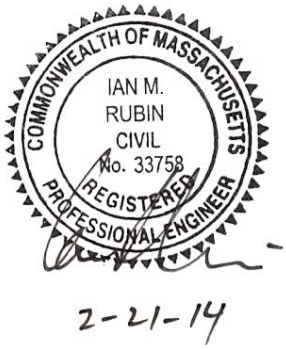
PROJECT REPORT

FOR

NEW ENGLAND SHIRDI SAI PARIVAAR TEMPLE
BOSTON ROAD
GROTON, MA



FEBRUARY 21, 2014

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1. DRAINAGE REPORT

1.1 Site Description

Parcel of land currently has about 20 acres of uplands and two separate wetland areas: one a large vernal pool about 9 acres, and the other a small vegetated wetland about .1 acres. This parcel has access from Boston Road on the South-West side; the vernal pool is towards the North-West side; towards the North-East is a new housing development (Monarch Path); and the South-East side are residential single family homes in Littleton (Ernie's Drive). The parcel is divided with about 3 acres of upland in Littleton.

The upland is a hill sloping down in all directions with steeper slopes on the street and vernal pool sides. There are some prominent rock outcrops. The land is densely wooded with a mixture of deciduous and coniferous. A few larger trees, mostly in the lower areas, measure up to about 38" in diameter. In reference to NRCS (National Resources Conservation Service) soil survey, the majority of the uplands is a Hollis (rock outcrop)-Charlton (fine sandy loam) complex. In the higher areas, there is little Charlton and mostly Hollis rock outcrop. Towards the North-Eastern side is Canton fine sandy loam. Parallel to the street is Quonset loamy sand.

From on-site soil tests, depth to refusal on steeper slopes was found to be at about 5 feet. However, in more level areas, no refusal was encountered, and soils varied from loamy sands to fine and coarse sands and gravels. Depth to high groundwater in loamy sands was about 60 inches on higher grounds and 20 inches in places at lower elevation. In the case of sands and gravels, groundwater was not encountered. For full details see Soil Tests Report.

1.2 Catchment Areas

In **current conditions**, the site can be divided up into four separate catchment areas – each with separate design points. Catchment Area 1 feeds the vernal pool. The design point is taken as anywhere along the waters' edge, or wetland line. Catchment Area 2 feeds an existing catch basin on Boston Road. Catchment Area 3 directs runoff towards lots with houses on Ernie's Drive. Catchment 4 feeds the smaller wetlands area in the North Eastern corner of the property.

Catchments 3 and 4 eventually combine by tying into the storm drains on Ernie's Drive, but have been evaluated independently to determine impacts on each design point.

The vernal pool itself is included within the wetland area as a whole. As no changes to this wetland area are proposed, the wetland area is not included in the drainage calculations. In both pre- and post-conditions, the design point is at the bordering vegetated wetland line.

In **proposed conditions**, the land is divided into smaller sub-catchments that eventually feed the same design points as above. The smaller sub-catchments feed storm drains and eventually retention ponds – as for design points 1, 2 and 4. For design point 3, the catchment area with development is reduced in size with no further changes.

In addition to Design Points 1 to 4, all parking areas (5 total) are proposed with porous paving. Here these areas collect all rainfall within the parking areas, treat the runoff and are designed to ensure infiltration to existing soils within a period of less than 72 hours.

In all circumstances, drainage is designed to ensure that for all storm events, 2-year, 10-year, 25-year and 100-yr, there is no increase in rate or volume of stormwater runoff. Also, all Massachusetts Stormwater Management Standards are applied where appropriate – see below.

The overall site in percentages of area is as follows:

Current Conditions	
Impervious surfaces (Buildings and Pavement)	0.3%
Lawn	1.0 %
Woods	67.2%
Wetlands	0.1%
Vernal Pool	31.3%

Proposed Conditions	
Buildings	3.2%
Porous Pavement	6.0%
Sidewalks	1.9%
Lawn	20.5%
Woods	31.6%
Vernal Pool	31.3%
Wetlands	0.1%

1.3 Methods of Calculations

Calculations are based upon standard methodologies set forth in U.S. Soil Conservation Service TR-55 and TR-20 and performed by *HydroCAD Software*. More specifically, the rainfall is based upon a design storm in 24 hours, and a Type III Rainfall. The size of storm is as follows:

Storm Event	24-hr Precipitation
100-yr	6.6”
25-yr	5.4”
10-yr	4.5”
2-yr	3.2”

All calculations are carried out with the use of *HydroCAD Software* and based upon SCS Tr-55 and TR-20. As in standard practice, the Antecedent Moisture Content (AMC) is assumed normal in the calculations, that being AMC 2.

Formulae Used:

Time of Concentration, T_c, is calculated by summing different travel times, T_t, for each consecutive different type of flow from runoff. The types of flow in the design considered are as follows:

TR-55 Sheet Flow,

$$T_t = 0.007(nL)^{0.8} / (P_2^{0.5}.s^{0.4})$$

where:

T_t =Travel time [hours]
n = Manning's coefficient for sheet flow (See table)
L = Flow length [feet]
P_2 = 2-year, 24-hour rainfall [inches]
S = Land slope (along flow path) [ft/ft]

TR-55 Shallow Concentrated Flow,

$$T_t = L/V \text{ and } V = K_v.S^{1/2}$$

where:

V = Average velocity
K_v = Velocity factor
S = Land slope (along flow path) [rise/run]

and Channel Flow which is calculated using Manning's Equation.

The **amount of runoff** for a given storm event is determined by the SCS Runoff Equation is:

$$Q = (P-0.2S)^2/(P+0.8S) \text{ and } S = 1000/CN - 10,$$

where:

Q = Precipitation excess (runoff) [inches or mm]
P = Cumulative precipitation [inches or mm]
S = Potential maximum retention [inches]
CN = Curve number (TR-55)

For further details in design see **Massachusetts Stormwater Management Standards**.

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EXISTING CONDITIONS TABULATED DATA

sub-	Soil A			Soil B			Soil C			Soil D			
catchment	Imperv.	Grass	Woods	Imperv.	Grass	Woods	Imperv.	Grass	Woods	Imperv.	Grass	Woods	Wets
1	2099	6989	0	0	0	14129	0	0	308662	0	0	166565	0
2	2040	5422	589	0	0	0	0	0	79970	0	0	6447	0
3	0	0	0	0	0	0	0	0	106513	0	0	15519	0
4	0	0	0	0	0	69719	0	0	67777	0	0	0	0
Vernal	0	0	0	0	0	0	0	0	0	0	0	0	389402
Wets	0	0	0	0	0	0	0	0	0	0	0	0	1667
	4139	12411	589	0	0	83848	0	0	562922	0	0	188531	391069
	17139			83848			562922			188531			852440

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PROPOSED CONDITIONS TABULATED DATA

sub-	Soils A			Soils B		Soils C						Soils D							
catchment	road	grass	woods	grass	woods	road	sw	roof	grass	woods	porous p	road	sw	roof	f-pond	grass	woods	porous p	wets
1	2453	692	0	0	0	2007	0	0	1037	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	6593	0	0	5925	7119	0	460	0	0	0	475	2889	0	0
4	0	0	0	0	0	0	0	0	3559	4971	0	11870	5585	871	414	24404	11026	0	0
5	0	0	0	0	0	0	0	0	0	0	27927	0	0	0	0	0	0	4671	0
6	0	0	0	0	0	0	0	0	0	0	7544	0	0	0	0	2893	0	26311	0
7	0	0	0	0	0	0	0	0	0	0	0	8839	4285	0	449	12414	0	0	0
8	0	0	0	0	0	6496	1194	0	5561	0	0	2250	2786	0	353	8342	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2718	0
10	0	0	0	0	0	0	0	0	0	0	2691	0	0	0	0	0	0	0	0
11	0	0	0	0	0	7020	1895	0	12054	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	5554	1702	0	0	9446	0	0	0
14	0	0	0	0	0	11527	5213	0	16907	0	0	865	381	0	0	1707	0	0	0
15	0	500	470	0	0	0	0	0	614	69866	0	0	0	0	0	0	6447	0	0
16	0	0	0	0	0	0	0	0	5679	43449	0	0	0	0	0	0	0	0	0
17	0	0	0	20542	47421	0	78	2790	17042	20323	0	0	0	0	0	0	0	0	0
18	0	5384	4710	191	13938	0	0	0	51556	163979	0	0	0	0	0	3108	0	0	0
19	0	0	0	1756	0	0	0	0	19265	0	0	0	0	0	0	0	0	0	0
20	0	0	0	0	0	0	0	0	0	0	2605	0	0	0	0	0	0	0	0
21	0	0	0	0	0	0	0	0	8020	0	0	0	0	0	0	7800	0	0	0
22	0	2930	0	0	0	0	0	0	1420	0	0	0	0	0	0	0	0	0	0
wet 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	389402
wet 2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1667
temple	0	0	0	0	0	0	0	4304	0	0	0	0	0	17216	0	0	0	0	0
auditorium	0	0	0	0	0	0	0	14690	0	0	0	0	0	0	0	0	0	0	0
	2453	9506	5180	22489	61359	33643	8380	21784	148640	309707	40767	29838	14739	18087	1216	70589	20362	33700	391069
	17139			83848		562921						188531							391069

1.5 Runoff Tabulated Results

Existing Conditions [cfs]/[AF]

Design Pt.	2 yr	10 yr	25 yr	100 yr
1	7.63	15.90	22.24	31.15
	0.799	1.589	2.204	3.083
2	1.35	2.89	4.07	5.75
	0.143	0.288	0.403	0.567
3	2.08	4.44	6.27	8.84
	0.185	0.374	0.522	0.734
4	0.80	2.40	3.76	5.79
	0.110	0.268	0.402	0.602

Proposed Conditions [cfs]/[AF]

Design Pt.	2 yr	10 yr	25 yr	100 yr
1 (Reach 34)	4.69	10.64	15.32	23.35
	0.480	1.193	1.825	2.829
2 (Subs 1 & 15)	1.20	2.57	3.63	5.13
	0.140	0.279	0.387	0.541
3 (Sub 16)	0.76	1.68	2.40	3.41
	0.078	0.157	0.219	0.308
4 (Reach 21)	0.71	2.03	3.13	4.77
	0.107	0.247	0.364	0.536

1.6 Conclusion

These calculations show that for any major storm event (100-year, 25-year, 10-year and 2-year storms) using a combination of porous paving, detention/retention ponds, infiltration bed and other control devices, the proposed design mitigates any increases of runoff from development – in both rates of runoff and volumes of runoff.

2. POROUS PAVING

2.1 Benefits

The Porous Pavement is proposed at this development for these specific reasons:

- Reduction in size if recharge basins
- Better distribution of where stormwater is infiltrated

2.2 Design

All parking lots are design with porous asphalt and with appropriate choker course, filter course, filter blanket and reservoir course. Underlying native materials vary: in the major parking lot on the vernal pool side, the existing slope is fairly steep and requires terracing. Also, the finished level of the paving is substantially higher in elevation and reservoir course of crushed stone is proposed as the fill material.

