STORMWATER MANAGEMENT REPORT

Assisted Living Residence

361 Main Street
Medfield, Massachusetts

Prepared for:

LCB SENIOR LIVING
Independent & Assisted Living • Reflections Memory Care

LCB Senior Living
3 Edge Water Drive
Norwood, MA 02062

Presented by:

BEALS + THOMAS
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August 17, 2015

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8/17/2015

217704RP001

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1.0 INTRODUCTION

The proposed assisted living residence includes a stormwater management system designed to mitigate potential impacts the proposed project could have on the existing watershed. Stormwater controls have been proposed to control peak runoff rates, provide water quality, promote groundwater recharge and sediment removal. The proposed system has been designed to comply with:

- The 2008 Massachusetts Department of Environmental Protection (DEP) Stormwater Management Handbook,
- The Massachusetts Wetland Protection Act (310 CMR 10.00),
- Town of Medfield Wetlands Bylaw, and
- Town of Medfield Board of Health Regulations for Storm Water and Runoff Management

The pre- and post-development hydrologic conditions were modeled using HydroCAD™ version 10.00 to demonstrate that post-development stormwater runoff rates will be less than or equal to the pre-development rates. Watershed maps with soil types as well as detailed analysis of the model results are also included. The following tables summarizes the peak runoff rates and volumes for the pre- and post-development conditions.

Table 1: Pre- & Post-development Peak Runoff Rate Comparison, units are in cubic feet per second (cfs).

Storm Event	Design Point 1	
	Pre	Post
1 Year	*0.00*	0.00
2 Year	*0.01*	0.00
10 Year	*0.08*	0.08
50 Year	*1.18*	1.14
100 Year	*2.39*	2.32

Table 2: Pre- & Post-development Runoff Volume Comparison, units are in acre-feet.

Storm Event	Design Point 1	
	Pre	Post
1 Year	*0.001*	0.000
2 Year	*0.002*	0.001
10 Year	*0.044*	0.037
50 Year	*0.239*	0.192
100 Year	*0.384*	0.334

2.0 PRE-DEVELOPMENT CONDITIONS

2.1 Site Conditions

The Property is primarily undeveloped land forested with mixed-hardwoods, located off of Main Street/Route 109. A large portion of the Property is subject to Conservation Restrictions where no construction is allowed. The portion of the property on which the development is proposed (The Site) is located on several existing smaller lots. One of the existing lots has a single family house with a driveway and frontage on Main Street/Route 109.

Runoff from the site currently drains to 2 primary locations, the Vine Book and a catch basin in the Route 109 right-of-way which then drains to the Vine Brook based on Medfield GIS data. These design points have been named correspondingly in the hydrologic analyses.

There is a potential vernal pool located on the property to the northeast of the proposed development. No work is being proposed within 100-feet of the pool limit and no stormwater runoff from the proposed development discharges to the potential vernal pool.

2.2 Soil Description

The Natural Resources Conservation Service (NRCS) lists the on-site soils as Hinckley sandy loam, an excessively drained soil. Generally, this soil is located in outwash and flood plains, and has parent material described as loose sandy and gravelly glaciofluvial deposits. NRCS classifies this type of soil as hydrologic class A soil.

A Certified Soil Evaluator from Beals and Thomas conducted soil test pits on March 19th, 2015 to verify the NRCS classification. Four deep hole test pits and a falling head permeability test were performed onsite. The onsite soil testing confirmed the sandy outwash parent material. The location of the test pits are shown on the Topographic Plan. The test pit logs and permeability test results are included in Appendix A.

Groundwater was encountered in two of the four test pits conducted. The groundwater elevation was approximately consistent between the two test pits where it was observed. In the other two test pits the excavation was stopped above the observed groundwater elevation. Seasonal high groundwater is estimated to be at elevation 177.6' based on soil mottling.

In addition to the soil testing conducted for stormwater BMPs, soil test pits were conducted for the design of the building foundation by a representative from McPhail Associates. Test pits were conducted on August 8, 2014. The soils described in the test pit logs appear to be consistent with the Beals and Thomas soil descriptions. Bedrock was not encountered in any of the test pits that were conducted onsite. The Foundation Engineering Report prepared by McPhail Associates is included in Appendix A.

2.3 Hydrologic Analysis

Sub-catchment areas were delineated based on existing runoff patterns and topographic information. This information is shown on the *Pre-Development Conditions Hydrologic Areas Map* included in Appendix B. Summaries of each area with respect to Curve Number and Time of Concentration calculations can be found in the model results also in Appendix B.

3.0 POST-DEVELOPMENT CONDITIONS

3.1 Design Strategy

During the design phase of the site layout, consideration was given to conserving environmentally sensitive features and minimizing impact on the existing hydrology. On-site resource areas, such as the vegetated wetlands bordering the Vine Brook and the potential vernal pool were excluded from the development envelope and will not be altered by the proposed project.

A stormwater management system has been designed to provide treatment for stormwater runoff associated with the proposed impervious surfaces on site. The stormwater system was designed to capture and treat the runoff generated from a 2-inch storm event by the on-site impervious areas. Proprietary stormwater treatment systems were designed to treat the runoff rate associated with the water quality volume in accordance with the requirements of the DEP Stormwater Handbook. Stormwater BMP sizing worksheets and water quality sizing calculations are included in Appendix E of this report.

To recharge groundwater and mitigate increased stormwater flow rates associated with the proposed impervious area, a subsurface infiltration system has been proposed. The infiltration chambers have been sited in the southwest corner of the site. Based on the data presented in the subsurface soil testing the estimated seasonal high groundwater in this location is 4-feet below the bottom of the subsurface infiltration system. The infiltration system will discharge to the Vine Brook wetland system, consistent with the existing hydrology of the site.

3.2 Hydrologic Analysis

The established design points used in the pre-development conditions analysis were used in the post-development analysis for direct comparison. The tributary areas and flow paths were modified to reflect post-development conditions. See Appendix C for the *Post- Development Conditions Hydrologic Areas Map*. Summaries of each area with respect to Curve Number and Time of Concentration calculations can be found in the model results in Appendix C.

3.3 Stormwater Management Controls Sizing

Infiltration Chambers

The proposed stormwater infiltration system consists of Cultec Recharger 280HD chambers with a stone base. CDS® and Vortsentry® water quality treatment units have been proposed upgradient of the infiltration chambers to provide pretreatment and prevent clogging of the infiltration system. The water quality treatment units have been sized to treat the first 1-inch of stormwater runoff from impervious areas onsite. The infiltration system has been designed with multiple outlets positioned above the bottom of the chambers, requiring the infiltration chambers to partially fill up prior to discharging.

The infiltration system was sized using the Static Method, as described in Chapter 3 of the Massachusetts Stormwater Handbook, using a Rawl's exfiltration rate of 8.27 inches per hour. The system has been designed to meet the required recharge volume, and will fully dewater within 72 hours. A mounding analysis was performed showing that there will be greater than a 2 foot separation between the bottom of the infiltration system and the groundwater mound during a 2-year storm event. The mounding analysis can be found in Appendix C.

3.4 Hydraulic Calculations

The proposed storm drain system was analyzed based on the 25-year storm event using the Rational Formula. A watershed map and detailed hydraulic analysis are provided in Appendix D.

3.5 Compliance with DEP Stormwater Management Standards

The proposed stormwater management system was designed in compliance with the ten (10) DEP Stormwater Management Standards. The following summary provides key information related to the proposed stormwater management system, its design elements, and mitigation measures for potential impacts.

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

There will be no direct discharge of untreated stormwater to nearby wetlands or waters of the Commonwealth. Runoff from all impervious areas of the site will be conveyed to stormwater management controls for infiltration, water quality treatment, and runoff rate attenuation prior to discharge to adjacent wetlands.

STANDARD 2: **Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.**

The stormwater management design will control post-development peak discharge rates for the 1-, 2-, 10-, 50- and 100-year, 24-hour storms so as to maintain pre-development peak discharge rates. Refer to Section 1.0 Introduction for a summary of the peak runoff rates.

STANDARD 3: **Loss of annual recharge to groundwater shall be eliminated or minimized through the use of environmentally sensitive site design, low impact development techniques, stormwater 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 types. 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 stormwater management system includes a subsurface infiltration system that will effectively recharge groundwater on-site. Infiltration BMPs were sized using the static method based on the required recharge volume for the post-development site. As a result, annual recharge from the post-development site will approximate the annual recharge from the site under pre-development conditions. See Appendix E for stormwater BMP design worksheets and Groundwater Recharge Calculation.

STANDARD 4: **Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).**

The proposed project will meet the water quality requirements of Standard 4 using a subsurface infiltration system that achieve 80% TSS removal. Refer to Appendix E for the TSS removal worksheets. Structural BMPs that provide pretreatment for the subsurface infiltration system, including the deep sump hooded catch basins, CDS® and Vortsentry® water quality treatment systems. The proprietary treatment structures were sized to capture and treat the flow rate associated with the first 1.0-inch of runoff from proposed impervious surfaces. All proposed stormwater management BMPs will be operated and maintained to ensure continued water quality treatment of runoff. The Site Owner's Manual complies with the Long-Term Pollution Prevention Plan (Standard 4) and the Long-Term Operation and Maintenance Plan (Standard 9) requirements of the 2008 Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards. The Manual outlines source control and pollution prevention measures and maintenance requirements of stormwater best management practices (BMPs) associated with the proposed development.

STANDARD 5: **For land uses with higher potential pollutant loads (LUHPPLs), 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.**

The proposed project is not associated with stormwater discharges from land uses with higher potential pollutant loads.

STANDARD 6: **Stormwater discharges to critical areas must utilize certain stormwater management BMPs approved for critical areas. Critical areas are Outstanding Resource Waters, shellfish beds, swimming beaches, coldwater fisheries and recharge areas for public water supplies.**

The project site is location within the Medfield Secondary Aquifer Zone (Zone II) and there is a potential vernal pool located near the project site. Runoff from proposed impervious areas will be treated by a subsurface infiltration system which is an approved BMP for use in a Zone II and near vernal pools. The subsurface infiltration system is designed to treat greater than 1-inch of runoff from impervious areas. Proprietary structures will provide pretreatment for the subsurface infiltration system. In addition, no stormwater runoff from the proposed development will be discharged tributary to the vernal pool.

STANDARD 7: **Redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.**

Although a portion of the site was previously developed, this standard does not apply because the proposed project includes an increase in impervious area.

STANDARD 8: **A plan to control construction-related impacts during 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 draft Stormwater Pollution Prevention Plan (SWPPP) has been developed to comply with Section 3 of the NPDES Construction General Permit for Stormwater Discharges; therefore the requirements of Standard 8 are fulfilled.

STANDARD 9: **A Long-Term Operation and Maintenance (O&M) Plan shall be developed and implemented to ensure that stormwater management systems function as designed.**

The Site Owner's Manual complies with the Long-Term Pollution Prevention Plan (Standard 4) and the Long-Term Operation and Maintenance Plan (Standard 9) requirements of the 2008 Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards. The Manual outlines source control and pollution prevention measures and maintenance requirements of the stormwater best management practices (BMPs) associated with the proposed development.

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

There will be no illicit discharges to the proposed stormwater management system associated with the proposed project. An Illicit Discharge Compliance Statement is provided on the following page.

3.6 Illicit Discharge Compliance Statement

An illicit discharge is any discharge to a municipal separate storm sewer that is not comprised entirely of stormwater, discharges from fire-fighting activities, and certain non-designated non-stormwater discharges.

To the best of my knowledge, no detectable illicit discharge exists on site. The site plans included with this report detail the storm sewers that convey stormwater on the site and demonstrate that these systems do not include the entry of an illicit discharge. A Site Owner's Manual is also included, which contains the Long Term Pollution Plan that outlines measures to prevent future illicit discharges. As the Site Owner, I will ultimately be responsible for implementing the Long Term Pollution Prevention Plan.

Signature: _____

Owner's Name

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LCB

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Owner's Name

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

Checklist for Stormwater Report

A. Introduction

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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

8/17/2013
Signature and Date

Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

☒ is within the Zone II or Interim Wellhead Protection Area

☒ is near or to other critical areas

☒ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)

☐ involves runoff from land uses with higher potential pollutant loads.

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

☒ The ½" or 1" Water Quality Volume or

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

☐ Limited Project

☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.

☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area

☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff

☐ Bike Path and/or Foot Path

☐ Redevelopment Project

☐ Redevelopment portion of mix of new and redevelopment.

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

☒ An Illicit Discharge Compliance Statement is attached;

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

Appendix A
Soil Data

Soil Map—Norfolk and Suffolk Counties, Massachusetts

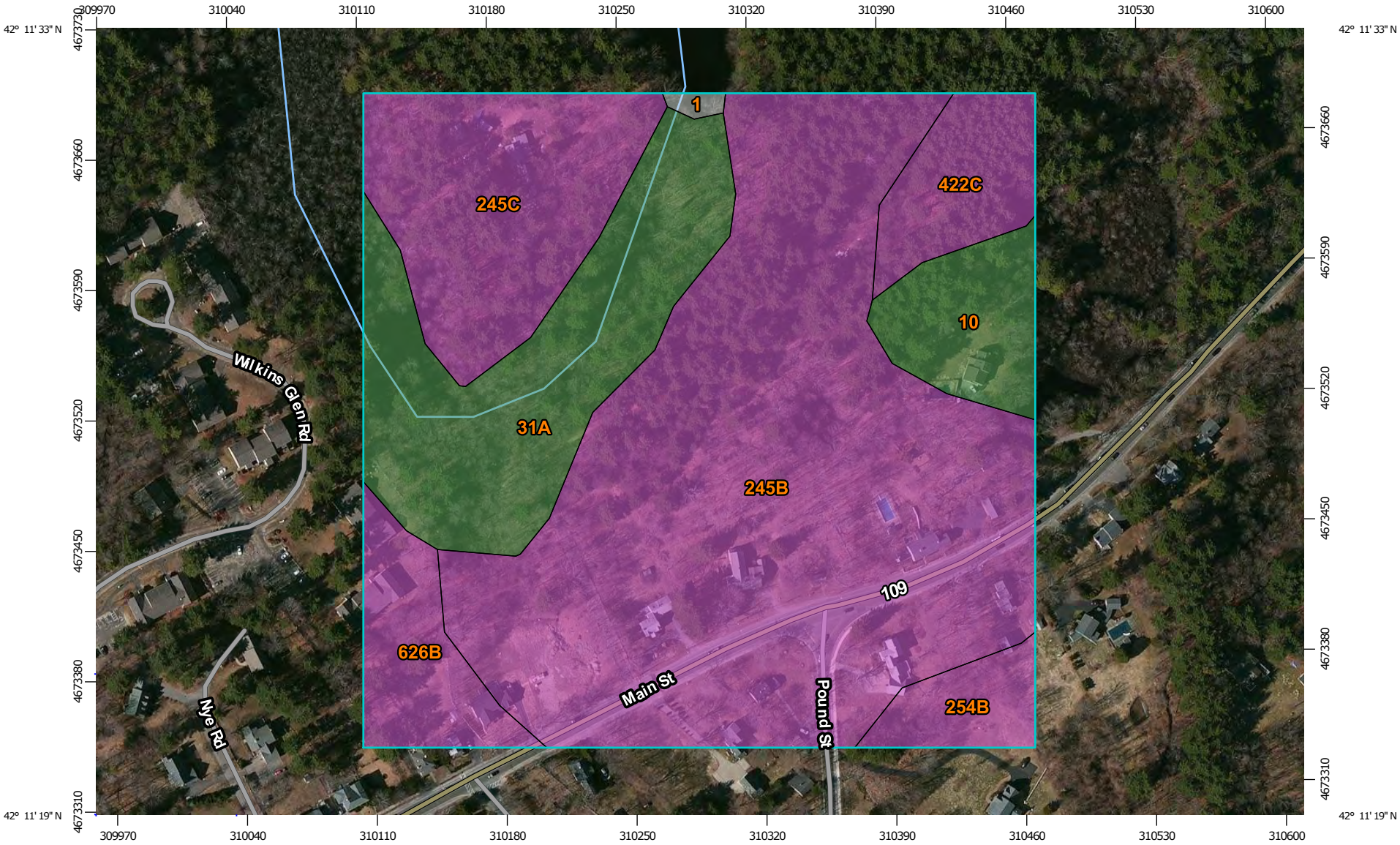
Map Scale: 1:2,980 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

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



Map Scale: 1:2,980 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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: http://websoilsurvey.nrcs.usda.gov
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 10, Sep 19, 2014

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

Date(s) aerial images were photographed: Mar 30, 2011—May 1, 2011

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Norfolk and Suffolk Counties, Massachusetts (MA616)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
1	Water		0.1	0.3%
10	Scarboro and Birdsall soils, 0 to 3 percent slopes	A/D	1.6	5.0%
31A	Walpole sandy loam, 0 to 3 percent slopes	A/D	5.2	16.6%
245B	Hinckley sandy loam, 3 to 8 percent slopes	A	16.5	52.2%
245C	Hinckley sandy loam, 8 to 15 percent slopes	A	4.1	13.0%
254B	Merrimac fine sandy loam, 3 to 8 percent slopes	A	0.9	2.9%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	A	1.5	4.8%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	A	1.7	5.3%
Totals for Area of Interest			**31.6**	**100.0%**

Description

Hydrologic soil groups are based on estimates of runoff potential. Soils are assigned to one of four groups according to the rate of water infiltration when the soils are not protected by vegetation, are thoroughly wet, and receive precipitation from long-duration storms.

The soils in the United States are assigned to four groups (A, B, C, and D) and three dual classes (A/D, B/D, and C/D). The groups are defined as follows:

Group A. Soils having a high infiltration rate (low runoff potential) when thoroughly wet. These consist mainly of deep, well drained to excessively drained sands or gravelly sands. These soils have a high rate of water transmission.

Group B. Soils having a moderate infiltration rate when thoroughly wet. These consist chiefly of moderately deep or deep, moderately well drained or well drained soils that have moderately fine texture to moderately coarse texture. These soils have a moderate rate of water transmission.

Group C. Soils having a slow infiltration rate when thoroughly wet. These consist chiefly of soils having a layer that impedes the downward movement of water or soils of moderately fine texture or fine texture. These soils have a slow rate of water transmission.

Group D. Soils having a very slow infiltration rate (high runoff potential) when thoroughly wet. These consist chiefly of clays that have a high shrink-swell potential, soils that have a high water table, soils that have a claypan or clay layer at or near the surface, and soils that are shallow over nearly impervious material. These soils have a very slow rate of water transmission.

If a soil is assigned to a dual hydrologic group (A/D, B/D, or C/D), the first letter is for drained areas and the second is for undrained areas. Only the soils that in their natural condition are in group D are assigned to dual classes.

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Commonwealth of Massachusetts
City/Town of Medfield
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserved disposal area)*

Deep Observation Hole Number: TP-1 | 03/19/2015 (Date) | 9:30 am (Time) | Sunny (Weather)

1. Location

Ground Elevation at Surface of Hole: 180.8 | Location (identify on plan): TP-1

2. Land Use: Residential yard (e.g., woodland, agricultural field, vacant lot, etc.) | None (Surface Stones) | < 2% (Slope (%))

Grass (Vegetation) | Outwash Plain (Landform) | Valley (Position on Landscape (attach sheet))

3. Distances from:

Open Water Body	>200' feet	Drainage Way	>100' feet	Possible Wet Area	116' feet
Property Line	51' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: Glacial Outwash | Unsuitable Materials Present: ☐ Yes ☒ No

If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No | If yes: Depth Weeping from Pit | 40" Depth Standing Water in Hole

Estimated Depth to High Groundwater: 38" inches | 177.6 elevation

Commonwealth of Massachusetts
City/Town of Medfield
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-1

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-10	A	10YR 3/3				Sandy Loam	10%	5%	Granular	Friable	
10-16	B	10YR 5/6				Loamy Sand	15%	10%	Massive	Friable	
16-78	C	2.5Y 5/4	38"	5YR5/8	10%	Sand	20%	20%	Single Grain	FPLH	

Additional Notes:

FPLH: Firm in Place, Loose in Hand

Rounded Stone and Cobbles

Groundwater observed weeping at 40", later standing at 40"

Commonwealth of Massachusetts
City/Town of Medfield

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

C. On-Site Review (*minimum of two holes required at every proposed primary and reserved disposal area)*

Deep Observation Hole Number: TP-2 | 3/19/15 (Date) | 10:15 am (Time) | Sunny (Weather)

1. Location

   Ground Elevation at Surface of Hole: 181.8 | Location (identify on plan): TP-2

2. Land Use: Residential Yard (e.g., woodland, agricultural field, vacant lot, etc.) | None (Surface Stones) | <2% (Slope (%))

   Grass (Vegetation) | Outwash Plain (Landform) | Valley (Position on Landscape (attach sheet))

3. Distances from:

Open Water Body	>200' feet	Drainage Way	>100' feet	Possible Wet Area	150' feet
Property Line	61' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: Glacial Outwash | Unsuitable Materials Present: ☐ Yes ☒ No

   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No | If yes: Depth Weeping from Pit | 50" Depth Standing Water in Hole

   Estimated Depth to High Groundwater: 50" inches | 177.6 elevation

Commonwealth of Massachusetts
City/Town of Medfield
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-2

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12	A	2.5Y 3/3				Sandy Loam	10%	10%	Granular	Friable	
12-18	B	2.5Y 6/6				Loamy Sand	15%	15%	Blocky	Friable	
18-36	BC	2.5Y 6/4				Loamy Sand	15%	20%	Blocky	Friable	
36-80	C	2.5Y 5/4				Sand	25%	20%	Single Grain	Loose	

Additional Notes:

Groundwater observed weeping at 50", later standing at 50", no definitive Redox features observed

Rounded Stones and Cobbles

Commonwealth of Massachusetts
City/Town of Medfield
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (*minimum of two holes required at every proposed primary and reserved disposal area)*

Deep Observation Hole Number: TP-3 | 3/19/15 (Date) | 1:30 pm (Time) | Sunny (Weather)

1. Location

   Ground Elevation at Surface of Hole: 183.3 Location (identify on plan): TP-3

2. Land Use: Residential yard (e.g., woodland, agricultural field, vacant lot, etc.) | None (Surface Stones) | 5% (Slope (%))

   Grass (Vegetation) | Outwash Plain (Landform) | Backslope (Position on Landscape (attach sheet))

3. Distances from:

Open Water Body	>200' feet	Drainage Way	>100 feet	Possible Wet Area	>200' feet
Property Line	45' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: Glacial Outwash Unsuitable Materials Present: ☒ Yes ☐ No

   If Yes: ☐ Disturbed Soil ☒ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

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

   Estimated Depth to High Groundwater: inches | elevation

Commonwealth of Massachusetts
City/Town of Medfield
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-3

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color- Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-6	A	10YR 3/3				Sandy Loam	5%	5%	Granular	Friable	
6-22	F	10YR 4/3				Loamy Sand	20%	20%	Massive	Friable	
22-28	Bb	10YR 5/6				Loamy Sand	15%	20%	Massive	Friable	
28-50	C1	2.5Y 5/4				Sand	25%	20%	Single Grain	FPLH	
50-66	C2	2.5Y 5/4				Sand	10%	5%	Single Grain	Loose	

Additional Notes:

No Redox or groundwater encountered

Rounded Stones and Cobbles

Wire and tube encountered at approx depth of 4', C2 layer is clean sand and may be bedding for tube and wire

Commonwealth of Massachusetts
City/Town of Medfield

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

C. On-Site Review (*minimum of two holes required at every proposed primary and reserved disposal area)*

Deep Observation Hole Number: TP-4 | 3/19/15 (Date) | 2:30 pm (Time) | Sunny (Weather)

1. Location

   Ground Elevation at Surface of Hole: 185 | Location (identify on plan): TP-4

2. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) | None (Surface Stones) | 5% (Slope (%))

   Tees: Pine, Oak (Vegetation) | Outwash Plain (Landform) | (Position on Landscape (attach sheet))

3. Distances from:

Open Water Body	>200' feet	Drainage Way	feet	Possible Wet Area	190' feet
Property Line	70' feet	Drinking Water Well	feet	Other	feet

4. Parent Material: Glacial Outwash | Unsuitable Materials Present: ☐ Yes ☒ No

   If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Impervious Layer(s) ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☐ Yes ☒ No | If yes: (Depth Weeping from Pit) (Depth Standing Water in Hole)

   Estimated Depth to High Groundwater: (inches) (elevation)

Commonwealth of Massachusetts
City/Town of Medfield
Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (continued)

Deep Observation Hole Number: TP-4

Depth (in.)	Soil Horizon/ Layer	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features (mottles)			Soil Texture (USDA)	Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
			Depth	Color	Percent		Gravel	Cobbles & Stones			
0-12	A	10YR 3/3				sandy loam	10%	15%	granular	friable	
12-14	B	10YR 4/3				loamy sand	15%	25%	massive	friable	
14-20	BC	2.5Y 5/4				loamy sand	20%	25%	massive	friable	
20-74	C	2.5Y 5/4				Sand	25%	25%	single grain	FPLH	

Additional Notes:

No Redox features of groundwater observed

Rounded stones and cobbles

Boulders encountered in bottom of pit, and excavated near bottom of pit

BEALS + THOMAS

Falling Head Permeability Test Results

Test Pit: TP-1

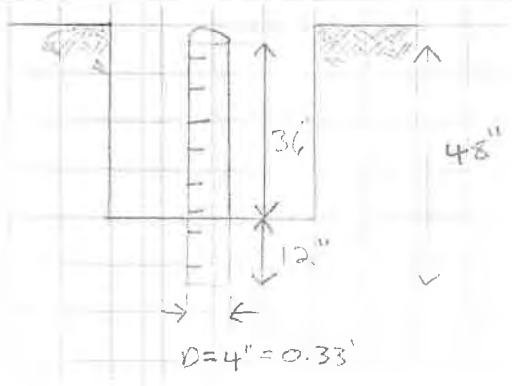
Hight (feet)	Drop (feet)	%Ho	Recorded Time (min)	(seconds)	Time (seconds
0.0	4.0	100	0	0	0
0.2	3.8	95	0	16	16
0.4	3.6	90	0	30	30
0.6	3.4	85	0	43	43
0.8	3.2	80	0	57	57
1.0	3.0	75	1	11	71
1.2	2.8	70	1	26	86
1.4	2.6	65	1	41	101
1.6	2.4	60	1	58	118
1.8	2.2	55	2	15	135
2.0	2.0	50	2	34	154
2.2	1.8	45	2	55	175
2.4	1.6	40	3	20	200
2.6	1.4	35	3	48	228
2.8	1.2	30	4	20	260
3.0	1.0	25	5	12	312

$$k = \frac{\pi D}{11 T_{37}}$$

$D = 4" = 0.33'$

T_{37} = 222 sec.

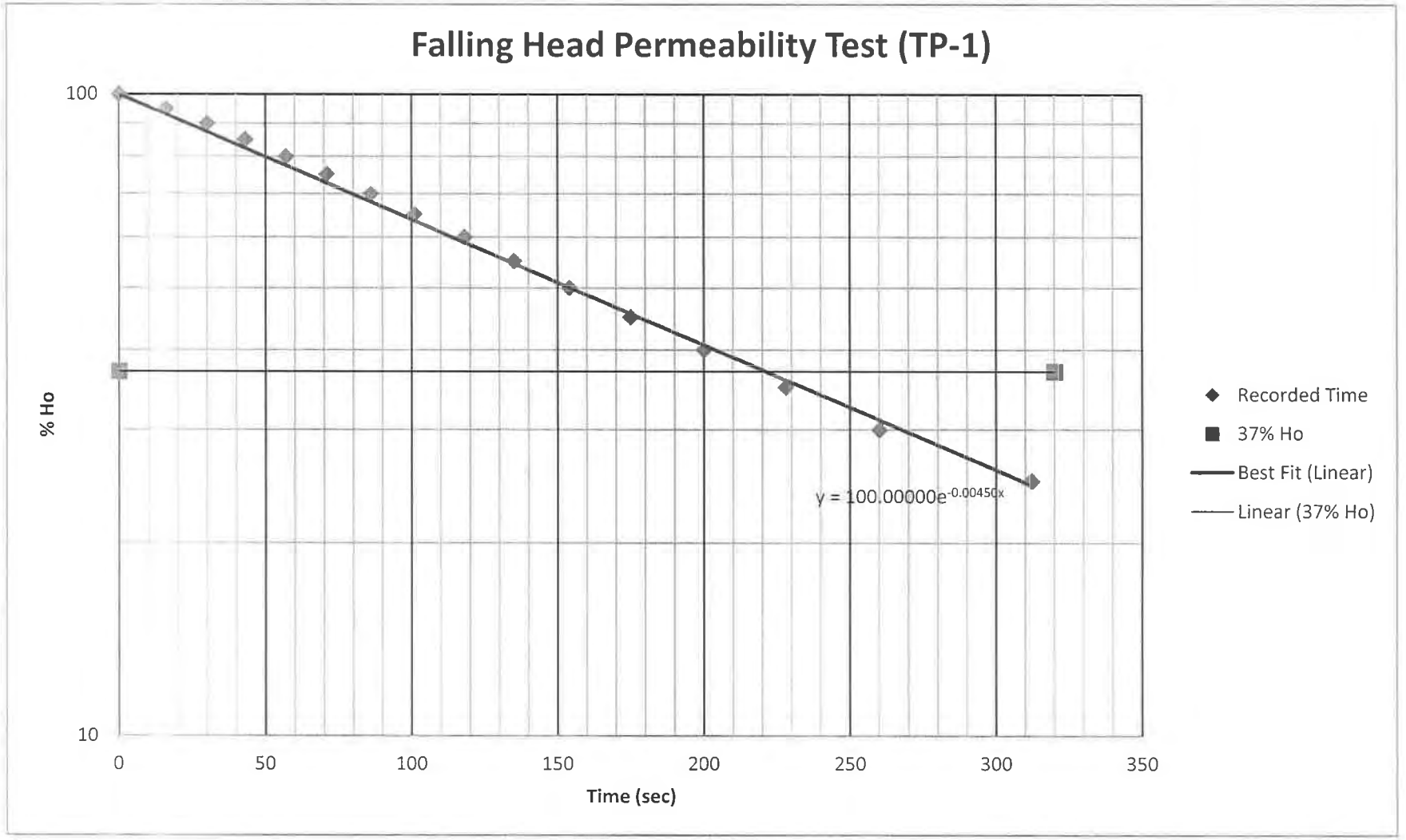
k = 18.5 in/hr



JOB NO. 2177.04
JOB: Assisted Living

COMPUTED BY: CPT
DATE: 03/20/15

CHECKED BY: DMF
DATE: 8/17/2015



JOB NO. 2177.04
JOB: Assisted Living

COMPUTED BY: CPT
DATE: 03/20/15

CHECKED BY: DMF
DATE: 8/17/2015

FIGURE 2A

NORTH

APPROXIMATE LIMITS OF PROPOSED PARKING

APPROXIMATE LIMITS OF PROPOSED BUILDING

APPROXIMATE LIMITS OF SUBJECT SITE

TP-1

TP-2

TP-3

TP-4

TP-5

TP-6

TP-7

TP-8

TP-9

REMAINS OF WALL

N/F BROWNE 10860/143 BK. 425 PL. 311 PL. BK. 611 PL. 59 (PARCEL D) 87,533 ± S.F. or 2.009 ± AC. 43-065

N/F STEPHEN J. BROWNE & LYNN E. BROWNE 26201/502 BK. 589 PL. 67 (LOT A & PARCEL B) PL. BK. 597 PL. 32 43-067

REGISTERED UNREGISTERED

44-120

LCC 424

100' BUFFER ZONE

NO ALTERATION ZONE

BRIDLE PATH

GATE POST

GATE POST

2 1/2 STORY WOOD

WF-1 WF-2 WF-3 WF-4 WF-5 WF-6 WF-7 WF-8 WF-9 WF-10 WF-67 WF-66 WF-65 WF-68 WF-69 WF-70 WF-71 WF-72

ABBVW ABBVW PVP

186 188 184 182

LEGEND

— APPROXIMATE LOCATION OF TEST PIT PERFORMED BY MATTUCHIO CONSTRUCTION CO., INC. ON AUGUST 8, 2014 FOR McPHAIL ASSOCIATES, LLC

REFERENCE: THIS PLAN WAS PREPARED FROM A 50-SCALE DRAWING ENTITLED "BASE PLAN" DATED OCTOBER 16, 2009 BY BEALS & THOMAS.

GRAPHIC SCALE

40 0 40 80

McPHAIL ASSOCIATES, LLC
Geotechnical and Geoenvironmental Engineers
2269 Massachusetts Avenue
Cambridge, MA 02140
617/868-1420
617/868-1423 (Fax)
www.mcphailgeo.com

361 MAIN STREET

MEDFIELD MASSACHUSETTS

SUBSURFACE EXPLORATION PLAN

FOR

LCB SENIOR LIVING

BY

McPHAIL ASSOCIATES, LLC

Date: SEPTEMBER 2014	Dwn: F.G.P.	Chkd: A.M.F.	Scale: 1" =40'
Project No: 5782			37

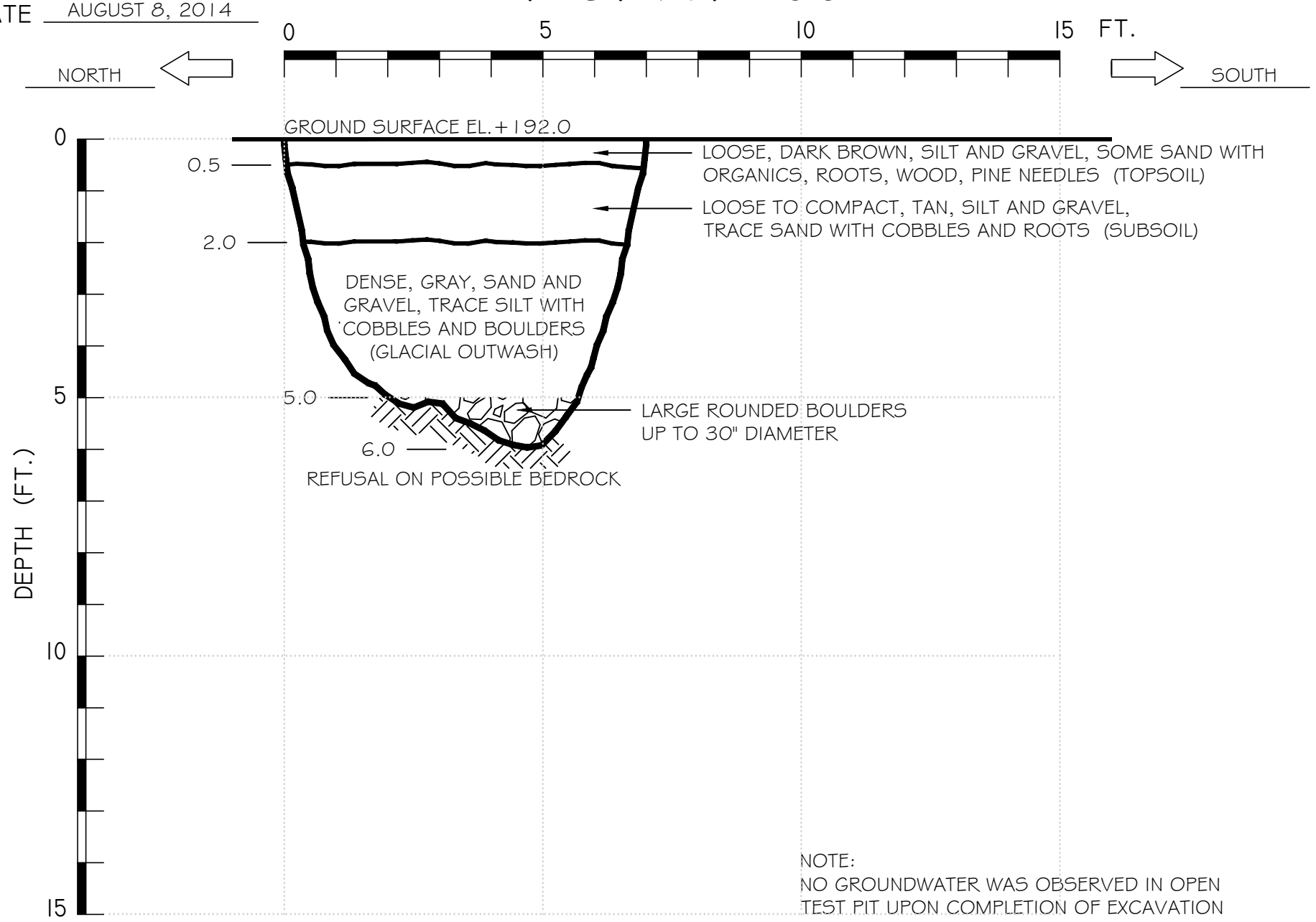
FILE NAME: H:\Acad\JOBS\5782\5782-F02A.dwg

JOB NO. 5782

DATE AUGUST 8, 2014

TEST PIT LOG

TEST PIT NO. 1



McPHAIL ASSOCIATES, LLC

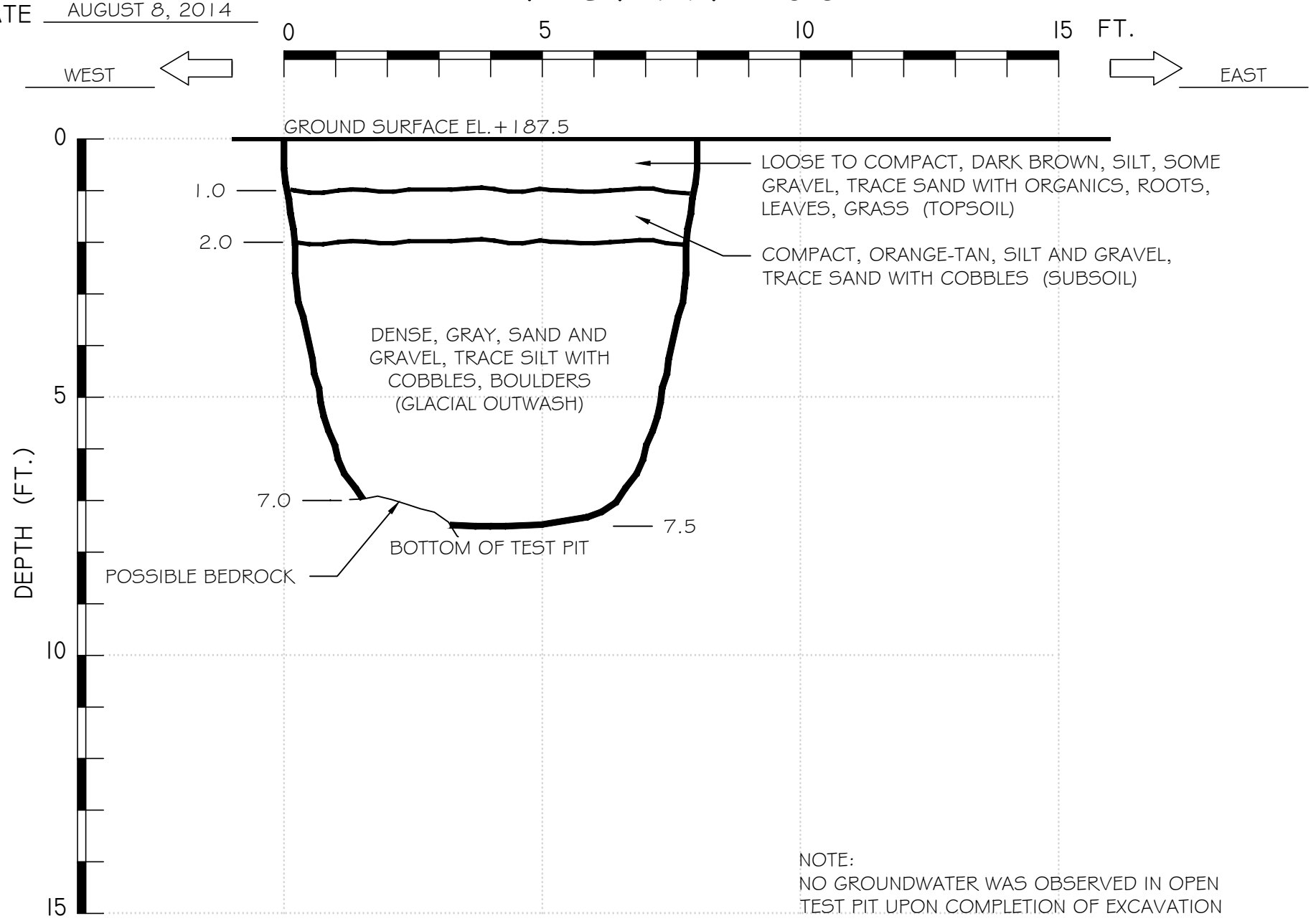
NOTE:
NO GROUNDWATER WAS OBSERVED IN OPEN TEST PIT UPON COMPLETION OF EXCAVATION

JOB NO. 5782

DATE AUGUST 8, 2014

TEST PIT LOG

TEST PIT NO. 2



NOTE:
NO GROUNDWATER WAS OBSERVED IN OPEN TEST PIT UPON COMPLETION OF EXCAVATION

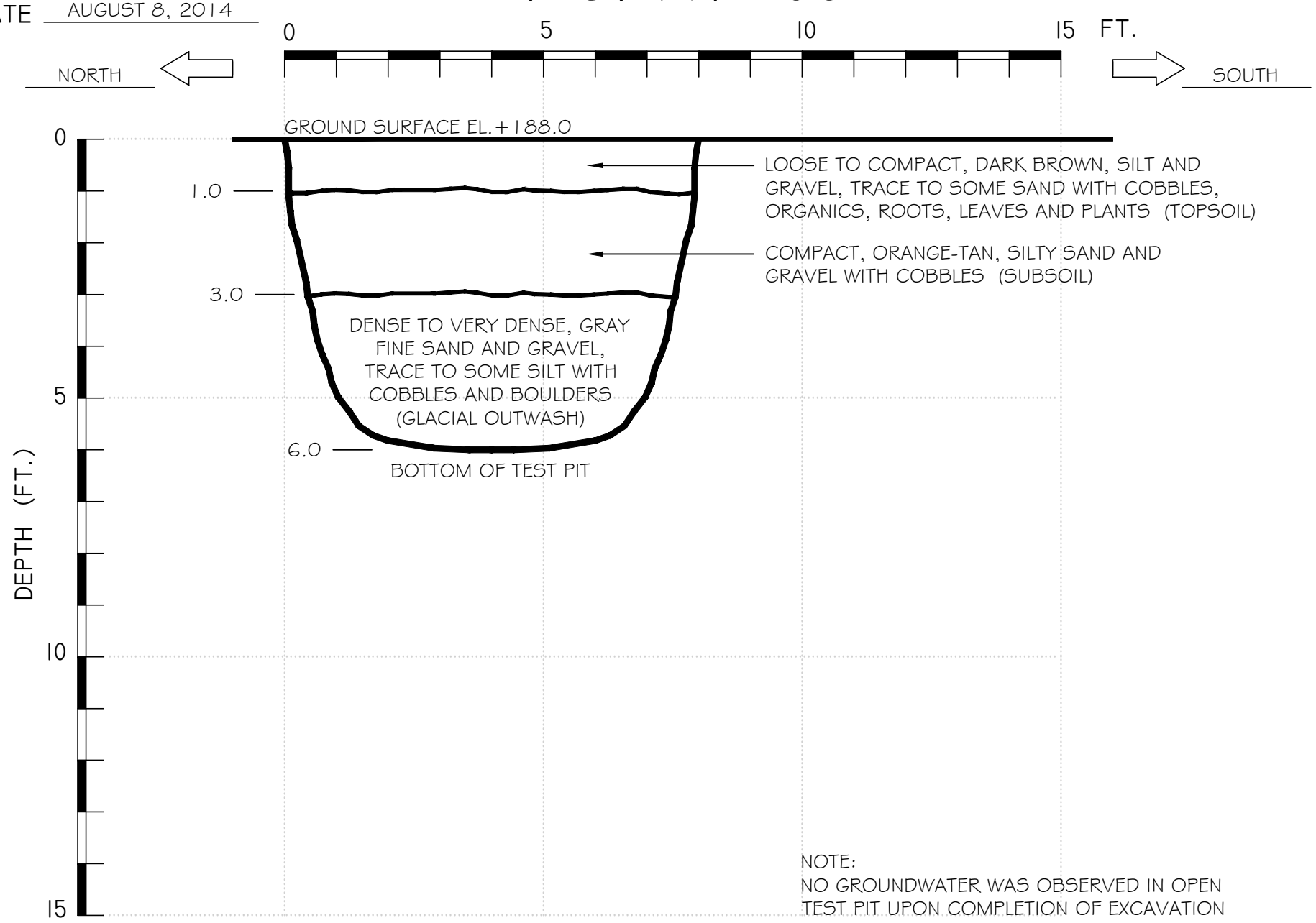
McPHAIL ASSOCIATES, LLC

JOB NO. 5782

DATE AUGUST 8, 2014

TEST PIT LOG

TEST PIT NO. 3



NOTE:
NO GROUNDWATER WAS OBSERVED IN OPEN TEST PIT UPON COMPLETION OF EXCAVATION

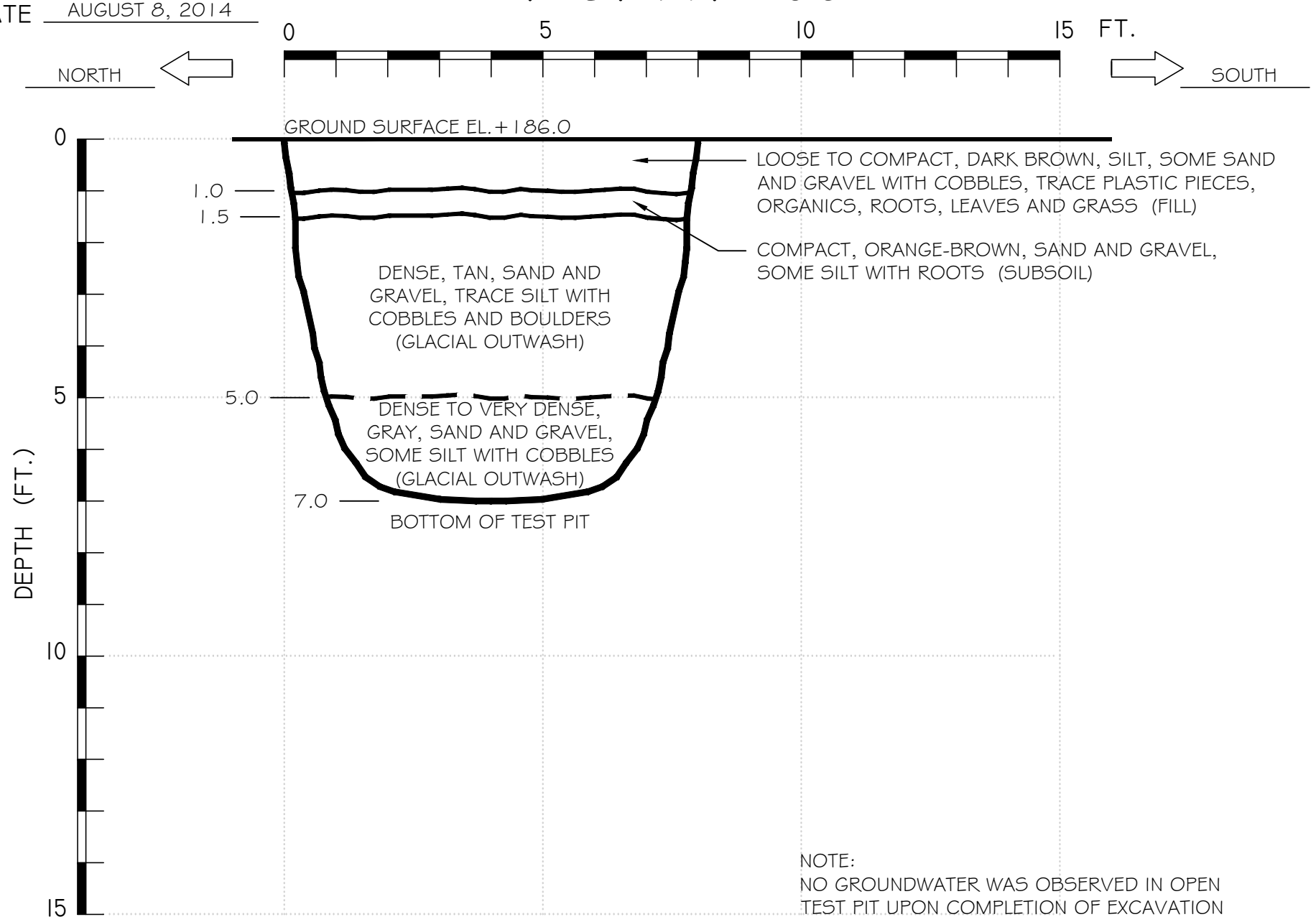
McPHAIL ASSOCIATES, LLC

TEST PIT LOG

JOB NO. 5782

DATE AUGUST 8, 2014

TEST PIT NO. 4



NOTE:
NO GROUNDWATER WAS OBSERVED IN OPEN TEST PIT UPON COMPLETION OF EXCAVATION

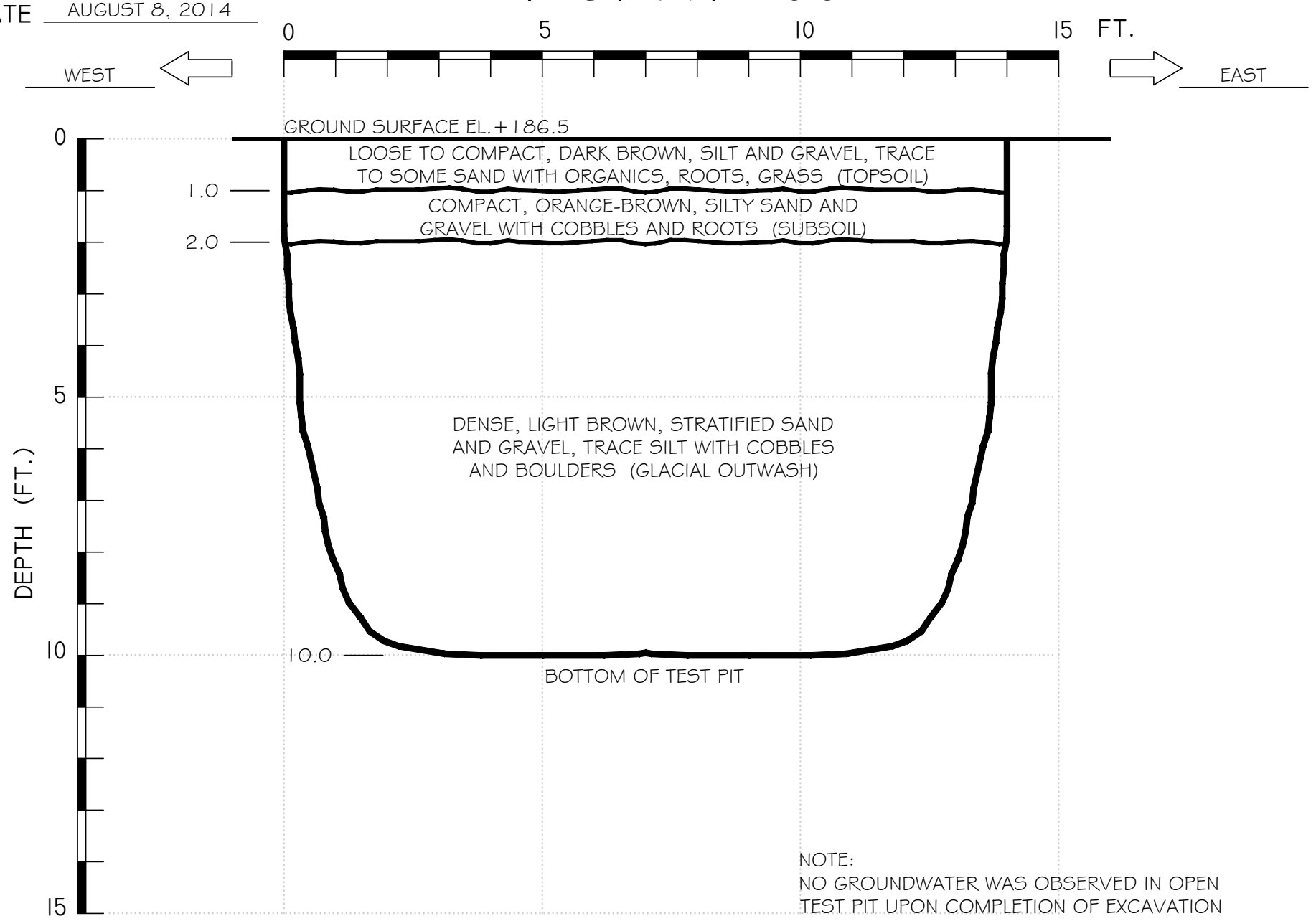
McPHAIL ASSOCIATES, LLC

JOB NO. 5782

DATE AUGUST 8, 2014

TEST PIT LOG

TEST PIT NO. 5



NOTE:
NO GROUNDWATER WAS OBSERVED IN OPEN TEST PIT UPON COMPLETION OF EXCAVATION

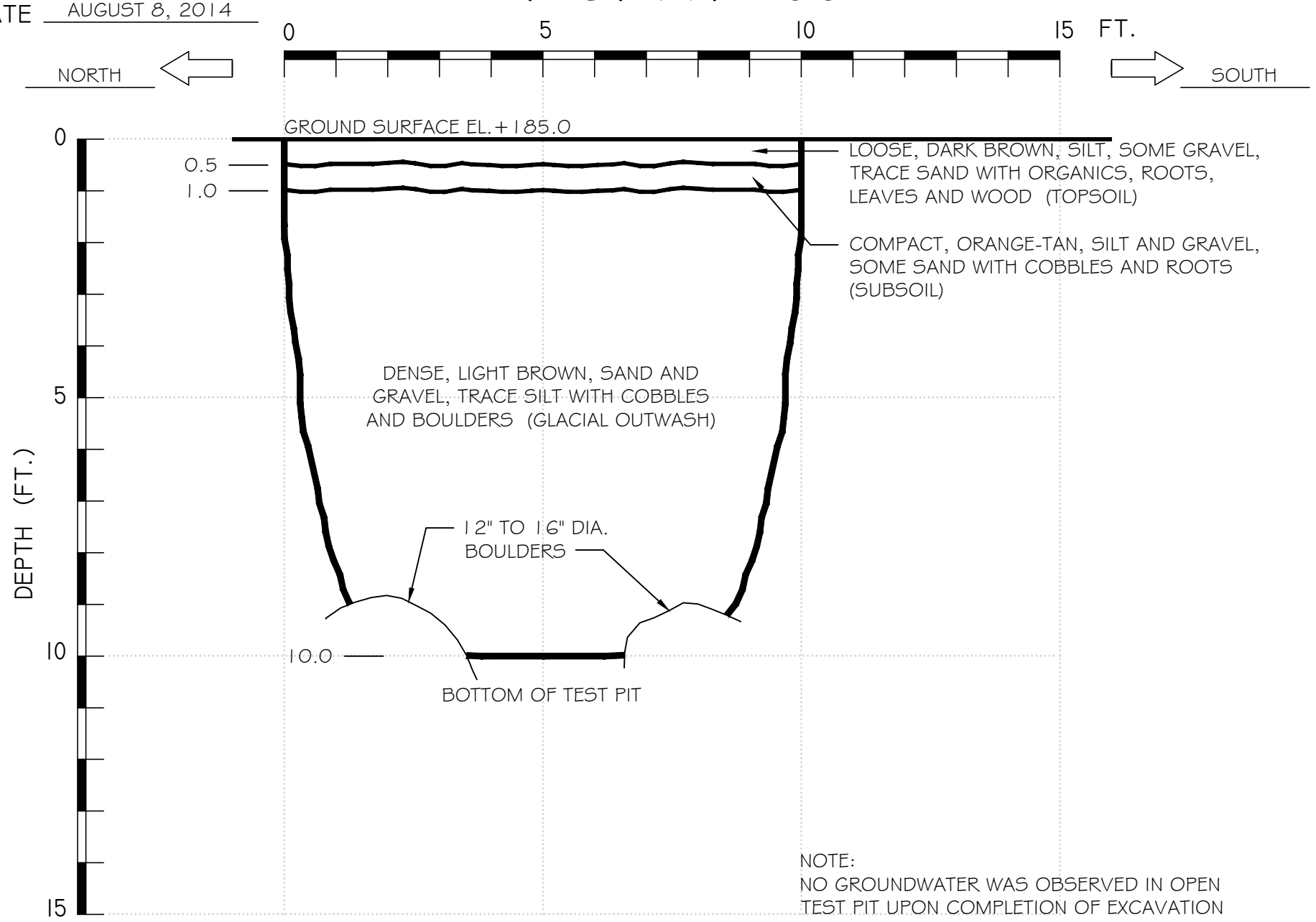
McPHAIL ASSOCIATES, LLC

JOB NO. 5782

DATE AUGUST 8, 2014

TEST PIT LOG

TEST PIT NO. 6



McPHAIL ASSOCIATES, LLC

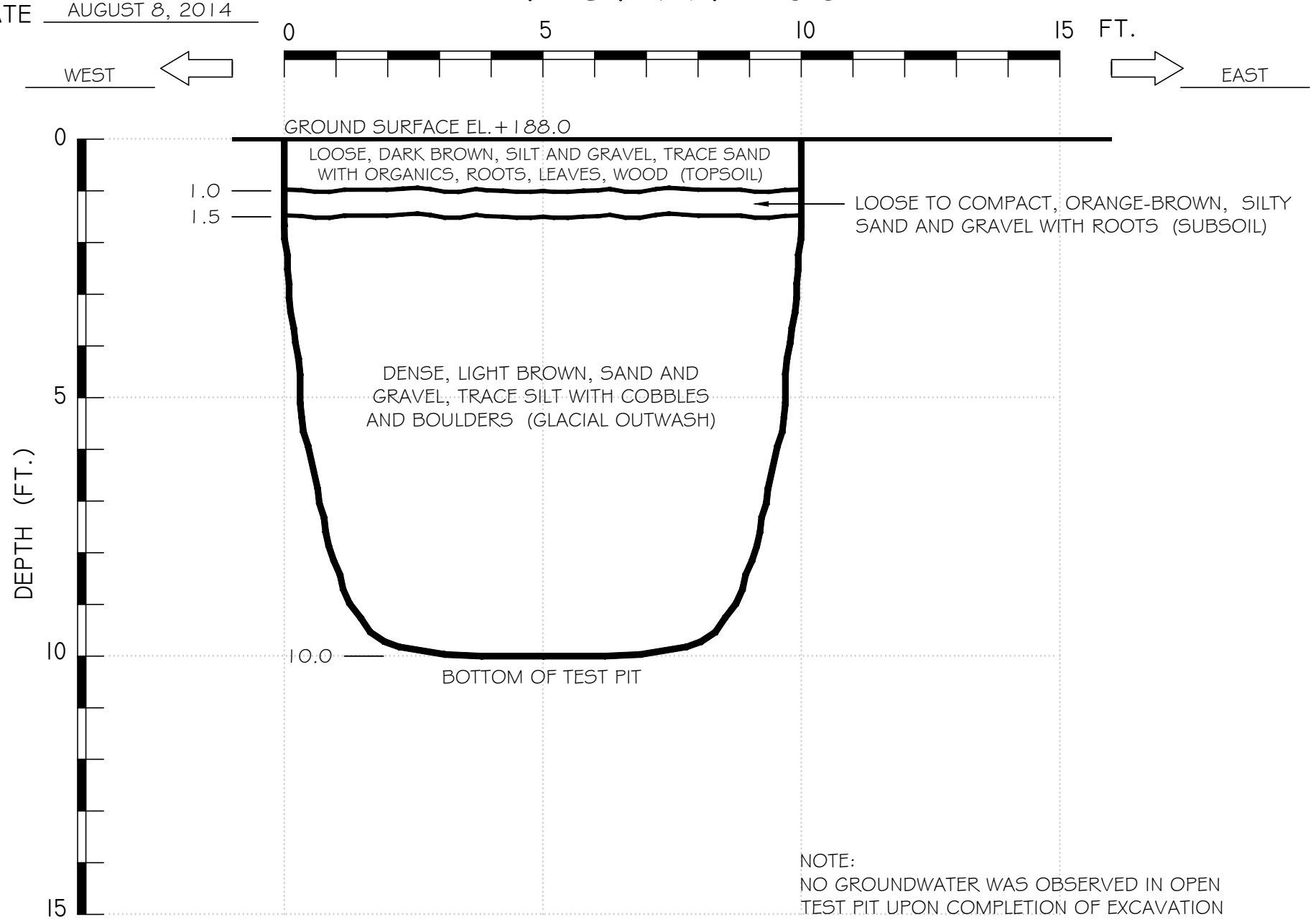
NOTE:
NO GROUNDWATER WAS OBSERVED IN OPEN TEST PIT UPON COMPLETION OF EXCAVATION

