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STORMWATER REPORT

135 Morrissey Boulevard

Boston (Dorchester), Massachusetts



Prepared for
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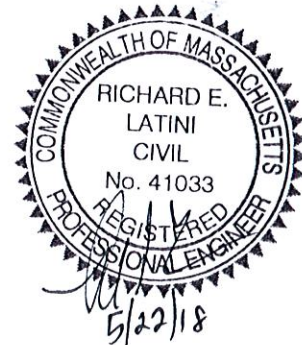




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Introduction

This Stormwater Management Report describes the existing drainage conditions and proposed stormwater best management practices (BMPs) designed to treat and control runoff as part of the redevelopment of 135 Morrissey Boulevard in the Dorchester neighborhood of Boston, Massachusetts.

The Site is approximately 16.6± acres and is almost completely covered by impervious surfaces. The building occupies over 7½ acres, and the paved parking, access, and loading over 8.3 acres. A majority of the Site's stormwater runoff ends up in a 60-inch pipe that traverses the site and outfalls into Patten's Cove located to the south of the Site. The front parking area drains into Morrissey Boulevard through the driveway openings, and gaps in the curbing along the parking area. The existing storm drain system provides almost no water quality treatment and stormwater infiltration is limited.

The Project will result in a decrease in impervious cover by over one acre. Stormwater BMPs will be constructed to improve the water quality of runoff from paved areas as well as the roof of the buildings. Stormwater BMPs include deep sump catch basins, subsurface infiltration systems, and stormwater treatment (water quality) units. These systems will capture and help reduce pollutant concentrations in the stormwater runoff prior to discharging to Patten's Cove and Boston Harbor.

Hydrology

Pre and post-development hydrology was analyzed with HydroCAD v 10.0, model using TR-20 methodology. The rainfall data was obtained from NOAA Atlas 14, Point Precipitation Frequency Estimates using 24-hour storms. The result of this analysis shows there will be a decrease in the peak discharge rates & volumes from the site in the post-development conditions for all the storm events analyzed (Refer to Table 1 in the Stormwater Management Standards section for pre- and post-development peak discharge rate comparisons).

PRE-CONSTRUCTION HYDROLOGY

The front parking area (easterly) has no drainage structures. Runoff drains towards Morrissey Boulevard either through the driveway openings or through gaps in the curbing along the easterly edge of the parking lot.

The building roof is collected by two drain lines under the building. These drain lines just about run the length of the building going front to back (east to west). Both drains tie into a drain line in the back of the building that runs approximately parallel with the I-93 right-of-way. This drain line



ultimately ties into a 60-inch storm drain that crosses under the main parking area to the south of the building and discharges into Patten's Cove

Surface runoff from the northerly loading area is captured by catch basins, which tie into the northerly drain line under the building mentioned above.

Surface runoff from the main parking area to the north of the building is picked up by catch basins, and eventually ends up in the 60-inch storm drain that outfalls into Patten's Cove.

POST-CONSTRUCTION HYDROLOGY

Flow to Storm Drain in Morrissey Boulevard

Stormwater runoff from the northerly portion of the front parking lot will be collected in deep sump catch basins, routed through a water quality unit for pretreatment before discharging to a subsurface infiltration system. The southerly portion of the front lot is too low to send to the infiltration system, but it is expected that over 80% of net annual total suspended solids (TSS) will be removed through the use of water quality units. This treated runoff, and overflows from the infiltration system during large storm events, will be directed to a new connection to the 36-inch storm drain in Morrissey Boulevard.

Flow to 60-Inch Storm Drain

It is proposed to collect all of the rooftop runoff and direct it to one of the several subsurface infiltration systems on-site. The infiltration systems all have overflows for large storm events. These overflows tie into the new closed drainage system on-site, which ultimately discharges to the 60-inch storm drain on-site. No new connections are proposed to the 60-inch pipe. The new storm drain system will tie into existing drain laterals off of the 60-inch pipe and located within the site.

Stormwater runoff from about 60% of the site to the south of the building, which includes most of the main parking area, will be collected in deep sump catch basins. The catch basins will be routed to water quality units providing over 80% removal of TSS prior to discharging to subsurface infiltration systems. The remaining portion of the site to the south of the building contains a portion of the parking area, the westerly loading dock, and the west entry courtyard area. This area gets routed to water quality units that will remove at least 80% of the TSS. Paved areas are captured by deep sump catch basins prior to the water quality units.

Runoff from the north entry courtyard is picked up by area drains and routed to an existing pipe that runs under the building. This pipe connects to the existing pipe network that is connected to the 60-inch storm drain.



Stormwater Management Standards

STANDARD 1: NO NEW UNTREATED DISCHARGES OR EROSION TO WETLANDS

The Project Site is fully developed with no evident stormwater Best Management Practices (BMPs). The Redevelopment intends to treat all impervious pavement areas through a series of deep sump catch basins, water quality units and, where feasible, stormwater infiltration. The roof drainage is untreated in existing conditions and ties into storm drain pipes in the back of the building. All roof areas are directed to an infiltration system in the proposed condition.

Stormwater runoff from the entire site, with the exception of the front parking area, is tributary to the 60-inch storm drain that crosses the main parking area in the southerly part of the site. This storm drain outlets into Patten’s Cove. No new connections to the 60-inch storm drain are proposed and there will be a reduction of flows due to the decrease of impervious areas on-site and the proposed stormwater management system improvements.

The front parking area currently drains via overland flow into Morrissey Boulevard primarily through breaks in the curbing along the parking area. It is proposed to collect stormwater runoff from this area in deep sump catch basins and route through proprietary separators. Runoff from a portion of this parking area will also be directed to an infiltration system. The closed drainage system will tie into the 36-inch storm drain in Morrissey Boulevard.

STANDARD 2: POST-DEVELOPMENT PEAK DISCHARGE RATES NOT TO EXCEED PRE-DEVELOPMENT PEAK DISCHARGE RATES

The project site discharges to Land Subject to Coastal Storm Flowage; however, the project is not seeking a waiver from the Standard 2 requirements. Peak discharge rates will be reduced as the result of a decrease in impervious area and the proposed stormwater management system. The 2, 10 and 100-year storm events were analyzed. Calculations are provided in Appendix C and D with a summary provided in Table 1 below.

Table 1. Pre- Vs Post-Development Peak Discharge Rates

Design Point	Pre-Development Rate (cfs)	Post-Development Rates (cfs)
2-Year Storm Event		
DP1: 36-inch Storm Drain in Morrissey Blvd	4.05	2.66
DP2: 60-inch Storm Drain On-Site	49.35	41.71



10-Year Storm Event		
DP1: 36-inch Storm Drain in Morrissey Blvd	7.00	6.92
DP2: 60-inch Storm Drain On-Site	78.68	76.11
100-Year Storm Event		
DP1: 36-inch Storm Drain in Morrissey Blvd	11.59	10.41
DP2: 60-inch Storm Drain On-Site	124.78	119.77

STANDARD 3: MINIMIZE OR ELIMINATE LOSS OF ANNUAL RECHARGE TO GROUNDWATER

The existing site primarily consist of impervious cover and groundwater recharge will be improved by the introduction of several landscaped areas and stormwater infiltration systems. The required recharge volume will be exceeded as averaged over the Site even though the Site has limitations including soils comprising primarily of urban fill that exhibits characteristics of C and D soils, and shallow depth to groundwater in several locations. The proposed design provides an equivalent recharge depth of 0.78 inches times the impervious area of the site, greatly exceeding the 0.25 inch target depth required.

Stormwater runoff that is directed towards the proposed stormwater infiltration systems receive pretreatment that removes at least 44% of the Total Suspended Solids (TSS).

STANDARD 4: STORMWATER MANAGEMENT SYSTEM TO REMOVE 80% OF AVERAGE ANNUAL LOAD OF TOTAL SUSPENDED SOLIDS (TSS)

Impervious pavement areas are collected by deep sump catch basins and directed to proprietary separators, and then in some cases to stormwater infiltration systems. The stormwater management system removes at least 80% of the TSS from these areas. A 1-inch water quality volume is used to design the system.

STANDARD 5: LAND USES WITH HIGHER POTENTIAL POLLUTANT LOADS

The site will have a high-intensity-use parking lot, which is considered a Land Use with Higher Potential Pollutant Loads (LUHPPL). Stormwater runoff from a majority of the parking areas will be directed to specific BMPs that are considered suitable for LUHPPL.



Runoff from some areas of the parking will be routed through deep sump catch basins and proprietary separators prior to connecting to the downstream storm drain system. This will result in an improvement over existing conditions, meeting the pretreatment requirements of Standard 5, and meeting the structural BMP requirements to the maximum extent practicable.

An operation and maintenance plan that is provided in this report and will be followed by the owner will further improve the stormwater runoff leaving the site. A long-term pollution prevention plan will also be followed, which will include source controls, good housekeeping practices, and emergency spill procedures.

STANDARD 6: STORMWATER DISCHARGES TO CRITICAL AREAS

The Site is not adjacent to a critical area; however, the stormwater runoff from the site is tributary to a portion of Boston Harbor (Proper) that is a Shellfish Suitability Area although shellfish growing is currently prohibited. The stormwater management system is intended to meet the pretreatment standard, and meet the Structural BMP requirements to the maximum extent practicable. Due to the presence of this potentially critical area, the water quality volume is based on one-inch, as opposed to ½ inch.

STANDARD 7: REDEVELOPMENT PROJECTS

The Project site is currently developed. The redevelopment will result in an improvement over existing conditions most notably in water quality and future maintenance. Reasonable efforts have been made to meet all the stormwater standards to the maximum extent practicable.

STANDARD 8: CONTROL CONSTRUCTION-RELATED IMPACTS

The project will install erosion and sediment controls prior to any major earthwork activity. The Contractor will be required to prepare a Storm Water Pollution Prevention Plan in conjunction with the General Permit for Construction Activity under the EPA's National Pollutant Discharge Elimination System (NPDES) program.

STANDARD 9: LONG-TERM OPERATION AND MAINTENANCE PLAN

See Appendix F for the operation and maintenance requirements of the stormwater management system.

STANDARD 10: NO ILLICIT DISCHARGES

There are no known or proposed illicit connections associated with this project. Illicit discharge compliance statement is provided in Appendix G.



Appendix A: Stormwater Checklist



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 8²
- 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.



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.

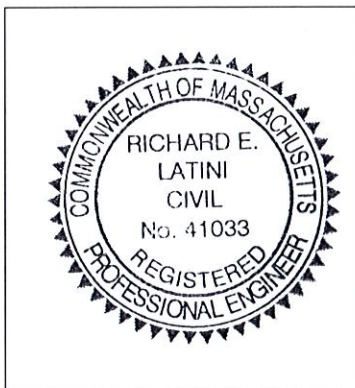
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

5/22/10

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 Field¹
- 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 proprietary 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.
 - * Infiltration is provided to the maximum extent practicable. There is not enough separation between the surface grade and seasonal high groundwater to provide infiltration at all locations

Standard 6: Critical Areas

- The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.
- Critical areas and BMPs are identified in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:
 - Limited Project
 - Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
 - Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
 - Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
 - Bike Path and/or Foot Path
- Redevelopment Project
- Redevelopment portion of mix of new and redevelopment.
- Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.
- The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
 - Construction Period Operation and Maintenance Plan;
 - Names of Persons or Entity Responsible for Plan Compliance;
 - Construction Period Pollution Prevention Measures;
 - Erosion and Sedimentation Control Plan Drawings;
 - Detail drawings and specifications for erosion control BMPs, including sizing calculations;
 - Vegetation Planning;
 - Site Development Plan;
 - Construction Sequencing Plan;
 - Sequencing of Erosion and Sedimentation Controls;
 - Operation and Maintenance of Erosion and Sedimentation Controls;
 - Inspection Schedule;
 - Maintenance Schedule;
 - Inspection and Maintenance Log Form.
- A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.



Checklist for Stormwater Report

Checklist (continued)

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

- The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has **not** been included in the Stormwater Report but will be submitted **before** land disturbance begins.
- The project is **not** covered by a NPDES Construction General Permit.
- The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.
- The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

- The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:
 - Name of the stormwater management system owners;
 - Party responsible for operation and maintenance;
 - Schedule for implementation of routine and non-routine maintenance tasks;
 - Plan showing the location of all stormwater BMPs maintenance access areas;
 - Description and delineation of public safety features;
 - Estimated operation and maintenance budget; and
 - Operation and Maintenance Log Form.
- The responsible party is **not** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:
 - A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
 - A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

- The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;
- An Illicit Discharge Compliance Statement is attached;
- NO Illicit Discharge Compliance Statement is attached but will be submitted **prior to** the discharge of any stormwater to post-construction BMPs.

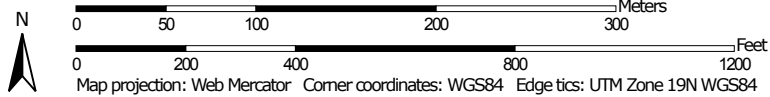


Appendix B: Soils Information

Soil Map—Norfolk and Suffolk Counties, Massachusetts




Map Scale: 1:4,200 if printed on A portrait (8.5" x 11") sheet.



MAP LEGEND

Area of Interest (AOI)

 Area of Interest (AOI)




















Soils



 Soil Map Unit Polygons

 Soil Map Unit Lines


 Soil Map Unit Points

Special Point Features






-  Blowout
-  Borrow Pit
-  Clay Spot
-  Closed Depression
-  Gravel Pit
-  Gravelly Spot
-  Landfill
-  Lava Flow
-  Marsh or swamp
-  Mine or Quarry
-  Miscellaneous Water
-  Perennial Water
-  Rock Outcrop
-  Saline Spot
-  Sandy Spot
-  Severely Eroded Spot
-  Sinkhole
-  Slide or Slip
-  Sodic Spot

-  Spoil Area
-  Stony Spot
-  Very Stony Spot
-  Wet Spot
-  Other
-  Special Line Features

Water Features

 Streams and Canals

Transportation

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

Background

 Aerial Photography

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Norfolk and Suffolk Counties, Massachusetts
 Survey Area Data: Version 13, Oct 6, 2017

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

Date(s) aerial images were photographed: Aug 10, 2014—Aug 25, 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

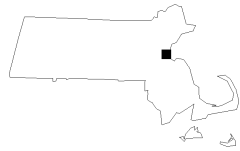
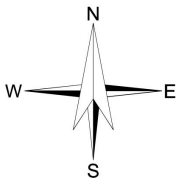
Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
1	Water	2.4	4.5%
603	Urban land, wet substratum, 0 to 3 percent slopes	33.7	65.0%
630C	Charlton-Hollis-Urban land complex, 3 to 15 percent slopes	6.0	11.6%
655	Udorthents, wet substratum	9.8	18.9%
Totals for Area of Interest		51.9	100.0%



SITE COORDINATES: 42°18'54"N, 71°31'1"W

HALEY & ALDRICH

THE BOSTON GLOBE PROPERTY
135 MORRISSEY BOULEVARD
BOSTON, MASSACHUSETTS

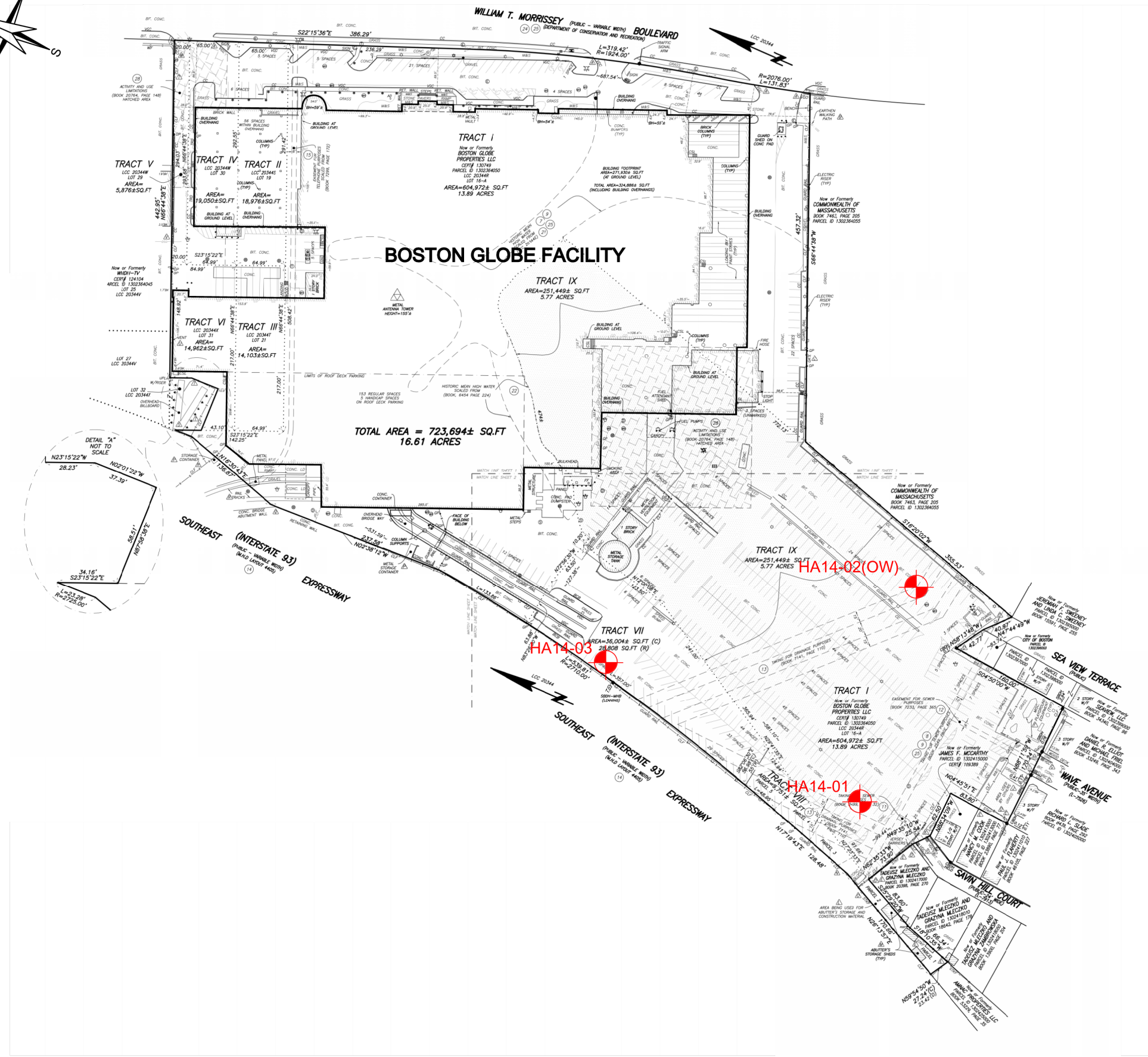
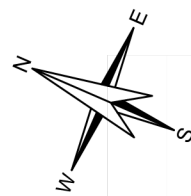


U.S.G.S. QUADRANGLE: BOSTON SOUTH, MA

PROJECT LOCUS

SCALE: 1:24,000
DECEMBER 2014

FIGURE 1



LEGEND:

- HA14-01 DESIGNATION AND APPROXIMATE LOCATION OF TEST BORING DRILLED BY NEW ENGLAND BORING CONTRACTORS, LLC. AND MONITORED BY HALEY & ALDRICH, INC. DURING THE PERIOD OF 15 AND 19 DECEMBER 2014.
- (OW) INDICATES GROUNDWATER OBSERVATION WELL INSTALLED IN TEST BORING.

NOTE:

1. BASE PLAN TAKEN FROM DRAWING TITLED "ALTA/ACSM LAND TITLE SURVEY, 135 WILLIAM T. MORRISSEY BOULEVARD, BOSTON, MASS." PREPARED BY FELDMAN LAND SURVEYORS AND DATED 23 DECEMBER 2014.
2. ELEVATIONS ARE IN FEET AND REFER TO BOSTON CITY BASE (BCB) DATUM.



HALEY & ALDRICH THE BOSTON GLOBE PROPERTY
 135 MORRISSEY BOULEVARD
 BOSTON, MASSACHUSETTS

SITE AND SUBSURFACE
 EXPLORATION LOCATION PLAN

SCALE: AS SHOWN
 DECEMBER 2014

FIGURE 2

TEST BORING REPORT

Boring No. HA14-01

Project 135 MORRISSEY BLVD, THE BOSTON GLOBE, BOSTON, MA
 Client WE 135 MORRISSEY BOULEVARD LLC
 Contractor NEW ENGLAND BORING CONTRACTORS, LLC

File No. 41321-000
 Sheet No. 1 of 3
 Start 15 December 2014
 Finish 15 December 2014
 Driller K. Smith

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	--	Rig Make & Model: Mobile B-53 Truck
Inside Diameter (in.)	4.0	1 3/8	--	Bit Type: Roller Bit
Hammer Weight (lb)	300	140	-	Drill Mud: None
Hammer Fall (in.)	24	30	-	Casing: HW Drive to 19.0 ft
				Hoist/Hammer: Winch Safety Hammer
				PID Make & Model:

H&A Rep. D. Palleiko
 Elevation 16.0 (est.)
 Datum Boston City Base
 Location See Plan

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size ¹ , structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test							
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength			
0					15.7	-BITUMINOUS CONCRETE-													
17	12	S1	0.5	SM	0.3	Dense gray silty SAND with gravel (SM), mps 1.0 in., no structure, no odor, moist, 30% ash, brick and glass in fragments, particles, and specks	5	15	5	20	35	20							
12	23	10	2.0																
5	5	S2	4.0	SM		Medium dense gray silty SAND (SM), mps 0.5 in., no structure, no odor, moist, 80% ash, in fragments, particles, and specks		5		15	40	40							
6	6	5	6.0																
6	3					-FILL-													
2	6	S3	9.0	OL/OH	7.2	Note: Stratum change at 8.75 ft. Stiff gray ORGANIC SILT (OL/OH), mps 0.05 in., no structure, no odor, moist, root and plant fibers					10	90	S	L	L				
6	6	14	11.0		8.8														
6	8					-ORGANIC DEPOSITS-													
9	12	S4	14.0	OL/OH	1.0	Stiff gray to red-brown ORGANIC SILT (OL/OH), mps 0.05 in., single layer of fine sand at 15.0 ft, 0.2 ft thick, no odor, wet					10	90	S	L	L				
12	17	17	16.0	CL	15.0	S4A: Very stiff olive-brown to olive-gray lean CLAY (CL), mps 0.10 in., no structure, no odor, moist, no pp data					5	95	N	M	M				
11	10	S5	19.0	CL		-MARINE DEPOSITS-													
10	10	8	21.0			Very stiff olive-brown to olive-gray lean CLAY (CL), mps 0.3 in., no structure, no odor, moist					5	95	N	M	M				

Water Level Data				Sample ID		Well Diagram		Summary	
Date	Time	Elapsed Time (hr.)	Depth (ft) to:			O - Open End Rod		Riser Pipe	Overburden (ft) 62.1
			Bottom of Casing	Bottom of Hole	Water	T - Thin Wall Tube		Screen	
						U - Undisturbed Sample <th></th> <th>Filter Sand</th> <th>Rock Cored (ft)</th>		Filter Sand	Rock Cored (ft)
						S - Split Spoon Sample <th></th> <th>Cuttings</th> <th>Samples 13S</th>		Cuttings	Samples 13S
								Grout	
								Concrete	
								Bentonite Seal	

Boring No. HA14-01

Field Tests: Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
 Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High V - Very High

¹Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. HA14-01

File No. 41321-000

Sheet No. 2 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size [†] , structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test						
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength		
20	11 11					PPA = 2.25 -3.25 tsf PPD = 1.75 -3.40 tsf												
25	6 6 9 16	S6 24	24.0 26.0	CL		Stiff gray lean CLAY (CL), mps 0.05 in., no structure, no odor, moist PPA = 2.25 - 2.5 tsf PPD = 2.0 - 2.5 tsf				5	95	N	M	M				
						-MARINE DEPOSITS-												
30	9 10 23 31	S7 24	29.0 31.0	ML		Medium dense gray SILT (ML), mps 0.05 in., no structure, no odor, wet					100	R	L	N				
35	2 6 13 9	S8 24	34.0 36.0	ML/ CL		Medium dense gray SILT (ML), mps 0.05 in., frequent interbeds of lean clay up to 8 in. thick, no odor, wet					100	R	L	L				
40	2 4 6 5	S9 24	39.0 41.0	CL		Stiff gray lean CLAY (CL), mps 0.05 in., frequent fine sand partings, no odor, moist PPA = 1.0 - 1.25 tsf PPD = 1.0 tsf					100	N	M	M				
45	3 6 22 14	S10 24	44.0 46.0	CL		Very stiff gray lean CLAY (CL), mps 0.05 in., frequent fine sand partings, no odor, moist PPA = 1.0 -1.25 tsf PPD = 1.0 tsf				5	95	N	M	M				
					-31.0 47.0	Note: Drill action indicates stratum change.												
	12	S11	49.0	SP-		Medium dense gray poorly graded SAND with silt (SP-SM), mps 0.05 in., no					90	10						

H&A-TEST BORING-09 REV HA-LIB09-BOS-GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\41321000-WINSTANLEY DUE DILIGENCE\GINT\41321-000-TB.GPJ 30 Dec 14

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA14-01

TEST BORING REPORT

Boring No. HA14-01

File No. 41321-000

Sheet No. 3 of 3

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size [†] , structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test								
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength				
50	16 10 14	13	51.0	SM		structure, odor, wet														
						-MARINE DEPOSITS-														
						Note: Rig chatters indicate gravel and cobbles at 53.0 and 55.5 ft.														
55	15 15 15 60	S12 9	54.0 56.0	SP		Medium dense olive-gray fading to red-brown poorly graded SAND (SP), mps 0.05 in., no odor, moist				95	5									
				CL	-39.5 55.5	Change to hard lean CLAY at 55.5 ft, no odor, moist							100	N	M	M				
					-41.0 57.0	Note: Drill indicates stratum change. Occasional cobbles														
60	26 48 100/1"	S13 6	59.0 61.0	SM		Very dense olive brown silty SAND with gravel (SM), mps 1.0 in., no structure, no odor, wet	5	15	15	25	20	20								
						-GLACIOFLUVIAL DEPOSITS-														
					-46.1 62.1	Note: Advanced roller bit to 62.1 ft. Constant hard, smooth drilling. Note: Refusal on probable BEDROCK. BOTTOM OF EXPLORATION 62.1 FT														

H&A-TEST BORING-09 REV HA-LIB09-BOS-GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\41321\000-WINSTANLEY DUE DILIGENCE\GINT\41321-000-TB.GPJ 30 Dec 14

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA14-01

Project 135 MORRISSEY BLVD, THE BOSTON GLOBE, BOSTON, MA
 Client WE 135 MORRISSEY BOULEVARD LLC
 Contractor NEW ENGLAND BORING CONTRACTORS, LLC

File No. 41321-000
 Sheet No. 1 of 2
 Start 19 December 2014
 Finish 19 December 2014
 Driller K. Smith

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	NW/HW	S	--	Rig Make & Model: Mobile B-53 Truck
Inside Diameter (in.)	3.0/4.0	1 3/8	--	Bit Type: Roller Bit
Hammer Weight (lb)	300	140	-	Drill Mud: None
Hammer Fall (in.)	24	30	-	Casing: HW Drive to
				Hoist/Hammer: Cat-Head Safety Hammer
				PID Make & Model:

H&A Rep. D. Palleiko
 Elevation 16.0 (est.)
 Datum Boston City Base
 Location See Plan

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION <small>(Density/consistency, color, GROUP NAME, max. particle size[†], structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)</small>	Gravel		Sand			Field Test						
								% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength		
0						15.6	-BITUMINOUS CONCRETE-												
8	4	S1	0.5	SM		0.4	Loose brown silty SAND with gravel (SM), mps 0.8 in., no structure, no odor, moist, 20 -25% ash, cinder, glass, coal in fragments, particles, and specks	15	10	40	35								
4	3	12	2.0																
5	1	S2	5.0	SM			-FILL-												
1	1	9	7.0				Very loose gray, black and red-brown mottled 100% ASH, cinders, slag in fragments, particles, and specks	5	15	10	15	20	35						
1	1																		
10	2	S3	10.0	OL/OH		5.5	Note: Stratum change at 10.5 ft. 10.5-12.5: Soft dark brown fibrous ORGANIC SILT (OL/OH), mps 0.05 in., rootmat structure, moderate H2S odor, moist					5	95	S	L	L			
2	2	10	12.0																
1	1																		
2	2																		
15	3	S4	15.0	OL/OH			-ORGANIC DEPOSITS-												
3	3	16	17.0				Medium stiff light gray ORGANIC SILT (OL/OH), mps 0.05 in., occasional brown fibrous peat up to 2 in. thick, no odor, moist					5	95	S	L	L			
3	3																		
5	5																		
20						-3.0	Note: Drill action indicates stratum change at 19.0 ft												
						19.0	-MARINE DEPOSITS-												

Water Level Data						Sample ID		Well Diagram				Summary								
Date	Time	Elapsed Time (hr.)	Depth (ft) to:			O - Open End Rod	T - Thin Wall Tube								Overburden (ft)	Rock Cored (ft)	Samples	9S	Boring No.	HA14-02(OW)
			Bottom of Casing	Bottom of Hole	Water															
12/19/14	1400	0.25	17.0	42.0	11.8									42.0						

Field Tests: Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
 Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High V - Very High

[†]Note: Maximum particle size is determined by direct observation within the limitations of sampler size.
 Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

HA-TEST BORING-09 REV HA-LIB09-BOS-GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\41321000-WINSTANLEY DUE DILIGENCE\GINT\41321-000-TB.GPJ 30 Dec 14

TEST BORING REPORT

Boring No. HA14-02(OW)

File No. 41321-000

Sheet No. 2 of 2

H&A-TEST BORING-09 REV HA-LIB09-BOS-GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\41321\000-WINSTANLEY DUE DILIGENCE\GINT\41321-000-TB.GPJ 30 Dec 14

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Well Diagram	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size†, structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test			
								% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity
20	6 5 6 6	S5 21	20.0 22.0	CL			Stiff yellow-brown lean CLAY (CL), mps 0.5 in., occasional fine sand partings, no odor, moist PPA = 2.0 tsf PPD = 2.0 tsf Note: Rig Chattering. Drill action indicates occasional gravel at 22.5 ft.						100	N	M	M
25	2 2 5 4	S6 24	25.0 27.0	CL			Medium stiff olive-gray lean CLAY (CL), mps 0.05 in., no structure, no odor, moist PPA = 1.5 - 1.25 tsf PPD = 1.25 tsf -MARINE DEPOSITS-						100	N	M	M
30	6 5 6 6	S7 20	30.0 32.0	CL			Stiff gray lean CLAY (CL), mps 0.05 in., frequent interbeds of silt up to 1.0 in. thick, no odor, moist						100	N	M	M
35	1 3 3 3	S8 24	35.0 37.0	CL			Medium stiff gray lean CLAY (CL), mps 0.05, no structure, no odor, moist PPA = 1.0 -1.25 tsf PPD = 1.0 tsf						100	N	M	M
40	1 3 4 3	S9 24	40.0 42.0	CL			Medium stiff gray lean CLAY (CL), mps 0.05 in., no structure, no odor, moist PPA = 1.0 tsf PPD = 0.75 tsf						100	N	M	M
						-26.0 42.0	BOTTOM OF EXPLORATION 42.0 FT									

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA14-02(OW)

TEST BORING REPORT

Boring No. HA14-03

Project 135 MORRISSEY BLVD, THE BOSTON GLOBE, BOSTON, MA
 Client WE 135 MORRISSEY BOULEVARD LLC
 Contractor NEW ENGLAND BORING CONTRACTORS, LLC

File No. 41321-000
 Sheet No. 1 of 6
 Start 16 December 2014
 Finish 19 December 2014
 Driller K. Smith

	Casing	Sampler	Barrel	Drilling Equipment and Procedures
Type	HW	S	NX	Rig Make & Model: Mobile B-53 Truck
Inside Diameter (in.)	4.0	1 3/8	2.0	Bit Type: Roller Bit
Hammer Weight (lb)	300	140	-	Drill Mud: None
Hammer Fall (in.)	24	30	-	Casing: HW Drive to 15 ft
				Hoist/Hammer: Cat-Head Safety Hammer
				PID Make & Model:

H&A Rep. D. Palleiko
 Elevation 16.0 (est.)
 Datum Boston City Base
 Location See Plan

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size [†] , structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test						
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength		
0					15.6	-BITUMINOUS CONCRETE-												
17	7	S1	0.5	SM	0.4	Medium dense black and gray silty SAND with gravel (SM), mps 0.75 in., no structure, no odor, moist, 20% ash in particles and specks	5	10	5	15	30	35						
7	7	8	2.0															
8						-FILL-												
5	2	S2	5.0	ML		Very loose dark brown with gray brown specks sandy SILT with gravel (ML), mps 0.5 in., no structure, no odor, moist, 75-80% ash, coal in fragments, particles and specks		15		10	15	60						
1	1	5	7.0															
1	1					-ASH FILL-												
10	WOH	S3	10.0	OL/OH	6.0	Note: Stratum change at 10.0 ft.						5	95					
1	1	18	12.0		10.0	Very soft brown to dark brown fibrous ORGANIC SOIL (OL/OH), mps 0.10 in., fibrous root mat structure, moderate to strong H2S odor, moist												
1						-ORGANIC DEPOSITS-												
15	5	S4	15.0	OL/OH		Stiff gray ORGANIC SILT (OL/OH), mps 0.05 in., occasional plant fiber, no odor, moist						5	95	S/N	L	L/M		
4	7	11	17.0															
7	8																	
18.0					-2.0	-MARINE DEPOSITS-												

Water Level Data						Sample ID		Well Diagram				Summary							
Date	Time	Elapsed Time (hr.)	Depth (ft) to:			O - Open End Rod	T - Thin Wall Tube	U - Undisturbed Sample	S - Split Spoon Sample	Riser Pipe	Screen	Filter Sand	Cuttings	Grout	Concrete	Bentonite Seal	Overburden (ft)	Rock Cored (ft)	Samples
			Bottom of Casing	Bottom of Hole	Water														
12/17/14	0700	16	15	48.25	11.05														
12/18/14	0700	16	15	107.6	11.34														

Boring No. HA14-03

Field Tests: Dilatancy: R - Rapid S - Slow N - None Plasticity: N - Nonplastic L - Low M - Medium H - High
 Toughness: L - Low M - Medium H - High Dry Strength: N - None L - Low M - Medium H - High V - Very High

[†]Note: Maximum particle size is determined by direct observation within the limitations of sampler size.

