STORMWATER REPORT

FOR

R.J. Devereaux Corp.
Proposed Site Plan
200 Bartlett Street
Northborough, MA

November 23, 2021

PREPARED FOR:
R.J. Devereaux Corp.

PREPARED BY:
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PROJECT NARRATIVE

200 Bartlett Street
Northborough MA 01532

Connorstone Engineering, Inc.
November 23, 2021

Site Location

The subject site consists of a 6.7 acre parcel of land located at 200 Bartlett Street in the Town of Northborough, MA. The site is shown on assessor's map 66 as parcel 7, and is within the Industrial Zoning District and Groundwater Overlay Districts, Area 1 and 3.

Existing Conditions

The existing site is currently developed with three primary buildings and two outbuildings along with associated parking, driveways, utilities, etc. The buildings were constructed at various times all prior to 1986. Two of the larger buildings closest to Bartlett Street are currently unoccupied and the rear building is occupied by an Auto repair garage. The rear southeast corner of the site is undeveloped. The existing conditions currently include 79,795 square feet of impervious surfaces. The existing structures are serviced by Town water and three on-site septic systems.

Wetland resource areas on-site include bordering vegetated wetlands along the southern property line. The wetlands were delineated by Three Oaks Environmental in the fall of 2019 and updated in February of 2020. The wetlands are bordering on an intermittent stream that flows from east to west through a culvert under Lyman Street and ultimately to Bartlett Pond. This stream is shown on the USGS maps as a heavy blue line, but was determined to be intermittent during the ANRAD process of the downgradient project at 1 Lyman Street. The intermittent stream also has areas associated with the 100 year flood hazard as shown on the Town of Northborough Flood Insurance Rate Map 25027C0653F, dated July 16, 2014. The mapping has shown the area as Zone A, which does not have an assigned based flood elevation. The Zone A boundary generally follows the elevation 275 contour line and is fully contained offsite. The Natural Heritage and Endangered Species Program (NHESP) have not identified any areas on-site as lying within the reported Priority or Estimated Habitat Areas.

The Natural Resource Conservation Service has mapped the soils within the site as Merrimac soils, which are all well drained sandy soils classified as hydrologic soil group A. Soils within the wetland areas was mapped as Freetown Muck. The mapping agrees with the soil testing performed on-site by Connorstone for design of the on-site septic system and drainage system. The mapping is attached and the soil test results are provided on the plans. The testing showed highly permeable sandy soil with groundwater varying from 64 to 48 inches below grade.

Proposed Work

The proposed plan includes renovation of the two main structures closest to Bartlett Street and removal of one of the outbuildings. The building to the East side of the site will be primarily utilized for maintenance and the other building to the west will be used for training and dry storage. The rear auto repair garage and outbuilding will remain in the current condition. The overall use of the site will be for a Contractor's Yard. Work will also include new parking and driveway access, a new septic system to replace the older failed system(s), a new stormwater management system that will include upgrades to the existing areas around the auto repair shop, site Landscaping, lighting, and related site work. The overall proposed impervious area will be 137,920 square feet (or an increase of 58,125 sq. ft.)

The proposed driveway and parking layout will provide access through the site and around the rear of the maintenance building. The layout will allow for full access to emergency and firefighting apparatus. The existing loading docks at the buildings would be maintained for the proposed use. The site grading has been designed to fit with the existing topography sloping down away from Bartlett Street, which will reduce the required fill on-site.

The building will be connected Town water and be serviced by a proposed on-site septic system. All required soil testing witnessed by the Board of Health has been performed to verify the design and adequacy of the proposed septic system.

Stormwater Management

Under the existing conditions, stormwater flows overland to the rear wetlands with no pretreatment or detention. There is also a small area to the front of the Maintenance Building that flows to a culvert under Bartlett Street. The proposed plan has been designed to provide increased groundwater recharge, treatment of all existing and proposed paved surfaces, and reduce the peak rate of runoff leaving the site.

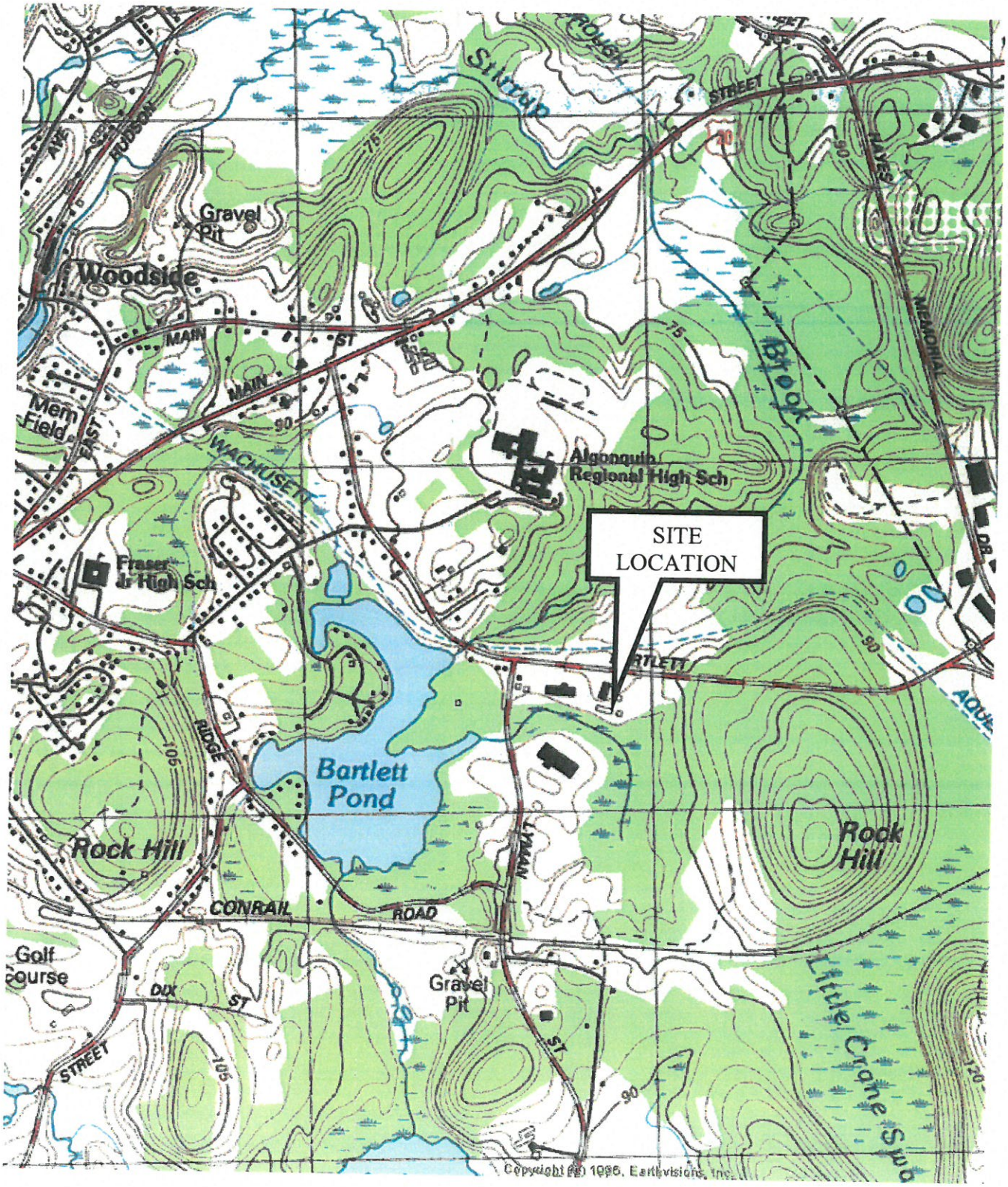
The proposed development will increase the site impervious area by 58,125 sq. ft.. In order to mitigate the runoff from the increased impervious area three infiltration structures have been proposed. These include two subsurface drywells and one surface infiltration basin. Soil testing has been performed in the BMP locations to verify suitable soil conditions and separation to groundwater.

All paved surfaces will be treated prior to discharge with Water Quality Structures (Stormceptor), which will provide both oil/gas separation and sediment removal. Within the new development areas additional treatment will also be provided with deep sump catch basins and infiltration BMPs'. This system will remove 96% of the annual total suspended solids and 60-70% of the phosphorus load.

The redevelopment areas at the existing auto garage will provide a significant improvement with the use of Water Quality Structures (Stormceptor), which will provide both oil/gas separation and sediment removal where none exists today.

The proposed site has been designed to meet the Massachusetts Stormwater Standards and the Northborough Land Disturbance Bylaw. Additional description of the standards is provided later in this report.

LOCUS MAPPING



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.

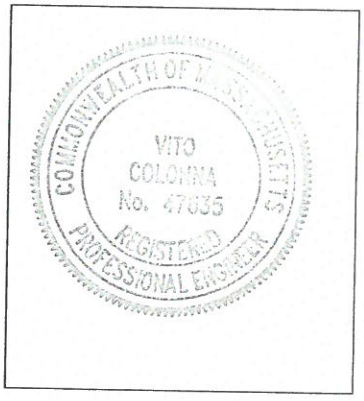
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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



11-23-21

Signature and Date

Checklist

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

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

Checklist for Stormwater Report

Checklist (continued)

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

- [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 Drains

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)

- [x] The BMP is sized (and calculations provided) based on:
  - [x] The ½" or 1" Water Quality Volume or
  - [x] The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- [x] 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.
- [x] 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

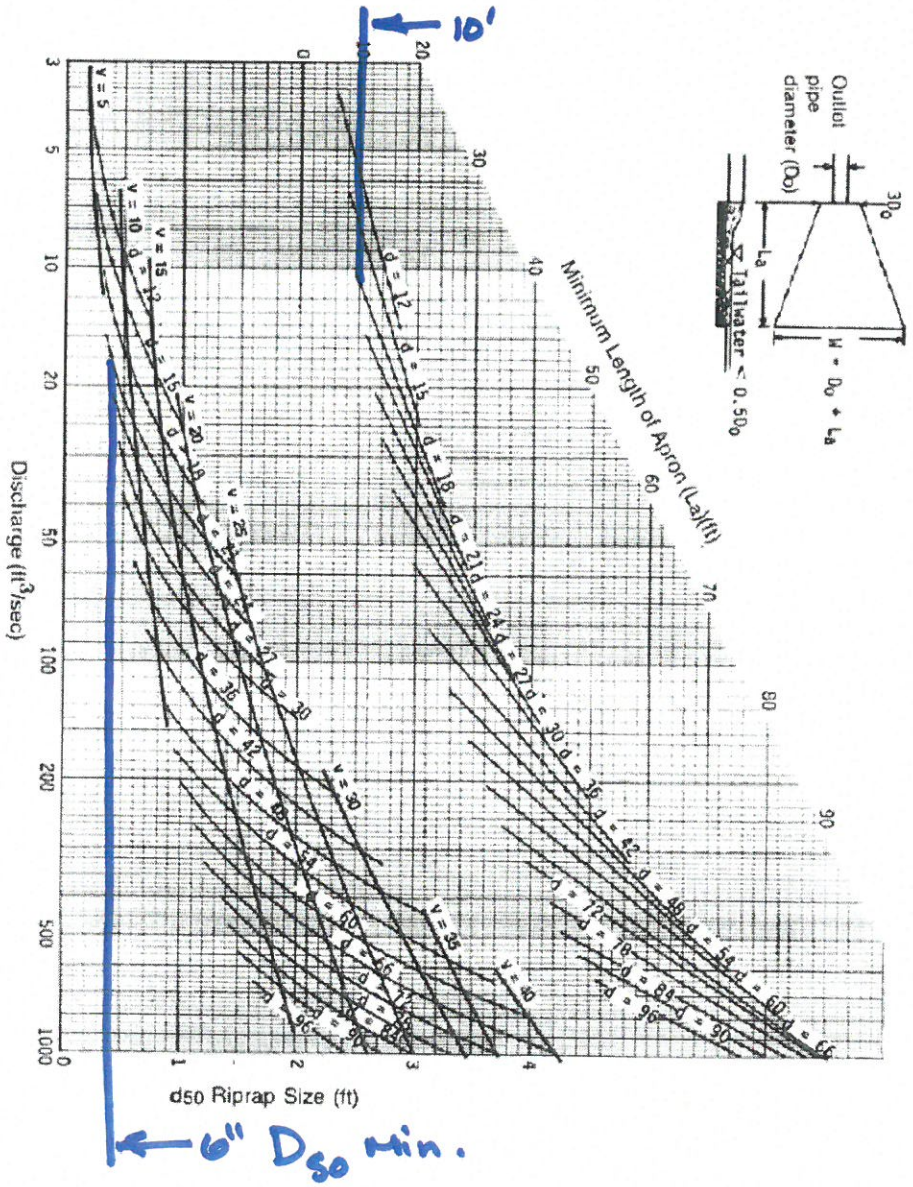
Standard 1: No New Untreated Discharges

There are no new untreated discharges to any areas subject to protection or the 100 foot buffer zone.

Pipe Point Discharge Design:

1. Stormwater Discharge Velocity:
   18" FE: $Q_{Full\ Fflow}$= 11.4 cfs / $V_{Full\ Flow}$= 6.5 fps (1% slope)
   12" FE: $Q_{Full\ Fflow}$= 5.5 cfs / $V_{Full\ Flow}$= 6.9 fps (2% slope)

2. Riprap sizing: Use: Riprap Size = 6" D_{50}
   Length= = 10 feet



Standard 2: Peak Rate Attenuation

The proposed Stormwater management system has been designed so that the post-development peak discharge rates and volumes do not exceed pre-development levels. The Hydrologic Model output has been attached to this report.

The pre- and post-development stormwater runoff has been analyzed using HydroCAD 9.10, 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 Northborough, MA. A copy of teh point precipitation data is included in teh model output section of this report. The rainfall depths used in the calculations are listed below:

Return Period	Inches
2 year	3.3
10 year	5.05
25 year	6.15
100year	7.85

Two analysis points were utilized for the existing and proposed conditions:

1. Rear Property Line
2. Culvert at Bartlett Street

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.

Table 1 – Summary of Analysis Point 1 – Rear Property Line

	2-Year Storm Existing (Proposed)	**10-Year Storm Existing (Proposed)**	**25-Year Storm Existing (Proposed)**	**100-Year Storm Existing (Proposed)**
Rate of Runoff	0.6 cfs (0.3 cfs)	4.2 cfs (3..3 cfs)	7.6 cfs (5.7 cfs)	13.6 cfs (10.0 cfs)
Volume of Runoff	0.12 ac-ft (0.06 ac-ft)	0.48 ac-ft (0.27 ac-ft)	0.77 ac-ft (0.50 ac-ft)	1.28 ac-ft (0.92 ac-ft)

Table 2 – Summary of Analysis Point 2 – Culvert at Bartlett Street

	2-Year Storm Existing (Proposed)	**10-Year Storm Existing (Proposed)**	**25-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)	0.4 cfs (0.3 cfs)
Volume of Runoff	0.0 ac-ft (0.0 ac-ft)	0.01 ac-ft (0.01 ac-ft)	0.02 ac-ft (0.02 ac-ft)	0.04 ac-ft (0.04 ac-ft)

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 bio-retention area, drywells, and infiltration basin.

Required Recharge Volume:

Post development increased impervious area = 58,125 S.F.
Onsite hydrologic soil group = A (0.60 inches of runoff)
Required Volume = 58,125 S.F. x 0.60 = **2,907 Cubic Feet**

Proposed Recharge Volume: (Static Method)

Volume within Infiltration Basin 1	=	7,460 Cubic Feet (up to outlet)
Volume within Drywell 1	=	880 Cubic Feet
Volume within Drywell 2	=	880 Cubic Feet
Total	=	**9,140 Cubic Feet**

Pretreatment

Pretreatment of 80% has been provided prior to recharge through Water Quality Structures (Stormceptor).

Separation to Groundwater

Soil testing performed on-site and has been shown on the plans. Groundwater was maintained at least two feet below the bottom of infiltration systems.

Soil Permeability

The design calculations are based upon the permeability rates listed in the stormwater handbook, also known as the 'Rales Rate.' This rate is based on the soil texture. The on-site soils are a sandy material and would have an assumed permeability rate of 8.27 inches per hour. Field testing was performed to verify the permeability within the proposed infiltration basin. The field measure rate varied between 12.4 inches per hour in the fine sand layer to >50 inches per hour in teh coarse sand layer. These values exceed the assumed value of 8.27 inches per hour.

Draw down Time (maximum 72 hours allowable):

Infiltration Basin -	(7,460 cubic feet) / (8.27 in/hr * 1/12 * 3,000 sq. ft.) = 4 hours
Drywell 1 & 2 -	(880 cubic feet) / (8.27 in/hr * 1/12 * 450 sq. ft.) = 3 hours
	(Rawles rate = 8.27 in/hr)

Mounding Analysis

A mounding analysis was performed for the infiltration system. The analysis demonstrates that the infiltration basin storage is fully dewatered within 72 hours, and the groundwater mound will not break out above the land or water surface of a wetland. The analysis was performed utilizing the Hantush method. The application rate was based upon the storage volume, and the hydraulic conductivity was based upon the field measured rate at each location.

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 and stormwater basins. A recommended long-term pollution prevention plan is provided as part of the attached Operation and Maintenance Plan.

Area to Infiltration Basin:

Pretreatment: Water Quality Structure (Stormceptor)

STC-1: TSS removal = 80%
Water quality flow rate = 0.81 cfs
WQF = (qu) x (imp. area in square miles) x (1-inch)
where qu = 795 (per MassDEP guidance table)
A = 28,600 sq. ft. = 0.001 sq. mi.

STC-2: TSS removal = 80%
Water quality flow rate = 1.64 cfs
WQF = (qu) x (imp. area in square miles) x (1-inch)
where qu = 795 (per MassDEP guidance table)
A = 57,720 sq. ft. = 0.002 sq. mi.

Infiltration Basin Design:

Required WQV: (1.0 in / 12 in/ft) * (86,320 s.f.) = 7,194 C.F.
Provided WQV: Available volume below spillway = 7,460 C.F

Total Phosphorus Removal = 60% - 70%

1 **BMP**	2 **TSS removal**	3 **Starting TSS** (5 from previous BMP)	4 **TSS Removal** **(2 * 3)**	5 **Remaining TSS** **(3 - 4)**
Stormceptor	80%	100%	80%	20%
Infiltration Basin	80%	20%	16%	4%
		Total TSS Removal =	96%	

Redevelopment Areas at Existing Garage

Water Quality Structure (Stormceptor)

STC-3: **TSS removal = 86%**
Water quality flow rate = 0.52 cfs
WQF = (qu) x (imp. area in square miles) x (1-inch)
where qu = 795 (per MassDEP guidance table)
A = 18,300 sq. ft. = 0.0006 sq. mi.

STC-4: **TSS removal = 89%**
Water quality flow rate = 0.29 cfs
WQF = (qu) x (imp. area in square miles) x (1-inch)
where qu = 795 (per MassDEP guidance table)
A = 10,100 sq. ft. = 0.00036 sq. mi.

Standard 5: Land Uses With Higher pollutant Loads

Not applicable - The proposed use is not classified as a land use with higher pollutant loads.

Standard 6: Critical Areas

Not applicable – The site is not located within any critical areas.

Standard 7: Redevelopment

The site is a partial re-development. However, the site has been designed to meet the new-construction MassDEP standards

Standard 8: Construction Period Controls

1. A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan have been attached with this report (SWPPP)

2. The temporary sediment traps have been provided along the downgradient edge of work. The plans have shown berms to be placed in teh two lower areas that would collect runoff from the work areas. Perimeter erosion controls have also been included with straw wattles and silt fence. During the initial phases of construction the existing paved areas would be utilized as stabilized construction entrances and staging areas.

3. 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 attached with this report.

Standard 10: Illicit Discharges

Illicit discharges are prohibited. Existing buildings will be serviced by a new on-site septic systems installed per Board of Health requirements.

STORMWATER DRAINAGE SYSTEM DESIGN

The street drainage system has been designed from calculations based upon the 25-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.