JOB NO. 5782

DATE AUGUST 8, 2014

TEST PIT LOG

TEST PIT NO. 7



NOTE:
NO GROUNDWATER WAS OBSERVED IN OPEN TEST PIT UPON COMPLETION OF EXCAVATION

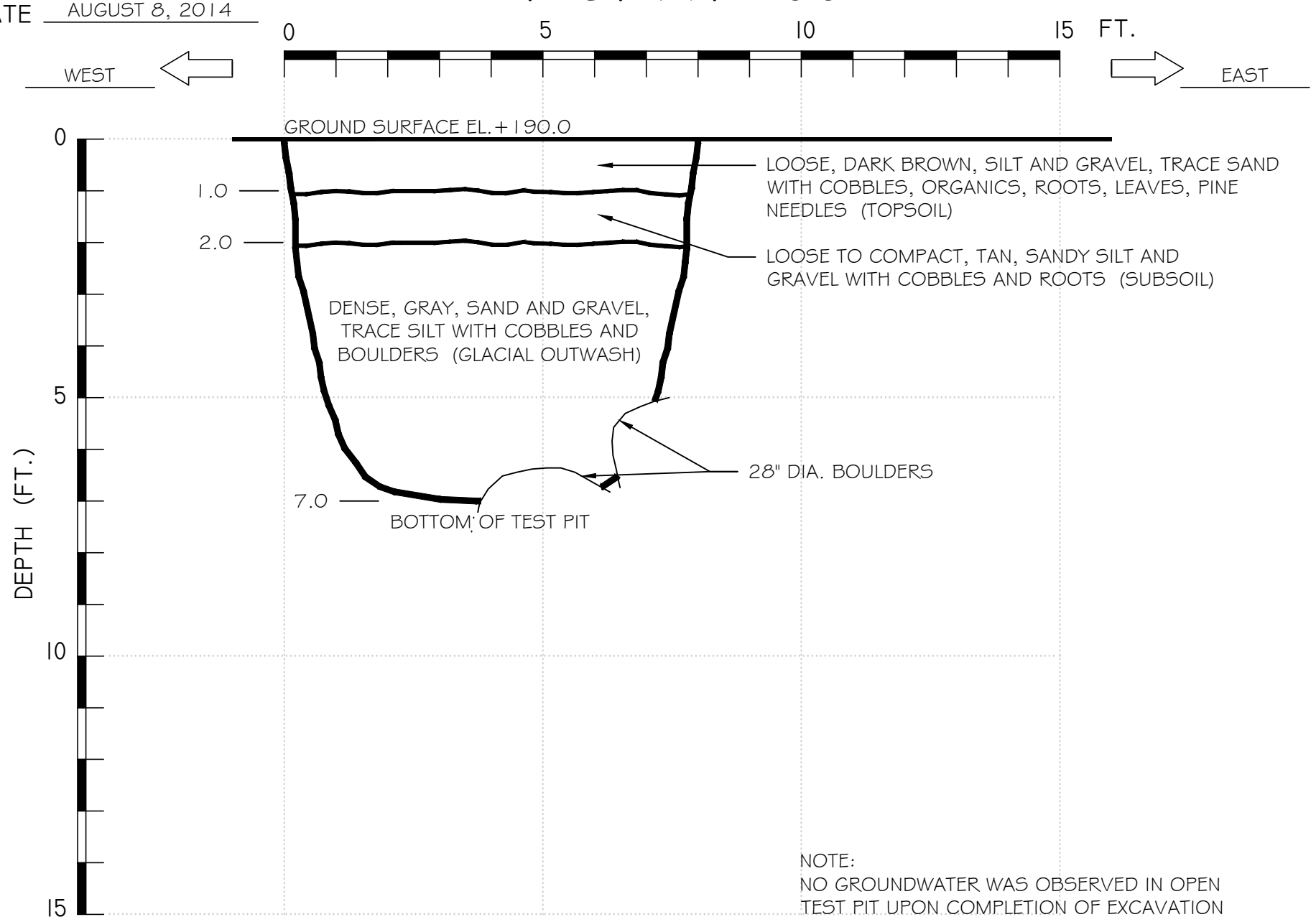
McPHAIL ASSOCIATES, LLC

JOB NO. 5782

DATE AUGUST 8, 2014

TEST PIT LOG

TEST PIT NO. 8



NOTE:
NO GROUNDWATER WAS OBSERVED IN OPEN TEST PIT UPON COMPLETION OF EXCAVATION

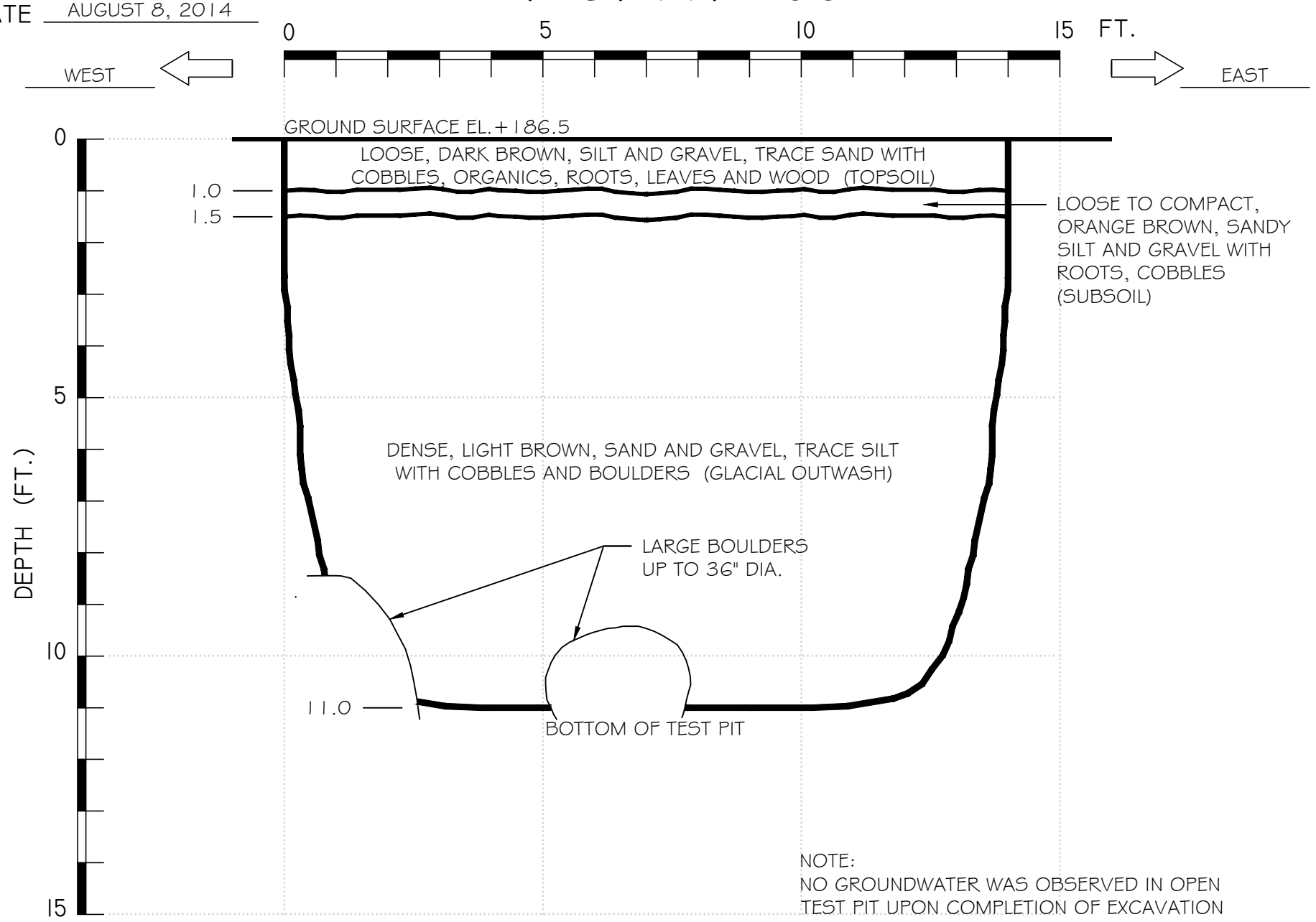
McPHAIL ASSOCIATES, LLC

JOB NO. 5782

DATE AUGUST 8, 2014

TEST PIT LOG

TEST PIT NO. 9



NOTE:
NO GROUNDWATER WAS OBSERVED IN OPEN TEST PIT UPON COMPLETION OF EXCAVATION

McPHAIL ASSOCIATES, LLC

Appendix B
Pre-Development Hydrologic Analysis

BEALS + THOMAS
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

CALCULATION SUMMARY

T 508.366.0560
F 508.366.4391
www.bealsandthomas.com
Regional Office: Plymouth, MA

JOB NO./LOCATION:

2177.04
Medfield, MA

CLIENT/PROJECT:

LCB Senior Living
Assisted Living Residence

SUBJECT/TITLE:

Existing Conditions Hydrology Design

OBJECTIVE OF CALCULATION:

- To determine the pre-development peak rates and volumes of runoff from the site for the 1, 2, 10, 50 & 100-year storm events at the design point.

CALCULATION METHOD(S):

- Runoff curve numbers (CN), time-of-concentration (Tc), and runoff rates were calculated based on TR-55 methodology.
- AutoCAD 2014 computer program was utilized for digitizing ground cover areas.
- Peak runoff rates were computed using HydroCAD version 10.00.

ASSUMPTIONS:

- Stormwater runoff from 353/355 Main Street which flows onto the project site has been excluded from the hydrologic model.

SOURCES OF DATA/EQUATIONS:

- Pre-Development Conditions Hydrologic Areas Map prepared by Beals and Thomas, Inc. File No. 217704P026A-001, dated 8/11/2015.
- NRCS Soil Survey for Norfolk County, hydrologic soil group report, downloaded from Web Soil Survey on 12/23/2014.
- TR-55 urban Hydrology for Small Watersheds, SCS, 1986.
- Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada, Cornell University, Publication No. RR 93-5.
- Massachusetts DEP Stormwater Management Handbook, February 2008.
- Town of Medfield Board of Health Regulations for Storm Water and Runoff Management.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	C. Taylor	8/12/15	D.M. Feeney	8/13/2015	D.M. Feeney	8/13/2015

BEALS + THOMAS
BEALS AND THOMAS, INC.
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144 Turnpike Road
Southborough, MA 01772-2104

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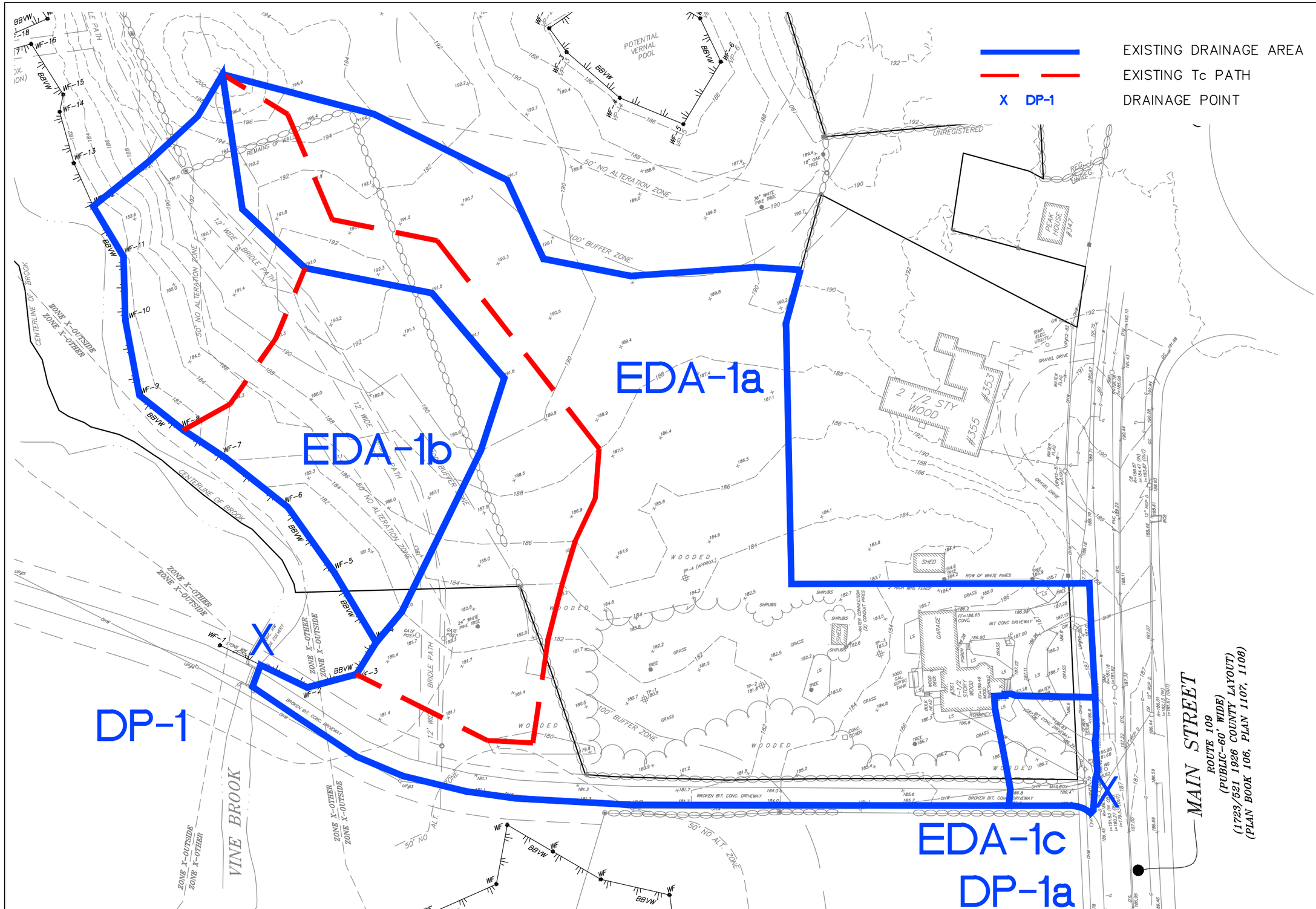
Regional Office: Plymouth, MA

CONCLUSIONS:

Storm Event	Peak Runoff Rates DP-1 (CFS)	Runoff Volume DP-1 (ac-ft)
1-Year	0.00	0.001
2-Year	0.01	0.002
10-Year	0.08	0.044
25-Year	1.18	0.239
100-Year	2.39	0.384

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	C. Taylor	8/12/15	D. M. Thomas	8/13/2015	D. M. Thomas	8/13/2015



Pre-Development Conditions Hydrologic Areas Map
Figure Number 001

Scale: 1" = 60' Date: 08/11/2015

B+T Drawing No. 217704P026A-001

B+T Project No. 2177.04

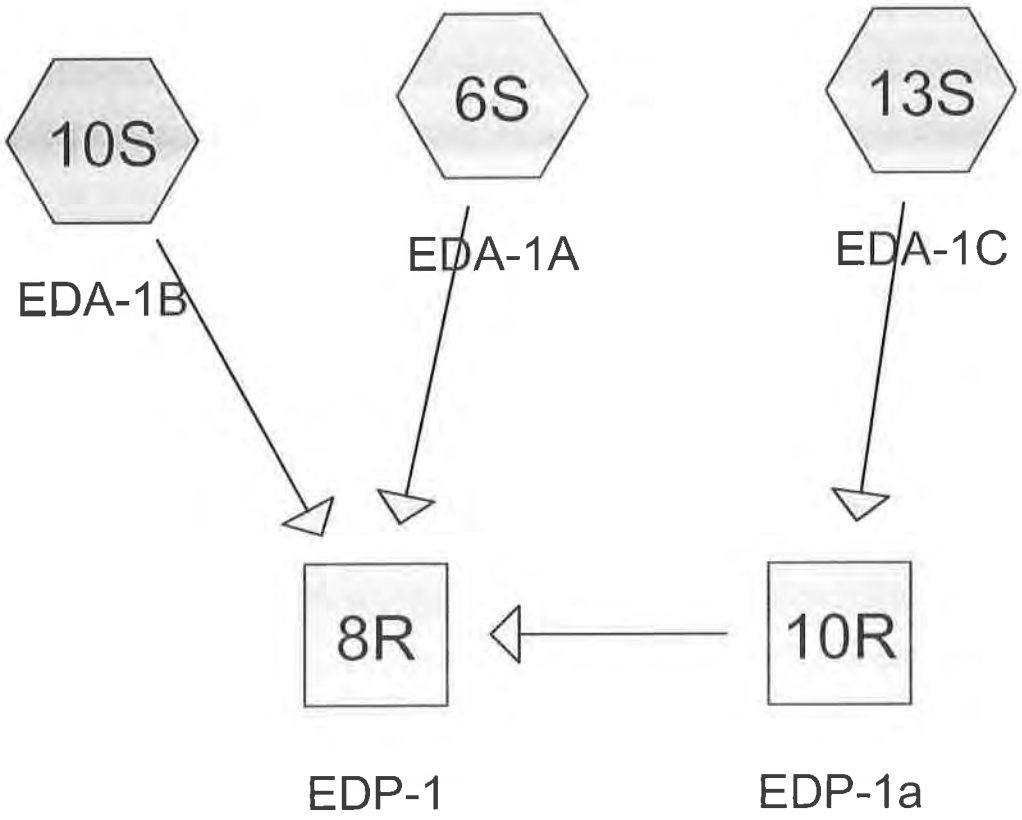
Assisted Living Residence
Medfield, Massachusetts

LCB Senior Living
3 Edge Water Drive
Norwood, Massachusetts

North Arrow

NORTH

Existing Conditions



Subcat Reach Pond Link

Routing Diagram for 217704HCP001
Prepared by Beals and Thomas, Printed 8/11/2015
HydroCAD® 10.00 s/n 04493 © 2011 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.951	30	Woods, Good, HSG A (6S, 10S, 13S)
0.647	39	>75% Grass cover, Good, HSG A (6S, 13S)
0.126	45	Woods, Poor, HSG A (Bridle Path) (6S, 10S)
0.270	98	Paved parking, HSG A (6S, 13S)
3.993	**37**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 6S: EDA-1A Runoff Area=126,388 sf 8.30% Impervious Runoff Depth=0.00"
Flow Length=692' Tc=19.6 min CN=38 Runoff=0.00 cfs 0.000 af

Subcatchment 10S: EDA-1B Runoff Area=43,160 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=137' Tc=9.2 min CN=31 Runoff=0.00 cfs 0.000 af

Subcatchment 13S: EDA-1C Runoff Area=4,378 sf 28.89% Impervious Runoff Depth=0.09"
Tc=5.0 min CN=54 Runoff=0.00 cfs 0.001 af

Reach 8R: EDP-1 Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach 10R: EDP-1a Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Total Runoff Area = 3.993 ac Runoff Volume = 0.001 af Average Runoff Depth = 0.00"
93.24% Pervious = 3.723 ac 6.76% Impervious = 0.270 ac

Summary for Subcatchment 6S: EDA-1A

[45] Hint: Runoff=Zero

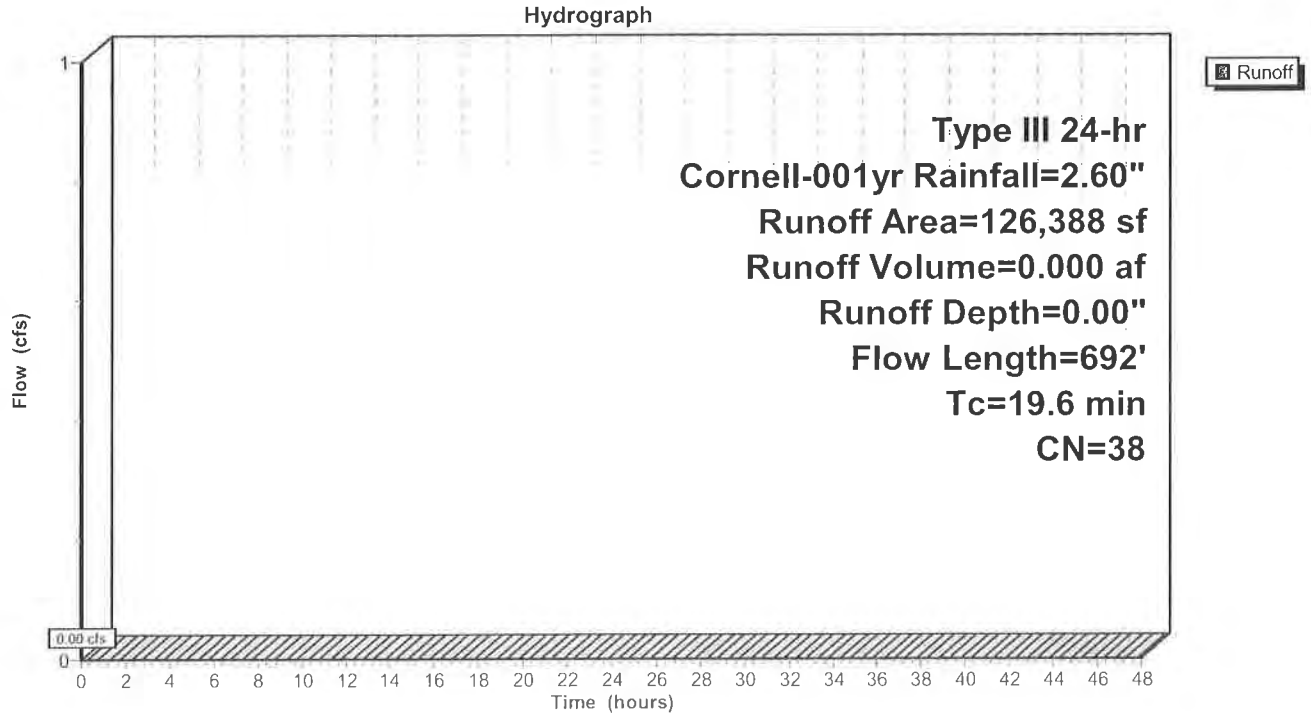
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-001yr Rainfall=2.60"

	Area (sf)	CN	Description
	10,484	98	Paved parking, HSG A
	26,074	39	>75% Grass cover, Good, HSG A
	88,238	30	Woods, Good, HSG A
*	1,592	45	Woods, Poor, HSG A (Bridle Path)
	126,388	38	Weighted Average
	115,904		91.70% Pervious Area
	10,484		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.1300	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
13.8	642	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.6	692	Total			

Subcatchment 6S: EDA-1A



Summary for Subcatchment 10S: EDA-1B

[45] Hint: Runoff=Zero

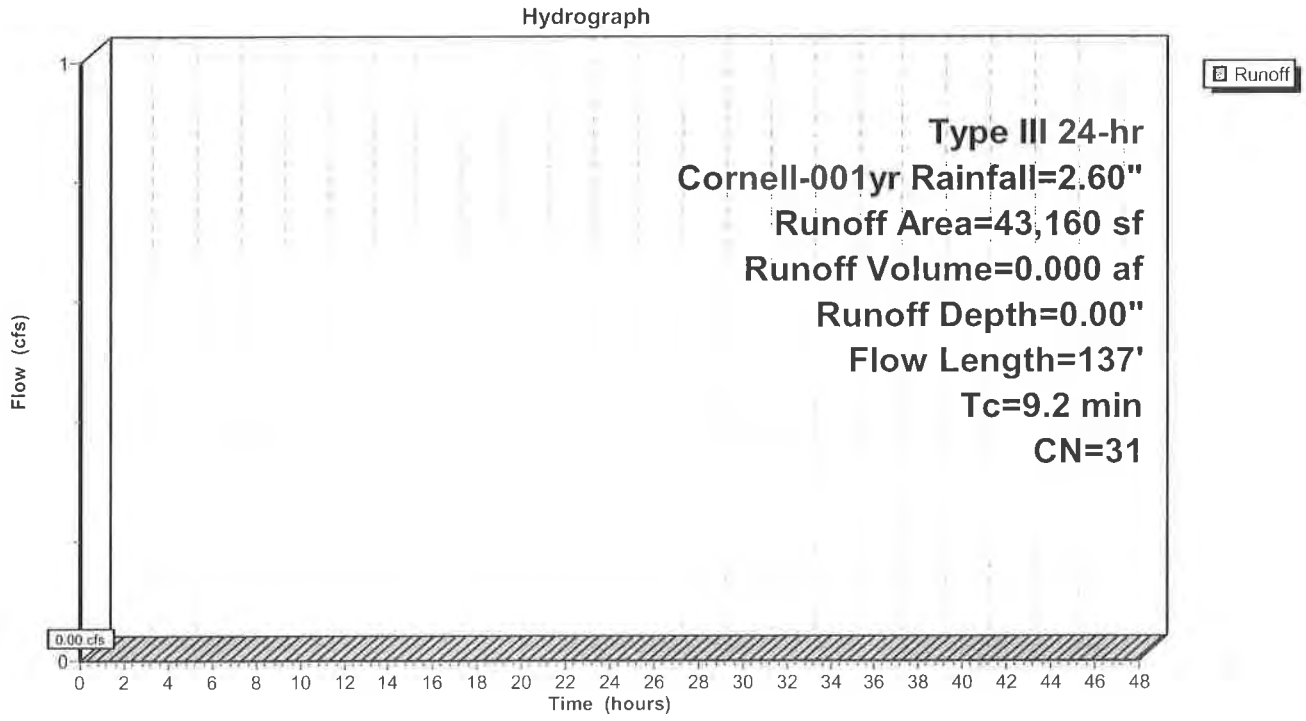
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-001yr Rainfall=2.60"

Area (sf)	CN	Description
39,275	30	Woods, Good, HSG A
3,885	45	Woods, Poor, HSG A (Bridle Path)
43,160	31	Weighted Average
43,160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0540	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	87	0.0954	1.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	137	Total			

Subcatchment 10S: EDA-1B



Summary for Subcatchment 13S: EDA-1C

[49] Hint: Tc<2dt may require smaller dt

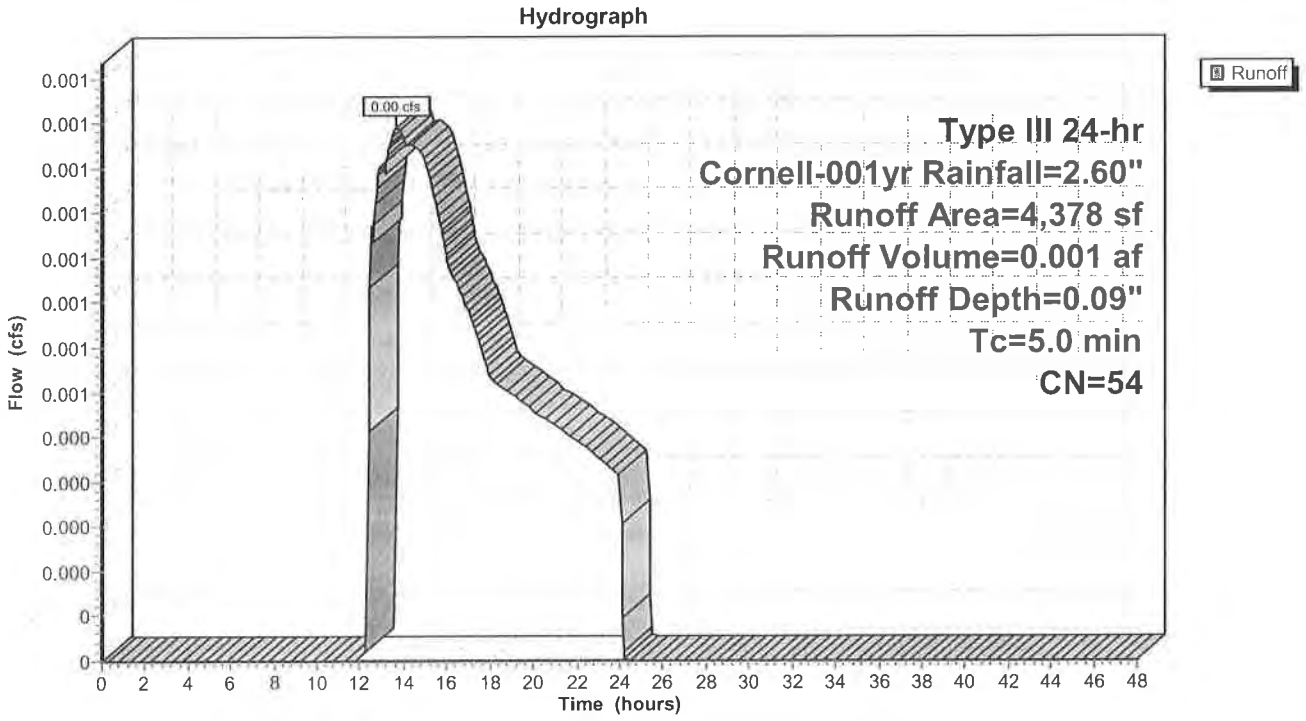
Runoff = 0.00 cfs @ 13.68 hrs, Volume= 0.001 af, Depth= 0.09"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-001yr Rainfall=2.60"

Area (sf)	CN	Description
1,265	98	Paved parking, HSG A
2,097	39	>75% Grass cover, Good, HSG A
1,016	30	Woods, Good, HSG A
4,378	54	Weighted Average
3,113		71.11% Pervious Area
1,265		28.89% Impervious Area

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

Subcatchment 13S: EDA-1C

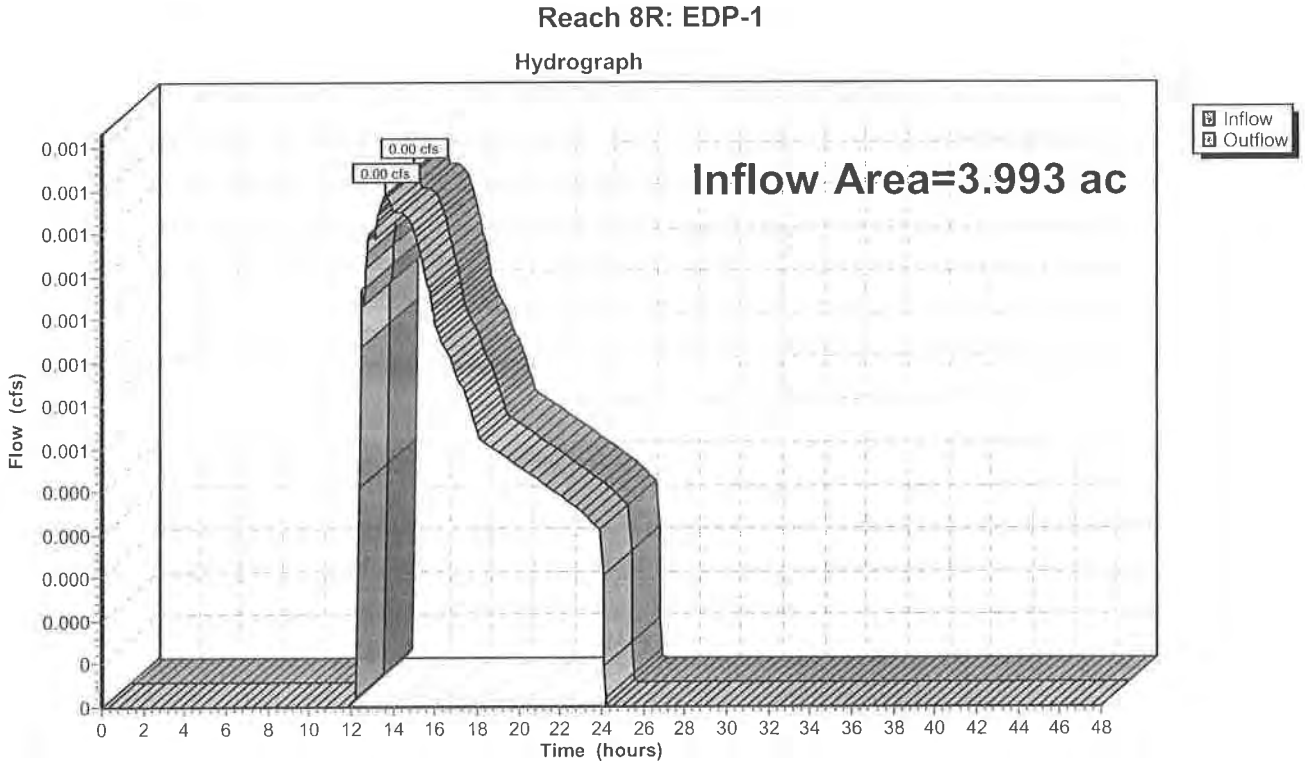


Summary for Reach 8R: EDP-1

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

Inflow Area = 3.993 ac, 6.76% Impervious, Inflow Depth = 0.00" for Cornell-001yr event
Inflow = 0.00 cfs @ 13.68 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 13.68 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs



Summary for Reach 10R: EDP-1a

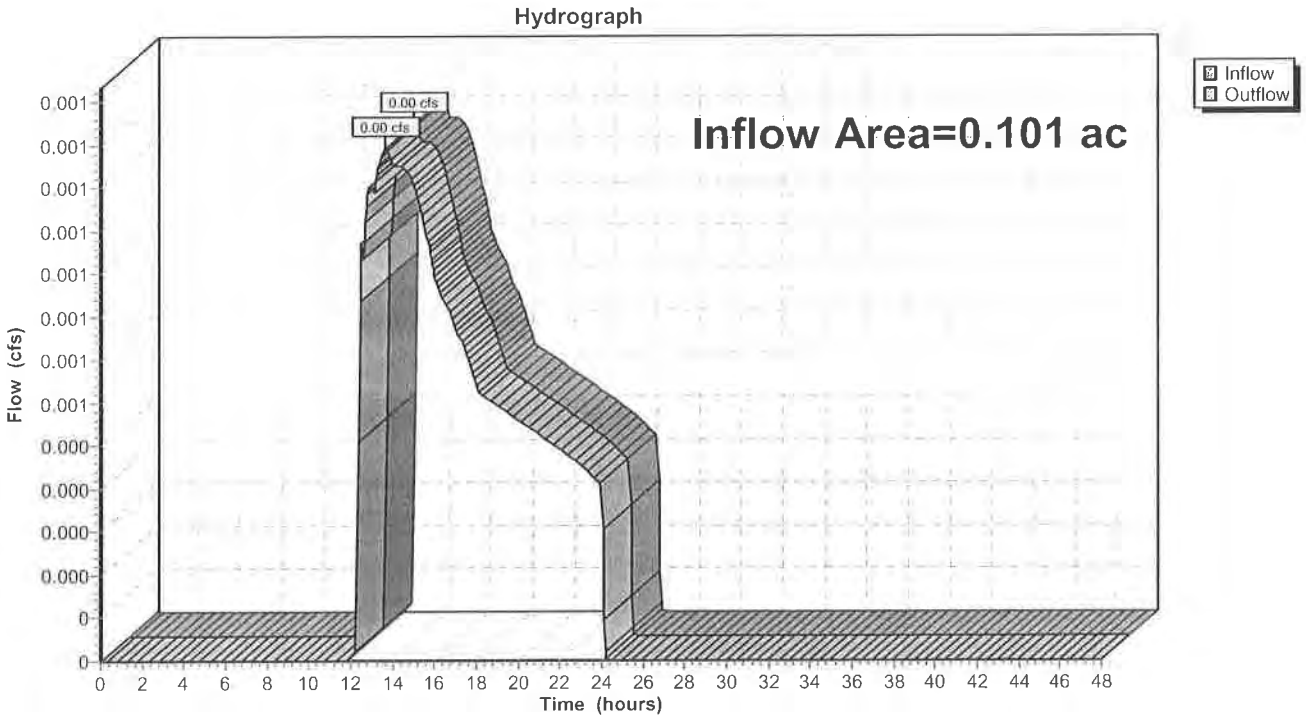
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.101 ac, 28.89% Impervious, Inflow Depth = 0.09" for Cornell-001yr event
Inflow = 0.00 cfs @ 13.68 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 13.68 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 10R: EDP-1a

Hydrograph



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 6S: EDA-1A Runoff Area=126,388 sf 8.30% Impervious Runoff Depth=0.00"
Flow Length=692' Tc=19.6 min CN=38 Runoff=0.00 cfs 0.000 af

Subcatchment 10S: EDA-1B Runoff Area=43,160 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=137' Tc=9.2 min CN=31 Runoff=0.00 cfs 0.000 af

Subcatchment 13S: EDA-1C Runoff Area=4,378 sf 28.89% Impervious Runoff Depth=0.24"
Tc=5.0 min CN=54 Runoff=0.01 cfs 0.002 af

Reach 8R: EDP-1 Inflow=0.01 cfs 0.002 af
Outflow=0.01 cfs 0.002 af

Reach 10R: EDP-1a Inflow=0.01 cfs 0.002 af
Outflow=0.01 cfs 0.002 af

Total Runoff Area = 3.993 ac Runoff Volume = 0.002 af Average Runoff Depth = 0.01"
93.24% Pervious = 3.723 ac 6.76% Impervious = 0.270 ac

Summary for Subcatchment 6S: EDA-1A

[45] Hint: Runoff=Zero

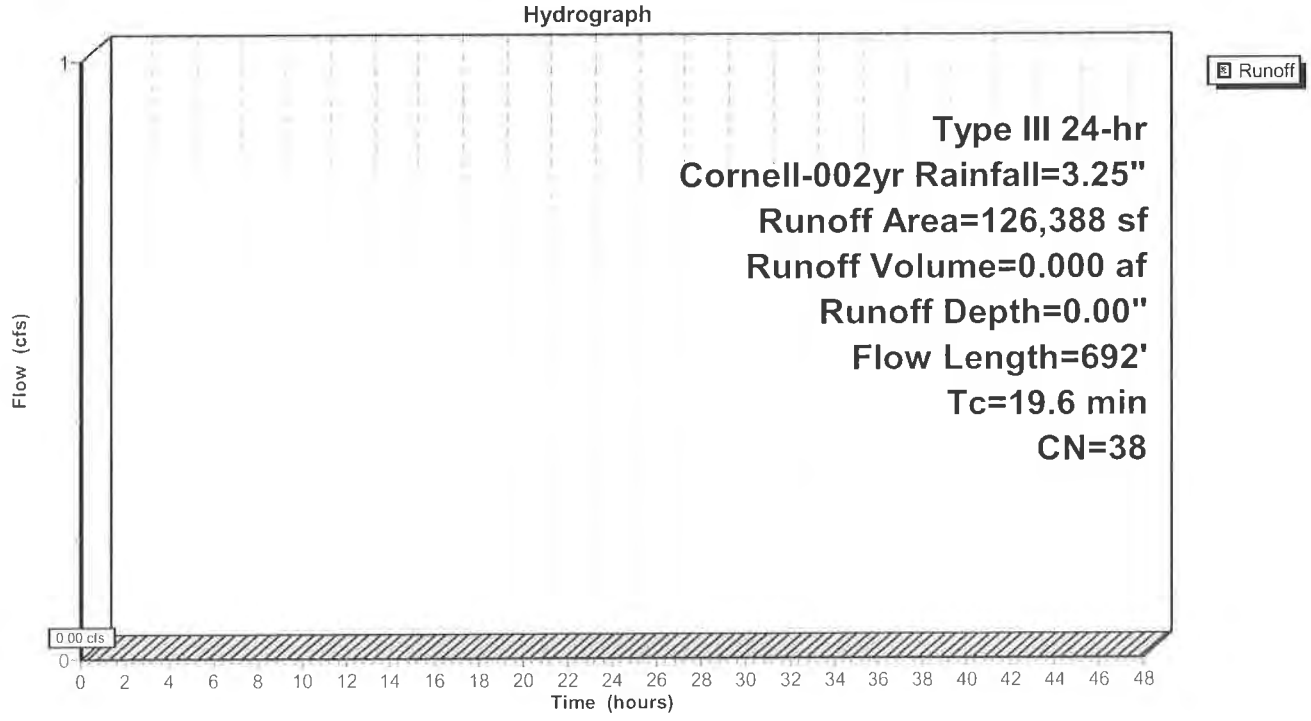
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-002yr Rainfall=3.25"

Area (sf)	CN	Description
10,484	98	Paved parking, HSG A
26,074	39	>75% Grass cover, Good, HSG A
88,238	30	Woods, Good, HSG A
* 1,592	45	Woods, Poor, HSG A (Bridle Path)
126,388	38	Weighted Average
115,904		91.70% Pervious Area
10,484		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.1300	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
13.8	642	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.6	692	Total			

Subcatchment 6S: EDA-1A



Summary for Subcatchment 10S: EDA-1B

[45] Hint: Runoff=Zero

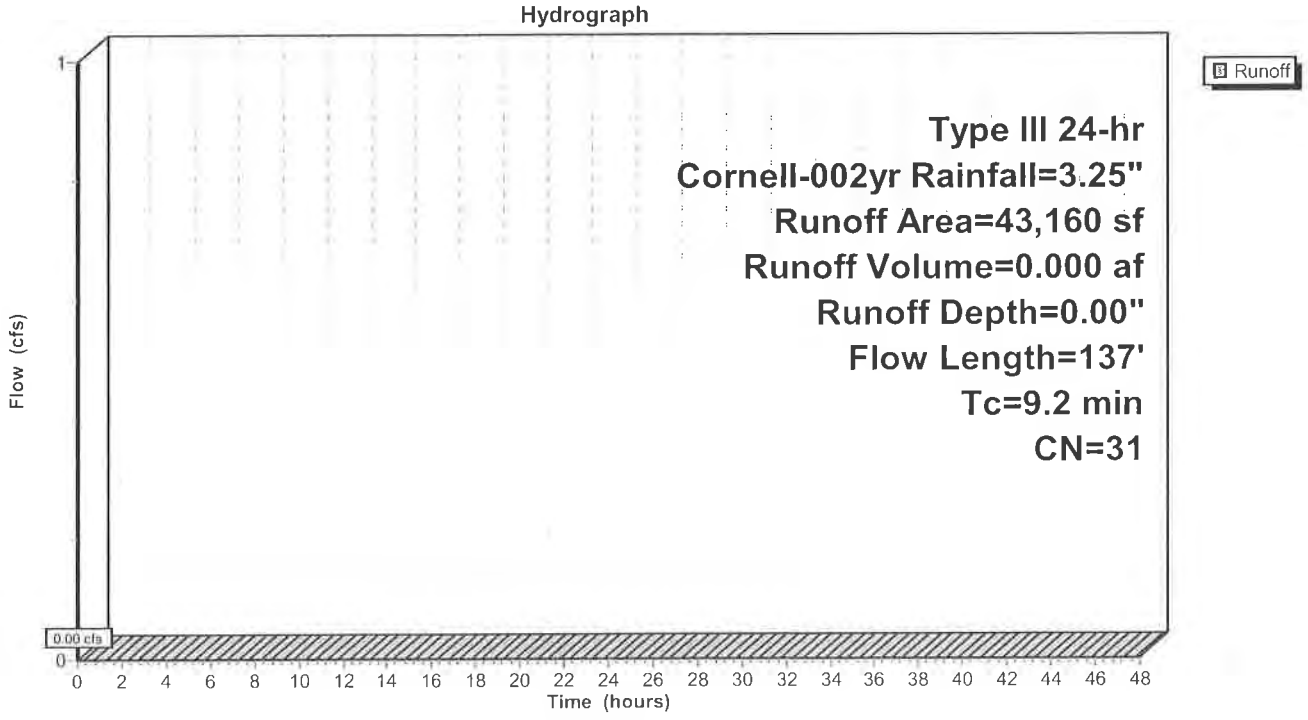
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-002yr Rainfall=3.25"

	Area (sf)	CN	Description
	39,275	30	Woods, Good, HSG A
*	3,885	45	Woods, Poor, HSG A (Bridle Path)
	43,160	31	Weighted Average
	43,160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0540	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	87	0.0954	1.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	137	Total			

Subcatchment 10S: EDA-1B



Summary for Subcatchment 13S: EDA-1C

[49] Hint: Tc<2dt may require smaller dt

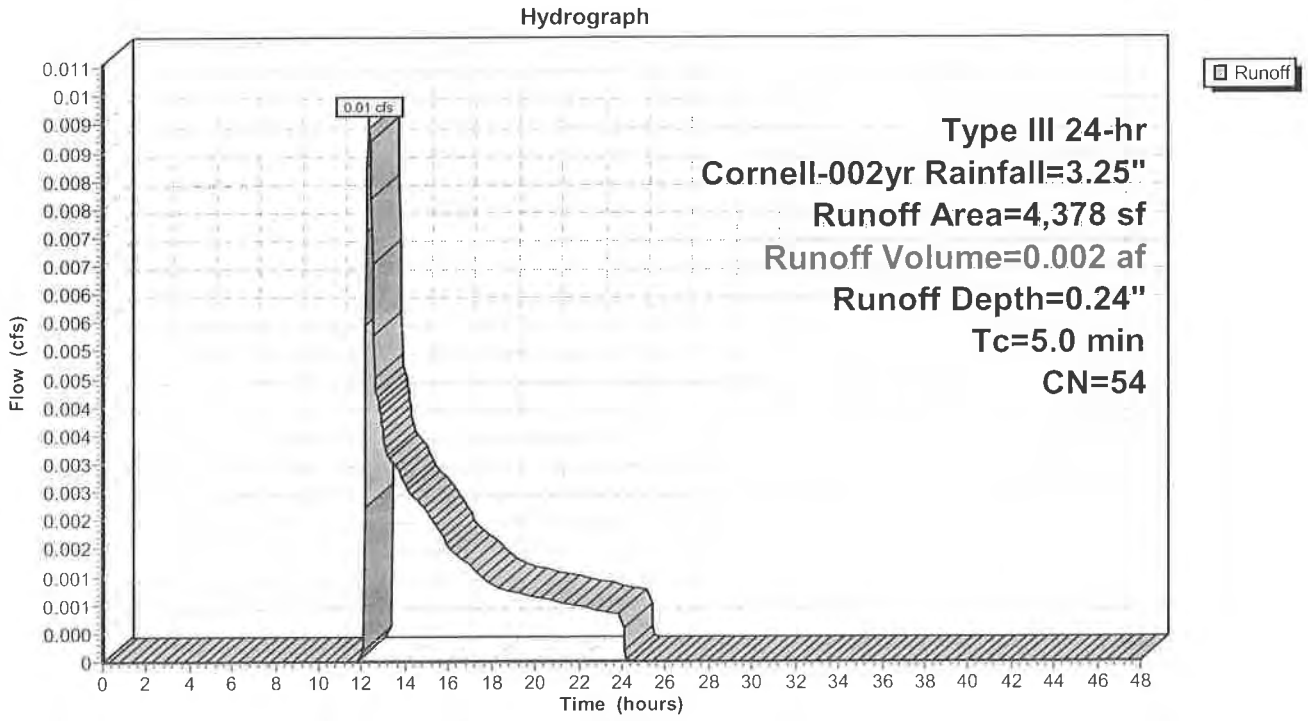
Runoff = 0.01 cfs @ 12.33 hrs, Volume= 0.002 af, Depth= 0.24"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-002yr Rainfall=3.25"

Area (sf)	CN	Description
1,265	98	Paved parking, HSG A
2,097	39	>75% Grass cover, Good, HSG A
1,016	30	Woods, Good, HSG A
4,378	54	Weighted Average
3,113		71.11% Pervious Area
1,265		28.89% Impervious Area

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

Subcatchment 13S: EDA-1C



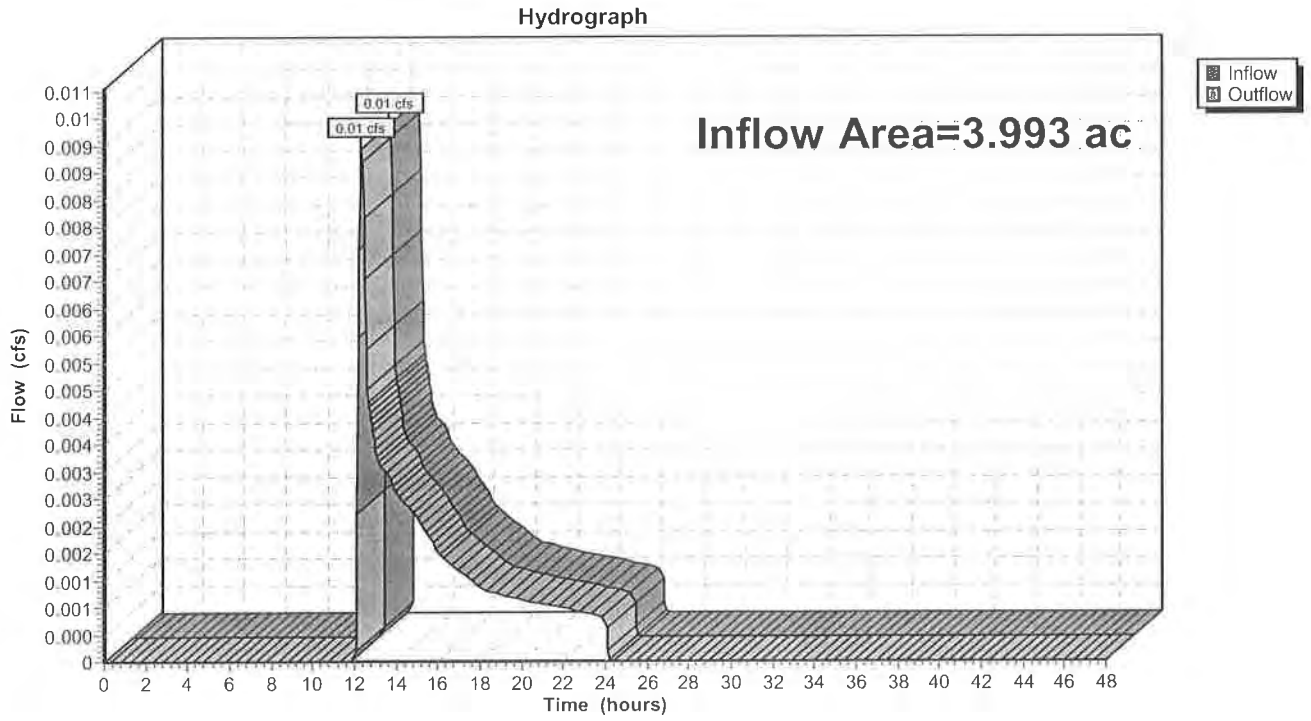
Summary for Reach 8R: EDP-1

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

Inflow Area = 3.993 ac, 6.76% Impervious, Inflow Depth = 0.01" for Cornell-002yr event
Inflow = 0.01 cfs @ 12.33 hrs, Volume= 0.002 af
Outflow = 0.01 cfs @ 12.33 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 8R: EDP-1



