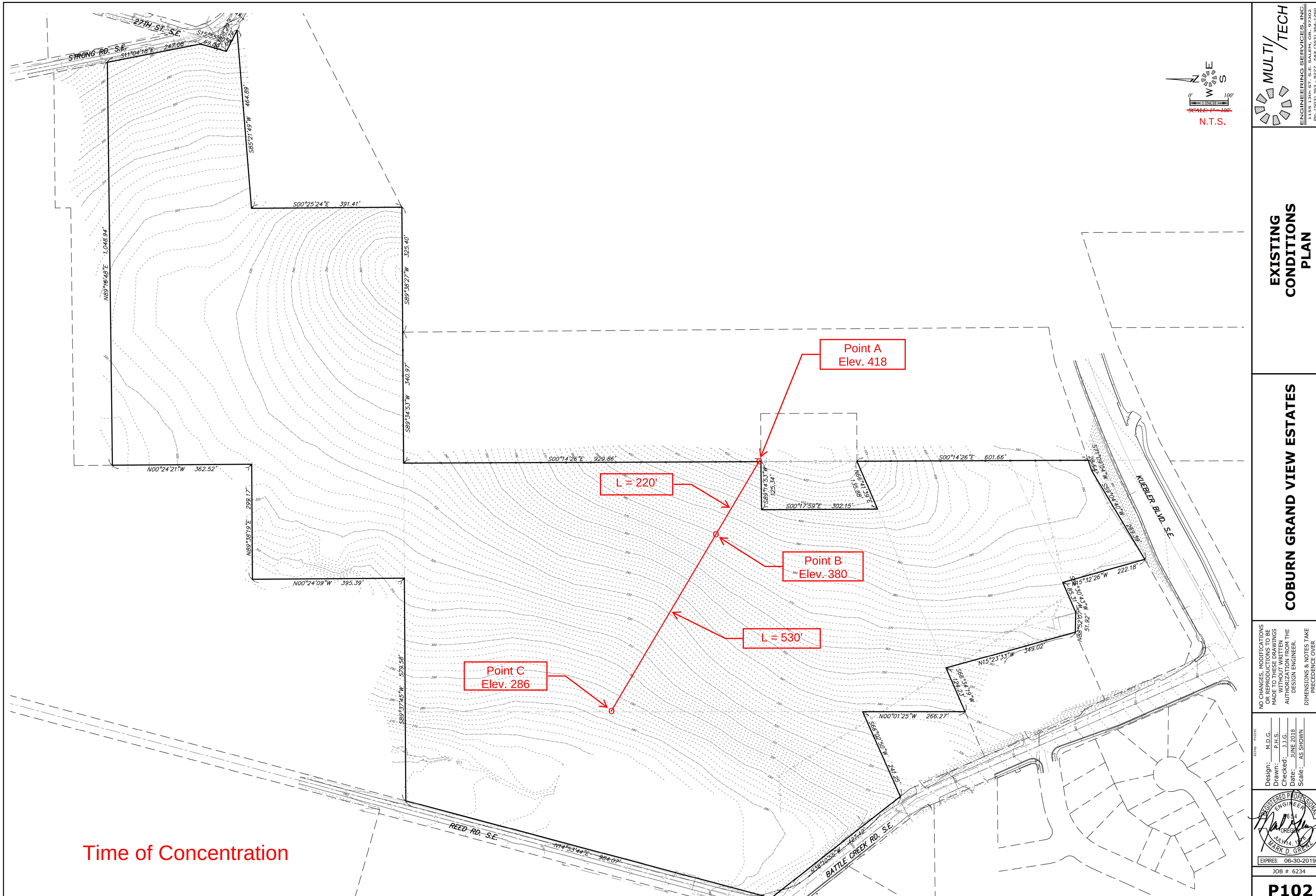
Design Infiltration Rates

Based on the results of our field infiltration testing, we recommend using the following infiltration rate(s) to design any on-site near surface storm water infiltration systems for the project:

Subgrade Soil Type	Recommended Infiltration Rate
sandy, clayey SILT (ML)	0.1 to 0.3 inches per hour (in/hr)

Note: A safety factor of two (2) was used to calculate the above recommended design infiltration rate. Additionally, given the gradational variability of the on-site sandy, clayey sit subgrade soils beneath the site as well as the anticipation of some site grading for the project, it is generally recommended that field testing be performed during and/or following construction of any on-site storm water infiltration system(s) in order to confirm that the above recommended design infiltration rates are appropriate.

Appendix C



Point A
Elev. 418
Point B
Elev. 380
Point C
Elev. 286
L = 220'
L = 530'
Time of Concentration
N.T.S.
STRONG RD. S.E.
27TH ST. S.E.
KUEBLER BLVD. S.E.
REED RD. S.E.
BATTLE CREEK RD. S.E.
S00°25'24"E 391.41'
S00°14'26"E 929.86'
S00°14'26"E 601.66'
S00°17'59"E 302.15'
N00°24'21"W 362.52'
N00°24'09"W 395.39'
N00°01'25"W 266.27'
N15°23'33"W 349.02'
N14°53'44"E 984.07'
S15°32'26"W 222.18'
EXISTING CONDITIONS PLAN
COBURN GRAND VIEW ESTATES
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: P.H.S.
Checked: J.J.G.
Date: JUNE 2018
Scale: AS SHOWN
MARK D. GREW
EXPIRES: 06-30-2019
JOB # 6234
P102

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

Project	By	Date
Coburn Grand View Estates	M. Hendrick	10/2018
Location	**Checked**	**Date**
Salem, Oregon		

Check one: ☑ Present ☐ Developed

Check one: ☑ 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 Tc only)

	Segment ID	A-B	
1.	Surface description (Table 4D-4)	Meadow/Pasture/Farm	
2.	Manning's roughness coefficient, n (Table 4D-4)	0.15	
3.	Flow length, L (total L † 300 ft) ft	220	
4.	Two-year 24-hour rainfall, P_2 in	2.2	
5.	Land slope, s ft/ft	0.173	
6.	$T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t hr	0.156 +	= 0.156

Shallow concentrated flow

	Segment ID	B-C	
7.	Surface description (paved or unpaved)	Forest & Meadow	
8.	Flow length, L ft	530	
9.	Watercourse slope, s ft/ft	0.177	
10.	Average velocity, V (figure 3-1) ft/s	1.1	
11.	$T_t = \frac{L}{3600\ V}$ Compute T_t hr	0.134 +	= 0.134

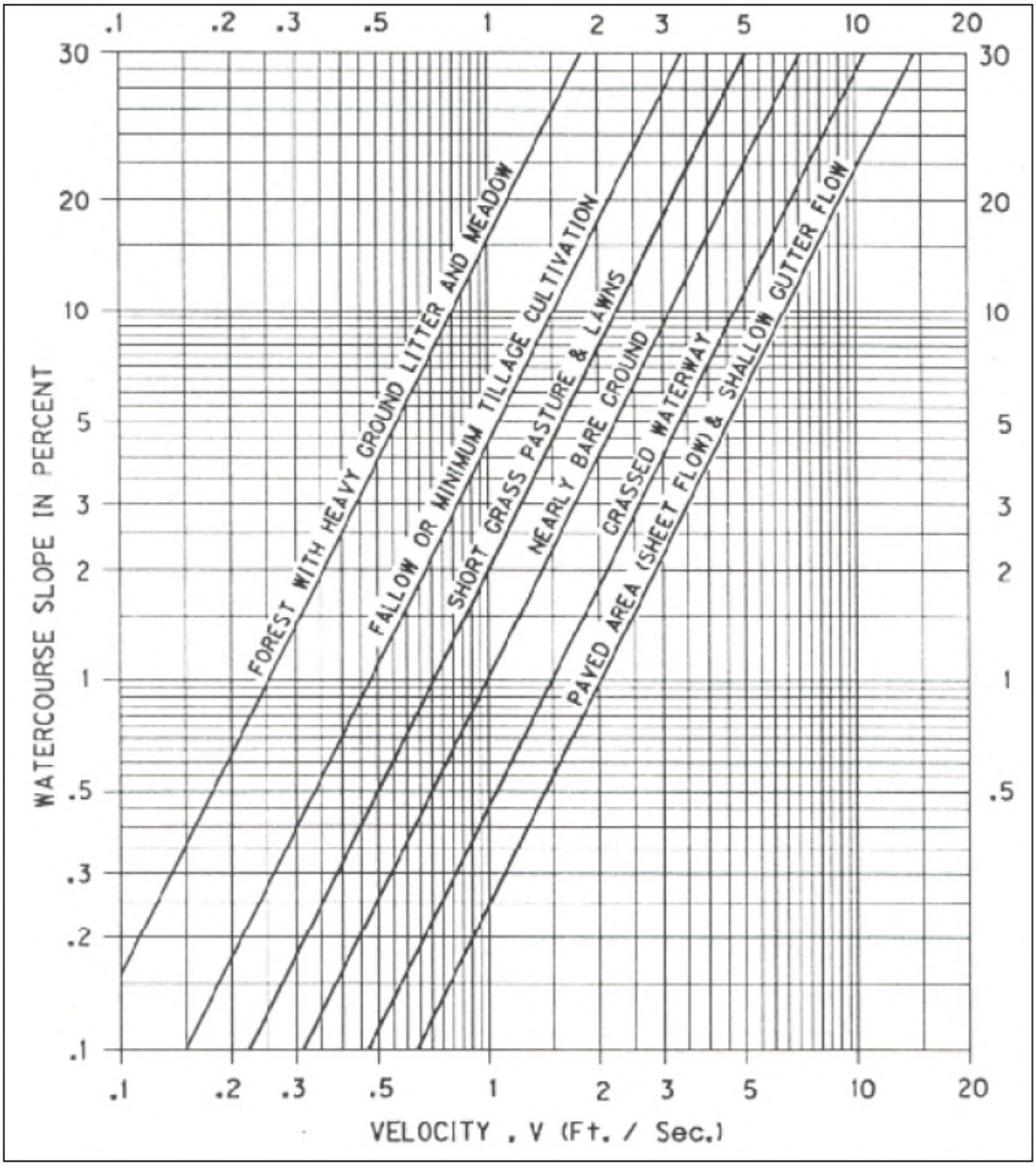
Channel flow

	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		0.29

0.29 Hrs = 17.4 Minutes

Manning's Roughness Coefficients for Overland Sheet Flow	
Surface Types:	**n**
Impervious Areas	0.014
Gravel Pavement	0.02
Developed: Landscape Areas (Except Lawns)	0.08
Undeveloped: Meadow, Pasture, or Farm	0.15
Developed: Lawns	0.24
Pre-developed: Mixed	0.30
Pre-developed: Woodland and Forest	0.40
Development Types:	**n**
Commercial Development	0.015
Industrial Development, Heavy	0.04
Industrial Development, Light	0.05
Dense Residential (over 6 units/acre)	0.08
Normal Residential (3 to 6 units/acre)	0.20
Light Residential (1 to 3 units/acre)	0.30
Parks	0.40

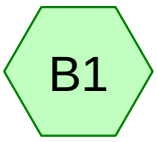
Table 4D-4. Manning's Roughness Coefficients for Overland Sheet Flow


.1
.2
.3
.5
1
2
3
5
10
20
30
20
10
5
3
2
1
.5
.3
.2
.1
WATERCOURSE SLOPE IN PERCENT
FOREST WITH HEAVY GROUND LITTER AND MEADOW
FALLOW OR MINIMUM TILLAGE CULTIVATION
SHORT GRASS PASTURE & LAWNS
NEARLY BARE GROUND
GRASSED WATERWAY
PAVED AREA (SHEET FLOW) & SHALLOW GUTTER FLOW
VELOCITY , V (Ft. / Sec.)

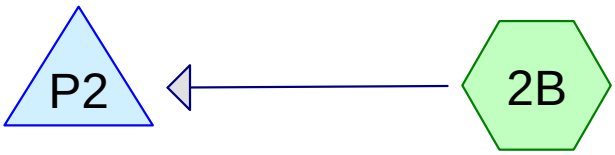
Appendix D

Control MH #1

Developed Conditions

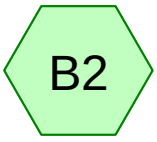


Existing Conditions (Basin #1)

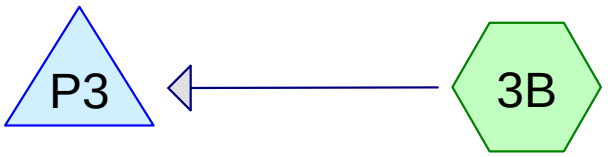


Control MH #2

Developed Conditions

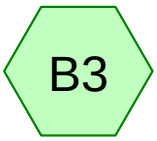


Existing Conditions (Basin #2)

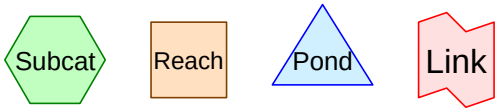


Control MH #3

Developed Conditions



Existing Conditions (Basin #3)



Summary for Subcatchment B1: Existing Conditions (Basin #1)

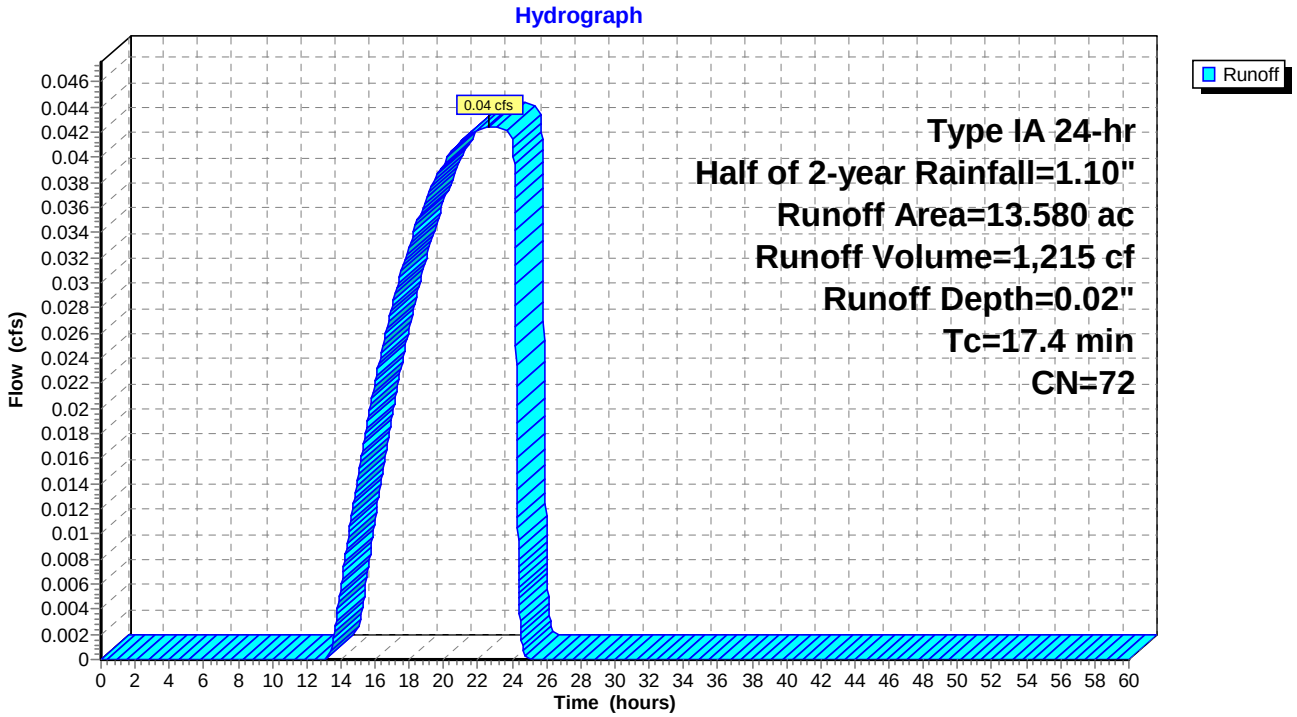
Runoff = 0.04 cfs @ 22.68 hrs, Volume= 1,215 cf, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half of 2-year Rainfall=1.10"

	Area (ac)	CN	Description
*	13.580	72	City of Salem Pre-developed, HSG C
	13.580		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, TR-55 Worksheet**

Subcatchment B1: Existing Conditions (Basin #1)



Summary for Subcatchment B2: Existing Conditions (Basin #2)

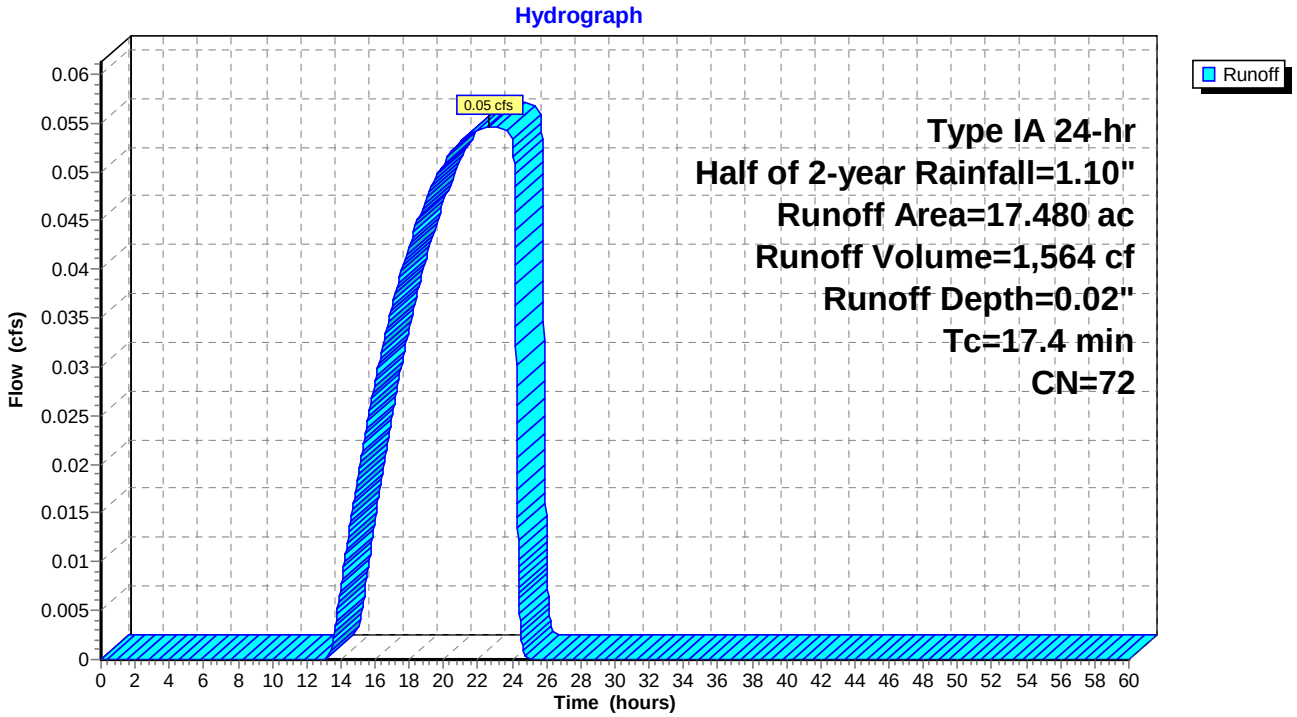
Runoff = 0.05 cfs @ 22.68 hrs, Volume= 1,564 cf, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half of 2-year Rainfall=1.10"

	Area (ac)	CN	Description
*	17.480	72	City of Salem Pre-developed, HSG C
	17.480		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, TR-55 Worksheet**

Subcatchment B2: Existing Conditions (Basin #2)



Summary for Subcatchment B3: Existing Conditions (Basin #3)

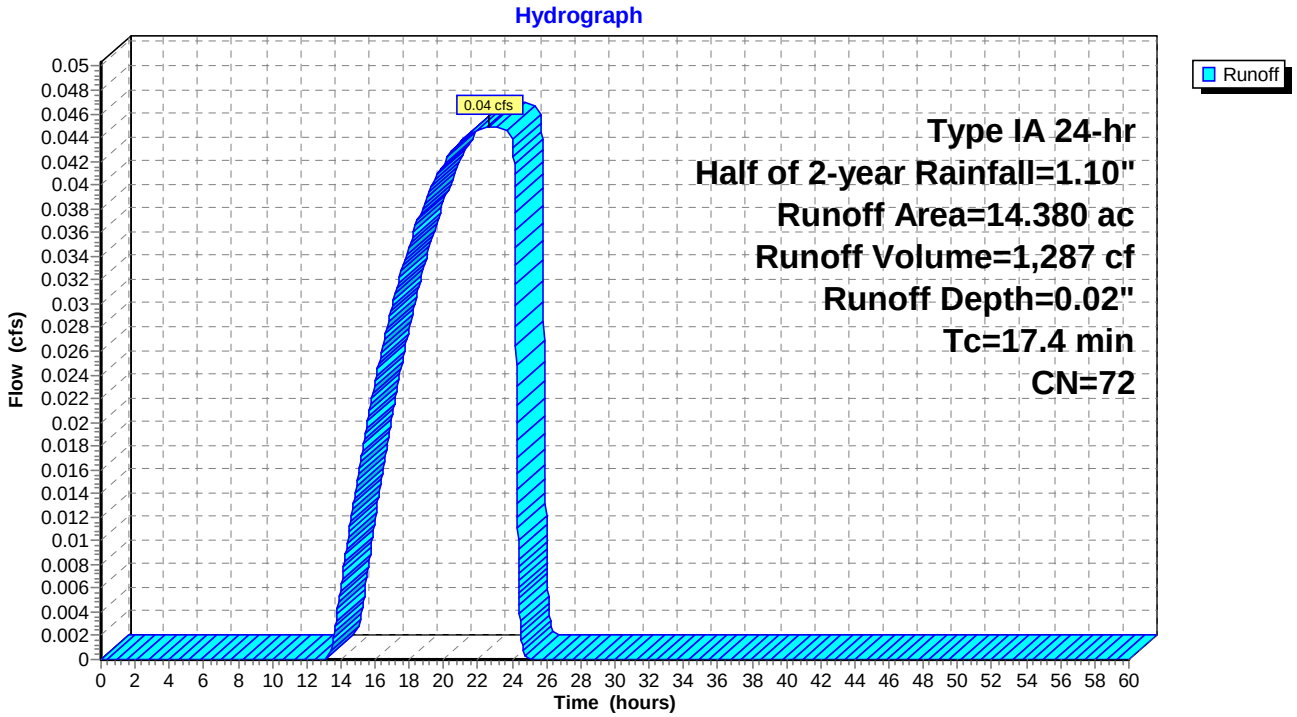
Runoff = 0.04 cfs @ 22.68 hrs, Volume= 1,287 cf, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half of 2-year Rainfall=1.10"

	Area (ac)	CN	Description
*	14.380	72	City of Salem Pre-developed, HSG C
	14.380		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, TR-55 Worksheet**

