



Andrews Survey & Engineering, Inc.

Land Surveying - Civil Engineering - Site Planning

Stormwater Management Report

April 18, 2019

Project:

**Cultivate Burncoat
22 Burncoat Street
Leicester, MA 01524**

Assessors Map/Lot:

Map 18B, Parcels B11 & B12

Applicant:

**Cultivate Holdings LLC
P.O. Box 245
Leicester, MA 01524**

Owner:

**Frank A. Germaine
67 Millbrook Street, Suite 100
Worcester, MA 01606**

Representative:

**Andrews Survey & Engineering, Inc.
104 Mendon Street
Uxbridge, MA 01569**

ASE JN: 2019-049



Uxbridge

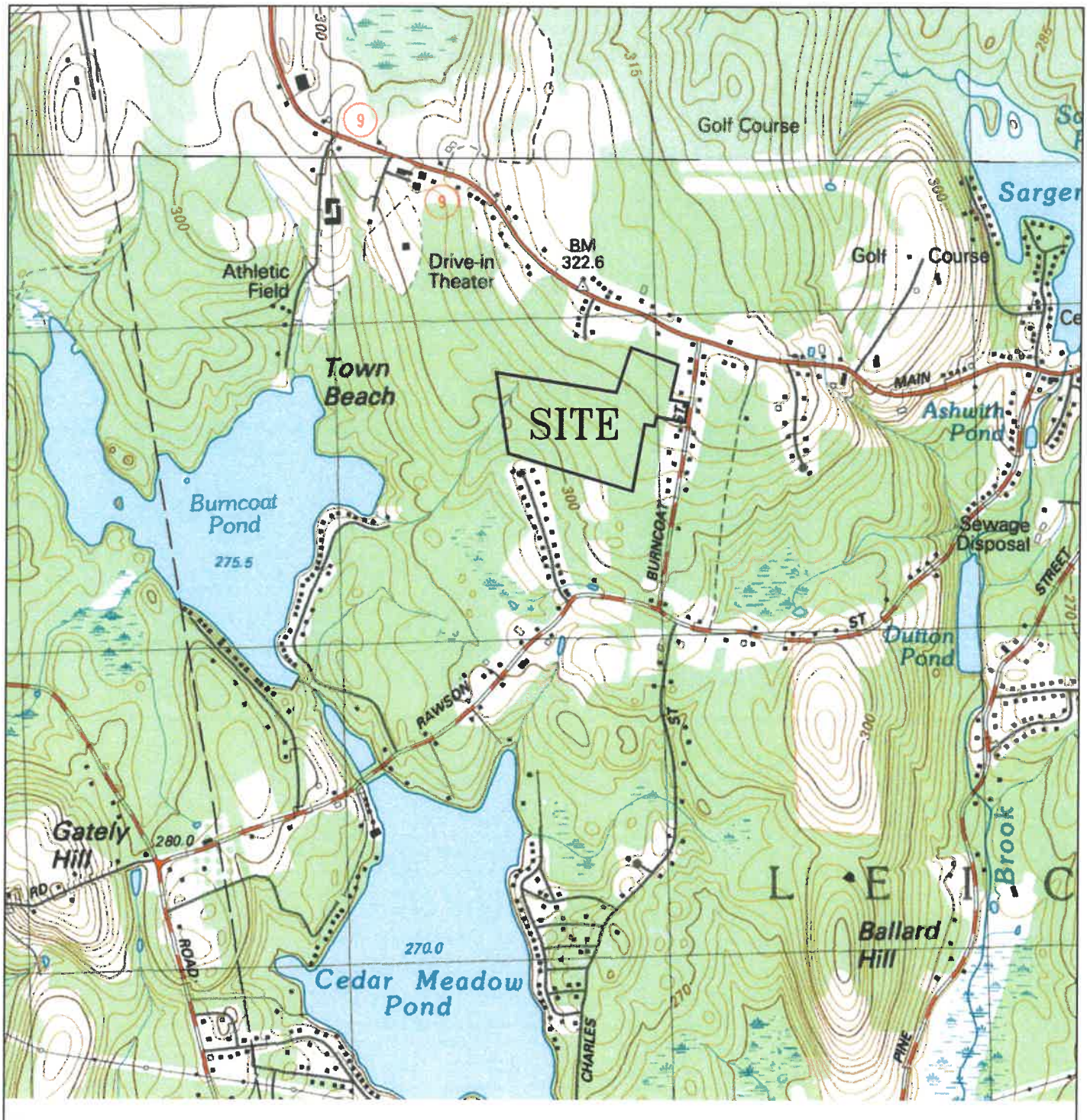
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North Attleboro

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U.S.G.S. LOCUS MAP

SCALE: 1"=1500'

**CULTIVATE BURNCOAT
22 BURNCOAT STREET
LEICESTER, MASSACHUSETTS**



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FIGURE 1.0

STORMWATER MANAGEMENT REPORT

**“Cultivate Burncoat”
22 Burncoat Street
Leicester, MA**

April 18, 2019

Prepared for:

Cultivate Holdings LLC
P.O. Box 245
Leicester, MA 01524

Prepared by:

Andrews Survey & Engineering, Inc.
P.O. Box 312, 104 Mendon Street
Uxbridge, MA 01569

ASE Project #2019-049

Prepared by: _____



Travis R. Brown



Reviewed by: _____


4/23/19

Richard M. Mainville, P.E.

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PART 1 – SUMMARY

1.0 PROJECT DESCRIPTION

The proposed project consists of an approximately 132,325 s.f. building containing greenhouses and a processing center located at 22 Burncoat Street and is an allowed use in the Highway Business-Industrial District 1 (HB-1) zoning district and is defined as “Marijuana Establishment.”. The site is located approximately 660 feet southerly of the intersection of Burncoat Street and Main Street (Route 9) and is bounded to the north by a currently vacant building, undeveloped parcels and a single-family home accessed from Main Street (Route 9), to the west by undeveloped properties, to the south by a residential subdivision on Pine Ridge Road and an undeveloped property, on the east by single-families residential properties and Burncoat Street.

The existing site consists an existing single-family house a garage and shed and approximately 39 acres of undeveloped wooded land. The topography of the existing project site consists of land sloping from the northeast to the southwest with a grade change of approximately 28 feet across the project area. The existing grade at Burncoat Street at the project entrance is approximately elevation 1037 and the elevation at the proposed building entrance is approximately 1030.

According to the USDA’s Web Soil Survey, the subject parcels consist of hydrologic soil group classification C. The subject parcels do not have any known water protection districts or wellhead protection areas, areas of critical environmental concerns (ACEC’s), NHESP Estimated or Priority Habitats, or Activity and Use Limitation areas (AUL). The subject site has three (3) wetland resource areas and associated buffer zones within the property limits. Two (2) of the wetland resource areas are located to the southwest of the project area and one (1) is located to the northwest of the project area.

This proposed establishment will consist of two (2) approximately 55,600 s.f of greenhouse space and one (1) approximately 21,100 s.f. processing area centered between the greenhouses. The proposed facility will contain 66 parking vehicular parking spaces and a loading lock providing access into the processing center. Water and sewer will be provided from Main Street (Route 9) down Burncoat Street to the site. Electric and communications will be provided from existing utility poles on Burncoat Street in the vicinity of the facility entrance. The project includes a stormwater management system designed in accordance with MassDEP Stormwater Management Handbook. As shown in the attached Stormwater Management Report, the project will incorporate Best Management Practices (BMP’s), which include deep sump catch basins, a surface infiltration basin and a long-term pollution prevention operations and maintenance plan for the proposed facility.

2.0 BACKGROUND DATA

Soils explorations were performed on the property by Andrews Survey & Engineering, Inc. on April 11, 2019. The U.S. Natural Resources Conservation Service (NRCS), formerly SCS Soil Survey Maps indicate that soils with hydrologic soil group classification C are present on the site, see Part IV of this report.

Soils mapping indicates the following:

- 307B – Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony (Hydrologic Soil Group Classification - C)
- 310B – Woodbridge fine sandy loam, 3 to 8 percent slopes (Hydrologic Soil Group Classification - C)
- 312B – Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony (Hydrologic Soil Group Classification - C)

3.0 COMPLIANCE WITH STORMWATER STANDARDS

3.1 Untreated Stormwater (Standard 1)

The project is designed so that new stormwater conveyances (outfalls/ discharges) do not discharge untreated stormwater into, or cause erosion to, wetlands.

Standard #1 is met.

3.2 Post-Development Peak Rates (Standard 2)

Hydrologic calculations were performed to determine the rate of runoff for the 2, 10, 25 and 100-year storm events under pre-development (present) conditions. This value was established as the future (post-development) maximum allowable rate. Unmitigated post-development rates were then computed in a similar manner. It is the intent of the stormwater management system to minimize impacts to drainage patterns of downstream property and wetlands while simultaneously providing water quality treatment to runoff prior to its release from the site or discharge to wetlands.

The U.S.D.A. Soil Conservation Service (SCS) Technical Release 55 (TR-55), 1986, was used as the procedure for estimating runoff. A SCS TR-20-based computer program, “HydroCAD,” was used for estimating peak discharges. TR-55 is a generally accepted model for use on small sites that begins with a rainfall amount uniformly imposed on the watershed over a specified time distribution. Mass rainfall is converted to mass runoff by using a runoff curve number (CN). CN is based on soils, ground cover, impervious areas, interception and surface storage. Runoff is then transformed into a hydrograph that depends on runoff travel time through segments of the watershed.

Development in a watershed changes its response to precipitation. The most common effects are reduced infiltration and decreased travel time, which result in significantly higher peak rates of runoff. The volume of runoff is determined primarily by the amount of precipitation and by infiltration characteristics related to soil type, antecedent rainfall, and type of vegetative cover, impervious surfaces, and surface retention. Travel time is determined primarily by slope, flow length, depth of flow surfaces. Peak rates of discharge are based on the relationship of the above parameters as well as the total drainage area of the watershed, the location of the development in relation to the total drainage area, and the effect of any flood control works or other manmade storage. Peak rates of discharge are also influenced by the distribution of rainfall within a given storm event.

Stormwater management computations for the project site were performed using SCS-based Hydrocad for existing and proposed conditions, curve numbers, time of concentration, and unit hydrograph computations. The following were considered as part of runoff calculations.

Since urban areas are seldom completely covered by impervious structure, soils and soil properties are an important factor in estimating the total volume of direct runoff. The infiltration and percolation rates of soils indicate their potential to absorb rainfall and thereby reduce the amount of direct runoff. Soils having a high infiltration rate (sands or gravels) have a low runoff potential, and soils having a low infiltration rate (clays) have a high runoff potential. Urbanization on soils with a high infiltration rate increases the volume of runoff and peak discharge more than urbanization on soils with a low infiltration rate.

The type of surface cover and its hydrologic condition affects runoff volume through its influence on the infiltration rate of the soil. Unused cultivated land yields more runoff than forested land for a given soil type. Covering areas with impervious material reduces surface storage and infiltration and increases the volume of runoff.

Some rainfall is retained on the ground surface and by vegetation before runoff begins. Interception is rainfall that is caught by foliage, twigs, branches, leaves, etc. This rainfall is lost to evaporation and thus never reaches the ground surface. Increasing the vegetative cover increases the amount of interception.

Surface depression storage begins when precipitation exceeds infiltration. Overland flow starts when the surface depressions are full. The water in depression storage is not available as direct runoff.

Initial abstraction is the sum of interception, depression, storage, and infiltration before runoff begins. It occurs on all types of cover, from lawn in good

condition to pavement. However, the amount of initial abstraction is less on pavement than on lawn.

Travel time (T_t) is the time it takes water to travel from one location to another in a watershed. T_t is a component of time of concentration (T_c) that is the time for runoff to travel from the hydraulically most distant point of the watershed to a point of interest within the watershed. T_c is computed by summing all the travel time for consecutive components of the drainage conveyance system.

T_c influences the shape and peak of the runoff hydrograph. Urbanization usually decreases T_c thereby increasing the peak discharge.

Development can change the effective slope of a watershed if flow paths are altered by channeling and by changing the surface grading for building lots, roads and ditches. The slopes of street gutters, roads and overland flow areas as well as stream channels are significant in determining travel times through urban watersheds.

Flow length may be reduced if natural meandering streams are changed to straight channels. It may be increased if overland flows are diverted through ditches, storm drains, or street gutters to larger collections systems.

Surface roughness is also a consideration. Flow velocity normally increases significantly when the flow path is changed from flow over rough surfaces of woodland, grassland and natural channels to sheet flow over smooth surfaces of parking lots, storm drains, gutters and lined channels.

3.2.1 Existing Conditions

Under the pre-development scenario, the watershed has been identified as one (1) subcatchment (SC-1) area outlining runoff to one (1) single analysis points referenced above, as shown on the plan entitled “WATERSHED MAP – EXISTING CONDITIONS”, included within the attached Maps.

3.2.2 Proposed Conditions

The proposed development will include the construction of greenhouses and processing center with associated parking, utilities, drainage, earthwork and paving. To accommodate stormwater runoff a number of Best Management Practices (BMP's) have been proposed, including deep sump catch basins, sediment forebay and an infiltration basin.

Under the post-development scenario, the site has been divided into four (4) drainage subcatchments, shown on the plan entitled “WATERSHED MAP – DEVELOPED CONDITIONS”, included within Part II – Pre & Post Construction Computations. There is no increase in contributing watershed area due to the development and peak runoff rates and volumes are mitigated

through the construction of the proposed stormwater management system.

