Stormwater Management Report

for:

The Pointe at Hills Farms
Shrewsbury, Massachusetts

Project Proponent:

Smart Growth Design LLC
625 South Street
Shrewsbury, MA 01550

June 2016

Waterman Design Associates, inc.
31 East Main Street • Westborough, MA 01581

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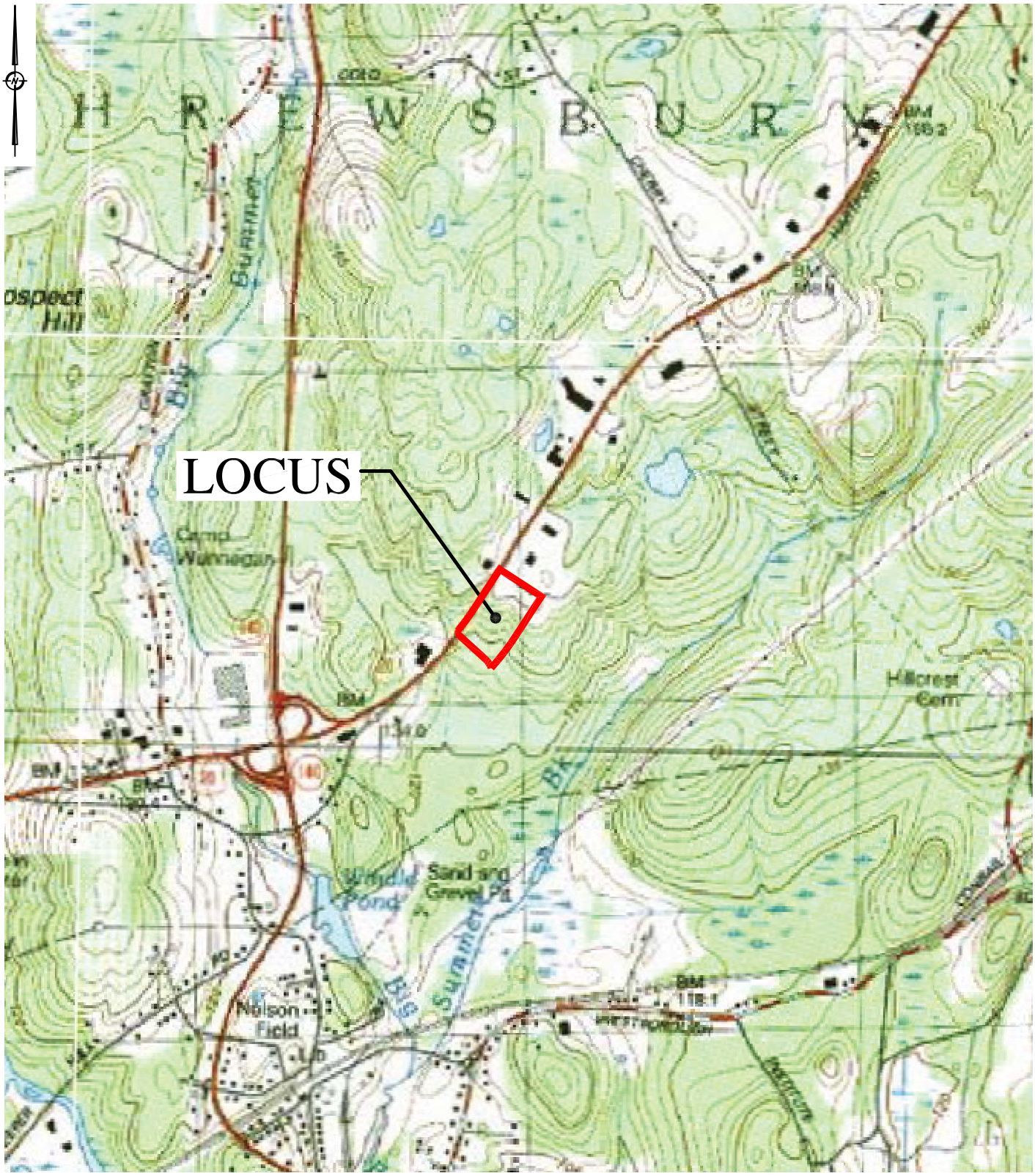

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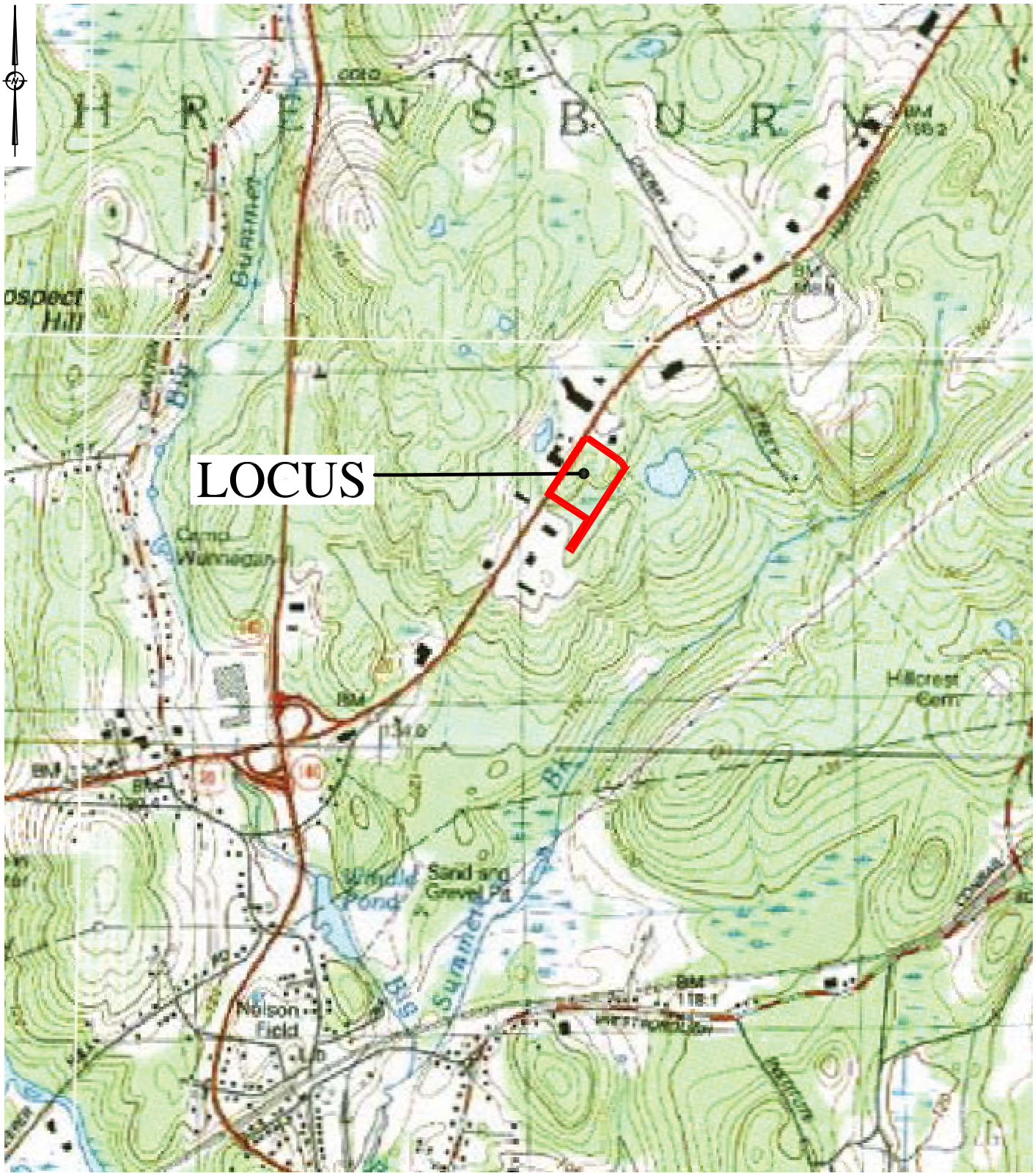
TITLE:	USGS LOCUS PHASE 1 440 Hartford Turnpike Shrewsbury, MA
OWNER/APPLICANT:	Smart Growth Design, LLC 625 South Street Shrewsbury, MA
SOURCE:	USGS Topographic Map 440 Hartford Turnpike Shrewsbury, MA

DATE:	09/01/15	*FILE NO.:*	0927600	*SCALE:*	1" = 1500'
JOB NO.:	0927.01	*DWG NO.:*	0927602A	*DRAWN BY:*	HKV



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SOURCE:	USGS Topographic Map 440 Hartford Turnpike Shrewsbury, MA

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PURPOSE

Revised hydrologic, calculations have been performed as part of the Comprehensive Permit Application for the Pointe at Hills Farm, a proposed two-phase multi-family residential development located in Shrewsbury, MA. The revised calculations were performed to verify size and location of stormwater collection and attenuation facilities for the sites and to demonstrate that the project will meet the standards of the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Regulations.

This report assesses the proposed project as it has been revised to reflect programmatic changes resulting from discussions with the ZBA, abutters, and Town staff as well as comments from the Town's peer review engineer. The analyses were performed to develop a stormwater management system that will protect public safety and convenience and minimize environmental impacts. Please refer to the original Stormwater Summary of November 2015 for a description of the existing conditions.

PROPOSED PROJECT

PHASE 1 – The project proponent, Smart Growth Design LLC, proposes to construct four (4) three-story multi-family residential apartment buildings, a free standing club house building, associated green spaces and parking lots, as well as appurtenances such as walkways, dumpster areas and free standing garage buildings.

Stormwater runoff will be collected in either drop inlets or deep-sump, hooded catch basins and conveyed to stormwater treatment units, and eventually one of three surface detention basins or one of several subsurface infiltration systems located throughout the site. Controlled outflow will be discharged to upland areas at a rates equal to or less than existing conditions for the 2, 10, and 100-year, 24-hour design storms.

PHASE 2 – The project proponent proposes to construct two (2) four-story multi-family residential apartment buildings, associated green spaces and parking lots, as well as appurtenances such as walkways and dumpster areas.

Stormwater runoff will be collected in either drop inlets, area drains or deep-sump, hooded catch basins and conveyed to stormwater treatment units, and eventually to one of the two surface detention basins or one of two subsurface infiltration systems. Controlled outflow will be discharged to upland areas at a rates equal to or less than existing conditions for the 2, 10, and 100-year, 24-hour design storms.

STORMWATER MANAGEMENT STANDARDS

STANDARD #1 – NO NEW UNTREATED DISCHARGES

The stormwater collection systems have been designed so that stormwater runoff from the parking areas are treated through a treatment train consisting of deep-sump, hooded catch basins, stormwater treatment units, a detention basin or a stormwater infiltration system. Additionally, all outlets have been designed so that there will be no erosion or scour to the wetlands of the Commonwealth. Refer to the Stormwater Standards Calculations at the end of this report.

STANDARD #2 – PEAK RATE ATTENUATION

METHODOLOGY

United States Soil Conservation Service, "Urban Hydrology for Small Watersheds, Technical Release Number 55" (TR-55) methods (HydroCAD 10.00) were utilized to develop runoff hydrographs for watershed areas affected by the proposed development. Existing and proposed runoff hydrographs were developed for the 2, 10, and 100-year, 24-hour rainfall events for the purpose of developing a stormwater management system that will limit post-development peak runoff rates to pre-development levels.

The proposed stormwater management system has been designed to meet the requirements of the Town of Shrewsbury and the MassDEP Stormwater Management Standards. The project will limit peak rates of runoff from the site and will infiltrate runoff to approximate existing groundwater recharge.

ANALYSIS SUMMARY

In order to assess the impact of the proposed development on peak runoff rates onto down-gradient properties, hydrologic calculations were performed for each of three design storms at the design point(s). The calculations refer to runoff quantities at the final design points, being Stoney Hill Road and behind the homes along the north side of Stoney Hill Road for Phase 1. For Phase 2 the design points are the large wetland system on the southern portion of the site, Hartford Turnpike, and Stoney Hill Road to the north.

Calculations of peak runoff rates for existing and proposed site conditions are included and summarized in Table I for comparison of peak runoff rates for the design point for the three design storms. A proposed hydrology plan is provided showing the various sub-watersheds draining to the proposed stormwater management facilities. Stormwater "run-on" from Hartford Turnpike and the abutting lot to the north are also collected, treated, detained, such that flow rates and water quality impacts are mitigated. Stormwater runoff from the overland areas not tributary to the stormwater management facilities will drain by sheet flow or shallow concentrated flow along the existing flow patterns to the design points.

Tables IA and IB demonstrate that the proposed stormwater management system will be effective in limiting peak rates of runoff from the subject property to approximate pre-development levels. Facilities for both phases have been oversized due to rocky subsurface conditions. The systems will be refined when the Notice of Intent is filed with the Conservation Commission.

TABLE IA: EXISTING AND PROPOSED PEAK RUNOFF / PHASE 1

DRAINAGE AREA	DESIGN STORM EVENT / PEAK RUNOFF (cfs)		
	2-Year	10-Year	100-Year
E1L	1.3	5.0	12.8
P1L	1.1	3.0	10.8
E2L	1.4	4.3	10.0
P2L	0.4	1.2	9.7

TABLE IB: EXISTING AND PROPOSED PEAK RUNOFF / PHASE 2

DRAINAGE AREA	DESIGN STORM EVENT / PEAK RUNOFF (cfs)		
	2-Year	10-Year	100-Year
E3S	3.7	9.0	17.3
P3L	3.5	7.1	15.3
E4S	1.0	2.5	4.9
P4S	0.1	0.3	0.6
E5S	0.4	0.9	1.7
P5S	0.2	0.5	0.9

TABLE IIA: EXISTING AND PROPOSED RUNOFF VOLUMES / PHASE 1

DRAINAGE AREA	DESIGN STORM EVENT / RUNOFF VOLUME (cf)		
	2-Year	10-Year	100-Year
E1L	16,859	41,240	84,002
P1L	44,680	86,923	160,014
E2L	18,777	39,527	73,288
P2L	1,831	10,010	31,035

TABLE IIB: EXISTING AND PROPOSED PEAK RUNOFF / PHASE 2

DRAINAGE AREA	DESIGN STORM EVENT / RUNOFF VOLUME (cf)		
	2-Year	10-Year	100-Year
E3S	12,881	28,854	54,640
P3L	23,185	44,485	83,598
E4S	3,573	8,155	15,621
P4S	413	942	1,804
E5L	1,233	2,761	5,229
P5S	723	1,564	2,896

STANDARD #3 – STORMWATER RECHARGE

Groundwater recharge is provided within the subsurface infiltration systems. Test pits have been performed throughout the site and in areas where infiltration is proposed. In Phase 1, the soils across the site and within areas of proposed infiltration facilities were found to be reasonably well drained, loamy sand with the characteristics of HSG B. In some in some instances the soil is less well drained. All of Phase 2 was found to be rocky and shallow to bedrock with relatively high

seasonal ground water. Rawls Rates for Sandy Loam (1.02 inches/hour) or Silt Loam (0.27 inches/hour) were used in the hydrologic models for the infiltration systems. Recharge systems are located more than fifty feet from wetland resource areas to prevent adverse impacts to such resources.

The tables below provides a summary of the attached groundwater recharge calculations. Calculations are based on HSG B and HSG C. The required volume of groundwater recharge for Phase 1 is equal to 0.35" and/or 0.25" over the proposed impervious areas. The required volume of groundwater recharge for Phase 2 is equal to 0.25" over the proposed impervious area.

PHASE 1 RECHARGE

REQUIRED (CF)	AVAILABLE (CF)†	PROVIDED (CF)*
8,238	27,558	8,238

PHASE 2 RECHARGE

REQUIRED (CF)	AVAILABLE (CF)†	PROVIDED (CF)*
2,318	15,664	2,318

† total volume below outlet inverts of INF systems
* weighted volume of all impervious on site

Calculations for recharge and drawdown are provided in the Stormwater Standards Calculations section of this report. Though all impervious areas do not drain to infiltration BMP's, weighted calculations demonstrate more than sufficient volume is available. Additionally, sufficient volume will be generated by the 2-year design storm event for those areas tributary to infiltration BMP's.

STANDARD #4 – WATER QUALITY

Water quality measures have been designed to provide a minimum of 80% Total Suspended Solids (TSS) removal, and to treat one inch of runoff prior to discharging to the upland areas of the sites. Over 80% TSS removal will be provided through the use of two basic treatment trains 1) deep-sump, hooded catch basin, stormwater treatment unit and/or sediment forebay, and detention basin, or 2) deep-sump, hooded catch basins, stormwater treatment units and subsurface infiltration systems. Full water quality calculations are provided in the Stormwater Standards Calculations section of this report.

STANDARD #5 – LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS (LUHPPLS)

Neither phase of the project may be considered a LUHPPL, therefore Standard #5 is not applicable.

STANDARD #6 – CRITICAL AREAS

Neither phase of the proposed project discharges near or to a Critical Area, therefore, Standard #6 is not applicable.

STANDARD #7 – REDEVELOPMENT PROJECT

The proposed projects may not be considered a redevelopment project, therefore, Standard #7 is not applicable.

STANDARD #8 – CONSTRUCTION POLLUTION PREVENTION AND EROSION AND SEDIMENTATION CONTROL

As the proposed area of disturbance for each phase is over one acre, a Notice of Intent (NOI) must be filed with the US EPA and a Stormwater Pollution Prevention Plan (SWPPP) shall be retained on-site during construction. A draft SWPPP is provided in the Appendices.

STANDARD #9 – OPERATION AND MAINTENANCE PLAN

The requisite Operation and Maintenance Plan and Long Term Pollution Prevention Plan is provided.

STANDARD #10 – PROHIBITION OF ILLICIT DISCHARGES

No known or planned Illicit Discharges are part of the project.

MASSACHUSETTS STORMWATER REPORT CHECKLIST (FOLLOWS AS PAGES 8A-8H):

HYDRAULIC ANALYSIS

METHODOLOGY

Rational Method calculations were performed for a 25-year and 100-year design storm to size collection system components. The Rational Method (Q = C i A) was used to estimate peak runoff rates to each inlet. Drainage areas and cover types were delineated to determine weighted runoff coefficients (C) to each inlet of the proposed collection system. Time of concentration paths (Tc) were estimated to determine storm intensities; a minimum Tc of 5 minutes was used for impervious areas and 10 minutes for pervious areas. Massachusetts Highway Department (MassDOT) Intensity-Duration-Frequency (IDF) curves for Worcester, MA were used to determine the storm intensity for each inlet. The pipes were sized utilizing Manning's equation and a backwater analysis was performed to determine pipe capacity and ensure the system will not flood above inlet grates.

ANALYSIS SUMMARY

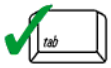
The proposed hydraulic system is designed adequately to convey runoff from the 25-year and 100-year storms to the stormwater management facilities. Additionally, the collection system was oversized to accommodate runoff from the 100-year storm in order to convey the runoff to the stormwater management facilities. During the 100-year storm the proposed hydraulic system will operate under surcharge conditions, however, no flooding conditions will be realized. Catch basin grates at the low points will operate under orifice conditions and will pond before all runoff can be conveyed to the piping system.

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

[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

Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 1: No New Untreated Discharges

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

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

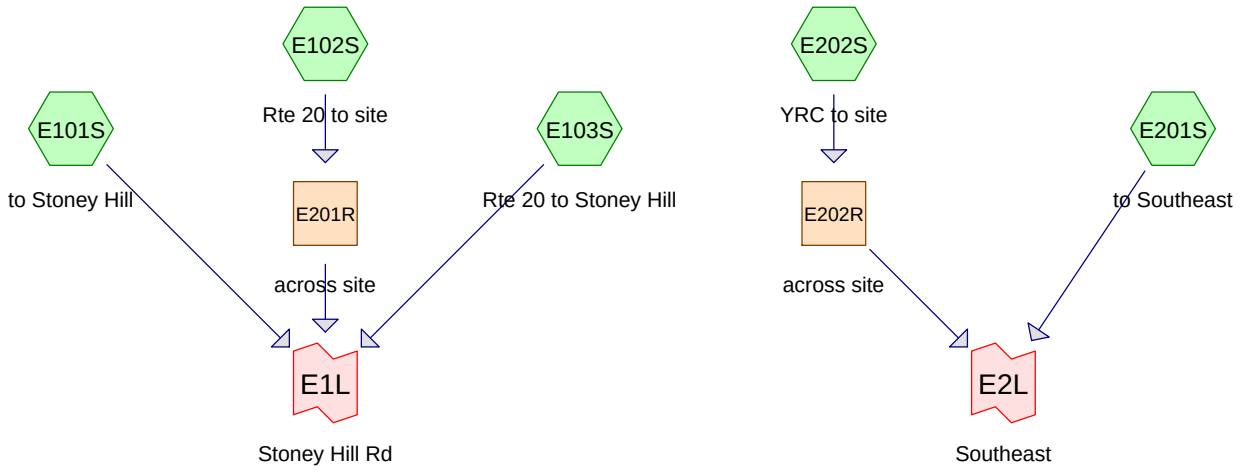
Standard 10: Prohibition of Illicit Discharges

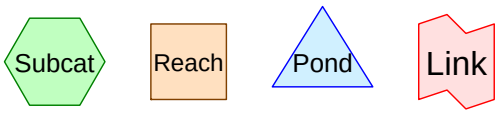
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ An Illicit Discharge Compliance Statement is attached;

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

EXISTING HYDROLOGY





Routing Diagram for 927.01 Existing Phase 1
Prepared by Waterman Design Associates, Inc.
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
39,982	61	>75% Grass cover, Good, HSG B (E102S, E103S, E202S)
4,860	74	>75% Grass cover, Good, HSG C (E102S, E103S)
52,284	98	Paved parking, HSG B (E202S)
35,129	98	Paved roads w/curbs & sewers, HSG B (E102S, E103S)
1,741	98	Paved roads w/curbs & sewers, HSG C (E102S)
7,405	98	WETLAND, HSG B (E101S, E201S)
324,046	55	Woods, Good, HSG B (E101S, E102S, E201S)
125,985	70	Woods, Good, HSG C (E101S, E201S, E202S)
591,432	**66**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
458,846	HSG B	E101S, E102S, E103S, E201S, E202S
132,586	HSG C	E101S, E102S, E103S, E201S, E202S
0	HSG D	
0	Other	
591,432		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
0	39,982	4,860	0	0	44,842	>75% Grass cover, Good	E102S, E103S, E202S
0	52,284	0	0	0	52,284	Paved parking	E202S
0	35,129	1,741	0	0	36,870	Paved roads w/curbs & sewers	E102S, E103S
0	7,405	0	0	0	7,405	WETLAND	E101S, E201S
0	324,046	125,985	0	0	450,031	Woods, Good	E101S, E102S, E201S, E202S
0	**458,846**	**132,586**	**0**	**0**	**591,432**	**TOTAL AREA**	

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

Subcatchment E101S: to Stoney Hill Runoff Area=284,623 sf 0.63% Impervious Runoff Depth=0.34"
Flow Length=1,060' Slope=0.0870 '/' Tc=20.6 min CN=58 Runoff=1.0 cfs 8,093 cf

Subcatchment E102S: Rte 20 to site Runoff Area=52,686 sf 67.63% Impervious Runoff Depth=1.84"
Tc=6.0 min CN=86 Runoff=2.5 cfs 8,057 cf

Subcatchment E103S: Rte 20 to Stoney Hill Runoff Area=11,612 sf 10.67% Impervious Runoff Depth=0.73"
Tc=6.0 min CN=68 Runoff=0.2 cfs 709 cf

Subcatchment E201S: to Southeast Runoff Area=170,824 sf 3.28% Impervious Runoff Depth=0.48"
Flow Length=880' Slope=0.0940 '/' Tc=15.4 min CN=62 Runoff=1.1 cfs 6,847 cf

Subcatchment E202S: YRC to site Runoff Area=71,687 sf 72.93% Impervious Runoff Depth=2.00"
Tc=6.0 min CN=88 Runoff=3.8 cfs 11,930 cf

Reach E201R: across site Avg. Flow Depth=0.33' Max Vel=0.28 fps Inflow=2.5 cfs 8,057 cf
n=0.400 L=800.0' S=0.0625 '/' Capacity=111.4 cfs Outflow=0.9 cfs 8,057 cf

Reach E202R: across site Avg. Flow Depth=0.27' Max Vel=0.26 fps Inflow=3.8 cfs 11,930 cf
n=0.400 L=930.0' S=0.0720 '/' Capacity=111.1 cfs Outflow=1.2 cfs 11,930 cf

Link E1L: Stoney Hill Rd Inflow=1.3 cfs 16,859 cf
Primary=1.3 cfs 16,859 cf

Link E2L: Southeast Inflow=1.4 cfs 18,777 cf
Primary=1.4 cfs 18,777 cf

Total Runoff Area = 591,432 sf Runoff Volume = 35,636 cf Average Runoff Depth = 0.72"
83.67% Pervious = 494,873 sf 16.33% Impervious = 96,559 sf

Summary for Subcatchment E101S: to Stoney Hill

Runoff = 1.0 cfs @ 12.48 hrs, Volume= 8,093 cf, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

	Area (sf)	CN	Description
	221,698	55	Woods, Good, HSG B
*	1,797	98	WETLAND, HSG B
	61,128	70	Woods, Good, HSG C
	284,623	58	Weighted Average
	282,826		99.37% Pervious Area
	1,797		0.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,060	0.0870	0.86		**Lag/CN Method,**

Summary for Subcatchment E102S: Rte 20 to site

Runoff = 2.5 cfs @ 12.09 hrs, Volume= 8,057 cf, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
33,890	98	Paved roads w/curbs & sewers, HSG B
12,714	61	>75% Grass cover, Good, HSG B
1,741	98	Paved roads w/curbs & sewers, HSG C
2,487	74	>75% Grass cover, Good, HSG C
1,854	55	Woods, Good, HSG B
52,686	86	Weighted Average
17,055		32.37% Pervious Area
35,631		67.63% Impervious Area

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

Summary for Subcatchment E103S: Rte 20 to Stoney Hill

Runoff = 0.2 cfs @ 12.11 hrs, Volume= 709 cf, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
1,239	98	Paved roads w/curbs & sewers, HSG B
8,000	61	>75% Grass cover, Good, HSG B
2,373	74	>75% Grass cover, Good, HSG C
11,612	68	Weighted Average
10,373		89.33% Pervious Area
1,239		10.67% Impervious Area

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

Summary for Subcatchment E201S: to Southeast

Runoff = 1.1 cfs @ 12.30 hrs, Volume= 6,847 cf, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

	Area (sf)	CN	Description
	100,494	55	Woods, Good, HSG B
*	5,608	98	WETLAND, HSG B
	64,722	70	Woods, Good, HSG C
	170,824	62	Weighted Average
	165,216		96.72% Pervious Area
	5,608		3.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	880	0.0940	0.95		**Lag/CN Method,**

Summary for Subcatchment E202S: YRC to site

Runoff = 3.8 cfs @ 12.09 hrs, Volume= 11,930 cf, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

	Area (sf)	CN	Description
*	52,284	98	Paved parking, HSG B
	19,268	61	>75% Grass cover, Good, HSG B
	135	70	Woods, Good, HSG C
	71,687	88	Weighted Average
	19,403		27.07% Pervious Area
	52,284		72.93% Impervious Area

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

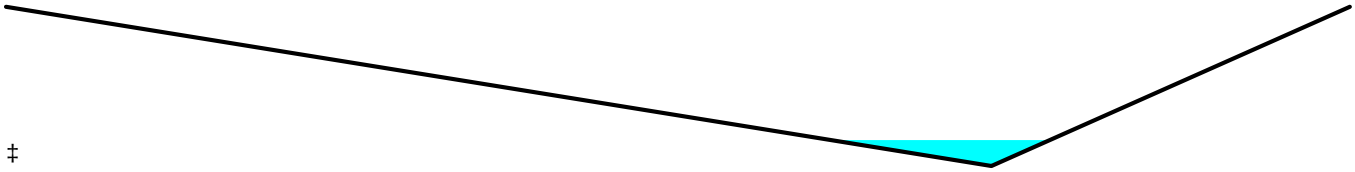
Summary for Reach E201R: across site

Inflow Area = 52,686 sf, 67.63% Impervious, Inflow Depth = 1.84" for 2-year event
Inflow = 2.5 cfs @ 12.09 hrs, Volume= 8,057 cf
Outflow = 0.9 cfs @ 13.20 hrs, Volume= 8,057 cf, Atten= 65%, Lag= 66.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.28 fps, Min. Travel Time= 48.1 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 160.8 min

Peak Storage= 2,552 cf @ 12.40 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 2.00' Flow Area= 120.0 sf, Capacity= 111.4 cfs

Custom cross-section, Length= 800.0' Slope= 0.0625 '/'
Constant n= 0.400 Sheet flow: Woods+light brush
Inlet Invert= 464.00', Outlet Invert= 414.00'



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Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	426.00	0.00
88.00	424.00	2.00
120.00	426.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.0
2.00	120.0	120.1	96,000	111.4

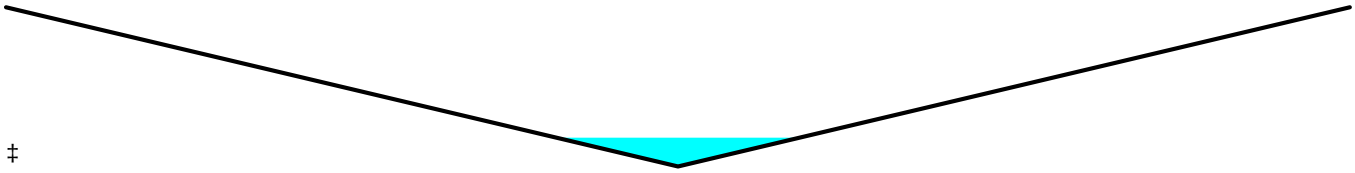
Summary for Reach E202R: across site

Inflow Area = 71,687 sf, 72.93% Impervious, Inflow Depth = 2.00" for 2-year event
Inflow = 3.8 cfs @ 12.09 hrs, Volume= 11,930 cf
Outflow = 1.2 cfs @ 13.40 hrs, Volume= 11,930 cf, Atten= 69%, Lag= 78.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.26 fps, Min. Travel Time= 58.8 min
Avg. Velocity = 0.07 fps, Avg. Travel Time= 214.0 min

Peak Storage= 4,129 cf @ 12.42 hrs
Average Depth at Peak Storage= 0.27'
Bank-Full Depth= 1.50' Flow Area= 135.0 sf, Capacity= 111.1 cfs

Custom cross-section, Length= 930.0' Slope= 0.0720 '/'
Constant n= 0.400 Sheet flow: Woods+light brush
Inlet Invert= 488.00', Outlet Invert= 421.00'



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Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	436.00	0.00
90.00	434.50	1.50
180.00	436.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.0
1.50	135.0	180.0	125,550	111.1

Summary for Link E1L: Stoney Hill Rd

Inflow Area = 348,921 sf, 11.08% Impervious, Inflow Depth = 0.58" for 2-year event
Inflow = 1.3 cfs @ 13.11 hrs, Volume= 16,859 cf
Primary = 1.3 cfs @ 13.11 hrs, Volume= 16,859 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Link E2L: Southeast

Inflow Area = 242,511 sf, 23.87% Impervious, Inflow Depth = 0.93" for 2-year event
Inflow = 1.4 cfs @ 13.39 hrs, Volume= 18,777 cf
Primary = 1.4 cfs @ 13.39 hrs, Volume= 18,777 cf, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment E101S: to Stoney Hill Runoff Area=284,623 sf 0.63% Impervious Runoff Depth=1.06"
Flow Length=1,060' Slope=0.0870 '/' Tc=20.6 min CN=58 Runoff=4.5 cfs 25,154 cf

Subcatchment E102S: Rte 20 to site Runoff Area=52,686 sf 67.63% Impervious Runoff Depth=3.28"
Tc=6.0 min CN=86 Runoff=4.5 cfs 14,404 cf

Subcatchment E103S: Rte 20 to Stoney Hill Runoff Area=11,612 sf 10.67% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=68 Runoff=0.5 cfs 1,682 cf

Subcatchment E201S: to Southeast Runoff Area=170,824 sf 3.28% Impervious Runoff Depth=1.32"
Flow Length=880' Slope=0.0940 '/' Tc=15.4 min CN=62 Runoff=4.1 cfs 18,742 cf

Subcatchment E202S: YRC to site Runoff Area=71,687 sf 72.93% Impervious Runoff Depth=3.48"
Tc=6.0 min CN=88 Runoff=6.4 cfs 20,785 cf

Reach E201R: across site Avg. Flow Depth=0.42' Max Vel=0.33 fps Inflow=4.5 cfs 14,404 cf
n=0.400 L=800.0' S=0.0625 '/' Capacity=111.4 cfs Outflow=1.7 cfs 14,404 cf

Reach E202R: across site Avg. Flow Depth=0.35' Max Vel=0.31 fps Inflow=6.4 cfs 20,785 cf
n=0.400 L=930.0' S=0.0720 '/' Capacity=111.1 cfs Outflow=2.2 cfs 20,785 cf

Link E1L: Stoney Hill Rd Inflow=5.0 cfs 41,240 cf
Primary=5.0 cfs 41,240 cf

Link E2L: Southeast Inflow=4.3 cfs 39,527 cf
Primary=4.3 cfs 39,527 cf

Total Runoff Area = 591,432 sf Runoff Volume = 80,767 cf Average Runoff Depth = 1.64"
83.67% Pervious = 494,873 sf 16.33% Impervious = 96,559 sf

Summary for Subcatchment E101S: to Stoney Hill

Runoff = 4.5 cfs @ 12.34 hrs, Volume= 25,154 cf, Depth= 1.06"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Description
	221,698	55	Woods, Good, HSG B
*	1,797	98	WETLAND, HSG B
	61,128	70	Woods, Good, HSG C
	284,623	58	Weighted Average
	282,826		99.37% Pervious Area
	1,797		0.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,060	0.0870	0.86		**Lag/CN Method,**

Summary for Subcatchment E102S: Rte 20 to site

Runoff = 4.5 cfs @ 12.09 hrs, Volume= 14,404 cf, Depth= 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
33,890	98	Paved roads w/curbs & sewers, HSG B
12,714	61	>75% Grass cover, Good, HSG B
1,741	98	Paved roads w/curbs & sewers, HSG C
2,487	74	>75% Grass cover, Good, HSG C
1,854	55	Woods, Good, HSG B
52,686	86	Weighted Average
17,055		32.37% Pervious Area
35,631		67.63% Impervious Area

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

Summary for Subcatchment E103S: Rte 20 to Stoney Hill

Runoff = 0.5 cfs @ 12.10 hrs, Volume= 1,682 cf, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
1,239	98	Paved roads w/curbs & sewers, HSG B
8,000	61	>75% Grass cover, Good, HSG B
2,373	74	>75% Grass cover, Good, HSG C
11,612	68	Weighted Average
10,373		89.33% Pervious Area
1,239		10.67% Impervious Area

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

Summary for Subcatchment E201S: to Southeast

Runoff = 4.1 cfs @ 12.24 hrs, Volume= 18,742 cf, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Description
	100,494	55	Woods, Good, HSG B
*	5,608	98	WETLAND, HSG B
	64,722	70	Woods, Good, HSG C
	170,824	62	Weighted Average
	165,216		96.72% Pervious Area
	5,608		3.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	880	0.0940	0.95		**Lag/CN Method,**

Summary for Subcatchment E202S: YRC to site

Runoff = 6.4 cfs @ 12.09 hrs, Volume= 20,785 cf, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Description
*	52,284	98	Paved parking, HSG B
	19,268	61	>75% Grass cover, Good, HSG B
	135	70	Woods, Good, HSG C
	71,687	88	Weighted Average
	19,403		27.07% Pervious Area
	52,284		72.93% Impervious Area

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

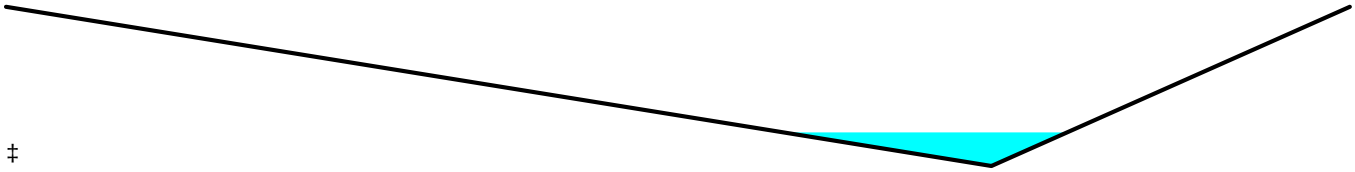
Summary for Reach E201R: across site

Inflow Area = 52,686 sf, 67.63% Impervious, Inflow Depth = 3.28" for 10-year event
Inflow = 4.5 cfs @ 12.09 hrs, Volume= 14,404 cf
Outflow = 1.7 cfs @ 13.02 hrs, Volume= 14,404 cf, Atten= 61%, Lag= 55.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.33 fps, Min. Travel Time= 40.6 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 146.4 min

