DRAINAGE REPORT

For

Maple Street Solar LLC

PROPOSED

"Proposed Solar Farm – Parcel 3"

160 Maple Street
Bellingham & Franklin, Massachusetts
Norfolk County

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July 20, 2023
#W201257

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I. EXECUTIVE SUMMARY

This report examines the changes in drainage that can be expected as the result of the installation of ground mounted photovoltaic panels and associated site improvements on the easterly side of Maple Street in the Towns of Bellingham and Franklin, Massachusetts.

The Project, as described further herein, is proposed within the southern portion of the existing Maplegate Country Club property, hereinafter referred to as "Parcel 3". The Country Club property is proposed to be subdivided into three (3) parcels. Parcel 2, centrally located on the property, is included as part of this drainage analysis. Parcel 1, located to the north, has been analyzed in a separate Stormwater Report.

This report analyzes approximately 70.5± acres of land associated with the existing country club, including paved and gravel cart paths, golf greens, landscaping, resource areas, and wooded areas. The study area is surrounded by the northern portion of the existing country club property (Parcel 1) to the north, wooded land and Mine Brook to the east, Route 495 to the south, and an existing solar field and Maple Street to the west. A 325' wide New England Power Company easement with associated utility poles and overhead wires traverses the southwestern portion of the site. Majority of the site improvements are proposed in Franklin, while minor site and utility improvements are proposed in Bellingham and located in the westernmost portion of the site.

The Project includes the construction of a new 15,000± KW solar field along with new gravel access drives and associated utilities. This report addresses a comparative analysis of the pre- and post-development site runoff conditions. The project will also provide erosion and sedimentation controls during the demolition and construction periods, as well as long term stabilization of the site. Refer to the Site Development Plans prepared by Bohler documenting the design of the proposed solar field and its associated components.

For the purposes of this analysis the pre- and post-development drainage conditions were analyzed at one (1) "design point" where stormwater runoff currently drains to under existing conditions. This design point is described in further detail in **Section II** below. A summary of the existing and proposed conditions peak runoff rates and volumes for the 2-, 10-, 25-, and 100-year storms can be found in **Tables 1.1** and **1.2** below. In addition, the Project has been designed in accordance with the Massachusetts Department of Environmental Protection (MassDEP) Stormwater Management Standards, the Town of Franklin Stormwater Management Regulations,

and Section 17-1 of the MassDEP Wetlands Program Policy for Photovoltaic System (PVS) Solar Array Review, 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	36.58	36.58	**0.00**	94.47	94.47	**0.00**	135.09	135.09	**0.00**	201.40	201.40	**0.00**

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

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	5.46	5.46	**0.0**	13.07	13.07	**0.0**	18.47	18.47	**0.0**	27.41	27.41	**0.0**

**Volumes are represented in acre feet (af)*

II. EXISTING SITE CONDITIONS

Existing Site Description

For the purposes of this analysis, the analyzed watershed boundary has been established to include Parcel 3 as well as a portion of Parcel 2 due to the existing drainage patterns. As such, the study area is approximately 70.5± acres.

The study area consists of land associated with the existing Maplegate Country Club located along the easterly side of Maple Street in the Towns of Bellingham and Franklin, Massachusetts. Along with golf greens, the study area consists of paved and gravel cart paths, landscaping, resource areas, and wooded areas.

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)
71B	Ridgebury fine sandy loam, extremely stony	D
103C	Charlton-Hollis-Rock outcrop complex	B
315B	Scituate fine sandy loam	C
317B	Scituate fine sandy loam, extremely stony	C
654	Udorthents, loamy	A

Majority of the soils at the site are mapped as Scituate fine sandy loam and classified by NRCS as Hydrologic Soil Group (HSG) 'C'. A portion of the soils along Route 495 to the southwest are mapped as Udorthents, loamy and classified as HSG 'A'. The remaining soils in the southeastern portion of the site are mapped as Ridgebury fine sandy loam and Charlton-Hollis-Rock outcrop complex and are classified as HSG 'D' and HSG 'B', respectively. Refer to **Appendix C** for additional soil information.

Existing Collection and Conveyance

Runoff generated onsite drains overland to either a series of onsite water hazards / resource areas, which ultimately overflow and discharge to wetlands associated with Mine Brook, or directly to the associated wetlands. Slopes on the site range from 0.5%-50% with on-site elevations ranging from 237 in the northwest to 184 in the southeast.

Existing Watersheds and Design Point Information

For the purposes of this analysis, the pre- and post-development drainage conditions were analyzed at one (1) "design point" where stormwater runoff currently drains to under existing conditions. The existing site consists of one (1) sub-catchment, as described below, to analyze existing flow rates and volumes at the design point.

Sub-catchment E1 contains approximately 70.5± acres associated with Parcel 3 and a portion of Parcel 2, and consists of paved and gravel cart paths, golf greens, resource areas, landscaping, and wooded areas. The associated curve number (CN) is calculated to be 70 with a time of concentration (Tc) of 35.4 minutes. Runoff from this sub-catchment flows overland to wetlands associated with Mine Brook (DP1).

Refer to **Tables 1.1** and **1.2** for the existing conditions peak rates of runoff and volumes. Refer to the Existing Conditions Drainage Map in **Appendix D** for a graphical representation of the existing drainage areas.

III. PROPOSED SITE CONDITIONS

Proposed Development Description

The Project includes the construction of a new 15,000± KW solar field along with new gravel access drives and associated utilities located in the central and southern portions of the existing Maplegate Country Club property.

The proposed solar field and majority of all associated components are proposed to be constructed within the limits of the Town of Franklin. Electrical service to the Project is proposed to be serviced from a utility pole located on the westerly side of Maple Street in the Town of Bellingham. Proposed overhead wires will extend across Maple Street to new utility poles constructed on the Project site and located outside of wetland limits. Services will then continue underground to the Project site in Franklin via directional drilling to limit impacts to resource areas. A 20' long by 10' wide gravel parking space is proposed to be constructed along Maple Street to provide vehicle parking for access to the new electrical utilities.

Proposed Development Collection and Conveyance

The proposed Project has been designed such that existing drainage patterns are maintained and runoff is conveyed in a manner consistent with existing conditions. Runoff generated onsite will continue to flow overland to either onsite water hazards / resource areas and overflow to wetlands associated with Mine Brook, or directly to associated wetlands. Refer to **Section V** for additional information.

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 point described in **Section II** above. The site consists of one (1) sub-catchment in the proposed condition, as described below, at which proposed flow rates and volumes at the design point were analyzed.

Sub-catchment P1 contains approximately 70.5± acres associated with Parcel 3 and a portion of Parcel 2 and consists of paved and gravel cart paths located at existing wetland crossings, new gravel roads, impervious pads for utility equipment, resource areas, landscaping, and wooded areas. The associated CN is calculated to be 70 with a Tc of 35.4 minutes. Runoff from this sub-catchment flows overland to wetlands associated with Mine Brook (DP1).

Refer to **Tables 1.1 and 1.2** for the calculated proposed conditions peak rates of runoff and volumes. Refer to the Proposed Conditions Drainage Map in **Appendix E** 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 CNs and Tc's 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)	3.37	5.25	6.42	8.23

*Values derived from NOAA Atlas 14 on 6/30/23

The Project proposes to meet peak rates and volumes of runoff for the 2-, 10-, 25- and 100-year design storm events.

V. STORMWATER MANAGEMENT STANDARDS

The Project has been designed in accordance with the MassDEP Stormwater Management guidelines, Town of Franklin Stormwater Management Regulations, and Section 17-1 of the MassDEP Wetlands Program Policy for Photovoltaic System (PVS) Solar Array Review.

Standard #1: No New Untreated Discharges

There are no new untreated discharges proposed as part of the Project.

Standard #2: Peak Rate Attenuation

As outlined in **Tables 1.1** and **1.2**, the development of the site has been designed so that post-development peak rates and volumes of runoff meet pre-development conditions for the 2-, 10-, 25- and 100-year storm events at all design points.

Standard #3: Recharge

The Project proposes to reduce the amount of impervious coverage across the study area by approximately 2± acres; therefore, Standard #3 is met. Refer to **Appendix F** of this report for supporting calculations.

The Town of Franklin Bylaw requires that 0.8 inches be retained across the total impervious area of the post-development condition, which is equal to approximately 314 cubic feet of volume. Impervious surfaces in the post-development condition consist of existing paved cart paths at existing wetland crossings and proposed concrete pads associated with utility equipment. The Project proposes to remove existing paved surfaces to the maximum extent practicable and proposes no new paved surfaces. In addition, areas of existing cart paths to be removed will be restored to pre-development landscaped conditions. Therefore, there are no additional stormwater management features proposed as part of the Project.

Standard #4: Water Quality

The Project proposes to improve water quality generated from the site by significantly reducing vehicular use, spreading of fertilizers and pesticides, and overall impervious coverage by approximately 2± acres. In addition, areas of existing cart paths to be removed will be restored to pre-development landscaped conditions. Accordingly, as per Section 17-1 of the MassDEP Wetlands Program Policy for PVS Solar Array Review, additional TSS removal above that which is anticipated to occur naturally, is not required.

Standard #5: Land Use with Higher Potential Pollutant Loads

Not Applicable for this project.

Standard #6: Critical Areas

A Zone II has been established and covers the eastern portion of the site. There are no new untreated paved surfaces discharging to the Zone II or to DP1; therefore, there are no pretreatment or structural BMPs proposed as part of the Project.

The Project proposes to improve post-development discharges from the site compared to pre-development conditions by significantly reducing vehicular use, spreading of fertilizers and pesticides, and overall impervious coverage by approximately 2± acres. In addition, areas of existing cart paths to be removed will be restored to pre-development landscaped conditions.

Standard #7: Redevelopment

The Project proposes to reduce the amount of impervious coverage across the study area by approximately 2± acres, and as a result proposes to improve post-development conditions by promoting recharge and improving water quality onsite. The proposed project is a redevelopment and has been designed in accordance with the Massachusetts Stormwater Management Regulations to meet the standards to the maximum extent practicable and the Town of Franklin Stormwater Management Regulations as they apply to redevelopment projects.

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 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 includes a list of responsible parties and 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.

Standard #10: Prohibition of Illicit Discharges

The Project 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 Project meets existing peak rates and volumes of runoff associated with the study area when compared to pre-development conditions for the 2-, 10-, 25- and 100-year storm frequencies. The site has been designed such that runoff is conveyed in a manner consistent with existing conditions and directed to locations to which runoff is currently flowing. The pre-development versus post-development stormwater discharge comparisons are contained in **Tables 1.1** and **1.2**.

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.

