STORMWATER ANALYSIS

FOR

CARRIAGE HILL LOFTS

AT

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PREPARED ON
9/18/2025

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1. Project Description

1.1. Introduction

Sweet Management Inc. (The Applicant) is proposing to redevelop three abandoned structures from industrial use to commercial/residential mixed-use, as well as construct a fourth structure to serve a parking garage for the redevelopment. The applicant has retained the services of Millennium Engineering Inc. (MEI) for civil engineering services associated with the redevelopment, including the design of a stormwater management system and the preparation of this report.

The site is 9 Oakland St. in the Town of Amesbury Massachusetts. There are two parcels linked to this address, numbered 94 and 95 on Map 53 of the local assessor's maps. The purpose of this report is to explain the design of the proposed development's stormwater management system, and document the system's compliance with State and Municipal regulations.

1.2. Existing Conditions

This section will describe the project site in its current state.

1.2.1. Topography & Natural Resources

The site can be described as urban landscape with decades of prior development. Having been built onto the side of a hill, both flat and steep grades are present, with little to no transition between the two, aside from retaining walls. No natural resources such as wetlands protected habitats are known to exist on the site.

1.2.2. Existing Structures & Use

Three structures exist on the site, all of which are rectangular brick buildings that were originally constructed as industrial mills. The buildings are currently abandoned, and efforts to clean them up so that they can be used again are underway. Volatile Organic Compounds (VOC's) were detected in the soil beneath these buildings, and a monitoring and remediation program has been in place for almost a decade. More information on this can be found at the Massachusetts Department of Environmental Protection under the Release Tracking Number (RTN) 3-32360.

1.2.3. Utilities

The site is surrounded by gas, electricity, water, sewer, and storm drain utilities, and service connections for electric, water and sewer have been identified on record plans. It is not known if these connections are still in use.

1.3. Proposed Conditions

This section will describe all proposed changes to the project site.

1.3.1. Alterations to Topography & Natural Resources

In general, the project does not propose significant changes to the grading of the site. The new parking garage will be built into the steepest parts of the site, replacing the sites only patch of woods. The only other topographical changes will be the conversion of some of the sites paved areas to lawns and landscaped areas.

1.3.2. Proposed Structures & Use

As alluded to previously, The Applicant intends to redevelop the site into a mixed use of residential and commercial. New construction will include lawn, landscaped areas, patios, a parking garage, and fresh pavement where the parking lot and sidewalk have deteriorated.

1.3.3. Proposed Utilities

At the time of this report, project proposes the reactivation of electric, water, and sewer services, and the project's stormwater management system will discharge directly to the municipal storm drain system. It is not known if there is a combined sewer overflow downstream of where the proposed sewer and storm drain service lines connect to the municipal main lines.

2. Stormwater Management

2.1. Hydrology

This section will describe the existing hydrologic characteristics of the watershed in which the site is located as relevant to stormwater management.

2.1.1. Rainfall

State and Municipal regulations require use of the latest available rainfall data for the 2-, 10-, 25-, and 100-year, 24-hr rain events. The rainfall depth for each of these events was taken from data published by the Natural Resource Conservation Service (NRCS) based on Atlas-14 Volume 10. Table 1 below summarizes the rainfall depth for each storm.

Table 1: Recurrence & Depth of Design Storms

Recurrence Interval	Rainfall Depth (in.)
2-year	3.24
10-year	5.12
25-year	6.30
100-year	8.11

2.1.2. Soils

Soil Boring Logs recorded between December 2014 and August 2017 by Soil Exploration Corp., and Clean Soils Environmental LTD., were used to determine the composition of the soils at the project site. Copies of these logs have been included with this report as Attachment 2). The logs revealed that the sand and inorganic silt make up the majority of the soil beneath the site, with the former being the more prevalent of the two. For this reason, the stormwater model uses hydrologic soil group A (HSG A) for the whole of the site, and an infiltration rate of 8.27 inches/hour was selected from the 1982 Rawls Rates table included in Chapter 1 of Volume 3 of the Massachusetts Stormwater Management Handbook.

2.1.3. Pre-Development Subcatchments

Under Pre-Development conditions, the site was modelled as a single subcatchment, where all runoff flows overland in a Southwesterly direction until it is collected by a municipal storm drain network. This storm drain network was used as the sole design point for the site. Of the site's

1.259 acres, 72% is covered by impervious surfaces such as pavement, sidewalks, and roof. This results in a higher peak runoff rate despite the soil's conduciveness to drainage and infiltration. The remainder of the site is covered by lawns and a single patch of woods; both of which are in fair condition. A visual of this subcatchment's boundaries and flow path are provided in Attachment 3), and a summary of the total drainage and impervious surfaces are provided by Table 2 below.

Table 2: Pre-Development Subcatchment Summary

Subcatchment Number	Receiving Design Point	Impervious Surface (acres)	Total Area (acres)
S1	DP1	0.898	1.259

2.1.4. Post-Development Subcatchments

In post-development, the drainage area is divided into 4 subcatchments. S1-1 and S1-3 Represent the areas that drain to the southerly and northerly infiltration chambers respectively, while S1-2 represents the small open area between the new garage and the central building, and S1-4 represents the remaining area of the property. A map of these areas is included in Attachment 3), while Table 3 below summarizes the impervious surface and total area of each post development subcatchment.

Runoff from the site is still directed toward the southwest corner of the lot, however the path runoff takes to get there is slightly different. Runoff from S1-1 is directed toward an array of six infiltration chambers buried beneath the new parking garage. From there, no less than 2,051ft^3 of runoff is forced to infiltrate into the ground. Runoff exceeding this volume is discharged via orifice control structures and an HDPE culvert to municipal storm drains beneath Chestnut St.

Runoff from S1-2 is allowed to pond in a vegetated open space, and the volume of which is low enough that all runoff is infiltrated without significant flooding.

Runoff from S1-3 is routed to an array of four infiltration chambers beneath the northerly parking lot. No less than 1,778ft^3 of runoff is forced to infiltrate by this chamber, and any excess is discharged via control orifices and an HDPE culvert to municipal storm drains beneath Oakland St.

Runoff from the remainder of the site, S1-4, is not treated, and flows in various directions away from the site before being collected by municipal storm drains.

Table 3: Post-Development Subcatchment Summary

Subcatchment Number	Receiving Design Point	Impervious Surface (acres)	Total Area (acres)
S1-1	DP1	0.608	0.608
S1-2	"	0.013	0.013
S1-3	"	0.499	0.541
S1-4	"	0.057	0.097
Total	n/a	**1.177**	**1.259**

2.1.5. Receiving Waters

As alluded to previously, runoff that is not infiltrated naturally or by design is received by a municipal storm drain network. While this has yet to be confirmed, it is assumed that this storm drain network discharges to nearby Plumbush Creek, located South of the site.

2.2. Compliance with Regulatory Standards

This section will describe how the project's stormwater management system (The System) will comply with the standards established by the Commonwealth of Massachusetts. Municipal standards will be cited where applicable.

2.2.1. Standard 1: Untreated Stormwater

As stated by Standard 1: *"No new stormwater conveyances (e.g. outfalls) will discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth."*

Of the 1.177 acres of the site's post-development impervious surface, 1.120 acres (95%), is treated by The System. See Table 5 below for a break-down of which subcatchments do and do not receive treatment for their impervious surfaces.

A total of 0.057 acres (3,275ft^2) of the site will not be treated by the site's stormwater management system. Stormwater from these areas is collected by the municipal storm drain system, therefore, the redevelopment of this site complies with Standard 1 because the redeveloped site does not have, nor will it create an outfall which discharges untreated stormwater directly to the waters and wetlands of the Commonwealth.

2.2.2. Standard 2: Post-Development Peak Discharge Rates

As stated by Standard 2: *"Stormwater management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates."*

The System has been designed to prevent the peak discharge rates of the 2-, 10-, 25, and 100-year rain events do not exceed their pre-development values. Table 4 below summarizes the peak flow rates under pre- and post-development conditions, as well as the pre- and post-development drainage area. To find out more about how these values were calculated, see Attachment 4).

Table 4: Pre- and Post-Development Peak Runoff Rates

Design Point	Total Drainage Area (Ac)		Peak Rates of Runoff (cfs)							
			2-Year		10-Year		25-Year		100-Year	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
DP-1	1.259	**1.259**	2.70	**0.21**	5.22	**2.00**	6.82	**4.38**	9.28	**7.82**

All peak flows under post-development conditions are well below their pre-development values, therefore, this project meets Standard 2 to the maximum extent practicable.

2.2.3. Standard 3: Recharge to Groundwater

As stated by Standard 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 operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from pre-development conditions based on soil type. This*

condition is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook."

Given HSG A soils, the required recharge volume for each structural best management practice (BMP) is 0.6 inches multiplied by the impervious surface that drains to the BMP. The BMP's selected for this development are two arrays of subsurface storage and infiltration tanks. Table 5 below summarizes the recharge volume required for each subcatchment, and the recharge volume provided by each BMP.

Table 5: Required Recharge Volume & Treated Area Summary

Subcatchment Number	Impervious Surface (acres)	Required Recharge Volume (ft^3)	Receives Treatment (Y/N)	Provided Recharge Volume (ft^3)	Treated Impervious (acres)
S1-1	0.608	1323.3	Y	2051	0.608
S1-2	0.013	28	Y	175	0.013
S1-3	0.499	1087	Y	1778	0.499
S1-4	0.057	164	N	0	0
Total	**1.177**	**2602.3**	**n/a**	**4004.0**	**1.120**

Even though 5% of the redevelopment's impervious surface is untreated, the minimum volume that is forcibly infiltrated by The System is far in excess of what is required; therefore, The System meets Standard 3 to the maximum extent practicable.

2.2.4. Standard 4: Removal of 80% of Total Suspended Solids

Standard 4 states that *"Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when: (a) Suitable practices for source control and pollution prevention are identified in long-term pollution prevention plan, and thereafter implemented and maintained; (b) Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and (c) Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook."*

The vast majority of the site's impervious surface is rood

2.2.5. Standard 5: Land Uses with Higher Potential Pollutant Loads

Standard 5 states that *"For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and/or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook."*

No new discharges with higher potential pollutant loads are associated with the proposed use.

Regarding the site's previous industrial use and remediation efforts, The Applicant informed MEI that such remediation efforts have since been completed, so The System has not been analyzed

for impacts related to any existing pollutants. Therefore, the redevelopment meets Standard 5 to the maximum extent practicable.

2.2.6. Standard 6: Critical Areas

Standard 6 states that *"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 is not located within Zone II or Interim Wellhead Protection Area of a Public Water Supply, nor will stormwater from the redevelopment be discharged to them. Therefore, Standard 6 is not applicable to this project.

2.2.7. Standard 7: Redevelopment

Standard 7 states that *"A redevelopment project is required to meet the following Stormwater Management Standards only to the maximum extent practicable: Standard 2, 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"*

This project is a redevelopment of an existing site and is therefore subject to this standard. For information on how the redevelopment will meet the modified versions of Standards 1-6, please see their respective sections within this report.

2.2.8. Standard 8: Erosion & Sedimentation Controls

Standard 8 states that *"A plan to control construction related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented."*

A plan for controlling erosion and sedimentation during construction will be submitted alongside the civil plans for the project. The plan will be appropriate for the type of work expected for this project; therefore, the redevelopment complies with Standard 8.

2.2.9. Standard 9: Operation & Maintenance Plans

Standard 9 states: *"A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed."*

A long-term operation and maintenance plan has been prepared for The System. Please see Attachment 5) for a copy of the plan. This plan covers all the BMP's associated with The System, thereby proving that the redevelopment complies with Standard 9.

2.2.10. Standard 10: Illicit Discharges to Drainage System

Standard 10 states: *"All illicit discharges to the stormwater management system are prohibited."*

Given that remediation efforts at the site have been completed, and that the infiltration BMPs are well above the water table, no pollutants from the redevelopments previous use will enter The System as illicit discharges. Furthermore, access to the redevelopment's stormwater will be

limited to authorized personnel only, thereby reducing the likelihood of illicit discharges to The System to the maximum extent practicable. An Illicit Discharge Compliance Statement shall be submitted by The Applicant to the permitting authority prior to the discharge of any stormwater to post-construction BMPs.