Subcatchment B3: Existing Conditions (Basin #3)



Summary for Subcatchment 1B: Developed Conditions

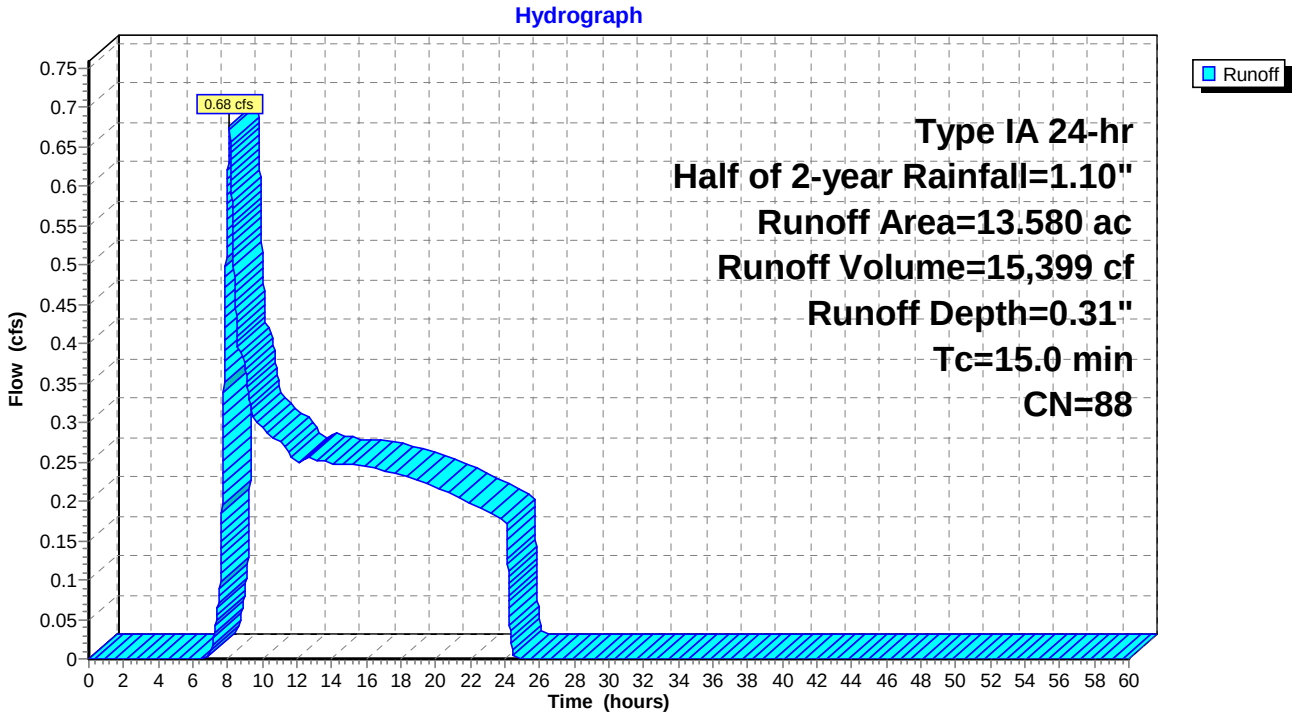
Runoff = 0.68 cfs @ 8.11 hrs, Volume= 15,399 cf, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half of 2-year Rainfall=1.10"

	Area (ac)	CN	Description
	5.430	74	>75% Grass cover, Good, HSG C
*	8.150	98	Impervious surface, HSG C
	13.580	88	Weighted Average
	5.430		39.99% Pervious Area
	8.150		60.01% Impervious Area

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

Subcatchment 1B: Developed Conditions



Summary for Subcatchment 2B: Developed Conditions

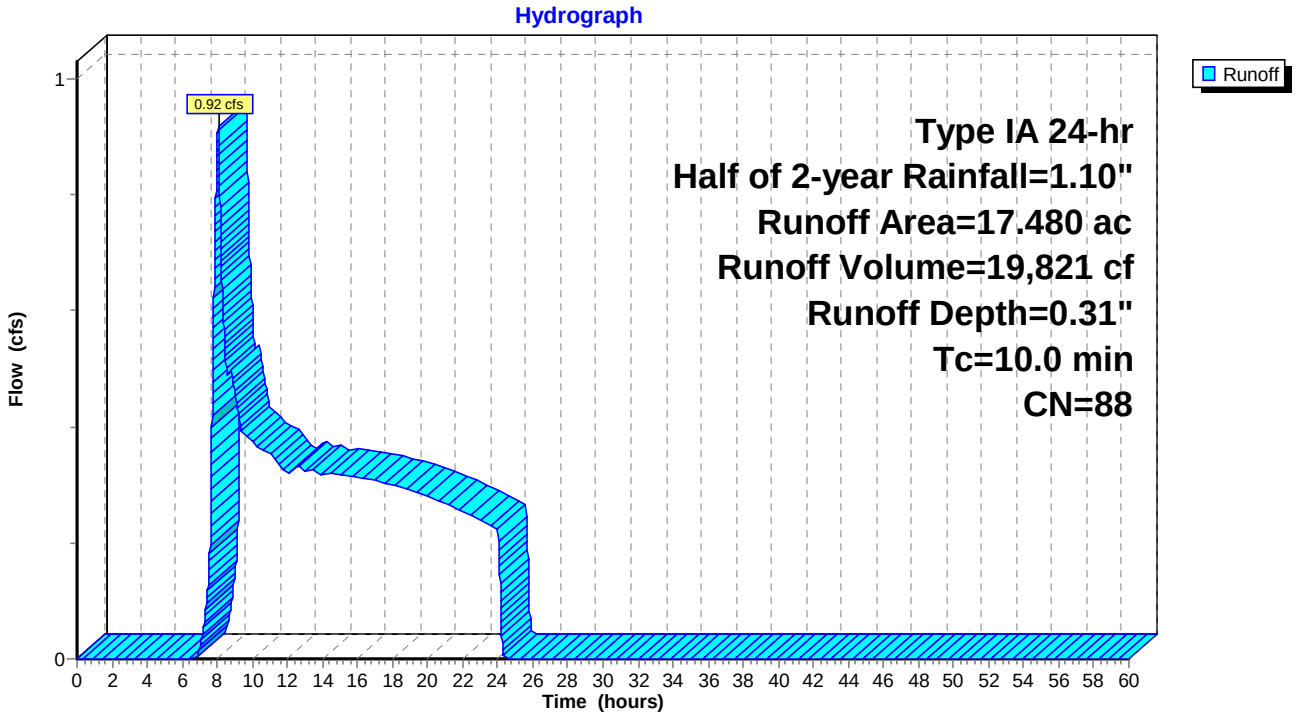
Runoff = 0.92 cfs @ 8.06 hrs, Volume= 19,821 cf, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half of 2-year Rainfall=1.10"

	Area (ac)	CN	Description
	6.990	74	>75% Grass cover, Good, HSG C
*	10.490	98	Impervious surface, HSG C
	17.480	88	Weighted Average
	6.990		39.99% Pervious Area
	10.490		60.01% Impervious Area

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

Subcatchment 2B: Developed Conditions



Summary for Subcatchment 3B: Developed Conditions

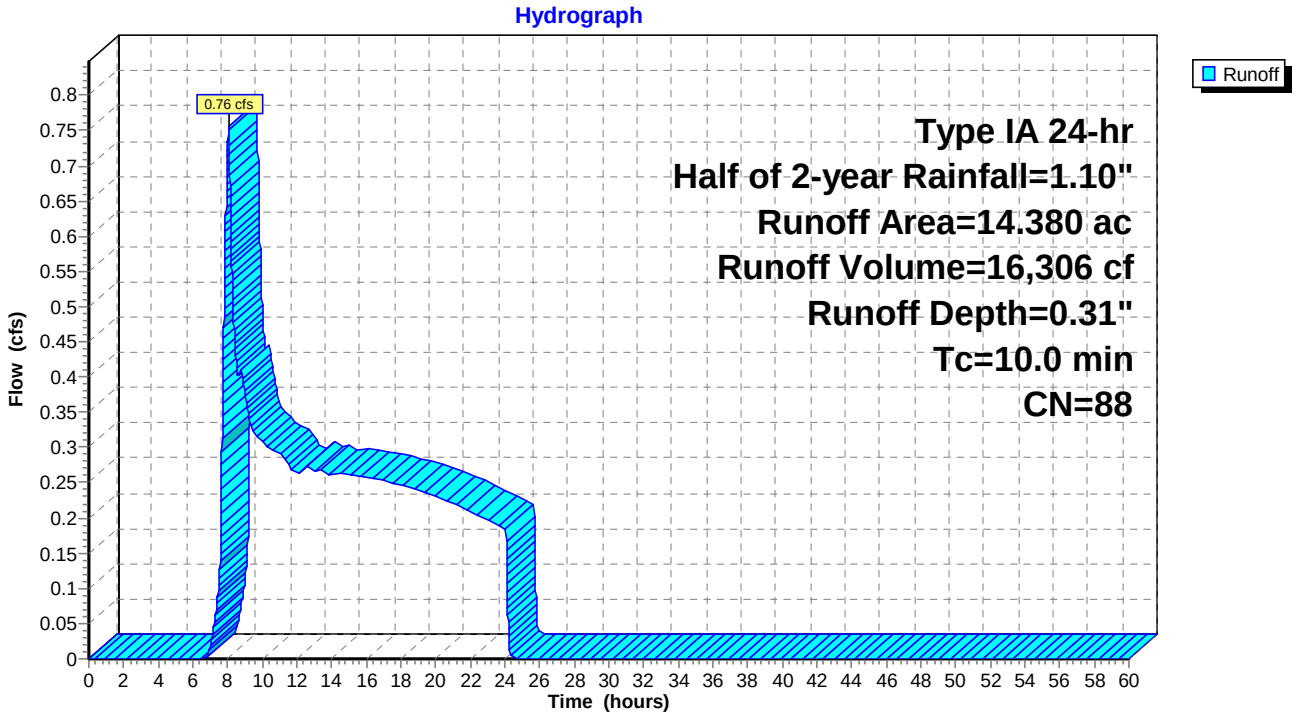
Runoff = 0.76 cfs @ 8.06 hrs, Volume= 16,306 cf, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr Half of 2-year Rainfall=1.10"

	Area (ac)	CN	Description
	5.750	74	>75% Grass cover, Good, HSG C
*	8.630	98	Impervious surface, HSG C
	14.380	88	Weighted Average
	5.750		39.99% Pervious Area
	8.630		60.01% Impervious Area

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

Subcatchment 3B: Developed Conditions



Summary for Pond P1: Control MH #1

Inflow Area = 591,545 sf, 60.01% Impervious, Inflow Depth = 0.31" for Half of 2-year event
Inflow = 0.68 cfs @ 8.11 hrs, Volume= 15,399 cf
Outflow = 0.04 cfs @ 24.29 hrs, Volume= 7,139 cf, Atten= 94%, Lag= 970.7 min
Primary = 0.04 cfs @ 24.29 hrs, Volume= 7,139 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 293.83' @ 24.29 hrs Surf.Area= 9,350 sf Storage= 13,371 cf
Flood Elev= 299.00' Surf.Area= 9,350 sf Storage= 61,719 cf

Plug-Flow detention time= 1,478.2 min calculated for 7,139 cf (46% of inflow)
Center-of-Mass det. time= 1,206.6 min (2,096.1 - 889.6)

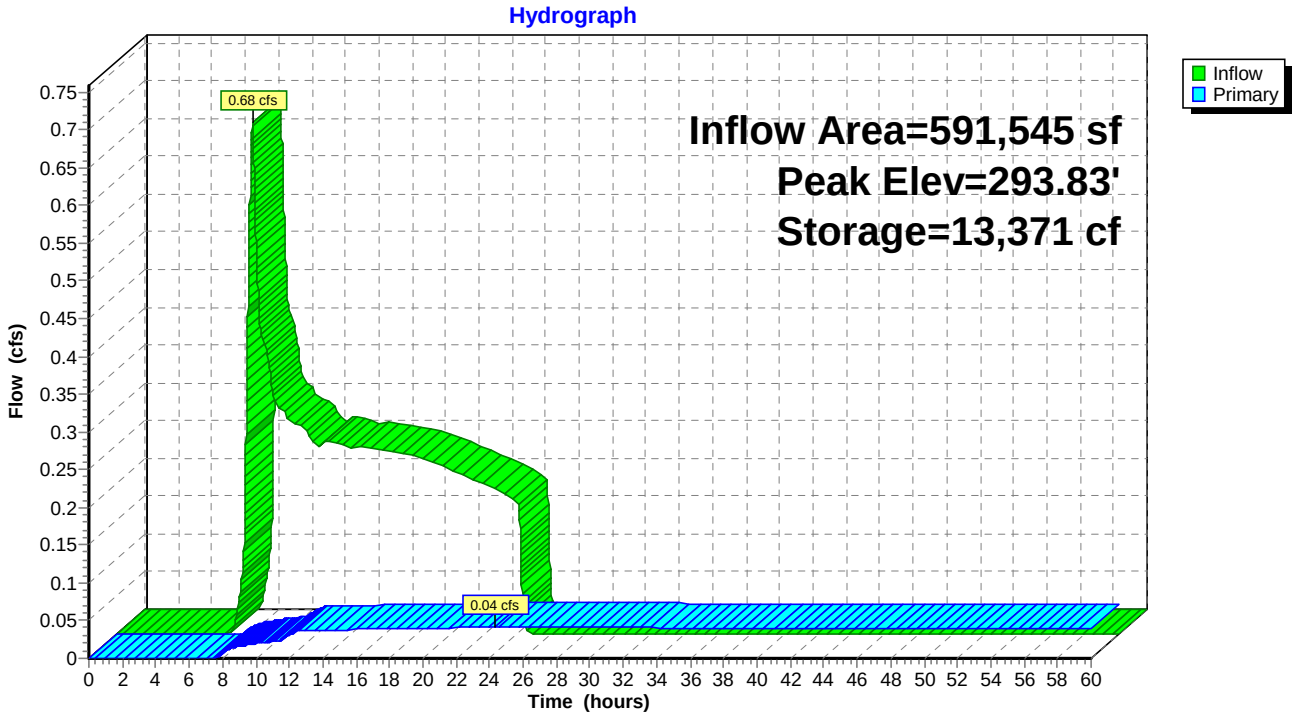
Volume	Invert	Avail.Storage	Storage Description
#1	289.99'	71,069 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
289.99	9,350	0.0	0	0
290.00	9,350	40.0	37	37
291.25	9,350	40.0	4,675	4,712
291.26	9,350	5.0	5	4,717
292.99	9,350	5.0	809	5,526
293.00	9,350	100.0	93	5,619
294.00	9,350	100.0	9,350	14,969
295.00	9,350	100.0	9,350	24,319
296.00	9,350	100.0	9,350	33,669
297.00	9,350	100.0	9,350	43,019
298.00	9,350	100.0	9,350	52,369
299.00	9,350	100.0	9,350	61,719
300.00	9,350	100.0	9,350	71,069

Device	Routing	Invert	Outlet Devices
#1	Primary	290.00'	**15.0" Round 15" Culvert** L= 100.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 290.00' / 289.70' S= 0.0030 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	290.00'	**0.9" Vert. Orifice #1** C= 0.600 Limited to weir flow at low heads
#3	Device 1	294.00'	**8.5" Vert. Orifice #2** C= 0.600 Limited to weir flow at low heads
#4	Device 1	295.50'	**8.5" Vert. Orifice #3** C= 0.600 Limited to weir flow at low heads
#5	Device 1	299.00'	**15.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.04 cfs @ 24.29 hrs HW=293.83' (Free Discharge)
└**1=15" Culvert** (Passes 0.04 cfs of 9.02 cfs potential flow)
  ├**2=Orifice #1** (Orifice Controls 0.04 cfs @ 9.38 fps)
  ├**3=Orifice #2** (Controls 0.00 cfs)
  ├**4=Orifice #3** (Controls 0.00 cfs)
  └**5=Overflow** (Controls 0.00 cfs)

Pond P1: Control MH #1



Summary for Pond P2: Control MH #2

Inflow Area = 761,429 sf, 60.01% Impervious, Inflow Depth = 0.31" for Half of 2-year event
Inflow = 0.92 cfs @ 8.06 hrs, Volume= 19,821 cf
Outflow = 0.05 cfs @ 24.19 hrs, Volume= 9,377 cf, Atten= 94%, Lag= 968.1 min
Primary = 0.05 cfs @ 24.19 hrs, Volume= 9,377 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 272.30' @ 24.19 hrs Surf.Area= 9,000 sf Storage= 17,103 cf
Flood Elev= 277.00' Surf.Area= 9,000 sf Storage= 59,377 cf

Plug-Flow detention time= 1,459.0 min calculated for 9,377 cf (47% of inflow)
Center-of-Mass det. time= 1,191.7 min (2,076.6 - 884.9)

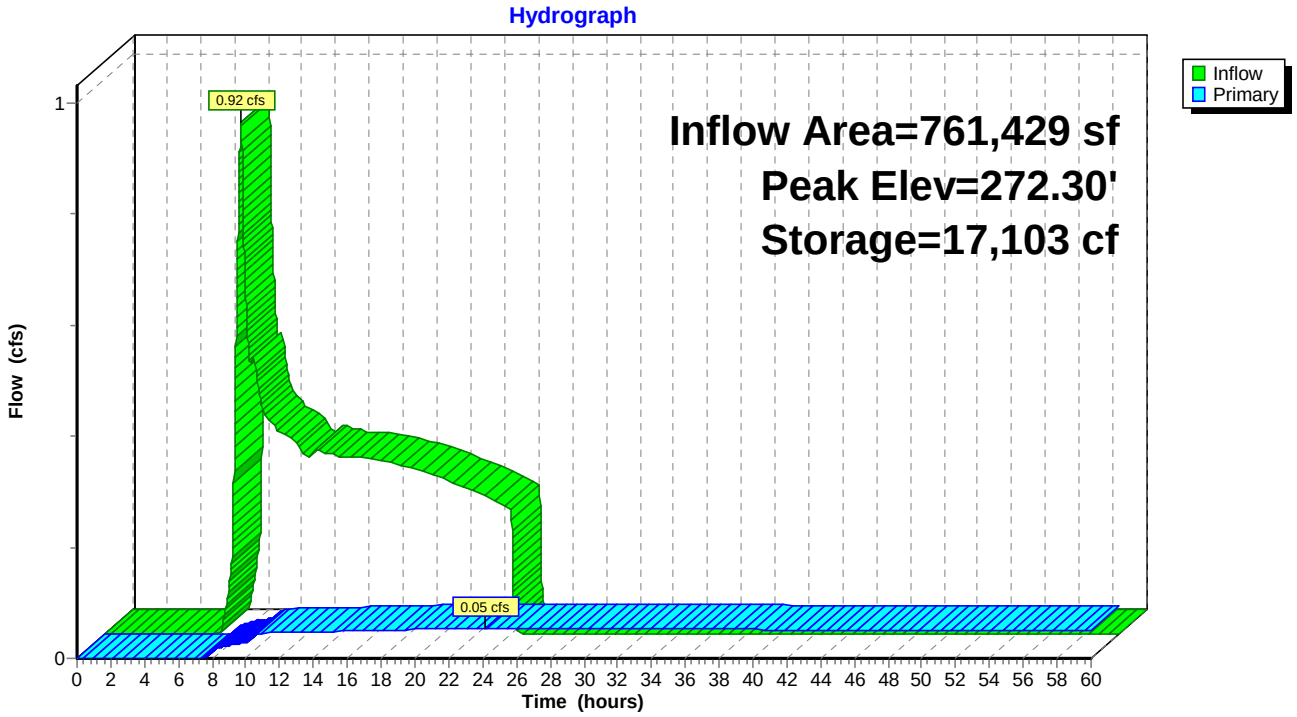
Volume	Invert	Avail.Storage	Storage Description
#1	267.99'	68,377 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
267.99	9,000	0.0	0	0
268.00	9,000	40.0	36	36
269.24	9,000	40.0	4,464	4,500
269.25	9,000	5.0	4	4,504
270.99	9,000	5.0	783	5,288
271.00	9,000	100.0	90	5,377
272.00	9,000	100.0	9,000	14,377
273.00	9,000	100.0	9,000	23,377
274.00	9,000	100.0	9,000	32,377
275.00	9,000	100.0	9,000	41,377
276.00	9,000	100.0	9,000	50,377
277.00	9,000	100.0	9,000	59,377
278.00	9,000	100.0	9,000	68,377

Device	Routing	Invert	Outlet Devices
#1	Primary	268.00'	**15.0" Round 15" Culvert** L= 100.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 268.00' / 267.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	268.00'	**1.0" Vert. Orifice #1** C= 0.600 Limited to weir flow at low heads
#3	Device 1	272.50'	**9.0" Vert. Orifice #2** C= 0.600 Limited to weir flow at low heads
#4	Device 1	275.00'	**9.0" Vert. Orifice #3** C= 0.600 Limited to weir flow at low heads
#5	Device 1	277.00'	**15.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.05 cfs @ 24.19 hrs HW=272.30' (Free Discharge)
└**1=15" Culvert** (Passes 0.05 cfs of 10.02 cfs potential flow)
  ├**2=Orifice #1** (Orifice Controls 0.05 cfs @ 9.94 fps)
  ├**3=Orifice #2** (Controls 0.00 cfs)
  ├**4=Orifice #3** (Controls 0.00 cfs)
  └**5=Overflow** (Controls 0.00 cfs)

Pond P2: Control MH #2



Summary for Pond P3: Control MH #3

Inflow Area = 626,393 sf, 60.01% Impervious, Inflow Depth = 0.31" for Half of 2-year event
Inflow = 0.76 cfs @ 8.06 hrs, Volume= 16,306 cf
Outflow = 0.04 cfs @ 24.19 hrs, Volume= 7,512 cf, Atten= 94%, Lag= 968.2 min
Primary = 0.04 cfs @ 24.19 hrs, Volume= 7,512 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 272.20' @ 24.19 hrs Surf.Area= 7,875 sf Storage= 14,139 cf
Flood Elev= 278.00' Surf.Area= 7,875 sf Storage= 59,830 cf

Plug-Flow detention time= 1,468.3 min calculated for 7,512 cf (46% of inflow)
Center-of-Mass det. time= 1,195.3 min (2,080.2 - 884.9)