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

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

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

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

COMMONWEALTH OF MASSACHUSETTS
JOHN A. KUCICH
CIVIL
No. 41530
REGISTERED PROFESSIONAL ENGINEER

7/20/23
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 (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

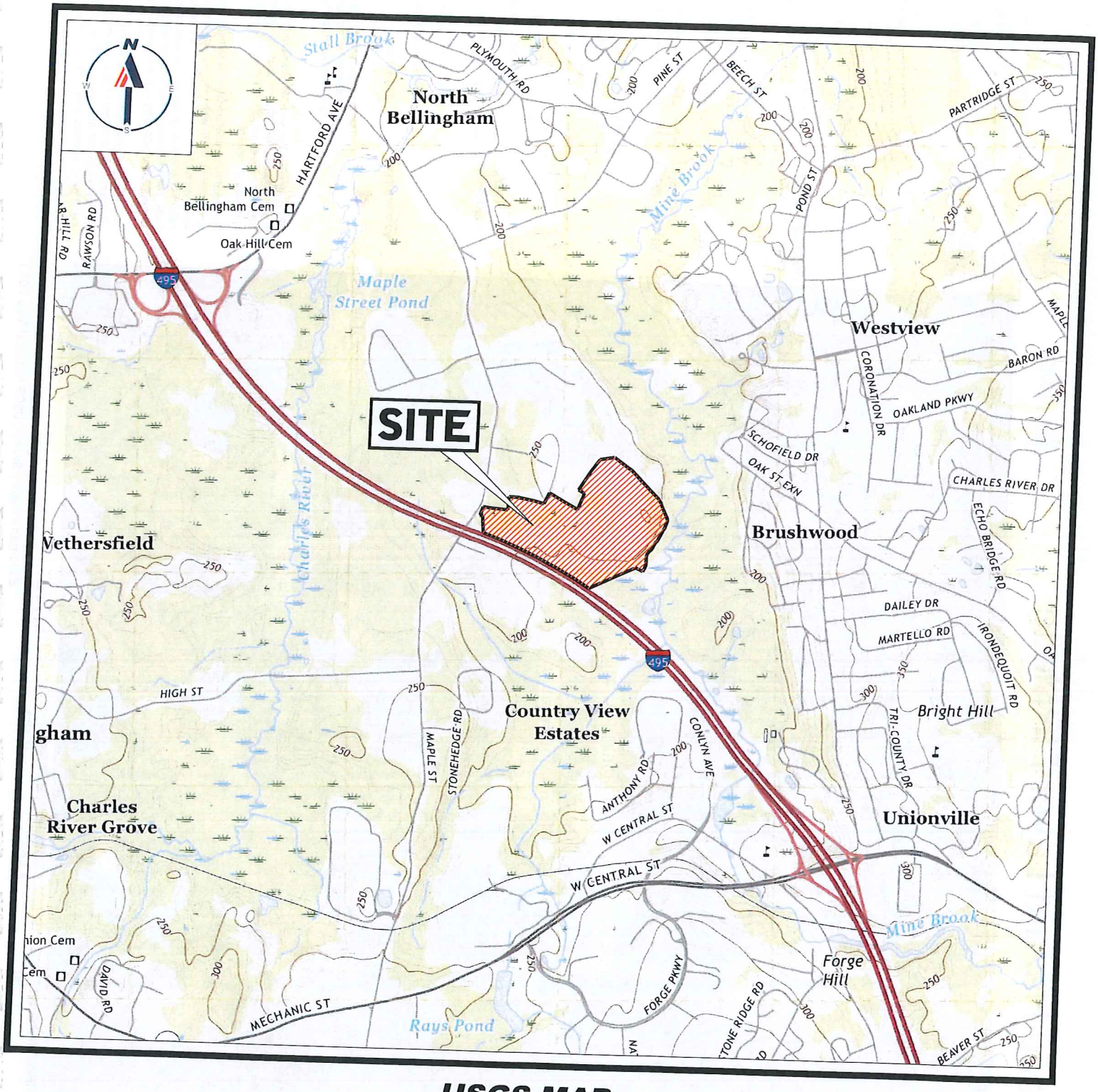
☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☒ 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*



USGS MAP

SCALE: 1" = 2,000'
SOURCE: FRANKLIN MASSACHUSETTS USGS QUADRANGLE

National Flood Hazard Layer FIRMette

FEMA

71°26'49"W 42°6'28"N

71°26'12"W 42°6'1"N

0 250 500 1,000 1,500 2,000 Feet 1:6,000

Basemap Imagery Source: USGS National Map 2023

Legend

SEE FIS REPORT FOR DETAILED LEGEND AND INDEX MAP FOR FIRM PANEL LAYOUT

SPECIAL FLOOD HAZARD AREAS
- Without Base Flood Elevation (BFE) *Zone A, V, A99*
- With BFE or Depth *Zone AE, AO, AH, VE, AR*
- Regulatory Floodway

OTHER AREAS OF FLOOD HAZARD
- 0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile *Zone X*
- Future Conditions 1% Annual Chance Flood Hazard *Zone X*
- Area with Reduced Flood Risk due to Levee. See Notes. *Zone X*
- Area with Flood Risk due to Levee *Zone D*

OTHER AREAS
- NO SCREEN Area of Minimal Flood Hazard *Zone X*
- Effective LOMRs
- Area of Undetermined Flood Hazard *Zone D*

GENERAL STRUCTURES
- Channel, Culvert, or Storm Sewer
- Levee, Dike, or Floodwall

OTHER FEATURES
- B 20.2 17.5 Cross Sections with 1% Annual Chance Water Surface Elevation
- 8 Coastal Transect
- 513 Base Flood Elevation Line (BFE)
- Limit of Study
- Jurisdiction Boundary
- Coastal Transect Baseline
- Profile Baseline
- Hydrographic Feature

MAP PANELS
- Digital Data Available
- No Digital Data Available
- Unmapped

N

The pin displayed on the map is an approximate point selected by the user and does not represent an authoritative property location.

This map complies with FEMA's standards for the use of digital flood maps if it is not void as described below. The basemap shown complies with FEMA's basemap accuracy standards

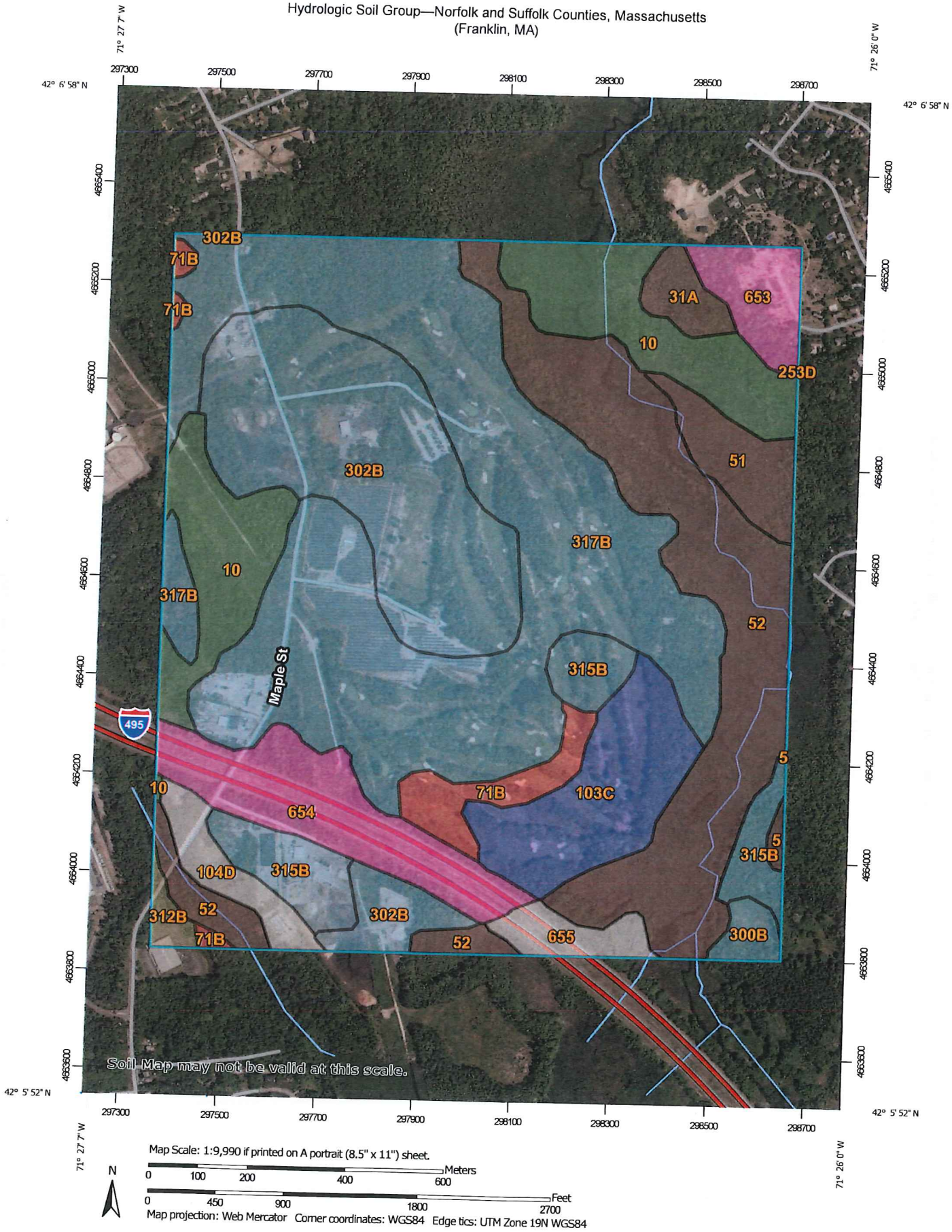
The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on 7/18/2023 at 2:43 PM and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

This map image is void if the one or more of the following map elements do not appear: basemap imagery, flood zone labels, legend, scale bar, map creation date, community identifiers, FIRM panel number, and FIRM effective date. Map images for unmapped and unmodernized areas cannot be used for regulatory purposes.

APPENDIX C: SOIL AND WETLAND INFORMATION

- *NCRS CUSTOM SOIL RESOURCE REPORT*

Hydrologic Soil Group—Norfolk and Suffolk Counties, Massachusetts
(Franklin, MA)



Map Scale: 1:9,990 if printed on A portrait (8.5" x 11") sheet.

N

0 100 200 400 600 Meters

0 450 900 1800 2700 Feet

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

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

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

Soil Rating Lines

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

Soil Rating Points

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

Water Features

- Streams and Canals

Transportation

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

Background

- Aerial Photography

MAP INFORMATION

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

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
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.

