CONCEPT
DRAINAGE REPORT

FOR THE

2120 W. Strong Road
STRONG ROAD RESIDENTIAL DEVELOPMENT
PRELIMINARY PLAT

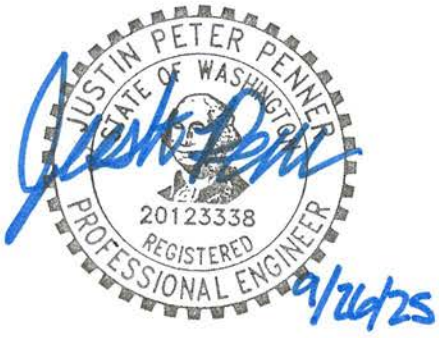
Spokane County, Washington

September 2025
WCE W.O. No. 2025-4026

Prepared by:

Whipple Consulting Engineers, Inc.
21 S. Pines Road
Spokane Valley, WA 99206
Whipplece.com

This report has been prepared by the staff of WCE under the direction of the undersigned professional engineer whose seal and signature appear hereon.



Justin Penner, P.E.

GENERAL

The proposed Strong Road Residential Development Preliminary Plat proposes the development of 12 residential lots ranging in size from approximately 3,780 sf to 5,080 sf located on approximately 1.41 acre, on Spokane County Parcel No. 26242.0054. The site lies in the City of Spokane on Five Mile Prairie north of Spokane City core. The site is adjacent to and north of Strong Road, east of N. Five Mile Road and northeast of the Strong Rd and Orchard St intersection. The site lies in the NE ¼ of Sec 24, T. 26 N., R. 42 E., W.M., and is located within the aquifer sensitive area. See Figure 1 for the Vicinity Map. The site also lies on the northern edge of the Five Mile Prairie Special Drainage Area.

Figure 1, Vicinity Map.

Figure 2, Special Draiange District

PURPOSE

The purpose of this concept drainage report is to determine the storm drainage facilities that will be required to treat and dispose of the increase in storm water runoff created by development of the vacant lands for the new development. The facilities will be designed to treat and dispose of the 2, 10, 25, 50 and 100-year storms, with any overflow stormwater meeting the thresholds in SRSM Table 2-1. Stormwater will be collected and treated in bioswales and discharged via Gravel Galleries as allowed based on known soil types. There are NO existing wetlands on the site. The Intensity, Duration, and Frequency (IDF) curves from the Spokane, Medical Lake, Reardon, Cheney and Rockford intensity curves as modified by the Spokane Regional Storm Manual (SRSM) are used for bowstring calculations to determine basin flows for reference for the Rational storm. The 2, 10-, 25-, 50- and 100-year rainfall intensity iso-pluvials from the Spokane Regional Stormwater Manual have been used for both the TR-55 and HEC-22 calculations for the HydroCAD stormwater model. For this analysis as and as allowed in SRSM 2.2.4 Flow Control, the Type IA-24-hr storm event will be used to size the storm facilities.

Figure 3, Excerpt from the SRSM related to Special Drainage Areas

7.9.1 SPECIAL DRAINAGE AREAS

Special Drainage Areas (SDAs) are designated areas with shallow soils, bedrock near the surface of the land, and soils or geological features that may make long-term infiltration of stormwater difficult or areas where infiltration may pose potential problems for on-site or adjacent properties. These areas may also contain steep slopes where infiltration of water and dispersion of water into the soils may be difficult or delayed, creating drainage problems such as erosion. Known areas of flooding or areas that historically have had drainage or high groundwater problems (mapped or unmapped) are also SDAs.

SDAs in the City of Spokane are described in SMC 17D.060 "Stormwater Facilities." Additional requirements for development in these areas are included in this ordinance.

Spokane County has mapped several SDAs. Among the mapped SDAs are portions of the Glenrose/Central Park Watershed, the North Spokane Stormwater Planning Area and the West Plains Stormwater Planning Areas. The Spokane County Stormwater Utility Section maintains and updates these maps. At the discretion of the local jurisdiction, an area can be designated as an SDA if it is determined that development may have adverse impacts on existing or future down-gradient or adjacent properties.

Unless specifically approved by the local jurisdiction, the peak rate and volume of stormwater runoff from any proposed land development to any natural or constructed point of discharge downstream shall not exceed the pre-development peak rate or volume of runoff. A down-gradient analysis demonstrating that there will be no expected adverse impacts on downgradient properties will be required. Exceptions with regard to rate and volume control can be made for regional facilities planned by the local jurisdiction.

Based on SMC 17D.060.135 and .060.140, this area is a special drainage area and an area of concern due to poorly draining soils related generally to the shallow bedrock and poor soil types found on Five Mile Prairie.

Special Drainage Area considerations.

1. The WA DNR Stream Type Map does not have a stream in this vicinity.
2. Infiltration is allowed when additional infiltration information from a geotechnical study and engineer is provided. Geotechnical study to be done at time of construction if required.
3. Downstream discharge can occur in pre-developed rates and types.

ANALYSIS METHODOLOGY

Generally, the Rational Method, which is recommended for basins less than ten acres in size, should be used to determine the peak discharges and runoff volumes for all onsite basins. All off-site basins and all on-site basins larger than ten acres will use the SCS Method to determine peak discharge and runoff volumes. Additionally, basins which contain wetlands have been analyzed using SCS and the Water Budget / Evaporation procedures from Spokane County. For this Concept Stormwater Analysis, the SCS Method as analyzed in the HydroCAD Stormwater Modeling program version 10.20-2f (40 node version) has been used, with the Rational "Bowstring" method used for Treatment sizing and as a pond size check.

TOPOGRAPHY

The site is considered a flat terrain site with existing slopes on site ranging from 2 to 4-percent. As shown on the preliminary plat map, the proposed road system will follow contours that run generally downhill from north to south and east to west. The roads will be sloped to generally follow the lay of the land.

SOILS

As can be seen from the USDA, Soil Conservation Service (SCS) soils report in the Appendix, the surrounding area consists of several soil types. Below are excerpts from the NRCS Soil Survey. A full geotechnical evaluation will be provided for final design if required.

Figure X, Soil Unit Map from NRCS Soil Report (in the Appendix)

Figure X, Soil Name and Composition from NRCS Soil Report (in the Appendix)

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
7140	Urban land-Uhlig, disturbed complex, 0 to 8 percent slopes	1.9	100.0%
Totals for Area of Interest		1.9	100.0%

All soils on site have the following hydrologic soil classification.

Hydrologic Soil Classification – C

DRAINAGE NARRATIVE

BASIN SUMMARY – Pre-Developed (HydroCAD Pre Basin = 1S)

The existing site is 1.41 Acres in size, as noted earlier there are no critical areas such as streams or wetlands on site.

The site sits east of the proposed North Grove subdivision which has proposed controlled drainage facilities and only pervious portions of the upstream properties will be directed to the west.

In the pre-developed condition, there is only one basin, which drains generally via sheet flow down slope to Strong Road. Due to the nature of the site, generally overgrown fallow grass with trees and buildings, only that runoff that would contribute to the driveway from Strong Road would convey water directly to Strong Road.

For pre-developed sheet flow analysis, the site was divided into a single Basin 1S where, as noted, the site sheet flows from east to west and north to south, essentially to the SW corner of the site.

Because the soil types are Type C soils and the slopes are fairly flat, the site has been observed to not flow or discharge storm events wherein rivulets or other flow patterns would develop, therefore sheet flow is assumed to govern terminating, on site.

For this project a pre-developed CN value of 77 - for 2 Acre lots with Type C Soil was used. By using this value at CN=77 for the pre-developed analysis, it will result in larger storage volumes as it will provide a greater percentage of change between a CN_{pre} vs CN_{post}, which is how the SCS method analyses works, which is SCS evaluates the storage as a change in percentage change after the initial abstraction is removed.

Table 1. Pre-Developed Basin Summary Table

	Area (ac)				SCS Rate (cfs)				
Basin	Imp	Pervious	Offsite	Total	2-yr	10-yr	25-yr	50-yr	100-yr
A	0	1.56	0	1.56	0.01	0.04	0.07	0.11	0.15

BASIN SUMMARY – Post-Developed Narrative

The post developed site is divided into two basins, Basins A and B, for analysis in the Concept Storm Report as shown on the attached basin map. The following are narratives on the various basins and sub-basins and where and how the water is treated and discharged. It should be noted that the two basins A and B are generally separated by proposed sidewalk. Basin A will drain to two separate ponds on either side of the proposed roadway and will be connected by a pipe between the two ponds so that they function hydraulically as one pond.

As the soils are Type C, non-approved for drywell soils 1815A will be used per SRSM guidelines, as the soils encountered do not meet the criteria for equation 6-1a or 6-1c.

Bio-Infiltration Swale Design

Bio-infiltration swales shall be sized using either Equation 6-1a or 6-1b. These equations estimate the volume required to treat stormwater runoff and were developed using the Alternate Hydrograph Method found in the *Stormwater Management Manual for Eastern Washington*.

$$V = 1133AP^{1.53} \quad \text{(6-1a)}$$

$$V = 1815AP^{1.53} \quad \text{(6-1b)}$$

Where: V = volume of bio-infiltration swale (cubic feet);

A = hydraulically connected impervious area to be treated (acres); and,

P = precipitation amount for the 6-month NRCS Type II 24 hour water quality design storm.

P shall be 1 inch for the all of the Spokane region, therefore the above equations can be simplified as follows:

$$V = 1133A \quad \text{(6-1c)}$$

$$V = 1815A \quad \text{(6-1d)}$$

Equations 6-1a and 6-1c can only be used when the following requirements are met, otherwise, Equations 6-1b and 6-1d shall be used:

- The subgrade soils have less than 12% fines; and,
- The subgrade soils have an infiltration rate greater than 0.15 in/hr.

Appendix 6A provides an example calculation for bioinfiltration swales.

Basin A (HydroCAD Post Basin 2S and Pond 4P)

This basin as described earlier generally mimics the pre-developed basin and is generally bounded on the south by Strong Road, on the west by the existing Forest Grove subdivision, on the north by the existing Forest Grove subdivision and on the east by the existing access road for the City of Spokane's water reservoir.

This basin contains both proposed road and all the proposed lots. The drainage from this Basin will be from north to south to Pond A1 and Pond A2. Pond A1 and Pond A2 will be connected by a stormwater pipe so that they will function hydraulically as one pond. Each pond will have gravel gallery to discharge underground. The outflow rate from the gravel gallery is an assumed value of infiltration based on surrounding projects. Additional Geotechnical justification can be provided as requested, generally this would be provided at the final design. See Appendix for additional information.

Basin B (HydroCAD Post Basin 4S and Pond 5P)

This basin as described earlier is generally bounded on the north by Basin A, on the west the by the propose North Grove subdivision, and on the south and east by the existing roadside conditions of Strong Rd. This basin consists of proposed Strong Rd frontages.

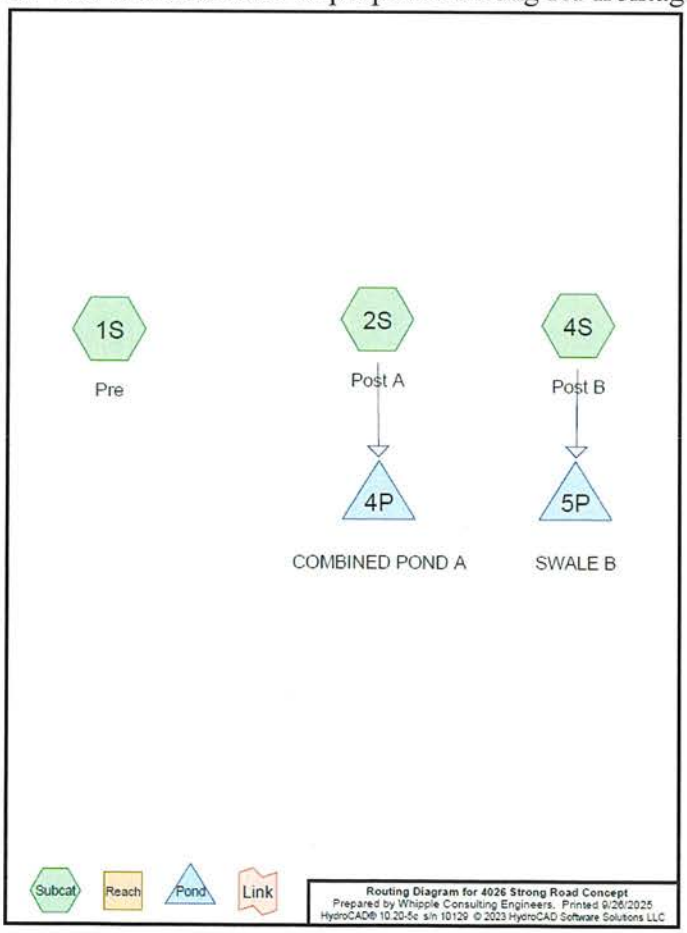


Table No. 2 – Post Developed Basin Summary – 25 Year

SCS – POND BASIN INFORMATION SUMMARY						
Basins	Area (AC)	CN Values Pre-Developed	CN Values Post-Development	25- Year Discharge Rates (cfs)		Req'd 25- Year Storage Volumes (cf)
				Pre	Post	
A	1.40	77	83	-	0.00	2,827
B	0.16	77	92	-	0.01	398
Total				0.07	0.01	

Table No. 3 – Post Developed Basin Summary – 100 Year

SCS – POND BASIN INFORMATION SUMMARY						
Basins	Area (AC)	CN Values Pre-Developed	CN Values Post-Development	100- Year Discharge Infiltration Rates (cfs)		Req'd 100- Year Storage Volumes (cf)
				Pre	Post	
A	1.40	77	83	-	0.05	3,795
B	0.16	77	92	-	0.01	401
Total				0.15	0.06	

POND DESIGN

Pond A will be sized to hold the 25-year storm with a discharge route for the 100-year storm that is less than or equal to predeveloped rate/volume as shown in table 2 and 3. Pond B will overflow the 25-yr and 100-yr storm downstream in the same manner, rate/volume, as in the predeveloped condition as shown in table 2 and 3.

Table No. 4 – 25 and 100-yr Pond Volume Summary

Pond	**25 and 100-Year Pond Volume Summary**					
	25-Year Proposed (cf)	**100-Year Proposed (cf)**	**Bottom Elevation**	**25- Year W.S. Elev.**	**100-Year W.S. Elev.**	**Outlet Elev.**
A	2,827	3,795	98.5	100.36	100.53	100.5
B	398	401	100	100.51	100.51	100.5

CONCLUSION

This report demonstrates that the SCS method and the proposed storm water design for this system, for the proposed project can capture, detain and release at pre-developed rates or less to meet SRSM requirements.

Per Page 3-6 of the SRSM, there are additional items that need to be addressed. These areas are as follow:

Critical Area Discussion:

This project has no critical areas.

Perpetual Maintenance of Facilities:

The proposed storm drainage system in addition to gutter flow may be a system of pipes and catch basins in public roads and as such will be maintained by the Jurisdiction. The ponds, while part of the public system will be maintained in Tracts within the plat and will be maintained by the project HOA.

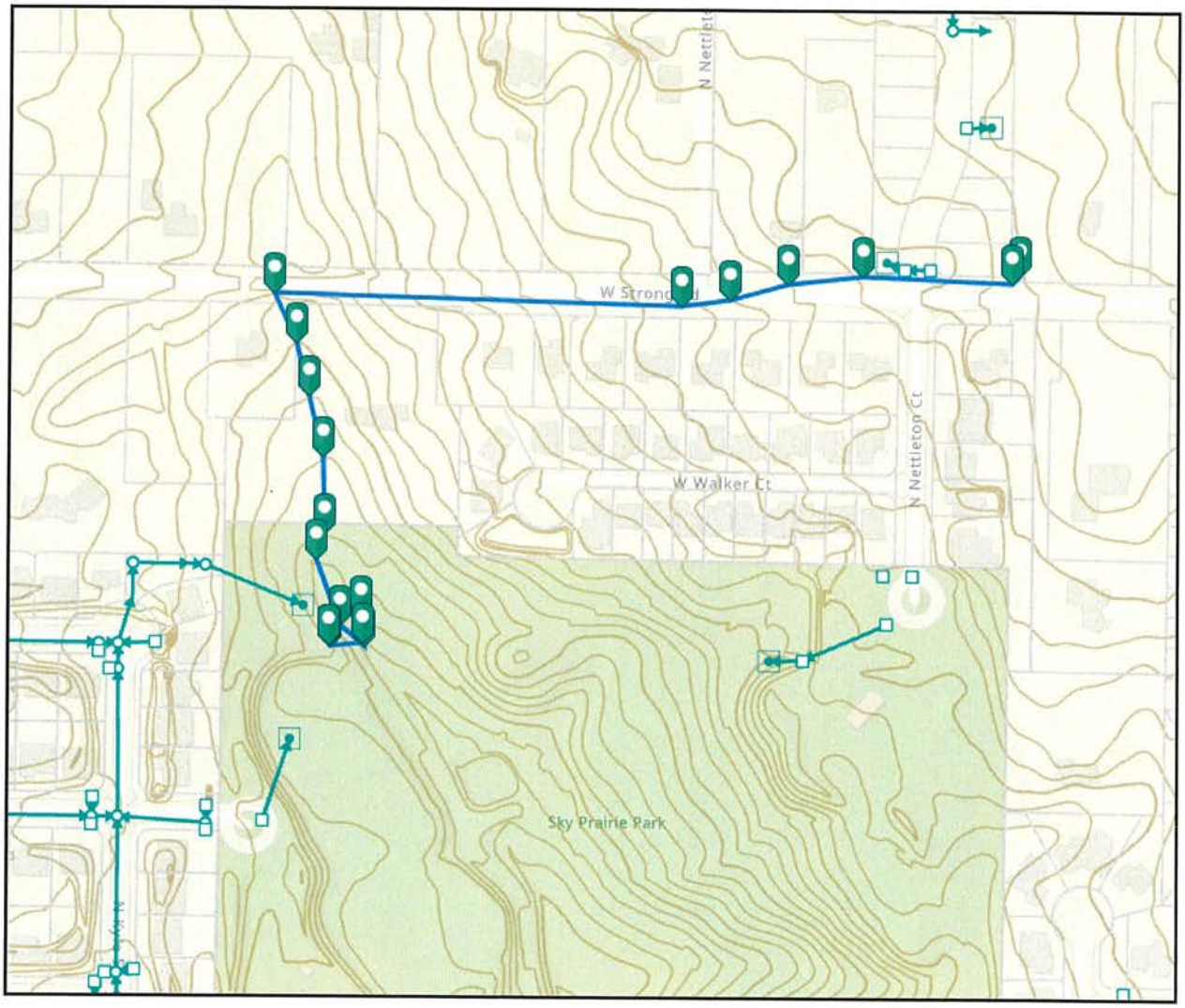
Offsite Easements:

None are required currently.

