DRAINAGE REPORT

For

PROPOSED
Early Education Facility

739 Pleasant Street
Weymouth, Massachusetts
Norfolk County

Prepared by:

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BOHLER

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I. EXECUTIVE SUMMARY

This report examines the changes in drainage that can be expected as the result of the development of a proposed early education childcare facility at 739 Pleasant Street in the Town of Weymouth, Massachusetts. The site, which contains approximately 2.44 acres of land, is a lot with a residential 2-story frame building, sheds, associated driveways, and is mostly undeveloped with grassed and wooded areas. The proposed site will meet MassDEP Stormwater Handbook and Town of Weymouth Stormwater Management Plan requirements.

The proposed project includes the construction of a new 16,200± sf freestanding Gardner School early education facility with new paved parking areas, landscaping, stormwater management components, and associated utilities. This report addresses a comparative analysis of the pre- and post-development site runoff conditions. Additionally, this report provides calculations documenting the design of the proposed stormwater conveyance/management system as illustrated within the accompanying Site Development Plans prepared by Bohler. The project will also provide erosion and sedimentation controls during the demolition and construction periods, as well as long term stabilization of the site.

For the purposes of this analysis the pre- and post-development drainage conditions were analyzed at four (4) "design points" where stormwater runoff currently drains to under existing conditions. These design points are described in further detail in **Section II** below. A summary of the existing and proposed conditions peak runoff rates for the 2-, 10-, 25-, and 100-year storms can be found in **Table 1.1** below. In addition, the project has been designed to meet or exceed the Stormwater Management Standards as detailed herein.

Table 1.1: Design Point Peak Runoff Rate Summary

Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP1	0.20	0.28	**0.08****	1.37	0.69	**-0.68**	2.42	0.98	**-1.44**	4.29	1.46	**-2.83**
DP2	0.08	0.08	**0.00**	0.76	0.63	**-0.13**	1.40	1.09	**-0.31**	2.56	1.93	**-0.63**
DP3	0.00	0.00	**0.00**	0.02	0.01	**-0.01**	0.06	0.03	**-0.03**	0.18	0.11	**-0.07**
DP4	0.22	0.14	**-0.08**	0.52	0.31	**-0.21**	0.72	0.42	**-0.30**	1.04	0.60	**-0.44**

**Flows are represented in cubic feet per second (cfs)*

** increase is considered *de minimus* and is a result of HydroCAD hydrologic modelling in which an area (P-1) is decreasing in size but increasing in curve number.

Table 1.2: Design Point Volume Summary

Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP1	0.037	0.022	**-0.015**	0.129	0.051	**-0.078**	0.204	0.071	**-0.133**	0.339	0.106	**-0.233**
DP2	0.018	0.016	**-0.002**	0.071	0.055	**-0.016**	0.115	0.087	**-0.028**	0.195	0.170	**-0.025**
DP3	0.000	0.000	**0.000**	0.02	0.002	**-0.018**	0.009	0.006	**-0.003**	0.018	0.012	**-0.006**
DP4	0.018	0.010	**-0.008**	0.039	0.022	**-0.017**	0.054	0.031	**-0.023**	0.079	0.044	**-0.055**

**Volumes are represented in acre-feet (ac-ft)*

II. EXISTING SITE CONDITIONS

Existing Site Description

The site consists of approximately 2.44 acres of land located along Pleasant Street in the Town of Weymouth, Massachusetts. The site currently has a single 2-story frame residential building with a few sheds with grassed and wooded areas. Slopes along the site vary from approximately 3% to 50%, from the dirt paths to various hilled areas located onsite. The existing impervious area is approximately 0.09 acres.

On-Site Soil Information

Soils within the analyzed area consist of the following as classified by the Natural Resource Conservation Service (NRCS):

Table 2.1: Existing Soil Information

Soil Unit Symbol	Soil Name / Description	Hydrologic Soil Group (HSG)
51	Swansea Muck	B/D
103B	Charlton-Hollis-Rock outcrop complex	A
602	Urban Land	N/A

Onsite soil testing was performed by Whitestone Associates, inc. on 5/26/2023, 5/30/2023, 5/31/2023, and 7/31/2023 and was reported in their Report of Geotechnical Investigation issued June 26, 2023, and their Supplemental Report of Geotechnical Investigation issued August 16, 2023. Refer to **Appendix C** for additional information.

Existing Collection and Conveyance

The northeastern portions of the site drain to the north east towards wetlands. The northwest portion of the site drain towards Pleasant Street and is collected into the municipal drainage

system. The southwest portion of the site drains towards the abutting property. The southeast portion of the property drains towards the southeastern abutting property. The slopes on site vary from approximate 3% to 50%. Elevations on site range from 103 to 82 at Pleasant Street to the northwest of the site.

Existing Watersheds and Design Point Information

For the purposes of this analysis, the pre- and post-development drainage conditions were analyzed at four (4) "design points" as described below where stormwater runoff currently drains to under existing conditions. The existing site was subdivided into four (4) separate sub catchments, as described below, to analyze existing and proposed flow rates at each design point. The minimum time of concentration for all proposed areas is calculated as 6 minutes (0.1 hr).

Design Point #1 (DP1) is the municipal drainage system in Pleasant Street. Under existing conditions, this design point receives stormwater flows from approximately 1.46 acres of land, designated as watershed "E1". Refer to Table 2.1 below for additional detail.

Design Point #2 (DP2) is the existing wetlands/basin to the northeast of the site. Under existing conditions, this design point receives stormwater flows from approximately 0.91 acres of land, designated as watershed "E2". Refer to Table 2.1 below for additional detail.

Design Point #3 (DP3) is the existing wetlands/basin to the northeast of the site. Under existing conditions, this design point receives stormwater flows from approximately 0.15 acres of land, designated as watershed "E3". Refer to Table 2.1 below for additional detail.

Design Point #4 (DP2) is the southeast abutter. Under existing conditions, this design point receives stormwater flows from approximately 0.20 acres of land, designated as watershed "E4". Refer to Table 2.1 below for additional detail.

Table 2.2: Existing Sub-Catchment Summary

Sub-catchment Name	Total Area (acres)	Cover Description	Curve Number (CN)	Time of Concentration (Tc, minutes)
E1	1.42±	Rooftops, paved parking, grass, gravel, woods	55	7.5
E2	0.96±	Paved parking, grass, woods, gravel	53	6.0
E3	0.15±	Rooftops, paved parking, gravel, grass, woods	42	7.9
E4	0.20±	Gravel, grass, woods	73	7.4

Refer to **Table 1.1, 1.2, and 5.1** for the existing conditions peak rates of runoff. Refer to **Appendix D** and the Drainage Area Maps in the appendices of this report for a graphical representation of the existing drainage areas.

III. PROPOSED SITE CONDITIONS

Proposed Development Description

The proposed project includes the construction of a new 16,200± sf freestanding childcare facility along with new paved parking areas, landscaping, stormwater management components, and associated utilities. The site, including the proposed parking areas, has been designed to flow to deep sump catch basins. The catch basins will capture and convey the stormwater runoff via an underground pipe system to a proposed at-grade infiltration basin. Pretreatment of stormwater runoff will be provided by the deep sump catch basins and a sediment forebay. Runoff from the rooftop has been designed to flow to a separate infiltration basin. The total proposed impervious area on site is approximately 1.13 acres.

Proposed Development Collection and Conveyance

Deep sump hooded catch basins are proposed to collect and route runoff from the paved parking areas to the proposed surface basin. Pipes have been designed for the 25-year storm using the Rational Method. Pipe and outlet protection sizing calculations are included in **Appendix F**.

Proposed Watersheds and Design Point Information

The project has been designed to maintain existing drainage watersheds to the greatest extent possible, with the same design points described in **Section II** above. The site was subdivided into four (4) separate sub catchments for the proposed conditions as described below. The minimum time of concentration for all proposed areas is calculated as 6 minutes (0.1 hr).

Under proposed conditions DP#1 receives stormwater flows from approximately 0.28 acres of land, designated as watershed “P-1.” Refer to Table 3.1 below for additional detail.

Under proposed conditions DP#2 receives stormwater flows from approximately 2.21 acres of land, designated as watersheds “P-R,” “P-2”, “P-2A”, and “P-2B.” Refer to Table 3.1 below for additional detail.

Under proposed conditions DP#3 receives stormwater flows from approximately 0.13 acres of land, designated as watershed “P-3.” Refer to Table 3.1 below for additional detail.

Under proposed conditions DP#4 receives stormwater flows from approximately 0.11 acres of land, designated as watershed "P-4." Refer to Table 3.1 below for additional detail.

Table 3.1: Proposed Sub-catchment Summary

Sub-catchment Name	Total Area (acres)	Cover Description	Curve Number (CN)	Time of Concentration (Tc, minutes)	Hydrologic Routing
P-1	0.28±	Paved parking, grass	70	6.0	DP1
P-R	0.37±	Rooftops	98	6.0	Basin #2 / Basin #1 / DP2
P-2A	0.34±	Paved parking, woods, water surface, grass	80	6.0	Basin #2 / Basin #1 / DP2
P-2B	0.87±	Paved parking, woods, grass	83	6.0	Basin #1 / DP2
P-2	0.63±	Grass, Paved parking, woods	55	6.0	DP2
P-3	0.13±	Woods, paved parking, grass	39	6.0	DP3
P-4	0.11±	Grass, Woods	74	6.0	DP4

Refer to **Table 1.1, 1.2, and 5.1** for the calculated proposed conditions peak rates of runoff and volumes. For additional hydrologic information, refer to **Appendix D** and the Drainage Area Maps in the appendices of this report for a graphical representation of the proposed drainage areas.

IV. METHODOLOGY

Peak Flow Calculations

Methodology utilized to design the proposed stormwater management system includes compliance with the guidelines set forth in the latest edition of the Massachusetts DEP Stormwater Handbook. The pre- and post-development runoff rates being discharged from the site were computed using the HydroCAD computer program. The drainage area and outlet information were entered into the program, which routes storm flows based on NRCS TR-20 and TR-55 methods. The other components of the model were determined following standard NRCS procedures for Curve Numbers (CNs) and times of concentrations documented in the appendices of this report. The rainfall data utilized and listed below in table 4.1 below for stormwater calculations is based on NOAA Atlas 14. Refer to **Appendix F** for more information.

Table 4.1: NOAA Atlas 14 Rainfall Intensities

Frequency	2 year	10 year	25 year	100 year
Rainfall* (inches)	3.36	5.16	6.27	8.00

*Values derived from NOAA ATLAS 14 on 07/18/2023

The proposed stormwater management as designed will provide a decrease in peak rates of runoff from the proposed facility for the 2-, 10-, 25- and 100-year design storm events. Additionally, the proposed project meets, or exceeds, the MADEP Stormwater Management standards. Compliance with these standards is described further below.

V. STORMWATER MANAGEMENT STANDARDS

Standard #1: No New Untreated Discharges

The project has been designed so that proposed impervious areas (including the building roof and paved parking/driveway areas) will be collected and passed through the proposed drainage system for treatment prior to discharge.

Standard #2: Peak Rate Attenuation

As outlined in **Table 1.1** and **Table 6.1**, the development of the site and the proposed stormwater management system, have been designed so that post-development peak rates of runoff are at or below pre-development conditions for the 2-, 10-, 25- and 100-year storm events at all design points.

Standard #3: Recharge

The stormwater runoff from the project will be collected and diverted to a proposed infiltration basin. The project as proposed will involve the creation of approximately 45,300 square feet of new impervious area and is required to infiltrate 2,371 cubic feet of stormwater as defined in Stormwater Standard 3. The proposed infiltration basins will provide 6,228 cubic feet of volume below the lowest outlets for groundwater recharge. Refer to **Appendix F** of this report for calculations documenting required and provided recharge volumes.

The DEP Stormwater Standards require that the infiltration BMP drains completely within 72 hours of the end of the storm event. Calculations showing that the proposed infiltration basin #1 will drain within 3.3 hours, and that the proposed basin #2 will drain within 1.4 hours are included in **Appendix F** of this report.

A four (4) foot separation to estimated seasonal high groundwater is provided to Basin #1 and a groundwater mounding analysis is not required. Basin #2 will be more than two feet, but less than four feet above the estimated seasonal high groundwater elevation. However, based on the very well-drained nature of the site soils, the calculated drawdown time of 1.4 hours, and the lack of any sensitive receptors in the vicinity of the basin (no wetlands, no building basements), it is clear that groundwater mounding is not an issue for this basin.

Standard #4: Water Quality

Water quality treatment is provided via deep sump catch basins, a sediment forebay, and two (2) infiltration basins. TSS removal calculations are included in **Appendix F** of this report. The project as proposed will involve the creation of 45,300 square feet of new impervious area and is required to treat 1,888 cubic feet of water quality volume as defined in Stormwater Standard 4. The proposed infiltration basins provide 6,228 cubic feet of water quality volume below the lowest outlet for water quality treatment. Refer to **Appendix F** of this report for calculations documenting required and provided water quality volumes.

Standard #5: Land Use with Higher Potential Pollutant Loads

Not Applicable for this project.

Standard #6: Critical Areas

Not Applicable for this project.

Standard #7: Redevelopment

The project is a mix of redevelopment and new development and has been designed as if new development.

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

The proposed project will provide construction period erosion and sedimentation controls as indicated within the site plan set provided for this project. This includes a proposed construction exit, protection for stormwater inlets, protection around temporary material stock piles and various other techniques as outlined on the erosion and sediment control sheets. Additionally, the project is required to file a Notice of Intent with the US EPA and implement a Stormwater Pollution Prevention Plan (SWPPP) during the construction period. The SWPPP will be prepared prior to the start of construction and will be implemented by the site contractor under the guidance and responsibility of the project's proponent.

Standard #9: Operation and Maintenance Plan (O&M Plan)

An Operation and Maintenance (O&M) Plan for this site has been prepared and is included in **Appendix G** of this report. The O&M Plan outlines procedures and time tables for the long term operation and maintenance of the proposed site stormwater management system, including initial

inspections upon completion of construction, and periodic monitoring of the system components, in accordance with established practices and the manufacturer's recommendations. The O&M Plan includes a list of responsible parties and an estimated budget for inspections and maintenance.

Standard #10: Prohibition of Illicit Discharges

The proposed stormwater system will only convey allowable non-stormwater discharges (firefighting waters, irrigation, air conditioning condensates, etc.) and will not contain any illicit discharges from prohibited sources. An Illicit Discharge Statement is included in **Appendix G** of this report.

VI. SUMMARY

In summary, the proposed stormwater management system illustrated on the drawings prepared by Bohler results in a reduction in peak rates of runoff from the subject site when compared to pre-development conditions for the 2-, 10-, 25- and 100-year storm frequencies. In addition, the proposed best management practices will result in an effective removal of total suspended solids from the post-development runoff. The pre-development versus post-development stormwater discharge comparison is contained in **Table 5.1** below:

Table 5.1: Design Point Peak Runoff Rate Summary

Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP1	0.20	0.28	**0.08****	1.37	0.69	**-0.68**	2.42	0.98	**-1.44**	4.29	1.46	**-2.83**
DP2	0.08	0.08	**0.00**	0.76	0.63	**-0.13**	1.40	1.09	**-0.31**	2.56	1.93	**-0.63**
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DP4	0.22	0.14	**-0.08**	0.52	0.31	**-0.21**	0.72	0.42	**-0.30**	1.04	0.60	**-0.44**

**Flows are represented in cubic feet per second (cfs)*

** increase is considered *de minimus* and is a result of HydroCAD hydrologic modelling in which an area (P-1) is decreasing in size but increasing in curve number.

Table 6.2: Design Point Volume Summary

Point of Analysis	2-Year Storm			10-Year Storm			25-Year Storm			100-Year Storm		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
DP1	0.037	0.022	**-0.015**	0.129	0.051	**-0.078**	0.204	0.071	**-0.133**	0.339	0.106	**-0.233**
DP2	0.018	0.016	**-0.002**	0.071	0.055	**-0.016**	0.115	0.087	**-0.028**	0.195	0.170	**-0.025**
DP3	0.000	0.000	**0.000**	0.02	0.002	**-0.018**	0.009	0.006	**-0.003**	0.018	0.012	**-0.006**
DP4	0.018	0.010	**-0.008**	0.039	0.022	**-0.017**	0.054	0.031	**-0.023**	0.079	0.044	**-0.055**

**Volumes are represented in acre-feet (ac-ft)*

As outlined in the tables above, the proposed stormwater management system as designed will provide a decrease in peak rates of runoff from the proposed facility for the 2-, 10-, 25- and 100-year storm events. Additionally, the project meets or exceeds the MADEP Stormwater Management Standards as described further herein.

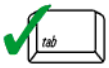
APPENDIX A: MASSACHUSETTS STORMWATER MANAGEMENT CHECKLIST

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

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

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

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

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

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

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

10/05/2023

Signature and Date

Checklist

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

☐ New development

☐ Redevelopment

☒ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

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

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

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

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

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

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

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

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

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

Standard 4: Water Quality

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

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

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

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

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

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

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

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

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

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

☐ All exposure has been eliminated.

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

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

Standard 6: Critical Areas

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

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

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

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

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

Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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

Standard 9: Operation and Maintenance Plan

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

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

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

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

Standard 10: Prohibition of Illicit Discharges

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

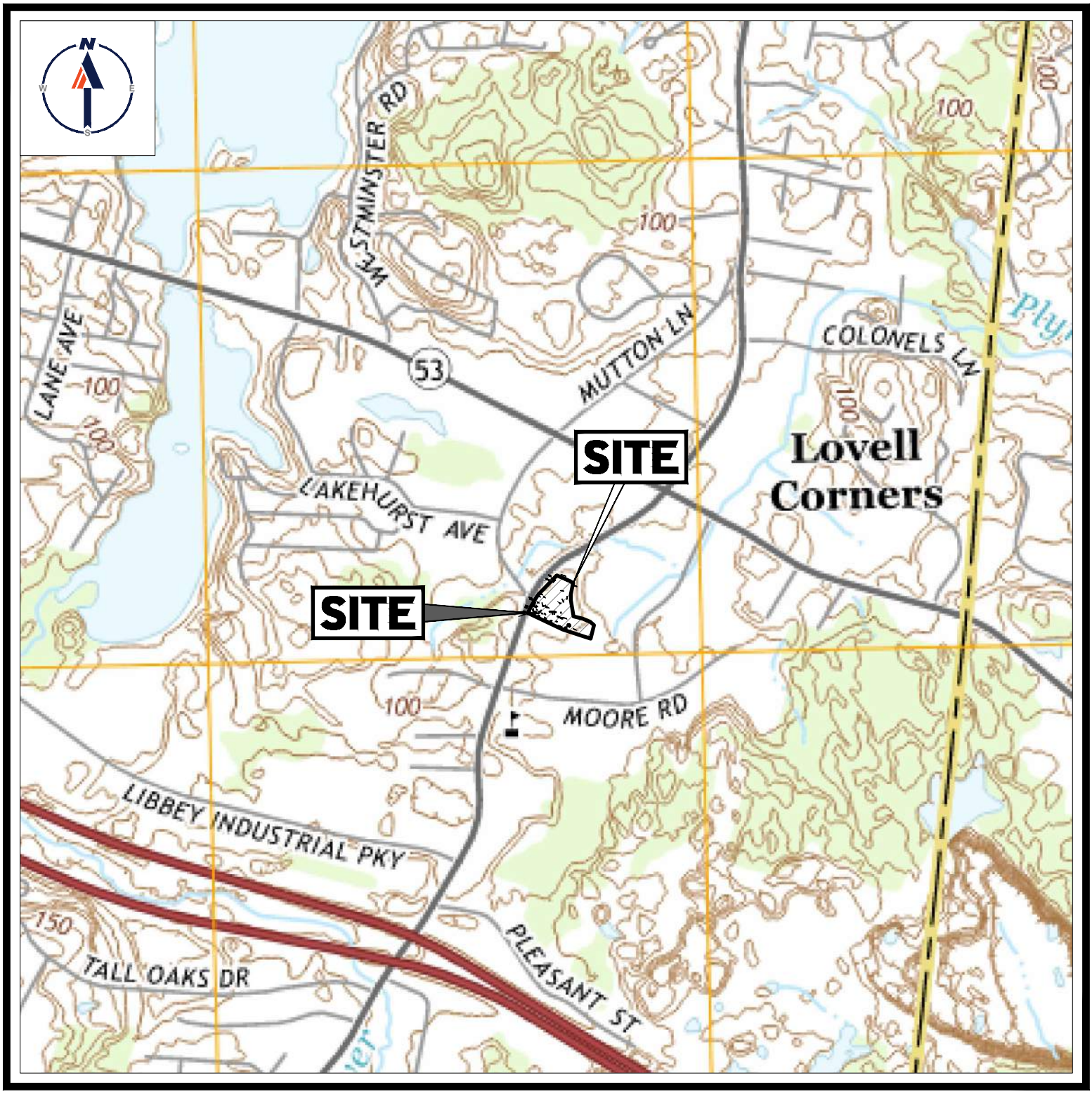
☐ An Illicit Discharge Compliance Statement is attached;

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

APPENDIX B: PROJECT LOCATION MAPS

- *USGS MAP*
- *FEMA FIRMETTE*

APPENDIX B:

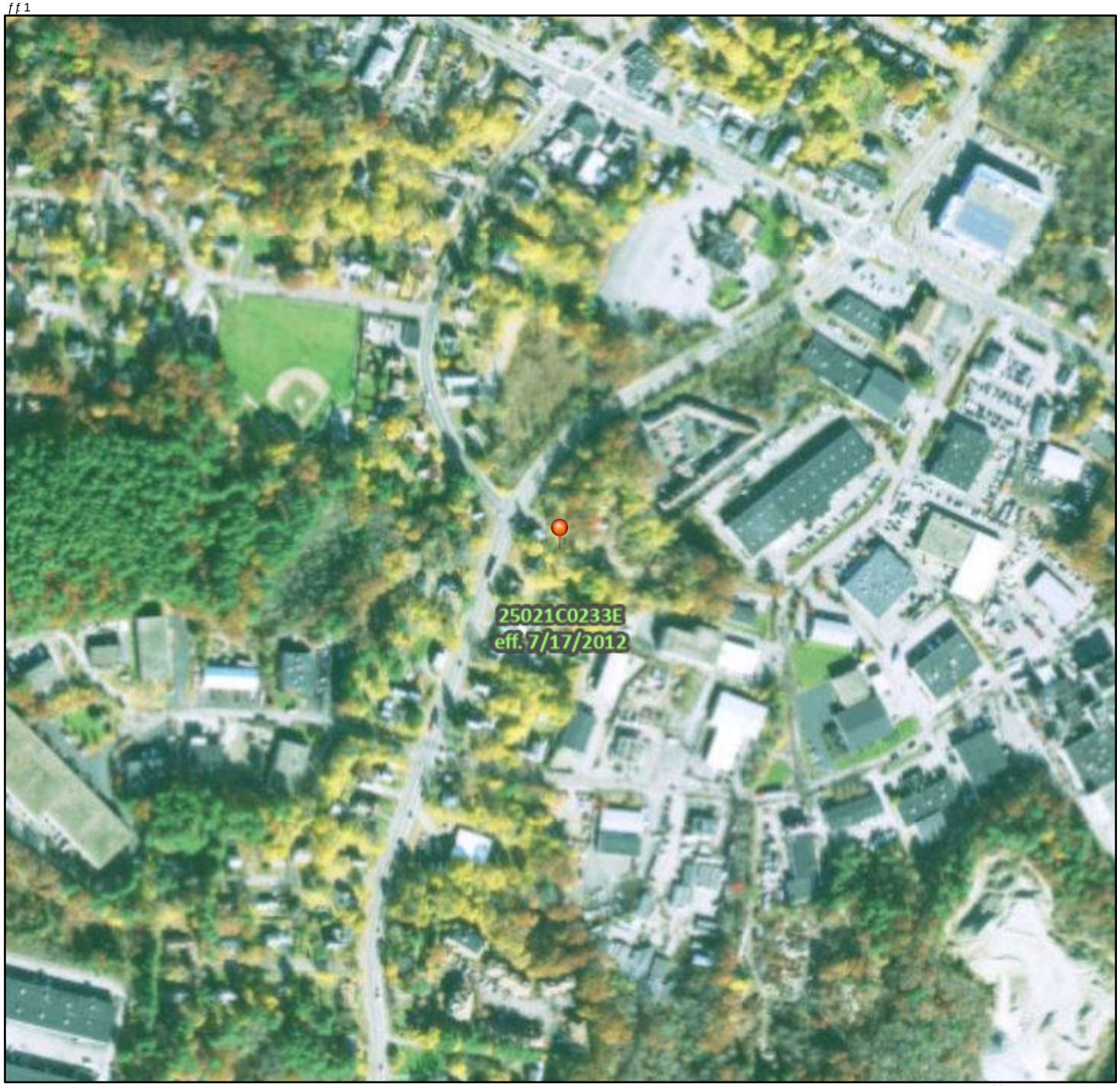


USGS MAP

SCALE: 1" = 1,000'
SOURCE: USGS WEYMOUTH MA
QUADRANGLE 2015

1DWLRQDO)ORRG+D]DUG'DWD)ORZ6WXG\

FEMA



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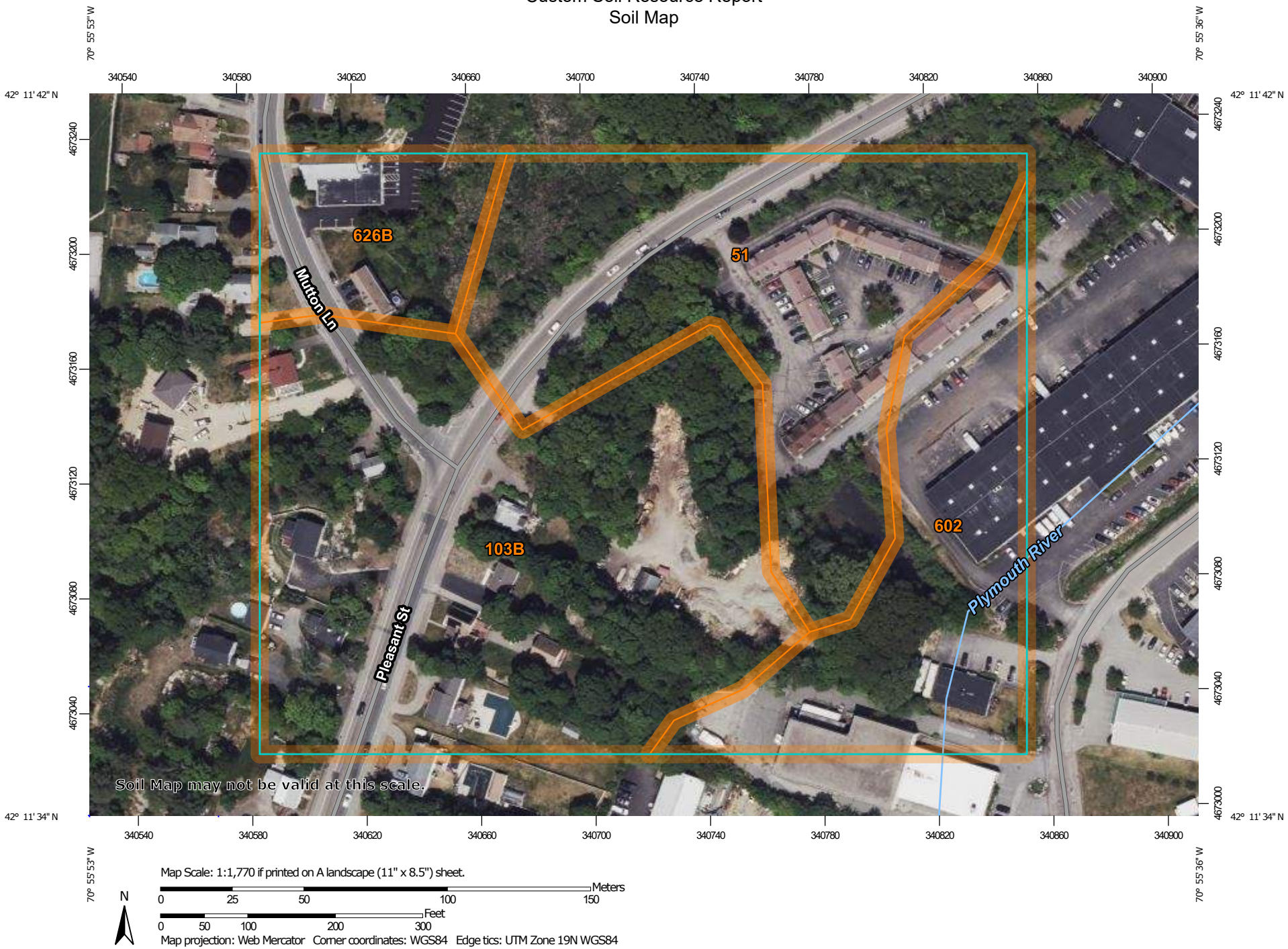
APPENDIX C: SOIL AND WETLAND INFORMATION

