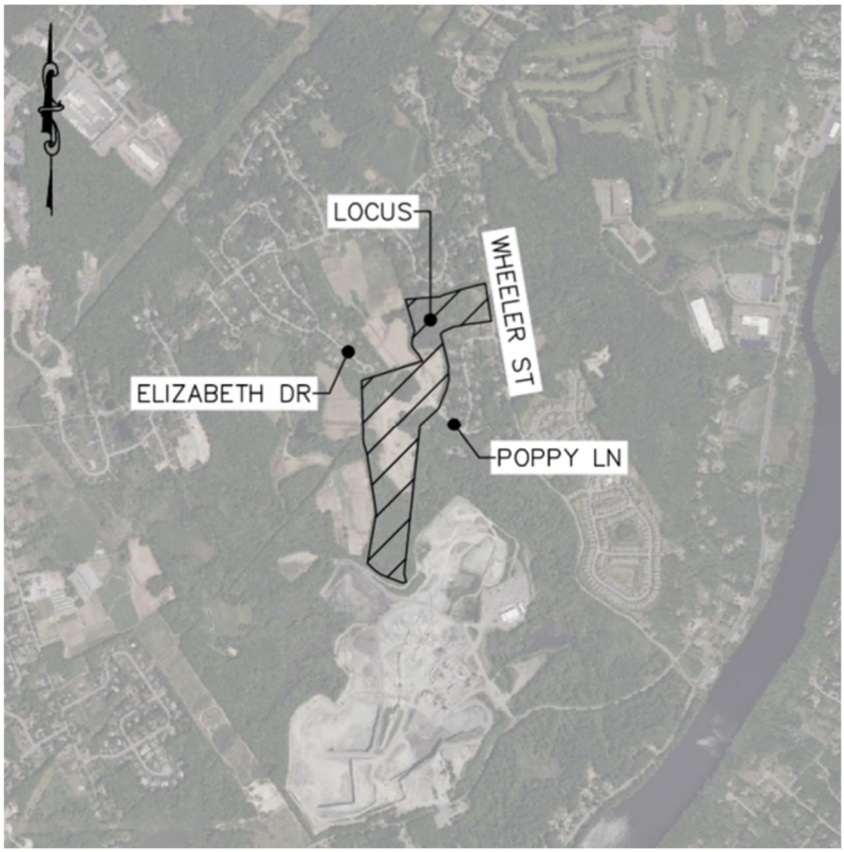
DRAINAGE REPORT

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

CIVIL DESIGN CONSULTANTS, INC

344 North Main Street | Andover · MA 01810
(978) 416-0920 | www.civildci.com



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:

May 9, 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 1-23) 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 ±4,726-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 Hydrologic Soil Group (HSG) A/D
- Swansea Muck, HSG B/D
- Freetown Muck, HSG B/D
- Hinkley Loamy Sand, 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, but is considered for 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 ±4,726-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 11.50-AC.

The post-development condition consists of sixteen (17) 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, PWA-5C) and three infiltration basins (PWA-5B, PWA-5J, 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	0.29	6.0	30
DP-5	PWA-5A	0.54	6.0	34
	PWA-5B	2.43	8.7	70
	PWA-5C	2.74	11.2	76
	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	65
	PWA-5H	0.84	6.0	80
	PWA-5I	3.90	22.8	63
	PWA-5J	2.04	6.0	68
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	3.31
Post-Development	0.00	0.03	0.17	3.22

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	0.86

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	0.013

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	0.025	0.104	0.668

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

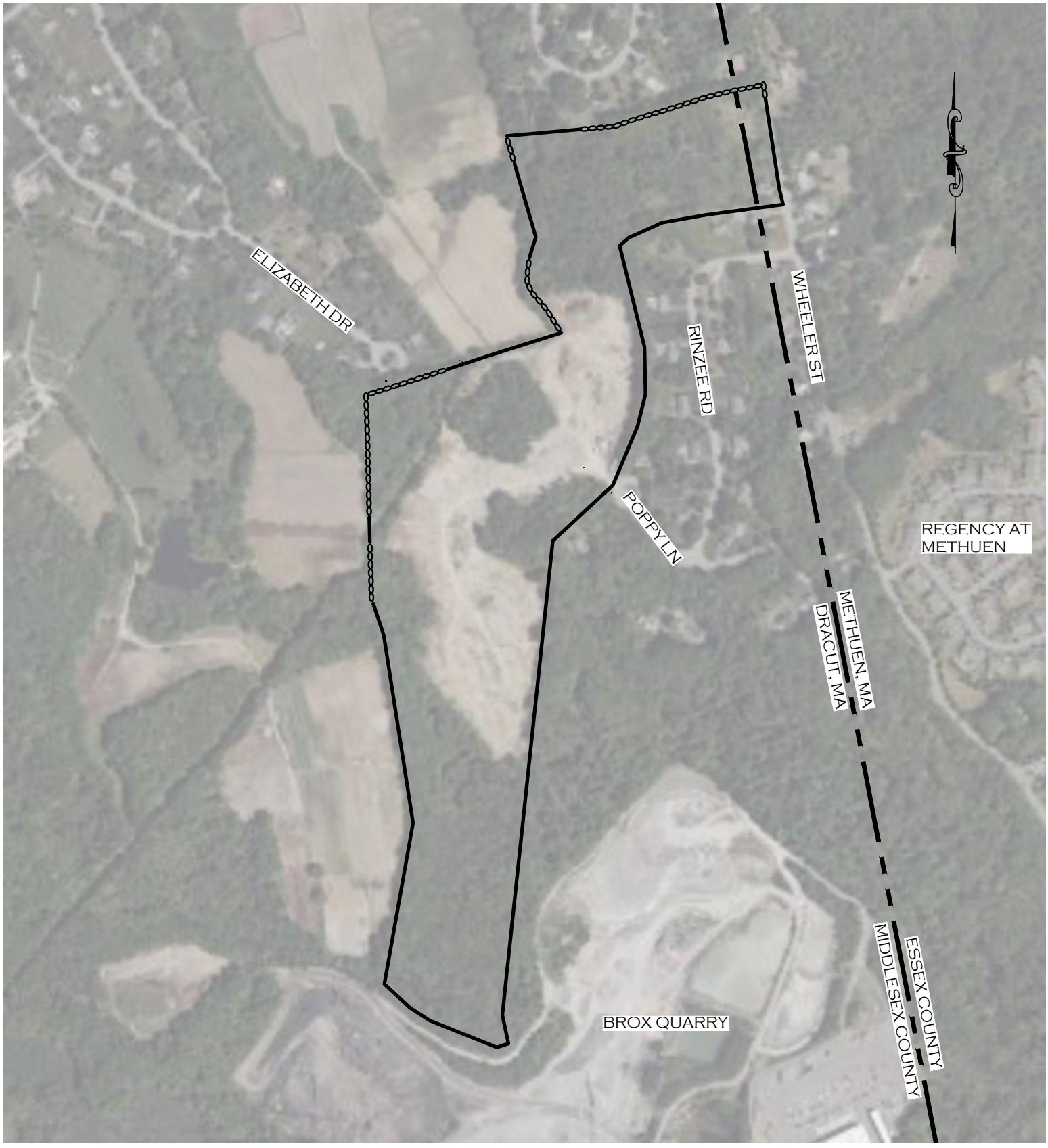
Design Point #8 Volumes (Acre-Ft)

	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	0.014	0.183

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. Infiltration rates for BMPs were determined by field testing in accordance with ASTM D-5126, with a factor of safety of 4 applied for Infiltration Basins, and a factor of safety of 2 applied for Subsurface Infiltration Systems. The excess factor of safety for Infiltration Basins was applied to account for any lost drainage capacity due to loaming and seeding of the basin floor.

TAB 2



CIVIL DESIGN CONSULTANTS, INC

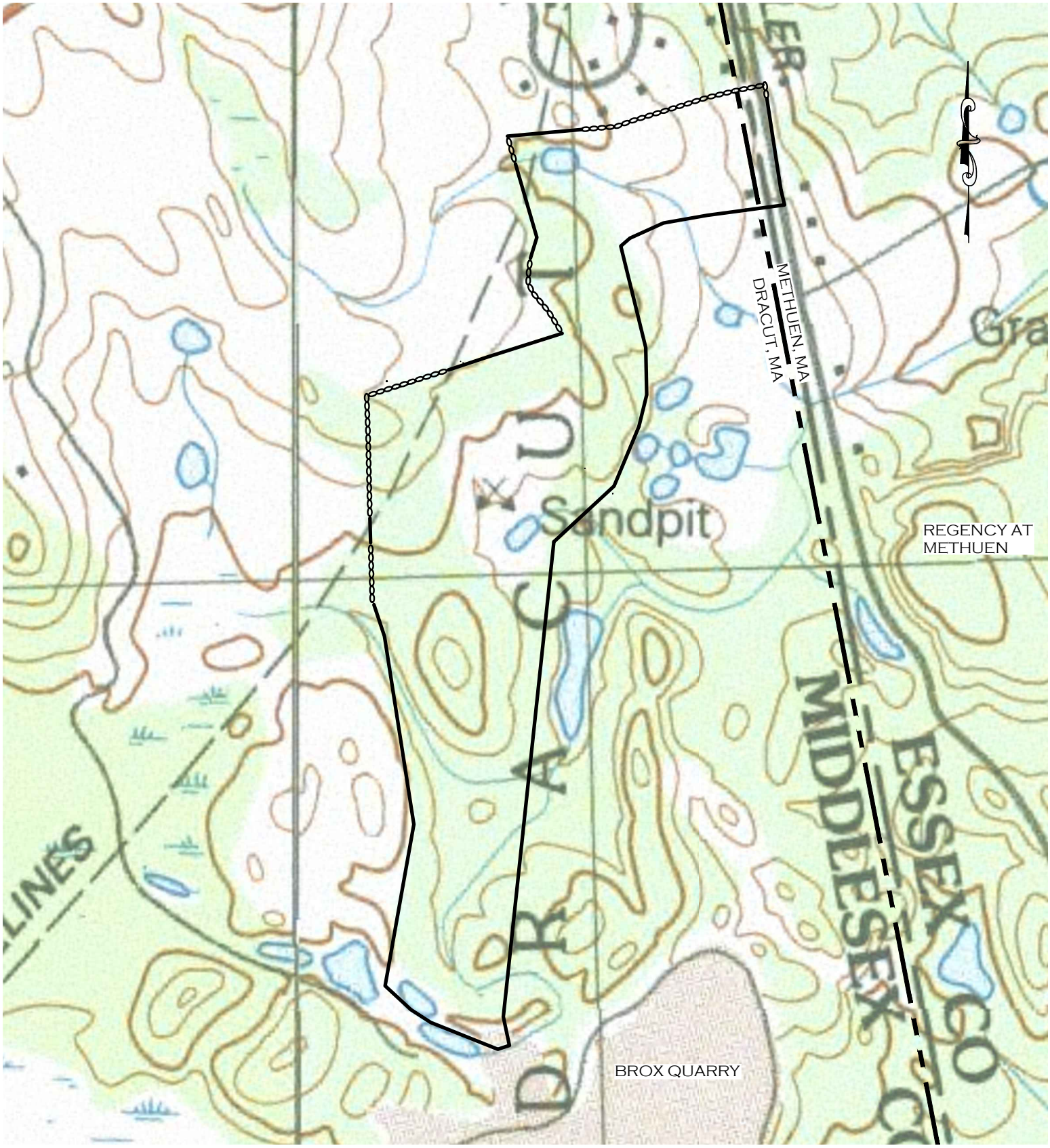
344 North Main Street | Andover · MA 01810
(978) 416-0920 | www.civildci.com

PROJECT:
THE HOMES AT MURPHY'S FARM LLC
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



CIVIL DESIGN CONSULTANTS, INC

344 North Main Street | Andover · MA 01810
(978) 416-0920 | www.civildci.com

PROJECT:
THE HOMES AT MURPHY'S FARM LLC

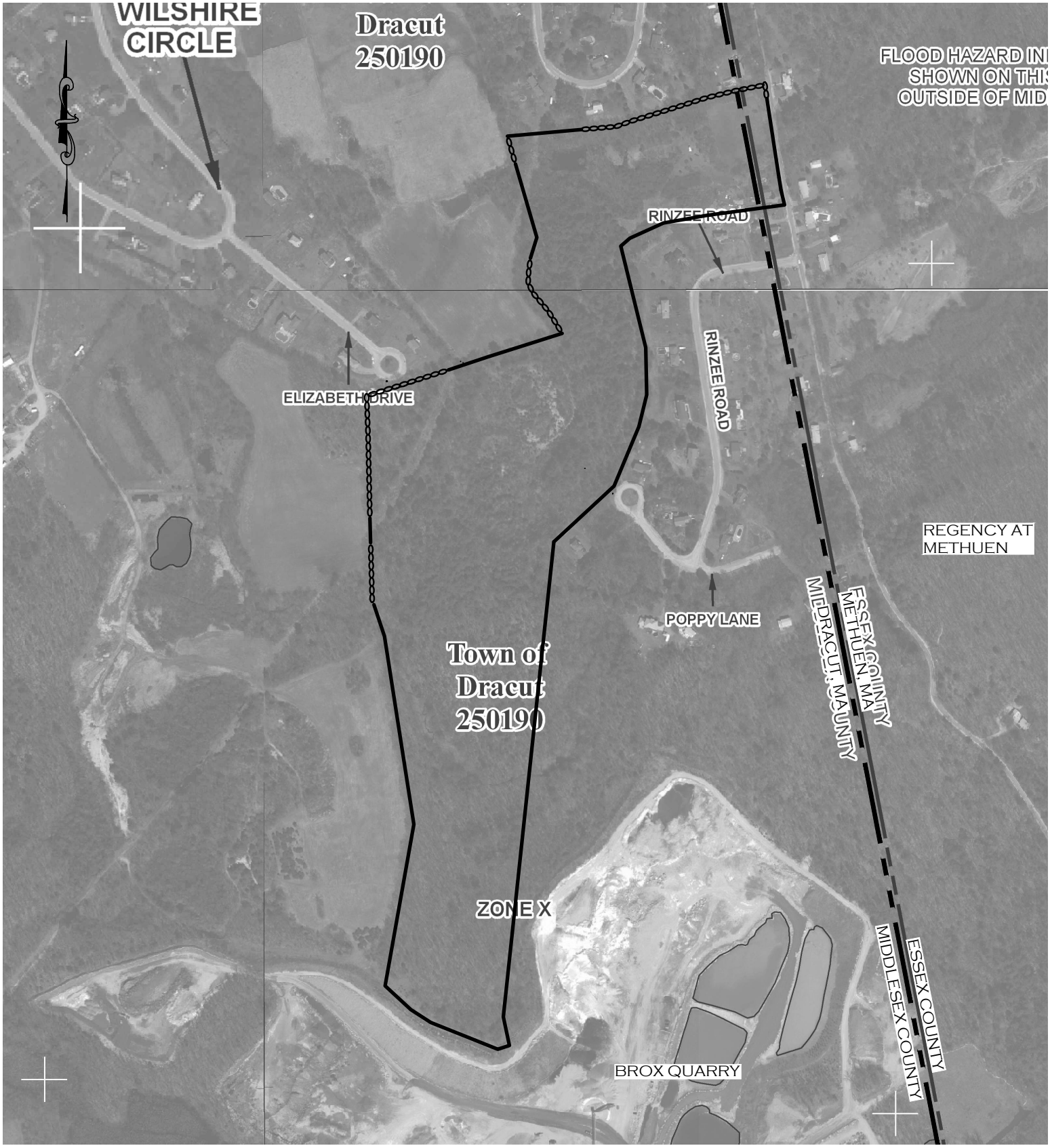
18 CASSIMERE STREET
ANDOVER, MA 01810

PREPARED FOR:
MURPHY'S FARM

DRACUT, MA 01826

FIGURE 2: USGS

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



CIVIL DESIGN CONSULTANTS, INC

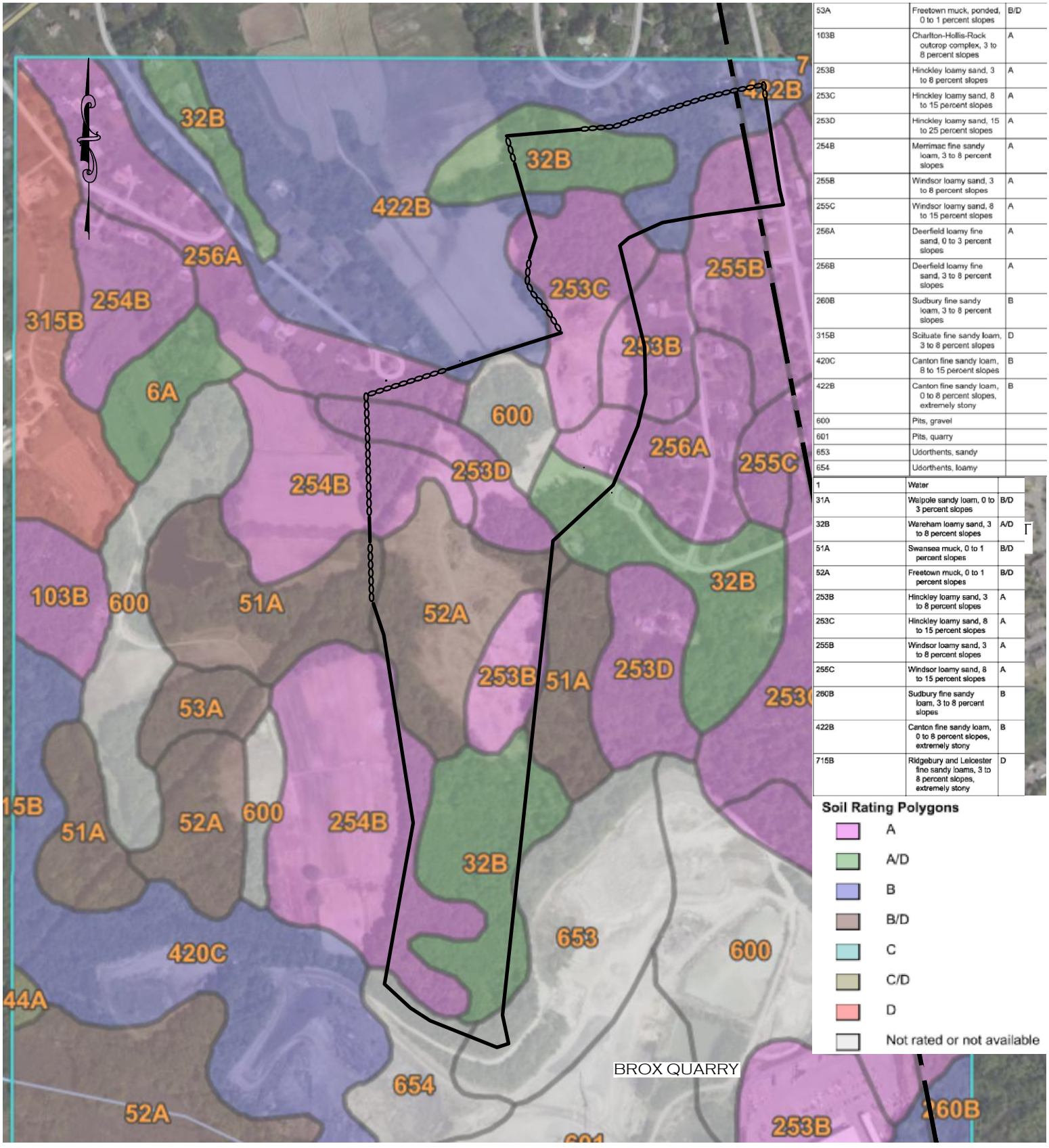
344 North Main Street | Andover · MA 01810
(978) 416-0920 | www.civildci.com

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

PREPARED FOR:
MURPHY'S FARM
DRACUT, MA 01826

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

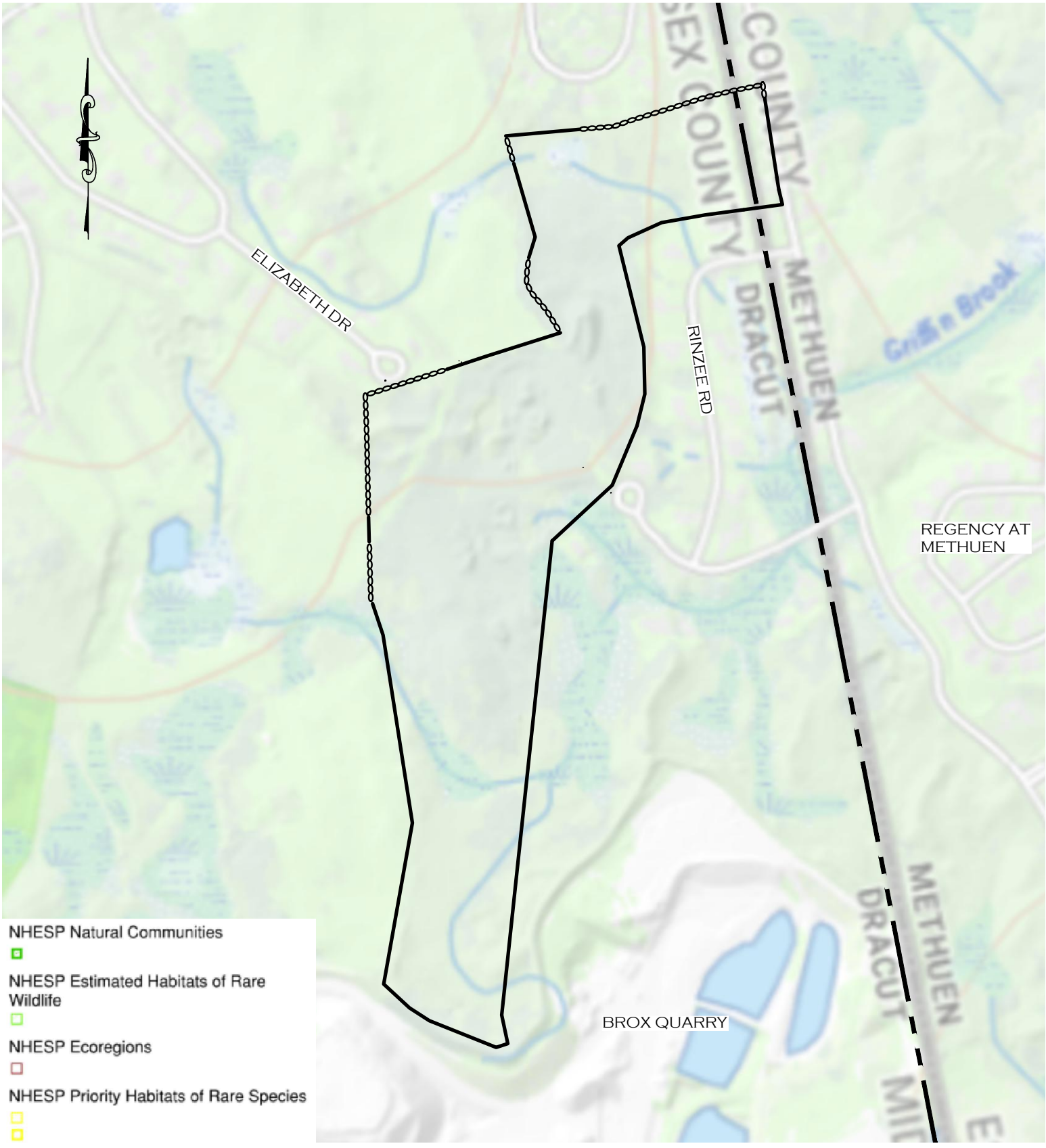
CIVIL DESIGN CONSULTANTS, INC
344 North Main Street | Andover · MA 01810
(978) 416-0920 | www.civildci.com

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

PREPARED FOR:
MURPHY'S FARM
DRACUT, MA 01826

FIGURE 4: SOILS

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



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

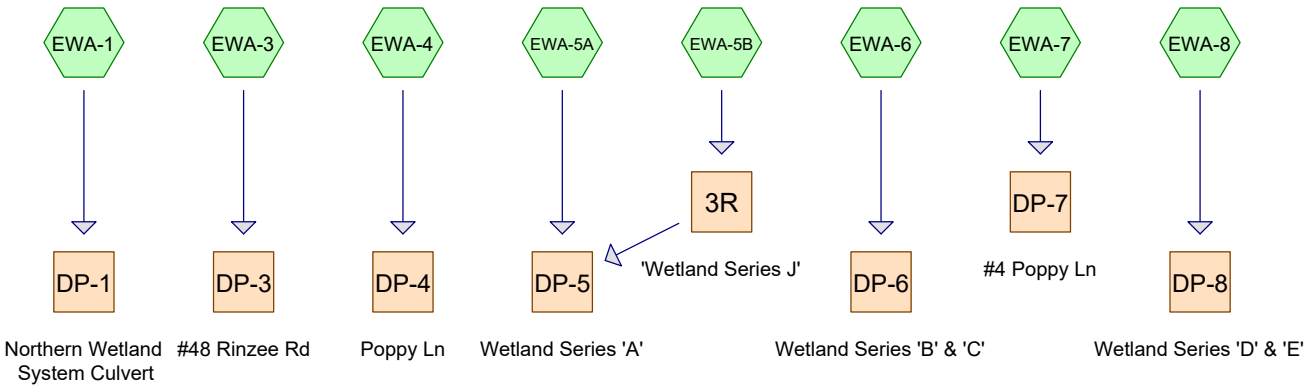
PROJECT:
THE HOMES AT MURPHY'S FARM LLC
18 CASSIMERE STREET
ANDOVER, MA 01810

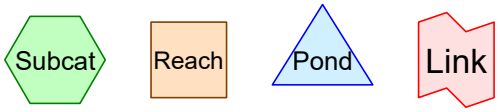
PREPARED FOR:
MURPHY'S FARM
DRACUT, MA 01826

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 - R3
Prepared by Civil Design Consultants, Inc, Printed 5/7/2025

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	25-Yr	Type III 24-hr		Default	24.00	1	5.94	2
3	100-Yr	Type III 24-hr		Default	24.00	1	8.55	2

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)
35.34	**32**	**TOTAL AREA**

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	
35.34		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.50	0.50	0.00	0.00	0.00	2.00	>75% Grass cover, Good	EWA-1, EWA-5B
32.07	1.27	0.00	0.00	0.00	33.34	Woods, Good	EWA-1, EWA-3, EWA-4, EWA-5A, EWA-5B, EWA-6, EWA-7, EWA-8
33.57	**1.77**	**0.00**	**0.00**	**0.00**	**35.34**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	3R	137.05	136.05	143.0	0.0070	0.013	0.0	12.0	0.0	

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 3R: 'Wetland Series J' Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
12.0" Round Pipe n=0.013 L=143.0' S=0.0070 '/' Capacity=2.98 cfs Outflow=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 3R: 'Wetland Series J' Avg. Flow Depth=0.07' Max Vel=1.18 fps Inflow=0.03 cfs 0.016 af
12.0" Round Pipe n=0.013 L=143.0' S=0.0070 '/' Capacity=2.98 cfs Outflow=0.03 cfs 0.016 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:

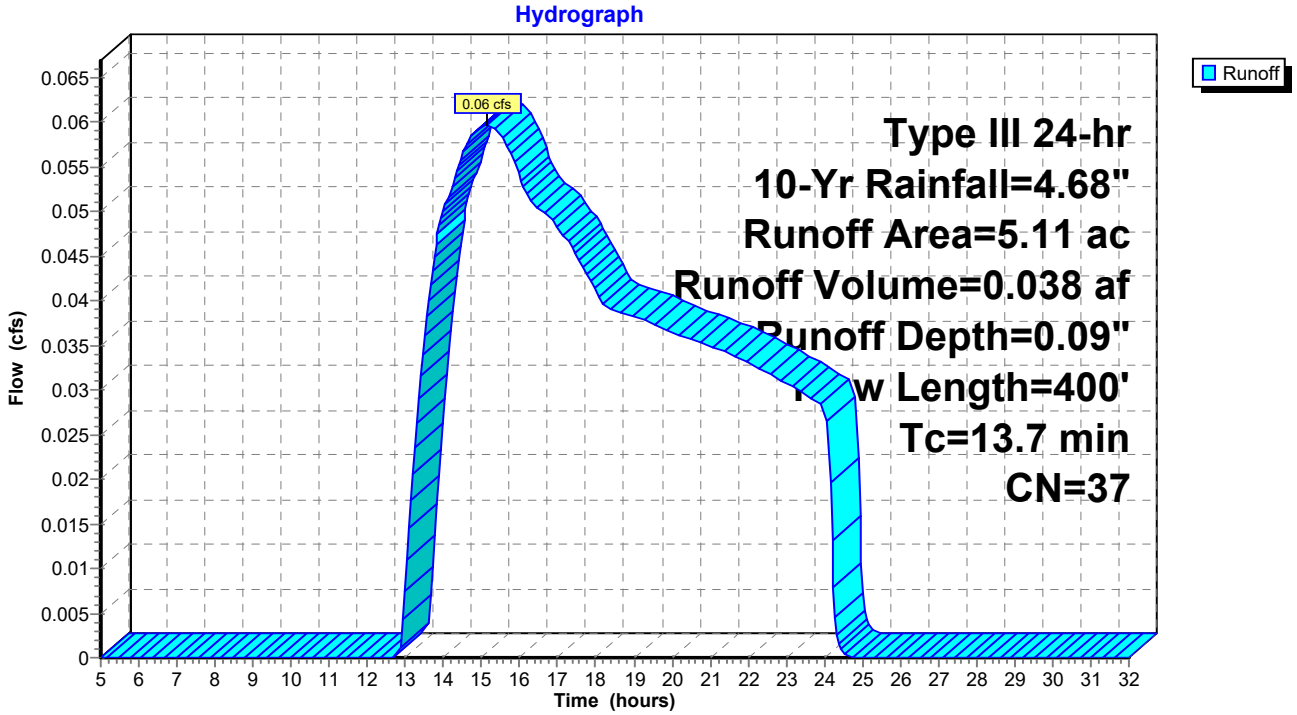
Runoff = 0.06 cfs @ 15.11 hrs, Volume= 0.038 af, Depth= 0.09"
Routed to Reach DP-1 : Northern Wetland System Culvert

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:

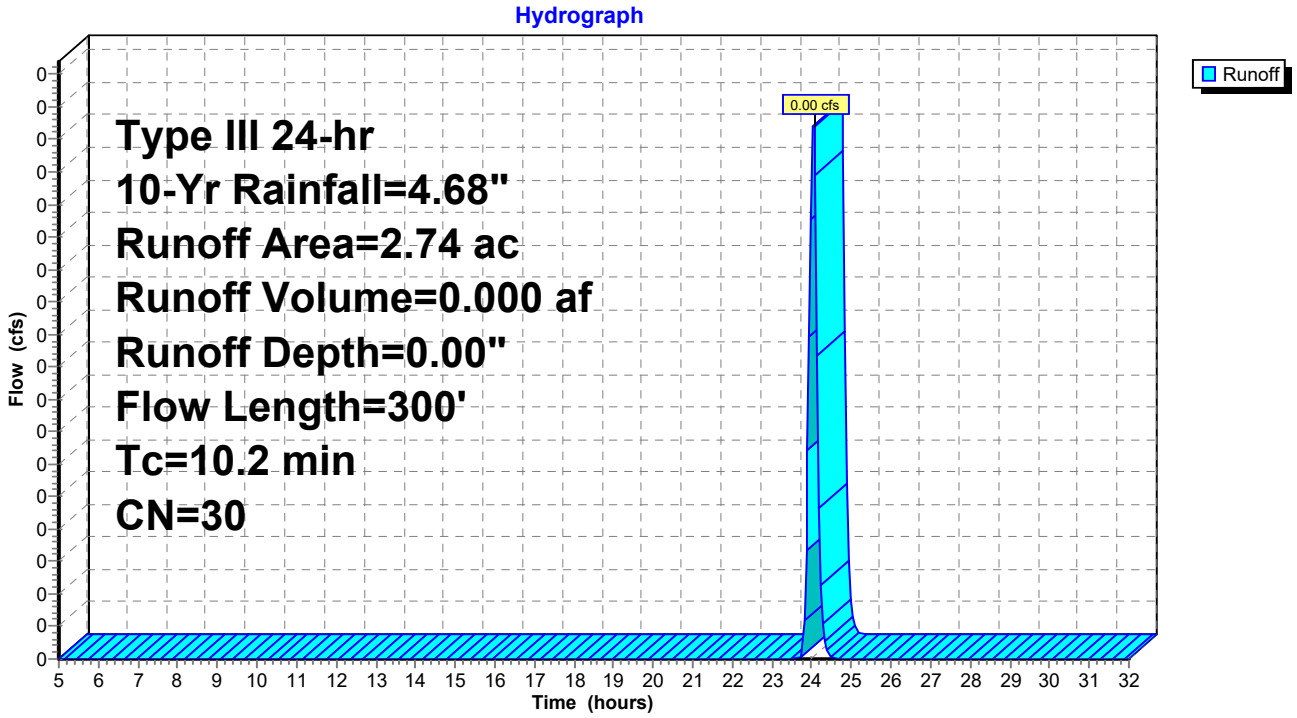
Runoff = 0.00 cfs @ 24.06 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-3 : #48 Rinzee Rd

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:

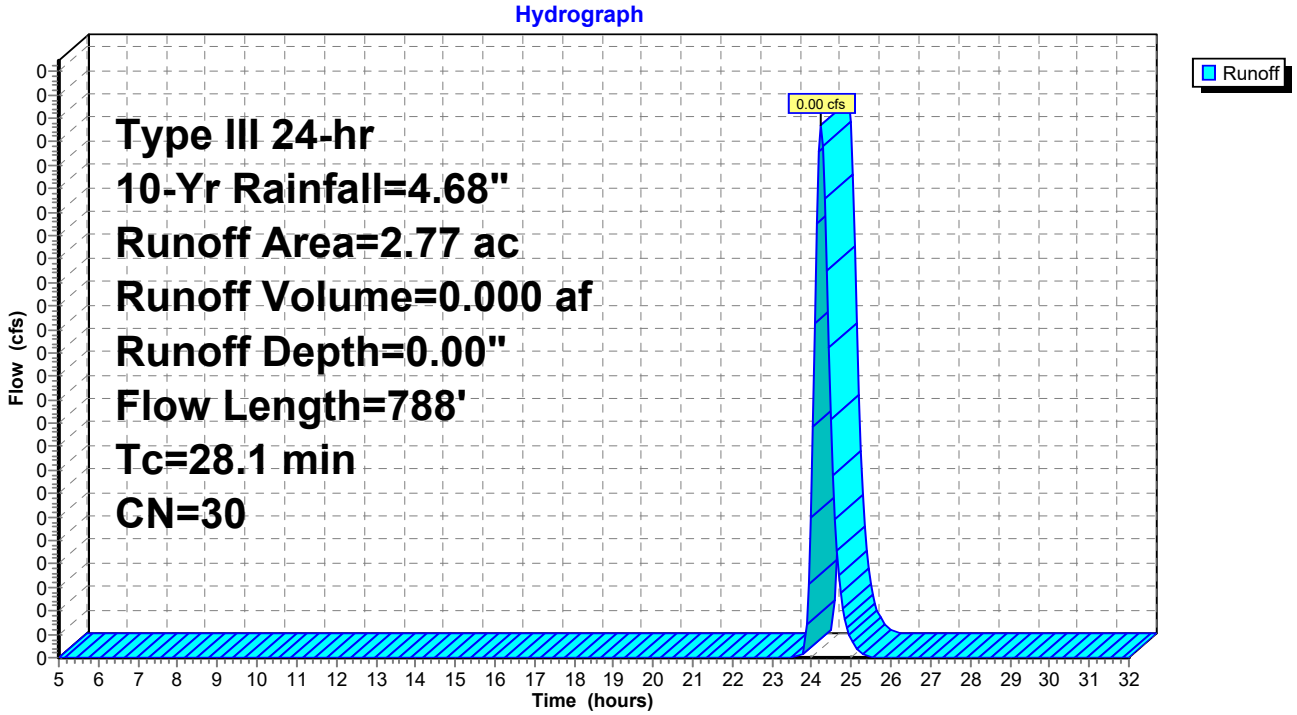
Runoff = 0.00 cfs @ 24.25 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-4 : Poppy Ln