Peak Storage= 4,260 cf @ 12.34 hrs
Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 2.00' Flow Area= 120.0 sf, Capacity= 111.4 cfs

Custom cross-section, Length= 800.0' Slope= 0.0625 '/'
Constant n= 0.400 Sheet flow: Woods+light brush
Inlet Invert= 464.00', Outlet Invert= 414.00'



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Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	426.00	0.00
88.00	424.00	2.00
120.00	426.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.0
2.00	120.0	120.1	96,000	111.4

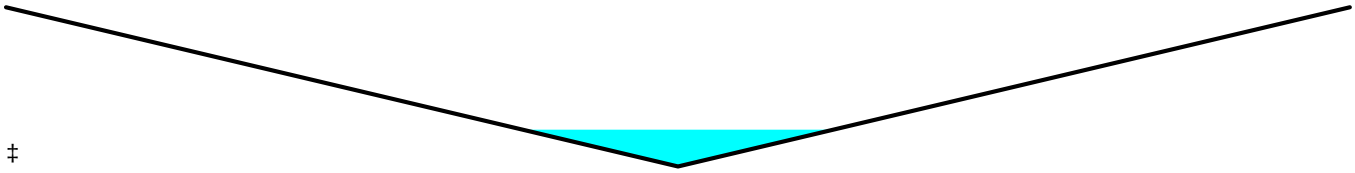
Summary for Reach E202R: across site

Inflow Area = 71,687 sf, 72.93% Impervious, Inflow Depth = 3.48" for 10-year event
Inflow = 6.4 cfs @ 12.09 hrs, Volume= 20,785 cf
Outflow = 2.2 cfs @ 13.20 hrs, Volume= 20,785 cf, Atten= 65%, Lag= 66.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.31 fps, Min. Travel Time= 49.9 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 196.0 min

Peak Storage= 6,738 cf @ 12.37 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 1.50' Flow Area= 135.0 sf, Capacity= 111.1 cfs

Custom cross-section, Length= 930.0' Slope= 0.0720 '/'
Constant n= 0.400 Sheet flow: Woods+light brush
Inlet Invert= 488.00', Outlet Invert= 421.00'



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Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	436.00	0.00
90.00	434.50	1.50
180.00	436.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.0
1.50	135.0	180.0	125,550	111.1

Summary for Link E1L: Stoney Hill Rd

Inflow Area = 348,921 sf, 11.08% Impervious, Inflow Depth = 1.42" for 10-year event
Inflow = 5.0 cfs @ 12.34 hrs, Volume= 41,240 cf
Primary = 5.0 cfs @ 12.34 hrs, Volume= 41,240 cf, Atten= 0%, Lag= 0.0 min

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

Summary for Link E2L: Southeast

Inflow Area = 242,511 sf, 23.87% Impervious, Inflow Depth = 1.96" for 10-year event
Inflow = 4.3 cfs @ 12.24 hrs, Volume= 39,527 cf
Primary = 4.3 cfs @ 12.24 hrs, Volume= 39,527 cf, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment E101S: to Stoney Hill Runoff Area=284,623 sf 0.63% Impervious Runoff Depth=2.41"
Flow Length=1,060' Slope=0.0870 '/' Tc=20.6 min CN=58 Runoff=11.7 cfs 57,144 cf

Subcatchment E102S: Rte 20 to site Runoff Area=52,686 sf 67.63% Impervious Runoff Depth=5.37"
Tc=6.0 min CN=86 Runoff=7.2 cfs 23,558 cf

Subcatchment E103S: Rte 20 to Stoney Hill Runoff Area=11,612 sf 10.67% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=68 Runoff=1.0 cfs 3,300 cf

Subcatchment E201S: to Southeast Runoff Area=170,824 sf 3.28% Impervious Runoff Depth=2.80"
Flow Length=880' Slope=0.0940 '/' Tc=15.4 min CN=62 Runoff=9.4 cfs 39,874 cf

Subcatchment E202S: YRC to site Runoff Area=71,687 sf 72.93% Impervious Runoff Depth=5.59"
Tc=6.0 min CN=88 Runoff=10.1 cfs 33,415 cf

Reach E201R: across site Avg. Flow Depth=0.52' Max Vel=0.38 fps Inflow=7.2 cfs 23,558 cf
n=0.400 L=800.0' S=0.0625 '/' Capacity=111.4 cfs Outflow=3.1 cfs 23,558 cf

Reach E202R: across site Avg. Flow Depth=0.43' Max Vel=0.36 fps Inflow=10.1 cfs 33,415 cf
n=0.400 L=930.0' S=0.0720 '/' Capacity=111.1 cfs Outflow=3.8 cfs 33,415 cf

Link E1L: Stoney Hill Rd Inflow=12.7 cfs 84,002 cf
Primary=12.7 cfs 84,002 cf

Link E2L: Southeast Inflow=10.0 cfs 73,288 cf
Primary=10.0 cfs 73,288 cf

Total Runoff Area = 591,432 sf Runoff Volume = 157,290 cf Average Runoff Depth = 3.19"
83.67% Pervious = 494,873 sf 16.33% Impervious = 96,559 sf

Summary for Subcatchment E101S: to Stoney Hill

Runoff = 11.7 cfs @ 12.31 hrs, Volume= 57,144 cf, Depth= 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

	Area (sf)	CN	Description
	221,698	55	Woods, Good, HSG B
*	1,797	98	WETLAND, HSG B
	61,128	70	Woods, Good, HSG C
	284,623	58	Weighted Average
	282,826		99.37% Pervious Area
	1,797		0.63% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.6	1,060	0.0870	0.86		**Lag/CN Method,**

Summary for Subcatchment E102S: Rte 20 to site

Runoff = 7.2 cfs @ 12.09 hrs, Volume= 23,558 cf, Depth= 5.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
33,890	98	Paved roads w/curbs & sewers, HSG B
12,714	61	>75% Grass cover, Good, HSG B
1,741	98	Paved roads w/curbs & sewers, HSG C
2,487	74	>75% Grass cover, Good, HSG C
1,854	55	Woods, Good, HSG B
52,686	86	Weighted Average
17,055		32.37% Pervious Area
35,631		67.63% Impervious Area

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

Summary for Subcatchment E103S: Rte 20 to Stoney Hill

Runoff = 1.0 cfs @ 12.09 hrs, Volume= 3,300 cf, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
1,239	98	Paved roads w/curbs & sewers, HSG B
8,000	61	>75% Grass cover, Good, HSG B
2,373	74	>75% Grass cover, Good, HSG C
11,612	68	Weighted Average
10,373		89.33% Pervious Area
1,239		10.67% Impervious Area

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

Summary for Subcatchment E201S: to Southeast

Runoff = 9.4 cfs @ 12.22 hrs, Volume= 39,874 cf, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

	Area (sf)	CN	Description
	100,494	55	Woods, Good, HSG B
*	5,608	98	WETLAND, HSG B
	64,722	70	Woods, Good, HSG C
	170,824	62	Weighted Average
	165,216		96.72% Pervious Area
	5,608		3.28% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.4	880	0.0940	0.95		**Lag/CN Method,**

Summary for Subcatchment E202S: YRC to site

Runoff = 10.1 cfs @ 12.09 hrs, Volume= 33,415 cf, Depth= 5.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

	Area (sf)	CN	Description
*	52,284	98	Paved parking, HSG B
	19,268	61	>75% Grass cover, Good, HSG B
	135	70	Woods, Good, HSG C
	71,687	88	Weighted Average
	19,403		27.07% Pervious Area
	52,284		72.93% Impervious Area

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

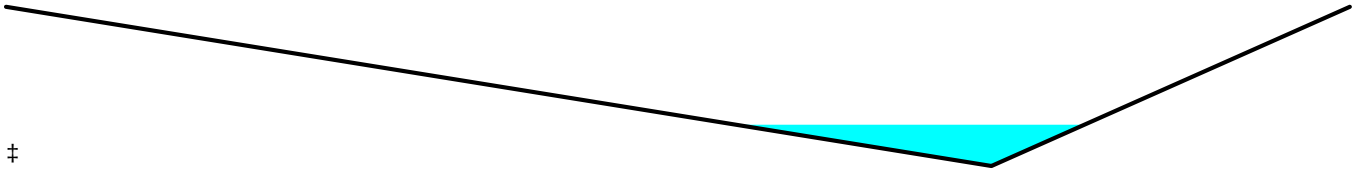
Summary for Reach E201R: across site

Inflow Area = 52,686 sf, 67.63% Impervious, Inflow Depth = 5.37" for 100-year event
Inflow = 7.2 cfs @ 12.09 hrs, Volume= 23,558 cf
Outflow = 3.1 cfs @ 12.89 hrs, Volume= 23,558 cf, Atten= 58%, Lag= 47.9 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.38 fps, Min. Travel Time= 35.3 min
Avg. Velocity = 0.10 fps, Avg. Travel Time= 134.2 min

Peak Storage= 6,469 cf @ 12.30 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 2.00' Flow Area= 120.0 sf, Capacity= 111.4 cfs

Custom cross-section, Length= 800.0' Slope= 0.0625 '/'
Constant n= 0.400 Sheet flow: Woods+light brush
Inlet Invert= 464.00', Outlet Invert= 414.00'



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Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	426.00	0.00
88.00	424.00	2.00
120.00	426.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.0
2.00	120.0	120.1	96,000	111.4

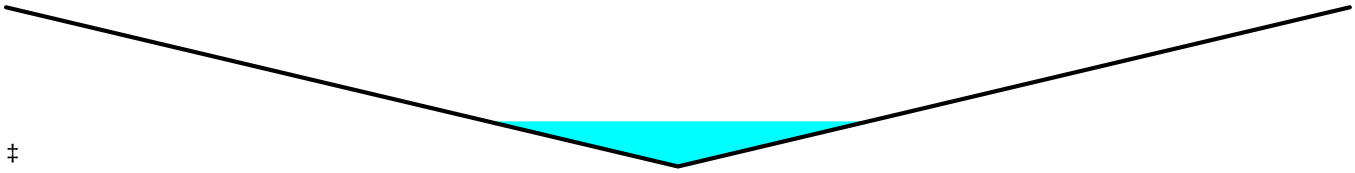
Summary for Reach E202R: across site

Inflow Area = 71,687 sf, 72.93% Impervious, Inflow Depth = 5.59" for 100-year event
Inflow = 10.1 cfs @ 12.09 hrs, Volume= 33,415 cf
Outflow = 3.8 cfs @ 13.06 hrs, Volume= 33,415 cf, Atten= 62%, Lag= 58.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.36 fps, Min. Travel Time= 43.6 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 180.4 min

Peak Storage= 10,088 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.50' Flow Area= 135.0 sf, Capacity= 111.1 cfs

Custom cross-section, Length= 930.0' Slope= 0.0720 '/'
Constant n= 0.400 Sheet flow: Woods+light brush
Inlet Invert= 488.00', Outlet Invert= 421.00'



‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	436.00	0.00
90.00	434.50	1.50
180.00	436.00	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.0
1.50	135.0	180.0	125,550	111.1

Summary for Link E1L: Stoney Hill Rd

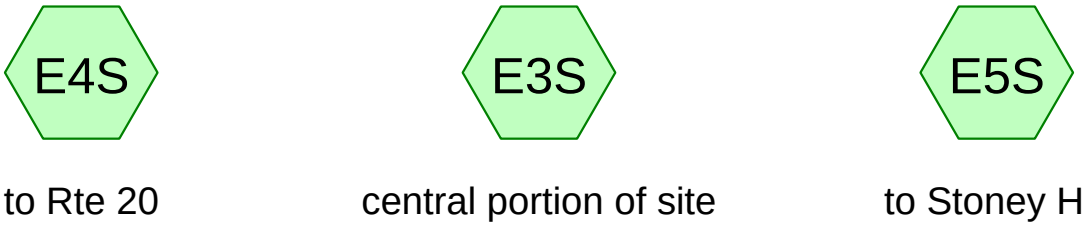
Inflow Area = 348,921 sf, 11.08% Impervious, Inflow Depth = 2.89" for 100-year event
Inflow = 12.7 cfs @ 12.31 hrs, Volume= 84,002 cf
Primary = 12.7 cfs @ 12.31 hrs, Volume= 84,002 cf, Atten= 0%, Lag= 0.0 min

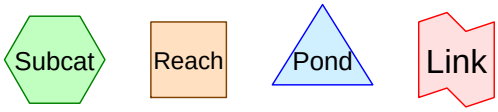
Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Summary for Link E2L: Southeast

Inflow Area = 242,511 sf, 23.87% Impervious, Inflow Depth = 3.63" for 100-year event
Inflow = 10.0 cfs @ 12.22 hrs, Volume= 73,288 cf
Primary = 10.0 cfs @ 12.22 hrs, Volume= 73,288 cf, Atten= 0%, Lag= 0.0 min

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





Routing Diagram for 927.02 Existing Phase 2
Prepared by Waterman Design Associates, Inc.
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
57,784	74	>75% Grass cover, Good, HSG C (E3S, E4S, E5S)
629	98	Unconnected pavement, HSG C (E3S)
184,530	70	Woods, Good, HSG C (E3S, E4S, E5S)
1,959	98	ledge, HSG C (E3S)
76	89	rip rap, HSG C (E3S)
244,978	**71**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
244,978	HSG C	E3S, E4S, E5S
0	HSG D	
0	Other	
244,978		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
0	0	57,784	0	0	57,784	>75% Grass cover, Good	E3S, E4S, E5S
0	0	629	0	0	629	Unconnected pavement	E3S
0	0	184,530	0	0	184,530	Woods, Good	E3S, E4S, E5S
0	0	1,959	0	0	1,959	ledge	E3S
0	0	76	0	0	76	rip rap	E3S
0	**0**	**244,978**	**0**	**0**	**244,978**	**TOTAL AREA**	

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E3S: central portion of site Runoff Area=176,259 sf 1.47% Impervious Runoff Depth>0.88"
Flow Length=420' Slope=0.1100 '/' Tc=6.0 min UI Adjusted CN=71 Runoff=3.7 cfs 12,881 cf

Subcatchment E4S: to Rte 20 Runoff Area=51,852 sf 0.00% Impervious Runoff Depth>0.83"
Tc=6.0 min CN=70 Runoff=1.0 cfs 3,573 cf

Subcatchment E5S: to Stoney Hill Runoff Area=16,867 sf 0.00% Impervious Runoff Depth>0.88"
Tc=6.0 min CN=71 Runoff=0.4 cfs 1,233 cf

Total Runoff Area = 244,978 sf Runoff Volume = 17,687 cf Average Runoff Depth = 0.87"
98.94% Pervious = 242,390 sf 1.06% Impervious = 2,588 sf

Summary for Subcatchment E3S: central portion of site

Runoff = 3.7 cfs @ 12.10 hrs, Volume= 12,881 cf, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

	Area (sf)	CN	Adj	Description
	29,232	74		>75% Grass cover, Good, HSG C
*	76	89		rip rap, HSG C
*	1,959	98		ledge, HSG C
	55,968	70		Woods, Good, HSG C
	12,961	70		Woods, Good, HSG C
	19,305	74		>75% Grass cover, Good, HSG C
	271	74		>75% Grass cover, Good, HSG C
	55,858	70		Woods, Good, HSG C
	629	98		Unconnected pavement, HSG C
	176,259	72	71	Weighted Average, UI Adjusted
	173,671			98.53% Pervious Area
	2,588			1.47% Impervious Area
	629			24.30% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	420	0.1100	1.16		**Lag/CN Method,**

Summary for Subcatchment E4S: to Rte 20

Runoff = 1.0 cfs @ 12.10 hrs, Volume= 3,573 cf, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
4,447	74	>75% Grass cover, Good, HSG C
47,405	70	Woods, Good, HSG C
51,852	70	Weighted Average
51,852		100.00% Pervious Area

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

Summary for Subcatchment E5S: to Stoney Hill

Runoff = 0.4 cfs @ 12.10 hrs, Volume= 1,233 cf, Depth> 0.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
4,529	74	>75% Grass cover, Good, HSG C
12,338	70	Woods, Good, HSG C
16,867	71	Weighted Average
16,867		100.00% Pervious Area

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

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E3S: central portion of site Runoff Area=176,259 sf 1.47% Impervious Runoff Depth>1.96"
Flow Length=420' Slope=0.1100 '/' Tc=6.0 min UI Adjusted CN=71 Runoff=9.0 cfs 28,854 cf

Subcatchment E4S: to Rte 20 Runoff Area=51,852 sf 0.00% Impervious Runoff Depth>1.89"
Tc=6.0 min CN=70 Runoff=2.5 cfs 8,155 cf

Subcatchment E5S: to Stoney Hill Runoff Area=16,867 sf 0.00% Impervious Runoff Depth>1.96"
Tc=6.0 min CN=71 Runoff=0.9 cfs 2,761 cf

Total Runoff Area = 244,978 sf Runoff Volume = 39,770 cf Average Runoff Depth = 1.95"
98.94% Pervious = 242,390 sf 1.06% Impervious = 2,588 sf

Summary for Subcatchment E3S: central portion of site

Runoff = 9.0 cfs @ 12.10 hrs, Volume= 28,854 cf, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Adj	Description
	29,232	74		>75% Grass cover, Good, HSG C
*	76	89		rip rap, HSG C
*	1,959	98		ledge, HSG C
	55,968	70		Woods, Good, HSG C
	12,961	70		Woods, Good, HSG C
	19,305	74		>75% Grass cover, Good, HSG C
	271	74		>75% Grass cover, Good, HSG C
	55,858	70		Woods, Good, HSG C
	629	98		Unconnected pavement, HSG C
	176,259	72	71	Weighted Average, UI Adjusted
	173,671			98.53% Pervious Area
	2,588			1.47% Impervious Area
	629			24.30% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	420	0.1100	1.16		**Lag/CN Method,**

Summary for Subcatchment E4S: to Rte 20

Runoff = 2.5 cfs @ 12.10 hrs, Volume= 8,155 cf, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
4,447	74	>75% Grass cover, Good, HSG C
47,405	70	Woods, Good, HSG C
51,852	70	Weighted Average
51,852		100.00% Pervious Area

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

Summary for Subcatchment E5S: to Stoney Hill

Runoff = 0.9 cfs @ 12.10 hrs, Volume= 2,761 cf, Depth> 1.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
4,529	74	>75% Grass cover, Good, HSG C
12,338	70	Woods, Good, HSG C
16,867	71	Weighted Average
16,867		100.00% Pervious Area

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

Time span=0.00-24.00 hrs, dt=0.05 hrs, 481 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment E3S: central portion of site Runoff Area=176,259 sf 1.47% Impervious Runoff Depth>3.72"
Flow Length=420' Slope=0.1100 '/' Tc=6.0 min UI Adjusted CN=71 Runoff=17.3 cfs 54,640 cf

Subcatchment E4S: to Rte 20 Runoff Area=51,852 sf 0.00% Impervious Runoff Depth>3.62"
Tc=6.0 min CN=70 Runoff=4.9 cfs 15,621 cf

Subcatchment E5S: to Stoney Hill Runoff Area=16,867 sf 0.00% Impervious Runoff Depth>3.72"
Tc=6.0 min CN=71 Runoff=1.7 cfs 5,229 cf

Total Runoff Area = 244,978 sf Runoff Volume = 75,490 cf Average Runoff Depth = 3.70"
98.94% Pervious = 242,390 sf 1.06% Impervious = 2,588 sf

Summary for Subcatchment E3S: central portion of site

Runoff = 17.3 cfs @ 12.09 hrs, Volume= 54,640 cf, Depth> 3.72"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

	Area (sf)	CN	Adj	Description
	29,232	74		>75% Grass cover, Good, HSG C
*	76	89		rip rap, HSG C
*	1,959	98		ledge, HSG C
	55,968	70		Woods, Good, HSG C
	12,961	70		Woods, Good, HSG C
	19,305	74		>75% Grass cover, Good, HSG C
	271	74		>75% Grass cover, Good, HSG C
	55,858	70		Woods, Good, HSG C
	629	98		Unconnected pavement, HSG C
	176,259	72	71	Weighted Average, UI Adjusted
	173,671			98.53% Pervious Area
	2,588			1.47% Impervious Area
	629			24.30% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0	420	0.1100	1.16		**Lag/CN Method,**

Summary for Subcatchment E4S: to Rte 20

Runoff = 4.9 cfs @ 12.09 hrs, Volume= 15,621 cf, Depth> 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
4,447	74	>75% Grass cover, Good, HSG C
47,405	70	Woods, Good, HSG C
51,852	70	Weighted Average
51,852		100.00% Pervious Area

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

Summary for Subcatchment E5S: to Stoney Hill

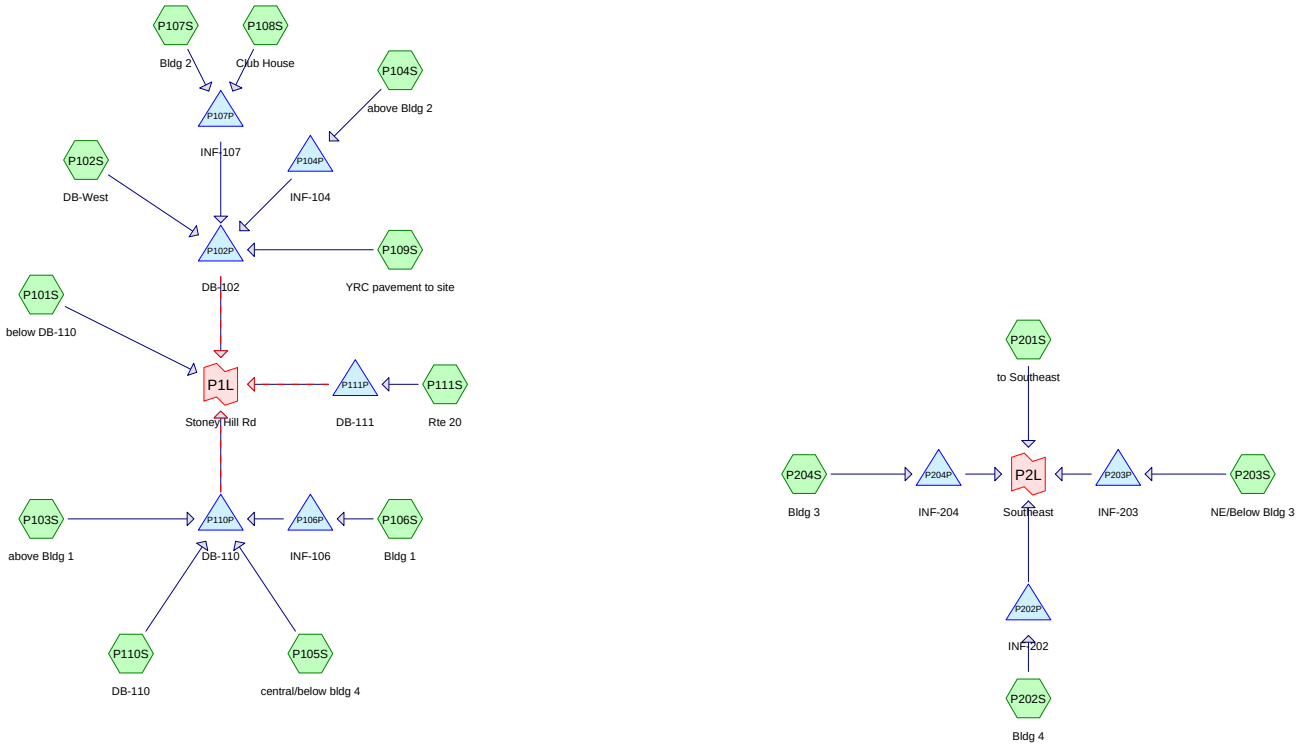
Runoff = 1.7 cfs @ 12.09 hrs, Volume= 5,229 cf, Depth> 3.72"

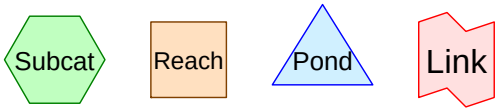
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
4,529	74	>75% Grass cover, Good, HSG C
12,338	70	Woods, Good, HSG C
16,867	71	Weighted Average
16,867		100.00% Pervious Area

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

PROPOSED HYDROLOGY





Routing Diagram for 927.01 Proposed Phase 1
Prepared by Waterman Design Associates, Inc.
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
205,174	61	>75% Grass cover, Good, HSG B (P101S, P102S, P103S, P104S, P105S, P110S, P111S, P201S, P203S)
56,868	74	>75% Grass cover, Good, HSG C (P103S, P104S, P105S, P111S, P201S, P203S)
181,455	98	Paved parking, HSG B (P101S, P102S, P103S, P104S, P105S, P109S, P111S, P203S)
46,238	98	Paved parking, HSG C (P103S, P104S, P105S, P111S, P203S)
40,368	98	Roofs, HSG B (P106S, P107S, P108S, P202S, P204S)
28,818	98	Roofs, HSG C (P107S, P108S, P204S)
7,640	98	Unconnected roofs, HSG B (P103S, P104S, P203S)
7,405	98	WETLAND, HSG B (P101S, P201S)
16,804	55	Woods, Good, HSG B (P101S, P201S)
662	70	Woods, Good, HSG C (P201S)
591,432	**82**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
458,846	HSG B	P101S, P102S, P103S, P104S, P105S, P106S, P107S, P108S, P109S, P110S, P111S, P201S, P202S, P203S, P204S
132,586	HSG C	P103S, P104S, P105S, P107S, P108S, P111S, P201S, P203S, P204S
0	HSG D	
0	Other	
591,432		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
0	205,174	56,868	0	0	262,042	>75% Grass cover, Good	P101S, P102S, P103S, P104S, P105S, P110S, P111S, P201S, P203S
0	181,455	46,238	0	0	227,693	Paved parking	P101S, P102S, P103S, P104S, P105S, P109S, P111S, P203S
0	40,368	28,818	0	0	69,186	Roofs	P106S, P107S, P108S, P202S, P204S
0	7,640	0	0	0	7,640	Unconnected roofs	P103S, P104S, P203S
0	7,405	0	0	0	7,405	WETLAND	P101S, P201S
0	16,804	662	0	0	17,466	Woods, Good	P101S, P201S
0	**458,846**	**132,586**	**0**	**0**	**591,432**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	P102P	422.00	418.00	144.0	0.0278	0.012	12.0	0.0	0.0
2	P102P	422.00	418.00	127.0	0.0315	0.013	12.0	0.0	0.0
3	P110P	420.00	418.00	39.0	0.0513	0.013	12.0	0.0	0.0
4	P111P	430.00	418.00	263.0	0.0456	0.012	12.0	0.0	0.0

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

Subcatchment P101S: below DB-110 Runoff Area=21,910 sf 23.95% Impervious Runoff Depth=0.73"
Tc=6.0 min CN=68 Runoff=0.4 cfs 1,338 cf

Subcatchment P102S: DB-West Runoff Area=25,321 sf 3.67% Impervious Runoff Depth=0.48"
Tc=6.0 min CN=62 Runoff=0.2 cfs 1,015 cf

Subcatchment P103S: above Bldg 1 Runoff Area=59,294 sf 65.65% Impervious Runoff Depth=1.84"
Flow Length=463' Slope=0.0518 '/' Tc=6.2 min CN=86 Runoff=2.9 cfs 9,068 cf

Subcatchment P104S: above Bldg 2 Runoff Area=62,460 sf 55.61% Impervious Runoff Depth=1.68"
Tc=6.0 min CN=84 Runoff=2.8 cfs 8,757 cf

Subcatchment P105S: central/below bldg 4 Runoff Area=83,356 sf 28.26% Impervious Runoff Depth=1.09"
Tc=6.0 min CN=75 Runoff=2.3 cfs 7,599 cf

Subcatchment P106S: Bldg 1 Runoff Area=16,067 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=1.1 cfs 3,973 cf

Subcatchment P107S: Bldg 2 Runoff Area=16,148 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=1.1 cfs 3,993 cf

Subcatchment P108S: Club House Runoff Area=4,675 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=0.3 cfs 1,156 cf

Subcatchment P109S: YRC pavement to site Runoff Area=52,337 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=3.6 cfs 12,942 cf

Subcatchment P110S: DB-110 Runoff Area=21,100 sf 0.00% Impervious Runoff Depth=0.44"
Tc=6.0 min CN=61 Runoff=0.2 cfs 781 cf

Subcatchment P111S: Rte 20 Runoff Area=89,283 sf 59.87% Impervious Runoff Depth=1.61"
Tc=6.0 min CN=83 Runoff=3.8 cfs 11,973 cf

Subcatchment P201S: to Southeast Runoff Area=29,995 sf 18.70% Impervious Runoff Depth=0.73"
Flow Length=400' Slope=0.0518 '/' Tc=9.4 min CN=68 Runoff=0.4 cfs 1,831 cf

Subcatchment P202S: Bldg 4 Runoff Area=16,148 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=1.1 cfs 3,993 cf

Subcatchment P203S: NE/Below Bldg 3 Runoff Area=77,190 sf 36.20% Impervious Runoff Depth=1.15"
Tc=6.0 min CN=76 Runoff=2.3 cfs 7,410 cf

Subcatchment P204S: Bldg 3 Runoff Area=16,148 sf 100.00% Impervious Runoff Depth=2.97"
Tc=6.0 min CN=98 Runoff=1.1 cfs 3,993 cf

Pond P102P: DB-102 Peak Elev=424.31' Storage=5,985 cf Inflow=3.8 cfs 13,957 cf
Primary=0.3 cfs 13,957 cf Secondary=0.0 cfs 0 cf Outflow=0.3 cfs 13,957 cf

Pond P104P: INF-104 Peak Elev=449.51' Storage=5,593 cf Inflow=2.8 cfs 8,757 cf
Discarded=0.1 cfs 8,757 cf Primary=0.0 cfs 0 cf Outflow=0.1 cfs 8,757 cf

Pond P106P: INF-106 Peak Elev=446.22' Storage=2,494 cf Inflow=1.1 cfs 3,973 cf
Discarded=0.0 cfs 3,973 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 3,973 cf

Pond P107P: INF-107 Peak Elev=458.87' Storage=3,565 cf Inflow=1.5 cfs 5,149 cf
Discarded=0.0 cfs 5,149 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 5,149 cf

Pond P110P: DB-110 Peak Elev=423.30' Storage=10,284 cf Inflow=5.3 cfs 17,447 cf
Primary=0.3 cfs 17,413 cf Secondary=0.0 cfs 0 cf Outflow=0.3 cfs 17,413 cf

Pond P111P: DB-111 Peak Elev=432.32' Storage=5,326 cf Inflow=3.8 cfs 11,973 cf
Primary=0.4 cfs 11,973 cf Secondary=0.0 cfs 0 cf Outflow=0.4 cfs 11,973 cf

Pond P202P: INF-202 Peak Elev=437.23' Storage=2,664 cf Inflow=1.1 cfs 3,993 cf
Discarded=0.0 cfs 3,993 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 3,993 cf

Pond P203P: INF-203 Peak Elev=439.07' Storage=5,014 cf Inflow=2.3 cfs 7,410 cf
Discarded=0.1 cfs 7,410 cf Primary=0.0 cfs 0 cf Outflow=0.1 cfs 7,410 cf

Pond P204P: INF-204 Peak Elev=443.48' Storage=3,168 cf Inflow=1.1 cfs 3,993 cf
Discarded=0.0 cfs 3,832 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 3,832 cf

Link P1L: Stoney Hill Rd Inflow=1.1 cfs 44,680 cf
Primary=1.1 cfs 44,680 cf

Link P2L: Southeast Inflow=0.4 cfs 1,831 cf
Primary=0.4 cfs 1,831 cf

Total Runoff Area = 591,432 sf Runoff Volume = 79,822 cf Average Runoff Depth = 1.62"
47.26% Pervious = 279,508 sf 52.74% Impervious = 311,924 sf

Summary for Subcatchment P101S: below DB-110

Runoff = 0.4 cfs @ 12.11 hrs, Volume= 1,338 cf, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

	Area (sf)	CN	Description
	3,450	98	Paved parking, HSG B
	10,959	61	>75% Grass cover, Good, HSG B
	5,704	55	Woods, Good, HSG B
*	1,797	98	WETLAND, HSG B
	21,910	68	Weighted Average
	16,663		76.05% Pervious Area
	5,247		23.95% Impervious Area

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

Summary for Subcatchment P102S: DB-West

Runoff = 0.2 cfs @ 12.12 hrs, Volume= 1,015 cf, Depth= 0.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
24,391	61	>75% Grass cover, Good, HSG B
930	98	Paved parking, HSG B
25,321	62	Weighted Average
24,391		96.33% Pervious Area
930		3.67% Impervious Area

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

Summary for Subcatchment P103S: above Bldg 1

Runoff = 2.9 cfs @ 12.09 hrs, Volume= 9,068 cf, Depth= 1.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
1,708	98	Paved parking, HSG C
1,063	74	>75% Grass cover, Good, HSG C
33,400	98	Paved parking, HSG B
19,303	61	>75% Grass cover, Good, HSG B
3,820	98	Unconnected roofs, HSG B
59,294	86	Weighted Average
20,366		34.35% Pervious Area
38,928		65.65% Impervious Area
3,820		9.81% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	463	0.0518	1.25		**Lag/CN Method,**

Summary for Subcatchment P104S: above Bldg 2

Runoff = 2.8 cfs @ 12.09 hrs, Volume= 8,757 cf, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
22,133	98	Paved parking, HSG C
13,086	74	>75% Grass cover, Good, HSG C
10,692	98	Paved parking, HSG B
14,639	61	>75% Grass cover, Good, HSG B
1,910	98	Unconnected roofs, HSG B
62,460	84	Weighted Average
27,725		44.39% Pervious Area
34,735		55.61% Impervious Area
1,910		5.50% Unconnected

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

Summary for Subcatchment P105S: central/below bldg 4

Runoff = 2.3 cfs @ 12.10 hrs, Volume= 7,599 cf, Depth= 1.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
20,194	98	Paved parking, HSG B
34,869	61	>75% Grass cover, Good, HSG B
24,928	74	>75% Grass cover, Good, HSG C
3,365	98	Paved parking, HSG C
83,356	75	Weighted Average
59,797		71.74% Pervious Area
23,559		28.26% Impervious Area

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

Summary for Subcatchment P106S: Bldg 1

Runoff = 1.1 cfs @ 12.09 hrs, Volume= 3,973 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
16,067	98	Roofs, HSG B
16,067		100.00% Impervious Area

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

Summary for Subcatchment P107S: Bldg 2

Runoff = 1.1 cfs @ 12.09 hrs, Volume= 3,993 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
2,888	98	Roofs, HSG B
13,260	98	Roofs, HSG C
16,148	98	Weighted Average
16,148		100.00% Impervious Area

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

Summary for Subcatchment P108S: Club House

Runoff = 0.3 cfs @ 12.09 hrs, Volume= 1,156 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
3,575	98	Roofs, HSG B
1,100	98	Roofs, HSG C
4,675	98	Weighted Average
4,675		100.00% Impervious Area

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

Summary for Subcatchment P109S: YRC pavement to site

Runoff = 3.6 cfs @ 12.09 hrs, Volume= 12,942 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
52,337	98	Paved parking, HSG B
52,337		100.00% Impervious Area

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

Summary for Subcatchment P110S: DB-110

Runoff = 0.2 cfs @ 12.13 hrs, Volume= 781 cf, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
21,100	61	>75% Grass cover, Good, HSG B
21,100		100.00% Pervious Area

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

Summary for Subcatchment P111S: Rte 20

Runoff = 3.8 cfs @ 12.09 hrs, Volume= 11,973 cf, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
45,722	98	Paved parking, HSG B
33,772	61	>75% Grass cover, Good, HSG B
4,381	98	Paved parking, HSG C
2,060	74	>75% Grass cover, Good, HSG C
791	98	Paved parking, HSG C
2,557	98	Paved parking, HSG B
89,283	83	Weighted Average
35,832		40.13% Pervious Area
53,451		59.87% Impervious Area

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

Summary for Subcatchment P201S: to Southeast

Runoff = 0.4 cfs @ 12.16 hrs, Volume= 1,831 cf, Depth= 0.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

	Area (sf)	CN	Description
	4,076	74	>75% Grass cover, Good, HSG C
	662	70	Woods, Good, HSG C
	8,549	61	>75% Grass cover, Good, HSG B
	11,100	55	Woods, Good, HSG B
*	5,608	98	WETLAND, HSG B
	29,995	68	Weighted Average
	24,387		81.30% Pervious Area
	5,608		18.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	400	0.0518	0.71		**Lag/CN Method,**

Summary for Subcatchment P202S: Bldg 4

Runoff = 1.1 cfs @ 12.09 hrs, Volume= 3,993 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
16,148	98	Roofs, HSG B
16,148		100.00% Impervious Area

