DRAINAGE REPORT

ALLEN & MAJOR ASSOCIATES, INC.

40B Multi-Family Site Development
444 East Central Street Franklin, MA

APPLICANT:
TAG Central LLC
1070 E Indiantown Rd, Suite 308
Jupiter, FL 33477

PREPARED BY:
Allen & Major Associates, Inc.
Engineer of Record: Carlton M. Quinn
100 Commerce Way, Suite 5
Woburn, Massachusetts 01801

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ISSUED:
February 7, 2025

REVISED:

A&M PROJECT NO.:
3317-01

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SECTION 1.0 -
DRAINAGE REPORT

Introduction

The purpose of this drainage report is to provide an overview of the proposed stormwater management system (SMS) for the proposed Multifamily project located at 444 East Central Street in Franklin. The report will show by means of narrative, calculations and exhibits that the proposed stormwater management system will meet or exceed the Massachusetts Department of Environmental Protection (MassDEP) stormwater standards, and the Franklin Stormwater Management Regulations.

The proposed site improvements include the development of 5 residential buildings and a clubhouse. The five residential buildings are composed of 264 units, with 66 (25%) of the units designated as affordable. The proposed site includes 356 parking stalls, parking garages, sidewalks, waste enclosures, drive aisles, and amenity areas. This site will be serviced by water, sewer, and electrical, which will be coordinated with the Town of Franklin.

The proposed SMS incorporates [structural and non-structural] Best Management Practices (BMPs) to provide stormwater peak flow mitigation, quality treatment, and conveyance.

The SMS includes underground infiltration systems, infiltration basins, water quality structures, and deep sump catch basins.

Site Categorization for Stormwater Regulations

The proposed site improvements at 444 East Central Street are considered a new development under the DEP Stormwater Management Standards due to the net increase in impervious area. A new development project is required to meet all the Stormwater Management Standards listed within the MA DEP Stormwater Handbook.

Site Location and Access

The parcel identified as 284-066-000-000 is a single lot with 200± feet of frontage on East Central Street entirely within the Town of Franklin. The lot area of the parcel is 14.6±acres. The parcel is located approximately 0.7 miles from the bordering town of Wrentham.

The parcel is abutted by residential neighborhoods on Red Gate Lane & Northern Spy Road to the east and south. Commercial developments abut the site to the west.

The site is accessed by an existing curb cut along East Central Street.

Existing Site Conditions

The site is currently owned and occupied by Stobbart Properties LLC. A portion of the site is developed and contains a wood frame nursery dwelling, greenhouses, sheds, and accessory buildings with associated parking and drive aisles. The principal gross building area is approximately 11,500 sf. A large portion of the site is undisturbed, consisting of tree cover, wetlands, and a stream.

The surface drainage flows were analyzed at four Study Points. Study Point #1 summarizes on-site flows to a perennial stream at the northern section of the parcel. The flows for this study point are generated from the "front" of the site, including the principal nursery building and surrounding area as well as a large area abutting the property eastward. These flows are captured via catch basins and routed through an underground pipe system to discharge to the perennial stream. Study Point #2 summarizes on-site flows to a perennial stream south of the perennial stream at Study Point #1. The flows for this study point are generated from the surrounding developed area and discharge directly into the stream. Study Point #3 summarizes on site flows directed to the offsite detention abutting the parcel to the northwest. Study Point #4 summarizes on site flows directed to the southernmost perennial stream.

Watershed

The subject property is located within the Charles Watershed. The Charles River flows 80 miles from Hopkinton, Mass. to Boston Harbor. The entire Charles River drains rain and melted snow from a watershed area of 310 square miles. Two hundred and sixty-eight square miles of that watershed area drain over the Watertown Dam into the Lower Charles River. The remaining 42 square miles drain directly into the Lower Charles River. The river flows through the municipalities of Milford, Bellingham, Franklin, Medway, Millis, Medfield, Sherborn, Dover, Natick, Wellesley, Needham, Dedham, Newton, Waltham, Watertown, Cambridge and Boston, MA and from there into Boston Harbor.

Source: United States Environmental Protection Agency (EPA)

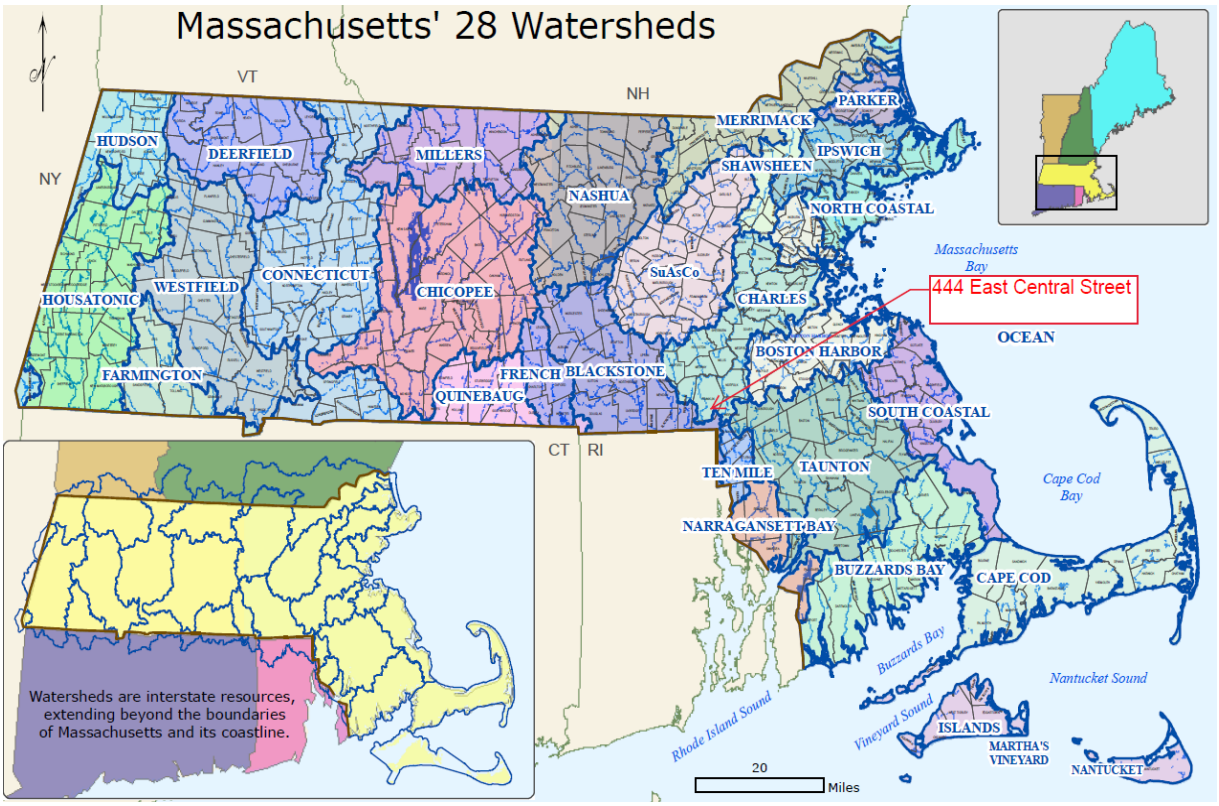


Exhibit 1: Watershed Map

Image Source: Mass.gov

Existing Soil Conditions

The on-site soils were identified using the USDA Natural Resources Conservation Services (NRCS) Soil Survey for Norfolk County. The site soil types, and corresponding Hydrologic Soil Groups (HSG) include:

- SCS 10 – Scarboro & Birdsall soils, 0 to 3 percent slopes, HSG A/D
- SCS 52 – Freetown muck, 0 to 1 percent slopes, HSG B/D
- SCS 254A – Merrimac Fine Sandy Loam, 0 to 3 percent slopes, HSG A
- SCS 254B – Merrimac Fine Sandy Loam, 3 to 8 percent slopes, HSG A
- SCS 260B – Sudbury Fine Sandy Loam, 2 to 8 percent slopes, HSG B
- SCS 420B – Canton Fine Sandy Loam. 3 to 8 percent slopes, HSG B

A copy of the NRCS Custom Soil Resource Report is included in the appendix of this report.

An exfiltration rate for the sandy loam has been determined to 1.02 inches per hour based upon Table 2.3.3 1982 Rawls Rate, Volume 3: Documenting Compliance with the Massachusetts's Stormwater Handbook.

FEMA Floodplain/Environmental Due Diligence

There are portions of the site located within the FEMA Zone "A" Special Flood Hazard Area Subject to Inundation by the 1% Annual Chance Flood (100-year floodplain). Zone "A" represents that there are no base flood elevations determined. There are also portions of the site encroached by Zone "X" Other Flood areas subject to 0.2% annual flood. The official Flood Insurance Rate Map (FIRM) effective date July 17, 2012, community panel 309 of 340, map number 25021C0309E. See Section 3 of this report for a copy of the FEMA FIRM.

Environmentally Sensitive Zones

The Commonwealth of Massachusetts asserts control over numerous protected and regulated areas including: Areas of Critical Environmental Concern (ACEC); Outstanding Resource Waters (ORWs); Priority and Protected Habitat for rare and endangered species, and areas protected under the Wetlands Protection Act. According to the MassGIS online map viewer MassMapper, the subject property is not located within AEC, ORW, or Priority and Protected Habitat for rare and endangered species areas. The subject is located within a few DEP wetlands. See Section 3 of this report for a copy of the wetland exhibit.

Drainage Analysis Methodology

A peak rate of runoff will be determined using techniques and data found in the following:

1. Urban Hydrology for Small Watersheds – Technical Release 55 by the United States Department of Agriculture Soils Conservation Service, June 1986. Runoff curve numbers and 24-hour precipitation values were obtained from this reference.
2. HydroCAD © Stormwater Modeling System by HydroCAD Software Solutions LLC, version 10.00-24. The HydroCAD program was used to generate the runoff hydrographs for the watershed areas, to determine discharge/ stage/storage characteristics for the stormwater BMPs, to perform drainage routing and to combine the results of the runoff hydrographs. HydroCAD uses the TR-20 methodology of the SCS Unit Hydrograph procedure (SCS-UH).

Proposed Conditions – Peak Rate of Runoff

The stormwater runoff analysis of the existing and proposed conditions includes an estimate of the peak rate of runoff from various rainfall events. Peak runoff rates were developed using TR55 Urban Hydrology for Small Watersheds, developed by the U.S. Department of Commerce, Engineering Division and the HydroCAD computer program. Further, the analysis has been prepared in accordance with the MassDEP and the city requirements and standard engineering practices. The peak rate of runoff has been estimated for each watershed during the 2, 10, and 100-year storm events.

The proposed stormwater management system for the site consists of deep sump catch basins, proprietary separators, infiltration basins, and subsurface infiltration structures.

These systems have been designed in accordance with the MA DEP Stormwater Management Policy to recharge groundwater and reduce rate of runoff from the parcel.

Infiltration System 1 discharges to Study Point #1. Infiltration System 2 & 3 discharge to Study Point #2.

Infiltration System 4,5,6 and Infiltration Basins 1 & 2 discharge to Study Point #4.

The stormwater runoff model indicates that the proposed site development reduces the rate of runoff during all storm events at the identified points of analysis. The following tables provide a summary of the estimated peak rate, in Cubic Feet per Second (CFS) at each of the four (4) Study Points for each of the design storm events. The HydroCAD worksheets are included in Section 4 and 5 of this report.

STUDY POINT #1			
	2-Year	10-Year	100-Year
Existing Flow (CFS)	2.27	5.50	12.09
Proposed Flow (CFS)	0.45	1.90	3.43
Reduction %	**80.2%**	**65.5%**	**71.6%**

STUDY POINT #2			
	2-Year	10-Year	100-Year
Existing Flow (CFS)	4.80	11.37	24.16
Proposed Flow (CFS)	1.84	6.28	16.33
Reduction %	**61.7%**	**44.8%**	**32.4%**

STUDY POINT #3			
	2-Year	10-Year	100-Year
Existing Flow (CFS)	0.00	0.00	0.06
Proposed Flow (CFS)	0.00	0.00	0.00
Reduction %	**0.0%**	**0.0%**	**100.0%**

STUDY POINT #4			
	2-Year	10-Year	100-Year
Existing Flow (CFS)	10.32	23.97	50.88
Proposed Flow (CFS)	10.31	23.88	50.47
Reduction %	**0.1%**	**0.4%**	**0.8%**

MASSDEP Stormwater Performance Standards

The MA DEP Stormwater Management Policy was developed to improve water quality by implementing performance standards for stormwater management. The intent is to implement the stormwater management standards through the review of Notice of Intent filings by the issuing authority (Conservation Commission or DEP). The following section outlines how the proposed Stormwater Management System meets the standards set forth by the Policy.

BMP's implemented in the design include –

- Deep Sump Catch Basins
- Proprietary Separators
- Subsurface Structures
- Infiltration Basins

Stormwater Best Management Practices (BMP's) have been incorporated into the design of the project to mitigate the anticipated pollutant loading. An Operations and Maintenance Plan has been developed for the project, which addresses the long-term maintenance requirements of the proposed system.

Temporary erosion and sedimentation controls will be incorporated into the construction phase of the project. These temporary controls may include straw bale and/or silt fence barriers, inlet sediment traps, slope stabilization, and stabilized construction entrances.

The Massachusetts Department of Environmental Protection has established ten (10) Stormwater Management Standards. A project that meets or exceeds the standards is presumed to satisfy the regulatory requirements regarding stormwater management. The Standards are enumerated below as well as descriptions and supporting calculations as to how the Project will comply with the Standards:

1. *No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth.*

   The proposed development will not introduce any new outfalls with direct discharge to a wetland area or waters of the Commonwealth of Massachusetts. All discharges will be treated for water quality and the rate will not be increased over existing conditions.

2. *Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04.*

The proposed development has been designed so that the post-development peak discharge rates do not exceed the predevelopment peak discharge rates. A summary of the existing and proposed discharge rates is included within this document.

3. *Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.*

   The existing annual recharge for the site has been approximated in the proposed condition. There are proposed subsurface infiltration systems designed to meet this requirement. Stormwater runoff generated from the impervious areas of the proposed development are routed through these infiltration BMPs. The proposed Recharge Volume is based on the Static Method per the MA DEP Stormwater Management Standards, Volume 3, Chapter 1.

4. *Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This standard is met when:*
   - *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*
   - *Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and*
   - *Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.*

   The proposed stormwater management system has been designed so that the 44% TSS removal standard will be met for each drainage area. Standard #4 is met when structural stormwater best management practices are sized to capture and treat the required water quality volume and pretreatment is provided in accordance with the Massachusetts Stormwater Handbook. Standard #4 also requires that suitable source control measures are identified

in the LongTerm Pollution Prevention Plan. The 44% TSS removal standard will be met using some combination of the following: deep-sump, hooded catch basins, subsurface infiltration systems with Isolator Rows and proprietary separators.

The water quality volume for the site development will be captured and treated using proprietary separators and infiltration systems equipped with Isolator Rows. All systems have been sized to meet the water quality flow rate for the 0.5" storm event.

5. *For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M.G.L. c. 21, §§ 26-53 and the regulations promulgated thereunder at 314 CMR 3.00, 314 CMR 4.00 and 314 CMR 5.00.*

   The site is considered a source of higher potential pollutant loads because [it has a parking lot with 1,000 vehicle trips per day or more. Shopping centers, malls, and large office parks.] Pretreatment and Source reduction is provided to the maximum extent practicable. The drainage system will be designed to treat 1" water quality volume utilizing the BMPs listed in Table LUHPPL, within the Massachusetts Stormwater Handbook, Volume 1: Overview of the Massachusetts Stormwater Standards, Chapter 1, Page 14. This requirement only applies to stormwater discharges that come into contract with the actual area or activity on the site that may generate the higher potential pollutant load.

6. *Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the*

Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2)(a)1 or (b) to an Outstanding Resource Water or Special Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

The stormwater systems have been sized to properly treat stormwater discharges to critical areas.

7. *A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.*

   The proposed project is not considered a re-development project under the Stormwater Management Handbook guidelines as there is an increase in the amount of impervious area.

8. *A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.*

   A plan to control construction-related impacts, including erosion, sedimentation and other pollutant sources during construction has been developed. A detailed Erosion and Sedimentation Control Plan is included in the Permit Drawings. The proponent will prepare and submit a Stormwater Pollution Prevention Plan (SWPPP) prior to commencement of construction activities that will result in the disturbance of one acre of land or more.

9. *A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.*

A Long-Term Operation & Maintenance (O&M) Plan has been developed for the proposed stormwater management system and is included within this document. See Section 2.0 of this report.

10. *All illicit discharges to the stormwater management system are prohibited.*

    There are no expected illicit discharges to the stormwater management system. The applicant will submit the Illicit Discharge Compliance Statement prior to the discharge of stormwater runoff to the post-construction stormwater best management practices and prior to the issuance of a Certificate of Compliance.

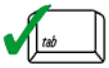
See the next page for the MassDEP Stormwater Checklist.

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

Checklist for Stormwater Report

A. Introduction

Important: When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.



A Stormwater Report must be submitted with the Notice of Intent permit application to document compliance with the Stormwater Management Standards. The following checklist is NOT a substitute for the Stormwater Report (which should provide more substantive and detailed information) but is offered here as a tool to help the applicant organize their Stormwater Management documentation for their Report and for the reviewer to assess this information in a consistent format. As noted in the Checklist, the Stormwater Report must contain the engineering computations and supporting information set forth in Volume 3 of the Massachusetts Stormwater Handbook. The Stormwater Report must be prepared and certified by a Registered Professional Engineer (RPE) licensed in the Commonwealth.

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

In addition to all plans and supporting information, the Stormwater Report must include a brief narrative describing stormwater management practices, including environmentally sensitive site design and LID techniques, along with a diagram depicting runoff through the proposed BMP treatment train. Plans are required to show existing and proposed conditions, identify all wetland resource areas, NRCS soil types, critical areas, Land Uses with Higher Potential Pollutant Loads (LUHPPL), and any areas on the site where infiltration rate is greater than 2.4 inches per hour. The Plans shall identify the drainage areas for both existing and proposed conditions at a scale that enables verification of supporting calculations.

As noted in the Checklist, the Stormwater Management Report shall document compliance with each of the Stormwater Management Standards as provided in the Massachusetts Stormwater Handbook. The soils evaluation and calculations shall be done using the methodologies set forth in Volume 3 of the Massachusetts Stormwater Handbook.

To ensure that the Stormwater Report is complete, applicants are required to fill in the Stormwater Report Checklist by checking the box to indicate that the specified information has been included in the Stormwater Report. If any of the information specified in the checklist has not been submitted, the applicant must provide an explanation. The completed Stormwater Report Checklist and Certification must be submitted with the Stormwater Report.

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[1] The Stormwater Report may also include the Illicit Discharge Compliance Statement required by Standard 10. If not included in the Stormwater Report, the Illicit Discharge Compliance Statement must be submitted prior to the discharge of stormwater runoff to the post-construction best management practices.

[2] For some complex projects, it may not be possible to include the Construction Period Erosion and Sedimentation Control Plan in the Stormwater Report. In that event, the issuing authority has the discretion to issue an Order of Conditions that approves the project and includes a condition requiring the proponent to submit the Construction Period Erosion and Sedimentation Control Plan before commencing any land disturbance activity on the site.

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

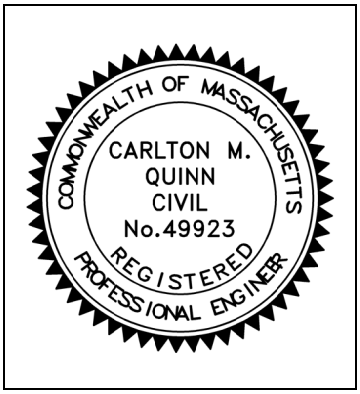
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



2.11.25

Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

- ☐ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
  - ☐ Credit 1
  - ☐ Credit 2
  - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): Undeground Infiltration Systems (SC-800), Infiltration Basins

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

☐ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

SECTION 2.0 -
OPERATION & MAINTENANCE PLAN

Introduction

In accordance with the standards set forth by the Stormwater Management Policy issued by the Massachusetts Department of Environmental Protection (MassDEP), Allen & Major Associates, Inc. has prepared the following Operations & Maintenance (O&M) Plan for the existing development at 444 East Central Street, Franklin, MA.

The plan is broken down into three major sections. The first section describes construction-related erosion and sedimentation controls (Demolition & Construction Maintenance Plan). The second section describes the long-term pollution prevention measures (Long Term Pollution Prevention Plan). The third section is a post-construction operation and maintenance plan designed to address the long-term maintenance needs of the stormwater management system (Long-Term Maintenance Plan – Facilities Description).

Notification Procedures for Change of Responsibility for O&M

The Stormwater Management System (SMS) for this project is owned by TAG Central LLC. The owner shall be legally responsible for the long-term operation and maintenance of this SMS as outlined in this Operation and Maintenance Plan.

The owner shall submit an annual summary report and the completed Operation & Maintenance Schedule & Checklist to the Conservation Commission (via email or print copy), highlighting inspection and maintenance activities including performances of BMPs. Should ownership of the SMS change, the owner will continue to be responsible until the succeeding owner shall notify the Commission that the succeeding owner has assumed such responsibility. Upon subsequent transfers, the responsibility shall continue to be that of transferring owner until the transferee owner notifies the Commission of its assumption of responsibility.

In the event the SMS will serve multiple lots/owners, such as the subdivision of the existing parcel or creation of lease areas, the owner(s) shall establish an association on other legally enforceable arrangements under which the association or a single party shall have legal responsibility for the operation and maintenance of the entire SMS. The legal instrument creating such responsibility shall be recorded with the Registry of Deeds and promptly following its recording, a copy thereof shall be furnished to the Commission.

Contact Information

Stormwater Management System Owner:	TAG Central LLC 1070 E Indiantown Rd Jupiter, FL

Emergency Contact Information:

TAG Central LLC (Owner/Operator)	Phone: (561) 685-5336
Allen & Major Associates, Inc. (Site Civil Engineer)	Phone: (781) 935-6889
Franklin Department of Public Works	Phone: (508) 553-5500
Franklin Conservation Commission	Phone: (508) 520-4929
Franklin Fire Department (non-emergency line)	Phone: (508) 528-2323
MassDEP Emergency Response	Phone: (888) 304-1133
Clean Harbors Inc (24-Hour Line)	Phone: (800) 645-8265

Demolition & Construction Maintenance Plan

1. Call Digsafe: 1-888-344-7233
2. Contact the City at least three (3) days prior to start of demolition and/or construction activities.
3. Install Erosion Control measures as shown on the Plans prepared by A&M. The City shall review the installation of straw bales and silt fencing prior to the start of any site demolition work. Install Construction fencing if determined to be necessary at the commencement of construction.
4. Install construction entrances, straw bales, and silt fence at the locations shown on the Erosion Control Plan prepared by A&M.
5. Site access shall be achieved only from the designated construction entrances.
6. Cut and clear trees in construction areas only (within the limit of work; see plans).
7. Stockpiles of materials subject to erosion shall be stabilized with erosion control matting or temporary seeding whenever practicable, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased.
8. Install silt sacks and straw bales around each drain inlet prior to any demolition and or construction activities.

9. All erosion control measures shall be inspected weekly and after every rainfall event. Records of these inspections shall be kept on-site for review.
10. All erosion control measures shall be maintained, repaired, or replaced as required or at the direction of the owner's engineer or the City.
11. Sediment accumulation up-gradient of the straw bales, silt fence, and stone check dams greater than 6" in depth shall be removed and disposed of in accordance with all applicable regulations.
12. If it appears that sediment is exiting the site, silt sacks shall be installed in all catch basins adjacent to the site. Sediment accumulation on all adjacent catch basin inlets shall be removed and the silt sack replaced if torn or damaged.
13. Install stone check dams on-site during construction as needed. Refer to the erosion control details. Temporary sediment basins combined with stone check damns shall be installed on-site during construction to control and collect runoff from upland areas of this site during demolition and construction activities.
14. The contractor shall comply with the Sedimentation and Erosion Control Notes as shown on the Site Development Plans and Specifications.
15. The stabilized construction entrances shall be inspected weekly and records of inspections kept. The entrances shall be maintained by adding additional clean, angular, durable stone to remove the soil from the construction vehicle's tires when exiting the site. If soil is still leaving the site via the construction vehicle tires, adjacent roadways shall be kept clean by street sweeping.
16. Dust pollution shall be controlled using on-site water trucks and/or an approved soil stabilization product.
17. During demolition and construction activities, Status Reports on compliance with this O&M Document shall be submitted weekly. The report shall document any deficiencies and corrective actions taken by the applicant.

Long-Term Pollution Prevention Plan

Standard #4 from the MassDEP Stormwater Management Handbook requires that a Long-Term Pollution Prevention Plan (LTPPP) be prepared and incorporated as part of the Operation and Maintenance Plan of the Stormwater Management System. The purpose of the LTPPP is to identify potential sources of pollution that may affect the quality of stormwater discharges, and to describe the implementation of practices to reduce the pollutants in stormwater discharges. The following items describe the source control and proper procedures of the LTPPP.

- Housekeeping
  The existing development has been designed to maintain a high level of water quality treatment for all stormwater discharge to the wetland areas. An Operation and Maintenance (O&M) plan has been prepared and is included in this section of the report. The owner (or its designee) is responsible for adherence to the O&M plan in a strict and complete manner.

- Storing of Materials & Water Products
  The trash and waste program for the site includes exterior dumpsters. There is a trash contractor used to pick up the waste material in the dumpsters. The stormwater drainage system has water quality inlets designed to capture trash and debris.

- Vehicle Washing
  Outdoor vehicle washing has the potential to result in high loads of nutrients, metals, and hydrocarbons during dry weather conditions, as the detergent-rich water used to wash the grime off the vehicle enters the stormwater drainage system. The existing development does not include any designated vehicle washing areas, nor is it expected that any vehicle washing will take place on-site.

- Spill Prevention & Response
  Sources of potential spill hazards include vehicle fluids, liquid fuels, pesticides, paints, solvents, and liquid cleaning products. The majority of the spill hazards would likely occur within the buildings and would not enter the stormwater drainage system. However, there are spill hazards from vehicle fluids or liquid fuels located outside of the buildings. These exterior spill hazards have the potential to enter the stormwater drainage system and are to be addressed as follows:

  1. Spill hazards of pesticides, paints, and solvents shall be remediated using the Manufacturers' recommended spill cleanup protocol.
  2. Vehicle fluids and liquid fuel spill shall be remediated according to the local and state regulations governing fuel spills.
  3. The owner shall have the following equipment and materials on hand to address a spill clean-up: brooms, dust pans, mops, rags, gloves, absorptive material, sand, sawdust, plastic and metal trash containers.
  4. All spills shall be cleaned up immediately after discovery.
  5. Spills of toxic or hazardous material shall be reported, regardless of size, to the Massachusetts Department of Environmental Protection at (888) 304-1333.

6. Should a spill occur, the pollution prevention plan will be adjusted to include measures to prevent another spill of a similar nature. A description of the spill, along with the causes and cleanup measures will be included in the updated pollution prevention plan.

- Maintenance of Lawns, Gardens, and Other Landscaped Areas
  It should be recognized that this is a general guideline towards achieving high quality and well-groomed landscaped areas. The grounds staff/landscape contractor must recognize the shortcomings of a general maintenance plan such as this, and modify and/or augment it based on weekly, monthly, and yearly observations. In order to assure the highest quality conditions, the staff must also recognize and appreciate the need to be aware of the constantly changing conditions of the landscaping and be able to respond to them on a proactive basis. No trees shall be planted over the drain lines or recharge area, and that only shallow rooted plants and shrubs will be allowed.

  - Fertilizer
    Maintenance practices should be aimed at reducing environmental, mechanical and pest stresses to promote healthy and vigorous growth. When necessary, pest outbreaks should be treated with the most sensitive control measure available. Synthetic chemical controls should be used only as a last resort to organic and biological control methods. Fertilizer, synthetic chemical controls and pest management applications (when necessary) shall be performed only by licensed applicators in accordance with the manufacturer's label instructions when environmental conditions are conducive to controlled product application.

    Only slow-release organic fertilizers should be used in the planting and mulch areas to limit the amount of nutrients that could enter downstream resource areas. Fertilization of the planting and mulch areas will be performed within manufacturers labeling instructions and shall not exceed an NPK ration of 1:1:1 (i.e. Triple 10 fertilizer mix), considered a low nitrogen mixture. Fertilizers approved for the use under this O&M Plan are as follows:

    Type: LESCO® 28-0-12 (Lawn Fertilizer)
    MERIT® 0.2 Plus Turf Fertilizer
    MOMENTUM™ Force Weed & Feed

  - Suggested Aeration Program
    In-season aeration of lawn areas is good cultural practice, and is recommended whenever feasible. It should be accomplished with a solid thin tine aeration method to reduce disruption to the use of the area. The

depth of solid tine aeration is similar to core type, but should be performed when the soil is somewhat drier for a greater overall effect.

Depending on the intensity of use, it can be expected that all landscaped lawn areas will need aeration to reduce compaction at least once per year. The first operation should occur in late May following the spring season. Methods of reducing compaction will vary based on the nature of the compaction. Compaction on newly established landscaped areas is generally limited to the top 2-3" and can be alleviated using hollow core or thin tine aeration methods.

The spring aeration should consist of two passes at opposite directions with 1/4" hollow core tines penetrating 3-5" into the soil profile. Aeration should occur when the soil is moist but not saturated. The soil cores should be shattered in place and dragged or swept back into the turf to control thatch. If desired the cores may also be removed and the area top-dressed with sand or sandy loam. If the area drains on average too slowly, the topdressing should contain a higher percentage of sand. If it is draining on average too quickly, the top dressing should contain a higher percentage of soil and organic matter.

- Landscape Maintenance Program Practices:
  - Lawn
    1. Mow a minimum of once a week in spring, to a height of 2" to 2 1/2" high. Mowing should be frequent enough so that no more than 1/3 of grass blade is removed at each mowing. The top growth supports the roots; the shorter the grass is cute, the less the roots will grow. Short cutting also dries out the soil and encourages weeds to germinate.
    2. Mow approximately once every two weeks from July 1st to August 15th depending on lawn growth.
    3. Mow on a ten-day cycle in fall, when growth is stimulated by cooler nights and increased moisture.
    4. Do not remove grass clippings after mowing.
    5. Keep mower blades sharp to prevent ragged cuts on grass leaves, which cause a brownish appearance and increase the chance for disease to enter a leaf.
  - Shrubs
    1. Mulch not more than 3" depth with shredded pine or fir bark.

2. Hand prune annually, immediately after blooming, to remove 1/3 of the above-ground biomass (older stems). Stem removals are to occur within 6" of the ground to open up shrub and maintain two-year wood (the blooming wood).
3. Hand-prune evergreen shrubs only as needed to remove dead and damaged wood and to maintain the naturalistic form of the shrub. Never mechanically shear evergreen shrubs.

- Trees
  1. Provide aftercare of new tree plantings for the first three years.
  2. Do not fertilize trees, it artificially stimulates them (unless tree health warrants).
  3. Water once a week for the first year; twice a month for the second; once a month for the third year.
  4. Prune trees on a four-year cycle.
- Invasive Species
  1. Inform the Conservation Commission Agent prior to the removal of invasive species proposed either through hand work or through chemical removal.

- Storage and Use of Herbicides and Pesticides

  Integrated Pest Management is the combination of all methods (of pest control) which may prevent, reduce, suppress, eliminate, or repel an insect population. The main requirements necessary to support any pest population are food, shelter and water, and any upset of the balance of these will assist in controlling a pest population. Scientific pest management is the knowledgeable use of all pest control methods (sanitation, mechanical, chemical) to benefit mankind's health, welfare, comfort, property and food. A Pest Management Professional (PMP) should be retained who is licensed with the Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, Department of Agricultural Resources.

  The site manager will be provided with approved bulletin before entering into or renewing an agreement to apply pesticides for the control of indoor household or structural pests, refer to 333 CMR 13.08.

  Before beginning each application, the applicator must post a Department approved notice on all of the entrances to the treated room or area. The applicator must leave such notices posted after the application. The notice will be posted at conspicuous point(s) of access to the area treated. The location and number of

signs will be determined by the configuration of the area to be treated based on the applicator's best judgment. It is intended to give sufficient notice so that no one comes into an area being treated unaware that the applicator is working and pesticides are being applied. However, if the contracting entity does not want the signs posted, he/she may sign a Department approved waiver indicating this.

The applicator or employer will provide to any person upon their request the following information on previously conducted applications:

1. Name and phone number of pest control company;
2. Date and time of the application;
3. Name and license number of the applicator;
4. Target pests; and
5. Name and EPA Registration Number of pesticide products applied.

- Pet Waste Management
  The owner's landscape crew (or designee) shall remove any obvious pet waste that has been left behind by pet owners within the development. The pet waste shall be disposed of in accordance with local and state regulations.
- Operations and Management of Septic Systems
  There are no proposed septic systems within the limits of the project.
- Management of Deicing Chemicals and Snow
  Snow will be stockpiled on site until the accumulated snow becomes a hazard to the daily operations of the site. It will be the responsibility of the snow removal contractor to properly dispose of transported snow according to MassDEP, Bureau of Resource Protection – Snow Disposal Guideline #BRPG01-01, governing the proper disposal of snow. It will be the responsibility of the snow removal contractor to follow these guidelines and all applicable laws and regulations

  The owner's maintenance staff (or its designee) will be responsible for the clearing of the sidewalk and building entrances. The owner may be required to use a de-icing agent such as potassium chloride to maintain a safe walking surface. If used, the de-icing agent for the walkways and building entrances will be kept within the storage rooms located within the building. If used, de-icing agents will not be stored outside. The owner's maintenance staff will limit the application of sand.

Long-Term Maintenance Plan – Facilities Description

A maintenance log will be kept (i.e. report) summarizing inspections, maintenance, and any corrective actions taken. The log will include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediments or debris, the location

where the sediment and debris was disposed after removal will be indicated. The log will be made accessible to department staff and a copy provided to the department upon request.

The following is a description of the Stormwater Management System for the project site.

Stormwater Collection System – On-Site:

The stormwater collection system is a series of inlets located at low points within the limits of the paved area. All of the proposed on-site catch basins incorporate a deep sump and hooded outlet. The catch basins are connected by a closed gravity pipe network that pass through proprietary separators prior to entering the underground infiltration systems or infiltration basins.

Structural Pretreatment BMPs: Regular maintenance of these BMPs is especially critical because they typically receive the highest concentration of suspended solids during the first flush of a storm event.

Deep Sump Catch Basins:

Deep sump catch basins, also known as oil and grease or hooded catch basins, are underground retention systems designed to remove trash, debris, and coarse sediment from stormwater runoff, and serve as temporary spill containment devices for floatables such as oils and greases.

Regular maintenance is essential. Deep sump catch basins remain effective by removing pollutants only if they are cleaned out frequently. One study found that once 50% of the sump volume is filled, the catch basin is not able to retain additional sediments.

Inspect or clean deep sump catch basins at least four times per year and at the end of the foliage and snow-removal seasons. Sediments must also be removed four times per year or whenever the depths of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

Clamshell buckets are typically used to remove sediment in Massachusetts. However, vacuum trucks are preferable, because they remove more trapped sediment and supernatant than clamshells. Vacuuming is also a speedier process and is less likely to snap the cast iron hood within the deep sump catch basin.

Always consider the safety of the staff cleaning deep sump catch basins. Cleaning a deep sump catch basin within a road with active traffic or even within a parking lot is dangerous, and a police detail may be necessary to safeguard workers.

Although catch basin debris often contains concentrations of oil and hazardous materials, such as petroleum hydrocarbons and metals, MassDEP classifies them as solid waste. Unless there is evidence that they have been contaminated by a spill

or other means, MassDEP does not routinely require catch basin cleanings to be tested before disposal. Contaminated catch basin cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000, and handled as hazardous waste.

In the absence of evidence of contamination, catch basin cleanings may be taken to a landfill or other facility permitted by MassDEP to accept solid waste, without any prior approval by MassDEP. However, some landfills require catch basin cleanings to be tested before they are accepted.

With prior MassDEP approval, catch basin cleanings may be used as grading and shaping materials at landfills undergoing closure (see Revised Guidelines for Determining Closure Activities at Inactive Unlined Landfill Sites) or as daily cover at active landfills. MassDEP also encourages the beneficial reuse of catch basin cleanings whenever possible. A Beneficial Reuse Determination is required for such use.

MassDEP regulations prohibit landfills from accepting materials that contain free-draining liquids. One way to remove liquids is to use a hydraulic lift truck during cleaning operations so that the material can be decanted at the site. After loading material from several catch basins into a truck, elevate the truck so that any free-draining liquid can flow back into the structure. If there is no free water in the truck, the material may be deemed to be sufficiently dry. Otherwise catch basin cleanings must undergo a Paint Filter Liquids Test. Go to www.Mass.gov/dep/recycle/laws/cafacts.doc for information on all of the MassDEP requirements pertaining to the disposal of catch basin cleanings.

Treatment BMPs:

Wet Basins:

Wet basins use a permanent pool of water as the primary mechanism to treat stormwater. The pool allows sediments to settle (including fine sediments) and removes soluble pollutants. Wet basins must have additional dry storage capacity to control peak discharge rates. Wet basins have a moderate to high capacity to remove most urban pollutants, depending on how large the volume of the permanent pool is in relation to the runoff from the surrounding watershed.

Inspect wet basins at least once per year to ensure they are operating as designed. Inspect the outlet structure for evidence of clogging or excessive outflow releases. Potential problems to check include: subsidence, erosion, cracking or tree growth on the embankment, damage to the emergency spillway, sediment accumulation around the outlet, inadequacy of the inlet/outlet channel erosion control measures, change in the condition of the pilot channel, erosion within the basin and banks,

and the emergence of invasive species. During inspections, note any changes to the wet basin or the contributing watershed area because these may affect basin performance. At least twice a year, mow the upper-stage, side slopes, embankment and emergency spillway. At this time, also check the sediment in the forebay for accumulated material, sediment, trash, and debris and remove it. Remove sediment from the basin as necessary, and at least once every 10 years.

Infiltration BMPs:

Subsurface Structures:

Subsurface structures are underground systems that capture runoff, and gradually infiltrate it into the groundwater through rock and gravel.

Because subsurface structures are installed underground, they are extremely difficult to maintain. Inspect inlets at least twice a year. Remove any debris that might clog the system. Include mosquito controls in the Operation and Maintenance Plan.

Inspect outlet from subsurface structures to adjacent resource area for signs of scour and sediment accumulation at least twice annually. Remove sediment accumulation and add rip rap as necessary to prevent scour.

Other BMPs and Accessories:

Outlet Structures:

Outlets of BMPs are devices that control the flow of stormwater out of the BMP to the conveyance system.

Inspect outlet structures twice per year. Remove any accumulated sediment and debris that could prevent flow at the outlet structure.

Vegetated Areas:

Inspect slopes and embankments early in the growing season to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill erosion is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

Roadway and Parking Surfaces:

Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader.

Other Maintenance Activity:

- Mosquito Control - Both above ground and underground stormwater BMPs have the potential to serve as mosquito breeding areas. Good design, proper operation and maintenance, and treatment with larvicides can minimize this potential. See the supplemental information for Mosquito Control in Stormwater Management Practices, and the Operation and Maintenance Plan Schedule for inspection schedule.
- Street Sweeping - Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along road shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader.

Inspection and Maintenance Frequency and Corrective Measures

In accordance with MA DEP Stormwater Handbook: Volume 2, Chapter 2; the previously described BMPs will be inspected and the identified deficiencies will be corrected. Clean-out must include the removal and legal disposal of any accumulated sediments, trash, and debris. In any and all cases, operations, inspections, and maintenance activities shall utilize best practical measures to avoid and minimize impacts to wetland resource areas outside the footprint of the SMS.

Supplemental Information

- Operation & Maintenance Plan Schedule
- Massachusetts Stormwater Handbook, Chapter 5, Miscellaneous Stormwater Topics, Mosquito Control in Stormwater Management Practices.

OPERATION AND MAINTENANCE PLAN SCHEDULE **Date: 2/14/2025**

ALLEN & MAJOR ASSOCIATES, INC.

Project: 40B Multi-Family Site Development
Project Address: 444 East Central Street Fanklin, MA

Responsible for O&M Plan: TAG Central LLC
Address: 1070 E Indiantown Rd, Jupiter, FL
Phone: (561) 685-5336

All information within table is derived from Massachussetts Stormwater Handbook: Volume 2, Chapter 2

BMP CATEGORY	BMP OR MAINTENANCE ACTIVITY	SCHEDULE/ FREQUENCY	NOTES	ESTIMATED ANNUAL MAINTENANCE COST	INSPECTION PERFORMED	
					DATE:	BY:
STRUCTURAL PRETREATMENT BMPs	**DEEP SUMP CATCH BASIN**	Four times per year (quarterly).	Inspect and clean catch basin units whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.	$1,000		
	PROPRIETARY SEPARATORS	In accordance with manufacturers requirements, but no less than twice a year following installation and once a year thereafter.	Remove sediment and other trapped pollutants at frequency or level specified by manufacturer.	$2,000		

INFILTRATION BMPs	**INFILTRATION BASIN**	Inspect after every major storm during first 3 months of operation and twice a year thereafter. Clean pretreatment devices twice a year and after every major storm.	Inspect to ensure proper functioning. Mow the buffer area, side slopes, and basin bottom if grassed floor; rake if stone bottom; remove trash and debris; remove grass clippings and accumulated organic matter.	$1,500		
	SUBSURFACE STRUCTURES	Inspect structure inlets at least twice a year. Remove debris that may clog the system as needed.	Because subsurface structures are installed underground, they are extremely difficult to maintain. Remove any debris that might clog the system.	$500		
BMP ACCESSORIES	**OUTLET STRUCTURES**	Periodic cleaning of Outlet Control Structures as needed.	Clear trash and debris as necessary.	$500		

OTHER MAINTENANCE ACTIVITY	**MOSQUITO CONTROL**	Inspect BMPs as needed to ensure the system's drainage time is less than the maximum 72 hour period.	Massachusetts stormwater handbook requires all stormwater practices that are designed to drain do so within 72 hours to reduce the number of mosquitos that mature to adults since the aquatic stage of a mosquito is 7-10 days.	$100		
	SNOW STORAGE	Clear and remove snow to approved storage locations as necessary to ensure systems are working properly and are protected from meltwater pollutants.	Carefully select snow disposal sites before winter. Avoid dumping removed snow over catch basins, or in detention ponds, sediment forebays, rivers, wetlands, and flood plains. It is also prohibited to dump snow in the bioretention basins or gravel swales.	$500		
	STREET SWEEPING	Clear accumulations of winter sand in parking lots and along roadways at least once a year, preferably in the spring.	Sweep, power broom or vacuum paved areas. Submit information that confirms that all street sweepings have been completed in accordance with state and local requirements	$2,000		

Chapter 5
Miscellaneous Stormwater Topics

Mosquito Control in Stormwater Management Practices

Both aboveground and underground stormwater BMPs have the potential to serve as mosquito breeding areas. Good design, proper operation and maintenance and treatment with larvicides can minimize this potential.

