7651

PRELIMINARY DRAINAGE REPORT
FOR

Kuebler Partition
2592 Kuebler Road S
Salem, Oregon

October 24, 2024

MULTI/TECH
ENGINEERING SERVICES, INC.

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INTRODUCTION

The Kuebler Partition is a proposed 3 lot partition with the construction of a roadway to service the parcels. The subject property is Tax Lot 100 of Marion County Assessor's Map 08 3W 17, located at 2592 Kuebler Road S. The property is approximately 34.23 acres, bound by Kuebler Road to the north, Ballyntyne Road to the south, and Channel Street to the east. Large lot residential development borders the west side of the property. A vicinity map and supporting maps are in Appendix A of this report. An aerial image of the property can be seen below, with the project site outlined in ORANGE.

Figure 1: Project area

This project proposes large acreage parcels to be developed for single-family residential. Parcels 1 and 2 are proposed to be 5.00 acre parcels, with Parcel 3 containing the remaining 22.72 acres. As a part of this development, a shadow plan has been included to show the further development of Parcel 3. This preliminary stormwater report will discuss the future development and extension of Croisan Creek Road. The development plans for each individual parcel is not known at this time, each parcel will be required to meet their own stormwater needs when they develop.

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

EXISTING CONDITIONS

The existing property consists of 34.23 acres of underdeveloped land. The site consists of several large trees, both Oak and other varieties, mostly located along the northern and western portions of the property. The property slopes from the high point on the west to the east, with a maximum relief of 126 feet from west to east. Croisan Creek runs along the east side of the property with an accompanying Riparian Corridor. There are also three existing ponds located across the property.

Given the size of the proposed parcels, it is not known what development will take place on each parcel. For this reason, the individual parcels drainage is not considered in this design. The design contained in this report is for the total new roadway through the project. The area in the undeveloped state will match this area only.

Table 1: Predeveloped Summary Table

Basin	Area (ft^2) Impervious CN = 98	Pervious CN = 74	Undeveloped CN = 72	Composite CN	Time of Concentration (min)
Undeveloped			73,834	72	36

SOILS

The Natural Resource Conservation Service Web Soil Survey was used to determine the hydrologic soil group classification for runoff calculations. The report identifies the site to be Jory, Nekia, and Abiqua silta clay loam soils. These soils are in the hydrologic soil group C. The report is in Appendix B. Hydrologic Soil Group C requires a predeveloped curve number of 72 be used for the predeveloped analysis.

Infiltration tests have not yet been completed. For the purpose of the preliminary design, the site will be modeled with no underlying infiltration. This will produce the most conservative design for sizing. Given professional knowledge of sites nearby as well as the topography, it is unlikely that infiltration would be suitable for this project, regardless of the infiltration rate. Other properties in the area have experienced landslide issues. Deposits of fine soils on top of basalt on a slope presents the opportunity for slip planes to develop.

EXPLANATION OF DESIGN

As shown on the shadow plan, Croisan Creek Road will be extended from Ballyntine Road to Kuebler Road, north to south. For this proposed partition, only the southern half of Croisan Creek Road is to be constructed. The proposed alignment of Croisan Creek Road runs mostly parallel to the contour lines, with the roadway sloping to the north. Approximately half of the roadway will be constructed at a future phase. The runoff generated from the roadway will be treated by streetside planter box facilities.

Detention of the runoff to the predeveloped flow control will be achieved with a pond located in the northwest portion of the site, near an existing pond just outside of the riparian corridor.

Lots 1 and 2 are 5.00 acre parcels. The development plans for these parcels are not known at this time. For this reason, the stormwater treatment and control for these parcels should be handled when the individual parcels develop. Depending on the final design, the proposed storm pond may have additional capacity for water quantity control.

Because the individual lots will be responsible for their own runoff at the time of their own development, only the area for the roadway is used for the analysis. The time of concentration is calculated for the overall site. This time of concentration should be used for all of the development to ensure the runoff from the entire site more accurately matches the predeveloped condition.

STORMWATER ANALYSIS

Runoff for both the pre and post-developed conditions are calculated using HydroCAD 10.00 and the Santa Barbara Unit Hydrograph (SBUH). The NRCS Type 1A rainfall distribution is used. The City of Salem rainfall depths to be used in the analysis are shown in Table 2.

Table 2: 24-hour Rainfall Depths for analysis from City of Salem Stormwater Standards

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

For the pre-developed conditions, a time of concentration of 36.0 was calculated for the entire site. The time of concentration data is in Appendix C. Even though this analysis only looks at the runoff from the proposed street, this time of concentration should be used for future development on this site. The calculations are incorporated in the HydroCAD output located in Appendix C. The entire area was calasified as “City of Salem, Pre-developed, HSG C” with a curve number (CN) of 72. A pre-developed basin map is in Appendix A.

Table 3: Allowable predeveloped flowrate (cfs)

Storm Event	Site Allowable Release Rate (cfs)
1/2 - 2	0.005
10	0.155
25	0.223
100	0.38

City of Salem Stormwater Standards require treatment of the runoff generated from the hard surface be treated for the water quality event. The ½ the 2, 10, 25, and 100 year storm events are to be detained such that the flow leaving the site does not exceed the predeveloped flowrate. Please note that predeveloped rates are based on the area for the roadway only.

Table 4: Developed Conditions Summary Table

Basin	Landscaping HSG C (ft^2) CN = 74	Impervious HSG C (ft^2) CN = 98	TOTAL (ft^2)	Tc (min)	Composite CN
Site Total	22,914	50,920	73,834	5	91

The postdeveloped flowrates were calculated using HydroCAD 10.20. A time of concentration of 5 minutes was assumed for the developed area. The proposed roadway is mostly impervious area, with a typical section of 30 feet of asphalt with a 9 feet wide landscape strip and 5 feet wide sidewalk on both sides. Table 4 summarizes the postdeveloped basin with the calculated composite curve number. The developed basin map can be found in Appendix A.

Detention and Flow Control

The runoff will be routed through the streetside planter boxes before it is conveyed to a detention pond located in the northwest portion of the site. The detention pond has a bottom surface area of approximately 6,173 square feet with three to one (horizontal to vertical) or greater side slopes for a total top surface area of approximately 12,407 square feet. The maximum pond depth is 3 feet, with a foot of freeboard. The bottom elevation is set at 438.00.

Based on the above design parameters, runoff from the developed conditions will be controlled to or below the half the 2 year, 10 year, 25 year, and 100 year predeveloped release rates. The release rates and detention requirements were generated from the HydroCAD software, which can be seen in Appendix D. Table 5 below summarizes the requirements for the storm events.

Table 5: Detention and Release Rate Summary

Storm Event	Allowable Release Rate (cfs)	Release Rate (cfs)	Required Detention Volume (ft^3)	Provided Detention Volume (ft^3)
1/2 - 2	0.005	0.005	3,578	37,160
10	0.155	0.009	14,049	37,160
25	0.223	0.09	15,829	37,160
100	0.38	0.192	16,086	37,160

Flow control is achieved with multiple orifices in a standard City of Salem control structure. The sizing of the orifice uses the standard orifice equation provided in the City of Salem Stormwater Management Manual. Table 6 below identifies orifice size, elevation, and the water surface elevation.

Table 6: Control Structure Summary

Storm Event	Control Orifice (#)	Release Rate (cfs)	Orifice Diameter (inches)	Elevation (feet)	W.S. Elevation (feet)
1/2 - 2	1	0.005	0.50	438.00	438.54
10	1	0.009	0.50	438.00	439.85
25	2	0.09	12.00	440.00	440.04
100	Weir Notch	0.192	12.00	440.00	440.07
Overflow	Weir				

Table 7: Release Rate Summary (cfs)

Storm Event	Allowable Release Rate (cfs)	Release Rate (cfs)
1/2 - 2	0.005	0.005
10	0.121	0.009
25	0.168	0.090
100	0.278	0.192

As can be seen in Table 7, the proposed detention systems will meter the runoff rates from the development to release at or below the existing conditions. The proposed pond contains additional capacity for additional runoff and/or overdetention.

WATER QUALITY ANALYSIS

The runoff will be treated through the use of streetside planter boxes. Water quality flows were calculated with HydroCAD 10.20. The Santa Barbara Unit Hydrograph method was used to generate the hydrographs. A Type 1A rainfall distribution and a 24-hour rainfall depth of 1.38 inches in 24 hours was used to determine the water quality flowrate.

The planter boxes are analyzed and sized such that all the stormwater generated during the water quality event can filtrate through the growing media. The growing media is modeled with an infiltration rate of 2.0 inches per hour, per the City of Salem Standards.

For the purposes of the preliminary design, the water quality event was modeled to one planter box facility. The exact location of the planter boxes will be determined during final design, per the final street plan. For the purposes of the preliminary design, a total planter box 220 feet long and 8 feet wide was analyzed to be constructed along the total length of the roadway (i.e. 110 feet per side of the roadway for the full build of Croisan Mountain Road). The maximum water surface elevation is modeled at 0.46 feet. The facility will be drained by storm hour 26. The underdrain will collect the water and convey it to the detention pond. A beehive is provided 0.50 feet above the growing media to bypass larger flow events to the conveyance system. Check dams will be provided as needed based on the grade of the proposed roadway. Those details will be determined during the final design process.

The hydrograph can be seen attached in Appendix E.

Table 8: Planter Box Summary

Total PB Length	220 feet
PB Width	8 feet
Maximum Depth	6 inches
WQ Water Surface Depth	3 inches
Growing Media Rate	2 inches/hour