ATTACHMENT 1)

NRCS WEB SOIL SURVEY REPORT

United States Department of Agriculture

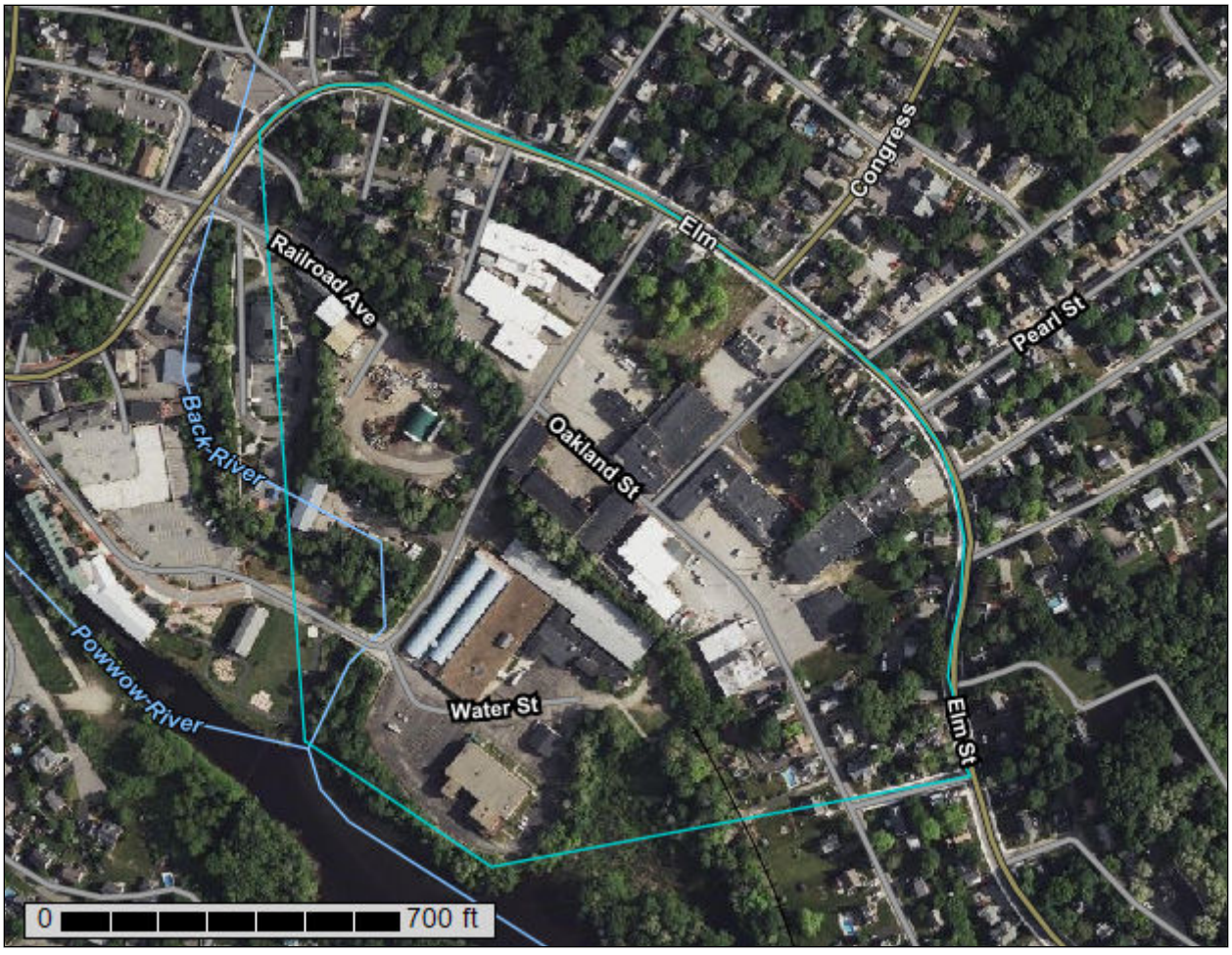
NRCS

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

Area Surrounding 9 Oakland St



September 18, 2025

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 (https://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.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
12A	Maybid silt loam, 0 to 3 percent slopes	1.7	4.3%
230C	Unadilla very fine sandy loam, 8 to 15 percent slopes	2.5	6.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	7.9	19.9%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	2.6	6.6%
258B	Amostown fine sandy loam, 3 to 8 percent slopes	5.4	13.5%
602	Urban land	19.1	48.1%
607	Water, saline	0.5	1.3%
Totals for Area of Interest		**39.8**	**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

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

Map Unit Setting

National map unit symbol: vjhj
Elevation: 0 to 130 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

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
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 supply, 0 to 60 inches: Moderate (about 8.8 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6w
Hydrologic Soil Group: C/D
Ecological site: F144AY020MA - Very Wet Coastal Lake Plain
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

230C—Unadilla very fine sandy loam, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: vjx1
Elevation: 600 to 1,800 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

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

Description of Unadilla

Setting

Landform: Lakebeds (relict)
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Convex
Parent material: Soft coarse-silty glaciolacustrine deposits

Typical profile

H1 - 0 to 9 inches: very fine sandy loam
H2 - 9 to 53 inches: very fine sandy loam
H3 - 53 to 60 inches: very fine sandy loam

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 10.6 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 3e

Hydrologic Soil Group: B
Ecological site: F144AY024NY - Well Drained Eolian Outwash
Hydric soil rating: No

Minor Components

Belgrade
Percent of map unit: 20 percent
Hydric soil rating: No

255B—Windsor loamy sand, 3 to 8 percent slopes

Map Unit Setting
National map unit symbol: 2svkf
Elevation: 0 to 1,210 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: Farmland of statewide importance

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

Description of Windsor

Setting
Landform: Outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loose sandy glaciofluvial deposits derived from granite and/or schist and/or gneiss

Typical profile
Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 3 inches: loamy sand
Bw - 3 to 25 inches: loamy sand
C - 25 to 65 inches: sand

Properties and qualities
Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Excessively drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None

Maximum salinity: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water supply, 0 to 60 inches: Low (about 4.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Minor Components

Hinckley

Percent of map unit: 10 percent
Landform: Eskers
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: F145XY008MA - Dry Outwash
Hydric soil rating: No

Deerfield, loamy sand

Percent of map unit: 5 percent
Landform: Terraces
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

256A—Deerfield loamy fine sand, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 2xfg8
Elevation: 0 to 1,100 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

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

Description of Deerfield

Setting

Landform: Outwash terraces, outwash deltas, outwash plains, kame terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear

Across-slope shape: Convex, linear, concave
Parent material: Sandy outwash derived from granite, gneiss, and/or quartzite

Typical profile

Ap - 0 to 9 inches: loamy fine sand
Bw - 9 to 25 inches: loamy fine sand
BC - 25 to 33 inches: fine sand
Cg - 33 to 60 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: About 15 to 37 inches
Frequency of flooding: None
Frequency of ponding: None
Maximum salinity: Nonsaline (0.0 to 1.9 mmhos/cm)
Sodium adsorption ratio, maximum: 11.0
Available water supply, 0 to 60 inches: Moderate (about 6.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 7 percent
Landform: Outwash terraces, kame terraces, outwash deltas, outwash plains
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Wareham

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

Sudbury

Percent of map unit: 2 percent
Landform: Outwash plains, kame terraces, outwash deltas, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave, convex, linear
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Ninigret

Percent of map unit: 1 percent
Landform: Kame terraces, outwash plains, outwash terraces

Landform position (three-dimensional): Tread
Down-slope shape: Convex, linear
Across-slope shape: Convex, concave
Hydric soil rating: No

258B—Amostown fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: vj2g
Elevation: 0 to 100 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: All areas are prime farmland

Map Unit Composition

Amostown and similar soils: 70 percent
Minor components: 30 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Amostown

Setting

Landform: Lakebeds, deltas
Landform position (two-dimensional): Footslope
Landform position (three-dimensional): Rise
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Friable coarse-loamy glaciofluvial deposits derived from mica schist over hard coarse-loamy glaciolacustrine deposits

Typical profile

H1 - 0 to 11 inches: fine sandy loam
H2 - 11 to 38 inches: fine sandy loam
H3 - 38 to 60 inches: stratified very fine sand to silt loam

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Moderately well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to moderately high (0.06 to 0.60 in/hr)
Depth to water table: About 12 to 30 inches
Frequency of flooding: None
Frequency of ponding: None
Available water supply, 0 to 60 inches: High (about 9.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2e
Hydrologic Soil Group: C/D

Ecological site: F144AY027MA - Moist Sandy Outwash
Hydric soil rating: No

Minor Components

Pollux
Percent of map unit: 20 percent
Hydric soil rating: No

Walpole variant
Percent of map unit: 10 percent
Landform: Terraces
Hydric soil rating: Yes

602—Urban land

Map Unit Setting
National map unit symbol: vjx3
Frost-free period: 125 to 165 days
Farmland classification: Not prime farmland

Map Unit Composition
Urban land: 80 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting
Parent material: Excavated and filled land

Minor Components

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

Merrimac
Percent of map unit: 2 percent
Hydric soil rating: No

Hinckley
Percent of map unit: 2 percent
Hydric soil rating: No

Windsor
Percent of map unit: 2 percent
Hydric soil rating: No

Charlton
Percent of map unit: 2 percent
Hydric soil rating: No

Paxton
Percent of map unit: 2 percent
Hydric soil rating: No

607—Water, saline

Map Unit Setting
National map unit symbol: vk29
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition
Water, saline: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Minor Components

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

Soil Information for All Uses

Soil Properties and Qualities

The Soil Properties and Qualities section includes various soil properties and qualities displayed as thematic maps with a summary table for the soil map units in the selected area of interest. A single value or rating for each map unit is generated by aggregating the interpretive ratings of individual map unit components. This aggregation process is defined for each property or quality.

Soil Physical Properties

Soil Physical Properties are measured or inferred from direct observations in the field or laboratory. Examples of soil physical properties include percent clay, organic matter, saturated hydraulic conductivity, available water capacity, and bulk density.

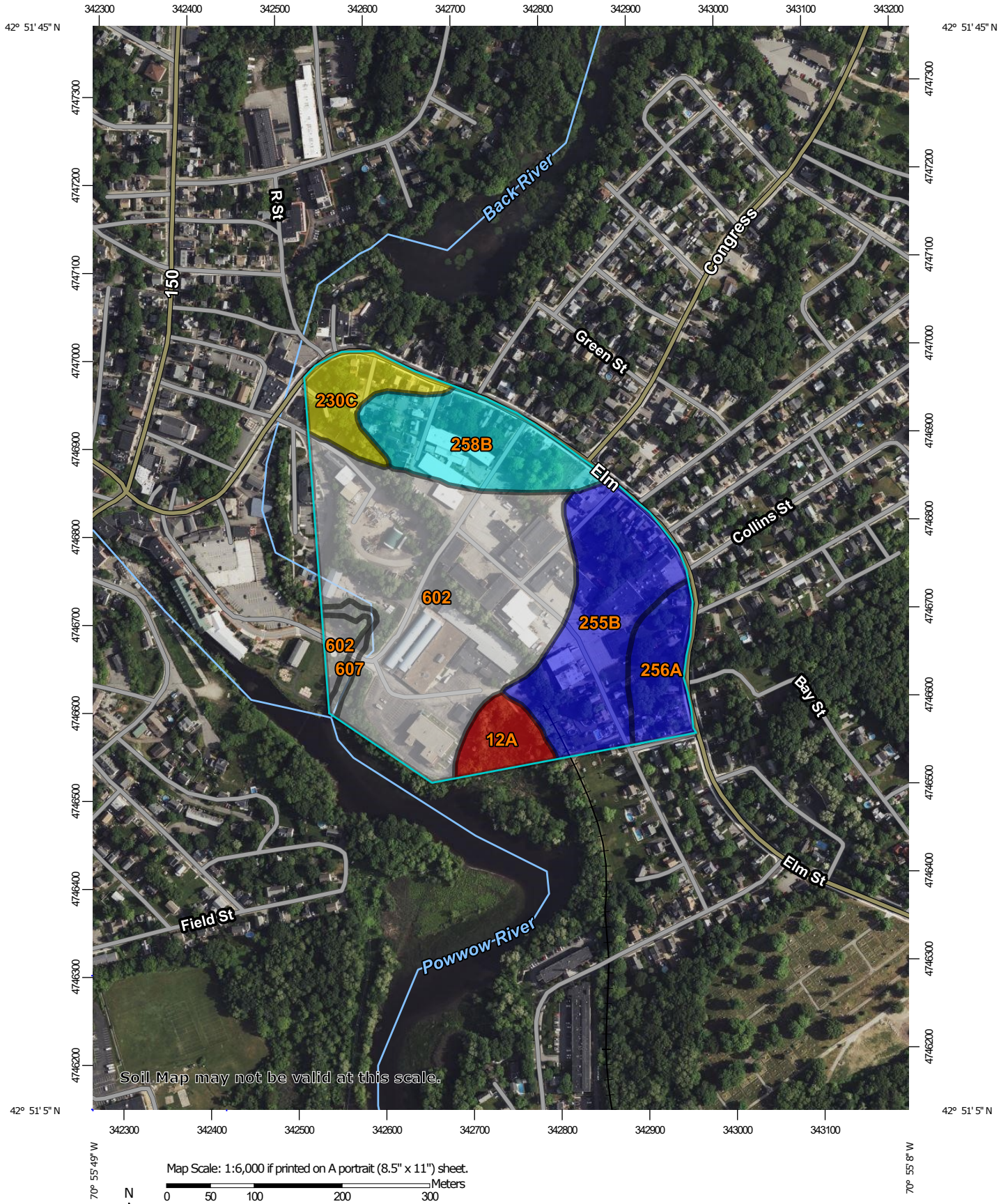
Saturated Hydraulic Conductivity (Ksat)

Saturated hydraulic conductivity (Ksat) refers to the ease with which pores in a saturated soil transmit water. The estimates are expressed in terms of micrometers per second. They are based on soil characteristics observed in the field, particularly structure, porosity, and texture. Saturated hydraulic conductivity is considered in the design of soil drainage systems and septic tank absorption fields.

For each soil layer, this attribute is actually recorded as three separate values in the database. A low value and a high value indicate the range of this attribute for the soil component. A "representative" value indicates the expected value of this attribute for the component. For this soil property, only the representative value is used.

