DRAINAGE REPORT

Murphy's Farm
Dracut, MA 01826
Map 22 / Lot 53 &
Map 39 / Block 53 / Lots 1-23

CIVIL DESIGN CONSULTANTS, INC

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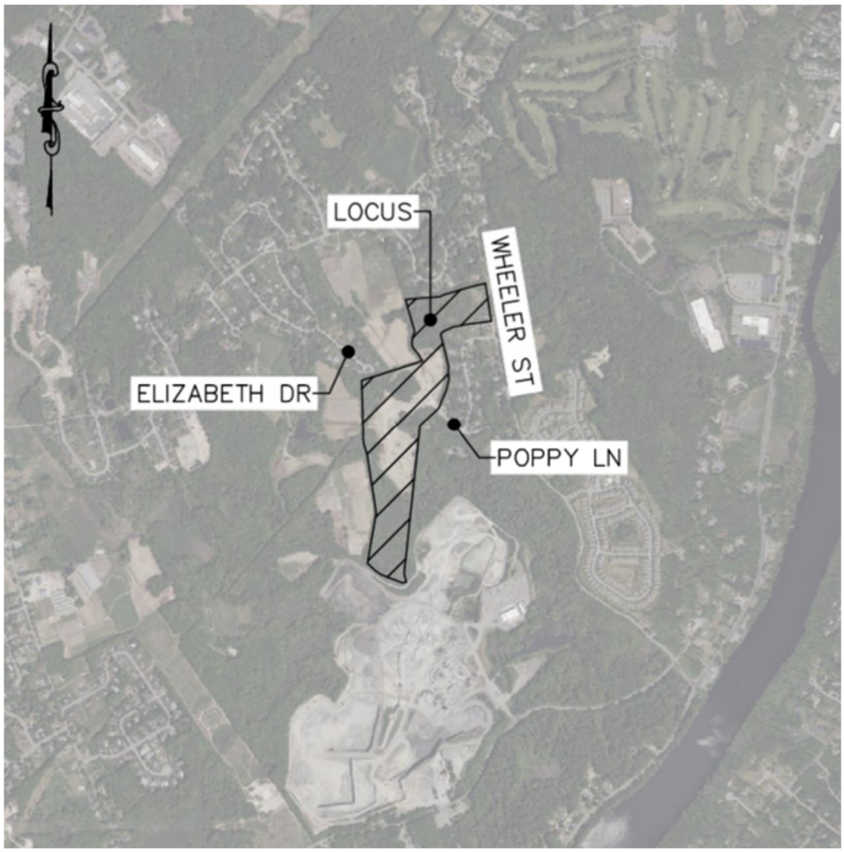


APPLICANT:

The Homes at Murphy's Farm, LLC
18 Cassimere Street
Andover, MA 01810

SUBMITTED TO:

Town of Dracut
11 Spring Park Ave.
Dracut, MA 01826

ISSUED:

April 22, 2024

REVISED:

March 28, 2025

CDCI FILE #: 23-10524

DRAINAGE REPORT

TAB 1

DRAINAGE REPORT

Murphy's Farm
Dracut, MA

PROJECT DESCRIPTION

The applicant proposes to develop Murphy's Farm (Map 22, Lot 53 & Map 39, Block 53, Lots 1-24) in Dracut, MA into a 40B development consisting of 63 Multi-Family Dwellings containing a total of 268 units, as well as two accessory buildings. The project consists of constructing ±4,400-FT of new roadway along with associated infrastructure including driveways, landscaping, snow storage, parks, drainage facilities, and utilities. The project plans illustrate the proposal in detail including zoning, easements, construction details, roadway profile and provisions for utilities. Drainage will be collected and routed through a series of best management practices sized to address the MADEP Stormwater Management Standards as well as the local stormwater regulations.

SITE DESCRIPTION

The total area of the project site is approximately 33.30-AC and is located within the Residential-1 (R-1) zoning district. The site is located on the easterly side of Dracut, between Poppy Lane and Elizabeth Drive. A portion of the property has frontage on Wheeler Street in Methuen, MA. On-site resource areas include bordering vegetated wetlands (BVW), and vernal pools, both with associated setbacks. Elevations vary, ranging from approximately 114-FT along the frontage of Wheeler Street to a high of approximately 178-FT near Elizabeth Drive, at the boundary shared with 489 Wheeler Road. The resource areas were delineated by Norse Environmental Services in August 2015, and an ORAD was issued on January 26, 2016.

According to the Natural Resource Conservation Service Soil Survey for Essex County, Massachusetts, the on-site soils beyond the limit of the wetlands consist of the following soil types:

- Wareham Loamy Fine Sand Hydraulic Soil Group (HSG) A/D
- Swansea Muck, HSG B/D
- Freetown Muck, HSG B/D
- Hinkley Loamy San, HSG A
- Merrimac Fine Sandy Loam, HSG A
- Windsor Loamy Sand, HSG A
- Deerfield Loamy Fine Sand, HSG A
- Canton Fine Sandy Loam, HSG B
- Pits, gravel, Unranked
- Pits, quarry, Unranked
- Udorthents, Unranked

For the purposes of drainage calculations, portions of the Swansea Muck, Freetown Muck, Pits, and Udorthents map units were considered to be an HSG-A soil due to surrounding mapped soils, wetland delineation, and test pit results. Test pits were conducted by this office in December of 2023, April of 2024, and December of 2024 to determine soil texture and estimated seasonal high groundwater elevations. Test pit logs are provided under Tab 5 of this report. Finally, according to the Flood Insurance Rate Map for Essex County, Massachusetts Maps 25017C0163E and 25017C0161E, no part of this site is located within the 100-year base flood elevation.

SURFACE DRAINAGE

Pre-Development Condition

The project site has been disturbed and currently consists largely of bare sandy soil, however for drainage design purposes the existing cover types are assumed to be 'Woods' to mimic historic pre-development conditions. The pre-development condition consists of eight (8) watershed areas contributing to seven (7) design points. Design Point #1 (DP-1) receives runoff from EWA-1 and consists of overland flow through the northern wetland complex and into a culvert running across Wheeler Street. Design Point #3 (DP-3) receives runoff from EWA-3 and consists of overland flow directed off-site, towards #48 Rinzee Road.

Design Point #4 (DP-4) receives runoff from EWA-4 and consists of overland flow directed towards Poppy Lane. Design Point #5 (DP-5) receives runoff from EWA-5A and EWA-5B and consists of overland flow directed towards the Wetland Series 'A'. Runoff from EWA-5A first ponds in Wetland Series 'J' prior to flowing through a culvert that discharges to Wetland Series 'A'. This culvert was installed after the issuance of an Order of Conditions associated with DEP#145-1050 and is not considered for the sake of pre-development drainage calculations. Design Point #6 (DP-6) receives runoff from EWA-6 and consists of overland flow directed towards Wetland Series 'B' and 'C'. Design Point #7 (DP-7) receives runoff from EWA-7 and consists of overland flow directed towards #4 Poppy Lane. Design Point #8 (DP-8) receives runoff from EWA-8 and consists of overland flow directed towards series 'D' and 'E' wetland complex. Contributing areas to the Design Points are detailed in the following Table 1.

TABLE 1: EXISTING WATERSHED DESIGN POINT DETAILS

DESIGN POINT	AREA NAME	AREA (Acres)	Tc (min.)	CN
DP-1	EWA-1	5.11	13.7	37
DP-3	EWA-3	2.74	10.2	30
DP-4	EWA-4	2.77	28.1	30
DP-5	EWA-5A	1.14	14.9	30
	EWA-5B	10.52	19.5	33
DP-6	EWA-6	2.34	16.2	30
DP-7	EWA-7	3.96	14.3	30
DP-8	EWA-8	6.76	24.8	30

Post-Development Condition

The proposed project includes the construction of 63 Multi-Family Dwellings containing a total of 268 units, as well as three accessory buildings. Other components include construction of a new ±4,400-FT roadway along with landscaping, snow storage, parks, drainage, utilities, and associated appurtenances. Drainage will be collected and routed through a series of best management practices sized to address the MADEP Stormwater Management Standards. Impervious area will include bituminous concrete pavement and rooftop areas, and totals 11.46-AC.

The post-development condition consists of sixteen (16) watershed areas discharging to seven (7) design points. DP-1 receives overland flow from PWA-1. DP-3 receives overland flow from PWA-3. DP-4 receives overland flow from PWA-4. DP-5 receives overland flow from PWA-5A as well as discharge from two subsurface systems (PWA-5G, PWA-5F, PWA-5I) and three infiltration basins (PWA-5B, PWA-5C, PWA-5D, and PWA-5H). Runoff from PWA-5E is first routed through wetland series 'J' before discharging to wetland series 'A' through an existing culvert. The existing culvert will be upgraded to an 18" RCP in accordance with MassDOT design guidelines, and is modeled as part of the reach associated with Wetland Series 'J', flowing at approximately 10% capacity during the 100-Year storm. DP-6 receives overland flow from PWA-6. DP-7 receives overland flow from PWA-7. DP-8 receives overland flow from PWA-8A as well as discharge from one subsurface system (PWA-8B).

The design points are summarized in Table 2 below.

TABLE 2: PROPOSED WATERSHED DESIGN POINT DETAILS

DESIGN POINT	AREA NAME	AREA (Acres)	Tc (min.)	CN
DP-1	PWA-1	4.46	13.7	37
DP-3	PWA-3	0.28	6.6	33
DP-4	PWA-4	0.31	6.0	30
DP-5	PWA-5A	0.58	6.0	34
	PWA-5B	2.44	8.7	70
	PWA-5C	4.88	6.0	72
	PWA-5D	4.29	13.1	46
	PWA-5E	1.78	9.6	34
	PWA-5F	1.52	6.0	81
	PWA-5G	0.47	6.0	64
	PWA-5H	0.84	6.0	80
	PWA-5I	3.75	22.8	64
DP-6	PWA-6	1.80	9.6	30
DP-7	PWA-7	0.87	13.2	31
DP-8	PWA-8A	1.40	8.5	31
	PWA-8B	5.67	6.0	74

Peak Discharge Comparison

As illustrated in the following tables, the impact of the proposed improvements has been mitigated through the use of best management practices including infiltration basins, subsurface infiltration and subsurface detention systems for up to and including the 100-year, 24-hour storm event.

Design Point #1 Peak Flows (CFS)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.00	0.06	0.45	3.53
Post-Development	0.00	0.05	0.40	3.08

Design Point #3 Peak Flows (CFS)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.00	0.00	0.02	0.51
Post-Development	0.00	0.00	0.01	0.11

Design Point #4 Peak Flows (CFS)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.00	0.00	0.02	0.40
Post-Development	0.00	0.00	0.00	0.06

Design Point #5 Peak Flows (CFS)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.00	0.03	0.23	3.67
Post-Development	0.00	0.02	0.09	2.96

Design Point #6 Peak Flows (CFS)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.00	0.00	0.02	0.40
Post-Development	0.00	0.00	0.01	0.34

Design Point #7 Peak Flows (CFS)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.00	0.00	0.03	0.70
Post-Development	0.00	0.00	0.01	0.20

Design Point #8 Peak Flows (CFS)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.00	0.00	0.05	1.01
Post-Development	0.00	0.00	0.04	0.90

Peak Volume Comparison

As illustrated in the following tables, the impact of the proposed improvements has been mitigated through the use of best management practices including infiltration basins, subsurface infiltration and subsurface detention systems for up to and including the 100-year, 24-hour storm event, with the exception of the 2- and 10-year storm events for Design Point 5. A waiver to the Dracut Stormwater Regulations for maintaining peak volumes pre- and post-development has been requested. Due to grading restrictions in the vicinity of PWP-5G, infiltration is not feasible, and as such post-volumes cannot meet existing volumes for these storm events.

Design Point #1 Volumes (Acre-Ft)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.000	0.038	0.140	0.508
Post-Development	0.000	0.033	0.122	0.444

Design Point #3 Volumes (Acre-Ft)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.000	0.000	0.015	0.127
Post-Development	0.000	0.000	0.004	0.019

Design Point #4 Volumes (Acre-Ft)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.000	0.000	0.015	0.128
Post-Development	0.000	0.000	0.002	0.014

Design Point #5 Volumes (Acre-Ft)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.000	0.016	0.146	0.765
Post-Development	0.007	0.019	0.060	0.539

Design Point #6 Volumes (Acre-Ft)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.000	0.000	0.013	0.108
Post-Development	0.000	0.000	0.010	0.083

Design Point #7 Volumes (Acre-Ft)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.000	0.000	0.022	0.183
Post-Development	0.000	0.000	0.007	0.046

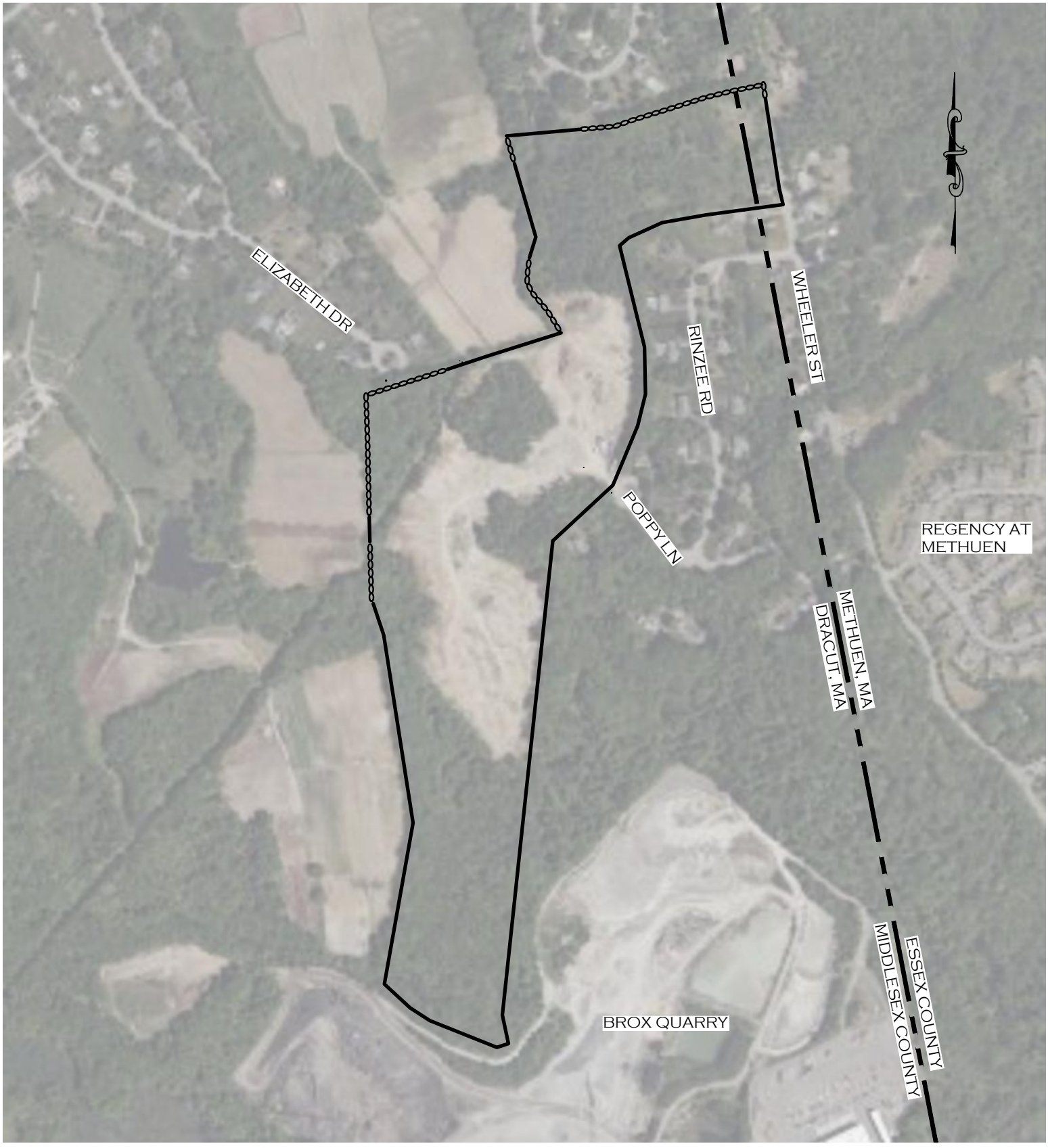
Design Point #8 Volumes (Acre-Ft)

	2-YR (3.08-IN)	10-YR (4.68-IN)	25-YR (5.94-IN)	100-YR (8.55-IN)
Pre-Development	0.000	0.000	0.037	0.312
Post-Development	0.000	0.000	0.018	0.278

METHODOLOGY

Drainage calculations were performed using the computer program HydroCAD by HydroCAD Software Solutions, LLC based upon Technical Release 20 (TR-20), developed by the NRCS. Drainage calculations were prepared for the 2-YR, 10-YR, 25-YR, and 100-YR Type III 24-hour storm events. Rainfall data corresponds with Cornell Extreme Precipitation. Curve numbers were generated using the information provided in TR-55 and the SCS Soils Survey.

TAB 2



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PROJECT:
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18 CASSIMERE STREET
ANDOVER, MA 01810

PREPARED FOR:
MURPHY'S FARM
DRACUT, MA 01826

FIGURE 1: ORTHO

PREPARED BY: TJS
SCALE: 1"=500'
CDCI FILE #: 23-10524
DATE: MARCH 29, 2024

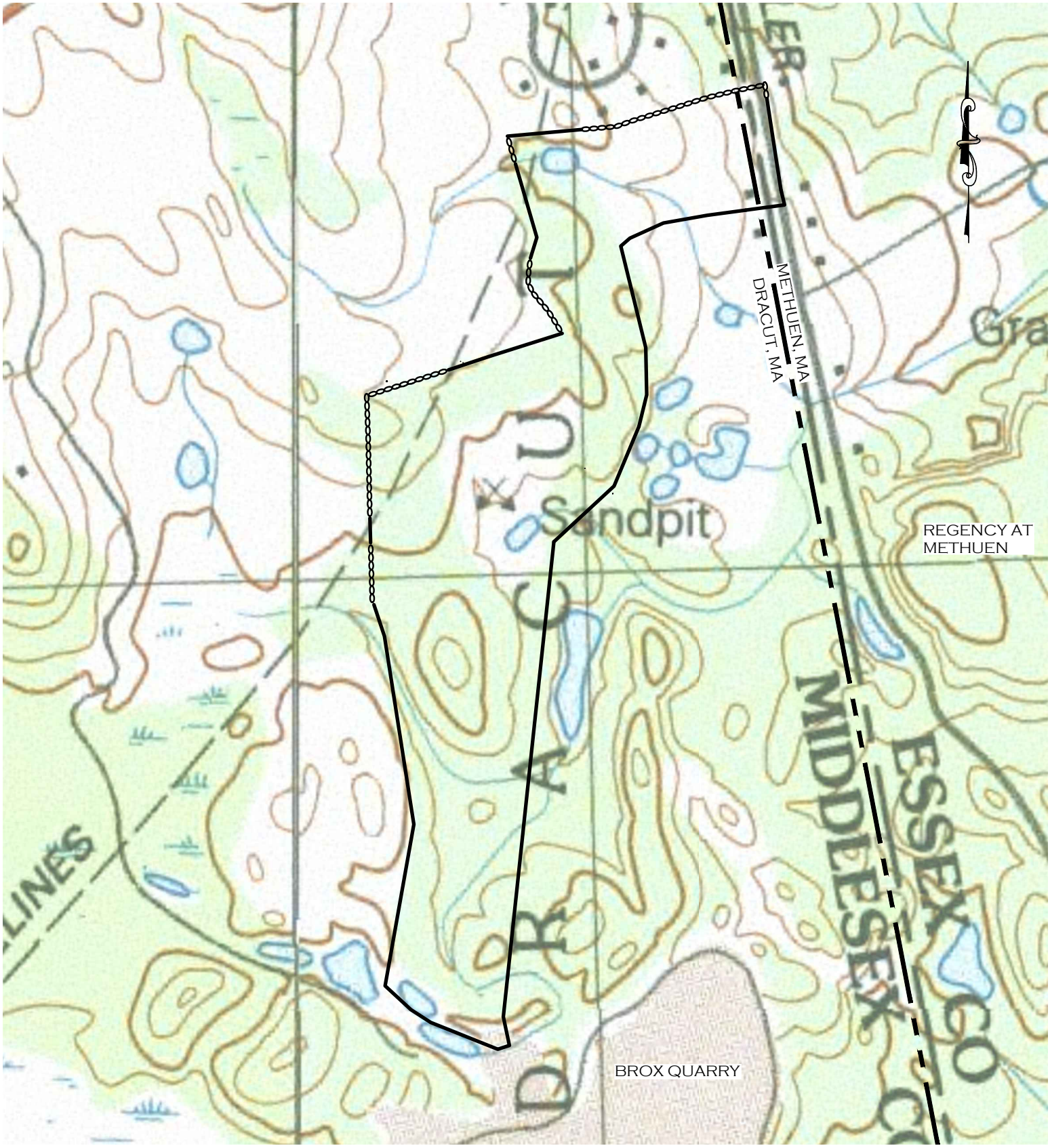

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FIGURE 2: USGS

PREPARED BY: TJS
SCALE: 1"=500'
CDCI FILE #: 23-10524
DATE: MARCH 29, 2024

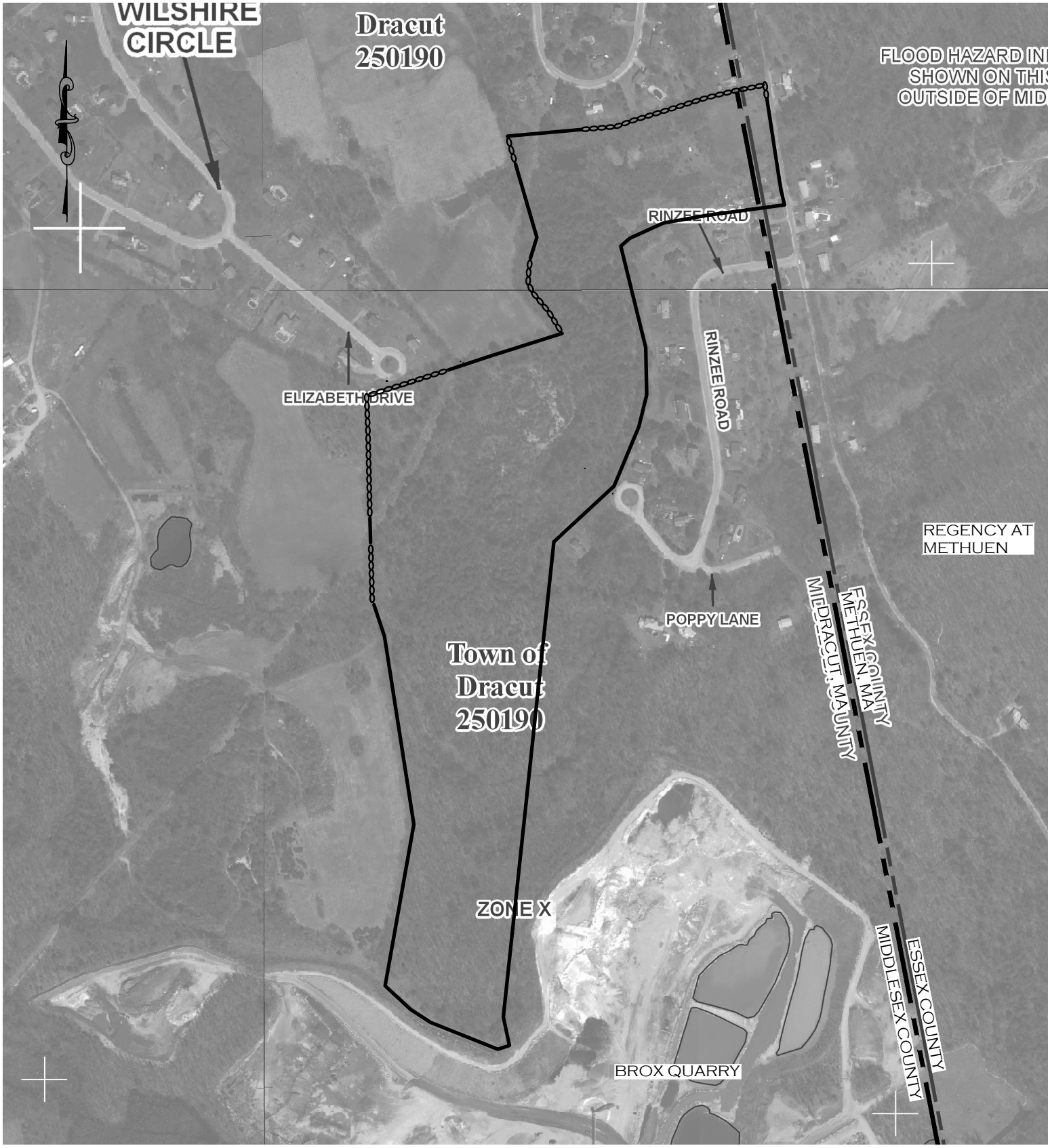

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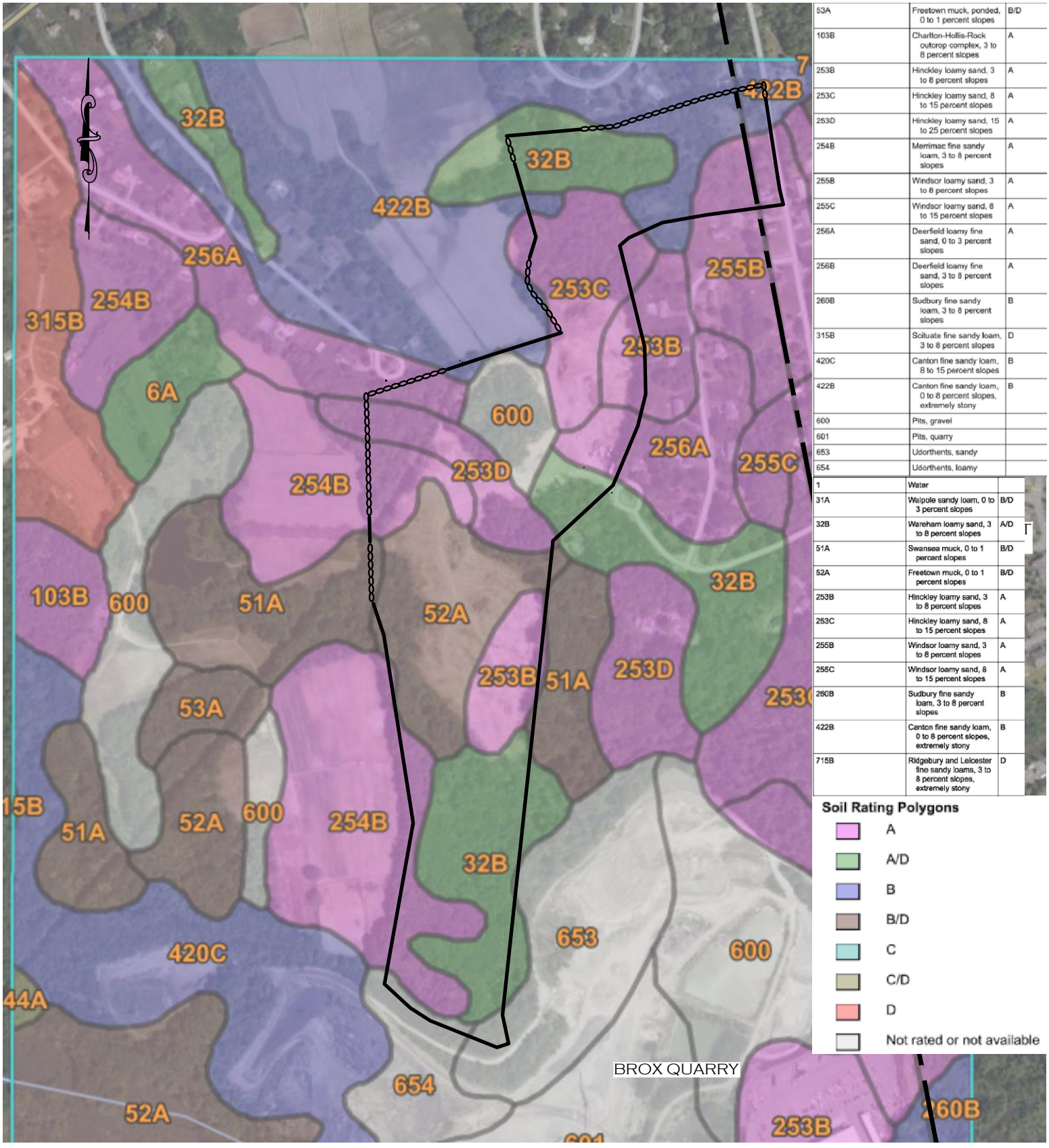
FIGURE 3: FEMA

PREPARED BY:	TJS
SCALE:	1"=500'
CDCI FILE #:	23-10524
DATE:	MARCH 29, 2024



53A	Freetown muck, ponded, 0 to 1 percent slopes	B/D
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	A
253B	Hinckley loamy sand, 3 to 8 percent slopes	A
253C	Hinckley loamy sand, 8 to 15 percent slopes	A
253D	Hinckley loamy sand, 15 to 25 percent slopes	A
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A
255B	Windsor loamy sand, 3 to 8 percent slopes	A
255C	Windsor loamy sand, 8 to 15 percent slopes	A
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A
256B	Deerfield loamy fine sand, 3 to 8 percent slopes	A
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	B
315B	Scituate fine sandy loam, 3 to 8 percent slopes	D
420C	Canton fine sandy loam, 8 to 15 percent slopes	B
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B
600	Pits, gravel	
601	Pits, quarry	
653	Udorthents, sandy	
654	Udorthents, loamy	
1	Water	
31A	Walpole sandy loam, 0 to 3 percent slopes	B/D
32B	Wareham loamy sand, 3 to 8 percent slopes	A/D
51A	Swansea muck, 0 to 1 percent slopes	B/D
52A	Freetown muck, 0 to 1 percent slopes	B/D
253B	Hinckley loamy sand, 3 to 8 percent slopes	A
253C	Hinckley loamy sand, 8 to 15 percent slopes	A
255B	Windsor loamy sand, 3 to 8 percent slopes	A
255C	Windsor loamy sand, 8 to 15 percent slopes	A
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	B
422B	Canton fine sandy loam, 0 to 8 percent slopes, extremely stony	B
715B	Ridgebury and Leicester fine sandy loams, 3 to 8 percent slopes, extremely stony	D

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FIGURE 4: SOILS

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SCALE: 1"=500'
CDCI FILE #: 23-10524
DATE: MARCH 29, 2024

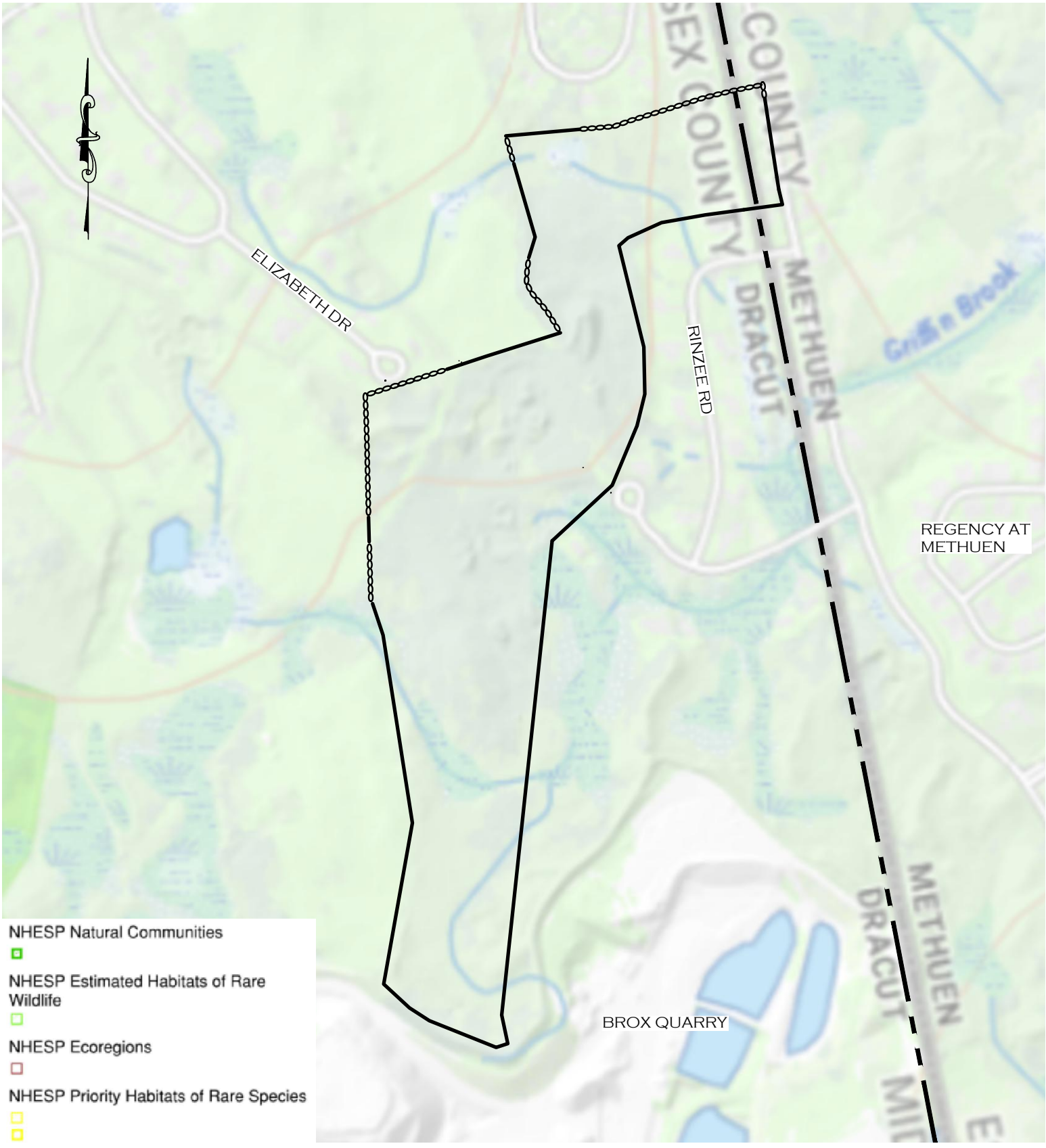

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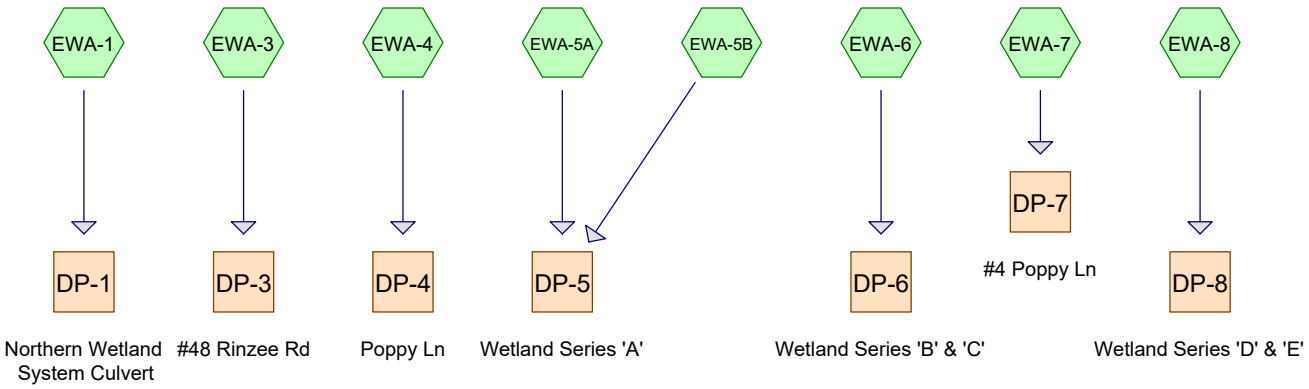
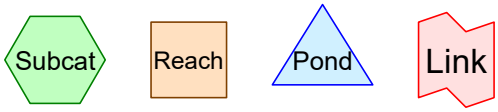
FIGURE 5: NHESP

PREPARED BY: TJS
SCALE: 1"=500'
CDCI FILE #: 23-10524
DATE: MARCH 29, 2024

TAB 3





Routing Diagram for 23-10524 - Pre - R2
Prepared by Civil Design Consultants, Inc, Printed 3/28/2025

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.50	39	>75% Grass cover, Good, HSG A (EWA-1, EWA-5B)
0.50	61	>75% Grass cover, Good, HSG B (EWA-1, EWA-5B)
32.07	30	Woods, Good, HSG A (EWA-1, EWA-3, EWA-4, EWA-5A, EWA-5B, EWA-6, EWA-7, EWA-8)
1.27	55	Woods, Good, HSG B (EWA-1, EWA-5B)

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
33.57	HSG A	EWA-1, EWA-3, EWA-4, EWA-5A, EWA-5B, EWA-6, EWA-7, EWA-8
1.77	HSG B	EWA-1, EWA-5B
0.00	HSG C	
0.00	HSG D	
0.00	Other	

Time span=5.00-32.00 hrs, dt=0.05 hrs, 541 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEWA-1: Runoff Area=5.11 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=400' Tc=13.7 min CN=37 Runoff=0.00 cfs 0.000 af

SubcatchmentEWA-3: Runoff Area=2.74 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=300' Tc=10.2 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentEWA-4: Runoff Area=2.77 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=788' Tc=28.1 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentEWA-5A: Runoff Area=1.14 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=323' Tc=14.9 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentEWA-5B: Runoff Area=10.52 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=715' Tc=19.5 min CN=33 Runoff=0.00 cfs 0.000 af

SubcatchmentEWA-6: Runoff Area=2.34 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=611' Tc=16.2 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentEWA-7: Runoff Area=3.96 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=456' Tc=14.3 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentEWA-8: Runoff Area=6.76 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=320' Slope=0.0100 '/' Tc=24.8 min CN=30 Runoff=0.00 cfs 0.000 af

Reach DP-1: Northern Wetland System Culvert Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-3: #48 Rinzee Rd Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-4: Poppy Ln Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: Wetland Series 'A' Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-6: Wetland Series 'B' & 'C' Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-7: #4 Poppy Ln Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-8: Wetland Series 'D' & 'E' Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Time span=5.00-32.00 hrs, dt=0.05 hrs, 541 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEWA-1: Runoff Area=5.11 ac 0.00% Impervious Runoff Depth=0.09"
Flow Length=400' Tc=13.7 min CN=37 Runoff=0.06 cfs 0.038 af

SubcatchmentEWA-3: Runoff Area=2.74 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=300' Tc=10.2 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentEWA-4: Runoff Area=2.77 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=788' Tc=28.1 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentEWA-5A: Runoff Area=1.14 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=323' Tc=14.9 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentEWA-5B: Runoff Area=10.52 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=715' Tc=19.5 min CN=33 Runoff=0.03 cfs 0.016 af

SubcatchmentEWA-6: Runoff Area=2.34 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=611' Tc=16.2 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentEWA-7: Runoff Area=3.96 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=456' Tc=14.3 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentEWA-8: Runoff Area=6.76 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=320' Slope=0.0100 '/' Tc=24.8 min CN=30 Runoff=0.00 cfs 0.000 af

Reach DP-1: Northern Wetland System Culvert Inflow=0.06 cfs 0.038 af
Outflow=0.06 cfs 0.038 af

Reach DP-3: #48 Rinzee Rd Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-4: Poppy Ln Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: Wetland Series 'A' Inflow=0.03 cfs 0.016 af
Outflow=0.03 cfs 0.016 af

Reach DP-6: Wetland Series 'B' & 'C' Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-7: #4 Poppy Ln Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-8: Wetland Series 'D' & 'E' Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Summary for Subcatchment EWA-1:

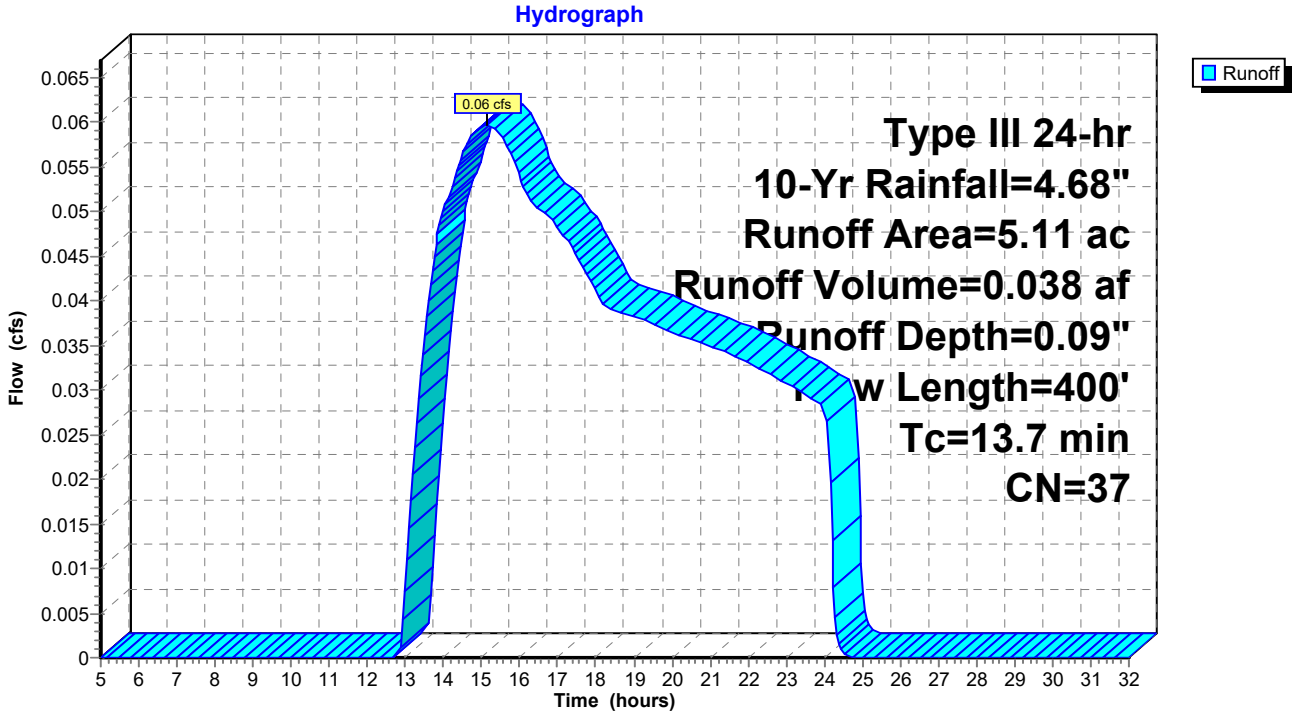
Runoff = 0.06 cfs @ 15.11 hrs, Volume= 0.038 af, Depth= 0.09"
Routed to Reach DP-1 : Northern Wetland System Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
0.34	61	>75% Grass cover, Good, HSG B
0.52	39	>75% Grass cover, Good, HSG A
3.49	30	Woods, Good, HSG A
0.76	55	Woods, Good, HSG B
5.11	37	Weighted Average
5.11		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0650	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
6.2	350	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.7	400	Total			

Subcatchment EWA-1:



Summary for Subcatchment EWA-3:

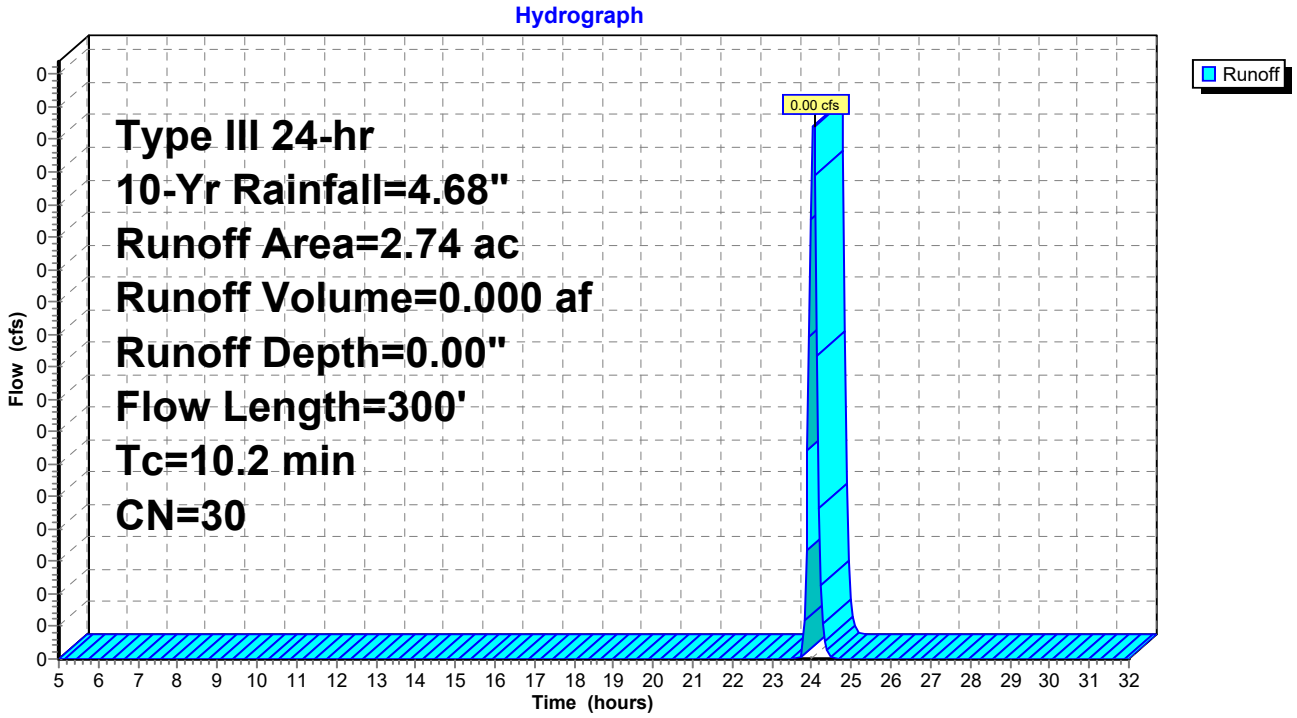
Runoff = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-3 : #48 Rinzee Rd

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
2.74	30	Woods, Good, HSG A
2.74		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
3.9	250	0.0450	1.06		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.2	300	Total			

Subcatchment EWA-3:



Summary for Subcatchment EWA-4:

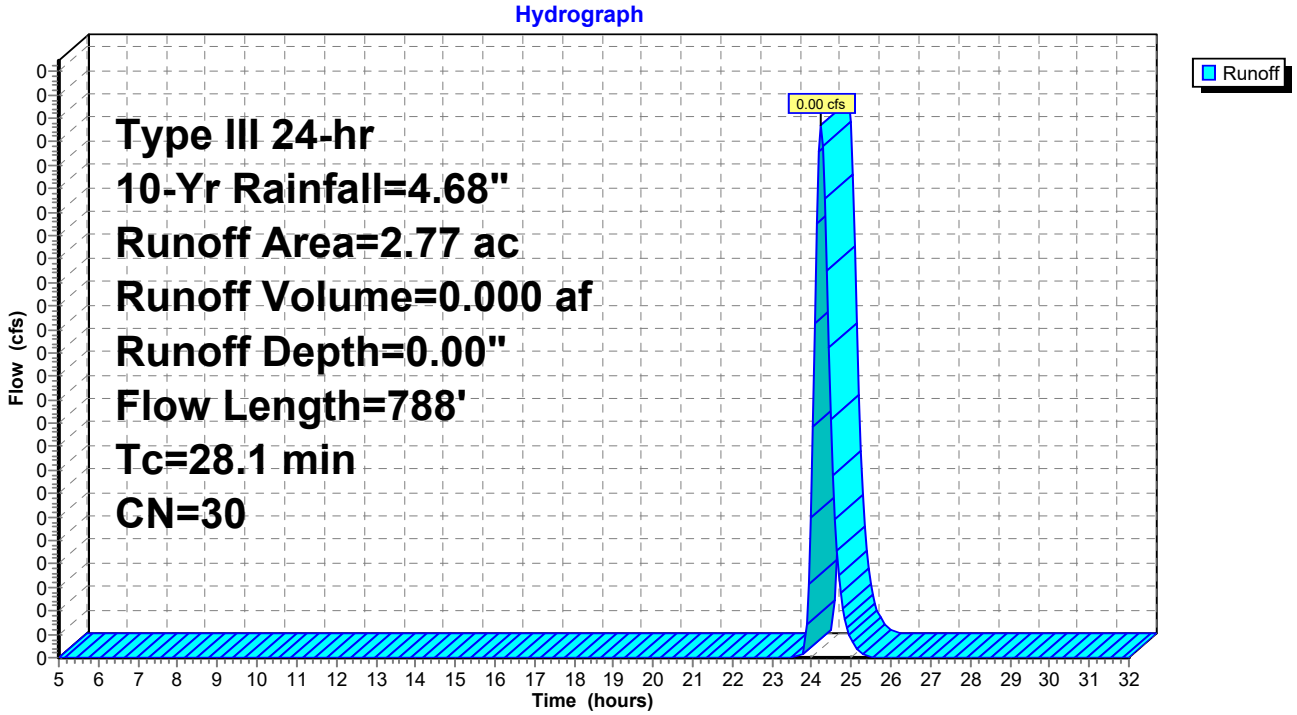
Runoff = 0.00 cfs @ 24.25 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-4 : Poppy Ln

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
2.77	30	Woods, Good, HSG A
2.77		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
4.5	250	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
10.8	276	0.0072	0.42		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.1	212	0.0190	0.69		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
28.1	788	Total			

Subcatchment EWA-4:



Summary for Subcatchment EWA-5A:

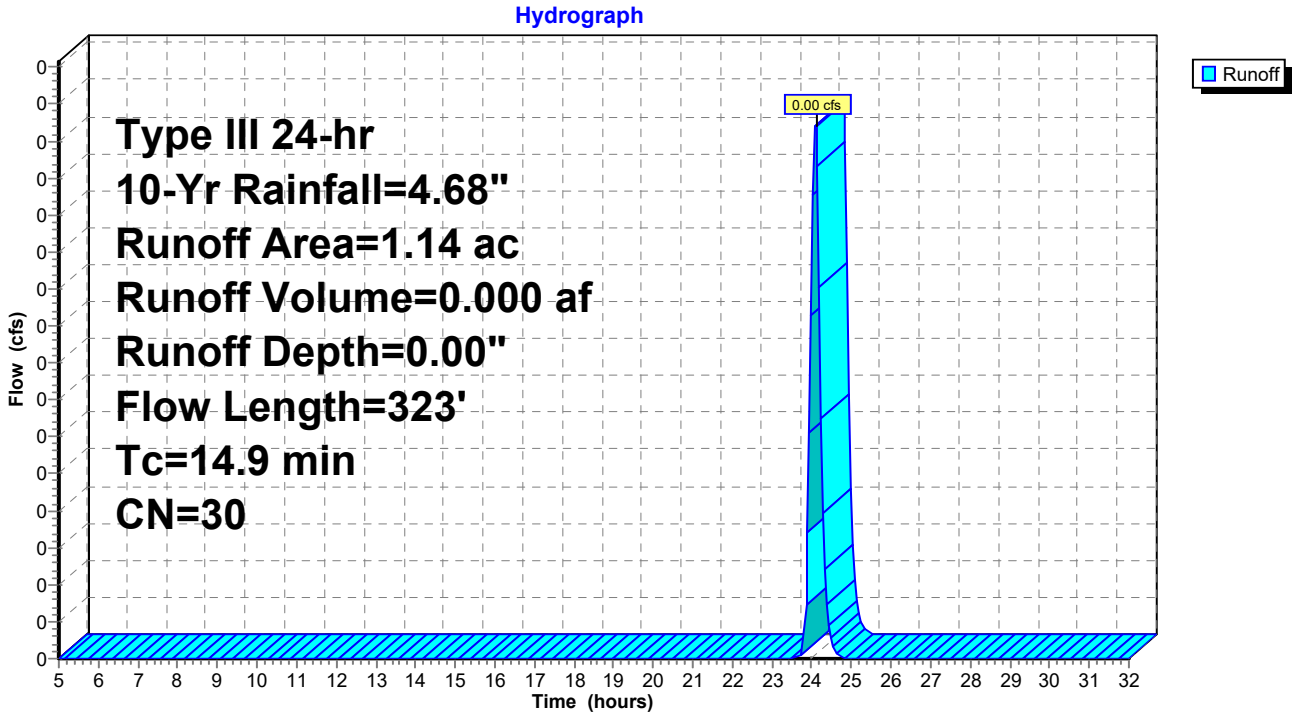
Runoff = 0.00 cfs @ 24.11 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-5 : Wetland Series 'A'

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
1.14	30	Woods, Good, HSG A
1.14		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.8	50	0.0330	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
3.4	146	0.0200	0.71		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.7	127	0.0620	1.24		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.9	323	Total			

Subcatchment EWA-5A:



Summary for Subcatchment EWA-5B:

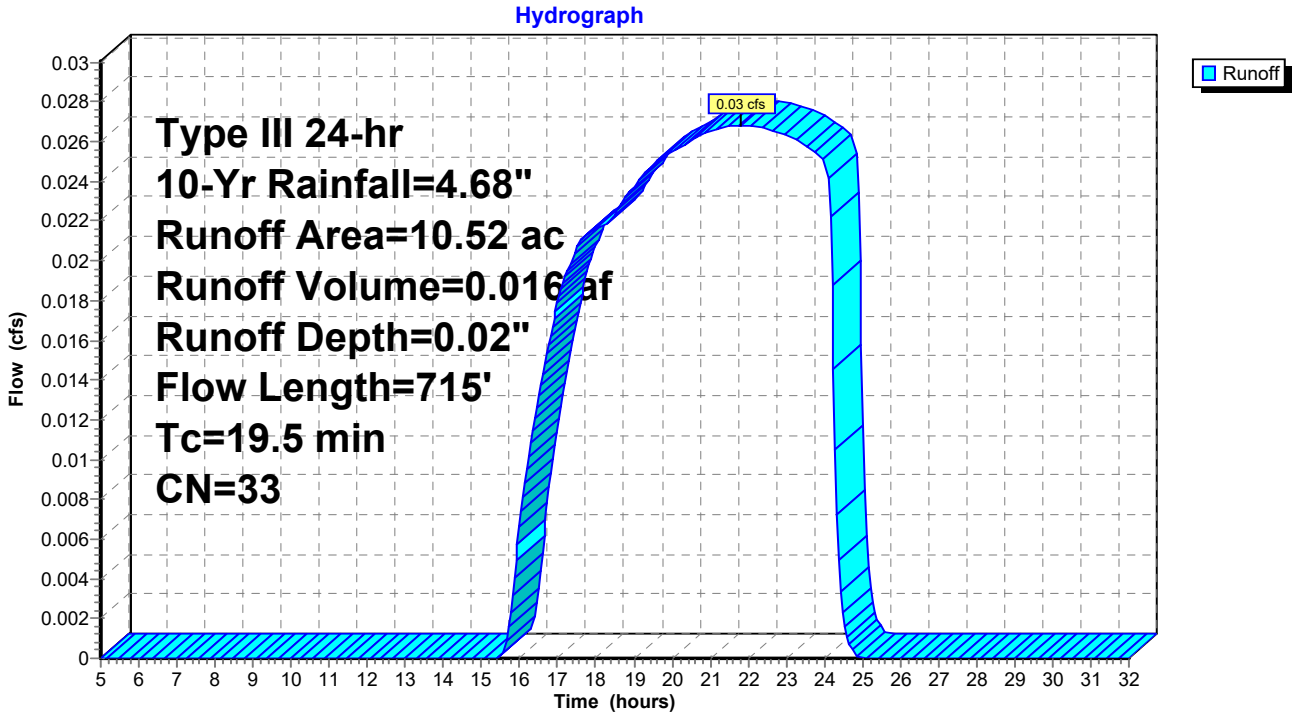
Runoff = 0.03 cfs @ 21.82 hrs, Volume= 0.016 af, Depth= 0.02"
Routed to Reach DP-5 : Wetland Series 'A'

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
8.87	30	Woods, Good, HSG A
0.51	55	Woods, Good, HSG B
0.98	39	>75% Grass cover, Good, HSG A
0.16	61	>75% Grass cover, Good, HSG B
10.52	33	Weighted Average
10.52		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
5.2	251	0.0260	0.81		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.1	76	0.0520	1.14		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.1	168	0.0120	0.55		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.8	170	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.5	715	Total			

Subcatchment EWA-5B:



Summary for Subcatchment EWA-6:

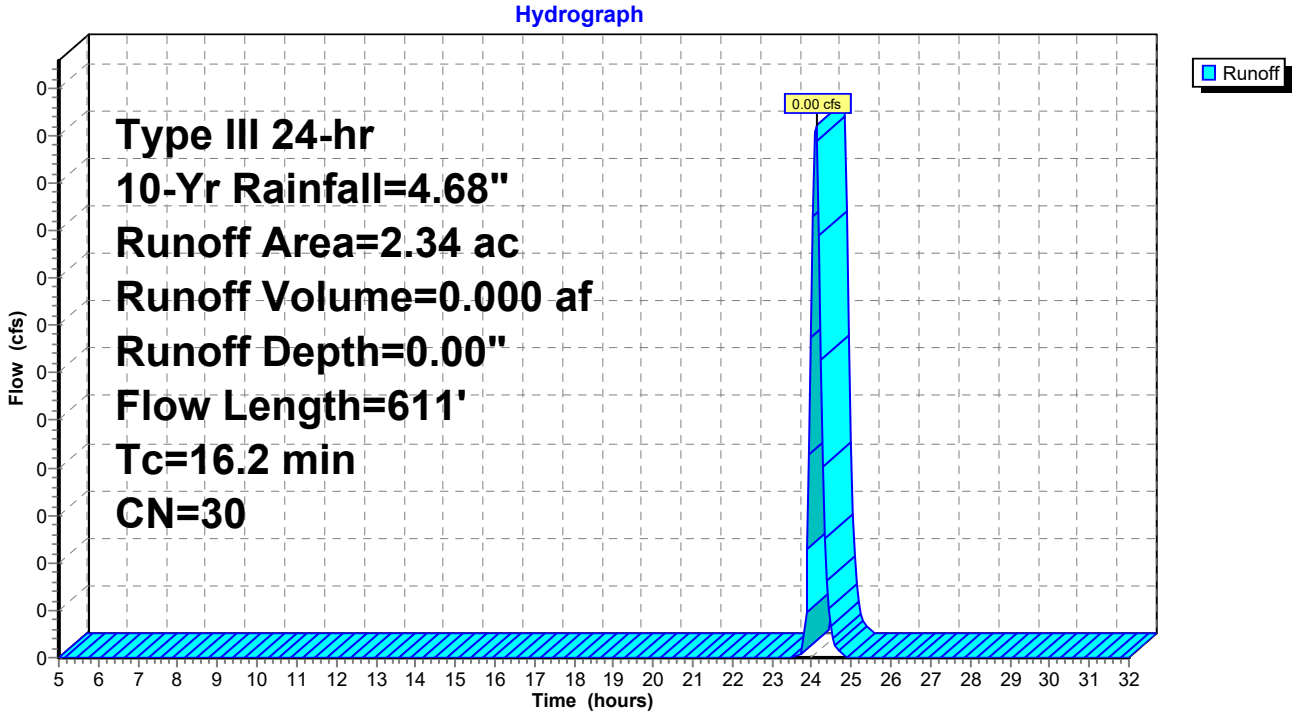
Runoff = 0.00 cfs @ 24.12 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-6 : Wetland Series 'B' & 'C'

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
2.34	30	Woods, Good, HSG A
2.34		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
5.8	282	0.0260	0.81		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.8	204	0.0590	1.21		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
0.7	75	0.1300	1.80		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
16.2	611	Total			

Subcatchment EWA-6:



Summary for Subcatchment EWA-7:

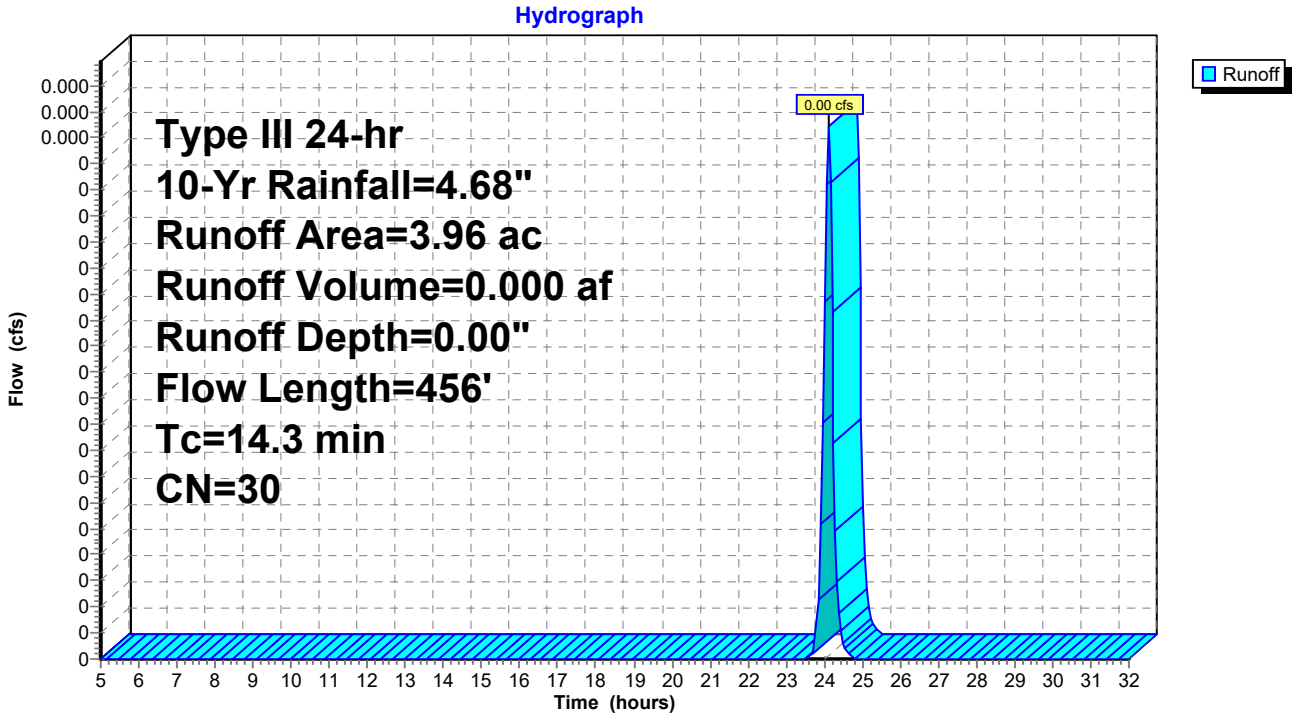
Runoff = 0.00 cfs @ 24.10 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-7 : #4 Poppy Ln

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
3.96	30	Woods, Good, HSG A
3.96		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
6.6	406	0.0420	1.02		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
14.3	456	Total			

Subcatchment EWA-7:



Summary for Subcatchment EWA-8:

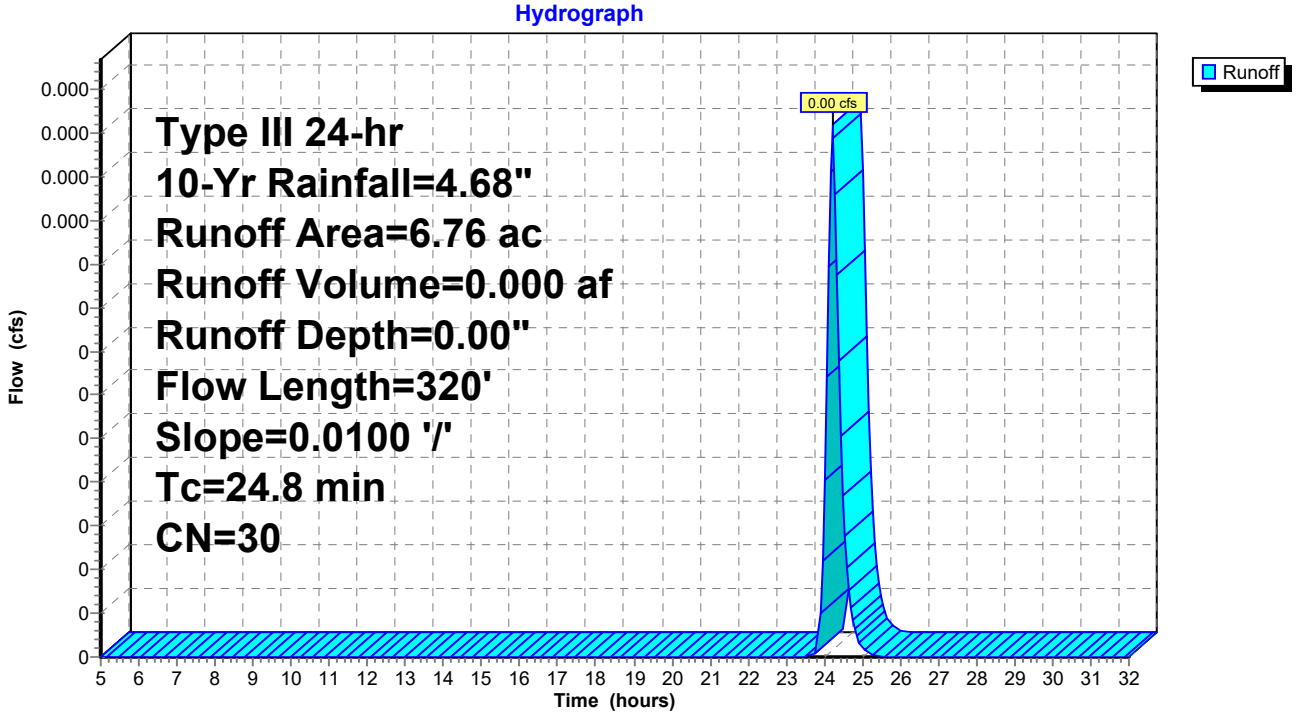
Runoff = 0.00 cfs @ 24.21 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-8 : Wetland Series 'D' & 'E'

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
6.76	30	Woods, Good, HSG A
6.76		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.8	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
9.0	270	0.0100	0.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
24.8	320	Total			

Subcatchment EWA-8:



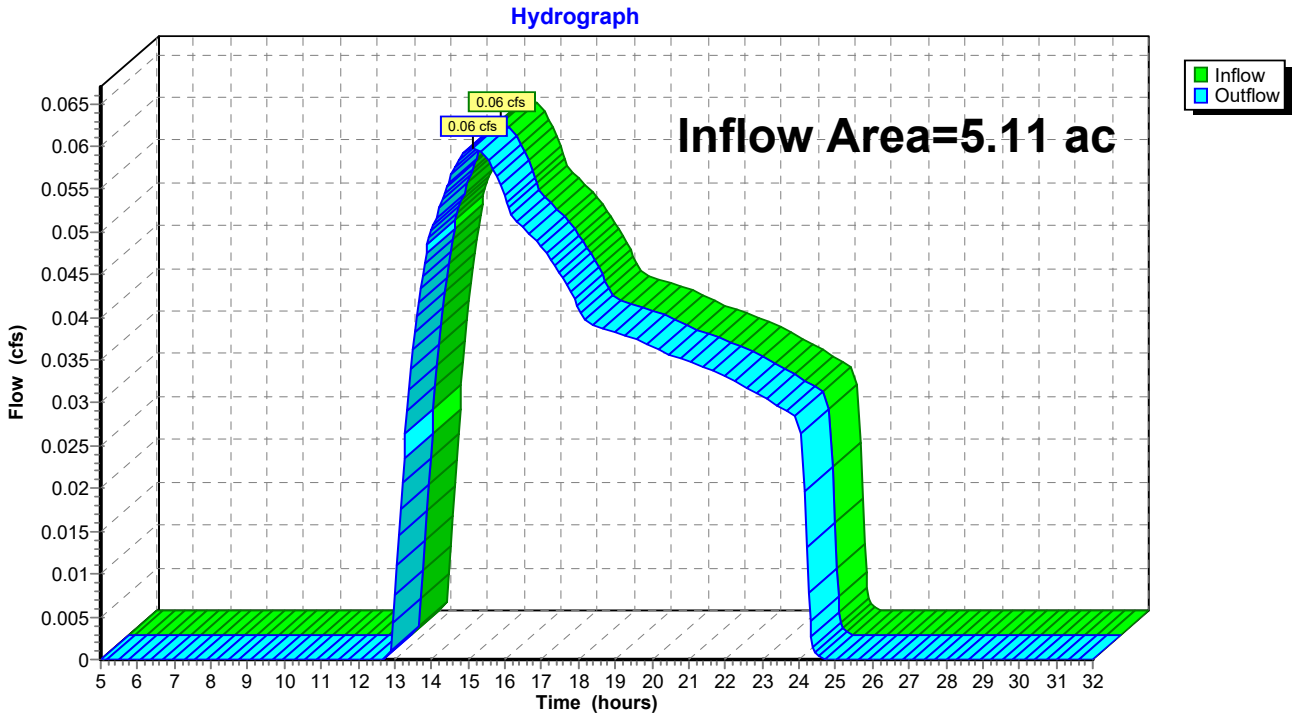
Summary for Reach DP-1: Northern Wetland System Culvert

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 5.11 ac, 0.00% Impervious, Inflow Depth = 0.09" for 10-Yr event
Inflow = 0.06 cfs @ 15.11 hrs, Volume= 0.038 af
Outflow = 0.06 cfs @ 15.11 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-1: Northern Wetland System Culvert



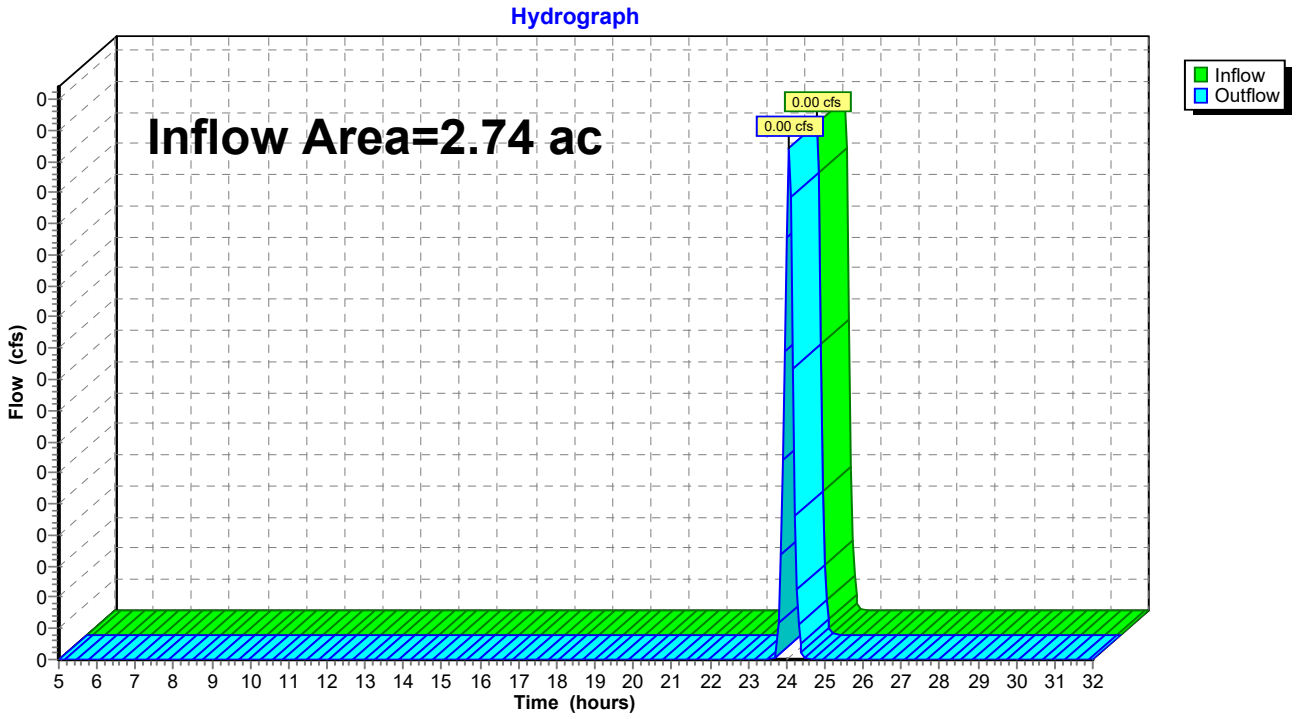
Summary for Reach DP-3: #48 Rinzee Rd

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.74 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr event
Inflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-3: #48 Rinzee Rd



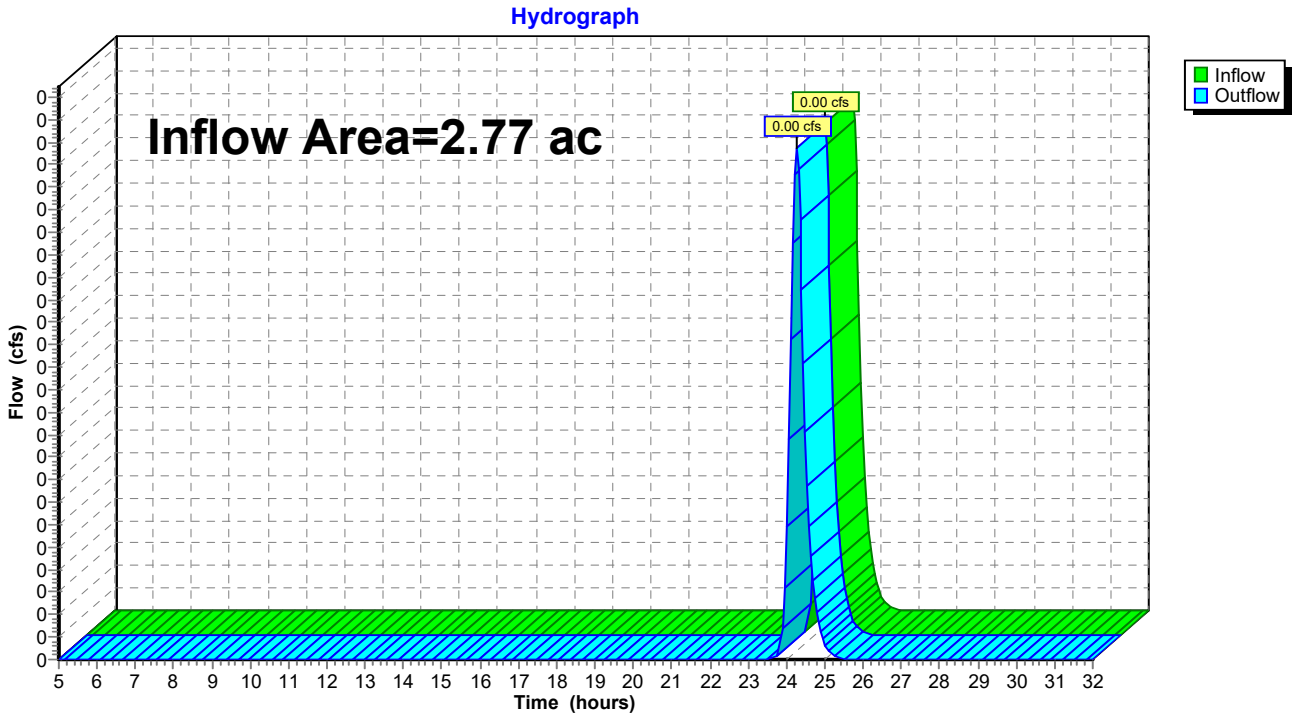
Summary for Reach DP-4: Poppy Ln

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.77 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr event
Inflow = 0.00 cfs @ 24.25 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.25 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-4: Poppy Ln



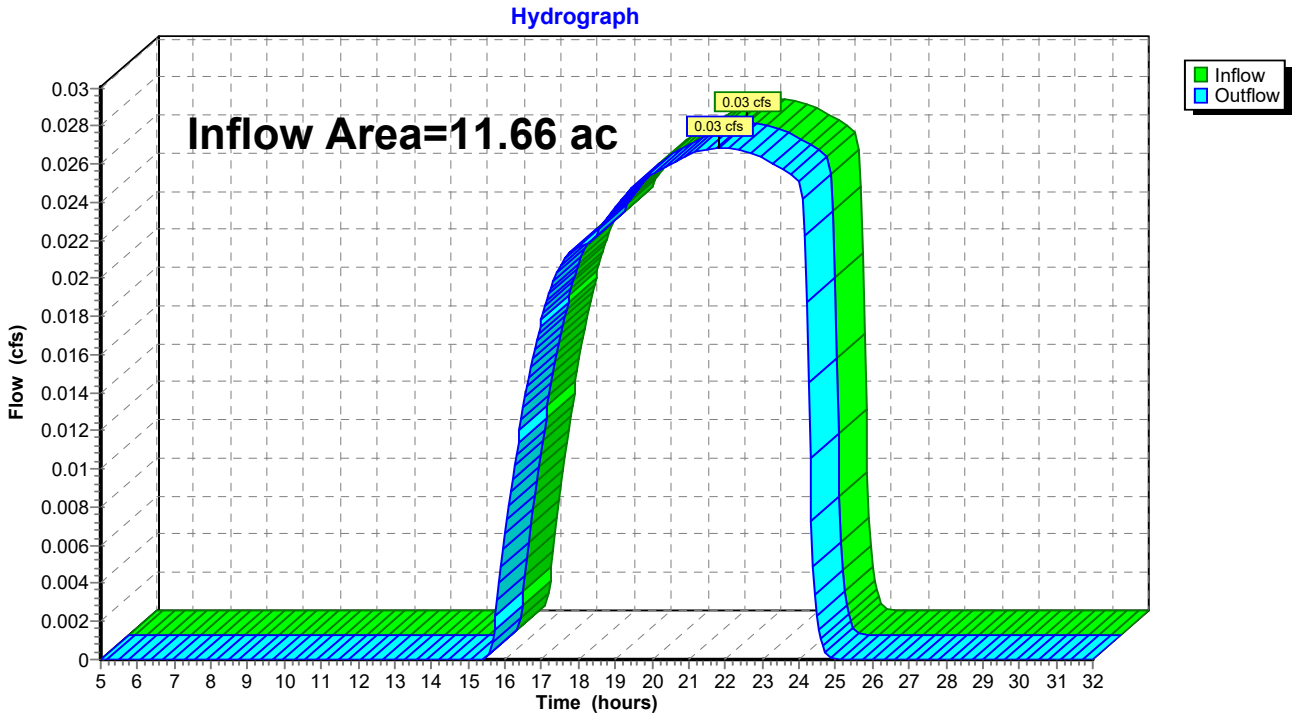
Summary for Reach DP-5: Wetland Series 'A'

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 11.66 ac, 0.00% Impervious, Inflow Depth = 0.02" for 10-Yr event
Inflow = 0.03 cfs @ 21.82 hrs, Volume= 0.016 af
Outflow = 0.03 cfs @ 21.82 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-5: Wetland Series 'A'



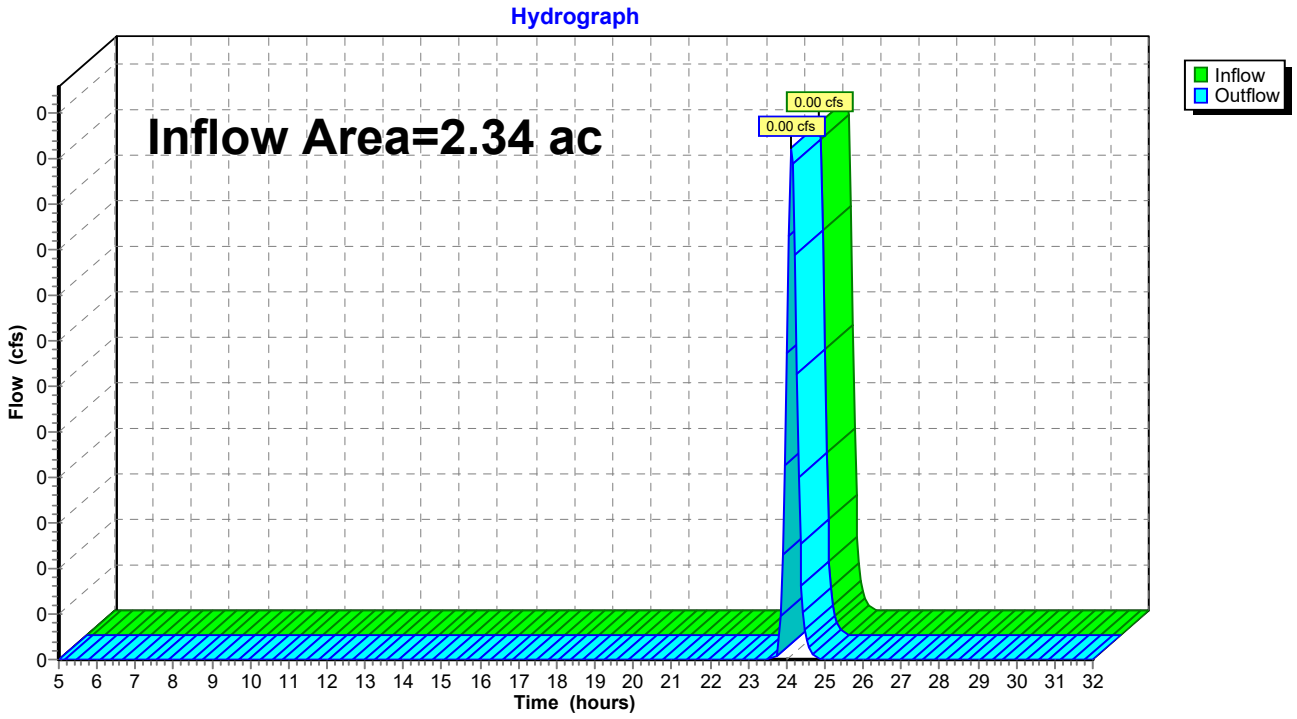
Summary for Reach DP-6: Wetland Series 'B' & 'C'

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 2.34 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr event
Inflow = 0.00 cfs @ 24.12 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.12 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-6: Wetland Series 'B' & 'C'



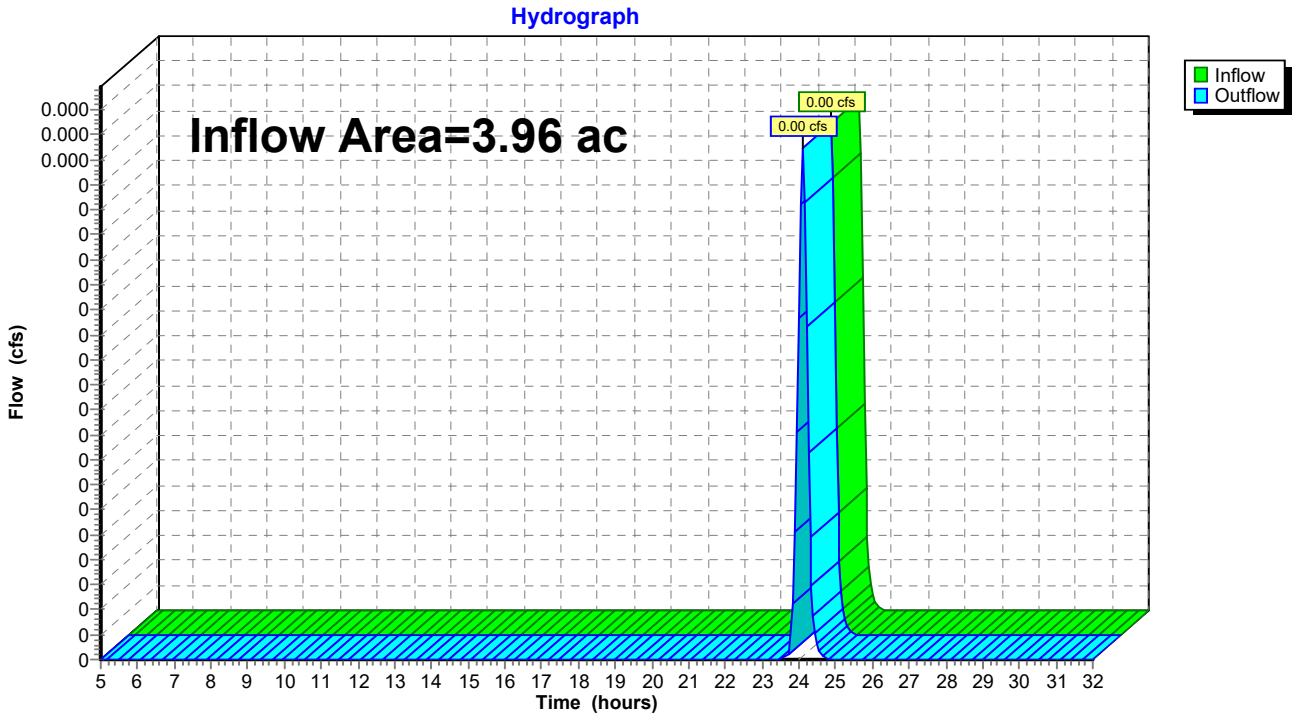
Summary for Reach DP-7: #4 Poppy Ln

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.96 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr event
Inflow = 0.00 cfs @ 24.10 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.10 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-7: #4 Poppy Ln



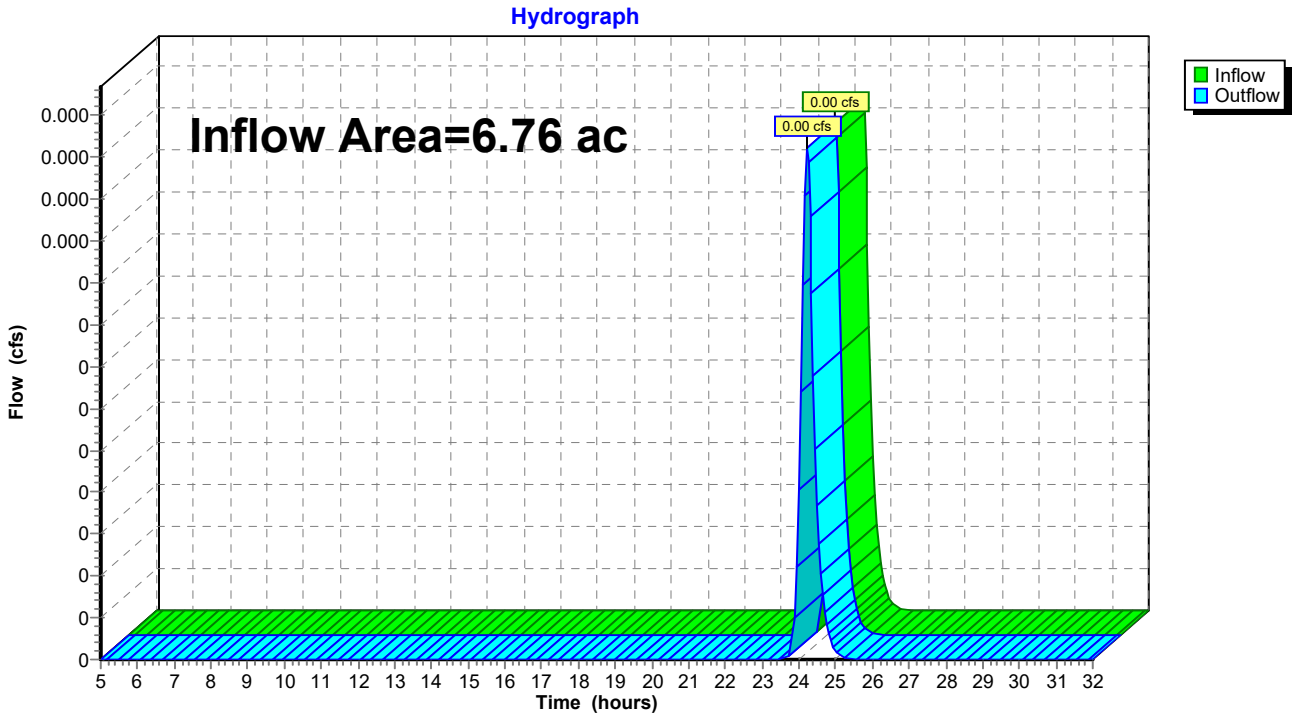
Summary for Reach DP-8: Wetland Series 'D' & 'E'