OPERATIONS AND MAINTENANCE

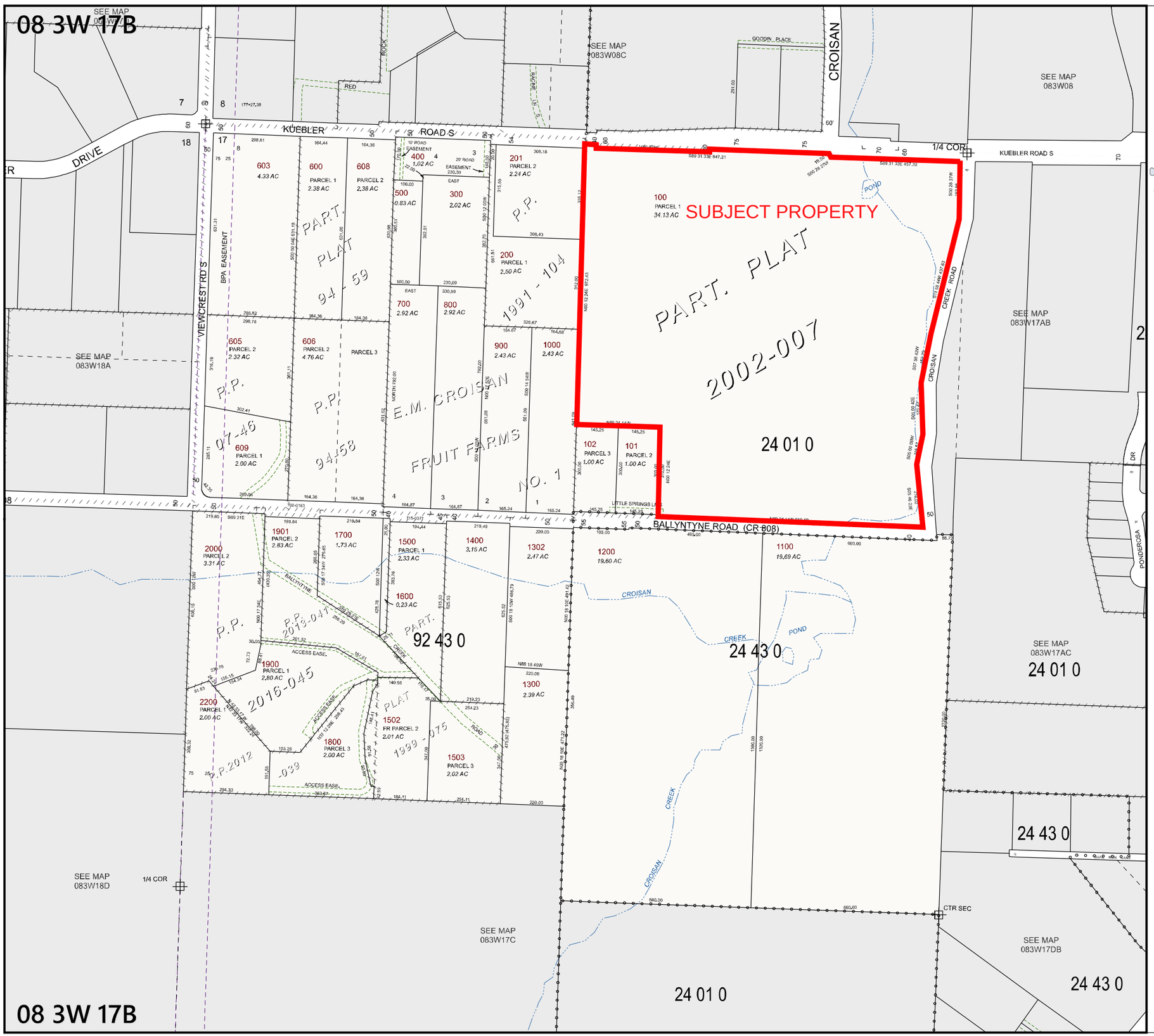
The proposed planter boxes and detention pond will be used to treat and detain public water and therefore will be public facilities. The long-term operations and maintenance obligations will belong to the City of Salem.

When the lot systems developed, if the systems are to remain on the proposed lots, their operations and maintenance tasks will be the responsibility of the individual property owners. Those are not included in this document.

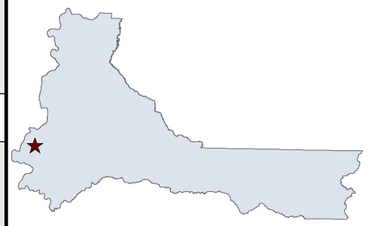
CONCLUSION

Based on the presented information, the proposed preliminary design demonstrates the feasibility of the proposed project to meet the City of Salem water quality and water quantity performance standards. If there are any questions regarding this analysis or the design, please contact Natalie Janney at Multi/Tech Engineering by phone at (503) 363-9227 or via e-mail at NJanney@mtengineering.net.

APPENDIX A: MAPS



08 3W 17B
SALEM



MARION COUNTY, OREGON

NW1/4 SEC17 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
- 16 15 / 21 22 Section Corner

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 / 174.00

CANCELLED NUMBERS

601
602
604
607
1201
1301
1501
2100

DISCLAIMER: THIS MAP WAS PREPARED FOR ASSESSMENT PURPOSES ONLY

Marion County OREGON — Assessors Office Cartography Dept

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

PLOT DATE: 10/16/2020

SALEM
08 3W 17B

Pre-Developed Basin Map

Basin	Area (ft²) Impervious CN = 98	Area (ft²) Pervious CN = 74	Undeveloped CN = 72	Composite CN	Time of Concentration (min)
Undeveloped			73,834	72	36

Storm Event	Site Allowable Release Rate (cfs)
1/2 - 2	0.005
10	0.155
25	0.223
100	0.38

KUEBLER ROAD S.
CROISAN CREEK RD.
CROISAN CR.
BALLYNTYNE ROAD (CR 808)
CHANNEL ST.
CROISAN CREEK
RIPARIAN CORRIDOR
EX. POND
PUMP BLD.
T.L. #4400
T.L. #4300
T.L. #4002
T.L. #4001
T.L. #4000
T.L. #3900
T.L. #201
T.L. #6100
T.L. #6000
T.L. #700
T.L. #1000
T.L. #102
T.L. #101
T.L. #1400
T.L. #1302
T.L. #1200
T.L. #1100
T.L. #5900
T.L. #2700
CROISAN
1 5.00 AC. 217,800 S.F.
2 5.00 AC. 217,800 S.F.
3 5.00 AC. 217,800 S.F.
4 5.00 AC. 217,800 S.F.
5 5.42 AC. 236,072 S.F.
6 6.35 AC. 276,714 S.F.
N89°31'37"W 847.21'
S0°45'48"W 10.01'
S89°31'21"E 457.31'
N0°29'11"E 193.93'
S89°47'34"E 805.87'
S0°12'26"W 972.40'
S89°47'34"E 762.19'
N89°47'34"W 383.67'
N1°58'19"E 437.62'
N7°56'19"E 152.25'
N0°59'30"W 170.42'
N5°01'45"E 116.52'
N5°47'01"W 216.10'
S89°47'34"E 757.67'
S89°24'41"E 290.48'
S0°12'34"W 310.07'
S89°23'54"E 919.64'
447.01'
344.11'
60'
10'
0' 1 INCH 80'
SCALE: 1" = 80'

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SHADOW PLAN

KUEBLER PARTITION

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

DIMENSIONS & NOTES TAKE PRECEDENCE OVER SCALED GRAPHICAL REPRESENTATION.

7651p PART-2
Design: M.D.G.
Drawn: D.G.G.
Checked: M.D.G.
Issue Date: 5/25/24
Scale: AS SHOWN
As-Built: ____

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

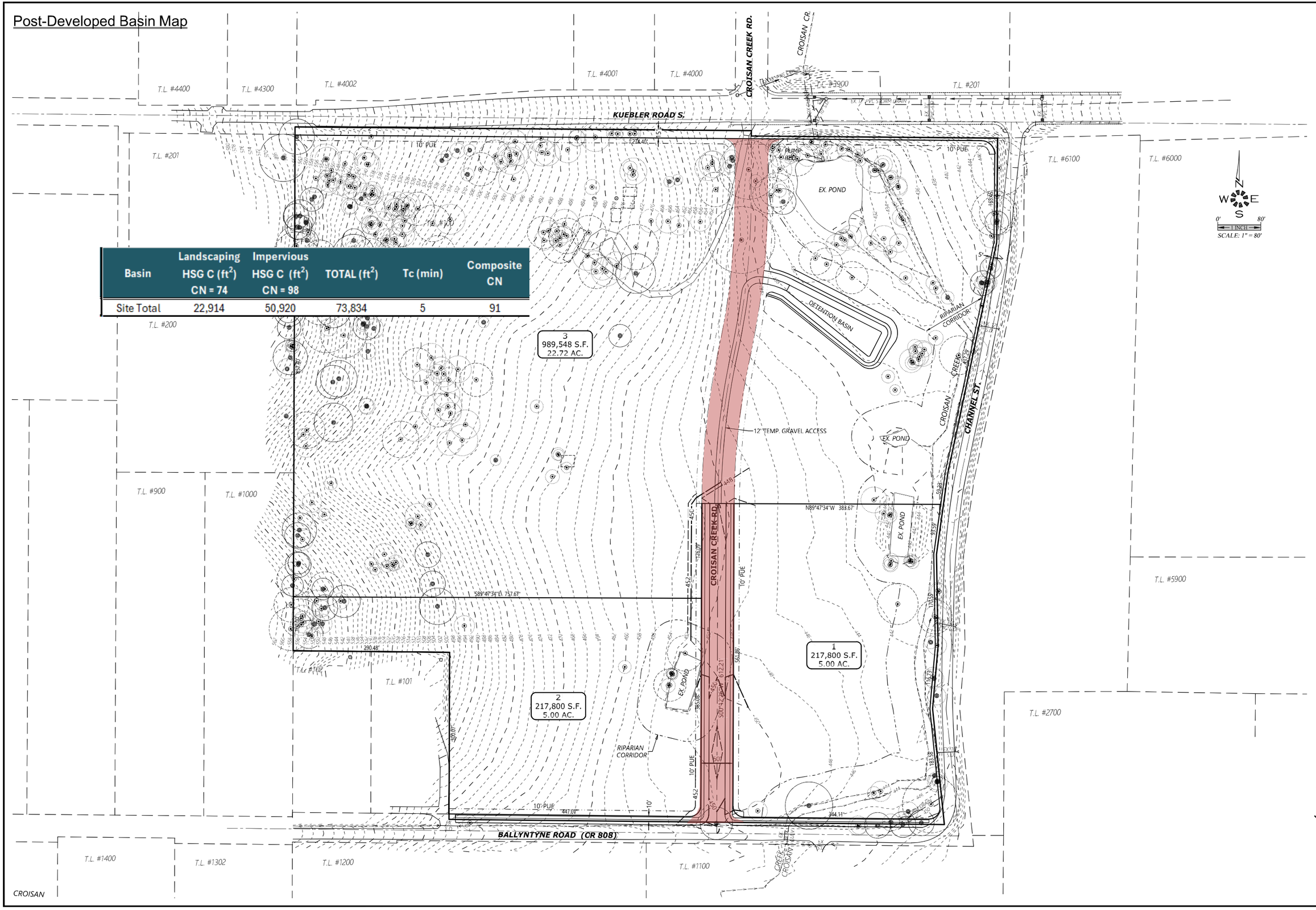
JOB # 7651

P2

J:\Tax\7651 Kuebler\365\Partition\Dwg\s2365 tp.dwg PART-2, 6/25/2024 9:39:56 AM, DGuile

Post-Developed Basin Map

Basin	Landscaping HSG C (ft^2) CN = 74	Impervious HSG C (ft^2) CN = 98	TOTAL (ft^2)	Tc (min)	Composite CN
Site Total	22,914	50,920	73,834	5	91



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GRADING PLAN

KUEBLER PARTITION

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.