The numeric Ksat values have been grouped according to standard Ksat class limits.

Map—Saturated Hydraulic Conductivity (Ksat)



Map Scale: 1:6,000 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 50 100 200 300

Feet: 0 250 500 1000 1500

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

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils

Soil Rating Polygons
- <= 0.9599
- > 0.9599 and <= 16.8267
- > 16.8267 and <= 18.8583
- > 18.8583 and <= 100.0000
- Not rated or not available

Soil Rating Lines
- <= 0.9599
- > 0.9599 and <= 16.8267
- > 16.8267 and <= 18.8583
- > 18.8583 and <= 100.0000
- Not rated or not available

Soil Rating Points
- <= 0.9599
- > 0.9599 and <= 16.8267
- > 16.8267 and <= 18.8583
- > 18.8583 and <= 100.0000
- Not rated or not available

Water Features
- Streams and Canals

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

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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:
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 20, Aug 27, 2024

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

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

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

Table—Saturated Hydraulic Conductivity (Ksat)

Map unit symbol	Map unit name	Rating (micrometers per second)	Acres in AOI	Percent of AOI
12A	Maybid silt loam, 0 to 3 percent slopes	0.9599	1.7	4.3%
230C	Unadilla very fine sandy loam, 8 to 15 percent slopes	16.8267	2.5	6.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	100.0000	7.9	19.9%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	100.0000	2.6	6.6%
258B	Amostown fine sandy loam, 3 to 8 percent slopes	18.8583	5.4	13.5%
602	Urban land		19.1	48.1%
607	Water, saline		0.5	1.3%
Totals for Area of Interest			**39.8**	**100.0%**

Rating Options—Saturated Hydraulic Conductivity (Ksat)

Units of Measure: micrometers per second

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Slowest

Interpret Nulls as Zero: No

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Average)

Top Depth: 0

Bottom Depth: 600

Units of Measure: Inches

Soil Qualities and Features

Soil qualities are behavior and performance attributes that are not directly measured, but are inferred from observations of dynamic conditions and from soil properties. Example soil qualities include natural drainage, and frost action. Soil features are attributes that are not directly part of the soil. Example soil features include slope and depth to restrictive layer. These features can greatly impact the use and management of the soil.

Unified Soil Classification (Selected Depth)

The Unified soil classification system classifies mineral and organic mineral soils for engineering purposes on the basis of particle-size characteristics, liquid limit, and plasticity index. It identifies three major soil divisions: (i) coarse-grained soils having less than 50 percent, by weight, particles smaller than 0.074 mm in diameter; (ii) fine-grained soils having 50 percent or more, by weight, particles smaller than 0.074 mm in diameter; and (iii) highly organic soils that demonstrate certain organic characteristics. These divisions are further subdivided into a total of 15 basic soil groups. The major soil divisions and basic soil groups are determined on the basis of estimated or measured values for grain-size distribution and Atterberg limits. ASTM D 2487 shows the criteria chart used for classifying soil in the Unified system and the 15 basic soil groups of the system and the plasticity chart for the Unified system.

The various groupings of this classification correlate in a general way with the engineering behavior of soils. This correlation provides a useful first step in any field or laboratory investigation for engineering purposes. It can serve to make some general interpretations relating to probable performance of the soil for engineering uses.

For each soil horizon in the database one or more Unified soil classifications may be listed. One is marked as the representative or most commonly occurring. The dominant condition or dominant component representative Unified classification is shown for the user-selected depth range of the soil.

Map—Unified Soil Classification (Selected Depth)

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

CH
CL
CL-A (proposed)
CL-K (proposed)
CL-ML
CL-O (proposed)
CL-T (proposed)
GC
GC-GM
GM
GP
GP-GC
GP-GM
GW
GW-GC
GW-GM
MH
MH-A (proposed)
MH-K (proposed)
MH-O (proposed)
MH-T (proposed)
ML
ML-A (proposed)
ML-K (proposed)
ML-O (proposed)
ML-T (proposed)
OH
OH-T (proposed)
OL
PT
SC
SC-SM
SM
SP
SP-SC
SP-SM
SW
SW-SC
SW-SM
Not rated or not available

Soil Rating Lines

CH
CL
CL-A (proposed)
CL-K (proposed)
CL-ML
CL-O (proposed)
CL-T (proposed)
GC
GC-GM
GM
GP
GP-GC
GP-GM
GW
GW-GC
GW-GM
MH
MH-A (proposed)
MH-K (proposed)
MH-O (proposed)
MH-T (proposed)
ML
ML-A (proposed)
ML-K (proposed)
ML-O (proposed)
ML-T (proposed)
OH
OH-T (proposed)
OL
PT
SC
SC-SM
SM
SP
SP-SC
SP-SM
SW
SW-SC
SW-SM
Not rated or not available

Soil Rating Points

CH
CL
CL-A (proposed)
CL-K (proposed)
CL-ML
CL-O (proposed)
CL-T (proposed)
GC
GC-GM
GM
GP
GP-GC
GP-GM
GW
GW-GC
GW-GM
MH
MH-A (proposed)
MH-K (proposed)
MH-O (proposed)
MH-T (proposed)
ML
ML-A (proposed)
ML-K (proposed)
ML-O (proposed)
ML-T (proposed)
OH
OH-T (proposed)
OL
PT
SC
SC-SM
SM
SP
SP-SC
SP-SM
SW
SW-SC
SW-SM
Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

MAP INFORMATION


Interstate Highways


US Routes

Major Roads

Local Roads

Background


Aerial Photography

The soil surveys that comprise your AOI were mapped at 1:15,800.

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

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

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Survey Area Data: Version 20, Aug 27, 2024

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

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

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

Table—Unified Soil Classification (Selected Depth)

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12A	Maybid silt loam, 0 to 3 percent slopes		1.7	4.3%
230C	Unadilla very fine sandy loam, 8 to 15 percent slopes		2.5	6.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	PT	7.9	19.9%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	SM	2.6	6.6%
258B	Amostown fine sandy loam, 3 to 8 percent slopes		5.4	13.5%
602	Urban land		19.1	48.1%
607	Water, saline		0.5	1.3%
Totals for Area of Interest			**39.8**	**100.0%**

Rating Options—Unified Soil Classification (Selected Depth)

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Lower

Layer Options (Horizon Aggregation Method): Depth Range (Weighted Sum)

Top Depth: 0

Bottom Depth: 600

Units of Measure: Inches

Hydrologic Soil Group

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

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

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

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

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

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

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


70° 55' 49" W
70° 55' 8" W
42° 51' 45" N
42° 51' 5" N
342300
342400
342500
342600
342700
342800
342900
343000
343100
343200
4747300
4747200
4747100
4747000
4746900
4746800
4746700
4746600
4746500
4746400
4746300
4746200
Back River
R St
150
Congress
Green St
230C
258B
Elm
Collins St
602
602
607
255B
256A
12A
Bay St
Elm St
Field St
Powwow River
Soil Map may not be valid at this scale.
Map Scale: 1:6,000 if printed on A portrait (8.5" x 11") sheet.
Meters
0 50 100 200 300
Feet
0 250 500 1000 1500
N
Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Rating Polygons

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Lines

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Soil Rating Points

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:15,800.

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Coordinate System: Web Mercator (EPSG:3857)

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Survey Area Data: Version 20, Aug 27, 2024

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

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

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

Table—Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
12A	Maybid silt loam, 0 to 3 percent slopes	C/D	1.7	4.3%
230C	Unadilla very fine sandy loam, 8 to 15 percent slopes	B	2.5	6.3%
255B	Windsor loamy sand, 3 to 8 percent slopes	A	7.9	19.9%
256A	Deerfield loamy fine sand, 0 to 3 percent slopes	A	2.6	6.6%
258B	Amostown fine sandy loam, 3 to 8 percent slopes	C/D	5.4	13.5%
602	Urban land		19.1	48.1%
607	Water, saline		0.5	1.3%
Totals for Area of Interest			**39.8**	**100.0%**

Rating Options—Hydrologic Soil Group

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

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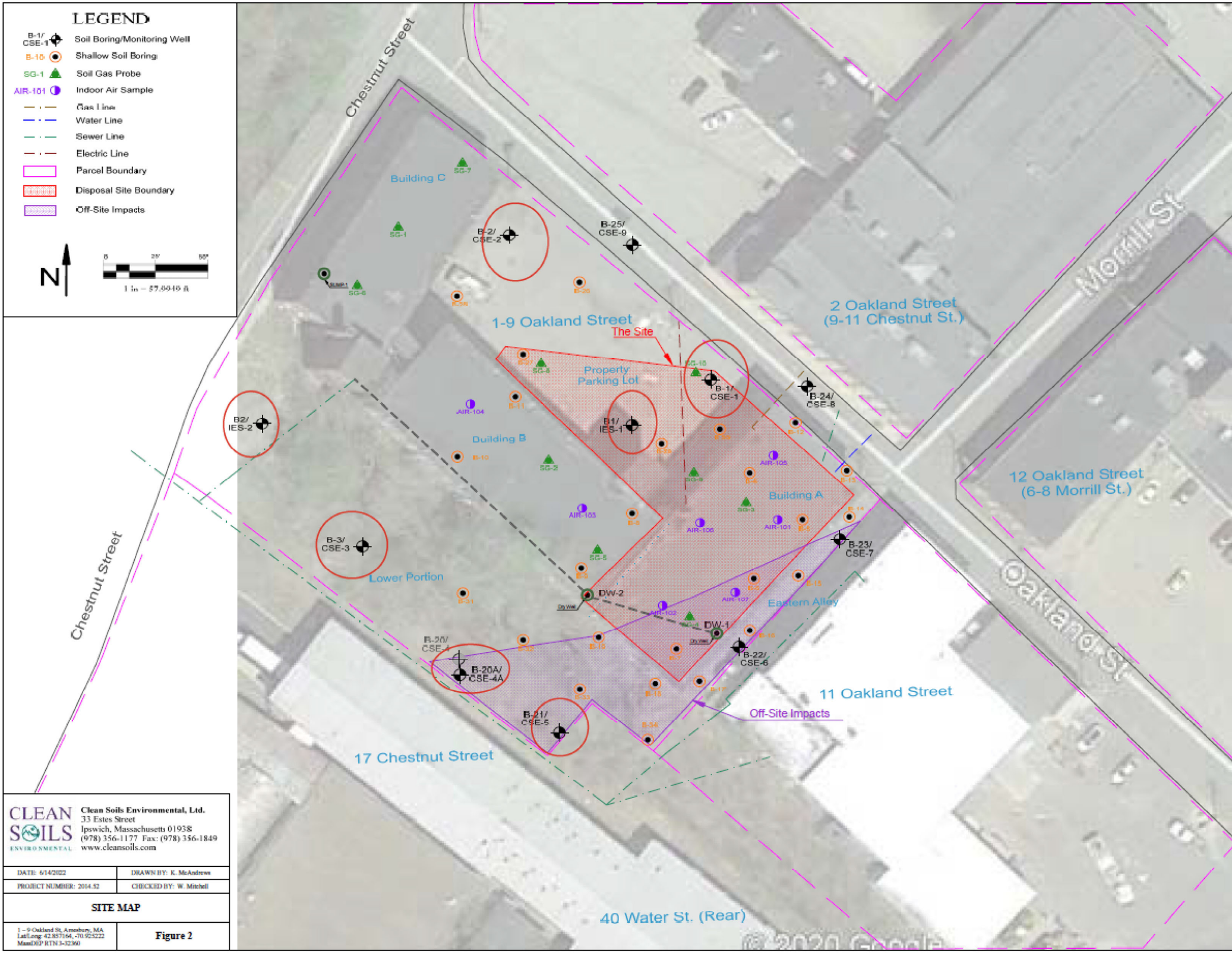
ATTACHMENT 2)

SOIL BORING LOGS AND LOCATIONS BY SOIL EXPLORATION CORP. AND CLEAN SOILS ENVIRONMENTAL, LLC.