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:

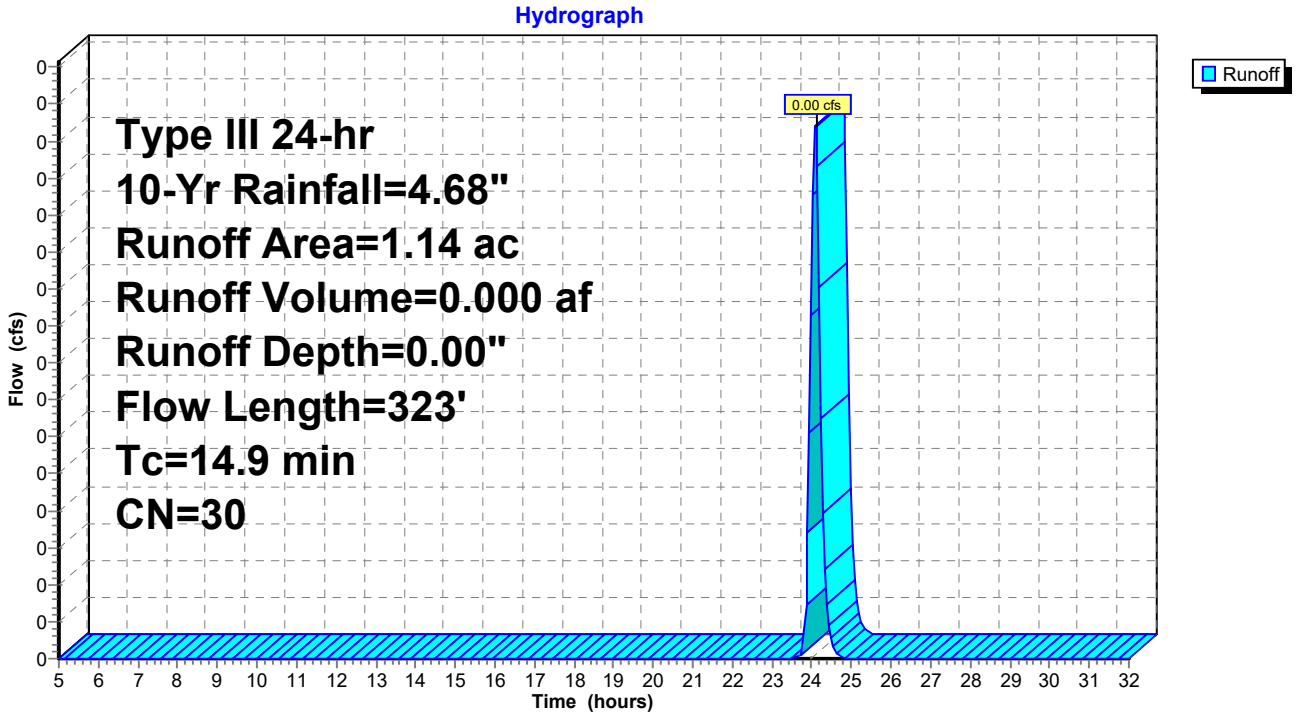
Runoff = 0.00 cfs @ 24.11 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-5 : Wetland Series 'A'

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:

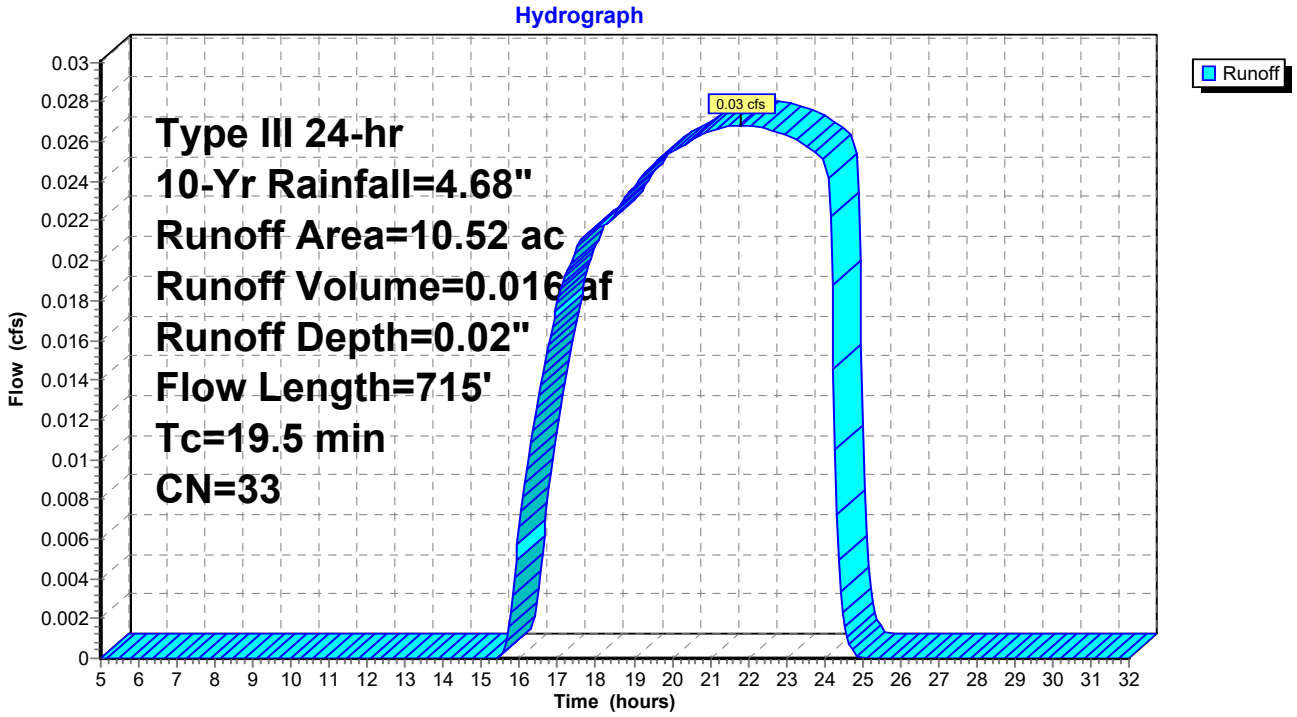
Runoff = 0.03 cfs @ 21.82 hrs, Volume= 0.016 af, Depth= 0.02"
Routed to Reach 3R : 'Wetland Series J'

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
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:

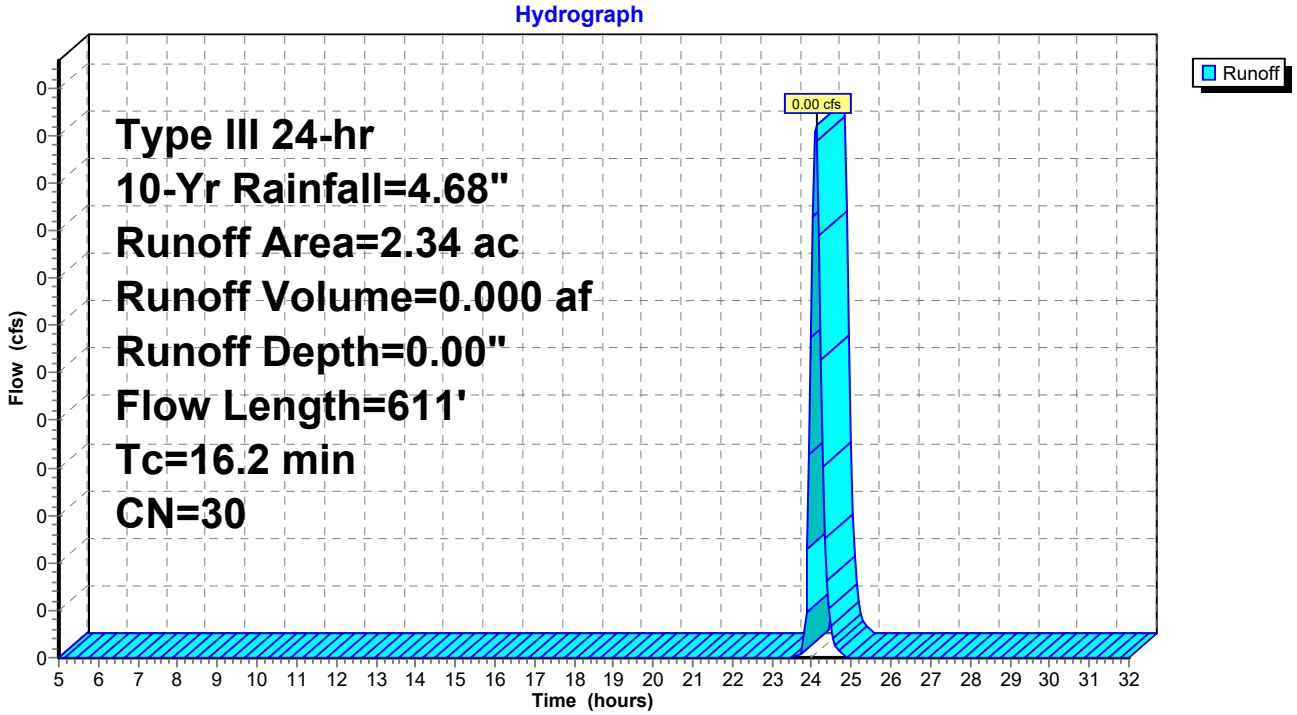
Runoff = 0.00 cfs @ 24.12 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-6 : Wetland Series 'B' & 'C'

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:

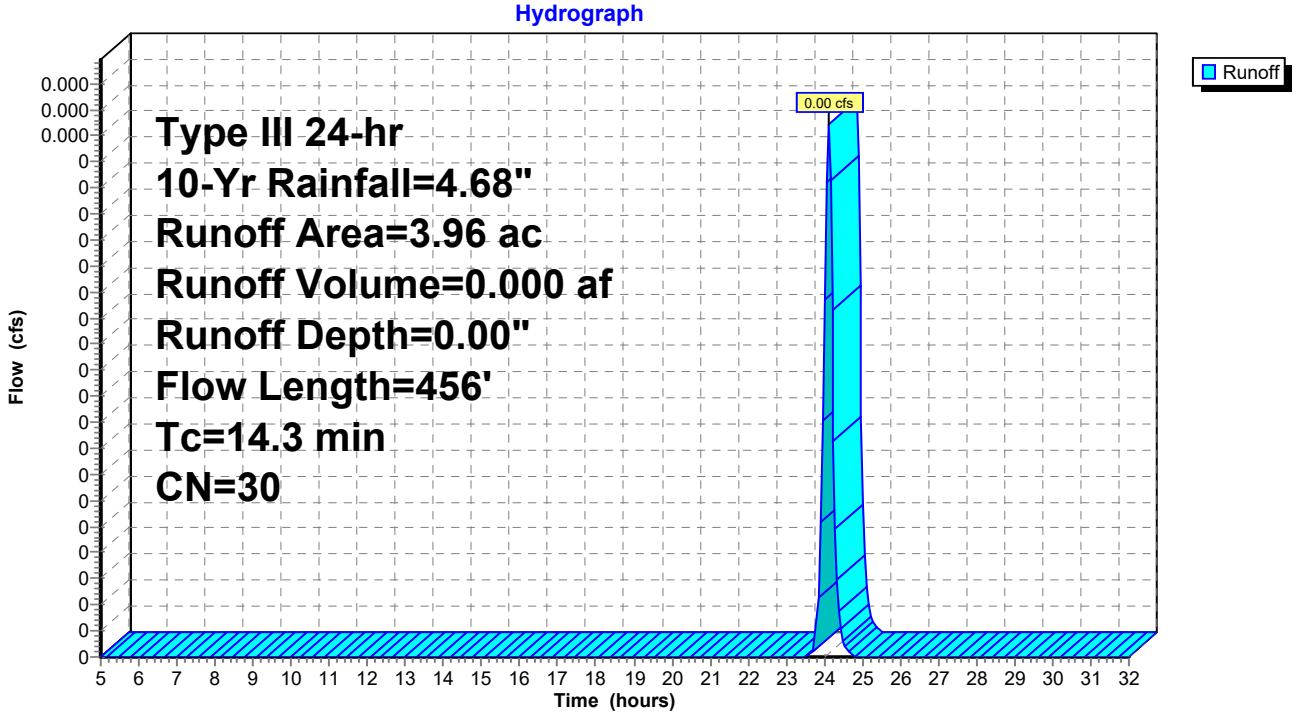
Runoff = 0.00 cfs @ 24.10 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-7 : #4 Poppy Ln

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:

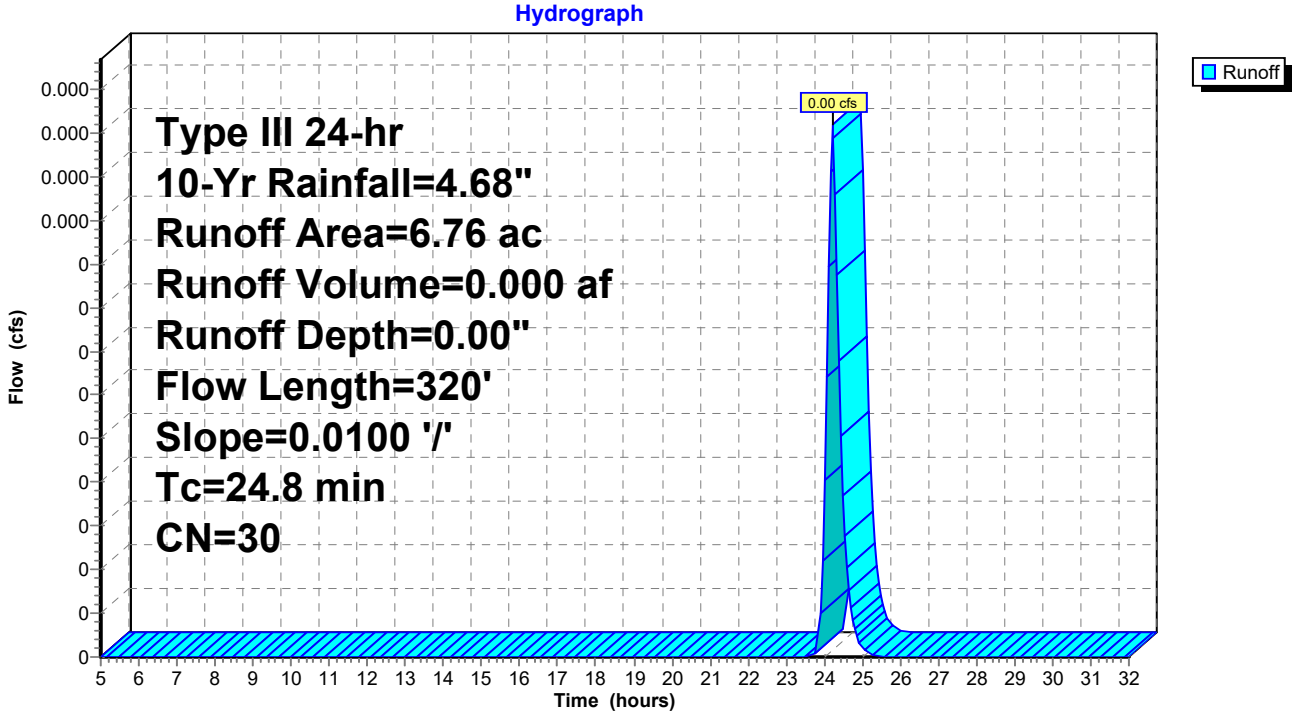
Runoff = 0.00 cfs @ 24.21 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-8 : Wetland Series 'D' & 'E'

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:



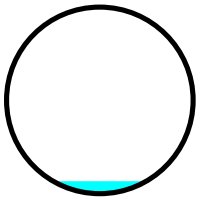
Summary for Reach 3R: 'Wetland Series J'

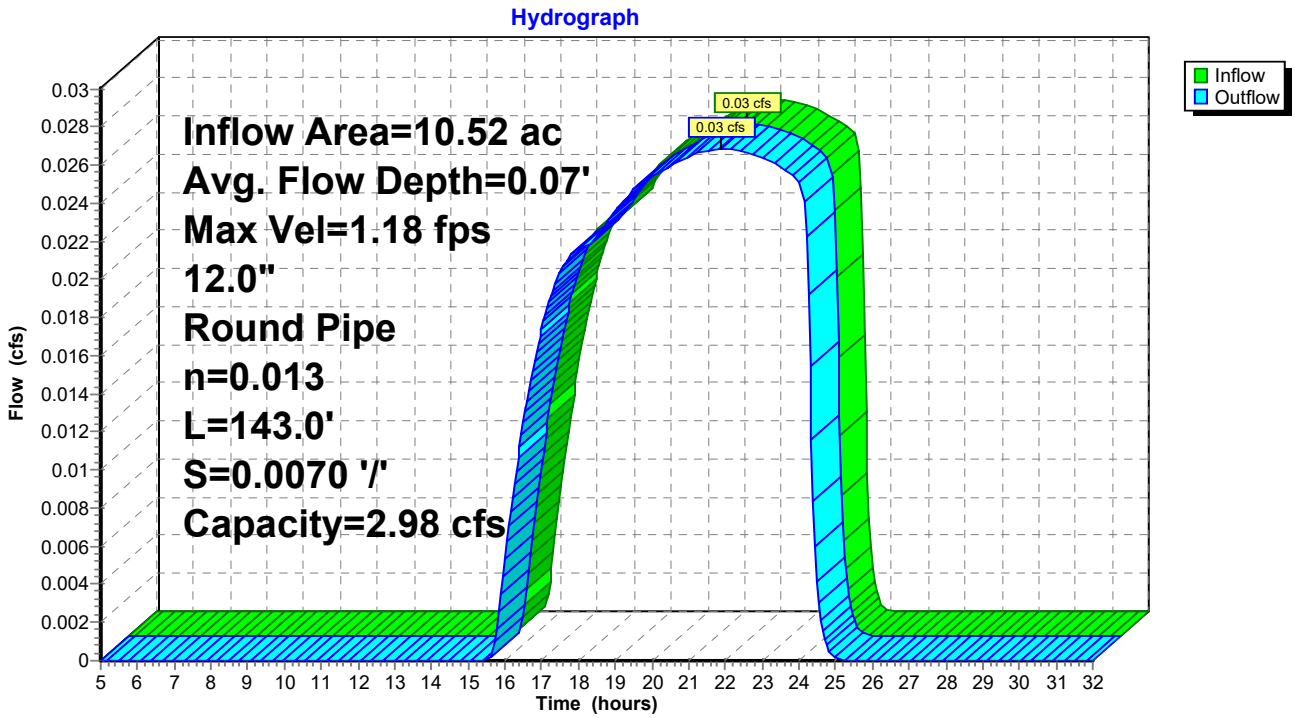
Inflow Area = 10.52 ac, 0.00% Impervious, Inflow Depth = 0.02" for 10-Yr event
Inflow = 0.03 cfs @ 21.82 hrs, Volume= 0.016 af
Outflow = 0.03 cfs @ 21.89 hrs, Volume= 0.016 af, Atten= 0%, Lag= 4.0 min
Routed to Reach DP-5 : Wetland Series 'A'

Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.18 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 1.04 fps, Avg. Travel Time= 2.3 min

Peak Storage= 3 cf @ 21.85 hrs
Average Depth at Peak Storage= 0.07' , Surface Width= 0.50'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 2.98 cfs

12.0" Round Pipe
n= 0.013
Length= 143.0' Slope= 0.0070 '/'
Inlet Invert= 137.05', Outlet Invert= 136.05'



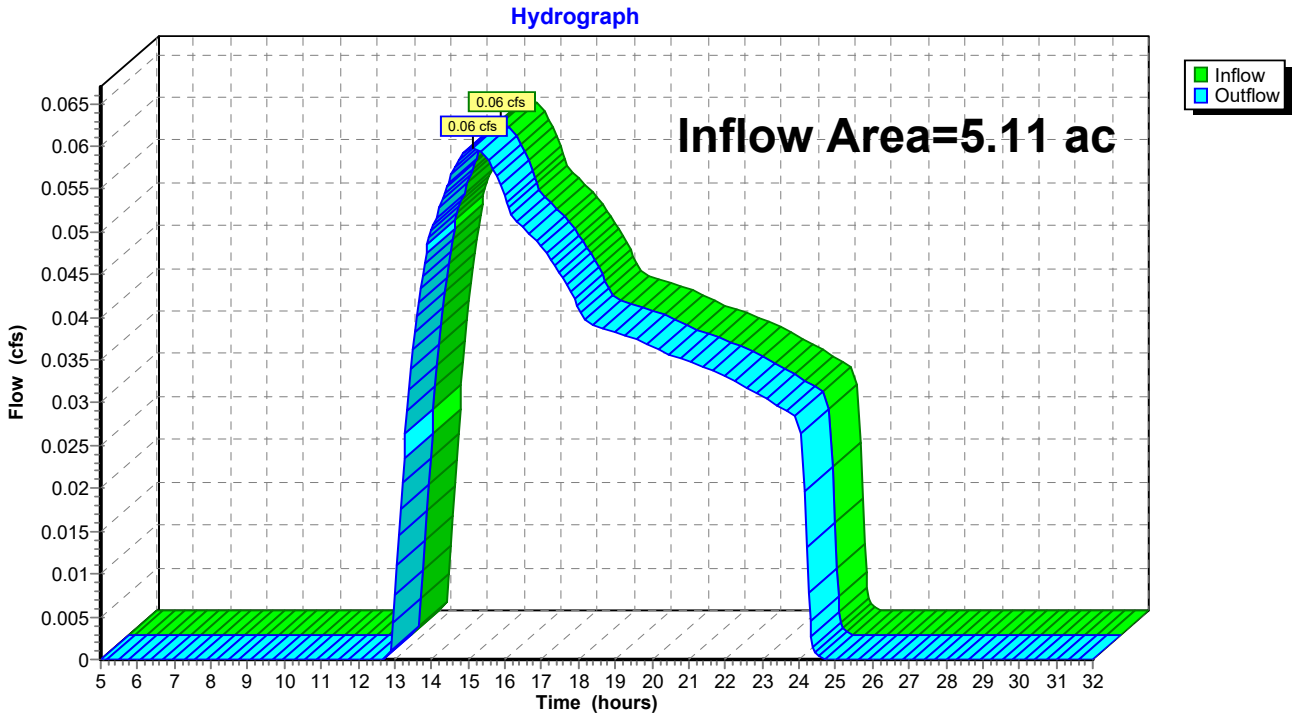


Summary for Reach DP-1: Northern Wetland System Culvert

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

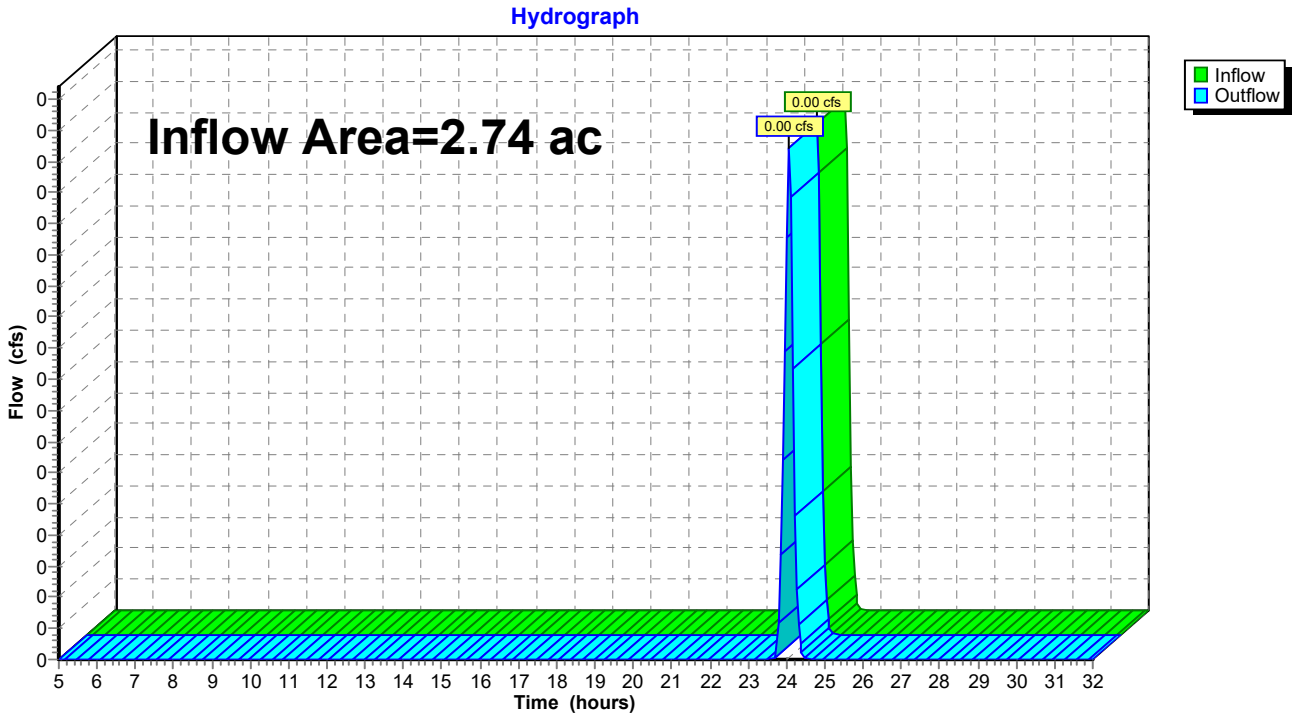


Summary for Reach DP-3: #48 Rinzee Rd

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

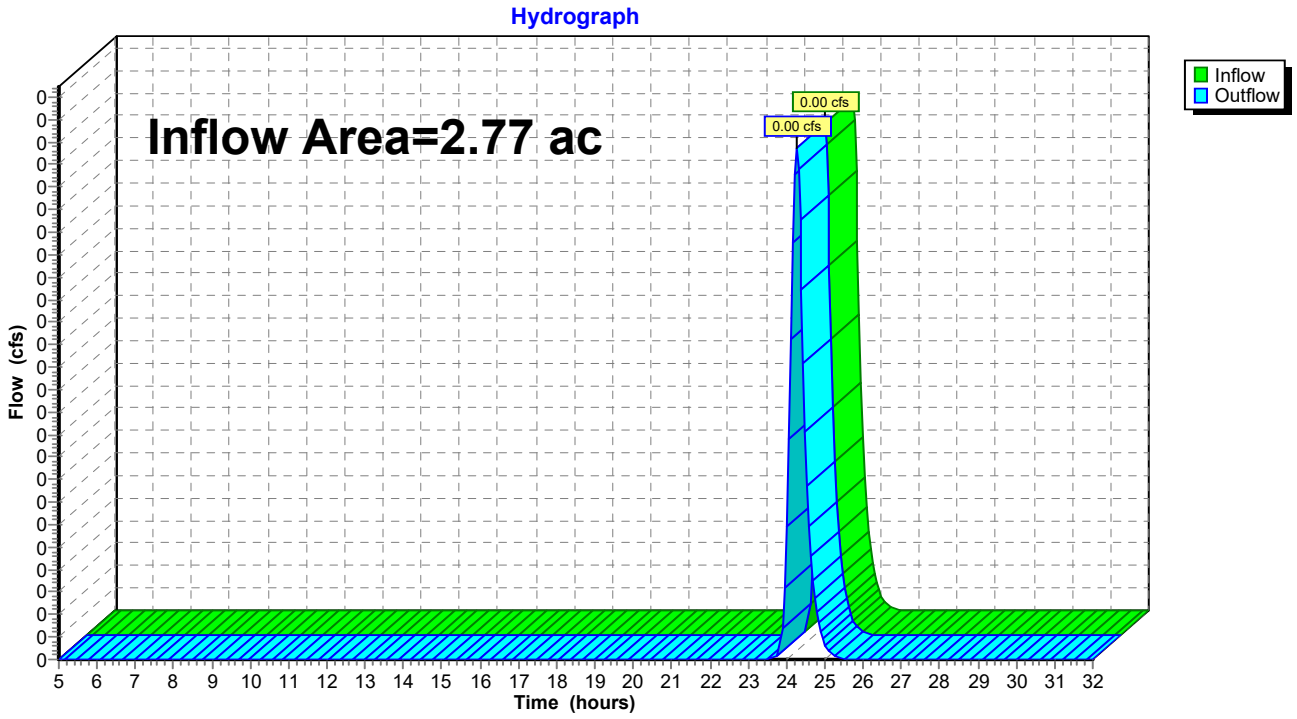


Summary for Reach DP-4: Poppy Ln

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

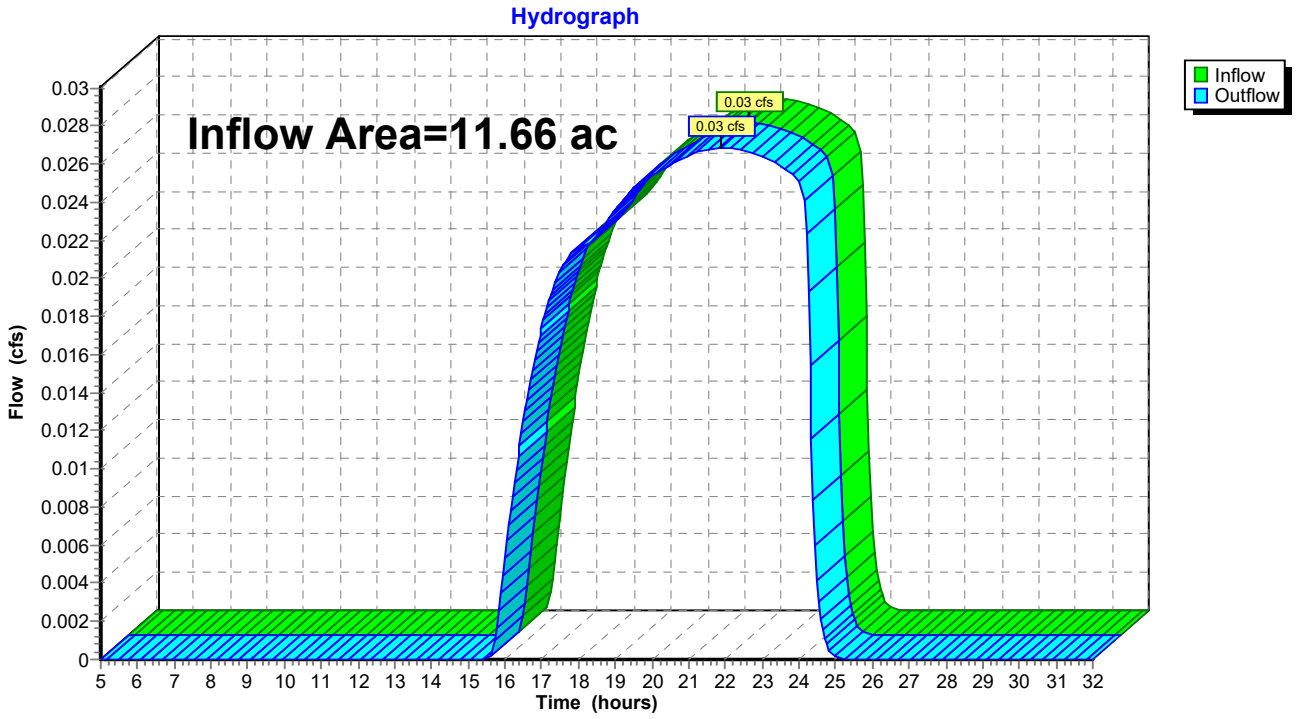


Summary for Reach DP-5: Wetland Series 'A'

Inflow Area = 11.66 ac, 0.00% Impervious, Inflow Depth = 0.02" for 10-Yr event
Inflow = 0.03 cfs @ 21.89 hrs, Volume= 0.016 af
Outflow = 0.03 cfs @ 21.89 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'

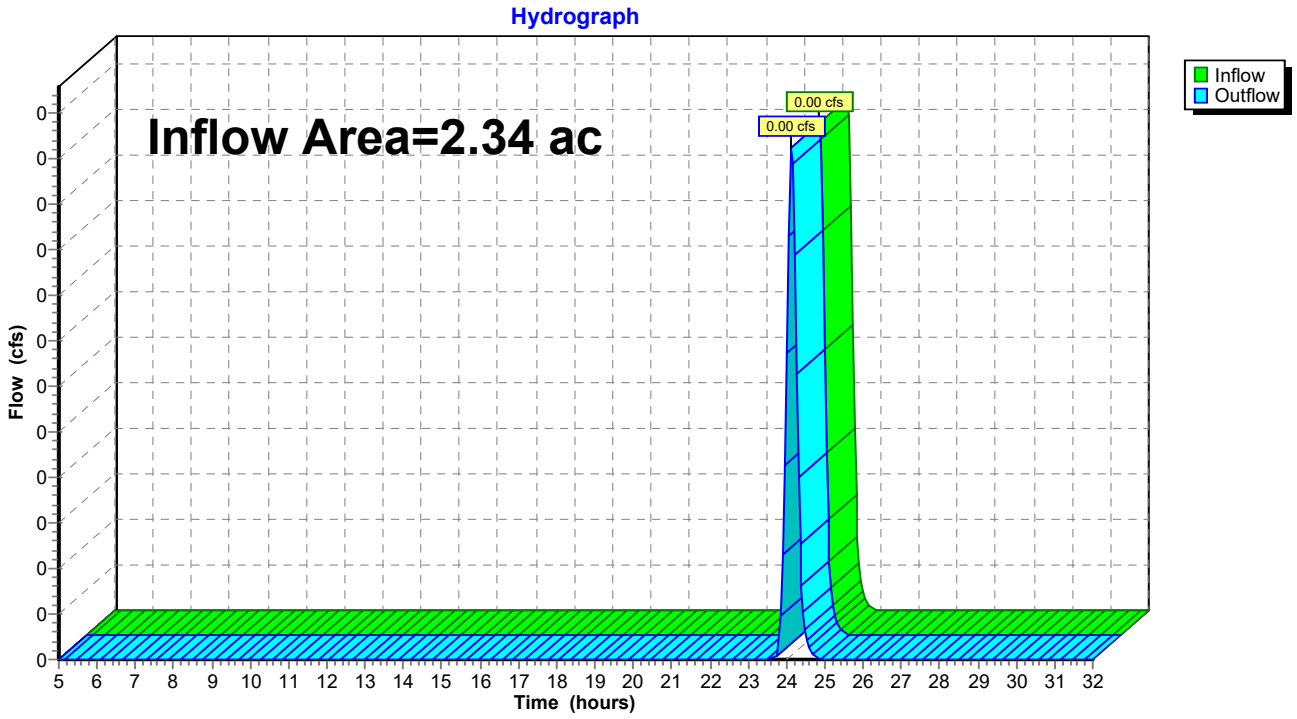


Summary for Reach DP-6: Wetland Series 'B' & 'C'

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'