- *NCRS CUSTOM SOIL RESOURCE REPORT*
- *REPORT OF GEOTECHNICAL INVESTIGATION*
- *STORMWATER INFILTRATION TESTING*
- *SOIL AND PERCOLATION TESTING*
- *WETLAND/WATERCOURSES REPORT*

Custom Soil Resource Report
Soil Map



Map Scale: 1:1,770 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 25 50 100 150

Feet: 0 50 100 200 300

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

MAP 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 18, Sep 9, 2022

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

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

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
51	Swansea muck, 0 to 1 percent slopes	4.1	29.8%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	6.0	43.3%
602	Urban land, 0 to 15 percent slopes	2.6	18.7%
626B	Merrimac-Urban land complex, 0 to 8 percent slopes	1.1	8.2%
Totals for Area of Interest		**13.9**	**100.0%**

Map Unit Descriptions

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

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

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

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

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

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

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

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

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

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

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

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

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SUPPLEMENTAL REPORT OF GEOTECHNICAL INVESTIGATION

PROPOSED CHILDCARE FACILITY
739 PLEASANT STREET
MAP 35, BLOCK 446, LOT 3
WEYMOUTH, NORFOLK COUNTY, MASSACHUSETTS

Prepared for:

INSITE DEVELOPMENT SERVICES, LLC
1400 Sixteenth Street
Suite 300
Oak Brook, Illinois 60523

Prepared by:

WHITESTONE ASSOCIATES, INC.
352 Turnpike Road
Suite 105
Southborough, Massachusetts 01772

Richard W.M. McLaren, P.E.
Senior Consultant

Ryan R. Roy, P.E.
Vice President

Whitestone Project No.: GM2320513.001
August 16, 2023

explorations were backfilled with excavated materials generated from the investigation. Boring and bedrock probe locations are shown on the *Test Location Plan* included as Figure 1. The boring *Records of Subsurface Exploration* are provided in Appendix A. The bedrock probe details are tabulated in Section 4.1 of this report.

Field exploration also consisted of initially excavating six test pits, identified as TP-1 through TP-6, then two additional test pits, identified as TP-7 and TP-8, with a John Deere 60G compact excavator to depths of 6.5 fbgs to 10 fbgs. A Massachusetts Title 5 Licensed Soil Evaluator (SE #14233) observed the excavation of selected test pits and groundwater conditions encountered. The test pits subsequently were backfilled to the surface with excavated soils from the investigation after observing soil conditions and conducting infiltration testing. The locations of the test pits are shown on the accompanying *Test Location Plan* included as Figure 1. *Records of Subsurface Exploration* for the test pits are provided in Appendix A.

Test locations were based on project information provided to Whitestone at the time of the investigation, including the InSite *Property Plan*. The locations of the explorations were adjusted to meet field access conditions. The subsurface tests were conducted in the presence of a Whitestone representative, who conducted field tests, recorded visual classifications, and collected samples of the various strata encountered. The tests were located in the field using phone-based GPS and aerial images. These locations are presumed to be accurate to the degree implied by the method used (+/- 20 feet).

Soil borings and Standard Penetration Tests (SPTs) were conducted in general accordance with ASTM International (ASTM) designation D1586. The Standard Penetration Resistance value (N) can be used as an indicator of the consistency of fine-grained soils and the relative density of coarse-grained soils. The N-value for various soil types can be correlated with the engineering behavior of earthworks and foundations.

Groundwater level observations, where encountered, were recorded during and immediately after the completion of field operations prior to backfilling test locations. Seasonal variations, temperature effects, and recent rainfall conditions may influence the levels of the groundwater and observed levels will depend on the permeability of the soils. Groundwater elevations derived from sources other than seasonally observed groundwater monitoring wells may not be representative of true groundwater levels.

2.3.2 Infiltration Testing

Test pits TP-2, TP-3, TP-7, and TP-8 were advanced to depths of 6.5 fbgs to 10 fbgs to evaluate soil conditions prior to infiltration testing. Infiltration tests I-1 through I-5 were conducted as falling head tests in cased holes at the locations shown on the *Test Location Plan*. PVC casing, two inches in diameter, was installed to the depths tabulated below. The soil was pre-soaked for approximately two hours. A thin layer of clean sand was placed in the bottom of the casing. Following testing, the casings were removed. The results are tabulated below.

SUMMARY OF INFILTRATION TESTING				
Location	**Approximate Ground Elevation (ft)**	**Test Depth (fbgs)**	**Approximate Test Elevation (ft)**	**Infiltration Rate (in/hr)**
I-1 (TP-2)	92	4.9	87.1	>10
I-2 (TP-3)	92.5	5.3	87.2	>10
I-3 (TP-7)	90	4.4	85.6	>10
I-4 (TP-8)	89	5.8	83.2	>10
I-5 (TP-8)	89	1.5	87.5	7

The measured high infiltration rates are for the relatively clean glaciofluvial sand. The glacial till, which closely underlies the glaciofluvial deposit, is significantly less permeable and will represent a confining layer for infiltration. If portions of the proposed systems are within or just above the glacial till soils infiltration values that are an order of magnitude lower should be used. Because of the glacial till a site-specific mounding analysis should be completed to fully evaluate the effects of the infiltration system. The bottom of the proposed SWM basin in this area is at elevation 83 feet above NAVD. Possible bedrock was encountered a few feet above this level in the test pits.

Typically, a Factor of Safety (FoS) is applied to measured infiltration rates to account for siltation and consolidation of soil below the systems over time. Safety factors used should consider how critical the systems are to the development and the available storage. If the system is critical or storage limited, a higher FoS should be applied. Infiltration rates are variable and dependent on test depth and stratification.

2.3.3 Laboratory Testing

Laboratory testing was conducted to determine additional, pertinent engineering characteristics of representative samples of on-site soils. The laboratory testing was conducted in general accordance with applicable ASTM standard test methods and included physical testing of the existing fill and glaciofluvial deposit.

Physical/Textural Analysis: Representative samples of the site soils were subjected to laboratory testing that included moisture content determination (ASTM D2216) and washed gradation analyses (ASTM D422) in order to conduct supplementary engineering soil classifications and to assess possible re-use of the site soils as structural fill. The strata tested were classified by the Unified Soil Classification System (USCS). The results of the laboratory testing are summarized in the following table:

LABORATORY ANALYSIS SUMMARY					
Boring	**Sample Number**	**Depth (fbgs)**	**Moisture Content (%)**	**Passing No. 200 Sieve (%)**	**Classification**
B-2	S-3	5.0 - 7.0	3.4	7.1	SW-SM
B-8	S-2	2.0 - 3.0	3.4	10.3	FILL (GP-GM)

N:\Job Folders\2023\2320513GM\Drawings and Plans\CAD\GM2320513.001.dwg

LEGEND

- B-1 BORING LOCATION
- TP-1 TEST PIT LOCATION
- I-1 INFILTRATION TEST
- P-1 ROCK PROBE

NOTE: ALL LOCATIONS ARE APPROXIMATE.

REFERENCE

THIS PLAN IS BASED ON A 12/8/22 PROPERTY PLAN PREPARED BY INSITE.

PROJECT #:	GM2320513.001
DESIGNED BY:	MR
DATE:	8/8/23
SCALE:	1" = 50'
PROJ. MGR.:	RR
FIGURE:	1

DRAWING TITLE:
TEST LOCATION PLAN

CLIENT:
INSITE REAL ESTATE, LLC

PROJECT:
PROPOSED CHILDCARE FACILITY
739 PLEASANT STREET
MAP 35, BLOCK 446, LOT 3
WEYMOUTH, NORFOLK COUNTY, MASSACHUSETTS

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RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-1

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC
Surface Elevation:	± 97.0 feet Above NAVD88	**Date Started:**	5/30/2023
Termination Depth:	4.0 feet bgs	**Date Completed:**	5/30/2023
Proposed Location:	Building	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	GS
		Equipment:	Diedrich D-50

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		2" Topsoil	
0 - 2	S-1	X	3 - 8 - 15 - 20	10	23		GLACIAL TILL		Gray-Brown, Medium Dense, Silty Sand with Gravel (SM)	
2 - 4	S-2	X	17 - 25 - 27 - 30	5	52				As Above, Gray, Very Dense (SM)	
						5.0			Boring Log B-1 Terminated upon Auger Refusal at Depth of 4.0 fbgs.	
						10.0				
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-2

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC
Surface Elevation:	± 96.0 feet Above NAVD88	**Date Started:**	5/31/2023
Termination Depth:	9.0 feet bgs	**Date Completed:**	5/31/2023
Proposed Location:	Building	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	GS
		Equipment:	Diedrich D-50

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1	X	5 - 7 - 7 - 7	7	14		GLACIO-FLUVIAL DEPOSIT		Brown, Medium Dense, Silty Sand with Gravel (SW-SM)	
2 - 4	S-2	X	5 - 5 - 8 - 9	14	13				As Above (SW-SM)	
						5.0				
5 - 7	S-3	X	6 - 12 - 16 - 18	14	28				As Above, Gray-Brown (SW-SM)	
						7.0				
7 - 9	S-4	X	15 - 15 - 18 - 25	21	33		GLACIAL TILL		Gray-Brown, Dense, Silty Sand with Gravel (SM)	
						10.0			Boring Log B-2 Terminated upon Auger Refusal at Depth of 9.0 fbgs.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

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RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-3

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC
Surface Elevation:	± 90.0 feet Above NAVD88	**Date Started:**	5/31/2023
Termination Depth:	5.0 feet bgs	**Date Completed:**	5/31/2023
Proposed Location:	Slope	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	GS
		Equipment:	Diedrich D-50

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		2" Topsoil	
0 - 2	S-1	X	4 - 4 - 4 - 8	10	8		GLACIO-FLUVIAL DEPOSIT		Brown, Loose, Poorly Graded Sand with Silt and Gravel (SP-SM)	
2 - 4	S-2	X	8 - 11 - 15 - 16	11	26				As Above, Medium Dense (SP-SM)	
						5.0				
									Boring Log B-3 Terminated upon Auger Refusal at Depth of 5.0 fbgs.	
						10.0				
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

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RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-4

Page 1 of 1

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC
Surface Elevation:	± 96.0 feet Above NAVD88	**Date Started:**	5/30/2023
Termination Depth:	17.5 feet bgs	**Date Completed:**	5/30/2023
Proposed Location:	Building	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	GS
		Equipment:	Diedrich D-50

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1	X	8 - 12 - 40 - 20	8	52		EXISTING FILL		Dark Brown, Very Dense, Topsoil/Gravel/Cobble Mixture (FILL)	
						2.5			As Above, Medium Dense (FILL)	
2 - 4	S-2	X	12 - 14 - 15 - 20	9	29		GLACIO-FLUVIAL DEPOSIT		Brown, Medium Dense, Poorly Graded Sand with Silt and Gravel (SP-SM)	
						5.0				
5 - 7	S-3	X	4 - 20 - 34 - 40	11	54				Gray, Very Dense, Silty Sand with Gravel (SM)	
7 - 9	S-4	X	20 - 20 - 20 - 29	15	40				As Above, Dense (SM)	
						10.0				
10 - 12	S-5	X	18 - 30 - 30 - 23	18	60		GLACIAL TILL		As Above, Very Dense (SM)	
12 - 14	S-6	X	15 - 16 - 22 - 42	14	38				As Above, Dense (SM)	
						15.0				
15 - 16	S-7	X	15 - 44 - 50/0"	5	88				As Above, Very Dense (SM)	
									Boring Log B-4 Terminated upon Auger Refusal at Depth of 17.5 fbgs.	
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-5

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC
Surface Elevation:	± 98.0 feet Above NAVD88	**Date Started:**	5/30/2023
Termination Depth:	7.2 feet bgs	**Date Completed:**	5/30/2023
Proposed Location:	Building	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	GS
		Equipment:	Diedrich D-50

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
							TS		4" Topsoil	
0 - 2	S-1		17 - 20 - 38 - 30	21	58		GLACIAL TILL		Gray-Brown, Very Dense, Silty Sand with Gravel (SM)	
2 - 3.2	S-2		12 - 34 - 100/2"	10	68				As Above (SM)	Cobbles
						5.0				
5 - 7	S-3		22 - 25 - 50 - 50	16	75				As Above (SM)	
7 - 7.2	S-4		100/2"	2	-				As Above (SM)	Cobbles
						10.0			Boring Log B-5 Terminated upon Auger Refusal at Depth of 7.2 fbgs.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-6

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC
Surface Elevation:	± 101.0 feet Above NAVD88	**Date Started:**	5/30/2023
Termination Depth:	7.5 feet bgs	**Date Completed:**	5/30/2023
Proposed Location:	Building	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	GS
		Equipment:	Diedrich D-50

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1	X	4 - 6 - 10 - 12	8	16		TS		3" Topsoil	
									Brown, Medium Dense, Poorly Graded Sand with Silt and Gravel (SP-SM)	
2 - 4	S-2	X	8 - 10 - 8 - 8	14	18		GLACIO-FLUVIAL DEPOSIT		As Above (SP-SM)	
						5.0				
5 - 7	S-3	X	3 - 10 - 14 - 35	14	24				As Above (SP-SM)	
						6.5				
							GLACIAL		Gray-Brown. Dense, Silty Sand with Gravel (SM)	
7 - 7.3	S-4	X	100/3"	2	-		TILL		As Above (SM)	Cobbles
									Boring Log B-6 Terminated upon Auger Refusal at Depth of 7.5 fbgs.	
						10.0				
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-7

Page 1 of 1

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC
Surface Elevation:	± 96.0 feet Above NAVD88	**Date Started:**	5/30/2023
Termination Depth:	9.0 feet bgs	**Date Completed:**	5/30/2023
Proposed Location:	Building	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	GS
		Equipment:	Diedrich D-50

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1		3 - 3 - 54 - 34	13	57		EXISTING FILL		Dark Brown, Very Dense, Topsoil/Gravel/Cobble Mixture (FILL)	
2 - 4	S-2		7 - 13 - 10 - 13	8	23				As Above, Medium Dense (FILL)	
						5.0				
5 - 7	S-3		17 - 27 - 22 - 32	13	49		GLACIAL TILL		Gray-Brown, Dense, Silty Sand with Gravel (SM)	
7 - 9	S-4		18 - 24 - 18 - 22	14	42				As Above (SM)	
						10.0			Boring Log B-7 Terminated upon Auger Refusal at Depth of 9.0 fbgs.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Boring No.: B-8

Page 1 of 1

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC
Surface Elevation:	± 95.0 feet Above NAVD88	**Date Started:**	5/30/2023
Termination Depth:	9.5 feet bgs	**Date Completed:**	5/30/2023
Proposed Location:	Building	**Logged By:**	ZH
Drill / Test Method:	HSA / SPT (Autohammer)	**Contractor:**	GS
		Equipment:	Diedrich D-50

Water Depth | Elevation (feet bgs) | (ft NAVD88)		Cave-In Depth | Elevation (feet bgs) | (ft NAVD88)	
During:	-- | --		
At Completion:	-- | --	**At Completion:**	-- | --
24 Hours:	-- | --	**24 Hours:**	-- | --

SAMPLE INFORMATION						DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (feet)	No	Type	Blows Per 6"	Rec. (in.)	N	(feet)				
						0.0				
0 - 2	S-1		4 - 11 - 9 - 8	12	20		EXISTING FILL		Dark Brown, Medium Dense, Topsoil/Gravel/Cobble Mixture (FILL)	
2 - 4	S-2		7 - 10 - 23 - 23	14	33	3.0			Brown, Medium Dense, Poorly Graded Gravel with Silt and Sand (FILL)	
4 - 6	S-3		5 - 30 - 40 - 35	0	70	5.0	GLACIAL TILL		Gray-Brown, Dense, Silty Sand with Gravel (SM) No Recovery. Very Dense	
6 - 8	S-4		36 - 32 - 33 - 39	22	65				Gray-Brown, Very Dense, Silty Sand with Gravel (SM)	
8 - 8.6	S-5		10 - 100/1"	6	-				As Above (SM)	Cobbles
						10.0			Boring Log B-8 Terminated upon Auger Refusal at Depth of 9.5 fbgs.	
						15.0				
						20.0				
						25.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-1

Page 1 of 1

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC

Surface Elevation:	± 91.0 feet NAVD88	**Date Started:**	5/26/2023		**Water Depth (feet bgs)**	**Elevation (ft NAVD88)**	**Cave-In Depth (feet bgs)** / **Elevation (ft NAVD88)**
Termination Depth:	10.0 feet bgs	**Date Completed:**	5/26/2023				
Proposed Location:	Playground	**Logged By:**	ZH	**During:**	--	--	
Excavating Method:	Compact Excavator	**Contractor:**	GS	**At Completion:**	--	--	**At Completion:** -- / --
Test Method:	Visual Observation	**Rig Type:**	John Deere 60G	**24 Hours:**	--	--	

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		5" Topsoil	No indications of ESHGW
1	1	Grab		GLACIO-FLUVIAL DEPOSIT		Brown to Gray, Poorly Graded Sand with Silt and Gravel, Cobbles, Boulders (SP-SM)	
5	2	Grab	5.0				
			6.7				
				GLACIAL TILL		Gray, Silty Sand with Gravel, Cobbles, Boulders (SM)	
9.5	3	Grab	10.0				
						Test Pit TP-1 Terminated at Depth of 10 Feet Below Ground Surface.	
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-2

Page 1 of 1

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC

				Water Depth (feet bgs)	Elevation (ft NAVD88)	Cave-In Depth (feet bgs)	Elevation (ft NAVD88)
Surface Elevation:	± 92.0 feet NAVD88	**Date Started:**	5/26/2023				
Termination Depth:	6.5 feet bgs	**Date Completed:**	5/26/2023				
Proposed Location:	SWM Area	**Logged By:**	ZH	**During:**	-- | --		
Excavating Method:	Compact Excavator	**Contractor:**	GS	**At Completion:**	-- | --	**At Completion:**	-- | --
Test Method:	Visual Observation	**Rig Type:**	John Deere 60G	**24 Hours:**	-- | --		

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				EXISTING FILL		Dark Brown, Topsoil mixed with Gravel (FILL)	
			1.5				
2	1	Grab		GLACIO-FLUVIAL DEPOSIT		Brown to Gray, Poorly Graded Sand with Silt and Gravel (SP-SM)	
5	2	Grab	5.0				Infiltration Test @ 4.9 fbgs ESHGW 5.1 fbgs
			5.5	GLACIAL TILL		Gray, Silty Sand with Gravel (SM)	
			10.0			Test Pit TP-2 Terminated upon Refusal at Depth of 6.5 Feet Below Ground Surface.	
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-3

Page 1 of 1

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC

Surface Elevation:	± 92.5 feet NAVD88	**Date Started:**	5/26/2023		**Water Depth (feet bgs) | Elevation (ft NAVD88)**	**Cave-In Depth (feet bgs) | Elevation (ft NAVD88)**	
Termination Depth:	6.8 feet bgs	**Date Completed:**	5/26/2023				
Proposed Location:	SWM Area	**Logged By:**	ZH	**During:**	-- | --		
Excavating Method:	Compact Excavator	**Contractor:**	GS	**At Completion:**	-- | --	**At Completion:**	-- | --
Test Method:	Visual Observation	**Rig Type:**	John Deere 60G	**24 Hours:**	-- | --		

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		5" Topsoil	
1	1	Grab					
3	2	Grab		GLACIO- FLUVIAL DEPOSIT		Brown to Gray, Poorly Graded Sand with Silt and Gravel (SP-SM)	
			5.0				Infiltration Test @ 5.3 fbgs ESHGW 5.5 fbgs
6	3	Grab	6.0				
				GLACIAL TILL		Gray, Silty Sand with Gravel (SM)	
						Test Pit TP-3 Terminated upon Refusal at Depth of 6.8 Feet Below Ground Surface.	
			10.0				
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-4

Page 1 of 1

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC
Surface Elevation:	± 93.0 feet NAVD88	**Date Started:**	5/26/2023
Termination Depth:	10.0 feet bgs	**Date Completed:**	5/26/2023
Proposed Location:	Parking	**Logged By:**	ZH
Excavating Method:	Compact Excavator	**Contractor:**	GS
Test Method:	Visual Observation	**Rig Type:**	John Deere 60G

	Water Depth (feet bgs)	Elevation (ft NAVD88)	Cave-In Depth (feet bgs)	Elevation (ft NAVD88)
During:	10.0	83.0		
At Completion:	--	--	--	--
24 Hours:	--	--		

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		6" Topsoil	No indications of ESHGW
				SUBSOIL		19" Subsoil, Roots	
3	1	Grab		GLACIO-FLUVIAL DEPOSIT		Brownto Gray, Poorly Graded Sand with Silt and Gravel, Cobbles, Boulders (SP-SM)	
			5.0				
6	2	Grab					
			10.0				
						Test Pit TP-4 Terminated at Depth of 10 Feet Below Ground Surface.	
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-5

Page 1 of 1

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC

				Water Depth (feet bgs)	Elevation (ft NAVD88)	Cave-In Depth (feet bgs)	Elevation (ft NAVD88)
Surface Elevation:	± 96.0 feet NAVD88	**Date Started:**	5/26/2023				
Termination Depth:	10.0 feet bgs	**Date Completed:**	5/26/2023				
Proposed Location:	Parking	**Logged By:**	ZH	**During:**	3.0 | 93.0		
Excavating Method:	Compact Excavator	**Contractor:**	GS	**At Completion:**	-- | --	**At Completion:**	-- | --
Test Method:	Visual Observation	**Rig Type:**	John Deere 60G	**24 Hours:**	-- | --		

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		2" Topsoil	No indications of ESHGW
1.5	1	Grab					
3	2	Grab					
				GLACIO- FLUVIAL DEPOSIT		Brown, Poorly Graded Sand with Silt and Gravel, Cobbles, Boulders (SP-SM)	
			5.0				
9	3	Grab					
			10.0				
						Test Pit TP-1 Terminated at Depth of 10 Feet Below Ground Surface.	
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-6

Page 1 of 1

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.000
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC

				Water Depth (feet bgs)	Elevation (ft NAVD88)	Cave-In Depth (feet bgs)	Elevation (ft NAVD88)
Surface Elevation:	± 96.0 feet NAVD88	**Date Started:**	5/26/2023				
Termination Depth:	10.0 feet bgs	**Date Completed:**	5/26/2023				
Proposed Location:	Parking	**Logged By:**	ZH	**During:**	6.5	89.5	
Excavating Method:	Compact Excavator	**Contractor:**	GS	**At Completion:**	--	--	**At Completion:** -- --
Test Method:	Visual Observation	**Rig Type:**	John Deere 60G	**24 Hours:**	--	--	

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		2" Topsoil	No indications of ESHGW
4	1	Grab		GLACIO-			
			5.0	FLUVIAL		Brown, Poorly Graded Sand with Silt and Gravel, Cobbles, Boulders (SP-SM)	
				DEPOSIT			
7	2	Grab					
9.5	3	Grab					
			10.0				
						Test Pit TP-6 Terminated at Depth of 10 Feet Below Ground Surface.	
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-7

Page 1 of 1

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.001
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC

Surface Elevation:	± 90.0 feet NAVD88	**Date Started:**	7/31/2023		**Water Depth (feet bgs) | Elevation (ft NAVD88)**	**Cave-In Depth (feet bgs) | Elevation (ft NAVD88)**	
Termination Depth:	10.0 feet bgs	**Date Completed:**	7/31/2023				
Proposed Location:	SWM Area	**Logged By:**	OR	**During:**	-- | --		
Excavating Method:	Compact Excavator	**Contractor:**	GS	**At Completion:**	-- | --	**At Completion:**	-- | --
Test Method:	Visual Observation	**Rig Type:**	John Deere 60G	**24 Hours:**	-- | --		

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				EXISTING FILL		Brown, Poorly Graded Sand with Silt and Gravel, Roots (FILL)	No indications of ESHGW
						Dark Brown, Silty Sand with Gravel (FILL)	
			4.5				Infiltration Test @ 4.4 fbgs
			5.0	GLACIO-FLUVIAL DEPOSIT		Brown, Poorly Graded Sand with Silt and Gravel, Cobbles, Boulders (SP-SM)	
9.5	1	Grab					
			10.0			Test Pit TP-7 Terminated at Depth of 10 Feet Below Ground Surface.	
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

WHITESTONE

RECORD OF SUBSURFACE EXPLORATION

Test Pit No.: TP-8

Page 1 of 1

Project:	Proposed Childcare Facility	**WAI Project No.:**	GM2320513.001
Location:	739 Pleasant Street, Weymouth, Norfolk County, Massachusetts	**Client:**	InSite Development Services, LLC

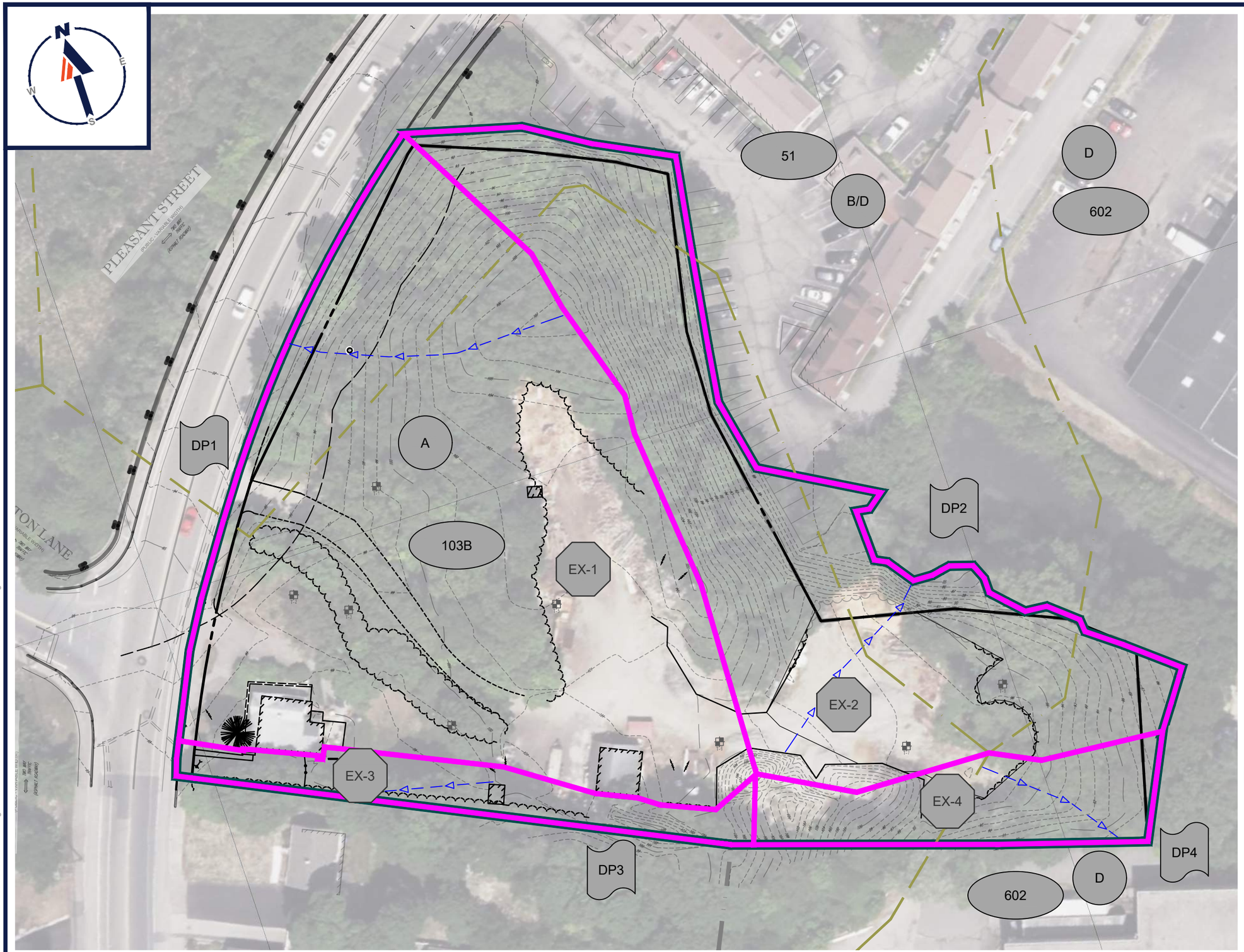
Surface Elevation:	± 89.0 feet NAVD88	**Date Started:**	7/31/2023		**Water Depth (feet bgs)**	**Elevation (ft NAVD88)**	**Cave-In Depth (feet bgs)** / **Elevation (ft NAVD88)**
Termination Depth:	10.0 feet bgs	**Date Completed:**	7/31/2023				
Proposed Location:	SWM Area	**Logged By:**	OR	**During:**	--	--	
Excavating Method:	Compact Excavator	**Contractor:**	GS	**At Completion:**	--	--	**At Completion:** -- / --
Test Method:	Visual Observation	**Rig Type:**	John Deere 60G	**24 Hours:**	--	--	

SAMPLE INFORMATION			DEPTH	STRATA		DESCRIPTION OF MATERIALS (Classification)	REMARKS
Depth (ft.)	Number	Type	(feet)				
			0.0				
				TOPSOIL		12" Topsoil	No indications of ESHGW
				SUBSOIL		12" Subsoil with Roots	
				GLACIO-FLUVIAL DEPOSIT		Brown, Poorly Graded Sand with Silt and Gravel (SP-SM)	
			5.0				
5.5	1	Grab		GLACIAL TILL		Gray-Brown, Silty Sand with Gravel (SM)	Infiltration Test @ 5.8 fbgs
						Brown, Silty Sand with Gravel (SM)	
			10.0			Test Pit TP-8 Terminated upon Refusal at Depth of 10 Feet Below Ground Surface.	
			15.0				

NOTES: bgs = below ground surface, msl = mean sea level, NA = Not Applicable, NE = Not Encountered, NS = Not Surveyed, P = Perched

APPENDIX D: EXISTING CONDITIONS HYDROLOGIC ANALYSIS

- *EXISTING CONDITIONS DRAINAGE MAP*
- *EXISTING CONDITIONS HYDROCAD COMPUTATIONS*



LEGEND

- DP# — DESIGN POINT
- EX-# — EXISTING SUBCATCHMENT
- XX# — BASIN OR MODELED DRAINAGE STRUCTURE
- A/B/C/D — HYDROLOGIC SOIL GROUP RATING
- UNIT — NRCS SOIL MAP UNIT
- OVERALL ANALYSIS BOUNDARY
- SUBCATCHMENT BOUNDARY
- NRCS SOIL BOUNDARY
- TIME OF CONCENTRATION

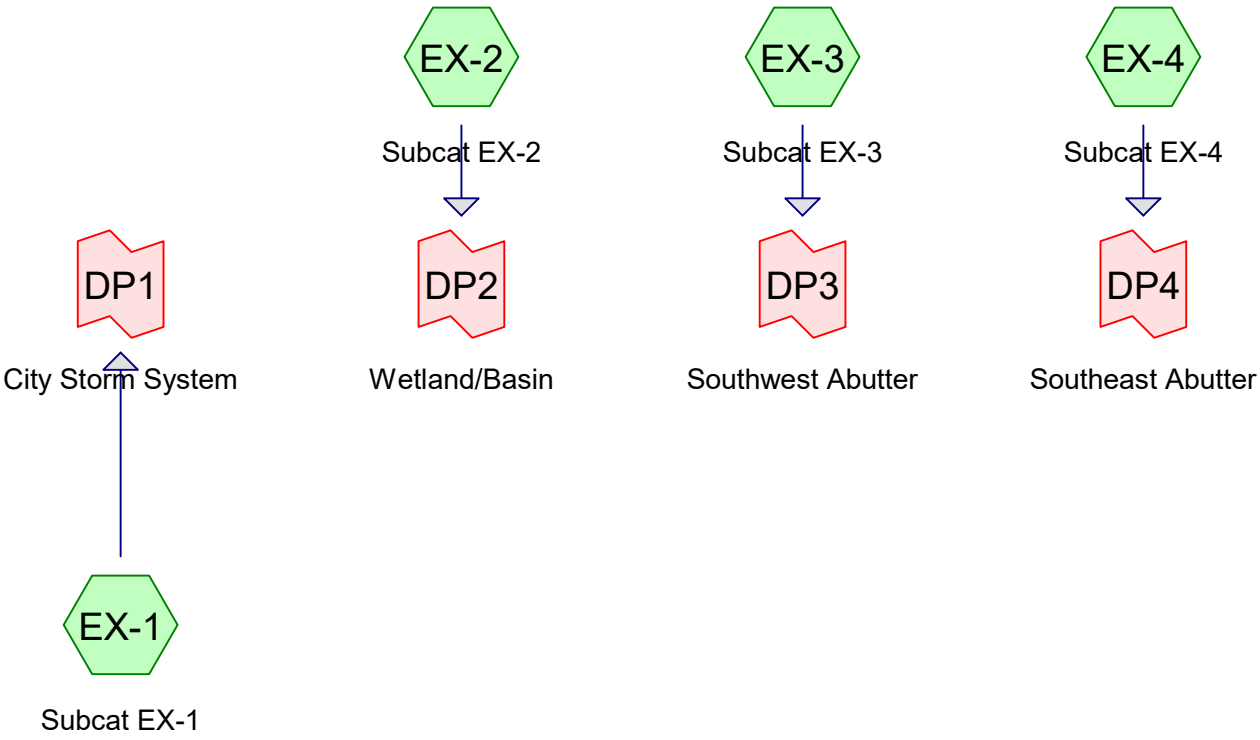
EXISTING CONDITIONS DRAINAGE AREA MAP

739 PLEASANT STREET
WEYMOUTH, MA

PREPARED BY
BOHLER

SCALE:1"=50' DATE: 10/05/2023

P:\2023\MAA230001.00\CAD\Drawings\Plan Sets\Civil Site Plans\MAA230001.00-HYDR-1a.dwg



Subcat Reach Pond Link

Routing Diagram for MAA230001 Existing Conditions
Prepared by Bohler Engineers, Printed 10/19/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 year	Type III 24-hr		Default	24.00	1	3.36	2
2	10 year	Type III 24-hr		Default	24.00	1	5.16	2
3	25 year	Type III 24-hr		Default	24.00	1	6.27	2
4	100 year	Type III 24-hr		Default	24.00	1	8.00	2

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

Subcatchment EX-1: Subcat EX-1 Runoff Area=1.463 ac 10.14% Impervious Runoff Depth=0.30"
Flow Length=130' Tc=7.5 min CN=55 Runoff=0.20 cfs 0.037 af

Subcatchment EX-2: Subcat EX-2 Runoff Area=0.912 ac 2.50% Impervious Runoff Depth=0.24"
Flow Length=113' Tc=6.0 min CN=53 Runoff=0.08 cfs 0.018 af

Subcatchment EX-3: Subcat EX-3 Runoff Area=0.150 ac 4.02% Impervious Runoff Depth=0.02"
Flow Length=81' Slope=0.0240 '/' Tc=7.9 min CN=42 Runoff=0.00 cfs 0.000 af

Subcatchment EX-4: Subcat EX-4 Runoff Area=0.197 ac 0.00% Impervious Runoff Depth=1.09"
Flow Length=84' Tc=7.4 min CN=73 Runoff=0.22 cfs 0.018 af

Link DP1: City Storm System Inflow=0.20 cfs 0.037 af
Primary=0.20 cfs 0.037 af

Link DP2: Wetland/Basin Inflow=0.08 cfs 0.018 af
Primary=0.08 cfs 0.018 af

Link DP3: Southwest Abutter Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link DP4: Southeast Abutter Inflow=0.22 cfs 0.018 af
Primary=0.22 cfs 0.018 af

Total Runoff Area = 2.722 ac Runoff Volume = 0.073 af Average Runoff Depth = 0.32"
93.49% Pervious = 2.544 ac 6.51% Impervious = 0.177 ac

Summary for Subcatchment EX-1: Subcat EX-1

Runoff = 0.20 cfs @ 12.33 hrs, Volume= 0.037 af, Depth= 0.30"
Routed to Link DP1 : City Storm System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.36"

Area (ac)	CN	Description
0.186	39	>75% Grass cover, Good, HSG A
0.031	61	>75% Grass cover, Good, HSG B
0.417	76	Gravel roads, HSG A
0.006	85	Gravel roads, HSG B
0.079	98	Paved parking, HSG A
0.037	98	Paved parking, HSG B
0.033	98	Roofs, HSG A
0.483	30	Woods, Good, HSG A
0.193	55	Woods, Good, HSG B
1.463	55	Weighted Average
1.315		89.86% Pervious Area
0.148		10.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.36"
0.2	80	0.1500	6.24		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	130	Total			

Summary for Subcatchment EX-2: Subcat EX-2

Runoff = 0.08 cfs @ 12.35 hrs, Volume= 0.018 af, Depth= 0.24"
Routed to Link DP2 : Wetland/Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.36"

Area (ac)	CN	Description
0.005	39	>75% Grass cover, Good, HSG A
0.046	61	>75% Grass cover, Good, HSG B
0.006	80	>75% Grass cover, Good, HSG D
0.146	76	Gravel roads, HSG A
0.031	85	Gravel roads, HSG B
0.011	98	Paved parking, HSG A
0.011	98	Paved parking, HSG B
0.355	30	Woods, Good, HSG A
0.226	55	Woods, Good, HSG B
0.073	77	Woods, Good, HSG D
0.912	53	Weighted Average
0.889		97.50% Pervious Area
0.023		2.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.44		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.36"
0.2	47	0.0532	3.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	16	0.6250	3.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.1					**Direct Entry,**
6.0	113	Total			

Summary for Subcatchment EX-3: Subcat EX-3

Runoff = 0.00 cfs @ 17.09 hrs, Volume= 0.000 af, Depth= 0.02"
Routed to Link DP3 : Southwest Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.36"

Area (ac)	CN	Description
0.088	39	>75% Grass cover, Good, HSG A
0.014	76	Gravel roads, HSG A
0.006	98	Paved parking, HSG A
0.000	98	Roofs, HSG A
0.041	30	Woods, Good, HSG A
0.150	42	Weighted Average
0.144		95.98% Pervious Area
0.006		4.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0240	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.36"
0.2	16	0.0240	1.08		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	15	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.9	81	Total			

Summary for Subcatchment EX-4: Subcat EX-4

Runoff = 0.22 cfs @ 12.12 hrs, Volume= 0.018 af, Depth= 1.09"
Routed to Link DP4 : Southeast Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.36"

Area (ac)	CN	Description
0.000	39	>75% Grass cover, Good, HSG A
0.002	80	>75% Grass cover, Good, HSG D
0.065	76	Gravel roads, HSG A
0.008	91	Gravel roads, HSG D
0.019	30	Woods, Good, HSG A
0.103	77	Woods, Good, HSG D
0.197	73	Weighted Average
0.197		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0748	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.36"
0.3	34	0.1515	1.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	84	Total			

Summary for Link DP1: City Storm System

Inflow Area = 1.463 ac, 10.14% Impervious, Inflow Depth = 0.30" for 2 year event
Inflow = 0.20 cfs @ 12.33 hrs, Volume= 0.037 af
Primary = 0.20 cfs @ 12.33 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP2: Wetland/Basin

Inflow Area = 0.912 ac, 2.50% Impervious, Inflow Depth = 0.24" for 2 year event
Inflow = 0.08 cfs @ 12.35 hrs, Volume= 0.018 af
Primary = 0.08 cfs @ 12.35 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP3: Southwest Abutter

Inflow Area = 0.150 ac, 4.02% Impervious, Inflow Depth = 0.02" for 2 year event
Inflow = 0.00 cfs @ 17.09 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 17.09 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP4: Southeast Abutter

Inflow Area = 0.197 ac, 0.00% Impervious, Inflow Depth = 1.09" for 2 year event
Inflow = 0.22 cfs @ 12.12 hrs, Volume= 0.018 af
Primary = 0.22 cfs @ 12.12 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment EX-1: Subcat EX-1 Runoff Area=1.463 ac 10.14% Impervious Runoff Depth=1.06"
Flow Length=130' Tc=7.5 min CN=55 Runoff=1.37 cfs 0.129 af

Subcatchment EX-2: Subcat EX-2 Runoff Area=0.912 ac 2.50% Impervious Runoff Depth=0.94"
Flow Length=113' Tc=6.0 min CN=53 Runoff=0.76 cfs 0.071 af

Subcatchment EX-3: Subcat EX-3 Runoff Area=0.150 ac 4.02% Impervious Runoff Depth=0.35"
Flow Length=81' Slope=0.0240 '/' Tc=7.9 min CN=42 Runoff=0.02 cfs 0.004 af

Subcatchment EX-4: Subcat EX-4 Runoff Area=0.197 ac 0.00% Impervious Runoff Depth=2.41"
Flow Length=84' Tc=7.4 min CN=73 Runoff=0.52 cfs 0.039 af

Link DP1: City Storm System Inflow=1.37 cfs 0.129 af
Primary=1.37 cfs 0.129 af

Link DP2: Wetland/Basin Inflow=0.76 cfs 0.071 af
Primary=0.76 cfs 0.071 af

Link DP3: Southwest Abutter Inflow=0.02 cfs 0.004 af
Primary=0.02 cfs 0.004 af

Link DP4: Southeast Abutter Inflow=0.52 cfs 0.039 af
Primary=0.52 cfs 0.039 af

Total Runoff Area = 2.722 ac Runoff Volume = 0.244 af Average Runoff Depth = 1.08"
93.49% Pervious = 2.544 ac 6.51% Impervious = 0.177 ac

Summary for Subcatchment EX-1: Subcat EX-1

Runoff = 1.37 cfs @ 12.13 hrs, Volume= 0.129 af, Depth= 1.06"
Routed to Link DP1 : City Storm System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.16"

Area (ac)	CN	Description
0.186	39	>75% Grass cover, Good, HSG A
0.031	61	>75% Grass cover, Good, HSG B
0.417	76	Gravel roads, HSG A
0.006	85	Gravel roads, HSG B
0.079	98	Paved parking, HSG A
0.037	98	Paved parking, HSG B
0.033	98	Roofs, HSG A
0.483	30	Woods, Good, HSG A
0.193	55	Woods, Good, HSG B
1.463	55	Weighted Average
1.315		89.86% Pervious Area
0.148		10.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.36"
0.2	80	0.1500	6.24		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	130	Total			

Summary for Subcatchment EX-2: Subcat EX-2

Runoff = 0.76 cfs @ 12.11 hrs, Volume= 0.071 af, Depth= 0.94"
Routed to Link DP2 : Wetland/Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.16"

Area (ac)	CN	Description
0.005	39	>75% Grass cover, Good, HSG A
0.046	61	>75% Grass cover, Good, HSG B
0.006	80	>75% Grass cover, Good, HSG D
0.146	76	Gravel roads, HSG A
0.031	85	Gravel roads, HSG B
0.011	98	Paved parking, HSG A
0.011	98	Paved parking, HSG B
0.355	30	Woods, Good, HSG A
0.226	55	Woods, Good, HSG B
0.073	77	Woods, Good, HSG D
0.912	53	Weighted Average
0.889		97.50% Pervious Area
0.023		2.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.44		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.36"
0.2	47	0.0532	3.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	16	0.6250	3.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.1					**Direct Entry,**
6.0	113	Total			

Summary for Subcatchment EX-3: Subcat EX-3

Runoff = 0.02 cfs @ 12.39 hrs, Volume= 0.004 af, Depth= 0.35"
Routed to Link DP3 : Southwest Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.16"

Area (ac)	CN	Description
0.088	39	>75% Grass cover, Good, HSG A
0.014	76	Gravel roads, HSG A
0.006	98	Paved parking, HSG A
0.000	98	Roofs, HSG A
0.041	30	Woods, Good, HSG A
0.150	42	Weighted Average
0.144		95.98% Pervious Area
0.006		4.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0240	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.36"
0.2	16	0.0240	1.08		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	15	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.9	81	Total			

Summary for Subcatchment EX-4: Subcat EX-4

Runoff = 0.52 cfs @ 12.11 hrs, Volume= 0.039 af, Depth= 2.41"
Routed to Link DP4 : Southeast Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.16"

Area (ac)	CN	Description
0.000	39	>75% Grass cover, Good, HSG A
0.002	80	>75% Grass cover, Good, HSG D
0.065	76	Gravel roads, HSG A
0.008	91	Gravel roads, HSG D
0.019	30	Woods, Good, HSG A
0.103	77	Woods, Good, HSG D
0.197	73	Weighted Average
0.197		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0748	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.36"
0.3	34	0.1515	1.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	84	Total			

Summary for Link DP1: City Storm System

Inflow Area = 1.463 ac, 10.14% Impervious, Inflow Depth = 1.06" for 10 year event
Inflow = 1.37 cfs @ 12.13 hrs, Volume= 0.129 af
Primary = 1.37 cfs @ 12.13 hrs, Volume= 0.129 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP2: Wetland/Basin

Inflow Area = 0.912 ac, 2.50% Impervious, Inflow Depth = 0.94" for 10 year event
Inflow = 0.76 cfs @ 12.11 hrs, Volume= 0.071 af
Primary = 0.76 cfs @ 12.11 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP3: Southwest Abutter

Inflow Area = 0.150 ac, 4.02% Impervious, Inflow Depth = 0.35" for 10 year event
Inflow = 0.02 cfs @ 12.39 hrs, Volume= 0.004 af
Primary = 0.02 cfs @ 12.39 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP4: Southeast Abutter

Inflow Area = 0.197 ac, 0.00% Impervious, Inflow Depth = 2.41" for 10 year event
Inflow = 0.52 cfs @ 12.11 hrs, Volume= 0.039 af
Primary = 0.52 cfs @ 12.11 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment EX-1: Subcat EX-1 Runoff Area=1.463 ac 10.14% Impervious Runoff Depth=1.68"
Flow Length=130' Tc=7.5 min CN=55 Runoff=2.42 cfs 0.204 af

Subcatchment EX-2: Subcat EX-2 Runoff Area=0.912 ac 2.50% Impervious Runoff Depth=1.51"
Flow Length=113' Tc=6.0 min CN=53 Runoff=1.40 cfs 0.115 af

Subcatchment EX-3: Subcat EX-3 Runoff Area=0.150 ac 4.02% Impervious Runoff Depth=0.71"
Flow Length=81' Slope=0.0240 '/' Tc=7.9 min CN=42 Runoff=0.06 cfs 0.009 af

Subcatchment EX-4: Subcat EX-4 Runoff Area=0.197 ac 0.00% Impervious Runoff Depth=3.31"
Flow Length=84' Tc=7.4 min CN=73 Runoff=0.72 cfs 0.054 af

Link DP1: City Storm System Inflow=2.42 cfs 0.204 af
Primary=2.42 cfs 0.204 af

Link DP2: Wetland/Basin Inflow=1.40 cfs 0.115 af
Primary=1.40 cfs 0.115 af

Link DP3: Southwest Abutter Inflow=0.06 cfs 0.009 af
Primary=0.06 cfs 0.009 af

Link DP4: Southeast Abutter Inflow=0.72 cfs 0.054 af
Primary=0.72 cfs 0.054 af

Total Runoff Area = 2.722 ac Runoff Volume = 0.382 af Average Runoff Depth = 1.69"
93.49% Pervious = 2.544 ac 6.51% Impervious = 0.177 ac

Summary for Subcatchment EX-1: Subcat EX-1

Runoff = 2.42 cfs @ 12.12 hrs, Volume= 0.204 af, Depth= 1.68"
Routed to Link DP1 : City Storm System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.27"

