Stormwater Management Report

140R Main Street, Newbury, Massachusetts

August 14, 2022

Submitted To:
Town of Newbury
Conservation Commission
25 High Road – Town Hall
Newbury, MA 01951

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WATERSTONE ENGINEERING
INNOVATIVE STORMWATER MANAGEMENT

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1.0 Executive Summary

This Stormwater Management Report is being submitted on behalf of New Leaf Energy (Applicant) pursuant to the Massachusetts Wetlands Protection Act (WPA) M.G.L. Ch. 131, Section 40 and its regulations (310 CMR 10.00). The Applicant is requesting the Commission review the proposed work as a Limited Project for the construction of a limited access maintenance roadway for periodic (annual) access to the point of interconnection with the NGRID transmission corridor pursuant to 310 CMR 10.53(3)(d) & (e). The stormwater report is prepared specifically to address the Massachusetts Department of Environmental Protection (MA DEP) Stormwater Standards and the requirements of the EPA Construction General Permit (CGP). As a Limited Project with no increase in impervious cover and no increase in peak runoff, many of the Stormwater Standards do not apply to the project. Based on our analysis of the pre- vs. post-development peak runoff conditions, the project does not increase the peak rate of discharge or increase impervious cover and meets the MA DEP Stormwater Standards as well as the requirements set forth in the Town of Newbury's various regulations and bylaws. The Project has been developed in accordance with the Stormwater Management Standards.

The Applicant proposes to construct an access road along the existing farm road and wetland crossing to satisfy the National Grid (NGRID) requirement for maintenance access to the interconnection via the solar facility. The road length is 1,037 ft and will be widened from approximately 9 ft to 12 ft with clearing both sides totaling 22 ft wide (5 ft on either side).

This is for an existing 2.795 megawatt (mW) ground mounted solar facility completed in 2021 at 136/140R North Main Street in Newbury, Essex County, Massachusetts, MADEP Amended Final Order of Conditions # 050-1163. The completed project was approved by the Town of Newbury by Special Permit on May 16, 2018. This project alters none of the conditions of the Special Permit with the exception of the additional access road in the rear of the facility, the increase in protected wetland areas, and a net increase in wetland restoration.

A Conservation Restriction amendment has been drafted and approved by the Greenbelt Essex County Land Trust, the grantee and executor of the trust. The amendment includes the addition of a 0.976-acre easement for the maintenance access road and the additional protection of 1.185 acres of wetland which has been added to the Yesair Trust increasing the entire protected area to 82.185 acres. The CR was submitted to the state for review and approval on 4/13/2022 by the land trust. This involved a lot line revision which was presented to the Planning Board on December 15, 2021 at which point it received the board endorsement that it was in fact an Approval Not Required. Proposed work is within Bordering Vegetated Wetlands, previously undeveloped Riverfront Area, and the 100-Foot Buffer Zone to the resource areas. Although the proposed activities meet the performance standards for applicable resource areas, the Applicant is requesting the Commission review the proposed work as a Limited Project for the construction of a limited access maintenance roadway for periodic (annual) access to the point of interconnection with the NGRID transmission corridor pursuant to 310 CMR 10.53(3)(d) & (e).

310 CMR 10.53 (d) The construction, reconstruction, operation and maintenance of underground and overhead public utilities, such as electrical distribution or transmission lines, or

communication, sewer, water and natural gas lines, may be permitted, in accordance with the following general conditions and any additional conditions deemed necessary by the issuing authority:

1. *The issuing authority may require a reasonable alternative route with fewer adverse effects for a local distribution or connecting line not reviewed by the Energy Facilities Siting Council;*
2. *Best available measures shall be used to minimize adverse effects during construction;*
3. *The surface vegetation and contours of the area shall be substantially restored; and*
4. *All sewer lines shall be constructed to minimize inflow and leakage.*

10.53(3)(e): The construction and maintenance of a new roadway or driveway of minimum legal and practical width acceptable to the planning board, where reasonable alternatives means of access from a public way to an upland area of the same owner is unavailable... The issuing authority may require the applicant to utilize access over an adjacent parcel of land currently or formerly owned by the applicant, or in which the applicant has, or can obtain, an ownership interest. The applicant shall design the roadway or driveway according to the minimum length and width acceptable to the Planning Board, and shall present reasonable alternative means of access to the Board. The applicant shall provide replication of bordering vegetated wetlands and compensatory flood storage to the extent practicable.

The site conditions and the proposed project are depicted on the attached project plans prepared by Waterstone Engineering, dated November 11, 2021. This Project Narrative describes the existing conditions, wetland resource areas, proposed design, and regulatory compliance for work within jurisdictional areas on and near the site.

2.0 Project Description

2.1 Maintenance Access Road

The proposed project is the final NGRID requirement to complete the interconnection of the 2.795 MW ground-mounted solar facility by providing a maintenance access road to the electric utility transmission corridor through the customer facility. The proposed work would occur by upgrading an existing cart path through the eastern portion of the facility, through the forested wetlands and uplands, and across the large wetland system at the location of the existing cattle crossing, to the point of interconnection within the NGRID transmission corridor. The road length is 1,037 ft and will be widened from approximately 9 ft to 12 ft with clearing both sides totaling 22 ft wide (5 ft on either side). This includes bumpouts approximately every 400 ft to allow for 2 vehicle passage where road width extends to 20 ft and subsequent clearing to 30 ft. The maintenance access road will be widened temporarily to 20 ft to enable access for a 500-ton crane for bridge construction. The road width will be reduced to 12’ as noted prior after bridge construction is complete. The existing cart path will be removed and replaced with a 12 ft wide 150 ft span truss bridge to eliminate wetland impacts making the project a net plus for wetlands. The bridge capacity is H-20 loading with a maximum capacity of 40,000 lbs, 20 tons.

No impervious coverage will be added. There will be the addition of approximately 23,000 sf of gravel roadway including a 150-ft truss bridge with open pervious decking. A 20-ft bar gate with signage will control access to the site at the transmission corridor. Traffic usage will be almost

zero with annual usage of the roadway expected for inspection and maintenance activities. The maintenance access road will otherwise remain unused with the rare exception of emergency or maintenance access.

The proposed project will consist of the following key components:

- Maintenance access roads
- 150-ft truss bridge, H20
- 120 sf of permanent and 470 sf of temporary wetland impact
- 1,485 sf of wetland restoration
- 20' bar gate
- Signage

The selected alternative is the least impactful viable option and will result in a net gain of 1,365 sf wetlands and the additional protection of 1.185 acres of wetlands placed into Conservation Restriction totaling 82.185 acres. The proposed location of the maintenance access road is within forested areas of the site to upgrade the existing cart path and will require additional 0.59 acres of tree removal. Limited earth disturbance will occur during the road widening and the construction of the bridge foundations. There will also be earthwork associated with the removal of the existing 135 ft wetland crossing at the cart path. This cart path will be removed as part of the bridge construction resulting in 1,485 sf of wetland restoration.

2.2 Cart Path Removal and Wetland Restoration

Cart path removal and wetland restoration will occur as follows. Wetland restoration of 1,450 sf to occur by removal of existing cart path creating bottom land wetland in combination with river front. Approximately 135 ft long x 11 ft wide cart path to be removed and restored as wetland. Installation of a 150 ft long x 12 ft wide truss bridge will occur over the prior cart path location. Bridge is to be shipped in 6 sections 25 ft long. Large mature trees will be avoided and removed only as needed in consultation with supervising engineer. Wetland plants and soil to be transplanted from cart path disturbed areas for 800 sf wetland creation. This includes shrubs and other obligate and facultative wetland species. Wetland plant transplantation and excavation to be coordinated with site contractor and landscaper knowledgeable of wetland plantings. Depth of excavation for cart path removal to be approximately 36" or more to wetland/pond bottom equivalent to an estimated removal of 4,500 cf of fill. Water depth estimated to be 24" and path is approximately 12" above the water surface.

Wetland restoration elements are as follows. Wetland restoration boundaries will be clearly marked prior to the start of restoration work and confirmed by the supervising engineer. Install turbidity curtain in open water section and silt fence and straw wattle at limit of disturbance. Any equipment used in the restoration area will not enter the undisturbed wetland area. Cart path shall be removed/excavated between temporary bridge supports. Temporary bridge supports shall be placed upon timber mats at each of the 6 joints between truss sections. Excavation below temporary bridge supports shall be sufficient to allow removal of timber mats and cribbing from the shore without access by heavy equipment, post bridge assembly. Excavated materials should be placed within the upland areas as fill material or hauled off site. Wetland plants and soils shall be

transplanted from the cart path restoration areas and installed in the 800 sf wetland creation area. Remove the erosion control once the creation has been properly stabilized.

Requirements for construction phasing are as follows. Construction phasing, sequencing and engineering oversight is required to ensure the successful wetland restoration and bridge installation. Temporary construction methods and phasing considerations account for the necessary use of large construction equipment within the wetland area while both removing and excavating the cart path and installing the bridge and temporary construction measures. The contractor shall submit a construction phasing plan. The phasing plan will be adapted based on feedback with the bridge designer, the crane operator, the supervising engineer, and the contractor.

Construction dewatering may be required to help control surface water and groundwater and to conduct work "in the dry". Water level is anticipated to be high as excavation will be below standing water. Construction dewatering may be to area located outside of the proposed restoration.

2.3 Bridge Construction and Crane Placement

For bridge construction details, refer to final design and specifications to be provided with construction drawings. Crane placement will occur in a temporary laydown are on the north side of the bridge. A temporary lay down area and pad 30’ x 200’ will be cleared to allow for crane setup, counterweights, outriggers, operation, and construction staging. A 500-ton crane is needed for placement of 5 individual 30’ truss sections (23,000 lb each) upon the temporary bridge supports. This includes a boom swing area of 50’ radius semi-circle at the laydown area and allow for the extension of the maximum boom radius of 170’ for placement of the furthest truss sections. The laydown area will be restored to a 12’ road upon completion.

Construction of 2 bin wall bridge abutments is required. Bin walls are each 30’L x 12’D x 7’H. Precast concrete sill foundations will be placed upon each bin wall including an 18’2"L x 3’10”H x 3’8”W backwall and a 27’L x 4’2”D x 3’2”H baseslab. Excavation for the bin walls will require construction dewatering. Water level is anticipated to be high as excavation will be below standing water. Construction dewatering may be achieved with localized sump pumps and discharged to nearby excavated pits located well outside of the proposed restoration.

3.0 Introduction

This is for an existing 2.795 megawatt (mW) ground mounted solar facility completed in 2021 at 140R North Main Street in Newbury, Essex County, Massachusetts, MADEP Amended Final Order of Conditions # 050-1163. The completed project was approved by the Town of Newbury by Special Permit on May 16, 2018. This project alters none of the conditions of the Special Permit with the exception of the additional maintenance access road in the rear of the facility, the increase in protected wetland areas, and a net increase in wetland restoration.

The site is located in Byfield, Newbury, Essex County, Massachusetts on the east side of Main Street. The parcel is R41-42, Book 38304, Page 458; Book 38800, Page 599. The site owner is Karen E. Yesair Thiel and Kavy N. Yesair, Successor Trustees of the Ruth A. Yesair Trust.

Existing access to the site is along the driveway on parcel R-41-42A and then along a main access road, see Figure 1. The proposed maintenance access drive will continue along an existing cart path located on Assessor's Parcel R-41-42. The maintenance access road will continue along the cart path to the east and eventually terminate at Massachusetts Electric Co transmission corridor, parcel U11-0-17.

A Conservation Restriction amendment has been drafted and approved by the Greenbelt Essex County Land Trust, the grantee and executor of the trust. The amendment includes the addition of a 0.976 acre easement (see Figure 1, Sheet C-3.0 in the NOI Plan Set) for the maintenance access road and the additional protection of 1.185 acres of wetland which has been added to the Yesair Trust increasing the entire protected area to 82.185 acres. The CR was submitted to the state for review and approval on 4/13/2022 by the land trust. This involved a lot line revision which was presented to the Planning Board on December 15, 2021 at which point it received the board endorsement that it was in fact an Approval Not Required.

3.1 Land Use and Hydrologic Soil Types

Table 1 summarizes the land use distribution for the project area and subwatershed 4 for existing and proposed conditions.

Table 1 Land Use Distributions for Existing and Proposed Conditions - Subwatershed 4

Land Cover	Soil Group	CN	Existing Conditions (Acres)	Proposed Conditions (Acres)
Dirt Roads	A	72	0.27	
Gravel Road		96		0.377
Woods, Good	A	30	18.938	18.938
Woods, Good	B	55	2.782	2.782
Woods, Good	C	70	16.797	16.69
50-75% Grass cover, Fair	A	49	0.31	0.31
50-75% Grass cover, Fair	B	69	0.109	0.109
50-75% Grass cover, Fair	C	79	0.82	0.82
		Total	**40.026**	**40.026**

Hydrologic soil groups are used in equations that estimate runoff from rainfall. Soil properties that influence runoff potential are those that influence the minimum rate of infiltration for a bare soil after prolonged wetting and when not frozen. The soils of the U.S. are placed into four groups A, B, C, D. Definitions of the classes are as follows:

- Hydrologic Group A: Soils with low runoff potential. Soils having high infiltration rates even when thoroughly wetted and consisting chiefly of deep, well drained to excessively well-drained sands or gravels.
- Hydrologic Group B: Soils having moderate infiltration rates even when thoroughly wetted and consisting chiefly of moderately deep to deep, moderately well drained to well drained soils with moderately fine to moderately coarse textures.
- Hydrologic Group C: Soils having slow infiltration rates even when thoroughly wetted and consisting chiefly of soils with a layer that impedes downward movement of water, or soils with moderately fine to fine textures.

- Hydrologic Group D: Soils with high runoff potential. Soils having very slow infiltration rates even when thoroughly wetted and consisting chiefly of clay soils with a high swelling potential, soils with a permanent high water table, soils with a clay pan or clay layer at or near the surface, and shallow soils over nearly impervious material.