EPA recommends that stormwater treatment practices dewater within 3 days (72 hours) to reduce the number of mosquitoes that mature to adults, since the aquatic stage of many mosquito species is 7 to 10 days. Massachusetts has had a 72-hour dewatering rule in its Stormwater Management Standards since 1996. The 2008 technical specifications for BMPs set forth in Volume 2, Chapter 2 of the Massachusetts Stormwater Handbook also concur with this practice by requiring that all stormwater practices designed to drain do so within 72 hours.

Some stormwater practices are designed to include permanent wet pools. These practices – if maintained properly – can limit mosquito breeding by providing habitat for mosquito predators. Additional measures that can be taken to reduce mosquito populations include increasing water circulation, attracting mosquito predators by adding suitable habitat, and applying larvicides.

The Massachusetts State Reclamation and Mosquito Control Board (SRMCB), through the Massachusetts Mosquito Control Districts, can undertake further mosquito control actions specifically for the purpose of mosquito control pursuant to Massachusetts General Law Chapter 252. The Mosquito Control Board, http://www.mass.gov/agr/mosquito/, describes mosquito control methods and is in the process of developing guidance documents that describe Best Management Practices for mosquito control projects.

The SRMCB and Mosquito Control Districts are not responsible for operating and maintaining stormwater BMPs to reduce mosquito populations. The owners of property that construct the stormwater BMPs or municipalities that "accept" them through local subdivision approval are responsible for their maintenance.[1] The SRMCB is composed of officials from MassDEP, Department of Agricultural Resources, and Department of Conservation and Recreation. The nine (9) Mosquito Control Districts overseen by the SRMCB are located throughout Massachusetts, covering 176 municipalities.

Construction Period Best Management Practices for Mosquito Control

To minimize mosquito breeding during construction, it is essential that the following actions be taken to minimize the creation of standing pools by taking the following actions:

- ***Minimize Land Disturbance:*** Minimizing land disturbance reduces the likelihood of mosquito breeding by reducing silt in runoff that will cause construction period controls to clog and retain standing pools of water for more than 72 hours.
- ***Catch Basin inlets:*** Inspect and refresh filter fabric, hay bales, filter socks or stone dams on a regular basis to ensure that any stormwater ponded at the inlet drains within 8 hours after precipitation stops. Shorter periods may be necessary to avoid hydroplaning in roads

[1] MassDEP and MassHighway understand that the numerous stormwater BMPs along state highways pose a unique challenge. To address this challenge, the 2004 MassHighway Stormwater Handbook will provide additional information on appropriate operation and maintenance practices for mosquito control when the Handbook is revised to reflect the 2008 changes to the Stormwater Management Standards..

caused by water ponded at the catch basin inlet. Treat catch basin sumps with larvicides such as *Bacillus sphaericus* (*Bs*) using a licensed pesticide applicator.

- ***Check Dams:*** If temporary check dams are used during the construction period to lag peak rate of runoff or pond runoff for exfiltration, inspect and repair the check dams on a regular basis to ensure that any stormwater ponded behind the check dam drains within 72 hours.
- ***Design construction period sediment traps*** to dewater within 72 hours after precipitation. Because these traps are subject to high silt loads and tend to clog, treat them with the larvicide *Bs* after it rains from June through October, until the first frost occurs.
- ***Construction period open conveyances:*** When temporary manmade ditches are used for channelizing construction period runoff, inspect them on a regular basis to remove any accumulated sediment to restore flow capacity to the temporary ditch.
- ***Revegetating Disturbed Surfaces:*** Revegetating disturbed surfaces reduces sediment in runoff that will cause construction period controls to clog and retain standing pools of water for greater than 72 hours.
- ***Sediment fences/hay bale barriers:*** When inspections find standing pools of water beyond the 24-hour period after a storm, take action to restore barrier to its normal function.

Post-Construction Stormwater Treatment Practices

- Mosquito control begins with the environmentally sensitive site design. Environmentally sensitive site design that minimizes impervious surfaces reduces the amount of stormwater runoff. Disconnecting runoff using the LID Site Design credits outlined in the Massachusetts Stormwater Handbook reduces the amount of stormwater that must be conveyed to a treatment practice. Utilizing green roofs minimizes runoff from smaller storms. Storage media must be designed to dewater within 72 hours after precipitation.
- Mosquito control continues with the selection of structural stormwater BMPs that are unlikely to become breeding grounds for mosquitoes, such as:
    - ***Bioretention Areas/Rain Gardens/Sand Filter:*** These practices tend not to result in mosquito breeding. If any level spreaders, weirs or sediment forebays are used as part of the design, inspect them and correct them as necessary to prevent standing pools of water for more than 72 hours.
    - ***Infiltration Trenches:*** This practice tends not to result in mosquito breeding. If any level spreaders, weirs, or sediment forebays are used as part of the design, inspect them and correct them as necessary to prevent standing pools of water for more than 72 hours.
- Another mosquito control strategy is to select BMPs that can become habitats for mosquito predators, such as:
    - ***Constructed Stormwater Wetlands:*** Habitat features can be incorporated in constructed stormwater wetlands to attract dragonflies, amphibians, turtles, birds, bats, and other natural predators of mosquitoes.
    - ***Wet Basins:*** Wet basins can be designed to incorporate fish habitat features, such as deep pools. Introduce fish in consultation with Massachusetts Division of Fisheries and Wildlife. Vegetation within wet basins designed as fish habitat must be properly managed to ensure that vegetation does not overtake the habitat. Proper design to ensure that no low circulation or "dead" zones are created may reduce the potential for mosquito breeding. Introducing bubblers may increase water circulation in the wet basin.

Effective mosquito controls require proponents to design structural BMPs to prevent ponding and facilitate maintenance and, if necessary, the application of larvicides. Examples of such design practices include the following:

- ***Basins:*** Provide perimeter access around wet basins, extended dry detention basins and dry detention basins for both larviciding and routine maintenance. Control vegetation to ensure that access pathways stay open.
- ***BMPs without a permanent pool of water:*** All structural BMPs that do not rely on a permanent pool of water must drain and completely dewater within 72 hours after precipitation. This includes dry detention basins, extended dry detention basins, infiltration basins, and dry water quality swales. Use underdrains at extended dry detention basins to drain the small pools that form due to accumulation of silts. Wallace indicates that extended dry extended detention basins may breed more mosquitoes than wet basins. It is, therefore, imperative to design outlets from extended dry detention basins to completely dewater within the 72-hour period.
- ***Energy Dissipators and Flow Spreaders:*** Currier and Moeller, 2000 indicate that shallow recesses in energy dissipators and flow spreaders trap water where mosquitoes breed. Set the riprap in grout to reduce the shallow recesses and minimize mosquito breeding.
- ***Outlet control structures:*** Debris trapped in small orifices or on trash racks of outlet control structures such as multiple stage outlet risers may clog the orifices or the trash rack, causing a standing pool of water. Optimize the orifice size or trash rack mesh size to provide required peak rate attenuation/water quality detention/retention time while minimizing clogging.
- ***Rain Barrels and Cisterns:*** Seal lids to reduce the likelihood of mosquitoes laying eggs in standing water. Install mosquito netting over inlets. The cistern system should be designed to ensure that all collected water is drained into it within 72 hours.
- ***Subsurface Structures, Deep Sump Catch Basins, Oil Grit Separators, and Leaching Catch Basins:*** Seal all manhole covers to reduce likelihood of mosquitoes laying eggs in standing water. Install mosquito netting over the outlet (CALTRANS 2004).

The Operation and Maintenance Plan should provide for mosquito prevention and control.

- ***Check dams:*** Inspect permanent check dams on the schedule set forth in the O&M Plan. Inspect check dams 72 hours after storms for standing water ponding behind the dam. Take corrective action if standing water is found.
- ***Cisterns:*** Apply *Bs* larvicide in the cistern if any evidence of mosquitoes is found. The Operation and Maintenance Plan shall specify how often larvicides should be applied to waters in the cistern.
- ***Water quality swales:*** Remove and properly dispose of any accumulated sediment as scheduled in the Operation and Maintenance Plan.
- ***Larvicide Treatment:*** The Operation and Maintenance Plan must include measures to minimize mosquito breeding, including larviciding.
- The party identified in the Operation and Maintenance Plan as responsible for maintenance shall see that larvicides are applied as necessary to the following stormwater treatment practices: catch basins, oil/grit separators, wet basins, wet water quality swales, dry extended detention basins, infiltration basins, and constructed stormwater wetlands. The Operation and Maintenance Plan must ensure that all larvicides are applied by a licensed pesticide applicator and in compliance with all pesticide label requirements.
- The Operation and Maintenance Plan should identify the appropriate larvicide and the time and method of application. For example, *Bacillus sphaericus (Bs*), the preferred

larvicide for stormwater BMPs, should be hand-broadcast.[2] Alternatively, Altosid, a Methopren product, may be used. Because some practices are designed to dewater between storms, such as dry extended detention and infiltration basins, the Operation and Maintenance Plan should provide that larviciding must be conducted during or immediately after wet weather, when the detention or infiltration basin has a standing pool of water, unless a product is used that can withstand extended dry periods.

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[2] *Bacillus thuringienis israelensis* or *Bti* is usually applied by helicopter to wetlands and floodplains

Roads and Stormwater BMPs

In general, the stormwater BMPs used for land development projects can also be used for new roadways and roadway improvement projects. However, for improvement of existing roads, there are often constraints that limit the choice of BMP. These constraints derive from the linear configuration of the road, the limited area within the existing right-of-way, the structural and safety requirements attendant to good roadway design, and the long-term maintainability of the roadway drainage systems. The MassHighway Handbook provides strategies for dealing with the constraints associated with providing stormwater BMPs for roadway redevelopment projects.

Roadway design can minimize impacts caused by stormwater. Reducing roadway width reduces the total and peak volume of runoff. Designing a road with country drainage (no road shoulders or curbs) disconnects roadway runoff. Disconnection of roadway runoff is eligible for the Low Impact Site Design Credit provided the drainage is disconnected in accordance with specifications outlined in Volume 3.

Like other parties, municipalities that work within wetlands jurisdictional areas and adjacent buffer zones must design and implement structural stormwater best management practices in accordance with the Stormwater Management Standards and the Stormwater Management Handbook. In addition, in municipalities and areas where state agencies operate stormwater systems, the DPWs (or other town or state agencies) must meet the "good housekeeping" requirement of the municipality's or agency's MS4 permit.

MassHighway has taken stormwater management one step further by working with MassDEP to develop the MassHighway Storm Water Handbook for Highways and Bridges. The purpose of the MassHighway Handbook is to provide guidance for persons involved in the design, permitting, review and implementation of state highway projects, especially those involving existing roadways where physical constraints often limit the stormwater management options available. These constraints, like those common to redevelopment sites, may make it difficult to comply precisely with the requirements of the Stormwater Management Standards and the Massachusetts Stormwater Handbook.[3] In response to these constraints, MassDEP and MHD developed specific design, permitting, review and implementation practices that meet the unique challenges of providing environmental protection for existing state roads. The information in the MassHighway Handbook may also aid in the planning and design of projects to build new highways and to add lanes to existing highways, since they may face similar difficulties in meeting the requirements of the Stormwater Management Standards.

Although it is very useful, the MassHighway Handbook does not allow MassHighway projects to proceed without individual review and approval by the issuing authority when subject to the Wetlands Protection Act Regulations, 310 CMR 10.00, or the 401 Water Quality Certification Regulations, 314 CMR 9.00. For example, MassHighway must provide a Conservation Commission with a project-specific Operation and Maintenance Plan in accordance with Standard 9 that documents how the project's post-construction BMPs will be operated and maintained.[4]

[3] The 2004 MassHighway Handbook outlines standardized methods for dealing with these constraints as they apply to highway redevelopment projects. MassDEP and MassHighway intend to work together to provide guidance for add a lane projects when the 2004 Handbook is revised to reflect the 2008 changes to the Stormwater Management Standards.

[4] The general permit for municipal separate storm sewer systems (the MS4 Permit) requires MassHighway to develop and implement procedures for the proper operation and maintenance of stormwater BMPs. To

Some municipalities have asked if the MassHighway Handbook governs municipal road projects. The answer is no.[5] The MassHighway Handbook was developed in response to the unique problems and challenges arising out of the management of the state highway system. Like other project proponents, cities and towns planning road or other projects in areas subject to jurisdiction under the Wetlands Protection Act must design and implement LID, non-structural and structural best management practices in accordance with the Stormwater Management Standards and the Massachusetts Stormwater Handbook.

avoid duplication of effort, MassHighway may be able rely on the same procedures to fulfill the operation and maintenance requirements of Standard 9 and the MS 4 Permit.

[5] Although the MassHighway Handbook does not govern municipal road projects, cities and towns may find some of the information presented in the Handbook useful.

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Massachusetts Department of Environmental Protection
Bureau of Water Resources
Snow Disposal Guidance

Effective Date: December 23, 2019

Applicability: Applies to all federal, state, regional and local agencies, as well as to private businesses.

Supersedes: Bureau of Resource Protection (BRP) Snow Disposal Guideline No. BRPG97-1 issued December 12, 1997 and BRPG01-01 issued March 8, 2001; Bureau of Water Resources (BWR) snow disposal guidance issued December 21, 2015 and December 12, 2018.

Approved by: Kathleen Baskin, Assistant Commissioner, Bureau of Water Resources

PURPOSE: To provide guidelines to all government agencies and private businesses regarding snow disposal site selection, site preparation and maintenance, and emergency snow disposal options that are protective of wetlands, drinking water, and water bodies, and are acceptable to the Massachusetts Department of Environmental Protection (MassDEP), Bureau of Water Resources.

APPLICABILITY: These Guidelines are issued by MassDEP's Bureau of Water Resources on behalf of all Bureau Programs (including Drinking Water Supply, Wetlands and Waterways, Wastewater Management, and Watershed Planning and Permitting). They apply to all federal agencies, state agencies, state authorities, municipal agencies and private businesses disposing of snow in the Commonwealth of Massachusetts.

INTRODUCTION

Finding a place to dispose of collected snow poses a challenge to municipalities and businesses as they clear roads, parking lots, bridges, and sidewalks. While MassDEP is aware of the threats to public safety caused by snow, collected snow that is contaminated with road salt, sand, litter, and automotive pollutants such as oil also threatens public health and the environment.

As snow melts, road salt, sand, litter, and other pollutants are transported into surface water or through the soil where they may eventually reach the groundwater. Road salt and other pollutants can contaminate water supplies and are toxic to aquatic life at certain levels. Sand washed into

waterbodies can create sand bars or fill in wetlands and ponds, impacting aquatic life, causing flooding, and affecting our use of these resources.

There are several steps that communities can take to minimize the impacts of snow disposal on public health and the environment. These steps will help communities avoid the costs of a contaminated water supply, degraded waterbodies, and flooding. Everything that occurs on the land has the potential to impact the Commonwealth's water resources. Given the authority of local government over the use of the land, municipal officials and staff have a critically important role to play in protecting our water resources.

The purpose of these guidelines is to help federal agencies, state agencies, state authorities, municipalities and businesses select, prepare, and maintain appropriate snow disposal sites before the snow begins to accumulate through the winter. Following these guidelines and obtaining the necessary approvals may also help municipalities in cases when seeking reimbursement for snow disposal costs from the Federal Emergency Management Agency is possible.

RECOMMENDED GUIDELINES

These snow disposal guidelines address: (1) site selection; (2) site preparation and maintenance; and (3) emergency snow disposal.

1. SITE SELECTION

The key to selecting effective snow disposal sites is to locate them adjacent to or on pervious surfaces in upland areas or upland locations on impervious surfaces away from water resources and drinking water wells. At these locations, the snow meltwater can filter into the soil, leaving behind sand and debris which can be removed in the spring. The following conditions should be followed:

- Within water supply Zone A and Zone II, avoid storage or disposal of snow and ice containing deicing chemicals that has been collected from streets located outside these zones. Municipalities may have a water supply protection land use control that prohibits the disposal of snow and ice containing deicing chemicals from outside the Zone A and Zone II, subject to the Massachusetts Drinking Water Regulations at 310 CMR 22.20C and 310 CMR 22.21(2).
- Avoid storage or disposal of snow or ice in Interim Wellhead Protection Areas (IWPA) of public water supply wells, and within 75 feet of a private well, where road salt may contaminate water supplies.
- Avoid dumping snow into any waterbody, including rivers, the ocean, reservoirs, ponds, or wetlands. In addition to water quality impacts and flooding, snow disposed of in open water can cause navigational hazards when it freezes into ice blocks.
- Avoid dumping snow on MassDEP-designated high and medium-yield aquifers where it may contaminate groundwater.
- Avoid dumping snow in sanitary landfills and gravel pits. Snow meltwater will create more contaminated leachate in landfills posing a greater risk to groundwater, and in gravel pits, there is little opportunity for pollutants to be filtered out of the meltwater because groundwater is close to the land surface.

- Avoid disposing of snow on top of storm drain catch basins or in stormwater drainage systems including detention basins, swales or ditches. Snow combined with sand and debris may block a stormwater drainage system, causing localized flooding. A high volume of sand, sediment, and litter released from melting snow also may be quickly transported through the system into surface water.

Recommended Site Selection Procedures

It is important that the municipal Department of Public Works or Highway Department, Conservation Commission, and Board of Health work together to select appropriate snow disposal sites. The following steps should be taken:

- Estimate how much snow disposal capacity may be needed for the season so that an adequate number of disposal sites can be selected and prepared.
- Identify sites that could potentially be used for snow disposal, such as municipal open space (e.g., parking lots or parks).
- Select sites located in upland locations that are not likely to impact sensitive environmental resources first.
- If more storage space is still needed, prioritize the sites with the least environmental impact (using the site selection criteria, and local or MassGIS maps as a guide).

Snow Disposal Mapping Assistance

MassDEP has an online mapping tool to assist in identifying possible locations to potentially dispose of snow. MassDEP encourages municipalities to use this tool to identify possible snow disposal options. The tool identifies wetland resource areas, public drinking water supplies and other sensitive locations where snow should not be disposed. The tool may be accessed through the Internet at the following web address: **https://maps.env.state.ma.us/dep/arcgis/js/templates/PSF/**.

2. SITE PREPARATION AND MAINTENANCE

In addition to carefully selecting disposal sites before the winter begins, it is important to prepare and maintain these sites to maximize their effectiveness. The following maintenance measures should be undertaken for all snow disposal sites:

- A silt fence or equivalent barrier should be placed securely on the downgradient side of the snow disposal site.
- Wherever possible maintain a 50-foot vegetated buffer between the disposal site and adjacent waterbodies to filter pollutants from the meltwater.
- Clear debris from the site prior to using the site for snow disposal.
- Clear debris from the site and properly dispose of it at the end of the snow season, and no later than May 15.

3. SNOW DISPOSAL APPROVALS

Proper snow disposal may be undertaken through one of the following approval procedures:

- Routine snow disposal – Minimal, if any, administrative review is required in these cases when upland and pervious snow disposal locations or upland locations on impervious surfaces that have functioning and maintained stormwater management systems have been identified, mapped, and used for snow disposal following ordinary snowfalls. Use of upland and pervious snow disposal sites avoids wetland resource areas and allows snow meltwater to recharge groundwater and will help filter pollutants, sand, and other debris. This process will address the majority of snow removal efforts until an entity exhausts all available upland snow disposal sites. The location and mapping of snow disposal sites will help facilitate each entity's routine snow management efforts.
- Emergency Certifications – If an entity demonstrates that there is no remaining capacity at upland snow disposal locations, local conservation commissions may issue an Emergency Certification under the Massachusetts Wetlands Protection regulations to authorize snow disposal in buffer zones to wetlands, certain open water areas, and certain wetland resource areas (i.e. within flood plains). Emergency Certifications can only be issued at the request of a public agency or by order of a public agency for the protection of the health or safety of citizens, and are limited to those activities necessary to abate the emergency. See 310 CMR 10.06(1)-(4). Use the following guidelines in these emergency situations:
    - Dispose of snow in open water with adequate flow and mixing to prevent ice dams from forming.
    - Do not dispose of snow in salt marshes, vegetated wetlands, certified vernal pools, shellfish beds, mudflats, drinking water reservoirs and their tributaries, Zone IIs or IWPAs of public water supply wells, Outstanding Resource Waters, or Areas of Critical Environmental Concern.
    - Do not dispose of snow where trucks may cause shoreline damage or erosion.
    - Consult with the municipal Conservation Commission to ensure that snow disposal in open water complies with local ordinances and bylaws.

- Severe Weather Emergency Declarations – In the event of a large-scale severe weather event, MassDEP may issue a broader Emergency Declaration under the Wetlands Protection Act which allows federal agencies, state agencies, state authorities, municipalities, and businesses greater flexibility in snow disposal practices. Emergency Declarations typically authorize greater snow disposal options while protecting especially sensitive resources such as public drinking water supplies, vernal pools, land containing shellfish, FEMA designated floodways, coastal dunes, and salt marsh. In the event of severe winter storm emergencies, the snow disposal site maps created by municipalities will enable MassDEP and the Massachusetts Emergency Management Agency (MEMA) in helping communities identify appropriate snow disposal locations.

  If upland disposal sites have been exhausted, the Emergency Declaration issued by MassDEP allows for snow disposal near water bodies. In these situations, a buffer of at

least 50 feet, preferably vegetated, should still be maintained between the site and the waterbody. Furthermore, it is essential that the other guidelines for preparing and maintaining snow disposal sites be followed to minimize the threat to adjacent waterbodies.

Under extraordinary conditions, when all land-based snow disposal options are exhausted, the Emergency Declaration issued by MassDEP may allow disposal of snow in certain waterbodies under certain conditions. ***A federal agency, state agency, state authority, municipality or business seeking to dispose of snow in a waterbody should take the following steps***:

- Call the emergency contact phone number [(888) 304-1133)] and notify the MEMA of the municipality's intent.
- MEMA will ask for some information about where the requested disposal will take place.
- MEMA will confirm that the disposal is consistent with MassDEP's Severe Weather Emergency Declaration and these guidelines and is therefore approved.

During declared statewide snow emergency events, MassDEP's website will also highlight the emergency contact phone number [(888) 304-1133)] for authorizations and inquiries. For further non-emergency information about this Guidance you may contact your MassDEP Regional Office Service Center:

Northeast Regional Office, Wilmington, 978-694-3246
Southeast Regional Office, Lakeville, 508-946-2714
Central Regional Office, Worcester, 508-792-7650
Western Regional Office, Springfield, 413-755-2114

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CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	yd3	m3
CDS2015-4	4	1.2	3.0	0.9	0.5	0.4
CDS2015	5	1.5	3.0	0.9	1.3	1.0
CDS2020	5	1.5	3.5	1.1	1.3	1.0
CDS2025	5	1.5	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

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

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CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than eighteen inches the system should be cleaned out. **Note: To avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.**

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

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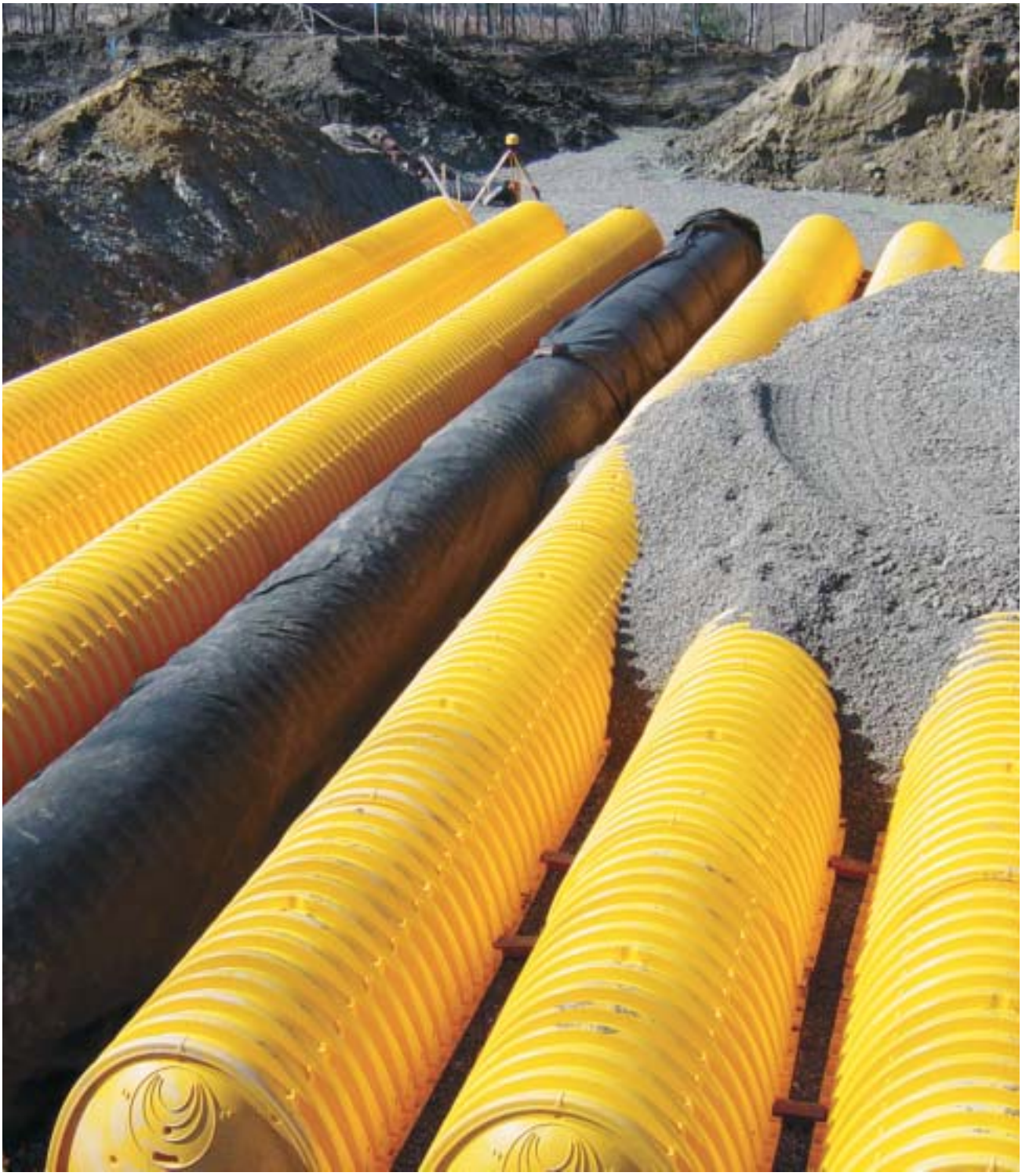


Isolator™ Row O&M Manual

StormTech® Chamber System for Stormwater Management

1.0 The Isolator™ Row

1.1 INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a patent pending technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

1.2 THE ISOLATOR™ ROW

The Isolator Row is a row of StormTech chambers, either SC-740 or SC-310 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

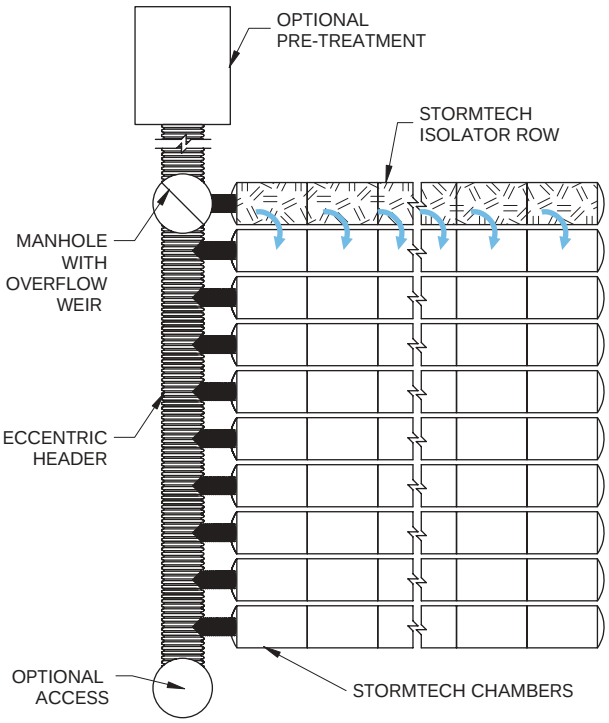
Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber.

The Isolator Row is typically designed to capture the "first flush" and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

StormTech Isolator Row with Overflow Spillway
(not to scale)



2.0 Isolator Row Inspection/Maintenance

2.1 INSPECTION

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

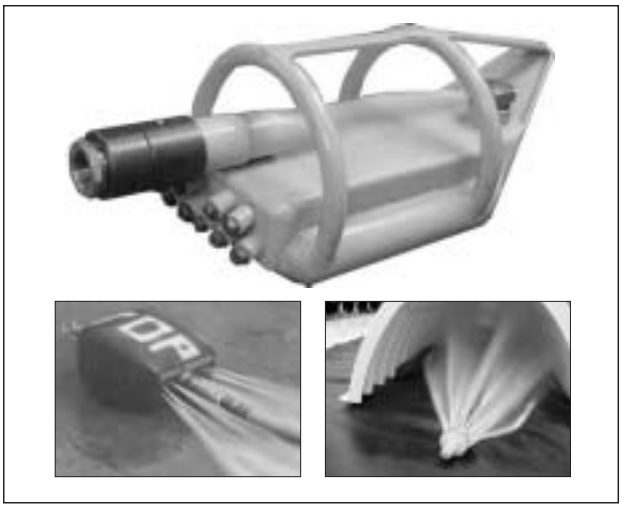
At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

2.2 MAINTENANCE

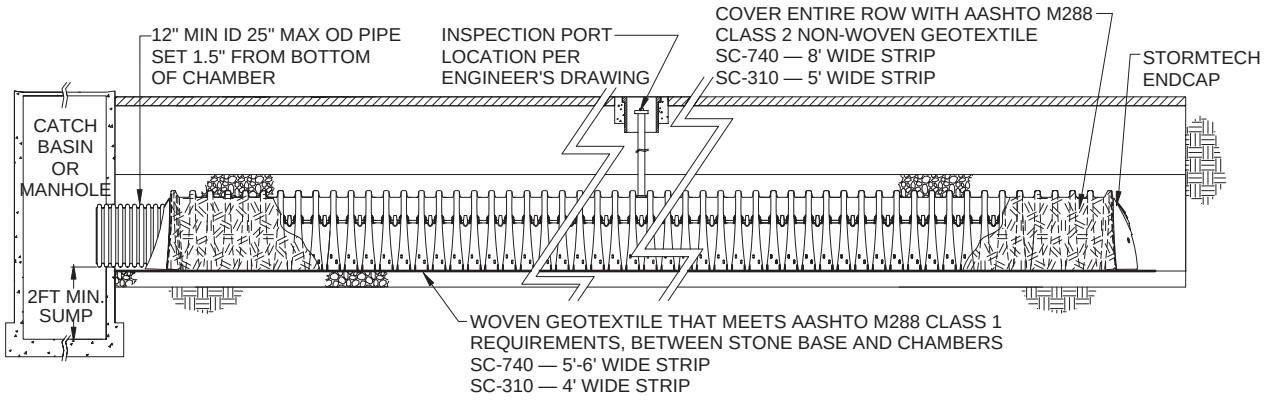
The Isolator Row was designed to reduce the cost of periodic maintenance. By “isolating” sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.



Examples of culvert cleaning nozzles appropriate for Isolator Row maintenance. (These are not StormTech products.)

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45” are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)



3.0 Isolator Row Step By Step Maintenance Procedures

Step 1) Inspect Isolator Row for sediment

A) Inspection ports (if present)

i. Remove lid from floor box frame

ii. Remove cap from inspection riser

iii. Using a flashlight and stadia rod, measure depth of sediment and record results on maintenance log.

iv. If sediment is at, or above, 3 inch depth proceed to Step 2. If not proceed to step 3.

B) All Isolator Rows

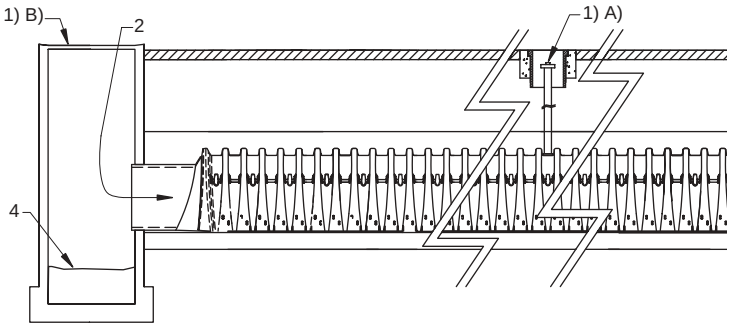
i. Remove cover from manhole at upstream end of Isolator Row

ii. Using a flashlight, inspect down Isolator Row through outlet pipe

1. Mirrors on poles or cameras may be used to avoid a confined space entry
2. Follow OSHA regulations for confined space entry if entering manhole

iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches) proceed to Step 2. If not proceed to Step 3.

StormTech Isolator Row (not to scale)



Step 2) Clean out Isolator Row using the JetVac process

A) A fixed culvert cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable

B) Apply multiple passes of JetVac until backflush water is clean

C) Vacuum manhole sump as required

Step 3) Replace all caps, lids and covers, record observations and actions

Step 4) Inspect & clean catch basins and manholes upstream of the StormTech system

Sample Maintenance Log

Date	Stadia Rod Readings		Sediment Depth (1) - (2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/01	6.3 ft.	none		New installation. Fixed point is CI frame at grade	djm
9/24/01		6.2	0.1 ft.	Some grit felt	sm
6/20/03		5.8	0.5 ft.	Mucky feel, debris visible in manhole and in Isolator row, maintenance due	rv
7/7/03	6.3 ft.		0	System jetted and vacuumed	djm

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Subsurface Stormwater Management℠

20 Beaver Road, Suite 104 | Wethersfield | Connecticut | 06109

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StormTech products are covered by one or more of the following patents: U.S. Patents: 5,401,459; 5,511,903; 5,716,163; 5,588,778; 5,839,844; Canadian Patents: 2,158,418 Other U.S. and Foreign Patents PendingPrinted in U.S.A.

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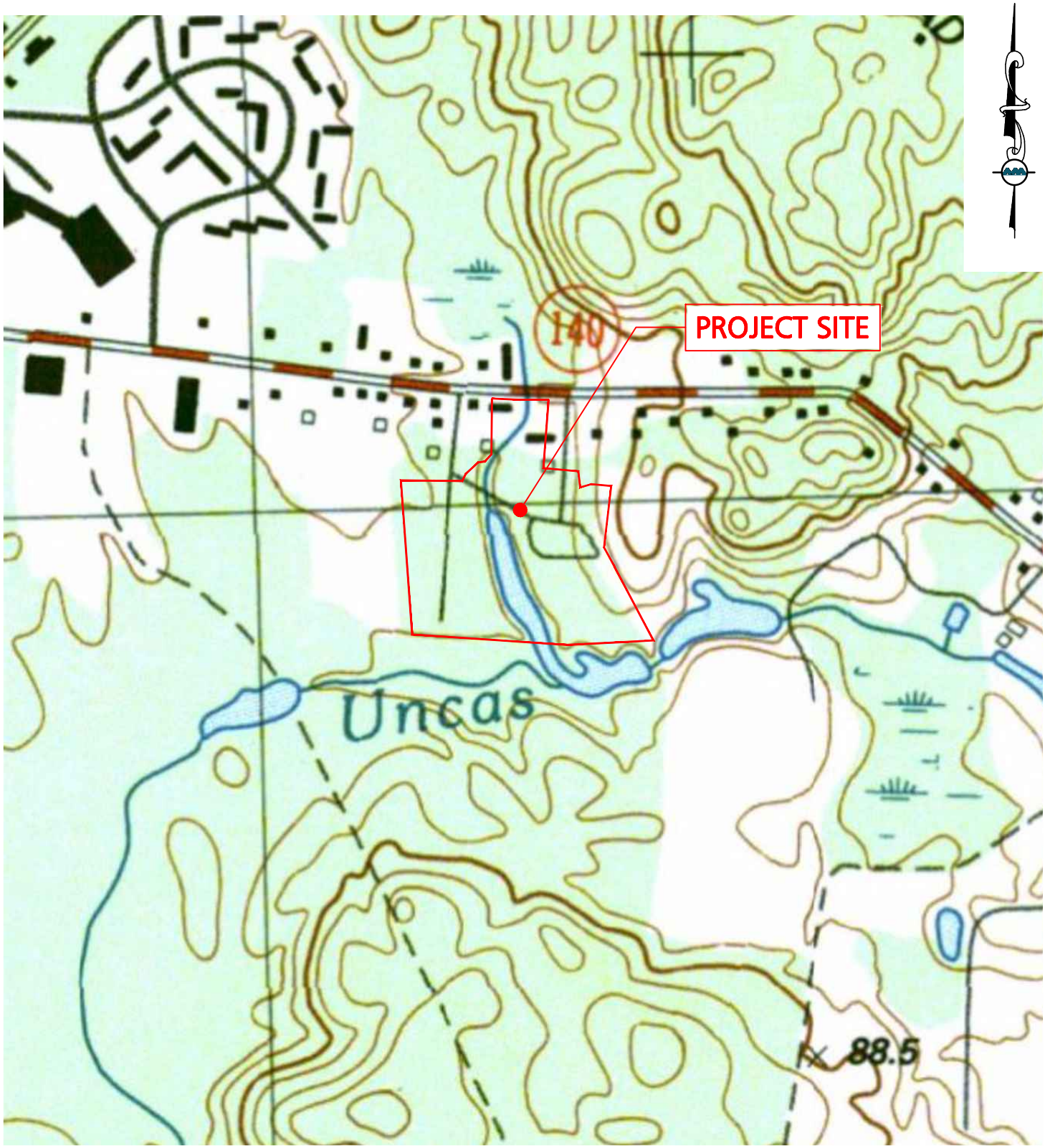
SECTION 3.0 -
EXHIBITS



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WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

PROJECT:

444 EAST CENTRAL STREET
FRANKLIN, MA

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USGS SITE LOCUS MAP

PROJECT NO.	3317-01	DATE:	02/07/2025
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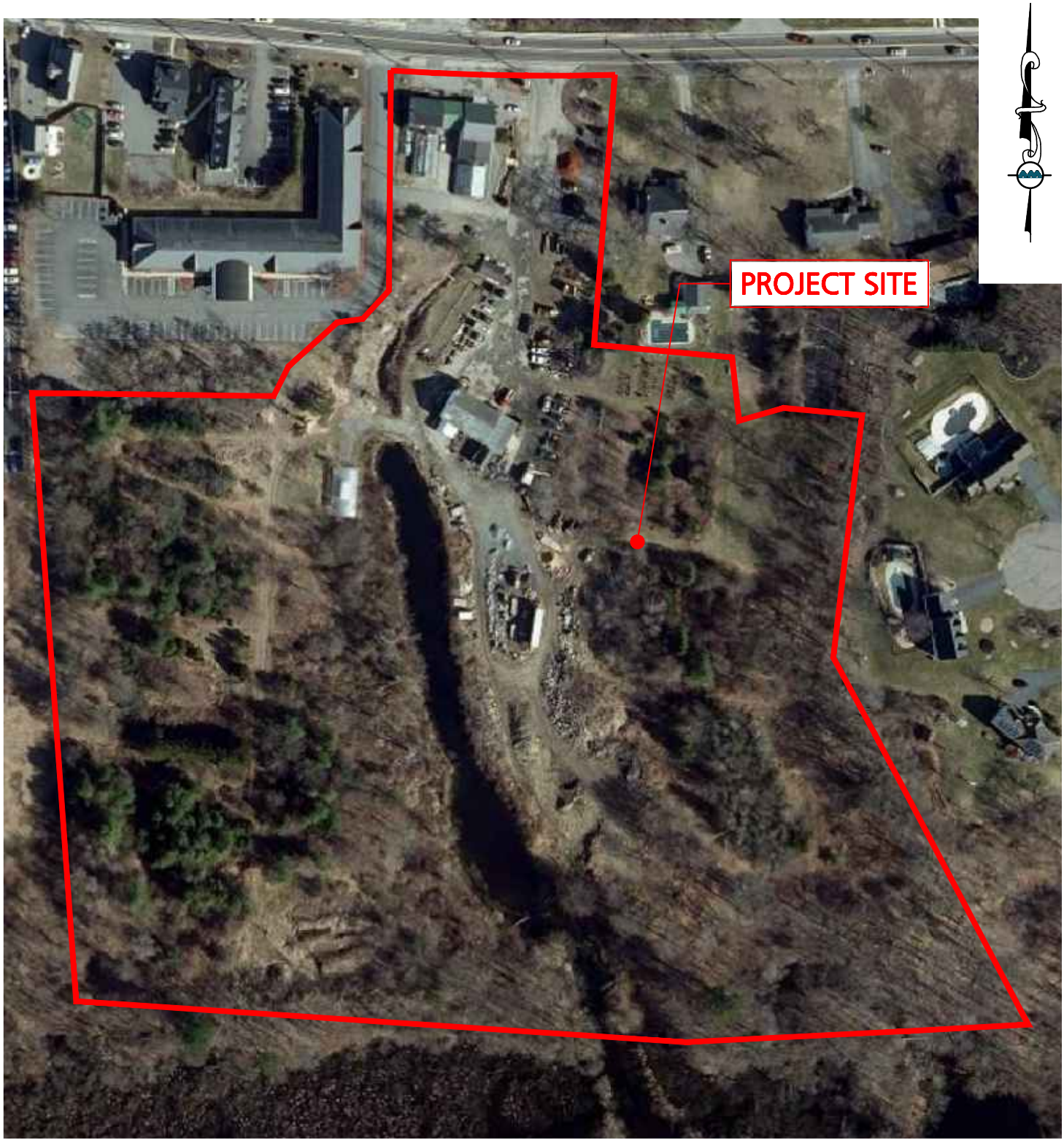
EX-1



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AERIAL PHOTO

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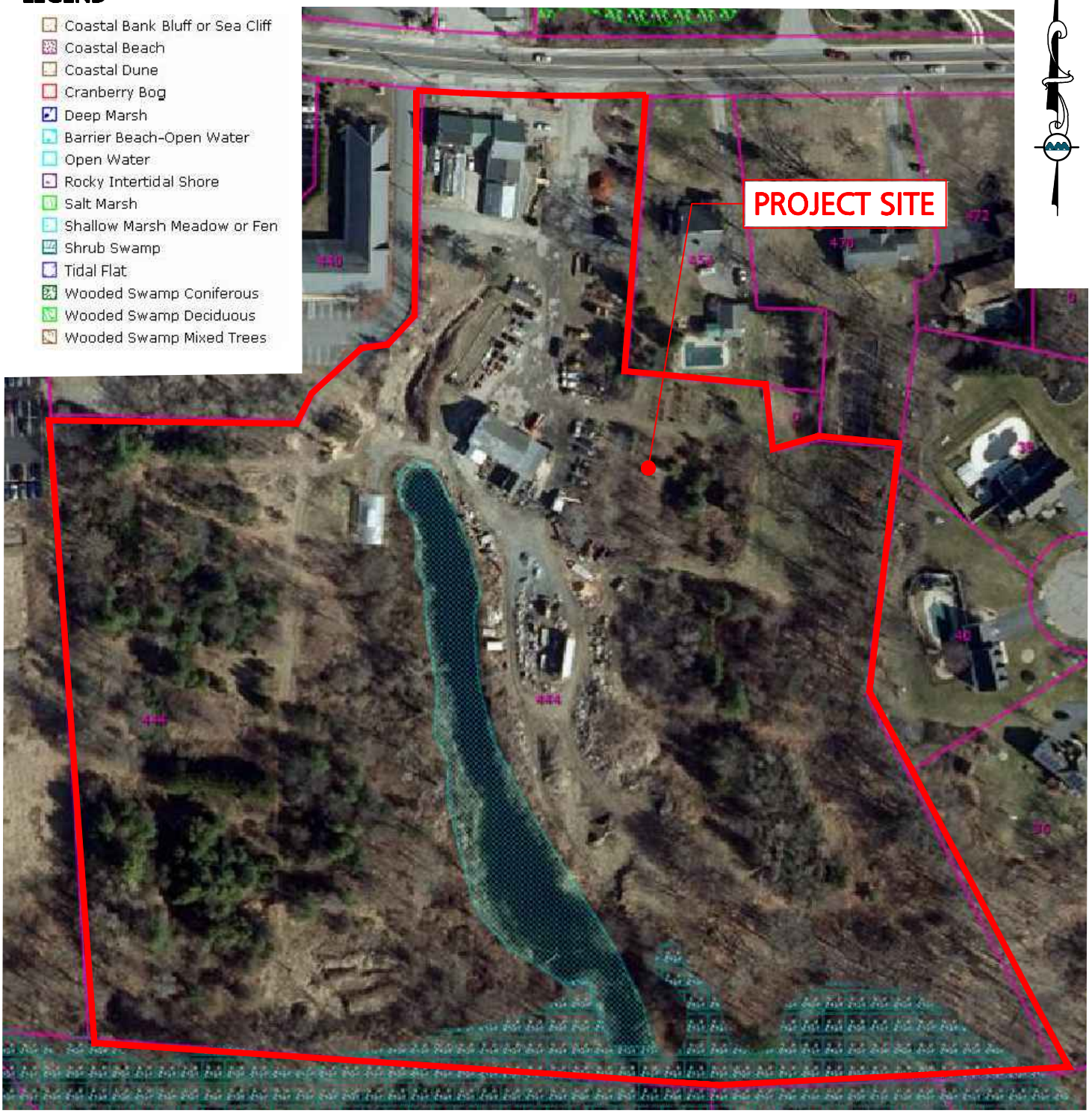
SHEET No.