7651p PART-4

Design: M.D.G.
Drawn: D.G.G.
Checked: M.D.G.
Issue Date: 9/25/24
Scale: AS SHOWN
As-Built: ____

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

JOB # 7651

P4

J:\Files\7651 Kuebler\2615\Partition\Dwg s\2615p dwg PART-4, 9/25/2024 10:12:39 AM, DGolie

APPENDIX B: SOILS INFORMATION

Soil Map—Marion County Area, Oregon

Map Scale: 1:3,380 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 150 300 600 900

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
AbB	Abiqua silty clay loam, 3 to 5 percent slopes	9.0	25.6%
JoD	Jory silty clay loam, 12 to 20 percent slopes	18.2	51.9%
MaA	McAlpin silty clay loam, 0 to 3 percent slopes	6.3	18.0%
NeC	Nekia silty clay loam, 7 to 12 percent slopes	0.4	1.1%
NeE	Nekia silty clay loam, 20 to 30 percent slopes	1.2	3.5%
Totals for Area of Interest		**35.1**	**100.0%**

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

Marion County Area, Oregon

AbB—Abiqua silty clay loam, 3 to 5 percent slopes

Map Unit Setting

National map unit symbol: 24nq
Elevation: 250 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

Abiqua and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Abiqua

Setting

Landform: Hills
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Alluvium

Typical profile

H1 - 0 to 21 inches: silty clay loam
H2 - 21 to 54 inches: silty clay
H3 - 54 to 72 inches: silty clay loam

Properties and qualities

Slope: 3 to 5 percent
Depth to restrictive feature: More than 80 inches
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: High (about 10.7 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R002XC006OR - Stream Terrace Group
Forage suitability group: Well drained < 15% Slopes (G002XY002OR)
Other vegetative classification: Well drained < 15% Slopes (G002XY002OR)

Hydric soil rating: No

Data Source Information

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

Marion County Area, Oregon

JoD—Jory silty clay loam, 12 to 20 percent slopes

Map Unit Setting

National map unit symbol: 24pz
Elevation: 300 to 1,000 feet
Mean annual precipitation: 40 to 60 inches
Mean annual air temperature: 50 to 54 degrees F
Frost-free period: 190 to 210 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Jory and similar soils: 100 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Jory

Setting

Landform: Hills
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Colluvium derived from tuff and basalt

Typical profile

H1 - 0 to 15 inches: silty clay loam
H2 - 15 to 63 inches: clay

Properties and qualities

Slope: 12 to 20 percent
Depth to restrictive feature: More than 80 inches
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: High (about 10.2 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 (G002XY001OR)
Other vegetative classification: Well Drained > 15% Slopes (G002XY001OR)

Hydric soil rating: No

Data Source Information

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

Marion County Area, Oregon

MaA—McAlpin silty clay loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 24qd
Elevation: 250 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

Mcalpin and similar soils: 95 percent
Minor components: 2 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Mcalpin

Setting

Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Mixed alluvium

Typical profile

H1 - 0 to 23 inches: silty clay loam
H2 - 23 to 65 inches: silty clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately 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: About 24 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.5 inches)

Interpretive groups

Land capability classification (irrigated): 2e
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: R002XC006OR - Stream Terrace Group
Forage suitability group: Moderately Well Drained < 15% Slopes (G002XY004OR)
Other vegetative classification: Moderately Well Drained < 15% Slopes (G002XY004OR)
Hydric soil rating: No

Minor Components

Waldo

Percent of map unit: 2 percent
Landform: Flood plains
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: Poorly Drained (G002XY006OR)
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

NeE—Nekia silty clay loam, 20 to 30 percent slopes

Map Unit Setting

National map unit symbol: 24qx
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: 92 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: 20 to 30 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): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: C
Ecological site: R002XC012OR - Red Hill Group
Forage suitability group: Well Drained > 15% Slopes (G002XY001OR)
Other vegetative classification: Well Drained > 15% Slopes (G002XY001OR)

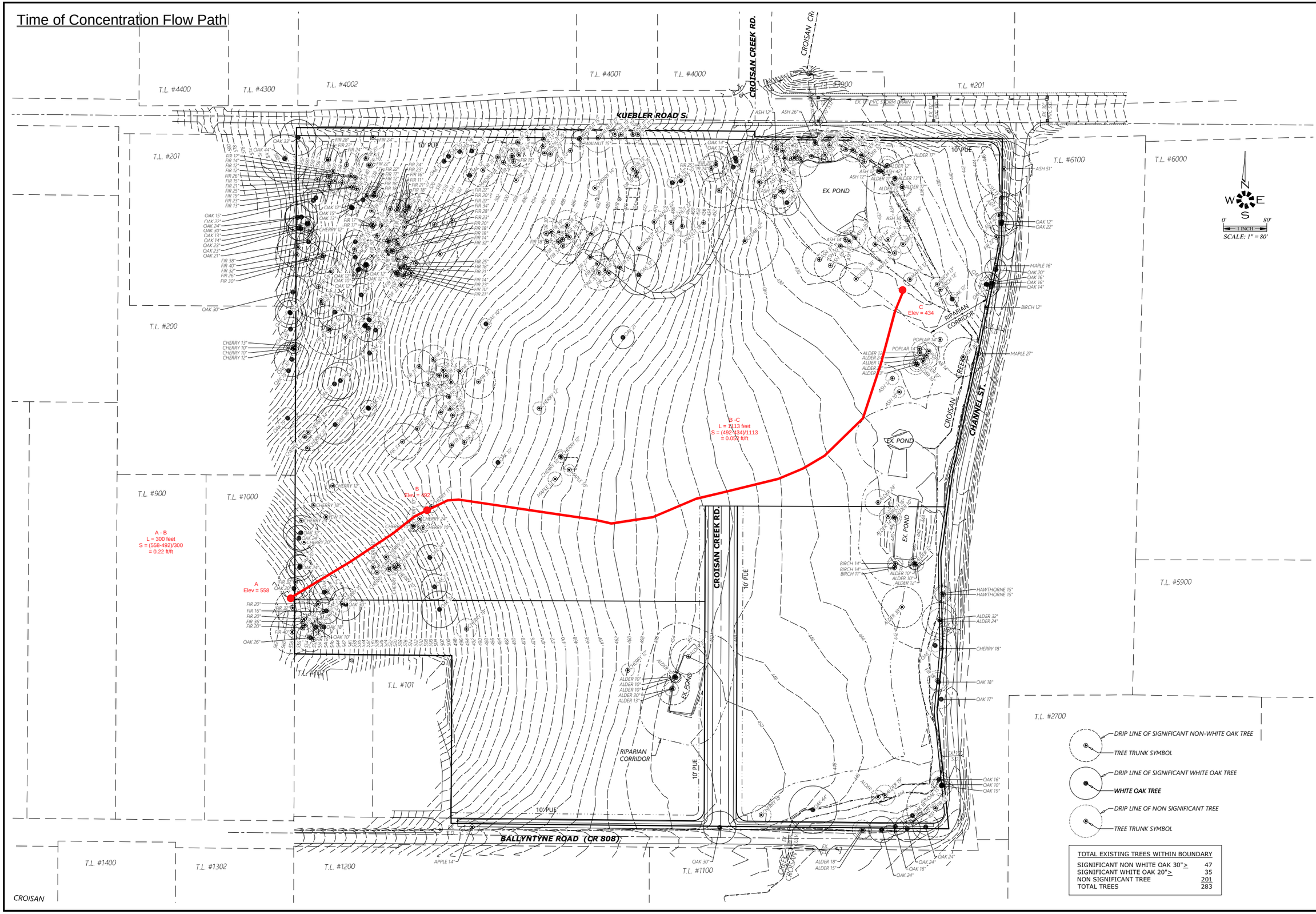
Hydric soil rating: No

Data Source Information

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

APPENDIX C: TIME OF CONCENTRATION AND PREDEVELOPED HYDROGRAPHS

Time of Concentration Flow Path



TOTAL EXISTING TREES WITHIN BOUNDARY	
SIGNIFICANT NON WHITE OAK 30">	47
SIGNIFICANT WHITE OAK 20">	35
NON SIGNIFICANT TREE	201
TOTAL TREES	283

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

TREE PLAN

KUEBLER PARTITION

7651p PART3

Design: M.D.G.
Drawn: D.G.G.
Checked: M.D.G.
Issue Date: 6/25/24
Scale: AS SHOWN
As-Built: ---

REGISTERED PROFESSIONAL ENGINEER
OREGON
JULY 19, 1978
MARK D. GRENZ
EXPIRES: 06-30-2025

JOB # 7651

P3

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

Project	By	Date
Kuebler Partition	N. Janney	10/2024
Location	**Checked**	**Date**
Kuebler Blvd, 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 T_c only)

Segment ID	A -B	
1. Surface description (table 3-1)	Pre-Developed	
2. Manning's roughness coefficient, n (table 3-1)	0.30	
3. Flow length, L (total L † 300 ft) ft	300	
4. Two-year 24-hour rainfall, P_2 in	2.2	
5. Land slope, s ft/ft	0.22	
6. $T_t = \frac{0.007\ (nL)^{0.8}}{P_2^{0.5}\ s^{0.4}}$ Compute T_t hr	0.32	+ =

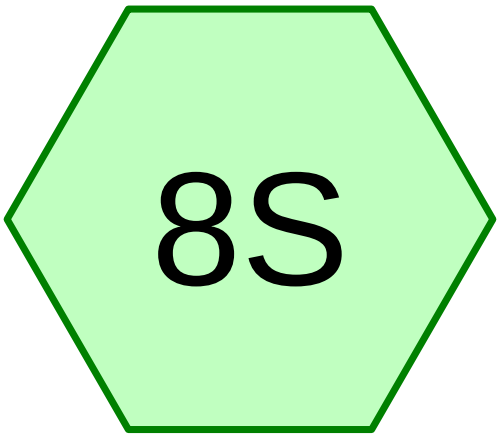
Shallow concentrated flow

Segment ID	B - C	
7. Surface description (paved or unpaved)	Pre-Developed	
8. Flow length, L ft	1113	
9. Watercourse slope, s ft/ft	0.052	
10. Average velocity, V (figure 3-1) ft/s	1.1	
11. $T_t = \frac{L}{3600\ V}$ Compute T_t hr	0.28	+ =

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		

Tc = 0.32 + 0.28 = 0.6 hour = 36 minutes



Predeveloped

Subcat Reach Pond Link

Routing Diagram for Prelim Hydrographs
Prepared by Multi/Tech Engineering Service, Printed 10/25/2024

Summary for Subcatchment 8S: Predeveloped

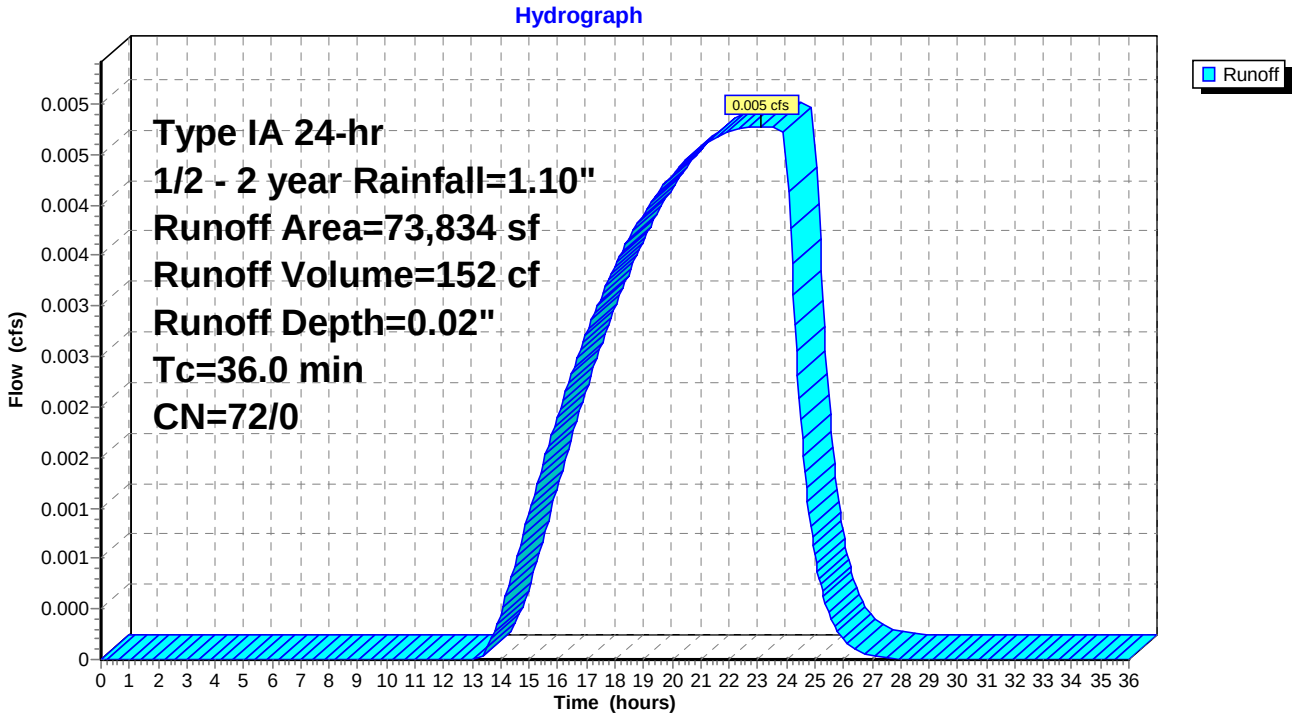
Runoff = 0.005 cfs @ 23.13 hrs, Volume= 152 cf, Depth= 0.02"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 1/2 - 2 year Rainfall=1.10"

