STORMWATER REPORT

Proposed Residential Development

at

55 West Union Street
Ashland, MA

June 25, 2025
Revised October 8, 2025

PREPARED FOR:
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PROJECT STORMWATER NARRATIVE

55 West Union Street
Ashland, MA

Connorstone Engineering, Inc.
June 25, 2025

The purpose of this analysis is to design a Stormwater Management System in accordance with the Massachusetts Stormwater Standards. This report provides a summary of the Stormwater Management System, and required documentation to verify compliance with the Ten (10) Standards.

Location: The subject site consists of 4.86 acres of land on both West Union Street and Memorial Drive. The parcel is shown on Assessors Map 19 as parcel 62. The site falls within the Highway Commerce zoning district.

Existing Conditions: The site is generally wooded with grassed clearings along the frontage and sloped areas adjacent to Memorial Drive. The site also contains several easement including (1) a municipal sewer easement and cross-country sewer main located through the central portion of the site generally bisecting the parcel; (2) a slope and drainage easement near the intersection of Memorial Drive that includes a subsurface drainage structure; and (3) a slope easement along Memorial Drive. The site includes no other structures or development.

Regulated wetland resource areas have been delineated in the north corner of the site and include an intermittent stream with bordering vegetated wetlands. The wetlands flow northerly under Memorial drive through and existing culvert. The site does not contain any FEMA flood hazard areas or Natural Heritage priority habitats or rare species areas.

Soils: The Natural Resource Conservation Service has mapped the soils within the development area as Narragansett-Hollis-Rock, and Narragansett silt loam. Narragansett-Hollis-Rock outcrop is located throughout the center of the site and typically contain restrictive features at shallow depths. Narragansett silt loam is located throughout the rest of the site, and is a Hydrologic Soil Group The development area is well drained soils classified as a hydrologic soil group (HSG) A soil. The soil classification was also confirmed through test pits performed throughout the site. The resulting soil logs and locations are provided on the site plans. The lower wetland areas were mapped as a "Whitman fine sandy loam," which correlate to wetland soil and hydrologic soil group D.

Proposed Project: The proposed plan includes development of the parcel with a single residential building containing 116 dwelling units and a footprint of approximately 30,915 square feet.

The development will include driveway access from Memorial Drive via two curb cuts located approximately 280 feet and 640 feet from West Union Street. Driveways and parking areas are then looped around the sides and rear of the building with a total of 184 parking spaces. The driveways provide access to all sides of the building and have been sized for the required emergency vehicles.

The existing cross country sewer line will be relocated around the rear of the building with a modified sewer easement proposed. Water service and fire protection would be provided off the existing 12-inch main in Memorial Drive.

The proposed development will result in approximately 104,900 square feet of impervious area on-site, and the overall limit of work will require a land disturbance area of approximately 4 acres. A complete stormwater management system has been proposed to mitigate the project impacts and increased impervious surfaces. This system will include several components including:

1. A drainage collection system throughout project consisting of deep sump catch basins for collection, drain manholes, and pipe conveyance system. The collection and conveyance system has been sized with capacity for the 100 year storm event.

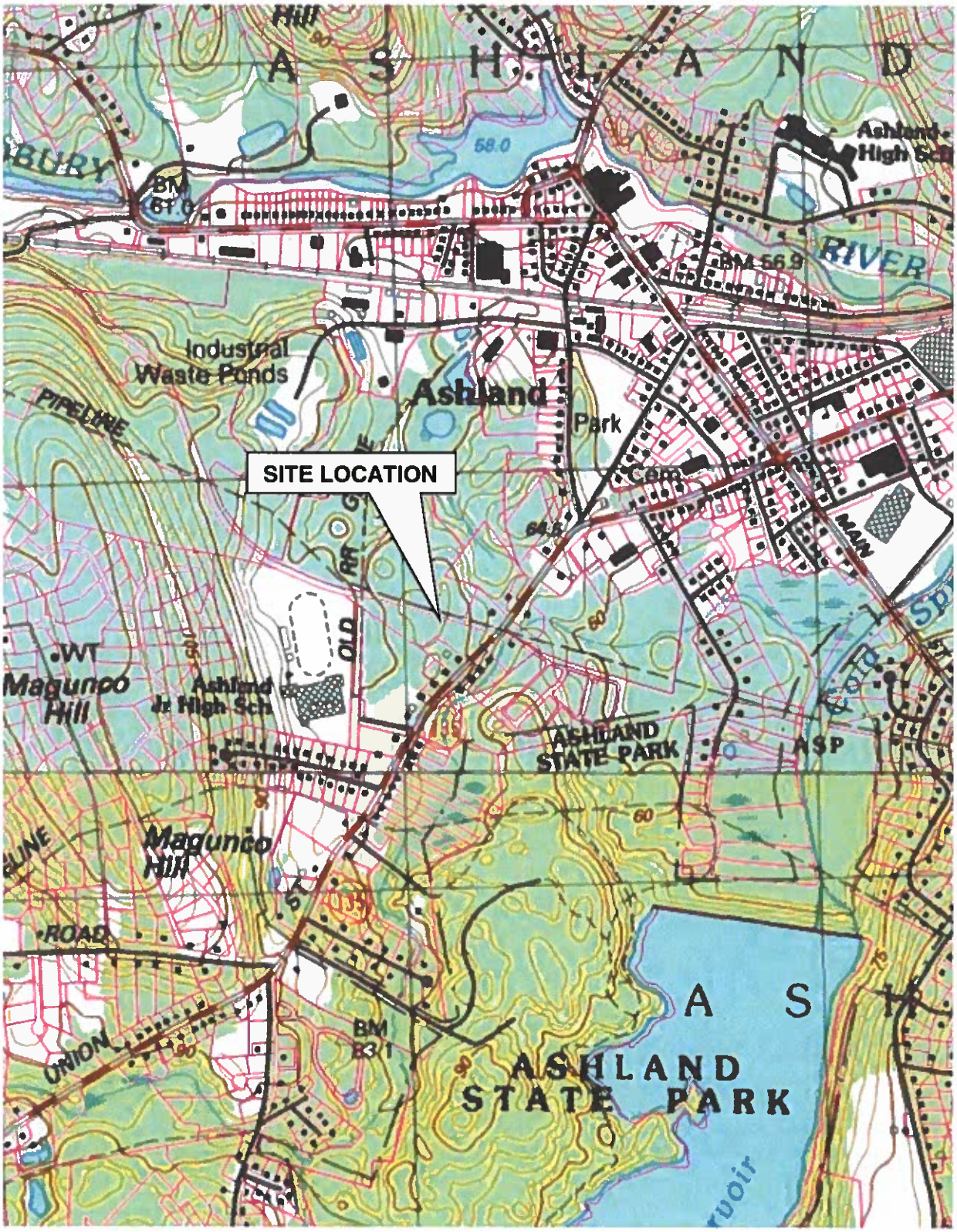
2. Pretreatment has been provided through five (5) water quality structures (Stormceptor, or equal), sized to removal at least 50% of the total suspended solid prior to discharge to the infiltration systems.

3. Subsurface infiltration system (drywell) located on the east side of the building to provide groundwater recharge. The drywell consists of 114 concrete chambers embedded in crushed stone. This system is sized to fully contain and infiltrate runoff from the east half of the site through the 100-year event.

4. Surface infiltration basin located along the far west end of the development. This basin is sized to provide stormwater treatment, recharge, and mitigate the rate of runoff to the wetland areas.

The proposed site has been designed to meet the Massachusetts Stormwater Standards, and additional description of the standards is provided later in this report.

USGS LOCUS MAP



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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

7/25/2025
Signature and Date

REVISED 9/8/2025

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:

- [x] 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
- [x] Other (describe): Roof Daywell

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

☐ The ½" or 1" Water Quality Volume or

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas; - SITE PLAN
- ☒ 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.

MA D.E.P. STORMWATER STANDARDS

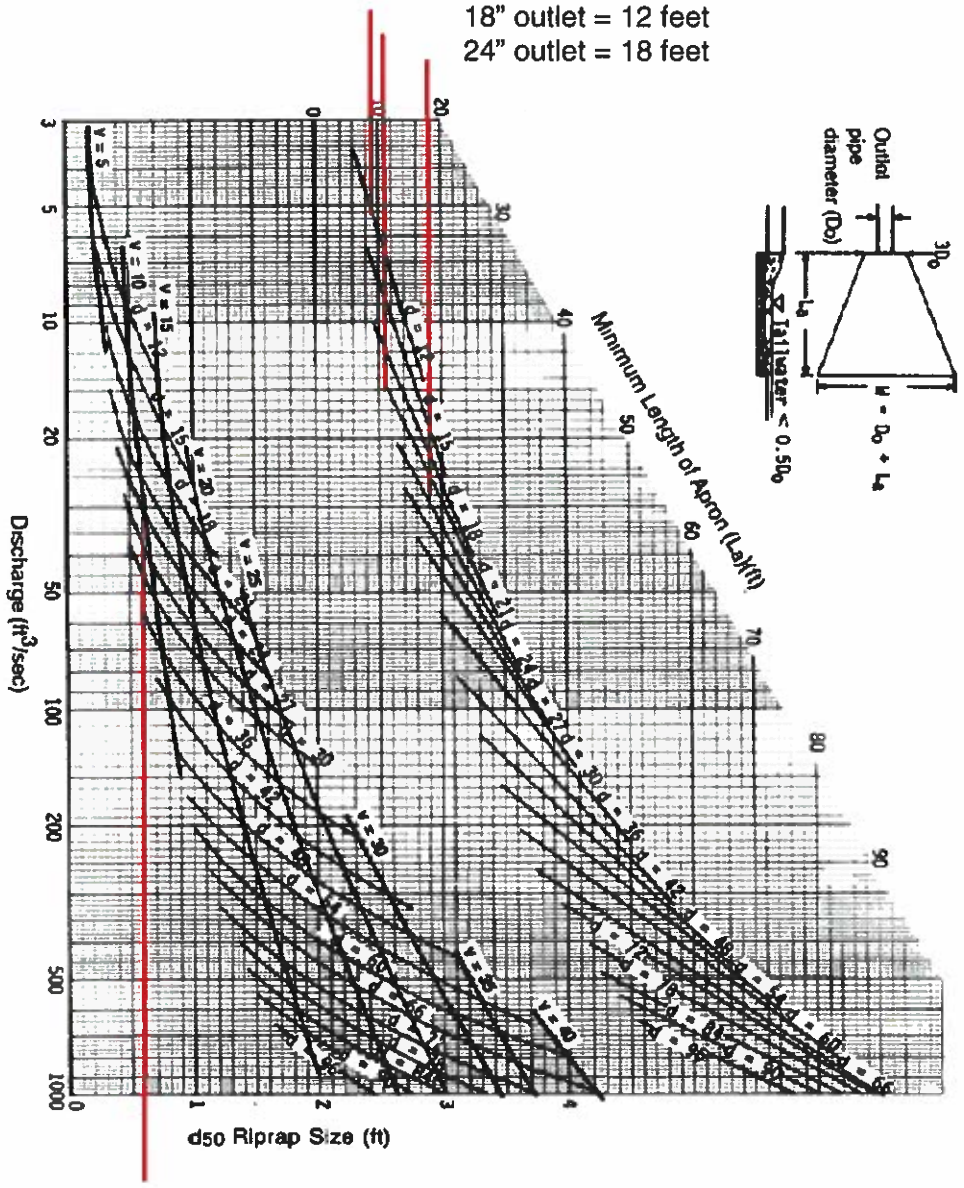
Standard 1: No New Untreated Discharges

There are no new untreated discharges to any areas subject to protection or the 100-foot buffer zone. All discharges would be pretreated though the stormwater system to remove >80% of the Total Suspended Solids.

Outlet Apron Design:

FE-1 (18" HDPE): $Q_{FULL\ FLOW}$= 12.7 cfs / $V_{FULL\ FLOW}$= 7.2 fps
FE-2 (12" RD): $Q_{FULL\ FLOW}$= 5.5 cfs / $V_{FULL\ FLOW}$= 7.0 fps
FE-3 (12" HDPE): $Q_{FULL\ FLOW}$= 6.1 cfs / $V_{FULL\ FLOW}$= 7.7 fps
FE-4 (18" HDPE): $Q_{FULL\ FLOW}$= 12.7 cfs / $V_{FULL\ FLOW}$= 7.2 fps
FE-5 (24" HDPE): $Q_{FULL\ FLOW}$= 27.4 cfs / $V_{FULL\ FLOW}$= 8.7 fps

Riprap sizing: Use: Riprap Size = 8" minimum diameter
Apron Lengths: 12" outlet = 10 feet
18" outlet = 12 feet
24" outlet = 18 feet



Standard 2: Peak Rate Attenuation

An analysis was performed to determine the peak rate of stormwater runoff leaving the site and design a stormwater management system in accordance with the MassDEP Stormwater Management Standard 2.

The proposed development has been mitigated through the use of a large subsurface drywell/infiltration system and a surface infiltration basin. The drywell has been sized to fully infiltrate all contributing runoff through the 100-year storm event, and the infiltration basin has been sized to slowly infiltrate and/or discharge runoff at a controlled rate to match the existing conditions.

The pre- and post-development stormwater runoff has been analyzed using HydroCAD 10.10, which is a stormwater modeling computer program utilizing a collection of techniques for the generation and routing of hydrographs, including Soil Conservation Service (SCS) Technical Release No. 20 (TR-20) and SCS Technical Release 55 (TR-55), *Urban Hydrology for Small Watersheds*. Rainfall depths for the design storms were taken from the most recent NOAA Atlas 14 for Ashland, MA. A copy of the point precipitation data is included in the model output section of this report. The rainfall depths used in the calculations are listed below:

Return Period	Inches
2 year	3.37
10 year	5.25
100 year	8.24

Three analysis points were utilized for the existing and proposed conditions to represent the three potential discharge points from the site including:

Analysis Point 1	Memorial Drive – Analysis Point 1 represents stormwater runoff that may discharge from the site over the frontage property line abutting Memorial Drive.
Analysis Point 2	West Union street – Analysis Point 2 represents stormwater runoff that may discharge from the site over the frontage property line abutting West Union Street.
Analysis Point 3	Southerly Property Line – Analysis Point 3 represents stormwater runoff that may discharge from the site over south property line to the abutting property.
Analysis Point 4	Wetland Areas – Analysis Point 4 represents the rear wetland area, and includes areas upgradient of the wetland and the surface area of the wetland itself.

Summary tables of the analysis points have been provided on the following page, and the model output has been provided later in this report.

Existing conditions were compared to proposed conditions to ensure that the proposed design will not increase the rate of runoff from the site and/or result in downstream impacts. A summary of the results is as follows:

Summary of Analysis Point 1 – Memorial Drive

	2-Year Storm Existing (Proposed)	10-Year Storm Existing (Proposed)	100-Year Storm Existing (Proposed)
Rate of Runoff	0.0 cfs (0.0 cfs)	0.0 cfs (0.0 cfs)	0.1 cfs (0.1 cfs)

Summary of Analysis Point 2 – West Union Street

	2-Year Storm Existing (Proposed)	10-Year Storm Existing (Proposed)	100-Year Storm Existing (Proposed)
Rate of Runoff	0.0 cfs (0.0 cfs)	0.0 cfs (0.0 cfs)	0.5 cfs (0.3 cfs)

Summary of Analysis Point 3 – South Property Line

	2-Year Storm Existing (Proposed)	10-Year Storm Existing (Proposed)	100-Year Storm Existing (Proposed)
Rate of Runoff	0.0 cfs (0.0 cfs)	0.0 cfs (0.0 cfs)	0.1 cfs (0.1 cfs)

Summary of Analysis Point 4 – Wetland Area

	2-Year Storm Existing (Proposed)	10-Year Storm Existing (Proposed)	100-Year Storm Existing (Proposed)
Rate of Runoff	0.0 cfs (0.0 cfs)	0.0 cfs (0.0 cfs)	0.1 cfs (0.0 cfs)

Standard 3: Stormwater Recharge

The proposed Stormwater management system has been designed to provide recharge of stormwater in excess of that required by Standard 3. Recharge has been provided through the proposed drywells and infiltration basin.

Required Recharge Volume:

Post development on-site impervious area = 104,900 S.F.
Onsite hydrologic soil group = A (0.6 inches of runoff)
Required Volume = 104,900 S.F. x 0.6 / 12 = **5,245 Cubic Feet**

Total Proposed Recharge Volume: **37,220 Cubic Feet**

Summary tables of the infiltration basin and drywell has been provided below:

Drywell	
Storage Volume Below Overflow (C.F)	17,480 c.f.
Bottom Elevation (ft.)	235.0
Lowest Outlet Elevation (ft.)	238.2
Bottom Area (Square feet)	7,850
Drawdown Time (hours)	11
Groundwater Elevation (ft.)	231
Groundwater Mound (ft.)	N/A – Greater than 4 foot separation to groundwater
Pretreatment	50% (water quality structure)

Infiltration Basin #	**Infiltration Basin #1**
Storage Volume Below Overflow (C.F)	24,000 c.f.
Bottom Elevation (ft.)	246.0
Lowest Outlet Elevation (ft.)	250.5
Bottom Area (Square feet)	2,000
Drawdown Time (hours)	60
Groundwater Elevation (ft.)	242
Groundwater Mound (ft.)	N/A – Greater than 4 foot separation to groundwater
Pretreatment	62% (deep sump catch basin, water quality structure)

Table Notes:

1. Soil Texture at drywells and basin-1 include loamy sand with a Rawles Rate of 2.41 in/hr utilized in the design. Textures are based upon the available testing as shown on the site plans.

2. Drawdown time is calculated as: (WQ Volume) / (Rawles Rate x bottom area x 1ft/12")

Standard 4: Water Quality

The proposed project has been designed to provide removal of the annual post construction load of total suspended solids at required discharge points through use of water quality structures (Stormceptor) as pretreatment and then either an infiltration basin or drywell for final treatment. A recommended long-term pollution prevention plan is provided as part of the attached Operation and Maintenance Plan.

1 **BMP**	2 **TSS removal**	3 **Starting TSS** (5 from previous BMP)	4 **TSS Removal** **(2 * 3)**	5 **Remaining TSS** **(3 - 4)**
Water Quality Structure (Stormceptor)	50%	100%	50%	50%
Infiltration Basin Or Subsurface Infiltration System	80%	50%	40%	10%
		Total TSS Removal =	90%	

Infiltration Basin Sizing Summary:

Required Water Quality Volume = 1-inch x impervious area
TSS removal = 80%

Impervious Area to Basin	55,170 sq. ft.
Required WQV	4,598 cu. ft.
Proposed WQV	24,000 cu. ft.

Subsurface Infiltration System Sizing Summary:

Required Water Quality Volume = 1-inch x impervious area
TSS removal = 80%

Impervious Area to Basin	50,730 sq. ft.
Required WQV	4,228 cu. ft.
Proposed WQV	14,100 cu. ft.

Pretreatment: Water Quality Structure (Stormceptor)

Water quality flow (WQF) rate conversion
WQF = (qu) x (imp. area in square miles) x (1-inch)
where qu = 795 (per MassDEP guidance table)

STC #	Model #	Impervious Area	WQF	TSS removal
1	450	5,560 sf	0.16 cfs	90%
2	450	16,050 sf	0.46 cfs	82%
3	450	15,395 sf	0.44 cfs	82%
4	900	22,135 sf	0.63 cfs	86%
5	450i	14,715 sf	0.42 cfs	83%

NOTE: TSS removal credit of 50% utilized in calculations.

(See attached manufacture's sizing worksheet)

Standard 5: Land Uses With Higher Pollutant Loads (LUHPL)

The Stormwater Management System has been designed to meet the requirements for a LUHPL including a 1-inch water quality volume, pretreatment of 44% TSS removal, and oil/gas separation through a water quality structure(s).

Standard 6: Critical Areas

Not applicable – The site does not contain any critical areas.

Standard 7: Redevelopment

Not applicable

Standard 8: Construction Period Controls

A Construction Period Pollution Prevention / Erosion Control measures have been provided on the site plans, and a Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan (SWPPP) will be provided prior to construction to allow coordination with the site contractor.

The project is covered by the NPDES General Construction Permit, and a NOI filing with EPA will be required prior to construction

Standard 9: Operation and Maintenance Plan

A recommended Operation and Maintenance Plan has been provided on the plans.

Standard 10: Illicit Discharges

Based upon site observations, no illicit discharges have been observed on the site. Illicit discharges are prohibited, and each building will be connected to the municipal sewer collection system.

Owner Certification: (to be signed prior to building occupancy)

The Owner is responsible for future compliance with all provisions of the Massachusetts Stormwater Management Policy, the EPA NPDES Construction General Permit (if applicable), and responsible for identifying, eliminating, and preventing future illicit discharges

Name: _____

Organization:_____

Signature:_____

Date:_____

STORMWATER DRAINAGE SYSTEM DESIGN
&
STORMWATER BASIN BRIMFULL SPILLWAY DESIGN

Drainage collection system design:

The street drainage system has been designed from calculations based upon the 100-year design storm to ensure capacity to convey stormwater.

Storm intensities were determined from exhibit 8-14 "*Intensity – Duration – Frequency Curve for Worcester, MA*" from the MassHighway Design Manual. The resulting analysis was performed using the Rational Method of determining peak storm flows. All storm sewer pipe sizes were determined using Manning's Equation for pipes flowing full.

