DRAINAGE REPORT 10-12 Mecahnic Street Newton, Massachusetts



January 16, 2020

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VTP project number: 28194

IMPERVIOUS AREAS

Date:	January 16, 2020		
Address:	10-12 Mecahnic Street		
Project:	28194		

Impervious Areas		Existing	Proposed
Buildings		1,240.7 s.f.	2,667.6 s.f.
Driveway		264.5 s.f.	2,246.6 s.f.
Walkways, patios		18.8 s.f.	806.4 s.f.
Retaining Walls		0.0 s.f.	373.1 s.f.
	Total	1,524.0 s.f.	6,093.7 s.f.
Increase in Impervious Area:	6.093.	7 - 1.524.0 = 4.569.7 s.f.	

Increase in Impervious Area:	6,093.7 - 1,524.0 = 4,569.7 s.f.
Lot area:	9,964.0 s.f.
4% of lot area:	398.6 s.f.

4,569.7 s.f. > 398.6 s.f. Drainage Required

DRAINAGE SUMMARY

Project Location: Project Number:	10-12 Mecahnic Str 28194	eet	Lot Area: Date:	9,964 sq. ft. 1/16/2020	= 0.229 acres
IMPERVIOUS AREAS:					
Existing Conditions:					
	Impervious Area:	1,524 sq. ft.	/ 43560 sq. ft. / a	cre	= 0.035 acres
	Pervious Area:	8,440 sq. ft.	/ 43560 sq. ft. / a	cre	= 0.194 acres
Runoff Coef	ficient (weighted):				
	0.0350 acres	x 0.95 =	0.0333 acres		
	0.1938 acres	x 0.35 =	0.0678 acres	<u>.</u>	
	0.229 acres		0.101 acres	/ 0.229 acres	= 0.441
Proposed Conditions:					
F	Impervious Area:	6,094 sq. ft.	/ 43560 sq. ft. / a	cre	= 0.140 acres
	Pervious Area:	3,870 sq. ft.	/ 43560 sq. ft. / a	cre	= 0.089 acres
Runoff Coef	ficient (weighted)				
Runon coor	0.1399 acres	x 0.95 =	0.1329 acres		
	0.0888 acres	x 0.35 =	0.0311 acres		
	0.229 acres		0.164 acres	/ 0.229 acres	= 0.716
VOLUME AND FLOW-					
$O_{25} \text{ pre} =$	= 0.441 x	5.91 x	0.229 =	0.597 cfs	
Q_{25} prot	= 0.716 x	5.91 x	0.229 =	0.969 cfs	
Q25 P000	01710 /1	0.91 /	0.229	0.909 010	
V ₂₅ pre =	= 0.493 x	0.597 x	0.229 =	0.067 ac-ft	
V ₂₅ post =	= 0.493 x	0.969 x	0.229 =	0.109 ac-ft	
Q ₁₀₀ pre =	= 0.441 x	8.78 x	0.229 =	0.887 cfs	
Q_{100} post =	= 0.716 x	8.78 x	0.229 =	1.440 cfs	
V ₁₀₀ pre =	= 0.732 x	0.887 x	0.229 =	0.149 ac-ft	
V_{100} post =	= 0.732 x	1.440 x	0.229 =	0.241 ac-ft	
V ₁₀₀ post	- $V_{100} \text{ pre} =$	0.241 ac-ft	- 0.149 ac-ft		= 0.092 ac-ft
0.092 ac-ft x	43560 sq. ft	t. / acre	= 4007.52 cu-ft	x 7.48 gal/cf	= 29,976 gal
Q ₁₀₀ post	- $Q_{100} \text{ pre} =$	1.440 cfs	- 0.887 cfs =	0.553 cfs	
0.553 cfs 2	60 sec/min	x 45 min	= 1493.10 cfm	x 7.48 gal/cf	= 11,168 gpm