Regional Facilities:

Should a storm event larger than a 100-year event take place such as rain on, snow on frozen ground occur, the site will over flow into Strong Road and drain to the west where there are culverts directing the storm waters to the Sky Prairie Park.

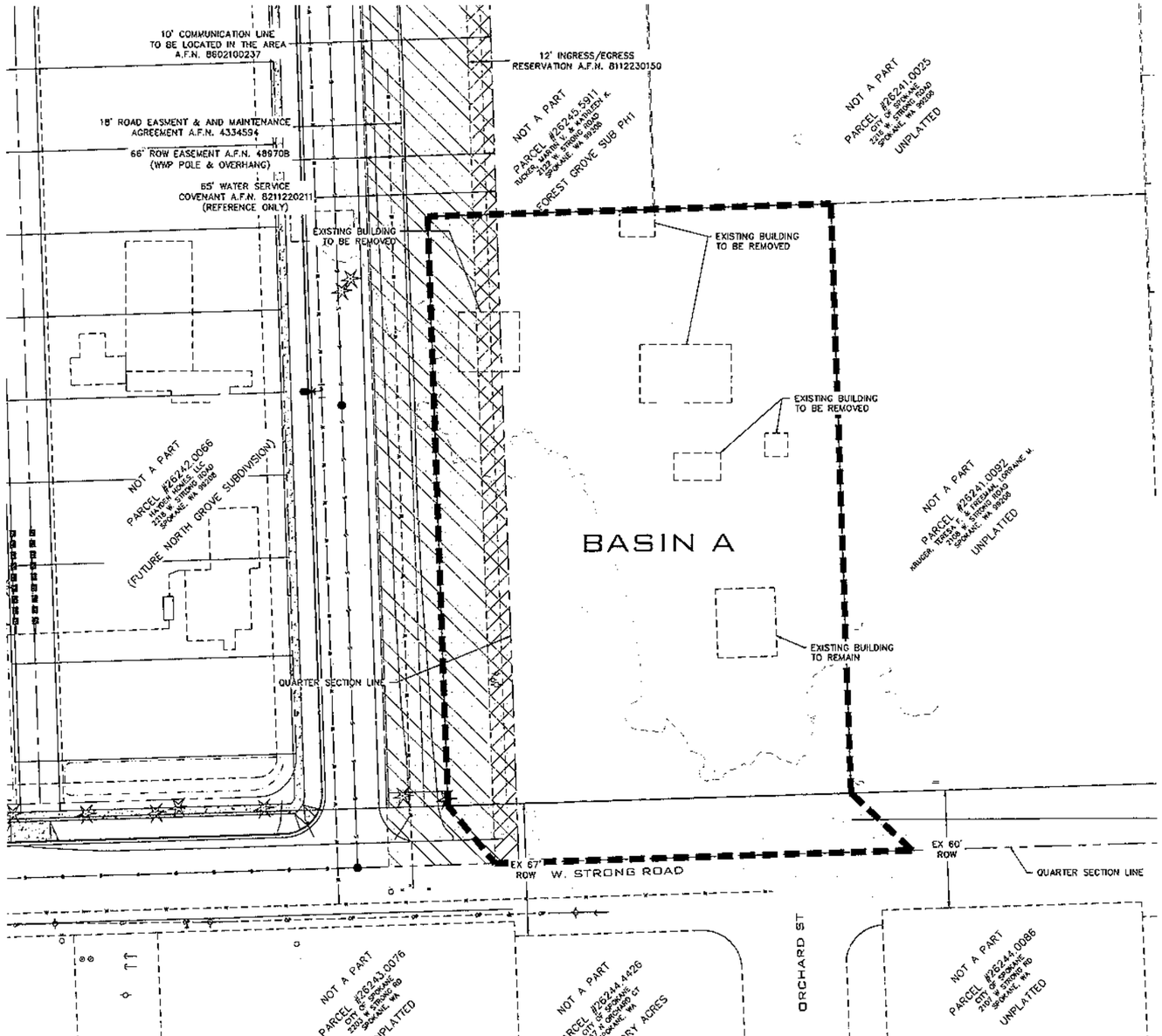
Figure X – Overland Flow to Regional Facilities



APPENDIX

- BASIN MAP – PRE
- BASIN MAP - POST
- BASIN REPORT
- POND VOLUME CALCULATIONS
- GRAVEL GALLERY WORKSHEET
- FLOW CONVERSION
- FIVE MILE PRAIRIE AREA SPECIAL DRAINGE MAP
- HYDROCAD CALCULATIONS
- SCS SOILS REPORT

UNDERGROUND SERVICE ALERT
ONE-CALL NUMBER
811
CALL TWO BUSINESS DAYS BEFORE YOU DIG



NAVD - 88
XXX

GRAPHIC SCALE
30 0 15 30 60
(IN FEET)
1 inch = 30 ft.

N
W E
S

SCALE: HORIZONTAL: 1"=30' VERTICAL: N/A	PROJ #: 25-4026 DATE: 09/29/25 DRAWN: JPP REVIEWED: TRW	Civil; Structural; Surveying; Traffic; X Planning; Landscape; Other	WCE WHIPPLE CONSULTING ENGINEERS 21 S. PINES ROAD SPOKANE VALLEY, WA 99206 PH 509-893-2617 FAX 509-926-0227	STRONG ROAD RES. DEVELOPEMENT PRELIMINARY BASIN 2120 W. STRONG RD. SPOKANE, WA	SHEET 1 OF 2 JOB NUMBER 25-4026

P:\PCE_DWGS\2025 WCE PROJECTS\25-4026 HOLDING- 2120 W STRONG RD\DWG\4026-BASIN.DWG PLOT DATE:09/29/25

Whipple Consulting Engineers
Basin Calculation Worksheet

13-Mar-25 25-4026 25-4026 Strong Road
JPP

Imp 0.9
Per 0.15

Intensities from IDF Curves - Spokane, Reardan, etc..
I (2 yr) = 2 inches I (10 yr)= 3.18 inches
I (25 yr) = 4 inches I (50 yr)= 4.57 inches
I (100 yr) = 5.1 inches

SPOKANE COUNTY - GSM - GRASSED PERCOLATION METHOD

Basin	Total	Total	Street	Existing Street	Adjacent	Sidewalk	Driveways	Driveways	Houses	Houses	Total	Total	Weighted	208 Area	208 Pond	208 Pond	Q=CIA (cfs)				
	sf	ac	sf	sf	Sidewalk sf	sf	# of	sf	# of	sf	Impervious	Pervious	"C"	sf	Area (sf)	Vol (cf)	2 yr Storm	10 yr Storm	25 yr Storm	50 yr Storm	100 yr Storm
Pre Developed	67,753.00	1.56	0.00	2,640.00	0.00	0.00	1.00	1,500.00	1.00	2,000.00	3,500.00	64,253.00	8221.67	1,500.00	125.00	62.50	0.59	0.93	1.17	1.34	1.50
Post Developed																					
A	60,880.00	1.40	7,748.00	0.00	0.00	850.00	12.00	4,800.00	12.00	24,000.00	37,398.00	23,482.00	26602.87	13,398.00	1116.50	558.25	1.71	2.71	3.41	3.90	4.35
B	7,007.00	0.16	990.00	2,460.00	0.00	1,100.00	0.00	0.00	0.00	0.00	4,550.00	2,457.00	27748.29	990.00	82.50	41.25	0.20	0.33	0.41	0.47	0.52
Post Total	**67,887.00**	**1.56**	**8,738.00**	**2,460.00**	**0.00**	**1,950.00**	**12.00**	**4,800.00**	**12.00**	**24,000.00**	**41,948.00**	**25,939.00**	**26721.09**	**14,388.00**	**1,199.00**	**599.50**	**1.91**	**3.04**	**3.82**	**4.37**	**4.88**

WHIPPLE CONSULTING ENGINEERS

POND VOLUME CALC SHEET

9/26/2025

25-4026 Strong Rd

Engineer JPP

										Treatment			Storage
Basins	Ponds/ Swales	Bottom Area sf	Squared Side lf	Total Treatment Area sf	Pond Bottom Elevation at Drywell	Pond Outlet Elevation	Pond Inlet Elevation (avg)	Conic Volume to Rim cf	Side Slope Volume cf	Total Volume to to Rim cf	Conic Volume to Inlet cf	Side Slope Volume cf	Total Volume to Inlet cf
A	Pond A1	800	28	995	1000.00	1000.50	1002.00	400	42	442	1,600	679	2,279
	Pond A2	600	24	769	1000.00	1000.50	1002.00	300	37	337	1,200	588	1,788
	TOTAL A	**1,400**	37.42	**1,764**						**779**			**4,067**
B	Pond B1	426	21	568	1000.00	1000.50	1000.80	213	31	244	340	79	420
	Pond B2	278	17	392	1000.00	1000.50	1000.80	139	25	164	222	64	286
	TOTAL 3	**703**	27	**960**						**407**			**706**

WHIPPLE CONSULTING ENGINEERS

GRAVEL GALLERY CALC SHEET

9/26/2025

25-4026 STRONG ROAD
JPP

Note: infiltration rates per local Geotech. Data

	Gallery Depth (Min)	Porosity of Gravel (Typ)				Sidewall Infiltration Rate
						Swale B
	ft	cf/cf				cfs/sf
	4	0.3				6.48E-06

Basins	Pond / Swale	Number of Galleries	Beginning Station	Ending Station	Width	Area	Gravel Gallery Bott. ELV	Volume	Storage Volume ROCK		Perimeter	Sidewall Area	Outflow
			ft	ft	ft	sf	ft	cf	cf		ft	sf	cfs
A1	A1	1	0.00	45.00	4	180	x	720	**216**		98.00	392.00	**0.003**
A2	A2	1	0.00	55.00	4	220	x	880	**264**		118.00	472.00	**0.003**
B	B	1	0.00	45.00	3	135	x	540	**162**		96.00	384.00	**0.002**
										THIS AREA FOR NOTES:			
Totals		3		#REF!	4	535		2140	**642**		312	1248	**0.00**

Storage Volume = Volume* Porosity
Sidewall Area= Perimeter*Depth
OutFlow = Sidewall Area * Sidewall Infiltration Rate

Note: Outflow Assumes a Full Gallery

WHIPPLE CONSULTING ENGINEERS

Flow Conversion from cfs/sf to in/hr or in/hr to cfs/sf

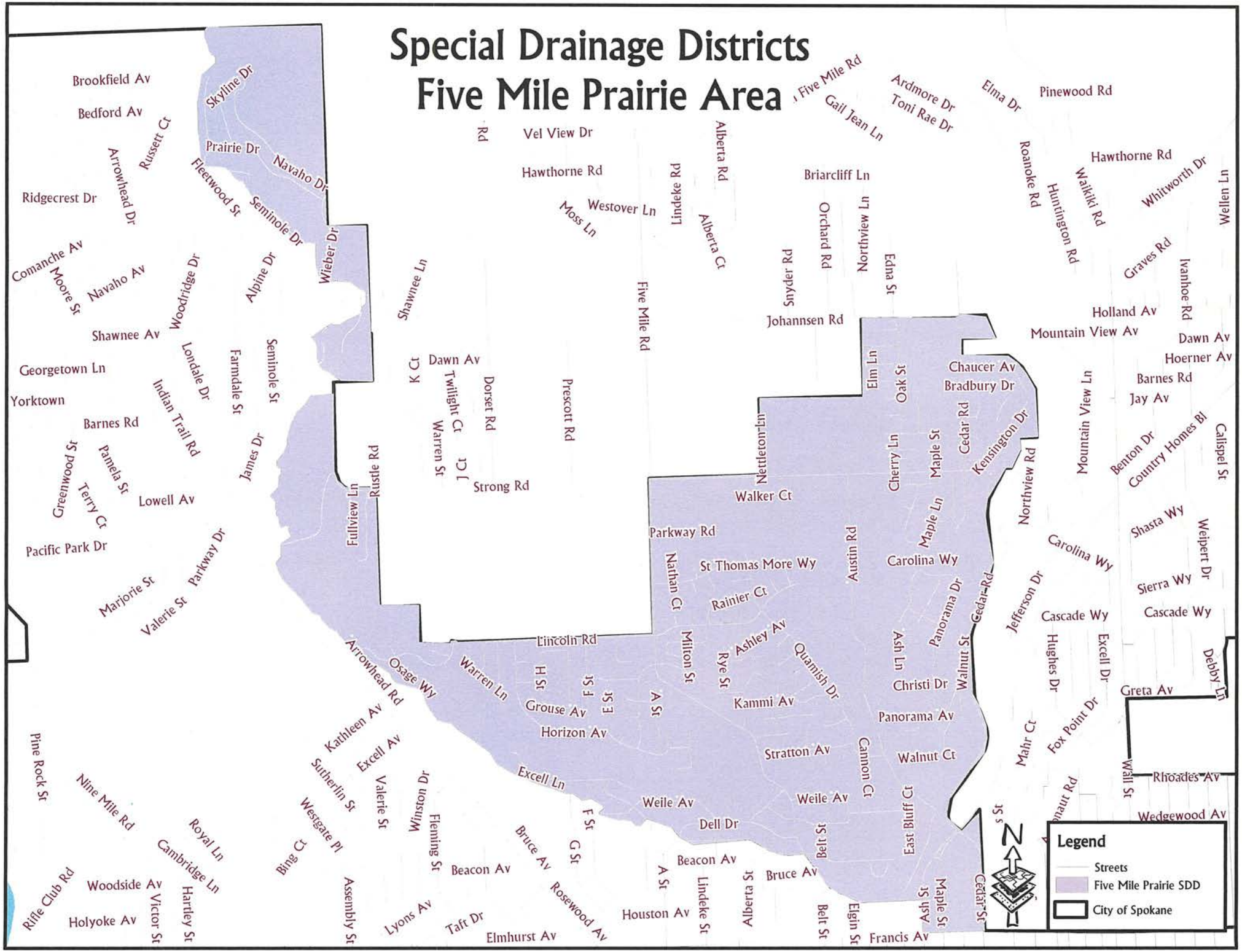
Date: 9/25/2025

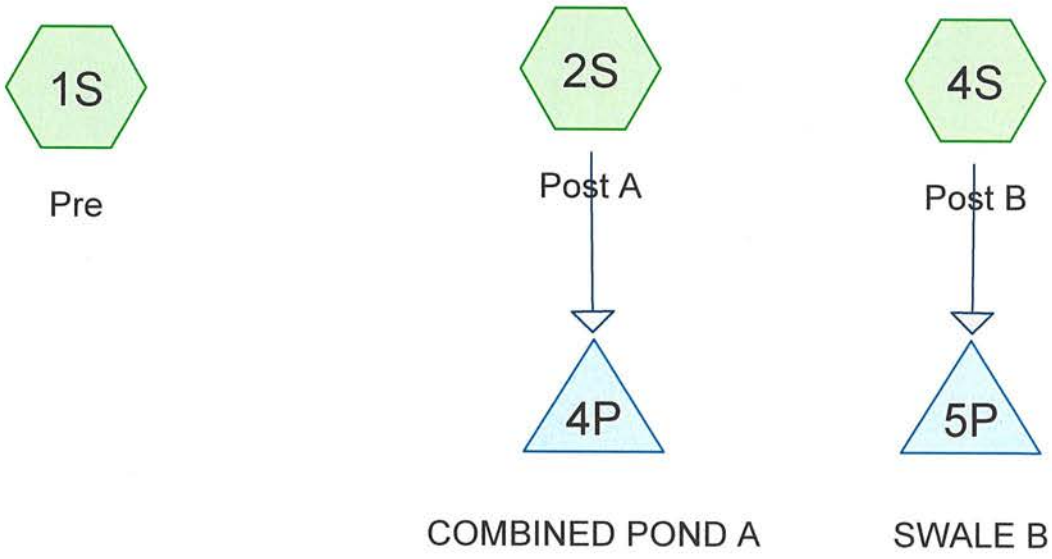
JOB # Strong Rd

Engineer: JPP

	From cfs/sf		To in/hr		From in/hr		To cfs/sf
1	0.00E+00	0	0.00		0.28	0.023333	6.48E-06
2	0.00E+00	0	0.00		0	0	0.00E+00
3	0.00E+00	0	0.00		0	0	0.00E+00
4	0.00E+00	0	0.00		0	0	0.00E+00
5	0.00E+00	0	0.00		0	0	0.00E+00