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

Summary for Subcatchment P203S: NE/Below Bldg 3

Runoff = 2.3 cfs @ 12.10 hrs, Volume= 7,410 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
12,173	98	Paved parking, HSG B
37,592	61	>75% Grass cover, Good, HSG B
13,860	98	Paved parking, HSG C
11,655	74	>75% Grass cover, Good, HSG C
1,910	98	Unconnected roofs, HSG B
77,190	76	Weighted Average
49,247		63.80% Pervious Area
27,943		36.20% Impervious Area
1,910		6.84% Unconnected

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

Summary for Subcatchment P204S: Bldg 3

Runoff = 1.1 cfs @ 12.09 hrs, Volume= 3,993 cf, Depth= 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
1,690	98	Roofs, HSG B
14,458	98	Roofs, HSG C
16,148	98	Weighted Average
16,148		100.00% Impervious Area

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

Summary for Pond P102P: DB-102

Inflow Area = 160,941 sf, 67.62% Impervious, Inflow Depth = 1.04" for 2-year event
Inflow = 3.8 cfs @ 12.09 hrs, Volume= 13,957 cf
Outflow = 0.3 cfs @ 13.02 hrs, Volume= 13,957 cf, Atten= 91%, Lag= 56.1 min
Primary = 0.3 cfs @ 13.02 hrs, Volume= 13,957 cf
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 424.31' @ 13.02 hrs Surf.Area= 4,079 sf Storage= 5,985 cf

Plug-Flow detention time= 171.9 min calculated for 13,957 cf (100% of inflow)
Center-of-Mass det. time= 171.6 min (939.2 - 767.5)

Volume	Invert	Avail.Storage	Storage Description
#1	422.00'	27,095 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
422.00	240	0	0
422.50	1,840	520	520
424.00	3,820	4,245	4,765
426.00	5,500	9,320	14,085
428.00	7,510	13,010	27,095

Device	Routing	Invert	Outlet Devices
#1	Primary	422.00'	**12.0" Round Culvert** L= 144.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 422.00' / 418.00' S= 0.0278 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	422.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	425.60'	**10.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	426.80'	**16.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	422.00'	**12.0" Round Culvert** L= 127.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 422.00' / 418.00' S= 0.0315 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#6	Device 5	427.00'	**16.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.3 cfs @ 13.02 hrs HW=424.31' (Free Discharge)
- **1=Culvert** (Passes 0.3 cfs of 5.1 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.3 cfs @ 7.12 fps)
  - **3=Orifice/Grate** (Controls 0.0 cfs)
- **4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=422.00' (Free Discharge)
- **5=Culvert** (Controls 0.0 cfs)
  - **6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P104P: INF-104

Inflow Area =	62,460 sf, 55.61% Impervious, Inflow Depth = 1.68" for 2-year event				
Inflow =	2.8 cfs @	12.09 hrs,	Volume=	8,757 cf	
Outflow =	0.1 cfs @	10.95 hrs,	Volume=	8,757 cf,	Atten= 97%, Lag= 0.0 min
Discarded =	0.1 cfs @	10.95 hrs,	Volume=	8,757 cf	
Primary =	0.0 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 449.51' @ 17.30 hrs Surf.Area= 3,196 sf Storage= 5,593 cf

Plug-Flow detention time= 738.7 min calculated for 8,752 cf (100% of inflow)
Center-of-Mass det. time= 739.0 min (1,568.5 - 829.6)

Volume	Invert	Avail.Storage	Storage Description
#1	447.00'	5,288 cf	**47.00'W x 68.00'L x 6.75'H Prismatoid** 21,573 cf Overall - 8,354 cf Embedded = 13,219 cf x 40.0% Voids
#2	447.75'	8,354 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 75 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 5 Rows of 15 Chambers Cap Storage= +35.7 cf x 2 x 5 rows = 357.0 cf
		13,641 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	447.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	451.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.1 cfs @ 10.95 hrs HW=447.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=447.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond P106P: INF-106

Inflow Area = 16,067 sf,100.00% Impervious, Inflow Depth = 2.97" for 2-year event
Inflow = 1.1 cfs @ 12.09 hrs, Volume= 3,973 cf
Outflow = 0.0 cfs @ 8.35 hrs, Volume= 3,973 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 8.35 hrs, Volume= 3,973 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 446.22' @ 16.83 hrs Surf.Area= 1,120 sf Storage= 2,494 cf

Plug-Flow detention time= 828.4 min calculated for 3,971 cf (100% of inflow)
Center-of-Mass det. time= 828.7 min (1,585.1 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1	443.00'	1,943 cf	**20.00'W x 56.00'L x 6.75'H Prismatoid** 7,560 cf Overall - 2,702 cf Embedded = 4,858 cf x 40.0% Voids
#2	443.75'	2,702 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 24 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 2 Rows of 12 Chambers Cap Storage= +35.7 cf x 2 x 2 rows = 142.8 cf
		4,645 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	443.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	447.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 8.35 hrs HW=443.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=443.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond P107P: INF-107

Inflow Area = 20,823 sf,100.00% Impervious, Inflow Depth = 2.97" for 2-year event
Inflow = 1.5 cfs @ 12.09 hrs, Volume= 5,149 cf
Outflow = 0.0 cfs @ 7.65 hrs, Volume= 5,149 cf, Atten= 98%, Lag= 0.0 min
Discarded = 0.0 cfs @ 7.65 hrs, Volume= 5,149 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 458.87' @ 18.00 hrs Surf.Area= 4,044 sf Storage= 3,565 cf

Plug-Flow detention time= 1,242.6 min calculated for 5,147 cf (100% of inflow)
Center-of-Mass det. time= 1,243.1 min (1,999.5 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1	457.00'	3,649 cf	**52.00'W x 60.00'L x 3.50'H Prismatoid** 10,920 cf Overall - 1,797 cf Embedded = 9,123 cf x 40.0% Voids
#2	457.00'	1,186 cf	**22.00'W x 42.00'L x 3.50'H Prismatoid** 3,234 cf Overall - 269 cf Embedded = 2,965 cf x 40.0% Voids
#3	458.00'	1,797 cf	**24.0" Round Pipe Storage** x 11 Inside #1 L= 52.0'
#4	458.00'	269 cf	**18.0" Round Pipe Storage** x 4 Inside #2 L= 38.0'
		6,901 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	457.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	459.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 7.65 hrs HW=457.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=457.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond P110P: DB-110

Inflow Area = 179,817 sf, 43.69% Impervious, Inflow Depth = 1.16" for 2-year event
Inflow = 5.3 cfs @ 12.10 hrs, Volume= 17,447 cf
Outflow = 0.3 cfs @ 15.61 hrs, Volume= 17,413 cf, Atten= 95%, Lag= 210.8 min
Primary = 0.3 cfs @ 15.61 hrs, Volume= 17,413 cf
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 423.30' @ 15.61 hrs Surf.Area= 9,303 sf Storage= 10,284 cf

Plug-Flow detention time= 558.2 min calculated for 17,413 cf (100% of inflow)
Center-of-Mass det. time= 557.0 min (1,399.6 - 842.6)

Volume	Invert	Avail.Storage	Storage Description
#1	422.00'	43,126 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
422.00	6,555	0	0
424.00	10,793	17,348	17,348
426.00	14,985	25,778	43,126

Device	Routing	Invert	Outlet Devices
#1	Primary	420.00'	**12.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 420.00' / 418.00' S= 0.0513 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	422.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	423.40'	**10.0" Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	424.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	425.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=0.3 cfs @ 15.61 hrs HW=423.30' (Free Discharge)
└─**1=Culvert** (Passes 0.3 cfs of 6.3 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.3 cfs @ 5.21 fps)
  ├─**3=Orifice/Grate** (Controls 0.0 cfs)
  └─**4=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=422.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir**(Controls 0.0 cfs)

Summary for Pond P111P: DB-111

Inflow Area =	89,283 sf, 59.87% Impervious, Inflow Depth = 1.61" for 2-year event				
Inflow =	3.8 cfs @	12.09 hrs,	Volume=	11,973 cf	
Outflow =	0.4 cfs @	13.18 hrs,	Volume=	11,973 cf,	Atten= 91%, Lag= 65.1 min
Primary =	0.4 cfs @	13.18 hrs,	Volume=	11,973 cf	
Secondary =	0.0 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 432.32' @ 13.18 hrs Surf.Area= 3,336 sf Storage= 5,326 cf

Plug-Flow detention time= 173.6 min calculated for 11,973 cf (100% of inflow)
Center-of-Mass det. time= 173.1 min (1,006.0 - 832.9)

Volume	Invert	Avail.Storage	Storage Description
#1	430.00'	22,935 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
430.00	600	0	0
431.00	2,440	1,520	1,520
432.00	3,090	2,765	4,285
434.00	4,610	7,700	11,985
436.00	6,340	10,950	22,935

Device	Routing	Invert	Outlet Devices
#1	Primary	430.00'	**12.0" Round Culvert** L= 263.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 430.00' / 418.00' S= 0.0456 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	430.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	433.75'	**8.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	434.90'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	435.00'	**10.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.4 cfs @ 13.18 hrs HW=432.32' (Free Discharge)
└─**1=Culvert** (Passes 0.4 cfs of 5.1 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.4 cfs @ 7.14 fps)
  ├─**3=Orifice/Grate** (Controls 0.0 cfs)
  └─**4=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=430.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir**(Controls 0.0 cfs)

Summary for Pond P202P: INF-202

Inflow Area =	16,148 sf,100.00% Impervious, Inflow Depth = 2.97" for 2-year event				
Inflow =	1.1 cfs @	12.09 hrs,	Volume=	3,993 cf	
Outflow =	0.0 cfs @	7.80 hrs,	Volume=	3,993 cf,	Atten= 98%, Lag= 0.0 min
Discarded =	0.0 cfs @	7.80 hrs,	Volume=	3,993 cf	
Primary =	0.0 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 437.23' @ 17.61 hrs Surf.Area= 928 sf Storage= 2,664 cf

Plug-Flow detention time= 1,067.1 min calculated for 3,991 cf (100% of inflow)
Center-of-Mass det. time= 1,067.5 min (1,823.9 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1	433.00'	1,652 cf	**29.00'W x 32.00'L x 6.75'H Prismatoid** 6,264 cf Overall - 2,133 cf Embedded = 4,131 cf x 40.0% Voids
#2	439.75'	46 cf	**29.00'W x 32.00'L x 1.00'H Prismatoid** 928 cf Overall x 5.0% Voids
#3	433.75'	2,133 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 18 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 3 Rows of 6 Chambers Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf
		3,832 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	433.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	439.00'	**8.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 7.80 hrs HW=433.08' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=433.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond P203P: INF-203

Inflow Area =	77,190 sf, 36.20% Impervious, Inflow Depth = 1.15" for 2-year event				
Inflow =	2.3 cfs @	12.10 hrs, Volume=	7,410 cf		
Outflow =	0.1 cfs @	11.50 hrs, Volume=	7,410 cf,	Atten= 98%,	Lag= 0.0 min
Discarded =	0.1 cfs @	11.50 hrs, Volume=	7,410 cf		
Primary =	0.0 cfs @	0.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 439.07' @ 19.24 hrs Surf.Area= 2,340 sf Storage= 5,014 cf

Plug-Flow detention time= 926.0 min calculated for 7,406 cf (100% of inflow)
Center-of-Mass det. time= 926.3 min (1,781.9 - 855.6)

Volume	Invert	Avail.Storage	Storage Description
#1	436.00'	3,986 cf	**39.00'W x 60.00'L x 6.75'H Prismatoid** 15,795 cf Overall - 5,830 cf Embedded = 9,965 cf x 40.0% Voids
#2	436.75'	5,830 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 52 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 4 Rows of 13 Chambers Cap Storage= +35.7 cf x 2 x 4 rows = 285.6 cf
		9,816 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	436.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	440.75'	**10.0" Vert. Orifice/Grate X 2.00** C= 0.600

Discarded OutFlow Max=0.1 cfs @ 11.50 hrs HW=436.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=436.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond P204P: INF-204

Inflow Area =	16,148 sf,100.00% Impervious,	Inflow Depth =	2.97"	for 2-year event	
Inflow =	1.1 cfs @	12.09 hrs,	Volume=	3,993 cf	
Outflow =	0.0 cfs @	6.40 hrs,	Volume=	3,832 cf,	Atten= 99%, Lag= 0.0 min
Discarded =	0.0 cfs @	6.40 hrs,	Volume=	3,832 cf	
Primary =	0.0 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 443.48' @ 23.00 hrs Surf.Area= 1,856 sf Storage= 3,168 cf

Plug-Flow detention time= 2,276.1 min calculated for 3,832 cf (96% of inflow)
Center-of-Mass det. time= 2,251.8 min (3,008.2 - 756.4)

Volume	Invert	Avail.Storage	Storage Description
#1	441.00'	3,136 cf	**29.00'W x 64.00'L x 6.75'H Prismatoid** 12,528 cf Overall - 4,687 cf Embedded = 7,841 cf x 40.0% Voids
#2	441.75'	4,687 cf	**ADS_StormTech MC-4500 +Cap** x 42 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 3 Rows of 14 Chambers Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf
		7,823 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	441.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	445.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 6.40 hrs HW=441.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=441.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Link P1L: Stoney Hill Rd

Inflow Area =	451,951 sf, 54.45% Impervious,	Inflow Depth >	1.19"	for 2-year event	
Inflow =	1.1 cfs @	12.14 hrs,	Volume=	44,680 cf	
Primary =	1.1 cfs @	12.14 hrs,	Volume=	44,680 cf,	Atten= 0%, Lag= 0.0 min

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

Summary for Link P2L: Southeast

Inflow Area =	139,481 sf, 47.21% Impervious,	Inflow Depth =	0.16"	for 2-year event	
Inflow =	0.4 cfs @	12.16 hrs,	Volume=	1,831 cf	
Primary =	0.4 cfs @	12.16 hrs,	Volume=	1,831 cf,	Atten= 0%, Lag= 0.0 min

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

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

Subcatchment P101S: below DB-110 Runoff Area=21,910 sf 23.95% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=68 Runoff=1.0 cfs 3,174 cf

Subcatchment P102S: DB-West Runoff Area=25,321 sf 3.67% Impervious Runoff Depth=1.32"
Tc=6.0 min CN=62 Runoff=0.8 cfs 2,778 cf

Subcatchment P103S: above Bldg 1 Runoff Area=59,294 sf 65.65% Impervious Runoff Depth=3.28"
Flow Length=463' Slope=0.0518 '/' Tc=6.2 min CN=86 Runoff=5.0 cfs 16,211 cf

Subcatchment P104S: above Bldg 2 Runoff Area=62,460 sf 55.61% Impervious Runoff Depth=3.09"
Tc=6.0 min CN=84 Runoff=5.1 cfs 16,073 cf

Subcatchment P105S: central/below bldg 4 Runoff Area=83,356 sf 28.26% Impervious Runoff Depth=2.29"
Tc=6.0 min CN=75 Runoff=5.0 cfs 15,894 cf

Subcatchment P106S: Bldg 1 Runoff Area=16,067 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=1.7 cfs 6,110 cf

Subcatchment P107S: Bldg 2 Runoff Area=16,148 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=1.7 cfs 6,141 cf

Subcatchment P108S: Club House Runoff Area=4,675 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=0.5 cfs 1,778 cf

Subcatchment P109S: YRC pavement to site Runoff Area=52,337 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=5.5 cfs 19,903 cf

Subcatchment P110S: DB-110 Runoff Area=21,100 sf 0.00% Impervious Runoff Depth=1.25"
Tc=6.0 min CN=61 Runoff=0.6 cfs 2,199 cf

Subcatchment P111S: Rte 20 Runoff Area=89,283 sf 59.87% Impervious Runoff Depth=2.99"
Tc=6.0 min CN=83 Runoff=7.0 cfs 22,274 cf

Subcatchment P201S: to Southeast Runoff Area=29,995 sf 18.70% Impervious Runoff Depth=1.74"
Flow Length=400' Slope=0.0518 '/' Tc=9.4 min CN=68 Runoff=1.2 cfs 4,346 cf

Subcatchment P202S: Bldg 4 Runoff Area=16,148 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=1.7 cfs 6,141 cf

Subcatchment P203S: NE/Below Bldg 3 Runoff Area=77,190 sf 36.20% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=76 Runoff=4.8 cfs 15,256 cf

Subcatchment P204S: Bldg 3 Runoff Area=16,148 sf 100.00% Impervious Runoff Depth=4.56"
Tc=6.0 min CN=98 Runoff=1.7 cfs 6,141 cf

Pond P102P: DB-102 Peak Elev=425.61' Storage=11,986 cf Inflow=6.3 cfs 26,402 cf
Primary=0.4 cfs 26,402 cf Secondary=0.0 cfs 0 cf Outflow=0.4 cfs 26,402 cf

Pond P104P: INF-104 Peak Elev=451.73' Storage=10,717 cf Inflow=5.1 cfs 16,073 cf
Discarded=0.1 cfs 14,443 cf Primary=0.1 cfs 1,631 cf Outflow=0.2 cfs 16,073 cf

Pond P106P: INF-106 Peak Elev=447.68' Storage=3,596 cf Inflow=1.7 cfs 6,110 cf
Discarded=0.0 cfs 5,301 cf Primary=0.1 cfs 809 cf Outflow=0.1 cfs 6,110 cf

Pond P107P: INF-107 Peak Elev=459.27' Storage=4,534 cf Inflow=2.2 cfs 7,919 cf
Discarded=0.0 cfs 5,828 cf Primary=0.2 cfs 2,091 cf Outflow=0.2 cfs 7,919 cf

Pond P110P: DB-110 Peak Elev=423.89' Storage=16,177 cf Inflow=10.7 cfs 35,113 cf
Primary=1.9 cfs 35,072 cf Secondary=0.0 cfs 0 cf Outflow=1.9 cfs 35,072 cf

Pond P111P: DB-111 Peak Elev=433.85' Storage=11,309 cf Inflow=7.0 cfs 22,274 cf
Primary=0.5 cfs 22,274 cf Secondary=0.0 cfs 0 cf Outflow=0.5 cfs 22,274 cf

Pond P202P: INF-202 Peak Elev=439.21' Storage=3,583 cf Inflow=1.7 cfs 6,141 cf
Discarded=0.0 cfs 5,104 cf Primary=0.1 cfs 1,037 cf Outflow=0.2 cfs 6,141 cf

Pond P203P: INF-203 Peak Elev=441.00' Storage=8,056 cf Inflow=4.8 cfs 15,256 cf
Discarded=0.1 cfs 10,628 cf Primary=0.5 cfs 4,628 cf Outflow=0.5 cfs 15,256 cf

Pond P204P: INF-204 Peak Elev=445.00' Storage=5,253 cf Inflow=1.7 cfs 6,141 cf
Discarded=0.0 cfs 3,891 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 3,891 cf

Link P1L: Stoney Hill Rd Inflow=3.0 cfs 86,923 cf
Primary=3.0 cfs 86,923 cf

Link P2L: Southeast Inflow=1.2 cfs 10,010 cf
Primary=1.2 cfs 10,010 cf

Total Runoff Area = 591,432 sf Runoff Volume = 144,419 cf Average Runoff Depth = 2.93"
47.26% Pervious = 279,508 sf 52.74% Impervious = 311,924 sf

Summary for Subcatchment P101S: below DB-110

Runoff = 1.0 cfs @ 12.10 hrs, Volume= 3,174 cf, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Description
	3,450	98	Paved parking, HSG B
	10,959	61	>75% Grass cover, Good, HSG B
	5,704	55	Woods, Good, HSG B
*	1,797	98	WETLAND, HSG B
	21,910	68	Weighted Average
	16,663		76.05% Pervious Area
	5,247		23.95% Impervious Area

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

Summary for Subcatchment P102S: DB-West

Runoff = 0.8 cfs @ 12.10 hrs, Volume= 2,778 cf, Depth= 1.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
24,391	61	>75% Grass cover, Good, HSG B
930	98	Paved parking, HSG B
25,321	62	Weighted Average
24,391		96.33% Pervious Area
930		3.67% Impervious Area

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

Summary for Subcatchment P103S: above Bldg 1

Runoff = 5.0 cfs @ 12.09 hrs, Volume= 16,211 cf, Depth= 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
1,708	98	Paved parking, HSG C
1,063	74	>75% Grass cover, Good, HSG C
33,400	98	Paved parking, HSG B
19,303	61	>75% Grass cover, Good, HSG B
3,820	98	Unconnected roofs, HSG B
59,294	86	Weighted Average
20,366		34.35% Pervious Area
38,928		65.65% Impervious Area
3,820		9.81% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	463	0.0518	1.25		**Lag/CN Method,**

Summary for Subcatchment P104S: above Bldg 2

Runoff = 5.1 cfs @ 12.09 hrs, Volume= 16,073 cf, Depth= 3.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
22,133	98	Paved parking, HSG C
13,086	74	>75% Grass cover, Good, HSG C
10,692	98	Paved parking, HSG B
14,639	61	>75% Grass cover, Good, HSG B
1,910	98	Unconnected roofs, HSG B
62,460	84	Weighted Average
27,725		44.39% Pervious Area
34,735		55.61% Impervious Area
1,910		5.50% Unconnected

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

Summary for Subcatchment P105S: central/below bldg 4

Runoff = 5.0 cfs @ 12.09 hrs, Volume= 15,894 cf, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
20,194	98	Paved parking, HSG B
34,869	61	>75% Grass cover, Good, HSG B
24,928	74	>75% Grass cover, Good, HSG C
3,365	98	Paved parking, HSG C
83,356	75	Weighted Average
59,797		71.74% Pervious Area
23,559		28.26% Impervious Area

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

Summary for Subcatchment P106S: Bldg 1

Runoff = 1.7 cfs @ 12.09 hrs, Volume= 6,110 cf, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
16,067	98	Roofs, HSG B
16,067		100.00% Impervious Area

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

Summary for Subcatchment P107S: Bldg 2

Runoff = 1.7 cfs @ 12.09 hrs, Volume= 6,141 cf, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
2,888	98	Roofs, HSG B
13,260	98	Roofs, HSG C
16,148	98	Weighted Average
16,148		100.00% Impervious Area

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

Summary for Subcatchment P108S: Club House

Runoff = 0.5 cfs @ 12.09 hrs, Volume= 1,778 cf, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
3,575	98	Roofs, HSG B
1,100	98	Roofs, HSG C
4,675	98	Weighted Average
4,675		100.00% Impervious Area

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

Summary for Subcatchment P109S: YRC pavement to site

Runoff = 5.5 cfs @ 12.09 hrs, Volume= 19,903 cf, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
52,337	98	Paved parking, HSG B
52,337		100.00% Impervious Area

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

Summary for Subcatchment P110S: DB-110

Runoff = 0.6 cfs @ 12.10 hrs, Volume= 2,199 cf, Depth= 1.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
21,100	61	>75% Grass cover, Good, HSG B
21,100		100.00% Pervious Area

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

Summary for Subcatchment P111S: Rte 20

Runoff = 7.0 cfs @ 12.09 hrs, Volume= 22,274 cf, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
45,722	98	Paved parking, HSG B
33,772	61	>75% Grass cover, Good, HSG B
4,381	98	Paved parking, HSG C
2,060	74	>75% Grass cover, Good, HSG C
791	98	Paved parking, HSG C
2,557	98	Paved parking, HSG B
89,283	83	Weighted Average
35,832		40.13% Pervious Area
53,451		59.87% Impervious Area

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

Summary for Subcatchment P201S: to Southeast

Runoff = 1.2 cfs @ 12.14 hrs, Volume= 4,346 cf, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

	Area (sf)	CN	Description
	4,076	74	>75% Grass cover, Good, HSG C
	662	70	Woods, Good, HSG C
	8,549	61	>75% Grass cover, Good, HSG B
	11,100	55	Woods, Good, HSG B
*	5,608	98	WETLAND, HSG B
	29,995	68	Weighted Average
	24,387		81.30% Pervious Area
	5,608		18.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	400	0.0518	0.71		**Lag/CN Method,**

Summary for Subcatchment P202S: Bldg 4

Runoff = 1.7 cfs @ 12.09 hrs, Volume= 6,141 cf, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
16,148	98	Roofs, HSG B
16,148		100.00% Impervious Area

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

Summary for Subcatchment P203S: NE/Below Bldg 3

Runoff = 4.8 cfs @ 12.09 hrs, Volume= 15,256 cf, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
12,173	98	Paved parking, HSG B
37,592	61	>75% Grass cover, Good, HSG B
13,860	98	Paved parking, HSG C
11,655	74	>75% Grass cover, Good, HSG C
1,910	98	Unconnected roofs, HSG B
77,190	76	Weighted Average
49,247		63.80% Pervious Area
27,943		36.20% Impervious Area
1,910		6.84% Unconnected

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

Summary for Subcatchment P204S: Bldg 3

Runoff = 1.7 cfs @ 12.09 hrs, Volume= 6,141 cf, Depth= 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
1,690	98	Roofs, HSG B
14,458	98	Roofs, HSG C
16,148	98	Weighted Average
16,148		100.00% Impervious Area

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

Summary for Pond P102P: DB-102

Inflow Area = 160,941 sf, 67.62% Impervious, Inflow Depth = 1.97" for 10-year event
Inflow = 6.3 cfs @ 12.09 hrs, Volume= 26,402 cf
Outflow = 0.4 cfs @ 15.56 hrs, Volume= 26,402 cf, Atten= 93%, Lag= 208.5 min
Primary = 0.4 cfs @ 15.56 hrs, Volume= 26,402 cf
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 425.61' @ 15.56 hrs Surf.Area= 5,169 sf Storage= 11,986 cf

Plug-Flow detention time= 302.3 min calculated for 26,389 cf (100% of inflow)
Center-of-Mass det. time= 302.4 min (1,091.2 - 788.8)

Volume	Invert	Avail.Storage	Storage Description
#1	422.00'	27,095 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
422.00	240	0	0
422.50	1,840	520	520
424.00	3,820	4,245	4,765
426.00	5,500	9,320	14,085
428.00	7,510	13,010	27,095

Device	Routing	Invert	Outlet Devices
#1	Primary	422.00'	**12.0" Round Culvert** L= 144.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 422.00' / 418.00' S= 0.0278 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	422.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	425.60'	**10.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	426.80'	**16.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	422.00'	**12.0" Round Culvert** L= 127.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 422.00' / 418.00' S= 0.0315 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#6	Device 5	427.00'	**16.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=0.4 cfs @ 15.56 hrs HW=425.61' (Free Discharge)
- **1=Culvert** (Passes 0.4 cfs of 6.7 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.4 cfs @ 8.98 fps)
  - **3=Orifice/Grate** (Orifice Controls 0.0 cfs @ 0.27 fps)
- **4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=422.00' (Free Discharge)
- **5=Culvert** (Controls 0.0 cfs)
  - **6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P104P: INF-104

Inflow Area =	62,460 sf, 55.61% Impervious, Inflow Depth = 3.09" for 10-year event			
Inflow =	5.1 cfs @	12.09 hrs, Volume=	16,073 cf	
Outflow =	0.2 cfs @	15.29 hrs, Volume=	16,073 cf, Atten= 96%, Lag= 191.8 min	
Discarded =	0.1 cfs @	9.55 hrs, Volume=	14,443 cf	
Primary =	0.1 cfs @	15.29 hrs, Volume=	1,631 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 451.73' @ 15.29 hrs Surf.Area= 3,196 sf Storage= 10,717 cf

Plug-Flow detention time= 1,180.5 min calculated for 16,073 cf (100% of inflow)
Center-of-Mass det. time= 1,180.4 min (1,992.6 - 812.2)

Volume	Invert	Avail.Storage	Storage Description
#1	447.00'	5,288 cf	**47.00'W x 68.00'L x 6.75'H Prismatoid** 21,573 cf Overall - 8,354 cf Embedded = 13,219 cf x 40.0% Voids
#2	447.75'	8,354 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 75 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 5 Rows of 15 Chambers Cap Storage= +35.7 cf x 2 x 5 rows = 357.0 cf
		13,641 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	447.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	451.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.1 cfs @ 9.55 hrs HW=447.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.1 cfs @ 15.29 hrs HW=451.73' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.1 cfs @ 1.62 fps)

Summary for Pond P106P: INF-106

Inflow Area = 16,067 sf,100.00% Impervious, Inflow Depth = 4.56" for 10-year event
Inflow = 1.7 cfs @ 12.09 hrs, Volume= 6,110 cf
Outflow = 0.1 cfs @ 13.39 hrs, Volume= 6,110 cf, Atten= 93%, Lag= 78.2 min
Discarded = 0.0 cfs @ 6.70 hrs, Volume= 5,301 cf
Primary = 0.1 cfs @ 13.39 hrs, Volume= 809 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 447.68' @ 13.39 hrs Surf.Area= 1,120 sf Storage= 3,596 cf

Plug-Flow detention time= 1,016.1 min calculated for 6,110 cf (100% of inflow)
Center-of-Mass det. time= 1,016.0 min (1,764.7 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1	443.00'	1,943 cf	**20.00'W x 56.00'L x 6.75'H Prismatoid** 7,560 cf Overall - 2,702 cf Embedded = 4,858 cf x 40.0% Voids
#2	443.75'	2,702 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 24 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 2 Rows of 12 Chambers Cap Storage= +35.7 cf x 2 x 2 rows = 142.8 cf
		4,645 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	443.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	447.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 6.70 hrs HW=443.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.1 cfs @ 13.39 hrs HW=447.68' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.1 cfs @ 1.44 fps)

Summary for Pond P107P: INF-107

Inflow Area = 20,823 sf,100.00% Impervious, Inflow Depth = 4.56" for 10-year event
Inflow = 2.2 cfs @ 12.09 hrs, Volume= 7,919 cf
Outflow = 0.2 cfs @ 12.88 hrs, Volume= 7,919 cf, Atten= 90%, Lag= 47.6 min
Discarded = 0.0 cfs @ 5.60 hrs, Volume= 5,828 cf
Primary = 0.2 cfs @ 12.88 hrs, Volume= 2,091 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 459.27' @ 12.88 hrs Surf.Area= 4,044 sf Storage= 4,534 cf

Plug-Flow detention time= 1,049.4 min calculated for 7,919 cf (100% of inflow)
Center-of-Mass det. time= 1,049.2 min (1,797.9 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1	457.00'	3,649 cf	**52.00'W x 60.00'L x 3.50'H Prismatoid** 10,920 cf Overall - 1,797 cf Embedded = 9,123 cf x 40.0% Voids
#2	457.00'	1,186 cf	**22.00'W x 42.00'L x 3.50'H Prismatoid** 3,234 cf Overall - 269 cf Embedded = 2,965 cf x 40.0% Voids
#3	458.00'	1,797 cf	**24.0" Round Pipe Storage** x 11 Inside #1 L= 52.0'
#4	458.00'	269 cf	**18.0" Round Pipe Storage** x 4 Inside #2 L= 38.0'
		6,901 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	457.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	459.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 5.60 hrs HW=457.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.2 cfs @ 12.88 hrs HW=459.27' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 1.76 fps)

Summary for Pond P110P: DB-110

Inflow Area =	179,817 sf, 43.69% Impervious, Inflow Depth = 2.34" for 10-year event				
Inflow =	10.7 cfs @	12.09 hrs,	Volume=	35,113 cf	
Outflow =	1.9 cfs @	12.58 hrs,	Volume=	35,072 cf,	Atten= 82%, Lag= 29.0 min
Primary =	1.9 cfs @	12.58 hrs,	Volume=	35,072 cf	
Secondary =	0.0 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 423.89' @ 12.58 hrs Surf.Area= 10,561 sf Storage= 16,177 cf

Plug-Flow detention time= 408.1 min calculated for 35,072 cf (100% of inflow)
Center-of-Mass det. time= 407.4 min (1,233.5 - 826.1)

Volume	Invert	Avail.Storage	Storage Description
#1	422.00'	43,126 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
422.00	6,555	0	0
424.00	10,793	17,348	17,348
426.00	14,985	25,778	43,126

Device	Routing	Invert	Outlet Devices
#1	Primary	420.00'	**12.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 420.00' / 418.00' S= 0.0513 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	422.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	423.40'	**10.0" Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	424.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	425.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=1.9 cfs @ 12.58 hrs HW=423.89' (Free Discharge)
└─**1=Culvert** (Passes 1.9 cfs of 7.0 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.3 cfs @ 6.40 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 1.6 cfs @ 2.38 fps)
  └─**4=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=422.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir**(Controls 0.0 cfs)

Summary for Pond P111P: DB-111

Inflow Area =	89,283 sf, 59.87% Impervious, Inflow Depth = 2.99" for 10-year event				
Inflow =	7.0 cfs @	12.09 hrs,	Volume=	22,274 cf	
Outflow =	0.5 cfs @	13.71 hrs,	Volume=	22,274 cf,	Atten= 93%, Lag= 97.3 min
Primary =	0.5 cfs @	13.71 hrs,	Volume=	22,274 cf	
Secondary =	0.0 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 433.85' @ 13.71 hrs Surf.Area= 4,497 sf Storage= 11,309 cf

Plug-Flow detention time= 282.1 min calculated for 22,262 cf (100% of inflow)
Center-of-Mass det. time= 282.2 min (1,097.3 - 815.1)

Volume	Invert	Avail.Storage	Storage Description
#1	430.00'	22,935 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
430.00	600	0	0
431.00	2,440	1,520	1,520
432.00	3,090	2,765	4,285
434.00	4,610	7,700	11,985
436.00	6,340	10,950	22,935

Device	Routing	Invert	Outlet Devices
#1	Primary	430.00'	**12.0" Round Culvert** L= 263.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 430.00' / 418.00' S= 0.0456 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	430.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	433.75'	**8.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	434.90'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	435.00'	**10.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.5 cfs @ 13.71 hrs HW=433.85' (Free Discharge)
└─**1=Culvert** (Passes 0.5 cfs of 6.9 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.5 cfs @ 9.30 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.0 cfs @ 1.09 fps)
  └─**4=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=430.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir**(Controls 0.0 cfs)

Summary for Pond P202P: INF-202

Inflow Area =	16,148 sf,100.00% Impervious, Inflow Depth = 4.56" for 10-year event				
Inflow =	1.7 cfs @	12.09 hrs,	Volume=	6,141 cf	
Outflow =	0.2 cfs @	12.90 hrs,	Volume=	6,141 cf,	Atten= 90%, Lag= 49.0 min
Discarded =	0.0 cfs @	5.90 hrs,	Volume=	5,104 cf	
Primary =	0.1 cfs @	12.90 hrs,	Volume=	1,037 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 439.21' @ 12.90 hrs Surf.Area= 928 sf Storage= 3,583 cf

Plug-Flow detention time= 1,178.5 min calculated for 6,138 cf (100% of inflow)
Center-of-Mass det. time= 1,179.3 min (1,928.0 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1	433.00'	1,652 cf	**29.00'W x 32.00'L x 6.75'H Prismatoid** 6,264 cf Overall - 2,133 cf Embedded = 4,131 cf x 40.0% Voids
#2	439.75'	46 cf	**29.00'W x 32.00'L x 1.00'H Prismatoid** 928 cf Overall x 5.0% Voids
#3	433.75'	2,133 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 18 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 3 Rows of 6 Chambers Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf
		3,832 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	433.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	439.00'	**8.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 5.90 hrs HW=433.08' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.1 cfs @ 12.90 hrs HW=439.20' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.1 cfs @ 1.54 fps)

Summary for Pond P203P: INF-203

Inflow Area = 77,190 sf, 36.20% Impervious, Inflow Depth = 2.37" for 10-year event
Inflow = 4.8 cfs @ 12.09 hrs, Volume= 15,256 cf
Outflow = 0.5 cfs @ 13.00 hrs, Volume= 15,256 cf, Atten= 89%, Lag= 54.2 min
Discarded = 0.1 cfs @ 10.25 hrs, Volume= 10,628 cf
Primary = 0.5 cfs @ 13.00 hrs, Volume= 4,628 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 441.00' @ 13.00 hrs Surf.Area= 2,340 sf Storage= 8,056 cf

Plug-Flow detention time= 966.3 min calculated for 15,248 cf (100% of inflow)
Center-of-Mass det. time= 967.1 min (1,801.3 - 834.2)

Volume	Invert	Avail.Storage	Storage Description
#1	436.00'	3,986 cf	**39.00'W x 60.00'L x 6.75'H Prismatoid** 15,795 cf Overall - 5,830 cf Embedded = 9,965 cf x 40.0% Voids
#2	436.75'	5,830 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 52 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 4 Rows of 13 Chambers Cap Storage= +35.7 cf x 2 x 4 rows = 285.6 cf
		9,816 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	436.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	440.75'	**10.0" Vert. Orifice/Grate X 2.00** C= 0.600