3.2 Soil Types

Soil data was collected from the United States Department of Agriculture (USDA) Natural Resources Conservation Service web-based soil survey. Refer to Figure 5: NRCS Soil Survey Map. Based on the soils survey, the hydrological study area consists of ten soil types:

- 6A – Scarboboro mucky fine sandy loam, 0 to 1 percent slopes. Hydrologic Soil Group D.
- 12A – Maybid silt loam, 0 to 3 percent slopes. Hydrologic Soil Group D.
- 51A – Swansea muck, 0 to 1 percent slopes. Hydrologic Soil Group D.
- 312B – Woodbridge fine sandy loam, 3 to 8 percent slopes, extremely stony. Hydrologic Soil Group C.
- 421C – Canton fine sandy loam 8 to 15 percent slopes, very stony. Hydrologic Soil Group B.
- 421D – Canton fine sandy loam 15 to 25 percent slopes, very stony. Hydrologic Soil Group B.
- 422C – Canton fine sandy loam 8 to 15 percent slopes, extremely stony. Hydrologic Soil Group B.
- 422D – Canton fine sandy loam 15 to 25 percent slopes, extremely stony. Hydrologic Soil Group B.
- 711B – Charlton-Rock outcrop-Hollis complex, 3 to 8 percent slopes. Hydrologic Soil Group D.
- 711E – Rock outcrop-Charlton -Hollis complex, 15 to 35 percent slopes. Hydrologic Soil Group D

3.3 Existing Land Cover – Subwatershed 4

The proposed maintenance access road will occur in subwatershed 4 of the larger project site. Table 1 lists the existing land cover distribution for the proposed 40-acre subwatershed. The major land cover types is woods (good) with about 0.29 acres of a 9 ft wide, by 1,100 LF cart path through the woods to the current location of the electric utility transmission corridor.

3.4 Proposed Conditions – Subwatershed 4

The proposed project will include the installation of a maintenance access road to the electric utility transmission corridor through the customer facility. The proposed work would occur by upgrading an existing cart path through the eastern portion of the facility, through the forested wetlands and uplands, and across the large wetland system at the location of the existing cattle crossing, to the point of interconnection within the NGRID transmission corridor. The road length is 1,037 ft and will be widened from approximately 9 ft to 12 ft with clearing both sides totaling 22 ft wide (5 ft on either side). The maintenance access road will be widened temporarily to 20 ft to enable access for a 500-ton crane for bridge construction. The road width will be reduced to 12’ as noted prior after bridge construction is complete. The existing cart path will be removed and replaced with a 12 ft wide 150 ft span truss bridge to eliminate wetland impacts. The bridge capacity is H-20 loading with a maximum capacity of 40,000 lbs, 20 tons.

No impervious coverage will be added. There will be the addition of approximately 23,000 sf of gravel roadway including a 150-ft truss bridge with open pervious decking. A 20-ft bar gate with signage will control access to the site at the transmission corridor. Traffic usage will be almost zero with annual usage of the roadway expected for inspection and maintenance activities. The maintenance access road will otherwise remain unused with the rare exception of emergency or maintenance access.

This same gravel access drive will be utilized for construction access. There will be earthwork associated with the installation of the bridge and the temporary laydown area for the crane.

The work will consist mostly of tree clearing, removing the stumps and grading the stumped areas. Cart path removal and wetland restoration will occur by removal of approximately 135 ft long x 11 ft wide cart path to be removed and restored as wetland. Large mature trees will be avoided and removed only as needed in consultation with supervising engineer. Depth of excavation for cart path removal to be approximately 36" or more to wetland/pond bottom equivalent to an estimated removal of 4,500 cf of fill.

Construction phasing, sequencing and engineering oversight is required to ensure the successful wetland restoration and bridge installation. Temporary construction methods and phasing considerations account for the necessary use of large construction equipment within the wetland area while both removing and excavating the cart path and installing the bridge and temporary construction measures. A turbidity curtain will be installed in the open water sections and silt fence and straw wattle at limit of disturbance. Any equipment used in the restoration area will not enter the undisturbed wetland area. Construction dewatering may be required to help control surface water and groundwater and to conduct work "in the dry". Water level is anticipated to be high as excavation will be below standing water.

3.5 Rainfall Amounts

The precipitation source used was the Northeast Regional Climate Center (NRCC) climatology for extreme precipitation for New England (NRCC 2016). The use of the NRCC data provides a conservative design approach recognizing changes in climate and storm depths and is additionally protective of natural resources. The difference between the TP-40 and the more recent NRCC estimates of the 24-hour 100-year rainfall depth are considerable (6.5 inches verses 9.1 inches). Table 2 summarizes the total rainfall amounts input into the HydroCAD analysis for the above mentioned storm events. Refer to Appendix A – Hydrological Analysis for the HydroCAD input/output calculations.

Table 2 Total Rainfall vs. Storm Frequency

Storm Event	Total Rainfall Amounts
(24-hour)	(inches)
2-Year	3.19
10-Year	4.9
100-Year	9.12

The rainfall amounts summarized in Table 2 are based on review of the precipitation values for Massachusetts from the Northeast Regional Climate Center data providing data (and the specific region the site is located in) described in Technical Release 55, *Urban Hydrology for Small Watersheds* published by the United States Department of Agriculture, Natural Resources Conservation Service Conservation Engineering Division dated June 1986 and confirmed based on review of the Handbook for Conservation Commissioners by the Massachusetts Department of Environmental Protection dated March 2002.

3.6 FEMA Flood Insurance Rate Maps

According to the July 3, 2012 FEMA Flood Insurance Rate Map for Essex County, Massachusetts, Map Number 25009C0114F (Panel 833 of 1075), and the July 3, 2012 FEMA Flood Insurance Rate Map for Essex County, Massachusetts, Map Number 25009C0118F (Panel 118 of 600) there are no areas within the 100 year Floodplain.

4.0 Stormwater Analysis

HydroCAD Version 10.10 was used to evaluate the stormwater management impacts from the proposed project. This was done using the Soils Conservation Service (SCS) Technical Release 20 Method. Refer to Appendix A for HydroCAD Calculations. As part of this Stormwater Report we modeled the peak stormwater runoff rates at or near our property boundaries.

4.1 Existing Watershed

The proposed project occurs within subwatershed 4 of the project site. Refer to Figure 3 for predevelopment watershed conditions.

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- Subwatershed 4 represents the Eastern drainage area and consists mainly of woods and wetland areas. This area discharges from the east, through the wetlands to a natural channel south of the Site. The drainage area is 40.026 acres.

4.2 Proposed Stormwater Management

As this is a Limited Project with no addition of impervious cover, there is no actively proposed stormwater management. Rather there is an expansion of an existing 9 ft wide cart path to a 12' gravel road, and the removal of 1,485 square wetland crossing and replacement within a 150 ft span truss bridge with open (pervious) decking. Disturbed areas will be revegetated as indicated on Erosion Control Plan (See Sheet C-5.0 in the NOI Permit Plan Set). There in no increase in stormwater runoff due to expansion of the existing cart path and the removal and replacement of the existing wetland crossing.

Under proposed conditions, subwatershed #4 is used to model and evaluate the project runoff discharges. Refer to Figure 4 for proposed watersheds.

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- Sub-catchment Area 4S represents the Eastern drainage areaand consists mainly of woods and wetland areas. This area discharges from the east, through the wetlands to a natural channel south of the Site. The drainage area is 40.026 acres.

4.3 Comparison of Existing and Proposed Runoff

In order to meet MADEP Stormwater Management Standard 3, a HydroCAD analysis was used to determine whether there would be a change in peak runoff rates. With the modest addition of gravel road and the removal of the existing cart path, no increase in peak flow was observed for stormwater runoff. Refer to Appendix A for complete HydroCAD Calculations.

Table 3 summarizes the pre- and post-development peak runoff discharge rates.

Table 3 Comparison of Peak Stormwater Runoff Rates

Watershed 4S	Drainage Area (acres)	Peak Runoff Rates (cfs)		
	(acres)	2-Year Storm	10-Year Storm	100-Year Storm
Existing Conditions	40.026	0.7	11	70.6
Proposed Conditions	40.026	0.7	11	70.6
Difference	0	0	0	0

cfs = cubic feet per second

As shown in Table 3, post-development peak stormwater runoff rates for the project are equal to the pre-development peak stormwater runoff rates.

The rarely traveled gravel road will generate very little runoff. Similarly, the open decking on the new truss bridge is pervious and will not generate stormwater runoff and will allow water to pass through to the pervious ground surface below.

5.0 Stormwater Management Standards Compliance

As outlined in the Massachusetts Stormwater Handbook, the ten Stormwater Management Standards are applied to this project in accordance with the Wetlands Protection Bylaw, the Department of Environmental Protection (DEP) Stormwater Management Policy. This project will comply will all of the standards set forth in the Massachusetts Stormwater Standards and Handbook. How each standard is complied with is shown below.

Standard No. 1: No new stormwater conveyances may discharge untreated directly to or cause erosion in wetlands or waters of the Commonwealth.

As a Limited Project with no increase in impervious cover and no increase in peak runoff, this standard does not apply to the project. Proper construction and post-construction erosion controls will be implemented.

Standard No. 2: Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates.

There is no increase in peak discharge rates pre and post-development.

Standard No. 3:Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, stormwater best management practices, and good operations and maintenance.

As a Limited Project with no increase in impervious cover, this standard does not apply to the project. As there is no increase in impervious cover, there is also no loss of annual recharge from post-development conditions.

Standard No. 4:Stormwater Management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS).

As a Limited Project with no increase in peak runoff and no increase in impervious cover, this standard does not apply to the project. There is no formal stormwater management proposed as part of this Limited Project. There will be approximately 1 vehicle per year travelling down this road for routine inspections of the utility interconnection. Similarly with no increase in impervious cover there is not expected to be a change in pollutant load and therefore no need for treatment for water quality.

Standard No. 5:Stormwater discharges within the Zone II or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical area, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook.

The site does not discharge to the Zone II or Interim Wellhead Protection Area of a public water supply or to any other critical area.

Standard No. 6: A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5 and 6. Existing stormwater discharges shall comply with Standard 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Stormwater Management Standards and improve existing conditions.

The project is not a redevelopment project (for the purposes of complying with the stormwater standards).

Standard No. 7: A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period pollution prevention plan) shall be developed and implemented.

A Stormwater Pollution Prevention Plan (SWPPP) will be implemented to control erosion and sedimentation associated with the construction/installation of the project. Erosion and sedimentation controls will be in place prior to construction-related land disturbance on the site. A NPDES (National Pollutant Discharge Elimination System) Notice of Intent (NOI) will be filed

with the US EPA a minimum of 14 days prior to the commencement of construction. The Construction Period Pollution Prevention Plans are described in Section 6 of this report.

Standard No. 8: A long-term Operation and Maintenance Plan shall be developed and implemented to ensure that stormwater management systems function as designed.

An Operations and Maintenance Plan (O & M) has been developed and is included in Appendix C of this report. This is simply an expansion of the existing O&M plan with the additional roadway, bridge, and gate, all contained on the completed portion of the facility as well. The O & M Plan will be implemented to ensure that Best Management Practices are implemented. The owner of the system will be responsible for contracting with a solar system operations and maintenance company to implement the attached O & M Plan.

Standard No. 9: All illicit discharges to the stormwater management system are prohibited.

An Illicit Discharge Compliance Statement confirming that no illicit discharges exist on site is included in Appendix E of this report.

6.0 Construction Period Pollution Prevention Plans

The following information is based on the requirements of the MA DEP Stormwater Management requirements for Standard No. 8.

6.1 Construction Period Operation and Maintenance Plan

During construction a Project Manager and Site Superintendent will be in charge of the requirements included in Standard No. 8. They will both be responsible for implementation of the attached erosion and sedimentation controls, contracting with and coordinating with the subcontractors, notifying the Civil Engineer of record and also noting and areas in need of repair/replacement and modifications to the Construction Period Operation and Maintenance plan. At this point the Site Superintendent has not been determined. The two (2) contacts at this time are:

Jon Reavey	Project Manager	jreavey@borregosolar.com	413-427-2118
Robert Roseen, PE	Civil Engineer of Record	rroseen@waterstone-eng.com	603-686-2488

The Conservation Commission will be notified at such time when the Site Superintendent has been determined.

6.2 Pollution Prevention Measures

The following are some of the measures to be utilized to prevent erosion and to control sediment.

Stabilized Construction Entrance: A stabilized construction entrance will be installed at the location where vehicles are expected to enter and/or exit the site in order to prevent the off-site tracking of sediment onto adjacent public roadways. The stabilized construction entrances will consist of compacted three to five inch (3"-5") stone, placed over a layer of geotextile fabric (so as to provide separation from the underlying soil and prevent the stone from being ground down into the soil). The stabilized construction entrance must be wide enough to cover the entire width of the

entrance/exit and allow two vehicles to pass comfortably, and it should be flared where it meets the public roadway to accommodate longer construction vehicles. The stabilized construction entrance must be long enough to allow mud and sediment to become dislodged from vehicle tires, and/or a minimum of fifty feet (50') in length.

Over the course of construction, if the stabilized construction entrance becomes filled with accumulated sediment, the entrance will be maintained and replaced as needed to remain fully operational. The Contractor must inspect the stabilized construction entrance and adjacent public roadways for off-site sediment tracking and repair the entrance as necessary (remove accumulated sediment and add new stone as necessary). If tracking onto public roadways does occur, the streets in the vicinity of the stabilized construction entrance shall be swept immediately. The stabilized construction entrance shall not be removed until just prior to project completion.

Straw Wattles and Silt Fence: At the outset of the construction, a straw wattle and silt fence will be installed to prevent sediment –laden runoff from leaving the site. Straw wattles will be installed adjacent to the silt fence. Straw waddles are effective in treating low velocity sheet flow and is not intended for use in areas of concentrated or channelized flow. Straw waddles shall be inspected for rips, tears, and gaps between the waddles and the ground. An adequate reserve of straw waddles must be kept on site at all times for emergency and/or routine replacement. The straw waddles shall be removed only after exposed soils in the contributing drainage area are stabilized. A detail of the straw waddles is shown on the plans.

A silt fence shall be installed to prevent sediment –laden runoff from leaving the site. In addition, silt fence will be used on the down gradient sides of material stockpile areas. Silt fence is a sediment control BMP consisting of a length of geotextile fabric stretched between anchoring posts spaced at regular intervals along the site at low/down-slope areas. The geotextile fabric must be entrenched in the ground between the support posts. Silt fence is effective in treating low velocity sheet flow and is not intended for use in areas of concentrated or channelized flow. Silt fence shall be inspected for rips, tears, and gaps between the fence and the ground. An adequate reserve of silt fence must be kept on site at all times for emergency and/or routine replacement. Silt fence shall be removed only after exposed soils in the contributing drainage area are stabilized. Silt fence can also be used as an effective perimeter control to contain stockpiles of topsoil. Excavated materials should be placed within the upland areas as fill material or hauled off site.

Turbidity Curtain: Wetland restoration elements are as follows. Wetland restoration boundaries will be clearly marked prior to the start of restoration work and confirmed by the supervising engineer. Install turbidity curtain in open water section and silt fence and straw wattle at limit of disturbance. Any equipment used in the restoration area will not enter the undisturbed wetland area.