The following table presents the hydraulic calculations performed for sizing the site drainage system. The structure references refer to those as shown on the site plan submitted with this report.

Spillway design

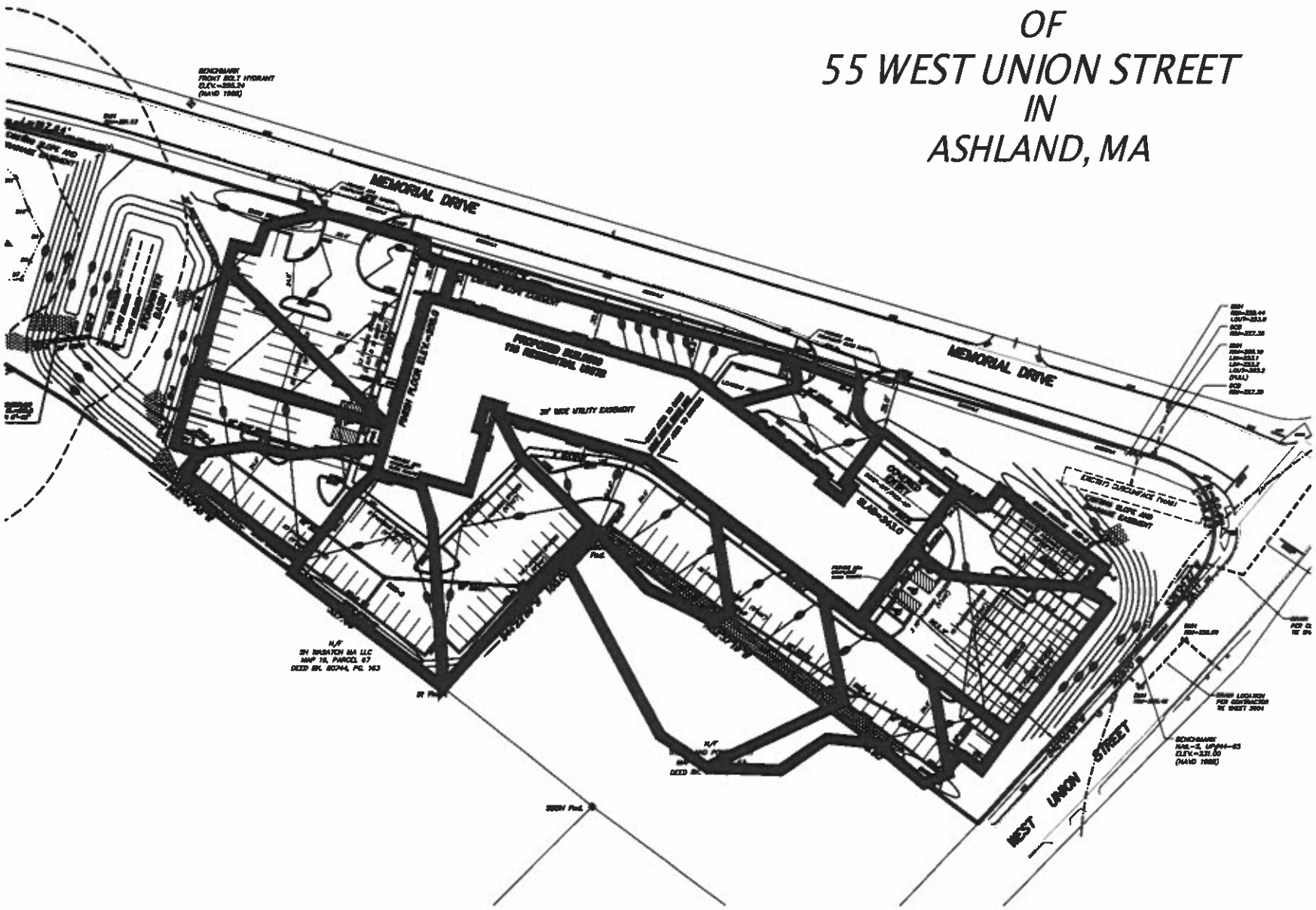
The stormwater basin has been provided with a 10-foot-wide emergency spillway. The spillway has been set at an elevation of 250.5, and has been designed to provide a minimum 1-foot freeboard when assuming a brimful condition. The attached HydroCAD Model output has shown a maximum ponding elevation of 251.0 with a top of berm elevation of 252.0.

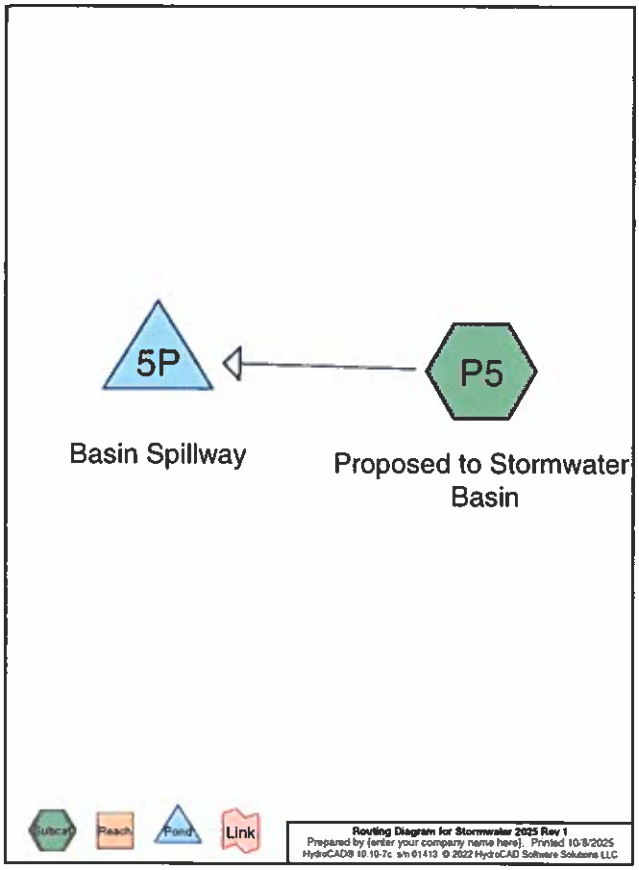
DRAIN PIPE SIZING CALCULATIONS

PROJECT Residential - Multifamily LOCATION 55 West Union Street BY: JJG n= 0.012
CLIENT John Dudley Ashland, MA DATE: **7/30/2025** RETURN PERIOD **100** year

Line		Area	C	CA	Tc	rain	Inlet flow Q	Pipe flow Qd	Pipe Size	Pipe Length	Slope	flowing full		Rim (feet)		Inv. El.	
FROM	TO	ac			min.	in/hr	cfs	cfs	in	ft	ft/ft	Qf	Vf	Upper	Lower	Upper	Lower
CB-1	STC-1	0.15	0.50	0.08	5	8.1	0.61	**0.61**	8	40	0.019	**1.79**	5.14	241.75	241.40	238.75	238.00
DI-1	STC-1	0.10	0.95	0.10	5	8.1	0.77	**0.77**	8	15	0.017	**1.69**	4.84	240.50	241.40	238.25	238.00
STC-1	Drywell-1					8.1		**1.38**	12	125	0.008	**3.37**	4.29	241.40	---	237.75	236.80
CB-2	STC-2	0.12	0.95	0.11	5	8.1	0.92	**0.92**	12	20	0.013	**4.32**	5.50	240.50	240.70	237.50	237.25
CB-3	STC-2	0.25	0.95	0.24	5	8.1	1.92	**1.92**	12	12	0.021	**5.57**	7.10	240.50	240.70	237.50	237.25
STC-2	Drywell-1							**2.85**	15	10	0.045	**14.85**	12.10	240.70	---	237.00	236.55
CB-7	DMH-1	0.20	0.95	0.19	5	8.1	1.54	**1.54**	12	105	0.047	**8.34**	10.62	247.75	242.85	244.25	239.35
CB-6	DMH-1	0.40	0.60	0.24	5	8.1	1.94	**1.94**	12	10	0.025	**6.11**	7.77	242.80	242.85	239.60	239.35
DMH-1	STC-3							**3.48**	12	75	0.021	**5.64**	7.18	242.85	241.55	239.25	237.65
CB-4	STC-3	0.17	0.80	0.14	5	8.1	1.10	**1.10**	12	18	0.019	**5.38**	6.86	241.10	241.55	238.00	237.65
CB-5	STC-3	0.04	0.95	0.04	5	8.1	0.31	**0.31**	12	15	0.023	**5.90**	7.51	241.10	241.55	238.00	237.65
STC-3	Drywell-1							**4.89**	15	18	0.047	**15.22**	12.40	241.55	---	237.40	236.55
CB-8	DMH-2	0.25	0.95	0.24	5	8.1	1.92	**1.92**	12	90	0.010	**3.86**	4.92	255.00	255.60	252.00	251.10
CB-9	DMH-2	0.19	0.95	0.18	5	8.1	1.46	**1.46**	12	25	0.036	**7.33**	9.33	255.00	255.60	252.00	251.10
DMH-2	DMH-3							**3.39**	12	165	0.005	**2.85**	3.63	255.60	254.45	251.00	250.10
CB-10	DMH-3	0.14	0.95	0.13	5	8.1	1.08	**1.08**	12	25	0.024	**5.98**	7.62	254.00	254.45	250.90	250.30
DMH-3	STC-4							**4.46**	15	12	0.008	**6.39**	5.21	254.45	254.50	250.00	249.90
CB-13	STC-4	0.12	0.95	0.11	5	8.1	0.92	**0.92**	12	8	0.050	**8.63**	10.99	254.00	254.50	250.30	249.90
STC-4	FE-1							**5.39**	18	12	0.013	**12.73**	7.20	254.50	---	249.65	249.50
CB-11	STC-5	0.27	0.80	0.22	5	8.1	1.75	**1.75**	12	6	0.042	**7.88**	10.04	253.70	254.50	250.50	250.25
CB-12	STC-5	0.12	0.95	0.11	5	8.1	0.92	**0.92**	12	9	0.028	**6.44**	8.19	254.00	254.50	250.50	250.25
STC-5	FE-3							**2.67**	12	20	0.025	**6.11**	7.77	254.50	---	250.00	249.50
ROOF DRAIN-1	FE-2	0.42	0.95	0.40	5	8.1	3.23	**3.23**	12	150	0.020	**5.46**	6.95	---	---	254.00	251.00
ROOF DRAIN-2	SIS-1	0.29	0.95	0.28	5	8.1	2.23	**2.23**	12	39	0.021	**5.53**	7.04	---	---	237.60	236.80

CATCH BASIN AREA MAP
OF
55 WEST UNION STREET
IN
ASHLAND, MA





Rainfall Events Listing (selected events)

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	100 Year	Type III 24-hr		Default	24.00	1	8.24	2

100 yr "Brimful"
POND ELEV. = 251.0

Summary for Subcatchment P5: Proposed to Stormwater Basin

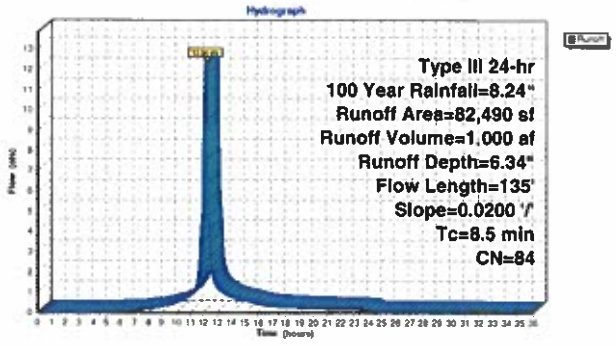
Runoff = 12.34 cfs @ 12.12 hrs, Volume= 1.000 af, Depth= 6.34"
Routed to Pond 5P : Basin Spillway

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.24"

Area (sf)	CN	Description
18,320	98	Roofs, HSG A
36,850	98	Paved parking, HSG A
19,420	39	>75% Grass cover, Good, HSG A
7,900	98	Water Surface, HSG A
82,490	84	Weighted Average
19,420		23.54% Pervious Area
63,070		76.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		Sheet Flow, Grass: Dense n= 0.240 P2= 3.37"
0.5	85	0.0200	2.87		Shallow Concentrated Flow, Paved Kv= 20.3 fps
8.5	135	Total			

Subcatchment P5: Proposed to Stormwater Basin



Summary for Pond 5P: Basin Spillway

Inflow Area = 1.894 ac, 76.46% Impervious, Inflow Depth = 6.34" for 100 Year event
Inflow = 12.34 cfs @ 12.12 hrs, Volume= 1.000 af
Outflow = 10.54 cfs @ 12.18 hrs, Volume= 1.000 af, Atten= 15%, Lag= 3.9 min
Primary = 10.54 cfs @ 12.18 hrs, Volume= 1.000 af

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 251.00' @ 12.18 hrs Surf.Area= 8,784 sf Storage= 4,274 cf

Plug-Flow detention time= 15.0 min calculated for 0.999 af (100% of inflow)
Center-of-Mass det. time= 15.1 min (809.2 - 794.1)

Volume	Invert	Avail.Storage	Storage Description
#1	250.50'	13,628 cf	Custom Stage Data (Conic) Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
250.50	8,200	0	0	8,200
252.00	10,000	13,628	13,628	10,070

Device	Routing	Invert	Outlet Devices
#1	Primary	250.50'	10.0' long + 3.0 '/' SideZ x 10.0' breadth Broad-Crested Rectangular Weir
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

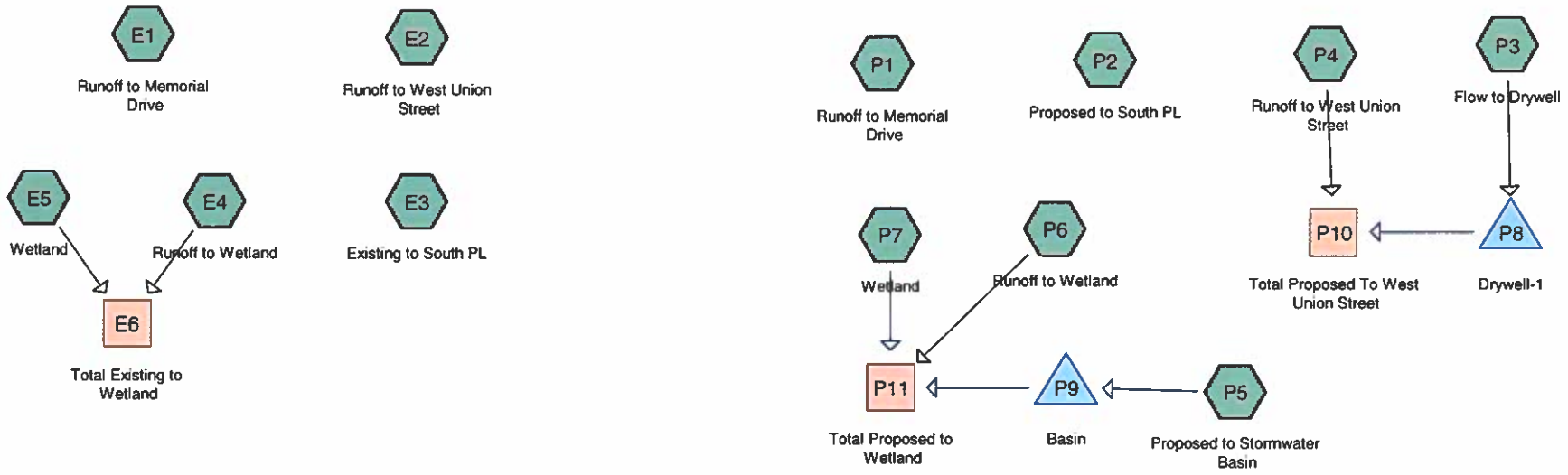
Primary OutFlow Max=10.39 cfs @ 12.18 hrs HW=251.00' (Free Discharge)
↳1=Broad-Crested Rectangular Weir (Weir Controls 10.39 cfs @ 1.81 fps)

HYDROCAD CALCULATIONS

EXISTING CONDITION
2 Year, 10 Year
& 100 Year Storm
Calculation Sheets

AND

PROPOSED CONDITION
2 Year, 10 Year
& 100 Year Storm
Calculation Sheets



Subcat Reach Pond Link

Routing Diagram for Stormwater 2025

Prepared by {enter your company name here}, Printed 7/31/2025

NOAA Atlas 14, Volume 10, Version 3
Location name: Ashland, Massachusetts, USA*
Latitude: 42.2533°, Longitude: -71.4721°
Elevation: 262 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	0.335 (0.261-0.428)	0.402 (0.313-0.514)	0.512 (0.397-0.657)	0.603 (0.465-0.779)	0.729 (0.544-0.983)	0.823 (0.602-1.14)	0.922 (0.655-1.32)	1.03 (0.696-1.51)	1.19 (0.772-1.80)	1.32 (0.836-2.04)
10-min	0.474 (0.369-0.606)	0.570 (0.443-0.729)	0.726 (0.563-0.932)	0.855 (0.659-1.10)	1.03 (0.770-1.39)	1.17 (0.853-1.61)	1.31 (0.928-1.87)	1.46 (0.985-2.14)	1.69 (1.09-2.55)	1.87 (1.18-2.89)
15-min	0.558 (0.434-0.713)	0.670 (0.521-0.857)	0.853 (0.661-1.10)	1.00 (0.775-1.30)	1.21 (0.906-1.64)	1.37 (1.00-1.89)	1.54 (1.09-2.20)	1.72 (1.16-2.52)	1.99 (1.29-3.00)	2.20 (1.39-3.40)
30-min	0.765 (0.595-0.978)	0.918 (0.714-1.18)	1.17 (0.906-1.50)	1.38 (1.06-1.78)	1.66 (1.24-2.24)	1.88 (1.37-2.59)	2.10 (1.50-3.01)	2.36 (1.59-3.44)	2.72 (1.76-4.11)	3.01 (1.91-4.65)
60-min	0.972 (0.756-1.24)	1.17 (0.907-1.49)	1.48 (1.15-1.91)	1.75 (1.35-2.26)	2.11 (1.58-2.85)	2.39 (1.74-3.29)	2.67 (1.90-3.82)	2.99 (2.02-4.37)	3.45 (2.24-5.22)	3.82 (2.42-5.90)
2-hr	1.23 (0.966-1.56)	1.49 (1.16-1.89)	1.91 (1.49-2.43)	2.26 (1.75-2.89)	2.73 (2.06-3.68)	3.09 (2.28-4.25)	3.47 (2.50-4.97)	3.93 (2.65-5.70)	4.61 (3.00-6.93)	5.19 (3.30-7.96)
3-hr	1.42 (1.12-1.80)	1.72 (1.35-2.18)	2.21 (1.73-2.81)	2.62 (2.04-3.34)	3.18 (2.40-4.26)	3.59 (2.66-4.93)	4.04 (2.92-5.79)	4.59 (3.11-6.64)	5.43 (3.53-8.13)	6.15 (3.91-9.39)
6-hr	1.82 (1.44-2.28)	2.21 (1.74-2.78)	2.84 (2.24-3.59)	3.37 (2.64-4.28)	4.10 (3.12-5.47)	4.64 (3.46-6.34)	5.23 (3.81-7.46)	5.95 (4.04-8.56)	7.08 (4.62-10.5)	8.06 (5.14-12.2)
12-hr	2.30 (1.84-2.87)	2.80 (2.20-3.50)	3.62 (2.88-4.54)	4.31 (3.40-5.43)	5.24 (4.01-6.94)	5.93 (4.45-8.05)	6.69 (4.88-9.47)	7.61 (5.19-10.9)	9.04 (5.92-13.4)	10.3 (6.58-15.5)
24-hr	2.74 (2.20-3.39)	3.37 (2.70-4.18)	4.40 (3.51-5.48)	5.25 (4.17-6.58)	6.43 (4.95-8.47)	7.29 (5.51-9.86)	8.24 (6.07-11.6)	9.42 (6.45-13.4)	11.3 (7.40-16.5)	12.8 (8.24-19.2)
2-day	3.04 (2.46-3.75)	3.80 (3.07-4.69)	5.04 (4.05-6.24)	6.07 (4.85-7.55)	7.48 (5.80-9.82)	8.52 (6.48-11.5)	9.66 (7.18-13.6)	11.1 (7.64-15.7)	13.5 (8.87-19.6)	15.5 (9.98-23.0)
3-day	3.29 (2.67-4.04)	4.10 (3.32-5.03)	5.42 (4.38-6.68)	6.52 (5.23-8.08)	8.03 (6.25-10.5)	9.14 (6.98-12.2)	10.4 (7.72-14.5)	11.9 (8.21-16.7)	14.4 (9.53-20.9)	16.6 (10.7-24.6)
4-day	3.53 (2.87-4.32)	4.37 (3.55-5.35)	5.74 (4.64-7.05)	6.87 (5.52-8.49)	8.44 (6.58-11.0)	9.58 (7.33-12.8)	10.8 (8.09-15.1)	12.5 (8.59-17.4)	15.0 (9.93-21.7)	17.3 (11.1-25.4)
7-day	4.22 (3.45-5.13)	5.11 (4.17-6.22)	6.55 (5.33-8.01)	7.76 (6.27-9.53)	9.41 (7.36-12.1)	10.6 (8.14-14.0)	12.0 (8.91-16.5)	13.6 (9.42-18.9)	16.2 (10.7-23.2)	18.4 (11.9-26.9)
10-day	4.89 (4.01-5.93)	5.81 (4.76-7.05)	7.31 (5.96-8.89)	8.55 (6.93-10.5)	10.3 (8.04-13.2)	11.5 (8.84-15.1)	12.9 (9.60-17.6)	14.5 (10.1-20.1)	17.0 (11.3-24.4)	19.1 (12.4-27.9)
20-day	6.90 (5.70-8.30)	7.88 (6.50-9.49)	9.48 (7.79-11.5)	10.8 (8.83-13.1)	12.6 (9.95-16.0)	14.0 (10.8-18.1)	15.5 (11.5-20.7)	17.1 (11.9-23.4)	19.3 (12.9-27.5)	21.2 (13.8-30.7)
30-day	8.54 (7.08-10.2)	9.56 (7.92-11.5)	11.2 (9.27-13.5)	12.6 (10.3-15.3)	14.5 (11.4-18.2)	16.0 (12.3-20.5)	17.5 (12.9-23.1)	19.0 (13.3-25.9)	21.1 (14.2-29.8)	22.7 (14.8-32.8)
45-day	10.5 (8.79-12.6)	11.6 (9.66-13.9)	13.3 (11.1-16.0)	14.8 (12.2-17.8)	16.8 (13.3-20.9)	18.3 (14.1-23.2)	19.8 (14.6-25.9)	21.3 (15.0-28.9)	23.1 (15.6-32.5)	24.4 (16.0-35.1)
60-day	12.2 (10.2-14.5)	13.3 (11.1-15.9)	15.1 (12.5-18.0)	16.6 (13.7-19.9)	18.6 (14.7-23.0)	20.2 (15.6-25.5)	21.7 (16.0-28.1)	23.1 (16.3-31.2)	24.7 (16.7-34.6)	25.8 (16.9-37.0)

[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.

