ENVIRONMENTAL SERVICES

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ENGINEERING SERVICES

STORMWATER REPORT

"NOBLE ENERGY REAL ESTATE HOLDINGS, LLC,"
PROPOSED FILLING STATION WITH DRIVE THRU
51 BOSTON POST ROAD (ROUTE 1)
EAST LYME, CT

APRIL 30, 2021
REVISED JULY 2, 2021

PREPARED FOR:

NOBLE ENERGY REAL ESTATE HOLDINGS, LLC
51 BOSTON POST ROAD
EAST LYME, CT 06333

PREPARED BY:

CMG ENVIRONMENTAL, INC.
CMG ID 2020-144

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STORMWATER MANAGEMENT NARRATIVE

Noble Energy Real Estate Holdings, LLC
Filling Station with Drive Thru
51 Boston Post Road (Route 1)
East Lyme, CT

This report provides engineering calculations and a summary of our technical evaluation of the proposed drainage and stormwater management improvements for the site located at #51 Boston Post Road (Rte. 1) in East Lyme, CT (the "Site").

Project Description

The project Applicant, *NOBLE ENERGY REAL ESTATE HOLDINGS, LLC,* retained CMG Engineering to prepare analysis of pre-and post-development drainage run-off conditions for a proposed 7,798 s.f. Filling Station/Convenience Store with drive thru and associated pump islands and parking lot, the proposed site improvements are on 3.24 +/- AC lot.

Currently, the Site is occupied by a vacant restaurant, multiple paved and gravel areas, and woods within the CA (Commercial) zoning district. The site is served by a water well (to be permitted by others) and a private waste water disposal system. The proposed project is considered "new" development and will result an increase of (38,449 s.f.) to Site impervious areas including a new 7,798 s.f. building, associated pavement, utilities, and stormwater management system.

This report summarizes our hydrologic analysis of site runoff conditions and proposed stormwater drainage system design for the site based on a review of site existing conditions, available soil data, and proposed site development activities.

Hydrologic Calculation Methodology

Hydrology

Computer Model: HydroCAD 10.0 © 1986-2015 Applied Microcomputer Systems, drainage modeling software;

Hydrologic Methodology: TR-20 & TR-55 Methodology is used in order to model the effects of the existing & proposed on-site stormwater systems. A minimum 10-minute time of concentration (based on the 2004 State of Connecticut Stormwater Quality Manual) is assumed in the included calculations.

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Surface Runoff Conditions

Rainfall Intensity: NOAA Atlas 14, Volume 10, Version 3 – Waterford, CT
Point Precipitation Frequency Estimates

2-Year Storm = 3.45 in.
10-Year Storm = 5.15 in
25-Year Storm = 6.20 in.
50-Year Storm = 6.99 in.
100-Year Storm = 7.83 in.

Watershed Areas: Watershed areas are calculated using AutoCAD software based on the subcatchment areas delineated on the enclosed "Existing Drainage Areas" Sheet D-1 and "Proposed Drainage Areas" Sheet D-2. The subcatchment areas shown, times of concentration and runoff coefficients are consistent with the Hydrologic Methodology discussed above.

Flood Plain

The Site is not located within Area of Minimal Flooding zone as shown on Flood Insurance Rate Map (FIRM) Town of East Lyme, CT Community Panel Number 09011C0477J, effective Date August 05, 2013.

Appendix A includes a copy of Site USGS Site Location Map, FEMA Flood Insurance Mapping, and NOAA rainfall data.

Soils & Topography

According to National Resources Conservation Services (NRCS) online mapping the Site soils consist of Udorthents-Urban land complex (306) and categorized as Hydrologic Soil Group "B" In general, the south west corner of the property drains to an existing off-site catch basin located at Boston post road, the west part of the property drains to I-95, the north part of the property drains to an off-site catch basin located at adjacent property (the Cemetery) which drains via 15" pipe to Niantic river, the East part of the property as well as the cemetery drain to Boston Post Road.

CMG conducted soil test pit excavations on March 22, 2021 at two locations on-site at the location of proposed basin for purposes of determining estimated seasonal high groundwater and soil classification.

Depth to Groundwater:

No groundwater was detected although Mottling was found at test pit TP-6 at a depth of 110" below existing grade and no mottling observed at test pit TP-7

Soil Conditions:

Test pits TP-6 and TP-7 were excavated to 11~12 ft. below grade and consist of varying depths of fill over the natural underlying sand layer.

Soil Permeability (k):

Based upon on-site classification, Site subsurface soils within the development area are classified as a "Loamy sand".

Design permeability (k) value:

***k* = 2.41 in / hr** (Rawls Rate: Loamy Sand 2.41 in/hr)

Appendix B includes a copy of On-site soil test pit field notes & NRCS soil data

Existing Conditions

OUTFALL (1S) – Off-Site - Boston Post Road

Stormwater runoff from the east portion of the property (**Subcatchment A**) and adjacent property - Cemetery **(Subcatchment F)**, discharge directly to the roadway gutter line along the north side of Boston Post Road.

OUTFALL (2S) – Off-Site Catch Basin

Stormwater runoff from the North portion of the property (**Subcatchment B**) discharge to an off-site catch basin located at the south west corner of the cemetery which drains via 15" pipe to Niantic River.

OUTFALL (3S) – Off-Site - I-95

Stormwater runoff from the West portion of the property (**Subcatchment C**) discharge directly to the road way gutter line along east side of I-95.

OUTFALL (4S) – Off-Site - Catch Basin

Stormwater runoff from the south west portion of the property (**Subcatchment D**) discharge to an offsite catch basin located at Boston Post Road.

OUTFALL (5S) – Off-Site - Niantic River

Stormwater runoff from the very east portion of the property (**Subcatchment E**) discharge to Niantic River.

The **"Existing Drainage Area" plan D-1** and calculations are included as **Appendix C.**

Proposed Drainage Improvements

The project Applicant, *Noble Energy Real Estate Holdings, LLC* is proposing to incorporate on-site stormwater design improvements to collect and treat the Site's storm water runoff for the Site's building roof drain & paved parking area to the maximum extent practicable given existing site conditions.

The following design elements will be incorporated into the proposed development's storm water management system:

OUTFALL (1S) – Boston Post Road

Runoff from Subcathments A, B, C, H, BLD1, BLD2, CAN1, CAN2 is directed through deep sump catch basins and roof drains to underground chamber infiltration system (Stormtech-MC4500 equipped with an "isolator row" to provide treatment prior to infiltration) then the overflow is directed to the proposed basin, the runoff from Subcatchments D, E, F, G, I, J, K is directed through deep sump catch basins and trench drains to proposed basin which overflows to Boston Post Road.

OUTFALL (2S) – Niantic River

Runoff from the undeveloped portion of the property (Subcathment M) will discharge to Niantic River as it was before development.

The **"Proposed Drainage Area" plan D-2** and calculations are included as **Appendix D.**

Proposed Stormwater Management System:

- **StormTech MC-4500 - Isolator Row**; pretreatment prior to discharge to infiltration practices.
- **StormTech MC-4500 Underground Chamber System:** treats stormwater runoff from impervious and landscaped areas with overflow to proposed Basin.
- **Deep sump Catch Basins:** collect runoff for Site's impervious and landscape areas.
- **Stormceptor 450i Water Quality Unit:** provide pre-treatment prior to discharge to proposed basin with minimum 80% TSS removal achievement.
- **A Long Term Operation and Maintenance Plan for the Site's stormwater system is also provided as Appendix G.**

Details of the complete storm water management system design are provided on the "Site Plans" prepared for *Noble Energy Real Estate Holdings, LLC* by CMG dated April 30, 2021.

CMG is providing "**Post-Development Drainage Areas" plan D-2** along with our hydrologic calculations as **Appendix D** to document the proposed Site stormwater management improvements.

Stormceptor 450Is Water Quality Unit Technical information is included as **Appendix E.**

CMG is providing "Rational Method Fig" plan D-3 and pipe sizing calculations as **Appendix F**

Water Quality Calculations:

1- Water Quality Units - StormCeptor 450i :

Design Calcs for WQU-1 and WQU-2 are included as **Appendix F** with 86% TSS removal achievement for WQU-1 and 80% for WQU-2.

2- StormTech MC4500 Isolator Row:

WQF = (qu)*(A)*(Q)

WHERE: qu: initial abstraction - from exhibit 4-11, chapter 4, tr-55 (cfs/mi2/inch)
A: drainage area (square miles)
Q: runoff depth (inch)

Q=(WQV(AC-FT)*12)/(DRAINAGE AREA (AC))

WQV = (1")*R*A/12

R=0.05+.009*I where i: percentage of impervious area

A: drainage area (ac)

ISOLATOR ROW 1 CALCS:

IMP. AREA:	27,426	SF
GRASS:	9,464	SF
I=	74%	
R=	0.72	
A=	0.85	AC
WQV=	0.051	AC-FT
Q=	0.72	INCH
CN=	89	
Ia=	0.247	FROM TABLE 4-1, CHAPTER 4, TR-55
Ia/p=	0.247	
qu=	525	FROM EXHIBIT 4-III, TR-55
WQF=	0.50	CFS

FOR MC-4500 FLOW RATE PER CHAMBE IS 0.28 CFS

 # OF CHAMBERS REQURIED = 2 CHAMBERS

 # OF CHAMBERS PROVIDED = 4 CHAMBERS

ISOLATOR ROW 2 CALCS:

IMP. AREA:	17,203	SF
GRASS:	3,395	SF
I=	84%	
R=	0.80	
A=	0.47	AC
WQV=	0.032	AC-FT
Q=	0.80	INCH
CN=	92	
Ia=	0.174	from table 4-1, chapter 4, tr-55

Ia/p=	0.174	
qu=	525	from exhibit 4-iii, tr-55
WQF=	0.31	CFS

FOR Stormtech MC-4500 Isolator row flow rate per chambe is 0.28 CFS

 # OF CHAMBERS REQURIED = 1 CHAMBERS

 # OF CHAMBERS PROVIDED = 4 CHAMBERS

Stormtech MC4500 Isolator row Literature is included as **Appendix G**

3- Groundwater Recharge Volume:

GRV = (D)(A)(I) /12

Where: D is groundwater recharge depth (0.25 per table 7-4 of CT water quality manual)

A is site area (3.22 Ac)

I is post development site impervious percentage (0.63)

GRV = 0.0421 AC-FT = 1,835 CF

The storage capacity of the proposed basin at outlet elevation (EL 23.8) is 21,075 CF which is greater than required Groundwater Recharge Volume (1,835 CF)

4- WQV drain time of Infiltration basin and Underground Infiltration System:

According to 2004 Connecticut Stormwater Quality Manual, the infiltration basin and underground infiltration units should be designed to completely drain the water quality volume into the soil within 72 hours after the storm.

WQV = (1")*R*A/12

R=0.05+.009*I where I: percentage of impervious area

A: drainage area (ac)

Underground Infiltration System:

IMP. Area: 44,629 SF

Grass: 12,859 SF

I= 77%

R= 0.74

A= 1.32 AC

WQV = 0.0814 AC-FT (3,546 CU-FT)

Depth of WQV = (3546 cu.ft)/(2,833 SF) = 1.25 ft (15 Inch)

Based on Rawls Rates table the infiltration rate of the natural soil would be 8.27 inch/hr but to be more Conservative use 2.41 inch/hr as infiltration rate.

Time required to drain water quality volume in underground infiltration system is:

(15 Inch)/(2.41 Inch/hr) = 6.22 hrs.

Infiltration Basin:

IMP. Area: 35,231 SF

Grass: 67,656 SF

I= 34%

R= 0.36

A= 2.36 AC

WQV = 0.071 AC-FT (3,093 CU-FT)

Depth of WQV = (3546 CU.FT)/(4,100 SF) = 0.86 FT (10.3 Inch)

Based on Rawls Rates table the infiltration rate of the natural soil would be 8.27 inch/hr but to be more

Conservative use 2.41 inch/hr as infiltration rate.
Time required to drain water quality volume in underground infiltration system is:
(10.3 Inch)/(2.41 Inch/hr) = 4.27 hrs.

Conclusions

Table No. 1 shows the proposed stormwater design improvements for the Site will reduce off-site runoff as following:

Outfall 1S (Boston Post Road): 77% reduction for 2-Year Storm, 85% reduction for 10-Year Storm, 87% reduction for 25-Year Storm, 77% reduction for 50-Year Storm, 56% reduction for 100-Year Storm.

Outfall 2S (Off-Site Niantic River): there is a no change in off-site runoff.

Outfall 3S (Off-Site I-95): 100% reduction for all storm events.

Outfall 4S (Off-Site catch basin located @ Boston Post Road): 100% reduction for all storm events.

Outfall 5S (Off-Site catch basin @ Cemetery): 100% reduction for all storm events.

Table No. 2 provides a summary of the Pre- and Post-Development drainage areas.

TABLE NO. 1

6/29/2021

STORMWATER RUNOFF PEAK FLOW SUMMARY
PROPOSED FILLING STATION
#51 BOSTON POST ROAD
EAST LYME, CT

Pre-Existing Site Development (Fig D1) Conditions						
		2-Year	10-Year	25-Year	50-Year	100-Year
1S - BOSTON POST ROAD	*Peak Flow (cfs)*	*1.58*	*4.53*	*6.67*	*8.37*	*10.25*
2S - OFF-SITE (NIANTIC RIVER)	*Peak Flow (cfs)*	*0.16*	*0.40*	*0.57*	*0.70*	*0.84*
3S - OFF-SITE (I-95)	*Peak Flow (cfs)*	*1.15*	*1.73*	*2.09*	*2.36*	*2.65*
4S - OFF-SITE (CB @ BP ROAD)	*Peak Flow (cfs)*	*0.21*	*0.44*	*0.59*	*0.71*	*0.84*
5S - OFF-SITE (CB@ CEMETERY)	*Peak Flow (cfs)*	*1.66*	*2.87*	*3.62*	*4.19*	*4.78*

Proposed - Site Development (Fig D2) Conditions						
1S - BOSTON POST ROAD	*Peak Flow (cfs)*	*0.36*	*0.67*	*0.87*	*2.09*	*4.61*
	Reduction %	*77%*	*85%*	*87%*	*75%*	*55%*
2S - OFF-SITE (NIANTIC RIVER)	*Peak Flow (cfs)*	*0.16*	*0.40*	*0.57*	*0.70*	*0.84*
	Reduction %	*No Change*	*No Change*	*No Change*	*No Change*	*No Change*
3S - OFF-SITE (I-95)	*Peak Flow (cfs)*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	Reduction %	*100%*	*100%*	*100%*	*100%*	*100%*
4S - OFF-SITE (CB @ BP ROAD)	*Peak Flow (cfs)*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*
	Reduction %	*100%*	*100%*	*100%*	*100%*	*100%*

TABLE NO. 2

DRAINAGE AREA CALCULATIONS
PROPOSED FILLING STATION
#51 BOSTON POST ROAD
EAST LYME, CT

PRE-DEVELOPMENT DRAINAGE AREAS (s.f.)

On-Site	Soil Type D						Watershed
Area	Impervious	Gravel	Grass/Ldscp	Woods			Total
A	11,809		39,284	27,352			78,445
B	22,092			9,679			31,771
C	15,353						15,353
D	2,441		4,255				6,696
E	1,973			6,103			8,076
F				41,000			41,000
							Total
	53,668	0	43,539	84,134			**181,341 s.f.**
				Total Site Area=	181,341	s.f.	**4.16** Ac
Total Impervious=	**53,668 s.f.**				4.16	Ac	
Total Open Space =	**127,673 s.f.**						

POST-DEVELOPMENT DRAINAGE AREAS (s.f.)

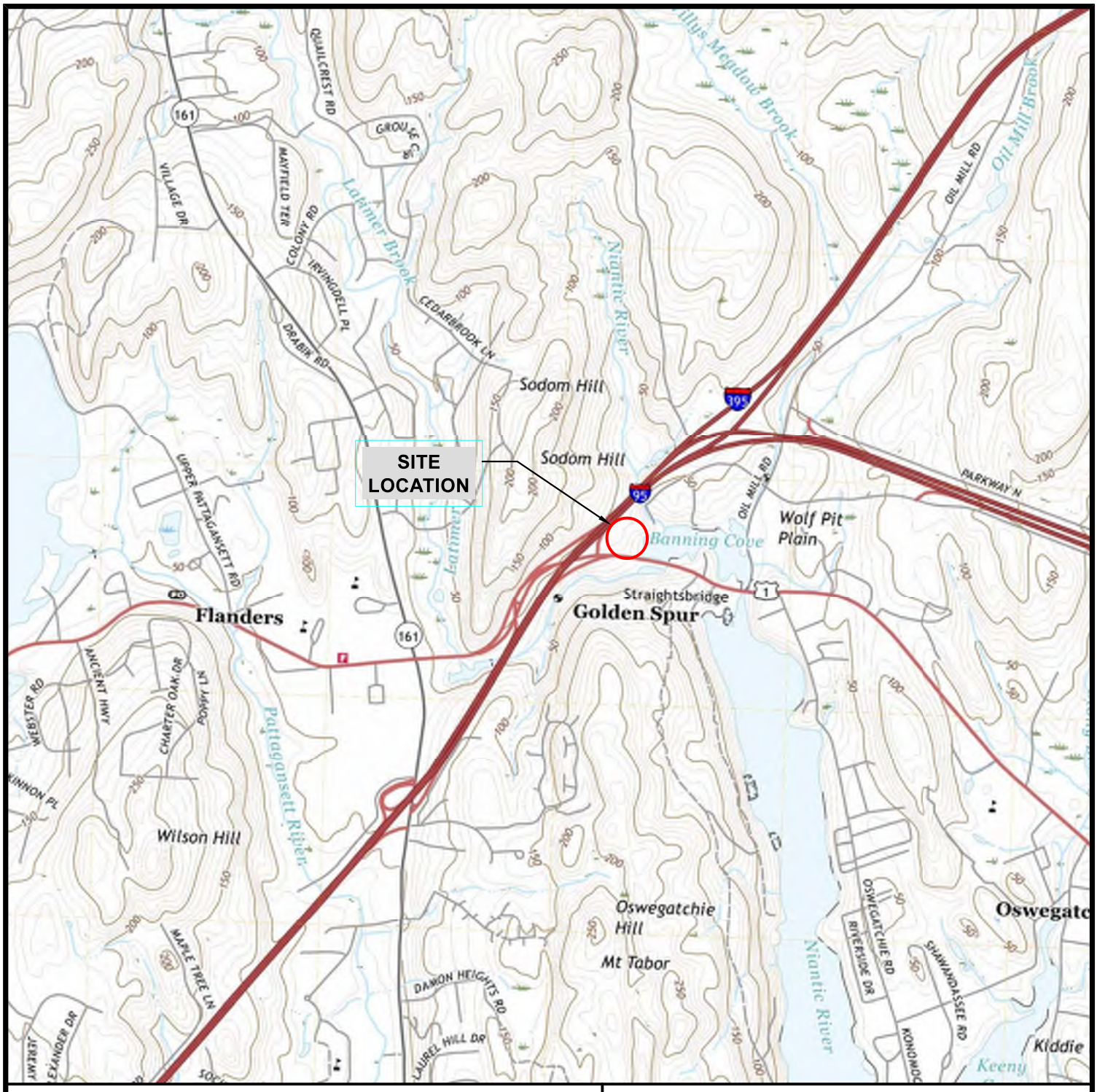
On-Site	Soil Type D						Watershed
Area	Impervious	Gravel	Grass/Ldscp	Woods			Total
A	13,113		7,260				20,373
B	4,786		944				5,730
C	3,842						3,842
D	9,862		7,962				17,824
E	4,706		833				5,539
F			41,000				41,000
G	6,531		1,944				8,475
H	12,097		1,260				13,357
I	10,791		3,395				14,186
J	5,020		3,183				8,203
K			11,504				11,504
L	4,307		3,836				8,143
M	1,973			6,103			8,076
BLD1	3,248						3,248
BKD2	4,449						4,449
CAN1	6,300						6,300
CAN2	1,092						1,092
							0
							Total
	92,117	0	83,121	6,103			***181,341 s.f.***
				Total Site Area=	181,341	s.f.	**4.16** Ac
Total Impervious=	**92,117 s.f.**				4.16	Ac	
Total Open Space =	**89,224 s.f.**						

Note:

[1] All Drainage Areas are calculated using CAD Software based on Pre- & Post Development Drainage Plans prepared by CMG date 4/30/21

Appendix A

USGS Site Location Map
&
FEMA Flood Plain Mapping
&
Rainfall Data



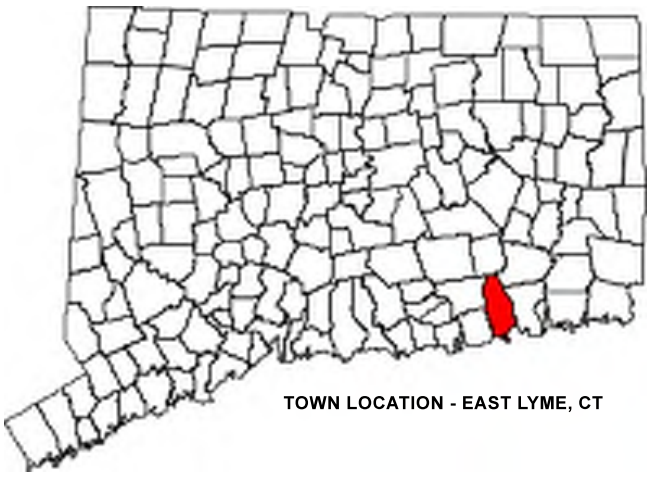


FIGURE 1: SITE LOCATION

51 BOSTON POST ROAD
EAST LYME, CT
CMG ID 2020-215

SCALE 1:2000'

2000 FT 0 2000 FT

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ENGINEERING SERVICES
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AREA OF MINIMAL FLOOD HAZARD
Zone X
Town of East Lyme
090096
09011C0477J
eff. 8/5/2013
Zone AE
(EL 9 Feet)
Latimer Brook
FLOODWAY
Zone AE
9.4 FEET
10 FEET
13 FEET
Zone AE
(EL 9 Feet)
FLOODWAY
Zone AE
18 FEET
24 FEET
Zone AE
Zone AE
(EL 12 Feet)

NOAA Atlas 14, Volume 10, Version 3
Location name: East Lyme, Connecticut, USA*
Latitude: 41.3709°, Longitude: -72.1991°
Elevation: 40.4 ft**
* source: ESRI Maps
** source: USGS

POINT PRECIPITATION FREQUENCY ESTIMATES

Sanja Perica, Sandra Pavlovic, Michael St. Laurent, Carl Trypaluk, Dale Unruh, Orlan Wilhite

NOAA, National Weather Service, Silver Spring, Maryland

PF_tabular | PF_graphical | Maps_&_aerials

PF tabular

PDS-based point precipitation frequency estimates with 90% confidence intervals (in inches)[1]

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	**0.337** (0.262-0.421)	**0.403** (0.314-0.504)	**0.511** (0.396-0.641)	**0.601** (0.463-0.757)	**0.725** (0.541-0.947)	**0.817** (0.598-1.09)	**0.915** (0.652-1.26)	**1.03** (0.691-1.43)	**1.19** (0.771-1.71)	**1.33** (0.839-1.94)
10-min	**0.478** (0.372-0.596)	**0.571** (0.444-0.714)	**0.724** (0.561-0.907)	**0.852** (0.656-1.07)	**1.03** (0.767-1.34)	**1.16** (0.848-1.54)	**1.30** (0.923-1.78)	**1.46** (0.979-2.03)	**1.69** (1.09-2.42)	**1.88** (1.19-2.75)
15-min	**0.562** (0.437-0.701)	**0.672** (0.523-0.840)	**0.852** (0.661-1.07)	**1.00** (0.772-1.26)	**1.21** (0.902-1.58)	**1.36** (0.997-1.81)	**1.53** (1.09-2.10)	**1.71** (1.15-2.39)	**1.98** (1.29-2.85)	**2.21** (1.40-3.23)
30-min	**0.794** (0.618-0.991)	**0.949** (0.738-1.19)	**1.20** (0.932-1.51)	**1.41** (1.09-1.78)	**1.71** (1.27-2.23)	**1.92** (1.41-2.56)	**2.15** (1.53-2.96)	**2.42** (1.63-3.37)	**2.80** (1.81-4.02)	**3.11** (1.97-4.55)
60-min	**1.03** (0.799-1.28)	**1.23** (0.954-1.53)	**1.56** (1.21-1.95)	**1.83** (1.41-2.30)	**2.20** (1.65-2.88)	**2.48** (1.82-3.31)	**2.78** (1.98-3.82)	**3.12** (2.10-4.35)	**3.61** (2.34-5.19)	**4.01** (2.54-5.86)
2-hr	**1.35** (1.06-1.67)	**1.61** (1.26-2.00)	**2.04** (1.60-2.54)	**2.40** (1.86-3.00)	**2.89** (2.18-3.75)	**3.26** (2.40-4.31)	**3.65** (2.62-4.99)	**4.10** (2.78-5.68)	**4.77** (3.11-6.79)	**5.33** (3.39-7.72)
3-hr	**1.57** (1.24-1.93)	**1.87** (1.47-2.31)	**2.37** (1.86-2.93)	**2.78** (2.17-3.46)	**3.35** (2.53-4.33)	**3.77** (2.80-4.97)	**4.22** (3.05-5.75)	**4.76** (3.23-6.54)	**5.54** (3.62-7.84)	**6.20** (3.95-8.92)
6-hr	**1.99** (1.58-2.44)	**2.37** (1.88-2.91)	**3.00** (2.37-3.68)	**3.51** (2.76-4.34)	**4.22** (3.22-5.42)	**4.76** (3.55-6.21)	**5.32** (3.86-7.18)	**5.99** (4.08-8.15)	**6.97** (4.57-9.76)	**7.80** (4.99-11.1)
12-hr	**2.46** (1.98-3.00)	**2.93** (2.35-3.57)	**3.69** (2.95-4.51)	**4.33** (3.43-5.31)	**5.20** (3.99-6.61)	**5.85** (4.39-7.57)	**6.54** (4.77-8.73)	**7.35** (5.04-9.91)	**8.53** (5.62-11.8)	**9.52** (6.11-13.4)
24-hr	**2.89** (2.33-3.49)	**3.45** (2.79-4.18)	**4.38** (3.52-5.31)	**5.15** (4.12-6.26)	**6.20** (4.80-7.83)	**6.99** (5.29-8.98)	**7.83** (5.76-10.4)	**8.82** (6.08-11.8)	**10.3** (6.80-14.1)	**11.5** (7.43-16.0)
2-day	**3.23** (2.63-3.87)	**3.90** (3.18-4.68)	**5.01** (4.07-6.03)	**5.92** (4.78-7.16)	**7.18** (5.61-9.01)	**8.12** (6.20-10.4)	**9.13** (6.78-12.0)	**10.3** (7.17-13.7)	**12.2** (8.10-16.6)	**13.8** (8.92-19.0)
3-day	**3.50** (2.87-4.18)	**4.23** (3.46-5.06)	**5.42** (4.42-6.50)	**6.41** (5.20-7.72)	**7.77** (6.09-9.71)	**8.78** (6.74-11.2)	**9.87** (7.36-13.0)	**11.2** (7.78-14.7)	**13.2** (8.80-17.8)	**14.9** (9.69-20.4)
4-day	**3.76** (3.09-4.47)	**4.52** (3.72-5.39)	**5.77** (4.72-6.90)	**6.81** (5.54-8.17)	**8.24** (6.48-10.2)	**9.29** (7.15-11.8)	**10.4** (7.80-13.6)	**11.8** (8.23-15.5)	**13.9** (9.28-18.7)	**15.7** (10.2-21.4)
7-day	**4.48**	**5.31**	**6.67**	**7.79**	**9.34**	**10.5**	**11.7**	**13.2**	**15.4**	**17.2**

	(3.71-5.31)	(4.39-6.29)	(5.50-7.92)	(6.38-9.29)	(7.39-11.5)	(8.11-13.2)	(8.78-15.2)	(9.24-17.1)	(10.3-20.5)	(11.2-23.3)
10-day	**5.19** (4.32-6.13)	**6.06** (5.04-7.16)	**7.48** (6.19-8.85)	**8.65** (7.12-10.3)	**10.3** (8.15-12.6)	**11.5** (8.89-14.3)	**12.8** (9.56-16.3)	**14.3** (10.0-18.4)	**16.4** (11.0-21.7)	**18.2** (11.9-24.5)
20-day	**7.38** (6.20-8.64)	**8.31** (6.97-9.73)	**9.82** (8.21-11.5)	**11.1** (9.19-13.1)	**12.8** (10.2-15.5)	**14.1** (11.0-17.3)	**15.5** (11.6-19.4)	**16.9** (12.0-21.6)	**18.9** (12.8-24.7)	**20.4** (13.4-27.1)
30-day	**9.20** (7.77-10.7)	**10.2** (8.57-11.9)	**11.7** (9.86-13.7)	**13.1** (10.9-15.3)	**14.9** (11.9-17.8)	**16.3** (12.7-19.7)	**17.6** (13.2-21.8)	**19.0** (13.5-24.1)	**20.8** (14.1-27.0)	**22.1** (14.5-29.1)
45-day	**11.5** (9.72-13.3)	**12.5** (10.6-14.5)	**14.1** (11.9-16.5)	**15.5** (13.0-18.1)	**17.4** (14.0-20.8)	**18.9** (14.8-22.8)	**20.4** (15.2-24.9)	**21.7** (15.5-27.3)	**23.3** (15.9-30.0)	**24.3** (16.1-31.9)
60-day	**13.3** (11.4-15.4)	**14.4** (12.3-16.7)	**16.2** (13.7-18.8)	**17.6** (14.8-20.5)	**19.6** (15.8-23.2)	**21.2** (16.6-25.4)	**22.7** (16.9-27.6)	**24.0** (17.2-30.1)	**25.5** (17.4-32.7)	**26.4** (17.5-34.4)

[1] Precipitation frequency (PF) estimates in this table are based on frequency analysis of partial duration series (PDS).

Numbers in parenthesis are PF estimates at lower and upper bounds of the 90% confidence interval. The probability that precipitation frequency estimates (for a given duration and average recurrence interval) will be greater than the upper bound (or less than the lower bound) is 5%. Estimates at upper bounds are not checked against probable maximum precipitation (PMP) estimates and may be higher than currently valid PMP values.

Please refer to NOAA Atlas 14 document for more information.