Post-development peak rates were determined and routed through infiltration basins with the resulting hydrographs added to the hydrographs for the overland areas. Based upon these analyses, the peak rates of runoff for the 2, 10, 25 and 100-year storm events are as follows:

Table 3.2.2.1 Stormwater Peak Rate Summary				
PEAK DISCHARGE RATE OF FLOW OFF-SITE				
Pre-Development (cfs)				
Analysis Point	2-YR	10-YR	25-YR	100-YR
AP 1	8.9	22.3	34.2	60.3
Post-Development (cfs)				
Analysis Point	2-YR	10-YR	25-YR	100-YR
AP 1	8.3	21.1	32.3	53.3
Pre-Development vs. Developed (cfs)				
Analysis Point	2-YR	10-YR	25-YR	100-YR
AP 1	-0.6	-1.2	-1.9	-7.0

Standard #2 is met.

3.3 Recharge to Groundwater (Standard 3)

Although runoff volumes will not increase after construction; recharge shall be provided. Therefore, stormwater runoff volume to be recharged to groundwater should be determined using the existing site (pre-development) soil conditions and the annual recharge from the post-development site should approximate the annual recharge from the pre-development or existing site, based on soil types.

<u>Hydrologic Soil Group</u>	<u>Volume to Recharge (x Total Impervious Area)</u>
A	0.60 inches of runoff
B	0.35 inches of runoff
C	0.25 inches of runoff
D	0.10 inches of runoff

Required Recharge Volume

0.60 inches runoff x total impervious area = Recharge Volume, "A" soil
 0.35 inches runoff x total impervious area = Recharge Volume, "B" soil
 0.25 inches runoff x total impervious area = Recharge Volume, "C" soil
 0.10 inches runoff x total impervious area = Recharge Volume, "D" soil

Recharge Volume Required

0.60 inches x (1ft. /12in.) x (0) sq. ft. = 0 cubic feet
 0.35 inches x (1ft. /12in.) x (0) sq. ft. = 0 cubic feet
 0.25 inches x (1ft. /12in.) x (187,326) sq. ft. = 3,902 cubic feet

0.15 inches x (1 ft. / 12 in.) x (0) sq. ft. = 0 cubic feet

Total Volume Required for Recharge = 3,902 cubic feet

Recharge Volume Provided

Infiltration Basin = 10,763 cu. ft. (volume below lowest outlet)

Total Recharge Volume Provided = 10,763 cu. ft.

Comparison of Required Recharge Volume to Provided Recharge

Provided Recharge - Required Recharge = Additional Recharge

10,763 cu. ft. – 3,902 cu. ft. = 6,861 cu. ft.

Drawdown Time

To determine whether an infiltration BMP will drain within 72 hours, the following formula must be used¹:

$$Time_{drawdown} = \frac{R_v}{(K)(Bottom\ Area)}$$

Where:

R_v = Storage Volume

K = Saturated Hydraulic Conductivity For “Static” and “Simple Dynamic” Methods, use Rawls Rate (see Table 2.3.3). For “Dynamic Field” Method, use 50% of the in-situ saturated hydraulic conductivity.

Bottom Area = Bottom Area of Recharge Structure

Basin Storage Volume / ((Infiltration Rate / 12) x Basin Bottom Area))

Infiltration Basin:

10,763 c.f. / (0.27 in/hr)(1 ft/12 in)(9,777 s.f.) = 48.9 hours

Per the Massachusetts Stormwater Standards a mounding analysis is required when the vertical separation from the bottom of an exfiltration system to seasonal high groundwater is less than four (4) feet and the recharge system is proposed to attenuate the peak discharge from a 10-year or higher 24-hour storm.

Mounding analysis calculated using the Hantush (1967) method. Automated calculator available online from the Aquifer Test Forum sponsored by HydroSOLVE, Inc. The calculated mounds will not interfere with the draining of the infiltration basins, the results are as follows:

Infiltration Basin

	Infiltration Area	No.1
Hydraulic Conductivity	ft/day	39
Specific Yield		Standard value for "Sandy Loam" material 0.28
Initial Saturated Thickness	ft	Standard value for "Sandy Loam" material 15
Design Recharge Rate	ft/day	Depth to bedrock 0.54
Time	days	infiltration rate 3
Bottom Infiltrating Area	sf	Minimum 72 hr evaluation period 9,777
Length of Infiltration Area	ft	295
Width of Infiltration Area	ft	42
Time when Infiltration Stops	days	2.04
		Calculated Draw down Time (see Above)
Maximum Water table rise at 72 hours ¹	ft	1.91
	in	23

**- Resulting mound will not interfere with the full draining of the infiltration area
in accordance with Mass Stormwater Standards -**

Standard #3 is met.

3.4 Removal of 80% TSS (Standard 4)

The proposed stormwater management system design calls for 4' deep sump catch basins to collect runoff from the roadway. Stormwater runoff from pavement areas will then be conveyed by a closed pipe system to a sediment forebay followed by an infiltration basin. Calculations for removal rates for all paved runoff are below. These calculations are shown on the attached TSS Calculation Worksheets.

Deep Sump Catch Basins	25%
Infiltration Basin w/ Sediment Forebay	80%

Water Quality

$V_{wq} = (D_{wq} \div 12 \text{ inches/foot}) (A_{imp})$

Where:

V_{wq} = Required Water Quality Volume (cubic feet)

D_{wq} = Water Quality Depth – 0.5 inches

A_{imp} = Impervious Area (s.f.)

V_{wq} Required

0.5 inch x (1ft. /12in.) x (187,326) sq. ft. = 7,805 cubic feet.

Water Quality Volume Provided

Outlets in the infiltration basin are set at an elevation above the required water quality volume.

Water Quality Volume Provided

Infiltration Basin = 10,763 cu. ft.

Total Water Quality Volume = 10,763 cu. ft.

Forebay Sizing

The forebay volume is based on 0.1-inch over the contributing impervious area, including pavers.

Infiltration Basin

Volume required = 0.1 inches x (1ft. /12in.) x (183,444) sq. ft. = 1,529 c.f.

Volume Provided Infiltration Basin = 2,132 c.f.

Standard #4 is met.

3.5 Land Uses with Higher Potential (Standard 5)

This project does not contain areas with higher potential for pollution.

Standard #5 is met.

3.6 Critical Areas (Standard 6 – Water Quality Treatments)

This site does not lie within a critical area.

Standard #6 is met.

3.7 Redevelopment (Standard 7)

Redevelopment projects are those that involve development, rehabilitation or expansion on previously developed sites provided the redevelopment results in no net increase in impervious area. Furthermore, components of redevelopment project, which include development of previously undeveloped sites, do not fall under Standard 7. In addition, redevelopment of previously developed sites must meet the Stormwater Management Standards to the maximum extent practicable. However, if it is not practicable to meet all the Standards, new (retrofitted or expanded) stormwater management systems must be designed to improve existing conditions.

This site is not a redevelopment project.

Standard #7 is not applicable.

3.8 Erosion and Sedimentation Controls (Standard 8)

An Erosion and Sedimentation Control Plan is provided as part of the site plan application to the Planning Board.

Standard #8 is met.

3.9 Operation and Maintenance Plan (Standard 9)

An Operation and Maintenance Plan is provided as part of the site plan application to the Planning Board.

Standard #9 is met.

3.10 Illicit Discharges (Standard 10)

On April 11, 2019 a site inspection was performed by Andrews Survey & Engineering, Inc. and no illicit discharges were found.

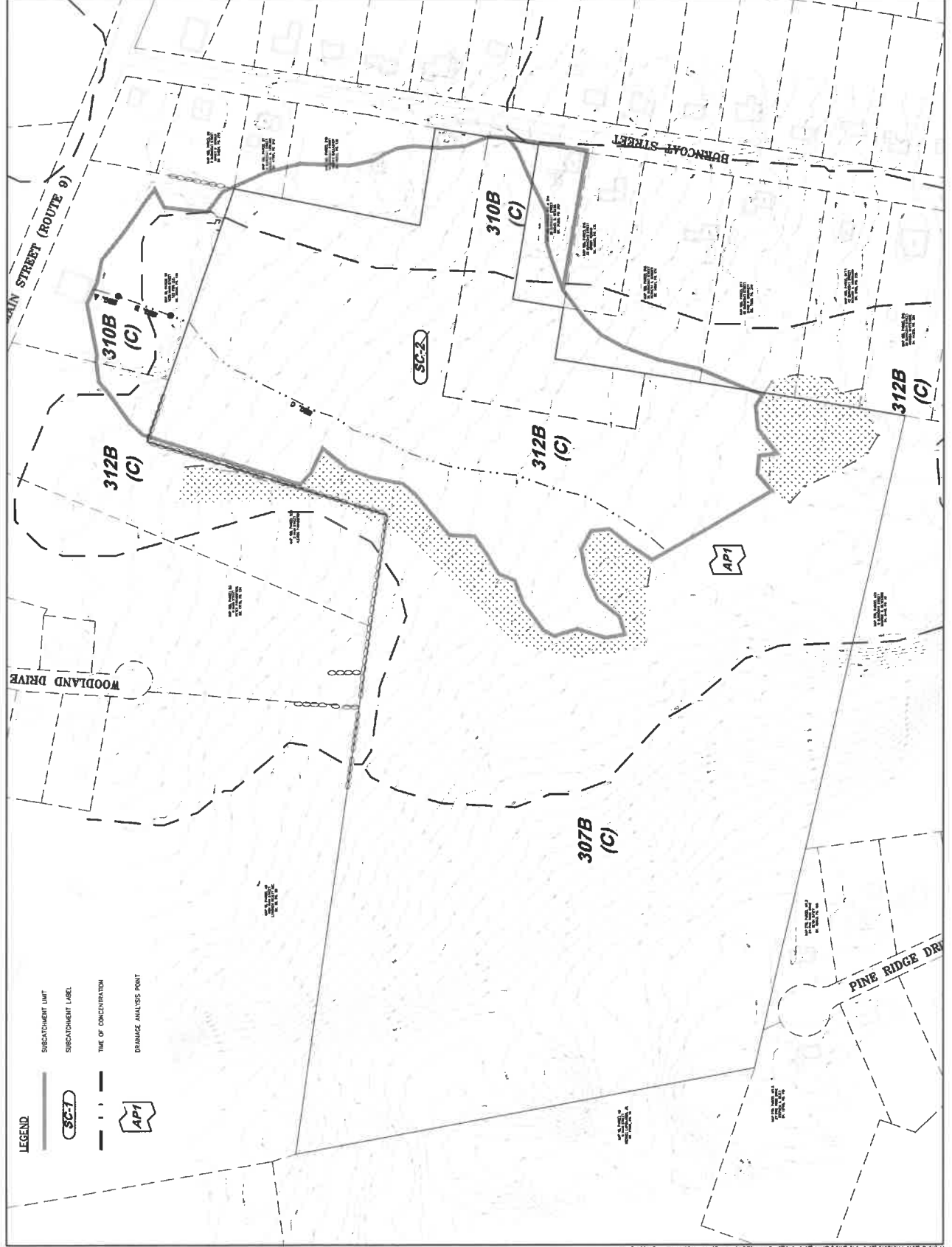
A pollution prevention plan is incorporated into this report to prevent illicit discharges during and after construction.

Standard #10 is met.

PART II – PRE & POST-CONSTRUCTION COMPUTATIONS

LEGEND

-  SUBCATCHMENT LIMIT
-  SUBCATCHMENT LABEL
-  TIME OF CONCENTRATION
-  DRAINAGE ANALYSIS POINT



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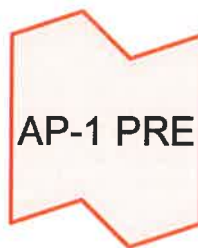
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PROJECT	NO.	DATE	REVISION	DESCRIPTION



PRE-DEVELOPMENT
WATERSHED MAP

DES BY: BMS DATE: APRIL 11, 2019
CWE BY: BMS PROJECT NO: 2018-004 D-1.0



Routing Diagram for 2019-015

Prepared by Andrews Survey & Eng., Inc., Printed 4/19/2019
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2019-015

Prepared by Andrews Survey & Eng., Inc.

Printed 4/19/2019

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Page 2

Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
52,596	74	>75% Grass cover, Good, HSG C (SC-1)
2,660	98	Roofs, HSG C (SC-1)
623,632	70	Woods, Good, HSG C (SC-1)
678,888	70	TOTAL AREA

2019-015

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Page 3

Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
678,888	HSG C	SC-1
0	HSG D	
0	Other	
678,888		TOTAL AREA

2019-015

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Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	52,596	0	0	52,596	>75% Grass cover, Good
0	0	2,660	0	0	2,660	Roofs
0	0	623,632	0	0	623,632	Woods, Good
0	0	678,888	0	0	678,888	TOTAL AREA

2019-015

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Cultivate Burncoat, Leicester
NRCC 24-hr D 2-Year Rainfall=3.13"

Printed 4/19/2019

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3

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 SC-1:

Runoff Area=678,888 sf 0.39% Impervious Runoff Depth=0.79"
Flow Length=1,228' Tc=14.8 min CN=70 Runoff=8.93 cfs 44,561 cf

Link AP-1 PRE:

Inflow=8.93 cfs 44,561 cf
Primary=8.93 cfs 44,561 cf

Total Runoff Area = 678,888 sf Runoff Volume = 44,561 cf Average Runoff Depth = 0.79"
99.61% Pervious = 676,228 sf 0.39% Impervious = 2,660 sf

2019-015

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Cultivate Burncoat, Leicester
NRCC 24-hr D 2-Year Rainfall=3.13"

Printed 4/19/2019

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Summary for Subcatchment SC-1:

Runoff = 8.93 cfs @ 12.25 hrs, Volume= 44,561 cf, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
2,660	98	Roofs, HSG C
623,632	70	Woods, Good, HSG C
52,596	74	>75% Grass cover, Good, HSG C
678,888	70	Weighted Average
676,228		99.61% Pervious Area
2,660		0.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Segment A Grass: Dense n= 0.240 P2= 3.20"
0.8	108	0.0200	2.28		Shallow Concentrated Flow, Segment B Unpaved Kv= 16.1 fps
5.8	1,070	0.0364	3.07		Shallow Concentrated Flow, Segment C Unpaved Kv= 16.1 fps
14.8	1,228	Total			

Summary for Link AP-1 PRE:

Inflow Area = 678,888 sf, 0.39% Impervious, Inflow Depth = 0.79" for 2-Year event
Inflow = 8.93 cfs @ 12.25 hrs, Volume= 44,561 cf
Primary = 8.93 cfs @ 12.25 hrs, Volume= 44,561 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

2019-015

Prepared by Andrews Survey & Eng., Inc.