Note: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

TEST BORING REPORT

Boring No. HA14-03

File No. 41321-000

Sheet No. 2 of 6

H&A-TEST BORING-09 REV HA-LIB09-BOS-GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\41321\000-WINSTANLEY DUE DILIGENCE\GINT\41321-000-TB.GPJ 30 Dec 14

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size [†] , structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test			
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity
20	2 5 6 12	S5 17	20.0 22.0	CL		Stiff gray lean CLAY (CL), mps 0.05 in., no structure, no odor, moist						100	N	M	M
25	4 5 6 8	S6 19	25.0 27.0	CL		Stiff gray lean CLAY (CL), mps 0.05 in., no structure, no odor, moist						100	N	M	M
30	3 3 6 5	S7 21	30.0 32.0	CL		Stiff gray lean CLAY (CL), mps 0.05 in., frequent moderately angular fine sand partings up to 1/32 in. thick, no odor, moist PPA = 0.5 tsf PPD = 0.5 tsf						100	N	M	M
35	2 1 2 4	S8 22	35.0 37.0	CL		Soft gray lean CLAY (CL), mps 0.05 in., frequent silt layers up to 2 in. thick, no odor, moist PPA = 1.0 - 1.5 tsf PPD = 1.0 - 1.25 tsf						100	N	M	M
						-MARINE DEPOSITS-									
40	2 2 3 3	S9 22	40.0 42.0	CL		Medium stiff gray lean CLAY (CL), frequent interbeds of silt up to 2 in. thick, no odor, moist						100	N	M	M
45	3 3 3 4	S10 14	45.0 47.0	ML		Loose gray SILT (ML), mps 0.05 in., frequent lean CLAY (CL) interbeds up to 2 in. thick, no odor, moist						100	R	L	N

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA14-03

TEST BORING REPORT

Boring No. HA14-03

File No. 41321-000

Sheet No. 3 of 6

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size [†] , structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test			
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity
50	3 4 5 10	S11 24	50.0 52.0	CL		Stiff gray lean CLAY (CL), mps 0.05 in., frequent vertical silt partings, no odor, moist, no PP data						100	N	M	M
55	4 4 5 5	S12 15	55.0 57.0	CL		Stiff gray lean CLAY (CL), mps 0.05 in., frequent fine sand/silt partings, no odor, moist PPA = 1.25 tsf PPD = 1.0 tsf						100	N	M	M
60	3 5 5 7	S13 24	60.0 62.0	CL		Stiff gray lean CLAY (CL), mps 0.05 in., no structure, no odor, moist PPA = 1.25 tsf PPD = 1.0 tsf						100	N	M	M
65	1 3 2 3	S14 24	65.0 67.0	CL		Medium stiff gray lean CLAY (CL), mps 0.05 in., frequent interbeds of silt up to 2 in. thick, no odor, wet						100	N	M	M
70	WOR 6 6 6	S15 24	70.0 72.0	CL		Stiff gray lean CLAY (CL), mps 0.05 in., no structure, no odor, moist PPA = 0.75 tsf PPD = 0.75 tsf						100	N	M	M
						-MARINE DEPOSITS-									
75	2 3 4 7	S16 15	75.0 77.0	CL		Medium stiff gray lean CLAY (CL), mps 0.05 in., occasional fine sand partings, no odor, moist						100	N	M	M

H&A-TEST BORING-09 REV HA-LIB09-BOS-GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\41321000-WINSTANLEY DUE DILIGENCE\GINT\41321-000-TB.GPJ 30 Dec 14

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA14-03

TEST BORING REPORT

Boring No. HA14-03

File No. 41321-000

Sheet No. 4 of 6

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size [†] , structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test			
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity
80	WOR WOH 3 5	S17 24	80.0 82.0	CL		Soft gray lean CLAY (CL), mps 0.05 in., no structure, no odor, moist PPA = 0.5 tsf						100	N	M	M
90	WOR/18" 5	S18 24	90.0 92.0	CL		Very soft gray lean CLAY (CL), mps 0.05 in., no structure, no odor, moist PPA = 0.05 tsf PPD = 0.5 tsf						100	N	M	M
100	1/12" 4 10	S19 24	100.0 102.0	CL		Soft gray lean CLAY (CL), mps 0.05 in., frequent fine sand partings, no odor, moist PPA = 0.5 tsf PPD = 0.5 tsf						100	N	M	M

H&A-TEST BORING-09 REV HA-LIB09-BOS.GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\41321000-WINSTANLEY DUE DILIGENCE\GINT\41321-000-TB.GPJ 30 Dec 14

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA14-03

TEST BORING REPORT

Boring No. HA14-03

File No. 41321-000

Sheet No. 5 of 6

Depth (ft)	Sampler Blows per 6 in.	Sample No. & Rec. (in.)	Sample Depth (ft)	USCS Symbol	Stratum Change Elev/Depth (ft)	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (Density/consistency, color, GROUP NAME, max. particle size [†] , structure, odor, moisture, optional descriptions GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Test				
							% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength
110	28	S20 15	110.0	SW-SM	-93.0 109.0	Note: Stratum change at 109.0 ft.	5	10	15	20	40	10				
	57		111.5			Very dense light brown well graded SAND with silt and gravel (SW-SM), mps 0.8 in., no structure, no odor, occasional iron stained band										
						-GLACIOFLUVIAL DEPOSITS-										
115	51	S21 10	115.0	GM	-98.0 114.0	Note: Drill action indicates stratum change at 114.0 ft.	55	20		10	15					
	46		117.0			Very dense light brown and gray mottled silty GRAVEL (GM), mps 1.2 in., weakly bonded, no odor, moist										
						-GLACIAL TILL-										
120	46	S22 13	120.0	GM	-102.0 118.0	Note: Drill action indicates stratum change. Till gets harder.	40	30		15	15					
	84		121.4			Very dense light brown and gray mottled silty GRAVEL with sand (GM), mps 1.2 in., moderately bonded, no odor, moist										
						-GLACIAL TILL-										
						Note: Drill action indicates top of bedrock at 122.0 ft.										
						TOP OF BEDROCK AT 122.0 FT SEE CORE BORING REPORT FOR ROCK DETAILS										
125																

H&A-TEST BORING-09 REV HA-LIB09-BOS-GLB HA-TB+CORE+WELL-07-2 W FENCE.GDT G:\41321000-WINSTANLEY DUE DILIGENCE\GINT\41321-000-TB.GPJ 30 Dec 14

NOTE: Soil identification based on visual-manual methods of the USCS as practiced by Haley & Aldrich, Inc.

Boring No. HA14-03

CORE BORING REPORT

Depth (ft)	Drilling Rate (min./ft)	Run No.	Run Depth (ft)	Recovery/RQD		Weathering	Elev./Depth (ft)	Visual Description and Remarks
				in.	%			
								<i>SEE TEST BORING REPORT FOR OVERBURDEN DETAILS</i>
							-106.0 122.0	Note: Advanced to 124.0 ft. Consistently hard material
125	4	C1	124.0	41	68	Slight		Medium hard, slightly weathered, lilac-purple aphanitic to fine grained ARGILLITE. Bedding extremely thin to very thin, low angle. Primary joints low angle, bed parallel, very close to extremely close, smooth, planar, fresh to discolored with iron stain, tight. Secondary joints high angle, close to moderately close, smooth, plan, fresh to discolored with iron stain, tight.
	5		129.0	9	15			
	5							
	5							
							-113.0 129.0	-CAMBRIDGE ARGILLITE- BOTTOM OF EXPLORATION 129.0 FT
130								
135								
140								
145								
150								
155								

H-A_CORE-WELL07-1 HA-LIB09-BOS.GLB HA-TB-CORE-WELL-07-1.GDT G:\41321\000-WINSTANLEY DUJE DILIGENCE\GINT\41321-000-TB.GPJ 30 Dec 14

**GROUNDWATER OBSERVATION WELL
INSTALLATION REPORT**

**Well No. HA14-02(OW)
Boring No. HA14-02(OW)**

Project 135 MORRISSEY BLVD, THE BOSTON GLOBE
 Location BOSTON, MA
 Client WE 135 MORRISSEY BOULEVARD LLC
 Contractor NEW ENGLAND BORING CONTRACTORS, LLC
 Driller K. Smith

Well Diagram

- Riser Pipe
- Screen
- Filter Sand
- Cuttings
- Grout
- Concrete
- Bentonite Seal

File No. 41321-000
 Date Installed 19 Dec 2014
 H&A Rep. D. Palleiko
 Location See Plan

Ground El. 16.0 (est.)
 Datum Boston City Base

Initial Water Level (depth bgs) 11.8 ft

SOIL/ROCK		GRAPHIC	WELL DETAILS	DEPTH (ft.)	ELEVATION (ft.)	WELL CONSTRUCTION DETAILS
CONDITIONS	DEPTH (ft.)					
				0.0	16.0	Type of protective cover <u>Roadway Box Cover</u>
CONCRETE	0.4			1.0	15.0	Depth of Roadway Box below ground surface <u>0.0 ft</u>
				3.0	13.0	Depth of top of riser below ground surface <u>0.3 ft</u>
FILL				5.0	11.0	Type of protective casing <u>Roadway Box</u>
				7.0	9.0	Length <u>0.9 ft</u>
				10.5		Inside diameter <u>5.0 in.</u>
ORGANIC DEPOSITS				17.0	-1.0	Depth of bottom of Roadway Box <u>0.9 ft</u>
				18.0	-2.0	Type of riser pipe <u>Schedule 40 PVC</u>
						Inside diameter of riser pipe <u>2.0 in.</u>
						Depth of bottom of riser pipe <u>7.0 ft</u>
						<u>Type of Seals</u> <u>Top of Seal (ft)</u> <u>Thickness (ft)</u>
						<u>Concrete</u> <u>0.0</u> <u>0.5</u>
						<u>Bentonite</u> <u>3.0</u> <u>2.0</u>
						<u>Bentonite</u> <u>18.0</u> <u>23.0</u>
						Diameter of borehole <u>4.5 in.</u>
						Depth to top of well screen <u>7.0 ft</u>
						Type of screen <u>Machine slotted Sch 40 PVC</u>
						Screen gauge or size of openings <u>0.010 in.</u>
						Diameter of screen <u>2.0 in.</u>
						Type of Backfill around Screen <u>Filter Sand</u>
						Depth to bottom of well screen <u>17.0 ft</u>
						Bottom of silt trap <u>-</u>
						Depth of bottom of borehole <u>42.0 ft</u>
				42.0	-26.0	

HA-LIB09-BOS-GLB GW INSTALLATION REPORT-07-1 G:\141321\1000-WINSTANLEY DUE DILIGENCE\GINT\41321-000-TB.GPJ 30 Dec 14

COMMENTS:



HALEY & ALDRICH, INC.
465 Medford St.
Suite 2200
Boston, MA 02129
617.886.7400

Letter of Transmittal

Date 15 March 2018
File Number 130861-009
From Lee S. Vanzler, P.E.; Michael J. Atwood, P.E.

To Hacin + Associates
11 Beacon Street, Suite 1010
Boston, MA 02108

Attention Richard Latini, P.E.

Copy to Nordblom: Todd Fremont-Smith; Steve Logan
John Moriarty & Associates: Will Marini; Joel Dyson; Eric Harstad; David Leathers
Stantec: Thomas Urtz

Subject 135 Morrissey Boulevard – Test Pit Explorations and Hydraulic Conductivity

Attachments

Test Pit Exploration Location Plan
Logs of Test Pit Explorations
Test Pit Photographs
Soil Gradation Data

Transmitted via First class mail Overnight express Hand delivery Email

We have reviewed soil gradation laboratory testing from soil samples collected during the 7 March 2018 test pit exploration program at 135 Morrissey Boulevard. The soil samples were collected from each of the three (3) test pits conducted within the area of the proposed stormwater recharge systems; refer the attached sketch showing the designations and approximate locations of the test pits, as well as photographs of each pit.

The table below provides a general summary of our observations, as well as an estimate of hydraulic conductivity calculated from the soil gradation laboratory testing. Additional description of the conditions observed is included in the attached test pit logs.

Test Pit ID	Test Pit Depth (ft)	Depth to Groundwater (ft)	Groundwater Elevation (BCB)	Estimated Hydraulic Conductivity (cm/sec)
TP18-1	9.5	7.0	10.0	1x10 ⁻²
TP18-2	9.5	8.0	7.5	2x10 ⁻⁴
TP18-3	10.0	9.5	9.0	3x10 ⁻⁶

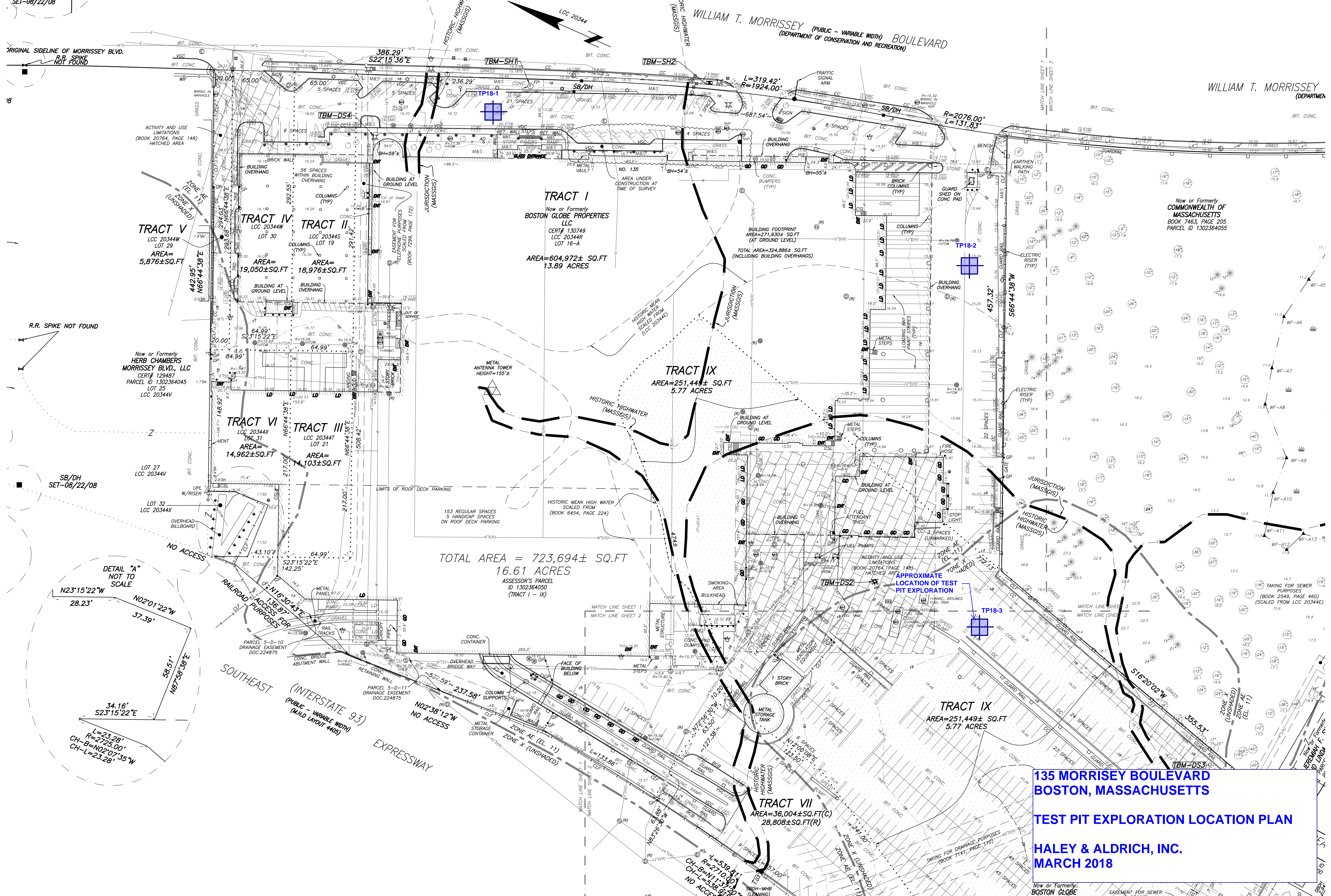


HALEY & ALDRICH, INC.
465 Medford St.
Suite 2200
Boston, MA 02129
617.886.7400

Letter of Transmittal

As you are aware, there is inherent variability in subsurface conditions, particularly in the near surface urban fill soils – this is evident from the wide range of estimated hydraulic conductivity in each of the three pits. While the hydraulic conductivity estimates are representative of the soil sample collected, permeability characteristics could vary across the plan limits of the proposed recharge systems.

Please let us know if you have any questions or if you need further information to help advance your stormwater recharge system design.



**135 MORRISSEY BOULEVARD
 BOSTON, MASSACHUSETTS**

TEST PIT EXPLORATION LOCATION PLAN

HALEY & ALDRICH, INC.
MARCH 2018

Now or Formerly
 BOSTON GLOBE

Project 135 WILLIAM T MORASSY BLVD
Location 135 WILLIAM T MORASSY BLVD
Client NORDBLOM
Contractor J. DERENZO
Equipment Used CAT 430 F rubber tire backhoe

File No. 130861-009
H&A Rep L. Navarret
Date 7 Mar 2018
Weather 30° cloudy/rain/snow

Ground El.: 17.0 **Location:** See Plan **Groundwater depths/entry rates (in./min.):**
El. Datum: Boston City Base

Depth (ft)	Sample ID	Stratum Change Elev./Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Tests								
					% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength				
0				-BITUMINOUS CONCRETE-														
		16.2 0.8 15.7 1.3	SP	Tan poorly graded SAND with gravel (SP), mps 1.5 in., no structure, no odor, dry, 1.5 dense grade (1.3 ft)	10	30	10	30	15	15								
2			SM	Light brown silty SAND with gravel (SM), mps 3.0 ft, no structure, no odor, dry, pieces/fragments of brick, glass, asphalt, pieces of 4.0 in. clay throughout	10	15	10	10	40	15								
4	TP18-1A 2.0 - 6.0			-URBAN FILL-														
6		11.0 6.0																
8	TP18-1B 6.0 - 9.5		SP	Brown poorly graded SAND with gravel (SP), mps 6.0 in., no odor, wet, pockets of approximately 2.0 to 3.0 in. organics Note: Encountered water at 8.0 ft.	25	25	30	20	25	5								
		7.5 9.5		-FILL-														
				BOTTOM OF EXPLORATION 9.5 FT														

Obstructions:	Remarks:	Field Tests	
		Dilatancy	R - Rapid S - Slow N - None Toughness L - Low M - Medium H - High Plasticity N - Nonplastic L - Low M - Medium H - High Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit			Boulders			Test Pit Dimensions (ft)	
at depth	8 / 7	ft	Diameter (in.)	Number	Approx. Vol. (cu.ft)	Pit Length x Width (ft) 5 x 11	
measured after	0 / 20	hours elapsed	12 to 24	3	=	Pit Depth (ft) 9.5	
			over 24	1	=		

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HA-TESTPIT-07-1 HA-LIB09-BOS-COPY.GLB HA-TP07-1.GDT G:\130861_NORDBLOM\GINT\130861-009-TP.GPJ 15 Mar 18

Project 135 WILLIAM T MORASSY BLVD
Location 135 WILLIAM T MORASSY BLVD
Client NORDBLOM
Contractor J. DERENZO
Equipment Used CAT 430 F rubber tire backhoe

File No. 130861-009
H&A Rep L. Navarret
Date 7 Mar 2018
Weather 30° rain/snow

Ground El.: 15.5

Location: See Plan

Groundwater depths/entry rates (in./min.):

El. Datum: Boston City Base

Depth (ft)	Sample ID	Stratum Change Elev./Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Tests								
					% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength				
0				-BITUMINOUS CONCRETE-														
		15.0 0.5	SP	Yellow brown poorly graded SAND (SP), mps 0.5 in., no structure, no odor, dry Note: Sidewell wet (south).	10	10	5	50	20	5								
2				-FILL-														
		12.5 3.0	SP	Gray poorly graded SAND with gravel (SP), mps 1.0 in., no structure, no odor, dry, dense grade	10	15	10	10	40	15								
		12.0 3.5		-FILL-														
4			SM	Dark brown silty SAND with gravel (SM), mps 16.0 in., no structure, slight odor, dry, pieces of wood, brick, some cinders	10	10	10	10	25	35								
	TP18-2 4.0 - 6.5			Note: Groundwater at 8.0 ft. Sample taken 3.5 to 6.0 ft.														
6				-FILL-														
8				Note: Sidewalls on south had water poring out.														
		6.0 9.5		BOTTOM OF EXPLORATION 9.5 FT														

Obstructions:	Remarks:	Field Tests	
		Dilatancy	R - Rapid S - Slow N - None Toughness L - Low M - Medium H - High Plasticity N - Nonplastic L - Low M - Medium H - High Dry Strength N - None L - Low M - Medium H - High V - Very High

Standing Water in Completed Pit			Boulders			Test Pit Dimensions (ft)	
at depth	8	ft	Diameter (in.)	Number	Approx. Vol. (cu.ft)	Pit Length x Width (ft) 4 x 8	
measured after	NA	hours elapsed	12 to 24	2	=	Pit Depth (ft) 9.5	
			over 24	-	=		

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.

HA-TESTPIT-07-1 HA-LIB09-BOS-COPY.GLB HA-TP07-1.GDT G:\130861_NORDBLOM\GINT\130861-009-TP.GPJ 15 Mar 18

Project 135 WILLIAM T MORASSY BLVD
Location 135 WILLIAM T MORASSY BLVD
Client NORDBLOM
Contractor J. DERENZO
Equipment Used CAT 430 F rubber tire backhoe

File No. 130861-009
H&A Rep L. Navarret
Date 7 Mar 2018
Weather 30° cloudy/rain/snow

Ground El.: 18.5 **Location:** See Plan **Groundwater depths/entry rates (in./min.):**
El. Datum: Boston City Base

Depth (ft)	Sample ID	Stratum Change Elev./Depth (ft)	USCS Symbol	VISUAL-MANUAL IDENTIFICATION AND DESCRIPTION (color, natural grain size and artificial component percentage estimates, maximum particle size, manual test properties, structure, odors, moisture, other descriptions and observations GEOLOGIC INTERPRETATION)	Gravel		Sand			Field Tests								
					% Coarse	% Fine	% Coarse	% Medium	% Fine	% Fines	Dilatancy	Toughness	Plasticity	Strength				
0		18.3		-BITUMINOUS CONCRETE-														
		0.3	SP	Tan poorly graded SAND with gravel (SP), mps 1.0 in., no structure, no odor, dry - dense grade	10	30	10	30	15	5								
		17.9																
		0.6	SP- SM	Brown poorly graded SAND with silt and gravel (SP-SM), mps 3.0 in., no structure, no odor, dry	10	15	10	15	40	10								
		16.9		-FILL-														
		1.6	SP- SM	Gray to brown poorly graded SAND with silt and gravel (SP-SM), mps 2.0 in., no structure, no odor, dry, pieces of clinkers, glass, brick, coal	10	15	10	15	40	10								
2																		
4				Note: Ash percentage up to 30%.														
6	TP18-3 0.0 - 10.0			-FILL-														
8				Note: Groundwater at 9.5 ft.														
10		8.5 10.0		BOTTOM OF EXPLORATION 10.0 FT														

Obstructions:	Remarks:	Field Tests		
		Dilatancy R - Rapid S - Slow N - None Toughness L - Low M - Medium H - High Plasticity N - Nonplastic L - Low M - Medium H - High Dry Strength N - None L - Low M - Medium H - High V - Very High		
Standing Water in Completed Pit		Boulders		Test Pit Dimensions (ft)
at depth	9.5 ft	Diameter (in.)	Number	Approx. Vol. (cu.ft)
measured after	0 hours elapsed	12 to 24	-	=
		over 24	-	=
				Pit Length x Width (ft) 4 x 7 Pit Depth (ft) 10.0

NOTE: Soil identification based on visual-manual methods of the USCS system as practiced by Haley & Aldrich, Inc.