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
5	Saco silt loam, frequently ponded, 0 to 1 percent slopes, frequently flooded	B/D	1.0	0.2%
10	Scarboro and Birdsall soils, 0 to 3 percent slopes	A/D	44.4	9.6%
31A	Walpole sandy loam, 0 to 3 percent slopes	B/D	5.3	1.1%
51	Swansea muck, 0 to 1 percent slopes	B/D	10.6	2.3%
52	Freetown muck, 0 to 1 percent slopes	B/D	75.6	16.3%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	D	10.8	2.3%
103C	Charlton-Hollis-Rock outcrop complex, 8 to 15 percent slopes	B	26.4	5.7%
104D	Hollis-Rock outcrop-Charlton complex, 15 to 35 percent slopes		8.0	1.7%
253D	Hinckley loamy sand, 15 to 35 percent slopes	A	0.0	0.0%
300B	Montauk fine sandy loam, 3 to 8 percent slopes	C	3.5	0.7%
302B	Montauk fine sandy loam, 0 to 8 percent slopes, extremely stony	C	70.6	15.2%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	C/D	2.4	0.5%
315B	Scituate fine sandy loam, 3 to 8 percent slopes	C	20.5	4.4%
317B	Scituate fine sandy loam, 3 to 8 percent slopes, extremely stony	C	142.7	30.7%
653	Udorthents, sandy	A	9.9	2.1%
654	Udorthents, loamy	A	26.4	5.7%

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
655	Udorthents, wet substratum		6.2	1.3%
Totals for Area of Interest			**464.2**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

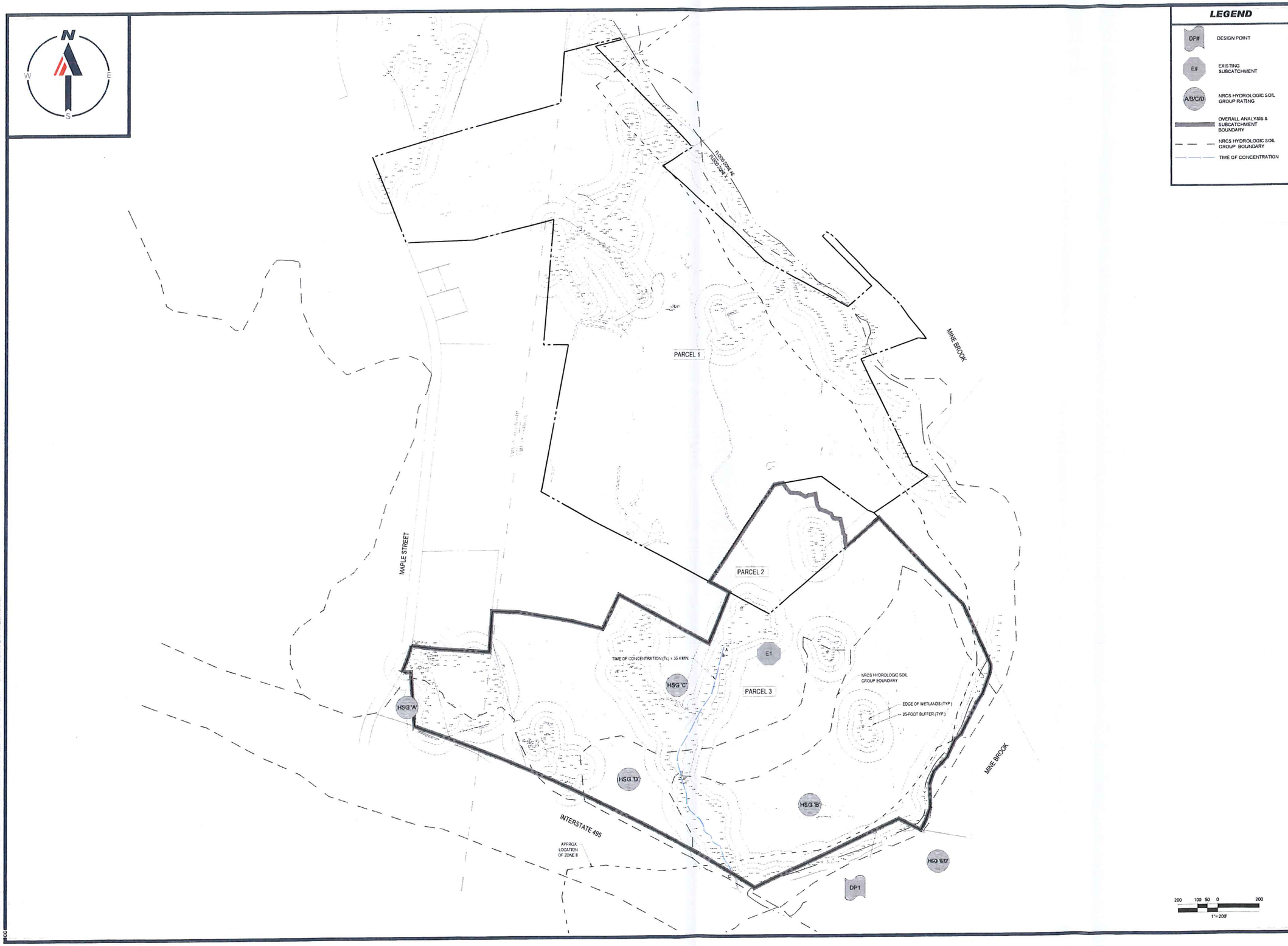
Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

APPENDIX D: EXISTING CONDITIONS HYDROLOGIC ANALYSIS

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



LEGEND

- DP# — DESIGN POINT
- E# — EXISTING SUBCATCHMENT
- A/B/C/D — NRCS HYDROLOGIC SOIL GROUP RATING
- OVERALL ANALYSIS & SUBCATCHMENT BOUNDARY
- NRCS HYDROLOGIC SOIL GROUP BOUNDARY
- TIME OF CONCENTRATION

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PROGRAM MANAGEMENT
LANDSCAPE ARCHITECTURE
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PERMITTING SERVICES
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REVISIONS

REV	DATE	COMMENT	DRAWN BY / CHECKED BY

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PROJECT No.:	W201257
DRAWN BY:	CMC / OCR
CHECKED BY:	GD
DATE:	07/20/2023
CAD I.D.:	W201257_EX-SOUTH

PROJECT:

PROPOSED SITE PLAN DOCUMENTS

FOR

MAPLE STREET SOLAR LLC

PROPOSED SOLAR FARM

LOTS INCLUDED (PARCEL #):255-001, 254-001, 239-010 A, 239-010 B, 239-010 C, PORTION OF D 239-010, & 32-0009
160 MAPLE STREET,
TOWN OF BELLINGHAM & FRANKLIN,
NORFOLK COUNTY, MASSACHUSETTS

BOHLER

352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900

www.BohlerEngineering.com

J.A. KUCICH

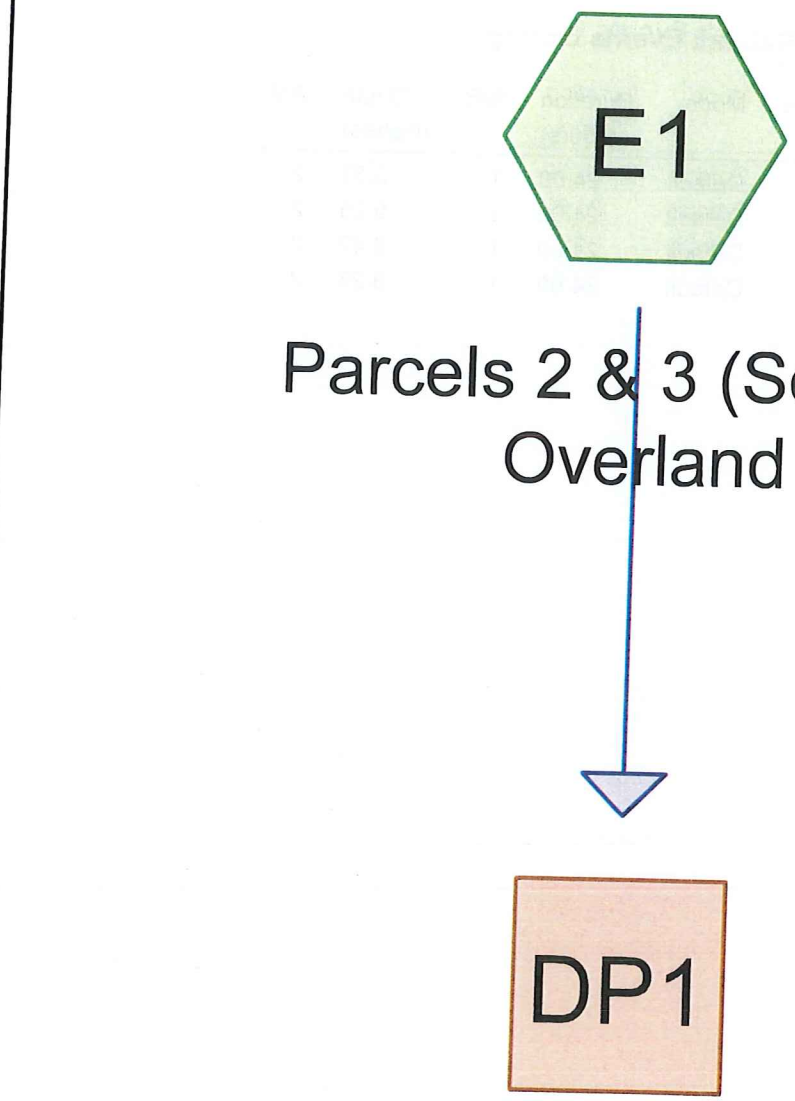
SHEET TITLE:

EXISTING CONDITIONS DRAINAGE AREA MAP

SHEET NUMBER:

EXDAM

ORG. DATE - 07/20/2023



Subcat Reach Pond Link

Routing Diagram for W201257-EX-South
Prepared by Bohler Engineers, Printed 7/19/2023
HydroCAD® 10.20-2g s/n 03478 © 2022 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Type III 24-hr		Default	24.00	1	3.37	2
2	10-yr	Type III 24-hr		Default	24.00	1	5.25	2
3	25-yr	Type III 24-hr		Default	24.00	1	6.42	2
4	100-yr	Type III 24-hr		Default	24.00	1	8.23	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.294	39	>75% Grass cover, Good, HSG A (E1)
11.803	61	>75% Grass cover, Good, HSG B (E1)
22.849	74	>75% Grass cover, Good, HSG C (E1)
5.986	80	>75% Grass cover, Good, HSG D (E1)
0.032	76	Gravel roads, HSG A (E1)
0.174	89	Gravel roads, HSG C (E1)
0.743	98	Paved parking, HSG B (E1)
1.220	98	Paved parking, HSG C (E1)
0.312	98	Paved parking, HSG D (E1)
0.297	98	Water Surface, HSG A (E1)
0.539	98	Water Surface, HSG B (E1)
1.447	98	Water Surface, HSG C (E1)
0.237	98	Water Surface, HSG D (E1)
0.883	30	Woods, Good, HSG A (E1)
10.153	55	Woods, Good, HSG B (E1)
10.488	70	Woods, Good, HSG C (E1)
2.093	77	Woods, Good, HSG D (E1)
70.550	**70**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.506	HSG A	E1
23.238	HSG B	E1
36.178	HSG C	E1
8.628	HSG D	E1
0.000	Other	
70.550		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.294	11.803	22.849	5.986	0.000	41.932	>75% Grass cover, Good	E1
0.032	0.000	0.174	0.000	0.000	0.206	Gravel roads	E1
0.000	0.743	1.220	0.312	0.000	2.275	Paved parking	E1
0.297	0.539	1.447	0.237	0.000	2.520	Water Surface	E1
0.883	10.153	10.488	2.093	0.000	23.617	Woods, Good	E1
2.506	**23.238**	**36.178**	**8.628**	**0.000**	**70.550**	**TOTAL AREA**	

Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE1: Parcels 2 & 3 (South) - Runoff Area=70.550 ac 6.80% Impervious Runoff Depth=0.93"
Flow Length=1,256' Tc=35.4 min CN=70 Runoff=36.58 cfs 5.461 af

Reach DP1: Wetlands associated with Mine Brook Inflow=36.58 cfs 5.461 af
Outflow=36.58 cfs 5.461 af

Total Runoff Area = 70.550 ac Runoff Volume = 5.461 af Average Runoff Depth = 0.93"
93.20% Pervious = 65.755 ac 6.80% Impervious = 4.795 ac

Summary for Subcatchment E1: Parcels 2 & 3 (South) - Overland

Runoff = 36.58 cfs @ 12.55 hrs, Volume= 5.461 af, Depth= 0.93"
Routed to Reach DP1 : Wetlands associated with Mine Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.37"