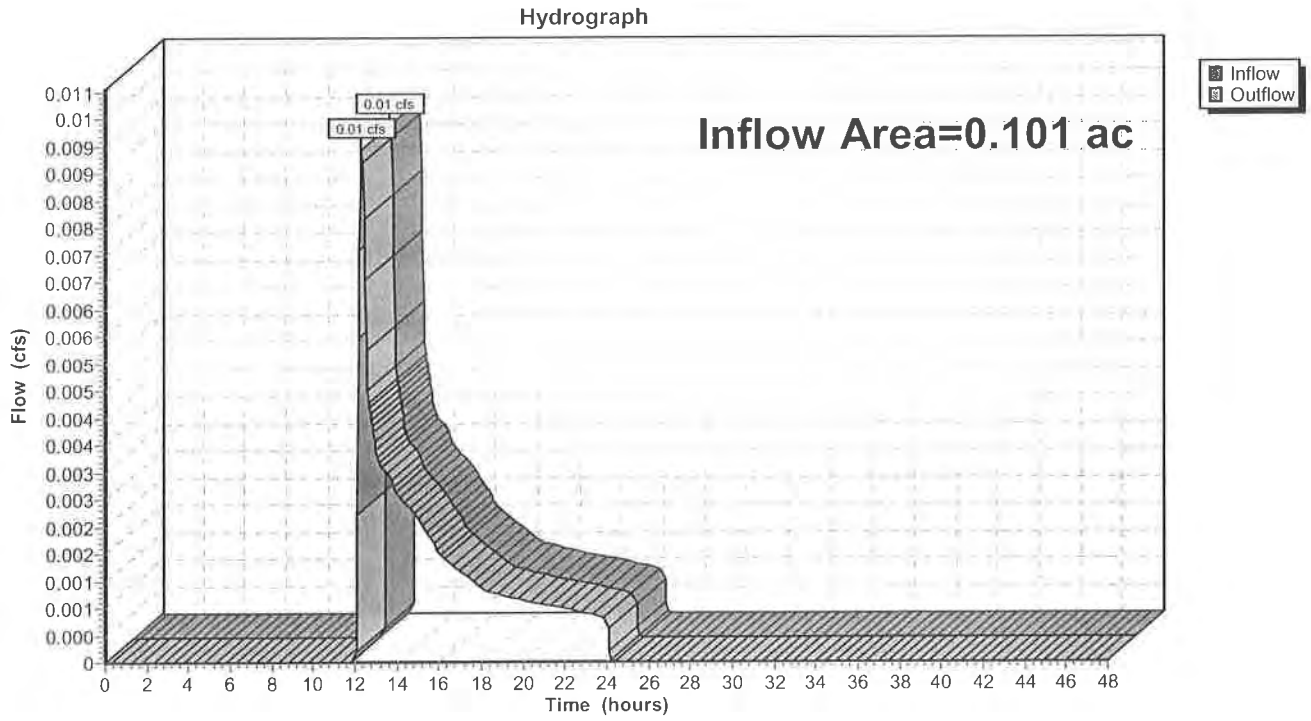
Summary for Reach 10R: EDP-1a

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

Inflow Area = 0.101 ac, 28.89% Impervious, Inflow Depth = 0.24" for Cornell-002yr event
Inflow = 0.01 cfs @ 12.33 hrs, Volume= 0.002 af
Outflow = 0.01 cfs @ 12.33 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 10R: EDP-1a



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 6S: EDA-1A Runoff Area=126,388 sf 8.30% Impervious Runoff Depth=0.15"
Flow Length=692' Tc=19.6 min CN=38 Runoff=0.06 cfs 0.036 af

Subcatchment 10S: EDA-1B Runoff Area=43,160 sf 0.00% Impervious Runoff Depth=0.01"
Flow Length=137' Tc=9.2 min CN=31 Runoff=0.00 cfs 0.001 af

Subcatchment 13S: EDA-1C Runoff Area=4,378 sf 28.89% Impervious Runoff Depth=0.87"
Tc=5.0 min CN=54 Runoff=0.08 cfs 0.007 af

Reach 8R: EDP-1 Inflow=0.08 cfs 0.044 af
Outflow=0.08 cfs 0.044 af

Reach 10R: EDP-1a Inflow=0.08 cfs 0.007 af
Outflow=0.08 cfs 0.007 af

Total Runoff Area = 3.993 ac Runoff Volume = 0.044 af Average Runoff Depth = 0.13"
93.24% Pervious = 3.723 ac 6.76% Impervious = 0.270 ac

Summary for Subcatchment 6S: EDA-1A

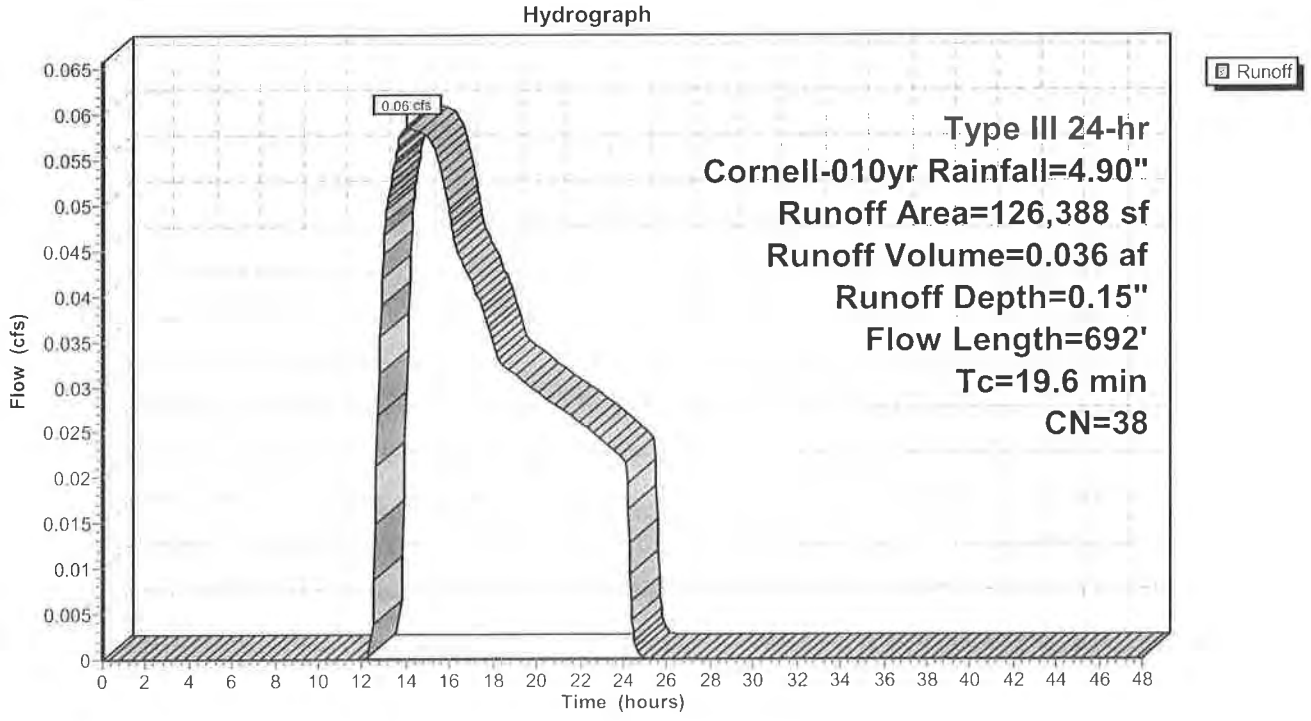
Runoff = 0.06 cfs @ 13.97 hrs, Volume= 0.036 af, Depth= 0.15"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-010yr Rainfall=4.90"

	Area (sf)	CN	Description
	10,484	98	Paved parking, HSG A
	26,074	39	>75% Grass cover, Good, HSG A
	88,238	30	Woods, Good, HSG A
*	1,592	45	Woods, Poor, HSG A (Bridle Path)
	126,388	38	Weighted Average
	115,904		91.70% Pervious Area
	10,484		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.1300	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
13.8	642	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.6	692	Total			

Subcatchment 6S: EDA-1A



Summary for Subcatchment 10S: EDA-1B

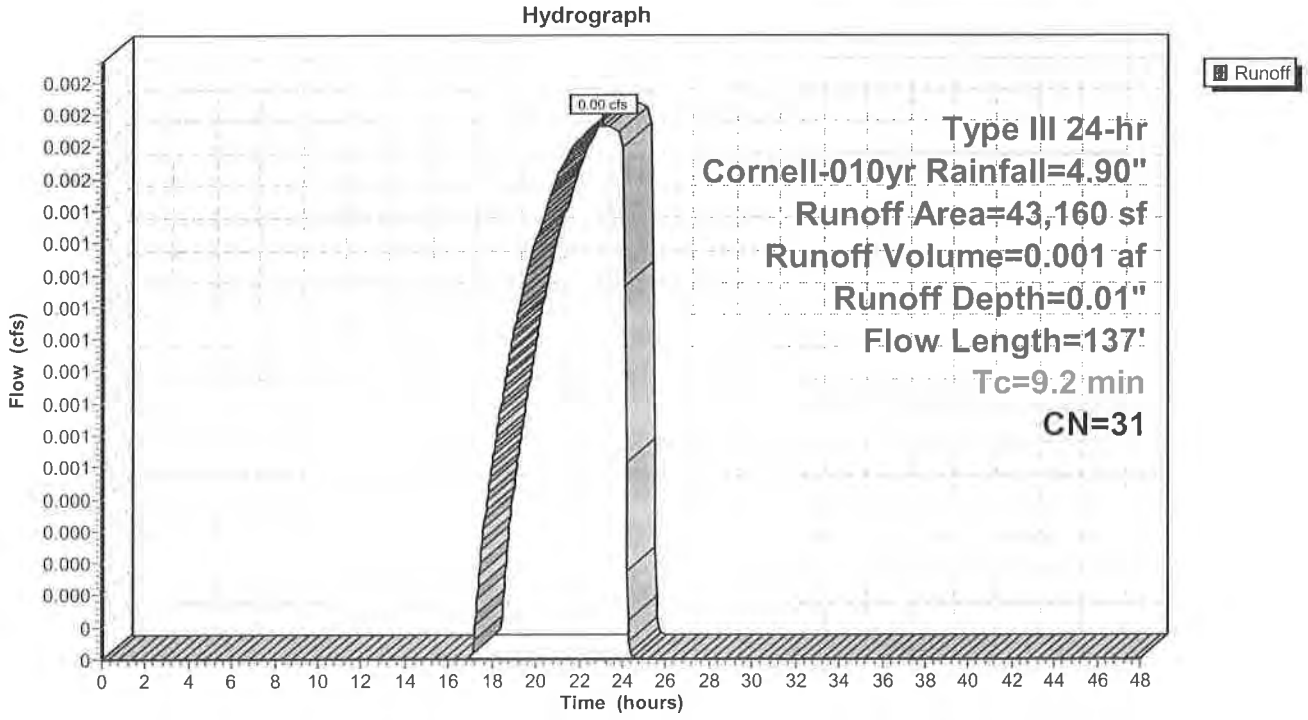
Runoff = 0.00 cfs @ 23.05 hrs, Volume= 0.001 af, Depth= 0.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-010yr Rainfall=4.90"

Area (sf)	CN	Description
39,275	30	Woods, Good, HSG A
* 3,885	45	Woods, Poor, HSG A (Bridle Path)
43,160	31	Weighted Average
43,160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0540	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	87	0.0954	1.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	137	Total			

Subcatchment 10S: EDA-1B



Summary for Subcatchment 13S: EDA-1C

[49] Hint: Tc<2dt may require smaller dt

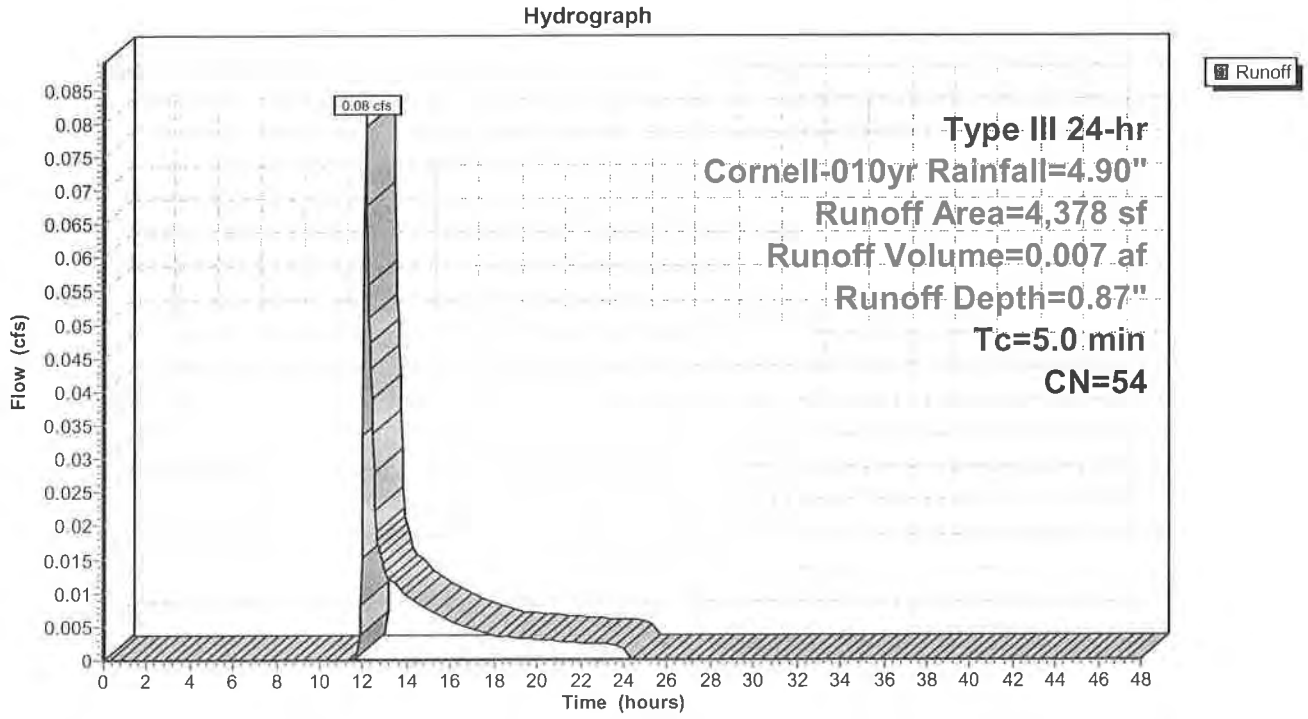
Runoff = 0.08 cfs @ 12.10 hrs, Volume= 0.007 af, Depth= 0.87"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-010yr Rainfall=4.90"

Area (sf)	CN	Description
1,265	98	Paved parking, HSG A
2,097	39	>75% Grass cover, Good, HSG A
1,016	30	Woods, Good, HSG A
4,378	54	Weighted Average
3,113		71.11% Pervious Area
1,265		28.89% Impervious Area

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

Subcatchment 13S: EDA-1C



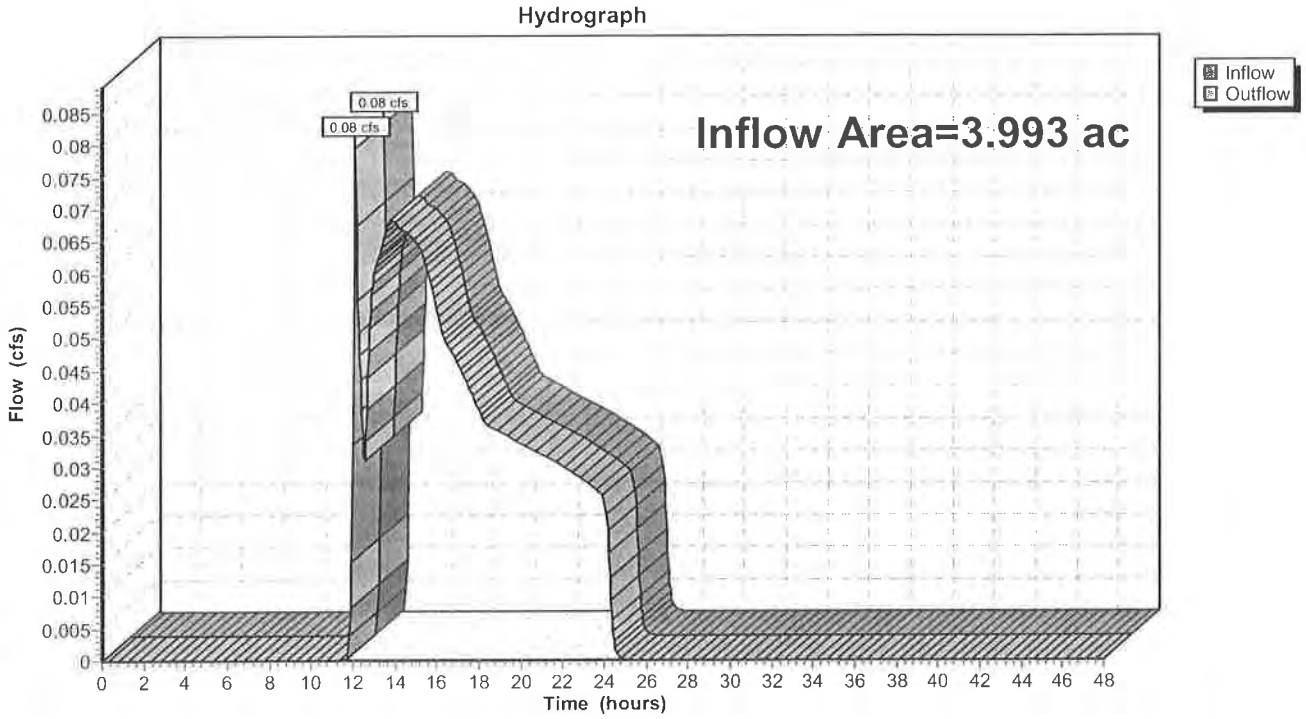
Summary for Reach 8R: EDP-1

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

Inflow Area = 3.993 ac, 6.76% Impervious, Inflow Depth = 0.13" for Cornell-010yr event
Inflow = 0.08 cfs @ 12.10 hrs, Volume= 0.044 af
Outflow = 0.08 cfs @ 12.10 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 8R: EDP-1



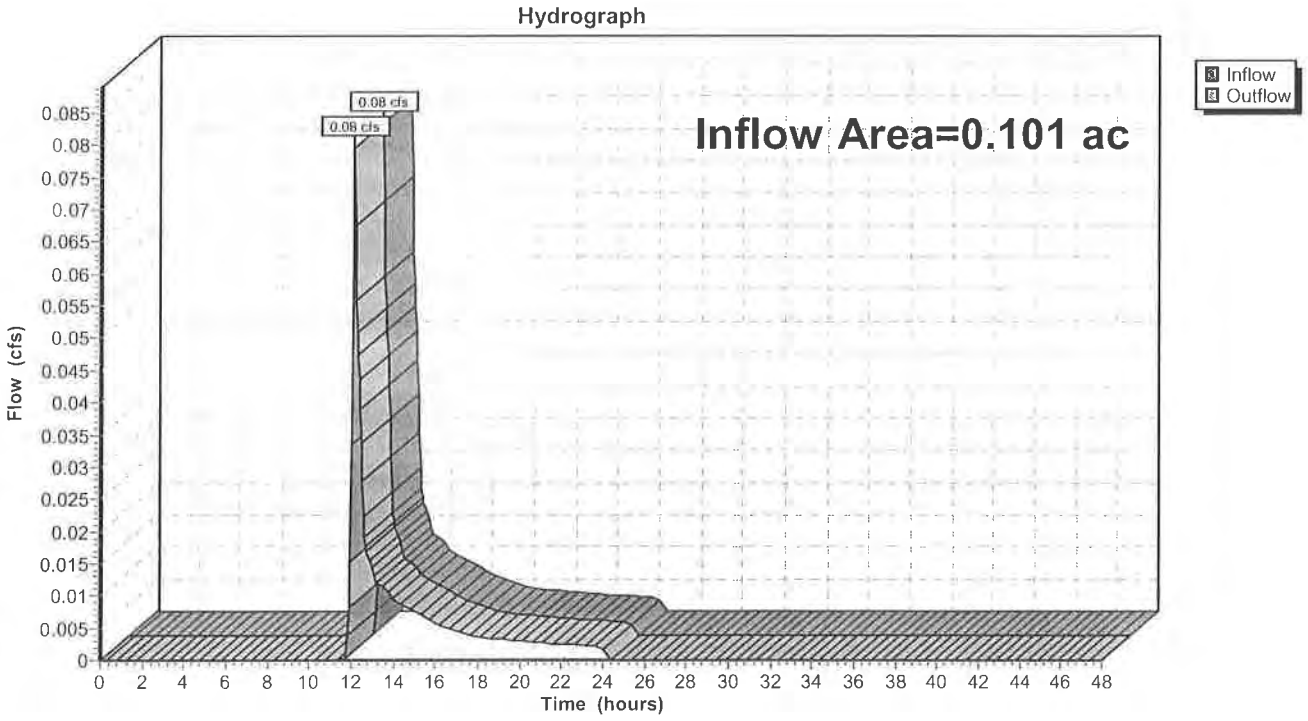
Summary for Reach 10R: EDP-1a

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

Inflow Area = 0.101 ac, 28.89% Impervious, Inflow Depth = 0.87" for Cornell-010yr event
Inflow = 0.08 cfs @ 12.10 hrs, Volume= 0.007 af
Outflow = 0.08 cfs @ 12.10 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 10R: EDP-1a



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 6S: EDA-1A Runoff Area=126,388 sf 8.30% Impervious Runoff Depth=0.80"
Flow Length=692' Tc=19.6 min CN=38 Runoff=1.04 cfs 0.194 af

Subcatchment 10S: EDA-1B Runoff Area=43,160 sf 0.00% Impervious Runoff Depth=0.32"
Flow Length=137' Tc=9.2 min CN=31 Runoff=0.07 cfs 0.027 af

Subcatchment 13S: EDA-1C Runoff Area=4,378 sf 28.89% Impervious Runoff Depth=2.22"
Tc=5.0 min CN=54 Runoff=0.25 cfs 0.019 af

Reach 8R: EDP-1 Inflow=1.18 cfs 0.239 af
Outflow=1.18 cfs 0.239 af

Reach 10R: EDP-1a Inflow=0.25 cfs 0.019 af
Outflow=0.25 cfs 0.019 af

Total Runoff Area = 3.993 ac Runoff Volume = 0.239 af Average Runoff Depth = 0.72"
93.24% Pervious = 3.723 ac 6.76% Impervious = 0.270 ac

Summary for Subcatchment 6S: EDA-1A

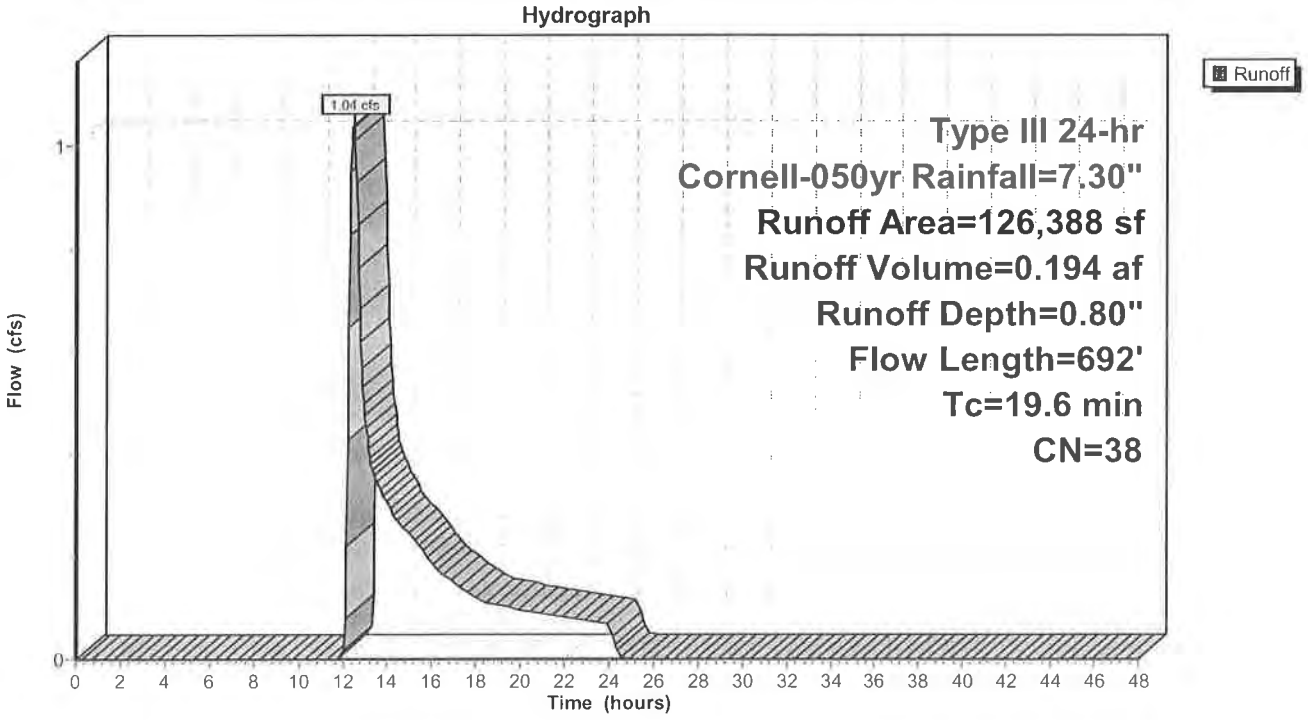
Runoff = 1.04 cfs @ 12.46 hrs, Volume= 0.194 af, Depth= 0.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-050yr Rainfall=7.30"

	Area (sf)	CN	Description
	10,484	98	Paved parking, HSG A
	26,074	39	>75% Grass cover, Good, HSG A
	88,238	30	Woods, Good, HSG A
*	1,592	45	Woods, Poor, HSG A (Bridle Path)
	126,388	38	Weighted Average
	115,904		91.70% Pervious Area
	10,484		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.1300	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
13.8	642	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.6	692	Total			

Subcatchment 6S: EDA-1A



Summary for Subcatchment 10S: EDA-1B

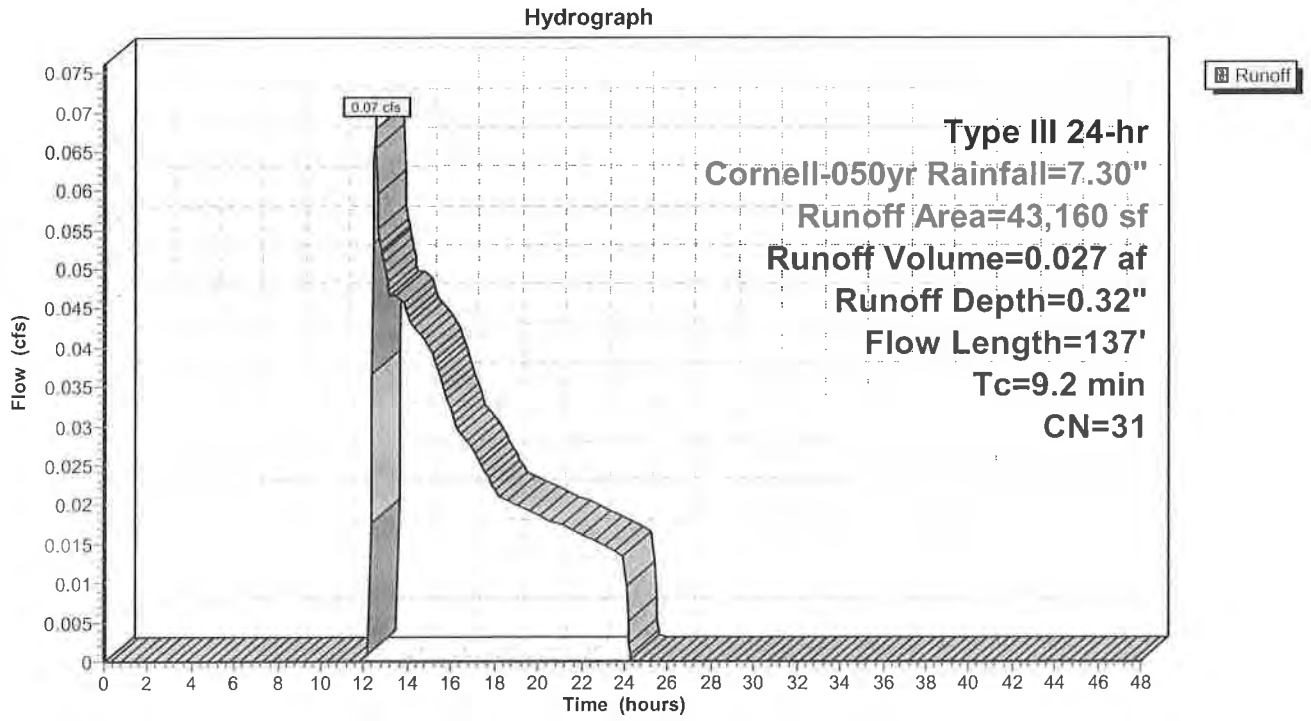
Runoff = 0.07 cfs @ 12.50 hrs, Volume= 0.027 af, Depth= 0.32"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-050yr Rainfall=7.30"

Area (sf)	CN	Description
39,275	30	Woods, Good, HSG A
* 3,885	45	Woods, Poor, HSG A (Bridle Path)
43,160	31	Weighted Average
43,160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0540	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	87	0.0954	1.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	137	Total			

Subcatchment 10S: EDA-1B



Summary for Subcatchment 13S: EDA-1C

[49] Hint: Tc<2dt may require smaller dt

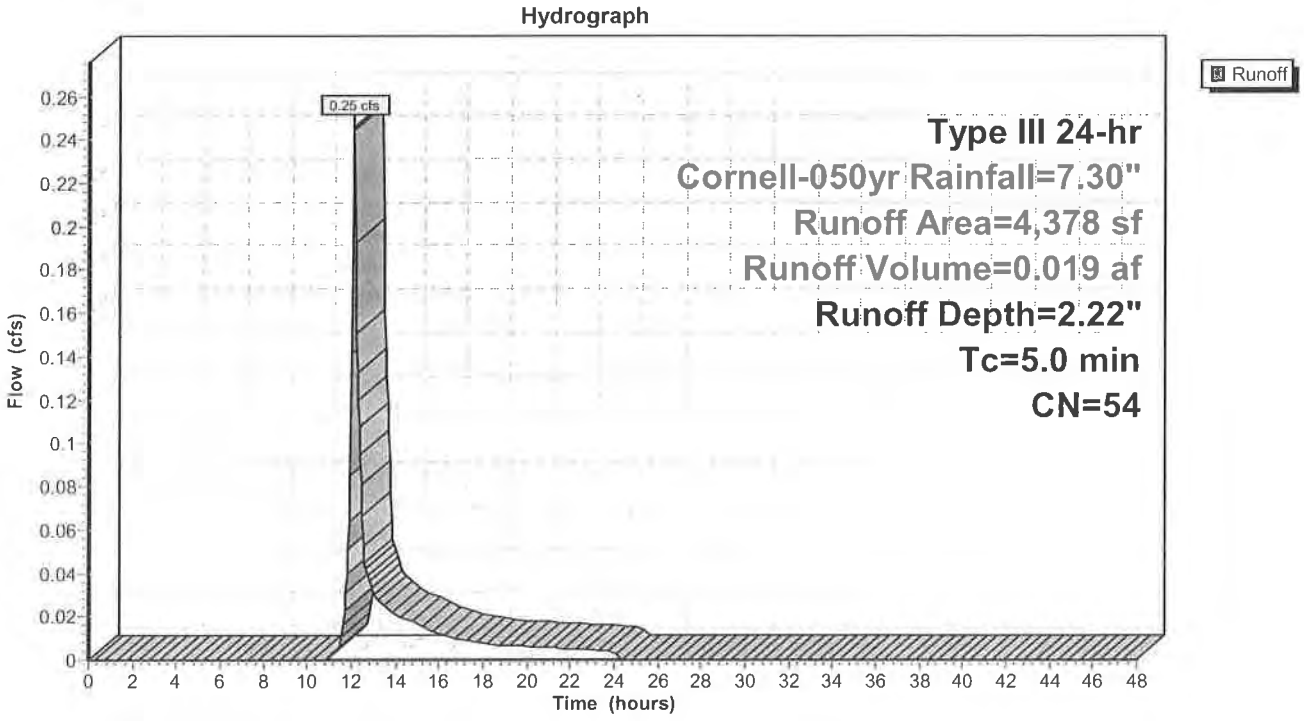
Runoff = 0.25 cfs @ 12.09 hrs, Volume= 0.019 af, Depth= 2.22"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-050yr Rainfall=7.30"

Area (sf)	CN	Description
1,265	98	Paved parking, HSG A
2,097	39	>75% Grass cover, Good, HSG A
1,016	30	Woods, Good, HSG A
4,378	54	Weighted Average
3,113		71.11% Pervious Area
1,265		28.89% Impervious Area

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

Subcatchment 13S: EDA-1C



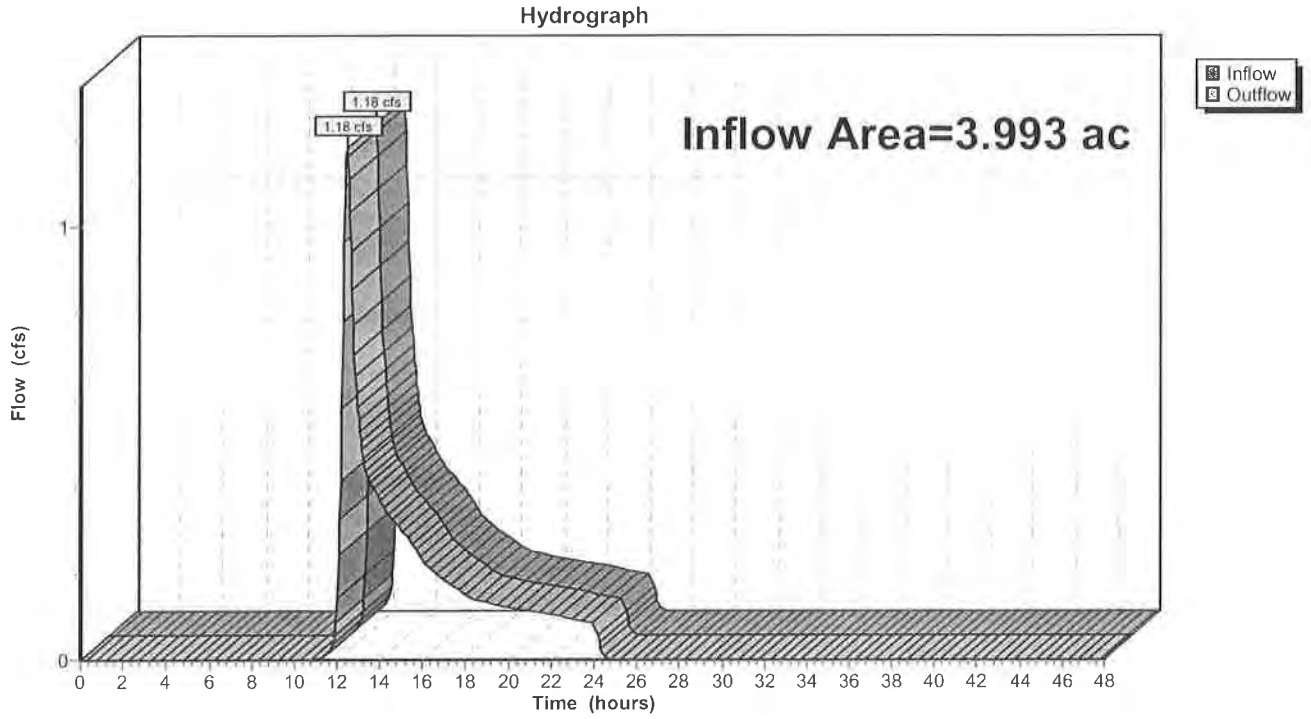
Summary for Reach 8R: EDP-1

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

Inflow Area = 3.993 ac, 6.76% Impervious, Inflow Depth = 0.72" for Cornell-050yr event
Inflow = 1.18 cfs @ 12.45 hrs, Volume= 0.239 af
Outflow = 1.18 cfs @ 12.45 hrs, Volume= 0.239 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 8R: EDP-1



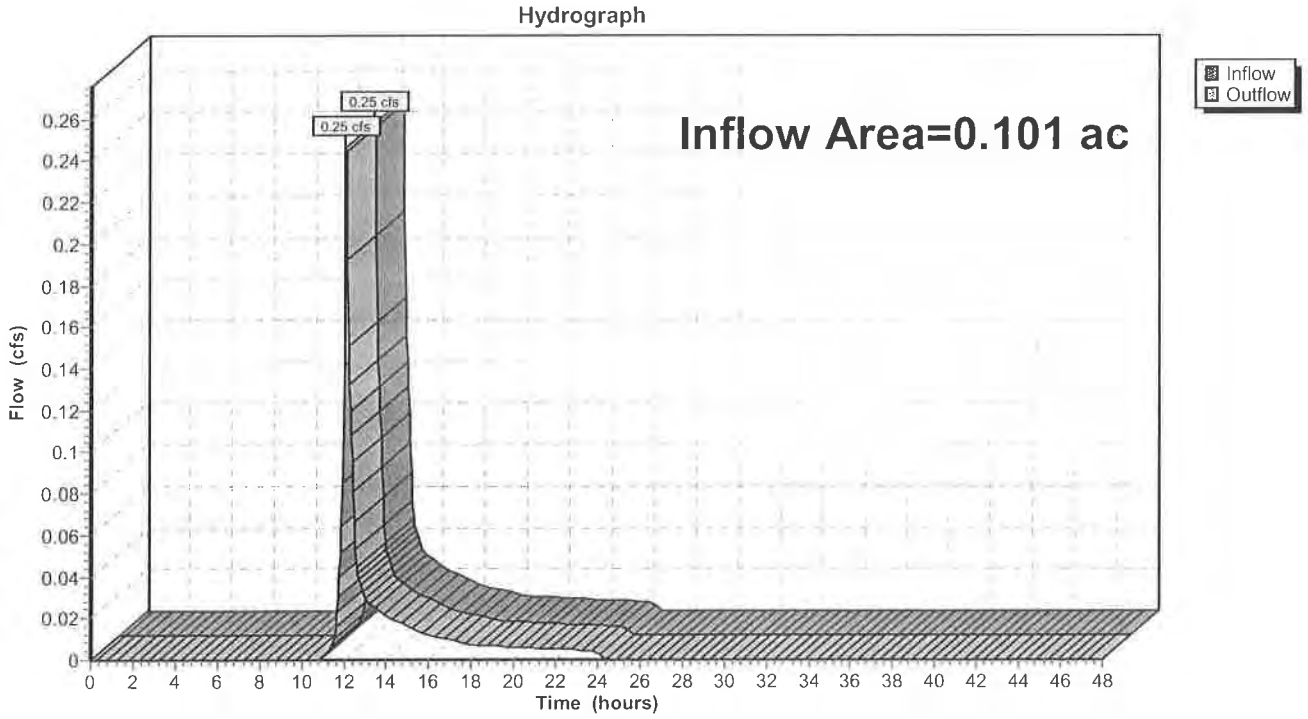
Summary for Reach 10R: EDP-1a

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

Inflow Area = 0.101 ac, 28.89% Impervious, Inflow Depth = 2.22" for Cornell-050yr event
Inflow = 0.25 cfs @ 12.09 hrs, Volume= 0.019 af
Outflow = 0.25 cfs @ 12.09 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 10R: EDP-1a



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 6S: EDA-1A Runoff Area=126,388 sf 8.30% Impervious Runoff Depth=1.27"
Flow Length=692' Tc=19.6 min CN=38 Runoff=2.01 cfs 0.308 af

Subcatchment 10S: EDA-1B Runoff Area=43,160 sf 0.00% Impervious Runoff Depth=0.62"
Flow Length=137' Tc=9.2 min CN=31 Runoff=0.24 cfs 0.051 af

Subcatchment 13S: EDA-1C Runoff Area=4,378 sf 28.89% Impervious Runoff Depth=3.02"
Tc=5.0 min CN=54 Runoff=0.34 cfs 0.025 af

Reach 8R: EDP-1 Inflow=2.39 cfs 0.384 af
Outflow=2.39 cfs 0.384 af

Reach 10R: EDP-1a Inflow=0.34 cfs 0.025 af
Outflow=0.34 cfs 0.025 af

Total Runoff Area = 3.993 ac Runoff Volume = 0.384 af Average Runoff Depth = 1.16"
93.24% Pervious = 3.723 ac 6.76% Impervious = 0.270 ac

Summary for Subcatchment 6S: EDA-1A

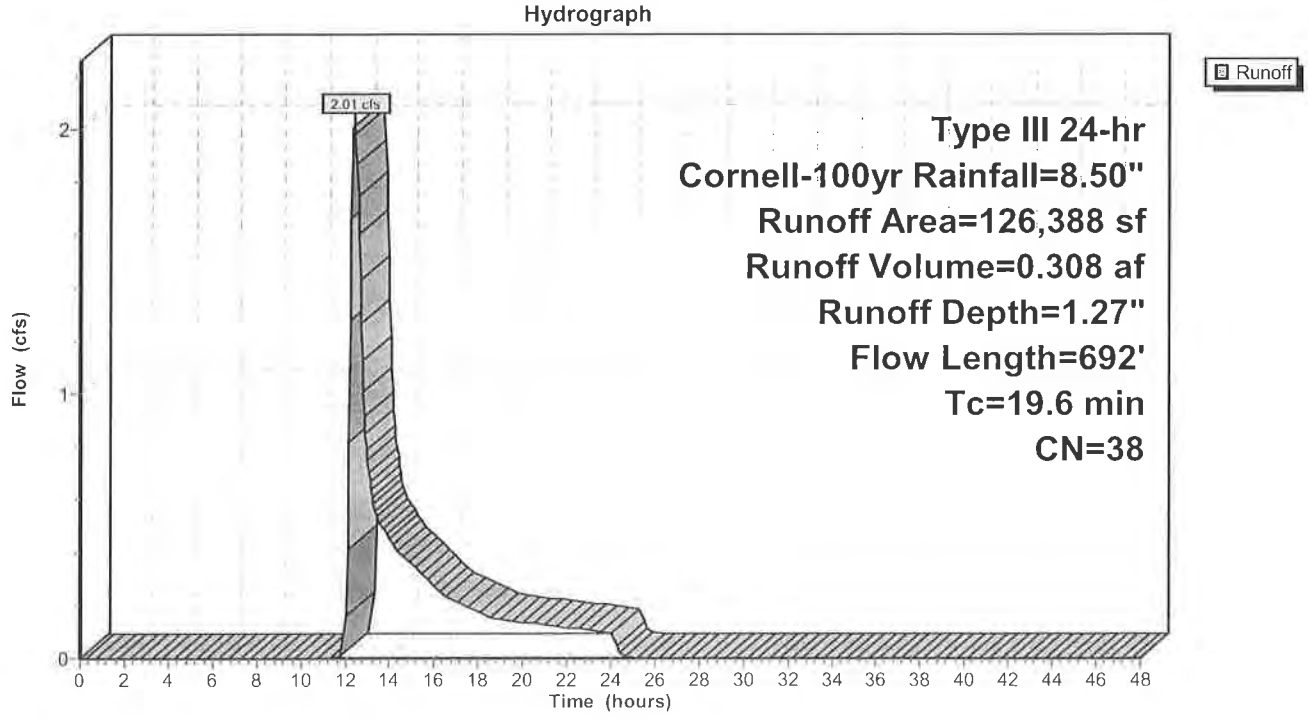
Runoff = 2.01 cfs @ 12.38 hrs, Volume= 0.308 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-100yr Rainfall=8.50"

	Area (sf)	CN	Description
	10,484	98	Paved parking, HSG A
	26,074	39	>75% Grass cover, Good, HSG A
	88,238	30	Woods, Good, HSG A
*	1,592	45	Woods, Poor, HSG A (Bridle Path)
	126,388	38	Weighted Average
	115,904		91.70% Pervious Area
	10,484		8.30% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	50	0.1300	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
13.8	642	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.6	692	Total			

Subcatchment 6S: EDA-1A



Summary for Subcatchment 10S: EDA-1B

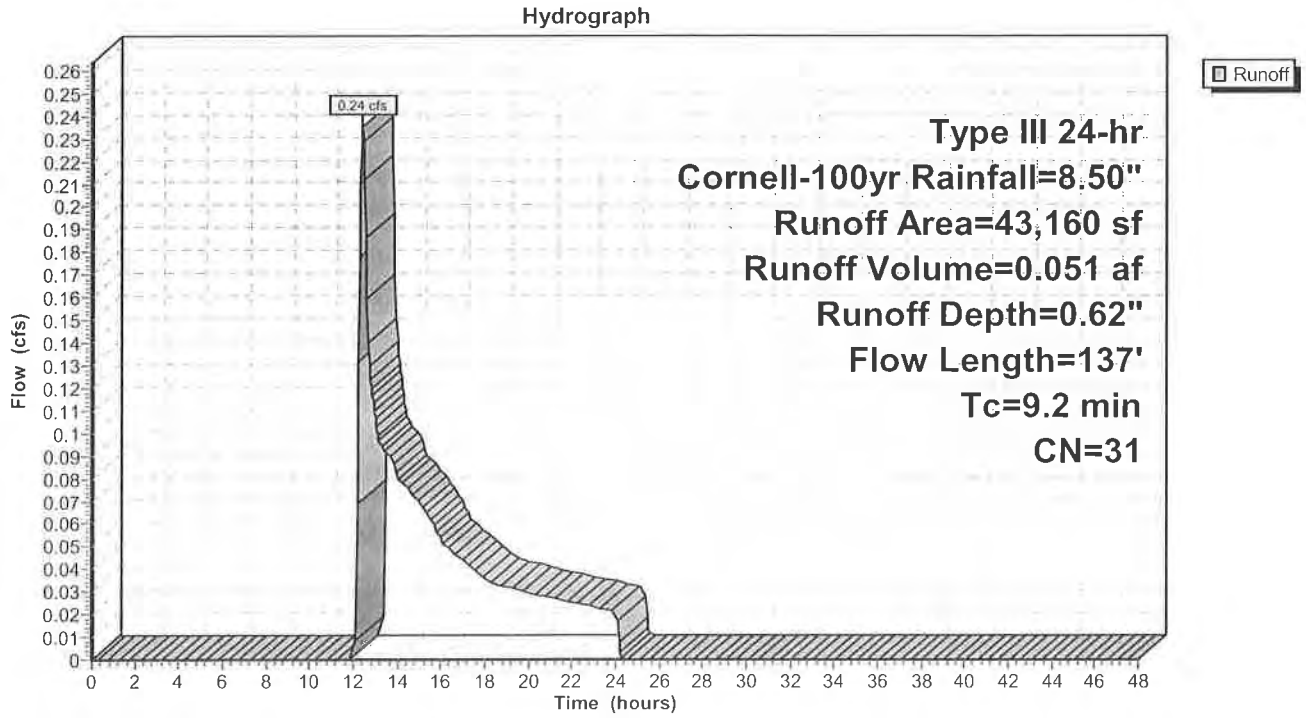
Runoff = 0.24 cfs @ 12.40 hrs, Volume= 0.051 af, Depth= 0.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-100yr Rainfall=8.50"

	Area (sf)	CN	Description
	39,275	30	Woods, Good, HSG A
*	3,885	45	Woods, Poor, HSG A (Bridle Path)
	43,160	31	Weighted Average
	43,160		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.3	50	0.0540	0.10		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.20"
0.9	87	0.0954	1.54		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
9.2	137	Total			

Subcatchment 10S: EDA-1B



Summary for Subcatchment 13S: EDA-1C

[49] Hint: Tc<2dt may require smaller dt

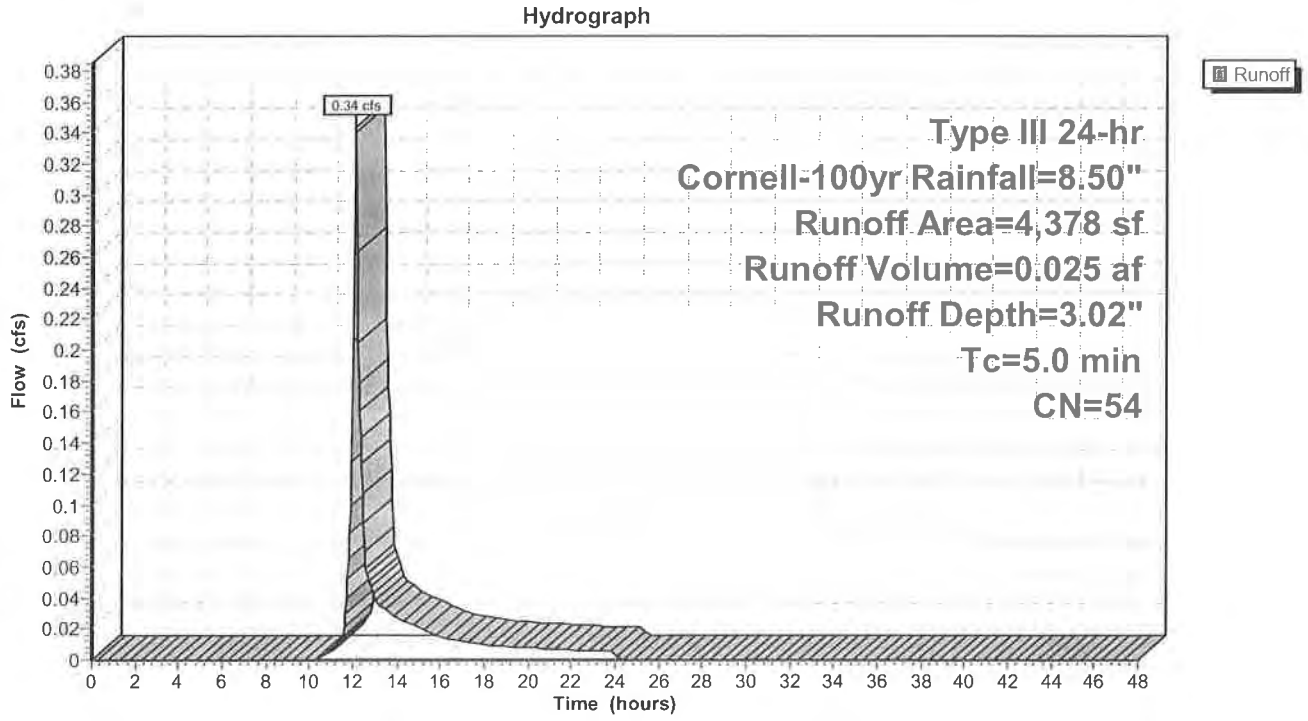
Runoff = 0.34 cfs @ 12.09 hrs, Volume= 0.025 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-100yr Rainfall=8.50"

Area (sf)	CN	Description
1,265	98	Paved parking, HSG A
2,097	39	>75% Grass cover, Good, HSG A
1,016	30	Woods, Good, HSG A
4,378	54	Weighted Average
3,113		71.11% Pervious Area
1,265		28.89% Impervious Area

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

Subcatchment 13S: EDA-1C



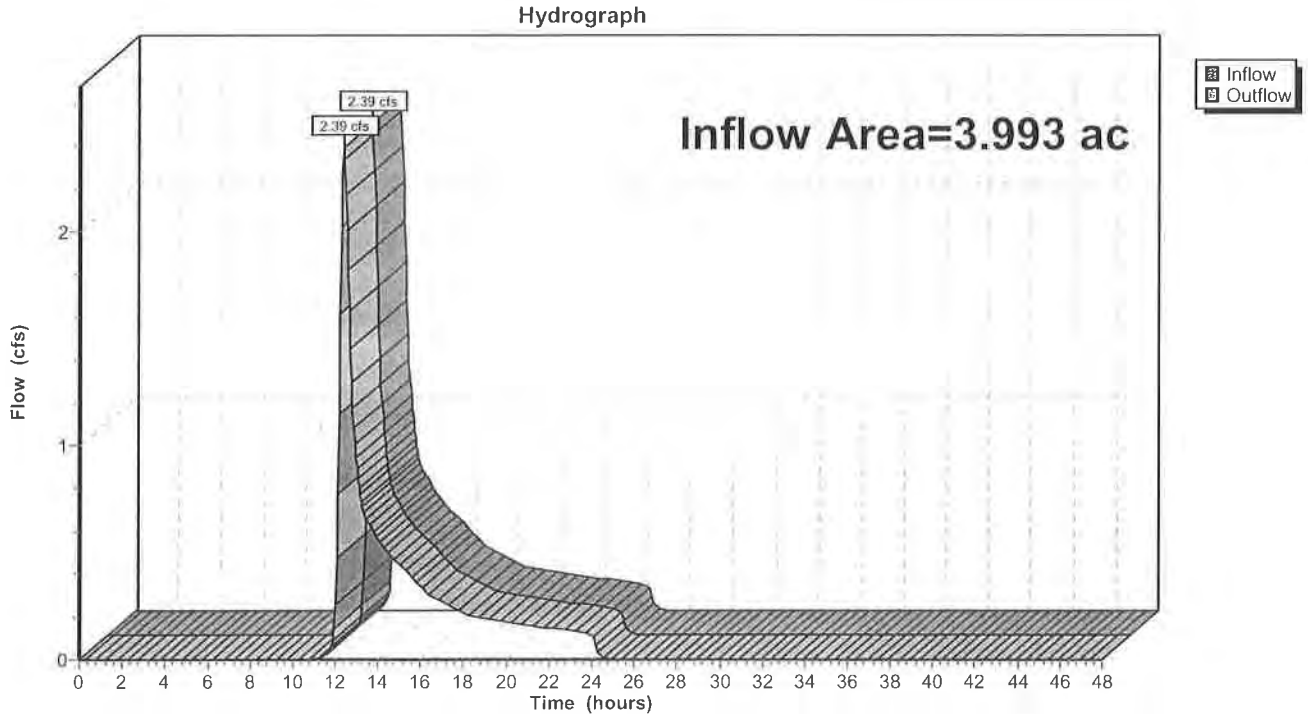
Summary for Reach 8R: EDP-1

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

Inflow Area = 3.993 ac, 6.76% Impervious, Inflow Depth = 1.16" for Cornell-100yr event
Inflow = 2.39 cfs @ 12.37 hrs, Volume= 0.384 af
Outflow = 2.39 cfs @ 12.37 hrs, Volume= 0.384 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 8R: EDP-1



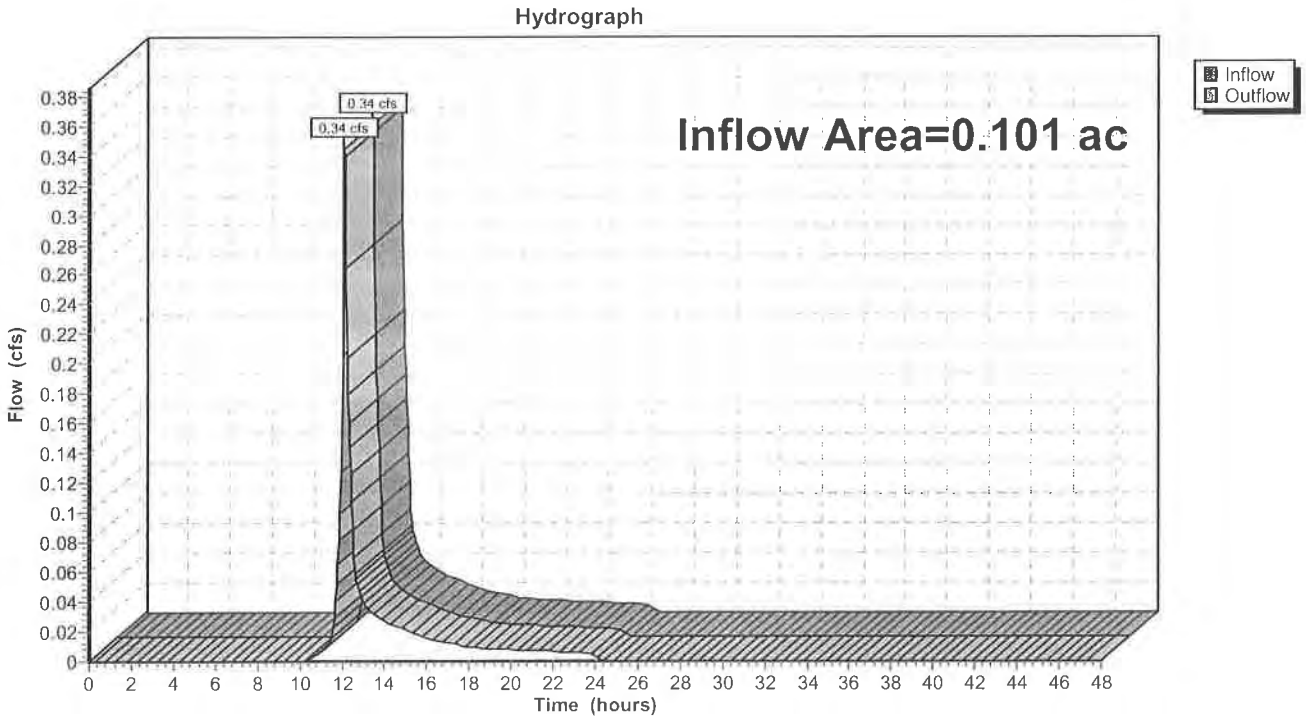
Summary for Reach 10R: EDP-1a

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

Inflow Area = 0.101 ac, 28.89% Impervious, Inflow Depth = 3.02" for Cornell-100yr event
Inflow = 0.34 cfs @ 12.09 hrs, Volume= 0.025 af
Outflow = 0.34 cfs @ 12.09 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 10R: EDP-1a



Appendix C
Post-Development Hydrologic Analysis

BEALS + THOMAS
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

CALCULATION SUMMARY

T 508.366.0560
F 508.366.4391
www.bealsandthomas.com
Regional Office: Plymouth, MA

JOB NO./LOCATION:

2177.04
Medfield, MA

CLIENT/PROJECT:

LCB Senior Living
Assisted Living Residence

SUBJECT/TITLE:

Proposed Conditions Hydrology Design

OBJECTIVE OF CALCULATION:

- To determine the post-development peak rates and volumes of runoff from the site for the 1, 2, 10, 50 & 100-year storm events at the design point.