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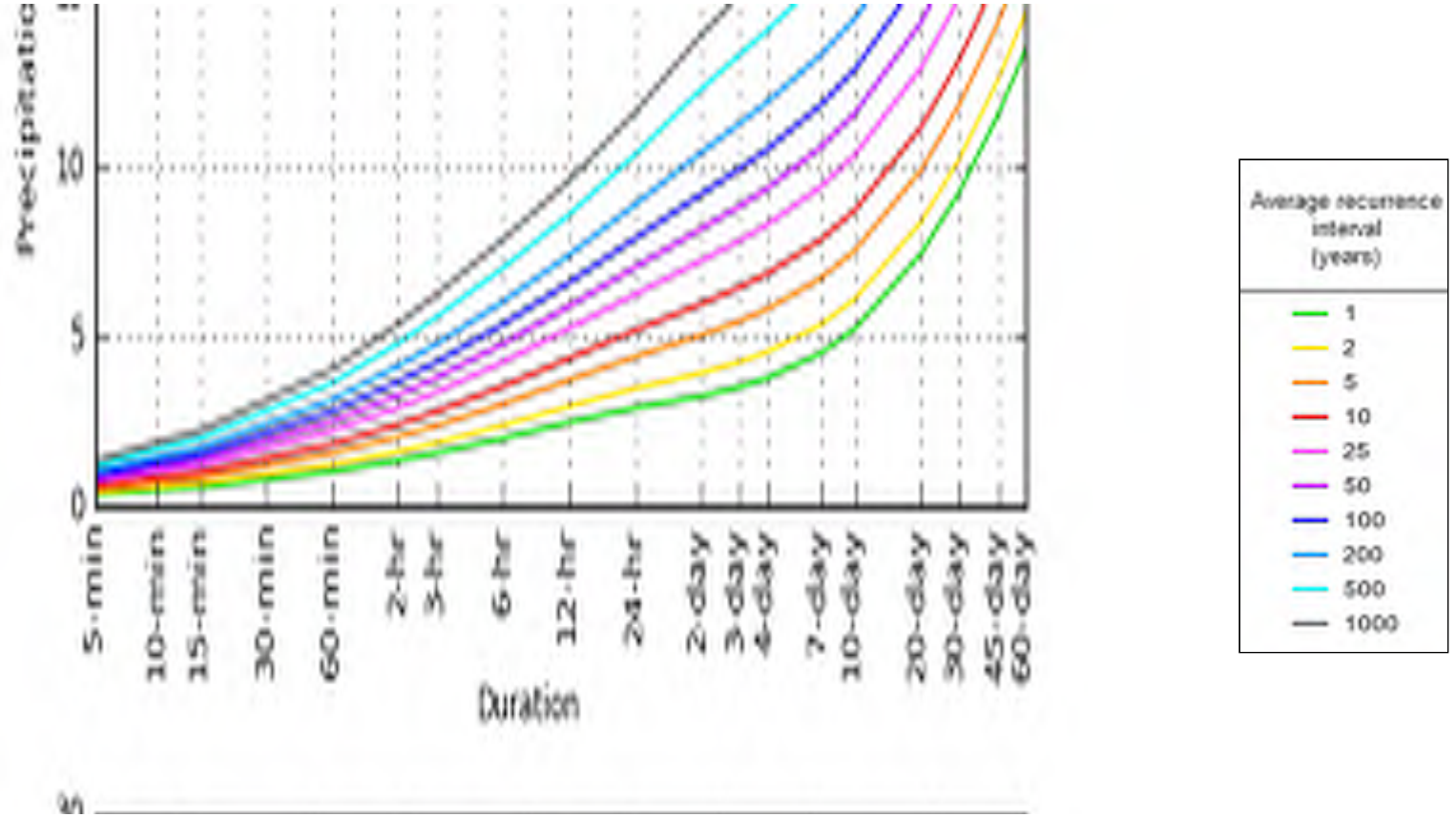
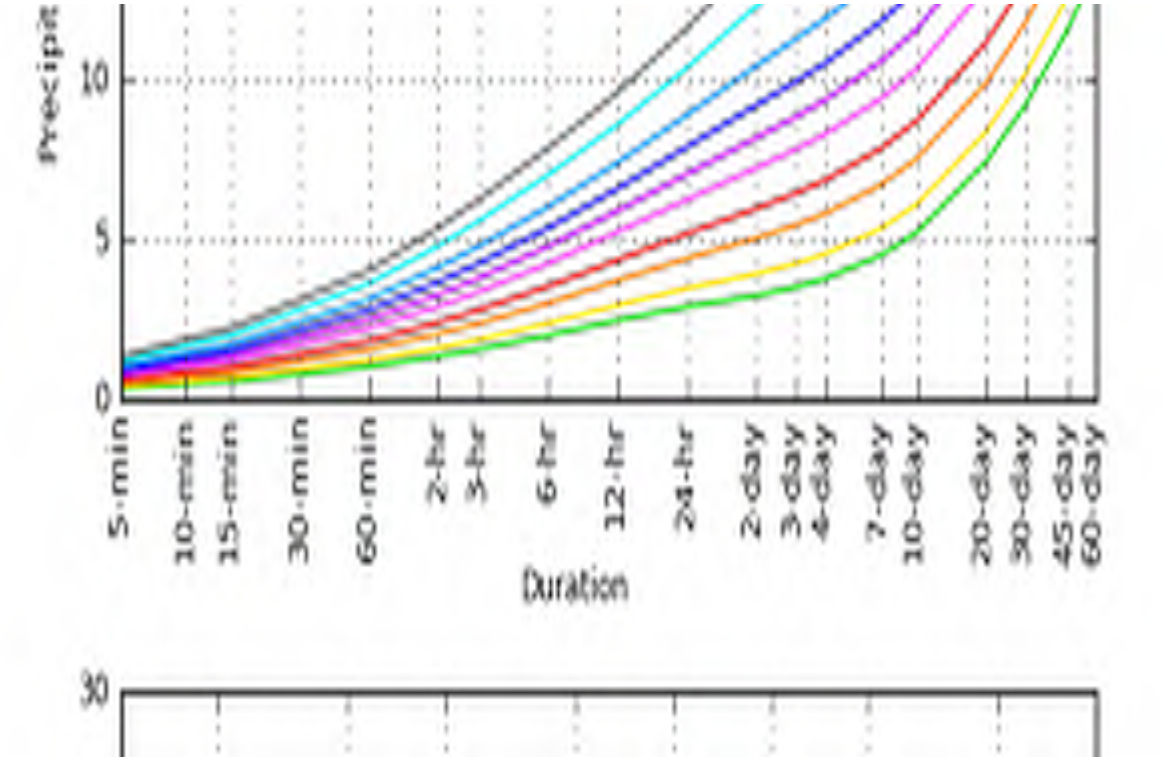
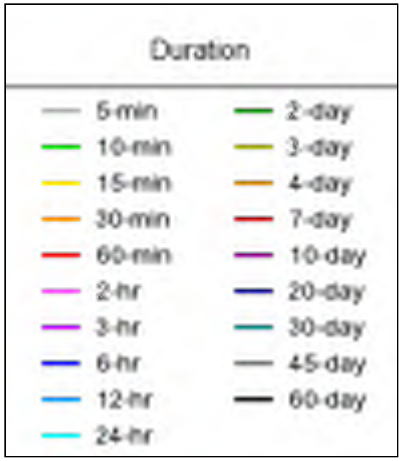
PF graphical







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Maps & aerials

Small scale terrain

Large scale terrain

Large scale map

Large scale aerial

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US Department of Commerce
National Oceanic and Atmospheric Administration
National Weather Service
National Water Center
1325 East West Highway
Silver Spring, MD 20910
Questions?: HDSC.Questions@noaa.gov

Disclaimer

Appendix B

Soil Test Pit field notes
&
NCRS Soil Mapping
&
Rawls Rate Table

FIELD OBSERVATION REPORT

Project Location: 51 ~~KEEN~~ BOSTON POST RD E. LYME. CT
Date: 3.22.21
CMG ID: 2020-144
Prepared By: J. BERNARDINO, PE

Time of Arrival: 7:30 AM
Time of Departure 2:30 PM.
Weather: SUNNY 60°

Personel On-Site:	
J. BERNARDINO	

Comments:

TEST PIT # 6 LOG E.G ELEV= 24.5

0" – 52" FILL
52" – 58" A LAYER – S. LOAM
58" – 72" B – S. LOAM.
72" – 144" C – SAND, COARSE

MOTTLES @ 110" EST. SHG WATER @ 116" +/– ELEV 15.3+/–

Submittals & Action Items:

67 HALL ROAD
STURBRIDGE, MA 01566
PHONE (774) 241-0901
FAX (774) 241-0906

ENVIRONMENTAL SERVICES

CMG EST. 2002

ENGINEERING SERVICES

FIELD OBSERVATION REPORT

Project Location: 51 BOSTON POST RD E. LYME. CT.
Date: 3.22.21
CMG ID: [redacted] 2020-144
Prepared By: J. BERNARDINO

Time of Arrival: 7:30
Time of Departure 2:30
Weather: SUNNY - 60°

Personel On-Site:	
J. BERNARDINO, PE.	

Comments:

E.G = 27.0 +/-

0'-8" - A LOAM.
8" - 30" - B SANDY LOAM
30" - 132" C SAND, [redacted] COARSE

NO MOTTLING OBSERVED.

Submittals & Action Items:

67 HALL ROAD
STURBRIDGE, MA 01566
PHONE (774) 241-0901
FAX (774) 241-0906

Map Scale: 1:2,620 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 35 70 140 210

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 18N WGS84

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Unit Polygons

Soil Map Unit Lines

Soil Map Unit Points

Special Point Features

Blowout

Borrow Pit

Clay Spot

Closed Depression

Gravel Pit

Gravelly Spot

Landfill

Lava Flow

Marsh or swamp

Mine or Quarry

Miscellaneous Water

Perennial Water

Rock Outcrop

Saline Spot

Sandy Spot

Severely Eroded Spot

Sinkhole

Slide or Slip

Sodic Spot

Spoil Area

Stony Spot

Very Stony Spot

Wet Spot

Other

Special Line Features

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

Background

Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:12,000.

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: State of Connecticut
Survey Area Data: Version 20, Jun 9, 2020

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

Date(s) aerial images were photographed: Mar 20, 2019—Mar 27, 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
38C	Hinckley loamy sand, 3 to 15 percent slopes	0.1	0.5%
38E	Hinckley loamy sand, 15 to 45 percent slopes	3.6	12.4%
61C	Canton and Charlton fine sandy loams, 8 to 15 percent slopes, very stony	0.1	0.2%
62C	Canton and Charlton fine sandy loams, 3 to 15 percent slopes, extremely stony	2.6	8.9%
62D	Canton and Charlton fine sandy loams, 15 to 35 percent slopes, extremely stony	1.8	6.1%
73C	Charlton-Chatfield complex, 0 to 15 percent slopes, very rocky	0.1	0.3%
73E	Charlton-Chatfield complex, 15 to 45 percent slopes, very rocky	1.2	4.1%
75E	Hollis-Chatfield-Rock outcrop complex, 15 to 45 percent slopes	0.0	0.0%
306	Udorthents-Urban land complex	11.6	39.5%
701B	Ninigret fine sandy loam, 3 to 8 percent slopes	2.0	6.8%
703B	Haven silt loam, 3 to 8 percent slopes	3.5	11.9%
820	Fort Neck silt loam, 0 to 1 meter water depth	2.7	9.4%
Totals for Area of Interest		**29.4**	**100.0%**

State of Connecticut

306—Udorthents-Urban land complex

Map Unit Setting

National map unit symbol: 9lmg
Elevation: 0 to 2,000 feet
Mean annual precipitation: 43 to 56 inches
Mean annual air temperature: 45 to 55 degrees F
Frost-free period: 120 to 185 days
Farmland classification: Not prime farmland

Map Unit Composition

Udorthents and similar soils: 50 percent
Urban land: 35 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Udorthents

Setting

Down-slope shape: Convex
Across-slope shape: Linear
Parent material: Drift

Typical profile

A - 0 to 5 inches: loam
C1 - 5 to 21 inches: gravelly loam
C2 - 21 to 80 inches: very gravelly sandy loam

Properties and qualities

Slope: 0 to 25 percent
Depth to restrictive feature: More than 80 inches
Drainage class: Well drained
Runoff class: Medium
Capacity of the most limiting layer to transmit water (Ksat): Very low to high (0.00 to 1.98 in/hr)
Depth to water table: About 54 to 72 inches
Frequency of flooding: None
Frequency of ponding: None
Available water capacity: Moderate (about 6.8 inches)

Interpretive groups

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

Description of Urban Land

Typical profile

H - 0 to 6 inches: material

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 8
Hydrologic Soil Group: D
Hydric soil rating: Unranked

Minor Components

Unnamed, undisturbed soils

Percent of map unit: 8 percent
Hydric soil rating: No

Udorthents, wet substratum

Percent of map unit: 5 percent
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Rock outcrop

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

Data Source Information

Soil Survey Area: State of Connecticut
Survey Area Data: Version 20, Jun 9, 2020

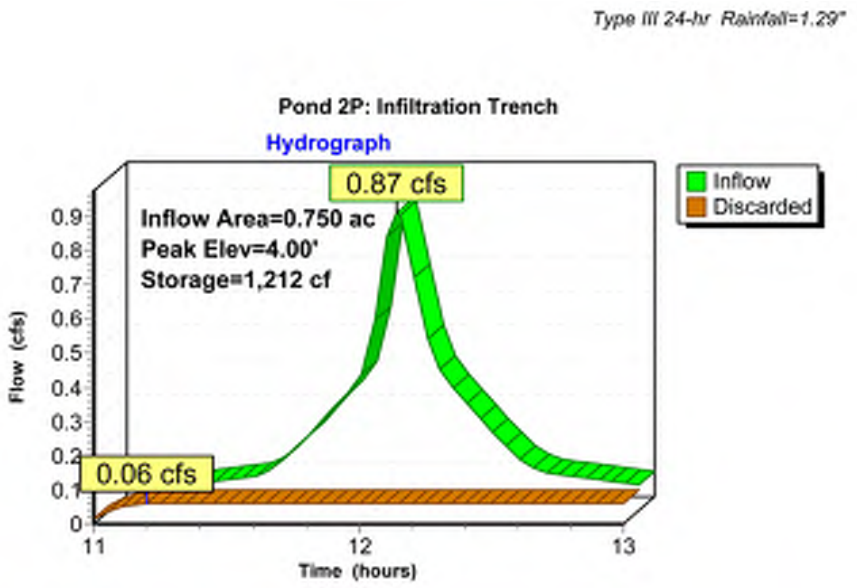


Table 2.3.3. 1982 Rawls Rates[18]

Texture Class	NRCS Hydrologic Soil Group (HSG)	Infiltration Rate Inches/Hour
Sand	A	8.27
Loamy Sand	A	2.41
Sandy Loam	B	1.02
Loam	B	0.52
Silt Loam	C	0.27
Sandy Clay Loam	C	0.17
Clay Loam	D	0.09
Silty Clay Loam	D	0.06
Sandy Clay	D	0.05
Silty Clay	D	0.04
Clay	D	0.02

[18] Rawls, Brakensiek and Saxton, 1982

Appendix C

Pre-Development Drainage Calculations

AREA A PRE: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 11,809 S.F., CN = 98
GRASS= 39,284 S.F., CN = 61
WOODS= 27,352 S.F., CN = 60

TOTAL= 78,445 S.F., CN = 66

AREA B PRE: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 22,092 S.F., CN = 98
GRASS = 0 S.F., CN = 61
WOODS = 9,679 S.F., CN = 60

TOTAL = 31,771 S.F., CN = 86

AREA C PRE: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 15,353 S.F., CN = 98
GRASS = 0 S.F., CN = 61
WOODS = 0 S.F., CN = 60

TOTAL = 15,353 S.F., CN = 98

AREA D PRE: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 2,441 S.F., CN = 98
GRASS = 4,255 S.F., CN = 61
WOODS = 0 S.F., CN = 60

TOTAL = 6,696 S.F., CN = 74

AREA E PRE: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 1,973 S.F., CN = 98
GRASS = 0 S.F., CN = 61
WOODS = 6,103 S.F., CN = 60

TOTAL = 8,076 S.F., CN = 69

AREA F POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 0 S.F., CN = 98
GRASS= 41,000 S.F., CN = 61

TOTAL= 41,000 S.F., CN = 61

LEGEND

- 100 — EXISTING CONTOURS
- A — WATERSHED SUBCATCHMENT
- 1S — OFF-SITE STORMWATER OUTFALL LOCATION
- WATERSHED BOUNDARY
- TIME OF CONCENTRATION FLOW PATH

GRAPHIC SCALE

60 0 30 60 120

(IN FEET)
1 inch = 60 ft.

REVISIONS

NO.	DATE	DESCRIPTION	BY	CKD

PROFESSIONAL SEAL

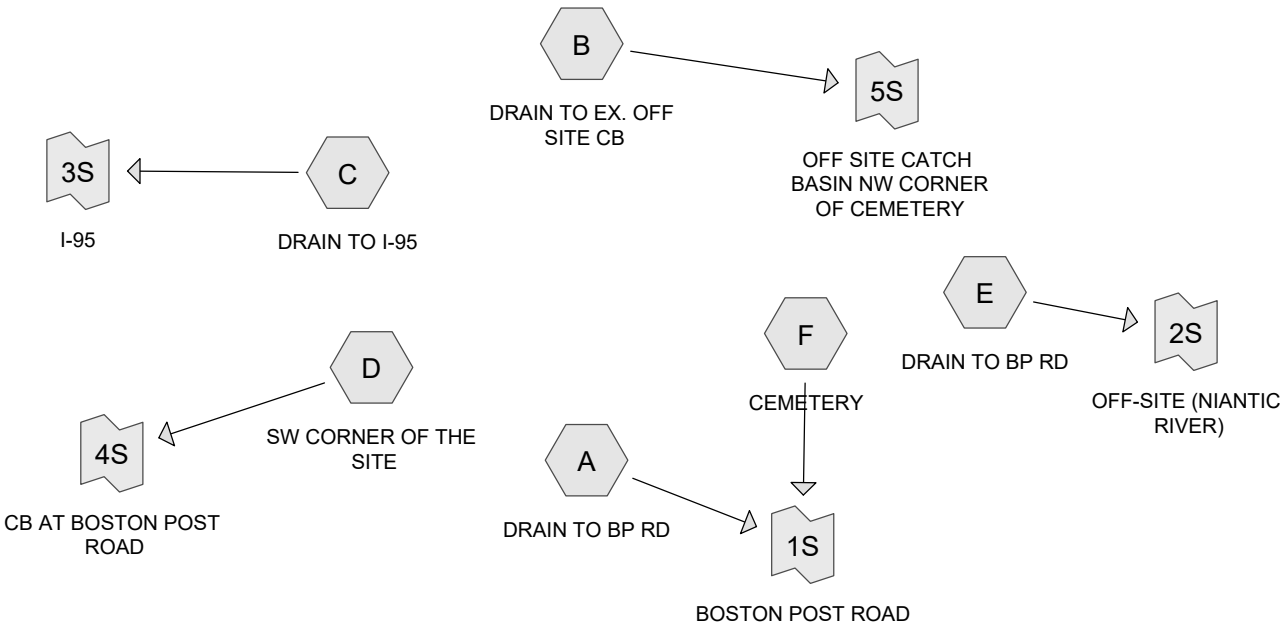
PROJECT:
PROPOSED FILLING STATION W/DRIVE THRU
51 BOSTON POST ROAD
EAST LYME, CT 06333

PREPARED FOR:
NOBLE ENERGY REAL ESTATE HOLDINGS, LLC
131 BUCKINGHAM STREET, SUITE 301
HARTFORD, CT 06106

ENGINEERING SERVICES
ENVIRONMENTAL SERVICES
67 Hall Road
Sturbridge, MA 01560
Phone: 774-241-0901
fax: 774-241-0906

CMG EST. 2002

ISSUE DATE: 04/30/2021
DRAWN BY: SH CHECKED BY: DTF
SCALE: 1" = 60'
PROJECT NO.: 2020-144
SHEET NAME:
PRE-DEVELOPMENT DRAINAGE MAP
SHEET NO.:
D - 1.0



Subcat Reach Pond Link

Routing Diagram for 2020-144_PRE_DEV_SH_04-05-2021
Prepared by {enter your company name here}, Printed 4/30/2021

Summary for Subcatchment A: DRAIN TO BP RD

Runoff = 1.23 cfs @ 12.15 hrs, Volume= 0.104 af, Depth> 0.69"

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 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
11,809	98	Paved parking, HSG B
39,284	61	>75% Grass cover, Good, HSG B
27,352	60	Woods, Fair, HSG B
78,445	66	Weighted Average
66,636		84.95% Pervious Area
11,809		15.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	430	0.0730	0.81		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment B: DRAIN TO EX. OFF SITE CB

Runoff = 1.66 cfs @ 12.11 hrs, Volume= 0.117 af, Depth> 1.92"

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 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
22,092	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
9,679	60	Woods, Fair, HSG B
31,771	86	Weighted Average
9,679		30.46% Pervious Area
22,092		69.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	287	0.0170	0.65		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment C: DRAIN TO I-95

Runoff = 1.15 cfs @ 12.09 hrs, Volume= 0.088 af, Depth> 3.00"

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 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
15,353	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
0	60	Woods, Fair, HSG B
15,353	98	Weighted Average
15,353		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment D: SW CORNER OF THE SITE

Runoff = 0.21 cfs @ 12.10 hrs, Volume= 0.014 af, Depth> 1.10"

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 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
2,441	98	Paved parking, HSG B
4,255	61	>75% Grass cover, Good, HSG B
0	60	Woods, Fair, HSG B
6,696	74	Weighted Average
4,255		63.55% Pervious Area
2,441		36.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment E: DRAIN TO BP RD

Runoff = 0.16 cfs @ 12.13 hrs, Volume= 0.013 af, Depth> 0.83"

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 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
1,973	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
6,103	60	Woods, Fair, HSG B
8,076	69	Weighted Average
6,103		75.57% Pervious Area
1,973		24.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	430	0.0730	0.87		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment F: CEMETERY

Runoff = 0.36 cfs @ 12.20 hrs, Volume= 0.038 af, Depth> 0.48"

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 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
41,000	61	>75% Grass cover, Good, HSG B
41,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	333	0.0450	0.53		**Lag/CN Method,**

Summary for Link 1S: BOSTON POST ROAD

Inflow Area = 2.742 ac, 9.89% Impervious, Inflow Depth > 0.62" for 2-Year Storm event
Inflow = 1.58 cfs @ 12.16 hrs, Volume= 0.142 af
Primary = 1.58 cfs @ 12.16 hrs, Volume= 0.142 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 2S: OFF-SITE (NIANTIC RIVER)

Inflow Area = 0.185 ac, 24.43% Impervious, Inflow Depth > 0.83" for 2-Year Storm event
Inflow = 0.16 cfs @ 12.13 hrs, Volume= 0.013 af
Primary = 0.16 cfs @ 12.13 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3S: I-95

Inflow Area = 0.352 ac,100.00% Impervious, Inflow Depth > 3.00" for 2-Year Storm event
Inflow = 1.15 cfs @ 12.09 hrs, Volume= 0.088 af
Primary = 1.15 cfs @ 12.09 hrs, Volume= 0.088 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 4S: CB AT BOSTON POST ROAD

Inflow Area = 0.154 ac, 36.45% Impervious, Inflow Depth > 1.10" for 2-Year Storm event
Inflow = 0.21 cfs @ 12.10 hrs, Volume= 0.014 af
Primary = 0.21 cfs @ 12.10 hrs, Volume= 0.014 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 5S: OFF SITE CATCH BASIN NW CORNER OF CEMETERY

Inflow Area = 0.729 ac, 69.54% Impervious, Inflow Depth > 1.92" for 2-Year Storm event
Inflow = 1.66 cfs @ 12.11 hrs, Volume= 0.117 af
Primary = 1.66 cfs @ 12.11 hrs, Volume= 0.117 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment A: DRAIN TO BP RD

Runoff = 3.30 cfs @ 12.14 hrs, Volume= 0.251 af, Depth> 1.67"

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 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
11,809	98	Paved parking, HSG B
39,284	61	>75% Grass cover, Good, HSG B
27,352	60	Woods, Fair, HSG B
78,445	66	Weighted Average
66,636		84.95% Pervious Area
11,809		15.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	430	0.0730	0.81		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment B: DRAIN TO EX. OFF SITE CB

Runoff = 2.87 cfs @ 12.10 hrs, Volume= 0.206 af, Depth> 3.39"

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 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
22,092	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
9,679	60	Woods, Fair, HSG B
31,771	86	Weighted Average
9,679		30.46% Pervious Area
22,092		69.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	287	0.0170	0.65		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment C: DRAIN TO I-95

Runoff = 1.73 cfs @ 12.09 hrs, Volume= 0.134 af, Depth> 4.56"

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 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
15,353	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
0	60	Woods, Fair, HSG B
15,353	98	Weighted Average
15,353		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment D: SW CORNER OF THE SITE

Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.030 af, Depth> 2.30"

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 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
2,441	98	Paved parking, HSG B
4,255	61	>75% Grass cover, Good, HSG B
0	60	Woods, Fair, HSG B
6,696	74	Weighted Average
4,255		63.55% Pervious Area
2,441		36.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment E: DRAIN TO BP RD

Runoff = 0.40 cfs @ 12.12 hrs, Volume= 0.029 af, Depth> 1.90"

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 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
1,973	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
6,103	60	Woods, Fair, HSG B
8,076	69	Weighted Average
6,103		75.57% Pervious Area
1,973		24.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	430	0.0730	0.87		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment F: CEMETERY

Runoff = 1.26 cfs @ 12.16 hrs, Volume= 0.104 af, Depth> 1.32"

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 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
41,000	61	>75% Grass cover, Good, HSG B
41,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	333	0.0450	0.53		**Lag/CN Method,**

Summary for Link 1S: BOSTON POST ROAD

Inflow Area = 2.742 ac, 9.89% Impervious, Inflow Depth > 1.55" for 10-Year Storm event
Inflow = 4.53 cfs @ 12.15 hrs, Volume= 0.355 af
Primary = 4.53 cfs @ 12.15 hrs, Volume= 0.355 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 2S: OFF-SITE (NIANTIC RIVER)

Inflow Area = 0.185 ac, 24.43% Impervious, Inflow Depth > 1.90" for 10-Year Storm event
Inflow = 0.40 cfs @ 12.12 hrs, Volume= 0.029 af
Primary = 0.40 cfs @ 12.12 hrs, Volume= 0.029 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3S: I-95

Inflow Area = 0.352 ac,100.00% Impervious, Inflow Depth > 4.56" for 10-Year Storm event
Inflow = 1.73 cfs @ 12.09 hrs, Volume= 0.134 af
Primary = 1.73 cfs @ 12.09 hrs, Volume= 0.134 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 4S: CB AT BOSTON POST ROAD

Inflow Area = 0.154 ac, 36.45% Impervious, Inflow Depth > 2.30" for 10-Year Storm event
Inflow = 0.44 cfs @ 12.09 hrs, Volume= 0.030 af
Primary = 0.44 cfs @ 12.09 hrs, Volume= 0.030 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 5S: OFF SITE CATCH BASIN NW CORNER OF CEMETERY

Inflow Area = 0.729 ac, 69.54% Impervious, Inflow Depth > 3.39" for 10-Year Storm event
Inflow = 2.87 cfs @ 12.10 hrs, Volume= 0.206 af
Primary = 2.87 cfs @ 12.10 hrs, Volume= 0.206 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment A: DRAIN TO BP RD

Runoff = 4.77 cfs @ 12.13 hrs, Volume= 0.358 af, Depth> 2.38"

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 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
11,809	98	Paved parking, HSG B
39,284	61	>75% Grass cover, Good, HSG B
27,352	60	Woods, Fair, HSG B
78,445	66	Weighted Average
66,636		84.95% Pervious Area
11,809		15.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	430	0.0730	0.81		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment B: DRAIN TO EX. OFF SITE CB

Runoff = 3.62 cfs @ 12.10 hrs, Volume= 0.264 af, Depth> 4.34"

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 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
22,092	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
9,679	60	Woods, Fair, HSG B
31,771	86	Weighted Average
9,679		30.46% Pervious Area
22,092		69.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	287	0.0170	0.65		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment C: DRAIN TO I-95

Runoff = 2.09 cfs @ 12.09 hrs, Volume= 0.162 af, Depth> 5.51"

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 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
15,353	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
0	60	Woods, Fair, HSG B
15,353	98	Weighted Average
15,353		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment D: SW CORNER OF THE SITE

Runoff = 0.59 cfs @ 12.09 hrs, Volume= 0.040 af, Depth> 3.12"

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 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
2,441	98	Paved parking, HSG B
4,255	61	>75% Grass cover, Good, HSG B
0	60	Woods, Fair, HSG B
6,696	74	Weighted Average
4,255		63.55% Pervious Area
2,441		36.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment E: DRAIN TO BP RD

Runoff = 0.57 cfs @ 12.12 hrs, Volume= 0.041 af, Depth> 2.65"

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 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
1,973	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
6,103	60	Woods, Fair, HSG B
8,076	69	Weighted Average
6,103		75.57% Pervious Area
1,973		24.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	430	0.0730	0.87		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment F: CEMETERY

Runoff = 1.92 cfs @ 12.16 hrs, Volume= 0.153 af, Depth> 1.95"

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 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
41,000	61	>75% Grass cover, Good, HSG B
41,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	333	0.0450	0.53		**Lag/CN Method,**

Summary for Link 1S: BOSTON POST ROAD

Inflow Area = 2.742 ac, 9.89% Impervious, Inflow Depth > 2.24" for 25-Year Storm event
Inflow = 6.67 cfs @ 12.14 hrs, Volume= 0.511 af
Primary = 6.67 cfs @ 12.14 hrs, Volume= 0.511 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 2S: OFF-SITE (NIANTIC RIVER)

Inflow Area = 0.185 ac, 24.43% Impervious, Inflow Depth > 2.65" for 25-Year Storm event
Inflow = 0.57 cfs @ 12.12 hrs, Volume= 0.041 af
Primary = 0.57 cfs @ 12.12 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3S: I-95

Inflow Area = 0.352 ac,100.00% Impervious, Inflow Depth > 5.51" for 25-Year Storm event
Inflow = 2.09 cfs @ 12.09 hrs, Volume= 0.162 af
Primary = 2.09 cfs @ 12.09 hrs, Volume= 0.162 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 4S: CB AT BOSTON POST ROAD