Some areas are over ledge. In these areas sub-drains are proposed to move water to areas beneath the porous paving where suitable existing soils are to provide adequate infiltration. The soils on this site, where there are deep enough soils, are all highly pervious soils – loamy sands that have a Rawls rate exceeding 2.4 in/hr. Designing for a 100-yr storm, where the rainfall is designed as 6.6 inches, the minimum infiltration area required to ensure that the entire storm volume recharges in less than 72 hours can be calculated as follows:

Area as a percentage of paved surface = 6.6/(2.41x72) x 100
= 3.8%

What this implies is that a relatively small area will suffice as long as enough reservoir course volume is available for temporary storage.

Full details of design are shown on plan.

3. SITE CUT & FILL VOLUME CALCULATIONS

Calculations are done by the Grid Method. The Grid method calculates volumes using a grid overlaid on the two surfaces (existing contours versus proposed contours) that comprise the current stratum. This method calculates the volumes by using the prismoidal volume of all grids and summarizing. This method is most accurate when the grid spacing is less than the average surface data spacing. In this case the grid spacing is ten feet.

Groton Temple Total Earthworks				
Stratum		Cut	Fill	Net
Surface 1	Surface 2	Cu. Yds	Cu.Yds	Cu. Yds
Existing Grade	Proposed Grade	36,256	41,478	5,222

4. MASSACHUSETTS STORMWATER MANAGEMENT STANDARDS

Standard 1 – Computations to show that discharge does not cause scour or erosion

There are 4 areas where point discharges occur (see table below). At each of these locations a suitable energy dissipater is provided to establish slower flow over existing undisturbed natural terrain. The flow rates at the points of discharge are shown below for all storm events.

Taking Retention Pond 2 for a 25-yr storm event as an example, the velocity of flow can be determined by Manning's Equation (channel flow). That is,

$$V = (1.486/n)*R_h^{2/3}*S^{1/2}$$

and, $R_h = A/P$

where, n is Manning's Coefficient
R_h is Hydraulic Radius
S is slope
A is Cross-sectional area
P is wetted perimeter

In this example,

n = 0.4 for woods with light underbrush
S = 0.20

Assuming wetted perimeter created by energy dissipater as 10 feet, and estimating the depth of flow to be 0.156' (determined by trial and error), then

$$R_h = 1.56/10 = 0.156 \text{ ft.}$$

and, $V = (1.486/0.4)*(0.156)^{2/3}*(0.20)^{1/2} = 0.48$ fps

Then checking the cross-sectional area,

$$A = Q/V = 0.75/0.48 = 1.56 \text{ ft.}$$ …O.K.

This is done for all cases as shown below.

Point Discharge	Outlet Flow [cfs]			
	2-yr	10-yr	25-yr	100-yr
Retention Pond 1	0.06	0.10	0.72	1.60
Retention Pond 2	0.00	1.49	3.17	7.48
Retention Pond 3	0.12	0.17	0.46	3.71
Infiltration Bed	0	0	0.45	1.84

Point Discharge	Natural Terrain		Velocity over natural terrain [fps]			
	Flow Length	Slope	2-yr	10-yr	25-yr	100-yr
Retention Pond 1	109	0.014	0.08	0.10	0.21	0.29
Retention Pond 2	103	0.175	0.00	0.61	0.82	1.16
Retention Pond 3	124	0.113	0.20	0.22	0.33	0.77
Infiltration Bed	103	0.155	0.00	0.00	0.36	0.64

All cases show a discharge velocity that is satisfactory, that is, without causing serious scouring or erosion over the natural terrain.

Standard 2 – Peak Rate Attenuation

From results in Drainage Calculations, peak rates of runoff with development in almost all cases are less than current conditions. Where rates are essentially the same applies only in one case, that being, the 2-year storm event at the existing catch basin on Boston Road (Design Point 2). See tabulated results in the Drainage Report.

Standard 3 – Stormwater Recharge

- **Soil Evaluation**

Though the drainage calculations are done based upon the Hydrologic Soil Group, further soil tests were done (see Soil Test Results) in the location of the retention ponds and infiltration bed. Hence, the infiltration rates, recharge volumes and other requirements in Stormwater Management are based upon the in situ testing.

More specifically, for each pond or infiltration basin, here are the results:

	Soil Type	ESHW	Rawls Rate [in/hr]
Retention Pond 1	LS	20"	2.41
Retention Pond 2	S	>120”	8.27
Retention Pond 3	LS	58"	2.41
Infiltration Bed	LS	60"	2.41

- **Required Recharge Volume**

From HSG as determined using NRSC maps, required Recharge Volumes when looking at the site as a whole are as follows:

HSG	Imp. Area [sq.ft.]	Target Depth Factor [in]	Rv [Ac.Ft.]	Rv [Cu.Ft.]
A	2,453	0.6	0.003	123
B	0	0.35	0.000	0
C	63,807	0.25	0.031	1329
D	63,880	0.1	0.012	532
		Total	0.046	1984

Volume recharged exceeds the required minimum (1,984 cu.ft.) by a substantial amount since the drainage is designed to ensure that the volume of runoff does not increase with development. Therefore, using the "static" method to calculate the recharge volume will suffice – that is, only the storage volume is considered – and not the amount actually recharged over the length of any particular storm.

- **Sizing**

Ponds act as both retention and detention ponds. The storage volumes are calculated from below the lowest invert elevation of all outlets.

	Ret. Volume [cu.ft.]
Retention Pond 1	546
Retention Pond 2	15,769
Retention Pond 3	3,583
Infiltration Bed	6,949
Total	27,843

As shown the potential storage volume way exceeds the required minimum.

- **72-hour Drawdown Analysis**

The drawdown time is the time it takes to recharge the full storage volume (see table above) using the Rawls Rate (see Table 2.3.3. in Massachusetts Stormwater Handbook). The results are shown in the table below:

	Ret. Volume [cu.ft.]	Rawls Rate [in/hr]	Pond Bottom Area [sq.ft.]	Drawdown Time [hrs]
Retention Pond 1	546	2.41	913	3.0
Retention Pond 2	15,769	8.27	1,565	14.6
Retention Pond 3	3,583	2.41	1,021	17.5
Infiltration Bed	6,949	2.41	2,430	14.2
Total	27,843			

- **Capture Area Adjustment**

In current conditions, there are four catchment areas each to a different design point. The areas of land for these catchments are as follows:

Design Point	Area (%)
1	58.5
2	11.1
3	14.3
4	16.1

In proposed conditions, there are the same design points. Combining the catchment areas to each design point, the areas are distributed as below:

Design Point	Area (%)
1	56.2
2	9.9
3	9.7
4	24.2

Design Points 3 and 4 both feed the same storm drains on Ernie's Drive – the numbers are then very close when comparing pre- vs. post-conditions: 30.4% vs. 33.9%. Also, Design Points 1 and 2 show a relatively small change with development.

- **Mounding Analysis**

See next page for typical Mounding Analysis calculations. The rainfall event in the calculations for the mounding is a two year storm – or the amount of exfiltration per pond is as calculated in a two-year storm event.

Tabulated Results:

	TH #	TH Elev.	G.W. Elev.	Ht. of Mounding	Elev. Of Mounding	Pond Bottom	Separation to G.W.
Retention Pond 1	713-5	235.7	234.0	0.97	234.97	236	1.03
Retention Pond 2	713-4	253.0	243.0	0.62	243.62	248	4.38
Retention Pond 3	TH - 14	251.5	244.5	2.18	246.68	252	5.32
Infiltration Bed	713-3	254.5	249.5	6.35	255.85	257	1.15

See following pages for calculations sheets per pond.

Stormwater Groundwater Mounding Calculator (Hantush Model)

Project Number **5041**
Project Location **Groton Temple, Groton, MA - POND 1**
Calculation by **Jonathan Markey, PE - 2/14/14**

Projected time since beginning of sorm to pond drain-down

Time	t	72	(Hours)	3 (days)

Leach Field Parameters

Length of Bed	L	88	(ft)	
Width of Bed	W	30	(ft)	
Field Dose Volume	Q	2178	CF	16291.44 (gal/day)
Stormwater Application Rate/unit area	I	0.825	(ft/day)	

Site Features

Soil Type		M. Sand	(texture)	
Hydraulic Conductivity of Aquifer	K	39	(ft/day)	*See Table 2*
Specific Yield of Aquifer	S_y	0.28	(ratio)	*See Table 3*
Height of saturated zone over imp. layer	h_o	20	(ft)	

Hantush Constants

Fitted Constant	C	1.4	*See Chart 1*
Fitted Constant	n	1.76	*See Chart 1*

Initial Estimate for Mound Height (Rise)	Z_{mi}	2	(ft)

Calculate Mound Height

$z_m = IC(L/4)^n(1/Kh)^{0.5n}(t/S_y)^{1-0.5n}$ $\quad h = h_o + (z_{mi}/2)$

Final Mound Height (Rise over h_o) Z_m **0.966388**

Table 2
Hydraulic Conductivity based on Rawls Rates

Texture Class	HSG	Infiltration Rate (In/Hr)	(ft/day)
Fine Gravel	A		1476
Meduim Gravel	A		886
Coarse Gravel	A		492
Coarse Sand	A		148
Medium Sand	A		39
Fine Sand	A	8.27	16.54
Loamy Sand	A	2.41	4.82
Sandy Loam	B	1.02	2.04
Fine Sandy Loam	B	0.52	1.04
Silt Loam	C	0.27	0.54
Sandy Clay Loam	C	0.17	0.34
Clay Loam	D	0.09	0.18
Silty Clay Loam	D	0.06	0.12
Sandy Clay	D	0.05	0.1
Silty Clay	D	0.04	0.08
Clay	D	0.02	0.04

Source:MA DEP Groundwater Mounding Seminar

L/W 2.933333

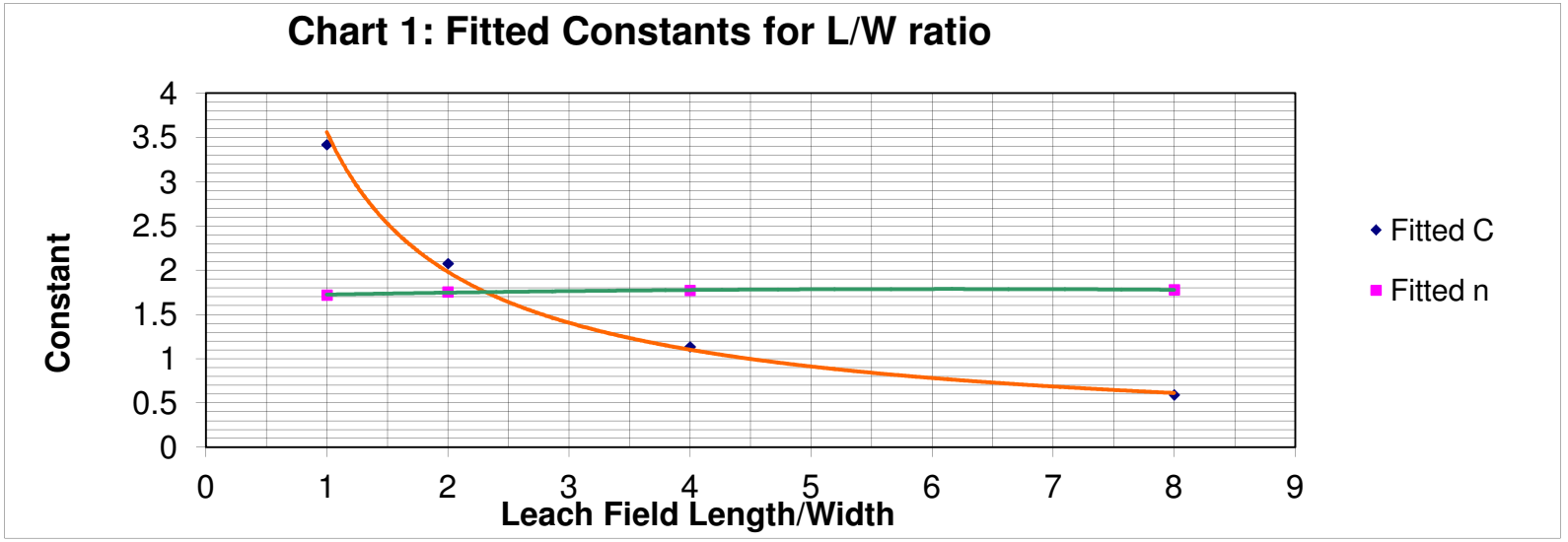
Table 1
Fitted Constants for L/W ratio

L/W	C	n
1	3.4179	1.7193
2	2.0748	1.7552
4	1.1348	1.7716
8	0.5922	1.7793

Table 3
Specific Yield of Aquifer

Texture Class	Specific Yield (%)
Coarse Gravel	0.23
Medium Gravel	0.24
Fine Gravel	0.25
Coarse Sand	0.27
Medium Sand	0.28
Fine Sand	0.23
Silt	0.08
Clay	0.03