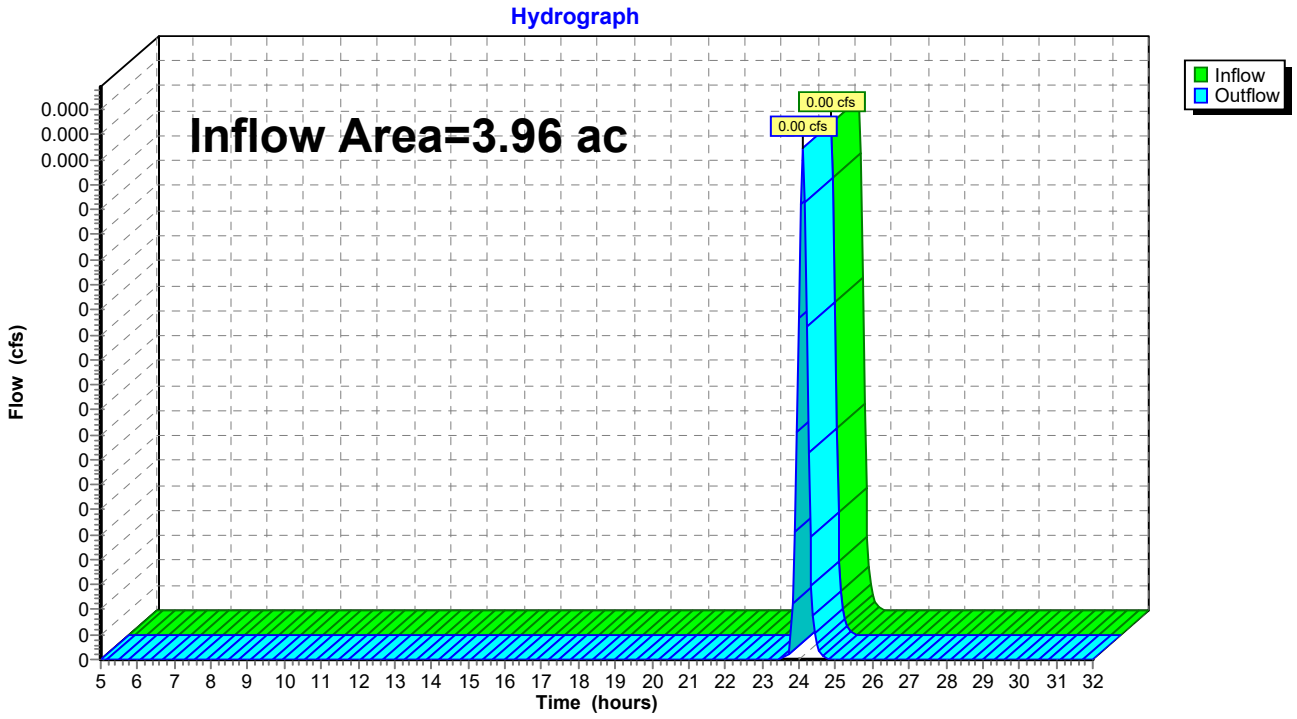


Summary for Reach DP-7: #4 Poppy Ln

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

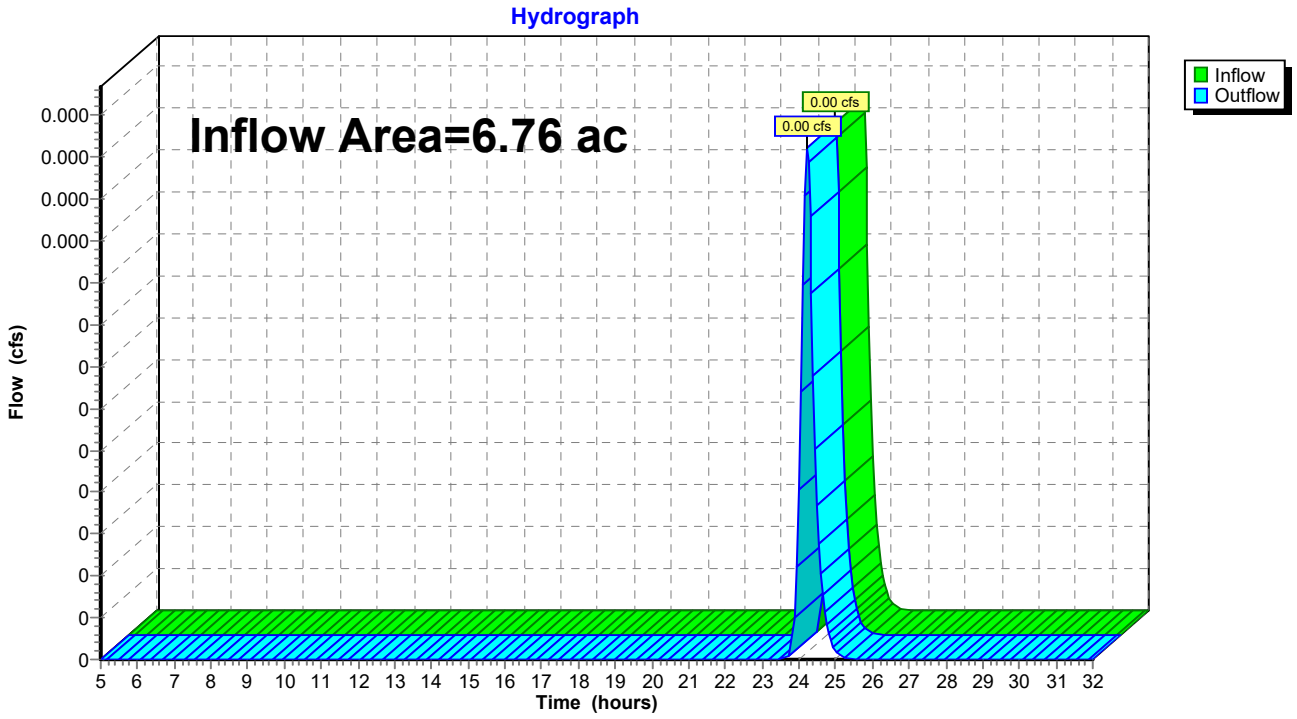


Summary for Reach DP-8: Wetland Series 'D' & 'E'

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 3R: 'Wetland Series J' Avg. Flow Depth=0.19' Max Vel=2.23 fps Inflow=0.22 cfs 0.140 af
12.0" Round Pipe n=0.013 L=143.0' S=0.0070 '/' Capacity=2.98 cfs Outflow=0.22 cfs 0.140 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 3R: 'Wetland Series J' Avg. Flow Depth=1.00' Max Vel=4.32 fps Inflow=3.47 cfs 0.713 af
12.0" Round Pipe n=0.013 L=143.0' S=0.0070 '/' Capacity=2.98 cfs Outflow=3.13 cfs 0.713 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

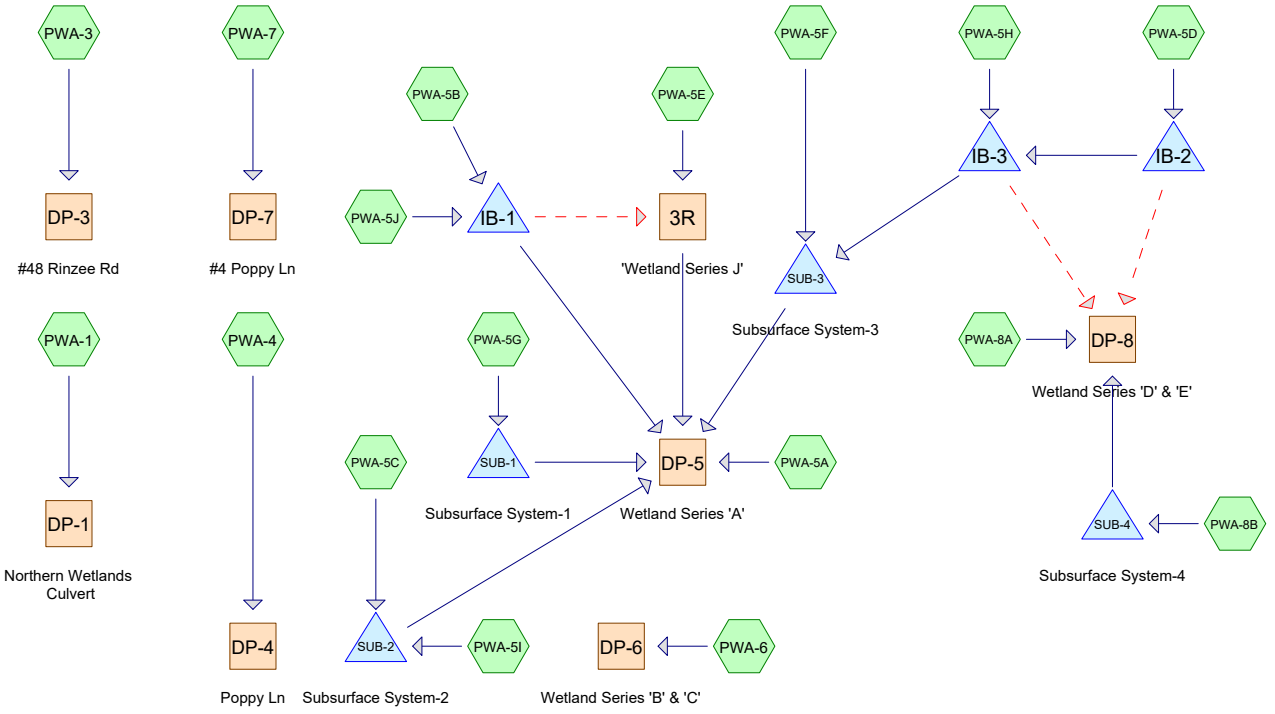
Reach DP-5: Wetland Series 'A' Inflow=3.31 cfs 0.765 af
Outflow=3.31 cfs 0.765 af

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 - R5
Prepared by Civil Design Consultants, Inc, Printed 5/7/2025

Project Notes

Rainfall events imported from "23-10524 - Pre - R1.hcp"

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	25-Yr	Type III 24-hr		Default	24.00	1	5.94	2
3	100-Yr	Type III 24-hr		Default	24.00	1	8.55	2
4	Custom	NOAA 24-hr	D	Default	24.00	1	3.40	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
11.58	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-5J, PWA-6, PWA-7, PWA-8A, PWA-8B)
0.77	61	>75% Grass cover, Good, HSG B (PWA-1, PWA-5C, PWA-5D, PWA-5E, PWA-5I, PWA-5J)
0.90	30	Brush, Good, HSG A (PWA-4, PWA-5E, PWA-6, PWA-7, PWA-8A)
7.12	98	Paved parking, HSG A (PWA-5B, PWA-5C, PWA-5D, PWA-5F, PWA-5G, PWA-5H, PWA-5I, PWA-5J, PWA-8B)
0.02	98	Paved parking, HSG B (PWA-5I, PWA-5J)
4.25	98	Roofs, HSG A (PWA-5B, PWA-5C, PWA-5D, PWA-5F, PWA-5H, PWA-5I, PWA-5J, PWA-8B)
0.11	98	Roofs, HSG B (PWA-5C, PWA-5I, PWA-5J)
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, PWA-5J)
35.32	**56**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
33.58	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-5J, PWA-6, PWA-7, PWA-8A, PWA-8B
1.74	HSG B	PWA-1, PWA-5C, PWA-5D, PWA-5E, PWA-5I, PWA-5J
0.00	HSG C	
0.00	HSG D	
0.00	Other	
35.32		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
11.58	0.77	0.00	0.00	0.00	12.35	>75% Grass cover, Good	PWA-1, PWA-3, PWA-5A, PWA-5B, PWA-5C, PWA-5D, PWA-5E, PWA-5F, PWA-5G, PWA-5H, PWA-5I, PWA-5J, PWA-6, PWA-7, PWA-8A, PWA-8B
0.90	0.00	0.00	0.00	0.00	0.90	Brush, Good	PWA-4, PWA-5E, PWA-6, PWA-7, PWA-8A
7.12	0.02	0.00	0.00	0.00	7.14	Paved parking	PWA-5B, PWA-5C, PWA-5D, PWA-5F, PWA-5G, PWA-5H, PWA-5I, PWA-5J, PWA-8B
4.25	0.11	0.00	0.00	0.00	4.36	Roofs	PWA-5B, PWA-5C, PWA-5D, PWA-5F, PWA-5H, PWA-5I, PWA-5J, PWA-8B
9.73	0.84	0.00	0.00	0.00	10.57	Woods, Good	PWA-1, PWA-3, PWA-4, PWA-5A, PWA-5C, PWA-5D, PWA-5E, PWA-5I,

Ground Covers (selected nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
33.58	**1.74**	**0.00**	**0.00**	**0.00**	**35.32**	**TOTAL AREA**	

Pipe Listing (selected nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	3R	136.00	135.00	143.0	0.0070	0.013	0.0	18.0	0.0	
2	IB-1	139.10	138.60	100.9	0.0050	0.013	0.0	12.0	0.0	
3	IB-2	145.00	144.40	69.0	0.0087	0.013	0.0	15.0	0.0	
4	IB-3	144.00	143.00	49.0	0.0204	0.013	0.0	12.0	0.0	
5	SUB-1	131.00	130.76	48.0	0.0050	0.013	0.0	12.0	0.0	
6	SUB-2	136.20	135.67	105.0	0.0050	0.013	0.0	15.0	0.0	
7	SUB-3	139.00	137.00	227.0	0.0088	0.013	0.0	15.0	0.0	
8	SUB-4	133.00	132.88	23.0	0.0052	0.013	0.0	12.0	0.0	

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=0.29 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=0.54 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=2.43 ac 52.26% Impervious Runoff Depth=0.76"
Flow Length=705' Tc=8.7 min CN=70 Runoff=1.70 cfs 0.154 af

SubcatchmentPWA-5C: Runoff Area=2.74 ac 61.31% Impervious Runoff Depth=1.07"
Flow Length=400' Tc=11.2 min CN=76 Runoff=2.74 cfs 0.244 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 44.68% Impervious Runoff Depth=0.54"
Tc=6.0 min CN=65 Runoff=0.22 cfs 0.021 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=3.90 ac 41.03% Impervious Runoff Depth=0.47"
Flow Length=1,000' Tc=22.8 min CN=63 Runoff=0.95 cfs 0.152 af

SubcatchmentPWA-5J: Runoff Area=2.04 ac 45.59% Impervious Runoff Depth=0.67"
Tc=6.0 min CN=68 Runoff=1.32 cfs 0.114 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

Subcatchment PWA-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=139.31' Storage=1,716 cf Inflow=2.98 cfs 0.267 af
Discarded=1.22 cfs 0.267 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=1.22 cfs 0.267 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=144.74' Storage=855 cf Inflow=1.25 cfs 0.092 af
Discarded=0.38 cfs 0.092 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.38 cfs 0.092 af

Pond SUB-1: Subsurface System-1 Peak Elev=131.57' Storage=737 cf Inflow=0.22 cfs 0.021 af
Outflow=0.00 cfs 0.007 af

Pond SUB-2: Subsurface System-2 Peak Elev=136.21' Storage=60 cf Inflow=3.11 cfs 0.396 af
Discarded=3.09 cfs 0.396 af Primary=0.00 cfs 0.000 af Outflow=3.09 cfs 0.396 af

Pond SUB-3: Subsurface System-3 Peak Elev=139.98' Storage=2,536 cf Inflow=2.39 cfs 0.174 af
Discarded=0.29 cfs 0.174 af Primary=0.00 cfs 0.000 af Outflow=0.29 cfs 0.174 af

Pond SUB-4: Subsurface System-4 Peak Elev=133.35' Storage=2,024 cf Inflow=5.90 cfs 0.453 af
Discarded=2.62 cfs 0.453 af Primary=0.00 cfs 0.000 af Outflow=2.62 cfs 0.453 af

Total Runoff Area = 35.32 ac Runoff Volume = 1.419 af Average Runoff Depth = 0.48"
67.44% Pervious = 23.82 ac 32.56% Impervious = 11.50 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=0.29 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=0.54 ac 0.00% Impervious Runoff Depth=0.03"
Tc=6.0 min CN=34 Runoff=0.00 cfs 0.001 af

SubcatchmentPWA-5B: Runoff Area=2.43 ac 52.26% Impervious Runoff Depth=1.80"
Flow Length=705' Tc=8.7 min CN=70 Runoff=4.46 cfs 0.365 af

SubcatchmentPWA-5C: Runoff Area=2.74 ac 61.31% Impervious Runoff Depth=2.27"
Flow Length=400' Tc=11.2 min CN=76 Runoff=6.08 cfs 0.519 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 44.68% Impervious Runoff Depth=1.44"
Tc=6.0 min CN=65 Runoff=0.73 cfs 0.057 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=3.90 ac 41.03% Impervious Runoff Depth=1.31"
Flow Length=1,000' Tc=22.8 min CN=63 Runoff=3.47 cfs 0.426 af

SubcatchmentPWA-5J: Runoff Area=2.04 ac 45.59% Impervious Runoff Depth=1.66"
Tc=6.0 min CN=68 Runoff=3.75 cfs 0.281 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

Subcatchment PWA-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=0.03 cfs 0.025 af
Outflow=0.03 cfs 0.025 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=140.02' Storage=8,416 cf Inflow=8.12 cfs 0.646 af
Discarded=1.46 cfs 0.646 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=1.46 cfs 0.646 af

Pond IB-2: Peak Elev=145.08' Storage=179 cf Inflow=0.66 cfs 0.138 af
Discarded=0.52 cfs 0.138 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.52 cfs 0.138 af

Pond IB-3: Peak Elev=145.48' Storage=2,344 cf Inflow=2.53 cfs 0.183 af
Discarded=0.54 cfs 0.183 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.54 cfs 0.183 af

Pond SUB-1: Subsurface System-1 Peak Elev=132.64' Storage=2,129 cf Inflow=0.73 cfs 0.057 af
Outflow=0.01 cfs 0.013 af

Pond SUB-2: Subsurface System-2 Peak Elev=136.75' Storage=4,994 cf Inflow=8.29 cfs 0.945 af
Discarded=4.17 cfs 0.948 af Primary=0.00 cfs 0.000 af Outflow=4.17 cfs 0.948 af

Pond SUB-3: Subsurface System-3 Peak Elev=141.56' Storage=6,646 cf Inflow=4.72 cfs 0.343 af
Discarded=0.29 cfs 0.337 af Primary=0.03 cfs 0.005 af Outflow=0.32 cfs 0.343 af

Pond SUB-4: Subsurface System-4 Peak Elev=134.97' Storage=11,288 cf Inflow=13.67 cfs 0.998 af
Discarded=2.62 cfs 0.998 af Primary=0.00 cfs 0.000 af Outflow=2.62 cfs 0.998 af

Total Runoff Area = 35.32 ac Runoff Volume = 3.350 af Average Runoff Depth = 1.14"
67.44% Pervious = 23.82 ac 32.56% Impervious = 11.50 ac

Summary for Subcatchment PWA-1:

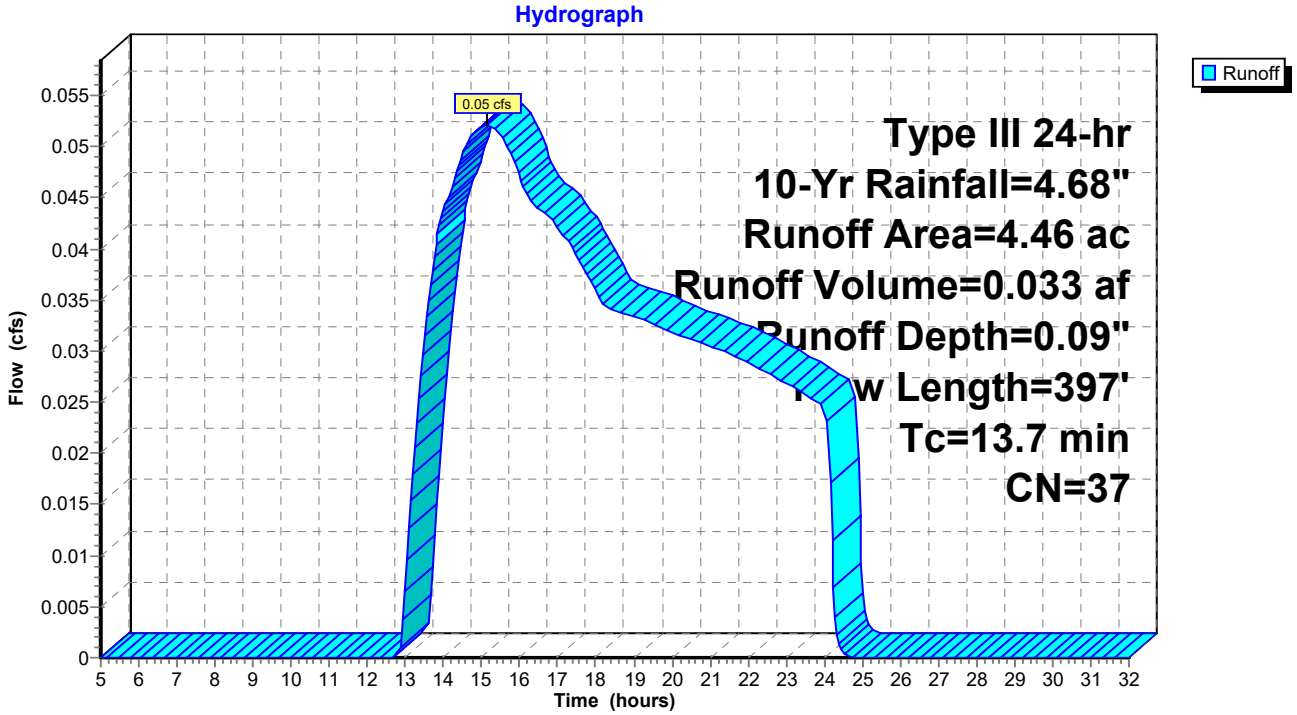
Runoff = 0.05 cfs @ 15.11 hrs, Volume= 0.033 af, Depth= 0.09"
Routed to Reach DP-1 : Northern Wetlands Culvert

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:

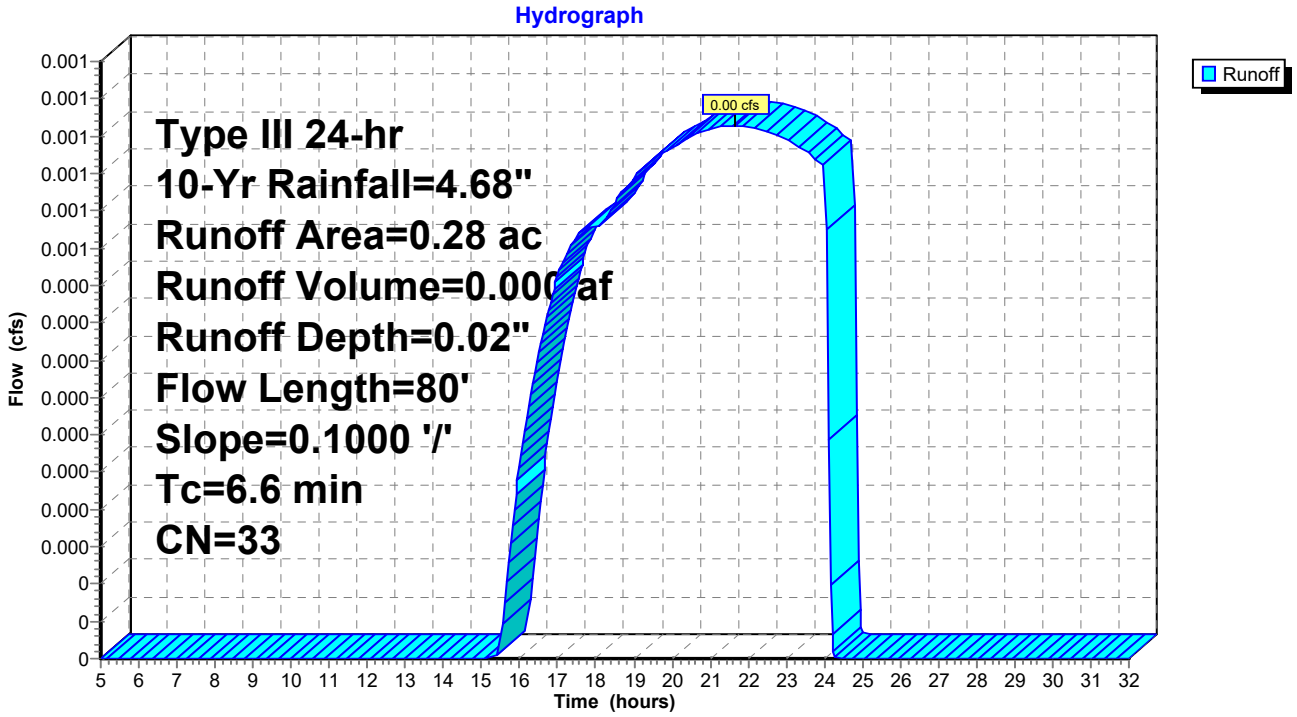
Runoff = 0.00 cfs @ 21.65 hrs, Volume= 0.000 af, Depth= 0.02"
Routed to Reach DP-3 : #48 Rinzee Rd

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:

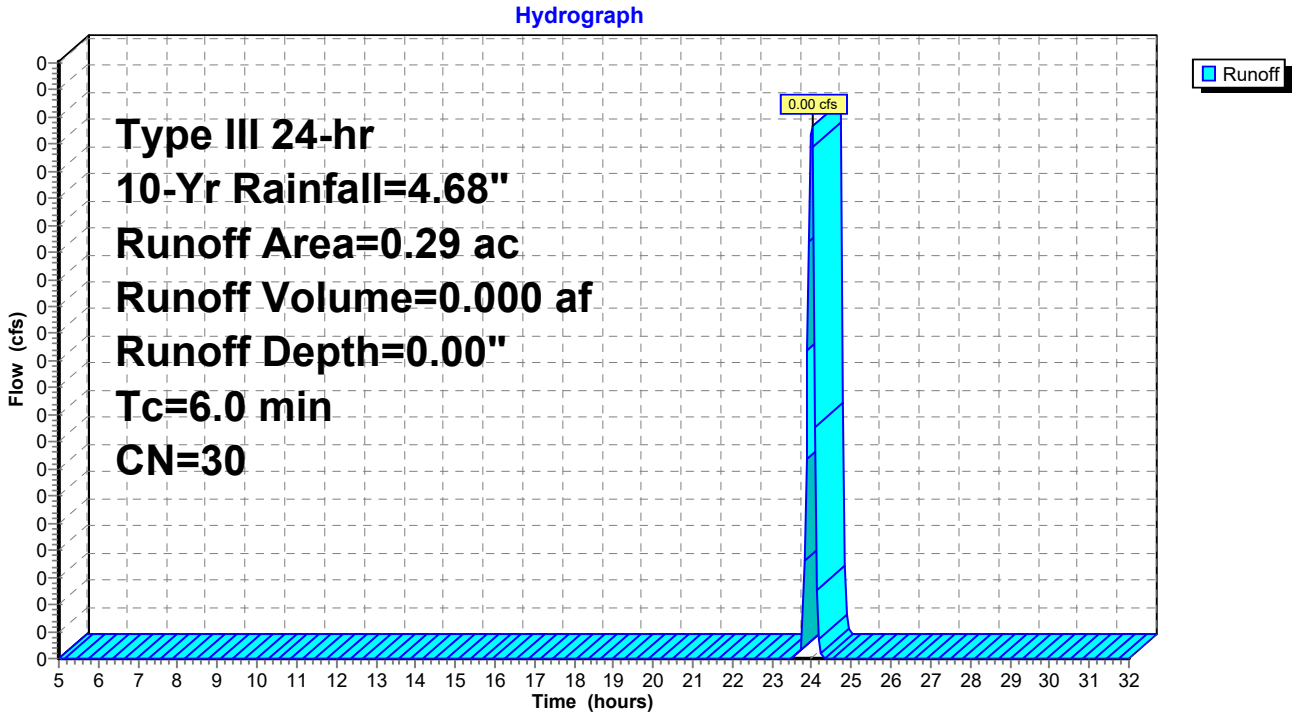
Runoff = 0.00 cfs @ 24.02 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-4 : Poppy Ln

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
0.15	30	Brush, Good, HSG A
0.14	30	Woods, Good, HSG A
0.29	30	Weighted Average
0.29		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:

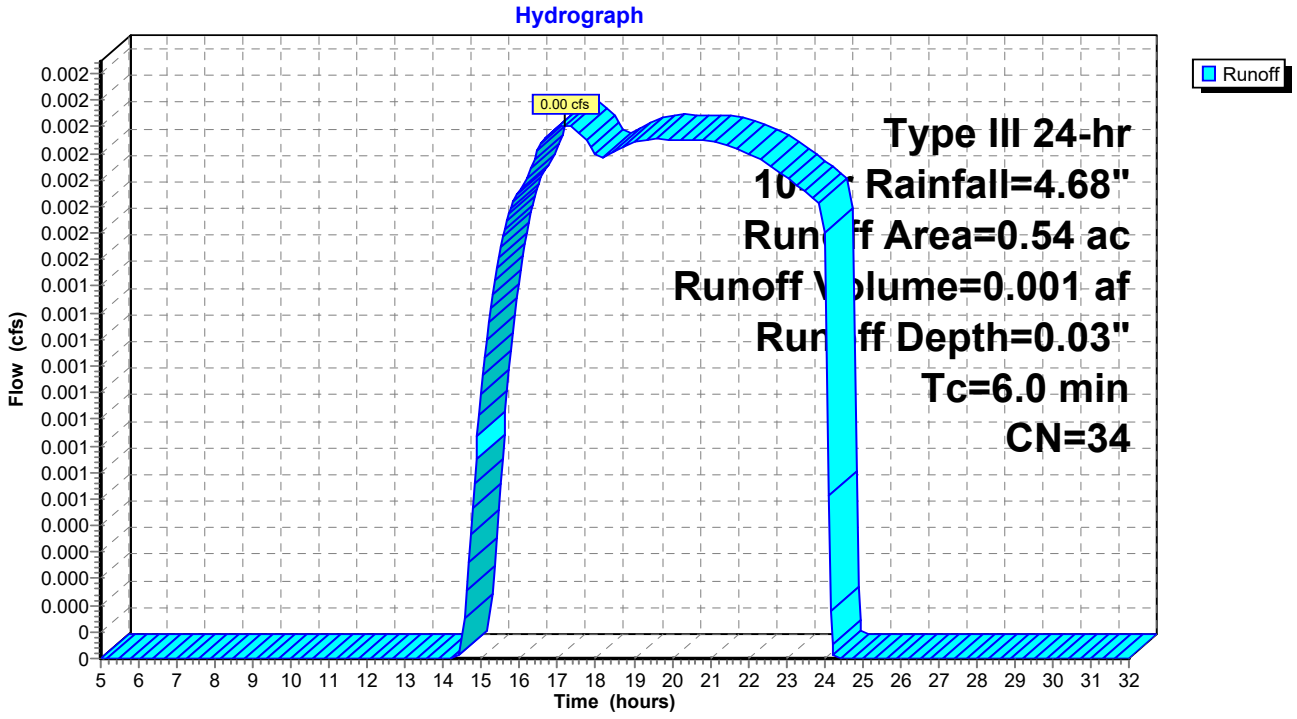
Runoff = 0.00 cfs @ 17.19 hrs, Volume= 0.001 af, Depth= 0.03"
Routed to Reach DP-5 : Wetland Series 'A'

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
0.21	39	>75% Grass cover, Good, HSG A
0.54	34	Weighted Average
0.54		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:

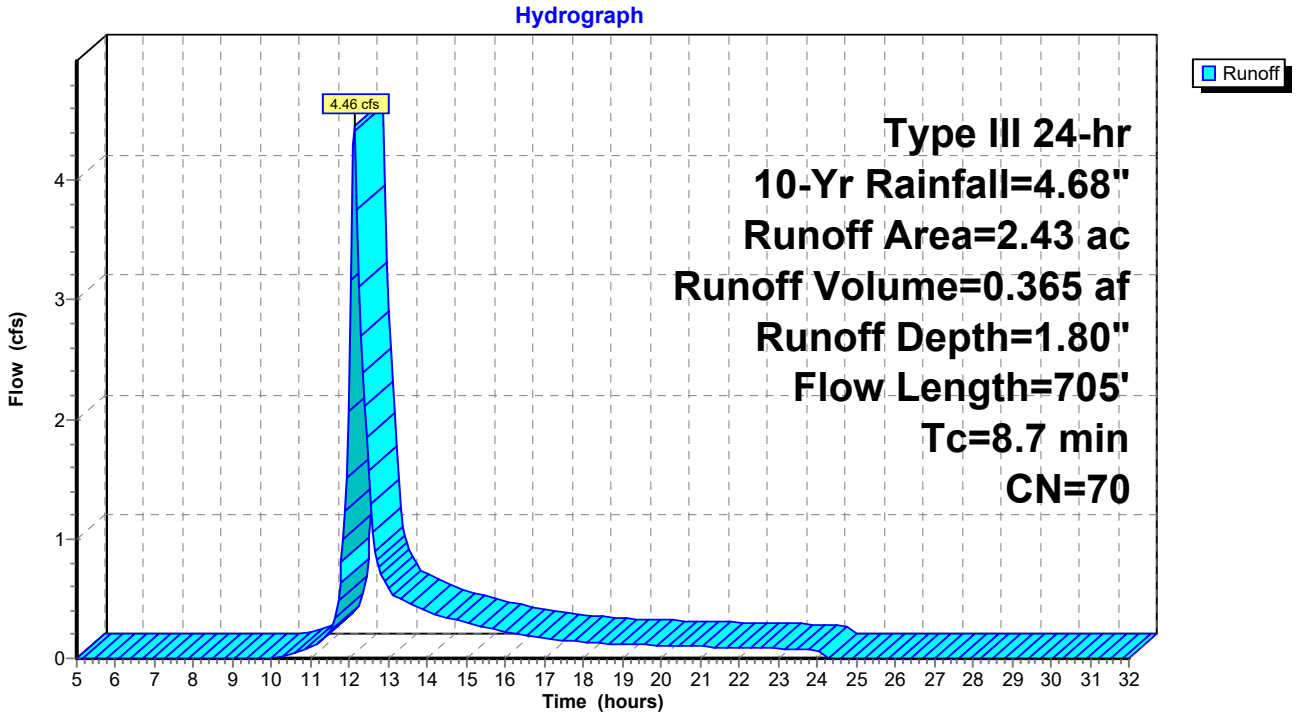
Runoff = 4.46 cfs @ 12.13 hrs, Volume= 0.365 af, Depth= 1.80"
Routed to Pond IB-1 :

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
1.16	39	>75% Grass cover, Good, HSG A
0.37	98	Roofs, HSG A
0.90	98	Paved parking, HSG A
2.43	70	Weighted Average
1.16		47.74% Pervious Area
1.27		52.26% 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:

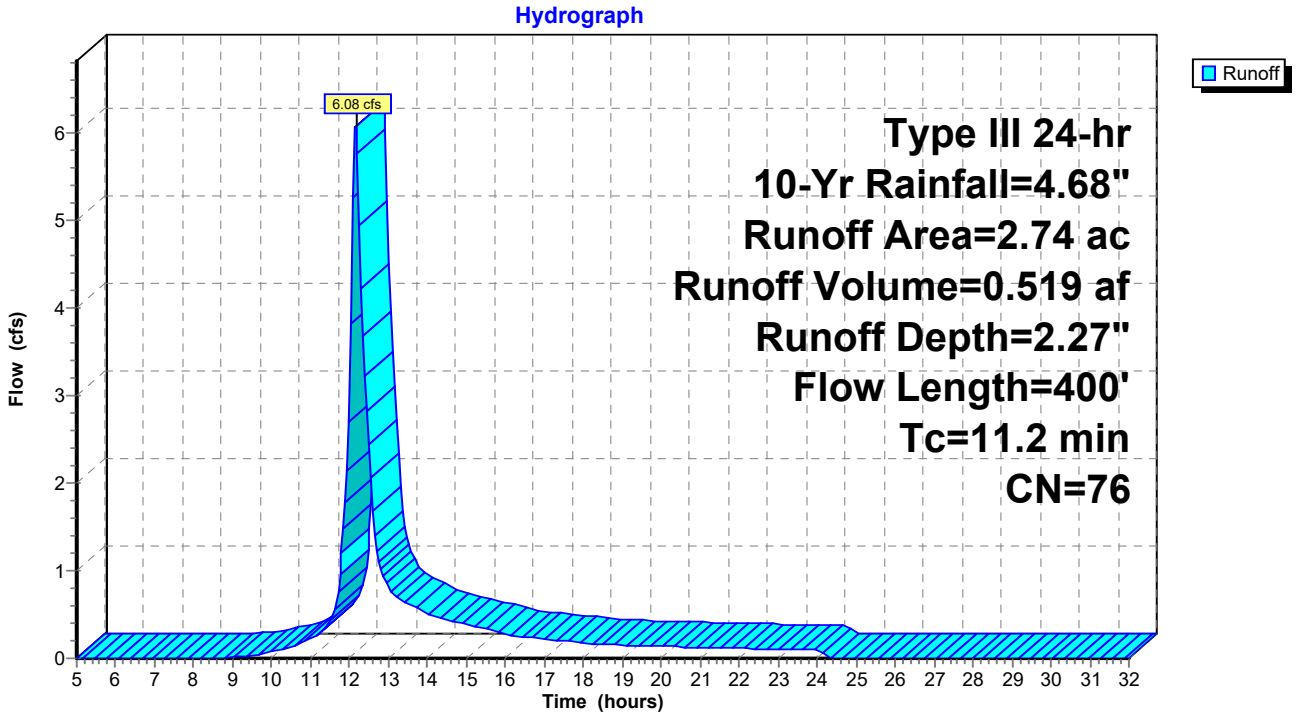
Runoff = 6.08 cfs @ 12.16 hrs, Volume= 0.519 af, Depth= 2.27"
Routed to Pond SUB-2 : Subsurface System-2

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
0.96	39	>75% Grass cover, Good, HSG A
0.08	61	>75% Grass cover, Good, HSG B
0.01	30	Woods, Good, HSG A
0.01	55	Woods, Good, HSG B
0.68	98	Roofs, HSG A
0.04	98	Roofs, HSG B
0.96	98	Paved parking, HSG A
2.74	76	Weighted Average
1.06		38.69% Pervious Area
1.68		61.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.9	50	0.1000	0.29		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.40"
8.3	350	0.0100	0.70		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.2	400	Total			

Subcatchment PWA-5C:



Summary for Subcatchment PWA-5D:

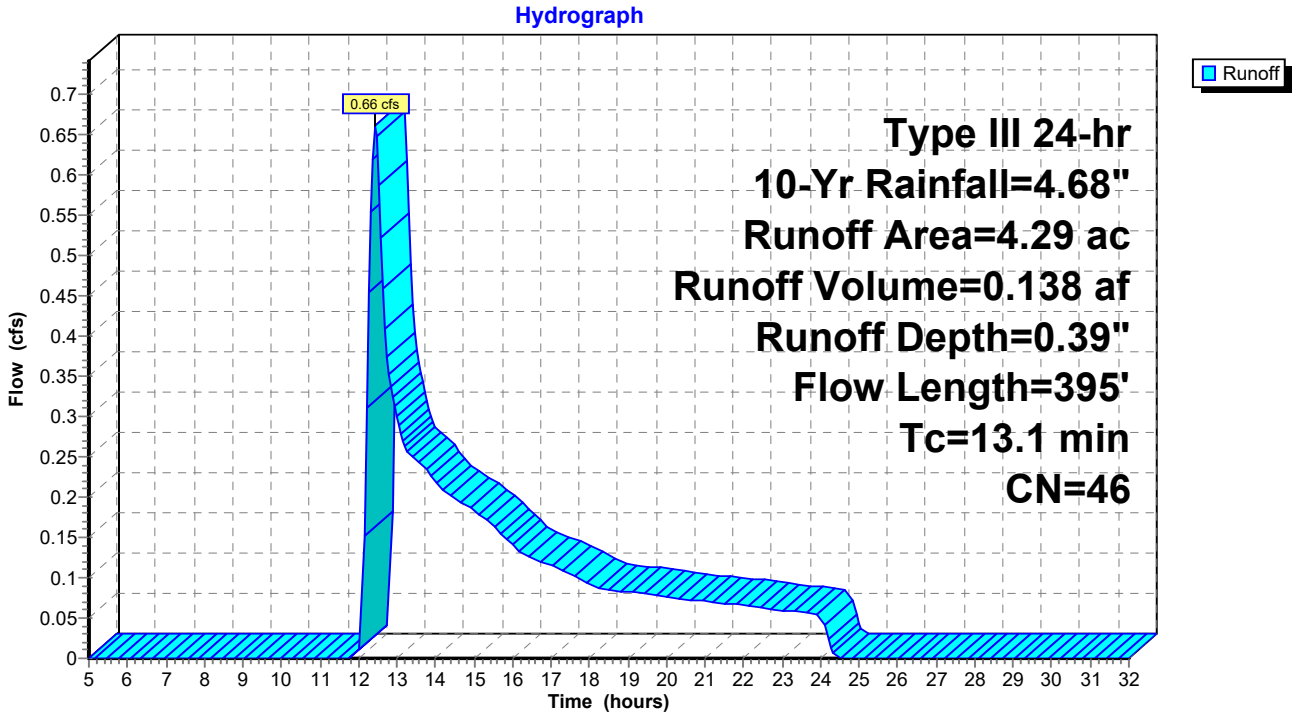
Runoff = 0.66 cfs @ 12.43 hrs, Volume= 0.138 af, Depth= 0.39"
Routed to Pond IB-2 :

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:

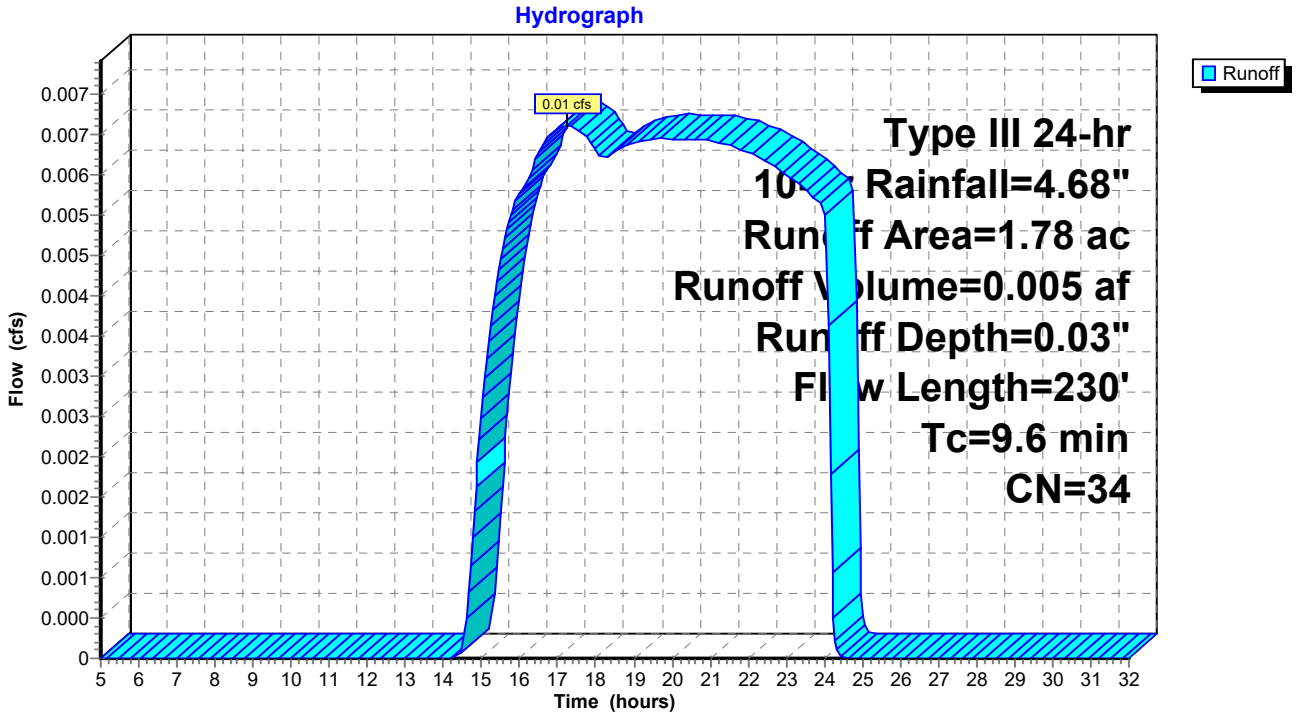
Runoff = 0.01 cfs @ 17.24 hrs, Volume= 0.005 af, Depth= 0.03"
Routed to Reach 3R : 'Wetland Series J'

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:

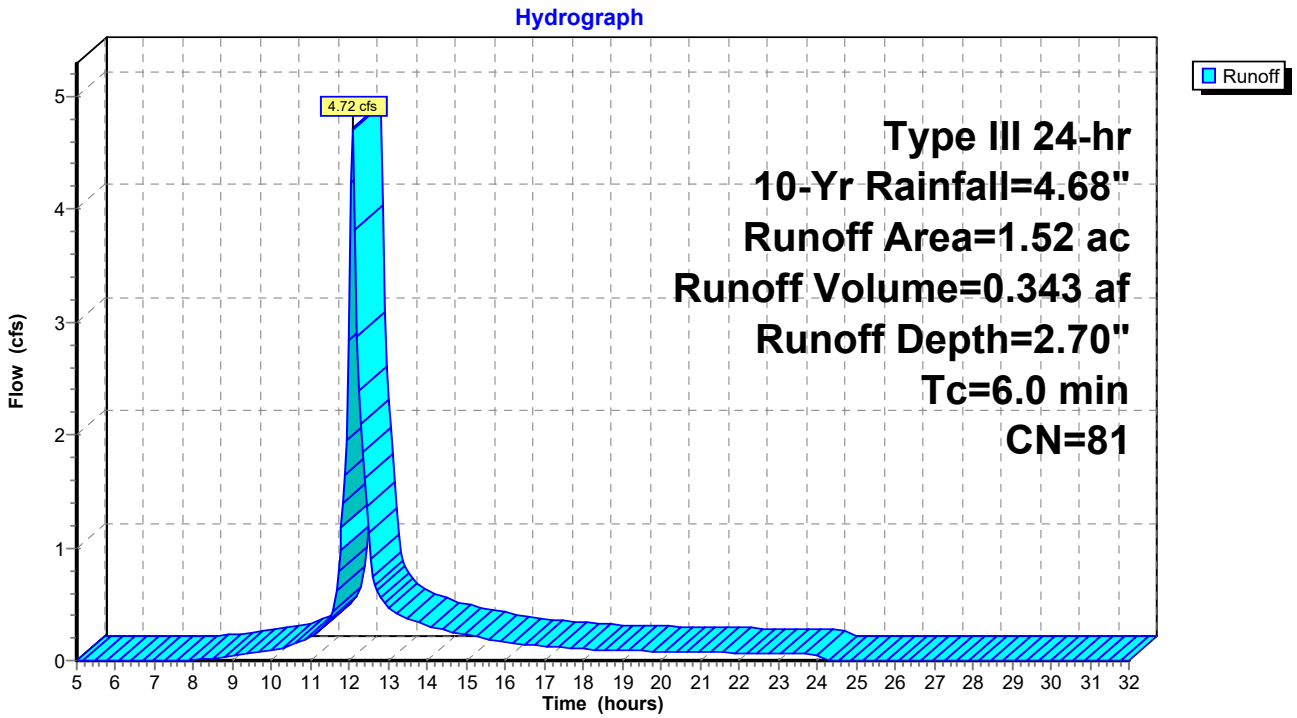
Runoff = 4.72 cfs @ 12.09 hrs, Volume= 0.343 af, Depth= 2.70"
Routed to Pond SUB-3 : Subsurface System-3

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:

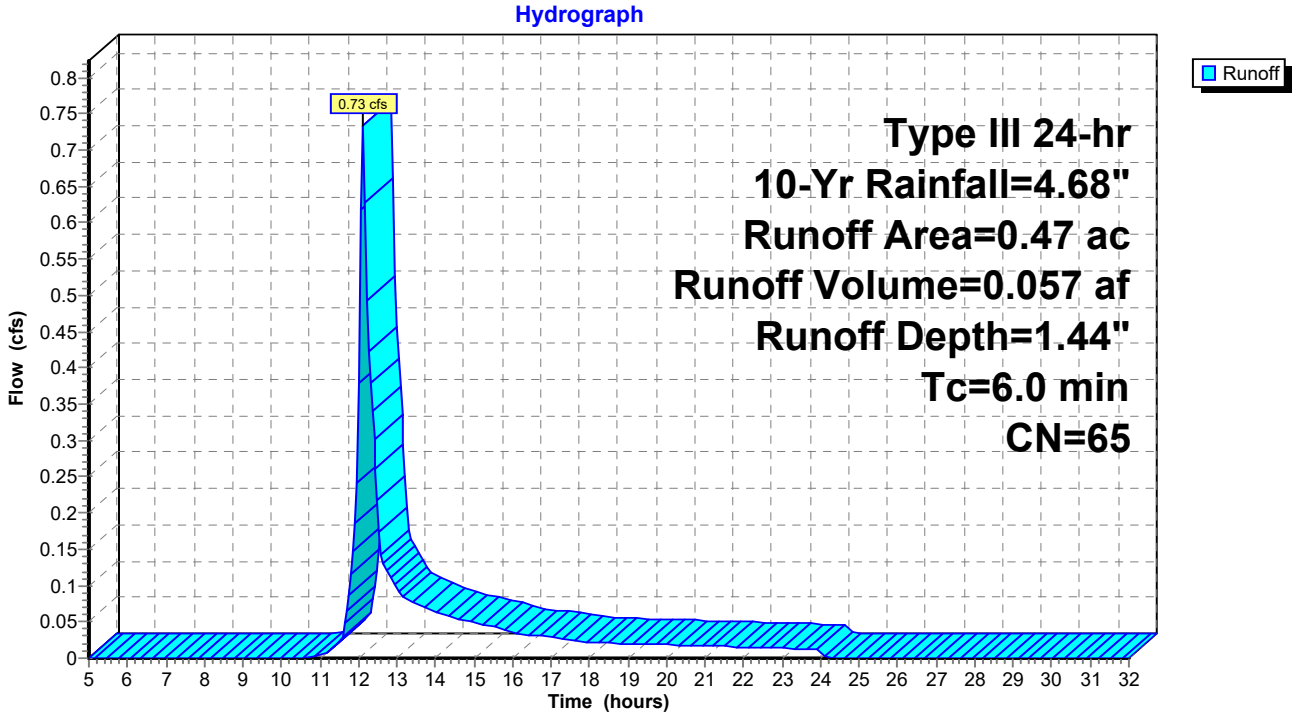
Runoff = 0.73 cfs @ 12.10 hrs, Volume= 0.057 af, Depth= 1.44"
Routed to Pond SUB-1 : Subsurface System-1

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
0.26	39	>75% Grass cover, Good, HSG A
0.21	98	Paved parking, HSG A
0.47	65	Weighted Average
0.26		55.32% Pervious Area
0.21		44.68% 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:

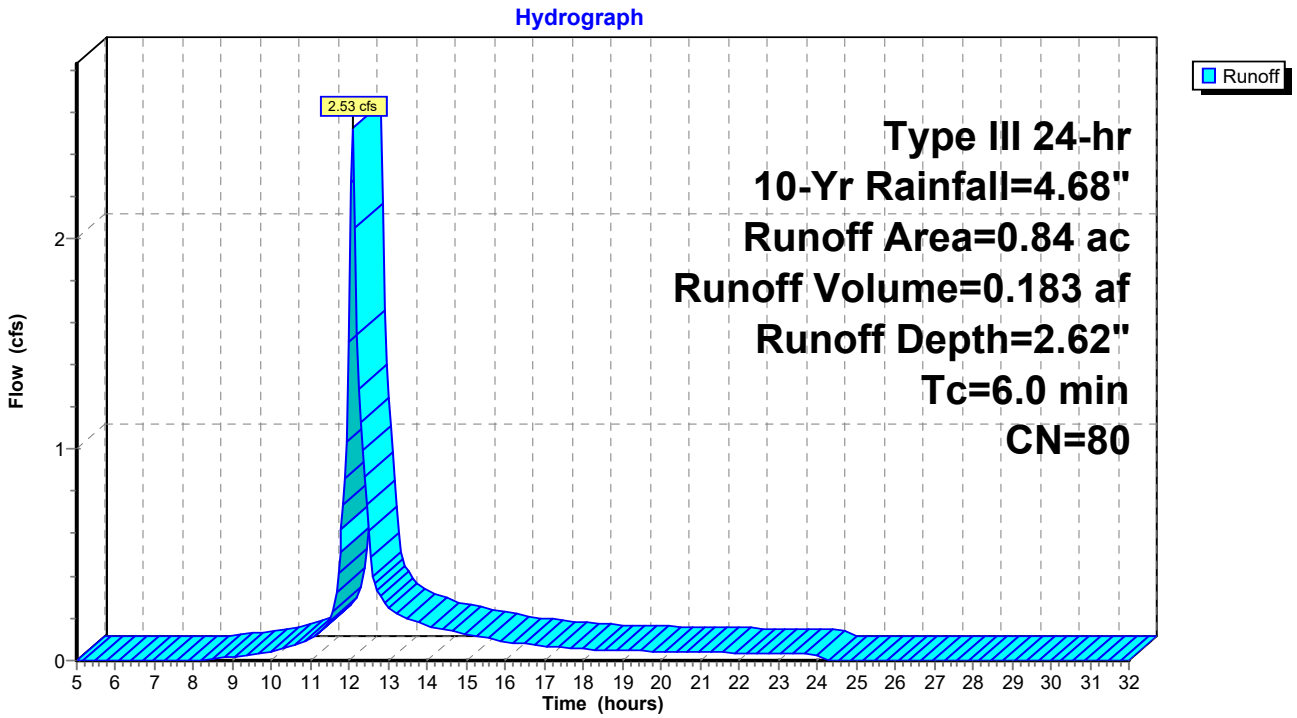
Runoff = 2.53 cfs @ 12.09 hrs, Volume= 0.183 af, Depth= 2.62"
Routed to Pond IB-3 :

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:

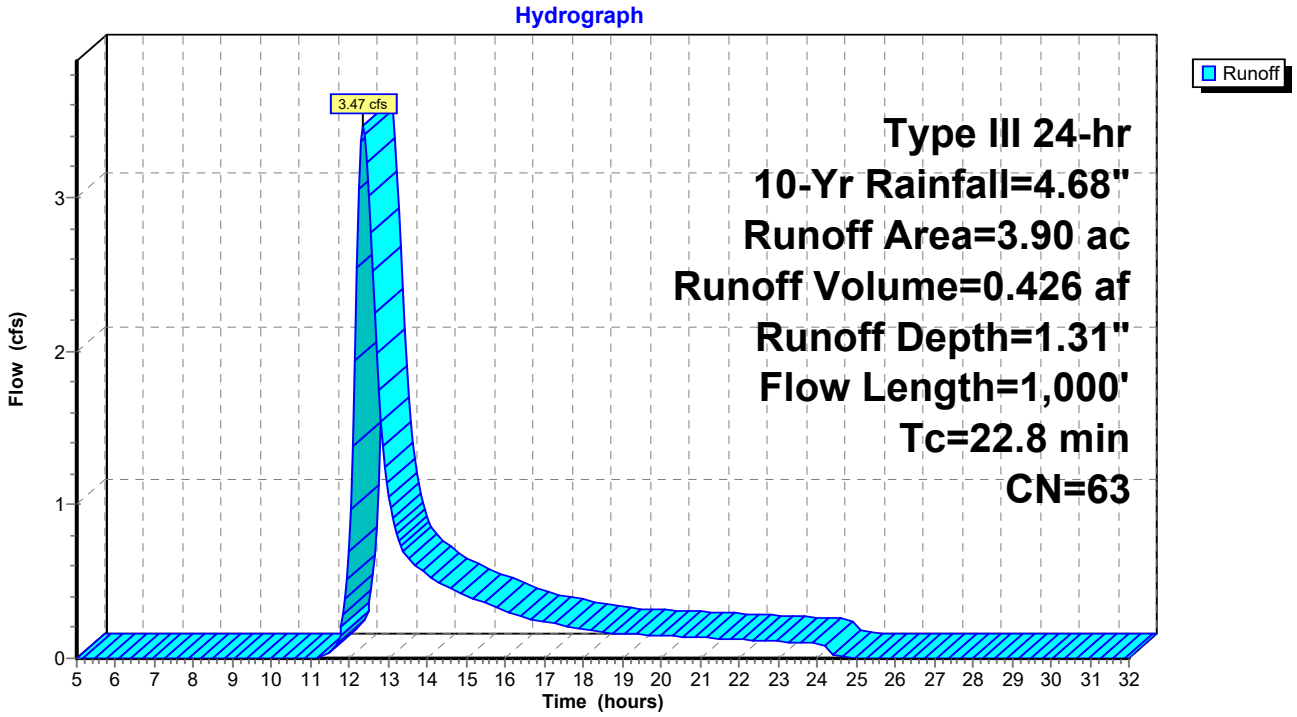
Runoff = 3.47 cfs @ 12.36 hrs, Volume= 0.426 af, Depth= 1.31"
Routed to Pond SUB-2 : Subsurface System-2

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
1.98	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
3.90	63	Weighted Average
2.30		58.97% Pervious Area
1.60		41.03% 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-5J:

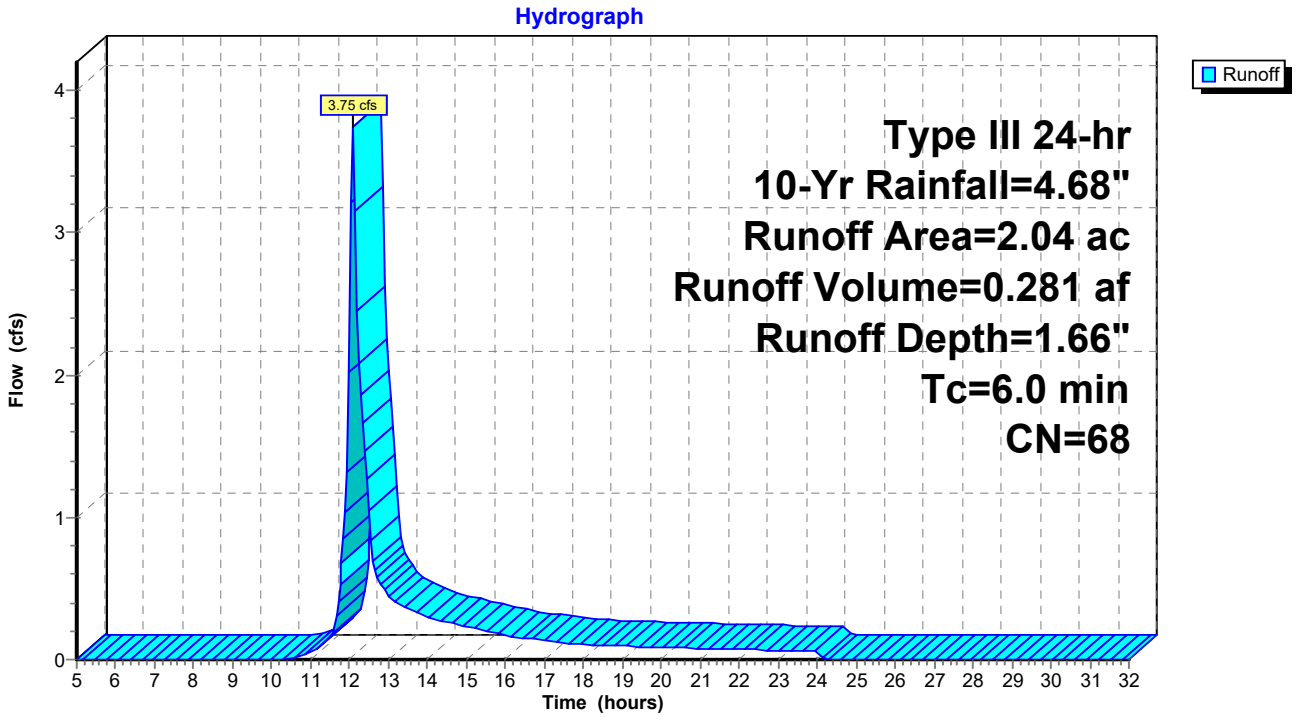
Runoff = 3.75 cfs @ 12.10 hrs, Volume= 0.281 af, Depth= 1.66"
Routed to Pond IB-1 :

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
0.93	39	>75% Grass cover, Good, HSG A
0.13	61	>75% Grass cover, Good, HSG B
0.05	55	Woods, Good, HSG B
0.25	98	Roofs, HSG A
0.03	98	Roofs, HSG B
0.64	98	Paved parking, HSG A
0.01	98	Paved parking, HSG B
2.04	68	Weighted Average
1.11		54.41% Pervious Area
0.93		45.59% Impervious Area

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

Subcatchment PWA-5J:



Summary for Subcatchment PWA-6:

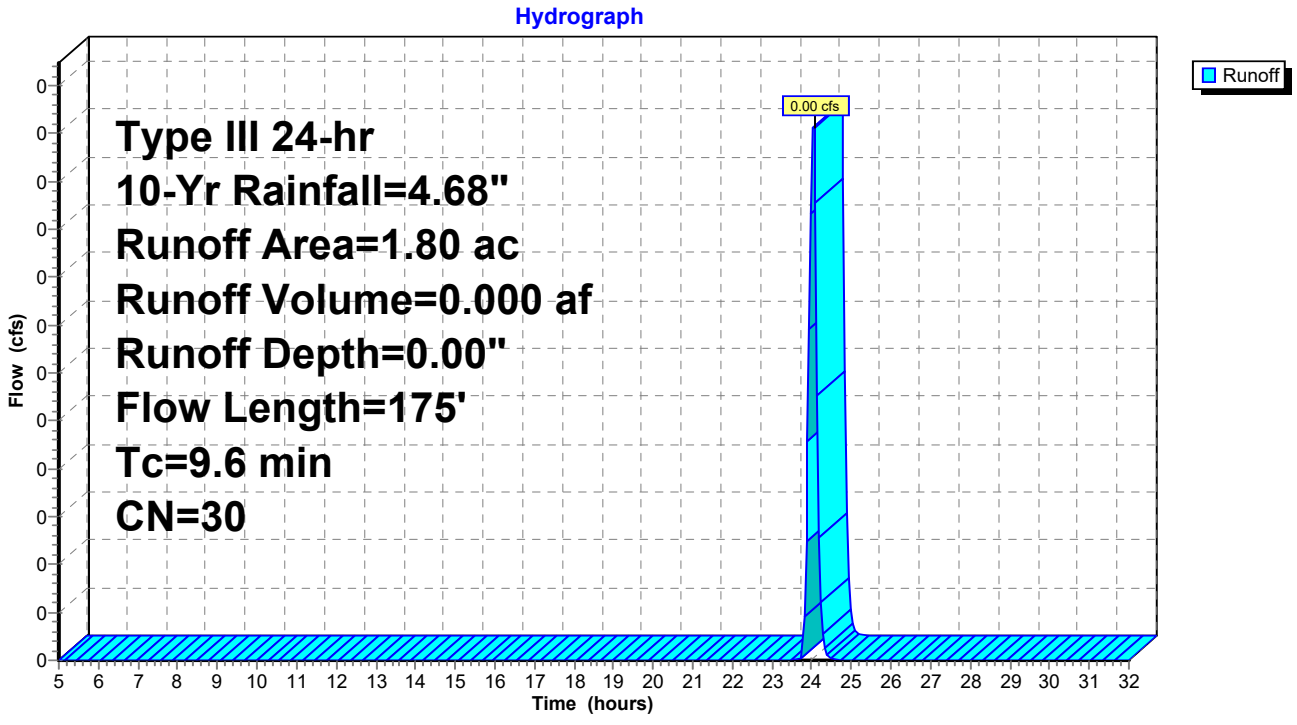
Runoff = 0.00 cfs @ 24.05 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-6 : Wetland Series 'B' & 'C'

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:

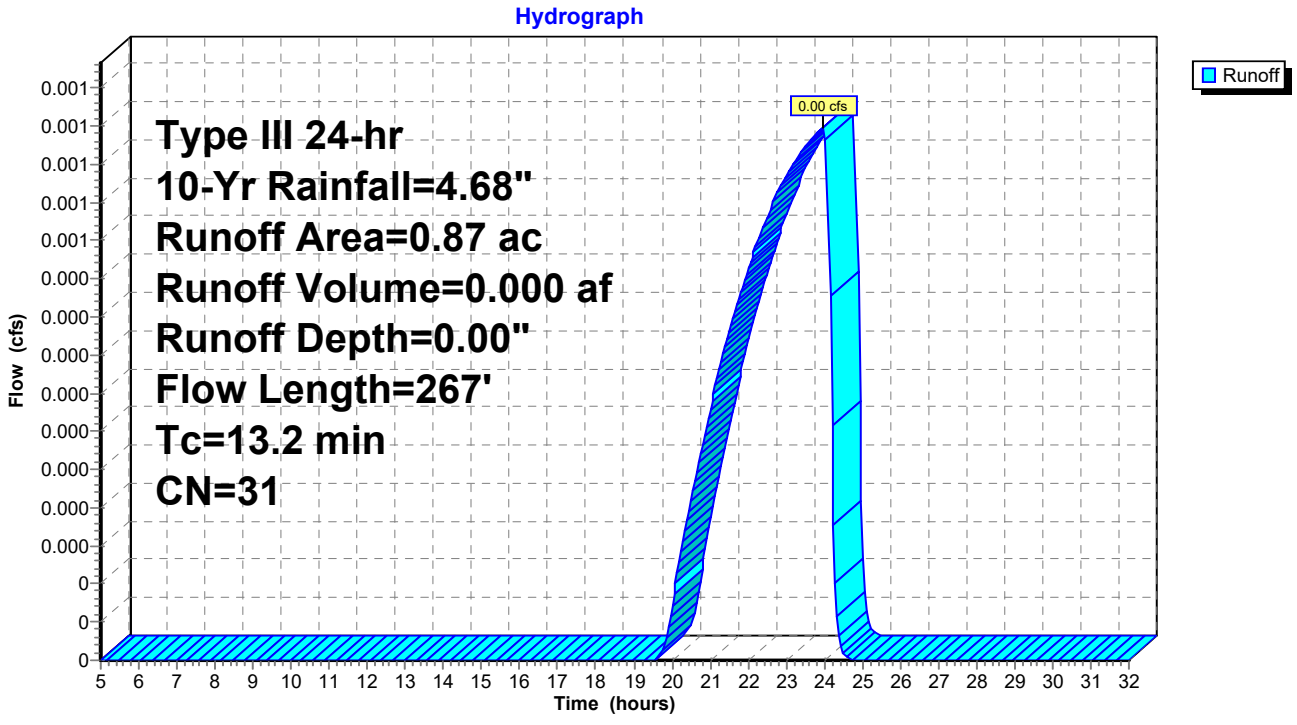
Runoff = 0.00 cfs @ 23.99 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-7 : #4 Poppy Ln

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:

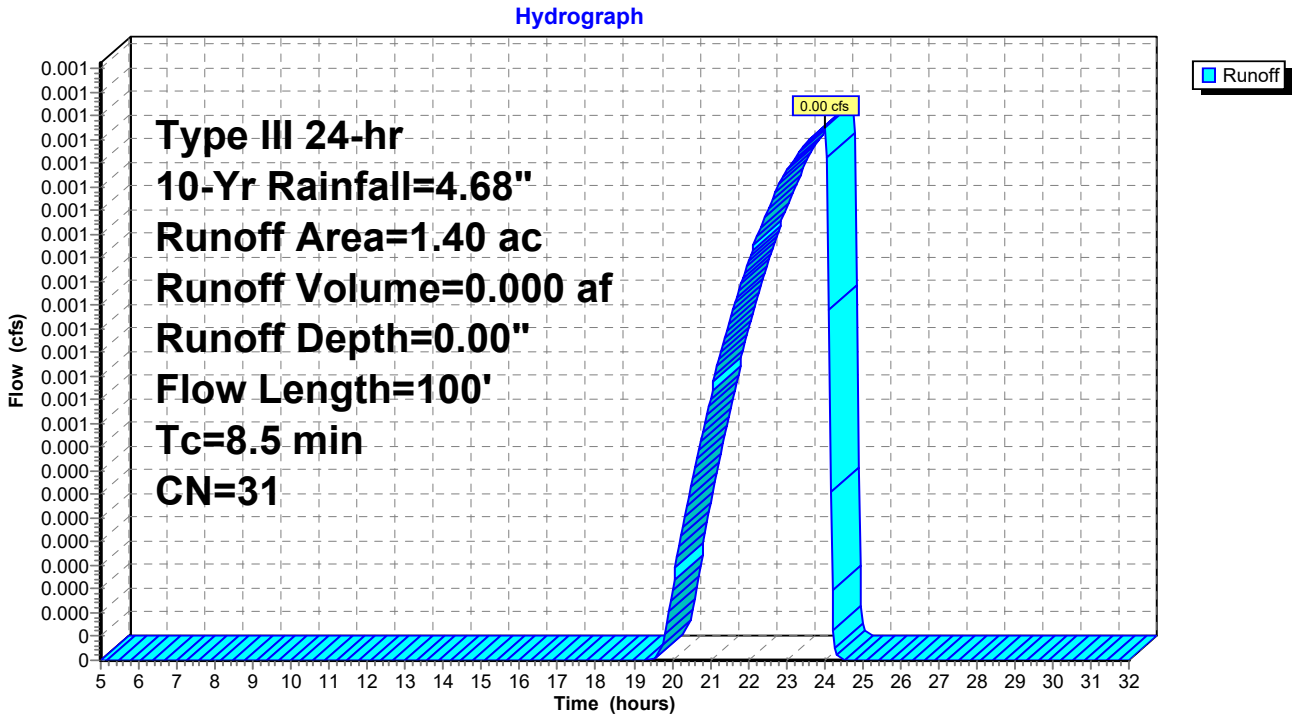
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach DP-8 : Wetland Series 'D' & 'E'

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:

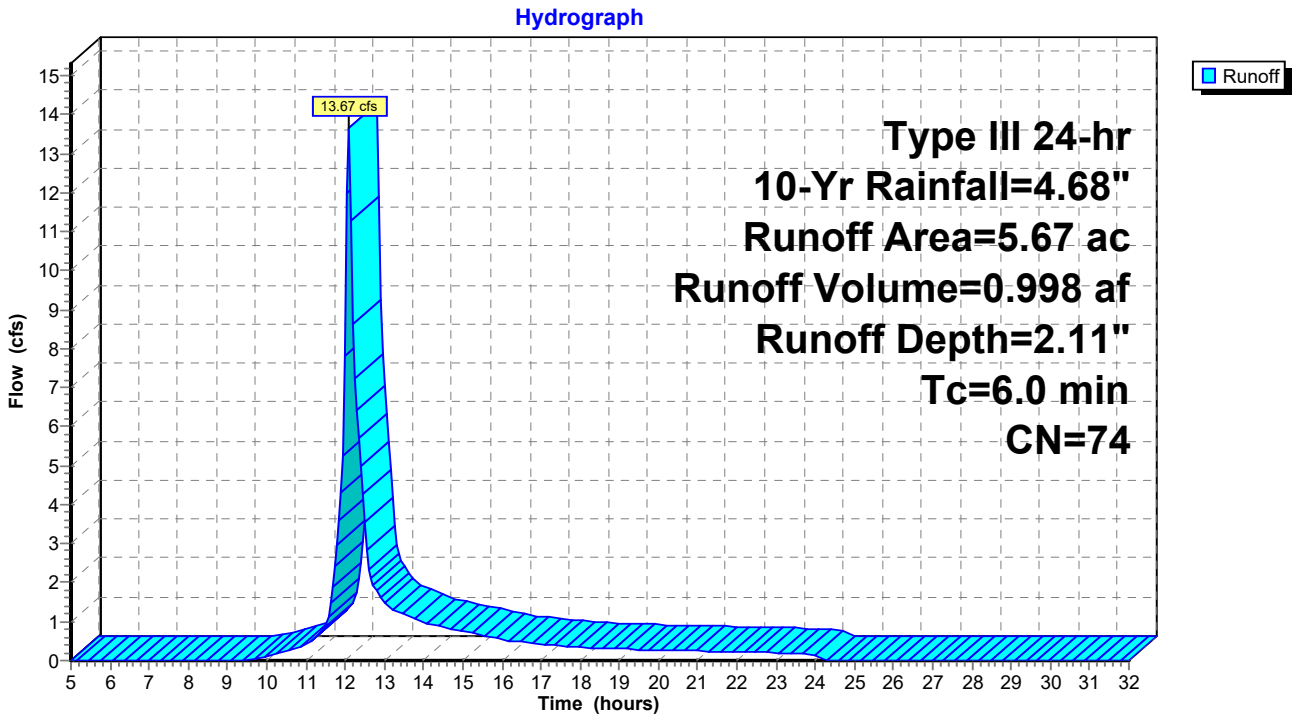
Runoff = 13.67 cfs @ 12.10 hrs, Volume= 0.998 af, Depth= 2.11"
Routed to Pond SUB-4 : Subsurface System-4

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'

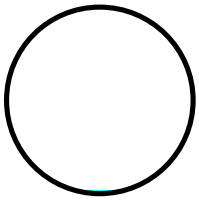
[52] Hint: Inlet/Outlet conditions not evaluated

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'

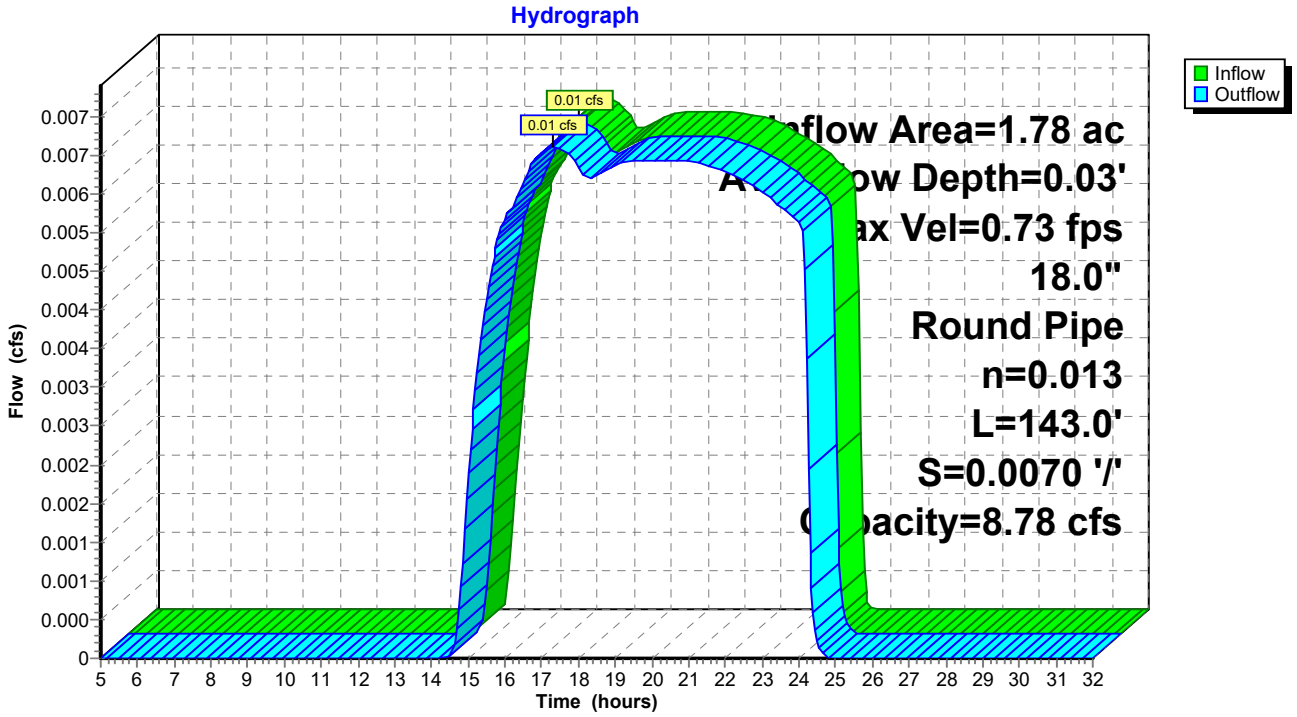
Routing by Stor-Ind+Trans method, Time Span= 5.00-32.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.73 fps, Min. Travel Time= 3.3 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 3.5 min

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'



Reach 3R: 'Wetland Series J'



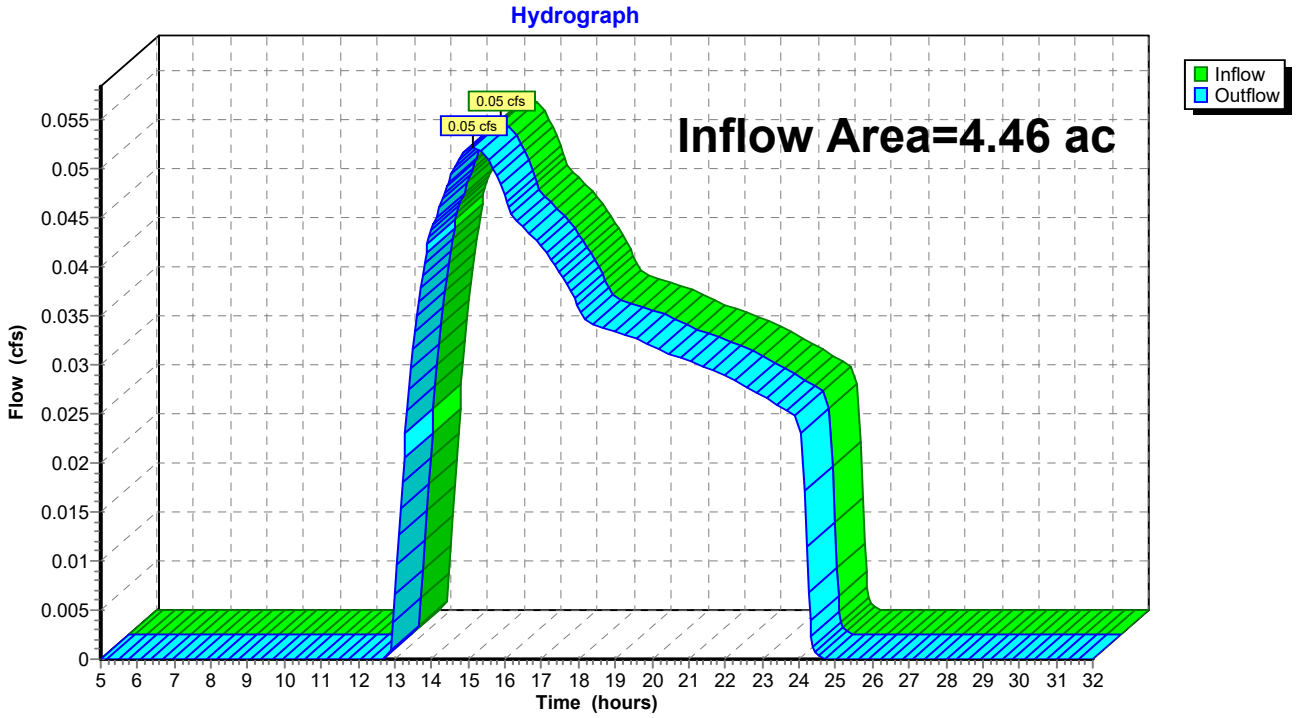
Summary for Reach DP-1: Northern Wetlands Culvert

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

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

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

Reach DP-1: Northern Wetlands Culvert



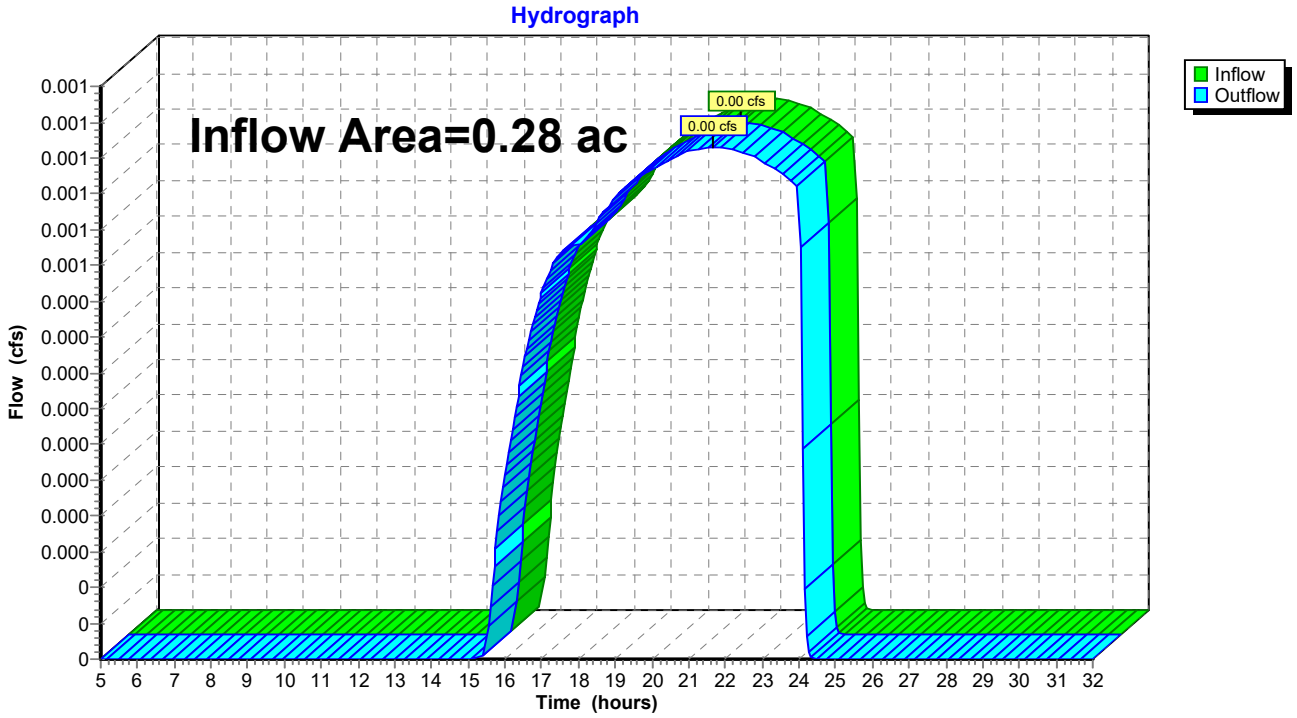
Summary for Reach DP-3: #48 Rinzee Rd

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

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

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

Reach DP-3: #48 Rinzee Rd



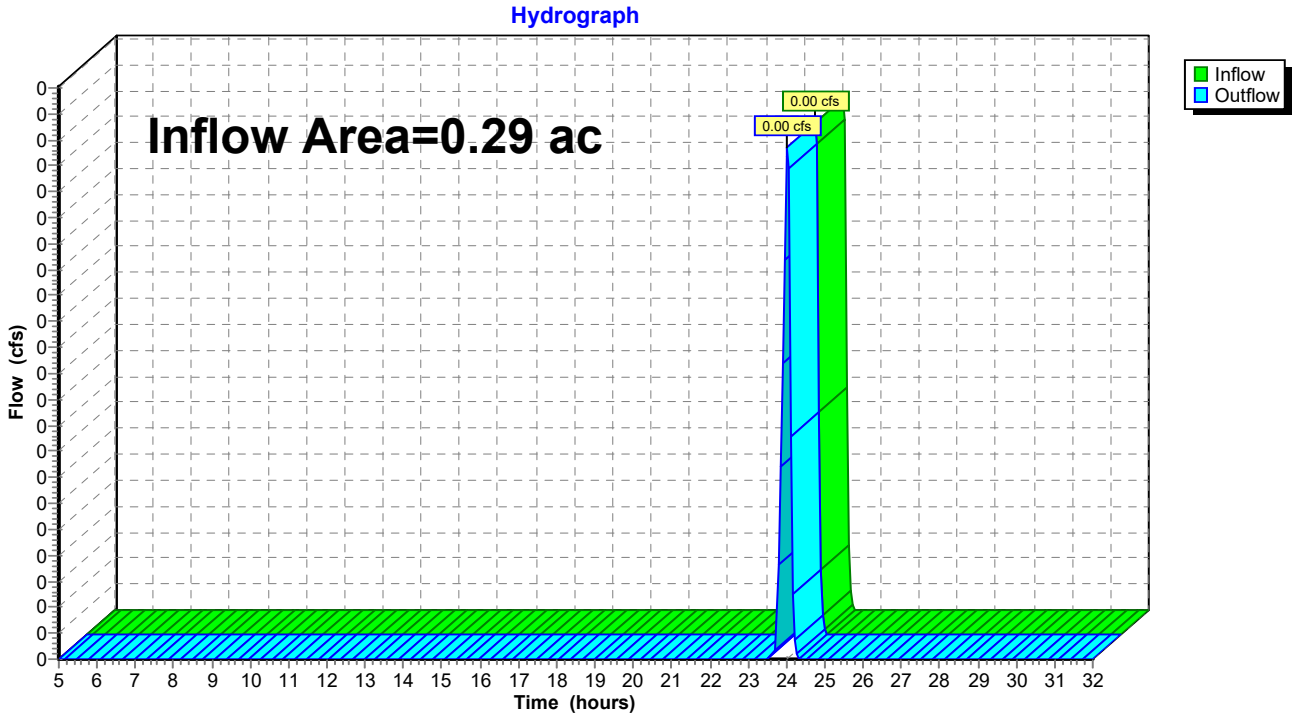
Summary for Reach DP-4: Poppy Ln

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

Inflow Area = 0.29 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

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

Reach DP-4: Poppy Ln



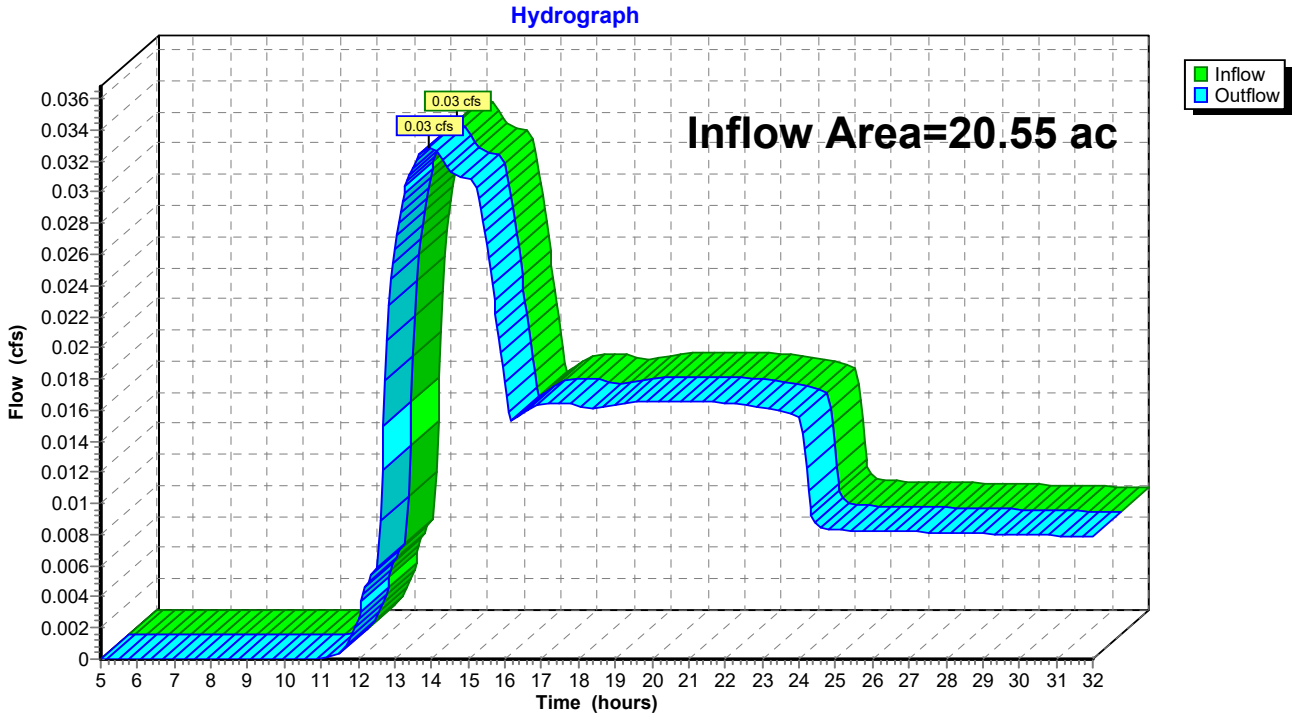
Summary for Reach DP-5: Wetland Series 'A'

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

Inflow Area = 20.55 ac, 39.42% Impervious, Inflow Depth > 0.01" for 10-Yr event
Inflow = 0.03 cfs @ 13.92 hrs, Volume= 0.025 af
Outflow = 0.03 cfs @ 13.92 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

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

Reach DP-5: Wetland Series 'A'



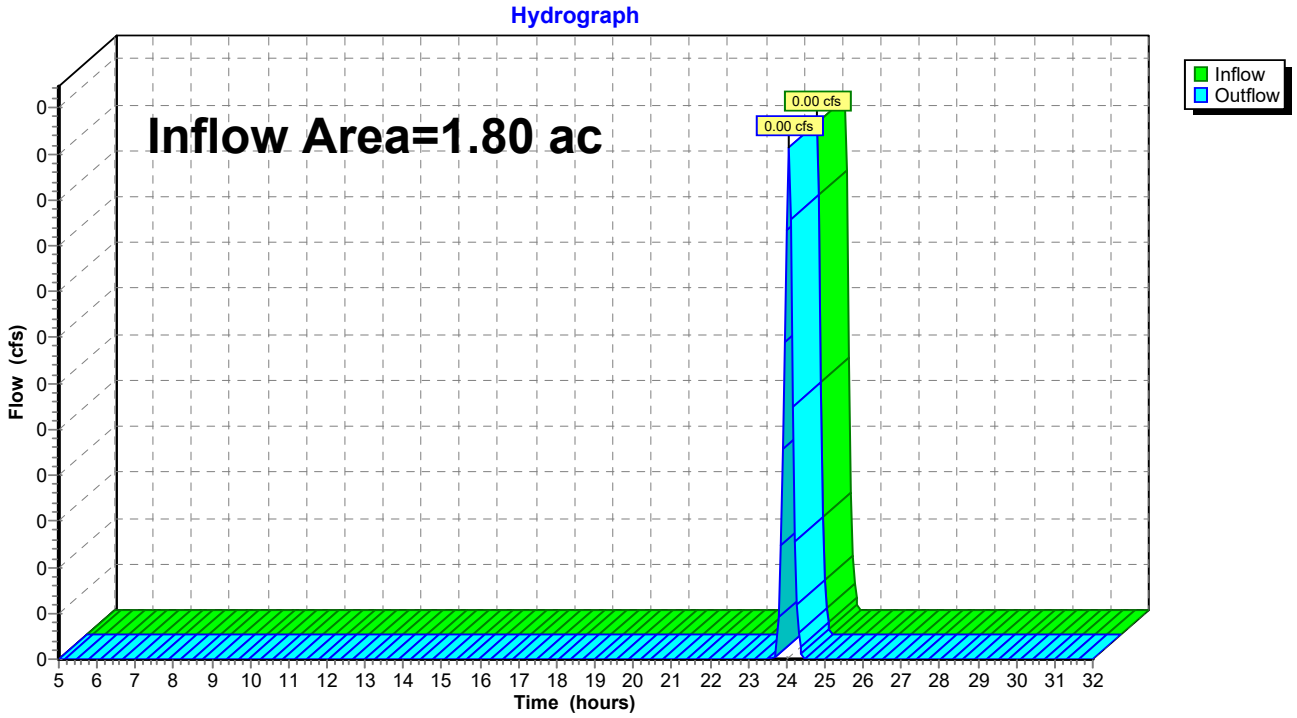
Summary for Reach DP-6: Wetland Series 'B' & 'C'

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

Inflow Area = 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

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

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



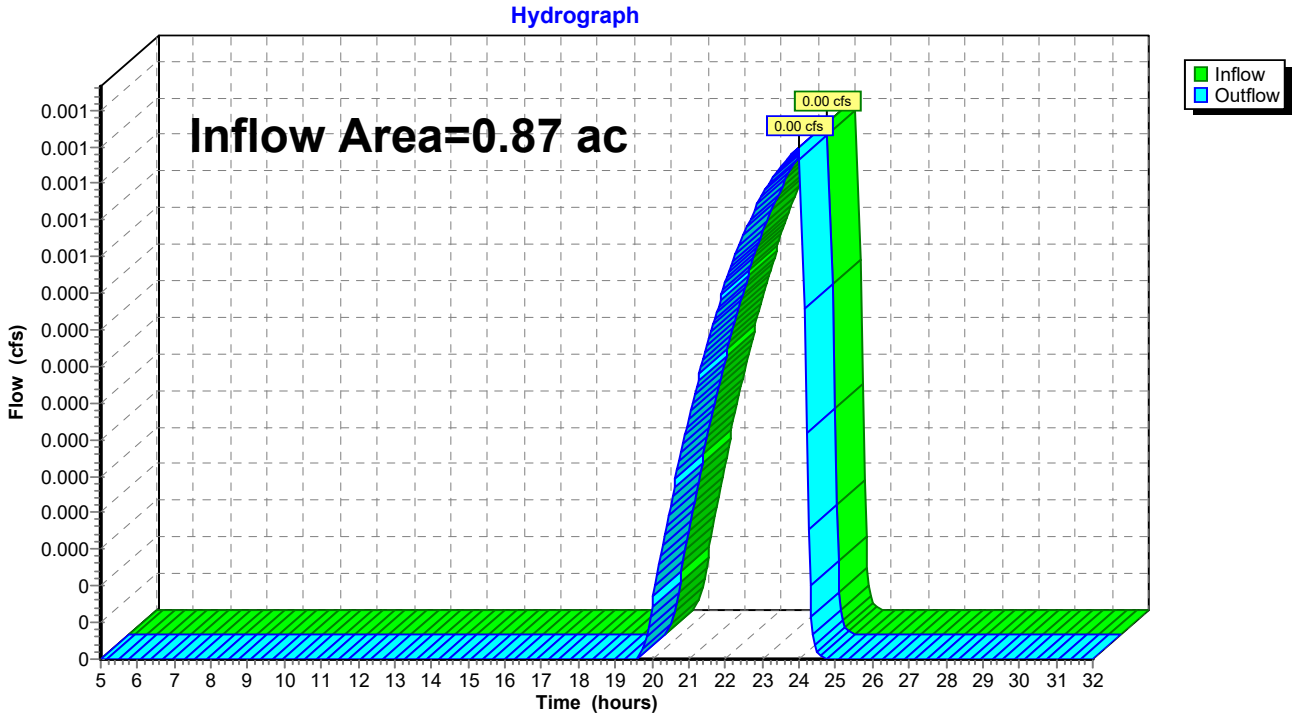
Summary for Reach DP-7: #4 Poppy Ln

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

Inflow Area = 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

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

Reach DP-7: #4 Poppy Ln



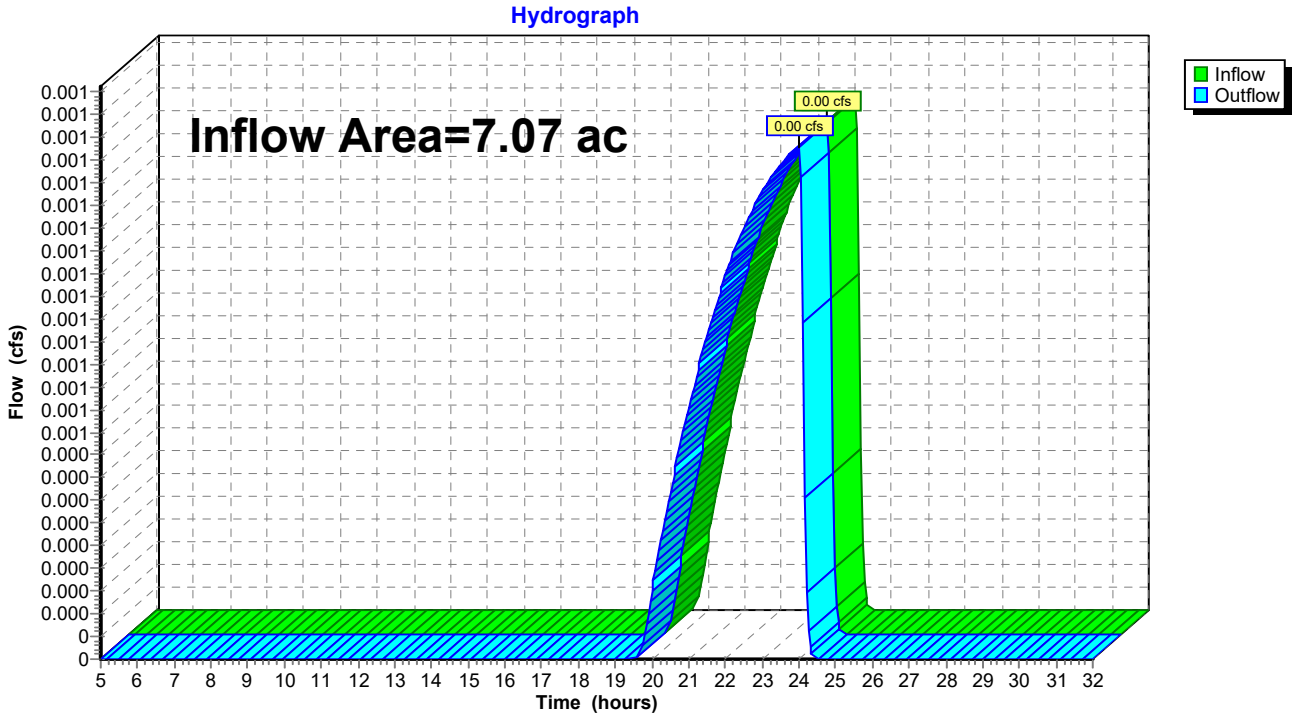
Summary for Reach DP-8: Wetland Series 'D' & 'E'

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

Inflow Area = 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

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 = 4.47 ac, 49.22% Impervious, Inflow Depth = 1.74" for 10-Yr event
Inflow = 8.12 cfs @ 12.11 hrs, Volume= 0.646 af
Outflow = 1.46 cfs @ 12.68 hrs, Volume= 0.646 af, Atten= 82%, Lag= 33.9 min
Discarded = 1.46 cfs @ 12.68 hrs, Volume= 0.646 af
Primary = 0.00 cfs @ 12.68 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= 140.02' @ 12.68 hrs Surf.Area= 10,213 sf Storage= 8,416 cf

Plug-Flow detention time= 46.1 min calculated for 0.645 af (100% of inflow)
Center-of-Mass det. time= 46.0 min (901.0 - 855.1)

Volume	Invert	Avail.Storage	Storage Description
#1	139.10'	51,539 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
139.10	8,040	0	0
140.00	10,170	8,195	8,195
141.00	12,134	11,152	19,347
142.00	16,475	14,305	33,651
143.00	19,300	17,888	51,539

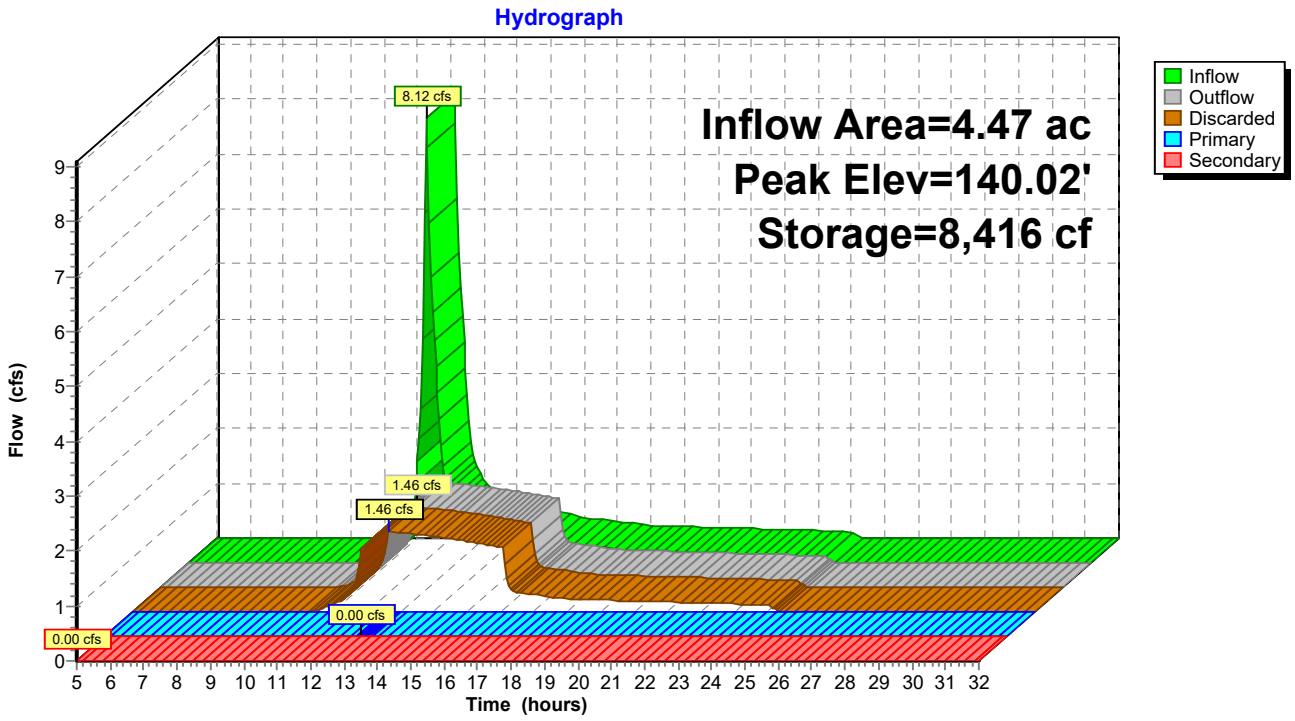
Device	Routing	Invert	Outlet Devices
#1	Discarded	139.10'	**6.170 in/hr Exfiltration over Surface area**
#2	Primary	139.10'	**12.0" Round Culvert** L= 100.9' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 139.10' / 138.60' S= 0.0050 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	140.00'	**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=1.46 cfs @ 12.68 hrs HW=140.02' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 1.46 cfs)

Primary OutFlow Max=0.00 cfs @ 12.68 hrs HW=140.02' (Free Discharge)
└**2=Culvert** (Passes 0.00 cfs of 1.88 cfs potential flow)
  └**3=Orifice/Grate** (Orifice Controls 0.00 cfs @ 0.50 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=139.10' (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 = 0.52 cfs @ 12.60 hrs, Volume= 0.138 af, Atten= 21%, Lag= 10.0 min
Discarded = 0.52 cfs @ 12.60 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= 145.08' @ 12.60 hrs Surf.Area= 2,284 sf Storage= 179 cf

Plug-Flow detention time= 2.6 min calculated for 0.138 af (100% of inflow)
Center-of-Mass det. time= 2.8 min (960.8 - 958.0)

Volume	Invert	Avail.Storage	Storage Description
#1	145.00'	16,478 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
145.00	2,180	0	0
146.00	3,482	2,831	2,831
148.00	6,694	10,176	13,007
148.50	7,189	3,471	16,478

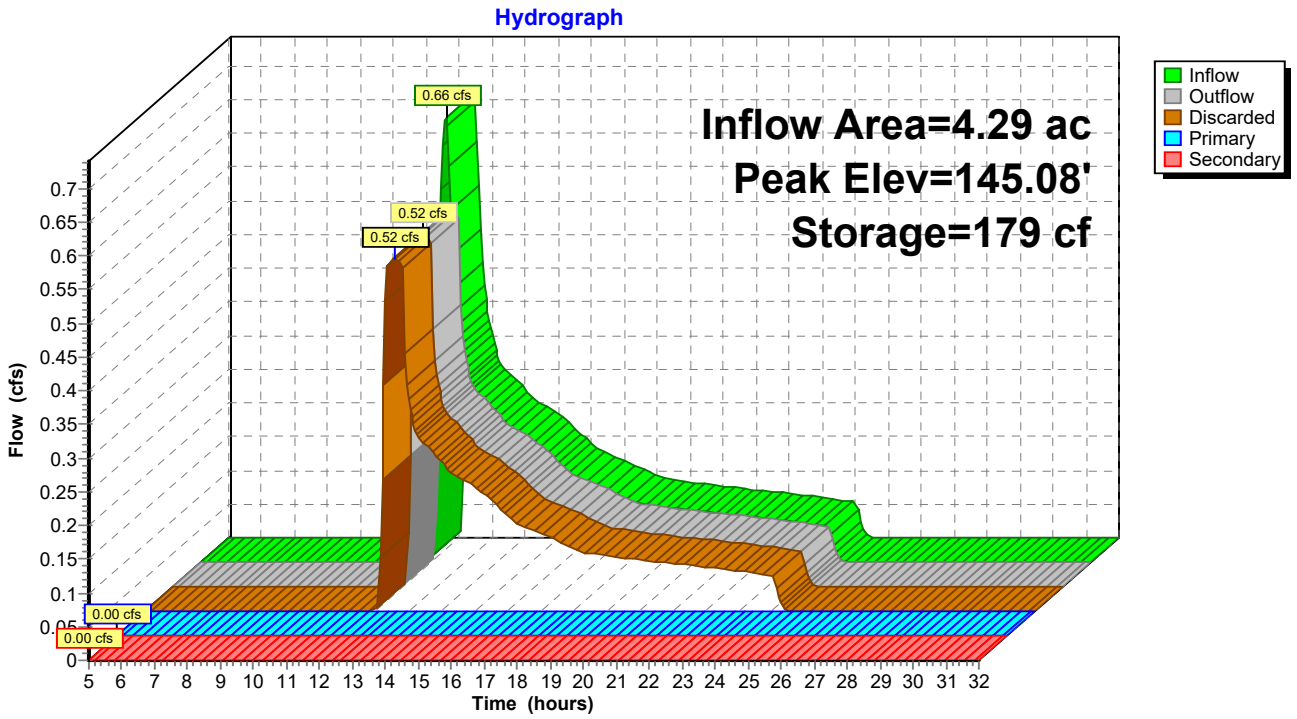
Device	Routing	Invert	Outlet Devices
#1	Discarded	145.00'	**9.900 in/hr Exfiltration over Surface area**
#2	Primary	145.00'	**15.0" Round Culvert** L= 69.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 145.00' / 144.40' S= 0.0087 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#3	Device 2	146.40'	**45.0 deg x 1.00' 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=0.52 cfs @ 12.60 hrs HW=145.08' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.52 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=145.08'
Storage=179 cf
0.66 cfs
0.52 cfs
0.52 cfs
0.00 cfs
0.00 cfs
Inflow
Outflow
Discarded
Primary
Secondary
Flow (cfs)
Time (hours)

