STORMWATER MANAGEMENT REPORT

Prepared For:
Nylah Crossing LLC
95 East Main Street Suite 100
Westborough, MA 01581

Prepared By:

MP DESIGN CONSULTANTS
DESIGNING AND MANAGING YOUR DREAM

MP Design Consultants
118 Turnpike Road, Suite 200
Southborough, MA 01772

Date:
March 13, 2024

Table of Contents

List of Tables

List of Appendices

1 Introduction

This Stormwater Management Report, prepared in accordance with Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards and the Town of Franklin Stormwater Management Standards, summarizes the Stormwater Management Plan and associated analyses for the proposed condominiums residences located at 240 East Central Street and 9 Lewis Street in Franklin, Massachusetts. A United States Geological Survey (USGS) Site Locus Map is provided as Figure 1 in Appendix A.

This stormwater report provides an analysis comparing the pre-development watershed condition to the post development, watershed figures provided as Figure 2 Pre-development and Figure 3 Post-development in Appendix A. This analysis is achieved through the surface runoff rates and volume calculations described further in the comparison tables. Post-development calculations are accomplished through the implementation of stormwater managements strategies to address all stormwater standards.

The following sections describe the existing and proposed stormwater management strategies. The report will further analyze the stormwater implementation and summarize compliance with applicable stormwater regulations.

1.1 Existing Conditions

The project site on East Central Street includes an existing building with a detached garage and driveway, additionally the same features are present on the section of the lot with frontage on Lewis Street. The projects subject parcel is created by 240 East Central Street and 9 Lewis Street parcels with an approximate 34,567 Square Feet combined. The southern portion of the site contains most of the lawn area, and the northern portion of the site is paved driveway areas with the dwellings. The project site is located within the Commercial (C-1) zoning district.

The project site topography is generally flat with elevations ranging from 285 on the northern part of the lot to 283 on the south part of the lot, elevations referenced to the North American Vertical Datum of 1988 (NAVD88). Stormwater runoff from the site predominantly flows from north to the south eventually reaching East Central Street and Lewis Street drainage system without any stormwater management practice.

The project site is within the Town of Franklin Water Resource District, and a Zone II.

1.2 Proposed Conditions

The design of the proposed stormwater management system is to collect, treat and infiltrate runoff from the impervious areas. Impervious areas on site are the parking lot, driveway and roof area. The total impervious area will occupy approximately 27,052 Square Feet.

Driveway impervious area runoff is effectively managed by pretreatment manholes, isolator rows, infiltration chambers, and deep sump drainage structures. Runoff from the parking lot will be collected by the catch basins to eventually reach the infiltration chambers through HDPE pipes. Roof runoff is collected in gutters and downspouts and are all directed to the Contech Chambermaxx systems.

2 Stormwater Management

2.1 Method of Calculation

The hydrologic model was created and calculated with HydroCAD®, Version 10.0 software, developed by HydroCAD® Software Solutions LLC, to analyze the hydrology of the Project Site. Hydraulic calculations were performed utilizing the Rational Method to determine contributing flows, and the Manning's Equation to determine pipe flows.

2.2 Sources of Data

The following sources of data were used for the hydrologic and hydraulic calculations:

- Soil Conservation Service (SCS) Technical Release No. 20 (TR-20)
- Natural Resources Conservation Service (NRCS) Soil Survey of Norfolk and Suffolk Counties, Massachusetts
- Subsurface Explorations by MP Design Consultants
- NOAA Precipitation Frequency Estimates

2.3 Rainfall Depths

In accordance with MassDEP Stormwater Management Policy and the National Oceanic and Atmospheric Administration (NOAA) Atlas 14, Volume 10, Version 3 the 2-, 10-, 25-, 50- and 100-year, 24-hour storm events were analyzed. Table 1 indicates the rainfall depths used for each storm event, refer to Appendix B – NOAA Rainfall Depths.

Table 1 **Rainfall Depths**

Storm Event	NOAA
2-Year, 24-Hour	3.36"
10-Year, 24-Hour	5.22"
25-Year, 24-Hour	6.39"
50-Year, 24-Hour	7.24"
100-Year, 24-Hour	8.18"

2.4 Soil Conditions

NRCS Soil Survey of Norfolk and Suffolk Counties, Massachusetts indicates that soils onsite consist of the following:

- 260B- Sudbury fine sandy loam, 2-8% slopes
- 602- Urban land, 0-15% slopes

Subsurface exploration consisting of 2 test pits has been performed by Chris Stanton. Based on subsurface explorations, soil conditions at these locations consist of fine sand. The NRCS Web Soil Survey and FORM 11 – Soil Suitability Assessment prepared by Chris Stanton is provided in Appendix C – Subsurface Explorations.

2.5 Existing Stormwater Management

The current project site does not provide any naturally shaped stormwater treatment areas.

2.5.1 Existing Watershed

Under existing conditions, the site is divided into 3 Sub-catchment areas, Drainage Area E-1, Drainage area E-2 and Drainage area E-3 (Refer to Appendix A - Figure 2 Pre-Development).

There are 2 points of analysis from the site:

- Design Point DP-1 – Northern portion of the property that captures stormwater flow from the small area of the driveway small portion of grass area. Flow from this area is conveyed by sheet flow through the grass area to East Central Street.

- Design Point DP-2 – Southern portion of the property that captures stormwater flow from most of the driveway, all the roof area, and most of the grass area. Flow from this area is conveyed by sheet flow through grass and pavement to the public drainage system.

- Design Point DP-3 – Eastern portion of the property that captures stormwater flow from most of the driveway, roof area, and grass area. Flow from this area is conveyed by sheet flow through grass and pavement to the public drainage system.

Drainage Area E-1: Consists of a driveway and grass area. Within the drainage area the lowest elevation is 284 towards the northern portion of the lot and the highest is 285 at the center of the lot surrounding the existing building.

Drainage Area E-2: Consists of the driveway, roof, and grass area. Within the drainage area the lowest elevation is 283 towards the southern portion of the lot near the public right of way and the highest is 285 at the center of the lot surrounding the existing building.

Drainage Area E-3: Consists of the driveway, roof, and grass area. Within the drainage area the lowest elevation is 283 towards the south eastern portion of the lot near the public right of way and the highest is 284 at the north eastern part of the lot surrounding the existing buildings off Lewis Street.

2.6 Proposed Stormwater Management

The proposed project incorporates a stormwater management system that meets the guidelines in the 2008 MassDEP Stormwater Management Policy. Stormwater quality and quantity on the Site will be managed by implementing a series of best management practices (BMPs) that will include. The proposed BMP's are anticipated to remove a minimum of 89 percent of total suspended solids (TSS) from stormwater runoff, maintain the peak flow rates of stormwater runoff, and maintain the recharge rates to groundwater, as described in the MassDEP Stormwater Standards section of this report.

2.6.1 Proposed Watershed

Under proposed conditions, the site is divided into 3 Sub-catchment areas, Drainage Areas P-1, P-2 and P-3 (Refer to Appendix A - Figure 3 Post-Development).

There are 3 points of analysis from the site:

- Design Point DP-1 – Northern portion of the property that captures stormwater flow from the small area of the proposed driveway and grassed area. Flow from the road is conveyed to the subsurface infiltration system.
- Design Point DP-2 – Southern portion of the property that captures stormwater flow from the proposed driveway, roof area and grass area of the west building along with lot frontage grass area. Flow from this area is conveyed to an infiltration system.

- Design Point DP-3 – Eastern portion of the property that captures stormwater flow from the proposed driveway, roof area, and grass area of the east building. Flow from this area is conveyed to an infiltration system.

Drainage Area P-1: Consists of a driveway, sidewalk and grass area. Within the drainage area the only elevation is 285 at the entrance to the proposed project.

Drainage Area P-2: Consists of the proposed driveway, roof and grass area of the western building. Additionally, it includes part of the roof and grassed area of the eastern building. Within the drainage area the lowest elevation is 282 towards the southern portion of the lot by the exit and the highest is 285 at the northeastern side of the lot. Stormwater from this drainage area is directed to deep sump catch basins which directs flows to a deep sump manhole structure which then discharges to an infiltration system.

Drainage Area P-3: Consists of a section of the proposed roof and grass area of the eastern building along with all of the proposed driveway. Within the drainage area the lowest elevation is 283 towards Lewis Street and the highest is 284 towards the front of the proposed building. Stormwater from this drainage area is directed to deep sump catch basins which directs flows to a isolator row which then discharges to an infiltration system.

3 MassDEP Stormwater Management Standards

The ten (10) MassDEP Stormwater Management Standards provided in the Stormwater Management Policy and Massachusetts Wetlands Protection Act relate to the protection of wetlands and water bodies, control of water quantity, recharge to groundwater, water quality and protection of critical areas, erosion/sedimentation control and stormwater maintenance. The MassDEP Checklist for Stormwater Report is provided in Appendix D, and the following sections summarize the Project's compliance with the Stormwater Management Standards.

3.1 Standard 1 – No New Untreated Discharges

The Project complies with Standard 1. No new point source discharges of untreated stormwater to or causing erosion in resource areas are proposed as part of the project.

3.2 Standard 2 – Peak Rate Attenuation

The Project complies with Standard 2. The Project's stormwater management systems are designed so that post-development peak discharge rates do not exceed pre-development discharge rates for the 2-, 10-, 25-, 50- and 100-year, 24-hour storm events, and so that there will not be increased flooding impacts nor to the abutters and public closed drainage system. Refer to Appendix E – Hydrocad Reports for further detailed information.

Table 2 **Comparison of Peak Runoff Rates – Design Point 1**

Storm Event (years)	Peak Runoff (cfs)		
	Pre-Development	Post-Development	Δ
2	0.15	0.08	-0.07
10	0.32	0.15	-0.17
25	0.44	0.19	-0.25
50	0.52	0.22	-0.30
100	0.61	0.26	-0.35

Table 3 **Comparison of Peak Runoff Rates – Design Point 2**

Storm Event (years)	Peak Runoff (cfs)		
	Pre-Development	Post-Development	Δ
2	0.29	0.00	-0.29
10	0.85	0.00	-0.85
25	1.25	0.53	-0.72
50	1.56	1.06	-0.50
100	1.91	1.78	-0.13

Table 4 **Comparison of Peak Runoff Rates – Design Point 3**

Storm Event (years)	Peak Runoff (cfs)		
	Pre-Development	Post-Development	Δ
2	0.22	0.00	-0.22
10	0.53	0.09	-0.44
25	0.74	0.34	-0.40
50	0.90	0.58	-0.32
100	1.08	0.88	-0.20

Table 5 **Comparison of Peak Runoff Volumes – Design Point 1**

Storm Event (years)	Peak Runoff Volume (af)		
	Pre-Development	Post-Development	Δ
2	0.011	0.006	-0.005
10	0.023	0.011	-0.012
25	0.031	0.014	-0.017
50	0.037	0.016	-0.021
100	0.044	0.019	-0.025

Table 6 **Comparison of Peak Runoff Volumes – Design Point 2**

Storm Event (years)	Peak Runoff Volume (af)		
	Pre-Development	Post-Development	Δ
2	0.033	0.00	-0.03
10	0.084	0.000	-0.08
25	0.121	0.018	-0.10
50	0.150	0.038	-0.11
100	0.183	0.061	-0.12

Table 7 **Comparison of Peak Runoff Volumes – Design Point 3**

Storm Event (years)	Peak Runoff Volume (af)		
	Pre-Development	Post-Development	Δ
2	0.017	0.000	-0.02
10	0.038	0.002	-0.04
25	0.053	0.009	-0.04
50	0.064	0.014	-0.05
100	0.077	0.021	-0.06

3.3 Standard 3 – Recharge

The Project complies with Standard 3. The proposed stormwater management system incorporates the use of subsurface infiltration basins to provide the required groundwater recharge. Refer to Appendix F for Recharge Calculations.

3.4 Standard 4 – Water Quality

The Project complies with Standard 4. The incorporation of the described stormwater best management practices (BMPs) will achieve a minimum cumulative Total Suspended Solids (TSS) removal rate of 89%, refer to Appendix I – TSS Removal Calculations. Refer to Appendix H for Water Quality Calculations and Appendix J for a copy of the Long-Term Pollution Prevention and Stormwater Operation & Maintenance Plan.

3.5 Standard 5 – Land Uses with Higher Potential Pollutant Loads

Standard 5 is not applicable to the Project. The Project is not considered a Land Use with Higher Potential for Pollutant Loads (LUHPPL) as defined in the Massachusetts Stormwater Handbook.

3.6 Standard 6 – Critical Areas

The project complies with Standard 6. The Project does discharge stormwater within the Zone II in overflow scenarios and the project discharges to a Water Resource District. The infiltration system BMP has been designed to provide a minimum of 89% TSS removal prior to infiltration.

3.7 Standard 7 – Redevelopment Projects

Standard 7 is not applicable to the Project. The Project does not qualify as a redevelopment project or other project subject to the Standards only to the maximum extent practicable.

3.8 Standard 8 – Construction Period Pollution Prevention and Erosion and Sedimentation Control

The project complies with Standard 8. The Project will not result in the disturbance of greater than one (1) acre of land and will have minimum land disturbance impact. An erosion and sediment control plan has been incorporated into the site plan.

3.9 Standard 9 – Operations and Maintenance Plan

The Project complies with Standard 9. An Operations and Maintenance Plan to be implemented by the owner and its staff to ensure that stormwater management systems function as designed is provided in Appendix J.

3.10 Standard 10 – Prohibition of Illicit Discharges

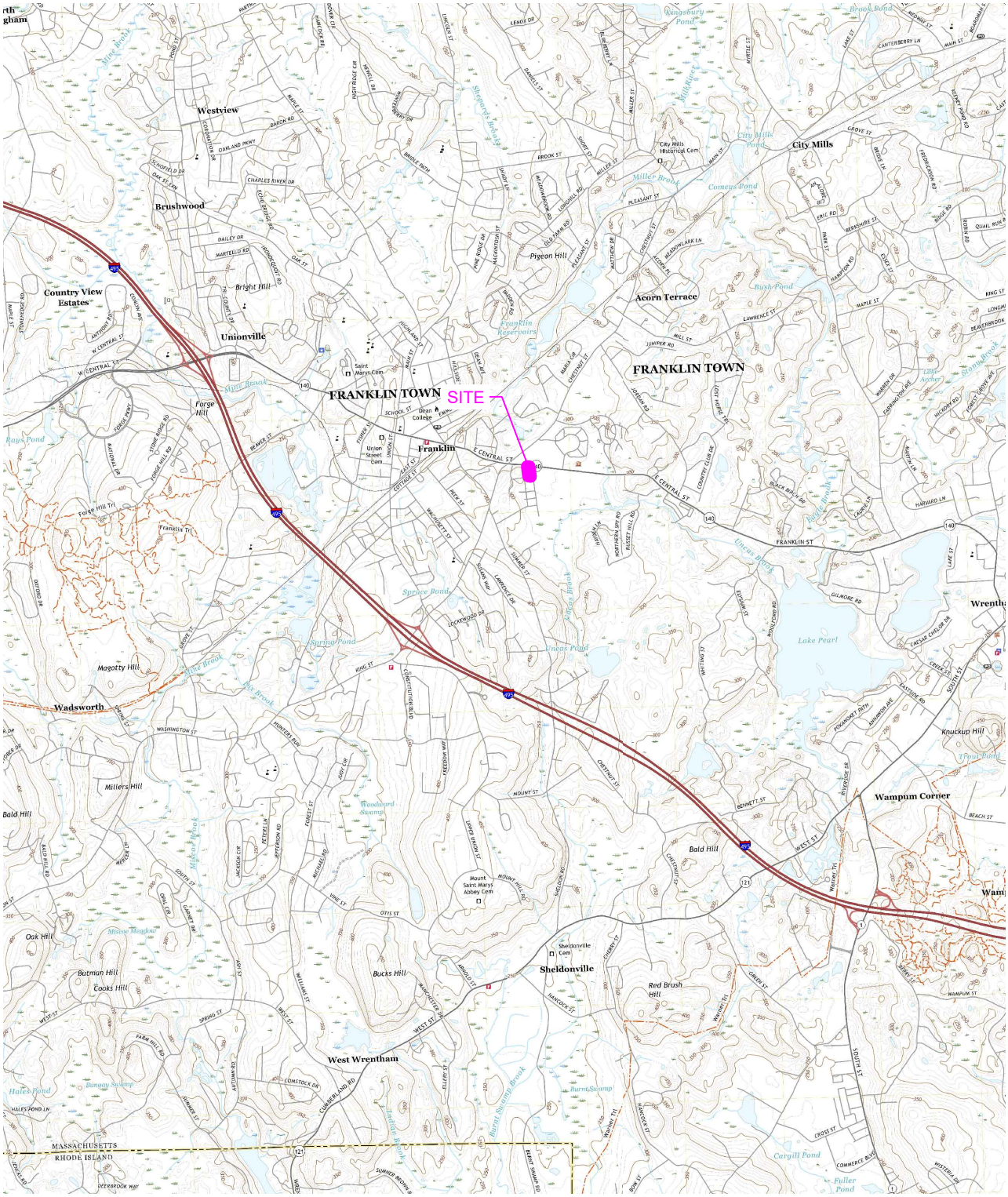
The Project complies with Standard 10. There are no known or designed illicit discharges on the project site. An Illicit Discharge Compliance Statement is provided in Appendix K.

4 Conclusion

The Stormwater Management Plan addresses both the quantity and quality of stormwater runoff from the Project Site and conforms to the ten (10) MassDEP Stormwater Management Standards and City of Franklin Stormwater Regulations. The Project will not have a negative impact on the surrounding areas, will be constructed in compliance with the Watershed Protection District, and will install stormwater BMPs to mitigate peak runoff rates while providing adequate recharge and treatment of stormwater runoff.

APPENDIX A

Figures



MP DESIGN CONSULTANTS
DESIGNING AND MANAGING YOUR DREAM

118 Turnpike Road, Suite 200
Southborough, MA 01772
contact@mpdconsultants.com

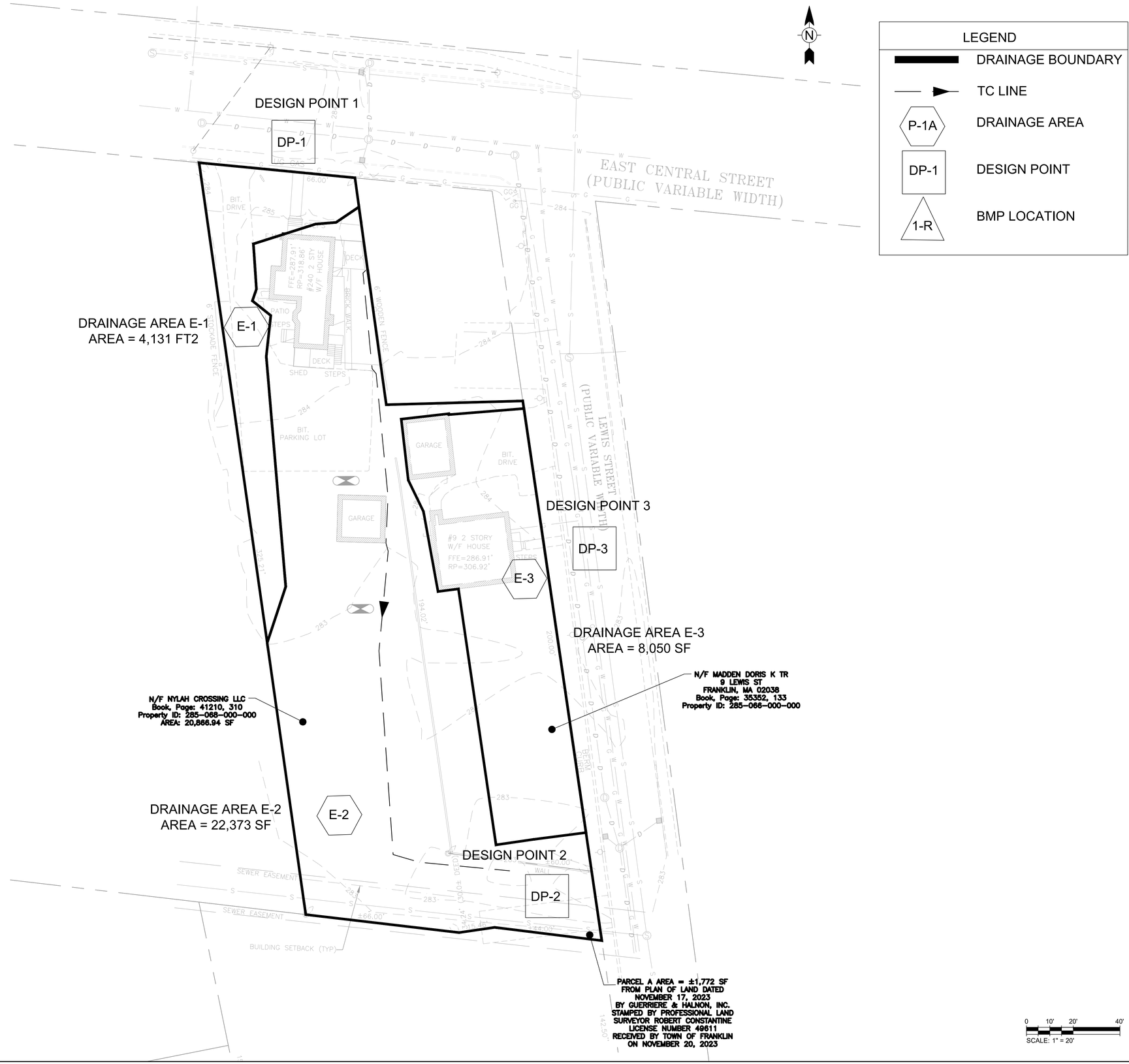
NYLAH CROSSING LLC

240 EAST CENTRAL STREET
FRANKLIN, MASSACHUSETTS

SITE LOCUS MAP

PROJ:	23004-002
DATE:	12/12/2023
DESN:	CMS

Figure 1



LEGEND

- DRAINAGE BOUNDARY
- TC LINE
- P-1A — DRAINAGE AREA
- DP-1 — DESIGN POINT
- 1-R — BMP LOCATION

MP DESIGN CONSULTANTS
DESIGNING AND MANAGING YOUR DREAM

118 TURNPIKE ROAD, SUITE 200
SOUTHBOROUGH, MA 01772

CONTACT@MPDCONSULTANTS.COM

REVISIONS

No.	DATE	DESCRIPTION

PROJECT

NYLAH CROSSING LLC

240 EAST CENTRAL STREET
FRANKLIN, MASSACHUSETTS 02038

PROPERTY OWNER:

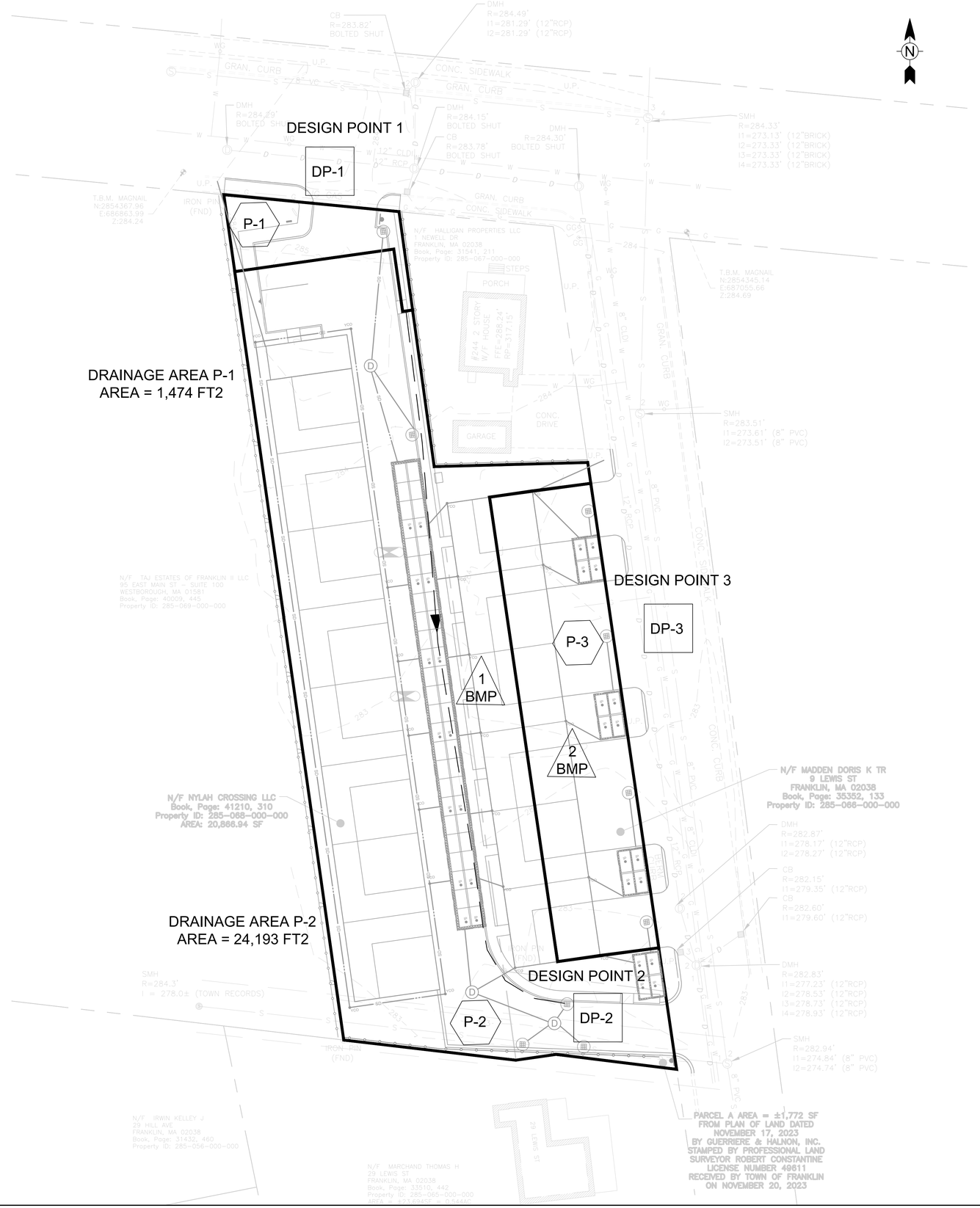
NYLAH CROSSING LLC
95 EAST MAIN STREET, SUITE 100
WESTBOROUGH, MASSACHUSETTS 01581

SHEET TITLE

PRE-DEVELOPMENT

SCALE:	1" = 20'
DATE:	08/18/2023
DRAWN BY:	CMS
CHECKED BY:	JG
FILE:	NYLAHCROSS.dwg

Figure 2



MP DESIGN CONSULTANTS
DESIGNING AND MANAGING YOUR DREAM

118 TURNPIKE ROAD, SUITE 200
SOUTHBOROUGH, MA 01772

CONTACT@MPDCONSULTANTS.COM

REVISIONS

No.	DATE	DESCRIPTION

PROJECT

NYLAH CROSSING LLC

240 EAST CENTRAL STREET
FRANKLIN, MASSACHUSETTS 02038

PROPERTY OWNER:

NYLAH CROSSING LLC
95 EAST MAIN STREET, SUITE 100
WESTBOROUGH, MASSACHUSETTS 01581

SHEET TITLE

POST-DEVELOPMENT

SCALE:	1" = 20'
DATE:	03/13/2024
DRAWN BY:	CMS
CHECKED BY:	JG
FILE:	NYLAHCROSS.dwg

Figure 3

APPENDIX B

NOAA Rainfall Depths

NOAA Atlas 14, Volume 10, Version 3
Location name: Franklin, Massachusetts, USA*
Latitude: 42.0802°, Longitude: -71.3867°
Elevation: m/ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.322 (0.252-0.406)	0.392 (0.307-0.495)	0.506 (0.395-0.643)	0.601 (0.467-0.768)	0.732 (0.549-0.977)	0.830 (0.610-1.13)	0.933 (0.665-1.32)	1.05 (0.707-1.52)	1.21 (0.784-1.82)	1.34 (0.849-2.07)
10-min	0.456 (0.357-0.575)	0.555 (0.435-0.701)	0.717 (0.560-0.909)	0.852 (0.661-1.09)	1.04 (0.778-1.38)	1.18 (0.864-1.60)	1.32 (0.942-1.88)	1.48 (1.00-2.16)	1.71 (1.11-2.58)	1.90 (1.20-2.93)
15-min	0.536 (0.420-0.677)	0.653 (0.511-0.825)	0.844 (0.659-1.07)	1.00 (0.778-1.28)	1.22 (0.915-1.63)	1.38 (1.02-1.89)	1.56 (1.11-2.21)	1.75 (1.18-2.54)	2.02 (1.31-3.04)	2.24 (1.41-3.44)
30-min	0.735 (0.576-0.927)	0.895 (0.701-1.13)	1.16 (0.903-1.47)	1.37 (1.07-1.75)	1.67 (1.26-2.24)	1.90 (1.40-2.59)	2.14 (1.52-3.03)	2.40 (1.62-3.49)	2.77 (1.80-4.18)	3.07 (1.94-4.73)
60-min	0.934 (0.732-1.18)	1.14 (0.891-1.44)	1.47 (1.15-1.87)	1.75 (1.36-2.23)	2.13 (1.60-2.84)	2.42 (1.77-3.30)	2.72 (1.93-3.85)	3.05 (2.06-4.44)	3.52 (2.28-5.31)	3.91 (2.47-6.02)
2-hr	1.20 (0.945-1.50)	1.47 (1.16-1.84)	1.92 (1.51-2.42)	2.30 (1.80-2.91)	2.81 (2.13-3.74)	3.19 (2.37-4.36)	3.60 (2.61-5.14)	4.10 (2.77-5.92)	4.84 (3.15-7.26)	5.48 (3.48-8.38)
3-hr	1.38 (1.10-1.73)	1.71 (1.35-2.13)	2.24 (1.77-2.80)	2.67 (2.10-3.37)	3.28 (2.49-4.36)	3.72 (2.78-5.07)	4.21 (3.06-6.00)	4.80 (3.26-6.92)	5.72 (3.73-8.54)	6.51 (4.14-9.92)
6-hr	1.79 (1.43-2.21)	2.20 (1.76-2.72)	2.87 (2.28-3.56)	3.42 (2.70-4.28)	4.18 (3.21-5.52)	4.75 (3.57-6.43)	5.36 (3.93-7.60)	6.13 (4.17-8.76)	7.31 (4.78-10.8)	8.34 (5.32-12.6)
12-hr	2.29 (1.84-2.81)	2.79 (2.24-3.43)	3.61 (2.89-4.46)	4.29 (3.42-5.33)	5.23 (4.03-6.84)	5.92 (4.47-7.94)	6.67 (4.90-9.36)	7.59 (5.20-10.8)	9.00 (5.91-13.2)	10.2 (6.54-15.3)
24-hr	2.74 (2.23-3.34)	3.36 (2.73-4.10)	4.38 (3.54-5.37)	5.22 (4.19-6.44)	6.39 (4.96-8.30)	7.24 (5.51-9.65)	8.18 (6.05-11.4)	9.33 (6.41-13.1)	11.1 (7.31-16.2)	12.6 (8.12-18.8)
2-day	3.09 (2.53-3.74)	3.86 (3.15-4.67)	5.11 (4.16-6.21)	6.15 (4.97-7.52)	7.58 (5.94-9.81)	8.63 (6.62-11.5)	9.79 (7.32-13.6)	11.3 (7.77-15.8)	13.6 (8.98-19.7)	15.6 (10.1-23.2)
3-day	3.36 (2.76-4.05)	4.19 (3.44-5.05)	5.54 (4.53-6.70)	6.66 (5.41-8.10)	8.20 (6.44-10.6)	9.32 (7.18-12.3)	10.6 (7.93-14.7)	12.2 (8.41-16.9)	14.7 (9.72-21.2)	16.9 (10.9-24.9)
4-day	3.63 (2.99-4.36)	4.48 (3.69-5.39)	5.88 (4.82-7.10)	7.04 (5.74-8.54)	8.64 (6.81-11.1)	9.81 (7.57-12.9)	11.1 (8.33-15.3)	12.7 (8.82-17.7)	15.3 (10.2-22.0)	17.6 (11.4-25.8)
7-day	4.38 (3.63-5.22)	5.28 (4.38-6.31)	6.76 (5.58-8.10)	7.99 (6.55-9.63)	9.68 (7.66-12.3)	10.9 (8.45-14.2)	12.3 (9.21-16.7)	13.9 (9.71-19.2)	16.5 (11.0-23.6)	18.7 (12.1-27.3)
10-day	5.08 (4.24-6.04)	6.02 (5.01-7.16)	7.55 (6.26-9.01)	8.82 (7.26-10.6)	10.6 (8.38-13.3)	11.9 (9.18-15.3)	13.3 (9.93-17.9)	14.9 (10.4-20.5)	17.4 (11.6-24.7)	19.5 (12.6-28.3)
20-day	7.17 (6.02-8.45)	8.17 (6.85-9.64)	9.81 (8.19-11.6)	11.2 (9.26-13.3)	13.0 (10.4-16.2)	14.5 (11.2-18.4)	15.9 (11.9-21.0)	17.5 (12.3-23.8)	19.8 (13.3-27.9)	21.6 (14.0-31.1)
30-day	8.91 (7.52-10.4)	9.95 (8.39-11.7)	11.7 (9.79-13.8)	13.1 (10.9-15.5)	15.0 (12.0-18.5)	16.5 (12.9-20.8)	18.1 (13.4-23.5)	19.6 (13.8-26.5)	21.7 (14.6-30.4)	23.3 (15.2-33.4)
45-day	11.1 (9.40-12.9)	12.2 (10.3-14.2)	14.0 (11.8-16.4)	15.5 (13.0-18.3)	17.5 (14.0-21.5)	19.1 (14.9-23.9)	20.7 (15.4-26.7)	22.2 (15.7-29.8)	24.1 (16.3-33.6)	25.4 (16.6-36.3)
60-day	12.9 (11.0-15.0)	14.1 (11.9-16.4)	15.9 (13.5-18.6)	17.5 (14.7-20.6)	19.6 (15.8-23.9)	21.3 (16.6-26.5)	22.9 (17.0-29.3)	24.4 (17.3-32.6)	26.1 (17.7-36.2)	27.2 (17.8-38.8)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

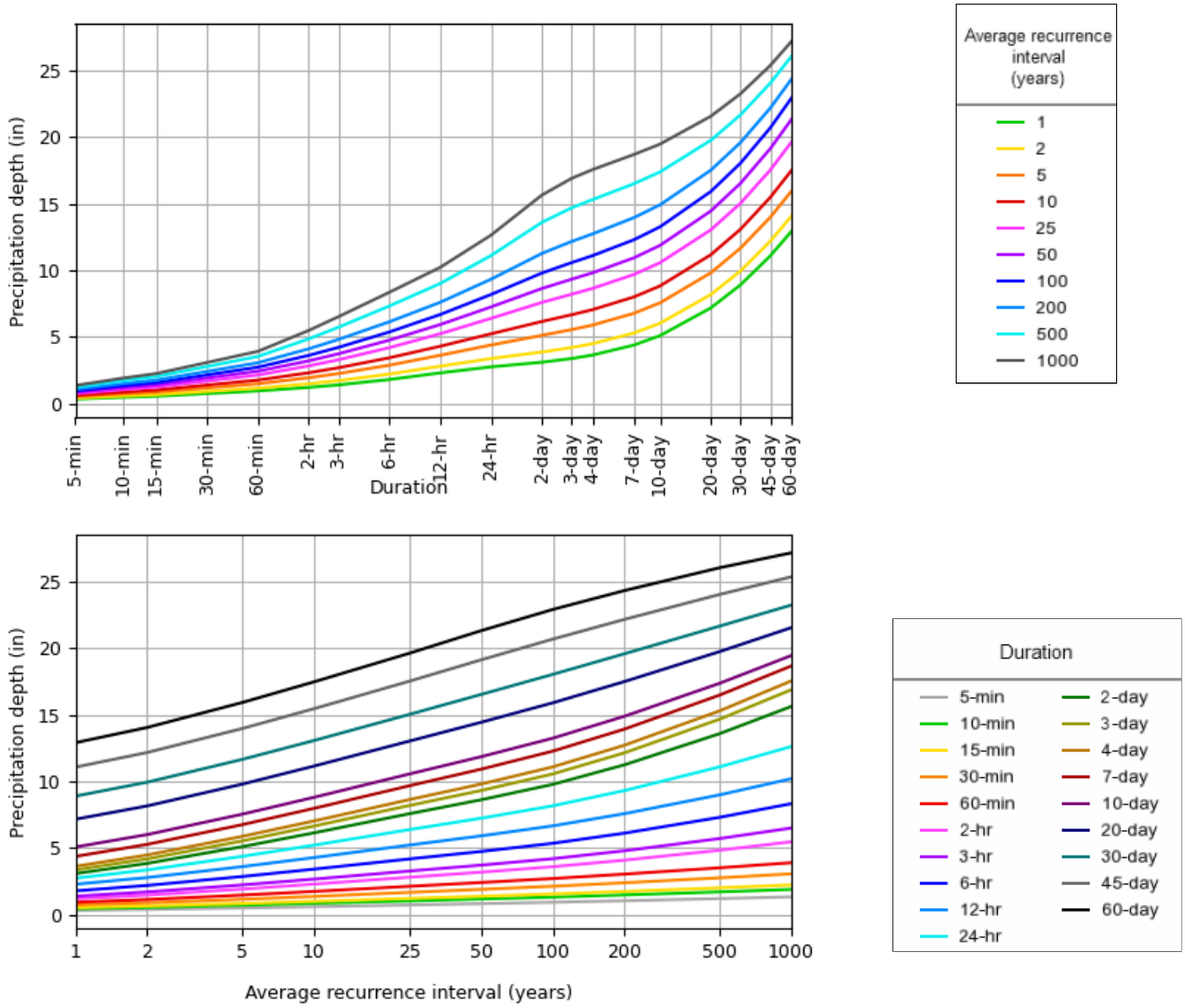
Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

Back to Top

PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.0802°, Longitude: -71.3867°



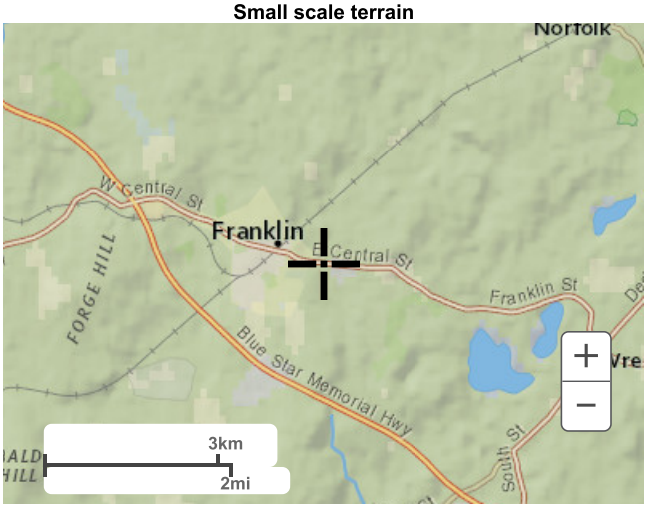
NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Tue Jan 9 03:14:05 2024

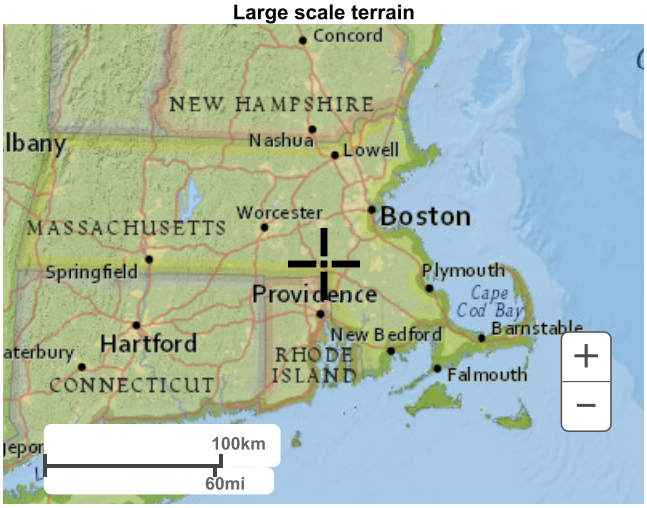
Back to Top

Maps & aerials

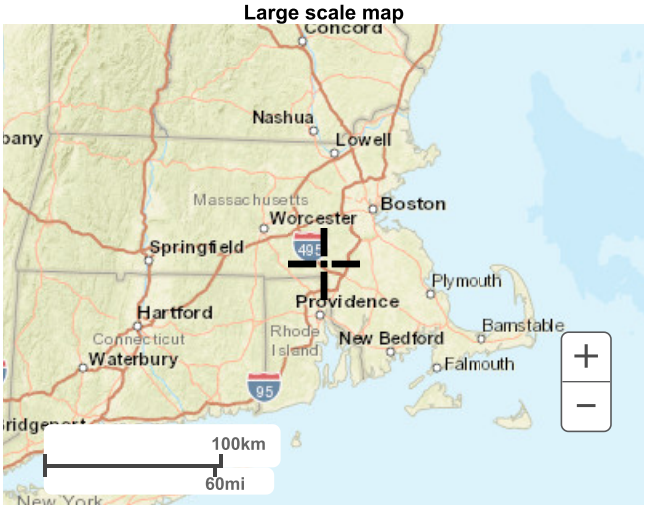
Small scale terrain



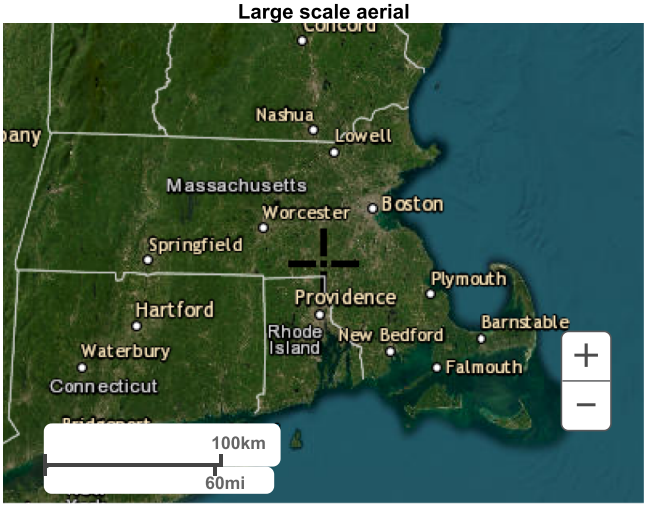
Large scale terrain



Large scale map



Large scale aerial



Back to Top

US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

APPENDIX C

Subsurface Exploration Data

Commonwealth of Massachusetts
City/Town of

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

A. Facility Information

NYLAH CROSSING LLC
Owner Name

240 East Central Street
Street Address

assessors map 285 - lot 068
Map/Lot #

Franklin
City

MA
State

02038
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☑ Yes ☐ No If yes: USGS (Source) ____ (Soil Map Unit)

Sudbury fine sandy loam, 2 to 8 percent slopes
Soil Name

none
Soil Limitations

Friable coarse-loamy eolian deposits over loose sandy glaciofluvial deposits
Soil Parent material

Outwash plains
Landform

3. Surficial Geological Report Available? ☐ Yes ☐ No If yes: ____ (Year Published/Source) ____ (Map Unit)

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☑ No

5. Within a velocity zone? ☐ Yes ☑ No

6. Within a Mapped Wetland Area? ☐ Yes ☑ No If yes, MassGIS Wetland Data Layer: ____ (Wetland Type)

7. Current Water Resource Conditions (USGS): ____ (Month/Day/ Year) Range: ☐ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed:

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: 1 (Hole #) | 08/01/2023 (Date) | 10:00 AM (Time) | Sunny 75 degrees (Weather) | 42.08025 (Latitude) | -71.38712 (Longitude:)

1. Land Use: Residential lot (e.g., woodland, agricultural field, vacant lot, etc.) | None (Vegetation) | None (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-5% (Slope (%))

Description of Location: Existing Residential Lot, flat site with treeline along outer perimeter

2. Soil Parent Material: Friable coarse-loamy eolian deposits over loose sandy glaciofluvial deposits | Outwash plains (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body NA feet | Drainage Way NA feet | Wetlands NA feet | Property Line 50 feet | Drinking Water Well NA feet | Other NA 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 Weeping from Pit _____ Depth 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			
0-4	A	LS	10YR3/3						massive	loose	
4-18	B	LS	7.5Y 5/4						massive	loose	
18-96	C1	FS	10YR 5/1					10%	granular	v. friable	

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: 2 (Hole #) | 08/01/2023 (Date) | 10:00AM (Time) | Sunny 75 degrees (Weather) | 42.08025 (Latitude) | -71.38712 (Longitude:)

1. Land Use: Residential Lot (e.g., woodland, agricultural field, vacant lot, etc.) | None (Vegetation) | None (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-5% (Slope (%))

Description of Location: Existing residential lot, flat, treeline along outer perimeter

2. Soil Parent Material: Friable coarse-loamy eolian deposits over loose sandy glaciofluvial deposits | Outwash plains (Landform) | BS (Position on Landscape (SU, SH, BS, FS, TS))

3. Distances from: Open Water Body NA feet | Drainage Way NA feet | Wetlands NA feet | Property Line 50 feet | Drinking Water Well NA feet | Other NA feet

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

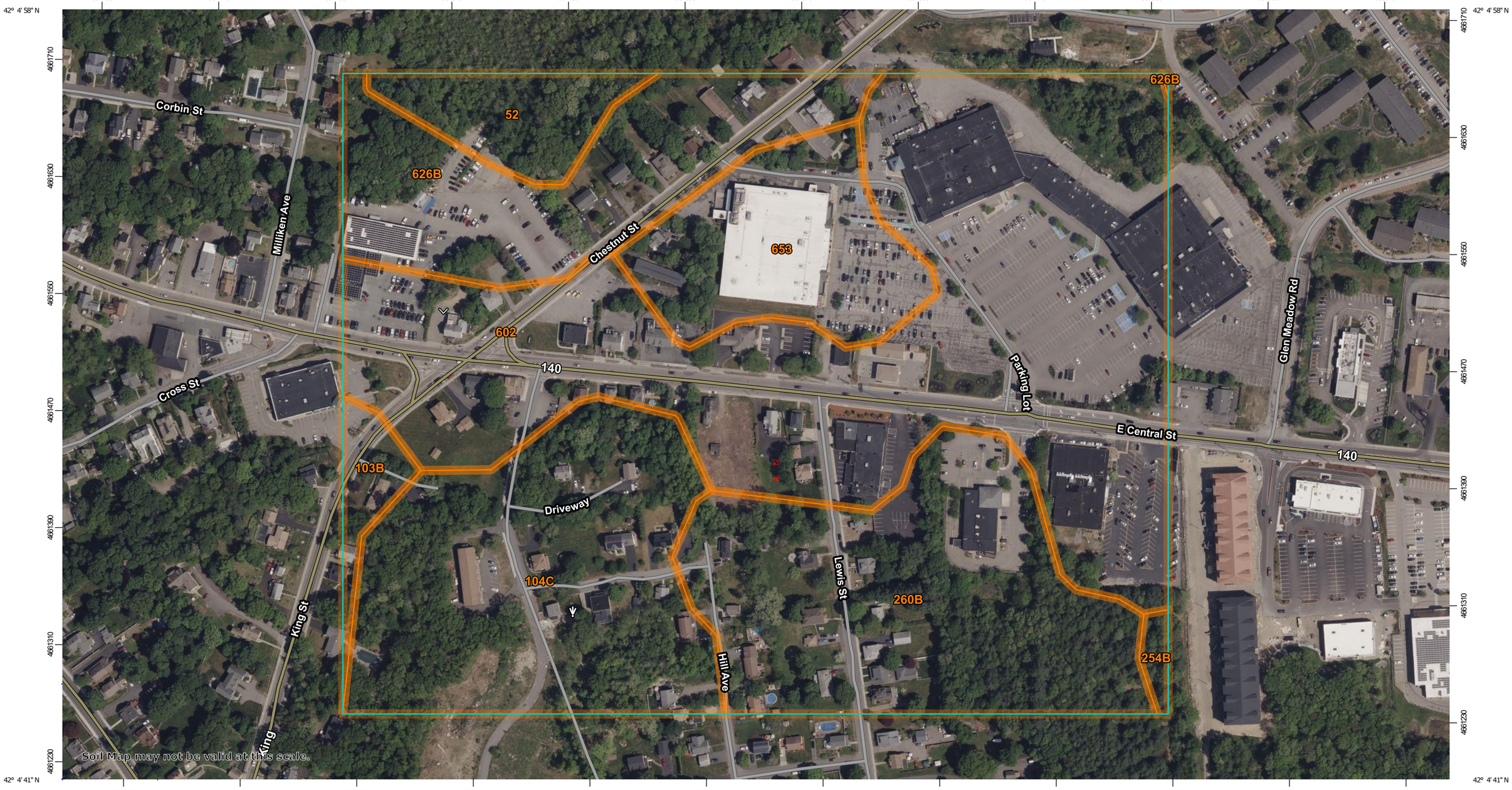
5. Groundwater Observed: ☐ Yes ☑ No If yes: _____ Depth Weeping from Pit _____ Depth Standing Water in Hole

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			
0-4	A	LS	10YR3/3						massive	loose	
4-36	B	LS	7.5Y 5/4						massive	loose	
36-96	C1	FS	10YR 5/1					10%	granular	v. friable	

Additional Notes:

Soil Map—Norfolk and Suffolk Counties, Massachusetts



Map Scale: 1:2,560 if printed on B landscape (17" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:25,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 18, Sep 9, 2022

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

Date(s) aerial images were photographed: May 22, 2022—Jun 5, 2022

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
52	Freetown muck, 0 to 1 percent slopes	2.2	3.5%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	1.0	1.6%
104C	Hollis-Rock outcrop-Charlton complex, 0 to 15 percent slopes	10.7	17.5%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	0.3	0.4%
260B	Sudbury fine sandy loam, 2 to 8 percent slopes	10.9	17.8%
602	Urban land, 0 to 15 percent slopes	24.2	39.4%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	7.0	11.5%
653	Udorthents, sandy	5.1	8.3%
Totals for Area of Interest		**61.4**	**100.0%**

APPENDIX D

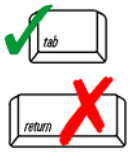
MassDEP Checklist for Stormwater Report

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.

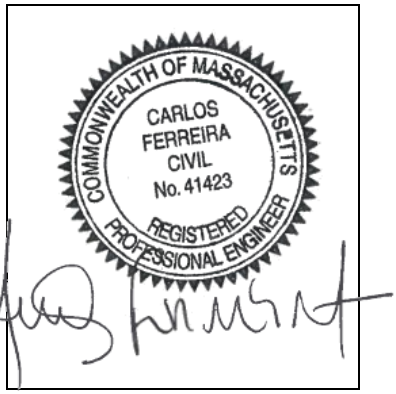
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



12/12/2023

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): Infiltration Chamber

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

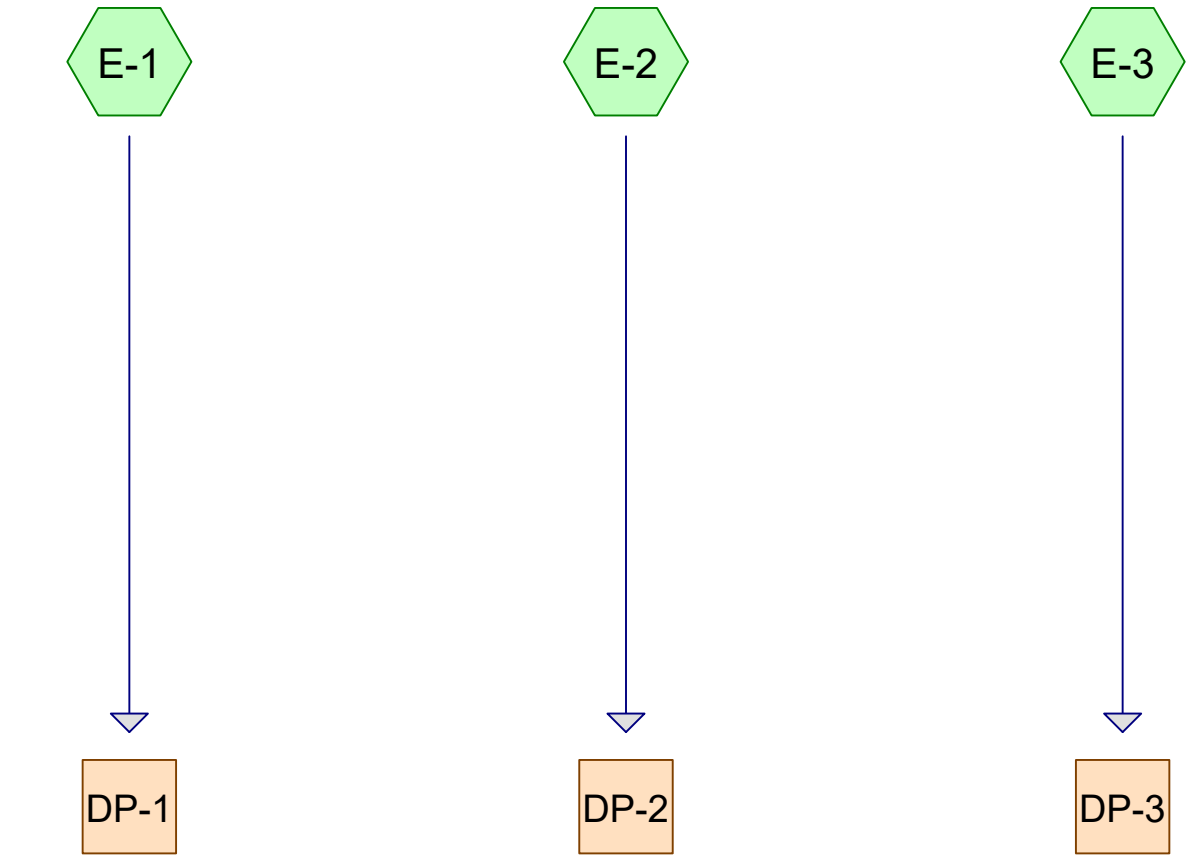
☐ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ 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.

APPENDIX E

HydroCAD Reports



Subcat Reach Pond Link

Routing Diagram for Franklin 240 East Central St Existing
Prepared by MP Design Consultants, Printed 3/13/2024

Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.36	2
2	10-Year	Type III 24-hr		Default	24.00	1	5.22	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.39	2
4	50-Year	Type III 24-hr		Default	24.00	1	7.24	2
5	100-Year	Type III 24-hr		Default	24.00	1	8.18	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.600	61	>75% Grass cover, Good, HSG B (E-1, E-2, E-3)
0.115	98	Paved parking, HSG B (E-1, E-2, E-3)
0.078	98	Roofs, HSG B (E-2, E-3)
0.794	**70**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.794	HSG B	E-1, E-2, E-3
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.794		**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
0.000	0.600	0.000	0.000	0.000	0.600	>75% Grass cover, Good	E-1, E-2, E-3
0.000	0.115	0.000	0.000	0.000	0.115	Paved parking	E-1, E-2, E-3
0.000	0.078	0.000	0.000	0.000	0.078	Roofs	E-2, E-3
0.000	**0.794**	**0.000**	**0.000**	**0.000**	**0.794**	**TOTAL AREA**	

Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE-1: Runoff Area=4,143 sf 44.61% Impervious Runoff Depth=1.39"
Tc=6.0 min CN=78 Runoff=0.15 cfs 0.011 af

SubcatchmentE-2: Runoff Area=22,373 sf 17.30% Impervious Runoff Depth=0.77"
Flow Length=279' Tc=15.7 min CN=67 Runoff=0.29 cfs 0.033 af

SubcatchmentE-3: Runoff Area=8,050 sf 33.71% Impervious Runoff Depth=1.09"
Tc=6.0 min CN=73 Runoff=0.22 cfs 0.017 af

Reach DP-1: Design Point 1 Inflow=0.15 cfs 0.011 af
Outflow=0.15 cfs 0.011 af

Reach DP-2: Design Point 2 Inflow=0.29 cfs 0.033 af
Outflow=0.29 cfs 0.033 af

Reach DP-3: Design Point 3 Inflow=0.22 cfs 0.017 af
Outflow=0.22 cfs 0.017 af

Total Runoff Area = 0.794 ac Runoff Volume = 0.061 af Average Runoff Depth = 0.92"
75.60% Pervious = 0.600 ac 24.40% Impervious = 0.194 ac

Summary for Subcatchment E-1:

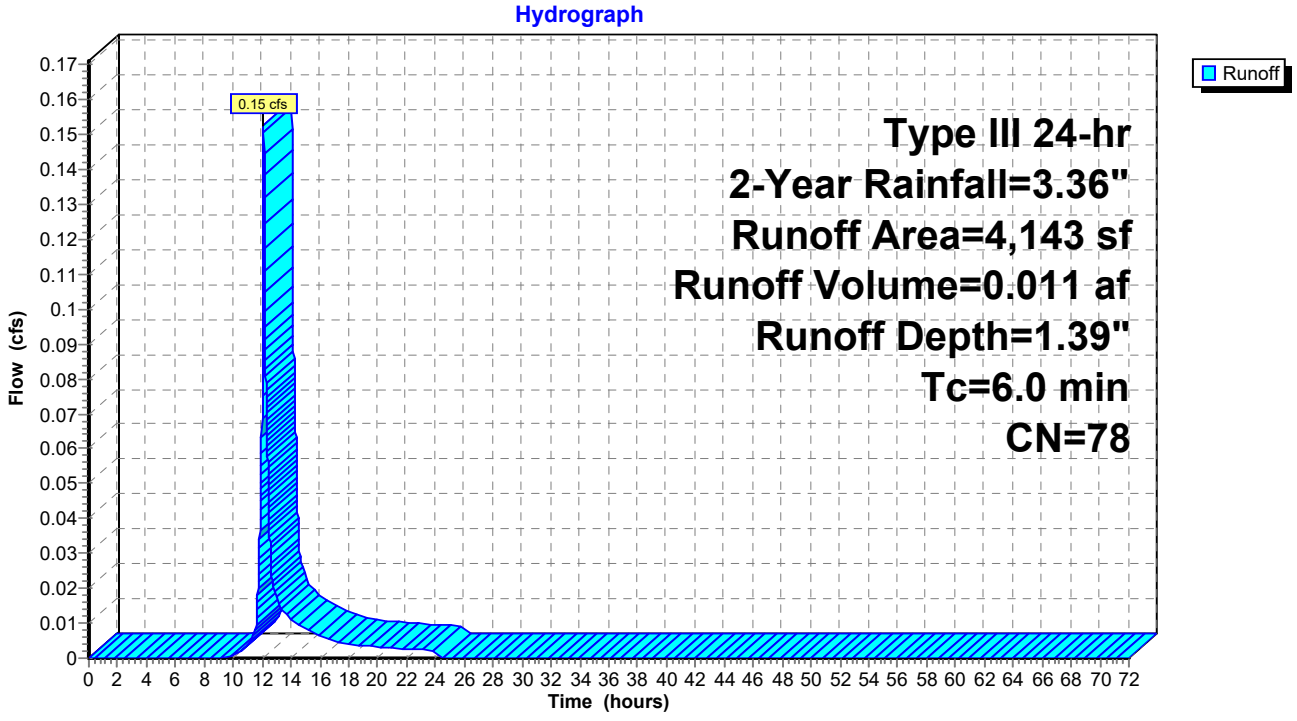
Runoff = 0.15 cfs @ 12.09 hrs, Volume= 0.011 af, Depth= 1.39"
Routed to Reach DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
1,848	98	Paved parking, HSG B
2,295	61	>75% Grass cover, Good, HSG B
4,143	78	Weighted Average
2,295		55.39% Pervious Area
1,848		44.61% Impervious Area