Srce:MA DEP G.W Mound Seminar



Stormwater Groundwater Mounding Calculator (Hantush Model)

Project Number **5041**
Project Location **Groton Temple, Groton, MA - POND 2**
Calculation by **Jonathan Markey, PE - 2/14/14**

Projected time since beginning of sorm to pond drain-down

Time	t	72	(Hours)	3 (days)

Leach Field Parameters

Length of Bed	L	164	(ft)	
Width of Bed	W	70	(ft)	
Field Dose Volume	Q	5314	CF	39748.72 (gal/day)
Stormwater Application Rate/unit area	I	0.462892	(ft/day)	

Site Features

Soil Type		C. Sand	(texture)	
Hydraulic Conductivity of Aquifer	K	148	(ft/day)	*See Table 2*
Specific Yield of Aquifer	S_y	0.27	(ratio)	*See Table 3*
Height of saturated zone over imp. layer	h_o	20	(ft)	

Hantush Constants

Fitted Constant	C	1.7	*See Chart 1*
Fitted Constant	n	1.75	*See Chart 1*

Initial Estimate for Mound Height (Rise)	Z_{mi}	2	(ft)

Calculate Mound Height

$z_m = IC(L/4)^n(1/Kh)^{0.5n}(t/S_y)^{1-0.5n}$ $\quad h = h_o + (z_{mi}/2)$

Final Mound Height (Rise over h_o) Z_m **0.621011**

Table 2
Hydraulic Conductivity based on Rawls Rates

Texture Class	HSG	Infiltration Rate (In/Hr)	(ft/day)
Fine Gravel	A		1476
Meduim Gravel	A		886
Coarse Gravel	A		492
Coarse Sand	A		148
Medium Sand	A		39
Fine Sand	A	8.27	16.54
Loamy Sand	A	2.41	4.82
Sandy Loam	B	1.02	2.04
Fine Sandy Loam	B	0.52	1.04
Silt Loam	C	0.27	0.54
Sandy Clay Loam	C	0.17	0.34
Clay Loam	D	0.09	0.18
Silty Clay Loam	D	0.06	0.12
Sandy Clay	D	0.05	0.1
Silty Clay	D	0.04	0.08
Clay	D	0.02	0.04

Source:MA DEP Groundwater Mounding Seminar

Table 3
Specific Yield of Aquifer

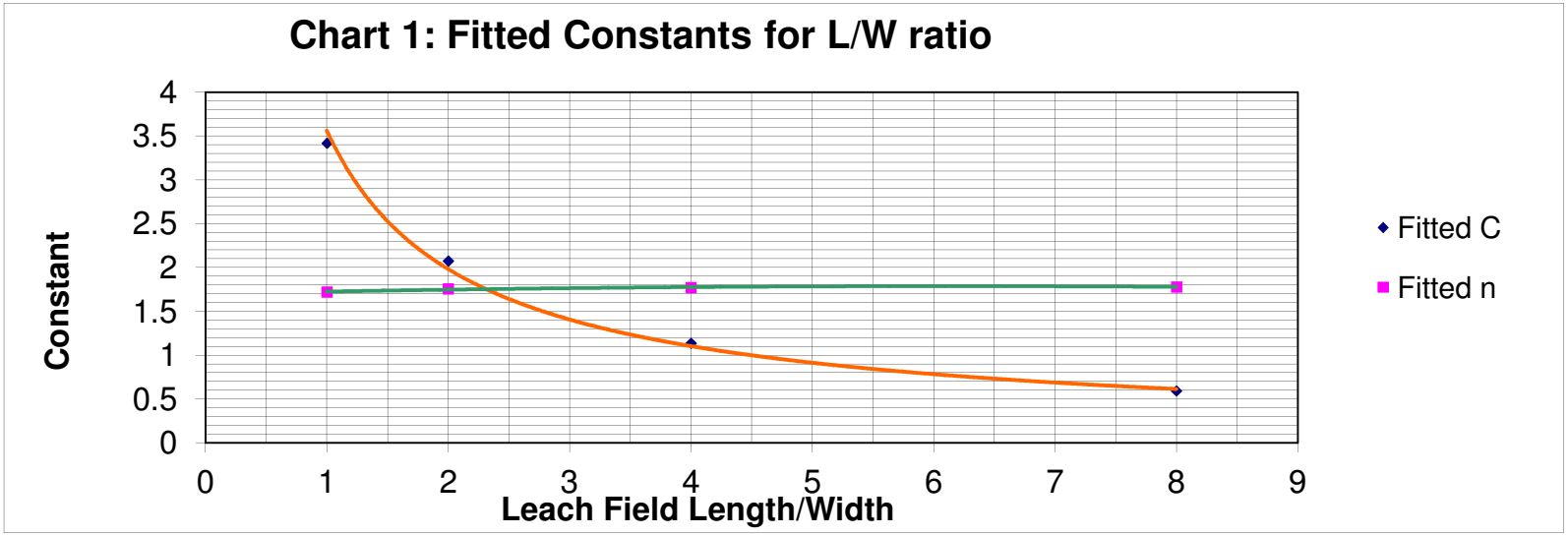
Texture Class	Specific Yield (%)
Coarse Gravel	0.23
Medium Gravel	0.24
Fine Gravel	0.25
Coarse Sand	0.27
Medium Sand	0.28
Fine Sand	0.23
Silt	0.08
Clay	0.03

Srce:MA DEP G.W Mound Seminar

L/W 2.342857

Table 1
Fitted Constants for L/W ratio

L/W	C	n
1	3.4179	1.7193
2	2.0748	1.7552
4	1.1348	1.7716
8	0.5922	1.7793



Stormwater Groundwater Mounding Calculator (Hantush Model)

Project Number **5041**
Project Location **Groton Temple, Groton, MA - POND 3**
Calculation by **Jonathan Markey, PE - 2/14/14**

Projected time since beginning of sorm to pond drain-down

Time	t	72	(Hours)	3 (days)

Leach Field Parameters

Length of Bed	L	128	(ft)	
Width of Bed	W	70	(ft)	
Field Dose Volume	Q	3179	CF	23778.92 (gal/day)
Stormwater Application Rate/unit area	I	0.354799	(ft/day)	

Site Features

Soil Type		M. Sand	(texture)	
Hydraulic Conductivity of Aquifer	K	39	(ft/day)	*See Table 2*
Specific Yield of Aquifer	S_y	0.28	(ratio)	*See Table 3*
Height of saturated zone over imp. layer	h_o	10	(ft)	

Hantush Constants

Fitted Constant	C	2.1	*See Chart 1*
Fitted Constant	n	1.73	*See Chart 1*

Initial Estimate for Mound Height (Rise) Z_{mi} 2 (ft)

Calculate Mound Height

$z_m = IC(L/4)^n(1/Kh)^{0.5n}(t/S_y)^{1-0.5n}$ $h = h_o + (z_{mi}/2)$

Final Mound Height (Rise over h_o) Z_m **2.178115**

Table 2
Hydraulic Conductivity based on Rawls Rates

Texture Class	HSG	Infiltration Rate (In/Hr)	(ft/day)
Fine Gravel	A		1476
Meduim Gravel	A		886
Coarse Gravel	A		492
Coarse Sand	A		148
Medium Sand	A		39
Fine Sand	A	8.27	16.54
Loamy Sand	A	2.41	4.82
Sandy Loam	B	1.02	2.04
Fine Sandy Loam	B	0.52	1.04
Silt Loam	C	0.27	0.54
Sandy Clay Loam	C	0.17	0.34
Clay Loam	D	0.09	0.18
Silty Clay Loam	D	0.06	0.12
Sandy Clay	D	0.05	0.1
Silty Clay	D	0.04	0.08
Clay	D	0.02	0.04

Source:MA DEP Groundwater Mounding Seminar

L/W 1.828571

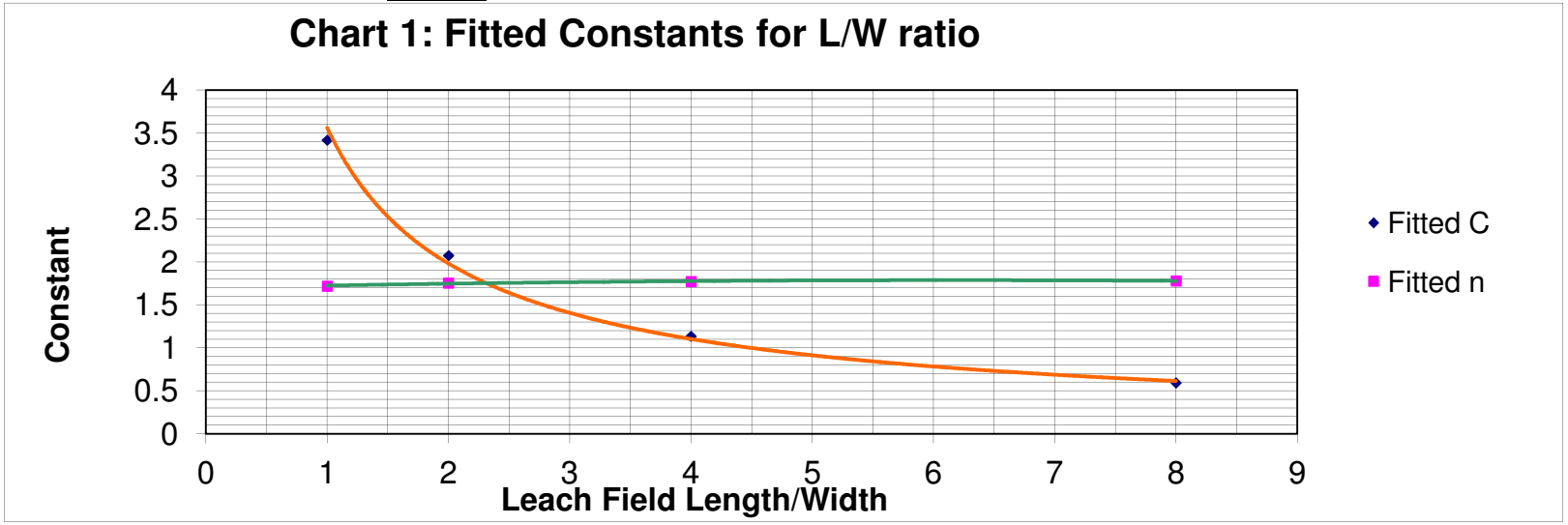
Table 1
Fitted Constants for L/W ratio

L/W	C	n
1	3.4179	1.7193
2	2.0748	1.7552
4	1.1348	1.7716
8	0.5922	1.7793

Table 3
Specific Yield of Aquifer

Texture Class	Specific Yield (%)
Coarse Gravel	0.23
Medium Gravel	0.24
Fine Gravel	0.25
Coarse Sand	0.27
Medium Sand	0.28
Fine Sand	0.23
Silt	0.08
Clay	0.03