Inflow Area = 0.154 ac, 36.45% Impervious, Inflow Depth > 3.12" for 25-Year Storm event
Inflow = 0.59 cfs @ 12.09 hrs, Volume= 0.040 af
Primary = 0.59 cfs @ 12.09 hrs, Volume= 0.040 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 5S: OFF SITE CATCH BASIN NW CORNER OF CEMETERY

Inflow Area = 0.729 ac, 69.54% Impervious, Inflow Depth > 4.34" for 25-Year Storm event
Inflow = 3.62 cfs @ 12.10 hrs, Volume= 0.264 af
Primary = 3.62 cfs @ 12.10 hrs, Volume= 0.264 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment A: DRAIN TO BP RD

Runoff = 5.94 cfs @ 12.13 hrs, Volume= 0.443 af, Depth> 2.95"

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 50-year storm Rainfall=6.99"

Area (sf)	CN	Description
11,809	98	Paved parking, HSG B
39,284	61	>75% Grass cover, Good, HSG B
27,352	60	Woods, Fair, HSG B
78,445	66	Weighted Average
66,636		84.95% Pervious Area
11,809		15.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	430	0.0730	0.81		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment B: DRAIN TO EX. OFF SITE CB

Runoff = 4.19 cfs @ 12.10 hrs, Volume= 0.307 af, Depth> 5.06"

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 50-year storm Rainfall=6.99"

Area (sf)	CN	Description
22,092	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
9,679	60	Woods, Fair, HSG B
31,771	86	Weighted Average
9,679		30.46% Pervious Area
22,092		69.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	287	0.0170	0.65		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment C: DRAIN TO I-95

Runoff = 2.36 cfs @ 12.09 hrs, Volume= 0.183 af, Depth> 6.23"

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 50-year storm Rainfall=6.99"

Area (sf)	CN	Description
15,353	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
0	60	Woods, Fair, HSG B
15,353	98	Weighted Average
15,353		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment D: SW CORNER OF THE SITE

Runoff = 0.71 cfs @ 12.09 hrs, Volume= 0.048 af, Depth> 3.77"

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 50-year storm Rainfall=6.99"

Area (sf)	CN	Description
2,441	98	Paved parking, HSG B
4,255	61	>75% Grass cover, Good, HSG B
0	60	Woods, Fair, HSG B
6,696	74	Weighted Average
4,255		63.55% Pervious Area
2,441		36.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment E: DRAIN TO BP RD

Runoff = 0.70 cfs @ 12.12 hrs, Volume= 0.050 af, Depth> 3.25"

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 50-year storm Rainfall=6.99"

Area (sf)	CN	Description
1,973	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
6,103	60	Woods, Fair, HSG B
8,076	69	Weighted Average
6,103		75.57% Pervious Area
1,973		24.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	430	0.0730	0.87		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment F: CEMETERY

Runoff = 2.47 cfs @ 12.16 hrs, Volume= 0.194 af, Depth> 2.47"

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 50-year storm Rainfall=6.99"

Area (sf)	CN	Description
41,000	61	>75% Grass cover, Good, HSG B
41,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	333	0.0450	0.53		**Lag/CN Method,**

Summary for Link 1S: BOSTON POST ROAD

Inflow Area = 2.742 ac, 9.89% Impervious, Inflow Depth > 2.79" for 50-year storm event
Inflow = 8.37 cfs @ 12.14 hrs, Volume= 0.637 af
Primary = 8.37 cfs @ 12.14 hrs, Volume= 0.637 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 2S: OFF-SITE (NIANTIC RIVER)

Inflow Area = 0.185 ac, 24.43% Impervious, Inflow Depth > 3.25" for 50-year storm event
Inflow = 0.70 cfs @ 12.12 hrs, Volume= 0.050 af
Primary = 0.70 cfs @ 12.12 hrs, Volume= 0.050 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3S: I-95

Inflow Area = 0.352 ac,100.00% Impervious, Inflow Depth > 6.23" for 50-year storm event
Inflow = 2.36 cfs @ 12.09 hrs, Volume= 0.183 af
Primary = 2.36 cfs @ 12.09 hrs, Volume= 0.183 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 4S: CB AT BOSTON POST ROAD

Inflow Area = 0.154 ac, 36.45% Impervious, Inflow Depth > 3.77" for 50-year storm event
Inflow = 0.71 cfs @ 12.09 hrs, Volume= 0.048 af
Primary = 0.71 cfs @ 12.09 hrs, Volume= 0.048 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 5S: OFF SITE CATCH BASIN NW CORNER OF CEMETERY

Inflow Area = 0.729 ac, 69.54% Impervious, Inflow Depth > 5.06" for 50-year storm event
Inflow = 4.19 cfs @ 12.10 hrs, Volume= 0.307 af
Primary = 4.19 cfs @ 12.10 hrs, Volume= 0.307 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Subcatchment A: DRAIN TO BP RD

Runoff = 7.23 cfs @ 12.13 hrs, Volume= 0.538 af, Depth> 3.59"

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 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
11,809	98	Paved parking, HSG B
39,284	61	>75% Grass cover, Good, HSG B
27,352	60	Woods, Fair, HSG B
78,445	66	Weighted Average
66,636		84.95% Pervious Area
11,809		15.05% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.9	430	0.0730	0.81		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment B: DRAIN TO EX. OFF SITE CB

Runoff = 4.78 cfs @ 12.10 hrs, Volume= 0.354 af, Depth> 5.83"

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 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
22,092	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
9,679	60	Woods, Fair, HSG B
31,771	86	Weighted Average
9,679		30.46% Pervious Area
22,092		69.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.3	287	0.0170	0.65		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment C: DRAIN TO I-95

Runoff = 2.65 cfs @ 12.09 hrs, Volume= 0.205 af, Depth> 6.99"

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 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
15,353	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
0	60	Woods, Fair, HSG B
15,353	98	Weighted Average
15,353		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment D: SW CORNER OF THE SITE

Runoff = 0.84 cfs @ 12.09 hrs, Volume= 0.057 af, Depth> 4.47"

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 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
2,441	98	Paved parking, HSG B
4,255	61	>75% Grass cover, Good, HSG B
0	60	Woods, Fair, HSG B
6,696	74	Weighted Average
4,255		63.55% Pervious Area
2,441		36.45% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment E: DRAIN TO BP RD

Runoff = 0.84 cfs @ 12.12 hrs, Volume= 0.060 af, Depth> 3.91"

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 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
1,973	98	Paved parking, HSG B
0	61	>75% Grass cover, Good, HSG B
6,103	60	Woods, Fair, HSG B
8,076	69	Weighted Average
6,103		75.57% Pervious Area
1,973		24.43% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.2	430	0.0730	0.87		**Lag/CN Method, LAG/CN METHOD**

Summary for Subcatchment F: CEMETERY

Runoff = 3.07 cfs @ 12.16 hrs, Volume= 0.239 af, Depth> 3.05"

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 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
41,000	61	>75% Grass cover, Good, HSG B
41,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	333	0.0450	0.53		**Lag/CN Method,**

Summary for Link 1S: BOSTON POST ROAD

Inflow Area = 2.742 ac, 9.89% Impervious, Inflow Depth > 3.40" for 100-Year Storm event
Inflow = 10.25 cfs @ 12.14 hrs, Volume= 0.778 af
Primary = 10.25 cfs @ 12.14 hrs, Volume= 0.778 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 2S: OFF-SITE (NIANTIC RIVER)

Inflow Area = 0.185 ac, 24.43% Impervious, Inflow Depth > 3.91" for 100-Year Storm event
Inflow = 0.84 cfs @ 12.12 hrs, Volume= 0.060 af
Primary = 0.84 cfs @ 12.12 hrs, Volume= 0.060 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 3S: I-95

Inflow Area = 0.352 ac,100.00% Impervious, Inflow Depth > 6.99" for 100-Year Storm event
Inflow = 2.65 cfs @ 12.09 hrs, Volume= 0.205 af
Primary = 2.65 cfs @ 12.09 hrs, Volume= 0.205 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 4S: CB AT BOSTON POST ROAD

Inflow Area = 0.154 ac, 36.45% Impervious, Inflow Depth > 4.47" for 100-Year Storm event
Inflow = 0.84 cfs @ 12.09 hrs, Volume= 0.057 af
Primary = 0.84 cfs @ 12.09 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Link 5S: OFF SITE CATCH BASIN NW CORNER OF CEMETERY

Inflow Area = 0.729 ac, 69.54% Impervious, Inflow Depth > 5.83" for 100-Year Storm event
Inflow = 4.78 cfs @ 12.10 hrs, Volume= 0.354 af
Primary = 4.78 cfs @ 12.10 hrs, Volume= 0.354 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Appendix D

Post-Development Drainage Calculations

AREA A POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 13,113 S.F., CN = 98
GRASS= 7,260 S.F., CN = 61

TOTAL= 20,373 S.F., CN = 85

AREA B POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 4,786 S.F., CN = 98
GRASS= 944 S.F., CN = 61

TOTAL= 5,730 S.F., CN = 92

AREA C POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 3,842 S.F., CN = 98

TOTAL = 3,842 S.F., CN = 98

AREA D POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 9,862 S.F., CN = 98
GRASS= 7,962 S.F., CN = 61

TOTAL= 17,824 S.F., CN = 82

AREA E POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 4,706 S.F., CN = 98
GRASS= 833 S.F., CN = 61

TOTAL= 5,539 S.F., CN = 92

AREA F POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 0 S.F., CN = 98
GRASS= 41,000 S.F., CN = 61

TOTAL= 41,000 S.F., CN = 61

AREA G POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 6,531 S.F., CN = 98
GRASS= 1,944 S.F., CN = 61

TOTAL= 8,475 S.F., CN = 90

AREA H POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 2,985 S.F., CN = 98
GRASS= 0 S.F., CN = 61

TOTAL= 2,985 S.F., CN = 98

AREA H2 POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 9,112S.F., CN = 98
GRASS= 1,260 S.F., CN = 61

TOTAL= 10,372 S.F., CN = 94

AREA I POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 10,791 S.F., CN = 98
GRASS= 3,395 S.F., CN = 61

TOTAL= 14,186 S.F., CN = 89

AREA J POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 5,020 S.F., CN = 98
GRASS= 3,183 S.F., CN = 61

TOTAL= 8,203 S.F., CN = 84

AREA K POST: (HYDROLOGIC SOIL TYPE: B)

GRASS= 11,504 S.F., CN = 61

TOTAL= 11,504 S.F., CN = 61

AREA L POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 4,307 S.F., CN = 98
GRASS= 2,309 S.F., CN = 61

TOTAL= 6,616 S.F., CN = 85

AREA M POST: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 1,973 S.F., CN = 98
WOODS= 7,630 S.F., CN = 60

TOTAL= 9,603 S.F., CN = 68

AREA BLD: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 7,697 S.F., CN = 98

TOTAL= 7,697 S.F., CN = 98

AREA CAN1: (HYDROLOGIC SOIL TYPE: B)

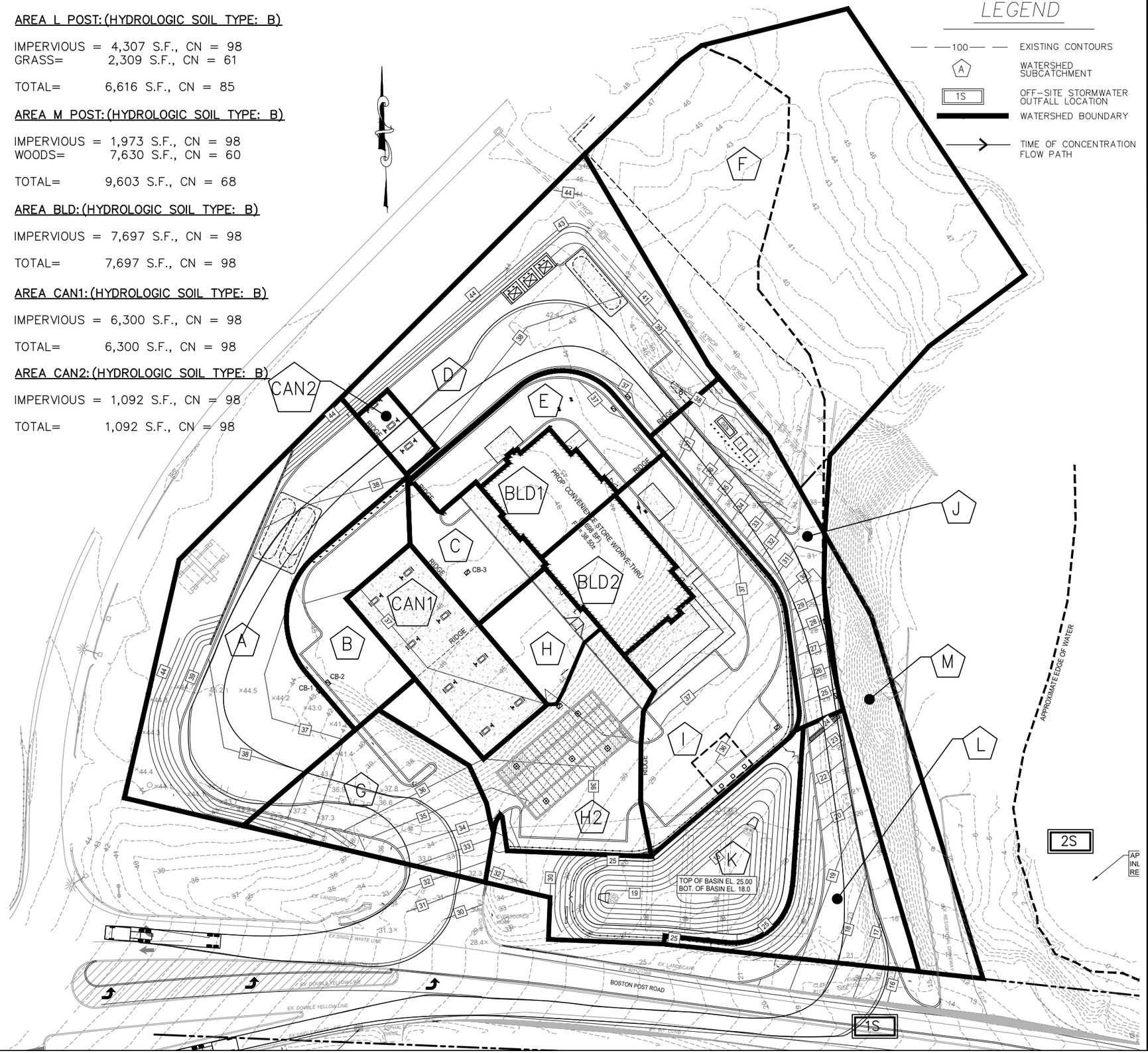
IMPERVIOUS = 6,300 S.F., CN = 98

TOTAL= 6,300 S.F., CN = 98

AREA CAN2: (HYDROLOGIC SOIL TYPE: B)

IMPERVIOUS = 1,092 S.F., CN = 98

TOTAL= 1,092 S.F., CN = 98



NO.	DATE	DESCRIPTION	BY	CKD
		REVISIONS		

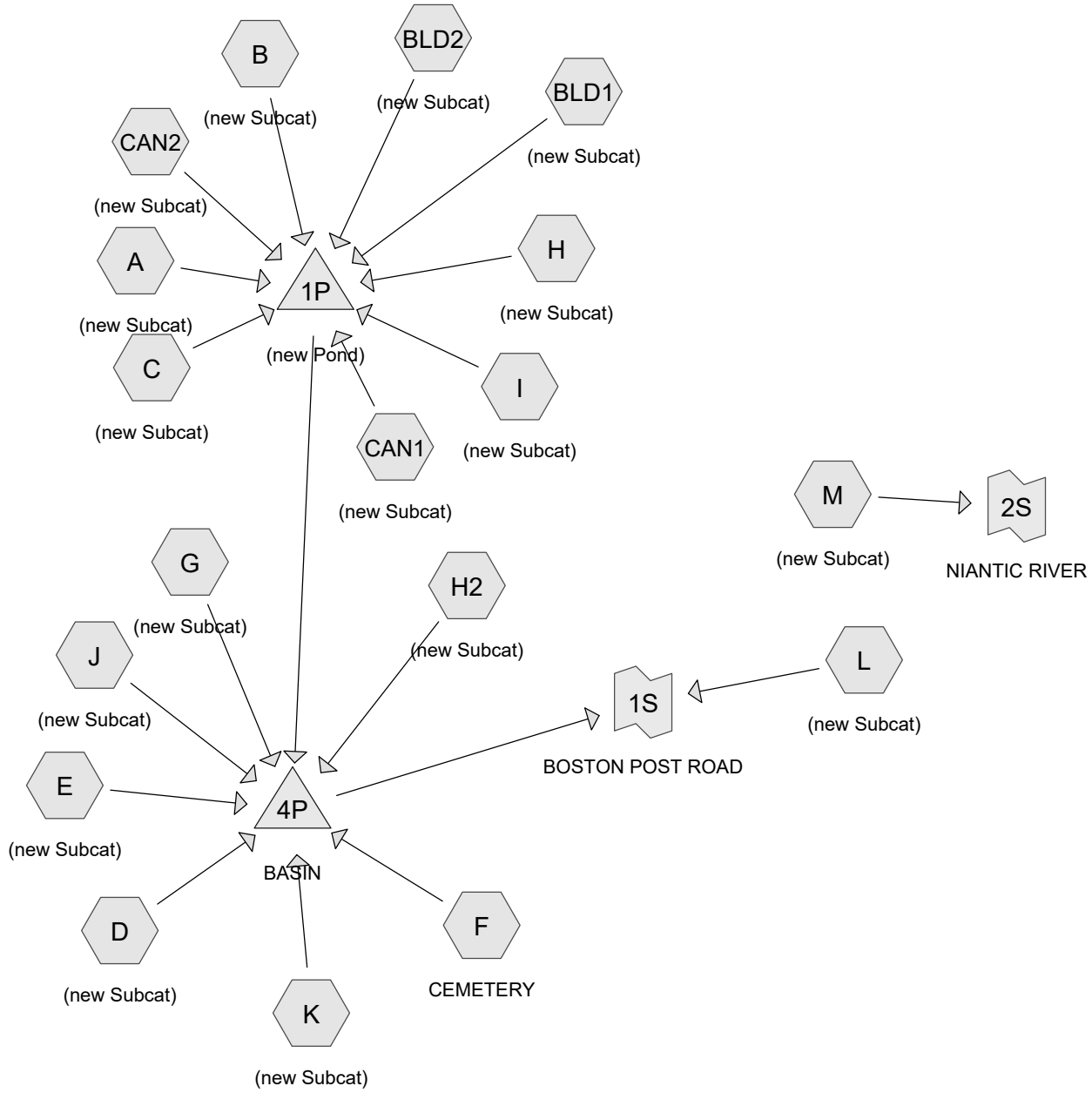
PROFESSIONAL SEAL

PROJECT:
PROPOSED FILLING STATION W/DRIVE THRU
51 BOSTON POST ROAD
EAST LYME, CT 06333

PREPARED FOR:
NOBLE ENERGY REAL ESTATE HOLDINGS, LLC
131 BUCKINGHAM STREET, SUITE 301
HARTFORD, CT 06106

ENGINEERING SERVICES
ENVIRONMENTAL SERVICES
67 Hall Road
Sturbridge, MA 01560
Phone: 774-241-0901
fax: 774-241-0906
CMG EST. 2002

ISSUE DATE: 04/30/2021
DRAWN BY: SH CHECKED BY: DTF
SCALE: 1" = 60'
PROJECT NO.: 2020-144
SHEET NAME:
POST-DEVELOPMENT DRAINAGE MAP
SHEET NO.:
D - 2.0



Subcat Reach Pond Link

Routing Diagram for 2020-144_POST_DEV_SH_06-08-2021
Prepared by {enter your company name here}, Printed 6/29/2021

Summary for Subcatchment A: (new Subcat)

Runoff = 1.06 cfs @ 12.09 hrs, Volume= 0.077 af, Depth= 1.97"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
13,113	98	Paved parking, HSG B
7,260	61	>75% Grass cover, Good, HSG B
20,373	85	Weighted Average
7,260		35.64% Pervious Area
13,113		64.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment B: (new Subcat)

Runoff = 0.38 cfs @ 12.09 hrs, Volume= 0.028 af, Depth= 2.59"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
4,786	98	Paved parking, HSG B
944	61	>75% Grass cover, Good, HSG B
5,730	92	Weighted Average
944		16.47% Pervious Area
4,786		83.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment BLD1: (new Subcat)

Runoff = 0.24 cfs @ 12.09 hrs, Volume= 0.020 af, Depth= 3.22"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
3,248	98	Roofs, HSG B
3,248		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment BLD2: (new Subcat)

Runoff = 0.33 cfs @ 12.09 hrs, Volume= 0.027 af, Depth= 3.22"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
4,449	98	Roofs, HSG B
4,449		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment C: (new Subcat)

Runoff = 0.29 cfs @ 12.09 hrs, Volume= 0.024 af, Depth= 3.22"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
3,842	98	Paved parking, HSG B
3,842		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment CAN1: (new Subcat)

Runoff = 0.47 cfs @ 12.09 hrs, Volume= 0.039 af, Depth= 3.22"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
6,300	98	Roofs, HSG B
6,300		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment CAN2: (new Subcat)

Runoff = 0.08 cfs @ 12.09 hrs, Volume= 0.007 af, Depth= 3.22"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
1,092	98	Roofs, HSG B
1,092		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment D: (new Subcat)

Runoff = 0.78 cfs @ 12.09 hrs, Volume= 0.057 af, Depth= 1.67"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
9,862	98	Paved parking, HSG B
7,962	61	>75% Grass cover, Good, HSG B
17,824	81	Weighted Average
7,962		44.67% Pervious Area
9,862		55.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment E: (new Subcat)

Runoff = 0.37 cfs @ 12.09 hrs, Volume= 0.027 af, Depth= 2.59"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
4,706	98	Paved parking, HSG B
833	61	>75% Grass cover, Good, HSG B
5,539	92	Weighted Average
833		15.04% Pervious Area
4,706		84.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment F: CEMETERY

Runoff = 0.36 cfs @ 12.20 hrs, Volume= 0.043 af, Depth= 0.55"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
41,000	61	>75% Grass cover, Good, HSG B
41,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	333	0.0450	0.53		**Lag/CN Method,**

Summary for Subcatchment G: (new Subcat)

Runoff = 0.53 cfs @ 12.09 hrs, Volume= 0.039 af, Depth= 2.40"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
6,531	98	Paved parking, HSG B
1,914	61	>75% Grass cover, Good, HSG B
8,445	90	Weighted Average
1,914		22.66% Pervious Area
6,531		77.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment H: (new Subcat)

Runoff = 0.22 cfs @ 12.09 hrs, Volume= 0.018 af, Depth= 3.22"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
2,985	98	Paved parking, HSG B
2,985		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment H2: (new Subcat)

Runoff = 0.72 cfs @ 12.09 hrs, Volume= 0.055 af, Depth= 2.79"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
9,112	98	Paved parking, HSG B
1,260	61	>75% Grass cover, Good, HSG B
10,372	94	Weighted Average
1,260		12.15% Pervious Area
9,112		87.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment I: (new Subcat)

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.063 af, Depth= 2.31"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
10,791	98	Paved parking, HSG B
3,395	61	>75% Grass cover, Good, HSG B
14,186	89	Weighted Average
3,395		23.93% Pervious Area
10,791		76.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment J: (new Subcat)

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.030 af, Depth= 1.89"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
5,020	98	Paved parking, HSG B
3,183	61	>75% Grass cover, Good, HSG B
8,203	84	Weighted Average
3,183		38.80% Pervious Area
5,020		61.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment K: (new Subcat)

Runoff = 0.12 cfs @ 12.12 hrs, Volume= 0.012 af, Depth= 0.55"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
11,504	61	>75% Grass cover, Good, HSG B
11,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment L: (new Subcat)

Runoff = 0.36 cfs @ 12.09 hrs, Volume= 0.026 af, Depth= 1.67"
Routed to Link 1S : BOSTON POST ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
4,307	98	Paved parking, HSG B
3,836	61	>75% Grass cover, Good, HSG B
8,143	81	Weighted Average
3,836		47.11% Pervious Area
4,307		52.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment M: (new Subcat)

Runoff = 0.20 cfs @ 12.10 hrs, Volume= 0.016 af, Depth= 0.87"
Routed to Link 2S : NIANTIC RIVER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 2-Year Storm Rainfall=3.45"

Area (sf)	CN	Description
1,973	98	Paved parking, HSG B
7,669	60	Woods, Fair, HSG B
9,642	68	Weighted Average
7,669		79.54% Pervious Area
1,973		20.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Pond 1P: (new Pond)

Inflow Area = 1.428 ac, 81.35% Impervious, Inflow Depth = 2.54" for 2-Year Storm event
Inflow = 3.94 cfs @ 12.09 hrs, Volume= 0.303 af
Outflow = 0.23 cfs @ 14.01 hrs, Volume= 0.303 af, Atten= 94%, Lag= 115.1 min
Discarded = 0.23 cfs @ 14.01 hrs, Volume= 0.303 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Pond 4P : BASIN

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 29.79' @ 14.01 hrs Surf.Area= 2,852 sf Storage= 6,218 cf
Flood Elev= 33.50' Surf.Area= 2,852 sf Storage= 12,236 cf

Plug-Flow detention time= 262.5 min calculated for 0.303 af (100% of inflow)
Center-of-Mass det. time= 262.5 min (1,049.4 - 786.9)

Volume	Invert	Avail.Storage	Storage Description
#1A	26.75'	4,678 cf	**37.58'W x 75.89'L x 6.75'H Field A** 19,253 cf Overall - 7,557 cf Embedded = 11,695 cf x 40.0% Voids
#2A	27.50'	7,557 cf	**ADS_StormTech MC-4500 b +Cap** x 68 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 68 Chambers in 4 Rows Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
		12,236 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 20.00'
#2	Primary	26.75'	**15.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 26.75' / 24.35' S= 0.0600 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#3	Device 2	32.65'	**5.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=0.23 cfs @ 14.01 hrs HW=29.79' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.23 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=26.75' (Free Discharge)
↑—**2=Culvert** (Controls 0.00 cfs)
↑—**3=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Summary for Pond 4P: BASIN

Inflow Area = 3.790 ac, 51.99% Impervious, Inflow Depth = 0.83" for 2-Year Storm event
Inflow = 3.16 cfs @ 12.10 hrs, Volume= 0.263 af
Outflow = 0.22 cfs @ 14.46 hrs, Volume= 0.263 af, Atten= 93%, Lag= 141.7 min
Discarded = 0.22 cfs @ 14.46 hrs, Volume= 0.263 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1S : BOSTON POST ROAD

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 20.69' @ 14.46 hrs Surf.Area= 3,341 sf Storage= 5,504 cf
Flood Elev= 24.25' Surf.Area= 7,032 sf Storage= 23,671 cf

Plug-Flow detention time= 297.4 min calculated for 0.263 af (100% of inflow)
Center-of-Mass det. time= 297.5 min (1,127.9 - 830.4)

Volume	Invert	Avail.Storage	Storage Description
#1	18.33'	29,266 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)
18.33	1,270	149.0	0	0	1,270
19.00	1,947	239.0	1,070	1,070	4,052
20.00	2,747	265.0	2,336	3,405	5,125
21.00	3,626	293.0	3,176	6,582	6,399
22.00	4,583	318.0	4,095	10,677	7,652
23.00	5,619	337.0	5,092	15,769	8,695
24.00	6,756	356.0	6,179	21,948	9,799
25.00	7,895	375.0	7,318	29,266	10,963

Device	Routing	Invert	Outlet Devices
#1	Primary	23.80'	**22.0' long (Profile 26) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 Coef. (English) 3.06 3.13 3.13
#2	Discarded	18.33'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.00'
#3	Device 1	21.00'	**18.0" Round Culvert** L= 55.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 21.00' S= -0.0364 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Discarded OutFlow Max=0.22 cfs @ 14.46 hrs HW=20.69' (Free Discharge)
↑—**2=Exfiltration** (Controls 0.22 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.33' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
↑—**3=Culvert** (Controls 0.00 cfs)

Summary for Link 1S: BOSTON POST ROAD

Inflow Area = 3.977 ac, 52.04% Impervious, Inflow Depth = 0.08" for 2-Year Storm event
Inflow = 0.36 cfs @ 12.09 hrs, Volume= 0.026 af
Primary = 0.36 cfs @ 12.09 hrs, Volume= 0.026 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link 2S: NIANTIC RIVER

Inflow Area = 0.221 ac, 20.46% Impervious, Inflow Depth = 0.87" for 2-Year Storm event
Inflow = 0.20 cfs @ 12.10 hrs, Volume= 0.016 af
Primary = 0.20 cfs @ 12.10 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment A: (new Subcat)

Runoff = 1.86 cfs @ 12.09 hrs, Volume= 0.137 af, Depth= 3.51"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
13,113	98	Paved parking, HSG B
7,260	61	>75% Grass cover, Good, HSG B
20,373	85	Weighted Average
7,260		35.64% Pervious Area
13,113		64.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment B: (new Subcat)

Runoff = 0.60 cfs @ 12.09 hrs, Volume= 0.046 af, Depth= 4.24"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
4,786	98	Paved parking, HSG B
944	61	>75% Grass cover, Good, HSG B
5,730	92	Weighted Average
944		16.47% Pervious Area
4,786		83.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment BLD1: (new Subcat)

Runoff = 0.37 cfs @ 12.09 hrs, Volume= 0.031 af, Depth= 4.91"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
3,248	98	Roofs, HSG B
3,248		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment BLD2: (new Subcat)

Runoff = 0.50 cfs @ 12.09 hrs, Volume= 0.042 af, Depth= 4.91"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
4,449	98	Roofs, HSG B
4,449		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment C: (new Subcat)

Runoff = 0.43 cfs @ 12.09 hrs, Volume= 0.036 af, Depth= 4.91"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
3,842	98	Paved parking, HSG B
3,842		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment CAN1: (new Subcat)

Runoff = 0.71 cfs @ 12.09 hrs, Volume= 0.059 af, Depth= 4.91"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
6,300	98	Roofs, HSG B
6,300		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment CAN2: (new Subcat)

Runoff = 0.12 cfs @ 12.09 hrs, Volume= 0.010 af, Depth= 4.91"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
1,092	98	Roofs, HSG B
1,092		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment D: (new Subcat)