Area (ac)	CN	Description
0.032	76	Gravel roads, HSG A
1.294	39	>75% Grass cover, Good, HSG A
0.883	30	Woods, Good, HSG A
0.297	98	Water Surface, HSG A
0.743	98	Paved parking, HSG B
11.803	61	>75% Grass cover, Good, HSG B
10.153	55	Woods, Good, HSG B
0.539	98	Water Surface, HSG B
1.220	98	Paved parking, HSG C
0.174	89	Gravel roads, HSG C
22.849	74	>75% Grass cover, Good, HSG C
10.488	70	Woods, Good, HSG C
1.447	98	Water Surface, HSG C
0.312	98	Paved parking, HSG D
5.986	80	>75% Grass cover, Good, HSG D
2.093	77	Woods, Good, HSG D
0.237	98	Water Surface, HSG D
70.550	70	Weighted Average
65.755		93.20% Pervious Area
4.795		6.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0280	0.08		**Sheet Flow, 222-220.6** Woods: Light underbrush n= 0.400 P2= 3.37"
24.9	1,206	0.0260	0.81		**Shallow Concentrated Flow, 220.6-189** Woodland Kv= 5.0 fps
35.4	1,256	Total			

Summary for Reach DP1: Wetlands associated with Mine Brook

Inflow Area = 70.550 ac, 6.80% Impervious, Inflow Depth = 0.93" for 2-yr event
Inflow = 36.58 cfs @ 12.55 hrs, Volume= 5.461 af
Outflow = 36.58 cfs @ 12.55 hrs, Volume= 5.461 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE1: Parcels 2 & 3 (South) - Runoff Area=70.550 ac 6.80% Impervious Runoff Depth=2.22"
Flow Length=1,256' Tc=35.4 min CN=70 Runoff=94.47 cfs 13.073 af

Reach DP1: Wetlands associated with Mine Brook Inflow=94.47 cfs 13.073 af
Outflow=94.47 cfs 13.073 af

Total Runoff Area = 70.550 ac Runoff Volume = 13.073 af Average Runoff Depth = 2.22"
93.20% Pervious = 65.755 ac 6.80% Impervious = 4.795 ac

Summary for Subcatchment E1: Parcels 2 & 3 (South) - Overland

Runoff = 94.47 cfs @ 12.51 hrs, Volume= 13.073 af, Depth= 2.22"
Routed to Reach DP1 : Wetlands associated with Mine Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.25"

Area (ac)	CN	Description
0.032	76	Gravel roads, HSG A
1.294	39	>75% Grass cover, Good, HSG A
0.883	30	Woods, Good, HSG A
0.297	98	Water Surface, HSG A
0.743	98	Paved parking, HSG B
11.803	61	>75% Grass cover, Good, HSG B
10.153	55	Woods, Good, HSG B
0.539	98	Water Surface, HSG B
1.220	98	Paved parking, HSG C
0.174	89	Gravel roads, HSG C
22.849	74	>75% Grass cover, Good, HSG C
10.488	70	Woods, Good, HSG C
1.447	98	Water Surface, HSG C
0.312	98	Paved parking, HSG D
5.986	80	>75% Grass cover, Good, HSG D
2.093	77	Woods, Good, HSG D
0.237	98	Water Surface, HSG D
70.550	70	Weighted Average
65.755		93.20% Pervious Area
4.795		6.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0280	0.08		**Sheet Flow, 222-220.6** Woods: Light underbrush n= 0.400 P2= 3.37"
24.9	1,206	0.0260	0.81		**Shallow Concentrated Flow, 220.6-189** Woodland Kv= 5.0 fps
35.4	1,256	Total			

Summary for Reach DP1: Wetlands associated with Mine Brook

Inflow Area = 70.550 ac, 6.80% Impervious, Inflow Depth = 2.22" for 10-yr event
Inflow = 94.47 cfs @ 12.51 hrs, Volume= 13.073 af
Outflow = 94.47 cfs @ 12.51 hrs, Volume= 13.073 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE1: Parcels 2 & 3 (South) - Runoff Area=70.550 ac 6.80% Impervious Runoff Depth=3.14"
Flow Length=1,256' Tc=35.4 min CN=70 Runoff=135.09 cfs 18.473 af

Reach DP1: Wetlands associated with Mine Brook Inflow=135.09 cfs 18.473 af
Outflow=135.09 cfs 18.473 af

Total Runoff Area = 70.550 ac Runoff Volume = 18.473 af Average Runoff Depth = 3.14"
93.20% Pervious = 65.755 ac 6.80% Impervious = 4.795 ac

Summary for Subcatchment E1: Parcels 2 & 3 (South) - Overland

Runoff = 135.09 cfs @ 12.50 hrs, Volume= 18.473 af, Depth= 3.14"
Routed to Reach DP1 : Wetlands associated with Mine Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.42"

Area (ac)	CN	Description
0.032	76	Gravel roads, HSG A
1.294	39	>75% Grass cover, Good, HSG A
0.883	30	Woods, Good, HSG A
0.297	98	Water Surface, HSG A
0.743	98	Paved parking, HSG B
11.803	61	>75% Grass cover, Good, HSG B
10.153	55	Woods, Good, HSG B
0.539	98	Water Surface, HSG B
1.220	98	Paved parking, HSG C
0.174	89	Gravel roads, HSG C
22.849	74	>75% Grass cover, Good, HSG C
10.488	70	Woods, Good, HSG C
1.447	98	Water Surface, HSG C
0.312	98	Paved parking, HSG D
5.986	80	>75% Grass cover, Good, HSG D
2.093	77	Woods, Good, HSG D
0.237	98	Water Surface, HSG D
70.550	70	Weighted Average
65.755		93.20% Pervious Area
4.795		6.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0280	0.08		**Sheet Flow, 222-220.6** Woods: Light underbrush n= 0.400 P2= 3.37"
24.9	1,206	0.0260	0.81		**Shallow Concentrated Flow, 220.6-189** Woodland Kv= 5.0 fps
35.4	1,256	Total			

Summary for Reach DP1: Wetlands associated with Mine Brook

Inflow Area = 70.550 ac, 6.80% Impervious, Inflow Depth = 3.14" for 25-yr event
Inflow = 135.09 cfs @ 12.50 hrs, Volume= 18.473 af
Outflow = 135.09 cfs @ 12.50 hrs, Volume= 18.473 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentE1: Parcels 2 & 3 (South) - Runoff Area=70.550 ac 6.80% Impervious Runoff Depth=4.66"
Flow Length=1,256' Tc=35.4 min CN=70 Runoff=201.40 cfs 27.412 af

Reach DP1: Wetlands associated with Mine Brook Inflow=201.40 cfs 27.412 af
Outflow=201.40 cfs 27.412 af

Total Runoff Area = 70.550 ac Runoff Volume = 27.412 af Average Runoff Depth = 4.66"
93.20% Pervious = 65.755 ac 6.80% Impervious = 4.795 ac

Summary for Subcatchment E1: Parcels 2 & 3 (South) - Overland

Runoff = 201.40 cfs @ 12.49 hrs, Volume= 27.412 af, Depth= 4.66"
Routed to Reach DP1 : Wetlands associated with Mine Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.23"

Area (ac)	CN	Description
0.032	76	Gravel roads, HSG A
1.294	39	>75% Grass cover, Good, HSG A
0.883	30	Woods, Good, HSG A
0.297	98	Water Surface, HSG A
0.743	98	Paved parking, HSG B
11.803	61	>75% Grass cover, Good, HSG B
10.153	55	Woods, Good, HSG B
0.539	98	Water Surface, HSG B
1.220	98	Paved parking, HSG C
0.174	89	Gravel roads, HSG C
22.849	74	>75% Grass cover, Good, HSG C
10.488	70	Woods, Good, HSG C
1.447	98	Water Surface, HSG C
0.312	98	Paved parking, HSG D
5.986	80	>75% Grass cover, Good, HSG D
2.093	77	Woods, Good, HSG D
0.237	98	Water Surface, HSG D
70.550	70	Weighted Average
65.755		93.20% Pervious Area
4.795		6.80% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0280	0.08		**Sheet Flow, 222-220.6** Woods: Light underbrush n= 0.400 P2= 3.37"
24.9	1,206	0.0260	0.81		**Shallow Concentrated Flow, 220.6-189** Woodland Kv= 5.0 fps
35.4	1,256	Total			

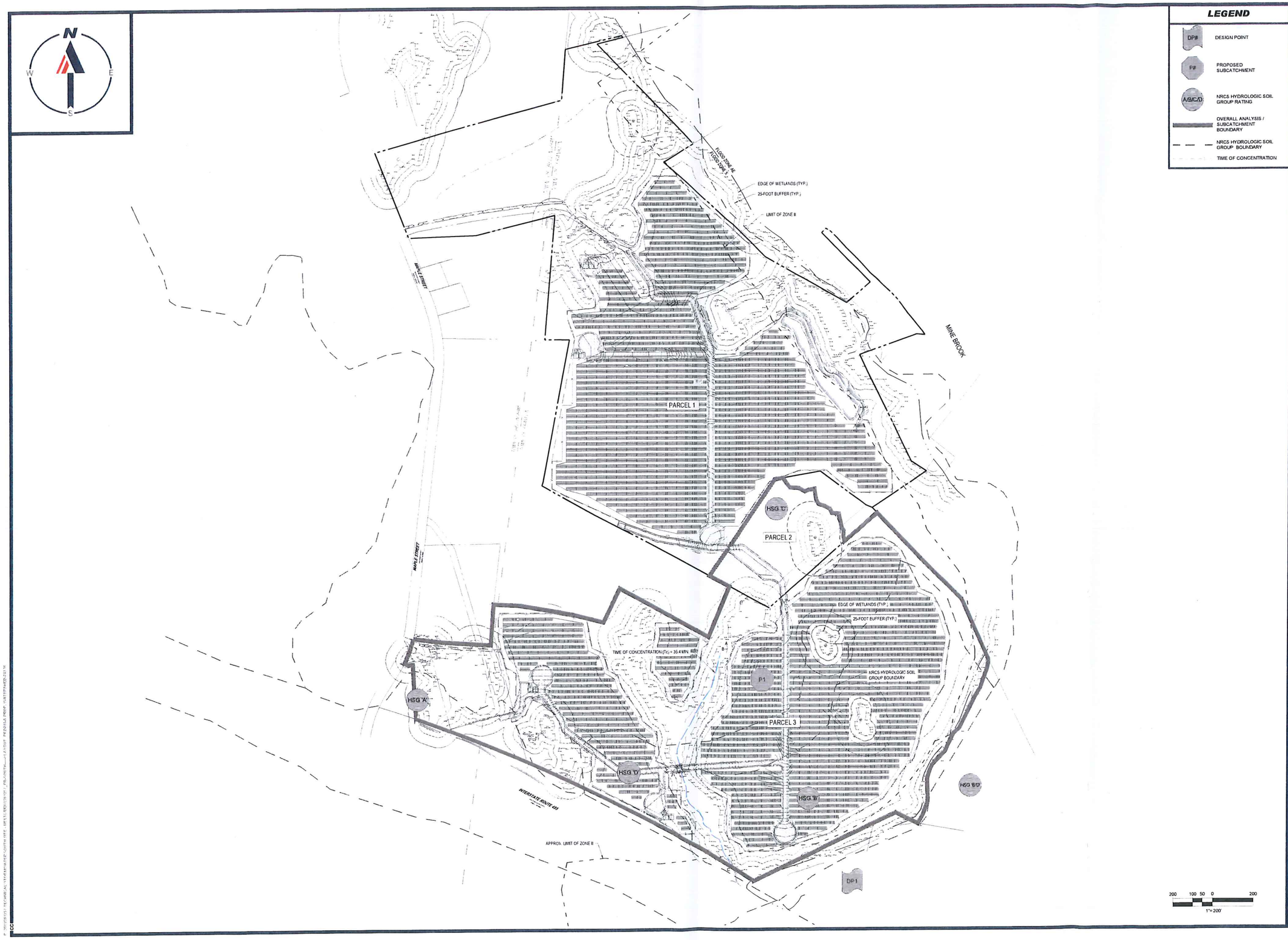
Summary for Reach DP1: Wetlands associated with Mine Brook

