

381 Payne Road Scarborough, Maine 04074 (800) 882-2227/ (207) 883-1000 FAX: (207) 883-1001

# Memorandum

TO:

Jean Fraser

FROM:

Lee Allen, P.E.

DATE:

December 7, 2015

RE:

171 Warren Avenue – Stormwater Design (Pocket Raingarden)

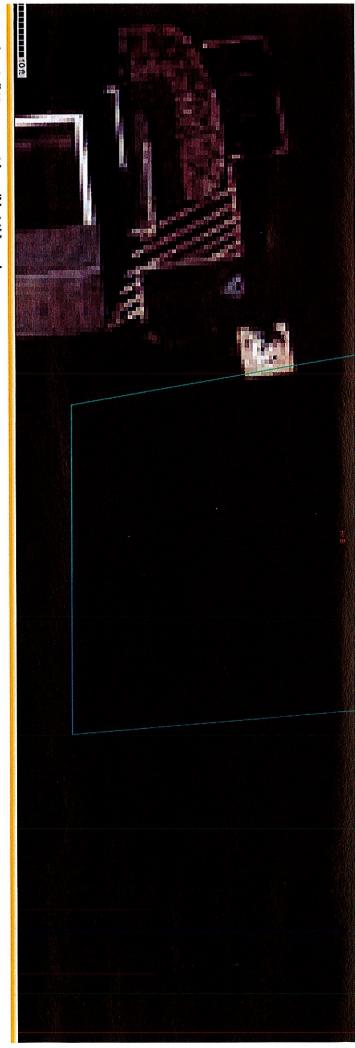
Following please find calculations and data that support the design of a pocket raingarden for the proposed expansion of 5 parking spaces at 171 Warren Avenue. The parking expansion introduces 1,663 sf of new impervious area to the site. A 200 sf "pocket raingarden" has been proposed to treat runoff from the new impervious surface. Stormwater runoff is proposed to be collected in a swale and directed to the raingarden. The raingarden was sized to contain and treat runoff from the 1-year storm event (first flush). The soil in this area was found to be Hollis Fine Sandy Loam (HrB) with saturated infiltration rate of 28.23 micrometer/sec. This infiltration rate was converted to an exfiltration rate over the bottom of the raingarden for the purposes of the HydroCAD analysis to size the raingarden. As can be seen from the HydroCAD data the raingarden will hold approximately 7" of water during the 1-year rain event without discharging over the spillway.

# NORTHEAST CIVIL SOLUTIONS, INC.

Surveying Engineering Land Planning 381 Payne Road, Scarborough, Maine 04074 Tel: 207-883-1000 • Fax: 207-883-1001

PROJECT (2011) - 32209	
SHEET NO	OF
CALCULATED BY LDA-	DATE 17/7/15
CHECKED BY	DATE
and During During	

	SCALE KAN CONTROCK CALCULATION
Some HTB: Howe FIRE SANDY LOIN	1
KART = SATURNIED HYDRAULIC CONDUCT	MUMY = MICYO M/SEC = 28,23 MICH M/SEC
	= 2.823×10 5 m/sec
	= ,000 2823 m/sec
the vince-	= 9.26 x10-5 ft/sec
NEW IMPERVIOUS AREA = 1,663 SF	
TRINC*   PANGARDON AREA = 200SF = QI	USIL = 10185 CFS = VA 19.26×10 51/sel/(200
SEE HYDROCATO DATA Q1 (FIRST F	FLUSHO) CUNTAINED WITHIN RAINGARDEN