	Area (sf)	CN	Description
*	73,834	72	City of Salem, Pre-developed HSG C
	73,834	72	100.00% Pervious Area

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

Subcatchment 8S: Predeveloped



Summary for Subcatchment 8S: Predeveloped

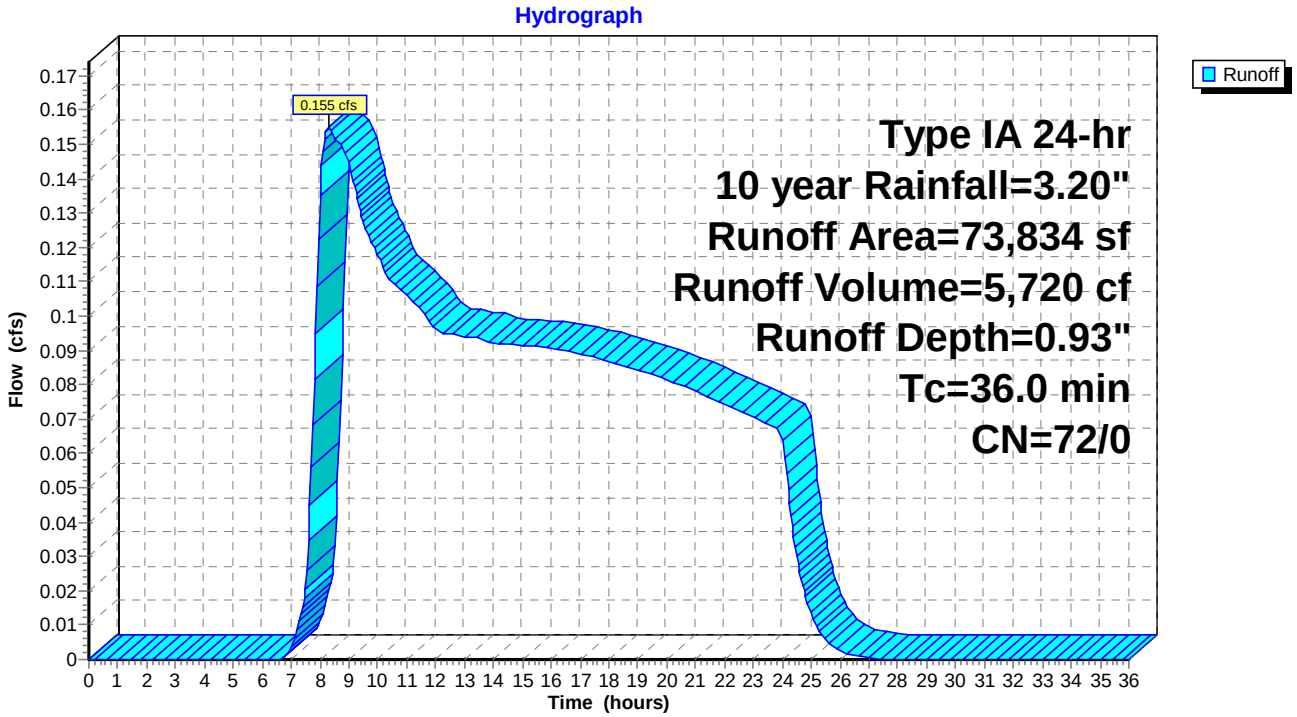
Runoff = 0.155 cfs @ 8.31 hrs, Volume= 5,720 cf, Depth= 0.93"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 year Rainfall=3.20"

	Area (sf)	CN	Description
*	73,834	72	City of Salem, Pre-developed HSG C
	73,834	72	100.00% Pervious Area

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

Subcatchment 8S: Predeveloped



Summary for Subcatchment 8S: Predeveloped

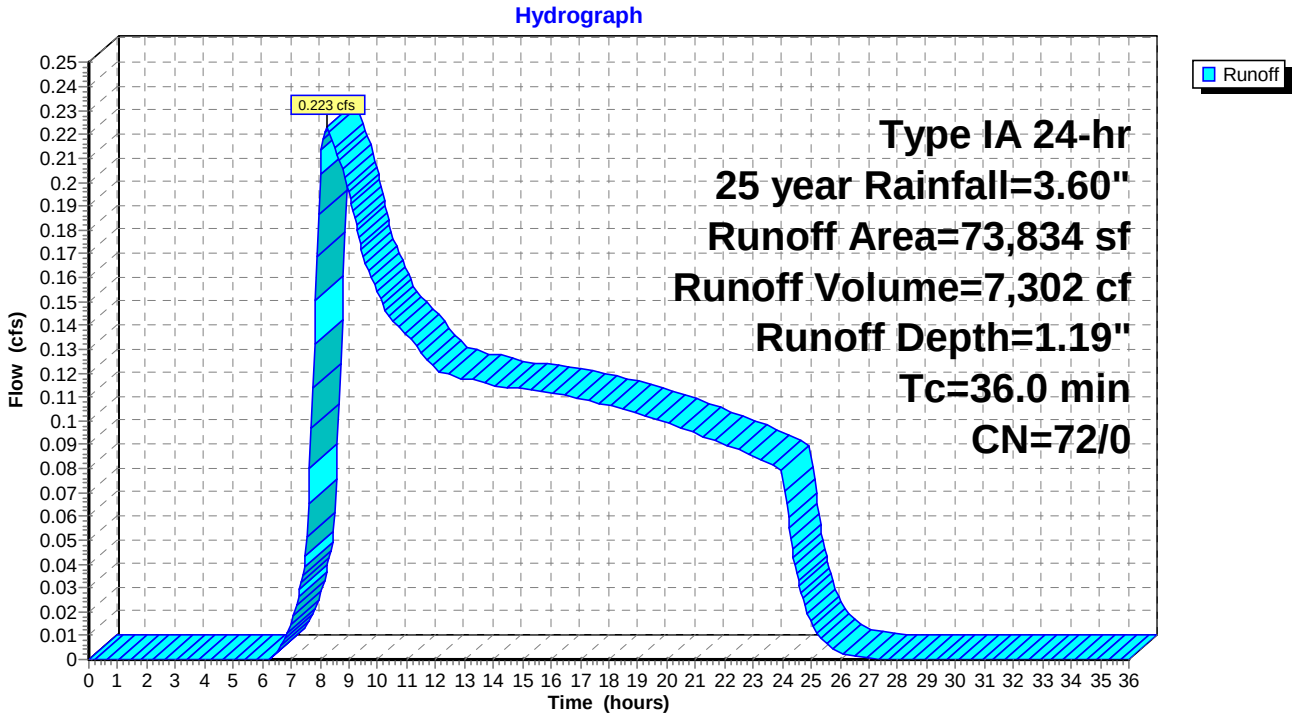
Runoff = 0.223 cfs @ 8.25 hrs, Volume= 7,302 cf, Depth= 1.19"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25 year Rainfall=3.60"

	Area (sf)	CN	Description
*	73,834	72	City of Salem, Pre-developed HSG C
	73,834	72	100.00% Pervious Area

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

Subcatchment 8S: Predeveloped



Summary for Subcatchment 8S: Predeveloped

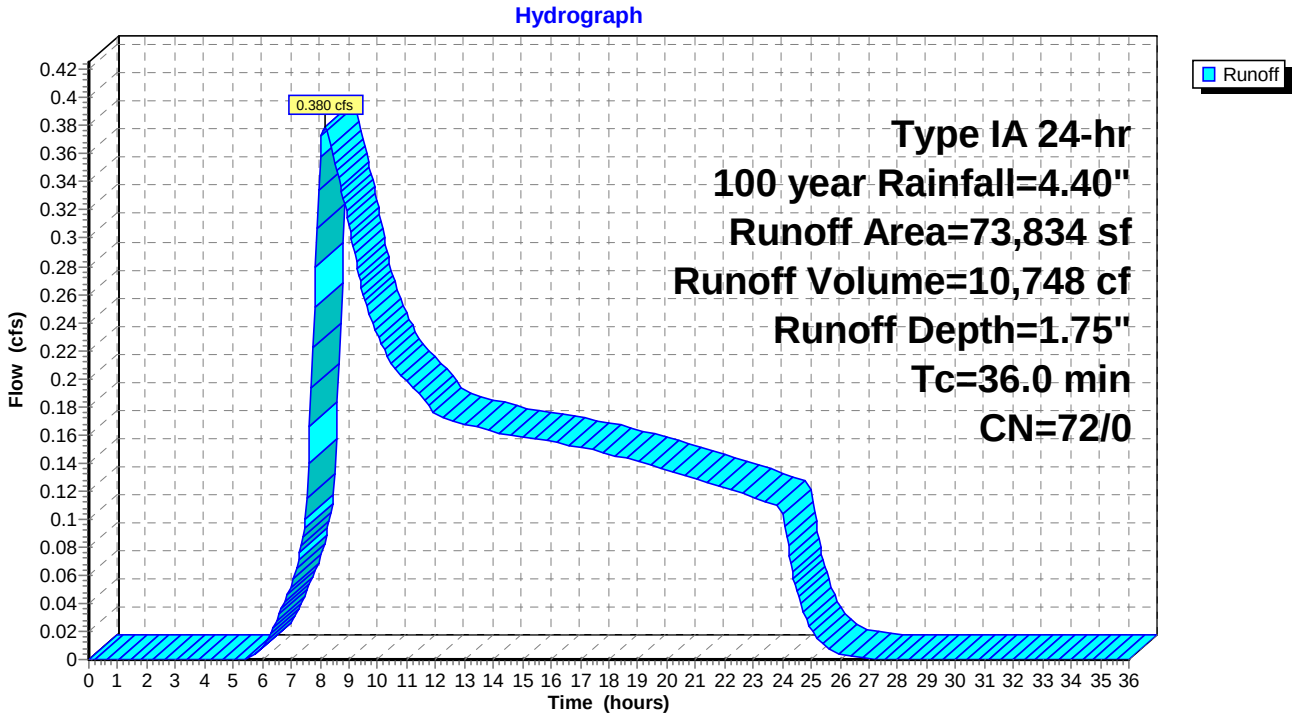
Runoff = 0.380 cfs @ 8.18 hrs, Volume= 10,748 cf, Depth= 1.75"