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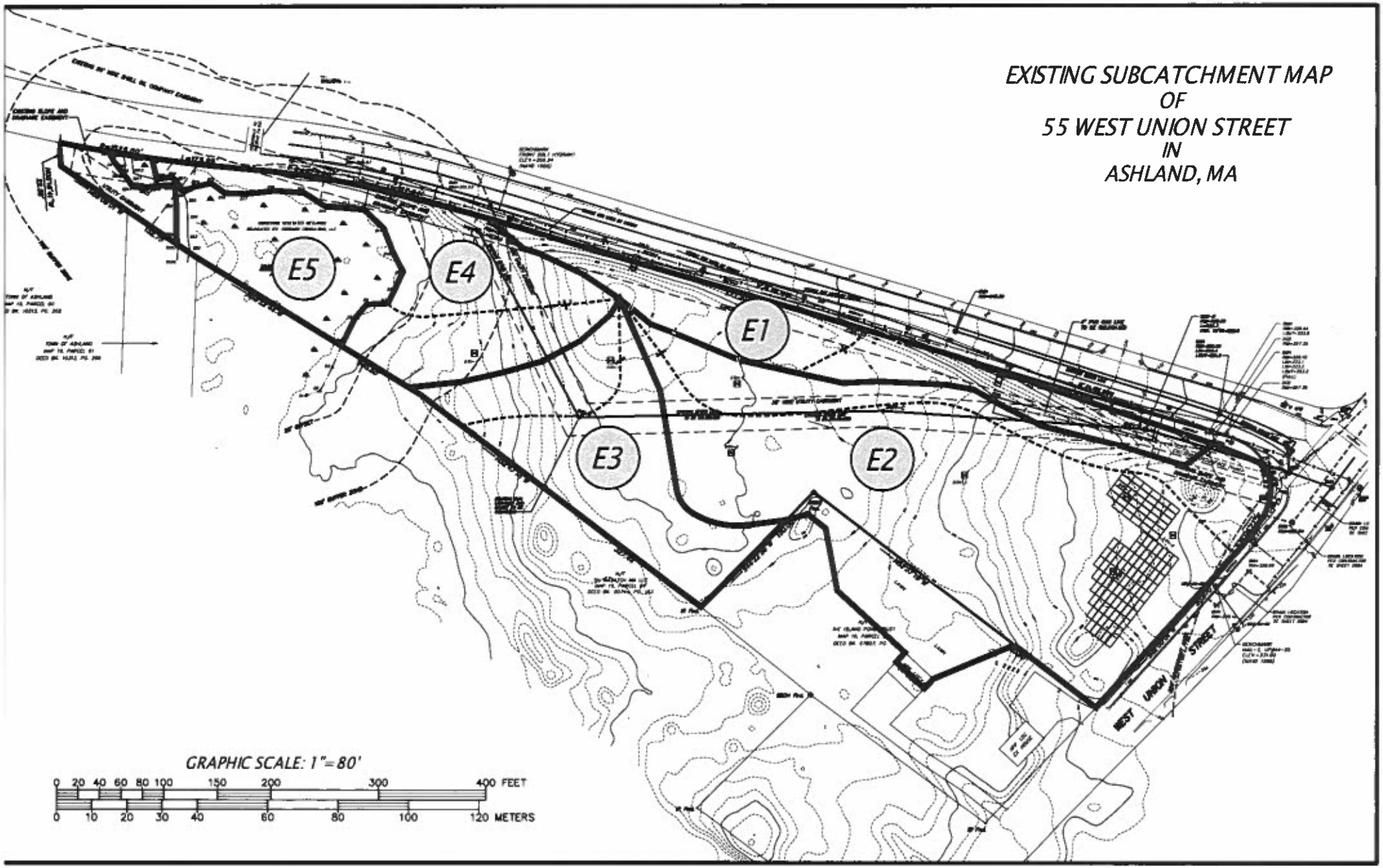
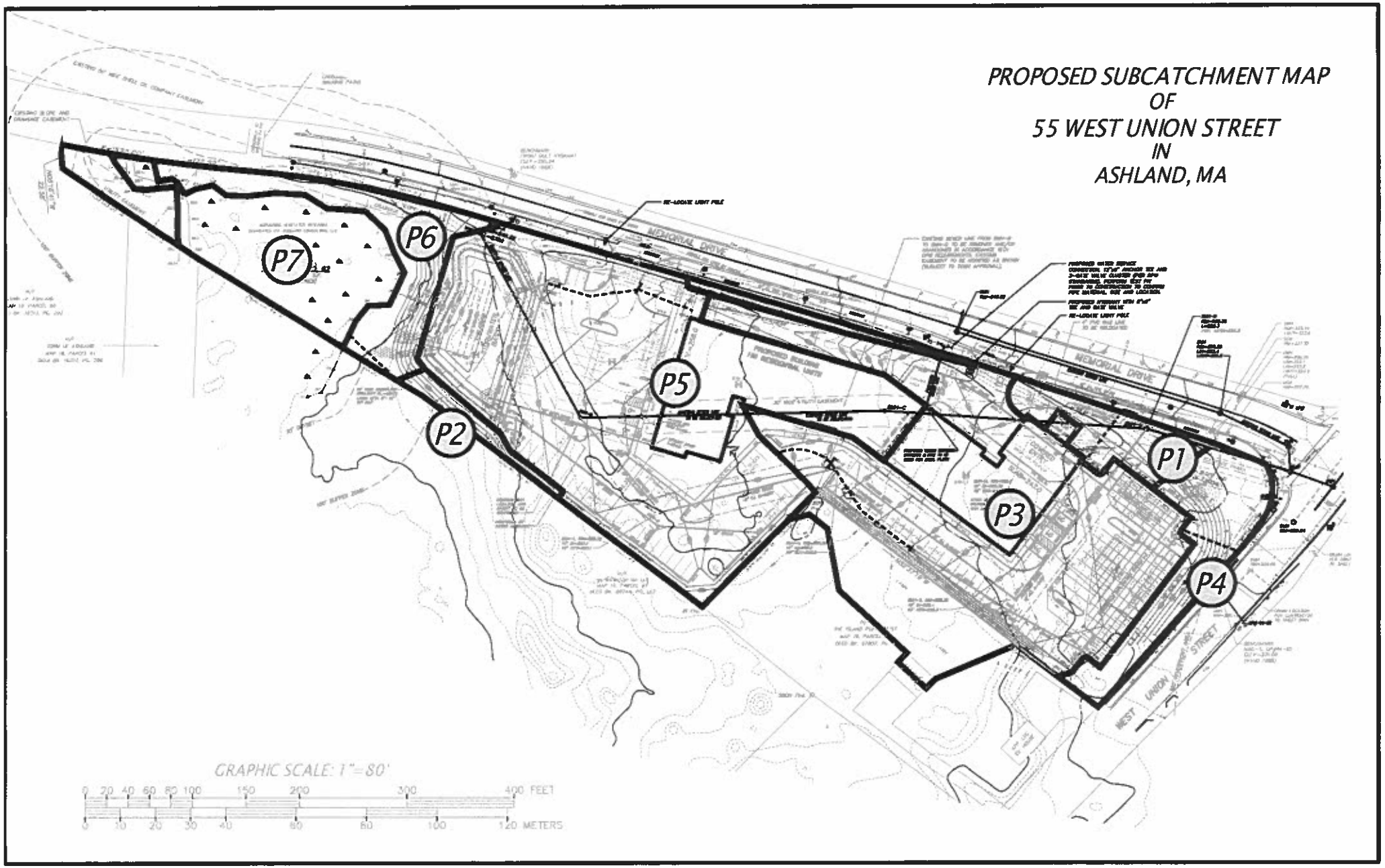
PF graphical


EXISTING SUBCATCHMENT MAP
OF
55 WEST UNION STREET
IN
ASHLAND, MA
E5
E4
E1
E3
E2
WEST UNION STREET
GRAPHIC SCALE: 1"=80'
0 20 40 60 80 100 150 200 300 400 FEET
0 10 20 30 40 60 80 100 120 METERS


PROPOSED SUBCATCHMENT MAP
OF
55 WEST UNION STREET
IN
ASHLAND, MA
P1
P2
P3
P4
P5
P6
P7
MEMORIAL DRIVE
WEST UNION STREET
GRAPHIC SCALE: 1"=80'
0 20 40 60 80 100 150 200 300 400 FEET
0 10 20 30 40 60 80 100 120 METERS

2-YEAR DESIGN STORM

Summary for Subcatchment E1: Runoff to Memorial Drive

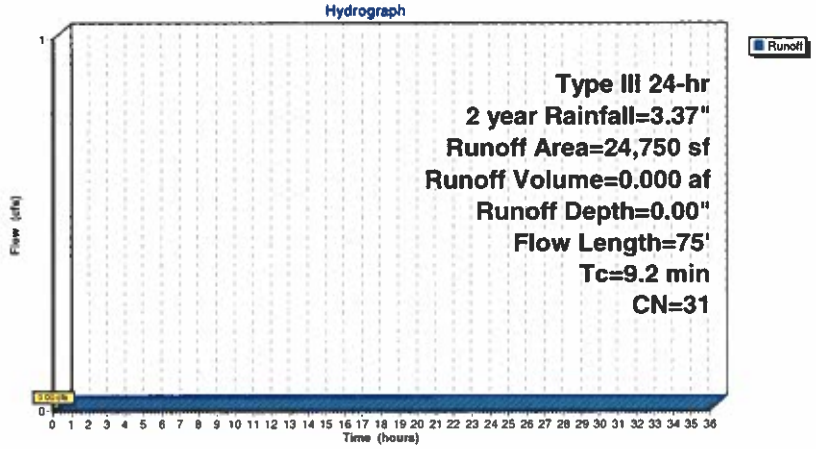
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to nonexistent node 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.37"

Area (sf)	CN	Description
3,550	39	>75% Grass cover, Good, HSG A
21,200	30	Woods, Good, HSG A
24,750	31	Weighted Average
24,750		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
0.1	25	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.2	75	Total			

Subcatchment E1: Runoff to Memorial Drive



Summary for Subcatchment E2: Runoff to West Union Street

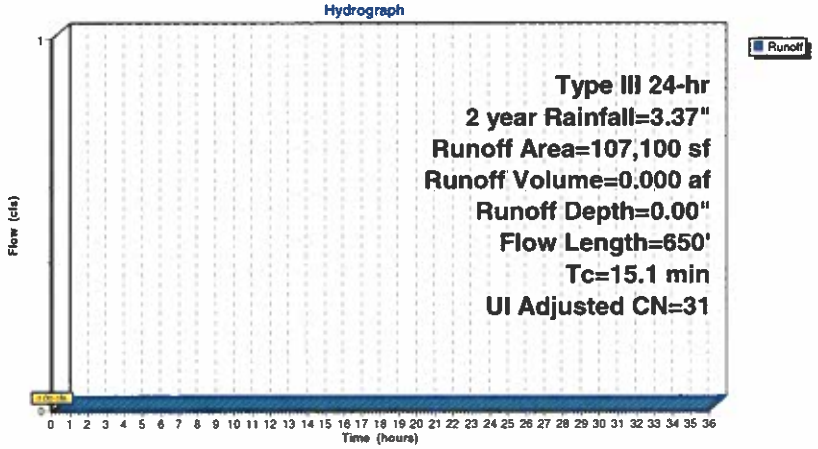
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to nonexistent node 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.37"

Area (sf)	CN	Adj	Description
92,100	30		Woods, Good, HSG A
2,700	39		>75% Grass cover, Good, HSG A
11,800	39		>75% Grass cover, Good, HSG A
500	98		Unconnected roofs, HSG A
107,100	32	31	Weighted Average, UI Adjusted
106,600			99.53% Pervious Area
500			0.47% Impervious Area
500			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
8.2	600	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.1	650	Total			

Subcatchment E2: Runoff to West Union Street



Summary for Subcatchment E3: Existing to South PL

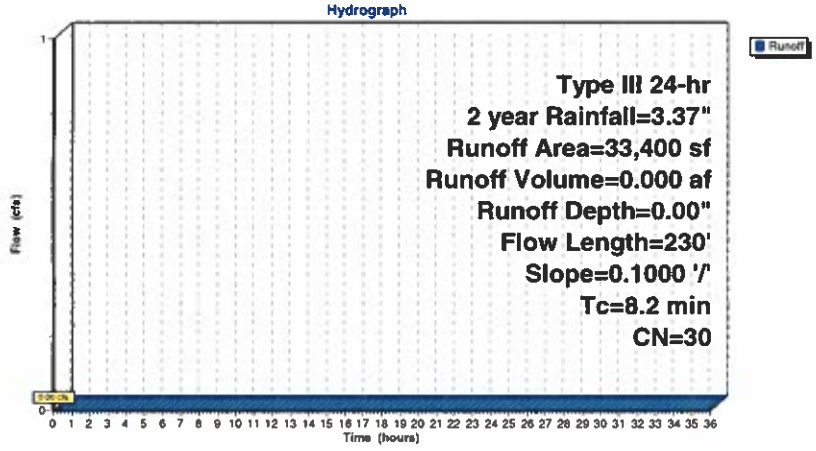
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.37"

Area (sf)	CN	Description
33,400	30	Woods, Good, HSG A
33,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
1.9	180	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	230	Total			

Subcatchment E3: Existing to South PL



Summary for Subcatchment E4: Runoff to Wetland

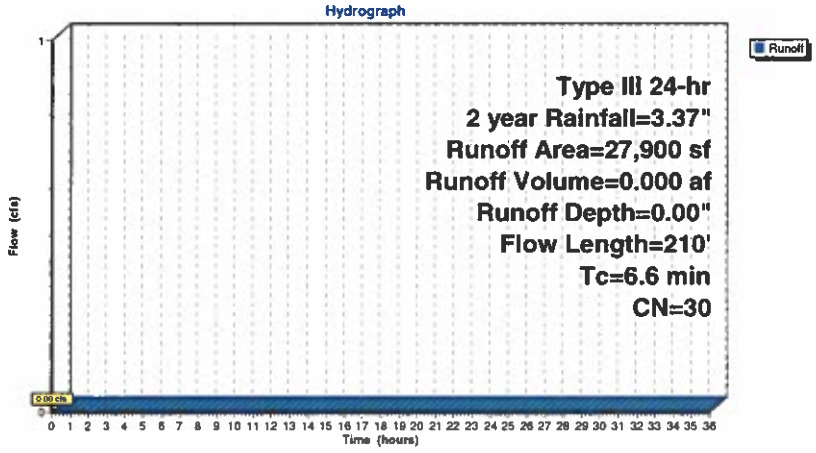
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to nonexistent node E6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.37"

Area (sf)	CN	Description
27,900	30	Woods, Good, HSG A
27,900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
1.4	160	0.1500	1.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.6	210	Total			

Subcatchment E4: Runoff to Wetland



Summary for Subcatchment P1: Runoff to Memorial Drive

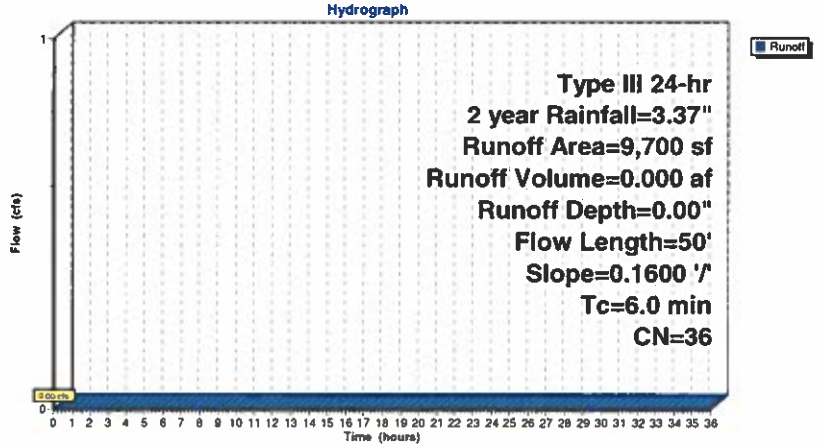
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.37"

Area (sf)	CN	Description
6,000	39	>75% Grass cover, Good, HSG A
3,700	30	Meadow, non-grazed, HSG A
9,700	36	Weighted Average
9,700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	50	0.1600	0.24		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
3.5	50	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P1: Runoff to Memorial Drive



Summary for Subcatchment P2: Proposed to South PL

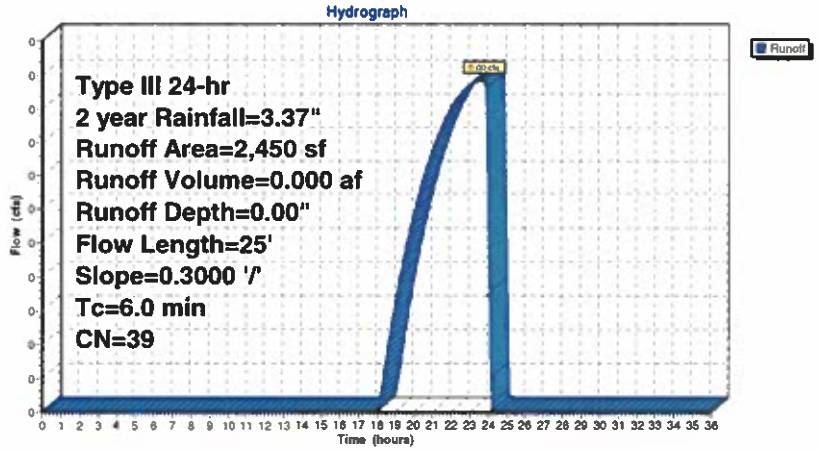
Runoff = 0.00 cfs @ 23.76 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.37"

Area (sf)	CN	Description
2,450	39	>75% Grass cover, Good, HSG A
2,450		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	25	0.3000	0.27		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
1.6	25	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P2: Proposed to South PL



Summary for Subcatchment P3: Flow to Drywell

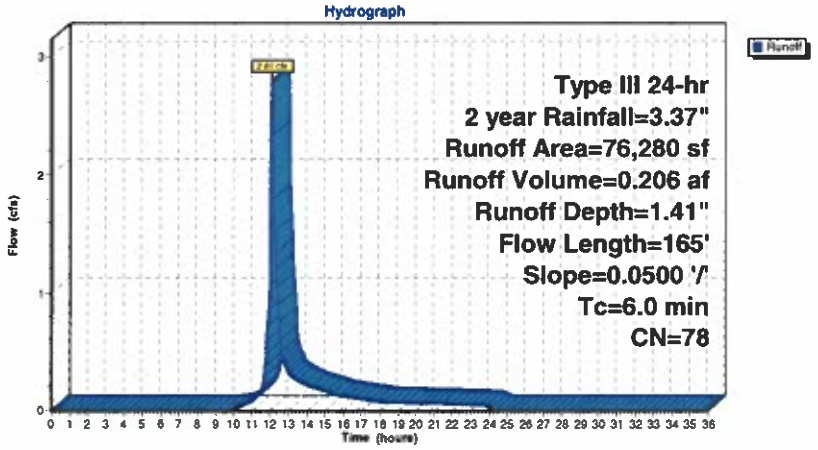
Runoff = 2.81 cfs @ 12.10 hrs, Volume= 0.206 af, Depth= 1.41"
Routed to Pond P8 : Drywell-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.37"

Area (sf)	CN	Description
37,635	98	Paved parking, HSG A
12,595	98	Roofs, HSG A
13,750	39	>75% Grass cover, Good, HSG A
11,800	39	>75% Grass cover, Good, HSG A
500	98	Unconnected roofs, HSG A
76,280	78	Weighted Average
25,550		33.50% Pervious Area
50,730		66.50% Impervious Area
500		0.99% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.77		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.37"
0.4	115	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	165	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P3: Flow to Drywell