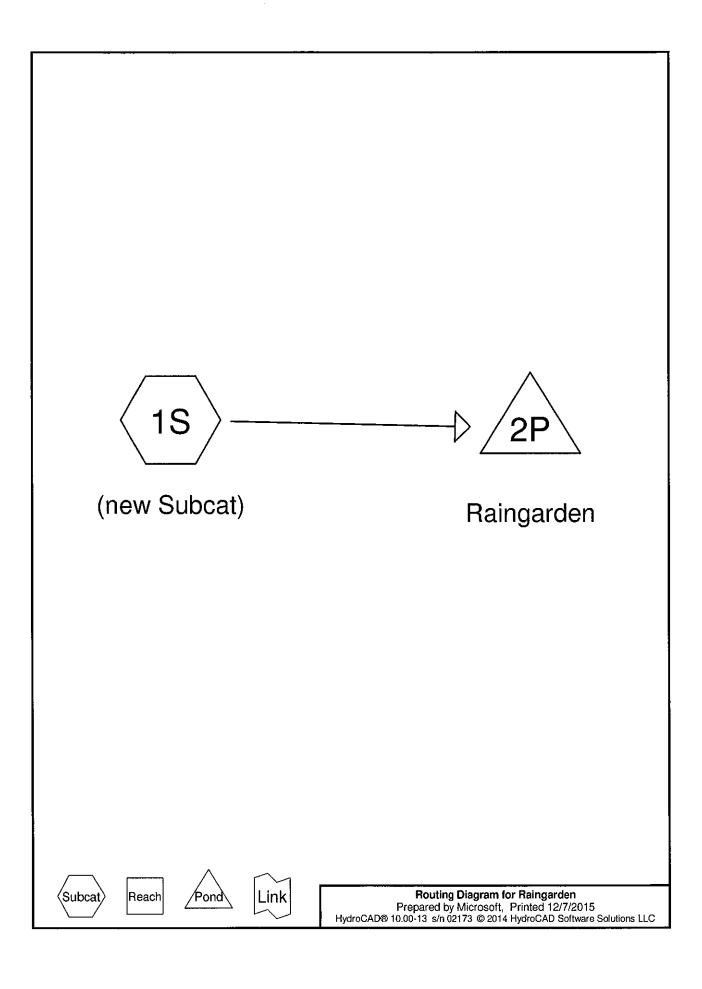


# <u>∧</u> Warning: Soil Map may not be valid at this scale.

You have zoomed in beyond the scale at which the soil map for this area is intended to be used. Mapping of soils is done at a particular scale. The soil surveys that comprise your AOI were mapped at 1:24,C The design of map units and the level of detail shown in the resulting soil map are dependent on that map 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 contrast been shown at a more detailed scale.

- Physical Soil Properties	oil Proper	ties												
erland County and Part of Oxford County, Maine	and Part	of Oxford Cou	nty, Maine											
symbol and oil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	ter Linear extensibility	Organic matter	Erosi	Erosion factors Kw Kf T	tors	Erosion factors Wind erodibility Wind erodil Kw Kf T group index	Wind erodil index
	Īn	Pct	Pct	Pct	g/cc	micro m/sec	In/In	Pct	Pct					
ollis fine sandy 3 to 8 percent														
	0-6	45-60- 85	0-34-50	2-6-10	0.75-0.98- 1.20	14.11-28.23-42.34	0.08-0.17-0.25	0.0- 1.5- 2.9	4.0-5.0-6.0 .32 .32	.32	.32	j <sub>ar</sub> s	ω	86
	6-18	45-48-85	0-46-50	2-6-10	0.90-1.15- 1.40	14.11(28.23)42.34	0.08-0.18-0.28	0.0-1.5-2.9	2.0-3.0-5.0 .49 .49	.49	.49			
	18-22	1	1	ī	ı	0.00-0.01-1.40	ı	1	1					



Raingarden
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Page 2

# Area Listing (all nodes)

	Description (subcatchment-numbers)
Ī	Paved parking, HSG A (1S) TOTAL AREA
	3)

# Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.038	HSG A	1\$
0.000	HSG B	
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.038		TOTAL AREA

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Page 4

# **Ground Covers (all nodes)**

 HSG-A	HSG-B	HSG-C	HSG-D	Other	Total	Ground	Subcatchment
(acres)	(acres)	(acres)	(acres)	(acres)	(acres)	Cover	Numbers
0.038 <b>0.038</b>	0.000 <b>0.000</b>	0.000 <b>0.000</b>	0.000 <b>0.000</b>	0.000 <b>0.000</b>	0.038 <b>0.038</b>	Paved parking TOTAL AREA	