Srce:MA DEP G.W Mound Seminar



Stormwater Groundwater Mounding Calculator (Hantush Model)

Project Number **5041**
Project Location **Groton Temple, Groton, MA - Inf. Bed**
Calculation by **Jonathan Markey, PE - 2/14/14**

Projected time since beginning of sorm to pond drain-down

Time	t	72	(Hours)	3	(days)

Leach Field Parameters

Length of Bed	L	54	(ft)		
Width of Bed	W	45	(ft)		
Field Dose Volume	Q	7753	CF	57992.44	(gal/day)
Stormwater Application Rate/unit area	I	3.190535	(ft/day)		

Site Features

Soil Type		M. Sand	(texture)	
Hydraulic Conductivity of Aquifer	K	39	(ft/day)	*See Table 2*
Specific Yield of Aquifer	S_y	0.28	(ratio)	*See Table 3*
Height of saturated zone over imp. layer	h_o	10	(ft)	

Hantush Constants

Fitted Constant	C	3.1	*See Chart 1*
Fitted Constant	n	1.72	*See Chart 1*

Initial Estimate for Mound Height (Rise)	Z_{mi}	3	(ft)

Calculate Mound Height

$z_m = IC(L/4)^n(1/Kh)^{0.5n}(t/S_y)^{1-0.5n}$ $\quad h = h_o + (z_{mi}/2)$

Final Mound Height (Rise over h_o) Z_m **6.354457**

Table 2
Hydraulic Conductivity based on Rawls Rates

Texture Class	HSG	Infiltration Rate (In/Hr)	(ft/day)
Fine Gravel	A		1476
Meduim Gravel	A		886
Coarse Gravel	A		492
Coarse Sand	A		148
Medium Sand	A		39
Fine Sand	A	8.27	16.54
Loamy Sand	A	2.41	4.82
Sandy Loam	B	1.02	2.04
Fine Sandy Loam	B	0.52	1.04
Silt Loam	C	0.27	0.54
Sandy Clay Loam	C	0.17	0.34
Clay Loam	D	0.09	0.18
Silty Clay Loam	D	0.06	0.12
Sandy Clay	D	0.05	0.1
Silty Clay	D	0.04	0.08
Clay	D	0.02	0.04

Source:MA DEP Groundwater Mounding Seminar

Table 3
Specific Yield of Aquifer

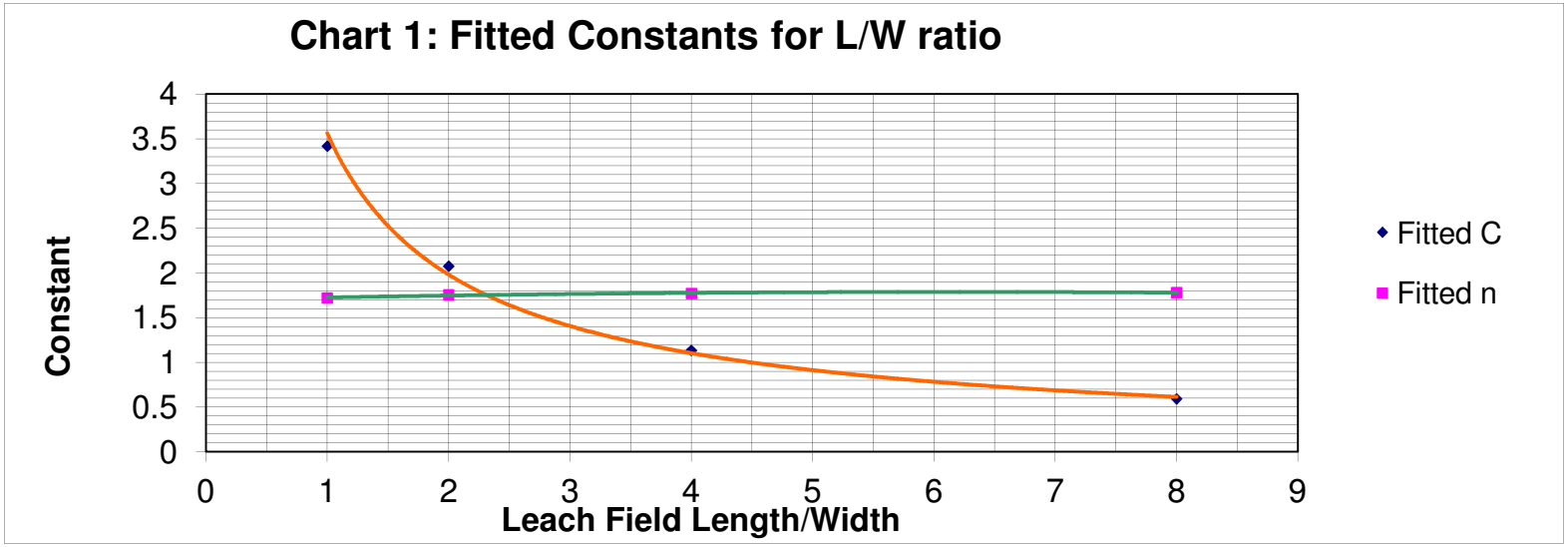
Texture Class	Specific Yield (%)
Coarse Gravel	0.23
Medium Gravel	0.24
Fine Gravel	0.25
Coarse Sand	0.27
Medium Sand	0.28
Fine Sand	0.23
Silt	0.08
Clay	0.03

Srce:MA DEP G.W Mound Seminar

L/W 1.2

Table 1
Fitted Constants for L/W ratio

L/W	C	n
1	3.4179	1.7193
2	2.0748	1.7552
4	1.1348	1.7716
8	0.5922	1.7793



Standard 4 – Required Water Quality Volume

Water quality volume is calculated from the impervious area collecting the runoff. A sediment forebay is provided for one pond, Pond 3, whereas for Ponds 1 and 2, a Stormceptor Model OSR 065 is proposed.

For the sediment forebay, the types of soils have a Rawl's Rate exceeding 2.4 in/hr and therefore the storage volume in the forebay is calculated from the first inch of runoff from the impervious area. That is,

Forebay volume in cu. ft. = 1 in. * imp. surface area in sq. ft. / 12.

	Imp. Area [sq.ft.]	Vol. Calc.	Design Vol.
Retention Pond 3	31457	2621	3016

For the Stormceptor Model OSR 065, the peak conveyance rate from the Water Quality Flow Rate table for Massachusetts Pretreatment is 5.5 cfs. The flow rate for both ponds considering 1" of runoff is less than 5.5 cfs.

Standard 5 – Land Uses with Higher Potential Pollutant Loads (LUHPPLs)

In the case of the Temple, the LUHPPLs do not exist. Nevertheless, as shown in Standard 4, the one-inch rule applies because of the rapid infiltration rate of soil types.

Standard 6 – Critical Areas

This applies to discharges within Zone II, Interim Wellhead Protection Areas or near or to other Critical Areas: Shellfish Growing Areas, Bathing Beaches, Outstanding Resource Waters, Special Resource Waters, and Cold-Water Fisheries. None of these conditions are prevail here.

Standard 7 – Computations demonstrating that the peak rate attenuation, recharge, and water quality treatment is provided to maximum extent practicable

See Drainage Report and Calculations that verify the above.

Standard 8 – Computations related to sizing of erosion and sediment controls

In addition to Standards 1 and 4 which provide the necessary calculations for erosion and sediment controls, see Erosion and Sediment Control Plans.

Standard 9 – Operations and Maintenance Plan

Operations and Maintenance is required during construction as well as once in operation.

For the construction phase, see Erosion and Sediment Control Plans as well as Stormwater Construction Site Inspection Report in Appendix 3.

For the long-term developed phase, see Stormwater Management System Operations and Maintenance Manual.

Standard 10 – Illicit Discharges

For Illicit Discharge see Stormwater Management System Operations and Maintenance Manual.

MARKEY & RUBIN, INC.
360 MASS. AVENUE, ACTON, MA 01720
PHONE: (978)264-4600

APPENDIX 1

TSS REMOVAL CALCULATION WORKSHEETS

INSTRUCTIONS:

Non-automated: Mar. 4, 2008

TSS Removal Calculation Worksheet

Location: Retention Pond 1 & 2

A BMP[1]	B TSS Removal Rate[1]	C Starting TSS Load*	D Amount Removed (B*C)	E Remaining Load (C-D)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Stormceptor	**0.55**	**0.75**	**0.41**	**0.34**
Wetbasin	**0.80**	**0.34**	**0.27**	**0.07**
	0.00	**0.07**	**0.00**	**0.07**
	0.00	**0.07**	**0.00**	**0.07**

Total TSS Removal = **93%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: **NESSP**

Prepared By: **Ian Rubin, PE**

Date: **19-Feb-14**

*Equals remaining load from previous BMP (E) which enters the BMP

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Retention Pond 3

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Deep Sump and Hooded Catch Basin	**0.25**	**1.00**	**0.25**	**0.75**
Sediment Forebay	**0.25**	**0.75**	**0.19**	**0.56**
Wet Basin	**0.80**	**0.56**	**0.45**	**0.11**
	0.00	**0.11**	**0.00**	**0.11**
	0.00	**0.11**	**0.00**	**0.11**

Total TSS Removal = **89%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: NESSP
Prepared By: **Ian Rubin, P.E.**
Date: **19-Feb-14**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

INSTRUCTIONS:
1. In BMP Column, click on Blue Cell to Activate Drop Down Menu
2. Select BMP from Drop Down Menu
3. After BMP is selected, TSS Removal and other Columns are automatically completed.