EX-2

LEGEND

- Coastal Bank Bluff or Sea Cliff
- Coastal Beach
- Coastal Dune
- Cranberry Bog
- Deep Marsh
- Barrier Beach-Open Water
- Open Water
- Rocky Intertidal Shore
- Salt Marsh
- Shallow Marsh Meadow or Fen
- Shrub Swamp
- Tidal Flat
- Wooded Swamp Coniferous
- Wooded Swamp Deciduous
- Wooded Swamp Mixed Trees



MA MAPPER DEP WETLANDS
THERE ARE OPEN WATER & SHRUB SWAMP WETLANDS DELINEATED ON THE SITE

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WETLANDS MAP

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SHEET No.
EX-3

LEGEND

SPECIAL FLOOD HAZARD AREAS (SFHAs) SUBJECT TO INUNDATION BY THE 1% ANNUAL CHANCE FLOOD

The 1% annual chance flood (100-year flood), also known as the base flood, is the flood that has a 1% chance of being equaled or exceeded in any given year. The Special Flood Hazard Area is the area subject to flooding by the 1% annual chance flood. Areas of Special Flood Hazard include Zones A, AE, AH, AO, AR, A99, V, and VE. The Base Flood Elevation is the water-surface elevation of the 1% annual chance flood.

ZONE A	No Base Flood Elevations determined.
ZONE AE	Base Flood Elevations determined.
ZONE AH	Flood depths of 1 to 3 feet (usually areas of ponding); Base Flood Elevations determined.
ZONE AO	Flood depths of 1 to 3 feet (usually sheet flow on sloping terrain); average depths determined. For areas of alluvial fan flooding, velocities also determined.
ZONE AR	Special Flood Hazard Areas formerly protected from the 1% annual chance flood by a flood control system that was subsequently decertified. Zone AR indicates that the former flood control system is being restored to provide protection from the 1% annual chance or greater flood.
ZONE A99	Area to be protected from 1% annual chance flood by a Federal flood protection system under construction; no Base Flood Elevations determined.
ZONE V	Coastal flood zone with velocity hazard (wave action); no Base Flood Elevations determined.
ZONE VE	Coastal flood zone with velocity hazard (wave action); Base Flood Elevations determined.

FLOODWAY AREAS IN ZONE AE

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 1% annual chance flood can be carried without substantial increases in flood heights.

OTHER FLOOD AREAS

ZONE X	Areas of 0.2% annual chance flood; areas of 1% annual chance flood with average depths of less than 1 foot or with drainage areas less than 1 square mile; and areas protected by levees from 1% annual chance flood.

OTHER AREAS

ZONE X	Areas determined to be outside the 0.2% annual chance floodplain.
ZONE D	Areas in which flood hazards are undetermined, but possible.

COASTAL BARRIER RESOURCES SYSTEM (CBRS) AREAS

OTHERWISE PROTECTED AREAS (OPAs)

CBRS areas and OPAs are normally located within or adjacent to Special Flood Hazard Areas.

1% Annual Chance Floodplain Boundary

0.2% Annual Chance Floodplain Boundary

Floodway boundary

Zone D boundary

CBRS and OPA boundary

Boundary dividing Special Flood Hazard Area Zones and boundary dividing Special Flood Hazard Areas of different Base Flood Elevations, flood depths, or flood velocities.

513 — Base Flood Elevation line and value; elevation in feet*

(EL 987) — Base Flood Elevation value where uniform within zone; elevation in feet*

*Referenced to the North American Vertical Datum of 1988

A — A — Cross section line

23 — 23 — Transect line

Culvert

Bridge

45° 02' 08", 93° 02' 12" — Geographic coordinates referenced to the North American Datum of 1983 (NAD 83) Western Hemisphere

4989000 M — 1000-meter ticks: Massachusetts State Plane Mainland Zone (FIPS Zone 2001), Lambert Conformal Conic projection

^{4989000m} N — 1000-meter Universal Transverse Mercator grid values, zone 19N

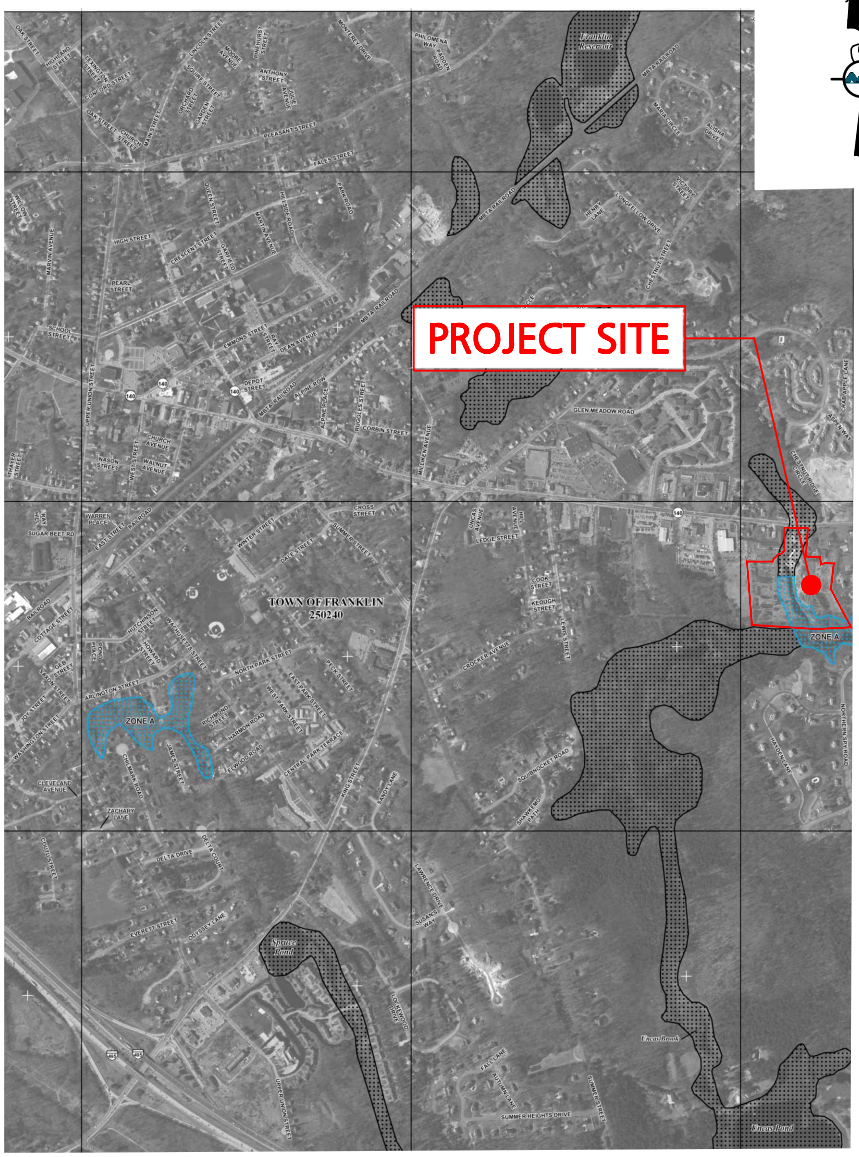
DX5510 — Bench mark (see explanation in Notes to Users section of this FIRM panel)

M1.5 — River Mile

MAP REPOSITORIES
Refer to Map Repositories list on Map Index

EFFECTIVE DATE OF COUNTYWIDE FLOOD INSURANCE RATE MAP
July 3, 2012

EFFECTIVE DATE(S) OF REVISION(S) TO THIS PANEL



FEMA FLOOD INSURANCE RATE MAP
NORFOLK COUNTY, MASSACHUSETTS
COMMUNITY PANEL 309 OF 430
MAP NUMBER 25021C0309E
EFFECTIVE DATE: JULY 17, 2012

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FEMA FIRM MAP

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SHEET No.

EX-4

LEGEND

- NHESP Priority Habitats of Rare Species
- NHESP Estimated Habitats of Rare Wildlife
- Property Tax Parcels

MA MAPPER PRIORITY & ESTIMATED HABITATS
THERE ARE NO NHESP PRIORITY/ESTIMATED HABITATS OF RARE SPECIES ON THE SITE

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PRIORITY & ESTIMATED HABITATS

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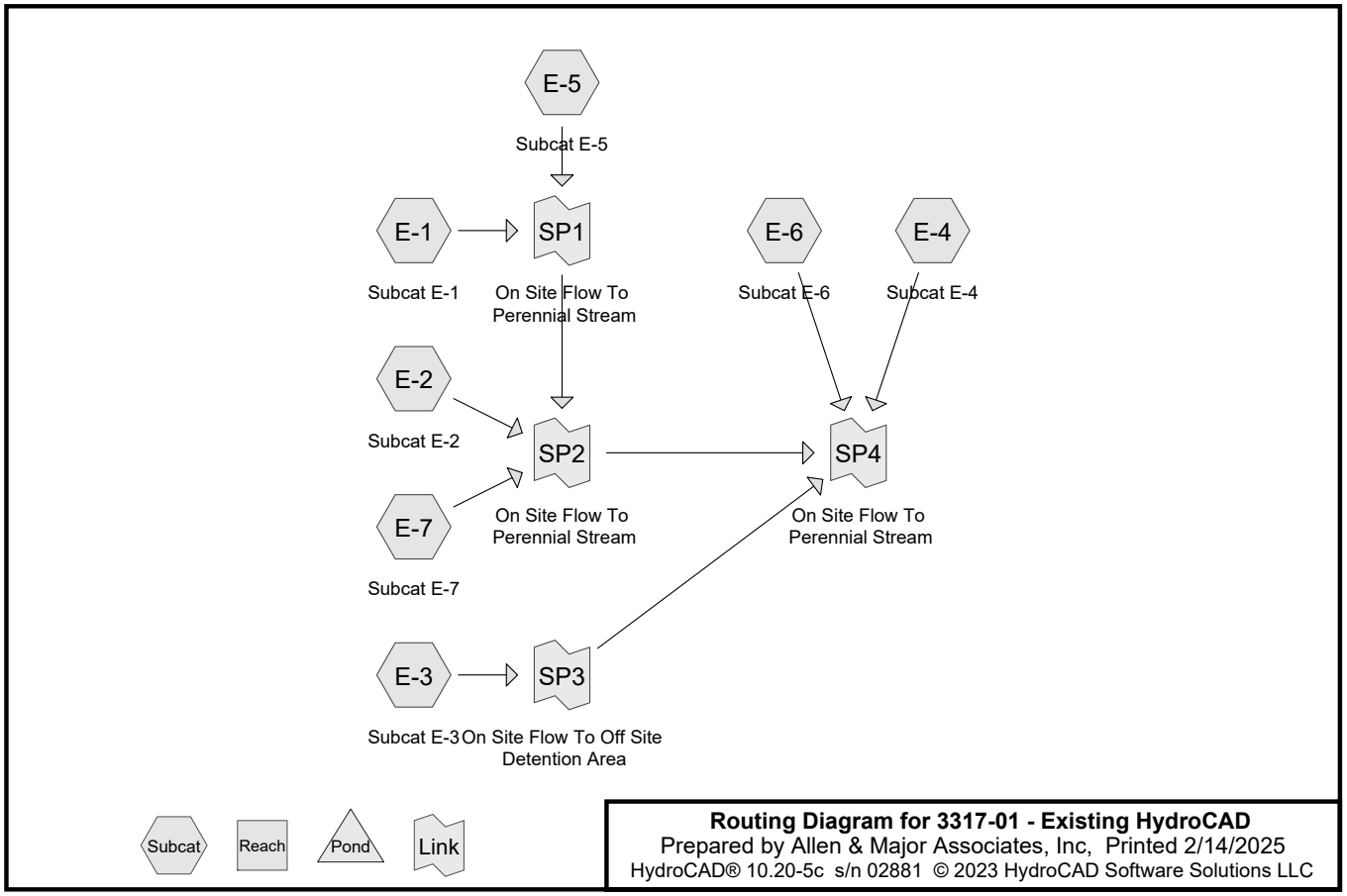
SHEET No.
EX-5

SECTION 4.0 -
EXISTING DRAINAGE ANALYSIS



Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
298,484	61	1/4 acre lots, 38% imp, HSG A (E-5, E-6, E-7)
5,499	87	1/4 acre lots, 38% imp, HSG D (E-5, E-7)
41,410	39	>75% Grass cover, Good, HSG A (E-1, E-2, E-4)
50,738	80	>75% Grass cover, Good, HSG D (E-1, E-2, E-4)
14,803	96	Gravel surface, HSG A (E-4)
8,965	96	Gravel surface, HSG D (E-2, E-4)
19,438	98	Paved parking, HSG A (E-1, E-2)
10,689	98	Paved parking, HSG D (E-1, E-2, E-4)
5,745	98	Unconnected roofs, HSG A (E-1, E-2)
5,982	98	Unconnected roofs, HSG D (E-2, E-4)
497	98	Water Surface, HSG A (E-1, E-2)
32,792	98	Water Surface, HSG D (E-2, E-4)
239,864	30	Woods, Good, HSG A (E-3, E-4)
81,454	55	Woods, Good, HSG B (E-4)
122,758	77	Woods, Good, HSG D (E-3, E-4)
939,118	**59**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
620,241	HSG A	E-1, E-2, E-3, E-4, E-5, E-6, E-7
81,454	HSG B	E-4
0	HSG C	
237,423	HSG D	E-1, E-2, E-3, E-4, E-5, E-7
0	Other	
939,118		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
298,484	0	0	5,499	0	303,984	1/4 acre lots, 38% imp	E-5, E-6, E-7
41,410	0	0	50,738	0	92,148	>75% Grass cover, Good	E-1, E-2, E-4
14,803	0	0	8,965	0	23,768	Gravel surface	E-2, E-4
19,438	0	0	10,689	0	30,127	Paved parking	E-1, E-2, E-4
5,745	0	0	5,982	0	11,727	Unconnected roofs	E-1, E-2, E-4
497	0	0	32,792	0	33,288	Water Surface	E-1, E-2, E-4
239,864	81,454	0	122,758	0	444,076	Woods, Good	E-3, E-4
620,241	**81,454**	**0**	**237,423**	**0**	**939,118**	**TOTAL AREA**	

Time span=0.00-36.00 hrs, dt=0.05 hrs, 721 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment E-1: Subcat E-1 Runoff Area=29,228 sf 79.10% Impervious Runoff Depth=6.71"
Tc=6.0 min CN=WQ Runoff=4.43 cfs 16,333 cf

Subcatchment E-2: Subcat E-2 Runoff Area=41,752 sf 43.11% Impervious Runoff Depth=5.56"
Tc=6.0 min CN=WQ Runoff=5.40 cfs 19,356 cf

Subcatchment E-3: Subcat E-3 Runoff Area=16,432 sf 0.00% Impervious Runoff Depth=0.47"
Tc=6.0 min CN=WQ Runoff=0.06 cfs 649 cf

Subcatchment E-4: Subcat E-4 Runoff Area=547,722 sf 6.21% Impervious Runoff Depth=3.10"
Flow Length=508' Tc=22.8 min CN=WQ Runoff=25.98 cfs 141,310 cf

Subcatchment E-5: Subcat E-5 Runoff Area=112,063 sf 38.00% Impervious Runoff Depth=3.60"
Tc=12.0 min CN=WQ Runoff=8.74 cfs 33,645 cf

Subcatchment E-6: Subcat E-6 Runoff Area=104,010 sf 38.00% Impervious Runoff Depth=3.57"
Tc=12.0 min CN=61 Runoff=8.04 cfs 30,918 cf

Subcatchment E-7: Subcat E-7 Runoff Area=87,911 sf 38.00% Impervious Runoff Depth=3.71"
Tc=10.0 min CN=WQ Runoff=7.47 cfs 27,191 cf

Link SP1: On Site Flow To Perennial Stream Inflow=12.09 cfs 49,978 cf
Primary=12.09 cfs 49,978 cf

Link SP2: On Site Flow To Perennial Stream Inflow=24.16 cfs 96,525 cf
Primary=24.16 cfs 96,525 cf

Link SP3: On Site Flow To Off Site Detention Area Inflow=0.06 cfs 649 cf
Primary=0.06 cfs 649 cf

Link SP4: On Site Flow To Perennial Stream Inflow=50.88 cfs 269,402 cf
Primary=50.88 cfs 269,402 cf

Total Runoff Area = 939,118 sf Runoff Volume = 269,402 cf Average Runoff Depth = 3.44"
79.70% Pervious = 748,462 sf 20.30% Impervious = 190,657 sf

Summary for Subcatchment E-1: Subcat E-1

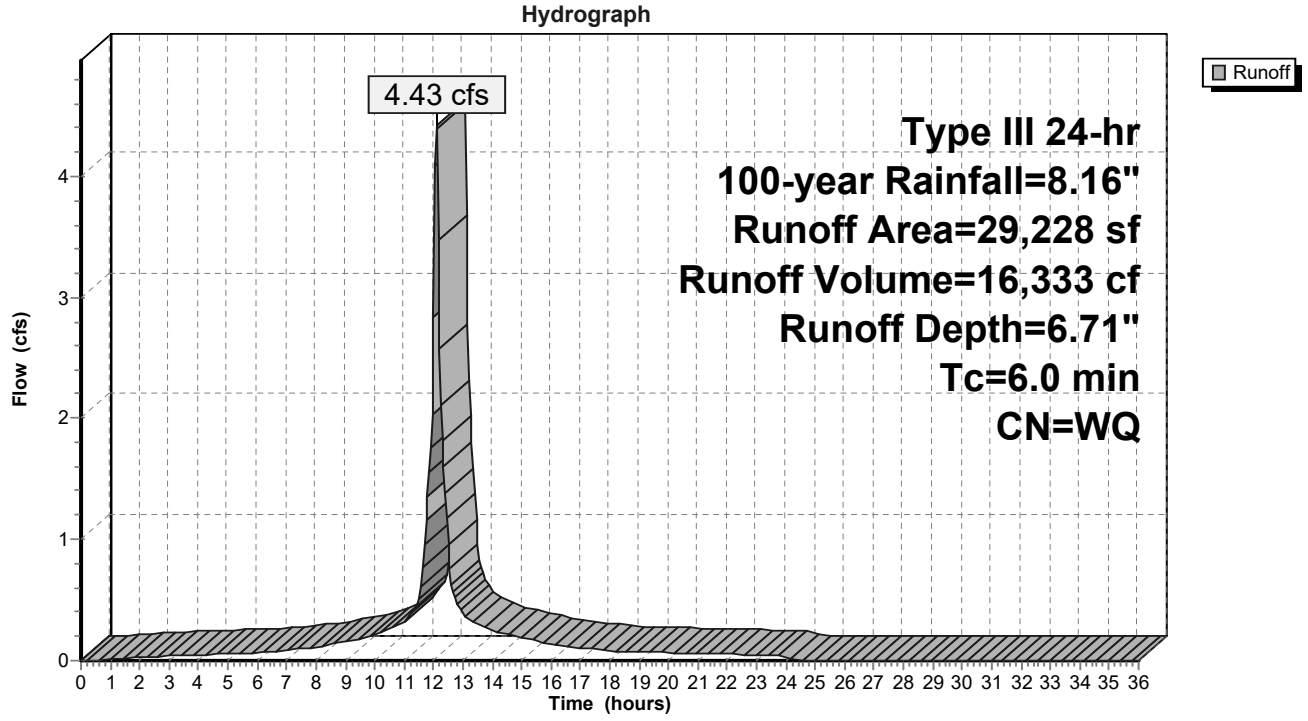
Runoff = 4.43 cfs @ 12.09 hrs, Volume= 16,333 cf, Depth= 6.71"
Routed to Link SP1 : On Site Flow To Perennial Stream

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.16"

Area (sf)	CN	Description
4,922	39	>75% Grass cover, Good, HSG A
5,459	98	Unconnected roofs, HSG A
15,988	98	Paved parking, HSG A
1,187	80	>75% Grass cover, Good, HSG D
1,241	98	Paved parking, HSG D
431	98	Water Surface, HSG A
29,228		Weighted Average
6,109	47	20.90% Pervious Area
23,119	98	79.10% Impervious Area
5,459		23.61% Unconnected

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

Subcatchment E-1: Subcat E-1



Summary for Subcatchment E-2: Subcat E-2

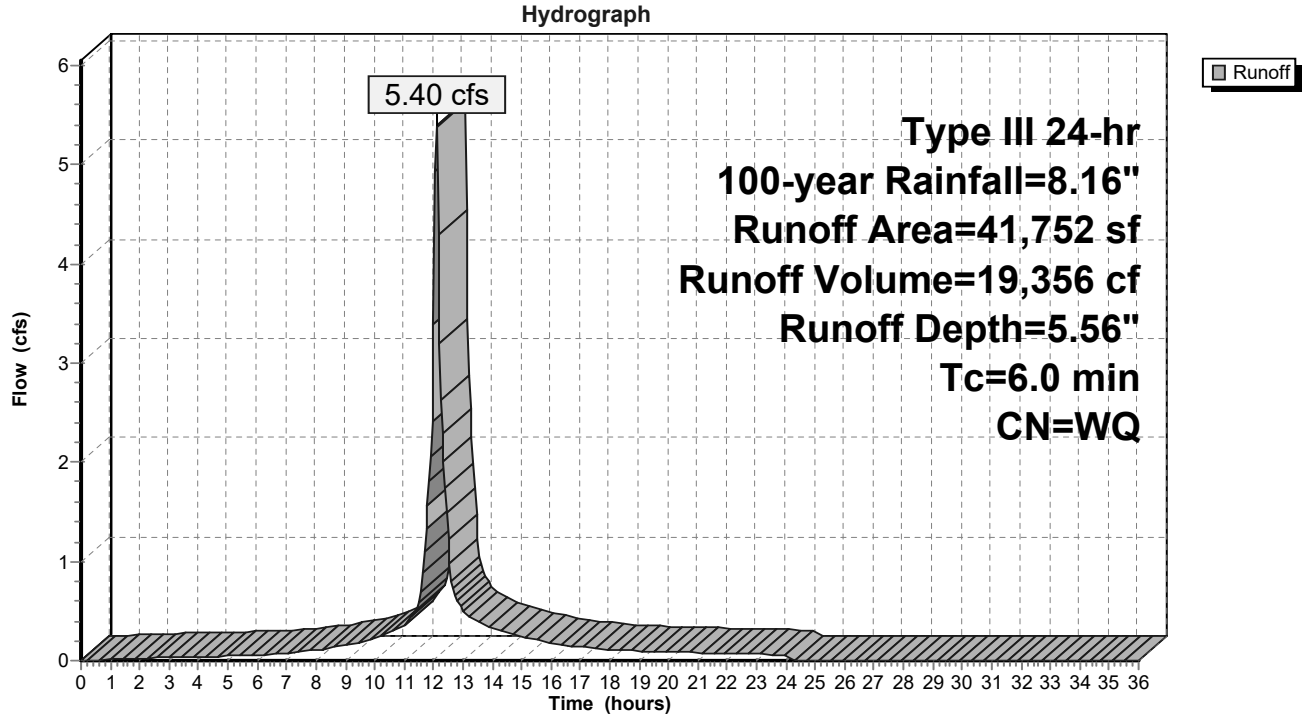
Runoff = 5.40 cfs @ 12.09 hrs, Volume= 19,356 cf, Depth= 5.56"
Routed to Link SP2 : On Site Flow To Perennial Stream

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.16"

Area (sf)	CN	Description
10,981	39	>75% Grass cover, Good, HSG A
3,450	98	Paved parking, HSG A
286	98	Unconnected roofs, HSG A
65	98	Water Surface, HSG A
2,962	98	Unconnected roofs, HSG D
2,412	98	Water Surface, HSG D
8,822	98	Paved parking, HSG D
1,317	96	Gravel surface, HSG D
11,456	80	>75% Grass cover, Good, HSG D
41,752		Weighted Average
23,755	62	56.89% Pervious Area
17,998	98	43.11% Impervious Area
3,249		18.05% Unconnected

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

Subcatchment E-2: Subcat E-2



Summary for Subcatchment E-3: Subcat E-3

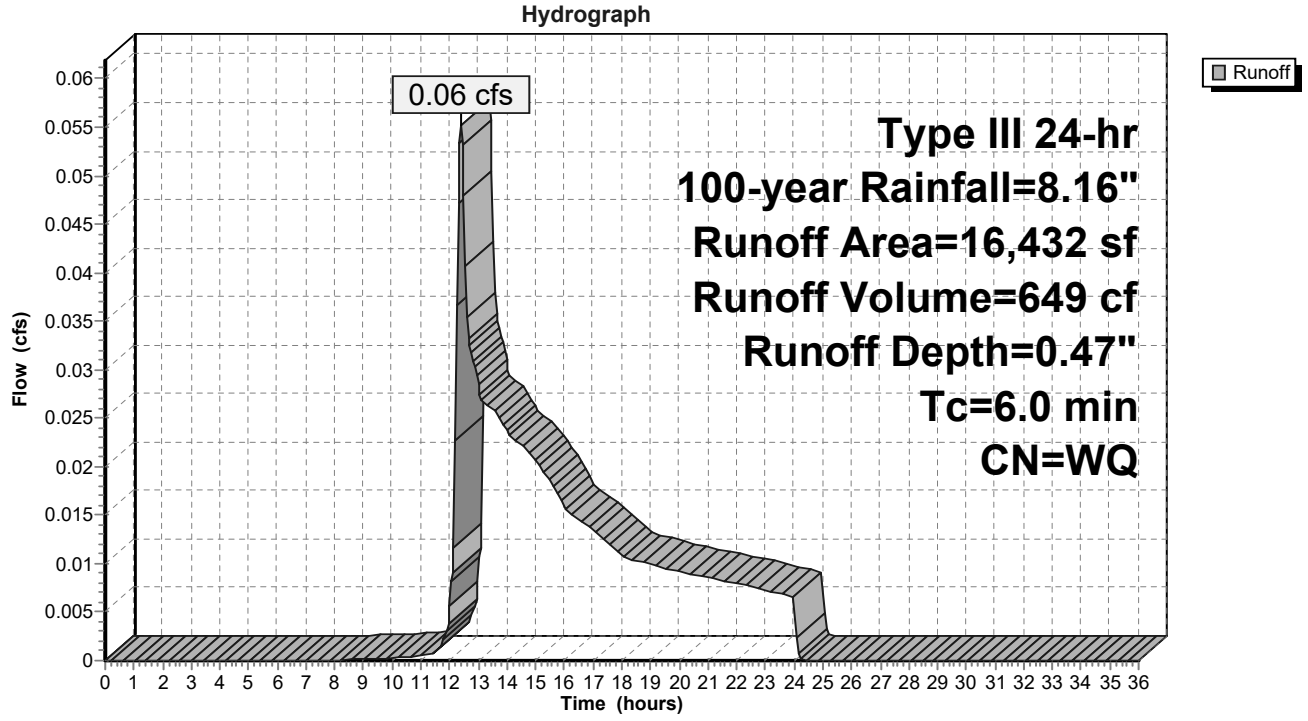
Runoff = 0.06 cfs @ 12.40 hrs, Volume= 649 cf, Depth= 0.47"
Routed to Link SP3 : On Site Flow To Off Site Detention Area

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.16"

Area (sf)	CN	Description
64	77	Woods, Good, HSG D
16,369	30	Woods, Good, HSG A
16,432		Weighted Average
16,432	30	100.00% Pervious Area

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

Subcatchment E-3: Subcat E-3



Summary for Subcatchment E-4: Subcat E-4

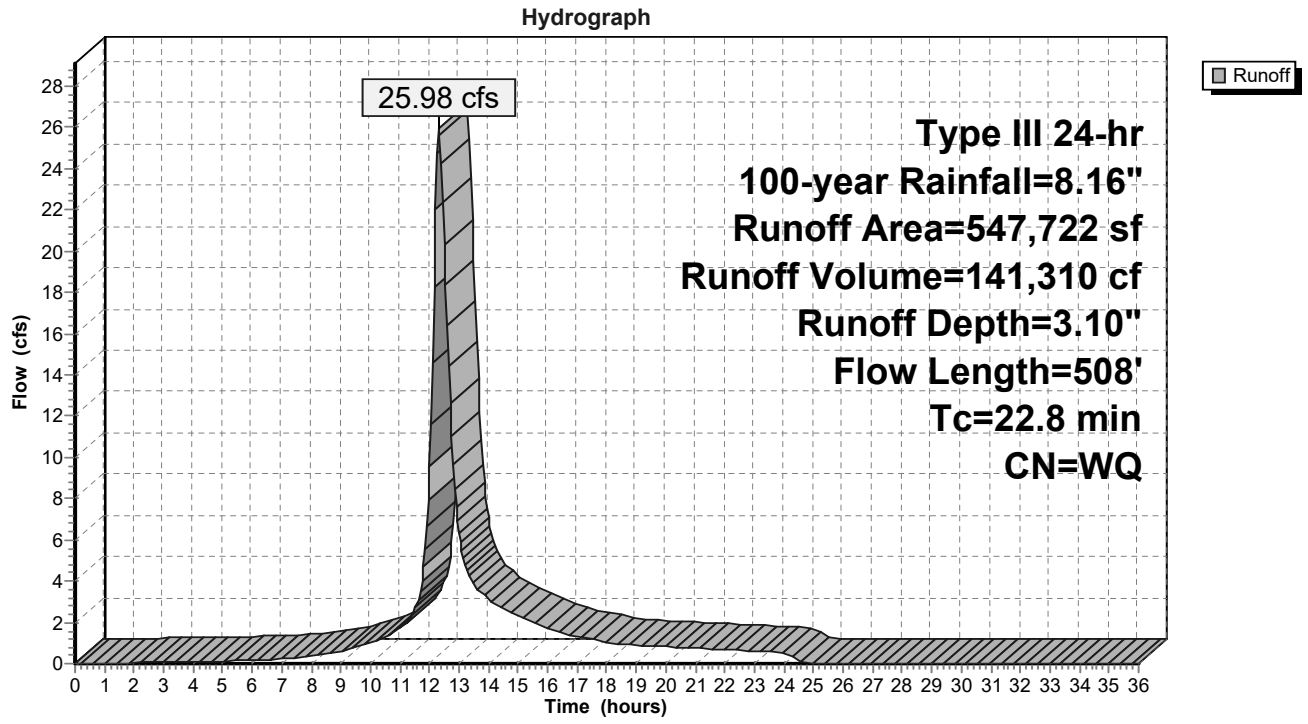
Runoff = 25.98 cfs @ 12.31 hrs, Volume= 141,310 cf, Depth= 3.10"
Routed to Link SP4 : On Site Flow To Perennial Stream

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.16"

Area (sf)	CN	Description
14,803	96	Gravel surface, HSG A
223,496	30	Woods, Good, HSG A
25,506	39	>75% Grass cover, Good, HSG A
626	98	Paved parking, HSG D
3,020	98	Unconnected roofs, HSG D
30,379	98	Water Surface, HSG D
7,648	96	Gravel surface, HSG D
122,695	77	Woods, Good, HSG D
38,095	80	>75% Grass cover, Good, HSG D
81,454	55	Woods, Good, HSG B
547,722		Weighted Average
513,696	52	93.79% Pervious Area
34,026	98	6.21% Impervious Area
3,020		8.88% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	195	0.1400	0.20		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.28"
3.6	153	0.0100	0.70		**Shallow Concentrated Flow, B-C** Short Grass Pasture Kv= 7.0 fps
2.5	130	0.0150	0.86		**Shallow Concentrated Flow, C-D** Short Grass Pasture Kv= 7.0 fps
0.1	30	0.0600	3.67		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
22.8	508	Total			

Subcatchment E-4: Subcat E-4



Summary for Subcatchment E-5: Subcat E-5

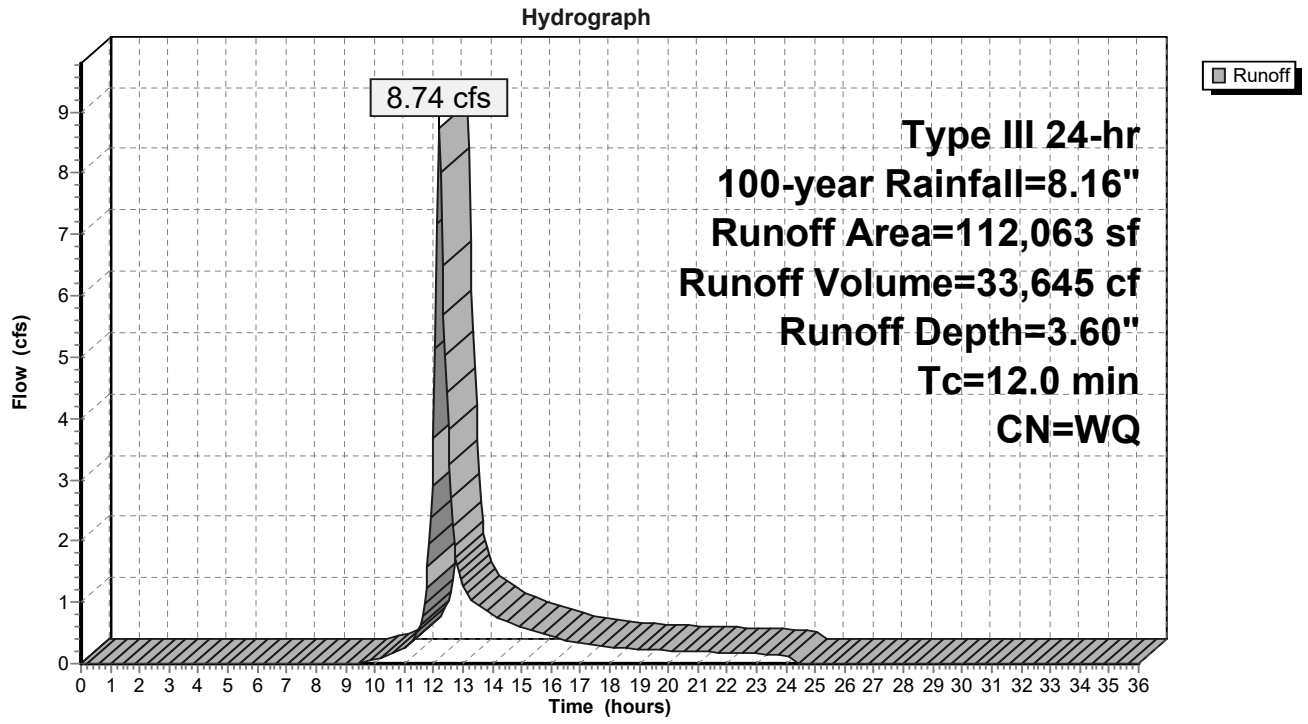
Runoff = 8.74 cfs @ 12.17 hrs, Volume= 33,645 cf, Depth= 3.60"
Routed to Link SP1 : On Site Flow To Perennial Stream

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.16"

Area (sf)	CN	Description
1,318	87	1/4 acre lots, 38% imp, HSG D
110,745	61	1/4 acre lots, 38% imp, HSG A
112,063		Weighted Average
69,479	39	62.00% Pervious Area
42,584	98	38.00% Impervious Area

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

Subcatchment E-5: Subcat E-5



Summary for Subcatchment E-6: Subcat E-6

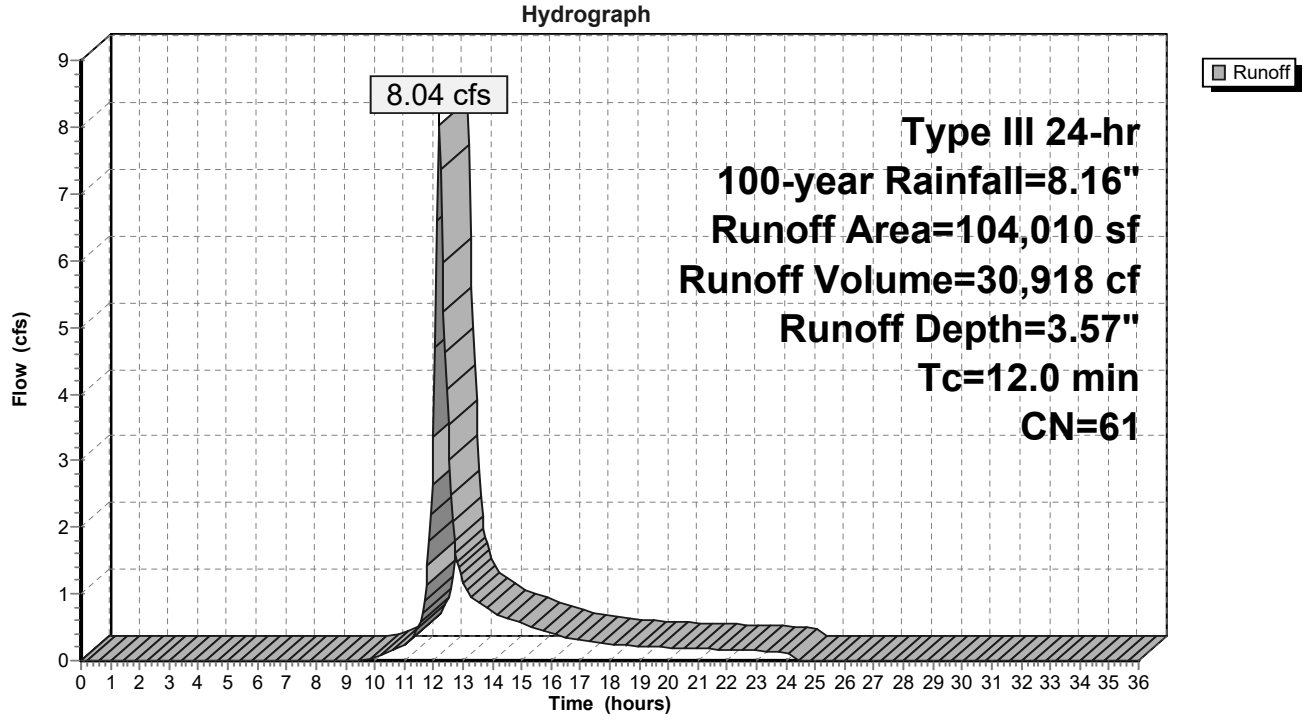
Runoff = 8.04 cfs @ 12.17 hrs, Volume= 30,918 cf, Depth= 3.57"
Routed to Link SP4 : On Site Flow To Perennial Stream

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.16"

Area (sf)	CN	Description
104,010	61	1/4 acre lots, 38% imp, HSG A
64,486	38	62.00% Pervious Area
39,524	98	38.00% Impervious Area