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 6.76 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr event
Inflow = 0.00 cfs @ 24.21 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.21 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-8: Wetland Series 'D' & 'E'



Time span=5.00-32.00 hrs, dt=0.05 hrs, 541 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEWA-1: Runoff Area=5.11 ac 0.00% Impervious Runoff Depth=0.33"
Flow Length=400' Tc=13.7 min CN=37 Runoff=0.45 cfs 0.140 af

SubcatchmentEWA-3: Runoff Area=2.74 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=300' Tc=10.2 min CN=30 Runoff=0.02 cfs 0.015 af

SubcatchmentEWA-4: Runoff Area=2.77 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=788' Tc=28.1 min CN=30 Runoff=0.02 cfs 0.015 af

SubcatchmentEWA-5A: Runoff Area=1.14 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=323' Tc=14.9 min CN=30 Runoff=0.01 cfs 0.006 af

SubcatchmentEWA-5B: Runoff Area=10.52 ac 0.00% Impervious Runoff Depth=0.16"
Flow Length=715' Tc=19.5 min CN=33 Runoff=0.22 cfs 0.140 af

SubcatchmentEWA-6: Runoff Area=2.34 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=611' Tc=16.2 min CN=30 Runoff=0.02 cfs 0.013 af

SubcatchmentEWA-7: Runoff Area=3.96 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=456' Tc=14.3 min CN=30 Runoff=0.03 cfs 0.022 af

SubcatchmentEWA-8: Runoff Area=6.76 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=320' Slope=0.0100 '/' Tc=24.8 min CN=30 Runoff=0.05 cfs 0.037 af

Reach DP-1: Northern Wetland System Culvert Inflow=0.45 cfs 0.140 af
Outflow=0.45 cfs 0.140 af

Reach DP-3: #48 Rinzee Rd Inflow=0.02 cfs 0.015 af
Outflow=0.02 cfs 0.015 af

Reach DP-4: Poppy Ln Inflow=0.02 cfs 0.015 af
Outflow=0.02 cfs 0.015 af

Reach DP-5: Wetland Series 'A' Inflow=0.23 cfs 0.146 af
Outflow=0.23 cfs 0.146 af

Reach DP-6: Wetland Series 'B' & 'C' Inflow=0.02 cfs 0.013 af
Outflow=0.02 cfs 0.013 af

Reach DP-7: #4 Poppy Ln Inflow=0.03 cfs 0.022 af
Outflow=0.03 cfs 0.022 af

Reach DP-8: Wetland Series 'D' & 'E' Inflow=0.05 cfs 0.037 af
Outflow=0.05 cfs 0.037 af

Time span=5.00-32.00 hrs, dt=0.05 hrs, 541 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentEWA-1: Runoff Area=5.11 ac 0.00% Impervious Runoff Depth=1.19"
Flow Length=400' Tc=13.7 min CN=37 Runoff=3.53 cfs 0.508 af

SubcatchmentEWA-3: Runoff Area=2.74 ac 0.00% Impervious Runoff Depth=0.55"
Flow Length=300' Tc=10.2 min CN=30 Runoff=0.51 cfs 0.127 af

SubcatchmentEWA-4: Runoff Area=2.77 ac 0.00% Impervious Runoff Depth=0.55"
Flow Length=788' Tc=28.1 min CN=30 Runoff=0.40 cfs 0.128 af

SubcatchmentEWA-5A: Runoff Area=1.14 ac 0.00% Impervious Runoff Depth=0.55"
Flow Length=323' Tc=14.9 min CN=30 Runoff=0.20 cfs 0.053 af

SubcatchmentEWA-5B: Runoff Area=10.52 ac 0.00% Impervious Runoff Depth=0.81"
Flow Length=715' Tc=19.5 min CN=33 Runoff=3.47 cfs 0.713 af

SubcatchmentEWA-6: Runoff Area=2.34 ac 0.00% Impervious Runoff Depth=0.55"
Flow Length=611' Tc=16.2 min CN=30 Runoff=0.40 cfs 0.108 af

SubcatchmentEWA-7: Runoff Area=3.96 ac 0.00% Impervious Runoff Depth=0.55"
Flow Length=456' Tc=14.3 min CN=30 Runoff=0.70 cfs 0.183 af

SubcatchmentEWA-8: Runoff Area=6.76 ac 0.00% Impervious Runoff Depth=0.55"
Flow Length=320' Slope=0.0100 '/' Tc=24.8 min CN=30 Runoff=1.01 cfs 0.312 af

Reach DP-1: Northern Wetland System Culvert Inflow=3.53 cfs 0.508 af
Outflow=3.53 cfs 0.508 af

Reach DP-3: #48 Rinzee Rd Inflow=0.51 cfs 0.127 af
Outflow=0.51 cfs 0.127 af

Reach DP-4: Poppy Ln Inflow=0.40 cfs 0.128 af
Outflow=0.40 cfs 0.128 af

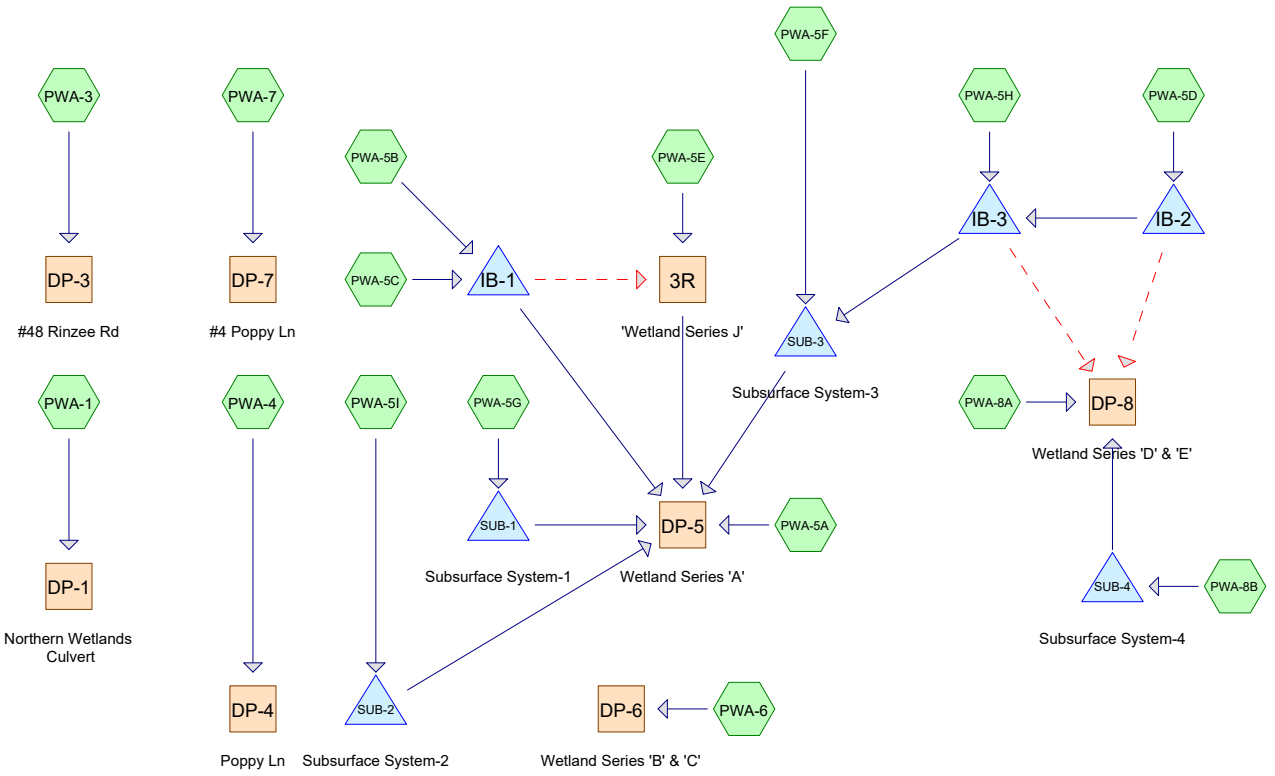
Reach DP-5: Wetland Series 'A' Inflow=3.67 cfs 0.765 af
Outflow=3.67 cfs 0.765 af

Reach DP-6: Wetland Series 'B' & 'C' Inflow=0.40 cfs 0.108 af
Outflow=0.40 cfs 0.108 af

Reach DP-7: #4 Poppy Ln Inflow=0.70 cfs 0.183 af
Outflow=0.70 cfs 0.183 af

Reach DP-8: Wetland Series 'D' & 'E' Inflow=1.01 cfs 0.312 af
Outflow=1.01 cfs 0.312 af

TAB 4



Subcat Reach Pond Link

Routing Diagram for 23-10524 - Post - R4
Prepared by Civil Design Consultants, Inc, Printed 3/24/2025

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Yr	Type III 24-hr		Default	24.00	1	3.08	2
2	10-Yr	Type III 24-hr		Default	24.00	1	4.68	2
3	25-Yr	Type III 24-hr		Default	24.00	1	5.94	2
4	100-Yr	Type III 24-hr		Default	24.00	1	8.55	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
11.57	39	>75% Grass cover, Good, HSG A (PWA-1, PWA-3, PWA-5A, PWA-5B, PWA-5C, PWA-5D, PWA-5E, PWA-5F, PWA-5G, PWA-5H, PWA-5I, PWA-6, PWA-7, PWA-8A, PWA-8B)
0.79	61	>75% Grass cover, Good, HSG B (PWA-1, PWA-5C, PWA-5D, PWA-5E, PWA-5I)
0.92	30	Brush, Good, HSG A (PWA-4, PWA-5E, PWA-6, PWA-7, PWA-8A)
7.09	98	Paved parking, HSG A (PWA-5B, PWA-5C, PWA-5D, PWA-5F, PWA-5G, PWA-5H, PWA-5I, PWA-8B)
0.03	98	Paved parking, HSG B (PWA-5C, PWA-5I)
4.26	98	Roofs, HSG A (PWA-5B, PWA-5C, PWA-5D, PWA-5F, PWA-5H, PWA-5I, PWA-8B)
0.11	98	Roofs, HSG B (PWA-5C, PWA-5I)
9.73	30	Woods, Good, HSG A (PWA-1, PWA-3, PWA-4, PWA-5A, PWA-5C, PWA-5D, PWA-5E, PWA-5I, PWA-6, PWA-7, PWA-8A)
0.84	55	Woods, Good, HSG B (PWA-1, PWA-5C, PWA-5E, PWA-5I)
35.34	**56**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
33.57	HSG A	PWA-1, PWA-3, PWA-4, PWA-5A, PWA-5B, PWA-5C, PWA-5D, PWA-5E, PWA-5F, PWA-5G, PWA-5H, PWA-5I, PWA-6, PWA-7, PWA-8A, PWA-8B
1.77	HSG B	PWA-1, PWA-5C, PWA-5D, PWA-5E, PWA-5I
0.00	HSG C	
0.00	HSG D	
0.00	Other	
35.34		**TOTAL AREA**

Time span=5.00-32.00 hrs, dt=0.05 hrs, 541 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPWA-1: Runoff Area=4.46 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=397' Tc=13.7 min CN=37 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-3: Runoff Area=0.28 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=80' Slope=0.1000 '/' Tc=6.6 min CN=33 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-4: Runoff Area=0.31 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-5A: Runoff Area=0.58 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=34 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-5B: Runoff Area=2.44 ac 52.05% Impervious Runoff Depth=0.76"
Flow Length=705' Tc=8.7 min CN=70 Runoff=1.71 cfs 0.154 af

SubcatchmentPWA-5C: Runoff Area=4.88 ac 53.48% Impervious Runoff Depth=0.86"
Tc=6.0 min CN=72 Runoff=4.41 cfs 0.348 af

SubcatchmentPWA-5D: Runoff Area=4.29 ac 17.02% Impervious Runoff Depth=0.04"
Flow Length=395' Tc=13.1 min CN=46 Runoff=0.02 cfs 0.015 af

SubcatchmentPWA-5E: Runoff Area=1.78 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=230' Tc=9.6 min CN=34 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-5F: Runoff Area=1.52 ac 71.71% Impervious Runoff Depth=1.38"
Tc=6.0 min CN=81 Runoff=2.39 cfs 0.174 af

SubcatchmentPWA-5G: Runoff Area=0.47 ac 42.55% Impervious Runoff Depth=0.50"
Tc=6.0 min CN=64 Runoff=0.20 cfs 0.020 af

SubcatchmentPWA-5H: Runoff Area=0.84 ac 70.24% Impervious Runoff Depth=1.31"
Tc=6.0 min CN=80 Runoff=1.25 cfs 0.092 af

SubcatchmentPWA-5I: Runoff Area=3.75 ac 42.67% Impervious Runoff Depth=0.50"
Flow Length=1,000' Tc=22.8 min CN=64 Runoff=1.04 cfs 0.158 af

SubcatchmentPWA-6: Runoff Area=1.80 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=175' Tc=9.6 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-7: Runoff Area=0.87 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=267' Tc=13.2 min CN=31 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-8A: Runoff Area=1.40 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=100' Tc=8.5 min CN=31 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-8B: Runoff Area=5.67 ac 59.96% Impervious Runoff Depth=0.96"
Tc=6.0 min CN=74 Runoff=5.90 cfs 0.453 af

Reach 3R: 'Wetland Series J' Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
18.0" Round Pipe n=0.013 L=143.0' S=0.0070 '/' Capacity=8.78 cfs Outflow=0.00 cfs 0.000 af

Reach DP-1: Northern Wetlands Culvert Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-3: #48 Rinzee Rd Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-4: Poppy Ln Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: Wetland Series 'A' Inflow=0.00 cfs 0.007 af
Outflow=0.00 cfs 0.007 af

Reach DP-6: Wetland Series 'B' & 'C' Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-7: #4 Poppy Ln Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-8: Wetland Series 'D' & 'E' Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond IB-1: Peak Elev=138.35' Storage=3,717 cf Inflow=6.02 cfs 0.503 af
Discarded=2.15 cfs 0.503 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=2.15 cfs 0.503 af

Pond IB-2: Peak Elev=145.00' Storage=4 cf Inflow=0.02 cfs 0.015 af
Discarded=0.02 cfs 0.015 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.015 af

Pond IB-3: Peak Elev=144.83' Storage=1,025 cf Inflow=1.25 cfs 0.092 af
Discarded=0.32 cfs 0.092 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.32 cfs 0.092 af

Pond SUB-1: Subsurface System-1 Peak Elev=131.56' Storage=0.015 af Inflow=0.20 cfs 0.020 af
Outflow=0.00 cfs 0.007 af

Pond SUB-2: Subsurface System-2 Peak Elev=135.06' Storage=306 cf Inflow=1.04 cfs 0.158 af
Discarded=0.98 cfs 0.158 af Primary=0.00 cfs 0.000 af Outflow=0.98 cfs 0.158 af

Pond SUB-3: Subsurface System-3 Peak Elev=139.94' Storage=2,150 cf Inflow=2.39 cfs 0.174 af
Discarded=0.44 cfs 0.174 af Primary=0.00 cfs 0.000 af Outflow=0.44 cfs 0.174 af

Pond SUB-4: Subsurface System-4 Peak Elev=133.66' Storage=4,730 cf Inflow=5.90 cfs 0.453 af
Discarded=1.38 cfs 0.453 af Primary=0.00 cfs 0.000 af Outflow=1.38 cfs 0.453 af

Total Runoff Area = 35.34 ac Runoff Volume = 1.414 af Average Runoff Depth = 0.48"
67.49% Pervious = 23.85 ac 32.51% Impervious = 11.49 ac

Time span=5.00-32.00 hrs, dt=0.05 hrs, 541 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPWA-1: Runoff Area=4.46 ac 0.00% Impervious Runoff Depth=0.09"
Flow Length=397' Tc=13.7 min CN=37 Runoff=0.05 cfs 0.033 af

SubcatchmentPWA-3: Runoff Area=0.28 ac 0.00% Impervious Runoff Depth=0.02"
Flow Length=80' Slope=0.1000 '/' Tc=6.6 min CN=33 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-4: Runoff Area=0.31 ac 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-5A: Runoff Area=0.58 ac 0.00% Impervious Runoff Depth=0.03"
Tc=6.0 min CN=34 Runoff=0.00 cfs 0.002 af

SubcatchmentPWA-5B: Runoff Area=2.44 ac 52.05% Impervious Runoff Depth=1.80"
Flow Length=705' Tc=8.7 min CN=70 Runoff=4.48 cfs 0.366 af

SubcatchmentPWA-5C: Runoff Area=4.88 ac 53.48% Impervious Runoff Depth=1.95"
Tc=6.0 min CN=72 Runoff=10.82 cfs 0.795 af

SubcatchmentPWA-5D: Runoff Area=4.29 ac 17.02% Impervious Runoff Depth=0.39"
Flow Length=395' Tc=13.1 min CN=46 Runoff=0.66 cfs 0.138 af

SubcatchmentPWA-5E: Runoff Area=1.78 ac 0.00% Impervious Runoff Depth=0.03"
Flow Length=230' Tc=9.6 min CN=34 Runoff=0.01 cfs 0.005 af

SubcatchmentPWA-5F: Runoff Area=1.52 ac 71.71% Impervious Runoff Depth=2.70"
Tc=6.0 min CN=81 Runoff=4.72 cfs 0.343 af

SubcatchmentPWA-5G: Runoff Area=0.47 ac 42.55% Impervious Runoff Depth=1.38"
Tc=6.0 min CN=64 Runoff=0.69 cfs 0.054 af

SubcatchmentPWA-5H: Runoff Area=0.84 ac 70.24% Impervious Runoff Depth=2.62"
Tc=6.0 min CN=80 Runoff=2.53 cfs 0.183 af

SubcatchmentPWA-5I: Runoff Area=3.75 ac 42.67% Impervious Runoff Depth=1.38"
Flow Length=1,000' Tc=22.8 min CN=64 Runoff=3.55 cfs 0.430 af

SubcatchmentPWA-6: Runoff Area=1.80 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=175' Tc=9.6 min CN=30 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-7: Runoff Area=0.87 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=267' Tc=13.2 min CN=31 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-8A: Runoff Area=1.40 ac 0.00% Impervious Runoff Depth=0.00"
Flow Length=100' Tc=8.5 min CN=31 Runoff=0.00 cfs 0.000 af

SubcatchmentPWA-8B: Runoff Area=5.67 ac 59.96% Impervious Runoff Depth=2.11"
Tc=6.0 min CN=74 Runoff=13.67 cfs 0.998 af

Reach 3R: 'Wetland Series J' Avg. Flow Depth=0.03' Max Vel=0.73 fps Inflow=0.01 cfs 0.005 af
18.0" Round Pipe n=0.013 L=143.0' S=0.0070 '/' Capacity=8.78 cfs Outflow=0.01 cfs 0.005 af

Reach DP-1: Northern Wetlands Culvert Inflow=0.05 cfs 0.033 af
Outflow=0.05 cfs 0.033 af

Reach DP-3: #48 Rinzee Rd Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-4: Poppy Ln Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-5: Wetland Series 'A' Inflow=0.02 cfs 0.019 af
Outflow=0.02 cfs 0.019 af

Reach DP-6: Wetland Series 'B' & 'C' Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-7: #4 Poppy Ln Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach DP-8: Wetland Series 'D' & 'E' Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond IB-1: Peak Elev=139.26' Storage=15,316 cf Inflow=15.14 cfs 1.161 af
Discarded=2.74 cfs 1.161 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=2.74 cfs 1.161 af

Pond IB-2: Peak Elev=145.06' Storage=178 cf Inflow=0.66 cfs 0.138 af
Discarded=0.54 cfs 0.138 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.54 cfs 0.138 af

Pond IB-3: Peak Elev=145.59' Storage=2,600 cf Inflow=2.53 cfs 0.183 af
Discarded=0.47 cfs 0.183 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.47 cfs 0.183 af

Pond SUB-1: Subsurface System-1 Peak Elev=132.68' Storage=0.046 af Inflow=0.69 cfs 0.054 af
Outflow=0.01 cfs 0.013 af

Pond SUB-2: Subsurface System-2 Peak Elev=135.86' Storage=4,623 cf Inflow=3.55 cfs 0.430 af
Discarded=1.03 cfs 0.430 af Primary=0.00 cfs 0.000 af Outflow=1.03 cfs 0.430 af

Pond SUB-3: Subsurface System-3 Peak Elev=141.55' Storage=5,806 cf Inflow=4.72 cfs 0.343 af
Discarded=0.44 cfs 0.343 af Primary=0.00 cfs 0.000 af Outflow=0.44 cfs 0.343 af

Pond SUB-4: Subsurface System-4 Peak Elev=135.27' Storage=16,354 cf Inflow=13.67 cfs 0.998 af
Discarded=1.38 cfs 0.998 af Primary=0.00 cfs 0.000 af Outflow=1.38 cfs 0.998 af

Total Runoff Area = 35.34 ac Runoff Volume = 3.347 af Average Runoff Depth = 1.14"
67.49% Pervious = 23.85 ac 32.51% Impervious = 11.49 ac

Summary for Subcatchment PWA-1:

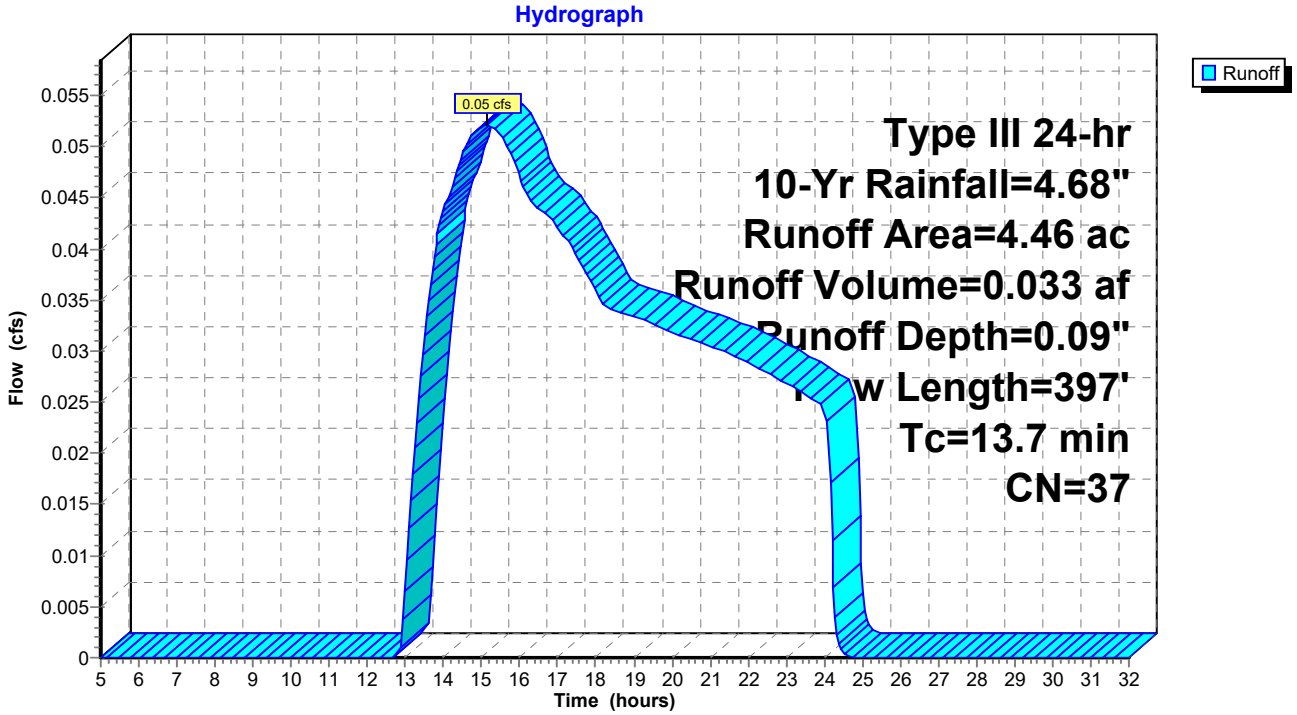
Runoff = 0.05 cfs @ 15.11 hrs, Volume= 0.033 af, Depth= 0.09"
Routed to Reach DP-1 : Northern Wetlands Culvert

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
0.29	61	>75% Grass cover, Good, HSG B
0.55	39	>75% Grass cover, Good, HSG A
2.97	30	Woods, Good, HSG A
0.65	55	Woods, Good, HSG B
4.46	37	Weighted Average
4.46		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.5	50	0.0650	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
6.2	347	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.7	397	Total			

Subcatchment PWA-1:



Summary for Subcatchment PWA-3:

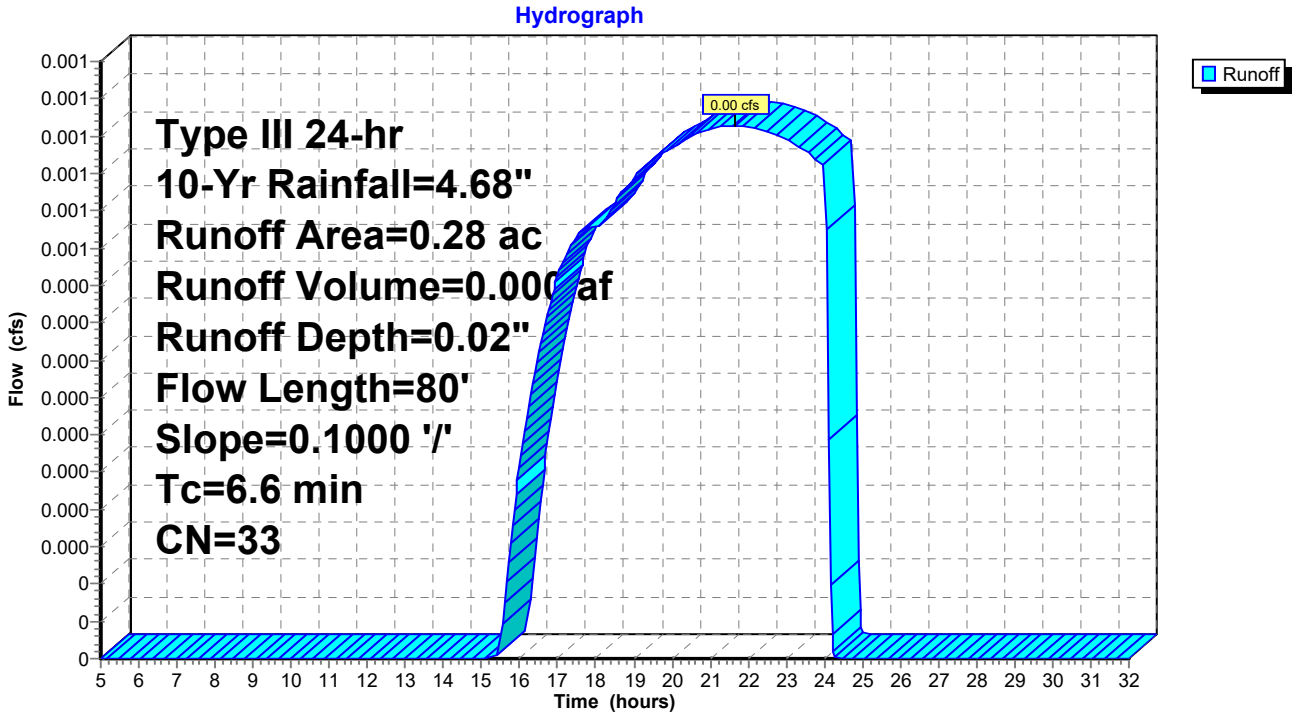
Runoff = 0.00 cfs @ 21.65 hrs, Volume= 0.000 af, Depth= 0.02"
Routed to Reach DP-3 : #48 Rinzee Rd

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
0.09	39	>75% Grass cover, Good, HSG A
0.19	30	Woods, Good, HSG A
0.28	33	Weighted Average
0.28		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
0.3	30	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.6	80	Total			

Subcatchment PWA-3:



Summary for Subcatchment PWA-4:

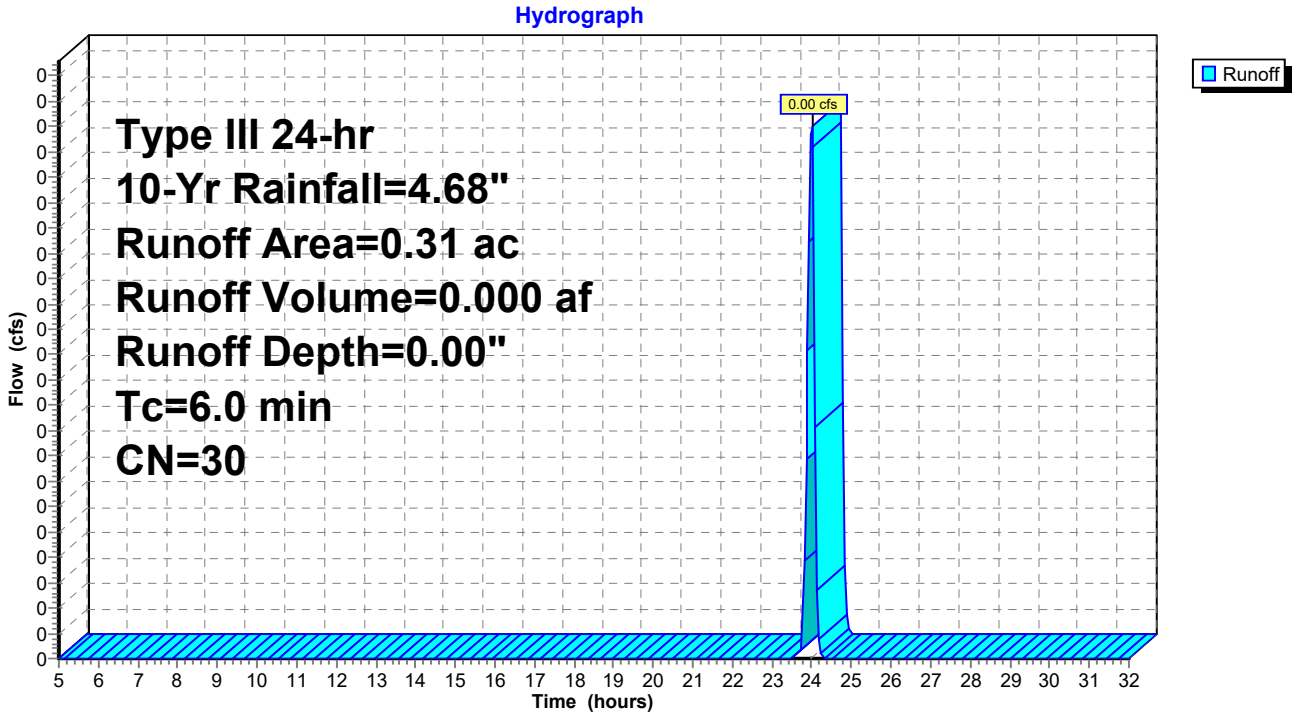
Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-4 : Poppy Ln

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
0.17	30	Brush, Good, HSG A
0.14	30	Woods, Good, HSG A
0.31	30	Weighted Average
0.31		100.00% Pervious Area

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

Subcatchment PWA-4:



Summary for Subcatchment PWA-5A:

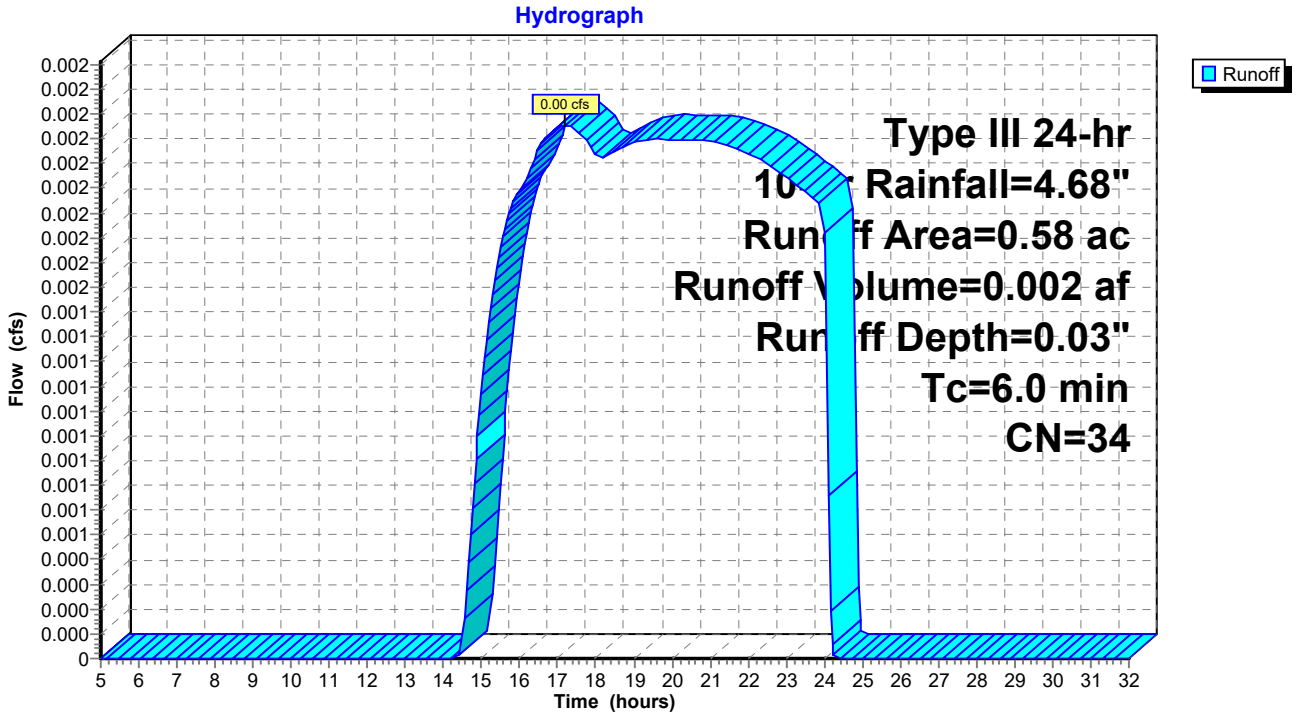
Runoff = 0.00 cfs @ 17.19 hrs, Volume= 0.002 af, Depth= 0.03"
Routed to Reach DP-5 : Wetland Series 'A'

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
0.33	30	Woods, Good, HSG A
0.25	39	>75% Grass cover, Good, HSG A
0.58	34	Weighted Average
0.58		100.00% Pervious Area

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

Subcatchment PWA-5A:



Summary for Subcatchment PWA-5B:

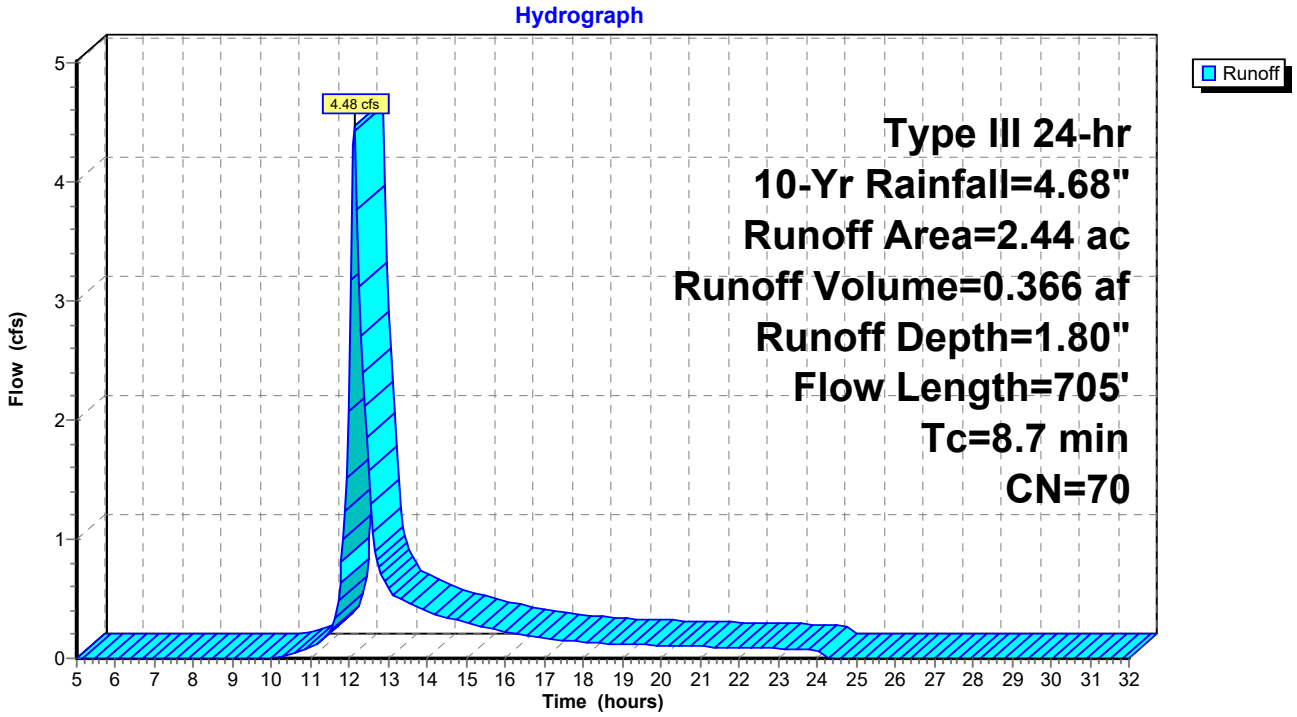
Runoff = 4.48 cfs @ 12.13 hrs, Volume= 0.366 af, Depth= 1.80"
Routed to Pond IB-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
1.17	39	>75% Grass cover, Good, HSG A
0.37	98	Roofs, HSG A
0.90	98	Paved parking, HSG A
2.44	70	Weighted Average
1.17		47.95% Pervious Area
1.27		52.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0360	0.19		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.40"
0.3	60	0.0400	3.00		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
1.1	265	0.0750	4.11		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
3.0	330	0.0150	1.84		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
8.7	705	Total			

Subcatchment PWA-5B:



Summary for Subcatchment PWA-5C:

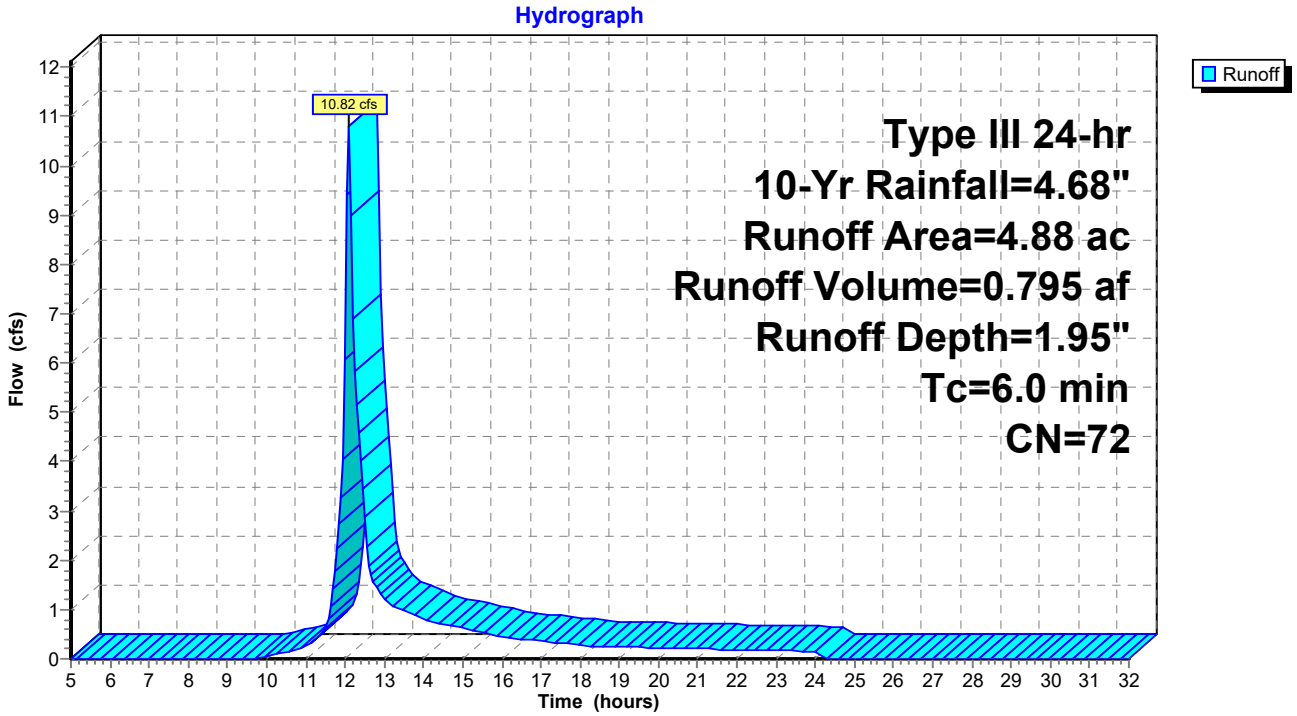
Runoff = 10.82 cfs @ 12.10 hrs, Volume= 0.795 af, Depth= 1.95"
Routed to Pond IB-1 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
1.97	39	>75% Grass cover, Good, HSG A
0.23	61	>75% Grass cover, Good, HSG B
0.01	30	Woods, Good, HSG A
0.06	55	Woods, Good, HSG B
0.94	98	Roofs, HSG A
0.07	98	Roofs, HSG B
1.58	98	Paved parking, HSG A
0.02	98	Paved parking, HSG B
4.88	72	Weighted Average
2.27		46.52% Pervious Area
2.61		53.48% Impervious Area

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

Subcatchment PWA-5C:



Summary for Subcatchment PWA-5D:

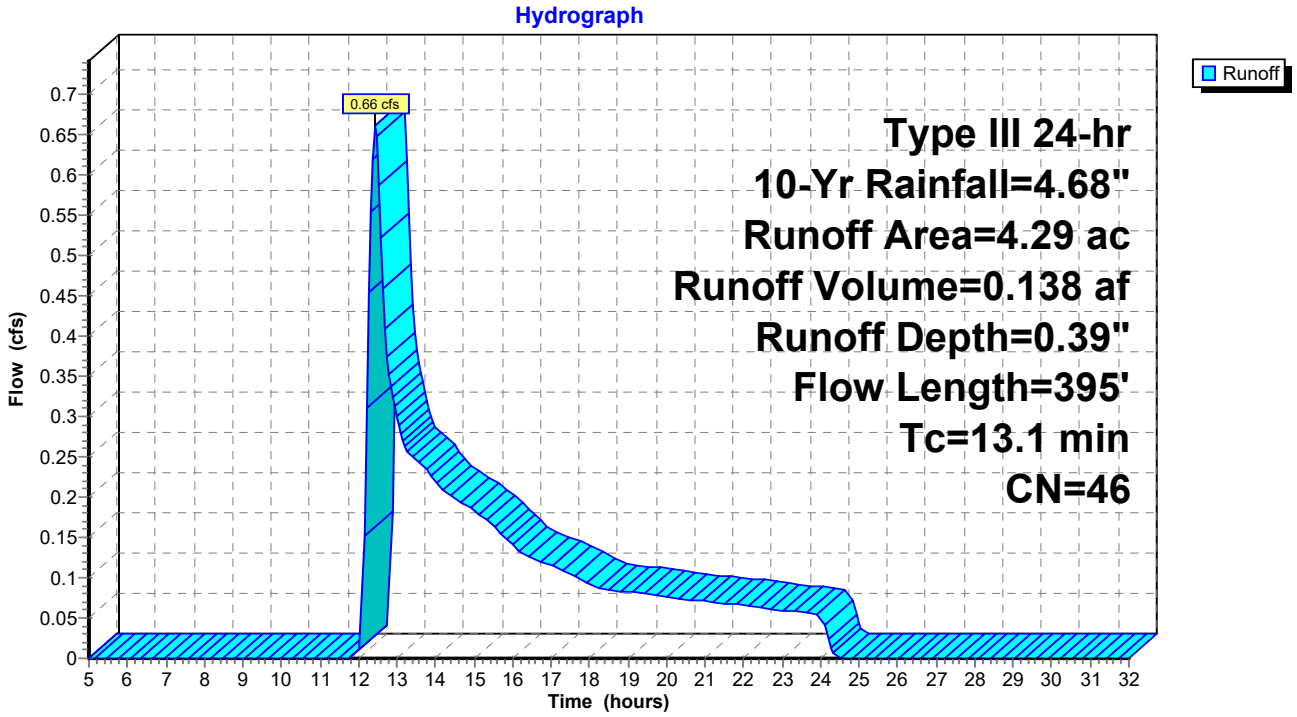
Runoff = 0.66 cfs @ 12.43 hrs, Volume= 0.138 af, Depth= 0.39"
Routed to Pond IB-2 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
1.61	39	>75% Grass cover, Good, HSG A
0.16	61	>75% Grass cover, Good, HSG B
1.79	30	Woods, Good, HSG A
0.24	98	Roofs, HSG A
0.49	98	Paved parking, HSG A
4.29	46	Weighted Average
3.56		82.98% Pervious Area
0.73		17.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
5.1	245	0.0260	0.81		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
1.7	100	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.1	395	Total			

Subcatchment PWA-5D:



Summary for Subcatchment PWA-5E:

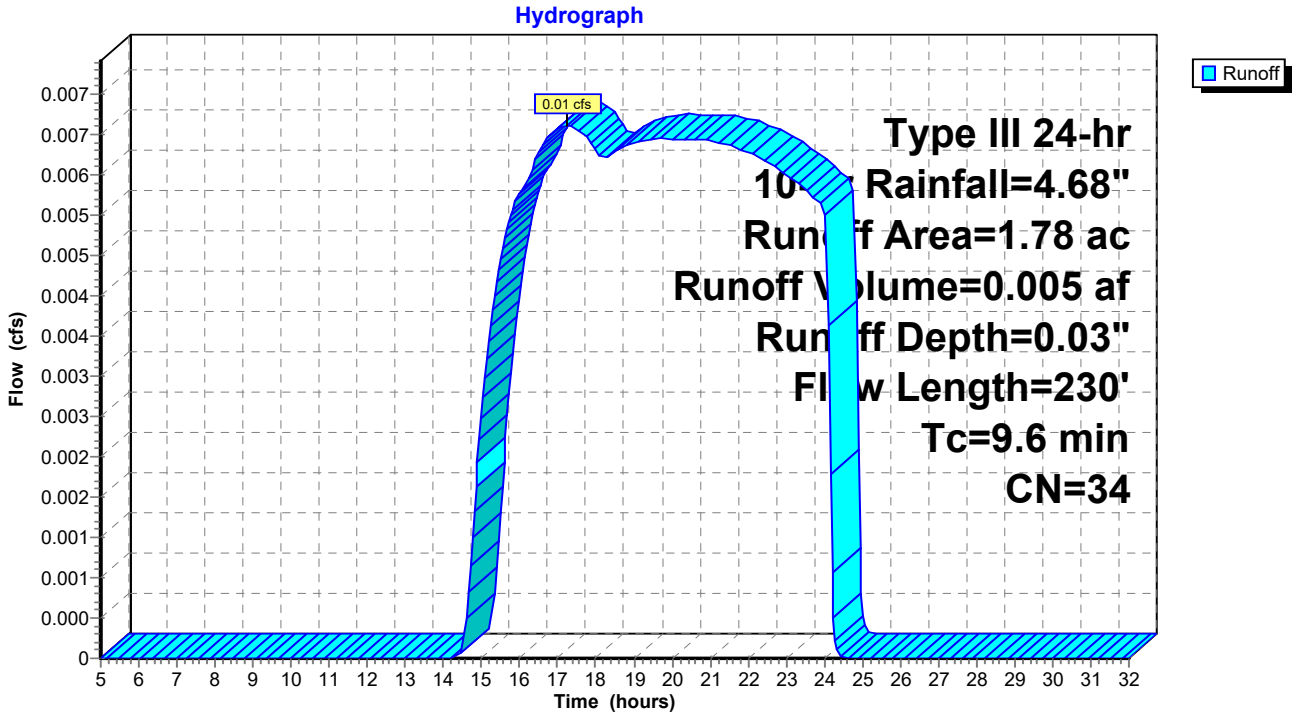
Runoff = 0.01 cfs @ 17.24 hrs, Volume= 0.005 af, Depth= 0.03"
Routed to Reach 3R : 'Wetland Series J'

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
0.49	39	>75% Grass cover, Good, HSG A
0.04	61	>75% Grass cover, Good, HSG B
0.19	30	Brush, Good, HSG A
0.98	30	Woods, Good, HSG A
0.08	55	Woods, Good, HSG B
1.78	34	Weighted Average
1.78		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0100	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.40"
0.3	30	0.0600	1.71		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.9	110	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.2	40	0.3700	4.26		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.6	230	Total			

Subcatchment PWA-5E:



Summary for Subcatchment PWA-5F:

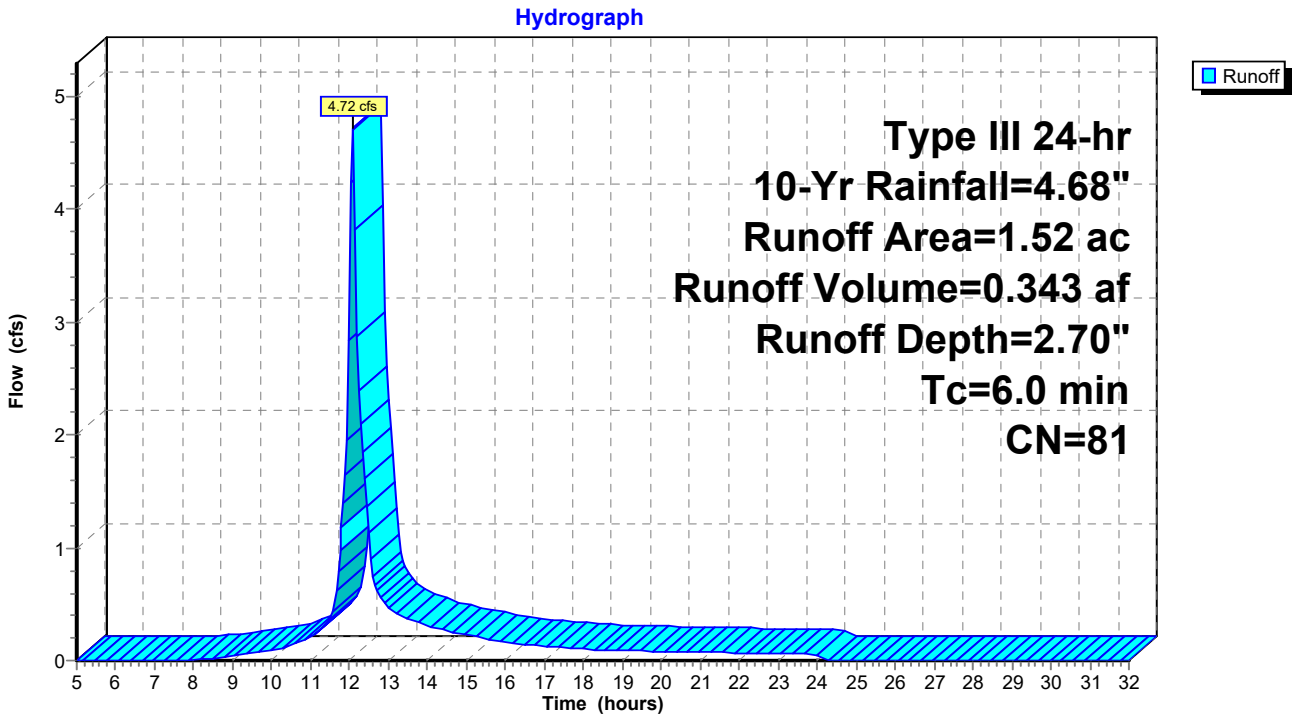
Runoff = 4.72 cfs @ 12.09 hrs, Volume= 0.343 af, Depth= 2.70"
Routed to Pond SUB-3 : Subsurface System-3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
0.43	39	>75% Grass cover, Good, HSG A
0.40	98	Roofs, HSG A
0.69	98	Paved parking, HSG A
1.52	81	Weighted Average
0.43		28.29% Pervious Area
1.09		71.71% Impervious Area

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

Subcatchment PWA-5F:



Summary for Subcatchment PWA-5G:

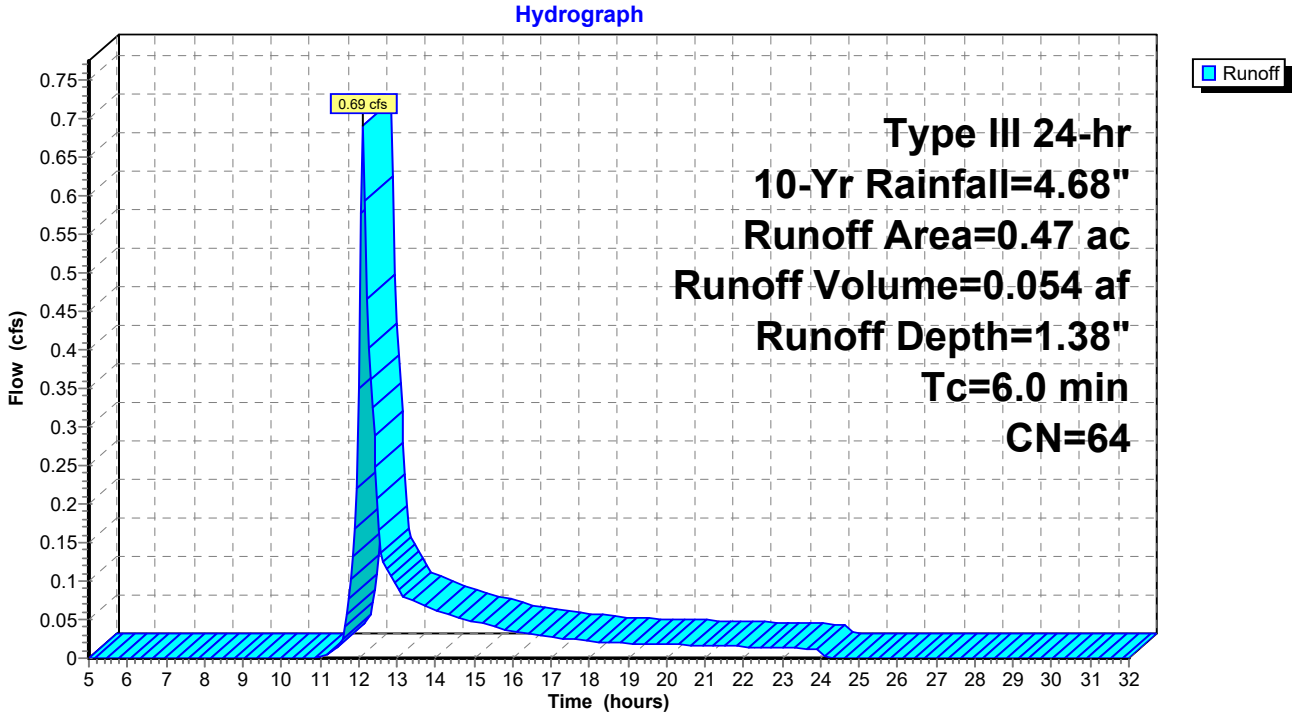
Runoff = 0.69 cfs @ 12.10 hrs, Volume= 0.054 af, Depth= 1.38"
Routed to Pond SUB-1 : Subsurface System-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
0.27	39	>75% Grass cover, Good, HSG A
0.20	98	Paved parking, HSG A
0.47	64	Weighted Average
0.27		57.45% Pervious Area
0.20		42.55% Impervious Area

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

Subcatchment PWA-5G:



Summary for Subcatchment PWA-5H:

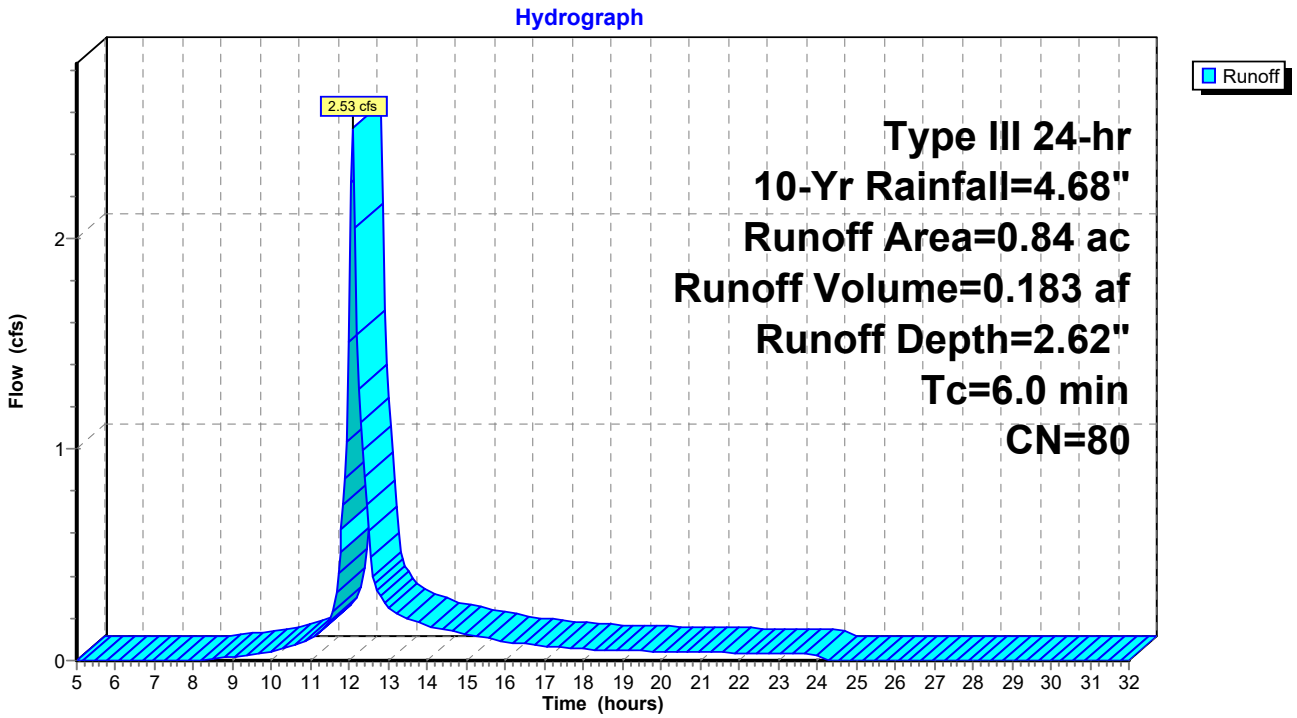
Runoff = 2.53 cfs @ 12.09 hrs, Volume= 0.183 af, Depth= 2.62"
Routed to Pond IB-3 :

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
0.25	39	>75% Grass cover, Good, HSG A
0.23	98	Roofs, HSG A
0.36	98	Paved parking, HSG A
0.84	80	Weighted Average
0.25		29.76% Pervious Area
0.59		70.24% Impervious Area

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

Subcatchment PWA-5H:



Summary for Subcatchment PWA-5I:

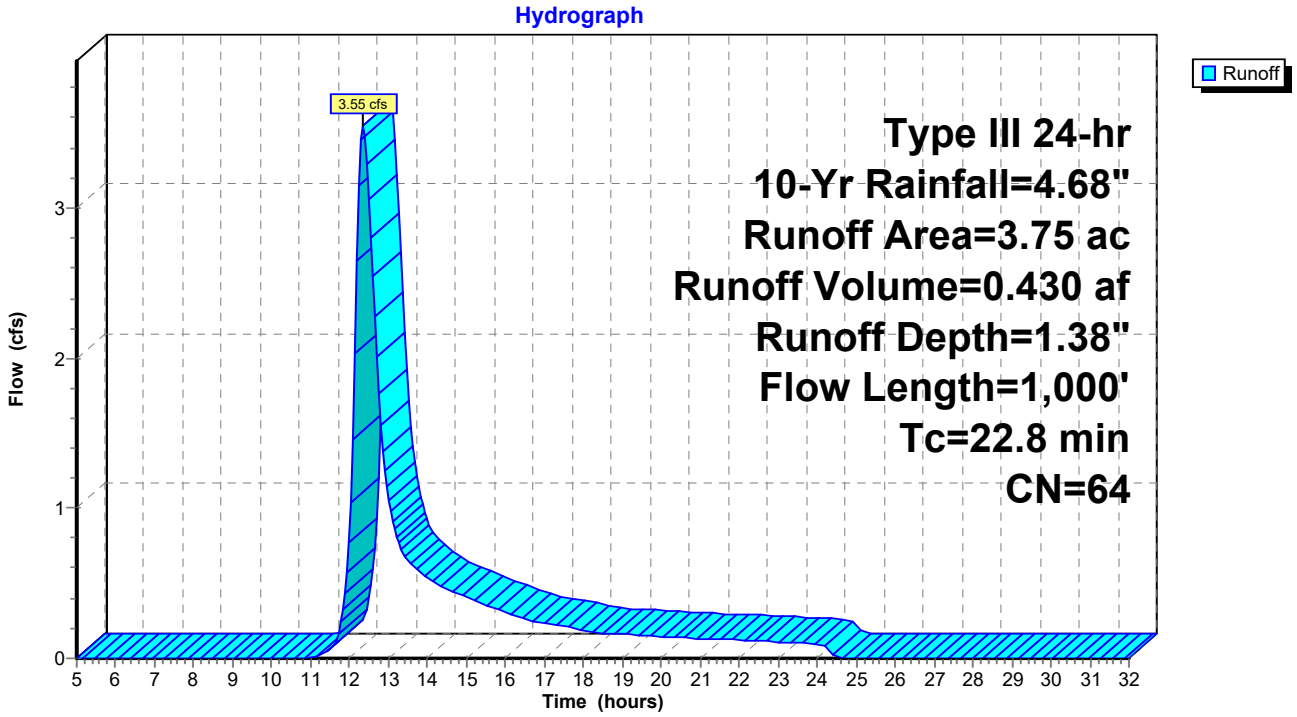
Runoff = 3.55 cfs @ 12.35 hrs, Volume= 0.430 af, Depth= 1.38"
Routed to Pond SUB-2 : Subsurface System-2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
0.20	30	Woods, Good, HSG A
0.05	55	Woods, Good, HSG B
1.83	39	>75% Grass cover, Good, HSG A
0.07	61	>75% Grass cover, Good, HSG B
0.62	98	Roofs, HSG A
0.04	98	Roofs, HSG B
0.93	98	Paved parking, HSG A
0.01	98	Paved parking, HSG B
3.75	64	Weighted Average
2.15		57.33% Pervious Area
1.60		42.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.40"
17.3	950	0.0170	0.91		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
22.8	1,000	Total			

Subcatchment PWA-5l:



Summary for Subcatchment PWA-6:

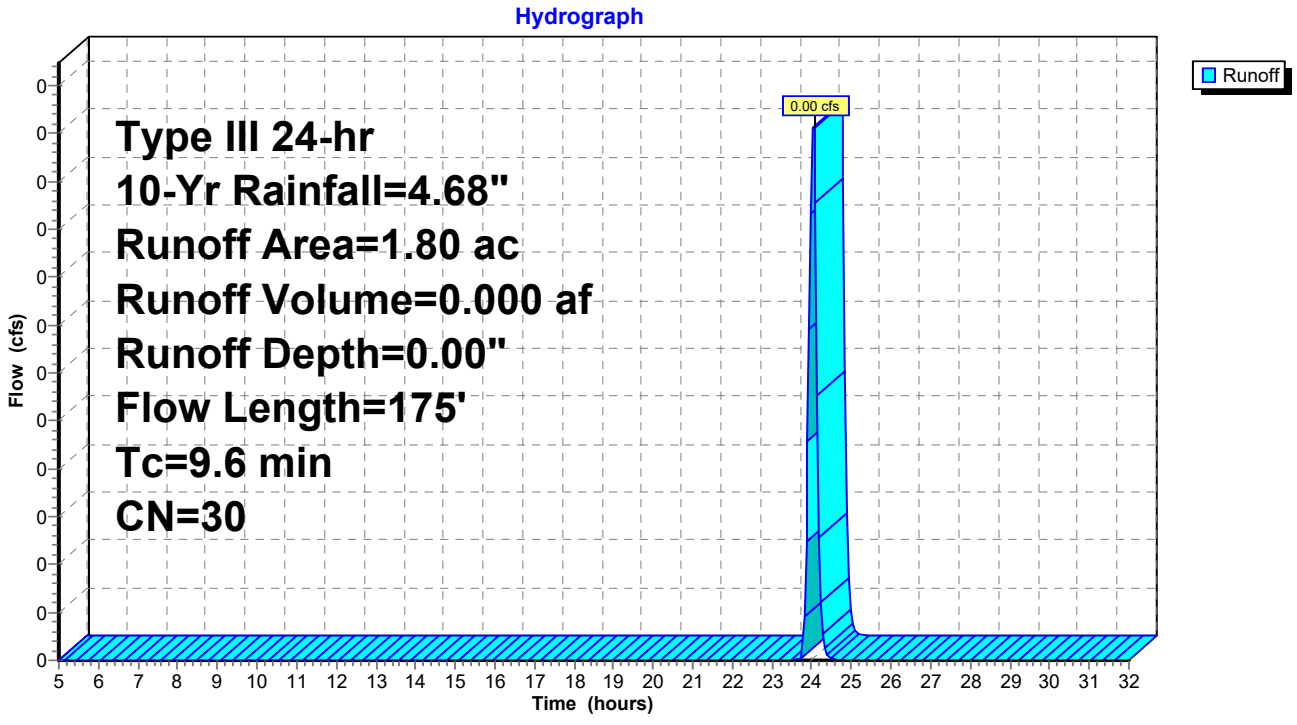
Runoff = 0.00 cfs @ 24.05 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-6 : Wetland Series 'B' & 'C'

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
0.07	39	>75% Grass cover, Good, HSG A
1.45	30	Woods, Good, HSG A
0.28	30	Brush, Good, HSG A
1.80	30	Weighted Average
1.80		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.7	50	0.0600	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
1.9	125	0.0500	1.12		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.6	175	Total			

Subcatchment PWA-6:



Summary for Subcatchment PWA-7:

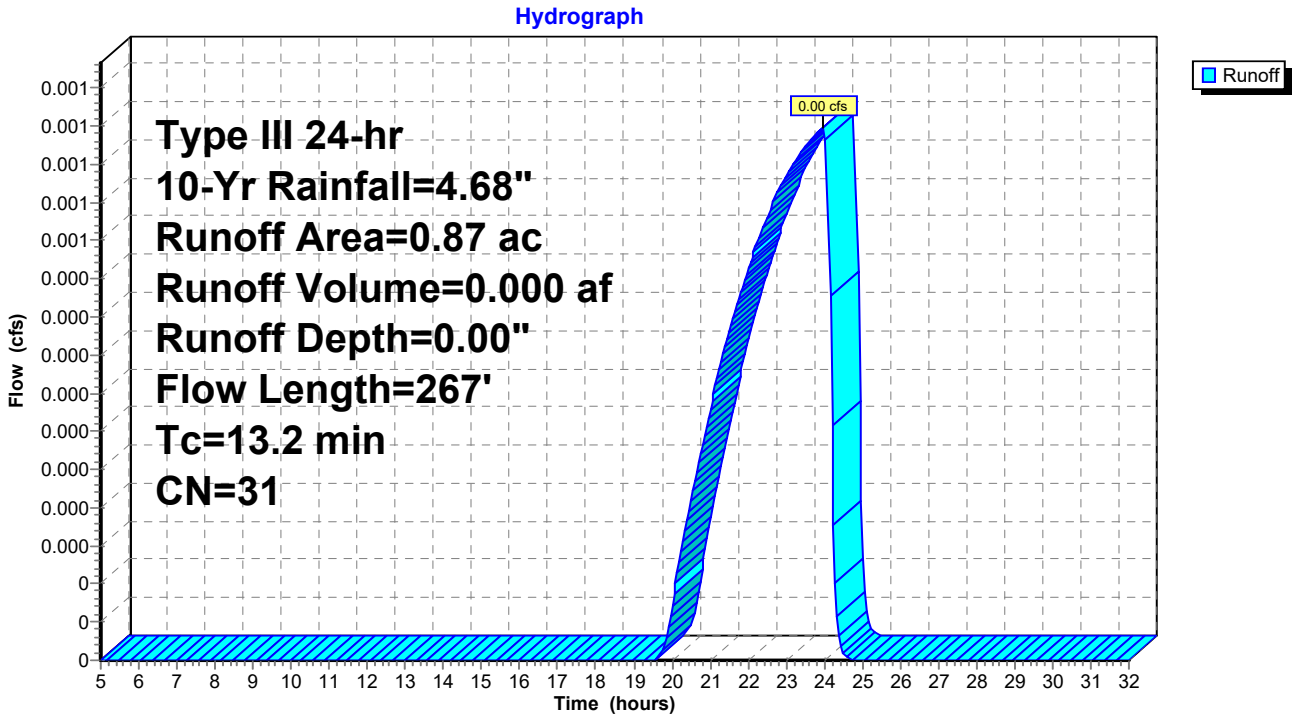
Runoff = 0.00 cfs @ 23.99 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-7 : #4 Poppy Ln

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
0.54	30	Woods, Good, HSG A
0.14	39	>75% Grass cover, Good, HSG A
0.19	30	Brush, Good, HSG A
0.87	31	Weighted Average
0.87		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.2	50	0.0300	0.08		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.40"
3.0	217	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.2	267	Total			

Subcatchment PWA-7:



Summary for Subcatchment PWA-8A:

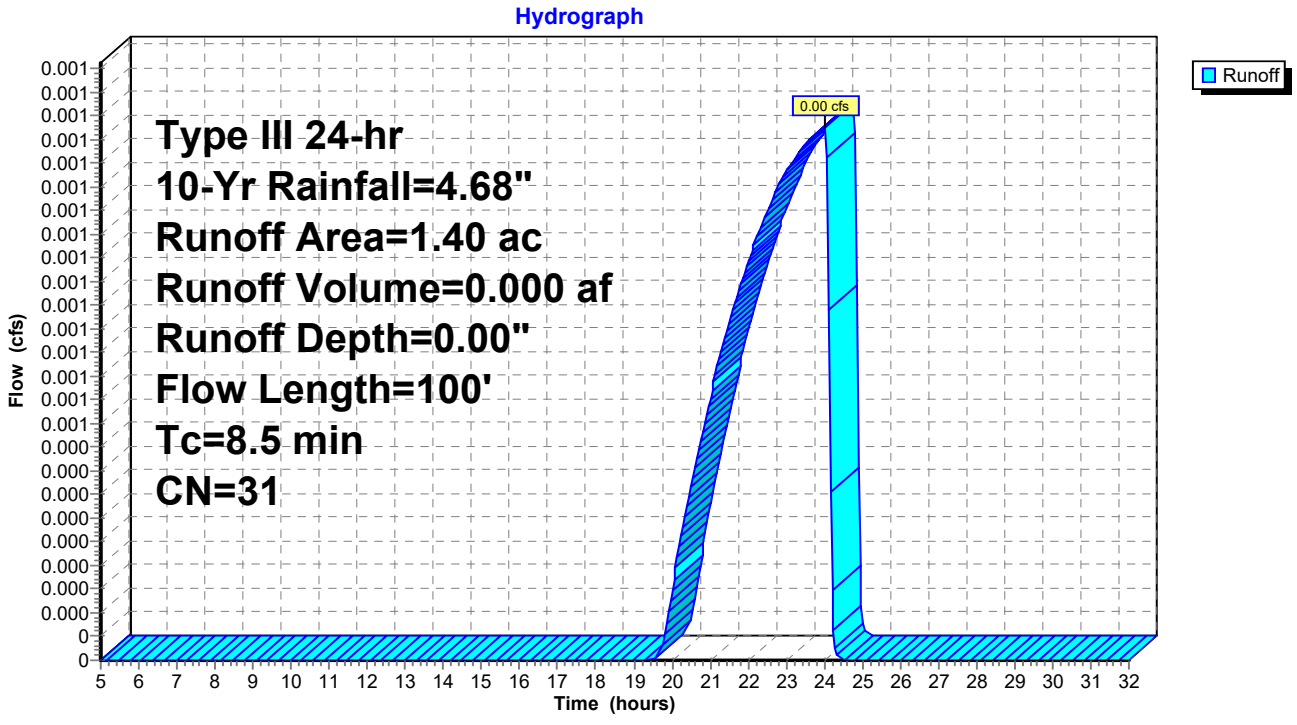
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-8 : Wetland Series 'D' & 'E'

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
1.13	30	Woods, Good, HSG A
0.18	39	>75% Grass cover, Good, HSG A
0.09	30	Brush, Good, HSG A
1.40	31	Weighted Average
1.40		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.40"
0.5	50	0.1200	1.73		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.5	100	Total			

Subcatchment PWA-8A:



Summary for Subcatchment PWA-8B:

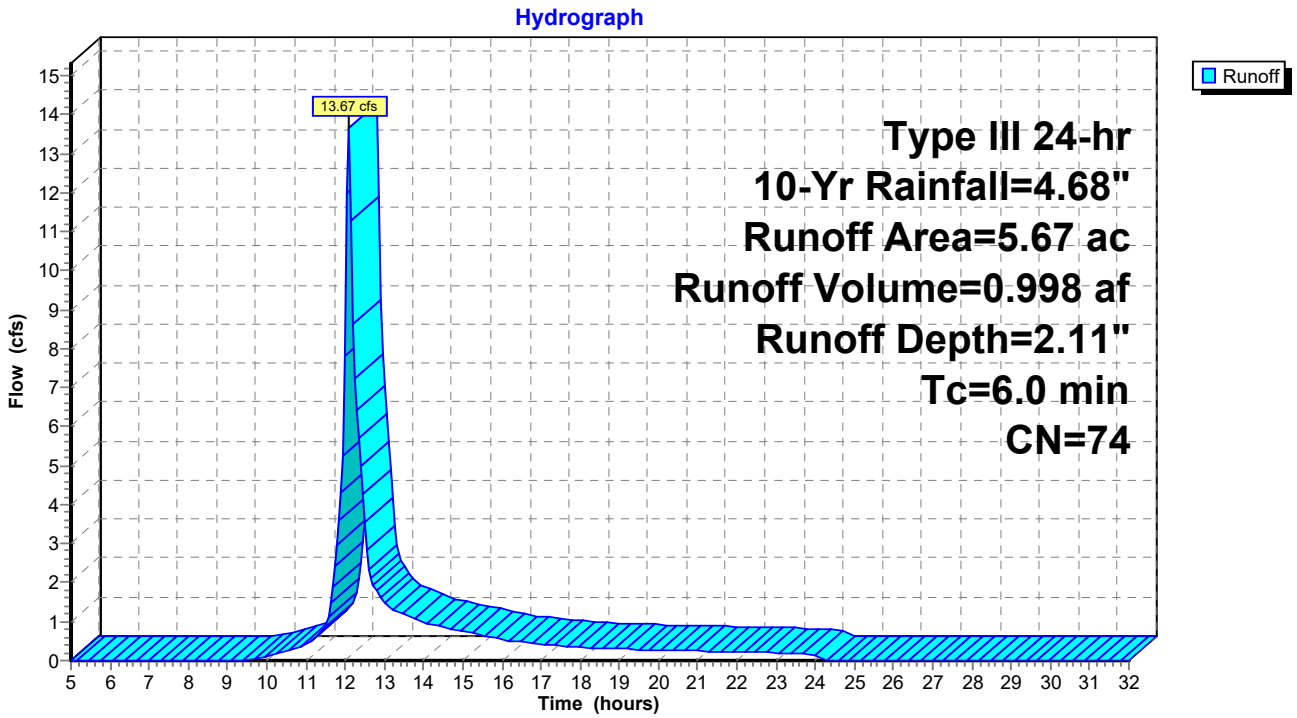
Runoff = 13.67 cfs @ 12.10 hrs, Volume= 0.998 af, Depth= 2.11"
Routed to Pond SUB-4 : Subsurface System-4

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Yr Rainfall=4.68"

Area (ac)	CN	Description
2.27	39	>75% Grass cover, Good, HSG A
1.46	98	Roofs, HSG A
1.94	98	Paved parking, HSG A
5.67	74	Weighted Average
2.27		40.04% Pervious Area
3.40		59.96% Impervious Area

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

Subcatchment PWA-8B:



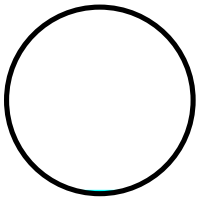
Summary for Reach 3R: 'Wetland Series J'

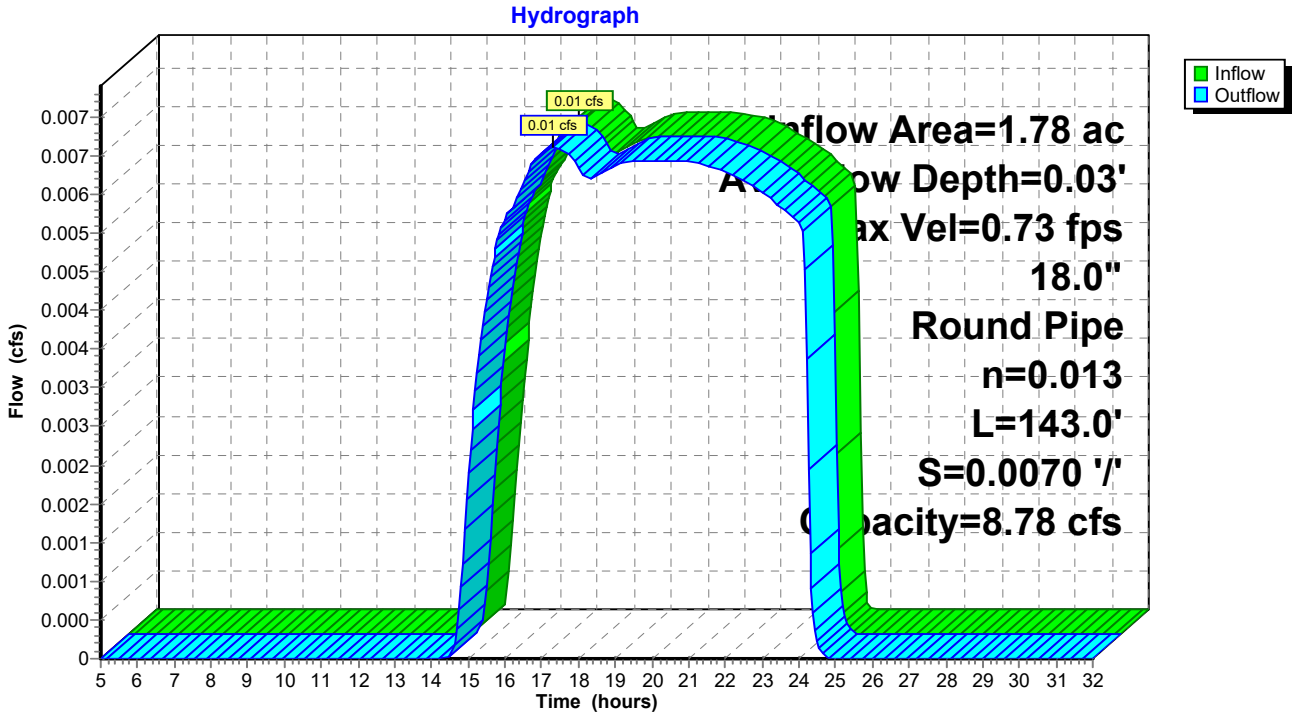
Inflow Area = 1.78 ac, 0.00% Impervious, Inflow Depth = 0.03" for 10-Yr event
Inflow = 0.01 cfs @ 17.24 hrs, Volume= 0.005 af
Outflow = 0.01 cfs @ 17.33 hrs, Volume= 0.005 af, Atten= 0%, Lag= 5.2 min
Routed to Reach DP-5 : Wetland Series 'A'

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.73 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 3.5 min

Peak Storage= 1 cf @ 17.27 hrs
Average Depth at Peak Storage= 0.03' , Surface Width= 0.43'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 8.78 cfs

18.0" Round Pipe
n= 0.013
Length= 143.0' Slope= 0.0070 '/'
Inlet Invert= 136.00', Outlet Invert= 135.00'



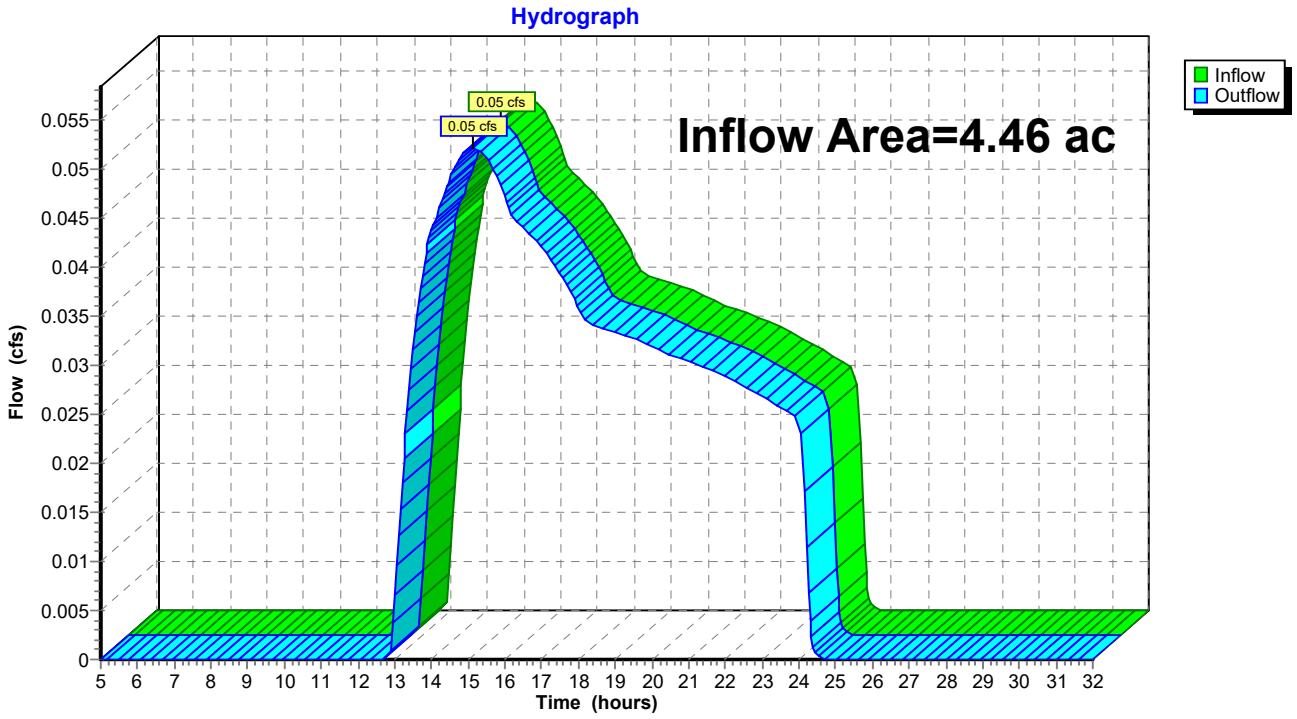


Summary for Reach DP-1: Northern Wetlands Culvert

Inflow Area = 4.46 ac, 0.00% Impervious, Inflow Depth = 0.09" for 10-Yr event
Inflow = 0.05 cfs @ 15.11 hrs, Volume= 0.033 af
Outflow = 0.05 cfs @ 15.11 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-1: Northern Wetlands Culvert

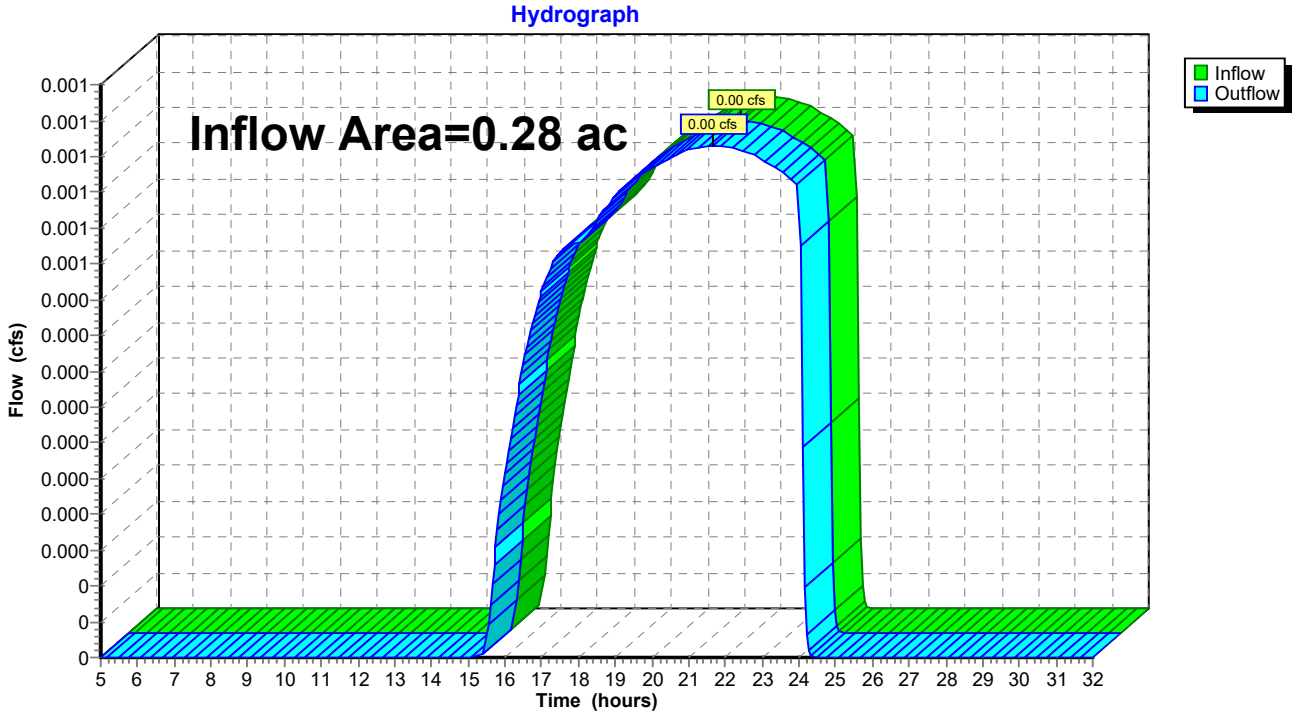


Summary for Reach DP-3: #48 Rinzee Rd

Inflow Area = 0.28 ac, 0.00% Impervious, Inflow Depth = 0.02" for 10-Yr event
Inflow = 0.00 cfs @ 21.65 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 21.65 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-3: #48 Rinzee Rd