Area (ac)	CN	Description
0.186	39	>75% Grass cover, Good, HSG A
0.031	61	>75% Grass cover, Good, HSG B
0.417	76	Gravel roads, HSG A
0.006	85	Gravel roads, HSG B
0.079	98	Paved parking, HSG A
0.037	98	Paved parking, HSG B
0.033	98	Roofs, HSG A
0.483	30	Woods, Good, HSG A
0.193	55	Woods, Good, HSG B
1.463	55	Weighted Average
1.315		89.86% Pervious Area
0.148		10.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.36"
0.2	80	0.1500	6.24		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	130	Total			

Summary for Subcatchment EX-2: Subcat EX-2

Runoff = 1.40 cfs @ 12.11 hrs, Volume= 0.115 af, Depth= 1.51"
Routed to Link DP2 : Wetland/Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.27"

Area (ac)	CN	Description
0.005	39	>75% Grass cover, Good, HSG A
0.046	61	>75% Grass cover, Good, HSG B
0.006	80	>75% Grass cover, Good, HSG D
0.146	76	Gravel roads, HSG A
0.031	85	Gravel roads, HSG B
0.011	98	Paved parking, HSG A
0.011	98	Paved parking, HSG B
0.355	30	Woods, Good, HSG A
0.226	55	Woods, Good, HSG B
0.073	77	Woods, Good, HSG D
0.912	53	Weighted Average
0.889		97.50% Pervious Area
0.023		2.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.44		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.36"
0.2	47	0.0532	3.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	16	0.6250	3.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.1					**Direct Entry,**
6.0	113	Total			

Summary for Subcatchment EX-3: Subcat EX-3

Runoff = 0.06 cfs @ 12.20 hrs, Volume= 0.009 af, Depth= 0.71"
Routed to Link DP3 : Southwest Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.27"

Area (ac)	CN	Description
0.088	39	>75% Grass cover, Good, HSG A
0.014	76	Gravel roads, HSG A
0.006	98	Paved parking, HSG A
0.000	98	Roofs, HSG A
0.041	30	Woods, Good, HSG A
0.150	42	Weighted Average
0.144		95.98% Pervious Area
0.006		4.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0240	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.36"
0.2	16	0.0240	1.08		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	15	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.9	81	Total			

Summary for Subcatchment EX-4: Subcat EX-4

Runoff = 0.72 cfs @ 12.11 hrs, Volume= 0.054 af, Depth= 3.31"
Routed to Link DP4 : Southeast Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.27"

Area (ac)	CN	Description
0.000	39	>75% Grass cover, Good, HSG A
0.002	80	>75% Grass cover, Good, HSG D
0.065	76	Gravel roads, HSG A
0.008	91	Gravel roads, HSG D
0.019	30	Woods, Good, HSG A
0.103	77	Woods, Good, HSG D
0.197	73	Weighted Average
0.197		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0748	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.36"
0.3	34	0.1515	1.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	84	Total			

Summary for Link DP1: City Storm System

Inflow Area = 1.463 ac, 10.14% Impervious, Inflow Depth = 1.68" for 25 year event
Inflow = 2.42 cfs @ 12.12 hrs, Volume= 0.204 af
Primary = 2.42 cfs @ 12.12 hrs, Volume= 0.204 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP2: Wetland/Basin

Inflow Area = 0.912 ac, 2.50% Impervious, Inflow Depth = 1.51" for 25 year event
Inflow = 1.40 cfs @ 12.11 hrs, Volume= 0.115 af
Primary = 1.40 cfs @ 12.11 hrs, Volume= 0.115 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP3: Southwest Abutter

Inflow Area = 0.150 ac, 4.02% Impervious, Inflow Depth = 0.71" for 25 year event
Inflow = 0.06 cfs @ 12.20 hrs, Volume= 0.009 af
Primary = 0.06 cfs @ 12.20 hrs, Volume= 0.009 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP4: Southeast Abutter

Inflow Area = 0.197 ac, 0.00% Impervious, Inflow Depth = 3.31" for 25 year event
Inflow = 0.72 cfs @ 12.11 hrs, Volume= 0.054 af
Primary = 0.72 cfs @ 12.11 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment EX-1: Subcat EX-1 Runoff Area=1.463 ac 10.14% Impervious Runoff Depth=2.78"
Flow Length=130' Tc=7.5 min CN=55 Runoff=4.29 cfs 0.339 af

Subcatchment EX-2: Subcat EX-2 Runoff Area=0.912 ac 2.50% Impervious Runoff Depth=2.57"
Flow Length=113' Tc=6.0 min CN=53 Runoff=2.56 cfs 0.195 af

Subcatchment EX-3: Subcat EX-3 Runoff Area=0.150 ac 4.02% Impervious Runoff Depth=1.44"
Flow Length=81' Slope=0.0240 '/' Tc=7.9 min CN=42 Runoff=0.18 cfs 0.018 af

Subcatchment EX-4: Subcat EX-4 Runoff Area=0.197 ac 0.00% Impervious Runoff Depth=4.81"
Flow Length=84' Tc=7.4 min CN=73 Runoff=1.04 cfs 0.079 af

Link DP1: City Storm System Inflow=4.29 cfs 0.339 af
Primary=4.29 cfs 0.339 af

Link DP2: Wetland/Basin Inflow=2.56 cfs 0.195 af
Primary=2.56 cfs 0.195 af

Link DP3: Southwest Abutter Inflow=0.18 cfs 0.018 af
Primary=0.18 cfs 0.018 af

Link DP4: Southeast Abutter Inflow=1.04 cfs 0.079 af
Primary=1.04 cfs 0.079 af

Total Runoff Area = 2.722 ac Runoff Volume = 0.632 af Average Runoff Depth = 2.78"
93.49% Pervious = 2.544 ac 6.51% Impervious = 0.177 ac

Summary for Subcatchment EX-1: Subcat EX-1

Runoff = 4.29 cfs @ 12.12 hrs, Volume= 0.339 af, Depth= 2.78"
Routed to Link DP1 : City Storm System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.00"

Area (ac)	CN	Description
0.186	39	>75% Grass cover, Good, HSG A
0.031	61	>75% Grass cover, Good, HSG B
0.417	76	Gravel roads, HSG A
0.006	85	Gravel roads, HSG B
0.079	98	Paved parking, HSG A
0.037	98	Paved parking, HSG B
0.033	98	Roofs, HSG A
0.483	30	Woods, Good, HSG A
0.193	55	Woods, Good, HSG B
1.463	55	Weighted Average
1.315		89.86% Pervious Area
0.148		10.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	50	0.0700	0.11		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.36"
0.2	80	0.1500	6.24		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
7.5	130	Total			

Summary for Subcatchment EX-2: Subcat EX-2

Runoff = 2.56 cfs @ 12.10 hrs, Volume= 0.195 af, Depth= 2.57"
Routed to Link DP2 : Wetland/Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.00"

Area (ac)	CN	Description
0.005	39	>75% Grass cover, Good, HSG A
0.046	61	>75% Grass cover, Good, HSG B
0.006	80	>75% Grass cover, Good, HSG D
0.146	76	Gravel roads, HSG A
0.031	85	Gravel roads, HSG B
0.011	98	Paved parking, HSG A
0.011	98	Paved parking, HSG B
0.355	30	Woods, Good, HSG A
0.226	55	Woods, Good, HSG B
0.073	77	Woods, Good, HSG D
0.912	53	Weighted Average
0.889		97.50% Pervious Area
0.023		2.50% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	50	0.0300	1.44		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.36"
0.2	47	0.0532	3.71		**Shallow Concentrated Flow,** Unpaved Kv= 16.1 fps
0.1	16	0.6250	3.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.1					**Direct Entry,**
6.0	113	Total			

Summary for Subcatchment EX-3: Subcat EX-3

Runoff = 0.18 cfs @ 12.15 hrs, Volume= 0.018 af, Depth= 1.44"
Routed to Link DP3 : Southwest Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.00"

Area (ac)	CN	Description
0.088	39	>75% Grass cover, Good, HSG A
0.014	76	Gravel roads, HSG A
0.006	98	Paved parking, HSG A
0.000	98	Roofs, HSG A
0.041	30	Woods, Good, HSG A
0.150	42	Weighted Average
0.144		95.98% Pervious Area
0.006		4.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.4	50	0.0240	0.11		**Sheet Flow,** Grass: Dense n= 0.240 P2= 3.36"
0.2	16	0.0240	1.08		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
0.3	15	0.0240	0.77		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.9	81	Total			

Summary for Subcatchment EX-4: Subcat EX-4

Runoff = 1.04 cfs @ 12.11 hrs, Volume= 0.079 af, Depth= 4.81"
Routed to Link DP4 : Southeast Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.00"

Area (ac)	CN	Description
0.000	39	>75% Grass cover, Good, HSG A
0.002	80	>75% Grass cover, Good, HSG D
0.065	76	Gravel roads, HSG A
0.008	91	Gravel roads, HSG D
0.019	30	Woods, Good, HSG A
0.103	77	Woods, Good, HSG D
0.197	73	Weighted Average
0.197		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0748	0.12		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.36"
0.3	34	0.1515	1.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
7.4	84	Total			

Summary for Link DP1: City Storm System

Inflow Area = 1.463 ac, 10.14% Impervious, Inflow Depth = 2.78" for 100 year event
Inflow = 4.29 cfs @ 12.12 hrs, Volume= 0.339 af
Primary = 4.29 cfs @ 12.12 hrs, Volume= 0.339 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP2: Wetland/Basin

Inflow Area = 0.912 ac, 2.50% Impervious, Inflow Depth = 2.57" for 100 year event
Inflow = 2.56 cfs @ 12.10 hrs, Volume= 0.195 af
Primary = 2.56 cfs @ 12.10 hrs, Volume= 0.195 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP3: Southwest Abutter

Inflow Area = 0.150 ac, 4.02% Impervious, Inflow Depth = 1.44" for 100 year event
Inflow = 0.18 cfs @ 12.15 hrs, Volume= 0.018 af
Primary = 0.18 cfs @ 12.15 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.0 min

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

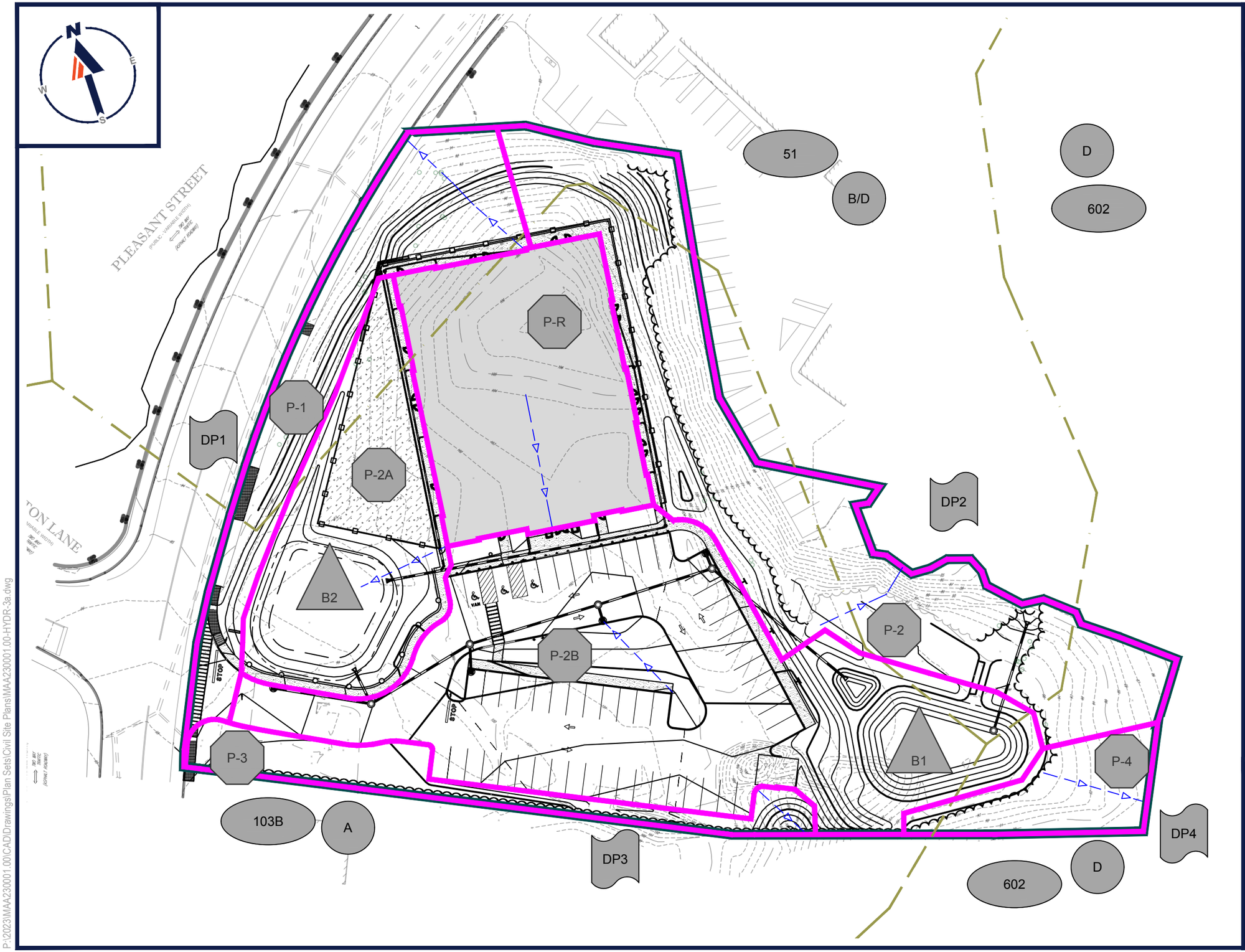
Summary for Link DP4: Southeast Abutter

Inflow Area = 0.197 ac, 0.00% Impervious, Inflow Depth = 4.81" for 100 year event
Inflow = 1.04 cfs @ 12.11 hrs, Volume= 0.079 af
Primary = 1.04 cfs @ 12.11 hrs, Volume= 0.079 af, Atten= 0%, Lag= 0.0 min

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

APPENDIX E: PROPOSED CONDITIONS HYDROLOGIC ANALYSIS

- *PROPOSED CONDITIONS DRAINAGE MAP*
- *PROPOSED CONDITIONS HYDROCAD CALCULATIONS*



LEGEND

- DP# — DESIGN POINT
- EX-# — EXISTING SUBCATCHMENT
- XX# — BASIN OR MODELED DRAINAGE STRUCTURE
- A/B/C/D — HYDROLOGIC SOIL GROUP RATING
- UNIT — NRCS SOIL MAP UNIT

- OVERALL ANALYSIS BOUNDARY
- SUBCATCHMENT BOUNDARY
- NRCS SOIL BOUNDARY
- TIME OF CONCENTRATION

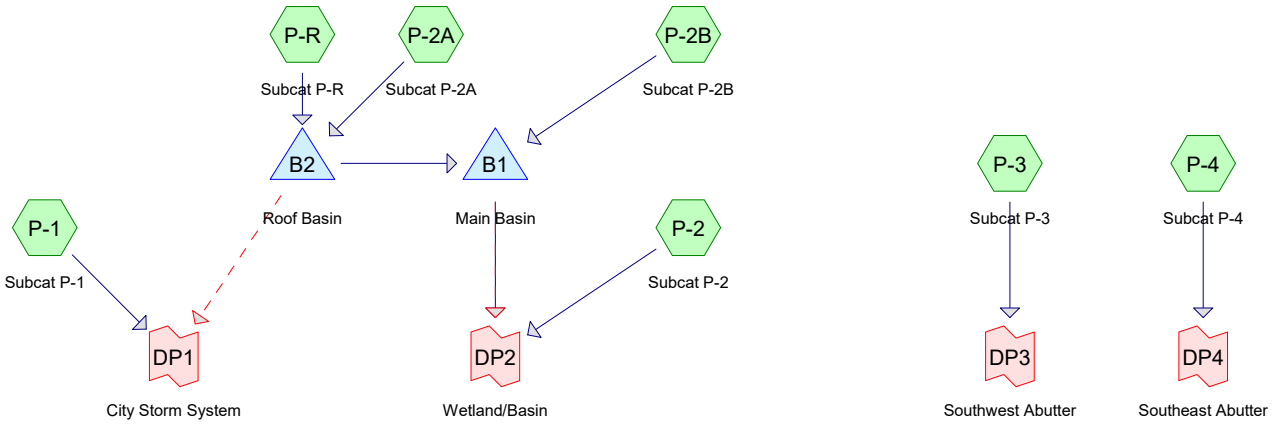
PROPOSED CONDITIONS DRAINAGE AREA MAP

739 PLEASANT STREET
WEYMOUTH, MA

PREPARED BY
BOHLER

SCALE:1"=50' DATE: 11/27/2023

P:\2023\MAA230001.00\CADD\Drawings\Plan Sets\Civil Site Plans\MAA230001.00-HYDR-3a.dwg



Subcat Reach Pond Link

Routing Diagram for MAA230001 Proposed Conditions Rev 11.27.23
Prepared by Bohler Engineers, Printed 11/28/2023

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2 year	Type III 24-hr		Default	24.00	1	3.36	2
2	10 year	Type III 24-hr		Default	24.00	1	5.16	2
3	25 year	Type III 24-hr		Default	24.00	1	6.27	2
4	100 year	Type III 24-hr		Default	24.00	1	8.00	2

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

Subcatchment P-1: Subcat P-1 Runoff Area=0.284 ac 28.87% Impervious Runoff Depth=0.92"
Flow Length=45' Tc=6.0 min CN=70 Runoff=0.28 cfs 0.022 af

Subcatchment P-2: Subcat P-2 Runoff Area=0.625 ac 8.04% Impervious Runoff Depth=0.30"
Flow Length=50' Slope=0.2400 '/' Tc=6.0 min CN=55 Runoff=0.08 cfs 0.016 af

Subcatchment P-2A: Subcat P-2A Runoff Area=0.336 ac 68.34% Impervious Runoff Depth=1.53"
Tc=6.0 min CN=80 Runoff=0.59 cfs 0.043 af

Subcatchment P-2B: Subcat P-2B Runoff Area=0.874 ac 76.00% Impervious Runoff Depth=1.89"
Flow Length=52' Slope=0.0570 '/' Tc=6.0 min CN=85 Runoff=1.90 cfs 0.138 af

Subcatchment P-3: Subcat P-3 Runoff Area=0.127 ac 0.79% Impervious Runoff Depth=0.00"
Tc=6.0 min CN=39 Runoff=0.00 cfs 0.000 af

Subcatchment P-4: Subcat P-4 Runoff Area=0.105 ac 0.00% Impervious Runoff Depth=1.20"
Flow Length=57' Tc=6.0 min CN=75 Runoff=0.14 cfs 0.010 af

Subcatchment P-R: Subcat P-R Runoff Area=0.372 ac 100.00% Impervious Runoff Depth=3.13"
Tc=6.0 min CN=98 Runoff=1.19 cfs 0.097 af

Pond B1: Main Basin Peak Elev=91.88' Storage=1,603 cf Inflow=1.90 cfs 0.138 af
Discarded=0.40 cfs 0.138 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.40 cfs 0.138 af

Pond B2: Roof Basin Peak Elev=96.79' Storage=879 cf Inflow=1.77 cfs 0.140 af
Discarded=0.64 cfs 0.140 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.64 cfs 0.140 af

Link DP1: City Storm System Inflow=0.28 cfs 0.022 af
Primary=0.28 cfs 0.022 af

Link DP2: Wetland/Basin Inflow=0.08 cfs 0.016 af
Primary=0.08 cfs 0.016 af

Link DP3: Southwest Abutter Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link DP4: Southeast Abutter Inflow=0.14 cfs 0.010 af
Primary=0.14 cfs 0.010 af

Total Runoff Area = 2.722 ac Runoff Volume = 0.326 af Average Runoff Depth = 1.44"
48.60% Pervious = 1.323 ac 51.40% Impervious = 1.399 ac

Summary for Subcatchment P-1: Subcat P-1

Runoff = 0.28 cfs @ 12.10 hrs, Volume= 0.022 af, Depth= 0.92"
Routed to Link DP1 : City Storm System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.36"

Area (ac)	CN	Description
0.026	39	>75% Grass cover, Good, HSG A
0.176	61	>75% Grass cover, Good, HSG B
0.036	98	Paved parking, HSG A
0.046	98	Paved parking, HSG B
0.284	70	Weighted Average
0.202		71.13% Pervious Area
0.082		28.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	30	0.0150	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.0	15	0.3300	9.25		**Shallow Concentrated Flow, Grass slope** Unpaved Kv= 16.1 fps
1.9					**Direct Entry,**
6.0	45	Total			

Summary for Subcatchment P-2: Subcat P-2

Runoff = 0.08 cfs @ 12.30 hrs, Volume= 0.016 af, Depth= 0.30"
Routed to Link DP2 : Wetland/Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.36"

Area (ac)	CN	Description
0.197	39	>75% Grass cover, Good, HSG A
0.142	61	>75% Grass cover, Good, HSG B
0.003	80	>75% Grass cover, Good, HSG D
0.039	98	Paved parking, HSG A
0.011	98	Paved parking, HSG B
0.064	30	Woods, Good, HSG A
0.101	55	Woods, Good, HSG B
0.068	77	Woods, Good, HSG D
0.625	55	Weighted Average
0.574		91.96% Pervious Area
0.050		8.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.2400	2.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7					**Direct Entry,**
6.0	50	Total			

Summary for Subcatchment P-2A: Subcat P-2A

Runoff = 0.59 cfs @ 12.10 hrs, Volume= 0.043 af, Depth= 1.53"
Routed to Pond B2 : Roof Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.36"

Area (ac)	CN	Description
0.092	39	>75% Grass cover, Good, HSG A
0.015	61	>75% Grass cover, Good, HSG B
0.112	98	Paved parking, HSG A
0.032	98	Paved parking, HSG B
0.086	98	Water Surface, HSG A
0.000	30	Woods, Good, HSG A
0.336	80	Weighted Average
0.106		31.66% Pervious Area
0.230		68.34% Impervious Area

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

Summary for Subcatchment P-2B: Subcat P-2B

Runoff = 1.90 cfs @ 12.09 hrs, Volume= 0.138 af, Depth= 1.89"
Routed to Pond B1 : Main Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.36"

Area (ac)	CN	Description
0.185	39	>75% Grass cover, Good, HSG A
0.016	61	>75% Grass cover, Good, HSG B
0.008	80	>75% Grass cover, Good, HSG D
0.568	98	Paved parking, HSG A
0.070	98	Water Surface, HSG A
0.011	98	Water Surface, HSG B
0.015	98	Water Surface, HSG D
0.000	30	Woods, Good, HSG A
0.874	85	Weighted Average
0.210		24.00% Pervious Area
0.664		76.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	52	0.0570	1.67		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.5					**Direct Entry,**
6.0	52	Total			

Summary for Subcatchment P-3: Subcat P-3

Runoff = 0.00 cfs @ 23.84 hrs, Volume= 0.000 af, Depth= 0.00"
Routed to Link DP3 : Southwest Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.36"

Area (ac)	CN	Description
0.126	39	>75% Grass cover, Good, HSG A
0.001	98	Paved parking, HSG A
0.000	30	Woods, Good, HSG A
0.127	39	Weighted Average
0.126		99.21% Pervious Area
0.001		0.79% Impervious Area

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

Summary for Subcatchment P-4: Subcat P-4

Runoff = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af, Depth= 1.20"
Routed to Link DP4 : Southeast Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.36"

Area (ac)	CN	Description
0.004	39	>75% Grass cover, Good, HSG A
0.010	80	>75% Grass cover, Good, HSG D
0.003	30	Woods, Good, HSG A
0.088	77	Woods, Good, HSG D
0.105	75	Weighted Average
0.105		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.36"
0.1	7	0.1515	1.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.0	57	Total			

Summary for Subcatchment P-R: Subcat P-R

Runoff = 1.19 cfs @ 12.09 hrs, Volume= 0.097 af, Depth= 3.13"
Routed to Pond B2 : Roof Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 year Rainfall=3.36"

Area (ac)	CN	Description
0.341	98	Roofs, HSG A
0.031	98	Roofs, HSG B
0.372	98	Weighted Average
0.372		100.00% Impervious Area

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

Summary for Pond B1: Main Basin

Inflow Area = 1.582 ac, 80.02% Impervious, Inflow Depth = 1.05" for 2 year event
Inflow = 1.90 cfs @ 12.09 hrs, Volume= 0.138 af
Outflow = 0.40 cfs @ 12.54 hrs, Volume= 0.138 af, Atten= 79%, Lag= 26.6 min
Discarded = 0.40 cfs @ 12.54 hrs, Volume= 0.138 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP2 : Wetland/Basin
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP2 : Wetland/Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 91.88' @ 12.54 hrs Surf.Area= 2,048 sf Storage= 1,603 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 26.6 min (850.5 - 823.9)

Volume	Invert	Avail.Storage	Storage Description
#1	91.00'	10,922 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
91.00	1,587	0	0	1,587
92.00	2,112	1,843	1,843	2,134
93.00	2,694	2,397	4,240	2,741
94.00	3,332	3,007	7,248	3,408
95.00	4,027	3,674	10,922	4,135

Device	Routing	Invert	Outlet Devices
#1	Discarded	91.00'	**8.270 in/hr Exfiltration over Wetted area**
#2	Primary	91.50'	**12.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.50' / 90.90' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	93.75'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	94.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	95.00'	**12.0' long x 27.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.40 cfs @ 12.54 hrs HW=91.88' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.40 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=91.00' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=91.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B2: Roof Basin