Discarded OutFlow Max=0.1 cfs @ 10.25 hrs HW=436.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=0.5 cfs @ 13.00 hrs HW=441.00' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.5 cfs @ 1.69 fps)

Summary for Pond P204P: INF-204

Inflow Area =	16,148 sf,100.00% Impervious,	Inflow Depth =	4.56"	for 10-year event	
Inflow =	1.7 cfs @	12.09 hrs,	Volume=	6,141 cf	
Outflow =	0.0 cfs @	4.25 hrs,	Volume=	3,891 cf,	Atten= 99%, Lag= 0.0 min
Discarded =	0.0 cfs @	4.25 hrs,	Volume=	3,891 cf	
Primary =	0.0 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 445.00' @ 24.05 hrs Surf.Area= 1,856 sf Storage= 5,253 cf

Plug-Flow detention time= 2,320.9 min calculated for 3,889 cf (63% of inflow)
Center-of-Mass det. time= 2,217.1 min (2,965.8 - 748.7)

Volume	Invert	Avail.Storage	Storage Description
#1	441.00'	3,136 cf	**29.00'W x 64.00'L x 6.75'H Prismatoid** 12,528 cf Overall - 4,687 cf Embedded = 7,841 cf x 40.0% Voids
#2	441.75'	4,687 cf	**ADS_StormTech MC-4500 +Cap** x 42 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 3 Rows of 14 Chambers Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf
		7,823 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	441.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	445.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 4.25 hrs HW=441.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=441.00' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Link P1L: Stoney Hill Rd

Inflow Area =	451,951 sf, 54.45% Impervious,	Inflow Depth >	2.31"	for 10-year event	
Inflow =	3.0 cfs @	12.52 hrs,	Volume=	86,923 cf	
Primary =	3.0 cfs @	12.52 hrs,	Volume=	86,923 cf,	Atten= 0%, Lag= 0.0 min

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

Summary for Link P2L: Southeast

Inflow Area =	139,481 sf, 47.21% Impervious,	Inflow Depth =	0.86"	for 10-year event	
Inflow =	1.2 cfs @	12.14 hrs,	Volume=	10,010 cf	
Primary =	1.2 cfs @	12.14 hrs,	Volume=	10,010 cf,	Atten= 0%, Lag= 0.0 min

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

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

Subcatchment P101S: below DB-110 Runoff Area=21,910 sf 23.95% Impervious Runoff Depth=3.41"
Tc=6.0 min CN=68 Runoff=2.0 cfs 6,226 cf

Subcatchment P102S: DB-West Runoff Area=25,321 sf 3.67% Impervious Runoff Depth=2.80"
Tc=6.0 min CN=62 Runoff=1.8 cfs 5,910 cf

Subcatchment P103S: above Bldg 1 Runoff Area=59,294 sf 65.65% Impervious Runoff Depth=5.37"
Flow Length=463' Slope=0.0518 '/' Tc=6.2 min CN=86 Runoff=8.1 cfs 26,513 cf

Subcatchment P104S: above Bldg 2 Runoff Area=62,460 sf 55.61% Impervious Runoff Depth=5.14"
Tc=6.0 min CN=84 Runoff=8.3 cfs 26,753 cf

Subcatchment P105S: central/below bldg 4 Runoff Area=83,356 sf 28.26% Impervious Runoff Depth=4.15"
Tc=6.0 min CN=75 Runoff=9.1 cfs 28,823 cf

Subcatchment P106S: Bldg 1 Runoff Area=16,067 sf 100.00% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=98 Runoff=2.5 cfs 9,052 cf

Subcatchment P107S: Bldg 2 Runoff Area=16,148 sf 100.00% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=98 Runoff=2.5 cfs 9,098 cf

Subcatchment P108S: Club House Runoff Area=4,675 sf 100.00% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=98 Runoff=0.7 cfs 2,634 cf

Subcatchment P109S: YRC pavement to site Runoff Area=52,337 sf 100.00% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=98 Runoff=8.1 cfs 29,487 cf

Subcatchment P110S: DB-110 Runoff Area=21,100 sf 0.00% Impervious Runoff Depth=2.70"
Tc=6.0 min CN=61 Runoff=1.5 cfs 4,751 cf

Subcatchment P111S: Rte 20 Runoff Area=89,283 sf 59.87% Impervious Runoff Depth=5.03"
Tc=6.0 min CN=83 Runoff=11.6 cfs 37,408 cf

Subcatchment P201S: to Southeast Runoff Area=29,995 sf 18.70% Impervious Runoff Depth=3.41"
Flow Length=400' Slope=0.0518 '/' Tc=9.4 min CN=68 Runoff=2.4 cfs 8,524 cf

Subcatchment P202S: Bldg 4 Runoff Area=16,148 sf 100.00% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=98 Runoff=2.5 cfs 9,098 cf

Subcatchment P203S: NE/Below Bldg 3 Runoff Area=77,190 sf 36.20% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=76 Runoff=8.6 cfs 27,385 cf

Subcatchment P204S: Bldg 3 Runoff Area=16,148 sf 100.00% Impervious Runoff Depth=6.76"
Tc=6.0 min CN=98 Runoff=2.5 cfs 9,098 cf

Pond P102P: DB-102 Peak Elev=426.73' Storage=18,342 cf Inflow=10.2 cfs 52,827 cf
Primary=2.7 cfs 52,827 cf Secondary=0.0 cfs 0 cf Outflow=2.7 cfs 52,827 cf

Pond P104P: INF-104 Peak Elev=453.63' Storage=13,488 cf Inflow=8.3 cfs 26,753 cf
Discarded=0.1 cfs 15,050 cf Primary=1.3 cfs 11,703 cf Outflow=1.4 cfs 26,753 cf

Pond P106P: INF-106 Peak Elev=448.65' Storage=4,152 cf Inflow=2.5 cfs 9,052 cf
Discarded=0.0 cfs 5,543 cf Primary=0.9 cfs 3,510 cf Outflow=0.9 cfs 9,052 cf

Pond P107P: INF-107 Peak Elev=459.92' Storage=5,957 cf Inflow=3.2 cfs 11,732 cf
Discarded=0.0 cfs 6,005 cf Primary=0.8 cfs 5,727 cf Outflow=0.8 cfs 11,732 cf

Pond P110P: DB-110 Peak Elev=424.75' Storage=26,023 cf Inflow=18.6 cfs 63,597 cf
Primary=5.5 cfs 63,553 cf Secondary=0.0 cfs 0 cf Outflow=5.5 cfs 63,553 cf

Pond P111P: DB-111 Peak Elev=434.95' Storage=16,768 cf Inflow=11.6 cfs 37,408 cf
Primary=2.4 cfs 37,408 cf Secondary=0.0 cfs 0 cf Outflow=2.4 cfs 37,408 cf

Pond P202P: INF-202 Peak Elev=440.67' Storage=3,828 cf Inflow=2.5 cfs 9,098 cf
Discarded=0.0 cfs 5,261 cf Primary=2.0 cfs 3,837 cf Outflow=2.0 cfs 9,098 cf

Pond P203P: INF-203 Peak Elev=442.18' Storage=9,285 cf Inflow=8.6 cfs 27,385 cf
Discarded=0.1 cfs 10,962 cf Primary=5.3 cfs 16,424 cf Outflow=5.4 cfs 27,385 cf

Pond P204P: INF-204 Peak Elev=445.75' Storage=6,152 cf Inflow=2.5 cfs 9,098 cf
Discarded=0.0 cfs 3,930 cf Primary=0.2 cfs 2,251 cf Outflow=0.2 cfs 6,181 cf

Link P1L: Stoney Hill Rd Inflow=10.8 cfs 160,014 cf
Primary=10.8 cfs 160,014 cf

Link P2L: Southeast Inflow=9.7 cfs 31,035 cf
Primary=9.7 cfs 31,035 cf

Total Runoff Area = 591,432 sf Runoff Volume = 240,762 cf Average Runoff Depth = 4.88"
47.26% Pervious = 279,508 sf 52.74% Impervious = 311,924 sf

Summary for Subcatchment P101S: below DB-110

Runoff = 2.0 cfs @ 12.09 hrs, Volume= 6,226 cf, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

	Area (sf)	CN	Description
	3,450	98	Paved parking, HSG B
	10,959	61	>75% Grass cover, Good, HSG B
	5,704	55	Woods, Good, HSG B
*	1,797	98	WETLAND, HSG B
	21,910	68	Weighted Average
	16,663		76.05% Pervious Area
	5,247		23.95% Impervious Area

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

Summary for Subcatchment P102S: DB-West

Runoff = 1.8 cfs @ 12.10 hrs, Volume= 5,910 cf, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
24,391	61	>75% Grass cover, Good, HSG B
930	98	Paved parking, HSG B
25,321	62	Weighted Average
24,391		96.33% Pervious Area
930		3.67% Impervious Area

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

Summary for Subcatchment P103S: above Bldg 1

Runoff = 8.1 cfs @ 12.09 hrs, Volume= 26,513 cf, Depth= 5.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
1,708	98	Paved parking, HSG C
1,063	74	>75% Grass cover, Good, HSG C
33,400	98	Paved parking, HSG B
19,303	61	>75% Grass cover, Good, HSG B
3,820	98	Unconnected roofs, HSG B
59,294	86	Weighted Average
20,366		34.35% Pervious Area
38,928		65.65% Impervious Area
3,820		9.81% Unconnected

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.2	463	0.0518	1.25		**Lag/CN Method,**

Summary for Subcatchment P104S: above Bldg 2

Runoff = 8.3 cfs @ 12.09 hrs, Volume= 26,753 cf, Depth= 5.14"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
22,133	98	Paved parking, HSG C
13,086	74	>75% Grass cover, Good, HSG C
10,692	98	Paved parking, HSG B
14,639	61	>75% Grass cover, Good, HSG B
1,910	98	Unconnected roofs, HSG B
62,460	84	Weighted Average
27,725		44.39% Pervious Area
34,735		55.61% Impervious Area
1,910		5.50% Unconnected

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

Summary for Subcatchment P105S: central/below bldg 4

Runoff = 9.1 cfs @ 12.09 hrs, Volume= 28,823 cf, Depth= 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
20,194	98	Paved parking, HSG B
34,869	61	>75% Grass cover, Good, HSG B
24,928	74	>75% Grass cover, Good, HSG C
3,365	98	Paved parking, HSG C
83,356	75	Weighted Average
59,797		71.74% Pervious Area
23,559		28.26% Impervious Area

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

Summary for Subcatchment P106S: Bldg 1

Runoff = 2.5 cfs @ 12.09 hrs, Volume= 9,052 cf, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
16,067	98	Roofs, HSG B
16,067		100.00% Impervious Area

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

Summary for Subcatchment P107S: Bldg 2

Runoff = 2.5 cfs @ 12.09 hrs, Volume= 9,098 cf, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
2,888	98	Roofs, HSG B
13,260	98	Roofs, HSG C
16,148	98	Weighted Average
16,148		100.00% Impervious Area

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

Summary for Subcatchment P108S: Club House

Runoff = 0.7 cfs @ 12.09 hrs, Volume= 2,634 cf, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
3,575	98	Roofs, HSG B
1,100	98	Roofs, HSG C
4,675	98	Weighted Average
4,675		100.00% Impervious Area

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

Summary for Subcatchment P109S: YRC pavement to site

Runoff = 8.1 cfs @ 12.09 hrs, Volume= 29,487 cf, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
52,337	98	Paved parking, HSG B
52,337		100.00% Impervious Area

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

Summary for Subcatchment P110S: DB-110

Runoff = 1.5 cfs @ 12.10 hrs, Volume= 4,751 cf, Depth= 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
21,100	61	>75% Grass cover, Good, HSG B
21,100		100.00% Pervious Area

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

Summary for Subcatchment P111S: Rte 20

Runoff = 11.6 cfs @ 12.09 hrs, Volume= 37,408 cf, Depth= 5.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
45,722	98	Paved parking, HSG B
33,772	61	>75% Grass cover, Good, HSG B
4,381	98	Paved parking, HSG C
2,060	74	>75% Grass cover, Good, HSG C
791	98	Paved parking, HSG C
2,557	98	Paved parking, HSG B
89,283	83	Weighted Average
35,832		40.13% Pervious Area
53,451		59.87% Impervious Area

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

Summary for Subcatchment P201S: to Southeast

Runoff = 2.4 cfs @ 12.14 hrs, Volume= 8,524 cf, Depth= 3.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

	Area (sf)	CN	Description
	4,076	74	>75% Grass cover, Good, HSG C
	662	70	Woods, Good, HSG C
	8,549	61	>75% Grass cover, Good, HSG B
	11,100	55	Woods, Good, HSG B
*	5,608	98	WETLAND, HSG B
	29,995	68	Weighted Average
	24,387		81.30% Pervious Area
	5,608		18.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.4	400	0.0518	0.71		**Lag/CN Method,**

Summary for Subcatchment P202S: Bldg 4

Runoff = 2.5 cfs @ 12.09 hrs, Volume= 9,098 cf, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
16,148	98	Roofs, HSG B
16,148		100.00% Impervious Area

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

Summary for Subcatchment P203S: NE/Below Bldg 3

Runoff = 8.6 cfs @ 12.09 hrs, Volume= 27,385 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
12,173	98	Paved parking, HSG B
37,592	61	>75% Grass cover, Good, HSG B
13,860	98	Paved parking, HSG C
11,655	74	>75% Grass cover, Good, HSG C
1,910	98	Unconnected roofs, HSG B
77,190	76	Weighted Average
49,247		63.80% Pervious Area
27,943		36.20% Impervious Area
1,910		6.84% Unconnected

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

Summary for Subcatchment P204S: Bldg 3

Runoff = 2.5 cfs @ 12.09 hrs, Volume= 9,098 cf, Depth= 6.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
1,690	98	Roofs, HSG B
14,458	98	Roofs, HSG C
16,148	98	Weighted Average
16,148		100.00% Impervious Area

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

Summary for Pond P102P: DB-102

Inflow Area = 160,941 sf, 67.62% Impervious, Inflow Depth = 3.94" for 100-year event
Inflow = 10.2 cfs @ 12.09 hrs, Volume= 52,827 cf
Outflow = 2.7 cfs @ 12.95 hrs, Volume= 52,827 cf, Atten= 73%, Lag= 51.6 min
Primary = 2.7 cfs @ 12.95 hrs, Volume= 52,827 cf
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 426.73' @ 12.95 hrs Surf.Area= 6,229 sf Storage= 18,342 cf

Plug-Flow detention time= 214.1 min calculated for 52,800 cf (100% of inflow)
Center-of-Mass det. time= 214.3 min (1,010.1 - 795.8)

Volume	Invert	Avail.Storage	Storage Description
#1	422.00'	27,095 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
422.00	240	0	0
422.50	1,840	520	520
424.00	3,820	4,245	4,765
426.00	5,500	9,320	14,085
428.00	7,510	13,010	27,095

Device	Routing	Invert	Outlet Devices
#1	Primary	422.00'	**12.0" Round Culvert** L= 144.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 422.00' / 418.00' S= 0.0278 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	422.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	425.60'	**10.0" Vert. Orifice/Grate** C= 0.600
#4	Primary	426.80'	**16.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	422.00'	**12.0" Round Culvert** L= 127.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 422.00' / 418.00' S= 0.0315 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#6	Device 5	427.00'	**16.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Primary OutFlow Max=2.7 cfs @ 12.95 hrs HW=426.73' (Free Discharge)
- **1=Culvert** (Passes 2.7 cfs of 7.6 cfs potential flow)
  - **2=Orifice/Grate** (Orifice Controls 0.5 cfs @ 10.33 fps)
  - **3=Orifice/Grate** (Orifice Controls 2.2 cfs @ 4.05 fps)
- **4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=422.00' (Free Discharge)
- **5=Culvert** (Controls 0.0 cfs)
  - **6=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P104P: INF-104

Inflow Area =	62,460 sf, 55.61% Impervious, Inflow Depth = 5.14" for 100-year event			
Inflow =	8.3 cfs @	12.09 hrs, Volume=	26,753 cf	
Outflow =	1.4 cfs @	12.57 hrs, Volume=	26,753 cf, Atten= 83%, Lag= 28.8 min	
Discarded =	0.1 cfs @	8.15 hrs, Volume=	15,050 cf	
Primary =	1.3 cfs @	12.57 hrs, Volume=	11,703 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 453.63' @ 12.57 hrs Surf.Area= 3,196 sf Storage= 13,488 cf

Plug-Flow detention time= 753.9 min calculated for 26,753 cf (100% of inflow)
Center-of-Mass det. time= 753.8 min (1,551.6 - 797.8)

Volume	Invert	Avail.Storage	Storage Description
#1	447.00'	5,288 cf	**47.00'W x 68.00'L x 6.75'H Prismatoid** 21,573 cf Overall - 8,354 cf Embedded = 13,219 cf x 40.0% Voids
#2	447.75'	8,354 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 75 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 5 Rows of 15 Chambers Cap Storage= +35.7 cf x 2 x 5 rows = 357.0 cf
		13,641 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	447.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	451.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.1 cfs @ 8.15 hrs HW=447.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=1.3 cfs @ 12.57 hrs HW=453.62' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 1.3 cfs @ 6.59 fps)

Summary for Pond P106P: INF-106

Inflow Area =	16,067 sf,100.00% Impervious, Inflow Depth = 6.76" for 100-year event				
Inflow =	2.5 cfs @	12.09 hrs,	Volume=	9,052 cf	
Outflow =	0.9 cfs @	12.33 hrs,	Volume=	9,052 cf,	Atten= 63%, Lag= 14.6 min
Discarded =	0.0 cfs @	4.30 hrs,	Volume=	5,543 cf	
Primary =	0.9 cfs @	12.33 hrs,	Volume=	3,510 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 448.65' @ 12.33 hrs Surf.Area= 1,120 sf Storage= 4,152 cf

Plug-Flow detention time= 730.1 min calculated for 9,048 cf (100% of inflow)
Center-of-Mass det. time= 730.9 min (1,473.8 - 743.0)

Volume	Invert	Avail.Storage	Storage Description
#1	443.00'	1,943 cf	**20.00'W x 56.00'L x 6.75'H Prismatoid** 7,560 cf Overall - 2,702 cf Embedded = 4,858 cf x 40.0% Voids
#2	443.75'	2,702 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 24 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 2 Rows of 12 Chambers Cap Storage= +35.7 cf x 2 x 2 rows = 142.8 cf
		4,645 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	443.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	447.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 4.30 hrs HW=443.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.9 cfs @ 12.33 hrs HW=448.65' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.9 cfs @ 4.56 fps)

Summary for Pond P107P: INF-107

Inflow Area =	20,823 sf,100.00% Impervious, Inflow Depth = 6.76" for 100-year event				
Inflow =	3.2 cfs @	12.09 hrs,	Volume=	11,732 cf	
Outflow =	0.8 cfs @	12.46 hrs,	Volume=	11,732 cf,	Atten= 75%, Lag= 22.3 min
Discarded =	0.0 cfs @	3.50 hrs,	Volume=	6,005 cf	
Primary =	0.8 cfs @	12.46 hrs,	Volume=	5,727 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 459.92' @ 12.46 hrs Surf.Area= 4,044 sf Storage= 5,957 cf

Plug-Flow detention time= 752.6 min calculated for 11,726 cf (100% of inflow)
Center-of-Mass det. time= 753.6 min (1,496.5 - 743.0)

Volume	Invert	Avail.Storage	Storage Description
#1	457.00'	3,649 cf	**52.00'W x 60.00'L x 3.50'H Prismatoid** 10,920 cf Overall - 1,797 cf Embedded = 9,123 cf x 40.0% Voids
#2	457.00'	1,186 cf	**22.00'W x 42.00'L x 3.50'H Prismatoid** 3,234 cf Overall - 269 cf Embedded = 2,965 cf x 40.0% Voids
#3	458.00'	1,797 cf	**24.0" Round Pipe Storage** x 11 Inside #1 L= 52.0'
#4	458.00'	269 cf	**18.0" Round Pipe Storage** x 4 Inside #2 L= 38.0'
		6,901 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	457.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	459.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 3.50 hrs HW=457.04' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.8 cfs @ 12.46 hrs HW=459.92' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.8 cfs @ 3.95 fps)

Summary for Pond P110P: DB-110

Inflow Area =	179,817 sf, 43.69% Impervious, Inflow Depth = 4.24" for 100-year event				
Inflow =	18.6 cfs @	12.09 hrs,	Volume=	63,597 cf	
Outflow =	5.5 cfs @	12.49 hrs,	Volume=	63,553 cf,	Atten= 71%, Lag= 23.5 min
Primary =	5.5 cfs @	12.49 hrs,	Volume=	63,553 cf	
Secondary =	0.0 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 424.75' @ 12.49 hrs Surf.Area= 12,364 sf Storage= 26,023 cf

Plug-Flow detention time= 267.0 min calculated for 63,519 cf (100% of inflow)
Center-of-Mass det. time= 268.5 min (1,079.3 - 810.8)

Volume	Invert	Avail.Storage	Storage Description
#1	422.00'	43,126 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
422.00	6,555	0	0
424.00	10,793	17,348	17,348
426.00	14,985	25,778	43,126

Device	Routing	Invert	Outlet Devices
#1	Primary	420.00'	**12.0" Round Culvert** L= 39.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 420.00' / 418.00' S= 0.0513 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf
#2	Device 1	422.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	423.40'	**10.0" Vert. Orifice/Grate X 2.00** C= 0.600
#4	Device 1	424.90'	**24.0" x 24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	425.00'	**20.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

Primary OutFlow Max=5.5 cfs @ 12.49 hrs HW=424.75' (Free Discharge)
└─**1=Culvert** (Passes 5.5 cfs of 7.8 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.4 cfs @ 7.80 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 5.1 cfs @ 4.65 fps)
  └─**4=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=422.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir**(Controls 0.0 cfs)

Summary for Pond P111P: DB-111

Inflow Area =	89,283 sf, 59.87% Impervious, Inflow Depth = 5.03" for 100-year event				
Inflow =	11.6 cfs @	12.09 hrs,	Volume=	37,408 cf	
Outflow =	2.4 cfs @	12.52 hrs,	Volume=	37,408 cf,	Atten= 80%, Lag= 26.1 min
Primary =	2.4 cfs @	12.52 hrs,	Volume=	37,408 cf	
Secondary =	0.0 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 434.95' @ 12.52 hrs Surf.Area= 5,434 sf Storage= 16,768 cf

Plug-Flow detention time= 226.4 min calculated for 37,389 cf (100% of inflow)
Center-of-Mass det. time= 226.6 min (1,027.0 - 800.4)

Volume	Invert	Avail.Storage	Storage Description
#1	430.00'	22,935 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
430.00	600	0	0
431.00	2,440	1,520	1,520
432.00	3,090	2,765	4,285
434.00	4,610	7,700	11,985
436.00	6,340	10,950	22,935

Device	Routing	Invert	Outlet Devices
#1	Primary	430.00'	**12.0" Round Culvert** L= 263.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 430.00' / 418.00' S= 0.0456 '/' Cc= 0.900 n= 0.012 Concrete pipe, finished, Flow Area= 0.79 sf
#2	Device 1	430.00'	**3.0" Vert. Orifice/Grate** C= 0.600
#3	Device 1	433.75'	**8.0" Vert. Orifice/Grate** C= 0.600
#4	Device 1	434.90'	**24.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	435.00'	**10.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=2.3 cfs @ 12.52 hrs HW=434.95' (Free Discharge)
└─**1=Culvert** (Passes 2.3 cfs of 8.0 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 0.5 cfs @ 10.58 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 1.6 cfs @ 4.48 fps)
  └─**4=Orifice/Grate** (Weir Controls 0.2 cfs @ 0.73 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=430.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir**(Controls 0.0 cfs)

Summary for Pond P202P: INF-202

Inflow Area =	16,148 sf,100.00% Impervious, Inflow Depth = 6.76" for 100-year event				
Inflow =	2.5 cfs @	12.09 hrs,	Volume=	9,098 cf	
Outflow =	2.0 cfs @	12.17 hrs,	Volume=	9,098 cf,	Atten= 18%, Lag= 4.8 min
Discarded =	0.0 cfs @	12.15 hrs,	Volume=	5,261 cf	
Primary =	2.0 cfs @	12.17 hrs,	Volume=	3,837 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 440.67' @ 12.16 hrs Surf.Area= 1,856 sf Storage= 3,828 cf

Plug-Flow detention time= 827.1 min calculated for 9,093 cf (100% of inflow)
Center-of-Mass det. time= 828.1 min (1,571.0 - 743.0)

Volume	Invert	Avail.Storage	Storage Description
#1	433.00'	1,652 cf	**29.00'W x 32.00'L x 6.75'H Prismatoid** 6,264 cf Overall - 2,133 cf Embedded = 4,131 cf x 40.0% Voids
#2	439.75'	46 cf	**29.00'W x 32.00'L x 1.00'H Prismatoid** 928 cf Overall x 5.0% Voids
#3	433.75'	2,133 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 18 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 3 Rows of 6 Chambers Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf
		3,832 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	433.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	439.00'	**8.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 12.15 hrs HW=440.62' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=1.8 cfs @ 12.17 hrs HW=440.49' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 1.8 cfs @ 5.18 fps)

Summary for Pond P203P: INF-203

Inflow Area =	77,190 sf, 36.20% Impervious, Inflow Depth = 4.26" for 100-year event				
Inflow =	8.6 cfs @	12.09 hrs,	Volume=	27,385 cf	
Outflow =	5.4 cfs @	12.21 hrs,	Volume=	27,385 cf,	Atten= 38%, Lag= 7.1 min
Discarded =	0.1 cfs @	8.85 hrs,	Volume=	10,962 cf	
Primary =	5.3 cfs @	12.21 hrs,	Volume=	16,424 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 442.18' @ 12.21 hrs Surf.Area= 2,340 sf Storage= 9,285 cf

Plug-Flow detention time= 552.4 min calculated for 27,371 cf (100% of inflow)
Center-of-Mass det. time= 553.3 min (1,370.8 - 817.4)

Volume	Invert	Avail.Storage	Storage Description
#1	436.00'	3,986 cf	**39.00'W x 60.00'L x 6.75'H Prismatoid** 15,795 cf Overall - 5,830 cf Embedded = 9,965 cf x 40.0% Voids
#2	436.75'	5,830 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 52 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 4 Rows of 13 Chambers Cap Storage= +35.7 cf x 2 x 4 rows = 285.6 cf
		9,816 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	436.00'	**1.020 in/hr Exfiltration over Surface area**
#2	Primary	440.75'	**10.0" Vert. Orifice/Grate X 2.00** C= 0.600

Discarded OutFlow Max=0.1 cfs @ 8.85 hrs HW=436.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.1 cfs)

Primary OutFlow Max=5.2 cfs @ 12.21 hrs HW=442.16' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 5.2 cfs @ 4.80 fps)

Summary for Pond P204P: INF-204

Inflow Area =	16,148 sf,100.00% Impervious,	Inflow Depth =	6.76"	for 100-year event	
Inflow =	2.5 cfs @	12.09 hrs,	Volume=	9,098 cf	
Outflow =	0.2 cfs @	13.36 hrs,	Volume=	6,181 cf,	Atten= 93%, Lag= 76.5 min
Discarded =	0.0 cfs @	2.85 hrs,	Volume=	3,930 cf	
Primary =	0.2 cfs @	13.36 hrs,	Volume=	2,251 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 445.75' @ 13.36 hrs Surf.Area= 1,856 sf Storage= 6,152 cf

Plug-Flow detention time= 1,575.3 min calculated for 6,178 cf (68% of inflow)
Center-of-Mass det. time= 1,477.5 min (2,220.5 - 743.0)

Volume	Invert	Avail.Storage	Storage Description
#1	441.00'	3,136 cf	**29.00'W x 64.00'L x 6.75'H Prismatoid** 12,528 cf Overall - 4,687 cf Embedded = 7,841 cf x 40.0% Voids
#2	441.75'	4,687 cf	**ADS_StormTech MC-4500 +Cap** x 42 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 3 Rows of 14 Chambers Cap Storage= +35.7 cf x 2 x 3 rows = 214.2 cf
		7,823 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	441.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	445.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 2.85 hrs HW=441.07' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.2 cfs @ 13.36 hrs HW=445.75' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 1.69 fps)

Summary for Link P1L: Stoney Hill Rd

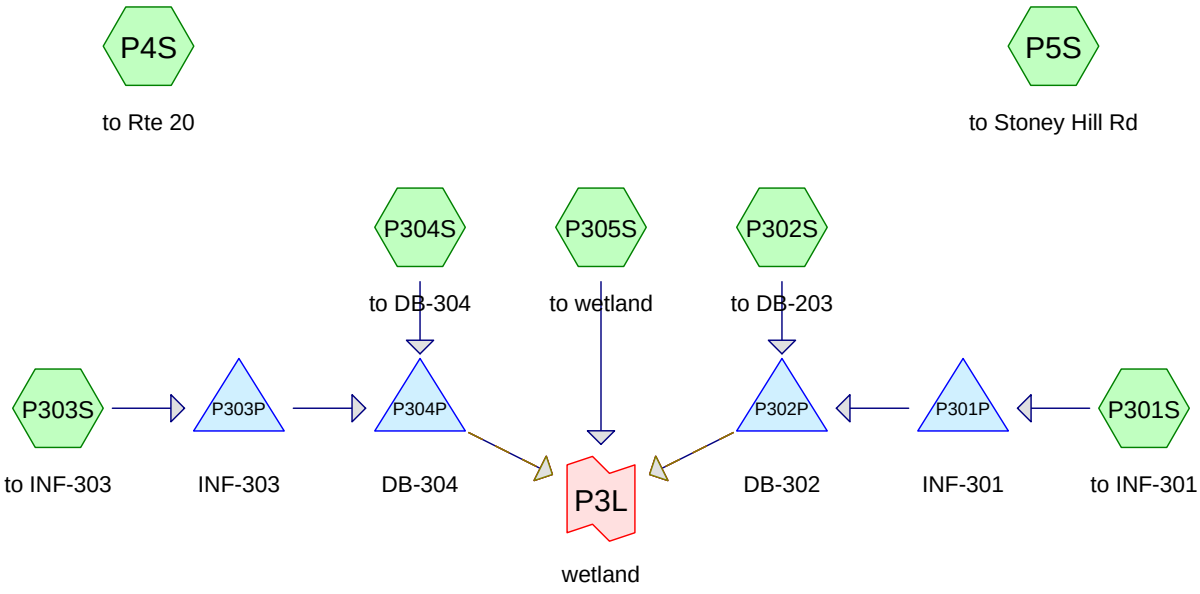
Inflow Area =	451,951 sf, 54.45% Impervious,	Inflow Depth =	4.25"	for 100-year event	
Inflow =	10.8 cfs @	12.51 hrs,	Volume=	160,014 cf	
Primary =	10.8 cfs @	12.51 hrs,	Volume=	160,014 cf,	Atten= 0%, Lag= 0.0 min

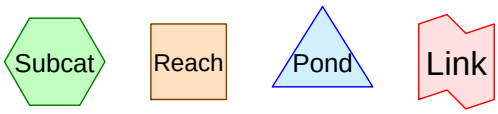
Primary outflow = Inflow, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs

Summary for Link P2L: Southeast

Inflow Area =	139,481 sf, 47.21% Impervious,	Inflow Depth =	2.67"	for 100-year event	
Inflow =	9.7 cfs @	12.17 hrs,	Volume=	31,035 cf	
Primary =	9.7 cfs @	12.17 hrs,	Volume=	31,035 cf,	Atten= 0%, Lag= 0.0 min

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





Routing Diagram for 927.02 Proposed Phase 2
Prepared by Waterman Design Associates, Inc.
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Area Listing (all nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
15,994	79	50-75% Grass cover, Fair, HSG C (P302S, P305S)
96,963	74	>75% Grass cover, Good, HSG C (P301S, P302S, P303S, P304S, P305S, P5S)
1,267	65	Brush, Good, HSG C (P5S)
73,357	98	Paved parking, HSG C (P301S, P302S, P303S, P304S)
37,912	98	Roofs, HSG C (P301S)
19,485	70	Woods, Good, HSG C (P305S, P4S)
244,978	**85**	**TOTAL AREA**

Soil Listing (all nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
244,978	HSG C	P301S, P302S, P303S, P304S, P305S, P4S, P5S
0	HSG D	
0	Other	
244,978		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover	Subcatchment Numbers
0	0	15,994	0	0	15,994	50-75% Grass cover, Fair	P302S, P305S
0	0	96,963	0	0	96,963	>75% Grass cover, Good	P301S, P302S, P303S, P304S, P305S, P5S
0	0	1,267	0	0	1,267	Brush, Good	P5S
0	0	73,357	0	0	73,357	Paved parking	P301S, P302S, P303S, P304S
0	0	37,912	0	0	37,912	Roofs	P301S
0	0	19,485	0	0	19,485	Woods, Good	P305S, P4S
0	**0**	**244,978**	**0**	**0**	**244,978**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	P302P	485.00	484.00	28.0	0.0357	0.013	15.0	0.0	0.0

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

Subcatchment P301S: to INF-301 Runoff Area=57,605 sf 68.47% Impervious Runoff Depth=2.17"
Tc=6.0 min CN=90 Runoff=3.3 cfs 10,410 cf

Subcatchment P302S: to DB-203 Runoff Area=57,853 sf 56.18% Impervious Runoff Depth=2.00"
Tc=6.0 min CN=88 Runoff=3.0 cfs 9,628 cf

Subcatchment P303S: to INF-303 Runoff Area=21,071 sf 8.31% Impervious Runoff Depth=1.15"
Tc=6.0 min CN=76 Runoff=0.6 cfs 2,023 cf

Subcatchment P304S: to DB-304 Runoff Area=49,932 sf 75.25% Impervious Runoff Depth=2.35"
Tc=6.0 min CN=92 Runoff=3.0 cfs 9,781 cf

Subcatchment P305S: to wetland Runoff Area=43,701 sf 0.00% Impervious Runoff Depth=1.04"
Tc=6.0 min CN=74 Runoff=1.1 cfs 3,778 cf

Subcatchment P4S: to Rte 20 Runoff Area=5,984 sf 0.00% Impervious Runoff Depth=0.83"
Tc=6.0 min CN=70 Runoff=0.1 cfs 413 cf

Subcatchment P5S: to Stoney Hill Rd Runoff Area=8,832 sf 0.00% Impervious Runoff Depth=0.98"
Tc=6.0 min CN=73 Runoff=0.2 cfs 723 cf

Pond P301P: INF-301 Peak Elev=509.81' Storage=9,040 cf Inflow=3.3 cfs 10,410 cf
Discarded=0.0 cfs 7,490 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 7,490 cf

Pond P302P: DB-302 Peak Elev=486.02' Storage=1,518 cf Inflow=3.0 cfs 9,628 cf
Primary=1.7 cfs 9,628 cf Secondary=0.0 cfs 0 cf Outflow=1.7 cfs 9,628 cf

Pond P303P: INF-303 Peak Elev=505.36' Storage=946 cf Inflow=0.6 cfs 2,023 cf
Discarded=0.0 cfs 2,023 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 2,023 cf

Pond P304P: DB-304 Peak Elev=502.70' Storage=3,448 cf Inflow=3.0 cfs 9,781 cf
Primary=1.0 cfs 9,779 cf Secondary=0.0 cfs 0 cf Tertiary=0.0 cfs 0 cf Outflow=1.0 cfs 9,779 cf

Link P3L: wetland Inflow=3.5 cfs 23,185 cf
Primary=3.5 cfs 23,185 cf

Total Runoff Area = 244,978 sf Runoff Volume = 36,756 cf Average Runoff Depth = 1.80"
54.58% Pervious = 133,709 sf 45.42% Impervious = 111,269 sf

Summary for Subcatchment P301S: to INF-301

Runoff = 3.3 cfs @ 12.09 hrs, Volume= 10,410 cf, Depth= 2.17"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
11,346	98	Roofs, HSG C
13,024	98	Roofs, HSG C
13,542	98	Roofs, HSG C
18,164	74	>75% Grass cover, Good, HSG C
1,529	98	Paved parking, HSG C
57,605	90	Weighted Average
18,164		31.53% Pervious Area
39,441		68.47% Impervious Area

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

Summary for Subcatchment P302S: to DB-203

Runoff = 3.0 cfs @ 12.09 hrs, Volume= 9,628 cf, Depth= 2.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
21,347	74	>75% Grass cover, Good, HSG C
32,503	98	Paved parking, HSG C
4,003	79	50-75% Grass cover, Fair, HSG C
57,853	88	Weighted Average
25,350		43.82% Pervious Area
32,503		56.18% Impervious Area

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

Summary for Subcatchment P303S: to INF-303

Runoff = 0.6 cfs @ 12.10 hrs, Volume= 2,023 cf, Depth= 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
19,320	74	>75% Grass cover, Good, HSG C
1,751	98	Paved parking, HSG C
21,071	76	Weighted Average
19,320		91.69% Pervious Area
1,751		8.31% Impervious Area