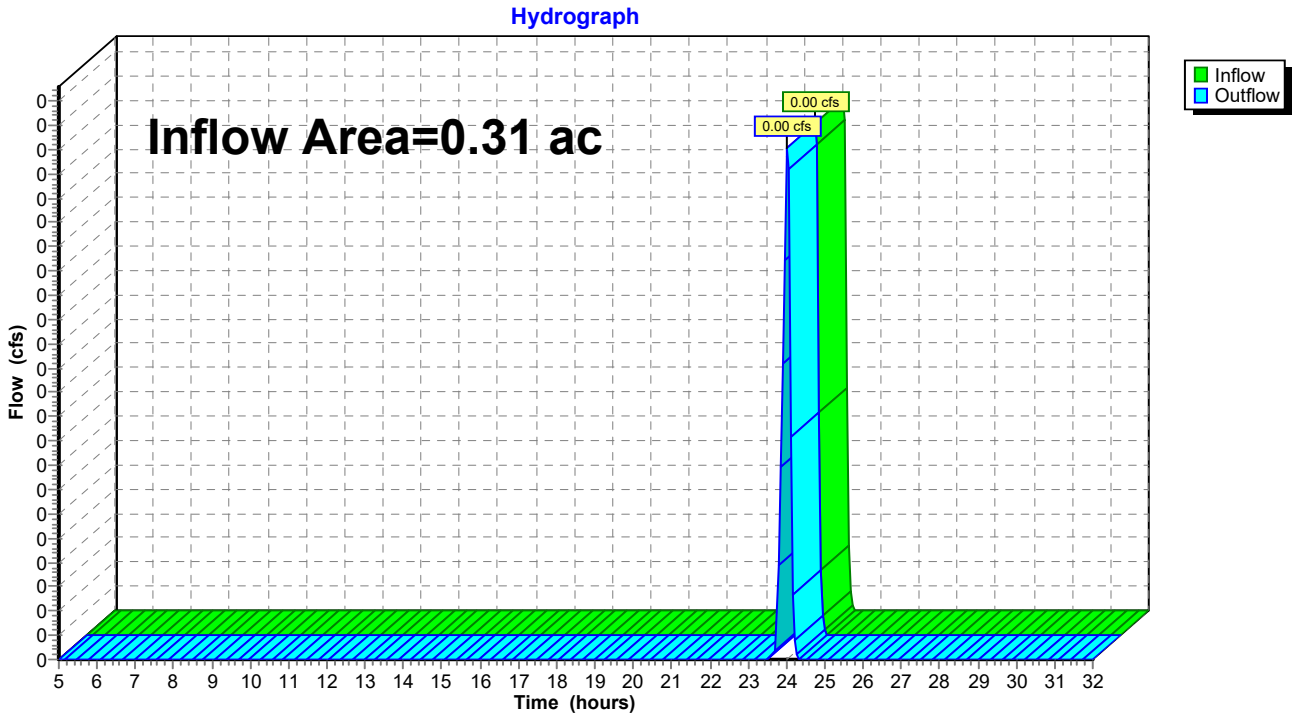


Summary for Reach DP-4: Poppy Ln

Inflow Area = 0.31 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr event
Inflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-4: Poppy Ln

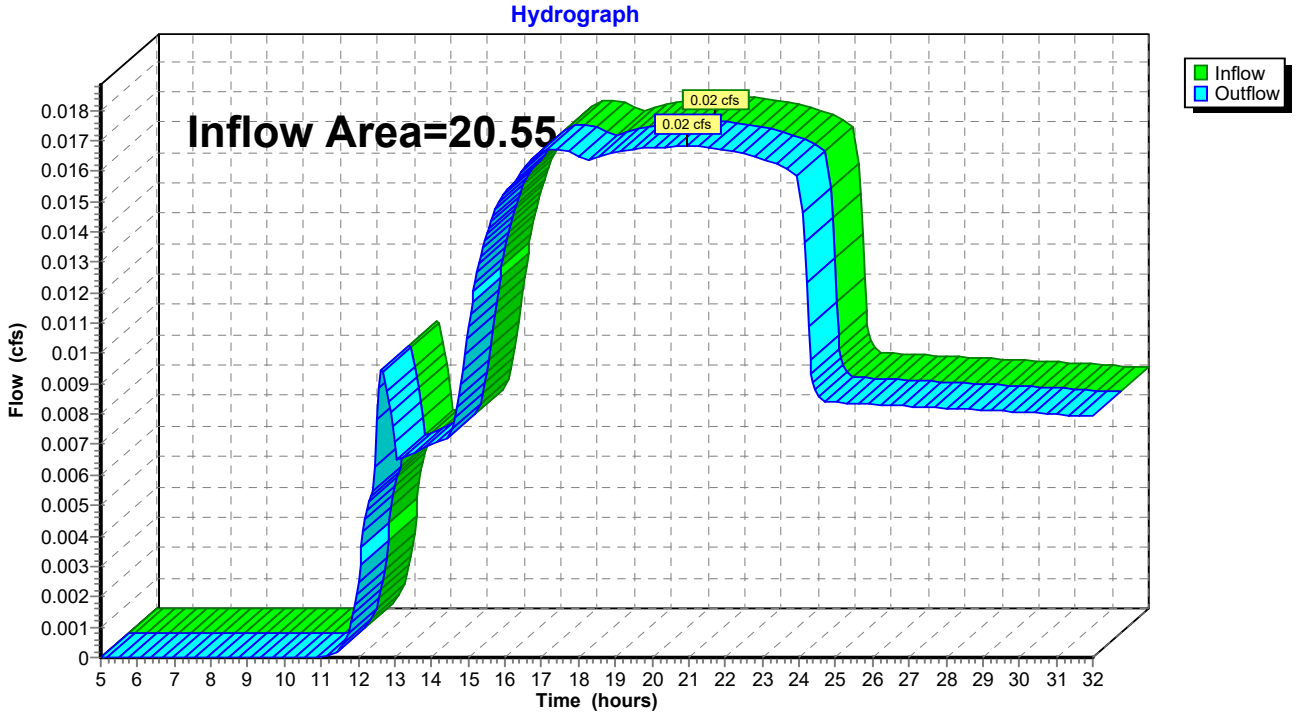


Summary for Reach DP-5: Wetland Series 'A'

Inflow Area = 20.55 ac, 39.37% Impervious, Inflow Depth > 0.01" for 10-Yr event
Inflow = 0.02 cfs @ 20.94 hrs, Volume= 0.019 af
Outflow = 0.02 cfs @ 20.94 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-5: Wetland Series 'A'

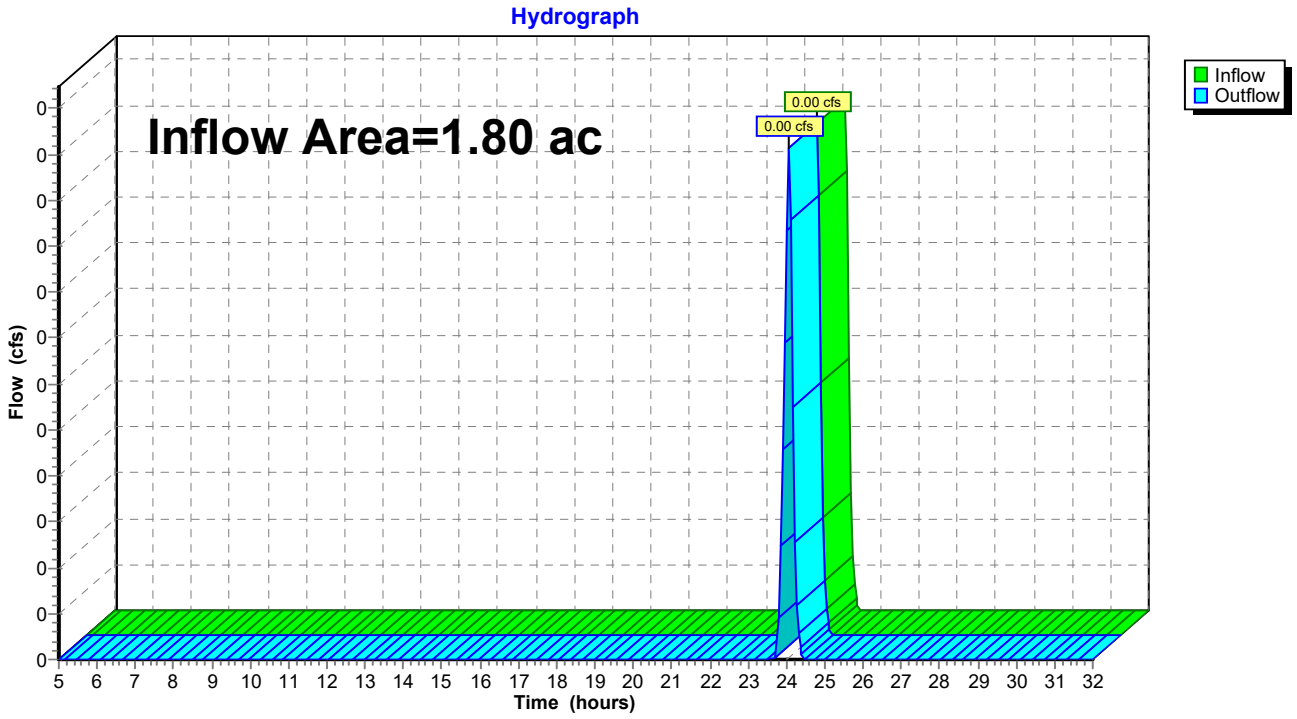


Summary for Reach DP-6: Wetland Series 'B' & 'C'

Inflow Area = 1.80 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr event
Inflow = 0.00 cfs @ 24.05 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.05 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-6: Wetland Series 'B' & 'C'

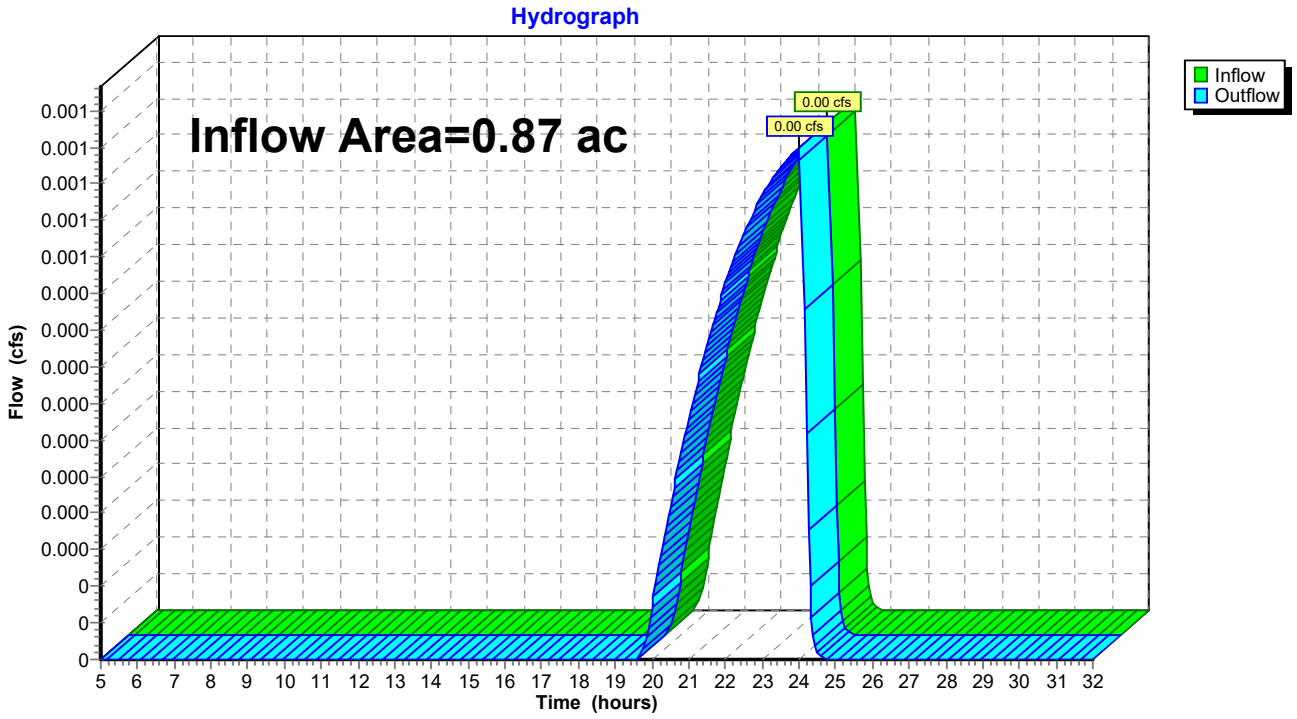


Summary for Reach DP-7: #4 Poppy Ln

Inflow Area = 0.87 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-Yr event
Inflow = 0.00 cfs @ 23.99 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 23.99 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-7: #4 Poppy Ln

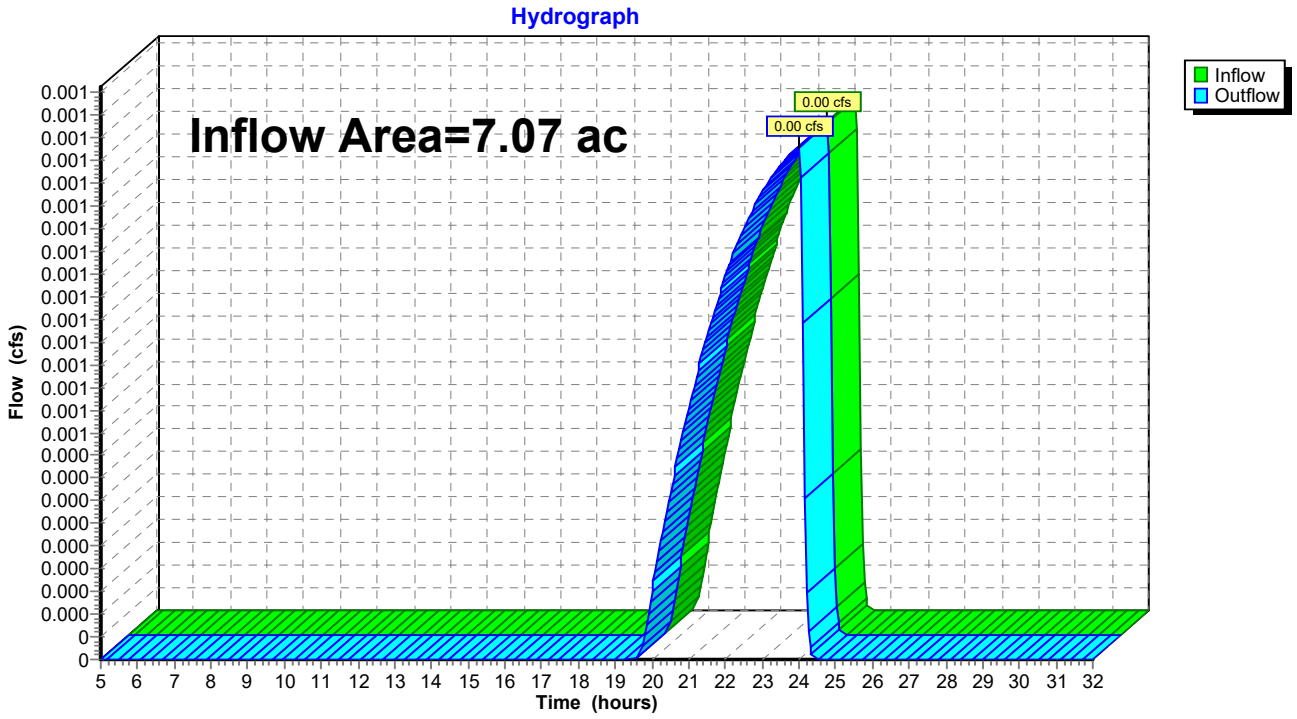


Summary for Reach DP-8: Wetland Series 'D' & 'E'

Inflow Area = 7.07 ac, 48.09% Impervious, Inflow Depth = 0.00" for 10-Yr event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1R

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs

Reach DP-8: Wetland Series 'D' & 'E'



Summary for Pond IB-1:

Inflow Area = 7.32 ac, 53.01% Impervious, Inflow Depth = 1.90" for 10-Yr event
Inflow = 15.14 cfs @ 12.10 hrs, Volume= 1.161 af
Outflow = 2.74 cfs @ 12.63 hrs, Volume= 1.161 af, Atten= 82%, Lag= 31.6 min
Discarded = 2.74 cfs @ 12.63 hrs, Volume= 1.161 af
Primary = 0.00 cfs @ 12.63 hrs, Volume= 0.000 af
Routed to Reach DP-5 : Wetland Series 'A'
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Reach 3R : 'Wetland Series J'

Routing by Stor-Ind method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 139.26' @ 12.63 hrs Surf.Area= 14,309 sf Storage= 15,316 cf

Plug-Flow detention time= 45.4 min calculated for 1.159 af (100% of inflow)
Center-of-Mass det. time= 45.3 min (893.7 - 848.5)

Volume	Invert	Avail.Storage	Storage Description
#1	138.00'	89,403 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
138.00	10,182	0	0
139.00	13,217	11,700	11,700
140.00	17,372	15,295	26,994
141.00	20,111	18,742	45,736
142.00	21,820	20,966	66,701
143.00	23,583	22,702	89,403

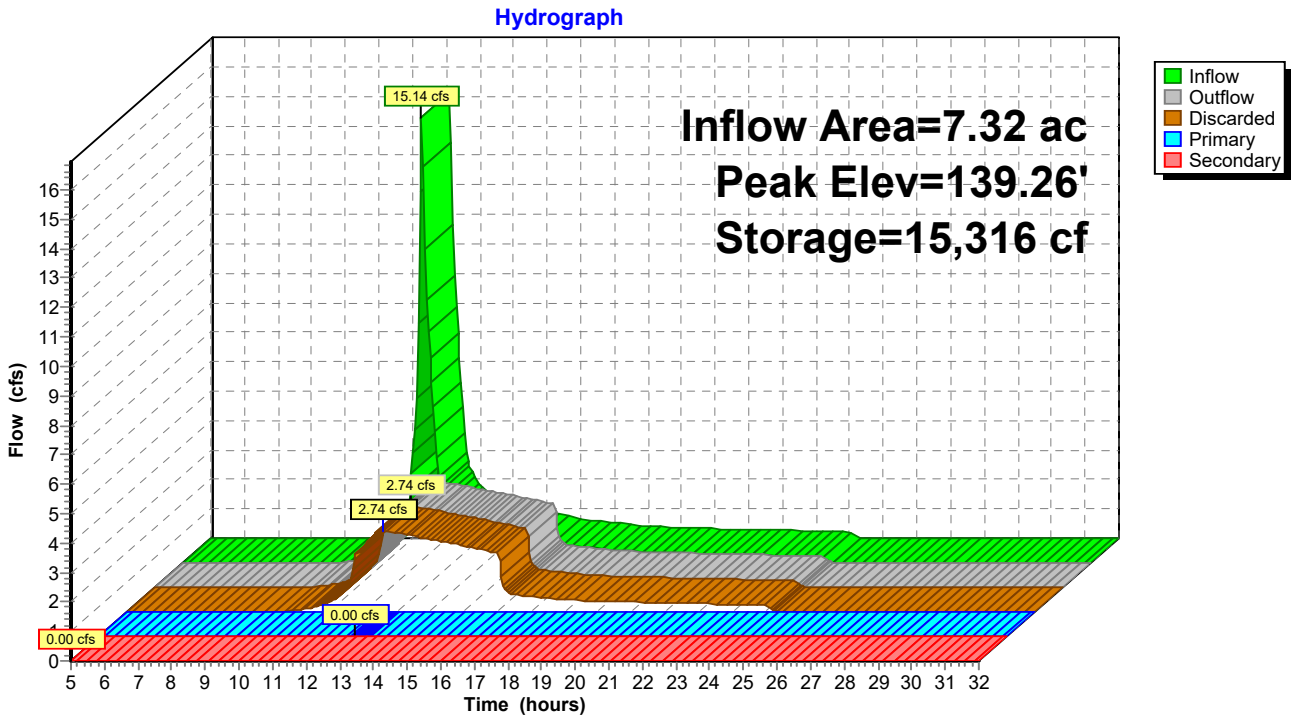
Device	Routing	Invert	Outlet Devices
#1	Discarded	138.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	138.00'	**12.0" Round Culvert** L= 116.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 138.00' / 135.90' S= 0.0181 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	139.20'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	141.90'	**12.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Device 2	142.00'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#6	Secondary	142.00'	**10.0' long x 5.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=2.74 cfs @ 12.63 hrs HW=139.26' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 2.74 cfs)

Primary OutFlow Max=0.00 cfs @ 12.63 hrs HW=139.26' (Free Discharge)
└**2=Culvert** (Passes 0.00 cfs of 2.61 cfs potential flow)
  └**3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.85 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)
  └**5=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=138.00' (Free Discharge)
└**6=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-1:



Summary for Pond IB-2:

Inflow Area = 4.29 ac, 17.02% Impervious, Inflow Depth = 0.39" for 10-Yr event
Inflow = 0.66 cfs @ 12.43 hrs, Volume= 0.138 af
Outflow = 0.54 cfs @ 12.59 hrs, Volume= 0.138 af, Atten= 19%, Lag= 9.4 min
Discarded = 0.54 cfs @ 12.59 hrs, Volume= 0.138 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Pond IB-3 :
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Reach DP-8 : Wetland Series 'D' & 'E'

Routing by Stor-Ind method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 145.06' @ 12.59 hrs Surf.Area= 2,796 sf Storage= 178 cf

Plug-Flow detention time= 2.9 min calculated for 0.138 af (100% of inflow)
Center-of-Mass det. time= 3.2 min (961.2 - 958.0)

Volume	Invert	Avail.Storage	Storage Description
#1	145.00'	17,272 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.00	2,725	0	0
146.00	3,830	3,278	3,278
148.00	6,694	10,524	13,802
148.50	7,189	3,471	17,272

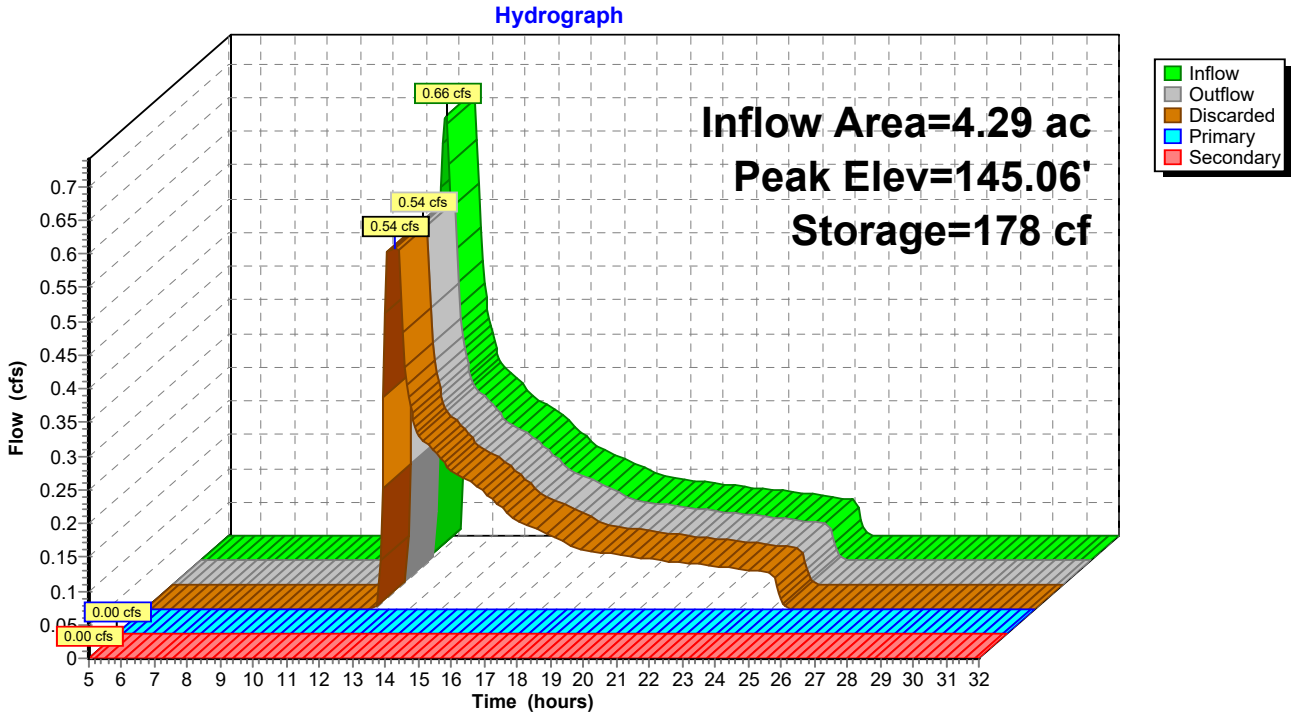
Device	Routing	Invert	Outlet Devices
#1	Discarded	145.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	145.00'	**15.0" Round Culvert** L= 69.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 145.00' / 144.40' S= 0.0087 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#3	Device 2	146.90'	**45.0 deg x 0.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#4	Device 2	147.40'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	147.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Discarded OutFlow Max=0.54 cfs @ 12.59 hrs HW=145.06' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.54 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=145.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
  ├**3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=145.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-2:


Hydrograph
Inflow Area=4.29 ac
Peak Elev=145.06'
Storage=178 cf
Inflow
Outflow
Discarded
Primary
Secondary
0.66 cfs
0.54 cfs
0.54 cfs
0.00 cfs
0.00 cfs
Flow (cfs)
Time (hours)

Summary for Pond IB-3:

Inflow Area = 5.13 ac, 25.73% Impervious, Inflow Depth = 0.43" for 10-Yr event
Inflow = 2.53 cfs @ 12.09 hrs, Volume= 0.183 af
Outflow = 0.47 cfs @ 12.56 hrs, Volume= 0.183 af, Atten= 81%, Lag= 28.2 min
Discarded = 0.47 cfs @ 12.56 hrs, Volume= 0.183 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Pond SUB-3 : Subsurface System-3
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Reach DP-8 : Wetland Series 'D' & 'E'

Routing by Stor-Ind method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 145.59' @ 12.56 hrs Surf.Area= 2,448 sf Storage= 2,600 cf

Plug-Flow detention time= 48.6 min calculated for 0.183 af (100% of inflow)
Center-of-Mass det. time= 48.5 min (873.1 - 824.7)

Volume	Invert	Avail.Storage	Storage Description
#1	144.00'	10,965 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
144.00	815	0	0
146.00	2,864	3,679	3,679
148.00	4,422	7,286	10,965

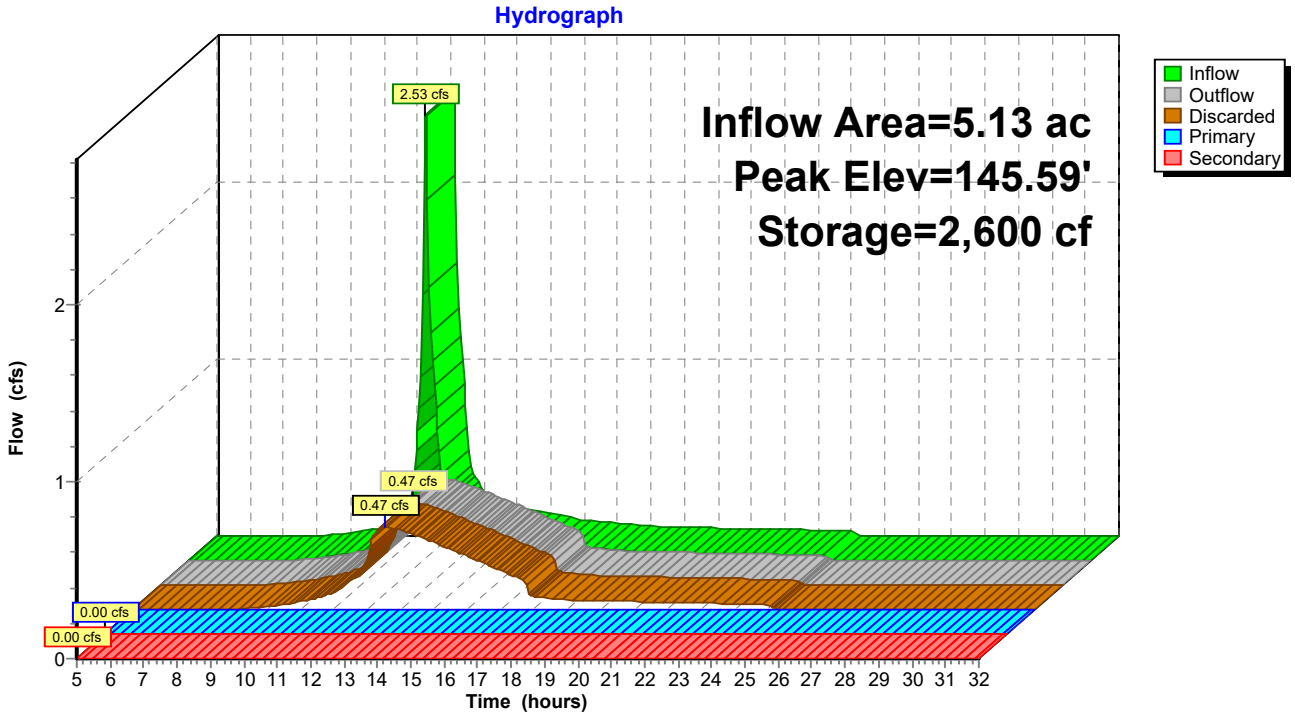
Device	Routing	Invert	Outlet Devices
#1	Discarded	144.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	144.00'	**12.0" Round Culvert** L= 49.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 144.00' / 143.00' S= 0.0204 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	146.00'	**45.0 deg x 0.95' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#4	Device 2	146.95'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	147.00'	**10.0' long x 5.0' 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 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.34 2.50 2.70 2.68 2.68 2.66 2.65 2.65 2.65 2.65 2.67 2.66 2.68 2.70 2.74 2.79 2.88

Discarded OutFlow Max=0.47 cfs @ 12.56 hrs HW=145.59' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.47 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=144.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
└**3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
└**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=144.00' (Free Discharge)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB-3:



Summary for Pond SUB-1: Subsurface System-1

Inflow Area = 0.47 ac, 42.55% Impervious, Inflow Depth = 1.38" for 10-Yr event
Inflow = 0.69 cfs @ 12.10 hrs, Volume= 0.054 af
Outflow = 0.01 cfs @ 24.06 hrs, Volume= 0.013 af, Atten= 99%, Lag= 717.4 min
Primary = 0.01 cfs @ 24.06 hrs, Volume= 0.013 af
Routed to Reach DP-5 : Wetland Series 'A'

Routing by Stor-Ind method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Peak Elev= 132.68' @ 24.06 hrs Surf.Area= 0.03 ac Storage= 0.046 af

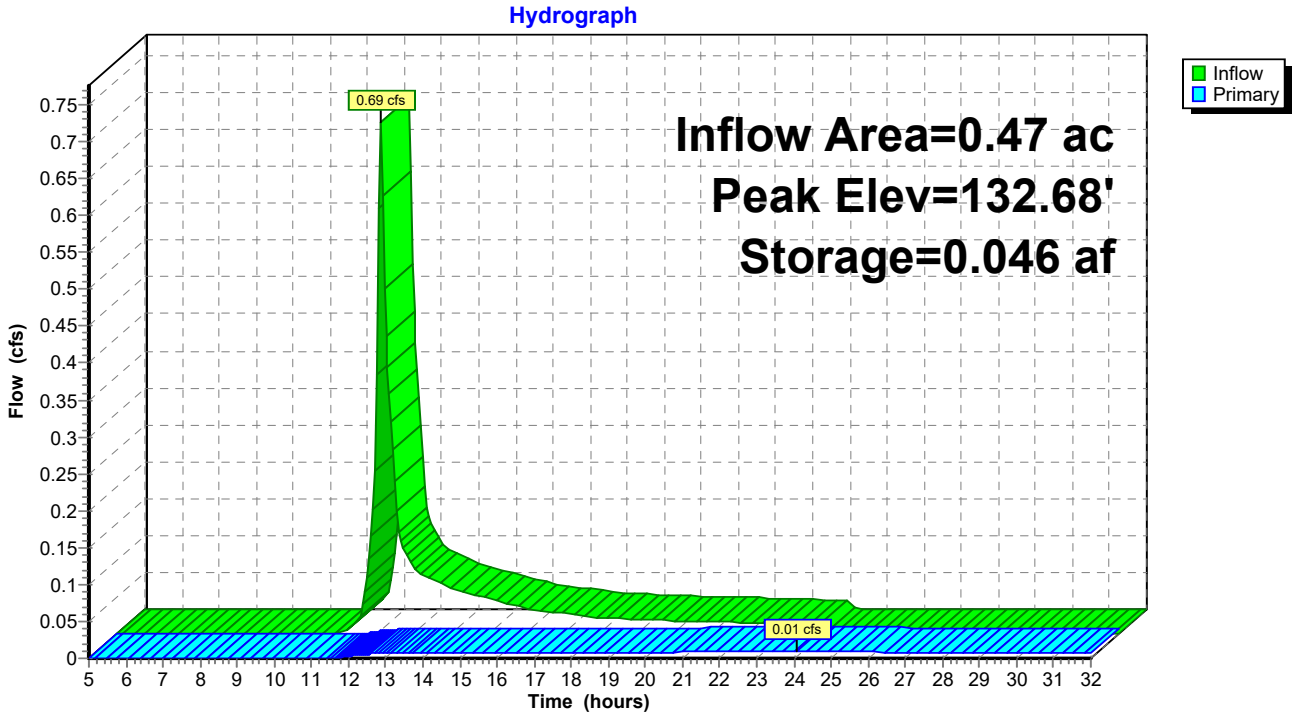
Plug-Flow detention time= 616.9 min calculated for 0.013 af (24% of inflow)
Center-of-Mass det. time= 469.9 min (1,337.9 - 868.0)

Volume	Invert	Avail.Storage	Storage Description
#1	131.00'	0.110 af	**8.00'W x 15.00'L x 4.00'H Prismatoid** x 10

Device	Routing	Invert	Outlet Devices
#1	Primary	131.00'	**12.0" Round Culvert** L= 48.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 131.00' / 130.76' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	131.00'	**0.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	134.10'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.01 cfs @ 24.06 hrs HW=132.68' (Free Discharge)
└**1=Culvert** (Passes 0.01 cfs of 3.48 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 6.19 fps)
  └**3=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond SUB-1: Subsurface System-1



Summary for Pond SUB-2: Subsurface System-2

Inflow Area = 3.75 ac, 42.67% Impervious, Inflow Depth = 1.38" for 10-Yr event
Inflow = 3.55 cfs @ 12.35 hrs, Volume= 0.430 af
Outflow = 1.03 cfs @ 12.15 hrs, Volume= 0.430 af, Atten= 71%, Lag= 0.0 min
Discarded = 1.03 cfs @ 12.15 hrs, Volume= 0.430 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Reach DP-5 : Wetland Series 'A'

Routing by Stor-Ind method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Peak Elev= 135.86' @ 13.01 hrs Surf.Area= 5,400 sf Storage= 4,623 cf

Plug-Flow detention time= 32.5 min calculated for 0.429 af (100% of inflow)
Center-of-Mass det. time= 32.5 min (916.1 - 883.6)

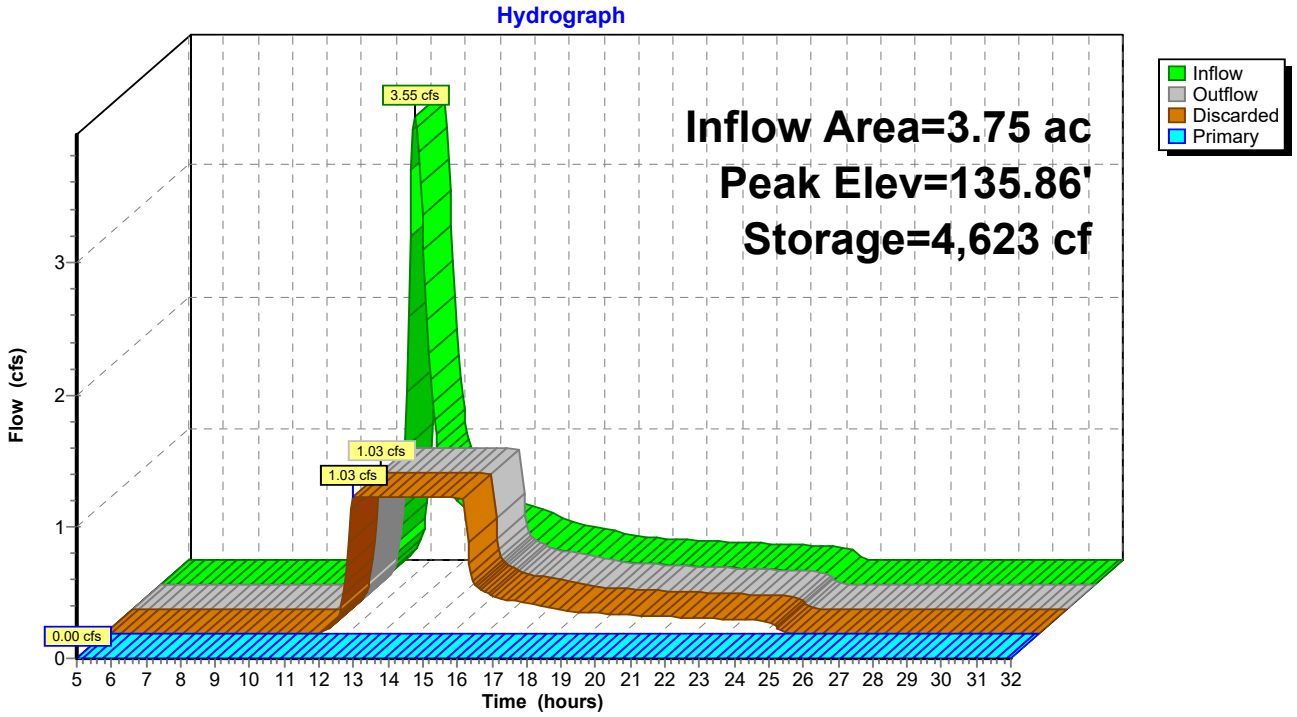
Volume	Invert	Avail.Storage	Storage Description
#1	135.00'	32,400 cf	**8.00'W x 15.00'L x 6.00'H 10x17 Concrete Chambers 12" Walk** 45

Device	Routing	Invert	Outlet Devices
#1	Discarded	135.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	137.00'	**15.0" Round Culvert** L= 55.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 137.00' / 136.72' S= 0.0051 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#3	Device 2	138.50'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	139.50'	**45.0 deg x 1.49' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#5	Primary	140.99'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=1.03 cfs @ 12.15 hrs HW=135.08' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.03 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=135.00' (Free Discharge)
├**2=Culvert** (Controls 0.00 cfs)
│ └**3=Orifice/Grate** (Controls 0.00 cfs)
│ └**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
└**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond SUB-2: Subsurface System-2



Summary for Pond SUB-3: Subsurface System-3

Inflow Area = 6.65 ac, 36.24% Impervious, Inflow Depth = 0.62" for 10-Yr event
Inflow = 4.72 cfs @ 12.09 hrs, Volume= 0.343 af
Outflow = 0.44 cfs @ 11.65 hrs, Volume= 0.343 af, Atten= 91%, Lag= 0.0 min
Discarded = 0.44 cfs @ 11.65 hrs, Volume= 0.343 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Reach DP-5 : Wetland Series 'A'

Routing by Stor-Ind method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Peak Elev= 141.55' @ 13.08 hrs Surf.Area= 2,280 sf Storage= 5,806 cf

Plug-Flow detention time= 114.3 min calculated for 0.342 af (100% of inflow)
Center-of-Mass det. time= 114.2 min (936.0 - 821.9)

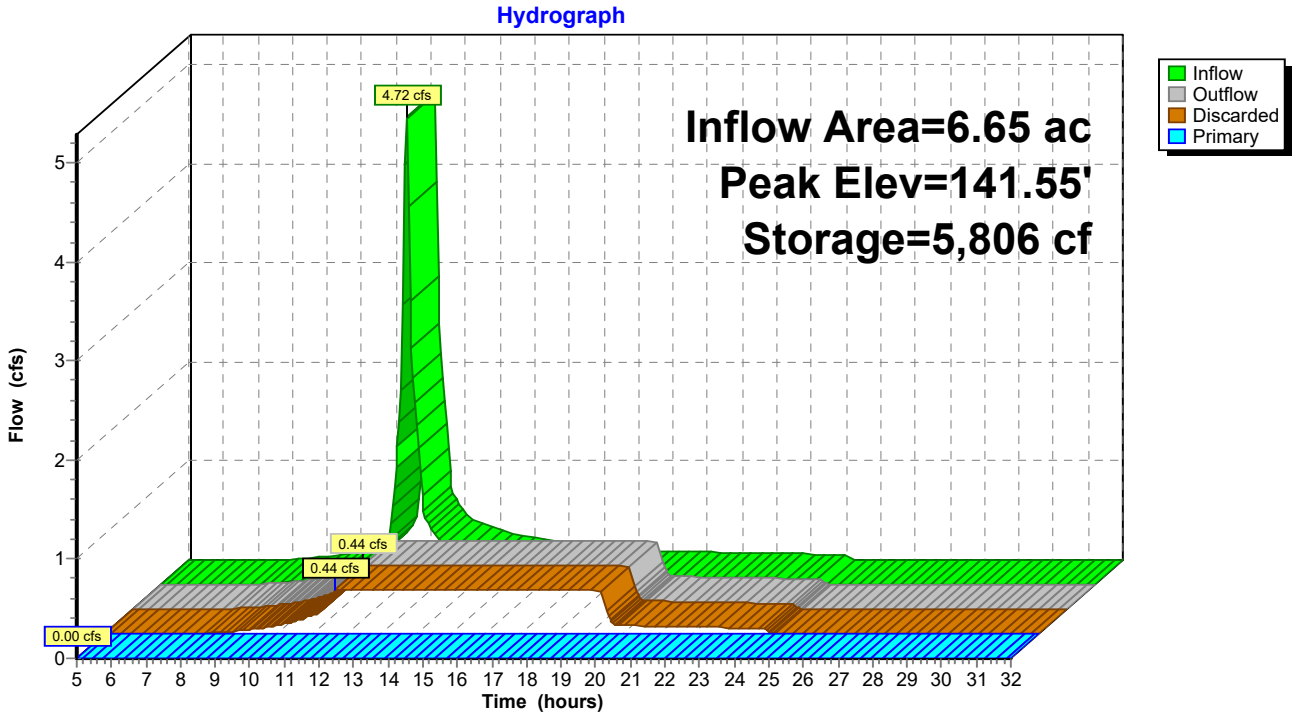
Volume	Invert	Avail.Storage	Storage Description
#1	139.00'	15,960 cf	**8.00'W x 15.00'L x 7.00'H 10x17 Concrete Chambers 12" Walk** 19