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

Subcatchment E-1:



Summary for Subcatchment E-2:

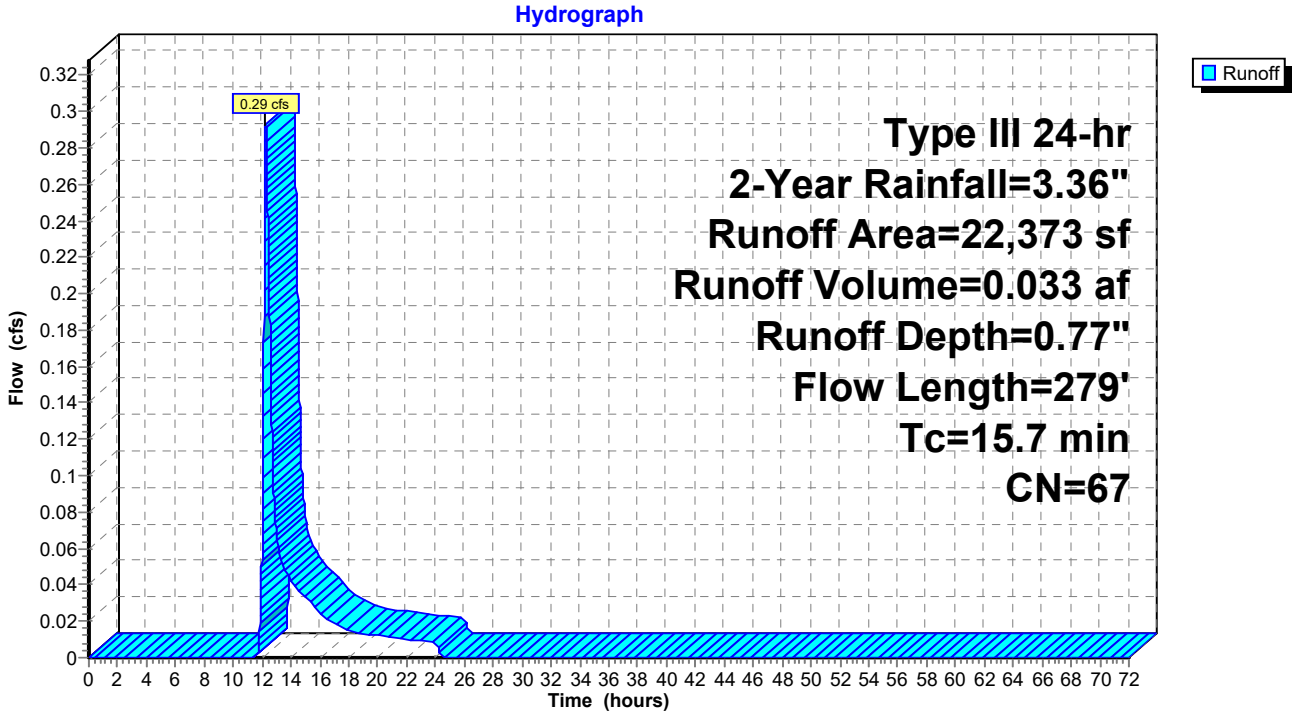
Runoff = 0.29 cfs @ 12.25 hrs, Volume= 0.033 af, Depth= 0.77"
Routed to Reach DP-2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
18,502	61	>75% Grass cover, Good, HSG B
2,057	98	Paved parking, HSG B
1,814	98	Roofs, HSG B
22,373	67	Weighted Average
18,502		82.70% Pervious Area
3,871		17.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.6	179	0.0060	1.16		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.7	279	Total			

Subcatchment E-2:



Summary for Subcatchment E-3:

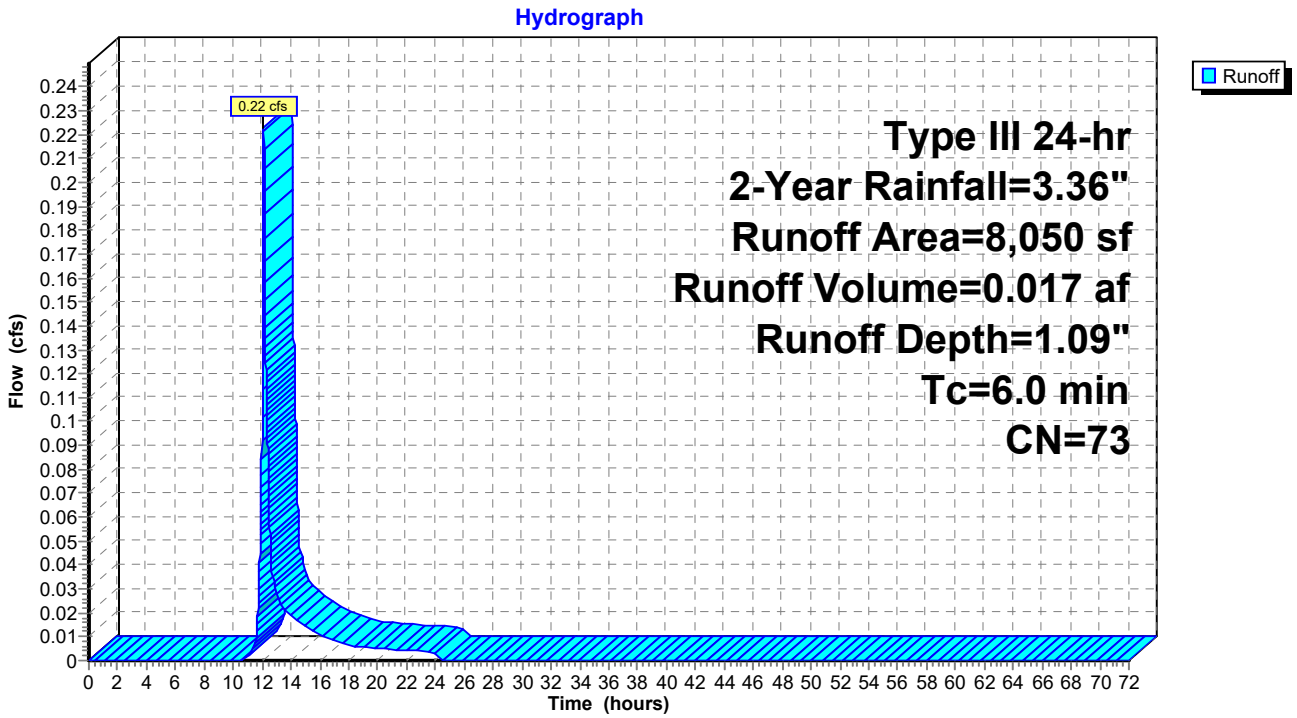
Runoff = 0.22 cfs @ 12.10 hrs, Volume= 0.017 af, Depth= 1.09"
Routed to Reach DP-3 : Design Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
5,336	61	>75% Grass cover, Good, HSG B
1,122	98	Paved parking, HSG B
1,592	98	Roofs, HSG B
8,050	73	Weighted Average
5,336		66.29% Pervious Area
2,714		33.71% Impervious Area

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

Subcatchment E-3:



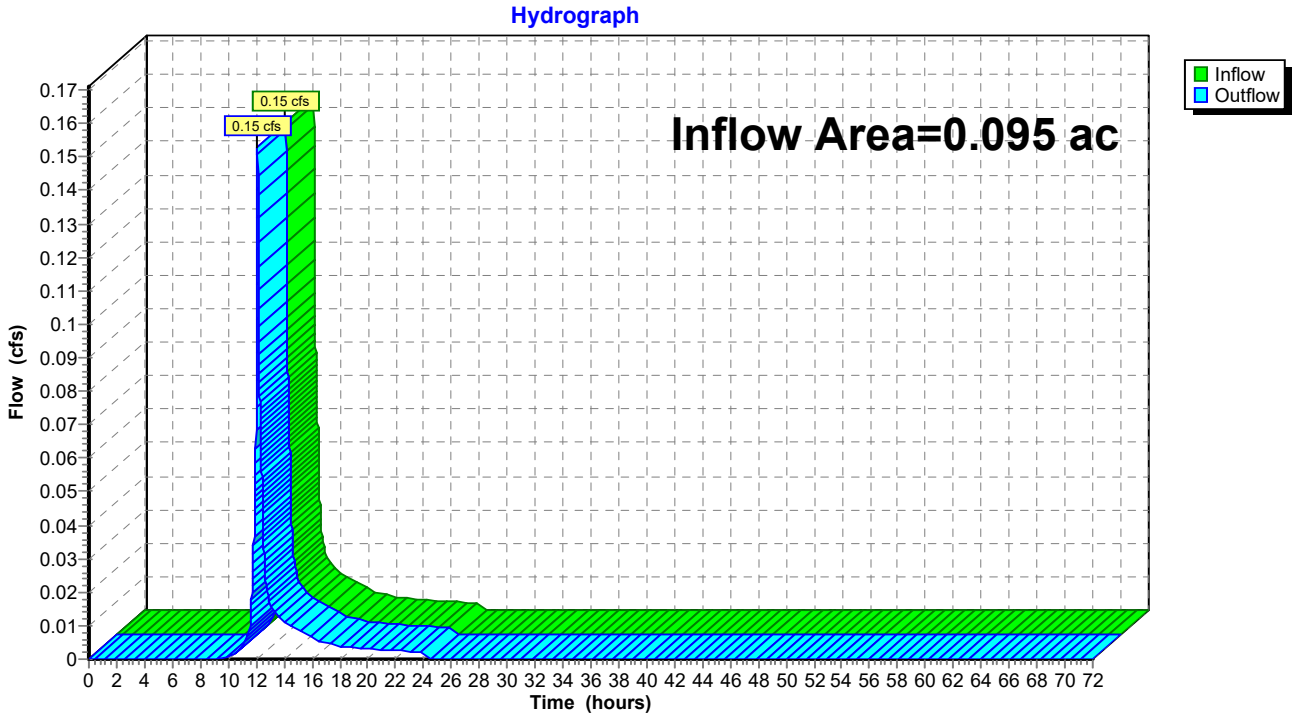
Summary for Reach DP-1: Design Point 1

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

Inflow Area = 0.095 ac, 44.61% Impervious, Inflow Depth = 1.39" for 2-Year event
Inflow = 0.15 cfs @ 12.09 hrs, Volume= 0.011 af
Outflow = 0.15 cfs @ 12.09 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-1: Design Point 1



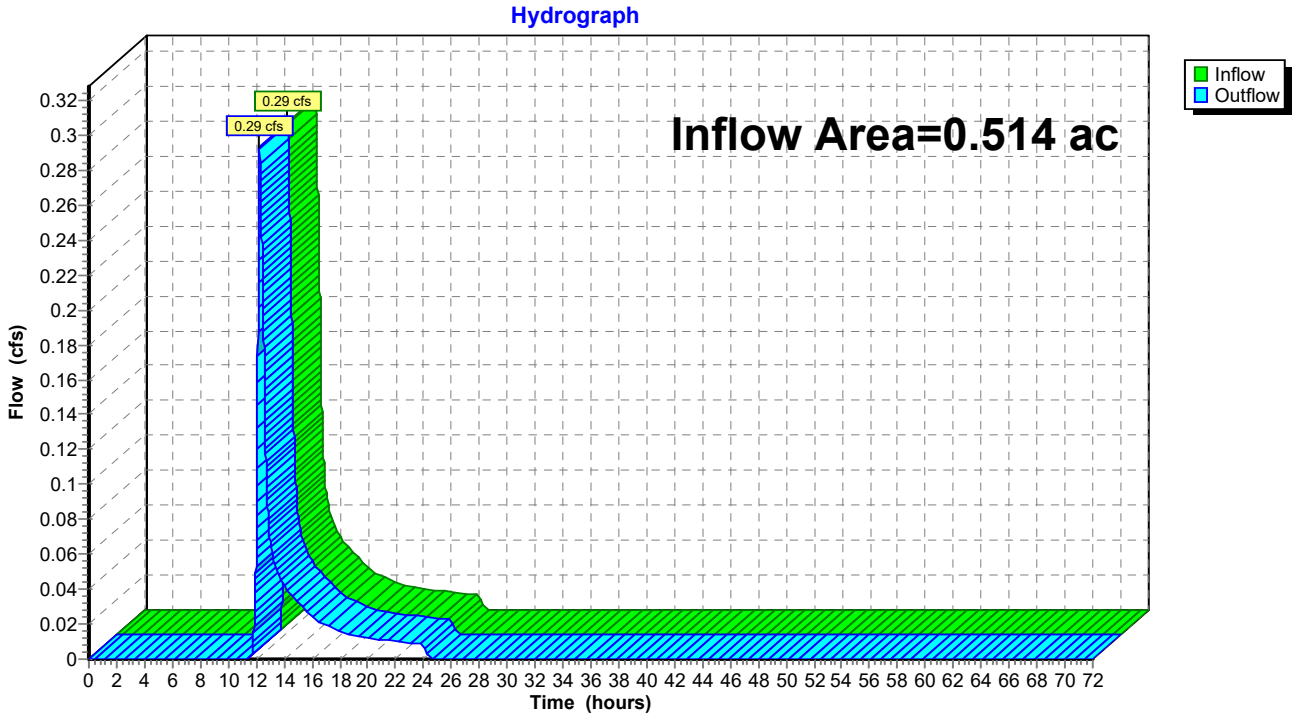
Summary for Reach DP-2: Design Point 2

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

Inflow Area = 0.514 ac, 17.30% Impervious, Inflow Depth = 0.77" for 2-Year event
Inflow = 0.29 cfs @ 12.25 hrs, Volume= 0.033 af
Outflow = 0.29 cfs @ 12.25 hrs, Volume= 0.033 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-2: Design Point 2



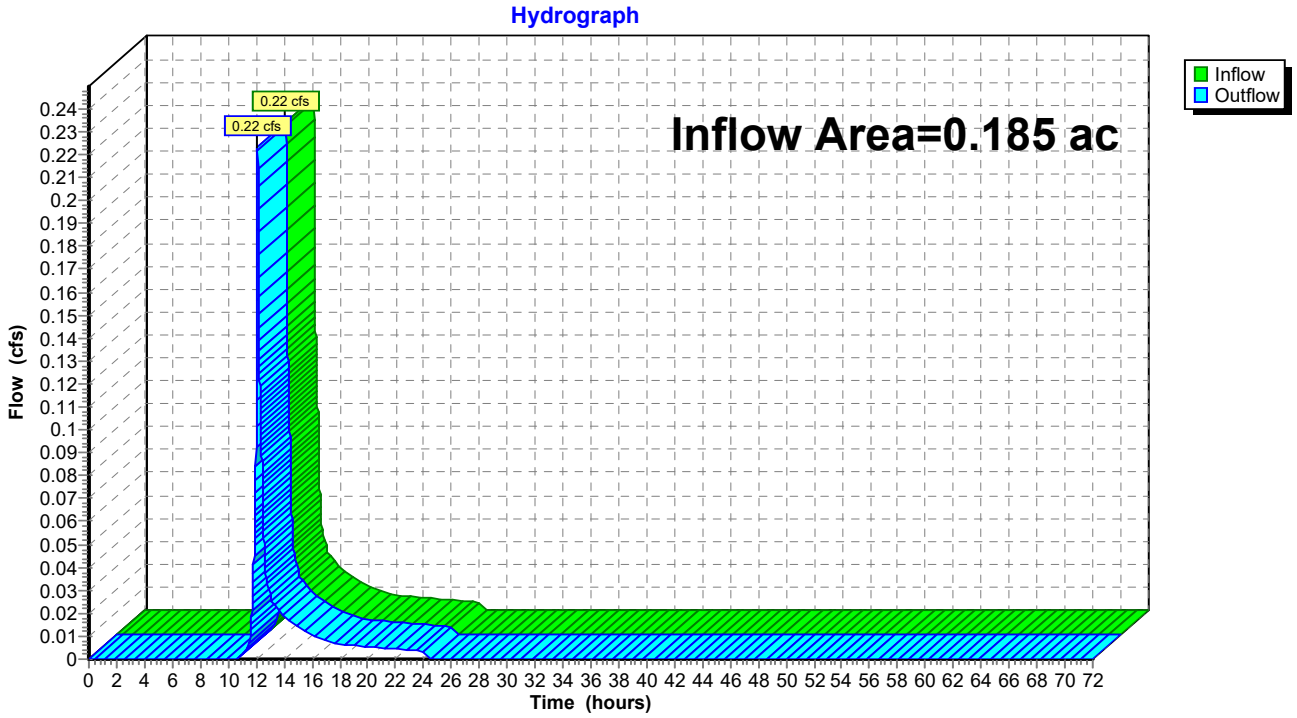
Summary for Reach DP-3: Design Point 3

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

Inflow Area = 0.185 ac, 33.71% Impervious, Inflow Depth = 1.09" for 2-Year event
Inflow = 0.22 cfs @ 12.10 hrs, Volume= 0.017 af
Outflow = 0.22 cfs @ 12.10 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-3: Design Point 3



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: Runoff Area=4,143 sf 44.61% Impervious Runoff Depth=2.90"
Tc=6.0 min CN=78 Runoff=0.32 cfs 0.023 af

Subcatchment E-2: Runoff Area=22,373 sf 17.30% Impervious Runoff Depth=1.96"
Flow Length=279' Tc=15.7 min CN=67 Runoff=0.85 cfs 0.084 af

Subcatchment E-3: Runoff Area=8,050 sf 33.71% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=73 Runoff=0.53 cfs 0.038 af

Reach DP-1: Design Point 1 Inflow=0.32 cfs 0.023 af
Outflow=0.32 cfs 0.023 af

Reach DP-2: Design Point 2 Inflow=0.85 cfs 0.084 af
Outflow=0.85 cfs 0.084 af

Reach DP-3: Design Point 3 Inflow=0.53 cfs 0.038 af
Outflow=0.53 cfs 0.038 af

Total Runoff Area = 0.794 ac Runoff Volume = 0.145 af Average Runoff Depth = 2.19"
75.60% Pervious = 0.600 ac 24.40% Impervious = 0.194 ac

Summary for Subcatchment E-1:

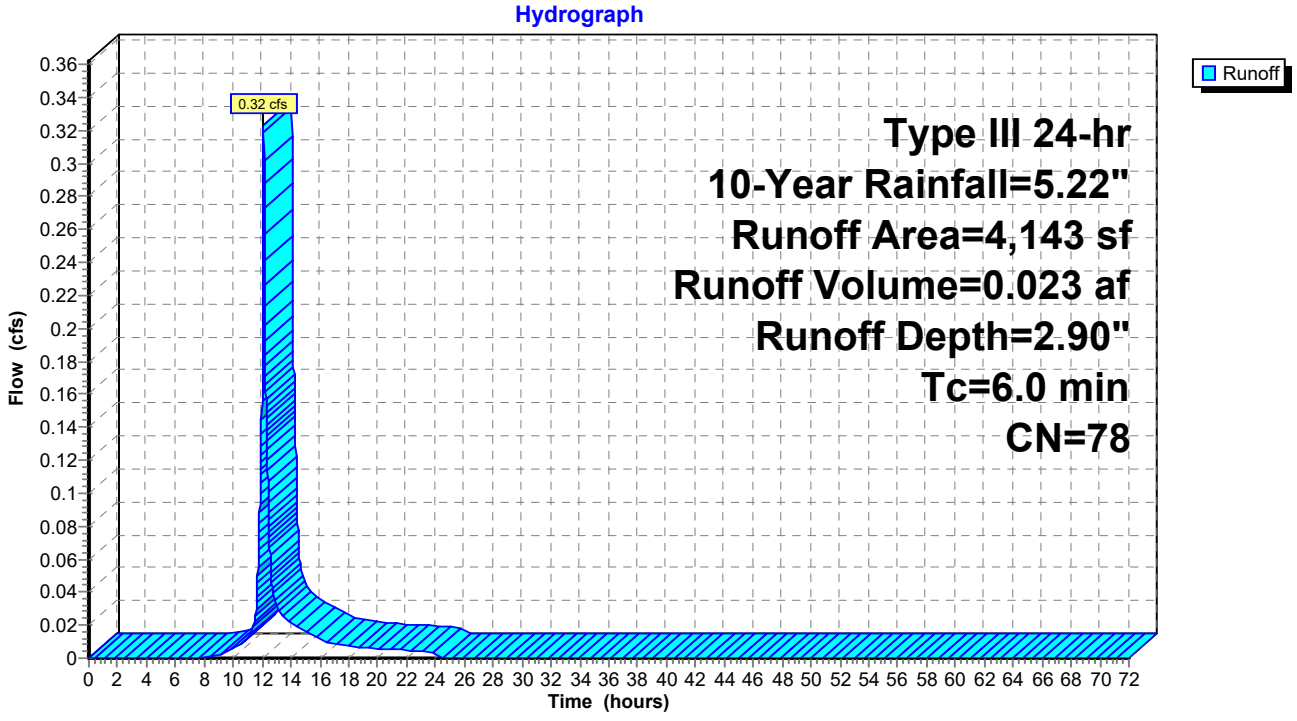
Runoff = 0.32 cfs @ 12.09 hrs, Volume= 0.023 af, Depth= 2.90"
Routed to Reach DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
1,848	98	Paved parking, HSG B
2,295	61	>75% Grass cover, Good, HSG B
4,143	78	Weighted Average
2,295		55.39% Pervious Area
1,848		44.61% Impervious Area

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

Subcatchment E-1:



Summary for Subcatchment E-2:

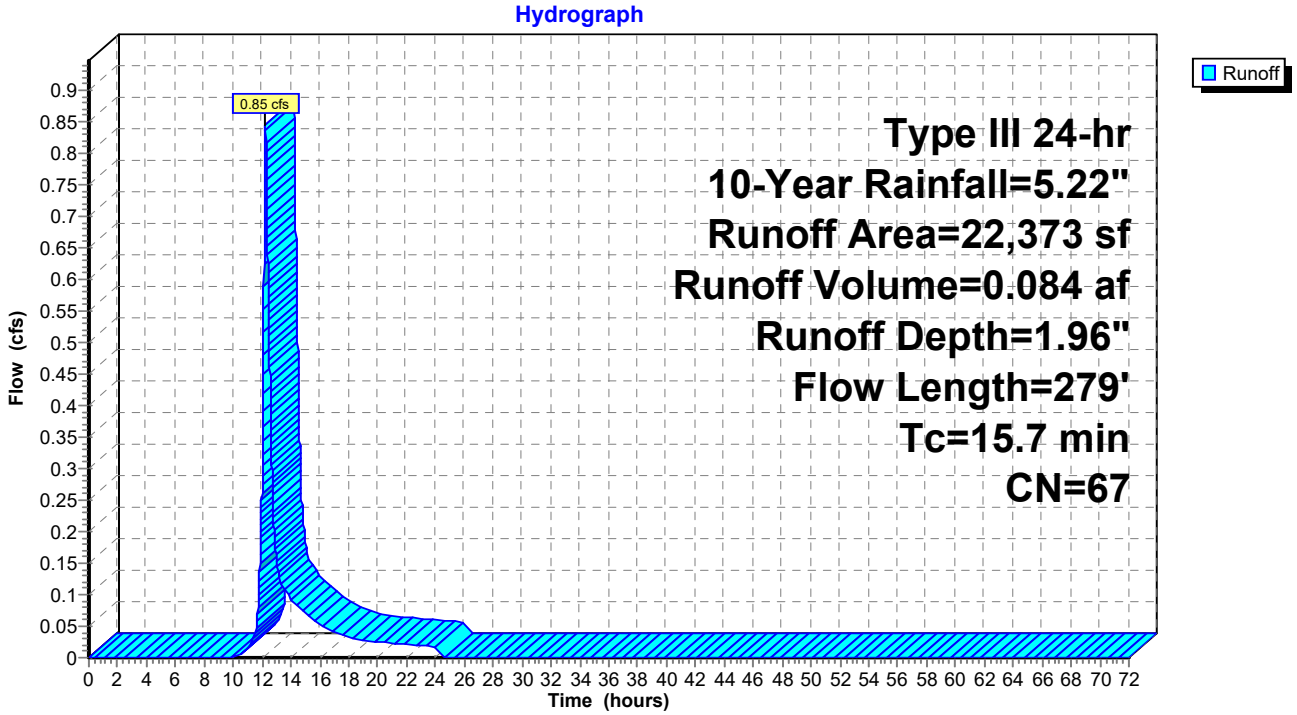
Runoff = 0.85 cfs @ 12.23 hrs, Volume= 0.084 af, Depth= 1.96"
Routed to Reach DP-2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
18,502	61	>75% Grass cover, Good, HSG B
2,057	98	Paved parking, HSG B
1,814	98	Roofs, HSG B
22,373	67	Weighted Average
18,502		82.70% Pervious Area
3,871		17.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.6	179	0.0060	1.16		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.7	279	Total			

Subcatchment E-2:



Summary for Subcatchment E-3:

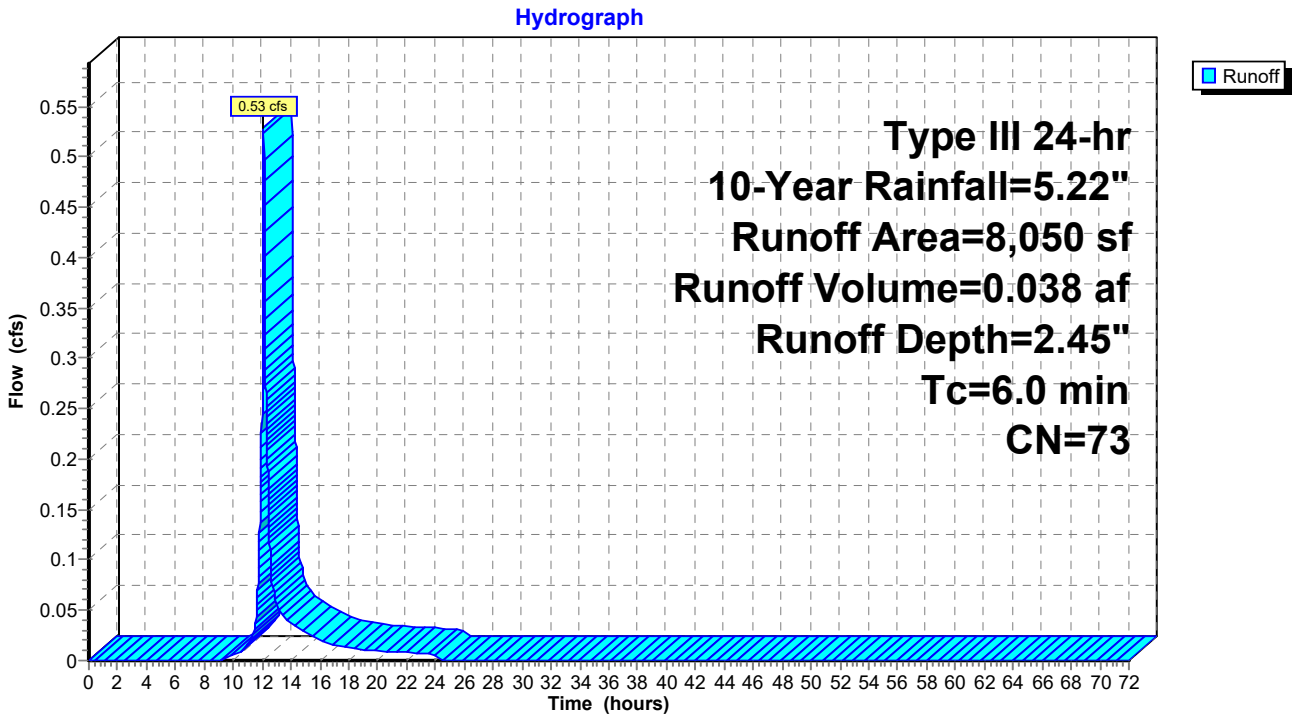
Runoff = 0.53 cfs @ 12.09 hrs, Volume= 0.038 af, Depth= 2.45"
Routed to Reach DP-3 : Design Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
5,336	61	>75% Grass cover, Good, HSG B
1,122	98	Paved parking, HSG B
1,592	98	Roofs, HSG B
8,050	73	Weighted Average
5,336		66.29% Pervious Area
2,714		33.71% Impervious Area

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

Subcatchment E-3:



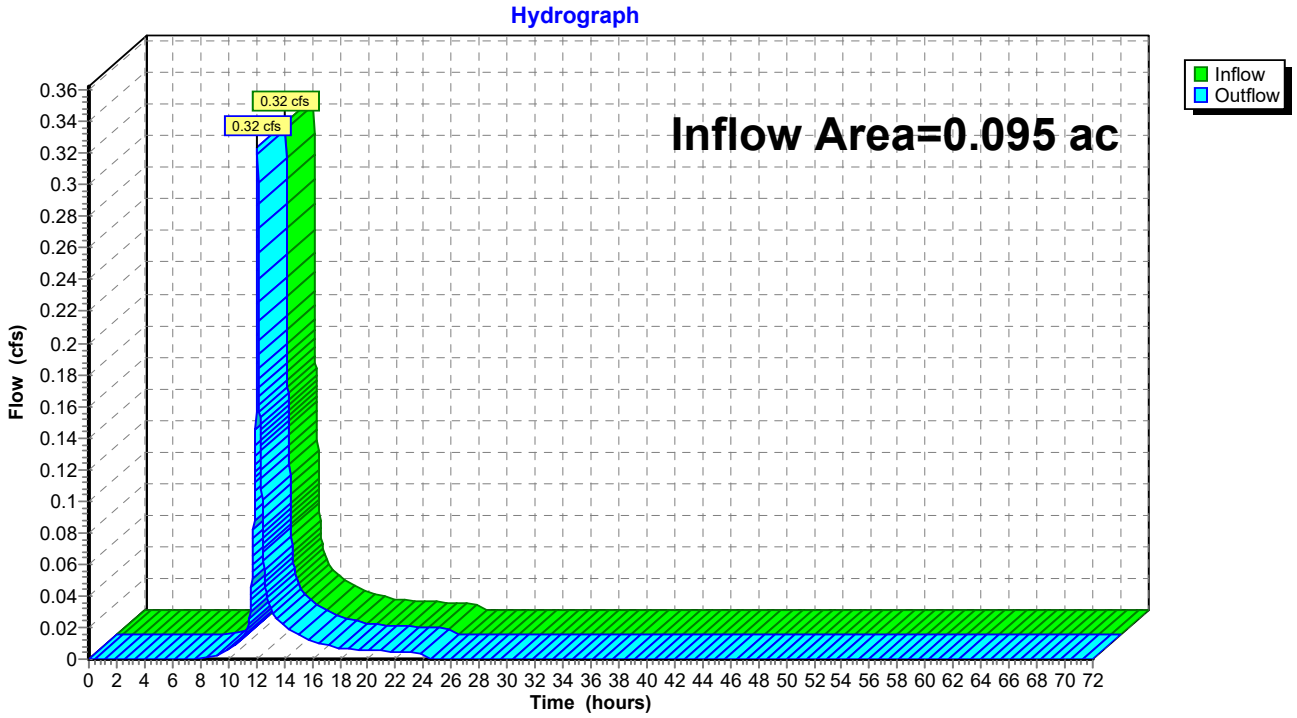
Summary for Reach DP-1: Design Point 1

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

Inflow Area = 0.095 ac, 44.61% Impervious, Inflow Depth = 2.90" for 10-Year event
Inflow = 0.32 cfs @ 12.09 hrs, Volume= 0.023 af
Outflow = 0.32 cfs @ 12.09 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-1: Design Point 1



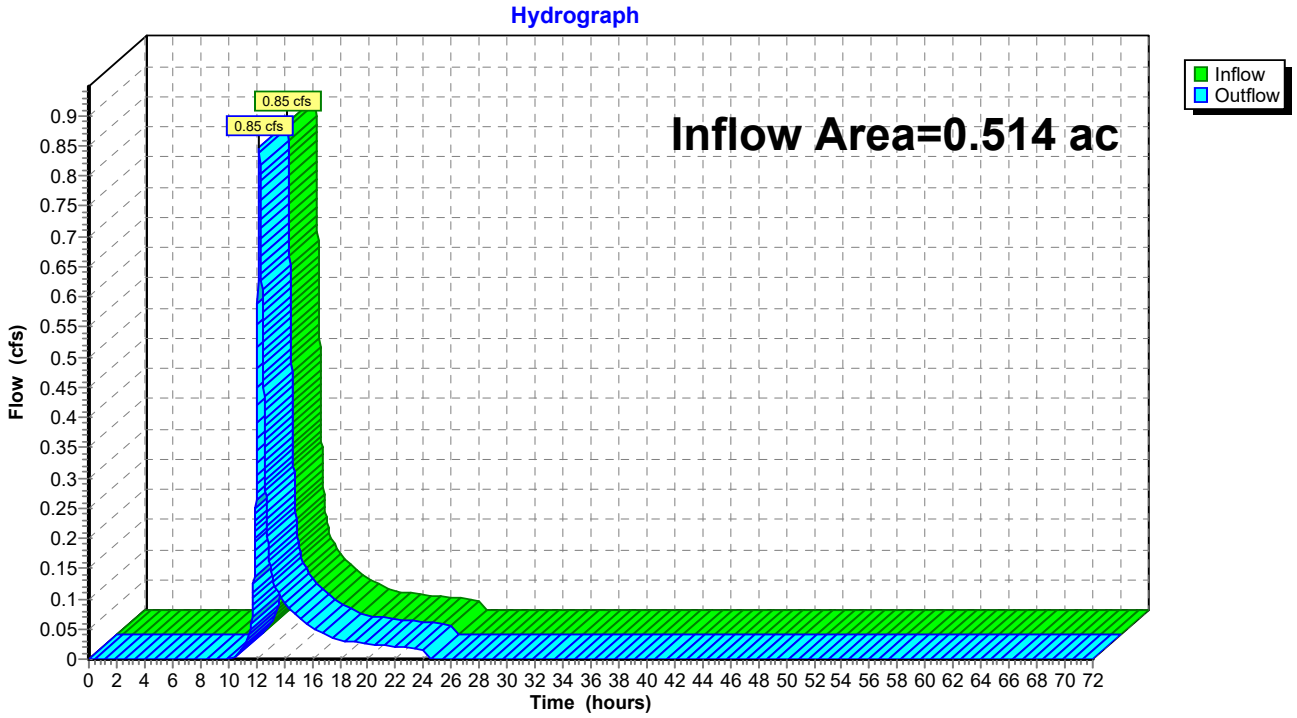
Summary for Reach DP-2: Design Point 2

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

Inflow Area = 0.514 ac, 17.30% Impervious, Inflow Depth = 1.96" for 10-Year event
Inflow = 0.85 cfs @ 12.23 hrs, Volume= 0.084 af
Outflow = 0.85 cfs @ 12.23 hrs, Volume= 0.084 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-2: Design Point 2



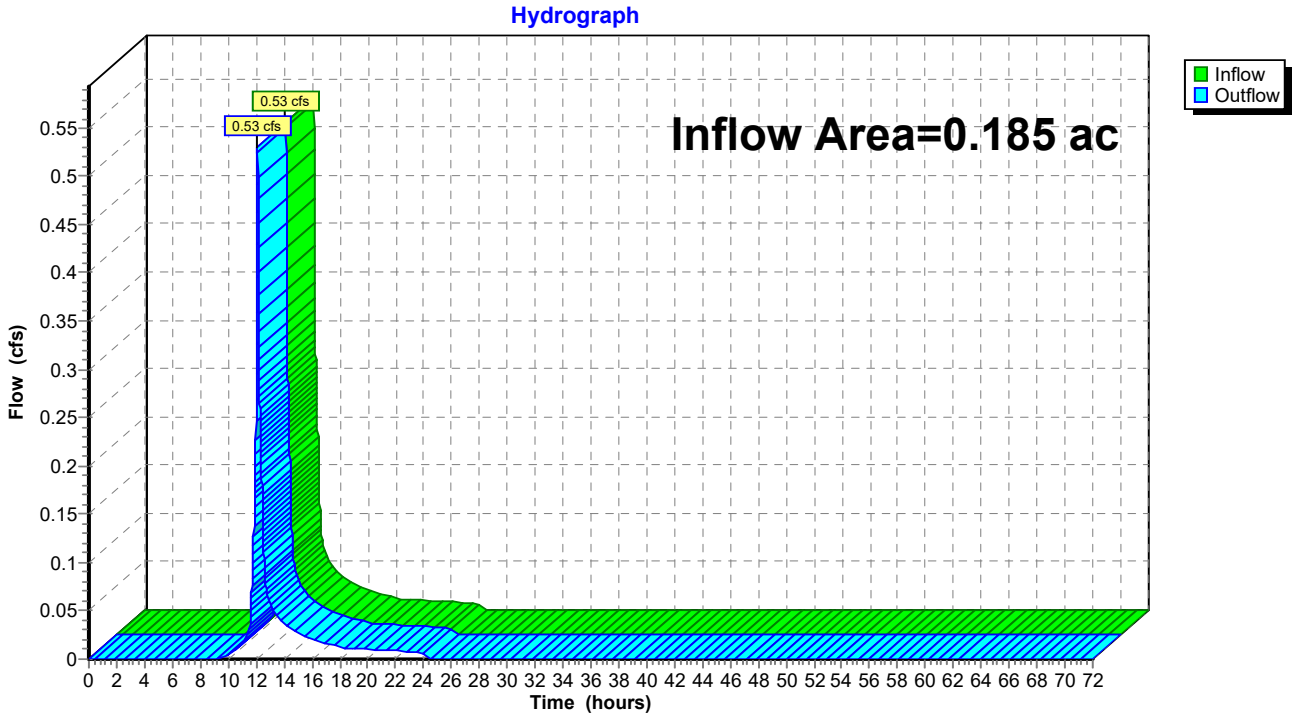
Summary for Reach DP-3: Design Point 3

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

Inflow Area = 0.185 ac, 33.71% Impervious, Inflow Depth = 2.45" for 10-Year event
Inflow = 0.53 cfs @ 12.09 hrs, Volume= 0.038 af
Outflow = 0.53 cfs @ 12.09 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-3: Design Point 3



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE-1: Runoff Area=4,143 sf 44.61% Impervious Runoff Depth=3.93"
Tc=6.0 min CN=78 Runoff=0.44 cfs 0.031 af

SubcatchmentE-2: Runoff Area=22,373 sf 17.30% Impervious Runoff Depth=2.83"
Flow Length=279' Tc=15.7 min CN=67 Runoff=1.25 cfs 0.121 af

SubcatchmentE-3: Runoff Area=8,050 sf 33.71% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=73 Runoff=0.74 cfs 0.053 af

Reach DP-1: Design Point 1 Inflow=0.44 cfs 0.031 af
Outflow=0.44 cfs 0.031 af

Reach DP-2: Design Point 2 Inflow=1.25 cfs 0.121 af
Outflow=1.25 cfs 0.121 af

Reach DP-3: Design Point 3 Inflow=0.74 cfs 0.053 af
Outflow=0.74 cfs 0.053 af

Total Runoff Area = 0.794 ac Runoff Volume = 0.205 af Average Runoff Depth = 3.10"
75.60% Pervious = 0.600 ac 24.40% Impervious = 0.194 ac

Summary for Subcatchment E-1:

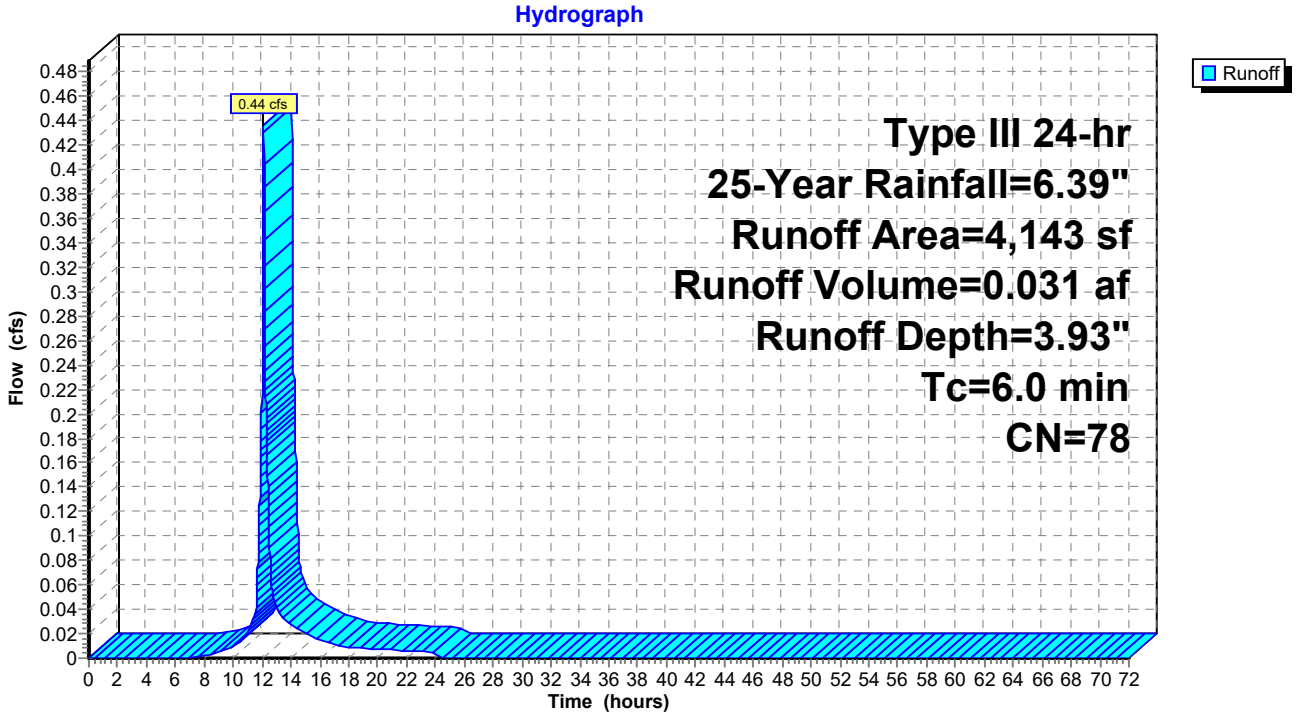
Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.031 af, Depth= 3.93"
Routed to Reach DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
1,848	98	Paved parking, HSG B
2,295	61	>75% Grass cover, Good, HSG B
4,143	78	Weighted Average
2,295		55.39% Pervious Area
1,848		44.61% Impervious Area

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

Subcatchment E-1:



Summary for Subcatchment E-2:

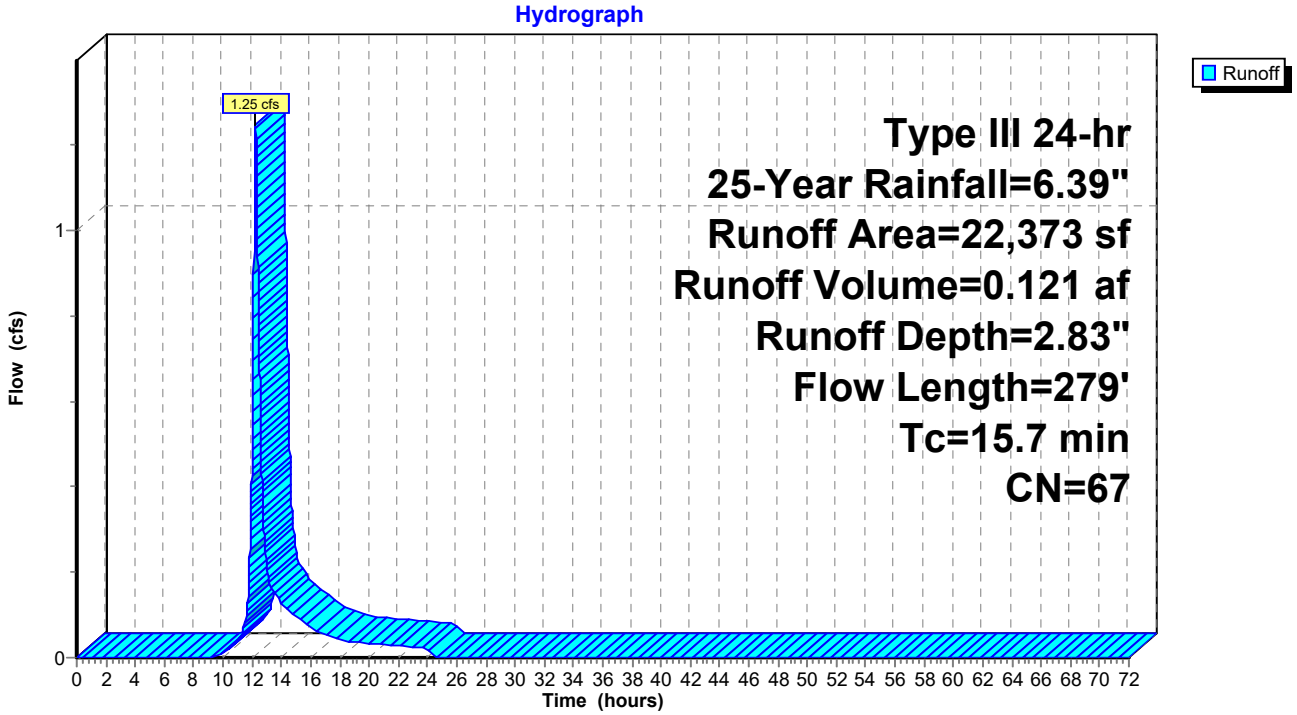
Runoff = 1.25 cfs @ 12.23 hrs, Volume= 0.121 af, Depth= 2.83"
Routed to Reach DP-2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
18,502	61	>75% Grass cover, Good, HSG B
2,057	98	Paved parking, HSG B
1,814	98	Roofs, HSG B
22,373	67	Weighted Average
18,502		82.70% Pervious Area
3,871		17.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.6	179	0.0060	1.16		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.7	279	Total			

Subcatchment E-2:



Summary for Subcatchment E-3:

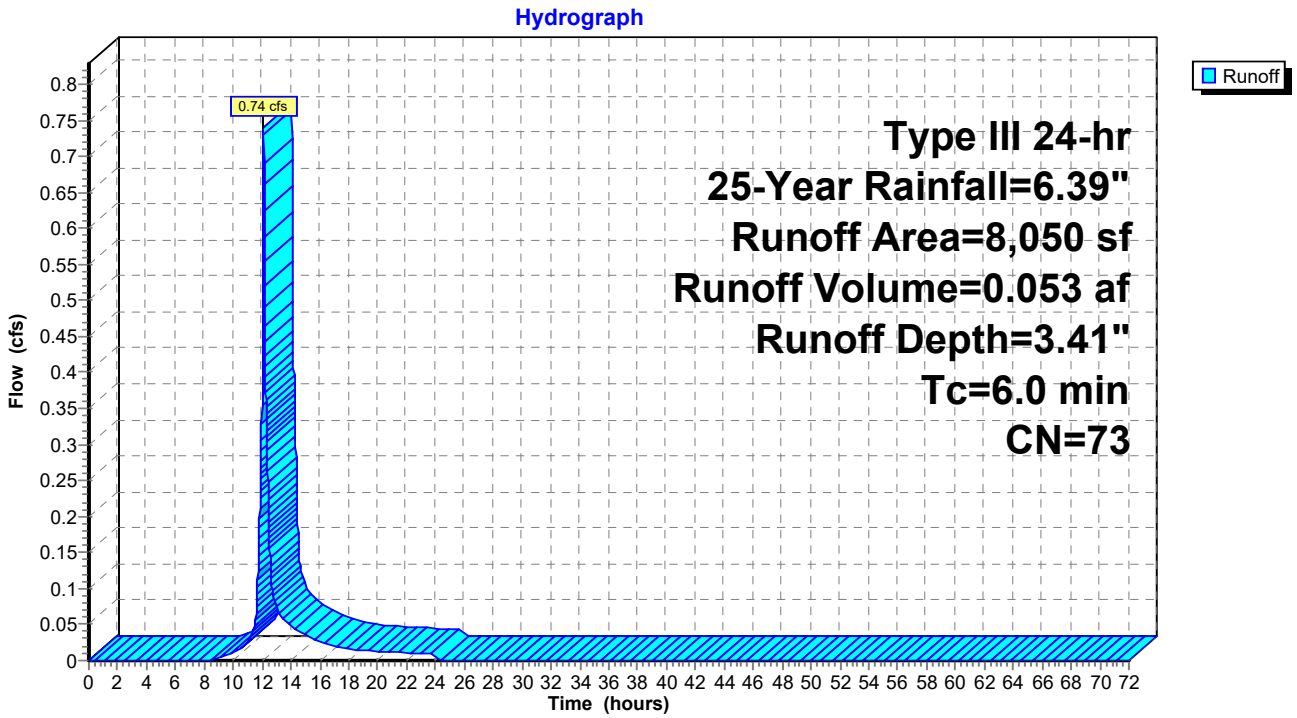
Runoff = 0.74 cfs @ 12.09 hrs, Volume= 0.053 af, Depth= 3.41"
Routed to Reach DP-3 : Design Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
5,336	61	>75% Grass cover, Good, HSG B
1,122	98	Paved parking, HSG B
1,592	98	Roofs, HSG B
8,050	73	Weighted Average
5,336		66.29% Pervious Area
2,714		33.71% Impervious Area

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

Subcatchment E-3:



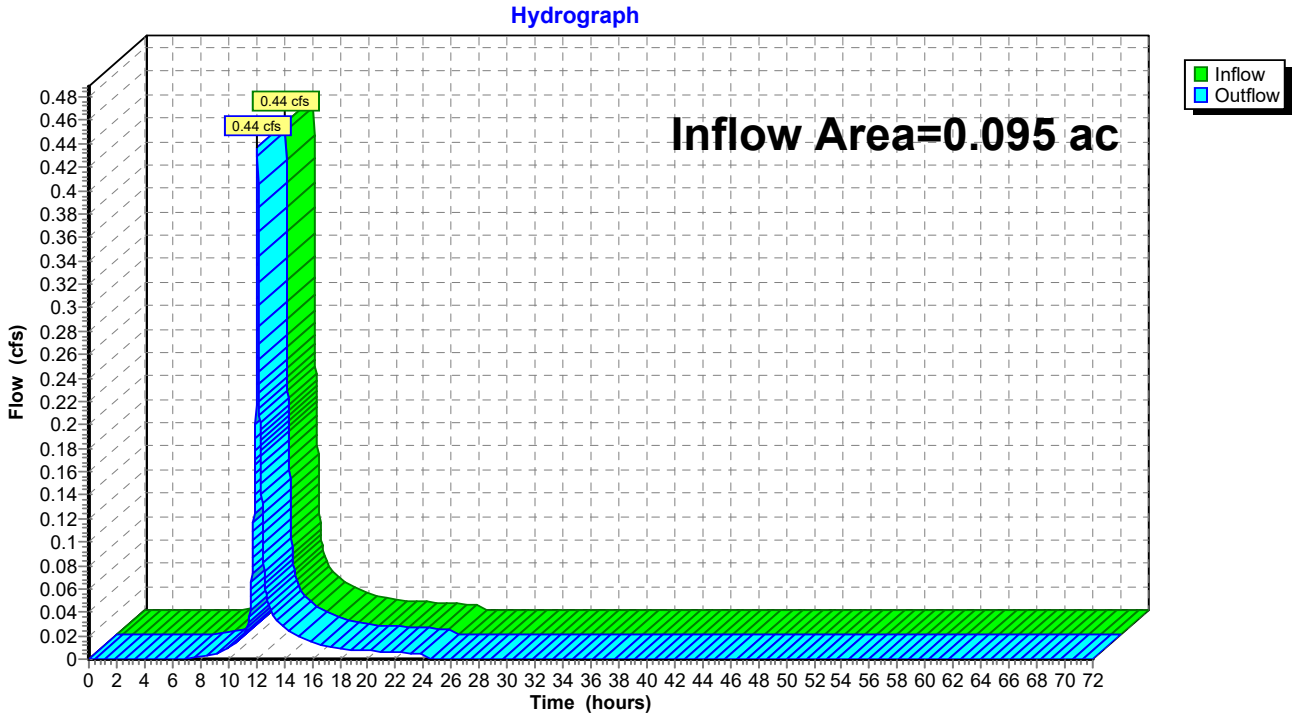
Summary for Reach DP-1: Design Point 1

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

Inflow Area = 0.095 ac, 44.61% Impervious, Inflow Depth = 3.93" for 25-Year event
Inflow = 0.44 cfs @ 12.09 hrs, Volume= 0.031 af
Outflow = 0.44 cfs @ 12.09 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-1: Design Point 1



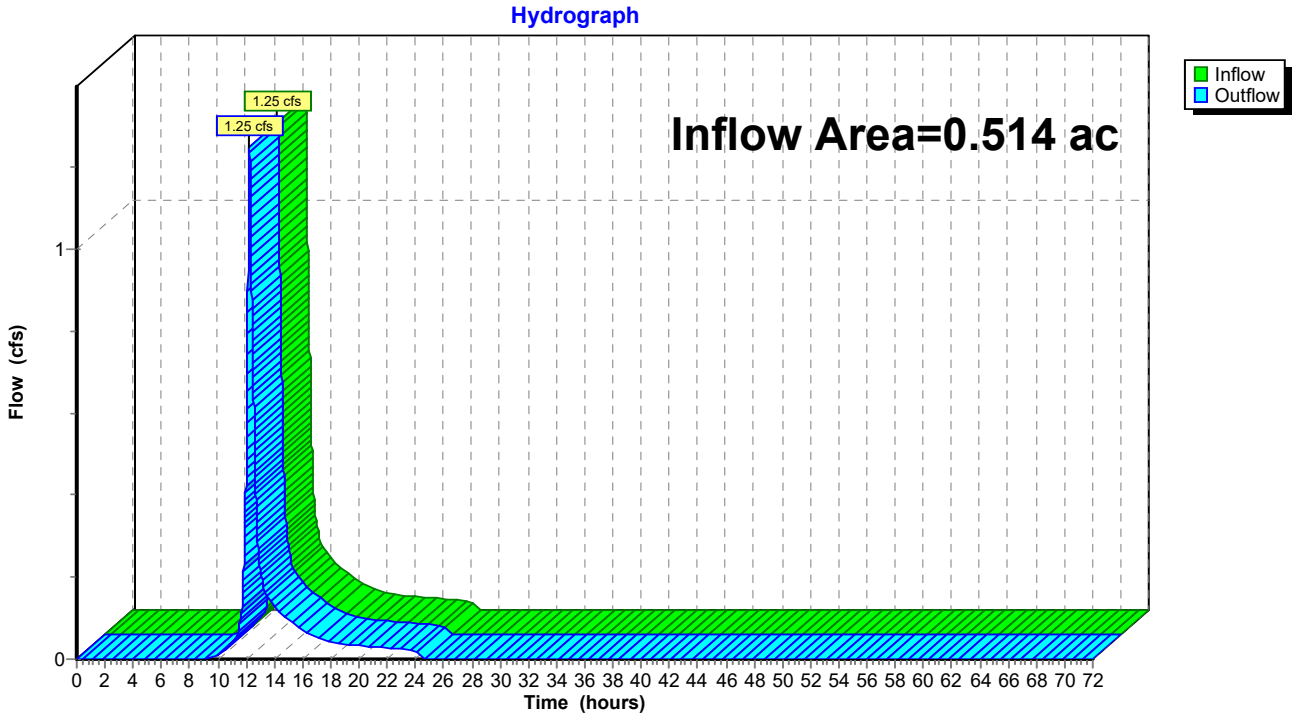
Summary for Reach DP-2: Design Point 2

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

Inflow Area = 0.514 ac, 17.30% Impervious, Inflow Depth = 2.83" for 25-Year event
Inflow = 1.25 cfs @ 12.23 hrs, Volume= 0.121 af
Outflow = 1.25 cfs @ 12.23 hrs, Volume= 0.121 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-2: Design Point 2



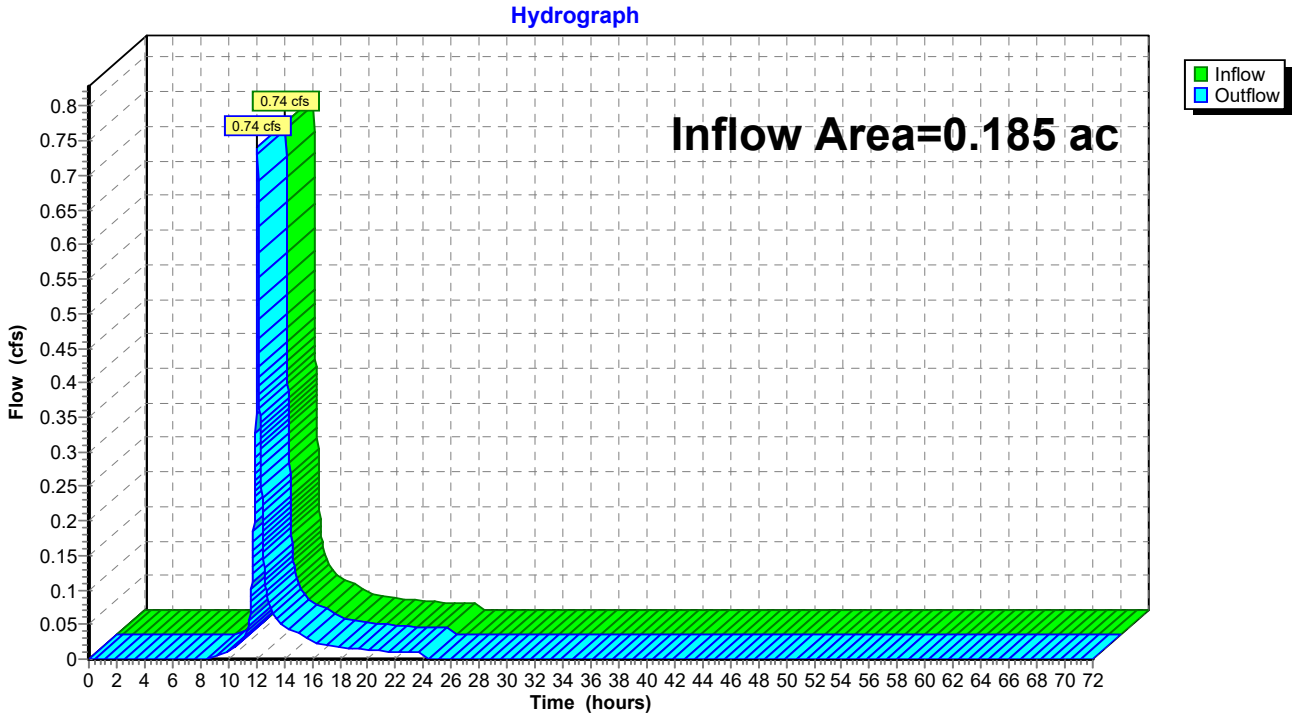
Summary for Reach DP-3: Design Point 3

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

Inflow Area = 0.185 ac, 33.71% Impervious, Inflow Depth = 3.41" for 25-Year event
Inflow = 0.74 cfs @ 12.09 hrs, Volume= 0.053 af
Outflow = 0.74 cfs @ 12.09 hrs, Volume= 0.053 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-3: Design Point 3