CALCULATION METHOD(S):

- Runoff curve numbers (CN), time-of-concentration (Tc), and runoff rates were calculated based on TR-55 methodology.
- AutoCAD 2014 computer program was utilized for digitizing ground cover areas.
- Peak runoff rates were computed using HydroCAD version 10.00.

ASSUMPTIONS:

- A conservative Rawl's soil infiltration rate of 8.27 in/hr was used for the proposed subsurface infiltration system based on insitu soil testing and the USDA soil texture classification. An onsite falling head permeability test resulted in an infiltration rates of 18 in/hr.
- Stormwater runoff from 353/355 Main Street which flows onto the project site has been excluded from the hydrologic model. Runoff from the adjacent property will not be directed to any detention system and will cross the site via a culvert. The culvert has been design to adequately convey the flow from the adjacent property.

SOURCES OF DATA/EQUATIONS:

- Post-Development Conditions Hydrologic Areas Map prepared by Beals and Thomas, Inc. File No. 217704P026A-002, dated 8/11/2015.
- NRCS Soil Survey for Norfolk County, hydrologic soil group report, downloaded from Web Soil Survey on 12/23/2014.
- TR-55 urban Hydrology for Small Watersheds, SCS, 1986.
- Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada, Cornell University, Publication No. RR 93-5.
- Massachusetts DEP Stormwater Management Handbook, February 2008.
- Town of Medfield Board of Health Regulations for Storm Water and Runoff Management.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	C. Taylor	8/12/15	D.M. Thomas	8/13/2015	D.M. Thomas	8/13/2015

BEALS + THOMAS
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

T 508.366.0560
F 508.366.4391
www.bealsandthomas.com
Regional Office: Plymouth, MA

CONCLUSIONS:

Storm Event	Peak Runoff Rates DP-1 (CFS)	Runoff Volume DP-1 (ac-ft)
1-Year	0.00	0.000
2-Year	0.00	0.001
10-Year	0.08	0.037
25-Year	1.14	0.192
100-Year	2.32	0.334

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	C. Taylor	8/12/15	D. M. Thomas	8/13/2015	D. M. Thomas	8/13/2015

EXISTING DRAINAGE AREA

EXISTING Tc PATH

X DP-1 DRAINAGE POINT

PDA-1b

PDA-1a

PDA-1c

PDA-1d

PDP-1

DP-1a

MAIN STREET
ROUTE 109
(PUBLIC-60' WIDE)
(1723/521 1926 COUNTY LAYOUT)
(PLAN BOOK 106, PLAN 1107, 1108)

Post-Development Conditions Hydrologic Areas Map
Figure Number 002

Scale: 1" = 80'

Date: 08/11/2015

B+T Drawing No. 217704P026A-002

B+T Project No. 2177.04

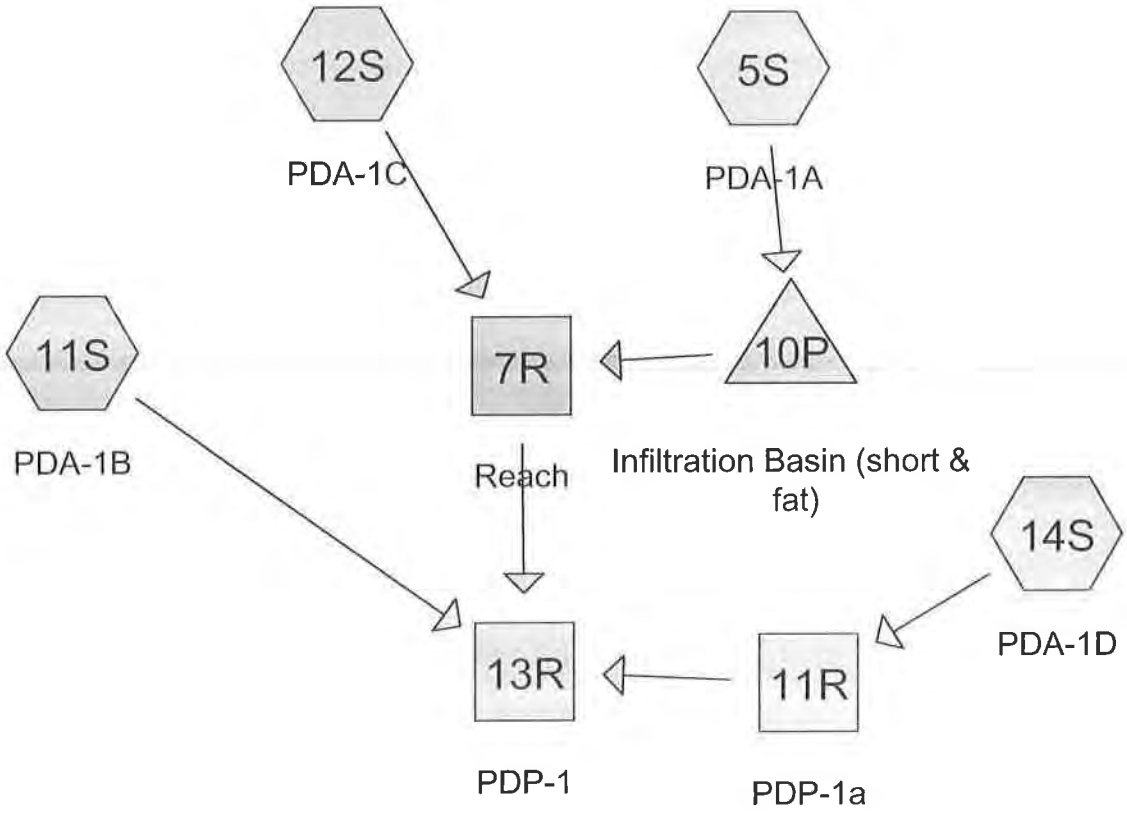
Assisted Living Residence
Medfield, Massachusetts

LCB Senior Living
3 Edge Water Drive
Norwood, Massachusetts

North Arrow

NORTH

Proposed Conditions



Subcat Reach Pond Link

Routing Diagram for 217704HCP001
Prepared by Beals and Thomas, Printed 8/11/2015
HydroCAD® 10.00 s/n 04493 © 2011 HydroCAD Software Solutions LLC

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.088	30	Woods, Good, HSG A (5S, 11S, 14S)
1.058	39	>75% Grass cover, Good, HSG A (5S, 11S, 12S, 14S)
0.126	45	Woods, Poor, HSG A (Bridle Path) (11S)
0.232	96	Gravel surface, HSG A (5S, 11S)
0.891	98	Paved parking, HSG A (5S, 11S, 14S)
0.602	98	Roofs, HSG A (5S)
3.996	**62**	**TOTAL AREA**

Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: PDA-1A Runoff Area=86,104 sf 67.87% Impervious Runoff Depth=1.26"
Tc=6.0 min CN=85 Runoff=2.85 cfs 0.207 af

Subcatchment 11S: PDA-1B Runoff Area=74,966 sf 7.91% Impervious Runoff Depth=0.00"
Flow Length=454' Tc=13.5 min CN=40 Runoff=0.00 cfs 0.000 af

Subcatchment 12S: PDA-1C Runoff Area=9,789 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 14S: PDA-1D Runoff Area=3,211 sf 20.43% Impervious Runoff Depth=0.02"
Tc=6.0 min CN=48 Runoff=0.00 cfs 0.000 af

Reach 7R: Reach Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=163.0' S=0.0061 '/' Capacity=33.69 cfs Outflow=0.00 cfs 0.000 af

Reach 11R: PDP-1a Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach 13R: PDP-1 Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond 10P: Infiltration Basin (short & fat) Peak Elev=181.84' Storage=0.017 af Inflow=2.85 cfs 0.207 af
Discarded=1.50 cfs 0.207 af Primary=0.00 cfs 0.000 af Outflow=1.50 cfs 0.207 af

Total Runoff Area = 3.996 ac Runoff Volume = 0.207 af Average Runoff Depth = 0.62"
62.64% Pervious = 2.503 ac 37.36% Impervious = 1.493 ac

Summary for Subcatchment 5S: PDA-1A

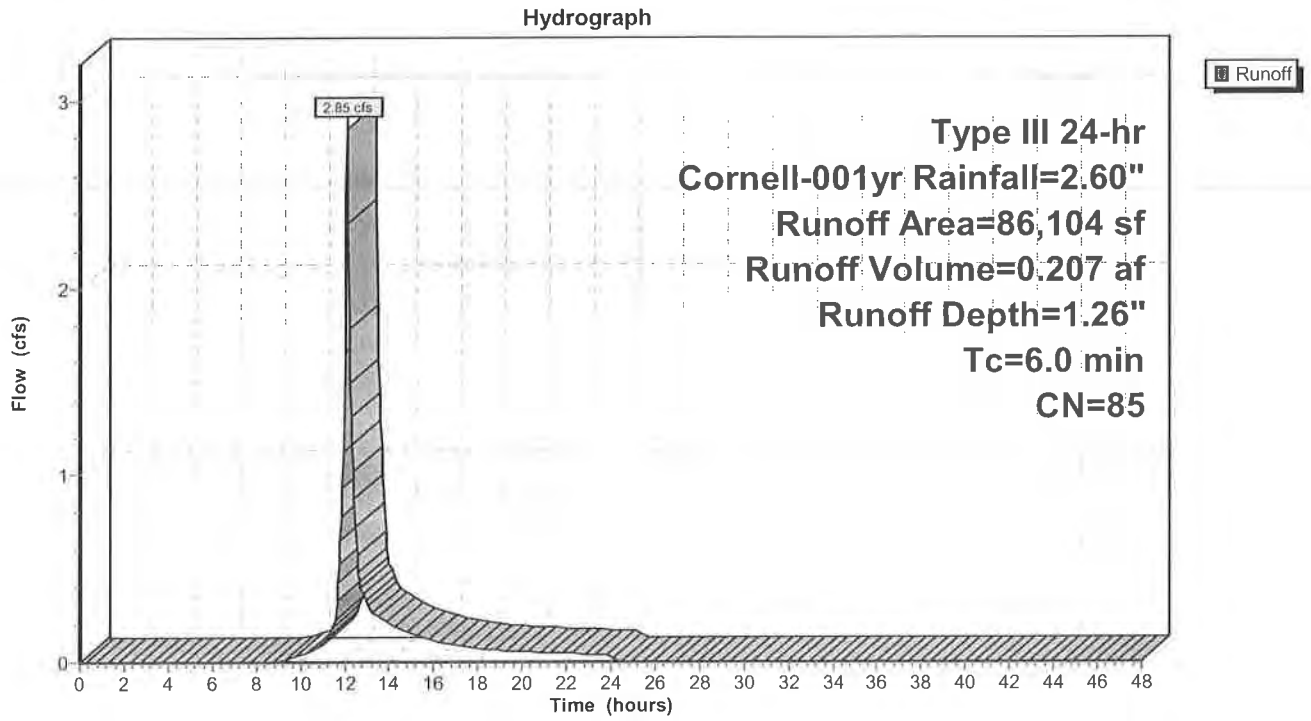
Runoff = 2.85 cfs @ 12.09 hrs, Volume= 0.207 af, Depth= 1.26"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-001yr Rainfall=2.60"

Area (sf)	CN	Description
26,234	98	Roofs, HSG A
32,204	98	Paved parking, HSG A
9,086	96	Gravel surface, HSG A
15,629	39	>75% Grass cover, Good, HSG A
2,951	30	Woods, Good, HSG A
86,104	85	Weighted Average
27,666		32.13% Pervious Area
58,438		67.87% Impervious Area

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

Subcatchment 5S: PDA-1A



Summary for Subcatchment 11S: PDA-1B

[45] Hint: Runoff=Zero

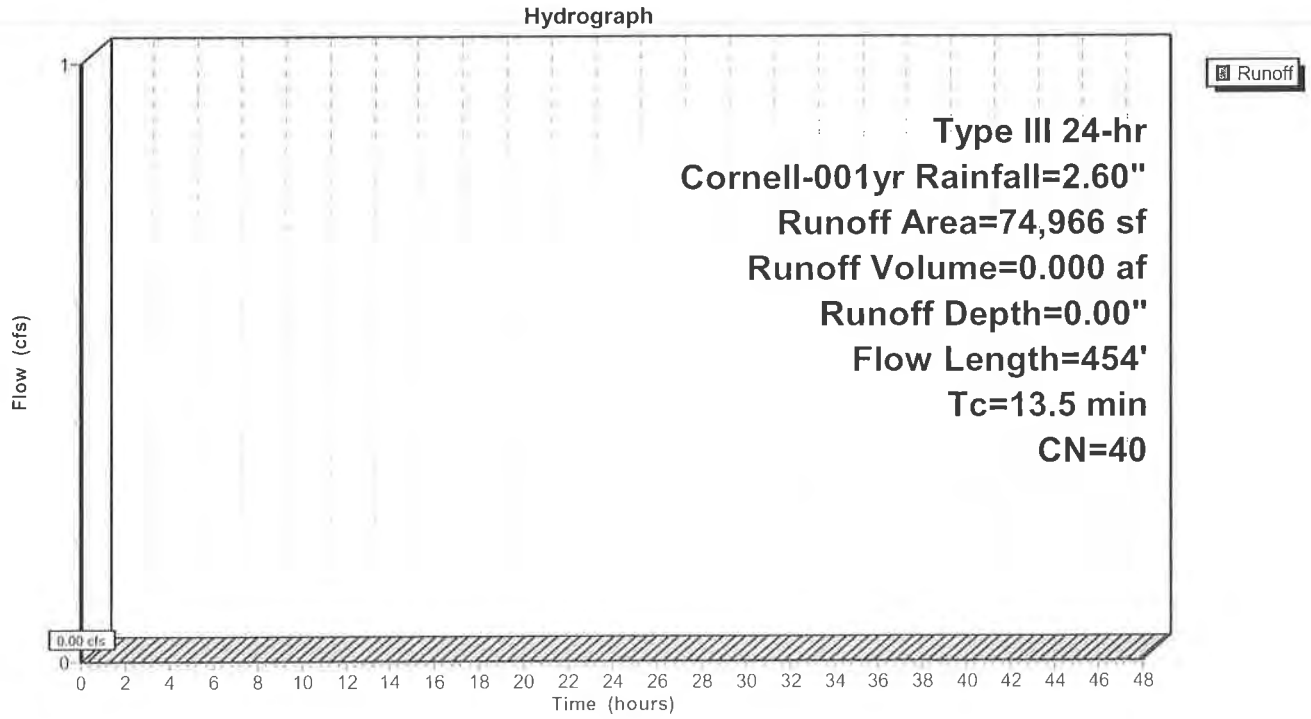
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-001yr Rainfall=2.60"

Area (sf)	CN	Description
5,931	98	Paved parking, HSG A
19,108	39	>75% Grass cover, Good, HSG A
43,432	30	Woods, Good, HSG A
* 5,477	45	Woods, Poor, HSG A (Bridle Path)
1,018	96	Gravel surface, HSG A
74,966	40	Weighted Average
69,035		92.09% Pervious Area
5,931		7.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
7.9	404	0.0148	0.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.5	454	Total			

Subcatchment 11S: PDA-1B



Summary for Subcatchment 12S: PDA-1C

[45] Hint: Runoff=Zero

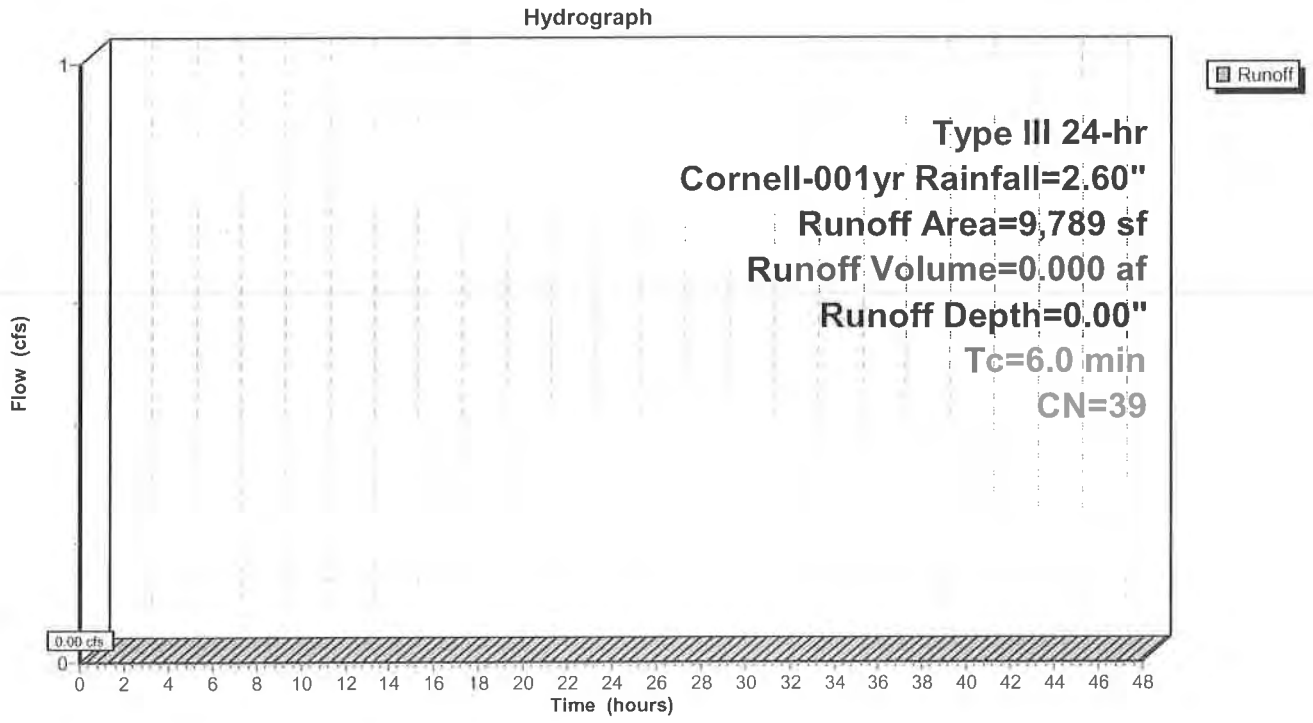
Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-001yr Rainfall=2.60"

Area (sf)	CN	Description
9,789	39	>75% Grass cover, Good, HSG A
9,789		100.00% Pervious Area

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

Subcatchment 12S: PDA-1C



Summary for Subcatchment 14S: PDA-1D

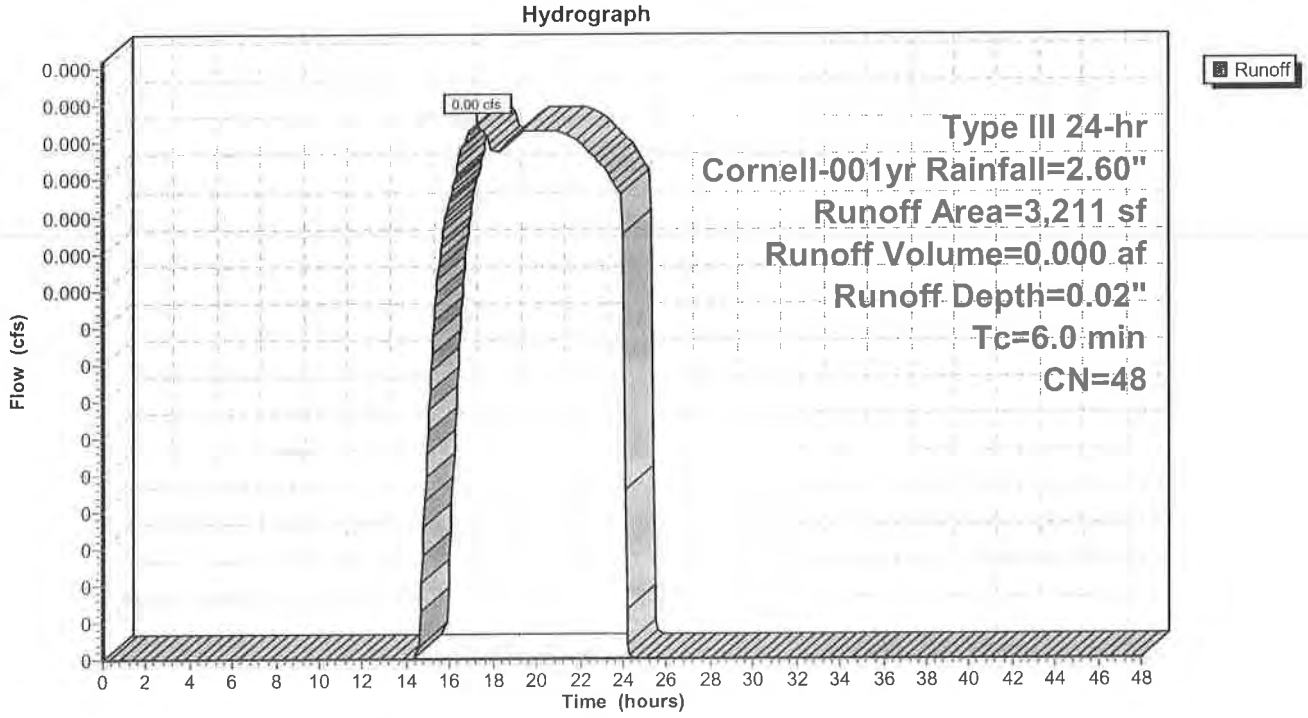
Runoff = 0.00 cfs @ 17.25 hrs, Volume= 0.000 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-001yr Rainfall=2.60"

Area (sf)	CN	Description
656	98	Paved parking, HSG A
1,553	39	>75% Grass cover, Good, HSG A
1,002	30	Woods, Good, HSG A
3,211	48	Weighted Average
2,555		79.57% Pervious Area
656		20.43% Impervious Area

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

Subcatchment 14S: PDA-1D



Summary for Reach 7R: Reach

Inflow Area = 2.201 ac, 60.94% Impervious, Inflow Depth = 0.00" for Cornell-001yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

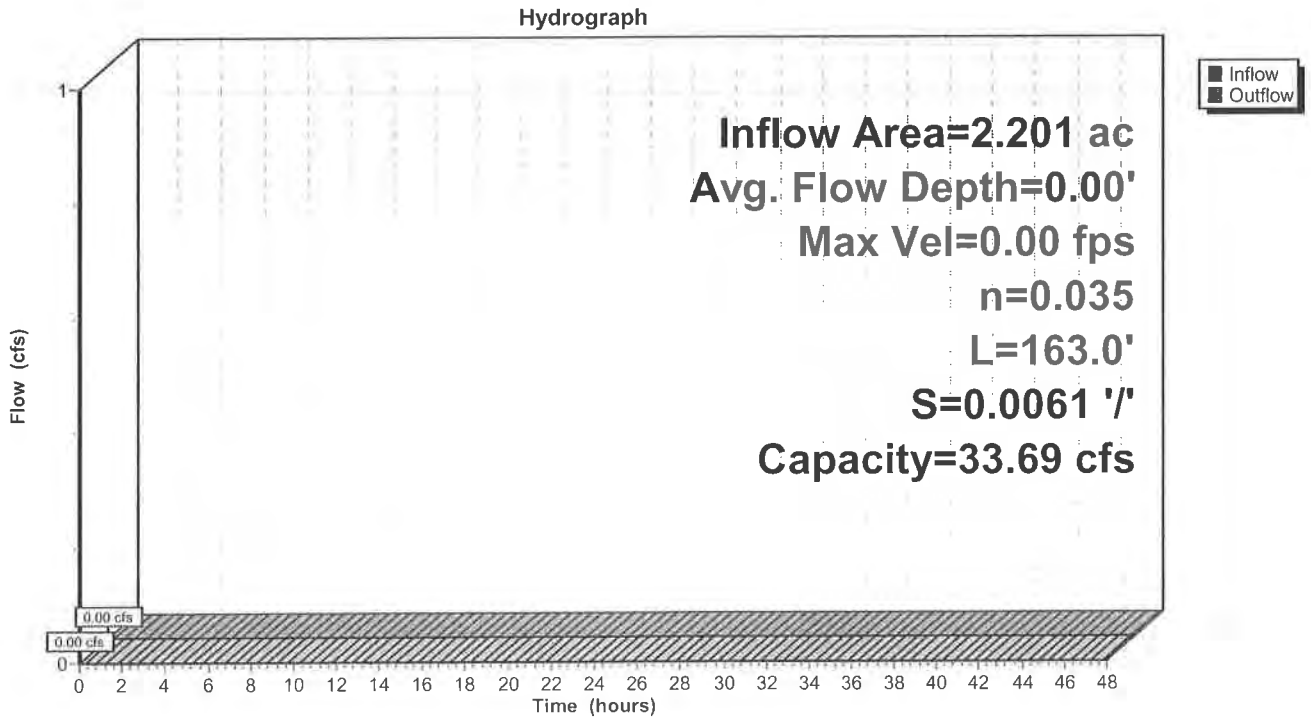
Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 13.3 sf, Capacity= 33.69 cfs

20.00' x 1.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 163.0' Slope= 0.0061 '/'
Inlet Invert= 181.00', Outlet Invert= 180.00'

‡

Reach 7R: Reach



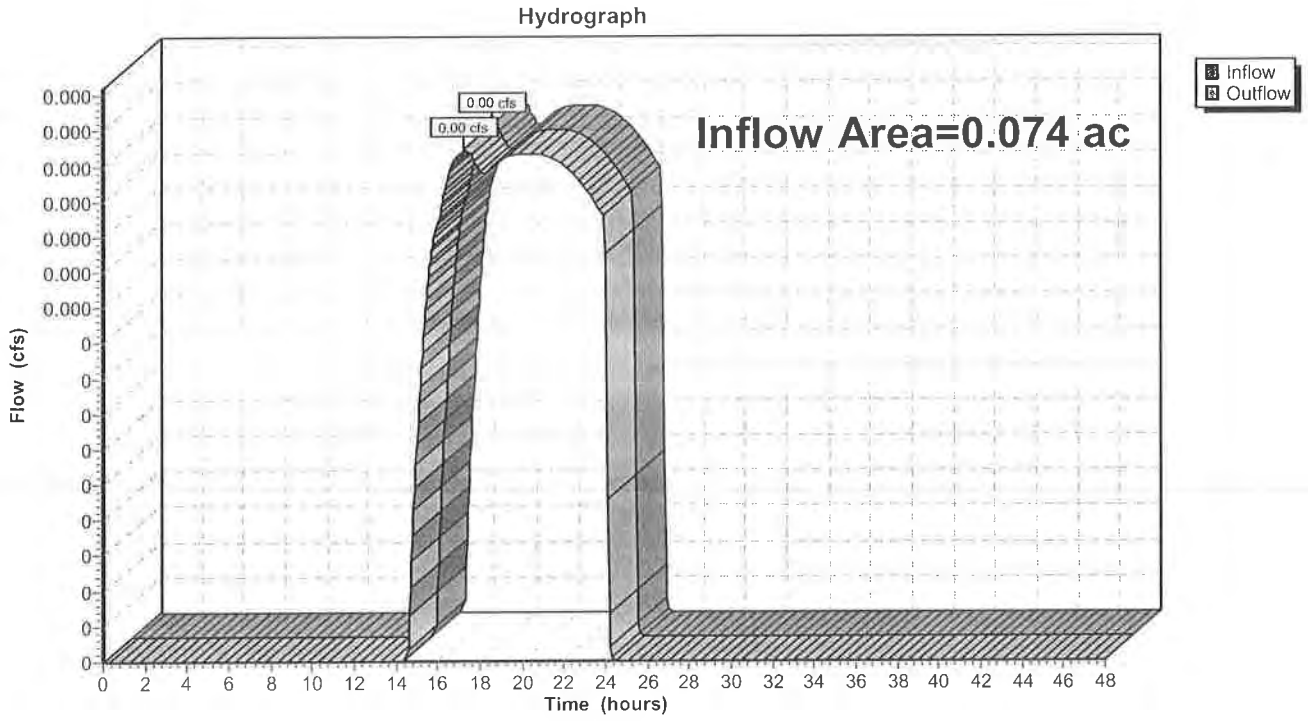
Summary for Reach 11R: PDP-1a

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

Inflow Area = 0.074 ac, 20.43% Impervious, Inflow Depth = 0.02" for Cornell-001yr event
Inflow = 0.00 cfs @ 17.25 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 17.25 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 11R: PDP-1a



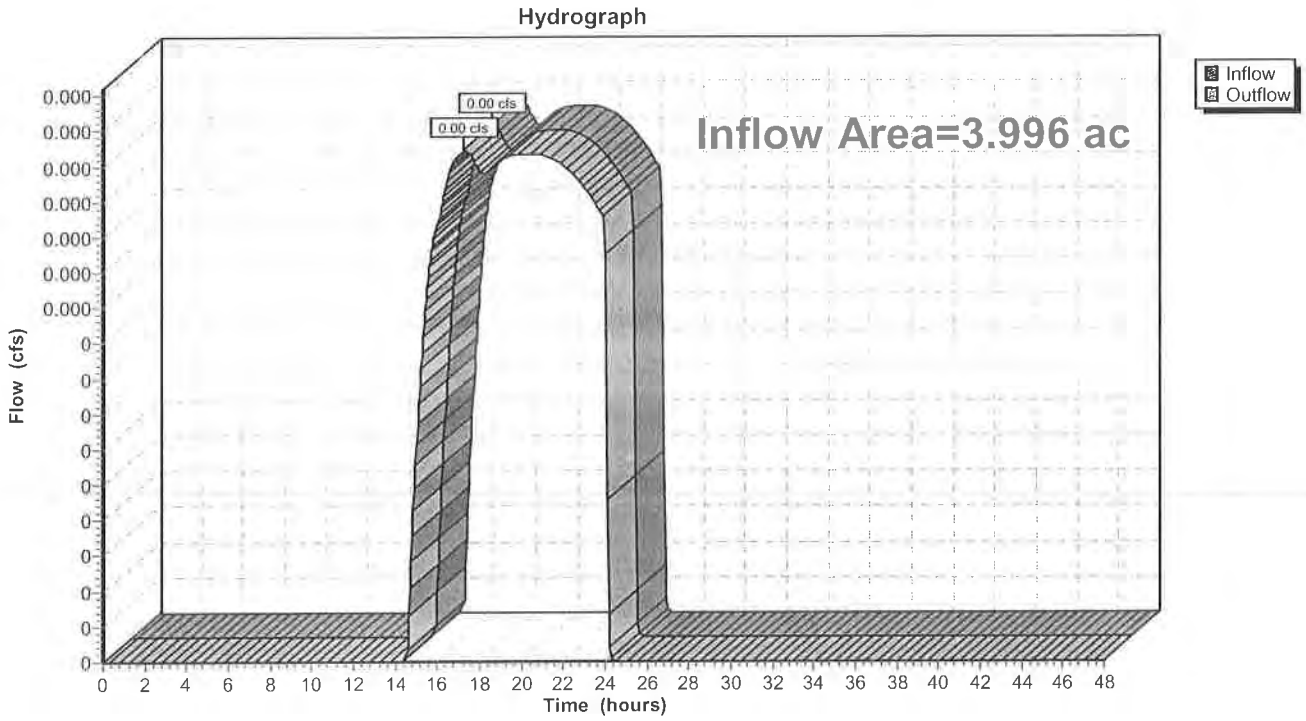
Summary for Reach 13R: PDP-1

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

Inflow Area = 3.996 ac, 37.36% Impervious, Inflow Depth = 0.00" for Cornell-001yr event
Inflow = 0.00 cfs @ 17.25 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 17.25 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 13R: PDP-1



Summary for Pond 10P: Infiltration Basin (short & fat)

Inflow Area = 1.977 ac, 67.87% Impervious, Inflow Depth = 1.26" for Cornell-001yr event
Inflow = 2.85 cfs @ 12.09 hrs, Volume= 0.207 af
Outflow = 1.50 cfs @ 12.05 hrs, Volume= 0.207 af, Atten= 48%, Lag= 0.0 min
Discarded = 1.50 cfs @ 12.05 hrs, Volume= 0.207 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 181.84' @ 12.25 hrs Surf.Area= 0.179 ac Storage= 0.017 af

Plug-Flow detention time= 2.7 min calculated for 0.207 af (100% of inflow)
Center-of-Mass det. time= 2.7 min (838.4 - 835.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	181.60'	0.137 af	**173.75'W x 45.00'L x 3.21'H Field A** 0.576 af Overall - 0.234 af Embedded = 0.342 af x 40.0% Voids
#2A	182.10'	0.234 af	**Cultec R-280** x 234 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 39 rows
		0.371 af	Total Available Storage

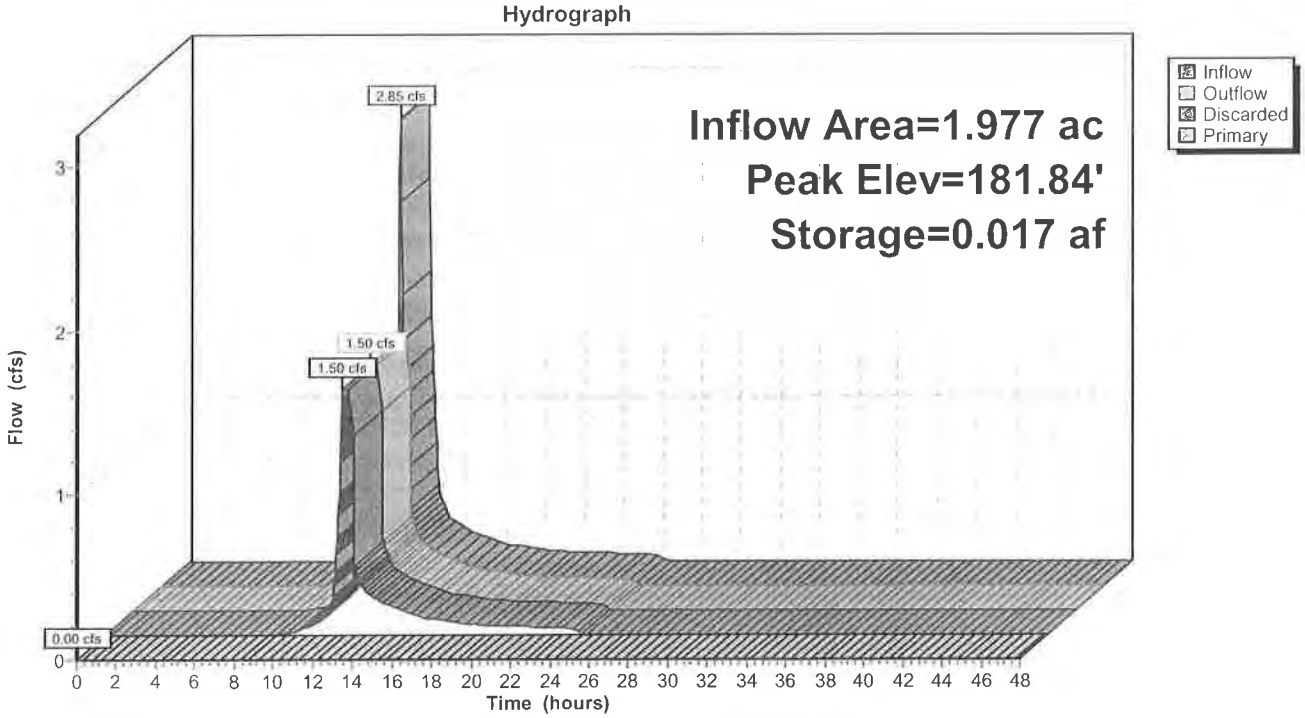
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	184.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	181.60'	**8.270 in/hr Exfiltration over Horizontal area**
#3	Primary	183.20'	**4.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=1.50 cfs @ 12.05 hrs HW=181.67' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 1.50 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=181.60' (Free Discharge)
├**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 10P: Infiltration Basin (short & fat)



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: PDA-1A Runoff Area=86,104 sf 67.87% Impervious Runoff Depth=1.80"
Tc=6.0 min CN=85 Runoff=4.09 cfs 0.297 af

Subcatchment 11S: PDA-1B Runoff Area=74,966 sf 7.91% Impervious Runoff Depth=0.00"
Flow Length=454' Tc=13.5 min CN=40 Runoff=0.00 cfs 0.001 af

Subcatchment 12S: PDA-1C Runoff Area=9,789 sf 0.00% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment 14S: PDA-1D Runoff Area=3,211 sf 20.43% Impervious Runoff Depth=0.10"
Tc=6.0 min CN=48 Runoff=0.00 cfs 0.001 af

Reach 7R: Reach Avg. Flow Depth=0.00' Max Vel=0.12 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=163.0' S=0.0061 '/' Capacity=33.69 cfs Outflow=0.00 cfs 0.000 af

Reach 11R: PDP-1a Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Reach 13R: PDP-1 Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.001 af

Pond 10P: Infiltration Basin (short & fat) Peak Elev=182.14' Storage=0.042 af Inflow=4.09 cfs 0.297 af
Discarded=1.50 cfs 0.297 af Primary=0.00 cfs 0.000 af Outflow=1.50 cfs 0.297 af

Total Runoff Area = 3.996 ac Runoff Volume = 0.298 af Average Runoff Depth = 0.89"
62.64% Pervious = 2.503 ac 37.36% Impervious = 1.493 ac

Summary for Subcatchment 5S: PDA-1A

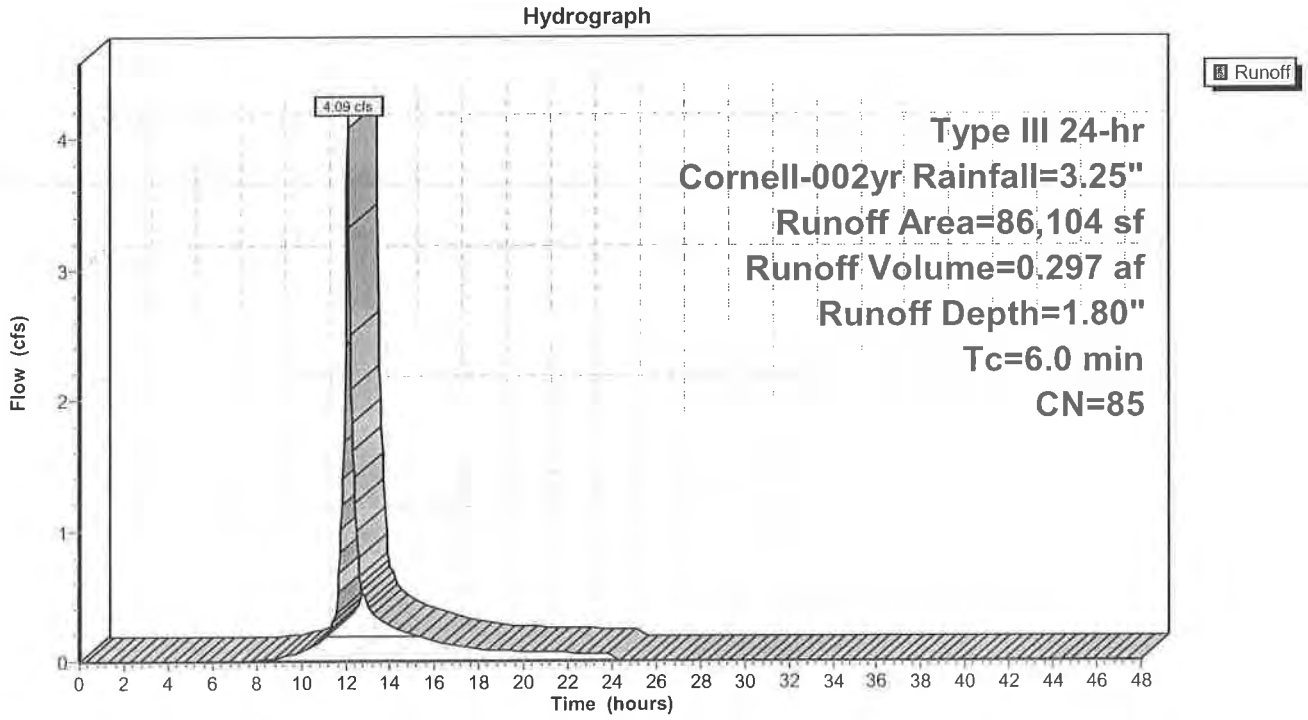
Runoff = 4.09 cfs @ 12.09 hrs, Volume= 0.297 af, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-002yr Rainfall=3.25"

Area (sf)	CN	Description
26,234	98	Roofs, HSG A
32,204	98	Paved parking, HSG A
9,086	96	Gravel surface, HSG A
15,629	39	>75% Grass cover, Good, HSG A
2,951	30	Woods, Good, HSG A
86,104	85	Weighted Average
27,666		32.13% Pervious Area
58,438		67.87% Impervious Area

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

Subcatchment 5S: PDA-1A



Summary for Subcatchment 11S: PDA-1B

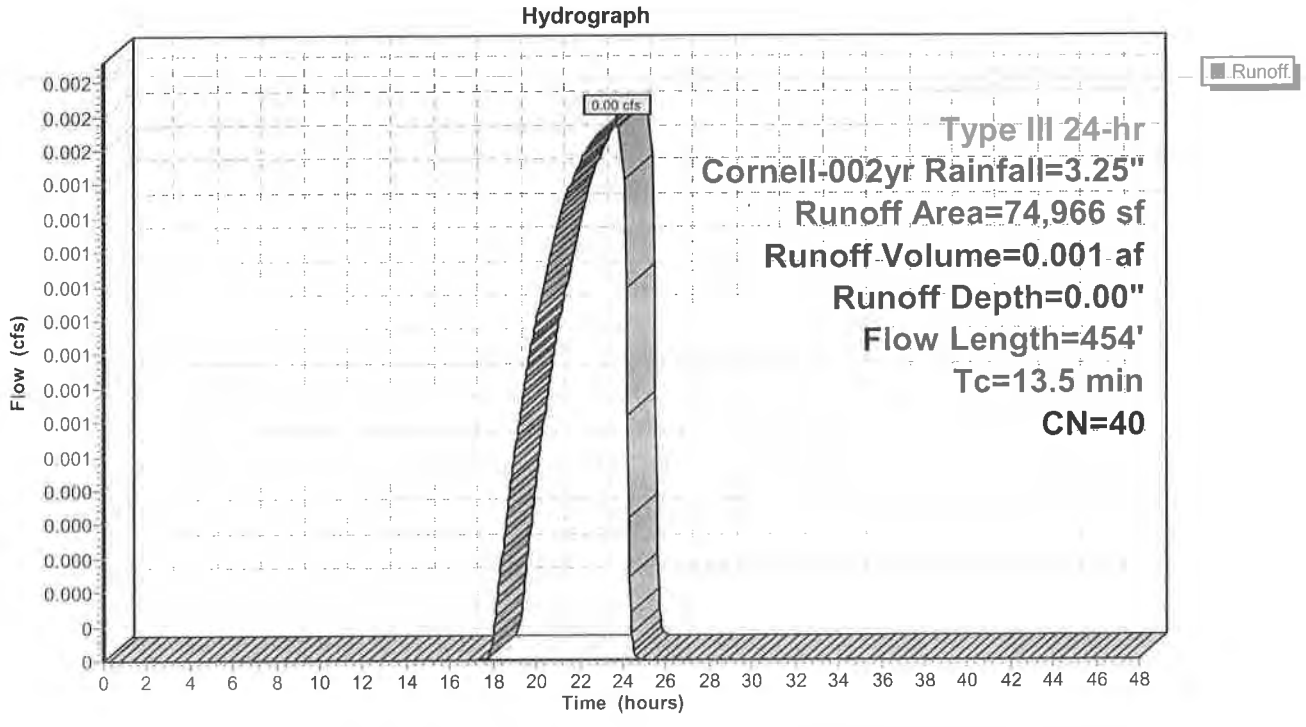
Runoff = 0.00 cfs @ 23.69 hrs, Volume= 0.001 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-002yr Rainfall=3.25"

Area (sf)	CN	Description
5,931	98	Paved parking, HSG A
19,108	39	>75% Grass cover, Good, HSG A
43,432	30	Woods, Good, HSG A
5,477	45	Woods, Poor, HSG A (Bridle Path)
1,018	96	Gravel surface, HSG A
74,966	40	Weighted Average
69,035		92.09% Pervious Area
5,931		7.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
7.9	404	0.0148	0.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.5	454	Total			

Subcatchment 11S: PDA-1B



Summary for Subcatchment 12S: PDA-1C

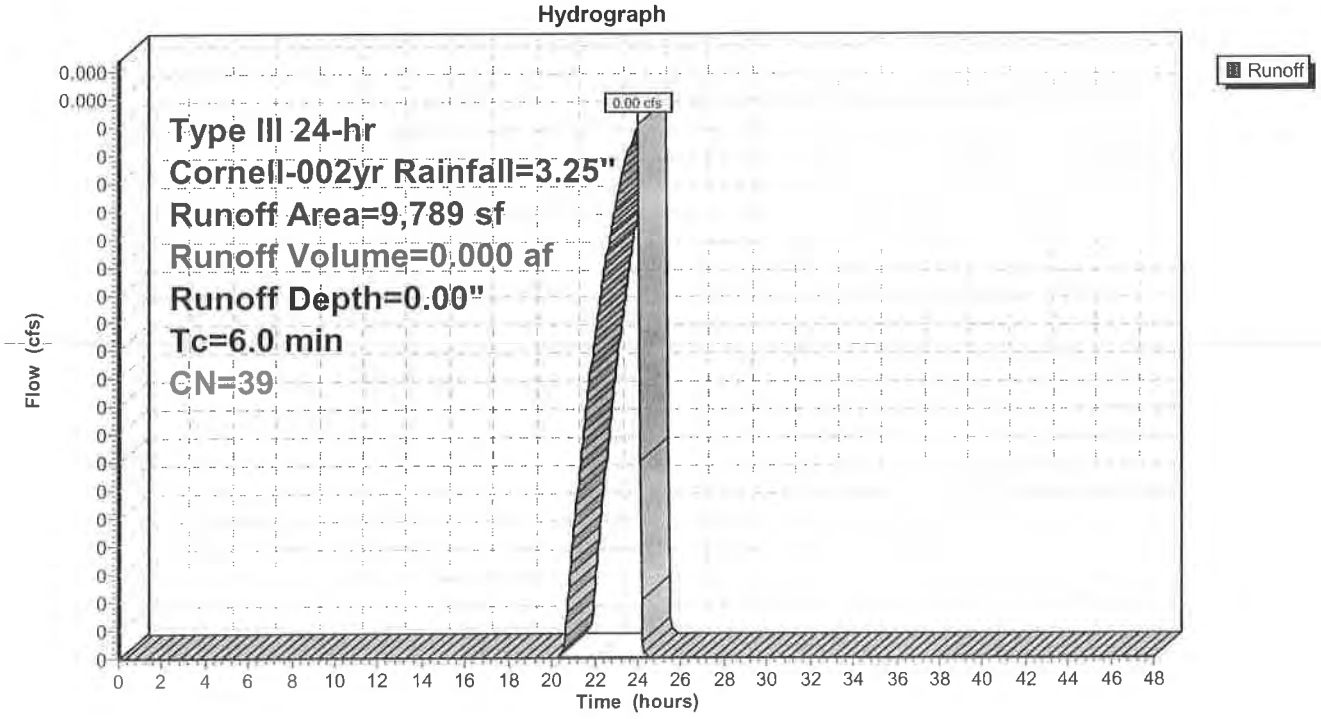
Runoff = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-002yr Rainfall=3.25"

Area (sf)	CN	Description
9,789	39	>75% Grass cover, Good, HSG A
9,789		100.00% Pervious Area

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

Subcatchment 12S: PDA-1C



Summary for Subcatchment 14S: PDA-1D

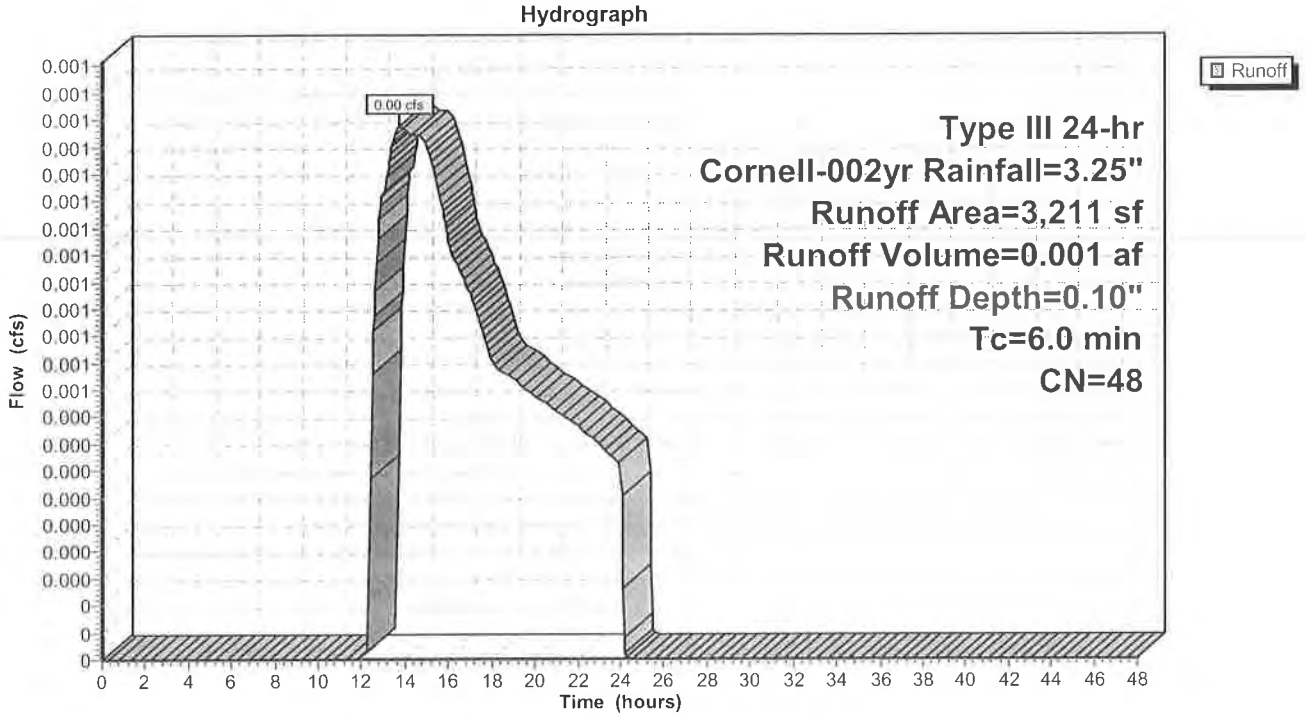
Runoff = 0.00 cfs @ 13.77 hrs, Volume= 0.001 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-002yr Rainfall=3.25"

Area (sf)	CN	Description
656	98	Paved parking, HSG A
1,553	39	>75% Grass cover, Good, HSG A
1,002	30	Woods, Good, HSG A
3,211	48	Weighted Average
2,555		79.57% Pervious Area
656		20.43% Impervious Area

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

Subcatchment 14S: PDA-1D



Summary for Reach 7R: Reach

Inflow Area = 2.201 ac, 60.94% Impervious, Inflow Depth = 0.00" for Cornell-002yr event
Inflow = 0.00 cfs @ 24.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 24.39 hrs, Volume= 0.000 af, Atten= 5%, Lag= 23.1 min

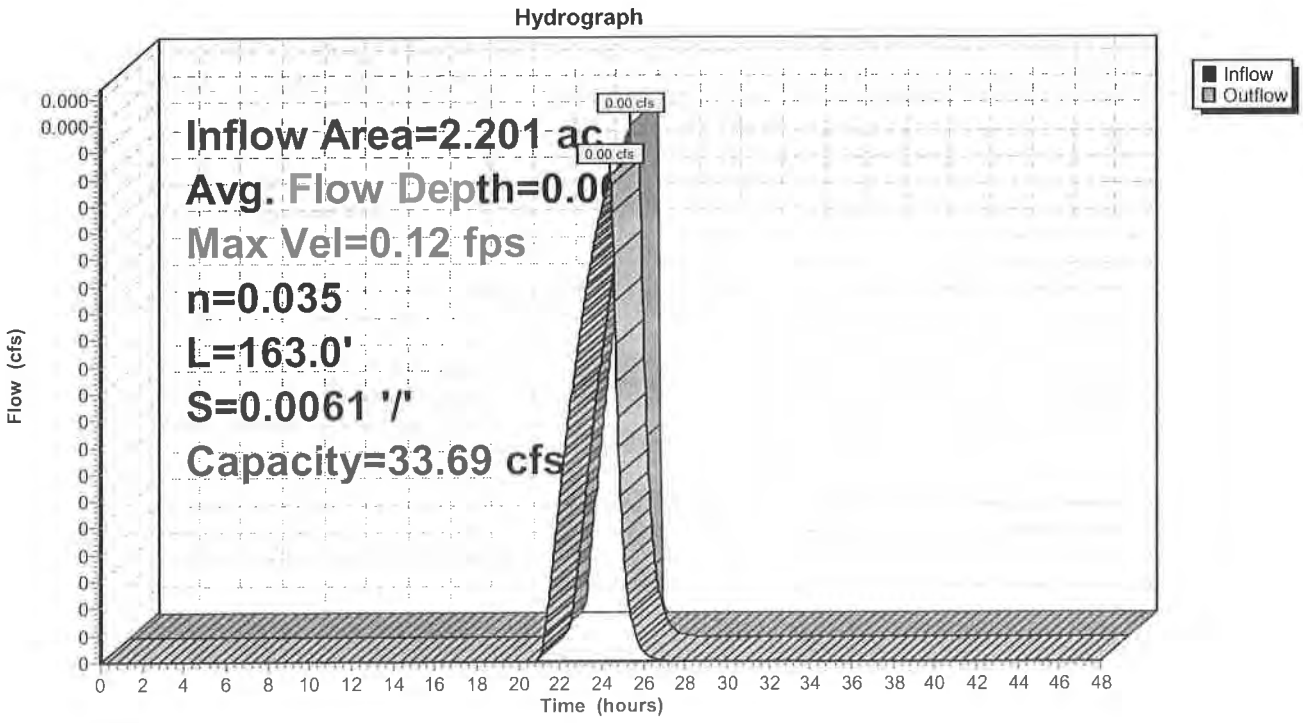
Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.12 fps, Min. Travel Time= 23.1 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 23.1 min

Peak Storage= 0 cf @ 24.01 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 13.3 sf, Capacity= 33.69 cfs

20.00' x 1.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 163.0' Slope= 0.0061 '/'
Inlet Invert= 181.00', Outlet Invert= 180.00'