Device	Routing	Invert	Outlet Devices
#1	Discarded	139.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	139.00'	**15.0" Round Culvert** L= 227.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 139.00' / 137.00' S= 0.0088 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#3	Device 2	144.40'	**45.0 deg x 1.50' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#4	Device 2	145.90'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.44 cfs @ 11.65 hrs HW=139.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.44 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=139.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
  ├**3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
  └**4=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond SUB-3: Subsurface System-3



Summary for Pond SUB-4: Subsurface System-4

Inflow Area = 5.67 ac, 59.96% Impervious, Inflow Depth = 2.11" for 10-Yr event
Inflow = 13.67 cfs @ 12.10 hrs, Volume= 0.998 af
Outflow = 1.38 cfs @ 11.75 hrs, Volume= 0.998 af, Atten= 90%, Lag= 0.0 min
Discarded = 1.38 cfs @ 11.75 hrs, Volume= 0.998 af
Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Routed to Reach DP-8 : Wetland Series 'D' & 'E'

Routing by Stor-Ind method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Peak Elev= 135.27' @ 13.09 hrs Surf.Area= 7,200 sf Storage= 16,354 cf

Plug-Flow detention time= 105.5 min calculated for 0.996 af (100% of inflow)
Center-of-Mass det. time= 105.3 min (946.1 - 840.7)

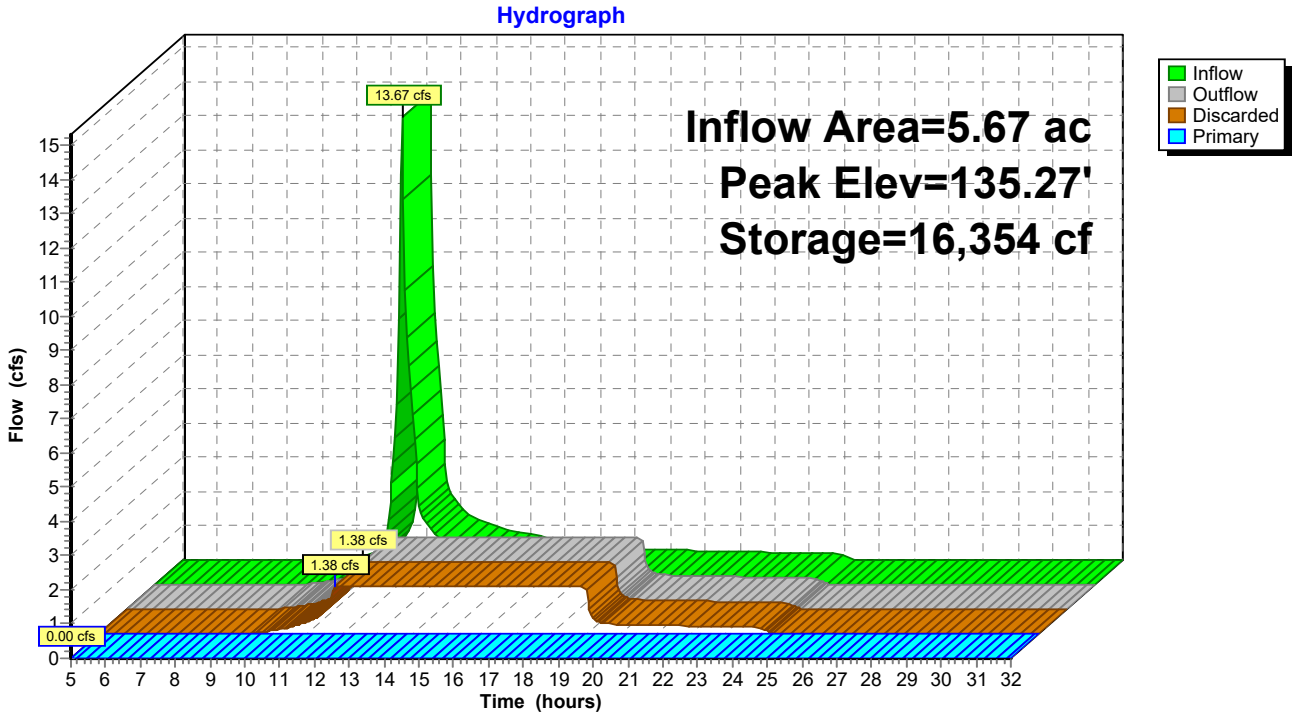
Volume	Invert	Avail.Storage	Storage Description
#1	133.00'	57,600 cf	**8.00'W x 15.00'L x 8.00'H 10x17 Concrete Chambers 12" Walk** 60

Device	Routing	Invert	Outlet Devices
#1	Discarded	133.00'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	134.00'	**12.0" Round Culvert** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 134.00' / 133.88' S= 0.0052 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	136.20'	**1.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	139.85'	**30.0 deg x 1.05' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)
#5	Device 2	140.90'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=1.38 cfs @ 11.75 hrs HW=133.09' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.38 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=133.00' (Free Discharge)
└**2=Culvert** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  ├**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
  └**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond SUB-4: Subsurface System-4



Time span=5.00-32.00 hrs, dt=0.05 hrs, 541 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPWA-1: Runoff Area=4.46 ac 0.00% Impervious Runoff Depth=0.33"
Flow Length=397' Tc=13.7 min CN=37 Runoff=0.40 cfs 0.122 af

SubcatchmentPWA-3: Runoff Area=0.28 ac 0.00% Impervious Runoff Depth=0.16"
Flow Length=80' Slope=0.1000 '/' Tc=6.6 min CN=33 Runoff=0.01 cfs 0.004 af

SubcatchmentPWA-4: Runoff Area=0.31 ac 0.00% Impervious Runoff Depth=0.07"
Tc=6.0 min CN=30 Runoff=0.00 cfs 0.002 af

SubcatchmentPWA-5A: Runoff Area=0.58 ac 0.00% Impervious Runoff Depth=0.20"
Tc=6.0 min CN=34 Runoff=0.02 cfs 0.010 af

SubcatchmentPWA-5B: Runoff Area=2.44 ac 52.05% Impervious Runoff Depth=2.76"
Flow Length=705' Tc=8.7 min CN=70 Runoff=6.99 cfs 0.561 af

SubcatchmentPWA-5C: Runoff Area=4.88 ac 53.48% Impervious Runoff Depth=2.94"
Tc=6.0 min CN=72 Runoff=16.49 cfs 1.197 af

SubcatchmentPWA-5D: Runoff Area=4.29 ac 17.02% Impervious Runoff Depth=0.84"
Flow Length=395' Tc=13.1 min CN=46 Runoff=2.14 cfs 0.301 af

SubcatchmentPWA-5E: Runoff Area=1.78 ac 0.00% Impervious Runoff Depth=0.20"
Flow Length=230' Tc=9.6 min CN=34 Runoff=0.05 cfs 0.029 af

SubcatchmentPWA-5F: Runoff Area=1.52 ac 71.71% Impervious Runoff Depth=3.83"
Tc=6.0 min CN=81 Runoff=6.64 cfs 0.485 af

SubcatchmentPWA-5G: Runoff Area=0.47 ac 42.55% Impervious Runoff Depth=2.22"
Tc=6.0 min CN=64 Runoff=1.17 cfs 0.087 af

SubcatchmentPWA-5H: Runoff Area=0.84 ac 70.24% Impervious Runoff Depth=3.73"
Tc=6.0 min CN=80 Runoff=3.58 cfs 0.261 af

SubcatchmentPWA-5I: Runoff Area=3.75 ac 42.67% Impervious Runoff Depth=2.22"
Flow Length=1,000' Tc=22.8 min CN=64 Runoff=6.00 cfs 0.694 af

SubcatchmentPWA-6: Runoff Area=1.80 ac 0.00% Impervious Runoff Depth=0.07"
Flow Length=175' Tc=9.6 min CN=30 Runoff=0.01 cfs 0.010 af

SubcatchmentPWA-7: Runoff Area=0.87 ac 0.00% Impervious Runoff Depth=0.09"
Flow Length=267' Tc=13.2 min CN=31 Runoff=0.01 cfs 0.007 af

SubcatchmentPWA-8A: Runoff Area=1.40 ac 0.00% Impervious Runoff Depth=0.09"
Flow Length=100' Tc=8.5 min CN=31 Runoff=0.02 cfs 0.011 af

SubcatchmentPWA-8B: Runoff Area=5.67 ac 59.96% Impervious Runoff Depth=3.13"
Tc=6.0 min CN=74 Runoff=20.43 cfs 1.481 af

Reach 3R: 'Wetland Series J' Avg. Flow Depth=0.08' Max Vel=1.34 fps Inflow=0.05 cfs 0.029 af
18.0" Round Pipe n=0.013 L=143.0' S=0.0070 '/' Capacity=8.78 cfs Outflow=0.05 cfs 0.029 af

Reach DP-1: Northern Wetlands Culvert Inflow=0.40 cfs 0.122 af
Outflow=0.40 cfs 0.122 af

Reach DP-3: #48 Rinzee Rd Inflow=0.01 cfs 0.004 af
Outflow=0.01 cfs 0.004 af

Reach DP-4: Poppy Ln Inflow=0.00 cfs 0.002 af
Outflow=0.00 cfs 0.002 af

Reach DP-5: Wetland Series 'A' Inflow=0.09 cfs 0.060 af
Outflow=0.09 cfs 0.060 af

Reach DP-6: Wetland Series 'B' & 'C' Inflow=0.01 cfs 0.010 af
Outflow=0.01 cfs 0.010 af

Reach DP-7: #4 Poppy Ln Inflow=0.01 cfs 0.007 af
Outflow=0.01 cfs 0.007 af

Reach DP-8: Wetland Series 'D' & 'E' Inflow=0.04 cfs 0.018 af
Outflow=0.04 cfs 0.018 af

Pond IB-1: Peak Elev=139.99' Storage=26,838 cf Inflow=23.25 cfs 1.758 af
Discarded=3.32 cfs 1.753 af Primary=0.02 cfs 0.004 af Secondary=0.00 cfs 0.000 af Outflow=3.34 cfs 1.758 af

Pond IB-2: Peak Elev=145.77' Storage=2,416 cf Inflow=2.14 cfs 0.301 af
Discarded=0.68 cfs 0.301 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.68 cfs 0.301 af

Pond IB-3: Peak Elev=146.13' Storage=4,051 cf Inflow=3.58 cfs 0.261 af
Discarded=0.57 cfs 0.261 af Primary=0.01 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.57 cfs 0.261 af

Pond SUB-1: Subsurface System-1 Peak Elev=133.79' Storage=0.077 af Inflow=1.17 cfs 0.087 af
Outflow=0.01 cfs 0.017 af

Pond SUB-2: Subsurface System-2 Peak Elev=136.94' Storage=10,498 cf Inflow=6.00 cfs 0.694 af
Discarded=1.03 cfs 0.694 af Primary=0.00 cfs 0.000 af Outflow=1.03 cfs 0.694 af

Pond SUB-3: Subsurface System-3 Peak Elev=143.12' Storage=9,384 cf Inflow=6.64 cfs 0.485 af
Discarded=0.44 cfs 0.485 af Primary=0.00 cfs 0.000 af Outflow=0.44 cfs 0.485 af

Pond SUB-4: Subsurface System-4 Peak Elev=136.98' Storage=28,657 cf Inflow=20.43 cfs 1.481 af
Discarded=1.38 cfs 1.474 af Primary=0.02 cfs 0.007 af Outflow=1.40 cfs 1.481 af

Total Runoff Area = 35.34 ac Runoff Volume = 5.261 af Average Runoff Depth = 1.79"
67.49% Pervious = 23.85 ac 32.51% Impervious = 11.49 ac

Time span=5.00-32.00 hrs, dt=0.05 hrs, 541 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentPWA-1: Runoff Area=4.46 ac 0.00% Impervious Runoff Depth=1.19"
Flow Length=397' Tc=13.7 min CN=37 Runoff=3.08 cfs 0.444 af

SubcatchmentPWA-3: Runoff Area=0.28 ac 0.00% Impervious Runoff Depth=0.81"
Flow Length=80' Slope=0.1000 '/' Tc=6.6 min CN=33 Runoff=0.11 cfs 0.019 af

SubcatchmentPWA-4: Runoff Area=0.31 ac 0.00% Impervious Runoff Depth=0.55"
Tc=6.0 min CN=30 Runoff=0.06 cfs 0.014 af

SubcatchmentPWA-5A: Runoff Area=0.58 ac 0.00% Impervious Runoff Depth=0.90"
Tc=6.0 min CN=34 Runoff=0.28 cfs 0.044 af

SubcatchmentPWA-5B: Runoff Area=2.44 ac 52.05% Impervious Runoff Depth=4.94"
Flow Length=705' Tc=8.7 min CN=70 Runoff=12.70 cfs 1.005 af

SubcatchmentPWA-5C: Runoff Area=4.88 ac 53.48% Impervious Runoff Depth=5.18"
Tc=6.0 min CN=72 Runoff=28.98 cfs 2.107 af

SubcatchmentPWA-5D: Runoff Area=4.29 ac 17.02% Impervious Runoff Depth=2.14"
Flow Length=395' Tc=13.1 min CN=46 Runoff=7.48 cfs 0.766 af

SubcatchmentPWA-5E: Runoff Area=1.78 ac 0.00% Impervious Runoff Depth=0.90"
Flow Length=230' Tc=9.6 min CN=34 Runoff=0.79 cfs 0.134 af

SubcatchmentPWA-5F: Runoff Area=1.52 ac 71.71% Impervious Runoff Depth>6.26"
Tc=6.0 min CN=81 Runoff=10.67 cfs 0.793 af

SubcatchmentPWA-5G: Runoff Area=0.47 ac 42.55% Impervious Runoff Depth=4.22"
Tc=6.0 min CN=64 Runoff=2.28 cfs 0.165 af

SubcatchmentPWA-5H: Runoff Area=0.84 ac 70.24% Impervious Runoff Depth=6.14"
Tc=6.0 min CN=80 Runoff=5.80 cfs 0.430 af

SubcatchmentPWA-5I: Runoff Area=3.75 ac 42.67% Impervious Runoff Depth=4.22"
Flow Length=1,000' Tc=22.8 min CN=64 Runoff=11.78 cfs 1.320 af

SubcatchmentPWA-6: Runoff Area=1.80 ac 0.00% Impervious Runoff Depth=0.55"
Flow Length=175' Tc=9.6 min CN=30 Runoff=0.34 cfs 0.083 af

SubcatchmentPWA-7: Runoff Area=0.87 ac 0.00% Impervious Runoff Depth=0.64"
Flow Length=267' Tc=13.2 min CN=31 Runoff=0.20 cfs 0.046 af

SubcatchmentPWA-8A: Runoff Area=1.40 ac 0.00% Impervious Runoff Depth=0.64"
Flow Length=100' Tc=8.5 min CN=31 Runoff=0.35 cfs 0.074 af

SubcatchmentPWA-8B: Runoff Area=5.67 ac 59.96% Impervious Runoff Depth=5.42"
Tc=6.0 min CN=74 Runoff=35.12 cfs 2.561 af

Reach 3R: 'Wetland Series J' Avg. Flow Depth=0.30' Max Vel=3.08 fps Inflow=0.79 cfs 0.134 af
18.0" Round Pipe n=0.013 L=143.0' S=0.0070 '/' Capacity=8.78 cfs Outflow=0.79 cfs 0.134 af

Reach DP-1: Northern Wetlands Culvert Inflow=3.08 cfs 0.444 af
Outflow=3.08 cfs 0.444 af

Reach DP-3: #48 Rinzee Rd Inflow=0.11 cfs 0.019 af
Outflow=0.11 cfs 0.019 af

Reach DP-4: Poppy Ln Inflow=0.06 cfs 0.014 af
Outflow=0.06 cfs 0.014 af

Reach DP-5: Wetland Series 'A' Inflow=2.96 cfs 0.527 af
Outflow=2.96 cfs 0.527 af

Reach DP-6: Wetland Series 'B' & 'C' Inflow=0.34 cfs 0.083 af
Outflow=0.34 cfs 0.083 af

Reach DP-7: #4 Poppy Ln Inflow=0.20 cfs 0.046 af
Outflow=0.20 cfs 0.046 af

Reach DP-8: Wetland Series 'D' & 'E' Inflow=0.90 cfs 0.278 af
Outflow=0.90 cfs 0.278 af

Pond IB-1: Peak Elev=141.51' Storage=56,239 cf Inflow=41.22 cfs 3.111 af
Discarded=4.02 cfs 3.094 af Primary=0.04 cfs 0.018 af Secondary=0.00 cfs 0.000 af Outflow=4.06 cfs 3.111 af

Pond IB-2: Peak Elev=147.45' Storage=10,361 cf Inflow=7.48 cfs 0.766 af
Discarded=1.13 cfs 0.719 af Primary=0.89 cfs 0.048 af Secondary=0.00 cfs 0.000 af Outflow=2.02 cfs 0.767 af

Pond IB-3: Peak Elev=146.91' Storage=6,598 cf Inflow=5.80 cfs 0.478 af
Discarded=0.68 cfs 0.393 af Primary=0.83 cfs 0.084 af Secondary=0.00 cfs 0.000 af Outflow=1.52 cfs 0.478 af

Pond SUB-1: Subsurface System-1 Peak Elev=134.17' Storage=0.087 af Inflow=2.28 cfs 0.165 af
Outflow=0.33 cfs 0.087 af

Pond SUB-2: Subsurface System-2 Peak Elev=139.95' Storage=26,752 cf Inflow=11.78 cfs 1.320 af
Discarded=1.03 cfs 1.283 af Primary=0.18 cfs 0.037 af Outflow=1.21 cfs 1.320 af

Pond SUB-3: Subsurface System-3 Peak Elev=145.70' Storage=15,286 cf Inflow=10.67 cfs 0.878 af
Discarded=0.44 cfs 0.671 af Primary=2.06 cfs 0.207 af Outflow=2.50 cfs 0.878 af

Pond SUB-4: Subsurface System-4 Peak Elev=140.86' Storage=56,613 cf Inflow=35.12 cfs 2.561 af
Discarded=1.38 cfs 2.357 af Primary=0.78 cfs 0.204 af Outflow=2.16 cfs 2.561 af

Total Runoff Area = 35.34 ac Runoff Volume = 10.006 af Average Runoff Depth = 3.40"
67.49% Pervious = 23.85 ac 32.51% Impervious = 11.49 ac

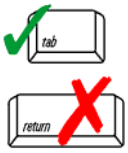
TAB 5

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

The following checklist is intended to serve as a guide for applicants as to the elements that ordinarily need to be addressed in a complete Stormwater Report. The checklist is also intended to provide conservation commissions and other reviewing authorities with a summary of the components necessary for a comprehensive Stormwater Report that addresses the ten Stormwater Standards.

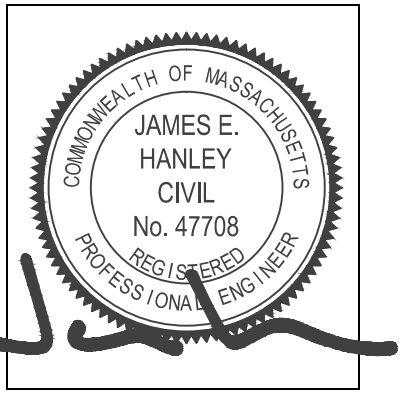
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the item is not applicable (N.A.) and provide the reasons for that determination.

A complete checklist must include the Certification set forth below signed by the Registered Professional Engineer who prepared the Stormwater Report.

Registered Professional Engineer's Certification

I have reviewed the Stormwater Report, including the soil evaluation, computations, Long-term Pollution Prevention Plan, the Construction Period Erosion and Sedimentation Control Plan (if included), the Long-term Post-Construction Operation and Maintenance Plan, the Illicit Discharge Compliance Statement (if included) and the plans showing the stormwater management system, and have determined that they have been prepared in accordance with the requirements of the Stormwater Management Standards as further elaborated by the Massachusetts Stormwater Handbook. I have also determined that the information presented in the Stormwater Checklist is accurate and that the information presented in the Stormwater Report accurately reflects conditions at the site as of the date of this permit application.

Registered Professional Engineer Block and Signature



March 28, 2025

Signature and Date

Checklist

Project Type: Is the application for new development, redevelopment, or a mix of new and redevelopment?

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

LID Measures: Stormwater Standards require LID measures to be considered. Document what environmentally sensitive design and LID Techniques were considered during the planning and design of the project:

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

[1] 80% TSS removal is required prior to discharge to infiltration BMP if Dynamic Field method is used.

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

The Long-Term Pollution Prevention Plan typically includes the following:

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☒ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☒ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

Standard 5: Land Uses With Higher Potential Pollutant Loads (LUHPPLs)

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 7: Redevelopments and Other Projects Subject to the Standards only to the maximum extent practicable

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control

A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan must include the following information:

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☐ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

Standard 8: Construction Period Pollution Prevention and Erosion and Sedimentation Control (continued)

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☒ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☐ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

Project: Murphy's Farm
Location: Dracut, MA
Client: The Homes at Murphy's Farm LLC

Project Number: 23-10524
Prepared By: Thomas Schomburg, EIT
Date: March 27, 2025

STORMWATER MANAGEMENT STANDARDS CALCULATIONS

Standard 1: Velocity & Rip-Rap Apron Sizing and Gradation Calculations

Outlet:	Q_{10}: (CFS)	Velocity (FPS)	Req'd	D_o: (FT)	L_A: (FT)	W_1: (FT)	W_2: (FT)	T_W: (FT)	d_{50}: (FT)
PFES-5	0.00	0.00	No	1	7.0	3.0	10.0	0.5	0.00
PFES-6	2.36	5.50	Yes	1	11.2	3.0	14.2	0.5	0.13
PFES-8	0.01	0.01	No	1	7.0	3.0	10.0	0.5	0.00
PFES-9	0.00	0.00	No	1	7.0	3.0	10.0	0.5	0.00
PFES-11	0.00	0.00	No	1	7.0	3.0	10.0	0.5	0.00
PFES-13	0.01	0.73	No	1	7.0	3.0	10.0	0.5	0.00

Conclusion: A Riprap apron is provided for each outfall. The Stormwater Management System conforms to Standard 1.

Standard 2: Peak Discharge Summary (CFS)

Design Point 1	2-Year (3.08-IN)	10-Year (4.68-IN)	25-Year (5.94-IN)	100-Year (8.55-IN)
Pre-Development Conditions:	0.00	0.06	0.45	3.53
Post Development Conditions:	0.00	0.05	0.40	3.08

Design Point 3	2-Year (3.08-IN)	10-Year (4.68-IN)	25-Year (5.94-IN)	100-Year (8.55-IN)
Pre-Development Conditions:	0.00	0.00	0.02	0.51
Post Development Conditions:	0.00	0.00	0.01	0.11

Design Point 4	2-Year (3.08-IN)	10-Year (4.68-IN)	25-Year (5.94-IN)	100-Year (8.55-IN)
Pre-Development Conditions:	0.00	0.00	0.02	0.40
Post Development Conditions:	0.00	0.00	0.00	0.06

Design Point 5	2-Year (3.08-IN)	10-Year (4.68-IN)	25-Year (5.94-IN)	100-Year (8.55-IN)
Pre-Development Conditions:	0.00	0.03	0.23	3.67
Post Development Conditions:	0.00	0.03	0.09	3.27

Design Point 6	2-Year (3.08-IN)	10-Year (4.68-IN)	25-Year (5.94-IN)	100-Year (8.55-IN)
Pre-Development Conditions:	0.00	0.00	0.02	0.40
Post Development Conditions:	0.00	0.00	0.01	0.34

Design Point 7	2-Year (3.08-IN)	10-Year (4.68-IN)	25-Year (5.94-IN)	100-Year (8.55-IN)
Pre-Development Conditions:	0.00	0.00	0.03	0.70
Post Development Conditions:	0.00	0.00	0.01	0.20

Design Point 8	2-Year (3.08-IN)	10-Year (4.68-IN)	25-Year (5.94-IN)	100-Year (8.55-IN)
Pre-Development Conditions:	0.00	0.00	0.05	1.01
Post Development Conditions:	0.00	0.00	0.04	0.90

Conclusion: The Stormwater Management System conforms to Standard 2.

Standard 3: Recharge Calculations (Static Method)

Infiltration Basin 1

Hydrologic Soils Group:	A	B	C	D		
Total Proposed Impervious Area:	3.79	0.09	0.00	0.00	3.88	
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	8,255	114	0	0	8,369	CF
Volume Below Lowest Outlet:					14,426	CF
Elevation of Lowest Invert:					139.20	
Determine Drawdown Time						
Saturated Hydraulic Conductivity (Rawls Rate):					8.27	IN/HR
Bottom Area of Infiltration Basin:					10,182	SF
Drawdown Time:					2.1	HRS

Infiltration Basin 2

Hydrologic Soils Group:	A	B	C	D		
Total Proposed Impervious Area:	0.73	0.00	0.00	0.00	0.73	
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	1,590	0	0	0	1,590	CF
Volume Below Lowest Outlet:					7,304	CF
Elevation of Lowest Invert:					146.90	
Determine Drawdown Time						
Saturated Hydraulic Conductivity (Rawls Rate):					8.27	IN/HR
Bottom Area of Infiltration Basin:					2,725	SF
Drawdown Time:					3.9	HRS

Infiltration Basin 3

Hydrologic Soils Group:	A	B	C	D		
Total Proposed Impervious Area:	0.59	0.09	0.00	0.00	0.68	
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	1,285	114	0	0	1,399	CF

Volume Below Lowest Outlet:	3,679	CF
Elevation of Lowest Invert:	146.00	

Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate):	8.27	IN/HR
Bottom Area of Infiltration Basin:	815	SF
Drawdown Time:	6.6	HRS

Subsurface System 2

Hydrologic Soils Group:	A	B	C	D		
Total Proposed Impervious Area:	1.55	0.05	0.00	0.00	1.60	
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	3,376	64	0	0	3,439	CF

Volume Below Lowest Outlet:	8,100	CF
Elevation of Lowest Invert:	138.50	

Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate):	8.27	IN/HR
Bottom Area of Infiltration Basin:	5,400	SF
Drawdown Time:	2.2	HRS

Subsurface System 3

Hydrologic Soils Group:	A	B	C	D		
Total Proposed Impervious Area:	1.09	0.00	0.00	0.00	1.09	
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	2,374	0	0	0	2,374	CF

Volume Below Lowest Outlet:	12,312	CF
Elevation of Lowest Invert:	144.40	

Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate):	8.27	IN/HR
Bottom Area of Infiltration Basin:	2,280	SF
Drawdown Time:	7.8	HRS

Subsurface System 4

Hydrologic Soils Group:	A	B	C	D		
Total Proposed Impervious Area:	3.40	0.00	0.00	0.00	3.40	
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	7,405	0	0	0	7,405	CF

Volume Below Lowest Outlet:	23,040	CF
Elevation of Lowest Invert:	136.20	

Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate):	8.27	IN/HR
Bottom Area of Infiltration Basin:	7,200	SF
Drawdown Time:	4.6	HRS

Capture Area Adjustment

Increase in Site Impervious:	11.46	Ac.
Impervious Draining to Basins:	11.38	Ac.
Adjusted Recharge Volume:	11,891	CF
Recharge Volume Provided:	65,182	CF
Percentage of Impervious Draining to Basins	99%	

Conclusion: The volume provided below the lowest invert in the infiltration basin exceed the minimum recharge volume required. In addition, the basin drains within 72-HRS to comply with DEP regulations. The Stormwater Management System conforms to Standard 3.

Standard 4: Water Quality Volume Calculations

Infiltration Basin 1

Water Quality Depth:	1.0	IN
Total Proposed Impervious Area:	3.88	Acres
Required Water Quality Volume:	14,084	CF
Provided Water Quality Volume:	14,426	CF

Infiltration Basin 2

Water Quality Depth:	1.0	IN
Total Proposed Impervious Area:	0.00	Acres
Required Water Quality Volume:	0	CF
Provided Water Quality Volume:	14,426	CF

Infiltration Basin 3

Water Quality Depth:	1.0	IN
Total Proposed Impervious Area:	0.00	Acres
Required Water Quality Volume:	0	CF
Provided Water Quality Volume:	14,426	CF

Subsurface System 1

See Stormtech Cutsheet for WQV & TSS

Subsurface System 2

Water Quality Depth:	1.0	IN
Total Proposed Impervious Area:	1.60	Acres
Required Water Quality Volume:	5,808	CF
Provided Water Quality Volume:	8,100	CF

Subsurface System 3

Water Quality Depth:	1.0	IN
Total Proposed Impervious Area:	2.02	Acres
Required Water Quality Volume:	7,333	CF
Provided Water Quality Volume:	12,312	CF

Subsurface System 4

Water Quality Depth:	1.0	IN
Total Proposed Impervious Area:	3.40	Acres
Required Water Quality Volume:	12,342	CF
Provided Water Quality Volume:	23,040	CF

TSS Removal Rate Calculations

44% Pretreatment for Infiltration Basins (Typical):

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump Catch Basin	25%	1	0.25	0.75
Sediment Forebay	25%	0.75	0.19	0.56
TSS Removed at Discharge from Pond:				**44%**

Treatment Provided at Discharge From Infiltration Basins 1, 2, and 3

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump Catch Basin	25%	1	0.25	0.75
Sediment Forebay & Infiltration Basin:	80%	0.75	0.60	0.15
TSS Removed at Discharge from Pond:				**85.0%**

Treatment Provided at Discharge From Subsurface-1

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump Catch Basins	25%	1	0.25	0.75
Contech CDS	80%	0.75	0.60	0.15
TSS Removed at Discharge from Pond:				**85.0%**

44% Pretreatment for Subsurface-2:

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump Catch Basin	25%	1	0.25	0.75
Isolator Row (Forebay)	25%	0.75	0.19	0.56
TSS Removed at Discharge from Pond:				**44%**

Treatment Provided at Discharge From Subsurface-2

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump Catch Basins	25%	1	0.25	0.75
Subsurface Structure	80%	0.75	0.60	0.15
TSS Removed at Discharge from Pond:				**85.0%**

44% Pretreatment for Subsurface-3:

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump Catch Basin	25%	1	0.25	0.75
Isolator Row (Forebay)	25%	0.75	0.19	0.56
TSS Removed at Discharge from Pond:				**44%**

Treatment Provided at Discharge From Subsurface-3

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump Catch Basins	25%	1	0.25	0.75
Subsurface Structure	80%	0.75	0.60	0.15
TSS Removed at Discharge from Pond:				**85.0%**

44% Pretreatment for Subsurface-4:

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump Catch Basin	25%	1	0.25	0.75
Isolator Row (Forebay)	25%	0.75	0.19	0.56
TSS Removed at Discharge from Pond:				**44%**

Treatment Provided at Discharge From Subsurface-4

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump Catch Basins	25%	1	0.25	0.75
Subsurface Structure	80%	0.75	0.60	0.15
TSS Removed at Discharge from Pond:				**85.0%**

Conclusion: The volume provided below the lowest invert in the infiltration basin and subsurface systems exceeds the Water Quality Volume and TSS Removal Rate is greater than 80%. BMPs with infiltration rates of greater than 2.41 in/hr have the required 44% TSS removal rate prior to infiltration. The Stormwater Management System conforms to Standard 4.

DEP BMP Performance Curves for Infiltration Basins and Infiltration Trenches (Subsurface Systems) are provided below, detailing the required >90% TSS and 60% TP removal for the local bylaw.

Standard 5: Land Uses With Higher Potential Pollutant Loads

Conclusion: The proposed use is not considered a Land Use with Higher Potential Pollutant Loads. This Standard is NOT Applicable.

Standard 6: Critical Areas

of the 100-Ft buffer afforded to vernal pools. The Stormwater Management System conforms to Standard 4.

Standard 7: Redevelopment

Conclusion: The development does not meet the criteria for redevelopment.

Standard 8: Construction Period Controls

Conclusion: The project is covered by a NPDES Construction General Permit. No SWPPP has been prepared at this time but will be prepared prior to the start of construction. A Construction Period Pollution Prevention Plan has been prepared and provided. The Stormwater Management System Conforms to Standard 8.

Standard 9: Operations and Maintenance Plan

Conclusion: An Operations and Maintenance Plan has been prepared and provided with this summary. The Stormwater Management System Conforms to Standard 9.

Standard 10: Illicit Discharges to Drainage System

Conclusion: All off-site discharges are comprised entirely of stormwater. The Stormwater Management System Conforms to Standard 10.

Project: Murphy's Farm
Location: Dracut, MA
Client: The Homes at Murphy's Farm LLC

Project Number: 23-10524
Prepared By: Thomas Schomburg, EIT
Date: February 25, 2025

FOREBAY SIZING CALCULATIONS

Infiltration Basin 1 - Forebay PWA-5C

Watershed Characteristics

Impervious Area (Ai):	2.61	Acres
Required (0.1-IN x Ai):	947	CF
Sediment Forebay Volume:	1487	CF
	OK	

Stage / Storage Tables

Sediment Forebay:	Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
	137.0	141	0	0
	140.0	850	1486.5	1486.5

Infiltration Basin 1 - Forebay PWA-5B

Watershed Characteristics

Impervious Area (Ai):	1.27	Acres
Required (0.1-IN x Ai):	461	CF
Sediment Forebay Volume:	727	CF
	OK	

Stage / Storage Tables

Sediment Forebay:	Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
	137.0	149	0	0
	139.0	578	727	727

Subsurface System 2 - Isolator Row

Watershed Characteristics

Impervious Area (Ai):	1.60	Acres
Required (0.1-IN x Ai):	581	CF
Sediment Forebay Volume:	720	CF
	OK	

Stage / Storage Tables

Isolator Row	Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
	143.0	360	0	0
	145.0	360	720	720

Subsurface System 3 - Isolator Row

Watershed Characteristics

Impervious Area (Ai):	1.09	Acres
Required (0.1-IN x Ai):	396	CF
Sediment Forebay Volume:	768	CF
	OK	

Stage / Storage Tables

Isolator Row	Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
	139.0	240	0	0
	142.2	240	768	768

Subsurface System 4 - Isolator Row

Watershed Characteristics

Impervious Area (Ai):	3.40	Acres
Required (0.1-IN x Ai):	1234	CF
Isolator Row Volume	1440	CF
	OK	

Stage / Storage Tables

Isolator Row	Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
	134.0	480	0	0
	137.0	480	1440	1440

Infiltration Basin 2 - Forebay

Watershed Characteristics

Impervious Area (Ai):	0.73	Acres
Required (0.1-IN x Ai):	265	CF
Sediment Forebay Volume:	299	CF
	OK	

Stage / Storage Tables

Sediment Forebay:	Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
	144.0	175	0	0
	145.0	422	299	299

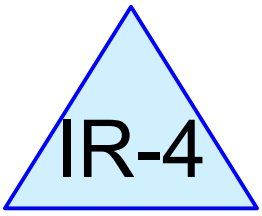
Infiltration Basin 3 - Forebay

Watershed Characteristics

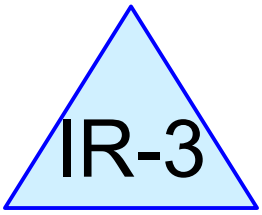
Impervious Area (Ai):	0.68	Acres
Required (0.1-IN x Ai):	247	CF
Sediment Forebay Volume:	592	CF
	OK	

Stage / Storage Tables

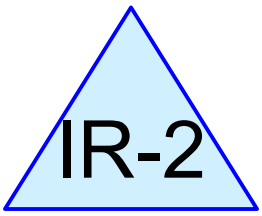
Sediment Forebay:	Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
	145.0	281	0	0
	146.0	903	592	592



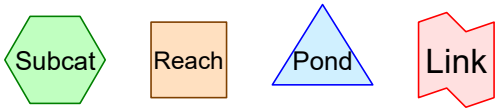
Isolator row for Sub-4



Isolator row for Sub-3



Isolator row for Sub-2



Summary for Pond IR-2: Isolator row for Sub-2

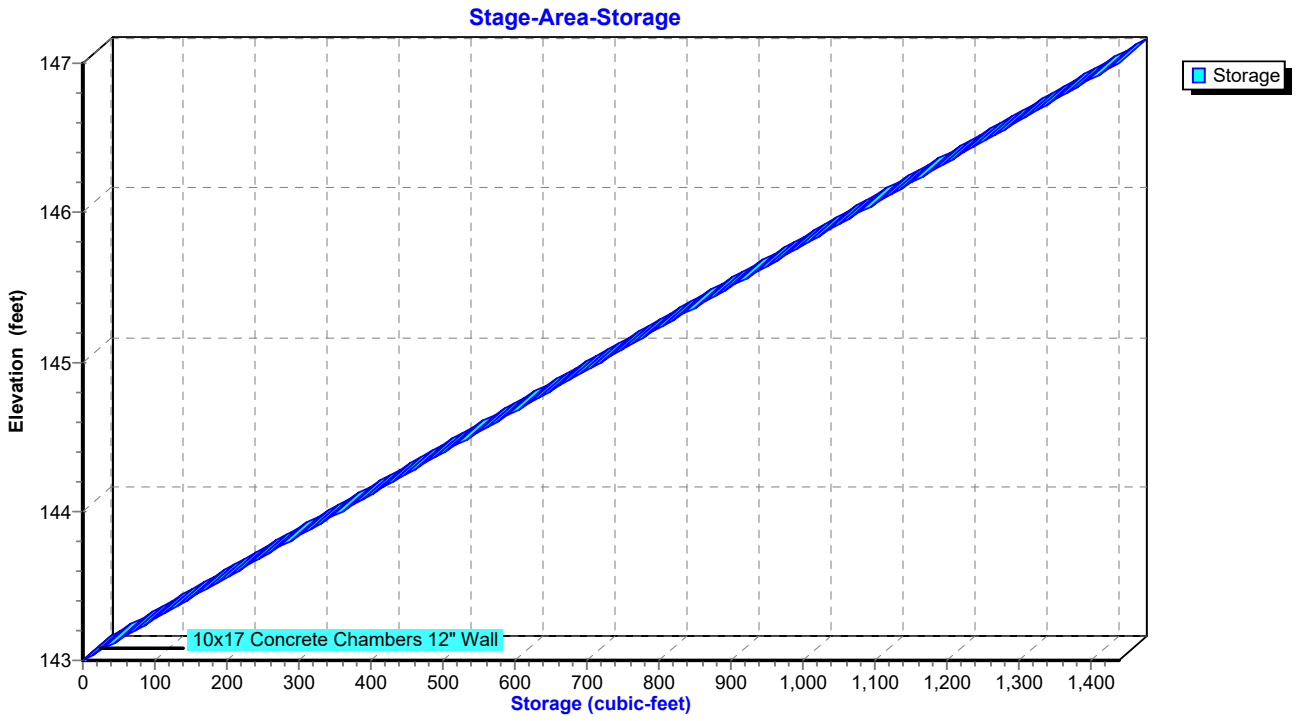
[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	143.00'	1,440 cf	**8.00'W x 15.00'L x 4.00'H 10x17 Concrete Chambers 12" Walk** 3

Device	Routing	Invert	Outlet Devices
#1	Primary	145.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Controls 0.0 cfs)

Pond IR-2: Isolator row for Sub-2



Summary for Pond IR-3: Isolator row for Sub-3

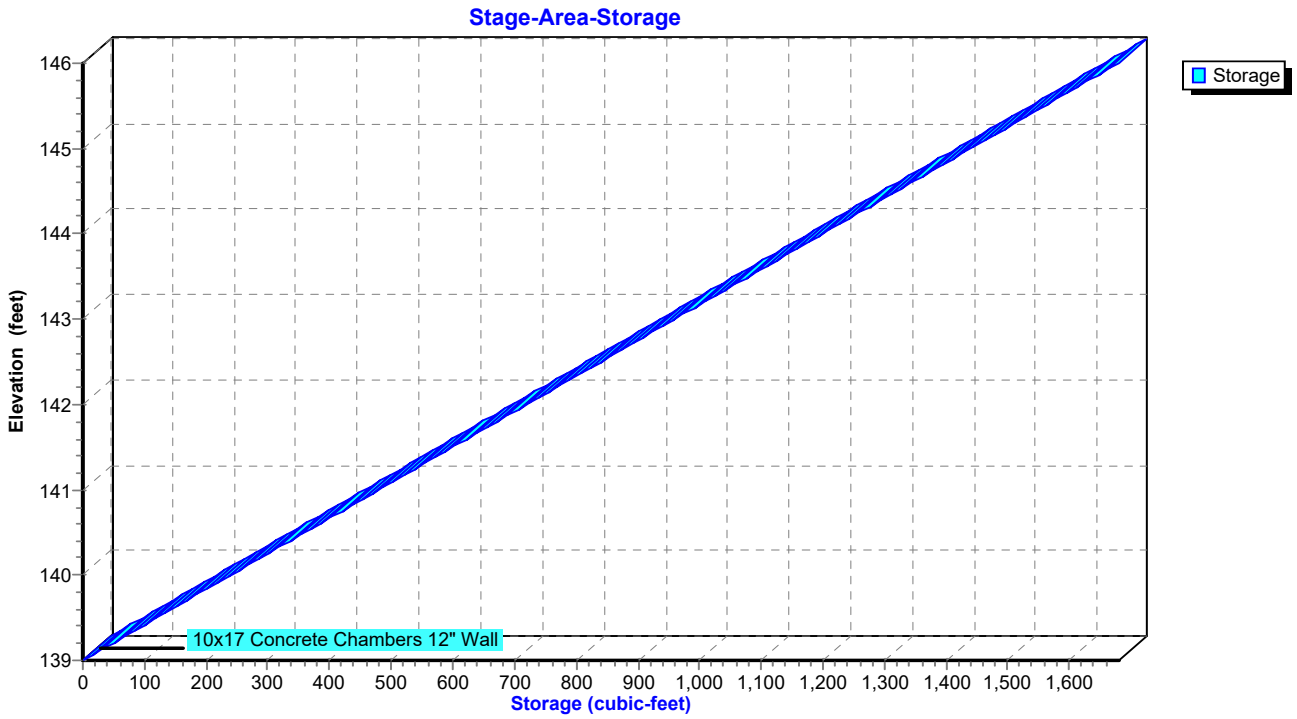
[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description
#1	139.00'	1,680 cf	**8.00'W x 15.00'L x 7.00'H 10x17 Concrete Chambers 12" Walk** 2

Device	Routing	Invert	Outlet Devices
#1	Primary	142.20'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Controls 0.0 cfs)