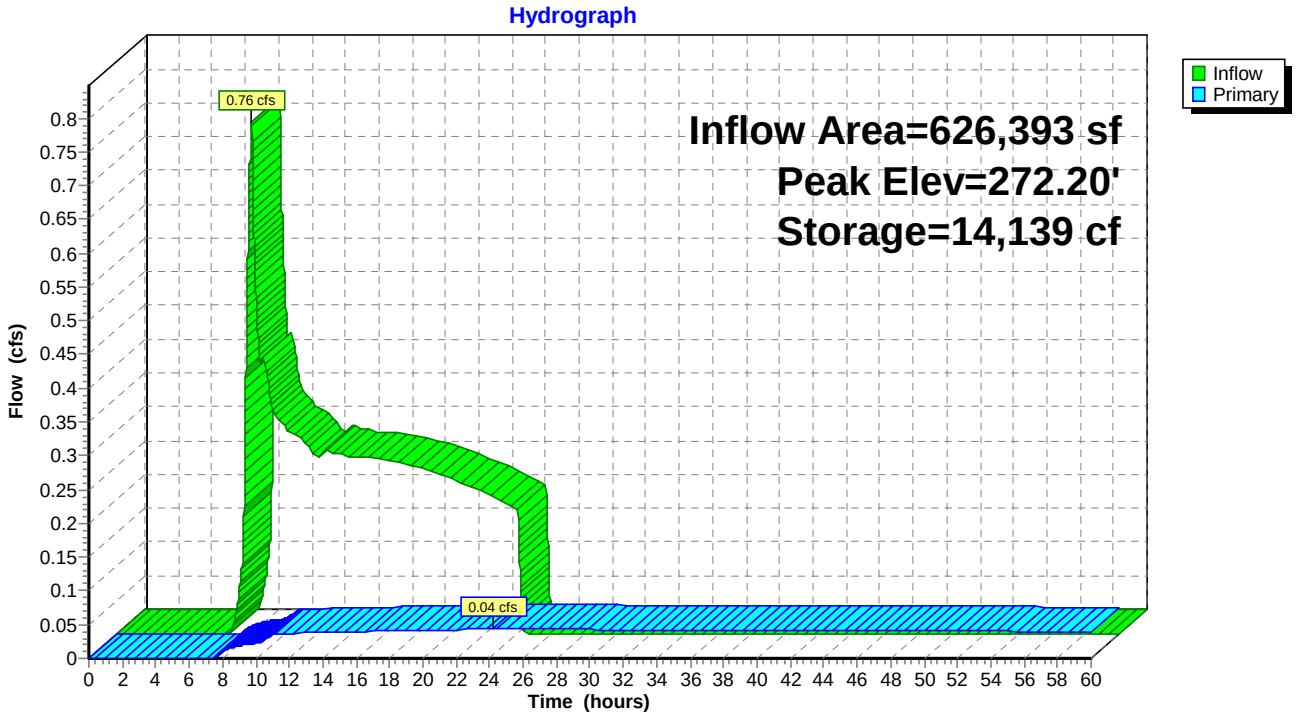
Volume	Invert	Avail.Storage	Storage Description
#1	267.99'	59,830 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
267.99	7,875	0.0	0	0
268.00	7,875	40.0	31	31
269.24	7,875	40.0	3,906	3,938
269.25	7,875	5.0	4	3,941
270.99	7,875	5.0	685	4,627
271.00	7,875	100.0	79	4,705
272.00	7,875	100.0	7,875	12,580
273.00	7,875	100.0	7,875	20,455
274.00	7,875	100.0	7,875	28,330
275.00	7,875	100.0	7,875	36,205
276.00	7,875	100.0	7,875	44,080
277.00	7,875	100.0	7,875	51,955
278.00	7,875	100.0	7,875	59,830

Device	Routing	Invert	Outlet Devices
#1	Primary	268.00'	**15.0" Round 15" Culvert** L= 50.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 268.00' / 267.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	268.00'	**0.9" Vert. Orifice #1** C= 0.600 Limited to weir flow at low heads
#3	Device 1	272.25'	**8.0" Vert. Orifice #2** C= 0.600 Limited to weir flow at low heads
#4	Device 1	277.00'	**15.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.04 cfs @ 24.19 hrs HW=272.20' (Free Discharge)
└**1=15" Culvert** (Passes 0.04 cfs of 12.15 cfs potential flow)
  ├**2=Orifice #1** (Orifice Controls 0.04 cfs @ 9.82 fps)
  ├**3=Orifice #2** (Controls 0.00 cfs)
  └**4=Overflow** (Controls 0.00 cfs)

Pond P3: Control MH #3



Summary for Subcatchment B1: Existing Conditions (Basin #1)

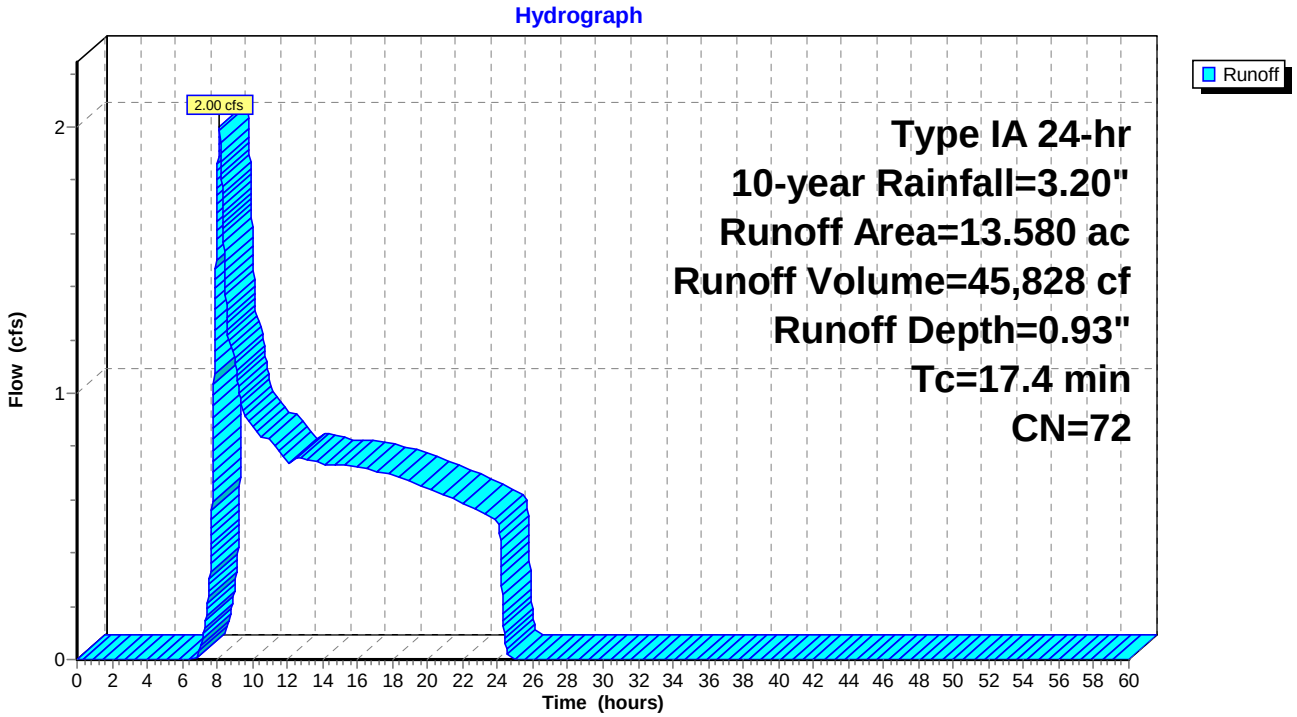
Runoff = 2.00 cfs @ 8.14 hrs, Volume= 45,828 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
*	13.580	72	City of Salem Pre-developed, HSG C
	13.580		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, TR-55 Worksheet**

Subcatchment B1: Existing Conditions (Basin #1)



Summary for Subcatchment B2: Existing Conditions (Basin #2)

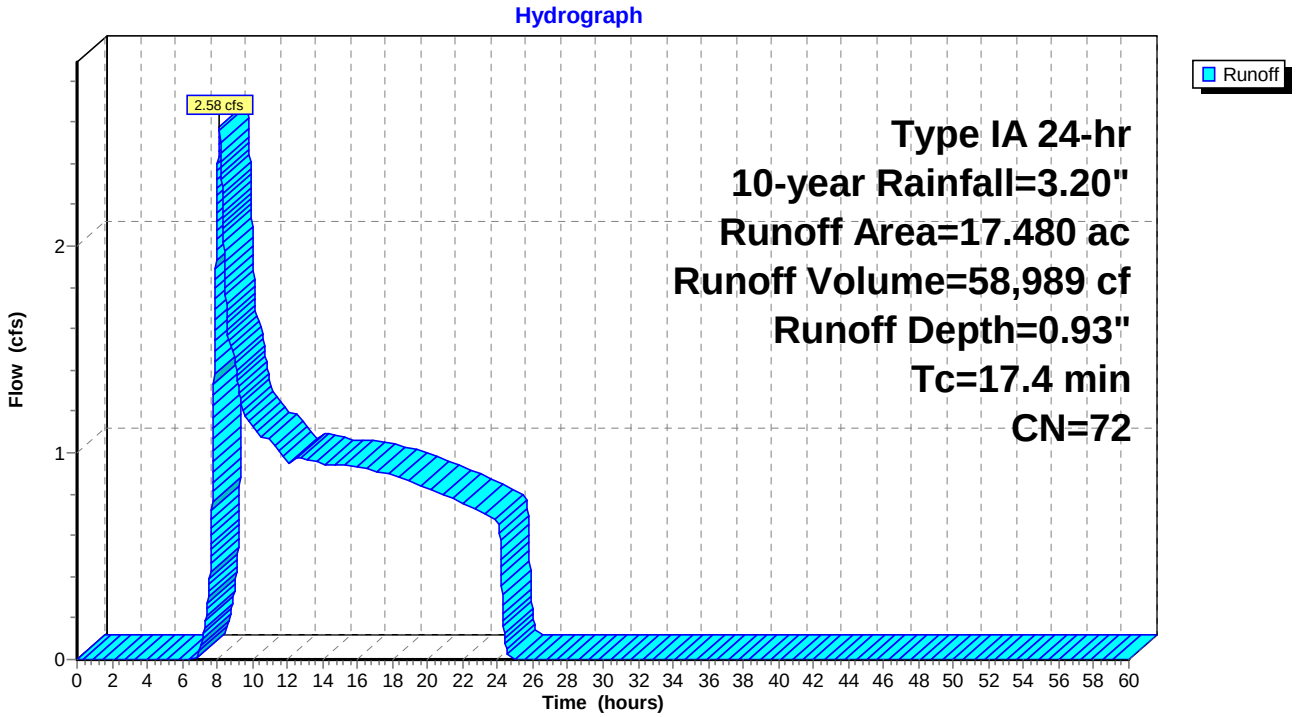
Runoff = 2.58 cfs @ 8.14 hrs, Volume= 58,989 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
*	17.480	72	City of Salem Pre-developed, HSG C
	17.480		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, TR-55 Worksheet**

Subcatchment B2: Existing Conditions (Basin #2)



Summary for Subcatchment B3: Existing Conditions (Basin #3)

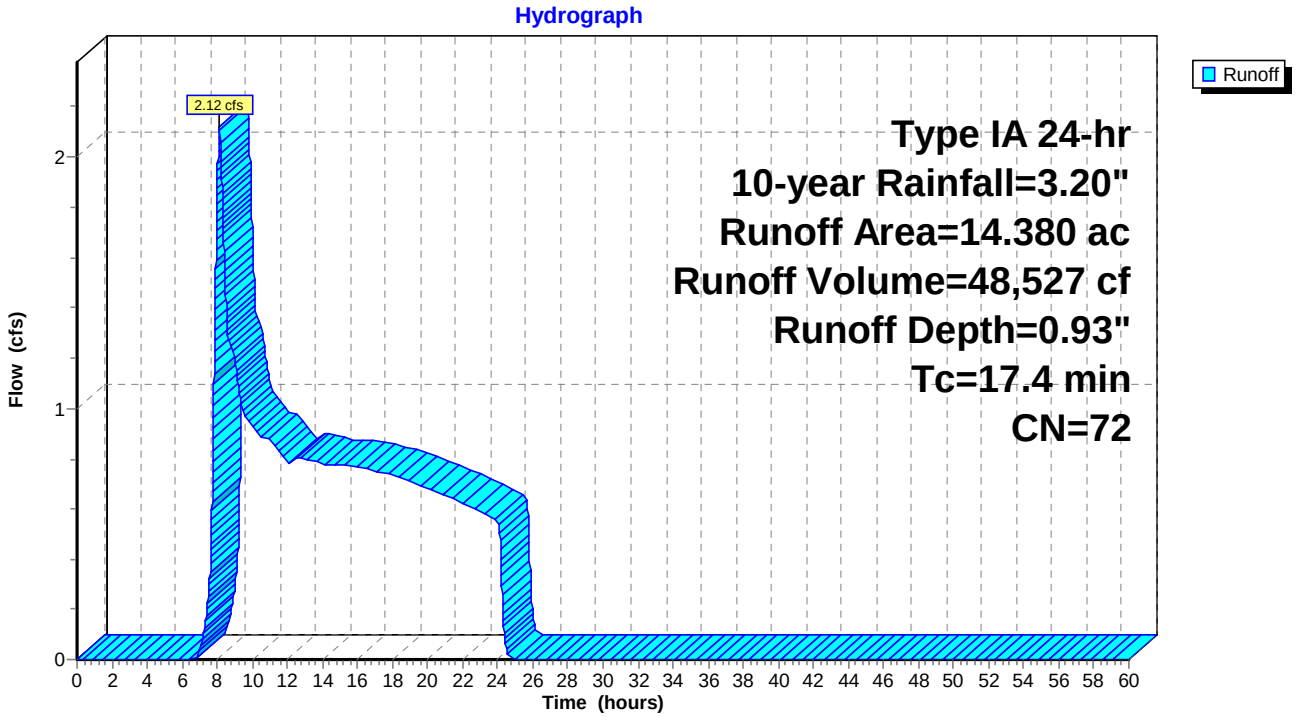
Runoff = 2.12 cfs @ 8.14 hrs, Volume= 48,527 cf, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
*	14.380	72	City of Salem Pre-developed, HSG C
	14.380		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, TR-55 Worksheet**

Subcatchment B3: Existing Conditions (Basin #3)



Summary for Subcatchment 1B: Developed Conditions

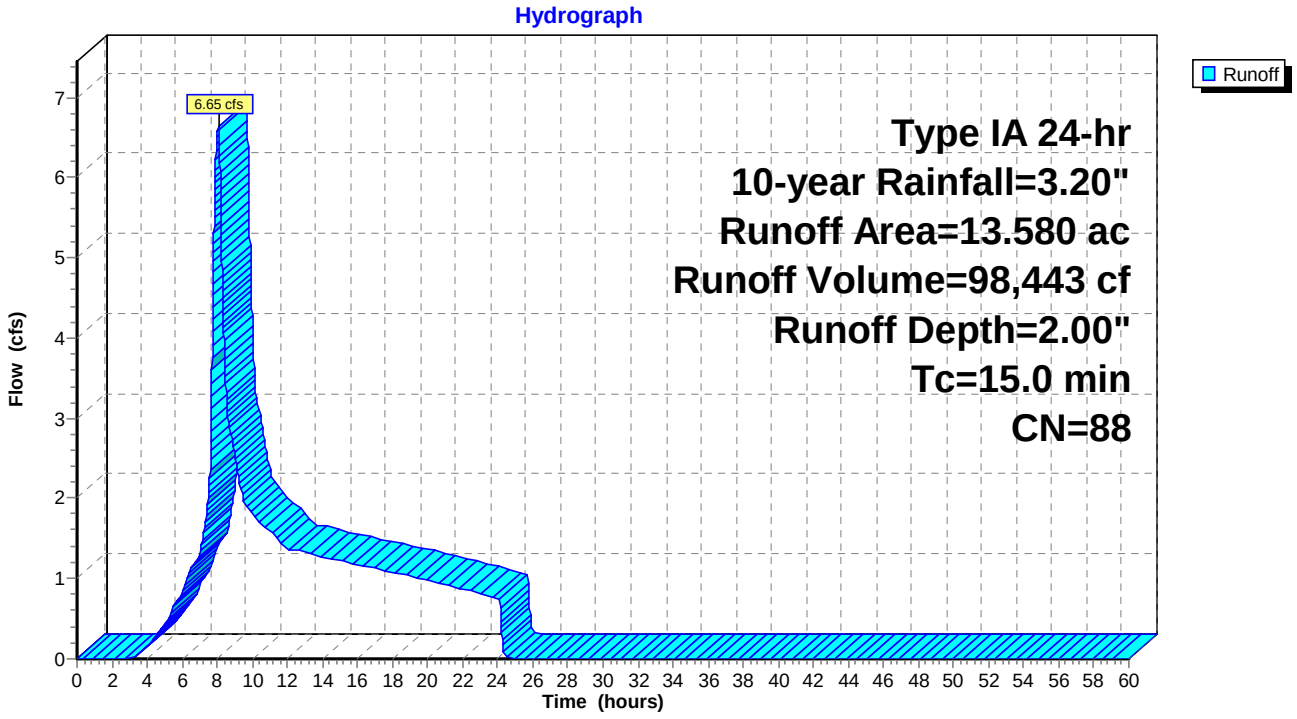
Runoff = 6.65 cfs @ 8.05 hrs, Volume= 98,443 cf, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
	5.430	74	>75% Grass cover, Good, HSG C
*	8.150	98	Impervious surface, HSG C
	13.580	88	Weighted Average
	5.430		39.99% Pervious Area
	8.150		60.01% Impervious Area

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

Subcatchment 1B: Developed Conditions



Summary for Subcatchment 2B: Developed Conditions

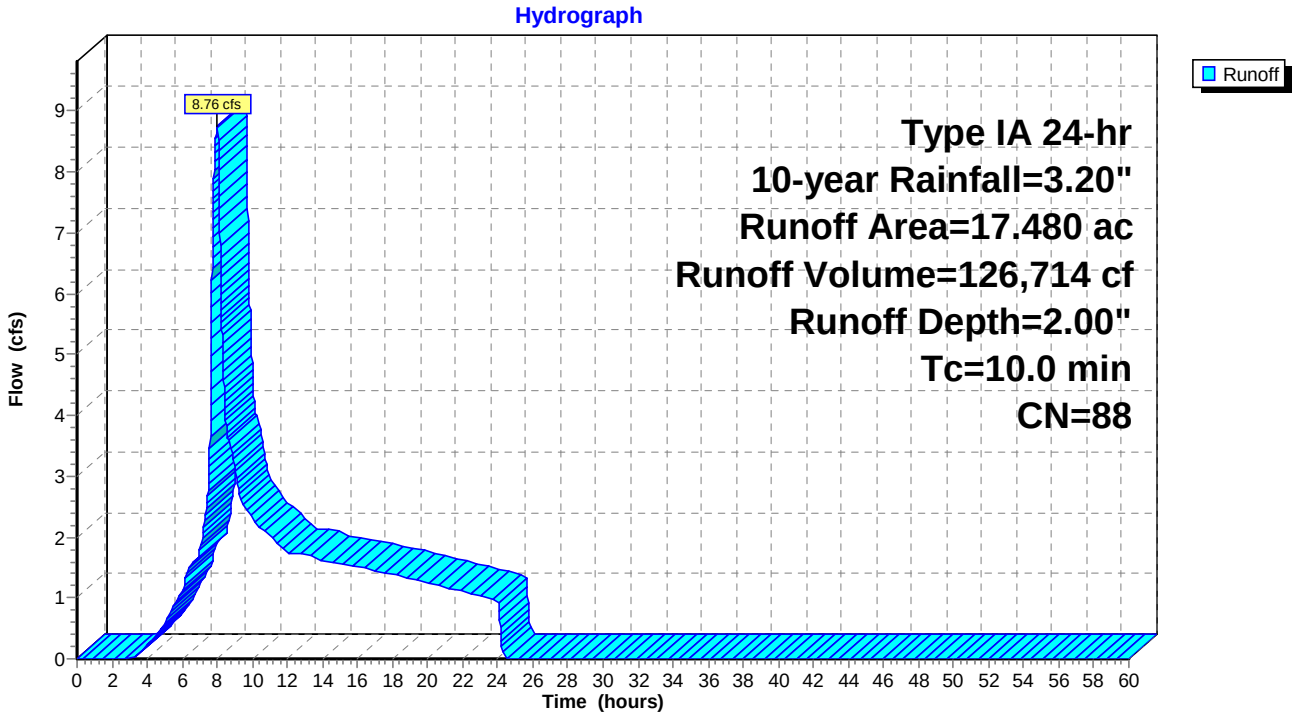
Runoff = 8.76 cfs @ 8.01 hrs, Volume= 126,714 cf, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
	6.990	74	>75% Grass cover, Good, HSG C
*	10.490	98	Impervious surface, HSG C
	17.480	88	Weighted Average
	6.990		39.99% Pervious Area
	10.490		60.01% Impervious Area

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

Subcatchment 2B: Developed Conditions



Summary for Subcatchment 3B: Developed Conditions

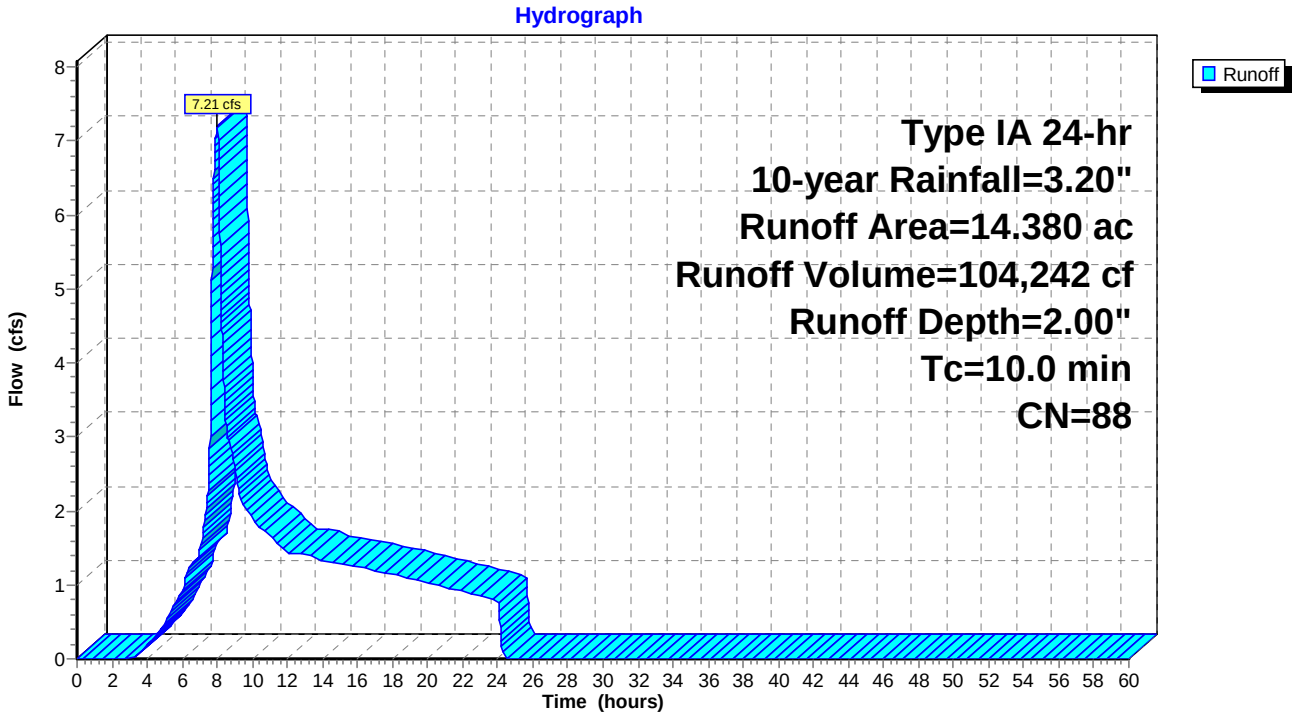
Runoff = 7.21 cfs @ 8.01 hrs, Volume= 104,242 cf, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 10-year Rainfall=3.20"