‡

Reach 7R: Reach



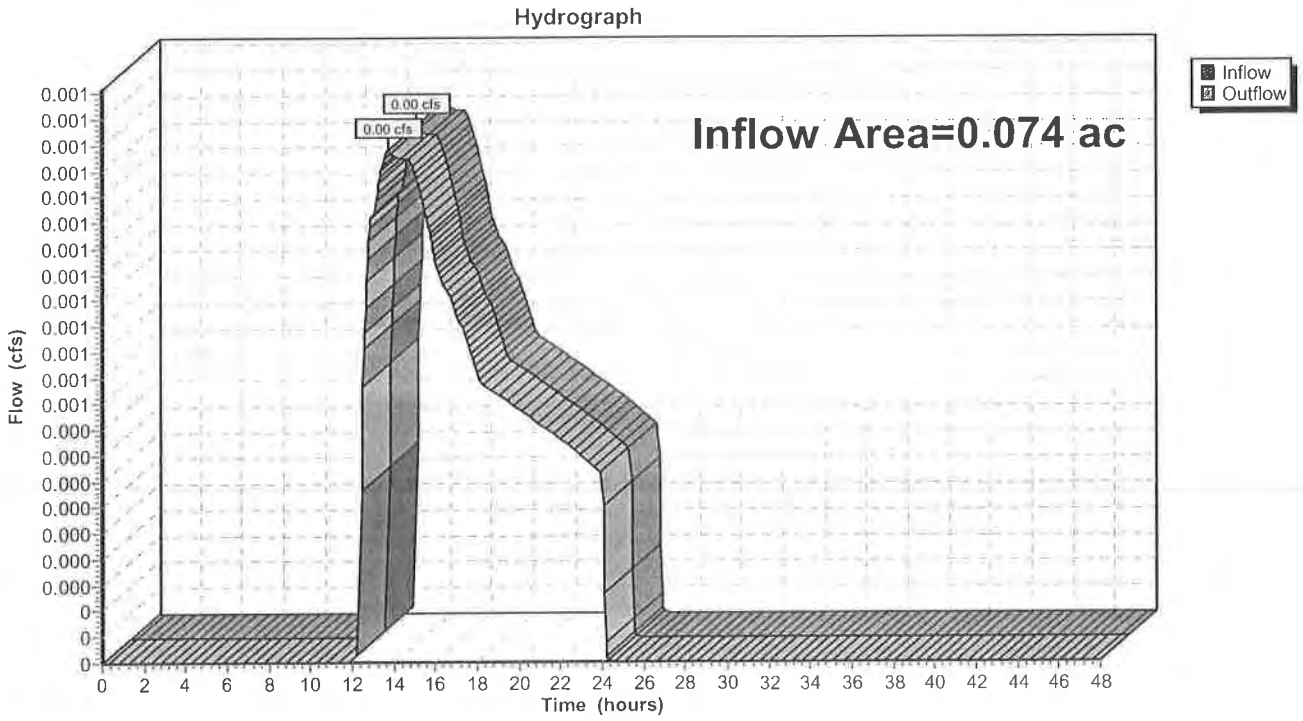
Summary for Reach 11R: PDP-1a

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

Inflow Area = 0.074 ac, 20.43% Impervious, Inflow Depth = 0.10" for Cornell-002yr event
Inflow = 0.00 cfs @ 13.77 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 13.77 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 11R: PDP-1a



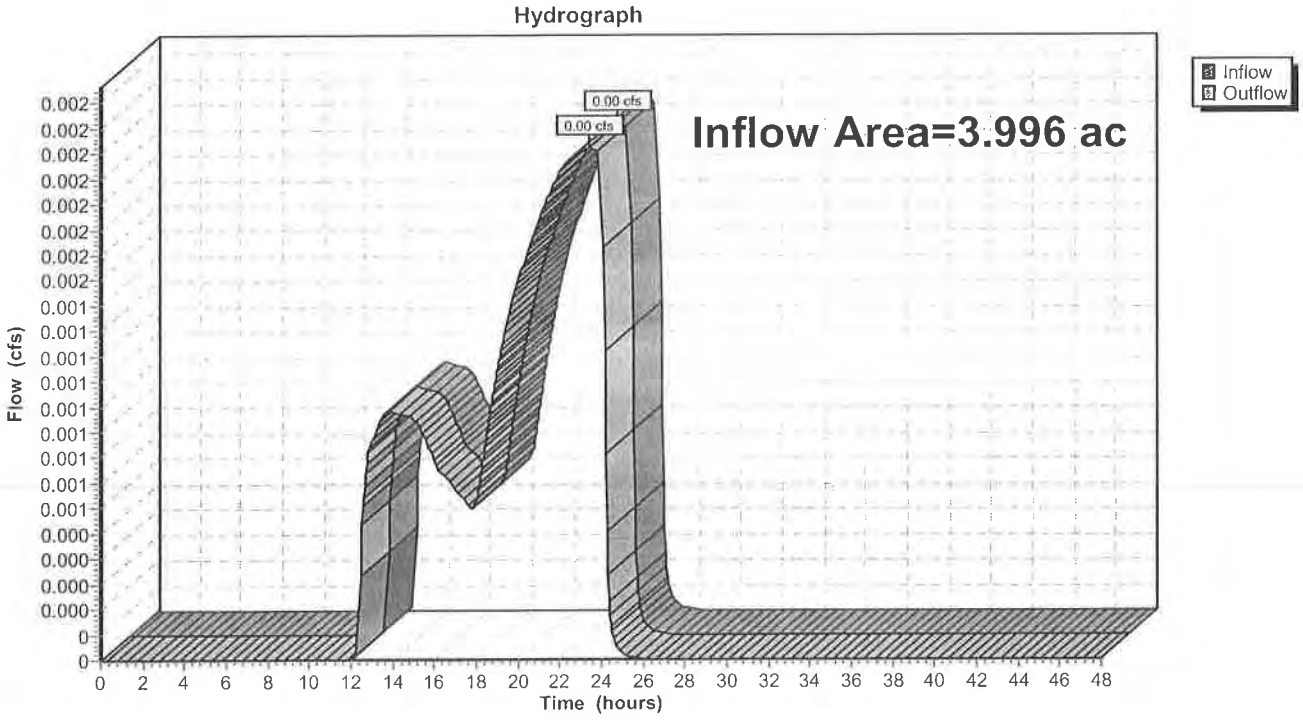
Summary for Reach 13R: PDP-1

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

Inflow Area = 3.996 ac, 37.36% Impervious, Inflow Depth = 0.00" for Cornell-002yr event
Inflow = 0.00 cfs @ 23.42 hrs, Volume= 0.001 af
Outflow = 0.00 cfs @ 23.42 hrs, Volume= 0.001 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 13R: PDP-1



Summary for Pond 10P: Infiltration Basin (short & fat)

Inflow Area = 1.977 ac, 67.87% Impervious, Inflow Depth = 1.80" for Cornell-002yr event
Inflow = 4.09 cfs @ 12.09 hrs, Volume= 0.297 af
Outflow = 1.50 cfs @ 11.95 hrs, Volume= 0.297 af, Atten= 63%, Lag= 0.0 min
Discarded = 1.50 cfs @ 11.95 hrs, Volume= 0.297 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 182.14' @ 12.38 hrs Surf.Area= 0.179 ac Storage= 0.042 af

Plug-Flow detention time= 6.2 min calculated for 0.296 af (100% of inflow)
Center-of-Mass det. time= 6.2 min (831.6 - 825.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	181.60'	0.137 af	**173.75'W x 45.00'L x 3.21'H Field A** 0.576 af Overall - 0.234 af Embedded = 0.342 af x 40.0% Voids
#2A	182.10'	0.234 af	**Cultec R-280** x 234 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 39 rows
		0.371 af	Total Available Storage

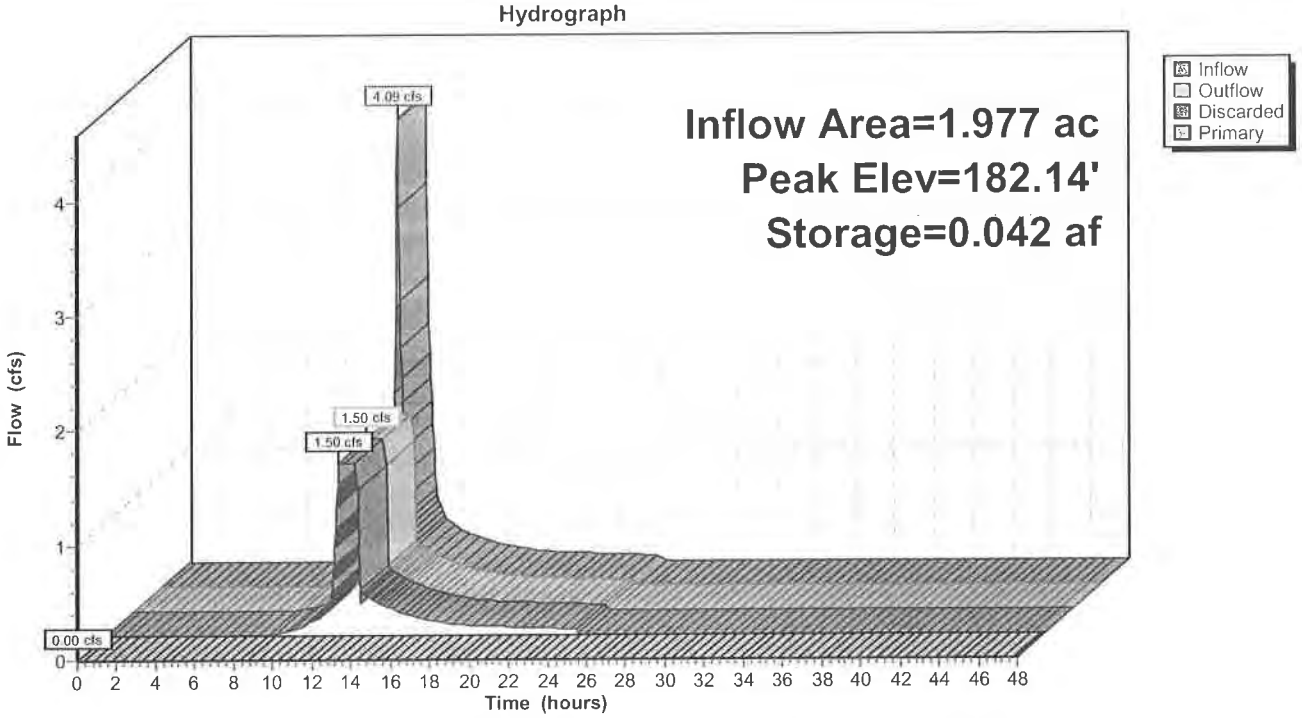
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	184.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	181.60'	**8.270 in/hr Exfiltration over Horizontal area**
#3	Primary	183.20'	**4.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=1.50 cfs @ 11.95 hrs HW=181.64' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 1.50 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=181.60' (Free Discharge)
├**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 10P: Infiltration Basin (short & fat)



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: PDA-1A Runoff Area=86,104 sf 67.87% Impervious Runoff Depth=3.28"
Tc=6.0 min CN=85 Runoff=7.36 cfs 0.540 af

Subcatchment 11S: PDA-1B Runoff Area=74,966 sf 7.91% Impervious Runoff Depth=0.21"
Flow Length=454' Tc=13.5 min CN=40 Runoff=0.07 cfs 0.031 af

Subcatchment 12S: PDA-1C Runoff Area=9,789 sf 0.00% Impervious Runoff Depth=0.18"
Tc=6.0 min CN=39 Runoff=0.01 cfs 0.003 af

Subcatchment 14S: PDA-1D Runoff Area=3,211 sf 20.43% Impervious Runoff Depth=0.55"
Tc=6.0 min CN=48 Runoff=0.02 cfs 0.003 af

Reach 7R: Reach Avg. Flow Depth=0.02' Max Vel=0.18 fps Inflow=0.01 cfs 0.003 af
n=0.035 L=163.0' S=0.0061 '/' Capacity=33.69 cfs Outflow=0.01 cfs 0.003 af

Reach 11R: PDP-1a Inflow=0.02 cfs 0.003 af
Outflow=0.02 cfs 0.003 af

Reach 13R: PDP-1 Inflow=0.08 cfs 0.037 af
Outflow=0.08 cfs 0.037 af

Pond 10P: Infiltration Basin (short & fat) Peak Elev=182.74' Storage=0.136 af Inflow=7.36 cfs 0.540 af
Discarded=1.50 cfs 0.540 af Primary=0.00 cfs 0.000 af Outflow=1.50 cfs 0.540 af

Total Runoff Area = 3.996 ac Runoff Volume = 0.577 af Average Runoff Depth = 1.73"
62.64% Pervious = 2.503 ac 37.36% Impervious = 1.493 ac

Summary for Subcatchment 5S: PDA-1A

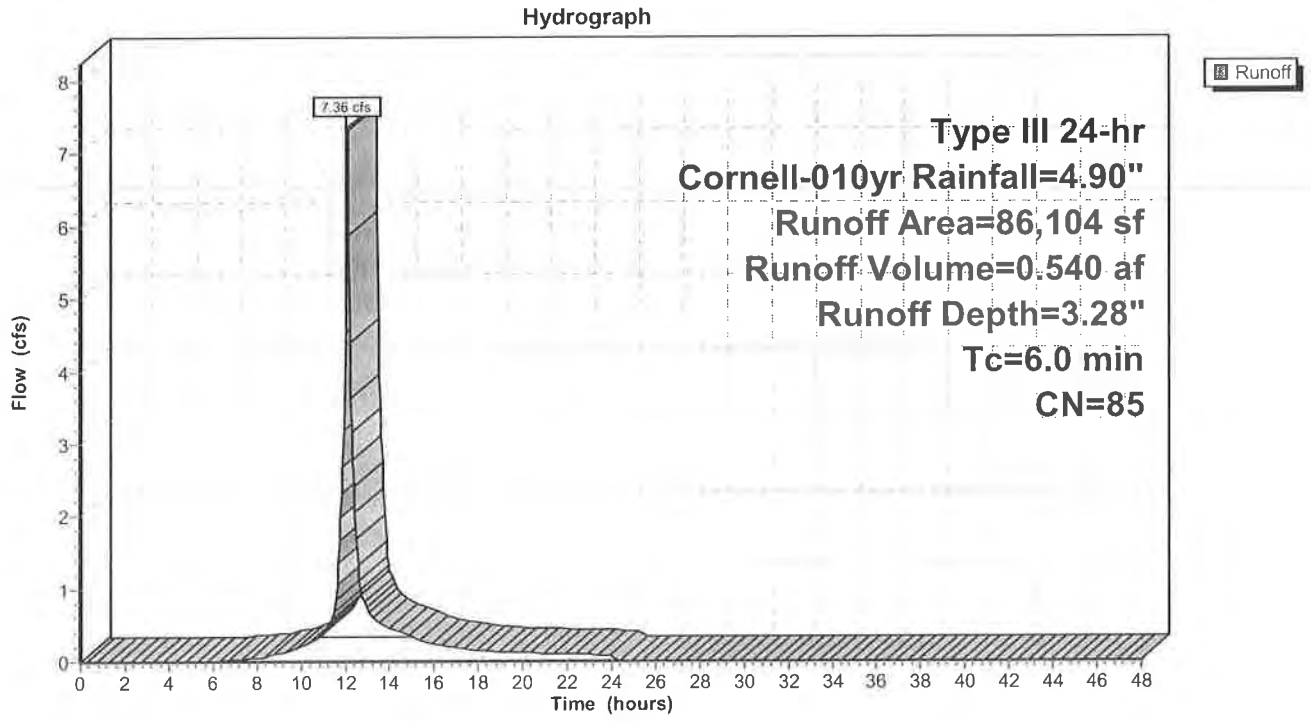
Runoff = 7.36 cfs @ 12.09 hrs, Volume= 0.540 af, Depth= 3.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-010yr Rainfall=4.90"

Area (sf)	CN	Description
26,234	98	Roofs, HSG A
32,204	98	Paved parking, HSG A
9,086	96	Gravel surface, HSG A
15,629	39	>75% Grass cover, Good, HSG A
2,951	30	Woods, Good, HSG A
86,104	85	Weighted Average
27,666		32.13% Pervious Area
58,438		67.87% Impervious Area

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

Subcatchment 5S: PDA-1A



Summary for Subcatchment 11S: PDA-1B

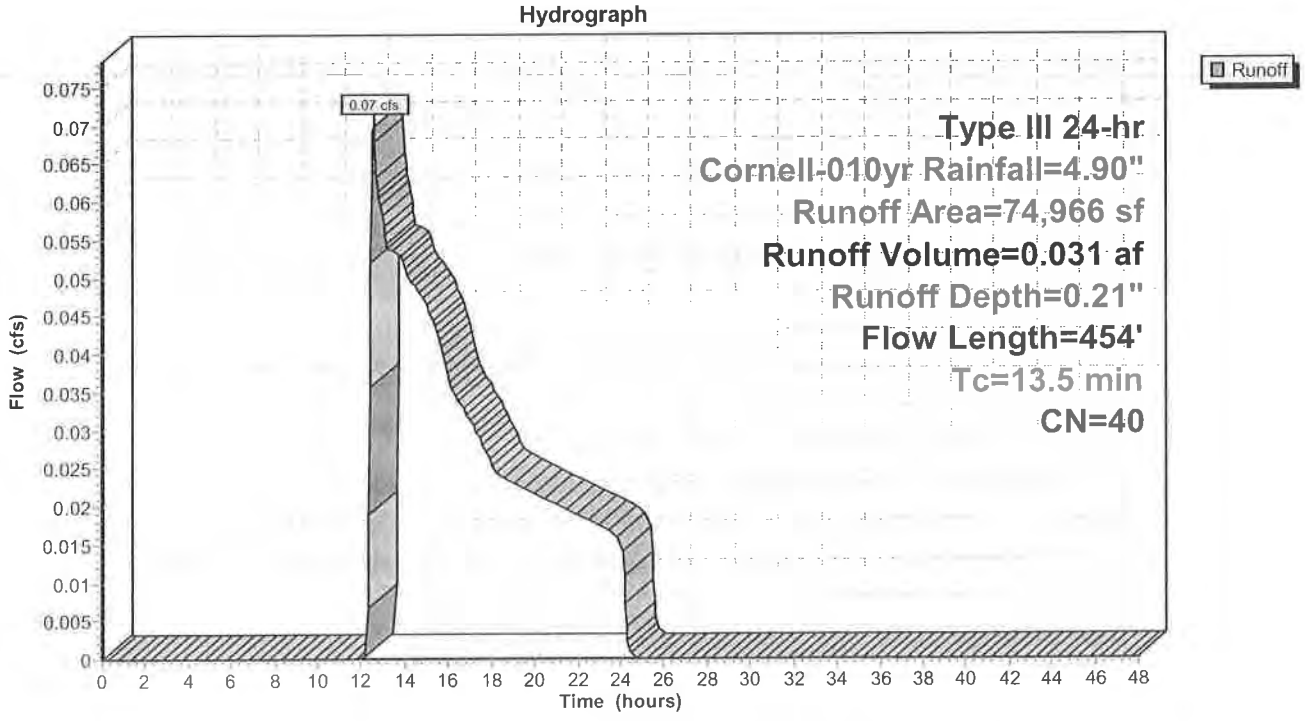
Runoff = 0.07 cfs @ 12.57 hrs, Volume= 0.031 af, Depth= 0.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-010yr Rainfall=4.90"

	Area (sf)	CN	Description
	5,931	98	Paved parking, HSG A
	19,108	39	>75% Grass cover, Good, HSG A
	43,432	30	Woods, Good, HSG A
*	5,477	45	Woods, Poor, HSG A (Bridle Path)
	1,018	96	Gravel surface, HSG A
	74,966	40	Weighted Average
	69,035		92.09% Pervious Area
	5,931		7.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
7.9	404	0.0148	0.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.5	454	Total			

Subcatchment 11S: PDA-1B



Summary for Subcatchment 12S: PDA-1C

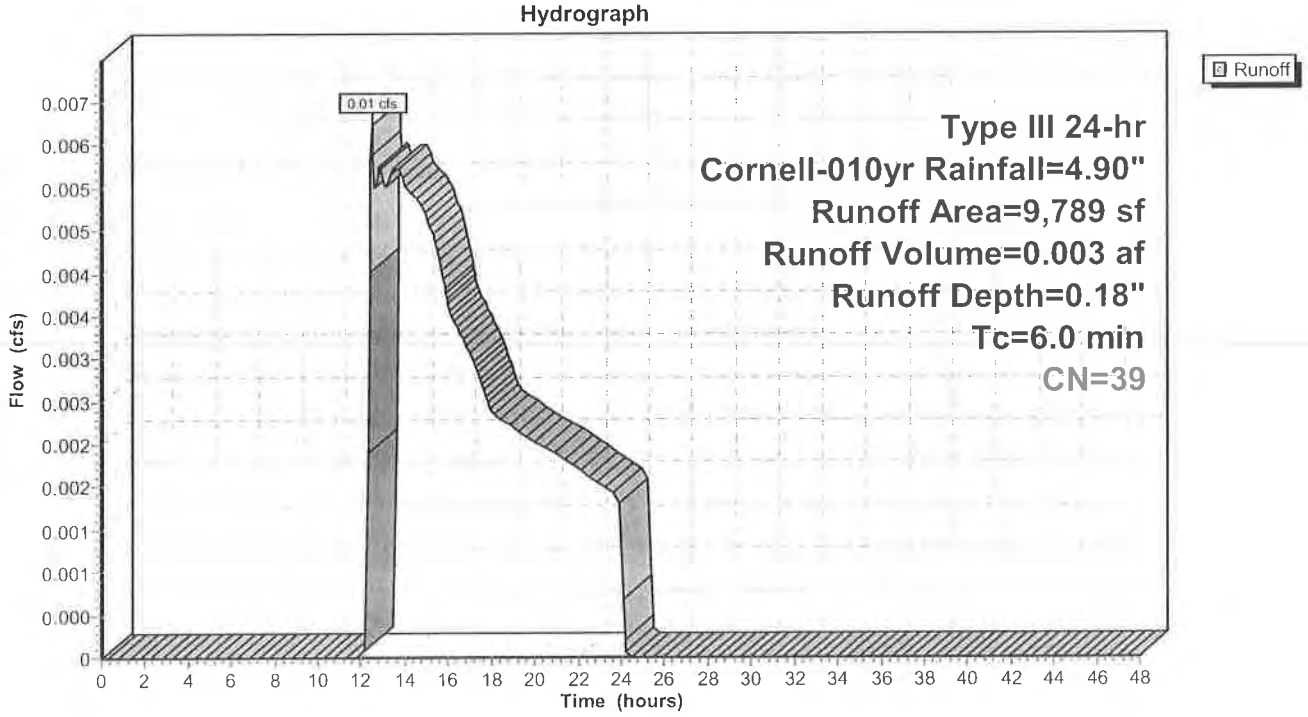
Runoff = 0.01 cfs @ 12.50 hrs, Volume= 0.003 af, Depth= 0.18"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-010yr Rainfall=4.90"

Area (sf)	CN	Description
9,789	39	>75% Grass cover, Good, HSG A
9,789		100.00% Pervious Area

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

Subcatchment 12S: PDA-1C



Summary for Subcatchment 14S: PDA-1D

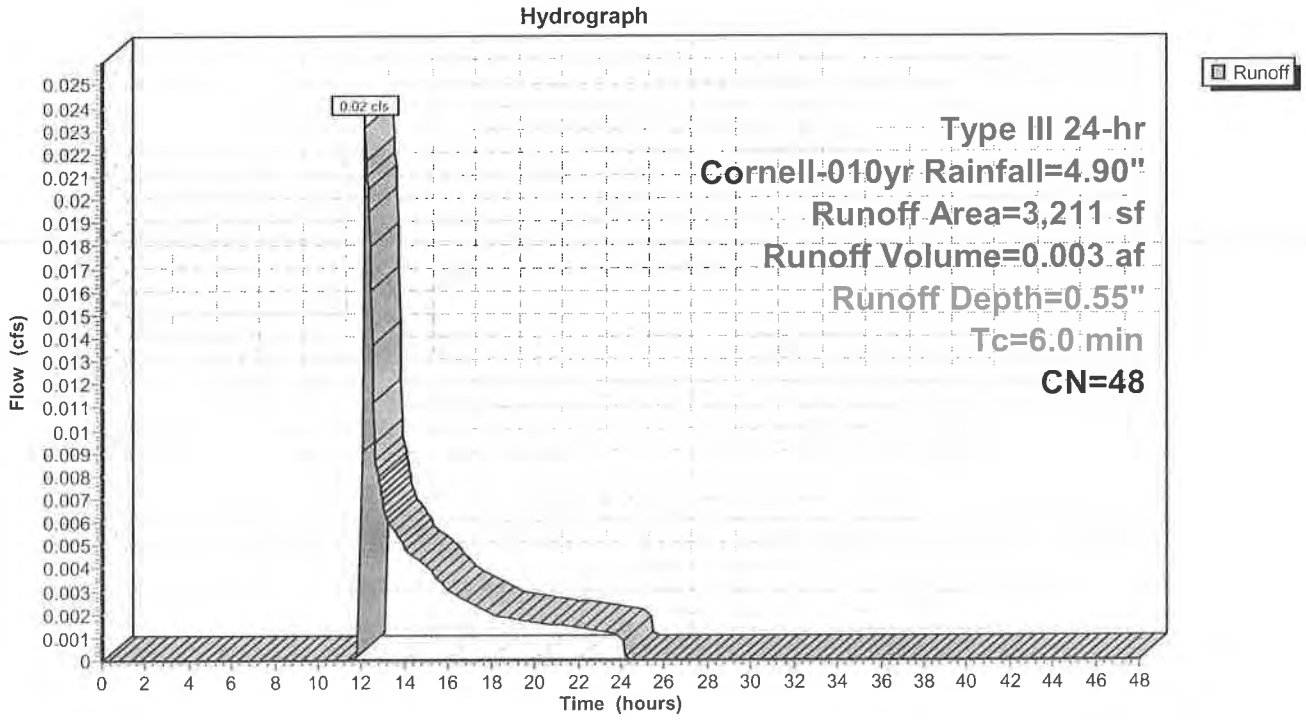
Runoff = 0.02 cfs @ 12.16 hrs, Volume= 0.003 af, Depth= 0.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-010yr Rainfall=4.90"

Area (sf)	CN	Description
656	98	Paved parking, HSG A
1,553	39	>75% Grass cover, Good, HSG A
1,002	30	Woods, Good, HSG A
3,211	48	Weighted Average
2,555		79.57% Pervious Area
656		20.43% Impervious Area

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

Subcatchment 14S: PDA-1D



Summary for Reach 7R: Reach

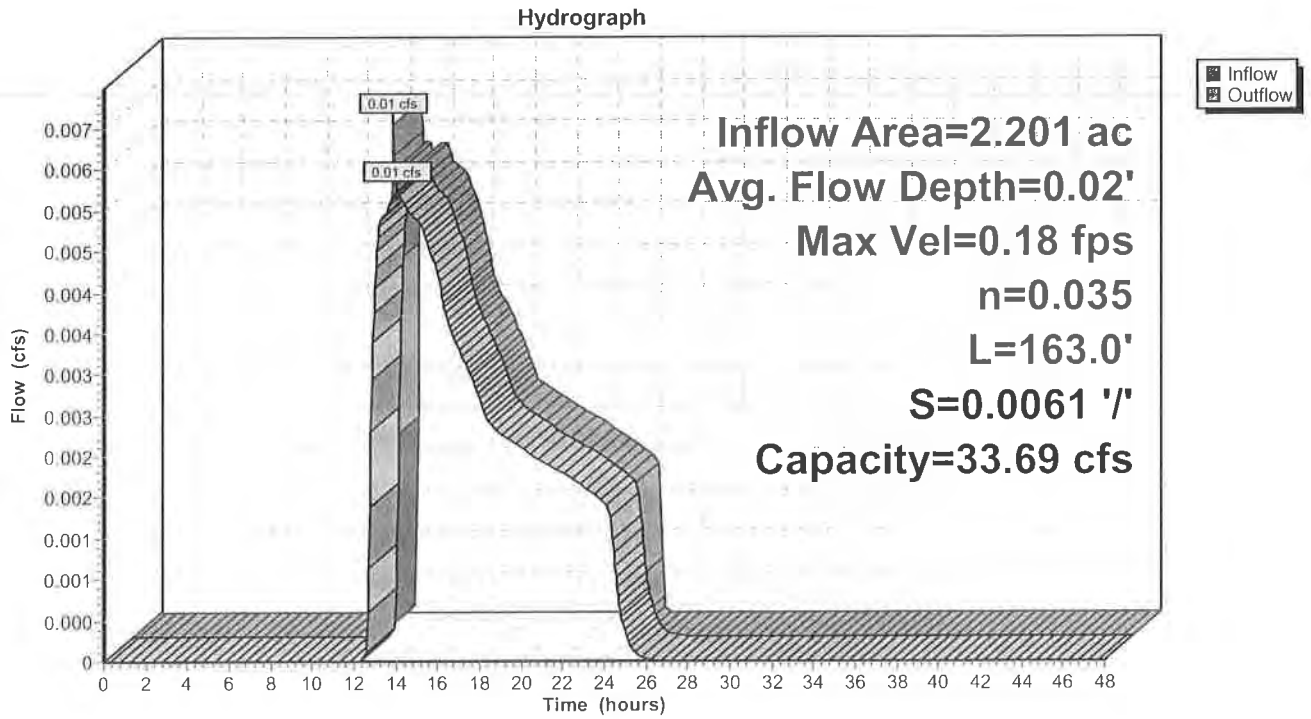
Inflow Area = 2.201 ac, 60.94% Impervious, Inflow Depth = 0.02" for Cornell-010yr event
Inflow = 0.01 cfs @ 12.50 hrs, Volume= 0.003 af
Outflow = 0.01 cfs @ 14.02 hrs, Volume= 0.003 af, Atten= 8%, Lag= 91.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.18 fps, Min. Travel Time= 15.1 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 18.2 min

Peak Storage= 5 cf @ 13.77 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 1.00' Flow Area= 13.3 sf, Capacity= 33.69 cfs

20.00' x 1.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 163.0' Slope= 0.0061 '/'
Inlet Invert= 181.00', Outlet Invert= 180.00'

‡



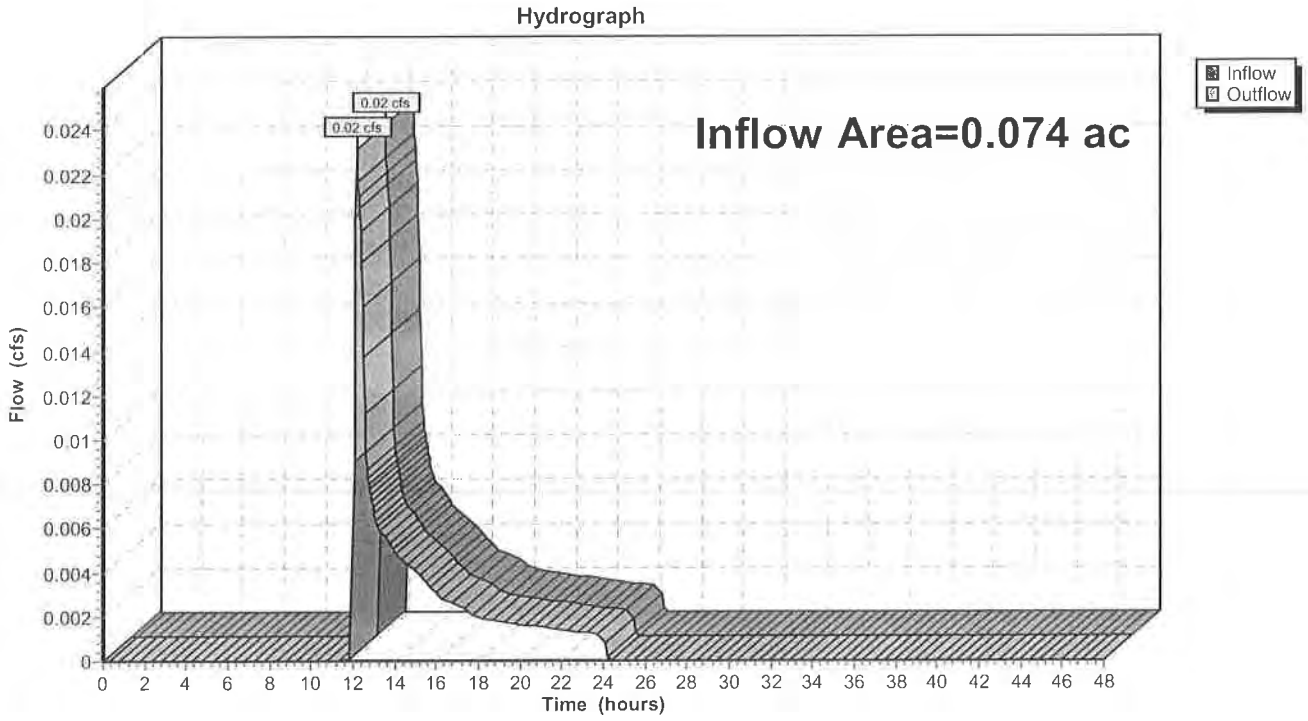
Summary for Reach 11R: PDP-1a

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

Inflow Area = 0.074 ac, 20.43% Impervious, Inflow Depth = 0.55" for Cornell-010yr event
Inflow = 0.02 cfs @ 12.16 hrs, Volume= 0.003 af
Outflow = 0.02 cfs @ 12.16 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 11R: PDP-1a



Summary for Reach 13R: PDP-1

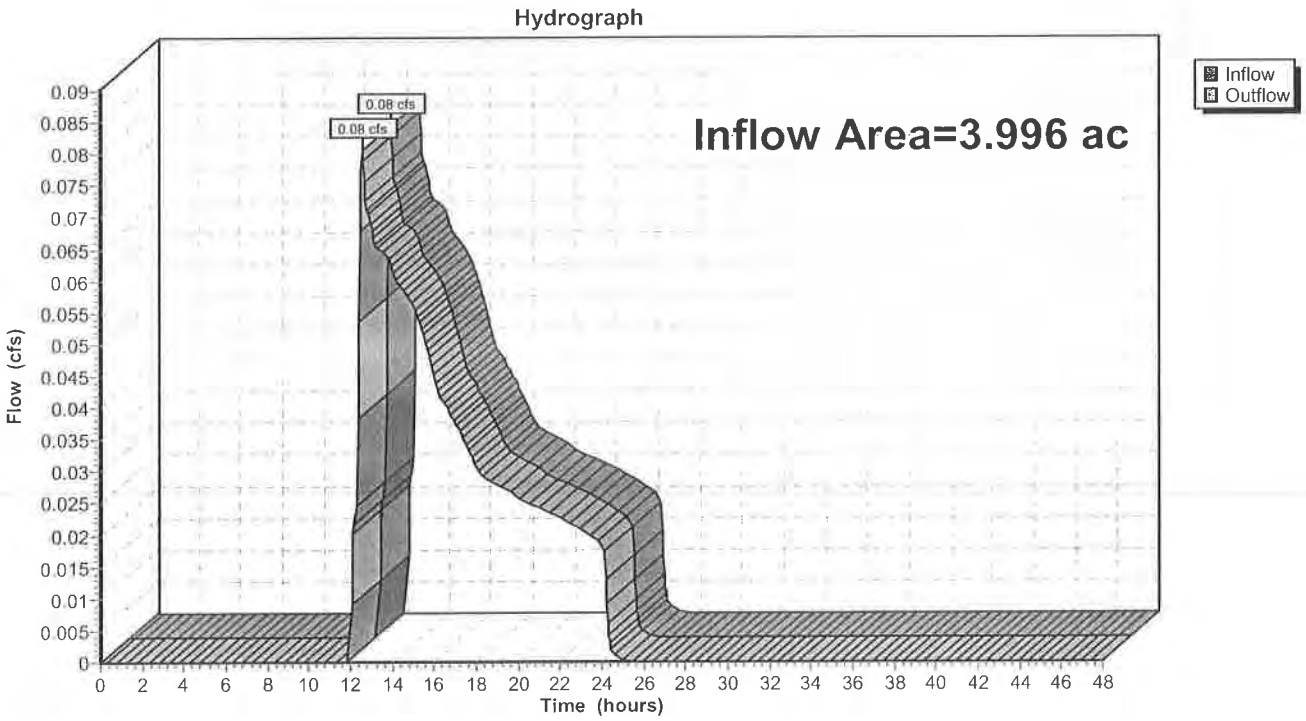
[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 3.996 ac, 37.36% Impervious, Inflow Depth = 0.11" for Cornell-010yr event
Inflow = 0.08 cfs @ 12.56 hrs, Volume= 0.037 af
Outflow = 0.08 cfs @ 12.56 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 13R: PDP-1

Hydrograph



Summary for Pond 10P: Infiltration Basin (short & fat)

Inflow Area = 1.977 ac, 67.87% Impervious, Inflow Depth = 3.28" for Cornell-010yr event
Inflow = 7.36 cfs @ 12.09 hrs, Volume= 0.540 af
Outflow = 1.50 cfs @ 11.75 hrs, Volume= 0.540 af, Atten= 80%, Lag= 0.0 min
Discarded = 1.50 cfs @ 11.75 hrs, Volume= 0.540 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 182.74' @ 12.53 hrs Surf.Area= 0.179 ac Storage= 0.136 af

Plug-Flow detention time= 22.7 min calculated for 0.539 af (100% of inflow)
Center-of-Mass det. time= 22.7 min (831.0 - 808.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	181.60'	0.137 af	**173.75'W x 45.00'L x 3.21'H Field A** 0.576 af Overall - 0.234 af Embedded = 0.342 af x 40.0% Voids
#2A	182.10'	0.234 af	**Cultec R-280** x 234 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 39 rows
		0.371 af	Total Available Storage

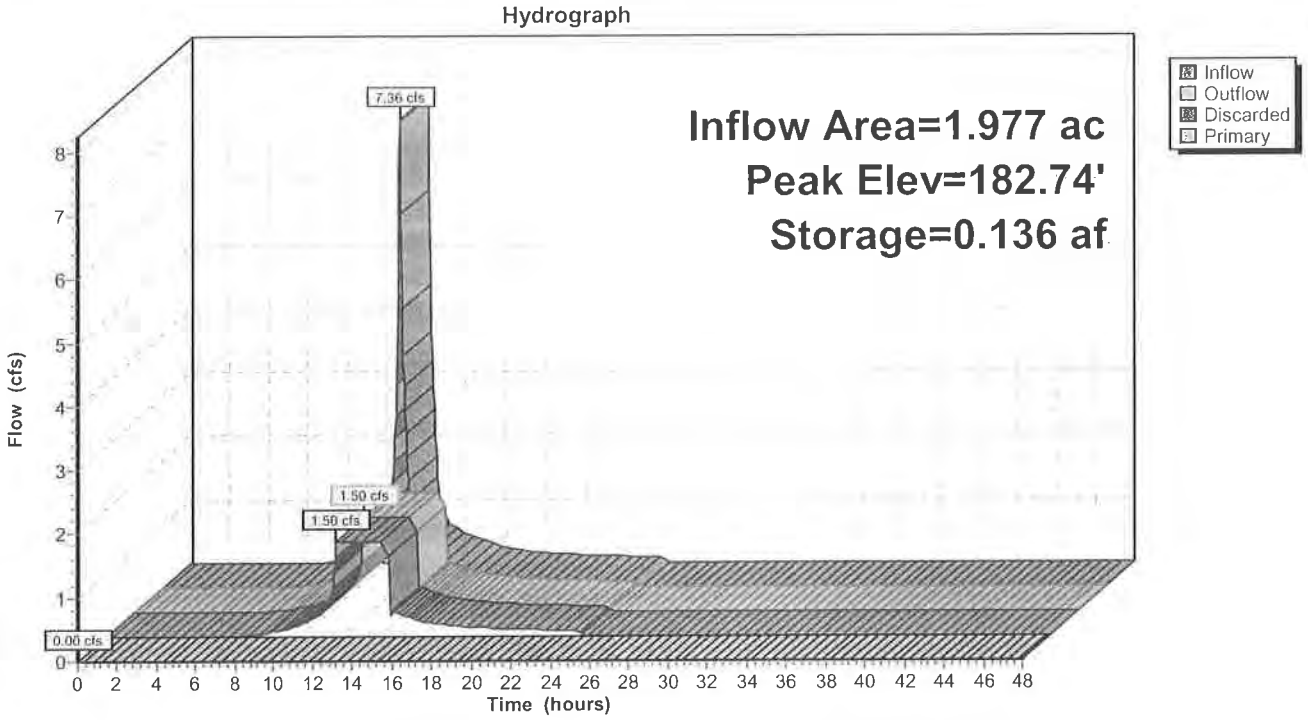
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	184.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	181.60'	**8.270 in/hr Exfiltration over Horizontal area**
#3	Primary	183.20'	**4.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=1.50 cfs @ 11.75 hrs HW=181.63' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 1.50 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=181.60' (Free Discharge)
├**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Controls 0.00 cfs)

Pond 10P: Infiltration Basin (short & fat)



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: PDA-1A Runoff Area=86,104 sf 67.87% Impervious Runoff Depth=5.54"
Tc=6.0 min CN=85 Runoff=12.17 cfs 0.913 af

Subcatchment 11S: PDA-1B Runoff Area=74,966 sf 7.91% Impervious Runoff Depth=0.96"
Flow Length=454' Tc=13.5 min CN=40 Runoff=0.91 cfs 0.137 af

Subcatchment 12S: PDA-1C Runoff Area=9,789 sf 0.00% Impervious Runoff Depth=0.88"
Tc=6.0 min CN=39 Runoff=0.12 cfs 0.016 af

Subcatchment 14S: PDA-1D Runoff Area=3,211 sf 20.43% Impervious Runoff Depth=1.65"
Tc=6.0 min CN=48 Runoff=0.12 cfs 0.010 af

Reach 7R: Reach Avg. Flow Depth=0.12' Max Vel=0.62 fps Inflow=0.35 cfs 0.045 af
n=0.035 L=163.0' S=0.0061 '/' Capacity=33.69 cfs Outflow=0.35 cfs 0.045 af

Reach 11R: PDP-1a Inflow=0.12 cfs 0.010 af
Outflow=0.12 cfs 0.010 af

Reach 13R: PDP-1 Inflow=1.14 cfs 0.192 af
Outflow=1.14 cfs 0.192 af

Pond 10P: Infiltration Basin (short & fat) Peak Elev=183.85' Storage=0.291 af Inflow=12.17 cfs 0.913 af
Discarded=1.50 cfs 0.884 af Primary=0.29 cfs 0.028 af Outflow=1.79 cfs 0.913 af

Total Runoff Area = 3.996 ac Runoff Volume = 1.077 af Average Runoff Depth = 3.23"
62.64% Pervious = 2.503 ac 37.36% Impervious = 1.493 ac

Summary for Subcatchment 5S: PDA-1A

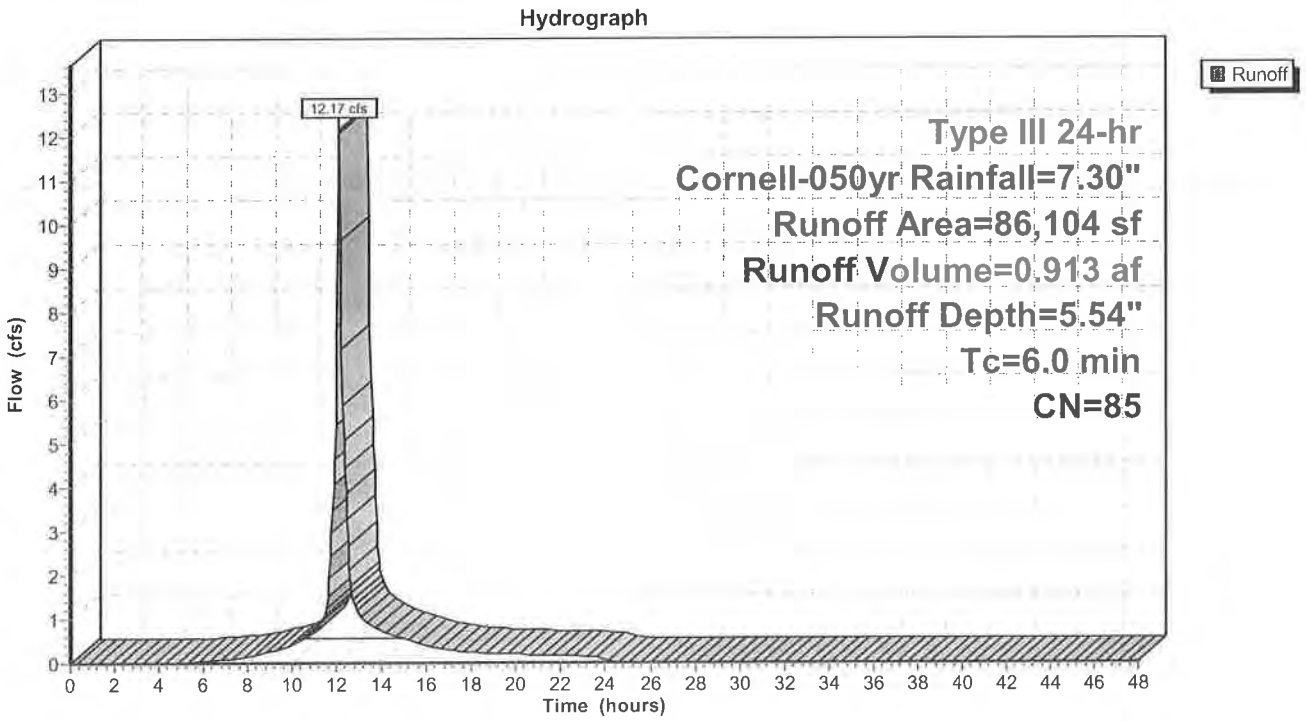
Runoff = 12.17 cfs @ 12.09 hrs, Volume= 0.913 af, Depth= 5.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-050yr Rainfall=7.30"

Area (sf)	CN	Description
26,234	98	Roofs, HSG A
32,204	98	Paved parking, HSG A
9,086	96	Gravel surface, HSG A
15,629	39	>75% Grass cover, Good, HSG A
2,951	30	Woods, Good, HSG A
86,104	85	Weighted Average
27,666		32.13% Pervious Area
58,438		67.87% Impervious Area

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

Subcatchment 5S: PDA-1A



Summary for Subcatchment 11S: PDA-1B

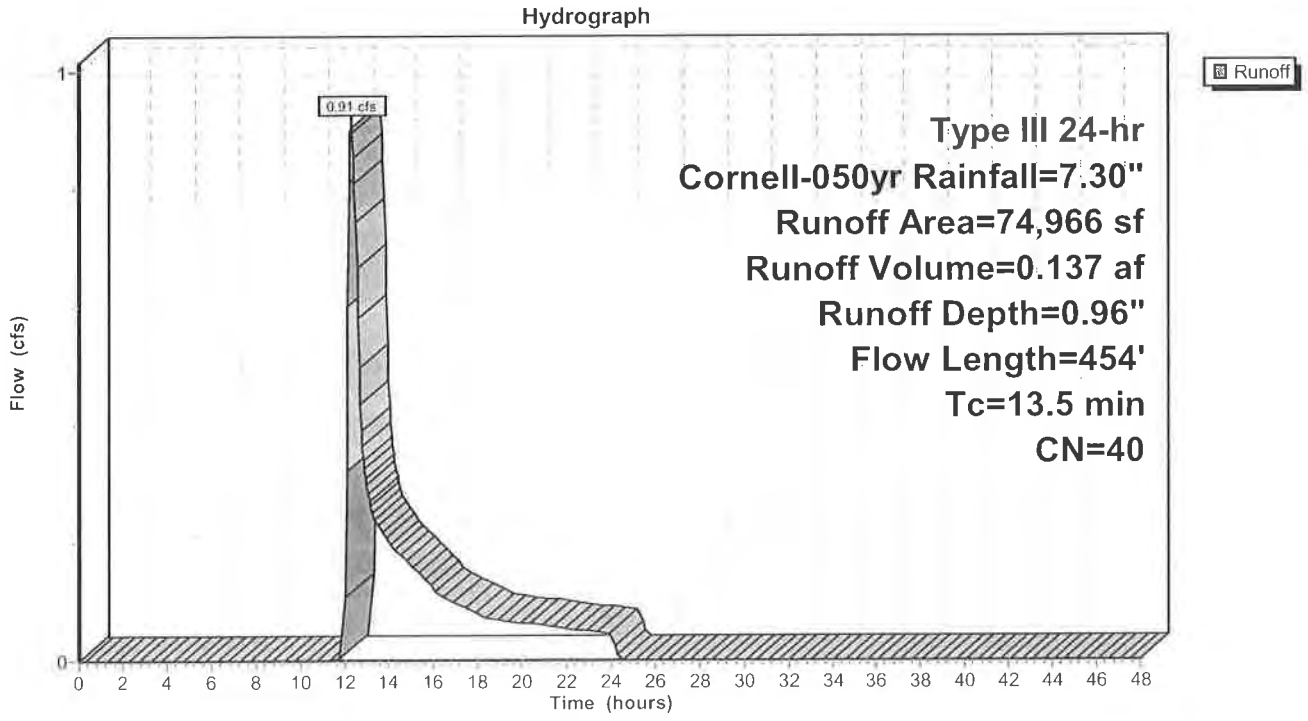
Runoff = 0.91 cfs @ 12.29 hrs, Volume= 0.137 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-050yr Rainfall=7.30"

Area (sf)	CN	Description
5,931	98	Paved parking, HSG A
19,108	39	>75% Grass cover, Good, HSG A
43,432	30	Woods, Good, HSG A
5,477	45	Woods, Poor, HSG A (Bridle Path)
1,018	96	Gravel surface, HSG A
74,966	40	Weighted Average
69,035		92.09% Pervious Area
5,931		7.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
7.9	404	0.0148	0.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.5	454	Total			

Subcatchment 11S: PDA-1B



Summary for Subcatchment 12S: PDA-1C

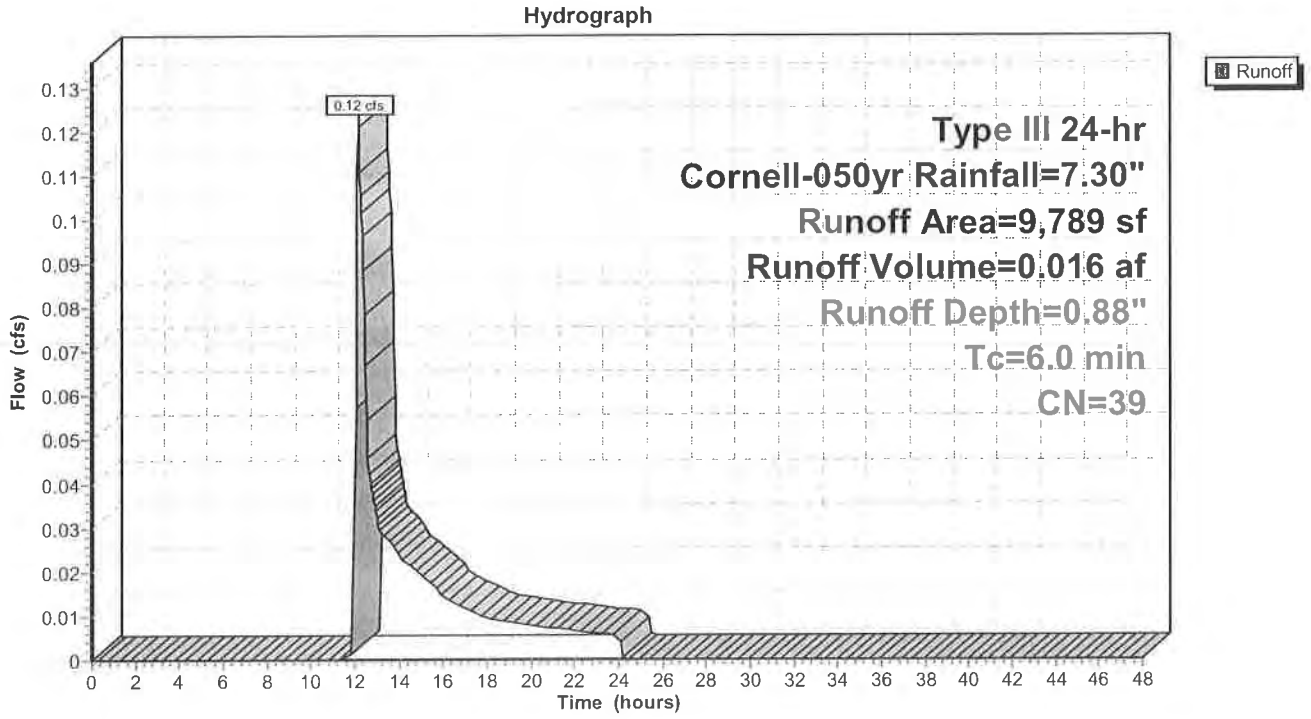
Runoff = 0.12 cfs @ 12.15 hrs, Volume= 0.016 af, Depth= 0.88"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-050yr Rainfall=7.30"

Area (sf)	CN	Description
9,789	39	>75% Grass cover, Good, HSG A
9,789		100.00% Pervious Area

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

Subcatchment 12S: PDA-1C



Summary for Subcatchment 14S: PDA-1D

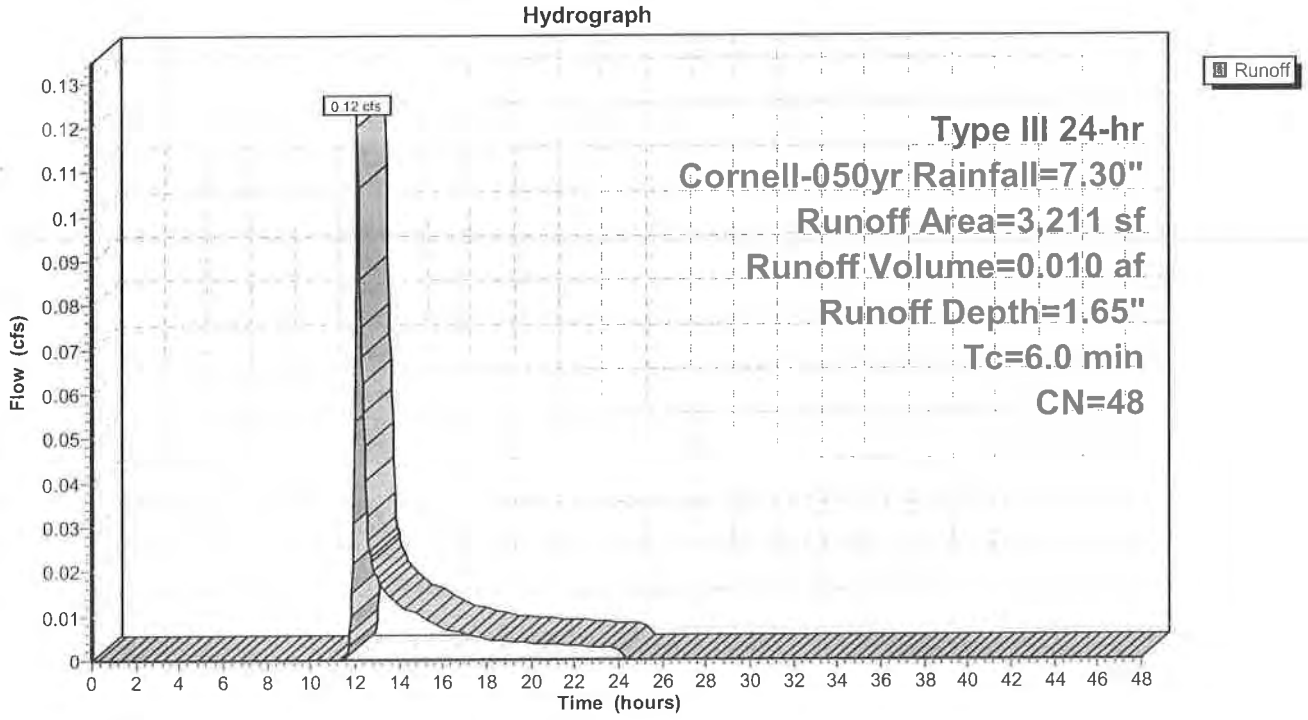
Runoff = 0.12 cfs @ 12.11 hrs, Volume= 0.010 af, Depth= 1.65"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-050yr Rainfall=7.30"

Area (sf)	CN	Description
656	98	Paved parking, HSG A
1,553	39	>75% Grass cover, Good, HSG A
1,002	30	Woods, Good, HSG A
3,211	48	Weighted Average
2,555		79.57% Pervious Area
656		20.43% Impervious Area

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

Subcatchment 14S: PDA-1D



Summary for Reach 7R: Reach

Inflow Area = 2.201 ac, 60.94% Impervious, Inflow Depth = 0.24" for Cornell-050yr event
Inflow = 0.35 cfs @ 12.49 hrs, Volume= 0.045 af
Outflow = 0.35 cfs @ 12.62 hrs, Volume= 0.045 af, Atten= 2%, Lag= 8.3 min