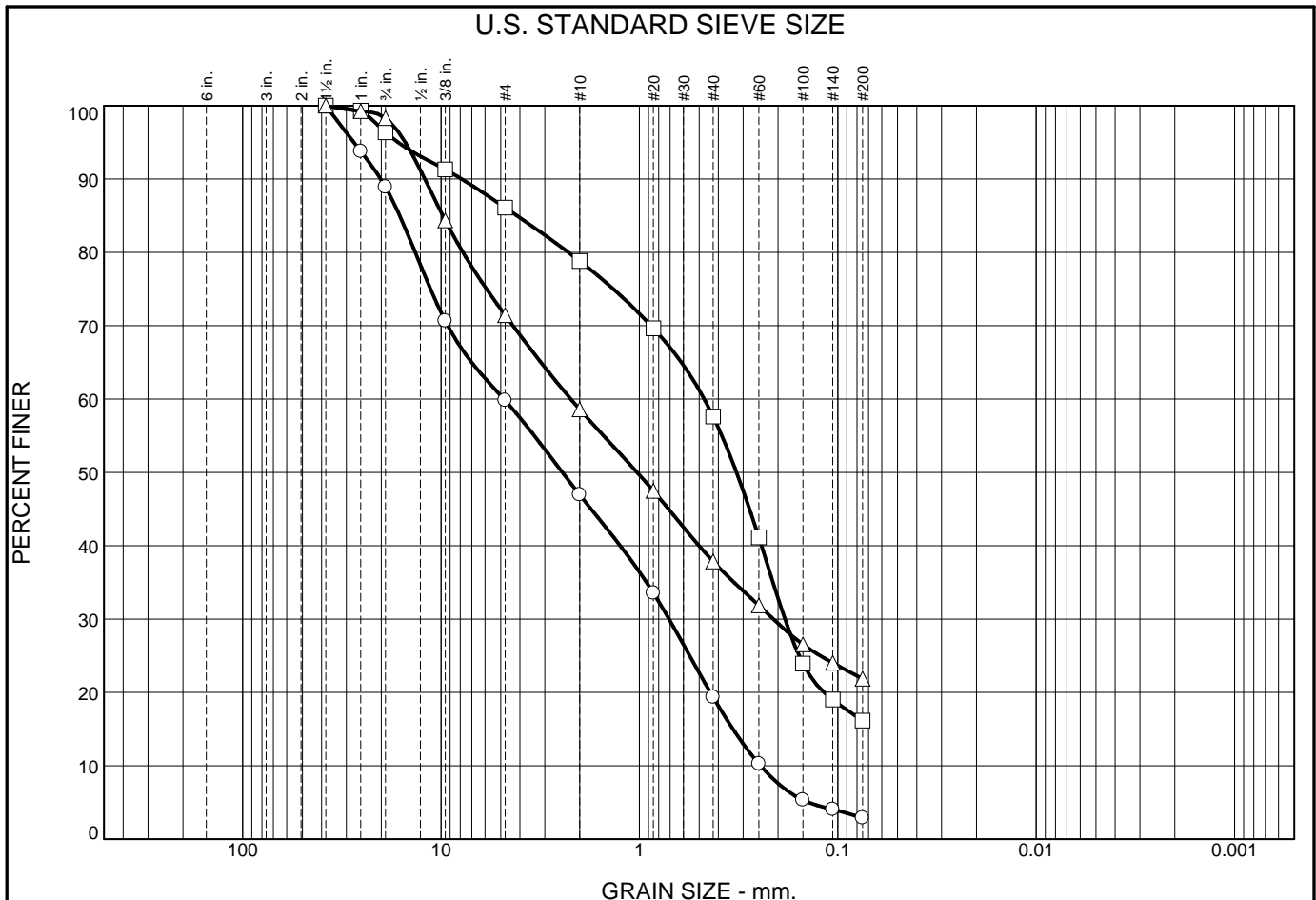
TEST PIT PHOTOGRAPH: TP18-1



TEST PIT PHOTOGRAPH: TP18-2




TEST PIT PHOTOGRAPH: TP18-3



	% +3"	% Gravel		% Sand			% Fines	
		Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
○	0.0	11.1	29.1	12.8	27.7	16.4	2.9	
□	0.0	3.6	10.3	7.3	21.2	41.4	16.2	
△	0.0	1.7	26.9	12.8	20.7	16.0	21.9	

Expl. No.	Sample No.	Depth (m.)	Atterberg Limits %			Water Content (%)	C _u	C _c	USCS
			W _L	W _P	I _P				
○	TP18-1A	3.0-6.0 ft.				9.7	19.64	0.43	SP
□	TP18-2	3.0-6.0 ft.				15.1			SM
△	TP18-3	4.0-7.0 ft.				35.5			SM

Sample Description	
○	Gray poorly graded sand with gravel
□	Dark brown silty sand
△	Brown silty sand with gravel

Remarks: ○ Fill □ Fill △ Ash Fill	Geotechnical Consulting Services, 135 Morrissey Boulevard Boston, Massachusetts  GRAIN SIZE DISTRIBUTION DATE: 3/12/2018
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Appendix C: Pre-Development Hydrology



NOAA Atlas 14, Volume 10, Version 2
Location name: **Dorchester, Massachusetts, USA***

Latitude: **42.316°**, Longitude: **-71.0492°**

Elevation: **10.89 ft****

* source: ESRI Maps

** source: USGS



POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

[PF tabular](#) | [PF graphical](#) | [Maps & aeriels](#)

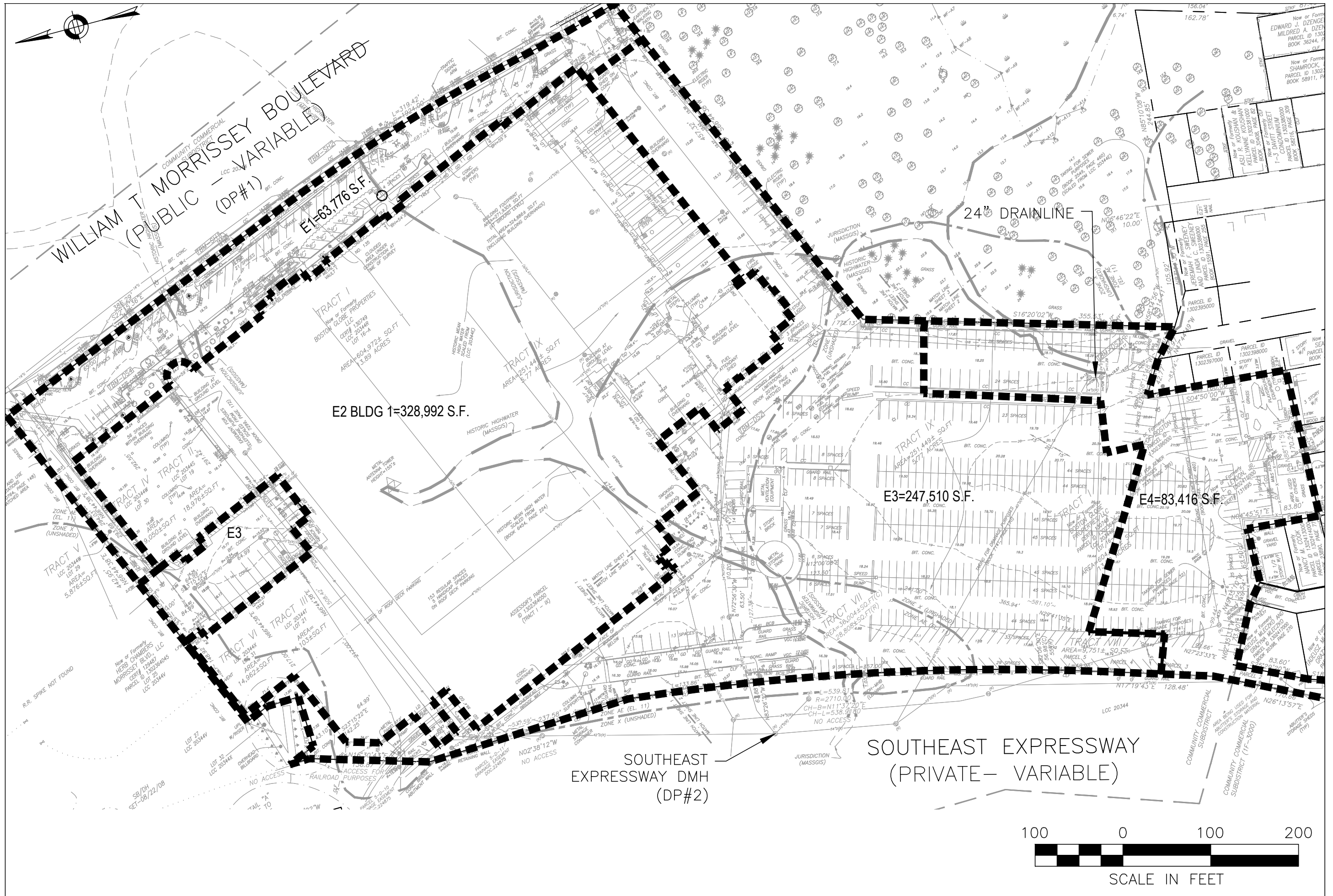
PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)¹										
Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.300 (0.247-0.365)	0.372 (0.305-0.452)	0.488 (0.399-0.597)	0.585 (0.475-0.721)	0.719 (0.581-0.939)	0.821 (0.625-1.11)	0.924 (0.680-1.31)	1.07 (0.730-1.54)	1.26 (0.821-1.90)	1.41 (0.890-2.17)
10-min	0.425 (0.350-0.517)	0.526 (0.432-0.641)	0.692 (0.566-0.846)	0.829 (0.673-1.02)	1.02 (0.794-1.33)	1.16 (0.886-1.57)	1.31 (0.963-1.85)	1.52 (1.03-2.19)	1.79 (1.16-2.69)	1.99 (1.26-3.08)
15-min	0.500 (0.411-0.608)	0.619 (0.508-0.754)	0.814 (0.665-0.995)	0.975 (0.792-1.20)	1.20 (0.934-1.57)	1.37 (1.04-1.84)	1.54 (1.13-2.18)	1.78 (1.22-2.57)	2.10 (1.37-3.17)	2.34 (1.48-3.62)
30-min	0.680 (0.559-0.827)	0.843 (0.692-1.03)	1.11 (0.907-1.36)	1.33 (1.08-1.64)	1.64 (1.28-2.14)	1.87 (1.42-2.52)	2.10 (1.55-2.98)	2.44 (1.67-3.52)	2.88 (1.88-4.34)	3.22 (2.04-4.98)
60-min	0.860 (0.707-1.05)	1.07 (0.876-1.30)	1.41 (1.15-1.72)	1.69 (1.37-2.08)	2.07 (1.62-2.71)	2.37 (1.81-3.19)	2.67 (1.97-3.78)	3.09 (2.11-4.47)	3.66 (2.38-5.52)	4.09 (2.59-6.31)
2-hr	1.11 (0.914-1.33)	1.39 (1.15-1.68)	1.85 (1.52-2.24)	2.23 (1.82-2.73)	2.76 (2.17-3.59)	3.16 (2.43-4.24)	3.57 (2.65-5.03)	4.18 (2.86-5.98)	4.99 (3.26-7.45)	5.61 (3.56-8.56)
3-hr	1.29 (1.07-1.55)	1.62 (1.34-1.95)	2.15 (1.78-2.61)	2.60 (2.13-3.17)	3.22 (2.54-4.17)	3.70 (2.85-4.93)	4.17 (3.11-5.86)	4.90 (3.36-6.97)	5.86 (3.83-8.69)	6.59 (4.19-10.00)
6-hr	1.68 (1.40-2.01)	2.09 (1.75-2.51)	2.77 (2.30-3.33)	3.33 (2.75-4.03)	4.11 (3.26-5.28)	4.71 (3.64-6.22)	5.30 (3.97-7.37)	6.21 (4.28-8.74)	7.40 (4.86-10.9)	8.30 (5.30-12.5)
12-hr	2.18 (1.83-2.58)	2.68 (2.25-3.18)	3.50 (2.93-4.17)	4.18 (3.47-5.02)	5.12 (4.08-6.51)	5.84 (4.54-7.63)	6.56 (4.92-9.00)	7.62 (5.28-10.6)	9.02 (5.95-13.1)	10.1 (6.45-15.0)
24-hr	2.64 (2.23-3.11)	3.26 (2.76-3.85)	4.29 (3.61-5.08)	5.14 (4.29-6.13)	6.31 (5.06-7.97)	7.21 (5.84-9.37)	8.11 (6.13-11.1)	9.49 (6.59-13.1)	11.3 (7.47-16.2)	12.7 (8.13-18.6)
2-day	2.99 (2.55-3.50)	3.79 (3.22-4.44)	5.08 (4.31-5.98)	6.16 (5.18-7.29)	7.64 (6.18-9.62)	8.78 (6.93-11.4)	9.92 (7.59-13.5)	11.8 (8.23-16.2)	14.3 (9.48-20.3)	16.2 (10.4-23.5)
3-day	3.28 (2.81-3.83)	4.14 (3.54-4.83)	5.54 (4.71-6.49)	6.70 (5.66-7.90)	8.30 (6.74-10.4)	9.53 (7.55-12.3)	10.8 (8.26-14.6)	12.8 (8.97-17.5)	15.6 (10.3-22.0)	17.7 (11.4-25.5)
4-day	3.56 (3.06-4.14)	4.44 (3.81-5.17)	5.88 (5.02-6.87)	7.08 (5.99-8.32)	8.73 (7.10-10.9)	9.99 (7.94-12.9)	11.3 (8.67-15.3)	13.4 (9.39-18.2)	16.3 (10.8-22.9)	18.4 (11.9-26.4)
7-day	4.32 (3.73-4.99)	5.23 (4.51-6.05)	6.72 (5.76-7.81)	7.95 (6.77-9.30)	9.65 (7.90-12.0)	11.0 (8.75-14.0)	12.3 (9.47-16.4)	14.5 (10.2-19.5)	17.4 (11.6-24.3)	19.6 (12.7-27.9)
10-day	5.02 (4.35-5.78)	5.95 (5.14-6.86)	7.47 (6.43-8.65)	8.74 (7.46-10.2)	10.5 (8.59-12.9)	11.8 (9.44-14.9)	13.2 (10.1-17.4)	15.3 (10.8-20.5)	18.2 (12.2-25.2)	20.4 (13.2-28.8)
20-day	7.03 (6.13-8.04)	8.04 (7.00-9.21)	9.71 (8.41-11.2)	11.1 (9.53-12.8)	13.0 (10.7-15.7)	14.4 (11.5-17.9)	15.9 (12.2-20.5)	17.8 (12.7-23.5)	20.4 (13.7-27.9)	22.3 (14.5-31.2)
30-day	8.68 (7.60-9.89)	9.77 (8.54-11.1)	11.5 (10.0-13.2)	13.0 (11.2-15.0)	15.0 (12.4-18.0)	16.6 (13.2-20.3)	18.2 (13.8-23.0)	19.9 (14.2-26.0)	22.2 (15.0-30.1)	23.9 (15.6-33.2)
45-day	10.8 (9.46-12.2)	11.9 (10.5-13.5)	13.8 (12.1-15.7)	15.4 (13.3-17.6)	17.5 (14.5-20.8)	19.2 (15.3-23.3)	20.9 (15.8-26.0)	22.4 (16.0-29.1)	24.4 (16.6-32.9)	26.0 (17.0-35.8)
60-day	12.5 (11.0-14.2)	13.7 (12.1-15.5)	15.7 (13.7-17.8)	17.3 (15.1-19.8)	19.6 (16.2-23.1)	21.3 (17.0-25.7)	23.1 (17.5-28.6)	24.5 (17.8-31.6)	26.4 (17.9-35.3)	27.8 (18.2-38.1)

¹ Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS). Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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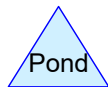
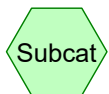
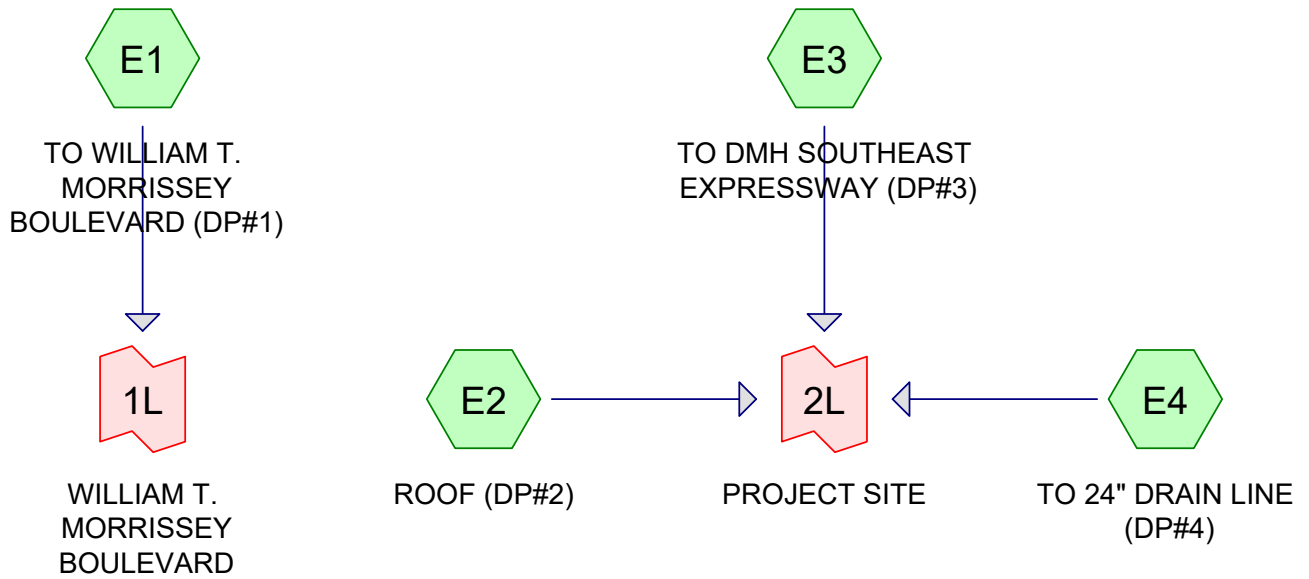


PRE-DEVELOPMENT DRAINAGE AREAS
135 MORRISSEY

HOWARD STEIN HUDSON
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FIGURE
D.1





Routing Diagram for Pre-135 Morrissey Blvd
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Pre-135 Morrissey Blvd

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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.720	74	>75% Grass cover, Good, HSG C (E1, E3, E4)
8.341	98	Paved parking, HSG C (E1, E3, E4)
7.553	98	Roofs, HSG C (E2)
16.614	97	TOTAL AREA

Pre-135 Morrissey Blvd

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Type III 24-hr 2-YR Rainfall=3.26"

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Summary for Subcatchment E1: TO WILLIAM T. MORRISSEY BOULEVARD (DP#1)

Runoff = 4.05 cfs @ 12.07 hrs, Volume= 0.282 af, Depth> 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
1.053	98	Paved parking, HSG C
0.411	74	>75% Grass cover, Good, HSG C
1.464	91	Weighted Average
0.411		28.07% Pervious Area
1.053		71.93% Impervious Area

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

Summary for Subcatchment E2: ROOF (DP#2)

Runoff = 24.77 cfs @ 12.07 hrs, Volume= 1.904 af, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
7.553	98	Roofs, HSG C
7.553		100.00% Impervious Area

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

Summary for Subcatchment E3: TO DMH SOUTHEAST EXPRESSWAY (DP#3)

Runoff = 18.64 cfs @ 12.07 hrs, Volume= 1.432 af, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
5.594	98	Paved parking, HSG C
0.088	74	>75% Grass cover, Good, HSG C
5.682	98	Weighted Average
0.088		1.55% Pervious Area
5.594		98.45% Impervious Area

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Type III 24-hr 2-YR Rainfall=3.26"

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

Summary for Subcatchment E4: TO 24" DRAIN LINE (DP#4)

Runoff = 5.94 cfs @ 12.07 hrs, Volume= 0.431 af, Depth> 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
1.694	98	Paved parking, HSG C
0.221	74	>75% Grass cover, Good, HSG C
1.915	95	Weighted Average
0.221		11.54% Pervious Area
1.694		88.46% Impervious Area

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

Summary for Link 1L: WILLIAM T. MORRISSEY BOULEVARD

Inflow Area = 1.464 ac, 71.93% Impervious, Inflow Depth > 2.31" for 2-YR event
Inflow = 4.05 cfs @ 12.07 hrs, Volume= 0.282 af
Primary = 4.05 cfs @ 12.07 hrs, Volume= 0.282 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link 2L: PROJECT SITE

Inflow Area = 15.150 ac, 97.96% Impervious, Inflow Depth > 2.98" for 2-YR event
Inflow = 49.35 cfs @ 12.07 hrs, Volume= 3.768 af
Primary = 49.35 cfs @ 12.07 hrs, Volume= 3.768 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

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Type III 24-hr 10-YR Rainfall=5.14"

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Summary for Subcatchment E1: TO WILLIAM T. MORRISSEY BOULEVARD (DP#1)

Runoff = 7.00 cfs @ 12.07 hrs, Volume= 0.502 af, Depth> 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
1.053	98	Paved parking, HSG C
0.411	74	>75% Grass cover, Good, HSG C
1.464	91	Weighted Average
0.411		28.07% Pervious Area
1.053		71.93% Impervious Area

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

Summary for Subcatchment E2: ROOF (DP#2)

Runoff = 39.36 cfs @ 12.07 hrs, Volume= 3.084 af, Depth> 4.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
7.553	98	Roofs, HSG C
7.553		100.00% Impervious Area

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

Summary for Subcatchment E3: TO DMH SOUTHEAST EXPRESSWAY (DP#3)

Runoff = 29.61 cfs @ 12.07 hrs, Volume= 2.320 af, Depth> 4.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
5.594	98	Paved parking, HSG C
0.088	74	>75% Grass cover, Good, HSG C
5.682	98	Weighted Average
0.088		1.55% Pervious Area
5.594		98.45% Impervious Area

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Type III 24-hr 10-YR Rainfall=5.14"

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

Summary for Subcatchment E4: TO 24" DRAIN LINE (DP#4)

Runoff = 9.72 cfs @ 12.07 hrs, Volume= 0.727 af, Depth> 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
1.694	98	Paved parking, HSG C
0.221	74	>75% Grass cover, Good, HSG C
1.915	95	Weighted Average
0.221		11.54% Pervious Area
1.694		88.46% Impervious Area

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

Summary for Link 1L: WILLIAM T. MORRISSEY BOULEVARD

Inflow Area = 1.464 ac, 71.93% Impervious, Inflow Depth > 4.12" for 10-YR event
Inflow = 7.00 cfs @ 12.07 hrs, Volume= 0.502 af
Primary = 7.00 cfs @ 12.07 hrs, Volume= 0.502 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link 2L: PROJECT SITE

Inflow Area = 15.150 ac, 97.96% Impervious, Inflow Depth > 4.86" for 10-YR event
Inflow = 78.68 cfs @ 12.07 hrs, Volume= 6.131 af
Primary = 78.68 cfs @ 12.07 hrs, Volume= 6.131 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

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Type III 24-hr 100-YR Rainfall=8.11"

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Summary for Subcatchment E1: TO WILLIAM T. MORRISSEY BOULEVARD (DP#1)

Runoff = 11.59 cfs @ 12.07 hrs, Volume= 0.857 af, Depth> 7.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
1.053	98	Paved parking, HSG C
0.411	74	>75% Grass cover, Good, HSG C
1.464	91	Weighted Average
0.411		28.07% Pervious Area
1.053		71.93% Impervious Area

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

Summary for Subcatchment E2: ROOF (DP#2)

Runoff = 62.30 cfs @ 12.07 hrs, Volume= 4.950 af, Depth> 7.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
7.553	98	Roofs, HSG C
7.553		100.00% Impervious Area

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

Summary for Subcatchment E3: TO DMH SOUTHEAST EXPRESSWAY (DP#3)

Runoff = 46.87 cfs @ 12.07 hrs, Volume= 3.724 af, Depth> 7.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
5.594	98	Paved parking, HSG C
0.088	74	>75% Grass cover, Good, HSG C
5.682	98	Weighted Average
0.088		1.55% Pervious Area
5.594		98.45% Impervious Area

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Type III 24-hr 100-YR Rainfall=8.11"

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

Summary for Subcatchment E4: TO 24" DRAIN LINE (DP#4)

Runoff = 15.61 cfs @ 12.07 hrs, Volume= 1.198 af, Depth> 7.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
1.694	98	Paved parking, HSG C
0.221	74	>75% Grass cover, Good, HSG C
1.915	95	Weighted Average
0.221		11.54% Pervious Area
1.694		88.46% Impervious Area

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

Summary for Link 1L: WILLIAM T. MORRISSEY BOULEVARD

Inflow Area = 1.464 ac, 71.93% Impervious, Inflow Depth > 7.03" for 100-YR event

Inflow = 11.59 cfs @ 12.07 hrs, Volume= 0.857 af

Primary = 11.59 cfs @ 12.07 hrs, Volume= 0.857 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link 2L: PROJECT SITE

Inflow Area = 15.150 ac, 97.96% Impervious, Inflow Depth > 7.82" for 100-YR event

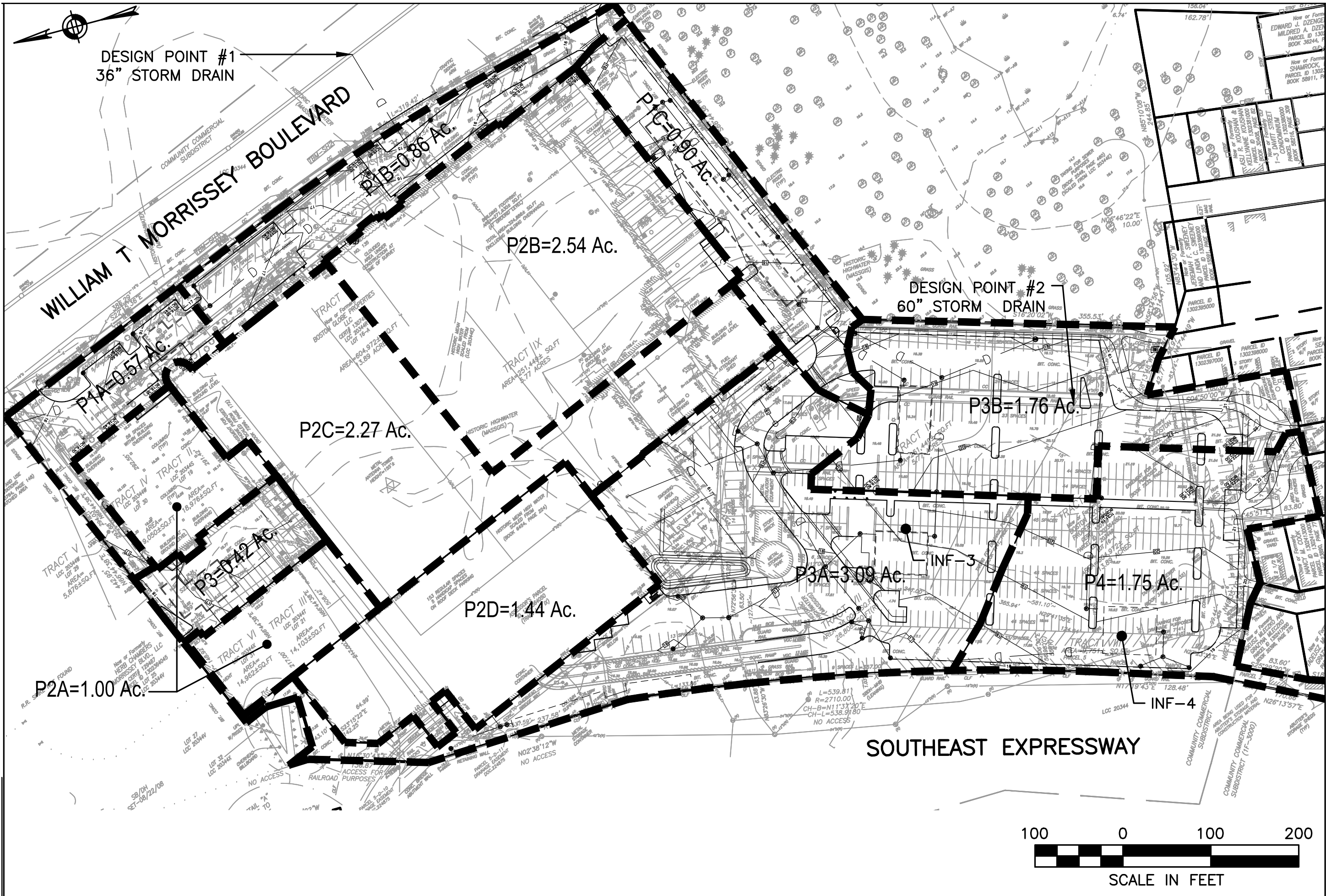
Inflow = 124.78 cfs @ 12.07 hrs, Volume= 9.872 af

Primary = 124.78 cfs @ 12.07 hrs, Volume= 9.872 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



Appendix D: Post-Development Hydrology



DESIGN POINT #1
36" STORM DRAIN

DESIGN POINT #2
60" STORM DRAIN

WILLIAM T MORRISSEY BOULEVARD

SOUTHEAST EXPRESSWAY

P2A=1.00 Ac.

P1A=0.57 Ac.

P2C=2.27 Ac.

P3=0.42 Ac.

P2D=1.44 Ac.

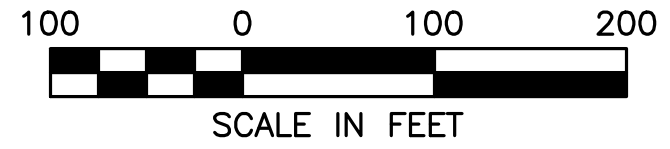
P2B=2.54 Ac.

P1C=0.90 Ac.

P3A=3.09 Ac.

P3B=1.76 Ac.

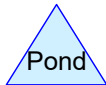
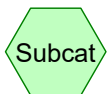
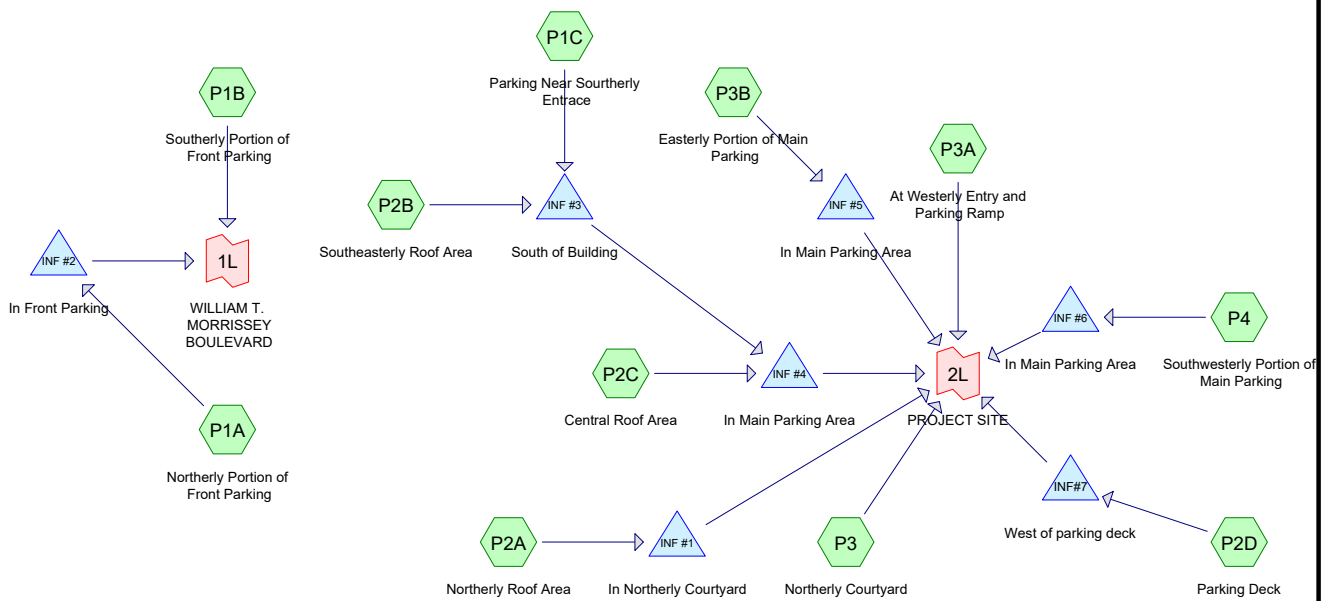
P4=1.75 Ac.