Runoff = 1.46 cfs @ 12.09 hrs, Volume= 0.106 af, Depth= 3.12"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
9,862	98	Paved parking, HSG B
7,962	61	>75% Grass cover, Good, HSG B
17,824	81	Weighted Average
7,962		44.67% Pervious Area
9,862		55.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment E: (new Subcat)

Runoff = 0.58 cfs @ 12.09 hrs, Volume= 0.045 af, Depth= 4.24"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
4,706	98	Paved parking, HSG B
833	61	>75% Grass cover, Good, HSG B
5,539	92	Weighted Average
833		15.04% Pervious Area
4,706		84.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment F: CEMETERY

Runoff = 1.26 cfs @ 12.16 hrs, Volume= 0.115 af, Depth= 1.46"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
41,000	61	>75% Grass cover, Good, HSG B
41,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	333	0.0450	0.53		**Lag/CN Method,**

Summary for Subcatchment G: (new Subcat)

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 4.02"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
6,531	98	Paved parking, HSG B
1,914	61	>75% Grass cover, Good, HSG B
8,445	90	Weighted Average
1,914		22.66% Pervious Area
6,531		77.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment H: (new Subcat)

Runoff = 0.34 cfs @ 12.09 hrs, Volume= 0.028 af, Depth= 4.91"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
2,985	98	Paved parking, HSG B
2,985		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment H2: (new Subcat)

Runoff = 1.13 cfs @ 12.09 hrs, Volume= 0.088 af, Depth= 4.46"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
9,112	98	Paved parking, HSG B
1,260	61	>75% Grass cover, Good, HSG B
10,372	94	Weighted Average
1,260		12.15% Pervious Area
9,112		87.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment I: (new Subcat)

Runoff = 1.42 cfs @ 12.09 hrs, Volume= 0.106 af, Depth= 3.92"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
10,791	98	Paved parking, HSG B
3,395	61	>75% Grass cover, Good, HSG B
14,186	89	Weighted Average
3,395		23.93% Pervious Area
10,791		76.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment J: (new Subcat)

Runoff = 0.73 cfs @ 12.09 hrs, Volume= 0.053 af, Depth= 3.41"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
5,020	98	Paved parking, HSG B
3,183	61	>75% Grass cover, Good, HSG B
8,203	84	Weighted Average
3,183		38.80% Pervious Area
5,020		61.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment K: (new Subcat)

Runoff = 0.41 cfs @ 12.10 hrs, Volume= 0.032 af, Depth= 1.46"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
11,504	61	>75% Grass cover, Good, HSG B
11,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment L: (new Subcat)

Runoff = 0.67 cfs @ 12.09 hrs, Volume= 0.049 af, Depth= 3.12"
Routed to Link 1S : BOSTON POST ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
4,307	98	Paved parking, HSG B
3,836	61	>75% Grass cover, Good, HSG B
8,143	81	Weighted Average
3,836		47.11% Pervious Area
4,307		52.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment M: (new Subcat)

Runoff = 0.49 cfs @ 12.10 hrs, Volume= 0.037 af, Depth= 1.99"
Routed to Link 2S : NIANTIC RIVER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 10-Year Storm Rainfall=5.15"

Area (sf)	CN	Description
1,973	98	Paved parking, HSG B
7,669	60	Woods, Fair, HSG B
9,642	68	Weighted Average
7,669		79.54% Pervious Area
1,973		20.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Pond 1P: (new Pond)

Inflow Area = 1.428 ac, 81.35% Impervious, Inflow Depth = 4.16" for 10-Year Storm event
Inflow = 6.36 cfs @ 12.09 hrs, Volume= 0.495 af
Outflow = 0.41 cfs @ 13.71 hrs, Volume= 0.495 af, Atten= 94%, Lag= 97.6 min
Discarded = 0.30 cfs @ 13.71 hrs, Volume= 0.489 af
Primary = 0.11 cfs @ 13.71 hrs, Volume= 0.006 af
Routed to Pond 4P : BASIN

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 32.68' @ 13.71 hrs Surf.Area= 2,852 sf Storage= 11,304 cf
Flood Elev= 33.50' Surf.Area= 2,852 sf Storage= 12,236 cf

Plug-Flow detention time= 399.6 min calculated for 0.495 af (100% of inflow)
Center-of-Mass det. time= 399.7 min (1,176.5 - 776.8)

Volume	Invert	Avail.Storage	Storage Description
#1A	26.75'	4,678 cf	**37.58'W x 75.89'L x 6.75'H Field A** 19,253 cf Overall - 7,557 cf Embedded = 11,695 cf x 40.0% Voids
#2A	27.50'	7,557 cf	**ADS_StormTech MC-4500 b +Cap** x 68 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 68 Chambers in 4 Rows Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
		12,236 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 20.00'
#2	Primary	26.75'	**15.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 26.75' / 24.35' S= 0.0600 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#3	Device 2	32.65'	**5.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=0.30 cfs @ 13.71 hrs HW=32.68' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.30 cfs)

Primary OutFlow Max=0.10 cfs @ 13.71 hrs HW=32.68' (Free Discharge)
↑—**2=Culvert** (Passes 0.10 cfs of 10.75 cfs potential flow)
↑—**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.10 cfs @ 0.60 fps)

Summary for Pond 4P: BASIN

Inflow Area = 3.790 ac, 51.99% Impervious, Inflow Depth = 1.62" for 10-Year Storm event
Inflow = 6.20 cfs @ 12.10 hrs, Volume= 0.511 af
Outflow = 0.35 cfs @ 14.97 hrs, Volume= 0.511 af, Atten= 94%, Lag= 172.3 min
Discarded = 0.35 cfs @ 14.97 hrs, Volume= 0.511 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1S : BOSTON POST ROAD

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 22.33' @ 14.97 hrs Surf.Area= 4,918 sf Storage= 12,266 cf
Flood Elev= 24.25' Surf.Area= 7,032 sf Storage= 23,671 cf

Plug-Flow detention time= 436.8 min calculated for 0.510 af (100% of inflow)
Center-of-Mass det. time= 437.0 min (1,255.6 - 818.6)

Volume	Invert	Avail.Storage	Storage Description
#1	18.33'	29,266 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)
18.33	1,270	149.0	0	0	1,270
19.00	1,947	239.0	1,070	1,070	4,052
20.00	2,747	265.0	2,336	3,405	5,125
21.00	3,626	293.0	3,176	6,582	6,399
22.00	4,583	318.0	4,095	10,677	7,652
23.00	5,619	337.0	5,092	15,769	8,695
24.00	6,756	356.0	6,179	21,948	9,799
25.00	7,895	375.0	7,318	29,266	10,963

Device	Routing	Invert	Outlet Devices
#1	Primary	23.80'	**22.0' long (Profile 26) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 Coef. (English) 3.06 3.13 3.13
#2	Discarded	18.33'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.00'
#3	Device 1	21.00'	**18.0" Round Culvert** L= 55.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 21.00' S= -0.0364 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Discarded OutFlow Max=0.35 cfs @ 14.97 hrs HW=22.33' (Free Discharge)
↑—**2=Exfiltration** (Controls 0.35 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.33' (Free Discharge)
↑—**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
↑—**3=Culvert** (Controls 0.00 cfs)

Summary for Link 1S: BOSTON POST ROAD

Inflow Area = 3.977 ac, 52.04% Impervious, Inflow Depth = 0.15" for 10-Year Storm event
Inflow = 0.67 cfs @ 12.09 hrs, Volume= 0.049 af
Primary = 0.67 cfs @ 12.09 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link 2S: NIANTIC RIVER

Inflow Area = 0.221 ac, 20.46% Impervious, Inflow Depth = 1.99" for 10-Year Storm event
Inflow = 0.49 cfs @ 12.10 hrs, Volume= 0.037 af
Primary = 0.49 cfs @ 12.10 hrs, Volume= 0.037 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment A: (new Subcat)

Runoff = 2.36 cfs @ 12.09 hrs, Volume= 0.175 af, Depth= 4.49"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
13,113	98	Paved parking, HSG B
7,260	61	>75% Grass cover, Good, HSG B
20,373	85	Weighted Average
7,260		35.64% Pervious Area
13,113		64.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment B: (new Subcat)

Runoff = 0.74 cfs @ 12.09 hrs, Volume= 0.058 af, Depth= 5.27"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
4,786	98	Paved parking, HSG B
944	61	>75% Grass cover, Good, HSG B
5,730	92	Weighted Average
944		16.47% Pervious Area
4,786		83.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment BLD1: (new Subcat)

Runoff = 0.44 cfs @ 12.09 hrs, Volume= 0.037 af, Depth= 5.96"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
3,248	98	Roofs, HSG B
3,248		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment BLD2: (new Subcat)

Runoff = 0.61 cfs @ 12.09 hrs, Volume= 0.051 af, Depth= 5.96"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
4,449	98	Roofs, HSG B
4,449		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment C: (new Subcat)

Runoff = 0.52 cfs @ 12.09 hrs, Volume= 0.044 af, Depth= 5.96"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
3,842	98	Paved parking, HSG B
3,842		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment CAN1: (new Subcat)

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.072 af, Depth= 5.96"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
6,300	98	Roofs, HSG B
6,300		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment CAN2: (new Subcat)

Runoff = 0.15 cfs @ 12.09 hrs, Volume= 0.012 af, Depth= 5.96"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
1,092	98	Roofs, HSG B
1,092		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment D: (new Subcat)

Runoff = 1.90 cfs @ 12.09 hrs, Volume= 0.139 af, Depth= 4.07"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
9,862	98	Paved parking, HSG B
7,962	61	>75% Grass cover, Good, HSG B
17,824	81	Weighted Average
7,962		44.67% Pervious Area
9,862		55.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment E: (new Subcat)

Runoff = 0.72 cfs @ 12.09 hrs, Volume= 0.056 af, Depth= 5.27"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
4,706	98	Paved parking, HSG B
833	61	>75% Grass cover, Good, HSG B
5,539	92	Weighted Average
833		15.04% Pervious Area
4,706		84.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment F: CEMETERY

Runoff = 1.92 cfs @ 12.16 hrs, Volume= 0.168 af, Depth= 2.14"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
41,000	61	>75% Grass cover, Good, HSG B
41,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	333	0.0450	0.53		**Lag/CN Method,**

Summary for Subcatchment G: (new Subcat)

Runoff = 1.06 cfs @ 12.09 hrs, Volume= 0.081 af, Depth= 5.04"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
6,531	98	Paved parking, HSG B
1,914	61	>75% Grass cover, Good, HSG B
8,445	90	Weighted Average
1,914		22.66% Pervious Area
6,531		77.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment H: (new Subcat)

Runoff = 0.41 cfs @ 12.09 hrs, Volume= 0.034 af, Depth= 5.96"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
2,985	98	Paved parking, HSG B
2,985		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment H2: (new Subcat)

Runoff = 1.37 cfs @ 12.09 hrs, Volume= 0.109 af, Depth= 5.49"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
9,112	98	Paved parking, HSG B
1,260	61	>75% Grass cover, Good, HSG B
10,372	94	Weighted Average
1,260		12.15% Pervious Area
9,112		87.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment I: (new Subcat)

Runoff = 1.76 cfs @ 12.09 hrs, Volume= 0.134 af, Depth= 4.93"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
10,791	98	Paved parking, HSG B
3,395	61	>75% Grass cover, Good, HSG B
14,186	89	Weighted Average
3,395		23.93% Pervious Area
10,791		76.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment J: (new Subcat)

Runoff = 0.93 cfs @ 12.09 hrs, Volume= 0.069 af, Depth= 4.38"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
5,020	98	Paved parking, HSG B
3,183	61	>75% Grass cover, Good, HSG B
8,203	84	Weighted Average
3,183		38.80% Pervious Area
5,020		61.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment K: (new Subcat)

Runoff = 0.63 cfs @ 12.10 hrs, Volume= 0.047 af, Depth= 2.14"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
11,504	61	>75% Grass cover, Good, HSG B
11,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment L: (new Subcat)

Runoff = 0.87 cfs @ 12.09 hrs, Volume= 0.063 af, Depth= 4.07"
Routed to Link 1S : BOSTON POST ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
4,307	98	Paved parking, HSG B
3,836	61	>75% Grass cover, Good, HSG B
8,143	81	Weighted Average
3,836		47.11% Pervious Area
4,307		52.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment M: (new Subcat)

Runoff = 0.70 cfs @ 12.10 hrs, Volume= 0.051 af, Depth= 2.78"
Routed to Link 2S : NIANTIC RIVER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Storm Rainfall=6.20"

Area (sf)	CN	Description
1,973	98	Paved parking, HSG B
7,669	60	Woods, Fair, HSG B
9,642	68	Weighted Average
7,669		79.54% Pervious Area
1,973		20.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Pond 1P: (new Pond)

Inflow Area = 1.428 ac, 81.35% Impervious, Inflow Depth = 5.18" for 25-Year Storm event
Inflow = 7.85 cfs @ 12.09 hrs, Volume= 0.617 af
Outflow = 2.85 cfs @ 12.37 hrs, Volume= 0.617 af, Atten= 64%, Lag= 17.1 min
Discarded = 0.31 cfs @ 12.37 hrs, Volume= 0.522 af
Primary = 2.55 cfs @ 12.37 hrs, Volume= 0.094 af
Routed to Pond 4P : BASIN

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 32.94' @ 12.37 hrs Surf.Area= 2,852 sf Storage= 11,598 cf
Flood Elev= 33.50' Surf.Area= 2,852 sf Storage= 12,236 cf

Plug-Flow detention time= 348.0 min calculated for 0.616 af (100% of inflow)
Center-of-Mass det. time= 348.2 min (1,120.5 - 772.4)

Volume	Invert	Avail.Storage	Storage Description
#1A	26.75'	4,678 cf	**37.58'W x 75.89'L x 6.75'H Field A** 19,253 cf Overall - 7,557 cf Embedded = 11,695 cf x 40.0% Voids
#2A	27.50'	7,557 cf	**ADS_StormTech MC-4500 b +Cap** x 68 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 68 Chambers in 4 Rows Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
		12,236 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 20.00'
#2	Primary	26.75'	**15.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 26.75' / 24.35' S= 0.0600 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#3	Device 2	32.65'	**5.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=0.30 cfs @ 12.37 hrs HW=32.92' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.30 cfs)

Primary OutFlow Max=2.32 cfs @ 12.37 hrs HW=32.92' (Free Discharge)
↑—**2=Culvert** (Passes 2.32 cfs of 10.99 cfs potential flow)
↑—**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 2.32 cfs @ 1.71 fps)

Summary for Pond 4P: BASIN

Inflow Area = 3.790 ac, 51.99% Impervious, Inflow Depth = 2.42" for 25-Year Storm event
Inflow = 8.23 cfs @ 12.10 hrs, Volume= 0.763 af
Outflow = 0.48 cfs @ 15.04 hrs, Volume= 0.763 af, Atten= 94%, Lag= 176.3 min
Discarded = 0.48 cfs @ 15.04 hrs, Volume= 0.763 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Routed to Link 1S : BOSTON POST ROAD

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 23.75' @ 15.04 hrs Surf.Area= 6,459 sf Storage= 20,279 cf
Flood Elev= 24.25' Surf.Area= 7,032 sf Storage= 23,671 cf

Plug-Flow detention time= 534.0 min calculated for 0.763 af (100% of inflow)
Center-of-Mass det. time= 534.4 min (1,342.5 - 808.2)

Volume	Invert	Avail.Storage	Storage Description
#1	18.33'	29,266 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)
18.33	1,270	149.0	0	0	1,270
19.00	1,947	239.0	1,070	1,070	4,052
20.00	2,747	265.0	2,336	3,405	5,125
21.00	3,626	293.0	3,176	6,582	6,399
22.00	4,583	318.0	4,095	10,677	7,652
23.00	5,619	337.0	5,092	15,769	8,695
24.00	6,756	356.0	6,179	21,948	9,799
25.00	7,895	375.0	7,318	29,266	10,963

Device	Routing	Invert	Outlet Devices
#1	Primary	23.80'	**22.0' long (Profile 26) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 Coef. (English) 3.06 3.13 3.13
#2	Discarded	18.33'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.00'
#3	Device 1	21.00'	**18.0" Round Culvert** L= 55.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 21.00' S= -0.0364 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Discarded OutFlow Max=0.48 cfs @ 15.04 hrs HW=23.75' (Free Discharge)
↑└**2=Exfiltration** (Controls 0.48 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=18.33' (Free Discharge)
↑└**1=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
↑└**3=Culvert** (Controls 0.00 cfs)

Summary for Link 1S: BOSTON POST ROAD

Inflow Area = 3.977 ac, 52.04% Impervious, Inflow Depth = 0.19" for 25-Year Storm event
Inflow = 0.87 cfs @ 12.09 hrs, Volume= 0.063 af
Primary = 0.87 cfs @ 12.09 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link 2S: NIANTIC RIVER

Inflow Area = 0.221 ac, 20.46% Impervious, Inflow Depth = 2.78" for 25-Year Storm event
Inflow = 0.70 cfs @ 12.10 hrs, Volume= 0.051 af
Primary = 0.70 cfs @ 12.10 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment A: (new Subcat)

Runoff = 2.73 cfs @ 12.09 hrs, Volume= 0.204 af, Depth= 5.24"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
13,113	98	Paved parking, HSG B
7,260	61	>75% Grass cover, Good, HSG B
20,373	85	Weighted Average
7,260		35.64% Pervious Area
13,113		64.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment B: (new Subcat)

Runoff = 0.85 cfs @ 12.09 hrs, Volume= 0.066 af, Depth= 6.04"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
4,786	98	Paved parking, HSG B
944	61	>75% Grass cover, Good, HSG B
5,730	92	Weighted Average
944		16.47% Pervious Area
4,786		83.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment BLD1: (new Subcat)

Runoff = 0.50 cfs @ 12.09 hrs, Volume= 0.042 af, Depth= 6.75"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
3,248	98	Roofs, HSG B
3,248		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment BLD2: (new Subcat)

Runoff = 0.68 cfs @ 12.09 hrs, Volume= 0.057 af, Depth= 6.75"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
4,449	98	Roofs, HSG B
4,449		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment C: (new Subcat)

Runoff = 0.59 cfs @ 12.09 hrs, Volume= 0.050 af, Depth= 6.75"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
3,842	98	Paved parking, HSG B
3,842		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment CAN1: (new Subcat)

Runoff = 0.97 cfs @ 12.09 hrs, Volume= 0.081 af, Depth= 6.75"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
6,300	98	Roofs, HSG B
6,300		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment CAN2: (new Subcat)

Runoff = 0.17 cfs @ 12.09 hrs, Volume= 0.014 af, Depth= 6.75"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
1,092	98	Roofs, HSG B
1,092		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment D: (new Subcat)

Runoff = 2.22 cfs @ 12.09 hrs, Volume= 0.164 af, Depth= 4.80"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
9,862	98	Paved parking, HSG B
7,962	61	>75% Grass cover, Good, HSG B
17,824	81	Weighted Average
7,962		44.67% Pervious Area
9,862		55.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment E: (new Subcat)

Runoff = 0.82 cfs @ 12.09 hrs, Volume= 0.064 af, Depth= 6.04"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
4,706	98	Paved parking, HSG B
833	61	>75% Grass cover, Good, HSG B
5,539	92	Weighted Average
833		15.04% Pervious Area
4,706		84.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment F: CEMETERY

Runoff = 2.47 cfs @ 12.16 hrs, Volume= 0.211 af, Depth= 2.69"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
41,000	61	>75% Grass cover, Good, HSG B
41,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	333	0.0450	0.53		**Lag/CN Method,**

Summary for Subcatchment G: (new Subcat)

Runoff = 1.22 cfs @ 12.09 hrs, Volume= 0.094 af, Depth= 5.81"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
6,531	98	Paved parking, HSG B
1,914	61	>75% Grass cover, Good, HSG B
8,445	90	Weighted Average
1,914		22.66% Pervious Area
6,531		77.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment H: (new Subcat)

Runoff = 0.46 cfs @ 12.09 hrs, Volume= 0.039 af, Depth= 6.75"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
2,985	98	Paved parking, HSG B
2,985		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment H2: (new Subcat)

Runoff = 1.56 cfs @ 12.09 hrs, Volume= 0.125 af, Depth= 6.28"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
9,112	98	Paved parking, HSG B
1,260	61	>75% Grass cover, Good, HSG B
10,372	94	Weighted Average
1,260		12.15% Pervious Area
9,112		87.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment I: (new Subcat)

Runoff = 2.02 cfs @ 12.09 hrs, Volume= 0.155 af, Depth= 5.70"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
10,791	98	Paved parking, HSG B
3,395	61	>75% Grass cover, Good, HSG B
14,186	89	Weighted Average
3,395		23.93% Pervious Area
10,791		76.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment J: (new Subcat)

Runoff = 1.08 cfs @ 12.09 hrs, Volume= 0.081 af, Depth= 5.13"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
5,020	98	Paved parking, HSG B
3,183	61	>75% Grass cover, Good, HSG B
8,203	84	Weighted Average
3,183		38.80% Pervious Area
5,020		61.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment K: (new Subcat)

Runoff = 0.80 cfs @ 12.10 hrs, Volume= 0.059 af, Depth= 2.69"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
11,504	61	>75% Grass cover, Good, HSG B
11,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment L: (new Subcat)

Runoff = 1.02 cfs @ 12.09 hrs, Volume= 0.075 af, Depth= 4.80"
Routed to Link 1S : BOSTON POST ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
4,307	98	Paved parking, HSG B
3,836	61	>75% Grass cover, Good, HSG B
8,143	81	Weighted Average
3,836		47.11% Pervious Area
4,307		52.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment M: (new Subcat)

Runoff = 0.86 cfs @ 12.09 hrs, Volume= 0.063 af, Depth= 3.40"
Routed to Link 2S : NIANTIC RIVER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 50-Year Storm Rainfall=6.99"

Area (sf)	CN	Description
1,973	98	Paved parking, HSG B
7,669	60	Woods, Fair, HSG B
9,642	68	Weighted Average
7,669		79.54% Pervious Area
1,973		20.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Pond 1P: (new Pond)

Inflow Area = 1.428 ac, 81.35% Impervious, Inflow Depth = 5.95" for 50-Year Storm event
Inflow = 8.97 cfs @ 12.09 hrs, Volume= 0.708 af
Outflow = 4.60 cfs @ 12.23 hrs, Volume= 0.709 af, Atten= 49%, Lag= 8.6 min
Discarded = 0.31 cfs @ 12.23 hrs, Volume= 0.543 af
Primary = 4.29 cfs @ 12.23 hrs, Volume= 0.166 af
Routed to Pond 4P : BASIN

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 33.06' @ 12.23 hrs Surf.Area= 2,852 sf Storage= 11,733 cf
Flood Elev= 33.50' Surf.Area= 2,852 sf Storage= 12,236 cf

Plug-Flow detention time= 316.7 min calculated for 0.708 af (100% of inflow)
Center-of-Mass det. time= 317.7 min (1,087.3 - 769.6)

Volume	Invert	Avail.Storage	Storage Description
#1A	26.75'	4,678 cf	**37.58'W x 75.89'L x 6.75'H Field A** 19,253 cf Overall - 7,557 cf Embedded = 11,695 cf x 40.0% Voids
#2A	27.50'	7,557 cf	**ADS_StormTech MC-4500 b +Cap** x 68 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 68 Chambers in 4 Rows Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
		12,236 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 20.00'
#2	Primary	26.75'	**15.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 26.75' / 24.35' S= 0.0600 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#3	Device 2	32.65'	**5.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=0.31 cfs @ 12.23 hrs HW=33.05' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.31 cfs)

Primary OutFlow Max=4.20 cfs @ 12.23 hrs HW=33.05' (Free Discharge)
↑—**2=Culvert** (Passes 4.20 cfs of 11.12 cfs potential flow)
↑—**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 4.20 cfs @ 2.08 fps)

Summary for Pond 4P: BASIN

Inflow Area = 3.790 ac, 51.99% Impervious, Inflow Depth = 3.05" for 50-Year Storm event
Inflow = 11.06 cfs @ 12.21 hrs, Volume= 0.963 af
Outflow = 2.45 cfs @ 12.67 hrs, Volume= 0.963 af, Atten= 78%, Lag= 27.9 min
Discarded = 0.50 cfs @ 12.67 hrs, Volume= 0.810 af
Primary = 1.95 cfs @ 12.67 hrs, Volume= 0.153 af
Routed to Link 1S : BOSTON POST ROAD

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 23.91' @ 12.67 hrs Surf.Area= 6,647 sf Storage= 21,328 cf
Flood Elev= 24.25' Surf.Area= 7,032 sf Storage= 23,671 cf

Plug-Flow detention time= 458.1 min calculated for 0.962 af (100% of inflow)
Center-of-Mass det. time= 458.5 min (1,260.7 - 802.1)

Volume	Invert	Avail.Storage	Storage Description
#1	18.33'	29,266 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)
18.33	1,270	149.0	0	0	1,270
19.00	1,947	239.0	1,070	1,070	4,052
20.00	2,747	265.0	2,336	3,405	5,125
21.00	3,626	293.0	3,176	6,582	6,399
22.00	4,583	318.0	4,095	10,677	7,652
23.00	5,619	337.0	5,092	15,769	8,695
24.00	6,756	356.0	6,179	21,948	9,799
25.00	7,895	375.0	7,318	29,266	10,963

Device	Routing	Invert	Outlet Devices
#1	Primary	23.80'	**22.0' long (Profile 26) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 Coef. (English) 3.06 3.13 3.13
#2	Discarded	18.33'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.00'
#3	Device 1	21.00'	**18.0" Round Culvert** L= 55.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 21.00' S= -0.0364 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Discarded OutFlow Max=0.50 cfs @ 12.67 hrs HW=23.91' (Free Discharge)
└**2=Exfiltration** (Controls 0.50 cfs)

Primary OutFlow Max=2.19 cfs @ 12.67 hrs HW=23.91' (Free Discharge)
└**1=Broad-Crested Rectangular Weir** (Passes 2.19 cfs of 2.32 cfs potential flow)
└**3=Culvert** (Inlet Controls 2.19 cfs @ 1.24 fps)

Summary for Link 1S: BOSTON POST ROAD

Inflow Area = 3.977 ac, 52.04% Impervious, Inflow Depth = 0.69" for 50-Year Storm event
Inflow = 2.09 cfs @ 12.67 hrs, Volume= 0.228 af
Primary = 2.09 cfs @ 12.67 hrs, Volume= 0.228 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link 2S: NIANTIC RIVER

Inflow Area = 0.221 ac, 20.46% Impervious, Inflow Depth = 3.40" for 50-Year Storm event
Inflow = 0.86 cfs @ 12.09 hrs, Volume= 0.063 af
Primary = 0.86 cfs @ 12.09 hrs, Volume= 0.063 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Subcatchment A: (new Subcat)

Runoff = 3.13 cfs @ 12.09 hrs, Volume= 0.236 af, Depth= 6.05"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
13,113	98	Paved parking, HSG B
7,260	61	>75% Grass cover, Good, HSG B
20,373	85	Weighted Average
7,260		35.64% Pervious Area
13,113		64.36% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment B: (new Subcat)

Runoff = 0.95 cfs @ 12.09 hrs, Volume= 0.075 af, Depth= 6.88"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
4,786	98	Paved parking, HSG B
944	61	>75% Grass cover, Good, HSG B
5,730	92	Weighted Average
944		16.47% Pervious Area
4,786		83.53% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment BLD1: (new Subcat)

Runoff = 0.56 cfs @ 12.09 hrs, Volume= 0.047 af, Depth= 7.59"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
3,248	98	Roofs, HSG B
3,248		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment BLD2: (new Subcat)

Runoff = 0.77 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 7.59"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
4,449	98	Roofs, HSG B
4,449		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment C: (new Subcat)

Runoff = 0.66 cfs @ 12.09 hrs, Volume= 0.056 af, Depth= 7.59"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
3,842	98	Paved parking, HSG B
3,842		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment CAN1: (new Subcat)

Runoff = 1.09 cfs @ 12.09 hrs, Volume= 0.091 af, Depth= 7.59"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
6,300	98	Roofs, HSG B
6,300		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment CAN2: (new Subcat)

Runoff = 0.19 cfs @ 12.09 hrs, Volume= 0.016 af, Depth= 7.59"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
1,092	98	Roofs, HSG B
1,092		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment D: (new Subcat)

Runoff = 2.57 cfs @ 12.09 hrs, Volume= 0.190 af, Depth= 5.58"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
9,862	98	Paved parking, HSG B
7,962	61	>75% Grass cover, Good, HSG B
17,824	81	Weighted Average
7,962		44.67% Pervious Area
9,862		55.33% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment E: (new Subcat)

Runoff = 0.92 cfs @ 12.09 hrs, Volume= 0.073 af, Depth= 6.88"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
4,706	98	Paved parking, HSG B
833	61	>75% Grass cover, Good, HSG B
5,539	92	Weighted Average
833		15.04% Pervious Area
4,706		84.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment F: CEMETERY

Runoff = 3.07 cfs @ 12.16 hrs, Volume= 0.260 af, Depth= 3.32"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
41,000	61	>75% Grass cover, Good, HSG B
41,000		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.5	333	0.0450	0.53		**Lag/CN Method,**

Summary for Subcatchment G: (new Subcat)

Runoff = 1.38 cfs @ 12.09 hrs, Volume= 0.107 af, Depth= 6.64"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
6,531	98	Paved parking, HSG B
1,914	61	>75% Grass cover, Good, HSG B
8,445	90	Weighted Average
1,914		22.66% Pervious Area
6,531		77.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment H: (new Subcat)

Runoff = 0.51 cfs @ 12.09 hrs, Volume= 0.043 af, Depth= 7.59"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
2,985	98	Paved parking, HSG B
2,985		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment H2: (new Subcat)

Runoff = 1.75 cfs @ 12.09 hrs, Volume= 0.141 af, Depth= 7.11"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
9,112	98	Paved parking, HSG B
1,260	61	>75% Grass cover, Good, HSG B
10,372	94	Weighted Average
1,260		12.15% Pervious Area
9,112		87.85% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment I: (new Subcat)

Runoff = 2.29 cfs @ 12.09 hrs, Volume= 0.177 af, Depth= 6.52"
Routed to Pond 1P : (new Pond)