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Cultivate Burncoat, Leicester

NRCC 24-hr D 10-Year Rainfall=4.68"

Printed 4/19/2019

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3

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 SC-1:

Runoff Area=678,888 sf 0.39% Impervious Runoff Depth=1.80"

Flow Length=1,228' Tc=14.8 min CN=70 Runoff=22.34 cfs 101,964 cf

Link AP-1 PRE:

Inflow=22.34 cfs 101,964 cf

Primary=22.34 cfs 101,964 cf

Total Runoff Area = 678,888 sf Runoff Volume = 101,964 cf Average Runoff Depth = 1.80"

99.61% Pervious = 676,228 sf 0.39% Impervious = 2,660 sf

2019-015

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Cultivate Burncoat, Leicester

NRCC 24-hr D 10-Year Rainfall=4.68"

Printed 4/19/2019

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Summary for Subcatchment SC-1:

Runoff = 22.34 cfs @ 12.23 hrs, Volume= 101,964 cf, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
2,660	98	Roofs, HSG C
623,632	70	Woods, Good, HSG C
52,596	74	>75% Grass cover, Good, HSG C
678,888	70	Weighted Average
676,228		99.61% Pervious Area
2,660		0.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Segment A
					Grass: Dense n= 0.240 P2= 3.20"
0.8	108	0.0200	2.28		Shallow Concentrated Flow, Segment B
					Unpaved Kv= 16.1 fps
5.8	1,070	0.0364	3.07		Shallow Concentrated Flow, Segment C
					Unpaved Kv= 16.1 fps
14.8	1,228	Total			

Summary for Link AP-1 PRE:

Inflow Area = 678,888 sf, 0.39% Impervious, Inflow Depth = 1.80" for 10-Year event
Inflow = 22.34 cfs @ 12.23 hrs, Volume= 101,964 cf
Primary = 22.34 cfs @ 12.23 hrs, Volume= 101,964 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

2019-015

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Cultivate Burncoat, Leicester
NRCC 24-hr D 25-Year Rainfall=5.88"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3

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 SC-1:

Runoff Area=678,888 sf 0.39% Impervious Runoff Depth=2.71"
Flow Length=1,228' Tc=14.8 min CN=70 Runoff=34.16 cfs 153,333 cf

Link AP-1 PRE:

Inflow=34.16 cfs 153,333 cf
Primary=34.16 cfs 153,333 cf

Total Runoff Area = 678,888 sf Runoff Volume = 153,333 cf Average Runoff Depth = 2.71"
99.61% Pervious = 676,228 sf 0.39% Impervious = 2,660 sf

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NRCC 24-hr D 25-Year Rainfall=5.88"

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Summary for Subcatchment SC-1:

Runoff = 34.16 cfs @ 12.23 hrs, Volume= 153,333 cf, Depth= 2.71"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (sf)	CN	Description
2,660	98	Roofs, HSG C
623,632	70	Woods, Good, HSG C
52,596	74	>75% Grass cover, Good, HSG C
678,888	70	Weighted Average
676,228		99.61% Pervious Area
2,660		0.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Segment A
					Grass: Dense n= 0.240 P2= 3.20"
0.8	108	0.0200	2.28		Shallow Concentrated Flow, Segment B
					Unpaved Kv= 16.1 fps
5.8	1,070	0.0364	3.07		Shallow Concentrated Flow, Segment C
					Unpaved Kv= 16.1 fps
14.8	1,228	Total			

Summary for Link AP-1 PRE:

Inflow Area = 678,888 sf, 0.39% Impervious, Inflow Depth = 2.71" for 25-Year event

Inflow = 34.16 cfs @ 12.23 hrs, Volume= 153,333 cf

Primary = 34.16 cfs @ 12.23 hrs, Volume= 153,333 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Cultivate Burncoat, Leicester
NRCC 24-hr D 100-Year Rainfall=8.34"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3

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 SC-1:

Runoff Area=678,888 sf 0.39% Impervious Runoff Depth=4.76"
Flow Length=1,228' Tc=14.8 min CN=70 Runoff=60.28 cfs 269,171 cf

Link AP-1 PRE:

Inflow=60.28 cfs 269,171 cf
Primary=60.28 cfs 269,171 cf

Total Runoff Area = 678,888 sf Runoff Volume = 269,171 cf Average Runoff Depth = 4.76"
99.61% Pervious = 676,228 sf 0.39% Impervious = 2,660 sf

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NRCC 24-hr D 100-Year Rainfall=8.34"

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Summary for Subcatchment SC-1:

Runoff = 60.28 cfs @ 12.22 hrs, Volume= 269,171 cf, Depth= 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

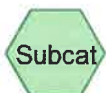
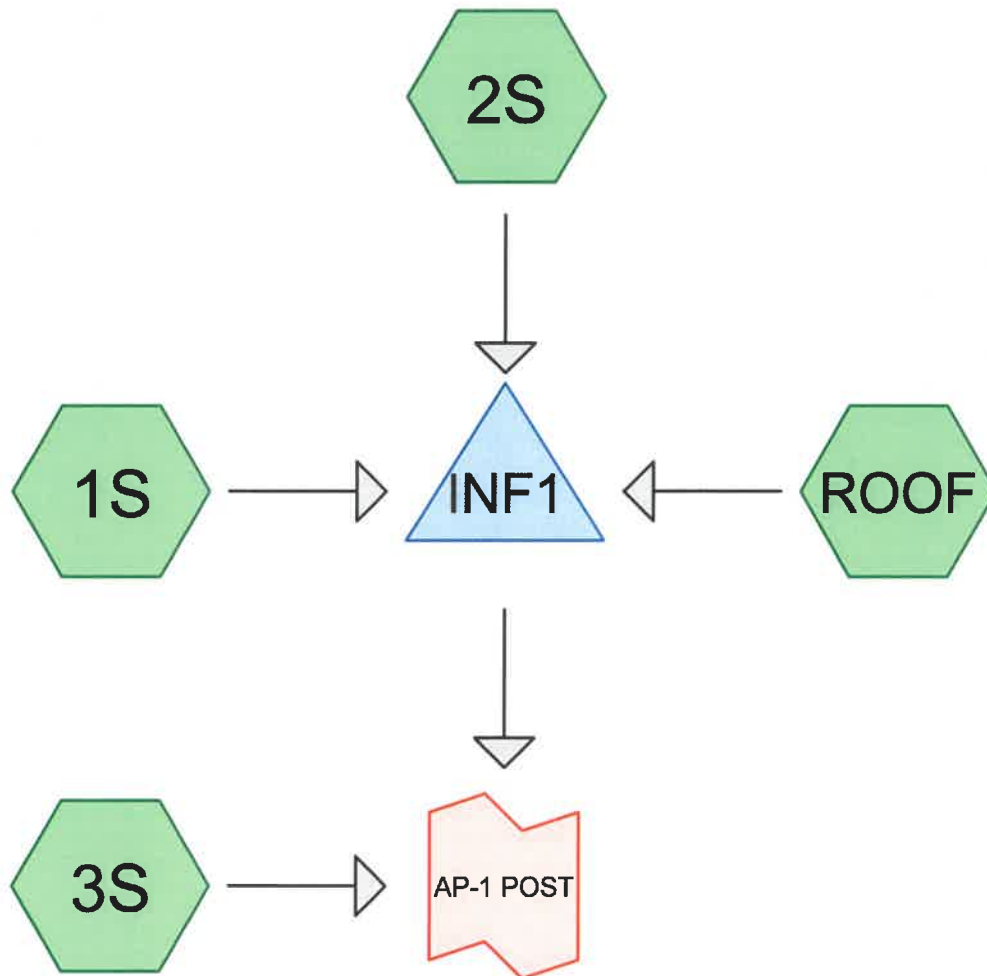
Area (sf)	CN	Description
2,660	98	Roofs, HSG C
623,632	70	Woods, Good, HSG C
52,596	74	>75% Grass cover, Good, HSG C
678,888	70	Weighted Average
676,228		99.61% Pervious Area
2,660		0.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Segment A Grass: Dense n= 0.240 P2= 3.20"
0.8	108	0.0200	2.28		Shallow Concentrated Flow, Segment B Unpaved Kv= 16.1 fps
5.8	1,070	0.0364	3.07		Shallow Concentrated Flow, Segment C Unpaved Kv= 16.1 fps
14.8	1,228	Total			

Summary for Link AP-1 PRE:

Inflow Area = 678,888 sf, 0.39% Impervious, Inflow Depth = 4.76" for 100-Year event
Inflow = 60.28 cfs @ 12.22 hrs, Volume= 269,171 cf
Primary = 60.28 cfs @ 12.22 hrs, Volume= 269,171 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs



Routing Diagram for 2019-049

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Area Listing (selected nodes)

Area (sq-ft)	CN	Description (subcatchment-numbers)
162,823	74	>75% Grass cover, Good, HSG C (1S, 2S, 3S)
55,001	98	Paved parking, HSG C (1S)
132,325	98	Roofs, HSG C (ROOF)
328,739	70	Woods, Good, HSG C (1S, 3S)
678,888	79	TOTAL AREA

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Soil Listing (selected nodes)

Area (sq-ft)	Soil Group	Subcatchment Numbers
0	HSG A	
0	HSG B	
678,888	HSG C	1S, 2S, 3S, ROOF
0	HSG D	
0	Other	
678,888		TOTAL AREA

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Ground Covers (selected nodes)

HSG-A (sq-ft)	HSG-B (sq-ft)	HSG-C (sq-ft)	HSG-D (sq-ft)	Other (sq-ft)	Total (sq-ft)	Ground Cover
0	0	162,823	0	0	162,823	>75% Grass cover, Good
0	0	55,001	0	0	55,001	Paved parking
0	0	132,325	0	0	132,325	Roofs
0	0	328,739	0	0	328,739	Woods, Good
0	0	678,888	0	0	678,888	TOTAL AREA

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NRCC 24-hr D 2-Year Rainfall=3.13"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3

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 1S:

Runoff Area=162,571 sf 33.83% Impervious Runoff Depth=1.35"
Tc=6.0 min CN=80 Runoff=5.61 cfs 18,267 cf

Subcatchment 2S:

Runoff Area=40,076 sf 0.00% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=74 Runoff=0.99 cfs 3,312 cf

Subcatchment 3S:

Runoff Area=343,916 sf 0.00% Impervious Runoff Depth=0.84"
Flow Length=1,228' Tc=14.8 min CN=71 Runoff=4.88 cfs 23,969 cf

Subcatchment ROOF:

Runoff Area=132,325 sf 100.00% Impervious Runoff Depth=2.90"
Tc=6.0 min CN=98 Runoff=8.55 cfs 31,954 cf

Pond INF1:

Peak Elev=1,019.82' Storage=21,139 cf Inflow=15.13 cfs 53,532 cf
Discarded=0.08 cfs 13,556 cf Primary=3.59 cfs 39,976 cf Outflow=3.68 cfs 53,533 cf

Link AP-1 POST:

Inflow=8.32 cfs 63,945 cf
Primary=8.32 cfs 63,945 cf

Total Runoff Area = 678,888 sf Runoff Volume = 77,501 cf Average Runoff Depth = 1.37"
72.41% Pervious = 491,562 sf 27.59% Impervious = 187,326 sf

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Cultivate Burncoat, Leicester
NRCC 24-hr D 2-Year Rainfall=3.13"

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Summary for Subcatchment 1S:

Runoff = 5.61 cfs @ 12.13 hrs, Volume= 18,267 cf, Depth= 1.35"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
55,001	98	Paved parking, HSG C
80,017	70	Woods, Good, HSG C
27,553	74	>75% Grass cover, Good, HSG C
162,571	80	Weighted Average
107,570		66.17% Pervious Area
55,001		33.83% Impervious Area

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

Summary for Subcatchment 2S:

Runoff = 0.99 cfs @ 12.14 hrs, Volume= 3,312 cf, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
40,076	74	>75% Grass cover, Good, HSG C
40,076		100.00% Pervious Area

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

Summary for Subcatchment 3S:

Runoff = 4.88 cfs @ 12.24 hrs, Volume= 23,969 cf, Depth= 0.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
248,722	70	Woods, Good, HSG C
95,194	74	>75% Grass cover, Good, HSG C
343,916	71	Weighted Average
343,916		100.00% Pervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Segment A
					Grass: Dense n= 0.240 P2= 3.20"
0.8	108	0.0200	2.28		Shallow Concentrated Flow, Segment B
					Unpaved Kv= 16.1 fps
5.8	1,070	0.0364	3.07		Shallow Concentrated Flow, Segment C
					Unpaved Kv= 16.1 fps
14.8	1,228	Total			

Summary for Subcatchment ROOF:

Runoff = 8.55 cfs @ 12.13 hrs, Volume= 31,954 cf, Depth= 2.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 2-Year Rainfall=3.13"

Area (sf)	CN	Description
132,325	98	Roofs, HSG C
132,325		100.00% Impervious Area