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 year Rainfall=4.40"

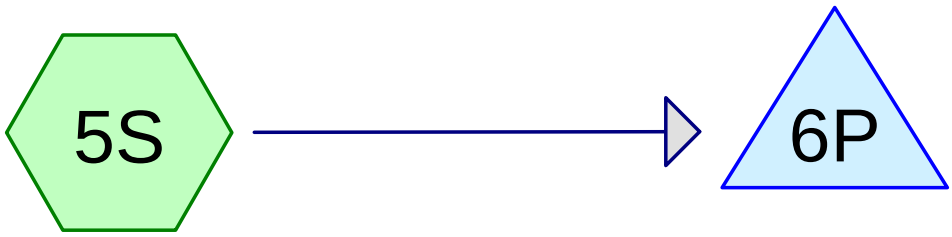
	Area (sf)	CN	Description
*	73,834	72	City of Salem, Pre-developed HSG C
	73,834	72	100.00% Pervious Area

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

Subcatchment 8S: Predeveloped



APPENDIX D: WATER QUANTITY HYDROGRAPHS



Croisan Rd - FULL BUILD

Pond

Subcat Reach Pond Link

Routing Diagram for Prelim Hydrographs
Prepared by Multi/Tech Engineering Service, Printed 10/25/2024

Summary for Subcatchment 5S: Croisan Rd - FULL BUILD

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

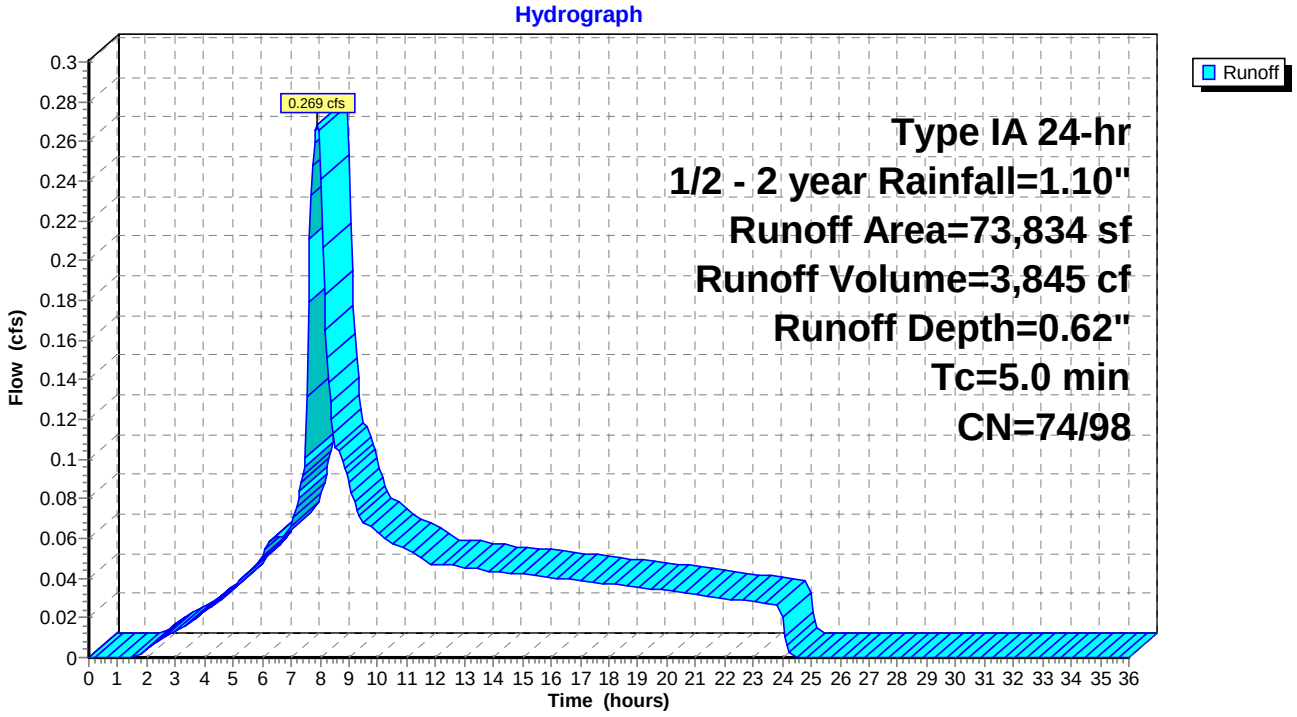
Runoff = 0.269 cfs @ 7.92 hrs, Volume= 3,845 cf, Depth= 0.62"
Routed to Pond 6P : Pond

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 1/2 - 2 year Rainfall=1.10"

Area (sf)	CN	Description
38,190	98	Paved roads w/curbs & sewers, HSG C
12,730	98	Paved parking, HSG C
22,914	74	>75% Grass cover, Good, HSG C
73,834	91	Weighted Average
22,914	74	31.03% Pervious Area
50,920	98	68.97% Impervious Area

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

Subcatchment 5S: Croisan Rd - FULL BUILD



Summary for Pond 6P: Pond

Inflow Area = 73,834 sf, 68.97% Impervious, Inflow Depth = 0.62" for 1/2 - 2 year event
Inflow = 0.269 cfs @ 7.92 hrs, Volume= 3,845 cf
Outflow = 0.005 cfs @ 24.17 hrs, Volume= 470 cf, Atten= 98%, Lag= 975.2 min
Primary = 0.005 cfs @ 24.17 hrs, Volume= 470 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 438.54' @ 24.17 hrs Surf.Area= 7,018 sf Storage= 3,578 cf

Plug-Flow detention time= 1,017.0 min calculated for 470 cf (12% of inflow)
Center-of-Mass det. time= 599.3 min (1,316.6 - 717.3)

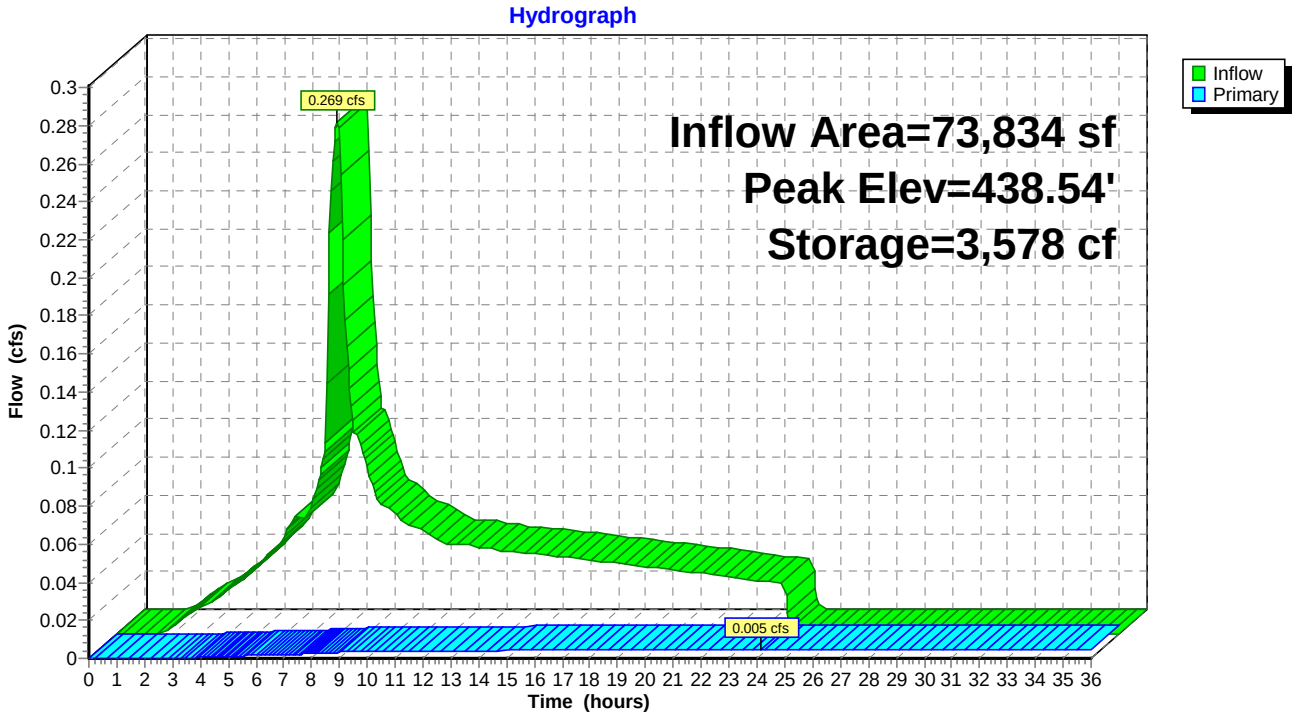
Volume	Invert	Avail.Storage	Storage Description
#1	438.00'	37,160 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
438.00	6,173	0	0
442.00	12,407	37,160	37,160

Device	Routing	Invert	Outlet Devices
#1	Primary	438.00'	**0.500" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	440.00'	**12.000" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.005 cfs @ 24.17 hrs HW=438.54' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 0.005 cfs @ 3.55 fps)
└─**2=Orifice/Grate** (Controls 0.000 cfs)

Pond 6P: Pond


Hydrograph
Inflow Area=73,834 sf
Peak Elev=438.54'
Storage=3,578 cf
0.269 cfs
0.005 cfs
Inflow
Primary
Flow (cfs)
Time (hours)
0 0.02 0.04 0.06 0.08 0.1 0.12 0.14 0.16 0.18 0.2 0.22 0.24 0.26 0.28 0.3
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Summary for Subcatchment 5S: Croisan Rd - FULL BUILD