Construction dewatering may be required to help control surface water and groundwater and to conduct work "in the dry". Water level is anticipated to be high as excavation will be below standing water. Construction dewatering will be conducted into areas with a straw wattle silt fence to prevent drainage to surface waters into areas outside of the proposed restoration.

All erosion control will be removed once the vegetation has been properly established.

Temporary Stabilization: Per Subpart 2.1.2.4.c of the EPA Construction General Permit, stabilization measures must be initiated as soon as practicable on portions of the site where construction activities have temporarily or permanently ceased, but in no case more than 14 days after the construction activity in that portion of the site has temporarily or permanently ceased. Temporary stabilization refers to a variety of erosion control BMPs that protect exposed soils from the erosive forces of precipitation (raindrop and sheet erosion) and/or prevent the formation of channelized flow (rill, gully and channel erosion). The Contractor must inspect temporarily stabilized areas to assess the effectiveness of temporary stabilization BMPs and replace/repair then as necessary.

6.3 Erosion and Sedimentation Control Plans

Please refer to sheets C-5.0 and C-7.0 for plans, details, and specifications.

6.4 Tree Clearing and Revegetation

Please refer to sheet C-3.0 and C-5.0 of the attached set of plans for tree clearing and revegetation of the site.

6.5 Inspection and Maintenance Schedule

The site erosion and sedimentation controls will be inspected each day by the on-site superintendent. It will be up to the Site Superintendent as to whether he/she will complete the inspection form every seven (7) days or every fourteen (14) days and when a rain event exceeds 1/4 ". A copy of the inspection form and maintenance (Corrective Action Form) are attached in Appendix D.

7.0 References

Federal Emergency Management Agency (FEMA). *Flood Insurance Rate Map.* Community Panel Number 25027C0610E, panel 610. Effective July 4, 2011. Accessed March 2014.

United States Department of Agriculture. Natural Resources Conservation Service (NRCS). *Technical Release-55: Urban Hydrology for Small Watersheds.* June 1986.

United States Department of Commerce, Weather Bureau, *Technical Paper No. 40 Rainfall Frequency Atlas of the United States for Durations for 30 minutes to 24 hours and Return Periods for 1 to 100 years.* May 1961

United States Department of Agriculture. Natural Resource Conservation Service (NRCS). 2009. *Web Soil Survey*. http://websoilsurvey.nrcs.usda.gov/app/. Accessed March 2014.

Massachusetts Department of Environmental Protection. 2008. *Massachusetts Stormwater Handbook, Volumes 1 – 3.*

Massachusetts Department of Environmental Protection. March 2002. *Handbook for Conservation Commissioners*.

Northeast Regional Climate Center (NRCC) (2016) www.nrcc.cornell.edu

Figures

Figure 1: Conservation Land and Easements – Sheet C -1.3

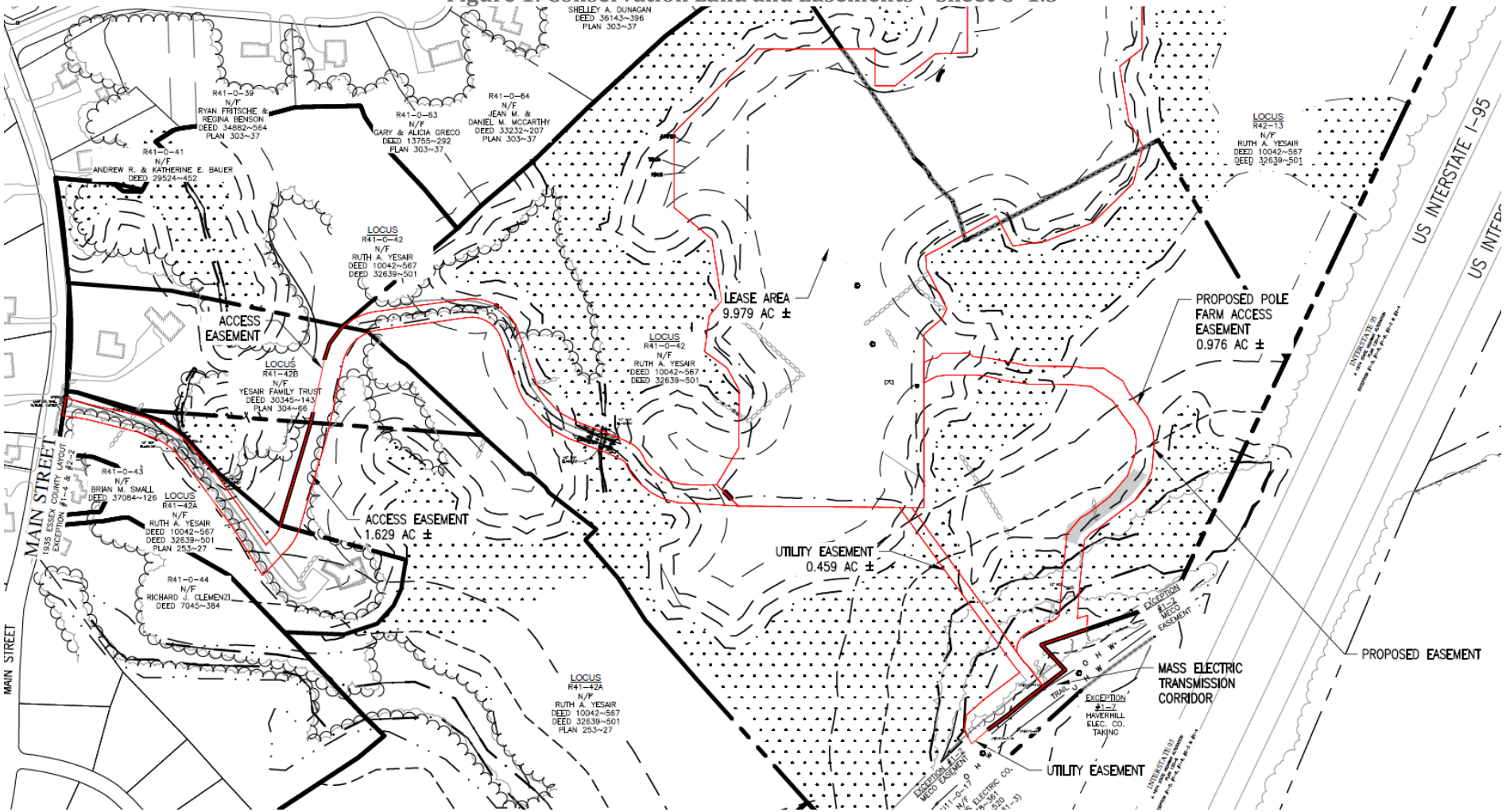
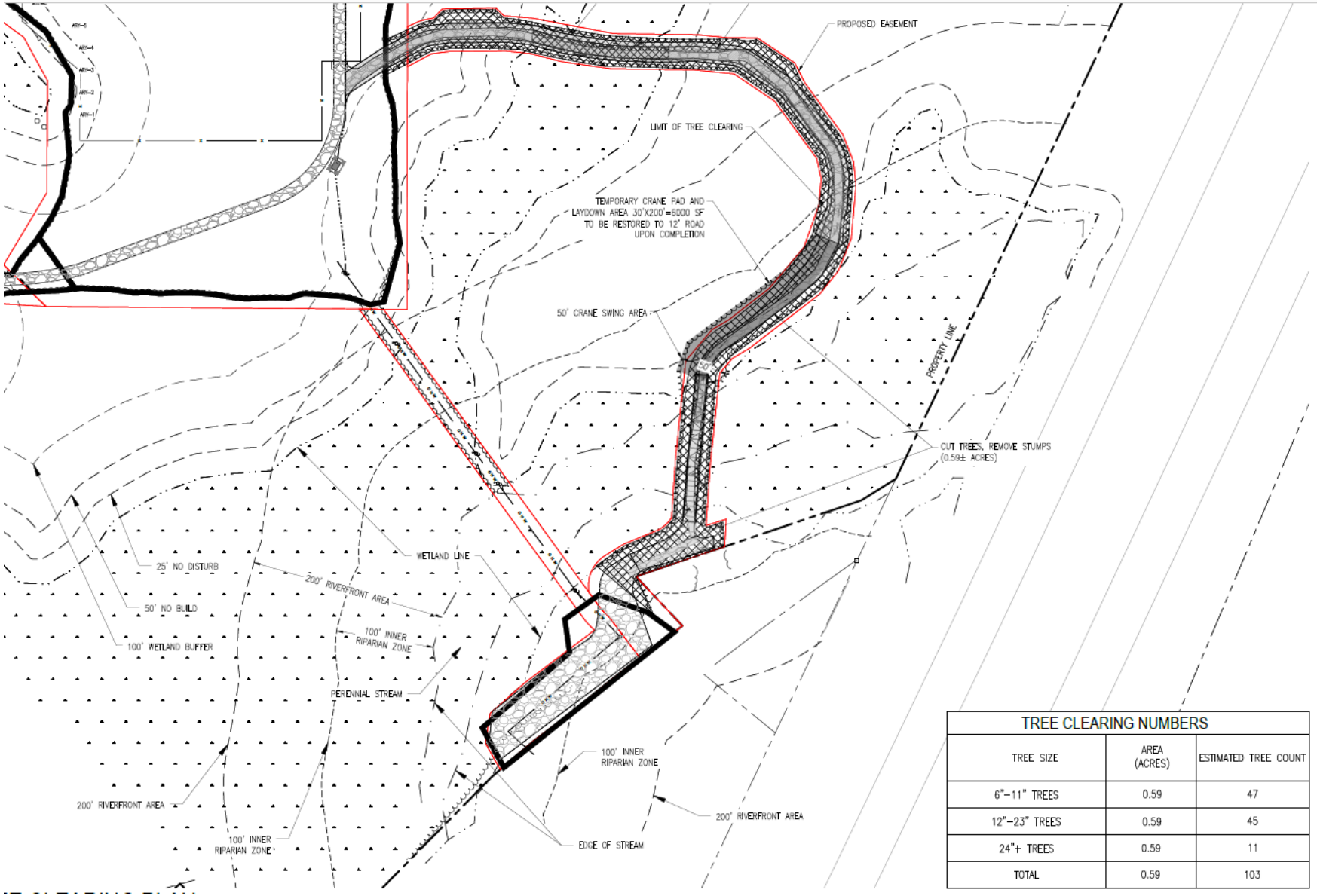


Figure 2: Tree Clearing Plan – Sheet C-3.0

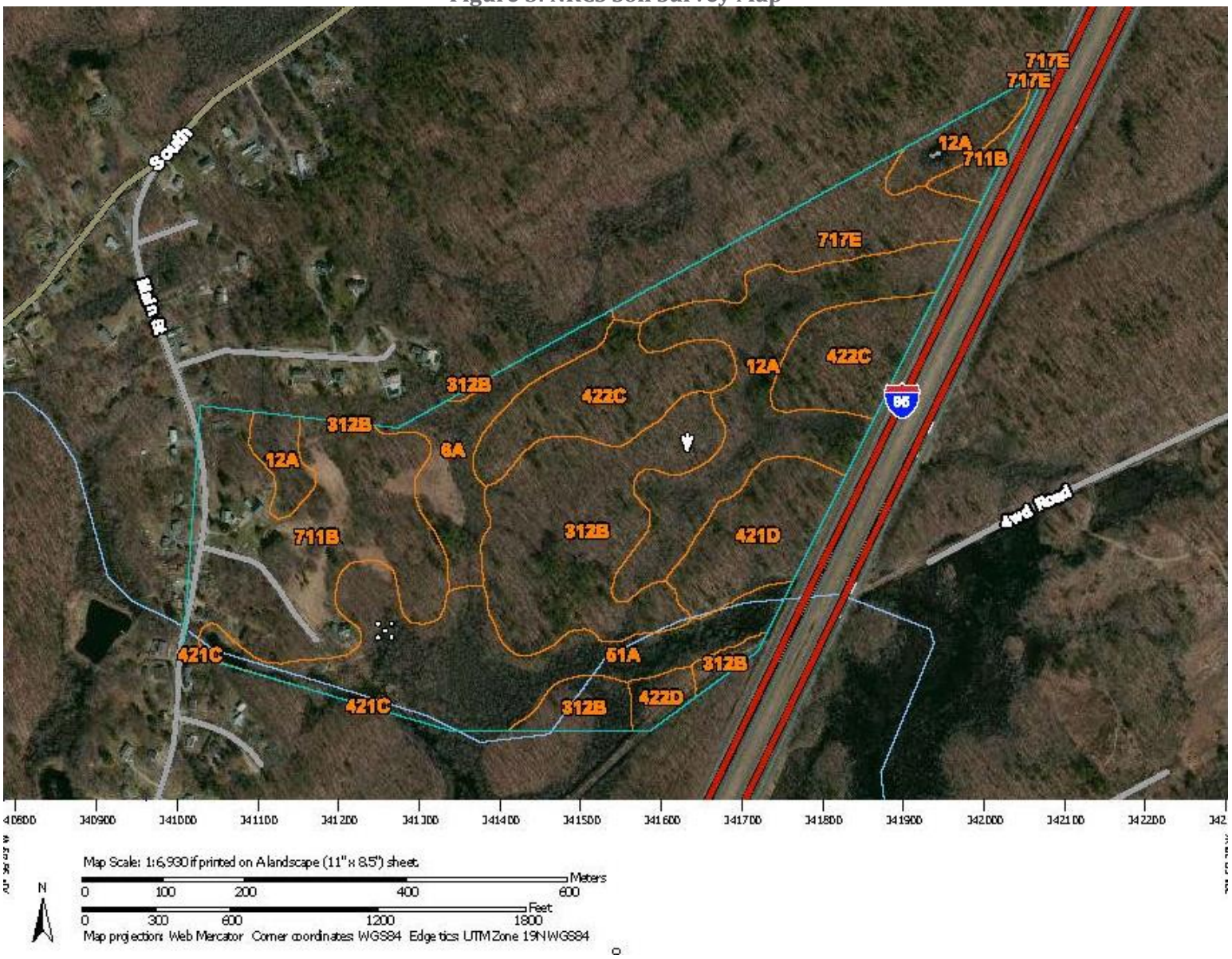


TREE CLEARING NUMBERS		
TREE SIZE	AREA (ACRES)	ESTIMATED TREE COUNT
6"–11" TREES	0.59	47
12"–23" TREES	0.59	45
24"+ TREES	0.59	11
TOTAL	0.59	103