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

Subcatchment E-6: Subcat E-6



Summary for Subcatchment E-7: Subcat E-7

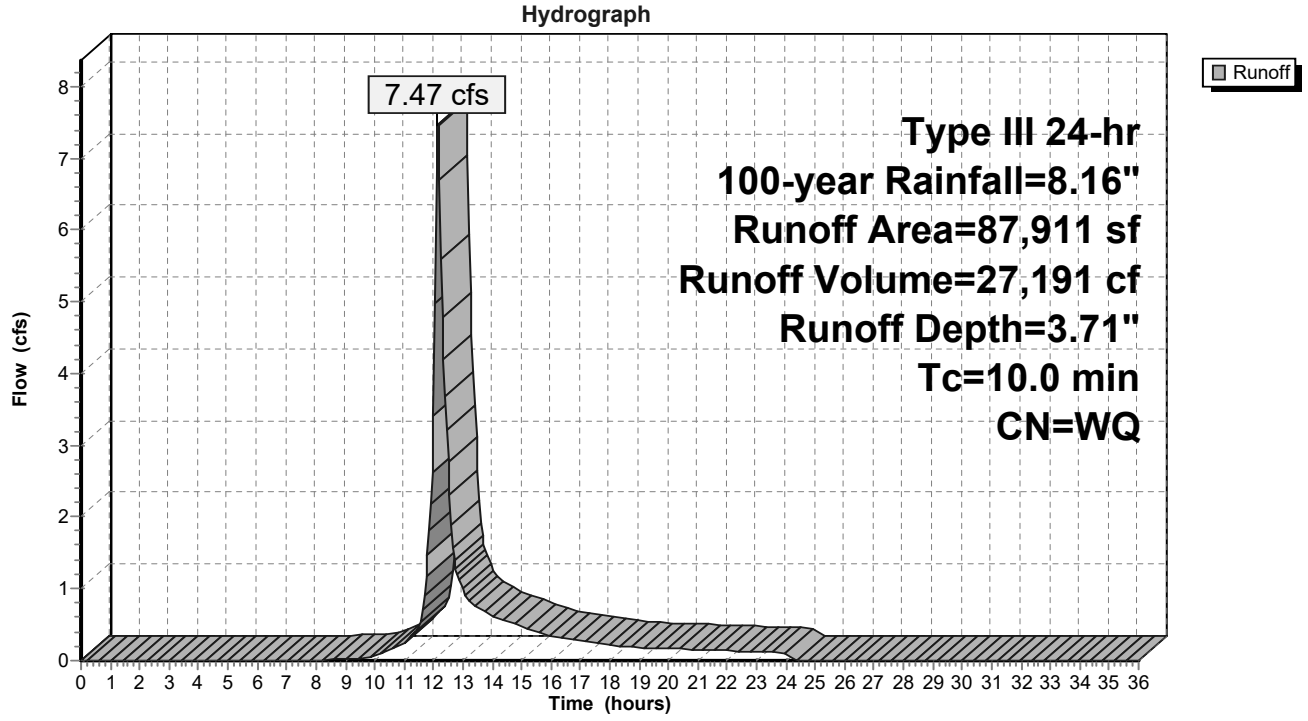
Runoff = 7.47 cfs @ 12.15 hrs, Volume= 27,191 cf, Depth= 3.71"
Routed to Link SP2 : On Site Flow To Perennial Stream

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=8.16"

Area (sf)	CN	Description
83,730	61	1/4 acre lots, 38% imp, HSG A
4,181	87	1/4 acre lots, 38% imp, HSG D
87,911		Weighted Average
54,505	40	62.00% Pervious Area
33,406	98	38.00% Impervious Area

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

Subcatchment E-7: Subcat E-7

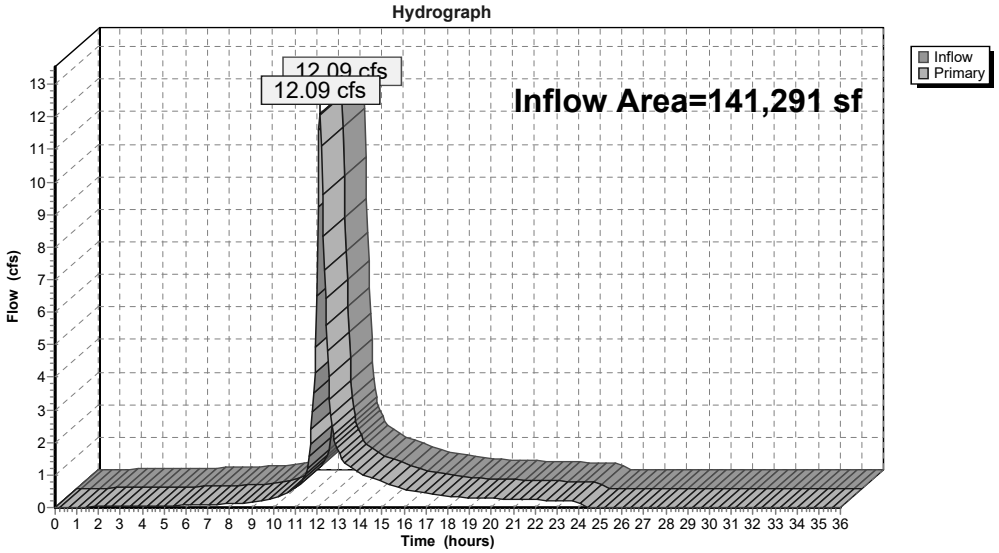


Summary for Link SP1: On Site Flow To Perennial Stream

Inflow Area = 141,291 sf, 46.50% Impervious, Inflow Depth = 4.24" for 100-year event
Inflow = 12.09 cfs @ 12.14 hrs, Volume= 49,978 cf
Primary = 12.09 cfs @ 12.14 hrs, Volume= 49,978 cf, Atten= 0%, Lag= 0.0 min
Routed to Link SP2 : On Site Flow To Perennial Stream

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP1: On Site Flow To Perennial Stream

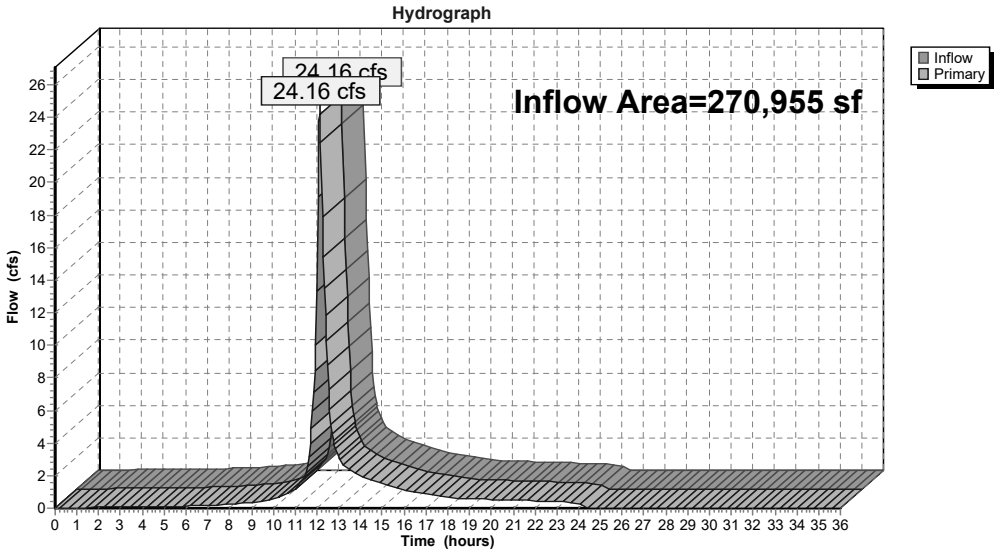


Summary for Link SP2: On Site Flow To Perennial Stream

Inflow Area = 270,955 sf, 43.22% Impervious, Inflow Depth = 4.27" for 100-year event
Inflow = 24.16 cfs @ 12.13 hrs, Volume= 96,525 cf
Primary = 24.16 cfs @ 12.13 hrs, Volume= 96,525 cf, Atten= 0%, Lag= 0.0 min
Routed to Link SP4 : On Site Flow To Perennial Stream

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP2: On Site Flow To Perennial Stream

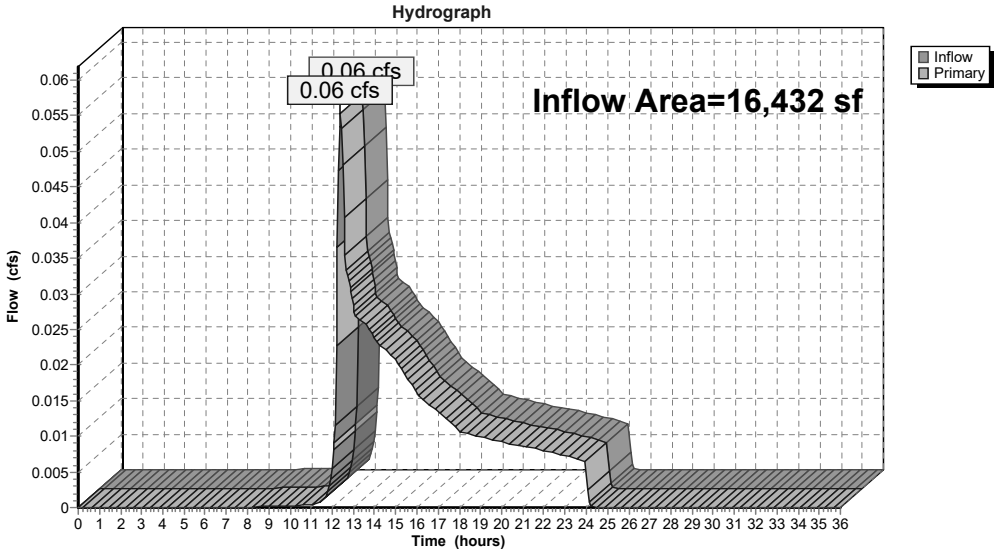


Summary for Link SP3: On Site Flow To Off Site Detention Area

Inflow Area = 16,432 sf, 0.00% Impervious, Inflow Depth = 0.47" for 100-year event
Inflow = 0.06 cfs @ 12.40 hrs, Volume= 649 cf
Primary = 0.06 cfs @ 12.40 hrs, Volume= 649 cf, Atten= 0%, Lag= 0.0 min
Routed to Link SP4 : On Site Flow To Perennial Stream

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP3: On Site Flow To Off Site Detention Area

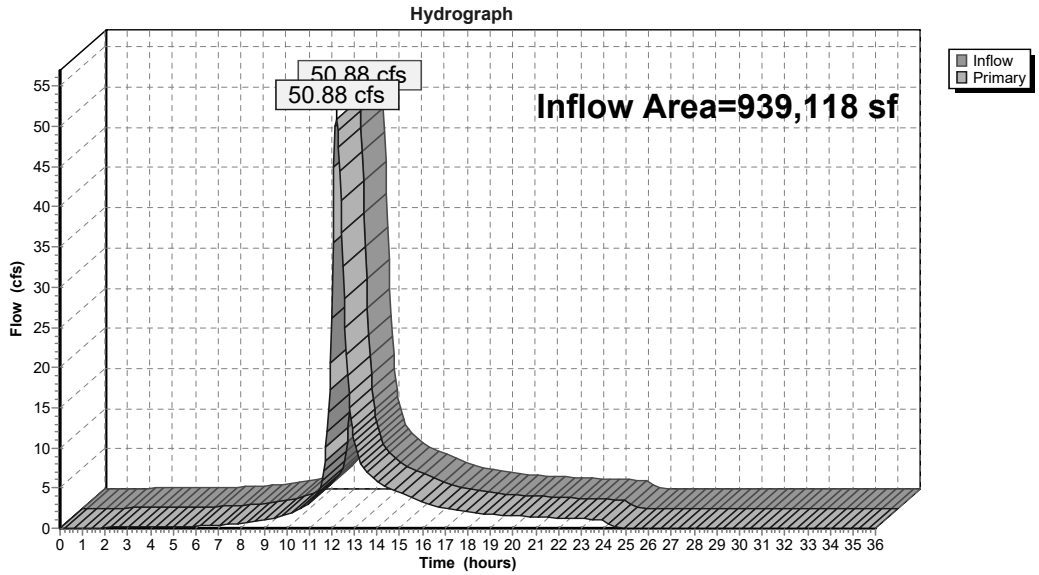


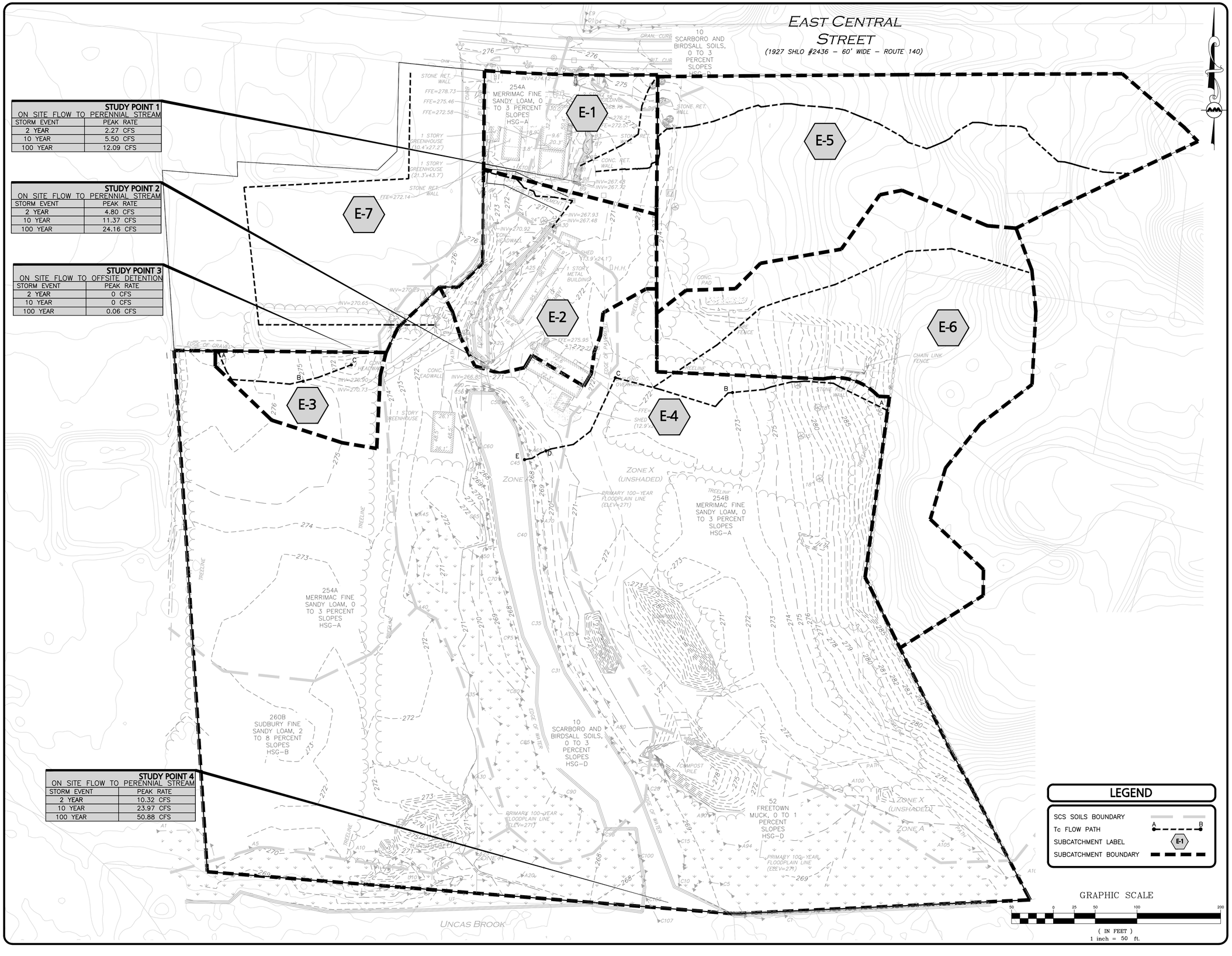
Summary for Link SP4: On Site Flow To Perennial Stream

Inflow Area = 939,118 sf, 20.30% Impervious, Inflow Depth = 3.44" for 100-year event
Inflow = 50.88 cfs @ 12.19 hrs, Volume= 269,402 cf
Primary = 50.88 cfs @ 12.19 hrs, Volume= 269,402 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs

Link SP4: On Site Flow To Perennial Stream





STUDY POINT 1 ON SITE FLOW TO PERENNIAL STREAM	
STORM EVENT	PEAK RATE
2 YEAR	2.27 CFS
10 YEAR	5.50 CFS
100 YEAR	12.09 CFS

STUDY POINT 2 ON SITE FLOW TO PERENNIAL STREAM	
STORM EVENT	PEAK RATE
2 YEAR	4.80 CFS
10 YEAR	11.37 CFS
100 YEAR	24.16 CFS

STUDY POINT 3 ON SITE FLOW TO OFFSITE DETENTION	
STORM EVENT	PEAK RATE
2 YEAR	0 CFS
10 YEAR	0 CFS
100 YEAR	0.06 CFS

STUDY POINT 4 ON SITE FLOW TO PERENNIAL STREAM	
STORM EVENT	PEAK RATE
2 YEAR	10.32 CFS
10 YEAR	23.97 CFS
100 YEAR	50.88 CFS

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION

APPLICANT\OWNER:

TAG CENTRAL LLC
275 REGATTA DRIVE
JUPITER, FL 33477

PROJECT:

40B MULTIFAMILY
444 EAST CENTRAL STREET
FRANKLIN, MA

PROJECT NO.	3317-01	DATE:	02-11-2025
SCALE:	1" = 50'	DWG. NAME:	C-3317-01
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
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environmental consulting ◆ landscape architecture
www.allenmajor.com
100 COMMERCE WAY, SUITE 5
WOBURN MA 01801
TEL: (781) 935-6889
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WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

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DRAWING TITLE:

EXISTING WATERSHED PLAN

SHEET No.

EWS

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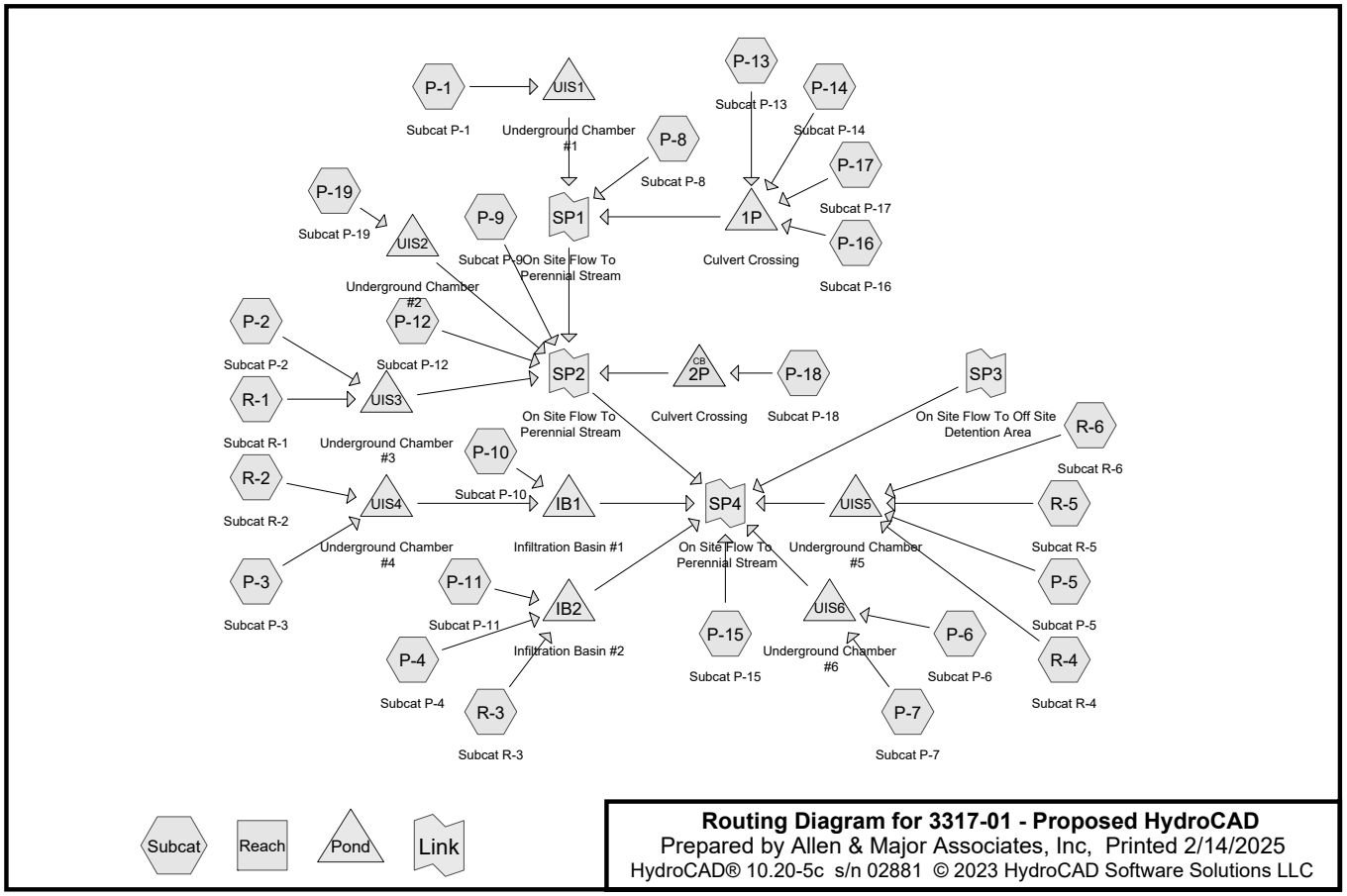
SECTION 5.0 -
PROPOSED DRAINAGE ANALYSIS



Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
298,495	61	1/4 acre lots, 38% imp, HSG A (P-16, P-17, P-18)
5,499	87	1/4 acre lots, 38% imp, HSG D (P-16, P-18)
106,122	39	>75% Grass cover, Good, HSG A (P-10, P-12, P-13, P-14, P-15, P-19, P-2, P-3, P-4, P-5, P-6, P-7, P-8, P-9)
34,789	61	>75% Grass cover, Good, HSG B (P-11, P-15, P-4)
54,935	80	>75% Grass cover, Good, HSG D (P-10, P-12, P-13, P-15, P-19, P-2, P-6, P-8, P-9)
584	96	Gravel surface, HSG A (P-19)
1,760	96	Gravel surface, HSG B (P-11)
3,806	96	Gravel surface, HSG D (P-19)
127,782	98	Paved parking, HSG A (P-1, P-10, P-19, P-2, P-3, P-4, P-5, P-6, P-7)
23,111	98	Paved parking, HSG B (P-11, P-4)
20,141	98	Paved parking, HSG D (P-1, P-10, P-2, P-3, P-6)
71,494	98	Unconnected roofs, HSG A (R-1, R-2, R-3, R-4, R-5, R-6)
11,605	98	Unconnected roofs, HSG B (R-3)
4,311	98	Unconnected roofs, HSG D (R-1, R-4)
496	98	Water Surface, HSG A (P-8, P-9)
3,545	98	Water Surface, HSG B (P-11)
34,778	98	Water Surface, HSG D (P-10, P-15, P-9)
15,028	30	Woods, Good, HSG A (P-15)
9,714	55	Woods, Good, HSG B (P-15)
111,122	77	Woods, Good, HSG D (P-15)
939,118	**73**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
620,001	HSG A	P-1, P-10, P-12, P-13, P-14, P-15, P-16, P-17, P-18, P-19, P-2, P-3, P-4, P-5, P-6, P-7, P-8, P-9, R-1, R-2, R-3, R-4, R-5, R-6
84,524	HSG B	P-11, P-15, P-4, R-3
0	HSG C	
234,593	HSG D	P-1, P-10, P-12, P-13, P-15, P-16, P-18, P-19, P-2, P-3, P-6, P-8, P-9, R-1, R-4
0	Other	
939,118		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
298,495	0	0	5,499	0	303,995	1/4 acre lots, 38% imp	P-16, P-17, P-18
106,122	34,789	0	54,935	0	195,845	>75% Grass cover, Good	P-10, P-11, P-12, P-13, P-14, P-15, P-19, P-2, P-3, P-4, P-5, P-6, P-7, P-8, P-9
584	1,760	0	3,806	0	6,150	Gravel surface	P-11, P-19
127,782	23,111	0	20,141	0	171,034	Paved parking	P-1, P-10, P-11, P-19, P-2, P-3, P-4, P-5, P-6, P-7
71,494	11,605	0	4,311	0	87,410	Unconnected roofs	R-1, R-2, R-3, R-4, R-5, R-6
496	3,545	0	34,778	0	38,819	Water Surface	P-10, P-11, P-15, P-8, P-9
15,028	9,714	0	111,122	0	135,864	Woods, Good	P-15
620,001	**84,524**	**0**	**234,593**	**0**	**939,118**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Width (inches)	Diam/Height (inches)	Inside-Fill (inches)	Node Name
1	1P	273.00	272.00	100.0	0.0100	0.013	0.0	10.0	0.0	Culvert Crossing
2	2P	273.00	272.00	100.0	0.0100	0.013	0.0	12.0	0.0	Culvert Crossing
3	IB1	272.00	271.00	100.0	0.0100	0.013	0.0	15.0	0.0	Infiltration Basin #1
4	IB2	273.00	272.00	100.0	0.0100	0.013	0.0	15.0	0.0	Infiltration Basin #2
5	UIS1	269.66	269.50	16.0	0.0100	0.013	0.0	12.0	0.0	Underground Chamber #1
6	UIS2	271.20	271.00	20.0	0.0100	0.013	0.0	12.0	0.0	Underground Chamber #2
7	UIS3	270.18	269.50	68.0	0.0100	0.013	0.0	12.0	0.0	Underground Chamber #3
8	UIS4	273.43	273.00	42.5	0.0101	0.013	0.0	18.0	0.0	Underground Chamber #4
9	UIS5	272.94	272.00	94.0	0.0100	0.013	0.0	24.0	0.0	Underground Chamber #5
10	UIS6	272.93	272.00	93.0	0.0100	0.025	0.0	24.0	0.0	Underground Chamber #6

Time span=0.00-30.00 hrs, dt=0.05 hrs, 601 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-Q
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment P-1: Subcat P-1 Runoff Area=2,664 sf 100.00% Impervious Runoff Depth=7.92"
Tc=6.0 min CN=WQ Runoff=0.48 cfs 1,758 cf

Subcatchment P-10: Subcat P-10 Runoff Area=6,641 sf 40.06% Impervious Runoff Depth=5.88"
Tc=6.0 min CN=WQ Runoff=0.93 cfs 3,252 cf

Subcatchment P-11: Subcat P-11 Runoff Area=12,840 sf 36.91% Impervious Runoff Depth=5.74"
Tc=6.0 min CN=WQ Runoff=1.75 cfs 6,139 cf

Subcatchment P-12: Subcat P-12 Runoff Area=11,413 sf 0.00% Impervious Runoff Depth=2.89"
Tc=10.0 min CN=WQ Runoff=0.68 cfs 2,746 cf

Subcatchment P-13: Subcat P-13 Runoff Area=11,129 sf 0.00% Impervious Runoff Depth=1.71"
Tc=6.0 min CN=WQ Runoff=0.39 cfs 1,583 cf

Subcatchment P-14: Subcat P-14 Runoff Area=3,151 sf 0.00% Impervious Runoff Depth=1.22"
Tc=6.0 min CN=39 Runoff=0.07 cfs 322 cf

Subcatchment P-15: Subcat P-15 Runoff Area=250,276 sf 12.14% Impervious Runoff Depth=4.76"
Flow Length=293' Tc=10.6 min CN=WQ Runoff=25.86 cfs 99,310 cf

Subcatchment P-16: Subcat P-16 Runoff Area=112,063 sf 38.00% Impervious Runoff Depth=3.60"
Tc=12.0 min CN=WQ Runoff=8.74 cfs 33,645 cf

Subcatchment P-17: Subcat P-17 Runoff Area=104,021 sf 38.00% Impervious Runoff Depth=3.57"
Tc=12.0 min CN=61 Runoff=8.04 cfs 30,921 cf

Subcatchment P-18: Subcat P-18 Runoff Area=87,911 sf 38.00% Impervious Runoff Depth=3.71"
Tc=10.0 min CN=WQ Runoff=7.47 cfs 27,191 cf

Subcatchment P-19: Subcat P-19 Runoff Area=8,567 sf 23.70% Impervious Runoff Depth=6.45"
Tc=6.0 min CN=WQ Runoff=1.27 cfs 4,603 cf

Subcatchment P-2: Subcat P-2 Runoff Area=18,645 sf 83.88% Impervious Runoff Depth=6.97"
Tc=6.0 min CN=WQ Runoff=2.94 cfs 10,826 cf

Subcatchment P-3: Subcat P-3 Runoff Area=43,434 sf 89.12% Impervious Runoff Depth=7.19"
Tc=6.0 min CN=WQ Runoff=7.05 cfs 26,031 cf

Subcatchment P-4: Subcat P-4 Runoff Area=42,495 sf 88.32% Impervious Runoff Depth=7.29"
Tc=6.0 min CN=WQ Runoff=7.05 cfs 25,832 cf

Subcatchment P-5: Subcat P-5 Runoff Area=47,652 sf 83.89% Impervious Runoff Depth=6.84"
Tc=6.0 min CN=WQ Runoff=7.33 cfs 27,167 cf

Subcatchment P-6: Subcat P-6 Runoff Area=14,388 sf 92.76% Impervious Runoff Depth=7.50"
Tc=6.0 min CN=WQ Runoff=2.44 cfs 8,989 cf

Subcatchment P-7: Subcat P-7 Runoff Area=40,222 sf 47.91% Impervious Runoff Depth=4.43"
Tc=6.0 min CN=WQ Runoff=3.89 cfs 14,857 cf

Subcatchment P-8: Subcat P-8 Runoff Area=18,446 sf 2.34% Impervious Runoff Depth=1.47"
Tc=6.0 min CN=WQ Runoff=0.51 cfs 2,252 cf

Subcatchment P-9: Subcat P-9 Runoff Area=15,750 sf 15.73% Impervious Runoff Depth=5.71"
Tc=6.0 min CN=WQ Runoff=2.25 cfs 7,499 cf

Subcatchment R-1: Subcat R-1 Runoff Area=5,578 sf 100.00% Impervious Runoff Depth=7.92"
Tc=6.0 min CN=WQ Runoff=1.00 cfs 3,682 cf

Subcatchment R-2: Subcat R-2 Runoff Area=18,265 sf 100.00% Impervious Runoff Depth=7.92"
Tc=6.0 min CN=98 Runoff=3.28 cfs 12,055 cf

Subcatchment R-3: Subcat R-3 Runoff Area=18,265 sf 100.00% Impervious Runoff Depth=7.92"
Tc=0.0 min CN=WQ Runoff=3.84 cfs 12,055 cf

Subcatchment R-4: Subcat R-4 Runoff Area=18,265 sf 100.00% Impervious Runoff Depth=7.92"
Tc=6.0 min CN=WQ Runoff=3.28 cfs 12,055 cf

Subcatchment R-5: Subcat R-5 Runoff Area=15,145 sf 100.00% Impervious Runoff Depth=7.92"
Tc=6.0 min CN=98 Runoff=2.72 cfs 9,996 cf

Subcatchment R-6: Subcat R-6 Runoff Area=11,892 sf 100.00% Impervious Runoff Depth=7.92"
Tc=6.0 min CN=98 Runoff=2.14 cfs 7,849 cf

Pond 1P: Culvert Crossing Peak Elev=275.97' Storage=25,494 cf Inflow=17.17 cfs 66,471 cf
10.0" Round Culvert n=0.013 L=100.0' S=0.0100 '/' Outflow=3.19 cfs 65,987 cf

Pond 2P: Culvert Crossing Peak Elev=280.08' Inflow=7.47 cfs 27,191 cf
12.0" Round Culvert n=0.013 L=100.0' S=0.0100 '/' Outflow=7.47 cfs 27,191 cf

Pond IB1: Infiltration Basin #1 Peak Elev=274.70' Storage=5,209 cf Inflow=1.83 cfs 16,997 cf
Discarded=0.20 cfs 5,706 cf Primary=0.65 cfs 11,296 cf Outflow=0.86 cfs 17,002 cf

Pond IB2: Infiltration Basin #2 Peak Elev=274.89' Storage=8,692 cf Inflow=11.07 cfs 44,026 cf
Discarded=0.32 cfs 15,181 cf Primary=5.25 cfs 28,847 cf Outflow=5.57 cfs 44,028 cf

Pond UIS1: Underground Chamber #1 Peak Elev=272.46' Storage=453 cf Inflow=0.48 cfs 1,758 cf
Discarded=0.03 cfs 1,362 cf Primary=0.14 cfs 398 cf Outflow=0.17 cfs 1,760 cf

Pond UIS2: Underground Chamber #2 Peak Elev=273.49' Storage=658 cf Inflow=1.27 cfs 4,603 cf
Discarded=0.03 cfs 2,088 cf Primary=0.94 cfs 2,515 cf Outflow=0.97 cfs 4,604 cf

Pond UIS3: Underground Chamber #3 Peak Elev=274.82' Storage=3,689 cf Inflow=3.94 cfs 14,508 cf
Discarded=0.10 cfs 8,060 cf Primary=2.68 cfs 6,455 cf Outflow=2.77 cfs 14,514 cf

Pond UIS4: Underground Chamber #4 Peak Elev=276.64' Storage=14,382 cf Inflow=10.33 cfs 38,086 cf
Discarded=0.36 cfs 24,362 cf Primary=1.49 cfs 13,746 cf Outflow=1.86 cfs 38,108 cf

Pond UIS5: Underground Chamber #5 Peak Elev=276.21' Storage=20,618 cf Inflow=15.47 cfs 57,067 cf
Discarded=0.52 cfs 34,785 cf Primary=2.97 cfs 22,287 cf Outflow=3.49 cfs 57,072 cf

Pond UIS6: Underground Chamber #6 Peak Elev=274.75' Storage=10,360 cf Inflow=6.33 cfs 23,846 cf
Discarded=0.10 cfs 9,274 cf Primary=1.62 cfs 9,355 cf Outflow=1.71 cfs 18,629 cf

Link SP1: On Site Flow To Perennial Stream Inflow=3.43 cfs 68,638 cf
Primary=3.43 cfs 68,638 cf

Link SP2: On Site Flow To Perennial Stream Inflow=16.33 cfs 115,044 cf
Primary=16.33 cfs 115,044 cf

Link SP3: On Site Flow To Off Site Detention Area
Primary=0.00 cfs 0 cf

Link SP4: On Site Flow To Perennial Stream Inflow=50.47 cfs 286,140 cf
Primary=50.47 cfs 286,140 cf

Total Runoff Area = 939,118 sf Runoff Volume = 392,616 cf Average Runoff Depth = 5.02"
56.05% Pervious = 526,336 sf 43.95% Impervious = 412,782 sf

Summary for Subcatchment P-1: Subcat P-1

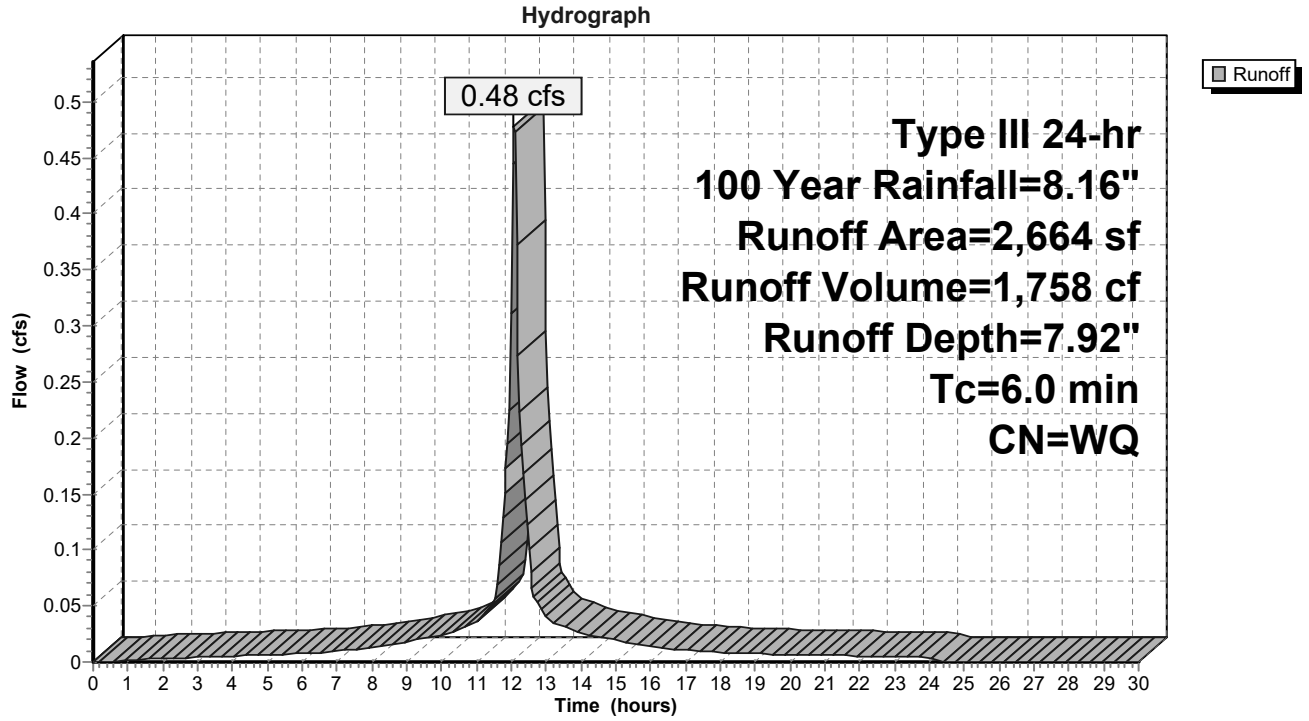
Runoff = 0.48 cfs @ 12.09 hrs, Volume= 1,758 cf, Depth= 7.92"
Routed to Pond UIS1 : Underground Chamber #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
1,757	98	Paved parking, HSG A
907	98	Paved parking, HSG D
2,664		Weighted Average
2,664	98	100.00% Impervious Area

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

Subcatchment P-1: Subcat P-1



Summary for Subcatchment P-10: Subcat P-10

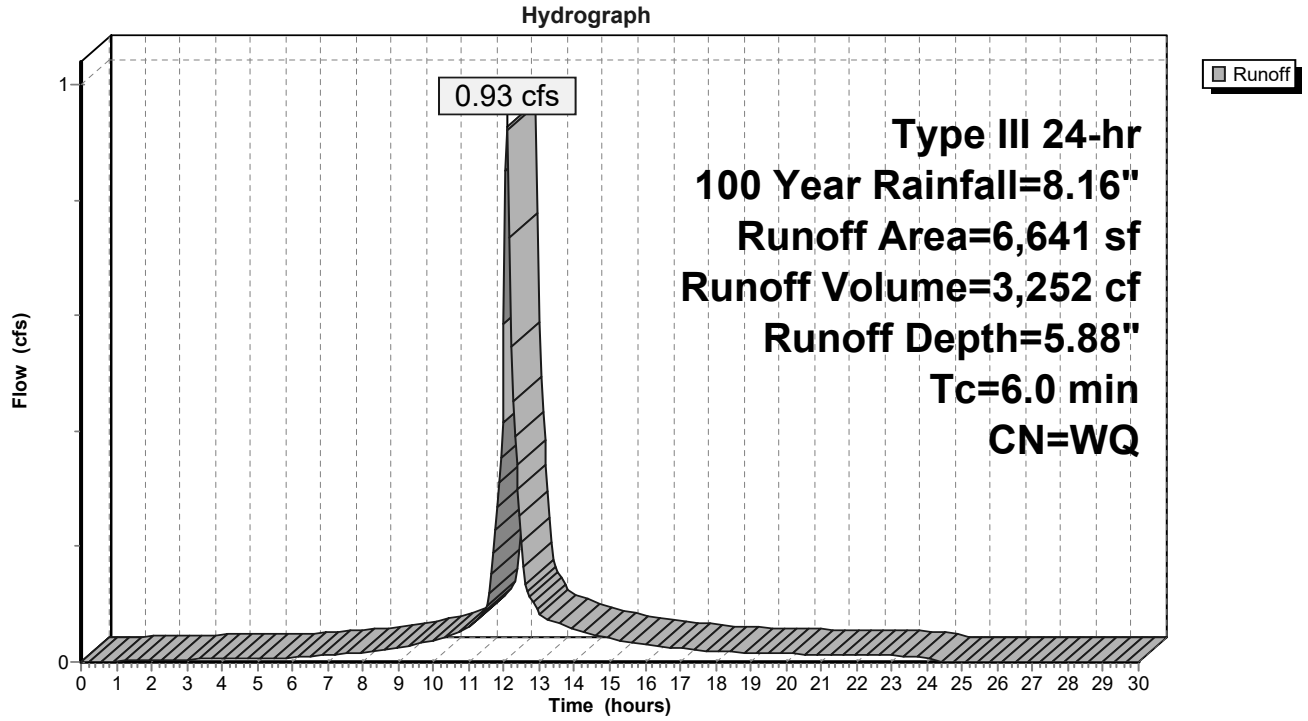
Runoff = 0.93 cfs @ 12.09 hrs, Volume= 3,252 cf, Depth= 5.88"
Routed to Pond IB1 : Infiltration Basin #1

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
1,108	39	>75% Grass cover, Good, HSG A
2,873	80	>75% Grass cover, Good, HSG D
62	98	Paved parking, HSG A
611	98	Paved parking, HSG D
1,987	98	Water Surface, HSG D
6,641		Weighted Average
3,980	69	59.94% Pervious Area
2,661	98	40.06% Impervious Area

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

Subcatchment P-10: Subcat P-10



Summary for Subcatchment P-11: Subcat P-11

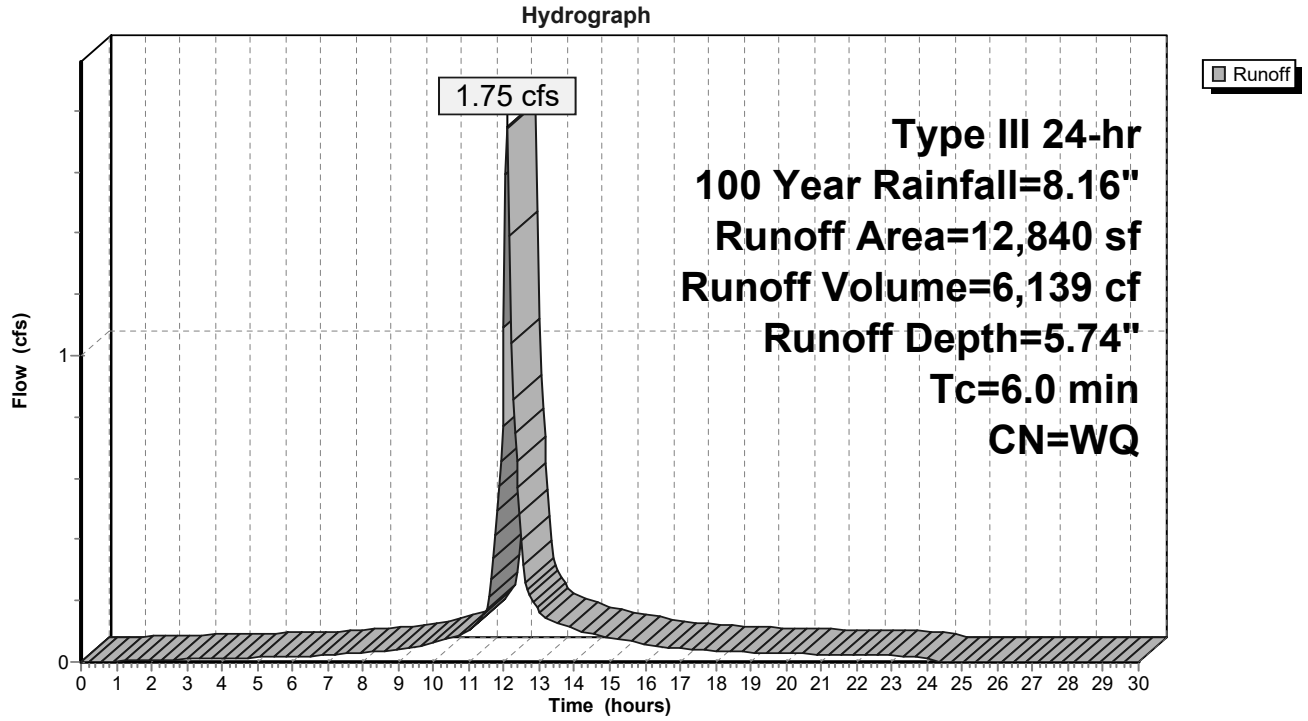
Runoff = 1.75 cfs @ 12.09 hrs, Volume= 6,139 cf, Depth= 5.74"
Routed to Pond IB2 : Infiltration Basin #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
6,341	61	>75% Grass cover, Good, HSG B
1,760	96	Gravel surface, HSG B
1,194	98	Paved parking, HSG B
3,545	98	Water Surface, HSG B
12,840		Weighted Average
8,101	69	63.09% Pervious Area
4,739	98	36.91% Impervious Area