DRAIN PIPE SIZING CALCULATIONS

PROJECT 200 Bartlett Street LOCATION Northborough, MA BY: VC n= 0.012

CLIENT RJ Devereaux Corp. SHEET 1 OF 1 DATE: 11/23/2021 RETURN PERIOD **25 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	DMH-1	0.06	0.95	1.1	5	6.5	0.41	**0.41**	12	60	0.013	**4.32**	5.50	287.30	286.95	284.30	283.55
CB-2	DMH-1	0.24	0.85	1.1	5	6.5	1.46	**1.46**	12	15	0.010	**3.86**	4.92	286.70	286.95	283.70	283.55
DMH-1	DMH-2							**1.87**	12	85	0.010	**3.86**	4.92	286.95	287.55	283.45	282.60
CB-3	DMH-2	0.13	0.80	1.1	5	6.5	0.74	**0.74**	12	25	0.020	**5.46**	6.95	287.00	287.55	284.00	283.50
CB-4	DMH-2	0.16	0.95	1.1	5	6.5	1.09	**1.09**	12	50	0.025	**6.11**	7.77	286.85	287.55	283.85	282.60
DMH-2	STC-1							**3.70**	15	75	0.010	**7.00**	5.71	287.55	288.25	282.45	281.70
CB-5	STC-1	0.15	0.95	1.1	5	6.5	1.02	**1.02**	12	20	0.090	**11.58**	14.75	288.00	288.25	283.50	281.70
Trech Drain	STC-1	0.02	0.95	1.1	5	6.5	0.14	**0.14**	6	90	0.031	**1.07**	5.46	286.00	288.25	284.50	281.70
STC-1	DMH-3							**4.85**	18	55	0.006	**9.08**	5.14	288.25	289.10	281.45	281.10
DMH-3	FE-1							**4.85**	18	190	0.005	**8.26**	4.67	289.10	---	281.00	280.00
CB-12	DMH-7	0.06	0.70	1.1	5	6.5	0.30	**0.30**	12	20	0.028	**6.40**	8.15	286.80	286.65	283.30	282.75
CB-11	DMH-7	0.64	0.55	1.1	5	6.5	2.52	**2.52**	12	22	0.011	**4.12**	5.24	286.00	286.65	283.00	282.75
DMH-7	DMH-6							**2.82**	12	80	0.010	**3.86**	4.92	286.65	287.00	282.65	281.85
CB-10	DMH-6	0.07	0.95	1.1	5	6.5	0.48	**0.48**	12	20	0.030	**6.69**	8.52	287.20	287.00	283.60	283.00
DMH-6	DMH-5							**3.29**	15	70	0.006	**5.61**	4.57	287.00	285.25	281.75	281.30
CB-9	DMH-5	0.25	0.95	1.1	5	6.5	1.70	**1.70**	12	30	0.012	**4.17**	5.31	284.85	285.25	281.85	281.50
DMH-5	DMH-4							**4.99**	18	30	0.007	**9.30**	5.26	285.25	284.65	281.20	281.00
CB-8	DMH-4	0.18	0.95	1.1	5	6.5	1.22	**1.22**	12	30	0.010	**3.86**	4.92	284.25	284.65	281.30	281.00
CB-7	DMH-4	0.22	0.95	1.1	5	6.5	1.49	**1.49**	12	15	0.020	**5.46**	6.95	285.00	284.65	281.50	281.20
DMH-4	STC-2							**7.71**	18	90	0.006	**8.49**	4.80	284.65	285.85	280.90	280.40
CB-6	STC-2	0.31	0.95	1.1	5	6.5	2.11	**2.11**	12	10	0.050	**8.63**	10.99	284.00	285.85	280.90	280.40
STC-2	FE-2							**9.81**	18	15	0.010	**11.39**	6.44	285.25	---	280.15	280.00
HW-1	STC-3	0.42	0.95	1.1	5	6.5	2.85	**2.85**	12	10	0.060	**9.46**	12.04	---	284.00	281.40	280.80
STC-3	FE-3							**2.85**	12	30	0.010	**3.86**	4.92	284.00	---	280.55	280.25
HW-2	STC-4	0.23	0.95	1.1	5	6.5	1.56	**1.56**	12	8	0.013	**4.32**	5.50	---	284.00	281.10	281.00
STC-4	FE-4							**1.56**	12	80	0.008	**3.48**	4.43	284.00	---	280.75	280.10

HYDROCAD CALCULATIONS

EXISTING CONDITION
2 Year, 10 Year, 25 Year
& 100 Year Storm
Calculation Sheets

AND

PROPOSED CONDITION
2 Year, 10 Year, 25 Year
& 100 Year Storm
Calculation Sheets

NOAA Atlas 14, Volume 10, Version 3
Location name: Northborough, Massachusetts, USA*
Latitude: 42.3197°, Longitude: -71.6098°
Elevation: 285.58 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	0.342 (0.261-0.441)	0.405 (0.309-0.524)	0.509 (0.387-0.660)	0.596 (0.451-0.777)	0.715 (0.526-0.972)	0.805 (0.581-1.12)	0.898 (0.631-1.29)	1.00 (0.671-1.48)	1.15 (0.743-1.75)	1.27 (0.802-1.97)
10-min	0.484 (0.370-0.625)	0.574 (0.438-0.742)	0.722 (0.549-0.935)	0.844 (0.639-1.10)	1.01 (0.745-1.38)	1.14 (0.823-1.58)	1.27 (0.894-1.83)	1.42 (0.951-2.09)	1.63 (1.05-2.48)	1.79 (1.14-2.79)
15-min	0.570 (0.435-0.735)	0.676 (0.516-0.873)	0.850 (0.646-1.10)	0.994 (0.753-1.30)	1.19 (0.876-1.62)	1.34 (0.968-1.86)	1.50 (1.05-2.15)	1.67 (1.12-2.46)	1.91 (1.24-2.92)	2.11 (1.34-3.28)
30-min	0.773 (0.590-0.998)	0.918 (0.700-1.19)	1.16 (0.879-1.50)	1.35 (1.02-1.76)	1.62 (1.19-2.21)	1.83 (1.32-2.54)	2.04 (1.43-2.93)	2.28 (1.53-3.35)	2.61 (1.69-3.98)	2.88 (1.83-4.49)
60-min	0.976 (0.746-1.26)	1.16 (0.885-1.50)	1.46 (1.11-1.90)	1.71 (1.29-2.23)	2.05 (1.51-2.79)	2.31 (1.67-3.21)	2.58 (1.82-3.72)	2.88 (1.93-4.25)	3.31 (2.14-5.05)	3.66 (2.31-5.69)
2-hr	1.22 (0.935-1.56)	1.47 (1.13-1.89)	1.88 (1.44-2.42)	2.22 (1.69-2.88)	2.69 (2.00-3.65)	3.04 (2.22-4.22)	3.42 (2.43-4.93)	3.86 (2.59-5.65)	4.51 (2.93-6.84)	5.06 (3.21-7.82)
3-hr	1.39 (1.07-1.78)	1.69 (1.30-2.16)	2.18 (1.67-2.80)	2.58 (1.97-3.34)	3.14 (2.34-4.25)	3.55 (2.60-4.92)	4.00 (2.86-5.76)	4.53 (3.05-6.61)	5.33 (3.47-8.05)	6.02 (3.83-9.25)
6-hr	1.78 (1.38-2.26)	2.16 (1.68-2.76)	2.80 (2.16-3.57)	3.32 (2.55-4.26)	4.04 (3.02-5.44)	4.57 (3.36-6.30)	5.15 (3.70-7.38)	5.84 (3.95-8.47)	6.89 (4.49-10.3)	7.79 (4.97-11.9)
12-hr	2.27 (1.77-2.87)	2.75 (2.15-3.48)	3.54 (2.75-4.49)	4.19 (3.24-5.34)	5.08 (3.93-6.80)	5.75 (4.25-7.86)	6.47 (4.66-9.19)	7.32 (4.97-10.5)	8.60 (5.63-12.8)	9.69 (6.20-14.7)
24-hr	2.71 (2.13-3.40)	3.29 (2.59-4.14)	4.25 (3.33-5.37)	5.05 (3.93-6.40)	6.14 (4.65-8.16)	6.95 (5.17-9.45)	7.83 (5.68-11.1)	8.88 (6.05-12.7)	10.5 (6.87-15.5)	11.8 (7.58-17.8)
2-day	3.01 (2.38-3.76)	3.71 (2.93-4.64)	4.85 (3.82-6.08)	5.79 (4.54-7.30)	7.09 (5.41-9.39)	8.05 (6.03-10.9)	9.10 (6.66-12.8)	10.4 (7.10-14.8)	12.4 (8.15-18.2)	14.1 (9.08-21.1)
3-day	3.26 (2.59-4.06)	4.01 (3.18-4.99)	5.23 (4.14-6.54)	6.25 (4.92-7.85)	7.65 (5.85-10.1)	8.68 (6.52-11.7)	9.81 (7.20-13.8)	11.2 (7.67-15.8)	13.4 (8.81-19.5)	15.2 (9.82-22.7)
4-day	3.50 (2.79-4.34)	4.28 (3.41-5.32)	5.56 (4.41-6.93)	6.62 (5.22-8.30)	8.08 (6.20-10.6)	9.16 (6.89-12.3)	10.3 (7.59-14.5)	11.8 (8.08-16.6)	14.0 (9.25-20.4)	15.9 (10.3-23.6)
7-day	4.19 (3.36-5.17)	5.03 (4.03-6.22)	6.40 (5.11-7.94)	7.54 (5.98-9.41)	9.11 (7.01-11.9)	10.3 (7.75-13.7)	11.5 (8.47-16.0)	13.0 (8.98-18.3)	15.3 (10.1-22.1)	17.2 (11.1-25.4)
10-day	4.86 (3.91-5.99)	5.74 (4.61-7.07)	7.16 (5.74-8.86)	8.35 (6.65-10.4)	9.98 (7.69-12.9)	11.2 (8.46-14.8)	12.5 (9.17-17.2)	14.0 (9.68-19.5)	16.2 (10.8-23.4)	18.1 (11.7-26.6)
20-day	6.91 (5.59-8.46)	7.84 (6.34-9.61)	9.37 (7.55-11.5)	10.6 (8.53-13.2)	12.4 (9.58-15.9)	13.7 (10.4-17.9)	15.1 (11.0-20.3)	16.5 (11.5-22.9)	18.5 (12.4-26.5)	20.1 (13.1-29.4)
30-day	8.61 (7.00-10.5)	9.58 (7.78-11.7)	11.2 (9.04-13.7)	12.5 (10.1-15.4)	14.3 (11.1-18.2)	15.7 (11.9-20.4)	17.1 (12.5-22.8)	18.5 (12.9-25.5)	20.4 (13.6-29.0)	21.7 (14.2-31.6)
45-day	10.7 (8.74-13.0)	11.7 (9.57-14.3)	13.4 (10.9-16.4)	14.8 (11.9-18.2)	16.7 (13.0-21.1)	18.2 (13.8-23.4)	19.6 (14.3-25.9)	21.0 (14.7-28.7)	22.6 (15.2-32.0)	23.8 (15.5-34.4)
60-day	12.5 (10.2-15.1)	13.5 (11.1-16.4)	15.3 (12.4-18.6)	16.7 (13.5-20.4)	18.7 (14.6-23.5)	20.3 (15.4-25.9)	21.7 (15.8-28.5)	23.0 (16.2-31.4)	24.6 (16.5-34.7)	25.6 (16.7-36.8)

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

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

Please refer to NOAA Atlas 14 document for more information.

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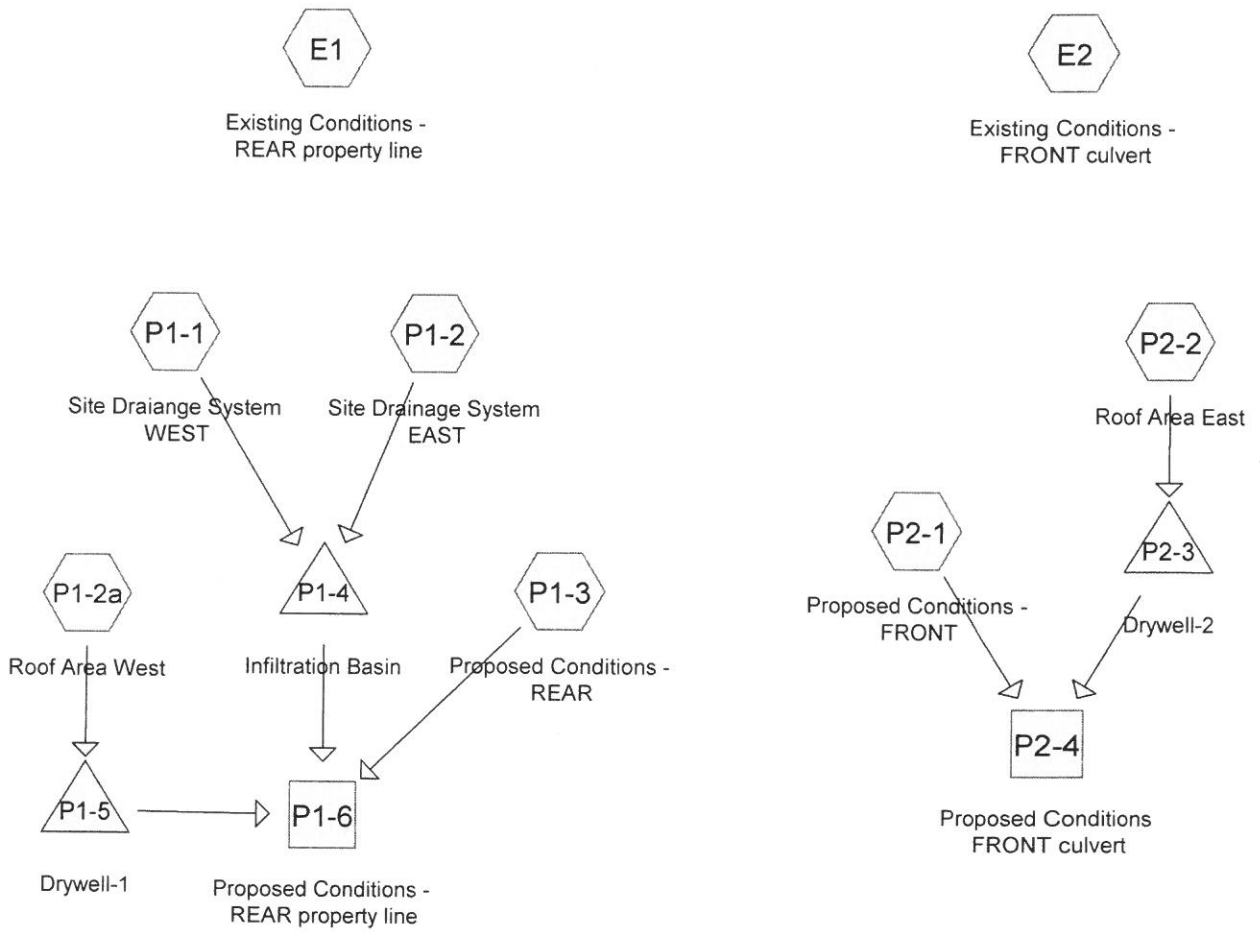
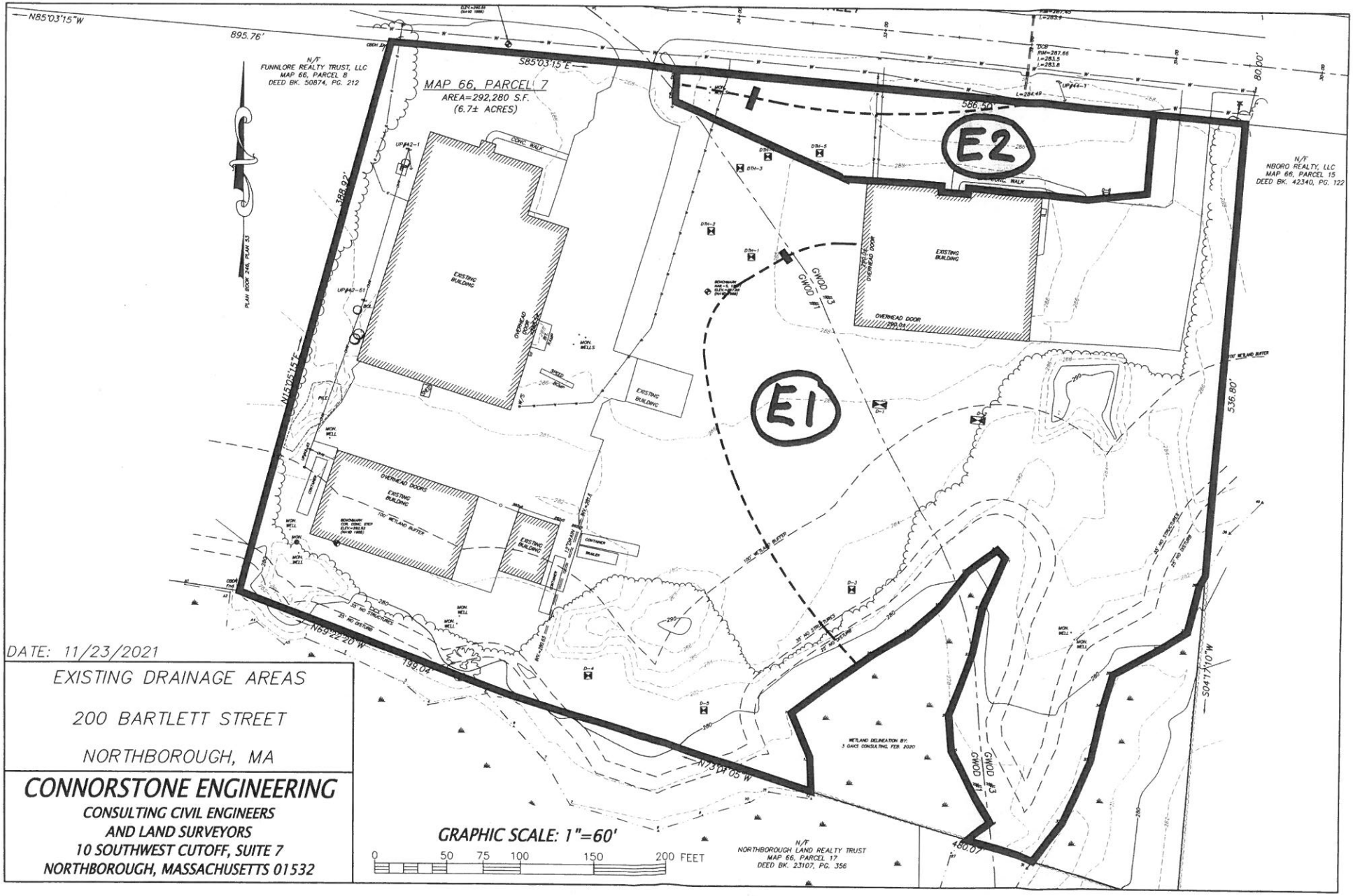