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: Runoff Area=4,143 sf 44.61% Impervious Runoff Depth=4.69"
Tc=6.0 min CN=78 Runoff=0.52 cfs 0.037 af

Subcatchment E-2: Runoff Area=22,373 sf 17.30% Impervious Runoff Depth=3.50"
Flow Length=279' Tc=15.7 min CN=67 Runoff=1.56 cfs 0.150 af

Subcatchment E-3: Runoff Area=8,050 sf 33.71% Impervious Runoff Depth=4.14"
Tc=6.0 min CN=73 Runoff=0.90 cfs 0.064 af

Reach DP-1: Design Point 1 Inflow=0.52 cfs 0.037 af
Outflow=0.52 cfs 0.037 af

Reach DP-2: Design Point 2 Inflow=1.56 cfs 0.150 af
Outflow=1.56 cfs 0.150 af

Reach DP-3: Design Point 3 Inflow=0.90 cfs 0.064 af
Outflow=0.90 cfs 0.064 af

Total Runoff Area = 0.794 ac Runoff Volume = 0.251 af Average Runoff Depth = 3.79"
75.60% Pervious = 0.600 ac 24.40% Impervious = 0.194 ac

Summary for Subcatchment E-1:

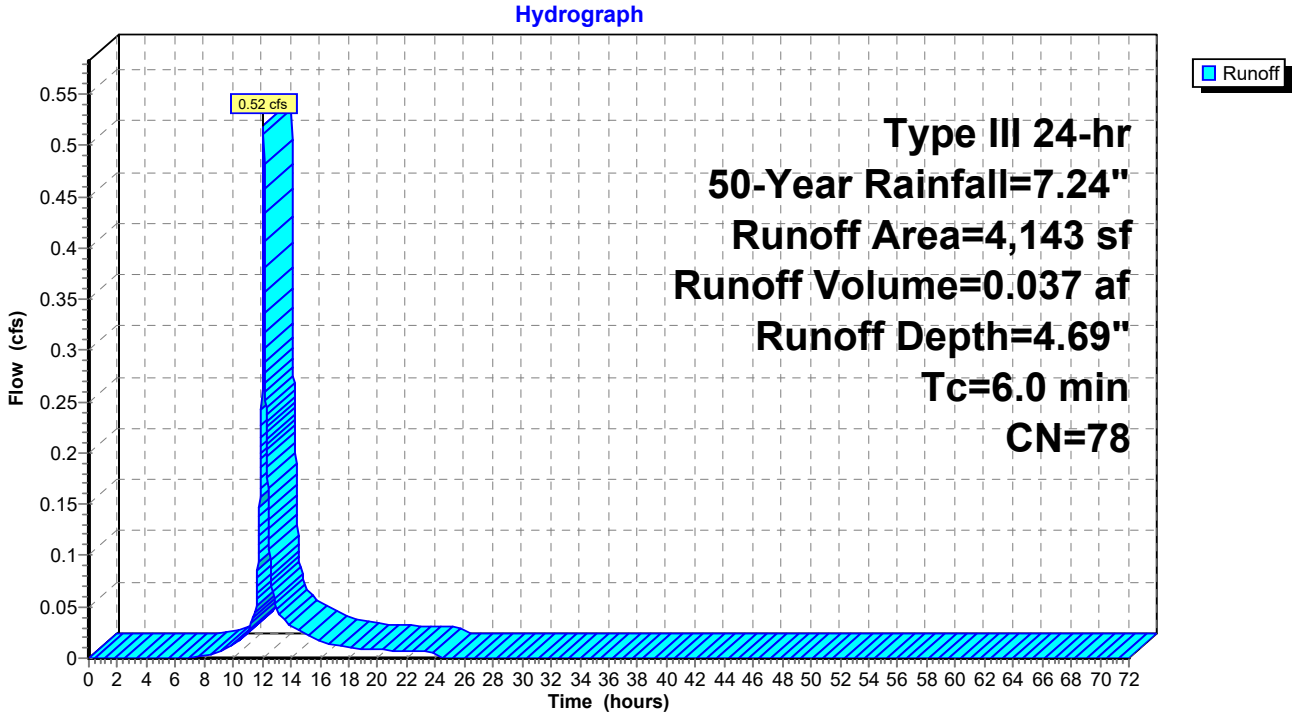
Runoff = 0.52 cfs @ 12.09 hrs, Volume= 0.037 af, Depth= 4.69"
Routed to Reach DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=7.24"

Area (sf)	CN	Description
1,848	98	Paved parking, HSG B
2,295	61	>75% Grass cover, Good, HSG B
4,143	78	Weighted Average
2,295		55.39% Pervious Area
1,848		44.61% Impervious Area

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

Subcatchment E-1:



Summary for Subcatchment E-2:

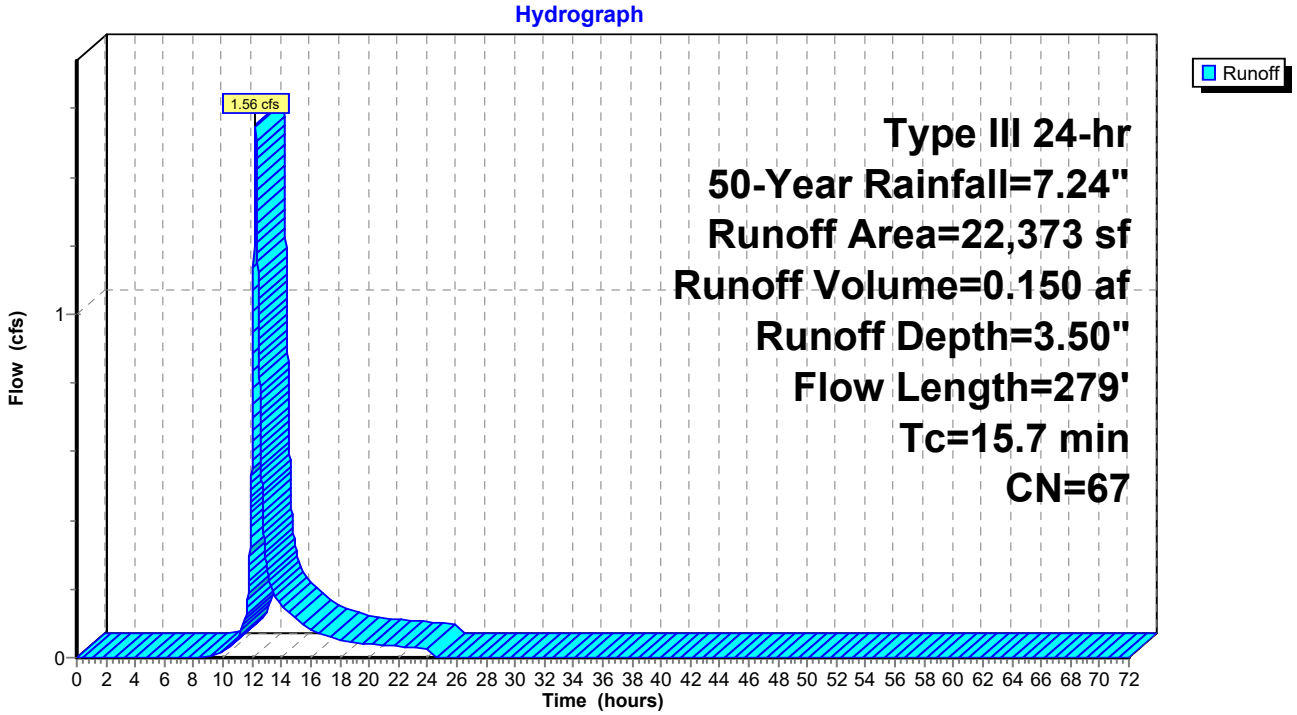
Runoff = 1.56 cfs @ 12.22 hrs, Volume= 0.150 af, Depth= 3.50"
Routed to Reach DP-2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=7.24"

Area (sf)	CN	Description
18,502	61	>75% Grass cover, Good, HSG B
2,057	98	Paved parking, HSG B
1,814	98	Roofs, HSG B
22,373	67	Weighted Average
18,502		82.70% Pervious Area
3,871		17.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.6	179	0.0060	1.16		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.7	279	Total			

Subcatchment E-2:



Summary for Subcatchment E-3:

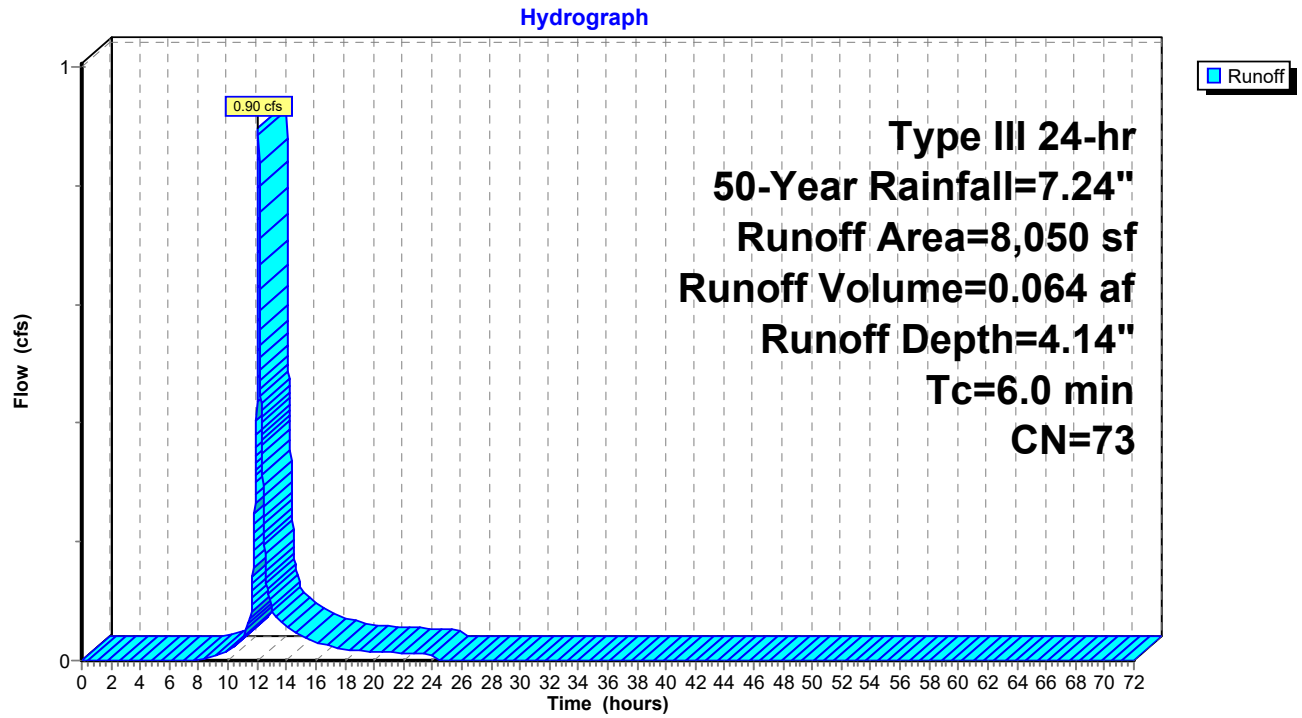
Runoff = 0.90 cfs @ 12.09 hrs, Volume= 0.064 af, Depth= 4.14"
Routed to Reach DP-3 : Design Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=7.24"

Area (sf)	CN	Description
5,336	61	>75% Grass cover, Good, HSG B
1,122	98	Paved parking, HSG B
1,592	98	Roofs, HSG B
8,050	73	Weighted Average
5,336		66.29% Pervious Area
2,714		33.71% Impervious Area

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

Subcatchment E-3:



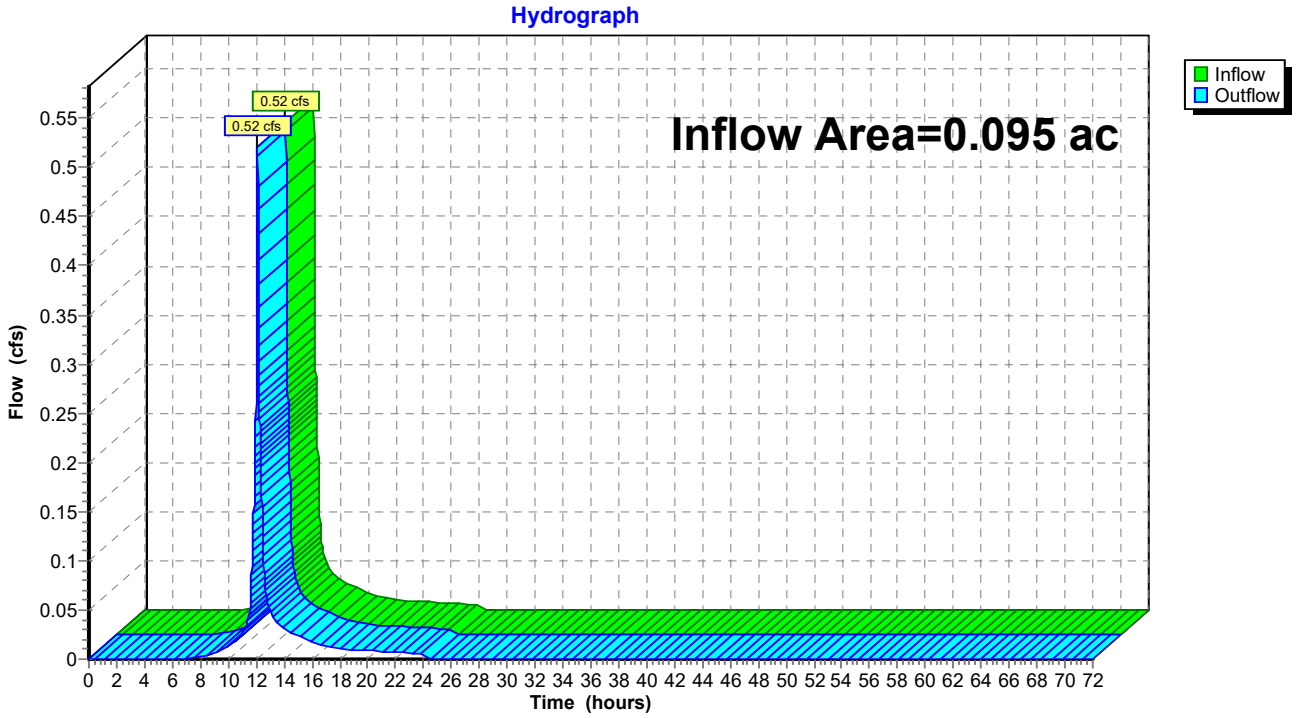
Summary for Reach DP-1: Design Point 1

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

Inflow Area = 0.095 ac, 44.61% Impervious, Inflow Depth = 4.69" for 50-Year event
Inflow = 0.52 cfs @ 12.09 hrs, Volume= 0.037 af
Outflow = 0.52 cfs @ 12.09 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-1: Design Point 1



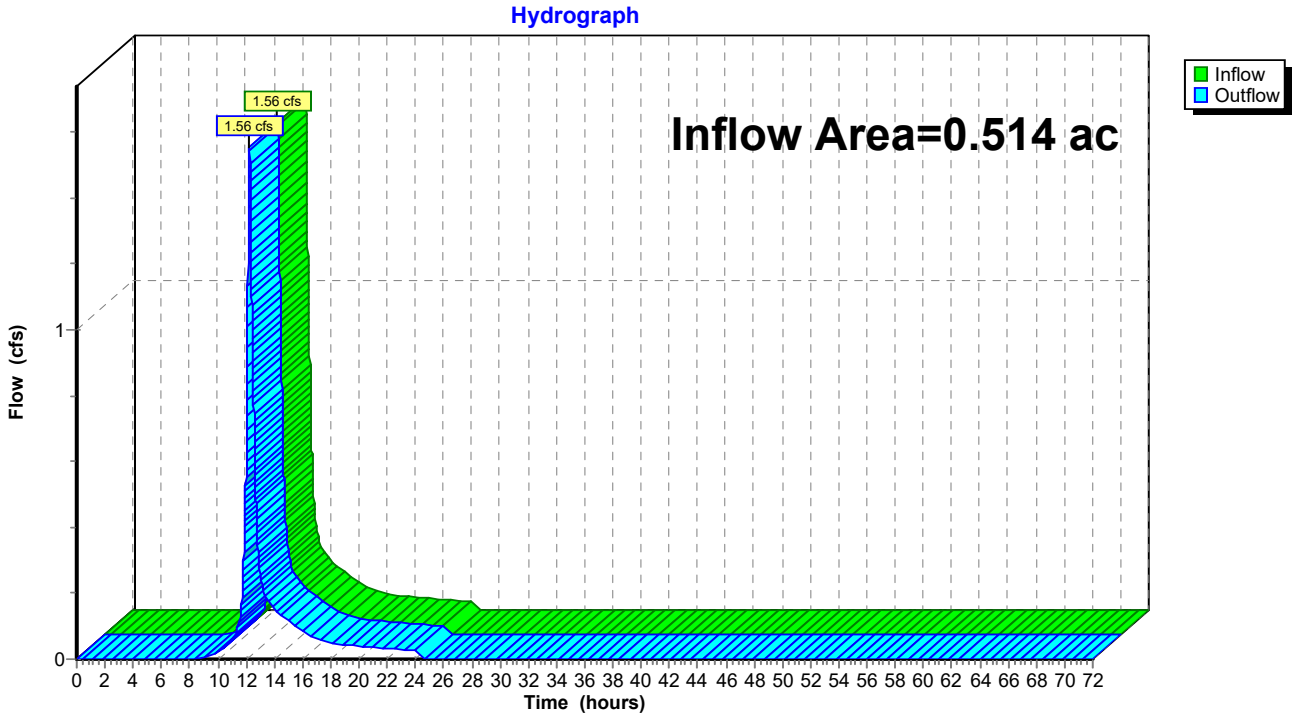
Summary for Reach DP-2: Design Point 2

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

Inflow Area = 0.514 ac, 17.30% Impervious, Inflow Depth = 3.50" for 50-Year event
Inflow = 1.56 cfs @ 12.22 hrs, Volume= 0.150 af
Outflow = 1.56 cfs @ 12.22 hrs, Volume= 0.150 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-2: Design Point 2



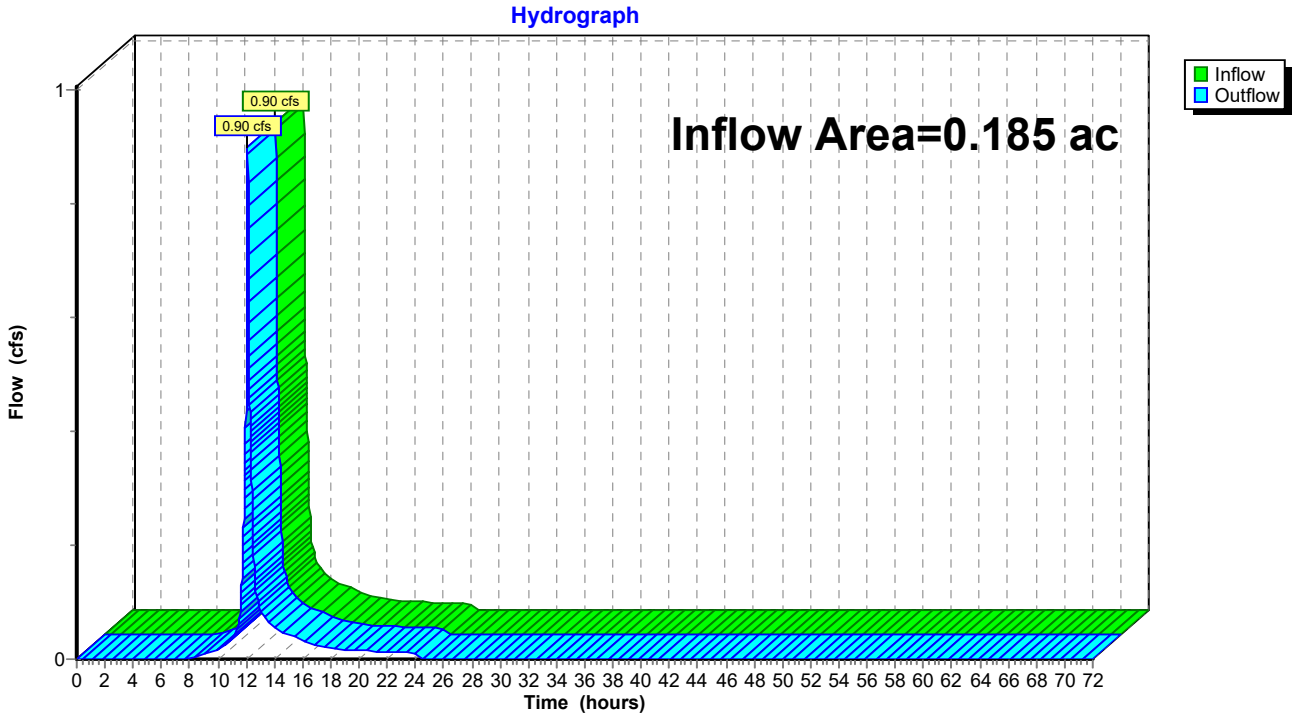
Summary for Reach DP-3: Design Point 3

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

Inflow Area = 0.185 ac, 33.71% Impervious, Inflow Depth = 4.14" for 50-Year event
Inflow = 0.90 cfs @ 12.09 hrs, Volume= 0.064 af
Outflow = 0.90 cfs @ 12.09 hrs, Volume= 0.064 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-3: Design Point 3



Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentE-1: Runoff Area=4,143 sf 44.61% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=78 Runoff=0.61 cfs 0.044 af

SubcatchmentE-2: Runoff Area=22,373 sf 17.30% Impervious Runoff Depth=4.27"
Flow Length=279' Tc=15.7 min CN=67 Runoff=1.91 cfs 0.183 af

SubcatchmentE-3: Runoff Area=8,050 sf 33.71% Impervious Runoff Depth=4.97"
Tc=6.0 min CN=73 Runoff=1.08 cfs 0.077 af

Reach DP-1: Design Point 1 Inflow=0.61 cfs 0.044 af
Outflow=0.61 cfs 0.044 af

Reach DP-2: Design Point 2 Inflow=1.91 cfs 0.183 af
Outflow=1.91 cfs 0.183 af

Reach DP-3: Design Point 3 Inflow=1.08 cfs 0.077 af
Outflow=1.08 cfs 0.077 af

Total Runoff Area = 0.794 ac Runoff Volume = 0.303 af Average Runoff Depth = 4.59"
75.60% Pervious = 0.600 ac 24.40% Impervious = 0.194 ac

Summary for Subcatchment E-1:

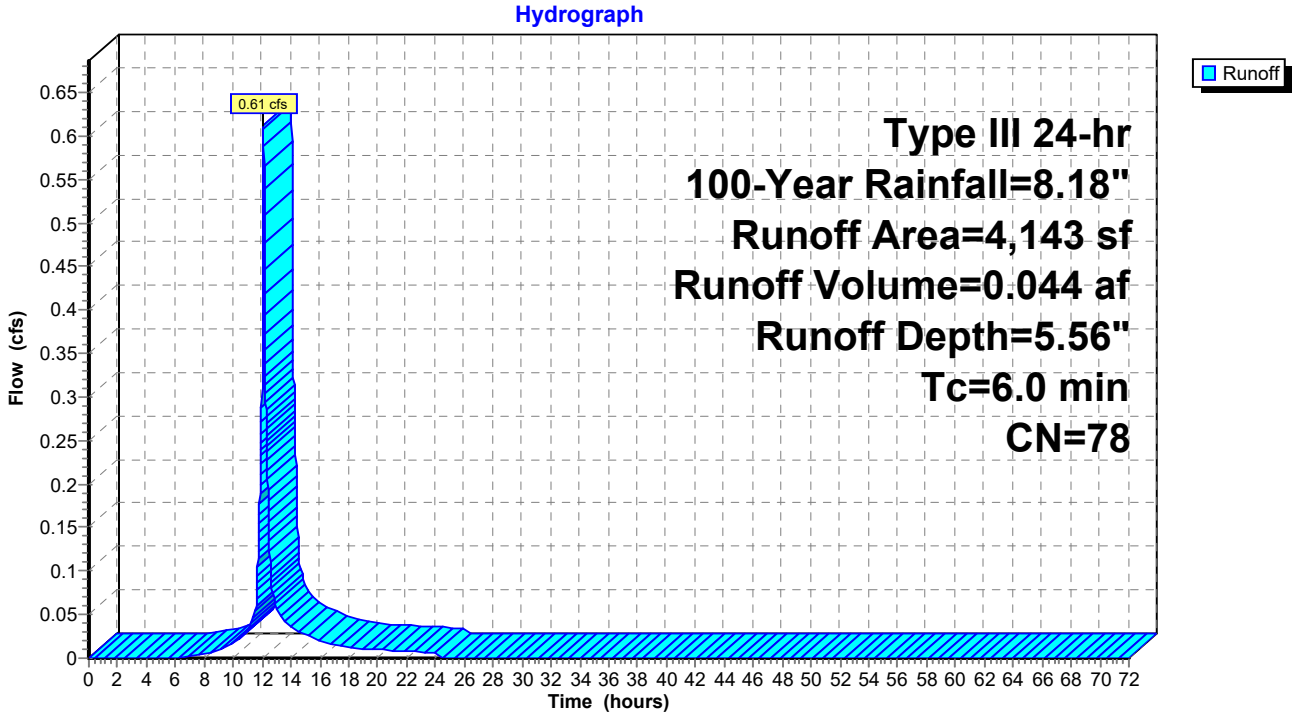
Runoff = 0.61 cfs @ 12.09 hrs, Volume= 0.044 af, Depth= 5.56"
Routed to Reach DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.18"

Area (sf)	CN	Description
1,848	98	Paved parking, HSG B
2,295	61	>75% Grass cover, Good, HSG B
4,143	78	Weighted Average
2,295		55.39% Pervious Area
1,848		44.61% Impervious Area

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

Subcatchment E-1:



Summary for Subcatchment E-2:

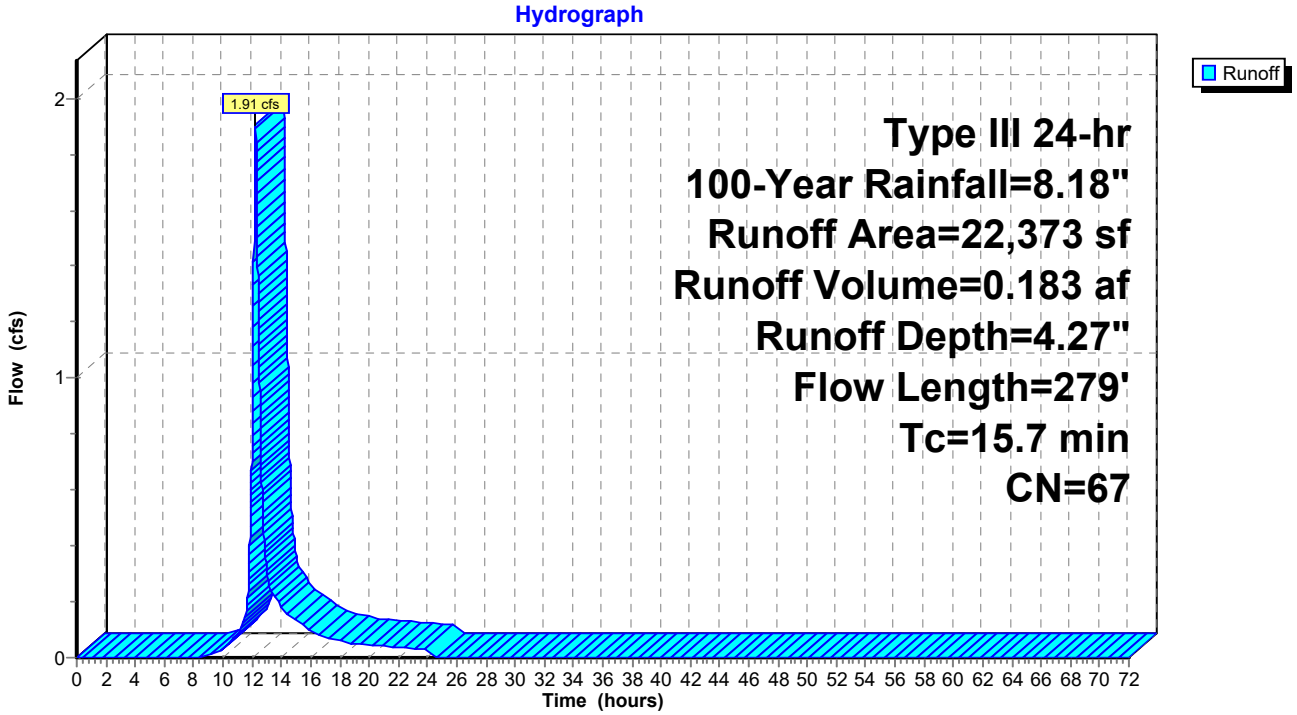
Runoff = 1.91 cfs @ 12.22 hrs, Volume= 0.183 af, Depth= 4.27"
Routed to Reach DP-2 : Design Point 2