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
10,791	98	Paved parking, HSG B
3,395	61	>75% Grass cover, Good, HSG B
14,186	89	Weighted Average
3,395		23.93% Pervious Area
10,791		76.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment J: (new Subcat)

Runoff = 1.24 cfs @ 12.09 hrs, Volume= 0.093 af, Depth= 5.93"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
5,020	98	Paved parking, HSG B
3,183	61	>75% Grass cover, Good, HSG B
8,203	84	Weighted Average
3,183		38.80% Pervious Area
5,020		61.20% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment K: (new Subcat)

Runoff = 0.99 cfs @ 12.10 hrs, Volume= 0.073 af, Depth= 3.32"
Routed to Pond 4P : BASIN

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
11,504	61	>75% Grass cover, Good, HSG B
11,504		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment L: (new Subcat)

Runoff = 1.18 cfs @ 12.09 hrs, Volume= 0.087 af, Depth= 5.58"
Routed to Link 1S : BOSTON POST ROAD

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
4,307	98	Paved parking, HSG B
3,836	61	>75% Grass cover, Good, HSG B
8,143	81	Weighted Average
3,836		47.11% Pervious Area
4,307		52.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Subcatchment M: (new Subcat)

Runoff = 1.04 cfs @ 12.09 hrs, Volume= 0.075 af, Depth= 4.09"
Routed to Link 2S : NIANTIC RIVER

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Type III 24-hr 100-Year Storm Rainfall=7.83"

Area (sf)	CN	Description
1,973	98	Paved parking, HSG B
7,669	60	Woods, Fair, HSG B
9,642	68	Weighted Average
7,669		79.54% Pervious Area
1,973		20.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, TC min. = 6 MINUTES**

Summary for Pond 1P: (new Pond)

Inflow Area = 1.428 ac, 81.35% Impervious, Inflow Depth = 6.78" for 100-Year Storm event
Inflow = 10.15 cfs @ 12.09 hrs, Volume= 0.806 af
Outflow = 8.54 cfs @ 12.17 hrs, Volume= 0.802 af, Atten= 16%, Lag= 4.8 min
Discarded = 0.31 cfs @ 12.17 hrs, Volume= 0.564 af
Primary = 8.22 cfs @ 12.17 hrs, Volume= 0.238 af
Routed to Pond 4P : BASIN

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs / 3
Peak Elev= 33.30' @ 12.17 hrs Surf.Area= 2,852 sf Storage= 12,006 cf
Flood Elev= 33.50' Surf.Area= 2,852 sf Storage= 12,236 cf

Plug-Flow detention time= 298.3 min calculated for 0.801 af (99% of inflow)
Center-of-Mass det. time= 294.6 min (1,061.7 - 767.0)

Volume	Invert	Avail.Storage	Storage Description
#1A	26.75'	4,678 cf	**37.58'W x 75.89'L x 6.75'H Field A** 19,253 cf Overall - 7,557 cf Embedded = 11,695 cf x 40.0% Voids
#2A	27.50'	7,557 cf	**ADS_StormTech MC-4500 b +Cap** x 68 Inside #1 Effective Size= 90.4"W x 60.0"H => 26.46 sf x 4.03'L = 106.5 cf Overall Size= 100.0"W x 60.0"H x 4.33'L with 0.31' Overlap 68 Chambers in 4 Rows Cap Storage= 39.5 cf x 2 x 4 rows = 316.0 cf
		12,236 cf	Total Available Storage

Storage Group A created with Chamber Wizard

Device	Routing	Invert	Outlet Devices
#1	Discarded	26.75'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 20.00'
#2	Primary	26.75'	**15.0" Round Culvert** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 26.75' / 24.35' S= 0.0600 '/' Cc= 0.900 n= 0.012, Flow Area= 1.23 sf
#3	Device 2	32.65'	**5.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Discarded OutFlow Max=0.31 cfs @ 12.17 hrs HW=33.23' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.31 cfs)

Primary OutFlow Max=7.21 cfs @ 12.17 hrs HW=33.23' (Free Discharge)
↑—**2=Culvert** (Passes 7.21 cfs of 11.29 cfs potential flow)
↑—**3=Sharp-Crested Vee/Trap Weir** (Weir Controls 7.21 cfs @ 2.49 fps)

Summary for Pond 4P: BASIN

Inflow Area = 3.790 ac, 51.99% Impervious, Inflow Depth = 3.72" for 100-Year Storm event
Inflow = 17.89 cfs @ 12.16 hrs, Volume= 1.175 af
Outflow = 4.89 cfs @ 12.52 hrs, Volume= 1.175 af, Atten= 73%, Lag= 21.9 min
Discarded = 0.53 cfs @ 12.52 hrs, Volume= 0.842 af
Primary = 4.36 cfs @ 12.52 hrs, Volume= 0.333 af
Routed to Link 1S : BOSTON POST ROAD

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 24.22' @ 12.52 hrs Surf.Area= 7,001 sf Storage= 23,474 cf
Flood Elev= 24.25' Surf.Area= 7,032 sf Storage= 23,671 cf

Plug-Flow detention time= 394.7 min calculated for 1.175 af (100% of inflow)
Center-of-Mass det. time= 394.5 min (1,192.2 - 797.7)

Volume	Invert	Avail.Storage	Storage Description
#1	18.33'	29,266 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)
18.33	1,270	149.0	0	0	1,270
19.00	1,947	239.0	1,070	1,070	4,052
20.00	2,747	265.0	2,336	3,405	5,125
21.00	3,626	293.0	3,176	6,582	6,399
22.00	4,583	318.0	4,095	10,677	7,652
23.00	5,619	337.0	5,092	15,769	8,695
24.00	6,756	356.0	6,179	21,948	9,799
25.00	7,895	375.0	7,318	29,266	10,963

Device	Routing	Invert	Outlet Devices
#1	Primary	23.80'	**22.0' long (Profile 26) Broad-Crested Rectangular Weir** Head (feet) 0.49 0.98 1.48 Coef. (English) 3.06 3.13 3.13
#2	Discarded	18.33'	**2.410 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 10.00'
#3	Device 1	21.00'	**18.0" Round Culvert** L= 55.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 19.00' / 21.00' S= -0.0364 '/' Cc= 0.900 n= 0.012, Flow Area= 1.77 sf

Discarded OutFlow Max=0.53 cfs @ 12.52 hrs HW=24.22' (Free Discharge)
↑└**2=Exfiltration** (Controls 0.53 cfs)

Primary OutFlow Max=4.34 cfs @ 12.52 hrs HW=24.22' (Free Discharge)
↑└**1=Broad-Crested Rectangular Weir** (Passes 4.34 cfs of 18.21 cfs potential flow)
↑└**3=Culvert** (Inlet Controls 4.34 cfs @ 2.46 fps)

Summary for Link 1S: BOSTON POST ROAD

Inflow Area = 3.977 ac, 52.04% Impervious, Inflow Depth = 1.27" for 100-Year Storm event
Inflow = 4.61 cfs @ 12.50 hrs, Volume= 0.420 af
Primary = 4.61 cfs @ 12.50 hrs, Volume= 0.420 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Summary for Link 2S: NIANTIC RIVER

Inflow Area = 0.221 ac, 20.46% Impervious, Inflow Depth = 4.09" for 100-Year Storm event
Inflow = 1.04 cfs @ 12.09 hrs, Volume= 0.075 af
Primary = 1.04 cfs @ 12.09 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Appendix E

Additional Stormwater Design
Drainage Calculations

REVISIONS

NO.	DATE	DESCRIPTION	BY	CKD

PROFESSIONAL SEAL

PROJECT:
PROPOSED FILLING STATION W/DRIVE THRU
51 BOSTON POST ROAD
EAST LYME, CT 06333

PREPARED FOR:
NOBLE ENERGY REAL ESTATE HOLDINGS, LLC
131 BUCKINGHAM STREET, SUITE 301
HARTFORD, CT 06106

ENGINEERING SERVICES
ENVIRONMENTAL SERVICES
67 Hall Road
Sturbridge, MA 01560
Phone: 774-241-0901
fax: 774-241-0906
CMG EST. 2002

ISSUE DATE: 04/28/2021
DRAWN BY: SH CHECKED BY: DTF
SCALE: 1" = 60'
PROJECT NO.: 2020-144
SHEET NAME:
RATIONAL METHOD DRAINAGE FIGURE
SHEET NO.:
D - 3.0

RATIONAL METHOD PIPE DESIGN WORKSHEET
NOBLE ENERGY
PROPOSED FILLING STATION WITH DRIVE THRU
EAST LYME, CT

LOCATION	PIPE SEGMENT From	To	INCREMENTAL AREA DESIGNATION	A (Acres)	Total A	C	C*A	Sum (C*A)	FLOW TIME (min.) To Inlet	In Chan.	Tot.	25-Yr I (in/hr)	25-Yr Q (cfs)	DESIGN CONDITIONS Pipe Diam (in.)	Length (ft)	Slope (%)	Q-full (cfs)	V-Full (fps)	Design (25-Yr) Depth Peak (in.)	V-Peak (fps)	Inverts Up	Down	Remarks
To DMH-2																							
	CB-1	CB-2		0.47		0.65	**0.30**		5		5	8.7	**2.65**	12	7	0.010	**3.87**	4.93	8.2	3.37	32.8	32.73	CB-1 Rim =36.00
		CB-2		0.13		0.78	**0.10**		5		5	8.7	**0.90**										CB-2 Rim =36.00
	CB-2	DMH-1			0.60			**0.41**	5		5	8.7	**3.55**	12	107	0.008	**3.55**	4.52	12.0	4.52	32.63	31.73	DMH-1 Rim =35.60
	CB-3	CB-6		0.09		0.90	**0.08**		5		5	8.7	**0.69**	12	97	0.010	**3.87**	4.93	2.1	0.88	34.15	33.18	CB-3 Rim =37.35
		CB-6		0.07		0.90	**0.06**		5		5	8.7	**0.54**										CB-6 Rim =36.90
	CB-6	DMH-1			0.157			**0.14**	5		5	8.7	**1.23**	12	93	0.006	**3.03**	3.86	4.9	1.56	33.08	32.51	
	DMH-1	DMH-2			0.756			**0.55**	5		5	8.7	**4.77**	15	10	0.010	**7.01**	5.72	10.2	3.89	27.79	27.69	DMH-2 Rim =35.20
To DMH-6																							
	CAN-2	DMH-7		0.025		0.90	**0.02**		5		5	8.7	**0.20**	6	20	0.013	**0.68**	3.47	1.7	1.00	35	34.75	DMH-7 Rim =38.00
	DMH-7	DMH-6			0.202			**0.18**	5		5	8.7	**1.58**	12	167	0.010	**3.84**	4.90	4.9	2.01	34.65	33	DMH-6 Rim =37.54
TO DMH-5																							
	CB-4	DMH-5		0.326		0.73	**0.24**		5		5	8.7	**2.08**	12	85	0.010	**3.87**	4.93	6.4	2.64	32.2	31.35	CB-4 Rim=35.40
TO FE-1																							
	TD-1	WQU-1		0.433		0.78	**0.34**		5		5	8.7	**2.94**	12	5.5	0.091	**11.66**	14.86	3.0	3.75	28.5	28.00	WQU-1 Rim=31.50
	WQU-1	DMH-4			0.433			**0.34**	5		5	8.7	**2.94**	12	15	0.010	**3.87**	4.93	9.1	3.75	27.75	27.60	DMH-4 Rim=32.00
	DMH-3	DMH-4											**2.85**	15	40	0.060	**17.18**	14.01	2.5	2.32	26.75	24.35	DMH-3 Rim=35.20
	DMH-4	FE-1											**5.79**	15	50	0.080	**19.84**	16.17	4.4	4.72	22	18.00	FE-1 INV=18
TO FE-2	CB-8	CB-7		0.127		0.79	**0.10**		5		5	8.7	**0.88**	12	11	0.012	**4.21**	5.36	2.5	1.12	33.63	33.50	CB-8 Rim=36.83
		CB-7		0.409		0.59	**0.24**		5		5	8.7	**2.09**										CB-7 Rim=36.90
	CB-7	CB-5			0.536			**0.34**	5		5	8.7	**2.97**	12	178	0.049	**8.55**	10.89	4.2	3.78	33.50	24.80	CB-5 Rim=28.00
		CB-5		1.082		0.25	**0.27**		10		10	6.2	**1.66**										
	CB-5	WQU-2			1.618			**0.61**	5		5	8.7	**5.31**	12	45	0.072	**10.40**	13.24	6.1	6.77	24.80	21.55	WQU-2 Rim=24.75
		WQU-2		0.048		0.78	**0.04**					8.7	**0.33**										
	WQU-2	DMH-8			1.666			**0.65**	5		5	8.7	**5.64**	15	33	0.010	**7.01**	5.72	12.1	4.60	21.55	21.22	DMH-8 Rim=25.10
	DMH-8	DMH-9			1.666			**0.65**	5		5	8.7	**5.64**	15	5.5	0.018	**9.46**	7.71	8.9	4.60	21.00	20.90	DMH-9 Rim=25.00
	DMH-9	FE-2			1.666			**0.65**	5		5	8.7	**5.64**	18	36	0.081	**32.37**	18.33	3.1	3.19	20.90	18.00	FE-2 Inv.=18.00
CAN-1 TO MC4500																							
	CAN-1	MC4500		0.145		0.90	**0.13**		5		5	8.7	**1.13**	8	123.5	0.055	**3.09**	8.85	2.9	3.25	35.00	28.16	

Notes:

1) Runoff Coefficient C-Values used; Impervious(Pavement) C=0.90 Grass/OpenSpace C=0.20, Residential Suburban C=.25~.40, Mannings "n" HDPE n=0.012
2) Rainfall Intensity I (in/hr) values taken from NOAA Atlas 14, volume 10, Version 3.
3) Five (5) minute minimum flow time used for minimum time of concentration (Tc) to CB inlet to system
5) Blue Highlight denotes calculated peak flow (cfs) to CB Inlet

Drainage Structure	Contributing Area Impervious	Grass/Lawn	Total s.f.	Ac.	Runoff Coefficient C
CB-1	13,113	7,260	20,373	0.468	0.65
CB-2	4,786	944	5,730	0.132	0.78
CB-3	3,842	-	3,842	0.088	0.90
CB-4	10,791	3,395	14,186	0.326	0.73
CB-5	3,292	43,823	47,115	1.082	0.25
CB-6	2,985	-	2,985	0.069	0.90
CB-7	9,862	7,962	17,824	0.409	0.59
CB-8	4,706	833	5,539	0.127	0.79

6/29/2021

RATIONAL METHOD PIPE DESIGN WORKSHEET
NOBLE ENERGY
PROPOSED FILLING STATION WITH DRIVE THRU
EAST LYME, CT

	PIPE SEGMENT		INCREMENTAL AREA						FLOW TIME (min.)			25-Yr	25-Yr	DESIGN CONDITIONS					Design (25-Yr)		Inverts		Remarks
LOCATION	From	To	DESIGNATION	A (Acres)	Total A	C	C*A	Sum (C*A)	To Inlet	In Chan.	Tot.	I (in/hr)	Q (cfs)	Pipe Diam (in.)	Length (ft)	Slope (%)	Q-full (cfs)	V-Full (fps)	Depth Peak (in.)	V-Peak (fps)	Up	Down	
TD-1	15,643	3,204	18,847	0.433		0.78																	
WQU-2	1,728	361	2,089	0.048		0.78																	
BLD	7,697	-	7,697	0.177		0.90																	
CAN1	6,300	-	6,300	0.145		0.90																	
CAN2	1,092	-	1,092	0.025		0.90																	

Appendix F

Water Quality Units Design Sheet

Brief Stormceptor Sizing Report - NOBLE-EAST LYME

Project Information & Location			
Project Name	NOBLE EAST LYME	**Project Number**	2020-144
City	EAST LYME	**State/ Province**	Connecticut
Country	United States of America	**Date**	4/28/2021
Designer Information		**EOR Information (optional)**	
Name	SAM HASSO	**Name**	
Company	CMG Environmental	**Company**	
Phone #	774-241-0901	**Phone #**	
Email	shasso@cmgenv.com	**Email**	

Stormwater Treatment Recommendation
The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	NOBLE-EAST LYME
Target TSS Removal (%)	80
TSS Removal (%) Provided	86
Recommended Stormceptor Model	STC 450i

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	86
STC 900	91
STC 1200	91
STC 1800	92
STC 2400	94
STC 3600	94
STC 4800	95
STC 6000	96
STC 7200	97
STC 11000	98
STC 13000	98
STC 16000	98

Sizing Details

Drainage Area	
Total Area (acres)	0.43
Imperviousness %	83.0

Rainfall	
Station Name	NEW HAVEN WB AIRPORT
State/Province	Connecticut
Station ID #	5273
Years of Records	22
Latitude	41°16'0"N
Longitude	72°53'0"W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Brief Stormceptor Sizing Report - NOBLE-EAST LYME/WQU-2

Project Information & Location			
Project Name	NOBLE EAST LYME	**Project Number**	2020-144
City	EAST LYME	**State/ Province**	Connecticut
Country	United States of America	**Date**	4/28/2021
Designer Information		**EOR Information (optional)**	
Name	SAM HASSO	**Name**	
Company	CMG Environmental	**Company**	
Phone #	774-241-0901	**Phone #**	
Email	shasso@cmgenv.com	**Email**	

Stormwater Treatment Recommendation
The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	NOBLE-EAST LYME/WQU-2
Target TSS Removal (%)	80
TSS Removal (%) Provided	80
Recommended Stormceptor Model	STC 450i

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

Stormceptor Sizing Summary	
Stormceptor Model	**% TSS Removal Provided**
STC 450i	80
STC 900	85
STC 1200	86
STC 1800	86
STC 2400	89
STC 3600	90
STC 4800	91
STC 6000	92
STC 7200	93
STC 11000	95
STC 13000	95
STC 16000	96

Sizing Details

Drainage Area	
Total Area (acres)	1.62
Imperviousness %	25.0

Rainfall	
Station Name	NEW HAVEN WB AIRPORT
State/Province	Connecticut
Station ID #	5273
Years of Records	22
Latitude	41°16'0"N
Longitude	72°53'0"W

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (Gal)	
Peak Conveyed Flow Rate (CFS)	
Water Quality Flow Rate (CFS)	

Up Stream Storage	
Storage (ac-ft)	Discharge (cfs)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cfs)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Notes

• Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
• Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
• For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
https://www.conteches.com/technical-guides/search?filter=1WBC0O5EYX

Appendix G

Stormtech MC-4500 Isolator Row Literature

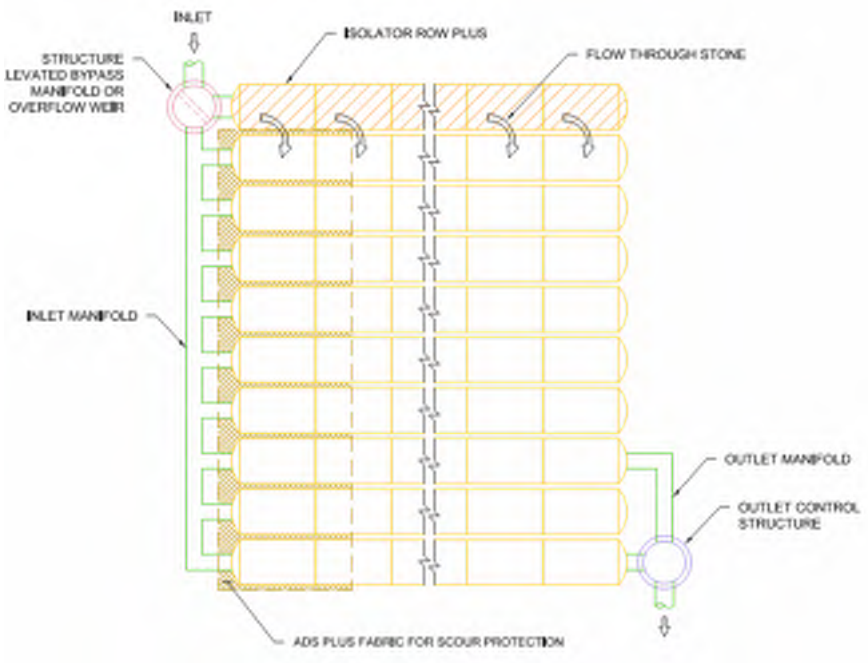
StormTech Isolator Row PLUS – Pollutant Removal

The following information is intended to provide a general overview of the pollutant removal capability of the StormTech Isolator™ Row PLUS, which is a patented filtration type BMP manufactured by StormTech, LLC. The StormTech Isolator Row PLUS is covered under several US and International patents.

I. Description:

The StormTech Isolator Row PLUS is a row or rows of thermoplastic chambers that sit on a layer of ADS PLUS fabric and are connected to a closely located structure for easy access. The chambers provide for settling and filtration of sediment and other contaminants as stormwater rises in the Isolator Row PLUS and ultimately passes through the fabric. The open-bottom chambers allow stormwater to flow out of the chambers. Sediment is captured in the Isolator Row PLUS, protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

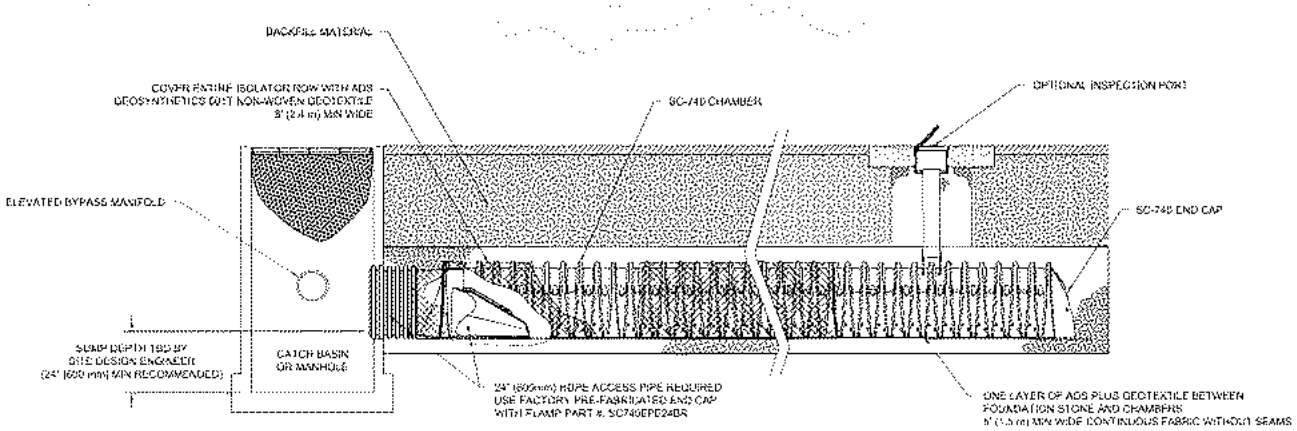
The StormTech Isolator Row PLUS is designed to capture the "first flush" and offers the versatility to be sized on a volume basis or a flow-rate basis. An upstream manhole not only provides access to the Isolator Row but includes a high low/concept such that stormwater flow rates or volumes that exceed the capacity of the Isolator Row bypass through a manifold to the other chambers. This is achieved with either a high-flow weir or an elevated manifold. This creates a differential between the Isolator Row PLUS and the manifold, thus allowing for settlement time in the Isolator Row PLUS.



Schematic of the StormTech Isolator Row PLUS System

Some of the unique features of the Isolator Row that contribute to its effectiveness and practicality include:

- Vast filtration surface area
- Large sediment storage volume
- Easily maintainable by most pipe and sewer maintenance companies
- Large network of ADS personnel that can help with designs and provide onsite guidance
- A state-of-the-art structural design that meets ASTM standards and incorporates AASHTO safety factors for both live loads and permanent dead loads



Isolator Row PLUS Cross Section Detail

II. Applicable Sites:

The Isolator Row PLUS can be effectively used for essentially all developed sites. The most common applications are highly impervious sites such as paved parking areas, roads as well as developed sites that include grassy or other landscaped areas. It is not intended to be used for construction sediments.

III. StormTech System & Isolator Row Testing:

October 2006 – Tennessee Tech University's Civil and Environmental Department prepared the "Performance Evaluation of Sediment Removal Efficiency – StormTech Isolator Row". Testing on a full-scale Isolator Row in a laboratory was done to determine the sediment removal efficiency with two different silica-water slurries in accordance with NJCAT protocols. In August of 2007, the technology was verified by NJCAT. Results are shown in Table 1.

September 2010 – The University of New Hampshire Stormwater Center released the "Final Report on Field Verification Testing of the StormTech Isolator Row Treatment Unit". Testing consisted of determining the water quality performance for multiple stormwater pollutants in accordance with TARP Tier II protocol. Testing was done for a system only consisting of the StormTech Isolator Row. Data was recorded for 23 storm events. Results are shown in Table 1.

January 2020 – BaySaver Technologies prepared the "NJCAT Technology Verification of Isolator Row PLUS". Testing on a full-scale Isolator Row PLUS in a laboratory was done to determine the sediment removal efficiency with a silica-water slurry in accordance with the updated NJCAT protocols. In July of 2020, the technology was verified by NJCAT. Results are shown in Table 1.

June 2020 – North Carolina State University Department of Biological and Agricultural Engineering prepared the technical report "An Evaluation of the StormTech Isolator Row and Subsurface Stormwater Management System at Capital Oaks Retirement Resort, Raleigh, North Carolina". 14 months of monitoring and over 73 precipitation events were completed to study the hydrologic and water quality performance of a StormTech MC-4500 system in Raleigh, NC. Results are shown in Table 1.

Table 1: StormTech Isolator Row 3rd Party Pollutant Removal Efficiency Data

Pollutant	University of New Hampshire (Isolator Row Only) Median	Raleigh, North Carolina (StormTech system with Isolator Row)	Tennessee Tech University (Isolator Row Only)	NJCAT Verification (Isolator Row PLUS only)
Total Suspended Solids	83%*	91%*	84%*	81%**
Total Phosphorus	33%	68%	Not Tested	Not Tested
Total Nitrogen	Not Tested	35%	Not Tested	Not Tested
Total Zinc	81%	Not Tested	Not Tested	Not Tested
Total Petroleum Hydrocarbons	91%	Not Tested	Not Tested	Not Tested

*Based on a flow rate of 2.5 gpm/sf (Isolator Row)
** Based on a flow rate of 4.1 gpm/sf (Isolator Row PLUS)

IV. Product Performance and Design

Minimum 80% TSS removal is achieved by sizing the Isolator Row PLUS to treat the water quality at a specific flow rate per chamber floor area using a single layer of ADS PLUS fabric. The design flow rates for each chamber size are listed below.

Model	Specific Flow Rate	Bottom Area	Flow Per Model
StormTech SC-160LP	4.1 gpm/sf	11.45 sf	0.11 cfs
StormTech SC-310	4.1 gpm/sf	17.7 sf	0.16 cfs
StormTech SC-740	4.1 gpm/sf	27.8 sf	0.26 cfs
StormTech DC-780	4.1 gpm/sf	27.8 sf	0.26 cfs
StormTech MC-3500	4.1 gpm/sf	42.9 sf	0.40 cfs
StormTech MC-4500	4.1 gpm/sf	30.1 sf	0.28 cfs

V. StormTech Isolator Row Approvals:

The StormTech Isolator Row and Isolator Row PLUS have been approved on a project by project basis for tens of thousands of projects around the world. Following are some examples:

- The Isolator Row PLUS is a verified filtration manufactured treatment device by the New Jersey Corporation for Advanced Testing (NJCAT) in accordance with NJDEP Filter Protocols.
- In Ohio, the Isolator Row is approved per the Ohio EPA as a pretreatment to underground storage and can be used for both storage volume and pretreatment as the water quality volume all passes through the Isolator Row.
- The Metropolitan St. Louis Sewer District (MSD) has approved the StormTech Isolator Row as a standalone post-construction stormwater Best Management Practice.
- In Massachusetts, approvals for the State DEP requirement of 80% TSS removal on an annual load basis are issued at the Conservation Commission level, and the Isolator Row is commonly used to meet these criteria.
- In Oregon, the Rogue Valley Storm Water Advisory Team (SWAT) has incorporated the StormTech Isolator Row into their Stormwater Design Manual as a pre-approved proprietary device for stormwater quality treatment.
- The Kansas City Metro Chapter of the American Public Works have included the StormTech Isolator Row wit a value rating of 3.0 in their Manual of Best Management Practices for Stormwater Quality.
- Maine DEP has approved the Isolator Row pollutant removal efficiency based on laboratory testing of 110 micron (US Silica OK-110) particle size
- In Texas, the City of Houston PWE as well as Harris county, has recognized the Isolator Row as an official water quality device.
- Under the New Environmental Technology Evaluation program, the Ontario (Canada) Ministry of the Environment has evaluated the Isolator row and issued a Certificate of Technology Assessment
- The Isolator Row PLUS has been evaluated and approved for Canadian Environment Technology Verification (ETV) by VerifiGlobal.

V. Isolator Row Maintenance:

The frequency of Inspection and Maintenance varies by location. A routine inspection schedule needs to be established for each individual location, based upon site-specific variables. The type of land use (i.e. industrial, commercial, public, residential), anticipated pollutant load, percent imperviousness, climate, rainfall data, etc., all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection schedule should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If, upon visual inspection, it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediment to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout.

Maintenance is accomplished with the jetvac process. The jetvac process utilizes a high-pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediment. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/jetvac combination vehicles. Selection of an appropriate jetvac nozzle will improve maintenance efficiency.

Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear-facing jets with an effective spread of at least 45" are best. Most jetvac reels have 200 feet of hose, allowing maintenance of an Isolator Row up to 50 chambers long. The jetvac process shall only be performed on StormTech Isolator Rows that have fabric specified by StormTech over their angular base stone.

Complete details of the design, operation, and maintenance of the Isolator Row PLUS can be found in the StormTech Isolator Row and Isolator Row PLUS O&M Manuals.

Appendix H

Stormwater Management System
Long-Term Operation & Maintenance (O&M) Plan

STORM WATER MANAGEMENT SYSTEM
LONG-TERM OPERATION & MAINTENANCE PLAN

April 30, 2021
Revised: July 2, 2021

Proposed Filling Station with Drive Thru
#51 Boston Post Road
East Lyme, Connecticut

Prepared For:
Noble Energy Real Estate Holdings, LLC
131 Buckingham Street, Suite 301
Hartford, CT 06106

Prepared By:
CMG Environmental, Inc.
67 Hall Road
Sturbridge, MA 01566
Phone: (774) 241-0901

CMG ID 2020-144

TABLE OF CONTENTS

TABLES

ATTACHMENTS

Long Term Operation & Maintenance Plan
Site Stormwater Management System
#51 BOSTON POST ROAD
Proposed Filling Station with Drive Thru
EAST LYME, CT

Operation and Maintenance (O&M) Plan

The purpose of this Storm Water Management System Operation and Maintenance Plan is to prevent erosion, sedimentation, pollution or other deterioration of the storm water management system and resource areas located on and adjacent to the site property located at **51 Boston Post Road in East Lyme, CT** (the "Site"). The storm water management system shall be maintained properly to assure its continued performance.