Subcat Reach Pond Link

Drainage Diagram for Bartlett
Prepared by Microsoft, Printed 11/23/2021



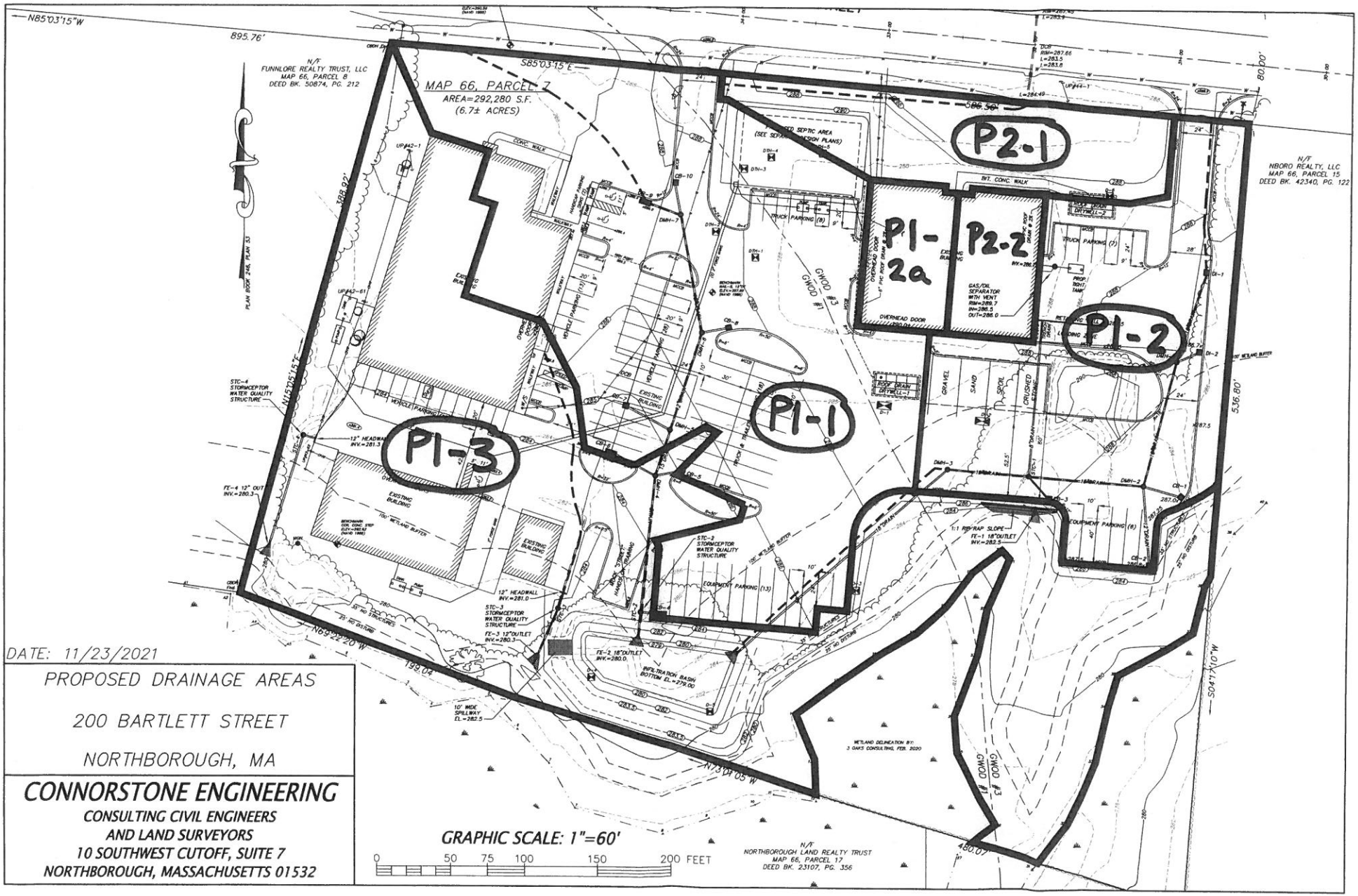
DATE: 11/23/2021

EXISTING DRAINAGE AREAS

200 BARTLETT STREET

NORTHBOROUGH, MA

CONNORSTONE ENGINEERING
CONSULTING CIVIL ENGINEERS
AND LAND SURVEYORS
10 SOUTHWEST CUTOFF, SUITE 7
NORTHBOROUGH, MASSACHUSETTS 01532



DATE: 11/23/2021

PROPOSED DRAINAGE AREAS

200 BARTLETT STREET

NORTHBOROUGH, MA

CONNORSTONE ENGINEERING
CONSULTING CIVIL ENGINEERS
AND LAND SURVEYORS
10 SOUTHWEST CUTOFF, SUITE 7
NORTHBOROUGH, MASSACHUSETTS 01532

Summary for Subcatchment E1: Existing Conditions - REAR property line

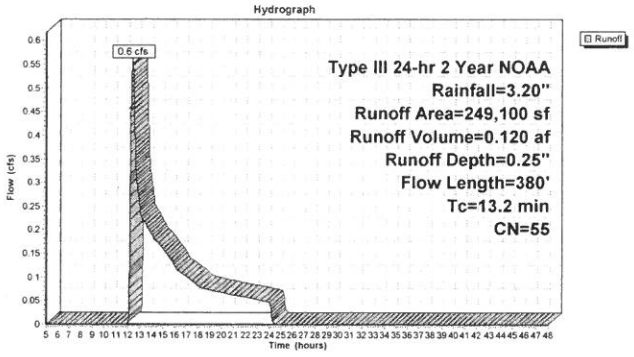
Runoff = 0.6 cfs @ 12.45 hrs, Volume= 0.120 af, Depth= 0.25"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year NOAA Rainfall=3.20"

Area (sf)	CN	Description
76,700	30	Woods, Good, HSG A
93,225	39	>75% Grass cover, Good, HSG A
79,175	98	Paved parking, HSG A
249,100	55	Weighted Average
169,925		68.22% Pervious Area
79,175		31.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
4.7	300	0.0230	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	30	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.2	380	Total			

Subcatchment E1: Existing Conditions - REAR property line



Summary for Subcatchment E2: Existing Conditions - FRONT culvert

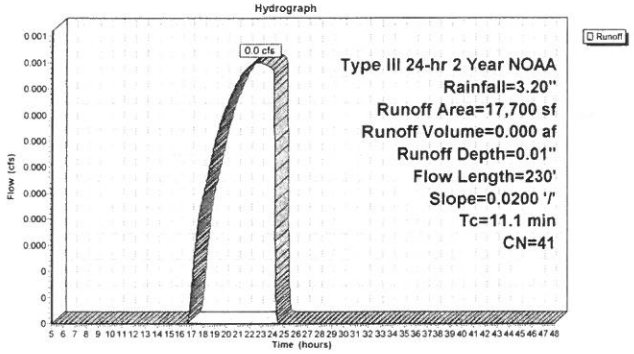
Runoff = 0.0 cfs @ 22.78 hrs, Volume= 0.000 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year NOAA Rainfall=3.20"

Area (sf)	CN	Description
0	30	Woods, Good, HSG A
17,080	39	>75% Grass cover, Good, HSG A
620	98	Paved parking, HSG A
17,700	41	Weighted Average
17,080		96.50% Pervious Area
620		3.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
3.0	180	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	230	Total			

Subcatchment E2: Existing Conditions - FRONT culvert



Summary for Subcatchment P1-1: Site Draiange System WEST

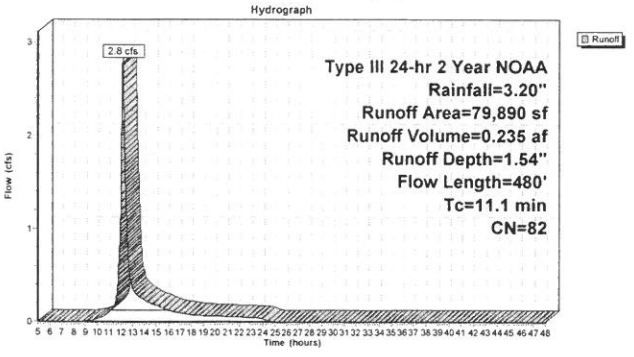
Runoff = 2.8 cfs @ 12.16 hrs, Volume= 0.235 af, Depth= 1.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year NOAA Rainfall=3.20"

Area (sf)	CN	Description
* 57,720	98	Paved Parking
22,170	39	>75% Grass cover, Good, HSG A
79,890	82	Weighted Average
22,170		27.75% Pervious Area
57,720		72.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
1.9	110	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.1	320	0.0100	4.91	3.86	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
11.1	480	Total			

Subcatchment P1-1: Site Draiange System WEST



Summary for Subcatchment P1-2: Site Drainage System EAST

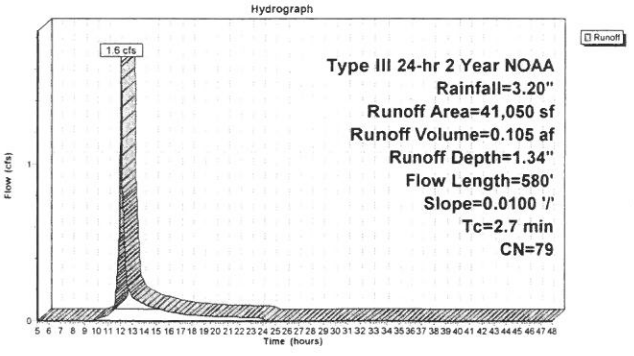
Runoff = 1.6 cfs @ 12.04 hrs, Volume= 0.105 af, Depth= 1.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year NOAA Rainfall=3.20"

Area (sf)	CN	Description
* 28,600	98	Pavement Areas
9,050	39	>75% Grass cover, Good, HSG A
3,400	30	Woods, Good, HSG A
41,050	79	Weighted Average
12,450		30.33% Pervious Area
28,600		69.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.92		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.4	50	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	480	0.0100	5.70	7.00	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
2.7	580	Total			

Subcatchment P1-2: Site Drainage System EAST



Summary for Subcatchment P1-2a: Roof Area West

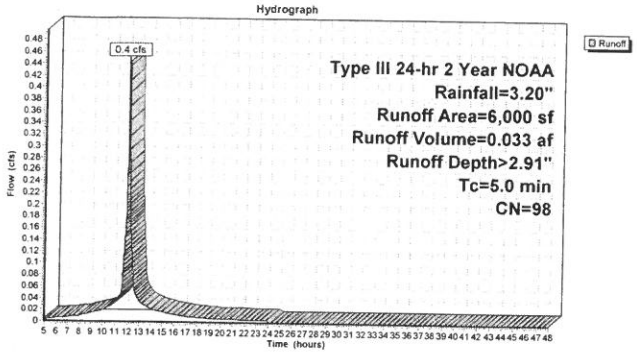
Runoff = 0.4 cfs @ 12.07 hrs, Volume= 0.033 af, Depth> 2.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year NOAA Rainfall=3.20"

	Area (sf)	CN	Description
*	6,000	98	Roof
	6,000		100.00% Impervious Area

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

Subcatchment P1-2a: Roof Area West



Summary for Subcatchment P1-3: Proposed Conditions - REAR

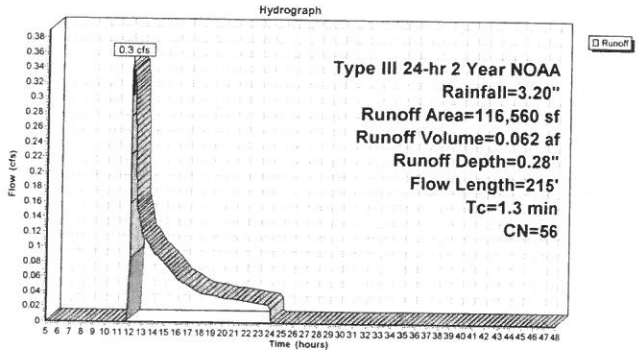
Runoff = 0.3 cfs @ 12.08 hrs, Volume= 0.062 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year NOAA Rainfall=3.20"

Area (sf)	CN	Description
36,400	30	Woods, Good, HSG A
40,560	39	>75% Grass cover, Good, HSG A
39,600	98	Paved parking, HSG A
116,560	56	Weighted Average
76,960		66.03% Pervious Area
39,600		33.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0400	1.60		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.6	120	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	45	0.0100	4.91	3.86	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.3	215	Total			

Subcatchment P1-3: Proposed Conditions - REAR



Summary for Subcatchment P2-1: Proposed Conditions - FRONT

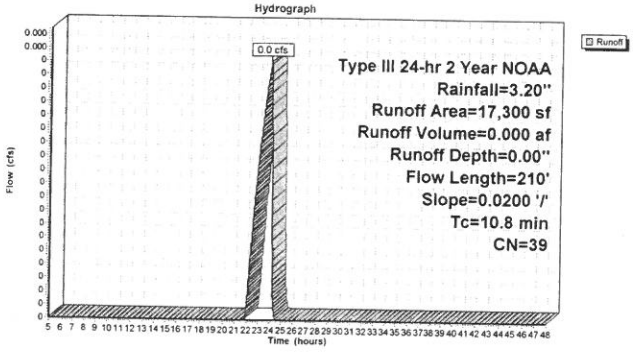
Runoff = 0.0 cfs @ 24.03 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year NOAA Rainfall=3.20"

Area (sf)	CN	Description
17,300	39	>75% Grass cover, Good, HSG A
17,300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
2.7	160	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.8	210	Total			

Subcatchment P2-1: Proposed Conditions - FRONT



Summary for Subcatchment P2-2: Roof Area East

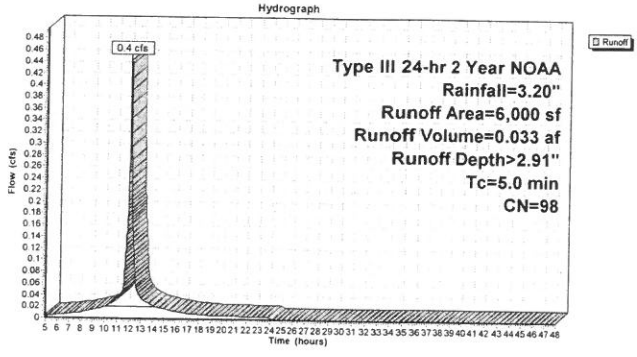
Runoff = 0.4 cfs @ 12.07 hrs, Volume= 0.033 af, Depth> 2.91"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 Year NOAA Rainfall=3.20"

Area (sf)	CN	Description
6,000	98	Roofs, HSG A
6,000		100.00% Impervious Area

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

Subcatchment P2-2: Roof Area East

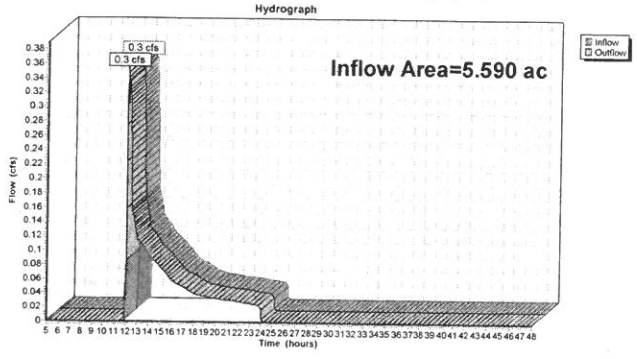


Summary for Reach P1-6: Proposed Conditions - REAR property line

Inflow Area = 5.590 ac, 54.18% Impervious, Inflow Depth = 0.13" for 2 Year NOAA event
Inflow = 0.3 cfs @ 12.08 hrs, Volume= 0.062 af
Outflow = 0.3 cfs @ 12.08 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs

Reach P1-6: Proposed Conditions - REAR property line

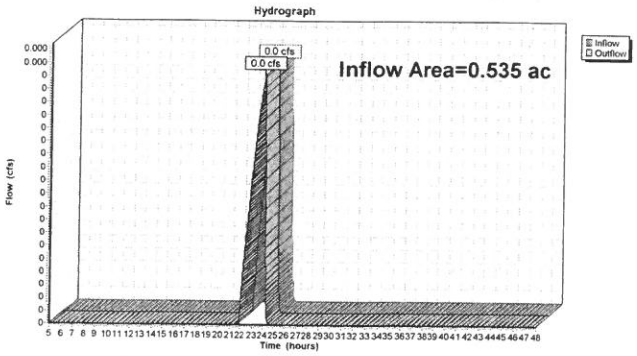


Summary for Reach P2-4: Proposed Conditions FRONT culvert

Inflow Area = 0.535 ac, 25.75% Impervious, Inflow Depth = 0.00" for 2 Year NOAA event
Inflow = 0.0 cfs @ 24.03 hrs, Volume= 0.000 af
Outflow = 0.0 cfs @ 24.03 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs

Reach P2-4: Proposed Conditions FRONT culvert



Summary for Pond P1-4: Infiltration Basin

Inflow Area = 2.776 ac, 71.37% Impervious, Inflow Depth = 1.47" for 2 Year NOAA event
Inflow = 3.7 cfs @ 12.11 hrs, Volume= 0.340 af
Outflow = 1.0 cfs @ 12.58 hrs, Volume= 0.340 af, Atten= 71%, Lag= 28.1 min
Discarded = 1.0 cfs @ 12.58 hrs, Volume= 0.340 af
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 280.19' @ 12.58 hrs Surf.Area= 3,853 sf Storage= 4,050 cf

Plug-Flow detention time= 30.2 min calculated for 0.340 af (100% of inflow)
Center-of-Mass det. time= 30.2 min (871.8 - 841.6)

Volume	Invert	Avail.Storage	Storage Description
#1	279.00'	18,380 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

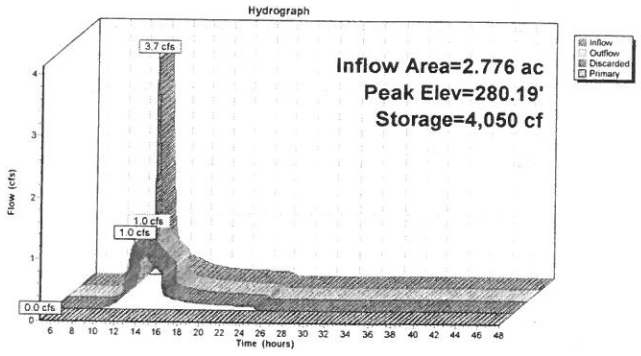
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
279.00	3,000	0	0	3,000
280.00	3,700	3,344	3,344	3,729
282.00	5,500	9,141	12,485	5,592
283.00	6,300	5,895	18,380	6,437

Device	Routing	Invert	Outlet Devices
#1	Discarded	279.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 276.50'
#2	Primary	282.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Primary	281.00'	**12.0" Round Culvert** L= 25.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 281.00' / 280.50' S= 0.0200 '/' Cc= 0.900 n= 0.012

Discarded OutFlow Max=1.0 cfs @ 12.58 hrs HW=280.19' (Free Discharge)
└**1=Exfiltration** (Controls 1.0 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=279.00' (Free Discharge)
├**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)
└**3=Culvert** (Controls 0.0 cfs)

Pond P1-4: Infiltration Basin



Summary for Pond P1-5: Drywell-1

Inflow Area = 0.138 ac,100.00% Impervious, Inflow Depth > 2.91" for 2 Year NOAA event
Inflow = 0.4 cfs @ 12.07 hrs, Volume= 0.033 af
Outflow = 0.2 cfs @ 12.32 hrs, Volume= 0.033 af, Atten= 66%, Lag= 15.0 min
Discarded = 0.2 cfs @ 12.32 hrs, Volume= 0.033 af
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 283.85' @ 12.32 hrs Surf.Area= 512 sf Storage= 239 cf

Plug-Flow detention time= 9.1 min calculated for 0.033 af (100% of inflow)
Center-of-Mass det. time= 9.1 min (774.6 - 765.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	283.00'	453 cf	**16.00'W x 32.00'L x 3.21'H Field A** 1,643 cf Overall - 510 cf Embedded = 1,133 cf x 40.0% Voids
#2A	283.50'	510 cf	**Cultec R-280** x 12 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
		963 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	283.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 280.70'
#2	Primary	290.00'	**6.0" Vert. Downspouts** C= 0.600

Discarded OutFlow Max=0.2 cfs @ 12.32 hrs HW=283.85' (Free Discharge)
└**1=Exfiltration** (Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=283.00' (Free Discharge)
└**2=Downspouts** (Controls 0.0 cfs)

Pond P1-5: Drywell-1 - Chamber Wizard Field A

Chamber Model = Cultec R-280
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap

47.0" Wide + 6.0" Spacing = 53.0" C-C

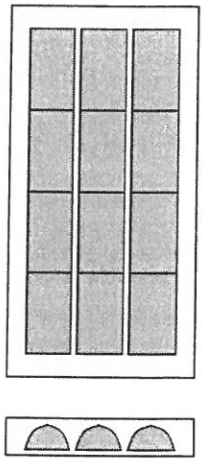
4 Chambers/Row x 7.00' Long = 28.00' + 24.0" End Stone x 2 = 32.00' Base Length
3 Rows x 47.0" Wide + 6.0" Spacing x 2 + 19.5" Side Stone x 2 = 16.00' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