Figure 3: Predevelopment Watershed HydroCAD

Figure 4: Post-development Watershed HydroCAD

Figure 5: NRCS Soil Survey Map

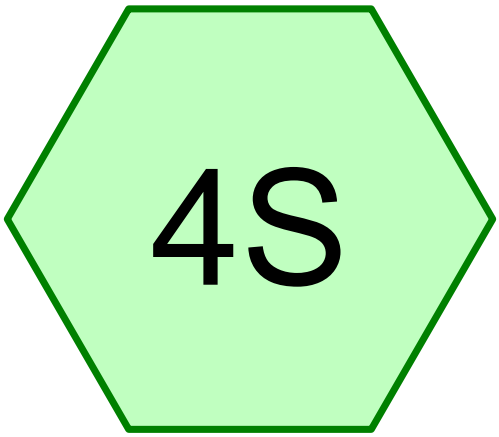


Appendix A: Hydrologic Calculations

August 2022

Existing Conditions Hydrologic Calculations

August 2022



Pond 2P East Drainage

Subcat Reach Pond Link

Routing Diagram for Existing Conditions_20220616
Prepared by Waterstone Engineering, Printed 7/5/2022
HydroCAD® 10.10-4b s/n 11617 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

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	3.19	2
2	10-year	Type III 24-hr		Default	24.00	1	4.90	2
3	100-year	Type III 24-hr		Default	24.00	1	9.12	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.310	49	50-75% Grass cover, Fair, HSG A (4S)
0.109	69	50-75% Grass cover, Fair, HSG B (4S)
0.820	79	50-75% Grass cover, Fair, HSG C (4S)
0.270	72	Dirt roads, HSG A (4S)
18.938	30	Woods, Good, HSG A (4S)
2.782	55	Woods, Good, HSG B (4S)
16.797	70	Woods, Good, HSG C (4S)
40.026	**50**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
19.518	HSG A	4S
2.891	HSG B	4S
17.617	HSG C	4S
0.000	HSG D	
0.000	Other	
40.026		**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
0.310	0.109	0.820	0.000	0.000	1.239	50-75% Grass cover, Fair	4S
0.270	0.000	0.000	0.000	0.000	0.270	Dirt roads	4S
18.938	2.782	16.797	0.000	0.000	38.517	Woods, Good	4S
19.518	**2.891**	**17.617**	**0.000**	**0.000**	**40.026**	**TOTAL AREA**	

Summary for Subcatchment 4S: Pond 2P East Drainage

Runoff = 0.7 cfs @ 13.88 hrs, Volume= 0.412 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.19"

Area (ac)	CN	Description
0.270	72	Dirt roads, HSG A
18.938	30	Woods, Good, HSG A
2.782	55	Woods, Good, HSG B
16.797	70	Woods, Good, HSG C
0.310	49	50-75% Grass cover, Fair, HSG A
0.109	69	50-75% Grass cover, Fair, HSG B
0.820	79	50-75% Grass cover, Fair, HSG C
40.026	50	Weighted Average
40.026		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.1	112	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	140	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	830	0.0024	1.04	13.81	**Parabolic Channel,** W=10.00' D=2.00' Area=13.3 sf Perim=11.0' n= 0.080
33.5	1,132	Total			

Summary for Subcatchment 4S: Pond 2P East Drainage

Runoff = 11.0 cfs @ 12.62 hrs, Volume= 2.145 af, Depth> 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.90"

Area (ac)	CN	Description
0.270	72	Dirt roads, HSG A
18.938	30	Woods, Good, HSG A
2.782	55	Woods, Good, HSG B
16.797	70	Woods, Good, HSG C
0.310	49	50-75% Grass cover, Fair, HSG A
0.109	69	50-75% Grass cover, Fair, HSG B
0.820	79	50-75% Grass cover, Fair, HSG C
40.026	50	Weighted Average
40.026		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
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13.4	830	0.0024	1.04	13.81	**Parabolic Channel,** W=10.00' D=2.00' Area=13.3 sf Perim=11.0' n= 0.080
33.5	1,132	Total			

Summary for Subcatchment 4S: Pond 2P East Drainage

Runoff = 70.6 cfs @ 12.51 hrs, Volume= 9.786 af, Depth> 2.93"

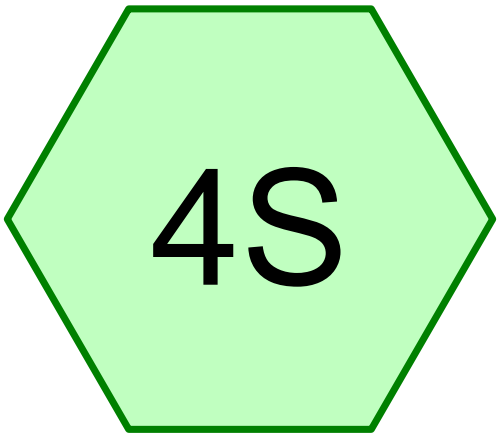
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=9.12"

Area (ac)	CN	Description
0.270	72	Dirt roads, HSG A
18.938	30	Woods, Good, HSG A
2.782	55	Woods, Good, HSG B
16.797	70	Woods, Good, HSG C
0.310	49	50-75% Grass cover, Fair, HSG A
0.109	69	50-75% Grass cover, Fair, HSG B
0.820	79	50-75% Grass cover, Fair, HSG C
40.026	50	Weighted Average
40.026		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.1	112	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	140	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	830	0.0024	1.04	13.81	**Parabolic Channel,** W=10.00' D=2.00' Area=13.3 sf Perim=11.0' n= 0.080
33.5	1,132	Total			

Proposed Conditions Hydrologic Calculations

August 2022



Pond 2P East Drainage

Subcat Reach Pond Link

Routing Diagram for Proposed Conditions_20220616
Prepared by Waterstone Engineering, Printed 7/5/2022
HydroCAD® 10.10-4b s/n 11617 © 2020 HydroCAD Software Solutions LLC

Rainfall Events Listing (selected events)

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	3.19	2
2	10-year	Type III 24-hr		Default	24.00	1	4.90	2
3	100-year	Type III 24-hr		Default	24.00	1	9.12	2

Area Listing (selected nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.310	49	50-75% Grass cover, Fair, HSG A (4S)
0.109	69	50-75% Grass cover, Fair, HSG B (4S)
0.820	79	50-75% Grass cover, Fair, HSG C (4S)
0.377	96	Gravel Road (4S)
18.938	30	Woods, Good, HSG A (4S)
2.782	55	Woods, Good, HSG B (4S)
16.690	70	Woods, Good, HSG C (4S)
40.026	**50**	**TOTAL AREA**

Soil Listing (selected nodes)

Area (acres)	Soil Group	Subcatchment Numbers
19.248	HSG A	4S
2.891	HSG B	4S
17.510	HSG C	4S
0.000	HSG D	
0.377	Other	4S
40.026		**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
0.310	0.109	0.820	0.000	0.000	1.239	50-75% Grass cover, Fair	4S
0.000	0.000	0.000	0.000	0.377	0.377	Gravel Road	4S
18.938	2.782	16.690	0.000	0.000	38.410	Woods, Good	4S
19.248	**2.891**	**17.510**	**0.000**	**0.377**	**40.026**	**TOTAL AREA**	

Summary for Subcatchment 4S: Pond 2P East Drainage

Runoff = 0.7 cfs @ 13.88 hrs, Volume= 0.412 af, Depth> 0.12"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2-year Rainfall=3.19"

	Area (ac)	CN	Description
*	0.377	96	Gravel Road
	18.938	30	Woods, Good, HSG A
	2.782	55	Woods, Good, HSG B
	16.690	70	Woods, Good, HSG C
	0.310	49	50-75% Grass cover, Fair, HSG A
	0.109	69	50-75% Grass cover, Fair, HSG B
	0.820	79	50-75% Grass cover, Fair, HSG C
	40.026	50	Weighted Average
	40.026		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.1	112	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	140	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	830	0.0024	1.04	13.81	**Parabolic Channel,** W=10.00' D=2.00' Area=13.3 sf Perim=11.0' n= 0.080
33.5	1,132	Total			

Summary for Subcatchment 4S: Pond 2P East Drainage

Runoff = 11.0 cfs @ 12.62 hrs, Volume= 2.145 af, Depth> 0.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-year Rainfall=4.90"

	Area (ac)	CN	Description
*	0.377	96	Gravel Road
	18.938	30	Woods, Good, HSG A
	2.782	55	Woods, Good, HSG B
	16.690	70	Woods, Good, HSG C
	0.310	49	50-75% Grass cover, Fair, HSG A
	0.109	69	50-75% Grass cover, Fair, HSG B
	0.820	79	50-75% Grass cover, Fair, HSG C
	40.026	50	Weighted Average
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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.1	112	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	140	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	830	0.0024	1.04	13.81	**Parabolic Channel,** W=10.00' D=2.00' Area=13.3 sf Perim=11.0' n= 0.080
33.5	1,132	Total			

Summary for Subcatchment 4S: Pond 2P East Drainage

Runoff = 70.6 cfs @ 12.51 hrs, Volume= 9.786 af, Depth> 2.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100-year Rainfall=9.12"

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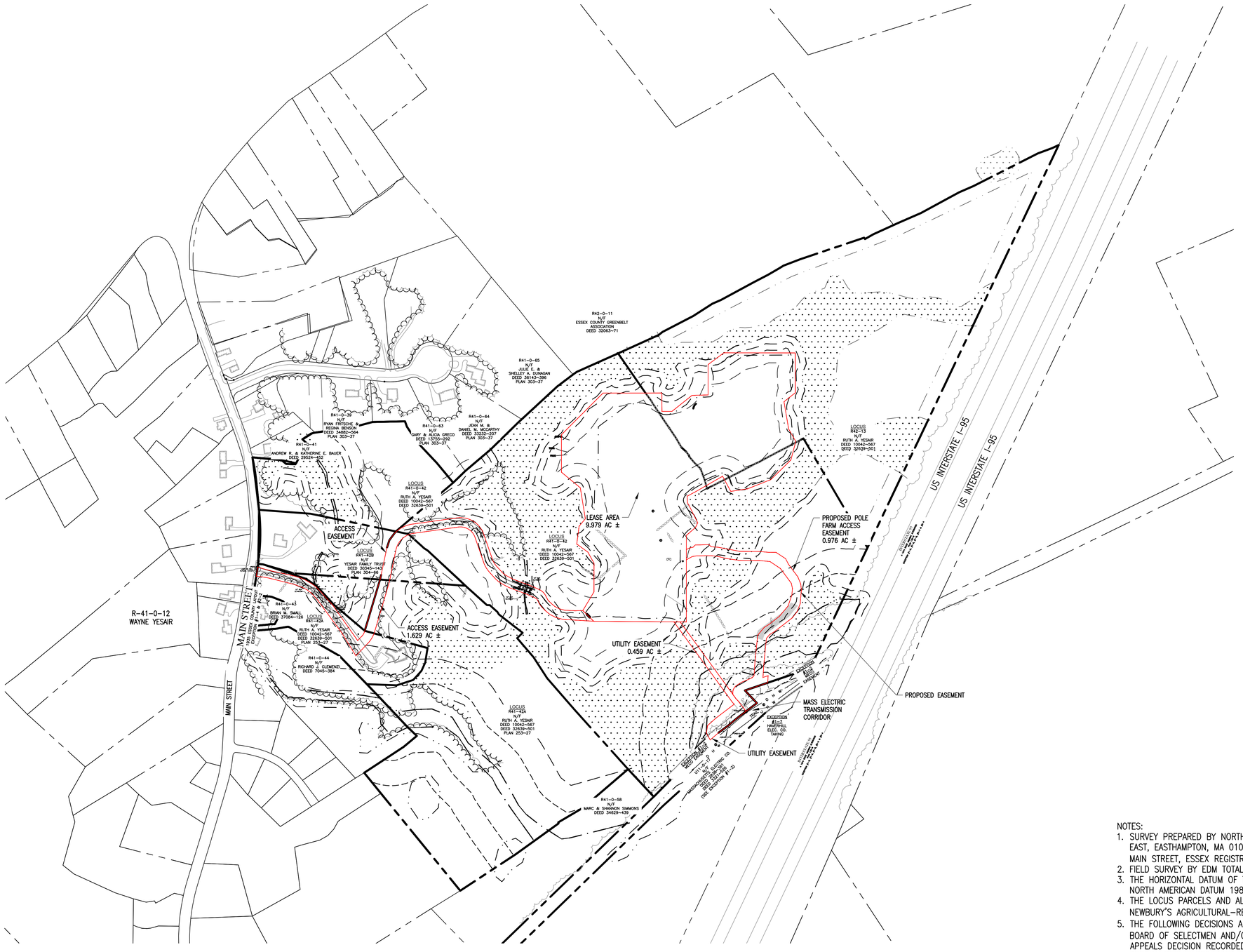
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.5	50	0.0100	0.05		**Sheet Flow,** Woods: Light underbrush n= 0.400 P2= 3.10"
1.1	112	0.1100	1.66		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
2.5	140	0.0350	0.94		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
13.4	830	0.0024	1.04	13.81	**Parabolic Channel,** W=10.00' D=2.00' Area=13.3 sf Perim=11.0' n= 0.080
33.5	1,132	Total			

Appendix B: Site Plan and Conservation Areas



NOTES:

1. SURVEY PREPARED BY NORTHEAST SURVEY CONSULTANTS 3 FERRY STREET, STUDIO 1 EAST, EASTHAMPTON, MA 01027. TITLED PLAN OF LAND IN NEWBURY, MA, 136 & 140R MAIN STREET, ESSEX REGISTRY, 12/9/2021, PREPARED FOR, BORREGO SOLAR, LLC
2. FIELD SURVEY BY EDM TOTAL STATION & RTK GPS.
3. THE HORIZONTAL DATUM OF THIS PLAN IS THE MASSACHUSETTS COORDINATE SYSTEM NORTH AMERICAN DATUM 1983 BASED ON AN RTK GPS SURVEY.
4. THE LOCUS PARCELS AND ALL ABUTTING PARCELS ARE LOCATED WITHIN THE TOWN OF NEWBURY'S AGRICULTURAL–RESIDENTIAL ZONING DISTRICT.
5. THE FOLLOWING DECISIONS AND/OR CONDITIONS BY THE ZONING BOARD OF APPEALS, BOARD OF SELECTMEN AND/OR PLANNING BOARD WERE FOUND: *ZONING BOARD OF APPEALS DECISION RECORDED IN DEED BOOK 36230 PAGE 218 *PLANNING BOARD SPECIAL PERMIT RECORDED IN DEED BOOK 37982 PAGE 87
6. BOUNDARIES OF PARCEL R41–42 DIMENSIONED ON SHEET 2 ARE THE RESULT OF A COMPILATION/PARTIAL FIELD SURVEY, UTILIZING PLAN BOOK 253 PAGE 27, PLAN BOOK 130 PAGE 6, PLAN BOOK 303 PAGE 37, AND STONEWALLS VISIBLE IN AERIAL PHOTOGRAPHY.