Inflow Area = 0.708 ac, 84.98% Impervious, Inflow Depth = 2.37" for 2 year event
Inflow = 1.77 cfs @ 12.09 hrs, Volume= 0.140 af
Outflow = 0.64 cfs @ 12.36 hrs, Volume= 0.140 af, Atten= 64%, Lag= 16.3 min
Discarded = 0.64 cfs @ 12.36 hrs, Volume= 0.140 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
  Routed to Pond B1 : Main Basin
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
  Routed to Link DP1 : City Storm System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 96.79' @ 12.36 hrs Surf.Area= 3,357 sf Storage= 879 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 6.6 min (788.0 - 781.4)

Volume	Invert	Avail.Storage	Storage Description
#1	96.50'	6,267 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.50	2,646	0	0
97.00	3,860	1,627	1,627
98.00	5,421	4,641	6,267

Device	Routing	Invert	Outlet Devices
#1	Discarded	96.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	97.25'	**12.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.25' / 96.64' S= 0.0197 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Secondary	98.10'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.64 cfs @ 12.36 hrs HW=96.79' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.64 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=96.50' TW=91.00' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=96.50' TW=0.00' (Dynamic Tailwater)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP1: City Storm System

Inflow Area = 0.284 ac, 28.87% Impervious, Inflow Depth = 0.92" for 2 year event
Inflow = 0.28 cfs @ 12.10 hrs, Volume= 0.022 af
Primary = 0.28 cfs @ 12.10 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP2: Wetland/Basin

Inflow Area = 2.207 ac, 59.64% Impervious, Inflow Depth = 0.08" for 2 year event
Inflow = 0.08 cfs @ 12.30 hrs, Volume= 0.016 af
Primary = 0.08 cfs @ 12.30 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP3: Southwest Abutter

Inflow Area = 0.127 ac, 0.79% Impervious, Inflow Depth = 0.00" for 2 year event
Inflow = 0.00 cfs @ 23.84 hrs, Volume= 0.000 af
Primary = 0.00 cfs @ 23.84 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP4: Southeast Abutter

Inflow Area = 0.105 ac, 0.00% Impervious, Inflow Depth = 1.20" for 2 year event
Inflow = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af
Primary = 0.14 cfs @ 12.10 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment P-1: Subcat P-1 Runoff Area=0.284 ac 28.87% Impervious Runoff Depth=2.16"
Flow Length=45' Tc=6.0 min CN=70 Runoff=0.69 cfs 0.051 af

Subcatchment P-2: Subcat P-2 Runoff Area=0.625 ac 8.04% Impervious Runoff Depth=1.06"
Flow Length=50' Slope=0.2400 '/' Tc=6.0 min CN=55 Runoff=0.63 cfs 0.055 af

Subcatchment P-2A: Subcat P-2A Runoff Area=0.336 ac 68.34% Impervious Runoff Depth=3.03"
Tc=6.0 min CN=80 Runoff=1.17 cfs 0.085 af

Subcatchment P-2B: Subcat P-2B Runoff Area=0.874 ac 76.00% Impervious Runoff Depth=3.52"
Flow Length=52' Slope=0.0570 '/' Tc=6.0 min CN=85 Runoff=3.48 cfs 0.256 af

Subcatchment P-3: Subcat P-3 Runoff Area=0.127 ac 0.79% Impervious Runoff Depth=0.23"
Tc=6.0 min CN=39 Runoff=0.01 cfs 0.002 af

Subcatchment P-4: Subcat P-4 Runoff Area=0.105 ac 0.00% Impervious Runoff Depth=2.58"
Flow Length=57' Tc=6.0 min CN=75 Runoff=0.31 cfs 0.022 af

Subcatchment P-R: Subcat P-R Runoff Area=0.372 ac 100.00% Impervious Runoff Depth=4.92"
Tc=6.0 min CN=98 Runoff=1.84 cfs 0.153 af

Pond B1: Main Basin Peak Elev=92.82' Storage=3,765 cf Inflow=3.48 cfs 0.256 af
Discarded=0.50 cfs 0.256 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.50 cfs 0.256 af

Pond B2: Roof Basin Peak Elev=97.16' Storage=2,257 cf Inflow=3.00 cfs 0.238 af
Discarded=0.79 cfs 0.238 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.79 cfs 0.238 af

Link DP1: City Storm System Inflow=0.69 cfs 0.051 af
Primary=0.69 cfs 0.051 af

Link DP2: Wetland/Basin Inflow=0.63 cfs 0.055 af
Primary=0.63 cfs 0.055 af

Link DP3: Southwest Abutter Inflow=0.01 cfs 0.002 af
Primary=0.01 cfs 0.002 af

Link DP4: Southeast Abutter Inflow=0.31 cfs 0.022 af
Primary=0.31 cfs 0.022 af

Total Runoff Area = 2.722 ac Runoff Volume = 0.625 af Average Runoff Depth = 2.75"
48.60% Pervious = 1.323 ac 51.40% Impervious = 1.399 ac

Summary for Subcatchment P-1: Subcat P-1

Runoff = 0.69 cfs @ 12.10 hrs, Volume= 0.051 af, Depth= 2.16"
Routed to Link DP1 : City Storm System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.16"

Area (ac)	CN	Description
0.026	39	>75% Grass cover, Good, HSG A
0.176	61	>75% Grass cover, Good, HSG B
0.036	98	Paved parking, HSG A
0.046	98	Paved parking, HSG B
0.284	70	Weighted Average
0.202		71.13% Pervious Area
0.082		28.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	30	0.0150	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.0	15	0.3300	9.25		**Shallow Concentrated Flow, Grass slope** Unpaved Kv= 16.1 fps
1.9					**Direct Entry,**
6.0	45	Total			

Summary for Subcatchment P-2: Subcat P-2

Runoff = 0.63 cfs @ 12.11 hrs, Volume= 0.055 af, Depth= 1.06"
Routed to Link DP2 : Wetland/Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.16"

Area (ac)	CN	Description
0.197	39	>75% Grass cover, Good, HSG A
0.142	61	>75% Grass cover, Good, HSG B
0.003	80	>75% Grass cover, Good, HSG D
0.039	98	Paved parking, HSG A
0.011	98	Paved parking, HSG B
0.064	30	Woods, Good, HSG A
0.101	55	Woods, Good, HSG B
0.068	77	Woods, Good, HSG D
0.625	55	Weighted Average
0.574		91.96% Pervious Area
0.050		8.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.2400	2.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7					**Direct Entry,**
6.0	50	Total			

Summary for Subcatchment P-2A: Subcat P-2A

Runoff = 1.17 cfs @ 12.09 hrs, Volume= 0.085 af, Depth= 3.03"
Routed to Pond B2 : Roof Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.16"

Area (ac)	CN	Description
0.092	39	>75% Grass cover, Good, HSG A
0.015	61	>75% Grass cover, Good, HSG B
0.112	98	Paved parking, HSG A
0.032	98	Paved parking, HSG B
0.086	98	Water Surface, HSG A
0.000	30	Woods, Good, HSG A
0.336	80	Weighted Average
0.106		31.66% Pervious Area
0.230		68.34% Impervious Area

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

Summary for Subcatchment P-2B: Subcat P-2B

Runoff = 3.48 cfs @ 12.09 hrs, Volume= 0.256 af, Depth= 3.52"
Routed to Pond B1 : Main Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.16"

Area (ac)	CN	Description
0.185	39	>75% Grass cover, Good, HSG A
0.016	61	>75% Grass cover, Good, HSG B
0.008	80	>75% Grass cover, Good, HSG D
0.568	98	Paved parking, HSG A
0.070	98	Water Surface, HSG A
0.011	98	Water Surface, HSG B
0.015	98	Water Surface, HSG D
0.000	30	Woods, Good, HSG A
0.874	85	Weighted Average
0.210		24.00% Pervious Area
0.664		76.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	52	0.0570	1.67		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.5					**Direct Entry,**
6.0	52	Total			

Summary for Subcatchment P-3: Subcat P-3

Runoff = 0.01 cfs @ 12.45 hrs, Volume= 0.002 af, Depth= 0.23"
Routed to Link DP3 : Southwest Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.16"

Area (ac)	CN	Description
0.126	39	>75% Grass cover, Good, HSG A
0.001	98	Paved parking, HSG A
0.000	30	Woods, Good, HSG A
0.127	39	Weighted Average
0.126		99.21% Pervious Area
0.001		0.79% Impervious Area

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

Summary for Subcatchment P-4: Subcat P-4

Runoff = 0.31 cfs @ 12.09 hrs, Volume= 0.022 af, Depth= 2.58"
Routed to Link DP4 : Southeast Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.16"

Area (ac)	CN	Description
0.004	39	>75% Grass cover, Good, HSG A
0.010	80	>75% Grass cover, Good, HSG D
0.003	30	Woods, Good, HSG A
0.088	77	Woods, Good, HSG D
0.105	75	Weighted Average
0.105		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.36"
0.1	7	0.1515	1.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.0	57	Total			

Summary for Subcatchment P-R: Subcat P-R

Runoff = 1.84 cfs @ 12.09 hrs, Volume= 0.153 af, Depth= 4.92"
Routed to Pond B2 : Roof Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 10 year Rainfall=5.16"

Area (ac)	CN	Description
0.341	98	Roofs, HSG A
0.031	98	Roofs, HSG B
0.372	98	Weighted Average
0.372		100.00% Impervious Area

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

Summary for Pond B1: Main Basin

Inflow Area = 1.582 ac, 80.02% Impervious, Inflow Depth = 1.94" for 10 year event
Inflow = 3.48 cfs @ 12.09 hrs, Volume= 0.256 af
Outflow = 0.50 cfs @ 12.62 hrs, Volume= 0.256 af, Atten= 86%, Lag= 31.7 min
Discarded = 0.50 cfs @ 12.62 hrs, Volume= 0.256 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP2 : Wetland/Basin
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP2 : Wetland/Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 92.82' @ 12.62 hrs Surf.Area= 2,584 sf Storage= 3,765 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 60.1 min (866.4 - 806.3)

Volume	Invert	Avail.Storage	Storage Description
#1	91.00'	10,922 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
91.00	1,587	0	0	1,587
92.00	2,112	1,843	1,843	2,134
93.00	2,694	2,397	4,240	2,741
94.00	3,332	3,007	7,248	3,408
95.00	4,027	3,674	10,922	4,135

Device	Routing	Invert	Outlet Devices
#1	Discarded	91.00'	**8.270 in/hr Exfiltration over Wetted area**
#2	Primary	91.50'	**12.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.50' / 90.90' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	93.75'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	94.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	95.00'	**12.0' long x 27.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.50 cfs @ 12.62 hrs HW=92.82' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.50 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=91.00' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=91.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B2: Roof Basin

Inflow Area = 0.708 ac, 84.98% Impervious, Inflow Depth = 4.03" for 10 year event
Inflow = 3.00 cfs @ 12.09 hrs, Volume= 0.238 af
Outflow = 0.79 cfs @ 12.46 hrs, Volume= 0.238 af, Atten= 74%, Lag= 22.2 min
Discarded = 0.79 cfs @ 12.46 hrs, Volume= 0.238 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
  Routed to Pond B1 : Main Basin
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
  Routed to Link DP1 : City Storm System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 97.16' @ 12.46 hrs Surf.Area= 4,107 sf Storage= 2,257 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 16.1 min (789.7 - 773.6)

Volume	Invert	Avail.Storage	Storage Description
#1	96.50'	6,267 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.50	2,646	0	0
97.00	3,860	1,627	1,627
98.00	5,421	4,641	6,267

Device	Routing	Invert	Outlet Devices
#1	Discarded	96.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	97.25'	**12.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.25' / 96.64' S= 0.0197 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Secondary	98.10'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.79 cfs @ 12.46 hrs HW=97.16' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.79 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=96.50' TW=91.00' (Dynamic Tailwater)
↑—**2=Culvert** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=96.50' TW=0.00' (Dynamic Tailwater)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP1: City Storm System

Inflow Area = 0.284 ac, 28.87% Impervious, Inflow Depth = 2.16" for 10 year event
Inflow = 0.69 cfs @ 12.10 hrs, Volume= 0.051 af
Primary = 0.69 cfs @ 12.10 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP2: Wetland/Basin

Inflow Area = 2.207 ac, 59.64% Impervious, Inflow Depth = 0.30" for 10 year event
Inflow = 0.63 cfs @ 12.11 hrs, Volume= 0.055 af
Primary = 0.63 cfs @ 12.11 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP3: Southwest Abutter

Inflow Area = 0.127 ac, 0.79% Impervious, Inflow Depth = 0.23" for 10 year event
Inflow = 0.01 cfs @ 12.45 hrs, Volume= 0.002 af
Primary = 0.01 cfs @ 12.45 hrs, Volume= 0.002 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP4: Southeast Abutter

Inflow Area = 0.105 ac, 0.00% Impervious, Inflow Depth = 2.58" for 10 year event
Inflow = 0.31 cfs @ 12.09 hrs, Volume= 0.022 af
Primary = 0.31 cfs @ 12.09 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment P-1: Subcat P-1 Runoff Area=0.284 ac 28.87% Impervious Runoff Depth=3.02"
Flow Length=45' Tc=6.0 min CN=70 Runoff=0.98 cfs 0.071 af

Subcatchment P-2: Subcat P-2 Runoff Area=0.625 ac 8.04% Impervious Runoff Depth=1.68"
Flow Length=50' Slope=0.2400 '/' Tc=6.0 min CN=55 Runoff=1.09 cfs 0.087 af

Subcatchment P-2A: Subcat P-2A Runoff Area=0.336 ac 68.34% Impervious Runoff Depth=4.03"
Tc=6.0 min CN=80 Runoff=1.54 cfs 0.113 af

Subcatchment P-2B: Subcat P-2B Runoff Area=0.874 ac 76.00% Impervious Runoff Depth=4.56"
Flow Length=52' Slope=0.0570 '/' Tc=6.0 min CN=85 Runoff=4.47 cfs 0.332 af

Subcatchment P-3: Subcat P-3 Runoff Area=0.127 ac 0.79% Impervious Runoff Depth=0.53"
Tc=6.0 min CN=39 Runoff=0.03 cfs 0.006 af

Subcatchment P-4: Subcat P-4 Runoff Area=0.105 ac 0.00% Impervious Runoff Depth=3.51"
Flow Length=57' Tc=6.0 min CN=75 Runoff=0.42 cfs 0.031 af

Subcatchment P-R: Subcat P-R Runoff Area=0.372 ac 100.00% Impervious Runoff Depth=6.03"
Tc=6.0 min CN=98 Runoff=2.23 cfs 0.187 af

Pond B1: Main Basin Peak Elev=93.38' Storage=5,305 cf Inflow=4.47 cfs 0.334 af
Discarded=0.57 cfs 0.334 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.57 cfs 0.334 af

Pond B2: Roof Basin Peak Elev=97.38' Storage=3,187 cf Inflow=3.78 cfs 0.300 af
Discarded=0.85 cfs 0.298 af Primary=0.07 cfs 0.002 af Secondary=0.00 cfs 0.000 af Outflow=0.92 cfs 0.300 af

Link DP1: City Storm System Inflow=0.98 cfs 0.071 af
Primary=0.98 cfs 0.071 af

Link DP2: Wetland/Basin Inflow=1.09 cfs 0.087 af
Primary=1.09 cfs 0.087 af

Link DP3: Southwest Abutter Inflow=0.03 cfs 0.006 af
Primary=0.03 cfs 0.006 af

Link DP4: Southeast Abutter Inflow=0.42 cfs 0.031 af
Primary=0.42 cfs 0.031 af

Total Runoff Area = 2.722 ac Runoff Volume = 0.827 af Average Runoff Depth = 3.64"
48.60% Pervious = 1.323 ac 51.40% Impervious = 1.399 ac

Summary for Subcatchment P-1: Subcat P-1

Runoff = 0.98 cfs @ 12.09 hrs, Volume= 0.071 af, Depth= 3.02"
Routed to Link DP1 : City Storm System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.27"

Area (ac)	CN	Description
0.026	39	>75% Grass cover, Good, HSG A
0.176	61	>75% Grass cover, Good, HSG B
0.036	98	Paved parking, HSG A
0.046	98	Paved parking, HSG B
0.284	70	Weighted Average
0.202		71.13% Pervious Area
0.082		28.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	30	0.0150	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.0	15	0.3300	9.25		**Shallow Concentrated Flow, Grass slope** Unpaved Kv= 16.1 fps
1.9					**Direct Entry,**
6.0	45	Total			

Summary for Subcatchment P-2: Subcat P-2

Runoff = 1.09 cfs @ 12.10 hrs, Volume= 0.087 af, Depth= 1.68"
Routed to Link DP2 : Wetland/Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.27"

Area (ac)	CN	Description
0.197	39	>75% Grass cover, Good, HSG A
0.142	61	>75% Grass cover, Good, HSG B
0.003	80	>75% Grass cover, Good, HSG D
0.039	98	Paved parking, HSG A
0.011	98	Paved parking, HSG B
0.064	30	Woods, Good, HSG A
0.101	55	Woods, Good, HSG B
0.068	77	Woods, Good, HSG D
0.625	55	Weighted Average
0.574		91.96% Pervious Area
0.050		8.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.2400	2.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7					**Direct Entry,**
6.0	50	Total			

Summary for Subcatchment P-2A: Subcat P-2A

Runoff = 1.54 cfs @ 12.09 hrs, Volume= 0.113 af, Depth= 4.03"
Routed to Pond B2 : Roof Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.27"

Area (ac)	CN	Description
0.092	39	>75% Grass cover, Good, HSG A
0.015	61	>75% Grass cover, Good, HSG B
0.112	98	Paved parking, HSG A
0.032	98	Paved parking, HSG B
0.086	98	Water Surface, HSG A
0.000	30	Woods, Good, HSG A
0.336	80	Weighted Average
0.106		31.66% Pervious Area
0.230		68.34% Impervious Area

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

Summary for Subcatchment P-2B: Subcat P-2B

Runoff = 4.47 cfs @ 12.09 hrs, Volume= 0.332 af, Depth= 4.56"
Routed to Pond B1 : Main Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.27"

Area (ac)	CN	Description
0.185	39	>75% Grass cover, Good, HSG A
0.016	61	>75% Grass cover, Good, HSG B
0.008	80	>75% Grass cover, Good, HSG D
0.568	98	Paved parking, HSG A
0.070	98	Water Surface, HSG A
0.011	98	Water Surface, HSG B
0.015	98	Water Surface, HSG D
0.000	30	Woods, Good, HSG A
0.874	85	Weighted Average
0.210		24.00% Pervious Area
0.664		76.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	52	0.0570	1.67		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.5					**Direct Entry,**
6.0	52	Total			

Summary for Subcatchment P-3: Subcat P-3

Runoff = 0.03 cfs @ 12.32 hrs, Volume= 0.006 af, Depth= 0.53"
Routed to Link DP3 : Southwest Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.27"

Area (ac)	CN	Description
0.126	39	>75% Grass cover, Good, HSG A
0.001	98	Paved parking, HSG A
0.000	30	Woods, Good, HSG A
0.127	39	Weighted Average
0.126		99.21% Pervious Area
0.001		0.79% Impervious Area

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

Summary for Subcatchment P-4: Subcat P-4

Runoff = 0.42 cfs @ 12.09 hrs, Volume= 0.031 af, Depth= 3.51"
Routed to Link DP4 : Southeast Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.27"

Area (ac)	CN	Description
0.004	39	>75% Grass cover, Good, HSG A
0.010	80	>75% Grass cover, Good, HSG D
0.003	30	Woods, Good, HSG A
0.088	77	Woods, Good, HSG D
0.105	75	Weighted Average
0.105		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.36"
0.1	7	0.1515	1.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.0	57	Total			

Summary for Subcatchment P-R: Subcat P-R

Runoff = 2.23 cfs @ 12.09 hrs, Volume= 0.187 af, Depth= 6.03"
Routed to Pond B2 : Roof Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 25 year Rainfall=6.27"

Area (ac)	CN	Description
0.341	98	Roofs, HSG A
0.031	98	Roofs, HSG B
0.372	98	Weighted Average
0.372		100.00% Impervious Area

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

Summary for Pond B1: Main Basin

Inflow Area = 1.582 ac, 80.02% Impervious, Inflow Depth = 2.53" for 25 year event
Inflow = 4.47 cfs @ 12.09 hrs, Volume= 0.334 af
Outflow = 0.57 cfs @ 12.71 hrs, Volume= 0.334 af, Atten= 87%, Lag= 37.3 min
Discarded = 0.57 cfs @ 12.71 hrs, Volume= 0.334 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP2 : Wetland/Basin
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP2 : Wetland/Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 93.38' @ 12.71 hrs Surf.Area= 2,928 sf Storage= 5,305 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 79.4 min (878.1 - 798.7)

Volume	Invert	Avail.Storage	Storage Description
#1	91.00'	10,922 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
91.00	1,587	0	0	1,587
92.00	2,112	1,843	1,843	2,134
93.00	2,694	2,397	4,240	2,741
94.00	3,332	3,007	7,248	3,408
95.00	4,027	3,674	10,922	4,135

Device	Routing	Invert	Outlet Devices
#1	Discarded	91.00'	**8.270 in/hr Exfiltration over Wetted area**
#2	Primary	91.50'	**12.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.50' / 90.90' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	93.75'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	94.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	95.00'	**12.0' long x 27.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.57 cfs @ 12.71 hrs HW=93.38' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.57 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=91.00' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Controls 0.00 cfs)
  ├**3=Orifice/Grate** (Controls 0.00 cfs)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=91.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B2: Roof Basin

Inflow Area = 0.708 ac, 84.98% Impervious, Inflow Depth = 5.08" for 25 year event
Inflow = 3.78 cfs @ 12.09 hrs, Volume= 0.300 af
Outflow = 0.92 cfs @ 12.48 hrs, Volume= 0.300 af, Atten= 76%, Lag= 23.2 min
Discarded = 0.85 cfs @ 12.48 hrs, Volume= 0.298 af
Primary = 0.07 cfs @ 12.48 hrs, Volume= 0.002 af
  Routed to Pond B1 : Main Basin
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
  Routed to Link DP1 : City Storm System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 97.38' @ 12.48 hrs Surf.Area= 4,447 sf Storage= 3,187 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 21.9 min (792.0 - 770.0)

Volume	Invert	Avail.Storage	Storage Description
#1	96.50'	6,267 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.50	2,646	0	0
97.00	3,860	1,627	1,627
98.00	5,421	4,641	6,267

Device	Routing	Invert	Outlet Devices
#1	Discarded	96.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	97.25'	**12.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.25' / 96.64' S= 0.0197 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Secondary	98.10'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.85 cfs @ 12.48 hrs HW=97.37' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.85 cfs)

Primary OutFlow Max=0.07 cfs @ 12.48 hrs HW=97.37' TW=93.32' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.07 cfs @ 1.20 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=96.50' TW=0.00' (Dynamic Tailwater)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP1: City Storm System

Inflow Area = 0.284 ac, 28.87% Impervious, Inflow Depth = 3.02" for 25 year event
Inflow = 0.98 cfs @ 12.09 hrs, Volume= 0.071 af
Primary = 0.98 cfs @ 12.09 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP2: Wetland/Basin

Inflow Area = 2.207 ac, 59.64% Impervious, Inflow Depth = 0.47" for 25 year event
Inflow = 1.09 cfs @ 12.10 hrs, Volume= 0.087 af
Primary = 1.09 cfs @ 12.10 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP3: Southwest Abutter

Inflow Area = 0.127 ac, 0.79% Impervious, Inflow Depth = 0.53" for 25 year event
Inflow = 0.03 cfs @ 12.32 hrs, Volume= 0.006 af
Primary = 0.03 cfs @ 12.32 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP4: Southeast Abutter

Inflow Area = 0.105 ac, 0.00% Impervious, Inflow Depth = 3.51" for 25 year event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 0.031 af
Primary = 0.42 cfs @ 12.09 hrs, Volume= 0.031 af, Atten= 0%, Lag= 0.0 min

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

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

Subcatchment P-1: Subcat P-1 Runoff Area=0.284 ac 28.87% Impervious Runoff Depth=4.46"
Flow Length=45' Tc=6.0 min CN=70 Runoff=1.46 cfs 0.106 af

Subcatchment P-2: Subcat P-2 Runoff Area=0.625 ac 8.04% Impervious Runoff Depth=2.78"
Flow Length=50' Slope=0.2400 '/' Tc=6.0 min CN=55 Runoff=1.93 cfs 0.145 af

Subcatchment P-2A: Subcat P-2A Runoff Area=0.336 ac 68.34% Impervious Runoff Depth=5.62"
Tc=6.0 min CN=80 Runoff=2.13 cfs 0.158 af

Subcatchment P-2B: Subcat P-2B Runoff Area=0.874 ac 76.00% Impervious Runoff Depth=6.21"
Flow Length=52' Slope=0.0570 '/' Tc=6.0 min CN=85 Runoff=6.00 cfs 0.452 af

Subcatchment P-3: Subcat P-3 Runoff Area=0.127 ac 0.79% Impervious Runoff Depth=1.16"
Tc=6.0 min CN=39 Runoff=0.11 cfs 0.012 af

Subcatchment P-4: Subcat P-4 Runoff Area=0.105 ac 0.00% Impervious Runoff Depth=5.04"
Flow Length=57' Tc=6.0 min CN=75 Runoff=0.60 cfs 0.044 af

Subcatchment P-R: Subcat P-R Runoff Area=0.372 ac 100.00% Impervious Runoff Depth=7.76"
Tc=6.0 min CN=98 Runoff=2.85 cfs 0.241 af