	Area (ac)	CN	Description
	5.750	74	>75% Grass cover, Good, HSG C
*	8.630	98	Impervious surface, HSG C
	14.380	88	Weighted Average
	5.750		39.99% Pervious Area
	8.630		60.01% Impervious Area

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

Subcatchment 3B: Developed Conditions



Summary for Pond P1: Control MH #1

Inflow Area = 591,545 sf, 60.01% Impervious, Inflow Depth = 2.00" for 10-year event
Inflow = 6.65 cfs @ 8.05 hrs, Volume= 98,443 cf
Outflow = 1.93 cfs @ 9.59 hrs, Volume= 87,491 cf, Atten= 71%, Lag= 92.2 min
Primary = 1.93 cfs @ 9.59 hrs, Volume= 87,491 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 295.34' @ 9.59 hrs Surf.Area= 9,350 sf Storage= 27,468 cf
Flood Elev= 299.00' Surf.Area= 9,350 sf Storage= 61,719 cf

Plug-Flow detention time= 322.7 min calculated for 87,491 cf (89% of inflow)
Center-of-Mass det. time= 251.4 min (1,022.9 - 771.6)

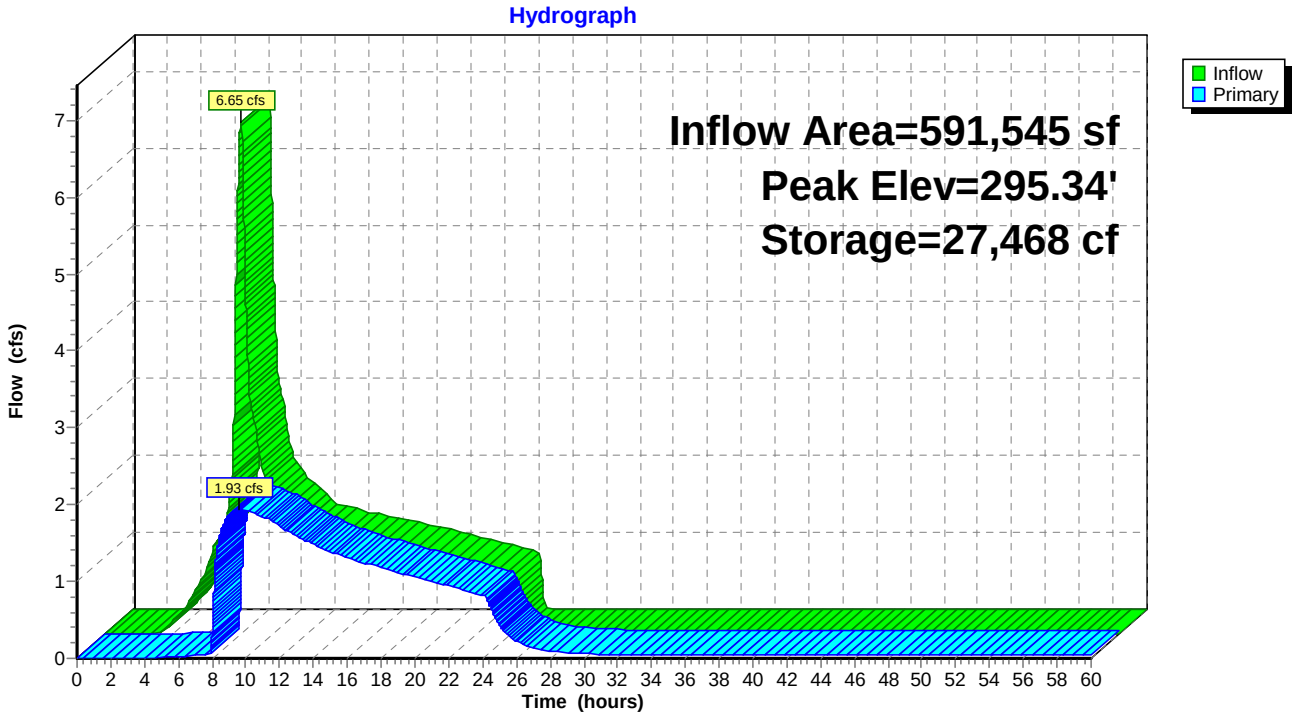
Volume	Invert	Avail.Storage	Storage Description
#1	289.99'	71,069 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
289.99	9,350	0.0	0	0
290.00	9,350	40.0	37	37
291.25	9,350	40.0	4,675	4,712
291.26	9,350	5.0	5	4,717
292.99	9,350	5.0	809	5,526
293.00	9,350	100.0	93	5,619
294.00	9,350	100.0	9,350	14,969
295.00	9,350	100.0	9,350	24,319
296.00	9,350	100.0	9,350	33,669
297.00	9,350	100.0	9,350	43,019
298.00	9,350	100.0	9,350	52,369
299.00	9,350	100.0	9,350	61,719
300.00	9,350	100.0	9,350	71,069

Device	Routing	Invert	Outlet Devices
#1	Primary	290.00'	**15.0" Round 15" Culvert** L= 100.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 290.00' / 289.70' S= 0.0030 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	290.00'	**0.9" Vert. Orifice #1** C= 0.600 Limited to weir flow at low heads
#3	Device 1	294.00'	**8.5" Vert. Orifice #2** C= 0.600 Limited to weir flow at low heads
#4	Device 1	295.50'	**8.5" Vert. Orifice #3** C= 0.600 Limited to weir flow at low heads
#5	Device 1	299.00'	**15.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=1.93 cfs @ 9.59 hrs HW=295.34' (Free Discharge)
└**1=15" Culvert** (Passes 1.93 cfs of 11.13 cfs potential flow)
  ├**2=Orifice #1** (Orifice Controls 0.05 cfs @ 11.08 fps)
  ├**3=Orifice #2** (Orifice Controls 1.88 cfs @ 4.77 fps)
  ├**4=Orifice #3** (Controls 0.00 cfs)
  └**5=Overflow** (Controls 0.00 cfs)

Pond P1: Control MH #1



Summary for Pond P2: Control MH #2

Inflow Area = 761,429 sf, 60.01% Impervious, Inflow Depth = 2.00" for 10-year event
Inflow = 8.76 cfs @ 8.01 hrs, Volume= 126,714 cf
Outflow = 2.56 cfs @ 9.41 hrs, Volume= 113,333 cf, Atten= 71%, Lag= 84.3 min
Primary = 2.56 cfs @ 9.41 hrs, Volume= 113,333 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 274.25' @ 9.41 hrs Surf.Area= 9,000 sf Storage= 34,601 cf
Flood Elev= 277.00' Surf.Area= 9,000 sf Storage= 59,377 cf

Plug-Flow detention time= 310.9 min calculated for 113,314 cf (89% of inflow)
Center-of-Mass det. time= 243.3 min (1,010.3 - 766.9)

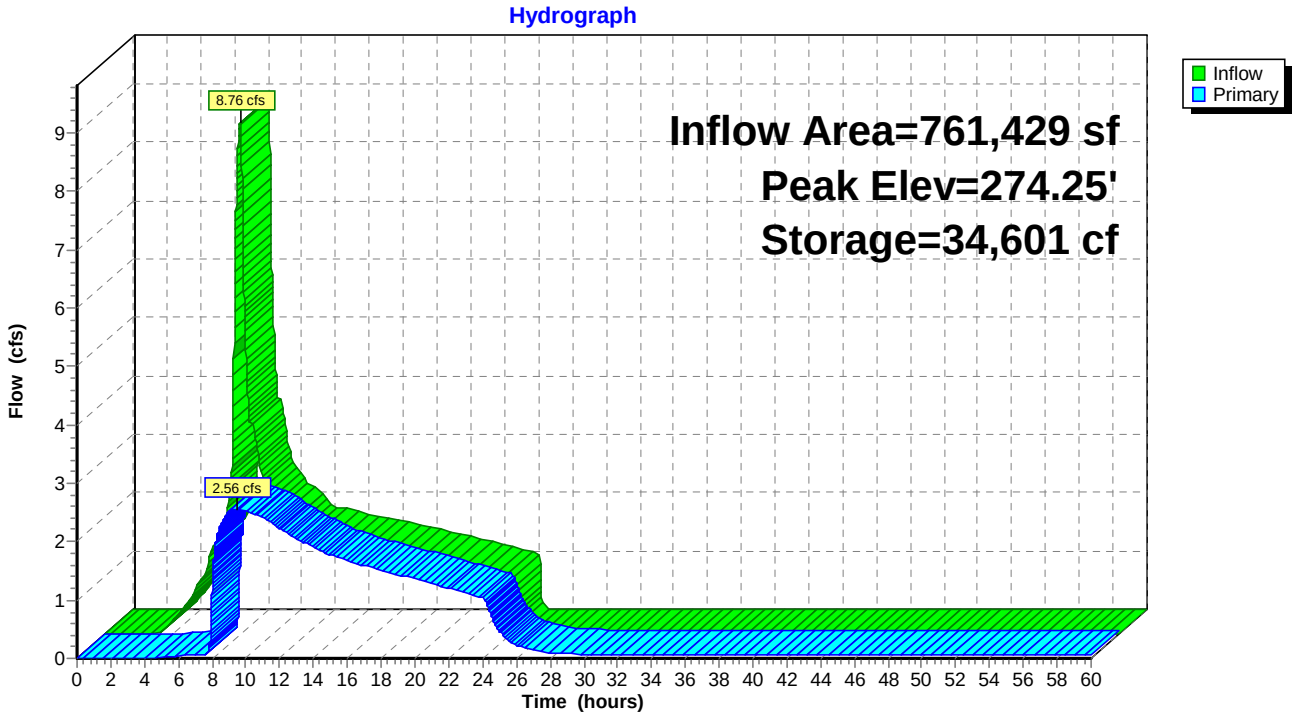
Volume	Invert	Avail.Storage	Storage Description
#1	267.99'	68,377 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
267.99	9,000	0.0	0	0
268.00	9,000	40.0	36	36
269.24	9,000	40.0	4,464	4,500
269.25	9,000	5.0	4	4,504
270.99	9,000	5.0	783	5,288
271.00	9,000	100.0	90	5,377
272.00	9,000	100.0	9,000	14,377
273.00	9,000	100.0	9,000	23,377
274.00	9,000	100.0	9,000	32,377
275.00	9,000	100.0	9,000	41,377
276.00	9,000	100.0	9,000	50,377
277.00	9,000	100.0	9,000	59,377
278.00	9,000	100.0	9,000	68,377

Device	Routing	Invert	Outlet Devices
#1	Primary	268.00'	**15.0" Round 15" Culvert** L= 100.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 268.00' / 267.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	268.00'	**1.0" Vert. Orifice #1** C= 0.600 Limited to weir flow at low heads
#3	Device 1	272.50'	**9.0" Vert. Orifice #2** C= 0.600 Limited to weir flow at low heads
#4	Device 1	275.00'	**9.0" Vert. Orifice #3** C= 0.600 Limited to weir flow at low heads
#5	Device 1	277.00'	**15.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.56 cfs @ 9.41 hrs HW=274.25' (Free Discharge)
└**1=15" Culvert** (Passes 2.56 cfs of 12.46 cfs potential flow)
  ├**2=Orifice #1** (Orifice Controls 0.07 cfs @ 11.99 fps)
  ├**3=Orifice #2** (Orifice Controls 2.49 cfs @ 5.64 fps)
  ├**4=Orifice #3** (Controls 0.00 cfs)
  └**5=Overflow** (Controls 0.00 cfs)

Pond P2: Control MH #2



Summary for Pond P3: Control MH #3

Inflow Area = 626,393 sf, 60.01% Impervious, Inflow Depth = 2.00" for 10-year event
Inflow = 7.21 cfs @ 8.01 hrs, Volume= 104,242 cf
Outflow = 2.06 cfs @ 9.47 hrs, Volume= 93,983 cf, Atten= 71%, Lag= 87.4 min
Primary = 2.06 cfs @ 9.47 hrs, Volume= 93,983 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 274.02' @ 9.47 hrs Surf.Area= 7,875 sf Storage= 28,452 cf
Flood Elev= 278.00' Surf.Area= 7,875 sf Storage= 59,830 cf

Plug-Flow detention time= 304.8 min calculated for 93,983 cf (90% of inflow)
Center-of-Mass det. time= 241.3 min (1,008.3 - 766.9)

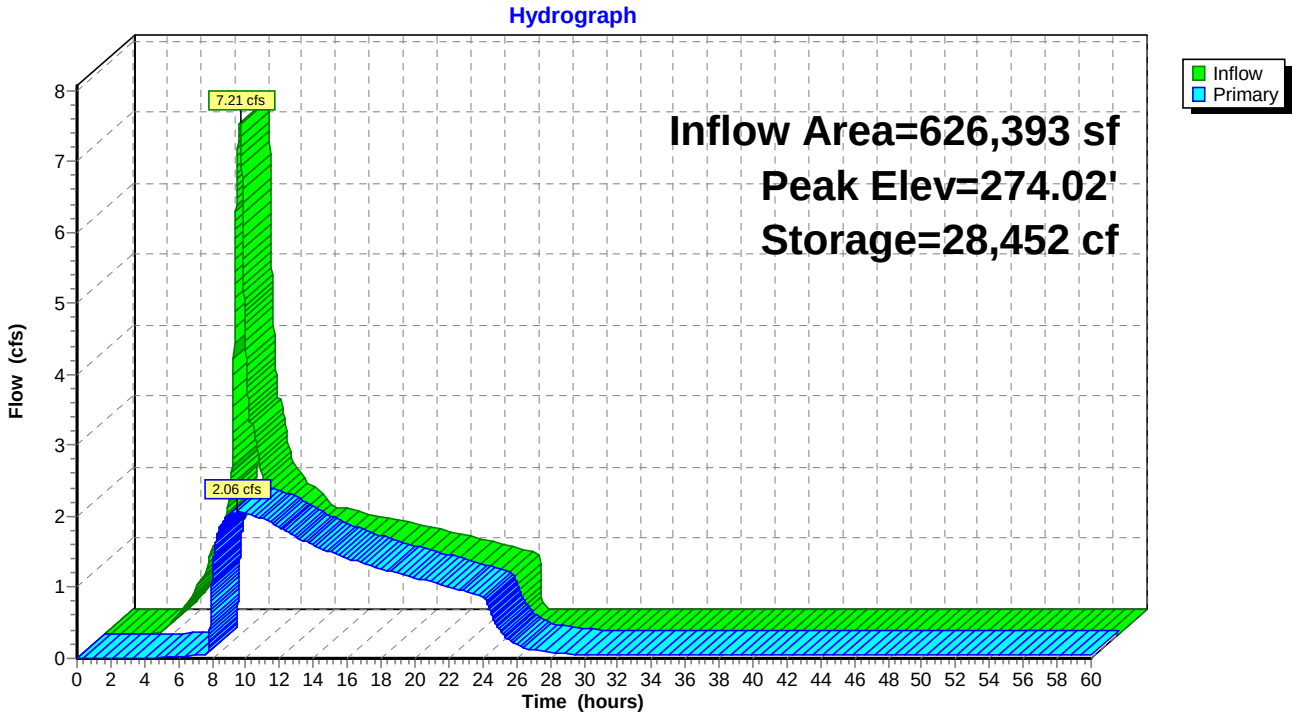
Volume	Invert	Avail.Storage	Storage Description
#1	267.99'	59,830 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
267.99	7,875	0.0	0	0
268.00	7,875	40.0	31	31
269.24	7,875	40.0	3,906	3,938
269.25	7,875	5.0	4	3,941
270.99	7,875	5.0	685	4,627
271.00	7,875	100.0	79	4,705
272.00	7,875	100.0	7,875	12,580
273.00	7,875	100.0	7,875	20,455
274.00	7,875	100.0	7,875	28,330
275.00	7,875	100.0	7,875	36,205
276.00	7,875	100.0	7,875	44,080
277.00	7,875	100.0	7,875	51,955
278.00	7,875	100.0	7,875	59,830

Device	Routing	Invert	Outlet Devices
#1	Primary	268.00'	**15.0" Round 15" Culvert** L= 50.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 268.00' / 267.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	268.00'	**0.9" Vert. Orifice #1** C= 0.600 Limited to weir flow at low heads
#3	Device 1	272.25'	**8.0" Vert. Orifice #2** C= 0.600 Limited to weir flow at low heads
#4	Device 1	277.00'	**15.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.06 cfs @ 9.47 hrs HW=274.02' (Free Discharge)
└**1=15" Culvert** (Passes 2.06 cfs of 15.01 cfs potential flow)
  ├**2=Orifice #1** (Orifice Controls 0.05 cfs @ 11.77 fps)
  ├**3=Orifice #2** (Orifice Controls 2.01 cfs @ 5.76 fps)
  └**4=Overflow** (Controls 0.00 cfs)

Pond P3: Control MH #3



Summary for Subcatchment B1: Existing Conditions (Basin #1)

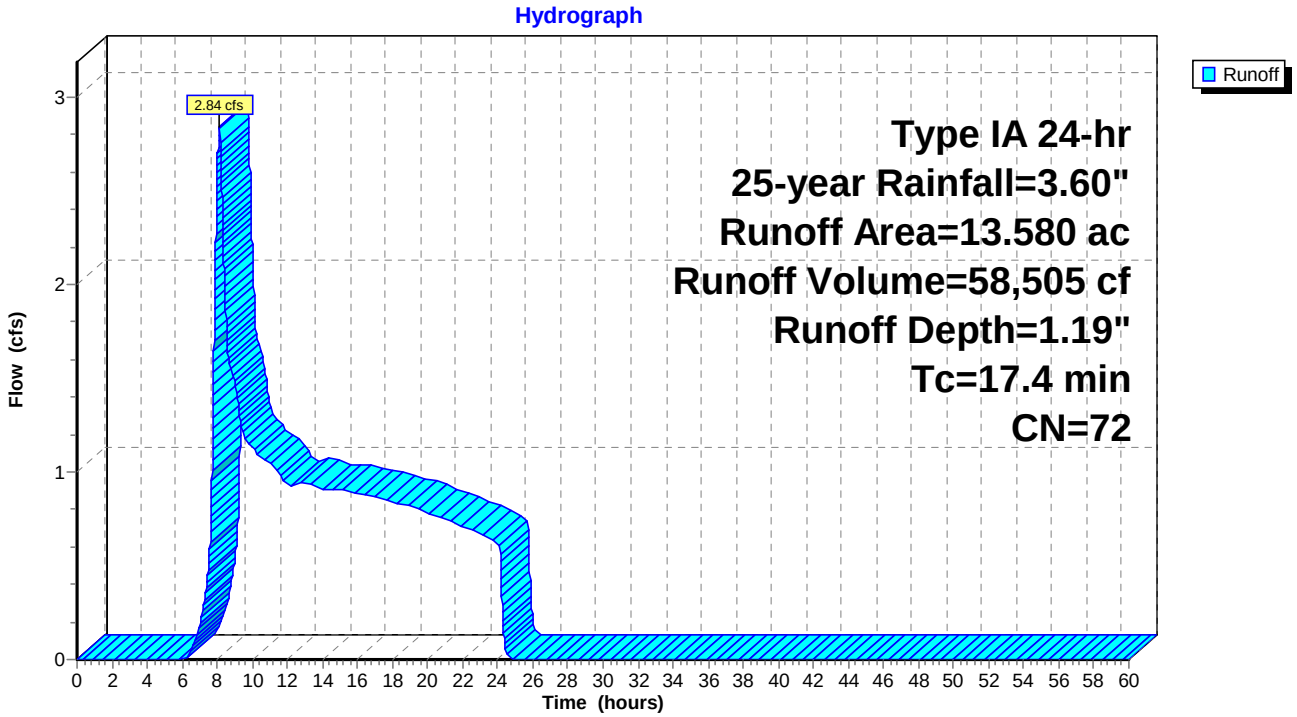
Runoff = 2.84 cfs @ 8.12 hrs, Volume= 58,505 cf, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-year Rainfall=3.60"

	Area (ac)	CN	Description
*	13.580	72	City of Salem Pre-developed, HSG C
	13.580		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, TR-55 Worksheet**

Subcatchment B1: Existing Conditions (Basin #1)



Summary for Subcatchment B2: Existing Conditions (Basin #2)

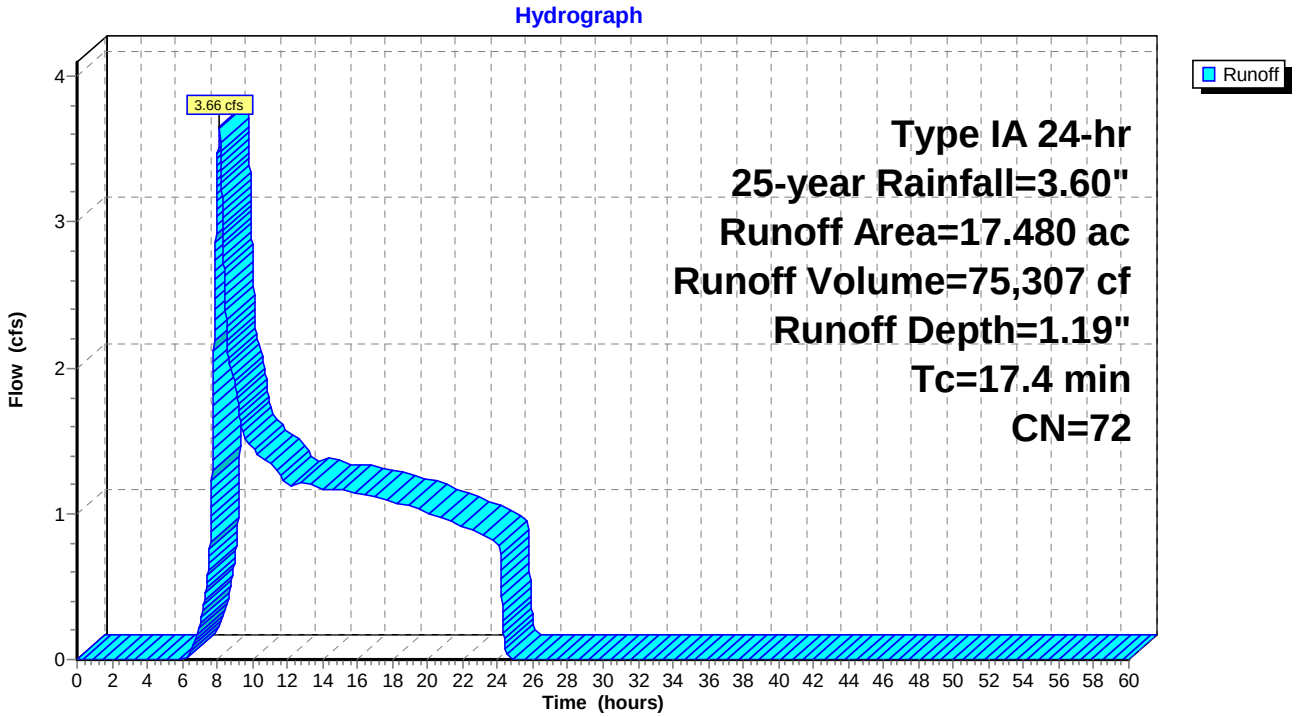
Runoff = 3.66 cfs @ 8.12 hrs, Volume= 75,307 cf, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-year Rainfall=3.60"