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.18"

Area (sf)	CN	Description
18,502	61	>75% Grass cover, Good, HSG B
2,057	98	Paved parking, HSG B
1,814	98	Roofs, HSG B
22,373	67	Weighted Average
18,502		82.70% Pervious Area
3,871		17.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.6	179	0.0060	1.16		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.7	279	Total			

Subcatchment E-2:



Summary for Subcatchment E-3:

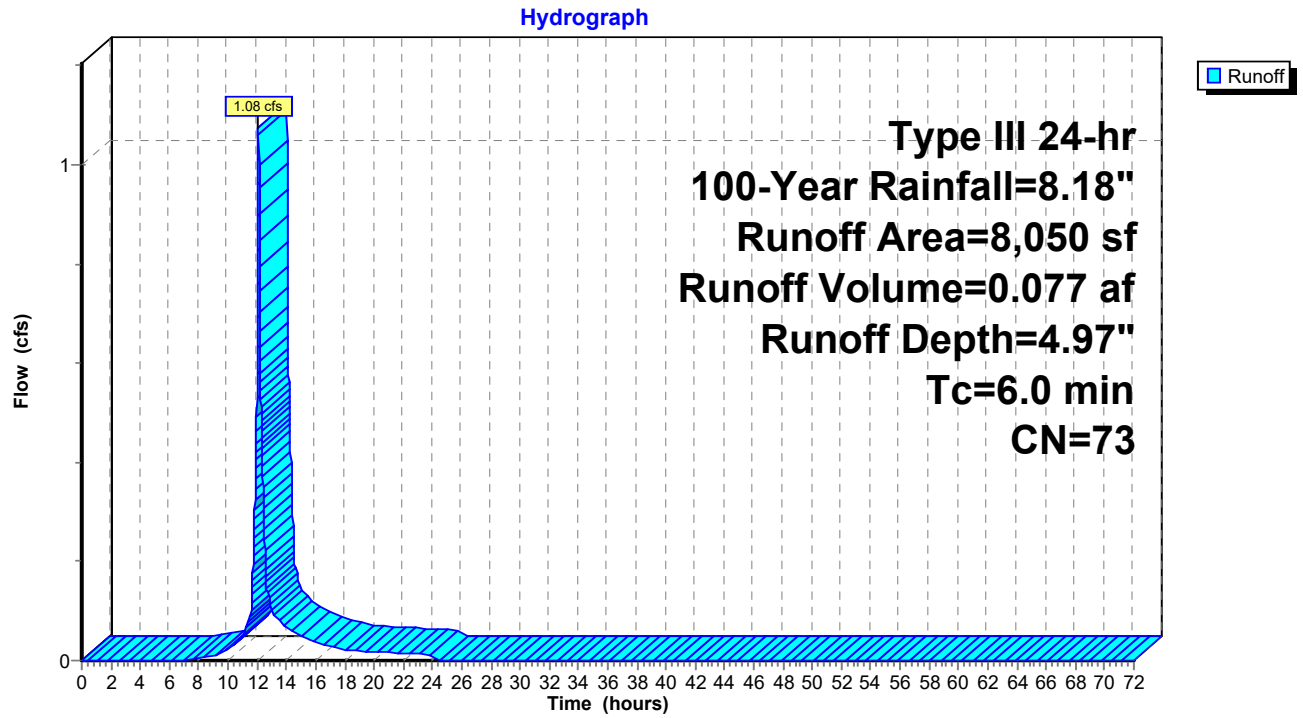
Runoff = 1.08 cfs @ 12.09 hrs, Volume= 0.077 af, Depth= 4.97"
Routed to Reach DP-3 : Design Point 3

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.18"

Area (sf)	CN	Description
5,336	61	>75% Grass cover, Good, HSG B
1,122	98	Paved parking, HSG B
1,592	98	Roofs, HSG B
8,050	73	Weighted Average
5,336		66.29% Pervious Area
2,714		33.71% Impervious Area

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

Subcatchment E-3:



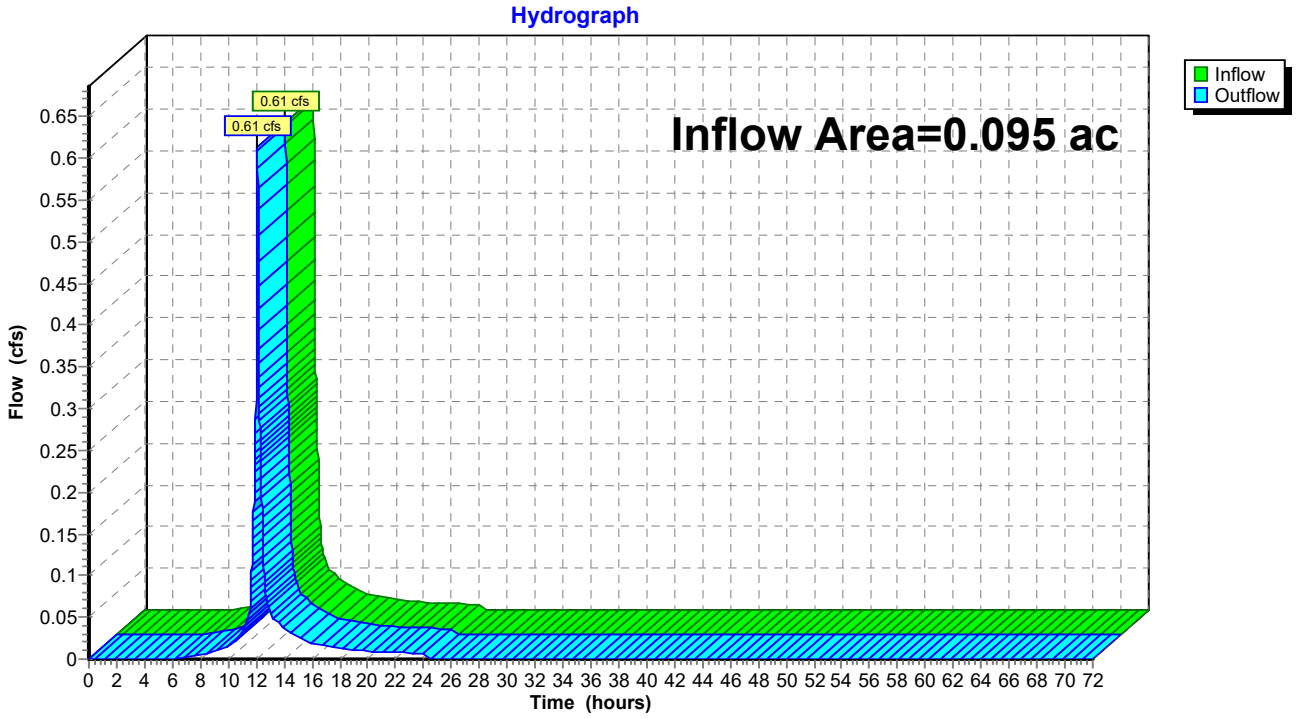
Summary for Reach DP-1: Design Point 1

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

Inflow Area = 0.095 ac, 44.61% Impervious, Inflow Depth = 5.56" for 100-Year event
Inflow = 0.61 cfs @ 12.09 hrs, Volume= 0.044 af
Outflow = 0.61 cfs @ 12.09 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-1: Design Point 1



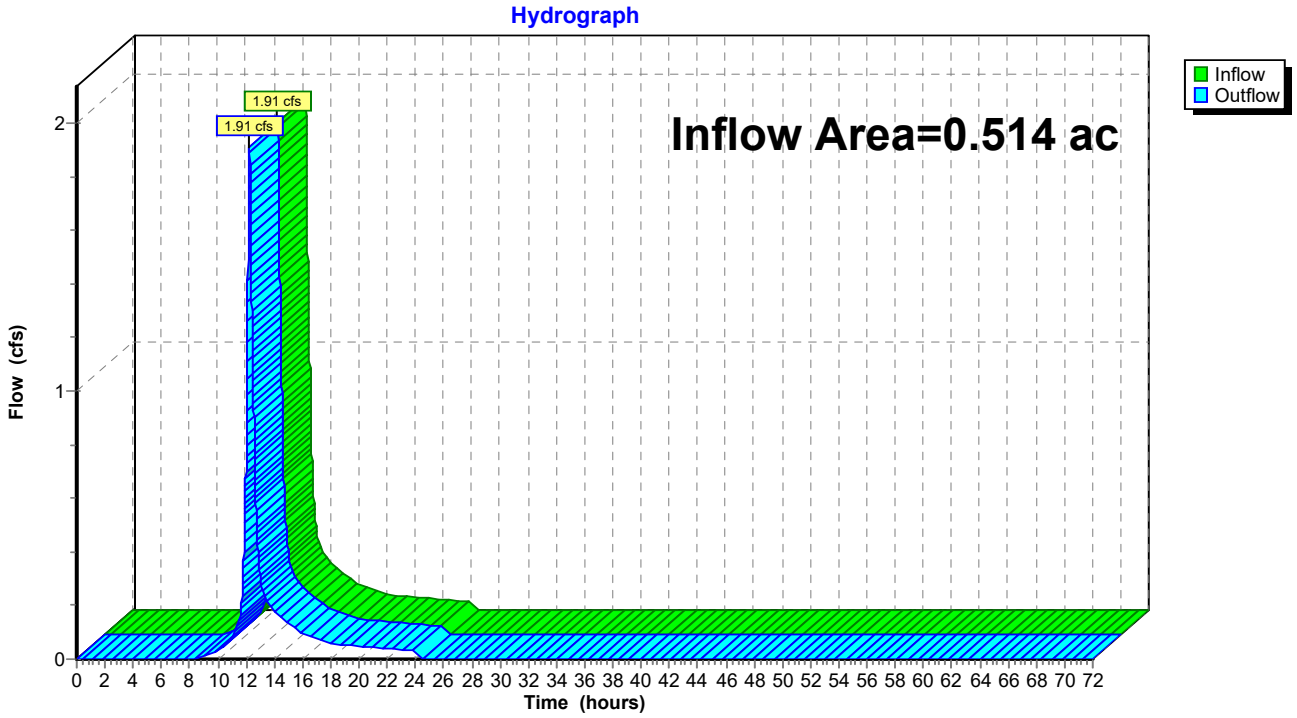
Summary for Reach DP-2: Design Point 2

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

Inflow Area = 0.514 ac, 17.30% Impervious, Inflow Depth = 4.27" for 100-Year event
Inflow = 1.91 cfs @ 12.22 hrs, Volume= 0.183 af
Outflow = 1.91 cfs @ 12.22 hrs, Volume= 0.183 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-2: Design Point 2



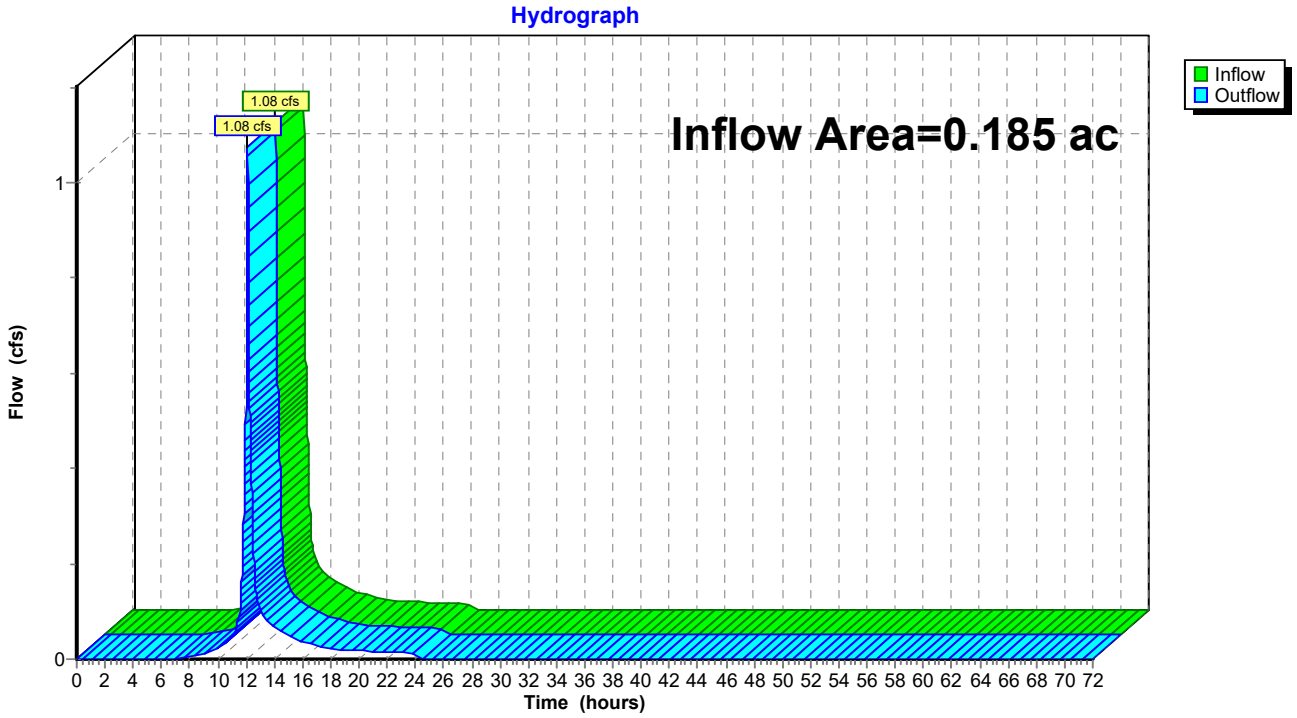
Summary for Reach DP-3: Design Point 3

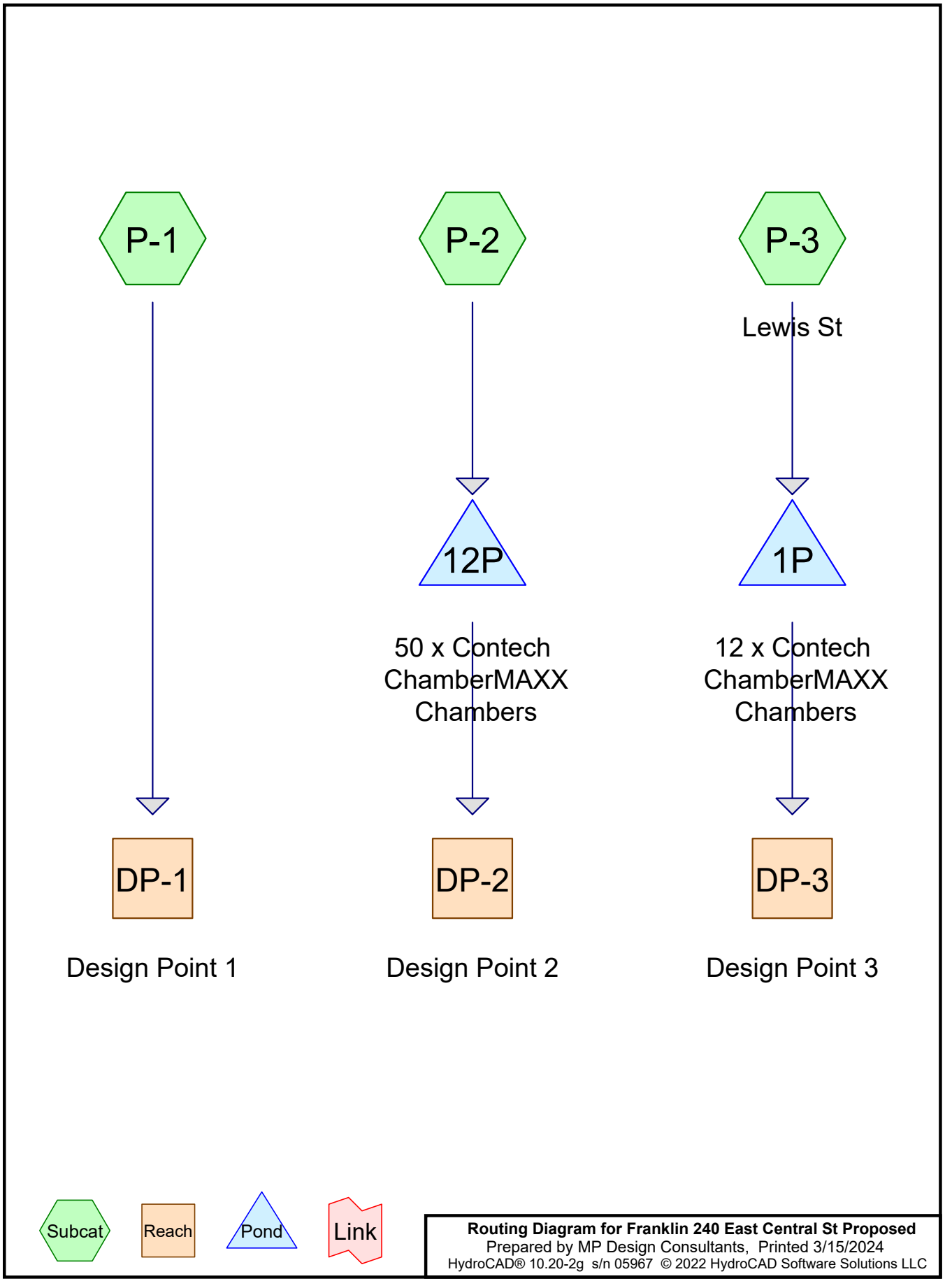
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.185 ac, 33.71% Impervious, Inflow Depth = 4.97" for 100-Year event
Inflow = 1.08 cfs @ 12.09 hrs, Volume= 0.077 af
Outflow = 1.08 cfs @ 12.09 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Reach DP-3: Design Point 3





Routing Diagram for Franklin 240 East Central St Proposed
Prepared by MP Design Consultants, Printed 3/15/2024

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	Type III 24-hr		Default	24.00	1	3.36	2
2	10-Year	Type III 24-hr		Default	24.00	1	5.22	2
3	25-Year	Type III 24-hr		Default	24.00	1	6.39	2
4	50-Year	Type III 24-hr		Default	24.00	1	7.24	2
5	100-Year	Type III 24-hr		Default	24.00	1	8.18	2
6	WQV	Type III 24-hr		Default	24.00	1	1.00	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.180	61	>75% Grass cover, Good, HSG B (P-1, P-2, P-3)
0.234	98	Paved parking, HSG B (P-1, P-2)
0.064	98	Paved roads w/curbs & sewers, HSG B (P-3)
0.316	98	Roofs, HSG B (P-2, P-3)
0.794	**90**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.794	HSG B	P-1, P-2, P-3
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.794		**TOTAL AREA**

Summary for Subcatchment P-1:

Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Depth= 2.06"
Routed to Reach DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
1,063	98	Paved parking, HSG B
445	61	>75% Grass cover, Good, HSG B
1,508	87	Weighted Average
445		29.51% Pervious Area
1,063		70.49% Impervious Area

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

Summary for Subcatchment P-2:

Runoff = 1.18 cfs @ 12.20 hrs, Volume= 0.111 af, Depth= 2.23"
Routed to Pond 12P : 50 x Contech ChamberMAXX Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
6,174	61	>75% Grass cover, Good, HSG B
9,118	98	Paved parking, HSG B
10,811	98	Roofs, HSG B
26,103	89	Weighted Average
6,174		23.65% Pervious Area
19,929		76.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.0	183	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.1	283	Total			

Summary for Subcatchment P-3: Lewis St

Runoff = 0.46 cfs @ 12.09 hrs, Volume= 0.033 af, Depth= 2.50"
Routed to Pond 1P : 12 x Contech ChamberMAXX Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
2,950	98	Roofs, HSG B
1,208	61	>75% Grass cover, Good, HSG B
2,797	98	Paved roads w/curbs & sewers, HSG B
6,955	92	Weighted Average
1,208		17.37% Pervious Area
5,747		82.63% Impervious Area

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

Summary for Reach DP-1: Design Point 1

Inflow Area = 0.035 ac, 70.49% Impervious, Inflow Depth = 2.06" for 2-Year event
Inflow = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af
Outflow = 0.08 cfs @ 12.09 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Design Point 2

Inflow Area = 0.599 ac, 76.35% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Design Point 3

Inflow Area = 0.160 ac, 82.63% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: 12 x Contech ChamberMAXX Chambers

Inflow Area = 0.160 ac, 82.63% Impervious, Inflow Depth = 2.50" for 2-Year event
Inflow = 0.46 cfs @ 12.09 hrs, Volume= 0.033 af
Outflow = 0.10 cfs @ 11.82 hrs, Volume= 0.033 af, Atten= 79%, Lag= 0.0 min
Discarded = 0.10 cfs @ 11.82 hrs, Volume= 0.033 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-3 : Design Point 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 277.59' @ 12.51 hrs Surf.Area= 497 sf Storage= 343 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 19.1 min (815.1 - 796.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	276.48'	459 cf	**30.03'W x 16.55'L x 3.52'H Field A** 1,752 cf Overall - 604 cf Embedded = 1,148 cf x 40.0% Voids
#2A	276.98'	579 cf	**Contech ChamberMaxx 2016** x 12 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 6 rows
		1,038 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.48'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	278.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.10 cfs @ 11.82 hrs HW=276.52' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.48' TW=0.00' (Dynamic Tailwater)
↑**2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 12P: 50 x Contech ChamberMAXX Chambers

Inflow Area = 0.599 ac, 76.35% Impervious, Inflow Depth = 2.23" for 2-Year event
Inflow = 1.18 cfs @ 12.20 hrs, Volume= 0.111 af
Outflow = 0.38 cfs @ 12.02 hrs, Volume= 0.111 af, Atten= 68%, Lag= 0.0 min
Discarded = 0.38 cfs @ 12.02 hrs, Volume= 0.111 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-2 : Design Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 277.32' @ 12.63 hrs Surf.Area= 1,989 sf Storage= 958 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 12.8 min (830.4 - 817.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	276.48'	1,817 cf	**11.03'W x 180.23'L x 3.52'H Field A** 7,010 cf Overall - 2,467 cf Embedded = 4,542 cf x 40.0% Voids
#2A	276.98'	2,364 cf	**Contech ChamberMaxx 2016** x 50 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 2 rows
		4,181 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.48'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	278.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.38 cfs @ 12.02 hrs HW=276.52' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.48' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Subcatchment P-1:

Runoff = 0.15 cfs @ 12.09 hrs, Volume= 0.011 af, Depth= 3.77"
Routed to Reach DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
1,063	98	Paved parking, HSG B
445	61	>75% Grass cover, Good, HSG B
1,508	87	Weighted Average
445		29.51% Pervious Area
1,063		70.49% Impervious Area

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

Summary for Subcatchment P-2:

Runoff = 2.06 cfs @ 12.20 hrs, Volume= 0.199 af, Depth= 3.98"
Routed to Pond 12P : 50 x Contech ChamberMAXX Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
6,174	61	>75% Grass cover, Good, HSG B
9,118	98	Paved parking, HSG B
10,811	98	Roofs, HSG B
26,103	89	Weighted Average
6,174		23.65% Pervious Area
19,929		76.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.0	183	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.1	283	Total			

Summary for Subcatchment P-3: Lewis St

Runoff = 0.76 cfs @ 12.08 hrs, Volume= 0.057 af, Depth= 4.30"
Routed to Pond 1P : 12 x Contech ChamberMAXX Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Rainfall=5.22"

Area (sf)	CN	Description
2,950	98	Roofs, HSG B
1,208	61	>75% Grass cover, Good, HSG B
2,797	98	Paved roads w/curbs & sewers, HSG B
6,955	92	Weighted Average
1,208		17.37% Pervious Area
5,747		82.63% Impervious Area

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

Summary for Reach DP-1: Design Point 1

Inflow Area = 0.035 ac, 70.49% Impervious, Inflow Depth = 3.77" for 10-Year event
Inflow = 0.15 cfs @ 12.09 hrs, Volume= 0.011 af
Outflow = 0.15 cfs @ 12.09 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Design Point 2

Inflow Area = 0.599 ac, 76.35% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Design Point 3

Inflow Area = 0.160 ac, 82.63% Impervious, Inflow Depth = 0.15" for 10-Year event
Inflow = 0.09 cfs @ 12.46 hrs, Volume= 0.002 af
Outflow = 0.09 cfs @ 12.46 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: 12 x Contech ChamberMAXX Chambers

Inflow Area = 0.160 ac, 82.63% Impervious, Inflow Depth = 4.30" for 10-Year event
Inflow = 0.76 cfs @ 12.08 hrs, Volume= 0.057 af
Outflow = 0.19 cfs @ 12.46 hrs, Volume= 0.057 af, Atten= 75%, Lag= 22.5 min
Discarded = 0.10 cfs @ 11.68 hrs, Volume= 0.055 af
Primary = 0.09 cfs @ 12.46 hrs, Volume= 0.002 af
Routed to Reach DP-3 : Design Point 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 278.65' @ 12.46 hrs Surf.Area= 497 sf Storage= 730 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 45.2 min (826.6 - 781.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	276.48'	459 cf	**30.03'W x 16.55'L x 3.52'H Field A** 1,752 cf Overall - 604 cf Embedded = 1,148 cf x 40.0% Voids
#2A	276.98'	579 cf	**Contech ChamberMaxx 2016** x 12 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 6 rows
		1,038 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.48'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	278.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.10 cfs @ 11.68 hrs HW=276.52' (Free Discharge)
1=Exfiltration (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.09 cfs @ 12.46 hrs HW=278.65' TW=0.00' (Dynamic Tailwater)
2=Orifice/Grate (Orifice Controls 0.09 cfs @ 1.31 fps)

Summary for Pond 12P: 50 x Contech ChamberMAXX Chambers

Inflow Area = 0.599 ac, 76.35% Impervious, Inflow Depth = 3.98" for 10-Year event
Inflow = 2.06 cfs @ 12.20 hrs, Volume= 0.199 af
Outflow = 0.38 cfs @ 11.84 hrs, Volume= 0.199 af, Atten= 82%, Lag= 0.0 min
Discarded = 0.38 cfs @ 11.84 hrs, Volume= 0.199 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-2 : Design Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 278.38' @ 12.80 hrs Surf.Area= 1,989 sf Storage= 2,572 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 42.9 min (844.3 - 801.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	276.48'	1,817 cf	**11.03'W x 180.23'L x 3.52'H Field A** 7,010 cf Overall - 2,467 cf Embedded = 4,542 cf x 40.0% Voids
#2A	276.98'	2,364 cf	**Contech ChamberMaxx 2016** x 50 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 2 rows
		4,181 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.48'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	278.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.38 cfs @ 11.84 hrs HW=276.52' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.48' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Subcatchment P-1:

Runoff = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af, Depth= 4.89"
Routed to Reach DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
1,063	98	Paved parking, HSG B
445	61	>75% Grass cover, Good, HSG B
1,508	87	Weighted Average
445		29.51% Pervious Area
1,063		70.49% Impervious Area

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

Summary for Subcatchment P-2:

Runoff = 2.61 cfs @ 12.20 hrs, Volume= 0.255 af, Depth= 5.11"
Routed to Pond 12P : 50 x Contech ChamberMAXX Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
6,174	61	>75% Grass cover, Good, HSG B
9,118	98	Paved parking, HSG B
10,811	98	Roofs, HSG B
26,103	89	Weighted Average
6,174		23.65% Pervious Area
19,929		76.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.0	183	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.1	283	Total			

Summary for Subcatchment P-3: Lewis St

Runoff = 0.95 cfs @ 12.08 hrs, Volume= 0.073 af, Depth= 5.45"
Routed to Pond 1P : 12 x Contech ChamberMAXX Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Rainfall=6.39"

Area (sf)	CN	Description
2,950	98	Roofs, HSG B
1,208	61	>75% Grass cover, Good, HSG B
2,797	98	Paved roads w/curbs & sewers, HSG B
6,955	92	Weighted Average
1,208		17.37% Pervious Area
5,747		82.63% Impervious Area

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

Summary for Reach DP-1: Design Point 1

Inflow Area = 0.035 ac, 70.49% Impervious, Inflow Depth = 4.89" for 25-Year event
Inflow = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af
Outflow = 0.19 cfs @ 12.09 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Design Point 2

Inflow Area = 0.599 ac, 76.35% Impervious, Inflow Depth = 0.36" for 25-Year event
Inflow = 0.53 cfs @ 12.59 hrs, Volume= 0.018 af
Outflow = 0.53 cfs @ 12.59 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Design Point 3

Inflow Area = 0.160 ac, 82.63% Impervious, Inflow Depth = 0.67" for 25-Year event
Inflow = 0.34 cfs @ 12.25 hrs, Volume= 0.009 af
Outflow = 0.34 cfs @ 12.25 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: 12 x Contech ChamberMAXX Chambers