Pond B1: Main Basin Peak Elev=94.29' Storage=8,234 cf Inflow=5.99 cfs 0.478 af
Discarded=0.69 cfs 0.453 af Primary=0.26 cfs 0.025 af Secondary=0.00 cfs 0.000 af Outflow=0.95 cfs 0.478 af

Pond B2: Roof Basin Peak Elev=97.62' Storage=4,322 cf Inflow=4.99 cfs 0.398 af
Discarded=0.92 cfs 0.373 af Primary=0.55 cfs 0.025 af Secondary=0.00 cfs 0.000 af Outflow=1.47 cfs 0.398 af

Link DP1: City Storm System Inflow=1.46 cfs 0.106 af
Primary=1.46 cfs 0.106 af

Link DP2: Wetland/Basin Inflow=1.93 cfs 0.170 af
Primary=1.93 cfs 0.170 af

Link DP3: Southwest Abutter Inflow=0.11 cfs 0.012 af
Primary=0.11 cfs 0.012 af

Link DP4: Southeast Abutter Inflow=0.60 cfs 0.044 af
Primary=0.60 cfs 0.044 af

Total Runoff Area = 2.722 ac Runoff Volume = 1.157 af Average Runoff Depth = 5.10"
48.60% Pervious = 1.323 ac 51.40% Impervious = 1.399 ac

Summary for Subcatchment P-1: Subcat P-1

Runoff = 1.46 cfs @ 12.09 hrs, Volume= 0.106 af, Depth= 4.46"
Routed to Link DP1 : City Storm System

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.00"

Area (ac)	CN	Description
0.026	39	>75% Grass cover, Good, HSG A
0.176	61	>75% Grass cover, Good, HSG B
0.036	98	Paved parking, HSG A
0.046	98	Paved parking, HSG B
0.284	70	Weighted Average
0.202		71.13% Pervious Area
0.082		28.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.1	30	0.0150	0.12		**Sheet Flow,** Grass: Short n= 0.150 P2= 3.36"
0.0	15	0.3300	9.25		**Shallow Concentrated Flow, Grass slope** Unpaved Kv= 16.1 fps
1.9					**Direct Entry,**
6.0	45	Total			

Summary for Subcatchment P-2: Subcat P-2

Runoff = 1.93 cfs @ 12.10 hrs, Volume= 0.145 af, Depth= 2.78"
Routed to Link DP2 : Wetland/Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.00"

Area (ac)	CN	Description
0.197	39	>75% Grass cover, Good, HSG A
0.142	61	>75% Grass cover, Good, HSG B
0.003	80	>75% Grass cover, Good, HSG D
0.039	98	Paved parking, HSG A
0.011	98	Paved parking, HSG B
0.064	30	Woods, Good, HSG A
0.101	55	Woods, Good, HSG B
0.068	77	Woods, Good, HSG D
0.625	55	Weighted Average
0.574		91.96% Pervious Area
0.050		8.04% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	50	0.2400	2.45		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
5.7					**Direct Entry,**
6.0	50	Total			

Summary for Subcatchment P-2A: Subcat P-2A

Runoff = 2.13 cfs @ 12.09 hrs, Volume= 0.158 af, Depth= 5.62"
Routed to Pond B2 : Roof Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.00"

Area (ac)	CN	Description
0.092	39	>75% Grass cover, Good, HSG A
0.015	61	>75% Grass cover, Good, HSG B
0.112	98	Paved parking, HSG A
0.032	98	Paved parking, HSG B
0.086	98	Water Surface, HSG A
0.000	30	Woods, Good, HSG A
0.336	80	Weighted Average
0.106		31.66% Pervious Area
0.230		68.34% Impervious Area

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

Summary for Subcatchment P-2B: Subcat P-2B

Runoff = 6.00 cfs @ 12.09 hrs, Volume= 0.452 af, Depth= 6.21"
Routed to Pond B1 : Main Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.00"

Area (ac)	CN	Description
0.185	39	>75% Grass cover, Good, HSG A
0.016	61	>75% Grass cover, Good, HSG B
0.008	80	>75% Grass cover, Good, HSG D
0.568	98	Paved parking, HSG A
0.070	98	Water Surface, HSG A
0.011	98	Water Surface, HSG B
0.015	98	Water Surface, HSG D
0.000	30	Woods, Good, HSG A
0.874	85	Weighted Average
0.210		24.00% Pervious Area
0.664		76.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	52	0.0570	1.67		**Shallow Concentrated Flow,** Short Grass Pasture Kv= 7.0 fps
5.5					**Direct Entry,**
6.0	52	Total			

Summary for Subcatchment P-3: Subcat P-3

Runoff = 0.11 cfs @ 12.12 hrs, Volume= 0.012 af, Depth= 1.16"
Routed to Link DP3 : Southwest Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.00"

Area (ac)	CN	Description
0.126	39	>75% Grass cover, Good, HSG A
0.001	98	Paved parking, HSG A
0.000	30	Woods, Good, HSG A
0.127	39	Weighted Average
0.126		99.21% Pervious Area
0.001		0.79% Impervious Area

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

Summary for Subcatchment P-4: Subcat P-4

Runoff = 0.60 cfs @ 12.09 hrs, Volume= 0.044 af, Depth= 5.04"
Routed to Link DP4 : Southeast Abutter

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.00"

Area (ac)	CN	Description
0.004	39	>75% Grass cover, Good, HSG A
0.010	80	>75% Grass cover, Good, HSG D
0.003	30	Woods, Good, HSG A
0.088	77	Woods, Good, HSG D
0.105	75	Weighted Average
0.105		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.9	50	0.1200	0.14		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.36"
0.1	7	0.1515	1.95		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
6.0	57	Total			

Summary for Subcatchment P-R: Subcat P-R

Runoff = 2.85 cfs @ 12.09 hrs, Volume= 0.241 af, Depth= 7.76"
Routed to Pond B2 : Roof Basin

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Type III 24-hr 100 year Rainfall=8.00"

Area (ac)	CN	Description
0.341	98	Roofs, HSG A
0.031	98	Roofs, HSG B
0.372	98	Weighted Average
0.372		100.00% Impervious Area

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

Summary for Pond B1: Main Basin

Inflow Area = 1.582 ac, 80.02% Impervious, Inflow Depth = 3.62" for 100 year event
Inflow = 5.99 cfs @ 12.09 hrs, Volume= 0.478 af
Outflow = 0.95 cfs @ 12.76 hrs, Volume= 0.478 af, Atten= 84%, Lag= 40.0 min
Discarded = 0.69 cfs @ 12.76 hrs, Volume= 0.453 af
Primary = 0.26 cfs @ 12.76 hrs, Volume= 0.025 af
Routed to Link DP2 : Wetland/Basin
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP2 : Wetland/Basin

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 94.29' @ 12.76 hrs Surf.Area= 3,525 sf Storage= 8,234 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 100.4 min (888.8 - 788.4)

Volume	Invert	Avail.Storage	Storage Description
#1	91.00'	10,922 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
91.00	1,587	0	0	1,587
92.00	2,112	1,843	1,843	2,134
93.00	2,694	2,397	4,240	2,741
94.00	3,332	3,007	7,248	3,408
95.00	4,027	3,674	10,922	4,135

Device	Routing	Invert	Outlet Devices
#1	Discarded	91.00'	**8.270 in/hr Exfiltration over Wetted area**
#2	Primary	91.50'	**12.0" Round Culvert** L= 60.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 91.50' / 90.90' S= 0.0100 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Device 2	93.75'	**4.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Device 2	94.50'	**48.0" x 48.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#5	Secondary	95.00'	**12.0' long x 27.5' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Discarded OutFlow Max=0.69 cfs @ 12.76 hrs HW=94.29' (Free Discharge)
└**1=Exfiltration** (Exfiltration Controls 0.69 cfs)

Primary OutFlow Max=0.26 cfs @ 12.76 hrs HW=94.29' TW=0.00' (Dynamic Tailwater)
└**2=Culvert** (Passes 0.26 cfs of 5.53 cfs potential flow)
  ├**3=Orifice/Grate** (Orifice Controls 0.26 cfs @ 2.93 fps)
  └**4=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=91.00' TW=0.00' (Dynamic Tailwater)
└**5=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond B2: Roof Basin

Inflow Area = 0.708 ac, 84.98% Impervious, Inflow Depth = 6.75" for 100 year event
Inflow = 4.99 cfs @ 12.09 hrs, Volume= 0.398 af
Outflow = 1.47 cfs @ 12.42 hrs, Volume= 0.398 af, Atten= 70%, Lag= 19.9 min
Discarded = 0.92 cfs @ 12.42 hrs, Volume= 0.373 af
Primary = 0.55 cfs @ 12.42 hrs, Volume= 0.025 af
Routed to Pond B1 : Main Basin
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link DP1 : City Storm System

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.05 hrs
Peak Elev= 97.62' @ 12.42 hrs Surf.Area= 4,829 sf Storage= 4,322 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 25.1 min (790.7 - 765.6)

Volume	Invert	Avail.Storage	Storage Description
#1	96.50'	6,267 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
96.50	2,646	0	0
97.00	3,860	1,627	1,627
98.00	5,421	4,641	6,267

Device	Routing	Invert	Outlet Devices
#1	Discarded	96.50'	**8.270 in/hr Exfiltration over Surface area**
#2	Primary	97.25'	**12.0" Round Culvert** L= 31.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 97.25' / 96.64' S= 0.0197 '/' Cc= 0.900 n= 0.012, Flow Area= 0.79 sf
#3	Secondary	98.10'	**20.0' long x 12.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.57 2.62 2.70 2.67 2.66 2.67 2.66 2.64

Discarded OutFlow Max=0.92 cfs @ 12.42 hrs HW=97.62' (Free Discharge)
↑—**1=Exfiltration** (Exfiltration Controls 0.92 cfs)

Primary OutFlow Max=0.55 cfs @ 12.42 hrs HW=97.62' TW=94.09' (Dynamic Tailwater)
↑—**2=Culvert** (Inlet Controls 0.55 cfs @ 2.07 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=96.50' TW=0.00' (Dynamic Tailwater)
↑—**3=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link DP1: City Storm System

Inflow Area = 0.284 ac, 28.87% Impervious, Inflow Depth = 4.46" for 100 year event
Inflow = 1.46 cfs @ 12.09 hrs, Volume= 0.106 af
Primary = 1.46 cfs @ 12.09 hrs, Volume= 0.106 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP2: Wetland/Basin

Inflow Area = 2.207 ac, 59.64% Impervious, Inflow Depth = 0.92" for 100 year event
Inflow = 1.93 cfs @ 12.10 hrs, Volume= 0.170 af
Primary = 1.93 cfs @ 12.10 hrs, Volume= 0.170 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP3: Southwest Abutter

Inflow Area = 0.127 ac, 0.79% Impervious, Inflow Depth = 1.16" for 100 year event
Inflow = 0.11 cfs @ 12.12 hrs, Volume= 0.012 af
Primary = 0.11 cfs @ 12.12 hrs, Volume= 0.012 af, Atten= 0%, Lag= 0.0 min

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

Summary for Link DP4: Southeast Abutter

Inflow Area = 0.105 ac, 0.00% Impervious, Inflow Depth = 5.04" for 100 year event
Inflow = 0.60 cfs @ 12.09 hrs, Volume= 0.044 af
Primary = 0.60 cfs @ 12.09 hrs, Volume= 0.044 af, Atten= 0%, Lag= 0.0 min

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

APPENDIX F: STORMWATER CALCULATIONS

- *MA STANDARD #3 – RECHARGE AND DRAWDOWN TIME*
- *MA STANDARD #4 – WATER QUALITY AND TSS REMOVAL*
- *TP40/NOAA/CORNELL RAINFALL DATA*
- *PIPE AND INLET SIZING*
- *OUTLET PROTECTION SIZING*

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MA DEP Standard 3: Recharge Volume Calculations

Required Recharge Volume - A Soils (0.60 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.965
Proposed Increase in Site Impervious Area (ac)	0.965
Recharge Volume Required (cf)	**2,102**

Required Recharge Volume - B Soils (0.35 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.075
Proposed Increase in Site Impervious Area (ac)	0.075
Recharge Volume Required (cf)	**95**

Required Recharge Volume - C Soils (0.25 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.000
Proposed Increase in Site Impervious Area (ac)	0.000
Recharge Volume Required (cf)	**0**

Required Recharge Volume - D Soils (0.10 in.)	
Existing Site Impervious Area (ac)	0.000
Proposed Site Impervious Area (ac)	0.000
Proposed Increase in Site Impervious Area (ac)	0.000
Recharge Volume Required (cf)	**0**

Total Recharge Volume Required (cf)	**2,197**

Recharge Volume Adjustment Factor	
Impervious Area Directed to Infiltration BMP (ac)	**0.874**
%Impervious Directed to Infiltration BMP	84%
Adjustment Factor	1.19
Adjusted Total Recharge Volume Required (cf)	**2,614**

Provided Recharge Volume*	
Basin 1	5,664
Basin 2	2,597
Total Recharge Volume Provided (cf)	**8,261**

Provided greater than or Equal to Required

*Volume provided below lowest outlet in cubic feet (cf)

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MA DEP Standard 3: Drawdown Time Calculations

Drawdown Time - Basin 1	
Volume below outlet pipe (Rv) (cf)	5,664
Soil Type	Sand - A
Infiltration rate (K)*	8.27
Bottom Area (sf)	1,587
Drawdown time (Hours)*	**5.2**
Drawdown Time - Basin 2	
Volume below outlet pipe (Rv) (cf)	2,597
Soil Type	Sand - A
Infiltration rate (K)*	8.27
Bottom Area (sf)	2,605
Drawdown time (Hours)**	**1.4**

*Infiltration Rates taken from Rawls Table
**Drawdown time = Rv / (K) x (bottom area)

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MA DEP Standard 4: Water Quality Volume Calculations

Water Quality Volume Required	
Water Quality Volume runoff (in.)*	0.5
Total Post Development Impervious Area (sf)	45,302
Required Water Quality Volume (cf)	**1,888**
*Water Quality volume runoff is equal to 0.5 or 1.0 inches of runoff times the total impervious area of the post development project site.	

Water Quality Volume Provided*	
Basin 1	5,664
Basin 2	2,597
Total Provided Water Quality Volume (cf)	**8,261**

Required WQV Provided

*Volume provided below lowest outlet pipe in cubic feet (cf)

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Stage-Area-Storage for Pond B1: Main Basin

Elevation (feet)	Surface (sq-ft)	Wetted (sq-ft)	Storage (cubic-feet)	
91.00	1,587	1,587	0	
91.10	1,636	1,638	161	
91.20	1,686	1,690	327	
91.30	1,737	1,743	498	
91.40	1,788	1,796	675	
91.50	1,840	1,851	856	
91.60	1,893	1,906	1,043	
91.70	1,947	1,961	1,235	
91.80	2,001	2,018	1,432	
91.90	2,056	2,075	1,635	
92.00	2,112	2,134	1,843	
92.10	2,167	2,191	2,057	
92.20	2,223	2,249	2,277	
92.30	2,279	2,308	2,502	
92.40	2,336	2,368	2,733	
92.50	2,394	2,428	2,969	
92.60	2,453	2,489	3,211	
92.70	2,512	2,551	3,460	
92.80	2,572	2,614	3,714	
92.90	2,633	2,677	3,974	
93.00	2,694	2,741	4,240	
93.10	2,755	2,804	4,513	
93.20	2,816	2,869	4,791	
93.30	2,878	2,934	5,076	
93.40	2,941	2,999	5,367	
93.50	3,005	3,065	5,664	Storage at lowest outlet
93.60	3,069	3,133	5,968	
93.70	3,133	3,200	6,278	
93.80	3,199	3,269	6,595	
93.90	3,265	3,338	6,918	
94.00	3,332	3,408	7,248	
94.10	3,399	3,477	7,584	
94.20	3,466	3,548	7,927	
94.30	3,534	3,619	8,277	
94.40	3,602	3,691	8,634	
94.50	3,671	3,763	8,998	
94.60	3,741	3,836	9,368	
94.70	3,812	3,910	9,746	
94.80	3,883	3,984	10,131	
94.90	3,955	4,059	10,523	
95.00	**4,027**	**4,135**	**10,922**	

Stage-Area-Storage for Pond B2: Roof Basin

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
96.50	2,605	0
96.52	2,653	53
96.54	2,700	106
96.56	2,748	161
96.58	2,795	216
96.60	2,843	272
96.62	2,890	330
96.64	2,938	388
96.66	2,985	447
96.68	3,033	507
96.70	3,080	569
96.72	3,128	631
96.74	3,175	694
96.76	3,223	758
96.78	3,270	823
96.80	3,318	888
96.82	3,365	955
96.84	3,413	1,023
96.86	3,460	1,092
96.88	3,508	1,161
96.90	3,555	1,232
96.92	3,603	1,304
96.94	3,650	1,376
96.96	3,698	1,450
96.98	3,745	1,524
97.00	3,793	1,600
97.02	3,825	1,676
97.04	3,857	1,752
97.06	3,888	1,830
97.08	3,920	1,908
97.10	3,952	1,987
97.12	3,984	2,066
97.14	4,016	2,146
97.16	4,048	2,227
97.18	4,079	2,308
97.20	4,111	2,390
97.22	4,143	2,472
97.24	4,175	2,556
97.26	4,207	2,639
97.28	4,238	2,724
97.30	4,270	2,809
97.32	4,302	2,895
97.34	4,334	2,981
97.36	4,366	3,068
97.38	4,398	3,156
97.40	4,429	3,244
97.42	4,461	3,333
97.44	4,493	3,422
97.46	4,525	3,513
97.48	4,557	3,603
97.50	4,589	3,695
97.52	4,620	3,787
97.54	4,652	3,880
97.56	4,684	3,973
97.58	4,716	4,067
97.60	4,748	4,162
97.62	4,779	4,257
97.64	4,811	4,353
97.66	4,843	4,449
97.68	4,875	4,547
97.70	4,907	4,644
97.72	4,939	4,743
97.74	4,970	4,842
97.76	5,002	4,942
97.78	5,034	5,042
97.80	5,066	5,143
97.82	5,098	5,245
97.84	5,129	5,347
97.86	5,161	5,450
97.88	5,193	5,553
97.90	5,225	5,658
97.92	5,257	5,762
97.94	5,289	5,868
97.96	5,320	5,974
97.98	5,352	6,081
98.00	**5,384**	**6,188**
98.02	5,384	6,188
98.04	5,384	6,188
98.06	5,384	6,188
98.08	5,384	6,188
98.10	5,384	6,188
98.12	5,384	6,188
98.14	5,384	6,188
98.16	5,384	6,188
98.18	5,384	6,188
98.20	5,384	6,188
98.22	5,384	6,188
98.24	5,384	6,188
98.26	5,384	6,188
98.28	5,384	6,188
98.30	5,384	6,188
98.34	5,384	6,188
98.36	5,384	6,188
98.38	5,384	6,188
98.40	5,384	6,188
98.42	5,384	6,188
98.44	5,384	6,188
98.46	5,384	6,188
98.48	5,384	6,188
98.50	5,384	6,188
98.52	5,384	6,188
98.54	5,384	6,188
98.56	5,384	6,188
98.58	5,384	6,188
98.60	5,384	6,188

lowest outlet = 97.25, volume = 2,598 CF

Stage-Area-Storage for Pond 1P: Sediment Forebay (Sizing)

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
92.00	49	0
92.05	53	3
92.10	57	5
92.15	62	8
92.20	66	11
92.25	70	15
92.30	74	18
92.35	78	22
92.40	83	26
92.45	87	31
92.50	91	35
92.55	95	40
92.60	99	45
92.65	104	50
92.70	108	55
92.75	112	60
92.80	116	66
92.85	120	72
92.90	125	78
92.95	129	84
93.00	133	91
93.05	138	98
93.10	144	105
93.15	149	112
93.20	155	120
93.25	160	128
93.30	165	136
93.35	171	144
93.40	176	153
93.45	182	162
93.50	187	171
93.55	192	180
93.60	198	190
93.65	203	200
93.70	209	211
93.75	214	221
93.80	219	232
93.85	225	243
93.90	230	254
93.95	236	266
94.00	241	278
94.05	248	290
94.10	254	303
94.15	261	316
94.20	267	329
94.25	274	342
94.30	281	356
94.35	287	370
94.40	294	385
94.45	300	400
94.50	307	415
94.55	314	431
94.60	320	446
94.65	327	463
94.70	333	479
94.75	340	496
94.80	347	513
94.85	353	531
94.90	360	548
94.95	366	567
95.00	373	585
95.05	385	604
95.10	396	623
95.15	408	644
95.20	419	664
95.25	431	686
95.30	443	707
95.35	454	730
95.40	466	753
95.45	477	776
95.50	**489**	**801**

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Forebay Sizing Calculations

Forebay #1	
Total Post Development Impervious Area (acres)	0.874
Forebay Volume Required (cf)	317.262
Forebay Volume Provided (cf)*	**577**

*Volume provided below lowest outlet of forebay, refer to attached storage tables

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MA DEP Standard 4: TSS Removal Calculation Worksheet

BMP Treatment Train: Rooftop to Basin 2, Parking lot and Basin 2 to Basin 1

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Infiltration Basin	**0.80**	**0.75**	**0.60**	**0.15**
		Total TSS Removal =	**85%**	

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

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MA DEP Standard 4: TSS Removal Calculation Worksheet

BMP Treatment Train: Rooftop to Basin 2, Parking lot and Basin 2 to Sediment Forebay

A BMP	B TSS Removal Rate	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Sediment Forebay	**0.25**	**0.75**	**0.19**	**0.56**
		Total TSS Removal =	**44%**	

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

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Empirical Preformed Scour Hole Equations:

Type 1: Scour Hole Depression = one-half pipe rise, m (ft)

$d_{50} = (0.0276\ R_p^{\ 2}/TW)\ (Q/R_p^{\ 2.5})^{1.333}$ **(** $d_{50} = (0.0125 R_p^{\ 2}/TW)\ (Q/R_p^{\ 2.5})^{1.333}$ **)** **(11.35)**

Type 2: Scour Hole Depression = full pipe rise, m (ft)

$d_{50} = (0.0181\ R_p^{\ 2}/TW)\ (Q/R_p^{\ 2.5})^{1.333}$ **(** $d_{50} = (0.0082 R_p^{\ 2}/TW)\ (Q/R_p^{\ 2.5})^{1.333}$**)** **(11.36)**

d_{50} = median stone size required, m (ft)

For variables S_p, R_p, TW and Q, see Section 11.13.5.

Type 1 and 2 preformed scour hole dimensions (See Figure 11-15)

$C = 3S_p + 6F$	Basin Length m (ft)	
$B = 2S_p + 6F$	Basin Inlet and Outlet Width m (ft)	**(11.37)**
$F = 0.5R_p$ (Type 1) or R_p (Type 2)	Basin Depression m (ft)	

Table 11-14 solves the above set of equations for Type 1 and 2 preformed scour holes for various pipe sizes.