12 Chambers x 42.5 cf = 510.0 cf Chamber Storage

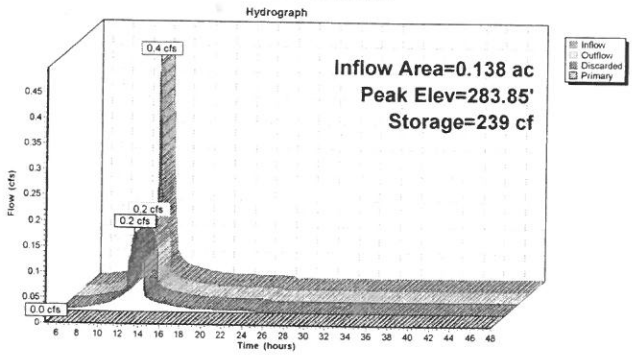
1,642.7 cf Field - 510.0 cf Chambers = 1,132.6 cf Stone x 40.0% Voids = 453.1 cf Stone Storage

Stone + Chamber Storage = 963.1 cf = 0.022 af

12 Chambers
60.8 cy Field
41.9 cy Stone



Pond P1-5: Drywell-1



Summary for Pond P2-3: Drywell-2

Inflow Area = 0.138 ac,100.00% Impervious, Inflow Depth > 2.91" for 2 Year NOAA event
Inflow = 0.4 cfs @ 12.07 hrs, Volume= 0.033 af
Outflow = 0.2 cfs @ 12.32 hrs, Volume= 0.033 af, Atten= 66%, Lag= 15.1 min
Discarded = 0.2 cfs @ 12.32 hrs, Volume= 0.033 af
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 284.84' @ 12.32 hrs Surf.Area= 512 sf Storage= 238 cf

Plug-Flow detention time= 8.9 min calculated for 0.033 af (100% of inflow)
Center-of-Mass det. time= 8.9 min (774.3 - 765.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	284.00'	453 cf	**16.00'W x 32.00'L x 3.21'H Field A** 1,643 cf Overall - 510 cf Embedded = 1,133 cf x 40.0% Voids
#2A	284.50'	510 cf	**Cultec R-280** x 12 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
		963 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	284.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 281.70'
#2	Primary	290.00'	**6.0" Vert. Downspouts** C= 0.600

Discarded OutFlow Max=0.2 cfs @ 12.32 hrs HW=284.84' (Free Discharge)
└**1=Exfiltration** (Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=284.00' (Free Discharge)
└**2=Downspouts** (Controls 0.0 cfs)

Pond P2-3: Drywell-2 - Chamber Wizard Field A

Chamber Model = Cultec R-280
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap

47.0" Wide + 6.0" Spacing = 53.0" C-C

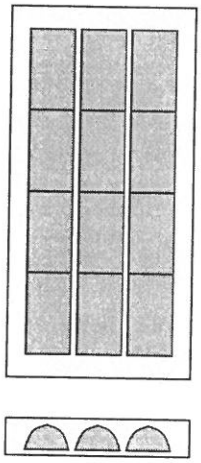
4 Chambers/Row x 7.00' Long = 28.00' + 24.0" End Stone x 2 = 32.00' Base Length
3 Rows x 47.0" Wide + 6.0" Spacing x 2 + 19.5" Side Stone x 2 = 16.00' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

12 Chambers x 42.5 cf = 510.0 cf Chamber Storage

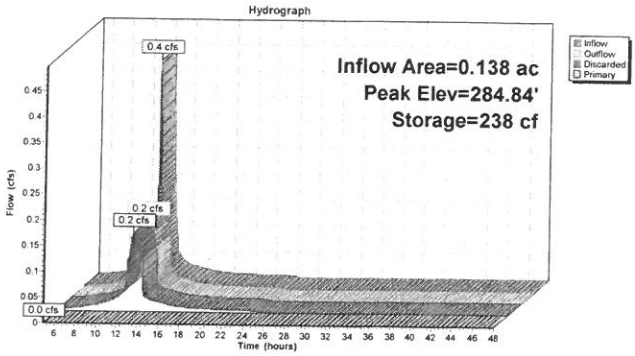
1,642.7 cf Field - 510.0 cf Chambers = 1,132.6 cf Stone x 40.0% Voids = 453.1 cf Stone Storage

Stone + Chamber Storage = 963.1 cf = 0.022 af

12 Chambers
60.8 cy Field
41.9 cy Stone



Pond P2-3: Drywell-2



Summary for Subcatchment E1: Existing Conditions - REAR property line

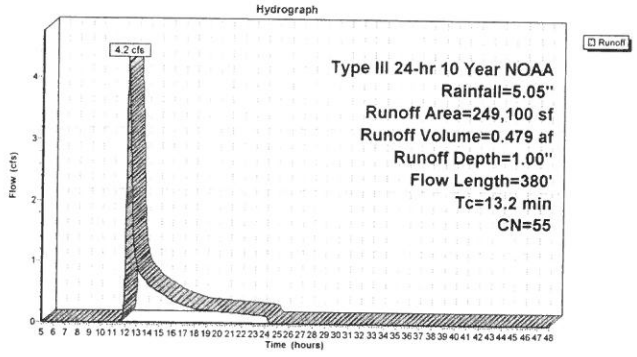
Runoff = 4.2 cfs @ 12.22 hrs, Volume= 0.479 af, Depth= 1.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year NOAA Rainfall=5.05"

Area (sf)	CN	Description
76,700	30	Woods, Good, HSG A
93,225	39	>75% Grass cover, Good, HSG A
79,175	98	Paved parking, HSG A
249,100	55	Weighted Average
169,925		68.22% Pervious Area
79,175		31.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
4.7	300	0.0230	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	30	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.2	380	Total			

Subcatchment E1: Existing Conditions - REAR property line



Summary for Subcatchment E2: Existing Conditions - FRONT culvert

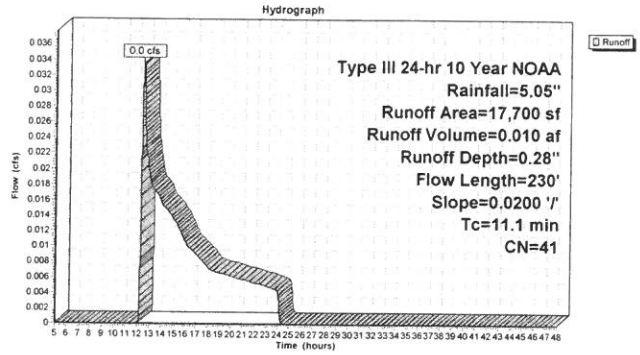
Runoff = 0.0 cfs @ 12.48 hrs, Volume= 0.010 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year NOAA Rainfall=5.05"

Area (sf)	CN	Description
0	30	Woods, Good, HSG A
17,080	39	>75% Grass cover, Good, HSG A
620	98	Paved parking, HSG A
17,700	41	Weighted Average
17,080		96.50% Pervious Area
620		3.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
3.0	180	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	230	Total			

Subcatchment E2: Existing Conditions - FRONT culvert



Summary for Subcatchment P1-1: Site Draiange System WEST

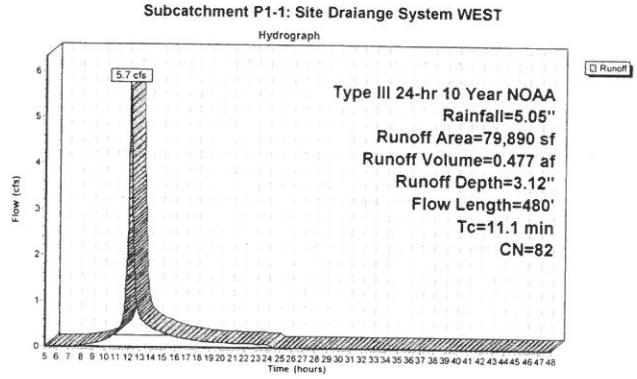
Runoff = 5.7 cfs @ 12.15 hrs, Volume= 0.477 af, Depth= 3.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year NOAA Rainfall=5.05"

Area (sf)	CN	Description
* 57,720	98	Paved Parking
22,170	39	>75% Grass cover, Good, HSG A
79,890	82	Weighted Average
22,170		27.75% Pervious Area
57,720		72.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
1.9	110	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.1	320	0.0100	4.91	3.86	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
11.1	480	Total			

Subcatchment P1-1: Site Draiange System WEST



Summary for Subcatchment P1-2: Site Drainage System EAST

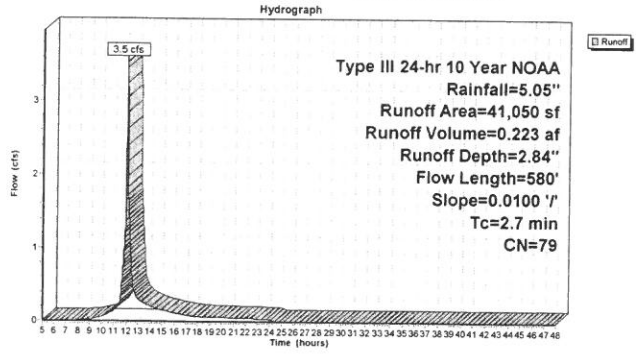
Runoff = 3.5 cfs @ 12.04 hrs, Volume= 0.223 af, Depth= 2.84"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year NOAA Rainfall=5.05"

Area (sf)	CN	Description
* 28,600	98	Pavement Areas
9,050	39	>75% Grass cover, Good, HSG A
3,400	30	Woods, Good, HSG A
41,050	79	Weighted Average
12,450		30.33% Pervious Area
28,600		69.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.92		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.4	50	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	480	0.0100	5.70	7.00	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
2.7	580	Total			

Subcatchment P1-2: Site Drainage System EAST



Summary for Subcatchment P1-2a: Roof Area West

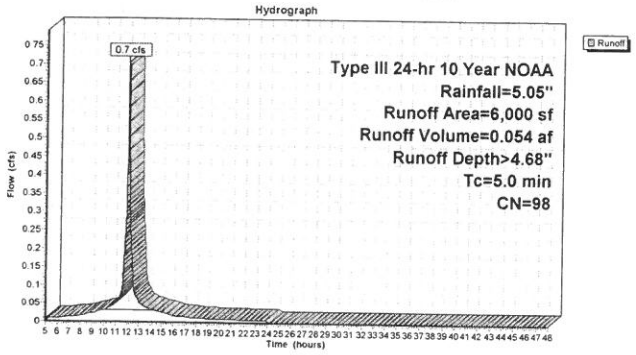
Runoff = 0.7 cfs @ 12.07 hrs, Volume= 0.054 af, Depth> 4.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year NOAA Rainfall=5.05"

Area (sf)	CN	Description
* 6,000	98	Roof
6,000		100.00% Impervious Area

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

Subcatchment P1-2a: Roof Area West



Summary for Subcatchment P1-3: Proposed Conditions - REAR

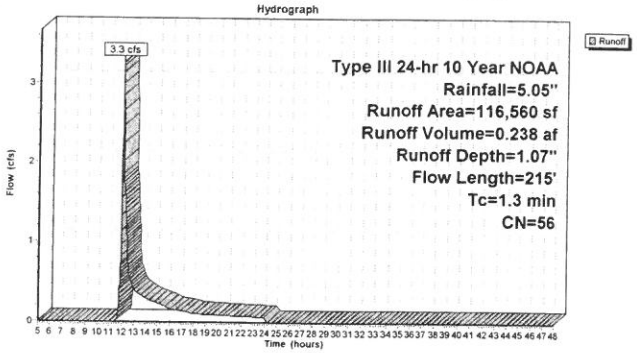
Runoff = 3.3 cfs @ 12.03 hrs, Volume= 0.238 af, Depth= 1.07"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year NOAA Rainfall=5.05"

Area (sf)	CN	Description
36,400	30	Woods, Good, HSG A
40,560	39	>75% Grass cover, Good, HSG A
39,600	98	Paved parking, HSG A
116,560	56	Weighted Average
76,960		66.03% Pervious Area
39,600		33.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0400	1.60		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.6	120	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	45	0.0100	4.91	3.86	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.3	215	Total			

Subcatchment P1-3: Proposed Conditions - REAR



Summary for Subcatchment P2-1: Proposed Conditions - FRONT

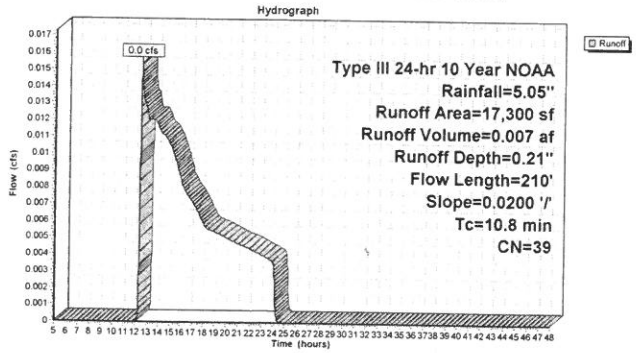
Runoff = 0.0 cfs @ 12.54 hrs, Volume= 0.007 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year NOAA Rainfall=5.05"

Area (sf)	CN	Description
17,300	39	>75% Grass cover, Good, HSG A
17,300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
2.7	160	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.8	210	Total			

Subcatchment P2-1: Proposed Conditions - FRONT



Summary for Subcatchment P2-2: Roof Area East

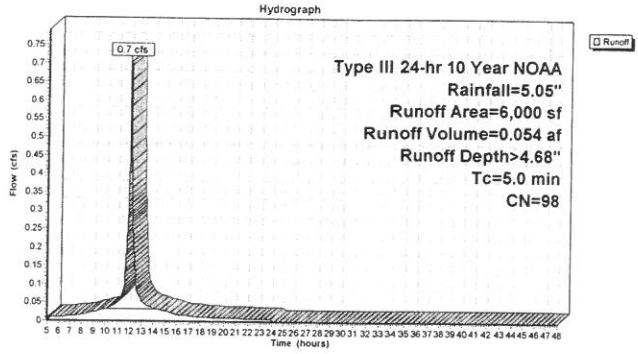
Runoff = 0.7 cfs @ 12.07 hrs, Volume= 0.054 af, Depth> 4.68"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 Year NOAA Rainfall=5.05"

Area (sf)	CN	Description
6,000	98	Roofs, HSG A
6,000		100.00% Impervious Area

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

Subcatchment P2-2: Roof Area East

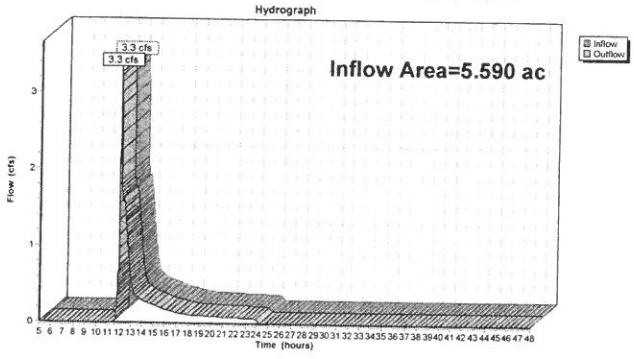


Summary for Reach P1-6: Proposed Conditions - REAR property line

Inflow Area = 5.590 ac, 54.18% Impervious, Inflow Depth = 0.58" for 10 Year NOAA event
Inflow = 3.3 cfs @ 12.03 hrs, Volume= 0.270 af
Outflow = 3.3 cfs @ 12.03 hrs, Volume= 0.270 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs

Reach P1-6: Proposed Conditions - REAR property line

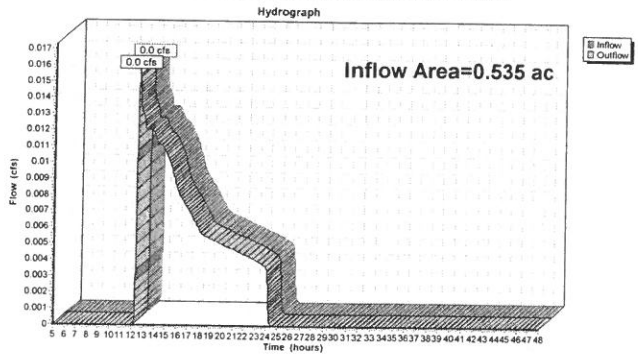


Summary for Reach P2-4: Proposed Conditions FRONT culvert

Inflow Area = 0.535 ac, 25.75% Impervious, Inflow Depth = 0.16" for 10 Year NOAA event
Inflow = 0.0 cfs @ 12.54 hrs, Volume= 0.007 af
Outflow = 0.0 cfs @ 12.54 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs

Reach P2-4: Proposed Conditions FRONT culvert



Summary for Pond P1-4: Infiltration Basin

Inflow Area = 2.776 ac, 71.37% Impervious, Inflow Depth = 3.03" for 10 Year NOAA event
Inflow = 7.7 cfs @ 12.10 hrs, Volume= 0.701 af
Outflow = 2.4 cfs @ 12.53 hrs, Volume= 0.701 af, Atten= 68%, Lag= 25.5 min
Discarded = 1.7 cfs @ 12.53 hrs, Volume= 0.669 af
Primary = 0.7 cfs @ 12.53 hrs, Volume= 0.032 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 281.47' @ 12.53 hrs Surf.Area= 4,986 sf Storage= 9,694 cf

Plug-Flow detention time= 50.2 min calculated for 0.701 af (100% of inflow)
Center-of-Mass det. time= 50.2 min (870.9 - 820.7)

Volume	Invert	Avail.Storage	Storage Description
#1	279.00'	18,380 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

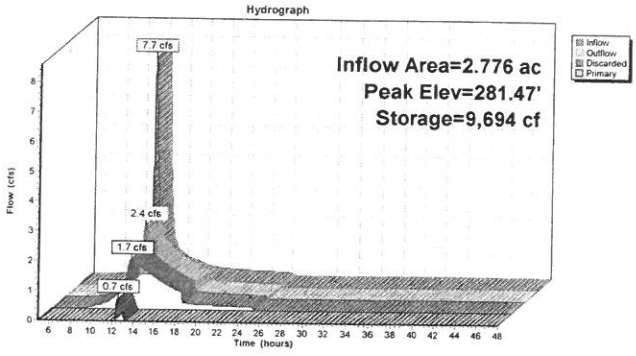
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
279.00	3,000	0	0	3,000
280.00	3,700	3,344	3,344	3,729
282.00	5,500	9,141	12,485	5,592
283.00	6,300	5,895	18,380	6,437

Device	Routing	Invert	Outlet Devices
#1	Discarded	279.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 276.50'
#2	Primary	282.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Primary	281.00'	**12.0" Round Culvert** L= 25.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 281.00' / 280.50' S= 0.0200 '/' Cc= 0.900 n= 0.012

Discarded OutFlow Max=1.7 cfs @ 12.53 hrs HW=281.47' (Free Discharge)
└**1=Exfiltration** (Controls 1.7 cfs)

Primary OutFlow Max=0.7 cfs @ 12.53 hrs HW=281.47' (Free Discharge)
├**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)
└**3=Culvert** (Inlet Controls 0.7 cfs @ 2.05 fps)

Pond P1-4: Infiltration Basin



Summary for Pond P1-5: Drywell-1

Inflow Area = 0.138 ac,100.00% Impervious, Inflow Depth > 4.68" for 10 Year NOAA event
Inflow = 0.7 cfs @ 12.07 hrs, Volume= 0.054 af
Outflow = 0.2 cfs @ 12.39 hrs, Volume= 0.054 af, Atten= 72%, Lag= 19.1 min
Discarded = 0.2 cfs @ 12.39 hrs, Volume= 0.054 af
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 284.53' @ 12.39 hrs Surf.Area= 512 sf Storage= 499 cf