Inflow Area = 0.160 ac, 82.63% Impervious, Inflow Depth = 5.45" for 25-Year event
Inflow = 0.95 cfs @ 12.08 hrs, Volume= 0.073 af
Outflow = 0.43 cfs @ 12.25 hrs, Volume= 0.073 af, Atten= 54%, Lag= 10.2 min
Discarded = 0.10 cfs @ 11.62 hrs, Volume= 0.064 af
Primary = 0.34 cfs @ 12.25 hrs, Volume= 0.009 af
Routed to Reach DP-3 : Design Point 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 278.79' @ 12.25 hrs Surf.Area= 497 sf Storage= 775 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 42.1 min (817.4 - 775.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	276.48'	459 cf	**30.03'W x 16.55'L x 3.52'H Field A** 1,752 cf Overall - 604 cf Embedded = 1,148 cf x 40.0% Voids
#2A	276.98'	579 cf	**Contech ChamberMaxx 2016** x 12 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 6 rows
		1,038 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.48'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	278.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.10 cfs @ 11.62 hrs HW=276.52' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.34 cfs @ 12.25 hrs HW=278.79' TW=0.00' (Dynamic Tailwater)
↑**2=Orifice/Grate** (Orifice Controls 0.34 cfs @ 1.82 fps)

Summary for Pond 12P: 50 x Contech ChamberMAXX Chambers

Inflow Area = 0.599 ac, 76.35% Impervious, Inflow Depth = 5.11" for 25-Year event
Inflow = 2.61 cfs @ 12.20 hrs, Volume= 0.255 af
Outflow = 0.91 cfs @ 12.59 hrs, Volume= 0.255 af, Atten= 65%, Lag= 23.6 min
Discarded = 0.38 cfs @ 11.77 hrs, Volume= 0.237 af
Primary = 0.53 cfs @ 12.59 hrs, Volume= 0.018 af
Routed to Reach DP-2 : Design Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 278.86' @ 12.59 hrs Surf.Area= 1,989 sf Storage= 3,227 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 48.3 min (842.8 - 794.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	276.48'	1,817 cf	**11.03'W x 180.23'L x 3.52'H Field A** 7,010 cf Overall - 2,467 cf Embedded = 4,542 cf x 40.0% Voids
#2A	276.98'	2,364 cf	**Contech ChamberMaxx 2016** x 50 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 2 rows
		4,181 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.48'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	278.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.38 cfs @ 11.77 hrs HW=276.52' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=0.53 cfs @ 12.59 hrs HW=278.86' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Orifice Controls 0.53 cfs @ 2.05 fps)

Summary for Subcatchment P-1:

Runoff = 0.22 cfs @ 12.08 hrs, Volume= 0.016 af, Depth= 5.71"
Routed to Reach DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=7.24"

Area (sf)	CN	Description
1,063	98	Paved parking, HSG B
445	61	>75% Grass cover, Good, HSG B
1,508	87	Weighted Average
445		29.51% Pervious Area
1,063		70.49% Impervious Area

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

Summary for Subcatchment P-2:

Runoff = 3.01 cfs @ 12.20 hrs, Volume= 0.297 af, Depth= 5.94"
Routed to Pond 12P : 50 x Contech ChamberMAXX Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=7.24"

Area (sf)	CN	Description
6,174	61	>75% Grass cover, Good, HSG B
9,118	98	Paved parking, HSG B
10,811	98	Roofs, HSG B
26,103	89	Weighted Average
6,174		23.65% Pervious Area
19,929		76.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.0	183	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.1	283	Total			

Summary for Subcatchment P-3: Lewis St

Runoff = 1.09 cfs @ 12.08 hrs, Volume= 0.084 af, Depth= 6.29"
Routed to Pond 1P : 12 x Contech ChamberMAXX Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 50-Year Rainfall=7.24"

Area (sf)	CN	Description
2,950	98	Roofs, HSG B
1,208	61	>75% Grass cover, Good, HSG B
2,797	98	Paved roads w/curbs & sewers, HSG B
6,955	92	Weighted Average
1,208		17.37% Pervious Area
5,747		82.63% Impervious Area

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

Summary for Reach DP-1: Design Point 1

Inflow Area = 0.035 ac, 70.49% Impervious, Inflow Depth = 5.71" for 50-Year event
Inflow = 0.22 cfs @ 12.08 hrs, Volume= 0.016 af
Outflow = 0.22 cfs @ 12.08 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Design Point 2

Inflow Area = 0.599 ac, 76.35% Impervious, Inflow Depth = 0.76" for 50-Year event
Inflow = 1.06 cfs @ 12.49 hrs, Volume= 0.038 af
Outflow = 1.06 cfs @ 12.49 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Design Point 3

Inflow Area = 0.160 ac, 82.63% Impervious, Inflow Depth = 1.08" for 50-Year event
Inflow = 0.58 cfs @ 12.18 hrs, Volume= 0.014 af
Outflow = 0.58 cfs @ 12.18 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: 12 x Contech ChamberMAXX Chambers

Inflow Area = 0.160 ac, 82.63% Impervious, Inflow Depth = 6.29" for 50-Year event
Inflow = 1.09 cfs @ 12.08 hrs, Volume= 0.084 af
Outflow = 0.68 cfs @ 12.18 hrs, Volume= 0.084 af, Atten= 38%, Lag= 5.9 min
Discarded = 0.10 cfs @ 11.49 hrs, Volume= 0.069 af
Primary = 0.58 cfs @ 12.18 hrs, Volume= 0.014 af
Routed to Reach DP-3 : Design Point 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 278.88' @ 12.18 hrs Surf.Area= 497 sf Storage= 806 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 40.5 min (812.3 - 771.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	276.48'	459 cf	**30.03'W x 16.55'L x 3.52'H Field A** 1,752 cf Overall - 604 cf Embedded = 1,148 cf x 40.0% Voids
#2A	276.98'	579 cf	**Contech ChamberMaxx 2016** x 12 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 6 rows
		1,038 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.48'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	278.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.10 cfs @ 11.49 hrs HW=276.52' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.58 cfs @ 12.18 hrs HW=278.88' TW=0.00' (Dynamic Tailwater)
↑**2=Orifice/Grate** (Orifice Controls 0.58 cfs @ 2.10 fps)

Summary for Pond 12P: 50 x Contech ChamberMAXX Chambers

Inflow Area = 0.599 ac, 76.35% Impervious, Inflow Depth = 5.94" for 50-Year event
Inflow = 3.01 cfs @ 12.20 hrs, Volume= 0.297 af
Outflow = 1.45 cfs @ 12.49 hrs, Volume= 0.297 af, Atten= 52%, Lag= 17.6 min
Discarded = 0.38 cfs @ 11.72 hrs, Volume= 0.259 af
Primary = 1.06 cfs @ 12.49 hrs, Volume= 0.038 af
Routed to Reach DP-2 : Design Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 279.03' @ 12.49 hrs Surf.Area= 1,989 sf Storage= 3,434 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 46.2 min (836.8 - 790.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	276.48'	1,817 cf	**11.03'W x 180.23'L x 3.52'H Field A** 7,010 cf Overall - 2,467 cf Embedded = 4,542 cf x 40.0% Voids
#2A	276.98'	2,364 cf	**Contech ChamberMaxx 2016** x 50 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 2 rows
		4,181 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.48'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	278.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.38 cfs @ 11.72 hrs HW=276.52' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=1.06 cfs @ 12.49 hrs HW=279.03' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Orifice Controls 1.06 cfs @ 2.49 fps)

Summary for Subcatchment P-1:

Runoff = 0.26 cfs @ 12.08 hrs, Volume= 0.019 af, Depth= 6.63"
Routed to Reach DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.18"

Area (sf)	CN	Description
1,063	98	Paved parking, HSG B
445	61	>75% Grass cover, Good, HSG B
1,508	87	Weighted Average
445		29.51% Pervious Area
1,063		70.49% Impervious Area

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

Summary for Subcatchment P-2:

Runoff = 3.45 cfs @ 12.20 hrs, Volume= 0.343 af, Depth= 6.86"
Routed to Pond 12P : 50 x Contech ChamberMAXX Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.18"

Area (sf)	CN	Description
6,174	61	>75% Grass cover, Good, HSG B
9,118	98	Paved parking, HSG B
10,811	98	Roofs, HSG B
26,103	89	Weighted Average
6,174		23.65% Pervious Area
19,929		76.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.0	183	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.1	283	Total			

Summary for Subcatchment P-3: Lewis St

Runoff = 1.24 cfs @ 12.08 hrs, Volume= 0.096 af, Depth= 7.22"
Routed to Pond 1P : 12 x Contech ChamberMAXX Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-Year Rainfall=8.18"

Area (sf)	CN	Description
2,950	98	Roofs, HSG B
1,208	61	>75% Grass cover, Good, HSG B
2,797	98	Paved roads w/curbs & sewers, HSG B
6,955	92	Weighted Average
1,208		17.37% Pervious Area
5,747		82.63% Impervious Area

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

Summary for Reach DP-1: Design Point 1

Inflow Area = 0.035 ac, 70.49% Impervious, Inflow Depth = 6.63" for 100-Year event
Inflow = 0.26 cfs @ 12.08 hrs, Volume= 0.019 af
Outflow = 0.26 cfs @ 12.08 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Design Point 2

Inflow Area = 0.599 ac, 76.35% Impervious, Inflow Depth = 1.22" for 100-Year event
Inflow = 1.78 cfs @ 12.40 hrs, Volume= 0.061 af
Outflow = 1.78 cfs @ 12.40 hrs, Volume= 0.061 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Design Point 3

Inflow Area = 0.160 ac, 82.63% Impervious, Inflow Depth = 1.55" for 100-Year event
Inflow = 0.88 cfs @ 12.15 hrs, Volume= 0.021 af
Outflow = 0.88 cfs @ 12.15 hrs, Volume= 0.021 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: 12 x Contech ChamberMAXX Chambers

Inflow Area = 0.160 ac, 82.63% Impervious, Inflow Depth = 7.22" for 100-Year event
Inflow = 1.24 cfs @ 12.08 hrs, Volume= 0.096 af
Outflow = 0.98 cfs @ 12.15 hrs, Volume= 0.096 af, Atten= 21%, Lag= 3.7 min
Discarded = 0.10 cfs @ 11.36 hrs, Volume= 0.075 af
Primary = 0.88 cfs @ 12.15 hrs, Volume= 0.021 af
Routed to Reach DP-3 : Design Point 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 278.98' @ 12.15 hrs Surf.Area= 497 sf Storage= 836 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 39.2 min (807.7 - 768.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	276.48'	459 cf	**30.03'W x 16.55'L x 3.52'H Field A** 1,752 cf Overall - 604 cf Embedded = 1,148 cf x 40.0% Voids
#2A	276.98'	579 cf	**Contech ChamberMaxx 2016** x 12 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 6 rows
		1,038 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.48'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	278.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.10 cfs @ 11.36 hrs HW=276.52' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.88 cfs @ 12.15 hrs HW=278.98' TW=0.00' (Dynamic Tailwater)
↑**2=Orifice/Grate** (Orifice Controls 0.88 cfs @ 2.36 fps)

Summary for Pond 12P: 50 x Contech ChamberMAXX Chambers

Inflow Area = 0.599 ac, 76.35% Impervious, Inflow Depth = 6.86" for 100-Year event
Inflow = 3.45 cfs @ 12.20 hrs, Volume= 0.343 af
Outflow = 2.16 cfs @ 12.40 hrs, Volume= 0.343 af, Atten= 37%, Lag= 11.9 min
Discarded = 0.38 cfs @ 11.62 hrs, Volume= 0.282 af
Primary = 1.78 cfs @ 12.40 hrs, Volume= 0.061 af
Routed to Reach DP-2 : Design Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 279.23' @ 12.40 hrs Surf.Area= 1,989 sf Storage= 3,577 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 44.4 min (831.2 - 786.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	276.48'	1,817 cf	**11.03'W x 180.23'L x 3.52'H Field A** 7,010 cf Overall - 2,467 cf Embedded = 4,542 cf x 40.0% Voids
#2A	276.98'	2,364 cf	**Contech ChamberMaxx 2016** x 50 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 2 rows
		4,181 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.48'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	278.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.38 cfs @ 11.62 hrs HW=276.52' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.38 cfs)

Primary OutFlow Max=1.78 cfs @ 12.40 hrs HW=279.23' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Orifice Controls 1.78 cfs @ 2.90 fps)

Summary for Subcatchment P-1:

Runoff = 0.01 cfs @ 12.10 hrs, Volume= 0.001 af, Depth= 0.22"
Routed to Reach DP-1 : Design Point 1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr WQV Rainfall=1.00"

Area (sf)	CN	Description
1,063	98	Paved parking, HSG B
445	61	>75% Grass cover, Good, HSG B
1,508	87	Weighted Average
445		29.51% Pervious Area
1,063		70.49% Impervious Area

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

Summary for Subcatchment P-2:

Runoff = 0.14 cfs @ 12.23 hrs, Volume= 0.014 af, Depth= 0.28"
Routed to Pond 12P : 50 x Contech ChamberMAXX Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr WQV Rainfall=1.00"

Area (sf)	CN	Description
6,174	61	>75% Grass cover, Good, HSG B
9,118	98	Paved parking, HSG B
10,811	98	Roofs, HSG B
26,103	89	Weighted Average
6,174		23.65% Pervious Area
19,929		76.35% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.1	100	0.0100	0.13		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.10"
2.0	183	0.0100	1.50		**Shallow Concentrated Flow,** Grassed Waterway Kv= 15.0 fps
15.1	283	Total			

Summary for Subcatchment P-3: Lewis St

Runoff = 0.07 cfs @ 12.09 hrs, Volume= 0.005 af, Depth= 0.40"
Routed to Pond 1P : 12 x Contech ChamberMAXX Chambers

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Type III 24-hr WQV Rainfall=1.00"

Area (sf)	CN	Description
2,950	98	Roofs, HSG B
1,208	61	>75% Grass cover, Good, HSG B
2,797	98	Paved roads w/curbs & sewers, HSG B
6,955	92	Weighted Average
1,208		17.37% Pervious Area
5,747		82.63% Impervious Area

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

Summary for Reach DP-1: Design Point 1

Inflow Area = 0.035 ac, 70.49% Impervious, Inflow Depth = 0.22" for WQV event
Inflow = 0.01 cfs @ 12.10 hrs, Volume= 0.001 af
Outflow = 0.01 cfs @ 12.10 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach DP-2: Design Point 2

Inflow Area = 0.599 ac, 76.35% Impervious, Inflow Depth = 0.00" for WQV event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Reach DP-3: Design Point 3

Inflow Area = 0.160 ac, 82.63% Impervious, Inflow Depth = 0.00" for WQV event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

Summary for Pond 1P: 12 x Contech ChamberMAXX Chambers

Inflow Area = 0.160 ac, 82.63% Impervious, Inflow Depth = 0.40" for WQV event
Inflow = 0.07 cfs @ 12.09 hrs, Volume= 0.005 af
Outflow = 0.07 cfs @ 12.09 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.07 cfs @ 12.09 hrs, Volume= 0.005 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-3 : Design Point 3

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 276.48' @ 12.09 hrs Surf.Area= 497 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 0.0 min (848.4 - 848.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	276.48'	459 cf	**30.03'W x 16.55'L x 3.52'H Field A** 1,752 cf Overall - 604 cf Embedded = 1,148 cf x 40.0% Voids
#2A	276.98'	579 cf	**Contech ChamberMaxx 2016** x 12 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 6 rows
		1,038 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.48'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	278.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.10 cfs @ 12.09 hrs HW=276.48' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.48' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

Summary for Pond 12P: 50 x Contech ChamberMAXX Chambers

Inflow Area = 0.599 ac, 76.35% Impervious, Inflow Depth = 0.28" for WQV event
Inflow = 0.14 cfs @ 12.23 hrs, Volume= 0.014 af
Outflow = 0.14 cfs @ 12.23 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.14 cfs @ 12.23 hrs, Volume= 0.014 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach DP-2 : Design Point 2

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
Peak Elev= 276.48' @ 0.00 hrs Surf.Area= 1,989 sf Storage= 0 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 0.0 min (878.4 - 878.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	276.48'	1,817 cf	**11.03'W x 180.23'L x 3.52'H Field A** 7,010 cf Overall - 2,467 cf Embedded = 4,542 cf x 40.0% Voids
#2A	276.98'	2,364 cf	**Contech ChamberMaxx 2016** x 50 Inside #1 Inside= 49.6"W x 25.2"H => 6.63 sf x 7.12'L = 47.2 cf Outside= 49.6"W x 30.0"H => 6.92 sf x 7.12'L = 49.3 cf Row Length Adjustment= +0.32' x 6.63 sf x 2 rows
		4,181 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	276.48'	**8.270 in/hr Exfiltration over Horizontal area**
#2	Primary	278.50'	**12.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.00 cfs @ 12.23 hrs HW=276.48' (Free Discharge)
↑—**1=Exfiltration** (Passes 0.00 cfs of 0.38 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=276.48' TW=0.00' (Dynamic Tailwater)
↑—**2=Orifice/Grate** (Controls 0.00 cfs)

APPENDIX F

Recharge Calculations

MP DESIGN CONSULTANTS
DESIGNING AND MANAGING YOUR DREAM

240 East Central St
Franklin, Massachusetts

MassDEP Standard No. 3 - Groundwater Recharge Calculations

Minimum Required Recharge Volume *(if 100% of impervious area discharging to recharge BMP)*					
NRCS Hydrologic Soil Type	**Approx. Soil Texture**	**Target Depth Factor (inches)**	**Impervious Area (acres)**	**Required Recharge (ac-ft)**	**(cf)**
A	sand	0.60	0.60	0.030	1,296
B	loam	0.35	0.00	0.000	0
C	silty loam	0.25	0.00	0.000	0
D	clay	0.10	0.00	0.000	0
		Totals =	**0.60**	**0.030**	**1,296**

MassDEP Standard No. 3 - Groundwater Recharge Calculations

Recharge Infiltration Chamber	**Static Storage Volume (cf)**
1	4,181
2	1,038
	5,219

Rv = F x impervious area x ratio of impervious area

Where: Rv = required recharge volume (acre-feet)
F = target depth factor associated with each hydrologic soil group (feet)
Impervious Area = pavement and rooftop area on site (acres)
Ratio of Impervious Area = total impervious area / impervious area discharging to recharge BMP

Notes:
1.) A minimum of 65% of impervious area is required to drain to recharge BMP.
2.) Refer to the 2008 Massachusetts Stormwater Handbook Volume 3, Chapter 1, pages 27-28 for required recharge requirement.

Rawls Rates

Texture Class	**NRCS Hydrologic Soil Group (HSG)**	**Infiltration Rate (inches/hour)**
sand	A	8.27
loamy sand	A	2.41
sandy loam	B	1.02
loam	B	0.52
silt loam	C	0.27
sandy clay loam	C	0.17
clay loam	D	0.09
silty clay loam	D	0.06
sandy clay	D	0.05
silty clay	D	0.04
clay	D	0.02

Refer to Massachusetts Stormwater Handbook Volume 3, Chapter 1, page 22 dated February 2008.

APPENDIX G

Drawdown Calculations

MP DESIGN CONSULTANTS
DESIGNING AND MANAGING YOUR DREAM

240 East Central St Franklin, Massachusetts						
Drawdown Time Calculations Summary						
Description	**Storage Volume (Cubic Feet)**	**NRCS Hydraulic Soil Group (HSG)**	**K (Inches/Hour)**	**Bottom Area (Square Feet)**	**Drawdown Time (Hours)**	**Outlet Invert Elevation**
BMP #1 - Infiltration Chambers	4,181	A - Sand	8.27	1,988	3.1	278.5
BMP #2 - Infiltration Chambers	1,038	A - Sand	8.27	497	3.0	278.5

Notes:

1. Saturated hydraulic conductivity based on Rawls Rates Table.

Rawls Rates Table		
Texture Class	**NRCS Hydrologic Soil Group (HSG)**	**Infiltration Rate (inches/hour)**
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

$$Time_{drawdown} = \frac{Rv}{(K)(Bottom\ Area)}$$

Where:

$Time_{drawdown}$ = time it takes the basin to drain completely (hours)

Rv = storage volume (cubic feet)

K = saturated hydraulic conductivity (feet/hour)

Bottom Area = bottom area of recharge structure (square feet)

1. Refer to Massachusetts Stormwater Handbook Volume 3, Chapter 1, Page 22 dated February 2008.

APPENDIX H

Water Quality Calculations

MP DESIGN CONSULTANTS
DESIGNING AND MANAGING YOUR DREAM

Impervious Cover
240 East Central St
Franklin, Massachusetts

BMP Forebay Volume and Water Quality Volume Calculations Summary

Description	BMP Type	Impervious Tributary Area (acres)	Forebay Runoff Depth (inches)	WQ Runoff Depth** (inches)	Required WQ Volume (cubic feet)	Provided WQ Volume (cubic feet)
BMP #1	Infiltration Chamber	0.47	0.10	1.0	1,688	4,181
BMP #2	Infiltration Chamber	0.13	0.10	1.0	472	1038

** This area is in a Zone II assume 1" WQ depth

APPENDIX I

TSS Removal Calculations

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: 240 East Central St, Franklin MA

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	0.25	1.00	0.25	0.75
Deep Sump and Hooded Catch Basin	0.25	0.75	0.19	0.56
Infiltration Trench	0.80	0.56	0.45	0.11
	0.00	0.11	0.00	0.11
	0.00	0.11	0.00	0.11

Total TSS Removal = 89%

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project:
Prepared By: CMS
Date: 12/12/2023

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

APPENDIX J

Long-Term Pollution Prevention And Stormwater Operation & Maintenance Plan

LONG-TERM POLLUTION PREVENTION AND STORMWATER OPERATION & MAINTENANCE PLAN

Prepared For:
Nylah Crossing LLC
95 East Main Street Suite 100
Westborough, MA 01581

Prepared By:

MP Design Consultants
118 Turnpike Road, Suite 200
Southborough, MA 01772

Date:
December 18, 2023

Table of Contents

List of Appendices

1 Introduction

The Long-Term Pollution Prevention (LTPP) and Stormwater Operation and Maintenance (O&M) Plan, filed with the Town of Franklin, shall be implemented at Nylah Crossing LLC development located at 240 East Central Street to ensure long-term functioning of the stormwater management system (System), and to provide suitable practices for source control of pollutants.

The System has been designed in accordance with the ten (10) MassDEP Stormwater Management Standards provided in the Stormwater Management Policy and Massachusetts Wetlands Protection Act, which relate to the protection of wetlands and water bodies, control of water quantity, recharge to groundwater, water quality and protection of critical areas, erosion/sedimentation control and stormwater maintenance. Preventative maintenance of the System is essential in the protection of these interests.

1.1 Responsible Party

The Owner possesses the primary responsibility for overseeing and implementing the LTPP and Stormwater O&M Plan. When necessary, the Owner shall designate responsibility to a professional engineer or other technical professional with expertise and experience with stormwater management facilities for the proper operation and maintenance of the System. In case of transfer of property ownership, future property owners shall be notified of the presence of the stormwater management system and the requirements for proper implementation of the LTPP and Stormwater O&M Plan.

Operator Name and Address:
Nylah Crossing LLC
95 East Main Street Suite 100
Westborough, MA 01581

1.2 Documentation

An Inspection and Maintenance Log and Schedule shall be kept by the Owner or designated responsible party summarizing inspections, maintenance, repairs and any corrective actions taken. At a minimum, the Inspection and Maintenance Log Forms shall include the date on which each inspection or maintenance task was performed, date and the amount of the last storm event in excess of 0.1 inches of rain in a 24-hour period, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task.

1.3 References

The LTPP and Stormwater O&M Plan references the following documents:

Site Plans:

Plans titled “NYLAH CROSSING LLC SITE PLAN REVIEW 240 EAST CENTRAL STREET FRANKLIN, MA” dated December 12, 2023 (or as amended), prepared by MP Design Consultants.

Stormwater Management Report:

Report titled “Stormwater Management Report” prepared for Nylah Crossing LLC dated December 18, 2023 (or as amended), prepared by MP Design Consultants.

2 Operations and Maintenance Program

The Owner or designated responsible party shall conduct the Stormwater O&M Program set forth in this document, ensure that inspections and record keeping are timely and accurate, and that cleaning and maintenance are performed in accordance with the recommended frequency for each System component. The Owner or designated responsible party shall also maintain all System components to function as they were designed to. Estimated annual cost of the Maintenance Program is $4,000.

Inspection and Maintenance Log Forms shall include the date on which each inspection or maintenance task was performed, date and the amount of the last storm event in excess of 0.1 inches of rain in a 24-hour period, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. Inspection findings shall include items such as physical conditions of the System components, depth of sediment in structures, evidence of overtopping or debris blockage, and maintenance required for each System component. Refer to Appendix A, Inspection and Maintenance Log Form for a sample form.

2.1 Inspection and Maintenance Frequency

The following areas and System components shall be inspected by the Owner or designated responsible party and maintained as specified below. The inspection and maintenance frequencies described below may be adjusted based on results gathered during inspections. Any adjustments to the below-mentioned inspection and maintenance schedule shall be relayed to the proper authorities to ensure reporting requirements are met. Any deficiencies to the following areas and systems shall be corrected upon discovery.

2.1.1 Yard Cleanout

Yard Cleanouts shall be inspected on an annual basis and cleaned or maintained as necessary. Inspections shall include ensuring the cleanout and cover are in good condition and checking if litter or accumulated sediment is obstructing flow through the structure. Common corrective actions include removal of litter and accumulated sediment.

2.1.2 Storm Drain Piping

Storm drain piping shall be inspected on an annual basis and cleaned or maintained as necessary. Inspection shall include checking if litter or accumulated sediment is obstructing flow. Typical observations that would indicate the storm drain piping is not functioning properly are roof gutter overflows or no discharge of runoff into the detention areas during a storm event. Common corrective actions include removal of litter and accumulated sediment.

2.1.3 Drainage Structures (Catch Basins and Manholes)

Drainage Inlets will be inspected quarterly and cleaned to ensure that the pipe connections are working in their intended fashion and that they are free of debris. Sediments and hydrocarbons will be properly handled and disposed of off-site, in accordance with local, state, and federal guidelines and regulations. The method of sediment removal will be by hand or vacuum and disposal must be documented.

2.1.4 Subsurface Infiltration System

The subsurface system (Contech) shall be inspected in accordance with the manufacturer's instructions. Inspection should occur monthly during the first year following installation, and then twice annually, once in the fall and then in the spring after the snow melts. Sediment removal will take place at the completion of construction and as deemed necessary based on the inspections.

3 Practices for Long-Term Pollution Prevention (LTPP)

The Owner or designated responsible party shall implement the LTPP practices set forth in this document.

3.1 Good Housekeeping Measures

The Owner or designated responsible party shall implement the following good housekeeping measures to ensure long-term pollution prevention and provide suitable practices for source control of pollutants.

3.1.1 Vehicles Washing Controls

The washing of vehicles is not anticipated at this site. In the event that vehicle washing is conducted at the site, it will be performed in a location where runoff can be collected in the closed stormwater collection system and directed to a stormwater quality unit. Runoff resulting from vehicle washing will not be directly discharged to a wetland.

3.1.2 Snow Management Guidelines

Snow shall not be dumped directly into water bodies, wetlands and surrounding buffer zones, or stormwater BMPs. Snow pile sites shall be in areas with relatively level slopes with stabilized groundcover, and a linear sedimentation control barrier shall be placed securely on the downgradient side of a snow pile. At the end of the snow season, debris accumulated sediment shall be cleared from the snow pile site and properly disposed of in accordance with local, state and federal guidelines and regulations.

3.1.3 Mosquito Control Guidelines

If evidence of mosquitos is found in any of the sediment forebays, larvicide may be applied by a licensed pesticide applicator in compliance with all pesticide label requirements, as well as any applicable local, state, or federal guidelines and regulations.

3.1.4 Pet Waste Management

Scoop up and seal pet waste in a plastic bag and dispose of properly in a closed solid waste container.

3.1.5 Solid Waste Management

Dispose of or recycle solid waste in closed containers and in accordance with any applicable local, state and federal guidelines and regulations.

3.1.6 Material Storage and Spill Prevention

Deicing chemicals, fertilizers, herbicides, pesticides, or other hazardous materials shall be stored under a roof or other structure and shall be kept in original containers unless they are not resealable. Manufacturer's labels and material safety data sheets shall be retained. Try to store only enough product required for the job, and when possible, all of a product shall be used before disposing of the container. Manufacturer, local, state and federal guidelines and regulations for proper use and disposal shall be followed.

The manufacturer's recommended methods for spill cleanup shall be clearly posted and site personnel shall be made aware of the procedures and the location of the information and cleanup supplies. Materials and equipment necessary for spill cleanup shall be kept in the material storage area on-site. Equipment and materials shall include, but not be limited to, brooms, dustpans, mops, rags, gloves, goggles, kitty litter, sand or sawdust, as well as plastic and metal containers specifically for this purpose. All spills shall be cleaned up immediately after discovery.

3.1.7 Routine Inspection and Maintenance of Stormwater BMPs

Conduct inspection and maintenance of the stormwater BMPs in accordance with the Stormwater O&M Program discussed above.

3.1.8 Maintenance of Landscaped Areas

Routine mowing shall be conducted on a consistent basis with grass cut to an adequate height to maintain a healthy and full vegetative cover. Bare areas, areas of sparse growth, and signs of erosion shall be addressed in accordance with the Stormwater O&M Program discussed above.