Summary for Subcatchment P4: Runoff to West Union Street

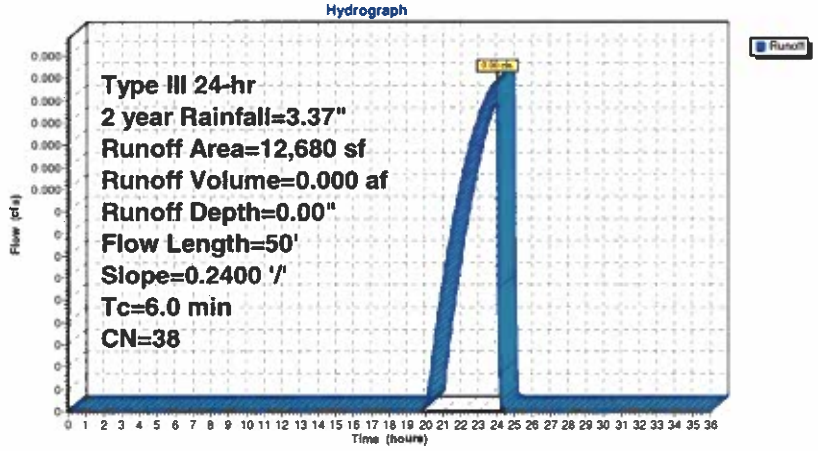
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach P10 : Total Proposed To West Union Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.37"

Area (sf)	CN	Description
11,680	39	>75% Grass cover, Good, HSG A
1,000	30	Meadow, non-grazed, HSG A
12,680	38	Weighted Average
12,680		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.2400	0.28		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
3.0	50	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P4: Runoff to West Union Street



Summary for Subcatchment P5: Proposed to Stormwater Basin

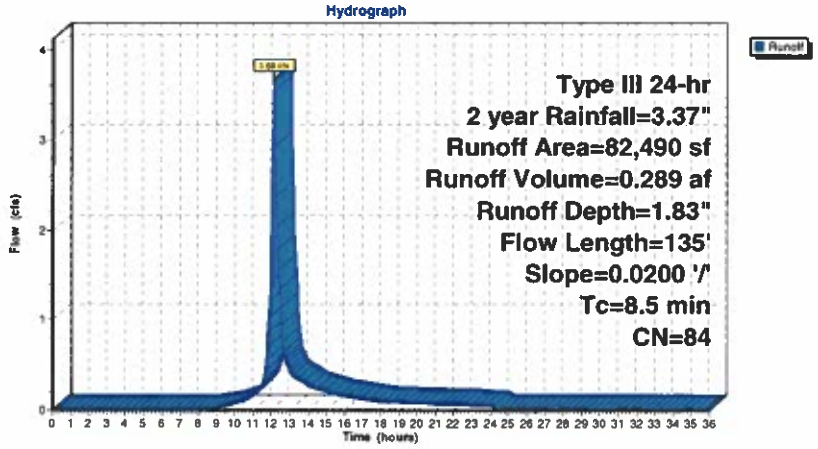
Runoff = 3.68 cfs @ 12.12 hrs, Volume= 0.289 af, Depth= 1.83"
Routed to Pond P9 : Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.37"

Area (sf)	CN	Description
18,320	98	Roofs, HSG A
36,850	98	Paved parking, HSG A
19,420	39	>75% Grass cover, Good, HSG A
7,900	98	Water Surface, HSG A
82,490	84	Weighted Average
19,420		23.54% Pervious Area
63,070		76.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
0.5	85	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.5	135	Total			

Subcatchment P5: Proposed to Stormwater Basin



Summary for Subcatchment P6: Runoff to Wetland

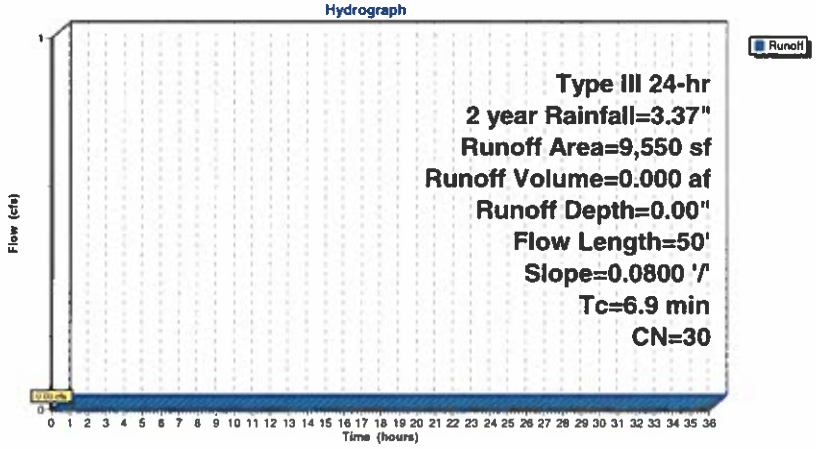
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Reach P11 : Total Proposed to Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.37"

Area (sf)	CN	Description
5,450	30	Meadow, non-grazed, HSG A
4,100	30	Woods, Good, HSG A
9,550	30	Weighted Average
9,550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"

Subcatchment P6: Runoff to Wetland

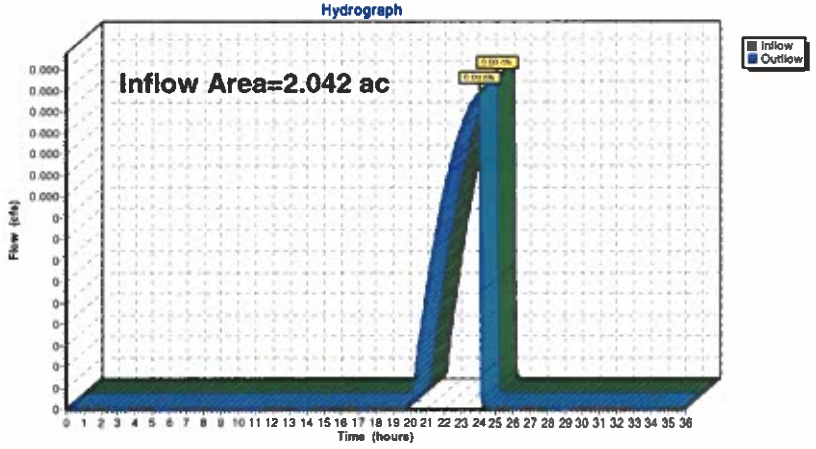


Summary for Reach P10: Total Proposed To West Union Street

Inflow Area = 2.042 ac, 57.03% Impervious, Inflow Depth = 0.00" for 2 year event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach P10: Total Proposed To West Union Street

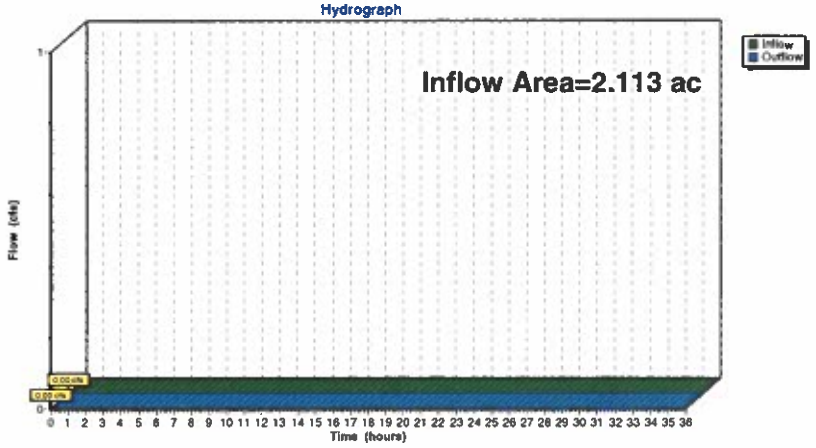


Summary for Reach P11: Total Proposed to Wetland

Inflow Area = 2.113 ac, 68.52% Impervious, Inflow Depth = 0.00" for 2 year event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1P

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach P11: Total Proposed to Wetland



Summary for Pond P8: Drywell-1

Inflow Area = 1.751 ac, 66.50% Impervious, Inflow Depth = 1.41" for 2 year event
Inflow = 2.81 cfs @ 12.10 hrs, Volume= 0.206 af
Outflow = 0.52 cfs @ 12.59 hrs, Volume= 0.206 af, Atten= 81%, Lag= 29.5 min
Discarded = 0.52 cfs @ 12.59 hrs, Volume= 0.206 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach P10 : Total Proposed To West Union Street

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 235.66' @ 12.59 hrs Surf.Area= 7,850 sf Storage= 2,568 cf

Plug-Flow detention time= 35.8 min calculated for 0.206 af (100% of inflow)
Center-of-Mass det. time= 35.8 min (881.4 - 845.6)

Volume	Invert	Avail.Storage	Storage Description
#1	235.00'	4,545 cf	**Custom Stage Data (Conic)** Listed below (Recalc) 31,400 cf Overall - 20,036 cf Embedded = 11,364 cf x 40.0% Voids
#2	235.50'	14,662 cf	**Shea Dry Well 1000gal** x 114 Inside #1 Inside= 62.0"W x 30.0"H => 12.86 sf x 10.00'L = 128.6 cf Outside= 68.0"W x 36.0"H => 16.74 sf x 10.50'L = 175.8 cf
		19,207 cf	Total Available Storage

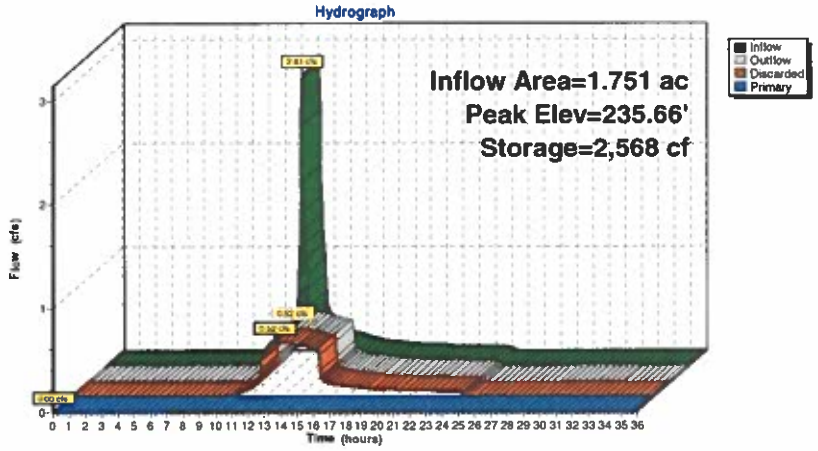
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
235.00	7,850	0	0	7,850
239.00	7,850	31,400	31,400	9,106

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	**2.410 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 231.00'
#2	Primary	238.20'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.52 cfs @ 12.59 hrs HW=235.66' (Free Discharge)
↳**1=Exfiltration** (Controls 0.52 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=235.00' (Free Discharge)
↳**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P8: Drywell-1



Summary for Pond P9: Basin

Inflow Area = 1.894 ac, 76.46% Impervious, Inflow Depth = 1.83" for 2 year event
Inflow = 3.68 cfs @ 12.12 hrs, Volume= 0.289 af
Outflow = 0.35 cfs @ 13.30 hrs, Volume= 0.289 af, Atten= 91%, Lag= 70.4 min
Discarded = 0.35 cfs @ 13.30 hrs, Volume= 0.289 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach P11 : Total Proposed to Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 247.70' @ 13.30 hrs Surf.Area= 4,935 sf Storage= 5,695 cf

Plug-Flow detention time= 194.7 min calculated for 0.289 af (100% of inflow)
Center-of-Mass det. time= 194.6 min (1,023.7 - 829.1)

Volume	Invert	Avail.Storage	Storage Description
#1	246.00'	38,192 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

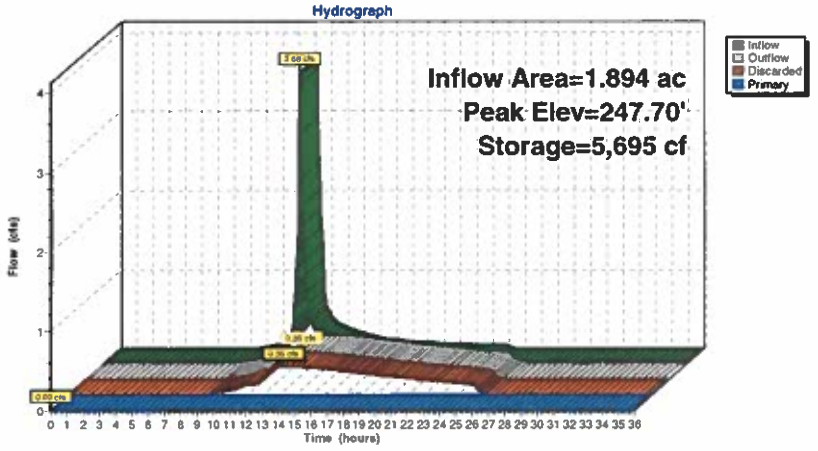
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
246.00	2,000	0	0	2,000
248.00	5,600	7,298	7,298	5,625
250.00	7,700	13,244	20,542	7,803
252.00	10,000	17,650	38,192	10,197

Device	Routing	Invert	Outlet Devices
#1	Discarded	246.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 242.00'
#2	Primary	250.50'	**10.0' long + 3.0 '/' SideZ x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Primary	250.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.35 cfs @ 13.30 hrs HW=247.70' (Free Discharge)
└**1=Exfiltration** (Controls 0.35 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=246.00' (Free Discharge)
├**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond P9: Basin



10-YEAR DESIGN STORM

Summary for Subcatchment E1: Runoff to Memorial Drive

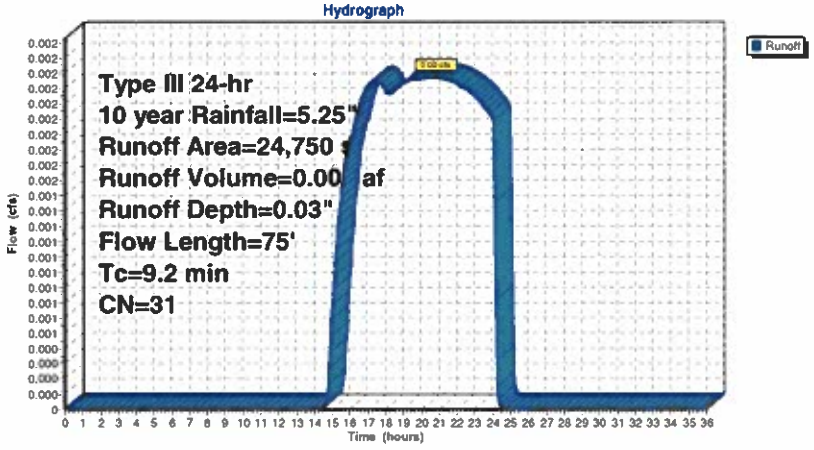
Runoff = 0.00 cfs @ 20.80 hrs, Volume= 0.002 af, Depth= 0.03"
Routed to nonexistent node 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.25"

Area (sf)	CN	Description
3,550	39	>75% Grass cover, Good, HSG A
21,200	30	Woods, Good, HSG A
24,750	31	Weighted Average
24,750		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
0.1	25	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.2	75	Total			

Subcatchment E1: Runoff to Memorial Drive



Summary for Subcatchment E2: Runoff to West Union Street

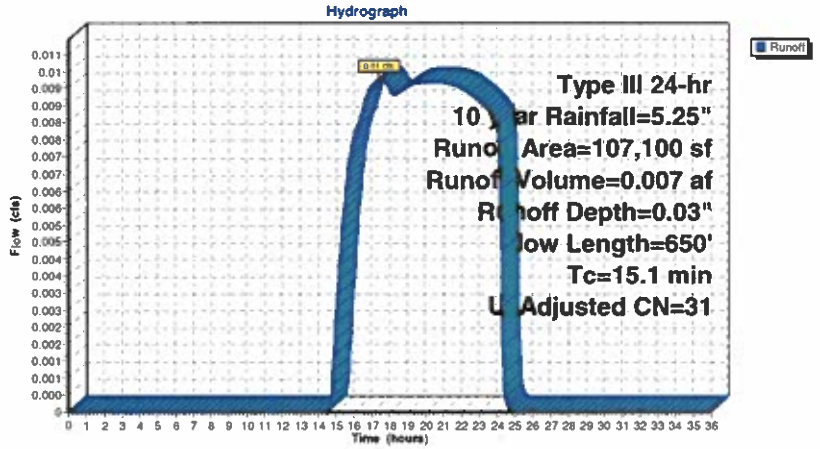
Runoff = 0.01 cfs @ 17.37 hrs, Volume= 0.007 af, Depth= 0.03"
Routed to nonexistent node 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.25"

Area (sf)	CN	Adj	Description
92,100	30		Woods, Good, HSG A
2,700	39		>75% Grass cover, Good, HSG A
11,800	39		>75% Grass cover, Good, HSG A
500	98		Unconnected roofs, HSG A
107,100	32	31	Weighted Average, UI Adjusted
106,600			99.53% Pervious Area
500			0.47% Impervious Area
500			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
8.2	600	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.1	650	Total			

Subcatchment E2: Runoff to West Union Street



Summary for Subcatchment E3: Existing to South PL

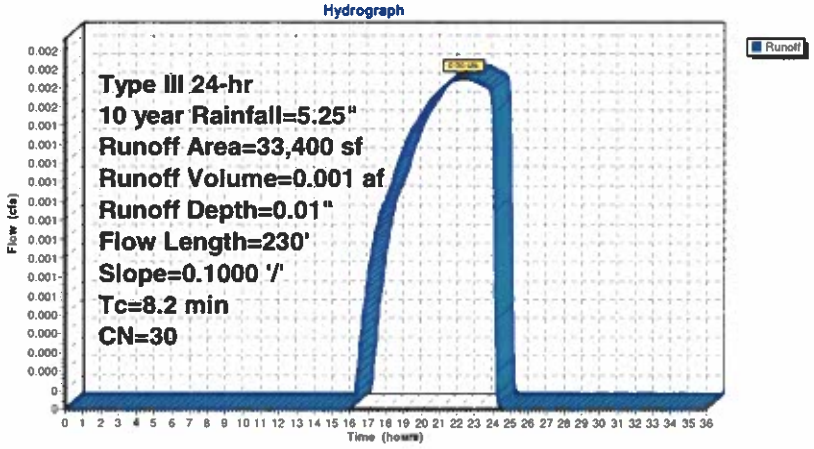
Runoff = 0.00 cfs @ 22.36 hrs, Volume= 0.001 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.25"

Area (sf)	CN	Description
33,400	30	Woods, Good, HSG A
33,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
1.9	180	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	230	Total			

Subcatchment E3: Existing to South PL



Summary for Subcatchment E4: Runoff to Wetland

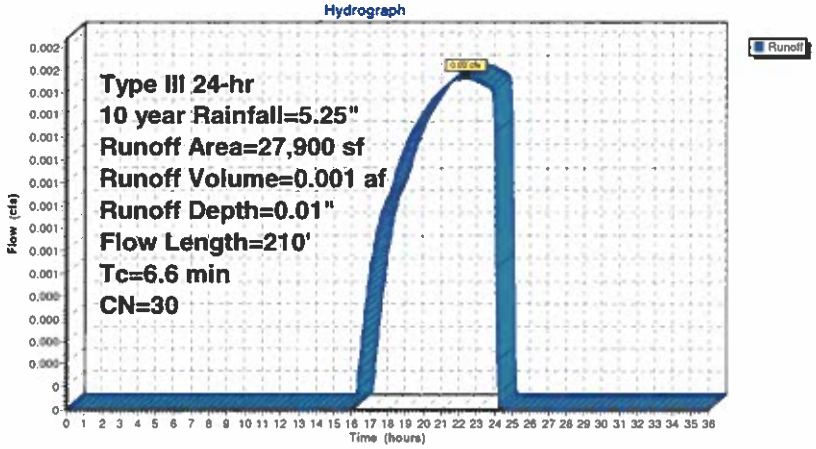
Runoff = 0.00 cfs @ 22.35 hrs, Volume= 0.001 af, Depth= 0.01"
Routed to nonexistent node E6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.25"

Area (sf)	CN	Description
27,900	30	Woods, Good, HSG A
27,900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
1.4	160	0.1500	1.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.6	210	Total			

Subcatchment E4: Runoff to Wetland



Summary for Subcatchment P1: Runoff to Memorial Drive

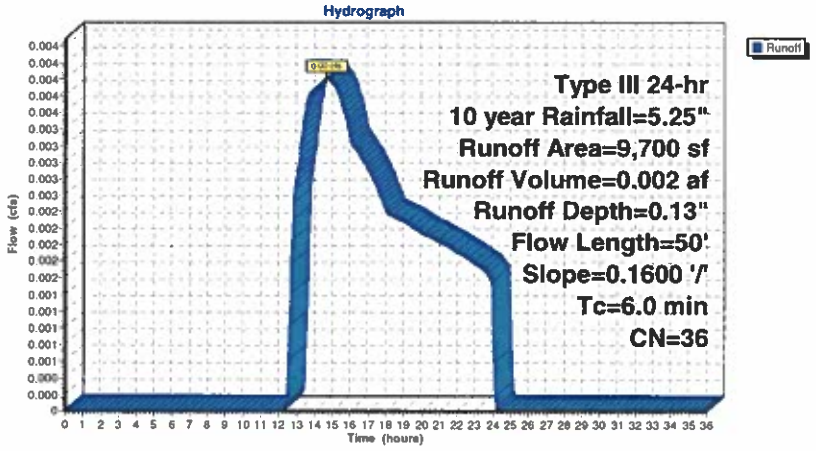
Runoff = 0.00 cfs @ 14.66 hrs, Volume= 0.002 af, Depth= 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.25"