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

Summary for Subcatchment P304S: to DB-304

Runoff = 3.0 cfs @ 12.09 hrs, Volume= 9,781 cf, Depth= 2.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
12,358	74	>75% Grass cover, Good, HSG C
37,574	98	Paved parking, HSG C
49,932	92	Weighted Average
12,358		24.75% Pervious Area
37,574		75.25% Impervious Area

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

Summary for Subcatchment P305S: to wetland

Runoff = 1.1 cfs @ 12.10 hrs, Volume= 3,778 cf, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
18,209	74	>75% Grass cover, Good, HSG C
1,955	70	Woods, Good, HSG C
11,991	79	50-75% Grass cover, Fair, HSG C
11,546	70	Woods, Good, HSG C
43,701	74	Weighted Average
43,701		100.00% Pervious Area

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

Summary for Subcatchment P4S: to Rte 20

Runoff = 0.1 cfs @ 12.10 hrs, Volume= 413 cf, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
5,984	70	Woods, Good, HSG C
5,984		100.00% Pervious Area

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

Summary for Subcatchment P5S: to Stoney Hill Rd

Runoff = 0.2 cfs @ 12.10 hrs, Volume= 723 cf, Depth= 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-year Rainfall=3.20"

Area (sf)	CN	Description
7,565	74	>75% Grass cover, Good, HSG C
1,267	65	Brush, Good, HSG C
8,832	73	Weighted Average
8,832		100.00% Pervious Area

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

Summary for Pond P301P: INF-301

Inflow Area = 57,605 sf, 68.47% Impervious, Inflow Depth = 2.17" for 2-year event
Inflow = 3.3 cfs @ 12.09 hrs, Volume= 10,410 cf
Outflow = 0.0 cfs @ 9.00 hrs, Volume= 7,490 cf, Atten= 99%, Lag= 0.0 min
Discarded = 0.0 cfs @ 9.00 hrs, Volume= 7,490 cf
Primary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 509.81' @ 24.06 hrs Surf.Area= 3,782 sf Storage= 9,040 cf

Plug-Flow detention time= 2,403.4 min calculated for 7,486 cf (72% of inflow)
Center-of-Mass det. time= 2,314.0 min (3,120.9 - 806.9)

Volume	Invert	Avail.Storage	Storage Description
#1	506.50'	6,580 cf	**61.00'W x 62.00'L x 7.00'H Prismatoid** 26,474 cf Overall - 10,024 cf Embedded = 16,450 cf x 40.0% Voids
#2	507.25'	10,024 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 90 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 6 Rows of 15 Chambers Cap Storage= +35.7 cf x 2 x 6 rows = 428.4 cf
		16,604 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	506.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	511.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 9.00 hrs HW=506.57' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=506.50' (Free Discharge)
└**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond P302P: DB-302

Inflow Area = 115,458 sf, 62.31% Impervious, Inflow Depth = 1.00" for 2-year event
Inflow = 3.0 cfs @ 12.09 hrs, Volume= 9,628 cf
Outflow = 1.7 cfs @ 12.23 hrs, Volume= 9,628 cf, Atten= 45%, Lag= 8.2 min
Primary = 1.7 cfs @ 12.23 hrs, Volume= 9,628 cf
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 486.02' @ 12.23 hrs Surf.Area= 1,821 sf Storage= 1,518 cf

Plug-Flow detention time= 21.5 min calculated for 9,623 cf (100% of inflow)
Center-of-Mass det. time= 21.7 min (836.8 - 815.1)

Volume	Invert	Avail.Storage	Storage Description
#1	485.00'	7,415 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
485.00	1,170	0	0
486.00	1,800	1,485	1,485
488.00	4,130	5,930	7,415

Device	Routing	Invert	Outlet Devices
#1	Primary	485.00'	**15.0" Round Culvert** L= 28.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 485.00' / 484.00' S= 0.0357 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	485.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 1	486.00'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600
#4	Device 1	487.00'	**16.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	487.00'	**30.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=1.7 cfs @ 12.23 hrs HW=486.02' (Free Discharge)
└─**1=Culvert** (Passes 1.7 cfs of 3.7 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 1.7 cfs @ 4.21 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 0.0 cfs @ 0.42 fps)
  └─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=485.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P303P: INF-303

Inflow Area =	21,071 sf,	8.31% Impervious,	Inflow Depth =	1.15"	for 2-year event
Inflow =	0.6 cfs @	12.10 hrs,	Volume=	2,023 cf	
Outflow =	0.0 cfs @	11.80 hrs,	Volume=	2,023 cf,	Atten= 93%, Lag= 0.0 min
Discarded =	0.0 cfs @	11.80 hrs,	Volume=	2,023 cf	
Primary =	0.0 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 505.36' @ 14.78 hrs Surf.Area= 6,500 sf Storage= 946 cf

Plug-Flow detention time= 247.1 min calculated for 2,022 cf (100% of inflow)
Center-of-Mass det. time= 247.1 min (1,102.6 - 855.6)

Volume	Invert	Avail.Storage	Storage Description
#1	505.00'	4,000 cf	**50.00'W x 100.00'L x 2.00'H Prismatoid** 10,000 cf Overall x 40.0% Voids
#2	505.00'	1,200 cf	**50.00'W x 30.00'L x 2.00'H Prismatoid** 3,000 cf Overall x 40.0% Voids
		5,200 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	505.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	506.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 11.80 hrs HW=505.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=505.00' (Free Discharge)
└─**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond P304P: DB-304

Inflow Area = 71,003 sf, 55.38% Impervious, Inflow Depth = 1.65" for 2-year event
Inflow = 3.0 cfs @ 12.09 hrs, Volume= 9,781 cf
Outflow = 1.0 cfs @ 12.38 hrs, Volume= 9,779 cf, Atten= 66%, Lag= 17.7 min
Primary = 1.0 cfs @ 12.38 hrs, Volume= 9,779 cf
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Tertiary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 502.70' @ 12.38 hrs Surf.Area= 4,935 sf Storage= 3,448 cf

Plug-Flow detention time= 119.8 min calculated for 9,779 cf (100% of inflow)
Center-of-Mass det. time= 119.6 min (917.4 - 797.8)

Volume	Invert	Avail.Storage	Storage Description
#1	502.00'	12,338 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.00	4,935	0	0
504.00	4,935	9,870	9,870
504.50	4,935	2,468	12,338

Device	Routing	Invert	Outlet Devices
#1	Primary	502.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	503.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Secondary	503.20'	**30.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height
#4	Tertiary	504.40'	**200.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=1.0 cfs @ 12.38 hrs HW=502.70' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 1.0 cfs @ 2.91 fps)
└─**2=Orifice/Grate** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=502.00' (Free Discharge)
└─**3=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

Tertiary OutFlow Max=0.0 cfs @ 0.00 hrs HW=502.00' (Free Discharge)
└─**4=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Link P3L: wetland

Inflow Area = 230,162 sf, 48.34% Impervious, Inflow Depth = 1.21" for 2-year event
Inflow = 3.5 cfs @ 12.15 hrs, Volume= 23,185 cf
Primary = 3.5 cfs @ 12.15 hrs, Volume= 23,185 cf, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment P301S: to INF-301 Runoff Area=57,605 sf 68.47% Impervious Runoff Depth=3.68"
Tc=6.0 min CN=90 Runoff=5.4 cfs 17,683 cf

Subcatchment P302S: to DB-203 Runoff Area=57,853 sf 56.18% Impervious Runoff Depth=3.48"
Tc=6.0 min CN=88 Runoff=5.2 cfs 16,774 cf

Subcatchment P303S: to INF-303 Runoff Area=21,071 sf 8.31% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=76 Runoff=1.3 cfs 4,164 cf

Subcatchment P304S: to DB-304 Runoff Area=49,932 sf 75.25% Impervious Runoff Depth=3.89"
Tc=6.0 min CN=92 Runoff=4.9 cfs 16,203 cf

Subcatchment P305S: to wetland Runoff Area=43,701 sf 0.00% Impervious Runoff Depth=2.21"
Tc=6.0 min CN=74 Runoff=2.5 cfs 8,033 cf

Subcatchment P4S: to Rte 20 Runoff Area=5,984 sf 0.00% Impervious Runoff Depth=1.89"
Tc=6.0 min CN=70 Runoff=0.3 cfs 942 cf

Subcatchment P5S: to Stoney Hill Rd Runoff Area=8,832 sf 0.00% Impervious Runoff Depth=2.12"
Tc=6.0 min CN=73 Runoff=0.5 cfs 1,564 cf

Pond P301P: INF-301 Peak Elev=511.73' Storage=13,847 cf Inflow=5.4 cfs 17,683 cf
Discarded=0.0 cfs 7,638 cf Primary=0.1 cfs 2,633 cf Outflow=0.2 cfs 10,270 cf

Pond P302P: DB-302 Peak Elev=486.44' Storage=2,397 cf Inflow=5.2 cfs 19,407 cf
Primary=3.7 cfs 19,407 cf Secondary=0.0 cfs 0 cf Outflow=3.7 cfs 19,407 cf

Pond P303P: INF-303 Peak Elev=505.99' Storage=2,571 cf Inflow=1.3 cfs 4,164 cf
Discarded=0.0 cfs 4,164 cf Primary=0.0 cfs 0 cf Outflow=0.0 cfs 4,164 cf

Pond P304P: DB-304 Peak Elev=503.11' Storage=5,479 cf Inflow=4.9 cfs 16,203 cf
Primary=1.5 cfs 16,201 cf Secondary=0.0 cfs 0 cf Tertiary=0.0 cfs 0 cf Outflow=1.5 cfs 16,201 cf

Link P3L: wetland Inflow=7.1 cfs 43,641 cf
Primary=7.1 cfs 43,641 cf

Total Runoff Area = 244,978 sf Runoff Volume = 65,364 cf Average Runoff Depth = 3.20"
54.58% Pervious = 133,709 sf 45.42% Impervious = 111,269 sf

Summary for Subcatchment P301S: to INF-301

Runoff = 5.4 cfs @ 12.09 hrs, Volume= 17,683 cf, Depth= 3.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
11,346	98	Roofs, HSG C
13,024	98	Roofs, HSG C
13,542	98	Roofs, HSG C
18,164	74	>75% Grass cover, Good, HSG C
1,529	98	Paved parking, HSG C
57,605	90	Weighted Average
18,164		31.53% Pervious Area
39,441		68.47% Impervious Area

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

Summary for Subcatchment P302S: to DB-203

Runoff = 5.2 cfs @ 12.09 hrs, Volume= 16,774 cf, Depth= 3.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
21,347	74	>75% Grass cover, Good, HSG C
32,503	98	Paved parking, HSG C
4,003	79	50-75% Grass cover, Fair, HSG C
57,853	88	Weighted Average
25,350		43.82% Pervious Area
32,503		56.18% Impervious Area

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

Summary for Subcatchment P303S: to INF-303

Runoff = 1.3 cfs @ 12.09 hrs, Volume= 4,164 cf, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
19,320	74	>75% Grass cover, Good, HSG C
1,751	98	Paved parking, HSG C
21,071	76	Weighted Average
19,320		91.69% Pervious Area
1,751		8.31% Impervious Area

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

Summary for Subcatchment P304S: to DB-304

Runoff = 4.9 cfs @ 12.09 hrs, Volume= 16,203 cf, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
12,358	74	>75% Grass cover, Good, HSG C
37,574	98	Paved parking, HSG C
49,932	92	Weighted Average
12,358		24.75% Pervious Area
37,574		75.25% Impervious Area

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

Summary for Subcatchment P305S: to wetland

Runoff = 2.5 cfs @ 12.10 hrs, Volume= 8,033 cf, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
18,209	74	>75% Grass cover, Good, HSG C
1,955	70	Woods, Good, HSG C
11,991	79	50-75% Grass cover, Fair, HSG C
11,546	70	Woods, Good, HSG C
43,701	74	Weighted Average
43,701		100.00% Pervious Area

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

Summary for Subcatchment P4S: to Rte 20

Runoff = 0.3 cfs @ 12.10 hrs, Volume= 942 cf, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
5,984	70	Woods, Good, HSG C
5,984		100.00% Pervious Area

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

Summary for Subcatchment P5S: to Stoney Hill Rd

Runoff = 0.5 cfs @ 12.10 hrs, Volume= 1,564 cf, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-year Rainfall=4.80"

Area (sf)	CN	Description
7,565	74	>75% Grass cover, Good, HSG C
1,267	65	Brush, Good, HSG C
8,832	73	Weighted Average
8,832		100.00% Pervious Area

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

Summary for Pond P301P: INF-301

Inflow Area = 57,605 sf, 68.47% Impervious, Inflow Depth = 3.68" for 10-year event
Inflow = 5.4 cfs @ 12.09 hrs, Volume= 17,683 cf
Outflow = 0.2 cfs @ 15.93 hrs, Volume= 10,270 cf, Atten= 97%, Lag= 230.7 min
Discarded = 0.0 cfs @ 7.30 hrs, Volume= 7,638 cf
Primary = 0.1 cfs @ 15.93 hrs, Volume= 2,633 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 511.73' @ 15.93 hrs Surf.Area= 3,782 sf Storage= 13,847 cf

Plug-Flow detention time= 1,881.5 min calculated for 10,270 cf (58% of inflow)
Center-of-Mass det. time= 1,776.5 min (2,568.6 - 792.1)

Volume	Invert	Avail.Storage	Storage Description
#1	506.50'	6,580 cf	**61.00'W x 62.00'L x 7.00'H Prismatoid** 26,474 cf Overall - 10,024 cf Embedded = 16,450 cf x 40.0% Voids
#2	507.25'	10,024 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 90 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 6 Rows of 15 Chambers Cap Storage= +35.7 cf x 2 x 6 rows = 428.4 cf
		16,604 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	506.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	511.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 7.30 hrs HW=506.57' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.1 cfs @ 15.93 hrs HW=511.73' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 0.1 cfs @ 1.63 fps)

Summary for Pond P302P: DB-302

Inflow Area = 115,458 sf, 62.31% Impervious, Inflow Depth = 2.02" for 10-year event
Inflow = 5.2 cfs @ 12.09 hrs, Volume= 19,407 cf
Outflow = 3.7 cfs @ 12.17 hrs, Volume= 19,407 cf, Atten= 28%, Lag= 5.0 min
Primary = 3.7 cfs @ 12.17 hrs, Volume= 19,407 cf
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 486.44' @ 12.17 hrs Surf.Area= 2,316 sf Storage= 2,397 cf

Plug-Flow detention time= 17.5 min calculated for 19,397 cf (100% of inflow)
Center-of-Mass det. time= 17.7 min (860.2 - 842.6)

Volume	Invert	Avail.Storage	Storage Description
#1	485.00'	7,415 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
485.00	1,170	0	0
486.00	1,800	1,485	1,485
488.00	4,130	5,930	7,415

Device	Routing	Invert	Outlet Devices
#1	Primary	485.00'	**15.0" Round Culvert** L= 28.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 485.00' / 484.00' S= 0.0357 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	485.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 1	486.00'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600
#4	Device 1	487.00'	**16.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	487.00'	**30.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=3.7 cfs @ 12.17 hrs HW=486.43' (Free Discharge)
└─**1=Culvert** (Passes 3.7 cfs of 5.3 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.1 cfs @ 5.23 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 1.6 cfs @ 2.23 fps)
  └─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=485.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P303P: INF-303

Inflow Area =	21,071 sf,	8.31% Impervious,	Inflow Depth =	2.37"	for 10-year event
Inflow =	1.3 cfs @	12.09 hrs,	Volume=	4,164 cf	
Outflow =	0.0 cfs @	11.20 hrs,	Volume=	4,164 cf,	Atten= 97%, Lag= 0.0 min
Discarded =	0.0 cfs @	11.20 hrs,	Volume=	4,164 cf	
Primary =	0.0 cfs @	0.00 hrs,	Volume=	0 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 505.99' @ 16.89 hrs Surf.Area= 6,500 sf Storage= 2,571 cf

Plug-Flow detention time= 642.1 min calculated for 4,162 cf (100% of inflow)
Center-of-Mass det. time= 642.2 min (1,476.5 - 834.2)

Volume	Invert	Avail.Storage	Storage Description
#1	505.00'	4,000 cf	**50.00'W x 100.00'L x 2.00'H Prismatoid** 10,000 cf Overall x 40.0% Voids
#2	505.00'	1,200 cf	**50.00'W x 30.00'L x 2.00'H Prismatoid** 3,000 cf Overall x 40.0% Voids
		5,200 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	505.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	506.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 11.20 hrs HW=505.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.0 cfs @ 0.00 hrs HW=505.00' (Free Discharge)
└─**2=Orifice/Grate** (Controls 0.0 cfs)

Summary for Pond P304P: DB-304

Inflow Area = 71,003 sf, 55.38% Impervious, Inflow Depth = 2.74" for 10-year event
Inflow = 4.9 cfs @ 12.09 hrs, Volume= 16,203 cf
Outflow = 1.5 cfs @ 12.40 hrs, Volume= 16,201 cf, Atten= 69%, Lag= 18.8 min
Primary = 1.5 cfs @ 12.40 hrs, Volume= 16,201 cf
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf
Tertiary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 503.11' @ 12.40 hrs Surf.Area= 4,935 sf Storage= 5,479 cf

Plug-Flow detention time= 99.2 min calculated for 16,201 cf (100% of inflow)
Center-of-Mass det. time= 99.0 min (883.0 - 784.0)

Volume	Invert	Avail.Storage	Storage Description
#1	502.00'	12,338 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.00	4,935	0	0
504.00	4,935	9,870	9,870
504.50	4,935	2,468	12,338

Device	Routing	Invert	Outlet Devices
#1	Primary	502.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	503.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Secondary	503.20'	**30.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height
#4	Tertiary	504.40'	**200.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=1.5 cfs @ 12.40 hrs HW=503.11' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 1.5 cfs @ 4.24 fps)
└─**2=Orifice/Grate** (Orifice Controls 0.0 cfs @ 1.13 fps)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=502.00' (Free Discharge)
└─**3=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

Tertiary OutFlow Max=0.0 cfs @ 0.00 hrs HW=502.00' (Free Discharge)
└─**4=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Link P3L: wetland

Inflow Area = 230,162 sf, 48.34% Impervious, Inflow Depth = 2.28" for 10-year event
Inflow = 7.1 cfs @ 12.15 hrs, Volume= 43,641 cf
Primary = 7.1 cfs @ 12.15 hrs, Volume= 43,641 cf, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment P301S: to INF-301 Runoff Area=57,605 sf 68.47% Impervious Runoff Depth=5.82"
Tc=6.0 min CN=90 Runoff=8.3 cfs 27,954 cf

Subcatchment P302S: to DB-203 Runoff Area=57,853 sf 56.18% Impervious Runoff Depth=5.59"
Tc=6.0 min CN=88 Runoff=8.1 cfs 26,967 cf

Subcatchment P303S: to INF-303 Runoff Area=21,071 sf 8.31% Impervious Runoff Depth=4.26"
Tc=6.0 min CN=76 Runoff=2.4 cfs 7,476 cf

Subcatchment P304S: to DB-304 Runoff Area=49,932 sf 75.25% Impervious Runoff Depth=6.05"
Tc=6.0 min CN=92 Runoff=7.4 cfs 25,194 cf

Subcatchment P305S: to wetland Runoff Area=43,701 sf 0.00% Impervious Runoff Depth=4.04"
Tc=6.0 min CN=74 Runoff=4.7 cfs 14,720 cf

Subcatchment P4S: to Rte 20 Runoff Area=5,984 sf 0.00% Impervious Runoff Depth=3.62"
Tc=6.0 min CN=70 Runoff=0.6 cfs 1,804 cf

Subcatchment P5S: to Stoney Hill Rd Runoff Area=8,832 sf 0.00% Impervious Runoff Depth=3.94"
Tc=6.0 min CN=73 Runoff=0.9 cfs 2,896 cf

Pond P301P: INF-301 Peak Elev=513.25' Storage=16,227 cf Inflow=8.3 cfs 27,954 cf
Discarded=0.0 cfs 7,773 cf Primary=1.2 cfs 12,743 cf Outflow=1.2 cfs 20,516 cf

Pond P302P: DB-302 Peak Elev=486.90' Storage=3,590 cf Inflow=8.1 cfs 39,710 cf
Primary=5.5 cfs 39,710 cf Secondary=0.0 cfs 0 cf Outflow=5.5 cfs 39,710 cf

Pond P303P: INF-303 Peak Elev=506.36' Storage=3,530 cf Inflow=2.4 cfs 7,476 cf
Discarded=0.0 cfs 4,789 cf Primary=0.3 cfs 2,687 cf Outflow=0.3 cfs 7,476 cf

Pond P304P: DB-304 Peak Elev=503.32' Storage=6,538 cf Inflow=7.4 cfs 27,881 cf
Primary=1.9 cfs 25,143 cf Secondary=4.3 cfs 2,736 cf Tertiary=0.0 cfs 0 cf Outflow=6.2 cfs 27,878 cf

Link P3L: wetland Inflow=15.3 cfs 82,308 cf
Primary=15.3 cfs 82,308 cf

Total Runoff Area = 244,978 sf Runoff Volume = 107,011 cf Average Runoff Depth = 5.24"
54.58% Pervious = 133,709 sf 45.42% Impervious = 111,269 sf

Summary for Subcatchment P301S: to INF-301

Runoff = 8.3 cfs @ 12.09 hrs, Volume= 27,954 cf, Depth= 5.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
11,346	98	Roofs, HSG C
13,024	98	Roofs, HSG C
13,542	98	Roofs, HSG C
18,164	74	>75% Grass cover, Good, HSG C
1,529	98	Paved parking, HSG C
57,605	90	Weighted Average
18,164		31.53% Pervious Area
39,441		68.47% Impervious Area

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

Summary for Subcatchment P302S: to DB-203

Runoff = 8.1 cfs @ 12.09 hrs, Volume= 26,967 cf, Depth= 5.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
21,347	74	>75% Grass cover, Good, HSG C
32,503	98	Paved parking, HSG C
4,003	79	50-75% Grass cover, Fair, HSG C
57,853	88	Weighted Average
25,350		43.82% Pervious Area
32,503		56.18% Impervious Area

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

Summary for Subcatchment P303S: to INF-303

Runoff = 2.4 cfs @ 12.09 hrs, Volume= 7,476 cf, Depth= 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
19,320	74	>75% Grass cover, Good, HSG C
1,751	98	Paved parking, HSG C
21,071	76	Weighted Average
19,320		91.69% Pervious Area
1,751		8.31% Impervious Area

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

Summary for Subcatchment P304S: to DB-304

Runoff = 7.4 cfs @ 12.09 hrs, Volume= 25,194 cf, Depth= 6.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
12,358	74	>75% Grass cover, Good, HSG C
37,574	98	Paved parking, HSG C
49,932	92	Weighted Average
12,358		24.75% Pervious Area
37,574		75.25% Impervious Area

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

Summary for Subcatchment P305S: to wetland

Runoff = 4.7 cfs @ 12.09 hrs, Volume= 14,720 cf, Depth= 4.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
18,209	74	>75% Grass cover, Good, HSG C
1,955	70	Woods, Good, HSG C
11,991	79	50-75% Grass cover, Fair, HSG C
11,546	70	Woods, Good, HSG C
43,701	74	Weighted Average
43,701		100.00% Pervious Area

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

Summary for Subcatchment P4S: to Rte 20

Runoff = 0.6 cfs @ 12.09 hrs, Volume= 1,804 cf, Depth= 3.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
5,984	70	Woods, Good, HSG C
5,984		100.00% Pervious Area

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

Summary for Subcatchment P5S: to Stoney Hill Rd

Runoff = 0.9 cfs @ 12.09 hrs, Volume= 2,896 cf, Depth= 3.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-year Rainfall=7.00"

Area (sf)	CN	Description
7,565	74	>75% Grass cover, Good, HSG C
1,267	65	Brush, Good, HSG C
8,832	73	Weighted Average
8,832		100.00% Pervious Area

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

Summary for Pond P301P: INF-301

Inflow Area = 57,605 sf, 68.47% Impervious, Inflow Depth = 5.82" for 100-year event
Inflow = 8.3 cfs @ 12.09 hrs, Volume= 27,954 cf
Outflow = 1.2 cfs @ 12.61 hrs, Volume= 20,516 cf, Atten= 86%, Lag= 31.1 min
Discarded = 0.0 cfs @ 5.60 hrs, Volume= 7,773 cf
Primary = 1.2 cfs @ 12.61 hrs, Volume= 12,743 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 513.25' @ 12.61 hrs Surf.Area= 3,782 sf Storage= 16,227 cf

Plug-Flow detention time= 1,018.4 min calculated for 20,505 cf (73% of inflow)
Center-of-Mass det. time= 933.3 min (1,713.1 - 779.9)

Volume	Invert	Avail.Storage	Storage Description
#1	506.50'	6,580 cf	**61.00'W x 62.00'L x 7.00'H Prismatoid** 26,474 cf Overall - 10,024 cf Embedded = 16,450 cf x 40.0% Voids
#2	507.25'	10,024 cf	**ADS_StormTech MC-4500 +Cap @ 4.03' L**x 90 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.6 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 6 Rows of 15 Chambers Cap Storage= +35.7 cf x 2 x 6 rows = 428.4 cf
		16,604 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	506.50'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	511.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 5.60 hrs HW=506.57' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=1.2 cfs @ 12.61 hrs HW=513.25' (Free Discharge)
└**2=Orifice/Grate** (Orifice Controls 1.2 cfs @ 5.90 fps)

Summary for Pond P302P: DB-302

Inflow Area = 115,458 sf, 62.31% Impervious, Inflow Depth = 4.13" for 100-year event
Inflow = 8.1 cfs @ 12.09 hrs, Volume= 39,710 cf
Outflow = 5.5 cfs @ 12.18 hrs, Volume= 39,710 cf, Atten= 33%, Lag= 5.7 min
Primary = 5.5 cfs @ 12.18 hrs, Volume= 39,710 cf
Secondary = 0.0 cfs @ 0.00 hrs, Volume= 0 cf

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 486.90' @ 12.18 hrs Surf.Area= 2,854 sf Storage= 3,590 cf

Plug-Flow detention time= 14.5 min calculated for 39,689 cf (100% of inflow)
Center-of-Mass det. time= 14.7 min (842.4 - 827.7)

Volume	Invert	Avail.Storage	Storage Description
#1	485.00'	7,415 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
485.00	1,170	0	0
486.00	1,800	1,485	1,485
488.00	4,130	5,930	7,415

Device	Routing	Invert	Outlet Devices
#1	Primary	485.00'	**15.0" Round Culvert** L= 28.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 485.00' / 484.00' S= 0.0357 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#2	Device 1	485.00'	**6.0" Vert. Orifice/Grate X 2.00** C= 0.600
#3	Device 1	486.00'	**6.0" Vert. Orifice/Grate X 4.00** C= 0.600
#4	Device 1	487.00'	**16.0' long x 0.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#5	Secondary	487.00'	**30.0' long x 16.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=5.5 cfs @ 12.18 hrs HW=486.90' (Free Discharge)
└─**1=Culvert** (Passes 5.5 cfs of 6.7 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 2.4 cfs @ 6.18 fps)
  ├─**3=Orifice/Grate** (Orifice Controls 3.0 cfs @ 3.88 fps)
  └─**4=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Secondary OutFlow Max=0.0 cfs @ 0.00 hrs HW=485.00' (Free Discharge)
└─**5=Broad-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Pond P303P: INF-303

Inflow Area =	21,071 sf,	8.31% Impervious,	Inflow Depth =	4.26"	for 100-year event
Inflow =	2.4 cfs @	12.09 hrs,	Volume=	7,476 cf	
Outflow =	0.3 cfs @	12.62 hrs,	Volume=	7,476 cf,	Atten= 85%, Lag= 32.0 min
Discarded =	0.0 cfs @	10.00 hrs,	Volume=	4,789 cf	
Primary =	0.3 cfs @	12.62 hrs,	Volume=	2,687 cf	

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 506.36' @ 12.62 hrs Surf.Area= 6,500 sf Storage= 3,530 cf

Plug-Flow detention time= 468.3 min calculated for 7,472 cf (100% of inflow)
Center-of-Mass det. time= 468.6 min (1,286.0 - 817.4)

Volume	Invert	Avail.Storage	Storage Description
#1	505.00'	4,000 cf	**50.00'W x 100.00'L x 2.00'H Prismatoid** 10,000 cf Overall x 40.0% Voids
#2	505.00'	1,200 cf	**50.00'W x 30.00'L x 2.00'H Prismatoid** 3,000 cf Overall x 40.0% Voids
		5,200 cf	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Discarded	505.00'	**0.270 in/hr Exfiltration over Surface area**
#2	Primary	506.00'	**6.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.0 cfs @ 10.00 hrs HW=505.02' (Free Discharge)
└─**1=Exfiltration** (Exfiltration Controls 0.0 cfs)

Primary OutFlow Max=0.3 cfs @ 12.62 hrs HW=506.36' (Free Discharge)
└─**2=Orifice/Grate** (Orifice Controls 0.3 cfs @ 2.04 fps)

Summary for Pond P304P: DB-304

Inflow Area =	71,003 sf, 55.38% Impervious,	Inflow Depth =	4.71"	for 100-year event	
Inflow =	7.4 cfs @	12.09 hrs, Volume=	27,881 cf		
Outflow =	6.2 cfs @	12.16 hrs, Volume=	27,878 cf,	Atten= 16%, Lag= 4.6 min	
Primary =	1.9 cfs @	12.17 hrs, Volume=	25,143 cf		
Secondary =	4.3 cfs @	12.16 hrs, Volume=	2,736 cf		
Tertiary =	0.0 cfs @	0.00 hrs, Volume=	0 cf		

Routing by Stor-Ind method, Time Span= 0.00-96.00 hrs, dt= 0.05 hrs
Peak Elev= 503.32' @ 12.17 hrs Surf.Area= 4,935 sf Storage= 6,538 cf

Plug-Flow detention time= 77.2 min calculated for 27,878 cf (100% of inflow)
Center-of-Mass det. time= 77.0 min (858.7 - 781.7)

Volume	Invert	Avail.Storage	Storage Description
#1	502.00'	12,338 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
502.00	4,935	0	0
504.00	4,935	9,870	9,870
504.50	4,935	2,468	12,338

Device	Routing	Invert	Outlet Devices
#1	Primary	502.00'	**8.0" Vert. Orifice/Grate** C= 0.600
#2	Primary	503.00'	**6.0" Vert. Orifice/Grate** C= 0.600
#3	Secondary	503.20'	**30.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 3.0' Crest Height
#4	Tertiary	504.40'	**200.0' long Sharp-Crested Rectangular Weir** 2 End Contraction(s) 4.0' Crest Height

Primary OutFlow Max=1.9 cfs @ 12.17 hrs HW=503.31' (Free Discharge)
└─**1=Orifice/Grate** (Orifice Controls 1.7 cfs @ 4.77 fps)
└─**2=Orifice/Grate** (Orifice Controls 0.2 cfs @ 1.91 fps)

Secondary OutFlow Max=3.8 cfs @ 12.16 hrs HW=503.31' (Free Discharge)
└─**3=Sharp-Crested Rectangular Weir** (Weir Controls 3.8 cfs @ 1.11 fps)

Tertiary OutFlow Max=0.0 cfs @ 0.00 hrs HW=502.00' (Free Discharge)
└─**4=Sharp-Crested Rectangular Weir** (Controls 0.0 cfs)

Summary for Link P3L: wetland

Inflow Area =	230,162 sf, 48.34% Impervious,	Inflow Depth =	4.29"	for 100-year event	
Inflow =	15.3 cfs @	12.16 hrs, Volume=	82,308 cf		
Primary =	15.3 cfs @	12.16 hrs, Volume=	82,308 cf,	Atten= 0%, Lag= 0.0 min	

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

HYDRAULICS

Conduit FlexTable: WDA Report (0927350.stc)

Pipe Label	-Structure- Upstream Downstream	-Rim- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Pipe Dia. (in)	Manning's n	Length (ft)	Slope (ft/ft)	Capacity (Full Flow) (ft^3/s)	System CA (ft^2)	System Intensity (in/h)	Section Discharge Capacity (ft^3/s)	Velocity (Average) (ft/s)
D-2	DMH-2	426.95	422.47	421.50	15	0.013	97	0.036	12.27	3,915	7.894	5.80	9.86
	FES-1	418.00	418.60	418.00			97					12.27	
D-3	DMH-3	426.80	422.47	421.80	12	0.013	6	0.033	6.50	3,915	7.978	0.72	5.46
	DMH-2	426.95	422.47	421.60			6					6.50	
D-4	CB-4	426.25	422.50	422.25	12	0.013	8	0.056	8.45	1,989	8.000	0.37	5.39
	DMH-3	426.80	422.47	421.80			8					8.45	
D-5	CB-5	426.25	422.50	422.25	12	0.013	18	0.025	5.63	1,926	8.000	0.36	4.01
	DMH-3	426.80	422.47	421.80			18					5.63	
D-7	DMH-7	435.95	425.97	425.20	12	0.013	32	0.037	6.90	18,392	7.575	3.22	8.64
	OF-6	424.00	424.50	424.00			32					6.90	
D-8	CB-8	435.75	432.36	431.75	12	0.013	42	0.024	5.50	11,094	8.000	2.05	6.49
	DMH-7	435.95	431.17	430.75			42					5.50	
D-9	DMH-9	437.40	433.28	432.80	12	0.013	86	0.021	5.15	7,297	7.653	1.29	5.46
	DMH-7	435.95	431.34	431.00			86					5.15	
D-10	CB-10	437.25	433.66	433.25	12	0.013	8	0.056	8.45	5,103	8.000	0.94	7.11
	DMH-9	437.40	433.28	432.80			8					8.45	
D-11	AD-11	441.35	437.61	437.35	12	0.013	81	0.056	8.44	2,195	7.727	0.39	5.48
	DMH-9	437.40	433.28	432.80			81					8.44	
D-12	AD-12	445.50	439.73	439.50	12	0.013	105	0.020	5.10	1,664	7.875	0.30	3.56
	AD-11	441.35	437.61	437.35			105					5.10	
D-13	AD-13	445.50	440.66	440.50	12	0.013	66	0.015	4.39	846	8.000	0.16	2.63
	AD-12	445.50	439.73	439.50			66					4.39	
D-15	DMH-15	435.20	425.40	424.20	12	0.013	32	0.037	6.90	37,579	7.715	7.47	9.51
	OF-14	423.00	423.98	423.00			32					6.90	
D-16	DMH-16	435.30	431.27	430.05	12	0.013	12	0.025	5.63	37,579	7.721	7.47	9.52
	DMH-15	435.20	430.73	429.75			12					5.63	
D-17	CB-17	435.30	431.79	431.30	12	0.013	34	0.013	4.10	7,380	8.000	1.37	4.69
	DMH-16	435.30	431.25	430.85			34					4.10	
D-18	CB-18	434.70	431.24	430.70	12	0.013	14	0.046	7.68	4,560	8.000	0.84	6.43
	DMH-16	435.30	431.27	430.05			14					7.68	
D-19	DMH-19	438.60	433.53	432.00	12	0.013	99	0.020	5.00	25,640	7.794	5.38	6.86
	DMH-16	435.30	431.27	430.05			99					5.00	
D-20	AD-20	436.00	433.60	432.50	12	0.013	62	0.008	3.20	6,375	8.000	1.18	1.50
	DMH-19	438.60	433.53	432.00			62					3.20	
D-21	DMH-21	441.15	437.52	436.65	12	0.013	79	0.026	5.74	19,265	7.877	4.27	8.00
	DMH-19	438.60	435.24	434.60			79					5.74	
D-22	CB-22	441.25	437.56	437.25	12	0.013	33	0.018	4.80	3,051	8.000	0.56	4.09
	DMH-21	441.15	437.52	436.65			33					4.80	
D-23	DMH-23	446.45	442.57	441.75	12	0.013	97	0.053	8.17	16,213	7.924	3.73	10.17
	DMH-21	441.15	437.52	436.65			97					8.17	
D-24	CB-24	446.35	442.90	442.35	12	0.013	30	0.020	5.04	8,898	8.000	1.65	5.74
	DMH-23	446.45	442.57	441.75			30					5.04	
D-25	CB-25	448.20	444.19	443.70	12	0.013	45	0.043	7.42	7,315	8.000	1.35	7.18
	DMH-23	446.45	442.57	441.75			45					7.42	
D-26	INF-106 OUT	451.00	447.86	447.50	12	0.013	99	0.053	8.20	0	8.000	0.76	6.53
	DMH-23	446.45	442.46	442.25			99					8.20	
D-27	RD-27	453.60	444.96	443.75	12	0.013	65	0.000	0.00	14,460	8.000	2.68	3.41