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

Summary for Pond INF1:

Inflow Area = 334,972 sf, 55.92% Impervious, Inflow Depth = 1.92" for 2-Year event
Inflow = 15.13 cfs @ 12.13 hrs, Volume= 53,532 cf
Outflow = 3.68 cfs @ 12.38 hrs, Volume= 53,533 cf, Atten= 76%, Lag= 14.9 min
Discarded = 0.08 cfs @ 12.38 hrs, Volume= 13,556 cf
Primary = 3.59 cfs @ 12.38 hrs, Volume= 39,976 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,019.82' @ 12.38 hrs Surf.Area= 13,560 sf Storage= 21,139 cf

Plug-Flow detention time= 400.6 min calculated for 53,525 cf (100% of inflow)
Center-of-Mass det. time= 400.9 min (1,208.1 - 807.3)

Volume	Invert	Avail.Storage	Storage Description		
#1	1,018.00'	75,401 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,018.00	9,777	680.0	0	0	9,777
1,020.00	13,969	718.0	23,622	23,622	14,230
1,022.00	18,388	755.0	32,256	55,878	18,810
1,023.00	20,682	774.0	19,524	75,401	21,245

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Cultivate Burncoat, Leicester
NRCC 24-hr D 2-Year Rainfall=3.13"

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Device	Routing	Invert	Outlet Devices
#1	Primary	1,022.00'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	1,018.00'	0.270 in/hr Exfiltration over Surface area
#3	Primary	1,017.50'	24.0" Round Culvert L= 32.8' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,017.50' / 1,017.00' S= 0.0152 ' S= 0.0152 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#4	Device 3	1,018.00'	1.5" Vert. Orifice/Grate C= 0.600
#5	Device 3	1,019.00'	8.0" Vert. Orifice/Grate X 3.00 C= 0.600
#6	Device 3	1,020.00'	12.0" Vert. Orifice/Grate X 3.00 C= 0.600
#7	Device 3	1,021.25'	1.5' long x 0.75' rise Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.08 cfs @ 12.38 hrs HW=1,019.82' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.08 cfs)

Primary OutFlow Max=3.59 cfs @ 12.38 hrs HW=1,019.82' TW=0.00' (Dynamic Tailwater)

↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

↑ **3=Culvert** (Passes 3.59 cfs of 17.38 cfs potential flow)

↑ **4=Orifice/Grate** (Orifice Controls 0.08 cfs @ 6.38 fps)

↑ **5=Orifice/Grate** (Orifice Controls 3.52 cfs @ 3.36 fps)

↑ **6=Orifice/Grate** (Controls 0.00 cfs)

↑ **7=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link AP-1 POST:

Inflow Area = 678,888 sf, 27.59% Impervious, Inflow Depth = 1.13" for 2-Year event
Inflow = 8.32 cfs @ 12.25 hrs, Volume= 63,945 cf
Primary = 8.32 cfs @ 12.25 hrs, Volume= 63,945 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Cultivate Burncoat, Leicester
NRCC 24-hr D 10-Year Rainfall=4.68"

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3

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 1S:

Runoff Area=162,571 sf 33.83% Impervious Runoff Depth=2.62"
Tc=6.0 min CN=80 Runoff=10.87 cfs 35,435 cf

Subcatchment 2S:

Runoff Area=40,076 sf 0.00% Impervious Runoff Depth=2.11"
Tc=6.0 min CN=74 Runoff=2.17 cfs 7,053 cf

Subcatchment 3S:

Runoff Area=343,916 sf 0.00% Impervious Runoff Depth=1.88"
Flow Length=1,228' Tc=14.8 min CN=71 Runoff=11.85 cfs 53,815 cf

Subcatchment ROOF:

Runoff Area=132,325 sf 100.00% Impervious Runoff Depth=4.44"
Tc=6.0 min CN=98 Runoff=12.87 cfs 49,001 cf

Pond INF1:

Peak Elev=1,020.58' Storage=32,016 cf Inflow=25.90 cfs 91,489 cf
Discarded=0.09 cfs 14,012 cf Primary=9.35 cfs 77,478 cf Outflow=9.44 cfs 91,490 cf

Link AP-1 POST:

Inflow=21.06 cfs 131,293 cf
Primary=21.06 cfs 131,293 cf

Total Runoff Area = 678,888 sf Runoff Volume = 145,305 cf Average Runoff Depth = 2.57"
72.41% Pervious = 491,562 sf 27.59% Impervious = 187,326 sf

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NRCC 24-hr D 10-Year Rainfall=4.68"

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Summary for Subcatchment 1S:

Runoff = 10.87 cfs @ 12.13 hrs, Volume= 35,435 cf, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
55,001	98	Paved parking, HSG C
80,017	70	Woods, Good, HSG C
27,553	74	>75% Grass cover, Good, HSG C
162,571	80	Weighted Average
107,570		66.17% Pervious Area
55,001		33.83% Impervious Area

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

Summary for Subcatchment 2S:

Runoff = 2.17 cfs @ 12.13 hrs, Volume= 7,053 cf, Depth= 2.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
40,076	74	>75% Grass cover, Good, HSG C
40,076		100.00% Pervious Area

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

Summary for Subcatchment 3S:

Runoff = 11.85 cfs @ 12.23 hrs, Volume= 53,815 cf, Depth= 1.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
248,722	70	Woods, Good, HSG C
95,194	74	>75% Grass cover, Good, HSG C
343,916	71	Weighted Average
343,916		100.00% Pervious Area

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Cultivate Burncoat, Leicester
NRCC 24-hr D 10-Year Rainfall=4.68"

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Segment A
					Grass: Dense n= 0.240 P2= 3.20"
0.8	108	0.0200	2.28		Shallow Concentrated Flow, Segment B
					Unpaved Kv= 16.1 fps
5.8	1,070	0.0364	3.07		Shallow Concentrated Flow, Segment C
					Unpaved Kv= 16.1 fps
14.8	1,228	Total			

Summary for Subcatchment ROOF:

Runoff = 12.87 cfs @ 12.13 hrs, Volume= 49,001 cf, Depth= 4.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 10-Year Rainfall=4.68"

Area (sf)	CN	Description
132,325	98	Roofs, HSG C
132,325		100.00% Impervious Area

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

Summary for Pond INF1:

Inflow Area = 334,972 sf, 55.92% Impervious, Inflow Depth = 3.28" for 10-Year event
 Inflow = 25.90 cfs @ 12.13 hrs, Volume= 91,489 cf
 Outflow = 9.44 cfs @ 12.28 hrs, Volume= 91,490 cf, Atten= 64%, Lag= 8.8 min
 Discarded = 0.09 cfs @ 12.28 hrs, Volume= 14,012 cf
 Primary = 9.35 cfs @ 12.28 hrs, Volume= 77,478 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 1,020.58' @ 12.28 hrs Surf.Area= 15,180 sf Storage= 32,016 cf

Plug-Flow detention time= 270.0 min calculated for 91,477 cf (100% of inflow)
 Center-of-Mass det. time= 270.2 min (1,068.0 - 797.8)

Volume	Invert	Avail.Storage	Storage Description		
#1	1,018.00'	75,401 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,018.00	9,777	680.0	0	0	9,777
1,020.00	13,969	718.0	23,622	23,622	14,230
1,022.00	18,388	755.0	32,256	55,878	18,810
1,023.00	20,682	774.0	19,524	75,401	21,245

2019-049

Cultivate Burncoat, Leicester
NRCC 24-hr D 10-Year Rainfall=4.68"

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Device	Routing	Invert	Outlet Devices
#1	Primary	1,022.00'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	1,018.00'	0.270 in/hr Exfiltration over Surface area
#3	Primary	1,017.50'	24.0" Round Culvert L= 32.8' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,017.50' / 1,017.00' S= 0.0152 ' S= 0.0152 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#4	Device 3	1,018.00'	1.5" Vert. Orifice/Grate C= 0.600
#5	Device 3	1,019.00'	8.0" Vert. Orifice/Grate X 3.00 C= 0.600
#6	Device 3	1,020.00'	12.0" Vert. Orifice/Grate X 3.00 C= 0.600
#7	Device 3	1,021.25'	1.5' long x 0.75' rise Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.09 cfs @ 12.28 hrs HW=1,020.58' (Free Discharge)↑ **2=Exfiltration** (Exfiltration Controls 0.09 cfs)**Primary OutFlow** Max=9.35 cfs @ 12.28 hrs HW=1,020.58' TW=0.00' (Dynamic Tailwater)↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)↑ **3=Culvert** (Passes 9.35 cfs of 21.79 cfs potential flow)↑ **4=Orifice/Grate** (Orifice Controls 0.09 cfs @ 7.63 fps)↑ **5=Orifice/Grate** (Orifice Controls 5.62 cfs @ 5.37 fps)↑ **6=Orifice/Grate** (Orifice Controls 3.63 cfs @ 2.58 fps)↑ **7=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)**Summary for Link AP-1 POST:**

Inflow Area = 678,888 sf, 27.59% Impervious, Inflow Depth = 2.32" for 10-Year event
 Inflow = 21.06 cfs @ 12.25 hrs, Volume= 131,293 cf
 Primary = 21.06 cfs @ 12.25 hrs, Volume= 131,293 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3

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 1S:

Runoff Area=162,571 sf 33.83% Impervious Runoff Depth=3.67"

Tc=6.0 min CN=80 Runoff=15.12 cfs 49,762 cf

Subcatchment 2S:

Runoff Area=40,076 sf 0.00% Impervious Runoff Depth=3.08"

Tc=6.0 min CN=74 Runoff=3.17 cfs 10,300 cf

Subcatchment 3S:

Runoff Area=343,916 sf 0.00% Impervious Runoff Depth=2.80"

Flow Length=1,228' Tc=14.8 min CN=71 Runoff=17.93 cfs 80,315 cf

Subcatchment ROOF:

Runoff Area=132,325 sf 100.00% Impervious Runoff Depth=5.64"

Tc=6.0 min CN=98 Runoff=16.21 cfs 62,215 cf

Pond INF1:

Peak Elev=1,020.98' Storage=38,251 cf Inflow=34.48 cfs 122,277 cf

Discarded=0.10 cfs 14,243 cf Primary=14.43 cfs 108,035 cf Outflow=14.53 cfs 122,277 cf

Link AP-1 POST:

Inflow=32.32 cfs 188,349 cf

Primary=32.32 cfs 188,349 cf

Total Runoff Area = 678,888 sf Runoff Volume = 202,592 cf Average Runoff Depth = 3.58"

72.41% Pervious = 491,562 sf 27.59% Impervious = 187,326 sf

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Summary for Subcatchment 1S:

Runoff = 15.12 cfs @ 12.13 hrs, Volume= 49,762 cf, Depth= 3.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (sf)	CN	Description
55,001	98	Paved parking, HSG C
80,017	70	Woods, Good, HSG C
27,553	74	>75% Grass cover, Good, HSG C
162,571	80	Weighted Average
107,570		66.17% Pervious Area
55,001		33.83% Impervious Area

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

Summary for Subcatchment 2S:

Runoff = 3.17 cfs @ 12.13 hrs, Volume= 10,300 cf, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (sf)	CN	Description
40,076	74	>75% Grass cover, Good, HSG C
40,076		100.00% Pervious Area

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

Summary for Subcatchment 3S:

Runoff = 17.93 cfs @ 12.23 hrs, Volume= 80,315 cf, Depth= 2.80"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (sf)	CN	Description
248,722	70	Woods, Good, HSG C
95,194	74	>75% Grass cover, Good, HSG C
343,916	71	Weighted Average
343,916		100.00% Pervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Segment A
					Grass: Dense n= 0.240 P2= 3.20"
0.8	108	0.0200	2.28		Shallow Concentrated Flow, Segment B
					Unpaved Kv= 16.1 fps
5.8	1,070	0.0364	3.07		Shallow Concentrated Flow, Segment C
					Unpaved Kv= 16.1 fps
14.8	1,228	Total			

Summary for Subcatchment ROOF:

Runoff = 16.21 cfs @ 12.13 hrs, Volume= 62,215 cf, Depth= 5.64"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 25-Year Rainfall=5.88"

Area (sf)	CN	Description
132,325	98	Roofs, HSG C
132,325		100.00% Impervious Area

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

Summary for Pond INF1:

Inflow Area = 334,972 sf, 55.92% Impervious, Inflow Depth = 4.38" for 25-Year event
 Inflow = 34.48 cfs @ 12.13 hrs, Volume= 122,277 cf
 Outflow = 14.53 cfs @ 12.25 hrs, Volume= 122,277 cf, Atten= 58%, Lag= 7.3 min
 Discarded = 0.10 cfs @ 12.25 hrs, Volume= 14,243 cf
 Primary = 14.43 cfs @ 12.25 hrs, Volume= 108,035 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
 Peak Elev= 1,020.98' @ 12.25 hrs Surf.Area= 16,049 sf Storage= 38,251 cf

Plug-Flow detention time= 219.0 min calculated for 122,260 cf (100% of inflow)
 Center-of-Mass det. time= 219.3 min (1,011.2 - 792.0)

Volume	Invert	Avail.Storage	Storage Description		
#1	1,018.00'	75,401 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,018.00	9,777	680.0	0	0	9,777
1,020.00	13,969	718.0	23,622	23,622	14,230
1,022.00	18,388	755.0	32,256	55,878	18,810
1,023.00	20,682	774.0	19,524	75,401	21,245