Area (sf)	CN	Description
6,000	39	>75% Grass cover, Good, HSG A
3,700	30	Meadow, non-grazed, HSG A
9,700	36	Weighted Average
9,700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	50	0.1600	0.24		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
3.5	50	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P1: Runoff to Memorial Drive



Summary for Subcatchment P2: Proposed to South PL

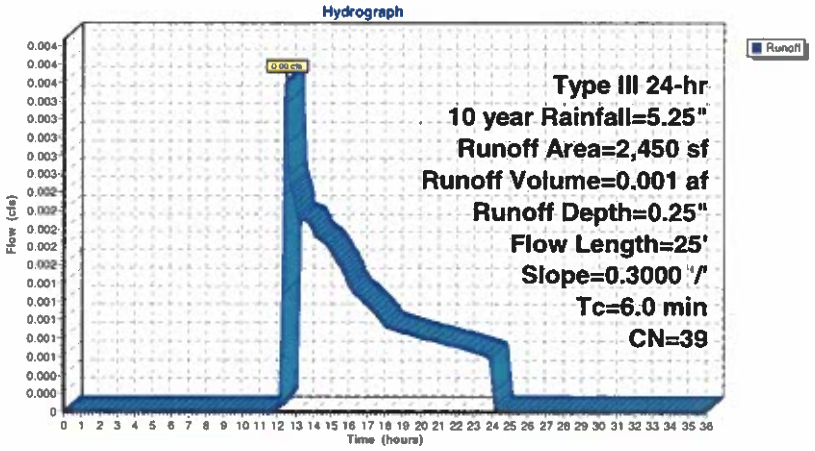
Runoff = 0.00 cfs @ 12.44 hrs, Volume= 0.001 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.25"

Area (sf)	CN	Description
2,450	39	>75% Grass cover, Good, HSG A
2,450		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	25	0.3000	0.27		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
1.6	25	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P2: Proposed to South PL



Summary for Subcatchment P3: Flow to Drywell

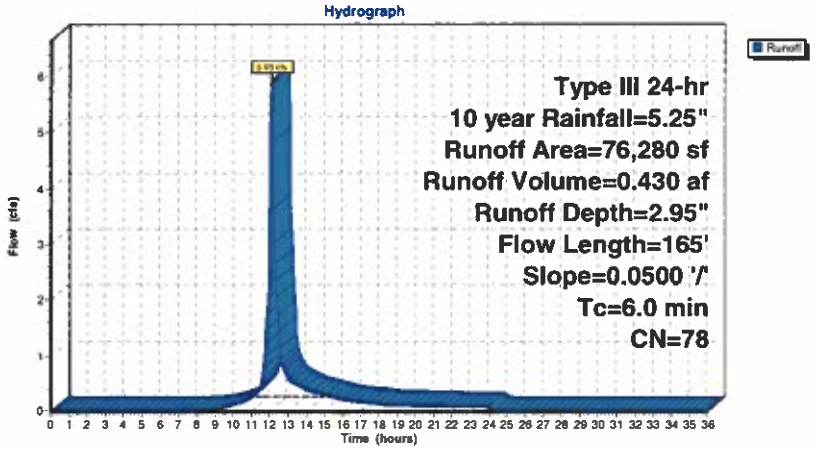
Runoff = 5.93 cfs @ 12.09 hrs, Volume= 0.430 af, Depth= 2.95"
Routed to Pond P8 : Drywell-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.25"

Area (sf)	CN	Description
37,635	98	Paved parking, HSG A
12,595	98	Roofs, HSG A
13,750	39	>75% Grass cover, Good, HSG A
11,800	39	>75% Grass cover, Good, HSG A
500	98	Unconnected roofs, HSG A
76,280	78	Weighted Average
25,550		33.50% Pervious Area
50,730		66.50% Impervious Area
500		0.99% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.77		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.37"
0.4	115	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	165	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P3: Flow to Drywell



Summary for Subcatchment P4: Runoff to West Union Street

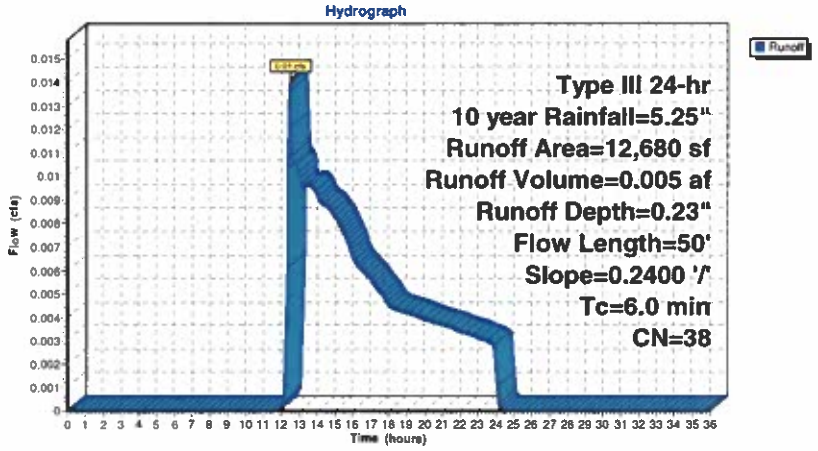
Runoff = 0.01 cfs @ 12.46 hrs, Volume= 0.005 af, Depth= 0.23"
Routed to Reach P10 : Total Proposed To West Union Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.25"

Area (sf)	CN	Description
11,680	39	>75% Grass cover, Good, HSG A
1,000	30	Meadow, non-grazed, HSG A
12,680	38	Weighted Average
12,680		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.2400	0.28		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
3.0	50	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P4: Runoff to West Union Street



Summary for Subcatchment P5: Proposed to Stormwater Basin

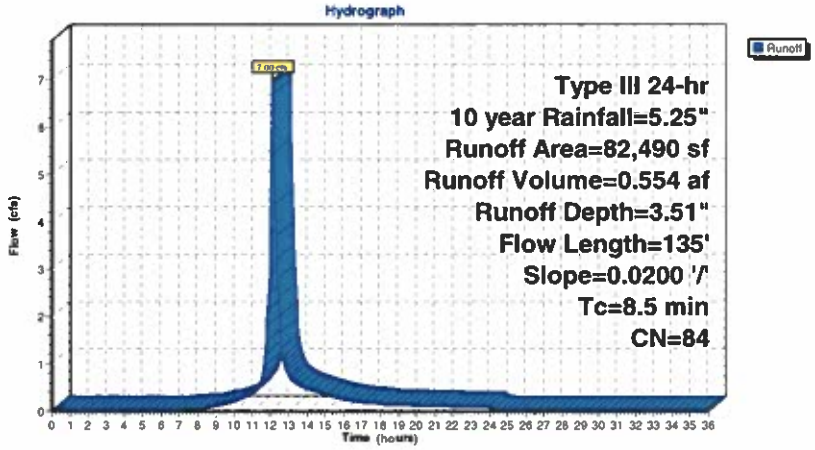
Runoff = 7.00 cfs @ 12.12 hrs, Volume= 0.554 af, Depth= 3.51"
Routed to Pond P9 : Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.25"

Area (sf)	CN	Description
18,320	98	Roofs, HSG A
36,850	98	Paved parking, HSG A
19,420	39	>75% Grass cover, Good, HSG A
7,900	98	Water Surface, HSG A
82,490	84	Weighted Average
19,420		23.54% Pervious Area
63,070		76.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
0.5	85	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.5	135	Total			

Subcatchment P5: Proposed to Stormwater Basin



Summary for Subcatchment P6: Runoff to Wetland

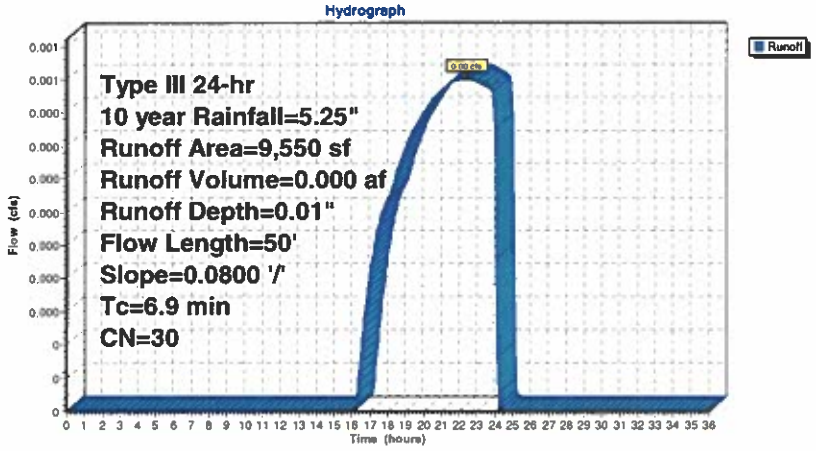
Runoff = 0.00 cfs @ 22.38 hrs, Volume= 0.000 af, Depth= 0.01"
Routed to Reach P11 : Total Proposed to Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.25"

Area (sf)	CN	Description
5,450	30	Meadow, non-grazed, HSG A
4,100	30	Woods, Good, HSG A
9,550	30	Weighted Average
9,550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"

Subcatchment P6: Runoff to Wetland

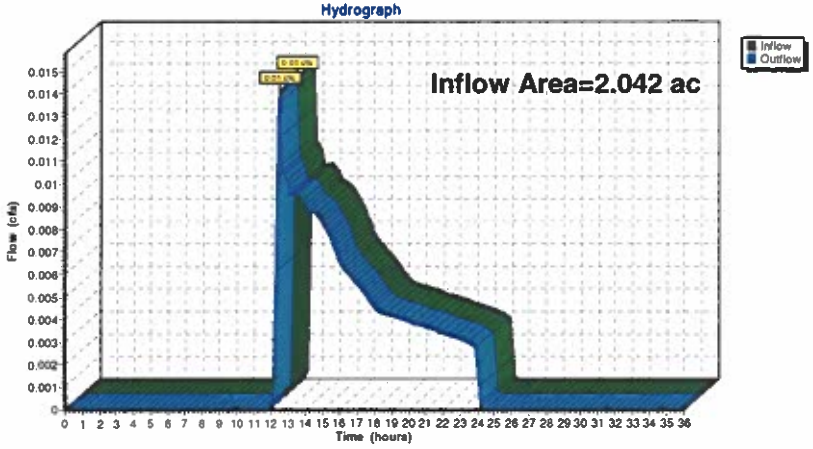


Summary for Reach P10: Total Proposed To West Union Street

Inflow Area = 2.042 ac, 57.03% Impervious, Inflow Depth = 0.03" for 10 year event
Inflow = 0.01 cfs @ 12.46 hrs, Volume= 0.005 af
Outflow = 0.01 cfs @ 12.46 hrs, Volume= 0.005 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach P10: Total Proposed To West Union Street

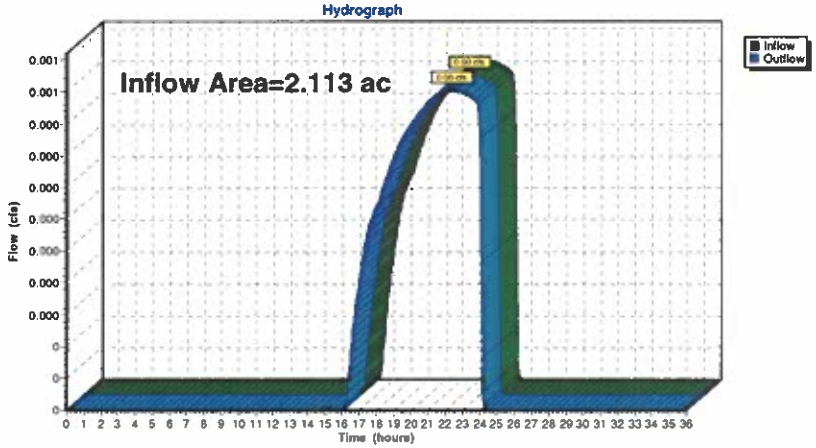


Summary for Reach P11: Total Proposed to Wetland

Inflow Area = 2.113 ac, 68.52% Impervious, Inflow Depth = 0.00" for 10 year event
Inflow = 0.00 cfs @ 22.38 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 22.38 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1P

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach P11: Total Proposed to Wetland



Summary for Pond P8: Drywell-1

Inflow Area = 1.751 ac, 66.50% Impervious, Inflow Depth = 2.95" for 10 year event
Inflow = 5.93 cfs @ 12.09 hrs, Volume= 0.430 af
Outflow = 0.62 cfs @ 12.97 hrs, Volume= 0.430 af, Atten= 90%, Lag= 52.8 min
Discarded = 0.62 cfs @ 12.97 hrs, Volume= 0.430 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach P10 : Total Proposed To West Union Street

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 236.39' @ 12.97 hrs Surf.Area= 7,850 sf Storage= 7,208 cf

Plug-Flow detention time= 105.9 min calculated for 0.429 af (100% of inflow)
Center-of-Mass det. time= 105.8 min (930.1 - 824.3)

Volume	Invert	Avail.Storage	Storage Description
#1	235.00'	4,545 cf	**Custom Stage Data (Conic)** Listed below (Recalc) 31,400 cf Overall - 20,036 cf Embedded = 11,364 cf x 40.0% Voids
#2	235.50'	14,662 cf	**Shea Dry Well 1000gal** x 114 Inside #1 Inside= 62.0"W x 30.0"H => 12.86 sf x 10.00'L = 128.6 cf Outside= 68.0"W x 36.0"H => 16.74 sf x 10.50'L = 175.8 cf
		19,207 cf	Total Available Storage

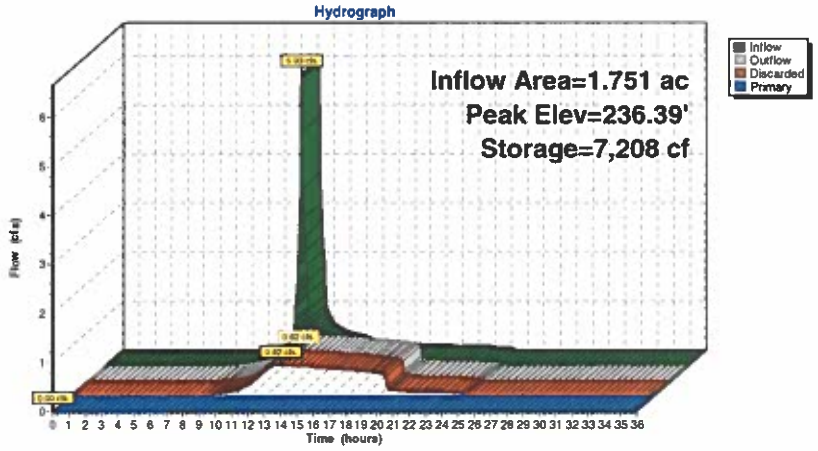
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
235.00	7,850	0	0	7,850
239.00	7,850	31,400	31,400	9,106

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	**2.410 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 231.00'
#2	Primary	238.20'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.62 cfs @ 12.97 hrs HW=236.39' (Free Discharge)
↳**1=Exfiltration** (Controls 0.62 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=235.00' (Free Discharge)
↳**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P8: Drywell-1



Summary for Pond P9: Basin

Inflow Area = 1.894 ac, 76.46% Impervious, Inflow Depth = 3.51" for 10 year event
Inflow = 7.00 cfs @ 12.12 hrs, Volume= 0.554 af
Outflow = 0.51 cfs @ 13.77 hrs, Volume= 0.554 af, Atten= 93%, Lag= 99.2 min
Discarded = 0.51 cfs @ 13.77 hrs, Volume= 0.554 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach P11 : Total Proposed to Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 248.84' @ 13.77 hrs Surf.Area= 6,446 sf Storage= 12,378 cf

Plug-Flow detention time= 289.2 min calculated for 0.553 af (100% of inflow)
Center-of-Mass det. time= 289.3 min (1,099.9 - 810.6)

Volume	Invert	Avail.Storage	Storage Description
#1	246.00'	38,192 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

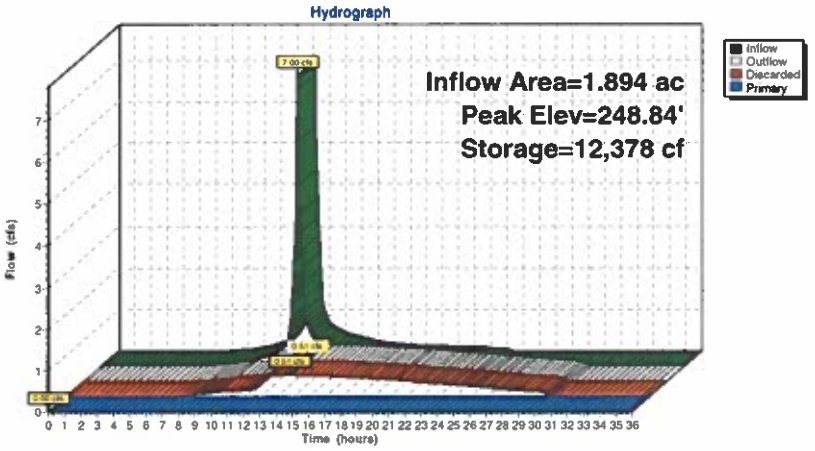
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
246.00	2,000	0	0	2,000
248.00	5,600	7,298	7,298	5,625
250.00	7,700	13,244	20,542	7,803
252.00	10,000	17,650	38,192	10,197

Device	Routing	Invert	Outlet Devices
#1	Discarded	246.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 242.00'
#2	Primary	250.50'	**10.0' long + 3.0 '/' SideZ x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Primary	250.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.51 cfs @ 13.77 hrs HW=248.84' (Free Discharge)
└**1=Exfiltration** (Controls 0.51 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=246.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond P9: Basin



100-YEAR DESIGN STORM

Summary for Subcatchment E1: Runoff to Memorial Drive

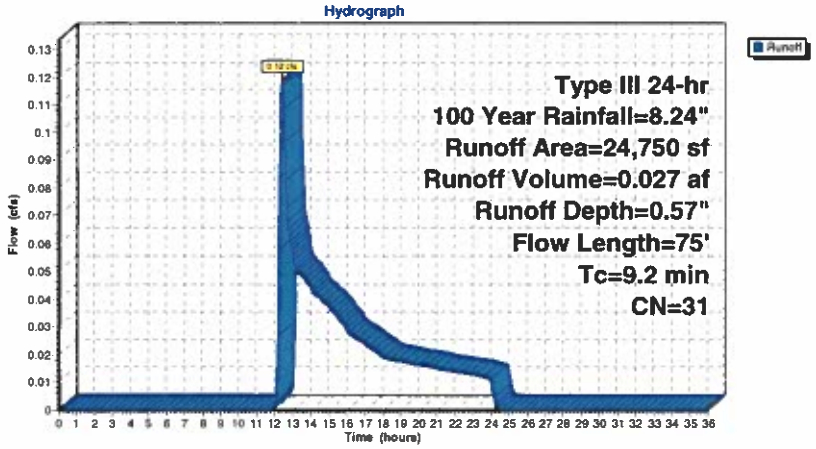
Runoff = 0.12 cfs @ 12.41 hrs, Volume= 0.027 af, Depth= 0.57"
Routed to nonexistent node 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.24"

Area (sf)	CN	Description
3,550	39	>75% Grass cover, Good, HSG A
21,200	30	Woods, Good, HSG A
24,750	31	Weighted Average
24,750		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.1	50	0.0400	0.09		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
0.1	25	0.2500	3.50		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
9.2	75	Total			

Subcatchment E1: Runoff to Memorial Drive



Summary for Subcatchment E2: Runoff to West Union Street

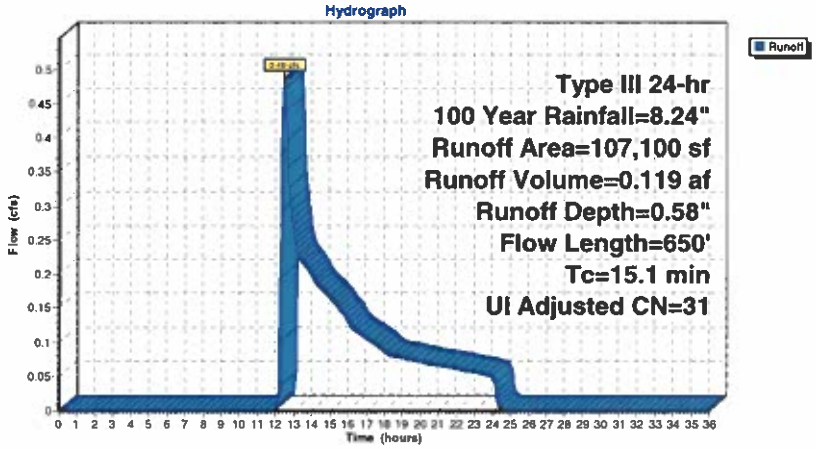
Runoff = 0.49 cfs @ 12.50 hrs, Volume= 0.119 af, Depth= 0.58"
Routed to nonexistent node 1R

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.24"