Inflow Area = 70.550 ac, 6.80% Impervious, Inflow Depth = 4.66" for 100-yr event
Inflow = 201.40 cfs @ 12.49 hrs, Volume= 27.412 af
Outflow = 201.40 cfs @ 12.49 hrs, Volume= 27.412 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

APPENDIX E: PROPOSED CONDITIONS HYDROLOGIC ANALYSIS

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



LEGEND

- DP# — DESIGN POINT
- P# — PROPOSED SUBCATCHMENT
- A/B/C/D — NRCS HYDROLOGIC SOIL GROUP RATING
- OVERALL ANALYSIS / SUBCATCHMENT BOUNDARY
- NRCS HYDROLOGIC SOIL GROUP BOUNDARY
- TIME OF CONCENTRATION

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PROJECT No.:	W201257
DRAWN BY:	CMC / OCR
CHECKED BY:	GD
DATE:	07/20/2023
CAD I.D.:	W201257_PR-SOUTH

PROJECT:

PROPOSED SITE PLAN DOCUMENTS

FOR

MAPLE STREET SOLAR LLC

PROPOSED SOLAR FARM

LOTS INCLUDED (PARCEL #):255-001, 254-001, 239-010 A, 239-010 B, 239-010 C, PORTION OF D 239-010, & 32-0009
160 MAPLE STREET,
TOWN OF BELLINGHAM & FRANKLIN,
NORFOLK COUNTY, MASSACHUSETTS

BOHLER
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
www.BohlerEngineering.com

J.A. KUCICH

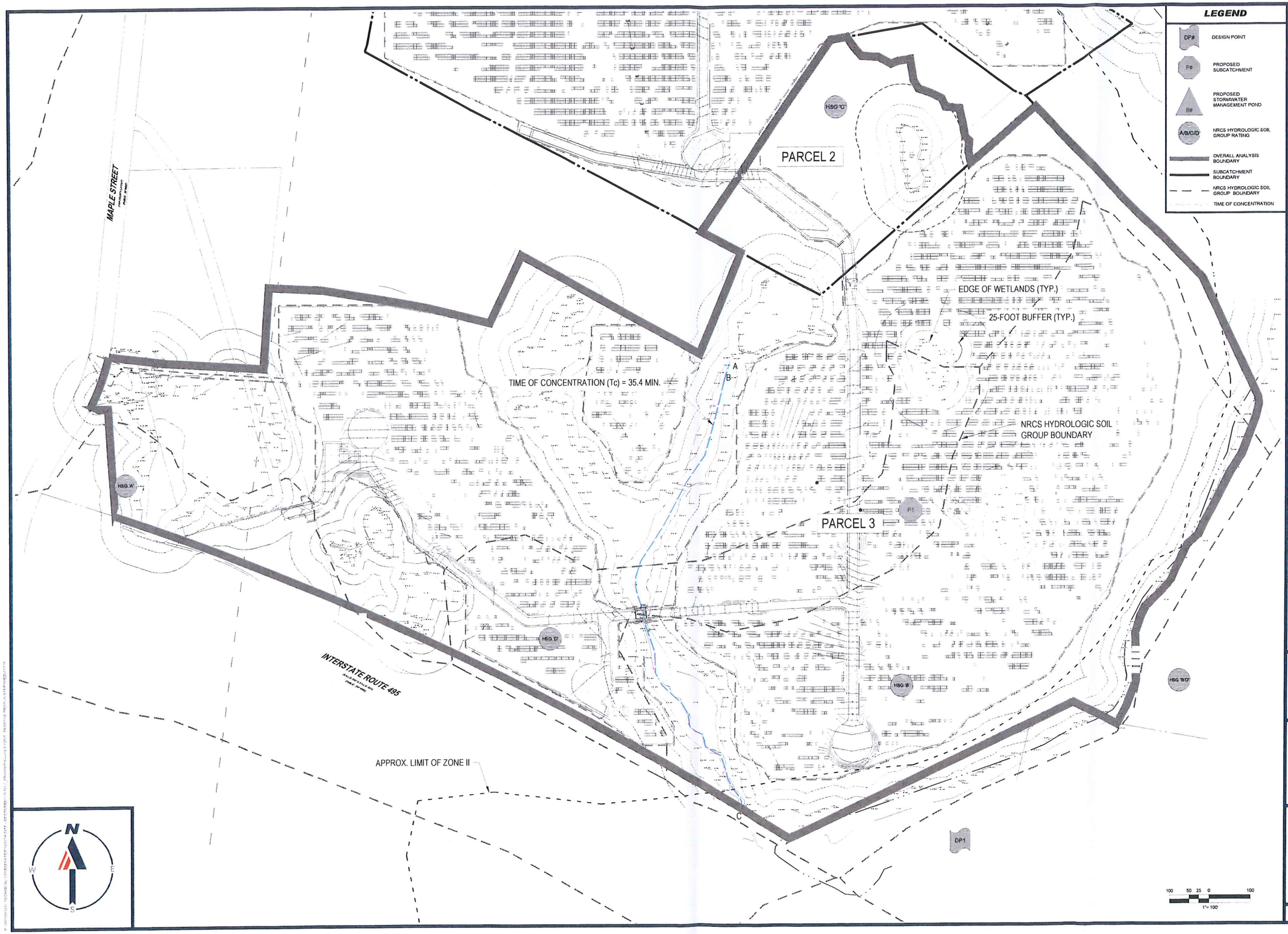
SHEET TITLE:

PROPOSED CONDITIONS DRAINAGE AREA MAP (A)

SHEET NUMBER:

PRDAM-A

ORG. DATE - 07/20/2023



LEGEND

- DP# — DESIGN POINT
- P# — PROPOSED SUBCATCHMENT
- B# — PROPOSED STORMWATER MANAGEMENT POND
- A/B/C/D — NRCS HYDROLOGIC SOIL GROUP RATING
- OVERALL ANALYSIS BOUNDARY
- SUBCATCHMENT BOUNDARY
- NRCS HYDROLOGIC SOIL GROUP BOUNDARY
- TIME OF CONCENTRATION

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REV	DATE	COMMENT	DRAWN BY / CHECKED BY

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PROJECT No.:	W201257
DRAWN BY:	CMC / OCR
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DATE:	07/20/2023
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PROJECT:

PROPOSED SITE PLAN DOCUMENTS

FOR

MAPLE STREET SOLAR LLC

PROPOSED SOLAR FARM

LOTS INCLUDED (PARCEL #):255-001, 254-001, 239-010 A, 239-010 B, 239-010 C, PORTION OF D 239-010, & 32-0009
160 MAPLE STREET,
TOWN OF BELLINGHAM & FRANKLIN,
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BOHLER
352 TURNPIKE ROAD
SOUTHBOROUGH, MA 01772
Phone: (508) 480-9900
www.BohlerEngineering.com

J.A. KUCICH

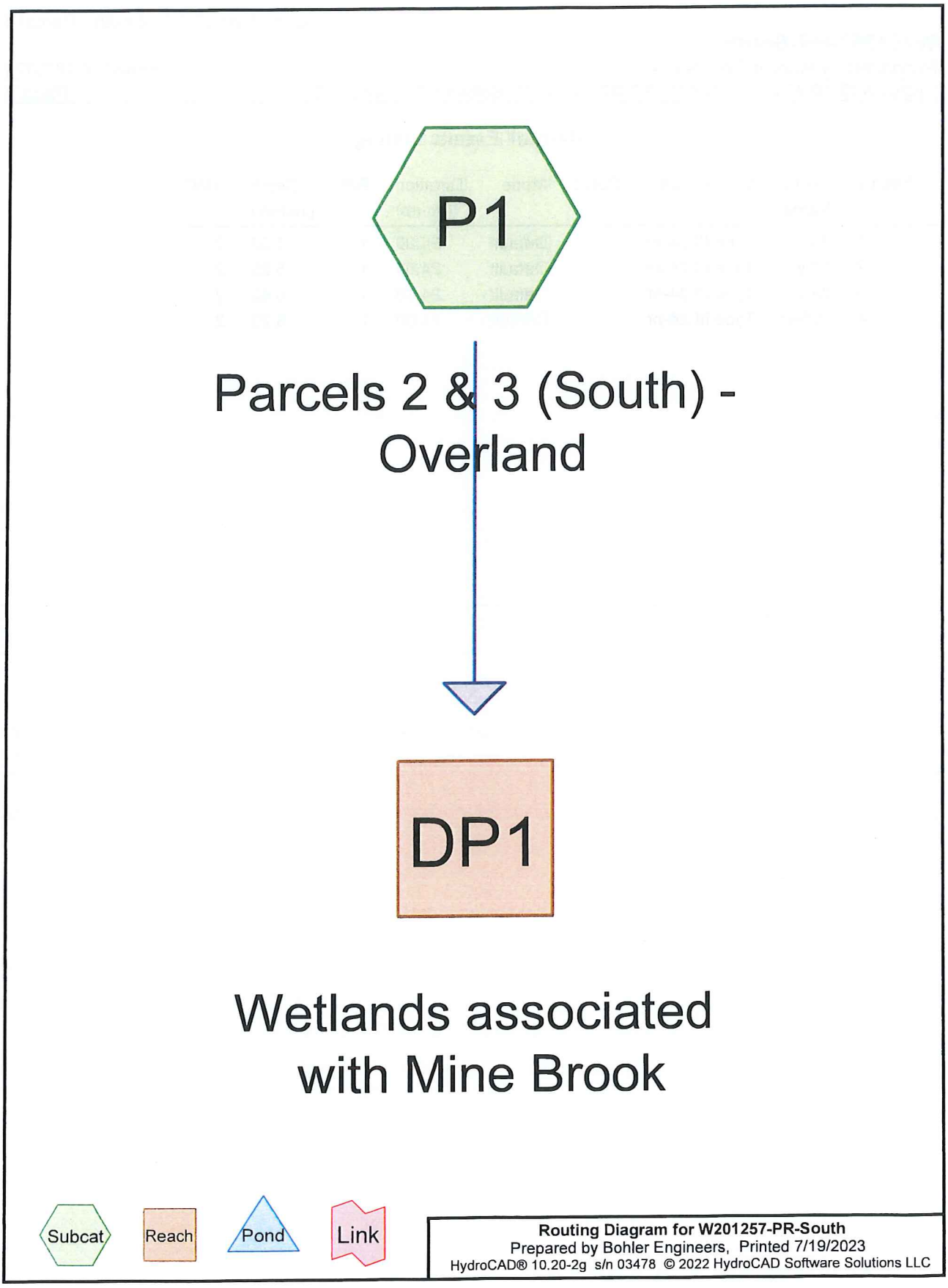
SHEET TITLE:

PROPOSED CONDITIONS DRAINAGE AREA MAP (B)

SHEET NUMBER:

PRDAM-B

ORG. DATE - 07/20/2023


P1
Parcels 2 & 3 (South) - Overland
DP1
Wetlands associated with Mine Brook
Subcat
Reach
Pond
Link
Routing Diagram for W201257-PR-South
Prepared by Bohler Engineers, Printed 7/19/2023
HydroCAD® 10.20-2g s/n 03478 © 2022 HydroCAD Software Solutions LLC

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-yr	Type III 24-hr		Default	24.00	1	3.37	2
2	10-yr	Type III 24-hr		Default	24.00	1	5.25	2
3	25-yr	Type III 24-hr		Default	24.00	1	6.42	2
4	100-yr	Type III 24-hr		Default	24.00	1	8.23	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.260	39	>75% Grass cover, Good, HSG A (P1)
16.693	61	>75% Grass cover, Good, HSG B (P1)
26.495	74	>75% Grass cover, Good, HSG C (P1)
7.296	80	>75% Grass cover, Good, HSG D (P1)
0.066	76	Gravel roads, HSG A (P1)
0.376	85	Gravel roads, HSG B (P1)
1.273	89	Gravel roads, HSG C (P1)
0.801	91	Gravel roads, HSG D (P1)
0.009	98	Paved parking, HSG B (P1)
0.058	98	Paved parking, HSG C (P1)
0.041	98	Paved parking, HSG D (P1)
0.297	98	Water Surface, HSG A (P1)
0.536	98	Water Surface, HSG B (P1)
1.447	98	Water Surface, HSG C (P1)
0.233	98	Water Surface, HSG D (P1)
0.883	30	Woods, Good, HSG A (P1)
5.624	55	Woods, Good, HSG B (P1)
6.905	70	Woods, Good, HSG C (P1)
0.257	77	Woods, Good, HSG D (P1)
70.550	**70**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
2.506	HSG A	P1
23.238	HSG B	P1
36.178	HSG C	P1
8.628	HSG D	P1
0.000	Other	
70.550		**TOTAL AREA**

Ground Covers (selected nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
1.260	16.693	26.495	7.296	0.000	51.744	>75% Grass cover, Good	P1
0.066	0.376	1.273	0.801	0.000	2.516	Gravel roads	P1
0.000	0.009	0.058	0.041	0.000	0.108	Paved parking	P1
0.297	0.536	1.447	0.233	0.000	2.513	Water Surface	P1
0.883	5.624	6.905	0.257	0.000	13.669	Woods, Good	P1
2.506	**23.238**	**36.178**	**8.628**	**0.000**	**70.550**	**TOTAL AREA**	

Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentP1: Parcels 2 & 3 (South) - Runoff Area=70.550 ac 3.72% Impervious Runoff Depth=0.93"
Flow Length=1,256' Tc=35.4 min CN=70 Runoff=36.58 cfs 5.461 af

Reach DP1: Wetlands associated with Mine Brook Inflow=36.58 cfs 5.461 af
Outflow=36.58 cfs 5.461 af

Total Runoff Area = 70.550 ac Runoff Volume = 5.461 af Average Runoff Depth = 0.93"
96.28% Pervious = 67.929 ac 3.72% Impervious = 2.621 ac

Summary for Subcatchment P1: Parcels 2 & 3 (South) - Overland

Runoff = 36.58 cfs @ 12.55 hrs, Volume= 5.461 af, Depth= 0.93"
Routed to Reach DP1 : Wetlands associated with Mine Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-yr Rainfall=3.37"

Area (ac)	CN	Description
0.883	30	Woods, Good, HSG A
0.297	98	Water Surface, HSG A
0.066	76	Gravel roads, HSG A
1.260	39	>75% Grass cover, Good, HSG A
0.009	98	Paved parking, HSG B
0.536	98	Water Surface, HSG B
0.376	85	Gravel roads, HSG B
16.693	61	>75% Grass cover, Good, HSG B
5.624	55	Woods, Good, HSG B
1.447	98	Water Surface, HSG C
0.058	98	Paved parking, HSG C
1.273	89	Gravel roads, HSG C
26.495	74	>75% Grass cover, Good, HSG C
6.905	70	Woods, Good, HSG C
0.041	98	Paved parking, HSG D
0.801	91	Gravel roads, HSG D
7.296	80	>75% Grass cover, Good, HSG D
0.257	77	Woods, Good, HSG D
0.233	98	Water Surface, HSG D
70.550	70	Weighted Average
67.929		96.28% Pervious Area
2.621		3.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0280	0.08		**Sheet Flow, 222-220.6** Woods: Light underbrush n= 0.400 P2= 3.37"
24.9	1,206	0.0260	0.81		**Shallow Concentrated Flow, 220.6-189** Woodland Kv= 5.0 fps
35.4	1,256	Total			

Summary for Reach DP1: Wetlands associated with Mine Brook

Inflow Area = 70.550 ac, 3.72% Impervious, Inflow Depth = 0.93" for 2-yr event
Inflow = 36.58 cfs @ 12.55 hrs, Volume= 5.461 af
Outflow = 36.58 cfs @ 12.55 hrs, Volume= 5.461 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentP1: Parcels 2 & 3 (South) - Runoff Area=70.550 ac 3.72% Impervious Runoff Depth=2.22"
Flow Length=1,256' Tc=35.4 min CN=70 Runoff=94.47 cfs 13.073 af

Reach DP1: Wetlands associated with Mine Brook Inflow=94.47 cfs 13.073 af
Outflow=94.47 cfs 13.073 af

Total Runoff Area = 70.550 ac Runoff Volume = 13.073 af Average Runoff Depth = 2.22"
96.28% Pervious = 67.929 ac 3.72% Impervious = 2.621 ac

Summary for Subcatchment P1: Parcels 2 & 3 (South) - Overland

Runoff = 94.47 cfs @ 12.51 hrs, Volume= 13.073 af, Depth= 2.22"
Routed to Reach DP1 : Wetlands associated with Mine Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-yr Rainfall=5.25"

Area (ac)	CN	Description
0.883	30	Woods, Good, HSG A
0.297	98	Water Surface, HSG A
0.066	76	Gravel roads, HSG A
1.260	39	>75% Grass cover, Good, HSG A
0.009	98	Paved parking, HSG B
0.536	98	Water Surface, HSG B
0.376	85	Gravel roads, HSG B
16.693	61	>75% Grass cover, Good, HSG B
5.624	55	Woods, Good, HSG B
1.447	98	Water Surface, HSG C
0.058	98	Paved parking, HSG C
1.273	89	Gravel roads, HSG C
26.495	74	>75% Grass cover, Good, HSG C
6.905	70	Woods, Good, HSG C
0.041	98	Paved parking, HSG D
0.801	91	Gravel roads, HSG D
7.296	80	>75% Grass cover, Good, HSG D
0.257	77	Woods, Good, HSG D
0.233	98	Water Surface, HSG D
70.550	70	Weighted Average
67.929		96.28% Pervious Area
2.621		3.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0280	0.08		**Sheet Flow, 222-220.6** Woods: Light underbrush n= 0.400 P2= 3.37"
24.9	1,206	0.0260	0.81		**Shallow Concentrated Flow, 220.6-189** Woodland Kv= 5.0 fps
35.4	1,256	Total			

Summary for Reach DP1: Wetlands associated with Mine Brook

Inflow Area = 70.550 ac, 3.72% Impervious, Inflow Depth = 2.22" for 10-yr event
Inflow = 94.47 cfs @ 12.51 hrs, Volume= 13.073 af
Outflow = 94.47 cfs @ 12.51 hrs, Volume= 13.073 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentP1: Parcels 2 & 3 (South) - Runoff Area=70.550 ac 3.72% Impervious Runoff Depth=3.14"
Flow Length=1,256' Tc=35.4 min CN=70 Runoff=135.09 cfs 18.473 af

Reach DP1: Wetlands associated with Mine Brook Inflow=135.09 cfs 18.473 af
Outflow=135.09 cfs 18.473 af

Total Runoff Area = 70.550 ac Runoff Volume = 18.473 af Average Runoff Depth = 3.14"
96.28% Pervious = 67.929 ac 3.72% Impervious = 2.621 ac

Summary for Subcatchment P1: Parcels 2 & 3 (South) - Overland

Runoff = 135.09 cfs @ 12.50 hrs, Volume= 18.473 af, Depth= 3.14"
Routed to Reach DP1 : Wetlands associated with Mine Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-yr Rainfall=6.42"

Area (ac)	CN	Description
0.883	30	Woods, Good, HSG A
0.297	98	Water Surface, HSG A
0.066	76	Gravel roads, HSG A
1.260	39	>75% Grass cover, Good, HSG A
0.009	98	Paved parking, HSG B
0.536	98	Water Surface, HSG B
0.376	85	Gravel roads, HSG B
16.693	61	>75% Grass cover, Good, HSG B
5.624	55	Woods, Good, HSG B
1.447	98	Water Surface, HSG C
0.058	98	Paved parking, HSG C
1.273	89	Gravel roads, HSG C
26.495	74	>75% Grass cover, Good, HSG C
6.905	70	Woods, Good, HSG C
0.041	98	Paved parking, HSG D
0.801	91	Gravel roads, HSG D
7.296	80	>75% Grass cover, Good, HSG D
0.257	77	Woods, Good, HSG D
0.233	98	Water Surface, HSG D
70.550	70	Weighted Average
67.929		96.28% Pervious Area
2.621		3.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0280	0.08		**Sheet Flow, 222-220.6** Woods: Light underbrush n= 0.400 P2= 3.37"
24.9	1,206	0.0260	0.81		**Shallow Concentrated Flow, 220.6-189** Woodland Kv= 5.0 fps
35.4	1,256	Total			

Summary for Reach DP1: Wetlands associated with Mine Brook

Inflow Area = 70.550 ac, 3.72% Impervious, Inflow Depth = 3.14" for 25-yr event
Inflow = 135.09 cfs @ 12.50 hrs, Volume= 18.473 af
Outflow = 135.09 cfs @ 12.50 hrs, Volume= 18.473 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

Time span=1.00-48.00 hrs, dt=0.05 hrs, 941 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

SubcatchmentP1: Parcels 2 & 3 (South) - Runoff Area=70.550 ac 3.72% Impervious Runoff Depth=4.66"
Flow Length=1,256' Tc=35.4 min CN=70 Runoff=201.40 cfs 27.412 af

Reach DP1: Wetlands associated with Mine Brook Inflow=201.40 cfs 27.412 af
Outflow=201.40 cfs 27.412 af

Total Runoff Area = 70.550 ac Runoff Volume = 27.412 af Average Runoff Depth = 4.66"
96.28% Pervious = 67.929 ac 3.72% Impervious = 2.621 ac

Summary for Subcatchment P1: Parcels 2 & 3 (South) - Overland

Runoff = 201.40 cfs @ 12.49 hrs, Volume= 27.412 af, Depth= 4.66"
Routed to Reach DP1 : Wetlands associated with Mine Brook