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Device	Routing	Invert	Outlet Devices
#1	Primary	1,022.00'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	1,018.00'	0.270 in/hr Exfiltration over Surface area
#3	Primary	1,017.50'	24.0" Round Culvert L= 32.8' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,017.50' / 1,017.00' S= 0.0152 ' / Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#4	Device 3	1,018.00'	1.5" Vert. Orifice/Grate C= 0.600
#5	Device 3	1,019.00'	8.0" Vert. Orifice/Grate X 3.00 C= 0.600
#6	Device 3	1,020.00'	12.0" Vert. Orifice/Grate X 3.00 C= 0.600
#7	Device 3	1,021.25'	1.5' long x 0.75' rise Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.10 cfs @ 12.25 hrs HW=1,020.98' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=14.43 cfs @ 12.25 hrs HW=1,020.98' TW=0.00' (Dynamic Tailwater)

↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

↑ **3=Culvert** (Passes 14.43 cfs of 23.80 cfs potential flow)

↑ **4=Orifice/Grate** (Orifice Controls 0.10 cfs @ 8.22 fps)

↑ **5=Orifice/Grate** (Orifice Controls 6.46 cfs @ 6.17 fps)

↑ **6=Orifice/Grate** (Orifice Controls 7.87 cfs @ 3.36 fps)

↑ **7=Sharp-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Link AP-1 POST:

Inflow Area = 678,888 sf, 27.59% Impervious, Inflow Depth = 3.33" for 25-Year event
Inflow = 32.32 cfs @ 12.23 hrs, Volume= 188,349 cf
Primary = 32.32 cfs @ 12.23 hrs, Volume= 188,349 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Time span=0.00-72.00 hrs, dt=0.01 hrs, 7201 points x 3

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 1S:

Runoff Area=162,571 sf 33.83% Impervious Runoff Depth=5.94"

Tc=6.0 min CN=80 Runoff=23.94 cfs 80,533 cf

Subcatchment 2S:

Runoff Area=40,076 sf 0.00% Impervious Runoff Depth=5.23"

Tc=6.0 min CN=74 Runoff=5.30 cfs 17,469 cf

Subcatchment 3S:

Runoff Area=343,916 sf 0.00% Impervious Runoff Depth=4.88"

Flow Length=1,228' Tc=14.8 min CN=71 Runoff=31.27 cfs 139,740 cf

Subcatchment ROOF:

Runoff Area=132,325 sf 100.00% Impervious Runoff Depth=8.10"

Tc=6.0 min CN=98 Runoff=23.03 cfs 89,319 cf

Pond INF1:

Peak Elev=1,021.74' Storage=51,200 cf Inflow=52.28 cfs 187,322 cf

Discarded=0.11 cfs 14,591 cf Primary=22.16 cfs 172,730 cf Outflow=22.27 cfs 187,322 cf

Link AP-1 POST:

Inflow=53.32 cfs 312,471 cf

Primary=53.32 cfs 312,471 cf

Total Runoff Area = 678,888 sf Runoff Volume = 327,062 cf Average Runoff Depth = 5.78"

72.41% Pervious = 491,562 sf 27.59% Impervious = 187,326 sf

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Summary for Subcatchment 1S:

Runoff = 23.94 cfs @ 12.13 hrs, Volume= 80,533 cf, Depth= 5.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
55,001	98	Paved parking, HSG C
80,017	70	Woods, Good, HSG C
27,553	74	>75% Grass cover, Good, HSG C
162,571	80	Weighted Average
107,570		66.17% Pervious Area
55,001		33.83% Impervious Area

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

Summary for Subcatchment 2S:

Runoff = 5.30 cfs @ 12.13 hrs, Volume= 17,469 cf, Depth= 5.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
40,076	74	>75% Grass cover, Good, HSG C
40,076		100.00% Pervious Area

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

Summary for Subcatchment 3S:

Runoff = 31.27 cfs @ 12.22 hrs, Volume= 139,740 cf, Depth= 4.88"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
248,722	70	Woods, Good, HSG C
95,194	74	>75% Grass cover, Good, HSG C
343,916	71	Weighted Average
343,916		100.00% Pervious Area

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Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	50	0.0200	0.10		Sheet Flow, Segment A
					Grass: Dense n= 0.240 P2= 3.20"
0.8	108	0.0200	2.28		Shallow Concentrated Flow, Segment B
					Unpaved Kv= 16.1 fps
5.8	1,070	0.0364	3.07		Shallow Concentrated Flow, Segment C
					Unpaved Kv= 16.1 fps
14.8	1,228	Total			

Summary for Subcatchment ROOF:

Runoff = 23.03 cfs @ 12.13 hrs, Volume= 89,319 cf, Depth= 8.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs
NRCC 24-hr D 100-Year Rainfall=8.34"

Area (sf)	CN	Description
132,325	98	Roofs, HSG C
132,325		100.00% Impervious Area

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

Summary for Pond INF1:

Inflow Area = 334,972 sf, 55.92% Impervious, Inflow Depth = 6.71" for 100-Year event
Inflow = 52.28 cfs @ 12.13 hrs, Volume= 187,322 cf
Outflow = 22.27 cfs @ 12.25 hrs, Volume= 187,322 cf, Atten= 57%, Lag= 7.2 min
Discarded = 0.11 cfs @ 12.25 hrs, Volume= 14,591 cf
Primary = 22.16 cfs @ 12.25 hrs, Volume= 172,730 cf

Routing by Dyn-Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,021.74' @ 12.25 hrs Surf.Area= 17,782 sf Storage= 51,200 cf

Plug-Flow detention time= 162.8 min calculated for 187,296 cf (100% of inflow)
Center-of-Mass det. time= 163.1 min (946.0 - 782.9)

Volume	Invert	Avail.Storage	Storage Description		
#1	1,018.00'	75,401 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,018.00	9,777	680.0	0	0	9,777
1,020.00	13,969	718.0	23,622	23,622	14,230
1,022.00	18,388	755.0	32,256	55,878	18,810
1,023.00	20,682	774.0	19,524	75,401	21,245

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Device	Routing	Invert	Outlet Devices
#1	Primary	1,022.00'	10.0' long x 10.0' breadth Broad-Crested Rectangular Weir Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#2	Discarded	1,018.00'	0.270 in/hr Exfiltration over Surface area
#3	Primary	1,017.50'	24.0" Round Culvert L= 32.8' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 1,017.50' / 1,017.00' S= 0.0152 ' S= 0.0152 ' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf
#4	Device 3	1,018.00'	1.5" Vert. Orifice/Grate C= 0.600
#5	Device 3	1,019.00'	8.0" Vert. Orifice/Grate X 3.00 C= 0.600
#6	Device 3	1,020.00'	12.0" Vert. Orifice/Grate X 3.00 C= 0.600
#7	Device 3	1,021.25'	1.5' long x 0.75' rise Sharp-Crested Rectangular Weir 2 End Contraction(s)

Discarded OutFlow Max=0.11 cfs @ 12.25 hrs HW=1,021.74' (Free Discharge)

↑ **2=Exfiltration** (Exfiltration Controls 0.11 cfs)

Primary OutFlow Max=22.16 cfs @ 12.25 hrs HW=1,021.74' TW=0.00' (Dynamic Tailwater)

↑ **1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

↑ **3=Culvert** (Passes 22.16 cfs of 27.23 cfs potential flow)

↑ **4=Orifice/Grate** (Orifice Controls 0.11 cfs @ 9.24 fps)

↑ **5=Orifice/Grate** (Orifice Controls 7.82 cfs @ 7.47 fps)

↑ **6=Orifice/Grate** (Orifice Controls 12.64 cfs @ 5.36 fps)

↑ **7=Sharp-Crested Rectangular Weir** (Weir Controls 1.58 cfs @ 2.29 fps)

Summary for Link AP-1 POST:

Inflow Area = 678,888 sf, 27.59% Impervious, Inflow Depth = 5.52" for 100-Year event

Inflow = 53.32 cfs @ 12.23 hrs, Volume= 312,471 cf

Primary = 53.32 cfs @ 12.23 hrs, Volume= 312,471 cf, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.01 hrs

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Summary for Pond FB:

[43] Hint: Has no inflow (Outflow=Zero)

Volume	Invert	Avail.Storage	Storage Description		
#1	1,018.00'	2,132 cf	Custom Stage Data (Irregular) Listed below (Recalc)		
Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,018.00	873	125.0	0	0	873
1,020.00	1,271	145.0	2,132	2,132	1,381

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Stage-Area-Storage for Pond INF1:

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)	Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
1,018.00	9,777	0	1,020.60	15,231	32,379
1,018.05	9,873	491	1,020.65	15,339	33,143
1,018.10	9,969	987	1,020.70	15,447	33,913
1,018.15	10,066	1,488	1,020.75	15,555	34,688
1,018.20	10,163	1,994	1,020.80	15,664	35,468
1,018.25	10,260	2,504	1,020.85	15,773	36,254
1,018.30	10,358	3,020	1,020.90	15,883	37,046
1,018.35	10,457	3,540	1,020.95	15,992	37,843
1,018.40	10,556	4,066	1,021.00	16,103	38,645
1,018.45	10,655	4,596	1,021.05	16,213	39,453
1,018.50	10,755	5,131	1,021.10	16,324	40,266
1,018.55	10,855	5,671	1,021.15	16,436	41,085
1,018.60	10,956	6,217	1,021.20	16,548	41,910
1,018.65	11,058	6,767	1,021.25	16,660	42,740
1,018.70	11,159	7,322	1,021.30	16,772	43,576
1,018.75	11,262	7,883	1,021.35	16,885	44,417
1,018.80	11,364	8,449	1,021.40	16,999	45,264
1,018.85	11,467	9,019	1,021.45	17,112	46,117
1,018.90	11,571	9,595	1,021.50	17,226	46,976
1,018.95	11,675	10,176	1,021.55	17,341	47,840
1,019.00	11,780	10,763	1,021.60	17,456	48,710
1,019.05	11,885	11,354	1,021.65	17,571	49,585
1,019.10	11,990	11,951	1,021.70	17,686	50,467
1,019.15	12,096	12,553	1,021.75	17,802	51,354
1,019.20	12,203	13,161	1,021.80	17,919	52,247
1,019.25	12,310	13,774	1,021.85	18,036	53,146
1,019.30	12,417	14,392	1,021.90	18,153	54,051
1,019.35	12,525	15,015	1,021.95	18,270	54,961
1,019.40	12,633	15,644	1,022.00	18,388	55,878
1,019.45	12,742	16,279	1,022.05	18,499	56,800
1,019.50	12,851	16,919	1,022.10	18,611	57,728
1,019.55	12,961	17,564	1,022.15	18,724	58,661
1,019.60	13,071	18,215	1,022.20	18,836	59,600
1,019.65	13,182	18,871	1,022.25	18,949	60,545
1,019.70	13,293	19,533	1,022.30	19,062	61,495
1,019.75	13,404	20,200	1,022.35	19,176	62,451
1,019.80	13,516	20,873	1,022.40	19,289	63,412
1,019.85	13,629	21,552	1,022.45	19,404	64,380
1,019.90	13,742	22,236	1,022.50	19,518	65,353
1,019.95	13,855	22,926	1,022.55	19,633	66,332
1,020.00	13,969	23,622	1,022.60	19,748	67,316
1,020.05	14,072	24,323	1,022.65	19,864	68,306
1,020.10	14,176	25,029	1,022.70	19,980	69,302
1,020.15	14,279	25,740	1,022.75	20,096	70,304
1,020.20	14,384	26,457	1,022.80	20,212	71,312
1,020.25	14,488	27,179	1,022.85	20,329	72,326
1,020.30	14,593	27,906	1,022.90	20,447	73,345
1,020.35	14,699	28,638	1,022.95	20,564	74,370
1,020.40	14,804	29,376	1,023.00	20,682	75,401
1,020.45	14,910	30,118			
1,020.50	15,017	30,867			
1,020.55	15,124	31,620			

PART III – PIPE SIZING CALCULATIONS

[illegible]

Pipe Calculations

PART IV - SUPPLEMENTAL DOCUMENTATION



Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.¹ This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8²
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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



Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

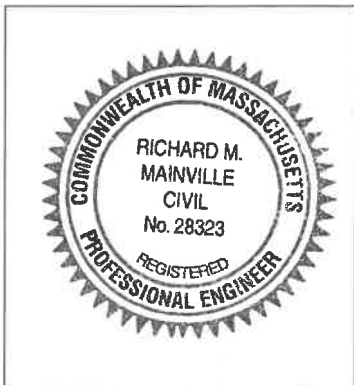
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature

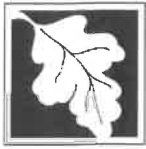


Richard M. Mainville 9/23/19
Signature and Date

Checklist

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

- ☒ New development
- ☐ Redevelopment
- ☐ Mix of New Development and Redevelopment



Checklist for Stormwater Report

Checklist (continued)

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

- ☒ No disturbance to any Wetland Resource Areas
- ☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)
- ☐ Reduced Impervious Area (Redevelopment Only)
- ☐ Minimizing disturbance to existing trees and shrubs
- ☐ LID Site Design Credit Requested:
 - ☐ Credit 1
 - ☐ Credit 2
 - ☐ Credit 3
- ☐ Use of "country drainage" versus curb and gutter conveyance and pipe
- ☐ Bioretention Cells (includes Rain Gardens)
- ☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)
- ☐ Treebox Filter
- ☐ Water Quality Swale
- ☐ Grass Channel
- ☐ Green Roof
- ☐ Other (describe): _____

Standard 1: No New Untreated Discharges

- ☒ No new untreated discharges
- ☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth
- ☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.



Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

- ☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.
- ☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.
- ☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

- ☒ Soil Analysis provided.
- ☒ Required Recharge Volume calculation provided.
- ☐ Required Recharge volume reduced through use of the LID site Design Credits.
- ☒ Sizing the infiltration, BMPs is based on the following method: Check the method used.
 - ☒ Static
 - ☐ Simple Dynamic
 - ☐ Dynamic Field¹
- ☒ Runoff from all impervious areas at the site discharging to the infiltration BMP.
- ☐ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.
- ☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.
- ☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:
 - ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
 - ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
 - ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
 - ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.
- ☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.
- ☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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



Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

- ☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.
- ☐ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
 - Provisions for storing materials and waste products inside or under cover;
 - Vehicle washing controls;
 - Requirements for routine inspections and maintenance of stormwater BMPs;
 - Spill prevention and response plans;
 - Provisions for maintenance of lawns, gardens, and other landscaped areas;
 - Requirements for storage and use of fertilizers, herbicides, and pesticides;
 - Pet waste management provisions;
 - Provisions for operation and management of septic systems;
 - Provisions for solid waste management;
 - Snow disposal and plowing plans relative to Wetland Resource Areas;
 - Winter Road Salt and/or Sand Use and Storage restrictions;
 - Street sweeping schedules;
 - Provisions for prevention of illicit discharges to the stormwater management system;
 - Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
 - Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
 - List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.
- ☒ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.
 - ☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:
 - ☐ is within the Zone II or Interim Wellhead Protection Area
 - ☐ is near or to other critical areas
 - ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
 - ☐ involves runoff from land uses with higher potential pollutant loads.
 - ☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.
 - ☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.



Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

- ☒ The BMP is sized (and calculations provided) based on:
 - ☒ The ½" or 1" Water Quality Volume or
 - ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.
- ☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.
- ☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

- ☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.
- ☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted **prior to** the discharge of stormwater to the post-construction stormwater BMPs.
- ☐ The NPDES Multi-Sector General Permit does **not** cover the land use.
- ☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.
- ☐ All exposure has been eliminated.
- ☐ All exposure has **not** been eliminated and all BMPs selected are on MassDEP LUHPPL list.
- ☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

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



Checklist for Stormwater Report

Checklist (continued)

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

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

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

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

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



Checklist for Stormwater Report

Checklist (continued)

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

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

Standard 9: Operation and Maintenance Plan

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

Standard 10: Prohibition of Illicit Discharges

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

National Flood Hazard Layer FIRMette



42°14'46.21"N



Uses The National Map. Orthorectified. Data refreshed October, 2017.

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

Legend

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

Without Base Flood Elevation (BFE)
Zone A1, V, A99

With BFE or Depth
Zone AE, AO, AH, VE, AR

Regulatory Floodway

0.2% Annual Chance Flood Hazard, Areas of 1% annual chance flood with average depth less than one foot or with drainage areas of less than one square mile
Zone X

Future Conditions 1% Annual Chance Flood Hazard
Zone X

Area with Reduced Flood Risk due to Levee. See Notes.
Zone X

Area with Flood Risk due to Levee
Zone D

NO SCREEN

Area of Minimal Flood Hazard
Zone X

Effective LOMRs

Area of Undetermined Flood Hazard
Zone D

Channel, Culvert, or Storm Sewer

Levee, Dike, or Floodwall

Cross Sections with 1% Annual Chance Water Surface Elevation

Coastal Transect

Base Flood Elevation Line (BFE)

Limit of Study

Jurisdiction Boundary

Coastal Transect Baseline

Profile Baseline

Hydrographic Feature

Digital Data Available

No Digital Data Available

Unmapped

MAP PANELS

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

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

The flood hazard information is derived directly from the authoritative NFHL web services provided by FEMA. This map was exported on **4/18/2019 at 8:38:23 AM** and does not reflect changes or amendments subsequent to this date and time. The NFHL and effective information may change or become superseded by new data over time.

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

Hydrologic Soil Group—Worcester County, Massachusetts, Southern Part



Map Scale: 1:6,140 if printed on A landscape (11" x 8.5") sheet.
 Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

0 50 100 200 300 400 500 600 700 800 900 1000 1500
 Meters

0 50 100 200 300 400 500 600 700 800 900 1000 1500
 Feet

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

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

C

C/D

D

Not rated or not available

MAP INFORMATION

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

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

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

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

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

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

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

Soil Survey Area: Worcester County, Massachusetts, Southern Part
Survey Area Data: Version 11, Sep 11, 2018

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

Date(s) aerial images were photographed: Apr 8, 2011—Apr 9, 2011

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

Hydrologic Soil Group

Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
305B	Paxton fine sandy loam, 3 to 8 percent slopes	C	8.7	4.8%
305C	Paxton fine sandy loam, 8 to 15 percent slopes	C	0.0	0.0%
307B	Paxton fine sandy loam, 0 to 8 percent slopes, extremely stony	C	46.4	25.3%
307C	Paxton fine sandy loam, 8 to 15 percent slopes, extremely stony	C	2.9	1.6%
310B	Woodbridge fine sandy loam, 3 to 8 percent slopes	C/D	50.0	27.3%
312B	Woodbridge fine sandy loam, 0 to 8 percent slopes, extremely stony	C/D	75.3	41.1%
Totals for Area of Interest			183.4	100.0%

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

Cultivate Burncoat - Leicester, MA

ASE# 2019-049

FES1

Do= 1.5 ft
Q= 14.1 cfs (25-yr Storm)
Tw= 0.75 ft

$$La = 1.7Q / (Do^{3/2}) + 8Do$$

La= 25.05 ft

$$W = 3Do + 0.4La$$

W= 14.52 ft

$$d50 = (0.02 / Tw) * ((Q / Do)^{4/3})$$

d50= 0.53 ft
6.35 in

FES2

Do= 1.25 ft
Q= 4.9 cfs (100-yr Storm)
Tw= 0.625 ft

$$La = 1.7Q / (Do^{3/2}) + 8Do$$

La= 15.96 ft

$$W = 3Do + 0.4La$$

W= 10.13 ft

$$d50 = (0.02 / Tw) * ((Q / Do)^{4/3})$$

d50= 0.20 ft
2.37 in

FES3

Do= 1.25 ft
Q= 11.5 cfs (100-yr Storm)
Tw= 0.625 ft

$$La = 1.7Q / (Do^{3/2}) + 8Do$$

La= 23.99 ft

$$W = 3Do + 0.4La$$

W= 13.35 ft

$$d50 = (0.02 / Tw) * ((Q / Do)^{4/3})$$

d50= 0.62 ft
7.40 in

FES4

Do= 2 ft
Q= 22.2 cfs (100-yr Storm)
Tw= 1 ft

$$La = 1.7Q / (Do^{3/2}) + 8Do$$

La= 29.34 ft

$$W = 3Do + 0.4La$$

W= 17.74 ft

$$d50 = (0.02 / Tw) * ((Q / Do)^{4/3})$$

d50= 0.50 ft
5.94 in

TSS REMOVAL WORKSHEET PRIOR TO INFILTRATION

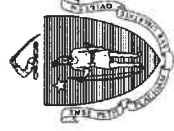
A	B	C	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (B x C)	Remaining Load (C - D)
Deep sump CB's w/ hoods	25.0%	100.0%	25.0%	75.0%
Sediment forebay	25.0%	75.0%	18.8%	56.3%
Total TSS Removal =			44.0%	

* Equals remaining load from previous BMP (E)

TSS REMOVAL WORKSHEET PRIOR TO DISCHARGE

A	B	C	D	E
BMP	TSS Removal Rate	Starting TSS Load*	Amount Removed (B x C)	Remaining Load (C - D)
Deep sump CB's w/ hoods	25.0%	100.0%	25.0%	75.0%
Infiltration Basin w/ sediment forebay	80.0%	75.0%	60.0%	15.0%
Total TSS Removal =			85.0%	

* Equals remaining load from previous BMP (E)



Commonwealth of Massachusetts
City/Town of LEICESTER

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Campanelli

Owner Name

22 Burncoat Street

Street Address

LeicesterMA

City

MA

State

18B B11

Map/Lot #

01524

Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No

If yes:

Woodbridge FSL, 3-8% slopes, extremely stony

None

Soil Limitations

Glacial Till

Ground Moraine

Soil Parent material

Landform

3. Surficial Geological Report Available? ☐ Yes ☒ No

If yes:

Year Published/Source

Map Unit

Oliver MA GIS

Source

312 B

Soil Map Unit

Description of Geologic Map Unit:

4. Flood Rate Insurance Map ☐ Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No

7. Current Water Resource Conditions (USGS):

4/19

Month/Day/ Year

If yes, MassGIS Wetland Data Layer:

Range: ☒ Above Normal

☐ Normal

☐ Below Normal

Wetland Type

8. Other references reviewed:

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Number: 4-11-1 Date: 4-11-19 Time: 9 AM Sun 50 Weather: Common Latitude: 42.243474 Longitude: -71.931438

1. Land Use: Woodland Trees / Shrubs: Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.): 0-3 Slope (%): 0-3

Description of Location:

2. Soil Parent Material: Glacial Till Ground Moraine: On Slope Position on Landscape (SU, SH, BS, FS, TS): Wetlands >100 feet

3. Distances from: Open Water Body >200 feet Drainage Way: >100 feet Wetlands: >100 feet
Property Line: >50 feet Drinking Water Well: >100 feet Other: _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 25" Depth Weeping from Pit 30" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-6	A	FSL	10 YR 3/2						Granular	Friable	
6-16	B	FSL	10 YR 5/6						Granular	Friable	
16-72	C	SL	2.5 Y 3/4	24"	10 YR 4/6	30	10	10	SAB	Firm	Redox Abundant / Distinct

Additional Notes:



Commonwealth of Massachusetts
City/Town of LEICESTER

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Number: 4-11-2 Hole # 4-11-19 Date 9 AM Time Sun 50 Weather 42.243474 Latitude -71.931438 Longitude: 0-3 Slope (%)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Common Surface Stones (e.g., cobbles, stones, boulders, etc.) 0-3 Slope (%)

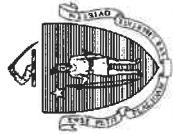
Description of Location:

2. Soil Parent Material: Glacial Till Ground Moraine On Slope
Position on Landscape (SU, SH, BS, FS, TS)
3. Distances from: Open Water Body > 100 feet Drainage Way > 50 feet Wetlands > 100 feet
Property Line > 50 feet Drinking Water Well > 100 feet Other feet
4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock
5. Groundwater Observed: ☒ Yes ☐ No If yes: 25" Depth Weeping from Pit 30" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-6	A	FSL	10 YR 3/2						Granular	Friable	
6-16	B	FSL	10 YR 5/6						Granular	Friable	
16-72	C	SL	2.5 Y 3/4	24"	10 YR 4/5		10	10	SAB	Firm	Redox Abundant / Distinct

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

- ☐ Depth observed standing water in observation hole
- ☐ Depth weeping from side of observation hole
- ☒ Depth to soil redoximorphic features (mottles)
- ☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)

Obs. Hole #4-11-1

_____ inches

_____ inches

24 inches

_____ inches

Obs. Hole #4-11-2

_____ inches

_____ inches

24 inches

_____ inches

Index Well Number

Reading Date

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well#

S_c

S_r

OW_c

OW_{max}

OW_r

S_h

2. Estimated Depth to High Groundwater: _____ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil system? ☒ Yes ☐ No absorption
- b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: _____ inches Lower boundary: _____ inches
- c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches



Commonwealth of Massachusetts
City/Town of LEICESTER

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

John M. Madeiros / SE # 2849

Typed or Printed Name of Soil Evaluator / License #

4-22-19

Date

6-30-2019

Expiration Date of License

Town of Leicester

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with [Percolation Test Form 12](#).

Field Diagrams: Use this area for field diagrams:



Commonwealth of Massachusetts
City/Town of LEICESTER

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Campanelli

Owner Name

22 Burncoat Street

Street Address

LeicesterMA

City

MA

State

18B B11

Map/Lot #

01524

Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes:

Oliver MA GIS
Source 312 B
Soil Map Unit

Woodbridge FSL, 3-8% slopes, extremely stony

None

Soil Limitations

Glacial Till

Ground Moraine

Landform

3. Surficial Geological Report Available? ☐ Yes ☒ No

If yes:

Year Published/Source Map Unit

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No

7. Current Water Resource Conditions (USGS):

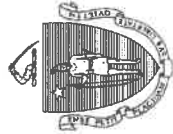
4/19
Month/Day/ Year

If yes, MassGIS Wetland Data Layer:

Range: ☒ Above Normal ☐ Normal ☐ Below Normal

Wetland Type

8. Other references reviewed:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 4-11-3 Hole # 4-11-19 Date 4-11-19 Time 9 AM Weather Sun 50 Latitude 42.243474 Longitude: -71.931438
0-3

1. Land Use Woodland Trees / Shrubs Vegetation Surface Stones (e.g., cobbles, stones, boulders, etc.) Common Slope (%) 0-3
(e.g., woodland, agricultural field, vacant lot, etc.)

Description of Location:

2. Soil Parent Material: Glacial Till Ground Moraine On Slope Position on Landscape (SU, SH, BS, FS, TS)
Landform Drainage Way >100 feet Wetlands >100 feet

3. Distances from: Open Water Body >200 feet Drinking Water Well >100 feet Other _____ feet
Property Line >50 feet

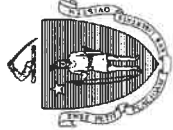
4. Unsuitable Materials Present: ☐ Yes ☒ No ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 25" Depth Weeping from Pit 30" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume	Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent				
0-10	A	FSL	10 YR 3/2					Granular	Friable	
10-16	B	FSL	10 YR 5/6					Granular	Friable	
16-72	C	SL	2.5 Y 3/4	24"	10 YR 4/6	30	10	SAB	Firm	Redox Abundant / Distinct

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Number: 4-11-4 Date: 4-11-19 Time: 9 AM Sun 50 Latitude: 42.243474 Longitude: -71.931438
Hole #

1. Land Use: Woodland Trees / Shrubs: Common Surface Stones (e.g., cobbles, stones, boulders, etc.): 0-3
(e.g., woodland, agricultural field, vacant lot, etc.)