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

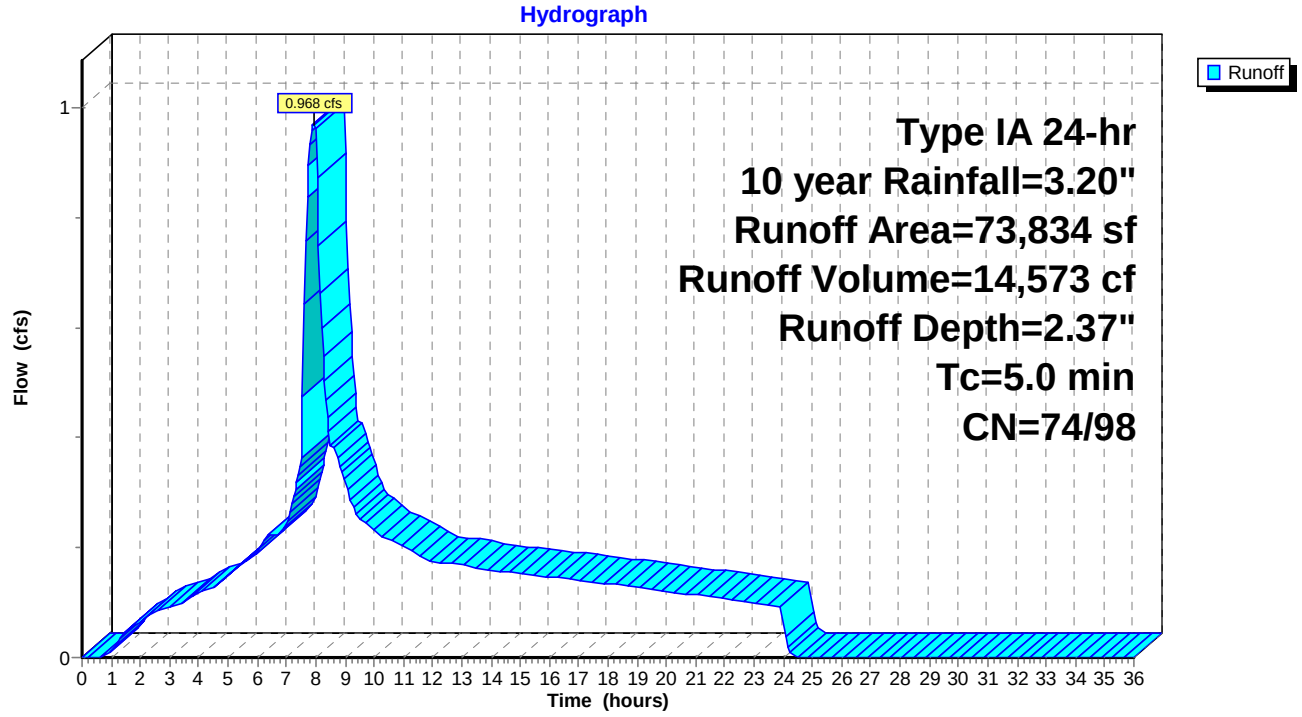
Runoff = 0.968 cfs @ 7.92 hrs, Volume= 14,573 cf, Depth= 2.37"
Routed to Pond 6P : Pond

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 year Rainfall=3.20"

Area (sf)	CN	Description
38,190	98	Paved roads w/curbs & sewers, HSG C
12,730	98	Paved parking, HSG C
22,914	74	>75% Grass cover, Good, HSG C
73,834	91	Weighted Average
22,914	74	31.03% Pervious Area
50,920	98	68.97% Impervious Area

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

Subcatchment 5S: Croisan Rd - FULL BUILD



Summary for Pond 6P: Pond

Inflow Area = 73,834 sf, 68.97% Impervious, Inflow Depth = 2.37" for 10 year event
Inflow = 0.968 cfs @ 7.92 hrs, Volume= 14,573 cf
Outflow = 0.009 cfs @ 24.22 hrs, Volume= 899 cf, Atten= 99%, Lag= 978.2 min
Primary = 0.009 cfs @ 24.22 hrs, Volume= 899 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 439.85' @ 24.22 hrs Surf.Area= 9,050 sf Storage= 14,049 cf

Plug-Flow detention time= 1,113.9 min calculated for 899 cf (6% of inflow)
Center-of-Mass det. time= 594.6 min (1,287.9 - 693.3)

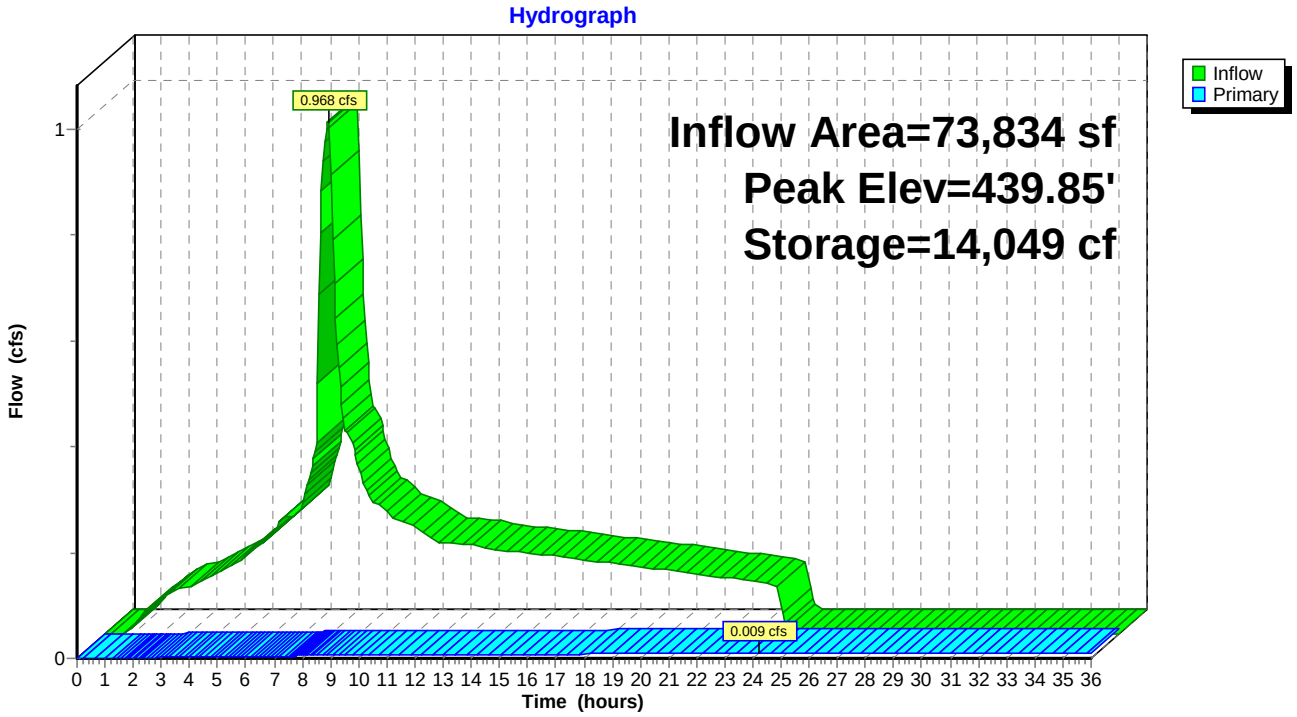
Volume	Invert	Avail.Storage	Storage Description
#1	438.00'	37,160 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
438.00	6,173	0	0
442.00	12,407	37,160	37,160

Device	Routing	Invert	Outlet Devices
#1	Primary	438.00'	**0.500" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	440.00'	**12.000" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.009 cfs @ 24.22 hrs HW=439.85' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 0.009 cfs @ 6.54 fps)
└─**2=Orifice/Grate** (Controls 0.000 cfs)

Pond 6P: Pond


Hydrograph
Inflow
Primary
0.968 cfs
0.009 cfs
Inflow Area=73,834 sf
Peak Elev=439.85'
Storage=14,049 cf
Flow (cfs)
0
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Summary for Subcatchment 5S: Croisan Rd - FULL BUILD

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

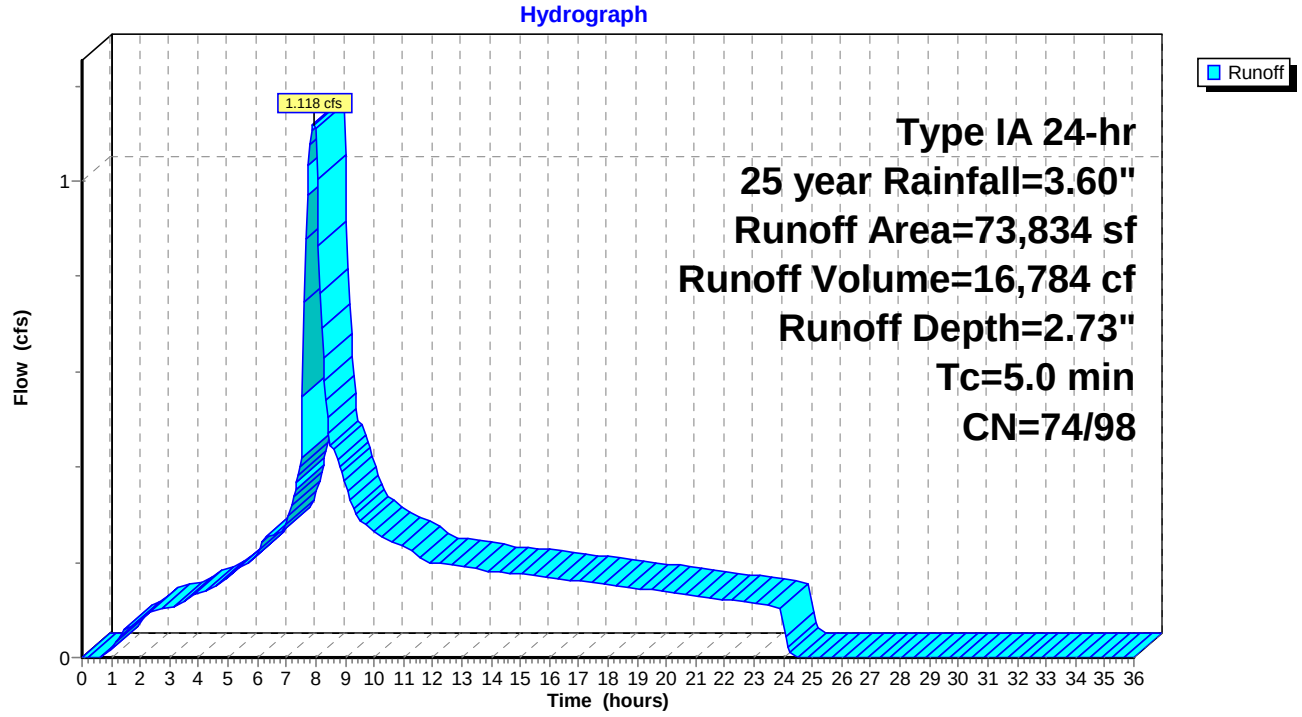
Runoff = 1.118 cfs @ 7.92 hrs, Volume= 16,784 cf, Depth= 2.73"
Routed to Pond 6P : Pond

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25 year Rainfall=3.60"

Area (sf)	CN	Description
38,190	98	Paved roads w/curbs & sewers, HSG C
12,730	98	Paved parking, HSG C
22,914	74	>75% Grass cover, Good, HSG C
73,834	91	Weighted Average
22,914	74	31.03% Pervious Area
50,920	98	68.97% Impervious Area

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

Subcatchment 5S: Croisan Rd - FULL BUILD



Summary for Pond 6P: Pond

Inflow Area = 73,834 sf, 68.97% Impervious, Inflow Depth = 2.73" for 25 year event
Inflow = 1.118 cfs @ 7.92 hrs, Volume= 16,784 cf
Outflow = 0.090 cfs @ 24.03 hrs, Volume= 1,622 cf, Atten= 92%, Lag= 966.7 min
Primary = 0.090 cfs @ 24.03 hrs, Volume= 1,622 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 440.04' @ 24.03 hrs Surf.Area= 9,351 sf Storage= 15,829 cf

Plug-Flow detention time= 1,137.0 min calculated for 1,622 cf (10% of inflow)
Center-of-Mass det. time= 655.0 min (1,345.9 - 690.9)