CLEAN SOILS ENVIRONMENTAL
Clean Soils Environmental, Ltd.
33 Estes Street
Ipswich, Massachusetts 01938
(978) 356-1177 Fax: (978) 356-1849
www.cleansoils.com

DATE: 6/14/2022	DRAWN BY: K. McAndrews
PROJECT NUMBER: 2014.52	CHECKED BY: W. Mitchell

SITE MAP

1 – 9 Oakland St, Amesbury, MA
Lat/Long: 42.857164, -70.925222
MassDEP RTN 3-32360

Figure 2

TEST BORING LOG

SHEET 1

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Clean Soils Environmental

Site: 1 Oakland Street

Amesbury, MA

BORING B-1

PROJECT NO. 14-1246

DATE: January 5, 2015

Ground Elevation:
Date Started: December 30, 2014
Date Finished: December 30, 2014
Driller: TF
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						3"	Asphalt.
1		1	12"	0"-2'0"	6-5-5-4	2'0"	Medium dense fine sand, little inorganic silt, little medium to coarse sand.
5		2	20"	5'0"-7'0"	4-2-2-3		
							Loose to medium dense, fine sand and inorganic silt, little medium to coarse sand.
10		3	22"	10'0"-12'0"	6-8-7-8		
15		4	10"	15'0"-17'0"	24-38-31-29	14'0"	
20		5	10"	20'0"-22'0"	11-14-13-15		
							Very dense to medium dense to very dense, fine to coarse sand, inorganic silt, fine to coarse gravel, cobbles.
25		6	0"	25'0"-26'0"	52-103		
30		7	12"	30'0"-32'0"	22-28-47-51	30'0"	
35		8	12"	35'0"-36'0"	67-93		Very dense, fine to coarse sand and some inorganic silt.
39							(Continued to Sheet 2)

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 2

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Clean Soils Environmental

Site: 1 Oakland Street

Amesbury, MA

BORING B-1 (continued)

PROJECT NO. 14-1246

DATE: January 5, 2015

Ground Elevation:
Date Started: December 30, 2014
Date Finished: December 30, 2014
Driller: TF
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
40		9	12"	40'0"-42'0"	17-18-26-29		
45						44'0"	End of boring at 44'0". Water encountered at 36'0". Well set at 43'0".
50							
55							
60							
65							
70							
75							
79							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 3

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Clean Soils Environmental

Site: 1 Oakland Street

Amesbury, MA

BORING B-2

PROJECT NO. 14-1246

DATE: January 5, 2015

Ground Elevation:
Date Started: December 30, 2014
Date Finished: December 30, 2014
Driller: TF
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						3"	Asphalt.
1		1	12"	0"-2'0"	6-7-4-5		Medium dense fine to coarse sand, fine gravel, some inorganic silt.
						3'0"	
5		2	16"	5'0"-7'0"	4-4-5-5		
10		3	22"	10'0"-12'0"	5-6-8-9		Loose to medium dense inorganic silt, clays, fine sand, little medium to coarse sand.
15		4	18"	15'0"-17'0"	6-7-6-10		
20		5	18"	20'0"-22'0"	11-13-15-17	20'0"	
25		6	18"	25'0"-27'0"	25-24-36-39		
30		7	18"	30'0"-32'0"	19-20-26-26		Medium dense to dense to medium dense, fine sand, some inorganic silt, dry to wet.
35		8	18"	35'0"-37'0"	10-10-11-12		
39							(Continued to Sheet 4)

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 4

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Clean Soils Environmental

Site: 1 Oakland Street

Amesbury, MA

BORING B-2 (continued)

PROJECT NO. 14-1246

DATE: January 5, 2015

Ground Elevation:
Date Started: December 30, 2014
Date Finished: December 30, 2014
Driller: TF
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
40		9	18"	40'0"-42'0"	8-8-9-14	42'0"	End of boring at 42'0". Water encountered at 35'0". Well set at 40'0".
45							
50							
55							
60							
65							
70							
75							
79							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 5

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Clean Soils Environmental

Site: 1 Oakland Street

Amesbury, MA

BORING B-3

PROJECT NO. 14-1246

DATE: January 5, 2015

Ground Elevation:
Date Started: December 31, 2014
Date Finished: December 31, 2014
Driller: TF
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
1		1	12"	0"-2'0"	4-5-6-10		Medium dense fine to coarse sand, fine gravel, some inorganic silt.
						3'0"	
5		2	16"	5'0"-7'0"	5-6-9-9		
10		3	16"	10'0"-12'0"	5-8-10-9		Medium dense fine sand, little medium sand, little inorganic silt, trace coarse sand.
15		4	18"	15'0"-17'0"	6-7-10-13		
						18'0"	
20		5	6"	20'0"-22'0"	18-25-22-34		Dense, fine to coarse sand, fine to coarse gravel, cobbles, some inorganic silt.
						22'0"	
25							End of boring at 22'0". Water encountered at 13'6". Well set at 20'0".
30							
35							
39							

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 6

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Clean Soils Environmental

Site: 1 Oakland Street

Amesbury, MA

BORING GP-1

PROJECT NO. 14-1246

DATE: January 5, 2015

Ground Elevation:
Date Started: December 31, 2014
Date Finished: December 31, 2014
Driller: TF
Soil Engineer/Geologist:

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
1						9"	9" concrete core.
						2'0"	Fine to coarse sand, fine to coarse gravel, soil gas point installed below concrete slab.
5							End of boring at 2'0".
10							
15							
20							
25							
30							
35							
39							

Notes: Gas Point 1

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log Page 1 of 8

Project No.	2014.52	Boring No.	**B-4**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel
G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, light brown, dry		1	B-4 (0 - 2')	G	NA	0.5	9:45	Soil Sample "B-4" collected for VOCs
	2 - 4 ft - fine to medium sands, light brown, dry		3	B-4 (2 - 4')	G	NA	0	9:45	
	4 - 6 ft - fine to medium sands, light brown, dry		5	B-4 (4 - 6')	G	NA	0	9:55	
	6 - 8 ft - fine to medium sands, light brown, dry		7	B-4 (6 - 8')	G	NA	0	9:55	
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log Page 2 of 8

Project No.	2014.52	Boring No.	**B-5**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel
G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, staining, light brown, dry		1	B-5 (0 - 2')	G	NA	1.7	10:20	Soil Sample "B-5" collected for VOCs
	2 - 4 ft - fine to medium sands, light brown, dry		3	B-5 (2 - 4')	G	NA	0.3	10:20	
	4 - 6 ft - fine to medium sands, light brown, dry		5	B-5 (4 - 6')	G	NA	0.1	10:30	
	6 - 8 ft - fine to medium sands, light brown, dry		7	B-5 (6 - 8')	G	NA	0	10:30	
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log Page 1 of 12

Project No.	2014.52	Boring No.	**B-5A**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Interior				
Drilling Equipment:	Track Mounted Geoprobe				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 2 ft - concrete, fine to medium sands, light brown, dry		1	B-5 (0 - 2')	G	NA	3.2	9:14	
	2 - 4 ft - fine to medium sands, light brown, dry		3	B-5 (2 - 4')	G	NA	0.8	9:14	
	4 - 6 ft - fine to medium sands, light brown, dry		5	B-5 (4 - 6')	G	NA	0.3	9:19	
	6 - 8 ft - fine to medium sands, light brown, dry		7	B-5 (6 - 8')	G	NA	0.3	9:19	Soil Sample "B-5 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log Page 3 of 8

Project No.	2014.52	Boring No.	**B-6**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel
G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, staining, light brown, dry		1	B-6 (0 - 2')	G	NA	6.2	10:50	Soil Sample "B-6" collected for VOCs
	2 - 4 ft - fine to medium sands, staining, light brown, dry		3	B-6 (2 - 4')	G	NA	5.3	10:50	
	4 - 6 ft - fine to medium sands, light brown, dry		5	B-6 (4 - 6')	G	NA	0.1	10:55	
	6 - 8 ft - fine to medium sands, light brown, dry		7	B-6 (6 - 8')	G	NA	0.1	10:55	
	Boring Terminated at 8 ft BGS		9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log Page 4 of 8

Project No.	2014.52	Boring No.	**B-7**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel
G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, staining, light brown, dry		1	B-7 (0 - 2')	G	NA	2.1	11:20	Soil Sample "B-7" collected for VOCs
	2 - 4 ft - fine to medium sands, staining, light brown, dry		3	B-7 (2 - 4')	G	NA	0.3	11:20	
	4 - 6 ft - fine to medium sands, staining, light brown, dry		5	B-7 (4 - 6')	G	NA	0.4	11:25	
	6 - 8 ft - fine to medium sands, light brown, dry		7	B-7 (6 - 8')	G	NA	0	11:25	
	Boring Terminated at 8 ft BGS		9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log Page 2 of 12

Project No.	2014.52	Boring No.	**B-7A**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel
G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to med sands, black staining, light brown, dry		1	B-7 (0 - 2')	G	NA	3.9	9:44	
	2 - 4 ft - fine to med sands, black staining, light brown, dry		3	B-7 (2 - 4')	G	NA	3.2	9:44	
	4 - 6 ft - fine to medium sands, light brown, dry		5	B-7 (4 - 6')	G	NA	2.3	9:48	
	6 - 8 ft - fine to medium sands, light brown, dry		7	B-7 (6 - 8')	G	NA	0.3	9:48	Soil Sample "B-7 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

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Project No.	2014.52	Boring No.	**B-8**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building B Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel
G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, light brown, dry		1	B-8 (0 - 2')	G	NA	0	12:15	Soil Sample "B-8" collected for VOCs
	2 - 4 ft - fine to medium sands, light brown, dry		3	B-8 (2 - 4')	G	NA	0	12:15	
	4 - 6 ft - fine to medium sands, light brown, dry		5	B-8 (4 - 6')	G	NA	0	12:25	
	6 - 8 ft - fine to medium sands, light brown, dry		7	B-8 (6 - 8')	G	NA	0	12:25	
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

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Project No.	2014.52	Boring No.	**B-9**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building B Interior				
Drilling Equipment:	Track Mounted Geoprobe				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 2 ft - concrete, fine to medium sands, light brown, dry		1	B-9 (0 - 2')	G	NA	0	12:40	Soil Sample "B-9" collected for VOCs
	2 - 4 ft - fine to medium sands, light brown, dry		3	B-9 (2 - 4')	G	NA	0	12:40	
	4 - 6 ft - fine to medium sands, light brown, dry		5	B-9 (4 - 6')	G	NA	0	12:50	
	6 - 8 ft - fine to medium sands, light brown, dry		7	B-9 (6 - 8')	G	NA	0	12:50	
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

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Project No.	2014.52	Boring No.	**B-10**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building B Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel
G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, light brown, dry		1	B-10 (0 - 2')	G	NA	0	12:55	Soil Sample "B-10" collected for VOCs
	2 - 4 ft - fine to medium sands, light brown, dry		3	B-10 (2 - 4')	G	NA	0	12:55	
	4 - 6 ft - fine to medium sands, light brown, dry		5	B-10 (4 - 6')	G	NA	0	13:05	
	6 - 8 ft - fine to medium sands, light brown, dry		7	B-10 (6 - 8')	G	NA	0	13:05	
	Boring Terminated at 8 ft BGS		9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

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Project No.	2014.52	Boring No.	**B-11**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	2/23/2015	Date Finished	2/23/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building B Interior				
Drilling Equipment:	Track Mounted Geoprobe				

CSE Personnel
G - Kevin McAndrews

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	Remarks
	0 - 2 ft - concrete, fine to medium sands, light brown, dry		1	B-11 (0 - 2')	G	NA	0	13:20	Soil Sample "B-11" collected for VOCs
	2 - 4 ft - fine to medium sands, light brown, dry		3	B-11 (2 - 4')	G	NA	0	13:20	
	4 - 6 ft - fine to medium sands, light brown, dry		5	B-11 (4 - 6')	G	NA	0	13:30	
	6 - 8 ft - fine to medium sands, light brown, dry		7	B-11 (6 - 8')	G	NA	0	13:30	
	Boring Terminated at 8 ft BGS		9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

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Project No.	2014.52	Boring No.	**B-12**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 2 ft - concrete, silty sands, light brown, dry		1	B-12 (0 - 2')	G	NA	0.8	12:20	Soil Sample "B-12 (0 - 2')" collected for VOCs
	2 - 4 ft - fine sands, light brown, dry		3	B-12 (2 - 4')	G	NA	0.7	12:20	
	4 - 6 ft - fine sands, light brown, dry		5	B-12 (4 - 6')	G	NA	0.8	12:25	
	6 - 8 ft - fine sands, silty clay, light brown, dry		7	B-12 (6 - 8')	G	NA	0.9	12:25	Soil Sample "B-12 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

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Project No.	2014.52	Boring No.	**B-13**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 2 ft - concrete, silty sands, light brown, dry		1	B-13 (0 - 2')	G	NA	0.8	12:30	Soil Sample "B-13 (0 - 2')" collected for VOCs
	2 - 4 ft - fine sands, silts, gravels, light brown, dry		3	B-13 (2 - 4')	G	NA	1	12:30	
	4 - 6 ft - fine sands, silts, gravels, light brown, dry		5	B-13 (4 - 6')	G	NA	0.8	12:35	
	6 - 8 ft - fine sands, silts, gravels, light brown, dry		7	B-13 (6 - 8')	G	NA	1	12:35	Soil Sample "B-13 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

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Project No.	2014.52	Boring No.	**B-14**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 2 ft - asphalt, silty sands, light brown, dry		1	B-14 (0 - 2')	G	NA	1.4	12:50	Soil Sample "B-14 (0 - 2')" collected for VOCs
	2 - 4 ft - fine sands, light brown, dry		3	B-14 (2 - 4')	G	NA	0.8	12:50	
	4 - 6 ft - fine sands, silts, gravels, light brown, dry		5	B-14 (4 - 6')	G	NA	1.1	12:55	
	6 - 8 ft - fine sands, silty clay, gravels, light brown, dry		7	B-14 (6 - 8')	G	NA	1	12:55	Soil Sample "B-14 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

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Project No.	2014.52	Boring No.	**B-15**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 2 ft - asphalt, silty sands, light brown, dry		1	B-15 (0 - 2')	G	NA	1.1	13:00	Soil Sample "B-15 (0 - 2')" collected for VOCs
	2 - 4 ft - fine sands, light brown, dry		3	B-15 (2 - 4')	G	NA	1.7	13:00	
	4 - 6 ft - fine sands, silts, gravels, light brown to orange, dry		5	B-15 (4 - 6')	G	NA	1	13:05	
	6 - 8 ft - fine sands, silty clay, light brown, dry		7	B-15 (6 - 8')	G	NA	0.7	13:05	Soil Sample "B-15 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