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

Subcatchment P-11: Subcat P-11



Summary for Subcatchment P-12: Subcat P-12

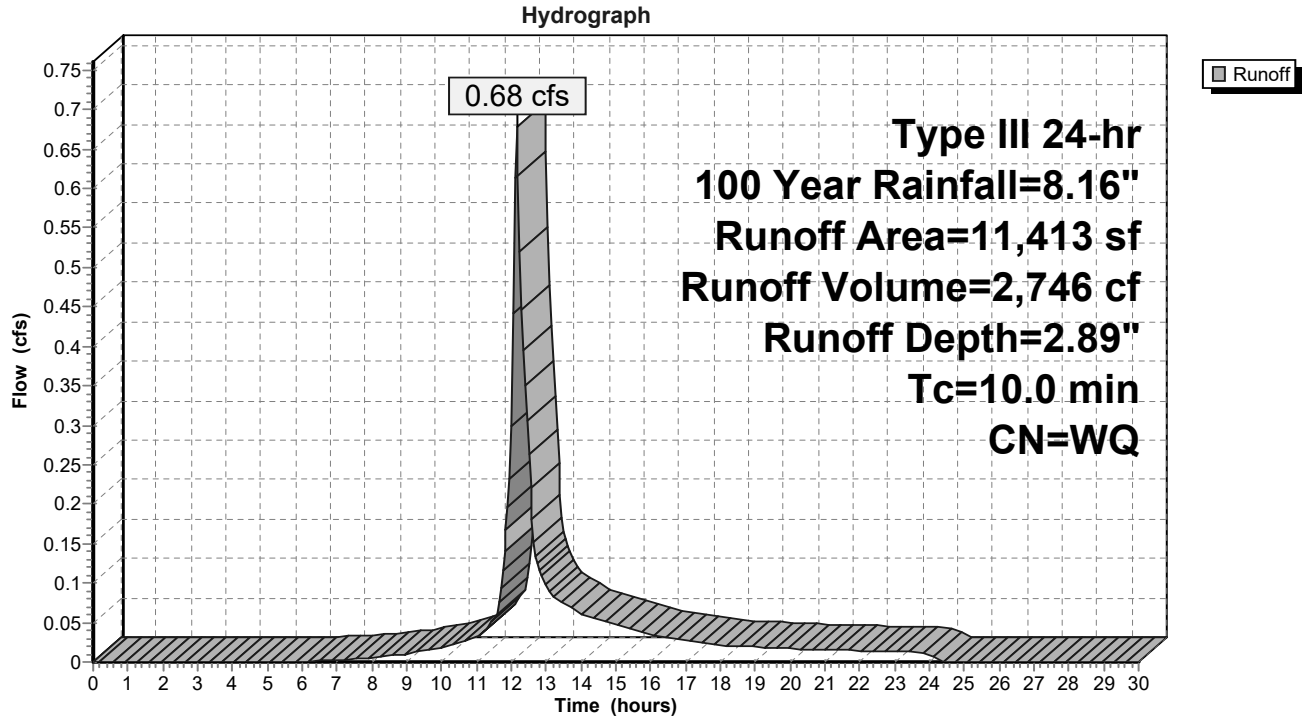
Runoff = 0.68 cfs @ 12.15 hrs, Volume= 2,746 cf, Depth= 2.89"
Routed to Link SP2 : On Site Flow To Perennial Stream

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
7,242	39	>75% Grass cover, Good, HSG A
4,171	80	>75% Grass cover, Good, HSG D
11,413		Weighted Average
11,413	54	100.00% Pervious Area

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

Subcatchment P-12: Subcat P-12



Summary for Subcatchment P-13: Subcat P-13

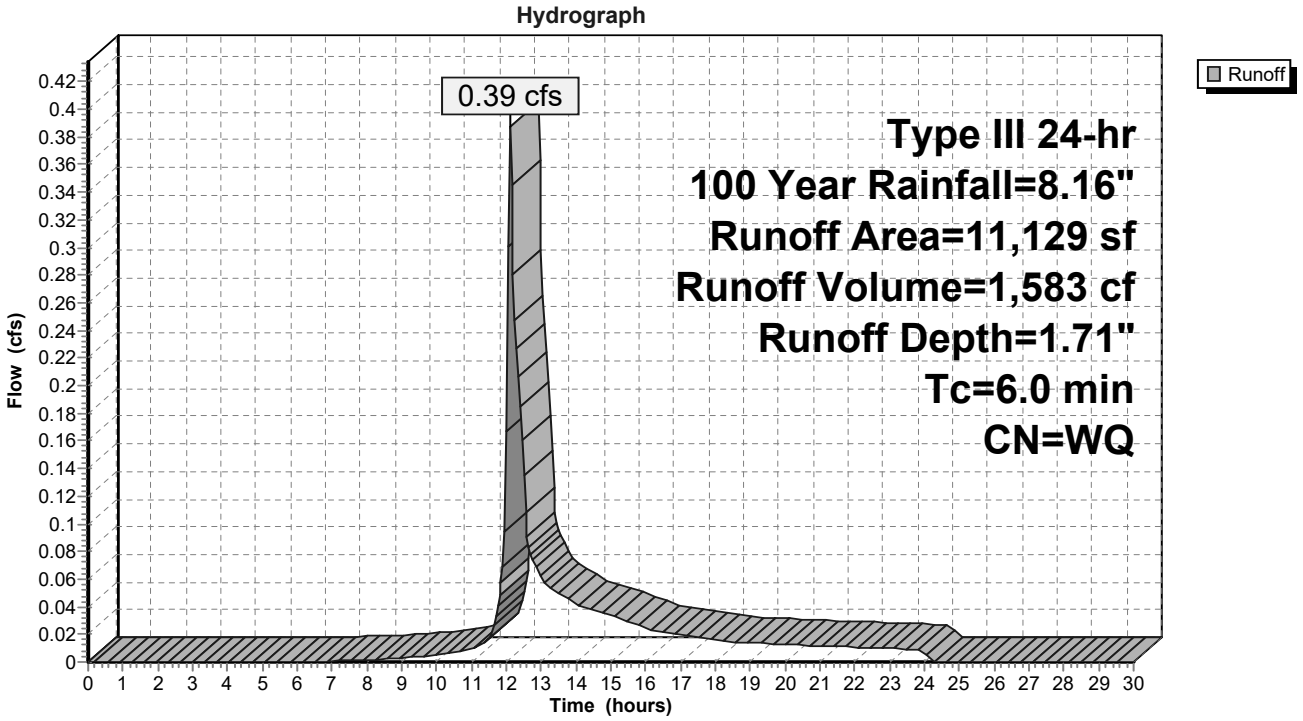
Runoff = 0.39 cfs @ 12.11 hrs, Volume= 1,583 cf, Depth= 1.71"
Routed to Pond 1P : Culvert Crossing

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
9,950	39	>75% Grass cover, Good, HSG A
1,179	80	>75% Grass cover, Good, HSG D
11,129		Weighted Average
11,129	43	100.00% Pervious Area

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

Subcatchment P-13: Subcat P-13



Summary for Subcatchment P-14: Subcat P-14

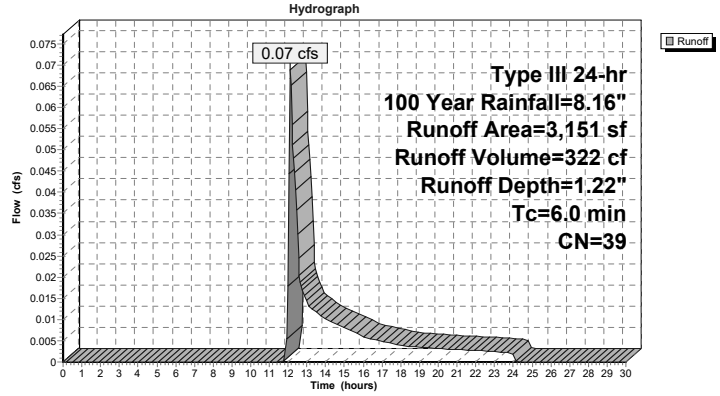
Runoff = 0.07 cfs @ 12.12 hrs, Volume= 322 cf, Depth= 1.22"
Routed to Pond 1P : Culvert Crossing

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
3,151	39	>75% Grass cover, Good, HSG A
3,151	39	100.00% Pervious Area

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

Subcatchment P-14: Subcat P-14



Summary for Subcatchment P-15: Subcat P-15

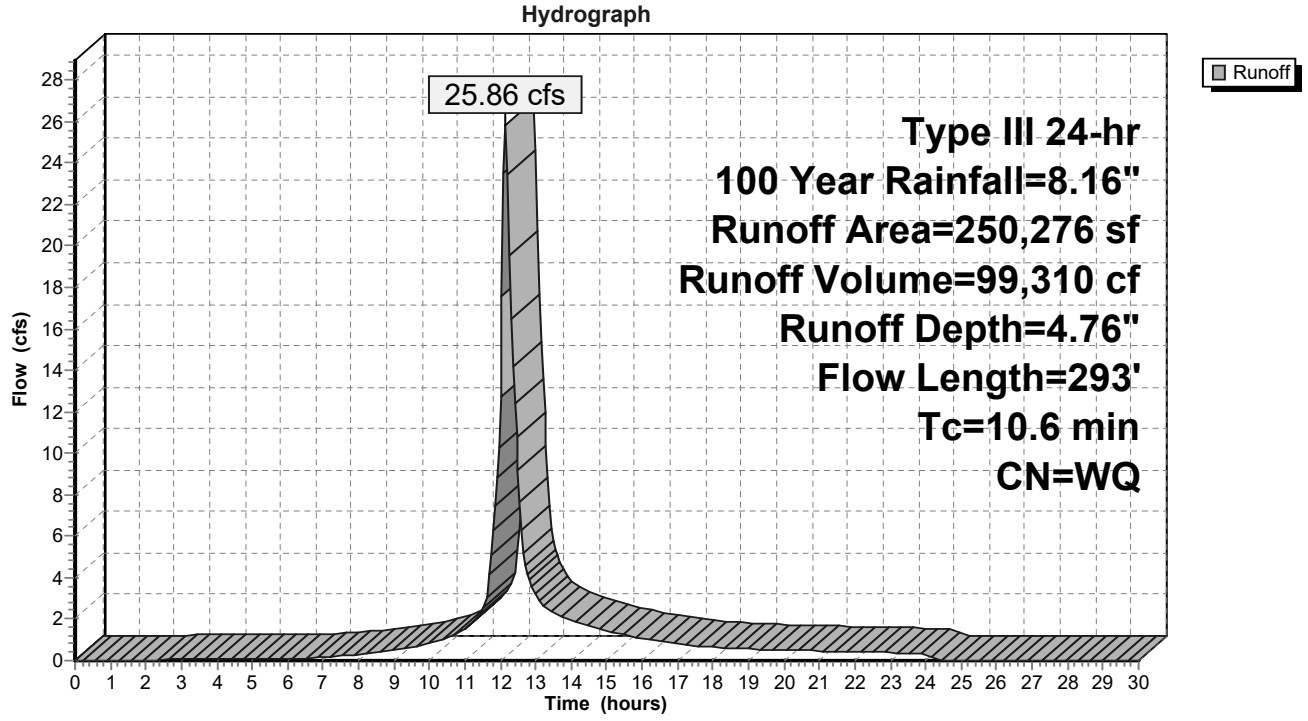
Runoff = 25.86 cfs @ 12.15 hrs, Volume= 99,310 cf, Depth= 4.76"
Routed to Link SP4 : On Site Flow To Perennial Stream

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
24,873	39	>75% Grass cover, Good, HSG A
21,606	61	>75% Grass cover, Good, HSG B
33,149	80	>75% Grass cover, Good, HSG D
30,379	98	Water Surface, HSG D
15,028	30	Woods, Good, HSG A
9,714	55	Woods, Good, HSG B
111,122	77	Woods, Good, HSG D
4,000	61	>75% Grass cover, Good, HSG B
405	39	>75% Grass cover, Good, HSG A
250,276		Weighted Average
219,897	67	87.86% Pervious Area
30,379	98	12.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.0	51	0.0300	0.12		**Sheet Flow, A-B** Grass: Dense n= 0.240 P2= 3.28"
3.6	242	0.0500	1.12		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
10.6	293	Total			

Subcatchment P-15: Subcat P-15



Summary for Subcatchment P-16: Subcat P-16

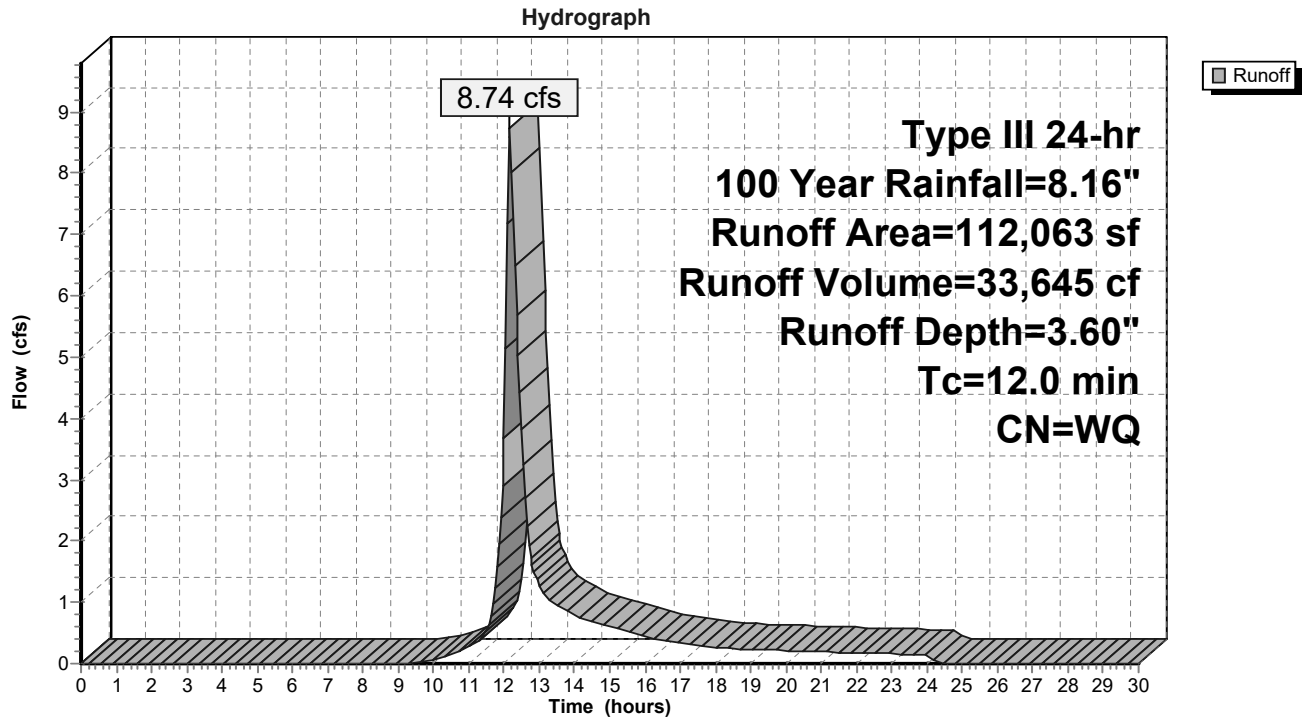
Runoff = 8.74 cfs @ 12.17 hrs, Volume= 33,645 cf, Depth= 3.60"
Routed to Pond 1P : Culvert Crossing

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
110,745	61	1/4 acre lots, 38% imp, HSG A
1,318	87	1/4 acre lots, 38% imp, HSG D
112,063		Weighted Average
69,479	39	62.00% Pervious Area
42,584	98	38.00% Impervious Area

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

Subcatchment P-16: Subcat P-16



Summary for Subcatchment P-17: Subcat P-17

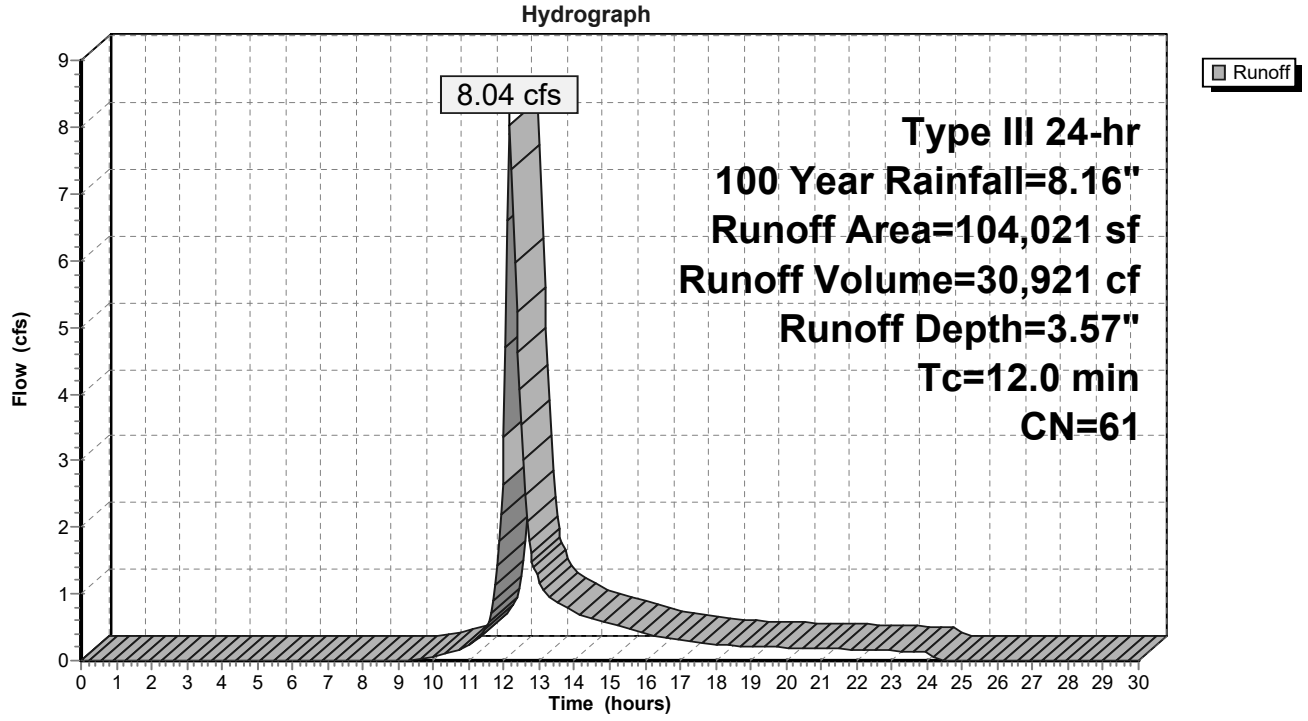
Runoff = 8.04 cfs @ 12.17 hrs, Volume= 30,921 cf, Depth= 3.57"
Routed to Pond 1P : Culvert Crossing

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
104,021	61	1/4 acre lots, 38% imp, HSG A
64,493	38	62.00% Pervious Area
39,528	98	38.00% Impervious Area

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

Subcatchment P-17: Subcat P-17



Summary for Subcatchment P-18: Subcat P-18

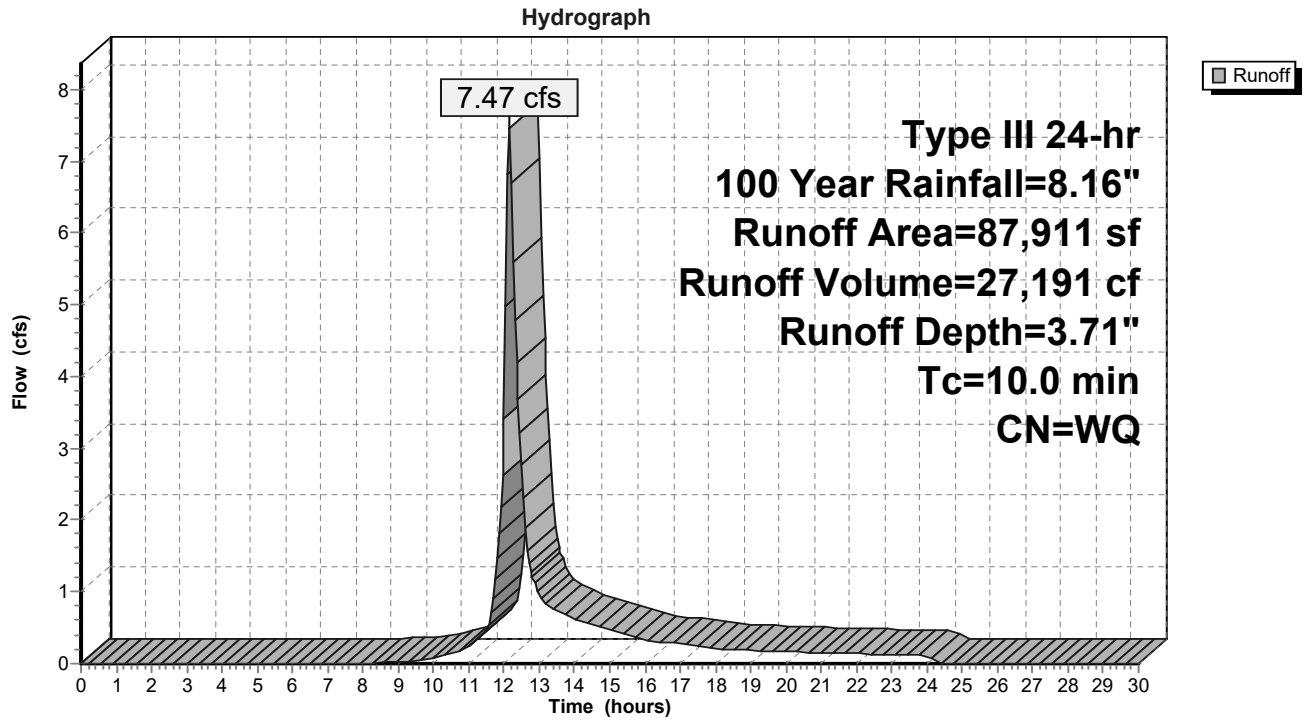
Runoff = 7.47 cfs @ 12.15 hrs, Volume= 27,191 cf, Depth= 3.71"
Routed to Pond 2P : Culvert Crossing

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
83,730	61	1/4 acre lots, 38% imp, HSG A
4,181	87	1/4 acre lots, 38% imp, HSG D
87,911		Weighted Average
54,505	40	62.00% Pervious Area
33,406	98	38.00% Impervious Area

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

Subcatchment P-18: Subcat P-18



Summary for Subcatchment P-19: Subcat P-19

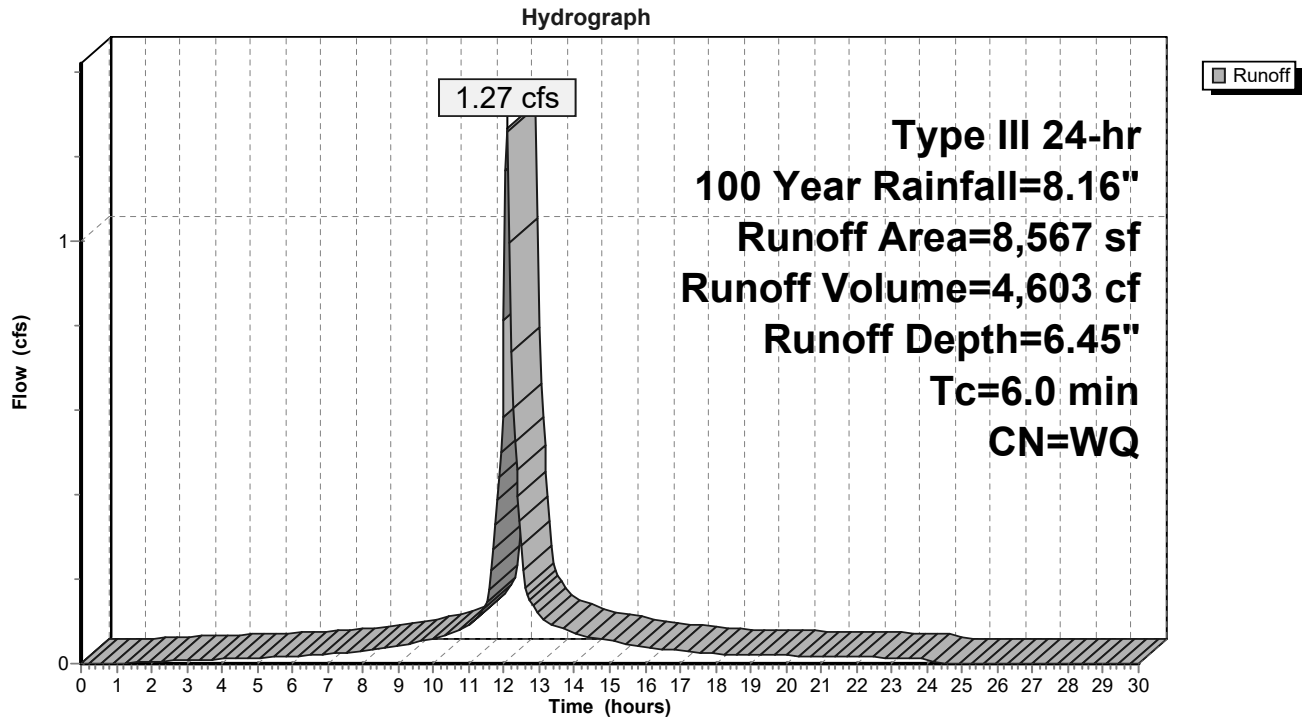
Runoff = 1.27 cfs @ 12.09 hrs, Volume= 4,603 cf, Depth= 6.45"
Routed to Pond UIS2 : Underground Chamber #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
584	96	Gravel surface, HSG A
3,806	96	Gravel surface, HSG D
2,030	98	Paved parking, HSG A
617	80	>75% Grass cover, Good, HSG D
1,530	39	>75% Grass cover, Good, HSG A
8,567		Weighted Average
6,537	81	76.30% Pervious Area
2,030	98	23.70% Impervious Area

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

Subcatchment P-19: Subcat P-19



Summary for Subcatchment P-2: Subcat P-2

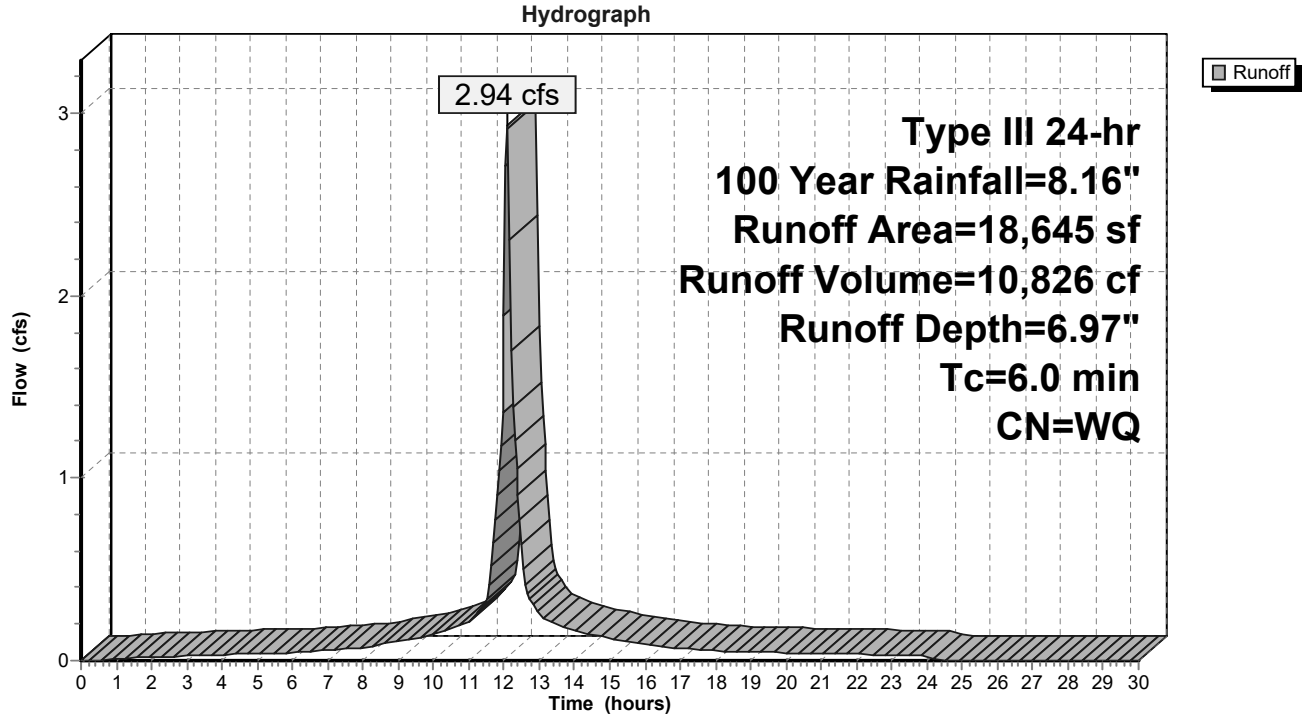
Runoff = 2.94 cfs @ 12.09 hrs, Volume= 10,826 cf, Depth= 6.97"
Routed to Pond UIS3 : Underground Chamber #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
2,485	39	>75% Grass cover, Good, HSG A
7,574	98	Paved parking, HSG A
8,066	98	Paved parking, HSG D
520	80	>75% Grass cover, Good, HSG D
18,645		Weighted Average
3,005	46	16.12% Pervious Area
15,640	98	83.88% Impervious Area

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

Subcatchment P-2: Subcat P-2



Summary for Subcatchment P-3: Subcat P-3

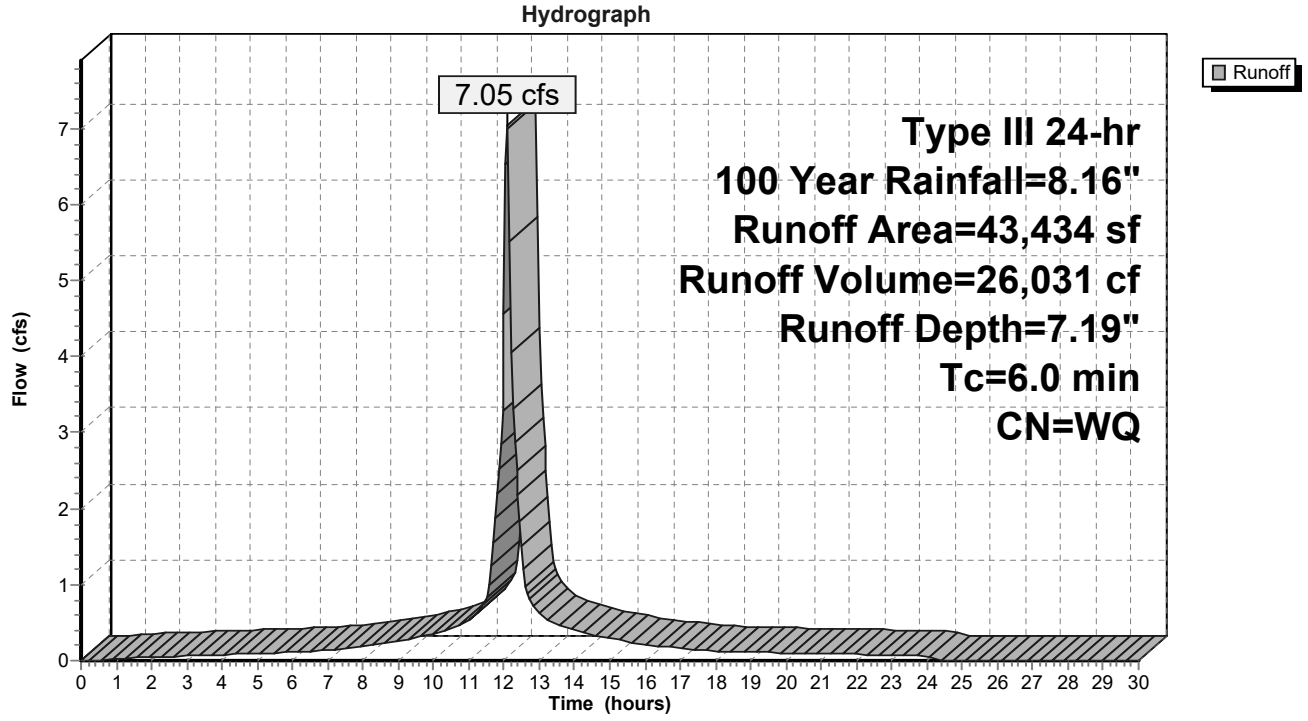
Runoff = 7.05 cfs @ 12.09 hrs, Volume= 26,031 cf, Depth= 7.19"
Routed to Pond UIS4 : Underground Chamber #4

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
4,724	39	>75% Grass cover, Good, HSG A
30,820	98	Paved parking, HSG A
7,890	98	Paved parking, HSG D
43,434		Weighted Average
4,724	39	10.88% Pervious Area
38,710	98	89.12% Impervious Area

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

Subcatchment P-3: Subcat P-3



Summary for Subcatchment P-4: Subcat P-4

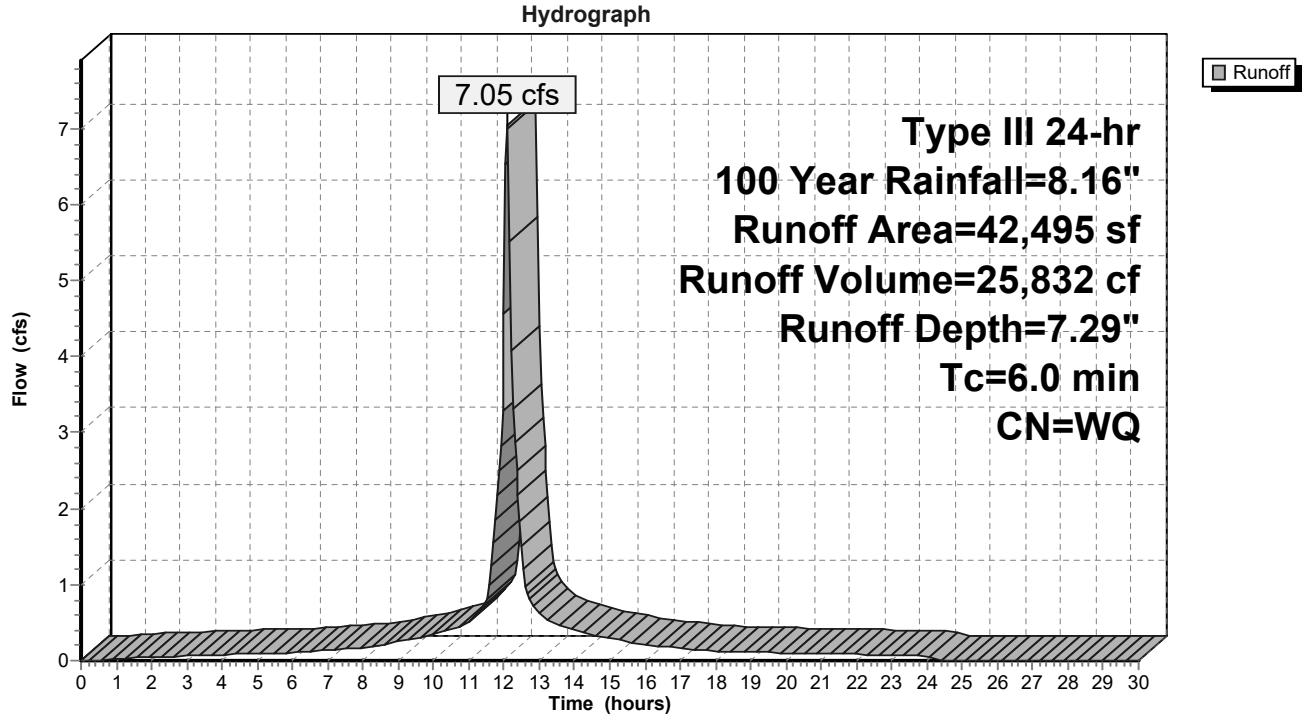
Runoff = 7.05 cfs @ 12.09 hrs, Volume= 25,832 cf, Depth= 7.29"
Routed to Pond IB2 : Infiltration Basin #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
2,123	39	>75% Grass cover, Good, HSG A
2,842	61	>75% Grass cover, Good, HSG B
15,613	98	Paved parking, HSG A
21,917	98	Paved parking, HSG B
42,495		Weighted Average
4,965	52	11.68% Pervious Area
37,530	98	88.32% Impervious Area

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

Subcatchment P-4: Subcat P-4



Summary for Subcatchment P-5: Subcat P-5

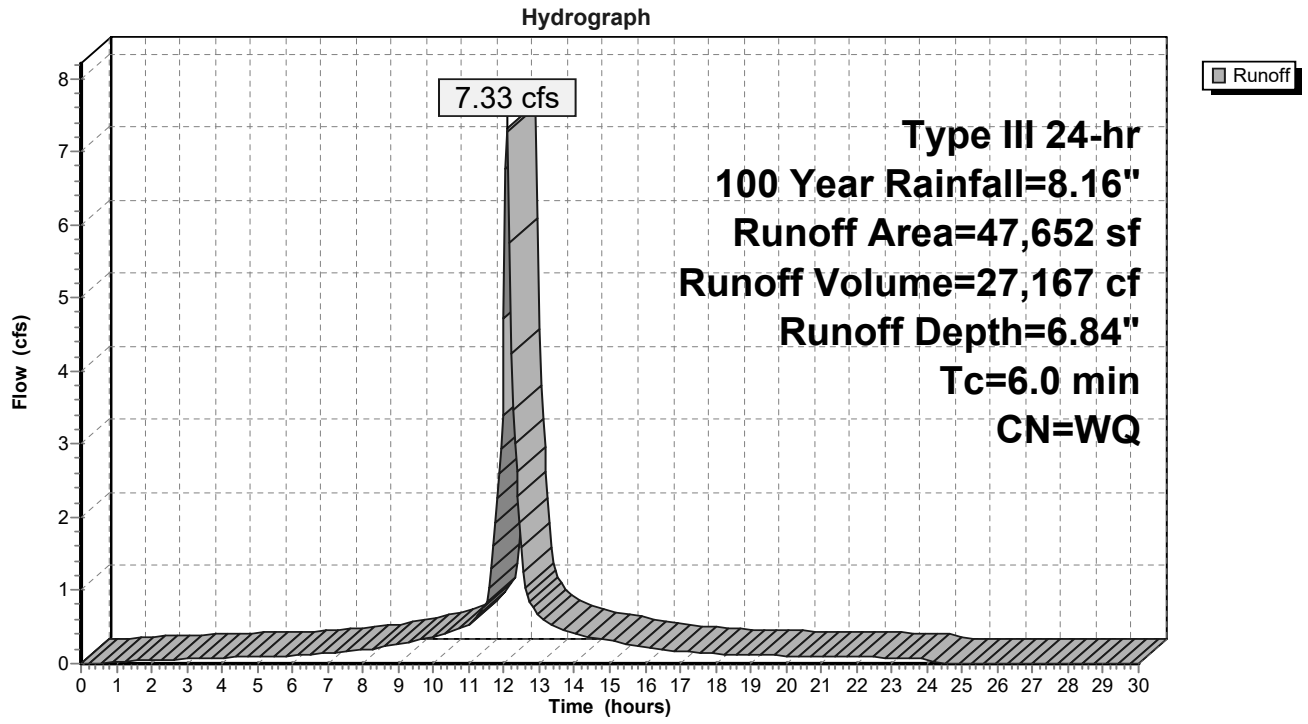
Runoff = 7.33 cfs @ 12.09 hrs, Volume= 27,167 cf, Depth= 6.84"
Routed to Pond UIS5 : Underground Chamber #5

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
7,677	39	>75% Grass cover, Good, HSG A
39,975	98	Paved parking, HSG A
47,652		Weighted Average
7,677	39	16.11% Pervious Area
39,975	98	83.89% Impervious Area