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FIGURE
D.2



Routing Diagram for Post-135 Morrissey Blvd
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.684	74	>75% Grass cover, Good, HSG C (P1A, P1B, P1C, P3A, P3B, P4)
0.033	96	Gravel surface, HSG C (P1B, P1C, P3A)
0.095	74	Landscaped Areas (P3)
7.217	98	Paved parking, HSG C (P1A, P1B, P1C, P3A, P3B, P4)
0.323	98	Pavement (P3)
2.266	98	Roof (P2C)
4.984	98	Roofs, HSG C (P2A, P2B, P2D)
16.602	95	TOTAL AREA

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Type III 24-hr 2-YR Rainfall=3.26"

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Summary for Subcatchment P1A: Northerly Portion of Front Parking

Runoff = 1.58 cfs @ 12.07 hrs, Volume= 0.110 af, Depth> 2.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
0.409	98	Paved parking, HSG C
0.162	74	>75% Grass cover, Good, HSG C
0.571	91	Weighted Average
0.162		28.37% Pervious Area
0.409		71.63% Impervious Area

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

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Type III 24-hr 2-YR Rainfall=3.26"

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Page 4

Summary for Subcatchment P1B: Southerly Portion of Front Parking

Runoff = 2.61 cfs @ 12.07 hrs, Volume= 0.187 af, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
0.728	98	Paved parking, HSG C
0.131	74	>75% Grass cover, Good, HSG C
0.003	96	Gravel surface, HSG C
0.862	94	Weighted Average
0.134		15.55% Pervious Area
0.728		84.45% Impervious Area

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

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Type III 24-hr 2-YR Rainfall=3.26"

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Summary for Subcatchment P1C: Parking Near Sourtherly Entrance

Runoff = 2.78 cfs @ 12.07 hrs, Volume= 0.202 af, Depth> 2.70"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
0.775	98	Paved parking, HSG C
0.109	74	>75% Grass cover, Good, HSG C
0.012	96	Gravel surface, HSG C
0.896	95	Weighted Average
0.121		13.50% Pervious Area
0.775		86.50% Impervious Area

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

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Type III 24-hr 2-YR Rainfall=3.26"

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Summary for Subcatchment P2A: Northerly Roof Area

Runoff = 3.27 cfs @ 12.07 hrs, Volume= 0.251 af, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
0.997	98	Roofs, HSG C
0.997		100.00% Impervious Area

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

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Type III 24-hr 2-YR Rainfall=3.26"

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Summary for Subcatchment P2B: Southeasterly Roof Area

Runoff = 8.34 cfs @ 12.07 hrs, Volume= 0.641 af, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
2.543	98	Roofs, HSG C
2.543		100.00% Impervious Area

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

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Type III 24-hr 2-YR Rainfall=3.26"

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Summary for Subcatchment P2C: Central Roof Area

Runoff = 7.43 cfs @ 12.07 hrs, Volume= 0.571 af, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
* 2.266	98	Roof
2.266		100.00% Impervious Area

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

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Type III 24-hr 2-YR Rainfall=3.26"

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Summary for Subcatchment P2D: Parking Deck

Runoff = 4.74 cfs @ 12.07 hrs, Volume= 0.364 af, Depth> 3.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
1.444	98	Roofs, HSG C
1.444		100.00% Impervious Area

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

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Type III 24-hr 2-YR Rainfall=3.26"

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Summary for Subcatchment P3: Northerly Courtyard

Runoff = 1.23 cfs @ 12.07 hrs, Volume= 0.087 af, Depth> 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

	Area (sf)	CN	Description
*	4,131	74	Landscaped Areas
*	14,060	98	Pavement
	18,191	93	Weighted Average
	4,131		22.71% Pervious Area
	14,060		77.29% Impervious Area

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

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Summary for Subcatchment P3A: At Westerly Entry and Parking Ramp

Runoff = 9.08 cfs @ 12.07 hrs, Volume= 0.644 af, Depth> 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
2.458	98	Paved parking, HSG C
0.611	74	>75% Grass cover, Good, HSG C
0.018	96	Gravel surface, HSG C
3.087	93	Weighted Average
0.629		20.38% Pervious Area
2.458		79.62% Impervious Area

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

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Type III 24-hr 2-YR Rainfall=3.26"

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Summary for Subcatchment P3B: Easterly Portion of Main Parking

Runoff = 5.19 cfs @ 12.07 hrs, Volume= 0.368 af, Depth> 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
1.426	98	Paved parking, HSG C
0.338	74	>75% Grass cover, Good, HSG C
1.764	93	Weighted Average
0.338		19.16% Pervious Area
1.426		80.84% Impervious Area

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

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Type III 24-hr 2-YR Rainfall=3.26"

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Summary for Subcatchment P4: Southwesterly Portion of Main Parking

Runoff = 5.16 cfs @ 12.07 hrs, Volume= 0.366 af, Depth> 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-YR Rainfall=3.26"

Area (ac)	CN	Description
1.421	98	Paved parking, HSG C
0.333	74	>75% Grass cover, Good, HSG C
1.754	93	Weighted Average
0.333		18.99% Pervious Area
1.421		81.01% Impervious Area

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

Summary for Pond INF #1: In Northerly Courtyard

Inflow Area = 0.997 ac, 100.00% Impervious, Inflow Depth > 3.03" for 2-YR event
 Inflow = 3.27 cfs @ 12.07 hrs, Volume= 0.251 af
 Outflow = 2.68 cfs @ 12.12 hrs, Volume= 0.168 af, Atten= 18%, Lag= 3.1 min
 Discarded = 0.02 cfs @ 8.09 hrs, Volume= 0.032 af
 Primary = 2.66 cfs @ 12.12 hrs, Volume= 0.135 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 14.37' @ 12.12 hrs Surf.Area= 0.068 ac Storage= 0.099 af

Plug-Flow detention time= 166.9 min calculated for 0.168 af (67% of inflow)
 Center-of-Mass det. time= 68.5 min (823.2 - 754.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	12.00'	0.029 af	39.50'W x 46.34'L x 3.50'H Field A 0.147 af Overall - 0.051 af Embedded = 0.096 af x 30.0% Voids
#2A	12.50'	0.051 af	ADS_StormTech SC-740 +Cap x 48 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 8 Rows of 6 Chambers
#3B	12.00'	0.018 af	44.25'W x 24.98'L x 3.50'H Field B 0.089 af Overall - 0.028 af Embedded = 0.060 af x 30.0% Voids
#4B	12.50'	0.028 af	ADS_StormTech SC-740 +Cap x 27 Inside #3 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 9 Rows of 3 Chambers
#5	12.45'	0.002 af	5.00'D x 3.45'H DMH
		0.128 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	12.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	12.45'	12.0" Round Culvert L= 10.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 12.45' / 12.40' S= 0.0050 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 2	14.00'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 8.09 hrs HW=12.45' (Free Discharge)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=2.65 cfs @ 12.12 hrs HW=14.37' (Free Discharge)
 ↳ **2=Culvert** (Passes 2.65 cfs of 3.56 cfs potential flow)
 ↳ **3=Broad-Crested Rectangular Weir** (Weir Controls 2.65 cfs @ 1.78 fps)

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Stage-Area-Storage for Pond INF #1: In Northerly Courtyard

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
12.00	0.067	0.000	14.65	0.068	0.108
12.05	0.067	0.001	14.70	0.068	0.110
12.10	0.067	0.002	14.75	0.068	0.111
12.15	0.067	0.003	14.80	0.068	0.113
12.20	0.067	0.004	14.85	0.068	0.114
12.25	0.067	0.005	14.90	0.068	0.115
12.30	0.067	0.006	14.95	0.068	0.116
12.35	0.067	0.007	15.00	0.068	0.117
12.40	0.067	0.008	15.05	0.068	0.118
12.45	0.068	0.009	15.10	0.068	0.119
12.50	0.068	0.010	15.15	0.068	0.120
12.55	0.068	0.013	15.20	0.068	0.121
12.60	0.068	0.015	15.25	0.068	0.122
12.65	0.068	0.018	15.30	0.068	0.123
12.70	0.068	0.021	15.35	0.068	0.124
12.75	0.068	0.023	15.40	0.068	0.125
12.80	0.068	0.026	15.45	0.068	0.126
12.85	0.068	0.028	15.50	0.068	0.128
12.90	0.068	0.031	15.55	0.068	0.128
12.95	0.068	0.034	15.60	0.068	0.128
13.00	0.068	0.036	15.65	0.068	0.128
13.05	0.068	0.039	15.70	0.068	0.128
13.10	0.068	0.041	15.75	0.068	0.128
13.15	0.068	0.044	15.80	0.068	0.128
13.20	0.068	0.046	15.85	0.068	0.128
13.25	0.068	0.049	15.90	0.068	0.128
13.30	0.068	0.051			
13.35	0.068	0.054			
13.40	0.068	0.056			
13.45	0.068	0.058			
13.50	0.068	0.061			
13.55	0.068	0.063			
13.60	0.068	0.066			
13.65	0.068	0.068			
13.70	0.068	0.070			
13.75	0.068	0.072			
13.80	0.068	0.075			
13.85	0.068	0.077			
13.90	0.068	0.079			
13.95	0.068	0.081			
14.00	0.068	0.084			
14.05	0.068	0.086			
14.10	0.068	0.088			
14.15	0.068	0.090			
14.20	0.068	0.092			
14.25	0.068	0.094			
14.30	0.068	0.096			
14.35	0.068	0.098			
14.40	0.068	0.100			
14.45	0.068	0.102			
14.50	0.068	0.103			
14.55	0.068	0.105			
14.60	0.068	0.107			

Summary for Pond INF #2: In Front Parking

Inflow Area = 0.571 ac, 71.63% Impervious, Inflow Depth > 2.31" for 2-YR event
 Inflow = 1.58 cfs @ 12.07 hrs, Volume= 0.110 af
 Outflow = 0.92 cfs @ 12.17 hrs, Volume= 0.073 af, Atten= 42%, Lag= 6.1 min
 Discarded = 0.01 cfs @ 8.31 hrs, Volume= 0.018 af
 Primary = 0.91 cfs @ 12.17 hrs, Volume= 0.055 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 12.49' @ 12.17 hrs Surf.Area= 0.048 ac Storage= 0.041 af

Plug-Flow detention time= 158.1 min calculated for 0.073 af (66% of inflow)
 Center-of-Mass det. time= 61.1 min (861.5 - 800.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	10.87'	0.023 af	24.83'W x 74.40'L x 2.33'H Field A 0.099 af Overall - 0.024 af Embedded = 0.075 af x 30.0% Voids
#2A	11.37'	0.024 af	ADS_StormTech SC-310 +Cap x 70 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 7 Rows of 10 Chambers
#3B	10.87'	0.003 af	8.17'W x 31.68'L x 2.33'H Field B 0.014 af Overall - 0.003 af Embedded = 0.011 af x 30.0% Voids
#4B	11.37'	0.003 af	ADS_StormTech SC-310 +Cap x 8 Inside #3 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 2 Rows of 4 Chambers
		0.052 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.87'	0.270 in/hr Exfiltration over Surface area
#2	Primary	11.20'	12.0" Round Culvert L= 7.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 11.20' / 11.10' S= 0.0143 1/1' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 2	12.30'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 8.31 hrs HW=10.89' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=0.90 cfs @ 12.17 hrs HW=12.49' (Free Discharge)
 ↑2=Culvert (Passes 0.90 cfs of 2.65 cfs potential flow)
 ↑3=Broad-Crested Rectangular Weir (Weir Controls 0.90 cfs @ 1.21 fps)

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Stage-Area-Storage for Pond INF #2: In Front Parking

Elevation (feet)	Surface (acres)	Storage (acre-feet)
10.87	0.048	0.000
10.92	0.048	0.001
10.97	0.048	0.001
11.02	0.048	0.002
11.07	0.048	0.003
11.12	0.048	0.004
11.17	0.048	0.004
11.22	0.048	0.005
11.27	0.048	0.006
11.32	0.048	0.007
11.37	0.048	0.007
11.42	0.048	0.009
11.47	0.048	0.011
11.52	0.048	0.013
11.57	0.048	0.014
11.62	0.048	0.016
11.67	0.048	0.018
11.72	0.048	0.020
11.77	0.048	0.021
11.82	0.048	0.023
11.87	0.048	0.025
11.92	0.048	0.026
11.97	0.048	0.028
12.02	0.048	0.029
12.07	0.048	0.031
12.12	0.048	0.032
12.17	0.048	0.034
12.22	0.048	0.035
12.27	0.048	0.036
12.32	0.048	0.038
12.37	0.048	0.039
12.42	0.048	0.040
12.47	0.048	0.041
12.52	0.048	0.042
12.57	0.048	0.043
12.62	0.048	0.044
12.67	0.048	0.045
12.72	0.048	0.045
12.77	0.048	0.046
12.82	0.048	0.047
12.87	0.048	0.047
12.92	0.048	0.048
12.97	0.048	0.049
13.02	0.048	0.050
13.07	0.048	0.050
13.12	0.048	0.051
13.17	0.048	0.052

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Summary for Pond INF #3: South of Building

Inflow Area = 3.439 ac, 96.48% Impervious, Inflow Depth > 2.94" for 2-YR event
 Inflow = 11.12 cfs @ 12.07 hrs, Volume= 0.843 af
 Outflow = 11.52 cfs @ 12.07 hrs, Volume= 0.569 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 11.98 hrs, Volume= 0.071 af
 Primary = 11.48 cfs @ 12.07 hrs, Volume= 0.498 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 14.09' @ 12.07 hrs Surf.Area= 0.151 ac Storage= 0.292 af

Plug-Flow detention time= 170.1 min calculated for 0.569 af (68% of inflow)
 Center-of-Mass det. time= 73.5 min (834.0 - 760.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.00'	0.101 af	25.25'W x 259.94'L x 3.50'H Field A 0.527 af Overall - 0.190 af Embedded = 0.338 af x 30.0% Voids
#2A	9.50'	0.190 af	ADS_StormTech SC-740 +Cap x 180 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 5 Rows of 36 Chambers
#3	12.20'	0.002 af	5.00'D x 3.50'H DMH
		0.293 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	12.00'	24.0" Round Culvert L= 10.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 12.00' / 11.95' S= 0.0050 ' / S= 0.0050 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf

Discarded OutFlow Max=0.04 cfs @ 11.98 hrs HW=12.25' (Free Discharge)
 ↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=11.42 cfs @ 12.07 hrs HW=14.08' (Free Discharge)
 ↑**2=Culvert** (Barrel Controls 11.42 cfs @ 4.34 fps)

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Stage-Area-Storage for Pond INF #3: South of Building

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
9.00	0.151	0.000	14.30	0.151	0.292
9.10	0.151	0.005	14.40	0.151	0.292
9.20	0.151	0.009	14.50	0.151	0.292
9.30	0.151	0.014	14.60	0.151	0.292
9.40	0.151	0.018	14.70	0.151	0.292
9.50	0.151	0.023	14.80	0.151	0.292
9.60	0.151	0.035	14.90	0.151	0.292
9.70	0.151	0.047	15.00	0.151	0.292
9.80	0.151	0.059	15.10	0.151	0.292
9.90	0.151	0.071	15.20	0.151	0.292
10.00	0.151	0.083	15.30	0.151	0.292
10.10	0.151	0.094	15.40	0.151	0.293
10.20	0.151	0.106	15.50	0.151	0.293
10.30	0.151	0.117	15.60	0.151	0.293
10.40	0.151	0.129	15.70	0.151	0.293
10.50	0.151	0.140			
10.60	0.151	0.151			
10.70	0.151	0.161			
10.80	0.151	0.172			
10.90	0.151	0.182			
11.00	0.151	0.192			
11.10	0.151	0.202			
11.20	0.151	0.212			
11.30	0.151	0.221			
11.40	0.151	0.229			
11.50	0.151	0.238			
11.60	0.151	0.245			
11.70	0.151	0.252			
11.80	0.151	0.258			
11.90	0.151	0.264			
12.00	0.151	0.268			
12.10	0.151	0.273			
12.20	0.151	0.278			
12.30	0.151	0.282			
12.40	0.151	0.287			
12.50	0.151	0.291			
12.60	0.151	0.291			
12.70	0.151	0.291			
12.80	0.151	0.291			
12.90	0.151	0.291			
13.00	0.151	0.291			
13.10	0.151	0.291			
13.20	0.151	0.292			
13.30	0.151	0.292			
13.40	0.151	0.292			
13.50	0.151	0.292			
13.60	0.151	0.292			
13.70	0.151	0.292			
13.80	0.151	0.292			
13.90	0.151	0.292			
14.00	0.151	0.292			
14.10	0.151	0.292			
14.20	0.151	0.292			

Summary for Pond INF #4: In Main Parking Area

Inflow Area = 5.705 ac, 97.88% Impervious, Inflow Depth > 2.25" for 2-YR event
 Inflow = 18.91 cfs @ 12.07 hrs, Volume= 1.069 af
 Outflow = 18.65 cfs @ 12.08 hrs, Volume= 0.868 af, Atten= 1%, Lag= 0.4 min
 Discarded = 0.02 cfs @ 9.22 hrs, Volume= 0.032 af
 Primary = 18.63 cfs @ 12.08 hrs, Volume= 0.835 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.25' @ 12.08 hrs Surf.Area= 0.066 ac Storage= 0.202 af

Plug-Flow detention time= 113.7 min calculated for 0.867 af (81% of inflow)
 Center-of-Mass det. time= 42.3 min (835.6 - 793.3)

Volume	Invert	Avail.Storage	Storage Description
#1A	10.25'	0.070 af	37.08'W x 77.40'L x 5.50'H Field A 0.362 af Overall - 0.130 af Embedded = 0.233 af x 30.0% Voids
#2A	11.00'	0.130 af	ADS_StormTech MC-3500 d +Cap x 50 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 5 Rows of 10 Chambers Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf
#3	11.63'	0.003 af	5.00'D x 6.97'H DMH
		0.203 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.25'	0.270 in/hr Exfiltration over Surface area
#2	Primary	11.50'	24.0" Round Culvert L= 98.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 11.50' / 11.00' S= 0.0051 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 2	16.00'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 9.22 hrs HW=11.63' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=18.50 cfs @ 12.08 hrs HW=17.25' (Free Discharge)

↑**2=Culvert** (Passes 18.50 cfs of 26.02 cfs potential flow)

↑**3=Broad-Crested Rectangular Weir** (Weir Controls 18.50 cfs @ 3.71 fps)

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Stage-Area-Storage for Pond INF #4: In Main Parking Area

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
10.25	0.066	0.000	15.55	0.066	0.197
10.35	0.066	0.002	15.65	0.066	0.199
10.45	0.066	0.004	15.75	0.066	0.201
10.55	0.066	0.006	15.85	0.066	0.201
10.65	0.066	0.008	15.95	0.066	0.201
10.75	0.066	0.010	16.05	0.066	0.201
10.85	0.066	0.012	16.15	0.066	0.201
10.95	0.066	0.014	16.25	0.066	0.202
11.05	0.066	0.018	16.35	0.066	0.202
11.15	0.066	0.023	16.45	0.066	0.202
11.25	0.066	0.028	16.55	0.066	0.202
11.35	0.066	0.034	16.65	0.066	0.202
11.45	0.066	0.039	16.75	0.066	0.202
11.55	0.066	0.044	16.85	0.066	0.202
11.65	0.066	0.050	16.95	0.066	0.202
11.75	0.066	0.055	17.05	0.066	0.202
11.85	0.066	0.060	17.15	0.066	0.202
11.95	0.066	0.066	17.25	0.066	0.202
12.05	0.066	0.071	17.35	0.066	0.202
12.15	0.066	0.076	17.45	0.066	0.202
12.25	0.066	0.081	17.55	0.066	0.202
12.35	0.066	0.086	17.65	0.066	0.202
12.45	0.066	0.091	17.75	0.066	0.202
12.55	0.066	0.096	17.85	0.066	0.202
12.65	0.066	0.101	17.95	0.066	0.202
12.75	0.066	0.106	18.05	0.066	0.202
12.85	0.066	0.111	18.15	0.066	0.202
12.95	0.066	0.116	18.25	0.066	0.202
13.05	0.066	0.120	18.35	0.066	0.202
13.15	0.066	0.125	18.45	0.066	0.203
13.25	0.066	0.129	18.55	0.066	0.203
13.35	0.066	0.134			
13.45	0.066	0.138			
13.55	0.066	0.142			
13.65	0.066	0.147			
13.75	0.066	0.151			
13.85	0.066	0.155			
13.95	0.066	0.158			
14.05	0.066	0.162			
14.15	0.066	0.166			
14.25	0.066	0.169			
14.35	0.066	0.172			
14.45	0.066	0.174			
14.55	0.066	0.177			
14.65	0.066	0.179			
14.75	0.066	0.181			
14.85	0.066	0.183			
14.95	0.066	0.185			
15.05	0.066	0.187			
15.15	0.066	0.189			
15.25	0.066	0.191			
15.35	0.066	0.193			
15.45	0.066	0.195			

Summary for Pond INF #5: In Main Parking Area

Inflow Area = 1.764 ac, 80.84% Impervious, Inflow Depth > 2.50" for 2-YR event
 Inflow = 5.19 cfs @ 12.07 hrs, Volume= 0.368 af
 Outflow = 5.39 cfs @ 12.09 hrs, Volume= 0.247 af, Atten= 0%, Lag= 1.2 min
 Discarded = 0.02 cfs @ 7.44 hrs, Volume= 0.027 af
 Primary = 5.37 cfs @ 12.09 hrs, Volume= 0.220 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 15.33' @ 12.09 hrs Surf.Area= 0.068 ac Storage= 0.131 af

Plug-Flow detention time= 158.8 min calculated for 0.247 af (67% of inflow)
 Center-of-Mass det. time= 63.6 min (854.2 - 790.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	11.75'	0.046 af	49.00'W x 60.58'L x 3.50'H Field A 0.238 af Overall - 0.084 af Embedded = 0.154 af x 30.0% Voids
#2A	12.25'	0.084 af	ADS_StormTech SC-740 +Cap x 80 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 10 Rows of 8 Chambers
#3	18.55'	0.002 af	4.00'D x 8.00'H DMH
		0.133 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.75'	0.270 in/hr Exfiltration over Surface area
#2	Primary	12.20'	18.0" Round Culvert L= 50.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 12.20' / 11.20' S= 0.0200 ' S= 0.0200 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#3	Device 2	14.75'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 7.44 hrs HW=11.90' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=5.23 cfs @ 12.09 hrs HW=15.32' (Free Discharge)
 ↑2=Culvert (Passes 5.23 cfs of 10.34 cfs potential flow)
 ↑3=Broad-Crested Rectangular Weir (Weir Controls 5.23 cfs @ 2.30 fps)

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Stage-Area-Storage for Pond INF #5: In Main Parking Area

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
11.75	0.068	0.000	19.70	0.068	0.131
11.90	0.068	0.003	19.85	0.068	0.131
12.05	0.068	0.006	20.00	0.068	0.131
12.20	0.068	0.009	20.15	0.068	0.131
12.35	0.068	0.016	20.30	0.068	0.131
12.50	0.068	0.024	20.45	0.068	0.131
12.65	0.068	0.032	20.60	0.068	0.131
12.80	0.068	0.040	20.75	0.068	0.131
12.95	0.068	0.048	20.90	0.068	0.131
13.10	0.068	0.055	21.05	0.068	0.131
13.25	0.068	0.063	21.20	0.068	0.131
13.40	0.068	0.070	21.35	0.068	0.131
13.55	0.068	0.077	21.50	0.068	0.131
13.70	0.068	0.084	21.65	0.068	0.132
13.85	0.068	0.091	21.80	0.068	0.132
14.00	0.068	0.097	21.95	0.068	0.132
14.15	0.068	0.103	22.10	0.068	0.132
14.30	0.068	0.108	22.25	0.068	0.132
14.45	0.068	0.113	22.40	0.068	0.132
14.60	0.068	0.117	22.55	0.068	0.132
14.75	0.068	0.120	22.70	0.068	0.132
14.90	0.068	0.123	22.85	0.068	0.132
15.05	0.068	0.127	23.00	0.068	0.132
15.20	0.068	0.130	23.15	0.068	0.132
15.35	0.068	0.131	23.30	0.068	0.132
15.50	0.068	0.131	23.45	0.068	0.132
15.65	0.068	0.131	23.60	0.068	0.132
15.80	0.068	0.131	23.75	0.068	0.132
15.95	0.068	0.131	23.90	0.068	0.132
16.10	0.068	0.131	24.05	0.068	0.132
16.25	0.068	0.131	24.20	0.068	0.132
16.40	0.068	0.131	24.35	0.068	0.132
16.55	0.068	0.131	24.50	0.068	0.132
16.70	0.068	0.131	24.65	0.068	0.132
16.85	0.068	0.131	24.80	0.068	0.132
17.00	0.068	0.131	24.95	0.068	0.132
17.15	0.068	0.131	25.10	0.068	0.132
17.30	0.068	0.131	25.25	0.068	0.133
17.45	0.068	0.131	25.40	0.068	0.133
17.60	0.068	0.131	25.55	0.068	0.133
17.75	0.068	0.131	25.70	0.068	0.133
17.90	0.068	0.131	25.85	0.068	0.133
18.05	0.068	0.131	26.00	0.068	0.133
18.20	0.068	0.131	26.15	0.068	0.133
18.35	0.068	0.131	26.30	0.068	0.133
18.50	0.068	0.131	26.45	0.068	0.133
18.65	0.068	0.131			
18.80	0.068	0.131			
18.95	0.068	0.131			
19.10	0.068	0.131			
19.25	0.068	0.131			
19.40	0.068	0.131			
19.55	0.068	0.131			

Summary for Pond INF #6: In Main Parking Area

Inflow Area = 1.754 ac, 81.01% Impervious, Inflow Depth > 2.50" for 2-YR event
 Inflow = 5.16 cfs @ 12.07 hrs, Volume= 0.366 af
 Outflow = 3.92 cfs @ 12.14 hrs, Volume= 0.233 af, Atten= 24%, Lag= 3.8 min
 Discarded = 0.02 cfs @ 12.05 hrs, Volume= 0.030 af
 Primary = 3.90 cfs @ 12.14 hrs, Volume= 0.202 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 15.47' @ 12.14 hrs Surf.Area= 0.075 ac Storage= 0.143 af

Plug-Flow detention time= 168.3 min calculated for 0.233 af (64% of inflow)
 Center-of-Mass det. time= 69.5 min (860.1 - 790.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	12.00'	0.051 af	53.75'W x 60.58'L x 3.50'H Field A 0.262 af Overall - 0.093 af Embedded = 0.169 af x 30.0% Voids
#2A	12.50'	0.093 af	ADS_StormTech SC-740 +Cap x 88 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 11 Rows of 8 Chambers
#3	14.55'	0.002 af	5.00'D x 3.85'H Vertical Cone/Cylinder
		0.145 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	12.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	12.50'	18.0" Round Culvert L= 11.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 12.50' / 12.35' S= 0.0136 ' /' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#3	Device 2	15.00'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 12.05 hrs HW=14.64' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=3.88 cfs @ 12.14 hrs HW=15.47' (Free Discharge)
 ↑2=Culvert (Passes 3.88 cfs of 10.02 cfs potential flow)
 ↑3=Broad-Crested Rectangular Weir (Weir Controls 3.88 cfs @ 2.05 fps)

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Stage-Area-Storage for Pond INF #6: In Main Parking Area

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
12.00	0.075	0.000	17.30	0.075	0.145
12.10	0.075	0.002	17.40	0.075	0.145
12.20	0.075	0.004	17.50	0.075	0.145
12.30	0.075	0.007	17.60	0.075	0.145
12.40	0.075	0.009	17.70	0.075	0.145
12.50	0.075	0.011	17.80	0.075	0.145
12.60	0.075	0.017	17.90	0.075	0.145
12.70	0.075	0.023	18.00	0.075	0.145
12.80	0.075	0.029	18.10	0.075	0.145
12.90	0.075	0.035	18.20	0.075	0.145
13.00	0.075	0.041	18.30	0.075	0.145
13.10	0.075	0.047	18.40	0.075	0.145
13.20	0.075	0.052			
13.30	0.075	0.058			
13.40	0.075	0.063			
13.50	0.075	0.069			
13.60	0.075	0.074			
13.70	0.075	0.079			
13.80	0.075	0.085			
13.90	0.075	0.090			
14.00	0.075	0.095			
14.10	0.075	0.099			
14.20	0.075	0.104			
14.30	0.075	0.109			
14.40	0.075	0.113			
14.50	0.075	0.117			
14.60	0.075	0.121			
14.70	0.075	0.124			
14.80	0.075	0.127			
14.90	0.075	0.130			
15.00	0.075	0.132			
15.10	0.075	0.135			
15.20	0.075	0.137			
15.30	0.075	0.139			
15.40	0.075	0.142			
15.50	0.075	0.144			
15.60	0.075	0.144			
15.70	0.075	0.144			
15.80	0.075	0.144			
15.90	0.075	0.144			
16.00	0.075	0.144			
16.10	0.075	0.144			
16.20	0.075	0.144			
16.30	0.075	0.144			
16.40	0.075	0.144			
16.50	0.075	0.144			
16.60	0.075	0.144			
16.70	0.075	0.144			
16.80	0.075	0.144			
16.90	0.075	0.145			
17.00	0.075	0.145			
17.10	0.075	0.145			
17.20	0.075	0.145			

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Summary for Pond INF#7: West of parking deck

Inflow Area = 1.444 ac, 100.00% Impervious, Inflow Depth > 3.03" for 2-YR event
 Inflow = 4.74 cfs @ 12.07 hrs, Volume= 0.364 af
 Outflow = 5.01 cfs @ 12.07 hrs, Volume= 0.247 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 2.80 hrs, Volume= 0.033 af
 Primary = 4.99 cfs @ 12.07 hrs, Volume= 0.214 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 14.65' @ 12.07 hrs Surf.Area= 2,930 sf Storage= 5,521 cf