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Project No.	2014.52	Boring No.	**B-16**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 2 ft - asphalt, silty sands, dark brown, staining, dry		1	B-16 (0 - 2')	G	NA	1.6	13:10	Soil Sample "B-16 (0 - 2')" collected for VOCs
	2 - 4 ft - fine sands, med brown, staining, dry		3	B-16 (2 - 4')	G	NA	4.9	13:10	Soil Sample "B-16 (2 - 4')" collected for VOCs
	4 - 6 ft - fine to med sands, minor silt, light brown, dry		5	B-16 (4 - 6')	G	NA	2.4	13:15	
	6 - 8 ft - fine sands, silty clay, light brown, dry		7	B-16 (6 - 8')	G	NA	2.6	13:15	Soil Sample "B-16 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

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Project No.	2014.52	Boring No.	**B-17**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 2 ft - asphalt, med to fine sands, dark brown, dry		1	B-17 (0 - 2')	G	NA	0.5	13:20	Soil Sample "B-17 (0 - 2')" collected for VOCs
	2 - 4 ft - silt w/ brick frags, dark brown, dry		3	B-17 (2 - 4')	G	NA	1.4	13:20	
	4 - 6 ft - fine to med sands, med brown, dry		5	B-17 (4 - 6')	G	NA	0.4	13:25	
	6 - 8 ft - fine sands, silty clay, light brown, dry		7	B-17 (6 - 8')	G	NA	0.2	13:25	Soil Sample "B-17 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

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Project No.	2014.52	Boring No.	**B-18**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Hammer Drill				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 2 ft - organic loam, dark brown, dry		1	B-18 (0 - 2')	G	NA	0.5	10:45	Soil Sample "B-18 (0 - 2')" collected for VOCs
	2 - 4 ft - fine to med sands, light brown, dry		3	B-18 (2 - 4')	G	NA	0.6	10:50	
	4 - 6 ft - fine to med sands, light brown, dry		5	B-18 (4 - 6')	G	NA	0.4	10:55	
	6 - 8 ft - fine to med sands, light brown, dry		7	B-18 (6 - 8')	G	NA	0.6	11:00	Soil Sample "B-18 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9						
			10						
			11						
			12						
			13						
			14						
			15						
			16						
			17						
			18						
			19						
			20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

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Project No.	2014.52	Boring No.	**B-19**	Monitoring Well No.	**NA**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	8 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Hammer Drill				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 2 ft - organic loam, dark brown, dry		1	B-19 (0 - 2')	G	NA	1	11:20	Soil Sample "B-19 (0 - 2')" collected for VOCs
	2 - 4 ft - fine to med sands, light brown, dry		3	B-19 (2 - 4')	G	NA	0.9	11:25	
	4 - 6 ft - fine to med sands, light brown, dry		5	B-19 (4 - 6')	G	NA	1	11:30	
	6 - 8 ft - fine to med sands, light brown, dry		7	B-19 (6 - 8')	G	NA	0.2	11:35	Soil Sample "B-19 (6 - 8')" collected for VOCs
	Boring Terminated at 8 ft BGS		9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20						

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

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Project No.	2014.52	Boring No.	**B-20**	Monitoring Well No.	**CSE-4**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	20 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 4 ft - fine to coarse sand, minor silt, staining, dark brown, dry		1	B-20 (0 - 4')	G	NA	0.3	14:30	
			2						
			3						
			4						
	4 - 8 ft - fine to medium sand, minor silt, staining, med brown, dry		5	B-20 (4 - 8')	G	NA	1	14:35	
			6						
			7						
			8						
	8 - 12 ft - fine to medium sand, light brown, moist		9	B-20 (8 - 12')	G	NA	0.4	14:40	
		▼	10						
			11						
			12						
	12 - 16 ft - fine to medium sand, med brown, wet		13	B-20 (12 - 16')	G	NA	0.5	14:45	
			14						
			15						
			16						
	16 - 20 ft - fine to medium sand, light to med brown, wet		17	B-20 (16 - 20')	G	NA	1.7	14:50	Soil Sample "B-20 (16 - 20')" collected for VOCs
			18						
			19						
			20						
	Boring Terminated at 20 ft BGS								

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

CLEAN SOILS ENVIRONMENTAL LTD

Field Boring Log Page 12 of 12

Project No.	2014.52	Boring No.	**B-21**	Monitoring Well No.	**CSE-5**
Address:	1 - 9 Oakland St. Amesbury, MA	Surface Elev.	NM	Completion Depth	20 ft BGS
Lat/Long:	42.857066, -70.924782	Auger Depth	NA	Rotary Depth	NA
Installed By:	Bronson Drilling	Date Started	6/2/2015	Date Finished	6/2/2015
Engineer/Geologist:	Kevin McAndrews				
Boring Location:	Building A Exterior				
Drilling Equipment:	Track Mounted Geoprobe				

Elev	DESCRIPTION OF MATERIALS	Graphic Log	Depth in Feet	SAMPLES: SAMPLE ID	SAMPLE TYPE (G or C)	BLOW COUNTS	PID READINGS (ppmv)	TIME COLLECTED	CSE Personnel: G - Kevin McAndrews / Remarks
	0 - 4 ft - fine to coarse sand, minor silt, staining, dark brown, dry		1	B-21 (0 - 4')	G	NA	1.2	15:30	
			2						
			3						
			4						
	4 - 8 ft - fine to medium sand, minor silt, staining, dark brown, dry		5	B-21 (4 - 8')	G	NA	15.8	15:35	
			6						
			7						
			8						
	8 - 12 ft - fine to medium sand, light brown, moist		9	B-21 (8 - 12')	G	NA	2.4	15:40	
		▼	10						
			11						
			12						
	12 - 16 ft - fine to medium sand, med brown, wet		13	B-21 (12 - 16')	G	NA	1.8	15:45	Soil Sample "B-21 (12 - 16')" collected for VOCs
			14						
			15						
			16						
	16 - 20 ft - fine to medium sand, light to med brown, wet		17	B-21 (16 - 20')	G	NA	1.4	15:50	
			18						
			19						
			20						
	Boring Terminated at 20 ft BGS								

NOTES:
PID = Photoionization detector used in jar-headspace screening
BGS = Below Ground Surface
▼ = Ground water encountered
ppmv = parts per million by volume
ft = feet
G = Grab
C = Composite

Soil appears to be natural formation

TEST BORING LOG

SHEET 1

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Clean Soils Environmental

Site: 1 Oakland Street

Amesbury, MA

BORING B-22

PROJECT NO. 15-0622

DATE: June 10, 2015

Ground Elevation:
Date Started: June 10, 2015
Date Finished: June 10, 2015
Driller: G
Soil Engineer/Geologist: KM

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						3"	Asphalt.
1		1	13"	1'0"-3'0"	5-5-6-5	3'0"	Loose to medium dense fine sand, little inorganic silt, little medium to coarse sand, brick frags.
5		2	18"	5'0"-7'0"	1-2-6-8		Loose dense, fine sand and inorganic silt, fine to coarse gravel, cobbles
10		3	24"	10'0"-12'0"	12-15-24-21	9'0"	
15		4	18"	15'0"-17'0"	13-18-20-23		
20		5	16"	20'0"-22'0"	14-22-25-26		Medium dense to very dense, fine to coarse sand, inorganic silt, fine to coarse gravel, cobbles.
25		6	8"	25'0"-27'0"	19-24-27-30		
30		7	16"	30'0"-32'0"	21-25-28-32	30'0"	
35		8	2"	35'0"-37'0"	100/2"		Very dense, fine to coarse sand, inorganic silt, fine to coarse gravel, dry to wet.
39							

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 2

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Clean Soils Environmental

Site: 1 Oakland Street

Amesbury, MA

BORING B-22 (continued)

PROJECT NO. 15-0622

DATE: June 10, 2015

Ground Elevation:
Date Started: June 10, 2015
Date Finished: June 10, 2015
Driller: G
Soil Engineer/Geologist: KM

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
40		9	0"	40'0"-42'0"	21-24-36-41		
45						44'0"	End of boring at 44'0". Water encountered at 36'0". Well set at 43'0".
50							
55							
60							
65							
70							
75							
79							

Notes: Hollow Stem Auger Size - 4-1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

TEST BORING LOG

SHEET 3

Soil Exploration Corp.
Geotechnical Drilling
Groundwater Monitor Well
148 Pioneer Drive
Leominster, MA 01453
978 840-0391

Clean Soils Environmental
Site: 1 Oakland Street
Amesbury, MA

BORING B-23

PROJECT NO. 15-0622
DATE: June 10, 2015

Ground Elevation:
Date Started: June 10, 2015
Date Finished: June 10, 2015
Driller: G
Soil Engineer/Geologist: KM

GROUNDWATER OBSERVATIONS			
DATE	DEPTH	CASING	STABILIZATION

Depth Ft.	Casing bl/ft	Sample No.	Pen/Rec	Sample Depth	Blows/6"	Strata	Visual Identification of Soil and / or Rock Sample
						3"	Asphalt.
1		1	12"	1'0"-3'0"	4-5-5-6	3'0"	Medium dense fine sand, little inorganic silt, little medium to coarse sand.
5		2	17"	5'0"-7'0"	8-14-20-22		Medium dense, fine sand and inorganic silt, fine to coarse gravel, cobbles
10		3	16"	10'0"-12'0"	11-20-22-27	9'0"	
15		4	15"	15'0"-17'0"	24-24-27-28		Medium dense to very dense, fine to coarse sand, inorganic silt, fine to coarse gravel, cobbles.
20		5	17"	20'0"-22'0"	23-21-22-22	20'0"	
25		6	9"	25'0"-27'0"	47-75/4"		
30		7	0"	30'0"-32'0"	75/4"		Very dense, fine to coarse sand, inorganic silt, dry to wet.
35		8	0"	35'0"-37'0"	100/3"		End of boring at 36'0". Water encountered at 34'0". Well set at 35'0".

Notes: Hollow Stem Auger Size - 4 1/4"

Cohesionless: 0 - 4 V. Loose, 4 - 10 Loose, 10 -30 M Dense, 30 -50 Dense, 50+ V Dense.
Cohesive: 0 -2 V Soft, 2 -4 Soft, 4 -8 M Stiff 8 -15 Stiff, 15 -30 V. Stiff, 30 + Hard.

Trace	0 to 10%
Little	10 to 20%
Some	20 to 35%
And	35% to 50%

	CASING	SAMPLE	CORE TYPE
ID SIZE (IN)		SS	
HAMMER WGT (LB)		140 lb.	
HAMMER FALL (IN)		30"	

CLEAN SOILS ENVIRONMENTAL LTD

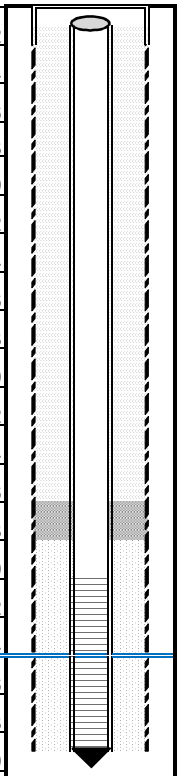
SOIL BORING LOG

ADDRESS:	1 - 9 Oakland St. Amesbury, MA	BORING/WELL ID:	**B-24 / CSE-8**
INSTALLED BY:	Technical Drilling Services	DATE:	7/6/2017
ENGINEER/GEOLOGIST:	Kevin McAndrews	PROJECT #:	2014.52
BORING LOCATION:	Oakland Street Roadway	TOTAL DEPTH: **40'**	WELL DIAMETER: 2"
DRILLING METHOD:	Hollow Stem Auger	WATER TABLE: **34'**	CONSTRUCTION: PVC

DEPTH (ft.)	SAMPLE ID	BLOWS PER 6"	PID (ppm)	LAB	DESCRIPTION
0 - 5'					No Recovery, Utility Clearance
5 - 7'	A	3,4,6,6	0.1		**SM**: fine sands w/ silt, olive gray to light brown, dry
10 - 12'	B	8,10,19,25	0.1		**SM**: fine sands w/ silty interbeds, tan to light brown, dry
15 - 17'	C	5,12,13,15	0		**SM-GM**: fine to crs sand, silty gravels, light to med brown, dry
20 - 22'	D	10,15,16,22	0.1		
25 - 27'	E	23,39,44,120	0.2		**SM-SC**: silty sand with clay interbeds, trace gravel, light to med brown, dry
30 - 32'	F	20,42,55,120	0		
35 - 37'	G	44,40,120	0.2	X	**SM-SC**: silty sand with clay interbeds, trace gravel, light to med brown, wet
					Boring Terminated at 40'

DEPTH BGS (ft): 0, 2, 4, 6, 8, 10, 12, 14, 16, 18, 20, 22, 24, 26, 28, 30, 32, 34, 36, 38, 40, 42, 44, 46, 48, 50

DIAGRAM



WELL CONSTRUCTION

Roadbox: YES

Native Fill/Grout: 0 - 26'

Bentonite Seal: 26 - 28'

PVC Riser: 0 - 30'

Sand Pack: 28 - 40'

Screen: 30 - 40'

Well Cap: @ 40'