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Pipe Label	-Structure- Upstream Downstream	-Rim- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Pipe Dia. (in)	Manning's n	Length (ft)	Slope (ft/ft)	Capacity (Full Flow) (ft^3/s)	System CA (ft^2)	System Intensity (in/h)	Section Discharge Capacity (ft^3/s)	Velocity (Average) (ft/s)
	INF-106 IN	454.00	444.45	443.75			65					0.00	
D-29	CB-29	414.00	413.08	412.00	18	0.013	114	0.018	13.91	0	8.000	7.70	8.07
	FES-28	410.00	410.80	410.00			114					13.91	
D-31	DMH-31	444.00	435.44	433.00	12	0.013	57	0.009	3.34	6,084	7.776	6.59	8.40
	OF-30	432.50	433.47	432.50			57					3.34	
D-32	INF-203 OUT	444.40	441.68	440.75	12	0.013	7	0.036	6.73	0	8.000	5.30	9.50
	DMH-31	444.00	441.29	440.50			7					6.73	
D-33	DMH-33	444.30	435.50	433.25	12	0.013	42	0.006	2.75	6,084	7.902	1.31	1.67
	DMH-31	444.00	435.44	433.00			42					2.75	
D-34	DMH-34	442.40	(N/A)	433.75	12	0.013	32	0.016	4.45	(N/A)	(N/A)	1.12	(N/A)
	DMH-33	444.30	(N/A)	433.25			32					4.45	
D-35	RD-35	445.00	434.76	433.80	12	0.013	31	0.002	1.43	14,533	8.000	2.69	3.43
	DMH-34	442.40	434.45	433.75			31					1.43	
D-36	DMH-34	442.40	434.45	433.75	12	0.013	20	0.000	0.00	8,449	7.955	1.56	1.98
	INF-202 IN	441.00	434.28	433.75			20					0.00	
D-37	INF-204 OUT	449.00	445.68	445.50	12	0.013	89	0.058	8.61	0	8.000	0.20	4.54
	DMH-33	444.30	440.41	440.30			89					8.61	
D-39	RD-39	456.00	441.75	441.75	12	0.013	26	0.000	0.00	0	8.000	0.00	0.00
	INF-204 IN	453.00	441.75	441.75			26					0.00	
D-42	DMH-42	450.80	438.69	437.80	12	0.013	49	0.021	5.22	25,743	7.540	4.49	7.47
	INF-203 IN	447.00	437.47	436.75			49					5.22	
D-43	CB-43	450.90	446.96	446.40	12	0.013	25	0.020	5.04	9,450	8.000	1.75	5.83
	DMH-42	450.80	446.31	445.90			25					5.04	
D-44	CB-44	450.80	446.74	446.30	12	0.013	18	0.022	5.31	5,832	8.000	1.08	5.30
	DMH-42	450.80	446.21	445.90			18					5.31	
D-45	DMH-45	465.70	459.28	458.70	12	0.013	280	0.042	7.34	10,461	7.719	1.87	7.81
	DMH-42	450.80	447.14	446.80			280					7.34	
D-46	DMH-46	468.00	463.07	462.50	12	0.013	42	0.019	4.92	10,090	7.756	1.81	5.79
	DMH-45	465.70	462.12	461.70			42					4.92	
D-47	CB-47	467.50	463.34	463.00	12	0.013	22	0.023	5.37	3,528	8.000	0.65	4.63
	DMH-46	468.00	463.07	462.50			22					5.37	
D-48	CB-48	468.95	464.85	464.45	12	0.013	24	0.019	4.88	4,992	8.000	0.92	4.78
	DMH-46	468.00	464.30	464.00			24					4.88	
D-49	DMH-49	476.00	470.22	470.00	12	0.013	180	0.033	6.50	1,570	7.972	0.29	4.17
	DMH-46	468.00	464.14	464.00			180					6.50	
D-50	CB-50	475.75	471.97	471.75	12	0.013	21	0.024	5.50	1,570	8.000	0.29	3.71
	DMH-49	476.00	471.41	471.25			21					5.50	
D-51	AD-51	463.00	459.61	459.50	12	0.013	81	0.010	3.54	370	8.000	0.07	1.77
	DMH-45	465.70	459.28	458.70			81					3.54	
D-52	DMH-52	436.00	432.21	431.00	18	0.013	31	0.032	18.87	54,686	7.739	9.79	10.78
	FES-51	430.00	430.84	430.00			31					18.87	
D-53	DMH-53	438.60	435.51	434.30	18	0.013	100	0.033	19.08	54,686	7.785	9.85	10.89
	DMH-52	436.00	431.76	431.00			100					19.08	
D-54	DMH-54	438.60	435.61	434.40	18	0.013	10	0.010	10.50	54,686	7.792	9.86	6.76
	DMH-53	438.60	435.47	434.30			10					10.50	
D-55	CB-55	437.95	435.61	434.45	12	0.013	7	0.007	3.01	3,109	8.000	0.58	0.73
	DMH-54	438.60	435.61	434.40			7					3.01	

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D-56	DMH-56	451.60	447.79	446.60	18	0.013	248	0.049	23.30	51,576	7.892	9.42	12.48
	DMH-54	438.60	435.61	434.40			248					23.30	
D-57	CB-57	451.95	447.79	446.95	12	0.013	10	0.035	6.67	2,880	8.000	0.53	5.08
	DMH-56	451.60	447.79	446.60			10					6.67	
D-58	CB-58	467.85	464.01	462.85	18	0.013	283	0.057	25.17	48,696	8.000	9.01	13.06
	DMH-56	451.60	447.79	446.60			283					25.17	
D-60	DMH-60	444.10	429.19	428.00	15	0.013	100	0.040	12.92	47,056	7.442	10.18	11.67
	FES-59	424.00	424.84	424.00			100					12.92	
D-61	DMH-61	446.25	443.24	442.05	15	0.013	75	0.026	10.42	47,056	7.481	10.23	9.67
	DMH-60	444.10	441.11	440.10			75					10.42	
D-62	DMH-62	453.65	450.84	449.65	15	0.013	182	0.042	13.20	47,056	7.557	10.31	11.89
	DMH-61	446.25	442.88	442.05			182					13.20	
D-63	INF-104 OUT	455.00	451.98	451.50	12	0.013	15	0.033	6.50	0	8.000	1.30	6.46
	DMH-62	453.65	451.32	451.00			15					6.50	
D-64	DMH-64	456.00	451.80	450.00	12	0.013	15	0.023	5.44	47,056	7.564	9.02	11.48
	DMH-62	453.65	450.84	449.65			15					5.44	
D-65	DMH-65	462.85	460.57	457.35	12	0.013	135	0.054	8.31	47,056	7.622	9.08	11.56
	DMH-64	456.00	451.80	450.00			135					8.31	
D-66	CB-66	461.00	460.61	459.00	12	0.013	75	0.022	5.28	0	8.000	0.78	0.99
	DMH-65	462.85	460.57	457.35			75					5.28	
D-67	DMH-67	483.00	476.99	476.00	12	0.013	267	0.064	9.03	47,056	7.954	8.66	13.09
	DMH-65	462.85	460.57	458.85			267					9.03	
D-68	CB-68	485.00	483.03	480.00	12	0.013	101	0.040	7.09	47,056	8.000	8.71	11.09
	DMH-67	483.00	476.99	476.00			101					7.09	
D-72	DMH-72	460.75	449.94	448.75	12	0.013	34	0.029	6.11	36,526	7.935	6.71	8.54
	INF-104 IN	459.00	448.72	447.75			34					6.11	
D-73	CB-73	460.50	456.93	456.50	12	0.013	18	0.028	5.94	5,658	8.000	1.05	5.70
	DMH-72	460.75	456.29	456.00			18					5.94	
D-74	DMH-74	461.95	458.40	457.45	12	0.013	24	0.031	6.30	30,869	7.948	5.68	9.08
	DMH-72	460.75	457.48	456.70			24					6.30	
D-75	CB-75	461.70	458.36	457.70	12	0.013	15	0.017	4.60	8,879	8.000	1.64	5.37
	DMH-74	461.95	458.40	457.45			15					4.60	
D-76	CB-76	462.00	458.67	458.25	12	0.013	21	0.014	4.26	5,343	8.000	0.99	4.42
	DMH-74	461.95	458.40	457.95			21					4.26	
D-77	DMH-77	464.00	459.75	459.00	12	0.013	34	0.031	6.26	16,647	7.970	3.07	7.94
	DMH-74	461.95	458.46	457.95			34					6.26	
D-78	CB-78	463.50	460.01	459.50	12	0.013	31	0.016	4.52	7,695	8.000	1.42	5.10
	DMH-77	464.00	459.75	459.00			31					4.52	
D-79	CB-79	463.50	460.05	459.50	12	0.013	31	0.016	4.52	8,952	8.000	1.66	5.32
	DMH-77	464.00	459.75	459.00			31					4.52	
D-81	RD-81	466.00	458.95	458.00	12	0.013	20	0.000	0.00	14,533	8.000	2.69	3.43
	OF-80	463.00	458.70	458.00			20					0.00	
D-83	RD-83	464.00	458.50	458.50	12	0.013	85	0.006	2.73	0	8.000	0.00	0.00
	OF-82	463.00	458.00	458.00			85					2.73	
D-92	DMH-92	436.00	430.16	429.50	12	0.013	147	0.045	7.58	0	7.980	2.36	8.53
	DMH-2	426.95	423.23	422.85			147					7.58	
D-93	OCS-93	434.90	430.66	430.00	12	0.013	25	0.020	5.04	0	8.000	2.36	6.31

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	DMH-92	436.00	429.99	429.50			25					5.04	
D-94	ocs-94	426.80	422.71	422.00	12	0.013	48	0.010	3.64	0	8.000	2.72	5.08
	DMH-2	426.95	422.47	421.50			48					3.64	
D-96	OCS-96	427.00	422.00	422.00	12	0.013	127	0.031	6.32	0	8.000	0.00	0.00
	FES-95	418.00	418.00	418.00			127					6.32	
D-99	OCS-99	424.90	420.94	420.00	12	0.013	39	0.051	8.07	0	8.000	5.45	11.03
	FES-98	420.00	418.63	418.00			39					8.07	
D-202	DMH-202	506.00	489.89	489.00	12	0.013	39	0.051	8.07	18,383	7.738	4.48	10.54
	FES-201	487.00	487.55	487.00			39					8.07	
D-203	DMH-203	504.90	494.39	493.50	12	0.013	15	0.033	6.50	18,383	7.747	4.49	8.93
	DMH-202	506.00	493.68	493.00			15					6.50	
D-204	DMH-204	499.55	494.52	494.20	12	0.013	94	0.007	3.07	3,127	7.956	0.58	3.00
	DMH-203	504.90	494.39	493.50			94					3.07	
D-205	CB-205	498.60	494.82	494.60	12	0.013	26	0.015	4.42	1,575	8.000	0.29	3.18
	DMH-204	499.55	494.52	494.20			26					4.42	
D-206	CB-206	498.45	494.67	494.45	12	0.013	24	0.010	3.64	1,553	8.000	0.29	2.76
	DMH-204	499.55	494.52	494.20			24					3.64	
D-207	DMH-207	506.90	503.24	502.40	12	0.013	38	0.039	7.08	15,255	7.767	3.93	9.25
	DMH-203	504.90	501.45	500.90			38					7.08	
D-208	CB-208	507.75	504.27	503.75	12	0.013	29	0.047	7.69	7,983	8.000	1.48	7.56
	DMH-207	506.90	503.24	502.40			29					7.69	
D-209	CB-209	507.50	503.99	503.50	12	0.013	34	0.032	6.41	7,272	8.000	1.35	6.46
	DMH-207	506.90	503.24	502.40			34					6.41	
D-210	DMH-210	511.05	507.51	507.05	12	0.013	141	0.033	6.47	0	7.880	1.19	6.28
	DMH-207	506.90	503.24	502.40			141					6.47	
D-211	DMH-211	513.50	509.96	509.50	12	0.013	110	0.022	5.32	0	7.981	1.19	5.45
	DMH-210	511.05	507.37	507.05			110					5.32	
D-212	INF-301 OUT	515.00	511.96	511.50	12	0.013	31	0.065	9.05	0	8.000	1.19	7.98
	DMH-211	513.50	509.74	509.50			31					9.05	
D-214	AD-214	513.50	508.74	508.00	12	0.013	71	0.011	3.66	16,282	7.940	2.99	5.20
	INF-301 IN A	515.00	507.94	507.25			71					3.66	
D-215	CB-215	513.00	509.69	509.00	12	0.013	69	0.014	4.29	14,179	8.000	2.62	5.73
	AD-214	513.50	508.74	508.00			69					4.29	
D-216	RD-216	515.00	508.36	507.75	12	0.013	24	0.021	5.14	10,935	8.000	2.02	6.16
	INF-301 IN A	515.00	507.70	507.25			24					5.14	
D-217	RD-217	514.80	508.42	507.45	12	0.013	22	0.009	3.40	21,425	8.000	3.97	5.05
	INF-301 IN B	515.00	508.09	507.25			22					3.40	
D-220	CB-220	506.10	503.19	502.10	12	0.013	10	0.010	3.56	28,585	8.000	5.29	6.74
	OF-219	502.00	502.93	502.00			10					3.56	
D-222	DMH-222	508.35	503.19	502.65	12	0.013	74	0.009	3.34	7,154	7.741	1.63	4.23
	OF-221	502.00	502.49	502.00			74					3.34	
D-223	DMH-223	509.60	504.23	503.75	12	0.013	135	0.008	3.22	7,154	7.914	1.31	3.88
	DMH-222	508.35	503.19	502.65			135					3.22	
D-224	CB-224	508.00	504.30	504.00	12	0.013	37	0.007	2.93	2,844	8.000	0.53	2.82
	DMH-223	509.60	504.23	503.75			37					2.93	
D-225	CB-225	508.00	504.38	504.00	12	0.013	49	0.005	2.54	4,310	8.000	0.80	2.86
	DMH-223	509.60	504.23	503.75			49					2.54	

Conduit FlexTable: WDA Report (0927350.stc)

Pipe Label	-Structure- Upstream Downstream	-Rim- Upstream Downstream (ft)	-HGL- Upstream Downstream (ft)	-Invert- Upstream Downstream (ft)	Pipe Dia. (in)	Manning's n	Length (ft)	Slope (ft/ft)	Capacity (Full Flow) (ft^3/s)	System CA (ft^2)	System Intensity (in/h)	Section Discharge Capacity (ft^3/s)	Velocity (Average) (ft/s)
D-226	INF-303 OUT	508.40	506.24	506.00	12	0.013	5	0.330	20.47	0	8.000	0.35	9.85
	DMH-222	508.35	504.45	504.35			5					20.47	
D-228	DMH-228	509.80	506.27	505.80	12	0.013	37	0.008	3.21	6,743	7.808	1.22	3.81
	INF-300 IN	511.00	505.93	505.50			37					3.21	
D-229	CB-229	512.50	508.97	508.50	12	0.013	183	0.015	4.33	6,743	8.000	1.25	4.76
	DMH-228	509.80	506.17	505.80			183					4.33	
D-231	OCS-231	487.00	485.00	485.00	15	0.013	22	0.045	13.77	0	8.000	0.00	0.00
	FES-230	484.00	484.00	484.00			22					13.77	

STORMWATER STANDARDS CALCULATIONS

WATERMAN DESIGN ASSOCIATES, INC.

PROJECT: The Pointe at Hills Farm - Phase 1
JOB NO.: 0927.01
FILE NO.:
COMPUTED BY/DATE:
CHECKED BY/DATE:

MA DEP Standard #1 - No Erosion or Scour

Riprap Plunge Pool Sizing for Culvert Outlets:

Y = Do (Do in feet)
L = 3 Do (feet)
W = 2 Do (feet)

Source: Standards for Soil Erosion and Sediment Control in New Jersey, NJ State Soil Conservation Committee, NJ Dept. of Agriculture (Rev. 1987)

Flared End #	Pipe Diameter (Do) (inches)	Depth of Pool (Y = Do) (feet)	Length of Pool (L) (feet)	Width of Pool (W) (feet)	Overall Length of Pool(feet)	Width of Pool (W) (feet)	Median Stone Diameter
FES-1	15	1.25	3.75	2.50	11.25	10.00	12
FES-95	12	1.00	3.00	2.00	9.00	8.00	12
FES-98	12	1.00	3.00	2.00	9.00	8.00	9

Riprap Plunge Pool Sizing for Culvert Outlets:

Y = 1/2Do (Do in feet)
L = 6 Do (feet)
W = 5 Do (feet)

Source: Standards for Soil Erosion and Sediment Control in New Jersey, NJ State Soil Conservation Committee, NJ Dept. of Agriculture (Rev. 1987)

Flared End #	Pipe Diameter (Do) (inches)	Depth of Pool (Y = Do) (feet)	Length of Pool (L) (feet)	Width of Pool (W) (feet)	Overall Length of Pool(feet)	Width of Pool (W) (feet)	Median Stone
FES-30	12	0.50	3.00	2.50	6.00	5.50	9
FES-51	18	0.75	4.50	3.75	9.00	8.25	9
FES-59	15	0.63	3.75	3.13	7.50	6.88	9

WATERMAN DESIGN ASSOCIATES, INC.

PROJECT: The Pointe at Hills Farm - Phase 2
JOB NO.: 0927.02
FILE NO.:
COMPUTED BY/DATE:
CHECKED BY/DATE:

MA DEP Standard #1 - No Erosion or Scour

Riprap Plunge Pool Sizing for Culvert Outlets:

Y = Do (Do in feet)
L = 3 Do (feet)
W = 2 Do (feet)

Source: Standards for Soil Erosion and Sediment Control in New Jersey, NJ State Soil Conservation Committee, NJ Dept. of Agriculture (Rev. 1987)

Flared End #	Pipe Diameter (Do) (inches)	Depth of Pool (Y = Do) (feet)	Length of Pool (L) (feet)	Width of Pool (W) (feet)	Overall Length of Pool(feet)	Width of Pool (W) (feet)	Median Stone Diameter
FES-201	12	1.00	3.00	2.00	9.00	8.00	9
FES-230	15	1.25	3.75	2.50	11.25	10.00	9

Riprap Plunge Pool Sizing for Culvert Outlets:

Y = 1/2Do (Do in feet)
L = 6 Do (feet)
W = 5 Do (feet)

Source: Standards for Soil Erosion and Sediment Control in New Jersey, NJ State Soil Conservation Committee, NJ Dept. of Agriculture (Rev. 1987)

Outlet #	Pipe Diameter (Do) (inches)	Depth of Pool (Y = Do) (feet)	Length of Pool (L) (feet)	Width of Pool (W) (feet)	Overall Length of Pool(feet)	Width of Pool (W) (feet)	Median Stone
OF-219	12	0.50	3.00	2.50	6.00	5.50	9
OF-221	12	0.50	3.00	2.50	6.00	5.50	9

WATERMAN DESIGN ASSOCIATES, INC.

PROJECT:	The Pointe At Hills Farm
JOB NO.:	927.01/Phase 1
FILE NO.:	Infiltration Calculations
COMPUTED BY:	TBS
DATE:	June 13, 2016
CHECKED BY:	
DATE:	

MA DEP Standard #3 - Infiltration

INFILTRATION VOLUME REQUIRED (A Soils = 0.60" times impervious area)
(B Soils = 0.35" times impervious area)
(C Soils = 0.25" times impervious area)
(D Soils = 0.10" times impervious area)

DRAINAGE AREA or DESCRIPTION	IMPERVIOUS AREA (sf)	INFILTRATION REQUIRED (cf)
Proposed, B soil	228831	6674
Proposed, C soil	75056	1564
Total Required	303887	8238

INFILTRATION VOLUME PROVIDED

SYSTEM or DRAINAGE AREA	INFILTRATION VOLUME AVAILABLE (cf)	INFILTRATION PROVIDED (cf) *	DRAWDOWN TIME (h)
Subsurface Infiltration (INF-104)	10258	2577	37.8
Subsurface Infiltration (INF-106)	3473	1192	36.5
Subsurface Infiltration (INF-107)	3888	1198	42.2
Subsurface Infiltration (INF-202)	2235	1198	28.3
Subsurface Infiltration (INF-203)	7704	2073	38.7
Total Provided	27558	8238	< 72 HOURS

*FRACTION OF 2 YR STORM RUNOFF

WATERMAN DESIGN ASSOCIATES, INC.

PROJECT:	The Pointe At Hills Farm
JOB NO.:	927.01/Phase 1
FILE NO.:	WQV Calculations
COMPUTED BY:	TBS
DATE:	June 15, 2016
CHECKED BY:	
DATE:	

MA DEP Standard #4 - Water Quality Volume - 1" Water Quality Volume
MA DEP Standard #5 - LUHPPL - 1" Water Quality Volume
MA DEP Standard #6 - 1" Water Quality Volume

WATER QUALITY VOLUME REQUIRED

Water Quality Volume Required = 1" over paved impervious area

DRAINAGE AREA	IMPERVIOUS AREA (sf)	WATER QUALITY REQUIRED (cf)
To INF-104	32825	2735
To INF-203	26033	2169
Total Required		4905

WATER QUALITY VOLUME PROVIDED

Volume provided below outlet elevations in basins/infiltration areas

DRAINAGE AREA	WATER QUALITY VOLUME PROVIDED (cf)	
To INF-104	Below Outlet: INF-104	10258
To INF-203	Below Outlet: INF-203	7704
Total Provided		17962

WATERMAN DESIGN ASSOCIATES, INC.

PROJECT: The Pointe At Hills Farm
JOB NO.: 927.01 / Phase 1
FILE NO.: WQV Rate Calculations
COMPUTED BY: TBS
DATE: June 21, 2016
CHECKED BY:
DATE:

MA DEP Standard #4 - Water Quality Volume - Discharge Rate
MA DEP Standard #5 - LUHPPL (1" WQV Requirement)

$Q_1 = q_u * A * WQV$

q_u = Unit Peak Discharge (csm/in) (Figure 4 attached)

q_u = 774 csm/in for 6 min Tc

A = Impervious Area (square miles)

43560 sf = 1 acre

640 acres = 1 square mile

WQV = Water Quality Volume (1 inch)

Treatment Unit	q_u (csm/in)	A (sf)	A (sq mi)	WQV (inches)	Q_1 (cfs)	Outfall
DMH-3	774	3,850	0.00014	1.0	0.11	FES-1
DMH-7	774	16,870	0.00061	1.0	0.47	FES-6
DMH-15	774	35,020	0.00126	1.0	0.97	FES-14
DMH-53	774	53,615	0.00192	1.0	1.49	FES-51
CB-68	774	52,284	0.00188	1.0	1.45	FES-59

WATERMAN DESIGN ASSOCIATES, INC.

PROJECT:	The Pointe At Hills Farm
JOB NO.:	927.02/Phase 2
FILE NO.:	Infiltration Calculations
COMPUTED BY:	TBS
DATE:	June 13, 2016
CHECKED BY:	
DATE:	

MA DEP Standard #3 - Infiltration

INFILTRATION VOLUME REQUIRED (A Soils = 0.60" times impervious area)
(B Soils = 0.35" times impervious area)
(C Soils = 0.25" times impervious area)
(D Soils = 0.10" times impervious area)

DRAINAGE AREA or DESCRIPTION	IMPERVIOUS AREA (sf)	INFILTRATION REQUIRED (cf)
Proposed, C soil	111269	2318
Total Required		2318

INFILTRATION VOLUME PROVIDED

SYSTEM or DRAINAGE AREA	INFILTRATION VOLUME AVAILABLE (cf)	INFILTRATION PROVIDED (cf) *	DRAWDOWN TIME (h)
Subsurface Infiltration (INF-301)	13064	2038	24.0
Subsurface Infiltration (INF-303)	2600	280	17.6
Total Provided	15664	2318	< 72 HOURS

*FRACTION OF 2 YR STORM RUNOFF

WATERMAN DESIGN ASSOCIATES, INC.

PROJECT:	The Pointe At Hills Farm
JOB NO.:	927.02/Phase 2
FILE NO.:	WQV Calculations
COMPUTED BY:	TBS
DATE:	June 15, 2016
CHECKED BY:	
DATE:	

MA DEP Standard #4 - Water Quality Volume - 1/2" Water Quality Volume
MA DEP Standard #5 - LUHPPL - 1" Water Quality Volume
MA DEP Standard #6 - 1" Water Quality Volume

WATER QUALITY VOLUME REQUIRED

Water Quality Volume Required = 0.5" over paved impervious area

DRAINAGE AREA	IMPERVIOUS AREA (sf)	WATER QUALITY REQUIRED (cf)
To INF-303	1751	73
Total Required		73

WATER QUALITY VOLUME PROVIDED

Volume provided below outlet elevations in basins/infiltration areas

DRAINAGE AREA	WATER QUALITY VOLUME PROVIDED (cf)	
To INF-303	Below Outlet: INF-303	2600
Total Provided		2600

WATERMAN DESIGN ASSOCIATES, INC.

PROJECT: The Pointe At Hills Farm
JOB NO.: 927.02/Phase 2
FILE NO.: WQV Rate Calculations
COMPUTED BY: TBS
DATE: June 21, 2016
CHECKED BY:
DATE:

MA DEP Standard #4 - Water Quality Volume - Discharge Rate
MA DEP Standard #5 - LUHPPL (1" WQV Requirement)

$Q_1 = q_u * A * WQV$

q_u = Unit Peak Discharge (csm/in) (Figure 4 attached)

q_u = 752 csm/in for 6 min Tc

A = Impervious Area (square miles)

43560 sf = 1 acre

640 acres = 1 square mile

WQV = Water Quality Volume (1/2 inch)

Treatment Unit	q_u (csm/in)	A (sf)	A (sq mi)	WQV (inches)	Q_1 (cfs)	Outfall
DMH-202	752	20,425	0.00073	0.5	0.28	FES-201
DCB-220	752	31,539	0.00113	0.5	0.43	FES-219
DMH-223	752	6,322	0.00023	0.5	0.09	FES-221

WATERMAN DESIGN ASSOCIATES, INC.

PROJECT:	The Pointe At Hills Farm
JOB NO.:	927.01/Phase 1
FILE NO.:	TSS Removal Calculations
COMPUTED BY:	TBS
DATE:	June 14, 2016
CHECKED BY:	
DATE:	

MA DEP Standard #4 - Total Suspended Solids (TSS) Removal - 80% TSS Removal
MA DEP Standard #5 - LUHPPL - 44% Pretreatment
MA DEP Standard #6 - Critical Area - 44% Pretreatment

DRAINAGE AREA: P103S

BMP TREATMENT TRAIN	% TSS REMOVAL	TSS REMOVED	REMAINING TSS
Catchbasin	25%	25%	75%
STU (CDS unit)	80%	60%	15%
TOTAL TSS REMOVED		85%	15%

DRAINAGE AREA: P104S

BMP TREATMENT TRAIN	% TSS REMOVAL	TSS REMOVED	REMAINING TSS
Catchbasin	25%	25%	75%
Infintration System	80%	60%	15%
TOTAL TSS REMOVED		85%	15%

DRAINAGE AREA: P105S

BMP TREATMENT TRAIN	% TSS REMOVAL	TSS REMOVED	REMAINING TSS
Catchbasin	25%	25%	75%
STU's (CDS & VortSentry units)	80%	60%	15%
TOTAL TSS REMOVED		85%	15%

DRAINAGE AREA: P111S

BMP TREATMENT TRAIN	% TSS REMOVAL	TSS REMOVED	REMAINING TSS
Catchbasin	25%	25%	75%
STU (CDS unit)	80%	60%	15%
	TOTAL TSS REMOVED	85%	15%

DRAINAGE AREA: P112S

BMP TREATMENT TRAIN	% TSS REMOVAL	TSS REMOVED	REMAINING TSS
Catchbasin	25%	25%	75%
SWTU	80%	60%	15%
	TOTAL TSS REMOVED	85%	15%

DRAINAGE AREA: P109S

BMP TREATMENT TRAIN	% TSS REMOVAL	TSS REMOVED	REMAINING TSS
STU (CDS unit)	80%	80%	20%
	TOTAL TSS REMOVED	80%	20%

DRAINAGE AREA: P203S

BMP TREATMENT TRAIN	% TSS REMOVAL	TSS REMOVED	REMAINING TSS
Catchbasin	25%	25%	75%
Infiltration System	80%	60%	15%
	TOTAL TSS REMOVED	85%	15%

DRAINAGE AREA: P101S

BMP TREATMENT TRAIN	% TSS REMOVAL	TSS REMOVED	REMAINING TSS
Catchbasin	25%	25%	75%
STU (CDS unit)	80%	60%	15%
	TOTAL TSS REMOVED	85%	15%

WATERMAN DESIGN ASSOCIATES, INC.

PROJECT:	The Pointe At Hills Farm
JOB NO.:	927.02/Phase 2
FILE NO.:	TSS Removal Calculations
COMPUTED BY:	TBS
DATE:	June 21, 2016
CHECKED BY:	
DATE:	

MA DEP Standard #4 - Total Suspended Solids (TSS) Removal - 80% TSS Removal
MA DEP Standard #5 - LUHPPL - 44% Pretreatment
MA DEP Standard #6 - Critical Area - 44% Pretreatment

DRAINAGE AREA: P302S

BMP TREATMENT TRAIN	% TSS REMOVAL	TSS REMOVED	REMAINING TSS
Catchbasin	25%	25%	75%
STU (VortSentry unit)	80%	60%	15%
	TOTAL TSS REMOVED	85%	15%

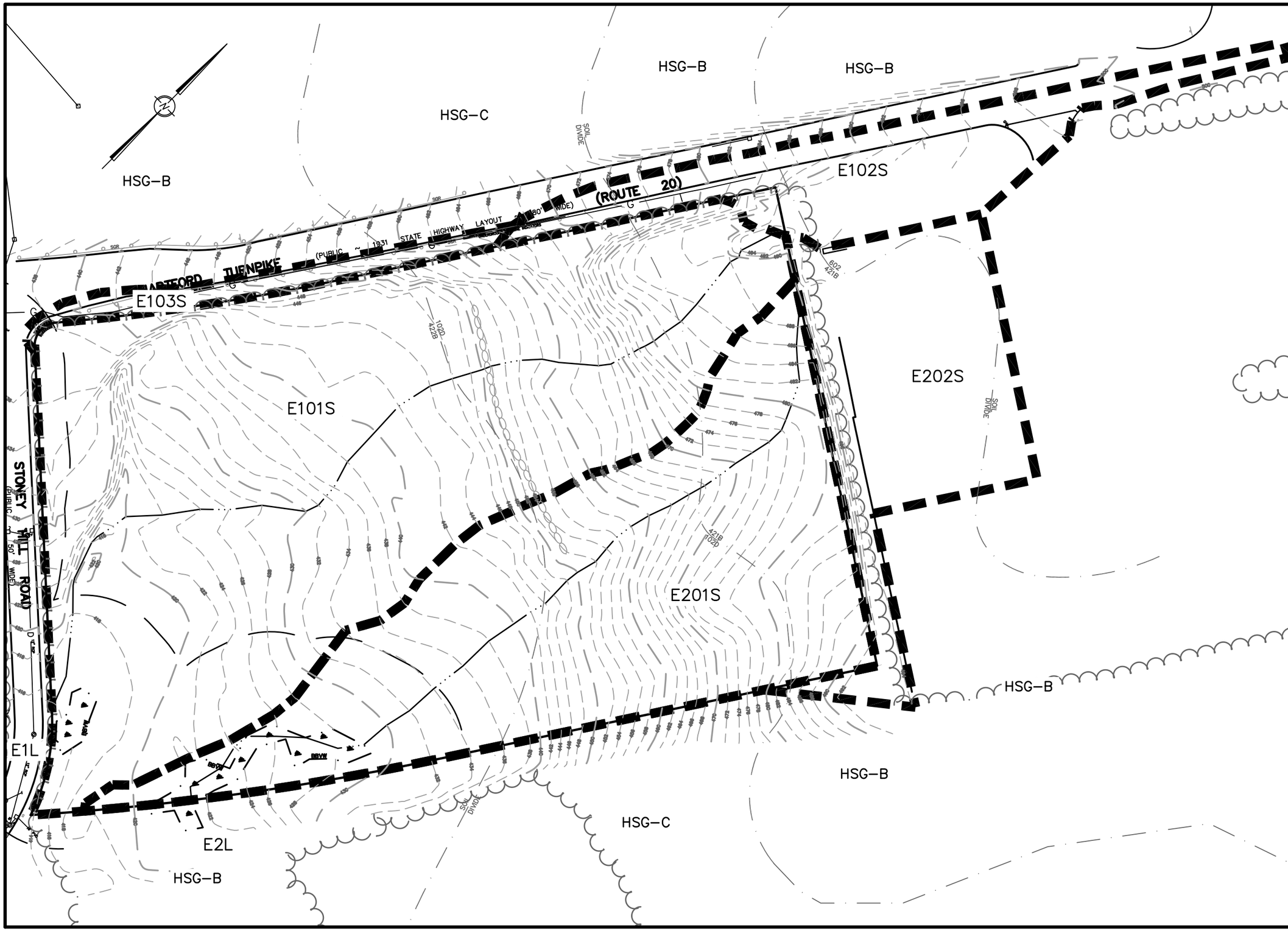
DRAINAGE AREA: P303S

BMP TREATMENT TRAIN	% TSS REMOVAL	TSS REMOVED	REMAINING TSS
Catchbasin	25%	25%	75%
Infinltration	80%	60%	15%
	TOTAL TSS REMOVED	85%	15%

DRAINAGE AREA: P304S

BMP TREATMENT TRAIN	% TSS REMOVAL	TSS REMOVED	REMAINING TSS
Catchbasin	25%	25%	75%
STU (CDS & Vortsentry units)	80%	60%	15%
	TOTAL TSS REMOVED	85%	15%

APPENDICES



TITLE: PHASE 1 - EXISTING HYDROLOGY PLAN
THE POINTE AT
HILLS FARM

OWNER: HARTFORD REALTY TRUST OF SHREWSBURY
291 Grafton Street
Shrewsbury, MA 01545

PREPARED FOR: SMART GROWTH DESIGN, LLC
625 South Street
Shrewsbury, MA 01545

DATE:	06/24/16	FILE NO.:	0927350
JOB NO.:	0927.01	DWG NO.:	0927351B
		REV. NO.:	
		REV. DATE:	
SCALE:	1" = 100'		
DRAWN BY:	TBS		

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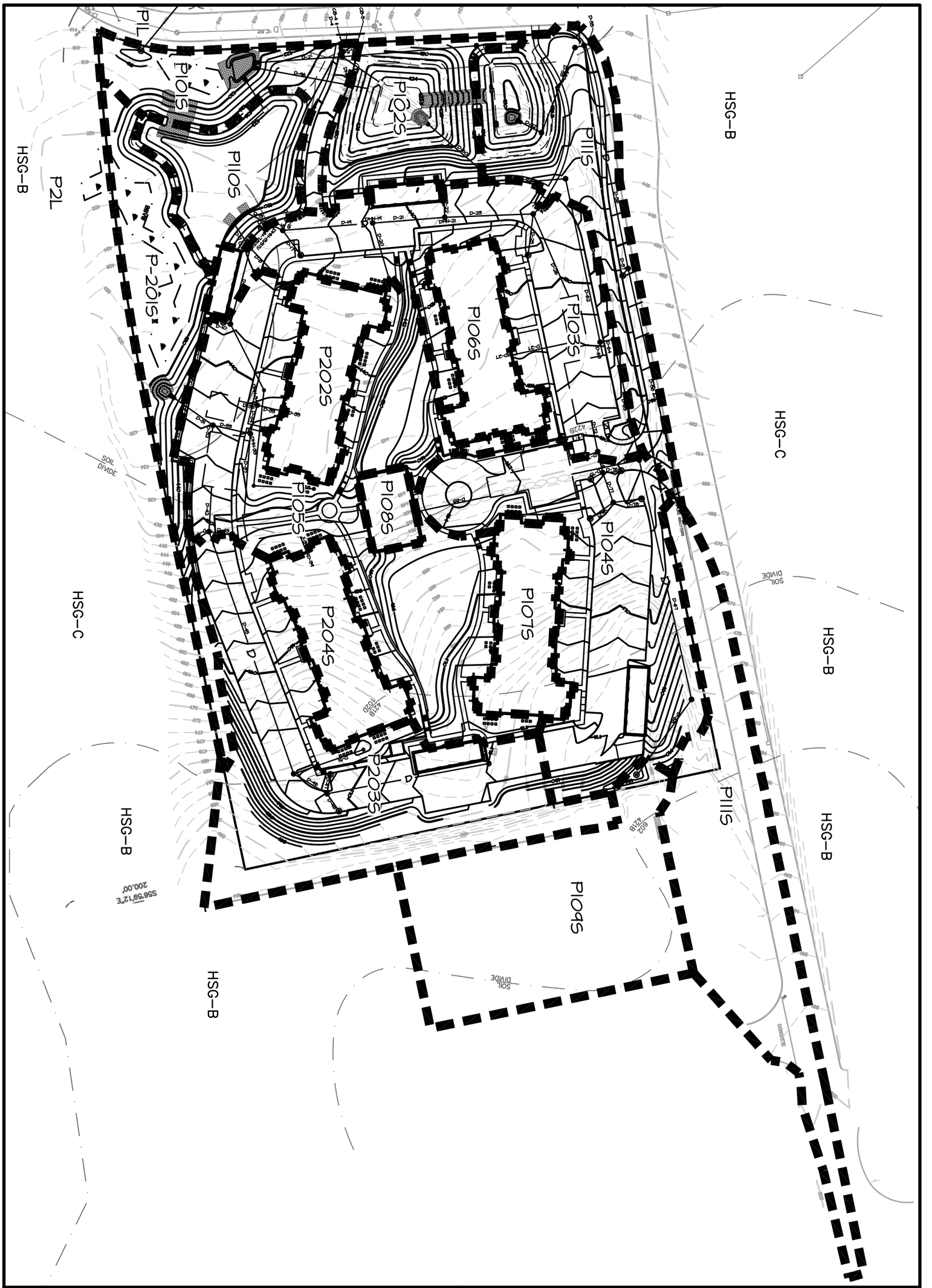
watermandesign.com wda@wdassoc.com