Raingarden

Type III 24-hr 1-Year Rainfall=2.60"

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Page 5

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Time span=5.00-20.00 hrs, dt=0.05 hrs, 301 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1S: (new Subcat)

Runoff Area=1,663 sf 100.00% Impervious Runoff Depth>2.22"

Flow Length=20' Slope=0.0200 '/' Tc=0.3 min CN=98 Runoff=0.11 cfs 0.007 af

Pond 2P: Raingarden

Peak Elev=101.06' Storage=74 cf Inflow=0.11 cfs 0.007 af

Discarded=0.02 cfs 0.007 af Primary=0.00 cfs 0.000 af Outflow=0.02 cfs 0.007 af

Total Runoff Area = 0.038 ac Runoff Volume = 0.007 af Average Runoff Depth = 2.22" 0.00% Pervious = 0.000 ac 100.00% Impervious = 0.038 ac

Page 6

# Summary for Subcatchment 1S: (new Subcat)

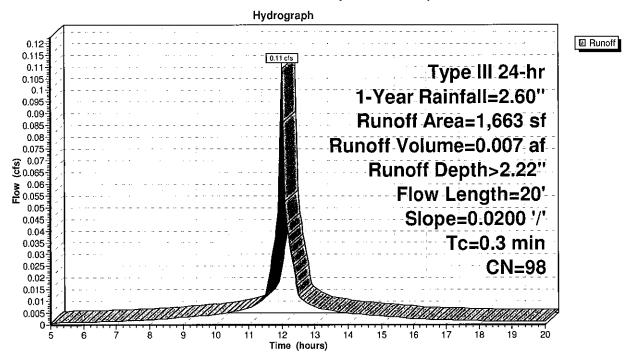
Runoff = 0.11 cfs @ 12.00 hrs, Volume=

0.007 af, Depth> 2.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Type III 24-hr 1-Year Rainfall=2.60"

A	rea (sf)	CN E	Description		
	1,663	98 F	aved park	ing, HSG A	
	1,663	1	00.00% Im	pervious A	rea
Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0200	0.98		Sheet Flow, SHeet Smooth surfaces n= 0.011 P2= 3.10"

## Subcatchment 1S: (new Subcat)



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# Summary for Pond 2P: Raingarden

Inflow Area = 0.038 ac,100.00% Impervious, Inflow Depth > 2.22" for 1-Year event

Inflow = 0.11 cfs @ 12.00 hrs, Volume= 0.007 af

Outflow = 0.02 cfs @ 11.65 hrs, Volume= 0.007 af, Atten= 82%, Lag= 0.0 min

Discarded = 0.02 cfs @ 11.65 hrs, Volume= 0.007 af Primary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs Peak Elev= 101.06' @ 12.41 hrs Surf.Area= 206 sf Storage= 74 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)

Center-of-Mass det. time= 19.2 min ( 755.8 - 736.5 )

Volume	Inve	ert Avail.Sto	rage Storage	e Description
#1	100.5	50' 1	75 cf Custon	n Stage Data (Prismatic) Listed below (Recalc)
Elevation (fee		Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
100.9 101.0 101.	50 00	50 200 250	0 63 113	0 63 175
Device	Routing	Invert	Outlet Device	es
#1	Primary	101.10'	Head (feet) ( 2.50 3.00 3. Coef. (Englis	3.0' breadth Broad-Crested Rectangular Weir 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 0.50 4.00 4.50 0.50 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 0.92 2.97 3.07 3.32
#2	Discarde	ed 100.50'	0.02 cfs Exfi	iltration at all elevations

**Discarded OutFlow** Max=0.02 cfs @ 11.65 hrs HW=100.52' (Free Discharge) **2=Exfiltration** (Exfiltration Controls 0.02 cfs)

Primary OutFlow Max=0.00 cfs @ 5.00 hrs HW=100.50' (Free Discharge) 1=Broad-Crested Rectangular Weir (Controls 0.00 cfs)

Printed 12/7/2015 Page 8

Pond 2P: Raingarden