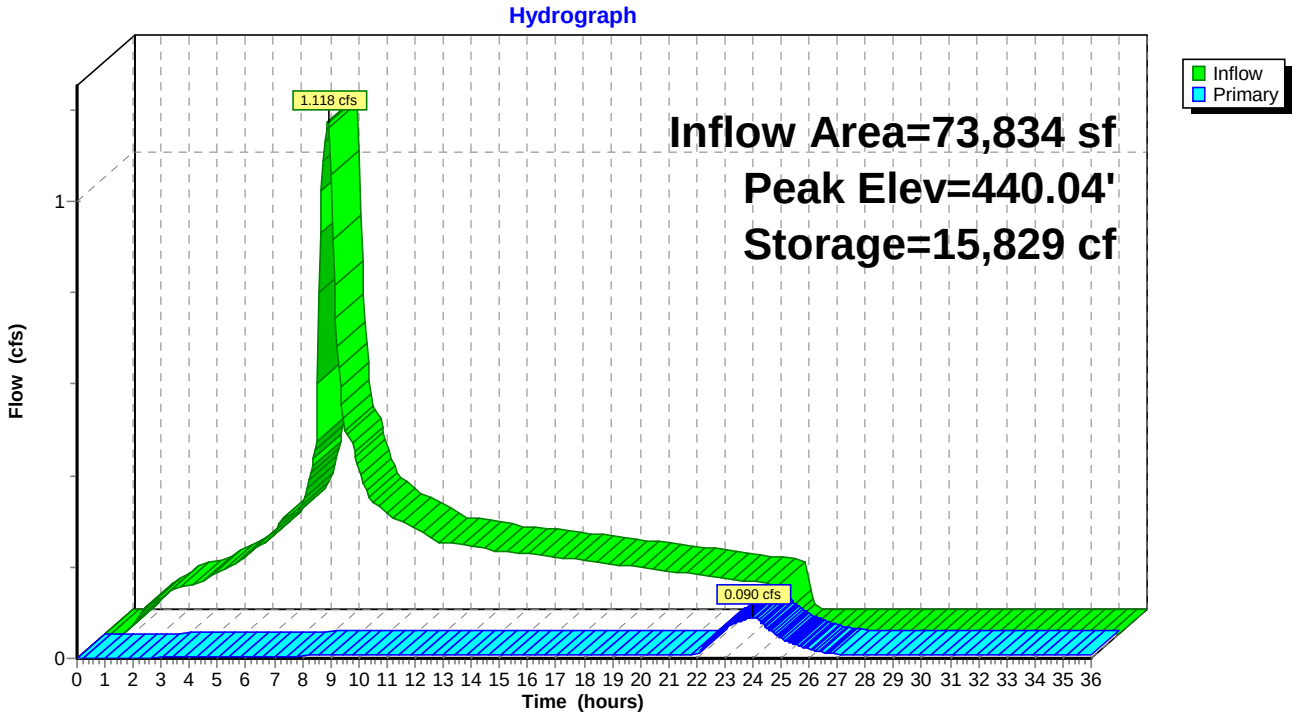
Volume	Invert	Avail.Storage	Storage Description
#1	438.00'	37,160 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
438.00	6,173	0	0
442.00	12,407	37,160	37,160

Device	Routing	Invert	Outlet Devices
#1	Primary	438.00'	**0.500" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	440.00'	**12.000" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.089 cfs @ 24.03 hrs HW=440.04' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 0.009 cfs @ 6.88 fps)
└─**2=Orifice/Grate** (Weir Controls 0.080 cfs @ 0.65 fps)

Pond 6P: Pond


Hydrograph
Inflow
Primary
1.118 cfs
0.090 cfs
Inflow Area=73,834 sf
Peak Elev=440.04'
Storage=15,829 cf
Flow (cfs)
0
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Summary for Subcatchment 5S: Croisan Rd - FULL BUILD

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

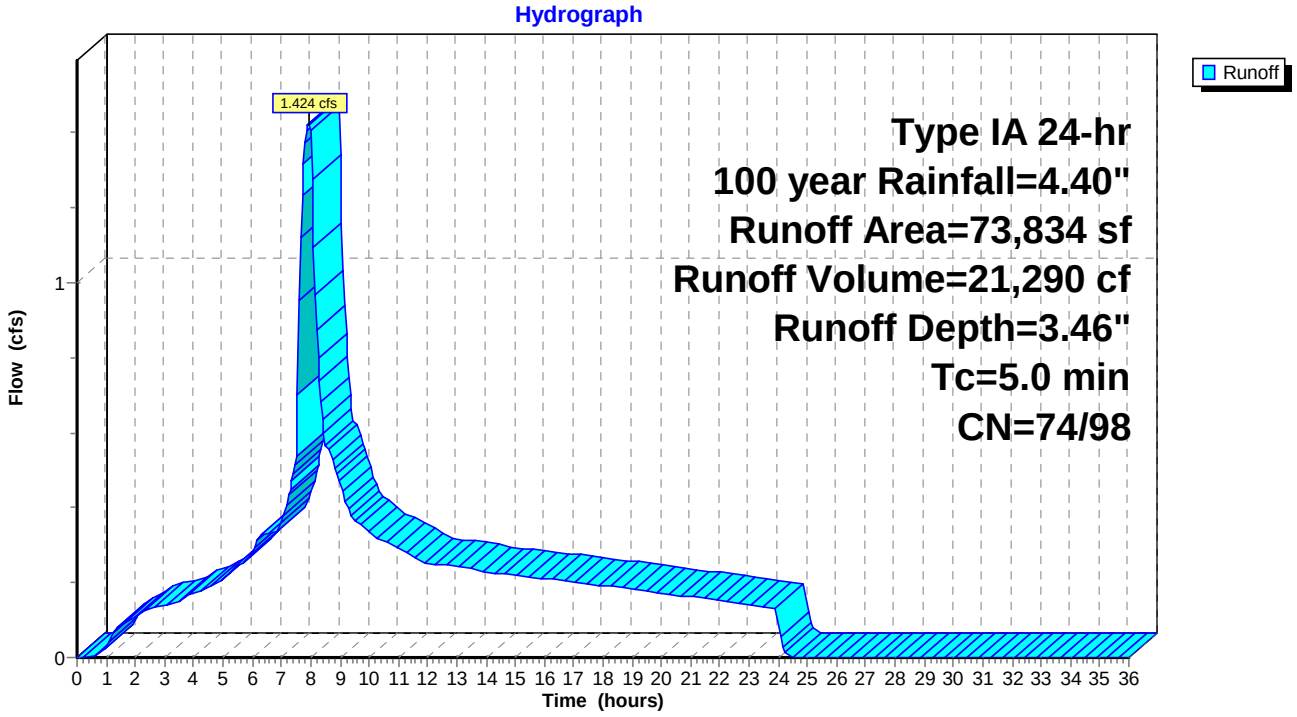
Runoff = 1.424 cfs @ 7.92 hrs, Volume= 21,290 cf, Depth= 3.46"
Routed to Pond 6P : Pond

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 year Rainfall=4.40"

Area (sf)	CN	Description
38,190	98	Paved roads w/curbs & sewers, HSG C
12,730	98	Paved parking, HSG C
22,914	74	>75% Grass cover, Good, HSG C
73,834	91	Weighted Average
22,914	74	31.03% Pervious Area
50,920	98	68.97% Impervious Area

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

Subcatchment 5S: Croisan Rd - FULL BUILD



Summary for Pond 6P: Pond

Inflow Area = 73,834 sf, 68.97% Impervious, Inflow Depth = 3.46" for 100 year event
Inflow = 1.424 cfs @ 7.92 hrs, Volume= 21,290 cf
Outflow = 0.192 cfs @ 18.02 hrs, Volume= 6,118 cf, Atten= 87%, Lag= 606.4 min
Primary = 0.192 cfs @ 18.02 hrs, Volume= 6,118 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 440.07' @ 18.02 hrs Surf.Area= 9,394 sf Storage= 16,086 cf

Plug-Flow detention time= 878.8 min calculated for 6,110 cf (29% of inflow)
Center-of-Mass det. time= 533.1 min (1,219.9 - 686.8)

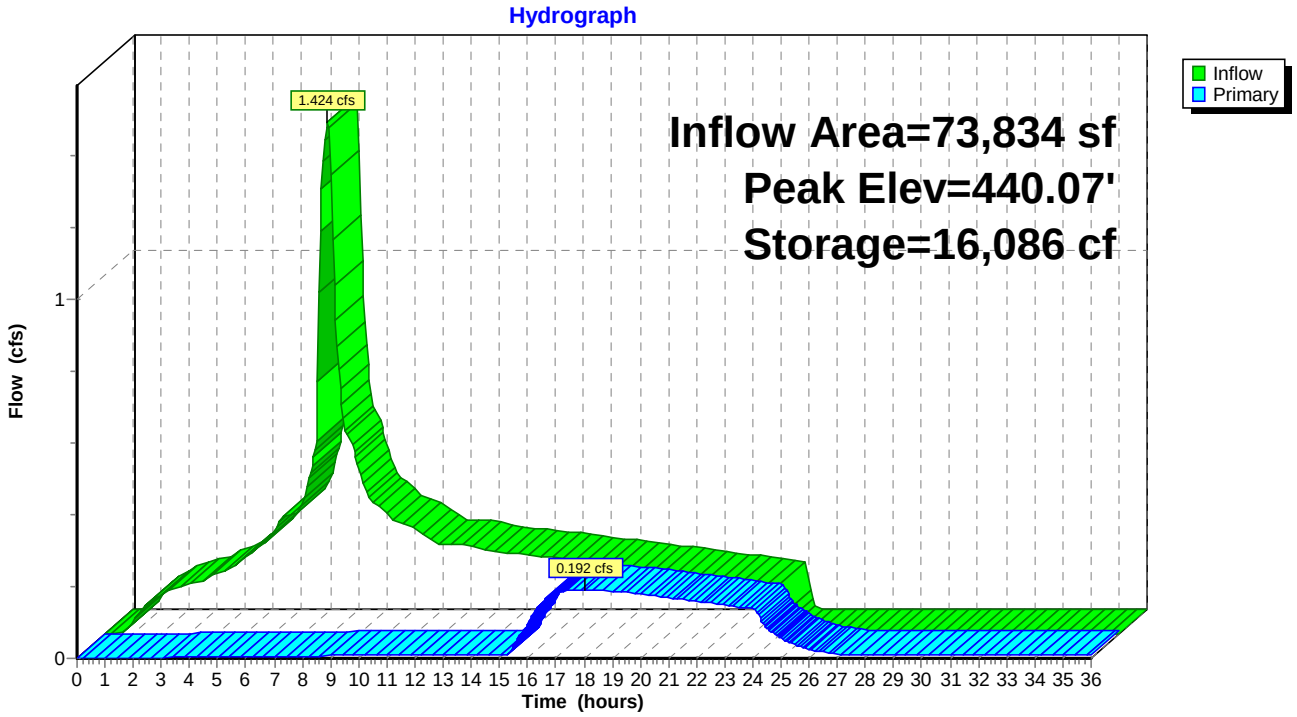
Volume	Invert	Avail.Storage	Storage Description
#1	438.00'	37,160 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
438.00	6,173	0	0
442.00	12,407	37,160	37,160