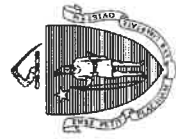
Description of Location:

2. Soil Parent Material: Glacial Till Ground Moraine Landform On Slope Position on Landscape (SU, SH, BS, FS, TS)
3. Distances from: Open Water Body > 100 feet Drainage Way > 50 feet Wetlands > 100 feet
Property Line > 50 feet Drinking Water Well > 100 feet Other feet
4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock
5. Groundwater Observed: ☒ Yes ☐ No If yes: 33" Depth Weeping from Pit 35" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10	A	FSL	10 YR 3/2						Granular	Friable	
10-16	B	FSL	10 YR 5/6						Granular	Friable	
16-72	C	SL	2.5 Y 3/4	30"	10 YR 4/5		10	10	SAB	Firm	Redox Abundant / Distinct

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

- ☐ Depth observed standing water in observation hole
- ☐ Depth weeping from side of observation hole
- ☒ Depth to soil redoximorphic features (mottles)
- ☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)

Obs. Hole #4-11-4

_____ inches

Obs. Hole #4-11-3

_____ inches

_____ inches

30 inches

24 inches

_____ inches

_____ inches

Index Well Number

Reading Date

$$S_h = S_c - [S_r \times (OW_c - OW_{\max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ $OW_{\max}$ _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: _____ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil system? ☒ Yes ☐ No absorption
- b. If yes, at what depth was it observed (exclude A and O Horizons)?
- c. If no, at what depth was impervious material observed?

Upper boundary:

16
inches

Lower boundary:

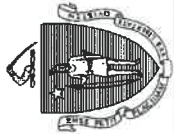
72
inches

Upper boundary:

_____ inches

Lower boundary:

_____ inches



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

4-22-19

Signature of Soil Evaluator

Date

John M. Madeiros / SE # 2849

6-30-2019

Typed or Printed Name of Soil Evaluator / License #

Expiration Date of License

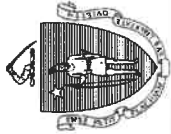
Town of Leicester

Name of Approving Authority Witness

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with [Percolation Test Form 12](#).

Field Diagrams: Use this area for field diagrams:



Commonwealth of Massachusetts
City/Town of LEICESTER

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Campanelli

Owner Name

22 Burncoat Street

Street Address

LeicesterMA

City

MA

State

18B B11

Map/Lot #

01524

Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes:

Oliver MA GIS 312 B

Source Soil Map Unit

Woodbridge FSL, 3-8% slopes, extremely stony

None

Soil Name

Soil Limitations

Glacial Till

Ground Moraine

Soil Parent material

Landform

3. Surficial Geological Report Available? ☐ Yes ☒ No

If yes:

Year Published/Source Map Unit

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No

If yes, MassGIS Wetland Data Layer:

7. Current Water Resource Conditions (USGS):

4/19

Month/Day/ Year

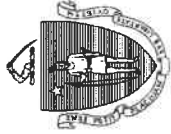
Range: ☒ Above Normal

Wetland Type

☐ Normal

☐ Below Normal

8. Other references reviewed:



Commonwealth of Massachusetts
City/Town of LEICESTER

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 4-11-5 4-11-19 10 AM Sun 50 42.243474 -71.931438
Hole # Date Time Weather Latitude Longitude:
1. Land Use Woodland Trees / Shrubs Common Surface Stones (e.g., cobbles, stones, boulders, etc.) 0-3 Slope (%)
 (e.g., woodland, agricultural field, vacant lot, etc.)

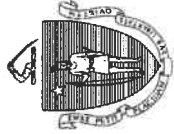
Description of Location:

2. Soil Parent Material: Glacial Till Ground Moraine On Slope
 Position on Landscape (SU, SH, BS, FS, TS)
3. Distances from: Open Water Body >200 feet Drainage Way >100 feet Wetlands >100 feet
 Property Line >50 feet Drinking Water Well >100 feet Other feet
4. Unsuitable Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock
5. Groundwater Observed: ☒ Yes ☐ No If yes: 38" Depth Weeping from Pit 42" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features		Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel			
0-10	A	FSL	10 YR 3/2					Granular	Friable	
10-18	B	FSL	10 YR 5/6					Granular	Friable	
18-72	C	SL	2.5 Y 3/4	30"	10 YR 4/6	30	10	SAB	Firm	Redox Abundant / Distinct

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Number: 4-11-6 Date: 4-11-19 Time: 9 AM Weather: Sun 50 Latitude: 42.243474 Longitude: -71.931438

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Trees / Shrubs: Common Surface Stones (e.g., cobbles, stones, boulders, etc.): 0-3 Slope (%): 0-3

Description of Location:

2. Soil Parent Material: Glacial Till

Ground Moraine
Landform

On Slope
Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >100 feet
Property Line >50 feet

Drainage Way >50 feet
Drinking Water Well >100 feet

Wetlands >100 feet
Other feet

4. Unsuitable

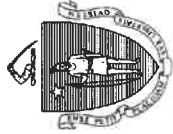
Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No If yes: 38" Depth Weeping from Pit 42" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10	A	FSL	10 YR 3/2						Granular	Friable	
10-17	B	FSL	10 YR 5/6						Granular	Friable	
17-72	C	SL	2.5 Y 3/4	30"	10 YR 4/5		10	20	SAB	Firm	Redox Abundant / Distinct

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

- ☐ Depth observed standing water in observation hole
- ☐ Depth weeping from side of observation hole
- ☒ Depth to soil redoximorphic features (mottles)
- ☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)

Obs. Hole # 4-11-5

_____ inches

Obs. Hole # 4-11-6

_____ inches

_____ inches

30 inches

_____ inches

Index Well Number _____

Reading Date _____

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

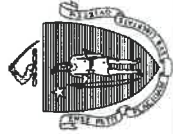
Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: _____ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil system? ☒ Yes ☐ No absorption
- b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 18 inches Lower boundary: 72 inches
- c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator

John M. Madeiros / SE # 2849

Typed or Printed Name of Soil Evaluator / License #

4-22-19

Date

6-30-2019

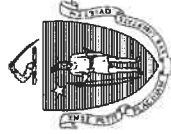
Expiration Date of License

Town of Leicester

Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with [Percolation Test Form 12](#).

Field Diagrams: Use this area for field diagrams:



Commonwealth of Massachusetts
City/Town of LEICESTER

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

A. Facility Information

Campanelli

Owner Name

22 Burncoat Street

Street Address

LeicesterMA

City

MA

State

18B B11

Map/Lot #

01524

Zip Code

B. Site Information

1. (Check one) ☒ New Construction ☐ Upgrade ☐ Repair

2. Soil Survey Available? ☒ Yes ☐ No If yes:

Oliver MA GIS 312 B

Source Soil Map Unit

Woodbridge FSL, 3-8% slopes, extremely stony

None

Soil Limitations

Glacial Till

Ground Moraine

Soil Parent material

Landform

3. Surficial Geological Report Available? ☐ Yes ☒ No

If yes:

Year Published/Source

Map Unit

Description of Geologic Map Unit:

4. Flood Rate Insurance Map Within a regulatory floodway? ☐ Yes ☒ No

5. Within a velocity zone? ☐ Yes ☒ No

6. Within a Mapped Wetland Area? ☐ Yes ☒ No

If yes, MassGIS Wetland Data Layer:

7. Current Water Resource Conditions (USGS):

4/19

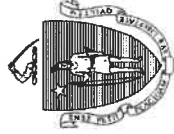
Month/Day/ Year

Range: ☒ Above Normal

☐ Normal

☐ Below Normal

8. Other references reviewed:



Commonwealth of Massachusetts
City/Town of LEICESTER

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review *(minimum of two holes required at every proposed primary and reserve disposal area)*

Deep Observation Hole Number: 4-11-7 Hole # 4-11-19 Date 11 AM Time Sun 50 Weather Common Latitude 42.243474 Longitude: -71.931438
0-3 Slope (%)

Woodland

1. Land Use (e.g., woodland, agricultural field, vacant lot, etc.)

Trees / Shrubs

Vegetation

Surface Stones (e.g., cobbles, stones, boulders, etc.)

Description of Location:

2. Soil Parent Material: Glacial Till

Ground Moraine

On Slope

Position on Landscape (SU, SH, BS, FS, TS)

3. Distances from: Open Water Body >200 feet

Drainage Way >100 feet

Wetlands >100 feet

Property Line >50 feet

Drinking Water Well >100 feet

Other _____ feet

4. Unsuitable Materials Present: ☐ Yes ☒ No ☐ If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock

5. Groundwater Observed: ☒ Yes ☐ No

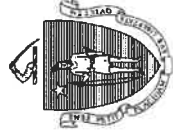
If yes: 50" Depth Weeping from Pit

60" Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-10	A	FSL	10 YR 3/2						Granular	Friable	
10-19	B	FSL	10 YR 5/6						Granular	Friable	
19-72	C	SL	2.5 Y 3/4	42"	10 YR 4/6	30	10	20	SAB	Firm	Redox Abundant / Distinct

Additional Notes:



Commonwealth of Massachusetts
City/Town of LEICESTER

Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

C. On-Site Review (minimum of two holes required at every proposed primary and reserve disposal area)

Deep Observation Hole Number: 4-11-8 Hole # 4-11-19 Date 11 AM Time Sun 50 Weather 42.243474 Latitude -71.931438 Longitude: 0-3 Slope (%)

1. Land Use: Woodland (e.g., woodland, agricultural field, vacant lot, etc.) Common Surface Stones (e.g., cobbles, stones, boulders, etc.) 0-3 Slope (%)

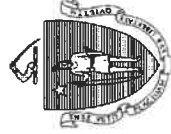
Description of Location:

2. Soil Parent Material: Glacial Till Ground Moraine Landform Top Slope Position on Landscape (SU, SH, BS, FS, TS)
3. Distances from: Open Water Body > 100 feet Drainage Way > 50 feet Wetlands > 100 feet
4. Unsuitable Property Line > 50 feet Drinking Water Well > 100 feet Other feet
- Materials Present: ☐ Yes ☒ No If Yes: ☐ Disturbed Soil ☐ Fill Material ☐ Weathered/Fractured Rock ☐ Bedrock
5. Groundwater Observed: ☐ Yes ☒ No If yes: N/A Depth Weeping from Pit N/A Depth Standing Water in Hole

Soil Log

Depth (in)	Soil Horizon /Layer	Soil Texture (USDA)	Soil Matrix: Color-Moist (Munsell)	Redoximorphic Features			Coarse Fragments % by Volume		Soil Structure	Soil Consistence (Moist)	Other
				Depth	Color	Percent	Gravel	Cobbles & Stones			
0-8	A	FSL	10 YR 3/2						Granular	Friable	
8-20	B	FSL	10 YR 5/6						Granular	Friable	
20-72	C	SL	2.5 Y 3/4	38"	10 YR 4/5		10	20	SAB	Firm	Redox Abundant / Distinct

Additional Notes:



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

D. Determination of High Groundwater Elevation

1. Method Used:

- ☐ Depth observed standing water in observation hole
- ☐ Depth weeping from side of observation hole
- ☒ Depth to soil redoximorphic features (mottles)
- ☐ Depth to adjusted seasonal high groundwater (S_h) (USGS methodology)

Obs. Hole #4-11-7

_____ inches

_____ inches

42 inches

_____ inches

Obs. Hole #4-11-8

_____ inches

_____ inches

38 inches

_____ inches

Index Well Number

Reading Date

$$S_h = S_c - [S_r \times (OW_c - OW_{max}) / OW_r]$$

Obs. Hole/Well# _____ S_c _____ S_r _____ OW_c _____ OW_{max} _____ OW_r _____ S_h _____

2. Estimated Depth to High Groundwater: _____ inches

E. Depth of Pervious Material

1. Depth of Naturally Occurring Pervious Material

- a. Does at least four feet of naturally occurring pervious material exist in all areas observed throughout the area proposed for the soil system? ☒ Yes ☐ No absorption
- b. If yes, at what depth was it observed (exclude A and O Horizons)? Upper boundary: 20 inches Lower boundary: 72 inches
- c. If no, at what depth was impervious material observed? Upper boundary: _____ inches Lower boundary: _____ inches



Form 11 - Soil Suitability Assessment for On-Site Sewage Disposal

F. Certification

I certify that I am currently approved by the Department of Environmental Protection pursuant to 310 CMR 15.017 to conduct soil evaluations and that the above analysis has been performed by me consistent with the required training, expertise and experience described in 310 CMR 15.017. I further certify that the results of my soil evaluation, as indicated in the attached Soil Evaluation Form, are accurate and in accordance with 310 CMR 15.100 through 15.107.

Signature of Soil Evaluator
John M. Madeiros / SE # 2849
Typed or Printed Name of Soil Evaluator / License #

Name of Approving Authority Witness

4-22-19
Date
6-30-2019
Expiration Date of License
Town of Leicester
Approving Authority

Note: In accordance with 310 CMR 15.018(2) this form must be submitted to the approving authority within 60 days of the date of field testing, and to the designer and the property owner with [Percolation Test Form 12](#).