CONSERVATION LAND AND EASEMENTS

APPROX. SCALE: 1"=150'

0 150' 300'

BORREGO SOLAR
55 TECHNOLOGY DRIVE, SUITE 102
LOWELL, MA 01851
PHONE: (888) 898-6273
FAX: (888) 843-6778
WWW.BORREGOSOLAR.COM

WATERSTONE ENGINEERING
INNOVATIVE STORMWATER MANAGEMENT
9 GRETA'S WAY
STRATHAM, NH 03885
(o) 603-686-2400

NOT FOR CONSTRUCTION

PERMIT DRAWINGS, NOT TO BE USED FOR CONSTRUCTIONS

COMMONWEALTH OF MASSACHUSETTS
ROBERT M. ROSEEN
No. 53176
REGISTERED PROFESSIONAL ENGINEER

06/08/22

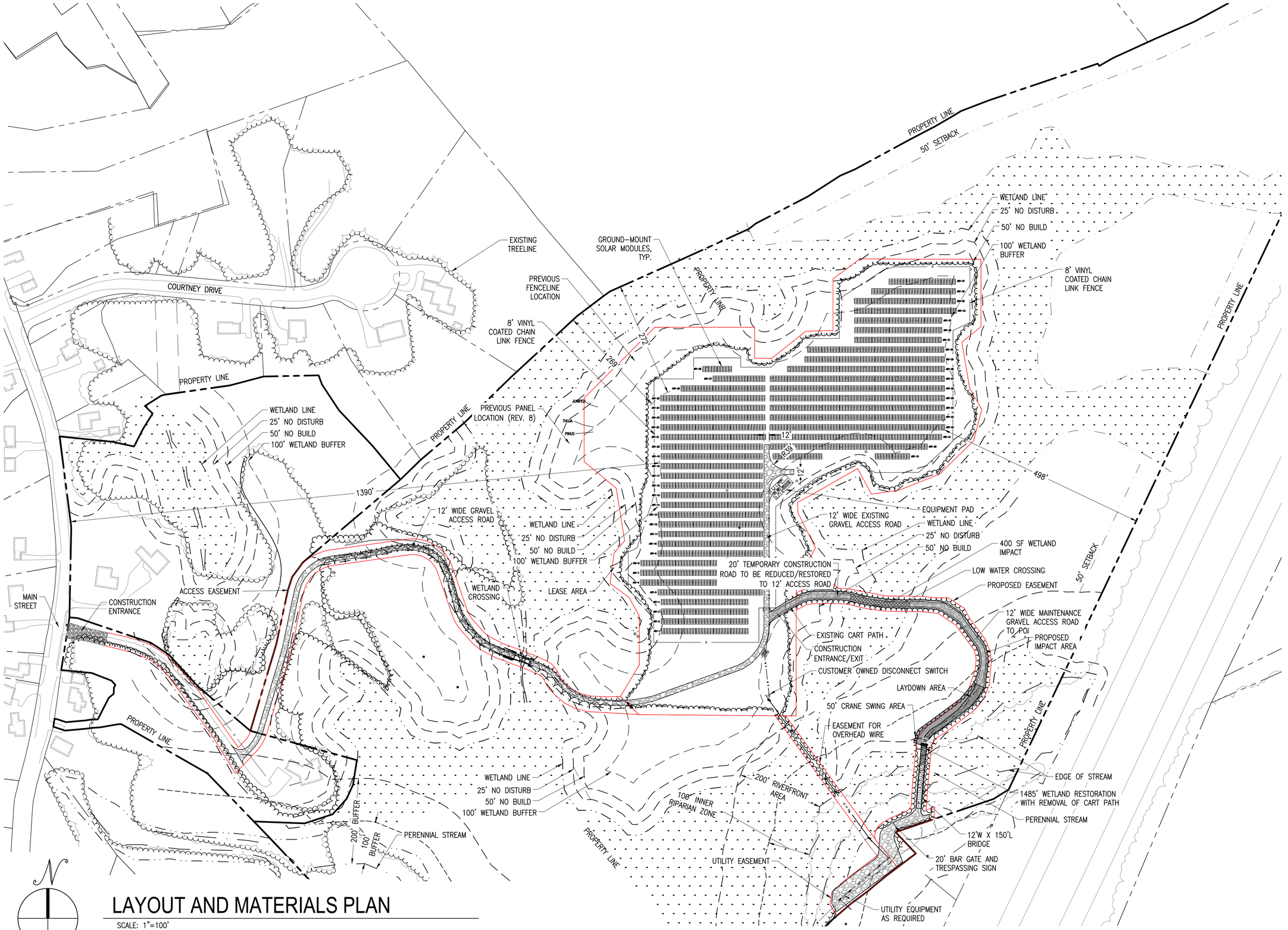
NOTICE OF INTENT
140 R MAIN STREET,
NEWBURY MA 01922

PROJECT NUMBER:
905–0391

REV	DATE	DRAWN	CHECKED	RELEASE LEVEL
1	03/25/20	DL	RR	CD–IFR REV 1
2	04/29/20	INDV	RR	CD–IFR REV 2
3	08/25/20	HR	RR	CD–IFC
4	09/17/20	HR	RR	CD–IFC REV 1
5	11/09/21	PS	RR	MAINTENANCE ACCESS ROAD
6	03/24/22	PS	RR	RECORD DRAWINGS
7	06/08/22	PS	RR	NOTICE OF INTENT

SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

C-1.3
CONSERVATION LAND AND EASEMENT



LAYOUT AND MATERIALS PLAN

SCALE: 1"=100'

BORREGO SOLAR
55 TECHNOLOGY DRIVE, SUITE 102
LOWELL, MA 01851
PHONE: (888) 898-6273
FAX: (888) 843-6778
WWW.BORREGOSOLAR.COM

WATERSTONE ENGINEERING
INNOVATIVE STORMWATER MANAGEMENT
9 GRETA'S WAY
STRATHAM, NH 03885
(o) 603-686-2466

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PERMIT DRAWINGS, NOT TO BE USED FOR CONSTRUCTIONS

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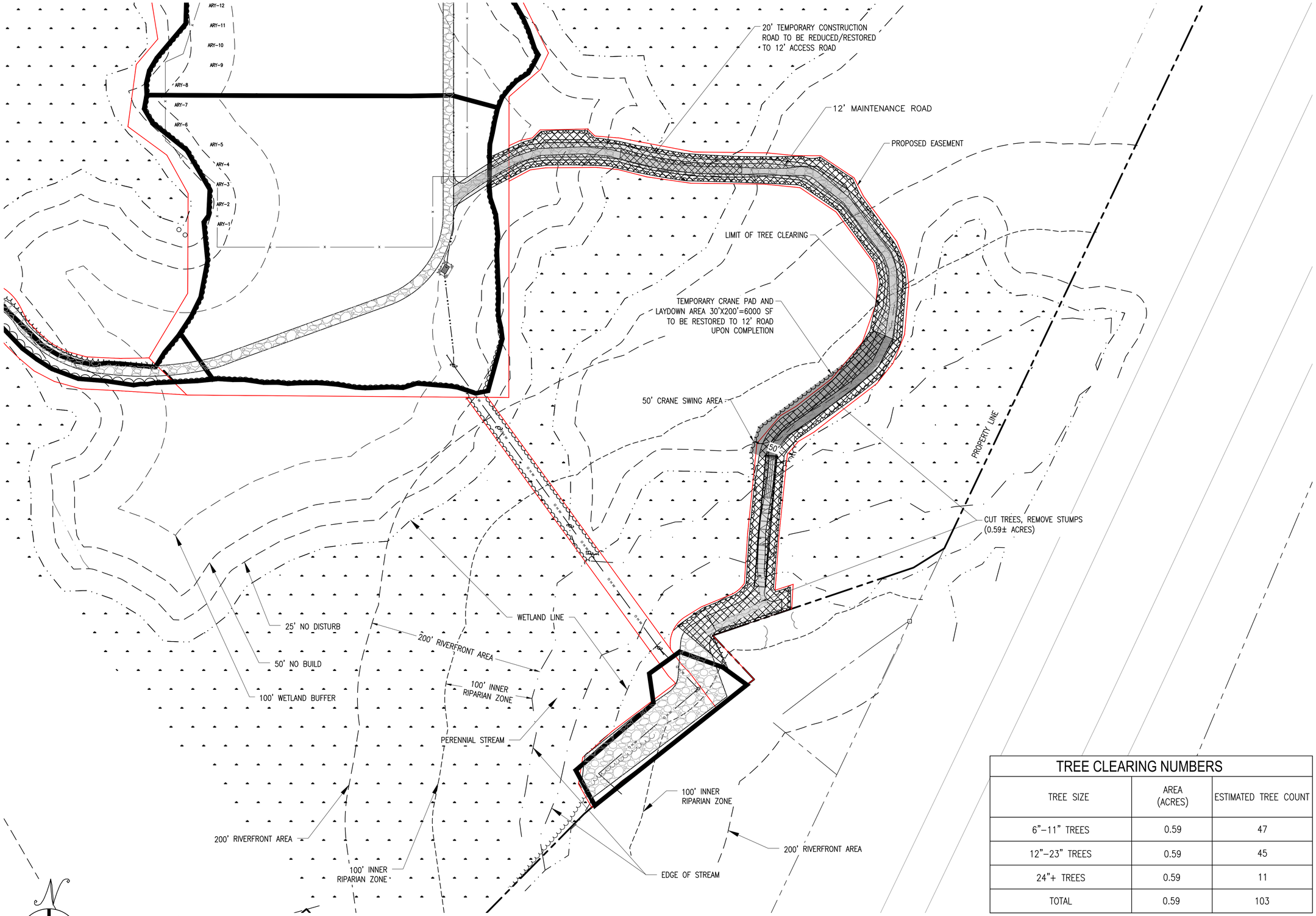
3	08/25/20	HR	RR	CD-IFC
4	09/17/20	HR	RR	CD-IFC REV 1
5	11/09/21	PS	RR	MAINTENANCE ACCESS ROAD
6	03/24/22	PS	RR	RECORD DRAWINGS
7	06/08/22	PS	RR	NOTICE OF INTENT

SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

C-2.0
LAYOUT AND MATERIALS PLAN



TREE CLEARING PLAN

SCALE: 1"=50'

0 50' 100'

TREE CLEARING NUMBERS

TREE SIZE	AREA (ACRES)	ESTIMATED TREE COUNT
6"–11" TREES	0.59	47
12"–23" TREES	0.59	45
24"+ TREES	0.59	11
TOTAL	0.59	103

BORREGO SOLAR
55 TECHNOLOGY DRIVE, SUITE 102
LOWELL, MA 01851
PHONE: (888) 898-6273
FAX: (888) 843-6778
WWW.BORREGOSOLAR.COM

WATERSTONE ENGINEERING
INNOVATIVE STORMWATER MANAGEMENT
9 GRETA'S WAY
STRATHAM, NH 03885
(o) 603-498-2440

NOT FOR CONSTRUCTION

PERMIT DRAWINGS, NOT TO BE USED FOR CONSTRUCTIONS

COMMONWEALTH OF MASSACHUSETTS
ROBERT M. ROSEEN
No. 53176
REGISTERED PROFESSIONAL ENGINEER
06/08/22

NOTICE OF INTENT
140 R MAIN STREET,
NEWBURY MA 01922

PROJECT NUMBER: 905-0391

REV	DATE	DRAWN	CHECKED	RELEASE LEVEL
1	03/25/20	DL	RR	CD-IFR REV 1
2	04/29/20	NDV	RR	CD-IFR REV 2
3	08/25/20	HR	RR	CD-IFC
4	09/17/20	HR	RR	CD-IFC REV 1
5	11/09/21	PS	RR	MAINTENANCE ACCESS ROAD
6	03/24/22	PS	RR	RECORD DRAWINGS
7	06/08/22	PS	RR	NOTICE OF INTENT

SCALES STATED ON DRAWINGS ARE VALID ONLY WHEN PLOTTED ARCH D 24" X 36"

C-3.0
TREE CLEARING PLAN

Appendix C: Operation and Maintenance Plan

August 2022

Operations and Maintenance Plan

for the Protection of
Vernal Pools and Upland Habitat

136 Main Street Solar Array
Newbury, Massachusetts

December 13, 2016, Revised October 30, 2017

Completed by:

Waterstone Engineering, PLLC.
9 Gretas Way
Stratham, NH 03885

Completed for:

Massachusetts Department of
Environmental Protection
Northeast Regional Office
205B Lowell Street
Wilmington, MA 01887

Prepared for:

Kavy Yesair
P.O. Box 929
Byfield, Massachusetts 01922

WATERSTONE ENGINEERING
INNOVATIVE STORMWATER MANAGEMENT

BORREGO SOLAR

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1.0 INTRODUCTION

The Massachusetts Department of Environmental Protection (MA DEP) Stormwater Standards require the long term maintenance of stormwater practices, and stipulate the establishment of a mechanism to provide for ongoing inspections and maintenance. This plan has been developed in accordance with the Stormwater Management Standards (chapter 1) and the Structural BMP Specifications (chapter 2) of the MADEP Stormwater Handbook. This plan includes recommendations for the protection of critical terrestrial habitat and vernal pools using current guidance recommended by the Army Corp of Engineers for development practices [1, 2] and BMPs[3]. The Plan recognizes the possibility of vernal pools in downgradient areas and is designed with the intention of minimizing long-term impact from ongoing project related operations and maintenance by minimizing invasive activities that would impact water quality and hydrology. These activities include minimizing vegetation clearing and timing to avoid amphibian migration, the prohibition of fertilizers and pesticides, prohibited use of deicing chemicals, and other non-structural BMPs.

This Stormwater Management System Operations and Maintenance (O&M) Plan, filed with the Town of Newbury (the Town), Massachusetts, will be implemented for the Borrego Solar Systems 2,795 kW (DC) ground-mounted photovoltaic solar array project, an approximately 9.5-acre development, located on the east side of Main Street in Newbury, MA (the Site) to ensure that the stormwater management systems function as designed. The stormwater management system protects and enhances the stormwater runoff water quality through the removal of sediment and pollutants, and source control significantly reduces the amount of pollutants entering the system.

This O&M Plan identifies responsible parties, proposes measures to protect vernal pool habitat, provides information on the required maintenance and inspection schedule for each stormwater management method used at the property, discusses signage to be installed, and outlines source control procedures. In addition, as per MADEP requirements, O&M inspection checklists and site plans are provided in Appendix A and B, respectively.