Plug-Flow detention time= 163.7 min calculated for 0.247 af (68% of inflow)
 Center-of-Mass det. time= 67.4 min (822.1 - 754.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	11.10'	1,206 cf	15.75'W x 110.42'L x 3.50'H Field A 6,087 cf Overall - 2,067 cf Embedded = 4,019 cf x 30.0% Voids
#2A	11.60'	2,067 cf	ADS_StormTech SC-740 +Cap x 45 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Rows of 15 Chambers
#3	11.00'	63 cf	4.00'D x 5.00'H Vertical Cone/Cylinder
#4B	11.10'	824 cf	15.75'W x 74.82'L x 3.50'H Field B 4,124 cf Overall - 1,378 cf Embedded = 2,746 cf x 30.0% Voids
#5B	11.60'	1,378 cf	ADS_StormTech SC-740 +Cap x 30 Inside #4 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Rows of 10 Chambers
		5,538 cf	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	10.80'	18.0" Round Culvert L= 166.0' Ke= 0.600 Inlet / Outlet Invert= 10.80' / 9.10' S= 0.0102 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	14.10'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	11.00'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.02 cfs @ 2.80 hrs HW=11.10' (Free Discharge)
 ↳ **3=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=4.98 cfs @ 12.07 hrs HW=14.65' (Free Discharge)
 ↳ **1=Culvert** (Passes 4.98 cfs of 14.05 cfs potential flow)
 ↳ **2=Broad-Crested Rectangular Weir** (Weir Controls 4.98 cfs @ 2.26 fps)

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Stage-Area-Storage for Pond INF#7: West of parking deck

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
11.00	13	0	13.65	2,930	4,557
11.05	13	1	13.70	2,930	4,629
11.10	2,930	1	13.75	2,930	4,699
11.15	2,930	46	13.80	2,930	4,764
11.20	2,930	90	13.85	2,930	4,825
11.25	2,930	134	13.90	2,930	4,882
11.30	2,930	179	13.95	2,930	4,934
11.35	2,930	223	14.00	2,930	4,983
11.40	2,930	268	14.05	2,930	5,031
11.45	2,930	312	14.10	2,930	5,076
11.50	2,930	356	14.15	2,930	5,121
11.55	2,930	401	14.20	2,930	5,165
11.60	2,930	445	14.25	2,930	5,210
11.65	2,930	559	14.30	2,930	5,254
11.70	2,930	673	14.35	2,930	5,298
11.75	2,930	786	14.40	2,930	5,343
11.80	2,930	900	14.45	2,930	5,387
11.85	2,930	1,013	14.50	2,930	5,432
11.90	2,930	1,125	14.55	2,930	5,476
11.95	2,930	1,237	14.60	2,930	5,520
12.00	2,930	1,349	14.65	2,930	5,521
12.05	2,930	1,460	14.70	2,930	5,522
12.10	2,930	1,570	14.75	2,930	5,522
12.15	2,930	1,680	14.80	2,930	5,523
12.20	2,930	1,789	14.85	2,930	5,524
12.25	2,930	1,898	14.90	2,930	5,524
12.30	2,930	2,006	14.95	2,930	5,525
12.35	2,930	2,113	15.00	2,930	5,525
12.40	2,930	2,220	15.05	2,930	5,526
12.45	2,930	2,326	15.10	2,930	5,527
12.50	2,930	2,432	15.15	2,930	5,527
12.55	2,930	2,536	15.20	2,930	5,528
12.60	2,930	2,640	15.25	2,930	5,529
12.65	2,930	2,743	15.30	2,930	5,529
12.70	2,930	2,845	15.35	2,930	5,530
12.75	2,930	2,946	15.40	2,930	5,530
12.80	2,930	3,047	15.45	2,930	5,531
12.85	2,930	3,146	15.50	2,930	5,532
12.90	2,930	3,244	15.55	2,930	5,532
12.95	2,930	3,341	15.60	2,930	5,533
13.00	2,930	3,438	15.65	2,930	5,534
13.05	2,930	3,533	15.70	2,930	5,534
13.10	2,930	3,626	15.75	2,930	5,535
13.15	2,930	3,719	15.80	2,930	5,535
13.20	2,930	3,811	15.85	2,930	5,536
13.25	2,930	3,900	15.90	2,930	5,537
13.30	2,930	3,989	15.95	2,930	5,537
13.35	2,930	4,075	16.00	2,930	5,538
13.40	2,930	4,160			
13.45	2,930	4,243			
13.50	2,930	4,325			
13.55	2,930	4,404			
13.60	2,930	4,482			

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Summary for Link 1L: WILLIAM T. MORRISSEY BOULEVARD

Inflow Area = 1.433 ac, 79.34% Impervious, Inflow Depth > 2.02" for 2-YR event
Inflow = 2.66 cfs @ 12.13 hrs, Volume= 0.241 af
Primary = 2.66 cfs @ 12.13 hrs, Volume= 0.241 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

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Type III 24-hr 2-YR Rainfall=3.26"

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Summary for Link 2L: PROJECT SITE

Inflow Area = 15.169 ac, 90.01% Impervious, Inflow Depth > 1.85" for 2-YR event

Inflow = 41.71 cfs @ 12.09 hrs, Volume= 2.338 af

Primary = 41.71 cfs @ 12.09 hrs, Volume= 2.338 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

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Type III 24-hr 10-YR Rainfall=5.14"

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Summary for Subcatchment P1A: Northerly Portion of Front Parking

Runoff = 2.73 cfs @ 12.07 hrs, Volume= 0.196 af, Depth> 4.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
0.409	98	Paved parking, HSG C
0.162	74	>75% Grass cover, Good, HSG C
0.571	91	Weighted Average
0.162		28.37% Pervious Area
0.409		71.63% Impervious Area

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

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Summary for Subcatchment P1B: Southerly Portion of Front Parking

Runoff = 4.32 cfs @ 12.07 hrs, Volume= 0.319 af, Depth> 4.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
0.728	98	Paved parking, HSG C
0.131	74	>75% Grass cover, Good, HSG C
0.003	96	Gravel surface, HSG C
0.862	94	Weighted Average
0.134		15.55% Pervious Area
0.728		84.45% Impervious Area

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

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Summary for Subcatchment P1C: Parking Near Sourtherly Entrance

Runoff = 4.55 cfs @ 12.07 hrs, Volume= 0.340 af, Depth> 4.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
0.775	98	Paved parking, HSG C
0.109	74	>75% Grass cover, Good, HSG C
0.012	96	Gravel surface, HSG C
0.896	95	Weighted Average
0.121		13.50% Pervious Area
0.775		86.50% Impervious Area

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

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Type III 24-hr 10-YR Rainfall=5.14"

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Summary for Subcatchment P2A: Northerly Roof Area

Runoff = 5.20 cfs @ 12.07 hrs, Volume= 0.407 af, Depth> 4.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
0.997	98	Roofs, HSG C
0.997		100.00% Impervious Area

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

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Type III 24-hr 10-YR Rainfall=5.14"

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Summary for Subcatchment P2B: Southeasterly Roof Area

Runoff = 13.25 cfs @ 12.07 hrs, Volume= 1.038 af, Depth> 4.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
2.543	98	Roofs, HSG C
2.543		100.00% Impervious Area

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

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Summary for Subcatchment P2C: Central Roof Area

Runoff = 11.81 cfs @ 12.07 hrs, Volume= 0.925 af, Depth> 4.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
* 2.266	98	Roof
2.266		100.00% Impervious Area

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

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Type III 24-hr 10-YR Rainfall=5.14"

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Summary for Subcatchment P2D: Parking Deck

Runoff = 7.52 cfs @ 12.07 hrs, Volume= 0.590 af, Depth> 4.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
1.444	98	Roofs, HSG C
1.444		100.00% Impervious Area

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

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Type III 24-hr 10-YR Rainfall=5.14"

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Summary for Subcatchment P3: Northerly Courtyard

Runoff = 2.06 cfs @ 12.07 hrs, Volume= 0.151 af, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

	Area (sf)	CN	Description
*	4,131	74	Landscaped Areas
*	14,060	98	Pavement
	18,191	93	Weighted Average
	4,131		22.71% Pervious Area
	14,060		77.29% Impervious Area

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

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Type III 24-hr 10-YR Rainfall=5.14"

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Summary for Subcatchment P3A: At Westerly Entry and Parking Ramp

Runoff = 15.25 cfs @ 12.07 hrs, Volume= 1.114 af, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
2.458	98	Paved parking, HSG C
0.611	74	>75% Grass cover, Good, HSG C
0.018	96	Gravel surface, HSG C
3.087	93	Weighted Average
0.629		20.38% Pervious Area
2.458		79.62% Impervious Area

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

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Summary for Subcatchment P3B: Easterly Portion of Main Parking

Runoff = 8.72 cfs @ 12.07 hrs, Volume= 0.637 af, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
1.426	98	Paved parking, HSG C
0.338	74	>75% Grass cover, Good, HSG C
1.764	93	Weighted Average
0.338		19.16% Pervious Area
1.426		80.84% Impervious Area

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

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Type III 24-hr 10-YR Rainfall=5.14"

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Summary for Subcatchment P4: Southwesterly Portion of Main Parking

Runoff = 8.67 cfs @ 12.07 hrs, Volume= 0.633 af, Depth> 4.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-YR Rainfall=5.14"

Area (ac)	CN	Description
1.421	98	Paved parking, HSG C
0.333	74	>75% Grass cover, Good, HSG C
1.754	93	Weighted Average
0.333		18.99% Pervious Area
1.421		81.01% Impervious Area

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

Summary for Pond INF #1: In Northerly Courtyard

Inflow Area = 0.997 ac, 100.00% Impervious, Inflow Depth > 4.90" for 10-YR event
 Inflow = 5.20 cfs @ 12.07 hrs, Volume= 0.407 af
 Outflow = 3.95 cfs @ 12.13 hrs, Volume= 0.323 af, Atten= 24%, Lag= 3.7 min
 Discarded = 0.02 cfs @ 5.80 hrs, Volume= 0.034 af
 Primary = 3.93 cfs @ 12.13 hrs, Volume= 0.289 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 14.69' @ 12.13 hrs Surf.Area= 0.068 ac Storage= 0.110 af

Plug-Flow detention time= 138.2 min calculated for 0.323 af (79% of inflow)
 Center-of-Mass det. time= 59.8 min (806.0 - 746.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	12.00'	0.029 af	39.50'W x 46.34'L x 3.50'H Field A 0.147 af Overall - 0.051 af Embedded = 0.096 af x 30.0% Voids
#2A	12.50'	0.051 af	ADS_StormTech SC-740 +Cap x 48 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 8 Rows of 6 Chambers
#3B	12.00'	0.018 af	44.25'W x 24.98'L x 3.50'H Field B 0.089 af Overall - 0.028 af Embedded = 0.060 af x 30.0% Voids
#4B	12.50'	0.028 af	ADS_StormTech SC-740 +Cap x 27 Inside #3 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 9 Rows of 3 Chambers
#5	12.45'	0.002 af	5.00'D x 3.45'H DMH
		0.128 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	12.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	12.45'	12.0" Round Culvert L= 10.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 12.45' / 12.40' S= 0.0050 1' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 2	14.00'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 5.80 hrs HW=12.45' (Free Discharge)
 ↳ **1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=3.93 cfs @ 12.13 hrs HW=14.69' (Free Discharge)
 ↳ **2=Culvert** (Inlet Controls 3.93 cfs @ 5.01 fps)
 ↳ **3=Broad-Crested Rectangular Weir** (Passes 3.93 cfs of 7.21 cfs potential flow)

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Stage-Area-Storage for Pond INF #1: In Northerly Courtyard

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
12.00	0.067	0.000	14.65	0.068	0.108
12.05	0.067	0.001	14.70	0.068	0.110
12.10	0.067	0.002	14.75	0.068	0.111
12.15	0.067	0.003	14.80	0.068	0.113
12.20	0.067	0.004	14.85	0.068	0.114
12.25	0.067	0.005	14.90	0.068	0.115
12.30	0.067	0.006	14.95	0.068	0.116
12.35	0.067	0.007	15.00	0.068	0.117
12.40	0.067	0.008	15.05	0.068	0.118
12.45	0.068	0.009	15.10	0.068	0.119
12.50	0.068	0.010	15.15	0.068	0.120
12.55	0.068	0.013	15.20	0.068	0.121
12.60	0.068	0.015	15.25	0.068	0.122
12.65	0.068	0.018	15.30	0.068	0.123
12.70	0.068	0.021	15.35	0.068	0.124
12.75	0.068	0.023	15.40	0.068	0.125
12.80	0.068	0.026	15.45	0.068	0.126
12.85	0.068	0.028	15.50	0.068	0.128
12.90	0.068	0.031	15.55	0.068	0.128
12.95	0.068	0.034	15.60	0.068	0.128
13.00	0.068	0.036	15.65	0.068	0.128
13.05	0.068	0.039	15.70	0.068	0.128
13.10	0.068	0.041	15.75	0.068	0.128
13.15	0.068	0.044	15.80	0.068	0.128
13.20	0.068	0.046	15.85	0.068	0.128
13.25	0.068	0.049	15.90	0.068	0.128
13.30	0.068	0.051			
13.35	0.068	0.054			
13.40	0.068	0.056			
13.45	0.068	0.058			
13.50	0.068	0.061			
13.55	0.068	0.063			
13.60	0.068	0.066			
13.65	0.068	0.068			
13.70	0.068	0.070			
13.75	0.068	0.072			
13.80	0.068	0.075			
13.85	0.068	0.077			
13.90	0.068	0.079			
13.95	0.068	0.081			
14.00	0.068	0.084			
14.05	0.068	0.086			
14.10	0.068	0.088			
14.15	0.068	0.090			
14.20	0.068	0.092			
14.25	0.068	0.094			
14.30	0.068	0.096			
14.35	0.068	0.098			
14.40	0.068	0.100			
14.45	0.068	0.102			
14.50	0.068	0.103			
14.55	0.068	0.105			
14.60	0.068	0.107			

Summary for Pond INF #2: In Front Parking

Inflow Area = 0.571 ac, 71.63% Impervious, Inflow Depth > 4.12" for 10-YR event
 Inflow = 2.73 cfs @ 12.07 hrs, Volume= 0.196 af
 Outflow = 2.66 cfs @ 12.09 hrs, Volume= 0.158 af, Atten= 2%, Lag= 1.0 min
 Discarded = 0.01 cfs @ 6.37 hrs, Volume= 0.020 af
 Primary = 2.65 cfs @ 12.09 hrs, Volume= 0.138 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 12.67' @ 12.09 hrs Surf.Area= 0.048 ac Storage= 0.045 af

Plug-Flow detention time= 112.9 min calculated for 0.158 af (81% of inflow)
 Center-of-Mass det. time= 40.0 min (824.5 - 784.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	10.87'	0.023 af	24.83'W x 74.40'L x 2.33'H Field A 0.099 af Overall - 0.024 af Embedded = 0.075 af x 30.0% Voids
#2A	11.37'	0.024 af	ADS_StormTech SC-310 +Cap x 70 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 7 Rows of 10 Chambers
#3B	10.87'	0.003 af	8.17'W x 31.68'L x 2.33'H Field B 0.014 af Overall - 0.003 af Embedded = 0.011 af x 30.0% Voids
#4B	11.37'	0.003 af	ADS_StormTech SC-310 +Cap x 8 Inside #3 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 2 Rows of 4 Chambers
		0.052 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.87'	0.270 in/hr Exfiltration over Surface area
#2	Primary	11.20'	12.0" Round Culvert L= 7.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 11.20' / 11.10' S= 0.0143 1/1' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 2	12.30'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 6.37 hrs HW=10.89' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=2.65 cfs @ 12.09 hrs HW=12.67' (Free Discharge)
 ↑2=Culvert (Passes 2.65 cfs of 2.94 cfs potential flow)
 ↑3=Broad-Crested Rectangular Weir (Weir Controls 2.65 cfs @ 1.77 fps)

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Stage-Area-Storage for Pond INF #2: In Front Parking

Elevation (feet)	Surface (acres)	Storage (acre-feet)
10.87	0.048	0.000
10.92	0.048	0.001
10.97	0.048	0.001
11.02	0.048	0.002
11.07	0.048	0.003
11.12	0.048	0.004
11.17	0.048	0.004
11.22	0.048	0.005
11.27	0.048	0.006
11.32	0.048	0.007
11.37	0.048	0.007
11.42	0.048	0.009
11.47	0.048	0.011
11.52	0.048	0.013
11.57	0.048	0.014
11.62	0.048	0.016
11.67	0.048	0.018
11.72	0.048	0.020
11.77	0.048	0.021
11.82	0.048	0.023
11.87	0.048	0.025
11.92	0.048	0.026
11.97	0.048	0.028
12.02	0.048	0.029
12.07	0.048	0.031
12.12	0.048	0.032
12.17	0.048	0.034
12.22	0.048	0.035
12.27	0.048	0.036
12.32	0.048	0.038
12.37	0.048	0.039
12.42	0.048	0.040
12.47	0.048	0.041
12.52	0.048	0.042
12.57	0.048	0.043
12.62	0.048	0.044
12.67	0.048	0.045
12.72	0.048	0.045
12.77	0.048	0.046
12.82	0.048	0.047
12.87	0.048	0.047
12.92	0.048	0.048
12.97	0.048	0.049
13.02	0.048	0.050
13.07	0.048	0.050
13.12	0.048	0.051
13.17	0.048	0.052

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Summary for Pond INF #3: South of Building

Inflow Area = 3.439 ac, 96.48% Impervious, Inflow Depth > 4.81" for 10-YR event
 Inflow = 17.80 cfs @ 12.07 hrs, Volume= 1.378 af
 Outflow = 17.79 cfs @ 12.07 hrs, Volume= 1.103 af, Atten= 0%, Lag= 0.1 min
 Discarded = 0.04 cfs @ 11.28 hrs, Volume= 0.075 af
 Primary = 17.75 cfs @ 12.07 hrs, Volume= 1.027 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 15.21' @ 12.07 hrs Surf.Area= 0.151 ac Storage= 0.292 af

Plug-Flow detention time= 136.8 min calculated for 1.103 af (80% of inflow)
 Center-of-Mass det. time= 60.2 min (811.3 - 751.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.00'	0.101 af	25.25'W x 259.94'L x 3.50'H Field A 0.527 af Overall - 0.190 af Embedded = 0.338 af x 30.0% Voids
#2A	9.50'	0.190 af	ADS_StormTech SC-740 +Cap x 180 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 5 Rows of 36 Chambers
#3	12.20'	0.002 af	5.00'D x 3.50'H DMH
		0.293 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	12.00'	24.0" Round Culvert L= 10.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 12.00' / 11.95' S= 0.0050 ' /' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf

Discarded OutFlow Max=0.04 cfs @ 11.28 hrs HW=12.22' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=17.73 cfs @ 12.07 hrs HW=15.20' (Free Discharge)

↑**2=Culvert** (Inlet Controls 17.73 cfs @ 5.64 fps)

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Stage-Area-Storage for Pond INF #3: South of Building

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
9.00	0.151	0.000	14.30	0.151	0.292
9.10	0.151	0.005	14.40	0.151	0.292
9.20	0.151	0.009	14.50	0.151	0.292
9.30	0.151	0.014	14.60	0.151	0.292
9.40	0.151	0.018	14.70	0.151	0.292
9.50	0.151	0.023	14.80	0.151	0.292
9.60	0.151	0.035	14.90	0.151	0.292
9.70	0.151	0.047	15.00	0.151	0.292
9.80	0.151	0.059	15.10	0.151	0.292
9.90	0.151	0.071	15.20	0.151	0.292
10.00	0.151	0.083	15.30	0.151	0.292
10.10	0.151	0.094	15.40	0.151	0.293
10.20	0.151	0.106	15.50	0.151	0.293
10.30	0.151	0.117	15.60	0.151	0.293
10.40	0.151	0.129	15.70	0.151	0.293
10.50	0.151	0.140			
10.60	0.151	0.151			
10.70	0.151	0.161			
10.80	0.151	0.172			
10.90	0.151	0.182			
11.00	0.151	0.192			
11.10	0.151	0.202			
11.20	0.151	0.212			
11.30	0.151	0.221			
11.40	0.151	0.229			
11.50	0.151	0.238			
11.60	0.151	0.245			
11.70	0.151	0.252			
11.80	0.151	0.258			
11.90	0.151	0.264			
12.00	0.151	0.268			
12.10	0.151	0.273			
12.20	0.151	0.278			
12.30	0.151	0.282			
12.40	0.151	0.287			
12.50	0.151	0.291			
12.60	0.151	0.291			
12.70	0.151	0.291			
12.80	0.151	0.291			
12.90	0.151	0.291			
13.00	0.151	0.291			
13.10	0.151	0.291			
13.20	0.151	0.292			
13.30	0.151	0.292			
13.40	0.151	0.292			
13.50	0.151	0.292			
13.60	0.151	0.292			
13.70	0.151	0.292			
13.80	0.151	0.292			
13.90	0.151	0.292			
14.00	0.151	0.292			
14.10	0.151	0.292			
14.20	0.151	0.292			

Summary for Pond INF #4: In Main Parking Area

Inflow Area = 5.705 ac, 97.88% Impervious, Inflow Depth > 4.11" for 10-YR event
 Inflow = 29.56 cfs @ 12.07 hrs, Volume= 1.952 af
 Outflow = 29.54 cfs @ 12.07 hrs, Volume= 1.751 af, Atten= 0%, Lag= 0.1 min
 Discarded = 0.02 cfs @ 7.24 hrs, Volume= 0.033 af
 Primary = 29.52 cfs @ 12.07 hrs, Volume= 1.718 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 18.61' @ 12.07 hrs Surf.Area= 0.066 ac Storage= 0.203 af

Plug-Flow detention time= 78.6 min calculated for 1.750 af (90% of inflow)
 Center-of-Mass det. time= 30.5 min (812.3 - 781.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	10.25'	0.070 af	37.08'W x 77.40'L x 5.50'H Field A 0.362 af Overall - 0.130 af Embedded = 0.233 af x 30.0% Voids
#2A	11.00'	0.130 af	ADS_StormTech MC-3500 d +Cap x 50 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 5 Rows of 10 Chambers Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf
#3	11.63'	0.003 af	5.00'D x 6.97'H DMH
		0.203 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.25'	0.270 in/hr Exfiltration over Surface area
#2	Primary	11.50'	24.0" Round Culvert L= 98.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 11.50' / 11.00' S= 0.0051 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 2	16.00'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 7.24 hrs HW=11.63' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=29.47 cfs @ 12.07 hrs HW=18.59' (Free Discharge)

↑**2=Culvert** (Inlet Controls 29.47 cfs @ 9.38 fps)

↑**3=Broad-Crested Rectangular Weir** (Passes 29.47 cfs of 55.29 cfs potential flow)

Post-135 Morrissey Blvd

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Stage-Area-Storage for Pond INF #4: In Main Parking Area

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
10.25	0.066	0.000	15.55	0.066	0.197
10.35	0.066	0.002	15.65	0.066	0.199
10.45	0.066	0.004	15.75	0.066	0.201
10.55	0.066	0.006	15.85	0.066	0.201
10.65	0.066	0.008	15.95	0.066	0.201
10.75	0.066	0.010	16.05	0.066	0.201
10.85	0.066	0.012	16.15	0.066	0.201
10.95	0.066	0.014	16.25	0.066	0.202
11.05	0.066	0.018	16.35	0.066	0.202
11.15	0.066	0.023	16.45	0.066	0.202
11.25	0.066	0.028	16.55	0.066	0.202
11.35	0.066	0.034	16.65	0.066	0.202
11.45	0.066	0.039	16.75	0.066	0.202
11.55	0.066	0.044	16.85	0.066	0.202
11.65	0.066	0.050	16.95	0.066	0.202
11.75	0.066	0.055	17.05	0.066	0.202
11.85	0.066	0.060	17.15	0.066	0.202
11.95	0.066	0.066	17.25	0.066	0.202
12.05	0.066	0.071	17.35	0.066	0.202
12.15	0.066	0.076	17.45	0.066	0.202
12.25	0.066	0.081	17.55	0.066	0.202
12.35	0.066	0.086	17.65	0.066	0.202
12.45	0.066	0.091	17.75	0.066	0.202
12.55	0.066	0.096	17.85	0.066	0.202
12.65	0.066	0.101	17.95	0.066	0.202
12.75	0.066	0.106	18.05	0.066	0.202
12.85	0.066	0.111	18.15	0.066	0.202
12.95	0.066	0.116	18.25	0.066	0.202
13.05	0.066	0.120	18.35	0.066	0.202
13.15	0.066	0.125	18.45	0.066	0.203
13.25	0.066	0.129	18.55	0.066	0.203
13.35	0.066	0.134			
13.45	0.066	0.138			
13.55	0.066	0.142			
13.65	0.066	0.147			
13.75	0.066	0.151			
13.85	0.066	0.155			
13.95	0.066	0.158			
14.05	0.066	0.162			
14.15	0.066	0.166			
14.25	0.066	0.169			
14.35	0.066	0.172			
14.45	0.066	0.174			
14.55	0.066	0.177			
14.65	0.066	0.179			
14.75	0.066	0.181			
14.85	0.066	0.183			
14.95	0.066	0.185			
15.05	0.066	0.187			
15.15	0.066	0.189			
15.25	0.066	0.191			
15.35	0.066	0.193			
15.45	0.066	0.195			

Summary for Pond INF #5: In Main Parking Area

Inflow Area = 1.764 ac, 80.84% Impervious, Inflow Depth > 4.33" for 10-YR event
 Inflow = 8.72 cfs @ 12.07 hrs, Volume= 0.637 af
 Outflow = 9.14 cfs @ 12.07 hrs, Volume= 0.516 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 5.40 hrs, Volume= 0.030 af
 Primary = 9.12 cfs @ 12.07 hrs, Volume= 0.486 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 15.54' @ 12.07 hrs Surf.Area= 0.068 ac Storage= 0.131 af

Plug-Flow detention time= 118.7 min calculated for 0.516 af (81% of inflow)
 Center-of-Mass det. time= 46.0 min (822.1 - 776.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	11.75'	0.046 af	49.00'W x 60.58'L x 3.50'H Field A 0.238 af Overall - 0.084 af Embedded = 0.154 af x 30.0% Voids
#2A	12.25'	0.084 af	ADS_StormTech SC-740 +Cap x 80 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 10 Rows of 8 Chambers
#3	18.55'	0.002 af	4.00'D x 8.00'H DMH
		0.133 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.75'	0.270 in/hr Exfiltration over Surface area
#2	Primary	12.20'	18.0" Round Culvert L= 50.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 12.20' / 11.20' S= 0.0200 ' /' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#3	Device 2	14.75'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 5.40 hrs HW=11.90' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=9.14 cfs @ 12.07 hrs HW=15.54' (Free Discharge)
 ↑2=Culvert (Passes 9.14 cfs of 10.80 cfs potential flow)
 ↑3=Broad-Crested Rectangular Weir (Weir Controls 9.14 cfs @ 2.91 fps)

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Stage-Area-Storage for Pond INF #5: In Main Parking Area

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
11.75	0.068	0.000	19.70	0.068	0.131
11.90	0.068	0.003	19.85	0.068	0.131
12.05	0.068	0.006	20.00	0.068	0.131
12.20	0.068	0.009	20.15	0.068	0.131
12.35	0.068	0.016	20.30	0.068	0.131
12.50	0.068	0.024	20.45	0.068	0.131
12.65	0.068	0.032	20.60	0.068	0.131
12.80	0.068	0.040	20.75	0.068	0.131
12.95	0.068	0.048	20.90	0.068	0.131
13.10	0.068	0.055	21.05	0.068	0.131
13.25	0.068	0.063	21.20	0.068	0.131
13.40	0.068	0.070	21.35	0.068	0.131
13.55	0.068	0.077	21.50	0.068	0.131
13.70	0.068	0.084	21.65	0.068	0.132
13.85	0.068	0.091	21.80	0.068	0.132
14.00	0.068	0.097	21.95	0.068	0.132
14.15	0.068	0.103	22.10	0.068	0.132
14.30	0.068	0.108	22.25	0.068	0.132
14.45	0.068	0.113	22.40	0.068	0.132
14.60	0.068	0.117	22.55	0.068	0.132
14.75	0.068	0.120	22.70	0.068	0.132
14.90	0.068	0.123	22.85	0.068	0.132
15.05	0.068	0.127	23.00	0.068	0.132
15.20	0.068	0.130	23.15	0.068	0.132
15.35	0.068	0.131	23.30	0.068	0.132
15.50	0.068	0.131	23.45	0.068	0.132
15.65	0.068	0.131	23.60	0.068	0.132
15.80	0.068	0.131	23.75	0.068	0.132
15.95	0.068	0.131	23.90	0.068	0.132
16.10	0.068	0.131	24.05	0.068	0.132
16.25	0.068	0.131	24.20	0.068	0.132
16.40	0.068	0.131	24.35	0.068	0.132
16.55	0.068	0.131	24.50	0.068	0.132
16.70	0.068	0.131	24.65	0.068	0.132
16.85	0.068	0.131	24.80	0.068	0.132
17.00	0.068	0.131	24.95	0.068	0.132
17.15	0.068	0.131	25.10	0.068	0.132
17.30	0.068	0.131	25.25	0.068	0.133
17.45	0.068	0.131	25.40	0.068	0.133
17.60	0.068	0.131	25.55	0.068	0.133
17.75	0.068	0.131	25.70	0.068	0.133
17.90	0.068	0.131	25.85	0.068	0.133
18.05	0.068	0.131	26.00	0.068	0.133
18.20	0.068	0.131	26.15	0.068	0.133
18.35	0.068	0.131	26.30	0.068	0.133
18.50	0.068	0.131	26.45	0.068	0.133
18.65	0.068	0.131			
18.80	0.068	0.131			
18.95	0.068	0.131			
19.10	0.068	0.131			
19.25	0.068	0.131			
19.40	0.068	0.131			
19.55	0.068	0.131			