Responsible Party:
Noble Energy Real Estate Holdings LLC
131 Buckingham St, Suite 301
Hartford, CT 06106
p. (860) 462-0527

Property Owner(s):
Herb Chambers of East Lyme
47 Eastern BLVD
Glastonbury, CT 06033

Storm water Management System Owner: (same as above)

The "Responsible Party" Shall:

- Prepare and submit an **"Operation and Maintenance (O & M) Compliance Statement" (see Attachment #1)** upon completion of site construction activities.
- Implement the routine and non-routine operation, maintenance, and inspection tasks in accordance with the procedures specified in this document to ensure that all storm water management systems function as designed;
- Maintain a log of all operation and maintenance (O & M) activities for the last five (5) years, including inspections, repairs, replacement and disposal (for disposal, the log shall indicate the type of material and disposal location);
- Make this log available to **Town of East Lyme** official representatives upon request;
- Agree to notify in writing all "future property owners" of the presence of the storm water management system and the requirement for proper operation and maintenance.

Table No. 1
#51 BOSTON POST ROAD, EAST LYME, CT
Proposed Filling Station with Drive Thru

STORMWATER SYSTEM INSPECTION AND MAINTENANCE SCHEDULE		
Best Management Practice (BMP)	**Inspection Frequency**	**Maintenance Frequency**
STRUCTURAL BMPs		
CATCH BASIN DEEP SUMP W/HOOD	Four (4) Times / Year	Remove Sediment twice/ Year (End of Foliage & Snow Removal Seasons)
STORMCEPTOR 450i	Per Manufacturer's recommendations or Bi-annual (early spring & late fall) at minimum	Per Manufacturer's recommendations or Annual (End Winter/Beginning Spring) Oil Removal - Upon Discovery Sediment Depth = 8 inches
STORMTECH MC4500 AND ISOLATOR ROW	Bi-annual for the first year then adjust based on previous observation	Conduct jetting and vactoring once per year or when inspection shows maintenance is necessary
STORMWATER INFILTRATION BASIN	Bi-Annual (Early Spring & Late Fall)	Remove Sediment or Debris that may clog the system as needed
RIP-RAP APRONS	Four (4) Times / Year	Remove Sediment (2) times/Year (End of Foliage & Snow Removal Seasons)
NON-STRUCTURAL STORMWATER CONTROLS		
SPILL KIT	Four (4) Times / Year	Replenish Spill Kit As Needed
Landscaping	Four (4) Times / Year	Seasonally As Needed
Roadway / Driveway Sweeping	Two (2) Times /Year	Seasonally As Needed
Snow Removal	Seasonally As Needed	In Accordance with M.G.L. Title XIV. Public Ways and Works; Chapter 85

STRUCTURAL STORMWATER BMP MAINTENANCE:
Deep Sump Catch Basin:

- Inspect or clean catch basin(s) at least four (4) times per year, including the end of the foliage and snow removal seasons.
- Inspection shall occur by probing the structure with a rod to determine the depth of accumulated sediment.
- Sediments must be removed four (2) times per year or whenever the depth of sediment is greater than or equal to one half of the depth from the bottom of the invert of the lowest pipe in the basin.
- The structure will be cleaned of water and sand/debris with the use of a vacuum truck. Material removed from the structure will be disposed of legally off-site by the vendor.
- Unless there is evidence that they have been contaminated by a spill or other means, catch basin cleanings may be taken to a landfill or other facility permitted by the state.

Water Quality Unit (Stormceptor 450i):

- The particle separator unit shall be inspected twice per year concurrently with the inspection of the on-site catch basin. All chambers of the system shall be inspected for the presence of "floating hydrocarbons" and "sediment".
- Clean this unit in accordance with manufacturer's recommendations when sediment depth has accumulated to a depth of **8-inches or if there is a documented spill/presence of floating hydrocarbons**.
- The system shall be cleaned with sump-vac or similar equipment when the sediment depth has accumulated to 8-inches. The cleaning shall occur through the manhole cover of the grit chamber. A copy of the owner's manual is included as **Attachment #4**.
- The structure will be cleaned of water and sand/debris with the use of a vacuum truck. Material removed from the structure will be disposed of legally off-site by the vendor.
- Unless there is evidence that they have been contaminated by a spill or other means, catch basin cleanings may be taken to a landfill or other facility permitted by MassDEP to accept solid waste.

Underground Infiltration System (StormTech MC4500):

- **Step 1:** Inspect Isolator Row Plus for Sediment per the following:

  Inspection Ports:

  1. Remove/open Lid on Inline drain
  2. Remove and clean flexstorm filter if installed
  3. Using a flashlight and stadia rod, measure depth of sediment and record on maintenance log.
  4. Lower camera into isolator row plus for visual inspection of sediment levels

5. Is sediment at or above 3" proceed to step 2 if not, proceed to step 3.

Isolator Plus Rows:

1. Remove cover from structure at upstream end of isolator row plus
2. Using a flashlight, inspect down the isolator row plus through outlet pipe, mirrors on poles or cameras may be used to avoid confined space entry, follow osha regs for confined space entry if entering manhole
3. If sediment is at, or above 3" proceed to step 2, if not proceed to step 3.

- **Step 2:** clean out isolator row plus using the JETVAC process as following:
    1. A fixed culvert cleaning nozzle with rear facing spread of 45" or more is preferred.
    2. Apply multiple passes of JETVAC until backflush water is clean
    3. Vacuum structure sump as required.
- **Step 3:** replace all covers, grates, filters, and lids; record observations and actions.
- **Step 4:** Inspect and clean basins and manholes upstream of the stormtech system.

Notes:

1. Inspect every 6 months during the first year of operation. Adjust the inspection interval based on previous observations of sediment accumulation and high water elevations.
2. Conduct jetting and vactoring annually or when inspection shows that maintenance is necessary. A copy of the owner's manual is included as **Attachment #4**

Storm Water Infiltration Basins

- Inspect basin inlets twice per year for signs of accumulation of sediment or debris. Any debris or sediment that could potentially clog the system shall be removed as necessary.
- Inspection shall also involve visual observations of failure apparent in the area surrounding the basins perimeter and outlet structure.
- Sediment collection areas shall be inspected on a bi-annual basis and cleaned/maintained at least four once per year;
- Vegetation within the stormwater basin shall be kept between 3-6 inches in height;

Following maintenance removal of accumulated sediment, any vegetation damaged within the basin area shall be repaired by re-seeding or re-sodding. When re-seeding, practices such as hydroseeding with a tackifier, blanket or similar practice should be incorporated to eliminate scour while the seeds germinate and develop roots.

Rip-rap Apron Outlets:

- Inspect regularly, especially after large rainfall events;
- Note and repair any erosion & sediment buildup at the Rip-Rap outlet protection.

Unless there is evidence that they have been contaminated by a spill or other means, catch basin cleanings may be taken to a landfill or other facility permitted by the state to accept solid waste

NON- STRUCTURAL STORM WATER MANAGEMENT CONTROLS:

Non-Structural Control Measures & Stormwater Treatment

- **SPILL KIT** - a minimum of one (1) 55-gallon overpack drum, spill response equipment, and oil absorbents need to be located on-site in an accessible location within the building.

Landscape & Pavement Maintenance:

- **No debris, refuse or other materials,** including but not limited to landscaping debris, leaves, shrubs and tree trimmings, logs, bricks, stone or trash shall be deposited within the vegetated wetland.
- The use of pesticides, herbicides, and fertilizers on the site shall be minimized to the extent practicable and shall be applied in accordance with manufacture recommendations by experienced and if applicable, licensed personnel.
- Pavement areas will be swept seasonally as necessary to remove accumulated winter sand and salt and fall leaves, and shall be swept as required to remove litter. Collected material will be properly disposed of off-site.

Trash Removal

- Inspect on-site area for litter and trash as needed. Any accumulated trash, litter, and discarded materials in this area will be removed and will be disposed of at a suitable location on a weekly basis.

HAZARDOUS WASTE / OIL SPILL RESPONSE PROCEDURE

Initial Notification. In the event of a spill of hazardous waste or oil the facility manager or supervisor will be notified immediately by telephone.

Assessment – Initial Containment. The supervisor or manager will assess the incident and initiate control measures. The supervisor will first contact the **Town of East Lyme Fire Department** and then notify the **Town of East Lyme Police Department**. The Fire Department is ultimately responsible for matters of public health and safety and should be notified immediately.

Niantic Fire Station Telephone: 911 (Emergency); (860) 739-3449 (Non-Emergency)

Police Department Telephone: 911 (Emergency); (860) 739-5900 (Non-Emergency)

Further Notification. Based on the assessment by the Fire Chief, additional notification to a clean up contractor may be made. The Fire Chief will be responsible for determining the level of clean up and notification required.

SNOW MANAGEMENT PLAN:

- No snow storage shall be located within or "deposited" within wetland resource areas on or off-site.
- Sodium Chloride to be used as de-icing materials, safety data sheet is attached in **Attachment #5**.
- No salt shall be used to treat unpaved areas during snow and ice conditions. The storage of all "de-icing" chemicals and treatment products is to be inside the building.
- If Site snow storage interferes with driveway maneuvers or sight distances (i.e. blocking of travel aisles, sight distance, or parking) the snow pile will be either removed or reduced legally in a legal manner by the snow plow vendor within 24-hours.
- Pavement areas will be swept seasonally as necessary to remove accumulated winter sand and salt and fall leaves, and shall be swept as required to remove litter. Collected material will be properly disposed of off-site.

INSPECTIONS / RECORDKEEPING:

Routine Inspections:

Routine inspections and maintenance to be conducted with the frequency described in this Operation and Maintenance Plan. All repairs and maintenance activities regarding the stormwater management system should be recorded and provided to the East Lyme Planning Board upon request. An example inspection form is provided in **Attachment #2**.

Recordkeeping

Records of all drainage system inspections and maintenance shall be kept on file for a period of at least **five (5) years.** Records of maintenance and repair activities shall be made available to the Planning Board annually, during inspection of the facility, and upon request.

PUBLIC SAFETY FEATURES:

- All cast iron storm water structure grates and covers shall be kept in good condition and kept closed at all times. Any damaged or broken structures will be replaced immediately upon discovery;

- Storm Water Management System Inspection & Maintenance;
- Snow Plowing & Removal.

Attachment #1

Operation & Maintenance (O & M) Compliance Statement

Illicit Discharge Compliance Statement

Site Storm Water Management System
#51 BOSTON POST ROAD
PROPOSED FILLING STATION WITH DRIVE THRU
EAST LYME, CT

Responsible Party:
Noble Energy Real Estate Holdings LLC
131 Buckingham St, Suite 301
Hartford, CT 06106
p. (860) 462-0527

Property Owner(s):
Herb Chambers of East Lyme
47 Eastern BLVD
Glastonbury, CT 06033

Storm Water Management System Owner: (same as above)

The above listed "responsible party" is responsible for implementation of this "Long-Term Operation and Maintenance Plan" and certifies that:

- The site has been inspected for erosion and appropriate steps have been taken to permanently stabilize any eroded areas;
- All aspects of storm water BMPs have been inspected for damage, wear and malfunction, and appropriate steps have been taken to repair or replace the system or portions of the system so that the storm water at the site may be managed in accordance with:
    - CT Stormwater Quality Manual
- There is no record or knowledge of illicit discharges to the on-site stormwater management system;
- All "future property owners" must be notified of their continuing legal responsibility to operate and maintain the Site Stormwater Management System.
- The "Long-Term Operation and Maintenance Plan" for the storm water BMPs is being implemented.

Signature of Responsible Party:

_____ _____
Noble Energy real Estate Holdings LLC LLC Date

Attachment #2

Stormwater Management System
Quarterly Inspection Form

Inspection Form - Storm Water Management System
#51 Boston Post Rd., East Lyme, Connecticut

QUARTERLY INSPECTION AND MAINTENANCE REPORT

Jan.-Mar. Apr.-Jun. July-Sep. Oct. – Dec.

Note: This Log should be copied prior to use. Note Additional Comments on back of Form.

Inspector's Name: _____ Date: _____ Time: _____ am/pm

Inspector's Qualifications: _____

Days Since Last Rainfall:_____ Amount of Last Rainfall:_____ inches

Item/Condition to be Checked	Maintenance Required		Corrective Action & Date
	No	Yes	
DEEP SUMP CATCH BASIN W/HOOD			*Clean when sediment Depth > 24 in. or sheen present
STORMCEPTOR 450i			*Clean when sediment Depth > 8 in. or sheen present
Stormtech MC4500			
Infiltration Basin			
Rip-Rap Aprons			
SPILL KIT			
Parking Lot / Driveway Sweeping			*Sweep Seasonally – As Needed
Landscaping / Trash Removal			
Snow Removal (seasonal)			*All De-icing chemical storage to be inside building

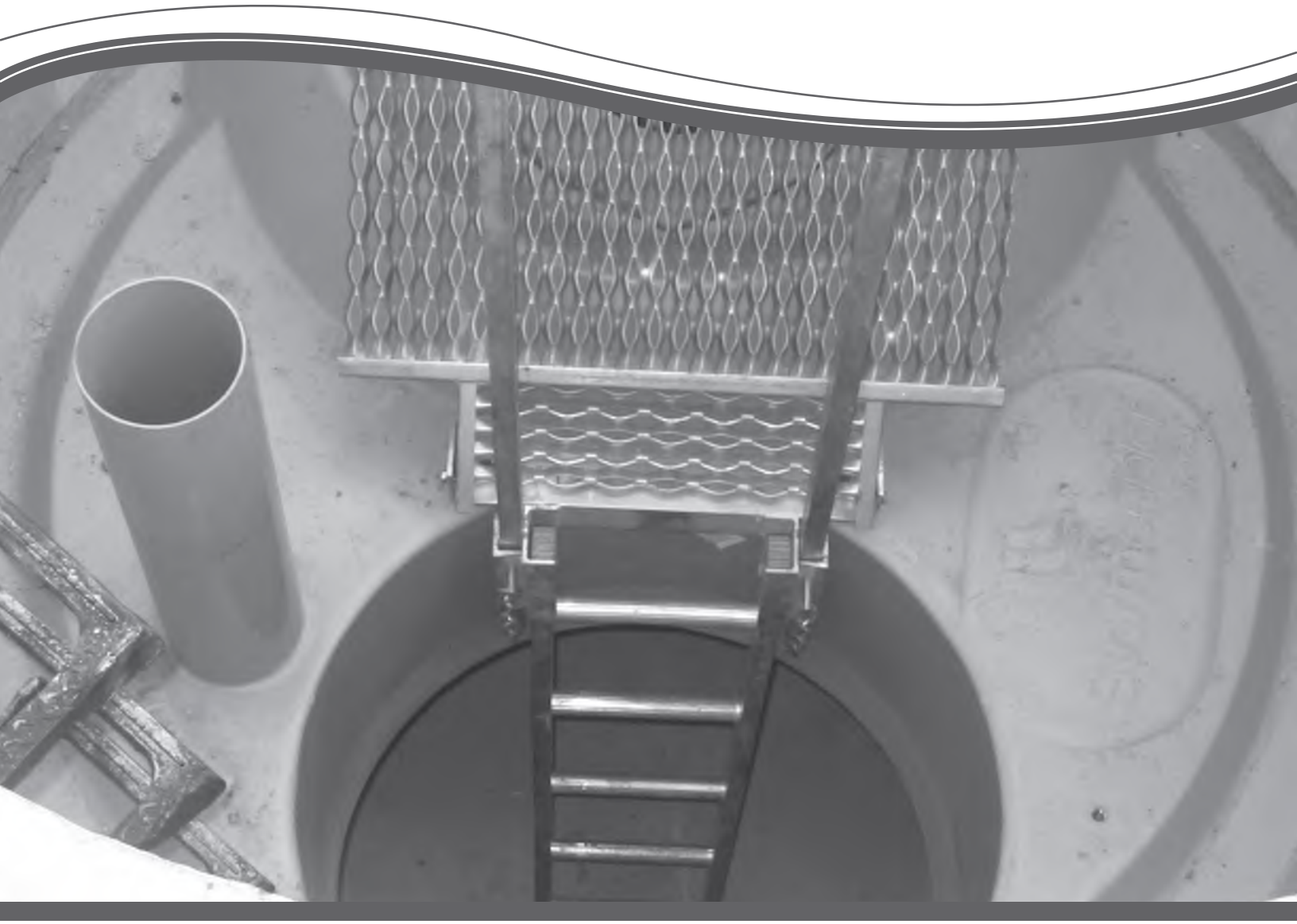
Additional Comments:_____

Attachment #3

Stormceptor Operation and Maintenance Guide

CONTECH®
ENGINEERED SOLUTIONS

Stormceptor® STC
Operation and Maintenance Guide



Stormceptor® STC

Stormceptor Design Notes

- Only the STC 450i is adaptable to function with a catch basin inlet and/or inline pipes.
- Only the Stormceptor models STC 450i to STC 7200 may accommodate multiple inlet pipes.

Inlet and outlet invert elevation differences are as follows:

Inlet and Outlet Pipe Invert Elevations Differences			
Inlet Pipe Configuration	STC 450i	STC 900 to STC 7200	STC 11000 to STC 16000
Single inlet pipe	3 in. (75 mm)	1 in. (25 mm)	3 in. (75 mm)
Multiple inlet pipes	3 in. (75 mm)	3 in. (75 mm)	Only one inlet pipe.

Maximum inlet and outlet pipe diameters:

Inlet/Outlet Configuration	Inlet Unit STC 450i	In-Line Unit STC 900 to STC 7200	Series* STC 11000 to STC 16000
Straight Through	24 inch (600 mm)	42 inch (1050 mm)	60 inch (1500 mm)
Bend (90 degrees)	18 inch (450 mm)	33 inch (825 mm)	33 inch (825 mm)

- The inlet and in-line Stormceptor units can accommodate turns to a maximum of 90 degrees.
- Minimum distance from top of grade to crown is 2 feet (0.6 m)
- Submerged conditions. A unit is submerged when the standing water elevation at the proposed location of the Stormceptor unit is greater than the outlet invert elevation during zero flow conditions. In these cases, please contact your local Stormceptor representative and provide the following information:
- Top of grade elevation
- Stormceptor inlet and outlet pipe diameters and invert elevations
- Standing water elevation
- Stormceptor head loss, K = 1.3 (for submerged condition, K = 4)

Stormceptor® STC

OPERATION AND MAINTENANCE GUIDE
Table of Content

1. About Stormceptor

The Stormceptor® STC (Standard Treatment Cell) was developed by Imbrium™ Systems to address the growing need to remove and isolate pollution from the storm drain system before it enters the environment. The Stormceptor STC targets hydrocarbons and total suspended solids (TSS) in stormwater runoff. It improves water quality by removing contaminants through the gravitational settling of fine sediments and floatation of hydrocarbons while preventing the re-suspension or scour of previously captured pollutants.

The development of the Stormceptor STC revolutionized stormwater treatment, and created an entirely new category of environmental technology. Protecting thousands of waterways around the world, the Stormceptor System has set the standard for effective stormwater treatment.

1.1. Patent Information

The Stormceptor technology is protected by the following patents:

- Australia Patent No. 693,164 • 693,164 • 707,133 • 729,096 • 779401
- Austrian Patent No. 289647
- Canadian Patent No 2,009,208 •2,137,942 • 2,175,277 • 2,180,305 • 2,180,383 • 2,206,338 • 2,327,768 (Pending)
- China Patent No 1168439
- Denmark DK 711879
- German DE 69534021
- Indonesian Patent No 16688
- Japan Patent No 9-11476 (Pending)
- Korea 10-2000-0026101 (Pending)
- Malaysia Patent No PI9701737 (Pending)
- New Zealand Patent No 314646
- United States Patent No 4,985,148 • 5,498,331 • 5,725,760 • 5,753,115 • 5,849,181 • 6,068,765 • 6,371,690
- Stormceptor OSR Patent Pending • Stormceptor LCS Patent Pending

2. Stormceptor Design Overview

2.1. Design Philosophy

The patented Stormceptor System has been designed to focus on the environmental objective of providing long-term pollution control. The unique and innovative Stormceptor design allows for continuous positive treatment of runoff during all rainfall events, while ensuring that all captured pollutants are retained within the system, even during intense storm events.

An integral part of the Stormceptor design is PCSWMM for Stormceptor - sizing software developed in conjunction with Computational Hydraulics Inc. (CHI) and internationally acclaimed expert, Dr. Bill James. Using local historical rainfall data and continuous simulation modeling, this software allows a Stormceptor unit to be designed for each individual site and the corresponding water quality objectives.

By using PCSWMM for Stormceptor, the Stormceptor System can be designed to remove a wide range of particles (typically from 20 to 2,000 microns), and can also be customized to remove a specific particle size distribution (PSD). The specified PSD should accurately reflect what is in the stormwater runoff to ensure the device is achieving the desired water quality objective. Since stormwater runoff contains small particles (less than 75 microns), it is important to design a treatment system to remove smaller particles in addition to coarse particles.

2.2. Benefits

The Stormceptor System removes free oil and suspended solids from stormwater, preventing spills and non-point source pollution from entering downstream lakes and rivers. The key benefits, capabilities and applications of the Stormceptor System are as follows:

- Provides continuous positive treatment during all rainfall events
- Can be designed to remove over 80% of the annual sediment load
- Removes a wide range of particles
- Can be designed to remove a specific particle size distribution (PSD)
- Captures free oil from stormwater
- Prevents scouring or re-suspension of trapped pollutants
- Pre-treatment to reduce maintenance costs for downstream treatment measures (ponds, swales, detention basins, filters)
- Groundwater recharge protection
- Spills capture and mitigation
- Simple to design and specify
- Designed to your local watershed conditions
- Small footprint to allow for easy retrofit installations
- Easy to maintain (vacuum truck)
- Multiple inlets can connect to a single unit
- Suitable as a bend structure
- Pre-engineered for traffic loading (minimum AASHTO HS-20)
- Minimal elevation drop between inlet and outlet pipes
- Small head loss
- Additional protection provided by an 18" (457 mm) fiberglass skirt below the top of the insert, for the containment of hydrocarbons in the event of a spill.

2.3. Environmental Benefit

Freshwater resources are vital to the health and welfare of their surrounding communities. There is increasing public awareness, government regulations and corporate commitment to reducing the pollution entering our waterways. A major source of this pollution originates from stormwater runoff from urban areas. Rainfall runoff carries oils, sediment and other contaminants from roads and parking lots discharging directly into our streams, lakes and coastal waterways.

The Stormceptor System is designed to isolate contaminants from getting into the natural environment. The Stormceptor technology provides protection for the environment from spills that occur at service stations and vehicle accident sites, while also removing contaminated sediment in runoff that washes from roads and parking lots.

3. Key Operation Features

3.1. Scour Prevention

A key feature of the Stormceptor System is its patented scour prevention technology. This innovation ensures pollutants are captured and retained during all rainfall events, even extreme storms. The Stormceptor System provides continuous positive treatment for all rainfall events, including intense storms. Stormceptor slows incoming runoff, controlling and reducing velocities in the lower chamber to create a non-turbulent environment that promotes free oils and floatable debris to rise and sediment to settle.

The patented scour prevention technology, the fiberglass insert, regulates flows into the lower chamber through a combination of a weir and orifice while diverting high energy flows away through the upper chamber to prevent scouring. Laboratory testing demonstrated no scouring when tested up to 125% of the unit's operating rate, with the unit loaded to 100% sediment capacity (NJDEP, 2005). Second, the depth of the lower chamber ensures the sediment storage zone is adequately separated from the path of flow in the lower chamber to prevent scouring.

3.2. Operational Hydraulic Loading Rate

Designers and regulators need to evaluate the treatment capacity and performance of manufactured stormwater treatment systems. A commonly used parameter is the "operational hydraulic loading rate" which originated as a design methodology for wastewater treatment devices.

Operational hydraulic loading rate may be calculated by dividing the flow rate into a device by its settling area. This represents the critical settling velocity that is the prime determinant to quantify the influent particle size and density captured by the device. PCSWMM for Stormceptor uses a similar parameter that is calculated by dividing the hydraulic detention time in the device by the fall distance of the sediment.

$$v_{SC} = \frac{H}{6_H} = \frac{Q}{A_S}$$

Where:

v_{SC} = critical settling velocity, ft/s (m/s)

H = tank depth, ft (m)

$Ø_H$ = hydraulic detention time, ft/s (m/s)

Q = volumetric flow rate, ft3/s (m3/s)

A_S = surface area, ft^2 (m^2)

(Tchobanoglous, G. and Schroeder, E.D. 1987. Water Quality. Addison Wesley.)

Unlike designing typical wastewater devices, stormwater systems are designed for highly variable flow rates including intense peak flows. PCSWMM for Stormceptor incorporates all of the flows into its calculations, ensuring that the operational hydraulic loading rate is considered not only for one flow rate, but for all flows including extreme events.

3.3. Double Wall Containment

The Stormceptor System was conceived as a pollution identifier to assist with identifying illicit discharges. The fiberglass insert has a continuous skirt that lines the concrete barrel wall for a depth of 18 inches (457 mm) that provides double wall containment for hydrocarbons storage. This protective barrier ensures that toxic floatables do not migrate through the concrete wall into the surrounding soils.

4. Stormceptor Product Line

4.1. Stormceptor Models

A summary of Stormceptor models and capacities are listed in Table 1.

Table 1. Stormceptor Models

Stormceptor Model	Total Storage Volume U.S. Gal (L)	Hydrocarbon Storage Capacity U.S. Gal (L)	Maximum Sediment Capacity ft^3 (L)
STC 450i	470 (1,780)	86 (330)	46 (1,302)
STC 900	952 (3,600)	251 (950)	89 (2,520)
STC 1200	1,234 (4,670)	251 (950)	127 (3,596)
STC 1800	1,833 (6,940)	251 (950)	207 (5,861)
STC 2400	2,462 (9,320)	840 (3,180)	205 (5,805)
STC 3600	3,715 (1,406)	840 (3,180)	373 (10,562)
STC 4800	5,059 (1,950)	909 (3,440)	543 (15,376)
STC 6000	6,136 (23,230)	909 (3,440)	687 (19,453)
STC 7200	7,420 (28,090)	1,059 (4,010)	839 (23,757)
STC 11000	11,194 (42,370)	2,797 (10, 590)	1,086 (30,752)
STC 13000	13,348 (50,530)	2,797 (10, 590)	1,374 (38,907)
STC 16000	15,918 (60,260)	3,055 (11, 560)	1,677 (47,487)

NOTE: Storage volumes may vary slightly from region to region. For detailed information, contact your local Stormceptor representative.

4.2. Inline Stormceptor

The Inline Stormceptor, Figure 1, is the standard design for most stormwater treatment applications. The patented Stormceptor design allows the Inline unit to maintain continuous positive treatment of total suspended solids (TSS) year-round, regardless of flow rate. The Inline Stormceptor is composed of a precast concrete tank with a fiberglass insert situated at the invert of the storm sewer pipe, creating an upper chamber above the insert and a lower chamber below the insert.

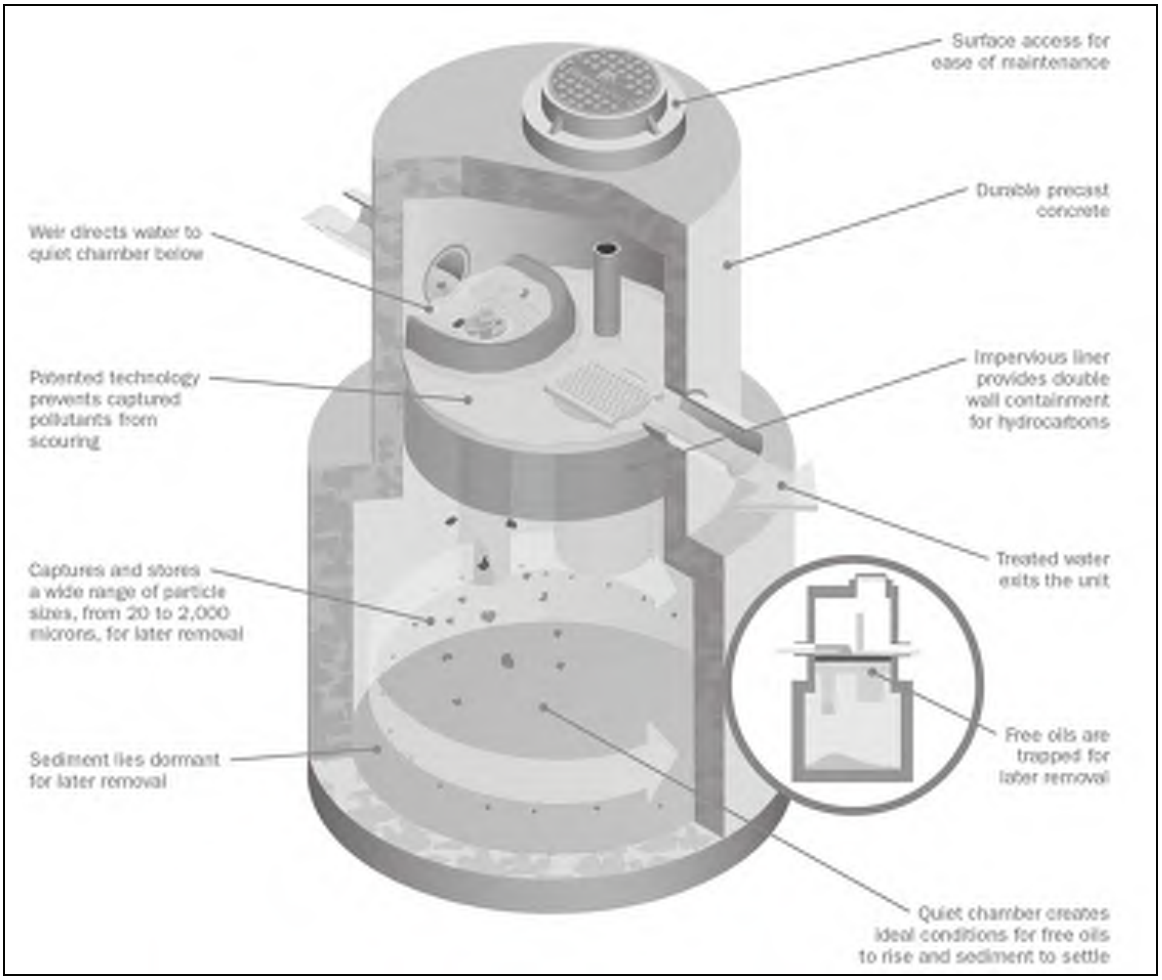


Figure 1. Inline Stormceptor

Operation

As water flows into the Stormceptor unit, it is slowed and directed to the lower chamber by a weir and drop tee. The stormwater enters the lower chamber, a non-turbulent environment, allowing free oils to rise and sediment to settle. The oil is captured underneath the fiberglass insert and shielded from exposure to the concrete walls by a fiberglass skirt. After the pollutants separate, treated water continues up a riser pipe, and exits the lower chamber on the downstream side of the weir before leaving the unit. During high flow events, the Stormceptor System's patented scour prevention technology ensures continuous pollutant removal and prevents re-suspension of previously captured pollutants.