END GALLET STORAGE.					
Design Infiltration Rate:	59 min/inch =	0.08 ft/hr	Rawls Ratio	p: 1.02	(Sandy-Loam)
Infiltration Canacity					
Initiation Capacity	Bottom Area =	8.0'	x 6 0'	= 48.0 sq. ft.	
	48.0 sq. ft.	x 0.08 ft/hr	= 3.8 cfh	= 91.2 cf/day	= 0.0021 ac-ft
				,	
Galley Storage					
	Total =	48.0 sq. ft.	x 3.25'	$= 156.0 ext{ cf}$	
Embedded	Galley Volume =	4.00'	x 4.00'	x 3.25'	= 52.0 cf
	Stone Volume =	156.0 cf	- 52.0 cf	= 104.0 cf	
	Storage =	stone volume	e x voids ratio	$= 104.0 \ge 0.35$	$= 36.4 ext{ cf}$
	Galley Volume =	3.50'	x 3.50'	x 3.25'	$= 39.8 ext{ cf}$
	Total Capacity = C	alley Volume +	stone void volu	me	
	1	39.8	+ 36.4	$= 76.2 ext{ cf}$	= 0.0017 ac-ft
T - 1	. 1/: 61 1	C1			
l otal s	tored/infiltrated = ir	initration capac	ty + total capaci	ty	
		0.0021 ac-ft	+0.0017 ac-ft	= 0.0038 ac-ft	
MIDDLE CALLEVS STOD	ACE.				
MIDDLE GALLEYSSION	<u>AGE:</u> 50 min/inch =	0.09 ft/hm	Dowle Doti	x 1.0 2	(Sandy Laam)
Design Inititration Rate:	39 mm/mcm =	0.08 10/11	Kawis Kali	5: 1.02	(Sandy-Loam)
Infiltration Capacity					
Infiltration Capacity	Bottom Area =	8.0'	x 4.0'	= 32.0 sq. ft.	
Infiltration Capacity	Bottom Area = 32.0 sq. ft.	8.0' x 0.08 ft/hr	x 4.0' = 2.6 cf/hr	= 32.0 sq. ft. = 62.4 cf/day	= 0.0014 ac-ft
Infiltration Capacity	Bottom Area = 32.0 sq. ft.	8.0' x 0.08 ft/hr	x 4.0' = 2.6 cf/hr	= 32.0 sq. ft. = 62.4 cf/day	= 0.0014 ac-ft
Infiltration Capacity Galley Storage	Bottom Area = 32.0 sq. ft.	8.0' x 0.08 ft/hr	x 4.0' = 2.6 cf/hr	= 32.0 sq. ft. = 62.4 cf/day	= 0.0014 ac-ft
Infiltration Capacity Galley Storage	Bottom Area = 32.0 sq. ft. Total =	8.0' x 0.08 ft/hr 32.0 sq. ft.	x 4.0' = 2.6 cf/hr x 3.25'	= 32.0 sq. ft. = 62.4 cf/day = 104.0 cf	= 0.0014 ac-ft
Infiltration Capacity Galley Storage Embedded	Bottom Area = 32.0 sq. ft. Total = Galley Volume =	8.0' x 0.08 ft/hr 32.0 sq. ft. 4.00'	x 4.0' = 2.6 cf/hr x 3.25' x 4.00'	= 32.0 sq. ft. = 62.4 cf/day = 104.0 cf x 3.25'	= 0.0014 ac-ft = 52.0 cf
Infiltration Capacity Galley Storage Embedded	Bottom Area = 32.0 sq. ft. Total = Galley Volume = Stone Volume =	8.0' x 0.08 ft/hr 32.0 sq. ft. 4.00' 104.0 cf	x 4.0' = 2.6 cf/hr x 3.25' x 4.00' - 52.0 cf	= 32.0 sq. ft. = 62.4 cf/day = 104.0 cf x 3.25' = 52.0 cf	= 0.0014 ac-ft = 52.0 cf
Infiltration Capacity Galley Storage Embedded	Bottom Area = 32.0 sq. ft. Total = Galley Volume = Stone Volume = Storage =	8.0' x 0.08 ft/hr 32.0 sq. ft. 4.00' 104.0 cf stone volume	x 4.0' = 2.6 cf/hr x 3.25' x 4.00' - 52.0 cf e x voids ratio	= 32.0 sq. ft. = 62.4 cf/day = 104.0 cf x 3.25' = 52.0 cf = 52.0 x 0.35	= 0.0014 ac-ft = 52.0 cf = 18.2 cf
Infiltration Capacity Galley Storage Embedded	Bottom Area = 32.0 sq. ft. Total = Galley Volume = Stone Volume = Storage = Galley Volume =	8.0' x 0.08 ft/hr 32.0 sq. ft. 4.00' 104.0 cf stone volume 3.50'	x 4.0' = 2.6 cf/hr x 3.25' x 4.00' - 52.0 cf e x voids ratio x 3.50'	= 32.0 sq. ft. = 62.4 cf/day = 104.0 cf x 3.25' = 52.0 cf = 52.0 x 0.35 x 3.25'	= 0.0014 ac-ft = 52.0 cf = 18.2 cf = 39.8 cf
Infiltration Capacity Galley Storage Embedded	Bottom Area = 32.0 sq. ft. Total = Galley Volume = Stone Volume = Galley Volume = Total Capacity = G	8.0' x 0.08 ft/hr 32.0 sq. ft. 4.00' 104.0 cf stone volume 3.50' Galley Volume +	x 4.0' = 2.6 cf/hr x 3.25' x 4.00' - 52.0 cf e x voids ratio x 3.50' stone void volue	= 32.0 sq. ft. = 62.4 cf/day = 104.0 cf x 3.25' = 52.0 cf = 52.0 x 0.35 x 3.25' me	= 0.0014 ac-ft = 52.0 cf = 18.2 cf = 39.8 cf
Infiltration Capacity Galley Storage Embedded	Bottom Area = 32.0 sq. ft. Total = Galley Volume = Stone Volume = Galley Volume = Galley Volume = Total Capacity = G	8.0' x 0.08 ft/hr 32.0 sq. ft. 4.00' 104.0 cf stone volume 3.50' Galley Volume + 52.0	x 4.0' = 2.6 cf/hr x 3.25' x 4.00' - 52.0 cf e x voids ratio x 3.50' stone void volum + 18.2	= 32.0 sq. ft. = 62.4 cf/day = 104.0 cf x 3.25' = 52.0 cf = 52.0 x 0.35 x 3.25' me = 70.2 cf	= 0.0014 ac-ft = 52.0 cf = 18.2 cf = 39.8 cf = 0.0016 ac-ft