Special Drainage Districts
Five Mile Prairie Area





Subcat Reach Pond Link

Routing Diagram for 4026 Strong Road Concept
Prepared by Whipple Consulting Engineers, Printed 9/26/2025

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 yr	Type IA 24-hr		Default	24.00	1	1.20	2
2	10 yr	Type IA 24-hr		Default	24.00	1	1.80	2
3	25 yr	Type IA 24-hr		Default	24.00	1	2.00	2
4	50 yr	Type IA 24-hr		Default	24.00	1	2.20	2
5	100 yr	Type IA 24-hr		Default	24.00	1	2.40	2

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.398	83	1/4 acre lots, 38% imp, HSG C (2S)
1.555	77	2 acre lots, 12% imp, HSG C (1S)
0.056	74	>75% Grass cover, Good, HSG C (4S)
0.104	98	Paved roads w/curbs & sewers, HSG C (4S)
3.114	**80**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
3.114	HSG C	1S, 2S, 4S
0.000	HSG D	
0.000	Other	
3.114		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.000	1.398	0.000	0.000	1.398	1/4 acre lots, 38% imp	2S
0.000	0.000	1.555	0.000	0.000	1.555	2 acre lots, 12% imp	1S
0.000	0.000	0.056	0.000	0.000	0.056	>75% Grass cover, Good	4S
0.000	0.000	0.104	0.000	0.000	0.104	Paved roads w/curbs & sewers	4S
0.000	**0.000**	**3.114**	**0.000**	**0.000**	**3.114**	**TOTAL AREA**	

Time span=1.00-72.00 hrs, dt=0.05 hrs, 1421 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Pre Runoff Area=67,753 sf 12.00% Impervious Runoff Depth=0.10"
Flow Length=550' Slope=0.0200 '/' Tc=23.9 min CN=77 Runoff=0.01 cfs 0.013 af

Subcatchment2S: Post A Runoff Area=60,880 sf 38.00% Impervious Runoff Depth=0.22"
Tc=5.0 min CN=83 Runoff=0.03 cfs 0.026 af

Subcatchment4S: Post B Runoff Area=7,007 sf 64.94% Impervious Runoff Depth=0.46"
Tc=5.0 min CN=90 Runoff=0.02 cfs 0.006 af

Pond 4P: COMBINED POND A Peak Elev=99.09' Storage=906 cf Inflow=0.03 cfs 0.026 af
Primary=0.01 cfs 0.019 af Secondary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.019 af

Pond 5P: SWALE B Peak Elev=100.28' Storage=214 cf Inflow=0.02 cfs 0.006 af
Primary=0.00 cfs 0.004 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.004 af

Total Runoff Area = 3.114 ac Runoff Volume = 0.045 af Average Runoff Depth = 0.17"
73.60% Pervious = 2.292 ac 26.40% Impervious = 0.822 ac

Summary for Subcatchment 1S: Pre

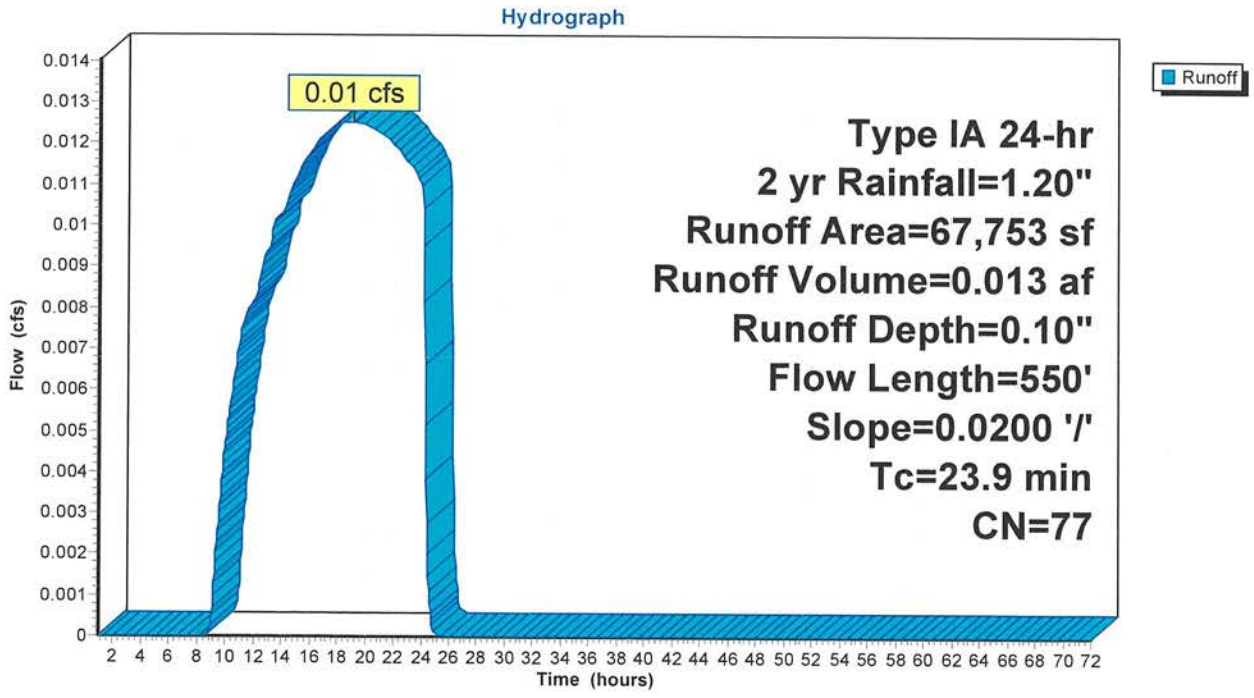
Runoff = 0.01 cfs @ 19.11 hrs, Volume= 0.013 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2 yr Rainfall=1.20"

Area (sf)	CN	Description
67,753	77	2 acre lots, 12% imp, HSG C
59,623		88.00% Pervious Area
8,130		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	100	0.0200	0.10		**Sheet Flow, Sheet Flow** Fallow n= 0.050 P2= 0.20"
7.6	450	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentraed Flow** Short Grass Pasture Kv= 7.0 fps
23.9	550	Total			

Subcatchment 1S: Pre



Summary for Subcatchment 2S: Post A

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

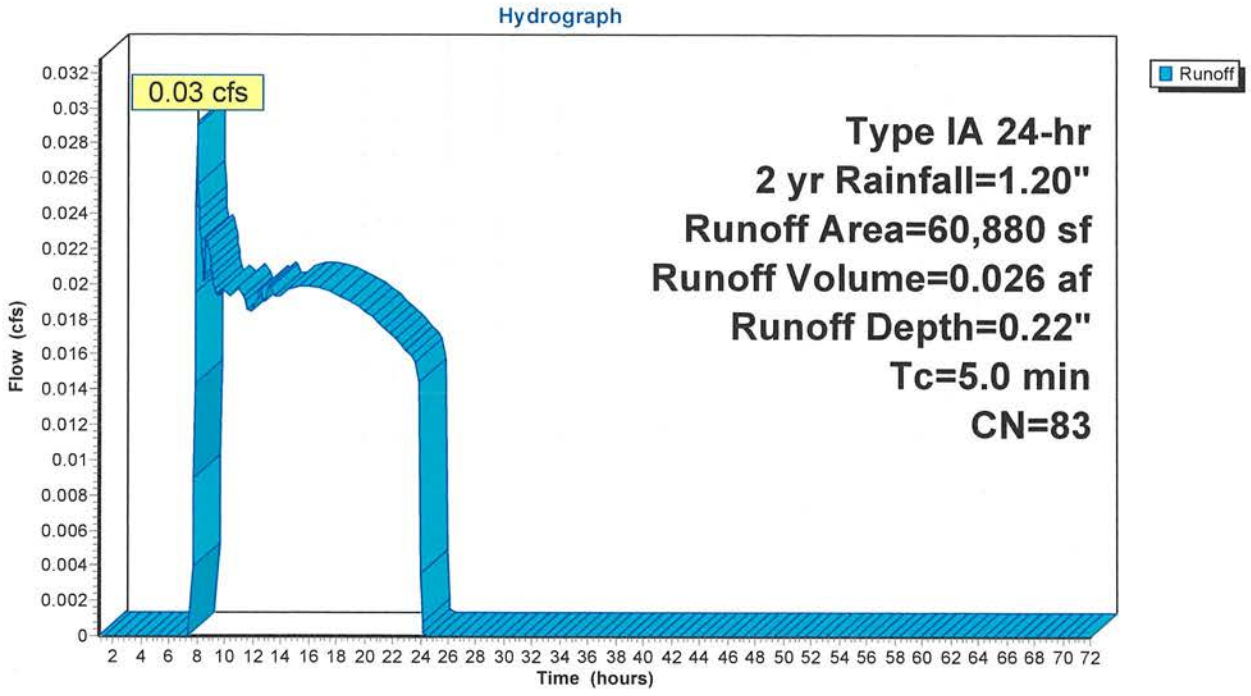
Runoff = 0.03 cfs @ 8.03 hrs, Volume= 0.026 af, Depth= 0.22"
Routed to Pond 4P : COMBINED POND A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2 yr Rainfall=1.20"

Area (sf)	CN	Description
60,880	83	1/4 acre lots, 38% imp, HSG C
37,746		62.00% Pervious Area
23,134		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Direct Entry 5 min**

Subcatchment 2S: Post A



Summary for Subcatchment 4S: Post B

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

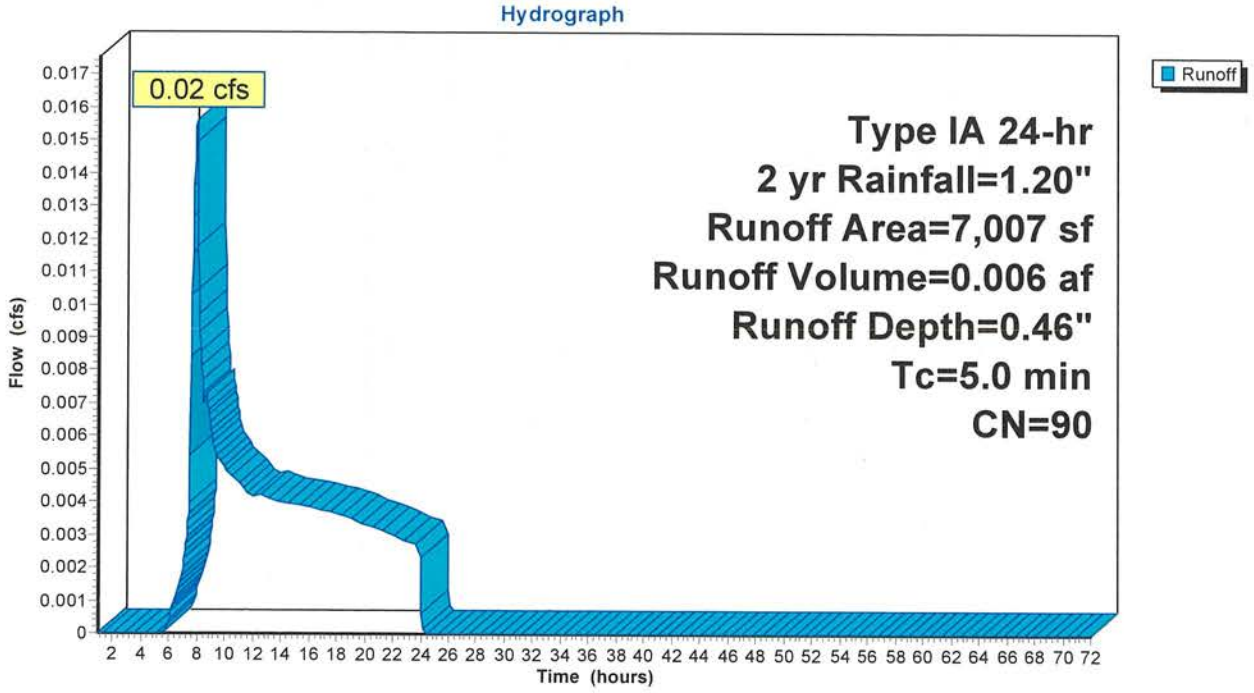
Runoff = 0.02 cfs @ 7.98 hrs, Volume= 0.006 af, Depth= 0.46"
Routed to Pond 5P : SWALE B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 2 yr Rainfall=1.20"

Area (sf)	CN	Description
2,457	74	>75% Grass cover, Good, HSG C
4,550	98	Paved roads w/curbs & sewers, HSG C
7,007	90	Weighted Average
2,457		35.06% Pervious Area
4,550		64.94% Impervious Area

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

Subcatchment 4S: Post B



Summary for Pond 4P: COMBINED POND A

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

Inflow Area =	1.398 ac,	38.00% Impervious,	Inflow Depth =	0.22"	for 2 yr event
Inflow =	0.03 cfs @	8.03 hrs,	Volume=	0.026 af	
Outflow =	0.01 cfs @	24.08 hrs,	Volume=	0.019 af,	Atten= 77%, Lag= 963.0 min
Primary =	0.01 cfs @	24.08 hrs,	Volume=	0.019 af	
Secondary =	0.00 cfs @	1.00 hrs,	Volume=	0.000 af	

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 99.09' @ 24.08 hrs Surf.Area= 1,677 sf Storage= 906 cf

Plug-Flow detention time= 1,397.0 min calculated for 0.019 af (76% of inflow)
Center-of-Mass det. time= 1,278.9 min (2,216.6 - 937.8)

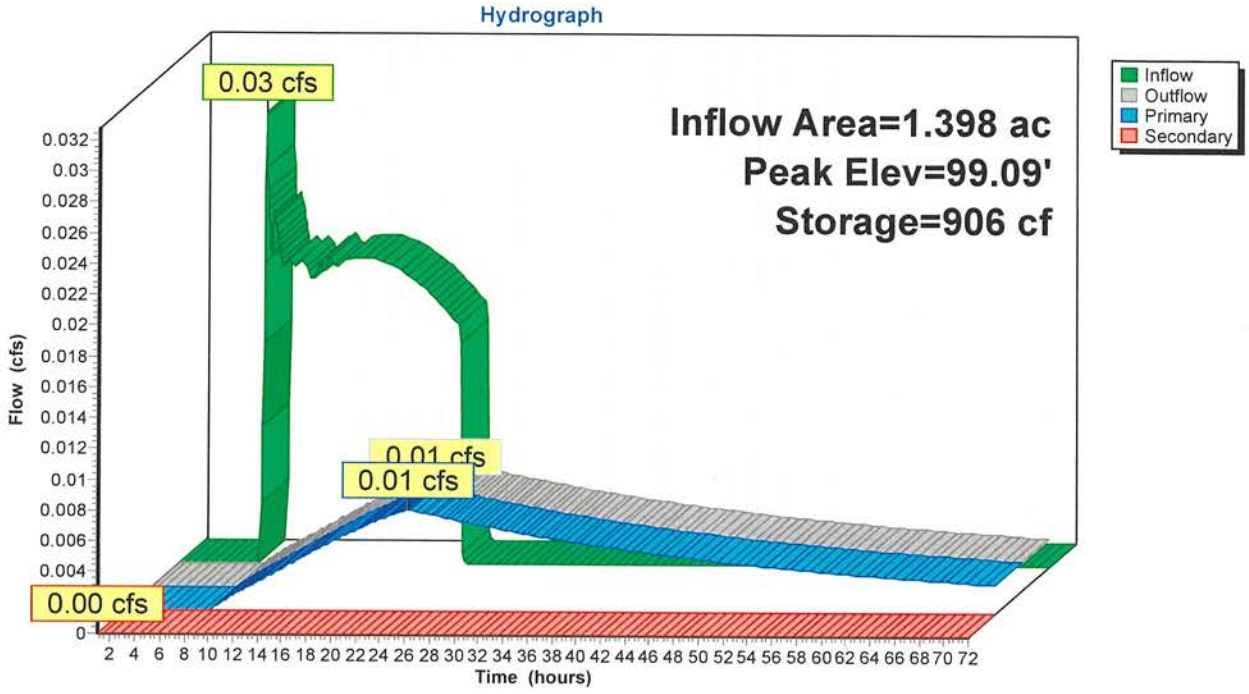
Volume	Invert	Avail.Storage	Storage Description
#1	98.50'	3,795 cf	**37.42'W x 37.42'L x 2.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	98.50'	**0.280 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00' Phase-In= 1.00'
#2	Secondary	100.50'	**3.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.01 cfs @ 24.08 hrs HW=99.09' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.01 cfs)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=98.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: COMBINED POND A