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

Subcatchment P-5: Subcat P-5



Summary for Subcatchment P-6: Subcat P-6

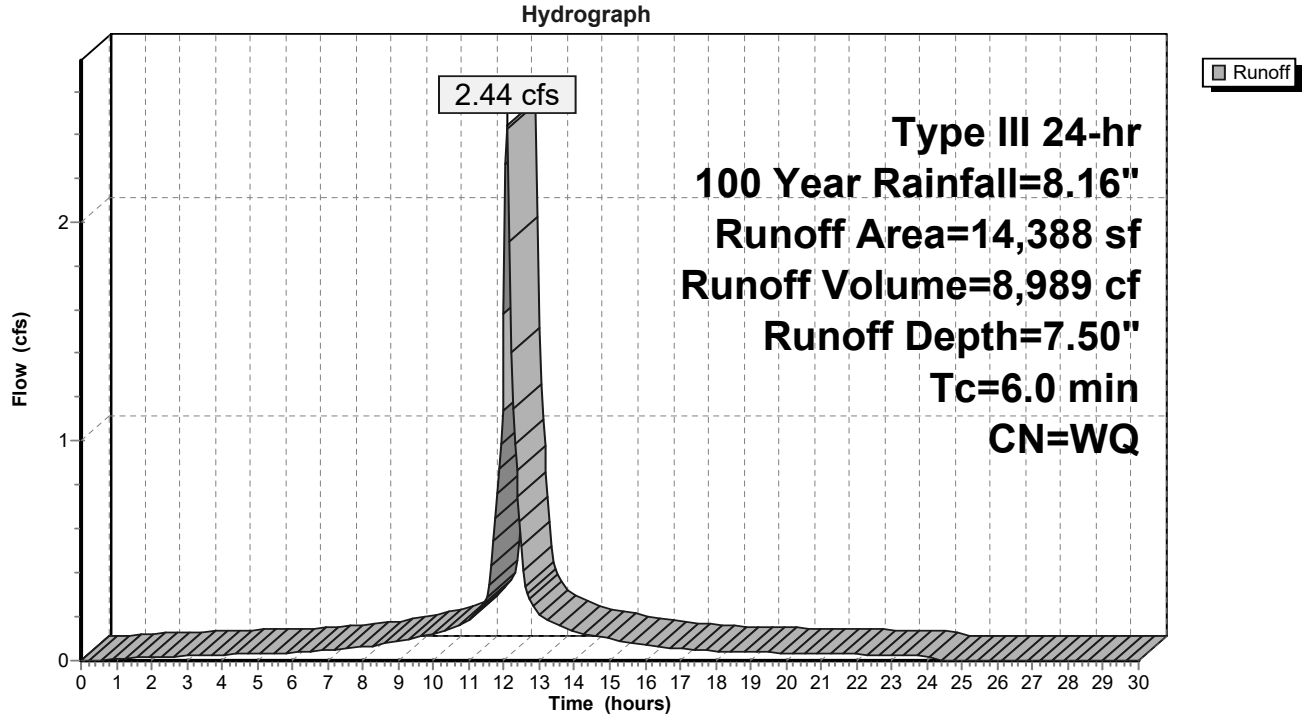
Runoff = 2.44 cfs @ 12.09 hrs, Volume= 8,989 cf, Depth= 7.50"
Routed to Pond UIS6 : Underground Chamber #6

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
848	39	>75% Grass cover, Good, HSG A
193	80	>75% Grass cover, Good, HSG D
10,680	98	Paved parking, HSG A
2,667	98	Paved parking, HSG D
14,388		Weighted Average
1,041	47	7.24% Pervious Area
13,347	98	92.76% Impervious Area

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

Subcatchment P-6: Subcat P-6



Summary for Subcatchment P-7: Subcat P-7

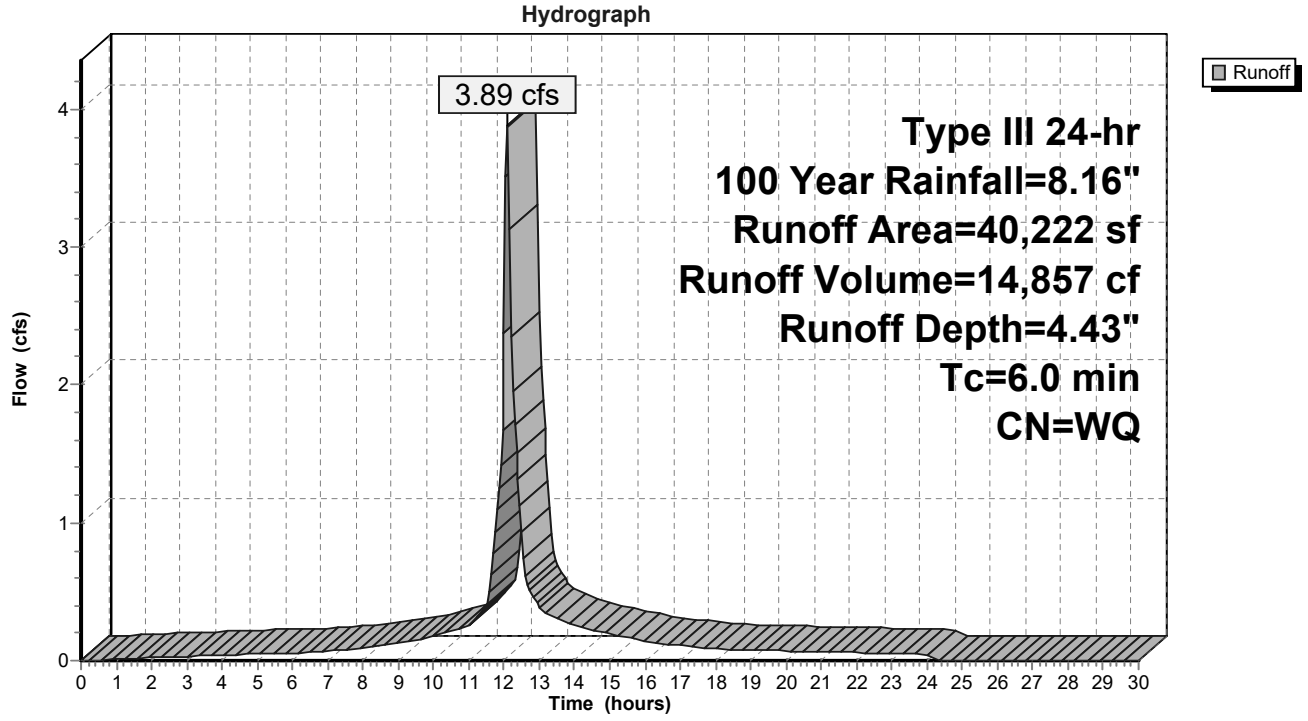
Runoff = 3.89 cfs @ 12.09 hrs, Volume= 14,857 cf, Depth= 4.43"
Routed to Pond UIS6 : Underground Chamber #6

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
20,951	39	>75% Grass cover, Good, HSG A
19,271	98	Paved parking, HSG A
40,222		Weighted Average
20,951	39	52.09% Pervious Area
19,271	98	47.91% Impervious Area

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

Subcatchment P-7: Subcat P-7



Summary for Subcatchment P-8: Subcat P-8

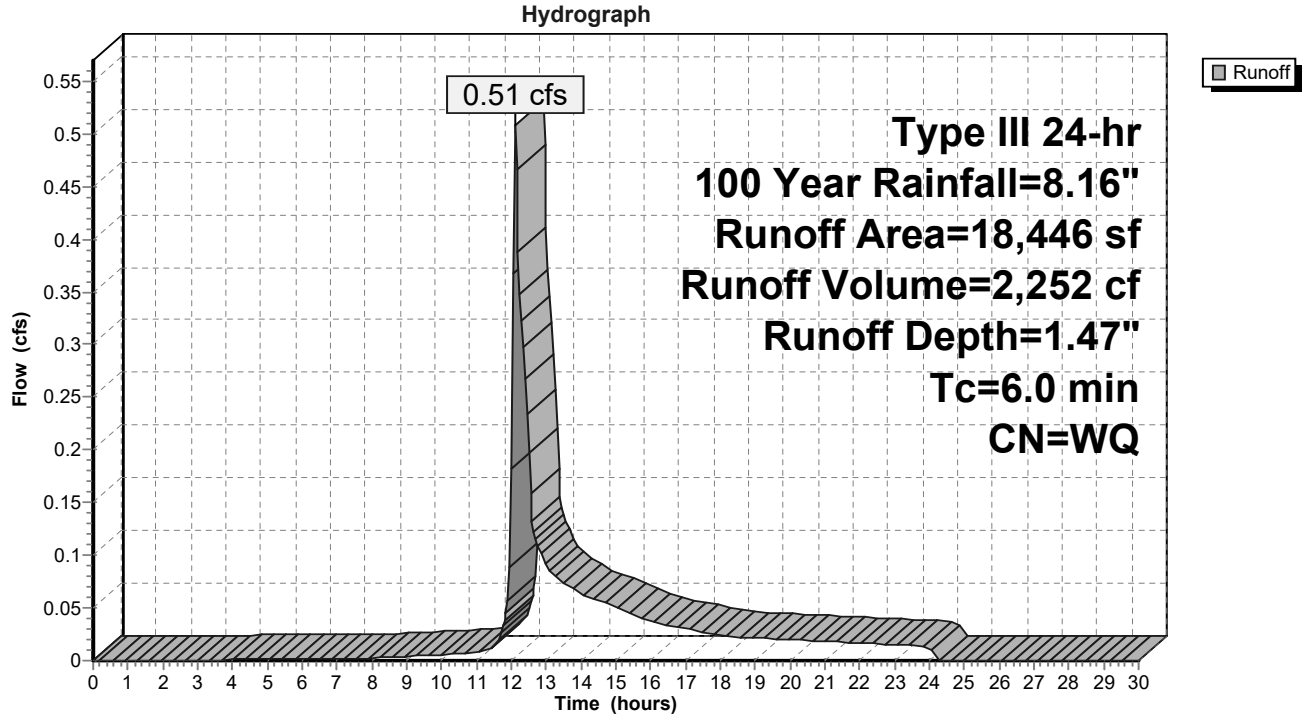
Runoff = 0.51 cfs @ 12.11 hrs, Volume= 2,252 cf, Depth= 1.47"
Routed to Link SP1 : On Site Flow To Perennial Stream

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
17,674	39	>75% Grass cover, Good, HSG A
341	80	>75% Grass cover, Good, HSG D
431	98	Water Surface, HSG A
18,446		Weighted Average
18,015	40	97.66% Pervious Area
431	98	2.34% Impervious Area

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

Subcatchment P-8: Subcat P-8



Summary for Subcatchment P-9: Subcat P-9

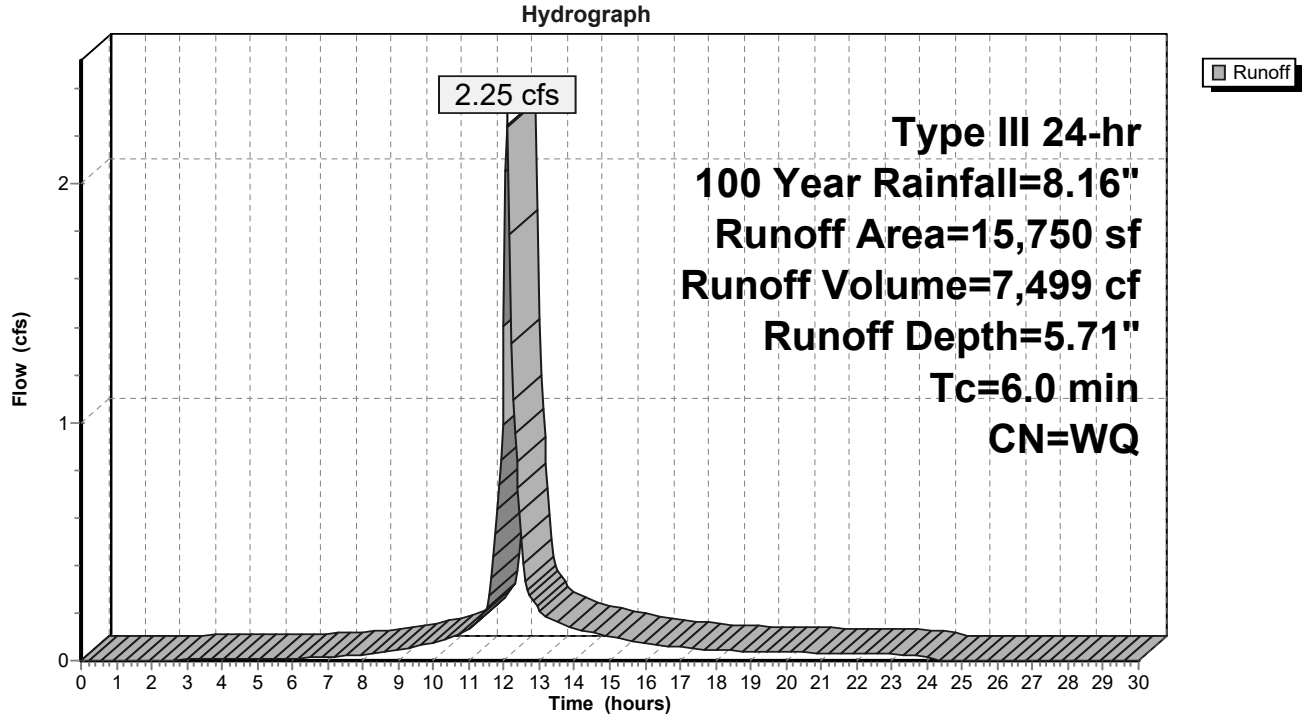
Runoff = 2.25 cfs @ 12.09 hrs, Volume= 7,499 cf, Depth= 5.71"
Routed to Link SP2 : On Site Flow To Perennial Stream

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
1,381	39	>75% Grass cover, Good, HSG A
11,892	80	>75% Grass cover, Good, HSG D
65	98	Water Surface, HSG A
2,412	98	Water Surface, HSG D
15,750		Weighted Average
13,273	76	84.27% Pervious Area
2,477	98	15.73% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Min. TC6**

Subcatchment P-9: Subcat P-9



Summary for Subcatchment R-1: Subcat R-1

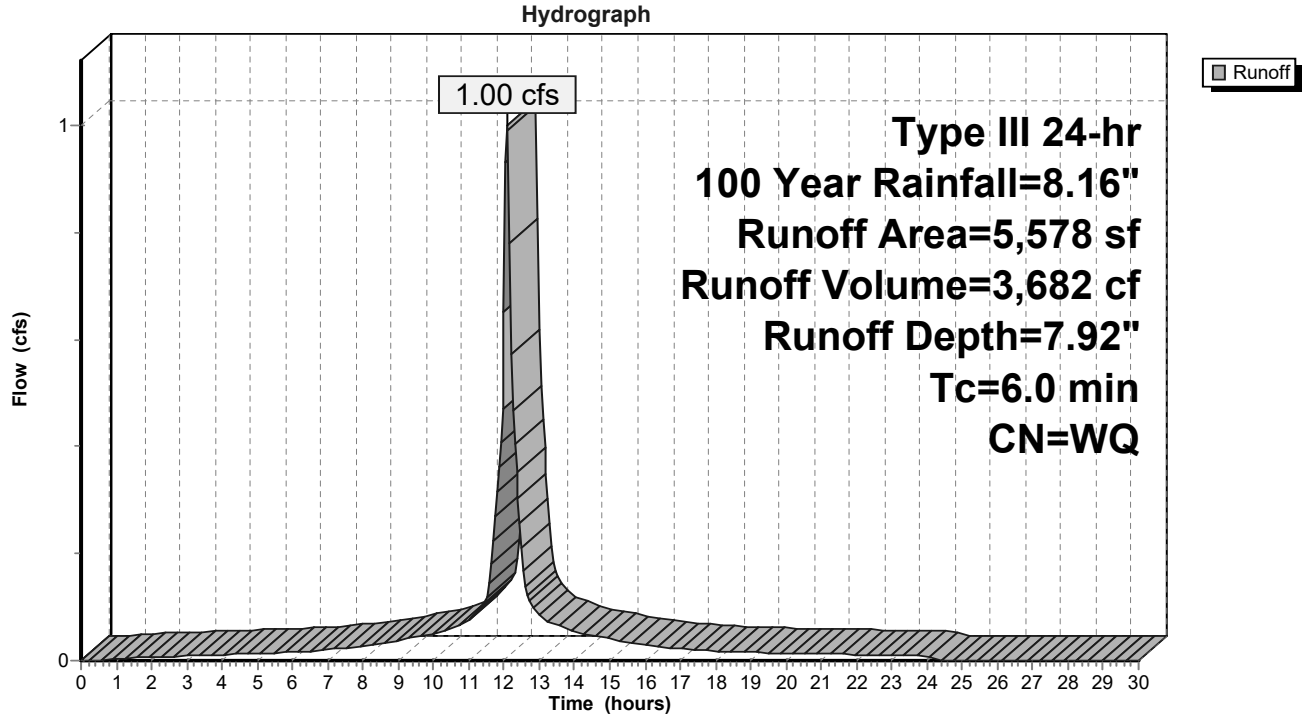
Runoff = 1.00 cfs @ 12.09 hrs, Volume= 3,682 cf, Depth= 7.92"
Routed to Pond UIS3 : Underground Chamber #3

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
2,080	98	Unconnected roofs, HSG A
3,498	98	Unconnected roofs, HSG D
5,578		Weighted Average
5,578	98	100.00% Impervious Area
5,578		100.00% Unconnected

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

Subcatchment R-1: Subcat R-1



Summary for Subcatchment R-2: Subcat R-2

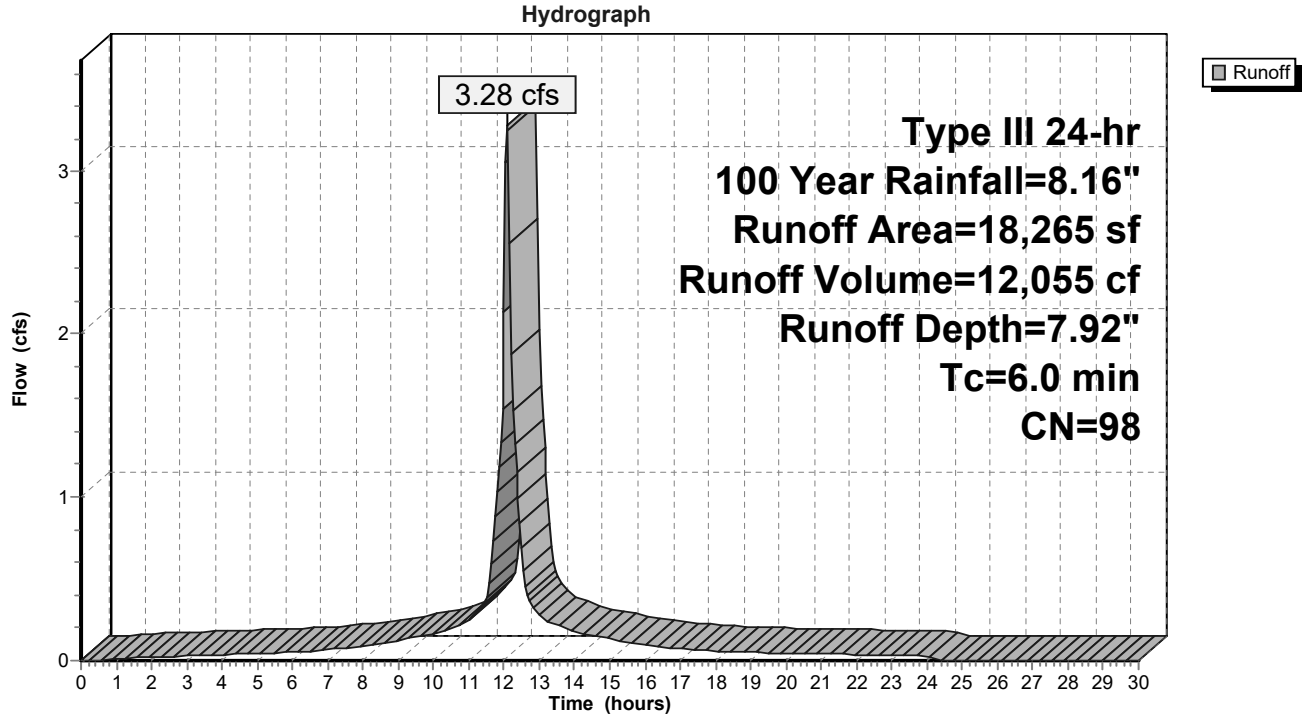
Runoff = 3.28 cfs @ 12.09 hrs, Volume= 12,055 cf, Depth= 7.92"
Routed to Pond UIS4 : Underground Chamber #4

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
18,265	98	Unconnected roofs, HSG A
18,265	98	100.00% Impervious Area
18,265		100.00% Unconnected

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

Subcatchment R-2: Subcat R-2



Summary for Subcatchment R-3: Subcat R-3

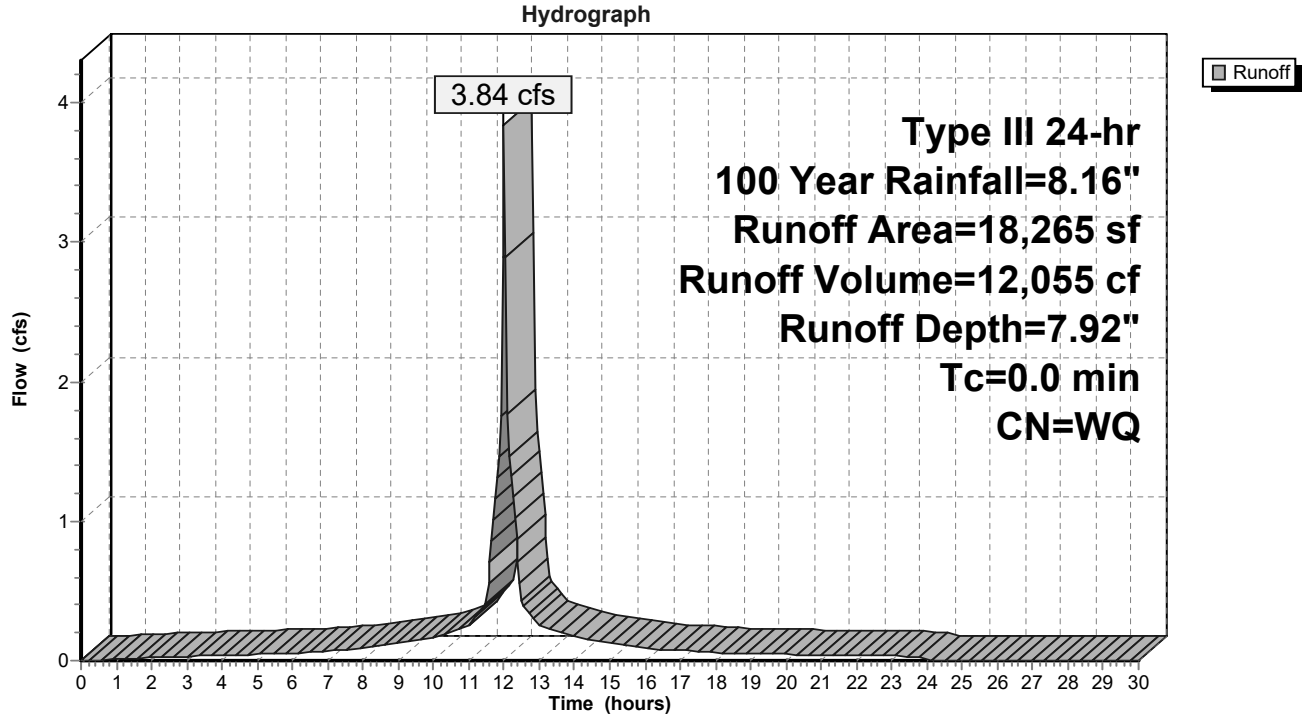
[46] Hint: Tc=0 (Instant runoff peak depends on dt)

Runoff = 3.84 cfs @ 12.00 hrs, Volume= 12,055 cf, Depth= 7.92"
Routed to Pond IB2 : Infiltration Basin #2

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
6,660	98	Unconnected roofs, HSG A
11,605	98	Unconnected roofs, HSG B
18,265		Weighted Average
18,265	98	100.00% Impervious Area
18,265		100.00% Unconnected

Subcatchment R-3: Subcat R-3



Summary for Subcatchment R-4: Subcat R-4

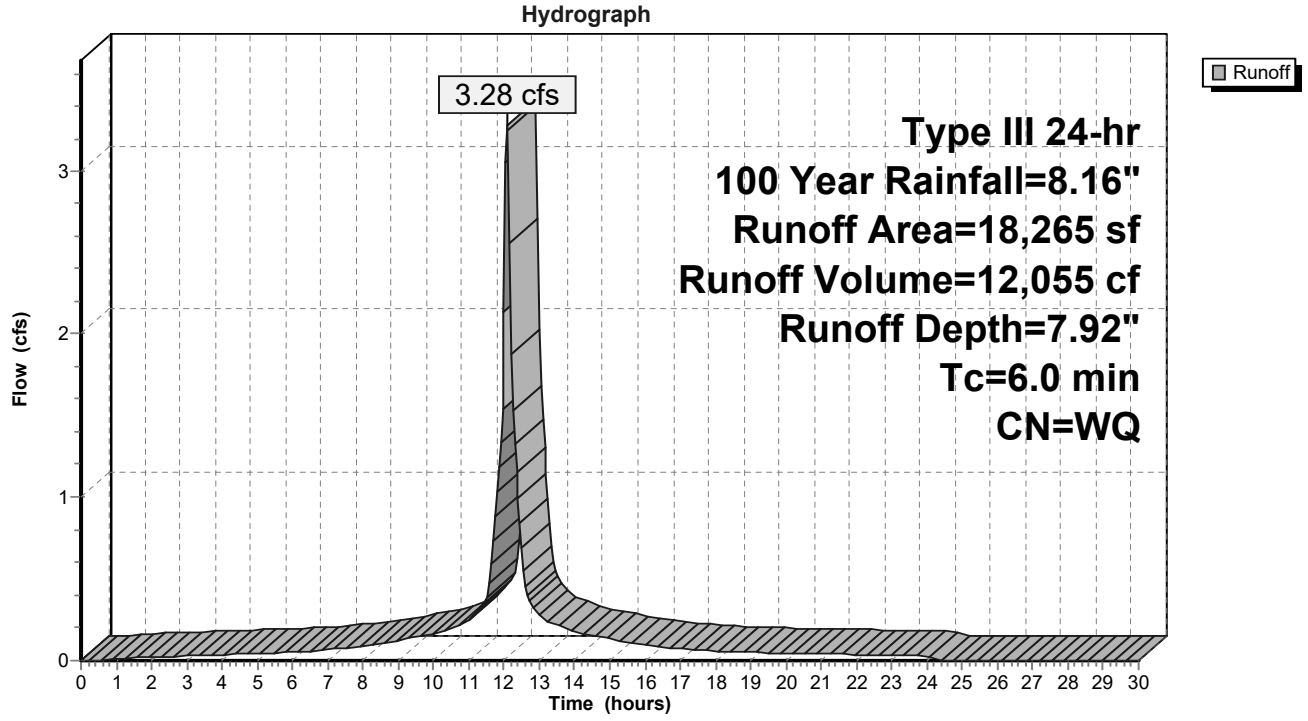
Runoff = 3.28 cfs @ 12.09 hrs, Volume= 12,055 cf, Depth= 7.92"
Routed to Pond UIS5 : Underground Chamber #5

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
17,452	98	Unconnected roofs, HSG A
813	98	Unconnected roofs, HSG D
18,265		Weighted Average
18,265	98	100.00% Impervious Area
18,265		100.00% Unconnected

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

Subcatchment R-4: Subcat R-4



Summary for Subcatchment R-5: Subcat R-5

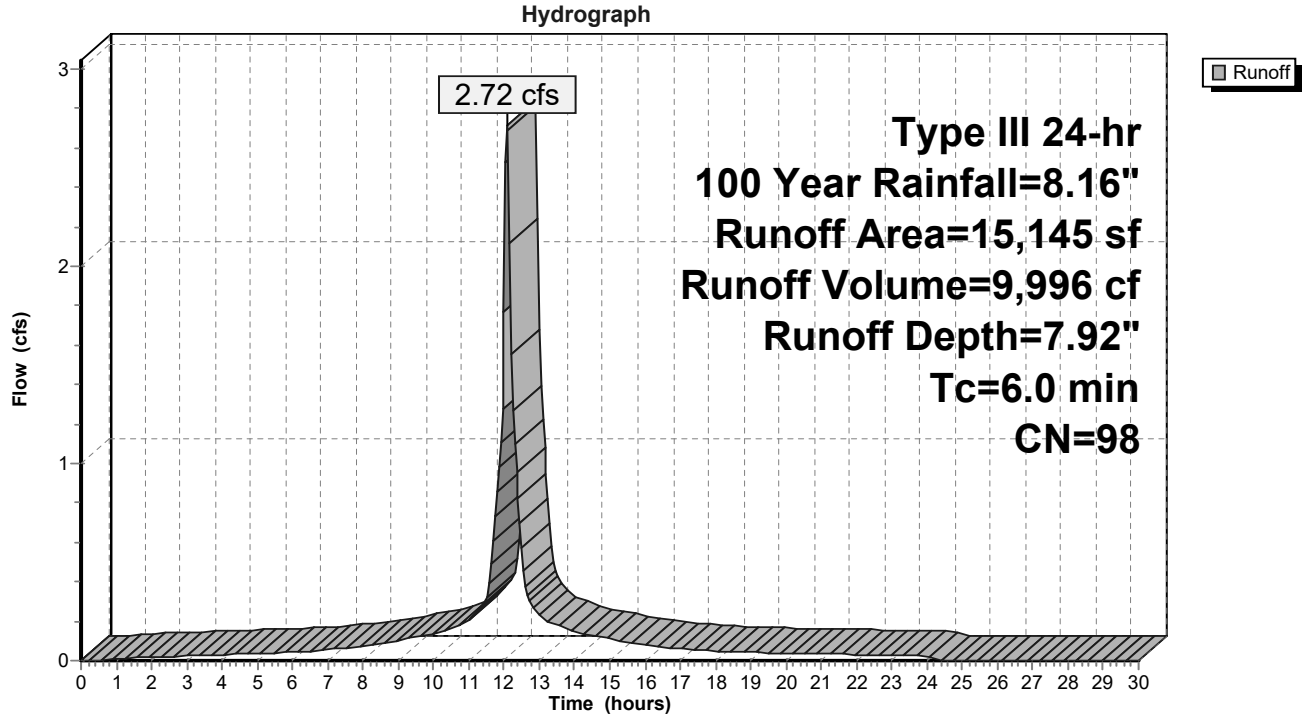
Runoff = 2.72 cfs @ 12.09 hrs, Volume= 9,996 cf, Depth= 7.92"
Routed to Pond UIS5 : Underground Chamber #5

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
15,145	98	Unconnected roofs, HSG A
15,145	98	100.00% Impervious Area
15,145		100.00% Unconnected

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

Subcatchment R-5: Subcat R-5



Summary for Subcatchment R-6: Subcat R-6

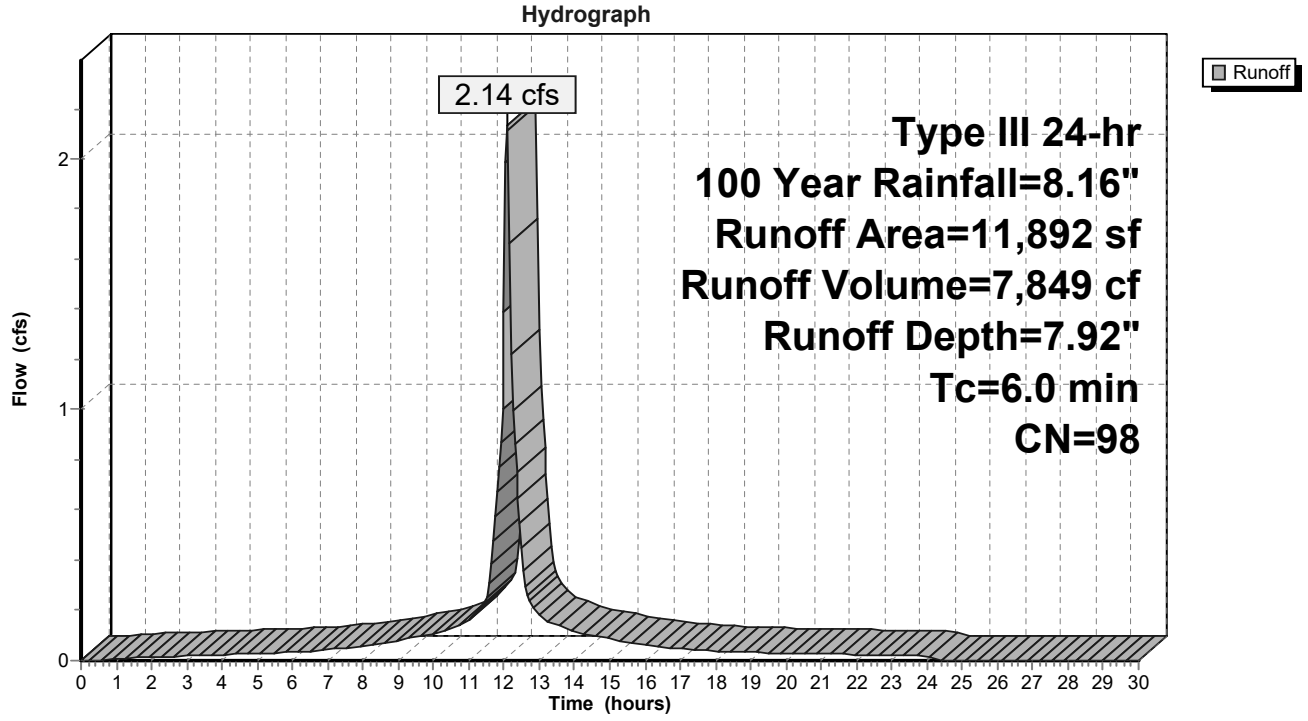
Runoff = 2.14 cfs @ 12.09 hrs, Volume= 7,849 cf, Depth= 7.92"
Routed to Pond UIS5 : Underground Chamber #5

Runoff by SCS TR-20 method, UH=SCS, Weighted-Q, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 Year Rainfall=8.16"

Area (sf)	CN	Description
11,892	98	Unconnected roofs, HSG A
11,892	98	100.00% Impervious Area
11,892		100.00% Unconnected

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

Subcatchment R-6: Subcat R-6



Summary for Pond 1P: Culvert Crossing

Inflow Area = 230,364 sf, 35.64% Impervious, Inflow Depth = 3.46" for 100 Year event
Inflow = 17.17 cfs @ 12.17 hrs, Volume= 66,471 cf
Outflow = 3.19 cfs @ 12.80 hrs, Volume= 65,987 cf, Atten= 81%, Lag= 37.7 min
Primary = 3.19 cfs @ 12.80 hrs, Volume= 65,987 cf
Routed to Link SP1 : On Site Flow To Perennial Stream

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 275.97' @ 12.80 hrs Surf.Area= 11,011 sf Storage= 25,494 cf

Plug-Flow detention time= 102.9 min calculated for 65,987 cf (99% of inflow)
Center-of-Mass det. time= 98.7 min (947.4 - 848.7)

Volume	Invert	Avail.Storage	Storage Description
#1	273.00'	25,798 cf	**Custom Stage Data (Irregular)**Listed below (Recalc)

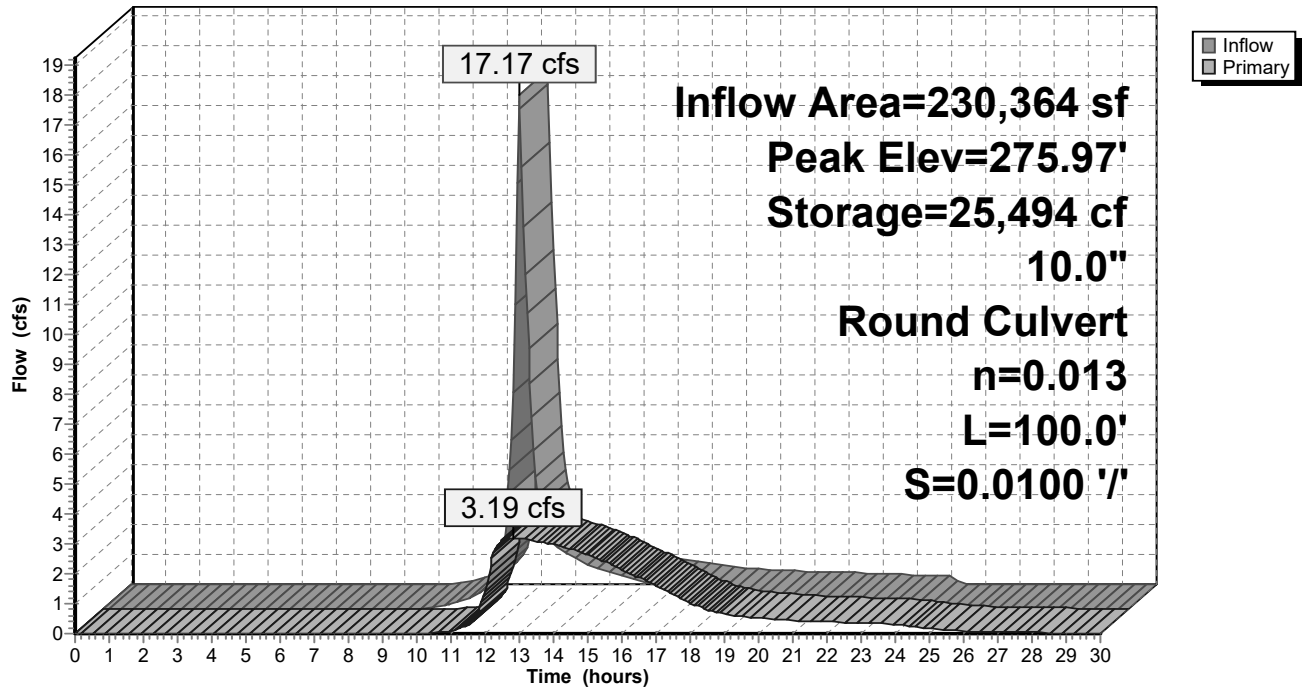
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	6,253	507.0	0	0	6,253
274.00	7,786	527.0	7,006	7,006	7,978
275.00	9,394	545.0	8,577	15,583	9,604
276.00	11,059	564.0	10,215	25,798	11,370

Device	Routing	Invert	Outlet Devices
#1	Primary	273.00'	**10.0" Round Culvert Crossing 12"** L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 273.00' / 272.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.55 sf

Primary OutFlow Max=3.19 cfs @ 12.80 hrs HW=275.97' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert Crossing 12"** (Barrel Controls 3.19 cfs @ 5.85 fps)

Pond 1P: Culvert Crossing

Hydrograph



Summary for Pond 2P: Culvert Crossing

[57] Hint: Peaked at 280.08' (Flood elevation advised)

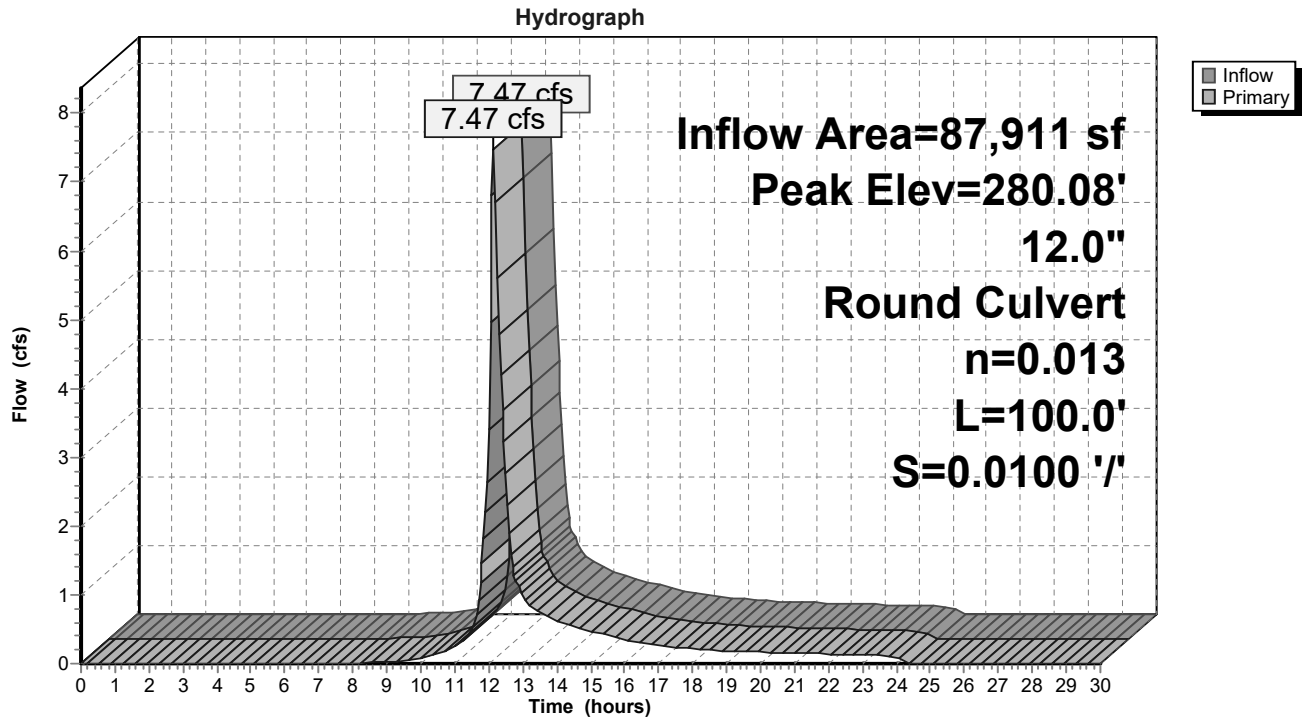
Inflow Area = 87,911 sf, 38.00% Impervious, Inflow Depth = 3.71" for 100 Year event
Inflow = 7.47 cfs @ 12.15 hrs, Volume= 27,191 cf
Outflow = 7.47 cfs @ 12.15 hrs, Volume= 27,191 cf, Atten= 0%, Lag= 0.0 min
Primary = 7.47 cfs @ 12.15 hrs, Volume= 27,191 cf
Routed to Link SP2 : On Site Flow To Perennial Stream

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 280.08' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	273.00'	**12.0" Round Culvert Crossing 12"** L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 273.00' / 272.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=7.44 cfs @ 12.15 hrs HW=280.03' TW=0.00' (Dynamic Tailwater)
↑—**1=Culvert Crossing 12"** (Barrel Controls 7.44 cfs @ 9.48 fps)

Pond 2P: Culvert Crossing



Summary for Pond IB1: Infiltration Basin #1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=46)

Inflow Area = 68,340 sf, 87.26% Impervious, Inflow Depth = 2.98" for 100 Year event
Inflow = 1.83 cfs @ 12.12 hrs, Volume= 16,997 cf
Outflow = 0.86 cfs @ 14.15 hrs, Volume= 17,002 cf, Atten= 53%, Lag= 121.4 min
Discarded = 0.20 cfs @ 14.15 hrs, Volume= 5,706 cf
Primary = 0.65 cfs @ 14.15 hrs, Volume= 11,296 cf
Routed to Link SP4 : On Site Flow To Perennial Stream

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 274.70' @ 14.15 hrs Surf.Area= 3,619 sf Storage= 5,209 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 76.3 min (892.3 - 816.0)

Volume	Invert	Avail.Storage	Storage Description
#1	273.00'	6,333 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