0.0014 ac-ft + 0.0016 ac-ft = 0.0030 ac-ft

REQUIRED SYSTEM STORAGE:

Storage required: 0.0920 ac-ft Storage provided: 0.0964 ac-ft Unit Type Qty. **Unit Capacity** Total End: 0.0038 ac-ft 0.0304 ac-ft 8 Middle: 22 0.0030 ac-ft 0.0660 ac-ft Low Profile End: 0.0000 ac-ft 0 0.0056 ac-ft Low Profile Middle: 0 0.0038 ac-ft 0.0000 ac-ft 0.0964 ac-ft Total = 30 units 0.0920 ac-ft > Therefore OK



USDA Natural Resources Conservation Service Web Soil Survey National Cooperative Soil Survey 12/23/2019 Page 1 of 3

MAP L	EGEND	MAP INFORMATION
Area of Interest (AOI) Area of Interest (AOI) Soils Soil Map Unit Polygons Clay Spot Soil Clay Spot Soil Clay Pit	Spoil Area Stony Spot Yery Stony Spot <t< th=""><th>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)</th></t<>	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)
Gravel Pit∴Gravelly Spot◯Landfill▲Lava Flow▲Marsh or swamp२Mine or Quarry◯Miscellaneous Water○Perennial Water∨Rock Outcrop↓Saline Spot∴Sandy Spot➡Severely Eroded Spot◇Slide or Slip∅Sodic Spot	 US Routes Major Roads Local Roads Background Aerial Photography	 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: Middlesex County, Massachusetts Survey Area Data: Version 19, Sep 12, 2019 Soil map units are labeled (as space allows) for map scales 1:50,000 or larger. Date(s) aerial images were photographed: Sep 11, 2019—Oct 5, 2019 The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.



Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
631C	Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky	0.3	100.0%
Totals for Area of Interest	•	0.3	100.0%



Middlesex County, Massachusetts

631C—Charlton-Urban land-Hollis complex, 3 to 15 percent slopes, rocky

Map Unit Setting

National map unit symbol: vr1g Elevation: 0 to 1,000 feet Mean annual precipitation: 32 to 54 inches Mean annual air temperature: 43 to 54 degrees F Frost-free period: 110 to 240 days Farmland classification: Not prime farmland

Map Unit Composition

Charlton and similar soils: 40 percent Urban land: 40 percent Hollis and similar soils: 10 percent Minor components: 10 percent Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Charlton

Setting

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

Typical profile

H1 - 0 to 5 inches: fine sandy loam

H2 - 5 to 22 inches: sandy loam

H3 - 22 to 65 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Moderate (about 7.3 inches)

Interpretive groups

Land capability classification (irrigated): None specified Land capability classification (nonirrigated): 3e Hydrologic Soil Group: A

JSDA

Hydric soil rating: No

Description of Urban Land

Setting

Landform position (two-dimensional): Footslope Landform position (three-dimensional): Base slope Down-slope shape: Linear Across-slope shape: Linear Parent material: Excavated and filled land

Description of Hollis

Setting

Landform: Ridges, hillslopes Landform position (two-dimensional): Backslope Landform position (three-dimensional): Side slope Down-slope shape: Linear Across-slope shape: Convex Parent material: Friable, shallow loamy basal till over granite and gneiss

Typical profile

H1 - 0 to 2 inches: fine sandy loam
H2 - 2 to 14 inches: fine sandy loam
H3 - 14 to 18 inches: unweathered bedrock

Properties and qualities

Slope: 3 to 15 percent
Percent of area covered with surface fragments: 9.0 percent
Depth to restrictive feature: 8 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

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

Minor Components

Canton

Percent of map unit: 4 percent Landform: Hills Landform position (two-dimensional): Backslope, toeslope Landform position (three-dimensional): Side slope, base slope Down-slope shape: Linear Across-slope shape: Convex

JSDA

Hydric soil rating: No

Udorthents, loamy

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

Rock outcrop

Percent of map unit: 2 percent Landform: Ledges Landform position (two-dimensional): Summit Landform position (three-dimensional): Head slope Down-slope shape: Concave Across-slope shape: Concave

Scituate

Percent of map unit: 1 percent Landform: Depressions, hillslopes Landform position (two-dimensional): Toeslope, summit Landform position (three-dimensional): Base slope, head slope Down-slope shape: Linear Across-slope shape: Concave Hydric soil rating: No

Montauk

Percent of map unit: 1 percent Landform: Hillslopes Landform position (two-dimensional): Shoulder, summit Landform position (three-dimensional): Nose slope, head slope Down-slope shape: Convex Across-slope shape: Convex Hydric soil rating: No

Data Source Information

Soil Survey Area: Middlesex County, Massachusetts Survey Area Data: Version 19, Sep 12, 2019