Summary for Pond 5P: SWALE B

Inflow Area = 0.161 ac, 64.94% Impervious, Inflow Depth = 0.46" for 2 yr event
Inflow = 0.02 cfs @ 7.98 hrs, Volume= 0.006 af
Outflow = 0.00 cfs @ 24.07 hrs, Volume= 0.004 af, Atten= 91%, Lag= 965.5 min
Primary = 0.00 cfs @ 24.07 hrs, Volume= 0.004 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 100.28' @ 24.07 hrs Surf.Area= 791 sf Storage= 214 cf

Plug-Flow detention time= 1,505.6 min calculated for 0.004 af (73% of inflow)
Center-of-Mass det. time= 1,354.1 min (2,194.2 - 840.1)

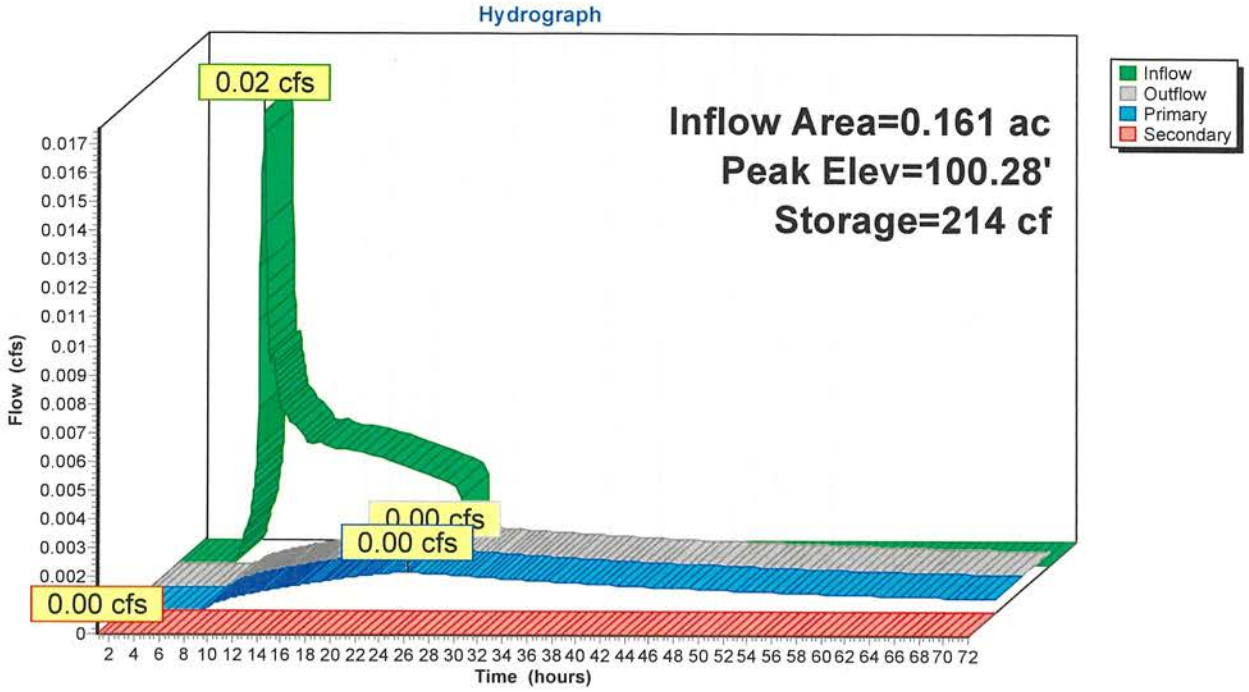
Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	655 cf	**27.00'W x 27.00'L x 0.80'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	**0.260 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00' Phase-In= 1.00'
#2	Secondary	100.50'	**3.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.00 cfs @ 24.07 hrs HW=100.28' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=100.00' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 5P: SWALE B



Time span=1.00-72.00 hrs, dt=0.05 hrs, 1421 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Pre Runoff Area=67,753 sf 12.00% Impervious Runoff Depth=0.35"
Flow Length=550' Slope=0.0200 '/' Tc=23.9 min CN=77 Runoff=0.04 cfs 0.045 af

Subcatchment2S: Post A Runoff Area=60,880 sf 38.00% Impervious Runoff Depth=0.56"
Tc=5.0 min CN=83 Runoff=0.15 cfs 0.065 af

Subcatchment4S: Post B Runoff Area=7,007 sf 64.94% Impervious Runoff Depth=0.93"
Tc=5.0 min CN=90 Runoff=0.04 cfs 0.012 af

Pond 4P: COMBINED POND A Peak Elev=99.81' Storage=2,249 cf Inflow=0.15 cfs 0.065 af
Primary=0.01 cfs 0.051 af Secondary=0.00 cfs 0.000 af Outflow=0.01 cfs 0.051 af

Pond 5P: SWALE B Peak Elev=100.50' Storage=396 cf Inflow=0.04 cfs 0.012 af
Primary=0.00 cfs 0.009 af Secondary=0.00 cfs 0.001 af Outflow=0.01 cfs 0.009 af

Total Runoff Area = 3.114 ac Runoff Volume = 0.123 af Average Runoff Depth = 0.47"
73.60% Pervious = 2.292 ac 26.40% Impervious = 0.822 ac

Summary for Subcatchment 1S: Pre

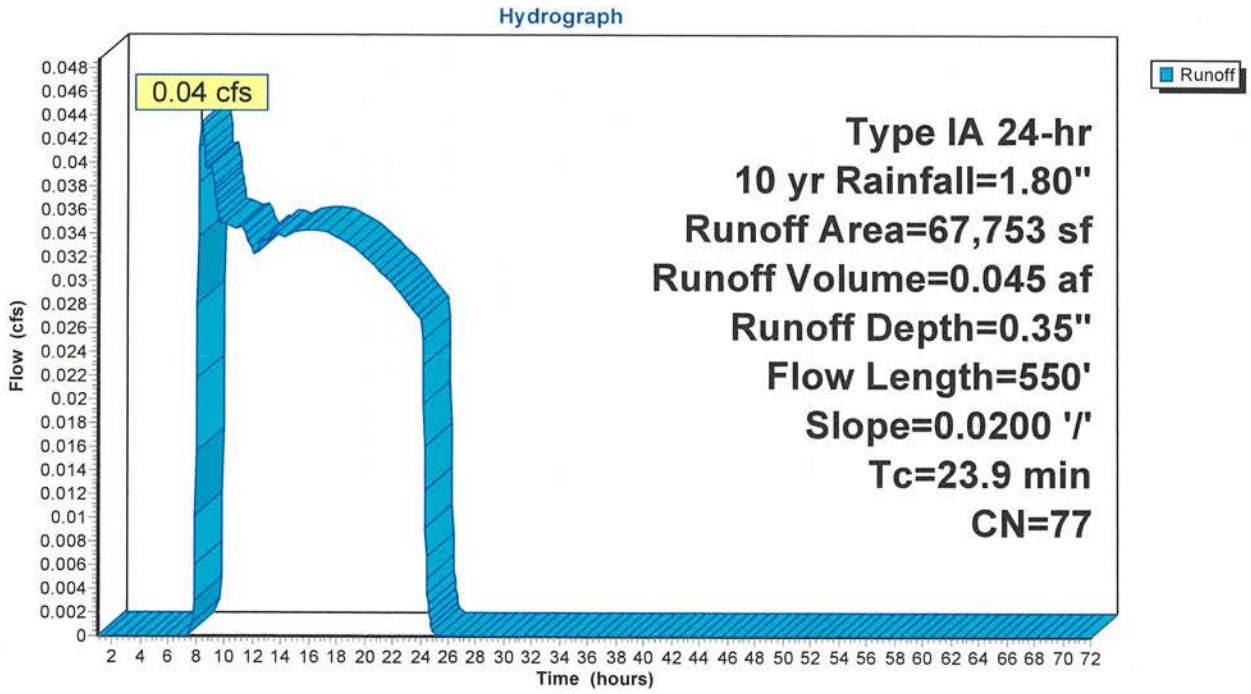
Runoff = 0.04 cfs @ 8.37 hrs, Volume= 0.045 af, Depth= 0.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 yr Rainfall=1.80"

Area (sf)	CN	Description
67,753	77	2 acre lots, 12% imp, HSG C
59,623		88.00% Pervious Area
8,130		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	100	0.0200	0.10		**Sheet Flow, Sheet Flow** Fallow n= 0.050 P2= 0.20"
7.6	450	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentraed Flow** Short Grass Pasture Kv= 7.0 fps
23.9	550	Total			

Subcatchment 1S: Pre



Summary for Subcatchment 2S: Post A

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

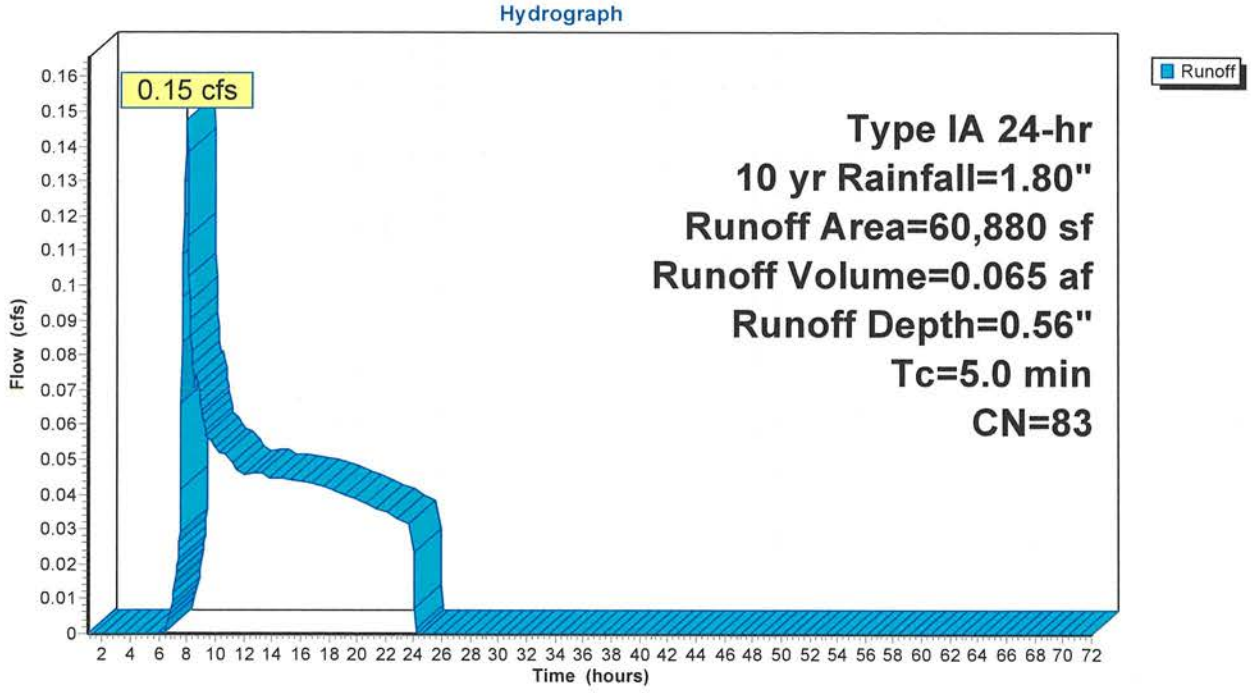
Runoff = 0.15 cfs @ 7.99 hrs, Volume= 0.065 af, Depth= 0.56"
Routed to Pond 4P : COMBINED POND A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 yr Rainfall=1.80"

Area (sf)	CN	Description
60,880	83	1/4 acre lots, 38% imp, HSG C
37,746		62.00% Pervious Area
23,134		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Direct Entry 5 min**

Subcatchment 2S: Post A



Summary for Subcatchment 4S: Post B

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

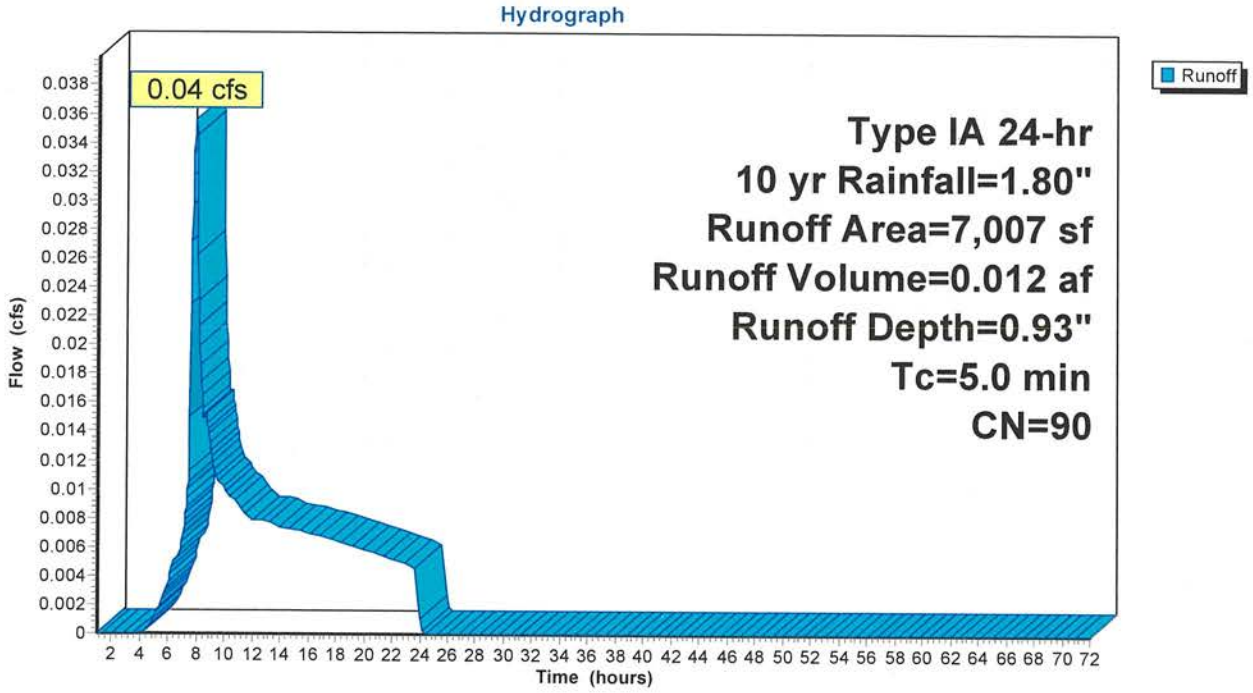
Runoff = 0.04 cfs @ 7.96 hrs, Volume= 0.012 af, Depth= 0.93"
Routed to Pond 5P : SWALE B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 10 yr Rainfall=1.80"

Area (sf)	CN	Description
2,457	74	>75% Grass cover, Good, HSG C
4,550	98	Paved roads w/curbs & sewers, HSG C
7,007	90	Weighted Average
2,457		35.06% Pervious Area
4,550		64.94% Impervious Area

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

Subcatchment 4S: Post B



Summary for Pond 4P: COMBINED POND A

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

Inflow Area = 1.398 ac, 38.00% Impervious, Inflow Depth = 0.56" for 10 yr event
Inflow = 0.15 cfs @ 7.99 hrs, Volume= 0.065 af
Outflow = 0.01 cfs @ 24.08 hrs, Volume= 0.051 af, Atten= 90%, Lag= 965.5 min
Primary = 0.01 cfs @ 24.08 hrs, Volume= 0.051 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 99.81' @ 24.08 hrs Surf.Area= 2,051 sf Storage= 2,249 cf

Plug-Flow detention time= 1,435.3 min calculated for 0.051 af (78% of inflow)
Center-of-Mass det. time= 1,313.3 min (2,180.9 - 867.6)