Plug-Flow detention time= 15.7 min calculated for 0.054 af (100% of inflow)
Center-of-Mass det. time= 15.7 min (777.4 - 761.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	283.00'	453 cf	**16.00'W x 32.00'L x 3.21'H Field A** 1,643 cf Overall - 510 cf Embedded = 1,133 cf x 40.0% Voids
#2A	283.50'	510 cf	**Cultec R-280** x 12 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
		963 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	283.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 280.70'
#2	Primary	290.00'	**6.0" Vert. Downspouts** C= 0.600

Discarded OutFlow Max=0.2 cfs @ 12.39 hrs HW=284.53' (Free Discharge)
↑**1=Exfiltration** (Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=283.00' (Free Discharge)
↑**2=Downspouts** (Controls 0.0 cfs)

Pond P1-5: Drywell-1 - Chamber Wizard Field A

Chamber Model = Cultec R-280
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap

47.0" Wide + 6.0" Spacing = 53.0" C-C

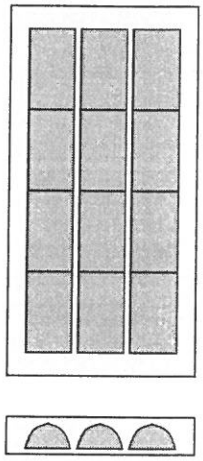
4 Chambers/Row x 7.00' Long = 28.00' + 24.0" End Stone x 2 = 32.00' Base Length
3 Rows x 47.0" Wide + 6.0" Spacing x 2 + 19.5" Side Stone x 2 = 16.00' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

12 Chambers x 42.5 cf = 510.0 cf Chamber Storage

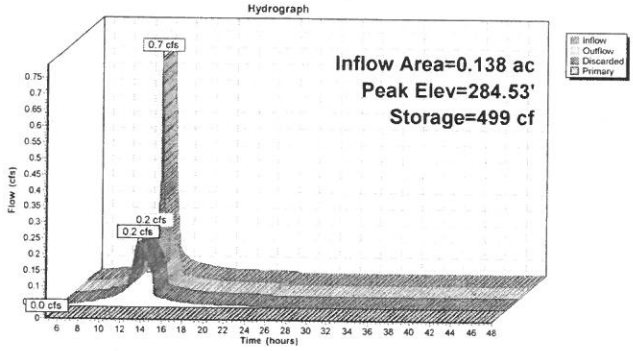
1,642.7 cf Field - 510.0 cf Chambers = 1,132.6 cf Stone x 40.0% Voids = 453.1 cf Stone Storage

Stone + Chamber Storage = 963.1 cf = 0.022 af

12 Chambers
60.8 cy Field
41.9 cy Stone



Pond P1-5: Drywell-1



Summary for Pond P2-3: Drywell-2

Inflow Area = 0.138 ac,100.00% Impervious, Inflow Depth > 4.68" for 10 Year NOAA event
Inflow = 0.7 cfs @ 12.07 hrs, Volume= 0.054 af
Outflow = 0.2 cfs @ 12.39 hrs, Volume= 0.054 af, Atten= 72%, Lag= 19.1 min
Discarded = 0.2 cfs @ 12.39 hrs, Volume= 0.054 af
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 285.53' @ 12.39 hrs Surf.Area= 512 sf Storage= 498 cf

Plug-Flow detention time= 15.5 min calculated for 0.054 af (100% of inflow)
Center-of-Mass det. time= 15.5 min (777.2 - 761.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	284.00'	453 cf	**16.00'W x 32.00'L x 3.21'H Field A** 1,643 cf Overall - 510 cf Embedded = 1,133 cf x 40.0% Voids
#2A	284.50'	510 cf	**Cultec R-280** x 12 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
		963 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	284.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 281.70'
#2	Primary	290.00'	**6.0" Vert. Downspouts** C= 0.600

Discarded OutFlow Max=0.2 cfs @ 12.39 hrs HW=285.53' (Free Discharge)
↑**1=Exfiltration** (Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=284.00' (Free Discharge)
↑**2=Downspouts** (Controls 0.0 cfs)

Pond P2-3: Drywell-2 - Chamber Wizard Field A

Chamber Model = Cultec R-280
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap

47.0" Wide + 6.0" Spacing = 53.0" C-C

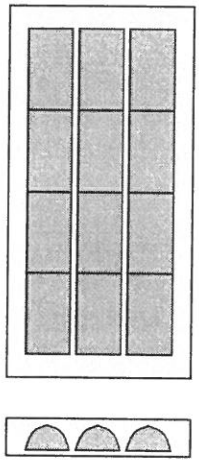
4 Chambers/Row x 7.00' Long = 28.00' + 24.0" End Stone x 2 = 32.00' Base Length
3 Rows x 47.0" Wide + 6.0" Spacing x 2 + 19.5" Side Stone x 2 = 16.00' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

12 Chambers x 42.5 cf = 510.0 cf Chamber Storage

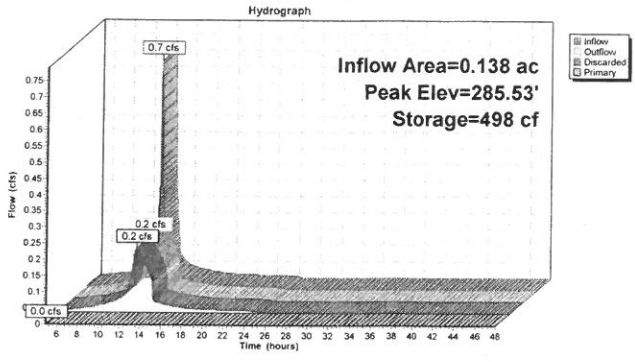
1,642.7 cf Field - 510.0 cf Chambers = 1,132.6 cf Stone x 40.0% Voids = 453.1 cf Stone Storage

Stone + Chamber Storage = 963.1 cf = 0.022 af

12 Chambers
60.8 cy Field
41.9 cy Stone



Pond P2-3: Drywell-2



Summary for Subcatchment E1: Existing Conditions - REAR property line

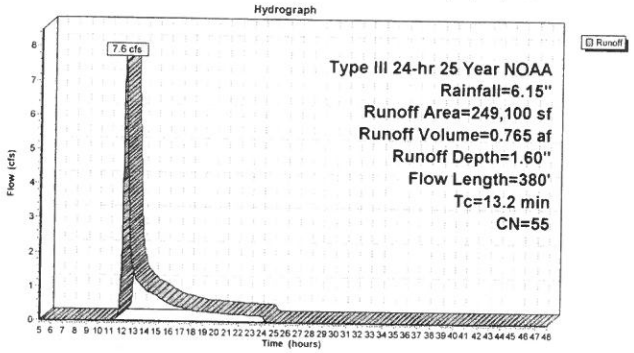
Runoff = 7.6 cfs @ 12.20 hrs, Volume= 0.765 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year NOAA Rainfall=6.15"

Area (sf)	CN	Description
76,700	30	Woods, Good, HSG A
93,225	39	>75% Grass cover, Good, HSG A
79,175	98	Paved parking, HSG A
249,100	55	Weighted Average
169,925		68.22% Pervious Area
79,175		31.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
4.7	300	0.0230	1.06		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.4	30	0.0600	1.22		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.2	380	Total			

Subcatchment E1: Existing Conditions - REAR property line



Summary for Subcatchment E2: Existing Conditions - FRONT culvert

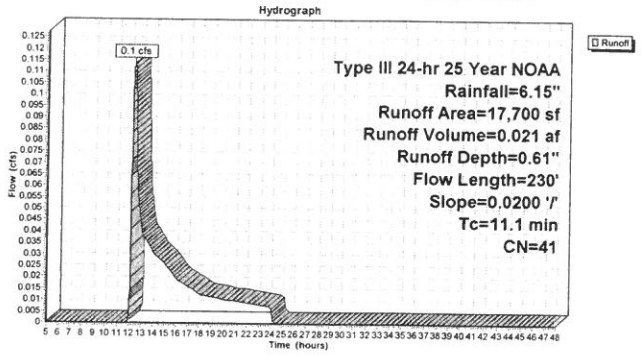
Runoff = 0.1 cfs @ 12.35 hrs, Volume= 0.021 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year NOAA Rainfall=6.15"

Area (sf)	CN	Description
0	30	Woods, Good, HSG A
17,080	39	>75% Grass cover, Good, HSG A
620	98	Paved parking, HSG A
17,700	41	Weighted Average
17,080		96.50% Pervious Area
620		3.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
3.0	180	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
11.1	230	Total			

Subcatchment E2: Existing Conditions - FRONT culvert



Summary for Subcatchment P1-1: Site Draiange System WEST

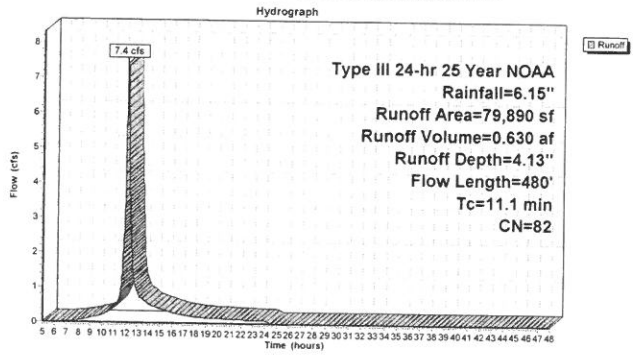
Runoff = 7.4 cfs @ 12.15 hrs, Volume= 0.630 af, Depth= 4.13"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year NOAA Rainfall=6.15"

Area (sf)	CN	Description
* 57,720	98	Paved Parking
22,170	39	>75% Grass cover, Good, HSG A
79,890	82	Weighted Average
22,170		27.75% Pervious Area
57,720		72.25% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
1.9	110	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
1.1	320	0.0100	4.91	3.86	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
11.1	480	Total			

Subcatchment P1-1: Site Draiange System WEST



Summary for Subcatchment P1-2: Site Drainage System EAST

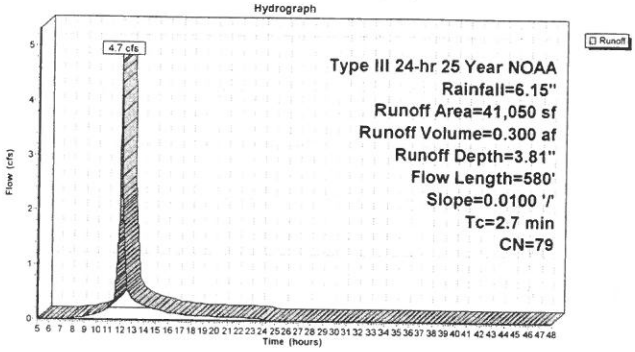
Runoff = 4.7 cfs @ 12.04 hrs, Volume= 0.300 af, Depth= 3.81"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year NOAA Rainfall=6.15"

Area (sf)	CN	Description
* 28,600	98	Pavement Areas
9,050	39	>75% Grass cover, Good, HSG A
3,400	30	Woods, Good, HSG A
41,050	79	Weighted Average
12,450		30.33% Pervious Area
28,600		69.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	50	0.0100	0.92		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.4	50	0.0100	2.03		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.4	480	0.0100	5.70	7.00	**Pipe Channel,** 15.0" Round Area= 1.2 sf Perim= 3.9' r= 0.31' n= 0.012
2.7	580	Total			

Subcatchment P1-2: Site Drainage System EAST



Summary for Subcatchment P1-2a: Roof Area West

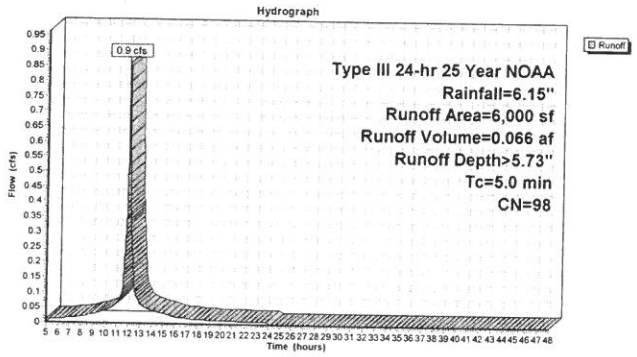
Runoff = 0.9 cfs @ 12.07 hrs, Volume= 0.066 af, Depth> 5.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year NOAA Rainfall=6.15"

	Area (sf)	CN	Description
*	6,000	98	Roof
	6,000		100.00% Impervious Area

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

Subcatchment P1-2a: Roof Area West



Summary for Subcatchment P1-3: Proposed Conditions - REAR

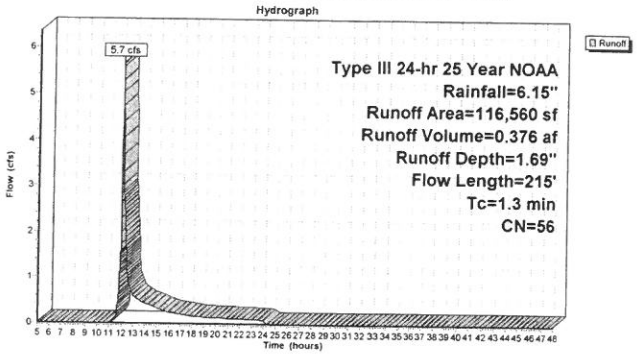
Runoff = 5.7 cfs @ 12.03 hrs, Volume= 0.376 af, Depth= 1.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year NOAA Rainfall=6.15"

	Area (sf)	CN	Description
	36,400	30	Woods, Good, HSG A
	40,560	39	>75% Grass cover, Good, HSG A
	39,600	98	Paved parking, HSG A
	116,560	56	Weighted Average
	76,960		66.03% Pervious Area
	39,600		33.97% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0400	1.60		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.30"
0.6	120	0.0300	3.52		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
0.2	45	0.0100	4.91	3.86	**Pipe Channel,** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.012
1.3	215	Total			

Subcatchment P1-3: Proposed Conditions - REAR



Summary for Subcatchment P2-1: Proposed Conditions - FRONT

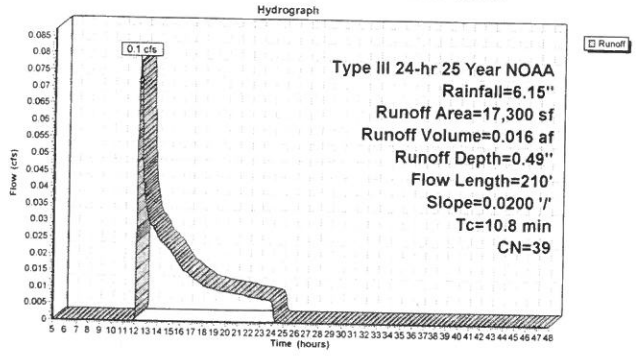
Runoff = 0.1 cfs @ 12.40 hrs, Volume= 0.016 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year NOAA Rainfall=6.15"

	Area (sf)	CN	Description
	17,300	39	>75% Grass cover, Good, HSG A
	17,300		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0200	0.10		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.30"
2.7	160	0.0200	0.99		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
10.8	210	Total			

Subcatchment P2-1: Proposed Conditions - FRONT



Summary for Subcatchment P2-2: Roof Area East

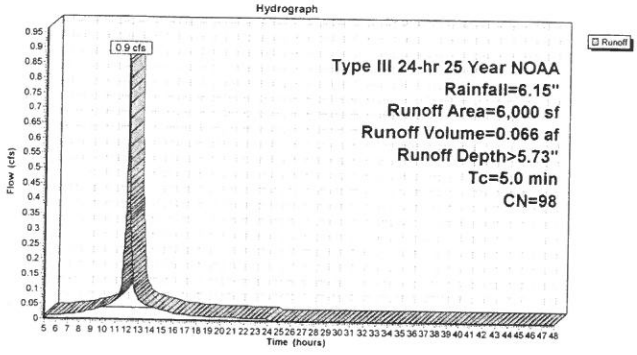
Runoff = 0.9 cfs @ 12.07 hrs, Volume= 0.066 af, Depth> 5.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 Year NOAA Rainfall=6.15"

	Area (sf)	CN	Description
	6,000	98	Roofs, HSG A
	6,000		100.00% Impervious Area

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

Subcatchment P2-2: Roof Area East

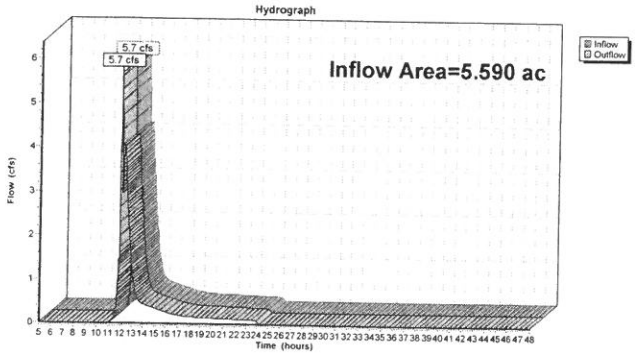


Summary for Reach P1-6: Proposed Conditions - REAR property line

Inflow Area = 5.590 ac, 54.18% Impervious, Inflow Depth = 1.07" for 25 Year NOAA event
Inflow = 5.7 cfs @ 12.03 hrs, Volume= 0.500 af
Outflow = 5.7 cfs @ 12.03 hrs, Volume= 0.500 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs

Reach P1-6: Proposed Conditions - REAR property line

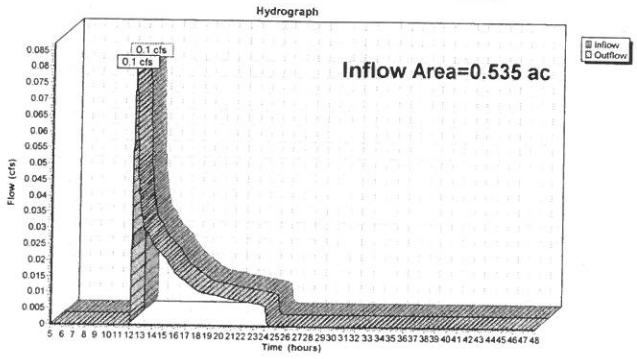


Summary for Reach P2-4: Proposed Conditions FRONT culvert

Inflow Area = 0.535 ac, 25.75% Impervious, Inflow Depth = 0.36" for 25 Year NOAA event
Inflow = 0.1 cfs @ 12.40 hrs, Volume= 0.016 af
Outflow = 0.1 cfs @ 12.40 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs

Reach P2-4: Proposed Conditions FRONT culvert



Summary for Pond P1-4: Infiltration Basin

Inflow Area = 2.776 ac, 71.37% Impervious, Inflow Depth = 4.02" for 25 Year NOAA event
Inflow = 10.1 cfs @ 12.10 hrs, Volume= 0.930 af
Outflow = 4.1 cfs @ 12.45 hrs, Volume= 0.930 af, Atten= 59%, Lag= 20.9 min
Discarded = 1.9 cfs @ 12.45 hrs, Volume= 0.806 af
Primary = 2.2 cfs @ 12.45 hrs, Volume= 0.124 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs
Peak Elev= 281.93' @ 12.45 hrs Surf.Area= 5,436 sf Storage= 12,129 cf

Plug-Flow detention time= 48.6 min calculated for 0.930 af (100% of inflow)
Center-of-Mass det. time= 48.6 min (861.3 - 812.7)

Volume	Invert	Avail.Storage	Storage Description
#1	279.00'	18,380 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

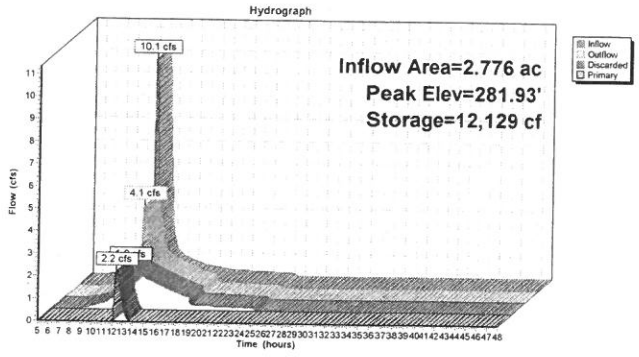
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
279.00	3,000	0	0	3,000
280.00	3,700	3,344	3,344	3,729
282.00	5,500	9,141	12,485	5,592
283.00	6,300	5,895	18,380	6,437