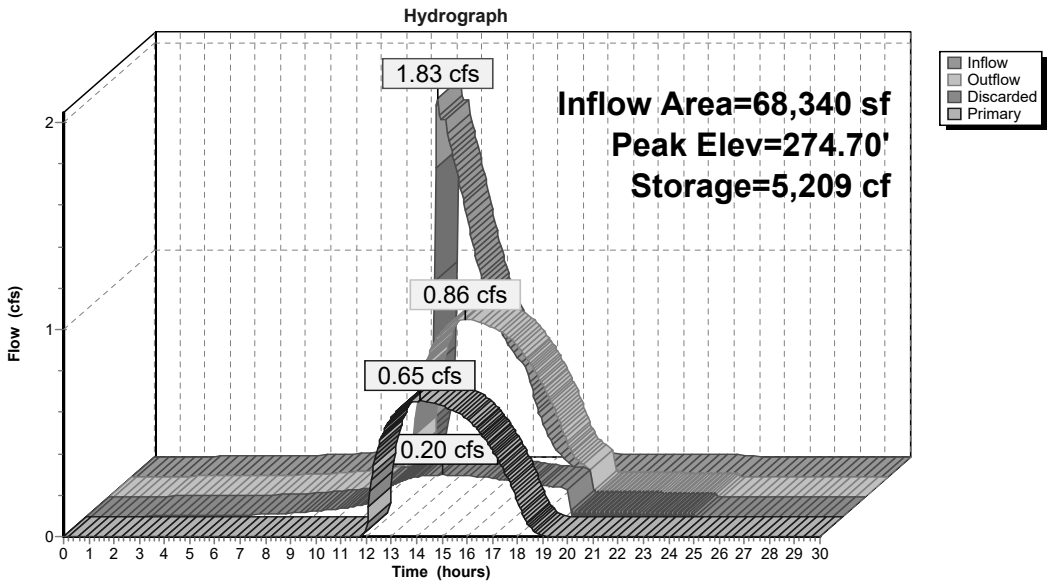
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	2,544	195.0	0	0	2,544
274.00	3,158	214.0	2,845	2,845	3,195
275.00	3,828	232.0	3,488	6,333	3,872

Device	Routing	Invert	Outlet Devices
#1	Primary	272.00'	**15.0" Round CMP_Round 15"** L= 100.0' Ke= 0.900 Inlet / Outlet Invert= 272.00' / 271.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Discarded	273.00'	**2.410 in/hr Exfiltration over Surface area**
#3	Device 1	273.00'	**4.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.20 cfs @ 14.15 hrs HW=274.70' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.20 cfs)

Primary OutFlow Max=0.65 cfs @ 14.15 hrs HW=274.70' TW=0.00' (Dynamic Tailwater)
└**1=CMP_Round 15"** (Passes 0.65 cfs of 6.72 cfs potential flow)
└**3=Orifice/Grate** (Orifice Controls 0.65 cfs @ 5.92 fps)

Pond IB1: Infiltration Basin #1



Summary for Pond IB2: Infiltration Basin #2

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=25)

Inflow Area = 73,600 sf, 82.25% Impervious, Inflow Depth = 7.18" for 100 Year event
Inflow = 11.07 cfs @ 12.06 hrs, Volume= 44,026 cf
Outflow = 5.57 cfs @ 12.24 hrs, Volume= 44,028 cf, Atten= 50%, Lag= 10.9 min
Discarded = 0.32 cfs @ 12.24 hrs, Volume= 15,181 cf
Primary = 5.25 cfs @ 12.24 hrs, Volume= 28,847 cf
Routed to Link SP4 : On Site Flow To Perennial Stream

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 274.89' @ 12.24 hrs Surf.Area= 5,679 sf Storage= 8,692 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 24.5 min (771.4 - 746.9)

Volume	Invert	Avail.Storage	Storage Description
#1	273.00'	9,301 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
273.00	3,545	358.0	0	0	3,545
274.00	4,648	377.0	4,084	4,084	4,715
275.00	5,808	396.0	5,217	9,301	5,946

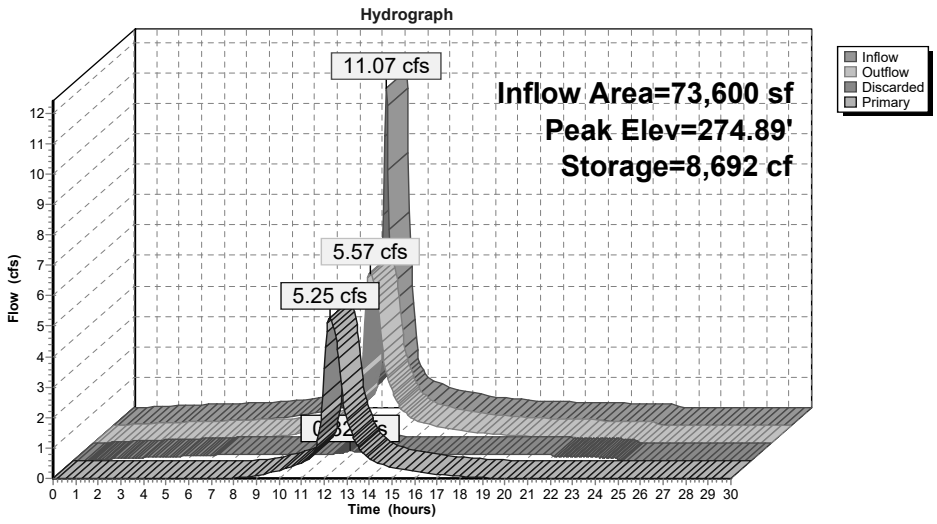
Device	Routing	Invert	Outlet Devices
#1	Primary	273.00'	**15.0" Round Culvert** L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 273.00' / 272.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Discarded	273.00'	**2.410 in/hr Exfiltration over Surface area**
#3	Device 1	273.00'	**10.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Primary	274.90'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

#5	Device 1	273.87'	**8.0" Vert. Orifice/Grate X 2.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.32 cfs @ 12.24 hrs HW=274.89' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.32 cfs)

Primary OutFlow Max=5.25 cfs @ 12.24 hrs HW=274.89' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Inlet Controls 5.25 cfs @ 4.28 fps)
└**3=Orifice/Grate** (Passes < 3.49 cfs potential flow)
└**5=Orifice/Grate** (Passes < 2.79 cfs potential flow)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond IB2: Infiltration Basin #2



Summary for Pond UIS1: Underground Chamber #1

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=58)

Inflow Area = 2,664 sf,100.00% Impervious, Inflow Depth = 7.92" for 100 Year event
Inflow = 0.48 cfs @ 12.09 hrs, Volume= 1,758 cf
Outflow = 0.17 cfs @ 12.35 hrs, Volume= 1,760 cf, Atten= 65%, Lag= 15.7 min
Discarded = 0.03 cfs @ 11.30 hrs, Volume= 1,362 cf
Primary = 0.14 cfs @ 12.35 hrs, Volume= 398 cf
Routed to Link SP1 : On Site Flow To Perennial Stream

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 272.46' @ 12.35 hrs Surf.Area= 589 sf Storage= 453 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 46.5 min (787.4 - 741.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	271.17'	521 cf	**11.00'W x 53.58'L x 3.75'H Field A** 2,210 cf Overall - 722 cf Embedded = 1,488 cf x 35.0% Voids
#2A	271.67'	722 cf	**ADS_StormTech SC-800 +Cap** x 14 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 14 Chambers in 2 Rows Cap Storage= 3.4 cf x 2 x 2 rows = 13.7 cf
		1,243 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	269.66'	**12.0" Round CMP_Round 12"** L= 16.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 269.66' / 269.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	272.00'	**3.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	274.00'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**

			Head (feet) 0.20 0.40 0.60 0.80 1.00
			Coef. (English) 2.80 2.92 3.08 3.30 3.32
#4	Discarded	271.17'	**2.410 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.03 cfs @ 11.30 hrs HW=271.21' (Free Discharge)
└**4=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.14 cfs @ 12.35 hrs HW=272.46' TW=0.00' (Dynamic Tailwater)
└**1=CMP_Round 12"** (Passes 0.14 cfs of 4.53 cfs potential flow)
  ├**2=Orifice/Grate** (Orifice Controls 0.14 cfs @ 2.79 fps)
  └**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond UIS1: Underground Chamber #1 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-800 +Cap (ADS StormTech® SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 2 rows = 13.7 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

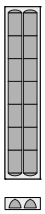
7 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 51.58' Row Length +12.0" End Stone x 2 = 53.58' Base Length
2 Rows x 51.0" Wide + 6.0" Spacing x 1 + 12.0" Side Stone x 2 = 11.00' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

14 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 2 Rows = 722.0 cf Chamber Storage

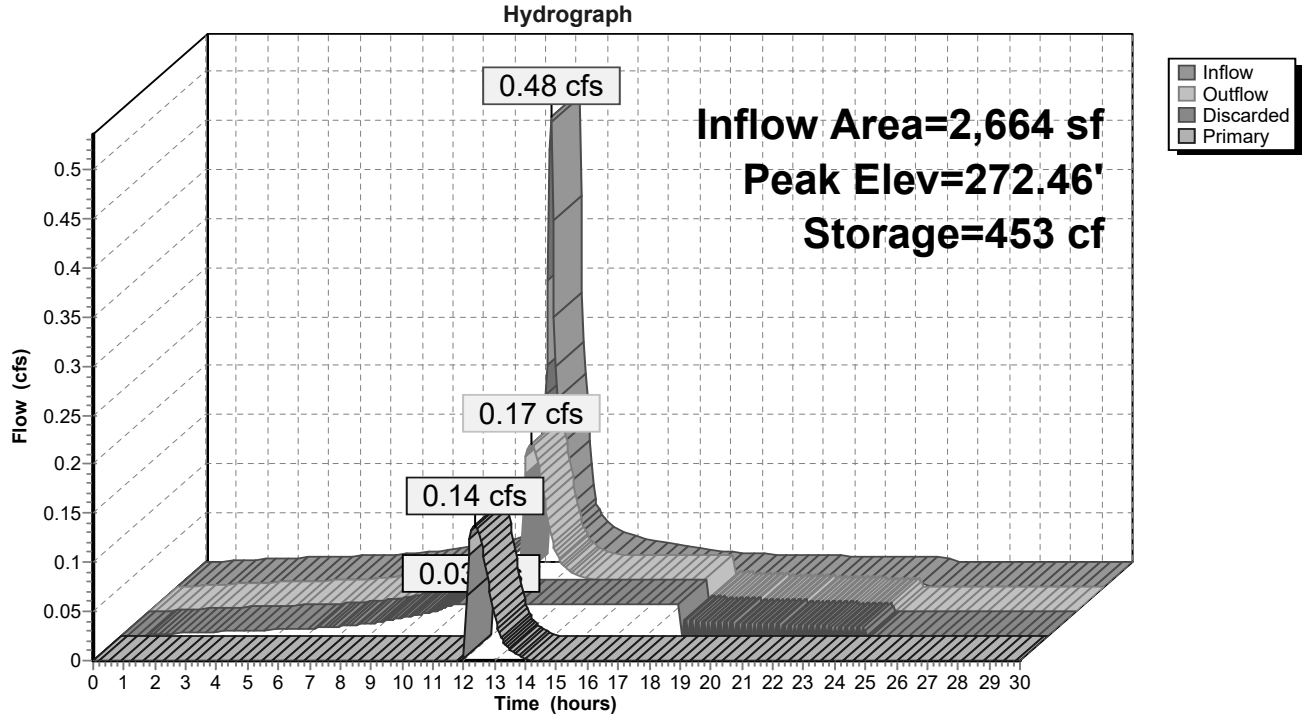
2,210.3 cf Field - 722.0 cf Chambers = 1,488.3 cf Stone x 35.0% Voids = 520.9 cf Stone Storage

Chamber Storage + Stone Storage = 1,242.9 cf = 0.029 af
Overall Storage Efficiency = 56.2%
Overall System Size = 53.58' x 11.00' x 3.75'

14 Chambers
81.9 cy Field
55.1 cy Stone



Pond UIS1: Underground Chamber #1



Summary for Pond UIS2: Underground Chamber #2

[87] Warning: Oscillations may require smaller dt or Finer Routing (severity=12)

Inflow Area = 8,567 sf, 23.70% Impervious, Inflow Depth = 6.45" for 100 Year event
Inflow = 1.27 cfs @ 12.09 hrs, Volume= 4,603 cf
Outflow = 0.97 cfs @ 12.16 hrs, Volume= 4,604 cf, Atten= 23%, Lag= 4.1 min
Discarded = 0.03 cfs @ 8.70 hrs, Volume= 2,088 cf
Primary = 0.94 cfs @ 12.16 hrs, Volume= 2,515 cf
Routed to Link SP2 : On Site Flow To Perennial Stream

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 273.49' @ 12.16 hrs Surf.Area= 576 sf Storage= 658 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 38.0 min (795.4 - 757.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	271.17'	367 cf	**18.17'W x 31.68'L x 2.33'H Field A** 1,343 cf Overall - 295 cf Embedded = 1,048 cf x 35.0% Voids
#2A	271.67'	295 cf	**ADS_StormTech SC-310 +Cap** x 20 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 20 Chambers in 5 Rows
		662 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	271.20'	**12.0" Round CMP_Round 12"** L= 20.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 271.20' / 271.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	273.45'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

#3	Discarded	271.17'	**2.410 in/hr Exfiltration over Surface area**
#4	Device 1	272.00'	**5.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.03 cfs @ 8.70 hrs HW=271.20' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.03 cfs)

Primary OutFlow Max=0.92 cfs @ 12.16 hrs HW=273.47' TW=0.00' (Dynamic Tailwater)
└**1=CMP_Round 12"** (Passes 0.92 cfs of 3.97 cfs potential flow)
  ├**2=Broad-Crested Rectangular Weir** (Weir Controls 0.03 cfs @ 0.39 fps)
  └**4=Orifice/Grate** (Orifice Controls 0.88 cfs @ 5.36 fps)

Pond UIS2: Underground Chamber #2 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-310 +Cap (ADS StormTech® SC-310 with cap length)
Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf
Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap

34.0" Wide + 6.0" Spacing = 40.0" C-C Row Spacing

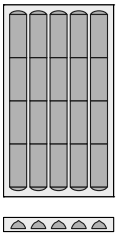
4 Chambers/Row x 7.12' Long +0.60' Cap Length x 2 = 29.68' Row Length +12.0" End Stone x 2 = 31.68' Base Length
5 Rows x 34.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 18.17' Base Width
6.0" Stone Base + 16.0" Chamber Height + 6.0" Stone Cover = 2.33' Field Height

20 Chambers x 14.7 cf = 294.8 cf Chamber Storage

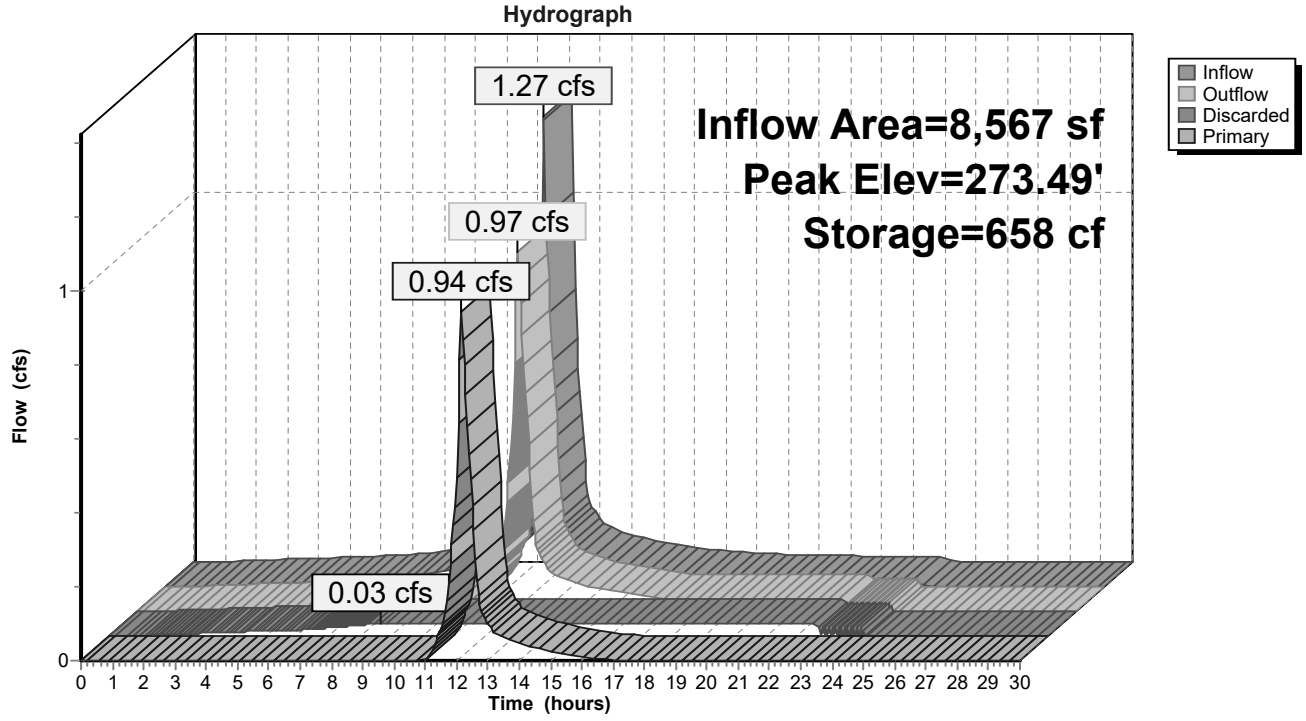
1,342.9 cf Field - 294.8 cf Chambers = 1,048.0 cf Stone x 35.0% Voids = 366.8 cf Stone Storage

Chamber Storage + Stone Storage = 661.7 cf = 0.015 af
Overall Storage Efficiency = 49.3%
Overall System Size = 31.68' x 18.17' x 2.33'

20 Chambers
49.7 cy Field
38.8 cy Stone



Pond UIS2: Underground Chamber #2



Summary for Pond UIS3: Underground Chamber #3

Inflow Area = 24,223 sf, 87.59% Impervious, Inflow Depth = 7.19" for 100 Year event
Inflow = 3.94 cfs @ 12.09 hrs, Volume= 14,508 cf
Outflow = 2.77 cfs @ 12.17 hrs, Volume= 14,514 cf, Atten= 30%, Lag= 5.1 min
Discarded = 0.10 cfs @ 8.50 hrs, Volume= 8,060 cf
Primary = 2.68 cfs @ 12.17 hrs, Volume= 6,455 cf
Routed to Link SP2 : On Site Flow To Perennial Stream

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 274.82' @ 12.17 hrs Surf.Area= 1,712 sf Storage= 3,689 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 127.2 min (872.2 - 745.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	271.17'	1,439 cf	**25.25'W x 67.82'L x 3.75'H Field A** 6,421 cf Overall - 2,311 cf Embedded = 4,111 cf x 35.0% Voids
#2A	271.67'	2,311 cf	**ADS_StormTech SC-800 +Cap** x 45 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 45 Chambers in 5 Rows Cap Storage= 3.4 cf x 2 x 5 rows = 34.2 cf
		3,750 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	270.18'	**12.0" Round CMP_Round 12"** L= 68.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 270.18' / 269.50' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	274.85'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	271.17'	**2.410 in/hr Exfiltration over Surface area**

#4	Device 1	273.15'	**9.5" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.10 cfs @ 8.50 hrs HW=271.21' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=2.64 cfs @ 12.17 hrs HW=274.78' TW=0.00' (Dynamic Tailwater)
└**1=CMP_Round 12"** (Passes 2.64 cfs of 6.05 cfs potential flow)
  └**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Orifice Controls 2.64 cfs @ 5.36 fps)

Pond UIS3: Underground Chamber #3 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-800 +Cap (ADS StormTech® SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 5 rows = 34.2 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

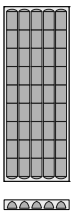
9 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 65.82' Row Length +12.0" End Stone x 2 = 67.82' Base Length
5 Rows x 51.0" Wide + 6.0" Spacing x 4 + 12.0" Side Stone x 2 = 25.25' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

45 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 5 Rows = 2,310.9 cf Chamber Storage

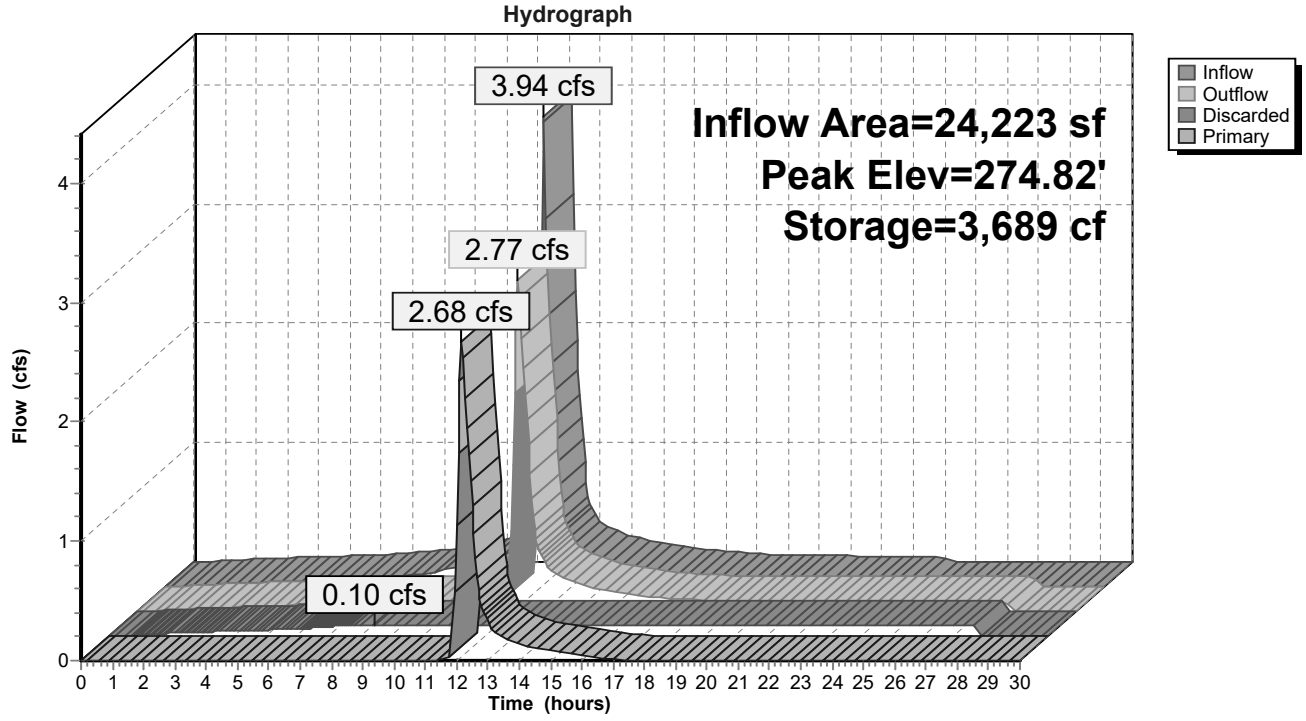
6,421.4 cf Field - 2,310.9 cf Chambers = 4,110.5 cf Stone x 35.0% Voids = 1,438.7 cf Stone Storage

Chamber Storage + Stone Storage = 3,749.5 cf = 0.086 af
Overall Storage Efficiency = 58.4%
Overall System Size = 67.82' x 25.25' x 3.75'

45 Chambers
237.8 cy Field
152.2 cy Stone



Pond UIS3: Underground Chamber #3



Summary for Pond UIS4: Underground Chamber #4

Inflow Area = 61,699 sf, 92.34% Impervious, Inflow Depth = 7.41" for 100 Year event
Inflow = 10.33 cfs @ 12.09 hrs, Volume= 38,086 cf
Outflow = 1.86 cfs @ 12.54 hrs, Volume= 38,108 cf, Atten= 82%, Lag= 27.2 min
Discarded = 0.36 cfs @ 9.50 hrs, Volume= 24,362 cf
Primary = 1.49 cfs @ 12.54 hrs, Volume= 13,746 cf
Routed to Pond IB1 : Infiltration Basin #1

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 276.64' @ 12.54 hrs Surf.Area= 6,540 sf Storage= 14,382 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 116.8 min (859.9 - 743.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	273.00'	5,330 cf	**63.25'W x 103.40'L x 3.75'H Field A** 24,525 cf Overall - 9,297 cf Embedded = 15,228 cf x 35.0% Voids
#2A	273.50'	9,297 cf	**ADS_StormTech SC-800 +Cap** x 182 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 182 Chambers in 13 Rows Cap Storage= 3.4 cf x 2 x 13 rows = 88.9 cf
		14,627 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	273.43'	**18.0" Round Culvert** L= 42.5' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 273.43' / 273.00' S= 0.0101 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	276.70'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	273.00'	**2.410 in/hr Exfiltration over Surface area**

#4	Device 1	274.20'	**6.2" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.36 cfs @ 9.50 hrs HW=273.04' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.36 cfs)

Primary OutFlow Max=1.49 cfs @ 12.54 hrs HW=276.64' TW=273.93' (Dynamic Tailwater)
└**1=Culvert** (Passes 1.49 cfs of 10.54 cfs potential flow)
  └**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Orifice Controls 1.49 cfs @ 7.11 fps)

Pond UIS4: Underground Chamber #4 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-800 +Cap (ADS StormTech® SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 13 rows = 88.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

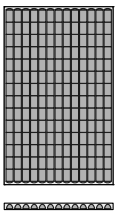
14 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 101.40' Row Length +12.0" End Stone x 2 = 103.40' Base Length
13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

182 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 13 Rows = 9,296.7 cf Chamber Storage

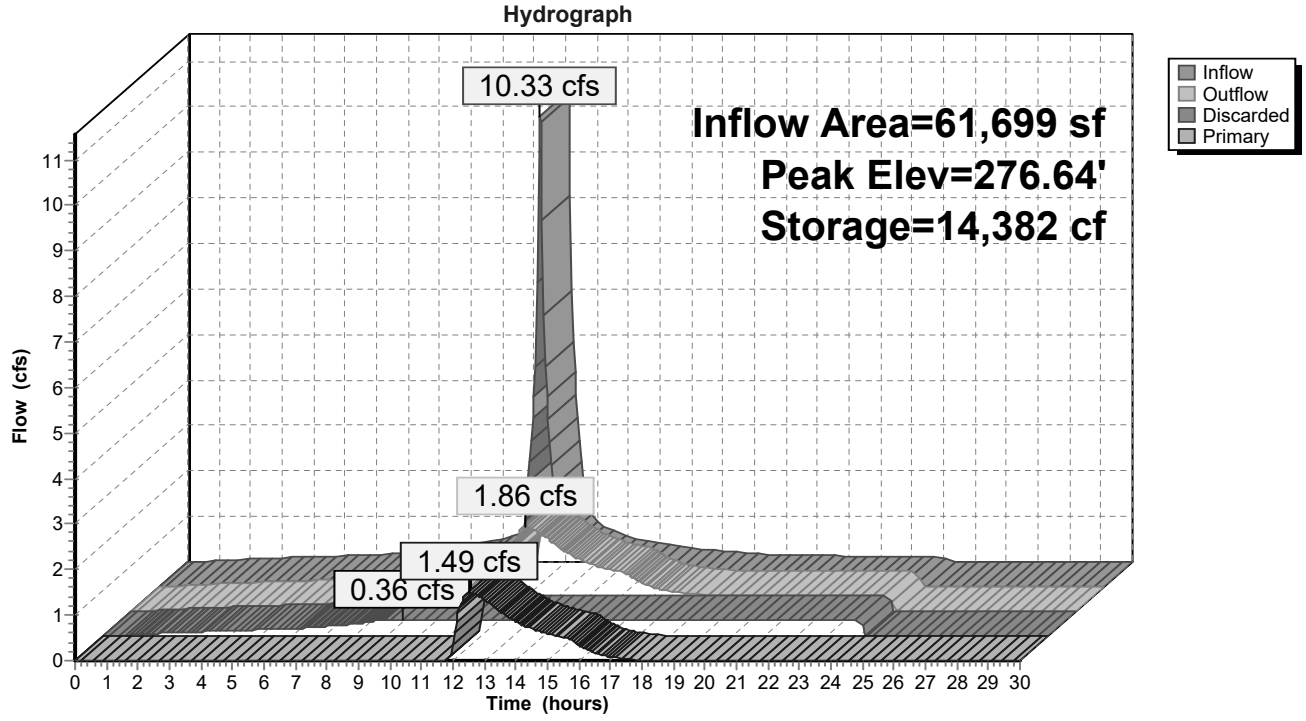
24,525.2 cf Field - 9,296.7 cf Chambers = 15,228.5 cf Stone x 35.0% Voids = 5,330.0 cf Stone Storage

Chamber Storage + Stone Storage = 14,626.7 cf = 0.336 af
Overall Storage Efficiency = 59.6%
Overall System Size = 103.40' x 63.25' x 3.75'

182 Chambers
908.3 cy Field
564.0 cy Stone



Pond UIS4: Underground Chamber #4



Summary for Pond UIS5: Underground Chamber #5

[58] Hint: Peaked 2.46' above defined flood level

Inflow Area = 92,954 sf, 91.74% Impervious, Inflow Depth = 7.37" for 100 Year event
Inflow = 15.47 cfs @ 12.09 hrs, Volume= 57,067 cf
Outflow = 3.49 cfs @ 12.49 hrs, Volume= 57,072 cf, Atten= 77%, Lag= 24.4 min
Discarded = 0.52 cfs @ 9.30 hrs, Volume= 34,785 cf
Primary = 2.97 cfs @ 12.49 hrs, Volume= 22,287 cf
Routed to Link SP4 : On Site Flow To Perennial Stream

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 276.21' @ 12.49 hrs Surf.Area= 9,241 sf Storage= 20,618 cf
Flood Elev= 273.75' Surf.Area= 9,241 sf Storage= 7,303 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 103.5 min (846.8 - 743.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	272.50'	7,494 cf	**63.25'W x 146.10'L x 3.75'H Field A** 34,653 cf Overall - 13,243 cf Embedded = 21,410 cf x 35.0% Voids
#2A	273.00'	13,243 cf	**ADS_StormTech SC-800 +Cap** x 260 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 260 Chambers in 13 Rows Cap Storage= 3.4 cf x 2 x 13 rows = 88.9 cf
		20,736 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	272.94'	**24.0" Round Culvert** L= 94.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 272.94' / 272.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#2	Device 1	276.20'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir**

			Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	272.50'	**2.410 in/hr Exfiltration over Surface area**
#4	Device 1	273.75'	**5.0" Vert. Orifice/Grate X 3.00** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.52 cfs @ 9.30 hrs HW=272.54' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.52 cfs)

Primary OutFlow Max=2.97 cfs @ 12.49 hrs HW=276.21' TW=0.00' (Dynamic Tailwater)
└**1=Culvert** (Passes 2.97 cfs of 18.00 cfs potential flow)
  └**2=Broad-Crested Rectangular Weir** (Weir Controls 0.01 cfs @ 0.29 fps)
  └**4=Orifice/Grate** (Orifice Controls 2.96 cfs @ 7.23 fps)

Pond UIS5: Underground Chamber #5 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-800 +Cap (ADS StormTech® SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 13 rows = 88.9 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

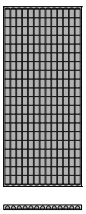
20 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 144.10' Row Length +12.0" End Stone x 2 = 146.10' Base Length
13 Rows x 51.0" Wide + 6.0" Spacing x 12 + 12.0" Side Stone x 2 = 63.25' Base Width
6.0" Stone Base + 33.0" Chamber Height + 6.0" Stone Cover = 3.75' Field Height

260 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 13 Rows = 13,242.9 cf Chamber Storage

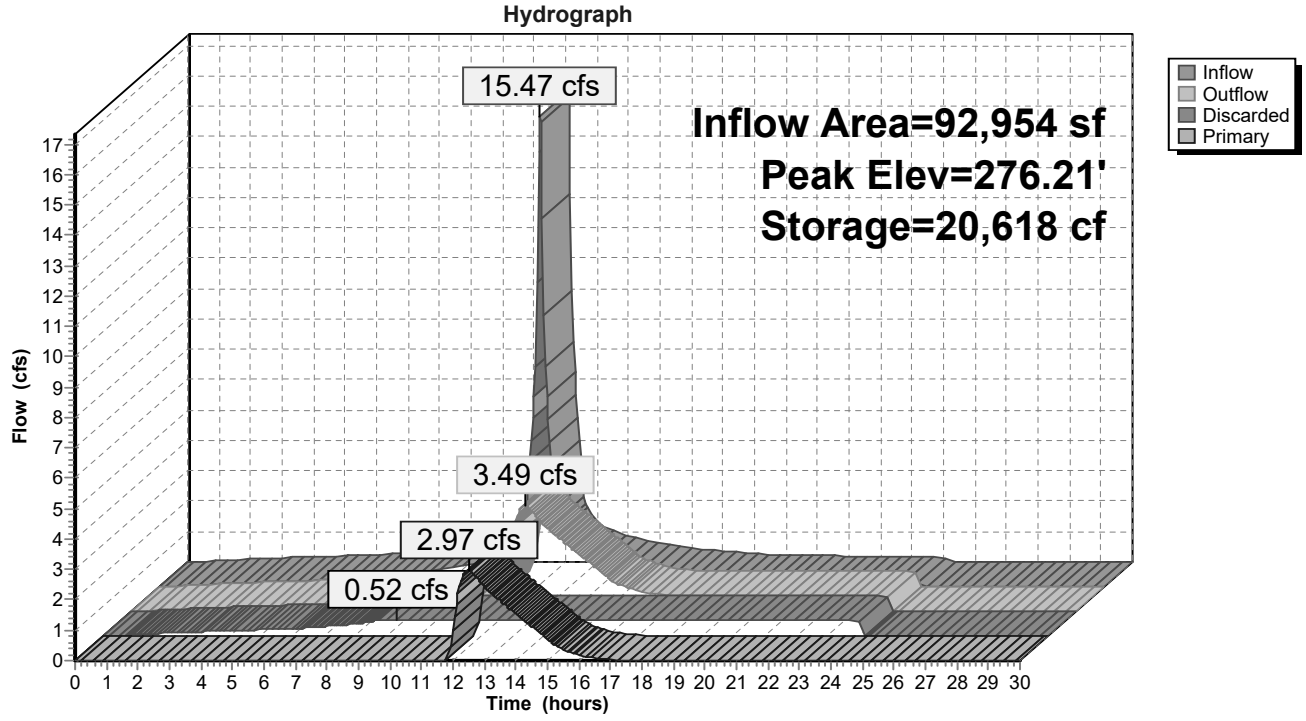
34,653.1 cf Field - 13,242.9 cf Chambers = 21,410.2 cf Stone x 35.0% Voids = 7,493.6 cf Stone Storage

Chamber Storage + Stone Storage = 20,736.5 cf = 0.476 af
Overall Storage Efficiency = 59.8%
Overall System Size = 146.10' x 63.25' x 3.75'

260 Chambers
1,283.4 cy Field
793.0 cy Stone



Pond UIS5: Underground Chamber #5



Summary for Pond UIS6: Underground Chamber #6

Inflow Area = 54,610 sf, 59.73% Impervious, Inflow Depth = 5.24" for 100 Year event
Inflow = 6.33 cfs @ 12.09 hrs, Volume= 23,846 cf
Outflow = 1.71 cfs @ 12.46 hrs, Volume= 18,629 cf, Atten= 73%, Lag= 22.5 min
Discarded = 0.10 cfs @ 7.35 hrs, Volume= 9,274 cf
Primary = 1.62 cfs @ 12.46 hrs, Volume= 9,355 cf
Routed to Link SP4 : On Site Flow To Perennial Stream

Routing by Dyn-Stor-Ind method, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs
Peak Elev= 274.75' @ 12.47 hrs Surf.Area= 4,028 sf Storage= 10,360 cf

Plug-Flow detention time= 236.8 min calculated for 18,629 cf (78% of inflow)
Center-of-Mass det. time= 150.8 min (907.7 - 756.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	270.00'	4,722 cf	**53.75'W x 74.93'L x 4.75'H Field A** 19,131 cf Overall - 5,640 cf Embedded = 13,491 cf x 35.0% Voids
#2A	271.00'	5,640 cf	**ADS_StormTech SC-800 +Cap** x 110 Inside #1 Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap 110 Chambers in 11 Rows Cap Storage= 3.4 cf x 2 x 11 rows = 75.2 cf
		10,362 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	272.93'	**24.0" Round CMP_Round 24"** L= 93.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 272.93' / 272.00' S= 0.0100 '/' Cc= 0.900 n= 0.025 Corrugated metal, Flow Area= 3.14 sf
#2	Device 1	274.65'	**4.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	270.00'	**1.020 in/hr Exfiltration over Surface area**
#4	Device 1	271.40'	**6.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads

Discarded OutFlow Max=0.10 cfs @ 7.35 hrs HW=270.05' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=1.59 cfs @ 12.46 hrs HW=274.74' TW=0.00' (Dynamic Tailwater)
└**1=CMP_Round 24"** (Passes 1.59 cfs of 9.27 cfs potential flow)
  ├**2=Broad-Crested Rectangular Weir** (Weir Controls 0.32 cfs @ 0.86 fps)
  └**4=Orifice/Grate** (Orifice Controls 1.27 cfs @ 6.48 fps)

Pond UIS6: Underground Chamber #6 - Chamber Wizard Field A

Chamber Model = ADS_StormTech SC-800 +Cap (ADS StormTech® SC-800 with cap volume)
Effective Size= 45.0"W x 33.0"H => 7.11 sf x 7.12'L = 50.6 cf
Overall Size= 51.0"W x 33.0"H x 7.55'L with 0.43' Overlap
Cap Storage= 3.4 cf x 2 x 11 rows = 75.2 cf

51.0" Wide + 6.0" Spacing = 57.0" C-C Row Spacing

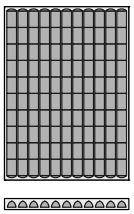
10 Chambers/Row x 7.12' Long +0.88' Cap Length x 2 = 72.93' Row Length +12.0" End Stone x 2 = 74.93' Base Length
11 Rows x 51.0" Wide + 6.0" Spacing x 10 + 12.0" Side Stone x 2 = 53.75' Base Width
12.0" Stone Base + 33.0" Chamber Height + 12.0" Stone Cover = 4.75' Field Height

110 Chambers x 50.6 cf + 3.4 cf Cap Volume x 2 x 11 Rows = 5,640.4 cf Chamber Storage

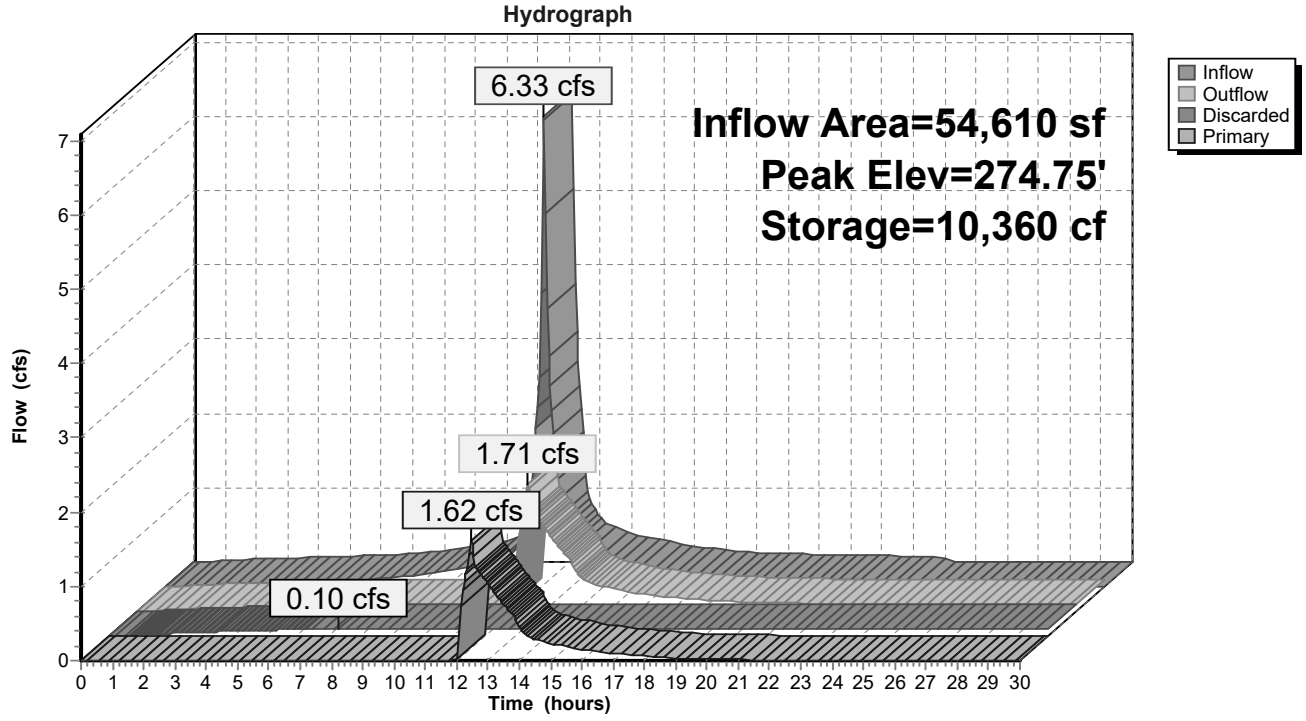
19,131.4 cf Field - 5,640.4 cf Chambers = 13,491.0 cf Stone x 35.0% Voids = 4,721.9 cf Stone Storage

Chamber Storage + Stone Storage = 10,362.2 cf = 0.238 af
Overall Storage Efficiency = 54.2%
Overall System Size = 74.93' x 53.75' x 4.75'

110 Chambers
708.6 cy Field
499.7 cy Stone



Pond UIS6: Underground Chamber #6

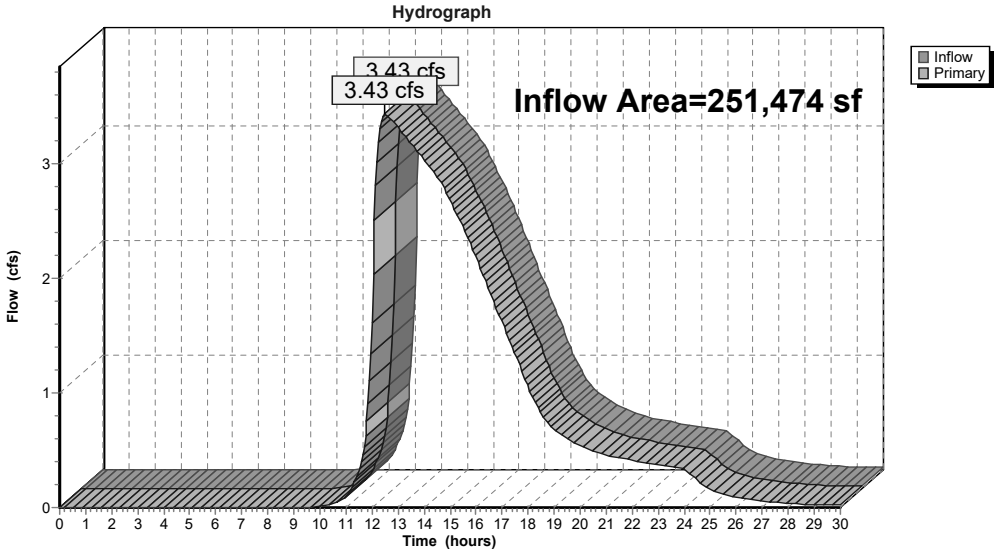


Summary for Link SP1: On Site Flow To Perennial Stream

Inflow Area = 251,474 sf, 33.88% Impervious, Inflow Depth > 3.28" for 100 Year event
Inflow = 3.43 cfs @ 12.49 hrs, Volume= 68,638 cf
Primary = 3.43 cfs @ 12.49 hrs, Volume= 68,638 cf, Atten= 0%, Lag= 0.0 min
Routed to Link SP2 : On Site Flow To Perennial Stream