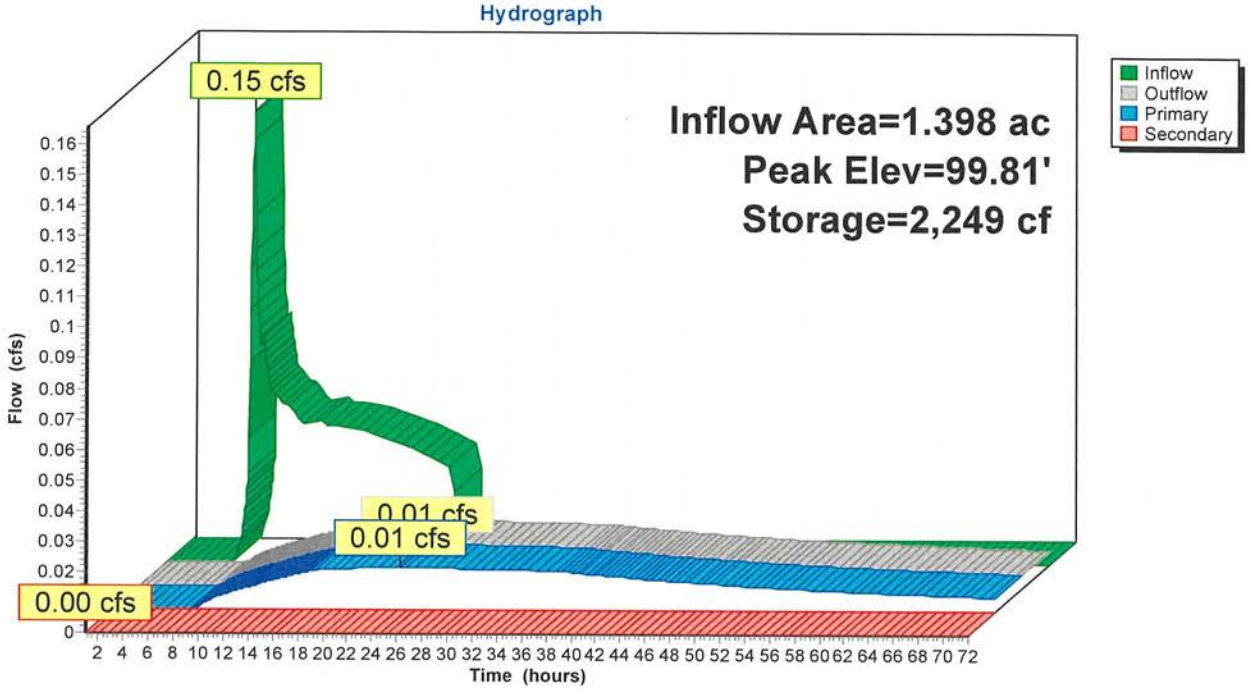
Volume	Invert	Avail.Storage	Storage Description
#1	98.50'	3,795 cf	**37.42'W x 37.42'L x 2.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	98.50'	**0.280 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00' Phase-In= 1.00'
#2	Secondary	100.50'	**3.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.01 cfs @ 24.08 hrs HW=99.81' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.01 cfs)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=98.50' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: COMBINED POND A



Summary for Pond 5P: SWALE B

Inflow Area = 0.161 ac, 64.94% Impervious, Inflow Depth = 0.93" for 10 yr event
Inflow = 0.04 cfs @ 7.96 hrs, Volume= 0.012 af
Outflow = 0.01 cfs @ 21.71 hrs, Volume= 0.009 af, Atten= 85%, Lag= 825.0 min
Primary = 0.00 cfs @ 21.71 hrs, Volume= 0.009 af
Secondary = 0.00 cfs @ 21.71 hrs, Volume= 0.001 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 100.50' @ 21.71 hrs Surf.Area= 842 sf Storage= 396 cf

Plug-Flow detention time= 1,414.7 min calculated for 0.009 af (76% of inflow)
Center-of-Mass det. time= 1,274.3 min (2,069.8 - 795.5)

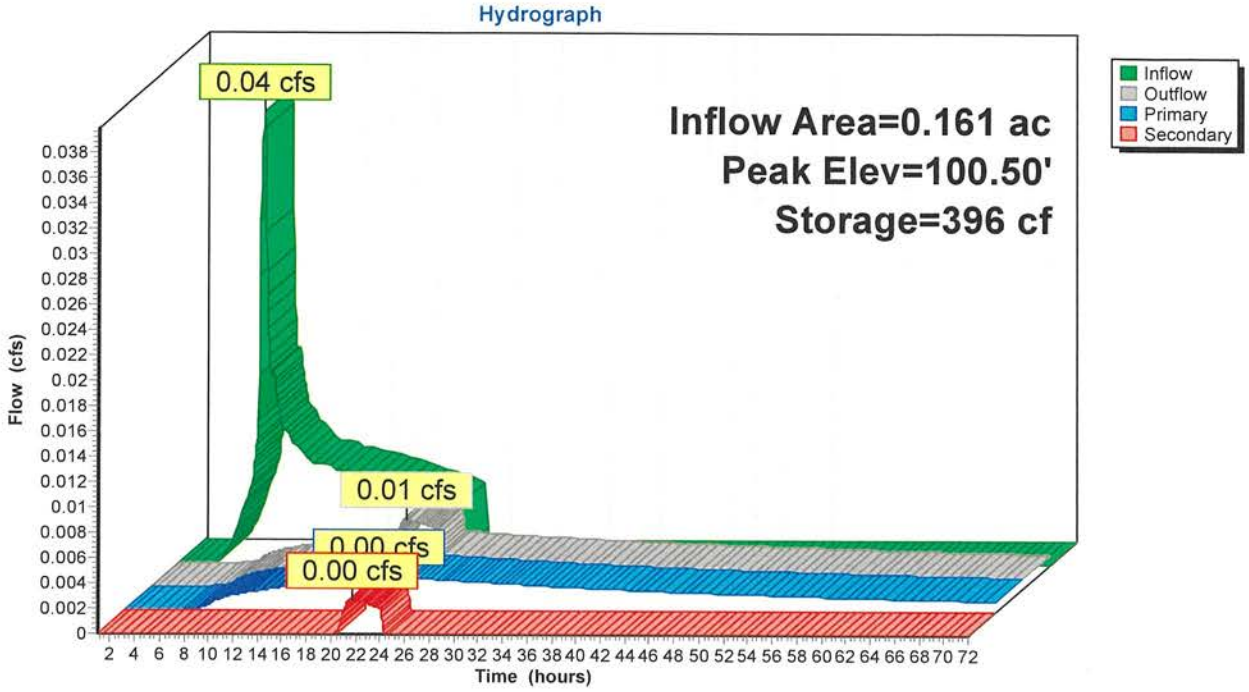
Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	655 cf	**27.00'W x 27.00'L x 0.80'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	**0.260 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00' Phase-In= 1.00'
#2	Secondary	100.50'	**3.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.00 cfs @ 21.71 hrs HW=100.50' (Free Discharge)
└**1=Exfiltration** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 21.71 hrs HW=100.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.00 cfs @ 0.18 fps)

Pond 5P: SWALE B



Time span=1.00-72.00 hrs, dt=0.05 hrs, 1421 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Pre Runoff Area=67,753 sf 12.00% Impervious Runoff Depth=0.45"
Flow Length=550' Slope=0.0200 '/' Tc=23.9 min CN=77 Runoff=0.07 cfs 0.058 af

Subcatchment2S: Post A Runoff Area=60,880 sf 38.00% Impervious Runoff Depth=0.70"
Tc=5.0 min CN=83 Runoff=0.20 cfs 0.081 af

Subcatchment4S: Post B Runoff Area=7,007 sf 64.94% Impervious Runoff Depth=1.09"
Tc=5.0 min CN=90 Runoff=0.04 cfs 0.015 af

Pond 4P: COMBINED POND A Peak Elev=100.08' Storage=2,827 cf Inflow=0.20 cfs 0.081 af
Primary=0.02 cfs 0.061 af Secondary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.061 af

Pond 5P: SWALE B Peak Elev=100.51' Storage=398 cf Inflow=0.04 cfs 0.015 af
Primary=0.00 cfs 0.009 af Secondary=0.01 cfs 0.003 af Outflow=0.01 cfs 0.012 af

Total Runoff Area = 3.114 ac Runoff Volume = 0.154 af Average Runoff Depth = 0.59"
73.60% Pervious = 2.292 ac 26.40% Impervious = 0.822 ac

Summary for Subcatchment 1S: Pre

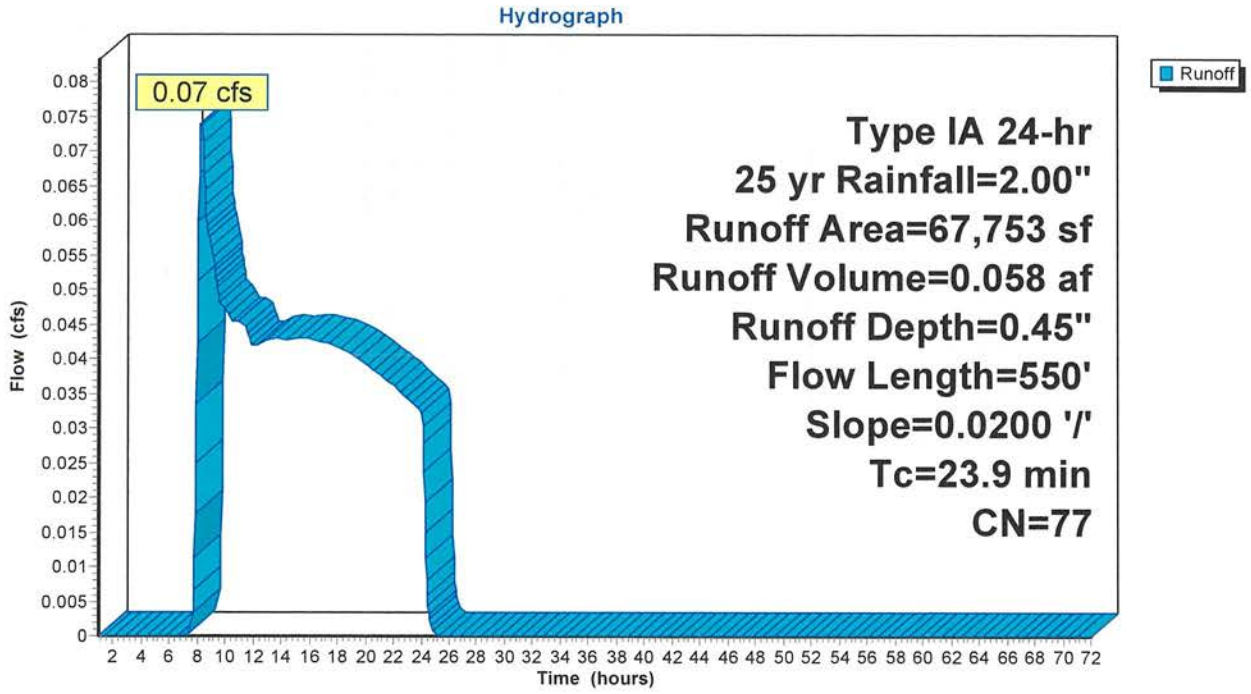
Runoff = 0.07 cfs @ 8.29 hrs, Volume= 0.058 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25 yr Rainfall=2.00"

Area (sf)	CN	Description
67,753	77	2 acre lots, 12% imp, HSG C
59,623		88.00% Pervious Area
8,130		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	100	0.0200	0.10		**Sheet Flow, Sheet Flow** Fallow n= 0.050 P2= 0.20"
7.6	450	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentraed Flow** Short Grass Pasture Kv= 7.0 fps
23.9	550	Total			

Subcatchment 1S: Pre



Summary for Subcatchment 2S: Post A

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

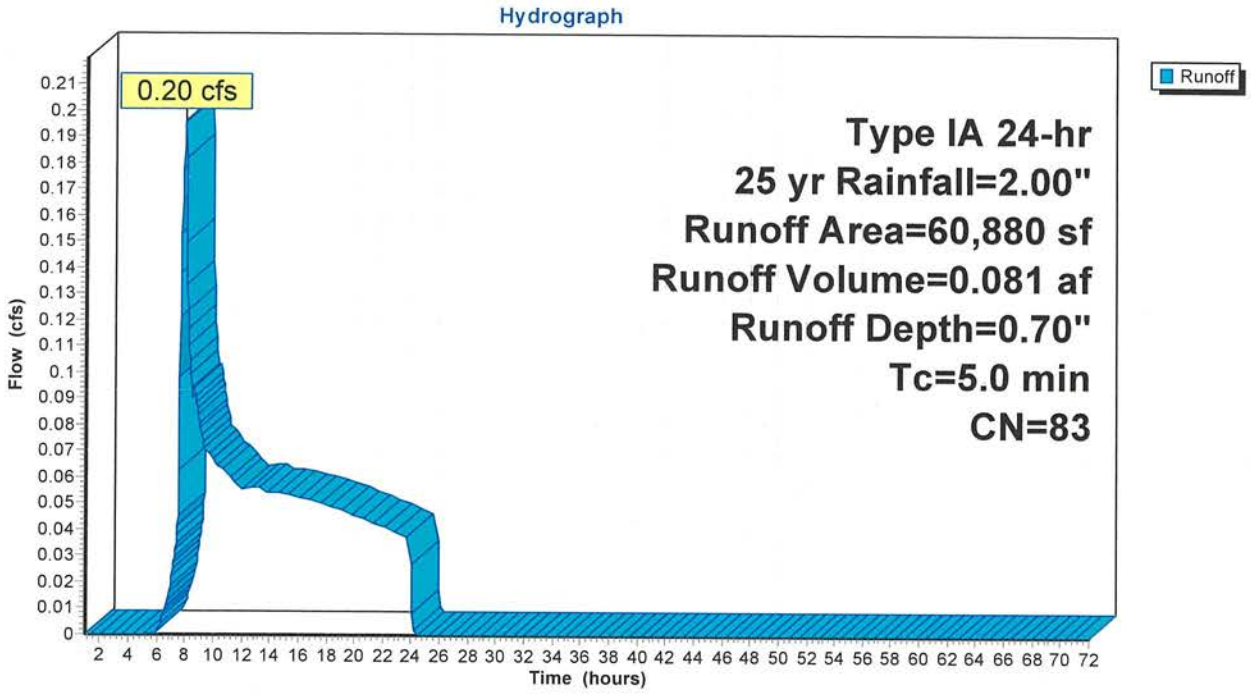
Runoff = 0.20 cfs @ 7.98 hrs, Volume= 0.081 af, Depth= 0.70"
Routed to Pond 4P : COMBINED POND A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25 yr Rainfall=2.00"

Area (sf)	CN	Description
60,880	83	1/4 acre lots, 38% imp, HSG C
37,746		62.00% Pervious Area
23,134		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Direct Entry 5 min**

Subcatchment 2S: Post A



Summary for Subcatchment 4S: Post B

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

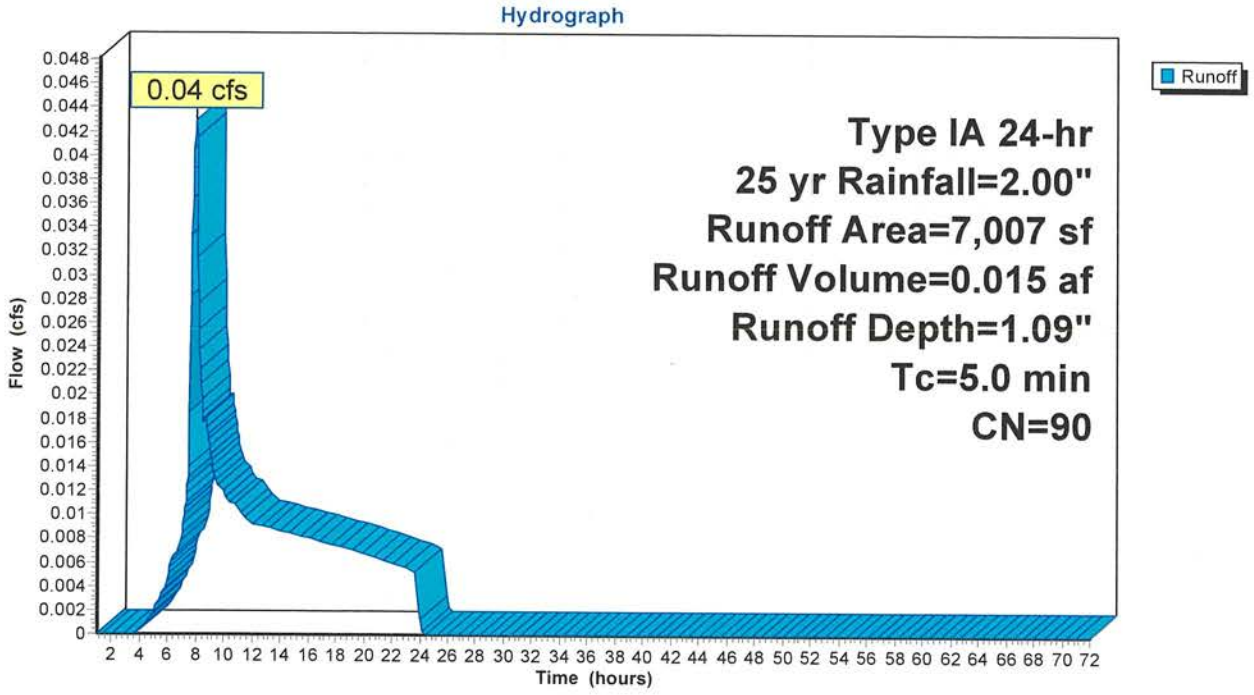
Runoff = 0.04 cfs @ 7.95 hrs, Volume= 0.015 af, Depth= 1.09"
Routed to Pond 5P : SWALE B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 25 yr Rainfall=2.00"

Area (sf)	CN	Description
2,457	74	>75% Grass cover, Good, HSG C
4,550	98	Paved roads w/curbs & sewers, HSG C
7,007	90	Weighted Average
2,457		35.06% Pervious Area
4,550		64.94% Impervious Area