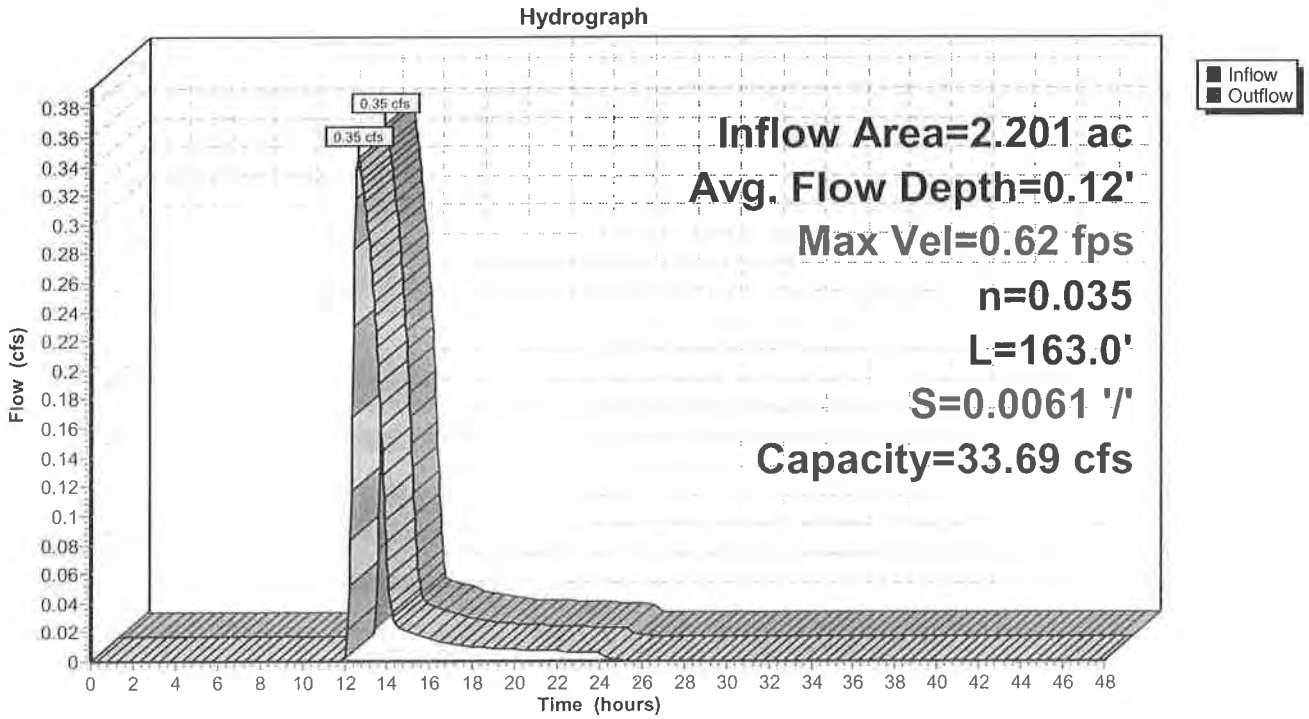
Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.62 fps, Min. Travel Time= 4.4 min
Avg. Velocity = 0.24 fps, Avg. Travel Time= 11.3 min

Peak Storage= 91 cf @ 12.55 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 1.00' Flow Area= 13.3 sf, Capacity= 33.69 cfs

20.00' x 1.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 163.0' Slope= 0.0061 '/'
Inlet Invert= 181.00', Outlet Invert= 180.00'

‡

Reach 7R: Reach



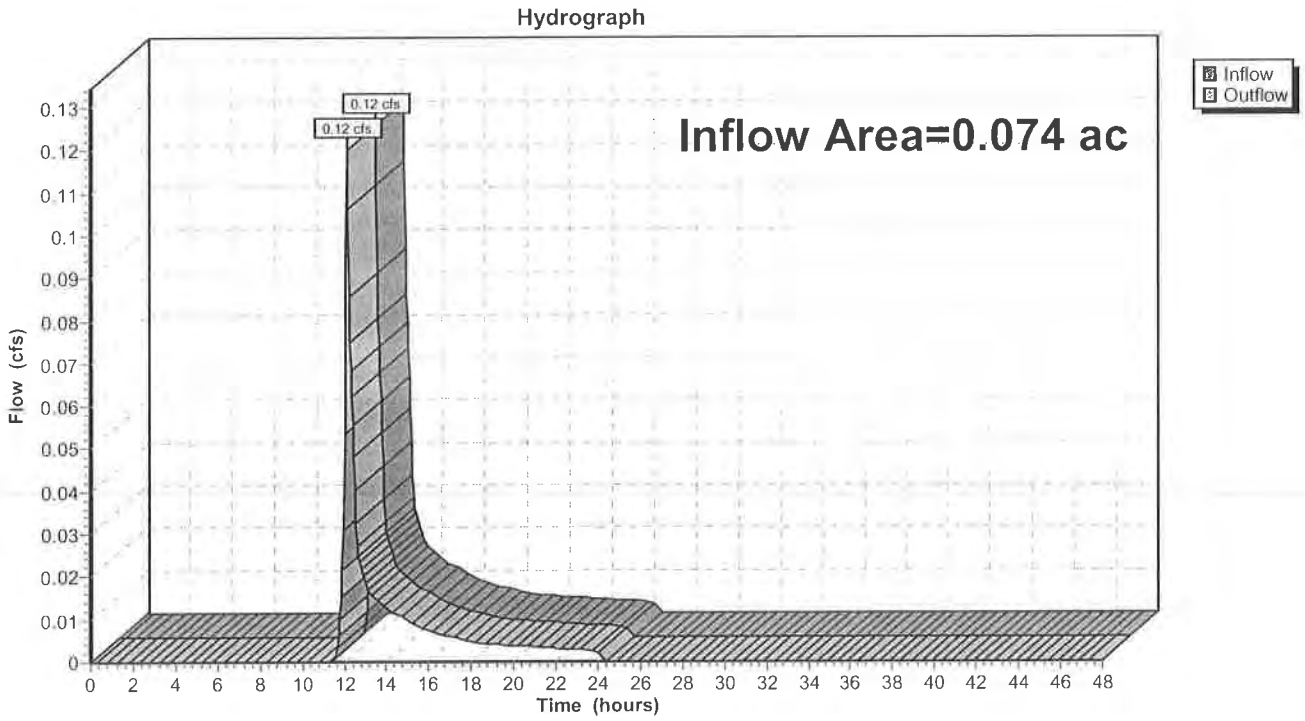
Summary for Reach 11R: PDP-1a

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

Inflow Area = 0.074 ac, 20.43% Impervious, Inflow Depth = 1.65" for Cornell-050yr event
Inflow = 0.12 cfs @ 12.11 hrs, Volume= 0.010 af
Outflow = 0.12 cfs @ 12.11 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 11R: PDP-1a



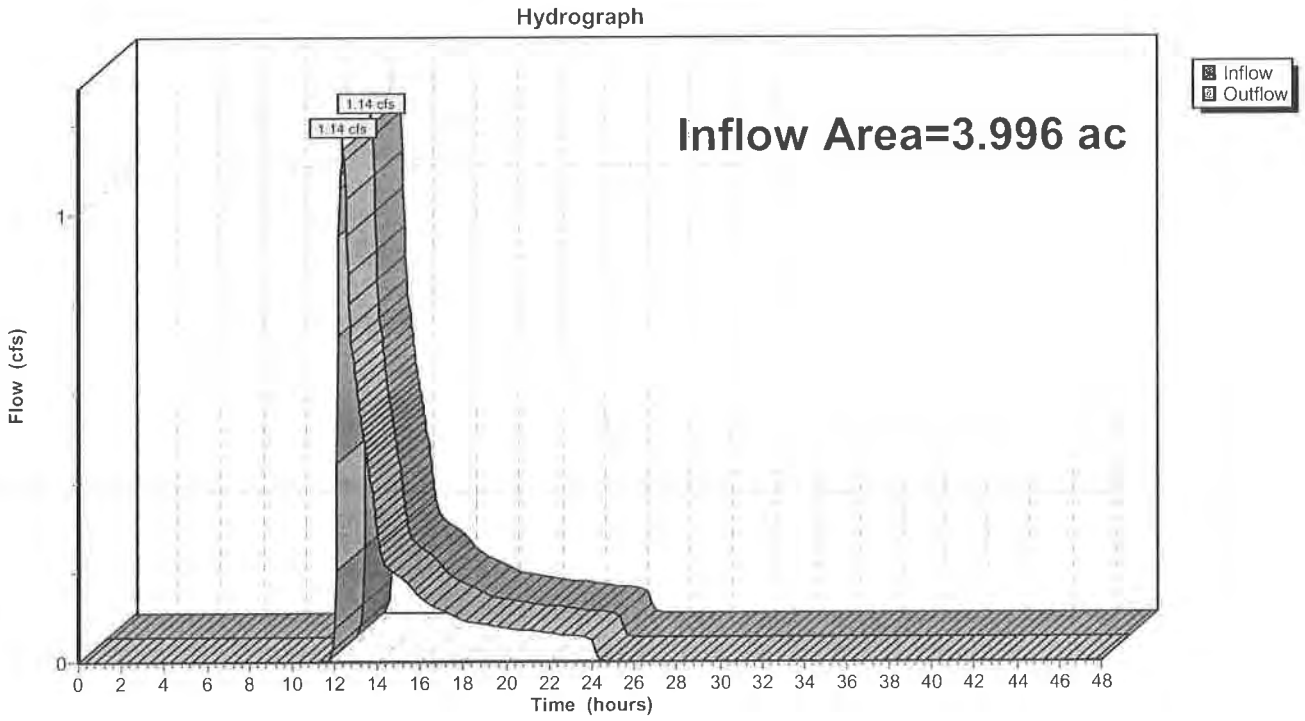
Summary for Reach 13R: PDP-1

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

Inflow Area = 3.996 ac, 37.36% Impervious, Inflow Depth = 0.58" for Cornell-050yr event
Inflow = 1.14 cfs @ 12.42 hrs, Volume= 0.192 af
Outflow = 1.14 cfs @ 12.42 hrs, Volume= 0.192 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 13R: PDP-1



Summary for Pond 10P: Infiltration Basin (short & fat)

Inflow Area = 1.977 ac, 67.87% Impervious, Inflow Depth = 5.54" for Cornell-050yr event
Inflow = 12.17 cfs @ 12.09 hrs, Volume= 0.913 af
Outflow = 1.79 cfs @ 12.60 hrs, Volume= 0.913 af, Atten= 85%, Lag= 30.9 min
Discarded = 1.50 cfs @ 11.65 hrs, Volume= 0.884 af
Primary = 0.29 cfs @ 12.60 hrs, Volume= 0.028 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 183.85' @ 12.60 hrs Surf.Area= 0.179 ac Storage= 0.291 af

Plug-Flow detention time= 53.1 min calculated for 0.912 af (100% of inflow)
Center-of-Mass det. time= 53.0 min (846.6 - 793.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	181.60'	0.137 af	**173.75'W x 45.00'L x 3.21'H Field A** 0.576 af Overall - 0.234 af Embedded = 0.342 af x 40.0% Voids
#2A	182.10'	0.234 af	**Cultec R-280** x 234 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 39 rows
		0.371 af	Total Available Storage

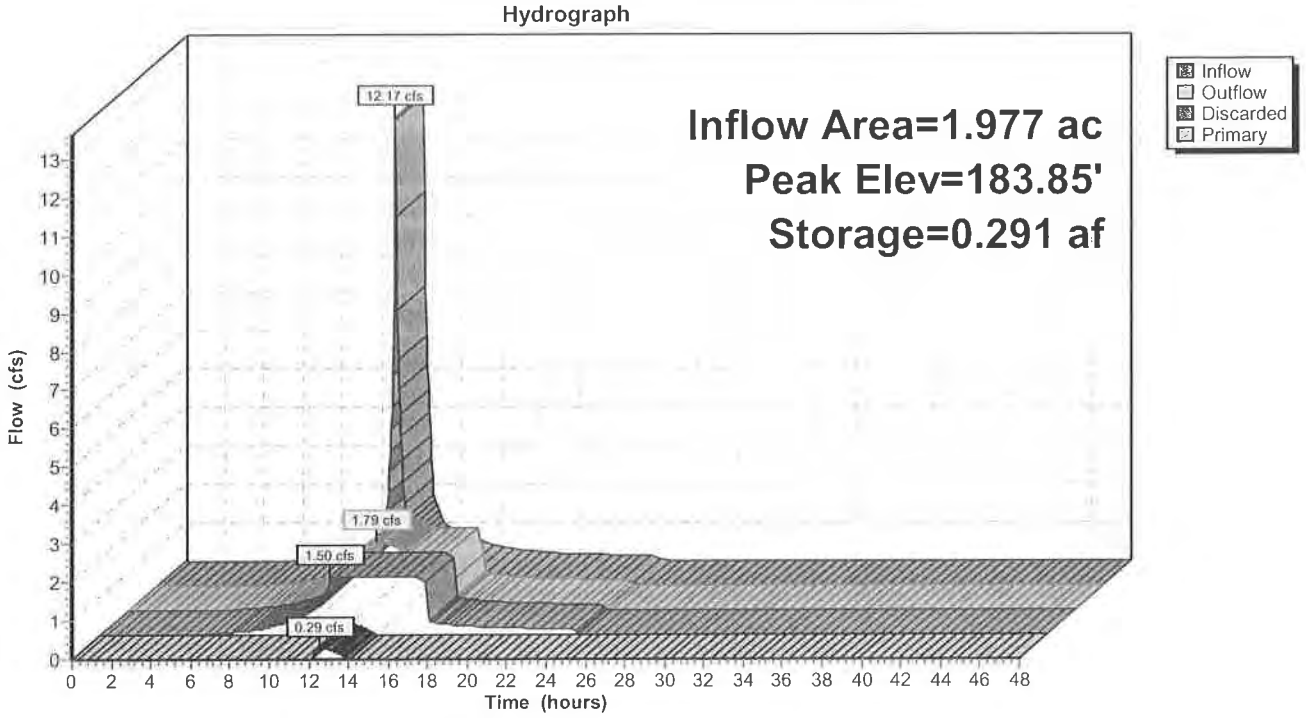
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	184.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	181.60'	**8.270 in/hr Exfiltration over Horizontal area**
#3	Primary	183.20'	**4.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=1.50 cfs @ 11.65 hrs HW=181.65' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 1.50 cfs)

Primary OutFlow Max=0.29 cfs @ 12.60 hrs HW=183.85' (Free Discharge)
├**1=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)
└**3=Orifice/Grate** (Orifice Controls 0.29 cfs @ 3.35 fps)

Pond 10P: Infiltration Basin (short & fat)



Time span=0.00-48.00 hrs, dt=0.05 hrs, 961 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 5S: PDA-1A Runoff Area=86,104 sf 67.87% Impervious Runoff Depth=6.70"
Tc=6.0 min CN=85 Runoff=14.57 cfs 1.103 af

Subcatchment 11S: PDA-1B Runoff Area=74,966 sf 7.91% Impervious Runoff Depth=1.48"
Flow Length=454' Tc=13.5 min CN=40 Runoff=1.71 cfs 0.212 af

Subcatchment 12S: PDA-1C Runoff Area=9,789 sf 0.00% Impervious Runoff Depth=1.37"
Tc=6.0 min CN=39 Runoff=0.25 cfs 0.026 af

Subcatchment 14S: PDA-1D Runoff Area=3,211 sf 20.43% Impervious Runoff Depth=2.34"
Tc=6.0 min CN=48 Runoff=0.18 cfs 0.014 af

Reach 7R: Reach Avg. Flow Depth=0.23' Max Vel=0.95 fps Inflow=1.46 cfs 0.108 af
n=0.035 L=163.0' S=0.0061 '/' Capacity=33.69 cfs Outflow=1.39 cfs 0.108 af

Reach 11R: PDP-1a Inflow=0.18 cfs 0.014 af
Outflow=0.18 cfs 0.014 af

Reach 13R: PDP-1 Inflow=2.32 cfs 0.334 af
Outflow=2.32 cfs 0.334 af

Pond 10P: Infiltration Basin (short & fat) Peak Elev=184.67' Storage=0.360 af Inflow=14.57 cfs 1.103 af
Discarded=1.50 cfs 1.020 af Primary=1.35 cfs 0.083 af Outflow=2.85 cfs 1.103 af

Total Runoff Area = 3.996 ac Runoff Volume = 1.355 af Average Runoff Depth = 4.07"
62.64% Pervious = 2.503 ac 37.36% Impervious = 1.493 ac

Summary for Subcatchment 5S: PDA-1A

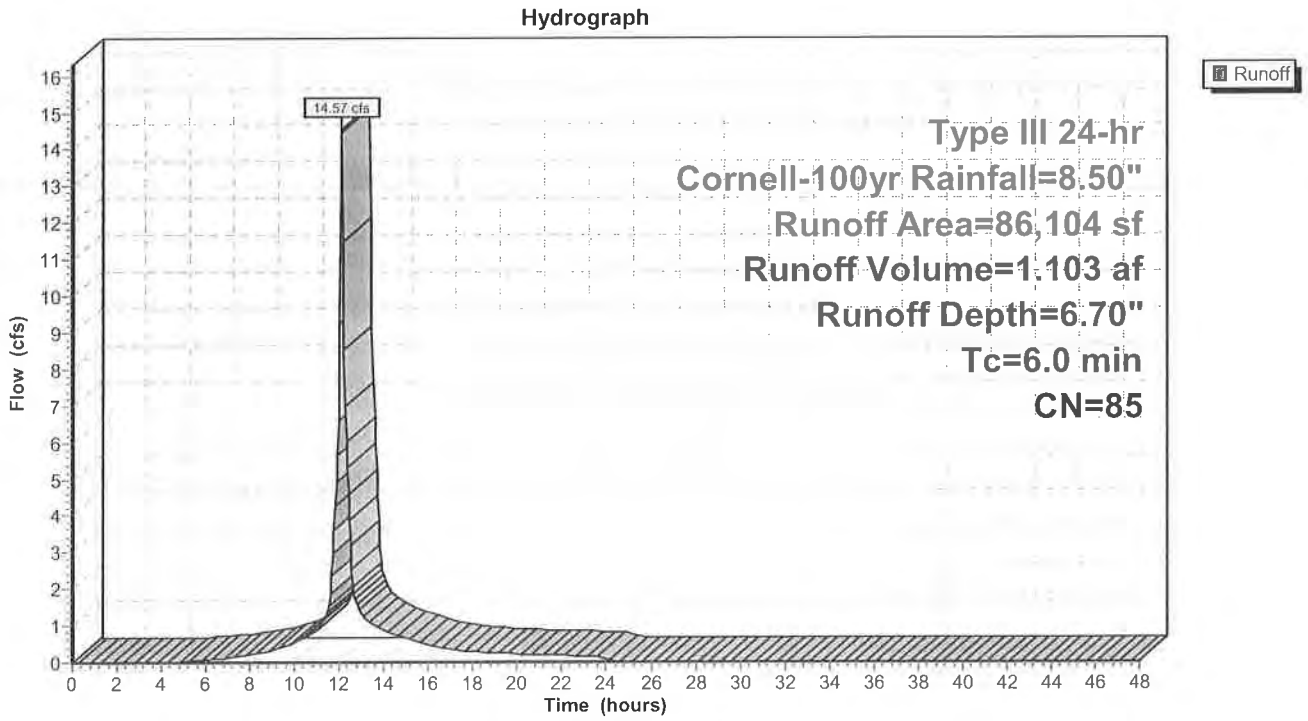
Runoff = 14.57 cfs @ 12.09 hrs, Volume= 1.103 af, Depth= 6.70"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-100yr Rainfall=8.50"

Area (sf)	CN	Description
26,234	98	Roofs, HSG A
32,204	98	Paved parking, HSG A
9,086	96	Gravel surface, HSG A
15,629	39	>75% Grass cover, Good, HSG A
2,951	30	Woods, Good, HSG A
86,104	85	Weighted Average
27,666		32.13% Pervious Area
58,438		67.87% Impervious Area

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

Subcatchment 5S: PDA-1A



Summary for Subcatchment 11S: PDA-1B

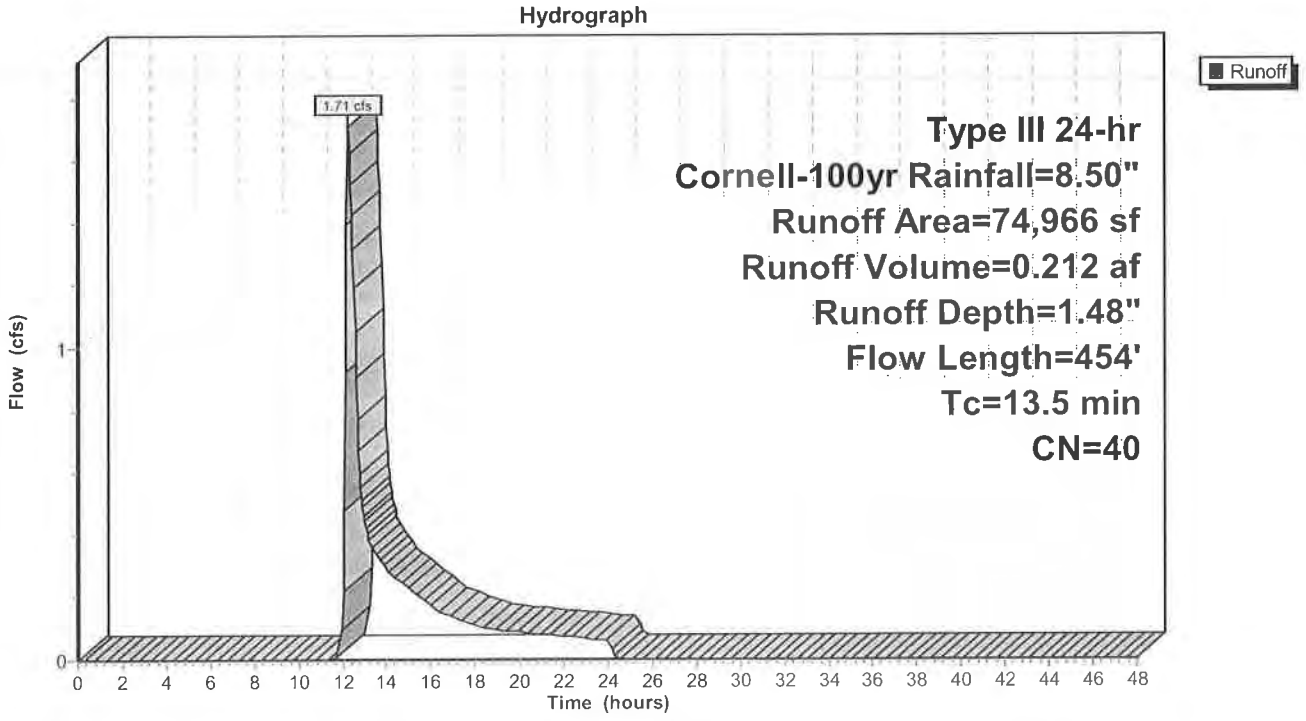
Runoff = 1.71 cfs @ 12.24 hrs, Volume= 0.212 af, Depth= 1.48"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-100yr Rainfall=8.50"

Area (sf)	CN	Description
5,931	98	Paved parking, HSG A
19,108	39	>75% Grass cover, Good, HSG A
43,432	30	Woods, Good, HSG A
* 5,477	45	Woods, Poor, HSG A (Bridle Path)
1,018	96	Gravel surface, HSG A
74,966	40	Weighted Average
69,035		92.09% Pervious Area
5,931		7.91% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.6	50	0.0200	0.15		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.20"
7.9	404	0.0148	0.85		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
13.5	454	Total			

Subcatchment 11S: PDA-1B



Summary for Subcatchment 12S: PDA-1C

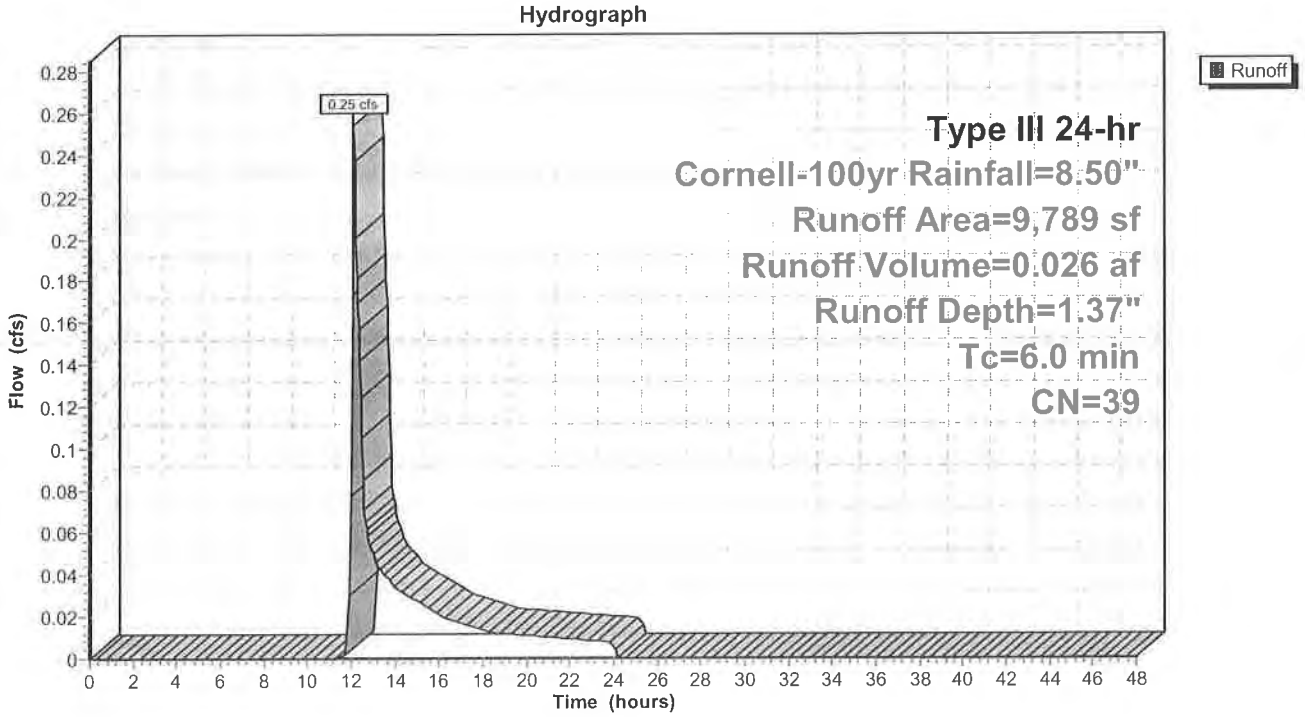
Runoff = 0.25 cfs @ 12.12 hrs, Volume= 0.026 af, Depth= 1.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-100yr Rainfall=8.50"

Area (sf)	CN	Description
9,789	39	>75% Grass cover, Good, HSG A
9,789		100.00% Pervious Area

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

Subcatchment 12S: PDA-1C



Summary for Subcatchment 14S: PDA-1D

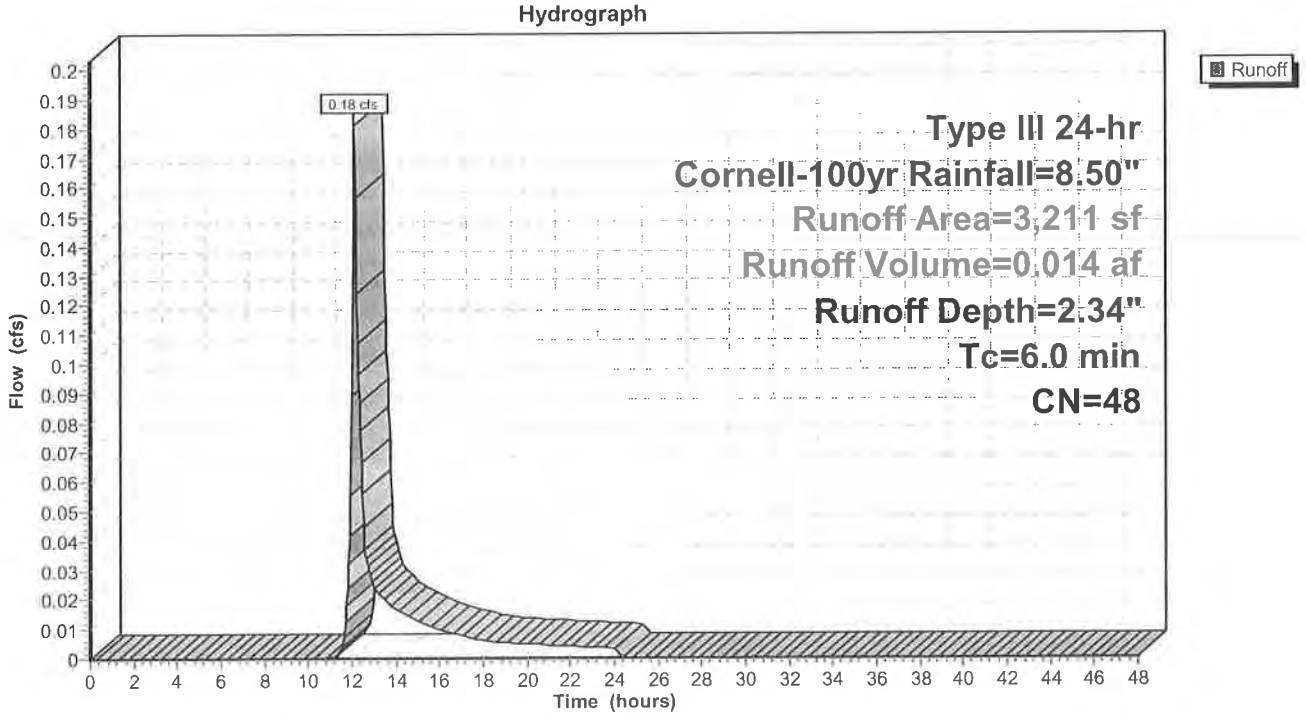
Runoff = 0.18 cfs @ 12.10 hrs, Volume= 0.014 af, Depth= 2.34"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr Cornell-100yr Rainfall=8.50"

Area (sf)	CN	Description
656	98	Paved parking, HSG A
1,553	39	>75% Grass cover, Good, HSG A
1,002	30	Woods, Good, HSG A
3,211	48	Weighted Average
2,555		79.57% Pervious Area
656		20.43% Impervious Area

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

Subcatchment 14S: PDA-1D



Summary for Reach 7R: Reach

Inflow Area = 2.201 ac, 60.94% Impervious, Inflow Depth = 0.59" for Cornell-100yr event
Inflow = 1.46 cfs @ 12.52 hrs, Volume= 0.108 af
Outflow = 1.39 cfs @ 12.61 hrs, Volume= 0.108 af, Atten= 5%, Lag= 5.4 min

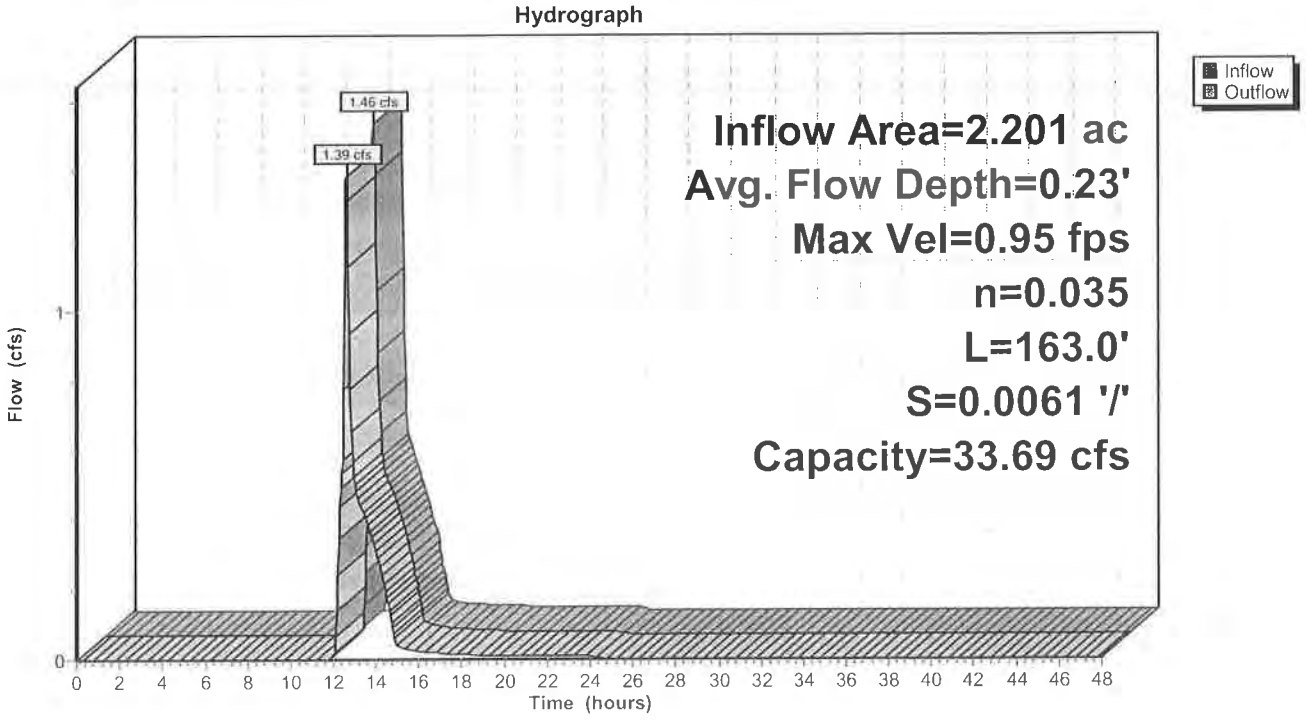
Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.95 fps, Min. Travel Time= 2.9 min
Avg. Velocity = 0.29 fps, Avg. Travel Time= 9.4 min

Peak Storage= 239 cf @ 12.57 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 1.00' Flow Area= 13.3 sf, Capacity= 33.69 cfs

20.00' x 1.00' deep Parabolic Channel, n= 0.035 Earth, dense weeds
Length= 163.0' Slope= 0.0061 '/'
Inlet Invert= 181.00', Outlet Invert= 180.00'

‡

Reach 7R: Reach



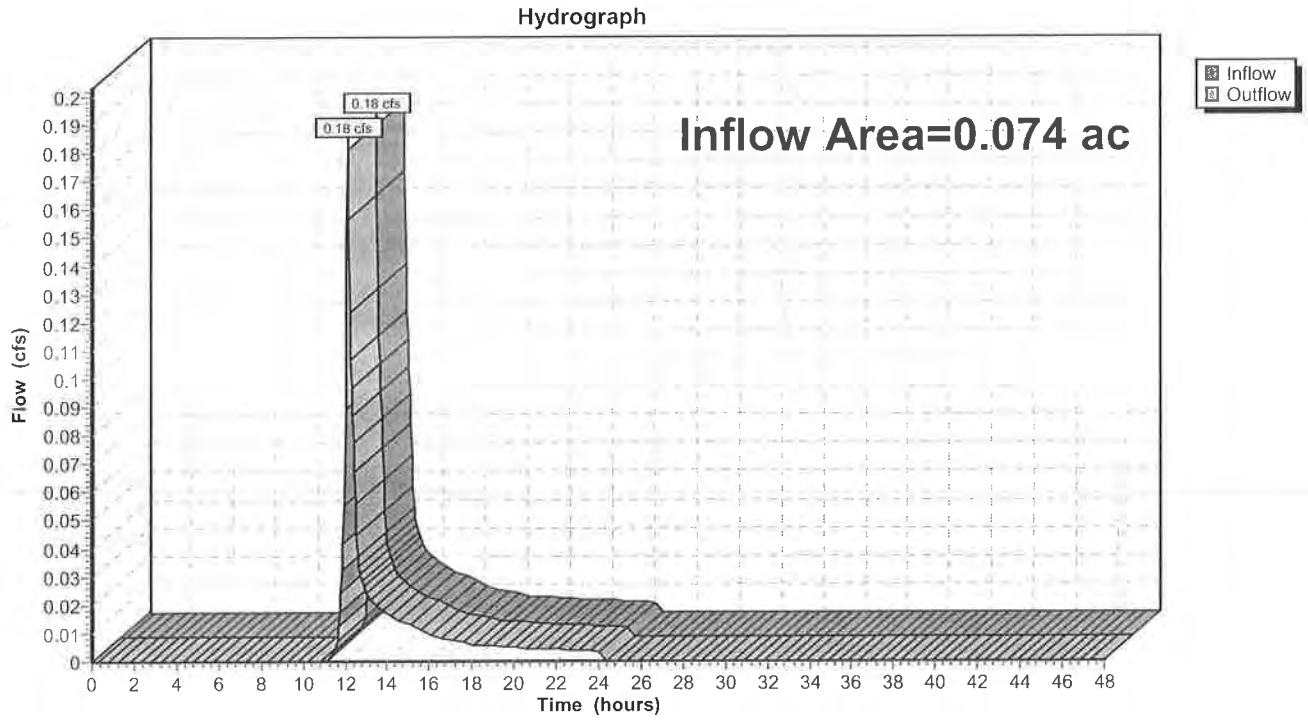
Summary for Reach 11R: PDP-1a

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

Inflow Area = 0.074 ac, 20.43% Impervious, Inflow Depth = 2.34" for Cornell-100yr event
Inflow = 0.18 cfs @ 12.10 hrs, Volume= 0.014 af
Outflow = 0.18 cfs @ 12.10 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 11R: PDP-1a



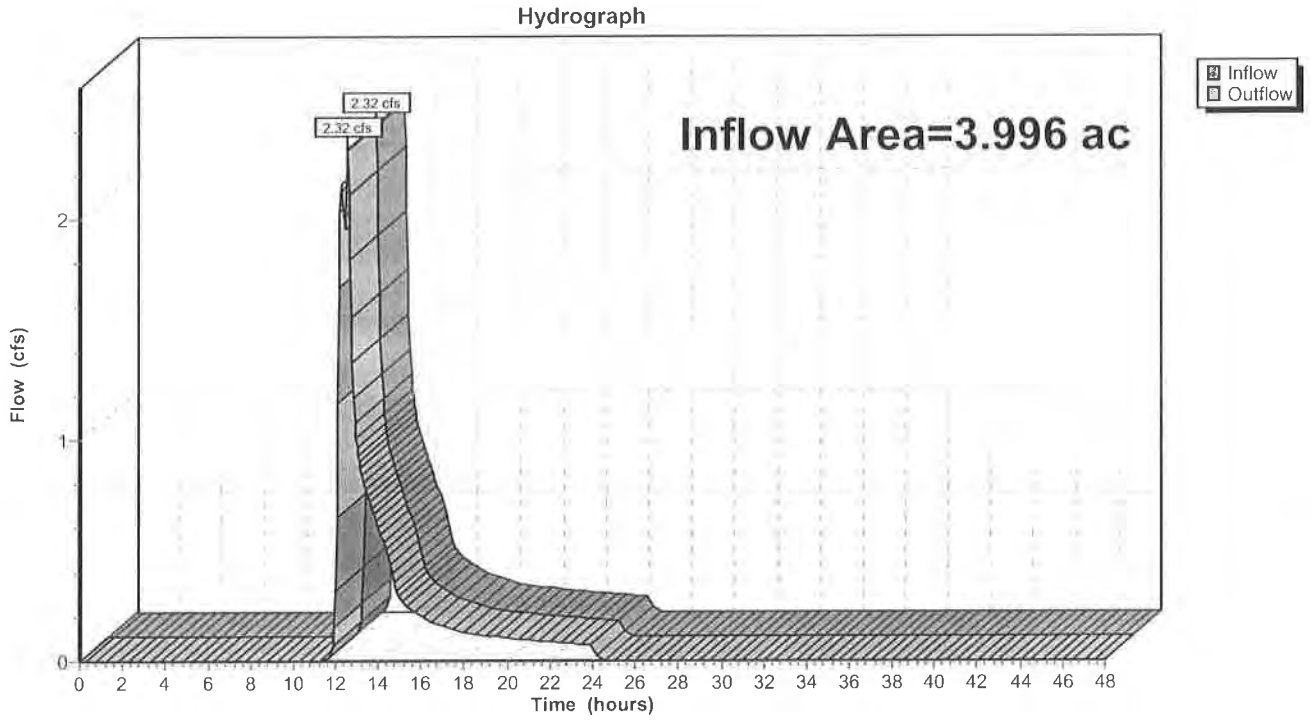
Summary for Reach 13R: PDP-1

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

Inflow Area = 3.996 ac, 37.36% Impervious, Inflow Depth = 1.00" for Cornell-100yr event
Inflow = 2.32 cfs @ 12.59 hrs, Volume= 0.334 af
Outflow = 2.32 cfs @ 12.59 hrs, Volume= 0.334 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs

Reach 13R: PDP-1



Summary for Pond 10P: Infiltration Basin (short & fat)

Inflow Area = 1.977 ac, 67.87% Impervious, Inflow Depth = 6.70" for Cornell-100yr event
Inflow = 14.57 cfs @ 12.09 hrs, Volume= 1.103 af
Outflow = 2.85 cfs @ 12.53 hrs, Volume= 1.103 af, Atten= 80%, Lag= 26.5 min
Discarded = 1.50 cfs @ 11.55 hrs, Volume= 1.020 af
Primary = 1.35 cfs @ 12.53 hrs, Volume= 0.083 af

Routing by Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 184.67' @ 12.53 hrs Surf.Area= 0.179 ac Storage= 0.360 af

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 61.3 min (849.7 - 788.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	181.60'	0.137 af	**173.75'W x 45.00'L x 3.21'H Field A** 0.576 af Overall - 0.234 af Embedded = 0.342 af x 40.0% Voids
#2A	182.10'	0.234 af	**Cultec R-280** x 234 Inside #1 Effective Size= 46.9"W x 26.0"H => 6.07 sf x 7.00'L = 42.5 cf Overall Size= 47.0"W x 26.5"H x 8.00'L with 1.00' Overlap Row Length Adjustment= +1.00' x 6.07 sf x 39 rows
		0.371 af	Total Available Storage

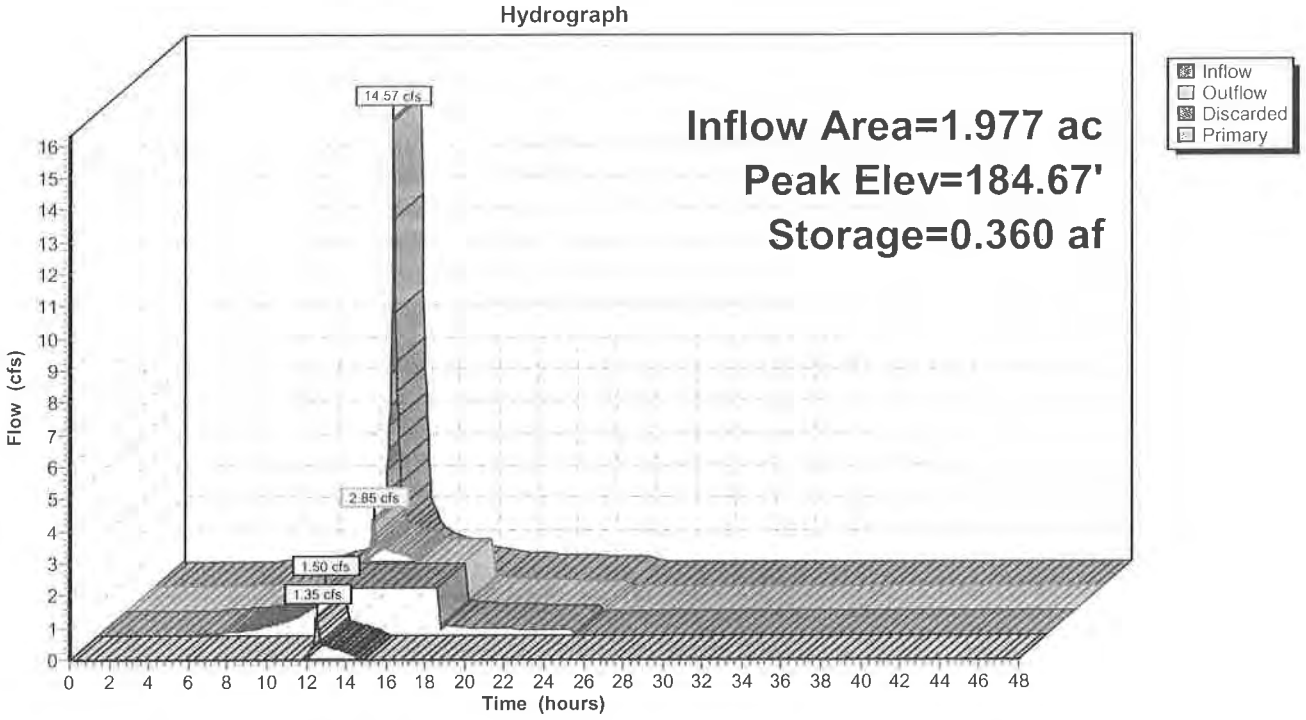
Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	184.50'	**4.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s)
#2	Discarded	181.60'	**8.270 in/hr Exfiltration over Horizontal area**
#3	Primary	183.20'	**4.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=1.50 cfs @ 11.55 hrs HW=181.63' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 1.50 cfs)

Primary OutFlow Max=1.32 cfs @ 12.53 hrs HW=184.66' (Free Discharge)
├**1=Sharp-Crested Rectangular Weir** (Weir Controls 0.84 cfs @ 1.32 fps)
└**3=Orifice/Grate** (Orifice Controls 0.48 cfs @ 5.48 fps)

Pond 10P: Infiltration Basin (short & fat)



BEALS + THOMAS
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
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CALCULATION SUMMARY

T 508.366.0560
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mail@btiweb.com I www.btiweb.com
Regional Office: Plymouth, MA

JOB NO./LOCATION:

2177.04
Medfield, MA

CLIENT/PROJECT:

LCB Senior Living
Assisted Living Residence

SUBJECT/TITLE:

Groundwater Mounding Calculation

OBJECTIVE OF CALCULATION:

- To calculate the approximate maximum groundwater mound beneath the proposed subsurface infiltration system during a 2-year storm event.

CALCULATION METHOD(S):

- Hantush equation used to calculate maximum groundwater mound.
- Runoff rates were calculated based on TR-55 methodology.

ASSUMPTIONS:

- Hydraulic conductivity of the soil is based on a falling head permeability test conducted on
- Rainfall from a 2-year 24 hour storm is 3.25 inches.
- Initial saturated thickness [Hi] of the soil beneath the infiltration system is 20 feet.
- Specific yield of the soil beneath the infiltration system is 0.35.
- Runoff will infiltrate over the course of 24 hours.

SOURCES OF DATA/EQUATIONS:

- AQTESOLV online Groundwater Mound Beneath Rectangular Recharge Area calculator, http://www.aqtesolv.com/forum/rmound.asp
- Proposed Conditions Hydrology Design prepared by Beals and Thomas, Inc. File No. 217704CS002, dated 8/13/2015.
- Hantush, Growth and decay of groundwater-mounds in response to uniform percolation, 1967.
- NRCS Soil Survey for Norfolk County, hydrologic soil group report, downloaded from Web Soil Survey on 12/23/2014.
- TR-55 urban Hydrology for Small Watersheds, SCS, 1986.
- Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada, Cornell University, Publication No. RR 93-5.
- Town of Medfield Board of Health Regulations for Storm Water and Runoff Management.
- Suficial Geoloic Map of the Medfield Quadrangle, Norfolk and Middlesex Counties, MA, by Richard Volckmann, 1975.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	C. Taylor	8/17/15	DMF	8/17/2015	DMF	8/7/2015

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Regional Office: Plymouth, MA

CONCLUSIONS:

The groundwater beneath the proposed subsurface infiltration system will mound **1.94 feet** during a 2-year storm event.

SOLUTIONS:

- Hydraulic Conductivity $[K] = \left(18.5\frac{in}{hr}\right) \times \left(\frac{1\ in}{12\ hr}\right)\left(\frac{24\ hr}{1\ day}\right) = 37\frac{ft}{day}$
- Specific Yield $[\epsilon] = 0.35$
- Initial Saturated Thickness $[Hi] = 20\ ft$
- Length of system $[A] = 174\ ft$
- Width of system $[B] = 45\ ft$
- Recharge Rate $[w] = \left(0.297\ \frac{ac\ ft}{day} \times \frac{43560\ ft^3}{1\ ac}\right) \div (174\ ft \times 45\ ft) = 1.65\ \frac{ft}{day}$

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	C. Taylor	8/17/15	DMF	8/17/2015	DMF	8/17/2015

Groundwater Mound Beneath Rectangular Recharge Area

by Glenn M. Duffield, President, HydroSOLVE, Inc.

Hantush (1967) presented the following equations for predicting the maximum height of the water table beneath a rectangular recharge area:

$$h_m^2 - h_i^2 = Z_m(t) = (2w/K)vtS^*(0.5A/(4vt)^{1/2},0.5B/(4vt)^{1/2}) \ldots\ldots (1)$$

$$v = K\bar{b}/\varepsilon \ldots\ldots (2)$$

$$\bar{b} = 0.5[h_i(0) + h(t)] \ldots\ldots (3)$$

where h_m is maximum height of mound above aquifer base (i.e., maximum saturated thickness of aquifer beneath recharge area); h_i is initial height of water table above aquifer base (i.e., initial saturated thickness of aquifer); K and ε are hydraulic conductivity and storativity (specific yield) of aquifer, respectively; w is constant rate of percolation from rectangular recharge area of length A and width B; $\bar{b}$ is a constant of linearization; and the function S* is an integral expression (see Hantush 1967). The aquifer is unconfined and assumed to have infinite extent.

If infiltration ends at time $t=t_0$, Hantush (1967) applied the principle of superposition to compute the decay of the mound as follows:

$$h_m^2 - h_i^2 = Z_m(t) - Z_m(t-t_0) \ldots\ldots (4)$$

Equation (1) is nonlinear owing to the definition of $\bar{b}$ in Equation (3); however, the solution is readily obtained by successive approximation.

Results of Groundwater Mounding Calculation

Solution by Successive Approximation

Iteration	$\bar{b}$	h_m*	% Change
1	20	21.8970865270881	9.48543263544062
2	20.948543263544121	21.9415304989072	0.202967512431673
3	20.970765249453621	21.9425523266688	4.65704870364902E-03
4	20.971276163334421	21.9425758097032	1.07020523487655E-04
5	20.971287904851621	21.9425763493709	2.45945450672025E-06

K [L/T]	ε	h_i [L]	A [L]	B [L]	w [L/T]	t [T]	h_m [L]
37	.35	20	174	45	1.65	1	21.9425763493709

maximum water-table rise (h_m - h_i) at time t = 1 is 1.94257634937086

Return to Groundwater Mounding Calculator

Click here for a benchmark for this calculator.

Hantush mounding calculations with contouring now available in AQTESOLV.

Appendix D
Hydraulic Calculations

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Regional Office: Plymouth, MA

CALCULATION SUMMARY

JOB NO./LOCATION:

2177.04
Medfield, MA

CLIENT/PROJECT:

LCB Senior Living
Assisted Living Residence

SUBJECT/TITLE:

Hydraulic Calculation

OBJECTIVE OF CALCULATION:

- To determine the number and location of drainage structures required to intercept stormwater runoff from the proposed impervious areas.
- To design the stormwater management system components to meet the design standards of the Massachusetts DEP Stormwater Handbook for water quality/inlet capacity.

CALCULATION METHOD(S):

- Drainage structures and pipes are designed using the Rational Formula and based on a 25-year storm event for Worcester County.
- The proposed system was analyzed with Autodesk Storm and Sanitary Analysis 2014.

ASSUMPTIONS:

- Runoff coefficient C=0.9 for pavement, C=0.8 for gravel, and C=0.3 for pervious areas.
- Manning's n=0.012 high-density polyethylene (HDPE) pipe.
- The minimum time of concentration is 6 minutes.
- The minimum full-flow (scour) velocity is 2.0 feet per second.
- Each structure captures 100% of tributary runoff.
- Due to elevation constraints, pipe crowns do not necessarily match where pipe diameters increase at drain manhole structures.

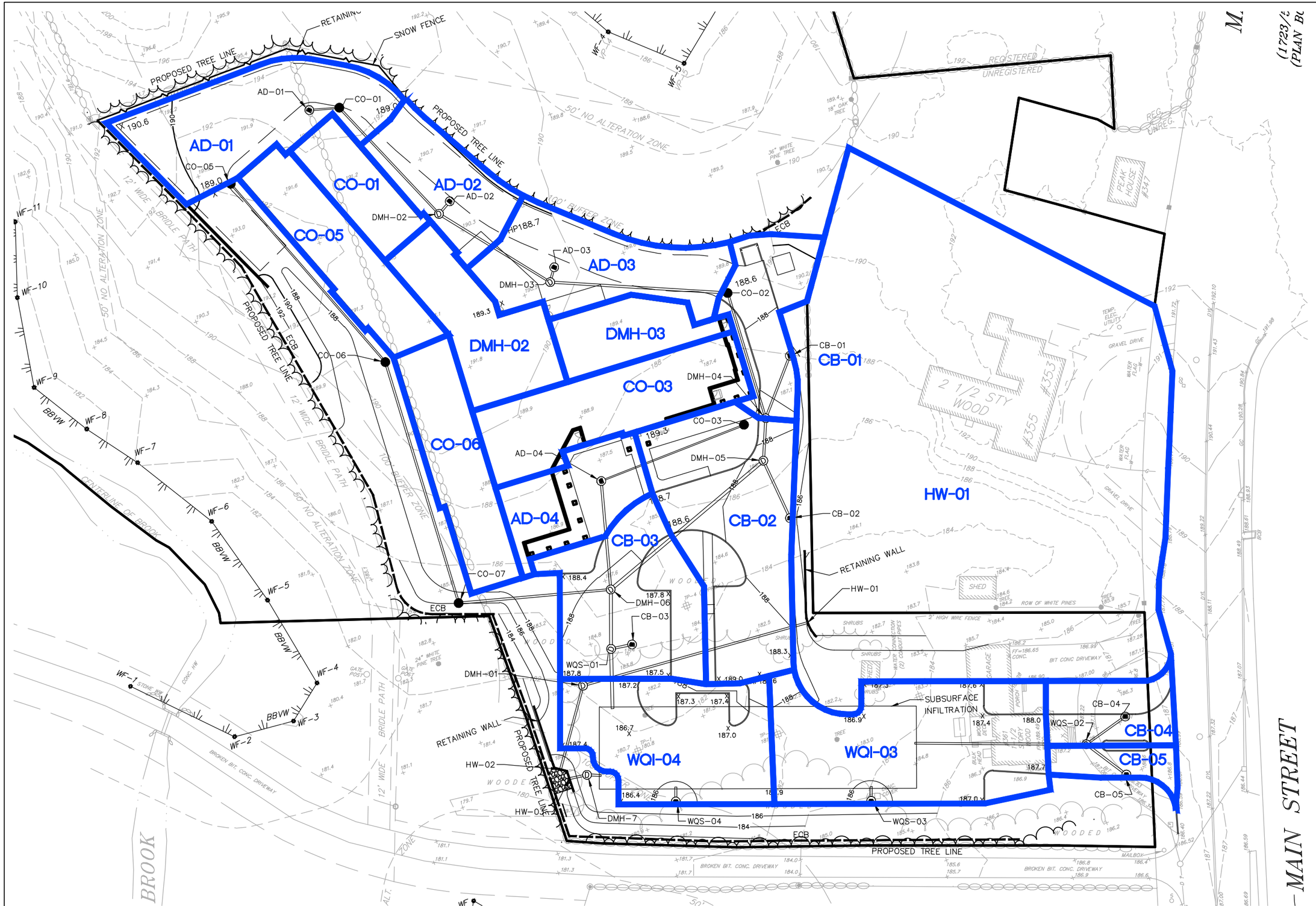
SOURCES OF DATA/EQUATIONS:

- Proposed Hydraulic Area map prepared by Beals and Thomas, Inc. plan 217704P026A-003 dated August 12, 2015.
- Rational Method (Q=CiA) was used to calculate peak runoff rates.
- Manning's Formula was used to determine pipe capacities.
- 25-year storm intensity obtained from Intensity/Duration rainfall curve in S.C.S Technical Report No. 40.
- Massachusetts DEP Stormwater Management Handbook, February, 2008.