1.1 Responsible Parties

The following parties are responsible for implementing the required reporting, inspection, and maintenance activities identified in this O&M Plan:

Kavy Yesair or Designated Alternate
P.O. Box 929

---

[1] United States Army Corps of Engineers, New England District. 2015. Vernal Pool Best Management Practices. January. Accessed: http://www.nae.usace.army.mil/Portals/74/docs/regulatory/VernalPools/VPBMPsJan2015.pdf

[2] Calhoun, Aram. 2010. Vernal Pool Direction Buffer Guidance. University of Maine. October. 3pp. Accessed: http://www.nae.usace.army.mil/Portals/74/docs/regulatory/VernalPools/VPBufferGuidance.pdf

[3] Calhoun, A. J. K. and M. W. Klemens. 2002. Best development practices: Conserving pool-breeding amphibians in residential and commercial developments in the northeastern United States. MCA Technical Paper No. 5, Metropolitan Conservation Alliance, Wildlife Conservation Society, Bronx, New York. Accessed: http://www.nae.usace.army.mil/Portals/74/docs/regulatory/VernalPools/BestDevelopmentPractices20Oct2014.pdf

Byfield, Massachusetts 01922

The Owner and The Responsible Parties possess the primary responsibility for overseeing and implementing the O&M Plan and assigned Designee who will be responsible for the proper operation and maintenance of the stormwater structures. Any transfer of responsibility for O&M activities or transfer of ownership shall be documented to the Town and the Massachusetts Department of Environmental Protection (MA DEP) in writing.

1.2 On-call Service Technician:

In response to an automated DAS alarm or request by Customer, a Service Technician will be required to visit the site within three (3) business days of notification to trouble shoot and resolve the issue. Emergency situations may require faster response.

1.3 Reporting, Tracking, Enforcement, and Schedule of Activities

Inspections will be reported annually by November 30 as detailed in Table 1 by the Designee. Reports and inspection forms will be reviewed for completeness by a licensed professional engineer or other qualified vendor, along with the O&M Plan, inspection findings, and corrective measures. An annual report form is provided in Appendix A. Electronic copies will be sent to the Town Planner and Code Inspection Officer. Electronic copies will be retained by the owner for such period as may be required by law and made available to appropriate parties upon request. Separate reports will be provided for events that present a risk to public safety and violations of Open Space Areas. All record keeping required by the O&M Plan will be maintained by the Responsible Parties. The Association recognizes the Municipalities' right to enforce the conditions of subdivision approval as provided by the state statute and detailed in the subdivision approval which provides the authority to enforce the conditions of approval. Enforcement process begins with the owner who will remedy any maintenance needs or violations within 60-90 days as feasible. Feasibility would include reasonable consideration for severity of remedy, scheduling for weather, and contractor availability. A complete description of the owner enforcement provisions will be described in the Declaration of Covenants.

These records will include an inspection and maintenance log to document each inspection and maintenance activity and a cataloguing of inspection forms herein. The inspection and maintenance log will include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediments or debris, the spoils will be disposed of offsite by an approved contractor in an appropriate manner. Any deficiencies found during inspection will be noted and corrective action undertaken by the owner. Stormwater management measures are detailed in Appendix A.

Table 1: Schedule for Inspection and Reporting Activities

Inspection and Reporting Activity	Timing
Annual reporting	November 30, Annually
Annual inspections of project grounds and conservation areas	June, Annually
Inspect stormwater management and erosion control including infiltration trenches , examine for 72 hour drawdown.	Every six months and after major storms
Tree inspection and additional limbing	June or October as needed to maintain the limit of clearing as outlined in sheet C-2.2 (Appendix B)
On-Call System Service Technician	Per request
Full System Electrical Inspection & Maintenance	One time per year
Module Washing	Optional (maximum once per year)
Vegetation Management and Mowing	Twice per year within fence (June and October), once per year outside of fence (June)

1.4 Site Development

The proposed project will require earthwork mostly in the form of tree clearing, removing stumps and grading the stumped areas. An estimated 12.41 acres (reduced from 13.42 acres) and approximately 1,644 trees will need to be cleared for the project site development. The estimated tree clearing area for each sector of the project is broken down in sheet C-2.2: Tree Clearing Plan (Appendix B). The area of tree clearing for each sector is shown in Table 2.

Table 2: Tree Clearing by Project Sector

Project Sector	Area (acres)	Total Trees
Area #1	3.09	412
Area #2	4.12	552
Area #3	4.92	676
Area #4	0.29	4
Total	12.41	1644

2.0 Operations and Maintenance Measures for the Protections of Vernal Pools and Critical Upland Habitat

This section describes the operations and maintenance measures for the solar array. Conservation efforts include a range of strategies for the protection of water quality and ecological integrity. The stormwater management goal of the Solar Array project is to provide the highest level of protection through the use of Low Impact Development practices (infiltration trenches) and non-structural practices such as the use of native and non-invasive non-native plants, and fertilizer and pesticide restrictions. The stormwater management system will consist of infiltration trenches located

periodically at the low end of a group of solar panels (16' by 32'). These infiltration trenches will be run on the contour of the solar array, as long as needed to capture flow. Refer to Appendix A for location of stormwater management control measures.

2.1 Revegetation Planting

All revegetation plantings will be limited to the use of native plants. Any plant listed as prohibited or restricted by the State of Massachusetts[4] shall be prohibited. Native plants can be identified from The State of Massachusetts' Native Plant List for Vegetated Buffers in New England.[5] The revegetation plan is listed in Appendix E as sheet C5.0.

2.2 Grass Seed Mixtures

Three grass seed mixtures will be used for revegetation of the site following development. Ernst Seeds mix 186-1 shall be used between the solar panels. Underneath the panels, Ernst Seeds mix 129 will be used. For areas outside the fence, Ernst Seeds mix 156 should be utilized. Further information on the specific components of each of these seed mixtures can be found at (www.ernstseed.com).

2.3 Signage and Critter Crossing

Signage will be installed at the entrance to the solar array indicating allowable activities and detailing environmental significance. Signage details are provided in Appendix B. Critter Crossing Signage will be maintained at low point locations where amphibians and turtles would be expected to cross during migration (mid to late March near vernal pools, mid to late June and again around October).

2.4 Stormwater Management and Infiltration Trenches

The following maintenance items are required as needed for infiltration trenches located along the solar panel array, in accordance with MADEP for infiltration trenches in the Massachusetts Stormwater Handbook (Chapter 2, Volume 2) and detailed in a checklist for inspection and maintenance of infiltration trenches in Appendix A.

- Mowing the infiltration trench side slopes and area around the infiltration trenches twice annually during times of year to avoid the potential for amphibian migration (June and October).

- Inspect basin after major storms to ensure it is draining with 72 hours. Corrective action will be taken if drawdown is not evident.

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[4] A list on prohibited invasive plants titled *Invasive Plant Species Found in Massachusetts*, contained in Appendix C of *The Massachusetts Buffer Manual: Using Vegetated Buffers to Protect our Lakes and* Rivers by the Berkshire Regional Planning Commission, can be found at, http://www.mass.gov/eea/docs/dep/water/bufman.pdf.

[5] A list on permissible plants titled *Native Plant List For Vegetated Buffers in New England,* contained in Appendix B of *The Massachusetts Buffer Manual: Using Vegetated Buffers to Protect our Lakes and* Rivers by the Berkshire Regional Planning Commission, can be found at, http://www.mass.gov/eea/docs/dep/water/bufman.pdf.

- Inspect, at a minimum, twice a year for erosion, leakage in embankments, tree growth, sediment accumulation, and signs of differential settlement.

- Remove trash and debris to prevent clogging.

- Remove sediment from basin as necessary to prevent clogging.

2.5 Conservation Easements for the Protections of Vernal Pools and Critical Terrestrial Habitat

The project is being designed with vernal pool protection guidance from the Army Corps of Engineers. This includes the protection of critical terrestrial habitat (CTH) and the establishment of unfragmented directional corridors in combination with land conservation.[1] No disturbance is proposed within the 25' no disturb buffer, no structures within the 50' no-build wetland buffer, and 100' separation from most vernal pools. The applicant will provide a conservation easement, shown in Appendix B, for the non-project parcel areas totaling 57.5 acres to provide for the long-term protection of critical terrestrial habitat and adjacent vernal pools. This includes easements for upland habitat of 34.9 acres, and 22.6 acres of wetlands. The project impact is 12.41 acres, with the residential lots 24.2 acres and the total parcel area of 93.6 acres. Specific elements included are:

1. Limit development to less than 25% of the developable upland on the property (extends 100-750 feet from the VP depression's edge).
2. Exclude roads and driveways from the VP envelope.
3. Establish directional corridors consisting of unfragmented forest with at least a partly-closed canopy of overstory (>50% cover) trees to provide shade, deep litter and woody debris.
4. Minimize impedance to amphibian terrestrial passage.

2.6 Limits on Tree and Invasive Species Management

Site will be visually inspected within the first 12 months during routine inspections for erosion and sedimentation control and will include the removal of invasive species.

2.7 Mowing

Inside the fence ground cover shall be mowed twice annually during times of year to avoid the potential for amphibian migration (June and October). Evaluation of the site conditions will be made in order to avoid mowing during the bird nesting season from February through July. Additional mowing may be necessary and will be noted in the annual report.

Additional vegetation management (exterior to the array fences) in accordance with the Yearly Management Plan included in the Order of Conditions shall be strictly adhered to. This includes ground cover shall be mowed once annually during times of year to avoid the potential for amphibian migration (October). Evaluation of the site conditions will be made in order to avoid mowing during the bird nesting season from February through July.

The site shall be inspected for evidence of erosion and rilling in any slopes. Any such conditions shall be noted in the annual report for re-vegetating.

2.8 Fertilizer and Pesticide Restriction

Fertilizer and pesticide use within the solar array and within the borders of the rights of way is prohibited. Long-term landscaping and maintenance activities will prohibit the use of fertilizers and pesticides, however in the event that these items are deemed necessary, a professional landscaper will be consulted and recommendations presented to the town Conservation Commission for approval.

2.9 Winter Maintenance and Restrictions on the Use of Chloride/Deicing Chemicals on Gravel Roadways

Winter road maintenance will be limited solely to plowing roadways to provide access to maintenance personnel and fire department as needed. Snow stockpiling will be limited to the laydown areas and outside of designated wetlands.

Chloride and deicing chemical usage will be prohibited within the easements, roadway, and solar array. Road usage is minimized for winter use and deicing will not be conducted.

2.10 System Electrical Inspection & Maintenance:

a. Electrical Maintenance
   The technician will:
   i. Perform a visual inspection of PV modules and array wiring, strain relief, mounting system, trackers, inverters, switchgear, transformers, combiner boxes, wireways and conduit, data acquisition system, weather sensors and outdoor lighting.
   ii. Check pyranometers and reference cells.
   iii. Record operational data from inverters and meters.
   iv. IR Thermography may be used as part of the visual inspection process.

b. Inspect External and/or Internal DC Disconnects and Combiner Boxes
   During the inspection, the technician will:
   i. Ensure that Imp testing is performed on all DC strings, and values are logged on the Borrego provided form.
   ii. Spot check torque values and tighten loose electrical connections.

c. Inverter and Transformer
   The technician will:
   i. Clean out all electrical enclosures
   ii. Clean inverter air filters
   iii. Perform Preventive Maintenance per manufacturer protocol as required to maintain inverter manufacturer's warranty.

d. AC Disconnects
   i. The technician will check for proper operation.

e. DAS
   i. Verify with Borrego O&M representative before leaving site that the DAS system is functioning properly.

f. Fencing, Gates, Civil

i. Annual visit will include a visual inspection of any fences, gates, equipment pads, etc. Facility improvements installed by Borrego Solar such as gravel access roads, etc. shall be inspected on a periodic basis per Borrego Solar.

g. Service Report
   i. A report must be filed with Borrego noting results of the annual inspection.

2.11 Lighting

Exterior and road lighting within the development will be limited and dark sky compliant. Use of low spillage lights (those that reflect light directly downward onto the area to be illuminated) will be required.

2.12 Source Control Provisions

As recommended by Standard 4 of MADEP Stormwater Handbook: Stormwater Management Standards, Volume 1 (2008), O&M Plans should include provisions for source control appropriate to the scale of the project in order to minimize the volume of stormwater coming into contact with regulated substances. The proposed Newbury Solar Array Project is not an area with "higher potential pollutant loads," as outlined in Standard 4 of MADEP Stormwater Handbook: Stormwater Management Standards and therefore does not necessitate a separate Source Control Plan. Instead, this section of the O&M Plan serves to outline source control activities to address the management of industrial materials, maintenance products, and ice management at the Site. Any industrial materials that would be regulated substances will be stored offsite or within closed areas and not exposed to the potential for runoff. These materials may include but are not limited to gasoline for maintenance equipment, and paints.

2.13 Personnel Training

All contracted personnel retained for work on site will be given a copy of this Plan and will receive training in applicable practices for maintenance of the stormwater systems and activities covered in this O&M Plan. A full training will be provided to personnel responsible for overseeing and implementing the O&M Plan and the assigned Designee. The training will include the complete elements of the O&M plan including inspection, corrective measures, and annual reporting. Any landscaper employed at the Site will be qualified to assess soil test results, fertilizer needs, and pest management consistent with this landscaping guidance. Similarly, all winter maintenance employees will be fully informed of deicing prohibitions and plowing limitations.

3.0 Conservation Areas and Deed Restrictions Protected Easements for surrounding areas

Surrounding wetlands will be protected by easement restrictions included in Appendix C conservation easements. These conservation areas include wetlands that are protected by a 100' buffer for planting restrictions, a 50' no construction buffer, and a 25' no disturb buffer. The locations and size of the wetlands are depicted in Appendix B on sheet C4.0 of this Operations and Maintenance Plan.

APPENDIX A: ANNUAL REPORT FORM AND O&M INSPECTION CHECKLISTS

A.1 Annual Reporting Form

A.2 Conservation Area Inspection Guidance and Checklist

A.3 Infiltration Trench Guidance and Checklist

ANNUAL REPORT
OPERATIONS AND MAINTENANCE (O&M)

NEWBURY SOLAR ARRAY, NEWBURY, MASSACHUSETTS
STORMWATER MANAGEMENT SYSTEM AND VERNAL POOL PROTECTION

RESPONSIBLE PARTY OR DESIGNEE:	
REVIEWING ENGINEER:	
ENGINEER SIGNATURE:	**DATE:**
DATE SUBMITTED TO TOWN:	

REPORT SUMMARY

INSPECTION AND REPORTING REQUIREMENTS

This report is intended to fulfill requirements for the Newbury Solar Array, Newbury, Massachusetts Stormwater Management System and Vernal Pool Protection Operations and Maintenance (O&M) Plan. All contracted personnel retained for work on site will be given a copy of this Plan and will receive training applicable practices for maintenance of the stormwater systems and activities covered in this O&M Plan.

