

Stormwater Management Report

Date: January 2025

Project: Ashland Rec Facility
240 & 260 Pleasant Street
Ashland, MA

Prepared For: Roger Martin
5 Michigan Drive
Natick, MA

Locus Map:



No Information on This Page

Stormwater quality and quantity calculations have been performed for 240-260 Pleasant Street in Ashland, MA to demonstrate compliance with the MassDEP Stormwater Standards, as enumerated in the Wetland Protection Regulations (310 CMR 10) and Town of Ashland Stormwater Management Bylaw (Chapter 343).

The subject Property is located on the south side of Pleasant Street and consists of two parcels addressed 240 & 260 Pleasant Street totaling approximately 81,965± square feet. The two parcels are mostly undeveloped; however, there is some pavement on the northwest corner, as well as a gravel parking area spanning both parcels. There are three (3) monitoring wells located near the southern property line, that will be marked and protected during and after the work is completed. The remainder of the Property is covered in dense brush and trees. The Connect Church abuts the Property to the West.

The Property drains in four directions, with about half the drainage going to two distinct low points and remaining on site, some flowing southeasterly overland towards the neighboring lot and a small fraction flowing northeasterly offsite toward Pleasant Street. Natural infiltration occurs as the flow moves across the unpaved areas. Soils are mapped as Merrimac-Urban Land complex (HSG A), typically a gravelly sand. Site specific soils testing confirmed the USDA/NRCS mapping in the area of the proposed development as results yielded lenses of sandy loam with a parent material classified as sand and gravel. There are no wetlands mapped onsite. A small portion of a 100-foot Buffer Zone to an offsite wetland falls on the southeasternmost corner of the Property; however, all proposed work will remain outside of the Buffer Zone. There are no FEMA flood zones (FIRM 25017C0513F) or areas of Natural Heritage Endangered Species on or immediately adjacent to the Property.

The Applicant is seeking to develop the Property with a recreational facility including a soccer field, playground area with a rubberized surface, crushed stone parking area, and other associated improvements. The stormwater management system has been designed to mitigate the change in runoff rates and volumes due to the proposed development. As a result of this design, all flow remains onsite. Access to the recreational facility will be from the church's existing property to the west and at the existing driveway at the Property frontage of 240-260 Pleasant Street.

This Report contains:

- A) MassDEP Stormwater Management Checklist
- B) Existing and Proposed Hydrologic Calculations (MassDEP Standards 1 & 2)
- C) Water Quality Calculations (MassDEP Standards 3, 4, 5, 6 & 7)
- D) Construction Period Pollution Prevention Plan, Long-Term Pollution Prevention Plan, Long-Term Operations & Maintenance Plan, and Illicit Discharge Statement (MassDEP Standards 8, 9 & 10)
- E) Soils Information
- F) FEMA Flood Map
- G) Existing Hydrology Map
- H) Proposed Hydrology Map

[https://ldcollaborative.sharepoint.com/sites/landdesigncollaborative/shared documents/_projects/24-0281 - ashland, 240 & 260 pleasant street/engineering/stormwater report components/20- ldc stormwater report.docx](https://ldcollaborative.sharepoint.com/sites/landdesigncollaborative/shared%20documents/_projects/24-0281-ashland,240%20%26%20pleasantstreet/engineering/stormwater%20report%20components/20-ldc%20stormwater%20report.docx)

No Information on This Page

A) MassDEP Stormwater Management Checklist (8 pages)

No Information on This Page



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 8²
- 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.



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.

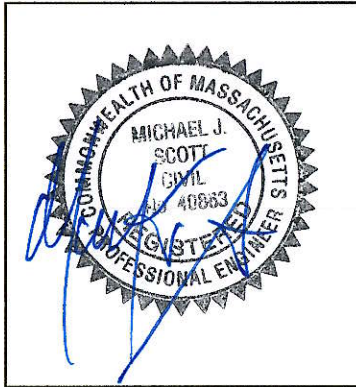
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



Signature and Date

Michael J. Scott 1-16-2025

Checklist

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

- New development
- Redevelopment
- Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- Soil Analysis provided.
- Required Recharge Volume calculation provided.
- Required Recharge volume reduced through use of the LID site Design Credits.
- Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - Static
 - Simple Dynamic
 - Dynamic Field¹
- 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.

B) Pre- and Post-Development Hydrologic Calculations (Standards 1 & 2)

Standard 1)

The stormwater system has been designed to mimic existing conditions and infiltrate runoff during the 2-, 10- & 100-year storm events, collecting, treating, and discharging stormwater runoff to groundwater via “country drainage” (a LID measure) conveyances to the designed drainage swales upgradient of the 100-foot Buffer Zone. The proposed drainage system will mitigate water quality and quantity to match the existing conditions in that stormwater will be collected, treated, and discharged to a surface infiltration/retention basin. To further help the system draw down, drainage catch basins/area drains are proposed at designed low points to promote infiltration. All runoff from the proposed Project will be handled directly on the site.

Standard 2)

The Project results in newly graded areas, cover types, and some new impervious surfaces. The proposed stormwater management system has been designed to mitigate stormwater runoff rates for the required storm events (refer to HydroCAD calculations), as summarized below.

No Information on This Page

Stormwater Management Report
 240 – 260 Pleasant Street | 24-0281
 January 2025

E XY	Existing Conditions Features where “E” designates “Existing”; X designates the area or feature “name”; and Y designates the feature - a sub-catchment “S”, a basin/depression/pond/ “P”, a conveyance/reach “R”, or a point of interest/summation point/link “L”		
P XY	Proposed Conditions Features where “P” designates “Proposed”; X designates area or feature “name”; and Y designates the feature - a sub-catchment “S”, a basin/depression/pond/ “P”, a conveyance/reach “R”, or a point of interest/summation point/link “L”		
Rates			
Point of Interest	Storm Event / Runoff (cubic feet/second)		
	2-Year	10-Year	100-Year
E 1L	0.0	0.4	1.7
E 2S	0.0	0.0	0.0
E 4S	0.0	0.0	0.1
P 1L	0.0	0.0	0.0
P 2S	0.0	0.0	0.0
P 4S	0.0	0.0	0.1
Volumes			
Point of Interest	Storm Event / Runoff (cubic feet)		
	2-Year	10-Year	100-Year
E 1L	416	2,419	8,817
E 2S	0	10	344
E 4S	18	84	246
P 1L	0	0	0
P 2S	0	27*	387*
P 4S	27	102	278
* Note: Flow remains on-site as there is a depression located in this Subcatchment.			

No Information on This Page



NOAA Atlas 14, Volume 10, Version 3
Location name: Ashland, Massachusetts, USA*
Latitude: 42.2614°, Longitude: -71.4757°
Elevation: 200 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	0.334 (0.260-0.427)	0.401 (0.312-0.514)	0.511 (0.396-0.657)	0.602 (0.463-0.778)	0.728 (0.543-0.983)	0.823 (0.601-1.13)	0.922 (0.654-1.32)	1.03 (0.695-1.51)	1.19 (0.773-1.81)	1.32 (0.838-2.04)
10-min	0.473 (0.368-0.605)	0.569 (0.441-0.728)	0.725 (0.562-0.932)	0.854 (0.657-1.10)	1.03 (0.769-1.39)	1.17 (0.852-1.61)	1.31 (0.927-1.87)	1.46 (0.985-2.14)	1.69 (1.10-2.56)	1.88 (1.19-2.90)
15-min	0.557 (0.433-0.712)	0.669 (0.519-0.857)	0.852 (0.659-1.10)	1.00 (0.773-1.30)	1.21 (0.905-1.64)	1.37 (1.00-1.89)	1.54 (1.09-2.20)	1.72 (1.16-2.52)	1.99 (1.29-3.01)	2.21 (1.40-3.41)
30-min	0.764 (0.593-0.976)	0.917 (0.712-1.17)	1.17 (0.903-1.50)	1.38 (1.06-1.78)	1.66 (1.24-2.24)	1.88 (1.37-2.59)	2.10 (1.49-3.01)	2.36 (1.59-3.45)	2.72 (1.76-4.12)	3.02 (1.91-4.66)
60-min	0.970 (0.754-1.24)	1.16 (0.904-1.49)	1.48 (1.15-1.91)	1.75 (1.34-2.26)	2.11 (1.57-2.85)	2.38 (1.74-3.29)	2.67 (1.90-3.82)	2.99 (2.02-4.38)	3.45 (2.24-5.22)	3.82 (2.42-5.91)
2-hr	1.23 (0.963-1.56)	1.49 (1.16-1.89)	1.91 (1.48-2.43)	2.25 (1.74-2.89)	2.73 (2.05-3.68)	3.09 (2.28-4.25)	3.47 (2.49-4.97)	3.92 (2.65-5.70)	4.61 (3.00-6.94)	5.20 (3.30-7.97)
3-hr	1.42 (1.11-1.79)	1.72 (1.35-2.18)	2.21 (1.72-2.80)	2.61 (2.03-3.34)	3.17 (2.40-4.26)	3.59 (2.66-4.93)	4.04 (2.92-5.79)	4.59 (3.10-6.64)	5.43 (3.54-8.14)	6.16 (3.92-9.41)
6-hr	1.81 (1.43-2.28)	2.20 (1.74-2.77)	2.84 (2.24-3.59)	3.37 (2.64-4.28)	4.10 (3.12-5.47)	4.64 (3.46-6.34)	5.22 (3.80-7.46)	5.95 (4.04-8.56)	7.08 (4.62-10.5)	8.06 (5.14-12.2)
12-hr	2.30 (1.83-2.87)	2.80 (2.23-3.50)	3.62 (2.87-4.54)	4.30 (3.39-5.42)	5.24 (4.00-6.94)	5.93 (4.44-8.04)	6.68 (4.88-9.46)	7.61 (5.19-10.9)	9.04 (5.92-13.4)	10.3 (6.57-15.5)
24-hr	2.73 (2.19-3.39)	3.36 (2.69-4.17)	4.39 (3.50-5.47)	5.24 (4.16-6.57)	6.42 (4.94-8.46)	7.28 (5.50-9.83)	8.23 (6.06-11.6)	9.41 (6.44-13.3)	11.2 (7.39-16.5)	12.8 (8.23-19.2)
2-day	3.04 (2.45-3.74)	3.80 (3.06-4.68)	5.03 (4.04-6.22)	6.06 (4.83-7.53)	7.47 (5.79-9.80)	8.50 (6.46-11.4)	9.65 (7.17-13.6)	11.1 (7.63-15.7)	13.4 (8.85-19.6)	15.5 (9.96-23.0)
3-day	3.28 (2.66-4.03)	4.09 (3.31-5.02)	5.41 (4.36-6.66)	6.51 (5.21-8.06)	8.02 (6.23-10.5)	9.12 (6.96-12.2)	10.3 (7.70-14.5)	11.9 (8.19-16.7)	14.4 (9.51-20.9)	16.6 (10.7-24.5)
4-day	3.52 (2.86-4.31)	4.36 (3.54-5.34)	5.72 (4.63-7.03)	6.86 (5.51-8.47)	8.42 (6.56-11.0)	9.56 (7.31-12.8)	10.8 (8.07-15.1)	12.4 (8.57-17.4)	15.0 (9.91-21.7)	17.2 (11.1-25.4)
7-day	4.21 (3.44-5.12)	5.10 (4.16-6.20)	6.54 (5.32-7.99)	7.74 (6.25-9.50)	9.39 (7.34-12.1)	10.6 (8.12-14.0)	11.9 (8.89-16.4)	13.6 (9.40-18.9)	16.1 (10.7-23.2)	18.3 (11.9-26.8)
10-day	4.88 (4.00-5.92)	5.80 (4.75-7.03)	7.29 (5.95-8.87)	8.53 (6.91-10.4)	10.2 (8.02-13.1)	11.5 (8.82-15.1)	12.9 (9.57-17.6)	14.5 (10.1-20.1)	17.0 (11.3-24.3)	19.1 (12.4-27.9)
20-day	6.88 (5.68-8.28)	7.86 (6.48-9.47)	9.46 (7.77-11.4)	10.8 (8.81-13.1)	12.6 (9.92-16.0)	14.0 (10.7-18.1)	15.4 (11.4-20.7)	17.0 (11.9-23.4)	19.3 (12.9-27.4)	21.1 (13.8-30.6)
30-day	8.52 (7.06-10.2)	9.54 (7.90-11.4)	11.2 (9.25-13.5)	12.6 (10.3-15.2)	14.5 (11.4-18.2)	16.0 (12.3-20.4)	17.4 (12.9-23.0)	19.0 (13.3-25.9)	21.1 (14.1-29.7)	22.7 (14.8-32.7)
45-day	10.5 (8.77-12.6)	11.6 (9.64-13.8)	13.3 (11.0-16.0)	14.8 (12.2-17.8)	16.8 (13.2-20.9)	18.3 (14.1-23.2)	19.8 (14.6-25.9)	21.3 (15.0-28.8)	23.1 (15.6-32.4)	24.4 (15.9-35.1)
60-day	12.2 (10.2-14.5)	13.3 (11.1-15.8)	15.1 (12.5-18.0)	16.5 (13.6-19.9)	18.6 (14.7-23.0)	20.2 (15.5-25.5)	21.7 (16.0-28.1)	23.1 (16.3-31.2)	24.7 (16.7-34.6)	25.8 (16.9-36.9)

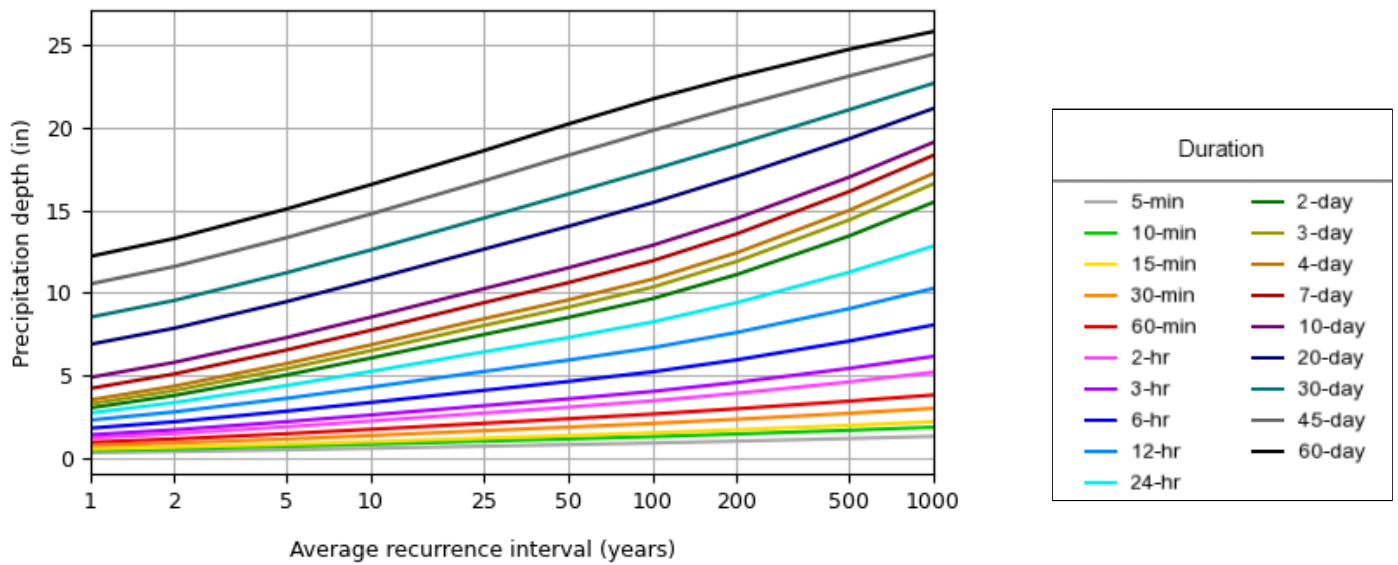
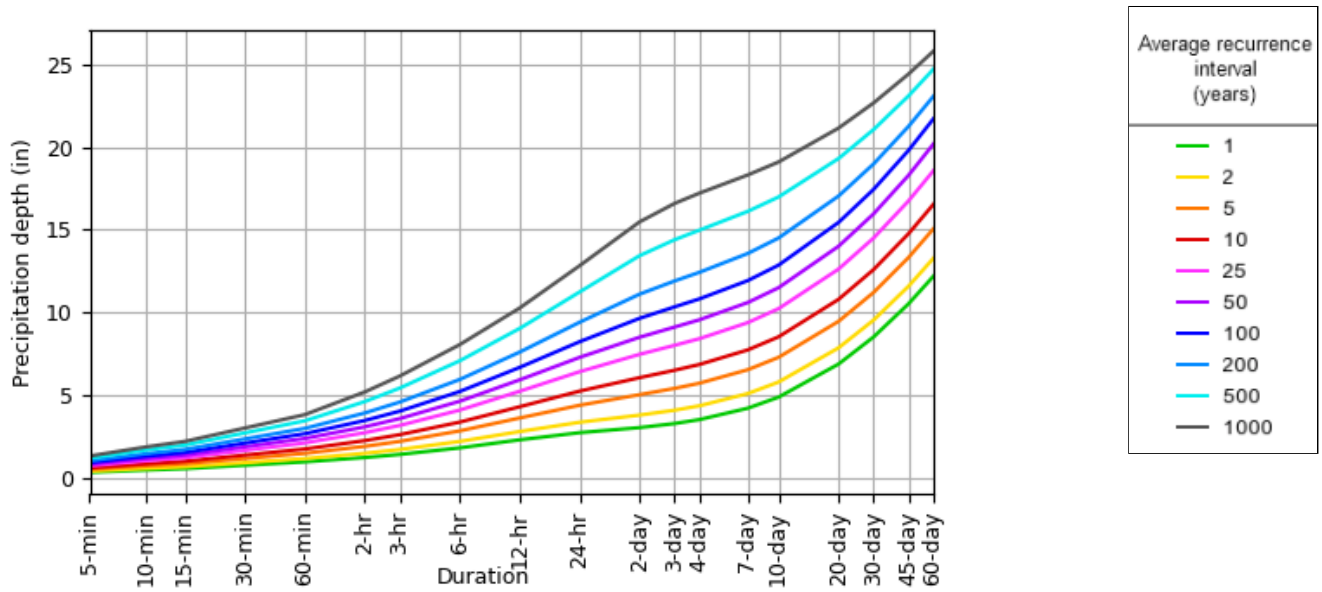
¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average 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

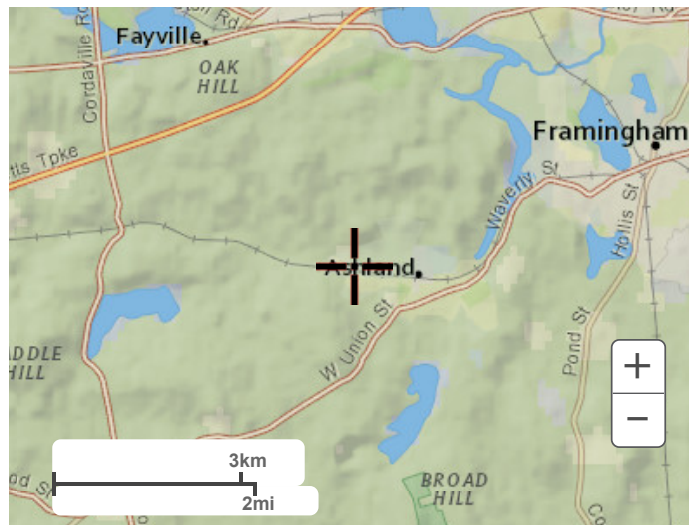
Latitude: 42.2614°, Longitude: -71.4757°



[Back to Top](#)

Maps & aerials

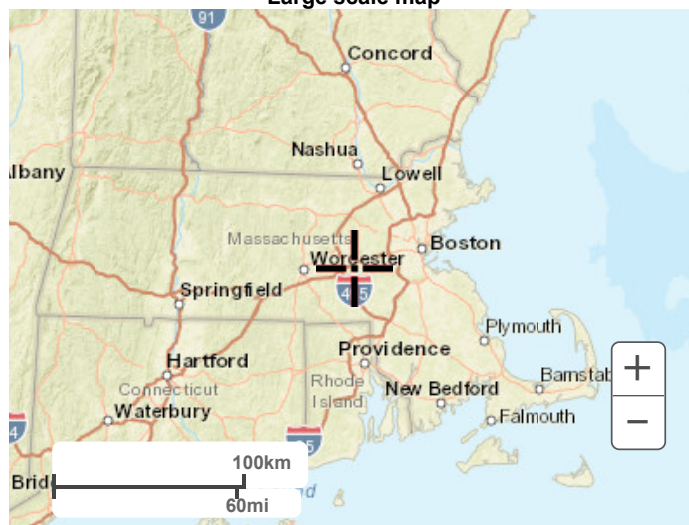
Small scale terrain



Large scale terrain



Large scale map



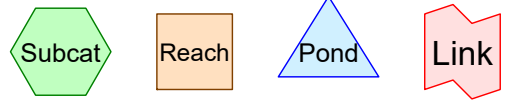
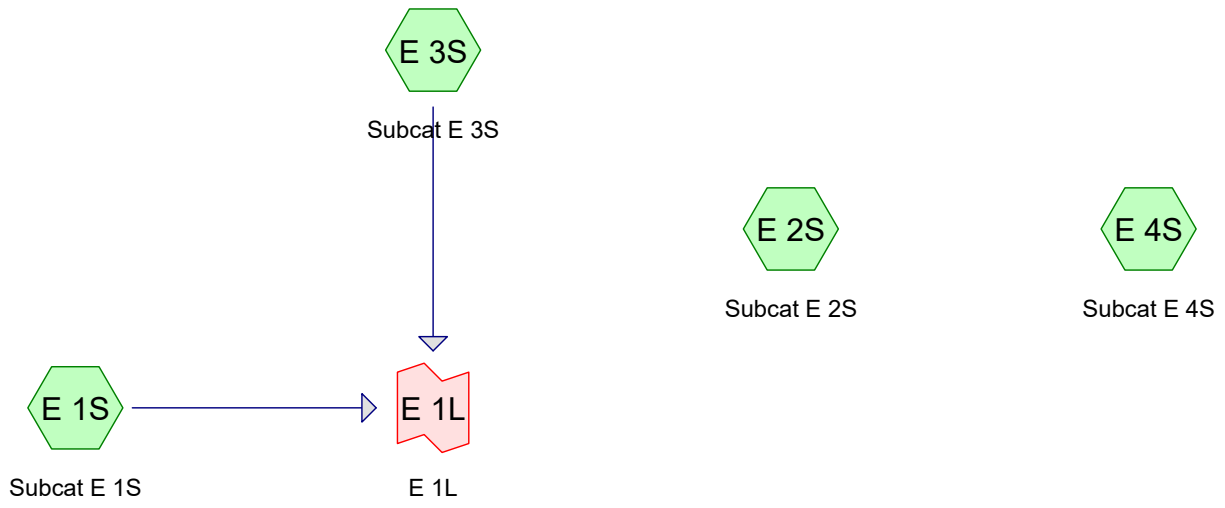
Large scale aerial



[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](#)



24-0281 - Existing Hydrology

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Page 2

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	5.24	2
3	100-Year	Type III 24-hr		Default	24.00	1	8.23	2

24-0281 - Existing Hydrology

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Page 3

Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
765	30	Brush, Good, HSG A (E 4S)
10,168	96	Gravel surface, HSG A (E 1S)
1,756	98	Paved parking, HSG A (E 1S, E 4S)
69,276	30	Woods, Good, HSG A (E 1S, E 2S, E 3S, E 4S)
81,965	40	TOTAL AREA

24-0281 - Existing Hydrology

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Page 4

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
81,965	HSG A	E 1S, E 2S, E 3S, E 4S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
81,965		TOTAL AREA

24-0281 - Existing Hydrology

Type III 24-hr 2-Year Rainfall=3.36"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Page 5

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E 1S: Subcat E 1S	Runoff Area=42,142 sf 3.30% Impervious Runoff Depth=0.12" Flow Length=255' Tc=15.0 min CN=48 Runoff=0.0 cfs 416 cf
Subcatchment E 2S: Subcat E 2S	Runoff Area=8,741 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=97' Tc=19.7 min CN=30 Runoff=0.0 cfs 0 cf
Subcatchment E 3S: Subcat E 3S	Runoff Area=29,902 sf 0.00% Impervious Runoff Depth=0.00" Flow Length=245' Tc=26.5 min CN=30 Runoff=0.0 cfs 0 cf
Subcatchment E 4S: Subcat E 4S	Runoff Area=1,180 sf 30.85% Impervious Runoff Depth=0.19" Tc=6.0 min CN=51 Runoff=0.0 cfs 18 cf
Link E 1L: E 1L	Inflow=0.0 cfs 416 cf Primary=0.0 cfs 416 cf

Total Runoff Area = 81,965 sf Runoff Volume = 434 cf Average Runoff Depth = 0.06"
97.86% Pervious = 80,209 sf 2.14% Impervious = 1,756 sf

24-0281 - Existing Hydrology

Type III 24-hr 2-Year Rainfall=3.36"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment E 1S: Subcat E 1S

Runoff = 0.0 cfs @ 13.78 hrs, Volume= 416 cf, Depth= 0.12"
 Routed to Link E 1L : E 1L