TITLE:	PHASE 2 - EXISTING HYDROLOGY PLAN THE POINTE AT HILLS FARM
OWNER:	HARTFORD REALTY TRUST OF SHREWSBURY 291 Grafton Street Shrewsbury, MA 01545
PREPARED FOR:	SMART GROWTH DESIGN, LLC 625 South Street Shrewsbury, MA 01545

DATE:	06/24/16	*FILE NO.:*	0927350	*SCALE:*	1" = 100'
JOB NO.:	0927.02	*DWG NO.:*	0927354B	*DRAWN BY:*	TBS
		REV. NO.:		*REV. DATE:*	



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TITLE:	PHASE 1 - PROPOSED HYDROLOGY PLAN THE POINTE AT HILLS FARM
OWNER:	HARTFORD REALTY TRUST OF SHREWSBURY 291 Grafton Street Shrewsbury, MA 01545
PREPARED FOR:	SMART GROWTH DESIGN, LLC 625 South Street Shrewsbury, MA 01545

DATE:	06/24/16	FILE NO.:	0927350	SCALE:	1" = 100'
JOB NO.:	0927.01	DWG NO.:	0927352B	DRAWN BY:	TBS
		REV. NO.:		REV. DATE:	

TITLE: PHASE 2 - PROPOSED HYDROLOGY PLAN
THE POINTE AT
HILLS FARM

OWNER: HARTFORD REALTY TRUST OF SHREWSBURY
291 Grafton Street
Shrewsbury, MA 01545

PREPARED FOR: SMART GROWTH DESIGN, LLC
625 South Street
Shrewsbury, MA 01545

DATE:	06/24/16	FILE NO.:	0927350	SCALE:	1" = 100'
JOB NO.:	0927.02	DWG NO.:	0927353B	DRAWN BY:	TBS
		REV. NO.:		REV. DATE:	

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CIVIL ENGINEERS SURVEYORS LANDSCAPE ARCHITECTS PLANNERS

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

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

Custom Soil Resource Report for Worcester County, Massachusetts, Northeastern Part

the Pointe at Hills Farm

November 1, 2015

Preface

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

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

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

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

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

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

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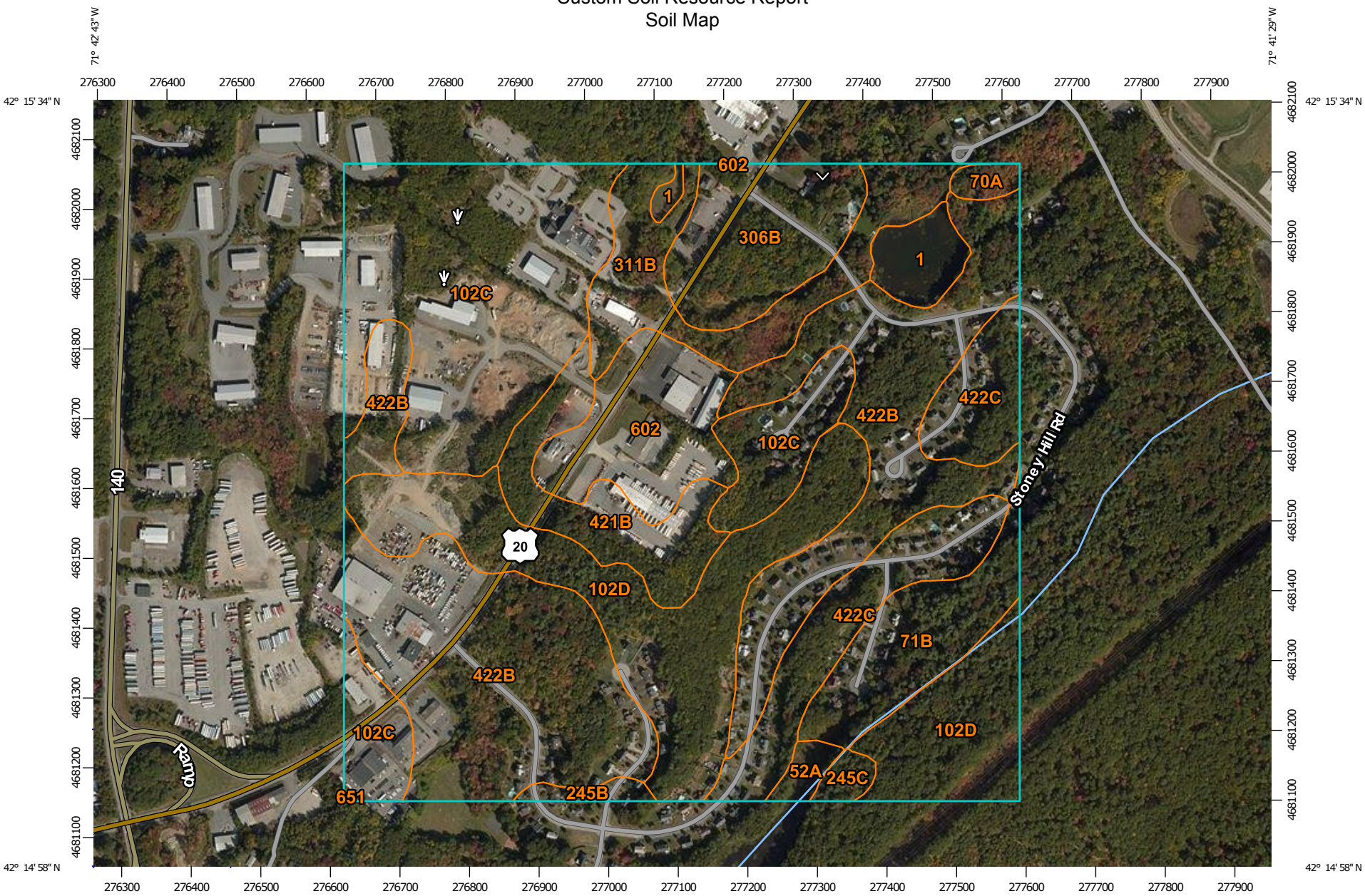
Soil Map

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

Custom Soil Resource Report
Soil Map



Map Scale: 1:7,740 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 350 700 1400 2100

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

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

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: Worcester County, Massachusetts, Northeastern Part
Survey Area Data: Version 10, Sep 28, 2015

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

Date(s) aerial images were photographed: Sep 12, 2014—Sep 28, 2014

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

Map Unit Legend

Worcester County, Massachusetts, Northeastern Part (MA613)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
1	Water	4.1	1.9%
52A	Freetown muck, 0 to 1 percent slopes	1.3	0.6%
70A	Ridgebury fine sandy loam, 0 to 3 percent slopes	1.1	0.5%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	10.3	4.7%
102C	Chatfield-Hollis-Rock outcrop complex, 3 to 15 percent slopes	43.8	19.9%
102D	Chatfield-Hollis-Rock outcrop complex, 15 to 25 percent slopes	35.7	16.2%
245B	Hinckley loamy sand, 3 to 8 percent slopes	1.2	0.5%
245C	Hinckley loamy sand, 8 to 15 percent slopes	1.1	0.5%
306B	Paxton fine sandy loam, 0 to 8 percent slopes, very stony	12.4	5.6%
311B	Woodbridge fine sandy loam, 0 to 8 percent slopes, very stony	13.5	6.1%
421B	Canton fine sandy loam, 3 to 8 percent slopes, very stony	10.1	4.6%
422B	Canton fine sandy loam, 3 to 8 percent slopes, extremely stony	57.1	25.9%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	16.4	7.5%
602	Urban land	12.0	5.4%
651	Udorthents, smoothed	0.0	0.0%
Totals for Area of Interest		**220.1**	**100.0%**

927 01 Sunny 85° Humid

w/ Nick DiPicato

8/4/15 Komatsu PC 158

815-01

0-8 A SL

8-33 B SL (GREYISH TAN)

33-120 C1 SL (COBBLES SOMO SMALL)

120-182 C2 SL (BONEY & GRAVELLY) (VERY OXIDIZED @ BOTTOM)

NO REF H_2O @ 170

IRON OXIDES @ 80 MOTTLING @ 54"

815-02

0-8 A SL

8-32 B SL

32-90 C1 SL (BONEY-COBBLES GREYISH TAN)

90-152 C2 SL (SAME " MORE TAN & MORE GRANULAR)

IRON OXIDE POCKETS

OXIDES & MOTTLES @ 50"

WEEPING @ 140

WATER @ 140"

NO REF

815-03

0-6 A SL

6-30 B SL

30-148 C SL (TAN & COBBLES)

VERY LARGE BOULDERS @ 84-148+

POSS. REF @ 148"

(REMOVING W/ HAMMER FOR CONTRACTOR)

MOTTLES & OXIDES @ 50"

NO H_2O

815-04

0-8 A SL

8-36 B SL

36-148 C SL (TAN & BONEY)

NO REF

NO H_2O MOTTLES @ 50"

815-05

0 A SL

24 B SL

52 C SL (Very Boney - TAN)

REF @ 51" (max) / 34 (min)

MOTTLES @ 38

NO H_2O

815-07

0-10 A SL

10-38 B SL

38-132 C SL (Very Bonny - TAN)

NO REF

H_2O @ 126"

~~SOR MOTTLES~~ DISTINCT OXIDE

BANO @ 70"

MOTTLES & OXIDES @ 46"

815-08

0-6 A SL

~~B~~ 6-26 B SL

26-132 C SL (TAN & BONNY)

MOTTLES @ 43

NO H_2O NO REF

815-06

0 A LS

29 B LS (REDISH)

80 C LS BONNY (REDISH TAN)

MOTTLES @ 48

TRAN BANDS @

TAN? @ 90 OHM

92702

7/31/15 UNWITNESSED SOIL TESTING
w/ MC w/ JOHN (DiPIETRO Const)
PHASE II 526 HARTFORD PIKE

715-01
0-5 A FSL
5-28 B FSL
28-78 C ~~FSS~~ SL TAN (SOME COBBLES)
No H_2O, MOTTLES/OXIDES @ 44"

REF @ 60" (min)
78" (max)

715-02
0-6 A ~~FSS~~ FSL
6-30 B S FSL
30-46 C FSL (TAN)
BOTTOM
REF @ 46" (max)/20" (min)
No MOTTLES
No H_2O

KOMATSU PC158 USLC
40K lb. MACHINE

715-03
0-6 A FSL
6-24 B FSL
24-48 C FSL (TAN/GREYISH)
SOME MOTTLING @
SHALE @ 18-24" (EAST SIDE)
REF @ 30" (MIN)/48" MAX
No H_2O

715-04
0-5 A FSL
5-20 B FSL
20-40 C SL
MOTTLES @ 28"
No H_2O
REF @ 40" (max)/28" (min)

715-05
0-7 A FSL
7-26 B FSL
26-48 C SL
REF @ 48
No H_2O
MOTTLES @ 38"

TP 715-06
0-6 A FSL (NORTH)
6-22 B FSL
REF @ 22" (max) / 16" (min)
Southend Northend

0-6" A FSL
6-30" B FSL (SOUTH)
30-102" C SL (Bmey) {30-48 (TAN) / 48-102 (GRAY)
No H_2O
REF @ 102"
Mottles @ 48"

TP. 517-08
0-8 A FSL
8-32 B FSL
32-56 C SL (LIGHT TAN)
REF @ 56
No mottles No H_2O

TP 517-07
0-6 A FSL
6-~~18~~ 20 B FSL
REF @ 20" (max) / 12" min
~~southnorth~~ / south
40' Long Trench

Another trench 25' south was attempted & scratched for 20' w/ similar results. 25060 may run across trench.

TP-517-09
0-6 A FSL
6-24 B FSL
24-122" C SL (Bmey)
REF @ 122"
No H_2O No mottles

JOINS PANEL 0827

2777000mE

MAP SCALE 1" = 500'

250 0 500 1000 FEET

NFIP

NATIONAL FLOOD INSURANCE PROGRAM

PANEL 0639F

FIRM

FLOOD INSURANCE RATE MAP

WORCESTER COUNTY, MASSACHUSETTS

(ALL JURISDICTIONS)

PANEL 639 OF 1075

(SEE MAP INDEX FOR FIRM PANEL LAYOUT)

CONTAINS:

COMMUNITY	NUMBER	PANEL	SUFFIX
GRAFTON, TOWN OF	250306	0639	F
SHREWSBURY, TOWN OF	250332	0639	F

Notice to User: The **Map Number** shown below should be used when placing map orders; the **Community Number** shown above should be used on insurance applications for the subject community.

MAP NUMBER
25027C0639F

MAP REVISED
JULY 16, 2014

Federal Emergency Management Agency

This is an official copy of a portion of the above referenced flood map. It was extracted using F-MIT On-Line. This map does not reflect changes or amendments which may have been made subsequent to the date on the title block. For the latest product information about National Flood Insurance Program flood maps check the FEMA Flood Map Store at www.msc.fema.gov

Stormwater Management System
O&M and Long Term Pollution Prevention Plan
The Pointe at Hills Farm
Shrewsbury, Massachusetts

June 2016

PREPARED FOR:

Smart Growth, LLC
625 South Street
Shrewsbury, MA

RESPONSIBILITY:

The Owner, or assigns, will be responsible for implementation of the Operation and Maintenance Plan for the stormwater management system and Long Term Pollution Prevention Plan for The Point at Hills Farm and for any corrective action required.

SITE CONDITIONS:

The stormwater management system for the site includes deep-sump, hooded catch basins; closed drainage system (pipe and manholes); stormwater treatment units (proprietary structures); surface detention basins; and subsurface infiltration systems.

DEEP SUMP CATCH BASINS:

1. Catch basins shall be inspected four (4) times per year and cleaned whenever depth of sediment is greater than twenty-four (24) inches.

2. All sediments and hydrocarbons shall be properly handled and disposed in accordance with local, state, and federal guidelines and regulations.

STORMWATER TREATMENT UNITS:

1. The Stormwater Treatment Units (CDS units and VortSentry units, or approved equal) shall be operated and maintained in accordance with the attached Maintenance Manuals by the manufacturer (as updated).

2. All sediments and hydrocarbons shall be properly handled and disposed in accordance with local, state, and federal guidelines and regulations.

SUBSURFACE INFILTRATION SYSTEM:

1. Inspection ports and system manholes are provided to allow for observation and cleaning of subsurface facilities. These covers may be buried, requiring clearing to access the infiltration system.

2. Facilities shall be inspected at least twice per year and after the first several rainfall events and after all major storms. Ponded water inside the infiltration facilities after several days may indicate the bottom of the system is clogged.

3. Downhill slopes from infiltration areas shall be monitored weekly during construction and monthly thereafter for the first year of operation for signs of breakout. Seepage from downhill slopes shall be an indication of a system failure and corrective action shall be taken.

4. Corrective action for system failure shall include removal and replacement of all stone aggregate and filter fabric. Accumulated sediment shall be removed from the trench bottom and the bottom shall be scarified or tilled to help induce infiltration.

DETENTION BASIN(S):

1. The basin(s) shall be inspected for accumulated sediment at least twice per year and sediment shall be removed when depth is 12 inches or at least once every 10 years.

2. Basins shall be inspected at least twice per year and immediately following large storm events to determine if the basin is functioning as intended. Inspections should be conducted during wet weather to determine if the basin is meeting the targeted detention times (24 hour average detention time; 72 hour drawdown). The basins shall be checked for slope integrity, soil moisture, vegetative health, soil stability, soil compaction, soil erosion, ponding, and sedimentation. Any necessary repairs shall be made immediately.

3. During the first few months following construction, the basin shall be inspected to ensure that the proposed vegetation becomes adequately established.

4. At least twice during the growing season, the basin, side slopes, and embankments shall be mowed and accumulated trash and debris removed.

5. To maintain the dense growth of vegetation, periodic reseeding shall be performed.

6. Basins shall not be used for snow removal and yard waste disposal.

7. Outlet control structures, headwalls, and riprap aprons or riprap stilling basins shall be checked a minimum of once per year for evidence of clogging or flow restrictions and cleared as necessary. Any debris or accumulated sediments which could hinder flows shall be removed and disposed.

SPILL CONTAINMENT:

1. The Owner is responsible for the maintenance and up-keep of all structures with sumps and hoods to ensure spill containment volume is available at all times.

2. In the event of a reportable spill, the Owner or its representative shall be responsible for notifying the appropriate authorities of the spill. In the event that spill materials discharges from a containment structure (e.g., catch-basin or Stormwater Treatment Unit) the Owner shall be responsible for spill removal and restoration of the stormwater management system to its original condition in accordance with all applicable local and state regulations.

LAWN/LANDSCAPE MAINTENANCE:

1. Apply pesticides and fertilizers properly; at the proper time of year and at proper application rates to ensure absorption.
2. Limit lawn watering: chose drought-tolerant landscaping and grasses, and use mulch and compost to retain moisture.

3. Under no circumstance shall the stormwater management system be used for yard waste and landscape debris.

DEICING:

1. The use and loading rates for application of deicing salts should be limited to the minimum required to maintain safe vehicular and pedestrian travel.

2. Alternative materials such as sand or gravel, calcium chloride, and calcium magnesium acetate should be considered in areas adjacent stormwater management facilities and resource areas.

3. Deicing materials shall not be stored on site.

SNOW MANAGEMENT:

1. Snow shall be stockpiled in pervious areas as indicated on the plans where it can slowly infiltrate. Under no circumstance shall the stormwater management system be used for snow storage.

2. Avoid dumping/piling snow over catch basins or in drainage channels to prevent blockages and localized flooding of the drainage system.

3. The Owner shall be responsible to manage snow storage on-site and to ensure that snow is not stockpiled in such a manner as to be a nuisance or hazard. If necessary, snow shall be removed from the site and disposed of in accordance with local, state and federal regulations.

4. Sediments deposited from the snow storage areas shall be removed every spring.

SWEEPING OF PAVED SURFACES:

1. All paved surfaces on-site including driveways, loading areas, and parking areas shall be swept at least once annually to remove accumulations of sand, silt, leaves, and other debris.

2. Sweeping should occur in March/April after snowmelt has occurred and thaw has begun. Sweepings shall be disposed of at an appropriate location away from resource areas (wetlands or waterways) and stormwater management facilities.

URBANGREEN®

VortSentry® HS Guide
Operation, Design, Performance and Maintenance

CONTECH®
ENGINEERED SOLUTIONS

VortSentry® HS

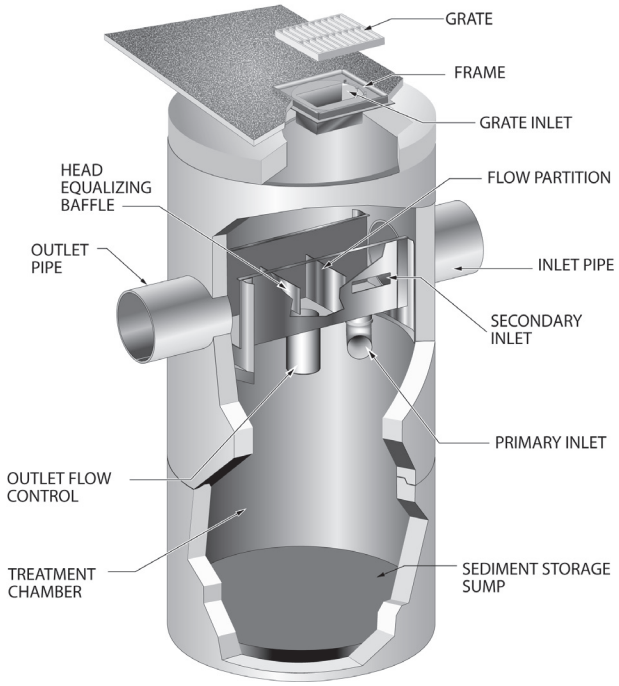
The VortSentry HS is a compact, below grade stormwater treatment system that employs helical flow technology to enhance gravitational separation of floating and settling pollutants from stormwater flows. With the ability to accept a wide range of pipe sizes, the VortSentry HS can treat and convey flows from small to large sites. A unique internal bypass design means higher flows can be diverted without the use of external bypass structures. The VortSentry HS is also available in a grate inlet configuration, which is ideal for retrofit installations.

Operation Overview

Low, frequently occurring storm flows are directed into the treatment chamber through the primary inlet. The tangentially oriented downward pipe induces a swirling motion in the treatment chamber that increases capture and containment abilities. Moderate storm flows are directed into the treatment chamber through the secondary inlet, which allows for capture of floating trash and debris. The secondary inlet also provides for treatment of higher flows without significantly increasing the velocity or turbulence in the treatment chamber. This allows for a more quiescent separation environment. Settleable solids and floating pollutants are captured and contained in the treatment chamber.

Flow exits the treatment chamber through the outlet flow control, which manages the amount of flow that is treated and helps maintain the helical flow patterns developed within the treatment chamber.

Flows exceeding the system's rated treatment flow are diverted away from the treatment chamber by the flow partition. Internal diversion of high flows eliminates the need for external bypass structures. During bypass, the head equalizing baffle applies head on the outlet flow control to limit the flow through the treatment chamber. This helps prevent re-suspension of previously captured pollutants.



Design Basics

There are two primary methods of sizing a VortSentry HS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow for a defined particle size. The summation process of the Rational Rainfall Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically, VortSentry HS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a particle gradation with an average particle size (d_{50}) of 240-microns (μm).

Water Quality Flow Rate Method

In many cases, regulations require that a specific flow rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval (i.e. the six-month storm) or a water quality depth (i.e. 1/2-inch of rainfall).

The VortSentry HS is designed to treat all flows up to the WQQ. Due to its internal bypass weir configuration, flow rates in the treatment chamber only increase minimally once the WQQ is surpassed. At influent rates higher than the WQQ, the flow partition will allow most flow exceeding the treatment flow rate to bypass the treatment chamber. This allows removal efficiency to remain relatively constant in the treatment chamber and reduces the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the VortSentry HS will remove a specific gradation of sediment at a specific removal efficiency. Therefore they are variable based on the gradation and removal efficiency specified by the design engineer and the unit size is scaled according to the project goal.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. The Rational Rainfall Method is a sizing program Contech uses to estimate a net annual sediment load reduction for a particular VortSentry HS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics. For more information on the Rational Rainfall Method, see *Vortechs Technical Bulletin 4: Modeling Long Term Load Reduction: The Rational Rainfall Method*, available at **www.ContechES.com/stormwater**

Treatment Flow Rate

The outlet flow control is sized to allow the WQQ to pass entirely through the treatment chamber at a water surface elevation equal to the crest of the flow partition. The head equalizing baffle applies head on the outlet flow control to limit the flow through the treatment chamber when bypass occurs, thus helping to prevent re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The VortSentry HS is available in three standard configurations: inline (with inlet and outlet pipes at 180° to each other), grated inlet, and a combination of grate and pipe inlets. All three configurations are available in 36-inch (900-mm) through 96-inch (2400-mm) diameter manholes.

The configuration of the system is determined by the suffix of the model name:

- A model name without a suffix denotes a standard pipe inlet (Example HS48).
- A "G" at the end of the model designation denotes a grate inlet (Example HS48G).
- A "GP" at the end of the model designation denotes a combination of grate and pipe inlets (Example HS48GP).

Performance

Full-Scale Laboratory Test Results

Laboratory testing of the VortSentry HS was conducted using F-55 Silica, a commercially available sand product with an average particle size of 240-μm (Table 1). This material was metered into a model HS48 VortSentry HS at an average concentration of between 250-mg/L and 300-mg/L at flow rates ranging from 0.50-cfs to 1.5-cfs (14-L/s to 56-L/s).

US Standard Sieve Size	Particle Size Micron (μm)	Cumulative Passing %
30	600	99.7%
40	425	95.7%
50	300	74.7%
70	212	33.7%
100	150	6.7%
140	106	0.7%

Table 1 : US Silica F-55 Particle Size Distribution

Removal efficiencies at each flow rate were calculated based on net sediment loads passing the influent and effluent sampling points. Results are illustrated in Figure 1.

Assuming that sediment in the inlet chamber is ideally mixed, removal rates through the system will decay according to the percentage of flow bypassed. This effect has been observed in the laboratory where the test system is designed to produce a

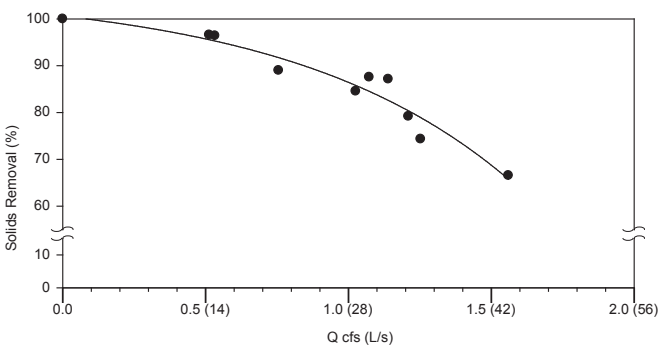


Figure 1: VortSentry HS Removal Efficiencies for 240-μm Particle Gradation

thoroughly mixed inlet stream. All VortSentry HS models have the same aspect ratio regardless of system diameter (i.e. an increase in diameter results in a corresponding increase in depth). Operating rates are expressed volumetrically.

Removal efficiency at each operating rate is calculated according to the average of volumetric and Froude scaling methods and is described by Equation 1.

Equation 1: $$\left(\frac{\text{Diameter Prototype}}{\text{Diameter Model}}\right)^{2.75} = \left(\frac{\text{Flow Rate Prototype}}{\text{Flow Rate Model}}\right)$$

Equation 1 and actual laboratory test results were used to determine the flow rate which would be required for the various VortSentry HS models to remove 80% of solids.

View report at **www.ContechES.com/stormwater**

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.ContechES.com/stormwater**

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 2, 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	6.0	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 2: VortSentry HS Maintenance Indicators and Sediment Storage Capacities.

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. Finer, silty particles at the top of the pile may be more difficult to feel with the measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.

Logon to **www.ContechES.com/stormwater** to download the VortSentry HS Inspection and Maintenance Log.

For assistance with maintaining your VortSentry HS, contact us regarding the Contech Maintenance compliance certification program.

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Support

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

vshs_manual 06/14 PDF IN-HOUSE

CONTECH®
ENGINEERED SOLUTIONS

CDS Guide
Operation, Design, Performance and Maintenance

CDS®

Using patented continuous deflective separation technology, the CDS system screens, separates and traps debris, sediment, and oil and grease from stormwater runoff. The indirect screening capability of the system allows for 100% removal of floatables and neutrally buoyant material without blinding. Flow and screening controls physically separate captured solids, and minimize the re-suspension and release of previously trapped pollutants. Inline units can treat up to 6 cfs, and internally bypass flows in excess of 50 cfs (1416 L/s). Available precast or cast-in-place, offline units can treat flows from 1 to 300 cfs (28.3 to 8495 L/s). The pollutant removal capacity of the CDS system has been proven in lab and field testing.

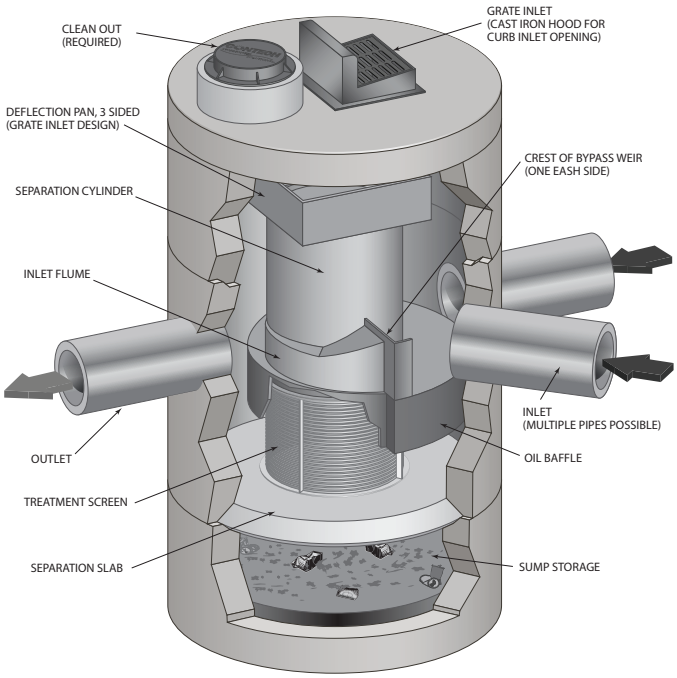
Operation Overview

Stormwater enters the diversion chamber where the diversion weir guides the flow into the unit's separation chamber and pollutants are removed from the flow. All flows up to the system's treatment design capacity enter the separation chamber and are treated.

Swirl concentration and screen deflection force floatables and solids to the center of the separation chamber where 100% of floatables and neutrally buoyant debris larger than the screen apertures are trapped.

Stormwater then moves through the separation screen, under the oil baffle and exits the system. The separation screen remains clog free due to continuous deflection.

During the flow events exceeding the treatment design capacity, the diversion weir bypasses excessive flows around the separation chamber, so captured pollutants are retained in the separation cylinder.



Design Basics

There are three primary methods of sizing a CDS system. The Water Quality Flow Rate Method determines which model size provides the desired removal efficiency at a given flow rate for a defined particle size. The Rational Rainfall Method™ or the and Probabilistic Method is used when a specific removal efficiency of the net annual sediment load is required.

Typically in the Unites States, CDS systems are designed to achieve an 80% annual solids load reduction based on lab generated performance curves for a gradation with an average particle size (d50) of 125 microns (μm). For some regulatory environments, CDS systems can also be designed to achieve an 80% annual solids load reduction based on an average particle size (d50) of 75 microns (μm) or 50 microns (μm).

Water Quality Flow Rate Method

In some cases, regulations require that a specific treatment rate, often referred to as the water quality design flow (WQQ), be treated. This WQQ represents the peak flow rate from either an event with a specific recurrence interval, e.g. the six-month storm, or a water quality depth, e.g. 1/2-inch (13 mm) of rainfall.

The CDS is designed to treat all flows up to the WQQ. At influent rates higher than the WQQ, the diversion weir will direct most flow exceeding the WQQ around the separation chamber. This allows removal efficiency to remain relatively constant in the separation chamber and eliminates the risk of washout during bypass flows regardless of influent flow rates.

Treatment flow rates are defined as the rate at which the CDS will remove a specific gradation of sediment at a specific removal efficiency. Therefore the treatment flow rate is variable, based on the gradation and removal efficiency specified by the design engineer.

Rational Rainfall Method™

Differences in local climate, topography and scale make every site hydraulically unique. It is important to take these factors into consideration when estimating the long-term performance of any stormwater treatment system. The Rational Rainfall Method combines site-specific information with laboratory generated performance data, and local historical precipitation records to estimate removal efficiencies as accurately as possible.

Short duration rain gauge records from across the United States and Canada were analyzed to determine the percent of the total annual rainfall that fell at a range of intensities. US stations' depths were totaled every 15 minutes, or hourly, and recorded in 0.01-inch increments. Depths were recorded hourly with 1-mm resolution at Canadian stations. One trend was consistent at all sites; the vast majority of precipitation fell at low intensities and high intensity storms contributed relatively little to the total annual depth.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Rainfall Method. Since most sites are relatively small and highly impervious, the Rational Rainfall Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS system are

determined. Performance efficiency curve determined from full scale laboratory tests on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Probabilistic Rational Method

The Probabilistic Rational Method is a sizing program Contech developed to estimate a net annual sediment load reduction for a particular CDS model based on site size, site runoff coefficient, regional rainfall intensity distribution, and anticipated pollutant characteristics.

The Probabilistic Method is an extension of the Rational Method used to estimate peak discharge rates generated by storm events of varying statistical return frequencies (e.g. 2-year storm event). Under the Rational Method, an adjustment factor is used to adjust the runoff coefficient estimated for the 10-year event, correlating a known hydrologic parameter with the target storm event. The rainfall intensities vary depending on the return frequency of the storm event under consideration. In general, these two frequency dependent parameters (rainfall intensity and runoff coefficient) increase as the return frequency increases while the drainage area remains constant.

These intensities, along with the total drainage area and runoff coefficient for each specific site, are translated into flow rates using the Rational Method. Since most sites are relatively small and highly impervious, the Rational Method is appropriate. Based on the runoff flow rates calculated for each intensity, operating rates within a proposed CDS are determined. Performance efficiency curve on defined sediment PSDs is applied to calculate solids removal efficiency. The relative removal efficiency at each operating rate is added to produce a net annual pollutant removal efficiency estimate.

Treatment Flow Rate

The inlet throat area is sized to ensure that the WQQ passes through the separation chamber at a water surface elevation equal to the crest of the diversion weir. The diversion weir bypasses excessive flows around the separation chamber, thus preventing re-suspension or re-entrainment of previously captured particles.

Hydraulic Capacity

The hydraulic capacity of a CDS system is determined by the length and height of the diversion weir and by the maximum allowable head in the system. Typical configurations allow hydraulic capacities of up to ten times the treatment flow rate. The crest of the diversion weir may be lowered and the inlet throat may be widened to increase the capacity of the system at a given water surface elevation. The unit is designed to meet project specific hydraulic requirements.

Performance

Full-Scale Laboratory Test Results

A full-scale CDS system (Model CDS2020-5B) was tested at the facility of University of Florida, Gainesville, FL. This CDS unit was evaluated under controlled laboratory conditions of influent flow rate and addition of sediment.

Two different gradations of silica sand material (UF Sediment & OK-110) were used in the CDS performance evaluation. The particle size distributions (PSDs) of the test materials were analyzed using standard method "Gradation ASTM D-422 "Standard Test Method for Particle-Size Analysis of Soils" by a certified laboratory.

UF Sediment is a mixture of three different products produced by the U.S. Silica Company: "Sil-Co-Sil 106", "#1 DRY" and "20/40 Oil Frac". Particle size distribution analysis shows that the UF Sediment has a very fine gradation (d50 = 20 to 30 μm) covering a wide size range (Coefficient of Uniformity, C averaged at 10.6). In comparison with the hypothetical TSS gradation specified in the NJDEP (New Jersey Department of Environmental Protection) and NJCAT (New Jersey Corporation for Advanced Technology) protocol for lab testing, the UF Sediment covers a similar range of particle size but with a finer d50 (d50 for NJDEP is approximately 50 μm) (NJDEP, 2003).

The OK-110 silica sand is a commercial product of U.S. Silica Sand. The particle size distribution analysis of this material, also included in Figure 1, shows that 99.9% of the OK-110 sand is finer than 250 microns, with a mean particle size (d50) of 106 microns. The PSDs for the test material are shown in Figure 1.

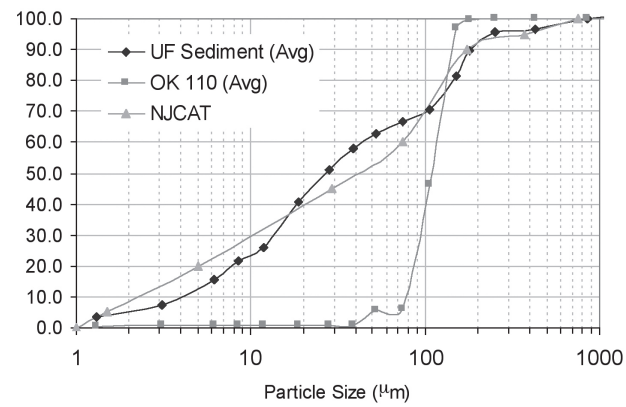


Figure 1. Particle size distributions

Tests were conducted to quantify the performance of a specific CDS unit (1.1 cfs (31.3-L/s) design capacity) at various flow rates, ranging from 1% up to 125% of the treatment design capacity of the unit, using the 2400 micron screen. All tests were conducted with controlled influent concentrations of approximately 200 mg/L. Effluent samples were taken at equal time intervals across the entire duration of each test run. These samples were then processed with a Dekaport Cone sample splitter to obtain representative sub-samples for Suspended Sediment Concentration (SSC) testing using ASTM D3977-97 "Standard Test Methods for Determining Sediment Concentration in Water Samples", and particle size distribution analysis.