	Area (ac)	CN	Description
*	17.480	72	City of Salem Pre-developed, HSG C
	17.480		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, TR-55 Worksheet**

Subcatchment B2: Existing Conditions (Basin #2)



Summary for Subcatchment B3: Existing Conditions (Basin #3)

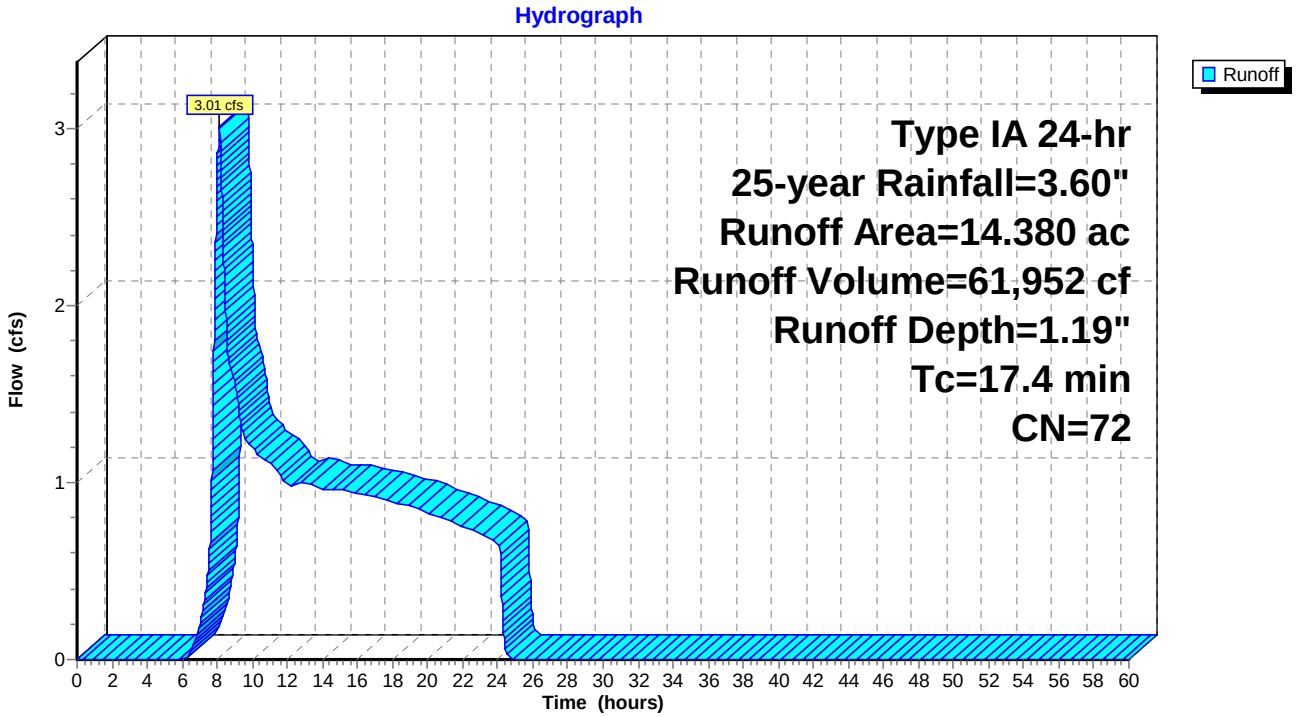
Runoff = 3.01 cfs @ 8.12 hrs, Volume= 61,952 cf, Depth= 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-year Rainfall=3.60"

	Area (ac)	CN	Description
*	14.380	72	City of Salem Pre-developed, HSG C
	14.380		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, TR-55 Worksheet**

Subcatchment B3: Existing Conditions (Basin #3)



Summary for Subcatchment 1B: Developed Conditions

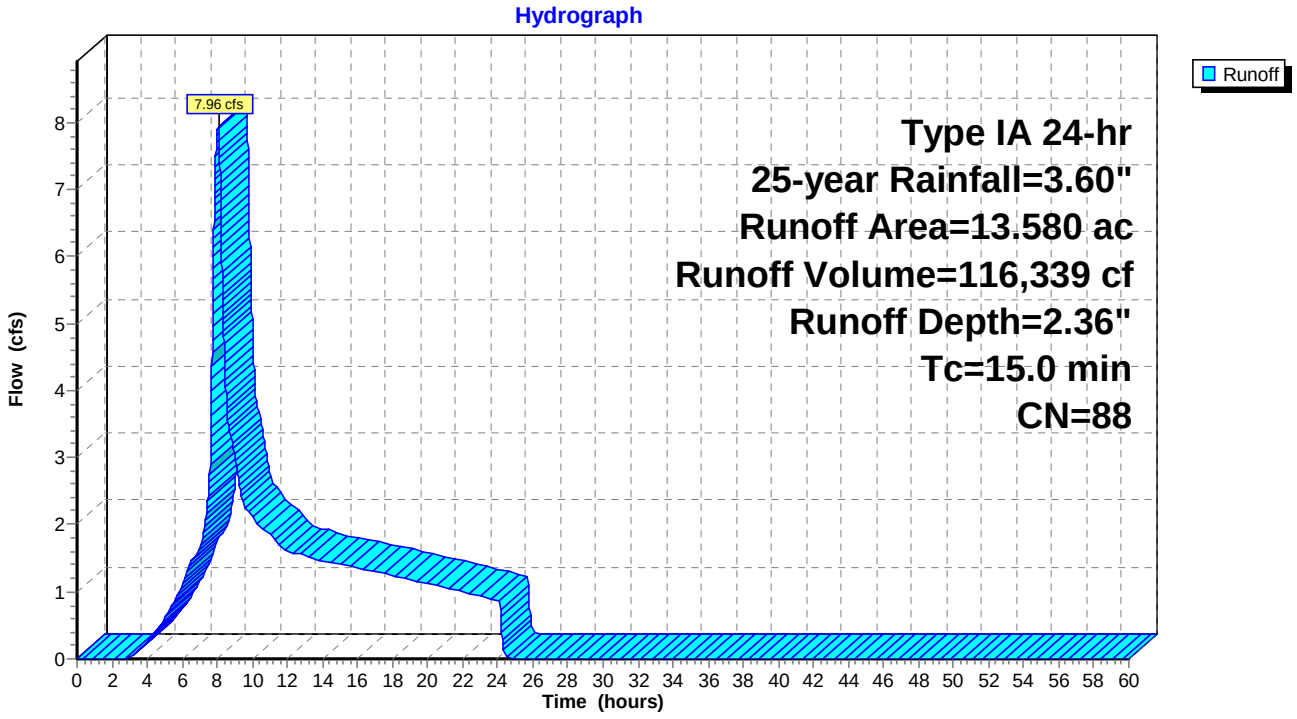
Runoff = 7.96 cfs @ 8.05 hrs, Volume= 116,339 cf, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-year Rainfall=3.60"

	Area (ac)	CN	Description
	5.430	74	>75% Grass cover, Good, HSG C
*	8.150	98	Impervious surface, HSG C
	13.580	88	Weighted Average
	5.430		39.99% Pervious Area
	8.150		60.01% Impervious Area

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

Subcatchment 1B: Developed Conditions



Summary for Subcatchment 2B: Developed Conditions

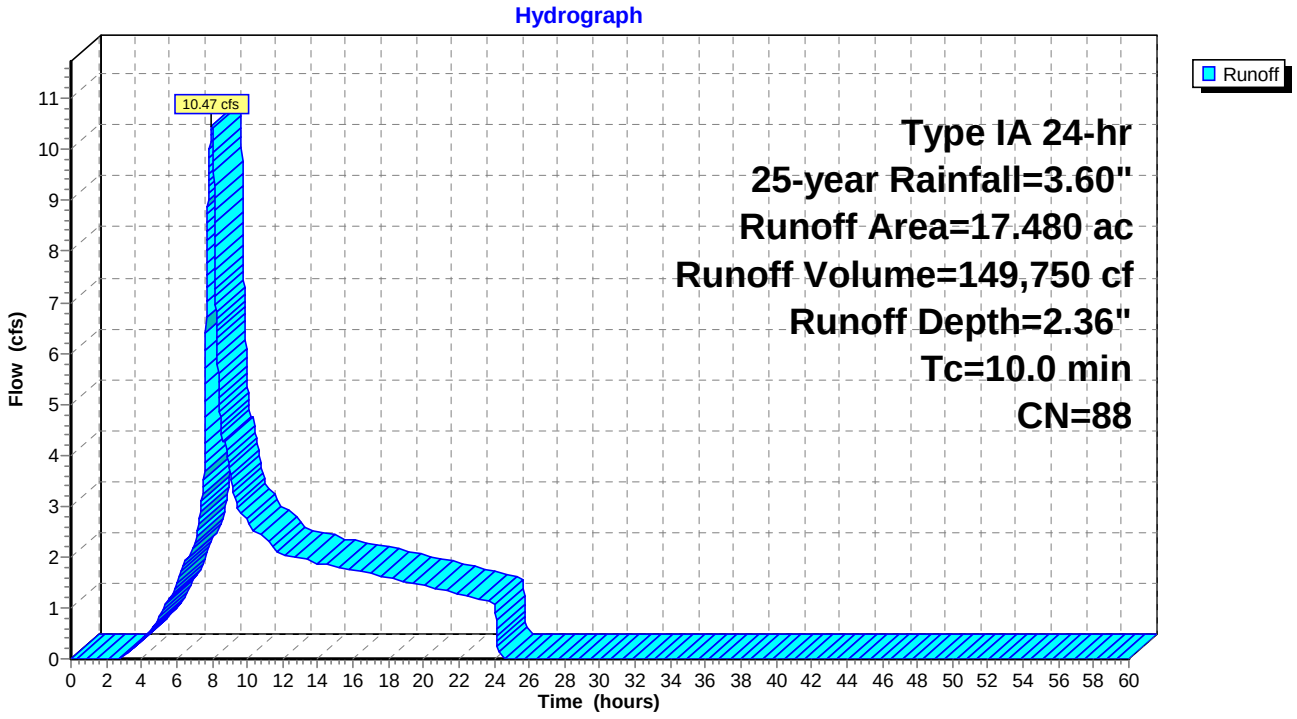
Runoff = 10.47 cfs @ 7.99 hrs, Volume= 149,750 cf, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-year Rainfall=3.60"

	Area (ac)	CN	Description
	6.990	74	>75% Grass cover, Good, HSG C
*	10.490	98	Impervious surface, HSG C
	17.480	88	Weighted Average
	6.990		39.99% Pervious Area
	10.490		60.01% Impervious Area

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

Subcatchment 2B: Developed Conditions



Summary for Subcatchment 3B: Developed Conditions

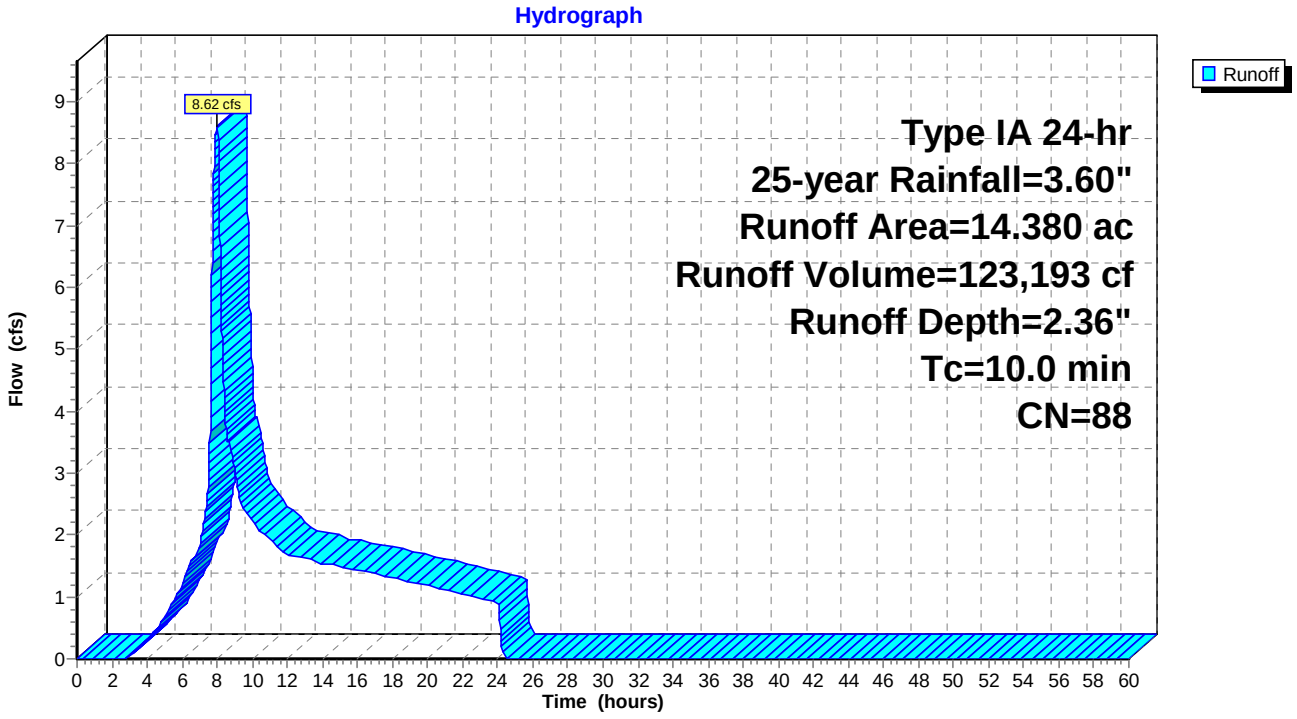
Runoff = 8.62 cfs @ 7.99 hrs, Volume= 123,193 cf, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 25-year Rainfall=3.60"

	Area (ac)	CN	Description
	5.750	74	>75% Grass cover, Good, HSG C
*	8.630	98	Impervious surface, HSG C
	14.380	88	Weighted Average
	5.750		39.99% Pervious Area
	8.630		60.01% Impervious Area

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

Subcatchment 3B: Developed Conditions



Summary for Pond P1: Control MH #1

Inflow Area = 591,545 sf, 60.01% Impervious, Inflow Depth = 2.36" for 25-year event
Inflow = 7.96 cfs @ 8.05 hrs, Volume= 116,339 cf
Outflow = 2.61 cfs @ 9.25 hrs, Volume= 105,363 cf, Atten= 67%, Lag= 72.3 min
Primary = 2.61 cfs @ 9.25 hrs, Volume= 105,363 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 295.79' @ 9.25 hrs Surf.Area= 9,350 sf Storage= 31,749 cf
Flood Elev= 299.00' Surf.Area= 9,350 sf Storage= 61,719 cf

Plug-Flow detention time= 292.3 min calculated for 105,346 cf (91% of inflow)
Center-of-Mass det. time= 230.9 min (993.1 - 762.2)

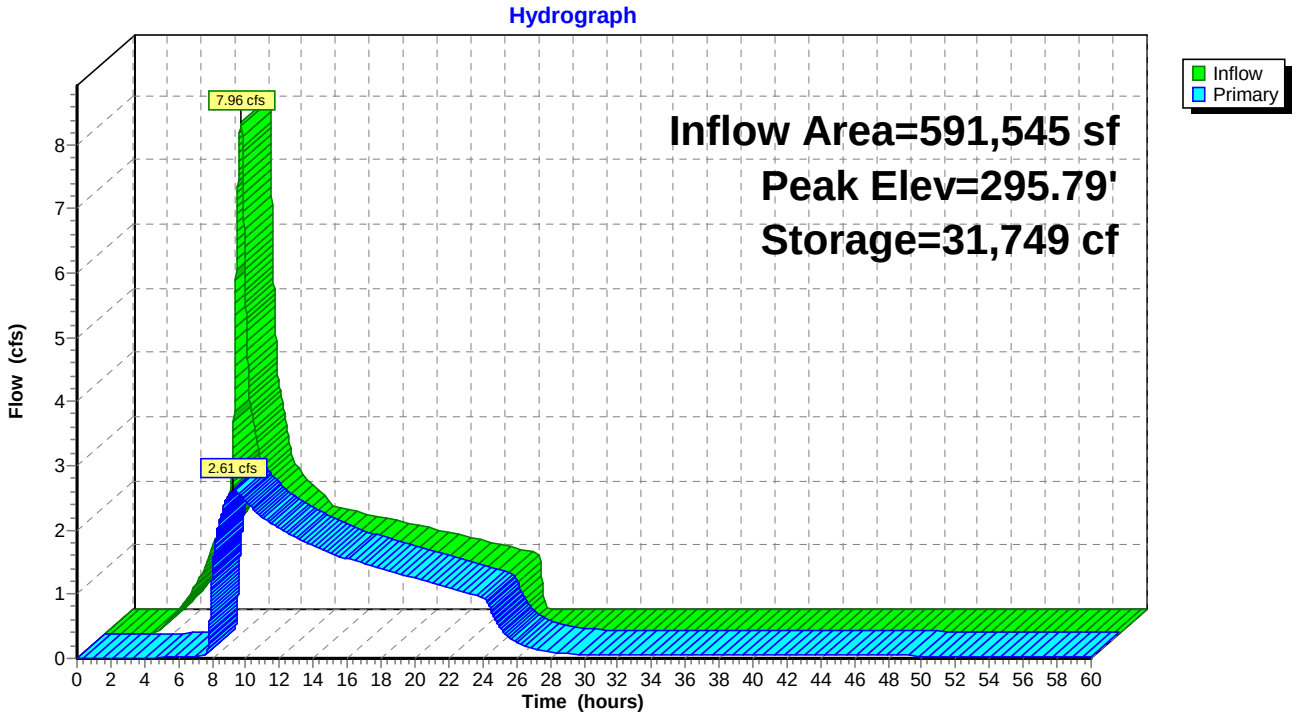
Volume	Invert	Avail.Storage	Storage Description
#1	289.99'	71,069 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
289.99	9,350	0.0	0	0
290.00	9,350	40.0	37	37
291.25	9,350	40.0	4,675	4,712
291.26	9,350	5.0	5	4,717
292.99	9,350	5.0	809	5,526
293.00	9,350	100.0	93	5,619
294.00	9,350	100.0	9,350	14,969
295.00	9,350	100.0	9,350	24,319
296.00	9,350	100.0	9,350	33,669
297.00	9,350	100.0	9,350	43,019
298.00	9,350	100.0	9,350	52,369
299.00	9,350	100.0	9,350	61,719
300.00	9,350	100.0	9,350	71,069

Device	Routing	Invert	Outlet Devices
#1	Primary	290.00'	**15.0" Round 15" Culvert** L= 100.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 290.00' / 289.70' S= 0.0030 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	290.00'	**0.9" Vert. Orifice #1** C= 0.600 Limited to weir flow at low heads
#3	Device 1	294.00'	**8.5" Vert. Orifice #2** C= 0.600 Limited to weir flow at low heads
#4	Device 1	295.50'	**8.5" Vert. Orifice #3** C= 0.600 Limited to weir flow at low heads
#5	Device 1	299.00'	**15.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.61 cfs @ 9.25 hrs HW=295.79' (Free Discharge)
└**1=15" Culvert** (Passes 2.61 cfs of 11.70 cfs potential flow)
  ├**2=Orifice #1** (Orifice Controls 0.05 cfs @ 11.55 fps)
  ├**3=Orifice #2** (Orifice Controls 2.28 cfs @ 5.78 fps)
  ├**4=Orifice #3** (Orifice Controls 0.29 cfs @ 1.85 fps)
  └**5=Overflow** (Controls 0.00 cfs)

Pond P1: Control MH #1



Summary for Pond P2: Control MH #2

Inflow Area = 761,429 sf, 60.01% Impervious, Inflow Depth = 2.36" for 25-year event
Inflow = 10.47 cfs @ 7.99 hrs, Volume= 149,750 cf
Outflow = 3.13 cfs @ 9.31 hrs, Volume= 136,338 cf, Atten= 70%, Lag= 79.4 min
Primary = 3.13 cfs @ 9.31 hrs, Volume= 136,338 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 274.95' @ 9.31 hrs Surf.Area= 9,000 sf Storage= 40,885 cf
Flood Elev= 277.00' Surf.Area= 9,000 sf Storage= 59,377 cf

Plug-Flow detention time= 285.1 min calculated for 136,315 cf (91% of inflow)
Center-of-Mass det. time= 226.7 min (984.3 - 757.6)