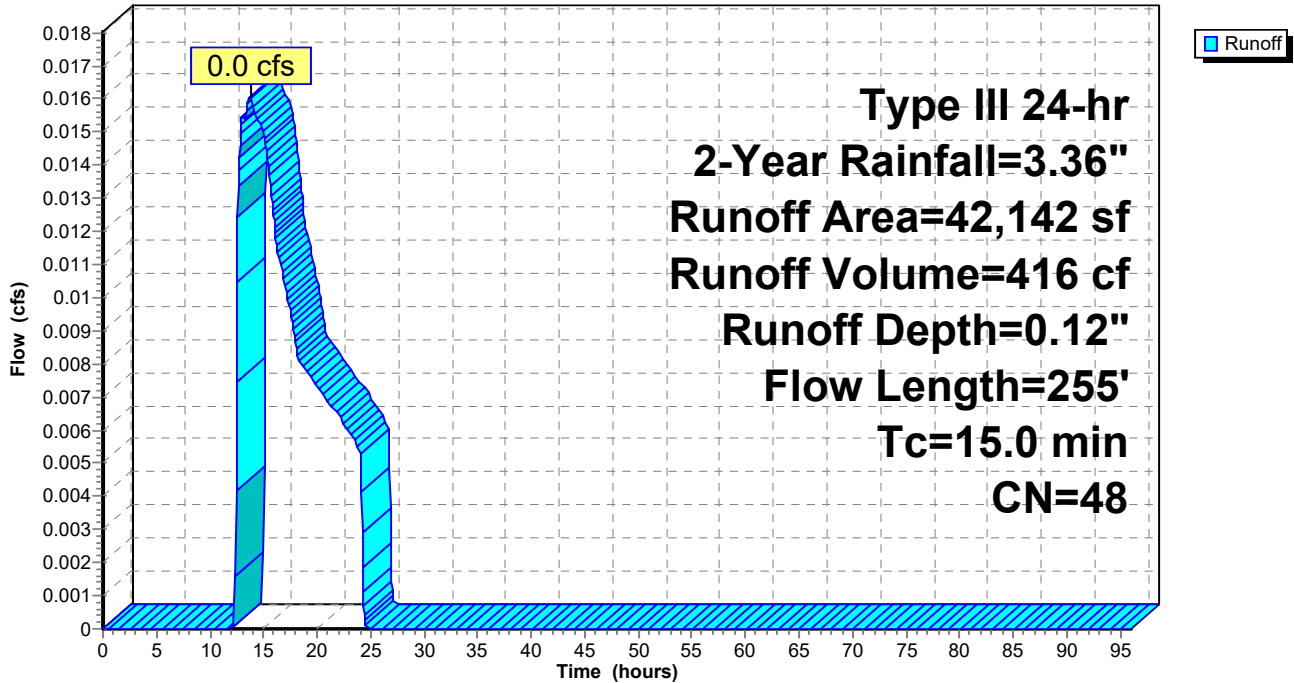
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
1,392	98	Paved parking, HSG A
10,168	96	Gravel surface, HSG A
30,582	30	Woods, Good, HSG A
42,142	48	Weighted Average
40,750		96.70% Pervious Area
1,392		3.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0300	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
3.2	103	0.0115	0.54		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.3	102	0.0070	1.35		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
15.0	255	Total			

Subcatchment E 1S: Subcat E 1S

Hydrograph



24-0281 - Existing Hydrology

Type III 24-hr 2-Year Rainfall=3.36"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment E 2S: Subcat E 2S

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

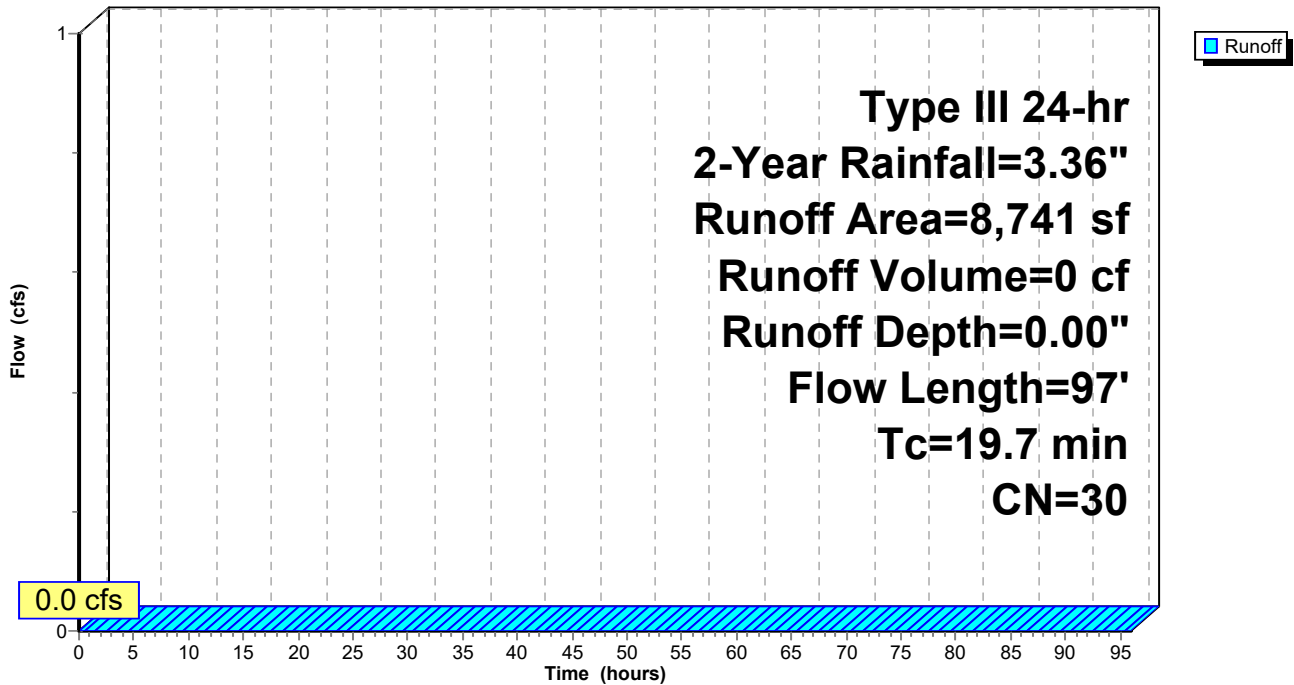
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
8,741	30	Woods, Good, HSG A
8,741		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	50	0.0300	0.05		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
1.4	47	0.0128	0.57		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
19.7	97	Total			

Subcatchment E 2S: Subcat E 2S

Hydrograph



24-0281 - Existing Hydrology

Type III 24-hr 2-Year Rainfall=3.36"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment E 3S: Subcat E 3S

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"
 Routed to Link E 1L : E 1L

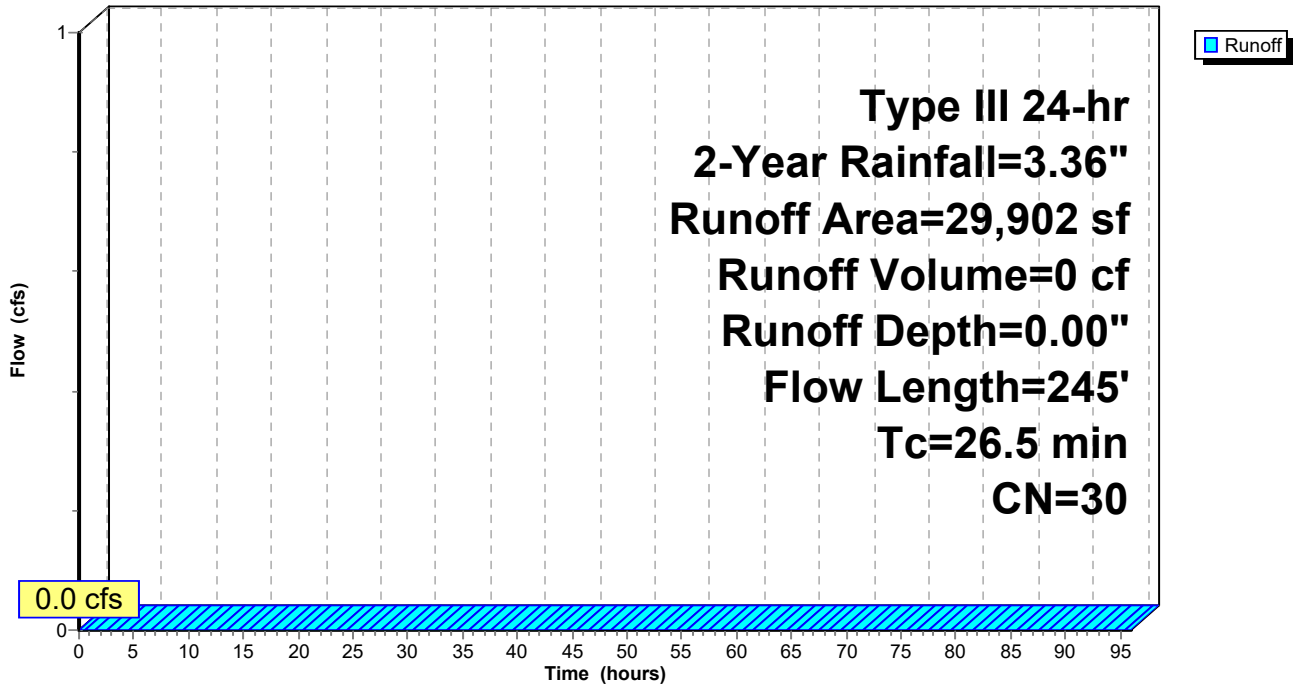
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
29,902	30	Woods, Good, HSG A
29,902		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.6	50	0.0250	0.04		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
6.9	195	0.0090	0.47		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.5	245	Total			

Subcatchment E 3S: Subcat E 3S

Hydrograph



24-0281 - Existing Hydrology

Type III 24-hr 2-Year Rainfall=3.36"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment E 4S: Subcat E 4S

Runoff = 0.0 cfs @ 12.40 hrs, Volume= 18 cf, Depth= 0.19"

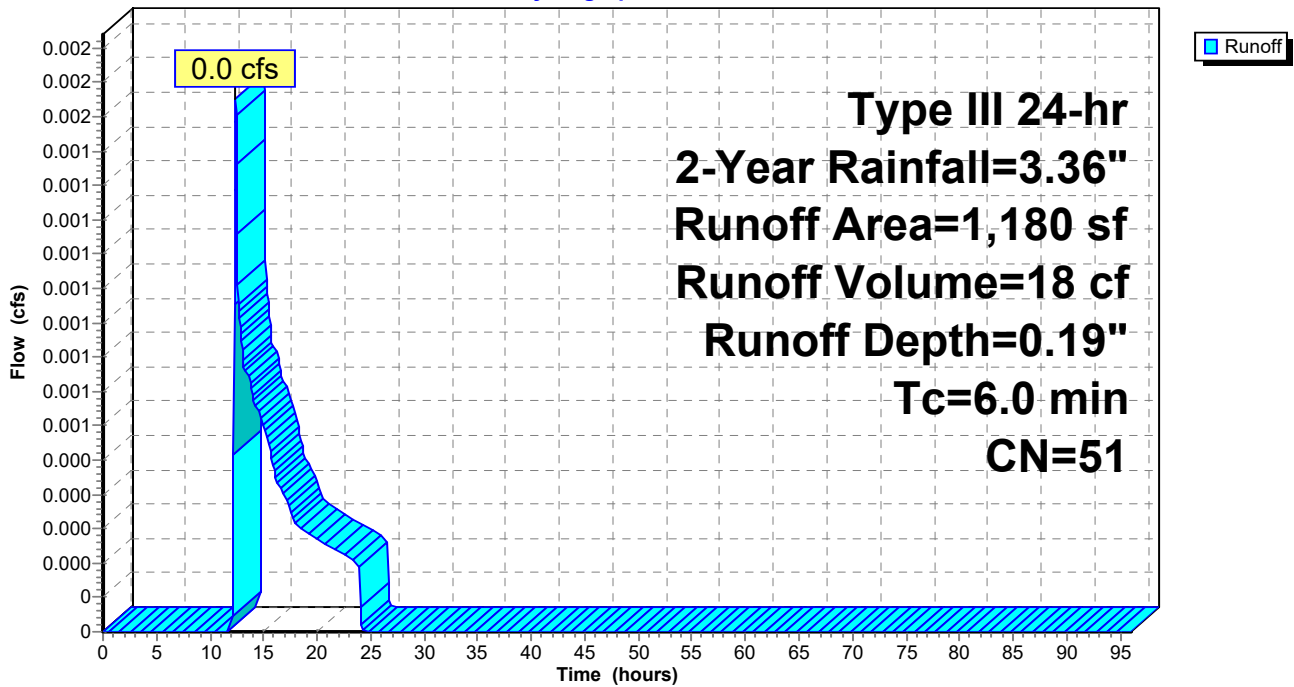
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
364	98	Paved parking, HSG A
765	30	Brush, Good, HSG A
51	30	Woods, Good, HSG A
1,180	51	Weighted Average
816		69.15% Pervious Area
364		30.85% Impervious Area

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

Subcatchment E 4S: Subcat E 4S

Hydrograph



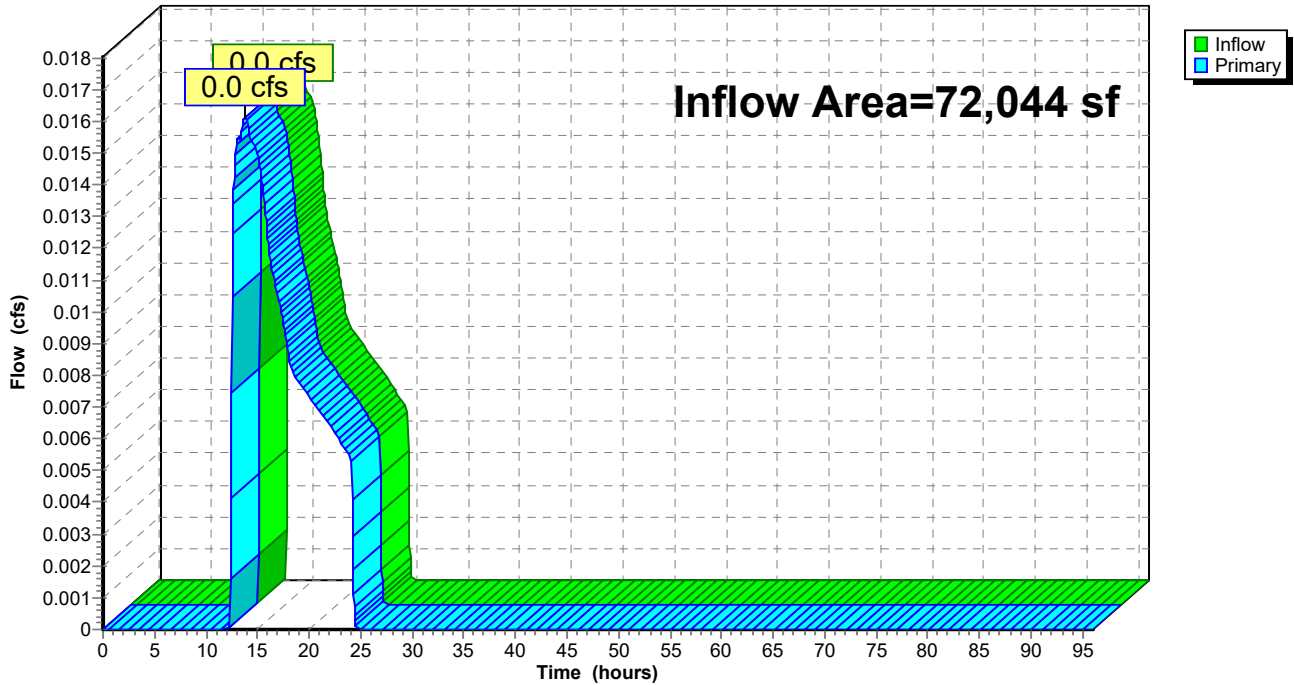
Summary for Link E 1L: E 1L

Inflow Area = 72,044 sf, 1.93% Impervious, Inflow Depth = 0.07" for 2-Year event
Inflow = 0.0 cfs @ 13.78 hrs, Volume= 416 cf
Primary = 0.0 cfs @ 13.78 hrs, Volume= 416 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link E 1L: E 1L

Hydrograph



24-0281 - Existing Hydrology

Type III 24-hr 10-Year Rainfall=5.24"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Page 11

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E 1S: Subcat E 1S

Runoff Area=42,142 sf 3.30% Impervious Runoff Depth=0.68"
Flow Length=255' Tc=15.0 min CN=48 Runoff=0.4 cfs 2,385 cf

Subcatchment E 2S: Subcat E 2S

Runoff Area=8,741 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=97' Tc=19.7 min CN=30 Runoff=0.0 cfs 10 cf

Subcatchment E 3S: Subcat E 3S

Runoff Area=29,902 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=245' Tc=26.5 min CN=30 Runoff=0.0 cfs 34 cf

Subcatchment E 4S: Subcat E 4S

Runoff Area=1,180 sf 30.85% Impervious Runoff Depth=0.85"
Tc=6.0 min CN=51 Runoff=0.0 cfs 84 cf

Link E 1L: E 1L

Inflow=0.4 cfs 2,419 cf
Primary=0.4 cfs 2,419 cf

Total Runoff Area = 81,965 sf Runoff Volume = 2,513 cf Average Runoff Depth = 0.37"
97.86% Pervious = 80,209 sf 2.14% Impervious = 1,756 sf

24-0281 - Existing Hydrology

Type III 24-hr 10-Year Rainfall=5.24"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment E 1S: Subcat E 1S

Runoff = 0.4 cfs @ 12.32 hrs, Volume= 2,385 cf, Depth= 0.68"
 Routed to Link E 1L : E 1L

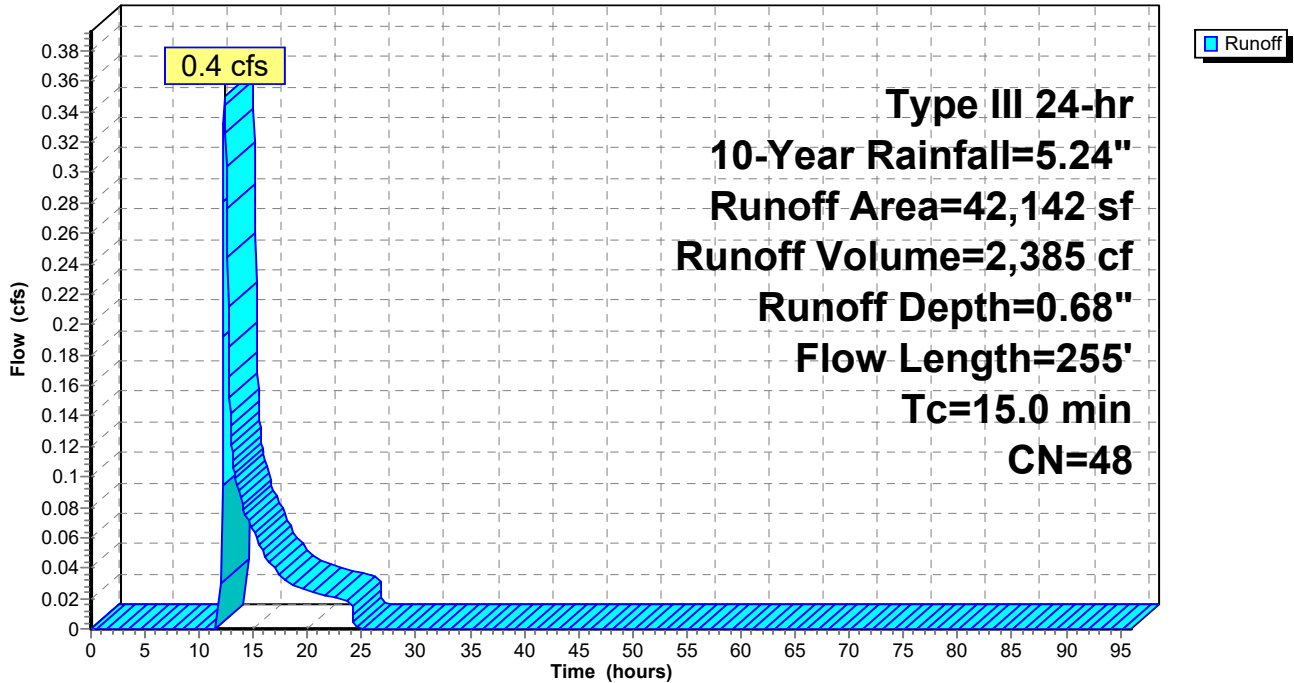
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=5.24"

Area (sf)	CN	Description
1,392	98	Paved parking, HSG A
10,168	96	Gravel surface, HSG A
30,582	30	Woods, Good, HSG A
42,142	48	Weighted Average
40,750		96.70% Pervious Area
1,392		3.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0300	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
3.2	103	0.0115	0.54		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.3	102	0.0070	1.35		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
15.0	255	Total			

Subcatchment E 1S: Subcat E 1S

Hydrograph



24-0281 - Existing Hydrology

Type III 24-hr 10-Year Rainfall=5.24"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment E 3S: Subcat E 3S

Runoff = 0.0 cfs @ 22.70 hrs, Volume= 34 cf, Depth= 0.01"
Routed to Link E 1L : E 1L

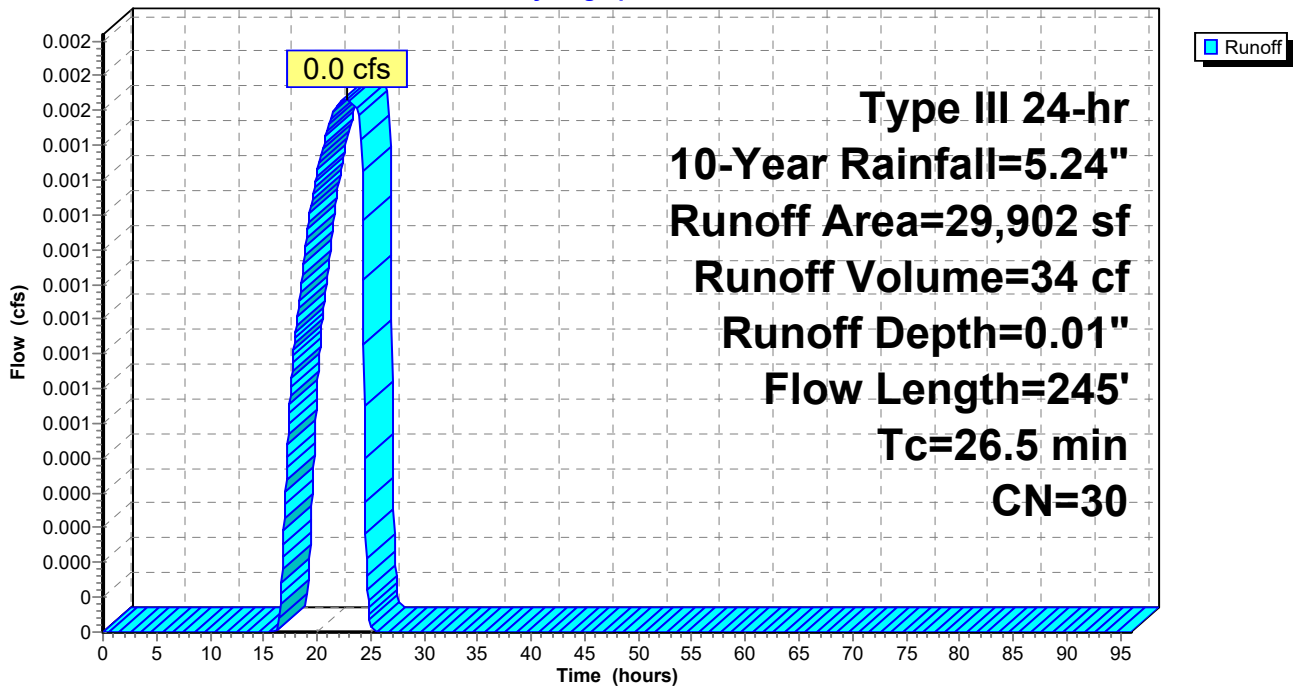
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.24"

Area (sf)	CN	Description
29,902	30	Woods, Good, HSG A
29,902		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.6	50	0.0250	0.04		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
6.9	195	0.0090	0.47		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.5	245	Total			

Subcatchment E 3S: Subcat E 3S

Hydrograph



24-0281 - Existing Hydrology

Type III 24-hr 10-Year Rainfall=5.24"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment E 4S: Subcat E 4S

Runoff = 0.0 cfs @ 12.12 hrs, Volume= 84 cf, Depth= 0.85"

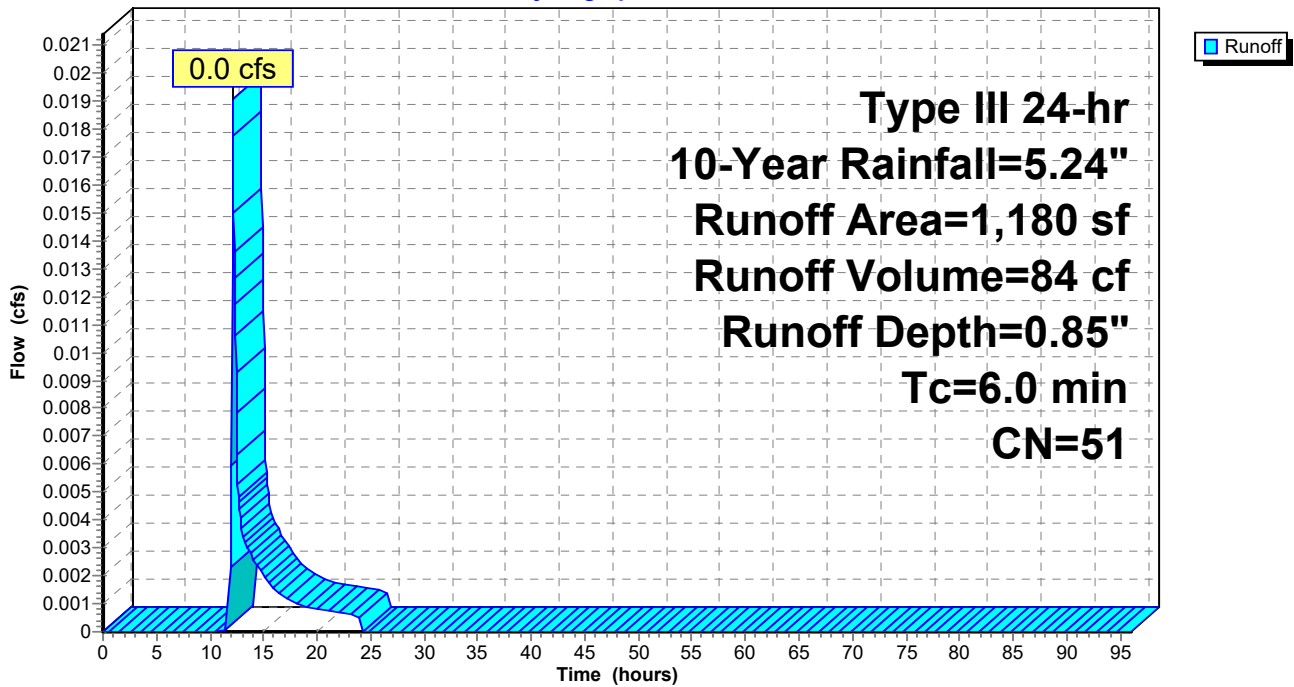
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.24"