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-yr Rainfall=8.23"

Area (ac)	CN	Description
0.883	30	Woods, Good, HSG A
0.297	98	Water Surface, HSG A
0.066	76	Gravel roads, HSG A
1.260	39	>75% Grass cover, Good, HSG A
0.009	98	Paved parking, HSG B
0.536	98	Water Surface, HSG B
0.376	85	Gravel roads, HSG B
16.693	61	>75% Grass cover, Good, HSG B
5.624	55	Woods, Good, HSG B
1.447	98	Water Surface, HSG C
0.058	98	Paved parking, HSG C
1.273	89	Gravel roads, HSG C
26.495	74	>75% Grass cover, Good, HSG C
6.905	70	Woods, Good, HSG C
0.041	98	Paved parking, HSG D
0.801	91	Gravel roads, HSG D
7.296	80	>75% Grass cover, Good, HSG D
0.257	77	Woods, Good, HSG D
0.233	98	Water Surface, HSG D
70.550	70	Weighted Average
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2.621		3.72% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	50	0.0280	0.08		**Sheet Flow, 222-220.6** Woods: Light underbrush n= 0.400 P2= 3.37"
24.9	1,206	0.0260	0.81		**Shallow Concentrated Flow, 220.6-189** Woodland Kv= 5.0 fps
35.4	1,256	Total			

Summary for Reach DP1: Wetlands associated with Mine Brook

Inflow Area = 70.550 ac, 3.72% Impervious, Inflow Depth = 4.66" for 100-yr event
Inflow = 201.40 cfs @ 12.49 hrs, Volume= 27.412 af
Outflow = 201.40 cfs @ 12.49 hrs, Volume= 27.412 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 1.00-48.00 hrs, dt= 0.05 hrs

APPENDIX F: STORMWATER CALCULATIONS

- *MA STANDARD #3 – RECHARGE CALCULATIONS*
- *RAINFALL DATA*

Proposed Solar Farm - Parcel 3
160 Maple Street
Bellingham & Franklin, MA
Bohler Job Number: W201257
July 20, 2023

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)	0.000
Proposed Increase in Site Impervious Area (ac)	0.000
Recharge Volume Required (cf)	**0**

Required Recharge Volume - B Soils (0.35 in.)	
Existing Site Impervious Area (ac)	0.743
Proposed Site Impervious Area (ac)	0.009
Proposed Increase in Site Impervious Area (ac)	-0.734
Recharge Volume Required (cf)	**0**

Required Recharge Volume - C Soils (0.25 in.)	
Existing Site Impervious Area (ac)	1.220
Proposed Site Impervious Area (ac)	0.058
Proposed Increase in Site Impervious Area (ac)	-1.162
Recharge Volume Required (cf)	**0**

Required Recharge Volume - D Soils (0.10 in.)	
Existing Site Impervious Area (ac)	0.312
Proposed Site Impervious Area (ac)	0.041
Proposed Increase in Site Impervious Area (ac)	-0.271
Recharge Volume Required (cf)	**0**

Total Recharge Volume Required (cf)	**0**

Prepared By:
BOHLER
352 Turnpike Road
Southborough, MA 01772
(508) 480-9900

7/19/2023

NOAA Atlas 14, Volume 10, Version 3
Location name: Bellingham, Massachusetts, USA*
Latitude: 42.1067°, Longitude: -71.4412°
Elevation: 230 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	0.328 (0.251-0.426)	0.396 (0.303-0.515)	0.508 (0.387-0.662)	0.600 (0.455-0.787)	0.728 (0.536-0.996)	0.825 (0.596-1.15)	0.925 (0.651-1.34)	1.04 (0.694-1.53)	1.19 (0.770-1.82)	1.32 (0.833-2.05)
10-min	0.464 (0.356-0.603)	0.561 (0.429-0.730)	0.720 (0.549-0.940)	0.851 (0.646-1.12)	1.03 (0.760-1.41)	1.17 (0.845-1.63)	1.31 (0.922-1.89)	1.47 (0.983-2.17)	1.69 (1.09-2.58)	1.86 (1.18-2.91)
15-min	0.546 (0.418-0.709)	0.660 (0.505-0.858)	0.846 (0.646-1.10)	1.00 (0.760-1.31)	1.21 (0.894-1.66)	1.38 (0.994-1.92)	1.54 (1.08-2.23)	1.73 (1.16-2.55)	1.98 (1.28-3.04)	2.19 (1.39-3.42)
30-min	0.745 (0.571-0.968)	0.902 (0.690-1.17)	1.16 (0.884-1.51)	1.37 (1.04-1.80)	1.66 (1.22-2.27)	1.88 (1.36-2.63)	2.11 (1.48-3.05)	2.36 (1.58-3.50)	2.72 (1.76-4.16)	3.00 (1.90-4.69)
60-min	0.945 (0.724-1.23)	1.14 (0.875-1.49)	1.47 (1.12-1.92)	1.74 (1.32-2.28)	2.11 (1.55-2.88)	2.39 (1.73-3.34)	2.68 (1.88-3.87)	3.00 (2.01-4.44)	3.45 (2.23-5.28)	3.81 (2.41-5.95)
2-hr	1.21 (0.935-1.57)	1.48 (1.14-1.91)	1.91 (1.47-2.48)	2.27 (1.73-2.96)	2.76 (2.05-3.77)	3.13 (2.28-4.37)	3.53 (2.51-5.11)	3.98 (2.68-5.87)	4.66 (3.02-7.10)	5.23 (3.32-8.11)
3-hr	1.40 (1.08-1.81)	1.72 (1.32-2.21)	2.22 (1.71-2.87)	2.64 (2.02-3.43)	3.22 (2.40-4.38)	3.65 (2.67-5.08)	4.11 (2.94-5.96)	4.66 (3.14-6.84)	5.49 (3.57-8.34)	6.20 (3.94-9.59)
6-hr	1.81 (1.40-2.31)	2.20 (1.71-2.82)	2.85 (2.20-3.66)	3.39 (2.61-4.38)	4.13 (3.09-5.60)	4.68 (3.44-6.49)	5.28 (3.80-7.62)	6.00 (4.05-8.75)	7.10 (4.63-10.7)	8.05 (5.14-12.4)
12-hr	2.29 (1.79-2.91)	2.79 (2.17-3.55)	3.61 (2.80-4.60)	4.28 (3.31-5.49)	5.21 (3.92-7.02)	5.90 (4.36-8.13)	6.65 (4.81-9.55)	7.56 (5.13-11.0)	8.96 (5.86-13.4)	10.2 (6.50-15.5)
24-hr	2.74 (2.15-3.46)	3.37 (2.64-4.26)	4.40 (3.43-5.57)	5.25 (4.07-6.69)	6.42 (4.85-8.60)	7.28 (5.41-9.99)	8.23 (5.99-11.8)	9.40 (6.39-13.5)	11.2 (7.36-16.7)	12.8 (8.21-19.4)
2-day	3.10 (2.44-3.89)	3.88 (3.05-4.86)	5.14 (4.03-6.48)	6.19 (4.83-7.84)	7.64 (5.81-10.2)	8.69 (6.51-11.9)	9.86 (7.25-14.1)	11.4 (7.75-16.3)	13.7 (9.04-20.4)	15.8 (10.2-23.9)
3-day	3.39 (2.68-4.23)	4.22 (3.33-5.28)	5.58 (4.39-7.00)	6.71 (5.25-8.47)	8.27 (6.31-11.0)	9.40 (7.06-12.8)	10.7 (7.85-15.2)	12.3 (8.39-17.5)	14.9 (9.78-21.9)	17.1 (11.0-25.7)
4-day	3.65 (2.89-4.55)	4.52 (3.57-5.63)	5.93 (4.68-7.42)	7.10 (5.57-8.94)	8.72 (6.66-11.6)	9.90 (7.44-13.4)	11.2 (8.25-15.9)	12.9 (8.81-18.3)	15.5 (10.2-22.8)	17.8 (11.5-26.7)
7-day	4.40 (3.50-5.45)	5.32 (4.22-6.60)	6.82 (5.40-8.48)	8.06 (6.34-10.1)	9.77 (7.48-12.8)	11.0 (8.30-14.8)	12.4 (9.12-17.4)	14.1 (9.70-20.0)	16.7 (11.1-24.5)	19.0 (12.3-28.3)
10-day	5.11 (4.07-6.31)	6.06 (4.82-7.49)	7.61 (6.04-9.44)	8.90 (7.02-11.1)	10.7 (8.17-13.9)	12.0 (9.01-16.0)	13.4 (9.82-18.6)	15.1 (10.4-21.3)	17.6 (11.7-25.7)	19.8 (12.8-29.4)
20-day	7.22 (5.78-8.85)	8.23 (6.58-10.1)	9.88 (7.88-12.2)	11.3 (8.92-13.9)	13.1 (10.1-17.0)	14.6 (11.0-19.2)	16.1 (11.7-21.9)	17.7 (12.3-24.8)	20.0 (13.4-29.0)	21.9 (14.2-32.4)
30-day	8.96 (7.20-10.9)	10.0 (8.04-12.2)	11.7 (9.39-14.4)	13.2 (10.5-16.3)	15.1 (11.6-19.4)	16.6 (12.5-21.7)	18.2 (13.2-24.5)	19.8 (13.7-27.5)	21.9 (14.6-31.6)	23.6 (15.4-34.7)
45-day	11.1 (8.97-13.5)	12.2 (9.84-14.9)	14.0 (11.3-17.2)	15.5 (12.4-19.1)	17.6 (13.5-22.3)	19.2 (14.4-24.8)	20.8 (15.0-27.7)	22.3 (15.5-30.8)	24.2 (16.2-34.7)	25.5 (16.7-37.5)
60-day	12.9 (10.5-15.7)	14.1 (11.4-17.1)	16.0 (12.8-19.4)	17.5 (14.0-21.4)	19.6 (15.1-24.8)	21.3 (16.0-27.4)	22.9 (16.6-30.3)	24.3 (17.0-33.6)	26.0 (17.5-37.2)	27.1 (17.7-39.7)