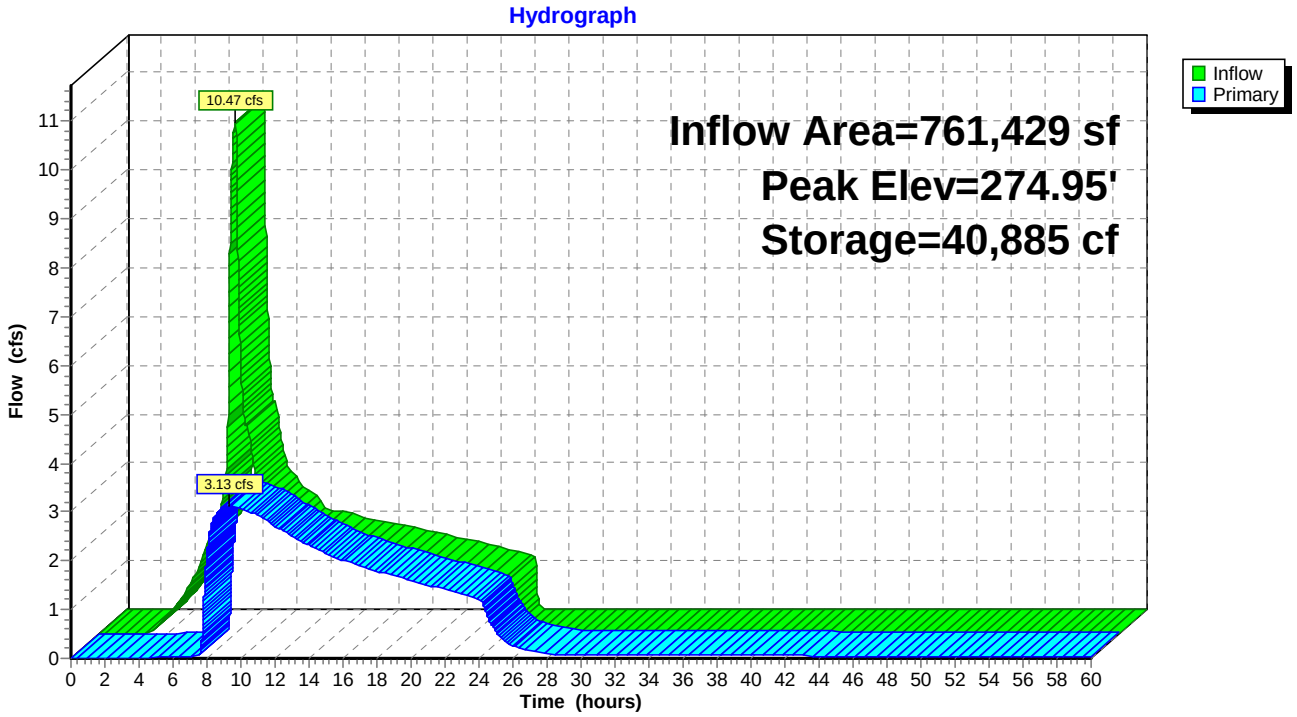
Volume	Invert	Avail.Storage	Storage Description
#1	267.99'	68,377 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
267.99	9,000	0.0	0	0
268.00	9,000	40.0	36	36
269.24	9,000	40.0	4,464	4,500
269.25	9,000	5.0	4	4,504
270.99	9,000	5.0	783	5,288
271.00	9,000	100.0	90	5,377
272.00	9,000	100.0	9,000	14,377
273.00	9,000	100.0	9,000	23,377
274.00	9,000	100.0	9,000	32,377
275.00	9,000	100.0	9,000	41,377
276.00	9,000	100.0	9,000	50,377
277.00	9,000	100.0	9,000	59,377
278.00	9,000	100.0	9,000	68,377

Device	Routing	Invert	Outlet Devices
#1	Primary	268.00'	**15.0" Round 15" Culvert** L= 100.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 268.00' / 267.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	268.00'	**1.0" Vert. Orifice #1** C= 0.600 Limited to weir flow at low heads
#3	Device 1	272.50'	**9.0" Vert. Orifice #2** C= 0.600 Limited to weir flow at low heads
#4	Device 1	275.00'	**9.0" Vert. Orifice #3** C= 0.600 Limited to weir flow at low heads
#5	Device 1	277.00'	**15.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.13 cfs @ 9.31 hrs HW=274.95' (Free Discharge)
└**1=15" Culvert** (Passes 3.13 cfs of 13.23 cfs potential flow)
  ├**2=Orifice #1** (Orifice Controls 0.07 cfs @ 12.65 fps)
  ├**3=Orifice #2** (Orifice Controls 3.06 cfs @ 6.93 fps)
  ├**4=Orifice #3** (Controls 0.00 cfs)
  └**5=Overflow** (Controls 0.00 cfs)

Pond P2: Control MH #2



Summary for Pond P3: Control MH #3

Inflow Area = 626,393 sf, 60.01% Impervious, Inflow Depth = 2.36" for 25-year event
Inflow = 8.62 cfs @ 7.99 hrs, Volume= 123,193 cf
Outflow = 2.50 cfs @ 9.38 hrs, Volume= 112,903 cf, Atten= 71%, Lag= 83.5 min
Primary = 2.50 cfs @ 9.38 hrs, Volume= 112,903 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 274.70' @ 9.38 hrs Surf.Area= 7,875 sf Storage= 33,817 cf
Flood Elev= 278.00' Surf.Area= 7,875 sf Storage= 59,830 cf

Plug-Flow detention time= 283.0 min calculated for 112,903 cf (92% of inflow)
Center-of-Mass det. time= 228.1 min (985.7 - 757.6)

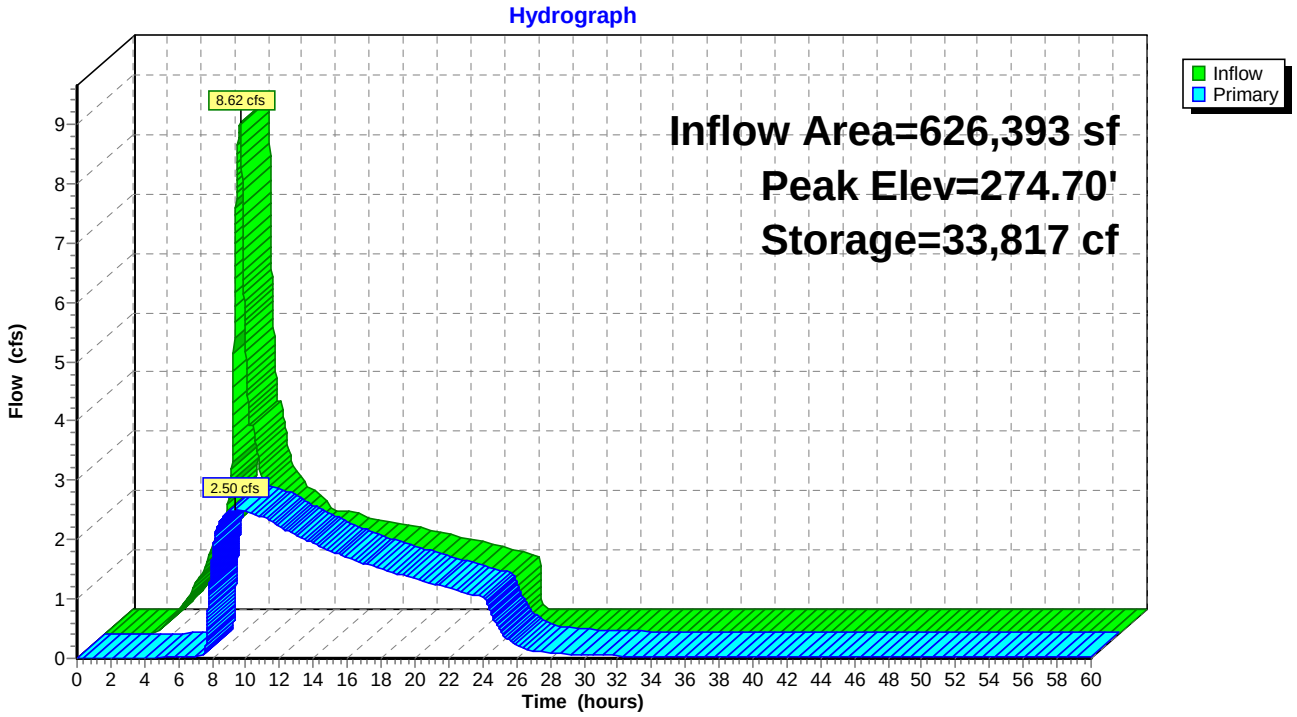
Volume	Invert	Avail.Storage	Storage Description
#1	267.99'	59,830 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
267.99	7,875	0.0	0	0
268.00	7,875	40.0	31	31
269.24	7,875	40.0	3,906	3,938
269.25	7,875	5.0	4	3,941
270.99	7,875	5.0	685	4,627
271.00	7,875	100.0	79	4,705
272.00	7,875	100.0	7,875	12,580
273.00	7,875	100.0	7,875	20,455
274.00	7,875	100.0	7,875	28,330
275.00	7,875	100.0	7,875	36,205
276.00	7,875	100.0	7,875	44,080
277.00	7,875	100.0	7,875	51,955
278.00	7,875	100.0	7,875	59,830

Device	Routing	Invert	Outlet Devices
#1	Primary	268.00'	**15.0" Round 15" Culvert** L= 50.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 268.00' / 267.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	268.00'	**0.9" Vert. Orifice #1** C= 0.600 Limited to weir flow at low heads
#3	Device 1	272.25'	**8.0" Vert. Orifice #2** C= 0.600 Limited to weir flow at low heads
#4	Device 1	277.00'	**15.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=2.50 cfs @ 9.38 hrs HW=274.70' (Free Discharge)
└**1=15" Culvert** (Passes 2.50 cfs of 15.95 cfs potential flow)
  ├**2=Orifice #1** (Orifice Controls 0.05 cfs @ 12.43 fps)
  ├**3=Orifice #2** (Orifice Controls 2.44 cfs @ 7.00 fps)
  └**4=Overflow** (Controls 0.00 cfs)

Pond P3: Control MH #3



Summary for Subcatchment B1: Existing Conditions (Basin #1)

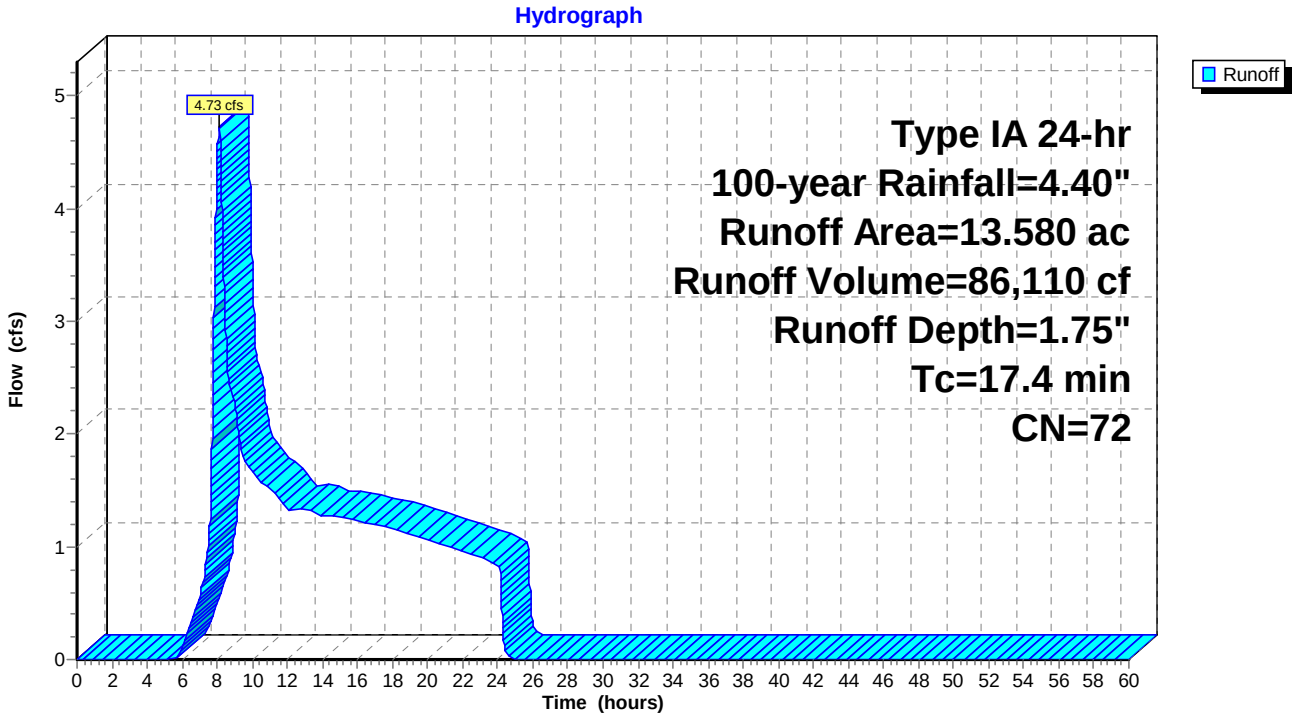
Runoff = 4.73 cfs @ 8.10 hrs, Volume= 86,110 cf, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-year Rainfall=4.40"

	Area (ac)	CN	Description
*	13.580	72	City of Salem Pre-developed, HSG C
	13.580		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, TR-55 Worksheet**

Subcatchment B1: Existing Conditions (Basin #1)



Summary for Subcatchment B2: Existing Conditions (Basin #2)

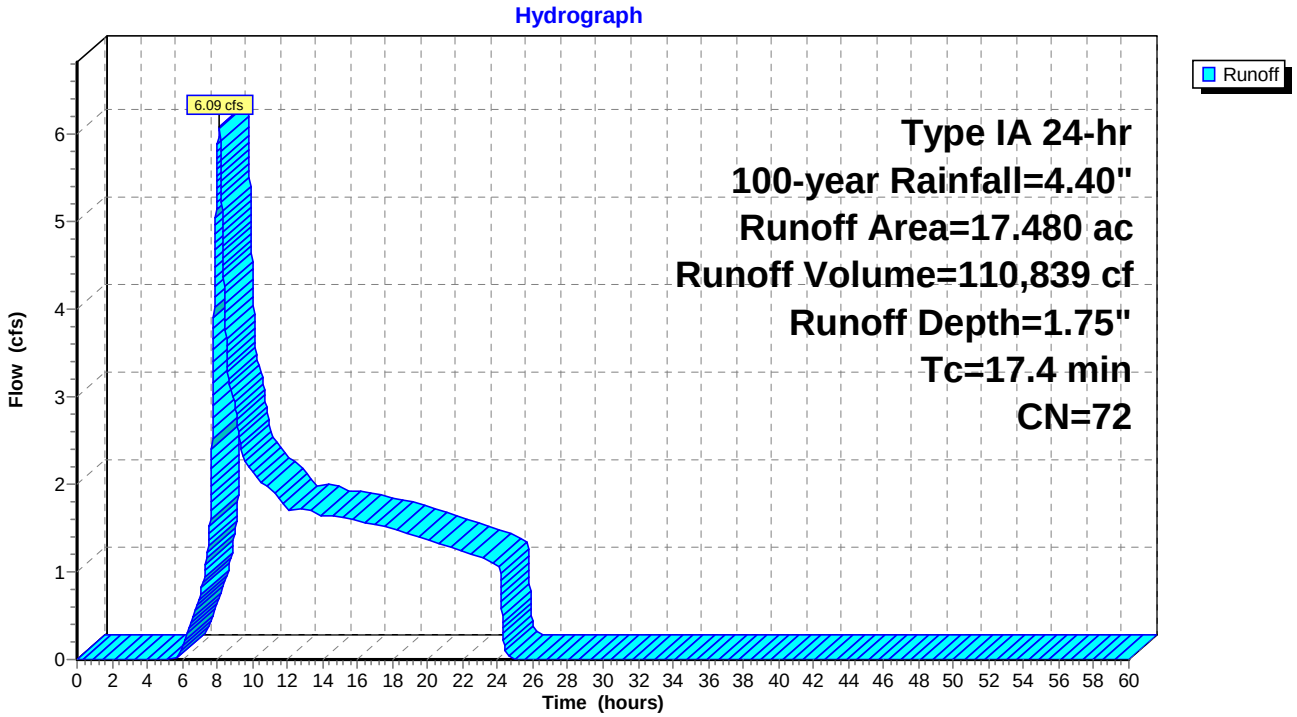
Runoff = 6.09 cfs @ 8.10 hrs, Volume= 110,839 cf, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-year Rainfall=4.40"

	Area (ac)	CN	Description
*	17.480	72	City of Salem Pre-developed, HSG C
	17.480		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, TR-55 Worksheet**

Subcatchment B2: Existing Conditions (Basin #2)



Summary for Subcatchment B3: Existing Conditions (Basin #3)

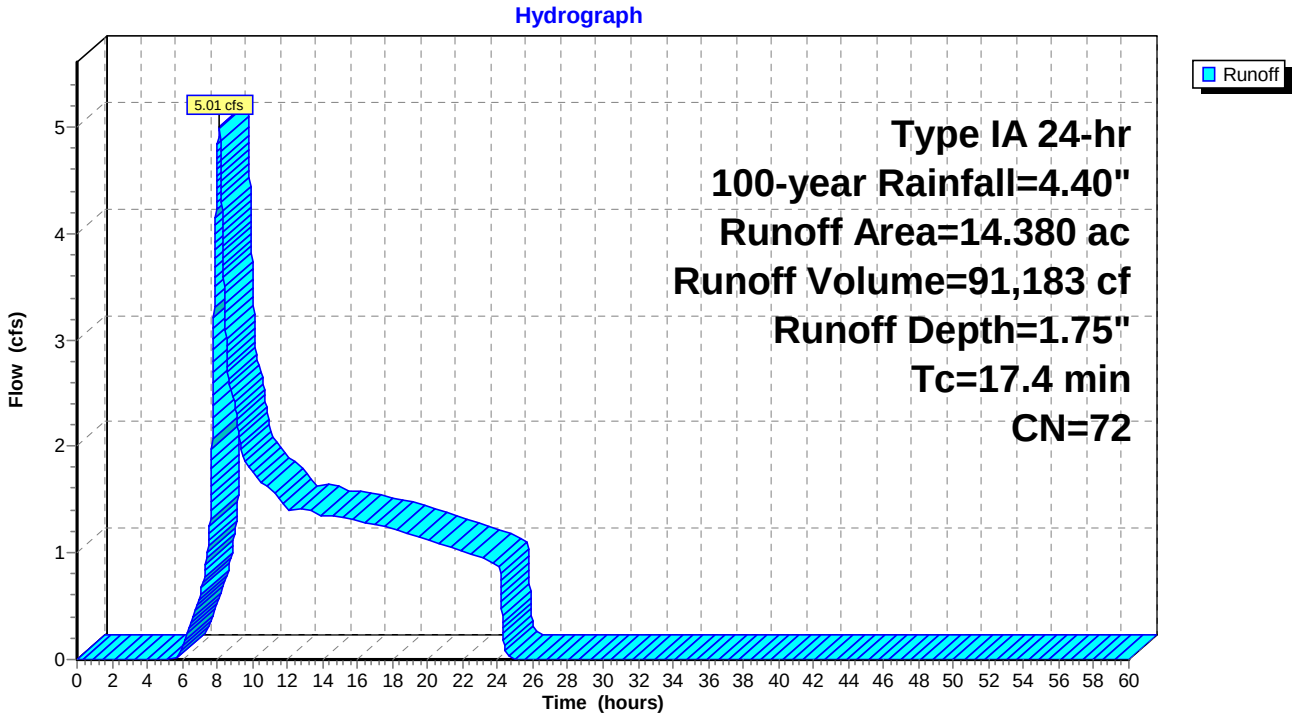
Runoff = 5.01 cfs @ 8.10 hrs, Volume= 91,183 cf, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-year Rainfall=4.40"

	Area (ac)	CN	Description
*	14.380	72	City of Salem Pre-developed, HSG C
	14.380		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, TR-55 Worksheet**

Subcatchment B3: Existing Conditions (Basin #3)



Summary for Subcatchment 1B: Developed Conditions

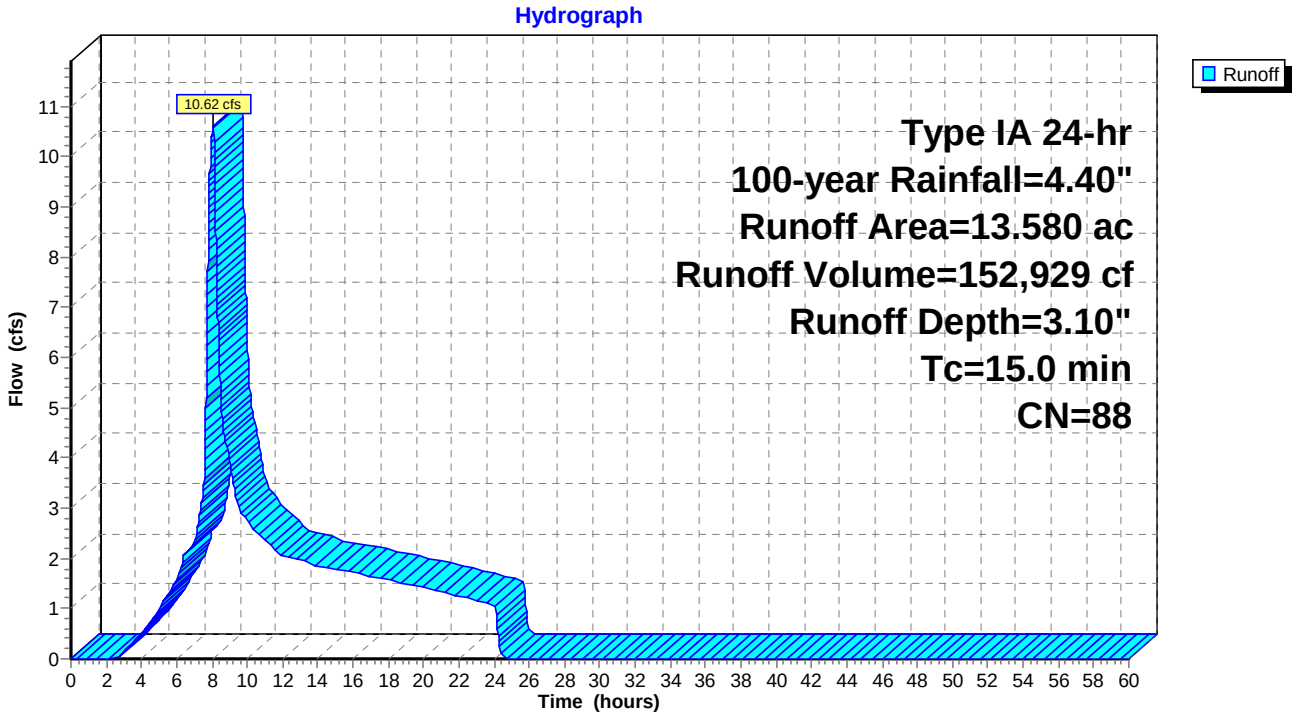
Runoff = 10.62 cfs @ 8.05 hrs, Volume= 152,929 cf, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-year Rainfall=4.40"

	Area (ac)	CN	Description
	5.430	74	>75% Grass cover, Good, HSG C
*	8.150	98	Impervious surface, HSG C
	13.580	88	Weighted Average
	5.430		39.99% Pervious Area
	8.150		60.01% Impervious Area