Device	Routing	Invert	Outlet Devices
#1	Discarded	279.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 276.50'
#2	Primary	282.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Primary	281.00'	**12.0" Round Culvert** L= 25.0' CPP, mitered to conform to fill, Ke= 0.700 Inlet / Outlet Invert= 281.00' / 280.50' S= 0.0200 '/' Cc= 0.900 n= 0.012

Discarded OutFlow Max=1.9 cfs @ 12.45 hrs HW=281.93' (Free Discharge)
└**1=Exfiltration** (Controls 1.9 cfs)

Primary OutFlow Max=2.2 cfs @ 12.45 hrs HW=281.93' (Free Discharge)
├**2=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)
└**3=Culvert** (Inlet Controls 2.2 cfs @ 2.90 fps)

Pond P1-4: Infiltration Basin



Summary for Pond P1-5: Drywell-1

Inflow Area = 0.138 ac,100.00% Impervious, Inflow Depth > 5.73" for 25 Year NOAA event
Inflow = 0.9 cfs @ 12.07 hrs, Volume= 0.066 af
Outflow = 0.2 cfs @ 12.40 hrs, Volume= 0.066 af, Atten= 73%, Lag= 20.1 min
Discarded = 0.2 cfs @ 12.40 hrs, Volume= 0.066 af
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 284.98' @ 12.40 hrs Surf.Area= 512 sf Storage= 658 cf

Plug-Flow detention time= 18.9 min calculated for 0.066 af (100% of inflow)
Center-of-Mass det. time= 18.9 min (779.5 - 760.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	283.00'	453 cf	**16.00'W x 32.00'L x 3.21'H Field A** 1,643 cf Overall - 510 cf Embedded = 1,133 cf x 40.0% Voids
#2A	283.50'	510 cf	**Cultec R-280** x 12 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
		963 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	283.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 280.70'
#2	Primary	290.00'	**6.0" Vert. Downspouts** C= 0.600

Discarded OutFlow Max=0.2 cfs @ 12.40 hrs HW=284.98' (Free Discharge)
↑**1=Exfiltration** (Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=283.00' (Free Discharge)
↑**2=Downspouts** (Controls 0.0 cfs)

Pond P1-5: Drywell-1 - Chamber Wizard Field A

Chamber Model = Cultec R-280
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap

47.0" Wide + 6.0" Spacing = 53.0" C-C

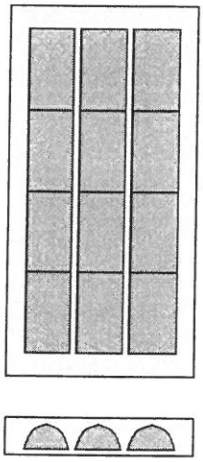
4 Chambers/Row x 7.00' Long = 28.00' + 24.0" End Stone x 2 = 32.00' Base Length
3 Rows x 47.0" Wide + 6.0" Spacing x 2 + 19.5" Side Stone x 2 = 16.00' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

12 Chambers x 42.5 cf = 510.0 cf Chamber Storage

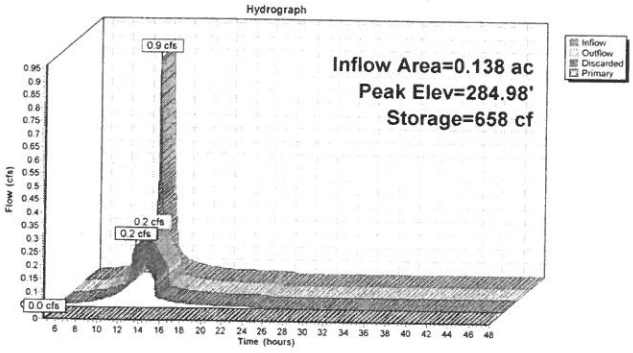
1,642.7 cf Field - 510.0 cf Chambers = 1,132.6 cf Stone x 40.0% Voids = 453.1 cf Stone Storage

Stone + Chamber Storage = 963.1 cf = 0.022 af

12 Chambers
60.8 cy Field
41.9 cy Stone



Pond P1-5: Drywell-1



Summary for Pond P2-3: Drywell-2

Inflow Area = 0.138 ac,100.00% Impervious, Inflow Depth > 5.73" for 25 Year NOAA event
Inflow = 0.9 cfs @ 12.07 hrs, Volume= 0.066 af
Outflow = 0.2 cfs @ 12.40 hrs, Volume= 0.066 af, Atten= 73%, Lag= 20.1 min
Discarded = 0.2 cfs @ 12.40 hrs, Volume= 0.066 af
Primary = 0.0 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 285.98' @ 12.40 hrs Surf.Area= 512 sf Storage= 657 cf

Plug-Flow detention time= 18.7 min calculated for 0.066 af (100% of inflow)
Center-of-Mass det. time= 18.7 min (779.3 - 760.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	284.00'	453 cf	**16.00'W x 32.00'L x 3.21'H Field A** 1,643 cf Overall - 510 cf Embedded = 1,133 cf x 40.0% Voids
#2A	284.50'	510 cf	**Cultec R-280** x 12 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap
		963 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	284.00'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 281.70'
#2	Primary	290.00'	**6.0" Vert. Downspouts** C= 0.600

Discarded OutFlow Max=0.2 cfs @ 12.40 hrs HW=285.98' (Free Discharge)
↑**1=Exfiltration** (Controls 0.2 cfs)

Primary OutFlow Max=0.0 cfs @ 5.00 hrs HW=284.00' (Free Discharge)
↑**2=Downspouts** (Controls 0.0 cfs)

Pond P2-3: Drywell-2 - Chamber Wizard Field A

Chamber Model = Cultec R-280
Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf
Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap

47.0" Wide + 6.0" Spacing = 53.0" C-C

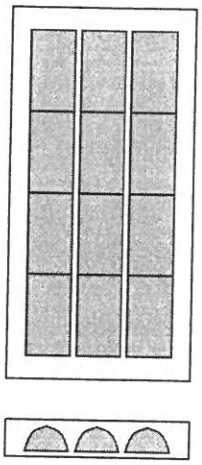
4 Chambers/Row x 7.00' Long = 28.00' + 24.0" End Stone x 2 = 32.00' Base Length
3 Rows x 47.0" Wide + 6.0" Spacing x 2 + 19.5" Side Stone x 2 = 16.00' Base Width
6.0" Base + 26.5" Chamber Height + 6.0" Cover = 3.21' Field Height

12 Chambers x 42.5 cf = 510.0 cf Chamber Storage

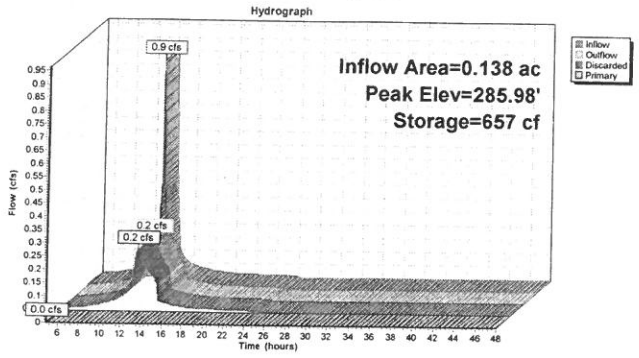
1,642.7 cf Field - 510.0 cf Chambers = 1,132.6 cf Stone x 40.0% Voids = 453.1 cf Stone Storage

Stone + Chamber Storage = 963.1 cf = 0.022 af

12 Chambers
60.8 cy Field
41.9 cy Stone



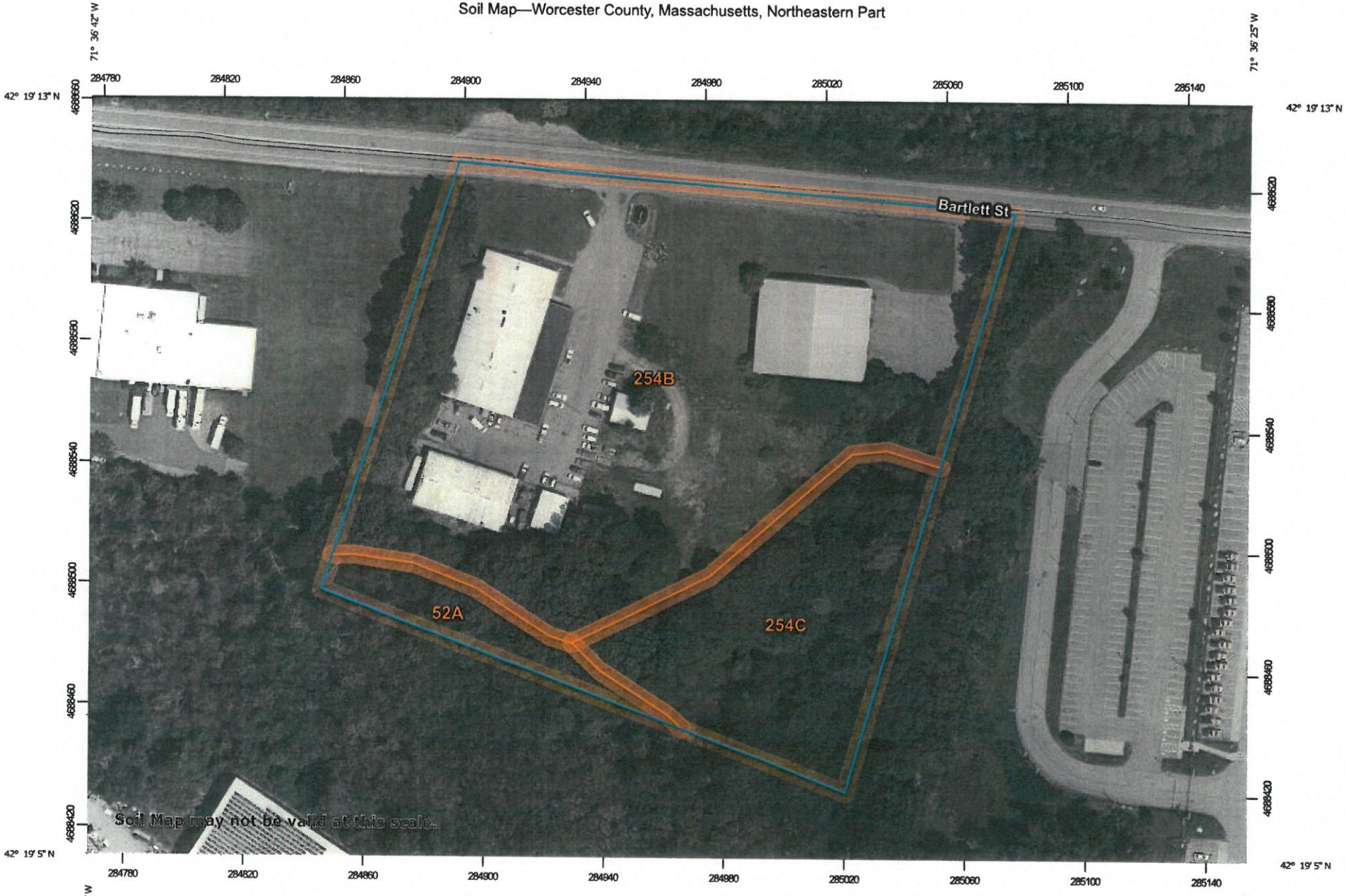
Pond P2-3: Drywell-2



SUBSURFACE SOIL DATA

NRCS Soil Mapping

Soil Map—Worcester County, Massachusetts, Northeastern Part



Map Scale: 1:1,760 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

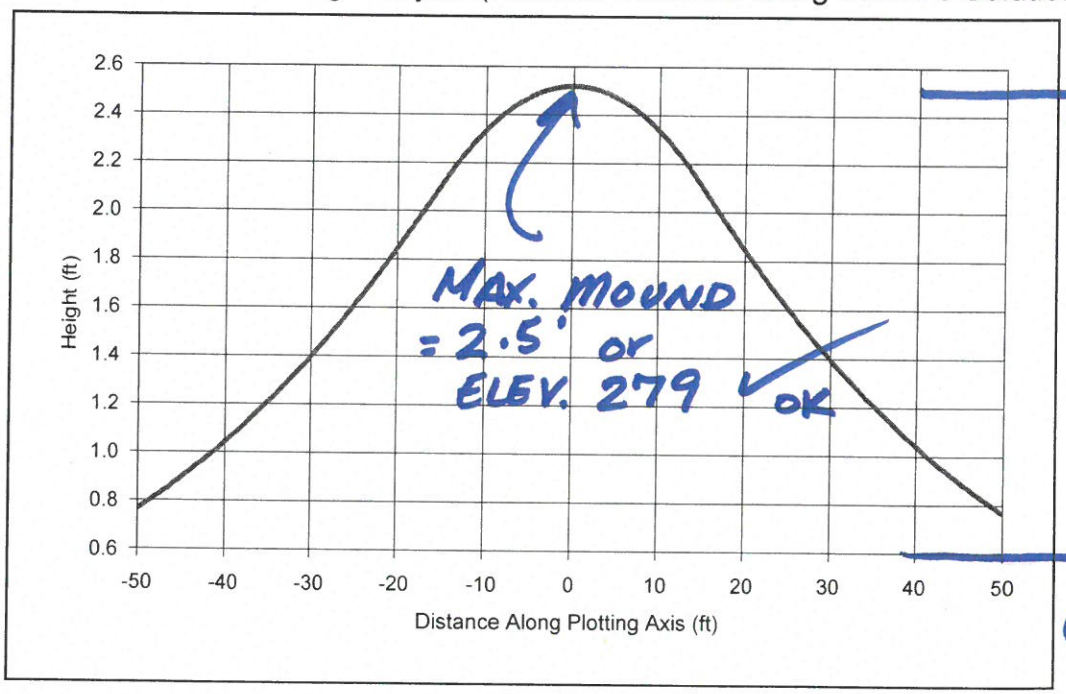
Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
52A	Freetown muck, 0 to 1 percent slopes	0.4	5.2%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	5.8	73.6%
254C	Merrimac fine sandy loam, 8 to 15 percent slopes	1.7	21.3%
Totals for Area of Interest		**7.9**	**100.0%**

GROUNDWATER MOUNDING CALCULATION

INFILTRATION BASIN - MOUNDING SUMMARY.

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



COMPANY: CSEI

PROJECT: Bartlett

ANALYST: vc

DATE: 11/23/2021 TIME: 11:14:06 AM

INPUT PARAMETERS

Application rate: 2.487 c.ft/day/sq. ft
Duration of application: 1 days
Fillable porosity: 0.28
Hydraulic conductivity: 25.6 ft/day = 12.8 in/hr
Initial saturated thickness: 20 ft
Length of application area: 100 ft
Width of application area: 30 ft
No constant head boundary used
Plotting axis from Y-Axis: 90 degrees
Edge of recharge area:
positive X: 15 ft
positive Y: 0 ft
Total volume applied: 7461 c.ft ✓ OK

WQV = 7,460

MODEL RESULTS

X (ft)	Y (ft)	Plot Axis (ft)	Mound Height (ft)
-50	0	-50	0.76
-42	0	-42	0.98
-34.1	0	-34	1.24
-26.1	0	-26	1.56
-19.9	0	-20	1.85
-15	0	-15	2.1
-11.1	0	-11	2.29
-7.7	0	-8	2.41
-4.8	0	-5	2.48
-2.9	0	-3	2.5
-1.6	0	-2	2.52
0	0	0	2.52
1.6	0	2	2.52
2.9	0	3	2.5
4.8	0	5	2.48
7.7	0	8	2.41
11.1	0	11	2.29
15	0	15	2.1
19.9	0	20	1.85
26.1	0	26	1.56
34.1	0	34	1.24
42	0	42	0.98
50	0	50	0.76

WATER QUALITY STRUCTURE (STORMCEPTOR) SIZING CALCULATIONS

Stormceptor®

STC-1

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	11/22/2021
Project Name	Bartlett Street
Project Number	N/A
Location	STC-1

Designer Information

Company	N/A
Contact	N/A

Notes

N/A

Drainage Area

Total Area (ac)	0.94
Imperviousness (%)	70

The Stormceptor System model STC 450i achieves the water quality objective removing 82% TSS for a Fine (organics, silts and sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.81 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)	0.81

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	88
STC 2400	91
STC 3600	91
STC 4800	93
STC 6000	94
STC 7200	95
STC 11000	96
STC 13000	96
STC 16000	97

Rinker MATERIALS™

Stormceptor®

STC-2

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	11/22/2021
Project Name	Bartlett Street
Project Number	N/A
Location	STC-2

Designer Information

Company	N/A
Contact	N/A

Notes

N/A

Drainage Area

Total Area (ac)	1.83
Imperviousness (%)	73

The Stormceptor System model STC 900 achieves the water quality objective removing 81% TSS for a Fine (organics, silts and sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 1.64 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)	1.64

Upstream Storage

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

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	72
STC 900	**81**
STC 1200	81
STC 1800	81
STC 2400	85
STC 3600	86
STC 4800	88
STC 6000	89
STC 7200	91
STC 11000	93
STC 13000	93
STC 16000	94

Rinker MATERIALS™

Stormceptor®

STC-3

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	11/22/2021
Project Name	Bartlett Street
Project Number	N/A
Location	STC-3

Designer Information

Company	N/A
Contact	N/A

Notes

N/A

Drainage Area

Total Area (ac)	0.42
Imperviousness (%)	100

The Stormceptor System model STC 450i achieves the water quality objective removing 86% TSS for a Fine (organics, silts and sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.52 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)	0.52

Upstream Storage

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

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	**86**
STC 900	91
STC 1200	91
STC 1800	91
STC 2400	93
STC 3600	94
STC 4800	95
STC 6000	95
STC 7200	96
STC 11000	97
STC 13000	97
STC 16000	98

Rinker MATERIALS™

Stormceptor®

STC-4

Stormceptor Design Summary

PCSWMM for Stormceptor

Project Information

Date	11/22/2021
Project Name	Bartlett Street
Project Number	N/A
Location	STC-4

Designer Information

Company	N/A
Contact	N/A

Notes

N/A

Drainage Area

Total Area (ac)	0.23
Imperviousness (%)	100

The Stormceptor System model STC 450i achieves the water quality objective removing 89% TSS for a Fine (organics, silts and sand) particle size distribution; providing continuous positive treatment for a stormwater quality flow rate of 0.28 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)	0.28

Upstream Storage

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

Stormceptor Sizing Summary

Stormceptor Model	TSS Removal %
STC 450i	**89**
STC 900	94
STC 1200	94
STC 1800	94
STC 2400	95
STC 3600	96
STC 4800	97
STC 6000	97
STC 7200	98
STC 11000	98
STC 13000	98
STC 16000	99

Rinker MATERIALS™

STORMWATER OPERATION AND MAINTNANCE PLAN

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

200 Bartlett Street
Northborough, MA

Stormwater Management System Owner: AND Responsible Party R.J. Devereaux Corporation

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.

This plan includes general site restrictions, routing/non-routine operation and maintenance; reporting and record keeping; and an estimated budget.

General Conditions

1. The following site conditions are imposed as part of this Plan.
   - Illicit discharges into stormwater management system are perpetually prohibited.
   - The use of fertilizers should be limited to slow-release, low-nitrogen fertilizers.

2. The Town Engineer shall be notified before maintenance work is preformed and shall be afforded the opportunity to inspect the work. Copies of any contracts, inspection reports, and invoices for the work performed shall be retained and made available to the Town Engineer upon request.

3. All material removed from the drainage system (i.e. catch basin cleanings) shall be legally disposed of off-site.

Operation and Maintenance:

Stormwater management facilities should be inspected a minimum of four times per year and following at least one major storm per year. 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 Stormceptors.
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, catch basins and Stormceptors should be inspected four times annually, and cleaned whenever sediment accumulation exceeds 12 inches in catch basins and 8 inches in Stormceptors. 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 .Vaccum trucks shall be utilized for all cleanings.