[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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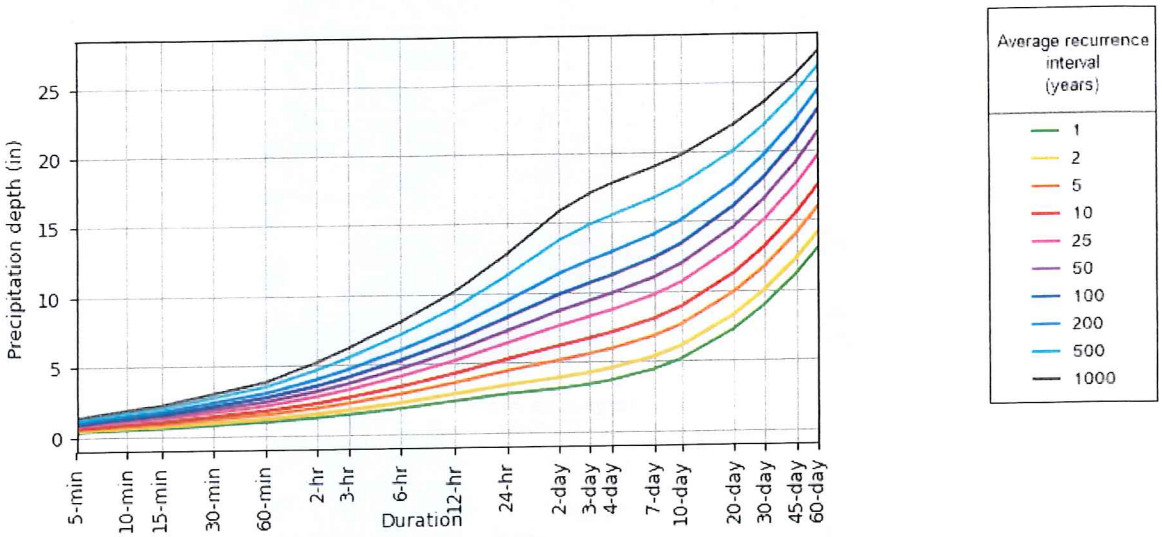
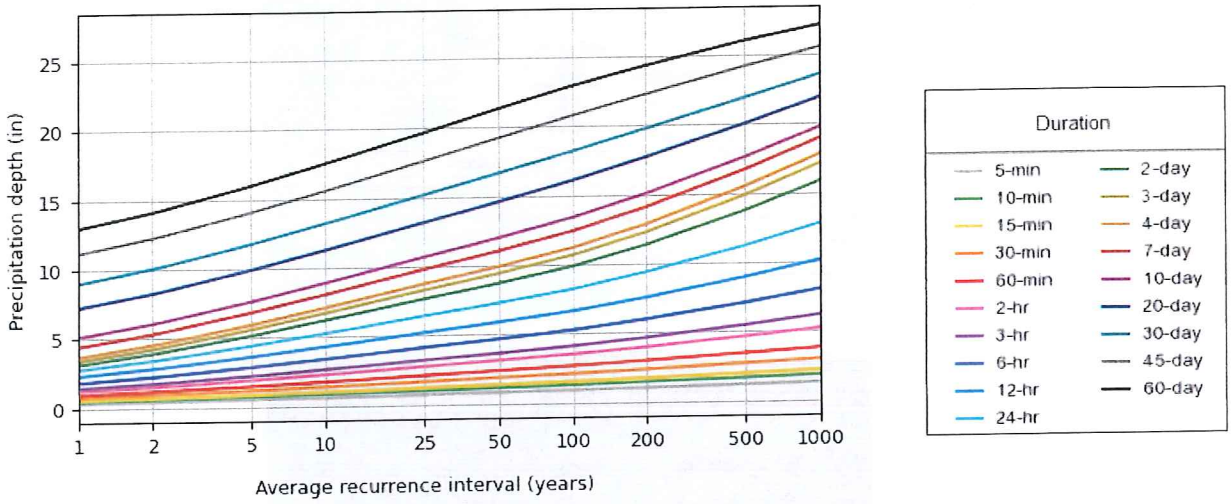
PF graphical

PDS-based depth-duration-frequency (DDF) curves
Latitude: 42.1067°, Longitude: -71.4412°





NOAA Atlas 14, Volume 10, Version 3

Created (GMT): Fri Jun 30 15:09:13 2023

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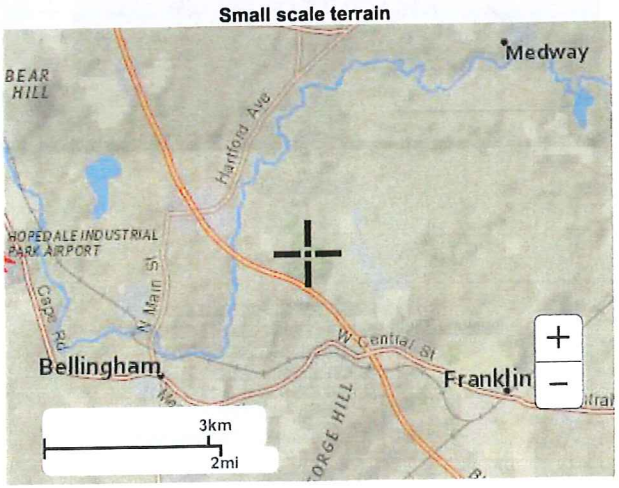
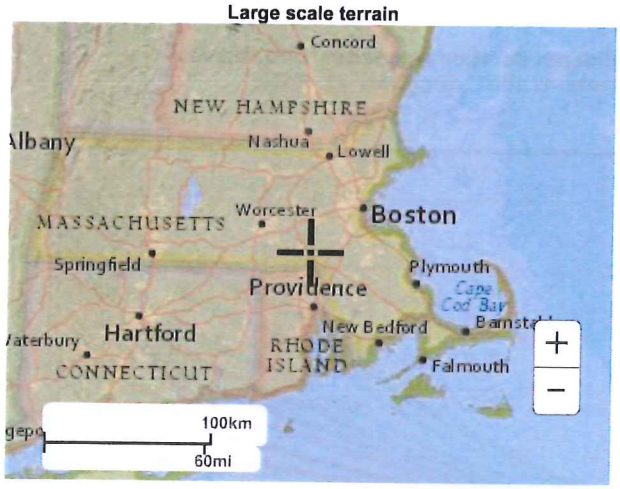
Maps & aerials

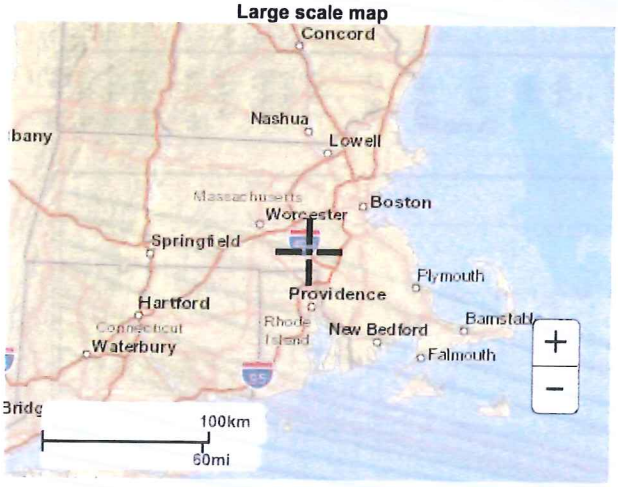
Small scale terrain



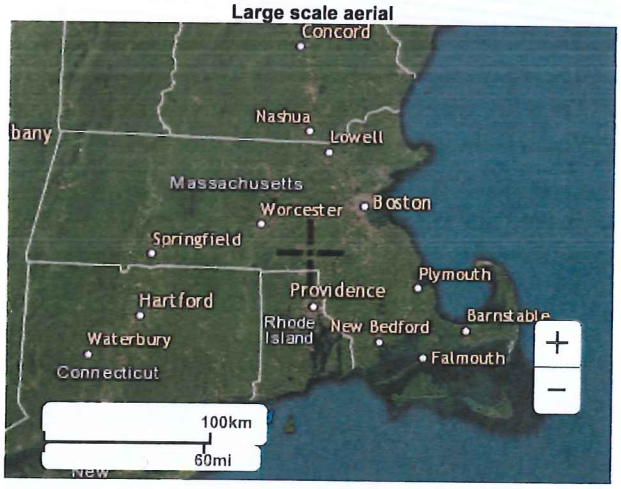
Large scale terrain



Large scale map



Large scale aerial



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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

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*

STORMWATER OPERATION AND MAINTENANCE PLAN

Proposed Solar Farm – Parcel 3
160 Maple Street
Bellingham & Franklin, MA

RESPONSIBLE PARTY DURING CONSTRUCTION:

Maple Street Solar LLC
177 Huntington Ave, Suite 1703 Unit 73069
Boston, MA 02115

RESPONSIBLE PARTY POST CONSTRUCTION:

Maple Street Solar LLC
Daniel Serber, Senior Director of Land Development
177 Huntington Ave, Suite 1703 Unit 73069
Boston, MA 02115
(559) 731-4645

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). Inspection reports shall be submitted to the Town Department of Public Works confirming maintenance efforts have been completed.

1. Existing drainage infrastructure (yard 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/yr. per structure

2. Solar Arrays: Preventative maintenance after every major storm event during the first three (3) months while vegetation establishes. Inspect two (2) times per year thereafter in areas where solar arrays are perpendicular to topography for signs of erosion. Inspect drip edges and provide mitigation / repairs before further erosion can take place. Mowing shall occur between and under panels no more than once per year between October 1st and November 15th.

Approximate Maintenance Budget: Inspection - $1,000/yr.
Mowing - $500yr.

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

Owner Signature:

Name: Daniel Serber (Maple Street Solar LLC Title: Senior Director

Signature: Daniel Serber Date: 07/19/2023

Name: _____ Title: _____

Signature: _____ Date: _____

STORMWATER MANAGEMENT SYSTEM

POST-CONSTRUCTION INSPECTION REPORT

LOCATION:

Proposed Solar Farm – Parcel 3
160 Maple Street
Bellingham & Franklin, MA

RESPONSIBLE PARTY:

Maple Street Solar LLC
Daniel Serber, Senior Director of Land Development
177 Huntington Ave, Suite 1703 Unit 73069
Boston, MA 02115
(559) 731-4645

NAME OF INSPECTOR:	INSPECTION DATE:
Note Condition of the Following (sediment depth, debris, standing water, damage, etc.):	
Yard Drains / Manholes / Piping:	
Solar Arrays:	
Other	
Other:	
Other:	

Note Recommended Actions to be taken on the Following (sediment and/or debris removal, repairs, etc.):
Yard Drains / Manholes / Piping:
Solar Arrays:
Other:
Other:
Other:
Comments:

STORMWATER INSPECTION AND MAINTENANCE LOG FORM			
Proposed Solar Farm – Parcel 3 ***160 Maple Street – Bellingham & Franklin, MA***			
Stormwater Management Practice	Responsible Party	Date	Maintenance Activity Performed

LONG-TERM POLLUTION PREVENTION PLAN

Proposed Solar Farm – Parcel 3
160 Maple Street
Bellingham & Franklin, MA

RESPONSIBLE PARTY DURING CONSTRUCTION:

Maple Street Solar LLC
177 Huntington Ave, Suite 1703 Unit 73069
Boston, MA 02115

RESPONSIBLE PARTY POST CONSTRUCTION:

Maple Street Solar LLC
Daniel Serber, Senior Director of Land Development
177 Huntington Ave, Suite 1703 Unit 73069
Boston, MA 02115
(559) 731-4645

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 driveways, landscaping, drainage infrastructure, etc.
- Proper storage and removal of solid waste (dumpsters), if applicable.
- Salting and/or sanding of vehicular / pedestrian 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.
- Snow removal shall be the responsibility of the property owner. In no case shall snow be disposed of or stored in resource areas (wetlands, floodplain, streams, or other water bodies).

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
- 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.

Owner Signature:

Name: Daniel Serber (Maple Street Solar LLC Title: Senior Director

Signature: Daniel Serber Date: 07/19/2023

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 Solar Farm – Parcel 3
160 Maple Street
Bellingham & Franklin, 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 following departments:

   - Town of Bellingham Board of Health at (508) 966-5820 and the Conservation Commission at (508) 657-2858; or the

   - Town of Franklin Board of Health at (508) 520-4905 and the Conservation Commission at (508) 520-4929.

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