Area (sf)	CN	Description
364	98	Paved parking, HSG A
765	30	Brush, Good, HSG A
51	30	Woods, Good, HSG A
1,180	51	Weighted Average
816		69.15% Pervious Area
364		30.85% Impervious Area

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

Subcatchment E 4S: Subcat E 4S

Hydrograph



24-0281 - Existing Hydrology

Type III 24-hr 10-Year Rainfall=5.24"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

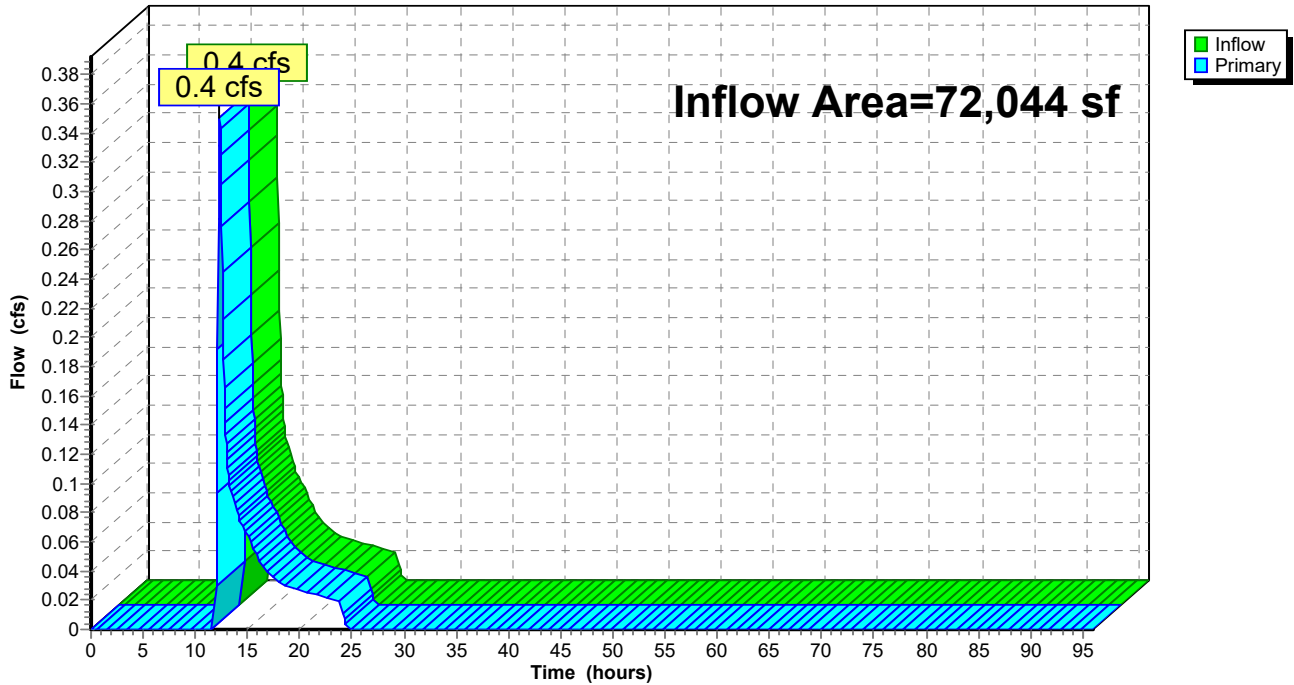
Summary for Link E 1L: E 1L

Inflow Area = 72,044 sf, 1.93% Impervious, Inflow Depth = 0.40" for 10-Year event
Inflow = 0.4 cfs @ 12.32 hrs, Volume= 2,419 cf
Primary = 0.4 cfs @ 12.32 hrs, Volume= 2,419 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link E 1L: E 1L

Hydrograph



24-0281 - Existing Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Page 17

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E 1S: Subcat E 1S

Runoff Area=42,142 sf 3.30% Impervious Runoff Depth=2.18"
Flow Length=255' Tc=15.0 min CN=48 Runoff=1.6 cfs 7,641 cf

Subcatchment E 2S: Subcat E 2S

Runoff Area=8,741 sf 0.00% Impervious Runoff Depth=0.47"
Flow Length=97' Tc=19.7 min CN=30 Runoff=0.0 cfs 344 cf

Subcatchment E 3S: Subcat E 3S

Runoff Area=29,902 sf 0.00% Impervious Runoff Depth=0.47"
Flow Length=245' Tc=26.5 min CN=30 Runoff=0.1 cfs 1,176 cf

Subcatchment E 4S: Subcat E 4S

Runoff Area=1,180 sf 30.85% Impervious Runoff Depth=2.50"
Tc=6.0 min CN=51 Runoff=0.1 cfs 246 cf

Link E 1L: E 1L

Inflow=1.7 cfs 8,817 cf
Primary=1.7 cfs 8,817 cf

Total Runoff Area = 81,965 sf Runoff Volume = 9,407 cf Average Runoff Depth = 1.38"
97.86% Pervious = 80,209 sf 2.14% Impervious = 1,756 sf

24-0281 - Existing Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment E 1S: Subcat E 1S

Runoff = 1.6 cfs @ 12.23 hrs, Volume= 7,641 cf, Depth= 2.18"
 Routed to Link E 1L : E 1L

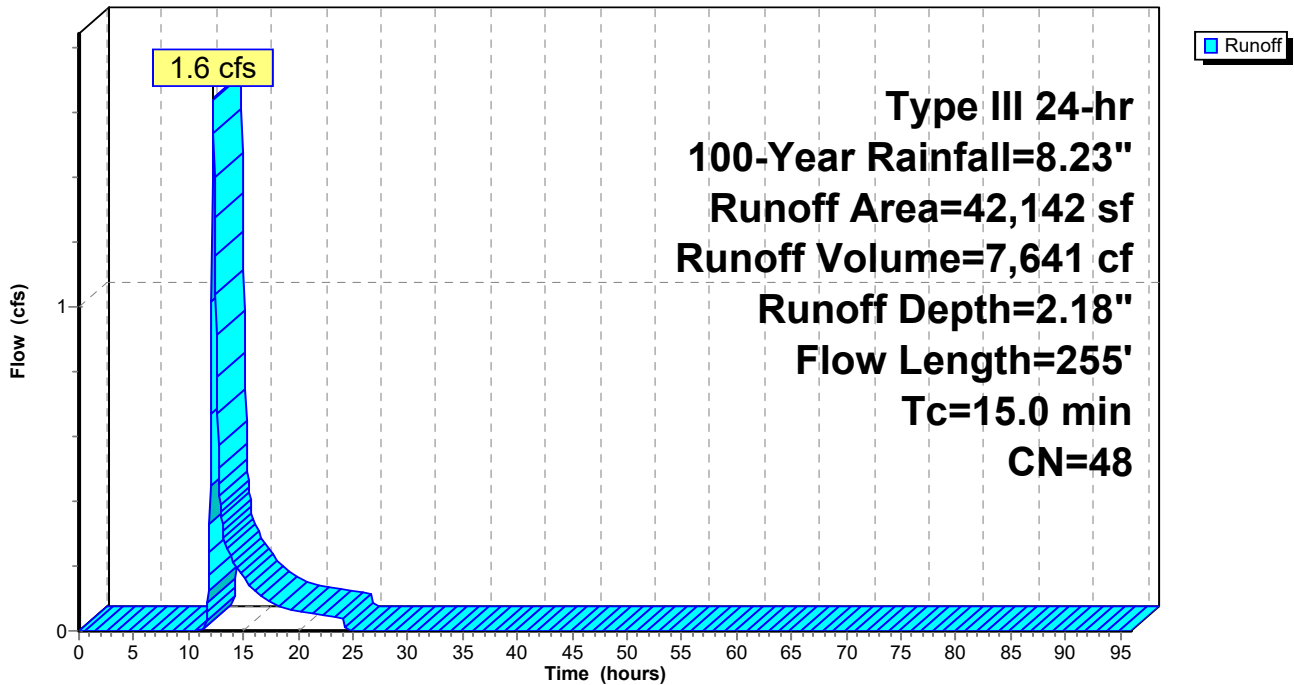
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.23"

Area (sf)	CN	Description
1,392	98	Paved parking, HSG A
10,168	96	Gravel surface, HSG A
30,582	30	Woods, Good, HSG A
42,142	48	Weighted Average
40,750		96.70% Pervious Area
1,392		3.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0300	0.08		Sheet Flow, Woods: Light underbrush n= 0.400 P2= 3.20"
3.2	103	0.0115	0.54		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
1.3	102	0.0070	1.35		Shallow Concentrated Flow, Unpaved Kv= 16.1 fps
15.0	255	Total			

Subcatchment E 1S: Subcat E 1S

Hydrograph



24-0281 - Existing Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment E 2S: Subcat E 2S

Runoff = 0.0 cfs @ 12.61 hrs, Volume= 344 cf, Depth= 0.47"

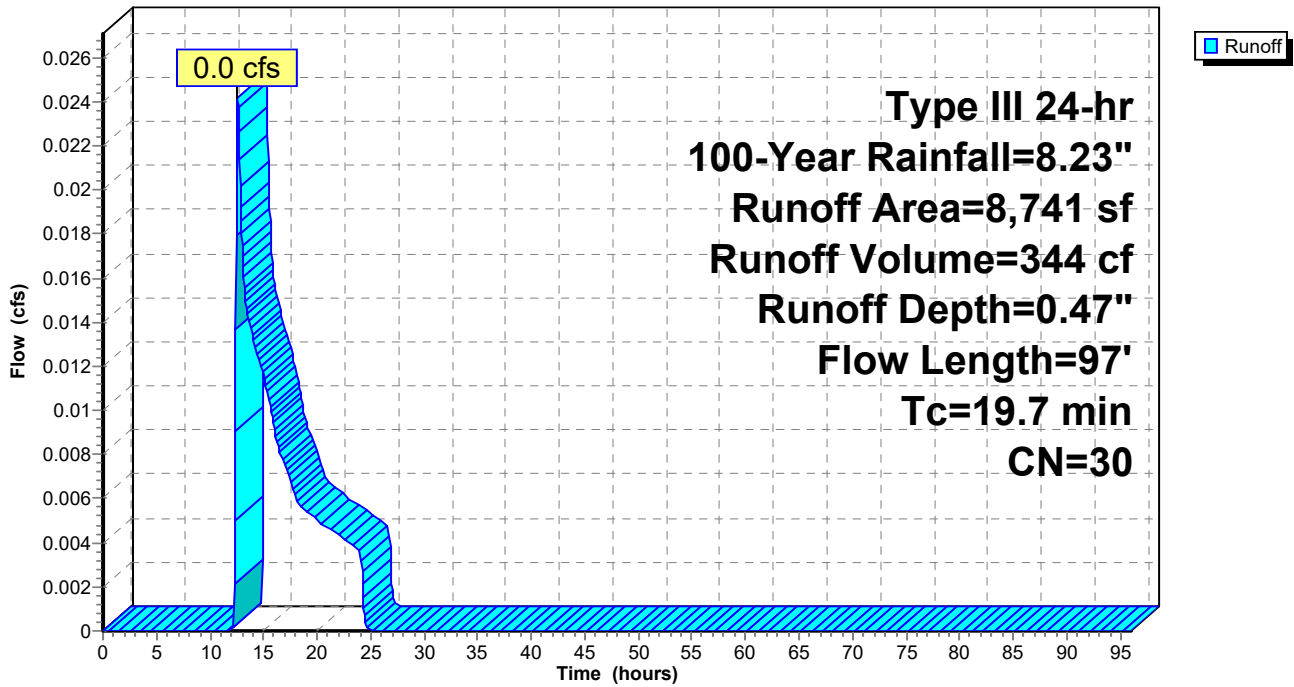
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.23"

Area (sf)	CN	Description
8,741	30	Woods, Good, HSG A
8,741		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	50	0.0300	0.05		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
1.4	47	0.0128	0.57		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
19.7	97	Total			

Subcatchment E 2S: Subcat E 2S

Hydrograph



24-0281 - Existing Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment E 3S: Subcat E 3S

Runoff = 0.1 cfs @ 12.71 hrs, Volume= 1,176 cf, Depth= 0.47"
 Routed to Link E 1L : E 1L

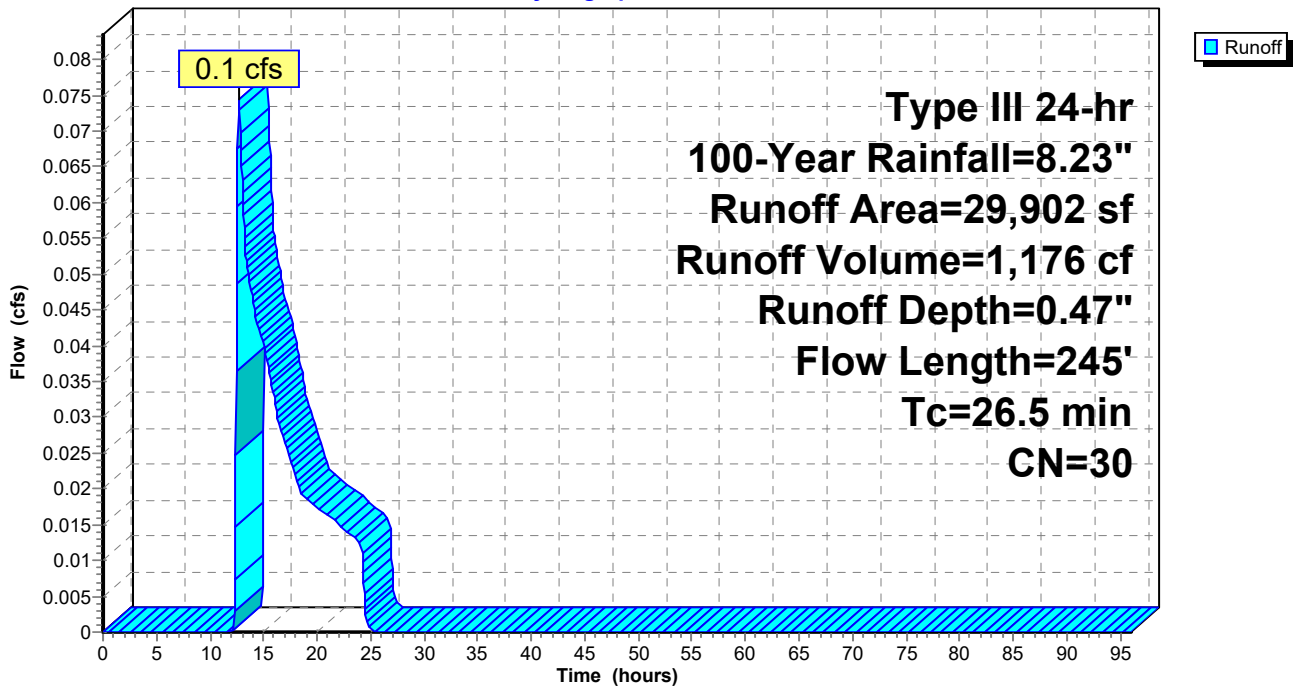
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.23"

Area (sf)	CN	Description
29,902	30	Woods, Good, HSG A
29,902		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.6	50	0.0250	0.04		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
6.9	195	0.0090	0.47		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
26.5	245	Total			

Subcatchment E 3S: Subcat E 3S

Hydrograph



24-0281 - Existing Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

Summary for Subcatchment E 4S: Subcat E 4S

Runoff = 0.1 cfs @ 12.10 hrs, Volume= 246 cf, Depth= 2.50"

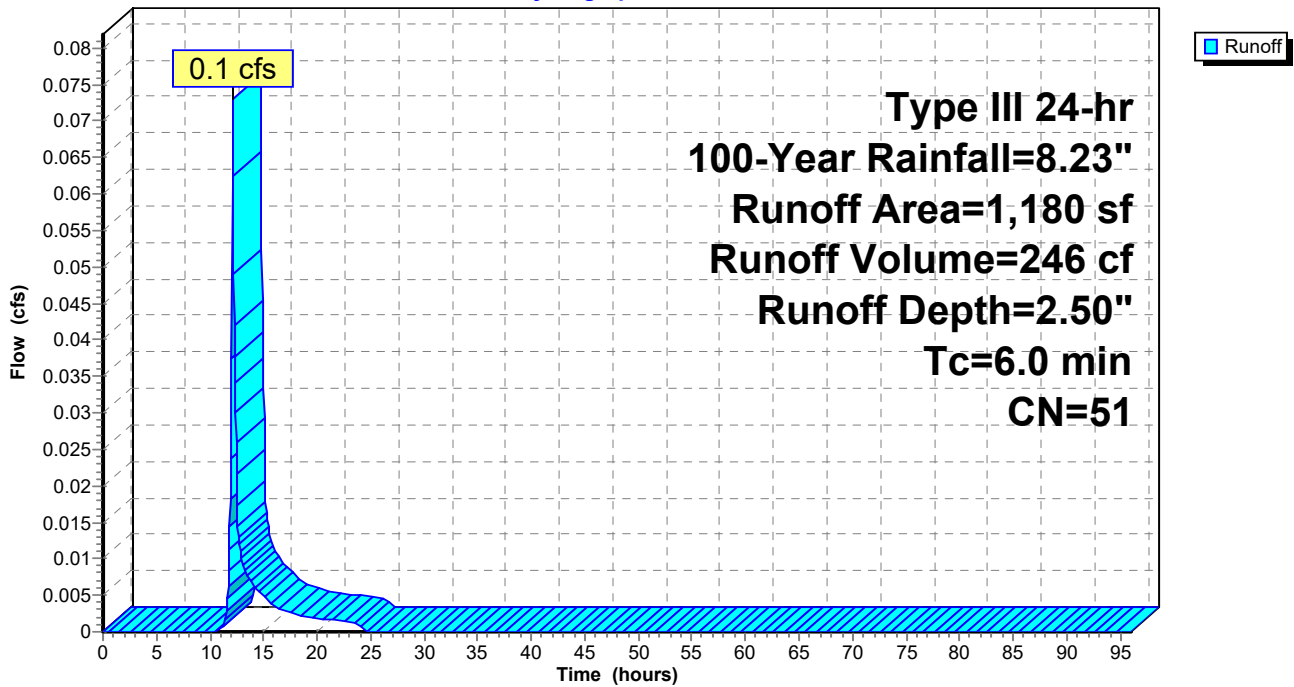
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.23"

Area (sf)	CN	Description
364	98	Paved parking, HSG A
765	30	Brush, Good, HSG A
51	30	Woods, Good, HSG A
1,180	51	Weighted Average
816		69.15% Pervious Area
364		30.85% Impervious Area

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

Subcatchment E 4S: Subcat E 4S

Hydrograph



24-0281 - Existing Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-5c s/n 11266 © 2023 HydroCAD Software Solutions LLC

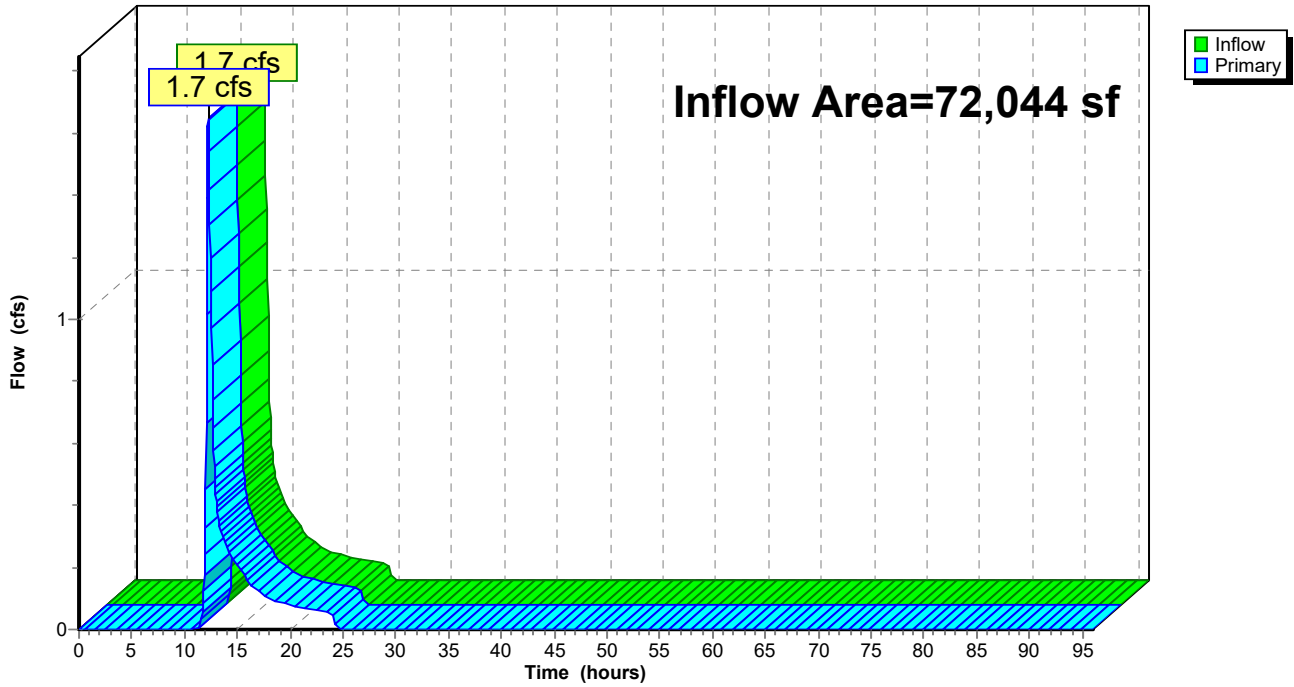
Summary for Link E 1L: E 1L

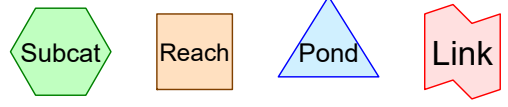
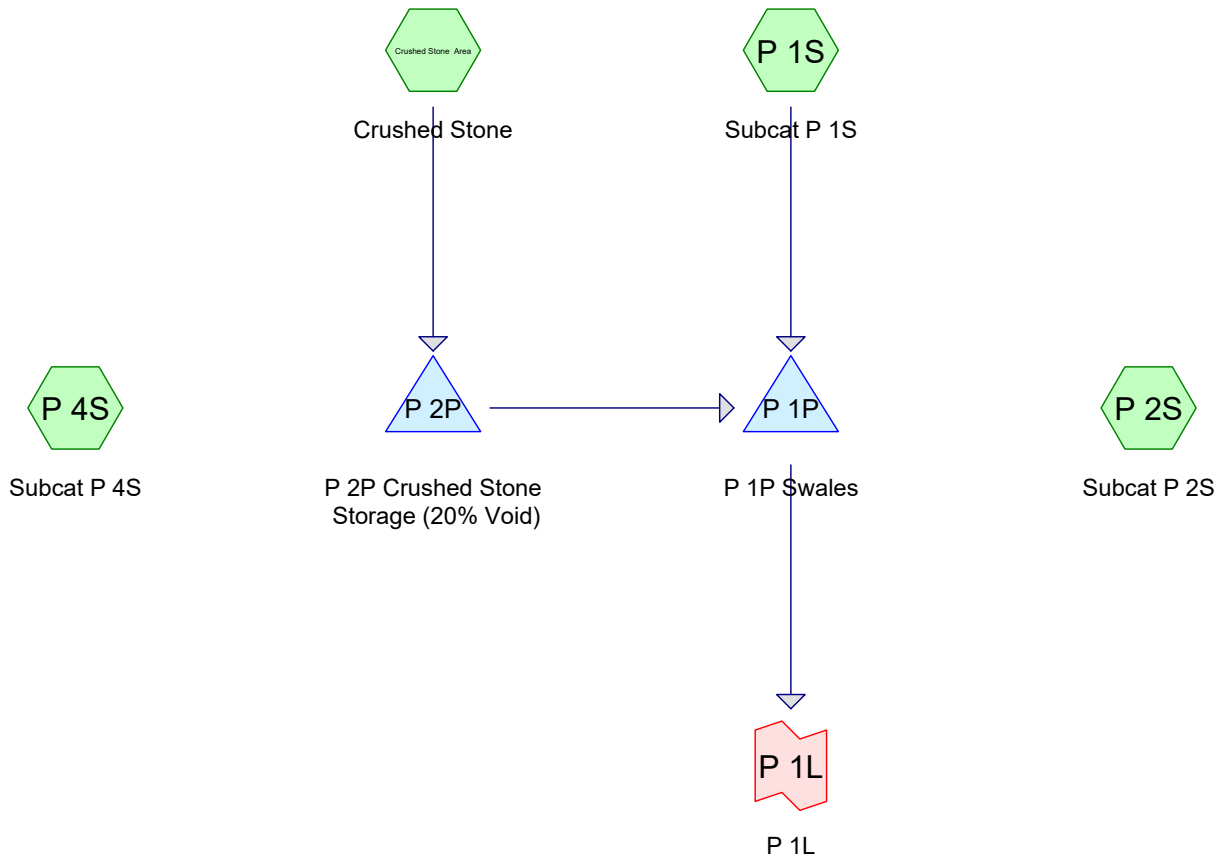
Inflow Area = 72,044 sf, 1.93% Impervious, Inflow Depth = 1.47" for 100-Year event
Inflow = 1.7 cfs @ 12.23 hrs, Volume= 8,817 cf
Primary = 1.7 cfs @ 12.23 hrs, Volume= 8,817 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link E 1L: E 1L

Hydrograph





24-0281 - Proposed Hydrology

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Page 2

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	5.24	2
3	100-Year	Type III 24-hr		Default	24.00	1	8.23	2

24-0281 - Proposed Hydrology

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Page 3

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
47,414	39	>75% Grass cover, Good, HSG A (P 1S, P 2S, P 4S)
764	30	Brush, Good, HSG A (P 4S)
17,511	76	Gravel roads, HSG A (Crushed Stone Area)
1,523	98	Paved parking, HSG A (P 1S, P 4S)
2,500	98	Unconnected pavement, HSG A (P 1S, P 2S)
12,253	30	Woods, Good, HSG A (P 1S, P 2S)
81,965	48	TOTAL AREA

24-0281 - Proposed Hydrology

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Page 4

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
81,965	HSG A	Crushed Stone Area, P 1S, P 2S, P 4S
0	HSG B	
0	HSG C	
0	HSG D	
0	Other	
81,965		TOTAL AREA

24-0281 - Proposed Hydrology

Type III 24-hr 2-Year Rainfall=3.36"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Crushed Stone Area: Crushed Stone Runoff Area=17,511 sf 0.00% Impervious Runoff Depth=1.26"
Tc=6.0 min CN=76 Runoff=0.6 cfs 1,845 cf