Field Diagrams: Use this area for field diagrams:

PART V – MAPS

ASE
Andros Engineering Inc.
 Land Surveying - Civil Engineering - Site Planning
 P.O. Box 312, 184 Myrtle Street
 North Attleboro, MA 01939
 P: 508.335.1000 F: 508.335.1009
 498 East Washington Street
 North Attleboro, Massachusetts 01939
 P: 508.335.1000 F: 508.335.1009

CULTIVATE BURNCOAT
 22 BURNCOAT STREET
 LEICESTER, MA 01524

CULTIVATE HOLDINGS LLC
 P.O. BOX 245
 LEICESTER, MA 01524

NO.	DATE	DESCRIPTION

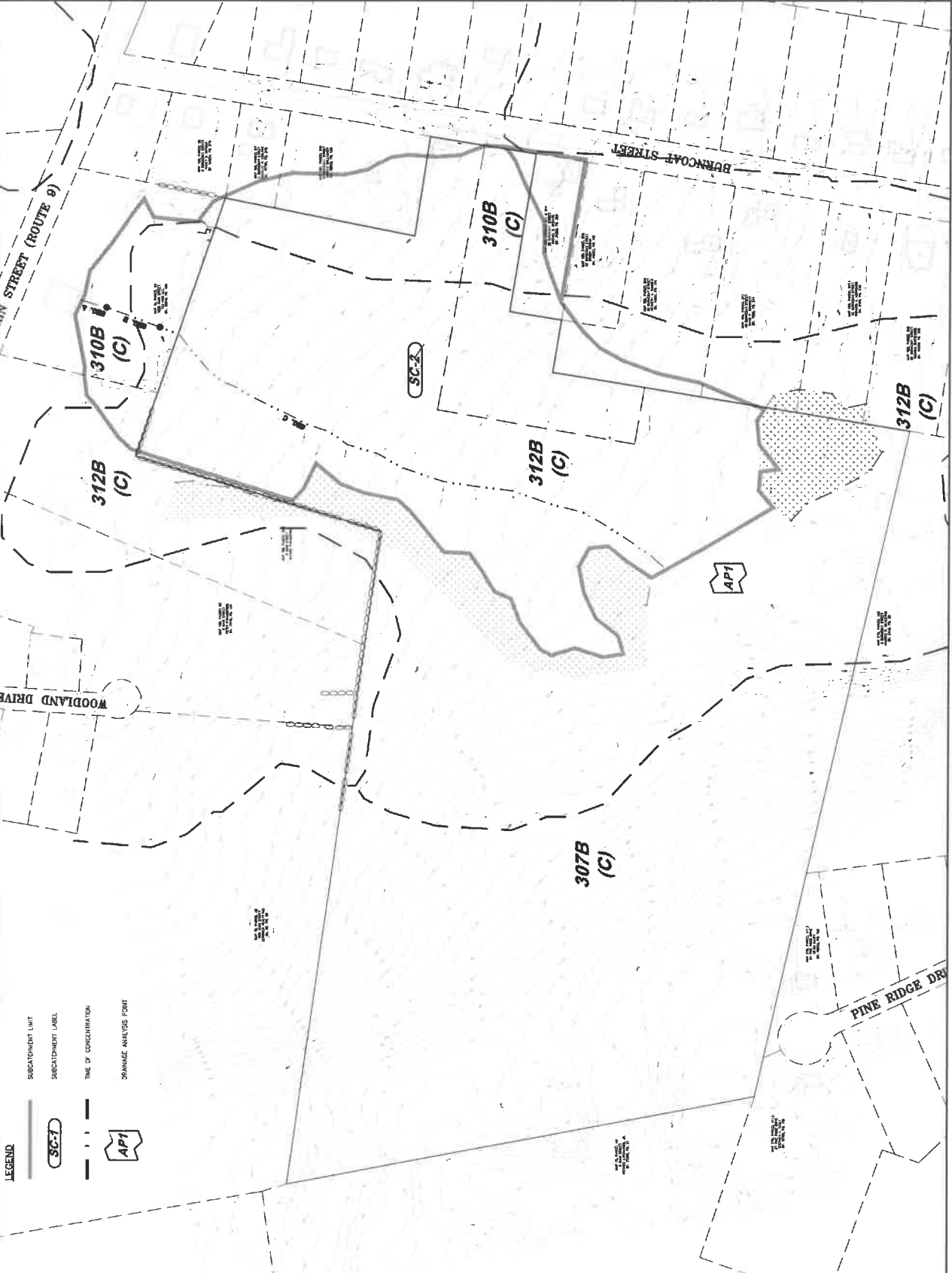
PROJECT: _____

APPLICANT: _____

GRAPHIC SCALE
 1 inch = 50 feet
 (IN FEET)

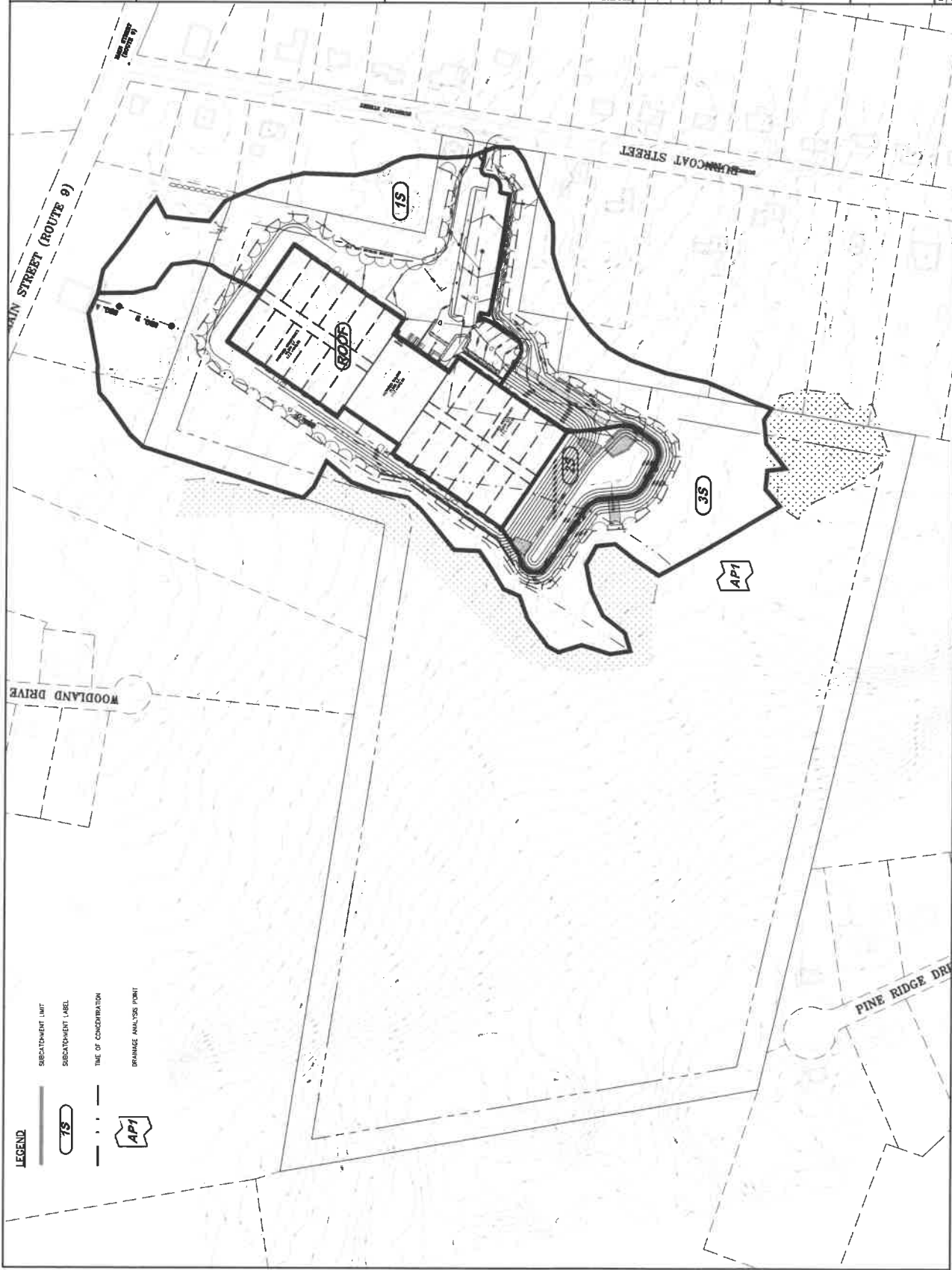
SHEET TITLE
 PRE-DEVELOPMENT
 WATERSHED MAP

DATE: APRIL 11, 2019
 SHEET NO. 2019-049
 D-1.0



LEGEND

-  SUBCATCHMENT LIMIT
-  SUBCATCHMENT LABEL
-  TIME OF CONCENTRATION
-  DRAINAGE ANALYSIS POINT



Address: 1000 Main Street, 1st Floor
 Leicester, MA 01524
 Phone: 508.520.1100
 Fax: 508.520.1101
 Email: info@aseinc.com
 Website: www.aseinc.com

CULTIVATE HOLDINGS LLC
 P.O. BOX 245
 LEICESTER, MA 01524

PROJECT	DATE	DESCRIPTION

GRAPHIC SCALE
 1 inch = 50 feet

SHEET TITLE
 POST-DEVELOPMENT
 WATERSHED MAP



Andrew S. Engineering, Inc.
Land Surveying - Civil Engineering - Site Planning
200, Box 112, 184 Middle Street
Leicester, MA 01524
P: 508.526.1000 F: 508.526.1001
www.ase-engineering.com
400 East Washington Street
North Attleboro, Massachusetts 01938
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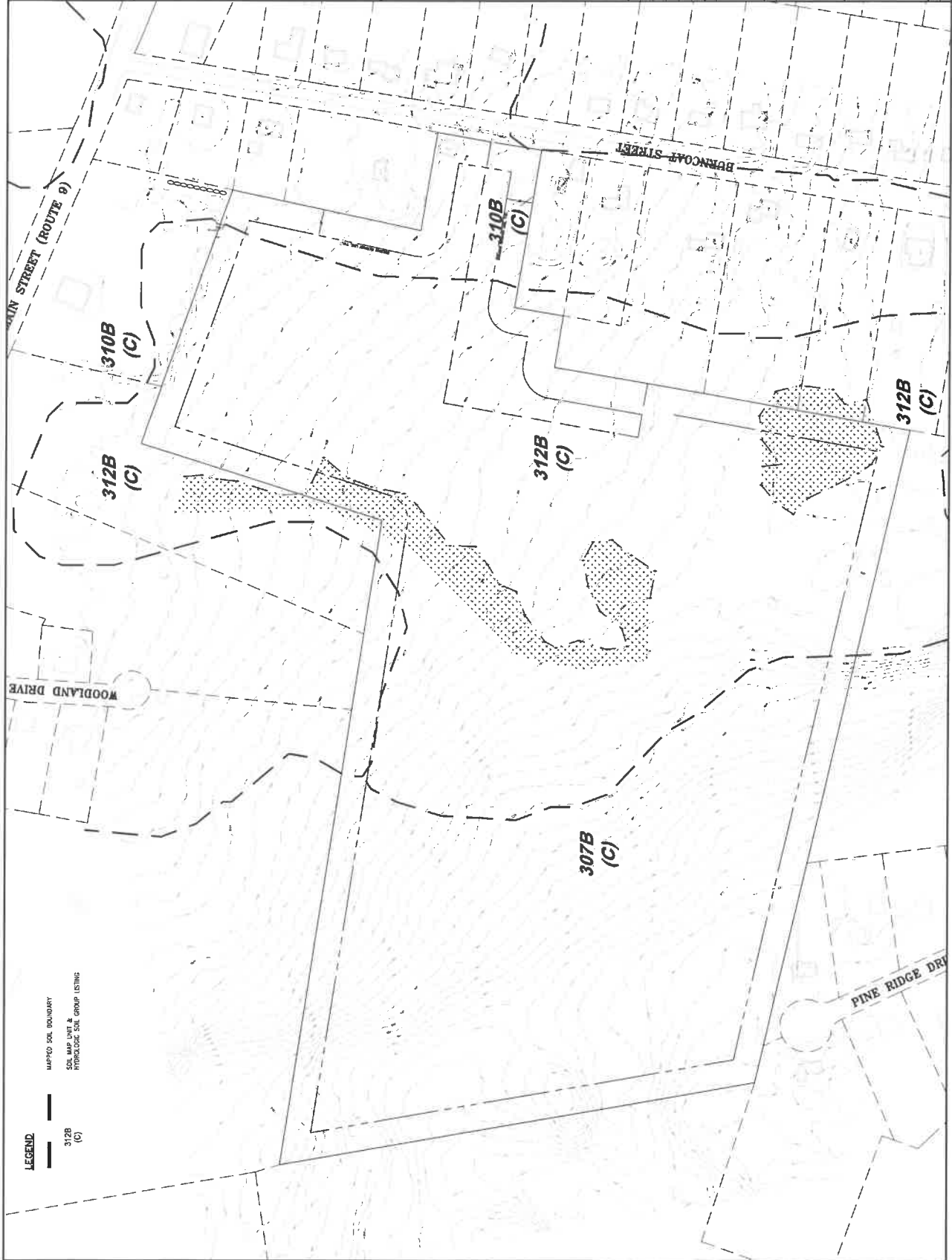
CULTIVATE HOLDINGS LLC
P.O. BOX 245
LEICESTER, MA 01524

REVISIONS	
NO.	DATE



LEGEND

- MAP TO SOIL BOUNDARY
- SOIL MAP UNIT & GROUP LISTING
- 312B (C)
- HYDROLOGIC SOIL GROUP LISTING



Advanced Survey & Engineering, Inc.
Land Mapping - Civil Engineering - Site Planning
P.O. Box 112, 184 Main Street
Leicester, MA 01524
Tel: 508.251.1122 Fax: 508.251.1123
E-Mail: info@aseinc.com
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LEICESTER, MA 01524

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LEICESTER, MA 01524

NO.	DATE	REVISIONS	DESCRIPTION

GRAPHIC SCALE
1" = 100' (1" = 30.48m)
1" = 100' (1" = 30.48m)
SHEET TITLE

SOILS MAP