The type of riprap required is as follows:

Modified	$d_{50} < 0.13$m (0.42 ft)
Intermediate	0.13m (0.42 ft) $< d_{50} <$ 0.20m (0.67 ft)
Standard	0.20m (0.67 ft) $< d_{50} <$ 0.38m (1.25 ft)
Special Design	0.38m (1.25 ft) $< d_{50}$

Reference: Report No. FHWA-RD-75-508 (“Culvert Outlet Protection Design: Computer Program Documentation”)

OUTLET PROTECTION
OUTLET VELOCITY > 14 feet/sec or Length of Apron exceeds limits shown on Tables 11-12.1 and 11-13.1

Preformed Scour Hole										
(See Figure 11-15)	PIPE DIAMETER OR SPAN (in)									
	12	15	18	24	30	36	42	48	54	60
Type 1										
B	5	6	8	10	13	15	18	20	23	25
C	6	8	9	12	15	18	21	24	27	30
d	Depends on riprap type(see Figure 11-15)									
$2S_p$	2.0	2.6	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
$3S_p$	3.0	3.9	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
$F = 0.5\ S_p$	0.5	0.625	0.75	1	1.25	1.5	1.75	2	2.25	2.5
Type 2										
B	8	10	12	16	20	24	28	32	36	40
C	9	11	14	18	23	27	32	36	41	45
d	Depends on riprap size (see Figure 11-15)									
$2S_p$	2.0	2.6	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
$3S_p$	3.0	3.9	4.5	6.0	7.5	9.0	10.5	12.0	13.5	15.0
$F = S_p$	1.0	1.3	1.5	2.0	2.5	3.0	3.5	4.0	4.5	5.0

Table 11-14.1 - Dimensions of Preformed Scour Hole (Feet)

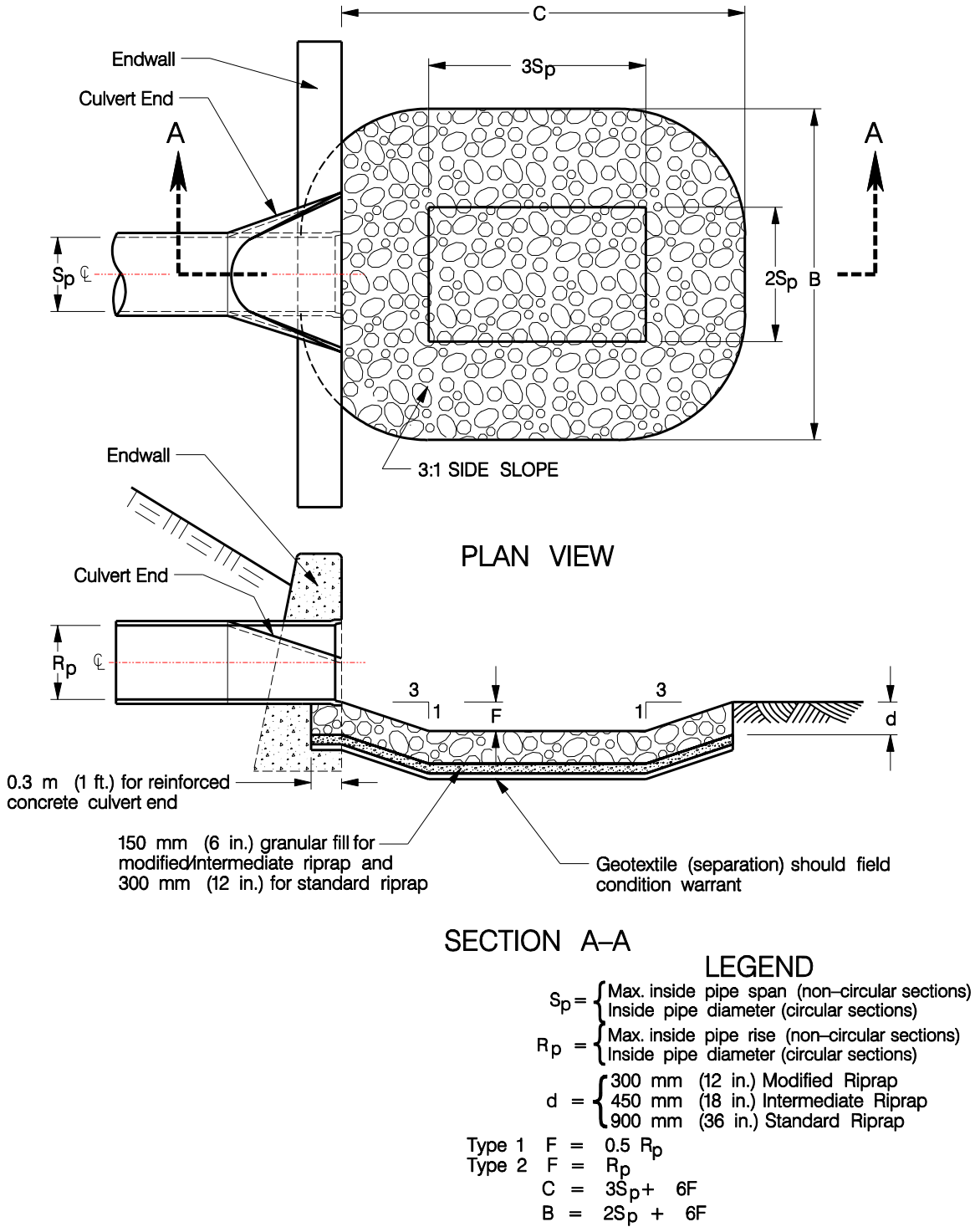

Figure 11-15 Preformed Scour Hole Type 1 and Type 2

NOAA Atlas 14, Volume 10, Version 3
Location name: East Weymouth, Massachusetts, USA*
Latitude: 42.1938°, Longitude: -70.9294°
Elevation: 92 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

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

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.303** (0.236-0.384)	**0.376** (0.293-0.477)	**0.496** (0.384-0.632)	**0.595** (0.459-0.763)	**0.732** (0.548-0.987)	**0.834** (0.612-1.15)	**0.943** (0.676-1.36)	**1.07** (0.722-1.57)	**1.27** (0.823-1.93)	**1.44** (0.911-2.23)
10-min	**0.429** (0.334-0.544)	**0.533** (0.415-0.676)	**0.703** (0.545-0.895)	**0.843** (0.650-1.08)	**1.04** (0.776-1.40)	**1.18** (0.868-1.63)	**1.34** (0.957-1.93)	**1.52** (1.02-2.23)	**1.80** (1.17-2.73)	**2.04** (1.29-3.16)
15-min	**0.505** (0.393-0.640)	**0.627** (0.488-0.796)	**0.827** (0.641-1.05)	**0.992** (0.765-1.27)	**1.22** (0.913-1.64)	**1.39** (1.02-1.92)	**1.57** (1.13-2.27)	**1.79** (1.20-2.62)	**2.12** (1.37-3.21)	**2.40** (1.52-3.71)
30-min	**0.700** (0.545-0.887)	**0.870** (0.676-1.10)	**1.15** (0.889-1.46)	**1.38** (1.06-1.76)	**1.69** (1.27-2.29)	**1.93** (1.42-2.67)	**2.18** (1.57-3.15)	**2.49** (1.67-3.64)	**2.95** (1.91-4.48)	**3.34** (2.12-5.18)
60-min	**0.895** (0.697-1.13)	**1.11** (0.865-1.41)	**1.47** (1.14-1.87)	**1.76** (1.36-2.26)	**2.17** (1.62-2.93)	**2.47** (1.82-3.41)	**2.79** (2.00-4.04)	**3.19** (2.14-4.66)	**3.78** (2.45-5.74)	**4.29** (2.72-6.64)
2-hr	**1.14** (0.888-1.43)	**1.43** (1.12-1.80)	**1.92** (1.49-2.42)	**2.32** (1.80-2.95)	**2.87** (2.16-3.85)	**3.28** (2.43-4.51)	**3.72** (2.69-5.35)	**4.27** (2.88-6.19)	**5.11** (3.32-7.67)	**5.83** (3.70-8.92)
3-hr	**1.32** (1.03-1.65)	**1.66** (1.30-2.08)	**2.22** (1.74-2.80)	**2.69** (2.09-3.41)	**3.34** (2.52-4.46)	**3.81** (2.83-5.22)	**4.33** (3.14-6.19)	**4.97** (3.36-7.16)	**5.95** (3.87-8.87)	**6.79** (4.32-10.3)
6-hr	**1.73** (1.36-2.15)	**2.15** (1.70-2.68)	**2.84** (2.24-3.56)	**3.42** (2.67-4.30)	**4.21** (3.19-5.57)	**4.79** (3.57-6.49)	**5.43** (3.94-7.67)	**6.20** (4.21-8.84)	**7.38** (4.82-10.9)	**8.40** (5.36-12.6)
12-hr	**2.27** (1.80-2.80)	**2.76** (2.19-3.42)	**3.57** (2.82-4.44)	**4.24** (3.34-5.30)	**5.17** (3.94-6.77)	**5.85** (4.37-7.84)	**6.59** (4.80-9.19)	**7.48** (5.10-10.6)	**8.81** (5.77-12.9)	**9.95** (6.37-14.8)
24-hr	**2.77** (2.21-3.40)	**3.36** (2.69-4.14)	**4.34** (3.46-5.36)	**5.16** (4.08-6.40)	**6.27** (4.81-8.15)	**7.10** (5.33-9.44)	**8.00** (5.85-11.1)	**9.07** (6.21-12.7)	**10.7** (7.03-15.4)	**12.1** (7.75-17.8)
2-day	**3.14** (2.52-3.83)	**3.88** (3.12-4.75)	**5.10** (4.08-6.25)	**6.11** (4.86-7.53)	**7.50** (5.78-9.69)	**8.53** (6.45-11.3)	**9.65** (7.11-13.3)	**11.0** (7.56-15.2)	**13.1** (8.66-18.7)	**15.0** (9.63-21.7)
3-day	**3.43** (2.77-4.18)	**4.24** (3.41-5.16)	**5.55** (4.45-6.77)	**6.64** (5.29-8.14)	**8.13** (6.29-10.5)	**9.24** (7.00-12.1)	**10.4** (7.72-14.3)	**11.9** (8.20-16.4)	**14.2** (9.39-20.2)	**16.2** (10.4-23.4)
4-day	**3.72** (3.00-4.50)	**4.54** (3.67-5.51)	**5.90** (4.74-7.18)	**7.02** (5.61-8.58)	**8.56** (6.63-11.0)	**9.70** (7.37-12.7)	**10.9** (8.10-14.9)	**12.5** (8.60-17.1)	**14.8** (9.81-20.9)	**16.9** (10.9-24.2)
7-day	**4.50** (3.65-5.42)	**5.36** (4.34-6.47)	**6.76** (5.46-8.18)	**7.93** (6.37-9.64)	**9.53** (7.41-12.1)	**10.7** (8.17-13.9)	**12.0** (8.89-16.2)	**13.6** (9.39-18.4)	**15.9** (10.6-22.3)	**18.0** (11.6-25.6)
10-day	**5.22** (4.25-6.27)	**6.10** (4.97-7.34)	**7.55** (6.12-9.10)	**8.75** (7.04-10.6)	**10.4** (8.10-13.1)	**11.6** (8.86-14.9)	**12.9** (9.57-17.2)	**14.5** (10.1-19.5)	**16.8** (11.2-23.4)	**18.8** (12.2-26.6)
20-day	**7.31** (5.99-8.72)	**8.28** (6.77-9.88)	**9.85** (8.03-11.8)	**11.2** (9.04-13.4)	**13.0** (10.1-16.1)	**14.3** (10.9-18.1)	**15.7** (11.6-20.5)	**17.3** (12.0-23.0)	**19.4** (13.0-26.6)	**21.1** (13.7-29.5)
30-day	**9.04** (7.43-10.7)	**10.1** (8.27-12.0)	**11.8** (9.61-14.0)	**13.1** (10.7-15.8)	**15.1** (11.8-18.6)	**16.6** (12.6-20.7)	**18.0** (13.2-23.2)	**19.5** (13.7-25.8)	**21.5** (14.4-29.3)	**23.0** (15.0-31.9)
45-day	**11.2** (9.24-13.3)	**12.3** (10.1-14.6)	**14.1** (11.6-16.8)	**15.6** (12.7-18.6)	**17.7** (13.8-21.6)	**19.3** (14.7-23.9)	**20.8** (15.3-26.5)	**22.3** (15.7-29.3)	**24.1** (16.2-32.6)	**25.4** (16.6-35.0)
60-day	**13.0** (10.8-15.4)	**14.2** (11.7-16.7)	**16.1** (13.2-19.0)	**17.6** (14.4-21.0)	**19.8** (15.6-24.1)	**21.5** (16.5-26.6)	**23.1** (17.0-29.2)	**24.6** (17.3-32.1)	**26.4** (17.8-35.4)	**27.5** (18.0-37.7)

[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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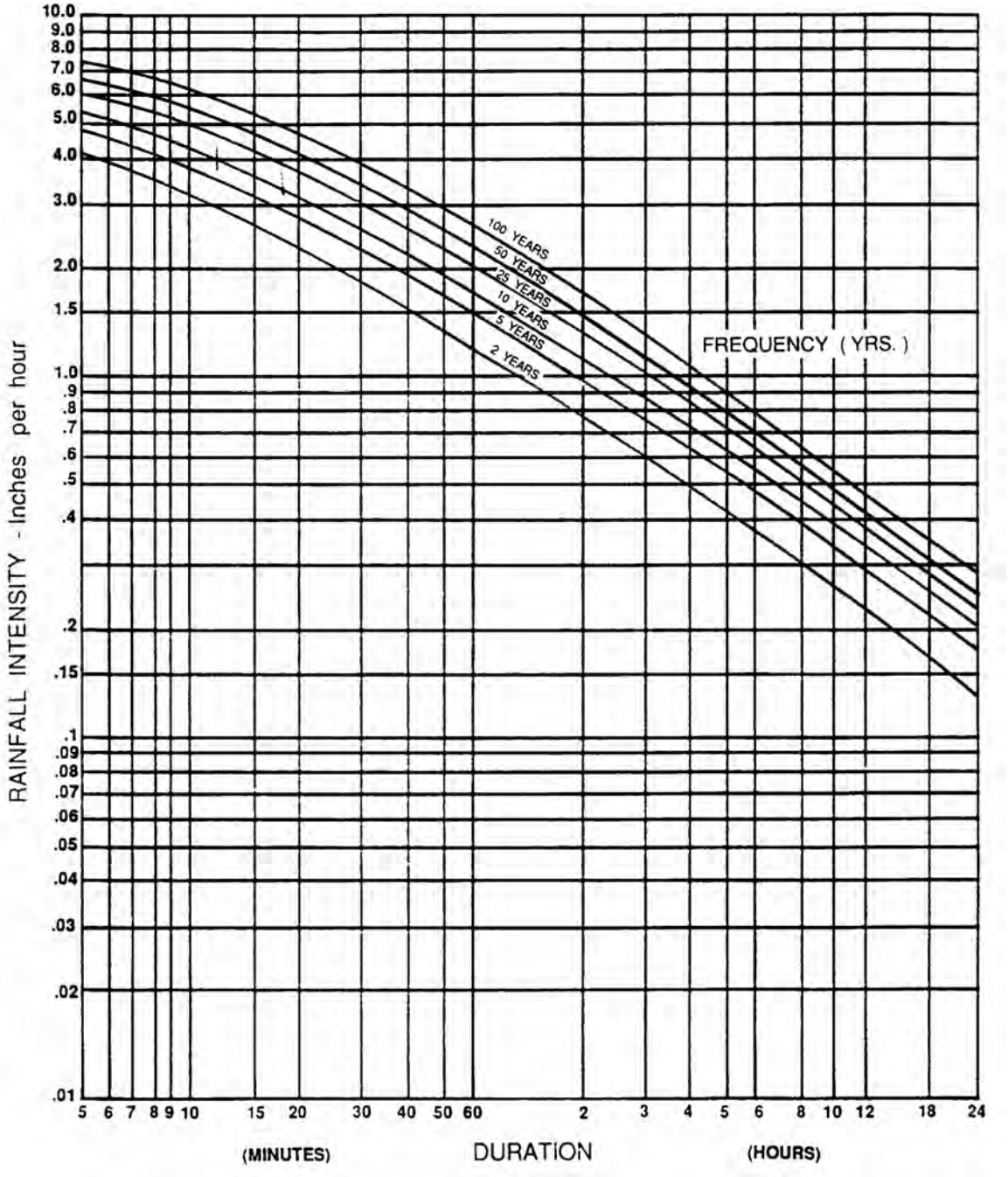
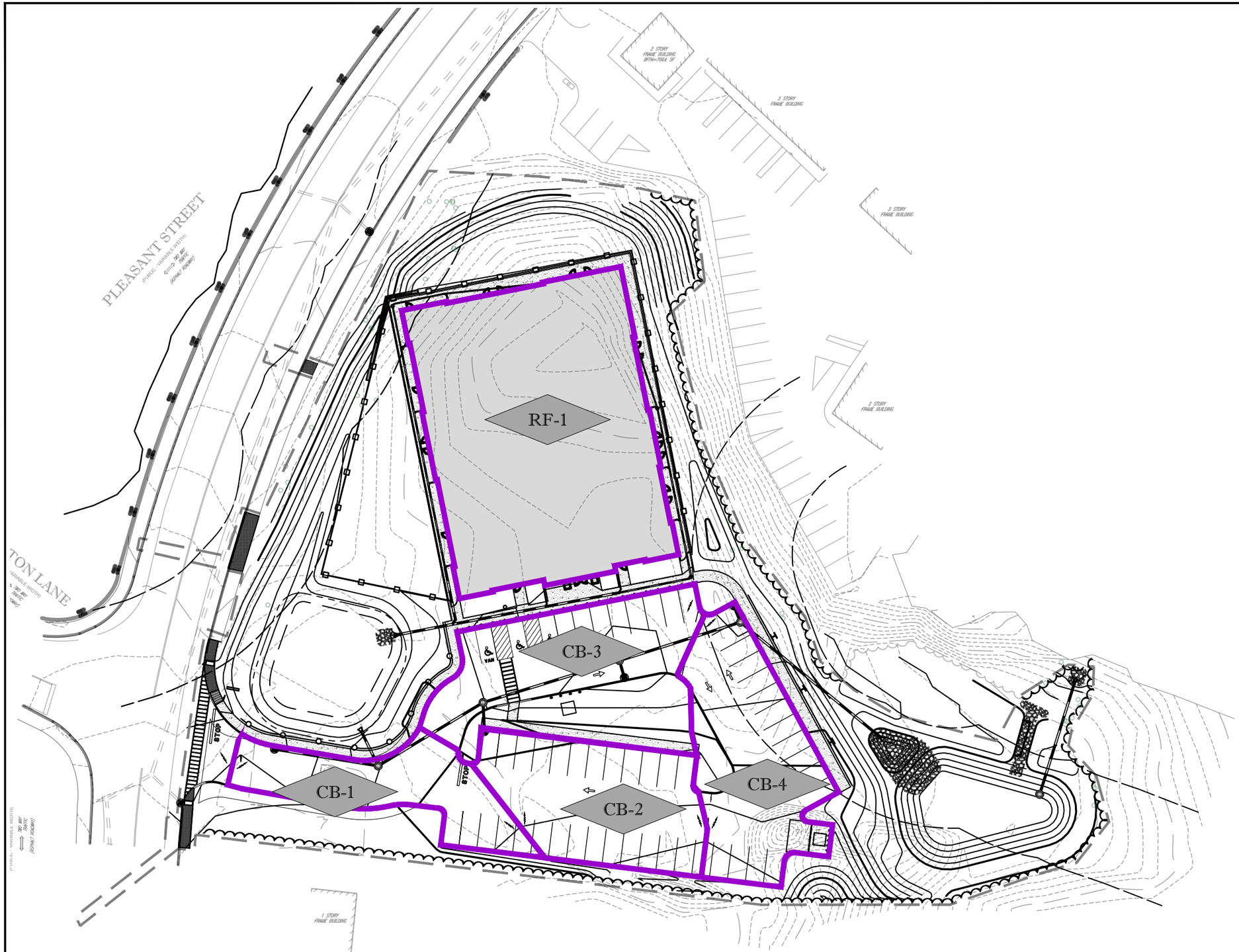
PF graphical

Exhibit 8-12
Intensity – Duration – Frequency Curve for Boston, MA



Source: TR55 - Urban Hydrology for Small Wetlands, NRCS



LEGEND

INLET CATCHMENT BOUNDARY

CB-# PROPOSED CATCH BASIN

RF-# ROOF TOP AREA

PROPOSED CATCH BASIN DRAINAGE AREA MAP

739 PLEASANT STREET
WEYMOUTH, MA

PREPARED BY

BOHLER

SCALE:1"=50' DATE: 11/27/2023

Proposed Gardner School
739 Pleasant Street
Weymouth, MA
Bohler Job Number: MAA230001.00
November 27, 2023

Rational Pipe Sizing Calculations

Design Period Storm:		25	Year	Design Period Intensity*			6.27	in/hr								
LOCATION		IMPERVIOUS			OTHER			SUM CA	Tc (min)	I (in/hr)	Q (cfs)	D (in)	S (ft/ft)	Material	n	Q Full (cfs)	V Full (fps)
FROM	TO	A	C	CA	A	C	CA										
RL-1	FES-2	0.19	0.90	0.17	0.00	0.30	0.00	0.17	5	6.27	1.07	12	0.005	HDPE	0.012	2.73	3.47
RL-2	FES-2	0.19	0.90	0.17	0.00	0.30	0.00	0.17	5	6.27	1.07	12	0.005	HDPE	0.012	2.73	3.47
CB-1	DMH-A	0.10	0.90	0.09	0.00	0.30	0.00	0.09	5	6.27	0.56	12	0.005	HDPE	0.012	2.73	3.47
FES-1	DMH-A	0.00	0.90	0.00	0.00	0.30	0.00	0.00	5	6.27	0.92	12	0.013	HDPE	0.012	4.40	5.60
DMH-A	DMH-B	0.00	0.90	0.00	0.00	0.30	0.00	0.09	5	6.27	0.56	12	0.005	HDPE	0.012	2.73	3.47
CB-2	DMH-B	0.14	0.90	0.13	0.00	0.30	0.00	0.13	5	6.27	0.79	12	0.040	HDPE	0.012	7.72	9.83
DMH-B	DMH-C	0.00	0.90	0.00	0.00	0.30	0.00	0.21	5	6.27	1.34	12	0.005	HDPE	0.012	2.73	3.47
CB-3	DMH-C	0.12	0.90	0.11	0.07	0.30	0.02	0.13	5	6.27	0.81	12	0.006	HDPE	0.012	2.99	3.81
DMH-C	DMH-D	0.00	0.90	0.00	0.00	0.30	0.00	0.34	5	6.27	2.15	12	0.005	HDPE	0.012	2.73	3.47
CB-4	DMH-D	0.14	0.90	0.13	0.01	0.30	0.00	0.13	5	6.27	0.82	12	0.005	HDPE	0.012	2.73	3.47
DMH-D	FES-3	0.00	0.90	0.00	0.00	0.30	0.00	0.47	5	6.27	2.97	15	0.005	HDPE	0.012	4.95	4.03
RL-1	RL-A	0.03	0.90	0.03	0.00	0.30	0.00	0.03	5	6.27	0.17	6	0.005	HDPE	0.012	0.43	2.19
RL-2	RL-A	0.03	0.90	0.03	0.00	0.30	0.00	0.03	5	6.27	0.17	6	0.005	HDPE	0.012	0.43	2.19
RL-A	RL-B	0.00	0.90	0.00	0.00	0.30	0.00	0.05	5	6.27	0.34	6	0.005	HDPE	0.012	0.43	2.19
RL-3	RL-B	0.03	0.90	0.03	0.00	0.30	0.00	0.03	5	6.27	0.17	6	0.005	HDPE	0.012	0.43	2.19
RL-B	RL-C	0.00	0.90	0.00	0.00	0.30	0.00	0.08	5	6.27	0.51	8	0.005	HDPE	0.012	0.93	2.65
RL-4	RL-C	0.03	0.90	0.03	0.00	0.30	0.00	0.03	5	6.27	0.17	6	0.005	HDPE	0.012	0.43	2.19
RL-C	RL-D	0.00	0.90	0.00	0.00	0.30	0.00	0.11	5	6.27	0.68	8	0.005	HDPE	0.012	0.93	2.65
RL-5	RL-D	0.03	0.90	0.03	0.00	0.30	0.00	0.03	5	6.27	0.17	6	0.005	HDPE	0.012	0.43	2.19
RL-D	RL-E	0.00	0.90	0.00	0.00	0.30	0.00	0.14	5	6.27	0.85	8	0.005	HDPE	0.012	0.93	2.65

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Proposed Gardner School
739 Pleasant Street
Weymouth, MA

RL-6	RL-E	0.03	0.90	0.03	0.00	0.30	0.00	0.03	5	6.27	0.17	6	0.005	HDPE	0.012	0.43	2.19
RL-E	RL-X	0.00	0.90	0.00	0.00	0.30	0.00	0.16	5	6.27	1.02	12	0.005	HDPE	0.012	2.73	3.47
RL-X	FES-2	0.00	0.90	0.00	0.00	0.30	0.00	0.32	5	6.27	2.03	12	0.005	HDPE	0.012	2.73	3.47
RL-12	RL-F	0.03	0.90	0.03	0.00	0.30	0.00	0.03	5	6.27	0.17	6	0.005	HDPE	0.012	0.43	2.19
RL-11	RL-F	0.03	0.90	0.03	0.00	0.30	0.00	0.03	5	6.27	0.17	6	0.005	HDPE	0.012	0.43	2.19
RL-F	RL-G	0.00	0.90	0.00	0.00	0.30	0.00	0.05	5	6.27	0.34	6	0.005	HDPE	0.012	0.43	2.19
RL10	RL-G	0.03	0.90	0.03	0.00	0.30	0.00	0.03	5	6.27	0.17	6	0.005	HDPE	0.012	0.43	2.19
RL-G	RL-H	0.00	0.90	0.00	0.00	0.30	0.00	0.08	5	6.27	0.51	8	0.005	HDPE	0.012	0.93	2.65
RL-9	RL-H	0.03	0.90	0.03	0.00	0.30	0.00	0.03	5	6.27	0.17	6	0.005	HDPE	0.012	0.43	2.19
RL-H	RL-I	0.00	0.90	0.00	0.00	0.30	0.00	0.11	5	6.27	0.68	8	0.005	HDPE	0.012	0.93	2.65
RL-8	RL-I	0.03	0.90	0.03	0.00	0.30	0.00	0.03	5	6.27	0.17	6	0.005	HDPE	0.012	0.43	2.19
RL-I	RL-J	0.00	0.90	0.00	0.00	0.30	0.00	0.14	5	6.27	0.85	8	0.005	HDPE	0.012	0.93	2.65
RL-7	RL-J	0.03	0.90	0.03	0.00	0.30	0.00	0.03	5	6.27	0.17	6	0.005	HDPE	0.012	0.43	2.19
RL-J	RL-K	0.00	0.90	0.00	0.00	0.30	0.00	0.16	5	6.27	1.02	12	0.005	HDPE	0.012	2.73	3.47
RL-K	RL-X	0.00	0.90	0.00	0.00	0.30	0.00	0.16	5	6.27	1.02	12	0.005	HDPE	0.012	2.73	3.47