Subcatchment P 1S: Subcat P 1S Runoff Area=55,871 sf 6.46% Impervious Runoff Depth=0.01"
Tc=6.0 min UI Adjusted CN=40 Runoff=0.0 cfs 39 cf

Subcatchment P 2S: Subcat P 2S Runoff Area=7,403 sf 0.04% Impervious Runoff Depth=0.00"
Flow Length=97' Tc=19.7 min CN=32 Runoff=0.0 cfs 0 cf

Subcatchment P 4S: Subcat P 4S Runoff Area=1,180 sf 34.92% Impervious Runoff Depth=0.27"
Tc=6.0 min CN=54 Runoff=0.0 cfs 27 cf

Pond P 1P: P 1P Swales Peak Elev=197.38' Storage=418 cf Inflow=0.5 cfs 666 cf
Discarded=0.1 cfs 664 cf Primary=0.0 cfs 0 cf Outflow=0.1 cfs 664 cf

Pond P 2P: P 2P Crushed Stone Storage (20% Void) Peak Elev=198.72' Storage=101 cf Inflow=0.6 cfs 1,845 cf
Discarded=0.1 cfs 1,219 cf Primary=0.5 cfs 627 cf Outflow=0.6 cfs 1,846 cf

Link P 1L: P 1L Inflow=0.0 cfs 0 cf
Primary=0.0 cfs 0 cf

Total Runoff Area = 81,965 sf Runoff Volume = 1,911 cf Average Runoff Depth = 0.28"
95.09% Pervious = 77,942 sf 4.91% Impervious = 4,023 sf

24-0281 - Proposed Hydrology

Type III 24-hr 2-Year Rainfall=3.36"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment Crushed Stone Area: Crushed Stone

Note:

Runoff = 0.6 cfs @ 12.10 hrs, Volume= 1,845 cf, Depth= 1.26"
Routed to Pond P 2P : P 2P Crushed Stone Storage (20% Void)

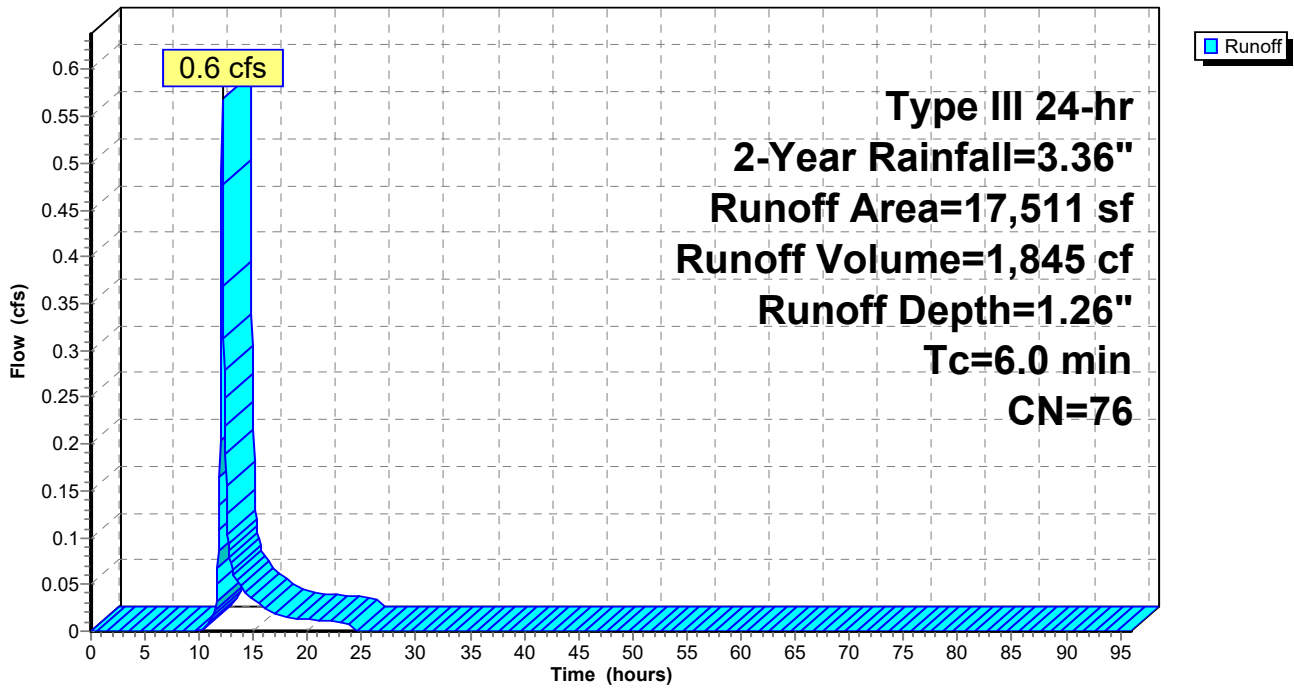
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
17,511	76	Gravel roads, HSG A
17,511		100.00% Pervious Area

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

Subcatchment Crushed Stone Area: Crushed Stone

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 2-Year Rainfall=3.36"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment P 1S: Subcat P 1S

Runoff = 0.0 cfs @ 22.45 hrs, Volume= 39 cf, Depth= 0.01"
 Routed to Pond P 1P : P 1P Swales

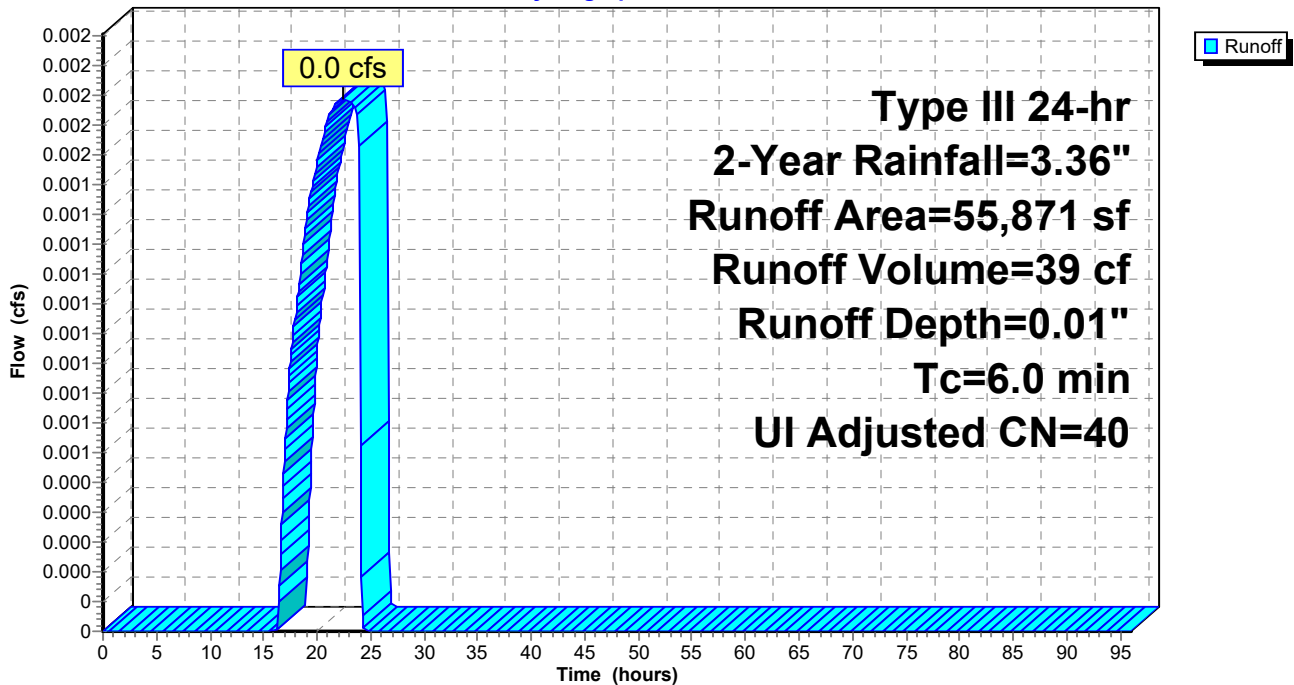
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Adj	Description
46,010	39		>75% Grass cover, Good, HSG A
1,111	98		Paved parking, HSG A
2,497	98		Unconnected pavement, HSG A
6,253	30		Woods, Good, HSG A
55,871	42	40	Weighted Average, UI Adjusted
52,263			93.54% Pervious Area
3,608			6.46% Impervious Area
2,497			69.21% Unconnected

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

Subcatchment P 1S: Subcat P 1S

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 2-Year Rainfall=3.36"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment P 2S: Subcat P 2S

[45] Hint: Runoff=Zero

Runoff = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Depth= 0.00"

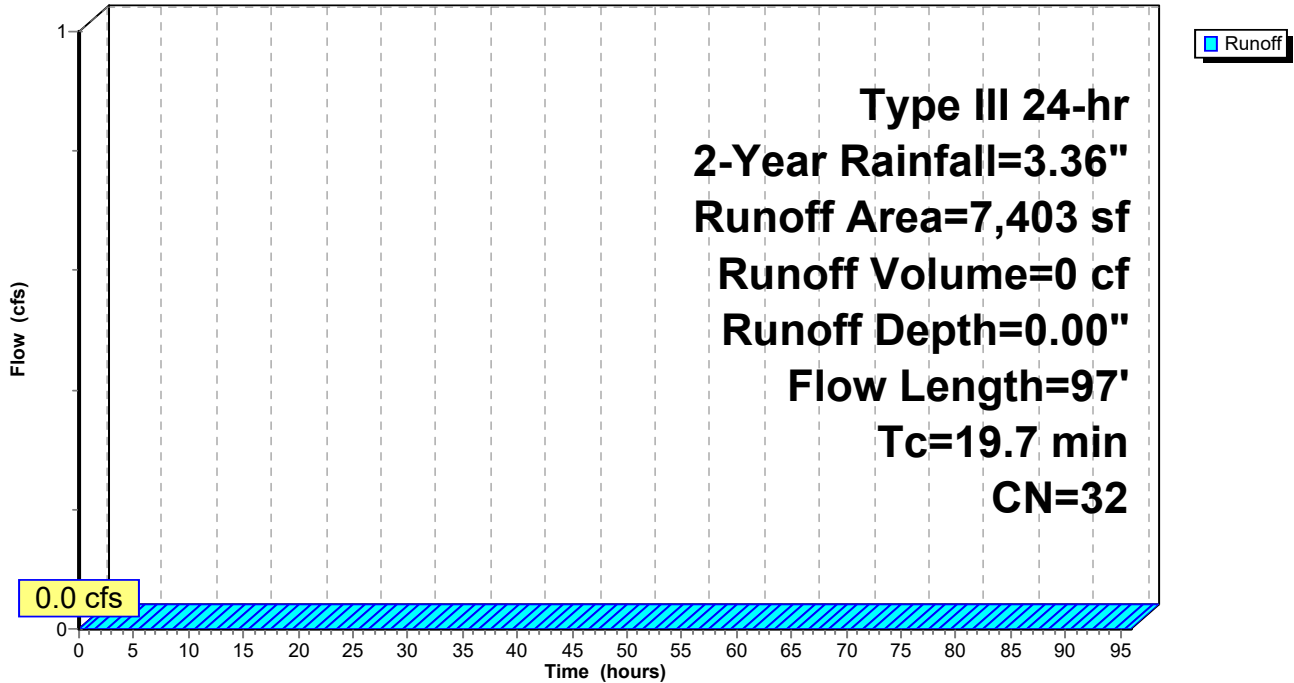
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
6,000	30	Woods, Good, HSG A
1,400	39	>75% Grass cover, Good, HSG A
3	98	Unconnected pavement, HSG A
7,403	32	Weighted Average
7,400		99.96% Pervious Area
3		0.04% Impervious Area
3		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	50	0.0300	0.05		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
1.4	47	0.0128	0.57		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
19.7	97	Total			

Subcatchment P 2S: Subcat P 2S

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 2-Year Rainfall=3.36"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment P 4S: Subcat P 4S

Runoff = 0.0 cfs @ 12.33 hrs, Volume= 27 cf, Depth= 0.27"

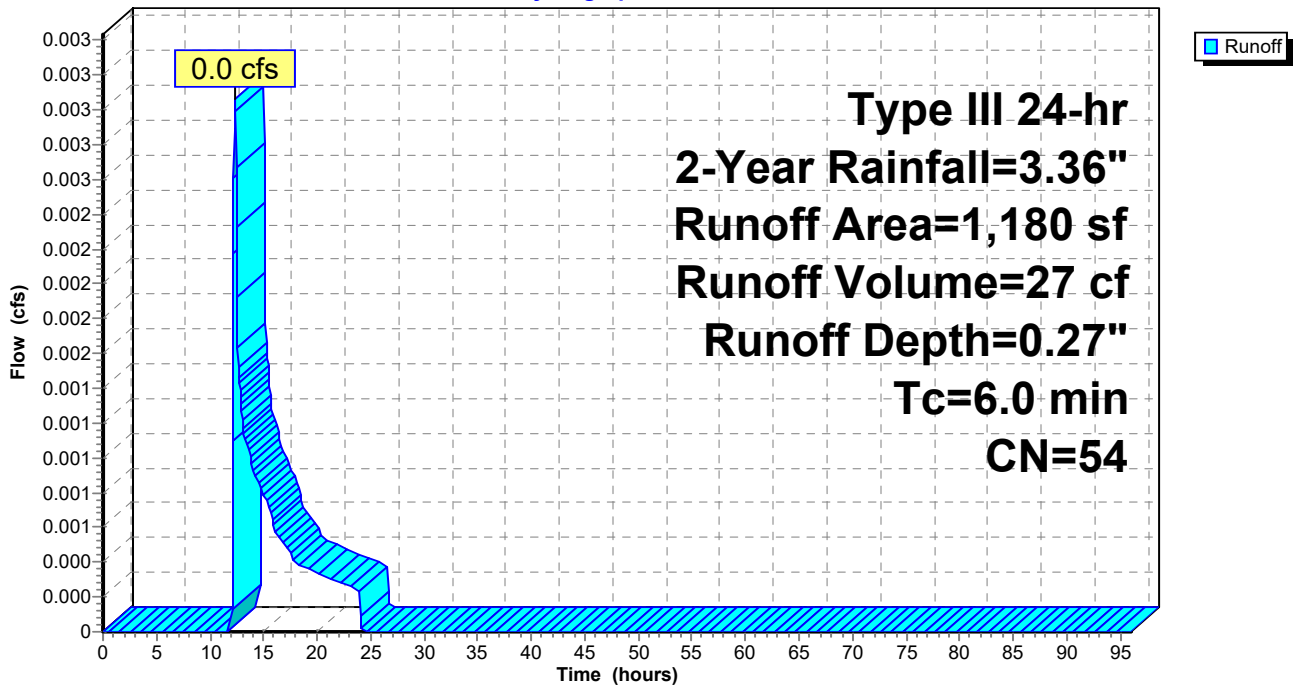
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 2-Year Rainfall=3.36"

Area (sf)	CN	Description
4	39	>75% Grass cover, Good, HSG A
412	98	Paved parking, HSG A
764	30	Brush, Good, HSG A
1,180	54	Weighted Average
768		65.08% Pervious Area
412		34.92% Impervious Area

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

Subcatchment P 4S: Subcat P 4S

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 2-Year Rainfall=3.36"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Pond P 1P: P 1P Swales

Inflow Area = 73,382 sf, 4.92% Impervious, Inflow Depth = 0.11" for 2-Year event
 Inflow = 0.5 cfs @ 12.10 hrs, Volume= 666 cf
 Outflow = 0.1 cfs @ 12.53 hrs, Volume= 664 cf, Atten= 84%, Lag= 26.0 min
 Discarded = 0.1 cfs @ 12.53 hrs, Volume= 664 cf
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link P 1L : P 1L

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 197.38' @ 12.53 hrs Surf.Area= 1,480 sf Storage= 418 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 52.3 min (816.6 - 764.4)

Volume	Invert	Avail.Storage	Storage Description
#1	197.00'	23,643 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	195.89'	0 cf	0.50'D x 1.11'H Vertical Cone/Cylinder x 2
		23,643 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
197.00	742	0	0
198.00	2,701	1,722	1,722
199.00	13,166	7,934	9,655
199.60	33,460	13,988	23,643

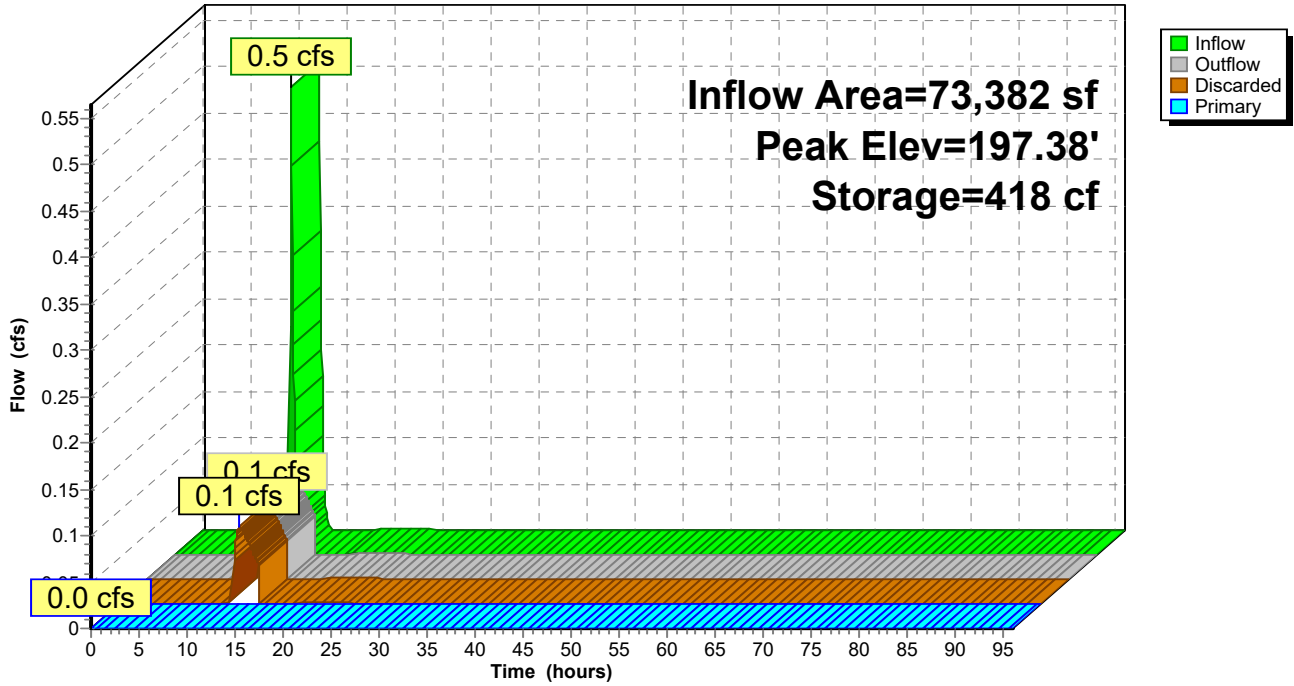
Device	Routing	Invert	Outlet Devices
#1	Primary	199.59'	240.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	195.89'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.1 cfs @ 12.53 hrs HW=197.38' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=195.89' (Free Discharge)
 ↳ **1=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P 1P: P 1P Swales

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 2-Year Rainfall=3.36"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Page 12

Summary for Pond P 2P: P 2P Crushed Stone Storage (20% Void)

Storage Calculation HydroCAD is conservative:

Surface Area of Parking Lot = 17,592 sf

Provided 4 inch thick layer of stone = 4/12

Storage Provide by Parking Area (Assume 20% Voids) =

$$(17,592) \times (4/12) \times (.2) = 1,173 \text{ cf}$$

Inflow Area = 17,511 sf, 0.00% Impervious, Inflow Depth = 1.26" for 2-Year event
 Inflow = 0.6 cfs @ 12.10 hrs, Volume= 1,845 cf
 Outflow = 0.6 cfs @ 12.10 hrs, Volume= 1,846 cf, Atten= 1%, Lag= 0.1 min
 Discarded = 0.1 cfs @ 12.10 hrs, Volume= 1,219 cf
 Primary = 0.5 cfs @ 12.10 hrs, Volume= 627 cf
 Routed to Pond P 1P : P 1P Swales

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 198.72' @ 12.10 hrs Surf.Area= 2,057 sf Storage= 101 cf

Plug-Flow detention time= 15.7 min calculated for 1,845 cf (100% of inflow)
 Center-of-Mass det. time= 16.0 min (868.8 - 852.8)

Volume	Invert	Avail.Storage	Storage Description
#1	198.00'	896 cf	Custom Stage Data (Prismatic) Listed below x 0.33 4,479 cf Overall x 20.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.00	0	0	0
198.37	804	149	149
198.67	6,162	1,045	1,194
199.67	7,571	6,867	8,060
200.67	2,877	5,224	13,284
200.87	0	288	13,572

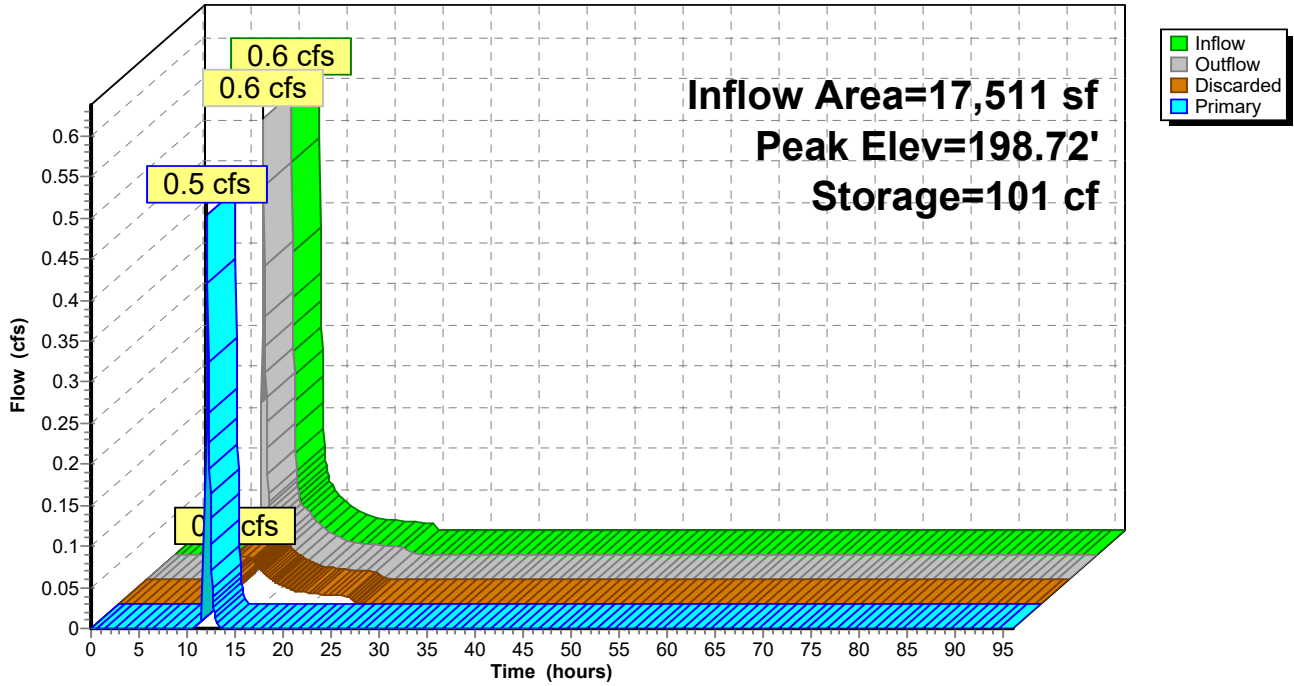
Device	Routing	Invert	Outlet Devices
#1	Primary	198.70'	60.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	198.00'	1.200 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.1 cfs @ 12.10 hrs HW=198.72' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.5 cfs @ 12.10 hrs HW=198.72' (Free Discharge)
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 0.5 cfs @ 0.40 fps)

Pond P 2P: P 2P Crushed Stone Storage (20% Void)

Hydrograph



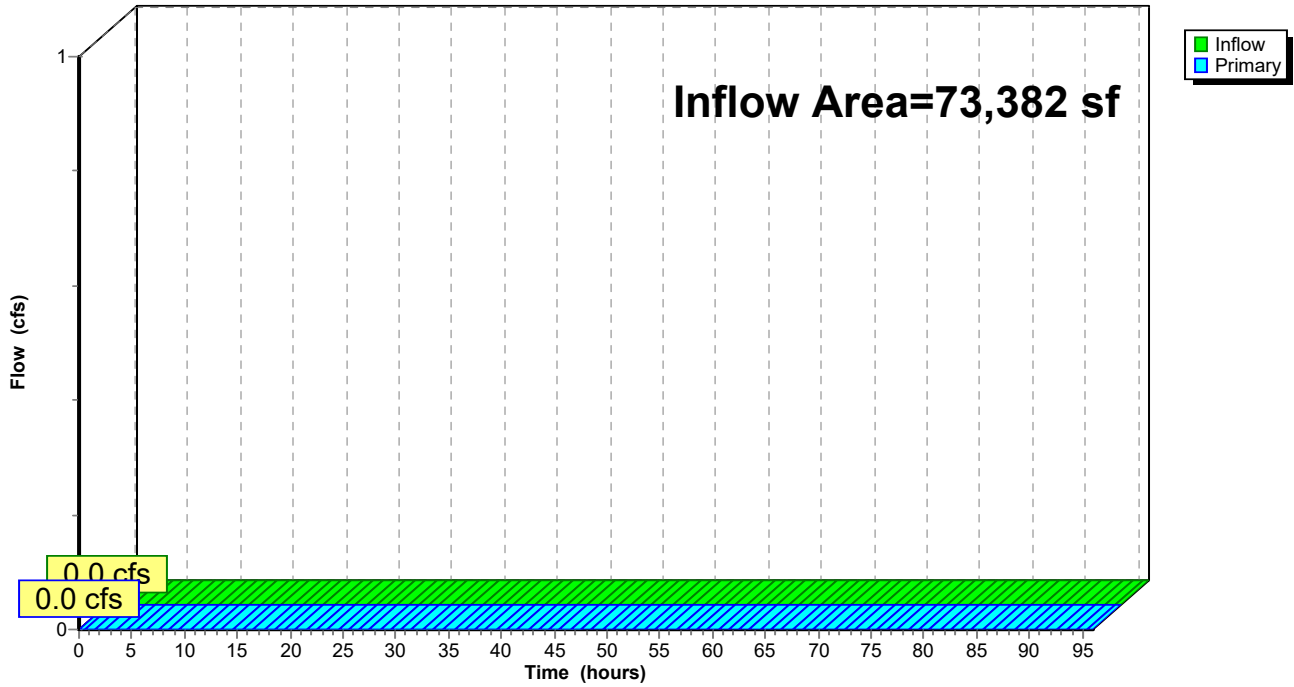
Summary for Link P 1L: P 1L

Inflow Area = 73,382 sf, 4.92% Impervious, Inflow Depth = 0.00" for 2-Year event
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link P 1L: P 1L