Version 1, Automated: Mar. 4, 2008

Location: Infiltration Basin

TSS Removal Calculation Worksheet

B BMP[1]	C TSS Removal Rate[1]	D Starting TSS Load*	E Amount Removed (C*D)	F Remaining Load (D-E)
Infiltration Basin	**0.80**	**1.00**	**0.80**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**
	0.00	**0.20**	**0.00**	**0.20**

Total TSS Removal = **80%**

Separate Form Needs to be Completed for Each Outlet or BMP Train

Project: NESSP
Prepared By: **Ian Rubin, P.E.**
Date: **19-Feb-14**

*Equals remaining load from previous BMP (E) which enters the BMP

Non-automated TSS Calculation Sheet must be used if Proprietary BMP Proposed
1. From MassDEP Stormwater Handbook Vol. 1

MARKEY & RUBIN, INC.
360 MASS. AVENUE, ACTON, MA 01720
PHONE: (978)264-4600

APPENDIX 2

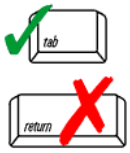
CHECKLIST FOR STORMWATER REPORT

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

A. Introduction

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



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

The Stormwater Report must include:

- The Stormwater Checklist completed and stamped by a Registered Professional Engineer (see page 2) that certifies that the Stormwater Report contains all required submittals.[1] This Checklist is to be used as the cover for the completed Stormwater Report.
- Applicant/Project Name
- Project Address
- Name of Firm and Registered Professional Engineer that prepared the Report
- Long-Term Pollution Prevention Plan required by Standards 4-6
- Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan required by Standard 8[2]
- Operation and Maintenance Plan required by Standard 9

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

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

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

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

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

Massachusetts Department of Environmental Protection
Bureau of Resource Protection - Wetlands Program

Checklist for Stormwater Report

B. Stormwater Checklist and Certification

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

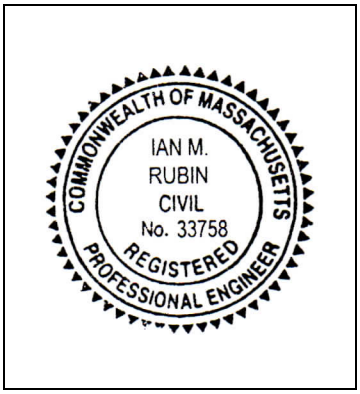
Note: Because stormwater requirements vary from project to project, it is possible that a complete Stormwater Report may not include information on some of the subjects specified in the Checklist. If it is determined that a specific item does not apply to the project under review, please note that the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

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

Registered Professional Engineer's Certification

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

Registered Professional Engineer Block and Signature



February 19, 2014

Signature and Date

Checklist

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

☒ New development

☐ Redevelopment

☐ Mix of New Development and Redevelopment

Checklist for Stormwater Report

Checklist (continued)

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

☒ No disturbance to any Wetland Resource Areas

☐ Site Design Practices (e.g. clustered development, reduced frontage setbacks)

☐ Reduced Impervious Area (Redevelopment Only)

☐ Minimizing disturbance to existing trees and shrubs

☐ LID Site Design Credit Requested:

- ☐ Credit 1
- ☐ Credit 2
- ☐ Credit 3

☐ Use of "country drainage" versus curb and gutter conveyance and pipe

☐ Bioretention Cells (includes Rain Gardens)

☐ Constructed Stormwater Wetlands (includes Gravel Wetlands designs)

☐ Treebox Filter

☐ Water Quality Swale

☐ Grass Channel

☐ Green Roof

☐ Other (describe): _____

Standard 1: No New Untreated Discharges

☒ No new untreated discharges

☒ Outlets have been designed so there is no erosion or scour to wetlands and waters of the Commonwealth

☒ Supporting calculations specified in Volume 3 of the Massachusetts Stormwater Handbook included.

Checklist for Stormwater Report

Checklist (continued)

Standard 2: Peak Rate Attenuation

☐ Standard 2 waiver requested because the project is located in land subject to coastal storm flowage and stormwater discharge is to a wetland subject to coastal flooding.

☐ Evaluation provided to determine whether off-site flooding increases during the 100-year 24-hour storm.

☒ Calculations provided to show that post-development peak discharge rates do not exceed pre-development rates for the 2-year and 10-year 24-hour storms. If evaluation shows that off-site flooding increases during the 100-year 24-hour storm, calculations are also provided to show that post-development peak discharge rates do not exceed pre-development rates for the 100-year 24-hour storm.

Standard 3: Recharge

☒ Soil Analysis provided.

☒ Required Recharge Volume calculation provided.

☐ Required Recharge volume reduced through use of the LID site Design Credits.

☐ Sizing the infiltration, BMPs is based on the following method: Check the method used.

☒ Static ☐ Simple Dynamic ☐ Dynamic Field[1]

☐ Runoff from all impervious areas at the site discharging to the infiltration BMP.

☒ Runoff from all impervious areas at the site is *not* discharging to the infiltration BMP and calculations are provided showing that the drainage area contributing runoff to the infiltration BMPs is sufficient to generate the required recharge volume.

☒ Recharge BMPs have been sized to infiltrate the Required Recharge Volume.

☐ Recharge BMPs have been sized to infiltrate the Required Recharge Volume *only* to the maximum extent practicable for the following reason:

- ☐ Site is comprised solely of C and D soils and/or bedrock at the land surface
- ☐ M.G.L. c. 21E sites pursuant to 310 CMR 40.0000
- ☐ Solid Waste Landfill pursuant to 310 CMR 19.000
- ☐ Project is otherwise subject to Stormwater Management Standards only to the maximum extent practicable.

☒ Calculations showing that the infiltration BMPs will drain in 72 hours are provided.

☐ Property includes a M.G.L. c. 21E site or a solid waste landfill and a mounding analysis is included.

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

Checklist for Stormwater Report

Checklist (continued)

Standard 3: Recharge (continued)

☒ The infiltration BMP is used to attenuate peak flows during storms greater than or equal to the 10-year 24-hour storm and separation to seasonal high groundwater is less than 4 feet and a mounding analysis is provided.

☒ Documentation is provided showing that infiltration BMPs do not adversely impact nearby wetland resource areas.

Standard 4: Water Quality

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

- Good housekeeping practices;
- Provisions for storing materials and waste products inside or under cover;
- Vehicle washing controls;
- Requirements for routine inspections and maintenance of stormwater BMPs;
- Spill prevention and response plans;
- Provisions for maintenance of lawns, gardens, and other landscaped areas;
- Requirements for storage and use of fertilizers, herbicides, and pesticides;
- Pet waste management provisions;
- Provisions for operation and management of septic systems;
- Provisions for solid waste management;
- Snow disposal and plowing plans relative to Wetland Resource Areas;
- Winter Road Salt and/or Sand Use and Storage restrictions;
- Street sweeping schedules;
- Provisions for prevention of illicit discharges to the stormwater management system;
- Documentation that Stormwater BMPs are designed to provide for shutdown and containment in the event of a spill or discharges to or near critical areas or from LUHPPL;
- Training for staff or personnel involved with implementing Long-Term Pollution Prevention Plan;
- List of Emergency contacts for implementing Long-Term Pollution Prevention Plan.

☐ A Long-Term Pollution Prevention Plan is attached to Stormwater Report and is included as an attachment to the Wetlands Notice of Intent.

☐ Treatment BMPs subject to the 44% TSS removal pretreatment requirement and the one inch rule for calculating the water quality volume are included, and discharge:

- ☐ is within the Zone II or Interim Wellhead Protection Area
- ☐ is near or to other critical areas
- ☐ is within soils with a rapid infiltration rate (greater than 2.4 inches per hour)
- ☐ involves runoff from land uses with higher potential pollutant loads.

☐ The Required Water Quality Volume is reduced through use of the LID site Design Credits.

☒ Calculations documenting that the treatment train meets the 80% TSS removal requirement and, if applicable, the 44% TSS removal pretreatment requirement, are provided.

Checklist for Stormwater Report

Checklist (continued)

Standard 4: Water Quality (continued)

☒ The BMP is sized (and calculations provided) based on:

- ☒ The ½" or 1" Water Quality Volume or
- ☐ The equivalent flow rate associated with the Water Quality Volume and documentation is provided showing that the BMP treats the required water quality volume.

☐ The applicant proposes to use proprietary BMPs, and documentation supporting use of proprietary BMP and proposed TSS removal rate is provided. This documentation may be in the form of the propriety BMP checklist found in Volume 2, Chapter 4 of the Massachusetts Stormwater Handbook and submitting copies of the TARP Report, STEP Report, and/or other third party studies verifying performance of the proprietary BMPs.

☐ A TMDL exists that indicates a need to reduce pollutants other than TSS and documentation showing that the BMPs selected are consistent with the TMDL is provided.

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

☐ The NPDES Multi-Sector General Permit covers the land use and the Stormwater Pollution Prevention Plan (SWPPP) has been included with the Stormwater Report.

☐ The NPDES Multi-Sector General Permit covers the land use and the SWPPP will be submitted ***prior to*** the discharge of stormwater to the post-construction stormwater BMPs.

☐ The NPDES Multi-Sector General Permit does ***not*** cover the land use.

☐ LUHPPLs are located at the site and industry specific source control and pollution prevention measures have been proposed to reduce or eliminate the exposure of LUHPPLs to rain, snow, snow melt and runoff, and been included in the long term Pollution Prevention Plan.

☐ All exposure has been eliminated.

☐ All exposure has ***not*** been eliminated and all BMPs selected are on MassDEP LUHPPL list.

☐ The LUHPPL has the potential to generate runoff with moderate to higher concentrations of oil and grease (e.g. all parking lots with >1000 vehicle trips per day) and the treatment train includes an oil grit separator, a filtering bioretention area, a sand filter or equivalent.

Standard 6: Critical Areas

☐ The discharge is near or to a critical area and the treatment train includes only BMPs that MassDEP has approved for stormwater discharges to or near that particular class of critical area.

☐ Critical areas and BMPs are identified in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

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

☐ The project is subject to the Stormwater Management Standards only to the maximum Extent Practicable as a:

- ☐ Limited Project
- ☐ Small Residential Projects: 5-9 single family houses or 5-9 units in a multi-family development provided there is no discharge that may potentially affect a critical area.
- ☐ Small Residential Projects: 2-4 single family houses or 2-4 units in a multi-family development with a discharge to a critical area
- ☐ Marina and/or boatyard provided the hull painting, service and maintenance areas are protected from exposure to rain, snow, snow melt and runoff
- ☐ Bike Path and/or Foot Path
- ☐ Redevelopment Project
- ☐ Redevelopment portion of mix of new and redevelopment.

☐ Certain standards are not fully met (Standard No. 1, 8, 9, and 10 must always be fully met) and an explanation of why these standards are not met is contained in the Stormwater Report.

☐ The project involves redevelopment and a description of all measures that have been taken to improve existing conditions is provided in the Stormwater Report. The redevelopment checklist found in Volume 2 Chapter 3 of the Massachusetts Stormwater Handbook may be used to document that the proposed stormwater management system (a) complies with Standards 2, 3 and the pretreatment and structural BMP requirements of Standards 4-6 to the maximum extent practicable and (b) improves existing conditions.

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

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

- Narrative;
- Construction Period Operation and Maintenance Plan;
- Names of Persons or Entity Responsible for Plan Compliance;
- Construction Period Pollution Prevention Measures;
- Erosion and Sedimentation Control Plan Drawings;
- Detail drawings and specifications for erosion control BMPs, including sizing calculations;
- Vegetation Planning;
- Site Development Plan;
- Construction Sequencing Plan;
- Sequencing of Erosion and Sedimentation Controls;
- Operation and Maintenance of Erosion and Sedimentation Controls;
- Inspection Schedule;
- Maintenance Schedule;
- Inspection and Maintenance Log Form.

☒ A Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan containing the information set forth above has been included in the Stormwater Report.

Checklist for Stormwater Report

Checklist (continued)

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

☐ The project is highly complex and information is included in the Stormwater Report that explains why it is not possible to submit the Construction Period Pollution Prevention and Erosion and Sedimentation Control Plan with the application. A Construction Period Pollution Prevention and Erosion and Sedimentation Control has ***not*** been included in the Stormwater Report but will be submitted ***before*** land disturbance begins.

☐ The project is ***not*** covered by a NPDES Construction General Permit.

☐ The project is covered by a NPDES Construction General Permit and a copy of the SWPPP is in the Stormwater Report.