Drywells / Infiltration Chambers
The Inspection ports should be opened and the infiltration chambers checked for accumulated debris and sediment at four times annually (spring and fall) with at least one after a major storm to see if they have fully drained. The inspector shall utilize the inspection port on the Cultec Chambers that receive flow to determine if any sediment or debris is entering the system. If any sediment is present and/or if the infiltration chambers do not drain within 72 hours of the end of a storm, then remediation may be necessary. It may be possible to flood the system to suspend sediment and debris and remove it with a vacuum truck. Otherwise replacement of the soil around and under the infiltration chambers may be required.

Gutters should be inspected and cleaned a minimum of twice per year (or cleaned whenever debris is noted). Downspouts should be inspected for connection and any evidence of overflow.

Infiltration Basin
After every major storm during the first 3 months of operation and thereafter 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.

The inspector shall visit the site three to four 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.

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.

The inspector shall ensure that there are no signs of scour around the inlets. Vegetation and riprap shall be in good condition (e.g., grass shall be dense and healthy looking; riprap shall be free from undermining and/or deterioration). Inlet structures shall be free from cracks, breaks, or deterioration of materials. If scour is evident, the damaged area shall be filled, compacted and reseeded, stabilized with a geotextile fabric, or

lined with riprap in that order. If rip rapped areas have been damaged, the riprap shall be replaced or supplemented. The use of concentrated flow dissipation devices, such as level spreaders, may help to eliminate inlet scour problems.

The outlet channel itself should be free from obstruction (e.g., fallen trees) and bank scour, or the undermining of riprap. The spillway should show no signs of settlement, erosion, or slope failure. Damaged natural areas along the outlet channel should be filled, compacted, and reseeded, to lined with geotextile fabric. Damaged rip rapped areas should be replaced and supplemented.

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.

Debris Accumulation

The inspector shall check basins and channels for both sediment and debris accumulations. Debris and sediment shall be removed at the time of the inspection, if feasible. Sediment shall not be allowed to accumulate and restrict flows. Most debris can be removed by hand or with hand tools (e.g. shovel). Some larger objects, such as fallen tree limbs, may have to be cut up before removal by hand is possible.

Vegetation

The 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 affected by lack of rainfall shall be watered. If a recently established vegetated area is determined to be inadequate for erosion control it shall be refertilized with microbial release, not sulfur encapsulated, fertilizer, (using half of the rate originally applied). If the stand is more than 60% damaged, it shall be reestablished, following the original preparation and seeding instructions. Areas of repeated erosion/scour problems shall be lined with riprap only after twice attempting to stabilize the area with geotextile fabric.

Pipe Outlets

Pipe outlets shall be checked for: (1) signs of seepage, (2) signs of scour, (3) cracks, breaks, or deterioration of materials, and (4) rip rap condition / undermining. The outlet channel itself shall be free from obstruction (e.g., fallen trees). Vegetation and riprap shall be in good condition (e.g., grass shall be dense and healthy looking; riprap shall be free from undermining and/or deterioration). If scour is evident, the damaged area shall be filled, compacted and reseeded, stabilized with a geotextile fabric, or lined with riprap in that order. If rip rapped areas have been damaged, the riprap shall be replaced or supplemented. The use of concentrated flow dissipation devices, such as level spreaders, may help to eliminate inlet scour problems.

Snow Removal

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

Public Safety Features

The driveway shall be kept free of snow and debris for emergency vehicle access. Storage shall not be allowed in these areas.

Activity	Frequency
Perform Inspection of all System Components and Prepare Report	Four times per year
Clean Catch Basins & Stormceptor	Minimum once per year or when sediment reaches 12-inches in catch basins or 8-inches in Stormceptor
Mow surface Infiltration area. Remove trash and debris; remove grass clippings and accumulated organic matter.	Minimum of twice per year
Street Sweeping	Minimum twice per year (spring and fall)
Clean / remediation of Infiltration system	As required based upon inspection
Clean Gutters	Minimum twice per year or whenever debris is noted

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.

Estimated Budget

The estimated annual budget to perform the routine scheduled maintenance is approximately $4,000.00. This estimate does not include the repair of structures, pipes, embankments; cleaning drain lines; snow plowing; or other non-routine tasks.

Emergency Response Plan / Spill Control Practices

On-site storage of hazardous materials shall not be allowed.

In the event of an accident in the roadway or on individual lots, where a significant amount of gasoline or other petroleum product is released, the following procedure should be followed:

1. Immediately contact the following agencies:

Northborough Fire Department	(508) 393-1537
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 catch basins, 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, additional corrective actions must be taken extending to the receiving water or beyond.

MAINTENANCE INSPECTION FORM
200 Bartlett Street
Northborough, MA

Date:_____ Inspector:_____ Signature:_____

Drainage Structures

DESIGNATION	DEPTH OF SEDIMENT	ACTION REQUIRED / TAKEN
CB-1		
CB-2		
CB-3		
CB-4		
CB-5		
Cb-6		
CB-7		
CB-8		
CB-9		
CB-10		
CB-11		
CB-12		
STC-1		
STC-2		
STC-3		
STC-4		
Dry Well 1		Dewatered (Y/N)
Dry Well 2		Dewatered (Y/N)
Infiltration Basin		Dewatered (Y/N)

Inspect Vegetation_____

Inspect Pavement Condition_____

COMMENTS / MAINTENANCE REQUIRED:_____

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

200 Bartlett Street
Northborough, MA

Stormwater Management System Owner: AND Responsible Party R.J. Devereaux Corporation

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.

This plan includes general site restrictions, routing/non-routine operation and maintenance; reporting and record keeping; and an estimated budget.

General Conditions

1. The following site conditions are imposed as part of this Plan.
   - Illicit discharges into stormwater management system are perpetually prohibited.
   - The use of fertilizers should be limited to slow-release, low-nitrogen fertilizers.

2. The Town Engineer shall be notified before maintenance work is preformed and shall be afforded the opportunity to inspect the work. Copies of any contracts, inspection reports, and invoices for the work performed shall be retained and made available to the Town Engineer upon request.

3. All material removed from the drainage system (i.e. catch basin cleanings) shall be legally disposed of off-site.

Operation and Maintenance:

Stormwater management facilities should be inspected a minimum of four times per year and following at least one major storm per year. 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 Stormceptors.
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, catch basins and Stormceptors should be inspected four times annually, and cleaned whenever sediment accumulation exceeds 12 inches in catch basins and 8 inches in Stormceptors. 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 .Vaccum trucks shall be utilized for all cleanings.

Drywells / Infiltration Chambers
The Inspection ports should be opened and the infiltration chambers checked for accumulated debris and sediment at four times annually (spring and fall) with at least one after a major storm to see if they have fully drained. The inspector shall utilize the inspection port on the Cultec Chambers that receive flow to determine if any sediment or debris is entering the system. If any sediment is present and/or if the infiltration chambers do not drain within 72 hours of the end of a storm, then remediation may be necessary. It may be possible to flood the system to suspend sediment and debris and remove it with a vacuum truck. Otherwise replacement of the soil around and under the infiltration chambers may be required.

Gutters should be inspected and cleaned a minimum of twice per year (or cleaned whenever debris is noted). Downspouts should be inspected for connection and any evidence of overflow.

Infiltration Basin
After every major storm during the first 3 months of operation and thereafter 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.

The inspector shall visit the site three to four 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.

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.

The inspector shall ensure that there are no signs of scour around the inlets. Vegetation and riprap shall be in good condition (e.g., grass shall be dense and healthy looking; riprap shall be free from undermining and/or deterioration). Inlet structures shall be free from cracks, breaks, or deterioration of materials. If scour is evident, the damaged area shall be filled, compacted and reseeded, stabilized with a geotextile fabric, or

lined with riprap in that order. If rip rapped areas have been damaged, the riprap shall be replaced or supplemented. The use of concentrated flow dissipation devices, such as level spreaders, may help to eliminate inlet scour problems.

The outlet channel itself should be free from obstruction (e.g., fallen trees) and bank scour, or the undermining of riprap. The spillway should show no signs of settlement, erosion, or slope failure. Damaged natural areas along the outlet channel should be filled, compacted, and reseeded, to lined with geotextile fabric. Damaged rip rapped areas should be replaced and supplemented.

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.

Debris Accumulation

The inspector shall check basins and channels for both sediment and debris accumulations. Debris and sediment shall be removed at the time of the inspection, if feasible. Sediment shall not be allowed to accumulate and restrict flows. Most debris can be removed by hand or with hand tools (e.g. shovel). Some larger objects, such as fallen tree limbs, may have to be cut up before removal by hand is possible.

Vegetation

The 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 affected by lack of rainfall shall be watered. If a recently established vegetated area is determined to be inadequate for erosion control it shall be refertilized with microbial release, not sulfur encapsulated, fertilizer, (using half of the rate originally applied). If the stand is more than 60% damaged, it shall be reestablished, following the original preparation and seeding instructions. Areas of repeated erosion/scour problems shall be lined with riprap only after twice attempting to stabilize the area with geotextile fabric.

Pipe Outlets

Pipe outlets shall be checked for: (1) signs of seepage, (2) signs of scour, (3) cracks, breaks, or deterioration of materials, and (4) rip rap condition / undermining. The outlet channel itself shall be free from obstruction (e.g., fallen trees). Vegetation and riprap shall be in good condition (e.g., grass shall be dense and healthy looking; riprap shall be free from undermining and/or deterioration). If scour is evident, the damaged area shall be filled, compacted and reseeded, stabilized with a geotextile fabric, or lined with riprap in that order. If rip rapped areas have been damaged, the riprap shall be replaced or supplemented. The use of concentrated flow dissipation devices, such as level spreaders, may help to eliminate inlet scour problems.

Snow Removal

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

Public Safety Features

The driveway shall be kept free of snow and debris for emergency vehicle access. Storage shall not be allowed in these areas.

Activity	Frequency
Perform Inspection of all System Components and Prepare Report	Four times per year
Clean Catch Basins & Stormceptor	Minimum once per year or when sediment reaches 12-inches in catch basins or 8-inches in Stormceptor
Mow surface Infiltration area. Remove trash and debris; remove grass clippings and accumulated organic matter.	Minimum of twice per year
Street Sweeping	Minimum twice per year (spring and fall)
Clean / remediation of Infiltration system	As required based upon inspection
Clean Gutters	Minimum twice per year or whenever debris is noted

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.

Estimated Budget

The estimated annual budget to perform the routine scheduled maintenance is approximately $4,000.00. This estimate does not include the repair of structures, pipes, embankments; cleaning drain lines; snow plowing; or other non-routine tasks.

Emergency Response Plan / Spill Control Practices

On-site storage of hazardous materials shall not be allowed.

In the event of an accident in the roadway or on individual lots, where a significant amount of gasoline or other petroleum product is released, the following procedure should be followed:

1. Immediately contact the following agencies:

Northborough Fire Department	(508) 393-1537
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 catch basins, 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, additional corrective actions must be taken extending to the receiving water or beyond.

MAINTENANCE INSPECTION FORM
200 Bartlett Street
Northborough, MA

Date:_____ Inspector:_____ Signature:_____

Drainage Structures

DESIGNATION	DEPTH OF SEDIMENT	ACTION REQUIRED / TAKEN
CB-1		
CB-2		
CB-3		
CB-4		
CB-5		
Cb-6		
CB-7		
CB-8		
CB-9		
CB-10		
CB-11		
CB-12		
STC-1		
STC-2		
STC-3		
STC-4		
Dry Well 1		Dewatered (Y/N)
Dry Well 2		Dewatered (Y/N)
Infiltration Basin		Dewatered (Y/N)

Inspect Vegetation_____

Inspect Pavement Condition_____

COMMENTS / MAINTENANCE REQUIRED:_____

CONSTRCUTION PERIOD STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

Stormwater Pollution Prevention Plan

for

Proposed Site Plan
200 Bartlett Street
Northborough, MA

This Stormwater Pollution Prevention Pan has been prepared in accordance with the MA Department of Environmental Protection Stormwater Standards and NPDES General Construction Permit for Stormwater Discharges from Construction Activities. All work shall be in accordance with the order of conditions issued by the Local Conservation Commission.

1.1 Project Information

Project Name and Location:	Contractors Yard 200 Bartlett Street Northborough, MA
Owner Name and Address:	RJ Devereaux Corp. 10 Emerson Place Boston, MA 02114
Site Operator:	Same as Owner
Accompanying Documents:	Plans titled "Site Plan, 200 Bartlett Street in Northborough, MA," prepared by Connorstone Engineering, Inc., are to be considered a part of this document.
NDPES Tracking Number:	_____
Latitude/Longitude:	Lat: 42.31950 Long: 71.60940
Project Description:	Contractors Yard
Estimated Dates:	Start: Spring 2022 Completion: Fall 2023
Name of Receiving Waters:	Bartlett Pond
Estimated Area of Disturbance:	4.1 Acres

1.2 Contact Information / Responsible Parties (complete prior to construction)

Operator(s):

Company Name:
Address:
Telephone #:
Area of Control: Entire Site

Project Manager(s) or Site Supervisor(s):

Company Name: Same as Operator
Address:
Telephone #:
Area of Control:

This SWPPP was Prepared by:

Connorstone Engineering, Inc.:
10 Southwest Cutoff
Northborough, MA 01532 / 508-393-9727

Emergency 24-Hour Contact:

Company Name: Same as Operator
Address:
Telephone #:
Area of Control:

Subcontractors:

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the Subcontractor Certifications/Agreement (Attached).

1.3 Existing Conditions

The subject site consists of a 6.7 acre parcel of land located at 200 Bartlett Street in the Town of Northborough, MA. The site is shown on assessor's map 66 as parcel 7, and is within the Industrial Zoning District and Groundwater Overlay Districts, Area 1 and 3. The existing site is currently developed with three primary buildings and two outbuildings along with associated parking, driveways, utilities, etc. The buildings were constructed at various times all prior to 1986. Two of the larger buildings closest to Bartlett Street are currently unoccupied and the rear building is occupied by an Auto repair garage. The rear southeast corner of the site is undeveloped. The existing conditions currently include 79,795 square feet of impervious surfaces. The existing structures are serviced by Town water and three on-site septic systems.

1.4 Proposed Development / Nature of Construction Activities

The proposed plan includes renovation of the two main structures closest to Bartlett Street and removal of one of the outbuildings. The building to the East side of the site will be primarily utilized for maintenance and the other building to the west will be used for training and dry storage. The rear auto repair garage and outbuilding will remain in the current condition. The overall use of the site will be for a Contractor's Yard. Work will also include new parking and driveway access, a new septic system to replace the older failed system(s), a new stormwater management system that will include upgrades to the existing areas around the auto repair shop, site Landscaping, lighting, and related site work. The overall proposed impervious area will be 137,920 square feet (or an increase of 58,125 sq. ft.)

The proposed driveway and parking layout will provide access through the site and around the rear of the maintenance building. The layout will allow for full access to emergency and firefighting apparatus. The existing loading docks at the buildings would be maintained for the proposed use. The site grading has been designed to fit with the existing topography sloping down away from Bartlett Street, which will reduce the required fill on-site. The building will be connected Town water and be serviced by a proposed on-site septic system. All required soil testing witnessed by the Board of Health has been performed to verify the design and adequacy of the proposed septic system.

1.5 Construction Site Estimates

Total parcel area:	6.7 acres
Total land disturbance:	4.1 acres
Impervious area before construction:	1.8 acres
Impervious area after construction:	3.2 acres

1.6 Sensitive Areas / Wetland Resources

Wetland resource areas on-site include bordering vegetated wetlands along the southern property line. The wetlands were delineated by Three Oaks Environmental in the fall of 2019 and updated in February of 2020. The wetlands are bordering on an intermittent stream that flows from east to west through a culvert under Lyman Street and ultimately to Bartlett Pond. This stream is shown on the USGS maps as a heavy blue line, but was determined to be intermittent during the ANRAD process of the downgradient project at 1 Lyman Street. The intermittent stream also has areas associated with the 100 year flood hazard as shown on the Town of Northborough Flood Insurance Rate Map 25027C0653F, dated July 16, 2014. The mapping has shown the area as Zone A, which does not have an assigned based flood elevation. The Zone A boundary generally follows the elevation 275 contour line and is fully contained offsite. The Natural Heritage and Endangered Species Program (NHESP) have not identified any areas on-site as lying within the reported Priority or Estimated Habitat Areas..

1.7 Discharge Information

The proposed drainage system will discharge to the on-site wetland system that flows toward a culvert under Lyman Street. This system ultimately discharges to Bartlett Pond. This pond is listed in the Massachusetts year 2016 integrated list of waters as Category 4c, Impairment not caused by pollutant – TMDL not required, due to non-native plants. Bartlett Pond flows to the Assebett River, which is a Class B Warm Water Stream.

1.8 Endangered Species Certification

The proposed project is not located in an Estimated or Priority Habitat of Rare Wildlife as indicated on the 2021 Estimated Habitat Map of State-Listed Rare Wetland Wildlife published by the Natural Heritage and Endangered Species Program (NHESP)

1.9 Potential Sources of Pollution

Potential sources of sediment to stormwater runoff:

- Clearing and grubbing operations
- Grading and site excavation operations
- Vehicle tracking
- Topsoil stripping and stockpiling
- Landscaping operations

Potential pollutants and sources, other than sediment, to stormwater runoff:

- Combined Staging Area—small fueling activities, minor equipment maintenance, sanitary facilities, and hazardous waste storage.
- Materials Storage Area—general building materials, solvents, adhesives, paving materials, paints, aggregates, trash, etc.
- Construction Activity—paving, curb/gutter installation, concrete pouring/mortar/stucco, and building construction.
- Concrete Washout Area

1.10 REQUIREMENT TO POST A NOTICE OF YOUR PERMIT COVERAGE.

- The operator must post a sign or other notice conspicuously at a safe, publicly accessible location in close proximity to the project site. The notice must be located so that it is visible from the public road that is nearest to the active part of the construction site, and it must use a font large enough to be readily viewed from a public right-of-way. At a minimum, the notice must include
- a. The NPDES ID (i.e., permit tracking number assigned to your NOI);
- b. A contact name and phone number for obtaining additional construction site information;
- c. The Uniform Resource Locator (URL) for the SWPPP (if available), or the following statement: "If you would like to obtain a copy of the Stormwater Pollution Prevention Plan (SWPPP) for this site, contact the EPA Regional Office at [include the appropriate CGP Regional Office contact information found at https://www.epa.gov/npdes/contact-us-stormwater#regional];" and
- d. The following statement "If you observe indicators of stormwater pollutants in the discharge or in the receiving waterbody, contact the EPA through the following website: https://www.epa.gov/enforcement/report-environmental-violations."

2.1 General Construction Sequencing of Major Activities

It is assumed that under normal conditions work will proceed in accordance with the following schedule. Major shifts in the schedule must be approved by the department of public works or their designate.

Typical hours of operation: Mon-Sat. 7:00 - 5:00

General Sequencing Plan

1. Install siltation barriers - erosion barriers as indicated on the plans
2. Utilize existing paved areas as construction entrance.
3. Begin building renovations.
4. Begin site preparation & Cut and remove trees within limit of work.
5. Install Berm to create temporary sediment basin with outlet.
6. Strip and stockpile top and sub soil.
7. Rough grade and cut/fill as necessary to subgrade. Fill to be placed such that runoff will be conveyed to sediment basin.
8. Stabilize slopes with hydroseed and/or woodchips or weed free straw or hay.
9. Install drain lines, underground utilities, and structures.
10. Install septic system and connections to existing buildings.
11. Place and compact driveway gravel.
12. Install binder pavement course.
13. Begin sweeping of all paved surfaces within the project site as necessary to prevent tracking off-site and siltation buildup in the completed drainage system.
14. Loam and seed road shoulders, drainage swales and exposed slopes.
15. Complete driveway construction including final pavement, and loam and seed all disturbed areas.
16. Once site is stabilized remove sediment basin, install the infiltration basin per the detail drawings.
17. Remove all sediment control devices and perform final cleanup.