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 10-Year Rainfall=5.24"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Crushed Stone Area: Crushed Stone Runoff Area=17,511 sf 0.00% Impervious Runoff Depth=2.73"
Tc=6.0 min CN=76 Runoff=1.3 cfs 3,990 cf

Subcatchment P 1S: Subcat P 1S Runoff Area=55,871 sf 6.46% Impervious Runoff Depth=0.29"
Tc=6.0 min UI Adjusted CN=40 Runoff=0.1 cfs 1,355 cf

Subcatchment P 2S: Subcat P 2S Runoff Area=7,403 sf 0.04% Impervious Runoff Depth=0.04"
Flow Length=97' Tc=19.7 min CN=32 Runoff=0.0 cfs 27 cf

Subcatchment P 4S: Subcat P 4S Runoff Area=1,180 sf 34.92% Impervious Runoff Depth=1.04"
Tc=6.0 min CN=54 Runoff=0.0 cfs 102 cf

Pond P 1P: P 1P Swales Peak Elev=197.92' Storage=1,512 cf Inflow=1.2 cfs 3,416 cf
Discarded=0.1 cfs 3,375 cf Primary=0.0 cfs 0 cf Outflow=0.1 cfs 3,375 cf

Pond P 2P: P 2P Crushed Stone Storage (20% Void) Peak Elev=198.74' Storage=108 cf Inflow=1.3 cfs 3,990 cf
Discarded=0.1 cfs 1,927 cf Primary=1.2 cfs 2,061 cf Outflow=1.3 cfs 3,988 cf

Link P 1L: P 1L Inflow=0.0 cfs 0 cf
Primary=0.0 cfs 0 cf

Total Runoff Area = 81,965 sf Runoff Volume = 5,475 cf Average Runoff Depth = 0.80"
95.09% Pervious = 77,942 sf 4.91% Impervious = 4,023 sf

24-0281 - Proposed Hydrology

Type III 24-hr 10-Year Rainfall=5.24"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment Crushed Stone Area: Crushed Stone

Note:

Runoff = 1.3 cfs @ 12.09 hrs, Volume= 3,990 cf, Depth= 2.73"
 Routed to Pond P 2P : P 2P Crushed Stone Storage (20% Void)

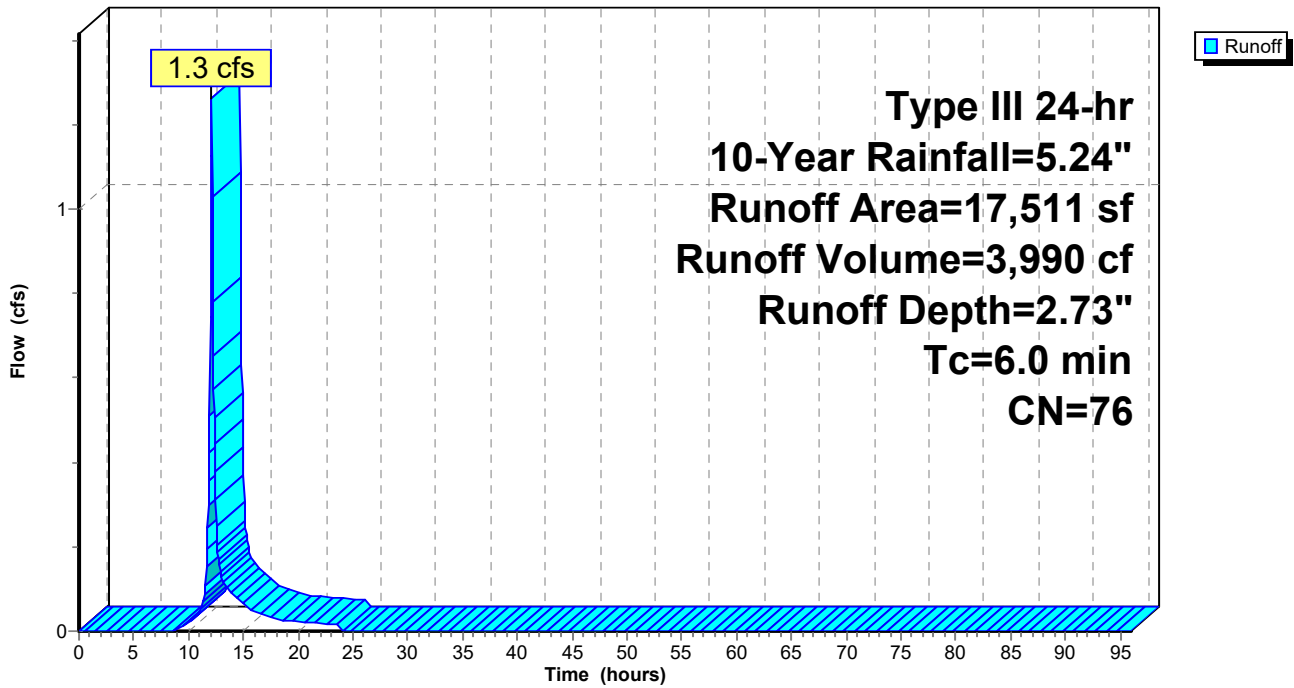
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=5.24"

Area (sf)	CN	Description
17,511	76	Gravel roads, HSG A
17,511		100.00% Pervious Area

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

Subcatchment Crushed Stone Area: Crushed Stone

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 10-Year Rainfall=5.24"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment P 1S: Subcat P 1S

Runoff = 0.1 cfs @ 12.41 hrs, Volume= 1,355 cf, Depth= 0.29"
 Routed to Pond P 1P : P 1P Swales

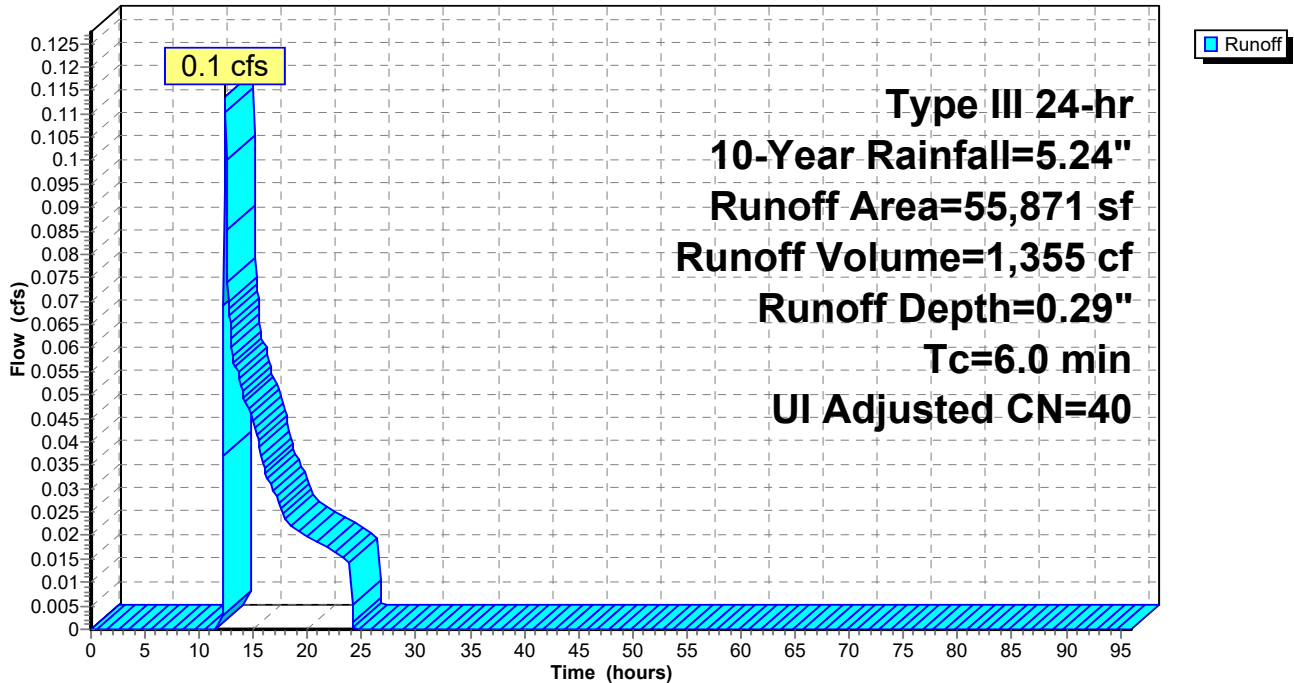
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=5.24"

Area (sf)	CN	Adj	Description
46,010	39		>75% Grass cover, Good, HSG A
1,111	98		Paved parking, HSG A
2,497	98		Unconnected pavement, HSG A
6,253	30		Woods, Good, HSG A
55,871	42	40	Weighted Average, UI Adjusted
52,263			93.54% Pervious Area
3,608			6.46% Impervious Area
2,497			69.21% Unconnected

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

Subcatchment P 1S: Subcat P 1S

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 10-Year Rainfall=5.24"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment P 2S: Subcat P 2S

Runoff = 0.0 cfs @ 17.10 hrs, Volume= 27 cf, Depth= 0.04"

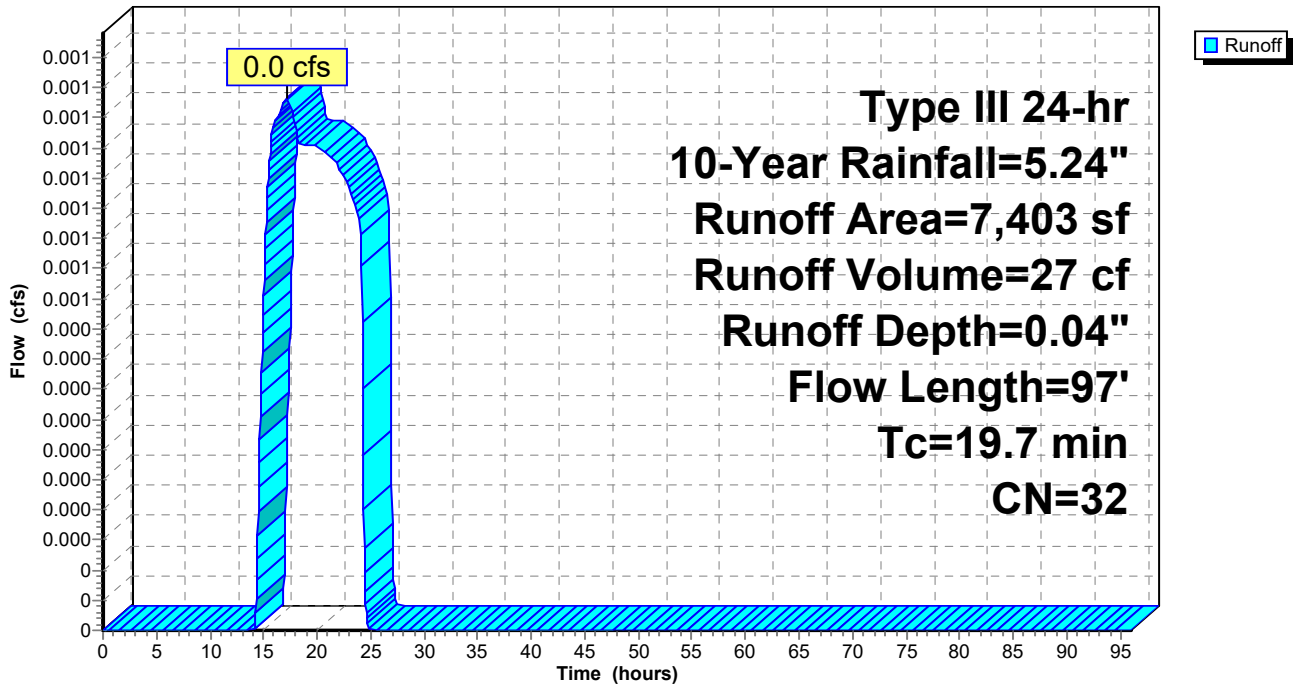
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 10-Year Rainfall=5.24"

Area (sf)	CN	Description
6,000	30	Woods, Good, HSG A
1,400	39	>75% Grass cover, Good, HSG A
3	98	Unconnected pavement, HSG A
7,403	32	Weighted Average
7,400		99.96% Pervious Area
3		0.04% Impervious Area
3		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	50	0.0300	0.05		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
1.4	47	0.0128	0.57		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
19.7	97	Total			

Subcatchment P 2S: Subcat P 2S

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 10-Year Rainfall=5.24"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment P 4S: Subcat P 4S

Runoff = 0.0 cfs @ 12.11 hrs, Volume= 102 cf, Depth= 1.04"

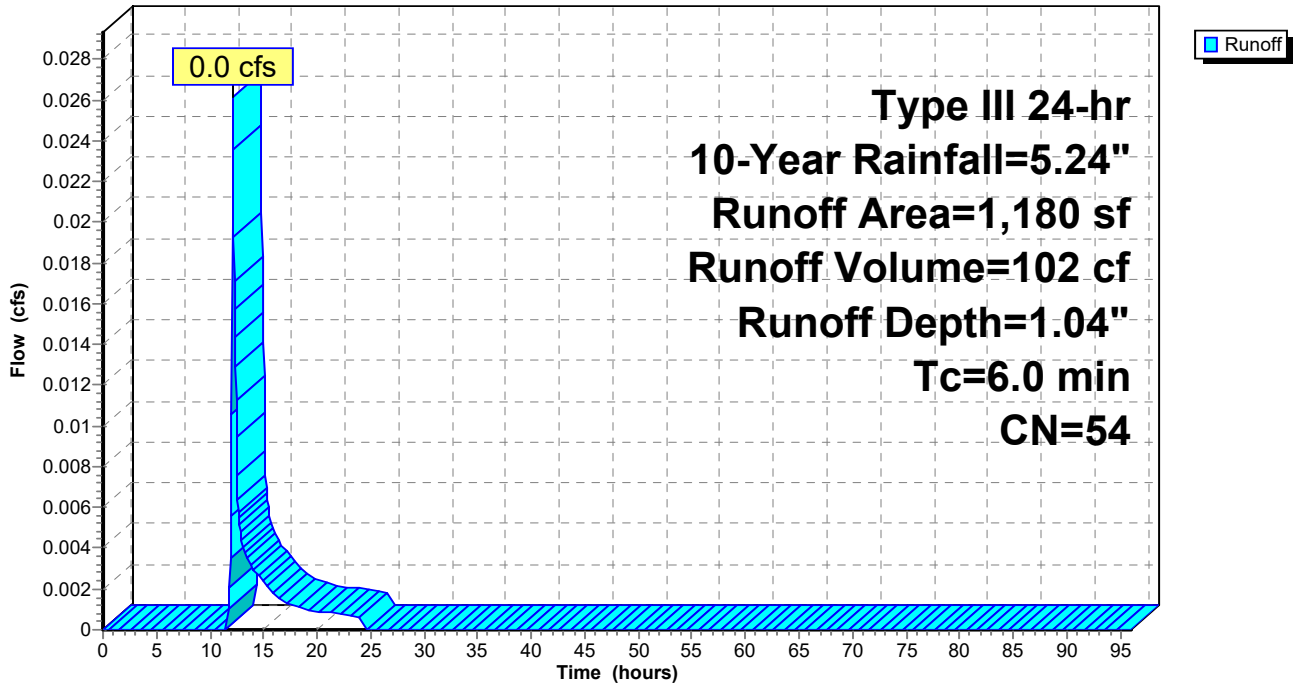
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Rainfall=5.24"

Area (sf)	CN	Description
4	39	>75% Grass cover, Good, HSG A
412	98	Paved parking, HSG A
764	30	Brush, Good, HSG A
1,180	54	Weighted Average
768		65.08% Pervious Area
412		34.92% Impervious Area

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

Subcatchment P 4S: Subcat P 4S

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 10-Year Rainfall=5.24"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Page 20

Summary for Pond P 1P: P 1P Swales

Inflow Area = 73,382 sf, 4.92% Impervious, Inflow Depth = 0.56" for 10-Year event
 Inflow = 1.2 cfs @ 12.10 hrs, Volume= 3,416 cf
 Outflow = 0.1 cfs @ 12.96 hrs, Volume= 3,375 cf, Atten= 88%, Lag= 52.1 min
 Discarded = 0.1 cfs @ 12.96 hrs, Volume= 3,375 cf
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link P 1L : P 1L

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 197.92' @ 12.96 hrs Surf.Area= 2,545 sf Storage= 1,512 cf

Plug-Flow detention time= 120.1 min calculated for 3,375 cf (99% of inflow)
 Center-of-Mass det. time= 112.8 min (950.3 - 837.5)

Volume	Invert	Avail.Storage	Storage Description
#1	197.00'	23,643 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	195.89'	0 cf	0.50'D x 1.11'H Vertical Cone/Cylinder x 2
		23,643 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
197.00	742	0	0
198.00	2,701	1,722	1,722
199.00	13,166	7,934	9,655
199.60	33,460	13,988	23,643

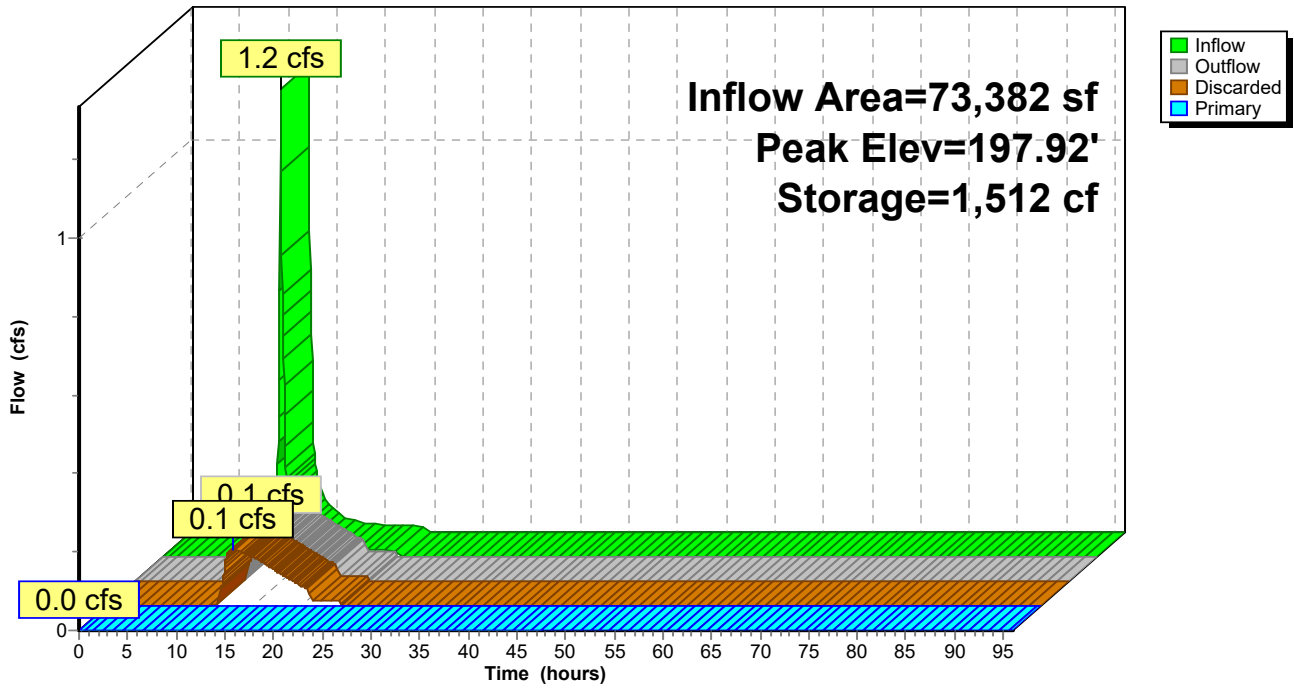
Device	Routing	Invert	Outlet Devices
#1	Primary	199.59'	240.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	195.89'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.1 cfs @ 12.96 hrs HW=197.92' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=195.89' (Free Discharge)
 ↳ **1=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P 1P: P 1P Swales

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 10-Year Rainfall=5.24"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Page 22

Summary for Pond P 2P: P 2P Crushed Stone Storage (20% Void)

Storage Calculation HydroCAD is conservative:

Surface Area of Parking Lot = 17,592 sf

Provided 4 inch thick layer of stone = 4/12

Storage Provide by Parking Area (Assume 20% Voids) =

$$(17,592) \times (4/12) \times (.2) = 1,173 \text{ cf}$$

Inflow Area = 17,511 sf, 0.00% Impervious, Inflow Depth = 2.73" for 10-Year event
 Inflow = 1.3 cfs @ 12.09 hrs, Volume= 3,990 cf
 Outflow = 1.3 cfs @ 12.09 hrs, Volume= 3,988 cf, Atten= 1%, Lag= 0.1 min
 Discarded = 0.1 cfs @ 12.09 hrs, Volume= 1,927 cf
 Primary = 1.2 cfs @ 12.09 hrs, Volume= 2,061 cf
 Routed to Pond P 1P : P 1P Swales

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 198.74' @ 12.09 hrs Surf.Area= 2,064 sf Storage= 108 cf

Plug-Flow detention time= 12.7 min calculated for 3,988 cf (100% of inflow)
 Center-of-Mass det. time= 12.3 min (842.4 - 830.1)

Volume	Invert	Avail.Storage	Storage Description
#1	198.00'	896 cf	Custom Stage Data (Prismatic) Listed below x 0.33 4,479 cf Overall x 20.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.00	0	0	0
198.37	804	149	149
198.67	6,162	1,045	1,194
199.67	7,571	6,867	8,060
200.67	2,877	5,224	13,284
200.87	0	288	13,572

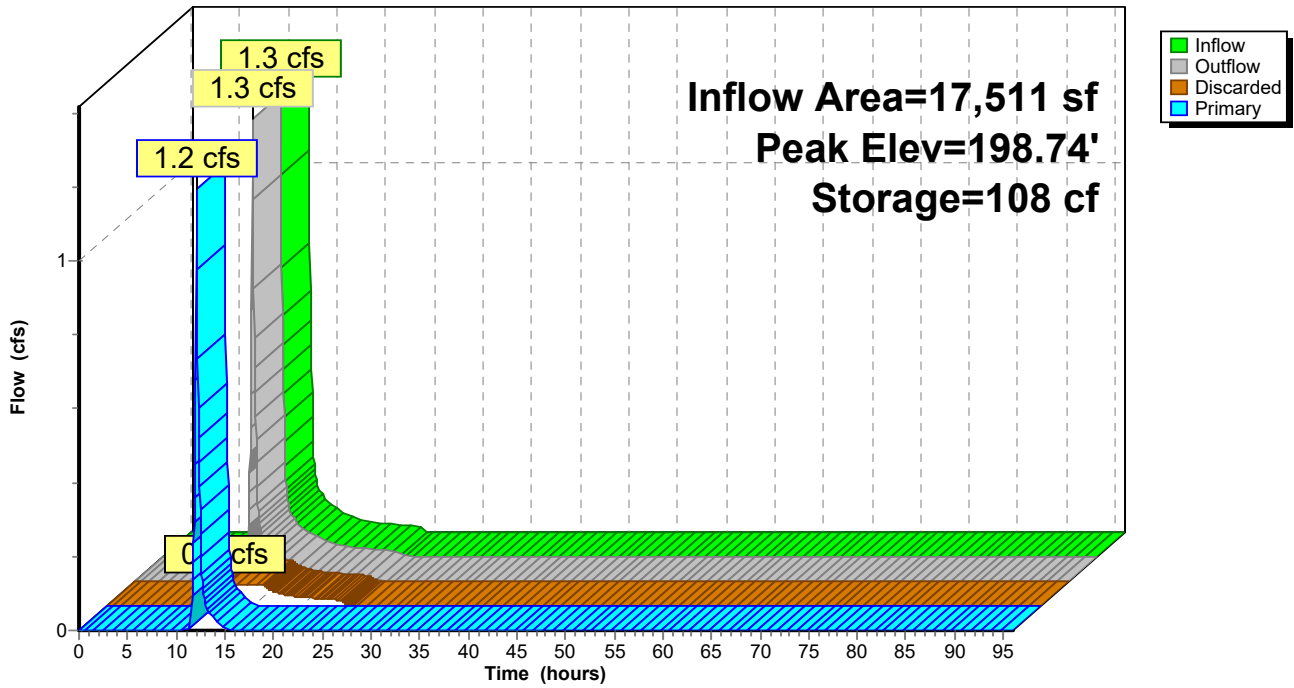
Device	Routing	Invert	Outlet Devices
#1	Primary	198.70'	60.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	198.00'	1.200 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.1 cfs @ 12.09 hrs HW=198.74' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=1.1 cfs @ 12.09 hrs HW=198.74' (Free Discharge)
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 1.1 cfs @ 0.53 fps)

Pond P 2P: P 2P Crushed Stone Storage (20% Void)