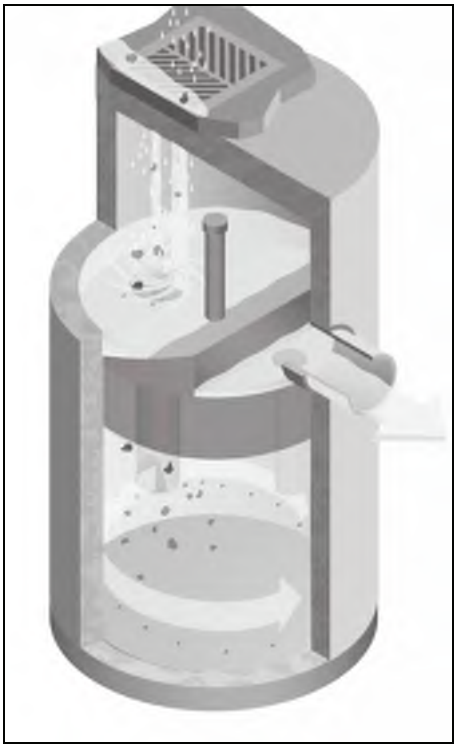


Figure 2. Inlet Stormceptor

4.3. Inlet Stormceptor

The Inlet Stormceptor System, Figure 2, was designed to provide protection for parking lots, loading bays, gas stations and other spill-prone areas. The Inlet Stormceptor is designed to remove sediment from stormwater introduced through a grated inlet, a storm sewer pipe, or both.

The Inlet Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

4.4. Series Stormceptor

Designed to treat larger drainage areas, the Series Stormceptor System, Figure 3, consists of two adjacent Stormceptor models that function in parallel. This design eliminates the need for additional structures and piping to reduce installation costs.

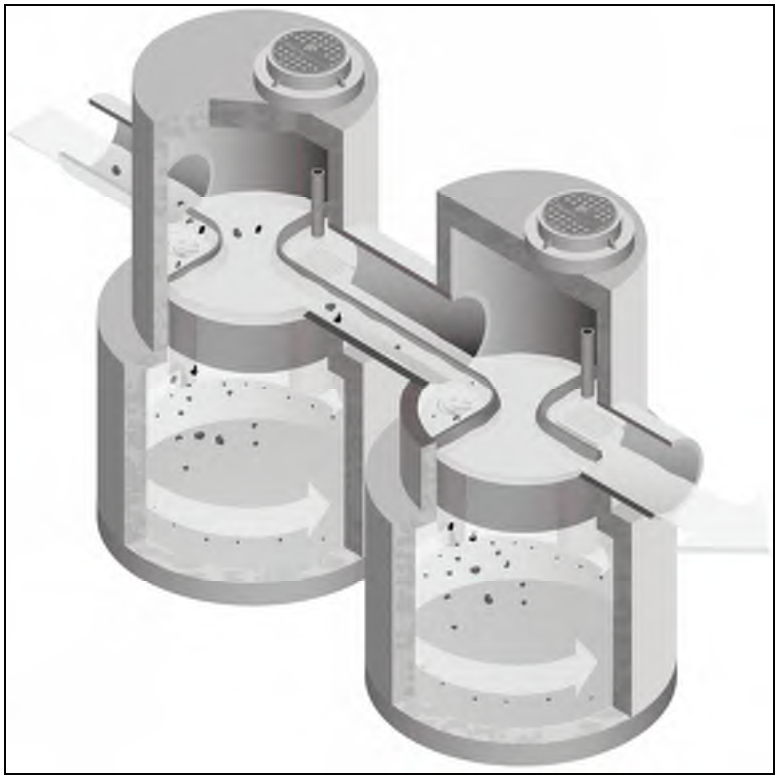


Figure 3. Series System

The Series Stormceptor design operates in the same manner as the Inline unit, providing continuous positive treatment, and ensuring that captured material is not re-suspended.

5. Sizing the Stormceptor System

The Stormceptor System is a versatile product that can be used for many different aspects of water quality improvement. While addressing these needs, there are conditions that the designer needs to be aware of in order to size the Stormceptor model to meet the demands of each individual site in an efficient and cost-effective manner.

PCSWMM for Stormceptor is the support tool used for identifying the appropriate Stormceptor model. In order to size a unit, it is recommended the user follow the seven design steps in the program. The steps are as follows:

STEP 1 – Project Details

The first step prior to sizing the Stormceptor System is to clearly identify the water quality objective for the development. It is recommended that a level of annual sediment (TSS) removal be identified and defined by a particle size distribution.

STEP 2 – Site Details

Identify the site development by the drainage area and the level of imperviousness. It is recommended that imperviousness be calculated based on the actual area of imperviousness based on paved surfaces, sidewalks and rooftops.

STEP 3 – Upstream Attenuation

The Stormceptor System is designed as a water quality device and is sometimes used in conjunction with onsite water quantity control devices such as ponds or underground detention systems. When possible, a greater benefit is typically achieved when installing a Stormceptor unit upstream of a detention facility. By placing the Stormceptor unit upstream of a detention structure, a benefit of less maintenance of the detention facility is realized.

STEP 4 – Particle Size Distribution

It is critical that the PSD be defined as part of the water quality objective. PSD is critical for the design of treatment system for a unit process of gravity settling and governs the size of a treatment system. A range of particle sizes has been provided and it is recommended that clays and silt-sized particles be considered in addition to sand and gravel-sized particles. Options and sample PSDs are provided in PCSWMM for Stormceptor. The default particle size distribution is the Fine Distribution, Table 2, option.

Table 2. Fine Distribution

Particle Size	Distribution	Specific Gravity
20	20%	1.3
60	20%	1.8
150	20%	2.2
400	20%	2.65
2000	20%	2.65

If the objective is the long-term removal of 80% of the total suspended solids on a given site, the PSD should be representative of the expected sediment on the site. For example, a system designed to remove 80% of coarse particles (greater than 75 microns) would provide relatively poor removal efficiency of finer particles that may be naturally prevalent in runoff from the site.

Since the small particle fraction contributes a disproportionately large amount of the total available particle surface area for pollutant adsorption, a system designed primarily for coarse particle capture will compromise water quality objectives.

STEP 5 – Rainfall Records

Local historical rainfall has been acquired from the U.S. National Oceanic and Atmospheric Administration, Environment Canada and regulatory agencies across North America. The rainfall data provided with PCSMM for Stormceptor provides an accurate estimation of small storm hydrology by modeling actual historical storm events including duration, intensities and peaks.

STEP 6 – Summary

At this point, the program may be executed to predict the level of TSS removal from the site. Once the simulation has completed, a table shall be generated identifying the TSS removal of each Stormceptor unit.

STEP 7 – Sizing Summary

Performance estimates of all Stormceptor units for the given site parameters will be displayed in a tabular format. The unit that meets the water quality objective, identified in Step 1, will be highlighted.

5.1. PCSWMM for Stormceptor

The Stormceptor System has been developed in conjunction with PCSWMM for Stormceptor as a technological solution to achieve water quality goals. Together, these two innovations model, simulate, predict and calculate the water quality objectives desired by a design engineer for TSS removal.

PCSWMM for Stormceptor is a proprietary sizing program which uses site specific inputs to a computer model to simulate sediment accumulation, hydrology and long-term total suspended solids removal. The model has been calibrated to field monitoring results from Stormceptor units that have been monitored in North America. The sizing methodology can be described by three processes:

1. Determination of real time hydrology
2. Buildup and wash off of TSS from impervious land areas
3. TSS transport through the Stormceptor (settling and discharge). The use of a calibrated model is the preferred method for sizing stormwater quality structures for the following reasons:
    - » The hydrology of the local area is properly and accurately incorporated in the sizing (distribution of flows, flow rate ranges and peaks, back-to-back storms, inter-event times)
    - » The distribution of TSS with the hydrology is properly and accurately considered in the sizing
    - » Particle size distribution is properly considered in the sizing
    - » The sizing can be optimized for TSS removal
    - » The cost benefit of alternate TSS removal criteria can be easily assessed
    - » The program assesses the performance of all Stormceptor models. Sizing may be selected based on a specific water quality outcome or based on the Maximum Extent Practicable

For more information regarding PCSWMM for Stormceptor, contact your local Stormceptor representative, or visit www.imbriumsystems.com to download a free copy of the program.

5.2. Sediment Loading Characteristics

The way in which sediment is transferred to stormwater can have a considerable effect on which type of system is implemented. On typical impervious surfaces (e.g. parking lots) sediment will build over time and wash off with the next rainfall. When rainfall patterns are examined, a short intense storm will have a higher concentration of sediment than a long slow drizzle. Together with rainfall data representing the site's typical rainfall patterns, sediment loading characteristics play a part in the correct sizing of a stormwater quality device.

Typical Sites

For standard site design of the Stormceptor System, PCSWMM for Stormceptor is utilized to accurately assess the unit's performance. As an integral part of the product's design, the program can be used to meet local requirements for total suspended solid removal. Typical installations of manufactured stormwater treatment devices would occur on areas such as paved parking lots or paved roads. These are considered "stable" surfaces which have non – erodible surfaces.

Unstable Sites

While standard sites consist of stable concrete or asphalt surfaces, sites such as gravel parking lots, or maintenance yards with stockpiles of sediment would be classified as "unstable". These types of sites do not exhibit first flush characteristics, are highly erodible and exhibit atypical sediment loading characteristics and must therefore be sized more carefully. Contact your local Stormceptor representative for assistance in selecting a proper unit sized for such unstable sites.

6. Spill Controls

When considering the removal of total petroleum hydrocarbons (TPH) from a storm sewer system there are two functions of the system: oil removal, and spill capture.

'Oil Removal' describes the capture of the minute volumes of free oil mobilized from impervious surfaces. In this instance relatively low concentrations, volumes and flow rates are considered. While the Stormceptor unit will still provide an appreciable oil removal function during higher flow events and/or with higher TPH concentrations, desired effluent limits may be exceeded under these conditions.

'Spill Capture' describes a manner of TPH removal more appropriate to recovery of a relatively high volume of a single phase deleterious liquid that is introduced to the storm sewer system over a relatively short duration. The two design criteria involved when considering this manner of introduction are overall volume and the specific gravity of the material. A standard Stormceptor unit will be able to capture and retain a maximum spill volume and a minimum specific gravity.

For spill characteristics that fall outside these limits, unit modifications are required. Contact your local Stormceptor Representative for more information.

One of the key features of the Stormceptor technology is its ability to capture and retain spills. While the standard Stormceptor System provides excellent protection for spill control, there are additional options to enhance spill protection if desired.

6.1. Oil Level Alarm

The oil level alarm is an electronic monitoring system designed to trigger a visual and audible alarm when a pre-set level of oil is reached within the lower chamber. As a standard, the oil

level alarm is designed to trigger at approximately 85% of the unit's available depth level for oil capture. The feature acts as a safeguard against spills caused by exceeding the oil storage capacity of the separator and eliminates the need for manual oil level inspection.

The oil level alarm installed on the Stormceptor insert is illustrated in Figure 4.

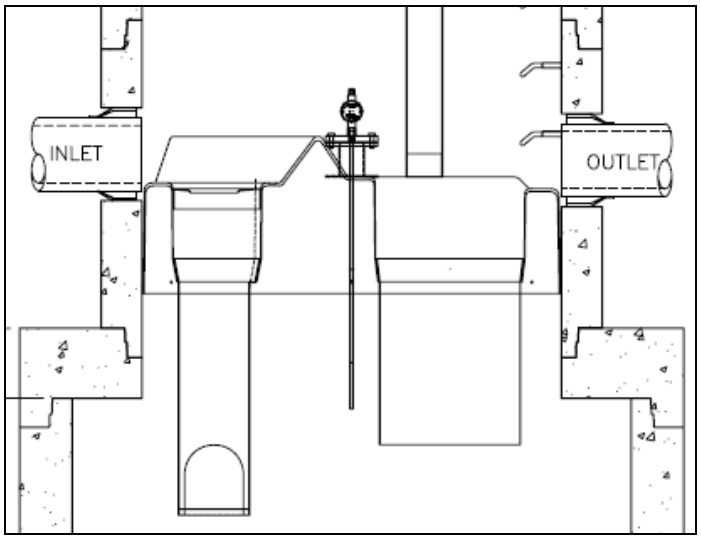


Figure 4. Oil level alarm

6.2. Increased Volume Storage Capacity

The Stormceptor unit may be modified to store a greater spill volume than is typically available. Under such a scenario, instead of installing a larger than required unit, modifications can be made to the recommended Stormceptor model to accommodate larger volumes. Contact your local Stormceptor representative for additional information and assistance for modifications.

7. Stormceptor Options

The Stormceptor System allows flexibility to incorporate to existing and new storm drainage infrastructure. The following section identifies considerations that should be reviewed when installing the system into a drainage network. For conditions that fall outside of the recommendations in this section, please contact your local Stormceptor representative for further guidance.

7.1. Installation Depth Minimum Cover

The minimum distance from the top of grade to the crown of the inlet pipe is 24 inches (600 mm). For situations that have a lower minimum distance, contact your local Stormceptor representative.

7.2. Maximum Inlet and Outlet Pipe Diameters

Maximum inlet and outlet pipe diameters are illustrated in Figure 5. Contact your local Stormceptor representative for larger pipe diameters

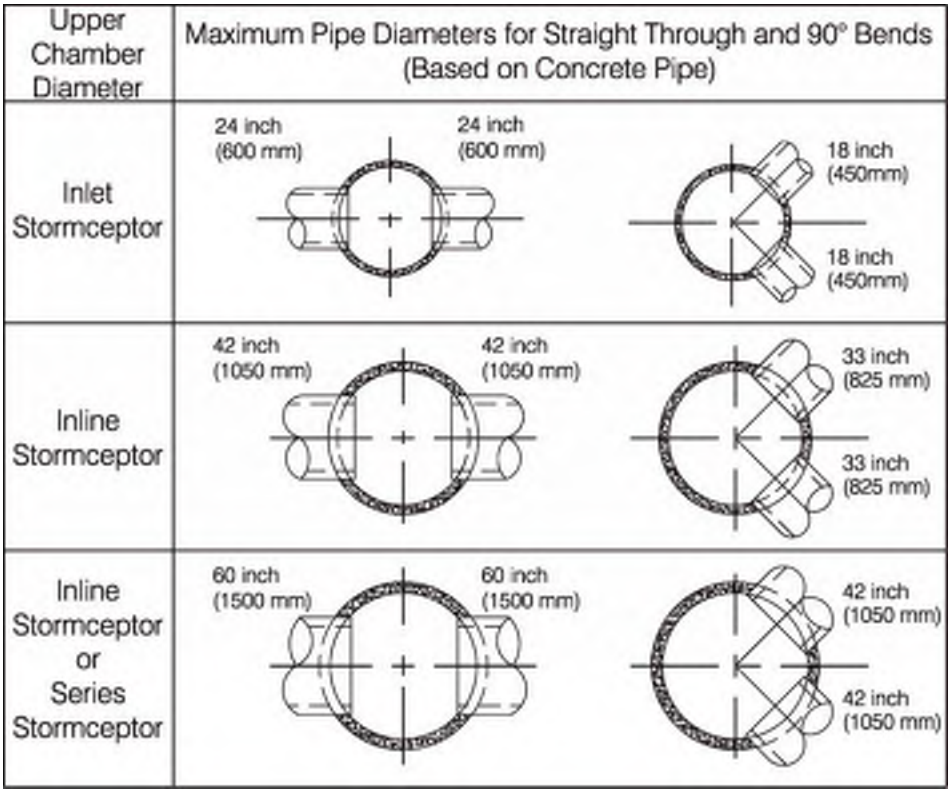


Figure 5. Maximum pipe diameters for straight through and bend applications

*The bend should only be incorporated into the second structure (downstream structure) of the Series Stormceptor System

7.3. Bends

The Stormceptor System can be used to change horizontal alignment in the storm drain network up to a maximum of 90 degrees. Figure 6 illustrates the typical bend situations of the Stormceptor System. Bends should only be applied to the second structure (downstream structure) of the Series Stormceptor System.

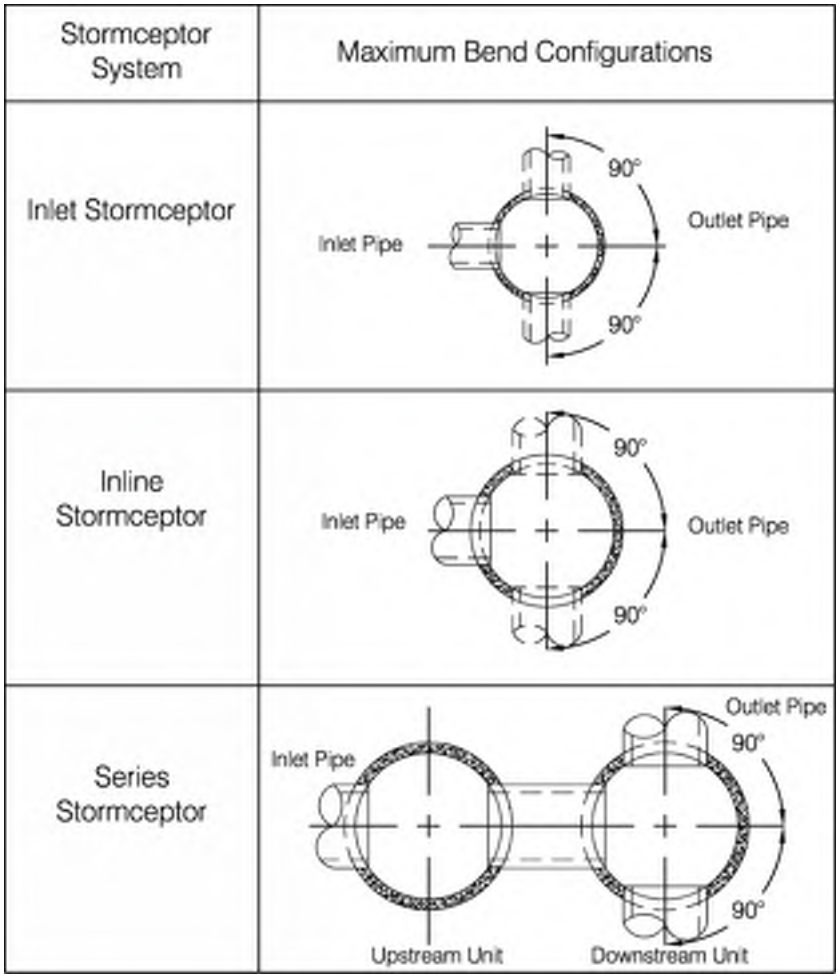


Figure 6. Maximum bend angles

7.4. Multiple Inlet Pipes

The Inlet and Inline Stormceptor System can accommodate two or more inlet pipes. The maximum number of inlet pipes that can be accommodated into a Stormceptor unit is a function of the number, alignment and diameter of the pipes and its effects on the structural integrity of the precast concrete. When multiple inlet pipes are used for new developments, each inlet pipe shall have an invert elevation 3 inches (75 mm) higher than the outlet pipe invert elevation.

7.5. Inlet/Outlet Pipe Invert Elevations

Recommended inlet and outlet pipe invert differences are listed in Table 3.

Table 3. Recommended Drops Between Inlet and Outlet Pipe Inverts

Number of Inlet Pipes	Inlet System	In-Line System	Series System
1	3 inches (75 mm)	1 inch (25 mm)	3 inches (75 mm)
>1	3 inches (75 mm)	3 inches (75 mm)	Not Applicable

7.6. Shallow Stormceptor

In cases where there may be restrictions to the depth of burial of storm sewer systems. In this situation, for selected Stormceptor models, the lower chamber components may be increased in diameter to reduce the overall depth of excavation required.

7.7. Customized Live Load

The Stormceptor system is typically designed for local highway truck loading (AASHTO HS- 20). When the project requires live loads greater than HS-20, the Stormceptor System may be customized structurally for a pre-specified live load. Contact your local Stormceptor representative for customized loading conditions.

7.8. Pre-treatment

The Stormceptor System may be sized to remove sediment and for spills control in conjunction with other stormwater BMPs to meet the water quality objective. For pretreatment applications, the Stormceptor System should be the first unit in a treatment train. The benefits of pre-treatment include the extension of the operational life (extension of maintenance frequency) of large stormwater management facilities, prevention of spills and lower total life- cycle maintenance cost.

7.9. Head loss

The head loss through the Stormceptor System is similar to a 60 degree bend at a manhole. The K value for calculating minor losses is approximately 1.3 (minor loss = k*1.3v2/2g).

However, when a Submerged modification is applied to a Stormceptor unit, the corresponding K value is 4.

7.10. Submerged

The Submerged modification, Figure 7, allows the Stormceptor System to operate in submerged or partially submerged storm sewers. This configuration can be installed on all models of the Stormceptor System by modifying the fiberglass insert. A customized weir height and a secondary drop tee are added.

Submerged instances are defined as standing water in the storm drain system during zero flow conditions. In these instances, the following information is necessary for the proper design and application of submerged modifications:

- Stormceptor top of grade elevation
- Stormceptor outlet pipe invert elevation
- Standing water elevation

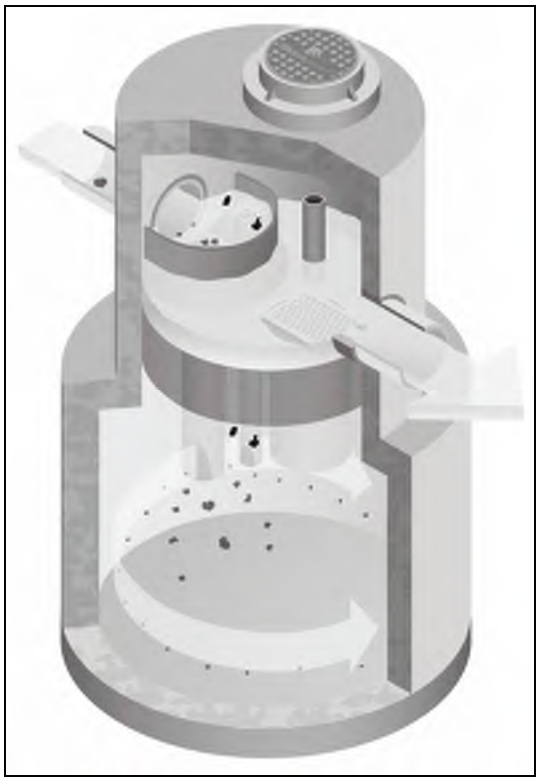


Figure 7. Submerged Stormceptor

8. Comparing Technologies

Designers have many choices available to achieve water quality goals in the treatment of stormwater runoff. Since many alternatives are available for use in stormwater quality treatment it is important to consider how to make an appropriate comparison between "approved alternatives". The following is a guide to assist with the accurate comparison of differing technologies and performance claims.

8.1. Particle Size Distribution (PSD)

The most sensitive parameter to the design of a stormwater quality device is the selection of the design particle size. While it is recommended that the actual particle size distribution (PSD) for sites be measured prior to sizing, alternative values for particle size should be selected to represent what is likely to occur naturally on the site. A reasonable estimate of a particle size distribution likely to be found on parking lots or other impervious surfaces should consist of a wide range of particles such as 20 microns to 2,000 microns (Ontario MOE, 1994).

There is no absolute right particle size distribution or specific gravity and the user is cautioned to review the site location, characteristics, material handling practices and regulatory requirements when selecting a particle size distribution. When comparing technologies, designs using different PSDs will result in incomparable TSS removal efficiencies. The PSD of the TSS removed needs to be standard between two products to allow for an accurate comparison.

8.2. Scour Prevention

In order to accurately predict the performance of a manufactured treatment device, there must be confidence that it will perform under all conditions. Since rainfall patterns cannot be predicted, stormwater quality devices placed in storm sewer systems must be able to withstand extreme events, and ensure that all pollutants previously captured are retained in the system.

In order to have confidence in a system's performance under extreme conditions, independent validation of scour prevention is essential when examining different technologies. Lack of independent verification of scour prevention should make a designer wary of accepting any product's performance claims.

8.3. Hydraulics

Full scale laboratory testing has been used to confirm the hydraulics of the Stormceptor System. Results of lab testing have been used to physically design the Stormceptor System and the sewer pipes entering and leaving the unit. Key benefits of Stormceptor are:

- Low head loss (typical k value of 1.3)
- Minimal inlet/outlet invert elevation drop across the structure
- Use as a bend structure
- Accommodates multiple inlets

The adaptability of the treatment device to the storm sewer design infrastructure can affect the overall performance and cost of the site.

8.4. Hydrology

Stormwater quality treatment technologies need to perform under varying climatic conditions. These can vary from long low intensity rainfall to short duration, high intensity storms. Since a treatment device is expected to perform under all these conditions, it makes sense that any system's design should accommodate those conditions as well.

Long-term continuous simulation evaluates the performance of a technology under the varying conditions expected in the climate of the subject site. Single, peak event design does not provide this information and is not equivalent to long-term simulation. Designers should request long-term simulation performance to ensure the technology can meet the long-term water quality objective.

9. Testing

The Stormceptor System has been the most widely monitored stormwater treatment technology in the world. Performance verification and monitoring programs are completed to the strictest standards and integrity. Since its introduction in 1990, numerous independent field tests and studies detailing the effectiveness of the Stormceptor System have been completed.

- Coventry University, UK – 97% removal of oil, 83% removal of sand and 73% removal of peat
- National Water Research Institute, Canada, - scaled testing for the development of the Stormceptor System identifying both TSS removal and scour prevention.
- New Jersey TARP Program – full scale testing of an STC 900 demonstrating 75% TSS removal of particles from 1 to 1000 microns. Scour testing completed demonstrated that the system does not scour. The New Jersey Department of Environmental Protection was followed.
- City of Indianapolis – full scale testing of an STC 900 demonstrating over 80% TSS removal of particles from 50 microns to 300 microns at 130% of the unit's operating rate. Scour testing completed demonstrated that the system does not scour.
- Westwood Massachusetts (1997), demonstrated >80% TSS removal
- Como Park (1997), demonstrated 76% TSS removal
- Ontario MOE SWAMP Program – 57% removal of 1 to 25 micron particles
- Laval Quebec – 50% removal of 1 to 25 micron particles

10. Installation

The installation of the concrete Stormceptor should conform in general to state highway, or local specifications for the installation of manholes. Selected sections of a general specification that are applicable are summarized in the following sections.

10.1. Excavation

Excavation for the installation of the Stormceptor should conform to state highway, or local specifications. Topsoil removed during the excavation for the Stormceptor should be stockpiled in designated areas and should not be mixed with subsoil or other materials.

Topsoil stockpiles and the general site preparation for the installation of the Stormceptor should conform to state highway or local specifications.

The Stormceptor should not be installed on frozen ground. Excavation should extend a minimum of 12 inches (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required.

In areas with a high water table, continuous dewatering may be required to ensure that the excavation is stable and free of water.

10.2. Backfilling

Backfill material should conform to state highway or local specifications. Backfill material should be placed in uniform layers not exceeding 12 inches (300mm) in depth and compacted to state highway or local specifications.

11. Stormceptor Construction Sequence

The concrete Stormceptor is installed in sections in the following sequence:

1. Aggregate base
2. Base slab
3. Lower chamber sections
4. Upper chamber section with fiberglass insert
5. Connect inlet and outlet pipes
6. Assembly of fiberglass insert components (drop tee, riser pipe, oil cleanout port and orifice plate
7. Remainder of upper chamber
8. Frame and access cover

The precast base should be placed level at the specified grade. The entire base should be in contact with the underlying compacted granular material. Subsequent sections, complete with joint seals, should be installed in accordance with the precast concrete manufacturer's recommendations.

Adjustment of the Stormceptor can be performed by lifting the upper sections free of the excavated area, re-leveling the base and re-installing the sections. Damaged sections and gaskets should be repaired or replaced as necessary. Once the Stormceptor has been constructed, any lift holes must be plugged with mortar.

12. Maintenance

12.1. Health and Safety

The Stormceptor System has been designed considering safety first. It is recommended that confined space entry protocols be followed if entry to the unit is required. In addition, the fiberglass insert has the following health and safety features:

- Designed to withstand the weight of personnel
- A safety grate is located over the 24 inch (600 mm) riser pipe opening
- Ladder rungs can be provided for entry into the unit, if required

12.2. Maintenance Procedures

Maintenance of the Stormceptor system is performed using vacuum trucks. No entry into the unit is required for maintenance (in most cases). The vacuum service industry is a well- established sector of the service industry that cleans underground tanks, sewers and catch basins. Costs to clean a Stormceptor will vary based on the size of unit and transportation distances.

The need for maintenance can be determined easily by inspecting the unit from the surface. The depth of oil in the unit can be determined by inserting a dipstick in the oil inspection/cleanout port.

Similarly, the depth of sediment can be measured from the surface without entry into the Stormceptor via a dipstick tube equipped with a ball valve. This tube would be inserted through the riser pipe. Maintenance should be performed once the sediment depth exceeds the guideline values provided in the Table 4.

Table 4. Sediment Depths Indicating Required Servicing*

Particle Size	Specific Gravity
Model	Sediment Depth inches (mm)
450i	8 (200)
900	8 (200)
1200	10 (250)
1800	15 (381)
2400	12 (300)
3600	17 (430)
4800	15 (380)
6000	18 (460)
7200	15 (381)
11000	17 (380)
13000	20 (500)
16000	17 (380)
* based on 15% of the Stormceptor unit's total storage	

Although annual servicing is recommended, the frequency of maintenance may need to be increased or reduced based on local conditions (i.e. if the unit is filling up with sediment more quickly than projected, maintenance may be required semi-annually; conversely once the site has stabilized maintenance may only be required every two or three years).