☐ The project is covered by a NPDES Construction General Permit but no SWPPP been submitted. The SWPPP will be submitted BEFORE land disturbance begins.

Standard 9: Operation and Maintenance Plan

☒ The Post Construction Operation and Maintenance Plan is included in the Stormwater Report and includes the following information:

- ☒ Name of the stormwater management system owners;
- ☒ Party responsible for operation and maintenance;
- ☒ Schedule for implementation of routine and non-routine maintenance tasks;
- ☒ Plan showing the location of all stormwater BMPs maintenance access areas;
- ☒ Description and delineation of public safety features;
- ☒ Estimated operation and maintenance budget; and
- ☒ Operation and Maintenance Log Form.

☐ The responsible party is ***not*** the owner of the parcel where the BMP is located and the Stormwater Report includes the following submissions:

- ☐ A copy of the legal instrument (deed, homeowner's association, utility trust or other legal entity) that establishes the terms of and legal responsibility for the operation and maintenance of the project site stormwater BMPs;
- ☐ A plan and easement deed that allows site access for the legal entity to operate and maintain BMP functions.

Standard 10: Prohibition of Illicit Discharges

☒ The Long-Term Pollution Prevention Plan includes measures to prevent illicit discharges;

☐ An Illicit Discharge Compliance Statement is attached;

☒ NO Illicit Discharge Compliance Statement is attached but will be submitted ***prior to*** the discharge of any stormwater to post-construction BMPs.

MARKEY & RUBIN, INC.
360 MASS. AVENUE, ACTON, MA 01720
PHONE: (978)264-4600

APPENDIX 3

STORMWATER CONSTRUCTION SITE INSPECTION REPORT

Stormwater Construction Site Inspection Report

General Information			
Project Name			
NPDES Tracking No.		**Location**	
Date of Inspection		**Start/End Time**	
Inspector's Name(s)			
Inspector's Title(s)			
Inspector's Contact Information			
Inspector's Qualifications			
Describe present phase of construction			

Type of Inspection:
❑ Regular ❑ Pre-storm event ❑ During storm event ❑ Post-storm event

Weather Information

Has there been a storm event since the last inspection? ❑Yes ❑No
If yes, provide:
Storm Start Date & Time: Storm Duration (hrs): Approximate Amount of Precipitation (in):

Weather at time of this inspection?
❑ Clear ❑Cloudy ❑ Rain ❑ Sleet ❑ Fog ❑ Snowing ❑ High Winds
❑ Other: Temperature:

Have any discharges occurred since the last inspection? ❑Yes ❑No
If yes, describe:

Are there any discharges at the time of inspection? ❑Yes ❑No
If yes, describe:

Site-specific BMPs

- *Number the structural and non-structural BMPs identified in your SWPPP on your site map and list them below (add as many BMPs as necessary). Carry a copy of the numbered site map with you during your inspections. This list will ensure that you are inspecting all required BMPs at your site.*
- *Describe corrective actions initiated, date completed, and note the person that completed the work in the Corrective Action Log.*

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
1		❑Yes ❑No	❑Yes ❑No	
2		❑Yes ❑No	❑Yes ❑No	
3		❑Yes ❑No	❑Yes ❑No	
4		❑Yes ❑No	❑Yes ❑No	
5		❑Yes ❑No	❑Yes ❑No	
6		❑Yes ❑No	❑Yes ❑No	
7		❑Yes ❑No	❑Yes ❑No	
8		❑Yes ❑No	❑Yes ❑No	
9		❑Yes ❑No	❑Yes ❑No	
10		❑Yes ❑No	❑Yes ❑No	
11		❑Yes ❑No	❑Yes ❑No	
12		❑Yes ❑No	❑Yes ❑No	
13		❑Yes ❑No	❑Yes ❑No	

	BMP	BMP Installed?	BMP Maintenance Required?	Corrective Action Needed and Notes
14		❑Yes ❑No	❑Yes ❑No	
15		❑Yes ❑No	❑Yes ❑No	
16		❑Yes ❑No	❑Yes ❑No	
17		❑Yes ❑No	❑Yes ❑No	
18		❑Yes ❑No	❑Yes ❑No	
19		❑Yes ❑No	❑Yes ❑No	
20		❑Yes ❑No	❑Yes ❑No	

Overall Site Issues

Below are some general site issues that should be assessed during inspections. Customize this list as needed for conditions at your site.

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
1	Are all slopes and disturbed areas not actively being worked properly stabilized?	❑Yes ❑No	❑Yes ❑No	
2	Are natural resource areas (e.g., streams, wetlands, mature trees, etc.) protected with barriers or similar BMPs?	❑Yes ❑No	❑Yes ❑No	
3	Are perimeter controls and sediment barriers adequately installed (keyed into substrate) and maintained?	❑Yes ❑No	❑Yes ❑No	
4	Are discharge points and receiving waters free of any sediment deposits?	❑Yes ❑No	❑Yes ❑No	
5	Are storm drain inlets properly protected?	❑Yes ❑No	❑Yes ❑No	
6	Is the construction exit preventing sediment from being tracked into the street?	❑Yes ❑No	❑Yes ❑No	
7	Is trash/litter from work areas collected and placed in covered dumpsters?	❑Yes ❑No	❑Yes ❑No	
8	Are washout facilities (e.g., paint, stucco, concrete) available, clearly marked, and maintained?	❑Yes ❑No	❑Yes ❑No	

	BMP/activity	Implemented?	Maintenance Required?	Corrective Action Needed and Notes
9	Are vehicle and equipment fueling, cleaning, and maintenance areas free of spills, leaks, or any other deleterious material?	❑Yes ❑No	❑Yes ❑No	
10	Are materials that are potential stormwater contaminants stored inside or under cover?	❑Yes ❑No	❑Yes ❑No	
11	Are non-stormwater discharges (e.g., wash water, dewatering) properly controlled?	❑Yes ❑No	❑Yes ❑No	
12	(Other)	❑Yes ❑No	❑Yes ❑No	

Non-Compliance

Describe any incidents of non-compliance not described above:

CERTIFICATION STATEMENT

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Print name and title: _____

Signature:_____ **Date:**_____

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5. IMPACT STUDY

3.1 Traffic and Access

The location of the access road to this site on Boston Road has high visibility in both directions – and therefore providing negligible danger to existing traffic. Sight distance exceeds 500-feet in both directions.

The impact on the vehicular density on Boston Road is minimal when considering the time of day people will be travelling to and from the temple. The majority of attendance is on Thursday nights. People start arriving the earliest at 6:30 pm and continue to arrive until as late as 8 pm. People start leaving any time with the latest being 9:00 pm.

The Temple is designed to seat 500 maximum – or estimated trips of 167 one way (assuming on average 3 per car). This increase in number of trips will spread out over a period of 1hr 30 minutes approximately, arriving and departing. On Thursday nights, this number will begin when the density on Boston Road is just ending rush hour density.

Attendance at the Temple also will take place on the weekends. However, weekend attendance is only for those who cannot attend on Thursday nights. The expected attendance is half of that as on Thursdays. Again, with no specific starting or ending time – trips are spread out over a relatively lengthy time period.

For the future auditorium, attendees are the same as those for the Temple. No additional traffic is expected for the auditorium.

3.2 Resource Areas

As shown on the Site Plans, towards the North-Westerly side of this site is a large wetland resource area (as defined and regulated by 310 CMR 10.00). This wetland covering about 9 acres of the site is a registered vernal pool – No. 3182. The delineation of this wetland was established under a Superseding Order of Conditions issued in December 2004. The same line is shown on the Site Plans with the same flag numbers.

Another wetland resource area covering about 0.1 acres is shown on the Site Plan and also established under the same Superseding Order of Conditions as mentioned above.

The majority of this parcel of land is in Priority Habitat overlay area No. PH 1458. Correspondence from the Natural Heritage & Endangered Species Program dated November 11, 2004 indicated that the Ch. 40B project previously proposed on this site would not adversely affect the habitat of state-listed rare wildlife species. This site plan proposed covers a very similar area as was proposed in the Ch. 40B plan.

This project has very limited impact on the above mentioned resource areas: No work is proposed within the resource area; very limited areas within the buffer zones are impacted and almost all of which are retention ponds – there for the protection of the wetlands. A Notice of Intent will be filed to ensure all necessary measures of protection are provided.

With reference to FEMA Flood Insurance Map for Community Panel Number 250194 008 B (Groton) and Community Panel Number 250200 001 B (Littleton), no portion of this site is within the 100 Year Flood Hazard Zone.

3.3 Groundwater

Impact on groundwater that may occur with development is effluent from stormwater or sewerage. In the case of this development, the onsite sewerage disposal system is designed in accordance with 310 CMR 15, State Environmental Code, Title 5, which provides adequate safety measures to prevent groundwater contamination. With stormwater, the design follows the Massachusetts Stormwater Management Standards.

In particular, one effect on groundwater, when analyzing stormwater, could be a displacement of the direction of flow. This can be caused by stormwater drainage being recharged in different locations than in current conditions. However, in the design of the stormwater drains, the location of the ponds and infiltration bed, and how these relate to the pre- and post-catchment areas, recharge is carefully directed to ensure that alterations in the direction of groundwater flow are minimized.

3.4 Wildlife

This site has a developed area covering 34.4% of the entire site. The remaining 65.6% is left unchanged and contiguous and thereby minimizing impacts on wildlife.

3.5 Surrounding Land Uses and Physical Character of the Area

All surrounding land is already developed, or under the process of being developed, with single family homes. The developer for this project has offered to provide a 50-foot buffer zone between proposed development on this site and the property line in areas where existing homes are nearby. Also, where insufficient natural vegetation provides sufficient screening, additional screening with evergreens will be provided.

This hill on this site currently extends up to an elevation of 292. In developing the land, the grades are reduced to a maximum height of 278 – that's a overall reduction of 14 feet – and thereby using natural screening.

3.6 Infrastructure and Public Services

- **Water Supply**
  The closest town water supply in Groton is from Bayberry Road. The distance from the end of the existing supply to the entrance to this site on Boston Road is 2,800 feet.
  The closest town water supply in Littleton is at Jane's Drive – that being about 700 feet away.
  Because of the expense of bringing water the distances shown, two wells are proposed on site – one for the fire cistern and the other for on site usage.
- **Utilities**
  Electric, Telephone and Cable currently exist on Boston Road by overhead wires on the North-East side. These will all be taken underground to the site where needed as shown on plan.

3.7 Lighting

Lighting is provided to light all roads and parking areas. The type of lighting proposed is shielded and only shines down.

3.8 Economic & Social Environment

As an alternative to the Ch. 40B proposal which is currently approved for construction, this development will have little impact on economic and social environment. There's minimal schooling required – the only residence proposed is the Priest's Residence consisting of four

two bedroom units. That's a possibility of one or two children who may need schooling. This also applies to local recreation and cultural facilities – minimum impact.

Police, fire, health and social service facilities could be impacted specifically on Thursday nights and weekends. The rest of the week, there will be little on site activity.