Hydrograph



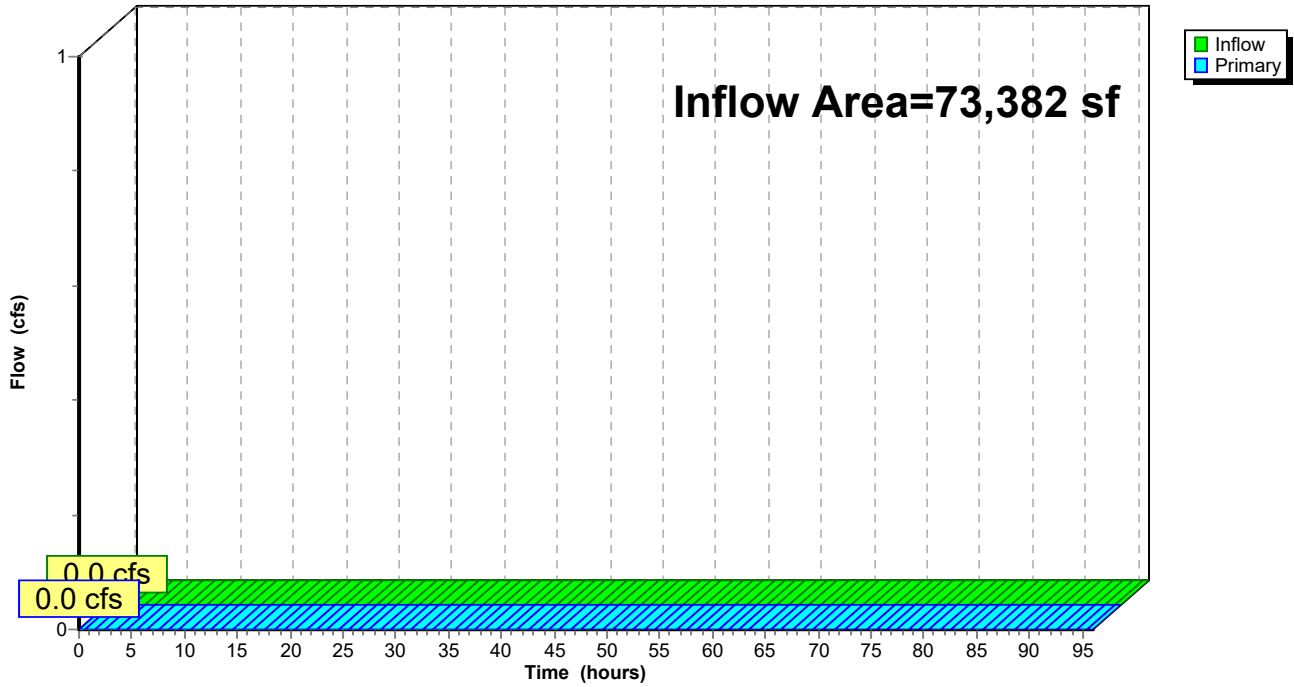
Summary for Link P 1L: P 1L

Inflow Area = 73,382 sf, 4.92% Impervious, Inflow Depth = 0.00" for 10-Year event
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link P 1L: P 1L

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Time span=0.00-96.00 hrs, dt=0.05 hrs, 1921 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment Crushed Stone Area: Crushed Stone Runoff Area=17,511 sf 0.00% Impervious Runoff Depth=5.37"
Tc=6.0 min CN=76 Runoff=2.5 cfs 7,833 cf

Subcatchment P 1S: Subcat P 1S Runoff Area=55,871 sf 6.46% Impervious Runoff Depth=1.35"
Tc=6.0 min UI Adjusted CN=40 Runoff=1.4 cfs 6,295 cf

Subcatchment P 2S: Subcat P 2S Runoff Area=7,403 sf 0.04% Impervious Runoff Depth=0.63"
Flow Length=97' Tc=19.7 min CN=32 Runoff=0.0 cfs 387 cf

Subcatchment P 4S: Subcat P 4S Runoff Area=1,180 sf 34.92% Impervious Runoff Depth=2.83"
Tc=6.0 min CN=54 Runoff=0.1 cfs 278 cf

Pond P 1P: P 1P Swales Peak Elev=198.56' Storage=4,884 cf Inflow=3.8 cfs 11,394 cf
Discarded=0.5 cfs 11,404 cf Primary=0.0 cfs 0 cf Outflow=0.5 cfs 11,404 cf

Pond P 2P: P 2P Crushed Stone Storage (20% Void) Peak Elev=198.76' Storage=119 cf Inflow=2.5 cfs 7,833 cf
Discarded=0.1 cfs 2,740 cf Primary=2.4 cfs 5,099 cf Outflow=2.4 cfs 7,838 cf

Link P 1L: P 1L Inflow=0.0 cfs 0 cf
Primary=0.0 cfs 0 cf

Total Runoff Area = 81,965 sf Runoff Volume = 14,794 cf Average Runoff Depth = 2.17"
95.09% Pervious = 77,942 sf 4.91% Impervious = 4,023 sf

24-0281 - Proposed Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment Crushed Stone Area: Crushed Stone

Note:

Runoff = 2.5 cfs @ 12.09 hrs, Volume= 7,833 cf, Depth= 5.37"
Routed to Pond P 2P : P 2P Crushed Stone Storage (20% Void)

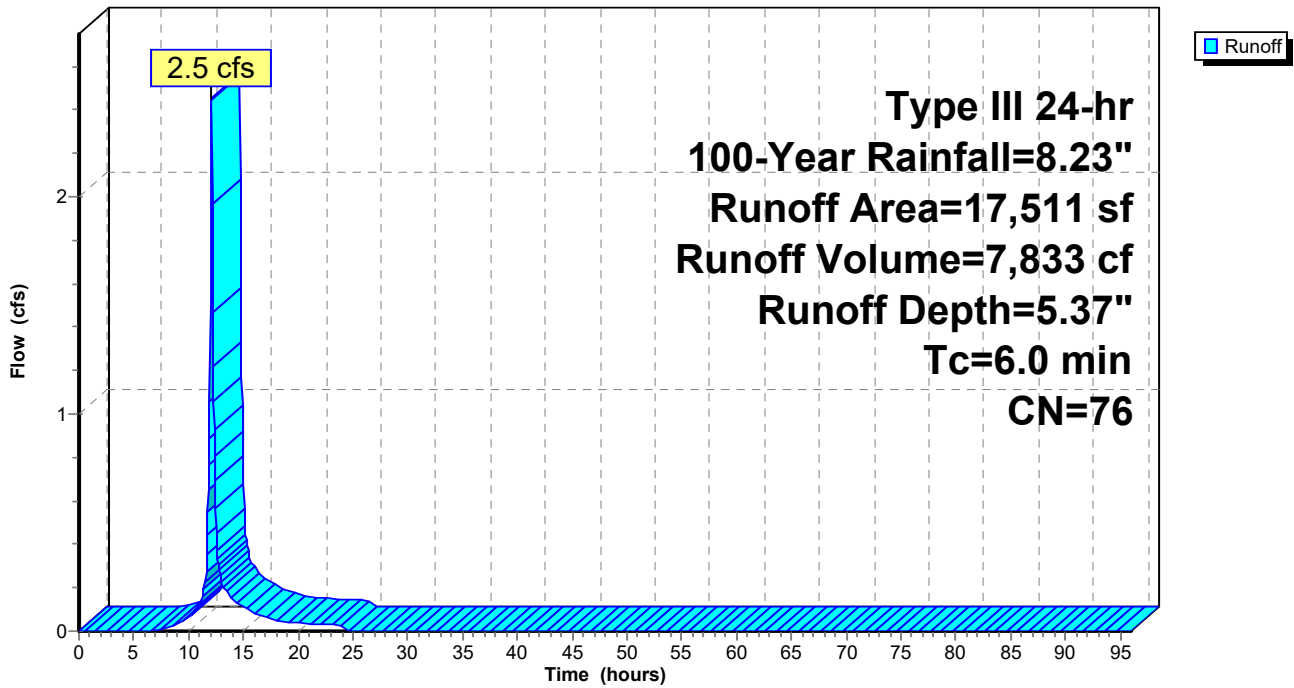
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.23"

Area (sf)	CN	Description
17,511	76	Gravel roads, HSG A
17,511		100.00% Pervious Area

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

Subcatchment Crushed Stone Area: Crushed Stone

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment P 1S: Subcat P 1S

Runoff = 1.4 cfs @ 12.12 hrs, Volume= 6,295 cf, Depth= 1.35"
 Routed to Pond P 1P : P 1P Swales

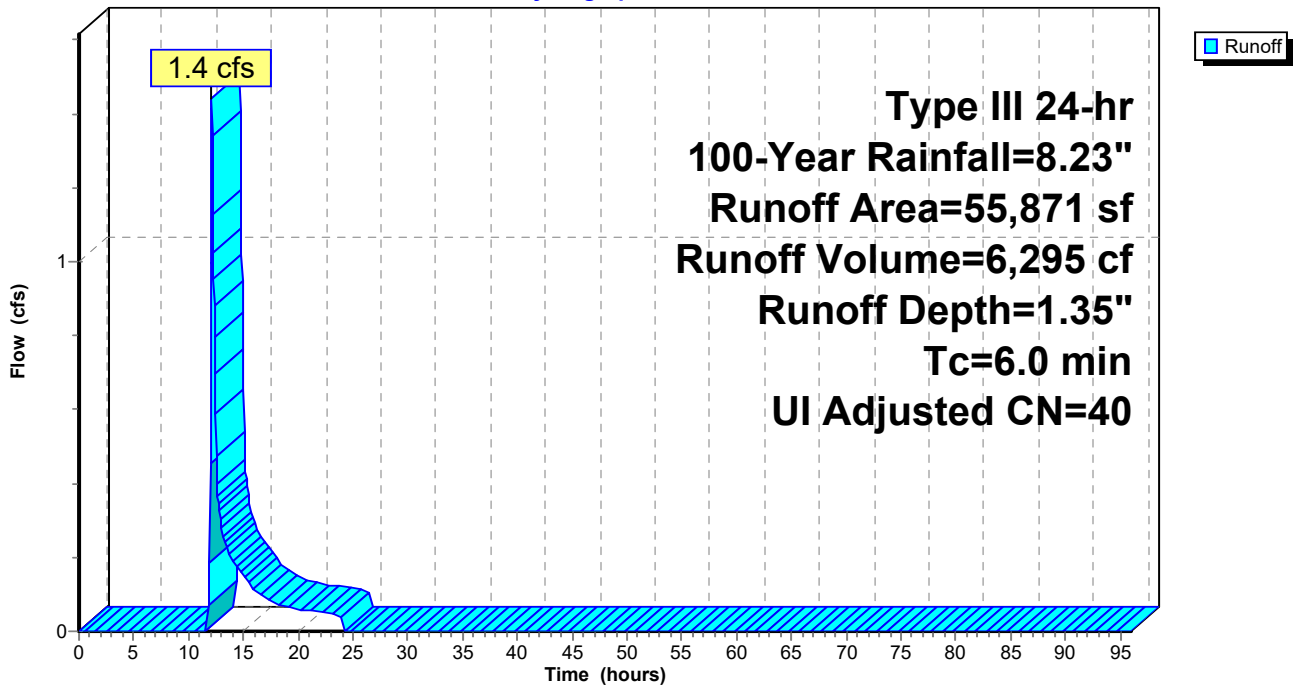
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.23"

Area (sf)	CN	Adj	Description
46,010	39		>75% Grass cover, Good, HSG A
1,111	98		Paved parking, HSG A
2,497	98		Unconnected pavement, HSG A
6,253	30		Woods, Good, HSG A
55,871	42	40	Weighted Average, UI Adjusted
52,263			93.54% Pervious Area
3,608			6.46% Impervious Area
2,497			69.21% Unconnected

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

Subcatchment P 1S: Subcat P 1S

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment P 2S: Subcat P 2S

Runoff = 0.0 cfs @ 12.55 hrs, Volume= 387 cf, Depth= 0.63"

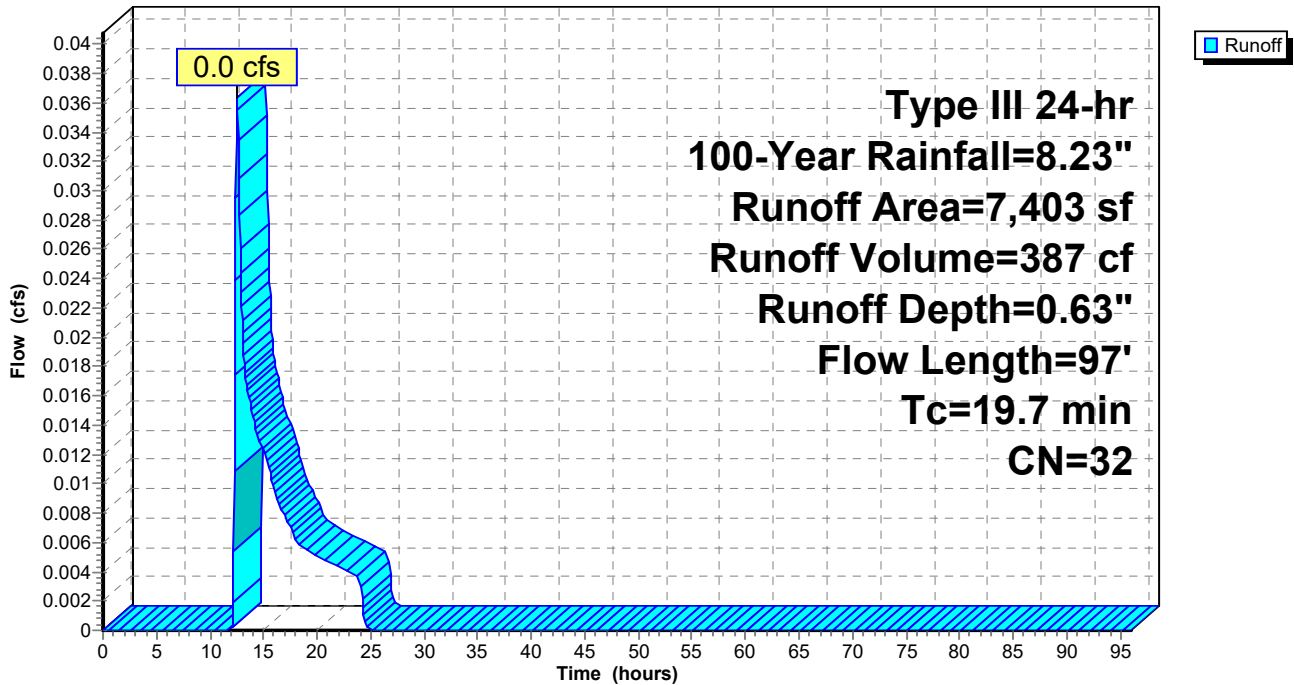
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
 Type III 24-hr 100-Year Rainfall=8.23"

Area (sf)	CN	Description
6,000	30	Woods, Good, HSG A
1,400	39	>75% Grass cover, Good, HSG A
3	98	Unconnected pavement, HSG A
7,403	32	Weighted Average
7,400		99.96% Pervious Area
3		0.04% Impervious Area
3		100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
18.3	50	0.0300	0.05		Sheet Flow, Woods: Dense underbrush n= 0.800 P2= 3.20"
1.4	47	0.0128	0.57		Shallow Concentrated Flow, Woodland Kv= 5.0 fps
19.7	97	Total			

Subcatchment P 2S: Subcat P 2S

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Summary for Subcatchment P 4S: Subcat P 4S

Runoff = 0.1 cfs @ 12.10 hrs, Volume= 278 cf, Depth= 2.83"

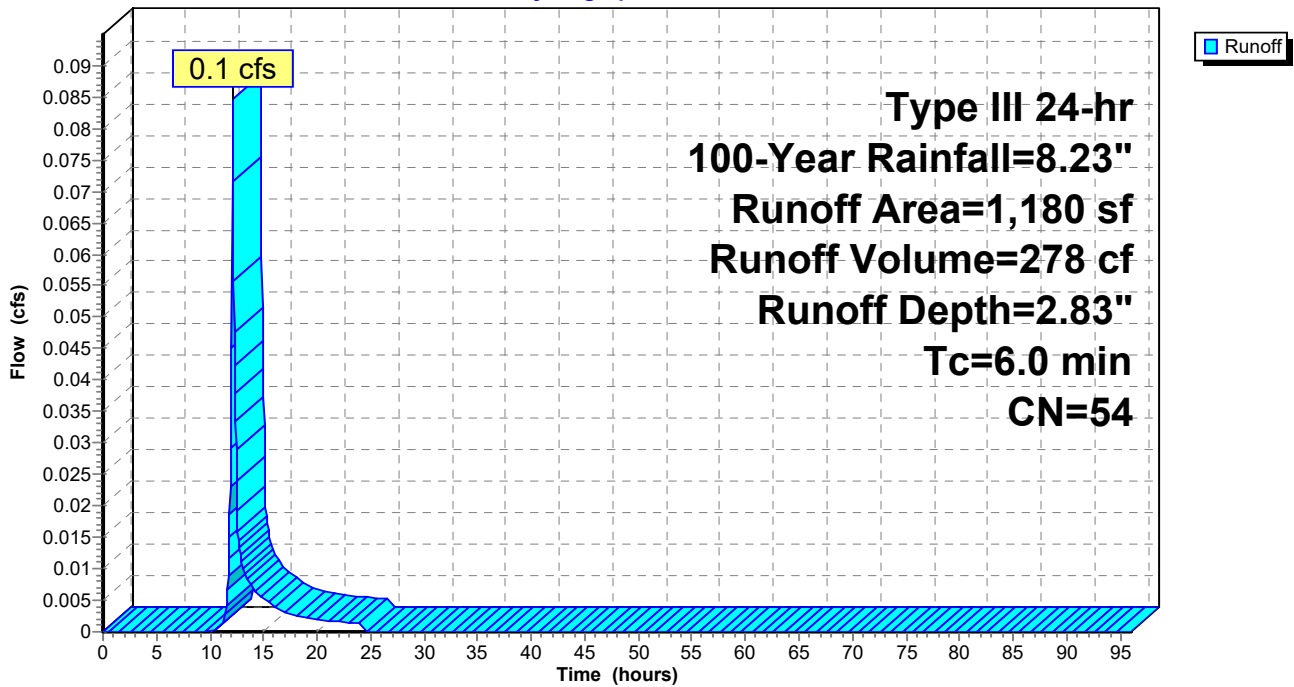
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Rainfall=8.23"

Area (sf)	CN	Description
4	39	>75% Grass cover, Good, HSG A
412	98	Paved parking, HSG A
764	30	Brush, Good, HSG A
1,180	54	Weighted Average
768		65.08% Pervious Area
412		34.92% Impervious Area

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

Subcatchment P 4S: Subcat P 4S

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Page 30

Summary for Pond P 1P: P 1P Swales

Inflow Area = 73,382 sf, 4.92% Impervious, Inflow Depth = 1.86" for 100-Year event
 Inflow = 3.8 cfs @ 12.10 hrs, Volume= 11,394 cf
 Outflow = 0.5 cfs @ 12.95 hrs, Volume= 11,404 cf, Atten= 87%, Lag= 50.9 min
 Discarded = 0.5 cfs @ 12.95 hrs, Volume= 11,404 cf
 Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
 Routed to Link P 1L : P 1L

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 198.56' @ 12.95 hrs Surf.Area= 8,572 sf Storage= 4,884 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
 Center-of-Mass det. time= 151.3 min (986.0 - 834.7)

Volume	Invert	Avail.Storage	Storage Description
#1	197.00'	23,643 cf	Custom Stage Data (Prismatic) Listed below (Recalc)
#2	195.89'	0 cf	0.50'D x 1.11'H Vertical Cone/Cylinder x 2
		23,643 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
197.00	742	0	0
198.00	2,701	1,722	1,722
199.00	13,166	7,934	9,655
199.60	33,460	13,988	23,643

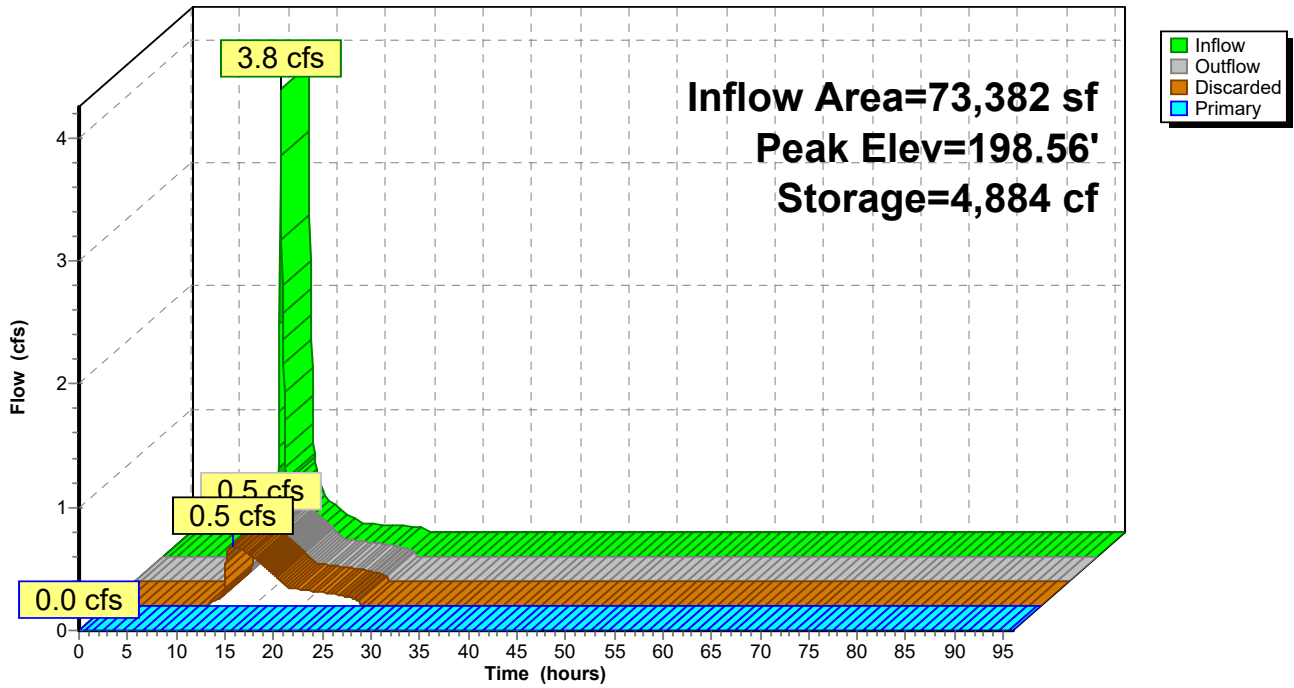
Device	Routing	Invert	Outlet Devices
#1	Primary	199.59'	240.0' long x 1.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32
#2	Discarded	195.89'	2.410 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.5 cfs @ 12.95 hrs HW=198.56' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.5 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=195.89' (Free Discharge)
 ↳ **1=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Pond P 1P: P 1P Swales

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

Page 32

Summary for Pond P 2P: P 2P Crushed Stone Storage (20% Void)

Storage Calculation HydroCAD is conservative:

Surface Area of Parking Lot = 17,592 sf

Provided 4 inch thick layer of stone = 4/12

Storage Provide by Parking Area (Assume 20% Voids) =

$$(17,592) \times (4/12) \times (.2) = 1,173 \text{ cf}$$

Inflow Area = 17,511 sf, 0.00% Impervious, Inflow Depth = 5.37" for 100-Year event
 Inflow = 2.5 cfs @ 12.09 hrs, Volume= 7,833 cf
 Outflow = 2.4 cfs @ 12.09 hrs, Volume= 7,838 cf, Atten= 1%, Lag= 0.0 min
 Discarded = 0.1 cfs @ 12.09 hrs, Volume= 2,740 cf
 Primary = 2.4 cfs @ 12.09 hrs, Volume= 5,099 cf
 Routed to Pond P 1P : P 1P Swales

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs / 2
 Peak Elev= 198.76' @ 12.09 hrs Surf.Area= 2,074 sf Storage= 119 cf

Plug-Flow detention time= 8.5 min calculated for 7,830 cf (100% of inflow)
 Center-of-Mass det. time= 9.0 min (819.8 - 810.8)

Volume	Invert	Avail.Storage	Storage Description
#1	198.00'	896 cf	Custom Stage Data (Prismatic) Listed below x 0.33 4,479 cf Overall x 20.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
198.00	0	0	0
198.37	804	149	149
198.67	6,162	1,045	1,194
199.67	7,571	6,867	8,060
200.67	2,877	5,224	13,284
200.87	0	288	13,572

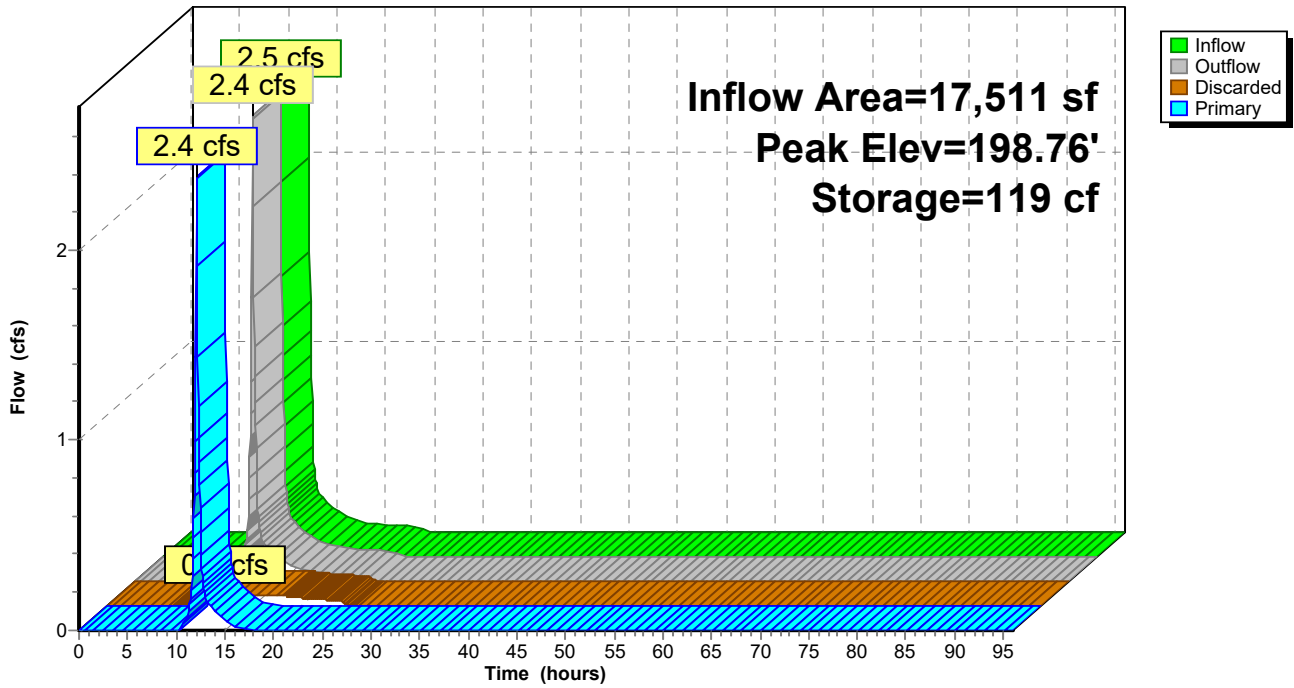
Device	Routing	Invert	Outlet Devices
#1	Primary	198.70'	60.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#2	Discarded	198.00'	1.200 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.1 cfs @ 12.09 hrs HW=198.76' (Free Discharge)
 ↳ **2=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=2.3 cfs @ 12.09 hrs HW=198.76' (Free Discharge)
 ↳ **1=Broad-Crested Rectangular Weir** (Weir Controls 2.3 cfs @ 0.67 fps)