Oil is removed through the oil inspection/cleanout port and sediment is removed through the riser pipe. Alternatively oil could be removed from the 24 inches (600 mm) opening if water is removed from the lower chamber to lower the oil level below the drop pipes.

The following procedures should be taken when cleaning out Stormceptor:

1. Check for oil through the oil cleanout port
2. Remove any oil separately using a small portable pump
3. Decant the water from the unit to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank
4. Remove the sludge from the bottom of the unit using the vacuum truck
5. Re-fill Stormceptor with water where required by the local jurisdiction

12.3. Submerged Stormceptor

Careful attention should be paid to maintenance of the Submerged Stormceptor System. In cases where the storm drain system is submerged, there is a requirement to plug both the inlet and outlet pipes to economically clean out the unit.

12.4. Hydrocarbon Spills

The Stormceptor is often installed in areas where the potential for spills is great. The Stormceptor System should be cleaned immediately after a spill occurs by a licensed liquid waste hauler.

12.5. Disposal

Requirements for the disposal of material from the Stormceptor System are similar to that of any other stormwater Best Management Practice (BMP) where permitted. Disposal options for the sediment may range from disposal in a sanitary trunk sewer upstream of a sewage treatment plant, to disposal in a sanitary landfill site. Petroleum waste products collected in the Stormceptor (free oil/chemical/fuel spills) should be removed by a licensed waste management company.

12.6. Oil Sheens

With a steady influx of water with high concentrations of oil, a sheen may be noticeable at the Stormceptor outlet. This may occur because a rainbow or sheen can be seen at very small oil concentrations (<10 mg/L). Stormceptor will remove over 98% of all free oil spills from storm sewer systems for dry weather or frequently occurring runoff events.

The appearance of a sheen at the outlet with high influent oil concentrations does not mean the unit is not working to this level of removal. In addition, if the influent oil is emulsified the Stormceptor will not be able to remove it. The Stormceptor is designed for free oil removal and not emulsified conditions.

SUPPORT

Drawings and specifications are available at www.ContechES.com.

Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, and earth stabilization products. For information, visit www.ContechES.com or call 800.338.1122

CONTECH ENGINEERED SOLUTIONS
800-925-5240
www.ContechES.com

Attachment #4

Stormtech MC4500 Operation and Maintenance Guide and Log

StormTech®
Detention • Retention • Water Quality
An ADS company

Isolator® Row O&M Manual


SC-740


MC-3500


MC-4500

THE MOST **ADVANCED** NAME IN WATER MANAGEMENT SOLUTIONS™

THE ISOLATOR® ROW

INTRODUCTION

An important component of any Stormwater Pollution Prevention Plan is inspection and maintenance. The StormTech Isolator Row is a technique to inexpensively enhance Total Suspended Solids (TSS) removal and provide easy access for inspection and maintenance.

THE ISOLATOR ROW

The Isolator Row is a row of StormTech chambers, either SC-160LP, SC-310, SC-310-3, SC-740, DC-780, MC-3500 or MC-4500 models, that is surrounded with filter fabric and connected to a closely located manhole for easy access. The fabric-wrapped chambers provide for settling and filtration of sediment as storm water rises in the Isolator Row and ultimately passes through the filter fabric. The open bottom chambers and perforated sidewalls (SC-310, SC- 310-3 and SC-740 models) allow storm water to flow both vertically and horizontally out of the chambers. Sediments are captured in the Isolator Row protecting the storage areas of the adjacent stone and chambers from sediment accumulation.

Two different fabrics are used for the Isolator Row. A woven geotextile fabric is placed between the stone and the Isolator Row chambers. The tough geotextile provides a media for storm water filtration and provides a durable surface for maintenance operations. It is also designed to prevent scour of the underlying stone and remain intact during high pressure jetting. A non-woven fabric is placed over the chambers to provide a filter media for flows passing through the perforations in the sidewall of the chamber. The non-woven fabric is not required over the SC-160LP, DC-780, MC-3500 or MC-4500 models as these chambers do not have perforated side walls.

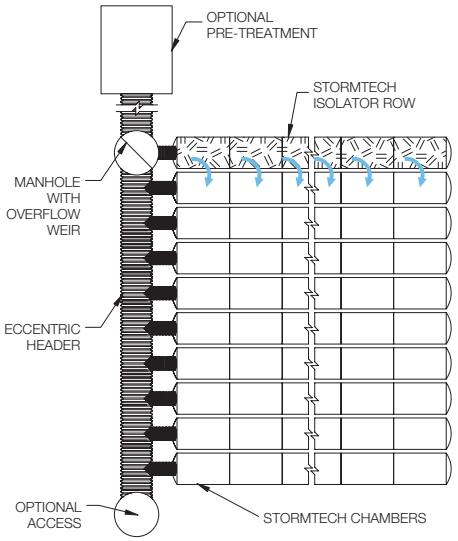
The Isolator Row is typically designed to capture the “first flush” and offers the versatility to be sized on a volume basis or flow rate basis. An upstream manhole not only provides access to the Isolator Row but typically includes a high flow weir such that storm water flowrates or volumes that exceed the capacity of the Isolator Row overtop the over flow weir and discharge through a manifold to the other chambers.

The Isolator Row may also be part of a treatment train. By treating storm water prior to entry into the chamber system, the service life can be extended and pollutants such as hydrocarbons can be captured. Pre-treatment best management practices can be as simple as deep sump catch basins, oil-water separators or can be innovative storm water treatment devices. The design of the treatment train and selection of pretreatment devices by the design engineer is often driven by regulatory requirements. Whether pretreatment is used or not, the Isolator Row is recommended by StormTech as an effective means to minimize maintenance requirements and maintenance costs.

Note: See the StormTech Design Manual for detailed information on designing inlets for a StormTech system, including the Isolator Row.

Looking down the Isolator Row from the manhole opening, woven geotextile is shown between the chamber and stone base.

StormTech Isolator Row with Overflow Spillway (not to scale)



ISOLATOR ROW INSPECTION/MAINTENANCE

INSPECTION

The frequency of inspection and maintenance varies by location. A routine inspection schedule needs to be established for each individual location based upon site specific variables. The type of land use (i.e. industrial, commercial, residential), anticipated pollutant load, percent imperviousness, climate, etc. all play a critical role in determining the actual frequency of inspection and maintenance practices.

At a minimum, StormTech recommends annual inspections. Initially, the Isolator Row should be inspected every 6 months for the first year of operation. For subsequent years, the inspection should be adjusted based upon previous observation of sediment deposition.

The Isolator Row incorporates a combination of standard manhole(s) and strategically located inspection ports (as needed). The inspection ports allow for easy access to the system from the surface, eliminating the need to perform a confined space entry for inspection purposes.

If upon visual inspection it is found that sediment has accumulated, a stadia rod should be inserted to determine the depth of sediment. When the average depth of sediment exceeds 3 inches throughout the length of the Isolator Row, clean-out should be performed.

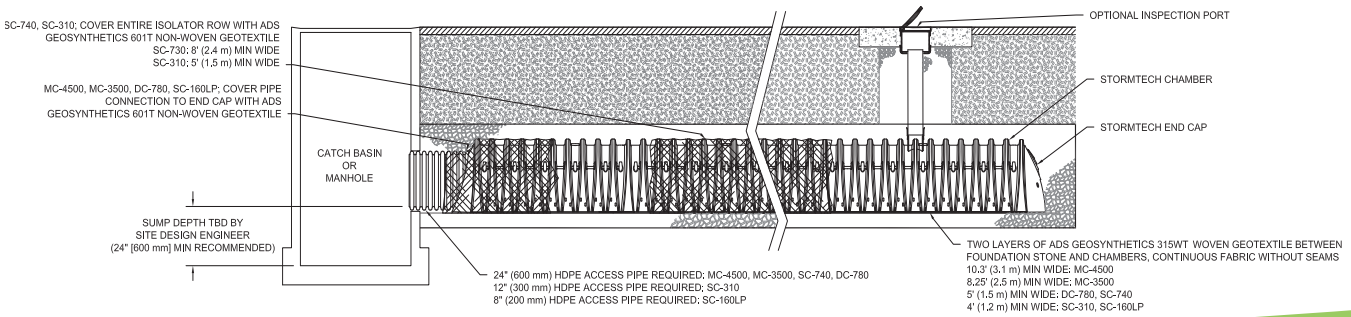
MAINTENANCE

The Isolator Row was designed to reduce the cost of periodic maintenance. By "isolating" sediments to just one row, costs are dramatically reduced by eliminating the need to clean out each row of the entire storage bed. If inspection indicates the potential need for maintenance, access is provided via a manhole(s) located on the end(s) of the row for cleanout. If entry into the manhole is required, please follow local and OSHA rules for a confined space entries.

Maintenance is accomplished with the JetVac process. The JetVac process utilizes a high pressure water nozzle to propel itself down the Isolator Row while scouring and suspending sediments. As the nozzle is retrieved, the captured pollutants are flushed back into the manhole for vacuuming. Most sewer and pipe maintenance companies have vacuum/JetVac combination vehicles. Selection of an appropriate JetVac nozzle will improve maintenance efficiency. Fixed nozzles designed for culverts or large diameter pipe cleaning are preferable. Rear facing jets with an effective spread of at least 45" are best. Most JetVac reels have 400 feet of hose allowing maintenance of an Isolator Row up to 50 chambers long. **The JetVac process shall only be performed on StormTech Isolator Rows that have AASHTO class 1 woven geotextile (as specified by StormTech) over their angular base stone.**

StormTech Isolator Row (not to scale)

Note: Non-woven fabric is only required over the inlet pipe connection into the end cap for SC-160LP, DC-780, MC-3500 and MC-4500 chamber models and is not required over the entire Isolator Row.



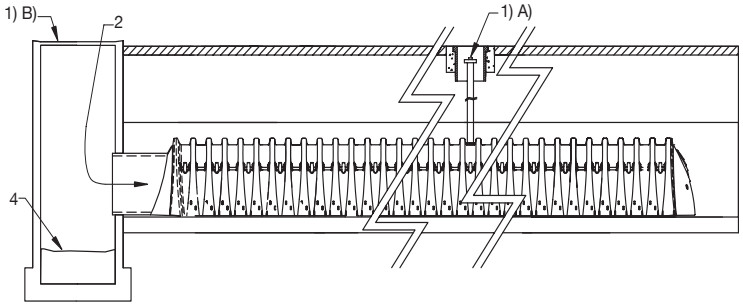
ISOLATOR ROW STEP BY STEP MAINTENANCE PROCEDURES

STEP 1
Inspect Isolator Row for sediment.
- A) Inspection ports (if present)
  - i. Remove lid from floor box frame
  - ii. Remove cap from inspection riser
  - iii. Using a flashlight and stadia rod,measure depth of sediment and record results on maintenance log.
  - iv. If sediment is at or above 3 inch depth, proceed to Step 2. If not, proceed to Step 3.
- B) All Isolator Rows
  - i. Remove cover from manhole at upstream end of Isolator Row
  - ii. Using a flashlight, inspect down Isolator Row through outlet pipe
    1. Mirrors on poles or cameras may be used to avoid a confined space entry
    2. Follow OSHA regulations for confined space entry if entering manhole
  - iii. If sediment is at or above the lower row of sidewall holes (approximately 3 inches), proceed to Step 2. If not, proceed to Step 3.

STEP 2
Clean out Isolator Row using the JetVac process.
- A) A fixed floor cleaning nozzle with rear facing nozzle spread of 45 inches or more is preferable
- B) Apply multiple passes of JetVac until backflush water is clean
- C) Vacuum manhole sump as required

STEP 3
Replace all caps, lids and covers, record observations and actions.

STEP 4
Inspect & clean catch basins and manholes upstream of the StormTech system.



SAMPLE MAINTENANCE LOG

Date	Stadia Rod Readings		Sediment Depth (1)–(2)	Observations/Actions	Inspector
	Fixed point to chamber bottom (1)	Fixed point to top of sediment (2)			
3/15/11	6.3 ft	none		New installation. Fixed point is CI frame at grade	DJM
9/24/11		6.2	0.1 ft	Some grit felt	SM
6/20/13		5.8	0.5 ft	Mucky feel, debris visible in manhole and in Isolator Row, maintenance due	NV
7/7/13	6.3 ft		0	System jetted and vacuumed	DJM

StormTech® Detention • Retention • Water Quality
A division of ADS

Advanced Drainage Systems, Inc.
4640 Trueman Blvd., Hilliard, OH 43026
1-800-821-6710 www.ads-pipe.com

Attachment #5

Safety Data Sheet for De-icing Material

SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards, Australian WorkSafe, Japanese Industrial Standard JIS Z 7250:2000, and European Directives

1. PRODUCT IDENTIFICATION

1.1 COMMON NAME:	***Rock Salt, Halite, Salt***
CHEMICAL NAME:	Sodium Chloride
CHEMICAL FORMULA:	NaCl
CAS#:	7647-14-5
PRODUCT NAMES AS LABELED:	ARSC 3 Gallon – Blue Treated Salt (Product Number ARBL3) ARSC 4 Gallon – Blue Treated Salt (Product Number ARBL4) ARSC Blue Treated Salt (Product Number ARBlue, 6 Gallon/Ton)
1.2 PRODUCT USE:	The de-icing of roads, walkways and surfaces
1.3 MANUFACTURER'S NAME:	**American Rock Salt Company LLC**
ADDRESS:	5520 Route 63, Mount Morris, New York 14510
BUSINESS PHONE:	1-585-243-9510
FAX NUMBER:	1-585-243-4353
WEB SITE:	www.americanrocksalt.com
1.4 EMERGENCY PHONE NUMBER:	
EMERGENCY PHONE #:	1-585-243-9544
EMAIL:	SDS@americanrocksalt.com
1.5 PREPARATION INFORMATION:	
DATE OF CURRENT REVISION:	June 10, 2015
DATE OF LAST REVISION:	New

2. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW:
Product Description: This product is a white to off-white to light blue to gray crystalline solid with no odor.
Health Hazards: Exposure to this product may cause irritation to eyes. Prolonged contact may cause skin irritation. May cause respiratory tract irritation.
Flammability Hazards: This product is a non-flammable solid.
Reactivity Hazards: None known
Environmental Hazards: The Environmental effects of this product have not been investigated. Release of this product is not expected to have significant adverse effects in the aquatic environment.

US DOT SYMBOLS
Non-Regulated Material

CANADA (WHMIS) SYMBOLS
"Not Controlled"

EUROPEAN and (GHS) Hazard Symbols

Signal Word: **WARNING!**

2.1 CLASSIFICATION OF SUBSTANCE OR MIXTURE IN ACCORDANCE WITH 29 CFR 1200 (OSHA HCS) AND THE EUROPEAN UNION DIRECTIVES:

This product does meet the definition of a hazardous substance or preparation as defined by 29 CFR 1910. 1200 AND the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.

EU HAZARD CLASSIFICATION OF INGREDIENTS PER DIRECTIVE 1272/2008/EC:
Index Number:
EC# 231-595-3 This substance is not classified in the Annex VI of Directive 67/548/EEC
EC# 237-081-9 This substance is not classified in the Annex VI of Directive 67/548/EEC
EC# 233-140-8 Annex VI Index# 017-013-00-2
EC# 232-094-6 This substance is not classified in the Annex VI of Directive 67/548/EEC
Substances not listed either individually or in group entries must be self classified.

Component(s) Contributing to Classification(s)
All Components

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2.2 LABEL ELEMENTS:

GHS Hazard Classification(s):

Skin Irritant Category 2
Eye Irritant Category 2A
STOT SE Category 3

Hazard Statement(s):

H315: Causes skin irritation
H319: Causes serious eye irritation
H335: May cause respiratory irritation

Precautionary Statement(s):

P261: Avoid breathing fume/mist/vapors/spray
P264: Wash skin after handling
P281: Use personal protective equipment as required

EU HAZARD CLASSIFICATION OF INGREDIENTS PER DIRECTIVE 1999/45/EC:

[Xi] Irritant

Risk Phrases:

R36/37/38: Irritating to eyes, respiratory system and skin

Safety Phrases:

S24/25: Avoid contact with skin and eyes
S45: In case of accident or if you feel unwell, seek medical attention immediately,

2.3 HEALTH HAZARDS OR RISKS FROM EXPOSURE:

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of exposure for this product are by inhalation, skin contact, eye contact or ingestion.

ACUTE:

INHALATION: Inhalation may be irritating to the respiratory tract.

CONTACT WITH SKIN: Repeated or prolonged contact may cause skin irritation.

EYE CONTACT: Contact may irritate the eyes, resulting in redness or watering.

INGESTION: Ingestion of a large quantity may cause gastrointestinal irritation with nausea and vomiting.

CHRONIC: None known

TARGET ORGANS: Acute: Eyes, Skin, Respiratory System **Chronic:** None Known

3. COMPOSITION AND INFORMATION ON INGREDIENTS

Hazardous Ingredients:	WT%	CAS#	EINECS #	Hazard Classification	Risk Phrases
Sodium Chloride	>99%	7647-14-5	231-598-3	[Xi] Irritant	R36/37/38
YPS (Yellow Prussiate of Soda) Sodium Ferrocyanide	0.0075%	13601-19-9	237-081-9	Not Classified	None
Liquid Calcium Chloride (Anhydrous, 20 – 45% $CaCl_2$ Solution)	0.0017%	10043-52-4	233-140-8	[Xi] Irritant	R36
Caliber, Blue Magic, Type I	<1%	7786-30-3	232-094-6	Not Classified	None
Liquid Calcium Chloride may be present on salt. Added to YPS delivery system during cold months					
Balance of other ingredients is less than 1% in concentration (or 0.1% for carcinogens, reproductive toxins, or respiratory sensitizers).					

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2010 format. This product has been classified in accordance with the hazard criteria of the CPR and the SDS contains all the information required by the CPR, EU Directives and the Japanese Industrial Standard *JIS Z 7250: 2000*.

4. FIRST-AID MEASURES

4.1 DESCRIPTION OF FIRST AID MEASURES:

EYE CONTACT: If product enters the eyes, open eyes while under gentle running water for at least 15 minutes. Seek medical attention if irritation persists.

SKIN CONTACT: If product contacts skin, wash skin thoroughly with soap and water after handling. Seek medical attention if irritation develops and persists.

INHALATION: If breathing becomes difficult, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Seek medical attention.

INGESTION: If product is swallowed, call physician or poison control center for most current information. If professional advice is not available, do not induce vomiting. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow. Seek medical advice. Take a copy of the label and/or SDS with the victim to the health professional.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known

4.2 SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED:

Exposure to this product may cause irritation to skin and eyes. Inhalation of dust may cause irritation to respiratory system. May be harmful if swallowed with digestive tract irritation and vomiting.

4.3 RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

5. FIRE-FIGHTING MEASURES

5.1 FIRE EXTINGUISHING MATERIALS:

Use fire extinguishing methods below:

Water Spray: Yes	Carbon Dioxide: Yes
Foam: Yes	Dry Chemical: Yes
Halon: Yes	Other: Any "C" Class

5.2 UNUSUAL FIRE AND EXPLOSION HAZARDS:

None known

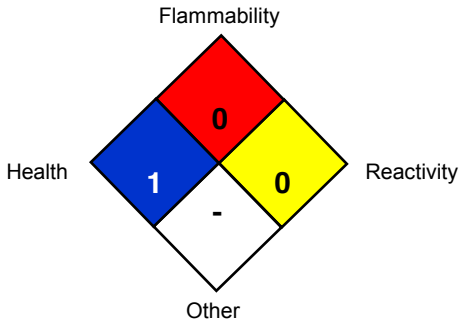
Explosion Sensitivity to Mechanical Impact: No

Explosion Sensitivity to Static Discharge: No

5.3 SPECIAL FIRE-FIGHTING PROCEDURES:

Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Isolate materials not yet involved in the fire and protect personnel. Move containers from fire area if this can be done without risk; otherwise, cool with carefully applied water spray. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING SYSTEM



HMIS RATING SYSTEM

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

HEALTH HAZARD (BLUE)	1
FLAMMABILITY HAZARD (RED)	0
PHYSICAL HAZARD (YELLOW)	0

PROTECTIVE EQUIPMENT

EYES	RESPIRATORY	HANDS	BODY
	See Sect 8		See Sect 8

For Routine Industrial Use and Handling Applications

Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate **3** = Serious **4** = Severe * = Chronic hazard

6. ACCIDENTAL RELEASE MEASURES

6.1 PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES:

See section 8.2 for Exposure Controls.

6.2 ENVIRONMENTAL PRECAUTIONS:

No specific hazards connected with leaks and splits.

6.3 SPILL AND LEAK RESPONSE:

Sweep up spilled materials and place in appropriate container for disposal or re-use. Dispose of in accordance with U.S. Federal, State, and local hazardous waste disposal regulations and those of Canada and its Provinces, those of Australia, Japan and EU Member States (see Section 13, Disposal Considerations).

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7. HANDLING and STORAGE

7.1 PRECAUTIONS FOR SAFE HANDLING:

Establish good personal hygiene and work practices. Always wash hands and face before eating, drinking or smoking.

7.2 STORAGE AND HANDLING PRACTICES:

Store in a dry area with <75% relative humidity to avoid caking.

7.3 SPECIFIC USES:

De-icing roads and walkways.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

8.1 EXPOSURE PARAMETERS:

Chemical Name	CAS#	ACGIH TLV	OSHA TWA
Sodium Chloride	7647-14-5	10 mg/m³ Total Dust	15 mg/m³ Total Dust

8.2 EXPOSURE CONTROLS:

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided above.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132) or equivalent standard of Canada, or standards of EU member states (including EN 149 for respiratory PPE, and EN 166 for face/eye protection), and those of Japan. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Not normally required when using this product. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), equivalent U.S. State standards, Canadian CSA Standard Z94.4-93, the European Standard EN149, or EU member states.

EYE PROTECTION Safety glasses or goggles are recommended to prevent eye contact. If necessary, refer to U.S. OSHA 29 CFR 1910.133, Canadian Standards, and the European Standard EN166, Australian Standards, or relevant Japanese Standards.

HAND PROTECTION: Protective gloves are recommended to prevent skin contact. If necessary, refer to U.S. OSHA 29 CFR 1910.138, the European Standard DIN EN 374, the appropriate Standards of Canada, Australian Standards, or relevant Japanese Standards.

BODY PROTECTION: Use body protect appropriate to task being performed. If necessary, refer to appropriate Standards of Canada, or appropriate Standards of the EU, Australian Standards, or relevant Japanese Standards.

9. PHYSICAL and CHEMICAL PROPERTIES

9.1 INFORMATION ON BASIC PHYSICAL AND CHEMICAL PROPERTIES:

APPEARANCE (Physical State) and COLOR: This product is a white to off-white to light blue to gray crystalline solid with no odor.
ODOR: None
ODOR THRESHOLD: Not Applicable
pH: Not Applicable
MELTING/FREEZING POINT: Not Applicable
BOILING POINT: >2575˚F
FLASH POINT: Not Applicable
EVAPORATION RATE (n-BuAc=1): Not Available
FLAMMABILITY (SOLID, GAS): Not Applicable
UPPER/LOWER FLAMMABILITY OR EXPLOSION LIMITS: Not Applicable
VAPOR PRESSURE (mm Hg @ 20°C (68°F): 2.4 mm @ 1376°F
VAPOR DENSITY: Not Applicable
RELATIVE DENSITY: Not Applicable
DENSITY: Not Applicable
SPECIFIC GRAVITY: 2.165
SOLUBILITY IN WATER: 317 g/l @ 60°F
WEIGHT PER GALLON: Not Available
PARTITION COEFFICENT (n-octanol/water): Not Applicable

AUTO-IGNITION TEMPERATURE: Not Applicable
DECOMPOSITION TEMPERATURE: Not Available
VISCOSITY: Not Available
VOC g/l / Lb/gal: 0

9.2 OTHER INFORMATION:
No additional information available.

10. STABILITY and REACTIVITY

10.1 REACTIVITY:
This product is not reactive.

10.2 STABILITY:
Stable under conditions of normal storage and use.

10.3 POSSIBILITY OF HAZARDOUS REACTIONS:
Chemical reactions occur when this product is involved with strong acids such as sulfuric or nitric acid.

10.4 CONDITIONS TO AVOID:
Incompatible materials

10.5 MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE:
Strong acids

10.6HAZARDOUS DECOMPOSITION PRODUCTS:
Thermal decomposition products include hydrochloric acid.

11. TOXICOLOGICAL INFORMATION

11.1 INFORMATION ON TOXICOLOGICAL EFFECTS:

TOXICITY DATA:
CAS#: 7647-14-5
Oral, rat: LD50 = 3,000 mg/kg;

SUSPECTED CANCER AGENT: None of the ingredients within this product are found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, or CAL/OSHA and therefore are not considered to be, or suspected to be, cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: This product may be irritating to skin, eyes or respiratory system.

SENSITIZATION TO THE PRODUCT: This product is not considered a respiratory system or skin sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: No information concerning the effects of this product and its components on the human reproductive system.

SPECIFIC TARGET ORGAN TOXICITY – SINGLE EXPOSURE: Eyes, respiratory System and Skin

SPECIFIC TARGET ORGAN TOXICITY – REPEATED EXPOSURE: None known

ASPIRATION HAZARD: None

12. ECOLOGICAL INFORMATION

12.1 TOXICITY:
This material is water soluble and occurs naturally, and is unlikely to have any long term effect on the environment. However, large or frequent applications or spills can have a potentially damaging effect on the environment.

12.2 PERSISTENCE AND DEGRADABILITY:
This material is not organic and therefore does not undergo biodegradation.

12.3 BIOACCUMULATIVE POTENTIAL:
Based on available information, the sodium chloride present may bioaccumulate in some aquatic organisms.

12.4 MOBILITY IN SOIL:
This material is water soluble and is expected to move rapidly with surface water or ground water flows.

12.5 RESULTS OF PBT ANDvPvB ASSESSMENT:
No specific data available on this product.

12.6 OTHER ADVERSE EFFECTS:
No specific data available on this product.
ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

12.7 WATER ENDANGERMENT CLASS:
Water endangering in accordance with EU Guideline 91/155-EWG. Not determined

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13. DISPOSAL CONSIDERATIONS

13.1 WASTE TREATMENT METHODS:

Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations, those of Canada, Australia, EU Member States and Japan.

13.2 EU Waste Code:

Not determined

14. TRANSPORTATION INFORMATION

US DOT, IATA, IMO, ADR:

U.S. DEPARTMENT OF TRANSPORTATION (DOT) SHIPPING REGULATIONS: This product is classified (per 49 CFR 172.101) by the U.S. Department of Transportation, as follows.

14.1 PROPER SHIPPING NAME: Non-Regulated Material

14.2 HAZARD CLASS NUMBER and DESCRIPTION: None

14.3 UN IDENTIFICATION NUMBER: None

14.4 PACKING GROUP: None

14.5 DOT LABEL(S) REQUIRED: None

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER: None

RQ QUANTITY: None

14.6 MARINE POLLUTANT: None of the components of this product are designated by the Department of Transportation to be Marine Pollutants (49 CFR 172.101, Appendix B).

14.7 SPECIAL PRECAUTIONS FOR USER:

Avoid exposure

14.8 INTERNATIONAL TRANSPORTION:

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This product is not considered as dangerous goods.

INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO): This product is not considered as dangerous goods.

14.9 TRANSPORT IN BULK ACCORDING TO ANNEX II OF MARPOL 73/78 AND IBC CODE:

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This product is not considered by the United Nations Economic Commission for Europe to be dangerous goods.

15. REGULATORY INFORMATION

15.1 UNITED STATES REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: The components of this product are not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for the components of this product. The default Federal SDS submission and inventory requirement filing threshold of 10,000 lbs (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. CERCLA REPORTABLE QUANTITY (RQ): None

U.S. TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory or are exempted form listing.

OTHER U.S. FEDERAL REGULATIONS: None

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Ingredients within this product are not on the Proposition 65 Lists.

15.2 CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: All components are DSL Listed, NDSL Listed and/or are exempt from listing.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS:

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the SDS contains all of the information required by those regulations.

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: This product is "Not Controlled", per WHMIS Controlled Product Regulations.

15.3 EUROPEAN ECONOMIC COMMUNITY INFORMATION:

This product does meet the definition of a hazardous substance or preparation as defined by the European Union Council Directives 67/548/EEC, 1999/45/EC, 1272/2008/EC and subsequent Directives.
See Section 2 for full Details.

15.4 AUSTRALIAN INFORMATION FOR PRODUCT:

The components of this product are listed on the International Chemical Inventory list.

15.5 JAPANESE INFORMATION FOR PRODUCT:

JAPANESE MINISTER OF INTERNATIONAL TRADE AND INDUSTRY (MITI) STATUS:

The components of this product are not listed as Class I Specified Chemical Substances, Class II Specified Chemical Substances, or Designated Chemical Substances by the Japanese MITI.

JAPANESE ENCS INVENTORY:

The components of this product are on the ENCS Inventory as indicated in the section on International Chemical Inventories, below.

POISONOUS AND DELETERIOUS SUBSTANCES CONTROL LAW:

No component of this product is a listed Specified Poisonous Substance under the Poisonous and Deleterious Substances Control Law.

15.6 INTERNATIONAL CHEMICAL INVENTORIES:

Listing of the components on individual country Chemical Inventories is as follows:
Asia-Pac: Listed
Australian Inventory of Chemical Substances (AICS): Listed
Korean Existing Chemicals List (ECL): Listed
Japanese Existing National Inventory of Chemical Substances (ENCS): Listed
Philippines Inventory if Chemicals and Chemical Substances (PICCS): Listed
Swiss Giftliste List of Toxic Substances: Listed
U.S. TSCA: Listed

16. OTHER INFORMATION

16.1 ABBREVIATIONS AND ACRONYMS:

ARD: European Agreement concerning the International Carriage of Dangerous Goods by Road
IMDG: International Maritime Code for Dangerous Goods
DOT: US Department of Transportation
IATA: International Air Transport Association
ACGIH: American Conference of Governmental Industrial Hygienists
NFPA: National Fire Protection Association (USA)

PREPARED BY: Paul Eigbrett – (**GHS MSDS Compliance PLUS)**

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END OF SDS SHEET