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link SP1: On Site Flow To Perennial Stream

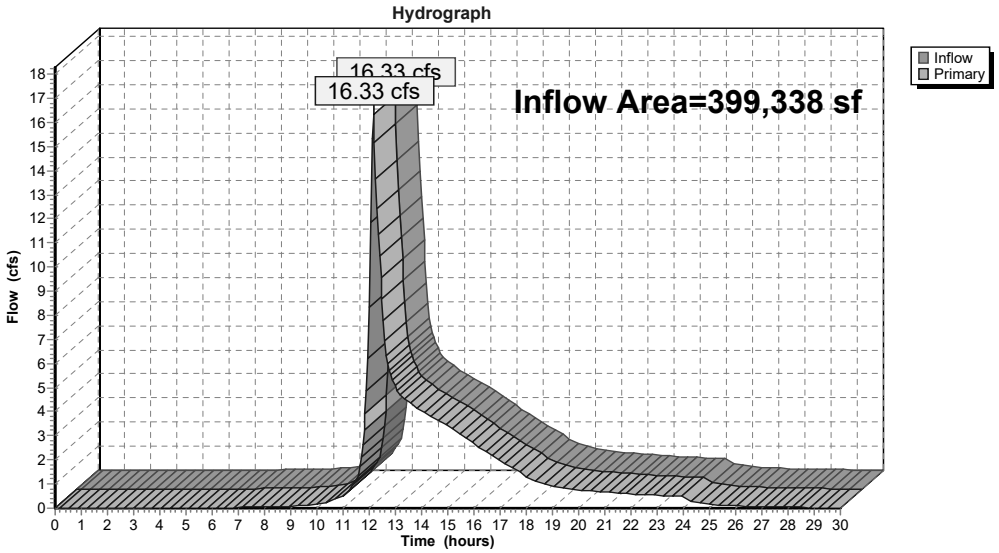


Summary for Link SP2: On Site Flow To Perennial Stream

Inflow Area = 399,338 sf, 36.14% Impervious, Inflow Depth > 3.46" for 100 Year event
Inflow = 16.33 cfs @ 12.15 hrs, Volume= 115,044 cf
Primary = 16.33 cfs @ 12.15 hrs, Volume= 115,044 cf, Atten= 0%, Lag= 0.0 min
Routed to Link SP4 : On Site Flow To Perennial Stream

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link SP2: On Site Flow To Perennial Stream



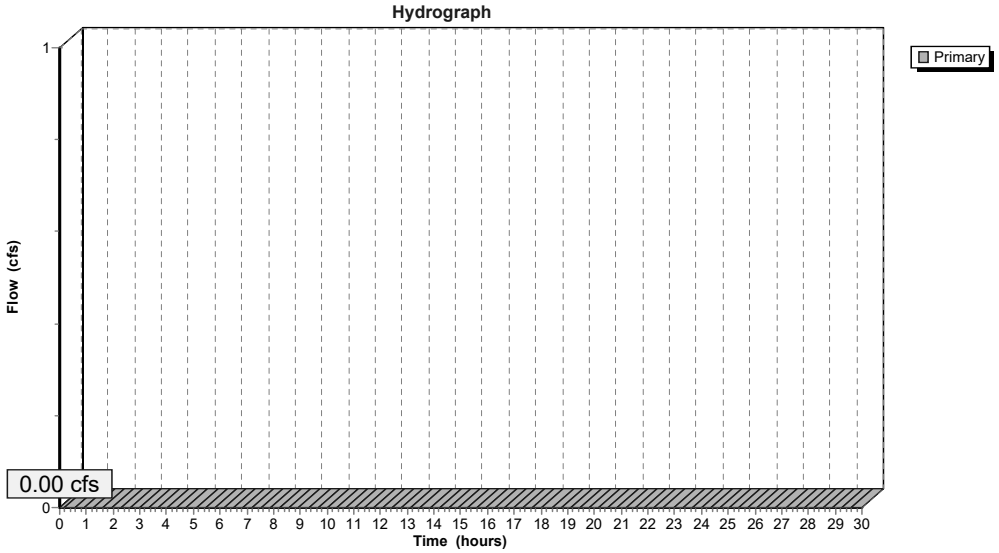
Summary for Link SP3: On Site Flow To Off Site Detention Area

[43] Hint: Has no inflow (Outflow=Zero)

Primary = 0.00 cfs @ 0.00 hrs, Volume= 0 cf
Routed to Link SP4 : On Site Flow To Perennial Stream

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link SP3: On Site Flow To Off Site Detention Area

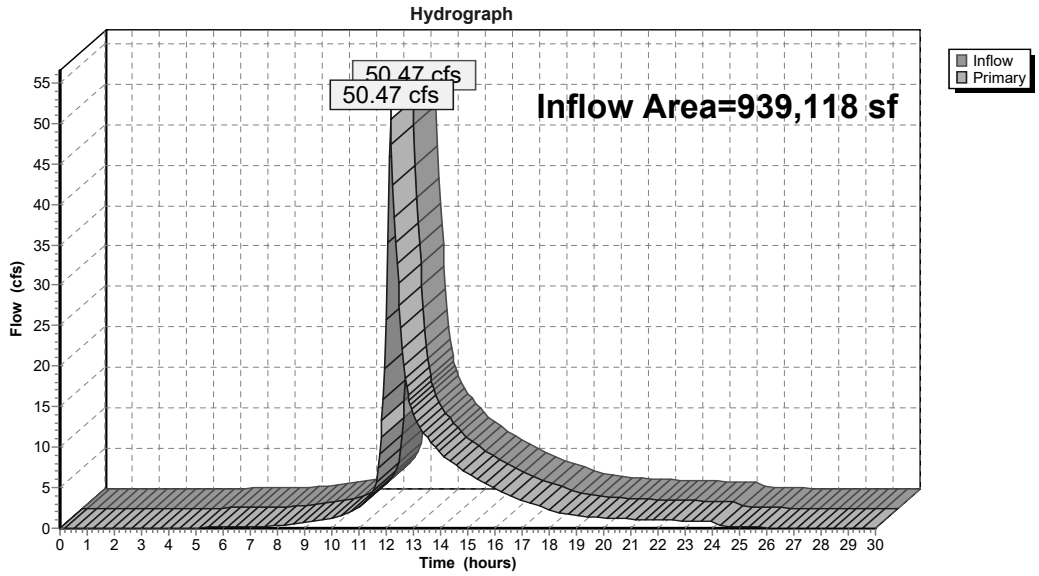


Summary for Link SP4: On Site Flow To Perennial Stream

Inflow Area = 939,118 sf, 43.95% Impervious, Inflow Depth > 3.66" for 100 Year event
Inflow = 50.47 cfs @ 12.16 hrs, Volume= 286,140 cf
Primary = 50.47 cfs @ 12.16 hrs, Volume= 286,140 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-30.00 hrs, dt= 0.05 hrs

Link SP4: On Site Flow To Perennial Stream



EAST CENTRAL STREET

(1927 SHLO #2436 – 60' WIDE – ROUTE 140)

STUDY POINT 1 ON SITE FLOW TO PERENNIAL STREAM	
STORM EVENT	PEAK RATE
2 YEAR	0.45 CFS
10 YEAR	1.90 CFS
100 YEAR	3.43 CFS

STUDY POINT 2 ON SITE FLOW TO PERENNIAL STREAM	
STORM EVENT	PEAK RATE
2 YEAR	1.84 CFS
10 YEAR	6.28 CFS
100 YEAR	16.33 CFS

STUDY POINT 3 ON SITE FLOW TO OFFSITE DETENTION	
STORM EVENT	PEAK RATE
2 YEAR	0 CFS
10 YEAR	0 CFS
100 YEAR	0 CFS

STUDY POINT 4 ON SITE FLOW TO PERENNIAL STREAM	
STORM EVENT	PEAK RATE
2 YEAR	10.31 CFS
10 YEAR	23.88 CFS
100 YEAR	50.47 CFS

LEGEND

- SCS SOILS BOUNDARY
- Tc FLOW PATH
- SUBCATCHMENT LABEL (E-1)
- SUBCATCHMENT BOUNDARY

GRAPHIC SCALE

50 0 25 50 100 200

(IN FEET)
1 inch = 50 ft.

PROFESSIONAL ENGINEER FOR
ALLEN & MAJOR ASSOCIATES, INC.

REV	DATE	DESCRIPTION

APPLICANT\OWNER:

TAG CENTRAL LLC
275 REGATTA DRIVE
JUPITER, FL 33477

PROJECT:

40B MULTIFAMILY
444 EAST CENTRAL STREET
FRANKLIN, MA

PROJECT NO.	3317-01	DATE:	02-11-2025
SCALE:	1" = 50'	DWG. NAME:	C-3317-01
DESIGNED BY:	MTB	CHECKED BY:	CMQ

PREPARED BY:

ALLEN & MAJOR ASSOCIATES, INC.
civil engineering ◆ land surveying
environmental consulting ◆ landscape architecture
www.allenmajor.com
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WOBURN MA 01801
TEL: (781) 935-6889
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WOBURN, MA ◆ LAKEVILLE, MA ◆ MANCHESTER, NH

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DRAWING TITLE:

PROPOSED WATERSHED PLAN

SHEET No.

PWS

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N:\PROJECTS\3317-01\CIVIL\DRAWINGS\CURRENT\C-3317-01_WATERSHED--PROPOSED.DWG

SECTION 6.0 -
APPENDIX

NOAA Atlas 14, Volume 10, Version 3
Location name: Franklin, Massachusetts, USA*
Latitude: 42.0791°, Longitude: -71.3773°
Elevation: 270 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	0.321 (0.252-0.404)	0.391 (0.307-0.493)	0.506 (0.396-0.640)	0.602 (0.468-0.766)	0.733 (0.551-0.976)	0.832 (0.612-1.13)	0.935 (0.667-1.32)	1.05 (0.709-1.52)	1.21 (0.788-1.83)	1.35 (0.853-2.07)
10-min	0.454 (0.357-0.572)	0.554 (0.435-0.698)	0.717 (0.561-0.906)	0.852 (0.663-1.08)	1.04 (0.780-1.38)	1.18 (0.867-1.60)	1.32 (0.945-1.87)	1.49 (1.00-2.16)	1.72 (1.12-2.59)	1.91 (1.21-2.93)
15-min	0.535 (0.420-0.673)	0.652 (0.512-0.821)	0.843 (0.660-1.07)	1.00 (0.780-1.28)	1.22 (0.918-1.63)	1.39 (1.02-1.89)	1.56 (1.11-2.20)	1.75 (1.18-2.54)	2.02 (1.31-3.04)	2.25 (1.42-3.45)
30-min	0.733 (0.576-0.922)	0.895 (0.702-1.13)	1.16 (0.907-1.46)	1.38 (1.07-1.75)	1.68 (1.26-2.24)	1.90 (1.40-2.59)	2.14 (1.53-3.03)	2.41 (1.63-3.49)	2.78 (1.81-4.19)	3.09 (1.96-4.75)
60-min	0.932 (0.732-1.17)	1.14 (0.893-1.43)	1.47 (1.15-1.86)	1.75 (1.36-2.23)	2.14 (1.60-2.84)	2.42 (1.78-3.30)	2.73 (1.95-3.86)	3.06 (2.07-4.44)	3.55 (2.30-5.34)	3.94 (2.49-6.05)
2-hr	1.19 (0.945-1.49)	1.47 (1.16-1.84)	1.93 (1.52-2.42)	2.30 (1.81-2.91)	2.82 (2.14-3.75)	3.21 (2.39-4.37)	3.62 (2.62-5.15)	4.12 (2.79-5.94)	4.88 (3.17-7.29)	5.52 (3.51-8.42)
3-hr	1.38 (1.10-1.72)	1.71 (1.36-2.12)	2.24 (1.77-2.80)	2.68 (2.11-3.37)	3.29 (2.51-4.36)	3.74 (2.80-5.08)	4.23 (3.08-6.01)	4.83 (3.28-6.94)	5.76 (3.75-8.57)	6.56 (4.17-9.95)
6-hr	1.79 (1.43-2.20)	2.20 (1.76-2.71)	2.87 (2.29-3.56)	3.43 (2.72-4.28)	4.20 (3.22-5.52)	4.76 (3.59-6.43)	5.38 (3.95-7.60)	6.15 (4.19-8.76)	7.34 (4.80-10.8)	8.37 (5.34-12.6)
12-hr	2.29 (1.85-2.80)	2.79 (2.25-3.42)	3.61 (2.90-4.44)	4.29 (3.43-5.31)	5.23 (4.04-6.81)	5.92 (4.48-7.91)	6.68 (4.91-9.32)	7.59 (5.20-10.7)	8.99 (5.91-13.2)	10.2 (6.53-15.2)
24-hr	2.75 (2.24-3.34)	3.37 (2.74-4.09)	4.38 (3.55-5.34)	5.22 (4.20-6.41)	6.38 (4.96-8.25)	7.23 (5.51-9.59)	8.16 (6.04-11.3)	9.30 (6.40-13.0)	11.1 (7.29-16.1)	12.6 (8.07-18.6)
2-day	3.09 (2.54-3.73)	3.86 (3.16-4.65)	5.10 (4.17-6.18)	6.14 (4.98-7.48)	7.56 (5.94-9.74)	8.61 (6.62-11.4)	9.76 (7.31-13.5)	11.2 (7.75-15.8)	13.5 (8.94-19.5)	15.5 (10.0-22.9)
3-day	3.37 (2.78-4.04)	4.19 (3.45-5.03)	5.53 (4.54-6.67)	6.64 (5.42-8.06)	8.18 (6.45-10.5)	9.30 (7.18-12.2)	10.5 (7.92-14.5)	12.1 (8.39-16.8)	14.6 (9.68-21.0)	16.8 (10.8-24.6)
4-day	3.63 (3.01-4.34)	4.48 (3.71-5.37)	5.87 (4.84-7.06)	7.03 (5.75-8.49)	8.62 (6.81-11.0)	9.78 (7.57-12.8)	11.1 (8.32-15.2)	12.7 (8.80-17.5)	15.2 (10.1-21.8)	17.4 (11.3-25.5)
7-day	4.38 (3.65-5.20)	5.28 (4.39-6.28)	6.75 (5.60-8.06)	7.97 (6.56-9.57)	9.65 (7.66-12.2)	10.9 (8.45-14.1)	12.2 (9.20-16.6)	13.9 (9.69-19.0)	16.4 (10.9-23.3)	18.6 (12.0-26.9)
10-day	5.09 (4.26-6.02)	6.02 (5.03-7.13)	7.54 (6.27-8.96)	8.80 (7.27-10.5)	10.5 (8.38-13.2)	11.8 (9.19-15.2)	13.2 (9.91-17.7)	14.8 (10.4-20.3)	17.3 (11.6-24.5)	19.3 (12.6-28.0)
20-day	7.18 (6.05-8.42)	8.17 (6.88-9.60)	9.80 (8.22-11.6)	11.1 (9.28-13.2)	13.0 (10.4-16.1)	14.4 (11.2-18.2)	15.9 (11.9-20.8)	17.5 (12.3-23.6)	19.7 (13.2-27.6)	21.4 (14.0-30.8)
30-day	8.91 (7.56-10.4)	9.96 (8.43-11.6)	11.7 (9.83-13.7)	13.1 (10.9-15.4)	15.0 (12.0-18.4)	16.5 (12.9-20.7)	18.0 (13.5-23.3)	19.5 (13.8-26.3)	21.6 (14.6-30.1)	23.2 (15.1-33.0)
45-day	11.1 (9.45-12.9)	12.2 (10.4-14.2)	14.0 (11.8-16.3)	15.5 (13.0-18.2)	17.5 (14.1-21.3)	19.1 (14.9-23.7)	20.7 (15.4-26.5)	22.1 (15.7-29.6)	24.0 (16.2-33.3)	25.3 (16.6-36.0)
60-day	12.9 (11.0-15.0)	14.1 (12.0-16.3)	15.9 (13.5-18.6)	17.5 (14.8-20.5)	19.6 (15.8-23.8)	21.3 (16.7-26.3)	22.9 (17.1-29.1)	24.3 (17.3-32.4)	26.0 (17.7-36.0)	27.1 (17.8-38.4)

[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.

Manning's Roughness Coefficients ("n")

Conduit	Manning's Coefficients
Closed Conduits	
Asbestos-Cement Pipe	0.011 to 0.015
Brick	0.013 to 0.017
Cast Iron Pipe	
Cement-lined and seal-coated	0.011 to 0.015
Concrete (Monolithic)	
Smooth forms	0.012 to 0.014
Rough forms	0.015 to 0.017
Concrete Pipe	0.011 to 0.015
Corrugated-Metal Pipe (1/2 - STUL 34470 2 1/2-inch corrgtn.)	
Plain	0.022 to 0.026
Paved invert	0.018 to 0.022
Spun asphalt-lined	0.011 to 0.015
Plastic Pipe (Smooth)	0.011 to 0.015
Vitrified Clay	
Pipes	0.011 to 0.015
Liner channels	0.013 to 0.017
Open Channels	
Lined Channels	
Asphalt	0.013 to 0.017
Brick	0.012 to 0.018
Concrete	0.011 to 0.020
Rubble or riprap	0.020 to 0.035
Vegetal	0.030 to 0.040
Excavated or Dredged	
Earth, straight and uniform	0.020 to 0.030
Earth, winding, fairly uniform	0.025 to 0.040
Rock	0.030 to 0.045
Unmaintained	0.050 to 0.140
Natural Channels (minor streams, top width at flood state < 100 feet)	
Fairly regular section	0.030 to 0.070
Irregular section with pools	0.040 to 0.100

Source: Design and Construction of Sanitary and Storm Sewers, American Society of Civil Engineers and the Water Pollution Control Federation, 1969.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Norfolk and Suffolk Counties, Massachusetts

444 East Central Street

November 29, 2023

Preface

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

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

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

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

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

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

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

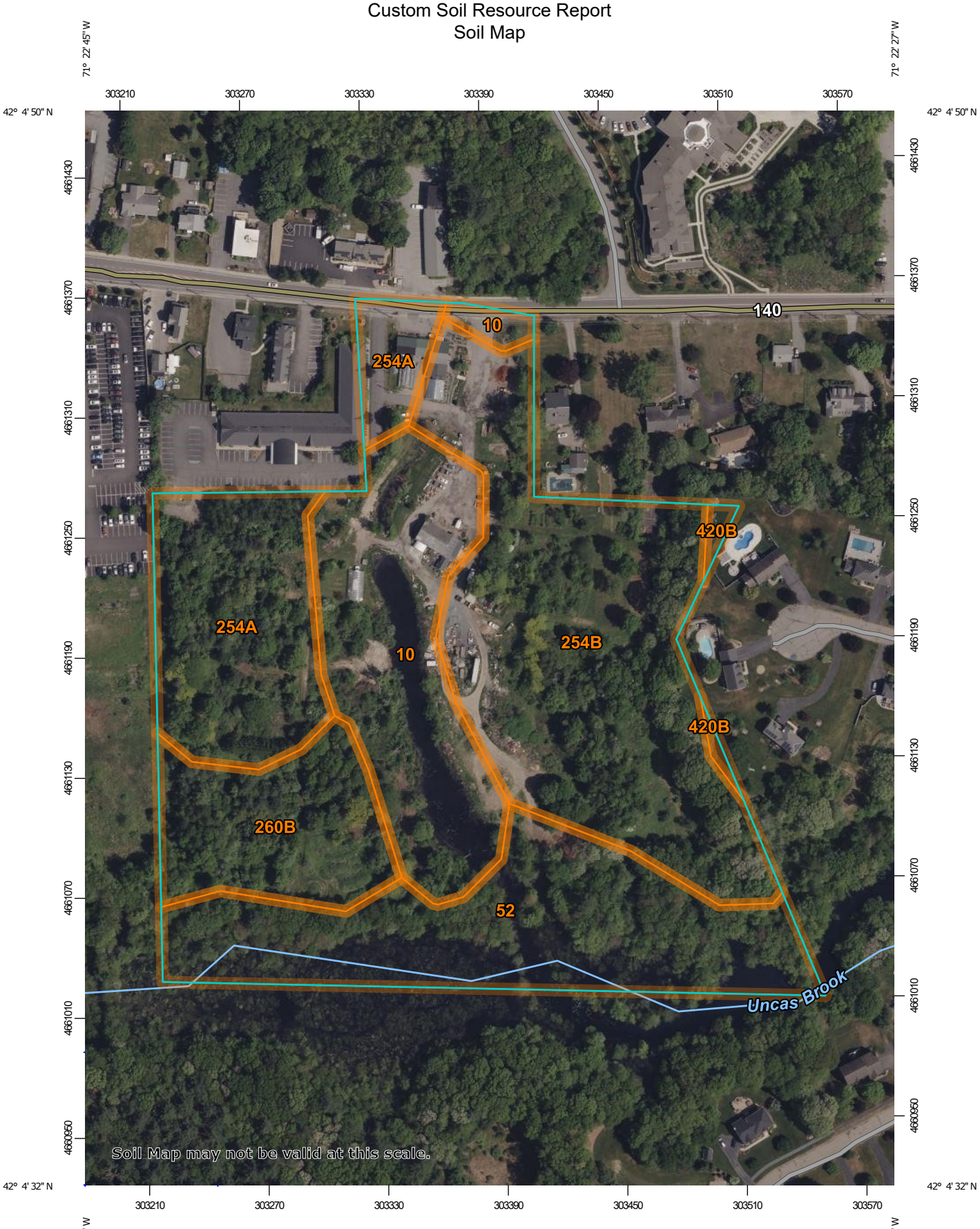
After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:2,620 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

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

MAP LEGEND

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

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

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

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
Survey Area Data: Version 19, Sep 10, 2023

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
10	Scarboro and Birdsall soils, 0 to 3 percent slopes	3.7	18.8%
52	Freetown muck, 0 to 1 percent slopes	4.3	21.8%
254A	Merrimac fine sandy loam, 0 to 3 percent slopes	3.3	16.4%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	6.3	31.9%
260B	Sudbury fine sandy loam, 2 to 8 percent slopes	2.1	10.5%
420B	Canton fine sandy loam, 3 to 8 percent slopes	0.1	0.6%
Totals for Area of Interest		**19.8**	**100.0%**

Map Unit Descriptions

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

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

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

was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

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

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

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

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

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

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

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

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

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

Norfolk and Suffolk Counties, Massachusetts

10—Scarboro and Birdsall soils, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: vkxw
Elevation: 0 to 2,100 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Scarboro and similar soils: 65 percent
Birdsall and similar soils: 25 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scarboro

Setting

Landform: Terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Loose sandy glaciofluvial deposits

Typical profile

H1 - 0 to 9 inches: mucky fine sandy loam
H2 - 9 to 60 inches: stratified loamy fine sand to gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Low (about 5.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Ecological site: F144AY031MA - Very Wet Outwash
Hydric soil rating: Yes

Description of Birdsall

Setting

Landform: Terraces
Landform position (two-dimensional): Toeslope

Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Soft coarse-silty glaciolacustrine deposits

Typical profile

H1 - 0 to 8 inches: very fine sandy loam
H2 - 8 to 16 inches: very fine sandy loam
H3 - 16 to 60 inches: silt loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 12.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: C/D
Ecological site: F144AY031MA - Very Wet Outwash
Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 5 percent
Landform: Bogs
Hydric soil rating: Yes

Raynham

Percent of map unit: 3 percent
Landform: Depressions
Hydric soil rating: Yes

Walpole

Percent of map unit: 2 percent
Landform: Terraces
Hydric soil rating: Yes

52—Freetown muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2t2q9
Elevation: 0 to 1,110 feet

Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Freetown and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freetown

Setting

Landform: Depressions, depressions, swamps, kettles, marshes, bogs
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material

Typical profile

Oe - 0 to 2 inches: mucky peat
Oa - 2 to 79 inches: muck

Properties and qualities

Slope: 0 to 1 percent
Surface area covered with cobbles, stones or boulders: 0.0 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water supply, 0 to 60 inches: Very high (about 19.2 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: B/D
Ecological site: F144AY043MA - Acidic Organic Wetlands
Hydric soil rating: Yes

Minor Components

Scarboro

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Swansea

Percent of map unit: 5 percent

Landform: Bogs, swamps, marshes, depressions, depressions, kettles
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

254A—Merrimac fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2tyqr
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Merrimac and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

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

Typical profile

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

Properties and qualities

Slope: 0 to 3 percent

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

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Crest, side slope, head slope, nose slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Agawam

Percent of map unit: 3 percent
Landform: Stream terraces, outwash terraces, outwash plains, moraines, eskers, kames
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 2 percent
Landform: Dunes, deltas, outwash terraces, outwash plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread, riser
Down-slope shape: Convex, linear
Across-slope shape: Convex, linear

Hydric soil rating: No

254B—Merrimac fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tyqs
Elevation: 0 to 1,290 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Merrimac and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Merrimac

Setting

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

Typical profile

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

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum content: 2 percent
Maximum salinity: Nonsaline (0.0 to 1.4 mmhos/cm)
Sodium adsorption ratio, maximum: 1.0
Available water supply, 0 to 60 inches: Low (about 4.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Sudbury

Percent of map unit: 5 percent
Landform: Deltas, terraces, outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Tread, dip
Down-slope shape: Concave
Across-slope shape: Linear
Hydric soil rating: No

Hinckley

Percent of map unit: 5 percent
Landform: Deltas, kames, eskers, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Crest, side slope, head slope, nose slope, rise
Down-slope shape: Convex
Across-slope shape: Convex, linear
Hydric soil rating: No

Windsor

Percent of map unit: 3 percent
Landform: Outwash terraces, dunes, deltas, outwash plains
Landform position (two-dimensional): Shoulder
Landform position (three-dimensional): Tread, riser
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Outwash plains, outwash terraces, moraines, stream terraces, eskers, kames
Landform position (three-dimensional): Rise
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

260B—Sudbury fine sandy loam, 2 to 8 percent slopes

Map Unit Setting

National map unit symbol: vky4

Elevation: 0 to 2,100 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

Sudbury and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sudbury

Setting

Landform: Outwash plains
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Riser
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable coarse-loamy eolian deposits over loose sandy glaciofluvial deposits

Typical profile

H1 - 0 to 11 inches: sandy loam
H2 - 11 to 22 inches: sandy loam
H3 - 22 to 60 inches: gravelly coarse sand

Properties and qualities

Slope: 2 to 8 percent
Depth to restrictive feature: 18 to 36 inches to strongly contrasting textural stratification
Drainage class: Moderately well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: About 18 to 36 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: B
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Hydric soil rating: No

Deerfield

Percent of map unit: 5 percent
Landform: Outwash plains
Landform position (two-dimensional): Footslope

Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: No

Walpole

Percent of map unit: 5 percent
Landform: Terraces
Hydric soil rating: Yes

420B—Canton fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2w81b
Elevation: 0 to 1,180 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: All areas are prime farmland

Map Unit Composition

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

Description of Canton

Setting

Landform: Hills, moraines, ridges
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Crest, nose slope, side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Parent material: Coarse-loamy over sandy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Ap - 0 to 7 inches: fine sandy loam
Bw1 - 7 to 15 inches: fine sandy loam
Bw2 - 15 to 26 inches: gravelly fine sandy loam
2C - 26 to 65 inches: gravelly loamy sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 19 to 39 inches to strongly contrasting textural stratification
Drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: Very low (about 2.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: B
Ecological site: F144AY034CT - Well Drained Till Uplands
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 10 percent
Landform: Hills, drumlins, ground moraines
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Montauk

Percent of map unit: 5 percent
Landform: Moraines, ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Charlton

Percent of map unit: 4 percent
Landform: Ridges, ground moraines, hills
Landform position (two-dimensional): Summit, shoulder, backslope
Landform position (three-dimensional): Crest, side slope
Down-slope shape: Convex, linear
Across-slope shape: Convex
Hydric soil rating: No

Swansea

Percent of map unit: 1 percent
Landform: Marshes, depressions, bogs, swamps, kettles
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

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Commonwealth of Massachusetts
City/Town of Franklin

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

A. Facility Information

TAG Central LLC
Owner Name

444 E Central Street
Street Address

284-066-000-000
Map/Lot #

Franklin
City

MA
State

02038
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey — Web Soil Survey (Source); 254B (Soil Map Unit); Merrimac fine sandy loam 3-8% slopes (Soil Series)

Kames, outwash plais, outwash terraces, moraines, eskers
Landform

Somewhat excessively drained.
Soil Limitations

loamy glaciofluvial deposits derived from granite, shcist and gneiss.
Soil Parent material

3. Surficial Geological Report — 2018 / Stone, Stone, & DiGiacomo-Cohen (Year Published/Source); Coarse Deposits (Map Unit)

consist of gravel deposits, sand and gravel deposits, and sand deposits
Description of Geologic Map Unit:

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

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☒ Yes ☐ No — If yes, MassGIS Wetland Data Layer: Shrub Swamp (Wetland Type)

7. Current Water Resource Conditions (USGS): 12/17/2023 (Month/Day/ Year) Range: ☒ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed: (Zone II, IWPA, Zone A, EEA Data Portal, etc.)
Not in Zone A or IWPA zones.
Is within Zone II area.

Commonwealth of Massachusetts
City/Town of Franklin

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

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

Deep Observation Hole Number: STP-1 (Hole #) | 12/6/2023 (Date) | 9:30 (Time) | Cloudy (Weather) | 42.079070 (Latitude) | -71.377240 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Landscaped area and small trees (Vegetation) | some stones nearby (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-3 (Slope (%))

Description of Location: Lawn area near entrance of site.

2. Soil Parent Material: Loamy glaciofluvial deposits | Outwash Terrace (Landform) | TS (Position on Landscape (SU, SH, BS, FS, TS, Plain))

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

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

5. Groundwater Observed: ☒ Yes ☐ No If yes: 27" Depth to Weeping in Hole 84" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-5	A	FSL	10YR 3/2	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	
5-13	C1	Coarse Sand	10YR 5/2	-	Cnc :- Dpl: -	-	15-35	15-35	S. Grain	Loose	stones, few cobbles
13-20	C2	Medium-Coarse Sand	10YR 5/4	-	Cnc :- Dpl: -	-	15-35	-	S. Grain	Loose	
20-114	C3	Fine Loamy Sand	10YR 7/1	22"	Cnc :7.5YR 5/8 Dpl: GLEY1 6/10Y	2%	15-35	15-35	S. Grain	Loose	Bouldery
					Cnc : Dpl:						
					Cnc : Dpl:						

Commonwealth of Massachusetts
City/Town of Franklin

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

Additional Notes:

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

Deep Observation Hole Number: STP-2 (Hole #) | 12/6/2023 (Date) | 10:55 (Time) | Cloudy (Weather) | 42.079070 (Latitude) | -71.377240 (Longitude)

1. Land Use: Vacant lot (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.) | 0-3 (Slope (%)

Description of Location: NW of STP-3, South of STP-1.

2. Soil Parent Material: Loamy glaciofluvial deposits | Outwash Terraces (Landform) | TS (Position on Landscape (SU, SH, BS, FS, TS, Plain)

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

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

5. Groundwater Observed: ☒ Yes ☐ No If yes: 40" Depth to Weeping in Hole 108" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-6	A	FSL	10YR 3/1	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	
6-37	Ab	Medium Loamy Sand	10YR 4/1	-	Cnc :- Dpl: -	-	15-35	-	S. Grain	Loose	
37-114	C1	Fine Loamy Sand	10YR 7/1	40"	Cnc :7.5YR 5/8 Dpl: GLEY1 6/10Y	2%	15-35	15-35	S. Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):

	Obs. Hole #STP-1	Obs. Hole #STP-2
☒ Depth to soil redoximorphic features	22 inches	40 inches
☐ Depth to observed standing water in observation hole	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number _____ Reading Date _____

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

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

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

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

   ☒ Yes ☐ No

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 6 inches Lower boundary: 114 inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

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

F. Certification

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

	12/18/2023
Signature of Soil Evaluator	Date
Carlton Quinn, PE	June 30, 2024
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Name of Approving Authority Witness	Approving Authority

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

Field Diagrams: Use this area for field diagrams:

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

Commonwealth of Massachusetts
City/Town of Franklin

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

A. Facility Information

TAG Central LLC
Owner Name

444 E Central Street
Street Address

284-066-000-000
Map/Lot #

Franklin
City

MA
State

02038
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey — Web Soil Survey (Source); 254B (Soil Map Unit); Merrimac fine sandy loam 3-8% slopes (Soil Series)

Kames, outwash plais, outwash terraces, moraines, eskers
Landform

Somewhat excessively drained.
Soil Limitations

loamy glaciofluvial deposits derived from granite, shcist and gneiss.
Soil Parent material

3. Surficial Geological Report — 2018 / Stone, Stone, & DiGiacomo-Cohen (Year Published/Source); Coarse Deposits (Map Unit)

consist of gravel deposits, sand and gravel deposits, and sand deposits
Description of Geologic Map Unit:

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

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☒ Yes ☐ No — If yes, MassGIS Wetland Data Layer: Shrub Swamp (Wetland Type)

7. Current Water Resource Conditions (USGS): 12/17/2023 (Month/Day/ Year) Range: ☒ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed: (Zone II, IWPA, Zone A, EEA Data Portal, etc.)
Not in Zone A or IWPA zones.
Is within Zone II area.

Commonwealth of Massachusetts
City/Town of Franklin

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

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

Deep Observation Hole Number: STP-3 (Hole #) | 12/6/2023 (Date) | 2:33 (Time) | Cloudy (Weather) | 42.079070 (Latitude) | -71.377240 (Longitude)

1. Land Use: Vacant Lot (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | Crushed stone nearby (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-3 (Slope (%))

Description of Location: SE of STP-2, NW of STP-4

2. Soil Parent Material: Loamy glaciofluvial deposits | outwash terrace (Landform) | TS (Position on Landscape (SU, SH, BS, FS, TS, Plain))

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

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

5. Groundwater Observed: ☒ Yes ☐ No If yes: 101" Depth to Weeping in Hole - Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-7	A	Fine Sandy Loam	10YR 3/2	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	
7-24	Ab	Coarse Sandy Loam	10YR 5/2	-	Cnc :- Dpl: -	-	15-35	-	Massive	Friable	Fill Layer
24-45	Ab2	Sandy Loam	10YR 2/1	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	Fill Layer
45-112	C	Fine Loamy Sand	10YR 7/1	45"	Cnc :7.5YR 5/8 Dpl: GLEY1 6/10Y	2%	15-35	15-35	S. Grain	Loose	Boulder at 112"
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of Franklin

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

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

Deep Observation Hole Number: STP-4 (Hole #) | 12/6/2023 (Date) | 12:05 (Time) | Cloudy (Weather) | 42.079070 (Latitude) | -71.377240 (Longitude)

1. Land Use: Vacant Lot (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | Some Stones (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-3 (Slope (%))

Description of Location: SE of STP-3

2. Soil Parent Material: Loamy glaciofluvial deposits | outwash terrace (Landform) | TS (Position on Landscape (SU, SH, BS, FS, TS, Plain))

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

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

5. Groundwater Observed: ☒ Yes ☐ No If yes: 72" Depth to Weeping in Hole 107" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-4	A	FSL	10YR 3/2	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	
4-29	Ab	SL	10YR3/3	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	Fill Layer
29-37	C1	Fine Sand	10YR 5/3	-	Cnc :- Dpl: -	-	-	-	S. Grain	Loose	
37-38	Ab2	FSL	10YR 3/2	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	
38-46	C2	Sand	10YR 5/2	-	Cnc :- Dpl: -	-	15-35	15-35	S. Grain	Loose	
46-120	2C	FLS	10YR 7/1	72"	Cnc :7.5YR 5/8 Dpl: GLEY1 6/10Y	2%	15-35	15-35	Massive	Friable	

Additional Notes:

Commonwealth of Massachusetts
City/Town of Franklin

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

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):	Obs. Hole #STP-3	Obs. Hole #STP-4
☒ Depth to soil redoximorphic features	45 inches	72 inches
☐ Depth to observed standing water in observation hole	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

_____ Index Well Number _____ Reading Date

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

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

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

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

      ☒ Yes ☐ No

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 45 inches Lower boundary: 112 inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Franklin

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

F. Certification

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

	12/18/2023
Signature of Soil Evaluator	Date
Carlton Quinn, PE	June 30, 2024
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Name of Approving Authority Witness	Approving Authority

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

Field Diagrams: Use this area for field diagrams:

Commonwealth of Massachusetts
City/Town of Franklin

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

A. Facility Information

TAG Central LLC
Owner Name

444 E Central Street
Street Address

284-066-000-000
Map/Lot #

Franklin
City

MA
State

02038
Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade

2. Soil Survey — Web Soil Survey (Source); 254B (Soil Map Unit); Merrimac fine sandy loam 3-8% slopes (Soil Series)

Kames, outwash plais, outwash terraces, moraines, eskers
Landform

Somewhat excessively drained.
Soil Limitations

loamy glaciofluvial deposits derived from granite, shcist and gneiss.
Soil Parent material

3. Surficial Geological Report — 2018 / Stone, Stone, & DiGiacomo-Cohen (Year Published/Source); Coarse Deposits (Map Unit)

consist of gravel deposits, sand and gravel deposits, and sand deposits
Description of Geologic Map Unit:

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

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☒ Yes ☐ No — If yes, MassGIS Wetland Data Layer: Shrub Swamp (Wetland Type)

7. Current Water Resource Conditions (USGS): 12/17/2023 (Month/Day/ Year) Range: ☒ Above Normal ☐ Normal ☐ Below Normal

8. Other references reviewed: (Zone II, IWPA, Zone A, EEA Data Portal, etc.)
Not in Zone A or IWPA zones.
Is within Zone II area.

Commonwealth of Massachusetts
City/Town of Franklin

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

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

Deep Observation Hole Number: STP-5 (Hole #) | 12/6/2023 (Date) | 1:20 (Time) | Cloudy (Weather) | 42.079070 (Latitude) | -71.377240 (Longitude)

1. Land Use: Vacant Lot (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | Some stones, light boulders (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 3-8 (Slope (%))

Description of Location: SW of STP-1.

2. Soil Parent Material: Loamy glaciofluvial deposits | outwash terrace (Landform) | TS (Position on Landscape (SU, SH, BS, FS, TS, Plain))

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

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

5. Groundwater Observed: ☒ Yes ☐ No If yes: 48" Depth to Weeping in Hole | 107" Depth to Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-12	A	FSL	10YR 3/2	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	
12-107	C	FLS	10YR 7/1	48"	Cnc :7.5YR 5/8 Dpl: GLEY1 6/10Y	2%	-	-	S. Grain	Loose	
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of Franklin

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

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

Deep Observation Hole Number: STP-6 (Hole #) | 12/6/2023 (Date) | 3:15 (Time) | Cloudy (Weather) | 42.079070 (Latitude) | -71.377240 (Longitude)

1. Land Use: Vacant Lot (e.g., woodland, agricultural field, vacant lot, etc.) | Trees (Vegetation) | N/A (Surface Stones (e.g., cobbles, stones, boulders, etc.)) | 0-3 (Slope (%))

Description of Location: West side of stream, near dry vegetation patch.

2. Soil Parent Material: Loamy glaciofluvial deposits | outwash terrace (Landform) | TS (Position on Landscape (SU, SH, BS, FS, TS, Plain))

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

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

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

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-8	A	SL	10YR 3/2	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	
8-24	Bw	SL	5YR 5/6	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	
24-31	C	Coarse Sand	10YR 5/3	24"	Cnc :- Dpl: -	-	-	-	S. Grain	Loose	
31-40	Bw2	SL	5YR 5/8	-	Cnc :- Dpl: -	-	-	-	Massive	Friable	
40-114	2C	LS	GLEY1 6/10Y	-	Cnc :- Dpl: -	-	-	-	S. Grain	Loose	
					Cnc : Dpl:						

Additional Notes:

Commonwealth of Massachusetts
City/Town of Franklin

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

D. Determination of High Groundwater Elevation

1. Method Used (Choose one):	Obs. Hole #STP-5	Obs. Hole #STP-6
☒ Depth to soil redoximorphic features	48 inches	24" inches
☐ Depth to observed standing water in observation hole	_____ inches	_____ inches
☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)	_____ inches	_____ inches

Index Well Number _____ Reading Date _____

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

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

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

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

      ☒ Yes ☐ No

   b. If yes, at what depth was it observed (exclude O, A, and E Horizons)? Upper boundary: 12 inches Lower boundary: 114 inches

   c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches

Commonwealth of Massachusetts
City/Town of Franklin

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

F. Certification

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

	12/18/2023
Signature of Soil Evaluator	Date
Carlton Quinn, PE	June 30, 2024
Typed or Printed Name of Soil Evaluator / License #	Expiration Date of License
Name of Approving Authority Witness	Approving Authority

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

Field Diagrams: Use this area for field diagrams:

Illicit Discharge Compliance Statement

Responsibility:

The Owner is responsible for ultimate compliance with all provisions of the Massachusetts Stormwater Management Policy, the USEPA NPDES Construction General Permit and responsible for identifying and eliminating illicit discharges (as defined by the USEPA).

OWNER NAME: TAG Central LLC

ADDRESS: 1070 E Indiantown Rd.

Jupiter, FL 33477

TEL. NUMBER: (561) 685-5336

Engineer's Compliance Statement:

To the best of my knowledge, the attached plans, computations and specifications meet the requirements of Standard 10 of the Massachusetts Stormwater Handbook regarding illicit discharges to the stormwater management system and that no detectable illicit discharges exist on the site. All documents and attachments were prepared under my direction and qualified personnel properly gathered and evaluated the information submitted, to the best of my knowledge.

Included with this statement are site plans, drawn to scale, that identify the location of systems for conveying stormwater on the site and show that these systems do not allow the entry of any illicit discharges into the stormwater management system. The plans also show any systems for conveying wastewater and/or groundwater on the site and show that there are no connections between the stormwater and wastewater systems.

For a redevelopment project (if applicable), all actions taken to identify and remove illicit discharges, including without limitation, visual screening, dye or smoke testing, and the removal of any sources of illicit discharges to the stormwater management system are documented and included with this statement.