Pond IR-3: Isolator row for Sub-3



Summary for Pond IR-4: Isolator row for Sub-4

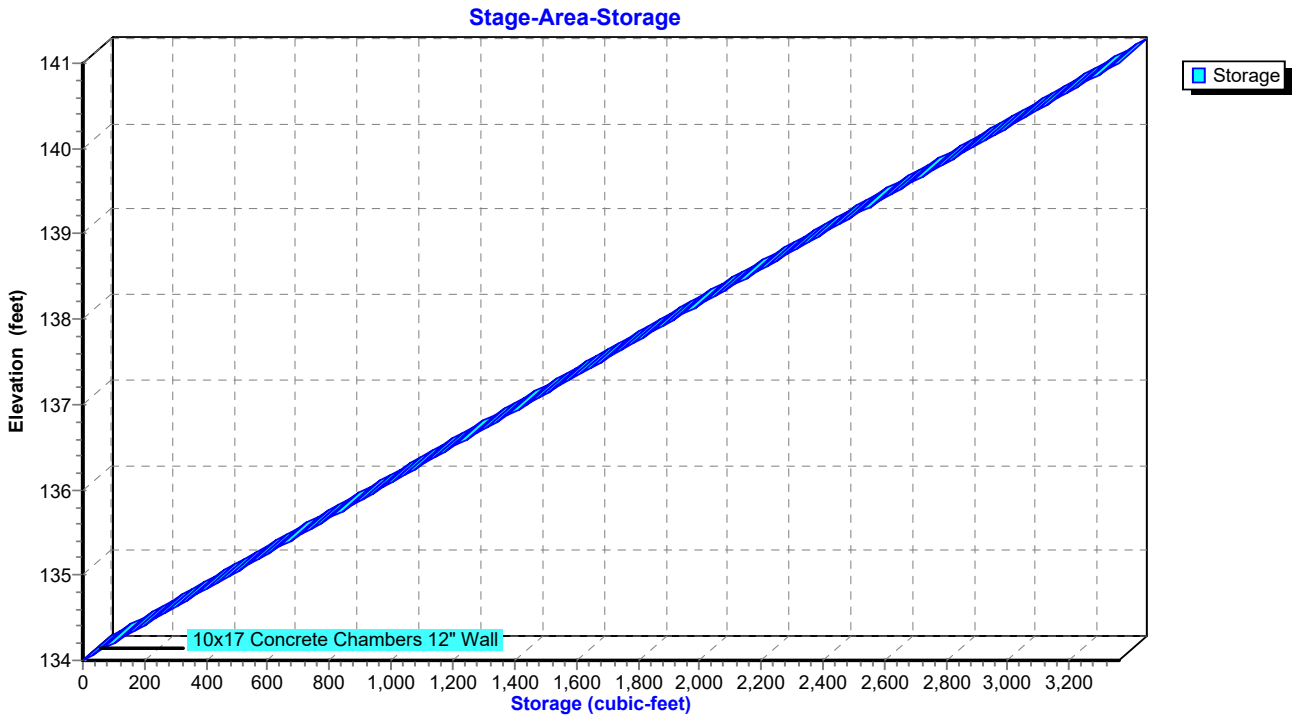
[43] Hint: Has no inflow (Outflow=Zero)

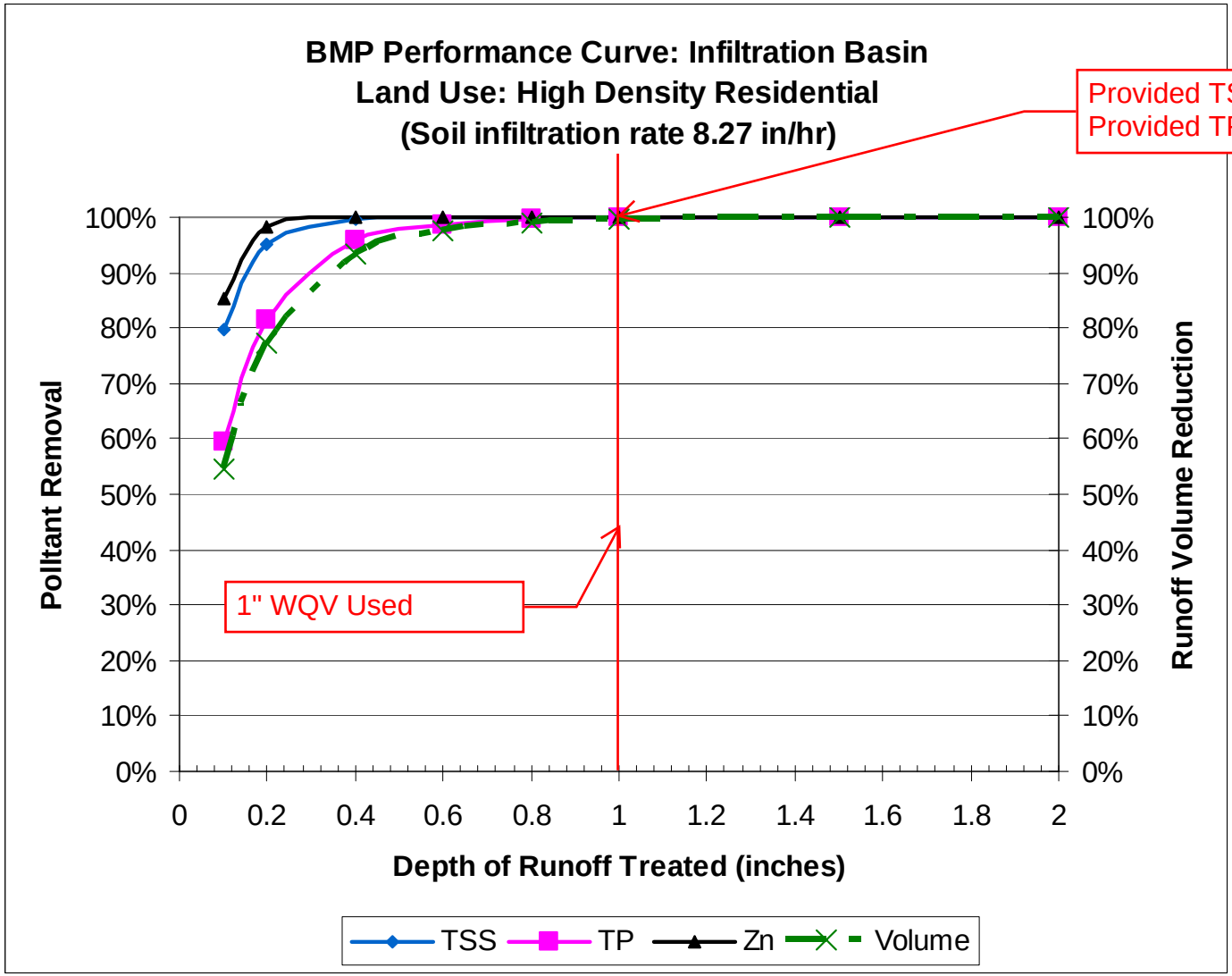
Volume	Invert	Avail.Storage	Storage Description
#1	134.00'	3,360 cf	**8.00'W x 15.00'L x 7.00'H 10x17 Concrete Chambers 12" Walk** 4

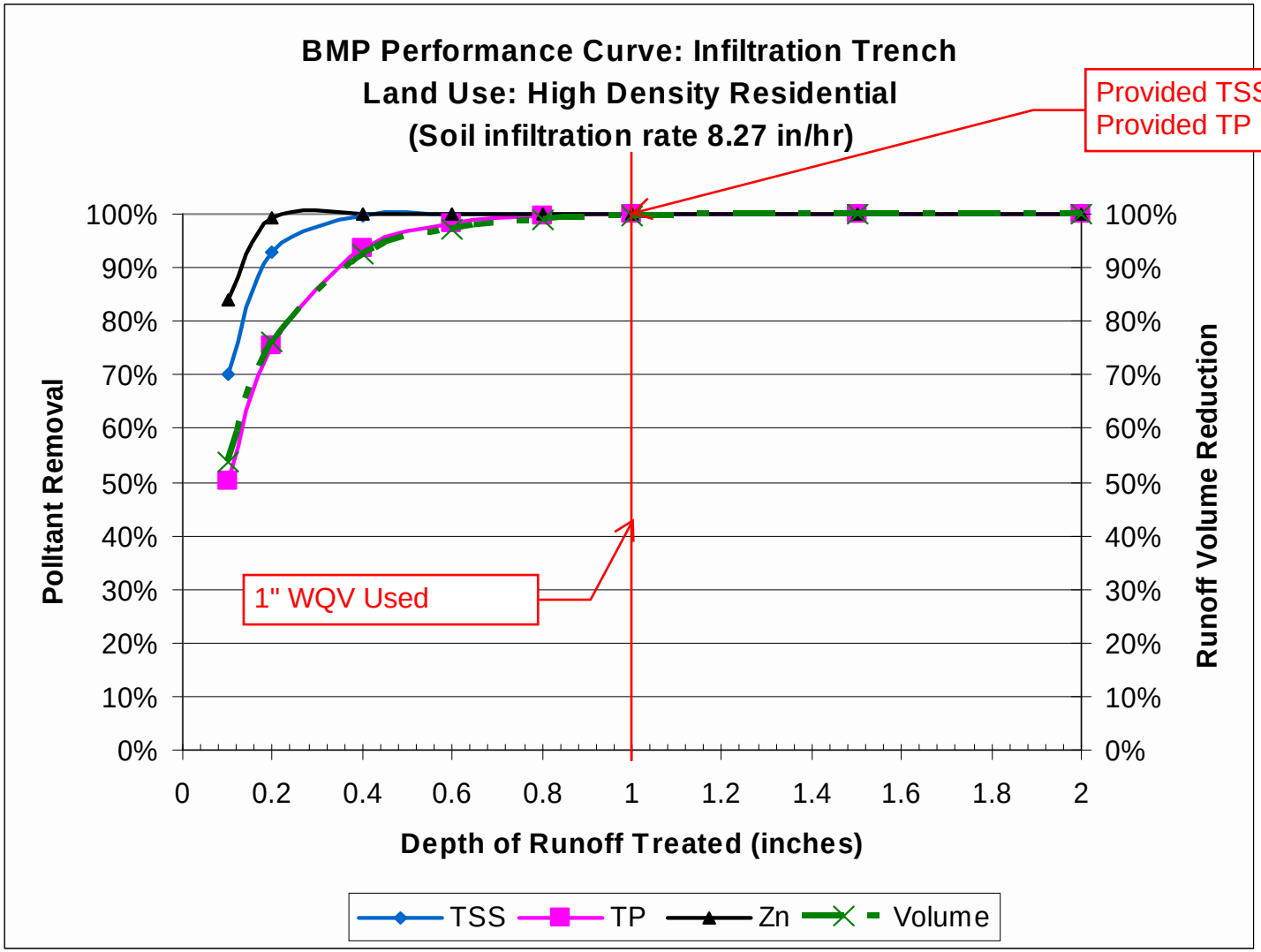
Device	Routing	Invert	Outlet Devices
#1	Primary	137.00'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=0.00' (Free Discharge)
1=Sharp-Crested Rectangular Weir (Controls 0.0 cfs)

Pond IR-4: Isolator row for Sub-4




BMP Performance Curve: Infiltration Basin
Land Use: High Density Residential
(Soil infiltration rate 8.27 in/hr)
Provided TSS Removal:100%
Provided TP Removal:100%
1" WQV Used
Polltant Removal
Runoff Volume Reduction
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Depth of Runoff Treated (inches)
TSS
TP
Zn
Volume


BMP Performance Curve: Infiltration Trench
Land Use: High Density Residential
(Soil infiltration rate 8.27 in/hr)
Provided TSS Removal:100%
Provided TP Removal:100%
1" WQV Used
Polltant Removal
Runoff Volume Reduction
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
1.8
2
Depth of Runoff Treated (inches)
TSS
TP
Zn
Volume

Project: The Homes at Murphy's Farm
Location: Andover, MA
Prepared For: Civil Design Consultants

Purpose: To calculate the water quality flow rate (WQF) over a given site area. In this situation the WQF is derived from the first 1" of runoff from the contributing impervious surface.

Reference: Massachusetts Dept. of Environmental Protection Wetlands Program / United States Department of Agriculture Natural Resources Conservation Service TR-55 Manual

Procedure: Determine unit peak discharge using Figure 1 or 2. Figure 2 is in tabular form so is preferred. Using the tc, read the unit peak discharge (qu) from Figure 1 or Table in Figure 2. qu is expressed in the following units: cfs/mi^2/watershed inches (csm/in).

Compute Q Rate using the following equation:

Q = (qu) (A) (WQV)

where:

Q = flow rate associated with first 1" of runoff
qu = the unit peak discharge, in csm/in.
A = impervious surface drainage area (in square miles)
WQV = water quality volume in watershed inches (1" in this case)

Structure Name	Impv. (acres)	A (miles^2)	t_c (min)	t_c (hr)	WQV (in)	qu (csm/in.)	Q (cfs)
CDS	0.24	0.0003797	6.0	0.100	1.00	774.00	0.29

CONTECH ENGINEERED SOLUTIONS

CDS TECHNOLOGIES

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD

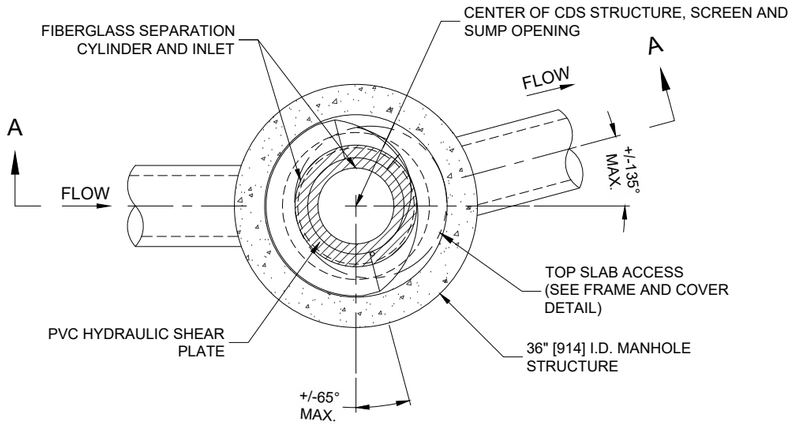
THE HOMES AT MURPHY'S FARM
ANDOVER, MA

Area	**0.24 ac**	Unit Site Designation	**CDS**
Weighted C	**0.9**	Rainfall Station #	**67**
t_c	**6 min**		
CDS Model	**1515-3**	CDS Treatment Capacity	**1.0 cfs**

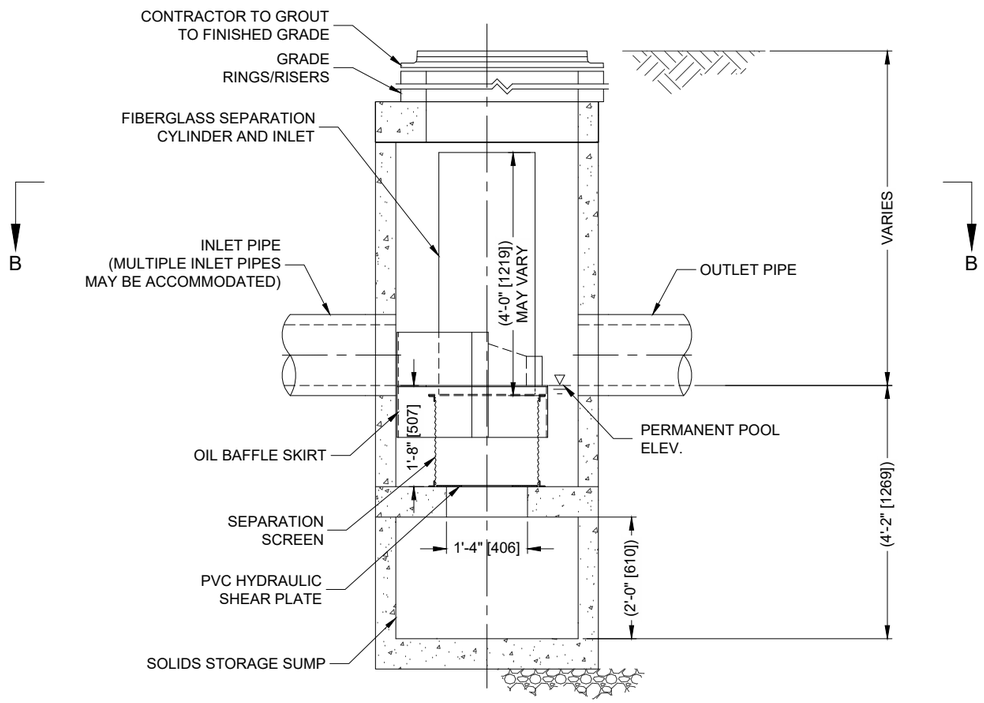
Rainfall Intensity[1] (in/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (cfs)	Treated Flowrate (cfs)	Incremental Removal (%)
0.08	41.0%	41.0%	0.02	0.02	39.4
0.16	23.9%	64.9%	0.03	0.03	22.6
0.24	11.5%	76.5%	0.05	0.05	10.8
0.32	7.4%	83.9%	0.07	0.07	6.9
0.40	4.4%	88.3%	0.09	0.09	4.1
0.48	2.9%	91.2%	0.10	0.10	2.6
0.56	1.8%	93.0%	0.12	0.12	1.6
0.64	1.2%	94.2%	0.14	0.14	1.0
0.72	1.6%	95.8%	0.16	0.16	1.4
0.80	0.8%	96.6%	0.17	0.17	0.7
1.00	0.6%	97.1%	0.22	0.22	0.5
1.40	1.4%	98.6%	0.31	0.31	1.1
1.80	0.9%	99.5%	0.39	0.39	0.6
2.20	0.5%	100.0%	0.48	0.48	0.3
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
0.00	0.0%	100.0%	0.00	0.00	0.0
					93.6
				Removal Efficiency Adjustment[2] =	0.0%
				Predicted % Annual Rainfall Treated =	100.0%
				Predicted Net Annual Load Removal Efficiency =	**93.6%**

1 - Based on 7 years of data from NCDC station #3276, Groveland, Essex County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.



PLAN VIEW B-B
N.T.S.

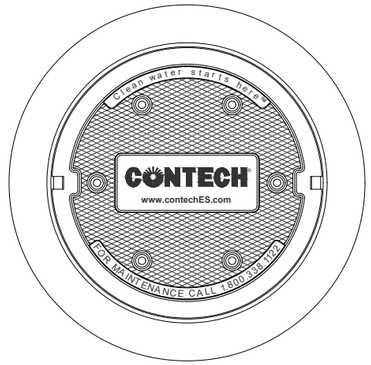


ELEVATION A-A
N.T.S.

CDS1515-3-C DESIGN NOTES

CDS1515-3-C RATED TREATMENT CAPACITY IS 1.0 CFS, OR PER LOCAL REGULATIONS.

THE STANDARD CDS1515-3-C CONFIGURATION IS SHOWN.



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	
WATER QUALITY FLOW RATE (CFS OR L/s)	*
PEAK FLOW RATE (CFS OR L/s)	*
RETURN PERIOD OF PEAK FLOW (YRS)	*
SCREEN APERTURE (2400 OR 4700)	*

PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*

RIM ELEVATION	*

ANTI-FLOTATION BALLAST	WIDTH	HEIGHT
	*	*

NOTES/SPECIAL REQUIREMENTS:

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. FOR SITE SPECIFIC DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
3. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING. CONTRACTOR TO CONFIRM STRUCTURE MEETS REQUIREMENTS OF PROJECT.
4. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING EARTH COVER OF 0' - 2', AND GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET AASHTO M306 AND BE CAST WITH THE CONTECH LOGO..
5. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.
6. CDS STRUCTURE SHALL BE PRECAST CONCRETE CONFORMING TO ASTM C-478 AND AASHTO LOAD FACTOR DESIGN METHOD.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE CDS MANHOLE STRUCTURE.
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT INLET AND OUTLET PIPE(S). MATCH PIPE INVERTS WITH ELEVATIONS SHOWN. ALL PIPE CENTERLINES TO MATCH PIPE OPENING CENTERLINES.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

CONTECH ENGINEERED SOLUTIONS LLC
www.contechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

CDS1515-3-C
ONLINE CDS
STANDARD DETAIL

Closed Drainage System Calculations

Location: Murphy's Farm, Dracut, MA
Client: The Homes at Murphy's Farm LLC
Subject: Closed Drainage System Calculations

Proj. No. 23-10524
Date 12/20/2024
Comp. TWS
Check

Design Parameters
Design Storm 25 Year Storm
"Min. Pipe Size

Location in Massachusetts 1 (1-Boston, 2-Barnstable, 3-Worcester, 4-Springfield, 5-Pittsfield)
Manning's roughness coefficient 0.013

Rainfall Data is For Boston

LOCATION		RAINFALL CONCENTRATION PERIOD IN MINUTES		COMBINED RUNOFF COEFF.	TRIBUTARY AREA IN ACRES		C x A		RAINFALL INTENSITY (i)	PEAK FLOW	PIPE							PROFILE			
FROM DRAINAGE NO.	TO DRAINAGE NO.	PIPE	TOTAL	C	INC	TOTAL	INC	TOTAL	IN/HR	CFS	SIZE IN	n VALUE	SLOPE FT/FT	LENGTH FT	FULL CAPACITY CFS	FULL VELOCITY FT/S	PEAK FLOW CONDITIONS VELOCITY FT/S	PEAK FLOW CONDITIONS d/D	INVERT ELEVATION UPPER END	INVERT ELEVATION LOWER END	RIM ELEVATION & DEPTH OF COVER UPPER RIM	RIM ELEVATION & DEPTH OF COVER DEPTH
PCB-1	PDMH-1		5.00	0.55	0.360	0.360	0.20	0.20	6.00	1.19	12	0.013	0.005	19	**2.52**	3.2	3.1	0.48				
PCB-2	PDMH-1		5.00	0.67	0.090	0.090	0.06	0.06	6.00	0.36	12	0.013	0.005	11	**2.52**	3.2	2.2	0.25				
PDMH-1	**SUBSURFACE-1**	**0.08**	**5.10**			**0.450**	**0.00**	**0.26**	**6.00**	**1.55**	**12**	**0.013**	**0.005**	**10**	**2.52**	**3.2**	**3.4**	**0.56**				
PCB-3	PDMH-2		5.00	0.55	0.040	0.040	0.02	0.02	6.00	0.13	12	0.013	0.005	8	**2.52**	3.2	1.7	0.15				
PCB-4	PDMH-2		5.00	0.76	0.050	0.050	0.04	0.04	6.00	0.23	12	0.013	0.005	14	**2.52**	3.2	1.9	0.19				
PDMH-2	**PFES-1**	**0.12**	**5.08**			**0.090**	**0.00**	**0.06**	**6.00**	**0.36**	**12**	**0.013**	**0.005**	**91**	**2.52**	**3.2**	**2.2**	**0.25**				
PCB-12	PDMH-6		5.00	0.52	0.530	0.530	0.28	0.28	6.00	1.65	12	0.013	0.005	13	**2.52**	3.2	3.4	0.59				
PCB-13	PDMH-6		5.00	0.74	0.440	0.440	0.33	0.33	6.00	1.95	12	0.013	0.005	13	**2.52**	3.2	3.5	0.66				
PDMH-6	**PDMH-15**	**0.06**	**5.06**			**0.970**	**0.00**	**0.60**	6.00	**3.61**	**15**	**0.013**	**0.005**	**144**	**4.57**	**3.7**	**4.1**	**0.67**				
PCB-10	PDMH-5		5.00	0.50	1.160	1.160	0.58	0.58	6.00	3.48	12	0.013	0.020	14	**5.04**	6.4	6.9	0.61				
PCB-11	PDMH-5		5.00	0.79	0.430	0.430	0.34	0.34	6.00	2.04	12	0.013	0.010	11	**3.56**	4.5	4.7	0.54				
PDMH-5	**PDMH-15**	**0.03**	**5.65**			**1.590**	**0.00**	**1.52**	6.00	**9.13**	**18**	**0.013**	**0.010**	**100**	**10.50**	**5.9**	**6.7**	**0.72**				
PCB-8	PDMH-4		5.00	0.81	0.470	0.470	0.38	0.38	6.00	2.28	12	0.013	0.050	12	**7.96**	10.1	8.7	0.36				
PCB-9	PDMH-4		5.00	0.64	0.780	0.780	0.50	0.50	6.00	3.00	12	0.013	0.050	11	**7.96**	10.1	9.4	0.42				
PDMH-4	**PDMH-3B**	**0.02**	**5.89**			**1.250**	**0.00**	**0.88**	6.00	**5.28**	**18**	**0.013**	**0.005**	**170**	**7.43**	**4.2**	**4.6**	**0.62**				
PCB-6	PDMH-3B		5.00	0.50	1.820	1.820	0.91	0.91	6.00	5.46	15	0.013	0.010	15	**6.46**	5.3	5.9	0.70				
PDMH-3B	**PDMH-3A**	**0.62**	**6.52**			**3.070**	**0.00**	**1.79**	**5.80**	**10.38**	**24**	**0.013**	**0.010**	**24**	**22.61**	**7.2**	**7.0**	**0.47**				
PCB-7	PDMH-3A		5.00	0.80	0.270	0.270	0.22	0.22	6.00	1.30	12	0.013	0.010	19	**3.56**	4.5	4.1	0.41				
PCB-5	PDMH-3A		5.00	0.62	0.730	0.730	0.45	0.45	6.00	2.72	12	0.013	0.010	26	**3.56**	4.5	5.0	0.65				
PDMH-3A	**PFES-3**	**0.09**	**6.57**			**4.070**	**0.00**	**2.46**	**5.80**	**14.26**	**24**	**0.013**	**0.013**	**152**	**25.78**	**8.2**	**8.4**	**0.53**				
PCB-26	**IB-1**		**5.00**	**0.58**	**2.700**	**2.700**	**1.57**	**1.57**	**6.00**	**9.40**	**18**	**0.013**	**0.029**	**34**	**17.88**	**10.1**	**10.2**	**0.51**				
			5.00			0.000	0.00	0.00	6.00	0.00	12	0.013	0.005	77	**2.52**	3.2	#N/A	#N/A				
PCB-14	PDHM-7		5.00	0.83	0.510	0.510	0.42	0.42	6.00	2.54	15	0.013	0.020	27	**9.13**	7.4	6.4	0.36				

PCB-15	PDMH-7		5.00	0.79	0.130	0.130	0.10	0.10	6.00	0.62	15	0.013	0.020	27	**9.13**	7.4	4.2	0.17				
PDMH-7	**PDMH-8**	**0.07**	**5.07**			**0.640**	**0.00**	**0.53**	**6.00**	**3.16**	**18**	**0.013**	**0.015**	**123**	**12.86**	**7.3**	**5.9**	**0.33**				
PCB-16	PDMH-8		5.00	0.62	0.100	0.100	0.06	0.06	6.00	0.37	12	0.013	0.010	35	**3.56**	4.5	2.9	0.21				
PCB-17	PDMH-8		5.00	0.54	0.780	0.780	0.42	0.42	6.00	2.53	12	0.013	0.010	38	**3.56**	4.5	4.9	0.62				
PDMH-8	**Subsurface**	**0.20**	**5.42**			**1.520**	**0.00**	**1.01**	**6.00**	**6.06**	**18**	**0.013**	**0.022**	**15**	**15.57**	**8.8**	**8.2**	**0.43**				
PCB-18	PDMH-9		5.00	0.69	0.330	0.330	0.23	0.23	6.00	1.37	12	0.013	0.005	22	**2.52**	3.2	3.3	0.52				
PCB-19	PDMH-9		5.00	0.90	0.090	0.090	0.08	0.08	6.00	0.49	12	0.013	0.005	29	**2.52**	3.2	2.4	0.29				
PDMH-9	**PDMH-10**	**0.20**	**5.11**			**0.420**	**0.00**	**0.31**	6.00	**1.85**	**12**	**0.013**	**0.005**	**192**	**2.52**	**3.2**	**3.5**	**0.63**				
PCB-20	PDMH-10		5.00	0.72	1.300	1.300	0.94	0.94	6.00	5.62	15	0.013	0.010	14	**6.46**	5.3	5.9	0.72				
PCB-21	PDMH-10		5.00	0.82	1.110	1.110	0.91	0.91	6.00	5.46	15	0.013	0.010	13	**6.46**	5.3	5.9	0.70				
PDMH-10	**PDMH-11**	**0.04**	**6.03**			**2.830**	**0.00**	**2.15**	**5.80**	**12.50**	**24**	**0.013**	**0.005**	**143**	**15.99**	**5.1**	**5.6**	**0.66**				
PDMH-11	**PDMH-12**	**0.04**	**6.45**			**2.830**	**0.00**	**2.15**	5.80	**12.50**	**24**	**0.013**	**0.005**	**142**	**15.99**	**5.1**	**5.6**	**0.66**				
PCB-22	PDMH-12		5.00	0.82	0.360	0.360	0.30	0.30	6.00	1.77	12	0.013	0.005	27	**2.52**	3.2	3.5	0.61				
PCB-23	PDMH-12		5.00	0.82	0.600	0.600	0.49	0.49	6.00	2.95	12	0.013	0.010	39	**3.56**	4.5	5.1	0.69				
PDMH-12	**PDMH-13**	**0.13**	**6.87**			**3.790**	**0.00**	**2.94**	5.80	**17.06**	**24**	**0.013**	**0.009**	**121**	**21.93**	**7.0**	**7.7**	**0.66**				
PCB-24	PDMH-13		5.00	0.84	0.340	0.340	0.29	0.29	6.00	1.71	12	0.013	0.045	11	**7.56**	9.6	7.6	0.31				
PCB-25	PDMH-13		5.00	0.81	0.080	0.080	0.06	0.06	4.75	0.31	12	0.013	0.045	12	**7.56**	9.6	4.6	0.13				
PDMH-13	**PDMH-21**	**0.02**	**7.14**			**4.210**	**0.00**	**3.29**	**4.75**	**15.64**	**24**	**0.013**	**0.039**	**18**	**44.66**	**14.2**	**12.8**	**0.40**				
PCB-29	PDMH-18		5.00	0.20	0.800	0.800	0.16	0.16	4.75	0.76	12	0.013	0.005	13	**2.52**	3.2	2.8	0.37				
PDMH-15	**PDMH-18**	**0.08**	**5.08**	**0.59**	**2.560**	**3.360**	**1.51**	**1.67**	4.75	**7.93**	**18**	**0.013**	**0.010**	**207**	**10.50**	**5.9**	**6.5**	**0.64**				
PCB-31	PDMH-25		5.00	0.82	0.360	0.360	0.30	0.30	4.75	1.40	12	0.013	0.010	17	**3.56**	4.5	4.2	0.43				
PCB-32	PDMH-25		5.00	0.85	0.290	0.290	0.25	0.25	4.75	1.17	12	0.013	0.010	17	3.56	4.5	4.0	0.39				
PDMH-25	**PFES-10**	**0.07**	**5.07**			**0.650**	**0.00**	**0.54**	**4.75**	**2.57**	**12**	**0.013**	**0.010**	**51**	**3.56**	**4.5**	**4.9**	**0.62**				
PCB-33	PDMH-27		5.00	0.20	0.430	0.430	0.09	0.09	4.75	0.41	12	0.013	0.016	223	4.43	5.6	3.4	0.19				
PCB-34	PDMH-27		5.00	0.79	0.360	0.360	0.28	0.28	4.75	1.35	12	0.013	0.010	10	3.56	4.5	4.2	0.42				
PCB-35	PDMH-27		5.00	0.60	0.210	0.210	0.13	0.13	4.75	0.60	12	0.013	0.010	14	3.56	4.5	3.3	0.27				
PDMH-27	**PFES-6**	**0.04**	**7.16**			**1.000**	**0.00**	**0.50**	**4.75**	**2.36**	**12**	**0.013**	**0.014**	**70**	**4.21**	**5.4**	**5.5**	**0.53**				

Project: Murphy's Farm
Client: The Homes at Murphy's Farm LLC
Project Number: 24-10524

Prepared By: TWS
Checked By: WJH
Date: 12/30/24
Revised:3/27/25

CIVIL DESIGN CONSULTANTS, INC
344 North Main Street | Andover · MA 01810
(978) 416-0920 | www.civildci.com

GRATE INLET CAPACITY CALCULATION SHEET

Design Criteria

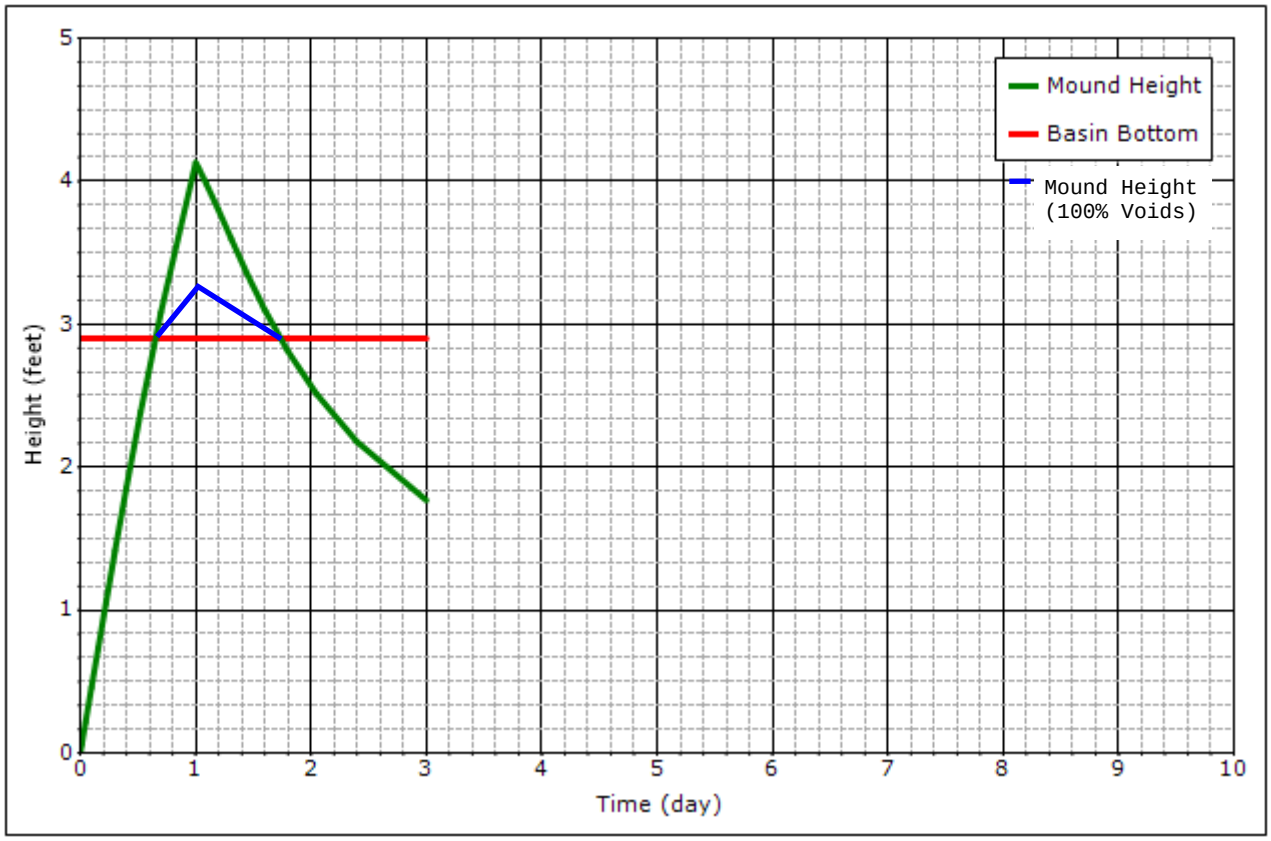
Orifice Flow	Weir Flow
$Q = 0.0108A*d^{0.5}$	$Q = 3.33L(H)^{1.5}$

Where,

A	=	the open area in the grate (square inches)
d	=	the depth of water over the grate (inches)
L	=	the perimeter of the grate (feet)
H	=	the gutter depth of water (feet)
Qc	=	the grate capacity (CFS)
Q10	=	the maximum 10-yr grate flow (CFS)

Structure	Low Point	A	d	L	H	Qc	Q10
PCB-1-5	no			8	0.22	2.7	2.4
PCB-6 (Dbl.)	no			12	0.22	4.1	4.9
PCB-7-9	no			8	0.22	2.7	2.7
PCB-10 (Dbl.)	no			12	0.22	4.1	3.1
PCB-11-13	no			8	0.22	2.7	1.8
PCB-14-15, 31-32	yes	212	6			5.6	5.3
PCB-16-19	no			8	0.22	2.7	2.3
PCB-20-21	yes	212	6			5.6	5.1
PCB-22-23	no			8	0.22	2.7	2.7
PCB-24-25	yes	212	6			5.6	1.5
PCB-26	yes	212	18			9.7	8.5
PCB-29	yes	212	6			5.6	0.8
PCB-31-32	no			8	0.22	2.7	1.4
PCB-33-35	yes	212	6		0.22	5.6	1.4

Groundwater Mounding Analysis (Hantush Method using Glover's Solution)



Company: Civil Design
Project: Consultants, Inc
Murphy's Farm IB-1
Analyst: Thomas Schomburg
Date: 03/25/2025

Recharge Basin Dimensions

Length (w): 91 ft
Width (l): 112 ft
Bottom Area: 10,192 ft²
SHGW Separation: 2.9 ft

Recharge Rate Calculations

Duration (t): 1 d
Volume (V): 14,426 ft³
Rate (R): 1.42 ft/d
Total Simulation Time: 3 d

Aquifer Characteristics

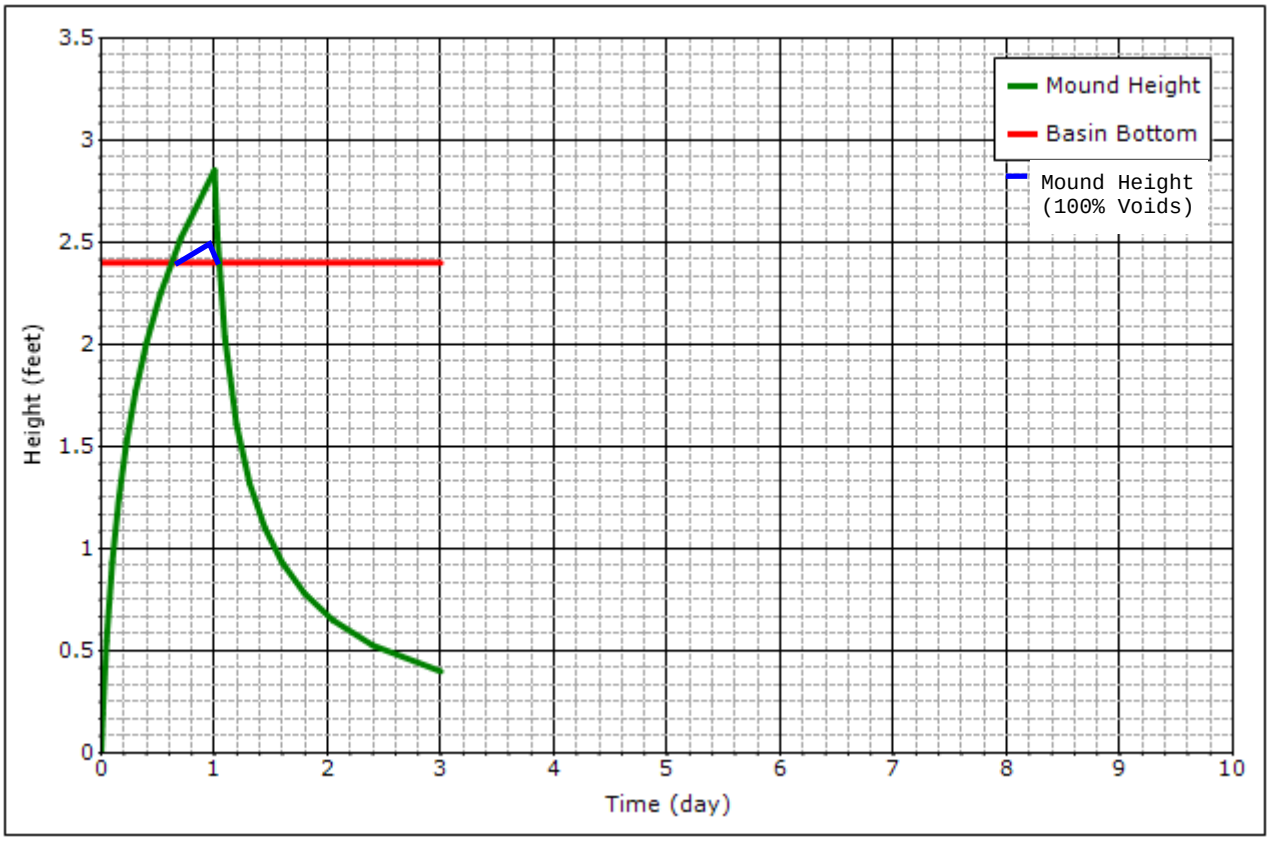
Hydraulic Conductivity (Kh): 41.35 ft/d
Drainable Porosity(Sy): 0.3
Saturated Thickness (h): 5 ft

Plot Geometry

X-Coordinate: 0 ft
Y-Coordinate: 0 ft
Left Side Plot Distance (Dl): 0 ft
Right Side Plot Distance (Dr): 0 ft
Plot Angle From Y-Axis (Φ): 0
Constant Head Boundary: No

Time (d)	Height (ft)
0.00	0.0000
0.01	0.0625
0.05	0.2168
0.10	0.4587
0.15	0.7330
0.22	1.0479
0.30	1.4152
0.40	1.8515
0.52	2.3867
0.70	3.0834
1.00	4.1299
1.03	4.0889
1.09	3.9831
1.19	3.8051
1.31	3.5942
1.44	3.3560
1.60	3.0957
1.80	2.8160
2.05	2.5139
2.40	2.1781
3.00	1.7684

Groundwater Mounding Analysis (Hantush Method using Glover's Solution)



Company: Civil Design
Project: Consultants, Inc
Murphy's Farm IB-3
Analyst: Thomas Schomburg
Date: 03/20/2025

Recharge Basin Dimensions

Length (w): 50 ft
Width (l): 16.3 ft
Bottom Area: 815 ft²
SHGW Separation: 2.4 ft

Recharge Rate Calculations

Duration (t): 1 d
Volume (V): 3,679 ft³
Rate (R): 4.51 ft/d
Total Simulation Time: 3 d