Area (sf)	CN	Adj	Description
92,100	30		Woods, Good, HSG A
2,700	39		>75% Grass cover, Good, HSG A
11,800	39		>75% Grass cover, Good, HSG A
500	98		Unconnected roofs, HSG A
107,100	32	31	Weighted Average, UI Adjusted
106,600			99.53% Pervious Area
500			0.47% Impervious Area
500			100.00% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
8.2	600	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
15.1	650	Total			

Subcatchment E2: Runoff to West Union Street



Summary for Subcatchment E3: Existing to South PL

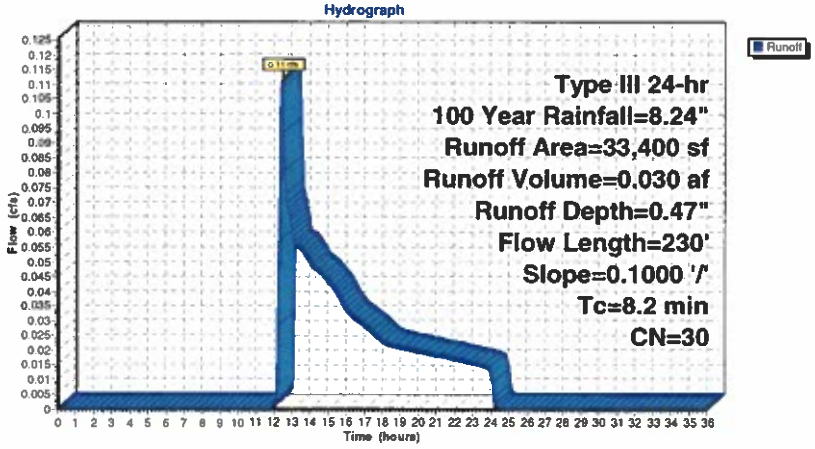
Runoff = 0.11 cfs @ 12.43 hrs, Volume= 0.030 af, Depth= 0.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.24"

Area (sf)	CN	Description
33,400	30	Woods, Good, HSG A
33,400		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.3	50	0.1000	0.13		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
1.9	180	0.1000	1.58		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
8.2	230	Total			

Subcatchment E3: Existing to South PL



Summary for Subcatchment E4: Runoff to Wetland

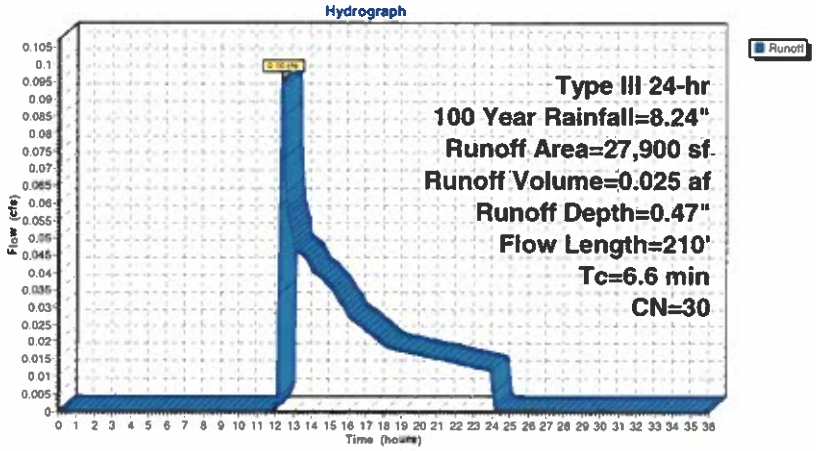
Runoff = 0.10 cfs @ 12.41 hrs, Volume= 0.025 af, Depth= 0.47"
Routed to nonexistent node E6

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.24"

Area (sf)	CN	Description
27,900	30	Woods, Good, HSG A
27,900		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.2	50	0.1600	0.16		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"
1.4	160	0.1500	1.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.6	210	Total			

Subcatchment E4: Runoff to Wetland



Summary for Subcatchment P1: Runoff to Memorial Drive

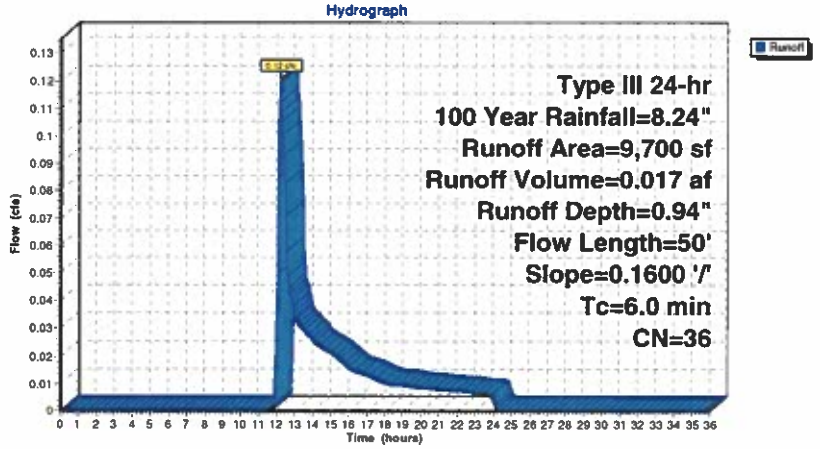
Runoff = 0.12 cfs @ 12.16 hrs, Volume= 0.017 af, Depth= 0.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.24"

Area (sf)	CN	Description
6,000	39	>75% Grass cover, Good, HSG A
3,700	30	Meadow, non-grazed, HSG A
9,700	36	Weighted Average
9,700		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.5	50	0.1600	0.24		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
3.5	50	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P1: Runoff to Memorial Drive



Summary for Subcatchment P2: Proposed to South PL

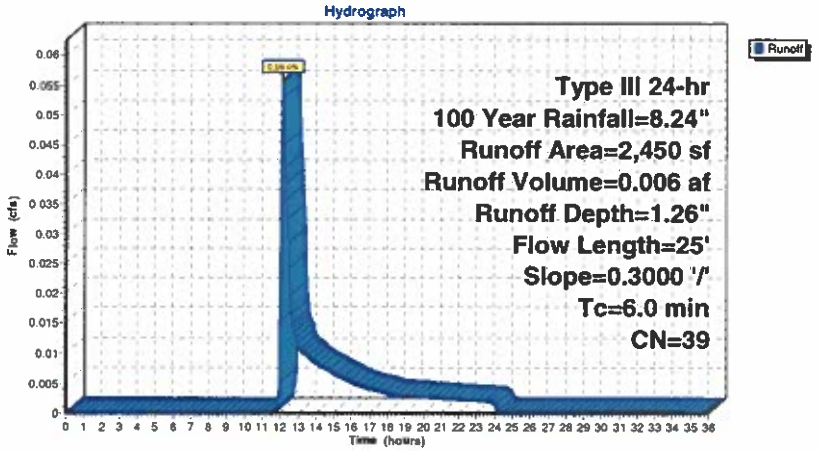
Runoff = 0.06 cfs @ 12.12 hrs, Volume= 0.006 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.24"

Area (sf)	CN	Description
2,450	39	>75% Grass cover, Good, HSG A
2,450		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	25	0.3000	0.27		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
1.6	25	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P2: Proposed to South PL



Summary for Subcatchment P3: Flow to Drywell

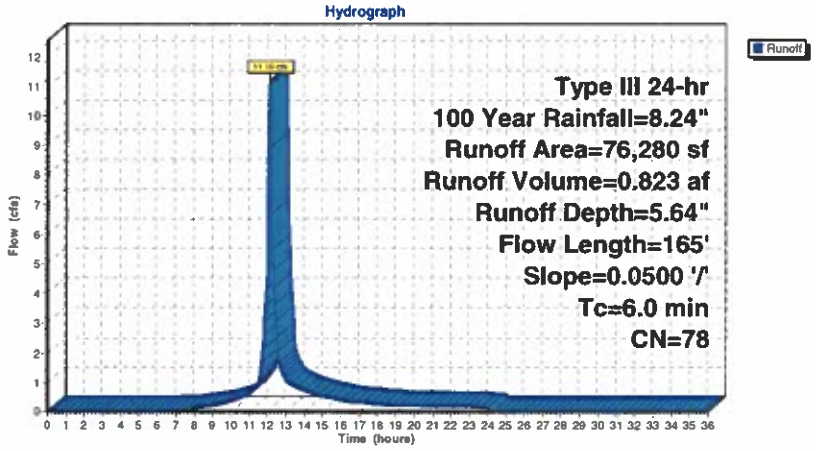
Runoff = 11.19 cfs @ 12.09 hrs, Volume= 0.823 af, Depth= 5.64"
Routed to Pond P8 : Drywell-1

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.24"

Area (sf)	CN	Description
37,635	98	Paved parking, HSG A
12,595	98	Roofs, HSG A
13,750	39	>75% Grass cover, Good, HSG A
11,800	39	>75% Grass cover, Good, HSG A
500	98	Unconnected roofs, HSG A
76,280	78	Weighted Average
25,550		33.50% Pervious Area
50,730		66.50% Impervious Area
500		0.99% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.77		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.37"
0.4	115	0.0500	4.54		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.9	165	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P3: Flow to Drywell



Summary for Subcatchment P4: Runoff to West Union Street

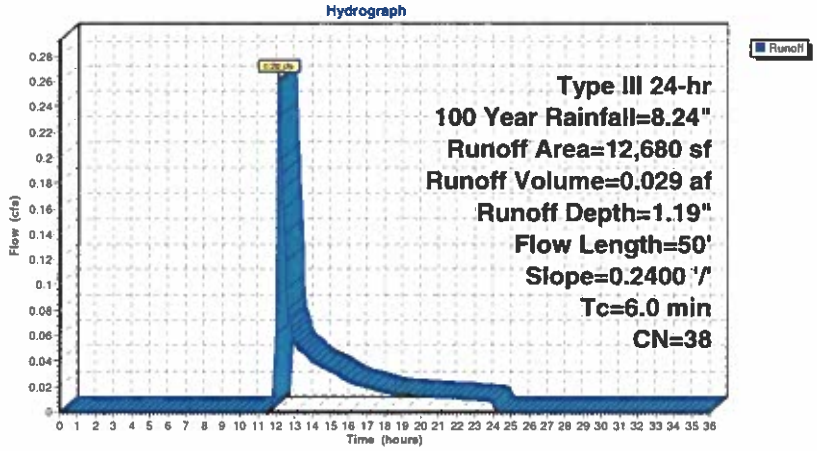
Runoff = 0.26 cfs @ 12.12 hrs, Volume= 0.029 af, Depth= 1.19"
Routed to Reach P10 : Total Proposed To West Union Street

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.24"

Area (sf)	CN	Description
11,680	39	>75% Grass cover, Good, HSG A
1,000	30	Meadow, non-grazed, HSG A
12,680	38	Weighted Average
12,680		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	50	0.2400	0.28		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
3.0	50	Total, Increased to minimum Tc = 6.0 min			

Subcatchment P4: Runoff to West Union Street



Summary for Subcatchment P5: Proposed to Stormwater Basin

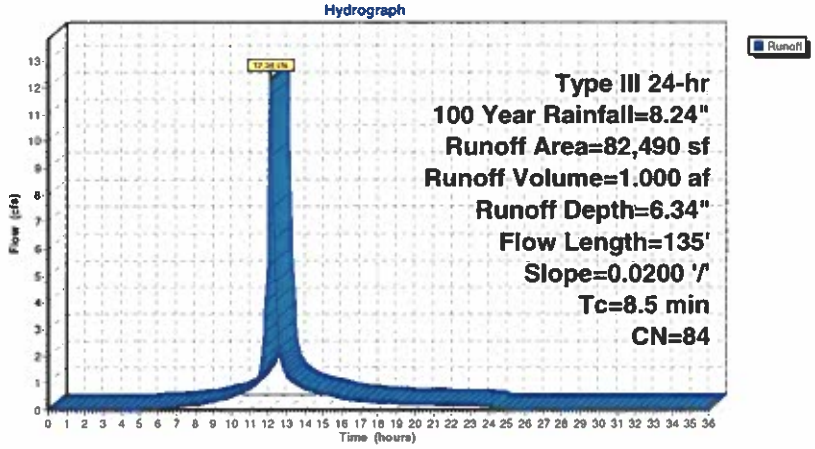
Runoff = 12.34 cfs @ 12.12 hrs, Volume= 1.000 af, Depth= 6.34"
Routed to Pond P9 : Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.24"

Area (sf)	CN	Description
18,320	98	Roofs, HSG A
36,850	98	Paved parking, HSG A
19,420	39	>75% Grass cover, Good, HSG A
7,900	98	Water Surface, HSG A
82,490	84	Weighted Average
19,420		23.54% Pervious Area
63,070		76.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.37"
0.5	85	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
8.5	135	Total			

Subcatchment P5: Proposed to Stormwater Basin



Summary for Subcatchment P6: Runoff to Wetland

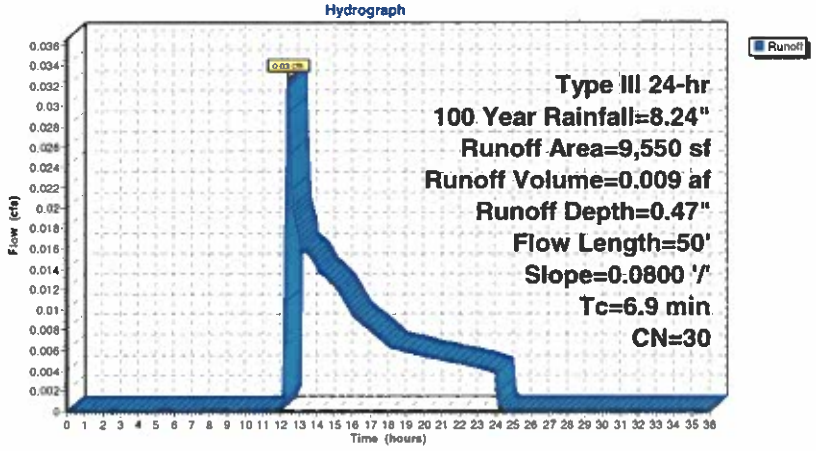
Runoff = 0.03 cfs @ 12.41 hrs, Volume= 0.009 af, Depth= 0.47"
Routed to Reach P11 : Total Proposed to Wetland

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.24"

Area (sf)	CN	Description
5,450	30	Meadow, non-grazed, HSG A
4,100	30	Woods, Good, HSG A
9,550	30	Weighted Average
9,550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.9	50	0.0800	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.37"

Subcatchment P6: Runoff to Wetland

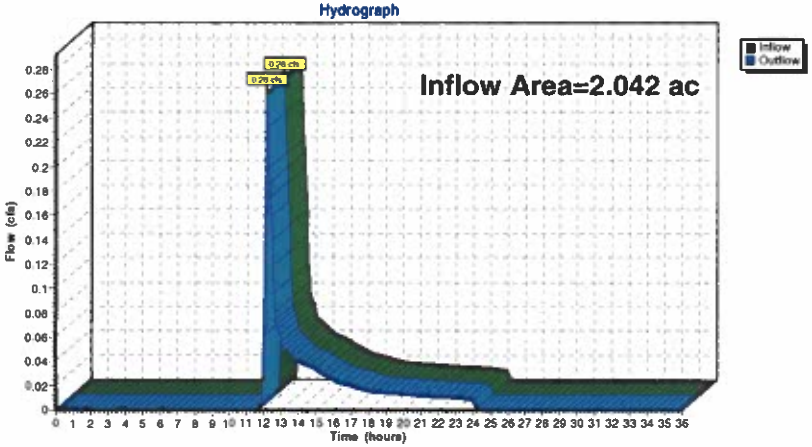


Summary for Reach P10: Total Proposed To West Union Street

Inflow Area = 2.042 ac, 57.03% Impervious, Inflow Depth = 0.17" for 100 Year event
Inflow = 0.26 cfs @ 12.12 hrs, Volume= 0.029 af
Outflow = 0.26 cfs @ 12.12 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach P10: Total Proposed To West Union Street

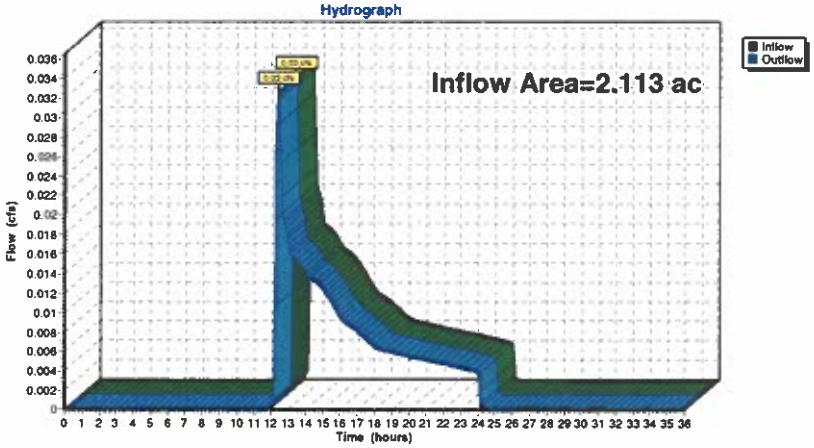


Summary for Reach P11: Total Proposed to Wetland

Inflow Area = 2.113 ac, 68.52% Impervious, Inflow Depth = 0.05" for 100 Year event
Inflow = 0.03 cfs @ 12.41 hrs, Volume= 0.009 af
Outflow = 0.03 cfs @ 12.41 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min
Routed to nonexistent node 1P

Routing by Stor-Ind+Trans method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Reach P11: Total Proposed to Wetland



Summary for Pond P8: Drywell-1

Inflow Area = 1.751 ac, 66.50% Impervious, Inflow Depth = 5.64" for 100 Year event
Inflow = 11.19 cfs @ 12.09 hrs, Volume= 0.823 af
Outflow = 0.81 cfs @ 13.54 hrs, Volume= 0.823 af, Atten= 93%, Lag= 86.9 min
Discarded = 0.81 cfs @ 13.54 hrs, Volume= 0.823 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach P10 : Total Proposed To West Union Street

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 237.84' @ 13.54 hrs Surf.Area= 7,850 sf Storage= 16,387 cf

Plug-Flow detention time= 210.2 min calculated for 0.822 af (100% of inflow)
Center-of-Mass det. time= 210.0 min (1,015.8 - 805.8)

Volume	Invert	Avail.Storage	Storage Description
#1	235.00'	4,545 cf	**Custom Stage Data (Conic)** Listed below (Recalc) 31,400 cf Overall - 20,036 cf Embedded = 11,364 cf x 40.0% Voids
#2	235.50'	14,662 cf	**Shea Dry Well 1000gal** x 114 Inside #1 Inside= 62.0"W x 30.0"H => 12.86 sf x 10.00'L = 128.6 cf Outside= 68.0"W x 36.0"H => 16.74 sf x 10.50'L = 175.8 cf
		19,207 cf	Total Available Storage

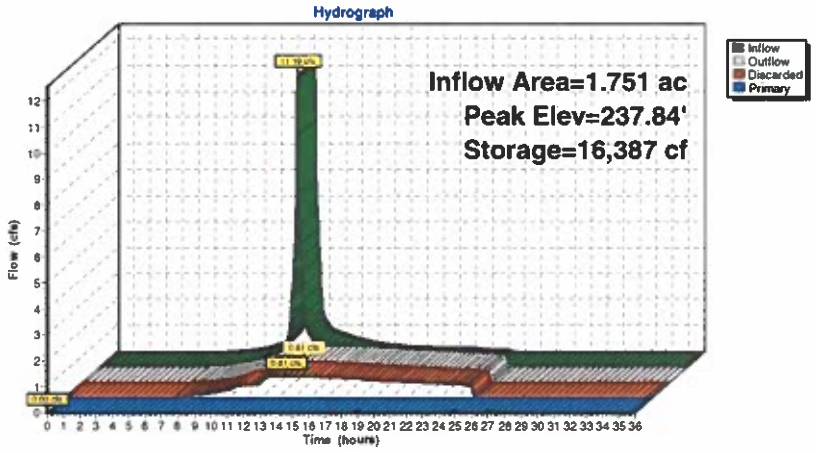
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
235.00	7,850	0	0	7,850
239.00	7,850	31,400	31,400	9,106

Device	Routing	Invert	Outlet Devices
#1	Discarded	235.00'	**2.410 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 231.00'
#2	Primary	238.20'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)

Discarded OutFlow Max=0.81 cfs @ 13.54 hrs HW=237.84' (Free Discharge)
↳**1=Exfiltration** (Controls 0.81 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=235.00' (Free Discharge)
↳**2=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond P8: Drywell-1



Summary for Pond P9: Basin

Inflow Area = 1.894 ac, 76.46% Impervious, Inflow Depth = 6.34" for 100 Year event
Inflow = 12.34 cfs @ 12.12 hrs, Volume= 1.000 af
Outflow = 0.75 cfs @ 14.09 hrs, Volume= 1.000 af, Atten= 94%, Lag= 118.1 min
Discarded = 0.75 cfs @ 14.09 hrs, Volume= 1.000 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Reach P11 : Total Proposed to Wetland

Routing by Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 250.49' @ 14.09 hrs Surf.Area= 8,241 sf Storage= 24,484 cf

Plug-Flow detention time= 402.7 min calculated for 0.999 af (100% of inflow)
Center-of-Mass det. time= 403.0 min (1,197.1 - 794.1)

Volume	Invert	Avail.Storage	Storage Description
#1	246.00'	38,192 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

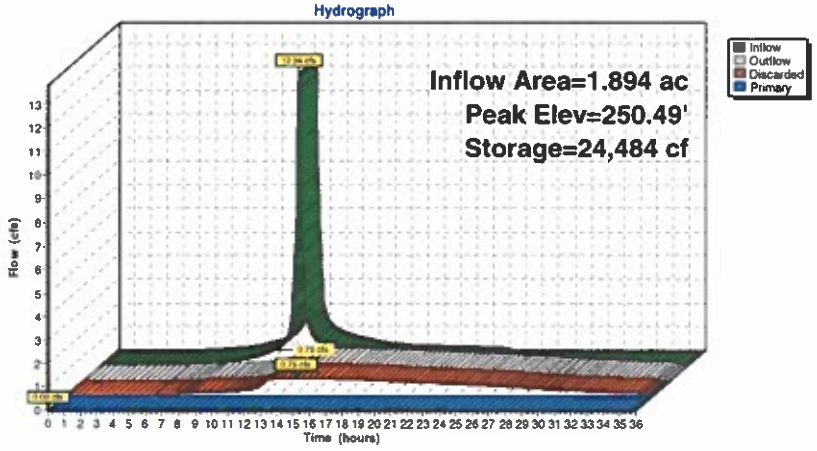
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
246.00	2,000	0	0	2,000
248.00	5,600	7,298	7,298	5,625
250.00	7,700	13,244	20,542	7,803
252.00	10,000	17,650	38,192	10,197

Device	Routing	Invert	Outlet Devices
#1	Discarded	246.00'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 242.00'
#2	Primary	250.50'	**10.0' long + 3.0 '/' SideZ x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Primary	250.50'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.75 cfs @ 14.09 hrs HW=250.49' (Free Discharge)
└**1=Exfiltration** (Controls 0.75 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=246.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond P9: Basin



STORMWATER OPERATIONS & MAINTENANCE PLAN

Stormwater Operations and Management Plan & Long-term Pollution Prevention Program

June 25, 2025

55 West Union Street
Ashland, MA

Stormwater Management System Owner and Responsible Party

Name:_____

Address: _____

Signature:_____

Title:_____

This Operation and Maintenance Plan has been prepared in accordance with the MA Department of Environmental Protection stormwater standards and recommendations outlined in the stormwater handbook. This plan outlines the minimum efforts necessary to ensure that the stormwater collection and treatment system and sedimentation and erosion control system for this site operates in accordance with Massachusetts Department of Environmental Protection (DEP) stormwater management policy. Efforts in addition to the minimum listed herein may be required to ensure adequate stormwater management.