MARKEY & RUBIN, INC.
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APPENDIX 4.1
SOIL TEST RESULTS

SOIL EVALUATION REPORT

APPLICANT:		**JOB NUMBER:**	5041
Name	NESSP, INC.		
Address	290 LITTLETON ROAD, UNIT 4, CHELMSFORD, MA		
PROJECT LOCATION:			
Lot No./Street & No.	Boston, Road (Route 119)		
Town/City, State, Zip	Groton, MA		
ATTENDEES:			
Soil Evaluatior:	Johnathan Markey, P.E.		
Approval Authority:	Nashoba Board of Health, Ira Grossman		
Owner Representative:			

OBSERVATION HOLE SOIL LOG

Hole Number and Date	Depth from Surface (inches)	Soil Horizon	Munsell Soil Color	Soil Classification	Other Descriptions and Comments
713-1 7/2/2103	0-7	A	10YR3/2	Sandy Loam	
	7-24	B	10YR5/8	Loamy Sand	
	24-118	C	2.5Y5/4	Loamy Sand	
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (Inches)	ESHWT (Inches)	
	None	58	None	58	
713-2 7/2/2103	0-6	A	10YR3/2	Sandy Loam	
	6-24	B	10YR5/8	Loamy Sand	
	24-60	C	2.5Y5/4	Loamy Sand	Boulders at 60"
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (Inches)	ESHWT (Inches)	
	None	60	None	60	
713-3 7/2/2103	0-6	A	10YR3/2	Sandy Loam	
	6-23	B	10YR5/8	Loamy Sand	
	23-60	C1	2.5Y5/4	Fine Loamy Sand	Boulders
	60-101	C2	2.5Y5/3	Loamy Sand	Boulders
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (Inches)	ESHWT (Inches)	
	None	60	None	60	

713-4 7/2/2103	0-5	A	10YR3/2	Sandy Loam	
	5-20	B	10YR5/8	Loamy Sand	
	20-60	C1	2.5Y6/4	Fine Loamy Sand	Boulders
	60-120	C2	2.5Y5/4	Coarse Sand	Boulders
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (Inches)	ESHWT (Inches)	
	None	None	None	>120	
713-5 7/2/2103	0-6	A	10YR3/2	Sandy Loam	
	6-20	B	10YR5/8	Loamy Sand	
	20-85	C	2.5Y3/3	Loamy Sand	Well Round Cobbles, Boulders at 85"
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (Inches)	ESHWT (Inches)	
	None	20	None	20	

SOIL EVALUATION REPORT

APPLICANT: **JOB NUMBER:** 02-112

Name Mattbob, Inc.

Address P.O. Box 4034, Westford, MA 01886

PROJECT LOCATION:

Lot No. / Street & No. Boston Road (Route 119)

Town/City, State, Zip Groton, MA

ATTENDEES:

Soil Evaluator: Mark A. Sleger, P.E. and David S. Kelley

Approval Authority Nashoba Board of Health

Owner Representative: Robert Tierney

OBSERVATION HOLE SOIL LOG

Hole Number and Date	Depth from Surface (inches)	Soil Horizon	Munsell Soil Color	Soil Classification	Other Descriptions and Comments
TP-15	0-2	A	10 YR 4/2	Loamy Sand	
11/23/2004	2-21	B	10 YR 6/8	Loamy Sand	
	21-65	C	2.5 Y 6/2	Loamy Sand	
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	65	None	None	None	
TP-14	0-5	A	10 YR 4/2	Sandy Loam	
11/23/2004	5-18	B	10 YR 6/8	Sandy Loam	
	18-84	C	2.5 Y 6/2	Sandy Loam	Large boulders
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	None	None	None	None	
TP-13	0-4	A	10 YR 4/2	Loamy Sand	
11/23/2004	4-23	B	10 YR 6/8	Loamy Sand	
	23-53	C	2.5 Y 6/2	Loamy Sand	
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	53	None	None	None	
TP-12	0-10	A	10 YR 4/2	Loamy Sand	
11/23/2004	10-18	B	10 YR 6/8	Loamy Sand	
	18-73	C	10 YR 6/2	Loamy sand	with gravel
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	None	51	None	51	
TP-11	0-6	A	10 YR 4/2	Loam	
8/4/2004	6-21	B	10 YR 6/8	Loamy Sand	
	21-75	C1	10 YR 4/3	Sand and Gravel	
	75-110	C2	2.5 Y 6/2	Fine Loamy Sand	Loose and Coarse
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	None	75	None	75	

SOIL EVALUATION REPORT

APPLICANT: **JOB NUMBER:** 02-112

Name Mattbob, Inc.

Address P.O. Box 4034, Westford, MA 01886

PROJECT LOCATION:

Lot No. / Street & No. Boston Road (Route 119)

Town/City, State, Zip Groton, MA

ATTENDEES:

Soil Evaluator: Mark A. Sleger, P.E. and David S. Kelley

Approval Authority Nashoba Board of Health

Owner Representative: Robert Tierney

OBSERVATION HOLE SOIL LOG

Hole Number and Date	Depth from Surface (inches)	Soil Horizon	Munsell Soil Color	Soil Classification	Other Descriptions and Comments
TP-5	0-4	A	10 YR 4/2	Loamy Sand	
8/4/2004	4-27	B	10 YR 6/8	Sandy Loam	
	27-83	C	2.5 Y 6/2	Fine Sand and Gravel	
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	83	None	None	None	
TP-3	0-6	A	10 YR 4/2	Loam	
8/4/2004	6-18	B	10 YR 4/3	Loamy Sand	
	18-84	C	2.5 Y 6/2	Loamy Sand	and gravel
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	None	None	None	None	
TP-8	0-8	A	10 YR 4/2	Loam	
8/4/2004	8-25	B	10 YR 6/8	Loamy Sand	
	25-70	C1	10 YR 4/3	Sand and Gravel	
	70-120	C2	2.5 Y 6/2	Loamy Sand and Gravel	Firm in Place
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	None	72	None	72	
TP-2	0-4	A	10 YR 4/2	Loam	
8/4/2004	4-24	B	10 YR 6/8	Loamy Sand	
	24-48	C1	10 YR 4/3	Coarse Sand and Gravel	Interlocking Rocks, firm in Place
	48-132	C2	2.5 Y 6/2	Coarse Sand and Gravel	Interlocking Rocks, firm in Place
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	None	54	None	54	

SOIL EVALUATION REPORT

APPLICANT: **JOB NUMBER:** 02-112

Name Mattbob, Inc.

Address P.O. Box 4034, Westford, MA 01886

PROJECT LOCATION:

Lot No. / Street & No. Boston Road (Route 119)

Town/City, State, Zip Groton, MA

ATTENDEES:

Soil Evaluator: Mark A. Sleger, P.E. and David S. Kelley

Approval Authority Nashoba Board of Health

Owner Representative: Robert Tierney

OBSERVATION HOLE SOIL LOG

Hole Number and Date	Depth from Surface (inches)	Soil Horizon	Munsell Soil Color	Soil Classification	Other Descriptions and Comments
402-1	0-4	A	10YR3/3	Sandy Loam	
4/26/2002	4-34	B	10YR4/6	Sandy Loam	roots at 34"
	34-96	C	10YR6/3	Loamy Sand	tight with boulders
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	none	none	none	>96"	

SOIL EVALUATION REPORT

APPLICANT: **JOB NUMBER:** 02-112

Name Mattbob, Inc.

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PROJECT LOCATION:

Lot No. / Street & No. Boston Road (Route 119)

Town/City, State, Zip Groton, MA

ATTENDEES:

Soil Evaluator: Mark A. Sleger

Approval Authority Nashoba Board of Health

Owner Representative: Robert Tierney

OBSERVATION HOLE SOIL LOG

Hole Number and Date	Depth from Surface (inches)	Soil Horizon	Munsell Soil Color	Soil Classification	Other Descriptions and Comments
702-1 7/24/2002	0-6	A	10YR3/3	Sandy Loam	
	6-24	B	10YR5/6	Sandy Loam	
	24-84	C	10YR6/3	Loamy Sand	tight with boulders
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	none	none	none	>84"	
402-3 4/26/2002	0-6	A	10YR3/3	Sandy Loam	
	6-24	B	10YR4/6	Sandy Loam	roots at 24"
	24-72	C1	10YR6/3	Fine Sand	some cobbles - few boulders
	72-108	C2	10YR6/3	Sandy Loam	
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	none	none	none	>108	
402-2 4/26/2002	0-4	A	10YR3/3	Sandy Loam	
	4-24	B	10YR4/6	Sandy Loam	
	24-60	C1	10YR5/4	M-C Sand	with gravel & cobbles - roots at 58"
	60-102	C2	10YR6/3	F-M Sand	with gravel & cobbles - tight
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	none	none	none	>102	
402-1 4/26/2002	0-4	A	10YR3/3	Sandy Loam	
	4-34	B	10YR4/6	Sandy Loam	roots at 34"
	34-96	C	10YR6/3	Loamy Sand	tight with boulders
	Depth to Refusal (Inches)	Depth to Mottles (Inches)	Depth to Water (inches)	ESHWT (inches)	
	none	none	none	>96"	

SOIL EVALUATION REPORT

APPLICANT: 02-112

Name Mattbob, Inc.

Address P.O. Box 4034, Westford, MA 01886

PROJECT LOCATION:

Lot No. / Street & No. Boston Road (Route 119)

Town/City, State, Zip Groton, MA

ATTENDEES:

Soil Evaluator: Mark A. Sleger, P.E. and David S. Kelley

Approval Authority Nashoba Board of Health

Owner Representative: Robert Tierney

PERCOLATION TEST RESULTS

Hole Number	Date	Depth to Bottom (inches)	Soil Classification	Percolation Rate (minutes per inch)	Other Descriptions and Comments
P-11A	08/04/04	75	Loamy Sand	12	
P-10A	08/04/04	47	Sand and Gravel	8	
P-9A	08/04/04	41	Sand and Gravel	11	
P-5A	08/04/04	43	Sand and Gravel	7	
P-2A	08/04/04	48	Loamy Sand	8	
P-1A	08/04/04	42	Loamy Sand	20	
702-1	07/24/02	52"	Loamy Sand	9	
402-3	07/24/02	54"	Fine Sand	<2	
402-2	07/24/02	44"	M-C Sand	4	
402-1	07/24/02	46	Loamy Sandy	5	