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

Subcatchment 1B: Developed Conditions



Summary for Subcatchment 2B: Developed Conditions

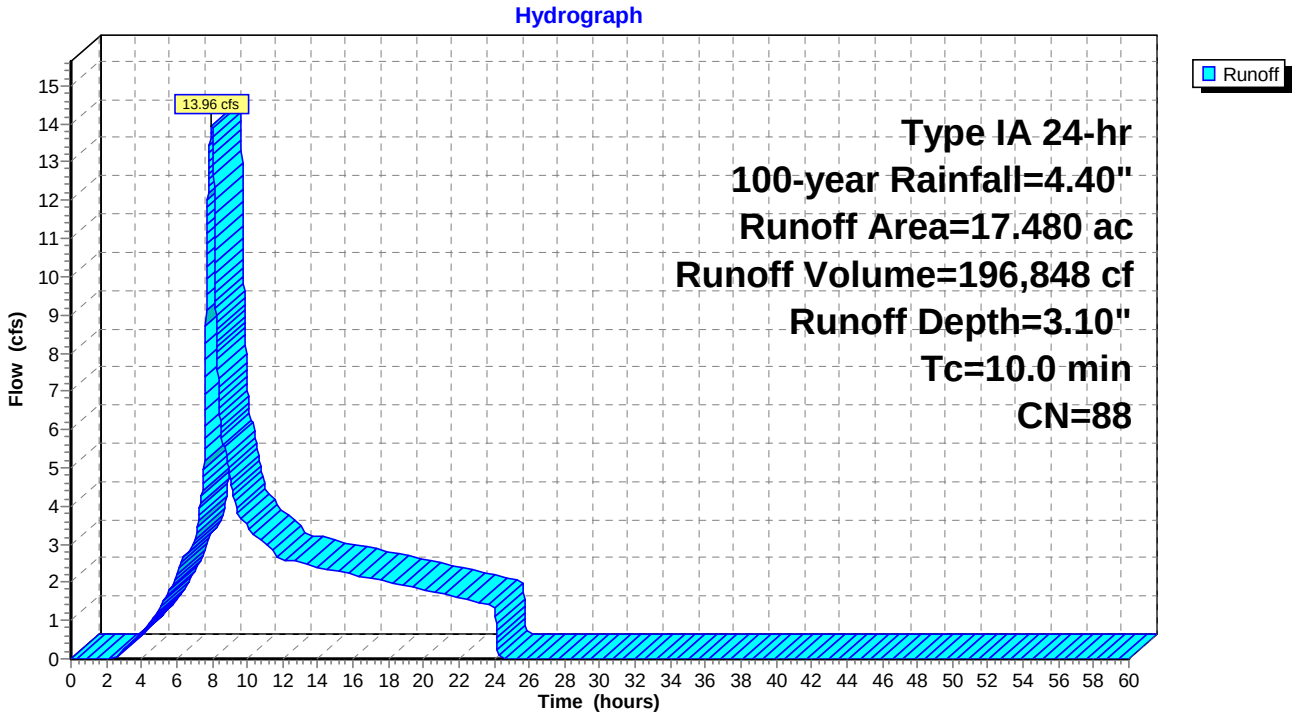
Runoff = 13.96 cfs @ 7.99 hrs, Volume= 196,848 cf, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-year Rainfall=4.40"

	Area (ac)	CN	Description
	6.990	74	>75% Grass cover, Good, HSG C
*	10.490	98	Impervious surface, HSG C
	17.480	88	Weighted Average
	6.990		39.99% Pervious Area
	10.490		60.01% Impervious Area

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

Subcatchment 2B: Developed Conditions



Summary for Subcatchment 3B: Developed Conditions

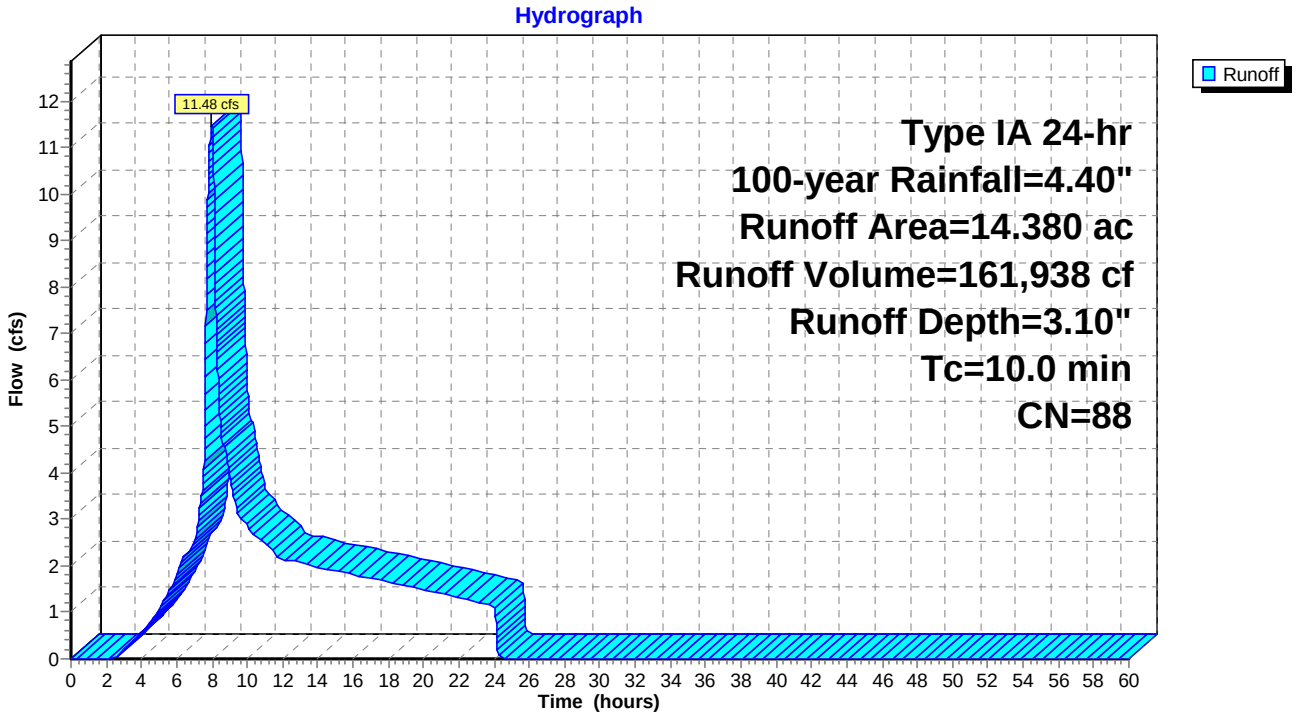
Runoff = 11.48 cfs @ 7.99 hrs, Volume= 161,938 cf, Depth= 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr 100-year Rainfall=4.40"

	Area (ac)	CN	Description
	5.750	74	>75% Grass cover, Good, HSG C
*	8.630	98	Impervious surface, HSG C
	14.380	88	Weighted Average
	5.750		39.99% Pervious Area
	8.630		60.01% Impervious Area

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

Subcatchment 3B: Developed Conditions



Summary for Pond P1: Control MH #1

Inflow Area = 591,545 sf, 60.01% Impervious, Inflow Depth = 3.10" for 100-year event
Inflow = 10.62 cfs @ 8.05 hrs, Volume= 152,929 cf
Outflow = 4.36 cfs @ 8.78 hrs, Volume= 141,898 cf, Atten= 59%, Lag= 43.9 min
Primary = 4.36 cfs @ 8.78 hrs, Volume= 141,898 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 296.50' @ 8.78 hrs Surf.Area= 9,350 sf Storage= 38,338 cf
Flood Elev= 299.00' Surf.Area= 9,350 sf Storage= 61,719 cf

Plug-Flow detention time= 247.6 min calculated for 141,874 cf (93% of inflow)
Center-of-Mass det. time= 199.4 min (946.9 - 747.5)

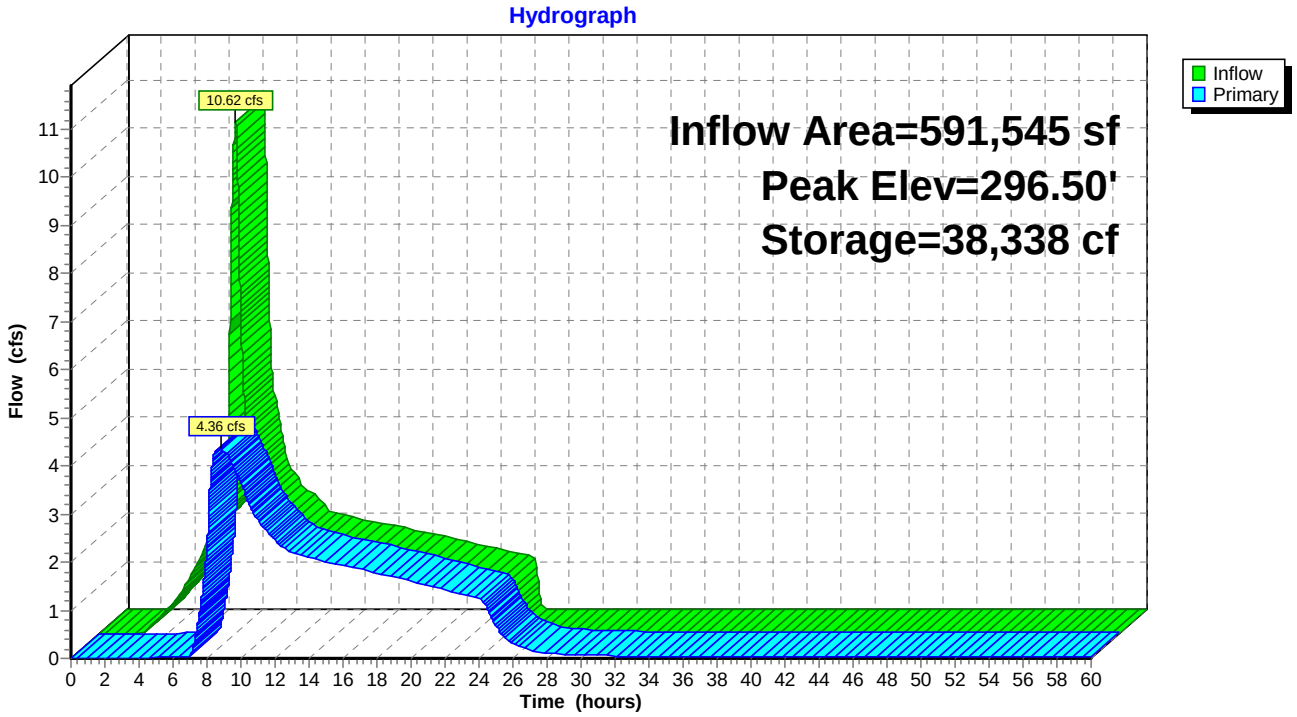
Volume	Invert	Avail.Storage	Storage Description
#1	289.99'	71,069 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
289.99	9,350	0.0	0	0
290.00	9,350	40.0	37	37
291.25	9,350	40.0	4,675	4,712
291.26	9,350	5.0	5	4,717
292.99	9,350	5.0	809	5,526
293.00	9,350	100.0	93	5,619
294.00	9,350	100.0	9,350	14,969
295.00	9,350	100.0	9,350	24,319
296.00	9,350	100.0	9,350	33,669
297.00	9,350	100.0	9,350	43,019
298.00	9,350	100.0	9,350	52,369
299.00	9,350	100.0	9,350	61,719
300.00	9,350	100.0	9,350	71,069

Device	Routing	Invert	Outlet Devices
#1	Primary	290.00'	**15.0" Round 15" Culvert** L= 100.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 290.00' / 289.70' S= 0.0030 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	290.00'	**0.9" Vert. Orifice #1** C= 0.600 Limited to weir flow at low heads
#3	Device 1	294.00'	**8.5" Vert. Orifice #2** C= 0.600 Limited to weir flow at low heads
#4	Device 1	295.50'	**8.5" Vert. Orifice #3** C= 0.600 Limited to weir flow at low heads
#5	Device 1	299.00'	**15.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=4.36 cfs @ 8.78 hrs HW=296.50' (Free Discharge)
└**1=15" Culvert** (Passes 4.36 cfs of 12.52 cfs potential flow)
  ├**2=Orifice #1** (Orifice Controls 0.05 cfs @ 12.24 fps)
  ├**3=Orifice #2** (Orifice Controls 2.78 cfs @ 7.05 fps)
  ├**4=Orifice #3** (Orifice Controls 1.52 cfs @ 3.87 fps)
  └**5=Overflow** (Controls 0.00 cfs)

Pond P1: Control MH #1



Summary for Pond P2: Control MH #2

Inflow Area = 761,429 sf, 60.01% Impervious, Inflow Depth = 3.10" for 100-year event
Inflow = 13.96 cfs @ 7.99 hrs, Volume= 196,848 cf
Outflow = 5.40 cfs @ 8.80 hrs, Volume= 183,364 cf, Atten= 61%, Lag= 49.0 min
Primary = 5.40 cfs @ 8.80 hrs, Volume= 183,364 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 275.94' @ 8.80 hrs Surf.Area= 9,000 sf Storage= 49,843 cf
Flood Elev= 277.00' Surf.Area= 9,000 sf Storage= 59,377 cf

Plug-Flow detention time= 246.0 min calculated for 183,334 cf (93% of inflow)
Center-of-Mass det. time= 200.1 min (943.0 - 742.9)

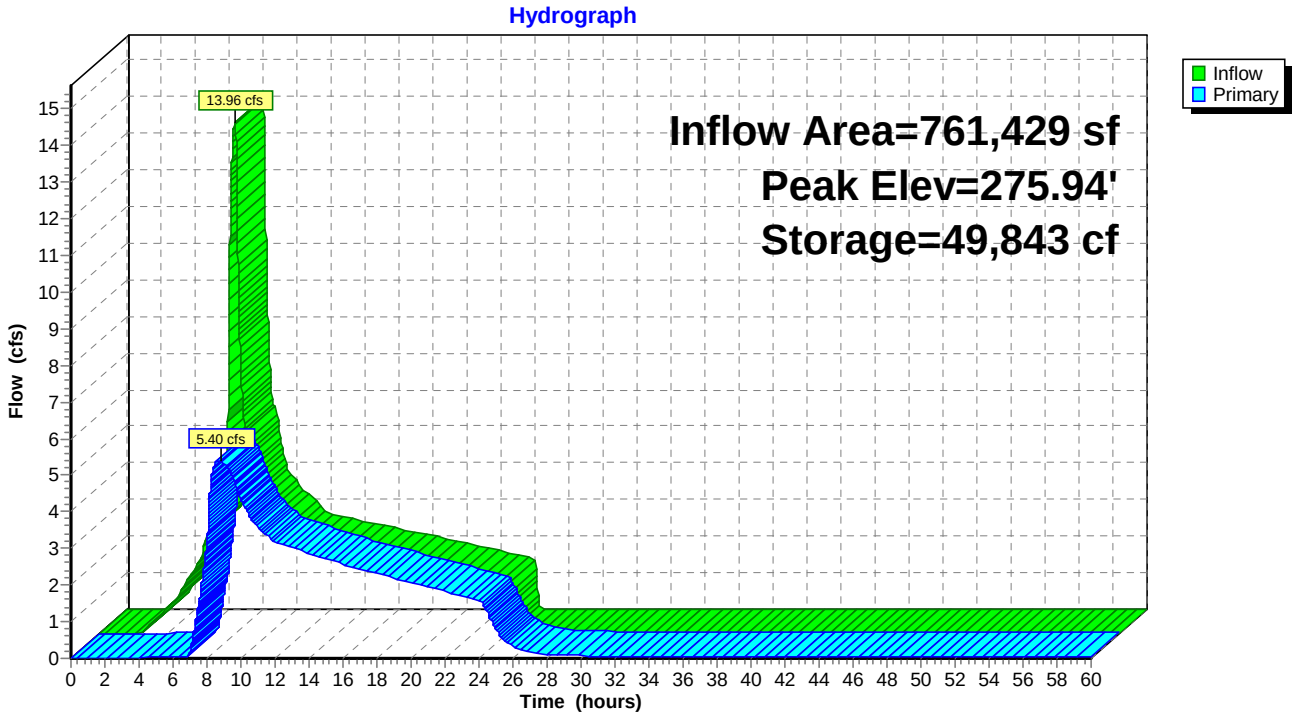
Volume	Invert	Avail.Storage	Storage Description
#1	267.99'	68,377 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
267.99	9,000	0.0	0	0
268.00	9,000	40.0	36	36
269.24	9,000	40.0	4,464	4,500
269.25	9,000	5.0	4	4,504
270.99	9,000	5.0	783	5,288
271.00	9,000	100.0	90	5,377
272.00	9,000	100.0	9,000	14,377
273.00	9,000	100.0	9,000	23,377
274.00	9,000	100.0	9,000	32,377
275.00	9,000	100.0	9,000	41,377
276.00	9,000	100.0	9,000	50,377
277.00	9,000	100.0	9,000	59,377
278.00	9,000	100.0	9,000	68,377

Device	Routing	Invert	Outlet Devices
#1	Primary	268.00'	**15.0" Round 15" Culvert** L= 100.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 268.00' / 267.50' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	268.00'	**1.0" Vert. Orifice #1** C= 0.600 Limited to weir flow at low heads
#3	Device 1	272.50'	**9.0" Vert. Orifice #2** C= 0.600 Limited to weir flow at low heads
#4	Device 1	275.00'	**9.0" Vert. Orifice #3** C= 0.600 Limited to weir flow at low heads
#5	Device 1	277.00'	**15.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=5.40 cfs @ 8.80 hrs HW=275.94' (Free Discharge)
└**1=15" Culvert** (Passes 5.40 cfs of 14.25 cfs potential flow)
  ├**2=Orifice #1** (Orifice Controls 0.07 cfs @ 13.53 fps)
  ├**3=Orifice #2** (Orifice Controls 3.72 cfs @ 8.43 fps)
  ├**4=Orifice #3** (Orifice Controls 1.60 cfs @ 3.62 fps)
  └**5=Overflow** (Controls 0.00 cfs)

Pond P2: Control MH #2



Summary for Pond P3: Control MH #3

Inflow Area = 626,393 sf, 60.01% Impervious, Inflow Depth = 3.10" for 100-year event
Inflow = 11.48 cfs @ 7.99 hrs, Volume= 161,938 cf
Outflow = 3.23 cfs @ 9.39 hrs, Volume= 151,577 cf, Atten= 72%, Lag= 84.1 min
Primary = 3.23 cfs @ 9.39 hrs, Volume= 151,577 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 276.13' @ 9.39 hrs Surf.Area= 7,875 sf Storage= 45,110 cf
Flood Elev= 278.00' Surf.Area= 7,875 sf Storage= 59,830 cf

Plug-Flow detention time= 261.8 min calculated for 151,552 cf (94% of inflow)
Center-of-Mass det. time= 218.7 min (961.6 - 742.9)

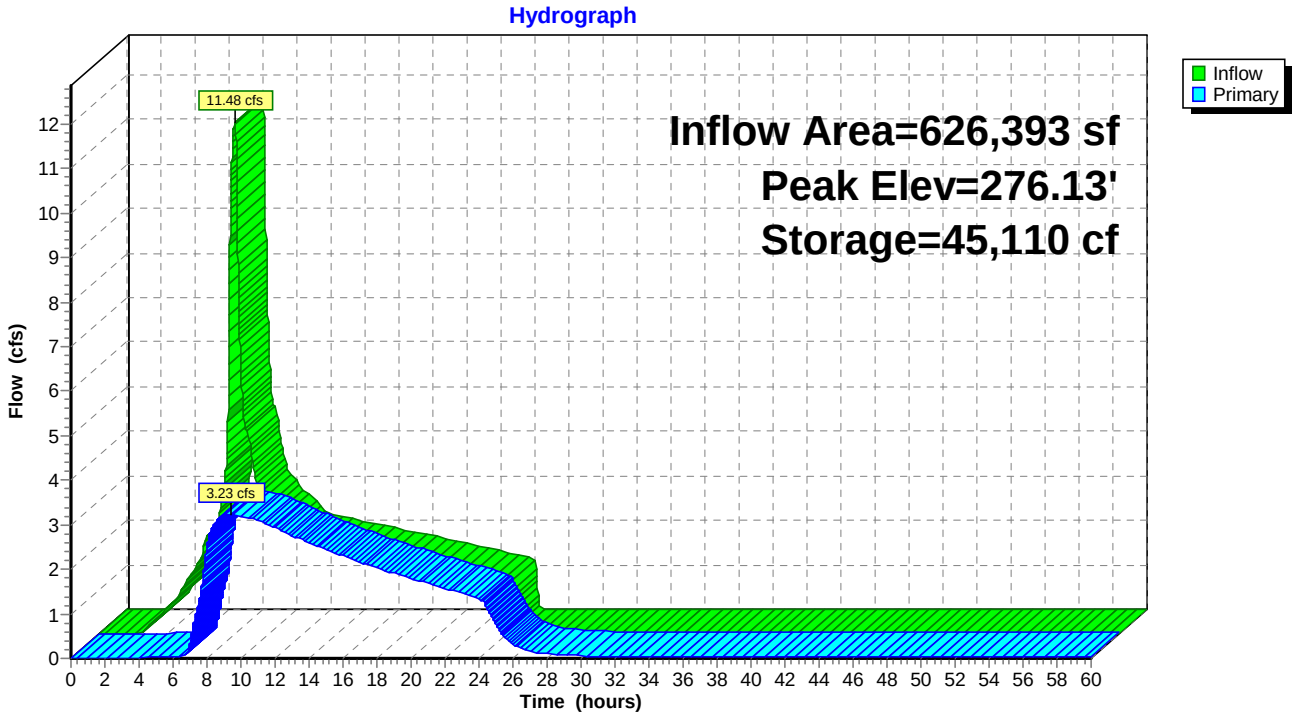
Volume	Invert	Avail.Storage	Storage Description
#1	267.99'	59,830 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
267.99	7,875	0.0	0	0
268.00	7,875	40.0	31	31
269.24	7,875	40.0	3,906	3,938
269.25	7,875	5.0	4	3,941
270.99	7,875	5.0	685	4,627
271.00	7,875	100.0	79	4,705
272.00	7,875	100.0	7,875	12,580
273.00	7,875	100.0	7,875	20,455
274.00	7,875	100.0	7,875	28,330
275.00	7,875	100.0	7,875	36,205
276.00	7,875	100.0	7,875	44,080
277.00	7,875	100.0	7,875	51,955
278.00	7,875	100.0	7,875	59,830

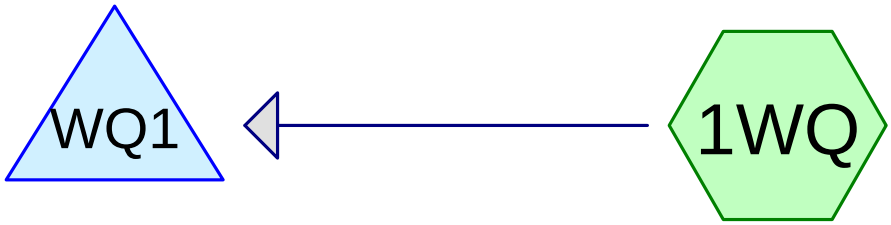
Device	Routing	Invert	Outlet Devices
#1	Primary	268.00'	**15.0" Round 15" Culvert** L= 50.0' RCP, rounded edge headwall, Ke= 0.100 Inlet / Outlet Invert= 268.00' / 267.50' S= 0.0100 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#2	Device 1	268.00'	**0.9" Vert. Orifice #1** C= 0.600 Limited to weir flow at low heads
#3	Device 1	272.25'	**8.0" Vert. Orifice #2** C= 0.600 Limited to weir flow at low heads
#4	Device 1	277.00'	**15.0" Horiz. Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=3.23 cfs @ 9.39 hrs HW=276.13' (Free Discharge)
└**1=15" Culvert** (Passes 3.23 cfs of 17.77 cfs potential flow)
  ├**2=Orifice #1** (Orifice Controls 0.06 cfs @ 13.70 fps)
  ├**3=Orifice #2** (Orifice Controls 3.17 cfs @ 9.07 fps)
  └**4=Overflow** (Controls 0.00 cfs)