Summary for Pond IB-3:

[79] Warning: Submerged Pond IB-2 Primary device # 2 INLET by 0.48'

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 = 0.54 cfs @ 12.53 hrs, Volume= 0.183 af, Atten= 79%, Lag= 26.1 min
Discarded = 0.54 cfs @ 12.53 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= 145.48' @ 12.53 hrs Surf.Area= 2,364 sf Storage= 2,344 cf

Plug-Flow detention time= 34.2 min calculated for 0.183 af (100% of inflow)
Center-of-Mass det. time= 34.1 min (858.8 - 824.7)

Volume	Invert	Avail.Storage	Storage Description
#1	144.10'	10,986 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
144.10	1,031	0	0
146.00	2,864	3,700	3,700
148.00	4,422	7,286	10,986

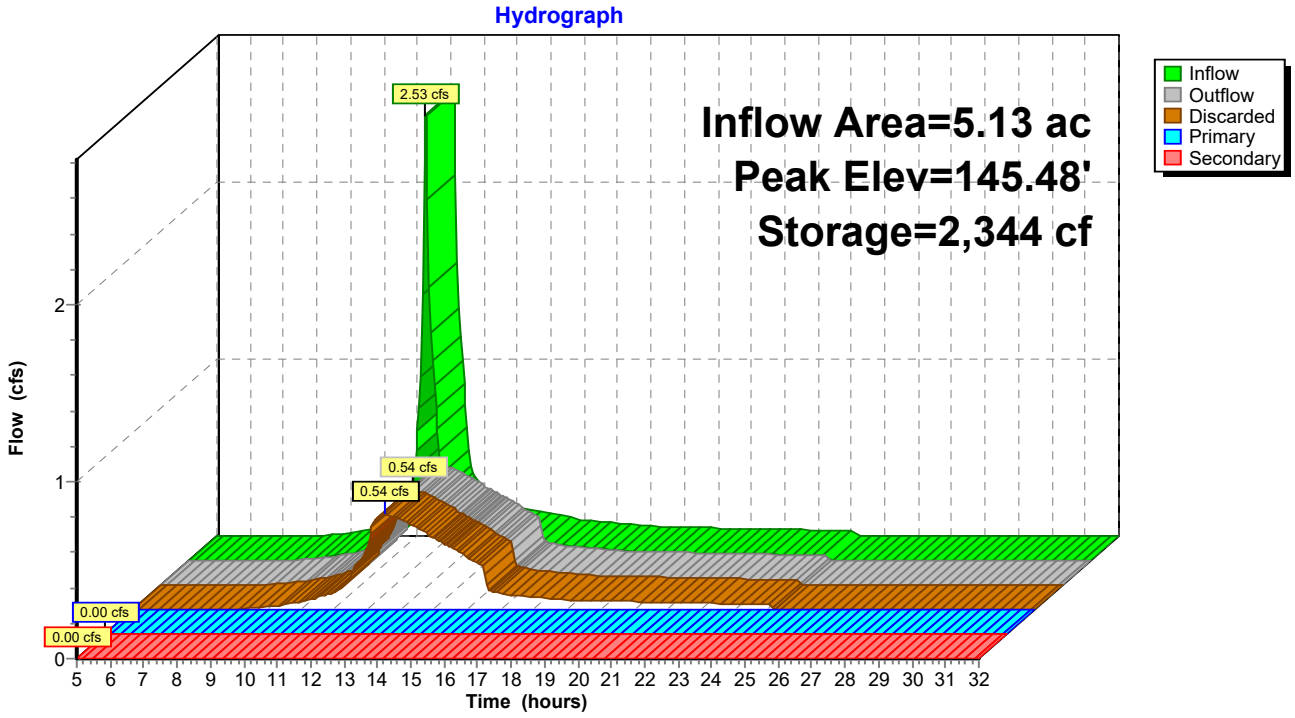
Device	Routing	Invert	Outlet Devices
#1	Discarded	144.10'	**9.900 in/hr Exfiltration over Surface area**
#2	Primary	144.00'	**12.0" Round Culvert** L= 49.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 144.00' / 143.00' S= 0.0204 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#3	Device 2	145.60'	**30.0 deg x 1.35' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)
#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=0.54 cfs @ 12.53 hrs HW=145.48' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.54 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=144.10' (Free Discharge)
└**2=Culvert** (Passes 0.00 cfs of 0.03 cfs potential flow)
  └**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=144.10' (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, 44.68% Impervious, Inflow Depth = 1.44" for 10-Yr event
Inflow = 0.73 cfs @ 12.10 hrs, Volume= 0.057 af
Outflow = 0.01 cfs @ 24.06 hrs, Volume= 0.013 af, Atten= 99%, Lag= 717.7 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= 132.64' @ 24.06 hrs Surf.Area= 1,300 sf Storage= 2,129 cf

Plug-Flow detention time= 619.4 min calculated for 0.013 af (23% of inflow)
Center-of-Mass det. time= 472.5 min (1,337.5 - 865.1)

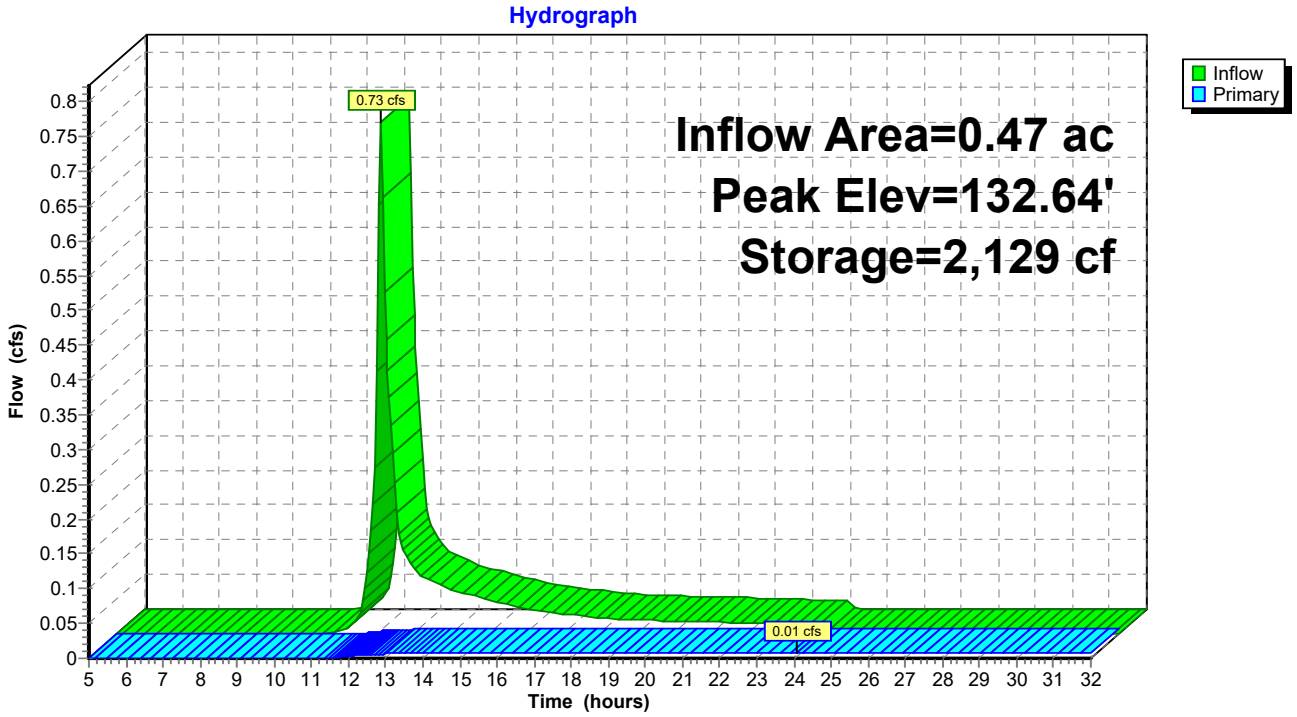
Volume	Invert	Avail.Storage	Storage Description
#1	131.00'	5,200 cf	**17 x 10 Chambers (Prismatic)** Listed below (Recalc) x 10

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
131.00	130	0	0
135.00	130	520	520

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=132.64' (Free Discharge)
↑**1=Culvert** (Passes 0.01 cfs of 3.40 cfs potential flow)
↑**2=Orifice/Grate** (Orifice Controls 0.01 cfs @ 6.12 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 = 6.64 ac, 49.40% Impervious, Inflow Depth = 1.71" for 10-Yr event
Inflow = 8.29 cfs @ 12.20 hrs, Volume= 0.945 af
Outflow = 4.17 cfs @ 12.05 hrs, Volume= 0.948 af, Atten= 50%, Lag= 0.0 min
Discarded = 4.17 cfs @ 12.05 hrs, Volume= 0.948 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 / 3
Peak Elev= 136.75' @ 12.60 hrs Surf.Area= 9,100 sf Storage= 4,994 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 5.5 min (866.7 - 861.1)

Volume	Invert	Avail.Storage	Storage Description
#1	136.20'	54,592 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc) x 70

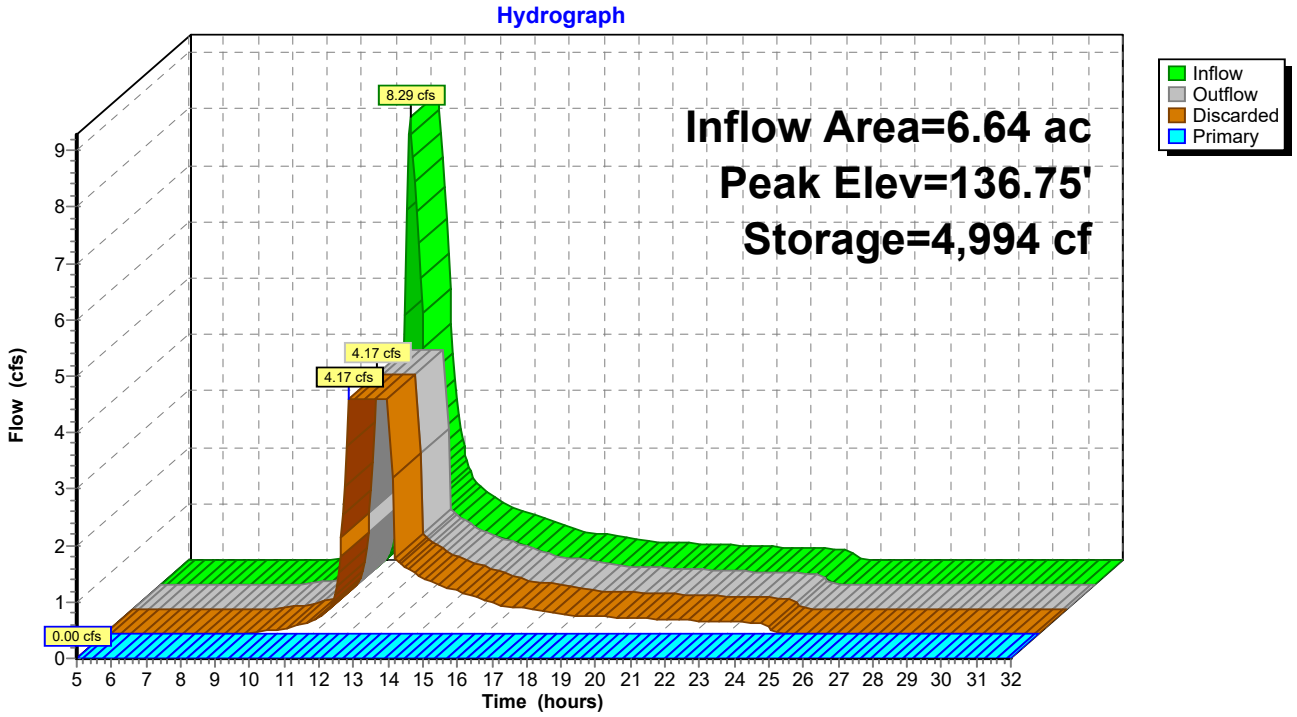
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
136.20	108	0	0
136.21	130	1	1
142.20	130	779	780

Device	Routing	Invert	Outlet Devices
#1	Discarded	136.20'	**19.800 in/hr Exfiltration over Surface area**
#2	Primary	136.20'	**15.0" Round Culvert** L= 105.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 136.20' / 135.67' S= 0.0050 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf
#3	Device 2	137.60'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	139.40'	**30.0 deg x 1.59' rise Sharp-Crested Vee/Trap Weir** Cv= 2.61 (C= 3.26)
#5	Device 2	140.99'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=4.17 cfs @ 12.05 hrs HW=136.21' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 4.17 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=136.20' (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 = 0.32 cfs @ 13.88 hrs, Volume= 0.343 af, Atten= 93%, Lag= 107.4 min
Discarded = 0.29 cfs @ 11.35 hrs, Volume= 0.337 af
Primary = 0.03 cfs @ 13.88 hrs, Volume= 0.005 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= 141.56' @ 13.88 hrs Surf.Area= 2,600 sf Storage= 6,646 cf

Plug-Flow detention time= 207.7 min calculated for 0.342 af (100% of inflow)
Center-of-Mass det. time= 207.4 min (1,029.3 - 821.9)

Volume	Invert	Avail.Storage	Storage Description
#1	139.00'	18,198 cf	**10x17 Concrete Subsurface (Prismatic)** Listed below (Recalc) x 20

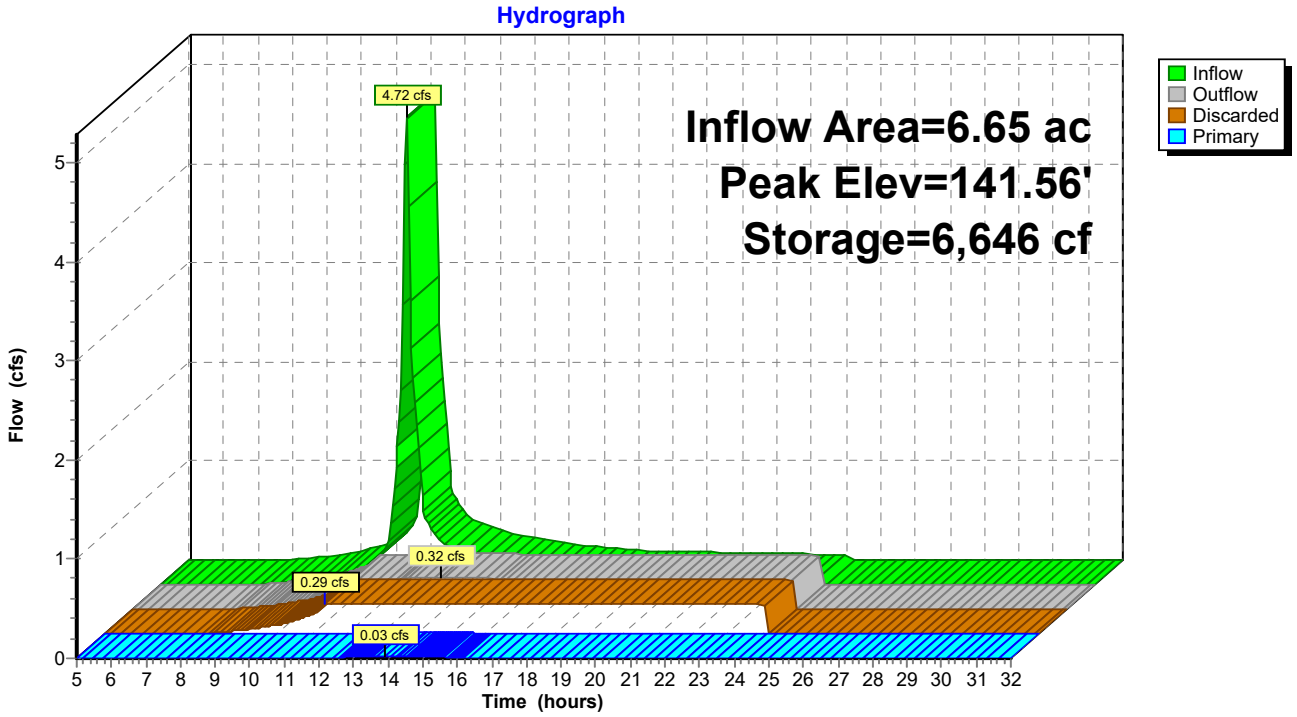
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
139.00	108	0	0
139.01	130	1	1
146.00	130	909	910

Device	Routing	Invert	Outlet Devices
#1	Discarded	139.00'	**4.890 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	141.30'	**1.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	144.60'	**45.0 deg x 1.30' rise Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)
#5	Device 2	145.90'	**5.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.29 cfs @ 11.35 hrs HW=139.01' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.29 cfs)

Primary OutFlow Max=0.03 cfs @ 13.88 hrs HW=141.56' (Free Discharge)
└**2=Culvert** (Passes 0.03 cfs of 6.87 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.03 cfs @ 2.12 fps)
  ├**4=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)
  └**5=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond SUB-3: Subsurface System-3



Summary for Pond SUB-4: Subsurface System-4

[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=3)

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 = 2.62 cfs @ 11.80 hrs, Volume= 0.998 af, Atten= 81%, Lag= 0.0 min
Discarded = 2.62 cfs @ 11.80 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= 134.97' @ 12.57 hrs Surf.Area= 5,720 sf Storage= 11,288 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 26.6 min (867.3 - 840.7)

Volume	Invert	Avail.Storage	Storage Description
#1	133.00'	45,755 cf	**10x17 Concrete Chambers (Prismatic)** Listed below (Recalc) x 44

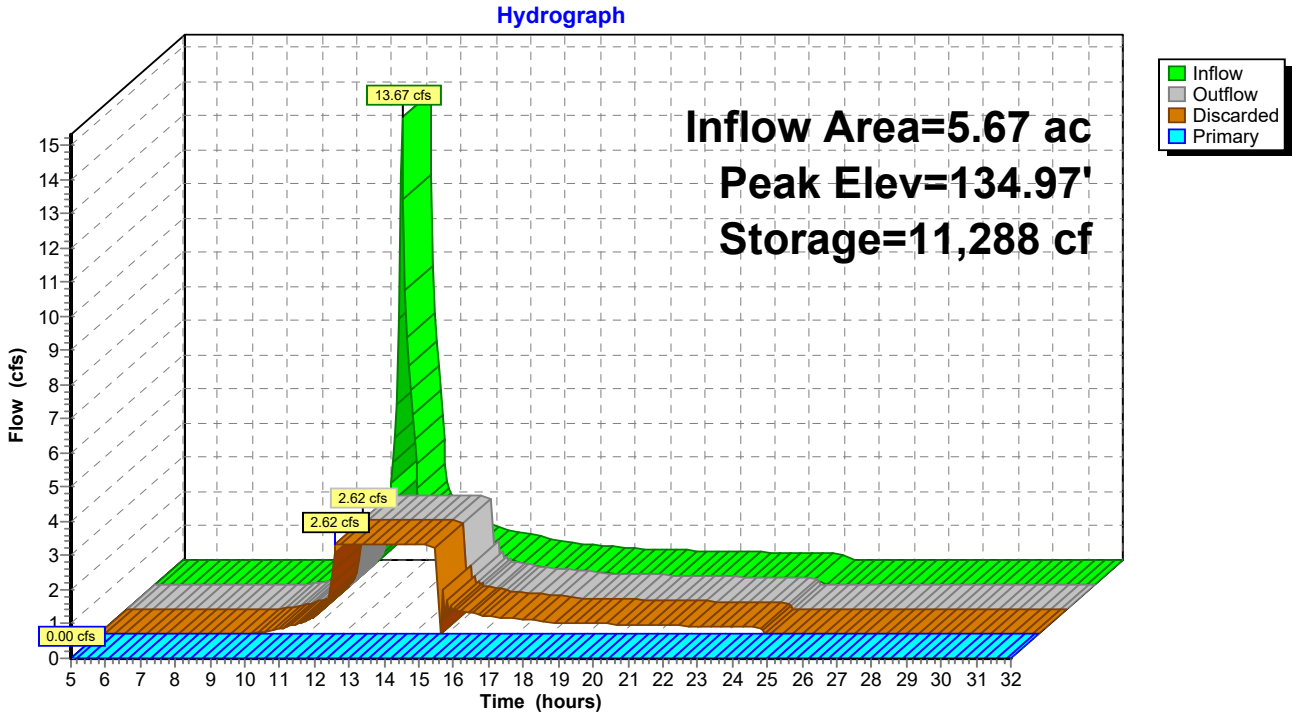
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
133.00	108	0	0
133.01	130	1	1
141.00	130	1,039	1,040

Device	Routing	Invert	Outlet Devices
#1	Discarded	133.00'	**19.800 in/hr Exfiltration over Surface area**
#2	Primary	133.00'	**12.0" Round Culvert** L= 23.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 133.00' / 132.88' S= 0.0052 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#3	Device 2	136.20'	**1.5" 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=2.62 cfs @ 11.80 hrs HW=133.02' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 2.62 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=0.29 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=0.54 ac 0.00% Impervious Runoff Depth=0.20"
Tc=6.0 min CN=34 Runoff=0.01 cfs 0.009 af

SubcatchmentPWA-5B: Runoff Area=2.43 ac 52.26% Impervious Runoff Depth=2.76"
Flow Length=705' Tc=8.7 min CN=70 Runoff=6.96 cfs 0.558 af

SubcatchmentPWA-5C: Runoff Area=2.74 ac 61.31% Impervious Runoff Depth=3.33"
Flow Length=400' Tc=11.2 min CN=76 Runoff=8.94 cfs 0.760 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 44.68% Impervious Runoff Depth=2.31"
Tc=6.0 min CN=65 Runoff=1.22 cfs 0.090 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=3.90 ac 41.03% Impervious Runoff Depth=2.13"
Flow Length=1,000' Tc=22.8 min CN=63 Runoff=5.96 cfs 0.694 af

SubcatchmentPWA-5J: Runoff Area=2.04 ac 45.59% Impervious Runoff Depth=2.57"
Tc=6.0 min CN=68 Runoff=5.98 cfs 0.438 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

Subcatchment PWA-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=0.17 cfs 0.104 af
Outflow=0.17 cfs 0.104 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 0.014 af
Outflow=0.04 cfs 0.014 af

Pond IB-1: Peak Elev=140.68' Storage=15,593 cf Inflow=12.81 cfs 0.996 af
Discarded=1.64 cfs 0.991 af Primary=0.02 cfs 0.005 af Secondary=0.00 cfs 0.000 af Outflow=1.66 cfs 0.996 af

Pond IB-2: Peak Elev=145.84' Storage=2,286 cf Inflow=2.14 cfs 0.301 af
Discarded=0.75 cfs 0.301 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.75 cfs 0.301 af

Pond IB-3: Peak Elev=145.99' Storage=3,659 cf Inflow=3.58 cfs 0.261 af
Discarded=0.65 cfs 0.258 af Primary=0.06 cfs 0.003 af Secondary=0.00 cfs 0.000 af Outflow=0.72 cfs 0.261 af

Pond SUB-1: Subsurface System-1 Peak Elev=133.69' Storage=3,499 cf Inflow=1.22 cfs 0.090 af
Outflow=0.01 cfs 0.017 af

Pond SUB-2: Subsurface System-2 Peak Elev=137.71' Storage=13,715 cf Inflow=13.04 cfs 1.454 af
Discarded=4.17 cfs 1.453 af Primary=0.01 cfs 0.000 af Outflow=4.18 cfs 1.453 af

Pond SUB-3: Subsurface System-3 Peak Elev=143.01' Storage=10,433 cf Inflow=6.64 cfs 0.488 af
Discarded=0.29 cfs 0.445 af Primary=0.08 cfs 0.044 af Outflow=0.37 cfs 0.488 af

Pond SUB-4: Subsurface System-4 Peak Elev=136.69' Storage=21,086 cf Inflow=20.43 cfs 1.481 af
Discarded=2.62 cfs 1.479 af Primary=0.04 cfs 0.003 af Outflow=2.66 cfs 1.482 af

Total Runoff Area = 35.32 ac Runoff Volume = 5.261 af Average Runoff Depth = 1.79"
67.44% Pervious = 23.82 ac 32.56% Impervious = 11.50 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=0.29 ac 0.00% Impervious Runoff Depth=0.55"
Tc=6.0 min CN=30 Runoff=0.06 cfs 0.013 af

SubcatchmentPWA-5A: Runoff Area=0.54 ac 0.00% Impervious Runoff Depth=0.90"
Tc=6.0 min CN=34 Runoff=0.26 cfs 0.041 af

SubcatchmentPWA-5B: Runoff Area=2.43 ac 52.26% Impervious Runoff Depth=4.94"
Flow Length=705' Tc=8.7 min CN=70 Runoff=12.64 cfs 1.000 af

SubcatchmentPWA-5C: Runoff Area=2.74 ac 61.31% Impervious Runoff Depth=5.66"
Flow Length=400' Tc=11.2 min CN=76 Runoff=15.10 cfs 1.293 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 44.68% Impervious Runoff Depth=4.34"
Tc=6.0 min CN=65 Runoff=2.34 cfs 0.170 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=3.90 ac 41.03% Impervious Runoff Depth=4.11"
Flow Length=1,000' Tc=22.8 min CN=63 Runoff=11.88 cfs 1.334 af

SubcatchmentPWA-5J: Runoff Area=2.04 ac 45.59% Impervious Runoff Depth=4.70"
Tc=6.0 min CN=68 Runoff=11.02 cfs 0.799 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

Subcatchment PWA-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 0.013 af
Outflow=0.06 cfs 0.013 af

Reach DP-5: Wetland Series 'A' Inflow=3.22 cfs 0.668 af
Outflow=3.22 cfs 0.668 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=0.86 cfs 0.183 af
Outflow=0.86 cfs 0.183 af

Pond IB-1: Peak Elev=141.94' Storage=32,747 cf Inflow=23.37 cfs 1.800 af
Discarded=2.32 cfs 1.777 af Primary=0.14 cfs 0.023 af Secondary=0.00 cfs 0.000 af Outflow=2.45 cfs 1.800 af

Pond IB-2: Peak Elev=147.39' Storage=9,217 cf Inflow=7.48 cfs 0.766 af
Discarded=1.31 cfs 0.672 af Primary=1.03 cfs 0.095 af Secondary=0.00 cfs 0.000 af Outflow=2.34 cfs 0.766 af

Pond IB-3: Peak Elev=146.78' Storage=6,159 cf Inflow=5.80 cfs 0.525 af
Discarded=0.79 cfs 0.405 af Primary=1.05 cfs 0.120 af Secondary=0.00 cfs 0.000 af Outflow=1.85 cfs 0.524 af

Pond SUB-1: Subsurface System-1 Peak Elev=134.17' Storage=4,115 cf Inflow=2.34 cfs 0.170 af
Outflow=0.29 cfs 0.085 af

Pond SUB-2: Subsurface System-2 Peak Elev=140.29' Storage=37,236 cf Inflow=23.78 cfs 2.627 af
Discarded=4.17 cfs 2.560 af Primary=0.62 cfs 0.062 af Outflow=4.79 cfs 2.622 af

Pond SUB-3: Subsurface System-3 Peak Elev=145.81' Storage=17,702 cf Inflow=10.75 cfs 0.913 af
Discarded=0.29 cfs 0.580 af Primary=1.83 cfs 0.323 af Outflow=2.13 cfs 0.903 af

Pond SUB-4: Subsurface System-4 Peak Elev=140.78' Storage=44,483 cf Inflow=35.12 cfs 2.561 af
Discarded=2.62 cfs 2.452 af Primary=0.71 cfs 0.109 af Outflow=3.33 cfs 2.561 af

Total Runoff Area = 35.32 ac Runoff Volume = 10.002 af Average Runoff Depth = 3.40"
67.44% Pervious = 23.82 ac 32.56% Impervious = 11.50 ac

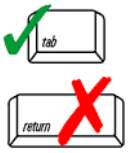
TAB 5

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.

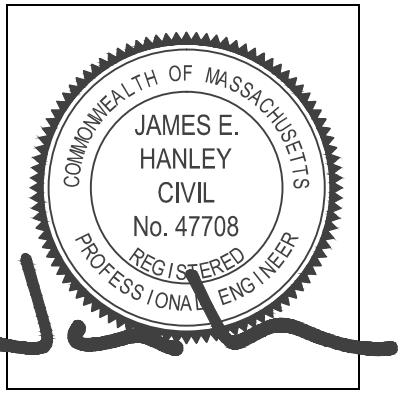
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



May 9, 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: May 5, 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	0.66	2.02	No	1	8.2	3.0	11.2	0.5	0.02
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	0.01	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	3.31
Post Development Conditions:	0.00	0.03	0.17	3.22

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	0.86

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:	2.16	0.04	0.00	0.00	2.20	
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	4,704	51	0	0	4,755	CF
Volume Below Lowest Outlet:					8,195	CF
Elevation of Lowest Invert:					140.00	
Determine Drawdown Time						
Saturated Hydraulic Conductivity (Rawls Rate):					6.17	IN/HR
Bottom Area of Infiltration Basin:					8,040	SF
Drawdown Time:					2.0	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:					4,352	CF
Elevation of Lowest Invert:					146.40	
Determine Drawdown Time						
Saturated Hydraulic Conductivity (Rawls Rate):					9.9	IN/HR
Bottom Area of Infiltration Basin:					2,180	SF
Drawdown Time:					2.4	HRS

Infiltration Basin 3

Hydrologic Soils Group:	A	B	C	D		
Total Proposed Impervious Area:	0.59	0.00	0.00	0.00	0.59	
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	1,285	0	0	0	1,285	CF
Volume Below Lowest Outlet:					2,632	CF
Elevation of Lowest Invert:					145.60	
Determine Drawdown Time						
Saturated Hydraulic Conductivity (Rawls Rate):					9.9	IN/HR
Bottom Area of Infiltration Basin:					1,031	SF
Drawdown Time:					3.1	HRS

Subsurface System 2

Hydrologic Soils Group:	A	B	C	D		
Total Proposed Impervious Area:	3.19	0.09	0.00	0.00	3.28	
Target Factor:	0.60	0.35	0.25	0.10		
Required Recharge Volume:	6,948	114	0	0	7,062	CF
Volume Below Lowest Outlet:					12,732	CF
Elevation of Lowest Invert:					137.60	
Determine Drawdown Time						
Saturated Hydraulic Conductivity (Rawls Rate):					19.8	IN/HR
Bottom Area of Infiltration Basin:					7,560	SF
Drawdown Time:					1.0	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:					5,978	CF
Elevation of Lowest Invert:					141.30	
Determine Drawdown Time						
Saturated Hydraulic Conductivity (Rawls Rate):					4.89	IN/HR
Bottom Area of Infiltration Basin:					2,160	SF
Drawdown Time:					6.8	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:	18,299	CF
Elevation of Lowest Invert:	136.20	

Determine Drawdown Time

Saturated Hydraulic Conductivity (Rawls Rate):	19.8	IN/HR
Bottom Area of Infiltration Basin:	5,720	SF
Drawdown Time:	1.9	HRS

Capture Area Adjustment

Increase in Site Impervious:	11.50	Ac.
Impervious Draining to Basins:	11.29	Ac.
Adjusted Recharge Volume:	12,037	CF
Recharge Volume Provided:	49,556	CF
Percentage of Impervious Draining to Basins	98%	

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:	2.20	Acres
Required Water Quality Volume:	7,986	CF
Provided Water Quality Volume:	8,195	CF

Infiltration Basin 2

Water Quality Depth:	1.0	IN
Total Proposed Impervious Area:	0.73	Acres
Required Water Quality Volume:	2,650	CF
Provided Water Quality Volume:	4,352	CF

Infiltration Basin 3

Water Quality Depth:	1.0	IN
Total Proposed Impervious Area:	0.59	Acres
Required Water Quality Volume:	2,142	CF
Provided Water Quality Volume:	2,632	CF

Subsurface System 1

See Stormtech Cutsheet for WQV & TSS

Subsurface System 2

Water Quality Depth:	1.0	IN
Total Proposed Impervious Area:	3.28	Acres
Required Water Quality Volume:	11,906	CF
Provided Water Quality Volume:	12,732	CF

Subsurface System 3

Water Quality Depth:	1.0	IN
Total Proposed Impervious Area:	1.09	Acres
Required Water Quality Volume:	3,957	CF
Provided Water Quality Volume:	5,978	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:	18,299	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%**

44% Pretreatment for Infiltration Basins 1 (PWA-5B):

	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Sediment Forebay	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%**

Extended Detention Basin 1

Water Quality Depth: 1.0 IN

Total Proposed Impervious Area: 0.21 Acres
Water Quality Volume: 762 CF

Calculate maximum orifice size:

h=	0.60	FT	Qavg=WQV/24 hours
Qavg=	0.0088	CFS	Q=2*Qavg
Qmax=	0.0176	CFS	Q=CA(2gh)^1/2
A=	0.00473	SF	A=Q/C(2gh)^.5
D=	0.93	IN maximum	
Dprovided=	0.5	IN	

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

outside 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: May 5, 2025

FOREBAY SIZING CALCULATIONS

Infiltration Basin 1 - Forebay PWA-5J

Watershed Characteristics

Impervious Area (Ai):	0.93	Acres
Required (0.1-IN x Ai):	338	CF
Sediment Forebay Volume:	509	CF
	OK	

Stage / Storage Tables

Sediment Forebay: Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
139.1	97	0	0
140.0	249	155.7	155.7
141.0	458	353.5	509.2

Infiltration Basin 1 - Forebay PWA-5B (First Forebay)

Watershed Characteristics

Impervious Area (Ai):	1.27	Acres
Required (0.1-IN x Ai):	461	CF
Sediment Forebay Volume:	737	CF
	OK	

Stage / Storage Tables

Sediment Forebay: Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
142.0	547	0	0
143.0	926	736.5	736.5

Infiltration Basin 1 - Forebay PWA-5B (Second Forebay)

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 (PWA-5I)

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 2 - Isolator Row (PWA-5C)

Watershed Characteristics

Impervious Area (Ai):	1.68	Acres
Required (0.1-IN x Ai):	610	CF
Sediment Forebay Volume:	720	CF
	OK	

Stage / Storage Tables

Isolator Row	Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
	136.6	360	0	0
	138.6	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)
	133.4	480	0	0
	136.4	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):	0.59	Acres
Required (0.1-IN x Ai):	214	CF
Sediment Forebay Volume:	693	CF
	OK	

Stage / Storage Tables

Sediment Forebay:	Elevation	Surface Area (SF)	Incremental Storage (CF)	Total Storage (CF)
	145.0	281	0	0
	146.0	1105	693	693