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

Subcatchment 4S: Post B



Summary for Pond 4P: COMBINED POND A

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

Inflow Area = 1.398 ac, 38.00% Impervious, Inflow Depth = 0.70" for 25 yr event
Inflow = 0.20 cfs @ 7.98 hrs, Volume= 0.081 af
Outflow = 0.02 cfs @ 24.09 hrs, Volume= 0.061 af, Atten= 92%, Lag= 966.1 min
Primary = 0.02 cfs @ 24.09 hrs, Volume= 0.061 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 100.08' @ 24.09 hrs Surf.Area= 2,201 sf Storage= 2,827 cf

Plug-Flow detention time= 1,527.8 min calculated for 0.061 af (76% of inflow)
Center-of-Mass det. time= 1,396.4 min (2,249.4 - 853.0)

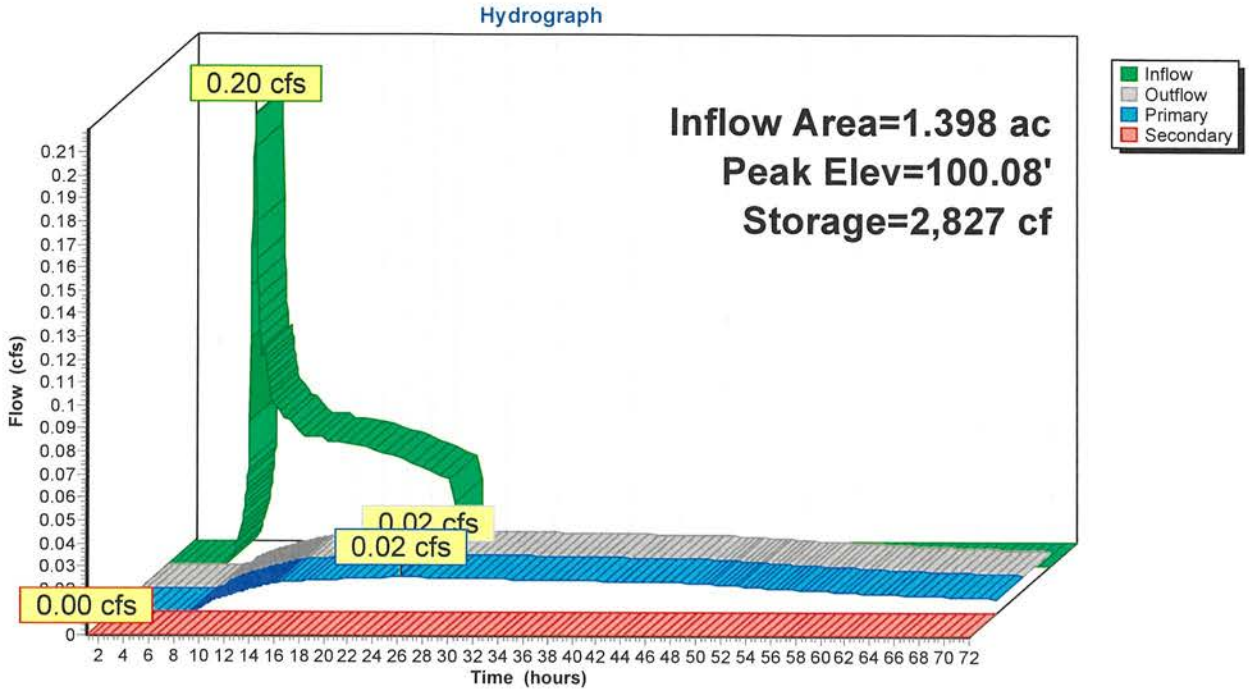
Volume	Invert	Avail.Storage	Storage Description
#1	98.50'	3,795 cf	**37.42'W x 37.42'L x 2.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	98.50'	**0.280 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00' Phase-In= 1.00'
#2	Secondary	100.50'	**3.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.02 cfs @ 24.09 hrs HW=100.08' (Free Discharge)
└**1=Exfiltration** (Controls 0.02 cfs)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=98.50' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond 4P: COMBINED POND A



Summary for Pond 5P: SWALE B

Inflow Area = 0.161 ac, 64.94% Impervious, Inflow Depth = 1.09" for 25 yr event
Inflow = 0.04 cfs @ 7.95 hrs, Volume= 0.015 af
Outflow = 0.01 cfs @ 17.25 hrs, Volume= 0.012 af, Atten= 82%, Lag= 558.0 min
Primary = 0.00 cfs @ 17.25 hrs, Volume= 0.009 af
Secondary = 0.01 cfs @ 17.25 hrs, Volume= 0.003 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 100.51' @ 17.25 hrs Surf.Area= 843 sf Storage= 398 cf

Plug-Flow detention time= 1,219.1 min calculated for 0.012 af (79% of inflow)
Center-of-Mass det. time= 1,096.2 min (1,881.6 - 785.4)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	655 cf	**27.00'W x 27.00'L x 0.80'H Prismatoid Z=2.0**

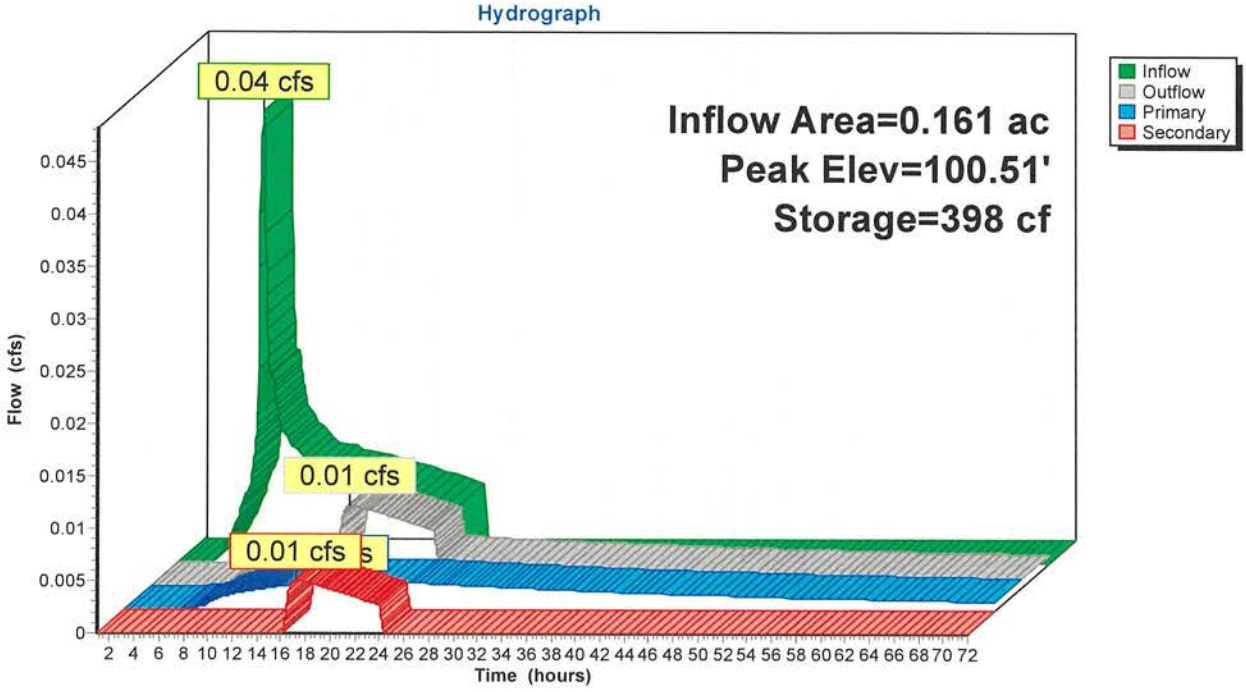
Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	**0.260 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00' Phase-In= 1.00'
#2	Secondary	100.50'	**3.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.00 cfs @ 17.25 hrs HW=100.51' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 17.25 hrs HW=100.51' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.00 cfs @ 0.22 fps)

Pond 5P: SWALE B

Hydrograph



Time span=1.00-72.00 hrs, dt=0.05 hrs, 1421 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Pre Runoff Area=67,753 sf 12.00% Impervious Runoff Depth=0.56"
Flow Length=550' Slope=0.0200 '/' Tc=23.9 min CN=77 Runoff=0.11 cfs 0.073 af

Subcatchment2S: Post A Runoff Area=60,880 sf 38.00% Impervious Runoff Depth=0.84"
Tc=5.0 min CN=83 Runoff=0.25 cfs 0.097 af

Subcatchment4S: Post B Runoff Area=7,007 sf 64.94% Impervious Runoff Depth=1.27"
Tc=5.0 min CN=90 Runoff=0.05 cfs 0.017 af

Pond 4P: COMBINED POND A Peak Elev=100.36' Storage=3,453 cf Inflow=0.25 cfs 0.097 af
Primary=0.02 cfs 0.071 af Secondary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.071 af

Pond 5P: SWALE B Peak Elev=100.51' Storage=399 cf Inflow=0.05 cfs 0.017 af
Primary=0.00 cfs 0.009 af Secondary=0.01 cfs 0.005 af Outflow=0.01 cfs 0.014 af

Total Runoff Area = 3.114 ac Runoff Volume = 0.187 af Average Runoff Depth = 0.72"
73.60% Pervious = 2.292 ac 26.40% Impervious = 0.822 ac

Summary for Subcatchment 1S: Pre

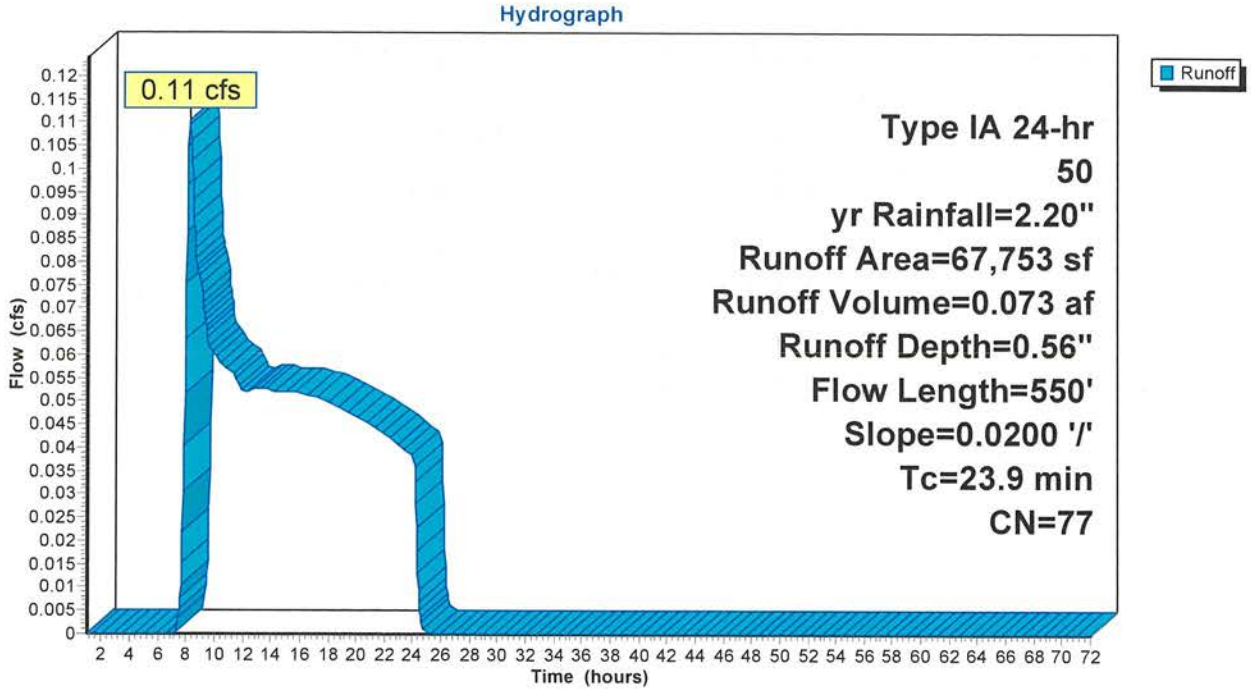
Runoff = 0.11 cfs @ 8.25 hrs, Volume= 0.073 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 50 yr Rainfall=2.20"

Area (sf)	CN	Description
67,753	77	2 acre lots, 12% imp, HSG C
59,623		88.00% Pervious Area
8,130		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	100	0.0200	0.10		**Sheet Flow, Sheet Flow** Fallow n= 0.050 P2= 0.20"
7.6	450	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentraed Flow** Short Grass Pasture Kv= 7.0 fps
23.9	550	Total			

Subcatchment 1S: Pre



Summary for Subcatchment 2S: Post A

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

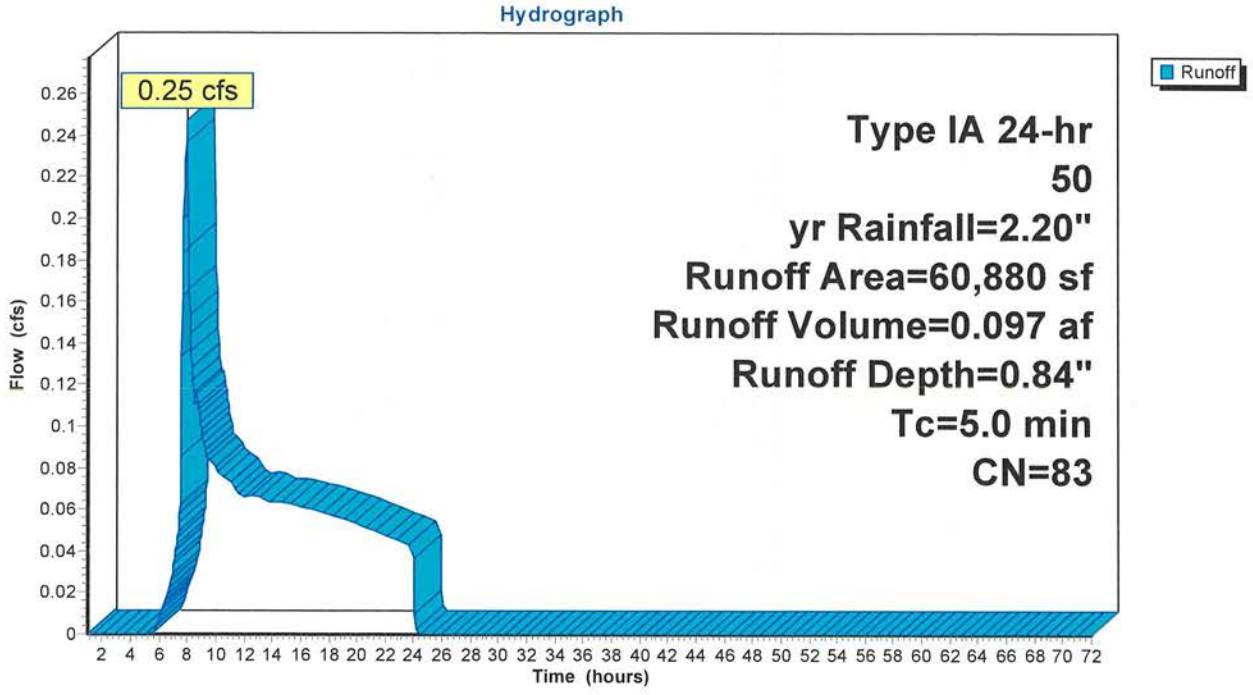
Runoff = 0.25 cfs @ 7.98 hrs, Volume= 0.097 af, Depth= 0.84"
Routed to Pond 4P : COMBINED POND A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 50 yr Rainfall=2.20"

Area (sf)	CN	Description
60,880	83	1/4 acre lots, 38% imp, HSG C
37,746		62.00% Pervious Area
23,134		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Direct Entry 5 min**