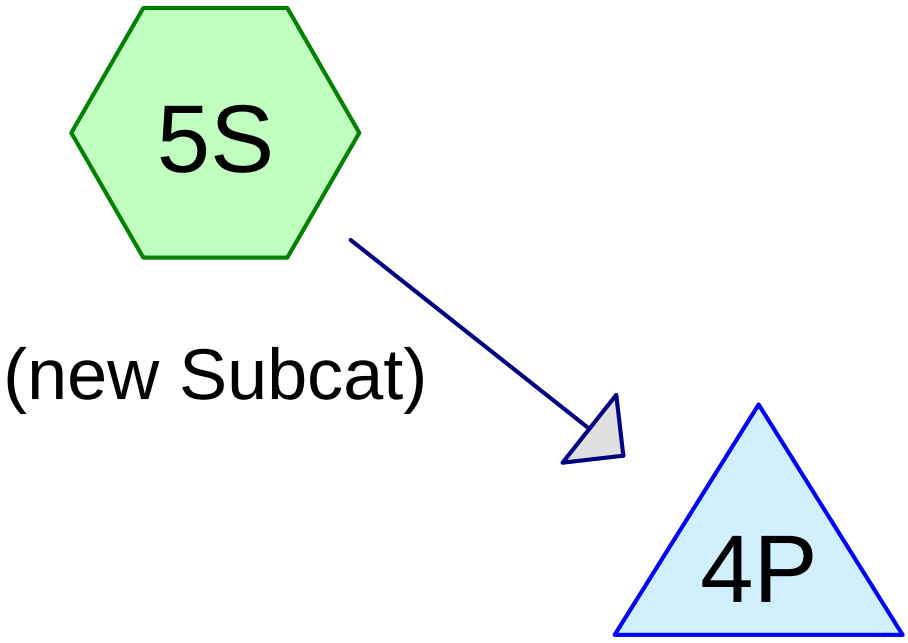
Device	Routing	Invert	Outlet Devices
#1	Primary	438.00'	**0.500" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Primary	440.00'	**12.000" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.186 cfs @ 18.02 hrs HW=440.07' (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.009 cfs @ 6.92 fps)
2=Orifice/Grate (Weir Controls 0.177 cfs @ 0.84 fps)

Pond 6P: Pond


Hydrograph
Inflow
Primary
1.424 cfs
0.192 cfs
Inflow Area=73,834 sf
Peak Elev=440.07'
Storage=16,086 cf
Flow (cfs)
0
1
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

APPENDIX E: WATER QUALITY HYDROGRAPH



PB - WQ

Subcat Reach Pond Link

Routing Diagram for Prelim Hydrographs
Prepared by Multi/Tech Engineering Service, Printed 10/25/2024

Summary for Subcatchment 5S: (new Subcat)

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

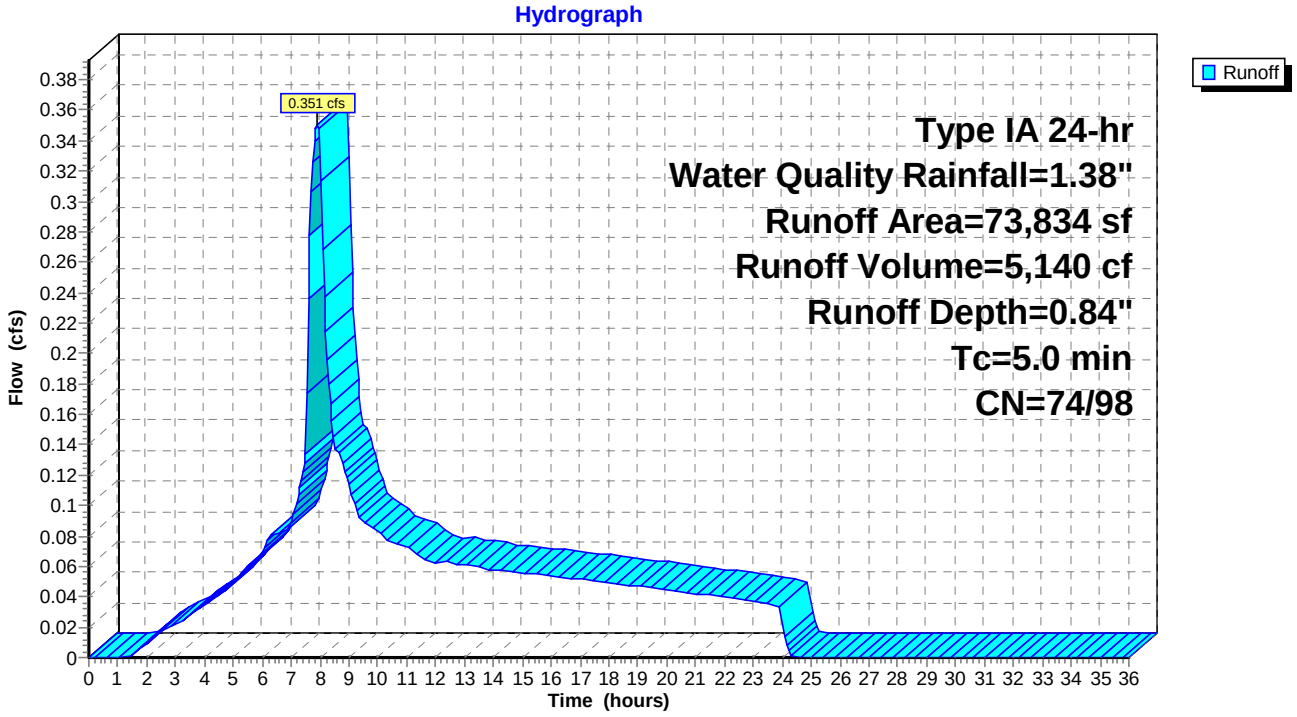
Runoff = 0.351 cfs @ 7.91 hrs, Volume= 5,140 cf, Depth= 0.84"
Routed to Pond 4P : PB - WQ

Runoff by SBUH method, Split Pervious/Imperv., Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type IA 24-hr Water Quality Rainfall=1.38"

Area (sf)	CN	Description
38,190	98	Paved roads w/curbs & sewers, HSG C
12,730	98	Paved parking, HSG C
22,914	74	>75% Grass cover, Good, HSG C
73,834	91	Weighted Average
22,914	74	31.03% Pervious Area
50,920	98	68.97% Impervious Area

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

Subcatchment 5S: (new Subcat)



Summary for Pond 4P: PB - WQ

Inflow Area = 73,834 sf, 68.97% Impervious, Inflow Depth = 0.84" for Water Quality event
Inflow = 0.351 cfs @ 7.91 hrs, Volume= 5,140 cf
Outflow = 0.081 cfs @ 6.40 hrs, Volume= 5,140 cf, Atten= 77%, Lag= 0.0 min
Discarded = 0.081 cfs @ 6.40 hrs, Volume= 5,140 cf
Primary = 0.000 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 0.46' @ 10.07 hrs Surf.Area= 0.040 ac Storage= 0.019 af

Plug-Flow detention time= 74.2 min calculated for 5,133 cf (100% of inflow)
Center-of-Mass det. time= 74.1 min (785.7 - 711.5)

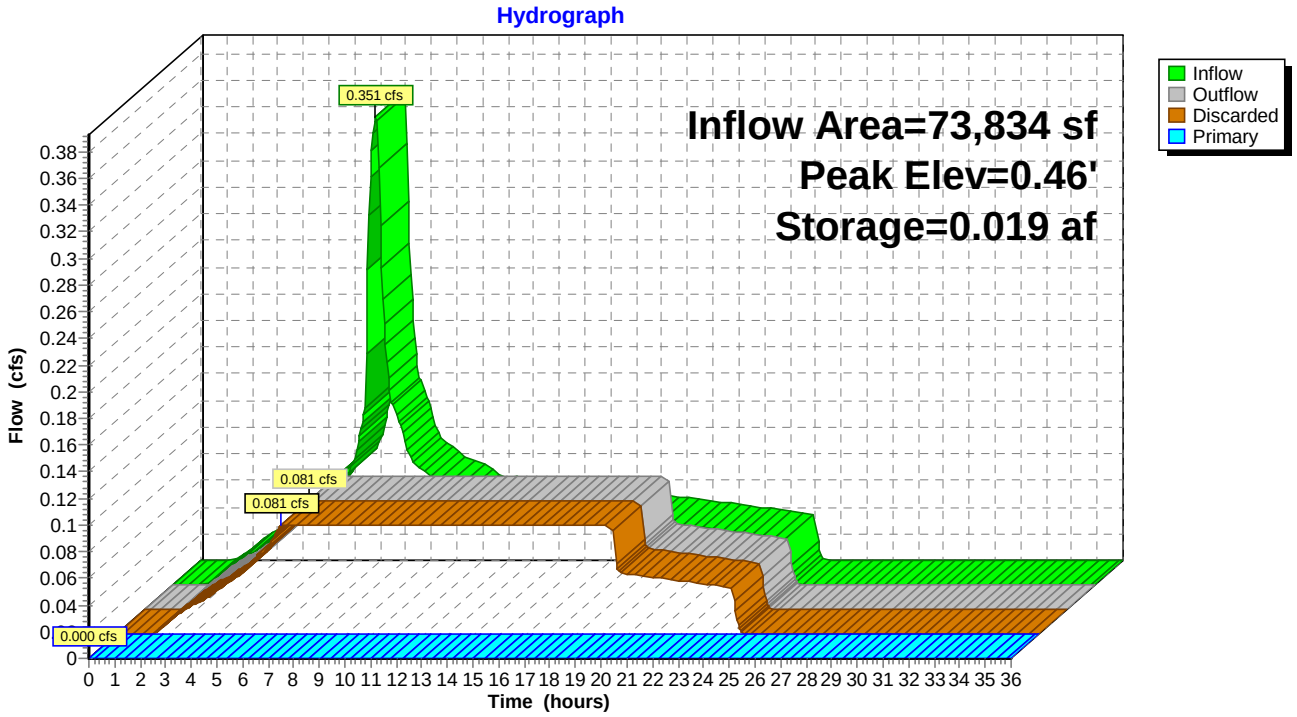
Volume	Invert	Avail.Storage	Storage Description
#1	0.00'	0.040 af	**8.00'W x 220.00'L x 1.00'H Prismatoid**

Device	Routing	Invert	Outlet Devices
#1	Primary	0.50'	**12.000" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#2	Discarded	0.00'	**2.000 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.081 cfs @ 6.40 hrs HW=0.01' (Free Discharge)
↑└**2=Exfiltration** (Exfiltration Controls 0.081 cfs)

Primary OutFlow Max=0.000 cfs @ 0.00 hrs HW=0.00' (Free Discharge)
↑└**1=Orifice/Grate** (Controls 0.000 cfs)

Pond 4P: PB - WQ


Hydrograph
Inflow Area=73,834 sf
Peak Elev=0.46'
Storage=0.019 af
0.351 cfs
0.081 cfs
0.081 cfs
0.000 cfs
Inflow
Outflow
Discarded
Primary
Flow (cfs)
Time (hours)