Pond P 2P: P 2P Crushed Stone Storage (20% Void)

Hydrograph



24-0281 - Proposed Hydrology

Type III 24-hr 100-Year Rainfall=8.23"

Prepared by Land Design Collaborative

HydroCAD® 10.20-6a s/n 11266 © 2024 HydroCAD Software Solutions LLC

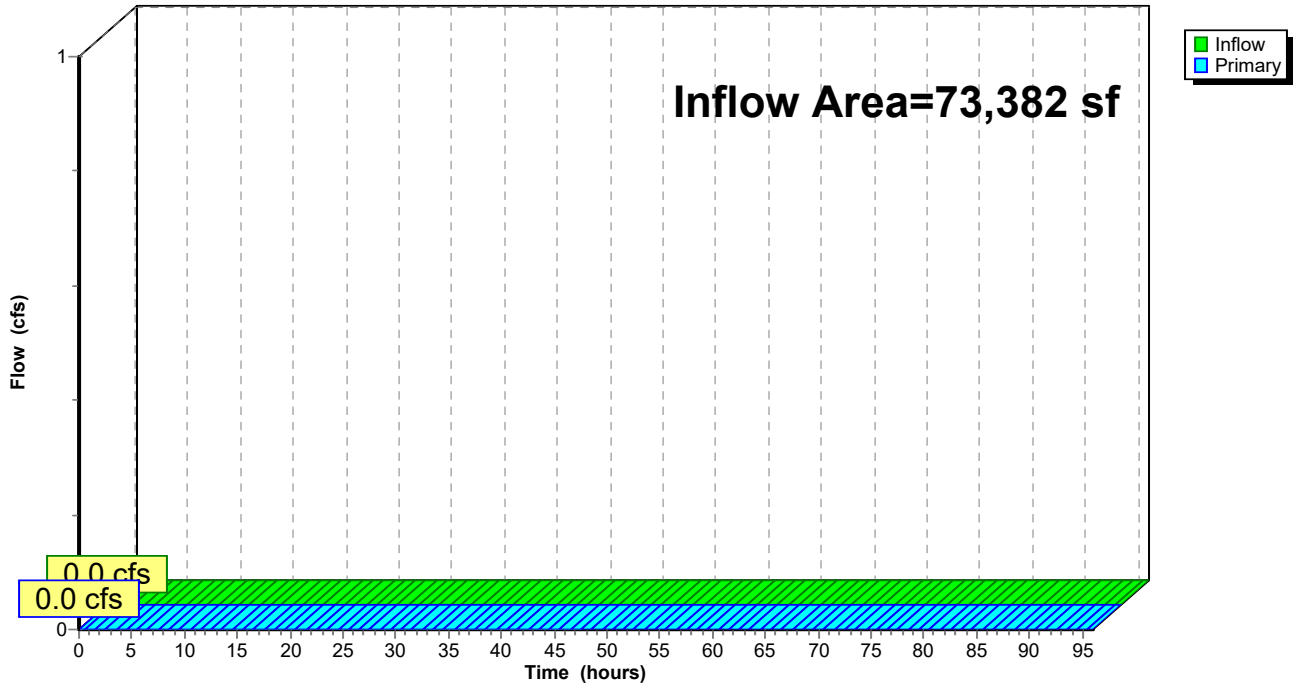
Summary for Link P 1L: P 1L

Inflow Area = 73,382 sf, 4.92% Impervious, Inflow Depth = 0.00" for 100-Year event
Inflow = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Link P 1L: P 1L

Hydrograph



C) Water Quality Calculations (Standards 3, 4, 5, 6 & 7)

The proposed stormwater management system is comprised of drainage catch basins/ area drains, open “country drainage”, and a surface infiltration retention basin. The proposed stormwater management system utilizes Low Impact Development (LID) measures including no disturbance to any Wetland Resource Areas, use of “country drainage”, and grass channels.

Standard 3)

The Project results in a slight increase in impervious area of roughly 2,267 s.f. however accounts for recharge volume for the 4,023 s.f. paved access drive and rubber impervious play area, thereby meeting the recharge requirements. Specifically, the required recharge volume is 224 c.f. (when factoring the capture area adjustment) while the proposed design provides 23,852 c.f.; more than satisfying the minimum requirement. Although the gravel surface is pervious, the proposed stormwater management design will provide adequate recharge volume to account for this area as well.

Standard 4)

The Project results in a slight increase in impervious area of roughly 2,267 s.f.; however, proposed TSS removal accounts for a water quality volume for the 4,023 s.f. paved access drive and rubber impervious play area, thereby meeting the water quality volume requirements. Specifically, the required water quality volume for the first inch of runoff is 335 c.f. while the proposed design provides 23,852 c.f. more than satisfying the minimum requirement. The site stormwater system provides water quality volume in the crushed stone parking area as well as the surface infiltration retention basin below their respective outlets for each.

Standard 5)

This standard is not applicable.

Standard 6)

This standard is not applicable.

Standard 7)

Although this Project is a mix of new development and redevelopment, the design fully complies and does not require relief from this Standard.

No Information on This Page

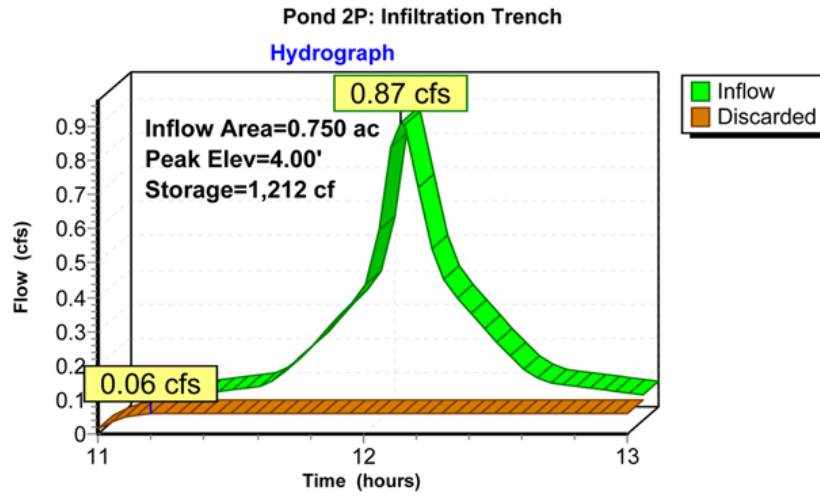


Table 2.3.3. 1982 Rawls Rates¹⁸

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

¹⁸ Rawls, Brakensiek and Saxton, 1982

Attention must be given to ensure consistency in units. In particular, the Target Depth Factors must be converted to feet.

NRCS HYDROLOGIC SOIL TYPE	APPROX. SOIL TEXTURE	TARGET DEPTH FACTOR (F)
A	sand	0.6-inch
B	loam	0.35-inch
C	silty loam	0.25-inch
D	clay	0.1-inch

Table 2.3.2: Recharge Target Depth by Hydrologic Soil Group

When a site contains multiple Hydrologic Soil Groups, determine the *Required Recharge Volume* for each impervious area by Hydrologic Soil Group and then add the volumes together.

Example: Assume a ten (10) acre site. 5.0 acres are proposed to be developed for a retail use. A section of the entrance roadway is to be bridged over a stream that is classified as land under water. As such, the bridging is subject to the Wetlands Protection Act Regulations, and the Stormwater Management Standards apply to stormwater runoff from all proposed roads, parking areas, and rooftops. Of the 5.0 acres proposed to be developed, 2 acres of impervious surfaces are proposed atop Hydrologic Soil Group (HSG) “A” soils, 1 acre of impervious surfaces atop HSG “B” soil, 1.5 acres of impervious surfaces atop HSG “C” soil, and 0.5 acres are proposed to be landscaped area. The remaining 5.0 acres, located on HSG “A” soil, are proposed to remain forested. Determine the *Required Recharge Volume*.

Solution: The *Required Recharge Volume* is determined only for the impervious surfaces. The 5.0-acre forested area and the 0.5-acre landscaped area are not impervious areas. Although converted from forest, landscaped area is pervious area for purposes of Standard 3. Use *Equation (1)* to determine the *Required Recharge Volume* for each Hydrologic Soil Group covered by impervious area. Add together the *Required Recharge Volumes* determined for each HSG.

$$Rv = F \times \text{impervious area}$$

$$Rv = [(F_{\text{HSG "A"}}) (\text{Area}_1)] + [(F_{\text{HSG "B"}}) (\text{Area}_2)] + [(F_{\text{HSG "C"}}) (\text{Area}_3)] + [(F_{\text{HSG "D"}}) (\text{Area}_4)] \text{ Equation (2)}$$

$$Rv = [(0.6\text{-in}/12)(2 \text{ acres})] + [(0.35\text{-in}/12)(1 \text{ acre})] + [(0.25\text{-in}/12)(1.5 \text{ acres})] + [(0.1\text{-in}/12)(0 \text{ acres})]$$

$$Rv = 0.1605 \text{ acre-feet}$$

$$Rv = 0.1605 \text{ acre-feet} \times 43560 \text{ square feet/acre-feet} = 6,991 \text{ cubic feet or } 258.9 \text{ cubic yards}$$

MassDEP Stormwater Standard 3
TSS Removal

Project: 240 - 260 Pleasant Street
Project No: 24-0281

Date: Jan-25
Page: C-2

Critical Area - Yes or No No

BMP Name	TSS Removal Rate	Starting TSS	Amount Removed	Remaining Load
Infiltration	80%	100%	80%	20%
	0%	20%	0%	20%
	0%	20%	0%	20%
	0%	20%	0%	20%
	0%	20%	0%	20%
		Total TSS Remaining:	20%	OK

No Information on This Page

Critical Area - Yes or No No

Impervious Area	Area (S.F.)	Soil	Depth (inches)	Volume (C.F.)
P 1S	3,608	A	0.60	180.4
P 2S	3	A	0.60	0.2
P 4S	412	A	0.60	20.6

Total Area 4,023 S.F. Volume Required **201.2** C.F.

Capture Area Adjustment

To Recharge Facility	Area (S.F.)	Volume Required	C.F.
P 1S	3,608	224.3	C.F.
P 4S	0		

Volume Provided below lowest invert (Static Method)

BMP	Area (S.F.)	Notes
P 1P	23,310	(See Stormwater Report)
P 2P	542	(See Stormwater Report)

Volume Provided: **23,852.0** C.F. **OK**

No Information on This Page

Critical Area and/or Rapid Infiltration - Yes or No No

Watershed (Subcatchment)	Impervious Area (S.F.)	Required Depth (inches)	Required Volume (C.F.)
P 1S	3,608	1.00	300.7
P 2S	3	1.00	0.3
P 4S	412	1.00	34.3
Total Area: 4,023			Volume Required: 335.3

Volume Provided (per HydroCAD)

BMP	Volume	Notes
P 1S	23,310	(See Stormwater Report)
P 4S	542	(See Stormwater Report)

Volumes reported are below lowest invert (Static Method)

Volume Provided **23,852.0** C.F. **OK**

No Information on This Page

D) Construction Period Pollution Prevention Plan, Long-Term Pollution Prevention Plan, and Long-Term Operations & Maintenance Plan (Standards 8, 9 & 10)

Standards 8 & 9)

Jere Schertzer, of Connect Church, is responsible for implementation of the Construction Period Pollution Prevention Plan, the Long-Term Operation & Maintenance Plan, and the Long-Term Pollution Prevention Plan for 240 – 260 Pleasant Street in Ashland, Massachusetts.

The sitework will result in more than one (1) acre of disturbance, therefore NPDES requirements of the Construction General Permit are applicable and a SWPPP is required. A SWPPP will be prepared prior to the start of construction once a contractor has been selected.

The stormwater management system for 240 – 260 Pleasant Street is comprised of drainage catch basins/ area drains, open “country drainage”, and a surface infiltration retention basin. Only stormwater may be discharged through these facilities. Refer to the following pages for specific requirements to prevent pollution and the maintenance of the stormwater management system.

Standard 10)

No illicit connections to the stormwater management system are known or proposed.

No Information on This Page

Best Management Practice	Frequency Of Inspection	Maintenance (Inspect for these items) and Frequency (major storms being ½" of rain or more)	Inspection (Date) Maintenance (Yes/No)	Maintenance Performed (Date and Initial)
Natural Buffer	Daily	These areas are beyond the Limit of Work and are to be protected. Replace Limit of Work demarcation (flagging, berms/dikes, fencing or ECB's) when deteriorated. Should infringement into Natural Buffers occur, take corrective action immediately and implement mitigation measures (seeding, planting of native trees or shrubs) to restore Natural Buffers.		
Erosion Control Barriers (ECB)	Weekly and after major storms	Remove sediment before it has accumulated to one-half of the above-ground height of ECB's. Replace ECB's before they have deteriorated/decomposed to half their original height or every twelve (12) months, whichever comes first. Sediments to be removed and disposed of above the ECB line in an area to be stabilized later. Fabric to be disposed of offsite. Natural liners and wooden stakes may be left to decompose.		
Silt-sacks	Weekly and after major storms	Replace at least twice per year, or when sediment reaches two (2) inches in depth, or if flooding is observed. Dispose of materials offsite.		
Anti-tracking Pad	Daily	Replace at least one per year, or when effectiveness has diminished. Where sediment has been tracked-out offsite onto paved roads, sidewalks, or other paved areas offsite, remove the deposited sediment by the end of the same business day in which the track-out occurs or by the end of the next business day if track-out occurs on a non-business day. Remove the track-out by sweeping, shoveling, or vacuuming these surfaces, or by using other similarly effective means of sediment removal. Hosing or sweeping tracked-out sediment into any stormwater conveyance, storm drain inlet, or water of the U.S. (i.e., wetland or stream) is PROHIBITED.		
Equipment Storage and Refueling	Daily	Storage or refueling of construction equipment within one hundred (100) feet of any stormwater conveyance, storm drain inlet, or water of the U.S. (i.e., wetland or stream) is PROHIBITED. Spill kits shall be readily available on site if refueling is to occur. All materials shall be disposed of offsite.		
Soil Stockpiles	Weekly and after major storms	Locate Stockpiles away from stormwater channels and conveyances. Provide ECB or Stone Check Dams around Stockpiles. Stockpiles that will remain unused for more than a month should be seeded with a quick cover crop such as Ryegrass (10-30 lbs./acres).		

Best Management Practice	Frequency Of Inspection	Maintenance (Inspect for these items) and Frequency (major storms being ½" of rain or more)	Inspection (Date) Maintenance (Yes/No)	Maintenance Performed (Date and Initial)
Sediment Basins	Weekly and after major storms	Remove floatables and any accumulated debris or as soon as observed. Remove accumulated sediment to maintain at least one-half of the design capacity and conduct all other appropriate maintenance to ensure the basin or impoundment remains in effective operating condition.		
Dust Control	Daily	Minimizing disturbed areas and rapid seeding/stabilization of disturbed areas is the preferred option. Water or an acceptable Dust Palliative should be used on haul roads to prevent dust from emanating and leaving the site or affecting Natural Buffers.		
Outlet & Channel Protection	Weekly and after major storm events	Observe slopes downgradient of Sediment Basins for stability, integrity, and erosion and repair immediately with seed or Turf Reinforcement Mat (TRM) and seed as necessary.		

Potential Source of Pollution	Protective Measures
-------------------------------	---------------------

Reportable Spill(s)	<ul style="list-style-type: none"> • Jere Shertzer is obligated to notify appropriate authorities of any spills of hazardous/harmful materials. • Should a spill bypass a containment device – catch basin, water quality structure, berm, etc. – and impact a stormwater detention or retention facility, the Responsible Party shall clean-up, mitigate and/or restore the facility to its original condition.
Lawn/Landscape Maintenance	<ul style="list-style-type: none"> • Clippings and yard waste shall not be disposed of in stormwater management facilities or wetland resource areas. • Pesticides and fertilizers shall only be stored on site in approved containers within a structure. • Pesticides and fertilizers shall be applied at the proper time of year in the minimal effective quantity/concentration. They should not be applied when severe rainfall events are forecast. • Use drought-tolerant species to limit watering requirements, and mulch and compost to retain soil moisture. Irrigate at appropriate times of day - early morning and late evening – for the minimal period necessary to restore soil moisture. • Pet waste shall not be disposed of in stormwater management facilities or wetland resource areas.
De-icing	<ul style="list-style-type: none"> • Application rates of de-icing materials shall be the minimum acceptable to adequately treat storm-specific conditions. Multiple treatments are preferred to use of excessive quantities during the initial response. • De-icing materials may not be stored on site. • Non-toxic and inert materials (sand/gravel) are preferable in areas adjacent to stormwater management facilities and wetland resource areas. For general use, calcium magnesium acetate (CMA), calcium chloride and potassium acetate are preferable to sodium chloride.
Snow Removal	<ul style="list-style-type: none"> • Snow shall be piled in pervious areas where melt water can infiltrate (as designated on the plan). • Snow shall not be piled within one hundred (100) feet of a wetland resource area. • Snow shall not be piled on catch basins, swales, or in stormwater basins. • Management of snow shall not create a nuisance or hazard. The Responsible Party shall remove snow from site if adequate area on site is not available. • Sediments deposited in snow storage areas shall be removed each spring and disposed of offsite.
Good House Keeping (LUHPPL Related)	<ul style="list-style-type: none"> • Store all chemicals and other potentially harmful/hazardous products in appropriate contains within a designated area in the building. • All automobile washing and/or reconditioning must occur within the building. • Equipment and containers of any hazardous/harmful material must be stored more than one hundred (100) feet from a wetland resource area and in accordance with any Local, State or Federal permit for said equipment and/or containerized storage.

No Information on This Page

Responsible Party:

Connect Church, Jere Shertzer, or their assigns are responsible for implementation of the Long-Term Operation & Maintenance Plan and the Long-Term Pollution Prevention Plan for 240-260 Pleasant Street in Ashland, Massachusetts.

System Components:

The stormwater management system for 240-260 Pleasant Street in Ashland, Massachusetts is comprised of pervious areas, area drains, open “country drainage”, and a **surface infiltration detention basin**. Only stormwater may be discharged through these facilities, there shall be no connections of floor drains and/or sanitary connections, and nothing shall be dumped into any of the System Components. The stormwater system components are shown on the attached Stormwater Management System Plan.

Drainage Catch Basins/ Area Drains – the area drains are six (6) inch Plastic Round Speed-D Styrene Drainage Catch Basins

Surface Infiltration Retention Basin – open stormwater basin meant to capture, retain, and infiltrate stormwater. The basins are to be kept free of trash and debris. No yard waste and / or landscape maintenance clippings or brush shall be disposed of in these areas. Residents may not store vehicles or other personal items in these areas. No accessory structures are permitted in these areas.

Pervious Areas – open, vegetated (turf lawns or other grasses) areas over which stormwater runoff flows slowly and in a sheeting manner. These areas are to be kept free of trash and debris. No yard waste and/or landscape maintenance clippings or brush shall be disposed of in these areas. Residents may not store vehicles or other personal items in these areas. No accessory structures are permitted in these areas.

Grass Channels / Drainage Swales (“country drainage”) – shallow channels/swales lined with vegetation. Some may be lined with a turf reinforcement mat (TRM).

Illicit Connections

No illicit connections to the stormwater management system are proposed or shall be installed during construction. No future connections to the stormwater system shall be allowed without permission of the Ashland Conservation Commission (Stormwater Permit Granting Authority). The proposed Rec Facility will only be served by an underground electric service for site lighting purposes. No other utilities are proposed.

Maintenance Schedule and Forms:

Refer to the following pages for specific requirements to prevent pollution and the maintenance of the stormwater management system.

Snow Storage / Removal:

Refer to the following pages for specific requirements on snow storage and removal.

Stormwater Management
 Long Term Operation
 & Maintenance Plan



Best Management Practice	Frequency Of Inspection	Maintenance (Inspect for these items) and Frequency	Inspection (Date) Maintenance (Yes/No)	Maintenance Performed (Date and Initial)
--------------------------	-------------------------	---	--	--

Street/Pavement Sweeping	Annually (March – April)	Annually (March – April). Paved areas to be swept of sediments, trash, and debris. Sediments to be removed and disposed off-site.		
Drainage Catch Basins/Area Drains	Quarterly	At least twice per year, or when sediment reaches six (6) inches in depth, or if flooding is observed. Remove floatables and sediment and dispose of off-site.		
Surface Infiltration Retention Basin	Monthly for first three (3) months Annually and after major storm events	At least twice per year or after major storm events. Remove trash and debris, mow the upper-stage, side slopes, embankment, and emergency spillway(s). Observe downgradient slopes for stability, integrity, and erosion and repair immediately. Re-seed slopes and bottom of basin to ensure dense vegetative cover. Remove sediment as necessary, but at least once every five (5) years.		
Grassed Channel / Drainage Swale	Monthly (mowing) Annually	Mow monthly during growing season. Remove sediment annually and re-seed (if necessary). Repair erosion and re-seed when necessary. Turf reinforcement mat (TRM) or rock riprap may be required.		

E) Soils Information

No Information on This Page



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

A. Facility Information

METROWEST FACILITIES LLC

Owner Name

350 PLEASANT STREET

Street Address

ASHLAND

City

MA
State

14-13-108 & 109

Map/Lot #

01721
Zip Code

B. Site Information

1. (Check one) New Construction Upgrade Repair

2. Soil Survey Available? Yes No If yes: MECS SOIL SURVEY

Source

626B
Soil Map Unit

MERRINGAC-URBAN COMPLEX
Soil Name

Soil Limitations

GRAVELLY SAND
Soil Parent material

OUTWASH PLAIN
Landform

3. Surficial Geological Report Available? Yes No

If yes:

Year Published/Source

Map Unit

BIOTITE GRANITE
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:



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: 1124-1 Hole # 11/13/24 Date AM Time SUNNY 30'S Weather 42.261 Latitude -71.475 Longitude: 2.5% Slope (%)

1. Land Use WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) SAPLINGS Vegetation H/A Surface Stones (e.g., cobbles, stones, boulders, etc.)

Description of Location: _____

2. Soil Parent Material: SAND & GRAVEL OUTWASH Landform PLAIN Position on Landscape (SU, SH, BS, FS, TS) BACKSLOPE

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

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

5. Groundwater Observed: Yes No If yes: _____ Depth 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			
0-7"	A _p	SANDY LOAM	10YR 3/2								
7-27"	B ₁ & B ₂	SANDY LOAM	2.5Y 7/4								
27-97"	C	SANDY GRAVEL	2.5Y 5/3	80"	7.5YR 5/8	5%		30%			

Additional Notes: NO GROUNDWATER
NO DEEPAGE



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: 1124-2 Hole # 11/13/24 Date AM Time SUNNY 30° Weather 42.261 Latitude -71.975 Longitude:

1. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) SAPLINGS Vegetation H/A Surface Stones (e.g., cobbles, stones, boulders, etc.) 2-5% Slope (%)

Description of Location: _____

2. Soil Parent Material: SAND & GRAVEL Landform: PLAIN Position on Landscape (SU, SH, BS, FS, TS): BACKSLOPE

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

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

5. Groundwater Observed: Yes No If yes: _____ Depth 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"-30"	A _p	SANDY LOAM	10YR 3/2								
30"-48"	B _{1u}	LOAMY SAND	2.5Y 7/4								
48"-105"	C	SANDY GRAVEL	2.5Y 9/3	80"	7.5Y 5/6	5%		30%			

Additional Notes: NO CIRCULE WATER
NO IDEALITE



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: 1124-3 11/13/24 AM SUNNY 30'S 42.261 -71.475
 Hole # Date Time Weather Latitude Longitude:

1. Land Use: WOODLAND SAPLINGS N/A 2-5%
 (e.g., woodland, agricultural field, vacant lot, etc.) Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Slope (%)

Description of Location: _____

2. Soil Parent Material: SAND & GRAVEL PLAIN BACKSLOPE
 _____ Landform Position on Landscape (SU, SH, BS, FS, TS)

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

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

5. Groundwater Observed: Yes No If yes: _____ Depth 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			
<u>0-6"</u>	<u>Ap</u>	<u>SANDY LOAM</u>	<u>10YR2/2</u>								
<u>6-27"</u>	<u>Bu1</u>	<u>LOAMY SAND</u>	<u>2.5Y7/4</u>								
<u>27-88"</u>	<u>C</u>	<u>SAND GRAVEL</u>	<u>2.5Y5/3</u>	<u>80"</u>	<u>7.5YR5/6</u>			<u>30%</u>			

Additional Notes: NO GROUNDWATER
NO WEAPONISE



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: 1126-4 Hole # 11/13/21 Date AM Time SUNNY 30'S Weather 42.241 Latitude -71.475 Longitude:

1. Land Use: 1. CLOUDLAND (e.g., woodland, agricultural field, vacant lot, etc.) SAPLING'S Vegetation H/A Surface Stones (e.g., cobbles, stones, boulders, etc.) 2-5% Slope (%)

Description of Location: _____

2. Soil Parent Material: SAND & GRAVEL Landform: OUTCROCK PLAIN Position on Landscape (SU, SH, BS, FS, TS): BACK SLOPE

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

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

5. Groundwater Observed: Yes No If yes: _____ Depth 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"-13"	A _D	SANDY LOAM	10YR 3/2								
13"-32"	B _{2d}	LOAMY SAND	2.5Y 7/4								
32"-102"	C	SAND GRAVEL	2.5Y 5/3	83"	7.5Y 4/6	5%		30%			

Additional Notes: NO GROUNDWATER
NO WEEPAGE



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: 1124-S Hole # 4/13/24 Date AM Time SUNNY 30° Weather 42.261 Latitude -71.975 Longitude

1. Land Use: WOODLAND (e.g., woodland, agricultural field, vacant lot, etc.) SAPLINGS Vegetation H/A Surface Stones (e.g., cobbles, stones, boulders, etc.) 2-5% Slope (%)

Description of Location: _____

2. Soil Parent Material: SAND & GRAVEL Landform OUTCASH PLAIN Position on Landscape (SU, SH, BS, FS, TS) BACK SLOPE

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

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

5. Groundwater Observed: Yes No If yes: _____ Depth 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"-9"	AP	SANDY LOAM	10YR 3/2								
9"-32"	B ₁	LOAMY SAND	2.5Y 7/4								
32"-102"	C	SAND GRAVEL	2.5Y 5/3					30%			

Additional Notes:
NO REDOX
NO GROUNDWATER
NO WEEPAGE



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

D. Determination of High Groundwater Elevation

- | | | |
|--|-------------------|-------------------|
| 1. Method Used: | Obs. Hole # _____ | Obs. Hole # _____ |
| <input type="checkbox"/> Depth observed standing water in observation hole | _____ inches | _____ inches |
| <input type="checkbox"/> Depth weeping from side of observation hole | _____ inches | _____ inches |
| <input checked="" type="checkbox"/> Depth to soil redoximorphic features (mottles) | _____ inches | _____ inches |
| <input type="checkbox"/> Depth to adjusted seasonal high groundwater (S_h)
(USGS methodology) | _____ inches | _____ inches |

Index Well Number _____

Reading Date _____

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: 60 inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil absorption system?