*Rainfall intensity provided by NOAA Atlas 14, Volume 10, Version 2 on 7/18/2023

Prepared By:
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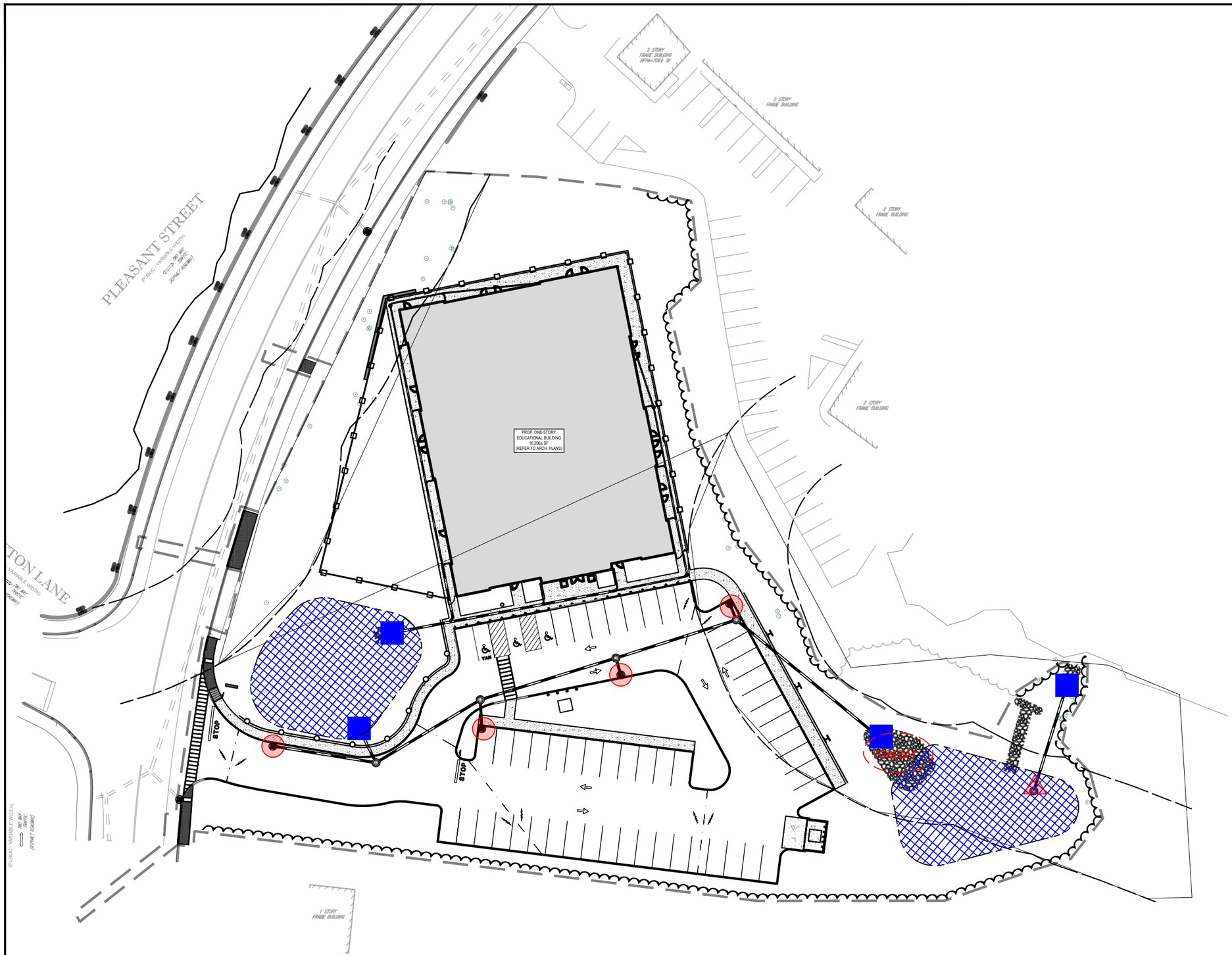
APPENDIX G: OPERATION AND MAINTENANCE

- *STORMWATER OPERATION AND MAINTENANCE PLAN*
- *INSPECTION REPORT*
- *INSPECTION AND MAINTENANCE LOG FORM*
- *LONG-TERM POLLUTION PREVENTION PLAN*
- *ILLICIT DISCHARGE STATEMENT*
- *SPILL PREVENTION*
- *PROPOSED OPERATION AND MAINTENANCE MAP*



LEGEND

- CATCH BASIN (SINGLE AND DOUBLE)
- HEADWALL / FLARED END SECTION
- OUTLET CONTROL STRUCTURE
- FOREBAY — SEDIMENT FOREBAY
- INFILTRATION SYSTEM (SURFACE)

OPERATION AND MAINTENANCE LOCATION MAP

739 PLEASANT STREET
WEYMOUTH, MA

PREPARED BY

BOHLER

SCALE:1"=50' DATE: 11/27/2023

STORMWATER OPERATION AND MAINTENANCE PLAN

Proposed Day Care Facility / Insite Real Estate, LLC
739 Pleasant Street
Weymouth, MA

RESPONSIBLE PARTY DURING CONSTRUCTION:

Contractor (TBD)

RESPONSIBLE PARTY POST CONSTRUCTION:

The Gardner School
739 Pleasant Street
Weymouth, MA

Construction Phase

During the construction phase, all erosion control devices and measures shall be maintained in accordance with the final record plans, local/state approvals and conditions, the EPA Construction General Permit and the Stormwater Pollution Prevention Plan (SWPPP) if applicable. Additionally, the maintenance of all erosion / siltation control measures during construction shall be the responsibility of the general contractor. Contact information of the OWNER and CONTRACTOR shall be listed in the SWPPP for this site. The SWPPP also includes information regarding construction period allowable and illicit discharges, housekeeping and emergency response procedures. Upon proper notice to the property owner, the Town/City or its authorized designee shall be allowed to enter the property at a reasonable time and in a reasonable manner for the purposes of inspection.

Post Development Controls

Once construction is completed, the post development stormwater controls are to be operated and maintained in compliance with the following permanent procedures (note that the continued implementation of these procedures shall be the responsibility of the Owner or its assignee): [include items from the following list as necessary – remove those that are not]

1. Parking lots: Sweep at least two (2) times per year and on a more frequent basis depending on sanding. Swept areas shall include all parking, drive aisles, and access aisles All resulting sweepings shall be collected and properly disposed of offsite in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $1,000/year

2. Catch basins, yard drains, trench drains, manholes and piping: Inspect two (2) times per year and at the end of foliage and snow-removal seasons. These features shall be cleaned two (2) times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the catch basin or underground system. Accumulated sediment and hydrocarbons present must be removed and properly disposed of off-site in accordance with MADEP and other applicable requirements.

Approximate Maintenance Budget: $500/year per structure.

3. Riprap apron / Scour Hole: Riprap and scour holes should be checked at least annually and after every major storm event (generally equal or greater to 3.0 inches in 24 hours) for displaced stones, slumping, and erosion at edges, especially downstream or downslope. If the riprap is damaged, it should be repaired before further damage can take place. Note and repair any erosion, stone displacement or low spots in the areas. Woody vegetation should be removed from the riprap annually.

   Approximate Maintenance Budget: $250/year per location.

4. Infiltration Basin: Preventative maintenance after every major storm event during the first three (3) months of operation and at least twice per year thereafter. Inspect structure and pretreatment BMP to ensure proper operation after every major storm event (generally equal or greater to 3.0 inches in 24 hours) for the first three months. Mow the buffer area, side slopes and basin bottom if grassed floor, rake if stone or sand bottom, remove trash and debris, remove grass clippings and accumulated organic matter. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $2,000/year per basin

5. Forebays: The sediment forebay areas shall be inspected once per month to ensure they are operating as intended and that all components are stable and in working order. Inspections shall be by qualified personnel. During the growing season, the forebay shall be mowed at least twice, with additional cuttings performed as needed. All vegetation (i.e. tree saplings) will be removed from embankments and the forebay bottom. The inlet to the forebay shall be inspected for erosion and sedimentation, and riprap shall be promptly repaired as needed. Sediment forebays shall be cleaned quarterly and when sediment depth reaches half the height of the stone weir, or three to six feet, whichever is less. After sediment is removed, replace any vegetation damaged during the clean out by either reseeding or re-sodding. Any sediment removed shall be disposed of in accordance with MADEP and other applicable requirements.

   Approximate Maintenance Budget: $500/year per forebay

All components of the stormwater system will be accessible by the owner or their assignee.

STORMWATER MANAGEMENT SYSTEM

POST-CONSTRUCTION INSPECTION REPORT

LOCATION:

Proposed Day Care Facility / Insite Real Estate, LLC
739 Pleasant Street
Weymouth, MA

RESPONSIBLE PARTY:

The Gardner School
739 Pleasant Street
Weymouth, MA

NAME OF INSPECTOR:	INSPECTION DATE:
Note Condition of the Following (sediment depth, debris, standing water, damage, etc.):	
Catch Basins:	
Discharge Points/ Flared End Sections / Rip Rap:	
Infiltration Basin:	
Other:	
Note Recommended Actions to be taken on the Following (sediment and/or debris removal, repairs, etc.):	

Catch Basins:
Discharge Points / Flared End Sections / Rip Rap:
Infiltration Basin:
Other:
Comments:

STORMWATER INSPECTION AND MAINTENANCE LOG FORM

Proposed Day Care Facility / Insite Real Estate, LLC
739 Pleasant Street
Weymouth, MA

Stormwater Management Practice	Responsible Party	Date	Maintenance Activity Performed

LONG-TERM POLLUTION PREVENTION PLAN

Proposed Day Care Facility / Insite Real Estate, LLC
739 Pleasant Street
Weymouth, MA

RESPONSIBLE PARTY DURING CONSTRUCTION:

Contractor (TBD)

RESPONSIBLE PARTY POST CONSTRUCTION:

The Gardner School
739 Pleasant Street
Weymouth, MA

For this site, the Long-Term Pollution Prevention Plan will consist of the following:

- The property owner shall be responsible for "good housekeeping" including proper periodic maintenance of building and pavement areas, curbing, landscaping, etc.
- Proper storage and removal of solid waste (dumpsters).
- Sweeping of parking lots, drive aisles and access aisles a minimum of twice per year with a commercial cleaning unit. Any sediment removed shall be disposed of in accordance with applicable local and state requirements.
- Sweeping of roadways, a minimum of twice per year with a commercial cleaning unit. Any sediment removed shall be disposed of in accordance with applicable local and state requirements.
- Regular inspections and maintenance of Stormwater Management System as noted in the "O&M Plan".
- Snow removal shall be the responsibility of the property owner. Snow shall not be plowed, dumped and/or placed in forebays, infiltration basins or similar stormwater controls. Salting and/or sanding of pavement / walkway areas during winter conditions shall only be done in accordance with all state/local requirements and approvals.
- No outdoor maintenance or washing of vehicles allowed.
- Trash and other debris shall be removed from all areas of the site at least twice yearly.

- Reseed any bare areas as soon as they occur. Erosion control measures shall be installed in these areas to prevent deposits of sediment from entering the drainage system.

- Grass shall be maintained at a minimum blade height of two to three inches and only 1/3 of the plant height shall be removed at a time. Clippings shall not be disposed of within stormwater management areas or adjacent resource areas.

- Plants shall be pruned as necessary.

- Snow piles shall be located adjacent to or on pervious surfaces in upland areas. This will allow snow melt water to filter into the soil, leaving behind sand and debris which can be removed in the springtime.

- In no case shall snow be disposed of or stored in resource areas (wetlands, floodplain, streams, or other water bodies).

- In no case shall snow be disposed of or stored in the detention basins, infiltration basins or bioretention areas.

- If necessary, stockpiled snow will be removed from the Site and disposed of at an off-site location in accordance with all local, state and federal regulations.

OPERATON AND MAINTENANCE TRAINING PROGRAM

The Owner will coordinate an annual in-house training session to discuss the Operations and Maintenance Plan, the Long-Term Pollution Prevention Plan, and the Spill Prevention Plan and response procedures. Annual training will include the following:

Discuss the Operations and Maintenance Plan

- Explain the general operations of the stormwater management system and its BMPs
- Identify potential sources of stormwater pollution and measures / methods of reducing or eliminating that pollution
- Emphasize good housekeeping measures

Discuss the Spill Prevention and Response Procedures

- Explain the process in the event of a spill
- Identify potential sources of spills and procedures for cleanup and /or reporting and notification
- Complete a yearly inventory or Materials Safety Data sheets of all tenants and confirm that no potentially harmful chemicals are in use.

ILLICIT DISCHARGE STATEMENT

Certain types of non-stormwater discharges are allowed under the U.S. Environmental Protection Agency Construction General Permit. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to or after its discharge. The control measures which have been outlined previously in this LTPPP will be strictly followed to ensure that no contamination of these non-storm water discharges takes place. Any existing illicit discharges, if discovered during the course of the work, will be reported to MassDEP and the local DPW, as applicable, to be addressed in accordance with their respective policies. No illicit discharges will be allowed in conjunction with the proposed improvements.

Duly Acknowledged:

_____

Name & Title Date

SPILL PREVENTION AND RESPONSE PROCEDURES (POST CONSTRUCTION)

In order to prevent or minimize the potential for a spill of Hazardous Substances or Oil or come into contact with stormwater, the following steps will be implemented:

1. All Hazardous Substances or Oil (such as pesticides, petroleum products, fertilizers, detergents, acids, paints, paint solvents, cleaning solvents, etc.) will be stored in a secure location, with their lids on, preferably under cover, when not in use.

2. The minimum practical quantity of all such materials will be kept on site.

3. A spill control and containment kit (containing, for example, absorbent materials, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.) will be provided on site.

4. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.

5. It is the OWNER's responsibility to ensure that all Hazardous Waste on site is disposed of properly by a licensed hazardous material disposal company. The OWNER is responsible for not exceeding Hazardous Waste storage requirements mandated by the EPA or state and local authorities.

In the event of a spill of Hazardous Substances or Oil, the following procedures should be followed:

1. All measures should be taken to contain and abate the spill and to prevent the discharge of the Hazardous Substance or Oil to stormwater or off-site. (The spill area should be kept well ventilated and personnel should wear appropriate protective clothing to prevent injury from contact with the Hazardous Substances.)

2. For spills of less than five (5) gallons of material, proceed with source control and containment, clean-up with absorbent materials or other applicable means unless an imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.

3. For spills greater than five (5) gallons of material immediately contact the MADEP at the toll-free 24-hour statewide emergency number: **1-888-304-1133**, the local fire department (**9-1-1**) and an approved emergency response contractor. Provide information on the type of material spilled, the location of the spill, the quantity spilled, and the time of the spill to the emergency response contractor or coordinator, and proceed with prevention, containment and/or clean-up if so desired. (Use the form provided, or similar).

4. If there is a Reportable Quantity (RQ) release, then the National Response Center should be notified immediately at (800) 424-8802; within 14 days a report should be submitted to the EPA regional office describing the release, the date and circumstances of the release and the steps taken to prevent another release. This Pollution Prevention Plan should be updated to reflect any such steps or actions taken and measures to prevent the same from reoccurring.

SPILL PREVENTION CONTROL AND COUNTERMEASURE FORM

Proposed Day Care Facility / Insite Real Estate, LLC
739 Pleasant Street
Weymouth, MA

Where a release containing a hazardous substance occurs, the following steps shall be taken by the facility manager and/or supervisor:

1. Immediately notify The Town Fire Department (at **9-1-1**)

2. All measures must be taken to contain and abate the spill and to prevent the discharge of the pollutant(s) to off-site locations, receiving waters, wetlands and/or resource areas.

3. Notify the Town Health Department at (781) 340-5008 and the Town Conservation Commission at (781) 340-5007.

4. Provide documentation from licensed contractor showing disposal and cleanup procedures were completed as well as details on chemicals that were spilled to the Town Health Department and Conservation Commission.

Date of spill:_____ Time:_____ Reported By:_____

Weather Conditions:_____

Material Spilled	**Location of Spill**	**Approximate Quantity of Spill (in gallons)**	**Agency(s) Notified**	**Date of Notification**

Cause of Spill: _____

_____

Measures Taken to Clean up Spill: _____

_____

Type of equipment: _____ Make: _____ Size: _____

License or S/N: _____

Location and Method of Disposal _____

_____

Procedures, method, and precautions instituted to prevent a similar occurrence from recurring: _____

_____

_____

Additional Contact Numbers:

- DEPARTMENT OF ENVIRONMENTAL PROTECTION (DEP) EMERGENCY PHONE: 1-888-304-1133
- NATIONAL RESPONSE CENTER PHONE: (800) 424-8802
- U.S. ENVIRONMENTAL PROTECTION AGENCY PHONE: (888) 372-7341

APPENDIX H: GROUNDWATER MOUNDING ANALYSIS

GROUNDWATER MOUNDING CALCULATIONS

The Gardner School
739 Pleasant Street
Weymouth, MA

Methodology

The bottom of the underground infiltration basin will be less than 4 feet from ESHGW and is designed to attenuate the 10-year storm event or larger. Therefore, groundwater mounding calculations are required according to MA DEP Stormwater Management Guidelines. The purpose of the calculations is to ensure that the mound will not prevent the full draining of the basin. The mounding analysis must show that the recharge volume will exfiltrate within seventy-two (72) hours. Additionally, it should be verified that the mounding effect will not cause stormwater to surge above the lowest discharge point out of a basin (during the 72-hour period) or raise the water elevation in a nearby resource area.

The groundwater mounding analysis was performed by a proprietary program using the USGS's Hantush Method Excel Spreadsheet. Input parameters are site specific and determined based on existing and proposed conditions. The required input parameters are the following: specific yield of the soil; duration of application; hydraulic conductivity; initial saturated thickness; length of application area; width of application area.

Calculations using the Hantush Method are considered conservative due to the fact that the unsaturated soil zone is not incorporated. In practice, this zone will have a significant positive effect on reducing the groundwater mounding under an infiltration basin by allowing horizontal migration. Based on the determination of ESHGW, there will be a minimum 2.7-foot unsaturated zone under the underground infiltration basin.

Variables used in the Hantush Groundwater calculations are the following:

R= 2,598 cf stored volume below lowest outlet / 2,605 sf basin footprint area=**1.00 ft /day (0.33 for t=3 days)**
Specific Yield of sandy silt = 23% **(0.23),** typical of fine sand
K, horizontal conductivity, assumed to be 10 times greater than the vertical conductivity. Infiltration testing resulted in a vertical infiltration rate of 8.2 in/hr, so K= 82 in /hr, or **164 ft/day**
x = ½ the width of the basin = **30± feet**
y = ½ the length of the basin = **30± feet**
t = **1 day & 3 days**
h(i) = initial thickness of saturated zone. Based on test pits #2 & #3, the difference in elevation between the ESHGW elevation and the restrictive bedrock layer below is **1.3 feet**

Summary

Based on the input data above, the groundwater mound height at the end of one days is 1.75 feet, which is within the approximately 2.3 foot unsaturated zone between the ESHGW and the bottom of the infiltration basin. An additional calculation with R and time adjusted for 3 days shows that at the end of 72 hours, the groundwater mound will have decayed to a height of less than one foot. Therefore, the basin will be empty and will not have water within it from a groundwater mound after three days.

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
Cells highlighted in yellow are values that can be changed by the user. Cells highlighted in red are output values based on user-specified inputs. The user MUST click the blue "Re-Calculate Now" button each time ANY of the user-specified inputs are changed otherwise necessary iterations to converge on the correct solution will not be done and values shown will be incorrect. Use consistent units for all input values (for example, feet and days)

use consistent units (e.g. feet & days **or** inches & hours)

Input Values		
1.0000	***R***	**Recharge (infiltration) rate (feet/day)**
0.230	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
164.00	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
30.000	**x**	**1/2 length of basin (x direction, in feet)**
30.000	**y**	**1/2 width of basin (y direction, in feet)**
1.000	**t**	**duration of infiltration period (days)**
1.300	**hi(0)**	**initial thickness of saturated zone (feet)**

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

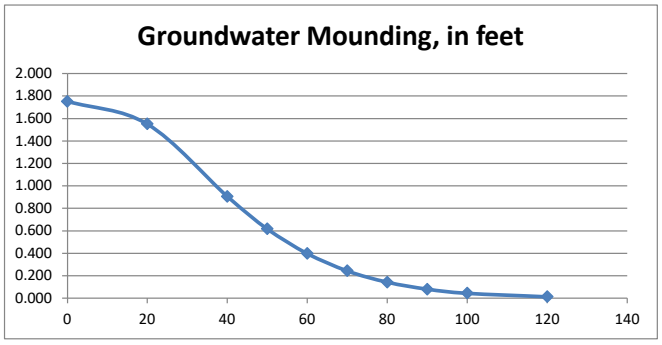
hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

3.053	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
1.753	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
1.753	**0**
1.551	**20**
0.906	**40**
0.617	**50**
0.398	**60**
0.243	**70**
0.142	**80**
0.080	**90**
0.043	**100**
0.012	**120**

Re-Calculate Now



Disclaimer

This spreadsheet solving the Hantush (1967) equation for ground-water mounding beneath an infiltration basin is made available to the general public as a convenience for those wishing to replicate values documented in the USGS Scientific Investigations Report 2010-5102 "Groundwater mounding beneath hypothetical stormwater infiltration basins" or to calculate values based on user-specified site conditions. Any changes made to the spreadsheet (other than values identified as user-specified) after transmission from the USGS could have unintended, undesirable consequences. These consequences could include, but may not be limited to: erroneous output, numerical instabilities, and violations of underlying assumptions that are inherent in results presented in the accompanying USGS published report. The USGS assumes no responsibility for the consequences of any changes made to the spreadsheet. If changes are made to the spreadsheet, the user is responsible for documenting the changes and justifying the results and conclusions.

This spreadsheet will calculate the height of a groundwater mound beneath a stormwater infiltration basin. More information can be found in the U.S. Geological Survey Scientific Investigations Report 2010-5102 "Simulation of groundwater mounding beneath hypothetical stormwater infiltration basins".

The user must specify infiltration rate (R), specific yield (Sy), horizontal hydraulic conductivity (Kh), basin dimensions (x, y), duration of infiltration period (t), and the initial thickness of the saturated zone (hi(0), height of the water table if the bottom of the aquifer is the datum). For a square basin the half width equals the half length (x = y). For a rectangular basin, if the user wants the water-table changes perpendicular to the long side, specify x as the short dimension and y as the long dimension. Conversely, if the user wants the values perpendicular to the short side, specify y as the short dimension, x as the long dimension. All distances are from the center of the basin. Users can change the distances from the center of the basin at which water-table aquifer thickness are calculated.
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use consistent units (e.g. feet & days **or** inches & hours)

Conversion Table

inch/hour	feet/day
0.67	1.33
2.00	4.00

hours	days
36	1.50

In the report accompanying this spreadsheet (USGS SIR 2010-5102), vertical soil permeability (ft/d) is assumed to be one-tenth horizontal hydraulic conductivity (ft/d).

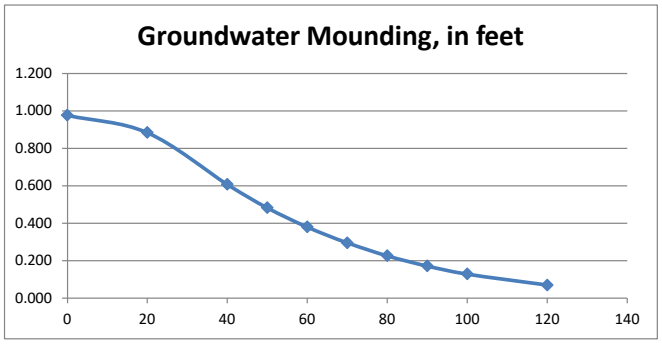
Input Values

0.3300	***R***	**Recharge (infiltration) rate (feet/day)**
0.230	**Sy**	**Specific yield, Sy (dimensionless, between 0 and 1)**
164.00	**K**	**Horizontal hydraulic conductivity, Kh (feet/day)***
30.000	**x**	**1/2 length of basin (x direction, in feet)**
30.000	**y**	**1/2 width of basin (y direction, in feet)**
3.000	**t**	**duration of infiltration period (days)**
1.300	**hi(0)**	**initial thickness of saturated zone (feet)**

2.277	**h(max)**	**maximum thickness of saturated zone (beneath center of basin at end of infiltration period)**
0.977	**Δh(max)**	**maximum groundwater mounding (beneath center of basin at end of infiltration period)**

Ground-water Mounding, in feet	Distance from center of basin in x direction, in feet
0.977	**0**
0.885	**20**
0.608	**40**
0.483	**50**
0.380	**60**
0.295	**70**
0.227	**80**
0.172	**90**
0.129	**100**
0.070	**120**

Re-Calculate Now



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Sensitivity Analysis

- Determine most sensitive parameters in Hantush method and Modflow
- Hydraulic conductivity, and specific yield

Rock Type	Grain size (mm)	Hydraulic Conductivity K (m/d)
Clay	0.0005-0.002	10^{-8}-10^{-2}
Silt	0.002-0.06	10^{-2} - 1
Fine Sand	0.06 -0.25	1 - 5
Medium Sand	0.25-0.50	5 - 20
Coarse Sand	0.50-2	20 - 100
Gravel	2-64	100 - 1000
Shale	small	$5x10^{-8}$ - $5x10^{-6}$
Sandstone	medium	10^{-3} - 1
Limestone	variable	10^{-5} - 1
Basalt	small	0.0003 - 3
Granite	large	0.0003 - 0.03
Slate	small	10^{-8} - 10^{-5}
Schist	medium	10^{-7} - 10^{-4}

Source: Brassington, 1988

Material	Specific Yield (%)
Gravel, coarse	23
Gravel, medium	24
Gravel, fine	25
Sand, coarse	27
Sand, medium	28
Sand, fine	23
Silt	8
Clay	3
Sandstone, fine-grained	21
Sandstone, medium-grained	27
Limestone	14
Dune sand	38
Loess	18
Peat	44
Schist	26
Siltstone	12
Till, predomintly silt	6
Till, predominantly sand	16
Till, predominantly gravel	16
Tuff	21

Source: Johnson, 1967