Obv. Contam? N

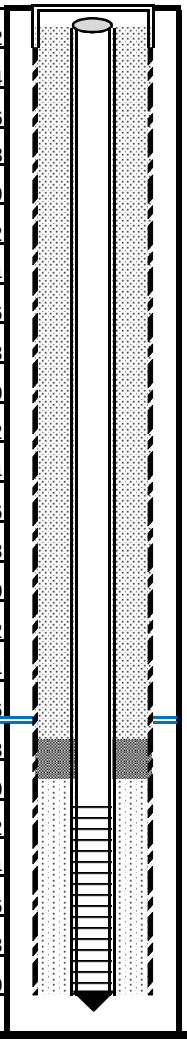
REMARKS:
Soils consist mainly of native glacial tills and glaciofluvial deposits
Bedrock refusal not encountered
No significant contamaintion observed

CLEAN SOILS ENVIRONMENTAL LTD

SOIL BORING LOG

ADDRESS:	1 - 9 Oakland St. Amesbury, MA	BORING/WELL ID:	**B-25 / CSE-9**
INSTALLED BY:	Technical Drilling Services	DATE:	8/28/2017
ENGINEER/GEOLOGIST:	Kevin McAndrews	PROJECT #:	2014.52
BORING LOCATION:	Oakland Street Roadway	TOTAL DEPTH: **50'**	WELL DIAMETER: 2"
DRILLING METHOD:	Hollow Stem Auger	WATER TABLE: **36'**	CONSTRUCTION: PVC

DEPTH (ft.)	SAMPLE ID	BLOWS PER 6"	PID (ppm)	LAB	DESCRIPTION
0 - 5'					No Recovery, Utility Clearance
5 - 7'	A	2,3,4,5	0.1		**ML**: silty, fine sands, trace clay, light to olive gray, dry
10 - 12'	B	2,4,5,6	0.1		
15 - 17'	C	2,4,5,7	0		**ML:** silty, fine sands, trace clay, light brown, dry
20 - 22'	D	3,6,7,10	0		
25 - 27'	E	9,23,10,13	0		**SM**: fine to med sands, light brown, dry
30 - 32'	F	22,26,30,34	0		**GW**: fine to med sand, gravels, light to med brown, dry
35 - 37'	G	20,17,22,27	0		**SM**: fine sand, silt, med brown, moist
40 - 42'	H	10,10,14,16	1.5	X	**ML:** silty, fine sands, trace clay, olive gray, moist
45 - 47'	I	9,13,22,17	0.3		
					Boring Terminated at 50'



Roadbox: YES

Native Fill/Grout: 0 - 37'

Bentonite Seal: 37 - 39'

PVC Riser: 0 - 40'

Sand Pack: 39 - 50'

Screen: 40 - 50'

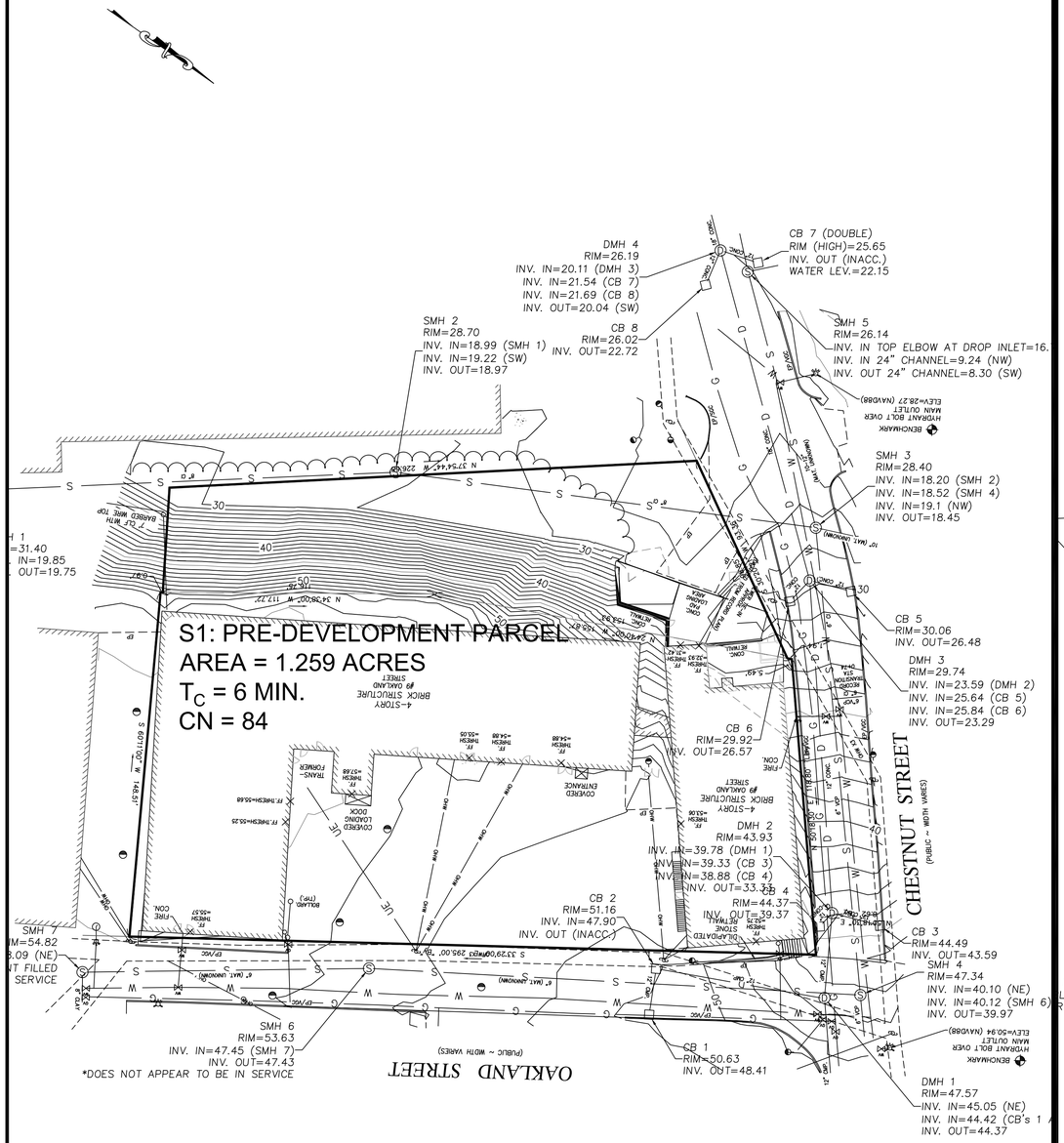
Well Cap: @ 50'

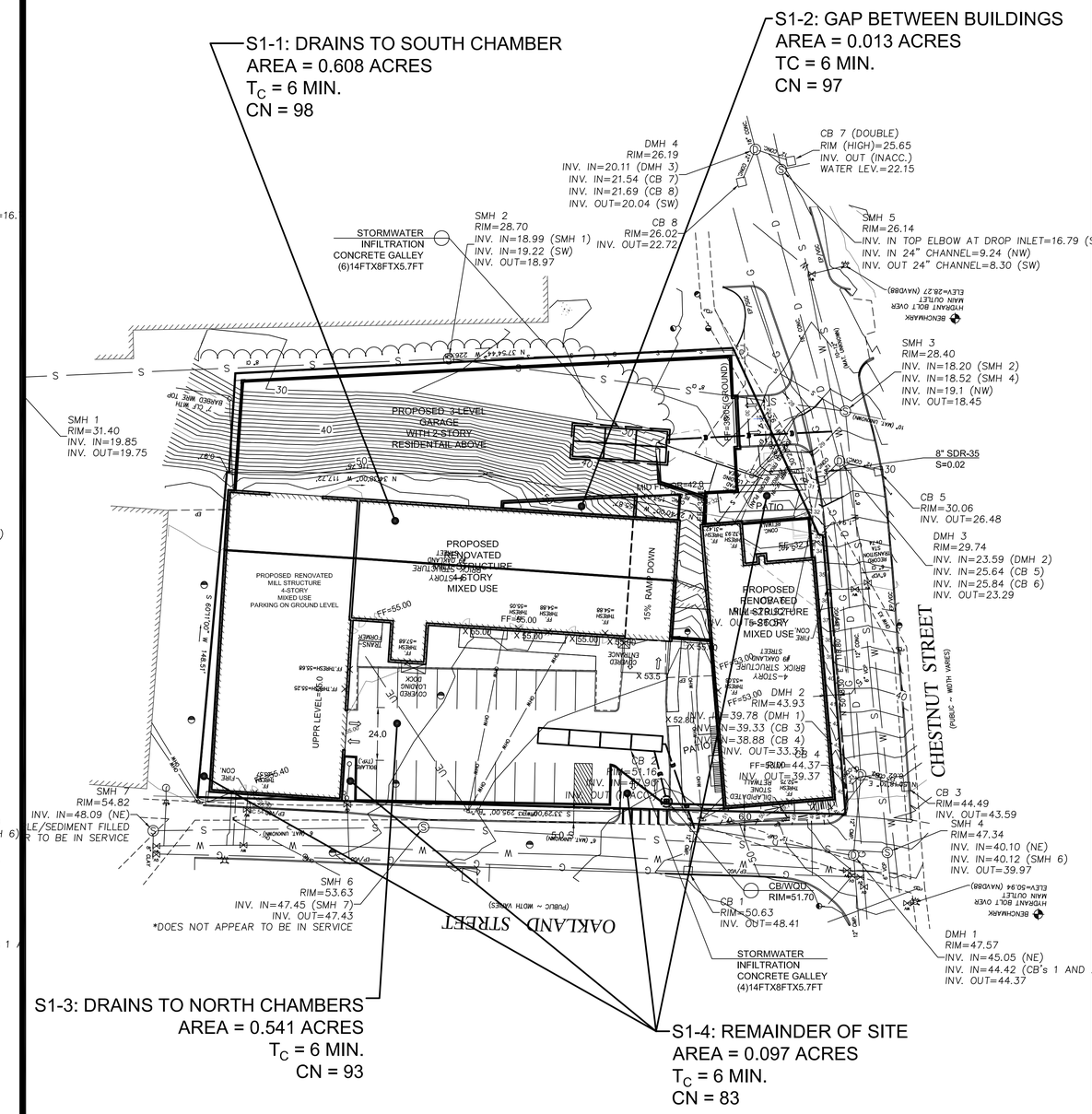
Obv. Contam? N

REMARKS: Soils consist mainly of native glacial tills and glaciofluvial deposits
Bedrock refusal not encountered
No significant contamaintion observed

ATTACHMENT 3)

PRE- & POST DEVELOPMENT DRAINAGE AREAS





PRE-DEVELOPMENT

1" = 30'

POST-DEVELOPMENT

1" = 30'

NORTH

MEI
MILLENNIUM ENGINEERING, INC.
ENGINEERING AND LAND SURVEYING
62 ELM ST. SALISBURY, MA 01952
(978) 463-8980

OWNER:

SWEET MANAGEMENT
9 OAKLAND STREET
AMESBURY, MA

PROJECT TEAM

9 OAKLAND ST
CARRIAGE HILL LOFTS
4-STORY BUILDING WITH GARAGE
9 OAKLAND STREET
AMESBURY, MA

PROJECT INFO

REV	DESCRIPTION	DATE

STAMP:

PRE-, POST-, DRAINAGE PLAN

SHEET NAME:

1 OF 1

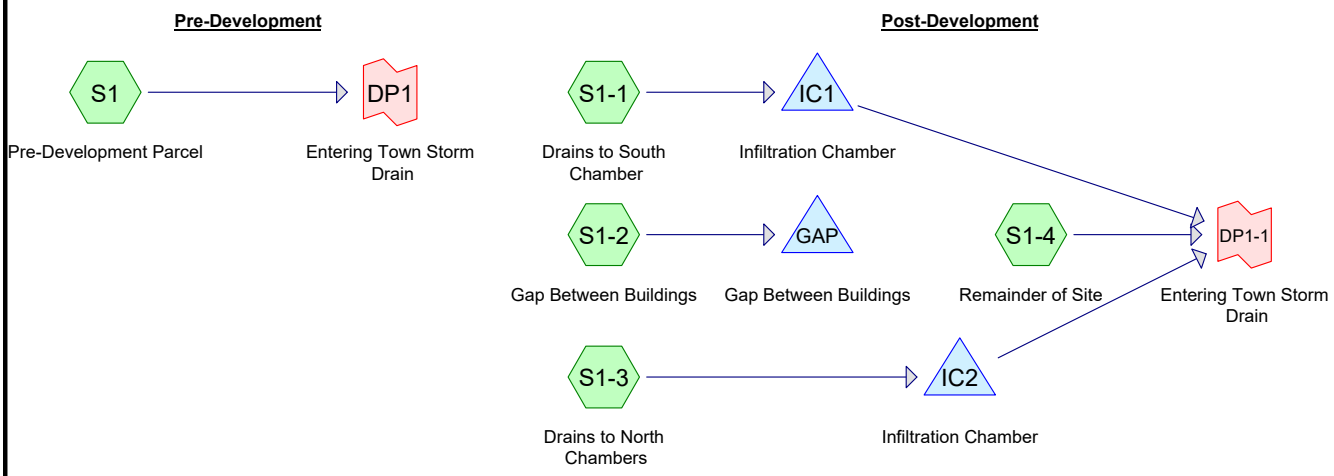
SHT NO:

DR BY: SBS
CHK BY: AM
PROJ NO: M254459
DATE: SEPT. 19, 2025
SCALE: AS NOTED

E:\sdskproj-2025\M254459\DWG\M254459-D.dwg

ATTACHMENT 4)