2.2 Erosion and Sediment Controls

General Conditions – Prior to initiating construction, all sedimentation and erosion control measures shall be installed as shown on the plans and detail drawings. This plan depicts the minimum required sedimentation and erosion controls. The contractor shall employ additional sedimentation and erosion control measures as necessitated by site conditions, or as directed by the owner, the owner's representative, or the conservation commission to ensure protection of all wetland resources and control sediment transport. if sedimentation plumes occur, the contractor shall stop work and install additional sedimentation control devices immediately to prevent further sedimentation.

Temporary Stabilization – Topsoil stockpiles and disturbed portions of the site where construction activity temporarily ceases for at least 7 days will be stabilized with a temporary seed and mulch no later than 7 days from the last construction activity in that area. The temporary seed shall be Erosion Control mix. Seeding shall be nutrient enriched hydroseed and cellulose or other degradable fibers capable of retaining moisture.

Permanent Stabilization – Initiate the installation of stabilization measures immediately in any areas of exposed soil where construction activities have permanently ceased or will be temporarily inactive for 7 or more calendar days; and Complete the installation of stabilization measures as soon as practicable, but no later than 7 calendar days after stabilization has been initiated. Final Stabilization Criteria (for any areas not covered by permanent structures). Establish uniform, perennial vegetation (i.e., evenly distributed, without large bare areas) that provides 70 percent or more of the cover that is provided by vegetation native to local undisturbed areas; and/or implement permanent non-vegetative stabilization measures to provide effective cover. The permanent seed mix consists of tall fescue, and annual rye. Prior to seeding, ground agricultural limestone shall be applied. Seeding shall be nutrient enriched hydroseed and cellulose or other degradable fibers capable of retaining moisture.

Erosion Barriers (Perimeter Controls) – Erosion Barriers shall consist of straw bales and silt fence. All devices shall be weed free to prevent spread of invasive species. Prior to the commencement of work, barriers shall be installed along the edge of proposed development, and as indicated on the plans. Additional barriers shall be located as conditions warrant or as directed by the owner, his representatives, or the local authority. In some areas barriers may have to be duplicated at regular intervals up gradient of wetlands, and it may be necessary to provide crushed stone armor when anticipated flows are expected to be heavy or fast.

Track out controls / Construction Entrance – Once pavement has been removed, a stabilized stone apron construction entrance shall be at all construction entrances to help prevent vehicle tracking of sediments. All vehicles shall enter and exit the sit via the stabilized construction entrance. The contractor shall inspect the construction entrance daily and after heavy use. If mud and soil clogs the voids in the crushed stone reducing the effectiveness, the pad shall be top dressed with new, clean stone. If the pad becomes completely clogged, replacement of the entire pad may be necessary. Dump trucks hauling material from the construction site will be covered with a tarpaulin.

Track out controls / Street Sweeping – Street sweeping in the vicinity of the project area shall be performed as needed until the project limits have been stabilized. All sediment tracked outside the limit of work shall be swept at the end of each working day.

Inlet Protection – All existing and proposed drainage system inlets, which may receive stormwater flow from disturbed areas, shall be provided with inlet protection (ring of weed free straw bales and catch basin inserts). The contractor shall maintain these devices until all work is completed and all areas have been adequately stabilized.

Temporary Sediment Traps / Basins – Sediment traps and/or basins shall be constructed as shown on the approved plans and as necessitated by field conditions. The minimum volume shall be 3600 cubic feet of storage for each acre of drainage area. Sediment traps/basins should be readily accessible for maintenance and sediment removal, and should remain in operation and be properly maintained until the site area is permanently stabilized by vegetation and/or when permanent structures are in place. Remove basin after drainage area has been permanently stabilized, inspected, and approved. Before removing dam, drain water and remove sediment; place waste material in designated disposal areas. Smooth site to blend with surrounding area and stabilize.

Dust Control – Dust control measures shall be implemented and maintained properly throughout dry weather periods until all disturbed areas have been permanently stabilized. Methods for dust control shall include water sprinkling and/or other methods approved by the engineer.

Soil Stockpiles – Soil stockpiles that are to remain inactive for 7 days or more shall be covered (tarps, blown straw, hydroseed, etc.) or temporarily stabilized to prevent erosion along with perimeter sedimentation controls. No materials subject to erosion shall be stockpiled overnight within 100 feet of a wetland unless covered.

Dewatering Operations – Dewatering operations, if required, shall discharge onto stabilized areas. All discharge water is to pass through sedimentation control devices to prevent impacts upon water bodies, bordering vegetated wetlands, drainage systems and abutting properties. No discharges from dewatering operations shall be discharged directly to the drainage system.

Snow Removal – Snow shall be plowed to the shoulder of the roadway. Any excess of that which can be stored on-site shall be removed. Snow shall not be plowed into the basin or into the 20-foot buffer zone to any wetland area. All catch basins shall be uncovered and functional immediately after snow plowing. Any snow piles shall be placed so that it will not interfere with runoff flow.

Topsoil – Topsoil shall be stripped and stockpiled on-site for reuse, unless otherwise noted on the plans (per stockpile requirements). Materials shall be re-used on-site to the maximum extent practical. Any excess shall be properly exported off-site.

Minimize Soil Compaction – Within the limits of the infiltration basins, the use of heavy equipment shall be limited to the maximum extent practical.

Vehicle Washing – Vehicle and equipment washing, other than hose down with clean water, shall not be allowed. All wash down water shall be directed to a sediment control device (not directly to any stormwater drainage system or wetland).

Fertilizer Discharge Restrictions.

- Apply at a rate and in amounts consistent with manufacturer's specifications,
- Apply during the growing season, and preferably timed to coincide as closely as possible to the period of maximum vegetation uptake and growth;
- Avoid applying before heavy rains that could cause excess nutrients to be discharged;
- Never apply to frozen ground;
- Never apply to stormwater conveyance channels with flowing water; and
- Follow all other federal, state, tribal, and local requirements regarding fertilizer application.

Washing of Applicators and Containers used for Paint, Concrete, or Other Materials. - Direct all wash water into a leak-proof container or leak-proof pit. The container or pit must be designed so that no overflows can occur due to inadequate sizing or precipitation Handle washout or cleanout wastes as follows: Do not dump liquid wastes in storm sewers; Dispose of liquid wastes in accordance with applicable regulations; and. Remove and dispose of hardened concrete waste consistent with your handling of other construction wastes. Locate any washout or cleanout activities as far away as possible from surface waters and stormwater inlets or conveyances, and, to the extent practicable, designate areas to be used for these activities and conduct such activities only in these areas.

2.3 Buffers

A minimum 25 Buffer has been provided to the wetland resource areas. Additional controls including perimeter barriers and sediment basins have been provided as an equivalent to a 50 foot buffer.

2.4 Inspection and Maintenance Schedule

The responsible party shall be responsible for maintaining all temporary and permanent sedimentation and erosion controls until work is complete and all areas have been permanently stabilized. At such time all sedimentation and erosion control measures shall be removed. These are the inspection and maintenance practices that will be used to maintain erosion and sediment controls during construction.

Schedule:

- All control measures will be inspected at least *once each week*.
- All erosion components shall be inspected with 24 hours of the occurrence of any precipitation event of 0.25 inches or greater.
- Depth of precipitation events shall be based upon NCDC reporting or on-site rain gauge.

Maintenance Practices:

- All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report of any deficiencies.
- Built up sediment shall be removed from the silt fence when it reaches a depth equal to one-third the height of the fence.
- The sediment traps shall be inspected for depth of sediment, and built up sediment will be removed when it reached 25 percent of the design capacity or at the end of the job. Check embankment for: settlement, seepage, or slumping along the toe or around pipe. Look for signs of piping. Repair immediately. Remove trash and other debris from principal spillway, emergency spillway, and pool area. Clean or replace gravel when sediment pool does not drain properly.
- Any diversion dikes will be inspected for breaches and promptly repaired.
- Temporary and permanent seeding and planting will be inspected for bare spots, washouts and healthy growth.
- Contractor to maintain a supply of erosion control devises on site at all times to repair any broken or damaged materials.

The site superintendent, will select three individuals who will be responsible for inspections, maintenance and repair activities, and filling out the inspection and maintenance reports. Personnel selected for inspection and maintenance responsibilities shall be a "qualified personnel" as defined in section 4. D of the GCP. Staff shall be trained in all inspection and maintenance practices for keeping the erosion and sediment controls used onsite in good working order.

An *inspection report* will be made after each inspection. Copies of the reports shall be maintained on site. At a minimum, the inspection report must include:

- The inspection date;
- Names, titles, and qualifications of personnel making the inspection;
- Weather information for the period since the last inspection including estimate of the beginning and duration of each storm event, approximate amount of rainfall for each storm event (in inches), and whether any discharges occurred;
- Location(s) of discharges of sediment or other pollutants from the site;
- Location(s) of BMPs that need to be maintained;
- Location(s) of BMPs that failed to operate as designed or proved inadequate for a particular location;
- Location(s) where additional BMPs are needed that did not exist at the time of inspection; and
- Corrective action required including implementation dates.

The inspection report must be signed in accordance with Appendix G, Section 11 of the GCP.

2.5 Staff and Training Requirements.

Prior to the commencement of earth-disturbing activities or pollutant-generating activities, whichever occurs first, you must ensure that the following personnel understand the requirements of this permit and their specific responsibilities with respect to those requirements:

- Personnel who are responsible for the design, installation, maintenance, and/or repair of stormwater controls (including pollution prevention measures);
- Personnel responsible for the application and storage of treatment chemicals (if applicable);
- Personnel who are responsible for conducting inspections as required in Part 4.1.1; and
- Personnel who are responsible for taking corrective actions.

Notes: (1) If the person requiring training is a new employee, who starts after you commence earth-disturbing or pollutant-generating activities, you must ensure that this person has the proper understanding as required above prior to assuming particular responsibilities related to compliance with this permit. (2) For emergency-related construction activities, the requirement to train personnel prior to commencement of earth-disturbing activities does not apply, however, such personnel must have the required training prior to NOI submission.

The operator is responsible for ensuring that all activities on the site comply with the requirements of the permit. The operator is not required to provide or document formal training for subcontractors or other outside service providers, but you must ensure that such personnel understand any requirements of the permit that may be affected by the work they are subcontracted to perform. At a minimum, personnel must be trained to understand the following if related to the scope of their job duties (e.g., only personnel responsible for conducting inspections need to understand how to conduct inspections):

- The location of all stormwater controls on the site required by this permit, and how they are to be maintained;
- The proper procedures to follow with respect to the permit's pollution prevention requirements;
- When and how to conduct inspections, record applicable findings, and take corrective actions.

3.1 Storage, Handling, and Waste Disposal

Building Products - Shall be covered or stored inside to prevent any discharge of pollutants. Comply with all application, disposal, and registration requirements.

Pesticides, herbicides, insecticides and fertilizers - Shall be covered or stored inside to prevent any discharge of pollutants. Comply with all application, disposal, and registration requirements.

Diesel fuel, oil, hydraulic fluids, other petroleum products, and other chemicals- store chemicals in water-tight containers, and provide either (1) cover (e.g., plastic sheeting or temporary roofs) to prevent these containers from coming into contact with rainwater, or (2) a similarly effective means designed to prevent the discharge of pollutants from these areas (e.g., spill kits), or provide secondary containment (e.g., spill berms, decks, spill containment pallets). Clean up spills immediately, using dry clean-up methods where possible, and dispose of used materials properly. Do not clean surfaces or spills by hosing the area down. Eliminate the source of the spill to prevent a discharge or a continuation of an ongoing discharge

Hazardous Waste - Separate hazardous or toxic waste from construction and domestic waste. Store waste in sealed containers, which are constructed of suitable materials to prevent leakage and corrosion, and which are labeled in accordance with applicable Resource Conservation and Recovery Act (RCRA) requirements and all other applicable federal, state, tribal, or local requirements; iii. Store all containers that will be stored outside within appropriately sized secondary containment (e.g., spill berms, decks, spill containment pallets) to prevent spills from being discharged, or provide a similarly effective means designed to prevent the discharge of pollutants from these areas (e.g., storing chemicals in covered area or having a spill kit available on site);

Dispose of hazardous or toxic waste in accordance with the manufacturer's recommended method of disposal and in compliance with federal, state, tribal, and local requirements. site personnel will be instructed in these practice and the individual who manages the day to day site operations, will be responsible for seeing that these procedures are followed.

Clean up spills immediately, using dry clean-up methods where possible, and dispose of used materials properly. Do not clean surfaces or spills by hosing the area down. Eliminate the source of the spill to prevent a discharge or a furtherance of an ongoing discharge

Sanitary Waste – All sanitary waste will be collected from the portable units a minimum of once per week by the sanitary pumping company, licensed by the Commonwealth of Massachusetts and as required by the local regulation. Position units in a secure location where they cannot be tipped over.

Waste Materials – All waste materials will be collected and stored in a securely lidded metal dumpster rented from a licensed waster management company. The dumpster will meet all local and State solid waster management regulations. All trash and construction debris from the site will be deposited in the dumpster. The dumpster will be emptied at least twice per month or more often if necessary, and the waste will be hauled to the waste management company. On work days, clean up and dispose of waste in designated waste containers. Clean up immediately if containers overflow. No construction waste materials will be buried onsite. All personnel will be instructed regarding the correct procedure for waste disposal. Notices stating these practices will be posted in the office trailer. The individual managing the day-to-day site operations will be responsible for seeing that these procedures are followed.

3.2 Building Material Inventory for Pollution Prevention Plan

The materials or substances listed below are expected to be present onsite during construction:

- Concrete
- Petroleum based products including asphalt concrete/emulsions, fuel(s), oil, etc.
- Wood
- Fertilizers and tachifiers
- Paints (enamel, latex and oil based stains)
- Metal studs and products
- Masonry block
- Roofing shingles
- Gypsum and plaster
- Stone products

Construction equipment and maintenance materials will be stored at the combined staging area and materials storage areas. A watertight container will be used to store hand tools, small parts, and other construction materials.

3.2 Spill Prevention Material Management Practices

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

Good Housekeeping – The following good housekeeping practices will be followed onsite during the construction project.

- An effort will be made to store only enough products to do the job.
- All materials stored onsite will be stored in a neat, orderly manner in this appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers and with the original manufacturers' label.
- Substances will not be mixed with one another unless recommended by the manufactures.
- Whenever possible, all of a product will be used up before disposing of the container.
- Manufacturers' recommendation for proper use and disposal will be followed.
- The Site Superintendent will inspect daily to ensure proper use and disposal of materials.
- Hazardous Procedures – In accordance with industry standards and Applicable regulations

Product Specific Practices – The following product specific practices will be followed onsite:
Petroleum Products – Transport and delivery of fuel in approved containers only.
Fertilizers – In accordance with labeling
Paints – In accordance with labeling

Spill Control Practices – Any spills of hazardous materials shall be contained and cleaned up immediately. If appropriate, the Massachusetts Department of Environmental Protection (DEP) shall be notified. There shall, at all times when work is underway on-site, be an individual present who is trained in proper spill control practices.

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

1. Immediately contact the following agencies:
   Northborough Fire Department (508) 393-1537
   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.

Where a release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117 or 40 CFR Part 302, occurs during a 24-hour period:

- Provide notice to the National Response Center (NRC) (800–424–8802; in the Washington, DC, metropolitan area call 202–267–2675) in accordance with the requirements of 40 CFR Part 110, 40 CFR Part 117 and 40 CFR Part 302 as soon as site staff have knowledge of the discharge; and

- Within 7 calendar days of knowledge of the release, provide a description of the release, the circumstances leading to the release, and the date of the release. You must also implement measures to prevent the reoccurrence of such releases and to respond to such releases.

Vehicle Fueling and Maintenance – All major equipment/vehicle fueling and maintenance will be performed off-site. When vehicle fueling must occur on-site, the fueling activity will occur in the staging area. Only minor equipment maintenance will occur on-site. All equipment fluids generated from maintenance activities will be disposed of into designated drums stored on spill pallets in accordance with Part 3.1 of the GCP. Absorbent, spill-cleanup materials and spill kits will be available at the combined staging and materials storage area. Drip pans will be placed under all equipment receiving maintenance and vehicles and equipment parked overnight.

3.3 Non-Storm Water Discharges

It is expected that the following non-storm water discharge will occur from the site during the construction period:

- Pavement wash waters (where no spills or leaks of toxic or hazardous material have occurred).
- Discharges from Fire Fighting activities
- Hydrant and water line flushing
- Landscape irrigation
- Vehicle wash
- Water for dust control
- Foundation / footing drains
- Construction dewatering water

4.0 Record Keeping / Updating of Documentation

This document is intended as a living document to be continuously revised and updated based on changing site conditions and the progression of construction. The SWPPP shall be continuously revised to indicate the condition and location of the various Best Management Practices.

Copies of the GCP, signed and certified NOI, and EPA notification of receipt must be included in the SWPPP. This SWPPP plan, the approved drawings made part of this document, inspection reports (made at least weekly), and required logs shall be maintained on site at all times. Inspection reports shall be retained with the SWPPP for at least three years.

The following inspection reports and logs shall be maintained:

- Inspection Reports
- Corrective Action Log
- SWPPP Amendment Log
- Grading and Stabilization Activities Log

5.0 Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Name: _____ Title: _____

Signature: _____ Date: _____

Contact information: _____

_____

SWPPP Attachments

- *NOI and Acknowledgement Letter from EPA/State (Insert once received)*
- *Inspection Reports*
- *Corrective Action Log*
- *Subcontractor Certifications/Agreements*
- *NPDES Construction General Permit*
  - *can be found at https://www.epa.gov/npdes/2017-construction-general-permit-cgp*

Stormwater Construction Site Inspection Report

General Information			
Project Name	**200 Bartlett Street**		
	Northborough, MA	**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Describe present phase of construction			

Type of Inspection:
❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event

Weather Information

Has there been a storm event since the last inspection? ❑Yes ❑No
If yes, provide:
Within 24 Hours: _____ inches
Within 72 Hours: _____ inches
Within 7 days: _____ inches

Weather at time of this inspection?
❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds
❑ Other: Temperature:

Have any discharges occurred since the last inspection? ❑Yes ❑No
If yes, describe:

Are there any discharges at the time of inspection? ❑Yes ❑No
If yes, describe:

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1	Construction Entrance and Street Sweeping	❑Yes ❑No	❑Yes ❑No	
2	Sediment Basin -1	❑Yes ❑No	❑Yes ❑No	Any Evidence of Overtopping_____ Sediment Depth_____
3	Wattles and Silt Fence (or equivalent)	❑Yes ❑No	❑Yes ❑No	Any Evidence of Overtopping_____ Sediment Depth_____
4	Soil Stockpile Protection / Stabilization	❑Yes ❑No	❑Yes ❑No	
5	Designated Construction Material Stockpile Areas	❑Yes ❑No	❑Yes ❑No	

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
6	Catch Basin Inlet Protection	❑Yes ❑No	❑Yes ❑No	Any Evidence of Bypass_____
7	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
8	Are natural resource areas protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
9	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
10	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
11	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
12	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
13	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	
14	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	
15	(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

Additional Comments / Description of Current Site Work

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____

Signature: _____ **Date:** _____

Corrective Action Log

Project Name:
SWPPP Contact:

Inspection Date	Inspector Name(s)	Description of BMP Deficiency	Corrective Action Needed (including planned date/responsible person)	Date Action Taken/Responsible person

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: _____

Project Title: _____

Operator(s): _____

As a subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Any person or group who violates any condition of the SWPPP may be subject to substantial penalties or loss of contract. You are encouraged to advise each of your employees working on this project of the requirements of the SWPPP. A copy of the SWPPP is available for your review at the office trailer.

Each subcontractor engaged in activities at the construction site that could impact stormwater must be identified and sign the following certification statement:

I certify under the penalty of law that I have read and understand the terms and conditions of the SWPPP for the above designated project and agree to follow the BMPs and practices described in the SWPPP.

This certification is hereby signed in reference to the above named project:

Company: _____

Address: _____

Telephone Number: _____

Type of construction service to be provided: _____

_____

_____

Signature: _____

Title: _____

Date: _____