Aquifer Characteristics

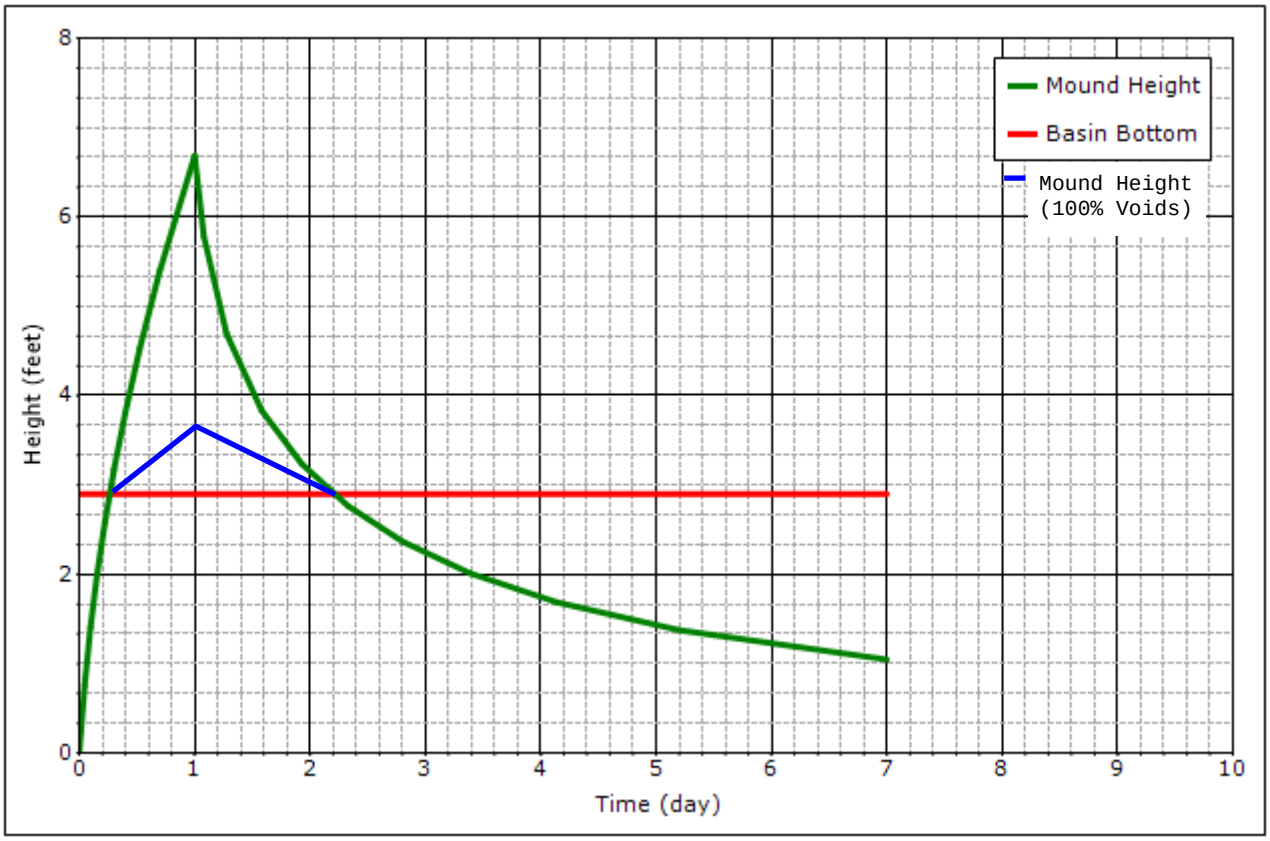
Hydraulic Conductivity (Kh): 41.35 ft/d
Drainable Porosity(Sy): 0.3
Saturated Thickness (h): 7 ft

Plot Geometry

X-Coordinate: 0 ft
Y-Coordinate: 0 ft
Left Side Plot Distance (Dl): 0 ft
Right Side Plot Distance (Dr): 0 ft
Plot Angle From Y-Axis (Φ): 0
Constant Head Boundary: No

Time (d)	Height (ft)
0.00	0.0000
0.01	0.1917
0.05	0.5495
0.10	0.9348
0.15	1.2472
0.22	1.5185
0.30	1.7674
0.40	2.0069
0.52	2.2504
0.70	2.5169
1.00	2.8543
1.03	2.5257
1.09	2.0371
1.19	1.6104
1.31	1.3217
1.44	1.1046
1.60	0.9299
1.80	0.7820
2.05	0.6509
2.40	0.5278
3.00	0.3999

Groundwater Mounding Analysis (Hantush Method using Glover's Solution)



Company: Civil Design
Project: Consultants, Inc
Murphy's Farm
Subsurface System-3
Analyst: Thomas Schomburg
Date: 03/20/2025

Recharge Basin Dimensions

Length (w): 142.5 ft
Width (l): 16 ft
Bottom Area: 2,280 ft²
SHGW Separation: 2.9 ft

Recharge Rate Calculations

Duration (t): 1 d
Volume (V): 12,312 ft³
Rate (R): 5.4 ft/d
Total Simulation Time: 7 d

Aquifer Characteristics

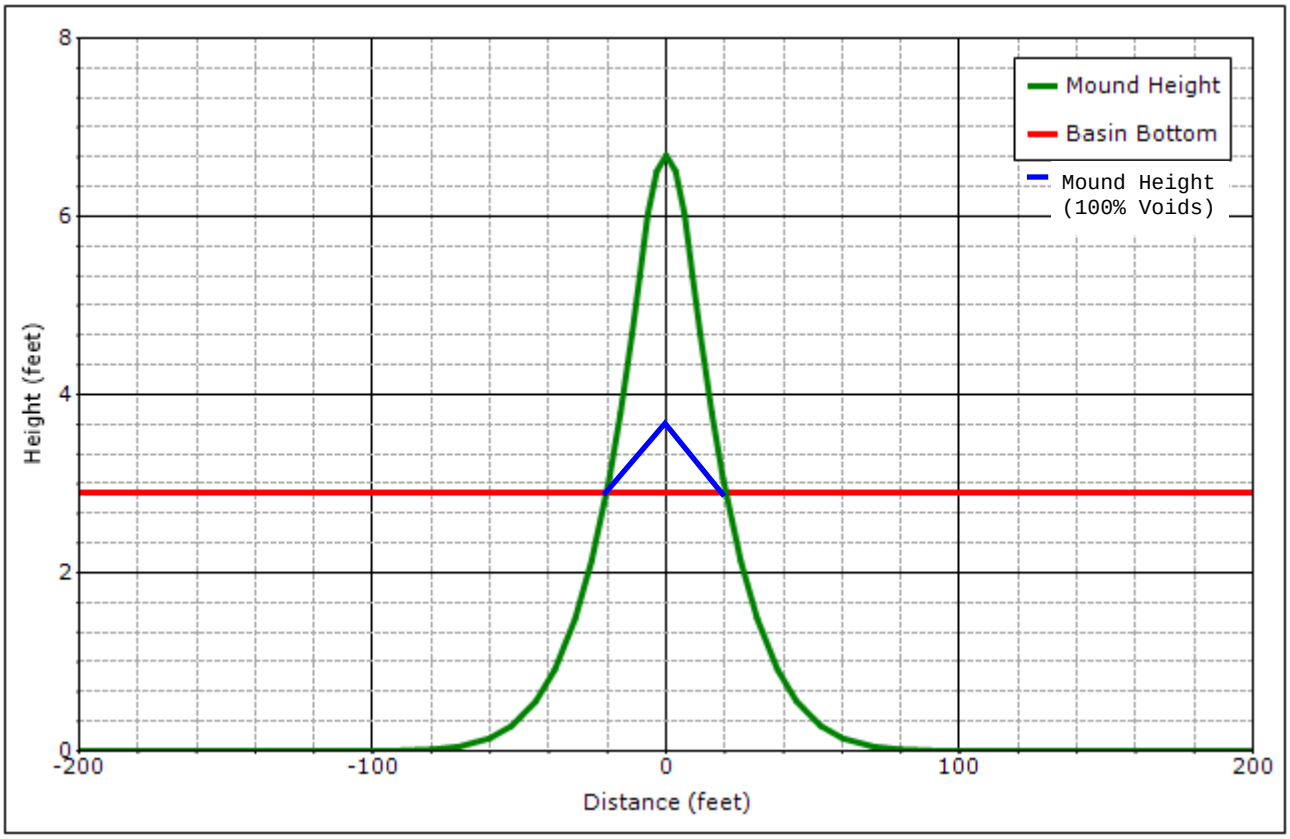
Hydraulic Conductivity (Kh): 41.35 ft/d
Drainable Porosity(Sy): 0.3
Saturated Thickness (h): 3 ft

Plot Geometry

X-Coordinate: 0 ft
Y-Coordinate: 0 ft
Left Side Plot Distance (Dl): 200 ft
Right Side Plot Distance (Dr): 200 ft
Plot Angle From Y-Axis (Φ): 1.570796326794
Constant Head Boundary: No

Time (d)	Height (ft)
0.00	0.0000
0.01	0.2330
0.05	0.7578
0.10	1.4105
0.15	2.0047
0.22	2.5826
0.30	3.1737
0.40	3.8065
0.52	4.5237
0.70	5.4059
1.00	6.6864
1.08	5.7856
1.27	4.6986
1.58	3.8332
1.93	3.2368
2.33	2.7650
2.81	2.3653
3.39	2.0126
4.14	1.6890
5.19	1.3776
7.00	1.0476

Groundwater Mounding Analysis (Hantush Method using Glover's Solution)



Company: Civil Design
Project: Consultants, Inc
Murphy's Farm
Subsurface System-3
Analyst: Thomas Schomburg
Date: 03/20/2025

Recharge Basin Dimensions

Length (w): 142.5 ft
Width (l): 16 ft
Bottom Area: 2,280 ft²
SHGW Separation: 2.9 ft

Recharge Rate Calculations

Duration (t): 1 d
Volume (V): 12,312 ft³
Rate (R): 5.4 ft/d
Total Simulation Time: 7 d

Aquifer Characteristics

Hydraulic Conductivity (Kh): 41.35 ft/d
Drainable Porosity(Sy): 0.3
Saturated Thickness (h): 3 ft

Plot Geometry

X-Coordinate: 0 ft
Y-Coordinate: 0 ft
Left Side Plot Distance (Dl): 200 ft
Right Side Plot Distance (Dr): 200 ft
Plot Angle From Y-Axis (Φ): 1.570796326794
Constant Head Boundary: No

Distance (ft)	Height (ft)	Distance (ft)	Height (ft)
-200.00	0.0009	0.00	6.6864
-185.56	0.0002	3.20	6.5096
-168.20	0.0000	6.30	6.0188
-153.74	0.0000	9.00	5.3290
-136.38	0.0000	11.60	4.6836
-121.92	0.0000	15.58	3.7912
-104.58	0.0008	19.38	3.0615
-92.98	0.0038	25.38	2.1387
-79.58	0.0192	30.98	1.4895
-70.42	0.0519	37.92	0.9158
-60.20	0.1427	44.36	0.5611
-52.64	0.2826	52.64	0.2826
-44.36	0.5611	60.20	0.1427
-37.92	0.9158	70.42	0.0519
-30.98	1.4895	79.58	0.0192
-25.38	2.1387	92.98	0.0038
-19.38	3.0615	104.58	0.0008
-15.58	3.7912	121.92	0.0000
-11.60	4.6836	136.38	0.0000
-9.00	5.3290	153.74	0.0000
-6.30	6.0188	168.20	0.0000
-3.20	6.5096	185.56	0.0002
		200.00	0.0009

LONG TERM OPERATIONS AND MAINTENANCE PROGRAM

March 27, 2025

This Long-Term Operations and Maintenance Program Plan has been prepared in accordance with the Stormwater Management Policy issued by the Department of Environmental Protection (DEP) for the proposed multi-family residential development located at Murphy's Farm in Dracut, MA. Upon a period beginning twelve months after the completion of the roadway, all structural BMP's shall be inspected twice annually, once in April and once in November. The inspection shall be performed as indicated below:

Street Sweeping

Street sweeping can be an effective method to reduce pollutant loading in runoff generated from pavement. Street sweeping shall be performed quarterly, using a high efficiency vacuum sweeper or regenerative air sweeper, with sweeping scheduled primarily in the spring and fall.

Snow Storage / Removal

Snow plowed from the proposed roadway will be placed or disposed of in accordance with the policy developed by DEP. Under no circumstances shall snow plowed or removed from the road be stockpiled within wetland resource areas. If conditions arise where snow storage areas are at capacity the Operator is required to remove and dispose of snow off site in conformance with all local, state and federal regulations.

Catch Basins

Catch basins shall be inspected and/or cleaned at least four times per year and at the end of the foliage and snow removal seasons. Sediment shall be removed four times per year or whenever the depth of the deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin. Sediment shall be removed and disposed of with a truck-mounted vacuum unit or other appropriate apparatus. The sediment will be disposed of at an approved offsite location in accordance with all applicable local, state, and federal regulations.

Drainage Outfalls

The outlets of the storm water management system will be inspected biannually. Any evidence of erosion or other damage will be reported to the appropriate town representative and repaired as soon as possible. Any sediment should be removed from the outlet structures.

Crushed Stone Conveyance Trench

Crushed stone conveyance trenches will be inspected and/or cleaned at least four times per year and at the end of the foliage and snow removal seasons. Sediment shall be removed four times per year or whenever the stone trench is visibly clogged. Sediment shall be removed and disposed of with a vacuum unit or other appropriate apparatus. The sediment will be disposed of at an approved offsite location in accordance with all applicable local, state, and federal regulations.

Sediment Forebay

Sediments and associated pollutants are removed only when sediment forebays are actually cleaned out, so regular maintenance is essential. Frequently removing accumulated sediments will make it less likely that sediments will be re-suspended. At a minimum, inspect sediment forebays monthly and clean them out at least four times per year. Stabilize the floor and sidewalls of the sediment forebay before making it operational, otherwise the practice will discharge excess amounts of suspended sediments. When mowing grasses, keep the grass height no greater than 6 inches. Set mower blades no lower than 3 to 4 inches. Check for signs of riling and gullying and repair as needed. After removing the sediment, replace any vegetation damaged during the clean-out by either reseeding or resodding. When reseeding, incorporate practices such as hydroseeding with a tackifier, blanket, or similar practice to ensure that no scour occurs in the forebay while the seeds germinate and develop roots.

Infiltration Basin

Infiltration basins are prone to clogging and failure, so it is imperative to develop and implement aggressive maintenance plans and schedules. Installing the required pretreatment BMPs will significantly reduce maintenance requirements for the basin. Inspections and preventive maintenance must be performed at least twice a year.

Once the basin is in use, inspect it after every major storm for the first few months to ensure it is stabilized and functioning properly and if necessary, take corrective action. Note how long water remains standing in the basin after a storm; standing water within the basin 48 to 72 hours after a storm indicates that the infiltration capacity may have been overestimated. If the ponding is due to clogging, immediately address the reasons for the clogging (such as upland sediment erosion, excessive compaction of soils, or low spots).

Thereafter, inspect the infiltration basin at least twice per year. Important items to check during the inspection include:

- Signs of differential settlement,
- Cracking,
- Erosion,
- Leakage in the embankments,
- Tree growth on the embankments,
- Condition of riprap,
- Operation of the drawdown device,
- Sediment accumulation and
- The health of the turf.

At least twice a year, mow the buffer area, side slopes, and basin bottom. Remove grass clippings and accumulated organic matter to prevent an impervious organic mat from forming. Remove trash and debris at the same time. Use deep tilling to break up clogged surfaces and revegetate immediately. Remove sediment from the basin as necessary but wait until the floor of the basin is thoroughly dry. Use light equipment to remove the top layer to not compact the underlying soil. Deeply till the remaining soil and revegetate as soon as possible. Inspect and clean pretreatment devices associated with basins at least twice a year, and ideally every other month.

Stormceptor (CDS)

Inspection and Maintenance is fundamental to the long-term performance of a Stormceptor oil/grit separator system. Stormceptors should be inspected post construction, prior to the discharge of any stormwater. Additional inspections should occur every 6 months for the first year to determine the sediment accumulation rate. After the first year, inspections should occur based on first-year observations or local requirements, whichever is stricter. Cleanings should be performed with a standard vacuum truck.

Isolator Row & Subsurface Infiltration Systems

The isolator rows & subsurface systems shall be inspected twice annually, once in April and once in November. If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted into the inspection port to determine the depth of sediment. When the average depth of sediment exceeds 3" throughout the length of the isolator row, a clean-out should be performed. Cleanings should be performed with a standard vacuum truck. Any and all debris and/or sediments shall be removed from the units and be disposed of at an approved offsite location in accordance with all applicable local, state, and federal regulations.

Mosquito Control Plan
Mosquito pupae and larvae need at least four days of ponded water to emerge as adults. Ensure that Infiltration Basin maintenance is performed as required so that the period of infiltration is less than 72 hours per DEP requirements.

Owner:
The Homes At Murphy's Farm, LLC
(c/o Kevin O'Brien)
18 Cassimere Street
Andover, MA 01810

Applicant / Responsible Party (During Construction):
The Homes At Murphy's Farm, LLC
(c/o Kevin O'Brien)
18 Cassimere Street
Andover, MA 01810

Responsible Party (After Construction):
A Property Management company shall be created and shall be responsible for the maintenance of the stormwater basins, subsurface systems, isolator rows, drainage outfalls, stone trenches, catch basins, and stormceptors.

Construction Period Pollution Prevention Plan:
A Stormwater Pollution Prevention Plan (SWPPP) will be prepared prior to construction to address the project's NPDES obligations with the EPA. The SWPPP will address the requirements of the Construction Period Pollution Prevention Plan.

System Map:
See *Comprehensive Permit Site Plan for Murphy's Farm* for the location of all stormwater management facilities.

Estimated Operations and Maintenance Budget
It is anticipated that the stormwater management system will require an annual budget of $10,000 to maintain.

CONTECH®
ENGINEERED SOLUTIONS

CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122

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800.925.5240
www.ContechES.com

CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. **Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

TEST PIT LOGS

Address: Murhpy's Farm, Dracut, MA
Date: 12/7/2023
S.E.: William Hall
Witness: Tina Rivard

Note: Areas where test pits were performed have been stripped of top and subsoil.

CDCI-1

Depth	Horizon	Color	Texture
0-120	C	10YR5/4	Coarse Sand

Many cobbles and stones
Not mottling observed
No water observed

CDCI-2

Depth	Horizon	Color	Texture
0-132	C	10YR5/4	Coarse Sand

Many cobbles and stones
Not mottling observed
No water observed

CDCI-3

Depth	Horizon	Color	Texture
0-156	C	10YR5/4	Coarse Sand

Many cobbles and stones
Not mottling observed
No water observed

CDCI-4

Depth	Horizon	Color	Texture
0-120	C	10YR5/4	Coarse Sand

Many cobbles and stones
Not mottling observed
No water observed

CDCI-5

Depth	Horizon	Color	Texture
0-126	C	10YR5/4	Coarse Sand

Many cobbles and stones
Not mottling observed
No water observed

CDCI-6

Depth	Horizon	Color	Texture
0-24	Fill	-----	-----
24-80	C	10YR5/4	Coarse Sand

Many cobbles and stones
Not mottling observed
No water observed
Ledge encountered at 80"

CDCI-7

Depth	Horizon	Color	Texture
0-72	Sandy Fill	-----	-----

Not mottling observed
No water observed
Ledge encountered at 72"

CDCI-8

Depth	Horizon	Color	Texture
0-80	C1	10YR5/4	Coarse Sand
80-144	C2	10YR6/3	Loamy Sand

Many cobbles and stones in C1 layer
Not mottling observed
No water observed

CDCI-9

Depth	Horizon	Color	Texture
0-102	C1	10YR5/4	Coarse Sand
102-144	C2	10YR6/3	Loamy Sand

Many cobbles and stones in C1 layer
Not mottling observed
No water observed

CDCI-10

Depth	Horizon	Color	Texture
0-84	C1	10YR5/4	Coarse Sand
84-136	C2	10YR6/3	F. Loamy Sand

Many cobbles and stones in C1 layer
Mottling @ 72"
Weeping @ 84"

Address: Murhpy's Farm, Dracut, MA
Date: 12/7/2023
S.E.: William Hall
Witness: Tina Rivard

Note: Areas where test pits were performed have been stripped of top and subsoil.

CDCI-11

Depth	Horizon	Color	Texture
0-90	C1	10YR5/4	Coarse Sand
90-166	C2	10YR6/3	F. Loamy Sand

Many cobbles and stones in C1 layer
Mottling @ 128"
Weeping @ 160"

CDCI-12

Depth	Horizon	Color	Texture
0-80	C1	10YR5/4	Coarse Sand
80-144	C2	10YR6/3	F. Loamy Sand

Many cobbles and stones in C1 layer
Mottling @ 112"
Weeping @ 144"

Address: Murphy's Farm, Dracut, MA
Date: 4/3/2024
S.E.: Thomas Schomburg
Witness: N/a

Note: Test pits CDCI-14 - CDCI-23 performed in areas that have been stripped of top and subsoil. Soil has begun to weather.

CDCI-13

Depth	Horizon	Color	Texture
0-16	A	10YR3/2	Sandy Loam
16-36	B	10YR5/6	Sandy Loam
36-80	C	10YR5/3	Sandy Loam

Mottling @ 32"
Water @ 40"

CDCI-14

Depth	Horizon	Color	Texture
0-16	A	10YR3/2	Sandy Loam
16-32	B	10YR5/6	Sandy Loam
32-108	C	10YR5/3	Sandy Loam

Mottling @ 30"
Water @ 30"

CDCI-15

Depth	Horizon	Color	Texture
0-12	A	10YR3/2	Sandy Loam
12-32	B	10YR5/6	Sandy Loam
32-96	C	10YR5/3	Sandy Loam

Mottling @ 30"
Water @ 30"

CDCI-16

Depth	Horizon	Color	Texture
0-48	FILL	-----	-----
48-80	C	10YR5/3	Loamy Sand

Mottling @ 56"
Water @ 72"
Ledge @ 80"

CDCI-17

Depth	Horizon	Color	Texture
0-16	B	10YR5/6	Fine Sand
16-80	C	10YR5/3	Fine Sand
80-108	C2	10YR5/3	Gravelly Sand

Many cobbles and stones in C Layer
C2 Layer primarily gravel
Mottling @ 24"
Water @ 80"

CDCI-18

Depth	Horizon	Color	Texture
0-24	B	10YR5/6	Sand
24-104	C	10YR5/3	Gravelly Sand

Many cobbles and stones in C Layer
Mottling @ 80"
No water observed

CDCI-19

Depth	Horizon	Color	Texture
0-12	B	10YR5/6	Sand
12-120	C	10YR5/3	Gravelly Sand

Many cobbles and stones in C Layer
Mottling @ 60"
Water @ 90"

CDCI-20

Depth	Horizon	Color	Texture
0-12	B	10YR5/6	Sand
12-102	C	10YR5/6	Gravelly Sand
102-138	2C	10YR5/3	F. Loamy Sand

Many cobbles and stones in C Layer
Mottling @ 102"
No water observed

Address: Murphy's Farm, Dracut, MA
Date: 4/3/2024
S.E.: Thomas Schomburg
Witness: N/a
Note: Test pits CDCI-14 - CDCI-23 performed in areas that have been stripped of top and subsoil. Soil has begun to weather.

CDCI-21

Depth	Horizon	Color	Texture
0-24	B	10YR5/6	Sand
24-48	C	10YR5/6	Gravelly Sand
48-80	2C	10YR5/3	F. Loamy Sand

Many cobbles and stones in C Layer
No mottling observed
No water observed
Ledge encountered at 80"

CDCI-22

Depth	Horizon	Color	Texture
0-16	B	10YR5/6	Sand
16-60	C	10YR5/6	Gravelly Sand
60-80	2C	10YR5/3	F. Loamy Sand

Many cobbles and stones in C Layer
No mottling observed
No water observed
Ledge encountered at 80"

CDCI-23

Depth	Horizon	Color	Texture
0-16	B	10YR5/6	Sand
16-54	C	10YR5/6	Gravelly Sand

Many cobbles and stones in C Layer
No mottling observed
No water observed
Ledge encountered at 54"

CDCI-24

Depth	Horizon	Color	Texture
0-8	A	10YR3/2	Sand
8-16	B	10YR5/6	Sand
16-60	C	10YR5/6	Gravelly Sand
60-72	2C	10YR5/3	F. Loamy Sand

Many cobbles and stones in C Layer
Mottling @ 32"
Water @ 72"
Ledge encountered at 72"

Address: Murphy's Farm, Dracut, MA
Date: 12/4/2024
S.E.: Thomas Schomburg & Steven Cummings
Witness: N/A

Note: Test pits CDCI-25 - CDCI-608 performed in areas that have been stripped of top and subsoil. Soil has begun to weather.

CDCI-25

Depth	Horizon	Color	Texture
0-30	B	10YR6/6	Loamy Sand
30-120	C	10YR6/4	Gravelly Sand

SHWT @ 72"

CDCI-26

Depth	Horizon	Color	Texture
0-24	B	10YR6/6	Loamy Sand
24-72	C	10YR6/4	Gravelly Sand
72-120		10YR6/2	Sand

SHWT @ 72"

CDCI-27

Depth	Horizon	Color	Texture
0-66		10YR6/6	Gravelly Sand
66-120		10YR6/1	Sand

SWHT @ 66"

CDCI-470

Depth	Horizon	Color	Texture
0-10	A	10YR3/3	Sandy Loam
10-26	B	10YR5/6	Loamy Sand
26-78	C	10YR7/3	Fine Sand

SHWT NOT OBSERVED

CDCI-471

Depth	Horizon	Color	Texture
0-12	A	10YR3/3	Loamy Sand
12-24	B	10YR5/6	Loamy Sand
24-80	C	10YR7/3	Fine Sand

SHWT NOT OBSERVED

CDCI-472

Depth	Horizon	Color	Texture
0-12	A	10YR5/6	Loamy Sand
12-24	B	10YR5/3	Loamy Sand
24-72	C	10YR7/3	Fine Sand

SHWT NOT OBSERVED

CDCI-473

Depth	Horizon	Color	Texture
0-8	A	10YR3/3	Sandy Loam
8-18	B	10YR5/6	Loamy Sand
18-72	C	10YR7/3	Fine Sand

SHWT NOT OBSERVED

CDCI-474

Depth	Horizon	Color	Texture
0-8	A	10YR3/3	Sandy Loam
8-20	B	10YR5/6	Loamy Sand
20-72	C	10YR6/4	Medium Sand

SHWT NOT OBSERVED

Address: Murphy's Farm, Dracut, MA
Date: 12/4/2024
S.E.: Thomas Schomburg & Steven Cummings
Witness: N/A

Note: Test pits CDCI-25 - CDCI-608 performed in areas that have been stripped of top and subsoil. Soil has begun to weather.

CDCI-475

Depth	Horizon	Color	Texture
0-8	A	10YR3/2	Loamy Sand
8-18	B	10YR3/6	Loamy Sand
18-72	C	10YR6/4	Medium Sand

SHWT NOT OBSERVED

CDCI-476

Depth	Horizon	Color	Texture
0-16	A	10YR3/2	Loamy Sand
16-28	B	10YR3/4	Loamy Sand
28-72	C	10YR7/4	Medium Sand

SHWT NOT OBSERVED

CDCI-477

Depth	Horizon	Color	Texture
0-6	A	10YR3/3	Sandy Loam
6-28	B	10YR5/4	Loamy Sand
28-72	C	10YR7/4	Medium Sand

SHWT NOT OBSERVED

CDCI-478

Depth	Horizon	Color	Texture
0-6	A	10YR3/3	Sandy Loam
6-26	B	10YR5/4	Loamy Sand
26-72	C	10YR7/4	Medium Sand

SHWT NOT OBSERVED

CDCI-479

Depth	Horizon	Color	Texture
0-10	A	10YR3/2	Loamy Sand
10-22	B	10YR5/4	Loamy Sand
22-80	C	10YR7/4	Medium Sand

SHWT NOT OBSERVED

CDCI-480

Depth	Horizon	Color	Texture
0-6	A	10YR3/3	Sandy Loam
6-18	B	10YR5/6	Loamy Sand
18-72	C	10YR7/3	Sand

SHWT NOT OBSERVED

CDCI-481

Depth	Horizon	Color	Texture
0-8	A	10YR3/2	Loamy Sand
8-16	B	10YR5/4	Loamy Sand
16-80	C	10YR7/3	Medium Sand

SHWT @ 48"

CDCI-480

Depth	Horizon	Color	Texture
0-6	A	10YR3/3	Sandy Loam
6-18	B	10YR5/6	Loamy Sand
18-72	C	10YR7/3	Sand

SHWT NOT OBSERVED

Address: Murphy's Farm, Dracut, MA
Date: 12/4/2024
S.E.: Thomas Schomburg & Steven Cummings
Witness: N/A

Note: Test pits CDCI-25 - CDCI-608 performed in areas that have been stripped of top and subsoil. Soil has begun to weather.

CDCI-482

Depth	Horizon	Color	Texture
0-8	A	10YR3/3	Sandy Loam
8-28	B	10YR5/6	Loamy Sand
28-78	C	10YR7/3	Medium Sand

SHWT @ 48"

CDCI-483

Depth	Horizon	Color	Texture
0-16	A	10YR5/2	Loamy Sand
16-24	B	10YR5/4	Loamy Sand
24-74	C	10YR7/3	Fine Sand

SHWT @ 36"

CDCI-484

Depth	Horizon	Color	Texture
0-10	A	10YR3/3	Sandy Loam
10-24	B	10YR6/6	Loamy Sand
24-78	C	10YR8/3	Medium Sand

SHWT @ 36"

CDCI-485

Depth	Horizon	Color	Texture
0-10	A	10YR5/2	Loamy Sand
10-32	B	10YR5/4	Loamy Sand
32-84	C	10YR7/3	Fine Sand

SHWT @ 36"

CDCI-486

Depth	Horizon	Color	Texture
0-6		10YR3/3	Sandy Loam
6-24		10YR5/8	Loamy Sand
24-72		10YR7/4	Medium Sand

SHWT NOT OBSERVED

CDCI-487

Depth	Horizon	Color	Texture
0-8	A	10YR3/2	Loamy Sand
8-24	B	10YR5/8	Loamy Sand
24-72	C	10YR7/4	Medium Sand

SHWT NOT OBSERVED

CDCI-488

Depth	Horizon	Color	Texture
0-8	A	10YR3/2	Loamy Sand
8-20	B	10YR5/8	Loamy Sand
20-72	C	10YR7/4	Medium Sand

SHWT NOT OBSERVED

CDCI-489

Depth	Horizon	Color	Texture
0-6		10YR3/3	Sandy Loam
6-22		10YR5/8	Loamy Sand
22-72		10YR7/4	Medium Sand

SHWT NOT OBSERVED

Address: Murphy's Farm, Dracut, MA
Date: 12/4/2024
S.E.: Thomas Schomburg & Steven Cummings
Witness: N/A

Note: Test pits CDCI-25 - CDCI-608 performed in areas that have been stripped of top and subsoil. Soil has begun to weather.

CDCI-490

Depth	Horizon	Color	Texture
0-6	A	10YR3/2	Loamy Sand
6-16	B	10YR5/8	Loamy Sand
16-48	C	10YR7/4	Medium Sand

SHWT NOT OBSERVED

CDCI-491

Depth	Horizon	Color	Texture
0-8		10YR3/3	Sandy Loam
8-28		10YR5/8	Loamy Sand
28-74		10YR7/4	Medium Sand

SHWT @ 60"

CDCI-492

Depth	Horizon	Color	Texture
0-12	A	10YR3/2	Loamy Sand
12-24	B	10YR5/8	Loamy Sand
24-72	C	10YR7/4	Medium Sand

SHWT NOT OBSERVED

CDCI-493

Depth	Horizon	Color	Texture
0-8	A	10YR3/3	Sandy Loam
8-24	B	10YR5/8	Loamy Sand
24-78	C	10YR7/4	Medium Sand

SHWT NOT OBSERVED

CDCI-494

Depth	Horizon	Color	Texture
0-30	B	10YR5/6	Loamy Sand
30-84		10YR6/4	Gravelly Sand
84-120		10YR6/1	Sand

SHWT @ 84"

CDCI-495

Depth	Horizon	Color	Texture
0-72	C	10YR6/6	Medium Sand
72-132	C2	10YR7/4	Fine Sand

SHWT @ 84"

CDCI-496

Depth	Horizon	Color	Texture
0-12	B	10YR5/6	Loamy Sand
12-72	C	10YR6/4	Medium Sand
72-120	C2	10YR6/1	Fine Sand

SHWT @ 84"

CDCI-497

Depth	Horizon	Color	Texture
0-60	Fill	-	-
60-120	C	10YR7/3	Loamy Sand

SHWT NOT OBSERVED

Address: Murphy's Farm, Dracut, MA
Date: 12/4/2024
S.E.: Thomas Schomburg & Steven Cummings
Witness: N/A

Note: Test pits CDCI-25 - CDCI-608 performed in areas that have been stripped of top and subsoil. Soil has begun to weather.

CDCI-498

Depth	Horizon	Color	Texture
0-60	Fill	-	-
60-120	C	10YR7/3	Fine Sand

SHWT NOT OBSERVED

CDCI-499

Depth	Horizon	Color	Texture
0-60	Fill	-	-
60-138	C	10YR7/3	Fine Sand

SHWT NOT OBSERVED

CDCI-600

Depth	Horizon	Color	Texture
0-90	Fill	-	-
90-126	C	10YR7/3	Sand

SHWT NOT OBSERVED

CDCI-601

Depth	Horizon	Color	Texture
0-96	Fill	-	-
96-120	C	10YR7/3	Sand

SHWT @ 96"

CDCI-602

Depth	Horizon	Color	Texture
0-66	Fill	-	-
66-84	B	10YR5/4	Sand
84-120	C	10YR7/3	Sand

SHWT @ 86"

CDCI-603

Depth	Horizon	Color	Texture
0-24	Fill	-	-
24-120	C	10YR5/3	Gravelly Sand

SHWT @ 60"

CDCI-604

Depth	Horizon	Color	Texture
0-24	Fill	-	-
24-108	C	10YR7/3	Sand

SHWT @ 48"

CDCI-605

Depth	Horizon	Color	Texture
0-72	Fill	-	-
72-108	C	10YR7/3	Sand

SHWT @ 60"

Address: Murphy's Farm, Dracut, MA
Date: 12/4/2024
S.E.: Thomas Schomburg & Steven Cummings
Witness: N/A

Note: Test pits CDCI-25 - CDCI-608 performed in areas that have been stripped of top and subsoil. Soil has begun to weather.

CDCI-606

Depth	Horizon	Color	Texture
0-12	A	10YR3/2	Sandy Loam
12-32	B	7.5YR4/6	Loamy Sand
32-120	C	10YR6/3	Medium Sand

SHWT @ 48"

CDCI-607

Depth	Horizon	Color	Texture
0-48	Fill	-	-
48-72	C	10YR5/3	Sand

SHWT NOT OBSERVED

CDCI-608

Depth	Horizon	Color	Texture
0-48	Fill	-	-
48-120		10YR7/4	Medium Sand

SHWT @ 84"

LEGEND

PROPERTY LINE	
ABUTTERS PROPERTY LINE	
EXISTING EDGE OF PAVEMENT	
LIMIT OF BORDERING VEGETATED WETLAND (BVW)	
WETLAND FLAG	WF 8D
WETLAND	
50 FT BUFFER ZONE TO BVW	
100 FT BUFFER ZONE TO BVW	
EXISTING CONTOUR	
EXISTING WATERSHED BOUNDARY	
EXISTING TC	
HYDROLOGIC SOILS GROUP A	
HYDROLOGIC SOILS GROUP B	
HYDROLOGIC SOILS GROUP C	
HYDROLOGIC SOILS GROUP D	

SOILS SUMMARY:

SYMBOL	DESCRIPTION	HSG
32B	WAREHAM LFS, 0–5% SLOPES	A/D
51A	SWANSEA MUCK, 0–1% SLOPES	B/D
52A	FRESTOWN MUCK, 0–1% SLOPES	B/D
253B	HINKLEY LS, 3–8% SLOPES	A
253C	HINKLEY LS, 8–15% SLOPES	A
253D	HINKLEY LS, 15–25% SLOPES	A
254B	MERRIMAC FSL, 3–8% SLOPES	A
255B	WINDSOR LS, 3–8% SLOPES	A
255C	WINDSOR LS, 8–15% SLOPES	A
256A	DEERFIELD LFS, 0–3% SLOPES	A
420C	CANTON FSL, 8–15% SLOPES	B
422B	CANTON FSL, 0–8% SLOPES	B
600	PITS, GRAVEL	N/A
601	PITS, QUARRY	N/A
653	UDORTHENTS, SANDY	N/A
654	UDORTHENTS, LOAMY	N/A

NAD83

EWA–8
A: 6.76–AC
CN: 30
TC: 24.8 MIN

EWA–7
A: 3.96–AC
CN: 30
TC: 14.3 MIN

EWA–6
A: 2.34–AC
CN: 30
TC: 16.2 MIN

EWA–5A
A: 1.14–AC
CN: 30
TC: 14.9 MIN

EWA–5B
A: 10.92–AC
CN: 33
TC: 19.5 MIN

EWA–4
A: 2.77–AC
CN: 31
TC: 28.1 MIN

EWA–3
A: 2.74–AC
CN: 30
TC: 10.2 MIN

EWA–1
A: 5.11–AC
CN: 37
TC: 13.7 MIN

DESIGN POINT-8
DESIGN POINT-7
DESIGN POINT-6
DESIGN POINT-5
DESIGN POINT-4
DESIGN POINT-3
DESIGN POINT-1

HSG-A
HSG-B

SBDHF
DHF
IRF
IRF CAP
UP
210
IRF BENT
0.00

HORIZONTAL SCALE
80 0 40 80 160 320
(IN FEET)
1"=80'

DATE	DESCRIPTION
REVISIONS	

APPLICANT:
THE HOMES AT MURPHY'S FARM LLC
18 CASSIMERE STREET
ANDOVER, MA 01810

PROJECT:
MURPHY'S FARM
DRACUT, MA 01826

DATE ISSUED:	–
PROJECT #:	23-10524
PREPARED BY:	TWS

PROFESSIONAL ENGINEER FOR CIVIL DESIGN CONSULTANTS, INC.

CIVIL DESIGN CONSULTANTS, INC
344 North Main Street | Andover - MA 01810
(978) 416-0920 | www.civildcc.com

DRAWING TITLE:
EXISTING WATERSHED PLAN

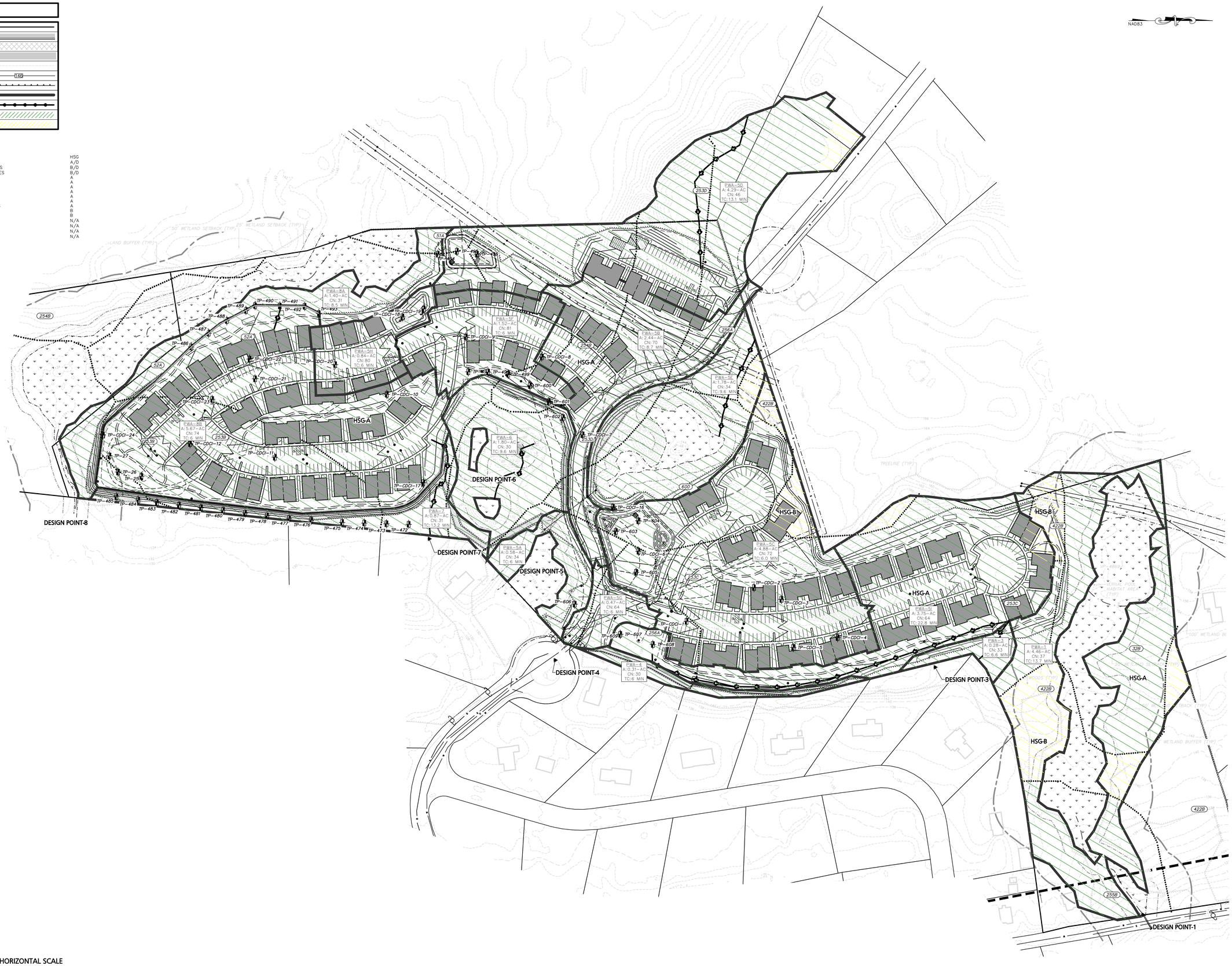
DRAWING #:
EWA

LEGEND

PROPERTY LINE	
PROPOSED BUILDING	
PROPOSED POROUS PAVEMENT	
PROPOSED BIT. CONC.	
EXISTING CONTOUR	
PROPOSED CONTOUR	140
PROPOSED RETAINING WALL	
PROPOSED WATERSHED BOUNDARY	
PROPOSED TC	
HYDROLOGIC SOILS GROUP A	
HYDROLOGIC SOILS GROUP B	

SOILS SUMMARY:

SYMBOL	DESCRIPTION	HSG
32B	WAREHAM LFS, 0–5% SLOPES	A/D
51A	SWANSEA MUCK, 0–1% SLOPES	B/D
52A	FREETOWN MUCK, 0–1% SLOPES	B/D
253B	HINKLEY LS, 3–8% SLOPES	A
253C	HINKLEY LS, 8–15% SLOPES	A
253D	HINKLEY LS, 15–25% SLOPES	A
254B	MERRIMAC FSL, 3–8% SLOPES	A
255B	WINDSOR LS, 3–8% SLOPES	A
255C	WINDSOR LS, 8–15% SLOPES	A
256A	DEERFIELD LFS, 0–3% SLOPES	A
420C	CANTON FSL, 8–15% SLOPES	B
422B	CANTON FSL, 0–8% SLOPES	B
600	PITS, GRAVEL	N/A
601	PITS, QUARRY	N/A
653	UDORTHENTS, SANDY	N/A
654	UDORTHENTS, LOAMY	N/A



HORIZONTAL SCALE

80 0 40 80 160 320

(IN FEET)

1"=80'

DATE	DESCRIPTION
03/27/25	REV. PER PEER REVIEW COMMENTS
03/25/25	REV. PER PEER REVIEW COMMENTS
01/21/25	REV. PER INTERNAL REVIEW
12/30/24	REV. PER PEER REVIEW COMMENTS
10/04/24	REV. PER PEER REVIEW COMMENTS
DATE	DESCRIPTION
REVISIONS	

APPLICANT:

THE HOMES AT MURPHY'S FARM LLC

18 CASSIMERE STREET
ANDOVER, MA 01810

PROJECT:

MURPHY'S FARM

DRACUT, MA 01826

DATE ISSUED:	APRIL 22, 2024
PROJECT #:	23-10524
PREPARED BY:	TWS

PROFESSIONAL ENGINEER FOR CIVIL DESIGN CONSULTANTS, INC.

CIVIL DESIGN CONSULTANTS, INC
344 North Main Street | Andover - MA 01810
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DRAWING TITLE:

GRADING, SEWER & UTILITIES PLAN

DRAWING #:

C-4B