Results and Modeling

Based on the data from the University of Florida, a performance model was developed for the CDS system. A regression analysis was used to develop a fitting curve representative of the scattered data points at various design flow rates. This model, which demonstrated good agreement with the laboratory data, can then be used to predict CDS system performance with respect

to SSC removal for any particle size gradation, assuming the particles are inorganic sandy-silt. Figure 2 shows CDS predictive performance for two typical particle size gradations (NJCAT gradation and OK-110 sand) as a function of operating rate.

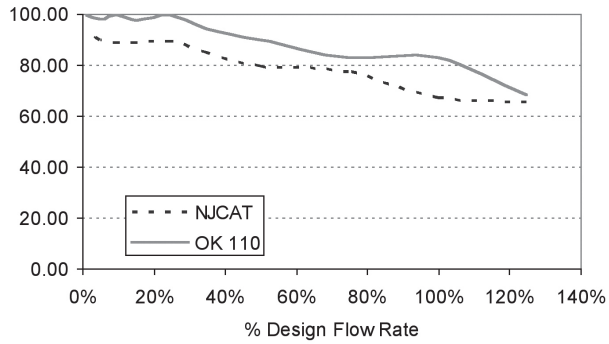


Figure 2. CDS stormwater treatment predictive performance for various particle gradations as a function of operating rate.

Many regulatory jurisdictions set a performance standard for hydrodynamic devices by stating that the devices shall be capable of achieving an 80% removal efficiency for particles having a mean particle size (d50) of 125 microns (e.g. Washington State Department of Ecology — WASDOE - 2008). The model can be used to calculate the expected performance of such a PSD (shown in Figure 3). The model indicates (Figure 4) that the CDS system with 2400 micron screen achieves approximately 80% removal at the design (100%) flow rate, for this particle size distribution (d50 = 125 μm).

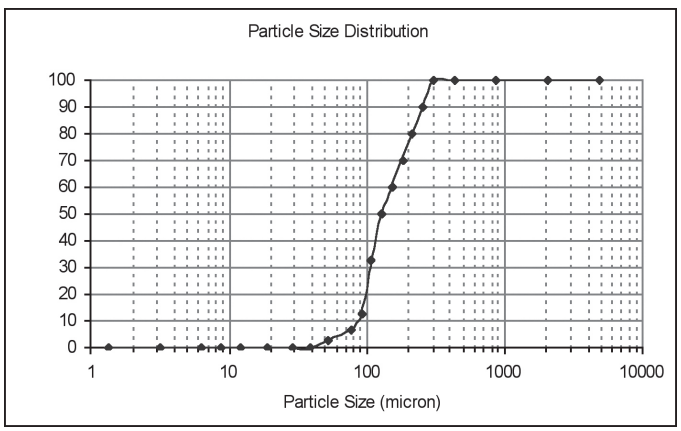


Figure 3. WASDOE PSD

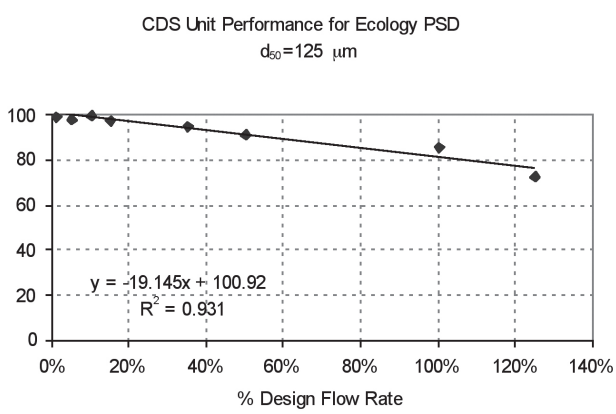


Figure 4. Modeled performance for WASDOE PSD.

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.

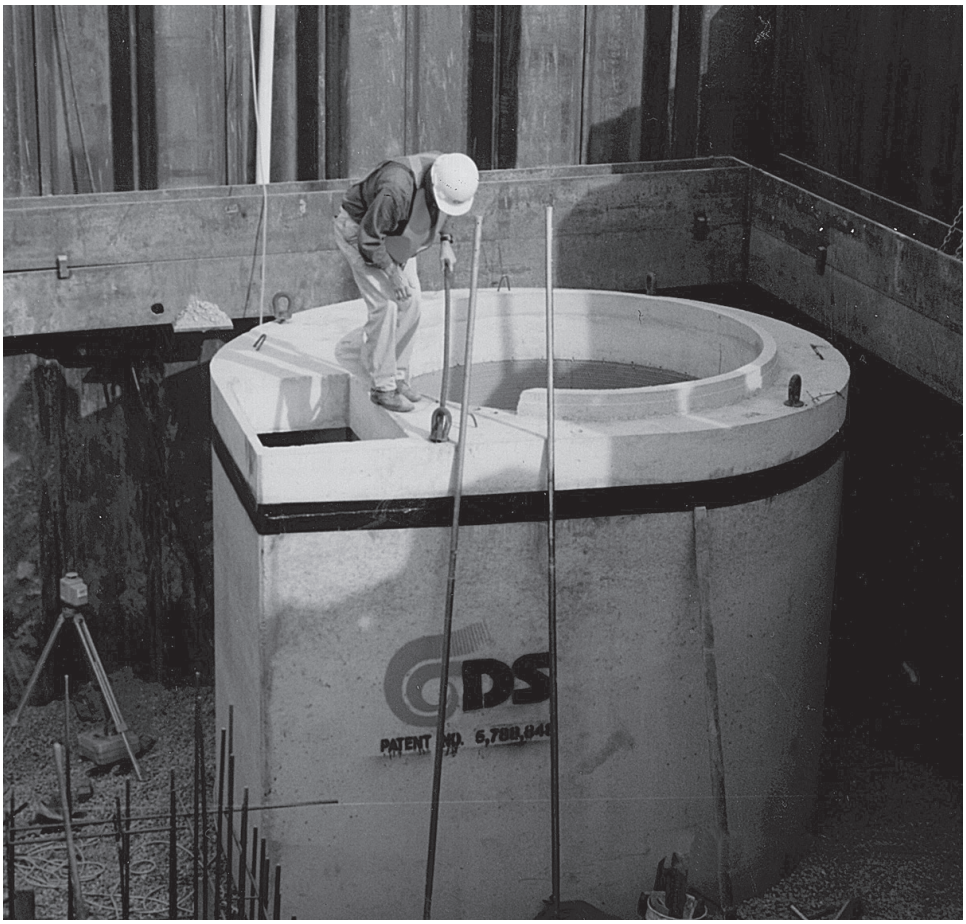
In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill. Motor oil and other hydrocarbons that accumulate on a more routine basis should 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 cleaned 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. Check your local regulations for specific requirements on disposal.

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

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Note: To avoid underestimating the volume of sediment in the chamber, carefully lower the measuring device to the top of the sediment pile. Finer silty particles at the top of the pile may be more difficult to feel with a measuring stick. These finer particles typically offer less resistance to the end of the rod than larger particles toward the bottom of the pile.



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.

Support

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

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cds_manual 7/14 PDF

RECYCLED PAPER

DRAFT
STORMWATER POLLUTION PREVENTION PLAN

June 2016

REFERENCE

National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activities, Permit # MAR120000

PROJECT NAME

The Pointe at Hills Farm
Shrewsbury, MA

1.5. Posting Permit Coverage:

The contractor shall post a sign or notice conspicuously so that is visible/legible from a public way near the construction site. The sign or notice shall be posted in a safe and publicly accessible location proximate to the project site. The sign shall include the NPDES Permit tracking number and contact name and phone number (in accordance with CGP 1.5).

7.2.1. Stormwater Team:

Refer to the Stormwater Team form found in the Forms section.

7.2.2. Nature of Construction Activities:

SITE DESCRIPTION

PHASE 1 – The existing lot consists of approximately 10.5 acres, is located at 440 Hartford Pike (Route 20) at the intersection with Stoney Hill Road, and is shown on the Town of Shrewsbury Assessor's Map 54, Parcel 15 and is located in the Limited Industrial Zone District. The lot configuration is generally of a rectangular nature (a corner lot) with approximately 813 feet of frontage along Hartford Pike and 530 feet of frontage along Stoney Hill Road. The lot depth measures approximately 530 feet. There are no existing building structures on the property.

Topography on site ranges from an elevation of about 414 in the southernmost corner of the site ascending northerly to an elevation 494 located in the northernmost corner of the site adjacent to Route 20 and land of now or formerly South Willow Realty Trust (elevations refer to NGVD 1929). The slope transitions across the property and can be best described as gentle to moderate in the southern portion of the site and moderate to steep in the north central portion of the property. The site drains north to south, with stormwater runoff eventually reaching two small ponding areas in the southern portion of the site.

There are two significant sources of stormwater "run-on" to the site. Roughly an acre of the Hartford Turnpike ROW and roughly an acre and a half of the abutting land to the north of the site presently

drain onto the site through breaks in existing curbing associated with Route 20 and the neighboring parking lot, respectively. There are no record drainage easements and there are no dedicated pretreatment or conveyance systems for these stormwater discharges from the abutting land.

Several small areas of isolated pooling were observed (dry at the time) on the site. These areas do not support wetland or potential vernal pool species or characteristics and do not qualify as resource areas under the State or local wetland regulations. The site overall is dominated primarily by hickory, maple, oak and pine. Numerous stones and boulders can be observed at the ground surface, especially in the southern portion of the site. Two small wetland areas exist in the southeasterly portion of the site. These wetland areas represent the two distinct points of stormwater runoff from the site, with one draining to Stoney Hill Road and the other draining behind (north of) the existing homes along Stoney Hill Road. Although there is a minor flow channel within the limits of one of these wetland areas, neither qualify as isolated land subject to flooding (ISLF) and neither may qualify as any other State protected wetland resource.

No portion of the site contains a Special Flood Hazard Area (aka 100-year flood zone). Refer to the NFIP Flood Insurance Rate Map for the Town of Shrewsbury, Map Number 25027C0639F, dated July 16, 2014. The property does not contain a designated area of estimated/priority habitat of rare species, wildlife or vernal pools, according to the Natural Heritage Atlas, valid from October 1, 2008.

Soils on-site are mapped by the SCS/NRCS as predominately Canton fine sandy loam (map units 421B and 422B). Canton fine, sandy loam is classified as Hydrologic Soils Group (HSG) B. A smaller area of Chatfield-Hollis-Rock Outcrop complex (map unit 102D) also is indicated toward the north central portion of the property. Chatfield-Hollis-Rock outcrop complex is HSG of B (Chatfield component), while the Hollis component is HSG D. WDA performed soils tests in August 2015 to verify the NRCS mapping.

PHASE 2 – The existing lot consists of approximately 8.9 acres and is located at 526 Hartford Pike (Route 20) at the intersection of Hartford Turnpike and Stoney Hill Road. The property is shown on the Town of Shrewsbury Assessor's Map 48, Parcel 9 and is located in the Limited Industrial Zone District. The lot configuration is generally of a rectangular nature (a corner lot) with approximately 700 feet of frontage along Hartford Pike and 522 feet of frontage along Stoney Hill Road. The lot depth measures approximately 530 feet. There are no existing building structures on the property, though a public sewer main traverses the property southwest to northeast.

Topography on site ranges from an elevation of about 524 in the northern corner of the site descending southerly to an elevation 484 located in the southern portion of the property A ridge runs parallel to Route 20 and is located on the west side of the property. The slope transitions across the property and can be best described as inconsistent with a pronounced swale running north/south in the central part of the parcel. Adjacent to the wetland resource that covers the southern portion of the site, the slope is steep, but becomes a gentle slope within the wetland area. Slopes within the swale and ridge are moderate.

The upland area is dominated primarily by black birch, red maple, shagbark hickory, oak, pine, hay scented fern, and Canada mayflower, mountain laurel, and witch hazel. Ledge outcrops can be observed at the ground surface.

A pipe culvert exists at the western part of the property conveying an intermittent stream from the Liberty Assembly of God Church property (#495 Hartford Turnpike) into the intermittent stream and wetland system on the property. An 8-inch PVC gravity sewer main is located along the southern edge of the upland area and is covered with a 12 foot wide compacted gravel access drive.

The entire sewer infrastructure and access drive are located within a 25-foot wide record sewer easement.

No portion of the site contains a Special Flood Hazard Area (aka 100-year flood zone). Refer to the NFIP Flood Insurance Rate Map for the Town of Shrewsbury, Map Number 25027C0639F, dated July 16, 2014. The property does not contain a designated area of estimated/priority habitat of rare species, wildlife or vernal pools, according to the Natural Heritage Atlas, valid from October 1, 2008.

Soils on-site are mapped by the SCS/NRCS as predominately Paxton fine sandy loam (map unit 306B). Paxton fine, sandy loam is classified as Hydrologic Soils Group (HSG) C. WDA performed soils tests in July 2015 to verify the NRCS mapping.

PROJECT DESCRIPTION

PHASE 1 – The project proponent, Smart Growth Design LLC, proposes to construct four (4) three-story multi-family residential apartment buildings, a free standing club house building, associated green spaces and parking lots, as well as appurtenances such as walkways, dumpster areas and free standing garage buildings.

Stormwater runoff will be collected in either drop inlets or deep-sump, hooded catch basins and conveyed to stormwater treatment units, and eventually one of three surface detention basins or one of several subsurface infiltration systems located throughout the site. Controlled outflow will be discharged to upland areas at a rates equal to or less than existing conditions for the 2, 10, and 100-year, 24-hour design storms.

PHASE 2 – The project proponent proposes to construct two (2) four-story multi-family residential apartment buildings, associated green spaces and parking lots, as well as appurtenances such as walkways and dumpster areas.

Stormwater runoff will be collected in either drop inlets, area drains or deep-sump, hooded catch basins and conveyed to stormwater treatment units, and eventually to one of the two surface detention basins or one of two subsurface infiltration systems. Controlled outflow will be discharged to upland areas at a rates equal to or less than existing conditions for the 2, 10, and 100-year, 24-hour design storms.

Low Impact Development (LID) Considerations:

> The project provides increased residential density over that allowed by conventional zoning, thereby providing required housing while altering/disturbing less land than would otherwise be permissible in the municipality. Additionally, a portion of Phase 2 may be considered redevelopment

7.2.3. Emergency-Related Projects:

Not applicable.

7.2.4. Identification of Other Site Operators:

Refer to the Subcontractor Certification Form(s) found in the Forms section.

7.2.5. Sequence and Estimated Dates of Construction Activities:

Project phasing is to be determined. Construction consists of the proposed building(s), accessory structure(s), access driveways, parking areas, installation of subsurface utility services, and stormwater management system. Construction will be considered complete upon final landscaping and ground surface stabilization. All erosion control measures will be installed prior to the commencement of construction, maintained throughout the construction process, and repaired or replaced as necessary. Diversion swales and/or erosion control measures consisting of, but not limited to, hay bales and/or silt fence, hay or bark mulch, tackifier, hydroseed, riprap, and erosion control blankets may be utilized during the construction phase.

General construction sequence:

- Provide 3”-6” trap rock construction entrance at all points of entry for construction vehicles.
- Fell trees within proposed construction area.
- Install erosion control barrier at the limit of clearing and limit of work line.
- Clear and grub site and properly dispose of stumps and brush.
- Rough grade stormwater management basins as temporary sediment basins.
- Rough grade temporary diversion swales and/or install temporary diversion dikes to direct runoff to temporary sediment basins.
- Install temporary riser pipes in temporary sediment (detention) basin outlet control structures.
- Loam and seed sediment basin embankments within seven days and irrigate (as dictated by weather conditions). Should weather conditions prevent germination (i.e., winter conditions or forecast long term precipitation), jute matting, bonded fiber matrix, or riprap slope protection shall be used to temporarily stabilize slopes.
- Stockpile top and subsoil from cleared areas and surround with silt fence if stockpile is to remain for more than forty-eight (48) hours.
- Rough grade access driveway corridors and parking areas.
- Install new drainage infrastructure and riprap aprons at the stormwater management basins.
- Rough grade remainder of site and provide jute matting where slopes exceed 3:1 and riprap slope protection where slopes exceed 2:1.
- Excavate building foundations, form and pour foundations, and rough grade around foundation.
- Install drainage, water, sewer and other underground utilities within access driveways and parking areas and provide utility services to building.
- Begin framing and continue building construction.
- Adjust grades in basin(s) and swales, final stabilization as needed (repair loam and seed, hay mulch, sod, hydroseed, etc.).
- Subgrade access driveways and parking areas.
- Place and roll gravel base, apply binder course on areas to be paved.
- Place curbing where applicable.
- Final grade proposed lawn areas along all driveways, parking areas, sidewalks, plant trees, loam and seed, apply hay mulch cover.
- Adjust catch basin grates, place hay bale check dams along curbs prior to catch basins or provide silt sacks (or equal) within catch basins until the site is completely stabilized.
- Apply top course of pavement to access drives, parking areas, and sidewalks.
- Street sweeping should occur once per month or as site/climatic conditions warrant during construction and until the surfaces adjacent to all driveways and sidewalks are stabilized.

ESTIMATED DATES OF CONSTRUCTION ACTIVITIES

The contractor and/or Stormwater Team must provide a schedule of the estimated **start dates and duration** of the activity for activities listed in CGP 7.2.5

7.2.5.1 Installation of stormwater control measures, and when they will be made operational, including an explanation of how the sequence and schedule for installation of stormwater control measures complies with Part 2.1.1.3a and of any departures from manufacturer specifications pursuant to Part 2.1.1.3b;

	Start Date	Duration

7.2.5.2 Commencement and duration of earth-disturbing activities, including clearing and grubbing, mass grading, site preparation (i.e., excavating, cutting and filling), final grading, and creation of soil and vegetation stockpiles requiring stabilization;

	Start Date	Duration

7.2.5.3 Cessation, temporarily or permanently, of construction activities on the site, or in designated portions of the site;

	Start Date	Duration

7.2.5.4 Final or temporary stabilization of areas of exposed soil. The dates for stabilization must reflect the applicable deadlines to which you are subject in Part 2.2.1;

	Start Date	Duration

7.2.5.5 Removal of temporary stormwater conveyances/channels and other stormwater control measures, removal of construction equipment and vehicles, and cessation of any pollutant-generating activities.

	Start Date	Duration

Note: If plans change due to unforeseen circumstances or for other reasons, the requirement to describe the sequence and estimated dates of construction activities is not meant to "lock in" the operator to meeting these projections. When departures from initial projections are necessary, this should be documented in the SWPPP itself or in associated records, as appropriate.

7.2.6. Site Map:

Refer to the project plans at the end of this document.

7.2.6.2. Impaired Waters (TMDL):

Your project will be considered to discharge to a Tier 2, Tier 2.5, or Tier 3 water if the first surface water to which you discharge is identified by a state, tribe, or EPA as a Tier 2, Tier 2.5, or Tier 3 water. For discharges that enter a storm sewer system prior to discharge, the first surface water to which you discharge is the waterbody that receives the stormwater discharge from the storm sewer system.

Runoff from the project site will discharge to Big Bummet Brook. Big Bummet Brook is not identified as Tier 2 and Tier 2.5 water in 314 CMR 4.06 Basin Classification or MassDEP's Massachusetts Year 2014 Integrated List of Waters.

7.2.7. Construction Site Pollutants:

Potential Pollutant Generating Activities (CGP 7.2.7.1):

Activity:	Planned?	Comments:	Pollution Control:
Paving	Yes	Roadways, sidewalks, and driveways	Erosion and sediment controls as described
Painting	Possible	New and rehabbed structures	Stormwater Management system includes hoods for oil control in both catch basins and water quality treatment structures.
Solid Waste Storage	Yes	During Construction. Following completion of construction – single family house waste.	During Construction solid waste will be stored and hauled in accordance with state and local regulations. Following Construction solid waste will be stored and hauled in accordance with state and local regulations.
Construction Dewatering	Possible	Potential due to shallow groundwater	Must follow Dewatering Practices (CGP 2.1.3.4)

Erosion and Sedimentation Controls

The contractor shall minimize exposed soils to the extent practicable during site construction activities. Erosion controls shall be installed prior to any construction activity, and maintained until all disturbed land surfaces are stabilized. Erosion control barrier (entrenched, staked silt fence backed by staked haybales) shall be installed in accordance with the approved Site Plans. Erosion control measures will be installed to prevent potential erosion and sedimentation of resource areas, abutting properties, and Town/State ways.

- Construction access points will be maintained to prevent tracking or flowing of sediment onto public or private roads.
- Erosion control barriers will be erected at the down gradient limit of work prior to commencement of construction, excavation, or grading. Double rows shall be used within 50' of surface water (i.e., bordering vegetated wetland).

- Permanent detention basins have been designed to be used as temporary sedimentation basins during construction considering soil types, contributing areas, and phasing. Contractor is required to provide temporary diversion swales during construction to direct runoff from open/graded areas to the detention/infiltration facilities.
- Hay bale check dams will be installed around existing and proposed uncovered catch basins in low points to protect against off-site sedimentation/siltation, as well as at 45° angles along curb lines and within temporary diversion swales.
- Curbing will be installed along the edge of the roadway to direct surface stormwater flows through the stormwater management system.
- Disturbed areas shall be minimized, and shall be stabilized as soon as practicable. Stabilization shall begin when construction permanently or temporarily ceases. Within 50' of a surface water (i.e., bordering vegetated wetland), stabilization shall be complete within seven (7) days of grading operations; elsewhere within fourteen (14) days of grading operations. Consistent with CGP Part 2.2.1.1, you are required to have completed:
    a. For vegetative stabilization, all activities necessary to initially seed or plant the area to be stabilized; and/or
    b. For non-vegetative stabilization, the installation or application of all such non-vegetative measures.
- Surround stockpiles with silt fence if stockpile is to remain for more than forty-eight (48) hours.
- Temporary stabilization will be accomplished utilizing temporary seeding with mulch during growing season. During non-growing season chopped hay, jute matting, bonded fiber matrix and/or riprap slope protection must be utilized.
- Stabilization of disturbed areas will be accomplished by building cover, paving, riprap slope stabilization, temporary seeding, permanent seeding, mulching (blown hay or wood chips), landscaping or acceptable equivalent practice.
- Riprap or other velocity reducing measures will be used where necessary to control erosion.
- Street sweeping will be conducted as necessary to control the migration of sediment. Following the installation of pavement on proposed roadways, street sweeping shall occur monthly unless the Town or MassDOT determines weekly sweeping necessary.
- Erosion control practices will be continued until all areas affected by the construction are stabilized.
- An adequate reserve of erosion control materials will be kept on site for emergency or routine replacement.

7.2.8. Non-Stormwater Discharges

No non-permitted, non-stormwater discharges are associated with this project. Process wastewater and sanitary wastewater are specifically prohibited from discharging on-site during the construction phase. Illegal dumping of trash on site will be controlled by monitoring and by periodic clean up. The following non-stormwater discharges are planned/not planned as a result of this project:

Water source	Planned?	Comments
Firefighting	No	Emergency only
Waterlines	Yes	Flushing hydrants only Water line flushing-no contaminants
Irrigation	No	
Vehicle Washing	No	No soap or detergent allowed

Dust Control	No	Watering as needed
Building Wash Down	No	External. No Detergents Allowed
Pavement Washing	No	Allowed only if no spills of toxic or hazardous materials has occurred. Must be directed to sediment basin or sediment traps.
Air Conditioner Condensate	Yes	Uncontaminated.
Groundwater	No	Foundation drain or underdrain.
Streams, Springs	No	Uncontaminated, non-turbid.
Construction Dewatering	No	Must follow Dewatering Practices (CGP 2.1.3.4)

7.2.9. Buffer Documentation:

Note: CGP requires a 50' ***undisturbed*** buffer or equivalent erosion controls if a surface water (i.e., most wetland resources) is within 50' of the site (i.e., proposed area of disturbance).

The project involves construction within 50' of a surface water (i.e., bordering vegetated wetlands). The following measures are utilized within the 50' buffer to control erosion and limit sedimentation of surface waters – double perimeter erosion controls; use of detention basins as temporary sediment basins; anti-tracking pads; temporary stockpile surrounds and/or vegetative stabilization; dust control; stabilization of steep slopes; and protection of storm drain inlets.

7.2.10. Description of Stormwater Control Measures:

The following measures will be taken to control pollutants occurring in stormwater runoff during and following construction:

- Temporary swales with hay bale and/or stone check dams will be provided if necessary during construction to direct runoff to temporary sedimentation basins.
- Silt fences and hay bales, staked in place, will be installed along all sloped boundaries of the construction areas.
- Sediment will be retained on-site within the limits of the erosion control barriers and removed regularly during construction.
- Post construction stormwater runoff from the project site will be directed through a closed drainage system (catch basins with 4' deep-sumps and hoods; stormwater treatment units) into detention basins, and ultimately to riprap spillways within onsite upland areas.

7.2.11. Pollution Prevention Procedures:

Control of Pollution from Spills - during construction (CGP 7.2.11.1)

- Discharging toxic or hazardous substances from a spill or other release (consistent with CGP 2.3.1.5) is prohibited. Where a leak, spill, or other release containing a hazardous substance or oil in an amount equal to or in excess of a reportable quantity established under either 40 CFR Part 110, 40 CFR Part 117, or 40 CFR Part 302 occurs during a 24-hour period, you must notify the National Response Center (NRC) at (800) 424-8802 in accordance with the requirements of

40 CFR Part 110, 40 CFR Part 117, and 40 CFR Part 302 as soon as you have knowledge of the discharge. You must also, within 7 calendar days of knowledge of the release, provide a description of the release, the circumstances leading to the release, and the date of the release.

- Spills or leaks will be treated according to material type, volume, and location of spill. Mitigation will include containing the spill, removing spilled material as practicable in a safe and environmentally sound manner, and remediating any damage to the environment.
- For large spills, Massachusetts DEP Hazardous Waste Incident Response Group will be notified immediately at (508) 792-7650 and an emergency response contractor will be called in.

Sewage and Solid Waste Control (CGP 7.2.11.2)

The following measures will be taken to control pollution by site-generated waste:

- Portable toilets shall be made available during the construction period, with wastes disposed of at an off-site location in accordance with local and state regulations.
- Construction site waste materials will be properly contained on site, and then disposed of at an off-site location in accordance with local and state regulations. Roll-offs will be maintained on-site for proper disposal of construction waste/debris. All wastes will be disposed of or recycled in accordance with local and state regulations by a licensed contractor.
- Solid waste generated by site construction will be removed to an approved location.
- The project must comply with MassDEP's Solid Waste and Air Pollution Control regulations, pursuant to M.G.L. c.40, s.54 and must comply with both Solid Waste and Air Pollution Control regulations, pursuant to M.G.L. c.40, s. 5.

7.2.12. Procedures for Inspection, Maintenance, and Corrective Action:

Refer to the Construction Inspection Form found in the Forms section. The Site Contractor and Owner will assign an on-site contact person to inspect erosion control measures as required (refer to Section: Inspection Procedures (CGP 4.1)) and report any adjustments or problem areas to the DPW and/or agent, Conservation Commission, and the project engineer. Repairs shall be made in accordance with Section: Maintenance Requirements (CGP 2.1.1.4).

Inspection Procedures (CGP 4.1)

- Frequency of Inspections (in accordance with CGP 4.1.2): Inspections shall be conducted once per every seven (7) calendar days or once every fourteen (14) calendar days and within twenty-four (24) hours of a storm event greater than 0.25 inches (a rain gauge must be properly maintained on-site or obtain storm event information from a weather station representative of this location). The inspector, in accordance with the CGP, shall maintain inspection logs on-site and shall record total rainfall during events 0.25 inches or greater.
- Areas to be inspected (in accordance with CGP 4.1.5): All cleared, graded, or excavated areas that have not completed stabilization; all stormwater controls, all material, waste, borrow, storage, and maintenance areas; all areas where stormwater typically flows on-site including drainage ways, diversion swales, conveyances, or treatment devices; all points of discharge from the site; all locations where stabilization measures have been implemented.
- Inspection Requirements (in accordance with CGP 4.1.6): Check whether all controls are installed, operational, and working as intended; determine if controls need to be replaced, repaired, or maintained; check for presence of conditions that could lead to spills, leaks, or other accumulations of pollutants; identify locations where new or modified stormwater controls are necessary; check for signs of visible erosion and sedimentation (at points of discharge and/or

surface waters flowing through site); identify any and all incidents of noncompliance observed; initiate corrective action.

- If a discharge is occurring during the inspection: Identify all discharge locations; observe and document visual quality of discharge (color, odor, suspended or settled solids, foam, oil sheen, etc.); document whether stormwater controls are operating effectively; describe controls not operating as intended or those in need of maintenance.
- Provide Inspection Report (in accordance with CGP 4.1.7). A sample Inspection Report is included herewith for guidance.

Maintenance Requirements (CGP 2.1.1.4)

- Erosion and sediment controls shall remain in effective operating condition during construction and during permit coverage.
- Sediment must be removed before it has accumulated to one-half the above-ground height of any perimeter control (hay bale or silt fence).
- If sediment has been tracked from the site onto streets, sediment must be removed by the end of the same work day in which it was tracked or by the end of the next work day if the tracking occurs on a non-work day. Shovel, sweep, or vacuum sediment; sediment may not be hosed or swept into any stormwater system.
- Should problems are found during construction:
  - If the problem does not require significant repair or replacement or if the problem can be corrected through routine maintenance: work to fix the problem must be initiated immediately after discovery and work must be completed by the close of the next work day.
  - When installation of new erosion control barrier/sediment control or significant repair is required: new or modified control must be installed and operational by no later than seven (7) calendar days from time of discovery (or document why it is infeasible and make it operational as soon as practicable).
- Should actions result in a change to the stormwater controls or procedures documented in this SWPPP, the SWPPP must be modified accordingly within seven (7) calendar days.

7.2.13. Staff Training:

Refer to the Staff Training Form found in the Forms section. The contractor must ensure that the required personnel were trained in accordance with CGP 6.

7.2.14. Documentation of Compliance with Other Federal Requirements:

- 7.2.14.1 *Endangered Species Act:* **Criterion A**. No federally-listed threatened or endangered species or their designated critical habitat(s) are likely to occur on the site. There are no areas of Priority or Estimated Habitats of Rare Wildlife or Certified Vernal Pools as referenced in Massachusetts Natural Heritage Atlas, 13th Edition, Effective October 1, 2008.
- 7.2.14.2 *Historic Properties:* no historic properties exist on the site based on our review of the Massachusetts Cultural Resource Information System.
- 7.2.14.3 *Safe Drinking Water Act Underground Injection Control (UIC) Requirement:* The project is required to file a UIC registration (BRP WS 06) with Massachusetts DEP for the subsurface infiltration systems within the site prior to discharge of treated stormwater into the system.

State and Local Control

The project is designed to comply with applicable State and Local regulations, including the Massachusetts Contingency Plan and the Massachusetts Stormwater Management Regulations. The project requires a Comprehensive Permit from the Shrewsbury Zoning Board of Appeals and Order of Conditions from the Shrewsbury Conservation Commission.

7.2.15. SWPPP Certification:

Refer to the SWPPP Certification form at the end of this section.

7.2.16. Post-Authorization Additions to the SWPPP:

Refer to the SWPPP Amendment Log in the Forms section.

7.3. On-Site Availability of SWPPP

The current copy of the SWPPP shall be retained on-site or at an easily accessible location so that it can be made available at the time of an on-site inspection or upon request by EPA; a state, tribal, or local agency approving stormwater management plans; the operator of a storm sewer system receiving discharges from the site; or representatives of the U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS).

STORMWATER TEAM (CGP 7.2.1)

May 2016

REFERENCE

National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activities, Permit # MAR120000

PROJECT NAME

The Pointe at Hills Farm
Shrewsbury, MA

STORMWATER TEAM

"Stormwater Team" – the group of individuals responsible for oversight of the development and modifications of the SWPPP, and oversight of compliance with the permit requirements. The individuals on the "Stormwater Team" must be identified below:

1. Name:
_____
_____
_____
_____
Area of control:
_____
_____

2. Name:
_____
_____
_____
_____
Area of control:
_____
_____

3. Name:
_____
_____
_____
_____
Area of control:
_____
_____

STORMWATER POLLUTION PREVENTION PLAN CERTIFICATION (CGP 7.2.15.)

The Pointe at Hills Farm
Shrewsbury, Massachusetts

	Owner	**Responsibility**
Name:	Smart Growth Design, LLC	The owner is responsible for the conduct of all construction activities, and ultimate compliance with all provisions of the Stormwater Pollution Prevention Plan.
Address:	625 South Street Shrewsbury, MA 0545	
Telephone:	(774) 275-0414	

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 contained therein. Based on my inquiry of the person or persons who manage the systems, or those persons directly responsible for gathering the information, the information 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.

Signature: _____ Date: _____
Corporate Officer

Printed Name: Francis P. Zarette

Representing: Smart Growth Design, LLC

FORMS:

STAFF TRAINING LOG

DELEGATION OF AUTHORITY FORM

SUBCONTRACTOR CERTIFICATION FORM

CONSTRUCTION INSPECTION REPORTS

SWPPP AMENDMENT LOG

STAFF TRAINING LOG

Instructor Name/Title:	
Course Location:	
Date:	
Course Length:	

TOPIC (check as appropriate):

	Erosion Control BMPs
	Sediment Control BMPs
	Non-Stormwater BMPs
	Emergency Procedures
	Good Housekeeping BMPs

Specific Training Objective:	

ATTENDEES:

Name of Attendee	Company

DELEGATION OF AUTHORITY
STORMWATER POLLUTION PREVENTION PLAN

I, _____, 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 _____ construction site. The designee is authorized to sign any reports, stormwater pollution prevention plans and all other documents required by the permit.

Name/Title:	
Company:	
Address:	
Phone:	

By signing this authorization, I confirm that I meet the requirements to make such a designation as set forth in Appendix G, Subsection 11.A 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 G, Subsection 11.B (1-3).

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:	
Company:	
Signature:	
Date:	

SUBCONTRACTOR CERTIFICATION
STORMWATER POLLUTION PREVENTION PLAN

Operator:	

As subcontractor, you are required to comply with the Stormwater Pollution Prevention Plan (SWPPP) for any work that you perform on-site. Failure to comply with the SWPPP may result in termination of the 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 and the above designated project and agree to follow the BMPs and practices described in the SWPPP.

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

Company:	
Address:	
Telephone:	
Construction Services to be Provided:	

Signature:	
Title:	
Date:	

Inspection Report (CGP 4.1.5, 4.1.6, 4.1.7)

(Inspection Reports shall be retained for at least 3 years from the date that the permit coverage expires and is terminated.)

REFERENCE:	The Pointe at Hills Farm Shrewsbury, Massachusetts
INSPECTION DATE:	
	Circle One: weekly? rainfall event?
INSPECTED BY:	
Rainfall Amount (in.):	

Rainfall Gauge Location:_____

Observations and Action Items

EROSION AND SEDIMENT CONTROLS:

Erosion Control (i.e. haybales, silt fence, sediment basin)	Installed?	Operational?	Working as Intended?	Repairs, Replacements or Maintenance? Identify

CONDITIONS THAT COULD LEAD TO SPILLS, LEAKS OR OTHER POLLUTANTS:

Identify Condition _____

NEW OR MODIFIED STORMWATER CONTROLS NECESSARY:

Identify New Control _____
Purpose _____

Identify Modified Control _____
Purpose _____

VISIBLE EROSION AND/OR SEDIMENTATION:

Points of Discharge / Location _____

Surface Waters _____

NONCOMPLIANCE:

Identify Noncompliance Issue

Regulatory Reference
(i.e. Order of Conditions)

IF DISCHARGE IS OCCURING DURING INSPECTION:

Identify all discharge points:

Visual Quality of discharge:

Stormwater controls not operating as intended:

Stormwater controls in need of maintenance:

CORRECTIVE ACTIONS REQUIRED:

Inspector Signature / Date

SWPPP AMENDMENT LOG

DATE	DESCRIPTION OF AMENDMENT	AMENDMENT PREPARED BY: (NAME/TITLE)

CGP 7.2.16.1 NOI submitted to EPA
CGP 7.2.16.2 EPA acknowledgment letter

STATE & LOCAL CONTROL

PROJECT PLAN REVIEW APPROVAL
STORMWATER PERMIT

CGP 7.2.16.3
CONSTRUCTION GENERAL PERMIT &
APPENDIX I – STANDARD PERMIT CONDITIONS
(Other Appendices not included herewith)

PROJECT PLANS