3.1.9 Prohibition of Illicit Discharges

Illicit discharges are discharges that do not entirely consist of stormwater, except for certain specified non-stormwater discharges such as firefighting activities, water line flushing, irrigation systems, lawn watering, and wash water from buildings without detergents. There are no known or proposed illicit connections associated with the Project, however if a potential illicit discharge is detected it shall be investigated to determine the nature and source of the discharge, and if required action shall be taken to eliminate the illicit discharge.

APPENDIX A

Inspection and Maintenance Log

Nylah Crossing LLC

SAMPLE Inspection and Maintenance Log Form

Inspector or Maintenance Personnel Name: _____
Date: _____

☐ Routine
☐ Response to Rainfall Event (_____ inches)
☐ Other (describe) _____

BMP	Required Inspection Frequency	Maintenance Frequency	Comments	Follow-up Action Required (Yes / No)
Yard Cleanout	Annually	As Needed		
Storm Drain` Piping	Annually	As Needed		
Drainage Structures (Catch Basins and Manholes)	Quarterly	As Needed		
Subsurface Infiltration System (As-Built)	Bi-annually	As Needed		

APPENDIX B

Operation & Maintenance
Subsurface Infiltration System

CONTECH®
ENGINEERED SOLUTIONS

ChamberMaxx® Inspection and Maintenance Guide

CHAMBERMaxx®

ChamberMaxx®

Safety

Before entering into any storm sewer or underground retention/detention system check to make sure all OSHA and local safety regulations and guidelines are observed during the maintenance process. Hard hats, safety glasses, steel-toed boots and any other appropriate personal protective equipment shall be worn at all times.

Inspection Frequency

Inspections are recommended at a minimum annually. The first year of operation may require more frequent inspections. Frequency of inspections will vary significantly on the local site conditions. An individual inspection schedule should be established for each site.

Inspections

Inspection is the key to effective maintenance and is easily performed. Inspections may need to be performed more often in the winter months in climates where sanding operations may lead to rapid sediment accumulations, or in equipment washdown areas. It is very useful to keep a record of each inspection. A sample inspection log is included for your use.

The entire treatment train should be inspected and maintained. The treatment train may consist of an upstream sump manhole, manifold system or pre-treatment HDS device. Inspections should start at the upstream device and continue downstream to the discharge orifice if incorporated into the chamber system.

Pre-Treatment Device Inspection

Inspection and maintenance procedures provided by the manufacturer should be followed for pre-treatment systems such as a CDS®, Vortechs®, VortSentry® or VortSentry® HS. Expected pollutants will be floatable trash, sediment and oil and grease. Pre-treatement devices are recommended for all detention/retention devices regardless of type.

Containment Row™ Inspection

The optional Containment Row consists of a diversion concrete manhole with a weir and a drain down orifice, and a row of chambers placed on woven geotextile. The diversion weir directs the first flush flows into the Containment Row of chambers. The majority of sediment will be captured in the Containment Row due to the extended detention time which allows the particles to settle out. Higher flows overtop (bypass) the weir into the manifold system.

The Containment Row will typically be located in the first row of chambers connected to the diversion manhole. Inspection can be done through accessing the diversion manhole and visually inspecting the Containment Row through the inlet pipe. Inspection ports throughout the system can be used for visual observation and measurement of sediment accumulation using a stadia rod. When the depth of sediment accumulates over 4-inch (102 mm), cleanout is recommended.

Manifold System Inspection

The main manifold pipe can be inspected from the diversion manhole upstream. When a quarter of the pipe volume has been filled with sediment the header system should be maintained.

Visual Inspection

Maintenance or further investigation may be required if any of the following conditions exist:

- Evidence of an unusual amount of silt and soil build-up on the surface.
- Clogged outlet drainpipe.
- System does not drain to the elevation of the lowest pipe in dry conditions.
- Evidence of potholes or sinkholes

Maintenance

Underground stormwater retention/detention systems 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 rather than the size or configuration of the system. If accumulated silt is interfering with the operation of the detention system (i.e.: blocking outlet pipes or deposits significantly reduce the storage capacity of the system) it should be removed.

It is easiest to maintain a system when there is no flow entering. For this reason, cleanout should be scheduled during dry weather.

A vacuum truck or other similar devices can be used to remove sediment from the treatment train. Starting upstream, maintain manholes with sumps and any pre-treatment devices (following manufacturer recommended procedures). Once maintenance is complete, replace all caps, lids and covers. It is important to document maintenance events on the Inspection and Maintenance Log.

Header System Maintenance:

If maintenance is required, use a high pressure nozzle with rear facing jets to wash the sediments and debris into the diversion manhole. Use the vacuum hose stinger nozzle to remove the washed sediments from the sump of the diversion manhole. It is important to not flush sediments into the chamber system during the maintenance process.

Containment Row™ Maintenance

If maintenance is required, a JetVac truck utilizing a high pressure nozzle (sledge dredging tool) with rear facing jets will be required. Insert the nozzle from the diversion manhole into the Containment Row through the inlet pipe. Turn the water feed hose on and feed the supply hose until the nozzle has reached the end of the Containment Row. Withdraw the nozzle slowly.

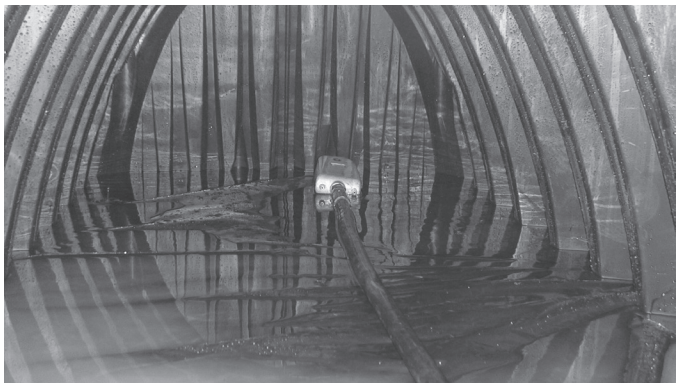


Figure 1— Containment Row shown with high pressure cleaning nozzle

The tool will backflush the Containment Row forcing debris into the diversion manhole sump. Use the stringer vacuum hose to remove the sediments and debris from the sump of the diversion manhole. Multiple passes may be required to fully cleanout the Containment Row. Vacuum out the diversion manhole and remove all debris. See Figure 1.

Inspection & Maintenance Log Sample Template

ChamberMaxx **Location:**

Date	Depth of Sediment	Accumulated Trash	Name of Inspector	Maintenance Performed/Notes

CHAMBERMaxx®

SUPPORT

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

CONTECH®
ENGINEERED SOLUTIONS
800.338.1122
www.ContechES.com

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

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; related foreign patents or other patents pending.

CONTECH®
ENGINEERED SOLUTIONS

ChamberMaxx® Retention Installation Guide

CHAMBERMaxx®

ChamberMaxx Retention Installation Guide

The ChamberMaxx system requires adherence to the following installation procedure for the structural integrity of the system to be maintained.

All illustrations and photographs are examples of typical situations. Each individual site will vary, so it is important to follow the engineering project drawings as designed and sealed by a registered Professional Engineer.

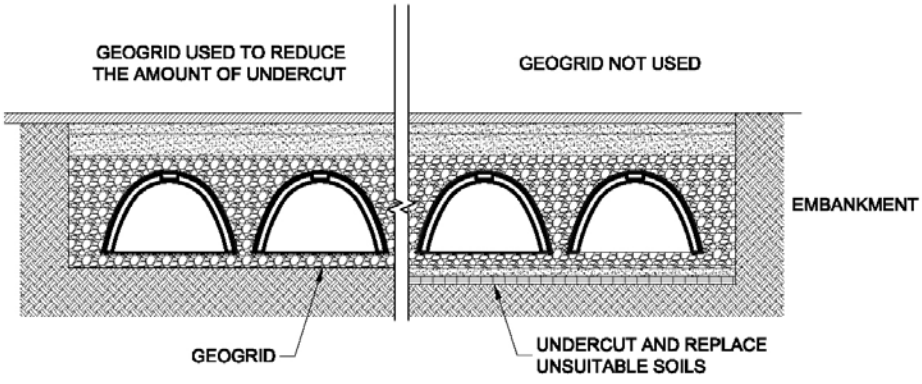
Prior to installation of the ChamberMaxx system a pre-construction meeting shall be conducted. Those required to attend are the supplier of the system, the general contractor, sub-contractors and the project Engineer of record.

Foundation

Construct a foundation that can support the design loading applied by the chambers and adjacent backfill weight as well as maintain its integrity during construction. A minimum of an extra foot of perimeter excavation is required for proper fit and adequate compaction. Excavation must be free of standing water. Dewater if present.

If soft or unsuitable soils are encountered, remove unsuitable material and bring back to grade with fill material as approved by the Engineer of record. See Detail A. The structural fill material gradation should not allow the migration of fines, which can cause settlement of the chamber system and possibly the above pavement, and occlusion of the void space in the bedding. If the structural fill material is not compatible with the underlying soils a Contech C-40, non-woven 4 oz separation geotextile, should be used as a separator.

Grade the foundation subgrade to a uniform and stable grade. If the subgrade is clay or relatively non-porous and the construction sequence will last for an extended period of time, it is best to slope the grade to one end of the system. This will allow excess water to drain quickly, preventing saturation of the subgrade.



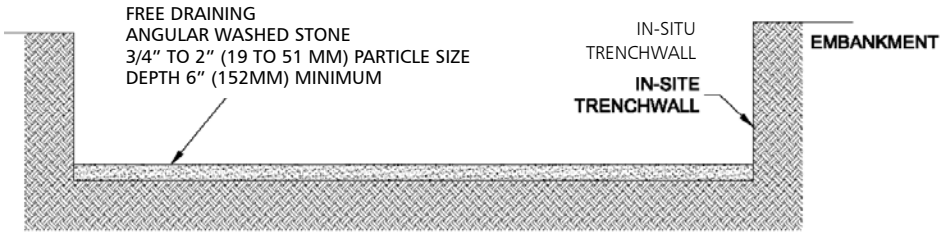
SECTION

DETAIL A

Bedding

A 6-inch (152 mm) minimum thickness, well-graded, free-draining angular washed stone 3/4 to 2-inch (19 to 51 mm) particle size is the required chamber bedding. Refer to project engineering plans for subgrade soil preparation and required stone foundation thickness. If the construction equipment will operate for an extended period of time on the bedding, use an engineering fabric or a geogrid to ensure the base material maintains its integrity. Bedding material is to be compacted to 90% AASHTO T99 standard proctor density. Do not use heavy equipment on bedding material to avoid excessive soil compaction. See Detail B.

Grade the base to a smooth, uniform grade to allow for the proper placement of chambers.



SECTION

DETAIL B

In-Situ Trench Wall

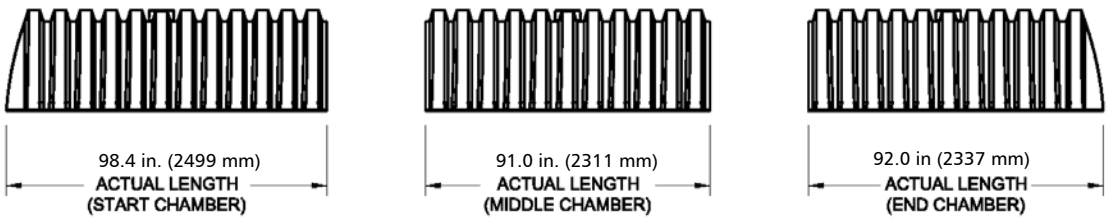
The trench wall must be capable of supporting the load that the chamber sheds as the system is loaded. If soils are not capable of supporting these loads, the integrity of the system can be compromised. Perform a simple soil pressure check using the applied loads to determine the limits of excavation beyond the edge of the outer most row of chambers. Wrap the walls with Contech C-40 non-woven geotextile to help prevent soil migration.

In most cases the requirements for a safe work environment and proper backfill placement and compaction take care of this concern.

ChamberMaxx Units

All systems are comprised of the Start, Mid and End chambers. The Start and End chambers are marked accordingly with a label on each end.

The maximum weight of a single chamber is 83 lbs. (37.65 kg) which allows the chamber to be hand carried. See Detail C.



ELEVATION VIEW

DETAIL C

Layout of the Manifold System

Temporarily layout the manifold system per the project engineering plans. Place the Start chamber of each row in your system. Standard spacing between rows is 5.6", with a minimum of 5" required between each row.. Use a reciprocating saw to cut the inlet pipe diameter hole out from the Start chamber at the correct inlet height. Insert the inlet pipe from the assembled manifold system into each Start chamber. Cover any open void spaces greater than 3/4-inch (19 mm) on the chambers with a non-woven geotextile to prevent infiltration of backfill material.

Layout of the Optional Containment Row

For ease of access during a maintenance operation, ChamberMaxx retention systems may have an optional Containment Row to allow for containment and settlement of sediments and associated pollutants during the initial flows of storm events. This row of chambers is set on top of a 2 layers of AASHTO M288 Class 1 woven geotextile a minimum of 53" wide with no overlaps.

1. Install diversion manhole per site plan.
2. Rollout the 12.5 ft (150 inch) wide woven geotextile and cut to the required length of the containment row while leaving 3-ft (.19m) overlap at each end of the chamber row. Fold the geotextile lengthwise creating 2 layers of 75" wide woven geotextile. Center the 2 layers of geotextile on the location of the containment row. The 75" wide geotextile layers will overlap approximately 1 ft of width on each side of the containment row. It may be necessary to temporarily weigh down the edges of the geotextile material to prevent displacement from wind.
3. Lay chambers for the Containment Row on the 2 layers of woven geotextile per the plans starting at the Start chamber, see Setting Units for installation instructions. It may be necessary to mark position of chambers on geotextile to ensure proper location during placement of chambers.
4. Install inlet connector pipe in Start chamber wall from the diversion manhole per plans.
5. Confirms the width of woven geotextile leaves a minimum of 6" around chamber along the sides. See Detail D.
6. Wrap the sides of the woven geotextile around the sides of the containment row and pin it to ensure that it does not unwrap during backfill
7. Fold overlapping ends of woven geotextile at the ends of the containment row so that they are flat against the end walls and fully wrapped around the inlet pipe of the containment row. Attach with construction tape as needed to keep the geotextile from moving during backfill.
8. Layout remaining chambers of retention system and header manifold per plans. See page 6.

Laying Out Scour Protection Netting

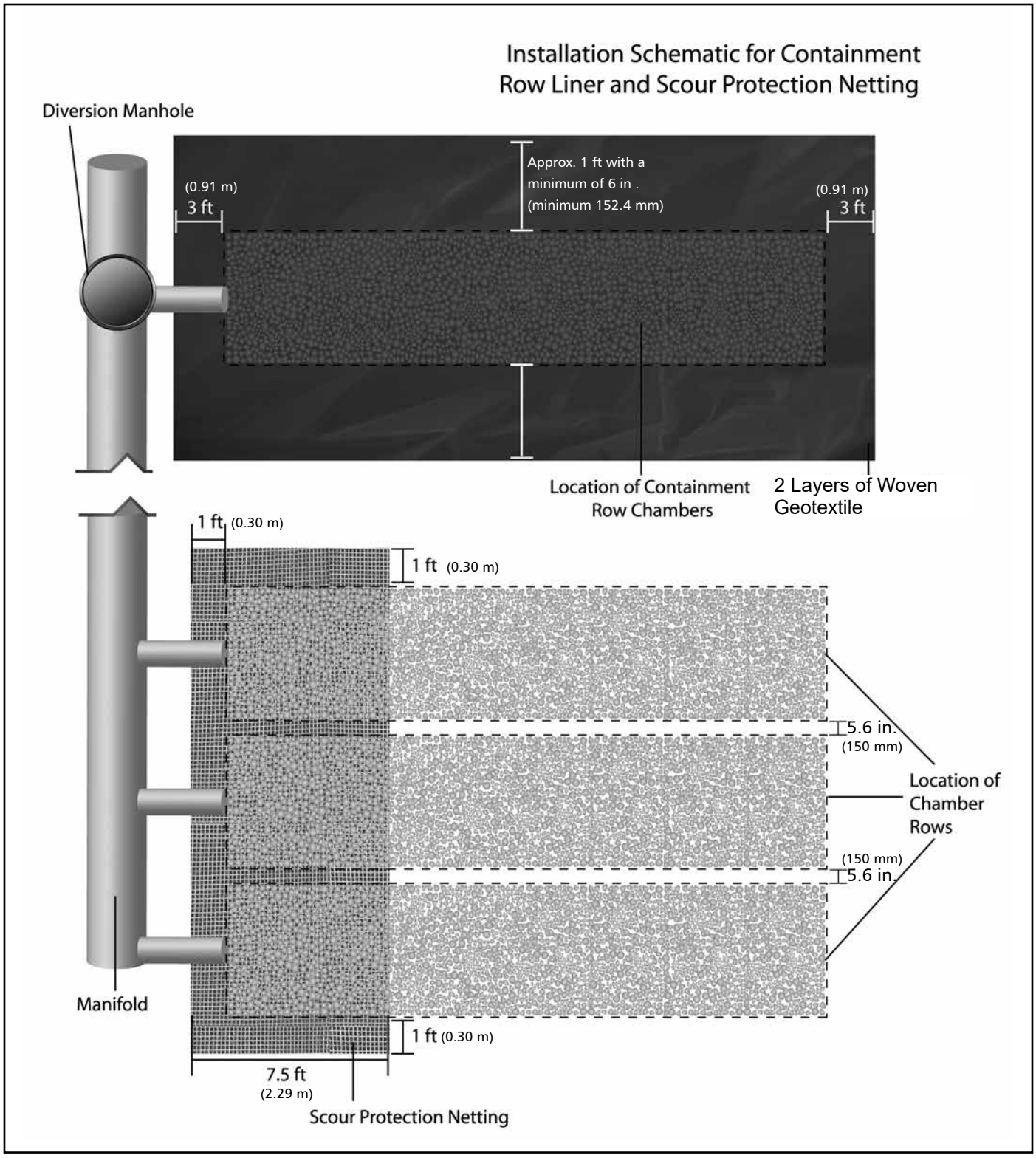
To insure the bedding is not disrupted as flows enter the system, rollout the Scour Protection Netting material perpendicular to the inlet chambers. In the area of the inlet chambers, lay the material with a one foot overlap towards the manifold system and footprint area. Tension material as needed to provide intimate contact with the bedding stone. When the inlet chamber is installed, this will "pin" the netting material in place. Inspect to insure netting is flat with no wrinkles and has intimate contact with the bedding stone. See Detail D.

Setting Units

Overlap the Mid chamber corrugation over the end of the Start chamber. Standard spacing between rows is 5.6", with a minimum of 5" required between each row. Always refer to the engineering plans for chamber arrangement. The End chamber will be the final chamber in each row.

Inspection Viewports

Where identified on the engineering project plans cut a 4-inch (102 mm) diameter hole in the reinforced circular port on the top of the chamber. Build an inspection port from PVC Schedule 40 pipe. Cut pipe to an oversized length, screw three small angle irons approximately 1-inch (25 mm) from the end of pipe. Anchor the riser in place on the chamber to keep secured during the backfill process. Install ring and cover on top of the riser pipe. After backfill, place an access casting in a concrete collar. To avoid crushing the inspection port riser, be sure concrete does not attach to riser pipe.


Installation Schematic for Containment
Row Liner and Scour Protection Netting
Diversion Manhole
(0.91 m)
3 ft
Approx. 1 ft with a
minimum of 6 in .
(minimum 152.4 mm)
(0.91 m)
3 ft
Location of Containment
Row Chambers
2 Layers of Woven
Geotextile
1 ft (0.30 m)
1 ft (0.30 m)
5.6 in.
(150 mm)
Location of
Chamber
Rows
(150 mm)
5.6 in.
Manifold
1 ft (0.30 m)
7.5 ft
(2.29 m)
Scour Protection Netting

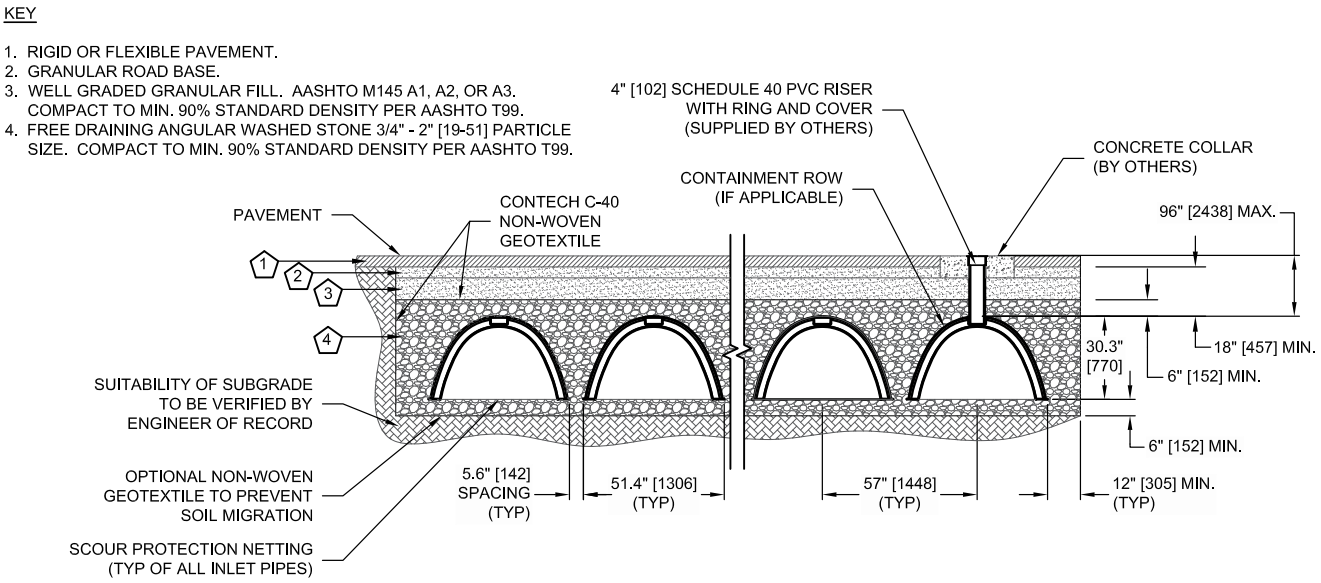
DETAIL D

Backfill Material

The chamber System incorporates two types of backfill material.

Free draining angular washed stone 3/4 to 2-inch (19 to 152 mm) particle size compacted to 90% AASHTO T99 is used around the chambers. This material is used around the chambers and within a minimum of 6-inches (152 mm) below and 6-inches (152 mm) above the chambers. The remaining space should be filled with an angular, well-graded granular fill meeting the requirements of AASHTO M145 A1, A2 or A3, compacted to 90% AASHTO T99.

Contech C-40 Non-Woven Geotextile should be used between the two layers of backfill material. See Detail E.



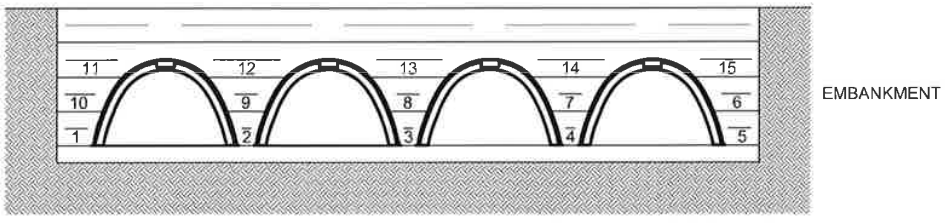
DETAIL E

Backfill Placement

Place backfill material in 6 to 8-inch (152 to 203 mm) loose lifts and compact to 90% AASHTO T99. Use mechanical hand tampers or approved compacting equipment to compact all backfill and embankment immediately adjacent to each side of the installation and over top of the installation to a minimum depth of 18-inches (457 mm). Place backfill so there is no more than a two lift differential between any of the chambers at anytime during the backfilling process. Advance the backfill along the length of the chamber system at the same rate to avoid differential loading on the chambers. Backfilling at differential heights from one side of the chamber to the other in excess of 16-inches (407 mm) can cause chamber distortion or potential collapse. Advance balanced lifts across the width of the system evenly along the length of the chambers as you backfill. See Detail F.

Use only lightweight tracked dozers (D-4 dozer or smaller) not exceeding 1,100 lbs/sf (0.54 kg/cm^2) ground pressure to spread backfill lifts over top of the chamber system. Maintain a minimum of 6-inch (152 mm) cover on top of chambers for the initial lifts.

For large systems use conveyor systems, backhoes with long reaches or draglines with stone buckets may be used to place backfill. Once minimum cover for construction loading across the entire width of the system is reached, advance the equipment to the end of the recently placed fill, and begin the sequence again until the system is completely backfilled. This type of construction sequence provides room for stockpiled backfill directly behind the backhoe, as well as the movement of construction traffic. Material stockpiles on top of the backfilled chamber system should be limited to six feet in total high above the structure and must provide balanced loading across all chambers. To determine the proper cover over the chambers to allow the movement of construction equipment, contact your local Contech Representative.



DETAIL F - TYPICAL BACKFILL SEQUENCE

Construction Loading

Typically, the minimum cover specified for a project assumes HS-20 or HS-25 live load. Because construction loads often exceed design live loads, increased temporary minimum cover requirements are necessary. Since construction equipment varies from job to job, it is best to address equipment specification and minimum cover requirements with our local Contech representative during the pre-construction meeting.

Equipment Restriction	
BACKFILL LEVEL*	ALLOWABLE CONSTRUCTION EQUIPMENT**
4 – Bedding	*No restrictions.*
4 – Back to Top of Chambers	*No equipment js permitted on or nearby the chambers. conveyors or excavators located such that their loads do not influence the chambers should be used to place the backfill stone. Stone should be worked between the chambers by hand.*
4 – Backfill Over the Top of the Chambers	*no wheel loads should be applied over the system. once 6" of stone has been placed over the crown of the chambers, lightweight tracked dozers with a maximum ground pressure of 1,100 psf are permitted over the structure. dozers must spread stone working in a direction parallel with the chamber rows; not working across the chamber rows. also, only small, walk behind compaction equipment can be used over the chambers until a minimum of 12" of cover is over the chambers.*
2 or 3 Select Fill Over the Chambers	*once 18" of compacted material is over the chambers, highway vehicles with axle loads of 32,000 pounds or less can be operated over the structures. front end loaders can be operated over the structures as long as the maximum wheel load does not exceed 16,000 pounds. compaction equipment can be operated over the structures as long as the dynamic force from the drum does not exceed 20,000 pounds and the gross vehicle weight does not exceed 12,000 pounds.*

** Please reference Detail E on page 7.*
*** Contact your local Contech Representative for questions on the use of specific pieces of construction equipment.*

Contractor Tool Checklist

- Wire cutters
- Stone bucket
- Transit or laser level
- Forklift or other type of equipment to unload chambers
- Reciprocating saw or router (to custom cut the end walls and inspection ports)
- Approved compaction equipment
- Excavator to dig trench and place stone and soil backfill
- Stone conveyor/light weight tracked dozer not exceeding 1,100 lbs/sf (0.54 kg/cm^2) to grade backfill

Material Checklist

Start, Mid and End ChamberMaxx chambers	Supplied by Contech
Manifold System	Supplied by Contech
Scour Protection Netting	Supplied by Contech
Contech C-40 Non-woven geotextile	Supplied by Contech
Containment Row Diversion Manhole if required)	Supplied by Contech
Containment Row AASHTO M288 Class 1 Woven Geotextile	Supplied by Contech
Free draining angular washed stone 3/4"-2" (.019 to .05 m) backfill material	Supplied by Contractor
Well graded granular backfill material	Supplied by Contractor
Construction Tape / Adhesive	Supplied by Contractor
Inspection port materials	Supplied by Contractor

ChamberMaxx Pre-Construction Checklist

Contech Field Contact and Phone: _____

Contech Plant Contact and Phone: _____

Contractor Contact and Phone: _____

Project Name: _____

Site Address: _____

Precon Attendees: _____

Topics to Review:

- ☐ Truck access and chamber storage availability/expectation
- ☐ Chamber unloading and handling safety, equipment and procedures
- ☐ System layout and fabrication drawing review
- ☐ Shipping schedule and installation sequence
- ☐ Scour protection netting layout
- ☐ Configuration and assembly
- ☐ Backfill material selection and placement procedure
- ☐ Backfill sequence, lift thickness and balanced loading
- ☐ Compaction requirement (90%) and equipment
- ☐ Additional Containment Row™ construction/liner material layout
- ☐ Inspection port installation

Notes: _____

_____

_____

_____

CHAMBERMaxx™

CONTECH ENGINEERED SOLUTIONS

Support

- Drawings and specifications are available at ContechES.com.
- Site-specific design support is available from Contech Engineered Solutions.

800.338.1122
www.ContechES.com

APPENDIX K

Illicit Discharge Statement

MP DESIGN CONSULTANTS

DESIGNING AND MANAGING YOUR DREAM

December 12, 2023

Planning Board

Re: Site Plan Review
240 East Central St, Franklin MA

Dear Mr. Donovan,

This statement is provided in accordance with the provisions of Massachusetts Stormwater Management Standards (the Standards), Standard 10, and the Massachusetts Stormwater Handbook.

To the best of the Owners and Engineers knowledge, no illicit discharges exist on the Project Site and no illicit discharges are proposed as part of the Project. The facility's Operation & Maintenance Plans are designed to prevent non-stormwater discharge to on-site stormwater Best Management Practices. Any illicit discharges identified during or after construction will be immediately disconnected in accordance with the Standards.

Very truly yours,

Carlos Ferreira | Engineer