CONCLUSIONS:

- The proposed stormwater collection system will convey 25-year storm event peak runoff rates without surcharging.
- The proposed stormwater management design has been reviewed for compliance with the stormwater management standards described in the Massachusetts DEP Stormwater Management Handbook.

REV	CALC. BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
0	C. Taylor	8/12/15	D. M. Thomas	8/13/2015	D. M. Thomas	8/13/2015
1						
2						



Hydraulic Areas Map
Figure Number 003
Scale: 1" = 50'
Date: 08/12/2015
B+T Drawing No. 217704P026A-003
B+T Project No. 2177.04

Assisted Living Residence
Medfield, Massachusetts

LCB Senior Living
3 Edge Water Drive
Norwood, Massachusetts

North Arrow


CO-05
AD-01
CO-01
CO-06
CO-07
AD-04
CO-02
DMH-01
CB-03
DMH-7
Sub-infil
CO-03
DMH-04
CB-01
CB-02
HW-01
Sub-infil-3
Sub-infil-2
WQS-02
CB-04
CB-05

Project Description

File Name	217704SSA001.SPF

Project Options

Flow Units	CFS
Elevation Type	Elevation
Hydrology Method	Rational
Time of Concentration (TOC) Method	User-Defined
Link Routing Method	Kinematic Wave
Enable Overflow Ponding at Nodes	YES
Skip Steady State Analysis Time Periods	NO

Analysis Options

Start Analysis On	Aug 10, 2015	00:00:00
End Analysis On	Aug 11, 2015	00:00:00
Start Reporting On	Aug 10, 2015	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	0
Subbasins	18
Nodes	34
Junctions	28
Outfalls	6
Flow Diversions	0
Inlets	0
Storage Nodes	0
Links	28
Channels	0
Pipes	28
Pumps	0
Orifices	0
Weirs	0
Outlets	0
Pollutants	0
Land Uses	0

Rainfall Details

Return Period	25 year(s)

Subbasin Summary

SN	Subbasin ID	Area (ac)	Weighted Runoff Coefficient	Total Rainfall Depth (in)	Total Runoff Depth (in)	Total Runoff Volume (ac-ft)	Peak Runoff (cfs)	Time of Concentration (days hh:mm:ss)
1	Sub-AD-01	0.15	0.67	0.5	0.3	0.00	0.6	0 00:05:00
2	Sub-AD-02	0.08	0.57	0.5	0.3	0.00	0.3	0 00:05:00
3	Sub-AD-03	0.13	0.65	0.5	0.3	0.00	0.5	0 00:05:00
4	Sub-AD-04	0.08	0.66	0.5	0.3	0.00	0.3	0 00:05:00
5	Sub-CB-01	0.08	0.66	0.5	0.3	0.00	0.3	0 00:05:00
6	Sub-CB-02	0.21	0.78	0.5	0.4	0.01	1.0	0 00:05:00
7	Sub-CB-03	0.15	0.71	0.5	0.4	0.00	0.6	0 00:05:00
8	Sub-CB-04	0.06	0.60	0.5	0.3	0.00	0.2	0 00:05:00
9	Sub-CB-05	0.03	0.87	0.5	0.4	0.00	0.2	0 00:05:00
10	Sub-CO-01	0.06	0.90	0.5	0.5	0.00	0.3	0 00:05:00
11	Sub-CO-03	0.13	0.90	0.5	0.5	0.00	0.7	0 00:05:00
12	Sub-CO-05	0.10	0.90	0.5	0.5	0.00	0.5	0 00:05:00
13	Sub-CO-06	0.10	0.90	0.5	0.5	0.00	0.5	0 00:05:00
14	Sub-DMH-02	0.10	0.90	0.5	0.5	0.00	0.5	0 00:05:00
15	Sub-DMH-03	0.06	0.90	0.5	0.5	0.00	0.3	0 00:05:00
16	Sub-HW-01	1.16	0.36	0.5	0.2	0.02	2.5	0 00:05:00
17	Sub-WQS-03	0.22	0.83	0.5	0.4	0.01	1.1	0 00:05:00
18	Sub-WQS-04	0.16	0.83	0.5	0.4	0.01	0.8	0 00:05:00

Node Summary

SN	Element ID	Element Type	Invert Elevation (ft)	Ground/Rim (Max) Elevation (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max Surcharge Depth Attained (ft)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	AD-01	Junction	185.30	188.50	185.30	188.50	0.60	185.60	0.00	0 00:00	0.00	0.00
2	AD-02	Junction	184.90	188.00	184.90	188.00	0.28	185.05	0.00	0 00:00	0.00	0.00
3	AD-03	Junction	184.50	188.00	184.50	188.00	0.50	184.70	0.00	0 00:00	0.00	0.00
4	AD-04	Junction	185.00	188.00	185.00	188.00	1.02	185.34	0.00	0 00:00	0.00	0.00
5	CB-01	Junction	184.00	187.50	184.00	187.50	0.33	184.18	0.00	0 00:00	0.00	0.00
6	CB-02	Junction	183.70	187.20	183.70	187.20	0.99	184.02	0.00	0 00:00	0.00	0.00
7	CB-03	Junction	183.00	186.80	183.00	186.80	0.64	183.19	0.00	0 00:00	0.00	0.00
8	CB-04	Junction	183.20	186.50	183.20	186.50	0.21	183.37	0.00	0 00:00	0.00	0.00
9	CB-O5	Junction	183.20	186.50	183.20	186.50	0.16	183.35	0.00	0 00:00	0.00	0.00
10	CO-01	Junction	185.10	188.70	185.10	188.70	0.90	185.63	0.00	0 00:00	0.00	0.00
11	CO-02	Junction	183.80	188.70	183.80	188.70	2.42	184.52	0.00	0 00:00	0.00	0.00
12	CO-03	Junction	186.00	189.00	186.00	189.00	0.72	186.33	0.00	0 00:00	0.00	0.00
13	CO-05	Junction	185.50	188.90	185.50	188.90	0.53	185.85	0.00	0 00:00	0.00	0.00
14	CO-06	Junction	184.80	189.00	184.80	189.00	1.01	185.22	0.00	0 00:00	0.00	0.00
15	CO-07	Junction	184.10	186.00	184.10	186.00	0.99	184.52	0.00	0 00:00	0.00	0.00
16	DMH-01	Junction	180.90	187.60	180.90	187.60	2.46	181.51	0.00	0 00:00	0.00	0.00
17	DMH-02	Junction	184.70	188.30	184.70	188.30	1.67	185.25	0.00	0 00:00	0.00	0.00
18	DMH-03	Junction	184.30	185.90	184.30	185.90	2.44	185.03	0.00	0 00:00	0.00	0.00
19	DMH-04	Junction	183.40	188.30	183.40	188.30	2.69	184.12	0.00	0 00:00	0.00	0.00
20	DMH-05	Junction	183.25	187.70	183.25	187.70	3.55	183.97	0.00	0 00:00	0.00	0.00
21	DMH-06	Junction	182.70	187.90	182.70	187.90	5.44	184.63	0.00	0 00:00	0.00	0.00
22	DMH-7	Junction	182.00	186.50	182.00	186.50	1.51	182.40	0.00	0 00:00	0.00	0.00
23	HW-01	Junction	182.50	184.17	182.50	184.17	2.51	183.05	0.00	0 00:00	0.00	0.00
24	Sub-Infil	Junction	182.10	0.00	182.10	0.00	1.35	182.48	0.00	0 00:00	0.00	0.00
25	WQS-01	Junction	182.30	187.00	182.30	187.00	5.97	183.35	0.00	0 00:00	0.00	0.00
26	WQS-02	Junction	183.00	187.00	183.00	187.00	0.36	183.21	0.00	0 00:00	0.00	0.00
27	WQS-03	Junction	182.80	185.80	182.80	185.80	1.09	183.09	0.00	0 00:00	0.00	0.00
28	WQS-04	Junction	182.80	185.80	182.80	185.80	0.81	183.04	0.00	0 00:00	0.00	0.00
29	HW-02	Outfall	180.50				2.45	181.11				
30	HW-03	Outfall	181.80				1.55	182.16				
31	Sub-Infil-1	Outfall	182.10				5.96	183.00				
32	Sub-Infil-2	Outfall	182.10				0.35	182.31				
33	Sub-Infil-3	Outfall	182.60				1.09	182.88				
34	Sub-Infil-5	Outfall	182.60				0.81	182.84				

Junction Input

SN	Element ID	Invert Elevation (ft)	Ground/Rim Rim Elevation (ft)	Minimum Pipe Cover (ft)	Rim to Invert Distance (ft)	Initial Water Elevation (ft)	Surcharge Elevation (ft)	Surcharge Depth (ft)
1	AD-01	185.30	188.50	0.00	3.20	185.30	188.50	0.00
2	AD-02	184.90	188.00	0.00	3.10	184.90	188.00	0.00
3	AD-03	184.50	188.00	0.00	3.50	184.50	188.00	0.00
4	AD-04	185.00	188.00	0.00	3.00	185.00	188.00	0.00
5	CB-01	184.00	187.50	0.00	3.50	184.00	187.50	0.00
6	CB-02	183.70	187.20	0.00	3.50	183.70	187.20	0.00
7	CB-03	183.00	186.80	0.00	3.80	183.00	186.80	0.00
8	CB-04	183.20	186.50	0.00	3.30	183.20	186.50	0.00
9	CB-O5	183.20	186.50	0.00	3.30	183.20	186.50	0.00
10	CO-01	185.10	188.70	0.00	3.60	185.10	188.70	0.00
11	CO-02	183.80	188.70	0.00	4.90	183.80	188.70	0.00
12	CO-03	186.00	189.00	0.00	3.00	186.00	189.00	0.00
13	CO-05	185.50	188.90	0.00	3.40	185.50	188.90	0.00
14	CO-06	184.80	189.00	0.00	4.20	184.80	189.00	0.00
15	CO-07	184.10	186.00	0.00	1.90	184.10	186.00	0.00
16	DMH-01	180.90	187.60	0.00	6.70	180.90	187.60	0.00
17	DMH-02	184.70	188.30	0.00	3.60	184.70	188.30	0.00
18	DMH-03	184.30	185.90	0.00	1.60	184.30	185.90	0.00
19	DMH-04	183.40	188.30	0.00	4.90	183.40	188.30	0.00
20	DMH-05	183.25	187.70	0.00	4.45	183.25	187.70	0.00
21	DMH-06	182.70	187.90	0.00	5.20	182.70	187.90	0.00
22	DMH-7	182.00	186.50	0.00	4.50	182.00	186.50	0.00
23	HW-01	182.50	184.17	0.00	1.67	182.50	184.17	0.00
24	Sub-Infil	182.10	0.00	0.00	-182.10	182.10	0.00	0.00
25	WQS-01	182.30	187.00	0.00	4.70	182.30	187.00	0.00
26	WQS-02	183.00	187.00	0.00	4.00	183.00	187.00	0.00
27	WQS-03	182.80	185.80	0.00	3.00	182.80	185.80	0.00
28	WQS-04	182.80	185.80	0.00	3.00	182.80	185.80	0.00

Junction Results

SN	Element ID	Peak Inflow (cfs)	Max HGL Elevation Attained (ft)	Max HGL Depth Attained (ft)	Max Surcharge Depth Attained (ft)	Min Freeboard Attained (ft)	Average HGL Elevation Attained (ft)	Average HGL Depth Attained (ft)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ac-in)	Total Time Flooded (min)
1	AD-01	0.60	185.60	0.30	0.00	2.90	185.30	0.00	0 00:05	0 00:00	0.00	0.00
2	AD-02	0.28	185.05	0.15	0.00	2.95	184.90	0.00	0 00:05	0 00:00	0.00	0.00
3	AD-03	0.50	184.70	0.20	0.00	3.30	184.50	0.00	0 00:05	0 00:00	0.00	0.00
4	AD-04	1.02	185.34	0.34	0.00	2.66	185.00	0.00	0 00:05	0 00:00	0.00	0.00
5	CB-01	0.33	184.18	0.18	0.00	3.32	184.00	0.00	0 00:05	0 00:00	0.00	0.00
6	CB-02	0.99	184.02	0.32	0.00	3.18	183.70	0.00	0 00:05	0 00:00	0.00	0.00
7	CB-03	0.64	183.19	0.19	0.00	3.61	183.00	0.00	0 00:05	0 00:00	0.00	0.00
8	CB-04	0.21	183.37	0.17	0.00	3.13	183.20	0.00	0 00:05	0 00:00	0.00	0.00
9	CB-O5	0.16	183.35	0.15	0.00	3.15	183.20	0.00	0 00:05	0 00:00	0.00	0.00
10	CO-01	0.90	185.63	0.53	0.00	3.07	185.10	0.00	0 00:05	0 00:00	0.00	0.00
11	CO-02	2.42	184.52	0.72	0.00	4.18	183.80	0.00	0 00:05	0 00:00	0.00	0.00
12	CO-03	0.72	186.33	0.33	0.00	2.67	186.00	0.00	0 00:05	0 00:00	0.00	0.00
13	CO-05	0.53	185.85	0.35	0.00	3.05	185.50	0.00	0 00:05	0 00:00	0.00	0.00
14	CO-06	1.01	185.22	0.42	0.00	3.78	184.80	0.00	0 00:05	0 00:00	0.00	0.00
15	CO-07	0.99	184.52	0.42	0.00	1.48	184.10	0.00	0 00:05	0 00:00	0.00	0.00
16	DMH-01	2.46	181.51	0.61	0.00	6.09	180.90	0.00	0 00:05	0 00:00	0.00	0.00
17	DMH-02	1.67	185.25	0.55	0.00	3.05	184.70	0.00	0 00:05	0 00:00	0.00	0.00
18	DMH-03	2.44	185.03	0.73	0.00	0.87	184.30	0.00	0 00:05	0 00:00	0.00	0.00
19	DMH-04	2.69	184.12	0.72	0.00	4.18	183.50	0.10	0 00:06	0 00:00	0.00	0.00
20	DMH-05	3.55	183.97	0.72	0.00	3.73	183.25	0.00	0 00:06	0 00:00	0.00	0.00
21	DMH-06	5.44	184.63	1.93	0.00	3.27	184.30	1.60	0 00:05	0 00:00	0.00	0.00
22	DMH-7	1.51	182.40	0.40	0.00	4.10	182.38	0.38	0 00:00	0 00:00	0.00	0.00
23	HW-01	2.51	183.05	0.55	0.00	1.12	182.50	0.00	0 00:05	0 00:00	0.00	0.00
24	Sub-Infil	1.35	182.48	0.38	0.00	0.62	182.48	0.38	0 00:00	0 00:00	0.00	0.00
25	WQS-01	5.97	183.35	1.05	0.00	3.65	182.50	0.20	0 00:06	0 00:00	0.00	0.00
26	WQS-02	0.36	183.21	0.21	0.00	3.79	183.00	0.00	0 00:05	0 00:00	0.00	0.00
27	WQS-03	1.09	183.09	0.29	0.00	2.71	182.80	0.00	0 00:05	0 00:00	0.00	0.00
28	WQS-04	0.81	183.04	0.24	0.00	2.76	182.80	0.00	0 00:05	0 00:00	0.00	0.00

Pipe Input

SN	Element ID	Length (ft)	Inlet Invert Elevation (ft)	Outlet Invert Elevation (ft)	Total Drop (ft)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (in)	Manning's Roughness	Initial Flow (cfs)	Flap Gate	No. of Barrels
1	Pipe - (16)	127.78	182.50	180.90	1.60	1.25	CIRCULAR	12.0	0.0120	0.00	No	1
2	Pipe - (17)	47.42	180.90	180.50	0.40	0.84	CIRCULAR	12.0	0.0120	0.00	No	1
3	Pipe - (18)	16.55	185.30	185.10	0.20	1.21	CIRCULAR	8.0	0.0120	0.00	No	1
4	Pipe - (19)	79.65	185.10	184.70	0.40	0.50	CIRCULAR	8.0	0.0120	0.00	No	1
5	Pipe - (19) (1)	71.48	184.70	184.30	0.40	0.56	CIRCULAR	12.0	0.0120	0.00	No	1
6	Pipe - (21)	97.39	184.30	183.80	0.50	0.51	CIRCULAR	12.0	0.0120	0.00	No	1
7	Pipe - (22)	71.66	183.80	183.40	0.40	0.56	CIRCULAR	12.0	0.0120	0.00	No	1
8	Pipe - (23)	23.29	183.40	183.25	0.15	0.64	CIRCULAR	12.0	0.0120	0.00	No	1
9	Pipe - (24)	109.37	183.25	182.70	0.55	0.50	CIRCULAR	18.0	0.0120	0.00	No	1
10	Pipe - (25)	32.54	182.70	182.50	0.20	0.61	CIRCULAR	18.0	0.0120	0.00	No	1
11	Pipe - (25) (2)	32.75	182.30	182.10	0.20	0.61	CIRCULAR	18.0	0.0120	0.00	No	1
12	Pipe - (26)	36.63	184.00	183.50	0.50	1.36	CIRCULAR	12.0	0.0120	0.00	No	1
13	Pipe - (27)	34.60	183.70	183.20	0.50	1.44	CIRCULAR	12.0	0.0120	0.00	No	1
14	Pipe - (29)	129.21	185.50	184.80	0.70	0.54	CIRCULAR	8.0	0.0120	0.00	No	1
15	Pipe - (30)	137.89	184.80	183.90	0.90	0.65	CIRCULAR	12.0	0.0120	0.00	No	1
16	Pipe - (31)	83.57	183.90	183.40	0.50	0.60	CIRCULAR	12.0	0.0120	0.00	No	1
17	Pipe - (32)	84.06	186.00	185.00	1.00	1.19	CIRCULAR	8.0	0.0120	0.00	No	1
18	Pipe - (33)	59.57	185.00	184.30	0.70	1.18	CIRCULAR	12.0	0.0120	0.00	No	1
19	Pipe - (34)	27.48	183.20	183.00	0.20	0.73	CIRCULAR	12.0	0.0120	0.00	No	1
20	Pipe - (35)	94.00	183.00	182.10	0.90	0.96	CIRCULAR	12.0	0.0120	0.00	No	1
21	Pipe - (36)	26.15	183.20	183.00	0.20	0.76	CIRCULAR	12.0	0.0120	0.00	No	1
22	Pipe - (37)	7.86	182.80	182.60	0.20	2.55	CIRCULAR	12.0	0.0120	0.00	No	1
23	Pipe - (38)	7.86	182.80	182.60	0.20	2.54	CIRCULAR	12.0	0.0120	0.00	No	1
24	Pipe - (39)	7.76	182.10	182.00	0.10	1.29	CIRCULAR	12.0	0.0120	0.00	No	1
25	Pipe - (40)	9.86	182.00	181.80	0.20	2.03	CIRCULAR	12.0	0.0120	0.00	No	1
26	Pipe - (41)	9.06	184.90	184.70	0.20	2.21	CIRCULAR	12.0	0.0120	0.00	No	1
27	Pipe - (42)	8.45	184.50	184.30	0.20	2.37	CIRCULAR	12.0	0.0120	0.00	No	1
28	Pipe - (44)	11.74	183.00	182.50	0.50	4.26	CIRCULAR	12.0	0.0120	0.00	No	1

Pipe Results

SN	Element ID	Peak Flow (cfs)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cfs)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (ft/sec)	Travel Time (min)	Peak Flow Depth (ft)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Pipe - (16)	2.46	0 00:05	4.32	0.57	8.55	0.25	0.54	0.54	0.00	Calculated
2	Pipe - (17)	2.45	0 00:05	3.54	0.69	4.89	0.16	0.61	0.61	0.00	Calculated
3	Pipe - (18)	0.60	0 00:05	1.44	0.41	3.94	0.07	0.30	0.45	0.00	Calculated
4	Pipe - (19)	0.88	0 00:05	0.93	0.95	3.47	0.38	0.52	0.78	0.00	Calculated
5	Pipe - (19) (1)	1.65	0 00:05	2.89	0.57	3.83	0.31	0.54	0.54	0.00	Calculated
6	Pipe - (21)	2.42	0 00:05	2.77	0.87	4.05	0.40	0.72	0.72	0.00	Calculated
7	Pipe - (22)	2.41	0 00:06	2.88	0.83	4.15	0.29	0.70	0.70	0.00	Calculated
8	Pipe - (23)	2.68	0 00:06	3.10	0.87	4.44	0.09	0.72	0.72	0.00	Calculated
9	Pipe - (24)	3.53	0 00:06	8.07	0.44	4.45	0.41	0.69	0.46	0.00	Calculated
10	Pipe - (25)	5.43	0 00:06	8.92	0.61	5.30	0.10	0.85	0.56	0.00	Calculated
11	Pipe - (25) (2)	5.96	0 00:06	8.89	0.67	5.40	0.10	0.90	0.60	0.00	Calculated
12	Pipe - (26)	0.32	0 00:05	4.51	0.07	4.14	0.15	0.18	0.18	0.00	Calculated
13	Pipe - (27)	0.98	0 00:05	4.40	0.22	5.16	0.11	0.32	0.32	0.00	Calculated
14	Pipe - (29)	0.50	0 00:05	0.96	0.52	4.92	0.44	0.34	0.51	0.00	Calculated
15	Pipe - (30)	0.99	0 00:05	2.75	0.36	3.29	0.70	0.41	0.41	0.00	Calculated
16	Pipe - (31)	0.99	0 00:06	3.53	0.28	3.88	0.36	0.36	0.36	0.00	Calculated
17	Pipe - (32)	0.71	0 00:05	1.43	0.49	5.98	0.23	0.33	0.49	0.00	Calculated
18	Pipe - (33)	1.01	0 00:05	4.18	0.24	4.41	0.23	0.33	0.33	0.00	Calculated
19	Pipe - (34)	0.15	0 00:05	3.29	0.05	2.78	0.16	0.15	0.15	0.00	Calculated
20	Pipe - (35)	0.35	0 00:05	3.78	0.09	3.06	0.51	0.21	0.21	0.00	Calculated
21	Pipe - (36)	0.21	0 00:05	3.38	0.06	2.97	0.15	0.17	0.17	0.00	Calculated
22	Pipe - (37)	1.09	0 00:05	6.16	0.18	5.90	0.02	0.29	0.29	0.00	Calculated
23	Pipe - (38)	0.81	0 00:05	6.16	0.13	5.43	0.02	0.24	0.24	0.00	Calculated
24	Pipe - (39)	1.51	0 00:00	4.38	0.34	5.26	0.02	0.39	0.39	0.00	Calculated
25	Pipe - (40)	1.55	0 00:00	5.50	0.28	6.08	0.03	0.36	0.36	0.00	Calculated
26	Pipe - (41)	0.28	0 00:05	5.73	0.05	3.78	0.04	0.15	0.15	0.00	Calculated
27	Pipe - (42)	0.50	0 00:05	5.94	0.08	4.59	0.03	0.20	0.20	0.00	Calculated
28	Pipe - (44)	0.64	0 00:05	7.97	0.08	6.06	0.03	0.19	0.19	0.00	Calculated

Assisted Living Residence: 25 year Design Storm Hydraulic Analysis

SN	From (Inlet) Node	To (Outlet) Node	Length	Inlet Invert Elevation	Outlet Invert Elevation	Total Drop	Average Slope	Pipe Shape	Pipe Diameter	Manning's Roughness	Peak Flow	Time of Peak Flow Occurrence	Max Flow Velocity	Travel Time	Design Flow Capacity	Max Flow / Design Flow Ratio	Max Flow Depth / Total Depth Ratio	Total Time Surcharged	Max Flow Depth	Reported Condition
			(ft)	(ft)	(ft)	(ft)	(%)		(inches)		(cfs)	(days hh:mm)	(ft/sec)	(min)	(cfs)			(min)	(ft)	
1	HW-01	DMH-01	127.78	182.50	180.90	1.60	1.2500	CIRCULAR	12.000	0.0120	2.46	0 00:05	8.55	0.25	4.32	0.57	0.54	0.00	0.54	Calculated
2	DMH-01	HW-02	47.42	180.90	180.50	0.40	0.8400	CIRCULAR	12.000	0.0120	2.45	0 00:05	4.89	0.16	3.54	0.69	0.61	0.00	0.61	Calculated
3	AD-01	CO-01	16.55	185.30	185.10	0.20	1.2100	CIRCULAR	8.040	0.0120	0.60	0 00:05	3.94	0.07	1.44	0.41	0.45	0.00	0.30	Calculated
4	CO-01	DMH-02	79.65	185.10	184.70	0.40	0.5000	CIRCULAR	8.040	0.0120	0.88	0 00:05	3.47	0.38	0.93	0.95	0.78	0.00	0.52	Calculated
5	DMH-02	DMH-03	71.48	184.70	184.30	0.40	0.5600	CIRCULAR	12.000	0.0120	1.65	0 00:05	3.83	0.31	2.89	0.57	0.54	0.00	0.54	Calculated
6	DMH-03	CO-02	97.39	184.30	183.80	0.50	0.5100	CIRCULAR	12.000	0.0120	2.42	0 00:05	4.05	0.40	2.77	0.87	0.72	0.00	0.72	Calculated
7	CO-02	DMH-04	71.66	183.80	183.40	0.40	0.5600	CIRCULAR	12.000	0.0120	2.41	0 00:06	4.15	0.29	2.88	0.83	0.70	0.00	0.70	Calculated
8	DMH-04	DMH-05	23.29	183.40	183.25	0.15	0.6400	CIRCULAR	12.000	0.0120	2.68	0 00:06	4.44	0.09	3.10	0.87	0.72	0.00	0.72	Calculated
9	DMH-05	DMH-06	109.37	183.25	182.70	0.55	0.5000	CIRCULAR	18.000	0.0120	3.53	0 00:06	4.45	0.41	8.07	0.44	0.46	0.00	0.69	Calculated
10	DMH-06	WQS-01	32.54	182.70	182.50	0.20	0.6100	CIRCULAR	18.000	0.0120	5.43	0 00:06	5.30	0.10	8.92	0.61	0.56	0.00	0.85	Calculated
11	WQS-01	Sub-Infil-1	32.75	182.30	182.10	0.20	0.6100	CIRCULAR	18.000	0.0120	5.96	0 00:06	5.40	0.10	8.89	0.67	0.60	0.00	0.90	Calculated
12	CB-01	DMH-04	36.63	184.00	183.50	0.50	1.3600	CIRCULAR	12.000	0.0120	0.32	0 00:05	4.14	0.15	4.51	0.07	0.18	0.00	0.18	Calculated
13	CB-02	DMH-05	34.60	183.70	183.20	0.50	1.4400	CIRCULAR	12.000	0.0120	0.98	0 00:05	5.16	0.11	4.40	0.22	0.32	0.00	0.32	Calculated
14	CO-05	CO-06	129.21	185.50	184.80	0.70	0.5400	CIRCULAR	8.040	0.0120	0.50	0 00:05	4.92	0.44	0.96	0.52	0.51	0.00	0.34	Calculated
15	CO-06	CO-07	137.89	184.80	183.90	0.90	0.6500	CIRCULAR	12.000	0.0120	0.99	0 00:05	3.29	0.70	2.75	0.36	0.41	0.00	0.41	Calculated
16	CO-07	DMH-06	83.57	183.90	183.40	0.50	0.6000	CIRCULAR	12.000	0.0120	0.99	0 00:06	3.88	0.36	3.53	0.28	0.36	0.00	0.36	Calculated
17	CO-03	AD-04	84.06	186.00	185.00	1.00	1.1900	CIRCULAR	8.040	0.0120	0.71	0 00:05	5.98	0.23	1.43	0.49	0.49	0.00	0.33	Calculated
18	AD-04	DMH-06	59.57	185.00	184.30	0.70	1.1800	CIRCULAR	12.000	0.0120	1.01	0 00:05	4.41	0.23	4.18	0.24	0.33	0.00	0.33	Calculated
19	CB-O5	WQS-02	27.48	183.20	183.00	0.20	0.7300	CIRCULAR	12.000	0.0120	0.15	0 00:05	2.78	0.16	3.29	0.05	0.15	0.00	0.15	Calculated
20	WQS-02	Sub-Infil-2	94.00	183.00	182.10	0.90	0.9600	CIRCULAR	12.000	0.0120	0.35	0 00:05	3.06	0.51	3.78	0.09	0.21	0.00	0.21	Calculated
21	CB-04	WQS-02	26.15	183.20	183.00	0.20	0.7600	CIRCULAR	12.000	0.0120	0.21	0 00:05	2.97	0.15	3.38	0.06	0.17	0.00	0.17	Calculated
22	WQS-03	Sub-Infil-3	7.86	182.80	182.60	0.20	2.5500	CIRCULAR	12.000	0.0120	1.09	0 00:05	5.90	0.02	6.16	0.18	0.29	0.00	0.29	Calculated
23	WQS-04	Sub-Infil-5	7.86	182.80	182.60	0.20	2.5400	CIRCULAR	12.000	0.0120	0.81	0 00:05	5.43	0.02	6.16	0.13	0.24	0.00	0.24	Calculated
24	Sub-Infil	DMH-7	7.76	182.10	182.00	0.10	1.2900	CIRCULAR	12.000	0.0120	1.51	0 00:00	5.26	0.02	4.38	0.34	0.39	0.00	0.39	Calculated
25	DMH-7	HW-03	9.86	182.00	181.80	0.20	2.0300	CIRCULAR	12.000	0.0120	1.55	0 00:00	6.08	0.03	5.50	0.28	0.36	0.00	0.36	Calculated
26	AD-02	DMH-02	9.06	184.90	184.70	0.20	2.2100	CIRCULAR	12.000	0.0120	0.28	0 00:05	3.78	0.04	5.73	0.05	0.15	0.00	0.15	Calculated
27	AD-03	DMH-03	8.45	184.50	184.30	0.20	2.3700	CIRCULAR	12.000	0.0120	0.50	0 00:05	4.59	0.03	5.94	0.08	0.20	0.00	0.20	Calculated
28	CB-03	WQS-01	11.74	183.00	182.50	0.50	4.2600	CIRCULAR	12.000	0.0120	0.64	0 00:05	6.06	0.03	7.97	0.08	0.19	0.00	0.19	Calculated

Appendix E
TSS Removal, Water Quality Volume, and Recharge Calculations

BEALS + THOMAS
Standard 3: Groundwater Recharge

Groundwater Recharge Volume Required:

Rv = F x Impervious Area, where:

Rv = Required Recharge Volume [Ac-ft]

F = Target Depth Factor associated with each Hydrologic Soil Group (HSG) [in]

Impervious Area = Total Pavement and Rooftop Area under Post-development Conditions [Ac]

			Impervious Area [Acres]	Required Recharge Volume [Ac-ft]	
HSG "A", use F =	0.6	in	1.340	0.067	
HSG "B", use F =	0.35	in	0.000	0.000	
HSG "C", use F =	0.25	in	0.000	0.000	
HSG "D", use F =	0.1	in	0.000	0.000	
Total Required Recharge Volume (Rv) =				**0.067**	**Ac-ft**

Capture Area Adjustment: (Ref: DEP Handbook V.3 Ch.1 P.27-28)

Total Site Impervious Area (Total)=	1.340	Acres
Impervious Area Draining to Infiltrative BMPs (infil) =	1.34	Acres (PDA-01B Impervious Area)
Percent Imp. Area Draining to Infiltrative BMPs =	100.0%	
Capture Area Adjustment Factor = (Total)/(Infil) = Ca =	1.00	
Adjusted Required Recharge Volume = Ca x Rv	**0.067**	**Ac-ft**

Groundwater Recharge Volume Provided :

BMP	Provided Recharge Volume [Ac-ft]
Subsurface Infiltration System =	0.205
Total Provided Recharge Volume =	**0.205** **Ac-ft**

PROVIDED GROUNDWATER RECHARGE VOLUME IS GREATER THAN OR EQUAL TO THE REQUIRED RECHARGE VOLUME, THEREFORE PROPOSED STORMWATER MANAGEMENT DESIGN IS IN COMPLIANCE WITH STANDARD 3.

JOB NO. 2177.04
JOB: Assisted Living Residence

COMPUTED BY: C. Taylor
DATE: 8/12/15

CHECKED BY: DmF
DATE: 8/13/2015

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Standard 3: Drawdown

$$\text{Drawdown Time} = \frac{Rv}{(K)\,(\text{Bottom Area})}$$

where:

Rv = Storage Volume Below Outlet [Ac-ft]

K= Infiltration Rate [in/hr]

Bottom Area= Bottom Area of Recharge System [Ac]

Infiltration System

10-Year Storm

Rv =	0.205 Ac-ft	
K =	8.270 in/hr	
Bottom Area =	0.179 Acres	
Drawdown Time =	**1.662 Hours**	*< 24 Hours, Design is in compliance with the standard.*

Note:

1. The infiltration BMPs have been designed to fully drain within 72 hours, therefore the proposed stormwater management design is in compliance with Standard 3 .

2. Infiltration Rate based on Volume 3, Chapter 1, Table 2.3.3 *Rawls Rates* from the 2008 MA DEP Stormwater Management Handbook.

JOB NO. 2177.04 COMPUTED BY: C. Taylor CHECKED BY: DMF

JOB: Assisted Living DATE: 8/12/15 DATE: 8/13/2015

Stage-Area-Storage for Pond 10P: Infiltration Basin (short & fat)

Elevation (feet)	Horizontal (acres)	Storage (acre-feet)
181.60	**0.179**	0.000
181.62	0.179	0.001
181.64	0.179	0.003
181.66	0.179	0.004
181.68	0.179	0.006
181.70	0.179	0.007
181.72	0.179	0.009
181.74	0.179	0.010
181.76	0.179	0.011
181.78	0.179	0.013
181.80	0.179	0.014
181.82	0.179	0.016
181.84	0.179	0.017
181.86	0.179	0.019
181.88	0.179	0.020
181.90	0.179	0.022
181.92	0.179	0.023
181.94	0.179	0.024
181.96	0.179	0.026
181.98	0.179	0.027
182.00	0.179	0.029
182.02	0.179	0.030
182.04	0.179	0.032
182.06	0.179	0.033
182.08	0.179	0.034
182.10	0.179	0.036
182.12	0.179	0.039
182.14	0.179	0.042
182.16	0.179	0.046
182.18	0.179	0.049
182.20	0.179	0.052
182.22	0.179	0.055
182.24	0.179	0.058
182.26	0.179	0.062
182.28	0.179	0.065
182.30	0.179	0.068
182.32	0.179	0.071
182.34	0.179	0.074
182.36	0.179	0.077
182.38	0.179	0.080
182.40	0.179	0.084
182.42	0.179	0.087
182.44	0.179	0.090
182.46	0.179	0.093
182.48	0.179	0.096
182.50	0.179	0.099
182.52	0.179	0.102
182.54	0.179	0.106
182.56	0.179	0.109
182.58	0.179	0.112
182.60	0.179	0.115
182.62	0.179	0.118
182.64	0.179	0.121
182.66	0.179	0.124
182.68	0.179	0.127
182.70	0.179	0.130
182.72	0.179	0.133
182.74	0.179	0.136
182.76	0.179	0.139
182.78	0.179	0.142
182.80	0.179	0.145
182.82	0.179	0.148
182.84	0.179	0.151
182.86	0.179	0.154
182.88	0.179	0.157
182.90	0.179	0.160
182.92	0.179	0.163
182.94	0.179	0.166
182.96	0.179	0.169
182.98	0.179	0.172
183.00	0.179	0.175
183.02	0.179	0.178
183.04	0.179	0.181
183.06	0.179	0.184
183.08	0.179	0.187
183.10	0.179	0.190
183.12	0.179	0.193
183.14	0.179	0.196
183.16	0.179	0.199
183.18	0.179	0.202
183.20	0.179	0.205
183.22	0.179	0.207
183.24	0.179	0.210
183.26	0.179	0.213
183.28	0.179	0.216
183.30	0.179	0.219
183.32	0.179	0.222
183.34	0.179	0.225
183.36	0.179	0.227
183.38	0.179	0.230
183.40	0.179	0.233
183.42	0.179	0.236
183.44	0.179	0.238
183.46	0.179	0.241
183.48	0.179	0.244
183.50	0.179	0.247
183.52	0.179	0.249
183.54	0.179	0.252
183.56	0.179	0.255
183.58	0.179	0.257
183.60	0.179	0.260
183.62	0.179	0.263
183.64	0.179	0.265
183.66	0.179	0.268
183.68	0.179	0.270
183.70	0.179	0.273
183.72	0.179	0.275
183.74	0.179	0.278
183.76	0.179	0.280
183.78	0.179	0.283
183.80	0.179	0.285
183.82	0.179	0.288
183.84	0.179	0.290
183.86	0.179	0.292
183.88	0.179	0.295
183.90	0.179	0.297
183.92	0.179	0.299
183.94	0.179	0.302
183.96	0.179	0.304
183.98	0.179	0.306
184.00	0.179	0.308
184.02	0.179	0.310
184.04	0.179	0.312
184.06	0.179	0.314
184.08	0.179	0.316
184.10	0.179	0.318
184.12	0.179	0.320
184.14	0.179	0.322
184.16	0.179	0.323
184.18	0.179	0.325
184.20	0.179	0.327
184.22	0.179	0.328
184.24	0.179	0.330
184.26	0.179	0.331
184.28	0.179	0.333
184.30	0.179	0.334
184.32	0.179	0.336
184.34	0.179	0.337
184.36	0.179	0.338
184.38	0.179	0.340
184.40	0.179	0.341
184.42	0.179	0.343
184.44	0.179	0.344
184.46	0.179	0.346
184.48	0.179	0.347
184.50	0.179	0.348
184.52	0.179	0.350
184.54	0.179	0.351
184.56	0.179	0.353
184.58	0.179	0.354
184.60	0.179	0.356
184.62	0.179	0.357
184.64	0.179	0.359
184.66	0.179	0.360
184.68	0.179	0.361
184.70	0.179	0.363
184.72	0.179	0.364
184.74	0.179	0.366
184.76	0.179	0.367
184.78	0.179	0.369
184.80	0.179	**0.370**

lowest outlet elevation

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Standard 4: Water Quality Volume Summary

$V_{WQ} = (D_{WQ} / 12 \text{ in/ft}) \times (A_{IMP} \times 43{,}560 \text{ SF/Ac})$ **where:**

V_{WQ} = Required Water Quality Volume [CF]

D_{WQ} = Water Quality Depth : Medfield Board of Health Regulations require treatment of the first 2 inches of precipitation. Runoff from a 2 in rainfall and a CN of 98 equales 1.77 in of runoff. [in]

A_{IMP} = Post-development Impervious Area; includes roof top areas [Ac]

Required Water Quality Volume:

Drainage Area/ Treatment Train	A_{IMP} [Ac]	D_{WQ} [in]	V_{WQ} Required [CF]
PDA-1a	1.340	1.77	8,610

Total Required Water Quality Volume: 8,610 Cubic Feet

Provided Water Quality Volume:

Drainage Area/ Treatment Train	BMP	Water Quality Volume Provided [CF]
PDA-1a	Infiltration System	8,930

Total Provided Water Quality Volume: 8,930 Cubic Feet

WATER QUALITY VOLUME PROVIDED IS GREATER THAN OR EQUAL TO THE REQUIRED WATER QUALITY VOLUME, THEREFORE PROPOSED STORMWATER MANAGEMENT DESIGN IS IN COMPLIANCE WITH STANDARD 4.

JOB NO. 2177.04 COMPUTED BY: C. Taylor CHECKED BY: DMF

JOB: Assisted Living DATE: 8/12/15 DATE: 8/13/2015

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Proprietary Water Quality Inlet Sizing

Step 1: Define Minimum Flow Rate per Water Quality Inlet to Treat Desired Water Quality Volume

Water quality inlets are sized based on flow rate; therefore expressing Water Quality Volume as a flow rate based on the percentage of cumulative average volume captured ensures systems are sized to achieve the desired Water Quality treatment level.

$Q = (q_u)(A)(WQV)$ where:

Q = peak flow rate associated with first 1.0-inch of runoff [CFS]

q_u = The Peak Discharge [CFS/mi^2/in] Massachusetts DEP Standard Method to Convert Required Water Quality Volume to a Discharge Rate for Sizing Flow Based Manufactured Proprietary Stormwater Treatment Practices

A = Contributing Drainage Area, Impervious Surface Only [Ac]

WQV = The Water Quality Treatment Depth [In]

WQI No.	A (Ac)	Tc (Min)	WQV (in)	q_u (csm/in)	Q (cfs)
WQS-1	0.95	6.0	1.0	774	1.15
WQS-2	0.06	6.0	1.0	774	0.07
WQS-3	0.20	6.0	1.0	774	0.24
WQS-4	0.14	6.0	1.0	774	0.17
Total	1.35	Acres			

Step 2: Size Water Quality Inlet as recommended by Manufacturer

See attached Sizing Report(s) for recommended model(s).

Step 3: Water Quality Volume Provided by WQI unit(s)

Total Impervious Area Treated by WQI unit(s): 1.35 Acres

58,706 SF

Treated Water Quality Depth : 1.0 inches

(accounted for by Average Water Quality Flow Rate)

Total Water Quality Volume provided by Water Quality Inlets: 4,892 CF

JOB NO. 2177.04 COMPUTED BY: C Taylor CHECKED BY: DMF

JOB: Assisted Living DATE: 8/12/15 DATE: 8/17/2015

INSTRUCTIONS:

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

Version 1, Automated: Mar. 4, 2008

Location: PDA-1a

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Proprietary Treatment Practice	0.00	1.00	0.00	1.00
Subsurface Infiltration Structure	0.80	1.00	0.80	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20
	0.00	0.20	0.00	0.20

Total TSS Removal = 80%

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

Project: Assisted Living Residence

Prepared By: C. Taylor

Date: 8/12/2015

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

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed

1. From MassDEP Stormwater Handbook Vol. 1

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Riprap Apron Sizing

Median Stone Sizing:

$$D_{50} = 0.2 D_0 \left(\frac{Q}{\sqrt{g} D_0^{2.5}} \right)^{\frac{4}{3}} \left(\frac{D_0}{TW} \right)$$

Where:

D_0 = Maximum Inside Pipe Diameter (ft)

D_{50} = Median Riprap Diameter (ft)

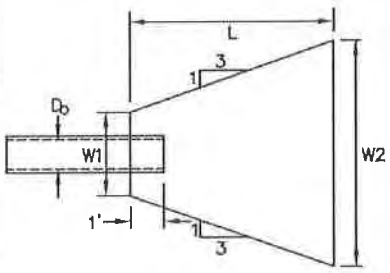
Q = Peak Discharge Rate from Hydraulic Design (cfs)

TW = Tailwater Depth (ft); (Use $0.4D_0$ if TW is unknown, max $1.0D_0$)

g = Gravitational Acceleration Constant = 32.2 ft/s^2

Apron Sizing:

D_{50} [In]	Apron Length (L) [ft]	Apron Depth [In]	Apron Width At Beginning	Apron Width At End
5	$4D_0$	$3.5D_{50}$	$3D_0$	$3D_0 + \frac{3}{4}L$
6	$4D_0$	$3.3D_{50}$	$3D_0$	$3D_0 + \frac{3}{4}L$
10	$5D_0$	$2.4D_{50}$	$3D_0$	$3D_0 + \frac{3}{4}L$
14	$6D_0$	$2.2D_{50}$	$3D_0$	$3D_0 + \frac{3}{4}L$
20	$7D_0$	$2.0D_{50}$	$3D_0$	$3D_0 + \frac{3}{4}L$
22	$8D_0$	$2.0D_{50}$	$3D_0$	$3D_0 + \frac{3}{4}L$



FLARED END SECTION	PIPE DIAMETER (D_0) (FEET)	25-YEAR STORM FLOW (Q) (CFS)	TAILWATER (TW) [ft]	MEDIAN STONE DIAMETER (D_{50}) (INCHES)	APRON LENGTH (L) (FEET)	APRON DEPTH [In]	APRON WIDTH AT BEGINING (W_1) [ft]	APRON WIDTH AT END (W_2) [ft]
HW-02	1.0	2.45	0.4	5	4.00	17.5	3.0	5.7
*HW-03	1.0	1.35	0.4	5	4.00	17.5	3.0	5.7

Notes

[1] Calculations performed in accordance with Hydraulic Engineering Circular No. 14, Third Edition; Hydraulic Design of Energy Dissipaters for Culverts and Channels, dated July 2006.

[2] Pipe shall extend 1 foot into riprap.

[3] For maximum pipe size of 60".

*100-year storm outflow from subsurface infiltration system.

JOB NO. 2177.04

JOB: Assisted Living Residence

COMPUTED BY: C. Taylor

DATE: 8/12/15

CHECKED BY: DMF

DATE: 8/18/2015

Appendix F
Site Owner's Manual

SITE OWNER'S MANUAL

Assisted Living Residence

361 Mains Street
Medfield, Massachusetts

Prepared for:

LCB Senior Living
3 Edge Water Drive
Norwood, MA 02062

Presented by:

B E A L S + T H O M A S
BEALS AND THOMAS, INC.
Reservoir Corporate Center
144 Turnpike Road
Southborough, MA 01772-2104

August 2015

217704RP002

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FIGURES

APPENDICES

1.0 INTRODUCTION

The Site Owner's Manual complies with the Long-Term Pollution Prevention Plan (Standard 4) and the Long-Term Operation and Maintenance Plan (Standard 9) requirements of the 2008 Massachusetts Department of Environmental Protection (DEP) Stormwater Handbook. The Manual outlines source control and pollution prevention measures and maintenance requirements of stormwater best management practices (BMPs) associated with the proposed development.

2.0 SITE OWNER'S AGREEMENT

2.1 Operation and Maintenance Compliance Statement

Site Owner: LCB Senior Living
3 Edge Water Drive
Norwood, MA 02062

Responsible Party: LCB Senior Living

LCB Senior Living or their successors shall maintain ownership of the on-site stormwater management system as well as the responsibility for operation and maintenance during the post-development stages of the project. The site has been inspected for erosion and appropriate measures have been taken to permanently stabilize any eroded areas. All aspects of stormwater best management practices (BMPs) have been inspected for damage, wear and malfunction, and appropriate steps have been taken to repair or replace the system or portions of the system so that the stormwater at the site may be managed in accordance with the Stormwater Management Standards. Future responsible parties shall be notified of their continuing legal responsibility to operate and maintain the BMPs. The operation and maintenance plan for the stormwater BMPs is being implemented.

_____ _____
Responsible Party Signature Date

2.2 Stormwater Maintenance Easements

There are no off-site areas utilized for stormwater control, therefore no stormwater management easements are required. The Site Owner will have access to all stormwater practices for inspection and maintenance, including direct maintenance access by heavy equipment to structures requiring regular maintenance.

2.3 Record Keeping

The Site Owner shall maintain a rolling log in which all inspections and maintenance activities for the past three years shall be recorded. The Operation and Maintenance Log includes information pertaining to inspections, repairs, and disposal relevant to the project's stormwater management system. The Log is located in Appendix A.

The Operation and Maintenance Log shall be made available to the Conservation Commission and the DEP upon request. The Conservation Commission and the DEP shall be allowed to enter and inspect the premises to evaluate and ensure that the responsible party complies with the maintenance requirements for each BMP.

2.4 Training

Employees involved in grounds maintenance and emergency response will be educated on the general concepts of stormwater management and groundwater protection. The Site Owner's Manual will be reviewed with the maintenance staff. The staff will be trained on the proper course of action for specific events expected to be incurred during routine maintenance or emergency situations.

3.0 LONG-TERM POLLUTION PREVENTION PLAN

In compliance with Standard 4 of the 2008 DEP Stormwater Management Handbook, this section outlines source control and pollution prevention measures to be employed on-site after construction.

3.1 Storage of Materials and Waste

The site shall be kept clear of trash and debris at all times. Certain materials and waste products shall be stored inside or outside upon an impervious surface and covered, as required by local and state regulations.

3.2 Vehicle Washing

No commercial vehicle washing shall take place on site.

3.3 Routine Inspections and Maintenance of Stormwater BMPs

See Section 4.0 Long-Term Operation and Maintenance Plan, for routine inspection and maintenance requirements for all proposed stormwater BMPs.

3.4 Spill Prevention and Response

A contingency plan shall be implemented to address the spill or release of petroleum products and hazardous materials and will include the following measures:

1. Equipment necessary to quickly attend to inadvertent spills or leaks shall be stored on-site in a secure but accessible location. Such equipment shall include but not be limited to the following: safety goggles, chemically resistant gloves and overshoe boots, water and chemical fire extinguishers, sand and shovels, suitable absorbent materials, storage containers and first aid equipment (i.e. Indian Valley Industries, Inc. 55-gallon Spill Containment kit or approved equivalent).

2. Spills or leaks shall be treated properly according to material type, volume of spillage and location of spill. Mitigation shall include preventing further spillage, containing the spilled material in the smallest practical area, removing spilled material in a safe and environmentally-friendly manner, and remediation of any damage to the environment.

3. For large spills, Massachusetts DEP Hazardous Waste Incident Response Group shall be notified immediately at (617) 792-7653 and an emergency response contractor shall be consulted.

3.5 Maintenance of Lawns, Gardens, and other Landscaped Areas

Lawns, gardens, and other landscaped areas shall be maintained regularly by the site owner. Vegetated and landscaped BMPs will be maintained as outlined in Section 4.0.

3.6 Storage and Use of Fertilizers, Herbicides, and Pesticides

All fertilizers, herbicides, and pesticides shall be stored in accordance with local, state, and federal regulations. The application rate and use of fertilizers, herbicides, and pesticides on the site shall at no time exceed local, state, or federal specifications.

3.7 Pet Waste Management

Pet owners shall be required to pick up after their animals and dispose of waste in the trash.

3.8 Operation and Management of Septic Systems

The proposed development will be serviced by Town sewer and there are no proposed septic systems.

3.9 Snow and Deicing Chemical Management

Snow removal and use of deicing chemicals at the proposed development shall comply with the following requirements:

- Plowed snow shall be placed outside of wetland boundaries and stormwater best management practices. The following maintenance measures shall be undertaken at all snow disposal sites:
  - Debris shall be cleared from an area prior to using it for snow disposal.
  - Debris and accumulated sediments shall be cleared from the site and properly disposed of at the end of the snow season and no later than May 15.
- In accordance with the Massachusetts General Laws, Chapter 85, Section 7A, salt and other de-icing chemicals will be stored at an indoor location. Salt and other deicing chemicals shall be stored in accordance with Massachusetts General Law.
- Sand piles shall be contained and stabilized to prevent the discharge of sand to wetlands or water bodies, and, where feasible, covered.
- The application of salt on the proposed parking areas, driveways, and sidewalks shall at no time exceed state or local requirements.

4.0 LONG-TERM OPERATION AND MAINTENANCE PLAN

This section outlines the stormwater best management practices (BMPs) associated with the proposed stormwater management system and identifies the long-term inspection and maintenance requirements for each BMP.

4.1 Stormwater Management System Components

The following table outlines the type and quantity of the BMPs and their general location. Please reference the site plans provided in the Figures section for exact location.

BMP Type	Quantity	Location
Area Drains	4	Throughout paved parking area.
Catch Basins	5	Throughout paved parking area.
Proprietary Water Quality Inlet	4	Throughout paved parking area.
Subsurface Infiltration System	1	Beneath the parking area in the southwest portion of the site.

4.2 Inspection and Maintenance Schedules

4.2.1 General Maintenance for Mosquito Control

If necessary to minimize mosquito breeding, a licensed pesticide applicator shall apply larvicides, such as Bacillus sphaericus (Bs) to all catch basins sumps, and water quality inlets. Larvicides shall be applied in compliance with all pesticide label requirements, and will be applied during or immediately after wet weather, unless the product used can withstand extended dry periods. Ensure all manhole covers, and inspection ports are secure to reduce the likelihood of mosquitoes laying eggs in standing water.

4.2.2 Deep Sump and Hooded Catch Basins

Catch basins shall be inspected four times per year, including after the foliage season. Other inspection and maintenance requirements include:

- Units shall be cleaned (organic material, sediment and hydrocarbons removed) four times per year or 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.
    - Cleanout shall always occur after street sweeping.

- If any evidence of hydrocarbons is found during inspection, the material shall be immediately removed using absorbent pads or other suitable measures and disposed of legally.
- Remove other accumulated debris as necessary.
- Transport and disposal of accumulated sediment off-site shall be in accordance with applicable local, state and federal guidelines and regulations.

4.2.3 Area Drains and Drop Inlets

Area drains and drop inlets shall be inspected and/or cleaned at least once per year.

4.2.4 Proprietary Separators

Maintenance of proprietary separators shall be performed according the recommendations set forth by the manufacturer (see Appendix C. Proprietary Separator Technical Manual for complete installation, operation and maintenance procedures). Inspection and maintenance procedures for proprietary devices are provided below:

- Units shall be inspected post-construction, prior to being put into service.
- Units shall be inspected not less than twice per year following installation and no less than once per year thereafter.
- Units shall be inspected immediately after any oil, fuel or chemical spill.
- All inspections shall include checking the oil level and sediment depth in the unit.
- Removal of sediments/oils shall occur per manufacturer recommendations.
- A licensed waste management company shall remove captured petroleum waste products from any oil, chemical or fuel spills and dispose.
- OSHA confined space entry protocols shall be followed if entry into the unit is required.

4.2.5 Subsurface Infiltration Structures

Subsurface infiltration structures shall be inspected twice per year. The inlets shall be inspected, and all debris that may clog the system shall be removed.

4.2.6 Stormwater Outfalls

Headwall and associated riprap spillways shall be inspected at least once per year and after major storm events (rainfall totals greater than 2.5 inches in 24 hours) to ensure that the stability of the outlet area is maintained. The outfall area shall be kept clear of debris such as trash, branches, and sediment. Repairs shall be made immediately if riprap displacement or downstream channel scour is observed.

4.3 Estimated Operation and Maintenance Budget

An operations and maintenance budget was prepared to approximate the annual cost of the inspections required in compliance with the DEP Stormwater Management Policy. The table below estimates the annual cost to inspect and maintain each proposed BMP, based on the requirements in Section 4.2.

BMP Type	# of BMPS	Annual O&M Cost (per BMP)[1]	Total Cost
Mosquito Control	9	$50-$100	$450 - $900
Catch Basin	5	$200-$400	$1000 - $2000
Area Drain/Drop Inlet	4	$50-$100	$200 - $400
CDS® or Vortsentry®	4	$100-$300	$400 - $1200
Subsurface Infiltration Structures	1	$200-$400	$200 - $400
Riprap Spillway	1	$50-$100	$50 - $100
		Total	**$2,300 - $5,000**

4.4 Public Safety Features

Multiple safety measures are proposed to protect the public and prevent pollutant contamination of the stormwater management system and other water resources. Guardrails and existing woodland vegetation along the access driveway will prevent cars from inadvertently detouring down steep side slopes and into adjacent wetlands or stormwater basins. It was designed to ensure protection to the public and prevent pollutant contamination of the stormwater management system and the municipal drainage system.

[1] Annual maintenance cost is based on estimate of the cost to complete all inspection and maintenance measures outlined in Section 4.2. For BMPs that require sediment removal at regular intervals (i.e. every 5 or 10 years), the annual cost includes the annual percentage of that cost.

Figures

Appendices

Appendix A

Operation and Maintenance Log

OPERATION AND MAINTENANCE LOG

This template is intended to comply with the operation and maintenance log requirements of the 2008 DEP Stormwater Management Handbook. Copies of this log should be made for all inspections and kept on file for three years from the inspection date.

Name/Company of Inspector:
Date/Time of Inspection:
Weather Conditions: (Note current weather and any recent precipitation events)

Stormwater BMP	Inspection Observations	Actions Required
Area Drains		
Catch Basins		
Subsurface Infiltration System		
Riprap Spillway		
CDS-1		
CDS-2		
Vortsentry-1		
Vortsentry-2		

Appendix B

List of Emergency Contacts

Appendix C

Proprietary Separator Technical Manual

CONTECH®
ENGINEERED SOLUTIONS

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	0.9	0.7
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
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

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.

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

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 the values listed in table 1 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.