Subcatchment 2S: Post A



Summary for Subcatchment 4S: Post B

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

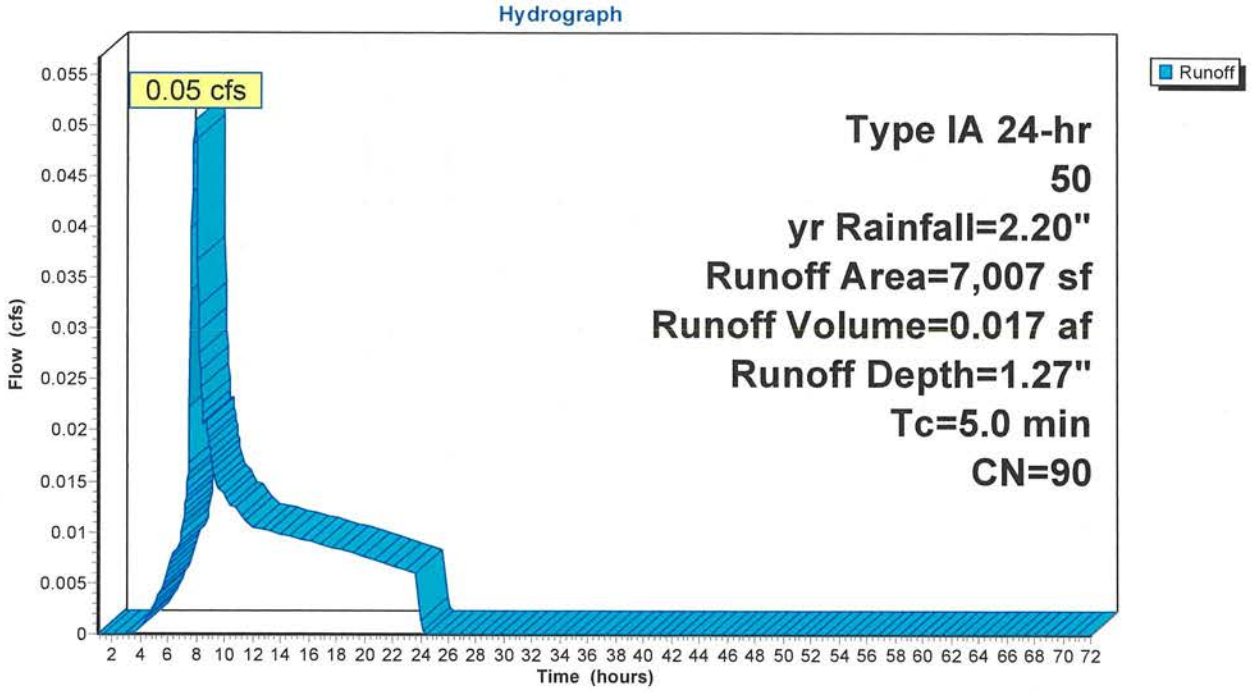
Runoff = 0.05 cfs @ 7.94 hrs, Volume= 0.017 af, Depth= 1.27"
Routed to Pond 5P : SWALE B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 50 yr Rainfall=2.20"

Area (sf)	CN	Description
2,457	74	>75% Grass cover, Good, HSG C
4,550	98	Paved roads w/curbs & sewers, HSG C
7,007	90	Weighted Average
2,457		35.06% Pervious Area
4,550		64.94% Impervious Area

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

Subcatchment 4S: Post B



Summary for Pond 4P: COMBINED POND A

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

Inflow Area = 1.398 ac, 38.00% Impervious, Inflow Depth = 0.84" for 50 yr event
Inflow = 0.25 cfs @ 7.98 hrs, Volume= 0.097 af
Outflow = 0.02 cfs @ 24.09 hrs, Volume= 0.071 af, Atten= 93%, Lag= 966.5 min
Primary = 0.02 cfs @ 24.09 hrs, Volume= 0.071 af
Secondary = 0.00 cfs @ 1.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 100.36' @ 24.09 hrs Surf.Area= 2,359 sf Storage= 3,453 cf

Plug-Flow detention time= 1,623.8 min calculated for 0.071 af (73% of inflow)
Center-of-Mass det. time= 1,475.3 min (2,316.1 - 840.8)

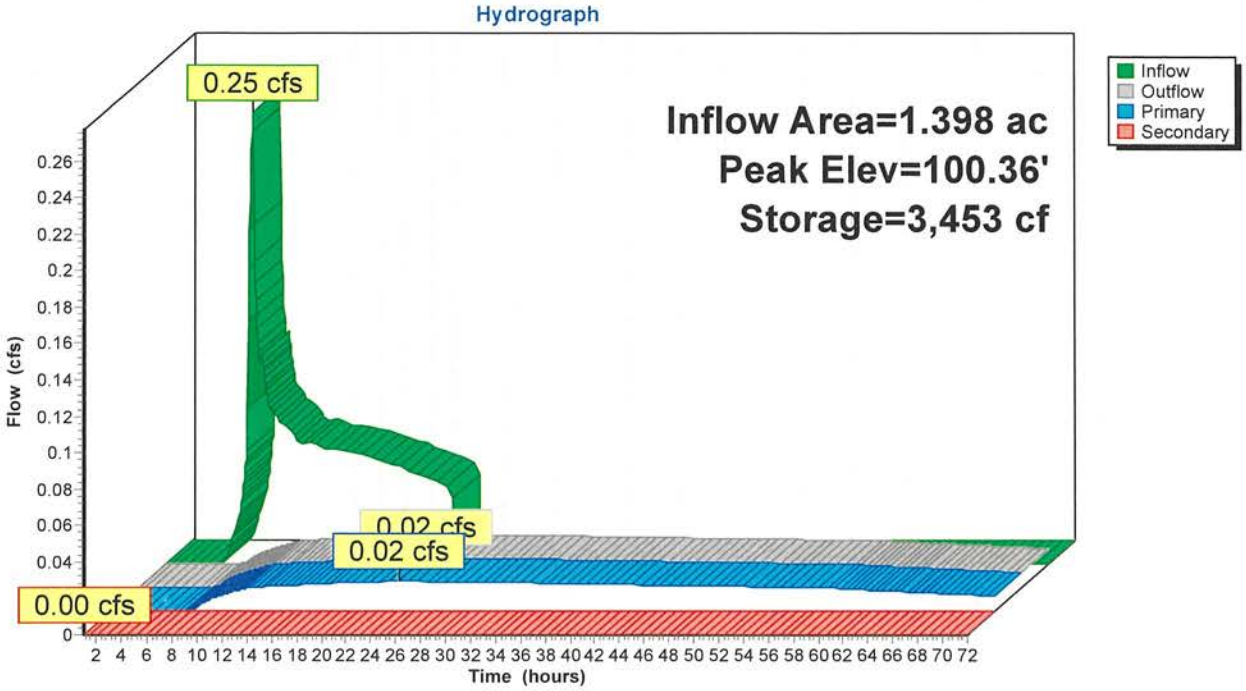
Volume	Invert	Avail.Storage	Storage Description
#1	98.50'	3,795 cf	**37.42'W x 37.42'L x 2.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	98.50'	**0.280 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00' Phase-In= 1.00'
#2	Secondary	100.50'	**3.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.02 cfs @ 24.09 hrs HW=100.36' (Free Discharge)
1=Exfiltration (Controls 0.02 cfs)

Secondary OutFlow Max=0.00 cfs @ 1.00 hrs HW=98.50' (Free Discharge)
2=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Pond 4P: COMBINED POND A



Summary for Pond 5P: SWALE B

Inflow Area = 0.161 ac, 64.94% Impervious, Inflow Depth = 1.27" for 50 yr event
Inflow = 0.05 cfs @ 7.94 hrs, Volume= 0.017 af
Outflow = 0.01 cfs @ 14.61 hrs, Volume= 0.014 af, Atten= 81%, Lag= 400.0 min
Primary = 0.00 cfs @ 14.61 hrs, Volume= 0.009 af
Secondary = 0.01 cfs @ 14.61 hrs, Volume= 0.005 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 100.51' @ 14.61 hrs Surf.Area= 843 sf Storage= 399 cf

Plug-Flow detention time= 1,059.2 min calculated for 0.014 af (82% of inflow)
Center-of-Mass det. time= 952.2 min (1,728.9 - 776.8)

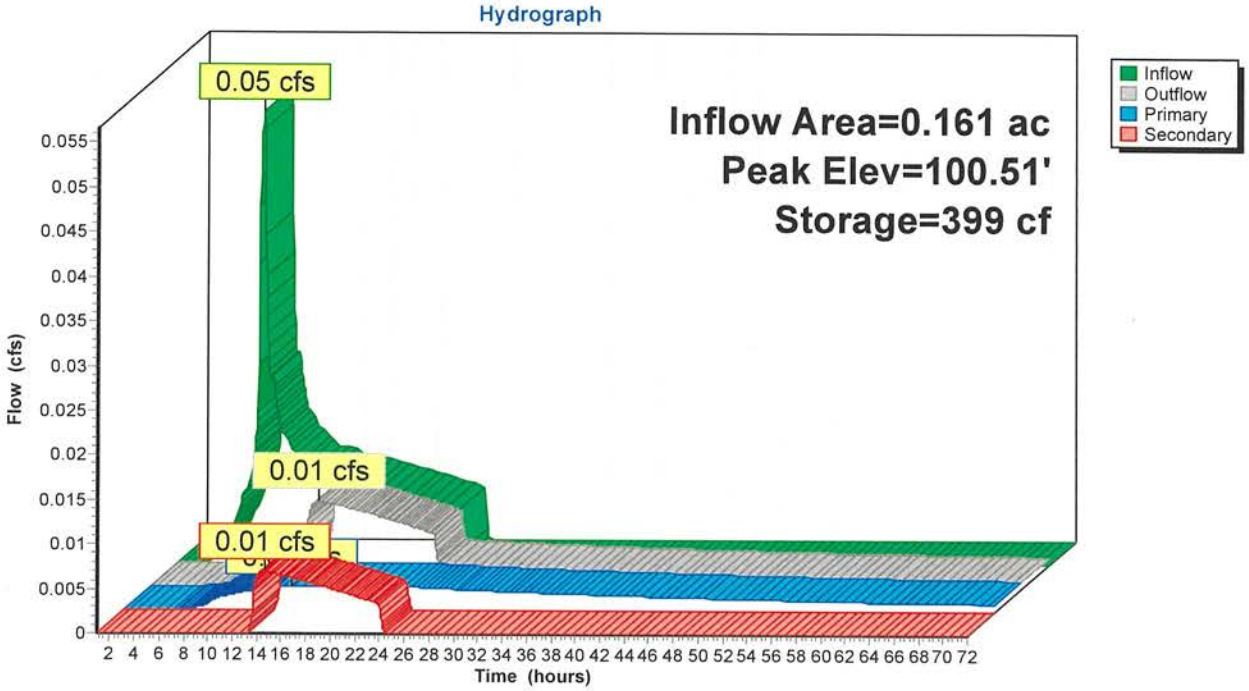
Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	655 cf	**27.00'W x 27.00'L x 0.80'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	**0.260 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00' Phase-In= 1.00'
#2	Secondary	100.50'	**3.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.00 cfs @ 14.61 hrs HW=100.51' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Secondary OutFlow Max=0.01 cfs @ 14.61 hrs HW=100.51' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.25 fps)

Pond 5P: SWALE B



Time span=1.00-72.00 hrs, dt=0.05 hrs, 1421 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment1S: Pre Runoff Area=67,753 sf 12.00% Impervious Runoff Depth=0.68"
Flow Length=550' Slope=0.0200 '/' Tc=23.9 min CN=77 Runoff=0.15 cfs 0.088 af

Subcatchment2S: Post A Runoff Area=60,880 sf 38.00% Impervious Runoff Depth=0.98"
Tc=5.0 min CN=83 Runoff=0.30 cfs 0.114 af

Subcatchment4S: Post B Runoff Area=7,007 sf 64.94% Impervious Runoff Depth=1.44"
Tc=5.0 min CN=90 Runoff=0.06 cfs 0.019 af

Pond 4P: COMBINED POND A Peak Elev=100.53' Storage=3,795 cf Inflow=0.30 cfs 0.114 af
Primary=0.02 cfs 0.076 af Secondary=0.05 cfs 0.007 af Outflow=0.07 cfs 0.084 af

Pond 5P: SWALE B Peak Elev=100.51' Storage=401 cf Inflow=0.06 cfs 0.019 af
Primary=0.00 cfs 0.009 af Secondary=0.01 cfs 0.007 af Outflow=0.01 cfs 0.016 af

Total Runoff Area = 3.114 ac Runoff Volume = 0.222 af Average Runoff Depth = 0.85"
73.60% Pervious = 2.292 ac 26.40% Impervious = 0.822 ac

Summary for Subcatchment 1S: Pre

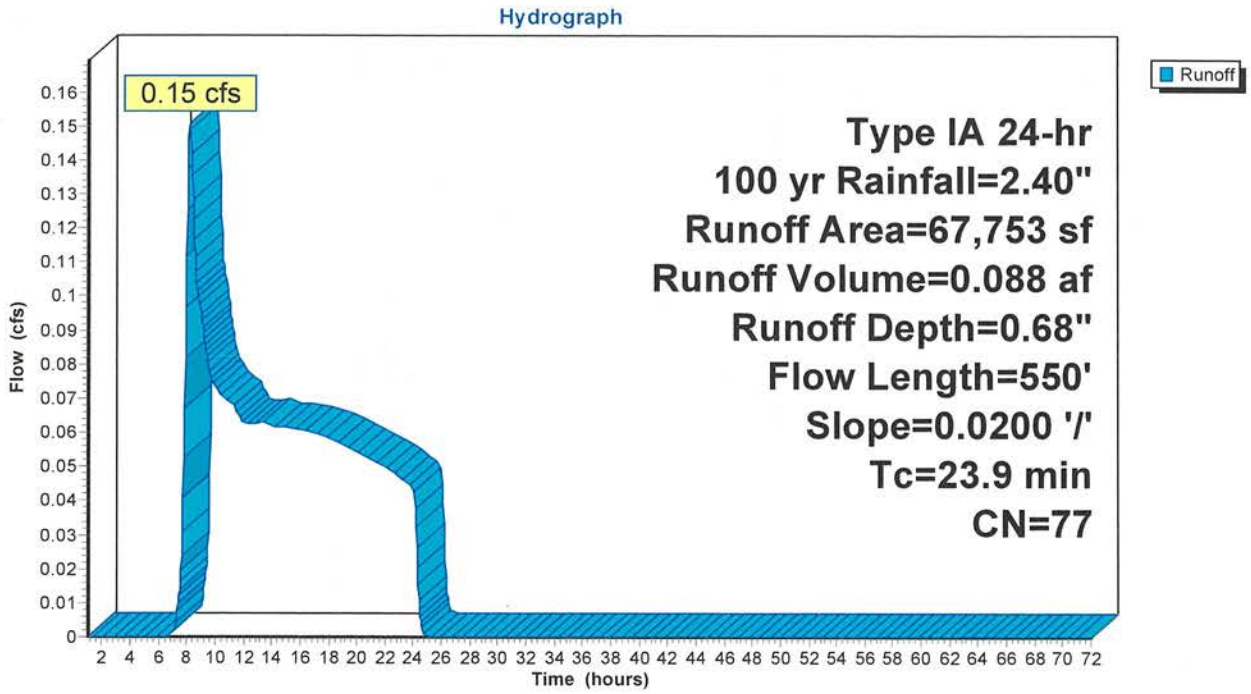
Runoff = 0.15 cfs @ 8.23 hrs, Volume= 0.088 af, Depth= 0.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 yr Rainfall=2.40"

Area (sf)	CN	Description
67,753	77	2 acre lots, 12% imp, HSG C
59,623		88.00% Pervious Area
8,130		12.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.3	100	0.0200	0.10		**Sheet Flow, Sheet Flow** Fallow n= 0.050 P2= 0.20"
7.6	450	0.0200	0.99		**Shallow Concentrated Flow, Shallow Concentraed Flow** Short Grass Pasture Kv= 7.0 fps
23.9	550	Total			

Subcatchment 1S: Pre



Summary for Subcatchment 2S: Post A

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

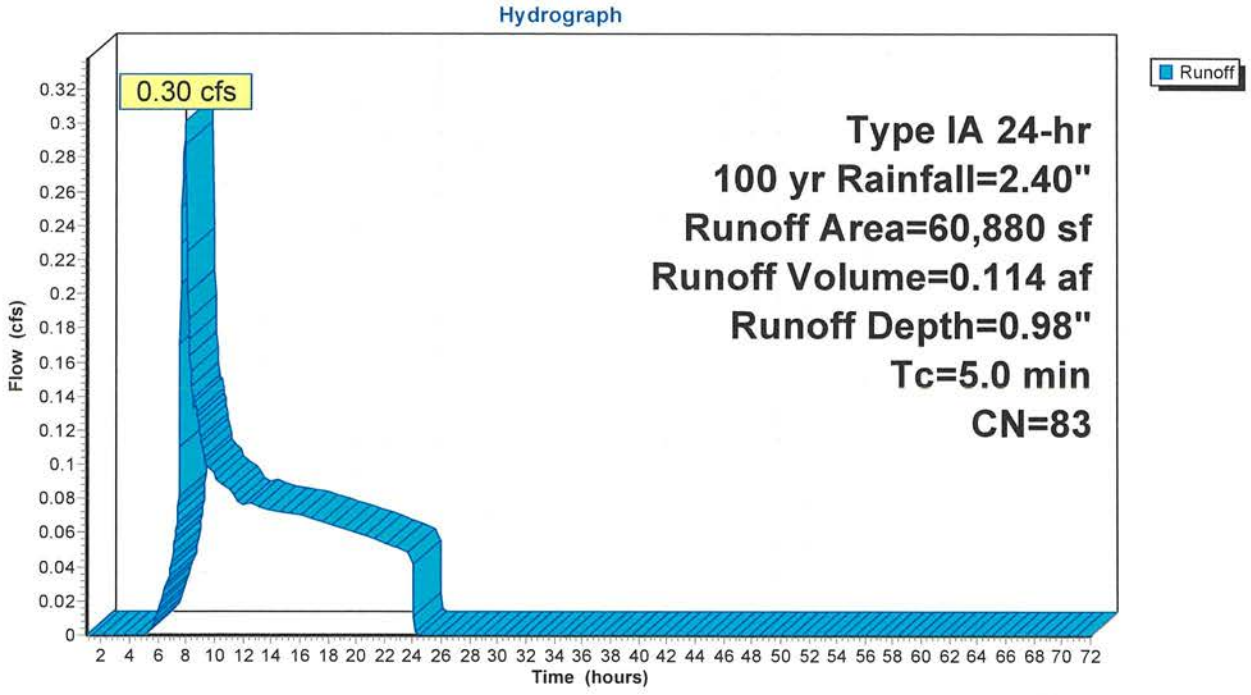
Runoff = 0.30 cfs @ 7.98 hrs, Volume= 0.114 af, Depth= 0.98"
Routed to Pond 4P : COMBINED POND A