Summary for Pond INF #6: In Main Parking Area

Inflow Area = 1.754 ac, 81.01% Impervious, Inflow Depth > 4.33" for 10-YR event
 Inflow = 8.67 cfs @ 12.07 hrs, Volume= 0.633 af
 Outflow = 8.83 cfs @ 12.07 hrs, Volume= 0.500 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 11.59 hrs, Volume= 0.034 af
 Primary = 8.81 cfs @ 12.07 hrs, Volume= 0.467 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 15.77' @ 12.07 hrs Surf.Area= 0.075 ac Storage= 0.144 af

Plug-Flow detention time= 125.2 min calculated for 0.500 af (79% of inflow)
 Center-of-Mass det. time= 48.4 min (824.4 - 776.1)

Volume	Invert	Avail.Storage	Storage Description
#1A	12.00'	0.051 af	53.75'W x 60.58'L x 3.50'H Field A 0.262 af Overall - 0.093 af Embedded = 0.169 af x 30.0% Voids
#2A	12.50'	0.093 af	ADS_StormTech SC-740 +Cap x 88 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 11 Rows of 8 Chambers
#3	14.55'	0.002 af	5.00'D x 3.85'H Vertical Cone/Cylinder
		0.145 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	12.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	12.50'	18.0" Round Culvert L= 11.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 12.50' / 12.35' S= 0.0136 ' / S= 0.0136 ' / Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#3	Device 2	15.00'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 11.59 hrs HW=14.56' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=8.79 cfs @ 12.07 hrs HW=15.77' (Free Discharge)
 ↑2=Culvert (Passes 8.79 cfs of 10.66 cfs potential flow)
 ↑3=Broad-Crested Rectangular Weir (Weir Controls 8.79 cfs @ 2.86 fps)

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Stage-Area-Storage for Pond INF #6: In Main Parking Area

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
12.00	0.075	0.000	17.30	0.075	0.145
12.10	0.075	0.002	17.40	0.075	0.145
12.20	0.075	0.004	17.50	0.075	0.145
12.30	0.075	0.007	17.60	0.075	0.145
12.40	0.075	0.009	17.70	0.075	0.145
12.50	0.075	0.011	17.80	0.075	0.145
12.60	0.075	0.017	17.90	0.075	0.145
12.70	0.075	0.023	18.00	0.075	0.145
12.80	0.075	0.029	18.10	0.075	0.145
12.90	0.075	0.035	18.20	0.075	0.145
13.00	0.075	0.041	18.30	0.075	0.145
13.10	0.075	0.047	18.40	0.075	0.145
13.20	0.075	0.052			
13.30	0.075	0.058			
13.40	0.075	0.063			
13.50	0.075	0.069			
13.60	0.075	0.074			
13.70	0.075	0.079			
13.80	0.075	0.085			
13.90	0.075	0.090			
14.00	0.075	0.095			
14.10	0.075	0.099			
14.20	0.075	0.104			
14.30	0.075	0.109			
14.40	0.075	0.113			
14.50	0.075	0.117			
14.60	0.075	0.121			
14.70	0.075	0.124			
14.80	0.075	0.127			
14.90	0.075	0.130			
15.00	0.075	0.132			
15.10	0.075	0.135			
15.20	0.075	0.137			
15.30	0.075	0.139			
15.40	0.075	0.142			
15.50	0.075	0.144			
15.60	0.075	0.144			
15.70	0.075	0.144			
15.80	0.075	0.144			
15.90	0.075	0.144			
16.00	0.075	0.144			
16.10	0.075	0.144			
16.20	0.075	0.144			
16.30	0.075	0.144			
16.40	0.075	0.144			
16.50	0.075	0.144			
16.60	0.075	0.144			
16.70	0.075	0.144			
16.80	0.075	0.144			
16.90	0.075	0.145			
17.00	0.075	0.145			
17.10	0.075	0.145			
17.20	0.075	0.145			

Summary for Pond INF#7: West of parking deck

Inflow Area = 1.444 ac, 100.00% Impervious, Inflow Depth > 4.90" for 10-YR event
 Inflow = 7.52 cfs @ 12.07 hrs, Volume= 0.590 af
 Outflow = 7.60 cfs @ 12.07 hrs, Volume= 0.473 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 1.48 hrs, Volume= 0.035 af
 Primary = 7.58 cfs @ 12.07 hrs, Volume= 0.438 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 14.81' @ 12.07 hrs Surf.Area= 2,930 sf Storage= 5,523 cf

Plug-Flow detention time= 135.0 min calculated for 0.473 af (80% of inflow)
 Center-of-Mass det. time= 58.4 min (804.6 - 746.2)

Volume	Invert	Avail.Storage	Storage Description
#1A	11.10'	1,206 cf	15.75'W x 110.42'L x 3.50'H Field A 6,087 cf Overall - 2,067 cf Embedded = 4,019 cf x 30.0% Voids
#2A	11.60'	2,067 cf	ADS_StormTech SC-740 +Cap x 45 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Rows of 15 Chambers
#3	11.00'	63 cf	4.00'D x 5.00'H Vertical Cone/Cylinder
#4B	11.10'	824 cf	15.75'W x 74.82'L x 3.50'H Field B 4,124 cf Overall - 1,378 cf Embedded = 2,746 cf x 30.0% Voids
#5B	11.60'	1,378 cf	ADS_StormTech SC-740 +Cap x 30 Inside #4 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Rows of 10 Chambers
		5,538 cf	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	10.80'	18.0" Round Culvert L= 166.0' Ke= 0.600 Inlet / Outlet Invert= 10.80' / 9.10' S= 0.0102 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	14.10'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	11.00'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.02 cfs @ 1.48 hrs HW=11.10' (Free Discharge)
 ↳3=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=7.58 cfs @ 12.07 hrs HW=14.81' (Free Discharge)
 ↳1=Culvert (Passes 7.58 cfs of 14.39 cfs potential flow)
 ↳2=Broad-Crested Rectangular Weir (Weir Controls 7.58 cfs @ 2.68 fps)

Stage-Area-Storage for Pond INF#7: West of parking deck

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
11.00	13	0	13.65	2,930	4,557
11.05	13	1	13.70	2,930	4,629
11.10	2,930	1	13.75	2,930	4,699
11.15	2,930	46	13.80	2,930	4,764
11.20	2,930	90	13.85	2,930	4,825
11.25	2,930	134	13.90	2,930	4,882
11.30	2,930	179	13.95	2,930	4,934
11.35	2,930	223	14.00	2,930	4,983
11.40	2,930	268	14.05	2,930	5,031
11.45	2,930	312	14.10	2,930	5,076
11.50	2,930	356	14.15	2,930	5,121
11.55	2,930	401	14.20	2,930	5,165
11.60	2,930	445	14.25	2,930	5,210
11.65	2,930	559	14.30	2,930	5,254
11.70	2,930	673	14.35	2,930	5,298
11.75	2,930	786	14.40	2,930	5,343
11.80	2,930	900	14.45	2,930	5,387
11.85	2,930	1,013	14.50	2,930	5,432
11.90	2,930	1,125	14.55	2,930	5,476
11.95	2,930	1,237	14.60	2,930	5,520
12.00	2,930	1,349	14.65	2,930	5,521
12.05	2,930	1,460	14.70	2,930	5,522
12.10	2,930	1,570	14.75	2,930	5,522
12.15	2,930	1,680	14.80	2,930	5,523
12.20	2,930	1,789	14.85	2,930	5,524
12.25	2,930	1,898	14.90	2,930	5,524
12.30	2,930	2,006	14.95	2,930	5,525
12.35	2,930	2,113	15.00	2,930	5,525
12.40	2,930	2,220	15.05	2,930	5,526
12.45	2,930	2,326	15.10	2,930	5,527
12.50	2,930	2,432	15.15	2,930	5,527
12.55	2,930	2,536	15.20	2,930	5,528
12.60	2,930	2,640	15.25	2,930	5,529
12.65	2,930	2,743	15.30	2,930	5,529
12.70	2,930	2,845	15.35	2,930	5,530
12.75	2,930	2,946	15.40	2,930	5,530
12.80	2,930	3,047	15.45	2,930	5,531
12.85	2,930	3,146	15.50	2,930	5,532
12.90	2,930	3,244	15.55	2,930	5,532
12.95	2,930	3,341	15.60	2,930	5,533
13.00	2,930	3,438	15.65	2,930	5,534
13.05	2,930	3,533	15.70	2,930	5,534
13.10	2,930	3,626	15.75	2,930	5,535
13.15	2,930	3,719	15.80	2,930	5,535
13.20	2,930	3,811	15.85	2,930	5,536
13.25	2,930	3,900	15.90	2,930	5,537
13.30	2,930	3,989	15.95	2,930	5,537
13.35	2,930	4,075	16.00	2,930	5,538
13.40	2,930	4,160			
13.45	2,930	4,243			
13.50	2,930	4,325			
13.55	2,930	4,404			
13.60	2,930	4,482			

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Summary for Link 1L: WILLIAM T. MORRISSEY BOULEVARD

Inflow Area = 1.433 ac, 79.34% Impervious, Inflow Depth > 3.83" for 10-YR event
Inflow = 6.92 cfs @ 12.08 hrs, Volume= 0.457 af
Primary = 6.92 cfs @ 12.08 hrs, Volume= 0.457 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link 2L: PROJECT SITE

Inflow Area = 15.169 ac, 90.01% Impervious, Inflow Depth > 3.69" for 10-YR event

Inflow = 76.11 cfs @ 12.07 hrs, Volume= 4.663 af

Primary = 76.11 cfs @ 12.07 hrs, Volume= 4.663 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

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Type III 24-hr 100-YR Rainfall=8.11"

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Summary for Subcatchment P1A: Northerly Portion of Front Parking

Runoff = 4.52 cfs @ 12.07 hrs, Volume= 0.334 af, Depth> 7.03"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
0.409	98	Paved parking, HSG C
0.162	74	>75% Grass cover, Good, HSG C
0.571	91	Weighted Average
0.162		28.37% Pervious Area
0.409		71.63% Impervious Area

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

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Type III 24-hr 100-YR Rainfall=8.11"

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Summary for Subcatchment P1B: Southerly Portion of Front Parking

Runoff = 6.99 cfs @ 12.07 hrs, Volume= 0.531 af, Depth> 7.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
0.728	98	Paved parking, HSG C
0.131	74	>75% Grass cover, Good, HSG C
0.003	96	Gravel surface, HSG C
0.862	94	Weighted Average
0.134		15.55% Pervious Area
0.728		84.45% Impervious Area

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

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Type III 24-hr 100-YR Rainfall=8.11"

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Summary for Subcatchment P1C: Parking Near Sourtherly Entrance

Runoff = 7.30 cfs @ 12.07 hrs, Volume= 0.560 af, Depth> 7.51"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
0.775	98	Paved parking, HSG C
0.109	74	>75% Grass cover, Good, HSG C
0.012	96	Gravel surface, HSG C
0.896	95	Weighted Average
0.121		13.50% Pervious Area
0.775		86.50% Impervious Area

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

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Type III 24-hr 100-YR Rainfall=8.11"

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Summary for Subcatchment P2A: Northerly Roof Area

Runoff = 8.22 cfs @ 12.07 hrs, Volume= 0.653 af, Depth> 7.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
0.997	98	Roofs, HSG C
0.997		100.00% Impervious Area

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

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Summary for Subcatchment P2B: Southeasterly Roof Area

Runoff = 20.98 cfs @ 12.07 hrs, Volume= 1.667 af, Depth> 7.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
2.543	98	Roofs, HSG C
2.543		100.00% Impervious Area

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

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Summary for Subcatchment P2C: Central Roof Area

Runoff = 18.69 cfs @ 12.07 hrs, Volume= 1.485 af, Depth> 7.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
* 2.266	98	Roof
2.266		100.00% Impervious Area

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

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Summary for Subcatchment P2D: Parking Deck

Runoff = 11.91 cfs @ 12.07 hrs, Volume= 0.946 af, Depth> 7.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
1.444	98	Roofs, HSG C
1.444		100.00% Impervious Area

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

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Summary for Subcatchment P3: Northerly Courtyard

Runoff = 3.36 cfs @ 12.07 hrs, Volume= 0.253 af, Depth> 7.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

	Area (sf)	CN	Description
*	4,131	74	Landscaped Areas
*	14,060	98	Pavement
	18,191	93	Weighted Average
	4,131		22.71% Pervious Area
	14,060		77.29% Impervious Area

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

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Type III 24-hr 100-YR Rainfall=8.11"

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Summary for Subcatchment P3A: At Westerly Entry and Parking Ramp

Runoff = 24.85 cfs @ 12.07 hrs, Volume= 1.869 af, Depth> 7.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
2.458	98	Paved parking, HSG C
0.611	74	>75% Grass cover, Good, HSG C
0.018	96	Gravel surface, HSG C
3.087	93	Weighted Average
0.629		20.38% Pervious Area
2.458		79.62% Impervious Area

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

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Type III 24-hr 100-YR Rainfall=8.11"

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Summary for Subcatchment P3B: Easterly Portion of Main Parking

Runoff = 14.20 cfs @ 12.07 hrs, Volume= 1.068 af, Depth> 7.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
1.426	98	Paved parking, HSG C
0.338	74	>75% Grass cover, Good, HSG C
1.764	93	Weighted Average
0.338		19.16% Pervious Area
1.426		80.84% Impervious Area

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

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Type III 24-hr 100-YR Rainfall=8.11"

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Summary for Subcatchment P4: Southwesterly Portion of Main Parking

Runoff = 14.12 cfs @ 12.07 hrs, Volume= 1.062 af, Depth> 7.27"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-YR Rainfall=8.11"

Area (ac)	CN	Description
1.421	98	Paved parking, HSG C
0.333	74	>75% Grass cover, Good, HSG C
1.754	93	Weighted Average
0.333		18.99% Pervious Area
1.421		81.01% Impervious Area

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

Summary for Pond INF #1: In Northerly Courtyard

Inflow Area = 0.997 ac, 100.00% Impervious, Inflow Depth > 7.87" for 100-YR event
 Inflow = 8.22 cfs @ 12.07 hrs, Volume= 0.653 af
 Outflow = 8.79 cfs @ 12.10 hrs, Volume= 0.569 af, Atten= 0%, Lag= 1.8 min
 Discarded = 0.02 cfs @ 3.73 hrs, Volume= 0.035 af
 Primary = 8.77 cfs @ 12.10 hrs, Volume= 0.534 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 21.57' @ 12.10 hrs Surf.Area= 0.068 ac Storage= 0.128 af

Plug-Flow detention time= 112.0 min calculated for 0.569 af (87% of inflow)
 Center-of-Mass det. time= 52.3 min (791.9 - 739.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	12.00'	0.029 af	39.50'W x 46.34'L x 3.50'H Field A 0.147 af Overall - 0.051 af Embedded = 0.096 af x 30.0% Voids
#2A	12.50'	0.051 af	ADS_StormTech SC-740 +Cap x 48 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 8 Rows of 6 Chambers
#3B	12.00'	0.018 af	44.25'W x 24.98'L x 3.50'H Field B 0.089 af Overall - 0.028 af Embedded = 0.060 af x 30.0% Voids
#4B	12.50'	0.028 af	ADS_StormTech SC-740 +Cap x 27 Inside #3 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 9 Rows of 3 Chambers
#5	12.45'	0.002 af	5.00'D x 3.45'H DMH
		0.128 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	12.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	12.45'	12.0" Round Culvert L= 10.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 12.45' / 12.40' S= 0.0050 '/ Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 2	14.00'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 3.73 hrs HW=12.45' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=8.63 cfs @ 12.10 hrs HW=21.30' (Free Discharge)
 ↑2=Culvert (Inlet Controls 8.63 cfs @ 10.98 fps)
 ↑3=Broad-Crested Rectangular Weir (Passes 8.63 cfs of 261.82 cfs potential flow)

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Stage-Area-Storage for Pond INF #1: In Northerly Courtyard

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
12.00	0.067	0.000	17.30	0.068	0.128
12.10	0.067	0.002	17.40	0.068	0.128
12.20	0.067	0.004	17.50	0.068	0.128
12.30	0.067	0.006	17.60	0.068	0.128
12.40	0.067	0.008	17.70	0.068	0.128
12.50	0.068	0.010	17.80	0.068	0.128
12.60	0.068	0.015	17.90	0.068	0.128
12.70	0.068	0.021	18.00	0.068	0.128
12.80	0.068	0.026	18.10	0.068	0.128
12.90	0.068	0.031	18.20	0.068	0.128
13.00	0.068	0.036	18.30	0.068	0.128
13.10	0.068	0.041	18.40	0.068	0.128
13.20	0.068	0.046	18.50	0.068	0.128
13.30	0.068	0.051	18.60	0.068	0.128
13.40	0.068	0.056	18.70	0.068	0.128
13.50	0.068	0.061	18.80	0.068	0.128
13.60	0.068	0.066	18.90	0.068	0.128
13.70	0.068	0.070	19.00	0.068	0.128
13.80	0.068	0.075	19.10	0.068	0.128
13.90	0.068	0.079	19.20	0.068	0.128
14.00	0.068	0.084	19.30	0.068	0.128
14.10	0.068	0.088	19.40	0.068	0.128
14.20	0.068	0.092	19.50	0.068	0.128
14.30	0.068	0.096	19.60	0.068	0.128
14.40	0.068	0.100	19.70	0.068	0.128
14.50	0.068	0.103	19.80	0.068	0.128
14.60	0.068	0.107	19.90	0.068	0.128
14.70	0.068	0.110	20.00	0.068	0.128
14.80	0.068	0.113	20.10	0.068	0.128
14.90	0.068	0.115	20.20	0.068	0.128
15.00	0.068	0.117	20.30	0.068	0.128
15.10	0.068	0.119	20.40	0.068	0.128
15.20	0.068	0.121	20.50	0.068	0.128
15.30	0.068	0.123	20.60	0.068	0.128
15.40	0.068	0.125	20.70	0.068	0.128
15.50	0.068	0.128	20.80	0.068	0.128
15.60	0.068	0.128	20.90	0.068	0.128
15.70	0.068	0.128	21.00	0.068	0.128
15.80	0.068	0.128	21.10	0.068	0.128
15.90	0.068	0.128	21.20	0.068	0.128
16.00	0.068	0.128	21.30	0.068	0.128
16.10	0.068	0.128	21.40	0.068	0.128
16.20	0.068	0.128	21.50	0.068	0.128
16.30	0.068	0.128			
16.40	0.068	0.128			
16.50	0.068	0.128			
16.60	0.068	0.128			
16.70	0.068	0.128			
16.80	0.068	0.128			
16.90	0.068	0.128			
17.00	0.068	0.128			
17.10	0.068	0.128			
17.20	0.068	0.128			

Summary for Pond INF #2: In Front Parking

Inflow Area = 0.571 ac, 71.63% Impervious, Inflow Depth > 7.03" for 100-YR event
 Inflow = 4.52 cfs @ 12.07 hrs, Volume= 0.334 af
 Outflow = 3.66 cfs @ 12.12 hrs, Volume= 0.297 af, Atten= 19%, Lag= 3.2 min
 Discarded = 0.01 cfs @ 4.21 hrs, Volume= 0.022 af
 Primary = 3.65 cfs @ 12.12 hrs, Volume= 0.274 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 13.19' @ 12.12 hrs Surf.Area= 0.048 ac Storage= 0.052 af

Plug-Flow detention time= 86.2 min calculated for 0.297 af (89% of inflow)
 Center-of-Mass det. time= 33.5 min (804.3 - 770.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	10.87'	0.023 af	24.83'W x 74.40'L x 2.33'H Field A 0.099 af Overall - 0.024 af Embedded = 0.075 af x 30.0% Voids
#2A	11.37'	0.024 af	ADS_StormTech SC-310 +Cap x 70 Inside #1 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 7 Rows of 10 Chambers
#3B	10.87'	0.003 af	8.17'W x 31.68'L x 2.33'H Field B 0.014 af Overall - 0.003 af Embedded = 0.011 af x 30.0% Voids
#4B	11.37'	0.003 af	ADS_StormTech SC-310 +Cap x 8 Inside #3 Effective Size= 28.9"W x 16.0"H => 2.07 sf x 7.12'L = 14.7 cf Overall Size= 34.0"W x 16.0"H x 7.56'L with 0.44' Overlap 2 Rows of 4 Chambers
		0.052 af	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.87'	0.270 in/hr Exfiltration over Surface area
#2	Primary	11.20'	12.0" Round Culvert L= 7.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 11.20' / 11.10' S= 0.0143 1/1' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 2	12.30'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.01 cfs @ 4.21 hrs HW=10.89' (Free Discharge)
 ↳1=Exfiltration (Exfiltration Controls 0.01 cfs)

Primary OutFlow Max=3.65 cfs @ 12.12 hrs HW=13.19' (Free Discharge)
 ↳2=Culvert (Inlet Controls 3.65 cfs @ 4.64 fps)
 ↳3=Broad-Crested Rectangular Weir (Passes 3.65 cfs of 11.13 cfs potential flow)

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Stage-Area-Storage for Pond INF #2: In Front Parking

Elevation (feet)	Surface (acres)	Storage (acre-feet)
10.87	0.048	0.000
10.92	0.048	0.001
10.97	0.048	0.001
11.02	0.048	0.002
11.07	0.048	0.003
11.12	0.048	0.004
11.17	0.048	0.004
11.22	0.048	0.005
11.27	0.048	0.006
11.32	0.048	0.007
11.37	0.048	0.007
11.42	0.048	0.009
11.47	0.048	0.011
11.52	0.048	0.013
11.57	0.048	0.014
11.62	0.048	0.016
11.67	0.048	0.018
11.72	0.048	0.020
11.77	0.048	0.021
11.82	0.048	0.023
11.87	0.048	0.025
11.92	0.048	0.026
11.97	0.048	0.028
12.02	0.048	0.029
12.07	0.048	0.031
12.12	0.048	0.032
12.17	0.048	0.034
12.22	0.048	0.035
12.27	0.048	0.036
12.32	0.048	0.038
12.37	0.048	0.039
12.42	0.048	0.040
12.47	0.048	0.041
12.52	0.048	0.042
12.57	0.048	0.043
12.62	0.048	0.044
12.67	0.048	0.045
12.72	0.048	0.045
12.77	0.048	0.046
12.82	0.048	0.047
12.87	0.048	0.047
12.92	0.048	0.048
12.97	0.048	0.049
13.02	0.048	0.050
13.07	0.048	0.050
13.12	0.048	0.051
13.17	0.048	0.052

Summary for Pond INF #3: South of Building

Inflow Area = 3.439 ac, 96.48% Impervious, Inflow Depth > 7.77" for 100-YR event
 Inflow = 28.28 cfs @ 12.07 hrs, Volume= 2.227 af
 Outflow = 28.28 cfs @ 12.07 hrs, Volume= 1.949 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.04 cfs @ 9.61 hrs, Volume= 0.078 af
 Primary = 28.24 cfs @ 12.07 hrs, Volume= 1.871 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 18.59' @ 12.07 hrs Surf.Area= 0.151 ac Storage= 0.293 af

Plug-Flow detention time= 107.9 min calculated for 1.949 af (87% of inflow)
 Center-of-Mass det. time= 49.8 min (793.4 - 743.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	9.00'	0.101 af	25.25'W x 259.94'L x 3.50'H Field A 0.527 af Overall - 0.190 af Embedded = 0.338 af x 30.0% Voids
#2A	9.50'	0.190 af	ADS_StormTech SC-740 +Cap x 180 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 5 Rows of 36 Chambers
#3	12.20'	0.002 af	5.00'D x 3.50'H DMH
		0.293 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	9.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	12.00'	24.0" Round Culvert L= 10.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 12.00' / 11.95' S= 0.0050 ' /' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf

Discarded OutFlow Max=0.04 cfs @ 9.61 hrs HW=12.21' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.04 cfs)

Primary OutFlow Max=28.24 cfs @ 12.07 hrs HW=18.59' (Free Discharge)

↑**2=Culvert** (Inlet Controls 28.24 cfs @ 8.99 fps)

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Stage-Area-Storage for Pond INF #3: South of Building

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
9.00	0.151	0.000	14.30	0.151	0.292
9.10	0.151	0.005	14.40	0.151	0.292
9.20	0.151	0.009	14.50	0.151	0.292
9.30	0.151	0.014	14.60	0.151	0.292
9.40	0.151	0.018	14.70	0.151	0.292
9.50	0.151	0.023	14.80	0.151	0.292
9.60	0.151	0.035	14.90	0.151	0.292
9.70	0.151	0.047	15.00	0.151	0.292
9.80	0.151	0.059	15.10	0.151	0.292
9.90	0.151	0.071	15.20	0.151	0.292
10.00	0.151	0.083	15.30	0.151	0.292
10.10	0.151	0.094	15.40	0.151	0.293
10.20	0.151	0.106	15.50	0.151	0.293
10.30	0.151	0.117	15.60	0.151	0.293
10.40	0.151	0.129	15.70	0.151	0.293
10.50	0.151	0.140	15.80	0.151	0.293
10.60	0.151	0.151	15.90	0.151	0.293
10.70	0.151	0.161	16.00	0.151	0.293
10.80	0.151	0.172	16.10	0.151	0.293
10.90	0.151	0.182	16.20	0.151	0.293
11.00	0.151	0.192	16.30	0.151	0.293
11.10	0.151	0.202	16.40	0.151	0.293
11.20	0.151	0.212	16.50	0.151	0.293
11.30	0.151	0.221	16.60	0.151	0.293
11.40	0.151	0.229	16.70	0.151	0.293
11.50	0.151	0.238	16.80	0.151	0.293
11.60	0.151	0.245	16.90	0.151	0.293
11.70	0.151	0.252	17.00	0.151	0.293
11.80	0.151	0.258	17.10	0.151	0.293
11.90	0.151	0.264	17.20	0.151	0.293
12.00	0.151	0.268	17.30	0.151	0.293
12.10	0.151	0.273	17.40	0.151	0.293
12.20	0.151	0.278	17.50	0.151	0.293
12.30	0.151	0.282	17.60	0.151	0.293
12.40	0.151	0.287	17.70	0.151	0.293
12.50	0.151	0.291	17.80	0.151	0.293
12.60	0.151	0.291	17.90	0.151	0.293
12.70	0.151	0.291	18.00	0.151	0.293
12.80	0.151	0.291	18.10	0.151	0.293
12.90	0.151	0.291	18.20	0.151	0.293
13.00	0.151	0.291	18.30	0.151	0.293
13.10	0.151	0.291	18.40	0.151	0.293
13.20	0.151	0.292	18.50	0.151	0.293
13.30	0.151	0.292	18.60	0.151	0.293
13.40	0.151	0.292			
13.50	0.151	0.292			
13.60	0.151	0.292			
13.70	0.151	0.292			
13.80	0.151	0.292			
13.90	0.151	0.292			
14.00	0.151	0.292			
14.10	0.151	0.292			
14.20	0.151	0.292			

Summary for Pond INF #4: In Main Parking Area

Inflow Area = 5.705 ac, 97.88% Impervious, Inflow Depth > 7.06" for 100-YR event
 Inflow = 46.93 cfs @ 12.07 hrs, Volume= 3.356 af
 Outflow = 46.94 cfs @ 12.07 hrs, Volume= 3.155 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 5.15 hrs, Volume= 0.034 af
 Primary = 46.92 cfs @ 12.07 hrs, Volume= 3.121 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 27.94' @ 12.07 hrs Surf.Area= 0.066 ac Storage= 0.203 af

Plug-Flow detention time= 55.7 min calculated for 3.153 af (94% of inflow)
 Center-of-Mass det. time= 23.2 min (793.7 - 770.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	10.25'	0.070 af	37.08'W x 77.40'L x 5.50'H Field A 0.362 af Overall - 0.130 af Embedded = 0.233 af x 30.0% Voids
#2A	11.00'	0.130 af	ADS_StormTech MC-3500 d +Cap x 50 Inside #1 Effective Size= 70.4"W x 45.0"H => 15.33 sf x 7.17'L = 110.0 cf Overall Size= 77.0"W x 45.0"H x 7.50'L with 0.33' Overlap 5 Rows of 10 Chambers Cap Storage= +14.9 cf x 2 x 5 rows = 149.0 cf
#3	11.63'	0.003 af	5.00'D x 6.97'H DMH
		0.203 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	10.25'	0.270 in/hr Exfiltration over Surface area
#2	Primary	11.50'	24.0" Round Culvert L= 98.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 11.50' / 11.00' S= 0.0051 ' / Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 3.14 sf
#3	Device 2	16.00'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 5.15 hrs HW=11.63' (Free Discharge)

↑**1=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=46.92 cfs @ 12.07 hrs HW=27.94' (Free Discharge)

↑**2=Culvert** (Inlet Controls 46.92 cfs @ 14.93 fps)

↑**3=Broad-Crested Rectangular Weir** (Passes 46.92 cfs of 547.58 cfs potential flow)

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Stage-Area-Storage for Pond INF #4: In Main Parking Area

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
10.25	0.066	0.000	20.85	0.066	0.203
10.45	0.066	0.004	21.05	0.066	0.203
10.65	0.066	0.008	21.25	0.066	0.203
10.85	0.066	0.012	21.45	0.066	0.203
11.05	0.066	0.018	21.65	0.066	0.203
11.25	0.066	0.028	21.85	0.066	0.203
11.45	0.066	0.039	22.05	0.066	0.203
11.65	0.066	0.050	22.25	0.066	0.203
11.85	0.066	0.060	22.45	0.066	0.203
12.05	0.066	0.071	22.65	0.066	0.203
12.25	0.066	0.081	22.85	0.066	0.203
12.45	0.066	0.091	23.05	0.066	0.203
12.65	0.066	0.101	23.25	0.066	0.203
12.85	0.066	0.111	23.45	0.066	0.203
13.05	0.066	0.120	23.65	0.066	0.203
13.25	0.066	0.129	23.85	0.066	0.203
13.45	0.066	0.138	24.05	0.066	0.203
13.65	0.066	0.147	24.25	0.066	0.203
13.85	0.066	0.155	24.45	0.066	0.203
14.05	0.066	0.162	24.65	0.066	0.203
14.25	0.066	0.169	24.85	0.066	0.203
14.45	0.066	0.174	25.05	0.066	0.203
14.65	0.066	0.179	25.25	0.066	0.203
14.85	0.066	0.183	25.45	0.066	0.203
15.05	0.066	0.187	25.65	0.066	0.203
15.25	0.066	0.191	25.85	0.066	0.203
15.45	0.066	0.195	26.05	0.066	0.203
15.65	0.066	0.199	26.25	0.066	0.203
15.85	0.066	0.201	26.45	0.066	0.203
16.05	0.066	0.201	26.65	0.066	0.203
16.25	0.066	0.202	26.85	0.066	0.203
16.45	0.066	0.202	27.05	0.066	0.203
16.65	0.066	0.202	27.25	0.066	0.203
16.85	0.066	0.202	27.45	0.066	0.203
17.05	0.066	0.202	27.65	0.066	0.203
17.25	0.066	0.202	27.85	0.066	0.203
17.45	0.066	0.202			
17.65	0.066	0.202			
17.85	0.066	0.202			
18.05	0.066	0.202			
18.25	0.066	0.202			
18.45	0.066	0.203			
18.65	0.066	0.203			
18.85	0.066	0.203			
19.05	0.066	0.203			
19.25	0.066	0.203			
19.45	0.066	0.203			
19.65	0.066	0.203			
19.85	0.066	0.203			
20.05	0.066	0.203			
20.25	0.066	0.203			
20.45	0.066	0.203			
20.65	0.066	0.203			