CONTECH®
ENGINEERED SOLUTIONS

VortSentry® HS Maintenance Guide

VortSentry® HS Maintenance

The VortSentry HS 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, i.e., unstable soils or heavy winter sanding will cause the treatment chamber to fill more quickly, but regular sweeping will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant deposition and transport 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 (i.e. spring and fall) however more frequent inspections may be necessary in equipment washdown areas and in climates where winter sanding operations may lead to rapid accumulations of a large volume of sediment. It is useful and often required as part of a permit to keep a record of each inspection. A simple inspection and maintenance log form for doing so is available for download at www.contechstormwater.com.

The VortSentry HS should be cleaned when the sediment has accumulated to a depth of two feet in the treatment chamber. This determination can be made by taking two measurements with a stadia rod or similar measuring device; 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 the distance given in Table 1, the VortSentry HS should be maintained to ensure effective treatment.

Cleaning

Cleaning of the VortSentry HS should be done during dry weather conditions when no flow is entering the system. Cleanout of the VortSentry HS with a vacuum truck is generally the most effective and convenient method of excavating pollutants from the system. Simply remove the manhole cover and insert the vacuum hose into the sump. All pollutants can be removed from this one access point from the surface with no requirements for Confined Space Entry.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, 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 adsorbent pads, which solidify the oils. These are usually much easier to remove from the unit individually, and less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Floating trash can be netted out if you wish to separate it from the other pollutants.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure proper safety precautions. If anyone physically enters the unit, Confined Space Entry procedures need to be followed.

Disposal of all material removed from the VortSentry HS should be done is accordance with local regulations. In many locations, disposal of evacuated sediments may be handled in the same manner as disposal of sediments removed from catch basins or deep sump manholes. Check your local regulations for specific requirements on disposal.

VortSentry HS Model	Diameter		Distance Between Water Surface and Top of Storage Sump		Sediment Storage		Oil Spill Storage	
	in	m	ft	m	yd^3	m^3	gal	liter
HS36	36	0.9	3.6	1.1	0.5	0.4	83	314
HS48	48	1.2	4.7	1.4	0.9	0.7	158	598
HS60	60	1.5	6	1.8	1.5	1.1	258	978
HS72	72	1.8	7.1	2.2	2.1	1.6	372	1409
HS84	84	2.1	8.4	2.6	2.9	2.2	649	2458
HS96	96	2.4	9.5	2.9	3.7	2.8	845	3199

Table 1: VortSentry HS Maintenance Indicators and Sediment Storage Capacities.

VortSentry HS Inspection & Maintenance Log

VortSentry HS Model:_____ Location:_____

Date	Water depth to shipment[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 the distance given in Table 1, 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.

Appendix G
Stormwater Pollution Prevention Plan

EPA Construction General Permit

Assisted Living Residence

361 Main Street
Medfield, Massachusetts

Prepared for:

LCB Senior Living
3 Edge Water Drive
Norwood, MA 02062

Presented by:

BEALS + THOMAS
Beals and Thomas, Inc.
Reservoir Corporate Center
144 Turnpike Road (Route 9)
Southborough, MA 01772-2104

August 2015

217704RP003

TABLE OF CONTENTS

Assisted Living Residence
Stormwater Pollution Prevention Plan (SWPPP)
Medfield, Massachusetts
217704RP003

LIST OF APPENDICES

1.0 CONTACT INFORMATION/RESPONSIBLE PARTIES

1.1 OPERATOR(S)/ SUBCONTRACTORS

Operator(s)

Company:	Owner Name				
Name:	Text				
Address:	Text				
City:	Text	State:	Text	ZIP Code:	Text
Telephone:	Text	Email:	Text		

Company:	Contractor Name				
Name:	Text				
Address:	Text				
City:	Text	State:	Text	ZIP Code:	Text
Telephone:	Text	Email:	Text		

Subcontractor(s)

Company:	Subcontractor Name				
Name:	Text				
Address:	Text				
City:	Text	State:	Text	ZIP Code:	Text
Telephone:	Text	Email:	Text		
Area of Control:		Site Work Contractor			

24-Hour Emergency Contact

Company:	Text
Name:	Text
Telephone:	Text

1.2 STORMWATER TEAM

SWPPP Preparer

Company:	Beals and Thomas, Inc.				
Name:	Christopher Taylor				
Address:	144 Turnpike Road				
City:	Southborough	State:	MA	ZIP Code:	01772
Telephone:	508-366-0560	Email:	ctaylor@bealsandthomas.com		

Personnel Responsible for Installation & Maintenance of Stormwater BMPs

Company:	Text				
Name:	Text				
Address:	Text				
City:	Text	State:	Text	ZIP Code:	Text
Telephone:	Text	Email:	Text		

Inspection Personnel

Company:	Text				
Name:	Text				
Address:	Text				
City:	Text	State:	Text	ZIP Code:	Text
Telephone:	Text	Email:	Text		

Personnel Responsible for Taking Corrective Actions

Company:	Text				
Name:	Text				
Address:	Text				
City:	Text	State:	Text	ZIP Code:	Text
Telephone:	Text	Email:	Text		

2.0 SITE EVALUATION, ASSESSMENT AND PLANNING

2.1 PROJECT/SITE INFORMATION

Project/Site Name:	Assisted Living Residence				
Project Street/Location:	361 Main Street				
City:	Medfield	State:	MA	ZIP Code:	02052
County or Similar Subdivision:	Norfolk County				

Latitude:	42.190535	Longitude:	-71.297794

Method for Determining Latitude/Longitude:

- ☐ USGS Topographic Map (specify scale: _____)
- ☐ EPA Website
- ☐ GPS
- ☒ Other (please specify): Google Maps

Horizontal Reference Datum:

- ☐ NAD 27
- ☐ NAD 83
- ☐ WGS 84
- ☒ Unknown

Is the project located on Indian country lands, or located on a property of religious of cultural significance to an Indian tribe? ☐ Yes ☒ No

If yes, provide the name of the Indian tribe associated with the area of Indian country (including the name of Indian reservation if applicable), or if not in Indian country, provide the name of the Indian tribe associated with the property:

_____

Is this project considered a federal facility? ☐ Yes ☒ No

Are you applying for permit coverage as a "federal operator" as defined in Appendix A of the 2012 CGP? ☐ Yes ☒ No

NPDES project or permit tracking number: Text

2.1.1 Emergency-Related Projects

Is this project in response to a public emergency? ☐ Yes ☒ No

If yes, document the cause of the public emergency *(e.g., natural disaster, extreme flooding conditions)*, information substantiating its occurrence *(e.g., state disaster declaration)*, and a description of the construction necessary to reestablish effective public services:

2.2 NATURE AND SEQUENCE OF CONSTRUCTION ACTIVITY

2.2.1 Function of the Construction Activity

Function of the construction activity:

- ☒ Residential
- ☐ Commercial
- ☐ Industrial
- ☐ Road Construction
- ☐ Linear Utility
- ☒ Other (please specify): Assisted Living Residence

2.2.2 Estimated Project Dates

Estimated Project Start Date: Text
Estimated Project Completion Date: Text

Estimated Timeline of Activity	Construction Activity and BMP Descriptions
Date Start –Date End	***Before any site grading activities begin*** 1. Stake Limit of Construction. Workers shall be informed that no construction activity is to occur beyond this limit at any time. 2. Clear vegetation as necessary within the limits of construction. 3. Grub the areas where silt fence is required, removing stumps and roots as necessary. The existing ground surface shall be disturbed as little as possible prior to the start of construction. 4. Install silt fence and straw bales as shown on the plans. An adequate stockpile of erosion control materials shall be on site at all times for emergency or routine replacement and shall include materials to repair silt fences, straw bales, or any other devices planned for use during construction. 5. Install storm drain inlet protection. 6. Construct stabilized construction exits. 7. Construct staging and materials storage area. 8. Install temporary sanitary facilities and dumpsters.
Date Start –Date End	***Site grading*** 1. Demolish and remove existing structure. 2. Begin site clearing and grubbing operations. 3. Commence excavation of temporary sedimentation basins. 4. Commence construction of temporary drainage channels to direct runoff to sedimentation basin(s) during construction. Check dams shall be installed along the temporary drainage channels to reduce velocities and collect sediment. 5. Begin overall site grading and topsoil stripping. 6. Establish topsoil stockpile. 7. Install silt fences around stockpile and cover stockpiles. 8. Disturbed areas where construction will cease for more than 14 days shall be stabilized with erosion controls.

Date Start –Date End	***Infrastructure (utilities, parking lot, etc.)*** 1. Construct temporary concrete washout area. 2. Install utilities, storm drains, sanitary sewers, and water services. 3. Install gutters, curbs, and prepare pavement subgrade.
Date Start –Date End	***Building Construction*** 1. Begin construction of building foundation and structure. 2. Parking lot paved, exterior building constructed 3. Remove temporary concrete washout area. 4. Implement winter stabilization procedures.
Date Start –Date End	***Final stabilization and landscaping*** 1. Finalize pavement activities. 2. Fill in and stabilize temporary sediment basin(s). 3. Remove all temporary control BMPs and stabilize any areas disturbed by their removal with erosion controls 4. Prepare final seeding and landscaping. 5. Monitor stabilized areas until final stabilization is reached.

2.3 SOILS, SLOPES, VEGETATION, AND CURRENT DRAINAGE PATTERNS

Soil type(s): The Natural Resources Conservation Service (NRCS) lists the on-site soils as Hinckley sandy loam, a excessively drained soil. Generally, this soil is located in outwash and flood plains, and has parent material described as loose sandy and gravelly glaciofluvial deposits. NRCS classifies this type of soil as hydrologic class A soil.

Slopes: The site is primarily flat with gentle slopes between 0% and 10%.

Drainage Patterns: Runoff from the existing site currently drains to 3 primary locations, the Vine Book located to the north of the site and a catch basin in the Route 109 right-of-way and a vernal pool located east of the site.

Vegetation: The majority of the property is wooded consisting of Pine, Oak and Maple trees. The area around the existing house is grassed.

2.4 CONSTRUCTION SITE ESTIMATES

Total property area:	13.78 acres
Total construction site area to be disturbed:	2.95 acres
Maximum area to be disturbed at one time:	2.95 acres
Percentage impervious area before construction:	9 %

Runoff coefficient before construction: 37

Percentage impervious area after construction: 47 %

Runoff coefficient after construction: 62

2.5 DISCHARGE INFORMATION

2.5.1 Description of Receiving Storm Sewer Systems

Does your project/site discharge stormwater into a Municipal Separate Storm Sewer System (MS4)? ☒ Yes ☐ No

2.5.2 Receiving Waters

List the name of the first surface water of the United States that receives runoff from your site. If your site discharges to more than one surface water of the United States list all applicable surface waters. For discharges that enter a storm sewer system prior to discharge, the first surface water is the water body that receives the stormwater discharge from the storm sewer system. Stormwater runoff from the site discharges to the Vine Brook.

2.5.3 Impaired Waters/ TMDLs

Has the surface water been listed as "impaired?" ☐ Yes ☒ No

If yes, list the pollutant(s) causing the impairment:

Describe the method(s) used to determine whether or not your project site discharges to an impaired water: Mass GIS layer for DEP 2012 Integrated River List.

Has a TMDL been completed? ☐ Yes ☒ No

2.5.4 Tier 2, 2.5, or 3 Waters

Is this surface water designated as a Tier 2, 2.5 or 3 water? ☐ Yes ☒ No

If yes specify which Tier the surface water is designated as:
☐ Tier 2 ☐ Tier 2.5 ☐ Tier 3

2.6 UNIQUE SITE FEATURES AND SENSITIVE AREAS

A potential vernal pool is located near the site. No stormwater runoff from the site is to be discharged to the potential vernal pool.

2.7 CONSTRUCTION SUPPORT ACTIVITIES

Construction support activities are not required for the project.

2.8 POTENTIAL SOURCES OF POLLUTION

2.8.1 Potential Sources of Sediment

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

2.8.2 Potential Sources of Non-Sediment Pollutants

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

Material/ Chemical	Physical Description	Stormwater Pollutants	Location[1]
Pesticides	Various colored to colorless liquid, powder, pellets, or grains	Chlorinated hydrocarbons, organophosphates, carbamates, arsenic	Herbicides used for noxious weed control
[2]Fertilizer	Liquid or solid grains	Nitrogen, phosphorous	Newly seeded areas
Cleaning solvents	Colorless, blue, or yellow-green liquid	Perchloroethylene, methylene chloride, trichloroethylene, petroleum distillates	No equipment cleaning allowed in project limits
Asphalt	Black solid	Oil, petroleum distillates	Streets, parking areas, and roofing
Glue/ adhesives	White or yellow liquid	Polymers, epoxies	Building construction
Paints	Various colored liquids	Metal oxides, stoddard solvent, talc, calcium	Building construction

		carbonate, arsenic	
Curing compounds	Creamy white liquid	Naphtha	Curb and gutter, walkways
Wood preservatives	Clear amber or dark brown liquid	Stoddard solvent, petroleum distillates, arsenic, copper, chromium	Timber pads and building construction
Hydraulic oil/fluids	Brown oily petroleum hydrocarbon	Mineral oil	Leaks or broken hoses from equipment
Gasoline	Colorless, pale brown or pink petroleum hydrocarbon	Benzene, ethyl benzene, toluene, xylene, MTBE	Secondary containment/staging area
Diesel Fuel	Clear, blue-green to yellow liquid	Petroleum distillate, oil & grease, naphthalene, xylenes	Secondary containment/staging area
Kerosene	Pale yellow liquid petroleum hydrocarbon	Coal oil, petroleum distillates	Secondary containment/staging area
Antifreeze/ coolant	Clear green/yellow liquid	Ethylene glycol, propylene glycol, heavy metals (copper, lead, zinc)	Leaks or broken hoses from equipment
Sanitary toilets	Various colored liquid	Bacteria, parasites, and viruses	Staging area

[1] Area where material/chemical is used on-site.
[2] Use of fertilizers containing nitrogen and/ or phosphorus in ratios greater than recommended by the manufacture must be documented.

2.9 SITE PLANS

The Topographic Plan shows the undeveloped site and its current features. The Site Plans show the developed site, or the major phases of development.

These Site Plans include:

- ☐ Delineation of construction phasing, if applicable
- ☒ Areas of soil disturbance and areas that will not be disturbed
- ☒ Direction(s) of stormwater flow and approximate slopes before and after major grading activities
- ☒ Natural features to be preserved
- ☒ Locations of major structural and non-structural BMPs identified in the SWPPP
- ☒ Location(s) of sediment, soil or other construction materials will be stockpiled
- ☒ Locations of stabilization measures
- ☐ Locations of off-site material, waste, borrow, or equipment storage areas

- ☒ Location of all waters of the U.S., including wetlands on or near the site. Indicate if water bodies are listed as impaired, or are identified as Tier 2, 2.5 or 3 waters.
- ☒ Boundary lines of any natural buffers,
- ☒ Locations where stormwater discharges or allowable non-stormwater to surface water(s)
- ☒ Locations of storm drain inlets and stormwater control measures on the site and in the immediate vicinity of the site
- ☒ Locations of all pollutant-generating activities
- ☐ Locations where polymers, flocculants, or other treatment chemicals will be used and stored
- ☐ Areas of federally-listed critical habitat for endangered or threatened species

See Appendix B: Site Plans

3.0 COMPLIANCE WITH APPLICABLE FEDERAL & STATE REQUIREMENTS

3.1 ENDANGERED SPECIES CERTIFICATION

Are endangered or threatened species and critical habitats on or near the project area?
☐ Yes ☒ No

Describe how this determination was made:
The MASSGIS NHESP Priority Habitat of Rare Species Layer, Updated September, 2008, indicates that no priority habitat of rare species are located within the project site.

3.2 HISTORIC PRESERVATION

Step 1
Will stormwater controls that require subsurface earth disturbance be installed on the site? ☒ Yes ☐ No

Step 2
If you answered yes in Step 1, have prior surveys or evaluations conducted on the site already determined that historic properties do not exist, or that prior disturbances at the site have precluded the existence of historic properties?
☐ Yes ☐ No

Step 3
If you answered no in Step 2, has it been determined that the installation of subsurface earth-disturbing stormwater controls will have no effect on historic properties?
☐ Yes ☐ No

If yes, provide documentation of the basis for your determination.

Step 4
If you answered no in Step 3, did the State Historic Preservation Officer (SHPO), Tribal Historic Preservation Office (THPO), or other tribal representative (whichever applies) respond within 15 calendar days to indicate whether the subsurface earth disturbances caused by the installation of stormwater controls affect historic properties?
☐ Yes ☐ No

If no, no further documentation is required. If yes, describe the nature of their response and include documentation in the Appendix:

☐ Written indication that adverse effects to historic properties from the installation of stormwater controls can be mitigated by agreed upon actions.

☐ No agreement has been reached regarding measures to mitigate effects to historic properties from the installation of stormwater controls.

☐ Other:

3.3 SAFE DRINKING WATER ACT UNDERGROUND INJECTION CONTROL REQUIREMENTS

Do you plan to install any of the following controls?

☐ Infiltration trenches (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

☒ Commercially manufactured pre-cast or pre-built proprietary subsurface detention vaults, chambers, or other devices designed to capture and infiltrate stormwater flow

☐ Drywells, seepage pits, or improved sinkholes (if stormwater is directed to any bored, drilled, driven shaft or dug hole that is deeper than its widest surface dimension, or has a subsurface fluid distribution system)

If yes, attach documentation of contact between you and the applicable state agency or EPA Regional Office responsible for implementing the requirements for underground injection wells in the Safe Drinking Water Act and EPA's implementing regulations at 40 CFR Parts 144-147.

3.4 APPLICABLE STATE OR LOCAL PROGRAMS

This SWPPP complies with the requirements of Standard 8 of the Massachusetts Department of Environmental Protection Stormwater Handbook, which states:

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 plans) shall be developed and implemented.

4.0 EROSION AND SEDIMENT CONTROL BMPS

This SWPPP contains a listing of the erosion and sediment control best management practices (BMPs) that will be implemented to control pollutants in stormwater discharges. The BMPs are categorized under one of the areas of BMP activity as described below:

- Natural Buffers or Equivalent Sediment Controls
- Minimize disturbed area and protect natural features and soil
- Phased construction activity
- Control stormwater flowing onto and through the project
- Stabilize soils
- Protect slopes
- Protect storm drain inlets
- Establish perimeter controls and sediment barriers
- Retain sediment on-site and control dewatering practices
- Establish stabilized construction exits

4.1 NATURAL BUFFERS OR EQUIVALENT SEDIMENT CONTROLS

Are there any surface waters located within 50 feet of your construction disturbances that receive stormwater discharges from the site? ☐ Yes ☒ No

4.2 MINIMIZE DISTURBED AREA AND PROTECT NATURAL FEATURES AND SOIL

4.2.1 Preserve Existing Vegetation

Description:	The preserved area of existing vegetation shall be as identified on the Site Plans and Sitework Specifications.
Installation Schedule:	The preserved area of existing vegetation shall be surrounded with the orange-colored plastic mesh fence, and trees shall be marked before construction begins at the site.
Maintenance and Inspection:	The area shall be inspected weekly to ensure the temporary fence is intact and the trees are clearly marked. During construction, preserved areas of existing vegetation shall be surrounded by the orange-colored mesh fence and clearly marked at all times.

4.2.2 Stockpiling Topsoil

Description:	Topsoil stripped from the immediate construction area shall be stockpiled as identified on the Site Plans and Sitework Specifications or as approved by the SWPPP preparer.
Installation Schedule:	Topsoil stockpiles shall be established during grading activities. The silt fence and temporary erosion controls shall be installed immediately after the stockpile has been established. When practical provide cover over the stockpile or temporary stabilization to avoid direct contract with precipitation and wind.
Maintenance and Inspection:	The area shall be inspected weekly for erosion and immediately after storm events. Areas on or around the stockpile that have eroded shall be stabilized immediately with erosion controls. See following Silt Fence section for Maintenance and inspection procedures.

4.3 PHASED CONSTRUCTION ACTIVITY

The proposed site is too small for phased grading to be practical. To minimize erosion during grading activities, grading and site work shall be conducted after snowmelt and during periods of predicted dry weather. The areas of the site that will remain vegetated after construction shall be graded first and stabilized with hydromulch or seeding immediately after grading activities are completed. All other areas of the construction site shall be stabilized if site work is not planned for more than 14 days. To minimize potential erosion from the site, only areas necessary to construct the grass drainage channels, sediment basin, and construction entrances/exits shall be disturbed initially. These areas shall be cleared, grubbed, and graded and the above measures shall be installed. These areas shall be stabilized immediately after construction but no later than 14 days after construction ceases.

For a timeline of construction activity, see the Estimated Project Dates section of this report.

4.4 STABILIZE SOIL

4.4.1 Temporary Stabilization

Description:	Initiation of temporary vegetative cover shall occur immediately where construction will cease for more that 14 days. It shall be established using hydroseeding for areas of exposed soil (including stockpiles).
Installation Schedule:	Temporary stabilization measures shall be initiated immediately where construction activities will temporarily cease for more than 14 days.
Maintenance and Inspection:	Stabilized areas shall be inspected weekly and after storm events until a dense cover of vegetation has become established. If failure is noticed at the seeded area, the

	area shall be reseeded, fertilized, and mulched immediately.

4.4.2 Mulching

Description:	Hydromulching shall provide immediate protection to exposed soils during short periods of disturbance. Hydromulch shall also be applied in areas that have been seeded for temporary or permanent stabilization.
Installation Schedule:	Hydromulch shall be applied to exposed soils during short periods of construction and seeded areas.
Maintenance and Inspection:	Mulched areas shall be inspected weekly and after storm events to check for movement of mulch or erosion. If washout, breakage, or erosion occurs, the surface shall be repaired, and new mulch shall be applied to the damaged area.

4.4.3 Permanent Stabilization

Description:	Initiation of permanent stabilization measures shall occur immediately after the final design grades are achieved and earth moving activities cease. Native species of plants shall be used to establish vegetative cover on exposed soils. Permanent stabilization shall be completed in accordance with the procedures outlined in the Final Stabilization section of this report.
Installation Schedule:	Portions of the site where construction activities have permanently ceased shall be stabilized, as soon as possible.
Maintenance and Inspection:	All seeded areas shall be inspected weekly during construction activities and after storm events until a dense cover of vegetation has been established. If failure is noticed at the seeded area, the area shall be reseeded, fertilized, and mulched immediately. Care shall be taken to avoid compacting newly placed topsoil. After construction is completed at the site, permanently stabilized areas shall be monitored until final stabilization is reached.

4.4.4 Dust Control

Description:	Dust from the site shall be controlled by using a mobile pressure-type distributor truck to apply potable water to disturbed areas. The mobile unit shall apply water at a rate of 300 gallons per acre and minimized as necessary to prevent runoff and ponding.
Installation Schedule:	Dust control shall be implemented as needed once site grading has been initiated and during windy conditions (forecasted or actual wind conditions of 20 mph or greater) while site grading is occurring. Spraying of potable water shall be performed no more than three times a day during the months of May–September and once per day during the months of October–April or whenever the dryness of the soil warrants it.
Maintenance and Inspection:	At least one mobile unit shall be available at all times to distribute potable water to control dust on the project area. Each mobile unit shall be equipped with a positive shutoff valve to prevent over watering of the disturbed area.

4.5 PROTECT STORM DRAIN INLETS

4.5.1 Filter Bags

☐ Permanent ☒ Temporary

Description:	Filter bag manufactured specifically for controlling sediment flow into all storm drain inlets to prevent coarse sediment from entering drainage systems prior to permanent stabilization of the disturbed area.
Installation Schedule:	Filter Bags shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Storm drain inlet protection shall be inspected weekly and following storms. Clogged filter bags shall be cleaned or replaced. Where there is evidence of sediment accumulation adjacent to the inlet protection measure, you must remove the deposited sediment by the end of the same work day it is found or by the following work day if removal the same day is not feasible. Collected sediments shall NOT be washed into storm drains.

4.6 ESTABLISH PERIMETER CONTROLS AND SEDIMENT BARRIERS

4.6.1 Erosion Control Barrier

☐ Permanent ☒ Temporary

Description:	An erosion control barrier, consisting of entrenched straw bales and siltation fencing, shall be installed along the downgradient side of the proposed project to decrease the velocity of sheet flows and intercept and detain small amounts of sediment from disturbed areas.
Installation Schedule:	Erosion Control Barrier shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Erosion Control Barrier shall be inspected weekly, following storms, and daily during rainy periods. Damaged fencing shall be replaced. Concentrated flows shall be intercepted and rerouted. Sediment accumulations shall be removed when reaching a depth of 6-inches, or one-half of the above ground height of the barrier, whichever is less. Deteriorated fencing material shall be replaced. Used fencing shall be properly disposed of.

4.6.2 Silt Fence

☐ Permanent ☒ Temporary

Description:	Entrenched silt fence shall be installed to decrease the velocity of sheet flows and intercept and detain small amounts of sediment from disturbed areas.
Installation Schedule:	Silt fence shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Silt fence shall be inspected weekly, following storms, and daily during rainy periods. Damaged fencing shall be replaced. Concentrated flows shall be intercepted and rerouted. Sediment accumulations shall be removed when reaching a depth of 6-inches. Deteriorated fencing material shall be replaced. Used fencing shall be properly disposed of.

4.7 PREVENT SOIL COMPACTION

4.7.1 Protect Proposed Infiltration Areas

☐ Permanent ☒ Temporary

Description:	An erosion control barrier, consisting of entrenched straw bales and siltation fencing, shall be installed around the perimeter of all proposed infiltration areas to prevent construction vehicles from impacting the area, to decrease the velocity of sheet flows and intercept, and detain small amounts of sediment from disturbed areas.
Installation Schedule:	The erosion control barrier shall be installed after clearing and grubbing.
Maintenance and Inspection:	Silt fence shall be inspected weekly, following storms, and daily during rainy periods. Damaged fencing shall be replaced. Concentrated flows shall be intercepted and rerouted. Sediment accumulations shall be removed when reaching a depth of 6-inches. Deteriorated fencing material shall be replaced. Used fencing shall be properly disposed of.

4.8 RETAIN SEDIMENT ON-SITE

4.8.1 Temporary Sediment Basins

☐ Permanent ☒ Temporary

Description:	Temporary sediment basins are located throughout the site between construction and wetland resource areas. These basins provide 3,600 cubic feet of storage per acre drained, as required by the EPA. Refer to the Temporary Sediment Basin Sizing Calculation located in Appendix K. Several temporary sediment basins will be utilized as sediment forebays following construction.
Installation Schedule:	Temporary Sediment Basins shall be installed during grading activities.
Maintenance and Inspection:	Temporary Sediment Basins shall be inspected weekly and following storms. Sediment shall be removed when it reaches a depth of one foot, or half the design capacity whichever is less. Damage to basin embankments and slopes shall be repaired.

4.9 ESTABLISH STABILIZED CONSTRUCTION ENTRANCE/EXIT

☐ Permanent ☒ Temporary

Description:	Temporary gravel or crushed stone construction entrances/exits or other means shall be used to minimize off-site movement of soil with vehicles. Construction access points shall be maintained to minimize tracking of soil onto public roads and existing parking lots to remain. If the rock entrance is not working to keep streets clean, then install wheel wash, sweep streets, or wash streets if wash water can be collected.
Installation Schedule:	Stabilized construction entrance shall be installed prior to clearing and grubbing.
Maintenance and Inspection:	Stabilized construction entrances shall be inspected daily. Gravel or crushed stone shall be added if the pad is no longer in accordance with the specifications. If the rock entrance is not working to keep streets clean, then install wheel wash, sweep streets, or wash streets if wash water can be collected. When sediment has been tracked off of the site, it shall be removed by the end of the same working day, or by the end of the next working day if track-out occurs on a non work day. Remove sediment by sweeping, shoveling or vacuuming roadways were sediment has been tracked-out.

4.10 DEWATERING PRACTICES

Description:	All groundwater or stormwater discharged from excavations, trenches, foundations, vaults, or other similar point shall be treated by sediment basins, sediment traps, sediment socks, dewatering tanks, tube settlers or filtration systems specifically designed to remove sediment from the excavations. All dewatering practices shall conform to the following: • Visible floating solids or foam shall not be discharged; • An oil-water separator or suitable filtration device (such as a cartridge filter) that is designed to remove oil, grease, or other products if dewatering water is found to contain these materials shall be used; • To the extent feasible, utilize vegetated, upland areas of the site to infiltrate dewatering water before discharge. In no case will surface waters be considered part of the treatment area; • Velocity dissipaters shall be installed at all points where dewatering activities are discharged to the surface. • With backwash water, either haul it away for disposal or return it to the beginning of the treatment process; and • Replace and clean the filter media used in dewatering devices when the pressure differential equals or exceeds the manufacturer's specifications.
Installation Schedule:	Install settling or filtration methods prior to commencing dewatering. Engineer is required to approve settling of filtration method design prior to installation.
Maintenance and Inspection:	Settling of filtration controls shall be inspected weekly and following storms. Sediment shall be removed when it reaches a depth of one foot, or half the design capacity whichever is less.

5.0 GOOD HOUSEKEEPING BMPS

This SWPPP contains a listing of the good housekeeping best management practices (BMPs) that shall be implemented to control pollutants in stormwater discharges during construction-related work. The BMPs are categorized below:

- Material Handling and Waste Management
- Establish Proper Building Material Staging Areas
- Designate Washout Areas
- Establish Proper Equipment/Vehicle Fueling and Maintenance Practices
- Allowable Non-Stormwater Discharges and Control Equipment/Vehicle Washing
- Spill Prevention and Control Plan

5.1 MATERIAL HANDLING AND WASTE MANAGEMENT

Several management procedures and practices are proposed to prevent and/or reduce the discharge of pollutants to stormwater from solid or liquid wastes that will be generated at the site. These measures are grouped into the following categories: (1) solid or construction waste disposal, (2) recycling, (3) sanitary and septic waste, and (4) hazardous materials.

5.1.1 Solid or Construction Waste Disposal

Description:	All waste materials shall be collected and disposed of into metal trash dumpsters in the materials storage area. Dumpsters shall have a secure watertight lid, be placed away from stormwater conveyances and drains, and meet all federal, state, and municipal regulations. Only trash and construction debris from the site shall be deposited in the dumpster. No construction materials shall be buried on-site unless authorized by a program for recycling/beneficial use. All personnel shall be instructed regarding the correct disposal of trash and construction debris. Notices that state these practices shall be posted in the office trailer and the individual who manages day-today site operations shall be responsible for seeing that these practices are followed.
Installation Schedule:	Trash dumpsters shall be installed once the materials storage area has been established.
Maintenance and Inspection:	The dumpsters shall be inspected weekly and immediately after storm events. The dumpsters shall be emptied weekly and taken to an approved landfill or recycling facility. If trash and construction debris are exceeding the dumpsters' capacity, the dumpsters shall be emptied more frequently.

5.1.2 Recycling

Description:	Wood pallets, cardboard boxes, and other recyclable construction scraps shall be disposed of in a designated dumpster for recycling. The dumpster shall have a secure watertight lid, be placed away from stormwater conveyances and drains and meet all local and state solid-waste management regulations. Only solid recyclable construction scraps from the site shall be deposited in the dumpster. All personnel shall be instructed regarding the correct procedure for disposal of recyclable construction scraps. Notices that state these procedures shall be posted in the office trailer, and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.
Installation Schedule:	Designated recycling dumpsters shall be installed once the area has been established.
Maintenance and Inspection:	The recycling dumpster shall be inspected weekly and immediately after storm events. The recycling dumpster shall be emptied weekly and taken to an approved recycling center. If recyclable construction wastes are exceeding the dumpsters' capacity, the dumpsters shall be emptied more frequently.

5.1.3 Sanitary and Septic Waste

Description:	Temporary sanitary facilities (portable toilets) shall be provided at the site throughout the construction phase. The portable toilets shall be located in the staging area, away from concentrated flow paths and traffic flow.
Installation Schedule:	The portable toilets shall be brought to the site once the staging area has been established.
Maintenance and Inspection:	All sanitary waste shall be collected from the portable facilities on a regular basis. The portable toilets shall be inspected weekly for evidence of leaking holding tanks. Toilets with leaking holding tanks shall be removed from the site and replaced with new portable toilets.

5.1.4 Hazardous Materials and Waste

Description:	All hazardous waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids shall be stored in structurally sound and sealed shipping containers, within the hazardous materials storage area. Hazardous waste materials shall be stored in appropriate and clearly marked containers and segregated from other non-waste materials. Secondary

	containment shall be provided for all waste materials in the hazardous materials storage area and shall consist of commercially available spill pallets. Additionally, all hazardous waste materials shall be disposed of in accordance with federal, state, and municipal regulations. Hazardous waste materials shall not be disposed of into the on-site dumpsters. All personnel shall be instructed regarding proper procedures for hazardous waste disposal. Notices that state these procedures shall be posted in the office trailer and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.
Installation Schedule:	Shipping containers used to store hazardous waste materials shall be installed once the site materials storage area has been installed.
Maintenance and Inspection:	The hazardous waste material storage areas shall be inspected weekly and after storm events. The storage areas shall be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Material safety data sheets, material inventory, and emergency contact numbers shall be maintained in the office trailer.

5.2 ESTABLISH PROPER BUILDING MATERIAL STAGING AREAS

Description:	Construction equipment and maintenance materials shall be stored at the combined staging area and materials storage areas. A watertight shipping container shall be used to store hand tools, small parts, and other construction materials. Nonhazardous building materials such as packaging material (wood, plastic, and glass), and construction scrap material (brick, wood, steel, metal scraps, and pipe cuttings) shall be stored in a separate covered storage facility adjacent to the shipping container. All hazardous-waste materials such as oil filters, petroleum products, paint, and equipment maintenance fluids shall be stored in structurally sound and sealed containers under cover within the storage area. All fertilizers, herbicides, insecticides and pesticides shall be stored in accordance with local, state, and federal regulations. At a minimum these materials shall be covered with plastic sheeting or a temporary roof to prevent contact with rainwater. Very large items, such as framing materials and stockpiled lumber, shall be stored in the open in the materials storage area. Such materials shall be elevated on wood blocks to minimize contact with runoff.
Installation Schedule:	The materials storage area shall be installed after grading and before any infrastructure is constructed at the site.
Maintenance and Inspection:	The storage area shall be inspected weekly and after storm events. The storage area shall be kept clean, well organized, and equipped with ample cleanup supplies as appropriate for the materials being stored. Perimeter controls, containment structures, covers, and liners shall be repaired or replaced as needed to maintain proper function.

5.3 DESIGNATE WASHOUT AREAS

5.3.1 Concrete Washout

Description:	A designated temporary, above-grade concrete washout area shall be constructed as detailed on the site plan. The temporary concrete washout area shall be constructed with a recommended minimum length and minimum width of 10 feet, but with sufficient quantity and volume to contain all liquid and concrete waste generated by washout operations. The washout area shall be lined with plastic sheeting at least 10 mils thick and free of any holes or tears. Signs shall be posted marking the location of the washout area to ensure that concrete equipment operators use the proper facility. Concrete pours shall not be conducted during or before an anticipated storm event. Concrete mixer trucks and chutes shall be washed in the designated area or concrete wastes shall be properly disposed of off-site. When the temporary washout area is no longer needed for the construction project, the hardened concrete and materials used to construct the area shall be removed and disposed of according to the maintenance section below, and the area shall be stabilized.
Installation Schedule:	The washout area shall be constructed before concrete pours occur at the site.
Maintenance and Inspection:	The washout areas shall be inspected daily to ensure that all concrete washing is being discharged into the washout area, no leaks or tears are present, and to identify when concrete wastes need to be removed. The washout areas shall be cleaned out once the area is filled to 75 percent of the holding capacity. Once the area's holding capacity has been reached, the concrete wastes shall be allowed to harden; the concrete shall be broken up, removed, and taken to an approved landfill for disposal or recycled on-site or off-site in accordance with applicable laws. The plastic sheeting shall be replaced if tears occur during removal of concrete wastes from the washout area.

Design Specifications:

1. Temporary concrete washout type Above Grade shall be constructed as shown above, with a recommended minimum length and minimum width of 10 feet.
2. The washout shall be a minimum of 50 feet from storm drain inlets.
3. Plastic lining shall be free of holes, tears, or other defects that compromise the impermeability of the material.

5.3.2 Applicators, Containers and Paint Washout

Description:	A designated temporary, above-grade washout area shall be constructed as needed for the washout and cleanout of stucco, paint, or other non-hazardous construction materials. The temporary washout area shall be a leak-proof container with sufficient volume to contain all liquid and waste generated by washout operations. The temporary washout shall be sited outside of all buffer zones.
Installation Schedule:	The washout area shall be constructed as needed.
Maintenance and Inspection:	The washout areas shall be inspected daily to ensure that all washing is being discharged into the washout area, no leaks or tears are present, and to identify when wastes need to be removed. The washout areas shall be cleaned out once the area is filled to 75 percent of the holding capacity. Liquid wastes shall be disposed of in accordance with applicable Federal and State requirements and shall not be discharged into drainage systems.

5.4 ESTABLISH PROPER EQUIPMENT/VEHICLE FUELING AND MAINTENANCE PRACTICES

Description:	Several types of vehicles and equipment will likely be used on-site throughout the project, including graders, scrapers, excavators, loaders, paving equipment, rollers, trucks and trailers, backhoes, and forklifts. All major equipment/vehicle fueling and maintenance shall be performed outside of wetland buffer zones. When vehicle fueling must occur on-site, the fueling activity shall occur in the staging area. Only minor equipment maintenance shall occur on-site. All equipment fluids generated from maintenance activities shall be disposed of into designated drums stored on spill pallets in accordance with the Material Handling and Waste Management Section. Absorbent, spill-cleanup materials and spill kits shall be available at the combined staging and materials storage area. Drip pans shall be placed under all equipment receiving maintenance.
Installation Schedule:	BMPs implemented for equipment and vehicle maintenance and fueling activities shall begin at the start of the project.
Maintenance and Inspection:	Inspect equipment/vehicle storage areas weekly and after storm events. Vehicles and equipment shall be inspected on each day of use. Leaks shall be repaired immediately, using dry cleanup measures where possible and eliminating the source of the discharge. Problem vehicle(s) or equipment shall be removed from the project site. Keep ample supply of spill-cleanup materials on-site and immediately clean up spills and dispose of materials properly. Do not clean surfaces by hosing-down the area

5.5 ALLOWABLE NON-STORMWATER DISCHARGES AND CONTROL EQUIPMENT / VEHICLE WASHING

Description:	All equipment and vehicle washing shall be performed off-site, except as required for wheel washes and concrete washout areas.
Installation Schedule:	N/A
Maintenance and Inspection:	N/A

5.6 SPILL PREVENTION AND CONTROL PROCEDURES

Description:	i. Employee Training: All employees shall be trained as detailed in the Inspection and Maintenance section of this report. ii. Vehicle Maintenance: Vehicles and equipment shall be maintained off-site. All vehicles and equipment including subcontractor vehicles shall be checked for leaking oil and fluids. Vehicles leaking fluids shall not be allowed on-site. iii. Hazardous Material Storage: Hazardous materials shall be stored in accordance with this report and federal and municipal regulations. iv. Spill Kits: Spill kits shall be kept within the materials storage area. Spills: All spills shall be cleaned up immediately upon discovery. Spent absorbent materials and rags shall be hauled off-site immediately after the spill is cleaned up for disposal at an approved landfill. Spills large enough to discharge to surface water shall be reported to the National Response Center at 1-800-424-8802 and MA DEP at 617-792-7653. v. Material safety data sheets: A material inventory and emergency contact information shall be maintained at the on-site project trailer.
Installation Schedule:	The spill prevention and control procedures shall be implemented once construction begins on-site.

Maintenance and Inspection:	All personnel shall be instructed the correct procedures for spill prevention and control. Notices that state these practices shall be posted in the office trailer, and the individual who manages day-to-day site operations shall be responsible for seeing that these procedures are followed.

5.7 FERTILIZER DISCHARGE RESTRICTIONS

Description:	Discharges from fertilizers containing nitrogen and phosphorus shall be minimized. Fertilizers shall be applied at rates and amounts consistent with the manufacture's specification, and shall at no time exceed local, state, or federal specifications. See project landscape specifications for acceptable fertilizers that can be used for the project.
Installation Schedule:	Fertilizers shall be applied at an appropriate time of year, timed to coincide as closely as possible to the period of maximum vegetation uptake and growth. Avoid applying fertilizers before heavy rains. Do not apply fertilizers to frozen ground or stormwater conveyance channels flowing with water.
Maintenance and Inspection:	N/A

5.8 ALLOWABLE NON-STORMWATER DISCHARGE MANAGEMENT

Any changes in construction activities that produce other allowable non-stormwater discharges shall be identified, and the SWPPP shall be amended and the appropriate erosion and sediment control shall be implemented.

The following is a list of allowable non-stormwater discharges:

- Water Used to Control Dust
- Uncontaminated Excavation Dewatering
- Landscape Irrigation
- Fire Hydrant Flushing
- Firefighting
- Waterline Flushing
- Building/Pavement Wash-Down
- Non-Detergent Laden Vehicle Wash Water
- Foundation or Footing Drains

6.0 POST-CONSTRUCTION BMPS

6.1 INFILTRATION TRENCH

Description:	Infiltration trenches shall be installed to control stormwater runoff from the parking area. The infiltration trench shall consist of an excavated, shallow trench backfilled with sand, coarse stone, and pea gravel, and lined with a filter fabric. The trench shall be 174 feet long, 45 feet wide, and have a depth of 4 feet.
Design Specifications:	Install according to sitework specifications and details.
Installation Schedule:	The infiltration trench shall be installed during the final stabilization phase of construction.
Maintenance and Inspection:	The trench shall be inspected weekly and after major storm events during construction. The area shall be checked for signs of erosion, seepage, and structural damage. Erosion, seepage, and structural damage shall be repaired immediately. Following completion of site construction and final stabilization, maintenance and inspection responsibilities shall be taken over by the Owner in accordance with the Long-Term Pollution Prevention Plan and Long-Term Operation & Maintenance Plan.

6.2 DEEP SUMP AND HOODED CATCH BASINS AND WATER QUALITY STRUCTURES

Description:	Deep sump and hooded catch basins and water quality structures shall be located throughout paved areas on site. Catch basins and water quality structures shall collect, treat, and convey stormwater runoff from the proposed roadways.
Design Specifications:	Handle and install according to site work specifications. Filter bags shall be installed in all storm drain inlets.
Installation Schedule:	Catch basins and water quality structures shall be installed during utility construction.
Maintenance and Inspection:	Catch basins and water quality structures shall be inspected weekly and after major storm events during construction. See maintenance of Filter Bags for information on maintenance procedures. Following completion of site construction and final stabilization, maintenance and inspection responsibilities shall be taken over by the Owner in accordance with the Long-Term Pollution Prevention Plan and Long-Term Operation & Maintenance Plan.

7.0 FINAL STABILIZATION

In compliance with the Construction General Permit, soil stabilization measures must be implemented immediately whenever earth-disturbing activities are temporarily or permanently ceased on any portion of the site. Earth-disturbing activities are temporarily ceased when clearing, grading, and excavation within any area of a site that will not include a permanent structure will not resume for a period of 14 or more calendar days, but such activities will resume in the future.

In the context of this provision, "immediately" means as soon as practicable, but no later than the end of the next work day, following the day when the earth-disturbing activities have temporarily or permanently ceased. The following activities constitute the initiation of stabilization:

- Preparing the soil for vegetative or non-vegetative stabilization;
- applying mulch or other non-vegetative product to the exposed area;
- seeding or planting the exposed area;
- starting any of the activities in listed above on a portion of the area to be stabilized, but not on the entire area; and
- finalizing arrangements to have stabilization product fully installed in compliance with the applicable deadline for completing stabilization.

As soon as practicable, but no later than 14 calendar days after the initiation of soil stabilization measures the following activities are required to be completed:

- For vegetative stabilization, all activities necessary to initially seed or plant the area to be stabilized; and/or
- For non-vegetative stabilization, the installation or application of all such non-vegetative measures.

The following sections detail the management practices proposed to achieve final stabilization of the site.

7.1 PERMANENT SEEDING

Description:	Permanent seeding shall be applied immediately after the final design grades are achieved on portions of the site but no later than 14 days after construction activities have permanently ceased. After the entire site is stabilized, any sediment that has accumulated shall be removed and hauled off-site for disposal at an approved landfill. Construction debris, trash and temporary BMPs (including silt fences, material storage areas, sanitary toilets, and inlet protection) shall also be removed and any areas disturbed during removal shall be seeded immediately. Seeding shall be performed in accordance to the Site Plans and Landscape Specifications for the project.
Installation Schedule:	Seeding shall occur at portions of the site where construction activities have permanently ceased shall be stabilized, as soon as possible but no later than 14 days after construction ceases.
Maintenance and Inspection:	All seeded areas shall be inspected weekly during construction activities for failure and after storm events until a dense cover of vegetation has been established. If failure is noticed at the seeded area, the area shall be reseeded, fertilized, and mulched immediately. After construction is completed at the site, permanently stabilized areas shall be monitored until final stabilization is reached.

8.0 INSPECTIONS AND MAINTENANCE

8.1 INSPECTIONS

8.1.1 Inspection Schedule and Procedures

Inspections of the site will be performed once every 7 days or 14 days and within 24 hours of the end of a storm event of 0.25-inch or greater unless otherwise specified. The inspections will verify that all BMPs required are implemented, maintained, and effectively minimizing erosion and preventing stormwater contamination from construction materials.

Inspections shall include all areas of the site disturbed by construction activity and areas used for storage of materials that are exposed to precipitation. Inspectors shall look for evidence of, or the potential for, pollutants entering the storm water conveyance system. Sedimentation and erosion control measures identified in the SWPPP shall be observed to ensure proper operation. Discharge locations shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to waters of the United States, where accessible. Where discharge locations are inaccessible, nearby downstream locations shall be inspected to the extent that such inspections are practicable. Locations where vehicles enter or exit the site shall be inspected for evidence of off-site sediment tracking.

Utility line installation, pipeline construction, and other examples of long, narrow, linear construction activities may limit the access of inspection personnel to the areas described in the above paragraph. Inspection of these areas could require that vehicles compromise temporarily or even permanently stabilized areas, cause additional disturbance of soils, and increase the potential for erosion. In these circumstances, controls shall be inspected on the same frequencies as other construction projects, but representative inspections may be performed. For representative inspections, personnel shall inspect controls along the construction site for 0.25 mile above and below each access point where a roadway, undisturbed right-of-way, or other similar feature intersects the construction site and allows access to the areas described above. The conditions of the controls along each inspected 0.25 mile segment may be considered as representative of the condition of controls along that reach extending from the end of the 0.25 mile segment to either the end of the next 0.25 mile inspected segment, or to the end of the project, whichever occurs first.

For detailed inspection procedures, see Sections 4 and 5.

All inspections shall be coordinated with a representative from LCB. An LCB representative shall accompany the Inspector, when possible, during inspections.

Inspection reports are required to be completed within 24-hours of an inspection. If corrective actions are identified by the Inspector during the inspection, he/she shall notify and submit a copy of the inspection report to the Operator(s). For corrective actions identified, the project managers shall be responsible for initiating the corrective action within 24 hours of the report and completing maintenance as soon as possible or before the next storm event. For any corrective actions requiring a SWPPP amendment or change to a stormwater conveyance or control design, the project manager shall notify the Owner, as soon as possible, before initiating the corrective action.

For a copy of the inspection report template, see Appendix E.

8.2 REDUCTIONS IN INSPECTION FREQUENCY

Once an area is stabilized, inspections may be reduced to once per month. If construction resumes at the stabilized area the inspection frequency shall increase as outlined in section 8.1.

If earth-disturbing activities are suspended due to frozen conditions inspections can be temporarily suspended until a thaw occurs.

8.3 CORRECTIVE ACTION LOG

The corrective action log describes repairs, replacements, and maintenance of BMPs undertaken as a result of the inspections and maintenance procedures. Additionally remedies of permit violations and clean and proper disposal of spills, releases other deposits should be recorded.

If it is determined the stormwater controls have not been installed as required, or that they are not functioning adequately corrective action is required within 7 calendar days.

See Appendix F – Corrective Action Log.

9.0 RECORDKEEPING AND TRAINING

9.1 RECORDKEEPING

A copy of the SWPPP, along with all inspection reports and corrective action logs are required to be stored at an accessible location at the site, and shall be made available upon request of the EPA, or state or local agency approving stormwater management plans.

The following records shall be kept at the project site and shall be available for inspectors to review. These records shall be retained for a minimum period of at least 3 years after the permit is terminated.

Date(s) when major grading activities occur:
See Appendix I – Grading and Stabilization Activities Log

Date(s) when construction activities temporarily or permanently cease on a portion of the site:
See Appendix I – Grading and Stabilization Activities Log

Date(s) when an area is either temporarily or permanently stabilized:
See Appendix I – Grading and Stabilization Activities Log

9.2 LOG OF CHANGES TO THE SWPPP

The log of changes to the SWPPP is maintained in Appendix G and includes additions of new BMPs, replacement of failed BMPs, significant changes in the activities or their timing on the project, changes in personnel, changes in inspection and maintenance procedures and update to site plans.

9.3 TRAINING

Prior to the commencement of earth-disturbing activities or pollutant-generating activities, whichever occurs first, training on the pollution prevention measures outlined in this SWPPP shall be provided to staff and subcontractors.

9.3.1 Individual(s) Responsible for Training

Company/Organization: Text

Name: Text

9.3.2 Description of Training Conducted

Informal training shall be conducted for all staff, including subcontractors, on the site. The training shall be conducted primarily via tailgate sessions and shall focus on avoiding damage to stormwater BMPs and preventing illicit discharges. The tailgate sessions shall be conducted biweekly and shall address the following topics: Erosion Control BMPs, Sediment Control BMPs, Non-Stormwater BMPs, Waste Management and Materials Storage BMPs, and Emergency Procedures specific to the construction site. (See Appendix J – Training Log)

Formal training shall be provided to all staff and subcontractors with specific stormwater responsibilities, such as installing and maintaining BMPs. The formal training shall cover all design and construction specifications for installing the BMPs and proper procedures for maintaining each BMP. Formal training shall occur before any BMPs are installed on the site. (See Appendix J – Training Log)

10.0 CERTIFICATION AND NOTIFICATION

10.1 SIGNATURE, PLAN REVIEW, AND MAKING PLANS AVAILABLE

A copy of the SWPPP (including a copy of the Construction General Permit, NOI, and acknowledgement letter from EPA shall be retained at the construction site (or other location easily accessible during normal business hours to EPA, a state, tribal or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; the operator of a municipal separate storm sewer receiving discharges from the site; and representatives of the U.S. Fish and Wildlife Service or the National Marine Fisheries Service) from the date of commencement of construction activities to the date of final stabilization. A copy of the SWPPP shall be available at a central location on-site for the use of all those identified as having responsibilities under the SWPPP. If an on-site location is unavailable to store the SWPPP when no personnel are present, notice of the plan's location shall be posted near the main entrance at the construction site.

A sign or other notice shall be posted conspicuously near the main entrance of the construction site. If displaying near the main entrance is infeasible, the notice will be posted in a local public building such as the town hall or public library. The sign or other notice shall contain the following information:

1. A copy of the completed Notice of Intent as submitted to the EPA Storm Water Notice Processing Center; and

2. If the location of the SWPPP or the name and telephone number of the contact person for scheduling SWPPP viewing times has changed (i.e., is different than that submitted to EPA in the NOI), the current location of the SWPPP and name and telephone number of a contact person for scheduling viewing times.

SWPPPs shall be made available upon request by EPA; a state, trial or local agency approving sediment and erosion plans, grading plans, or storm water management plans; local government officials; the operator of a municipal separate storm sewer receiving discharges from the site; and representative of the U.S. Fish and Wildlife Service or the National Marine Fisheries Service to the requestor. The copy of the SWPPP that is required to be kept on-site or locally available shall be made available, in its entirety, to the EPA staff for review and copying at the time of an on-site inspection.

10.2 OWNER CERTIFICATION

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

Name:_____ Title:_____

Signature:_____ Date:_____

10.3 OPERATOR CERTIFICATION

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

Name:_____ Title:_____

Signature:_____ Date:_____

APPENDICES

Appendix A

General Location Map

Appendix B

Site Plans

Appendix C

Construction General Permit

Appendix D

NOI and Acknowledgement Letter from EPA

Appendix E

Inspection Reports

Inspections under this SWPPP shall be conducted in accordance with each installed BMPs recommended maintenance requirements. This inspection frequency may be reduced to at least once every month if: a) the entire site is temporarily stabilized, b) runoff is unlikely due to winter conditions (e.g. site is covered with snow, ice, or the ground is frozen), or c) construction is occurring during seasonal arid periods in arid areas and semi-arid areas. If an inspection report is filed according to this modified schedule it shall be noted at the end of the report under the "NOTES" section.

The following five pages should be copied and completed for each inspection. All inspection forms should be compiled in a binder to prove compliance with this SWPPP.

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Stormwater Pollution Prevention Plan: Inspection Checklist

General Information			
Project Name			
NPDES Tracking No.		**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			
Type of Inspection: ❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event			
Weather Information			
Has there been a storm event since the last inspection? ❑Yes ❑No **If yes, provide:** Storm Start Date & Time: Storm Duration (hrs): Approx. Amount of Precipitation (in):			
Weather at time of this inspection? ❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds ❑ Other: Temperature:			
Have any discharges occurred since the last inspection? ❑Yes ❑No **If yes, describe:**			
Are there any discharges at the time of inspection? ❑Yes ❑No **If yes, describe:**			

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	
	❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	
Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	

BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

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

Print name and title:

_____

Signature:_____

Date:_____

Appendix F

Corrective Action Log

Corrective Action Log

Use this form to note the date and activity for accurate record keeping (make additional copies as necessary). Examples include the restaking or reinforcement of the erosion control barrier, site watering to prevent dust erosion, street sweeping, equipment and machinery repair, etc.

Date	Activity Description	Additional Action Items

Appendix G

SWPPP Amendment Log

The SWPPP, including the site plans, shall be amended whenever there is a change in design, construction, operation, or maintenance at the construction site that has or could have a significant effect on the discharge of pollutants to the waters of the United States that has not been previously addressed in the SWPPP.

The SWPPP shall be amended if during inspections or investigations by site staff, or by local, state, tribal or federal officials, it is determined that the SWPPP is ineffective in eliminating or significantly minimizing pollutants in storm water discharges from the construction site.

Based on the results of an inspection, the SWPPP shall be modified as necessary to include additional or modified BMPs designed to correct problems identified. Revisions to the SWPPP shall be completed within seven (7) calendar days following the inspection. Implementation of these additional or modified BMPs shall be accomplished as described in Subpart 3.6B of the Construction General Permit (located in Appendix C).

SWPPP Amendment Log

Amendment No.	Description of the Amendment	Date of Amendment	Amendment Prepared by (Name(s) and Title)

Appendix H

Subcontractor Certifications/Agreements

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Sample Subcontractor Certifications/Agreements

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Project Number: _____

Project Title: _____

Operator(s): _____

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

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

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

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

Company: _____

Address: _____

Telephone Number: _____

Type of construction service to be provided: _____

_____

_____

Signature: _____

Title: _____

Date: _____

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Appendix I

Grading and Stabilization Activities Log

Site Plans in Appendix B should be annotated to indicate areas where final stabilization has been accomplished and no further construction-phase permit requirements apply.

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The following records are to be kept by each Site Operator throughout the construction period and maintained in the SWPPP. Insert additional documentation for record keeping as necessary.

Grading and Stabilization Activities Log

Date	Location on Property	Description

Appendix J

Training Log

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Training Log

Date	Training Topic	Attendee	Signature of Training Coordinator

Appendix K

Delegation of Authority

Sample Delegation of Authority Form

Delegation of Authority

I, _____ (name), hereby designate the person or specifically described position below to be a duly authorized representative for the purpose of overseeing compliance with environmental requirements, including the Construction General Permit, at the _____ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

_____ (name of person or position)
_____ (company)
_____ (address)
_____ (city, state, zip)
_____ (phone)

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix I of EPA's Construction General Permit (CGP), and that the designee above meets the definition of a "duly authorized representative" as set forth in Appendix I.

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

Name: _____

Company: _____

Title: _____

Signature: _____

Date: _____

Appendix L

Historic Preservation Documentation

Appendix M

Temporary Sediment Basin Sizing Calculations

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