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 yr Rainfall=2.40"

Area (sf)	CN	Description
60,880	83	1/4 acre lots, 38% imp, HSG C
37,746		62.00% Pervious Area
23,134		38.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.0					**Direct Entry, Direct Entry 5 min**

Subcatchment 2S: Post A



Summary for Subcatchment 4S: Post B

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

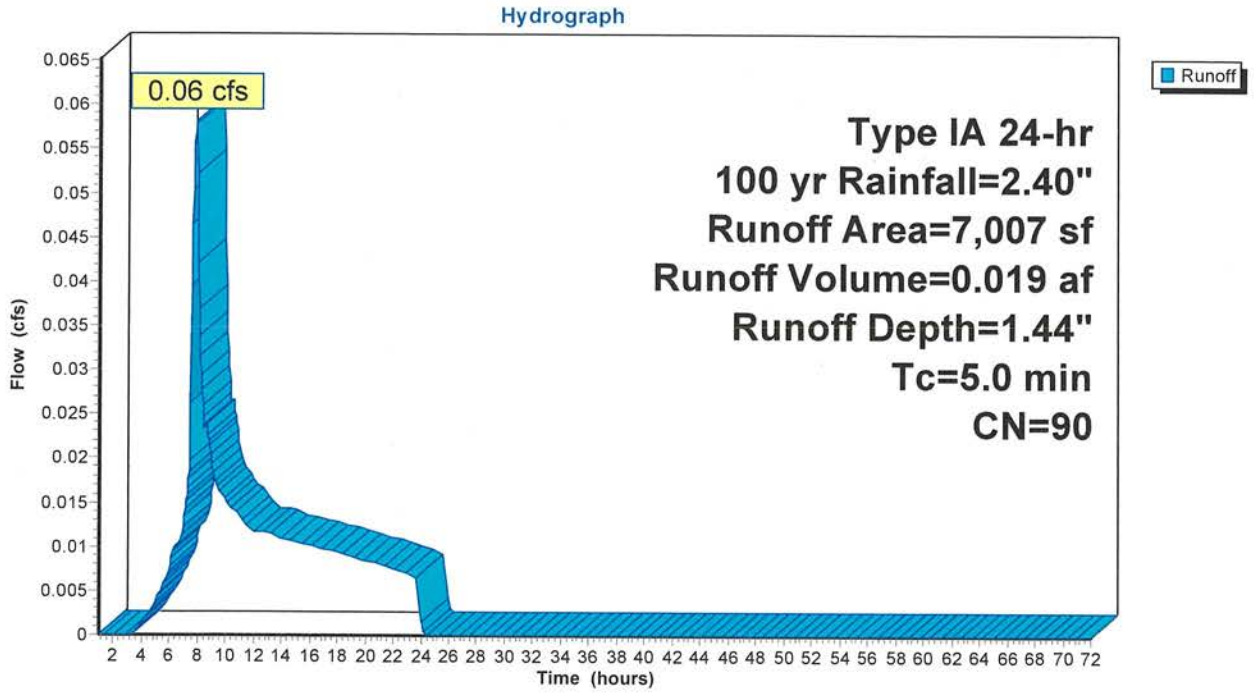
Runoff = 0.06 cfs @ 7.93 hrs, Volume= 0.019 af, Depth= 1.44"
Routed to Pond 5P : SWALE B

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Type IA 24-hr 100 yr Rainfall=2.40"

Area (sf)	CN	Description
2,457	74	>75% Grass cover, Good, HSG C
4,550	98	Paved roads w/curbs & sewers, HSG C
7,007	90	Weighted Average
2,457		35.06% Pervious Area
4,550		64.94% Impervious Area

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

Subcatchment 4S: Post B



Summary for Pond 4P: COMBINED POND A

[92] Warning: Device #2 is above defined storage
[93] Warning: Storage range exceeded by 0.03'
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=18)

Inflow Area =	1.398 ac,	38.00% Impervious,	Inflow Depth =	0.98" for 100 yr event
Inflow =	0.30 cfs @	7.98 hrs,	Volume=	0.114 af
Outflow =	0.07 cfs @	21.50 hrs,	Volume=	0.084 af, Atten= 78%, Lag= 811.3 min
Primary =	0.02 cfs @	21.50 hrs,	Volume=	0.076 af
Secondary =	0.05 cfs @	21.50 hrs,	Volume=	0.007 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 100.53' @ 21.50 hrs Surf.Area= 2,442 sf Storage= 3,795 cf

Plug-Flow detention time= 1,557.8 min calculated for 0.084 af (73% of inflow)
Center-of-Mass det. time= 1,410.0 min (2,240.2 - 830.3)

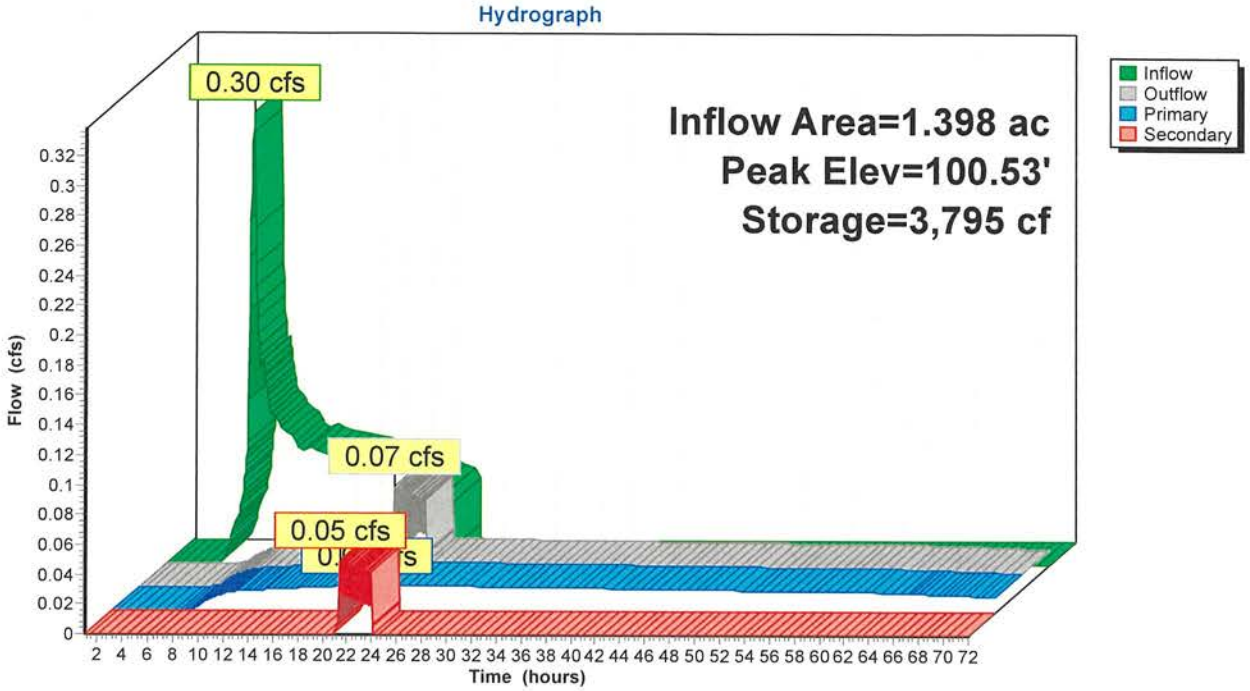
Volume	Invert	Avail.Storage	Storage Description
#1	98.50'	3,795 cf	**37.42'W x 37.42'L x 2.00'H Prismatoid Z=3.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	98.50'	**0.280 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00' Phase-In= 1.00'
#2	Secondary	100.50'	**3.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.02 cfs @ 21.50 hrs HW=100.53' (Free Discharge)
└**1=Exfiltration** (Controls 0.02 cfs)

Secondary OutFlow Max=0.05 cfs @ 21.50 hrs HW=100.53' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.05 cfs @ 0.48 fps)

Pond 4P: COMBINED POND A



Summary for Pond 5P: SWALE B

Inflow Area = 0.161 ac, 64.94% Impervious, Inflow Depth = 1.44" for 100 yr event
Inflow = 0.06 cfs @ 7.93 hrs, Volume= 0.019 af
Outflow = 0.01 cfs @ 12.59 hrs, Volume= 0.016 af, Atten= 80%, Lag= 279.4 min
Primary = 0.00 cfs @ 12.59 hrs, Volume= 0.009 af
Secondary = 0.01 cfs @ 12.59 hrs, Volume= 0.007 af

Routing by Stor-Ind method, Time Span= 1.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 100.51' @ 12.59 hrs Surf.Area= 843 sf Storage= 401 cf

Plug-Flow detention time= 933.6 min calculated for 0.016 af (84% of inflow)
Center-of-Mass det. time= 836.6 min (1,605.8 - 769.2)

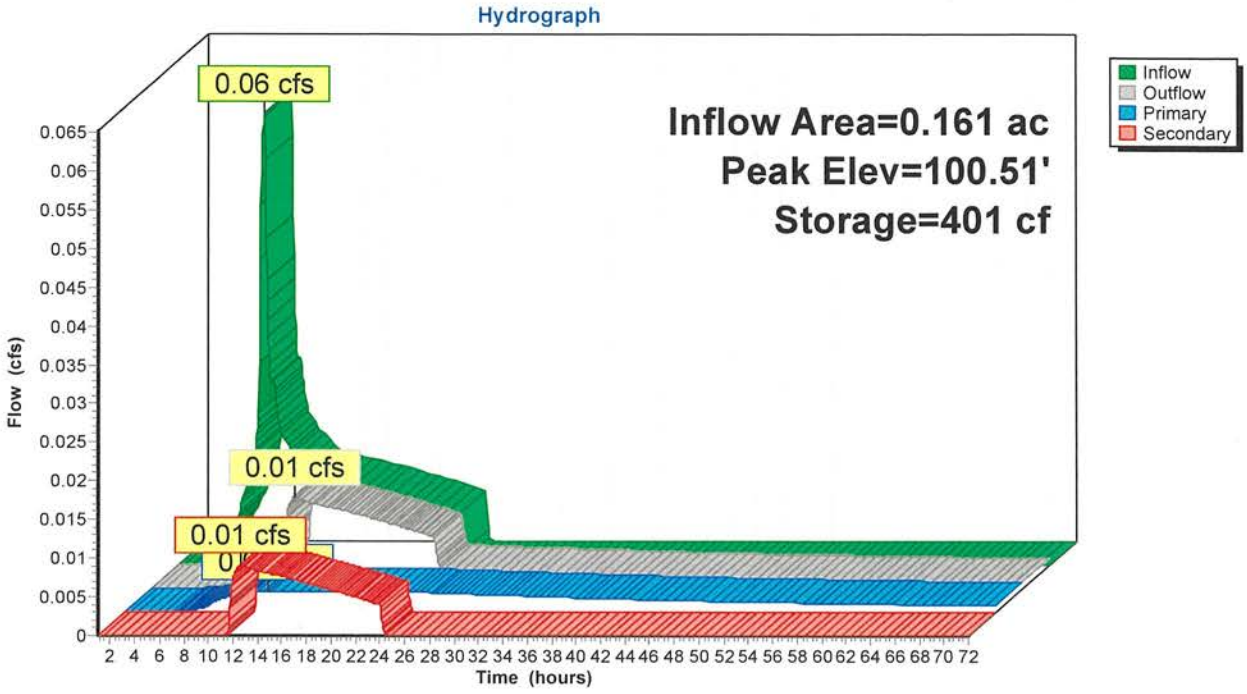
Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	655 cf	**27.00'W x 27.00'L x 0.80'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	100.00'	**0.260 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 80.00' Phase-In= 1.00'
#2	Secondary	100.50'	**3.0' long + 3.0 '/' SideZ x 1.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.00 cfs @ 12.59 hrs HW=100.51' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.00 cfs)

Secondary OutFlow Max=0.01 cfs @ 12.59 hrs HW=100.51' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.28 fps)

Pond 5P: SWALE 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 Spokane County, Washington

May 14, 2025

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require

alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination, write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, S.W., Washington, D.C. 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map

Map Scale: 1:625 if printed on A portrait (8.5" x 11") sheet.

Meters: 0 5 10 20 30

Feet: 0 30 60 120 180

N

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 11N 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 1:24,000.

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: Spokane County, Washington
Survey Area Data: Version 16, Aug 26, 2024

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

Date(s) aerial images were photographed: May 9, 2022—Aug 15, 2022

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
7140	Urban land-Uhlig, disturbed complex, 0 to 8 percent slopes	1.9	100.0%
Totals for Area of Interest		1.9	100.0%

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however,

onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Spokane County, Washington

7140—Urban land-Uhlig, disturbed complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2mfrn
Elevation: 2,350 to 2,400 feet
Mean annual precipitation: 18 to 20 inches
Mean annual air temperature: 46 to 52 degrees F
Frost-free period: 100 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 70 percent
Uhlig, disturbed, and similar soils: 20 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydric soil rating: No

Description of Uhlig, Disturbed

Setting

Landform: Outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loess mixed with minor amounts of volcanic ash over glaciofluvial deposits

Typical profile

Ap1 - 0 to 4 inches: ashy silt loam
Ap2 - 4 to 10 inches: ashy silt loam
A - 10 to 18 inches: ashy loam
Bt1 - 18 to 32 inches: loam
Bt2 - 32 to 42 inches: loam
C - 42 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 0 to 8 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 10.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C
Ecological site: F009XY002WA - Mesic Xeric Loamy Hills Ponderosa Pine Warm Dry Grass
Other vegetative classification: ponderosa pine/bluebunch wheatgrass (CN130)
Hydric soil rating: No

Minor Components

Seaboldt, warm, disturbed
Percent of map unit: 5 percent
Landform: Outwash plains on plateaus
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: ponderosa pine/Idaho fescue (CN140)
Hydric soil rating: No

Brincken, moist, disturbed
Percent of map unit: 3 percent
Landform: Outwash terraces on loess hills
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Other vegetative classification: ponderosa pine/Idaho fescue (CN140)
Hydric soil rating: No

Nez perce, disturbed
Percent of map unit: 2 percent
Landform: Plateaus
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Interfluve
Down-slope shape: Linear
Across-slope shape: Convex
Other vegetative classification: ponderosa pine/bluebunch wheatgrass (CN130)
Hydric soil rating: No

References

American Association of State Highway and Transportation Officials (AASHTO). 2004. Standard specifications for transportation materials and methods of sampling and testing. 24th edition.

American Society for Testing and Materials (ASTM). 2005. Standard classification of soils for engineering purposes. ASTM Standard D2487-00.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRoe. 1979. Classification of wetlands and deep-water habitats of the United States. U.S. Fish and Wildlife Service FWS/OBS-79/31.

Federal Register. July 13, 1994. Changes in hydric soils of the United States.

Federal Register. September 18, 2002. Hydric soils of the United States.

Hurt, G.W., and L.M. Vasilas, editors. Version 6.0, 2006. Field indicators of hydric soils in the United States.

National Research Council. 1995. Wetlands: Characteristics and boundaries.

Soil Survey Division Staff. 1993. Soil survey manual. Soil Conservation Service. U.S. Department of Agriculture Handbook 18. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_054262

Soil Survey Staff. 1999. Soil taxonomy: A basic system of soil classification for making and interpreting soil surveys. 2nd edition. Natural Resources Conservation Service, U.S. Department of Agriculture Handbook 436. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053577

Soil Survey Staff. 2010. Keys to soil taxonomy. 11th edition. U.S. Department of Agriculture, Natural Resources Conservation Service. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053580

Tiner, R.W., Jr. 1985. Wetlands of Delaware. U.S. Fish and Wildlife Service and Delaware Department of Natural Resources and Environmental Control, Wetlands Section.

United States Army Corps of Engineers, Environmental Laboratory. 1987. Corps of Engineers wetlands delineation manual. Waterways Experiment Station Technical Report Y-87-1.

United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/home/?cid=nrcs142p2_053374

United States Department of Agriculture, Natural Resources Conservation Service. National range and pasture handbook. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/landuse/rangepasture/?cid=stelprdb1043084

United States Department of Agriculture, Natural Resources Conservation Service. National soil survey handbook, title 430-VI. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/scientists/?cid=nrcs142p2_054242

United States Department of Agriculture, Natural Resources Conservation Service. 2006. Land resource regions and major land resource areas of the United States, the Caribbean, and the Pacific Basin. U.S. Department of Agriculture Handbook 296. http://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/soils/?cid=nrcs142p2_053624

United States Department of Agriculture, Soil Conservation Service. 1961. Land capability classification. U.S. Department of Agriculture Handbook 210. http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/nrcs142p2_052290.pdf