Stage-Area-Storage for Pond IR-2A: Isolator row for Sub-2 (PWA-5l)

Elevation (feet)	Storage (cubic-feet)
143.00	0
143.05	18
143.10	36
143.15	54
143.20	72
143.25	90
143.30	108
143.35	126
143.40	144
143.45	162
143.50	180
143.55	198
143.60	216
143.65	234
143.70	252
143.75	270
143.80	288
143.85	306
143.90	324
143.95	342
144.00	360
144.05	378
144.10	396
144.15	414
144.20	432
144.25	450
144.30	468
144.35	486
144.40	504
144.45	522
144.50	540
144.55	558
144.60	576
144.65	594
144.70	612
144.75	630
144.80	648
144.85	666
144.90	684
144.95	702
145.00	720
145.05	738
145.10	756
145.15	774
145.20	792
145.25	810
145.30	828
145.35	846
145.40	864
145.45	882
145.50	900
145.55	918
145.60	936
145.65	954
145.70	972
145.75	990
145.80	1,008
145.85	1,026
145.90	1,044
145.95	1,062
146.00	1,080
146.05	1,098
146.10	1,116
146.15	1,134
146.20	1,152
146.25	1,170
146.30	1,188
146.35	1,206
146.40	1,224
146.45	1,242
146.50	1,260
146.55	1,278
146.60	1,296
146.65	1,314
146.70	1,332
146.75	1,350
146.80	1,368
146.85	1,386
146.90	1,404
146.95	1,422
147.00	**1,440**

Stage-Area-Storage for Pond IR-2B: Isolator row for Sub-2 (PWA-5C)

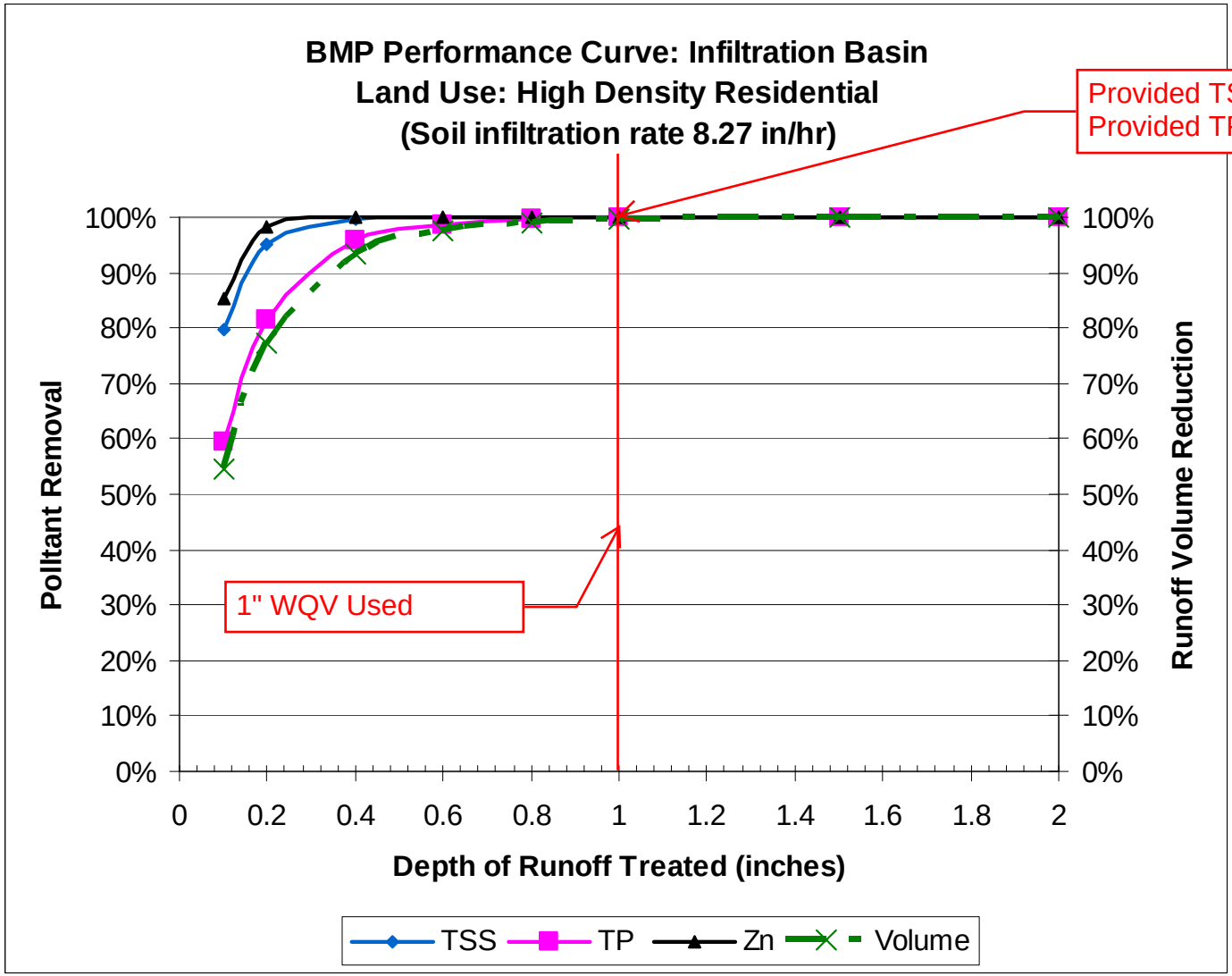
Elevation (feet)	Storage (cubic-feet)
136.60	0
136.65	18
136.70	36
136.75	54
136.80	72
136.85	90
136.90	108
136.95	126
137.00	144
137.05	162
137.10	180
137.15	198
137.20	216
137.25	234
137.30	252
137.35	270
137.40	288
137.45	306
137.50	324
137.55	342
137.60	360
137.65	378
137.70	396
137.75	414
137.80	432
137.85	450
137.90	468
137.95	486
138.00	504
138.05	522
138.10	540
138.15	558
138.20	576
138.25	594
138.30	612
138.35	630
138.40	648
138.45	666
138.50	684
138.55	702
138.60	720
138.65	738
138.70	756
138.75	774
138.80	792
138.85	810
138.90	828
138.95	846
139.00	864
139.05	882
139.10	900
139.15	918
139.20	936
139.25	954
139.30	972
139.35	990
139.40	1,008
139.45	1,026
139.50	1,044
139.55	1,062
139.60	1,080
139.65	1,098
139.70	1,116
139.75	1,134
139.80	1,152
139.85	1,170
139.90	1,188
139.95	1,206
140.00	1,224
140.05	1,242
140.10	1,260
140.15	1,278
140.20	1,296
140.25	1,314
140.30	1,332
140.35	1,350
140.40	1,368
140.45	1,386
140.50	1,404
140.55	1,422
140.60	**1,440**

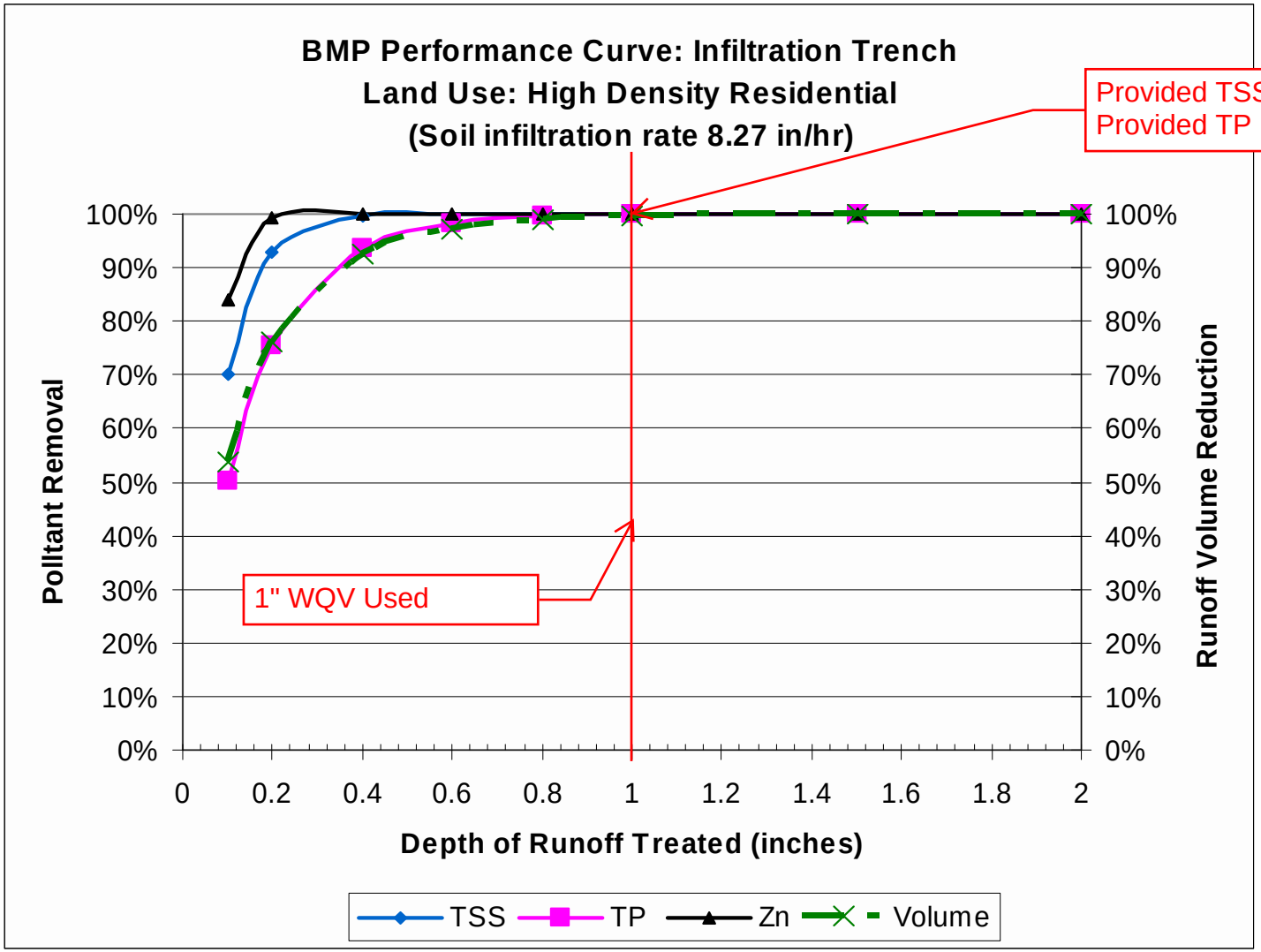
Stage-Area-Storage for Pond IR-3: Isolator row for Sub-3

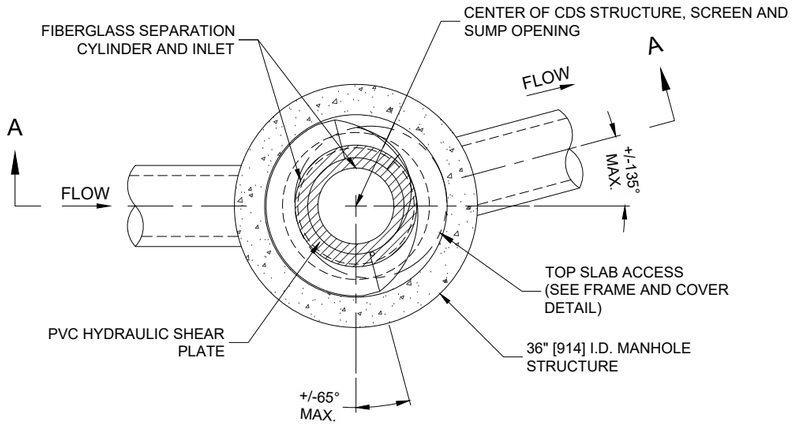
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
139.00	0	141.60	624	144.20	1,248
139.05	12	141.65	636	144.25	1,260
139.10	24	141.70	648	144.30	1,272
139.15	36	141.75	660	144.35	1,284
139.20	48	141.80	672	144.40	1,296
139.25	60	141.85	684	144.45	1,308
139.30	72	141.90	696	144.50	1,320
139.35	84	141.95	708	144.55	1,332
139.40	96	142.00	720	144.60	1,344
139.45	108	142.05	732	144.65	1,356
139.50	120	142.10	744	144.70	1,368
139.55	132	142.15	756	144.75	1,380
139.60	144	142.20	768	144.80	1,392
139.65	156	142.25	780	144.85	1,404
139.70	168	142.30	792	144.90	1,416
139.75	180	142.35	804	144.95	1,428
139.80	192	142.40	816	145.00	1,440
139.85	204	142.45	828	145.05	1,452
139.90	216	142.50	840	145.10	1,464
139.95	228	142.55	852	145.15	1,476
140.00	240	142.60	864	145.20	1,488
140.05	252	142.65	876	145.25	1,500
140.10	264	142.70	888	145.30	1,512
140.15	276	142.75	900	145.35	1,524
140.20	288	142.80	912	145.40	1,536
140.25	300	142.85	924	145.45	1,548
140.30	312	142.90	936	145.50	1,560
140.35	324	142.95	948	145.55	1,572
140.40	336	143.00	960	145.60	1,584
140.45	348	143.05	972	145.65	1,596
140.50	360	143.10	984	145.70	1,608
140.55	372	143.15	996	145.75	1,620
140.60	384	143.20	1,008	145.80	1,632
140.65	396	143.25	1,020	145.85	1,644
140.70	408	143.30	1,032	145.90	1,656
140.75	420	143.35	1,044	145.95	1,668
140.80	432	143.40	1,056	146.00	**1,680**
140.85	444	143.45	1,068		
140.90	456	143.50	1,080		
140.95	468	143.55	1,092		
141.00	480	143.60	1,104		
141.05	492	143.65	1,116		
141.10	504	143.70	1,128		
141.15	516	143.75	1,140		
141.20	528	143.80	1,152		
141.25	540	143.85	1,164		
141.30	552	143.90	1,176		
141.35	564	143.95	1,188		
141.40	576	144.00	1,200		
141.45	588	144.05	1,212		
141.50	600	144.10	1,224		
141.55	612	144.15	1,236		

Stage-Area-Storage for Pond IR-4: Isolator row for Sub-4

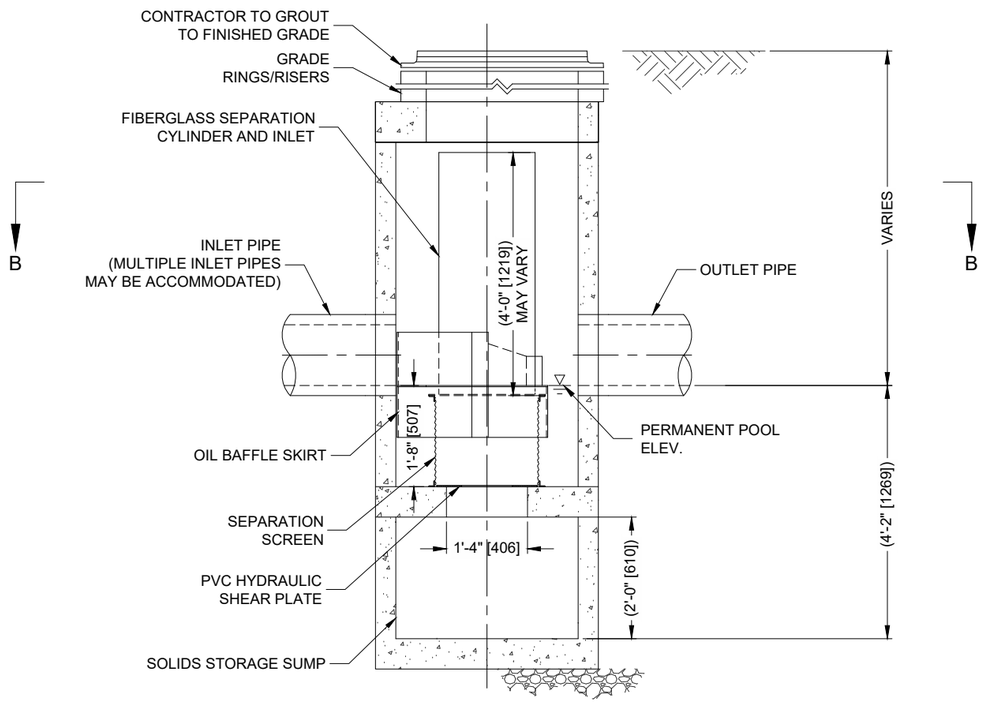
Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)	Elevation (feet)	Storage (cubic-feet)
133.40	0	136.00	1,248	138.60	2,496
133.45	24	136.05	1,272	138.65	2,520
133.50	48	136.10	1,296	138.70	2,544
133.55	72	136.15	1,320	138.75	2,568
133.60	96	136.20	1,344	138.80	2,592
133.65	120	136.25	1,368	138.85	2,616
133.70	144	136.30	1,392	138.90	2,640
133.75	168	136.35	1,416	138.95	2,664
133.80	192	136.40	1,440	139.00	2,688
133.85	216	136.45	1,464	139.05	2,712
133.90	240	136.50	1,488	139.10	2,736
133.95	264	136.55	1,512	139.15	2,760
134.00	288	136.60	1,536	139.20	2,784
134.05	312	136.65	1,560	139.25	2,808
134.10	336	136.70	1,584	139.30	2,832
134.15	360	136.75	1,608	139.35	2,856
134.20	384	136.80	1,632	139.40	2,880
134.25	408	136.85	1,656	139.45	2,904
134.30	432	136.90	1,680	139.50	2,928
134.35	456	136.95	1,704	139.55	2,952
134.40	480	137.00	1,728	139.60	2,976
134.45	504	137.05	1,752	139.65	3,000
134.50	528	137.10	1,776	139.70	3,024
134.55	552	137.15	1,800	139.75	3,048
134.60	576	137.20	1,824	139.80	3,072
134.65	600	137.25	1,848	139.85	3,096
134.70	624	137.30	1,872	139.90	3,120
134.75	648	137.35	1,896	139.95	3,144
134.80	672	137.40	1,920	140.00	3,168
134.85	696	137.45	1,944	140.05	3,192
134.90	720	137.50	1,968	140.10	3,216
134.95	744	137.55	1,992	140.15	3,240
135.00	768	137.60	2,016	140.20	3,264
135.05	792	137.65	2,040	140.25	3,288
135.10	816	137.70	2,064	140.30	3,312
135.15	840	137.75	2,088	140.35	3,336
135.20	864	137.80	2,112	140.40	**3,360**
135.25	888	137.85	2,136		
135.30	912	137.90	2,160		
135.35	936	137.95	2,184		
135.40	960	138.00	2,208		
135.45	984	138.05	2,232		
135.50	1,008	138.10	2,256		
135.55	1,032	138.15	2,280		
135.60	1,056	138.20	2,304		
135.65	1,080	138.25	2,328		
135.70	1,104	138.30	2,352		
135.75	1,128	138.35	2,376		
135.80	1,152	138.40	2,400		
135.85	1,176	138.45	2,424		
135.90	1,200	138.50	2,448		
135.95	1,224	138.55	2,472		


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



PLAN VIEW B-B
N.T.S.

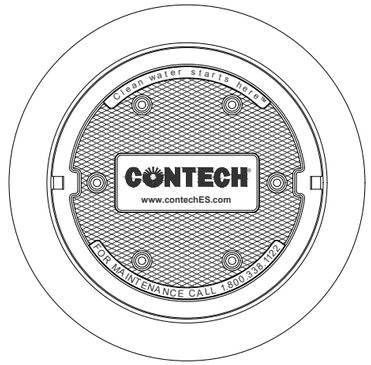


ELEVATION A-A
N.T.S.

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

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

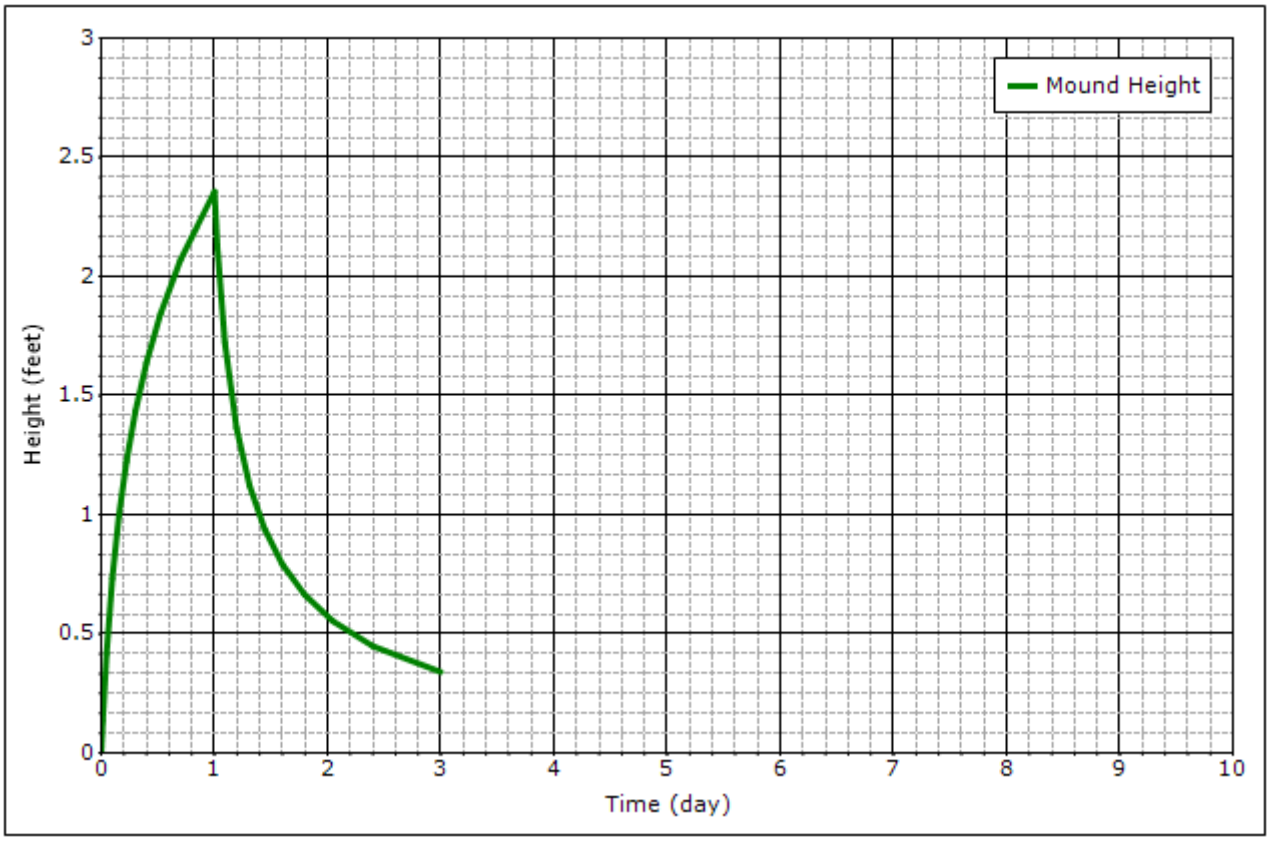
Area	**0.24 ac**	Unit Site Designation	**CDS**
Weighted C	**0.9**	Rainfall Station #	**67**
t_c	**6 min**		
CDS Model	**1515-3**	CDS Treatment Capacity	**1.0 cfs**

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.

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



Company: Civil Design
Project: Consultants, Inc
Murphy's Farm IB-3
Analyst: Thomas Schomburg
Date: 05/06/2025

Recharge Basin Dimensions

Length (w): 50 ft
Width (l): 20.6 ft
Bottom Area: 1,030 ft²
SHGW Separation: 2.5 ft

Recharge Rate Calculations

Duration (t): 1 d
Volume (V): 2,632 ft³
Rate (R): 2.6 ft/d
Total Simulation Time: 3 d

Aquifer Characteristics

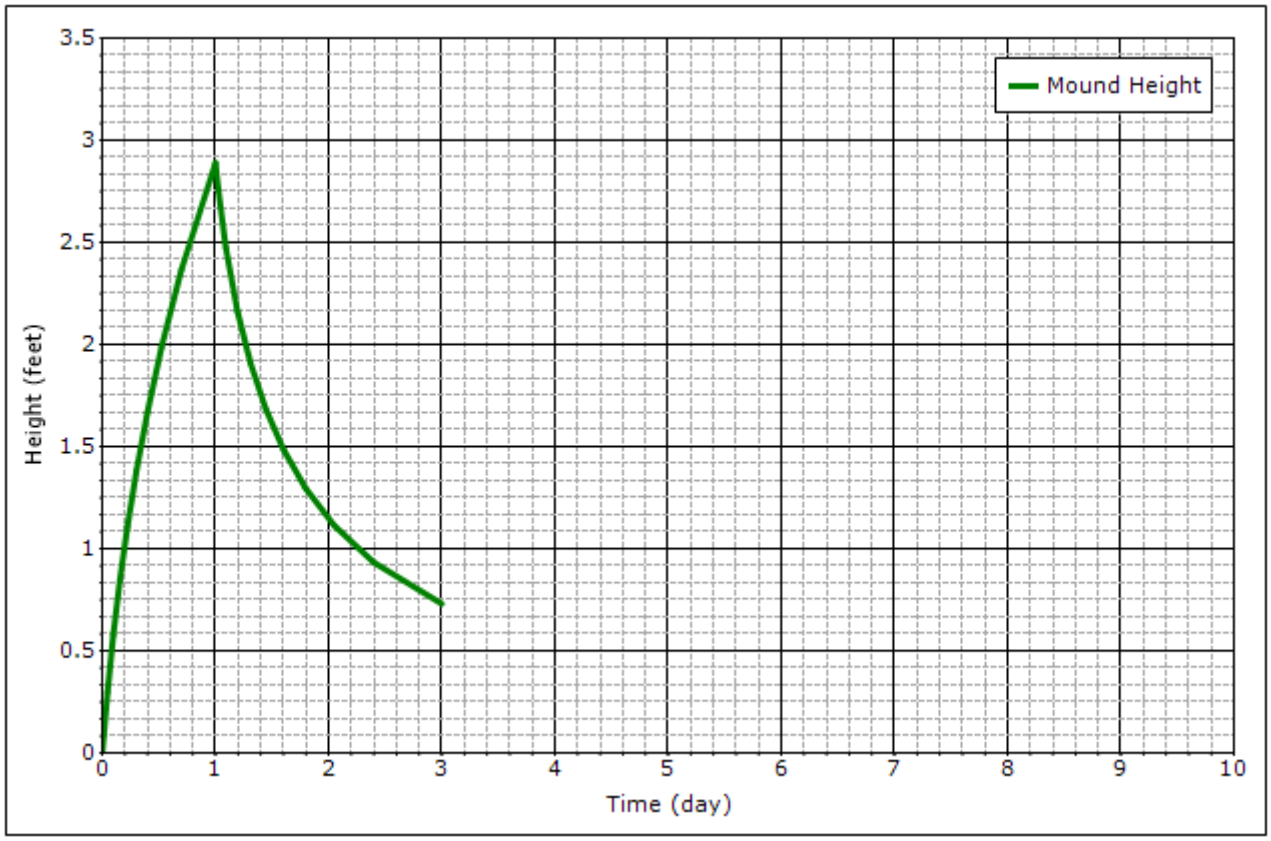
Hydraulic Conductivity (Kh): 49.5 ft/d
Drainable Porosity(Sy): 0.25
Saturated Thickness (h): 5 ft

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	0.1358
0.05	0.4160
0.10	0.7336
0.15	0.9953
0.22	1.2240
0.30	1.4345
0.40	1.6374
0.52	1.8440
0.70	2.0703
1.00	2.3572
1.03	2.1190
1.09	1.7230
1.19	1.3661
1.31	1.1226
1.44	0.9389
1.60	0.7908
1.80	0.6653
2.05	0.5539
2.40	0.4492
3.00	0.3405

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



Company: Civil Design
Project: Consultants, Inc
Murphy's Farm
Subsurface System-2
Analyst: Thomas Schomburg
Date: 05/05/2025

Recharge Basin Dimensions

Length (w): 170 ft
Width (l): 44.6 ft
Bottom Area: 7,582 ft²
SHGW Separation: 3 ft

Recharge Rate Calculations

Duration (t): 1 d
Volume (V): 12,732 ft³
Rate (R): 1.68 ft/d
Total Simulation Time: 3 d

Aquifer Characteristics

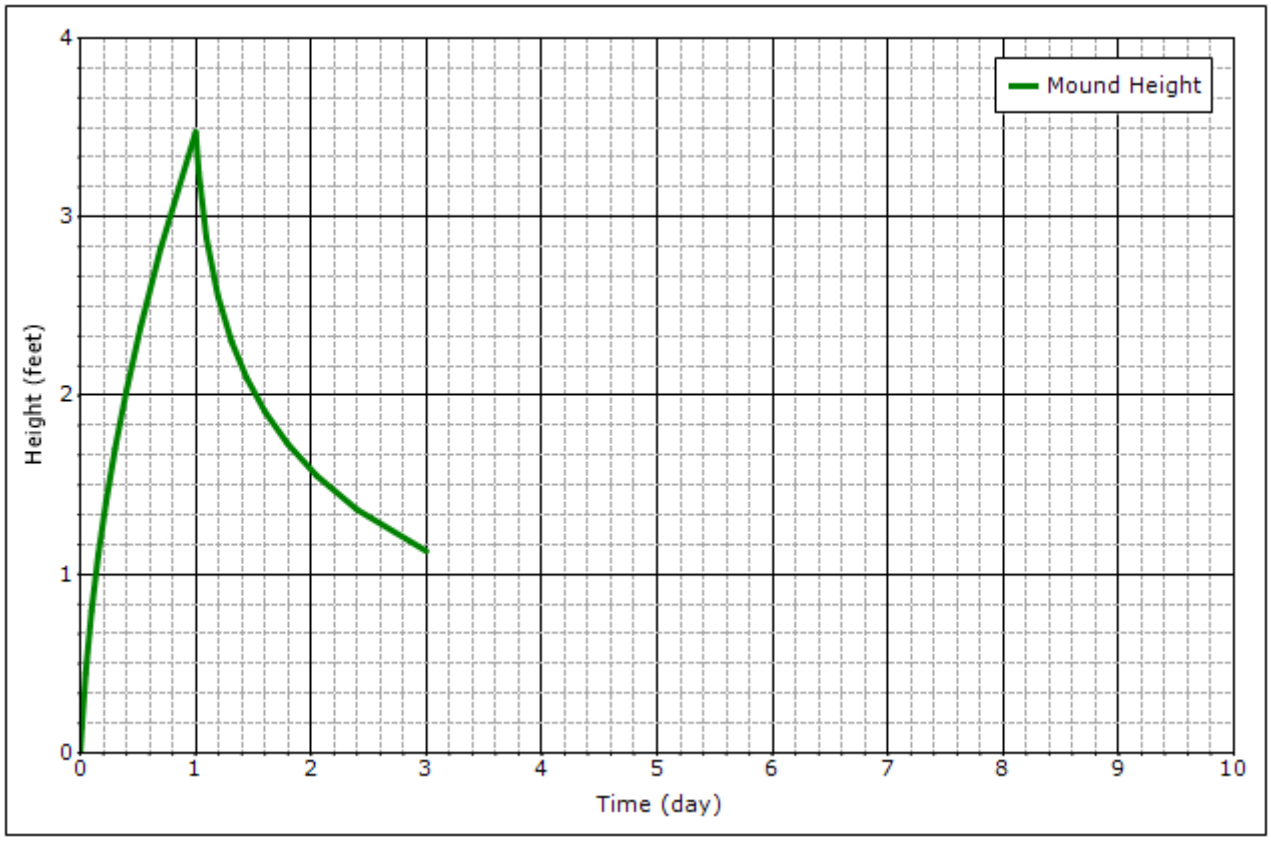
Hydraulic Conductivity (Kh): 99 ft/d
Drainable Porosity(Sy): 0.25
Saturated Thickness (h): 5 ft

Plot Geometry

X-Coordinate: 0 ft
Y-Coordinate: 0 ft
Left Side Plot Distance (Dl): 50 ft
Right Side Plot Distance (Dr): 50 ft
Plot Angle From Y-Axis (Φ): 1.570796326794
Constant Head Boundary: No

Time (d)	Height (ft)
0.00	0.0000
0.01	0.0887
0.05	0.2985
0.10	0.5795
0.15	0.8461
0.22	1.1096
0.30	1.3802
0.40	1.6680
0.52	1.9878
0.70	2.3680
1.00	2.8898
1.03	2.7535
1.09	2.4729
1.19	2.1633
1.31	1.9089
1.44	1.6865
1.60	1.4848
1.80	1.2969
2.05	1.1162
2.40	0.9339
3.00	0.7311

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: 05/08/2025

Recharge Basin Dimensions

Length (w): 160 ft
Width (l): 13.5 ft
Bottom Area: 2,160 ft²
SHGW Separation: 3.7 ft

Recharge Rate Calculations

Duration (t): 1 d
Volume (V): 5,978 ft³
Rate (R): 2.92 ft/d
Total Simulation Time: 3 d

Aquifer Characteristics

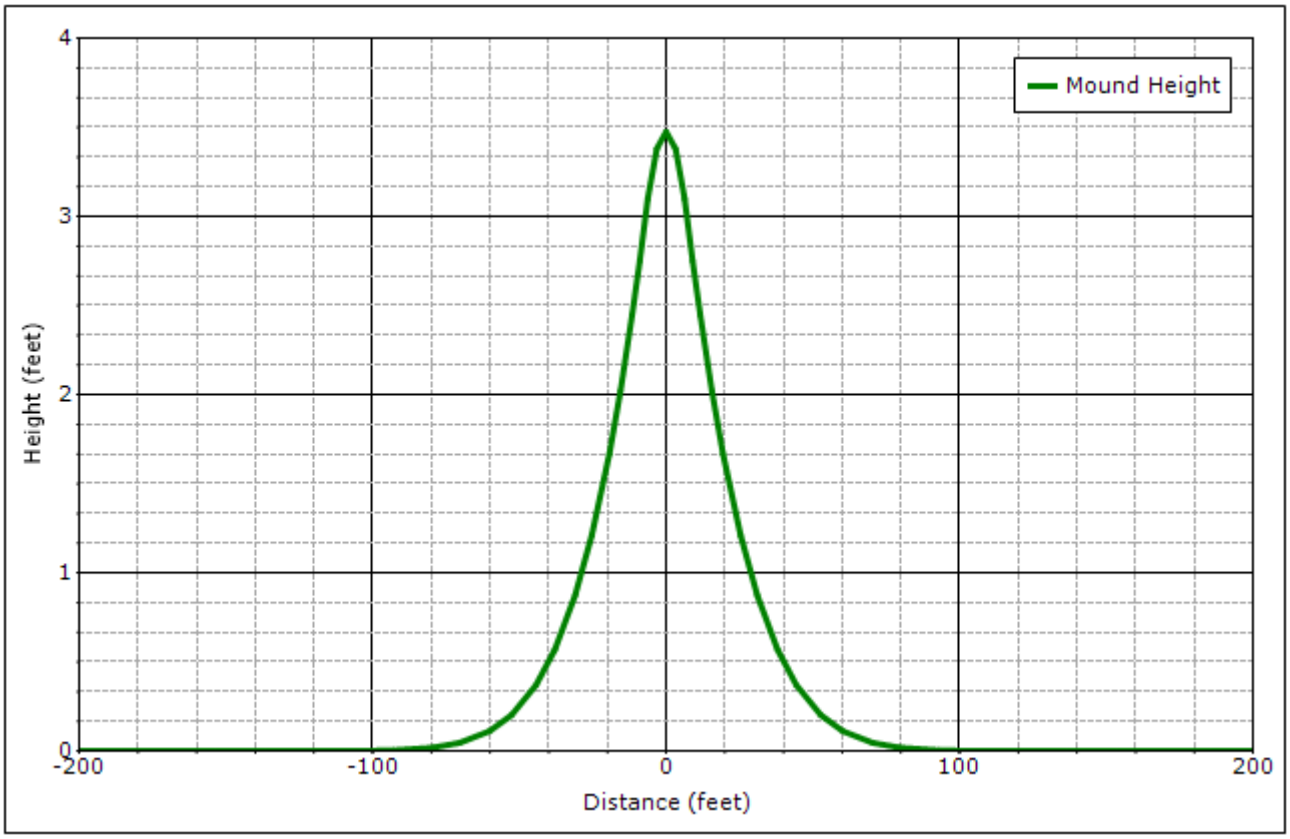
Hydraulic Conductivity (Kh): 41.35 ft/d
Drainable Porosity(Sy): 0.25
Saturated Thickness (h): 3 ft