General Conditions:

- The Town shall be notified prior to any work performed on the Stormwater System and shall be afforded the opportunity to inspect the work.
- Discharge of any material other that stormwater to the stormwater system is not permitted.
- Herbicides, pesticides and fertilizers shall be used as minimally as possible and always in accordance with manufacture's recommendations and federal law.
- All fertilizers shall be used sparingly and shall be low Phosphorus & Nitrogen.
- All future Owners shall be notified of the O&M requirements outlined herein, and the Town shall be notified of any ownership change.
- Uncovered and/or uncontained road de-icing materials shall not be stored on-site.
- All material removed from the drainage system (i.e. catch basin cleanings) shall be legally disposed of off-site.

Operation and Maintenance:

For the first year of operation, inspections shall occur quarterly. After that initial period, all stormwater management facilities should be inspected per the attached inspection schedule, with at least one inspection following a measurable storm (1/2-inch or greater). Upon completion of inspection, the inspector should specify any necessary corrective actions to be taken by ownership of the facility. The items to be inspected and maintained are described in the following sections.

Based on the observed conditions, the Responsible Party shall immediately schedule the appropriate maintenance. Some minor maintenance, such as the removal of blockages, debris and saplings in the basins may be conducted at the time of the inspection. More difficult maintenance activities, requiring special equipment, will have to be scheduled, such as the removal of excessive sediment or the repair of eroded areas. All sediment must be removed at least once per year.

Catch Basins and Water Quality Structures (Stormceptor)

The actual removal of sediments and associated pollutants and trash occurs only when sumps are cleaned out; therefore, regular maintenance is required. The more frequent the cleaning, the less likely sediments will be resuspended and subsequently discharged. Frequent cleaning also results in more volume available for future storms and enhances the overall performance.

At a minimum, structures should be inspected four times annually, and cleaned whenever sediment accumulation exceeds 24-inches within catch basins and 8-inches within water quality structures. Disposal of the accumulated sediment and hydrocarbons must be in accordance with applicable local, state, and federal guidelines and regulations. At each inspection, inspect gas trap hoods and repair as necessary. Inspect outlet pipe and remove debris. Vacuum trucks shall be utilized for cleaning and maintenance.

See Attached Manufacturer's O&M Manual and Recommendations.

Infiltration Basin

Infiltration basins shall be inspected at least twice annually. The inspector shall visually inspect the basin, noting each of the items listed below (Vegetation, Dewatering, Inlets, Outlets and Structural Stability). If any of the items are in need of attention, it shall be noted and the proper remedial action initiated, as described below, as soon as possible. At a minimum of twice per year, mow the buffer area, side slopes, and basin bottom. If grassed floor; rake if stone bottom; remove trash and debris; remove grass clippings and accumulated organic matter.

The inspector shall visit the site within three days after the rainfall of a major storm has ended to ensure that the facility has drained to the appropriate level. If significant water remains ponded in the system three (3) days after the latest rainfall, sediment removal/blockage removal activities shall be investigated and/or performed and a qualified engineer shall be consulted for recommendations.

The embankment and side slopes of the detention basins should exhibit no visible signs of erosion, settlement, slope failure, wildlife damage, or vehicle damage. Damaged side slopes should be repaired using similar fill of adequate permeability. Damaged embankments should be filled and compacted with impermeable soils to prevent seepage. Eroded areas should be reseeded as discussed under "vegetation". Repeated repairs to side slopes may necessitate the flattening of the slopes to ensure structural stability. Signs of vehicle damage may necessitate the construction of fences around certain areas.

Vegetation should be dense (and aesthetically acceptable on all portions of the device, including the side slopes, basin floor, buffer strips and the embankments. The inspector shall determine: (1) whether fertilizing is required (2) the areas where grass should be mowed, and (3) the areas which should be protected against erosion. In addition, recently seeded areas should be inspected for failures. Grasses of the fescue family can be mowed a minimum of twice per year, in July and late September. In addition to grass maintenance, any other vegetation in the basin area or access areas which has reached nuisance levels, (e.g., bushes, trees and weeds) should be trimmed or removed.

Repairs to damaged or deteriorating structures shall be made as soon as possible. Materials that cannot be adequately repaired, must be replaced.

Drywells

The inspector shall inspect the system at least two times annually, with at least one inspection after a measurable rain event. Each of the items listed below should be noted (Dewatering, Inlets, Outlets and Structural Stability). If any of the items are in need of attention, it shall be noted and the proper remedial action initiated, as soon as possible.

The inspector shall inspect the system through the manhole covers to check for sediment/debris and dewatering. If sediment is present and the infiltration system does not drain within 72 hours of the end of a storm, then remediation may be necessary and a qualified engineer should be contacted for recommendations. It may be possible to flood the system to suspend sediment and debris and remove it with a vacuum truck. Otherwise, replacement of the system may be required. The surface conditions over the system should be observed for signs of settlement. If settlement is observed the condition should be reported to the Engineer for review. The overflow / outlet structure should be checked for signs of repeated overflow.

Roof gutters (if present) should be cleaned at least twice annually (and whenever debris is noted) to help prevent debris from clogging the collection system and from entering the drywell. More frequent cleaning and reduction of debris entering the drywell will extend the lifespan of the system. It should be noted that there should be little to no sediment accumulation within the drywell.

Site Vegetation

Initial vegetation inspection shall occur four (4) weeks after final stabilization of the site; vegetation shall be dense (and aesthetically acceptable on all portions of the project, including the side slopes, buffer strips and the embankments). The inspector shall determine and document: (1) whether fertilizing is required (2) the areas where grass shall be mowed, and (3) the areas which shall be protected against erosion. In addition, recently seeded areas shall be inspected for failures.

Eroded areas shall be filled and compacted, if necessary, and reseeded as soon as possible. If an area erodes twice, then a geotextile fabric is to be installed to stabilize the area to allow vegetation to be established. These maintenance activities shall take place during the planting season. Areas of repeated erosion/scour problems shall be lined with riprap only after attempting to stabilize the area with geotextile fabric.

Street Sweeping

Street sweeping of the roadway should be performed at least twice per year, preferably in the spring after the snow has melted and, in the fall, prior to snowfall. Disposal of the sweepings must be in accordance with applicable local, state, and federal guidelines and regulations.

Snow Removal

Snow shall not be plowed toward the wetland areas or the infiltration basins. All catch basins and flow paths shall be uncovered and functional immediately after snow plowing.

Operation and Maintenance Schedule:

For the first year of operation, inspections shall occur quarterly. After that period the following schedule shall be followed:

Activity	Frequency
Perform Inspection of Catch Basins and Water Quality Structures (Stormceptors)	Four times per year
Perform Inspection of Entire System	Two times per year
Clean Catch Basins & Water Quality Structures	Minimum once per year or when sediment reaches 24 inches in catch basins or 8 inches in water quality structures.
Remove Accumulated Sediment at pipe inlets to Infiltration basin	Whenever sediment reaches a depth two (2) incher.
Maintain Infiltration Basin	Mow minimum twice per year (July and September) & remove grass clippings Clean sediment as required.
Street Sweeping	Minimum twice per year (spring and fall)

Reporting and Record Keeping

The responsible party will be responsible for maintaining accurate Maintenance Logs for all maintenance and inspections. The maintenance logs shall be kept on site for a minimum of three (3) years and be available for inspection by the Town municipal departments or other auditing authority, including inspections, repairs, replacement and disposal (for disposal, the log shall indicate the type of material and the disposal location). This will be a perpetual requirement of the Owners or their Designated Party.

The Site Maintenance Log will be completed as described above, and at a minimum will include the following items:

- Date activity performed;
- Last rain event;
- BMP's inspected and condition;
- Specific maintenance task;
- Staff or contractor performing activity;
- Verification of maintenance activity;
- For disposal include type of material and the disposal location; and
- Recommended additional maintenance tasks.

Easements – Easements are not required or proposed for the stormwater management system. The site does contain slope and drainage easements extending off of Memorial Drive, and a cross country sewer easement.

Public Safety – The responsible party should ensure all manhole covers and grates are installed and property situated, and maintain the fencing around the surface infiltration basin. Any access gates to the basin should also be property secured.

Spill Control Practices – Any spills of gas/oil or other hazardous materials shall be contained and cleaned up immediately. If appropriate, the Massachusetts Department of Environmental Protection (DEP) shall be notified.

In the event that hazardous material, gasoline or other petroleum is released, the following procedure should be followed:

1. Immediately contact the following agencies:
   Ashland Fire Department (508) 881-2323
   MassDEP Emergency Response (888) 304-1133

2. Provide support to agencies listed above, which may include contacting an outside contractor to provide clean-up or contacting a Licensed Site Professional (LSP) to lead the clean-up.

If the volume of spill has reached the drainage system, the structures should be cleaned by a licensed liquid waste hauler. The outlet to the drainage system should be inspected. If there is evidence of discharge from the drainage system or it has reached downgradient areas, additional corrective actions may be required extending to the receiving water or beyond.

The reportable limits on other chemicals can be found on the MassDEP website at http://eeaonline.eea.state.ma.us/DEP/MOMHL/hazmat.aspx

MAINTENANCE INSPECTION LOG FORM
55 West Union Street
Ashland, MA

Contractor _____ Date _____

OPERATION	Inspected	Cleaning / Maintenance required
1. Inspect Catch Basins & Inlets	_____	_____
2. Inspect Water Quality Structures (5)	_____	_____
3. Inspect Drywells	_____	_____
4. Inspect Drain Outlets	_____	_____
5. Inspect Infiltration Basins	_____	_____
6. Inspect for signs of drain line blockage	_____	_____
7. Inspect Pavement on-site	_____	_____
8. Inspect Vegetation on site	_____	_____

COMMENTS / MAINTENANCE REQUIRED: _____

CONTECH
ENGINEERED SOLUTIONS

Stormceptor® STC
Owner's Manual

Stormceptor® STC

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Stormceptor Operation and Components 2

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Recommended Stormceptor Inspection Procedure

Recommended Stormceptor Maintenance Procedure

Contact Information 5

For patent information, go to www.ContechES.com/ip.

Your selection of a Stormceptor® means that you have chosen the most recognized and efficient stormwater oil/sediment separator available for protecting the environment. Stormceptor is a pollution control device often referred to as a "Hydrodynamic Separator (HDS)" or an "Oil Grit Separator (OGS)", engineered to remove and retain pollutants from stormwater runoff to protect our lakes, rivers and streams from the harmful effects of non-point source pollution.

1 – Stormceptor Overview

Stormceptor is a patented stormwater quality structure most often utilized as a treatment component of the underground storm drain network for stormwater pollution prevention. Stormceptor is designed to remove sediment, total suspended solids (TSS), other pollutants attached to sediment, hydrocarbons and free oil from stormwater runoff. Collectively the Stormceptor provides spill protection and prevents non-point source pollution from entering downstream waterways.

Key benefits of Stormceptor include:

- Removes sediment, suspended solids, debris, nutrients, heavy metals, and hydrocarbons (oil and grease) from runoff and snowmelt.
- Will not scour or re-suspend trapped pollutants.
- Provides sediment and oil storage.
- Provides spill control for accidents, commercial and industrial developments.
- Easy to inspect and maintain (vacuum truck).
- "STORMCEPTOR" is clearly marked on the access cover (excluding inlet designs).
- Relatively small footprint.
- 3rd Party tested and independently verified.
- Dedicated team of experts available to provide support.

Model Types:

- STC (Standard)
- EOS (Extended Oil Storage)
- OSR (Oil and Sand Removal)
- MAX (Custom designed unit, specific to site)

Configuration Types:

- Inlet unit (accommodates inlet flow entry, and multi-pipe entry)
- In-Line (accommodates multi-pipe entry)
- Submerged Unit (accommodates the site's tailwater conditions)
- Series Unit (combines treatment in two systems)

PLEASE MAINTAIN YOUR STORMCEPTOR

To ensure long-term environmental protection through continued performance as originally designed for your site, Stormceptor must be maintained, as any stormwater treatment practice does. The need for maintenance is determined through inspection of the Stormceptor. Procedures for inspection are provided within this document. Maintenance of the Stormceptor is performed from the surface via vacuum truck.

If you require information about Stormceptor, or assistance in finding resources to facilitate inspections or maintenance of your Stormceptor please call Contech at 1-800-338-1122.

2 – Stormceptor Operation and Components

Stormceptor is a flexibly designed underground stormwater quality treatment device that is unparalleled in its effectiveness for pollutant capture and retention using patented flow separation technology. Stormceptor creates a non-turbulent treatment environment below the insert platform within the system. The insert diverts water into the lower chamber, allowing free oils and debris to rise, and sediment to settle under relatively low velocity conditions. These pollutants are trapped and stored below the insert and protected from large runoff events for later removal during the maintenance procedure.

With thousands of units operating worldwide, Stormceptor delivers reliable protection every day, in every storm. The patented Stormceptor design prohibits the scour and release of captured pollutants, ensuring superior water quality treatment and protection during even the most extreme storm events. Stormceptor's proven performance is backed by the longest record of lab and field verification in the industry.

Stormceptor Schematic and Component Functions

Below are schematics of two common Stormceptor configurations with key components identified and their functions briefly described.

- **Manhole access cover** – provides access to the subsurface components
- **Precast reinforced concrete structure** – provides the vessel's watertight structural support
- **Fiberglass insert** – separates vessel into upper and lower chambers
- **Weir** – directs incoming stormwater and oil spills into the lower chamber
- **Orifice plate** – prevents scour of accumulated pollutants
- **Inlet drop tee** – conveys stormwater into the lower chamber
- **Fiberglass skirt** – provides double-wall containment of hydrocarbons
- **Outlet riser pipe** – conveys treated water to the upper chamber; primary vacuum line access port for sediment removal
- **Oil inspection port** – primary access for measuring oil depth and oil removal
- **Safety grate** – safety measure to cover riser pipe in the event of manned entry into vessel

Figure 1.

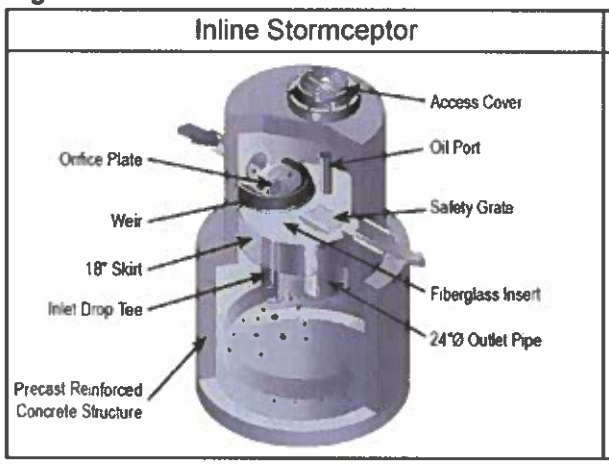
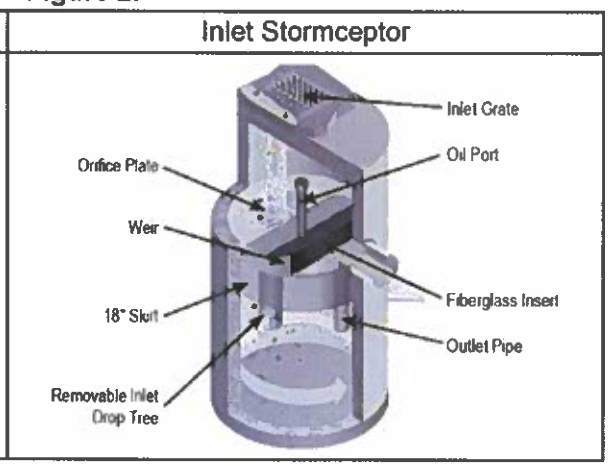


Figure 2.



3 – Stormceptor Identification

Stormceptor is available in both precast concrete and fiberglass vessels, with precast concrete often being the dominant material of construction.

In the Stormceptor, a patented, engineered fiberglass insert separates the structure into an upper chamber and lower chamber. The lower chamber will remain full of water, as this is where the pollutants are sequestered for later removal. Multiple Stormceptor model (STC, OSR, EOS and MAX) configurations exist, each to be inspected and maintained in a similar fashion.

Each unit is easily identifiable as a Stormceptor by the trade name "Stormceptor" embossed on each access cover at the surface. To determine the location of "inlet" Stormceptor units with horizontal catch basin inlet, look down into the grate as the Stormceptor insert will be visible. The name "Stormceptor" is not embossed on inlet models due to the variability of inlet grates used/approved across North America.

Once the location of the Stormceptor is determined, the model number may be identified by comparing the measured depth from the fiberglass insert level at the outlet pipe's invert (water level) to the bottom of the tank using Table 1.

In addition, starting in 1996 a metal serial number tag containing the model number has been affixed to the inside of the unit, on the fiberglass insert. If the unit does not have a serial number, or if there is any uncertainty regarding the size of the unit using depth measurements, please contact your local Contech Representative for assistance.

Sizes/Models

Typical general dimensions and capacities of the standard precast STC, EOS and OSR Stormceptor models are provided in Tables 1 and 2. Typical rim to invert measurements are provided later in this document. The total depth for cleaning will be the sum of the depth from outlet pipe invert (generally the water level) to rim (grade) and the depth from outlet pipe invert to the precast bottom of the unit. Note that depths and capacities may vary slightly between regions.

Table 1. Stormceptor Dimensions - Insert to Base of Structure

STC Model	Insert to Base (in.)
450	60
900	55
1200	71
1800	105
2400	94
3600	134
4800	128
6000	150
7200	134
11000*	128
13000*	150
16000*	134

Notes:
1. Depth Below Pipe Inlet Invert to the Inside Top Base Slab can vary slightly by manufacturing facility, and can be modified to accommodate specific site designs, pollutant loads or site conditions. Contact your local representative for assistance.
**Consist of two chamber structures in series.*

Table 2. Storage Capacities

STC Model	Hydrocarbon Storage Capacity (gal)	Sediment Capacity (ft^3)
450	86	46
900	251	89
1200	251	127
1800	251	207
2400	840	205
3600	840	373
4800	909	543
6000	909	687
7200	1059	839
11000*	2797	1089
13000*	2797	1374
16000*	3055	1677

Notes:
1. Hydrocarbon and Sediment capacities can be modified to accommodate specific site design requirements, contact your local representative for assistance.
**Consist of two chamber structures in series*

4 – Stormceptor Inspection and Maintenance

Regular inspection and maintenance is a proven, cost-effective way to maximize water resource protection for all stormwater pollution control practices, and is required to insure proper functioning of the Stormceptor. Both inspection and maintenance of the Stormceptor is easily performed from the surface. Stormceptor's patented technology has no moving parts, simplifying the inspection and maintenance process.

Please refer to the following information and guidelines before conducting inspection and maintenance activities.

When is inspection needed?