HYDROCAD HYDROLOGY PRINTOUT



Subcat Reach Pond Link

Routing Diagram for M254459-Redevelopment
Prepared by Millennium Engineering, Inc, Printed 9/18/2025

Rainfall Events Listing

Event#	Event Name	Storm Type	Curve	Mode	Duration (hours)	B/B	Depth (inches)	AMC
1	2-Year	NOAA10 24-hr	D	Default	24.00	1	3.24	2
2	10-Year	NOAA10 24-hr	D	Default	24.00	1	5.12	2
3	25-Year	NOAA10 24-hr	D	Default	24.00	1	6.30	2
4	100-Year	NOAA10 24-hr	D	Default	24.00	1	8.11	2

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.060	0.000	0.000	0.000	0.000	0.060	50-75% Grass cover, Fair	S1
0.065	0.000	0.000	0.000	0.000	0.065	>75% Grass cover, Good	S1-3, S1-4
0.067	0.000	0.000	0.000	0.000	0.067	Fallow, bare soil	S1
0.026	0.000	0.000	0.000	0.000	0.026	Gravel surface	S1-2, S1-4
1.201	0.000	0.000	0.000	0.000	1.201	Paved parking	S1, S1-3, S1-4
0.866	0.000	0.000	0.000	0.000	0.866	Roofs	S1-1, S1-2, S1-3
0.234	0.000	0.000	0.000	0.000	0.234	Woods/grass comb., Fair	S1

Time span=0.00-27.00 hrs, dt=0.015 hrs, 1801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Pre-Development Parcel Runoff Area=54,851 sf 71.33% Impervious Runoff Depth=1.72"
Tc=6.0 min CN=84 Runoff=2.70 cfs 0.180 af

Subcatchment S1-1: Drains to South Chamber Runoff Area=26,466 sf 100.00% Impervious Runoff Depth=3.01"
Tc=6.0 min CN=98 Runoff=1.98 cfs 0.152 af

Subcatchment S1-2: Gap Between Buildings Runoff Area=561 sf 37.79% Impervious Runoff Depth=2.90"
Tc=6.0 min CN=97 Runoff=0.04 cfs 0.003 af

Subcatchment S1-3: Drains to North Chambers Runoff Area=23,589 sf 92.16% Impervious Runoff Depth=2.48"
Tc=6.0 min CN=93 Runoff=1.60 cfs 0.112 af

Subcatchment S1-4: Remainder of Site Runoff Area=4,235 sf 58.84% Impervious Runoff Depth=1.72"
Tc=6.0 min CN=84 Runoff=0.21 cfs 0.014 af

Pond GAP: Gap Between Buildings Peak Elev=54.51' Storage=2 cf Inflow=0.04 cfs 0.003 af
Outflow=0.04 cfs 0.003 af

Pond IC1: Infiltration Chamber Peak Elev=24.93' Storage=1,519 cf Inflow=1.98 cfs 0.152 af
Discarded=0.28 cfs 0.152 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.28 cfs 0.152 af

Pond IC2: Infiltration Chamber Peak Elev=48.07' Storage=1,242 cf Inflow=1.60 cfs 0.112 af
Discarded=0.20 cfs 0.112 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.20 cfs 0.112 af

Link DP1: Entering Town Storm Drain Inflow=2.70 cfs 0.180 af
Primary=2.70 cfs 0.180 af

Link DP1-1: Entering Town Storm Drain Inflow=0.21 cfs 0.014 af
Primary=0.21 cfs 0.014 af

Time span=0.00-27.00 hrs, dt=0.015 hrs, 1801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Pre-Development Parcel Runoff Area=54,851 sf 71.33% Impervious Runoff Depth=3.38"
Tc=6.0 min CN=84 Runoff=5.22 cfs 0.355 af

Subcatchment S1-1: Drains to South Chamber Runoff Area=26,466 sf 100.00% Impervious Runoff Depth=4.88"
Tc=6.0 min CN=98 Runoff=3.16 cfs 0.247 af

Subcatchment S1-2: Gap Between Buildings Runoff Area=561 sf 37.79% Impervious Runoff Depth=4.77"
Tc=6.0 min CN=97 Runoff=0.07 cfs 0.005 af

Subcatchment S1-3: Drains to North Chambers Runoff Area=23,589 sf 92.16% Impervious Runoff Depth=4.32"
Tc=6.0 min CN=93 Runoff=2.68 cfs 0.195 af

Subcatchment S1-4: Remainder of Site Runoff Area=4,235 sf 58.84% Impervious Runoff Depth=3.38"
Tc=6.0 min CN=84 Runoff=0.40 cfs 0.027 af

Pond GAP: Gap Between Buildings Peak Elev=54.51' Storage=3 cf Inflow=0.07 cfs 0.005 af
Outflow=0.07 cfs 0.005 af

Pond IC1: Infiltration Chamber Peak Elev=26.31' Storage=2,411 cf Inflow=3.16 cfs 0.247 af
Discarded=0.35 cfs 0.229 af Primary=0.89 cfs 0.018 af Secondary=0.00 cfs 0.000 af Outflow=1.24 cfs 0.247 af

Pond IC2: Infiltration Chamber Peak Elev=49.82' Storage=2,038 cf Inflow=2.68 cfs 0.195 af
Discarded=0.26 cfs 0.178 af Primary=0.94 cfs 0.017 af Secondary=0.00 cfs 0.000 af Outflow=1.20 cfs 0.195 af

Link DP1: Entering Town Storm Drain Inflow=5.22 cfs 0.355 af
Primary=5.22 cfs 0.355 af

Link DP1-1: Entering Town Storm Drain Inflow=2.00 cfs 0.062 af
Primary=2.00 cfs 0.062 af

Time span=0.00-27.00 hrs, dt=0.015 hrs, 1801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Pre-Development Parcel Runoff Area=54,851 sf 71.33% Impervious Runoff Depth=4.48"
Tc=6.0 min CN=84 Runoff=6.82 cfs 0.470 af

Subcatchment S1-1: Drains to South Chamber Runoff Area=26,466 sf 100.00% Impervious Runoff Depth=6.06"
Tc=6.0 min CN=98 Runoff=3.89 cfs 0.307 af

Subcatchment S1-2: Gap Between Buildings Runoff Area=561 sf 37.79% Impervious Runoff Depth=5.94"
Tc=6.0 min CN=97 Runoff=0.08 cfs 0.006 af

Subcatchment S1-3: Drains to North Chambers Runoff Area=23,589 sf 92.16% Impervious Runoff Depth=5.48"
Tc=6.0 min CN=93 Runoff=3.35 cfs 0.247 af

Subcatchment S1-4: Remainder of Site Runoff Area=4,235 sf 58.84% Impervious Runoff Depth=4.48"
Tc=6.0 min CN=84 Runoff=0.53 cfs 0.036 af

Pond GAP: Gap Between Buildings Peak Elev=54.52' Storage=6 cf Inflow=0.08 cfs 0.006 af
Outflow=0.07 cfs 0.006 af

Pond IC1: Infiltration Chamber Peak Elev=26.85' Storage=2,761 cf Inflow=3.89 cfs 0.307 af
Discarded=0.38 cfs 0.266 af Primary=1.81 cfs 0.041 af Secondary=0.00 cfs 0.000 af Outflow=2.19 cfs 0.307 af

Pond IC2: Infiltration Chamber Peak Elev=50.37' Storage=2,283 cf Inflow=3.35 cfs 0.247 af
Discarded=0.28 cfs 0.207 af Primary=2.24 cfs 0.040 af Secondary=0.00 cfs 0.000 af Outflow=2.52 cfs 0.247 af

Link DP1: Entering Town Storm Drain Inflow=6.82 cfs 0.470 af
Primary=6.82 cfs 0.470 af

Link DP1-1: Entering Town Storm Drain Inflow=4.38 cfs 0.118 af
Primary=4.38 cfs 0.118 af

Time span=0.00-27.00 hrs, dt=0.015 hrs, 1801 points x 2
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment S1: Pre-Development Parcel Runoff Area=54,851 sf 71.33% Impervious Runoff Depth=6.20"
Tc=6.0 min CN=84 Runoff=9.28 cfs 0.651 af

Subcatchment S1-1: Drains to South Chamber Runoff Area=26,466 sf 100.00% Impervious Runoff Depth=7.87"
Tc=6.0 min CN=98 Runoff=5.02 cfs 0.398 af

Subcatchment S1-2: Gap Between Buildings Runoff Area=561 sf 37.79% Impervious Runoff Depth=7.75"
Tc=6.0 min CN=97 Runoff=0.11 cfs 0.008 af

Subcatchment S1-3: Drains to North Chambers Runoff Area=23,589 sf 92.16% Impervious Runoff Depth=7.27"
Tc=6.0 min CN=93 Runoff=4.37 cfs 0.328 af

Subcatchment S1-4: Remainder of Site Runoff Area=4,235 sf 58.84% Impervious Runoff Depth=6.20"
Tc=6.0 min CN=84 Runoff=0.72 cfs 0.050 af

Pond GAP: Gap Between Buildings Peak Elev=54.54' Storage=15 cf Inflow=0.11 cfs 0.008 af
Outflow=0.07 cfs 0.008 af

Pond IC1: Infiltration Chamber Peak Elev=27.56' Storage=3,222 cf Inflow=5.02 cfs 0.398 af
Discarded=0.42 cfs 0.317 af Primary=3.52 cfs 0.082 af Secondary=0.00 cfs 0.000 af Outflow=3.94 cfs 0.398 af

Pond IC2: Infiltration Chamber Peak Elev=50.58' Storage=2,378 cf Inflow=4.37 cfs 0.328 af
Discarded=0.29 cfs 0.248 af Primary=3.99 cfs 0.080 af Secondary=0.00 cfs 0.000 af Outflow=4.28 cfs 0.328 af

Link DP1: Entering Town Storm Drain Inflow=9.28 cfs 0.651 af
Primary=9.28 cfs 0.651 af

Link DP1-1: Entering Town Storm Drain Inflow=7.82 cfs 0.212 af
Primary=7.82 cfs 0.212 af

Summary for Subcatchment S1: Pre-Development Parcel

Runoff = 9.28 cfs @ 12.13 hrs, Volume= 0.651 af, Depth= 6.20"
Routed to Link DP1 : Entering Town Storm Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-27.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
10,210	43	Woods/grass comb., Fair, HSG A
2,592	49	50-75% Grass cover, Fair, HSG A
2,925	77	Fallow, bare soil, HSG A
39,124	98	Paved parking, HSG A
54,851	84	Weighted Average
15,727		28.67% Pervious Area
39,124		71.33% Impervious Area

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

Summary for Subcatchment S1-1: Drains to South Chamber

Runoff = 5.02 cfs @ 12.13 hrs, Volume= 0.398 af, Depth= 7.87"
Routed to Pond IC1 : Infiltration Chamber

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-27.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
26,466	98	Roofs, HSG A
26,466		100.00% Impervious Area

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

Summary for Subcatchment S1-2: Gap Between Buildings

Runoff = 0.11 cfs @ 12.13 hrs, Volume= 0.008 af, Depth= 7.75"
Routed to Pond GAP : Gap Between Buildings

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-27.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
349	96	Gravel surface, HSG A
212	98	Roofs, HSG A
561	97	Weighted Average
349		62.21% Pervious Area
212		37.79% Impervious Area

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

Summary for Subcatchment S1-3: Drains to North Chambers

Runoff = 4.37 cfs @ 12.13 hrs, Volume= 0.328 af, Depth= 7.27"
Routed to Pond IC2 : Infiltration Chamber

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-27.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
11,029	98	Roofs, HSG A
10,710	98	Paved parking, HSG A
1,850	39	>75% Grass cover, Good, HSG A
23,589	93	Weighted Average
1,850		7.84% Pervious Area
21,739		92.16% Impervious Area

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

Summary for Subcatchment S1-4: Remainder of Site

Runoff = 0.72 cfs @ 12.13 hrs, Volume= 0.050 af, Depth= 6.20"
Routed to Link DP1-1 : Entering Town Storm Drain

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-27.00 hrs, dt= 0.015 hrs
NOAA10 24-hr D 100-Year Rainfall=8.11"

Area (sf)	CN	Description
960	39	>75% Grass cover, Good, HSG A
783	96	Gravel surface, HSG A
2,492	98	Paved parking, HSG A
4,235	84	Weighted Average
1,743		41.16% Pervious Area
2,492		58.84% Impervious Area

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

Summary for Pond GAP: Gap Between Buildings

Inflow Area = 0.013 ac, 37.79% Impervious, Inflow Depth = 7.75" for 100-Year event
Inflow = 0.11 cfs @ 12.13 hrs, Volume= 0.008 af
Outflow = 0.07 cfs @ 12.19 hrs, Volume= 0.008 af, Atten= 37%, Lag= 3.8 min
Discarded = 0.07 cfs @ 12.19 hrs, Volume= 0.008 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-27.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 54.54' @ 12.19 hrs Surf.Area= 349 sf Storage= 15 cf
Flood Elev= 55.00' Surf.Area= 349 sf Storage= 175 cf

Plug-Flow detention time= 1.1 min calculated for 0.008 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (750.5 - 749.3)