Summary for Pond INF #5: In Main Parking Area

Inflow Area = 1.764 ac, 80.84% Impervious, Inflow Depth > 7.27" for 100-YR event
 Inflow = 14.20 cfs @ 12.07 hrs, Volume= 1.068 af
 Outflow = 14.16 cfs @ 12.07 hrs, Volume= 0.947 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 3.68 hrs, Volume= 0.032 af
 Primary = 14.14 cfs @ 12.07 hrs, Volume= 0.915 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.38' @ 12.07 hrs Surf.Area= 0.068 ac Storage= 0.131 af

Plug-Flow detention time= 91.2 min calculated for 0.947 af (89% of inflow)
 Center-of-Mass det. time= 37.8 min (801.5 - 763.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	11.75'	0.046 af	49.00'W x 60.58'L x 3.50'H Field A 0.238 af Overall - 0.084 af Embedded = 0.154 af x 30.0% Voids
#2A	12.25'	0.084 af	ADS_StormTech SC-740 +Cap x 80 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 10 Rows of 8 Chambers
#3	18.55'	0.002 af	4.00'D x 8.00'H DMH
		0.133 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	11.75'	0.270 in/hr Exfiltration over Surface area
#2	Primary	12.20'	18.0" Round Culvert L= 50.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 12.20' / 11.20' S= 0.0200 ' / S= 0.0200 ' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#3	Device 2	14.75'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 3.68 hrs HW=11.90' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=14.13 cfs @ 12.07 hrs HW=17.38' (Free Discharge)
 ↑2=Culvert (Inlet Controls 14.13 cfs @ 8.00 fps)
 ↑3=Broad-Crested Rectangular Weir (Passes 14.13 cfs of 56.53 cfs potential flow)

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Stage-Area-Storage for Pond INF #5: In Main Parking Area

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
11.75	0.068	0.000	19.70	0.068	0.131
11.90	0.068	0.003	19.85	0.068	0.131
12.05	0.068	0.006	20.00	0.068	0.131
12.20	0.068	0.009	20.15	0.068	0.131
12.35	0.068	0.016	20.30	0.068	0.131
12.50	0.068	0.024	20.45	0.068	0.131
12.65	0.068	0.032	20.60	0.068	0.131
12.80	0.068	0.040	20.75	0.068	0.131
12.95	0.068	0.048	20.90	0.068	0.131
13.10	0.068	0.055	21.05	0.068	0.131
13.25	0.068	0.063	21.20	0.068	0.131
13.40	0.068	0.070	21.35	0.068	0.131
13.55	0.068	0.077	21.50	0.068	0.131
13.70	0.068	0.084	21.65	0.068	0.132
13.85	0.068	0.091	21.80	0.068	0.132
14.00	0.068	0.097	21.95	0.068	0.132
14.15	0.068	0.103	22.10	0.068	0.132
14.30	0.068	0.108	22.25	0.068	0.132
14.45	0.068	0.113	22.40	0.068	0.132
14.60	0.068	0.117	22.55	0.068	0.132
14.75	0.068	0.120	22.70	0.068	0.132
14.90	0.068	0.123	22.85	0.068	0.132
15.05	0.068	0.127	23.00	0.068	0.132
15.20	0.068	0.130	23.15	0.068	0.132
15.35	0.068	0.131	23.30	0.068	0.132
15.50	0.068	0.131	23.45	0.068	0.132
15.65	0.068	0.131	23.60	0.068	0.132
15.80	0.068	0.131	23.75	0.068	0.132
15.95	0.068	0.131	23.90	0.068	0.132
16.10	0.068	0.131	24.05	0.068	0.132
16.25	0.068	0.131	24.20	0.068	0.132
16.40	0.068	0.131	24.35	0.068	0.132
16.55	0.068	0.131	24.50	0.068	0.132
16.70	0.068	0.131	24.65	0.068	0.132
16.85	0.068	0.131	24.80	0.068	0.132
17.00	0.068	0.131	24.95	0.068	0.132
17.15	0.068	0.131	25.10	0.068	0.132
17.30	0.068	0.131	25.25	0.068	0.133
17.45	0.068	0.131	25.40	0.068	0.133
17.60	0.068	0.131	25.55	0.068	0.133
17.75	0.068	0.131	25.70	0.068	0.133
17.90	0.068	0.131	25.85	0.068	0.133
18.05	0.068	0.131	26.00	0.068	0.133
18.20	0.068	0.131	26.15	0.068	0.133
18.35	0.068	0.131	26.30	0.068	0.133
18.50	0.068	0.131	26.45	0.068	0.133
18.65	0.068	0.131			
18.80	0.068	0.131			
18.95	0.068	0.131			
19.10	0.068	0.131			
19.25	0.068	0.131			
19.40	0.068	0.131			
19.55	0.068	0.131			

Summary for Pond INF #6: In Main Parking Area

Inflow Area = 1.754 ac, 81.01% Impervious, Inflow Depth > 7.27" for 100-YR event
 Inflow = 14.12 cfs @ 12.07 hrs, Volume= 1.062 af
 Outflow = 14.10 cfs @ 12.07 hrs, Volume= 0.929 af, Atten= 0%, Lag= 0.2 min
 Discarded = 0.02 cfs @ 10.09 hrs, Volume= 0.036 af
 Primary = 14.08 cfs @ 12.07 hrs, Volume= 0.893 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 17.64' @ 12.07 hrs Surf.Area= 0.075 ac Storage= 0.145 af

Plug-Flow detention time= 97.2 min calculated for 0.929 af (87% of inflow)
 Center-of-Mass det. time= 40.1 min (803.7 - 763.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	12.00'	0.051 af	53.75'W x 60.58'L x 3.50'H Field A 0.262 af Overall - 0.093 af Embedded = 0.169 af x 30.0% Voids
#2A	12.50'	0.093 af	ADS_StormTech SC-740 +Cap x 88 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 11 Rows of 8 Chambers
#3	14.55'	0.002 af	5.00'D x 3.85'H Vertical Cone/Cylinder
		0.145 af	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	12.00'	0.270 in/hr Exfiltration over Surface area
#2	Primary	12.50'	18.0" Round Culvert L= 11.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 12.50' / 12.35' S= 0.0136 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.77 sf
#3	Device 2	15.00'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32

Discarded OutFlow Max=0.02 cfs @ 10.09 hrs HW=14.56' (Free Discharge)
 ↑1=Exfiltration (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=14.05 cfs @ 12.07 hrs HW=17.63' (Free Discharge)
 ↑2=Culvert (Inlet Controls 14.05 cfs @ 7.95 fps)
 ↑3=Broad-Crested Rectangular Weir (Passes 14.05 cfs of 56.53 cfs potential flow)

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Stage-Area-Storage for Pond INF #6: In Main Parking Area

Elevation (feet)	Surface (acres)	Storage (acre-feet)	Elevation (feet)	Surface (acres)	Storage (acre-feet)
12.00	0.075	0.000	17.30	0.075	0.145
12.10	0.075	0.002	17.40	0.075	0.145
12.20	0.075	0.004	17.50	0.075	0.145
12.30	0.075	0.007	17.60	0.075	0.145
12.40	0.075	0.009	17.70	0.075	0.145
12.50	0.075	0.011	17.80	0.075	0.145
12.60	0.075	0.017	17.90	0.075	0.145
12.70	0.075	0.023	18.00	0.075	0.145
12.80	0.075	0.029	18.10	0.075	0.145
12.90	0.075	0.035	18.20	0.075	0.145
13.00	0.075	0.041	18.30	0.075	0.145
13.10	0.075	0.047	18.40	0.075	0.145
13.20	0.075	0.052			
13.30	0.075	0.058			
13.40	0.075	0.063			
13.50	0.075	0.069			
13.60	0.075	0.074			
13.70	0.075	0.079			
13.80	0.075	0.085			
13.90	0.075	0.090			
14.00	0.075	0.095			
14.10	0.075	0.099			
14.20	0.075	0.104			
14.30	0.075	0.109			
14.40	0.075	0.113			
14.50	0.075	0.117			
14.60	0.075	0.121			
14.70	0.075	0.124			
14.80	0.075	0.127			
14.90	0.075	0.130			
15.00	0.075	0.132			
15.10	0.075	0.135			
15.20	0.075	0.137			
15.30	0.075	0.139			
15.40	0.075	0.142			
15.50	0.075	0.144			
15.60	0.075	0.144			
15.70	0.075	0.144			
15.80	0.075	0.144			
15.90	0.075	0.144			
16.00	0.075	0.144			
16.10	0.075	0.144			
16.20	0.075	0.144			
16.30	0.075	0.144			
16.40	0.075	0.144			
16.50	0.075	0.144			
16.60	0.075	0.144			
16.70	0.075	0.144			
16.80	0.075	0.144			
16.90	0.075	0.145			
17.00	0.075	0.145			
17.10	0.075	0.145			
17.20	0.075	0.145			

Summary for Pond INF#7: West of parking deck

Inflow Area = 1.444 ac, 100.00% Impervious, Inflow Depth > 7.87" for 100-YR event
 Inflow = 11.91 cfs @ 12.07 hrs, Volume= 0.946 af
 Outflow = 11.89 cfs @ 12.07 hrs, Volume= 0.829 af, Atten= 0%, Lag= 0.0 min
 Discarded = 0.02 cfs @ 0.82 hrs, Volume= 0.035 af
 Primary = 11.87 cfs @ 12.07 hrs, Volume= 0.794 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
 Peak Elev= 15.03' @ 12.07 hrs Surf.Area= 2,930 sf Storage= 5,526 cf

Plug-Flow detention time= 107.1 min calculated for 0.829 af (88% of inflow)
 Center-of-Mass det. time= 49.1 min (788.8 - 739.7)

Volume	Invert	Avail.Storage	Storage Description
#1A	11.10'	1,206 cf	15.75'W x 110.42'L x 3.50'H Field A 6,087 cf Overall - 2,067 cf Embedded = 4,019 cf x 30.0% Voids
#2A	11.60'	2,067 cf	ADS_StormTech SC-740 +Cap x 45 Inside #1 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Rows of 15 Chambers
#3	11.00'	63 cf	4.00'D x 5.00'H Vertical Cone/Cylinder
#4B	11.10'	824 cf	15.75'W x 74.82'L x 3.50'H Field B 4,124 cf Overall - 1,378 cf Embedded = 2,746 cf x 30.0% Voids
#5B	11.60'	1,378 cf	ADS_StormTech SC-740 +Cap x 30 Inside #4 Effective Size= 44.6"W x 30.0"H => 6.45 sf x 7.12'L = 45.9 cf Overall Size= 51.0"W x 30.0"H x 7.56'L with 0.44' Overlap 3 Rows of 10 Chambers
		5,538 cf	Total Available Storage

Storage Group A created with Chamber Wizard
 Storage Group B created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Primary	10.80'	18.0" Round Culvert L= 166.0' Ke= 0.600 Inlet / Outlet Invert= 10.80' / 9.10' S= 0.0102 '/' Cc= 0.900 n= 0.011, Flow Area= 1.77 sf
#2	Device 1	14.10'	4.0' long x 0.5' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 Coef. (English) 2.80 2.92 3.08 3.30 3.32
#3	Discarded	11.00'	0.270 in/hr Exfiltration over Surface area

Discarded OutFlow Max=0.02 cfs @ 0.82 hrs HW=11.10' (Free Discharge)
 ↳ **3=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=11.87 cfs @ 12.07 hrs HW=15.03' (Free Discharge)
 ↳ **1=Culvert** (Passes 11.87 cfs of 14.88 cfs potential flow)
 ↳ **2=Broad-Crested Rectangular Weir** (Weir Controls 11.87 cfs @ 3.19 fps)

Stage-Area-Storage for Pond INF#7: West of parking deck

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
11.00	13	0	13.65	2,930	4,557
11.05	13	1	13.70	2,930	4,629
11.10	2,930	1	13.75	2,930	4,699
11.15	2,930	46	13.80	2,930	4,764
11.20	2,930	90	13.85	2,930	4,825
11.25	2,930	134	13.90	2,930	4,882
11.30	2,930	179	13.95	2,930	4,934
11.35	2,930	223	14.00	2,930	4,983
11.40	2,930	268	14.05	2,930	5,031
11.45	2,930	312	14.10	2,930	5,076
11.50	2,930	356	14.15	2,930	5,121
11.55	2,930	401	14.20	2,930	5,165
11.60	2,930	445	14.25	2,930	5,210
11.65	2,930	559	14.30	2,930	5,254
11.70	2,930	673	14.35	2,930	5,298
11.75	2,930	786	14.40	2,930	5,343
11.80	2,930	900	14.45	2,930	5,387
11.85	2,930	1,013	14.50	2,930	5,432
11.90	2,930	1,125	14.55	2,930	5,476
11.95	2,930	1,237	14.60	2,930	5,520
12.00	2,930	1,349	14.65	2,930	5,521
12.05	2,930	1,460	14.70	2,930	5,522
12.10	2,930	1,570	14.75	2,930	5,522
12.15	2,930	1,680	14.80	2,930	5,523
12.20	2,930	1,789	14.85	2,930	5,524
12.25	2,930	1,898	14.90	2,930	5,524
12.30	2,930	2,006	14.95	2,930	5,525
12.35	2,930	2,113	15.00	2,930	5,525
12.40	2,930	2,220	15.05	2,930	5,526
12.45	2,930	2,326	15.10	2,930	5,527
12.50	2,930	2,432	15.15	2,930	5,527
12.55	2,930	2,536	15.20	2,930	5,528
12.60	2,930	2,640	15.25	2,930	5,529
12.65	2,930	2,743	15.30	2,930	5,529
12.70	2,930	2,845	15.35	2,930	5,530
12.75	2,930	2,946	15.40	2,930	5,530
12.80	2,930	3,047	15.45	2,930	5,531
12.85	2,930	3,146	15.50	2,930	5,532
12.90	2,930	3,244	15.55	2,930	5,532
12.95	2,930	3,341	15.60	2,930	5,533
13.00	2,930	3,438	15.65	2,930	5,534
13.05	2,930	3,533	15.70	2,930	5,534
13.10	2,930	3,626	15.75	2,930	5,535
13.15	2,930	3,719	15.80	2,930	5,535
13.20	2,930	3,811	15.85	2,930	5,536
13.25	2,930	3,900	15.90	2,930	5,537
13.30	2,930	3,989	15.95	2,930	5,537
13.35	2,930	4,075	16.00	2,930	5,538
13.40	2,930	4,160			
13.45	2,930	4,243			
13.50	2,930	4,325			
13.55	2,930	4,404			
13.60	2,930	4,482			

Post-135 Morrissey Blvd

Prepared by Howard Stein Hudson

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Type III 24-hr 100-YR Rainfall=8.11"

Printed 5/17/2018

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Summary for Link 1L: WILLIAM T. MORRISSEY BOULEVARD

Inflow Area = 1.433 ac, 79.34% Impervious, Inflow Depth > 6.74" for 100-YR event
Inflow = 10.41 cfs @ 12.08 hrs, Volume= 0.805 af
Primary = 10.41 cfs @ 12.08 hrs, Volume= 0.805 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Link 2L: PROJECT SITE

Inflow Area = 15.169 ac, 90.01% Impervious, Inflow Depth > 6.63" for 100-YR event

Inflow = 119.77 cfs @ 12.07 hrs, Volume= 8.379 af

Primary = 119.77 cfs @ 12.07 hrs, Volume= 8.379 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs



Appendix E: Recharge and Water Quality Compliance Documentation

Table 1 Required Recharge Volume

135 William T Morressey Boulevard

As shown in Vol 3. Chapter 1 Page 15 of the Massachusetts Stormwater Handbook

Required Recharge Volume determined by the following equation:

$R_v = F \times A_{imp}$ where:

R_v Required Recharge Volume

F Target Depth Factor

A_{imp} Impervious Area

Given:

NRCS Hydrologic Soil Type - C

Target Depth Factor = 0.25 inch

Subcatchment	A_{imp}	A_{imp}	F	R_v	R_v
	ft. ²	acre	inch	acre-ft	ft. ³
P1A	17,824	0.41	0.25	0.0085	371
P1B	31,709	0.73	0.25	0.0152	661
P1C	33,760	0.78	0.25	0.0161	703
P2A	43,433	1.00	0.25	0.0208	905
P2B	110,757	2.54	0.25	0.0530	2,307
P2C	98,711	2.27	0.25	0.0472	2,056
P2D	62,911	1.44	0.25	0.0301	1,311
P3	14,060	0.32	0.25	0.0067	293
P3A	107,070	2.46	0.25	0.0512	2,231
P3B	62,131	1.43	0.25	0.0297	1,294
P4	61,916	1.42	0.25	0.0296	1,290
				TOTAL	13,423

Table 1

Table 2 Simple Dynamic Method for Recharge
 135 William T Morrissey Boulevard
 As shown in Vol 3. Chapter 1 Page 19 of the Massachusetts Stormwater Handbook
 Using the following equations

$A = R_v / (D + KT)$

$V = A \times D$

where

- R_v Required Recharge Volume
- A Minimum Req'd surface area of the bottom of the infiltration structure
- V Storage Volume
- D depth of the infiltration facility
- K Rawls rate for saturated hydraulic conductivity
- T allowable drawdown

Use

$k =$ 0.27 in/hr C-Soils

T 2 hours

Subcatchment	R_v	nD	A	$V_{Required}$	Receiving Recharge Facility	$V_{provided}$	$V_{provided} > V_{req}$
	ft. ³	ft	ft. ²	ft. ³		ft. ³	Yes/No
P1A	371.33	1.48	243.50	360.38	INF #2	1,612	Yes
P1B	660.60	0.00	0.00	660.60	NONE	0	No
P1C and P2B	3,010.77	2.65	1,117.17	2,960.50	INF #3	11,674	Yes
P2A	904.85	2.65	335.75	889.75	INF #1	3,659	Yes
P2C	2,056.48	4.05	502.19	2,033.88	INF #4	8,755	Yes
P2D	1,310.65	2.65	486.32	1,288.76	INF #7	5,076	Yes
P3	292.92	0.00	0.00	292.92	NONE	0	No
P3A	2,230.63	0.00	0.00	2,230.63	NONE	0	No
P3B	1,294.40	2.65	480.30	1,272.78	INF #5	5,227	Yes
P4	1,289.92	2.65	478.63	1,268.38	INF #6	5,750	Yes
TOTALS				13,258.57		41,753	Yes

Table 2

Table 3 Drawdown
 135 William T Morressey Boulevard

Using the following equations

$$\text{Time}_{\text{drawdown}} = R_v / (K * \text{Bottom Area})$$

As shown in Vol 3. Chapter 1 Page 25 of the Massachusetts Stormwater Handbook

$\text{Time}_{\text{drawdown}}$ Drawdown time for Infiltration BMP, must be < 72 hours

R_v Storage Volume

Bottom area Bottom Area of Recharge Structure

K Rawls rate for saturated hydraulic conductivity

k= 0.27 in/hr C -Soils

Subcatchment	R_v	Bottom Area	$\text{Time}_{\text{drawdown}}$	$\text{Time}_{\text{drawdown}} < 72 \text{ hours}$
	ft. ³	ft. ²	hours	Yes/No
INF #2	371.33	2106	7.84	Yes
INF #3	3,010.77	6563	20.39	Yes
INF #1	904.85	2936	13.70	Yes
INF #4	2,056.48	2870	31.85	Yes
INF #7	1,310.65	2918	19.96	Yes
INF #5	1,294.40	2968	19.38	Yes
INF #6	1,289.92	3256	17.61	Yes

Table 3

HSH Project No.: 16127

Project: 135 Morrissey Boulevard, Boston, MA

Date: May 17, 2018

TSS REMOVAL CALCULATION

Location: Subcatchment P1A

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump and Hooded Catchbasin	0.25	1.00	0.25	0.75
Proprietary Treatment Unit	0.85	0.75	0.64	0.11
Infiltration Basin	0.80	0.11	0.09	0.02

Total TSS Removal

98%

HSH Project No.: 16127

Project: 135 Morrissey Boulevard, Boston, MA

Date: May 17, 2018

TSS REMOVAL CALCULATION

Location: Subcatchment P1B

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump and Hooded Catchbasin	0.25	1.00	0.25	0.75
Proprietary Treatment Unit	0.86	0.75	0.65	0.11

Total TSS Removal 90%

HSH Project No.: 16127

Project: 135 Morrissey Boulevard, Boston, MA

Date: May 17, 2018

TSS REMOVAL CALCULATION

Location: Subcatchment P1C and P2B

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump and Hooded Catchbasin	0.25	1.00	0.25	0.75
Proprietary Treatment Unit	0.81	0.75	0.61	0.14
Infiltration Basin	0.80	0.14	0.11	0.03

Total TSS Removal

97%

HSH Project No.: 16127

Project: 135 Morrissey Boulevard, Boston, MA

Date: May 17, 2018

TSS REMOVAL CALCULATION

Location: Subcatchment P2A (Roof Area)

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Infiltration Basin	0.80	1.00	0.80	0.20

Total TSS Removal 80%

HSH Project No.: 16127

Project: 135 Morrissey Boulevard, Boston, MA

Date: May 17, 2018

TSS REMOVAL CALCULATION

Location: Subcatchment P2B (Roof Area)

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Infiltration Basin	0.80	1.00	0.80	0.20

Total TSS Removal 80%

HSH Project No.: 16127

Project: 135 Morrissey Boulevard, Boston, MA

Date: May 17, 2018

TSS REMOVAL CALCULATION

Location: Subcatchment P2C (Roof Area)

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Infiltration Basin	0.80	1.00	0.80	0.20

Total TSS Removal 80%

HSH Project No.: 16127

Project: 135 Morrissey Boulevard, Boston, MA

Date: May 17, 2018

TSS REMOVAL CALCULATION

Location: Subcatchment P2D

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Proprietary Treatment Unit	0.25	1.00	0.25	0.75
Infiltration Basin	0.80	0.75	0.60	0.15

Total TSS Removal 85%

HSH Project No.: 16127

Project: 135 Morrissey Boulevard, Boston, MA

Date: May 17, 2018

TSS REMOVAL CALCULATION

Location: Subcatchment P3A

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump and Hooded Catchbasin	0.25	1.00	0.25	0.75
Proprietary Treatment Unit	0.81	0.75	0.61	0.14

Total TSS Removal 86%

HSH Project No.: 16127

Project: 135 Morrissey Boulevard, Boston, MA

Date: May 17, 2018

TSS REMOVAL CALCULATION

Location: Subcatchment P3B

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump and Hooded Catchbasin	0.25	1.00	0.25	0.75
Proprietary Treatment Unit	0.83	0.75	0.62	0.13
Infiltration Basin	0.80	0.13	0.10	0.03

Total TSS Removal

97%

HSH Project No.: 16127

Project: 135 Morrissey Boulevard, Boston, MA

Date: May 17, 2018

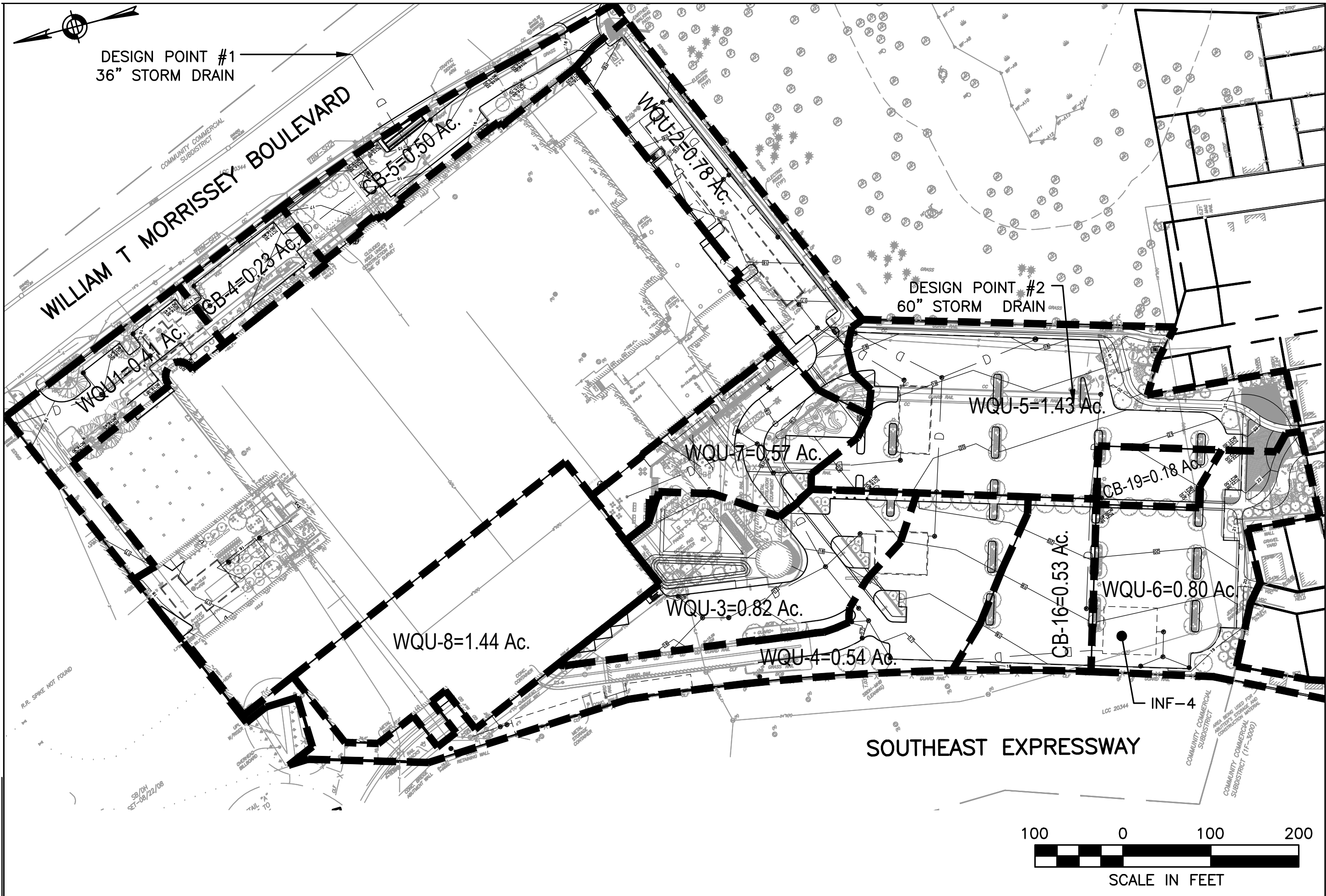
TSS REMOVAL CALCULATION

Location: Subcatchment P4

BMP	TSS Removal Rate	Starting TSS Load	Amount Removed	Remaining Load
Deep Sump and Hooded Catchbasin	0.25	1.00	0.25	0.75
Proprietary Treatment Unit	0.81	0.75	0.61	0.14
Infiltration Basin	0.80	0.14	0.11	0.03

Total TSS Removal

97%



**WATER QUALITY UNITS IMPERVIOUS AREAS
135 MORRISSEY BOULEVARD**

HOWARD STEIN HUDSON
11 Beacon Street, Suite 1010
Boston, MA 02108
www.hshassoc.com

**FIGURE
W.1**

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**BOSTON GLOBE
BOSTON, MA**

Area **0.23 ac**
 Weighted C **0.9**
 t_c **6 min**
 CDS Model **2015-4**

Unit Site Designation **CB-4**
 Rainfall Station # **69**

CDS Treatment Capacity **1.4 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.00	0.00	9.9
0.04	9.6%	19.8%	0.01	0.01	9.3
0.06	9.4%	29.3%	0.01	0.01	9.1
0.08	7.7%	37.0%	0.02	0.02	7.5
0.10	8.6%	45.6%	0.02	0.02	8.2
0.12	6.3%	51.9%	0.02	0.02	6.0
0.14	4.7%	56.5%	0.03	0.03	4.5
0.16	4.6%	61.2%	0.03	0.03	4.4
0.18	3.5%	64.7%	0.04	0.04	3.4
0.20	4.3%	69.1%	0.04	0.04	4.1
0.25	8.0%	77.1%	0.05	0.05	7.6
0.30	5.6%	82.7%	0.06	0.06	5.3
0.35	4.4%	87.0%	0.07	0.07	4.1
0.40	2.5%	89.5%	0.08	0.08	2.4
0.45	2.5%	92.1%	0.09	0.09	2.3
0.50	1.4%	93.5%	0.10	0.10	1.3
0.75	5.0%	98.5%	0.16	0.16	4.5
1.00	1.0%	99.5%	0.21	0.21	0.9
1.50	0.0%	99.5%	0.31	0.31	0.0
2.00	0.0%	99.5%	0.41	0.41	0.0
3.00	0.5%	100.0%	0.62	0.62	0.3
					95.1
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.5%
Predicted Net Annual Load Removal Efficiency =					88.7%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**BOSTON GLOBE
BOSTON, MA**