- Post-construction inspection is required prior to putting the Stormceptor into service.
- Routine inspections are recommended during the first year of operation to accurately assess the sediment accumulation.
- Inspection frequency in subsequent years is based on the maintenance plan developed in the first year.
- Inspections should also be performed immediately after oil, fuel, or other chemical spills.

When is maintenance cleaning needed?

- For optimum performance, the unit should be cleaned out once the sediment depth reaches the recommended maintenance sediment depth, which is approximately 15% of the unit's total storage capacity (see Table 3). The frequency should be adjusted based on historical inspection results due to variable site pollutant loading.
- Sediment removal is easier when removed on a regular basis at or prior to the recommended maintenance sediment depths, as sediment build-up can compact making removal more difficult.
- The unit should be cleaned out immediately after an oil, fuel or chemical spill.

What conditions can compromise Stormceptor performance?

- If construction sediment and debris is not removed prior to activating the Stormceptor unit, maintenance frequency may be reduced.
- If the system is not maintained regularly and fills with sediment and debris beyond the capacity as indicated in Table 2, pollutant removal efficiency may be reduced.
- If an oil spill(s) exceeds the oil capacity of the system, subsequent spills may not be captured.
- If debris clogs the inlet of the system, removal efficiency of sediment and hydrocarbons may be reduced.
- If a downstream blockage occurs, a backwater condition may occur for the Stormceptor and removal efficiency of sediment and hydrocarbons may be reduced.

What training is required?

The Stormceptor is to be inspected and maintained by professional vacuum cleaning service providers with experience in the maintenance of underground tanks, sewers and catch basins.

For typical inspection and maintenance activities, no specific supplemental training is required

Recommended Stormceptor Inspection Procedure:

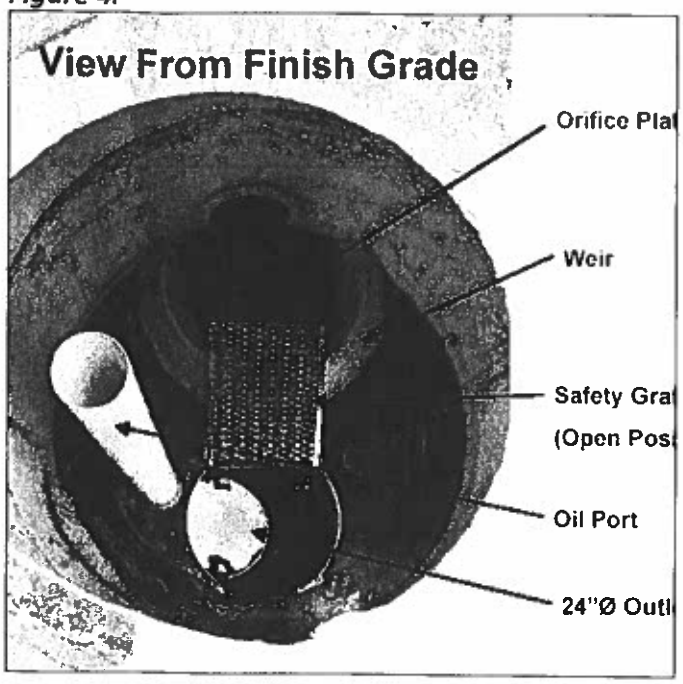
- Stormceptor is to be inspected from grade through a standard surface manhole access cover.
- Sediment and oil depth inspections are performed with a sediment probe and oil dipstick.
- Oil depth is measured through the oil inspection port, either a 4-inch or 6-inch diameter port.
- Sediment depth can be measured through the oil inspection port or the 24-inch diameter outlet riser pipe.
- Inspections also involve a visual inspection of the internal components of the system.

What equipment is typically required for maintenance?

- Vacuum truck equipped with water hose and jet nozzle
- Small pump and tubing for oil removal
- Manhole access cover lifting tool
- Oil dipstick / Sediment probe with ball valve (typically ¾-inch to 1-inch diameter)
- Flashlight
- Camera
- Data log / Inspection Report
- Safety cones
- Hard hats, safety shoes, safety glasses, chemical-resistant gloves, and hearing protection for service providers
- Gas analyzer, respiratory gear, hoist and safety harness for specially trained personnel if confined space entry is required

Figure 3.

Figure 4.



Recommended Stormceptor Maintenance Procedure

Maintenance of Stormceptor is performed using a vacuum truck. No entry into the unit is required for maintenance. DO NOT ENTER THE STORMCEPTOR CHAMBER unless you have the proper personal safety equipment, have been trained and are qualified to enter a confined space, as identified by local Occupational Safety and Health Regulations (e.g. 29 CFR 1910.146). Without the proper equipment, training and permit, entry into confined spaces can result in serious bodily harm and potentially death. Consult local and/or state regulations to determine the requirements for confined space entry. Be aware, and take precaution that the Stormceptor fiberglass insert may be slippery. In addition, be aware that some units do not have a safety grate to cover the outlet riser pipe that leads to the submerged, lower chamber.

- Ideally maintenance should be conducted during dry weather conditions when no flow is entering the unit.
- Stormceptor is to be maintained through a standard surface manhole access cover.
- Insert the oil dipstick into the oil inspection port. If oil is present, pump off the oil layer into separate containment using a small pump and tubing.
- Maintenance cleaning of accumulated sediment is performed with a vacuum truck.
  - » For 6-ft diameter models and larger, the vacuum hose is inserted into the lower chamber via the 24-inch outlet riser pipe (See Fig. 5).
  - » For 4-ft diameter model, the removable drop tee is lifted out, and the vacuum hose is inserted into the lower chamber via the 12-inch drop tee hole (See Fig. 6).

Figure 5.

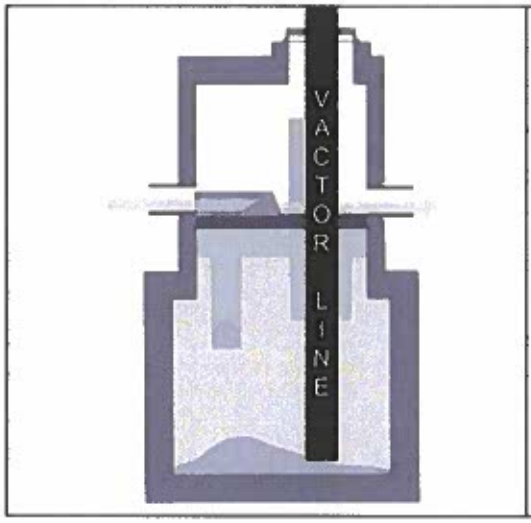
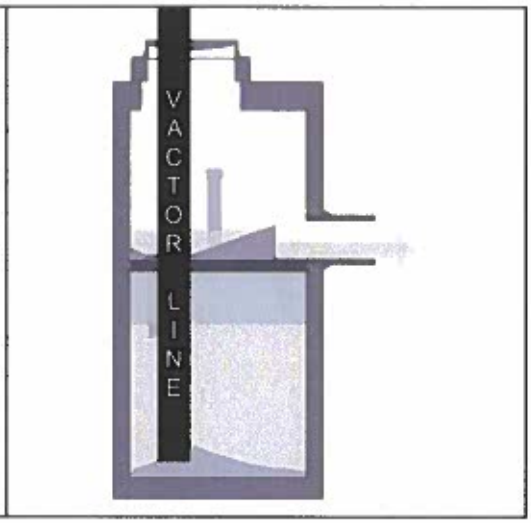


Figure 6.



- Using the vacuum hose, decant the water from the lower chamber into a separate containment tank or to the sanitary sewer, if permitted by the local regulating authority.
- Remove the sediment sludge from the bottom of the unit using the vacuum hose. For large Stormceptor units, a flexible hose is often connected to the primary vacuum line for ease of movement in the lower chamber.
- Units that have not been maintained regularly, have surpassed the maximum recommended sediment capacity, or contain damaged components may require manned entry by trained personnel using safe and proper confined space entry procedures.

What is required for proper disposal?

The requirements for the disposal of material removed from Stormceptor units are similar to that of any other stormwater treatment Best Management Practices (BMP). Local guidelines should be consulted prior to disposal of the separator contents. In most areas the sediment, once dewatered, can be disposed of in a sanitary landfill. It is not anticipated that the sediment would be classified as hazardous waste. This could be site and pollutant dependent. In some cases, approval from the disposal facility operator/agency may be required.

What about oil spills?

Stormceptor is often implemented in areas where there is high potential for oil, fuel or other hydrocarbon or chemical spills. Stormceptor units should be cleaned immediately after a spill occurs by a licensed liquid waste hauler. You should also notify the appropriate regulatory agencies as required in the event of a spill.

What if I see an oil rainbow or sheen at the Stormceptor outlet?

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a hydrocarbon rainbow or sheen can be seen at very small oil concentrations (< 10 ppm). Stormceptor is effective at removing 95% of free oil, and the appearance of a sheen at the outlet with high influent oil concentrations does not mean unit is not working to this level of removal. In addition, if the influent oil is emulsified, the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified or dissolved oil conditions.

What factors affect the costs involved with inspection/maintenance?

The Vacuum Service Industry for stormwater drainage and sewer systems is a well-established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean Stormceptor units will vary. Inspection and maintenance costs are most often based on unit size, the number of units on a site, sediment/oil/hazardous material loads, transportation distances, tipping fees, disposal requirements and other local regulations.

What factors predict maintenance frequency?

Maintenance frequency will vary with the amount of pollution on your site (number of hydrocarbon spills, amount of sediment, site activity and use, etc.). It is recommended that the frequency of maintenance be increased or reduced based on local conditions. If the sediment load is high from an unstable site or sediment loads transported from upstream catchments, maintenance may be required semi-annually. Conversely once a site has stabilized, maintenance may be required less frequently (for example: two to seven year, site and situation dependent). Maintenance should be performed immediately after an oil spill or once the sediment depth in Stormceptor reaches the value specified in Table 3 based on the unit size.

Table 3. Recommended Sediment Depths Indicating Maintenance

STC Model	Maintenance Sediment Depth (in)
450	8
900	8
1200	10
1800	15
2400	12
3600	17
4800	15
6000	18
7200	15
11000*	17
13000*	20
16000*	17

Notes:

1. The values above are for typical standard units.

** Per structure.*

Replacement parts

Since there are no moving parts during operation in a Stormceptor, broken, damaged, or worn parts are not typically encountered. Therefore, inspection and maintenance activities are generally focused on pollutant removal. However, if replacements parts are necessary, they may be purchased by contacting your local Contech Representative or call 800-338-1122.

The benefits of regular inspection and maintenance are many – from ensuring maximum operation efficiency, to keeping maintenance costs low, to the continued protection of natural waterways – and provide the key to Stormceptor's long and effective service life.

Stormceptor Inspection and Maintenance Log

Stormceptor Model No: _____

Allowable Sediment Depth: _____

Serial Number: _____

Installation Date: _____

Location Description of Unit: _____

Other Comments: _____

5 – Contact Information

Questions regarding the Stormceptor can be addressed by contacting your local Contech representative or by calling 800-338-1122.

SUPPORT

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

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

CONTECH ENGINEERED SOLUTIONS
800-925-5240
www.ContechES.com

WATER QUALITY STRUCTURE SIZING MODEL

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	7/30/2025
Project Name	Ashland 40B
Project Number	1
Location	West Union

Designer Information

Company	csei
Contact	v

Notes

STC-1

Drainage Area

Total Area (ac)	0.26
Imperviousness (%)	50

The Stormceptor System model STC 450i achieves the water quality objective removing 90% TSS for a NJDEP (clay, silt, sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.16 cfs.

Rainfall

Name	WORCESTER WSO AP
State	MA
ID	9923
Years of Records	1948 to 2005
Latitude	42°16'2"N
Longitude	71°52'34"W

Water Quality Objective

TSS Removal (%)	80
WQ Flow Rate (cfs)	0.16

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	90
STC 900	94
STC 1200	94
STC 1800	94
STC 2400	96
STC 3600	96
STC 4800	97
STC 6000	97
STC 7200	98
STC 11000	98
STC 13000	98
STC 16000	99

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	7/30/2025
Project Name	Ashland 40B
Project Number	1
Location	West Union

Designer Information

Company	csei
Contact	v

Notes

STC-2

Drainage Area

Total Area (ac)	0.37
Imperviousness (%)	100

The Stormceptor System model STC 450i achieves the water quality objective removing 82% TSS for a NJDEP (clay, silt, sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.46 cfs.

Rainfall

Name	WORCESTER WSO AP
State	MA
ID	9923
Years of Records	1948 to 2005
Latitude	42°16'2"N
Longitude	71°52'34"W

Water Quality Objective

TSS Removal (%)	80
WQ Flow Rate (cfs)	0.46

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	82
STC 900	89
STC 1200	89
STC 1800	89
STC 2400	91
STC 3600	92
STC 4800	94
STC 6000	94
STC 7200	95
STC 11000	97
STC 13000	97
STC 16000	97

Stormceptor®

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	7/30/2025
Project Name	Ashland 40B
Project Number	1
Location	West Union

Designer Information

Company	csei
Contact	v

Notes

STC-3

Drainage Area

Total Area (ac)	0.81
Imperviousness (%)	45

The Stormceptor System model STC 450i achieves the water quality objective removing 82% TSS for a NJDEP (clay, silt, sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.44 cfs.

Rainfall

Name	WORCESTER WSO AP
State	MA
ID	9923
Years of Records	1948 to 2005
Latitude	42°16'2"N
Longitude	71°52'34"W

Water Quality Objective

TSS Removal (%)	80
WQ Flow Rate (cfs)	0.44

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	82
STC 900	88
STC 1200	88
STC 1800	89
STC 2400	91
STC 3600	92
STC 4800	94
STC 6000	94
STC 7200	95
STC 11000	97
STC 13000	97
STC 16000	97

Rinker MATERIALS™

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	7/30/2025
Project Name	Ashland 40B
Project Number	1
Location	West Union

Designer Information

Company	csei
Contact	v

Notes

STC-4

Drainage Area

Total Area (ac)	0.72
Imperviousness (%)	70

The Stormceptor System model STC 900 achieves the water quality objective removing 86% TSS for a NJDEP (clay, silt, sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.63 cfs.

Rainfall

Name	WORCESTER WSO AP
State	MA
ID	9923
Years of Records	1948 to 2005
Latitude	42°16'2"N
Longitude	71°52'34"W

Water Quality Objective

TSS Removal (%)	80
WQ Flow Rate (cfs)	0.63

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	79
STC 900	86
STC 1200	86
STC 1800	86
STC 2400	89
STC 3600	90
STC 4800	92
STC 6000	92
STC 7200	94
STC 11000	96
STC 13000	96
STC 16000	97

Stormceptor®

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	7/30/2025
Project Name	Ashland 40B
Project Number	1
Location	West Union

Designer Information

Company	csei
Contact	v

Notes

STC-5

Drainage Area

Total Area (ac)	0.34
Imperviousness (%)	100

The Stormceptor System model STC 450i achieves the water quality objective removing 83% TSS for a NJDEP (clay, silt, sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.42 cfs.

Rainfall

Name	WORCESTER WSO AP
State	MA
ID	9923
Years of Records	1948 to 2005
Latitude	42°16'2"N
Longitude	71°52'34"W

Water Quality Objective

TSS Removal (%)	80
WQ Flow Rate (cfs)	0.42

Upstream Storage

Storage (ac-ft)	Discharge (cfs)
0	0

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	83
STC 900	89
STC 1200	89
STC 1800	89
STC 2400	92
STC 3600	92
STC 4800	94
STC 6000	94
STC 7200	95
STC 11000	97
STC 13000	97
STC 16000	98

Rinker MATERIALS™

Stormceptor®

Particle Size Distribution

Removing silt particles from runoff ensures that the majority of the pollutants, such as hydrocarbons and heavy metals that adhere to fine particles, are not discharged into our natural water courses. The table below lists the particle size distribution used to define the annual TSS removal.

NJDEP (clay, silt, sand)

Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s		Particle Size µm	Distribution %	Specific Gravity	Settling Velocity ft/s
1	5	2.65	0.0012					
4	15	2.65	0.0012					
29	25	2.65	0.0025					
75	15	2.65	0.0133					
175	30	2.65	0.0619					
375	5	2.65	0.1953					
750	5	2.65	0.4266					

Stormceptor Design Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal.
- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.
- Inlet and outlet invert elevation differences are as follows:

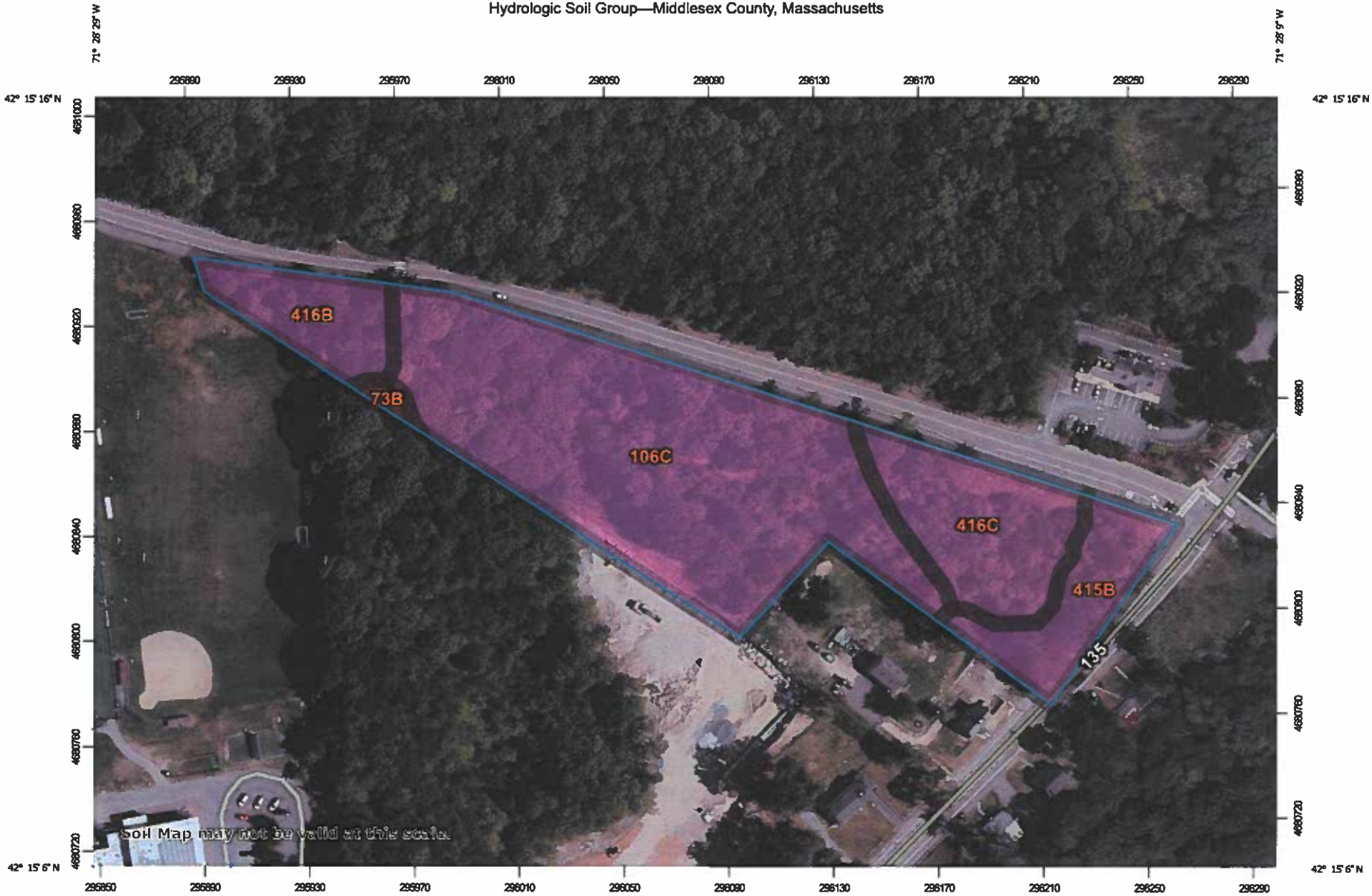
Inlet and Outlet Pipe Invert Elevations Differences

Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in.	1 in.	3 in.
Multiple inlet pipes	3 in.	3 in.	Only one inlet pipe.

- Design estimates are based on stable site conditions only, after construction is completed.
- Design estimates assume that the storm drain is not submerged during zero flows. For submerged applications, please contact your local Stormceptor representative.
- Design estimates may be modified for specific spills controls. Please contact your local Stormceptor representative for further assistance.
- For pricing inquiries or assistance, please contact Rinker Materials 1 (800) 909-7763 www.rinkerstormceptor.com

Rinker MATERIALS™

NRCS SOILS MAPPING



Map Scale: 1:2,060 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

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

MAP LEGEND

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

Soils

Soil Rating Polygons
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points
- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
73B	Whitman fine sandy loam, 0 to 3 percent slopes, extremely stony	D	0.0	0.8%
106C	Narragansett-Hollis-Rock outcrop complex, 3 to 15 percent slopes	A	3.4	61.8%
415B	Narragansett silt loam, 3 to 8 percent slopes	A	0.6	10.8%
416B	Narragansett silt loam, 3 to 8 percent slopes, very stony	A	0.5	9.6%
416C	Narragansett silt loam, 8 to 15 percent slopes, very stony	A	0.9	17.0%
Totals for Area of Interest			**5.5**	**100.0%**