Volume	Invert	Avail.Storage	Storage Description
#1	54.50'	454 cf	**Open Area (Prismatic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
54.50	349	0	0
55.00	349	175	175
55.01	561	5	179
55.50	561	275	454

Device	Routing	Invert	Outlet Devices
#1	Discarded	54.50'	**8.270 in/hr Exfiltration over Surface area below 55.00'** Conductivity to Groundwater Elevation = 41.00' Phase-In= 0.01'

Discarded OutFlow Max=0.07 cfs @ 12.19 hrs HW=54.54' (Free Discharge)
↑**1=Exfiltration** (Controls 0.07 cfs)

Summary for Pond IC1: Infiltration Chamber

Inflow Area = 0.608 ac,100.00% Impervious, Inflow Depth = 7.87" for 100-Year event
Inflow = 5.02 cfs @ 12.13 hrs, Volume= 0.398 af
Outflow = 3.94 cfs @ 12.17 hrs, Volume= 0.398 af, Atten= 21%, Lag= 2.7 min
Discarded = 0.42 cfs @ 12.17 hrs, Volume= 0.317 af
Primary = 3.52 cfs @ 12.17 hrs, Volume= 0.082 af
Routed to Link DP1-1 : Entering Town Storm Drain
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-27.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 27.56' @ 12.17 hrs Surf.Area= 792 sf Storage= 3,222 cf

Plug-Flow detention time= 39.7 min calculated for 0.398 af (100% of inflow)
Center-of-Mass det. time= 39.7 min (782.2 - 742.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	22.33'	431 cf	**18.00'W x 44.00'L x 6.17'H Field A** 4,887 cf Overall - 3,810 cf Embedded = 1,076 cf x 40.0% Voids
#2A	22.83'	3,000 cf	**Shea Leaching Chamber 8x14x5.7** x 6 Inside #1 Inside= 84.0"W x 60.0"H => 38.46 sf x 13.00'L = 500.0 cf Outside= 96.0"W x 68.0"H => 45.36 sf x 14.00'L = 635.0 cf 6 Chambers in 2 Rows
		3,431 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Secondary	28.50'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	22.33'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 15.00' Phase-In= 0.01'
#2	Primary	25.75'	**9.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	27.35'	**12.0" Horiz. Orifice/Grate** C= 0.600 in 13.5" Grate (79% open area) Limited to weir flow at low heads

Discarded OutFlow Max=0.42 cfs @ 12.17 hrs HW=27.55' (Free Discharge)
└**1=Exfiltration** (Controls 0.42 cfs)

Primary OutFlow Max=3.49 cfs @ 12.17 hrs HW=27.55' TW=0.00' (Dynamic Tailwater)
├**2=Orifice/Grate** (Orifice Controls 2.54 cfs @ 5.76 fps)
└**3=Orifice/Grate** (Weir Controls 0.94 cfs @ 1.48 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=22.33' (Free Discharge)

Summary for Pond IC2: Infiltration Chamber

Inflow Area = 0.542 ac, 92.16% Impervious, Inflow Depth = 7.27" for 100-Year event
Inflow = 4.37 cfs @ 12.13 hrs, Volume= 0.328 af
Outflow = 4.28 cfs @ 12.14 hrs, Volume= 0.328 af, Atten= 2%, Lag= 0.8 min
Discarded = 0.29 cfs @ 12.14 hrs, Volume= 0.248 af
Primary = 3.99 cfs @ 12.14 hrs, Volume= 0.080 af
Routed to Link DP1-1 : Entering Town Storm Drain
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-27.00 hrs, dt= 0.015 hrs / 2
Peak Elev= 50.58' @ 12.14 hrs Surf.Area= 580 sf Storage= 2,378 cf

Plug-Flow detention time= 49.8 min calculated for 0.328 af (100% of inflow)
Center-of-Mass det. time= 49.7 min (821.2 - 771.5)

Volume	Invert	Avail.Storage	Storage Description
#1A	45.08'	415 cf	**10.00'W x 58.00'L x 6.17'H Field A** 3,579 cf Overall - 2,540 cf Embedded = 1,038 cf x 40.0% Voids
#2A	45.58'	2,000 cf	**Shea Leaching Chamber 8x14x5.7** x 4 Inside #1 Inside= 84.0"W x 60.0"H => 38.46 sf x 13.00'L = 500.0 cf Outside= 96.0"W x 68.0"H => 45.36 sf x 14.00'L = 635.0 cf
		2,415 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#0	Secondary	51.25'	**Automatic Storage Overflow** (Discharged without head)
#1	Discarded	45.08'	**8.270 in/hr Exfiltration over Wetted area** Conductivity to Groundwater Elevation = 17.50' Phase-In= 0.01'
#2	Primary	49.25'	**9.0" Vert. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Primary	50.25'	**12.0" Horiz. Orifice/Grate** C= 0.600 in 13.5" Grate (79% open area) Limited to weir flow at low heads

Discarded OutFlow Max=0.29 cfs @ 12.14 hrs HW=50.57' (Free Discharge)
└**1=Exfiltration** (Controls 0.29 cfs)

Primary OutFlow Max=3.96 cfs @ 12.14 hrs HW=50.57' TW=0.00' (Dynamic Tailwater)
├**2=Orifice/Grate** (Orifice Controls 2.07 cfs @ 4.69 fps)
└**3=Orifice/Grate** (Weir Controls 1.89 cfs @ 1.86 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=45.08' (Free Discharge)

Summary for Link DP1: Entering Town Storm Drain

Inflow Area = 1.259 ac, 71.33% Impervious, Inflow Depth = 6.20" for 100-Year event
Inflow = 9.28 cfs @ 12.13 hrs, Volume= 0.651 af
Primary = 9.28 cfs @ 12.13 hrs, Volume= 0.651 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-27.00 hrs, dt= 0.015 hrs

Summary for Link DP1-1: Entering Town Storm Drain

Inflow Area = 1.246 ac, 93.38% Impervious, Inflow Depth = 2.04" for 100-Year event
Inflow = 7.82 cfs @ 12.16 hrs, Volume= 0.212 af
Primary = 7.82 cfs @ 12.16 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-27.00 hrs, dt= 0.015 hrs

ATTACHMENT 5)

STORMWATER MANAGEMENT OPERATION & MAINTENANCE PLAN

MILLENNIUM ENGINEERING, INC.
Land Surveyors and Civil Engineers

LONG-TERM POLLUTION PREVENTION AND OPERATION & MAINTENANCE PLAN FOR STORMWATER MANAGEMENT

AT

CARRIAGE HILL LOFTS
9 OAKLAND ST.
AMESBURY, MA

PREPARED FOR

9 OAKLAND STREET AMESBURY LLC.
PO BOX 999
DANVILLE, NH 03819

DATE: 9/19/2025

Massachusetts:

62 Elm Street
Salisbury, MA 01952
Phone: 978-463-8980

New Hampshire:

13 Hampton Road
Exeter, NH 03833
Phone: 603-778-0528

INTRODUCTION

This long-term Stormwater Management System Operations and Maintenance (O&M) Plan, filed with the City of Amesbury, shall be implemented for the proposed Carriage Hill Lofts redevelopment to ensure that the stormwater management system functions as designed. The Owner holds the primary responsibility for overseeing and implementing the O&M Plan and assigning a Property Manager who will be responsible for the proper operation and maintenance of the stormwater structures. In case of transfer of property ownership, future property owners shall be notified of the presence of the stormwater management system and the requirements for proper implementation of the O&M Plan. Included in the manual is a Stormwater Management O&M Plan identifying the key components of the stormwater system and a log for tracking inspections and maintenance.

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 number of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular vacuuming and litter removal, and prohibitions on the use of pesticides.

The purpose of the Stormwater Operations and Maintenance (O&M) plan is to ensure inspection of the system, removal of accumulated sediments, oils, and debris, and implementation of corrective action and record keeping activities.

The ongoing responsibility is the Owner, its successors, and assigns. Adequate maintenance is defined in this document as good working condition.

Contact information is provided below:

Responsibility for Operations and Maintenance
Dale Development. LLC
360 Washington Street
Rye, NH

ILLICIT DISCHARGE COMPLIANCE STATEMENT:

I,_____ (Signing on behalf of the owner Sweet Management, Inc.) verify that all illicit discharges to the stormwater management system are prohibited and no illicit discharges exist on the site.

FINAL STABILIZATION

Permanent Seeding

Loam and hydroseed any disturbed surfaces after the final design grades have been achieved. A minimum of 6" of loam shall be installed. Seed mix shall be a maximum of 10% rye grass and a minimum of 90% permanent bluegrass and/or fescue. Lime shall be applied at a rate of 2 tons/acre.

Construction debris, trash and temporary BMPs (including silt fences, material storage areas, and inlet protection) will also be removed and any areas disturbed during removal will be seeded immediately.

POST CONSTRUCTION BMP'S

Snow and Snow Melt Management

Proper management of snow and snow melt, snow removal and storage, use of deicing compounds, and other practices can minimize major runoff and pollutant loading impacts. Snow will be stored in areas adjacent to the edge of the roadway. Use of alternative deicing compounds, such as calcium chloride and calcium magnesium acetate, will be investigated for use. Professional services will be used for snow management.

Deep Sump/Hooded Catch Basins

Deep sump/hooded catch basins are incorporated in the proposed development's stormwater management plan as pre-treatment for the proposed drainage system. The sump provides for settlement of suspended solids and a hood is provided to remove floatables and trapped hydrocarbons. It is not anticipated that the proposed roadway will become an area of high sediment loading. The sump should be inspected and cleaned at least four times per year; the more frequent the cleaning, the less likely sediment will be resuspended and subsequently discharged. Catch basin sediments and debris shall be disposed of at an approved DEP landfill. The owner shall be responsible for the catch basin cleaning operations.

Infiltration Chamber

Infiltration chambers are incorporated into the site design for infiltration. The chambers shall be inspected after every major storm event in the first 4 months after construction to ensure proper function. Inspection ports shall be utilized for access and assessment. After the four-month period, the chambers shall be inspected a minimum of twice per year. Any grit or sediment found within the chambers impacting infiltration shall be removed by manual or mechanical methods, such as a vacuum truck. The Condominium Association will be responsible for proper maintenance of the subsurface systems.

Rip Rap

Inspect the rip rap outlets regularly, especially after major storm events. Notation of any low spots or erosion should be made.

LONG-TERM OPERATION AND MAINTENANCE PLAN

Good Housekeeping

The site shall be regularly inspected for any trash and debris. Any trash or debris shall be picked up and placed into waste containers.

Storing of materials and waste products inside or under cover

It is not anticipated that there will be storing of materials or waste products on site. If any materials are to be stored, they shall be stored inside or under cover.

Spill Control/Notification Practices

In addition to the good housekeeping and material management practices discussed above, the following practices will be followed for spill control, notification, and cleanup:

a) Manufacturer's recommended methods for spill cleanup will be clearly posted, and project area personnel will be informed of the procedures and the location of the information and cleanup supplies.
b) Materials and equipment necessary for spill cleanup will be kept in the material storage area on- site. Equipment and materials will include, but will not be limited to, shovels, wheelbarrows, brooms, dust pans, mops, rags, gloves, goggles, kitty litter or Speedi-Dry, sand, sawdust, and plastic and metal trash containers specifically designated for this purpose.
c) All spills will be cleaned up immediately after discovery.
d) The spill area will be kept well ventilated, and personnel will wear protective clothing to prevent injury from contact with a hazardous substance.
e) Spills of toxic or hazardous material in excess of reportable quantities, as established in the Massachusetts Contingency Plan (MCP), will be reported to the Massachusetts Department of Environmental Protection Division of Hazardous Waste [617) 292-5851 or (978) 661-7679].
f) The construction superintendent responsible for the daily operations will be the spill prevention and cleanup coordinator. He will designate at least three other project area personnel to receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of the responsible spill personnel will be posted in the material storage area and in the on-site office trailer.

Lawn Care

All lawn clippings, leaves, mulch, and any other landscaping items shall be kept out of storm drains. The use of pesticides and fertilizers on the lawn shall never be applied before a rain event. Only approved aquatic safe herbicides shall be allowed. The application of any fertilizers or pesticides shall be in accordance with the Manufacturer’s specifications.

Vehicle Washing

No harmful soaps or chemicals that are detrimental to the environment may be used in washing of cars or other items on the property.

Pet Waste Collection

Pet owners shall be responsible for picking up and disposing of all pet waste into waste containers.

Waste Collection

All trash and waste shall be placed in the dumpster on site. The cover to the dumpster shall remain closed at all times. Any trash or debris found on site shall be disposed of in the dumpster. Regular pickup of the dumpster shall occur to avoid the waste exceeding the dumpster capacity.

Snow and Snow Melt Management

Proper management of snow and snow melt, snow removal and storage, use of deicing compounds, and other practices can minimize major runoff and pollutant loading impacts. Snow will be stored in areas adjacent to the edge of the roadway. Use of alternative deicing compounds, such as calcium chloride and calcium magnesium acetate, will be investigated for use. Professional services will be used for snow management.

Street Sweeping:

The driveway and parking area shall be swept every spring season after the last snowfall. All sediment shall be removed and discarded off the property in accordance with all Local, State and Federal regulations.

Training

The individual who will be responsible for the inspection and maintenance of the stormwater system shall be trained by the previous person responsible or by contacting a local engineer for assistance.