Area **0.50 ac**
 Weighted C **0.9**
 t_c **6 min**
 CDS Model **2015-4**

Unit Site Designation **CB-5**
 Rainfall Station # **69**

CDS Treatment Capacity **1.4 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.02	0.02	9.3
0.06	9.4%	29.3%	0.03	0.03	9.1
0.08	7.7%	37.0%	0.04	0.04	7.4
0.10	8.6%	45.6%	0.05	0.05	8.1
0.12	6.3%	51.9%	0.05	0.05	6.0
0.14	4.7%	56.5%	0.06	0.06	4.4
0.16	4.6%	61.2%	0.07	0.07	4.3
0.18	3.5%	64.7%	0.08	0.08	3.3
0.20	4.3%	69.1%	0.09	0.09	4.0
0.25	8.0%	77.1%	0.11	0.11	7.3
0.30	5.6%	82.7%	0.14	0.14	5.1
0.35	4.4%	87.0%	0.16	0.16	3.9
0.40	2.5%	89.5%	0.18	0.18	2.2
0.45	2.5%	92.1%	0.20	0.20	2.2
0.50	1.4%	93.5%	0.23	0.23	1.2
0.75	5.0%	98.5%	0.34	0.34	4.1
1.00	1.0%	99.5%	0.45	0.45	0.8
1.50	0.0%	99.5%	0.68	0.68	0.0
2.00	0.0%	99.5%	0.90	0.90	0.0
3.00	0.5%	100.0%	1.35	1.35	0.2
					92.7
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.5%
Predicted Net Annual Load Removal Efficiency =					86.3%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**BOSTON GLOBE
BOSTON, MA**

Area **0.53 ac**
 Weighted C **0.9**
 t_c **6 min**
 CDS Model **2015-4**

Unit Site Designation **CB-16**
 Rainfall Station # **69**

CDS Treatment Capacity **1.4 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.02	0.02	9.3
0.06	9.4%	29.3%	0.03	0.03	9.1
0.08	7.7%	37.0%	0.04	0.04	7.4
0.10	8.6%	45.6%	0.05	0.05	8.1
0.12	6.3%	51.9%	0.06	0.06	5.9
0.14	4.7%	56.5%	0.07	0.07	4.4
0.16	4.6%	61.2%	0.08	0.08	4.3
0.18	3.5%	64.7%	0.09	0.09	3.3
0.20	4.3%	69.1%	0.10	0.10	4.0
0.25	8.0%	77.1%	0.12	0.12	7.3
0.30	5.6%	82.7%	0.14	0.14	5.0
0.35	4.4%	87.0%	0.17	0.17	3.9
0.40	2.5%	89.5%	0.19	0.19	2.2
0.45	2.5%	92.1%	0.21	0.21	2.2
0.50	1.4%	93.5%	0.24	0.24	1.2
0.75	5.0%	98.5%	0.36	0.36	4.0
1.00	1.0%	99.5%	0.48	0.48	0.8
1.50	0.0%	99.5%	0.72	0.72	0.0
2.00	0.0%	99.5%	0.95	0.95	0.0
3.00	0.5%	100.0%	1.43	1.40	0.1
					92.4
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.5%
Predicted Net Annual Load Removal Efficiency =					86.0%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**BOSTON GLOBE
BOSTON, MA**

Area **0.18 ac**
Weighted C **0.9**
 t_c **6 min**
CDS Model **2015-4**

Unit Site Designation **CB-19**
Rainfall Station # **69**

CDS Treatment Capacity **1.4 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.00	0.00	9.9
0.04	9.6%	19.8%	0.01	0.01	9.4
0.06	9.4%	29.3%	0.01	0.01	9.1
0.08	7.7%	37.0%	0.01	0.01	7.5
0.10	8.6%	45.6%	0.02	0.02	8.3
0.12	6.3%	51.9%	0.02	0.02	6.1
0.14	4.7%	56.5%	0.02	0.02	4.5
0.16	4.6%	61.2%	0.03	0.03	4.5
0.18	3.5%	64.7%	0.03	0.03	3.4
0.20	4.3%	69.1%	0.03	0.03	4.2
0.25	8.0%	77.1%	0.04	0.04	7.6
0.30	5.6%	82.7%	0.05	0.05	5.3
0.35	4.4%	87.0%	0.06	0.06	4.1
0.40	2.5%	89.5%	0.06	0.06	2.4
0.45	2.5%	92.1%	0.07	0.07	2.4
0.50	1.4%	93.5%	0.08	0.08	1.3
0.75	5.0%	98.5%	0.12	0.12	4.6
1.00	1.0%	99.5%	0.16	0.16	0.9
1.50	0.0%	99.5%	0.24	0.24	0.0
2.00	0.0%	99.5%	0.32	0.32	0.0
3.00	0.5%	100.0%	0.49	0.49	0.4
					95.6
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.5%
Predicted Net Annual Load Removal Efficiency =					89.1%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**BOSTON GLOBE
BOSTON, MA**

Area **0.41 ac**
 Weighted C **0.9**
 t_c **6 min**
 CDS Model **1515-3**

Unit Site Designation **WQU-1**
 Rainfall Station # **69**

CDS Treatment Capacity **1.0 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.01	0.01	9.3
0.06	9.4%	29.3%	0.02	0.02	9.0
0.08	7.7%	37.0%	0.03	0.03	7.4
0.10	8.6%	45.6%	0.04	0.04	8.1
0.12	6.3%	51.9%	0.04	0.04	5.9
0.14	4.7%	56.5%	0.05	0.05	4.4
0.16	4.6%	61.2%	0.06	0.06	4.3
0.18	3.5%	64.7%	0.07	0.07	3.3
0.20	4.3%	69.1%	0.07	0.07	4.0
0.25	8.0%	77.1%	0.09	0.09	7.3
0.30	5.6%	82.7%	0.11	0.11	5.0
0.35	4.4%	87.0%	0.13	0.13	3.9
0.40	2.5%	89.5%	0.15	0.15	2.2
0.45	2.5%	92.1%	0.17	0.17	2.2
0.50	1.4%	93.5%	0.18	0.18	1.2
0.75	5.0%	98.5%	0.28	0.28	4.0
1.00	1.0%	99.5%	0.37	0.37	0.7
1.50	0.0%	99.5%	0.55	0.55	0.0
2.00	0.0%	99.5%	0.74	0.74	0.0
3.00	0.5%	100.0%	1.10	1.00	0.1
					92.1
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.5%
Predicted Net Annual Load Removal Efficiency =					85.6%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**BOSTON GLOBE
BOSTON, MA**

Area **0.78 ac**
 Weighted C **0.9**
 t_c **6 min**
 CDS Model **1515-3**

Unit Site Designation **WQU-2**
 Rainfall Station # **69**

CDS Treatment Capacity **1.0 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.03	0.03	9.2
0.06	9.4%	29.3%	0.04	0.04	8.9
0.08	7.7%	37.0%	0.06	0.06	7.2
0.10	8.6%	45.6%	0.07	0.07	7.9
0.12	6.3%	51.9%	0.08	0.08	5.8
0.14	4.7%	56.5%	0.10	0.10	4.2
0.16	4.6%	61.2%	0.11	0.11	4.2
0.18	3.5%	64.7%	0.13	0.13	3.1
0.20	4.3%	69.1%	0.14	0.14	3.8
0.25	8.0%	77.1%	0.18	0.18	6.8
0.30	5.6%	82.7%	0.21	0.21	4.6
0.35	4.4%	87.0%	0.25	0.25	3.5
0.40	2.5%	89.5%	0.28	0.28	2.0
0.45	2.5%	92.1%	0.32	0.32	1.9
0.50	1.4%	93.5%	0.35	0.35	1.0
0.75	5.0%	98.5%	0.53	0.53	3.1
1.00	1.0%	99.5%	0.70	0.70	0.5
1.50	0.0%	99.5%	1.05	1.00	0.0
2.00	0.0%	99.5%	1.40	1.00	0.0
3.00	0.5%	100.0%	2.11	1.00	0.1
					87.7
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.3%
Predicted Net Annual Load Removal Efficiency =					81.2%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**BOSTON GLOBE
BOSTON, MA**

Area **0.82 ac**
 Weighted C **0.9**
 t_c **6 min**
 CDS Model **1515-3**

Unit Site Designation **WQU-3**
 Rainfall Station # **69**

CDS Treatment Capacity **1.0 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.03	0.03	9.2
0.06	9.4%	29.3%	0.04	0.04	8.9
0.08	7.7%	37.0%	0.06	0.06	7.2
0.10	8.6%	45.6%	0.07	0.07	7.9
0.12	6.3%	51.9%	0.09	0.09	5.7
0.14	4.7%	56.5%	0.10	0.10	4.2
0.16	4.6%	61.2%	0.12	0.12	4.1
0.18	3.5%	64.7%	0.13	0.13	3.1
0.20	4.3%	69.1%	0.15	0.15	3.8
0.25	8.0%	77.1%	0.18	0.18	6.8
0.30	5.6%	82.7%	0.22	0.22	4.6
0.35	4.4%	87.0%	0.26	0.26	3.5
0.40	2.5%	89.5%	0.30	0.30	2.0
0.45	2.5%	92.1%	0.33	0.33	1.9
0.50	1.4%	93.5%	0.37	0.37	1.0
0.75	5.0%	98.5%	0.55	0.55	3.0
1.00	1.0%	99.5%	0.74	0.74	0.5
1.50	0.0%	99.5%	1.11	1.00	0.0
2.00	0.0%	99.5%	1.48	1.00	0.0
3.00	0.5%	100.0%	2.21	1.00	0.1
					87.2
					Removal Efficiency Adjustment ² = 6.5%
					Predicted % Annual Rainfall Treated = 93.3%
					Predicted Net Annual Load Removal Efficiency = 80.7%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**BOSTON GLOBE
BOSTON, MA**

Area **0.54 ac**
 Weighted C **0.9**
 t_c **6 min**
 CDS Model **1515-3**

Unit Site Designation **WQU-4**
 Rainfall Station # **69**

CDS Treatment Capacity **1.0 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.02	0.02	9.3
0.06	9.4%	29.3%	0.03	0.03	9.0
0.08	7.7%	37.0%	0.04	0.04	7.3
0.10	8.6%	45.6%	0.05	0.05	8.1
0.12	6.3%	51.9%	0.06	0.06	5.9
0.14	4.7%	56.5%	0.07	0.07	4.3
0.16	4.6%	61.2%	0.08	0.08	4.3
0.18	3.5%	64.7%	0.09	0.09	3.2
0.20	4.3%	69.1%	0.10	0.10	3.9
0.25	8.0%	77.1%	0.12	0.12	7.1
0.30	5.6%	82.7%	0.15	0.15	4.9
0.35	4.4%	87.0%	0.17	0.17	3.7
0.40	2.5%	89.5%	0.19	0.19	2.1
0.45	2.5%	92.1%	0.22	0.22	2.1
0.50	1.4%	93.5%	0.24	0.24	1.1
0.75	5.0%	98.5%	0.36	0.36	3.7
1.00	1.0%	99.5%	0.49	0.49	0.7
1.50	0.0%	99.5%	0.73	0.73	0.0
2.00	0.0%	99.5%	0.97	0.97	0.0
3.00	0.5%	100.0%	1.46	1.00	0.1
					90.5
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.4%
Predicted Net Annual Load Removal Efficiency =					84.1%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**BOSTON GLOBE
BOSTON, MA**

Area **1.43 ac**
Weighted C **0.9**
 t_c **6 min**
CDS Model **2020-5**

Unit Site Designation **WQU-5**
Rainfall Station # **69**

CDS Treatment Capacity **2.2 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.03	0.03	9.8
0.04	9.6%	19.8%	0.05	0.05	9.2
0.06	9.4%	29.3%	0.08	0.08	9.0
0.08	7.7%	37.0%	0.10	0.10	7.3
0.10	8.6%	45.6%	0.13	0.13	8.0
0.12	6.3%	51.9%	0.15	0.15	5.8
0.14	4.7%	56.5%	0.18	0.18	4.3
0.16	4.6%	61.2%	0.21	0.21	4.2
0.18	3.5%	64.7%	0.23	0.23	3.2
0.20	4.3%	69.1%	0.26	0.26	3.9
0.25	8.0%	77.1%	0.32	0.32	7.0
0.30	5.6%	82.7%	0.39	0.39	4.8
0.35	4.4%	87.0%	0.45	0.45	3.6
0.40	2.5%	89.5%	0.51	0.51	2.1
0.45	2.5%	92.1%	0.58	0.58	2.0
0.50	1.4%	93.5%	0.64	0.64	1.1
0.75	5.0%	98.5%	0.97	0.97	3.4
1.00	1.0%	99.5%	1.29	1.29	0.6
1.50	0.0%	99.5%	1.93	1.93	0.0
2.00	0.0%	99.5%	2.57	2.20	0.0
3.00	0.5%	100.0%	3.86	2.20	0.1
					89.2
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.3%
Predicted Net Annual Load Removal Efficiency =					82.7%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**BOSTON GLOBE
BOSTON, MA**

Area **0.80 ac**
 Weighted C **0.9**
 t_c **6 min**
 CDS Model **1515-3**

Unit Site Designation **WQU-6**
 Rainfall Station # **69**

CDS Treatment Capacity **1.0 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.03	0.03	9.2
0.06	9.4%	29.3%	0.04	0.04	8.9
0.08	7.7%	37.0%	0.06	0.06	7.2
0.10	8.6%	45.6%	0.07	0.07	7.9
0.12	6.3%	51.9%	0.09	0.09	5.8
0.14	4.7%	56.5%	0.10	0.10	4.2
0.16	4.6%	61.2%	0.12	0.12	4.1
0.18	3.5%	64.7%	0.13	0.13	3.1
0.20	4.3%	69.1%	0.14	0.14	3.8
0.25	8.0%	77.1%	0.18	0.18	6.8
0.30	5.6%	82.7%	0.22	0.22	4.6
0.35	4.4%	87.0%	0.25	0.25	3.5
0.40	2.5%	89.5%	0.29	0.29	2.0
0.45	2.5%	92.1%	0.32	0.32	1.9
0.50	1.4%	93.5%	0.36	0.36	1.0
0.75	5.0%	98.5%	0.54	0.54	3.0
1.00	1.0%	99.5%	0.72	0.72	0.5
1.50	0.0%	99.5%	1.08	1.00	0.0
2.00	0.0%	99.5%	1.44	1.00	0.0
3.00	0.5%	100.0%	2.16	1.00	0.1
					87.4
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.3%
Predicted Net Annual Load Removal Efficiency =					81.0%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**BOSTON GLOBE
BOSTON, MA**

Area **0.57 ac**
 Weighted C **0.9**
 t_c **6 min**
 CDS Model **1515-3**

Unit Site Designation **WQU-7**
 Rainfall Station # **69**
 CDS Treatment Capacity **1.0 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.01	0.01	9.8
0.04	9.6%	19.8%	0.02	0.02	9.2
0.06	9.4%	29.3%	0.03	0.03	9.0
0.08	7.7%	37.0%	0.04	0.04	7.3
0.10	8.6%	45.6%	0.05	0.05	8.0
0.12	6.3%	51.9%	0.06	0.06	5.9
0.14	4.7%	56.5%	0.07	0.07	4.3
0.16	4.6%	61.2%	0.08	0.08	4.3
0.18	3.5%	64.7%	0.09	0.09	3.2
0.20	4.3%	69.1%	0.10	0.10	3.9
0.25	8.0%	77.1%	0.13	0.13	7.1
0.30	5.6%	82.7%	0.15	0.15	4.8
0.35	4.4%	87.0%	0.18	0.18	3.7
0.40	2.5%	89.5%	0.21	0.21	2.1
0.45	2.5%	92.1%	0.23	0.23	2.1
0.50	1.4%	93.5%	0.26	0.26	1.1
0.75	5.0%	98.5%	0.38	0.38	3.6
1.00	1.0%	99.5%	0.51	0.51	0.6
1.50	0.0%	99.5%	0.77	0.77	0.0
2.00	0.0%	99.5%	1.03	1.00	0.0
3.00	0.5%	100.0%	1.54	1.00	0.1
					90.2
Removal Efficiency Adjustment ² =					6.5%
Predicted % Annual Rainfall Treated =					93.4%
Predicted Net Annual Load Removal Efficiency =					83.7%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

**CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD**

**BOSTON GLOBE
BOSTON, MA**

Area **1.44 ac**
Weighted C **0.9**
 t_c **6 min**
CDS Model **2020-5**

Unit Site Designation **WQU-8**
Rainfall Station # **69**

CDS Treatment Capacity **2.2 cfs**

<u>Rainfall Intensity¹</u> <u>(in/hr)</u>	<u>Percent Rainfall Volume¹</u>	<u>Cumulative Rainfall Volume</u>	<u>Total Flowrate (cfs)</u>	<u>Treated Flowrate (cfs)</u>	<u>Incremental Removal (%)</u>
0.02	10.2%	10.2%	0.03	0.03	9.8
0.04	9.6%	19.8%	0.05	0.05	9.2
0.06	9.4%	29.3%	0.08	0.08	9.0
0.08	7.7%	37.0%	0.10	0.10	7.3
0.10	8.6%	45.6%	0.13	0.13	8.0
0.12	6.3%	51.9%	0.16	0.16	5.8
0.14	4.7%	56.5%	0.18	0.18	4.3
0.16	4.6%	61.2%	0.21	0.21	4.2
0.18	3.5%	64.7%	0.23	0.23	3.2
0.20	4.3%	69.1%	0.26	0.26	3.9
0.25	8.0%	77.1%	0.32	0.32	7.0
0.30	5.6%	82.7%	0.39	0.39	4.8
0.35	4.4%	87.0%	0.45	0.45	3.6
0.40	2.5%	89.5%	0.52	0.52	2.1
0.45	2.5%	92.1%	0.58	0.58	2.0
0.50	1.4%	93.5%	0.65	0.65	1.1
0.75	5.0%	98.5%	0.97	0.97	3.4
1.00	1.0%	99.5%	1.30	1.30	0.6
1.50	0.0%	99.5%	1.94	1.94	0.0
2.00	0.0%	99.5%	2.59	2.20	0.0
3.00	0.5%	100.0%	3.89	2.20	0.1
					89.1
					Removal Efficiency Adjustment ² = 6.5%
					Predicted % Annual Rainfall Treated = 93.3%
					Predicted Net Annual Load Removal Efficiency = 82.7%

1 - Based on 10 years of hourly precipitation data from NCDC Station 770, Boston WSFO AP, Suffolk County, MA

2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.



Appendix F: Operation and Maintenance Plan

**135 Morrissey Boulevard
Stormwater Management System**

**Operation and Maintenance Plan (O&M)
and
Long Term Pollution Prevention Plan (LTPPP)**

May 2018

This Stormwater Management System Operation and Maintenance Plan provides for the inspection and maintenance of structural Best Management Practices (BMPs) and for measures to prevent pollution associated with the 135 William T Morrissey Boulevard Project in Boston, MA.

This document has been prepared in accordance with the requirements of the Stormwater Regulations included in the Massachusetts Wetlands Protection Act Regulations (310 CMR 10).

Stormwater Management System Owner:

**135 Morrissey Owner LLC
c/o Nordblom Company
Attn.: Todd Fremont-Smith
71 Third Avenue
Burlington, MA 01803
Tel.: (781) 272-4000**

The stormwater management system will be maintained properly to assure its continued performance, as follows.

1. Catch basins and area drains
 - a. Inspect quarterly (January, April, July, October)
 - b. Clean 4 times per year or when deposits reach ½ the depth of the sump
2. Subsurface Infiltration Systems
 - a. Inspect every 6 months and after every major storm event, remove debris
 - b. Remove any debris that may clog system.
 - c. Remove sediment if depth reaches 3 inches.
3. Water Quality Units

Follow manufacturer's recommendations, general requirements include:

 - a. Inspect twice a year (spring and fall) minimum and after major storm events
 - b. System should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when appreciable level of hydrocarbons and trash has accumulated.

- c. Cleaning should be done during dry weather. Use of a vacuum truck is most effective to clean the sump. Absorbent pads are recommended to remove oil or other hydrocarbon layer. Trash and debris can be netted out. The screen should be cleaned of trash and debris.
- 4. Semi-annually (generally May and November)
 - a. Street sweeping

Practices for Long Term Pollution Prevention

Litter Pick-up

The Owner will conduct litter pick-up from the stormwater management facilities in conjunction with routine maintenance activities.

Routine Inspection and Maintenance of Stormwater BMPs

The Owner will conduct inspection and maintenance of the stormwater management practices in accordance with the guidelines discussed above.

Maintenance of Landscaped Areas

The Owner shall minimize use of fertilizers, herbicides, and pesticides for the maintenance of facilities covered by this plan.

Snow and Ice Management

Snow shall not be plowed to the back of the site where it could melt and flow untreated into Pattens Cove.

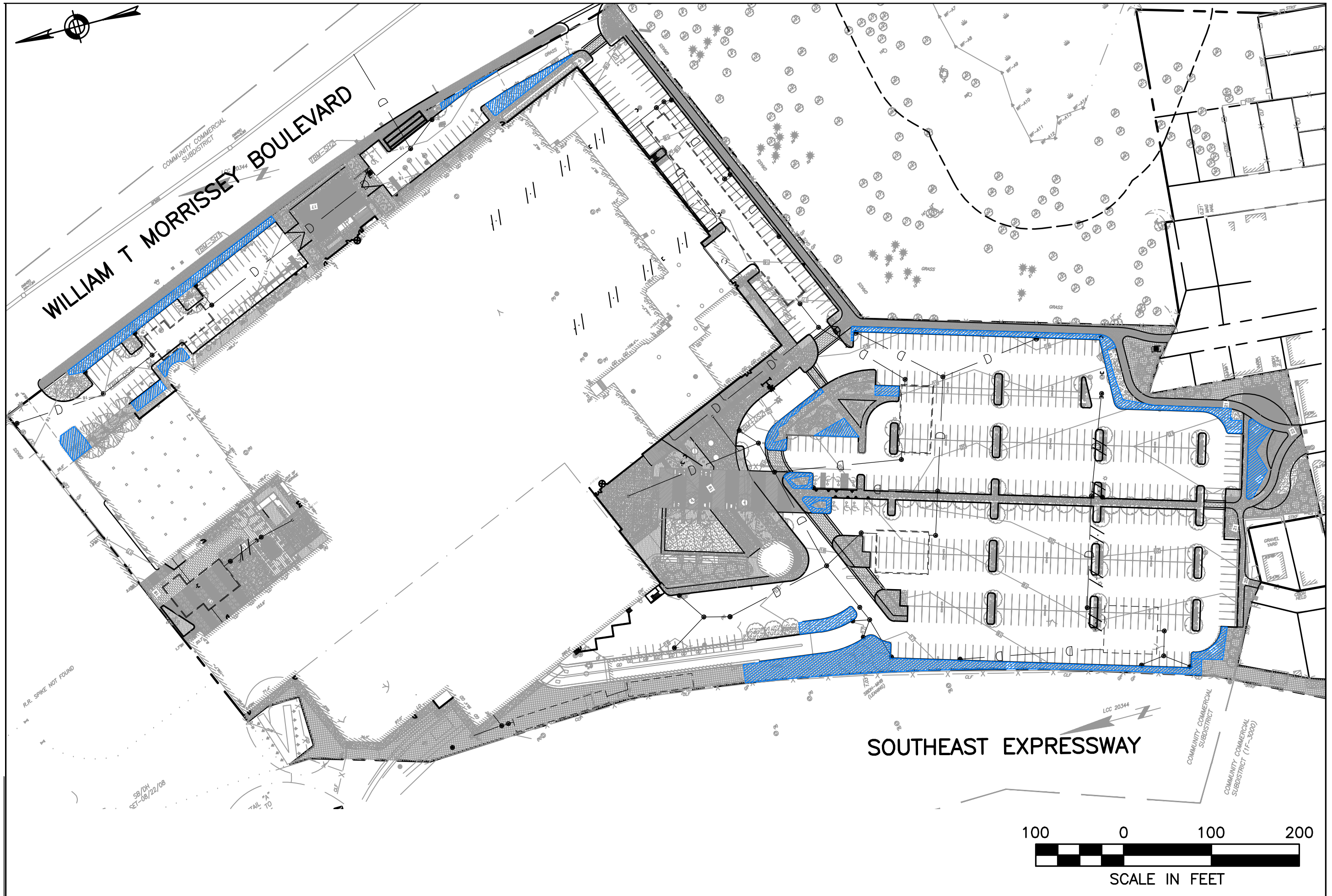
Prohibition of Illicit Discharges

The DEP Stormwater Management Standards prohibit illicit discharges to the storm water management system. Illicit discharges are discharges that do not entirely consist of stormwater, except for certain specified non-stormwater discharges.

Discharges from the following activities are not considered illicit discharges:

- | | |
|---|---|
| firefighting | foundation drains |
| water line flushing | footing drains |
| landscape irrigation | individual resident car washing |
| uncontaminated groundwater | flows from riparian habitats and wetlands |
| potable water sources | dechlorinated water from swimming pools |
| water used to clean residential buildings | water used for street washing |
| without detergents | air conditioning condensation |

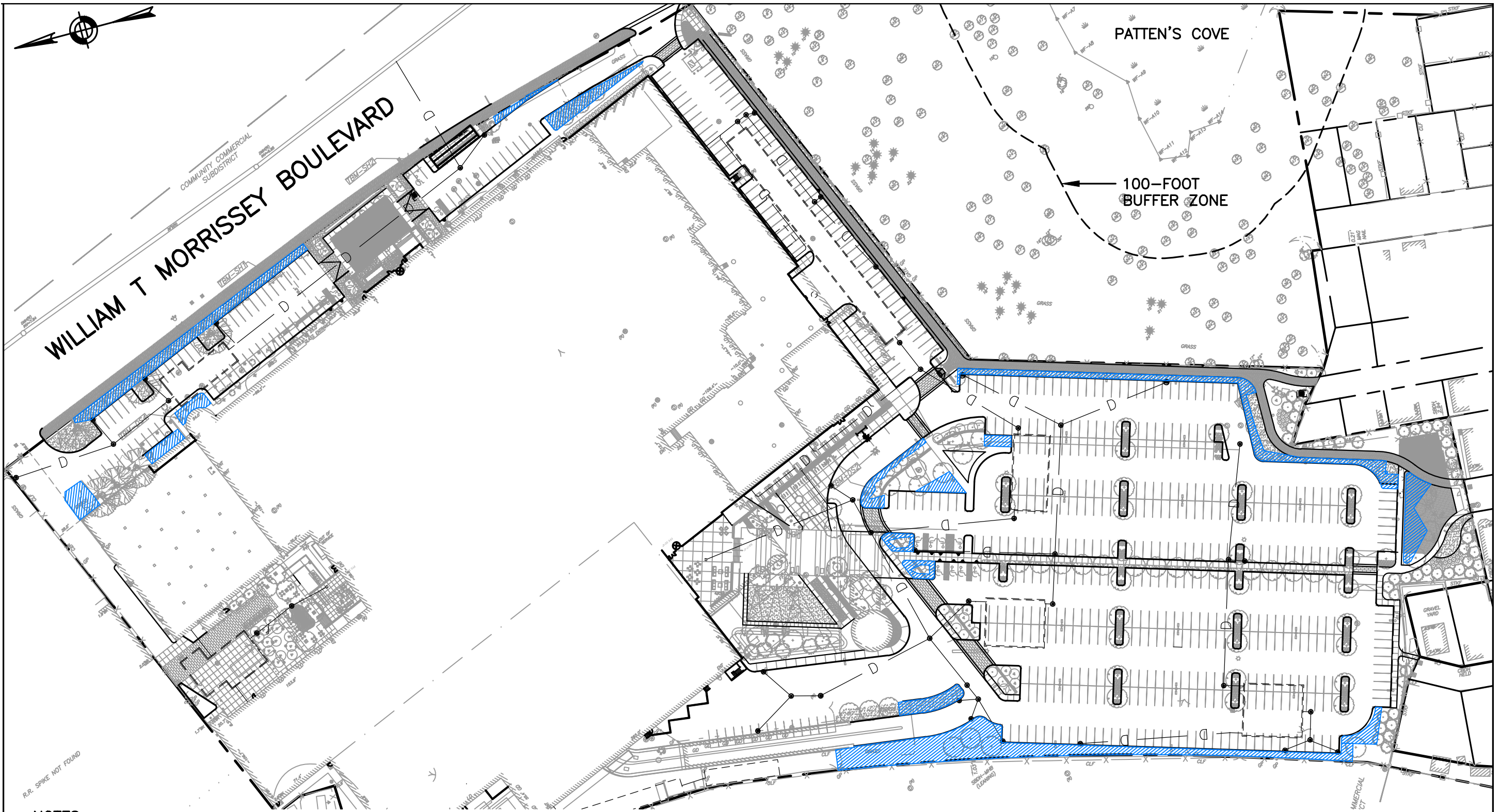
There are no known or proposed illicit connections associated with this project.



SNOW STORAGE
135 MORRISSEY BOULEVARD

HOWARD STEIN HUDSON
 11 Beacon Street, Suite 1010
 Boston, MA 02108
 www.hshassoc.com

FIGURE
S.1




- NOTES:**
1. KEEP STORM DRAIN INLETS CLEAR.
 2. SNOW DISPOSAL SITES MUST BE AT UPLAND LOCATIONS THAT DRAIN TO THE STORMWATER MANAGEMENT SYSTEM OR HAVE A 50-FOOT VEGETATIVE BUFFER STRIP
 3. DEBRIS SHOULD BE CLEARED AND PROPERLY DISPOSED OF AT THE END OF THE SNOW SEASON AND NO LATER THAN MAY 15.

 SNOW STORAGE AREA



**SNOW STORAGE
135 MORRISSEY BOULEVARD**


HOWARD STEIN HUDSON
11 Beacon Street, Suite 1010
Boston, MA 02108
www.hshassoc.com

**FIGURE
S.1**



Appendix G: Illicit Discharge Compliance Statement

Illicit Discharge Compliance Statement

To the best of my knowledge, belief and information the stormwater management system servicing 135 William T Morrissey Boulevard, Boston, Massachusetts will not receive illicit discharges, including wastewater discharges or stormwater contaminated by contact with process wastes, raw materials, toxic pollutants, or hazardous substances.

The stormwater management and conveyance systems are shown on the plans entitled "Grading & Utilities Plan" prepared by Howard Stein Hudson and included with the Notice of Intent submittal.

Applicant: **135 Morrissey Owner LLC**
c/o Nordblom Development Company, Inc.

Signature: _____



Todd Fremont-Smith
Authorized Representative

Address: 71 Third Avenue
Burlington, MA 01803

Tel.: (781) 272-4000