Yes No

b. If yes, at what depth was it observed (exclude A and O Horizons)?

Upper boundary: _____ inches Lower boundary: UNKNOWN _____ inches

c. If no, at what depth was impervious material observed?

Upper boundary: _____ inches Lower boundary: _____ inches



Commonwealth of Massachusetts

City/Town of Andover

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

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator [Signature]

Date 11/14/24

Typed or Printed Name of Soil Evaluator / License # LAWRENCE C. GIBBONS JR #26885

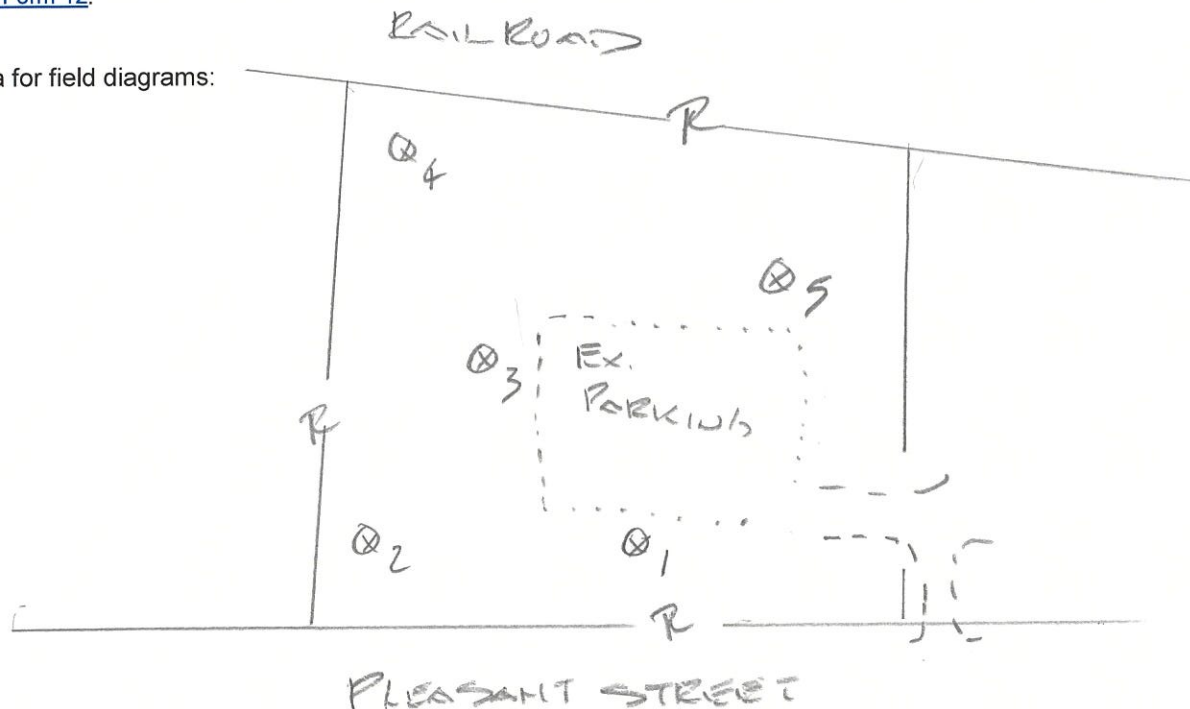
Expiration Date of License 6/30/25

Name of Approving Authority Witness _____

Approving Authority _____

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with [Percolation Test Form 12](#).

Field Diagrams: Use this area for field diagrams:





United States
Department of
Agriculture

NRCS

Natural
Resources
Conservation
Service

A product of the National
Cooperative Soil Survey,
a joint effort of the United
States Department of
Agriculture and other
Federal agencies, State
agencies including the
Agricultural Experiment
Stations, and local
participants

Custom Soil Resource Report for Middlesex County, Massachusetts

240-260 Pleasant Street Ashland,
MA



Preface

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

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

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

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

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

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

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

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

Contents

Preface	2
Soil Map	5
Soil Map.....	6
Legend.....	7
Map Unit Legend.....	8
Map Unit Descriptions.....	9
Middlesex County, Massachusetts.....	11
1—Water.....	11
6A—Scarboro mucky fine sandy loam, 0 to 3 percent slopes.....	11
53A—Freetown muck, ponded, 0 to 1 percent slopes.....	13
71B—Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony.....	14
73B—Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony...	16
253B—Hinckley loamy sand, 3 to 8 percent slopes.....	17
260B—Sudbury fine sandy loam, 3 to 8 percent slopes.....	19
307B—Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony....	21
307C—Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony..	22
307D—Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony.....	24
312B—Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony.....	26
336B—Rainbow silt loam, 3 to 8 percent slopes, very stony.....	27
416B—Narragansett silt loam, 3 to 8 percent slopes, very stony.....	29
416C—Narragansett silt loam, 8 to 15 percent slopes, very stony.....	30
416D—Narragansett silt loam, 15 to 25 percent slopes, very stony.....	32
422C—Canton fine sandy loam, 8 to 15 percent slopes, extremely stony..	33
626B—Merrimac-Urban land complex, 0 to 8 percent slopes.....	35
653—Udorthents, sandy.....	37
654—Udorthents, loamy.....	38
655—Udorthents, wet substratum.....	39
656—Udorthents-Urban land complex.....	40

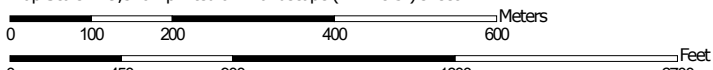
Soil Map

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

Custom Soil Resource Report Soil Map




Map Scale: 1:9,320 if printed on A landscape (11" x 8.5") sheet.



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 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Middlesex County, Massachusetts
 Survey Area Data: Version 24, Aug 27, 2024

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
1	Water	18.3	5.3%
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	3.6	1.0%
53A	Freetown muck, ponded, 0 to 1 percent slopes	12.2	3.5%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	0.1	0.0%
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	19.5	5.7%
253B	Hinckley loamy sand, 3 to 8 percent slopes	4.3	1.3%
260B	Sudbury fine sandy loam, 3 to 8 percent slopes	20.3	5.9%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	0.0	0.0%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	7.7	2.2%
307D	Paxton fine sandy loam, 15 to 25 percent slopes, extremely stony	34.9	10.1%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	0.3	0.1%
336B	Rainbow silt loam, 3 to 8 percent slopes, very stony	0.5	0.2%
416B	Narragansett silt loam, 3 to 8 percent slopes, very stony	56.0	16.2%
416C	Narragansett silt loam, 8 to 15 percent slopes, very stony	6.1	1.8%
416D	Narragansett silt loam, 15 to 25 percent slopes, very stony	14.0	4.1%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	1.8	0.5%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	58.8	17.0%
653	Udorthents, sandy	19.9	5.8%
654	Udorthents, loamy	19.2	5.6%
655	Udorthents, wet substratum	2.0	0.6%
656	Udorthents-Urban land complex	45.6	13.2%
Totals for Area of Interest		345.2	100.0%

Map Unit Descriptions

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

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

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

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

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

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas

Custom Soil Resource Report

shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Middlesex County, Massachusetts

1—Water

Map Unit Setting

National map unit symbol: 996p
Frost-free period: 110 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

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

Description of Water

Setting

Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Linear
Across-slope shape: Linear

6A—Scarboro mucky fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svky
Elevation: 0 to 1,320 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Scarboro and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scarboro

Setting

Landform: Drainageways, outwash deltas, outwash terraces, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits derived from schist and/or sandy glaciofluvial deposits derived from gneiss and/or sandy glaciofluvial deposits derived from granite

Typical profile

Oe - 0 to 3 inches: mucky peat
A - 3 to 11 inches: mucky fine sandy loam

Custom Soil Resource Report

Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton, extremely stony

Percent of map unit: 5 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Hollis, extremely stony

Percent of map unit: 4 percent
Landform: Ridges, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Nose slope, side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear, convex
Hydric soil rating: No

626B—Merrimac-Urban land complex, 0 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyr9
Elevation: 0 to 820 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Merrimac and similar soils: 45 percent
Urban land: 40 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

Landform: Outwash plains, outwash terraces, moraines, eskers, kames
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Side slope, crest, riser, tread
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Loamy glaciofluvial deposits derived from granite, schist, and gneiss over sandy and gravelly glaciofluvial deposits derived from granite, schist, and gneiss

Custom Soil Resource Report

Typical profile

Ap - 0 to 10 inches: fine sandy loam
Bw1 - 10 to 22 inches: fine sandy loam
Bw2 - 22 to 26 inches: stratified gravel to gravelly loamy sand
2C - 26 to 65 inches: stratified gravel to very gravelly sand

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: A
Ecological site: F144AY022MA - Dry Outwash
Hydric soil rating: No

Description of Urban Land

Typical profile

M - 0 to 10 inches: cemented material

Properties and qualities

Slope: 0 to 8 percent
Depth to restrictive feature: 0 inches to manufactured layer
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Available water supply, 0 to 60 inches: Very low (about 0.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Head slope, nose slope, side slope, crest, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear

Custom Soil Resource Report

Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent

Landform: Deltas, terraces, outwash plains

Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Tread, dip

Down-slope shape: Concave

Across-slope shape: Linear

Hydric soil rating: No

Windsor

Percent of map unit: 5 percent

Landform: Outwash terraces, dunes, outwash plains, deltas

Landform position (three-dimensional): Tread, riser

Down-slope shape: Linear, convex

Across-slope shape: Linear, convex

Hydric soil rating: No

653—Udorthents, sandy

Map Unit Setting

National map unit symbol: vr1k

Elevation: 0 to 3,000 feet

Mean annual precipitation: 32 to 50 inches

Mean annual air temperature: 45 to 50 degrees F

Frost-free period: 110 to 200 days

Farmland classification: Not prime farmland

Map Unit Composition

Udorthents, sandy, and similar soils: 85 percent

Minor components: 15 percent

Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents, Sandy

Setting

Parent material: Loamy alluvium and/or sandy glaciofluvial deposits and/or loamy glaciolacustrine deposits and/or loamy marine deposits and/or loamy basal till and/or loamy lodgment till

Properties and qualities

Slope: 0 to 25 percent

Depth to restrictive feature: More than 80 inches

Depth to water table: More than 80 inches

Frequency of flooding: None

Frequency of ponding: None

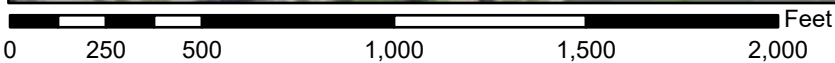
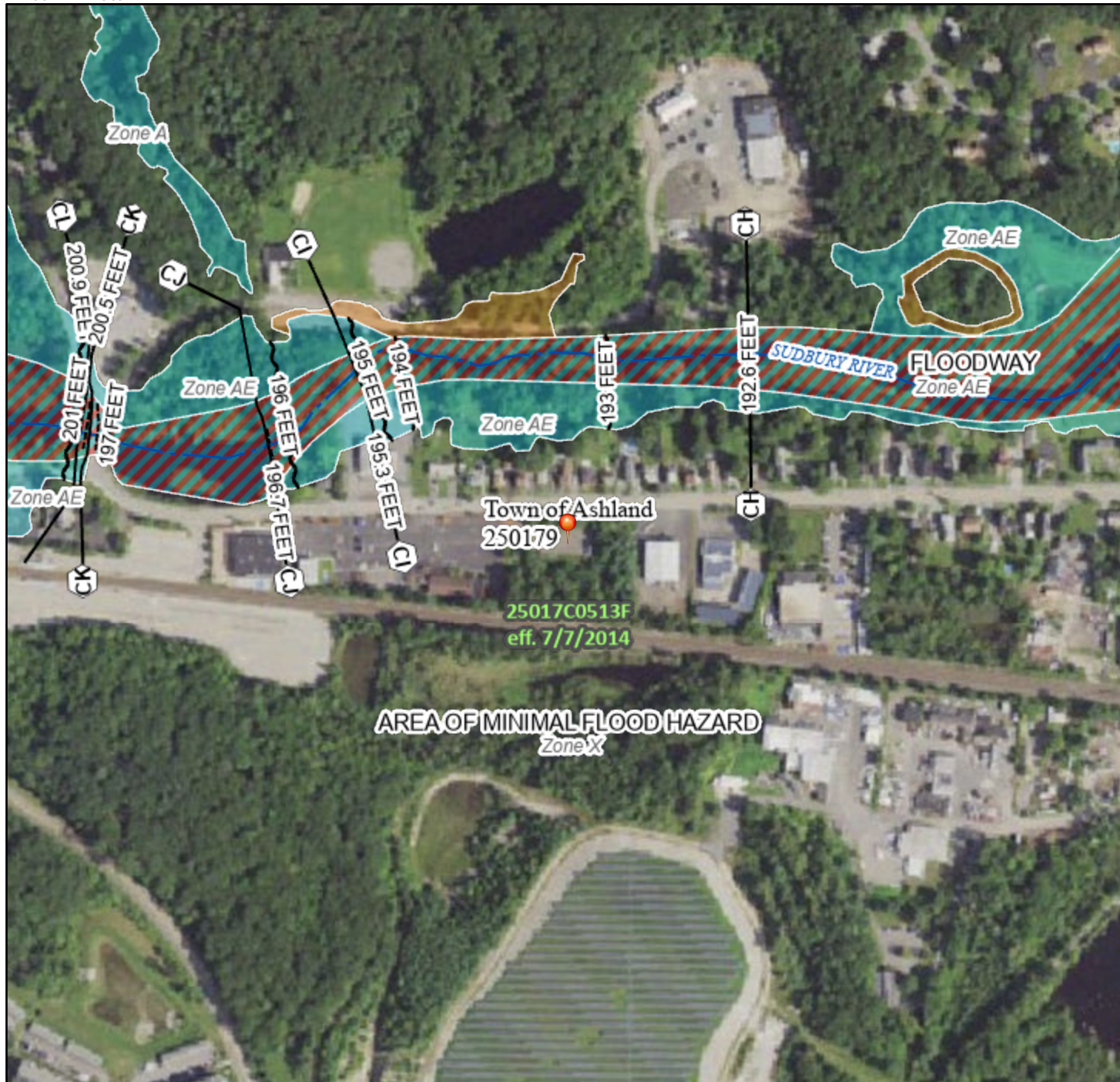
F) FEMA Flood Map

No Information on This Page

National Flood Hazard Layer FIRMMette



71°28'52"W 42°15'55"N



1:6,000

71°28'15"W 42°15'28"N

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS		Without Base Flood Elevation (BFE) Zone A, V, A99
		With BFE or Depth Zone AE, AO, AH, VE, AR
		Regulatory Floodway
OTHER AREAS OF FLOOD HAZARD		0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile Zone X
		Future Conditions 1% Annual Chance Flood Hazard Zone X
		Area with Reduced Flood Risk due to Levee. See Notes. Zone X
		Area with Flood Risk due to Levee Zone D
OTHER AREAS		NO SCREEN Area of Minimal Flood Hazard Zone X
		Effective LOMRs
GENERAL STRUCTURES		Area of Undetermined Flood Hazard Zone D
		Channel, Culvert, or Storm Sewer
OTHER FEATURES		Levee, Dike, or Floodwall
		20.2 Cross Sections with 1% Annual Chance Water Surface Elevation
		17.5 Coastal Transect
		Base Flood Elevation Line (BFE)
		Limit of Study
		Jurisdiction Boundary
		Coastal Transect Baseline
		Profile Baseline
		Hydrographic Feature
MAP PANELS		Digital Data Available
		No Digital Data Available
		Unmapped



The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

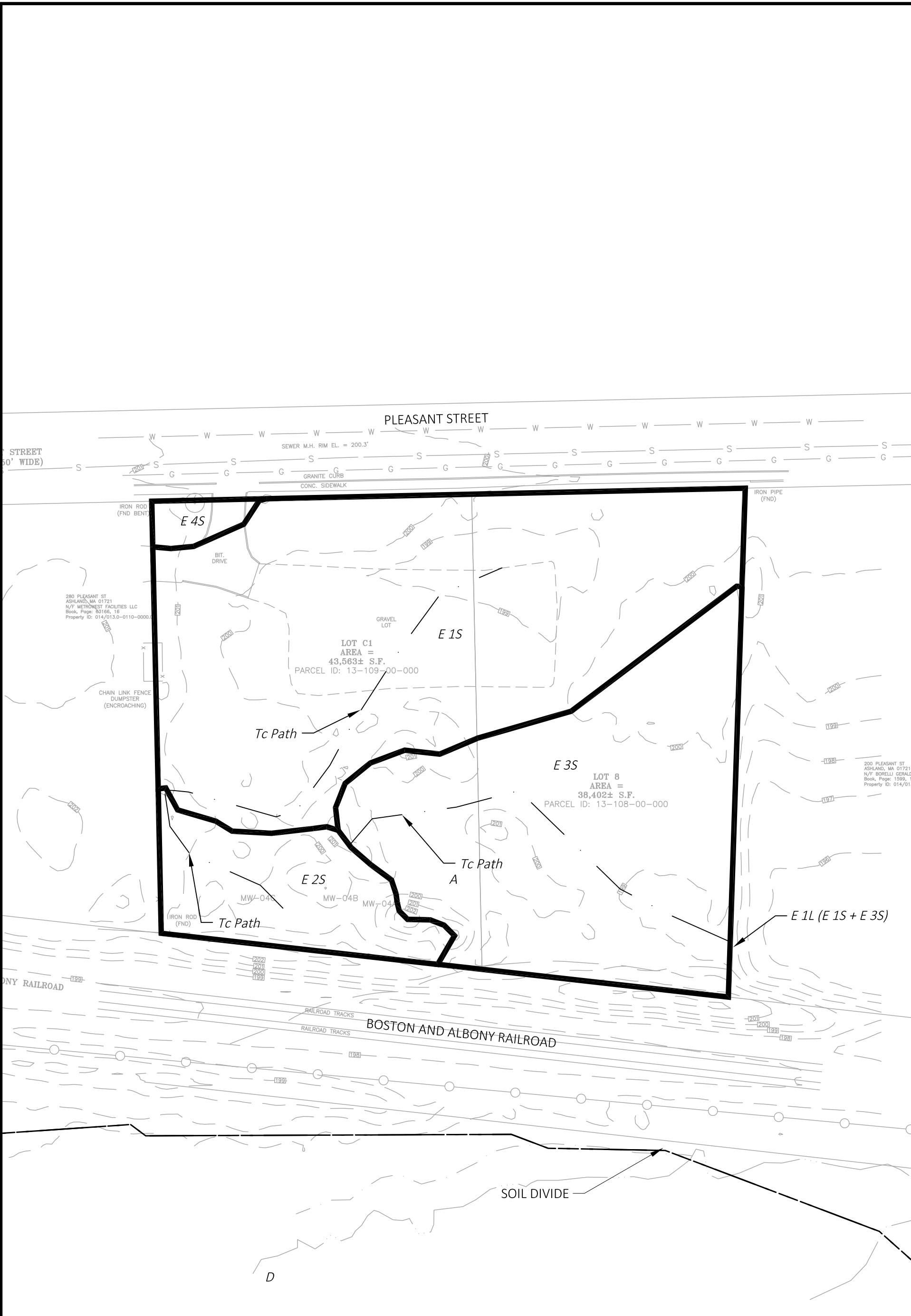
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **11/26/2024 at 2:45 PM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

No Information on This Page

G) Existing Watershed Map

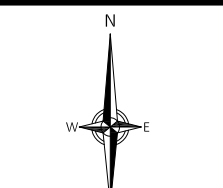
No Information on This Page



LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDcollaborative.com

Project Title:
Ashland Rec Facility
240 & 260 Pleasant Street
Ashland, MA

Sheet Title:
Existing Hydrology
240 & 260 Pleasant Street
Ashland, MA



Date: January 2025 Project No.: 24-0281 Reference Plan No.: C-250 Drawn By: ESM Checked By: MJS



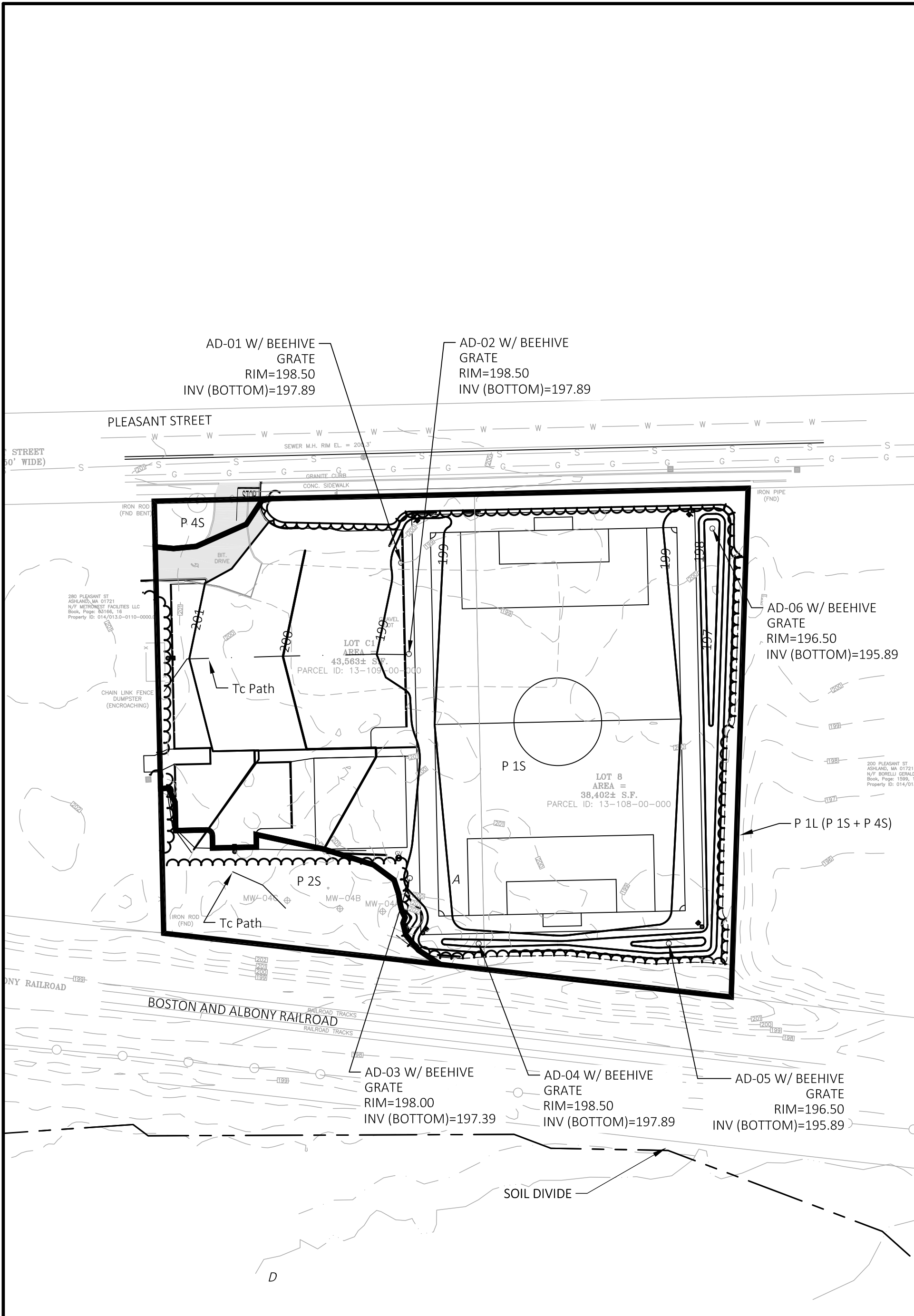
Scale: 1" = 50'

G-2

No Information on This Page

H) Proposed Watershed Map

No Information on This Page



AD-01 W/ BEEHIVE
GRATE
RIM=198.50
INV (BOTTOM)=197.89

AD-02 W/ BEEHIVE
GRATE
RIM=198.50
INV (BOTTOM)=197.89

AD-06 W/ BEEHIVE
GRATE
RIM=196.50
INV (BOTTOM)=195.89

AD-03 W/ BEEHIVE
GRATE
RIM=198.00
INV (BOTTOM)=197.39

AD-04 W/ BEEHIVE
GRATE
RIM=198.50
INV (BOTTOM)=197.89

AD-05 W/ BEEHIVE
GRATE
RIM=196.50
INV (BOTTOM)=195.89

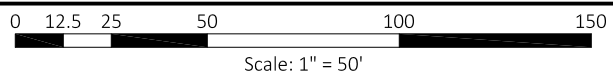


LAND DESIGN COLLABORATIVE
Chauncy Place | Terrace North | Suite 1
45 Lyman Street
Westborough, MA 01581
508.952.6300 | LDcollaborative.com

Project Title:
Ashland Rec Facility
240 & 260 Pleasant Street
Ashland, MA

Sheet Title:
Proposed Hydrology
240 & 260 Pleasant Street
Ashland, MA

Date: January 2025 Project No.: 24-0281 Reference Plan No.: C-260 Drawn By: ESM Checked By: MJS




H-2

C:\Users\EricMartel\Land Design Collaborative - Documents\..._L-datto New\projects (landdesign\datto)\PROJECTS\24-0281 - Ashland, 240 & 260 Pleasant Street\DWG\24-0281-C260.dwg

No Information on This Page