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	0.1451
0.05	0.4457
0.10	0.7950
0.15	1.1041
0.22	1.4009
0.30	1.7021
0.40	2.0231
0.52	2.3857
0.70	2.8306
1.00	3.4754
1.03	3.2510
1.09	2.8876
1.19	2.5545
1.31	2.3050
1.44	2.0964
1.60	1.9093
1.80	1.7320
2.05	1.5541
2.40	1.3630
3.00	1.1302

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: 05/08/2025

Recharge Basin Dimensions

Length (w): 160 ft
Width (l): 13.5 ft
Bottom Area: 2,160 ft²
SHGW Separation: 3.7 ft

Recharge Rate Calculations

Duration (t): 1 d
Volume (V): 5,978 ft³
Rate (R): 2.92 ft/d
Total Simulation Time: 3 d

Aquifer Characteristics

Hydraulic Conductivity (Kh): 41.35 ft/d
Drainable Porosity(Sy): 0.25
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	0.0000	0.00	3.4754
-185.56	0.0000	3.20	3.3801
-168.20	0.0000	6.30	3.0977
-153.74	0.0000	9.00	2.7508
-136.38	0.0000	11.60	2.4486
-121.92	0.0001	15.58	2.0212
-104.58	0.0013	19.38	1.6673
-92.98	0.0049	25.38	1.2096
-79.58	0.0196	30.98	0.8770
-70.42	0.0465	37.92	0.5704
-60.20	0.1120	44.36	0.3705
-52.64	0.2031	52.64	0.2031
-44.36	0.3705	60.20	0.1120
-37.92	0.5704	70.42	0.0465
-30.98	0.8770	79.58	0.0196
-25.38	1.2096	92.98	0.0049
-19.38	1.6673	104.58	0.0013
-15.58	2.0212	121.92	0.0001
-11.60	2.4486	136.38	0.0000
-9.00	2.7508	153.74	0.0000
-6.30	3.0977	168.20	0.0000
-3.20	3.3801	185.56	0.0000
		200.00	0.0000

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 5/9/2025
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	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	0.45	0.250	0.250	0.11	0.11	6.00	0.68	12	0.013	0.005	19	**2.52**	3.2	2.7	0.35				
PCB-2	PDMH-1		5.00	0.55	0.120	0.120	0.07	0.07	6.00	0.40	12	0.013	0.005	11	**2.52**	3.2	2.2	0.25				
PDMH-1	**SUBSURFACE-1**	**0.08**	**5.12**			**0.370**	**0.00**	**0.18**	**6.00**	**1.07**	**12**	**0.013**	**0.005**	**10**	**2.52**	**3.2**	**3.1**	**0.45**				
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**	**15**	**0.013**	**0.010**	**170**	**6.46**	**5.3**	**5.9**	**0.68**				
PCB-6	PDMH-3B		5.00	0.46	0.960	0.960	0.44	0.44	6.00	2.65	12	0.013	0.010	15	**3.56**	4.5	5.0	0.64				
PDMH-3B	**PDMH-3A**	**0.48**	**6.38**			**2.210**	**0.00**	**1.32**	**5.80**	**7.66**	**15**	**0.013**	**0.020**	**24**	**9.13**	**7.4**	**8.3**	**0.70**				
PCB-7	PDMH-3A		5.00	0.75	0.280	0.280	0.21	0.21	6.00	1.26	12	0.013	0.010	25	**3.56**	4.5	4.1	0.41				
PCB-5	PDMH-3A		5.00	0.64	0.080	0.080	0.05	0.05	6.00	0.31	12	0.013	0.010	27	**3.56**	4.5	2.7	0.19				
PDMH-3A	**SUBSURFACE-2**	**0.17**	**6.43**			**2.570**	**0.00**	**1.58**	**5.80**	**9.18**	**18**	**0.013**	**0.010**	**27**	**10.50**	**5.9**	**6.7**	**0.72**				
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	6.00	0.39	12	0.013	0.045	12	**7.56**	9.6	5.0	0.15				
PDMH-13	**PDMH-21**	**0.02**	**7.14**			**4.210**	**0.00**	**3.29**	5.80	**19.10**	**24**	**0.013**	**0.039**	**18**	**44.66**	**14.2**	**13.6**	**0.45**				
PCB-29	PDMH-18		5.00	0.20	0.800	0.800	0.16	0.16	6.00	0.96	12	0.013	0.005	13	**2.52**	3.2	3.0	0.42				
PDMH-15	**PDMH-18**	**0.07**	**5.07**	**0.59**	**2.560**	**3.360**	**1.51**	**1.67**	6.00	**10.02**	**18**	**0.013**	**0.010**	**207**	**10.50**	**5.9**	**6.8**	**0.78**				
PCB-31	PDMH-25		5.00	0.82	0.360	0.360	0.30	0.30	6.00	1.77	12	0.013	0.010	17	**3.56**	4.5	4.5	0.49				
PCB-32	PDMH-25		5.00	0.85	0.290	0.290	0.25	0.25	6.00	1.48	12	0.013	0.010	17	3.56	4.5	4.3	0.44				
PDMH-25	**PFES-10**	**0.06**	**5.06**			**0.650**	**0.00**	**0.54**	6.00	**3.25**	**12**	**0.013**	**0.010**	**51**	**3.56**	**4.5**	**5.1**	**0.75**				
PCB-33	PDMH-27		5.00	0.20	0.430	0.430	0.09	0.09	6.00	0.52	12	0.013	0.005	223	2.52	3.2	2.4	0.29				
PCB-34	PDMH-27		5.00	0.79	0.360	0.360	0.28	0.28	6.00	1.71	12	0.013	0.010	10	3.56	4.5	4.4	0.48				
PCB-35	PDMH-27		5.00	0.60	0.210	0.210	0.13	0.13	6.00	0.76	12	0.013	0.010	14	3.56	4.5	3.6	0.31				
PDMH-27	**PFES-6**	**0.04**	**7.16**			**1.000**	**0.00**	**0.50**	5.80	**2.88**	**12**	**0.013**	**0.014**	**70**	**4.21**	**5.4**	**5.8**	**0.60**				
PCB-36	PDMH-28		5.00	0.69	0.750	0.750	0.52	0.52	6.00	3.11	15	0.013	0.005	18	**4.57**	3.7	4.0	0.60				
PCB-37	PDMH-28		5.00	0.58	0.790	0.790	0.46	0.46	6.00	2.75	15	0.013	0.005	17	4.57	3.7	3.9	0.55				
PDMH-28	**PFES-14**	**0.04**	**5.08**			**1.540**	**0.00**	**0.98**	6.00	**5.85**	**15**	**0.013**	**0.010**	**79**	**6.46**	**5.3**	**6.0**	**0.74**				

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:5/9/25

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)
Q25	=	the maximum 25-yr grate flow (CFS)

Structure	Low Point	A	d	L	H	Qc	Q25
PCB-1-5	no			8	0.22	2.7	0.7
PCB-6-10(Dbl.)	no			12	0.22	4.1	3.5
PCB-11-13	no			8	0.22	2.7	2
PCB-14-15	yes	212	6			5.6	2.5
PCB-16-19	no			8	0.22	2.7	2.5
PCB-20-21 (Dbl.)	yes	412	6			10.9	5.6
PCB-22	no			8	0.22	2.7	1.7
PCB-24-25	yes	212	6			5.6	1.7
PCB-26	yes	212	18			9.7	9.4
PCB-29	yes	212	6			5.6	1
PCB-31-32	no			8	0.22	2.7	1.8
PCB-33-35	yes	212	6		0.22	5.6	1.7
PCB-36-37 (Dbl.)	no			12	0.22	4.1	3.1
PCB-23 (Dbl.)	no			12	0.22	4.1	3

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 606 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way 38 feet | Wetlands 38 feet | Property Line 76 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-12	A	Sandy Loam	10YR 3/2		Cnc : Dpl:				Single Grain	Loose	
12-32	B	Loamy Sand	7.5YR 4/6		Cnc : Dpl:				Single Grain	Loose	
32-120	C	Medium Sand	10YR 6/3	48"	Cnc : Dpl:	>5	25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:
Test Pit logs for BMPs on Form 11

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 605 (Hole #) 12/4/24 (Date) ____ (Time) ____ (Weather) ____ (Latitude) ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ Landform ____ Position on Landscape (SU, SH, BS, FS, TS, Plain) ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-72	Fill	-	-		Cnc : Dpl:				-	-	
72-108	C	Loamy Sand	7.5YR 4/6		Cnc : Dpl:		25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: CDCI-6 (Hole #) 12/7/23 (Date) _____ (Time) _____ (Weather) _____ (Latitude) _____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: _____ Landform _____ Position on Landscape (SU, SH, BS, FS, TS, Plain) _____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet
Property Line >100 feet | Drinking Water Well >100 feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☒ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-24	Fill	-	-		Cnc : Dpl:				-	-	
24-80	C	Coarse Sand	10YR 5/4		Cnc : Dpl:		25		Single Grain	Loose	Ledge @ 80"
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 603 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-24	Fill	-	-		Cnc : Dpl:				-	-	
24-120	C	Gravelly Sand	10YR 5/3	60"	Cnc : Dpl:	>5	25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 604 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-24	Fill	-	-		Cnc : Dpl:				-	-	
24-108	C	Sand	10YR 7/3	48"	Cnc : Dpl:	>5	25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 608 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-48	Fill	-	-		Cnc : Dpl:				-	-	
48-120	C	Medium Sand	10YR 7/4	84"	Cnc : Dpl:	>5	25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 609 (Hole #) 12/4/24 (Date) _____ (Time) _____ (Weather) _____ (Latitude) _____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Vegetation: Dec./Con. | Surface Stones (e.g., cobbles, stones, boulders, etc.): Yes | Slope (%): 5

Description of Location: See plans

2. Soil Parent Material: _____ Landform: _____ Position on Landscape (SU, SH, BS, FS, TS, Plain): _____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line 65 feet | Drinking Water Well >100 feet | Other _____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-48	Fill	-	-		Cnc : Dpl:				-	-	
48-120	C	Medium Sand	10YR 5/3		Cnc : Dpl:		25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 497 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-60	Fill	-	-		Cnc : Dpl:				-	-	
60-120	C	Loamy Sand	10YR 7/3		Cnc : Dpl:		15-25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 498 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-60	Fill	-	-		Cnc : Dpl:				-	-	
60-120	C	Fine Sand	10YR 7/3		Cnc : Dpl:		15-25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 499 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Vegetation: Dec./Con. | Surface Stones (e.g., cobbles, stones, boulders, etc.): Yes | Slope (%): 5

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-60	Fill	-	-		Cnc : Dpl:				-	-	
60-138	C	Fine Sand	10YR 7/3		Cnc : Dpl:		15-25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 600 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-90	Fill	-	-		Cnc : Dpl:				-	-	
90-126	C	Sand	10YR 7/3		Cnc : Dpl:		25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 602 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☒ Yes ☐ No If Yes: ☒ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-66	Fill	-	-		Cnc : Dpl:				-	-	
66-84	B	Sand	10YR 5/4		Cnc : Dpl:		15-25		Single Grain	Loose	
84-120	C	Sand	10YR 7/3	86"	Cnc : Dpl:	>5	25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 25 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line 63 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-30	B	Loamy Sand	10YR 6/6		Cnc : Dpl:				Single Grain	Loose	
30-120	C	Gravelly Sand	10YR 6/4	72"	Cnc : Dpl:	>5	25-35		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 26 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line 67 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-24	B	Loamy Sand	10YR 6/6		Cnc : Dpl:				Single Grain	Loose	
24-72	C	Gravelly Sand	10YR 6/4		Cnc : Dpl:		25-35		Single Grain	Loose	
72-120	C	Sand	10YR 6/2	72"	Cnc : Dpl:	>5	25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 27 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-66	B	Gravelly Sand	10YR 6/6		Cnc : Dpl:		25-35		Single Grain	Loose	
66-120	C	Sand	10YR 6/1	66"	Cnc : Dpl:	>5	25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 494 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way 40 feet | Wetlands 40 feet | Property Line 60 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-30	B	Loamy Sand	10YR 5/6		Cnc : Dpl:				Single Grain	Loose	
30-84	C	Gravelly Sand	10YR 6/4		Cnc : Dpl:		25-35		Single Grain	Loose	
84-120	C	Sand	10YR 6/1	84"	Cnc : Dpl:	>5	25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 495 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way 85 feet | Wetlands 85 feet | Property Line 55 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-72	C	Medium Sand	10YR 6/6		Cnc : Dpl:				Single Grain	Loose	
72-132	C2	Fine Sand	10YR 7/4	84"	Cnc : Dpl:	>5	15-25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 496 (Hole #) | 12/4/24 (Date) | ____ (Time) | ____ (Weather) | ____ (Latitude) | ____ (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Vegetation: Dec./Con. | Surface Stones (e.g., cobbles, stones, boulders, etc.): Yes | Slope (%): 5

Description of Location: See plans

2. Soil Parent Material: ____ | Landform: ____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): ____

3. Distances from: Open Water Body >100 feet | Drainage Way >100 feet | Wetlands >100 feet | Property Line 60 feet | Drinking Water Well >100 feet | Other ____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: ____ Depth to Weeping in Hole ____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-12	B	Loamy Sand	10YR 5/6		Cnc : Dpl:				Single Grain	Loose	
12-72	C	Medium Sand	10YR 6/4		Cnc : Dpl:		25		Single Grain	Loose	
72-120	C2	Fine Sand	10YR 6/1	84"	Cnc : Dpl:	>5	15-25		Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: CDCI-18 (Hole #) | 4/3/24 (Date) | (Time) | (Weather) | (Latitude) | (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: _____ | Landform: _____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): _____

3. Distances from: Open Water Body >100 feet | Drainage Way 70 feet | Wetlands 70 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No If yes: _____ Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-24	B	Sand	10YR 5/6		Cnc : Dpl:				Single Grain	Loose	
24-104	C	Gravelly Sand	10YR 5/3	80"	Cnc : Dpl:	>5	25-35	10+	Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: CDCI-19 (Hole #) | 4/3/24 (Date) | (Time) | (Weather) | (Latitude) | (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Dec./Con. (Vegetation) | Yes (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 5 (Slope (%))

Description of Location: See plans

2. Soil Parent Material: _____ | Landform: _____ | Position on Landscape (SU, SH, BS, FS, TS, Plain): _____

3. Distances from: Open Water Body >100 feet | Drainage Way 90 feet | Wetlands 90 feet | Property Line >100 feet | Drinking Water Well >100 feet | Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil/Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 90" Depth to Weeping in Hole _____ Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-12	B	Sand	10YR 5/6		Cnc : Dpl:				Single Grain	Loose	
12-120	C	Gravelly Sand	10YR 5/3	60"	Cnc : Dpl:	>5	25-35	10+	Single Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

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

Mottling @ 72"
No water observed

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

Mottling @ 72"
No water observed

TP-27

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

Mottling @ 66"
No water observed

TP-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

No mottling observed
No water observed

TP-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

No mottling observed
No water observed

TP-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

No mottling observed
No water observed

TP-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

No mottling observed
No water observed

TP-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

No mottling observed
No water observed

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

TP-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

No mottling observed
No water observed

TP-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

No mottling observed
No water observed

TP-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

No mottling observed
No water observed

TP-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

No mottling observed
No water observed

TP-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

No mottling observed
No water observed

TP-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

No mottling observed
No water observed

TP-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

Mottling @ 48"
No water observed

TP-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

No mottling observed
No water observed

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

TP-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

Mottling @ 48"
No water observed

TP-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

Mottling @ 36"
No water observed

TP-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

Mottling @ 36"
No water observed

TP-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

Mottling @ 36"
No water observed

TP-486

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

No mottling observed
No water observed

TP-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

No mottling observed
No water observed

TP-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

No mottling observed
No water observed

TP-489

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

No mottling observed
No water observed

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

TP-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

No mottling observed
No water observed

TP-491

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

Mottling @ 60"
No water observed

TP-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

No mottling observed
No water observed

TP-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

No mottling observed
No water observed

TP-494

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

Mottling @ 84"
No water observed

TP-495

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

Mottling @ 84"
No water observed

TP-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

Mottling @ 84"
No water observed

TP-497

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

No mottling observed
No water observed

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

TP-498

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

No mottling observed
No water observed

TP-499

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

No mottling observed
No water observed

TP-600

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

No mottling observed
No water observed

TP-601

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

Mottling @ 96"
No water observed

TP-602

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

Mottling @ 86"
No water observed

TP-603

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

Mottling @ 60"
No water observed

TP-604

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

Mottling @ 48"
No water observed

TP-605

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

Mottling @ 60"
No water observed

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

TP-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

Mottling @ 48"
No water observed

TP-607

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

Pit terminated early, no space to put material. See TP-609
No mottling observed
No water observed

TP-608

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

Mottling @ 84"
No water observed

TP-609

Depth	Horizon	Color	Texture
0-48	Fill	-	-
48-120	C	10YR 5/3	Medium Sand

No mottling observed
No water observed

Engineering Technologies Canada Ltd.

OWNER'S NAME: O'BRIEN HOMES, INC.

SITE LOCATION: MURPHY'S FARM

PID #:

TEST PIT #: P-1 @ TP-608

TECHNICIAN: TWS

DATE: 4/22/25

WEATHER/TEMPERATURE: 70° / PARTLY CLOUDY

FIELD PERMEABILITY TEST #: 1

D – reservoir diameter (cm)	8.25	Soil Texture	GRAVELLY SAND
d – well hole diameter (cm)	8.3	Soil Structure	SINGLE GRAIN
H – height of water in well (cm)	15.0	α* (cm-1)	0.36
Depth below ground surface (cm)	140	C – Factor	1.36

TIME (min)	(1) CHANGE IN TIME (min)	RESERVOIR WATER LEVEL (WL) (cm)	(2) CHANGE IN WL (cm)	(2) ÷ (1) RATE OF FALL (R) (cm/min)
9:25		40		
9:26	1	0	40	40

Quasi Steady-State Rate of Fall (R) = 40 cm/min

$K_{fs} = 2.8 \times 10^{-4}$ m/s = 39.69 in/hr

K_{fs} (FS=2) = 39.69 ÷ 2 = 19.8 in/hr

Engineering Technologies Canada Ltd.

OWNER'S NAME: SEE P-1

SITE LOCATION:

PID #:

TECHNICIAN:

TEST PIT #: P-2 @ TP-604

DATE: 4/22/25

WEATHER/TEMPERATURE:

FIELD PERMEABILITY TEST #: P-3

D – reservoir diameter (cm) 8.25
d – well hole diameter (cm) 8.3
H – height of water in well (cm) 15.0
Depth below ground surface (cm) 65

Soil Texture GRAVELLY SAND
Soil Structure SINGLE GRAIN
α* (cm-1) 0.36
C – Factor 1.36

TIME (min)	(1) CHANGE IN TIME (min)	RESERVOIR WATER LEVEL (WL) (cm)	(2) CHANGE IN WL (cm)	(2) ÷ (1) RATE OF FALL (R) (cm/min)
10:08		46		
09	1	80	20	
10	1	16	10	]
11	1	0	10	] 10

Quasi Steady-State Rate of Fall (R) = 10 **cm/min**

$K_{fs} = 6.9 \times 10^{-5}$ m/s = 9.78 in/hr

FS(2) => 4.89 in/hr

Engineering Technologies Canada Ltd.

OWNER'S NAME: SEE P-1

SITE LOCATION:

PID #:

TECHNICIAN:

TEST PIT #: P-3 @ TP-CDCI-6

DATE: 4/22/25

WEATHER/TEMPERATURE:

FIELD PERMEABILITY TEST #: P-4

D – reservoir diameter (cm)	8.25	Soil Texture	GRAVELLY SAND
d – well hole diameter (cm)	8.3	Soil Structure	SINGLE GRAIN
H – height of water in well (cm)	15.0	α* (cm-1)	0.36
Depth below ground surface (cm)	133	C – Factor	1.36

TIME (min)	(1) CHANGE IN TIME (min)	RESERVOIR WATER LEVEL (WL) (cm)	(2) CHANGE IN WL (cm)	(2) ÷ (1) RATE OF FALL (R) (cm/min)
10:58		40		
59	1	0	40	40

Quasi Steady-State Rate of Fall (R) = 40 **cm/min**

$K_{fs} = 2.8 \times 10^{-4}$ m/s = 39.69 in/hr

FS(2) => 19.8 in/hr

A SOIL DAMP FROM RAIN (PREVIOUS NIGHT)

Engineering Technologies Canada Ltd.

OWNER'S NAME: SEE P-1

SITE LOCATION:

PID #:

TECHNICIAN:

TEST PIT #: P-4 @ SUB 3 (TP-601)

DATE: 4/22/25

WEATHER/TEMPERATURE:

FIELD PERMEABILITY TEST #:

D – reservoir diameter (cm)	8.25	Soil Texture	GRAVELLY SAND
d – well hole diameter (cm)	8.3	Soil Structure	SINGLE GRAIN
H – height of water in well (cm)	15.0	α* (cm-1)	0.36
Depth below ground surface (cm)	92	C – Factor	1.36

TIME (min)	(1) CHANGE IN TIME (min)	RESERVOIR WATER LEVEL (WL) (cm)	(2) CHANGE IN WL (cm)	(2) ÷ (1) RATE OF FALL (R) (cm/min)
11:18		40		
19	1	23	17	
20	1	12	11	] 11
21	1	2	11	

Quasi Steady-State Rate of Fall (R) = 11 cm/min

$K_{fs} = 7.6 \times 10^{-5}$ m/s = 10.77 in/hr

FS(2) = 5.39 in/hr

Engineering Technologies Canada Ltd.

OWNER'S NAME: SCE P-1

SITE LOCATION:

PID #:

TECHNICIAN:

WEATHER/TEMPERATURE:

TEST PIT #: P-5 @ TP-494

DATE: 4/22/25

FIELD PERMEABILITY TEST #:

D – reservoir diameter (cm)	8.25	Soil Texture	GR. SAND
d – well hole diameter (cm)	8.3	Soil Structure	SG
H – height of water in well (cm)	15.0	α* (cm-1)	0.36
Depth below ground surface (cm)	129	C – Factor	1.36

TIME (min)	(1) CHANGE IN TIME (min)	RESERVOIR WATER LEVEL (WL) (cm)	(2) CHANGE IN WL (cm)	(2) ÷ (1) RATE OF FALL (R) (cm/min)
12:18		40		
19	1	0	40	40

Quasi Steady-State Rate of Fall (R) = 40 cm/min

$K_{FS} = 2.8 \times 10^{-4}$ m/s = 39.69 in/hr

FS(2) => 19.8 in/hr

Engineering Technologies Canada Ltd.

OWNER'S NAME: SEE P-1

SITE LOCATION:

PID #:

TEST PIT #: P-6 @ TP-COCI-19

TECHNICIAN:

DATE: 4/22/25

WEATHER/TEMPERATURE:

FIELD PERMEABILITY TEST #:

D – reservoir diameter (cm)	8.25	Soil Texture	GR. SAND
d – well hole diameter (cm)	8.3	Soil Structure	SG
H – height of water in well (cm)	15.0	α* (cm-1)	0.36
Depth below ground surface (cm)	92	C – Factor	1.36

TIME (min)	(1) CHANGE IN TIME (min)	RESERVOIR WATER LEVEL (WL) (cm)	(2) CHANGE IN WL (cm)	(2) ÷ (1) RATE OF FALL (R) (cm/min)
12:38		40		
39	1	0	40	40

Quasi Steady-State Rate of Fall (R) = 40 cm/min

$K_{FS} = 2.8 \times 10^{-4}$ m/s = 39.96 in/hr

FS(2) => 19.8 in/hr

Engineering Technologies Canada Ltd.

OWNER'S NAME: SEE P-1

SITE LOCATION:

PID #:

TECHNICIAN:

TEST PIT #: P-7 @ TP-25

DATE:

WEATHER/TEMPERATURE:

FIELD PERMEABILITY TEST #:

D – reservoir diameter (cm)	5.25	Soil Texture	GR. SAND
d – well hole diameter (cm)	8.3	Soil Structure	SG
H – height of water in well (cm)	15.0	α* (cm-1)	0.36
Depth below ground surface (cm)	123	C – Factor	1.36

TIME (min)	(1) CHANGE IN TIME (min)	RESERVOIR WATER LEVEL (WL) (cm)	(2) CHANGE IN WL (cm)	(2) ÷ (1) RATE OF FALL (R) (cm/min)
1:18		40		
19	1	0	40	40

Quasi Steady-State Rate of Fall (R) = 40 **cm/min**

$K_{fs} = 2.8 \times 10^{-4}$ m/s = 36.96 in/hr

FS(2) = 19.8 in/hr

LONG TERM OPERATIONS AND MAINTENANCE PROGRAM

May 9, 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

Because crushed stone trenches are prone to failure due to clogging, it is imperative that they be aggressively maintained on a regular schedule. Regular maintenance will prolong its operational life and delay the day when rehabilitation is needed. Inspect the trench after the first several rainfall events, after all major storms (2-Year frequency or greater), and on regularly scheduled dates every six months. Routinely remove grass clippings, leaves, and accumulated sediment from the surface of the trench. Ensure that seedlings are removed before they are firmly established. Inspect outlet pipes at connecting manhole structures to check for clogging. Inspect the trench 24 hours or several days after a rain event to look for ponded water. If there is ponded water at the surface of the trench, it is likely that the trench surface (Or embedded perforated pipe) is clogged. To address surface clogging, remove and replace the first layer of stone aggregate and the filter fabric. If water is ponded inside the trench, it is likely the pipe has clogged. To rehabilitate a failed trench, replace segments of perforated pipe, stone, and filter fabric as-needed.

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 Systems

The isolator rows & subsurface systems shall be inspected twice annually, once in April and once in November as well as after any major storm (2-Year recurrence or greater). 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. Outlet structures should be visually inspected for clogging conditions, and cleaned as required.

Mosquito Control Plan

Mosquito pupae and larvae need at least four days of ponded water to emerge as adults. Ensure that Infiltration Basin and subsurface system 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.

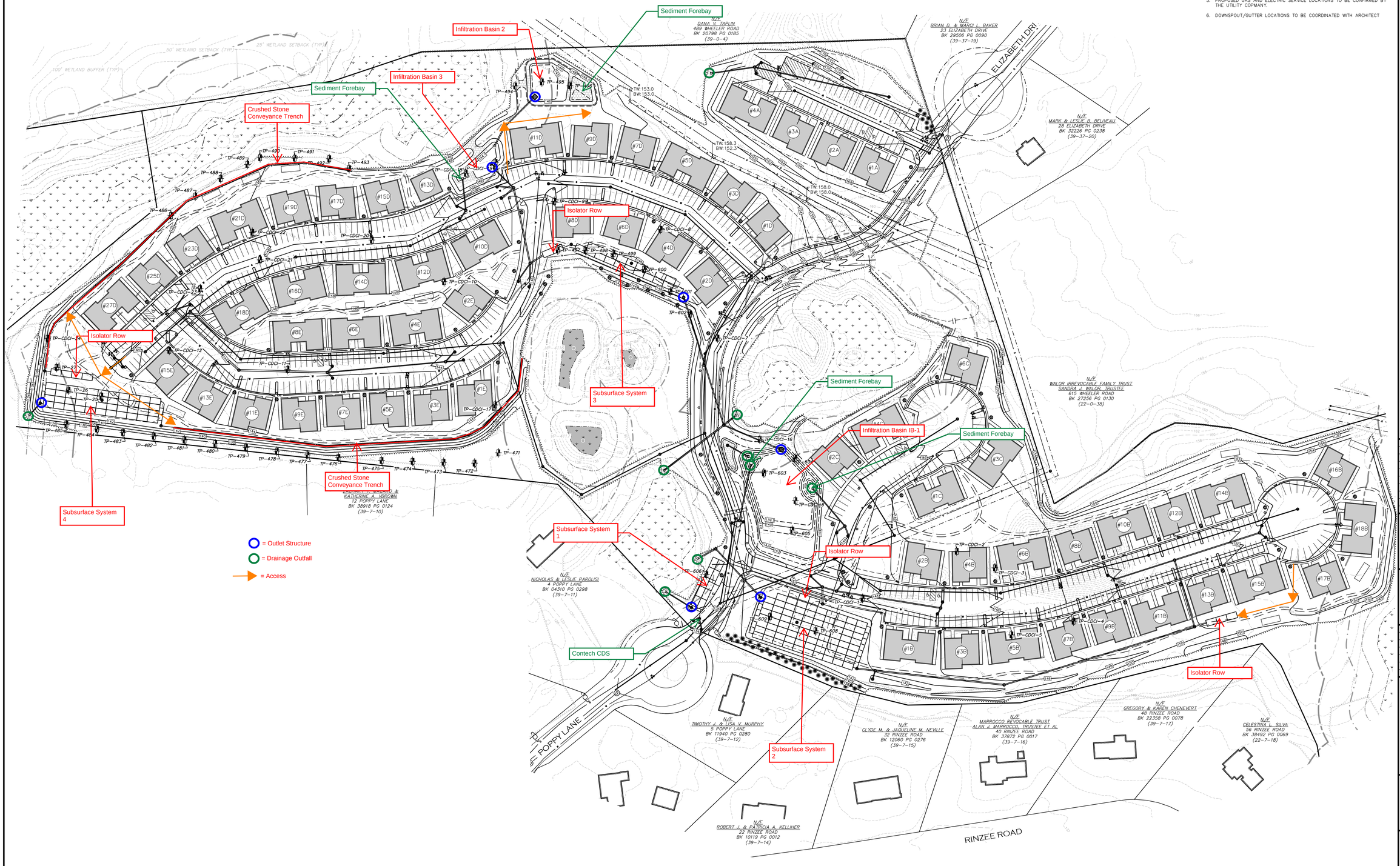
System Map:
See *Comprehensive Permit Site Plan for Murphy's Farm* and attached sketch for the location of all stormwater management facilities.

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

NAD83

PROJECT NOTES:

1. SEE SHEET C-1 FOR FULL PROJECT NOTES
2. SEE CONSTRUCTION SEQUENCING NOTES ON SHEET D-1.
3. CONTRACTOR IS TO VERIFY THE LOCATION, DEPTH, AND CONDITION OF THE EXISTING SEWER AND WATER PRIOR TO CONSTRUCTION.
4. PROPOSED WATER AND SEWER MAINS TO MAINTAIN 10-FT OF HORIZONTAL SEPARATION. WHERE SANITARY SEWERS CROSS WATER MAINS, THE SEWER SHALL BE LAID AT SUCH AN ELEVATION THAT THE CROWN OF THE SEWER IS AT LEAST 18 INCHES BELOW THE INVERT OF THE WATER MAIN. IF THE ELEVATION OF THE SEWER CANNOT BE VARIED TO MEET THIS REQUIREMENT, THE WATER MAIN SHALL BE RELOCATED TO PROVIDE THIS SEPARATION OR CONSTRUCTED WITH MECHANICAL JOINT PIPE FOR A DISTANCE OF 10 FEET ON EACH SIDE OF THE SEWER. ONE FULL LENGTH OF WATER MAIN SHALL BE CENTERED OVER THE SEWER SO THAT BOTH JOINTS WILL BE AS FAR FROM THE SEWER AS POSSIBLE. WHENEVER IT IS IMPOSSIBLE TO OBTAIN VERTICAL SEPARATION AS STIPULATED ABOVE, BOTH THE WATER MAIN AND SEWER SHALL BE ENCASED IN CONCRETE FOR A MINIMUM DISTANCE OF 10 FEET FROM THE CROSSING POINT OF THE OTHER PIPE AS MEASURED NORMALLY FROM ALL POINTS ALONG THE PIPE
5. PROPOSED GAS AND ELECTRIC SERVICE LOCATIONS TO BE CONFIRMED BY THE UTILITY COMPANY.
6. DOWNSPOUT/GUTTER LOCATIONS TO BE COORDINATED WITH ARCHITECT



HORIZONTAL SCALE

60 0 30 60 120 240

(IN FEET)

1"=60'

05/09/25	REV. PER PEER REVIEW COMMENTS
03/27/25	REV. PER PEER REVIEW COMMENTS
02/25/25	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
(978) 475-0520 | www.civildcc.com

DRAWING TITLE:

OVERALL GRADING & UTILITIES PLAN

DRAWING #:

C-4C

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

CONTECH
ENGINEERED SOLUTIONS
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.

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

NAD83

PWA-8A
A: 1.40-AC
CN: 31
TC: 8.5 MIN

PWA-8H
A: 0.84-AC
CN: 80
TC: 6 MIN

PWA-8B
A: 5.67-AC
CN: 74
TC: 6 MIN

PWA-5E
A: 1.52-AC
CN: 81
TC: 6 MIN

PWA-5B
A: 2.43-AC
CN: 70
TC: 8.7 MIN

PWA-5D
A: 4.29-AC
CN: 46
TC: 13.1 MIN

PWA-5C
A: 1.78-AC
CN: 34
TC: 9.6 MIN

PWA-6
A: 1.80-AC
CN: 30
TC: 9.6 MIN

PWA-5J
A: 2.04-AC
CN: 68
TC: 6 MIN

PWA-7
A: 0.87-AC
CN: 31
TC: 13.2 MIN

PWA-5A
A: 0.54-AC
CN: 34
TC: 6 MIN

PWA-5G
A: 0.47-AC
CN: 65
TC: 6 MIN

PWA-5C
A: 2.74-AC
CN: 76
TC: 11.2 MIN

PWA-5J
A: 3.90-AC
CN: 63
TC: 22.8 MIN

PWA-4
A: 0.29-AC
CN: 30
TC: 6 MIN

PWA-3
A: 0.28-AC
CN: 33
TC: 6.6 MIN

PWA-1
A: 4.46-AC
CN: 37
TC: 13.7 MIN

PWA-4SB
A: 0.69-AC
CN: 61
TC: 6 MIN
(WETLAND HABITAT AREA)

HSG-A

HSG-B

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

50' WETLAND SETBACK (TYP)
25' WETLAND SETBACK (TYP)
LAND BUFFER (TYP)
TREELINE (TYP)
100' WETLAND BUFFER (TYP)

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

05/09/25	REV. PER PEER REVIEW COMMENTS
03/27/25	REV. PER PEER REVIEW COMMENTS
02/25/25	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
(978) 686-0900 | www.civildc.com

DRAWING TITLE:
PROPOSED WATERSHED PLAN

DRAWING #:
PWP-1