Inspections will be reported annually upon the anniversary of the approval of a certificate of occupancy by the Designee. Reports and inspection forms will be reviewed for completeness with the O&M Plan, inspection findings, and corrective measures by a licensed professional engineer. An annual report form is provided in Appendix A of the O&M Plan. Electronic copies will be sent to the Town Planner and Code Enforcement Officer. Electronic copies will be retained by the owner for such a period as may be required by law and be made available to appropriate parties upon request. Separate reports will be provided for events that present a risk to public safety and violations of Open Space Areas. All record keeping required by the O&M Plan will be maintained by the Responsible Parties.

Records will include an inspection and maintenance log to document each inspection and maintenance activity and a cataloguing of inspection forms herein. The inspection and maintenance log will include the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. In addition, a deicing log will be maintained to track the amount and type of deicing materials applied on roads, if any. Any deficiencies found during inspection will be noted and corrective action undertaken either by the owner if needed, or by a contracted solar system operations and maintenance company as appropriate.

TOWN CONTACTS FOR SUBMITTAL	**COMPLETE**
Code Enforcement: Sam Joslin, (978) 465-0862 ext. 309	☐

Planning: Martha Taylor, (978) 465-0862 ext. 312	☐

REQUIRED ANNUAL REPORTING ELEMENTS	COMPLETE
1. Infiltration Trenches Inspection and Maintenance Checklist	☐
2. Conservation Area Inspection and Maintenance Checklist	☐
3. Deicing Log	☐
4. Reports for events that present a risk to public safety and violations of Open Space Areas	☐

INSPECTION ITEMS	SATISFACTORY (S) OR UNSATISFACTORY (U)	COMMENTS/ CORRECTIVE ACTION
1. Infiltration Trenches		
2. Conservation Areas		
3. Deicing Log		
4. Reports for events that present a risk to public safety and violations of Open Space Areas		

INSPECTION AND MAINTENANCE GUIDANCE FOR CONSERVATION AREA INSPECTIONS

Regular inspection and maintenance is critical to the health and sustainability of conservation areas. The Responsible Parties must maintain the conservation areas in accordance with the minimum requirements as detailed in Section 3.3 of the O&M Plan. This page provides guidance on maintenance activities that are typically required for conservation areas, along with a suggested frequency for each activity. Individual conservation areas may have more, or less, frequent maintenance needs, depending upon a variety of factors including: the occurrence of large storm events; overly wet or dry (i.e., drought) regional hydrologic conditions; seasonal changes; and traffic conditions.

Activity	Frequency
Inspect perimeter of conservation areas along the property lines of the open space areas and conservation fences to ensure these areas remain undisturbed, with the exception of allowable footpaths and other activities detailed in conservation deed.	Annually
Restricted activities include:	
• clearing of vegetation	
• removal of topsoil	
• construction of structures	
• dumping of trash	

CHECKLIST FOR INSPECTION OF CONSERVATION AREAS

Location:

Inspector:

Date: Time: Site Conditions:

Date Since Last Rain Event:

Inspection Items	Satisfactory (S) or Unsatisfactory (U)		Comments/Corrective Action
1. Perimeter inspection (annually)			
Conservation fences intact	**S**	**U**	
Property border undisturbed	**S**	**U**	
2. Inspection for restricted activities (annually)			
Clearing of vegetation	**S**	**U**	
Removal of topsoil	**S**	**U**	
Construction of structures	**S**	**U**	
Dumping of trash and debris	**S**	**U**	

Corrective Action Needed	Due Date
1.	
2.	
3.	

INSPECTION AND MAINTENANCE GUIDANCE FOR INFILTRATION TRENCHES

Maintenance of infiltration trenches can typically be performed as part of standard landscaping. Regular inspection and maintenance is critical to the effective operation of infiltration trenches to insure they remain clear of leaves and debris and free draining. This page provides guidance on maintenance activities that are typically required for these systems, along with the suggested frequency for each activity. Individual systems may have more, or less, frequent maintenance needs, depending on a variety of factors including the occurrence of large storm events, overly wet or dry (i.e., drought), regional hydrologic conditions, and the upstream land use.

INSPECTION ACTIVITIES

The most common maintenance activity is the removal of leaves from the system and bypass structure. Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system.

ACTIVITY	FREQUENCY
A record should be kept of the time for the system to drain completely after a storm event. The system should drain completely within 72 hours.	Every six months and after every major storm
Check to insure the filter surface remains well draining after storm events. **Remedy**: If filter bed is clogged, draining poorly, or standing water covers more than 15% of the surface 48 hours after a precipitation event, then remove top few inches of discolored material. Till or rake remaining material as needed.	
Check inlets and outlets for leaves and debris. **Remedy**: Rake in and around the system to clear it of debris. Also, clear the inlet and overflow if obstructed.	
Check for animal burrows and short circuiting in the system. **Remedy:** Soil erosion from short circuiting or animal boroughs should be repaired when they occur. The holes should be filled and lightly compacted	
Check to insure the filter bed does not contain more than 2 inches accumulated material **Remedy:** Remove sediment as necessary.	
Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. **Remedy:** Repair or replace any damaged structural parts, inlets, outlets, sidewalls.	Every six months
Mow the infiltration trench side slopes and surrounding area. Except during periods of amphibian migration as noted by signage.	Every 6 months or more frequently as needed

CHECKLIST FOR INSPECTION OF **INFILTRATION TRENCHES**	As needed

Location: Inspector:

Date: Time: Site Conditions:

Date Since Last Rain Event:

INSPECTION ITEMS

1. Initial Inspection After Installation	**Satisfactory (S) or Unsatisfactory (U)**		**Comments/Corrective Action**
Surface is at design level, typically 4” below overpass	**S**	**U**	
Overflow bypass / inlet (if available) is functional	**S**	**U**	
2. Debris Cleanup (1 time a year)			
Litter, leaves, and dead vegetation removed from the system	**S**	**U**	
3. Standing Water (1 time a year & after large storm events during first year)			
No evidence of standing water after 72 hours	**S**	**U**	
4. Short Circuiting & Erosion (1 time a year)			
No evidence of animal burrows or other holes	**S**	**U**	
No evidence of erosion	**S**	**U**	
6. Overflow Bypass / Inlet Inspection (1 time a year & after large storm events during first year)			
No evidence of blockage or accumulated leaves	**S**	**U**	
Good condition, no need for repair	**S**	**U**	

Corrective Action Needed	**Due Date**
1.	
2.	
3.	

Appendix D: Long Term Pollution Prevention Plan

August 2022

Long Term Pollution Prevention Plan

Good Housekeeping Practices

The Owner/Operator shall employ the use of good housekeeping practices by adhering to the maintenance schedules and procedures described in Appendix B - Operations and Maintenance Plan of this report.

Provisions for storing materials/waste products

The storing of hazardous materials and waste is not anticipated with this project. Materials Safety Data Sheets (MSDS) are not required since no materials or substances will be permanently stored on site.

Vehicle Washing

The washing of vehicles is not anticipated with this project.

Solar Panel Washing

The washing of panels is not typically required in the Northeast, as the average monthly rainfall amounts are sufficient to clean the panels. If it is determined that local conditions warrant cleaning of the panels, a construction water truck and non-toxic, bio-degradable materials will be used.

Requirements for routine inspections and maintenance of stormwater BMP's

The Operator shall adhere to the maintenance schedules and procedures described in Appendix B - Operations and Maintenance Plan of this report.

Spill Prevention and Response Plans

There is a minimal risk of a large spill requiring action on this project. Hazardous materials (such as, pesticides, petroleum products, fertilizers, detergents, acids, paints, cleaning solvents, etc.) will not be stored on-site.

In the event of a spill of hazardous substances or oil, the following procedures must be followed:

- All measures must be taken to contain and abate the spill and to prevent the discharge of hazardous substances or oil to storm water or off-site
- For spills less than five (5) gallons of material, proceed with source control and containment, clean-up with absorbent materials or other applicable means unless and imminent hazard or other circumstances dictate that the spill should be treated by a professional emergency response contractor.
- For spills greater than five (5) gallons of material, immediately contact the MA DEP Hazardous Waste Incident Response Group at (617) 792-7653 and an approved emergency response contractor. Provide information to emergency response contractor (or coordinator) on the type of material that spilled, the location, the estimated quantity and the time of the spill.

If there is a Reportable Quantity (RQ) release, notify the National Response Center immediately at (800) 424-8802. Within 14 days a report must 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 Long Term Pollution Prevention Plan must be updated to reflect any changes or steps taken to prevent the same for reoccurring.

Provisions for maintenance of landscaped areas.

Ground cover shall be mowed a minimum of once per year. Additional mowing may be necessary.

Provisions for solid waste management

A solid waste management program during construction (including dumpster, trash receptacles) shall be implemented, inspected and maintained in accordance with local and state requirements. During construction a properly sized dumpster will be on-site. No permanent dumpsters are proposed.

Emergency Contacts

Borrego Solar

Joe Busch, Director of Operations

1115 Westford Street, 2nd Floor
Lowell, MA 01851
Mobile: 978-602-0630
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Fire Department

Newbury Fire Rescue
3 Morgan Ave
Newbury, MA 01951
Emergency: Dial 911
978-463-2282

Police Department

Police Chief, Michael A. Reilly
25 High Road
Newbury, MA 01951
Emergency: Dial 911
978-462-4440

Massachusetts Department of Environmental Protection

(617) 292-5500

United States Environmental Protection Agency

(617) 918-1111

Appendix E: Illicit Discharge Statement

Illicit Discharge Statement:

The stormwater management system outlined in these plans is the system for conveying, treating, and infiltrating stormwater on site including stormwater best management practices intended to transport stormwater to the ground water. The control measures that have been included in the attached plans will be strictly followed to ensure that only storm water related discharges occur. By definition, an illicit discharge does not include discharges from the following activities or facilities: firefighting, water line flushing, landscape irrigation, uncontaminated ground water, potable water sources, foundation drains, air conditioning condensation, footing drains, individual resident car washing, flows from riparian habitats and wetlands, de-chlorinated water from swimming pools, water used for street washing and water used to clean residential buildings without detergents. Illicit discharges, if they exist currently, will be contained and eliminated in accordance with local, state and federal regulations and will be prohibited in the proposed project.

Robert Roseen, PE Date: July 5, 2022

For Borrego Solar

Appendix F: Supplemental Field Data

August 2022

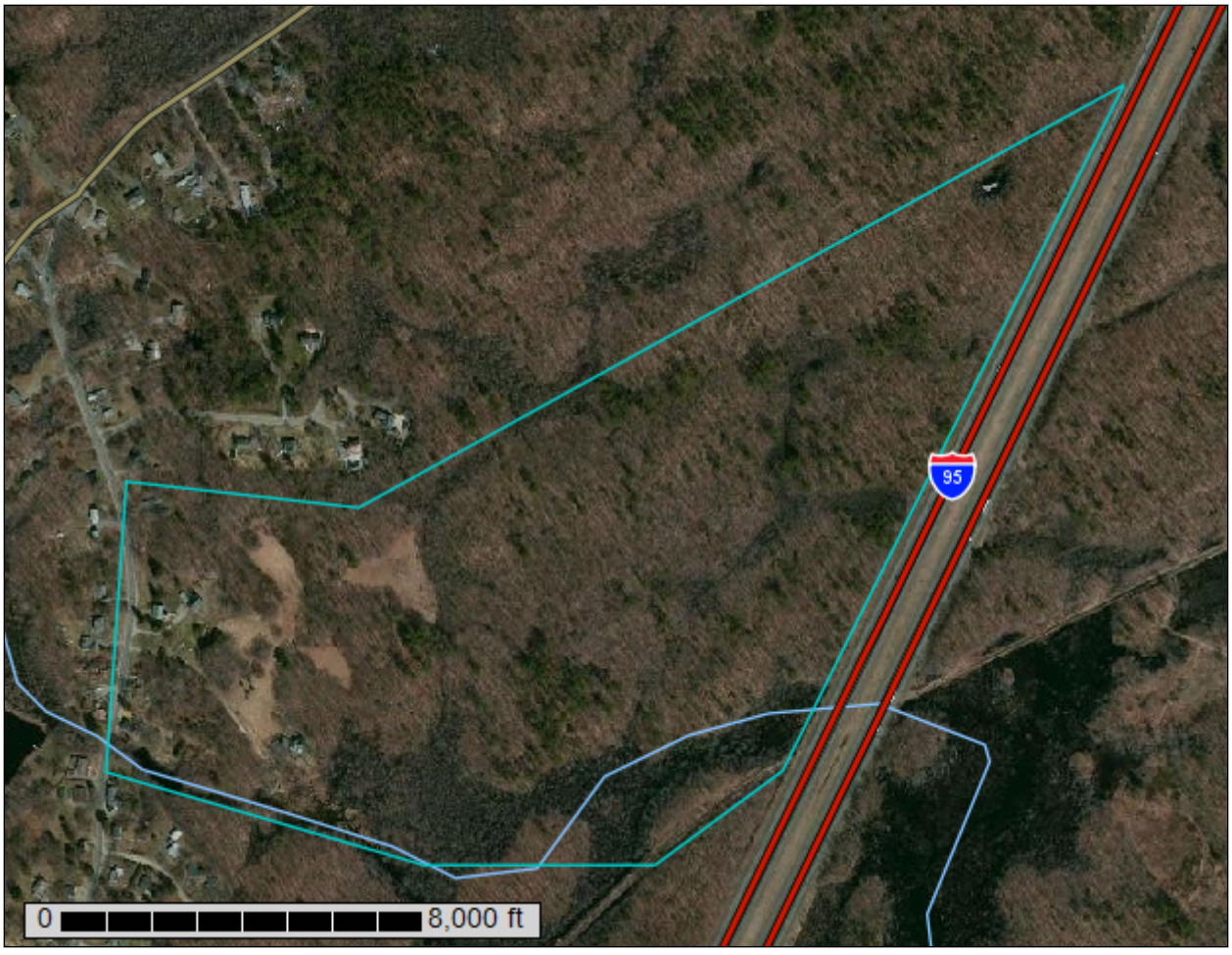
United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Essex County, Massachusetts, Northern Part