Pond P3: Control MH #3



Appendix E



Water Quality Media

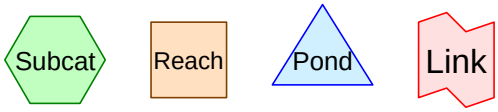
Developed Conditions
(Basin #1)

Water Quality Media

Developed Conditions
(Basin #2)

Water Quality Media

Developed Conditions
(Basin #3)



Routing Diagram for 20210202 WQ
Prepared by Multitech Engineering Services, Inc., Printed 2/3/2021

Summary for Subcatchment 1WQ: Developed Conditions (Basin #1)

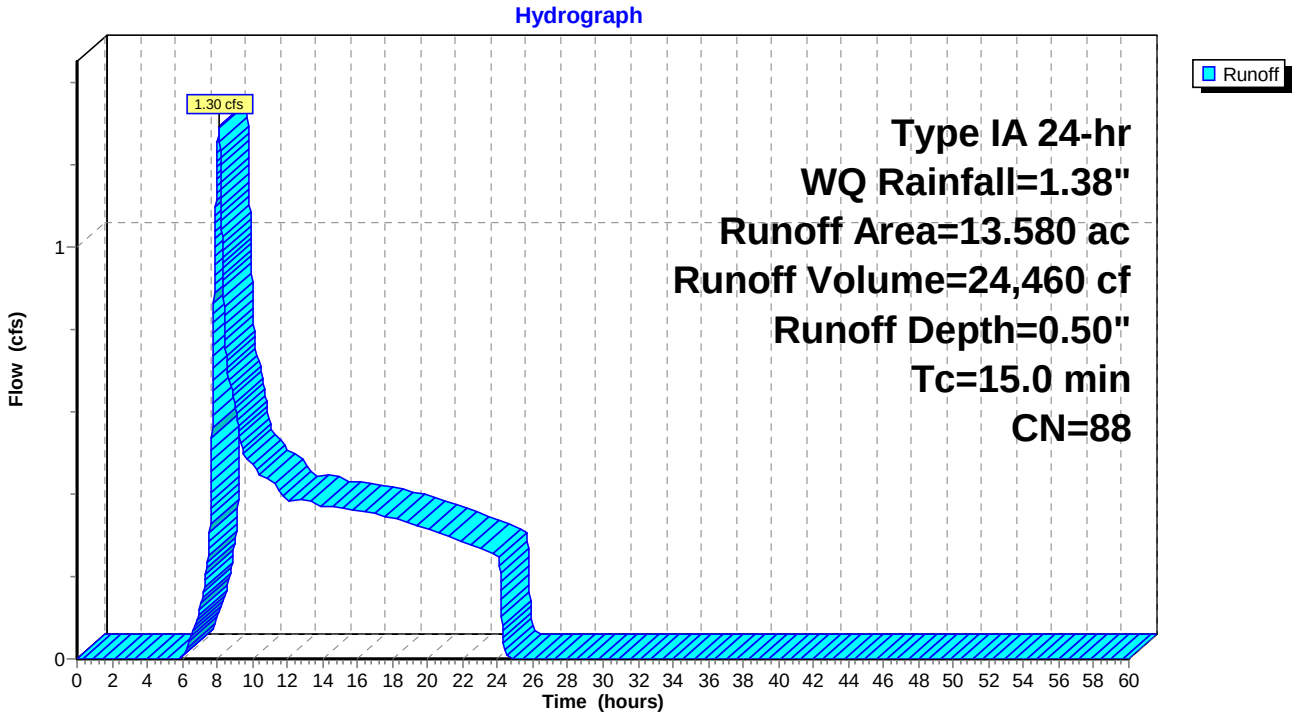
Runoff = 1.30 cfs @ 8.09 hrs, Volume= 24,460 cf, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (ac)	CN	Description
	5.430	74	>75% Grass cover, Good, HSG C
*	8.150	98	Impervious surface, HSG C
	13.580	88	Weighted Average
	5.430		39.99% Pervious Area
	8.150		60.01% Impervious Area

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

Subcatchment 1WQ: Developed Conditions (Basin #1)



Summary for Pond WQ1: Water Quality Media

Inflow Area = 591,545 sf, 60.01% Impervious, Inflow Depth = 0.50" for WQ event
Inflow = 1.30 cfs @ 8.09 hrs, Volume= 24,460 cf
Outflow = 0.43 cfs @ 7.71 hrs, Volume= 24,460 cf, Atten= 67%, Lag= 0.0 min
Primary = 0.43 cfs @ 7.71 hrs, Volume= 24,460 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 293.26' @ 11.09 hrs Surf.Area= 9,350 sf Storage= 2,544 cf
Flood Elev= 299.00' Surf.Area= 9,350 sf Storage= 56,193 cf

Plug-Flow detention time= 53.7 min calculated for 24,456 cf (100% of inflow)
Center-of-Mass det. time= 53.7 min (911.3 - 857.6)

Volume	Invert	Avail.Storage	Storage Description
#1	292.99'	65,543 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

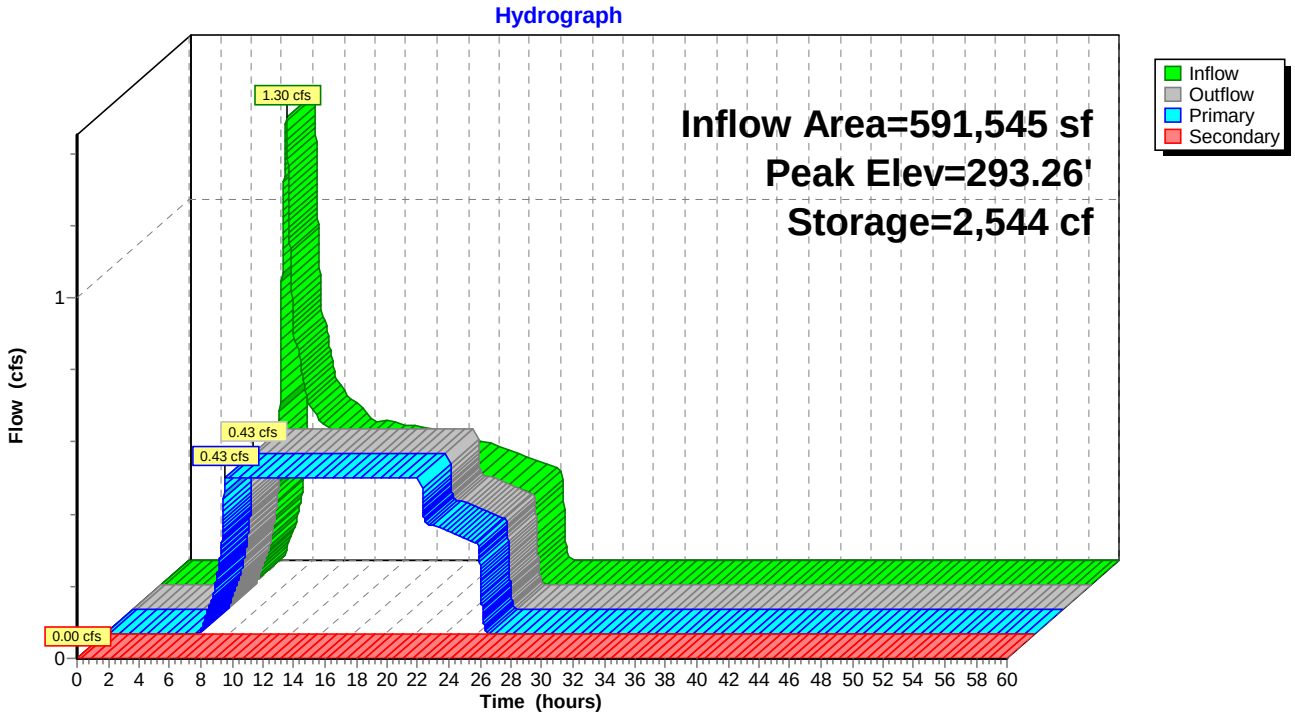
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
292.99	9,350	0.0	0	0
293.00	9,350	100.0	93	93
294.00	9,350	100.0	9,350	9,443
295.00	9,350	100.0	9,350	18,793
296.00	9,350	100.0	9,350	28,143
297.00	9,350	100.0	9,350	37,493
298.00	9,350	100.0	9,350	46,843
299.00	9,350	100.0	9,350	56,193
300.00	9,350	100.0	9,350	65,543

Device	Routing	Invert	Outlet Devices
#1	Primary	292.99'	**2.000 in/hr Exfiltration over Surface area**
#2	Secondary	293.50'	**24.0" Horiz. Beehive Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.43 cfs @ 7.71 hrs HW=293.00' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.43 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=292.99' (Free Discharge)
2=Beehive Overflow (Controls 0.00 cfs)

Pond WQ1: Water Quality Media



Summary for Subcatchment 2WQ: Developed Conditions (Basin #2)

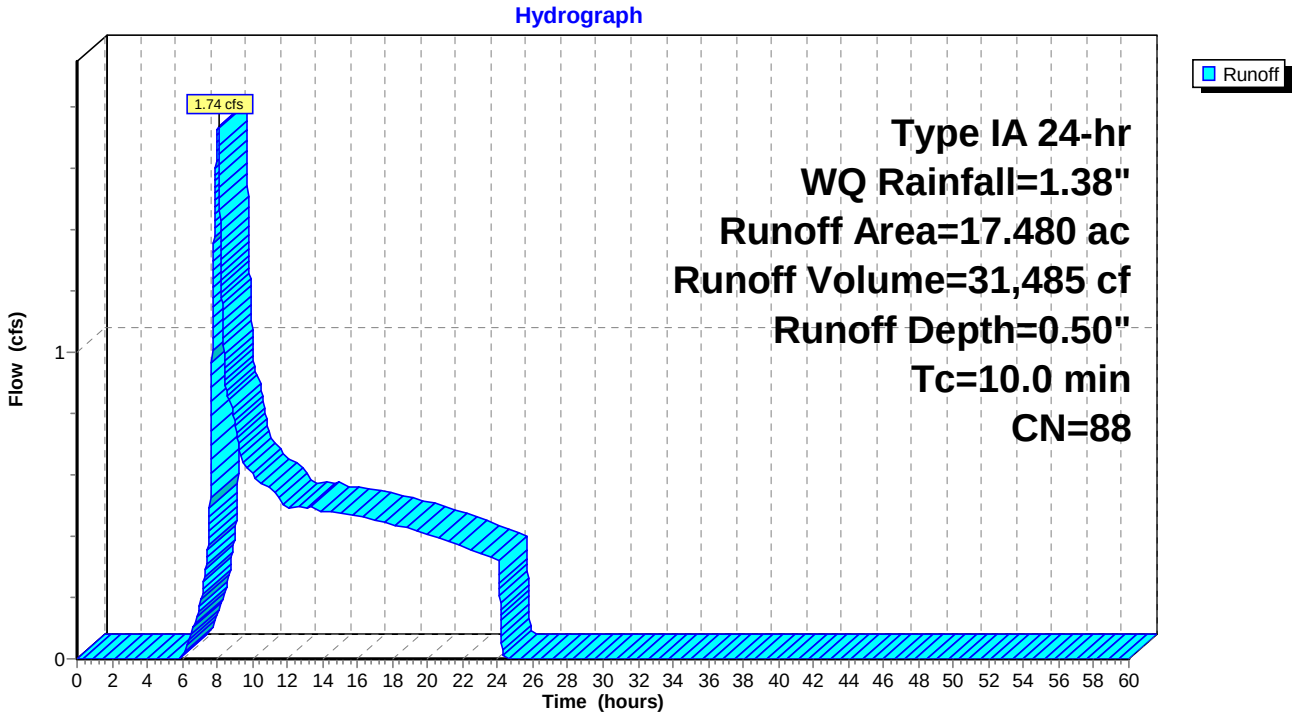
Runoff = 1.74 cfs @ 8.04 hrs, Volume= 31,485 cf, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (ac)	CN	Description
	6.990	74	>75% Grass cover, Good, HSG C
*	10.490	98	Impervious surface, HSG C
	17.480	88	Weighted Average
	6.990		39.99% Pervious Area
	10.490		60.01% Impervious Area

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

Subcatchment 2WQ: Developed Conditions (Basin #2)



Summary for Pond WQ2: Water Quality Media

Inflow Area = 761,429 sf, 60.01% Impervious, Inflow Depth = 0.50" for WQ event
Inflow = 1.74 cfs @ 8.04 hrs, Volume= 31,485 cf
Outflow = 0.42 cfs @ 7.59 hrs, Volume= 31,485 cf, Atten= 76%, Lag= 0.0 min
Primary = 0.42 cfs @ 7.59 hrs, Volume= 31,485 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 271.73' @ 19.31 hrs Surf.Area= 9,000 sf Storage= 6,640 cf
Flood Elev= 290.00' Surf.Area= 9,000 sf Storage= 54,090 cf

Plug-Flow detention time= 199.0 min calculated for 31,480 cf (100% of inflow)
Center-of-Mass det. time= 199.0 min (1,052.0 - 853.0)

Volume	Invert	Avail.Storage	Storage Description
#1	270.99'	54,090 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

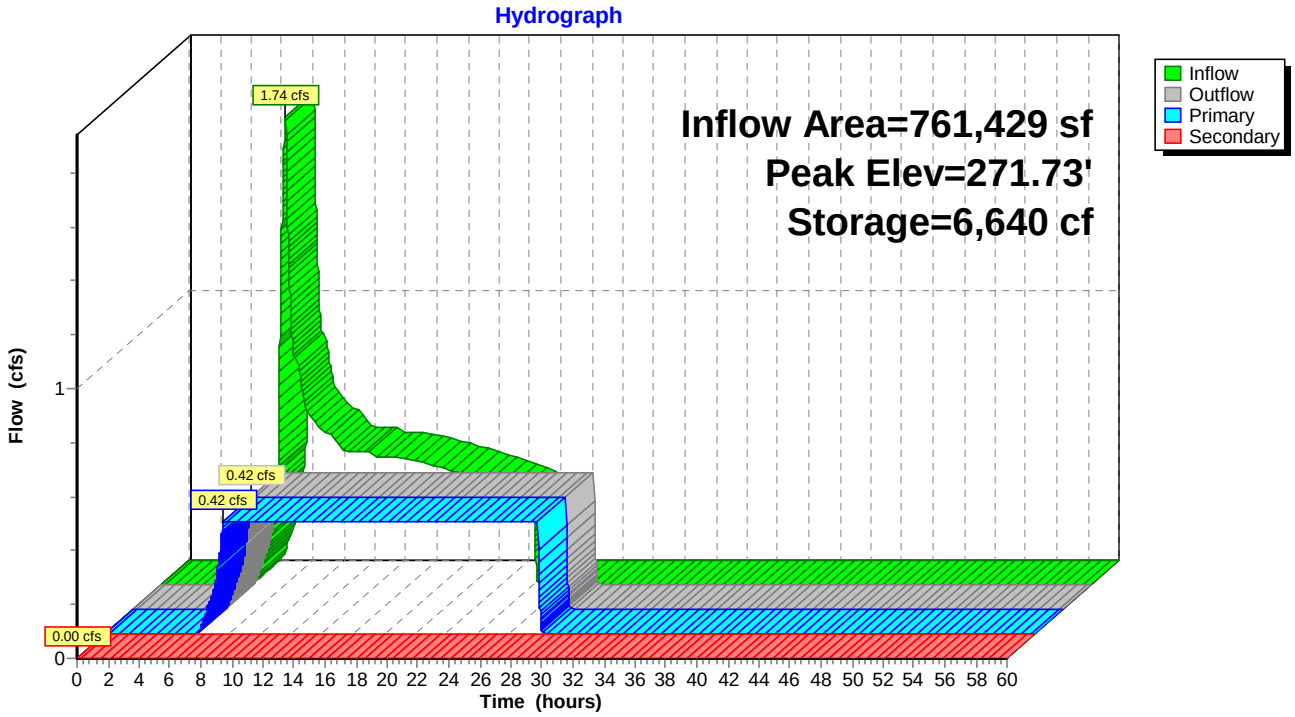
Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
270.99	9,000	0.0	0	0
271.00	9,000	100.0	90	90
272.00	9,000	100.0	9,000	9,090
273.00	9,000	100.0	9,000	18,090
274.00	9,000	100.0	9,000	27,090
275.00	9,000	100.0	9,000	36,090
276.00	9,000	100.0	9,000	45,090
277.00	9,000	100.0	9,000	54,090

Device	Routing	Invert	Outlet Devices
#1	Primary	270.99'	**2.000 in/hr Exfiltration over Surface area**
#2	Secondary	272.00'	**24.0" Horiz. Beehive Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.42 cfs @ 7.59 hrs HW=271.00' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.42 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=270.99' (Free Discharge)
└**2=Beehive Overflow** (Controls 0.00 cfs)

Pond WQ2: Water Quality Media



Summary for Subcatchment 3WQ: Developed Conditions (Basin #3)

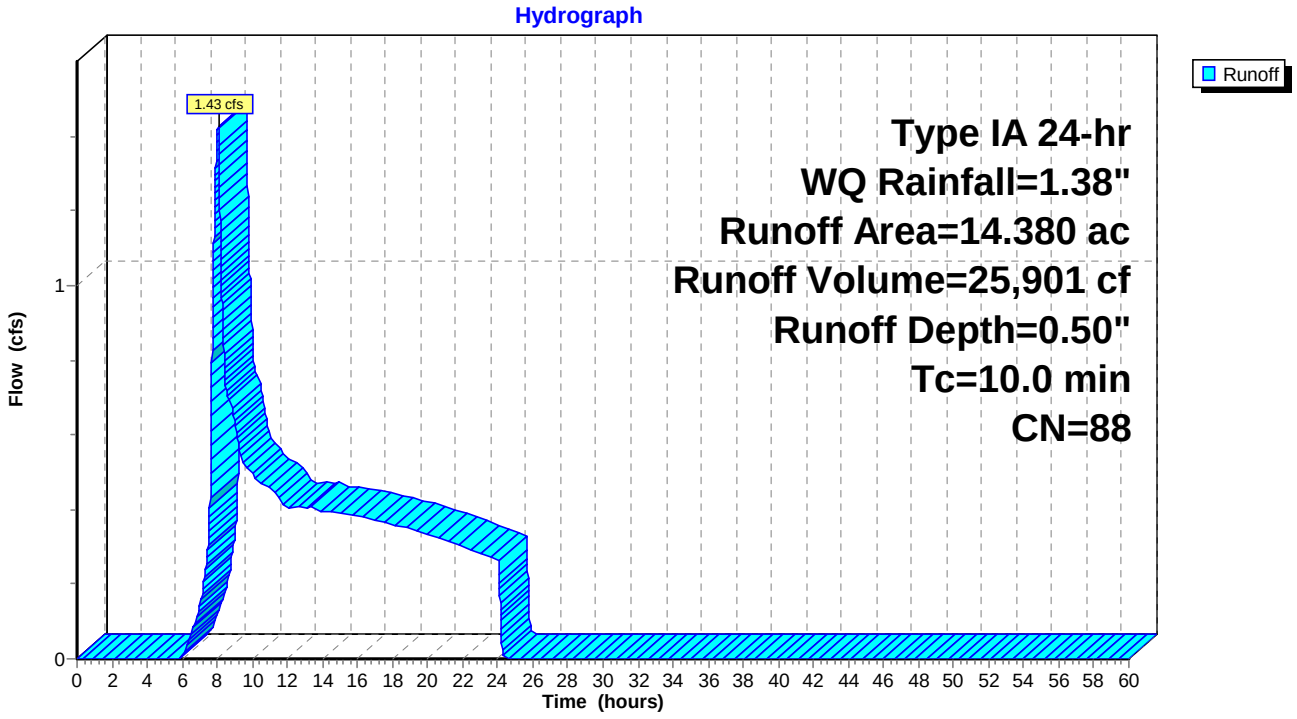
Runoff = 1.43 cfs @ 8.04 hrs, Volume= 25,901 cf, Depth= 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Type IA 24-hr WQ Rainfall=1.38"

	Area (ac)	CN	Description
	5.750	74	>75% Grass cover, Good, HSG C
*	8.630	98	Impervious surface, HSG C
	14.380	88	Weighted Average
	5.750		39.99% Pervious Area
	8.630		60.01% Impervious Area

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

Subcatchment 3WQ: Developed Conditions (Basin #3)



Summary for Pond WQ3: Water Quality Media

Inflow Area = 626,393 sf, 60.01% Impervious, Inflow Depth = 0.50" for WQ event
Inflow = 1.43 cfs @ 8.04 hrs, Volume= 25,901 cf
Outflow = 0.36 cfs @ 7.61 hrs, Volume= 25,901 cf, Atten= 74%, Lag= 0.0 min
Primary = 0.36 cfs @ 7.61 hrs, Volume= 25,901 cf
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-60.00 hrs, dt= 0.01 hrs
Peak Elev= 271.57' @ 17.66 hrs Surf.Area= 7,875 sf Storage= 4,605 cf
Flood Elev= 278.00' Surf.Area= 7,875 sf Storage= 55,204 cf

Plug-Flow detention time= 163.3 min calculated for 25,897 cf (100% of inflow)
Center-of-Mass det. time= 163.3 min (1,016.3 - 853.0)

Volume	Invert	Avail.Storage	Storage Description
#1	270.99'	55,204 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Voids (%)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
270.99	7,875	0.0	0	0
271.00	7,875	100.0	79	79
272.00	7,875	100.0	7,875	7,954
273.00	7,875	100.0	7,875	15,829
274.00	7,875	100.0	7,875	23,704
275.00	7,875	100.0	7,875	31,579
276.00	7,875	100.0	7,875	39,454
277.00	7,875	100.0	7,875	47,329
278.00	7,875	100.0	7,875	55,204

Device	Routing	Invert	Outlet Devices
#1	Primary	270.99'	**2.000 in/hr Exfiltration over Surface area**
#2	Secondary	271.75'	**24.0" Horiz. Beehive Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.36 cfs @ 7.61 hrs HW=271.00' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.36 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=270.99' (Free Discharge)
↑—**2=Beehive Overflow** (Controls 0.00 cfs)

Pond WQ3: Water Quality Media