September 27, 2016

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil scientists classified and named the soils in the survey area, they compared the

individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

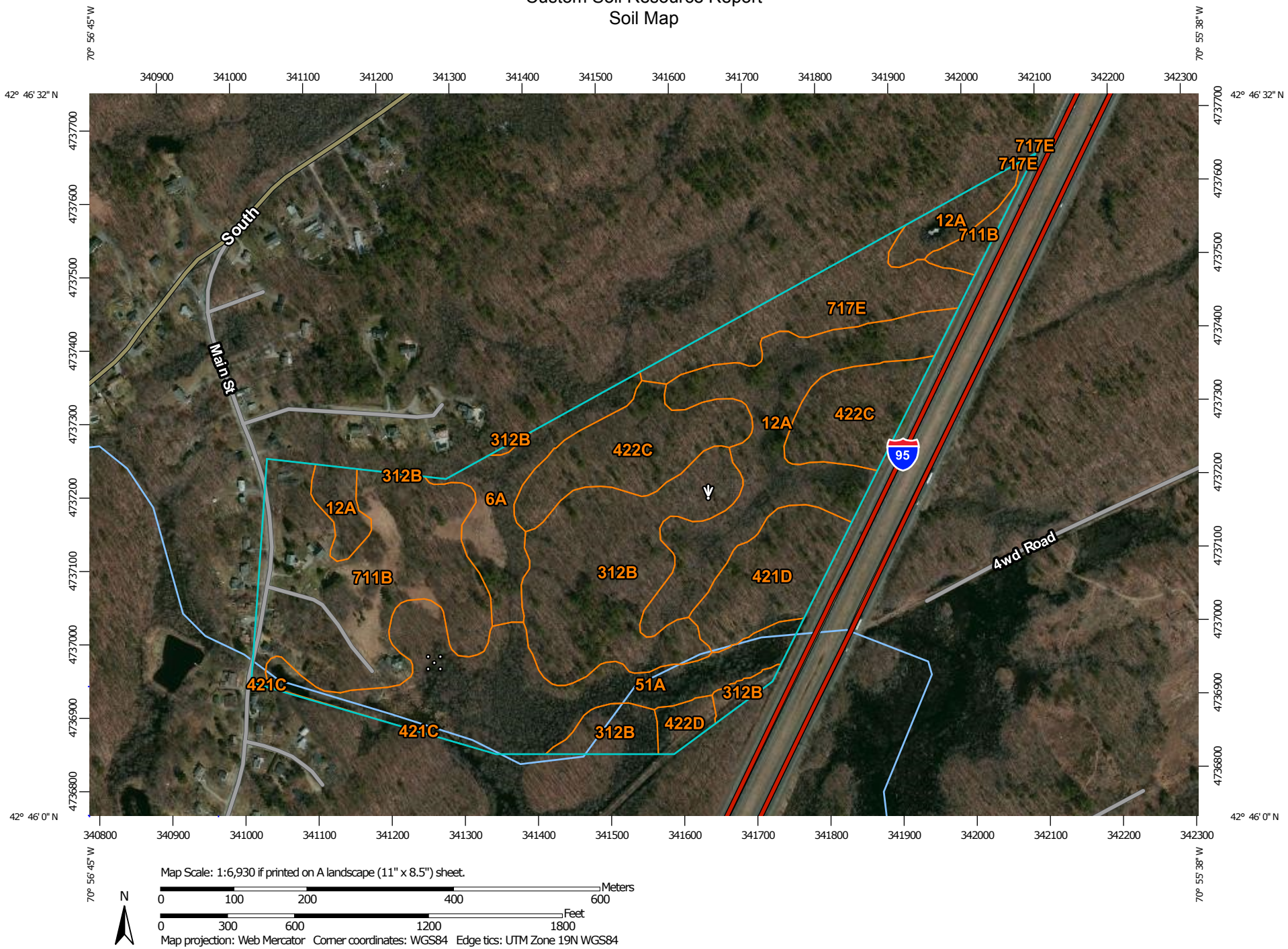
Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Custom Soil Resource Report
Soil Map



MAP 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 1:15,800.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

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

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

Soil Survey Area: Essex County, Massachusetts, Northern Part
Survey Area Data: Version 11, Sep 28, 2015

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

Date(s) aerial images were photographed: Mar 30, 2011—Apr 8, 2011

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

Map Unit Legend

Essex County, Massachusetts, Northern Part (MA605)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
6A	Scarboro mucky fine sandy loam, 0 to 3 percent slopes	5.5	5.6%
12A	Maybid silt loam, 0 to 3 percent slopes	17.0	17.4%
51A	Swansea muck, 0 to 1 percent slopes	14.0	14.4%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	16.2	16.6%
421C	Canton fine sandy loam, 8 to 15 percent slopes, very stony	0.0	0.0%
421D	Canton fine sandy loam, 15 to 25 percent slopes, very stony	5.9	6.1%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	12.0	12.3%
422D	Canton fine sandy loam, 15 to 25 percent slopes, extremely stony	1.1	1.1%
711B	Charlton-Rock outcrop-Hollis complex, 3 to 8 percent slopes	18.7	19.2%
717E	Rock outcrop-Charlton-Hollis complex, 15 to 35 percent slopes	7.2	7.3%
Totals for Area of Interest		**97.6**	**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.

Essex County, Massachusetts, Northern Part

6A—Scarboro mucky fine sandy loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2svky
Elevation: 0 to 1,320 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Scarboro and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Scarboro

Setting

Landform: Drainageways, outwash deltas, depressions, outwash terraces
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Sandy glaciofluvial deposits derived from schist and/or sandy glaciofluvial deposits derived from gneiss and/or sandy glaciofluvial deposits derived from granite

Typical profile

Oe - 0 to 3 inches: mucky peat
A - 3 to 11 inches: mucky fine sandy loam
Cg1 - 11 to 21 inches: sand
Cg2 - 21 to 65 inches: gravelly coarse sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (1.42 to 14.17 in/hr)
Depth to water table: About 0 to 2 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 5w
Hydrologic Soil Group: A/D
Hydric soil rating: Yes

Minor Components

Swansea

Percent of map unit: 10 percent
Landform: Bogs, swamps
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Wareham

Percent of map unit: 5 percent
Landform: Depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Walpole

Percent of map unit: 5 percent
Landform: Depressions, depressions, outwash plains, outwash terraces, deltas
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Tread, dip, talf
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

12A—Maybid silt loam, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: vjhj
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Maybid and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Maybid

Setting

Landform: Depressions, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Soft silty and clayey glaciolacustrine deposits and/or firm silty marine deposits

Typical profile

H1 - 0 to 7 inches: silt loam
H2 - 7 to 19 inches: silty clay
H3 - 19 to 60 inches: silty clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately high (0.00 to 0.20 in/hr)
Depth to water table: About 0 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: C/D
Hydric soil rating: Yes

Minor Components

Scantic

Percent of map unit: 12 percent
Landform: Depressions
Hydric soil rating: Yes

Swansea

Percent of map unit: 3 percent
Landform: Bogs
Hydric soil rating: Yes

51A—Swansea muck, 0 to 1 percent slopes

Map Unit Setting

National map unit symbol: 2trl2
Elevation: 0 to 1,140 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of unique importance

Map Unit Composition

Swansea and similar soils: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Swansea

Setting

Landform: Bogs, swamps
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Highly decomposed organic material over loose sandy and gravelly glaciofluvial deposits

Typical profile

Oa1 - 0 to 24 inches: muck
Oa2 - 24 to 34 inches: muck
Cg - 34 to 79 inches: coarse sand

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: Rare
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 16.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Freetown

Percent of map unit: 10 percent
Landform: Bogs, swamps
Landform position (three-dimensional): Dip
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman

Percent of map unit: 5 percent
Landform: Drainageways, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 5 percent
Landform: Depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope, tread, dip

Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

312B—Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: 2t2qs
Elevation: 0 to 1,580 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Woodbridge, extremely stony, and similar soils: 82 percent
Minor components: 18 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Woodbridge, Extremely Stony

Setting

Landform: Ground moraines, hills, drumlins
Landform position (two-dimensional): Summit, footslope, backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Concave
Across-slope shape: Linear
Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 2 inches: moderately decomposed plant material
A - 2 to 9 inches: fine sandy loam
Bw1 - 9 to 20 inches: fine sandy loam
Bw2 - 20 to 32 inches: fine sandy loam
Cd - 32 to 67 inches: gravelly fine sandy loam

Properties and qualities

Slope: 0 to 8 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 20 to 43 inches to densic material
Natural drainage class: Moderately well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 19 to 27 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)

Available water storage in profile: Low (about 4.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: C/D
Hydric soil rating: No

Minor Components

Paxton, extremely stony

Percent of map unit: 10 percent
Landform: Drumlins, ground moraines, hills
Landform position (two-dimensional): Summit, backslope, shoulder
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex, linear
Across-slope shape: Linear, convex
Hydric soil rating: No

Ridgebury, extremely stony

Percent of map unit: 8 percent
Landform: Hills, depressions, drumlins, ground moraines, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Head slope, base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

421C—Canton fine sandy loam, 8 to 15 percent slopes, very stony

Map Unit Setting

National map unit symbol: vj55
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Canton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex

Parent material: Friable coarse-loamy eolian deposits over friable sandy and gravelly basal till derived from granite and gneiss

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 33 inches: fine sandy loam
H3 - 33 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 18 to 36 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 10 percent
Hydric soil rating: No

Swansea

Percent of map unit: 5 percent
Landform: Bogs
Hydric soil rating: Yes

421D—Canton fine sandy loam, 15 to 25 percent slopes, very stony

Map Unit Setting

National map unit symbol: vj5c
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable coarse-loamy eolian deposits over friable sandy and gravelly basal till derived from granite and gneiss

Typical profile

H1 - 0 to 6 inches: fine sandy loam
H2 - 6 to 33 inches: fine sandy loam
H3 - 33 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 15 to 25 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 18 to 36 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 10 percent
Hydric soil rating: No

Charlton

Percent of map unit: 5 percent
Hydric soil rating: No

422C—Canton fine sandy loam, 8 to 15 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: vj5m
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F

Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable coarse-loamy eolian deposits over friable sandy and gravelly basal till derived from granite and gneiss

Typical profile

H1 - 0 to 3 inches: fine sandy loam
H2 - 3 to 33 inches: fine sandy loam
H3 - 33 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 8 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 18 to 36 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Scituate

Percent of map unit: 15 percent
Hydric soil rating: No

422D—Canton fine sandy loam, 15 to 25 percent slopes, extremely stony

Map Unit Setting

National map unit symbol: vj5p
Elevation: 0 to 1,000 feet
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Canton and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Canton

Setting

Landform: Hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Friable coarse-loamy eolian deposits over friable sandy and gravelly basal till derived from granite and gneiss

Typical profile

H1 - 0 to 3 inches: fine sandy loam
H2 - 3 to 33 inches: fine sandy loam
H3 - 33 to 60 inches: gravelly loamy sand

Properties and qualities

Slope: 15 to 25 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 18 to 36 inches to strongly contrasting textural stratification
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (2.00 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 4.4 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Scituate
Percent of map unit: 10 percent
Hydric soil rating: No

Charlton
Percent of map unit: 5 percent
Hydric soil rating: No

711B—Charlton-Rock outcrop-Hollis complex, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: vj6y
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 125 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Charlton and similar soils: 60 percent
Rock outcrop: 16 percent
Hollis and similar soils: 15 percent
Minor components: 9 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting
Landform: Ridges, hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Friable coarse-loamy eolian deposits over friable coarse-loamy basal till derived from granite and gneiss

Typical profile
H1 - 0 to 4 inches: fine sandy loam
H2 - 4 to 28 inches: gravelly fine sandy loam
H3 - 28 to 60 inches: gravelly fine sandy loam

Properties and qualities
Slope: 3 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches

Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Rock Outcrop

Setting

Parent material: Granite and gneiss

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Description of Hollis

Setting

Landform: Ridges, hills
Landform position (two-dimensional): Footslope, backslope
Landform position (three-dimensional): Side slope, base slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Shallow, friable loamy basal till derived from granite and gneiss over granite and gneiss

Typical profile

O - 0 to 1 inches: muck
H2 - 1 to 6 inches: fine sandy loam
H3 - 6 to 17 inches: gravelly fine sandy loam
H4 - 17 to 20 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: 10 to 60 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e
Hydrologic Soil Group: D
Hydric soil rating: No

Minor Components

Woodbridge
Percent of map unit: 5 percent
Hydric soil rating: No

Ridgebury
Percent of map unit: 4 percent
Landform: Depressions
Hydric soil rating: Yes

717E—Rock outcrop-Charlton-Hollis complex, 15 to 35 percent slopes

Map Unit Setting
National map unit symbol: vjrb
Mean annual precipitation: 45 to 54 inches
Mean annual air temperature: 43 to 54 degrees F
Frost-free period: 125 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition
Rock outcrop: 40 percent
Charlton and similar soils: 30 percent
Hollis and similar soils: 15 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Rock Outcrop

Setting
Parent material: Granite and gneiss

Properties and qualities
Slope: 15 to 25 percent
Depth to restrictive feature: 0 inches to lithic bedrock

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8s
Hydric soil rating: Unranked

Description of Charlton

Setting
Landform: Hills, ridges
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear

Across-slope shape: Convex
Parent material: Friable coarse-loamy eolian deposits over friable coarse-loamy basal till derived from granite and gneiss

Typical profile
H1 - 0 to 4 inches: fine sandy loam
H2 - 4 to 28 inches: gravelly fine sandy loam
H3 - 28 to 60 inches: gravelly fine sandy loam

Properties and qualities
Slope: 15 to 25 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.5 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Description of Hollis

Setting
Landform: Ridges, hills
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Shallow, friable loamy eolian deposits over granite and gneiss

Typical profile
O - 0 to 1 inches: muck
H2 - 1 to 6 inches: fine sandy loam
H3 - 6 to 17 inches: gravelly fine sandy loam
H4 - 17 to 20 inches: unweathered bedrock

Properties and qualities
Slope: 15 to 25 percent
Depth to restrictive feature: 10 to 60 inches to lithic bedrock
Natural drainage class: Somewhat excessively drained
Capacity of the most limiting layer to transmit water (Ksat): Very low (0.00 to 0.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.1 inches)

Interpretive groups
Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: D

Hydric soil rating: No

Minor Components

Chatfield

Percent of map unit: 5 percent
Hydric soil rating: No

Leicester

Percent of map unit: 5 percent
Landform: Depressions
Hydric soil rating: Yes

Sutton

Percent of map unit: 5 percent
Hydric soil rating: No

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