MARKEY & RUBIN, INC.
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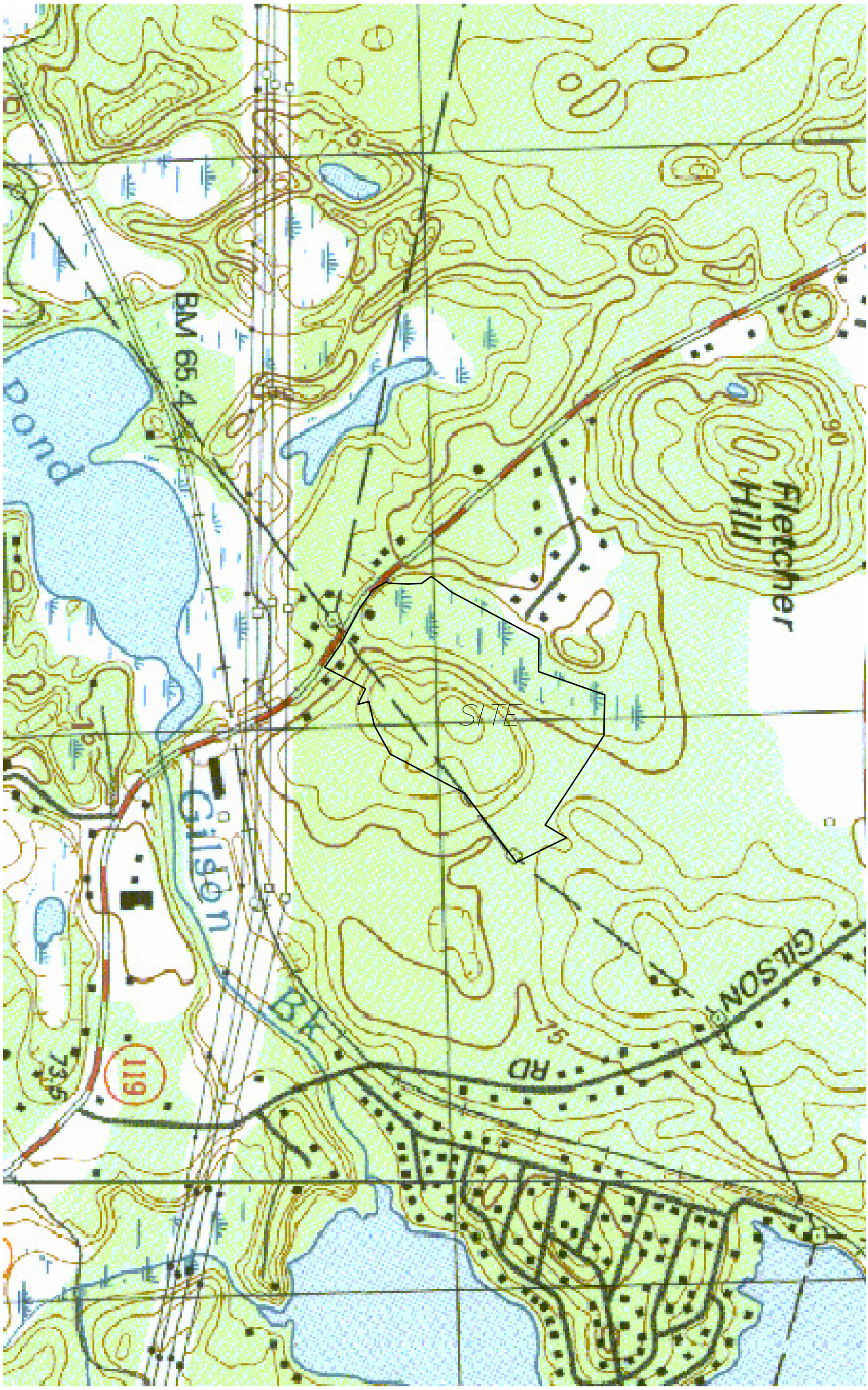
APPENDIX 4.2
USGS LOCUS MAP



USGS QUADRANGLE
GROTON, MASSACHUSETTS

FILE NO. 5041

BOSTON ROAD
GROTON, MA

PREPARED FOR:

NESSP, INC.
290 Littleton Road, Unit 4
Chelmsford, Massachusetts

360 MASSACHUSETTS AVE, SUITE 202
ACTON, MASSACHUSETTS 01720
P(978) 264-4600 F(978) 263-0447
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Markey & Rubin
CIVIL ENGINEERING

MARKEY & RUBIN, INC.
360 MASS. AVENUE, ACTON, MA 01720
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APPENDIX 4.3
NRCS SOIL MAP

Soil Map—Middlesex County, Massachusetts

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 1:25,000.

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

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

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
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: Middlesex County, Massachusetts
Survey Area Data: Version 12, Feb 26, 2010

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

Date(s) aerial images were photographed: Mar 30, 2011—May 1, 2011

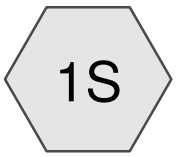
The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Middlesex County, Massachusetts (MA017)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
52A	Freetown muck, 0 to 1 percent slopes	25.1	11.9%
53A	Freetown muck, ponded, 0 to 1 percent slopes	5.9	2.8%
71B	Ridgebury fine sandy loam, 3 to 8 percent slopes, extremely stony	1.9	0.9%
103B	Charlton-Hollis-Rock outcrop complex, 3 to 8 percent slopes	15.1	7.2%
104C	Hollis-Rock outcrop-Charlton complex, 3 to 15 percent slopes	24.0	11.4%
105E	Rock outcrop-Hollis complex, 3 to 35 percent slopes	11.9	5.6%
259B	Carver loamy coarse sand, 3 to 8 percent slopes	3.5	1.7%
262B	Quonset sandy loam, 3 to 8 percent slopes	26.5	12.6%
262C	Quonset sandy loam, 8 to 15 percent slopes	13.0	6.2%
262D	Quonset sandy loam, 15 to 25 percent slopes	22.4	10.6%
262E	Quonset sandy loam, 25 to 35 percent slopes	1.2	0.6%
302D	Montauk fine sandy loam, 15 to 25 percent slopes, extremely stony	1.7	0.8%
422B	Canton fine sandy loam, 3 to 8 percent slopes, extremely stony	38.1	18.1%
422C	Canton fine sandy loam, 8 to 15 percent slopes, extremely stony	20.6	9.8%
Totals for Area of Interest		**211.0**	**100.0%**

MARKEY & RUBIN, INC.
360 MASS. AVENUE, ACTON, MA 01720
PHONE: (978)264-4600

APPENDIX 4.4
DRAINAGE CALCULATIONS

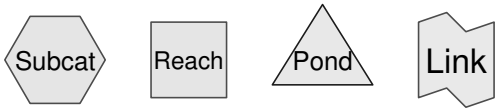


Design Pt. 1

Design Pt. 2

Design Pt. 4

Design Pt. 3



Routing Diagram for 5041exist-3
Prepared by Markey & Rubin, Inc.

Summary for Subcatchment 1S: Design Pt. 1

Runoff = 7.63 cfs @ 12.31 hrs, Volume= 0.799 af, Depth> 0.84"

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 yr Rainfall=3.20"

Area (sf)	CN	Description
2,099	98	Paved parking, HSG A
6,989	39	>75% Grass cover, Good, HSG A
14,129	55	Woods, Good, HSG B
308,662	70	Woods, Good, HSG C
166,565	77	Woods, Good, HSG D
498,444	72	Weighted Average
496,345		99.58% Pervious Area
2,099		0.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
11.1	800	0.0575	1.20		**Shallow Concentrated Flow, Shallow Conc** Woodland Kv= 5.0 fps
20.4	850	Total			

Summary for Subcatchment 2S: Design Pt. 2

Runoff = 1.35 cfs @ 12.31 hrs, Volume= 0.143 af, Depth> 0.79"

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 yr Rainfall=3.20"

Area (sf)	CN	Description
2,040	98	Paved parking, HSG A
5,422	68	<50% Grass cover, Poor, HSG A
79,970	70	Woods, Good, HSG C
6,447	77	Woods, Good, HSG D
589	30	Woods, Good, HSG A
94,468	71	Weighted Average
92,428		97.84% Pervious Area
2,040		2.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	575	0.0834	1.44		**Shallow Concentrated Flow, Shallow Conc** Woodland Kv= 5.0 fps
1.3	125	0.0050	1.63	0.98	**Channel Flow, Channel/Edge of Road** Area= 0.6 sf Perim= 3.0' r= 0.20' n= 0.022 Earth, clean & straight
20.2	750	Total			

Summary for Subcatchment 3S: Design Pt. 3

Runoff = 2.08 cfs @ 12.20 hrs, Volume= 0.185 af, Depth> 0.79"

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 yr Rainfall=3.20"

Area (sf)	CN	Description
106,513	70	Woods, Good, HSG C
15,519	77	Woods, Good, HSG D
122,032	71	Weighted Average
122,032		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	425	0.0635	1.26		**Shallow Concentrated Flow, Shallow Conc** Woodland Kv= 5.0 fps
12.7	475	Total			

Summary for Subcatchment 4S: Design Pt. 4

Runoff = 0.80 cfs @ 12.42 hrs, Volume= 0.110 af, Depth> 0.42"

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 yr Rainfall=3.20"

Area (sf)	CN	Description
69,719	55	Woods, Good, HSG B
67,777	70	Woods, Good, HSG C
137,496	62	Weighted Average
137,496		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet**
					Woods: Light underbrush n= 0.400 P2= 3.20"
9.9	375	0.0160	0.63		**Shallow Concentrated Flow, Shallow Conc**
					Woodland Kv= 5.0 fps
22.2	425	Total			

Summary for Subcatchment 1S: Design Pt. 1

Runoff = 15.90 cfs @ 12.30 hrs, Volume= 1.589 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 yr Rainfall=4.50"

Area (sf)	CN	Description
2,099	98	Paved parking, HSG A
6,989	39	>75% Grass cover, Good, HSG A
14,129	55	Woods, Good, HSG B
308,662	70	Woods, Good, HSG C
166,565	77	Woods, Good, HSG D
498,444	72	Weighted Average
496,345		99.58% Pervious Area
2,099		0.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
11.1	800	0.0575	1.20		**Shallow Concentrated Flow, Shallow Conc** Woodland Kv= 5.0 fps
20.4	850	Total			

Summary for Subcatchment 2S: Design Pt. 2

Runoff = 2.89 cfs @ 12.30 hrs, Volume= 0.288 af, Depth> 1.60"

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 yr Rainfall=4.50"

Area (sf)	CN	Description
2,040	98	Paved parking, HSG A
5,422	68	<50% Grass cover, Poor, HSG A
79,970	70	Woods, Good, HSG C
6,447	77	Woods, Good, HSG D
589	30	Woods, Good, HSG A
94,468	71	Weighted Average
92,428		97.84% Pervious Area
2,040		2.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	575	0.0834	1.44		**Shallow Concentrated Flow, Shallow Conc** Woodland Kv= 5.0 fps
1.3	125	0.0050	1.63	0.98	**Channel Flow, Channel/Edge of Road** Area= 0.6 sf Perim= 3.0' r= 0.20' n= 0.022 Earth, clean & straight
20.2	750	Total			

Summary for Subcatchment 3S: Design Pt. 3

Runoff = 4.44 cfs @ 12.19 hrs, Volume= 0.374 af, Depth> 1.60"

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 yr Rainfall=4.50"

Area (sf)	CN	Description
106,513	70	Woods, Good, HSG C
15,519	77	Woods, Good, HSG D
122,032	71	Weighted Average
122,032		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	425	0.0635	1.26		**Shallow Concentrated Flow, Shallow Conc** Woodland Kv= 5.0 fps
12.7	475	Total			

Summary for Subcatchment 4S: Design Pt. 4

Runoff = 2.40 cfs @ 12.35 hrs, Volume= 0.268 af, Depth> 1.02"

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 yr Rainfall=4.50"

Area (sf)	CN	Description
69,719	55	Woods, Good, HSG B
67,777	70	Woods, Good, HSG C
137,496	62	Weighted Average
137,496		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet**
					Woods: Light underbrush n= 0.400 P2= 3.20"
9.9	375	0.0160	0.63		**Shallow Concentrated Flow, Shallow Conc**
					Woodland Kv= 5.0 fps
22.2	425	Total			

Summary for Subcatchment 1S: Design Pt. 1

Runoff = 22.24 cfs @ 12.29 hrs, Volume= 2.204 af, Depth> 2.31"

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 yr Rainfall=5.40"

Area (sf)	CN	Description
2,099	98	Paved parking, HSG A
6,989	39	>75% Grass cover, Good, HSG A
14,129	55	Woods, Good, HSG B
308,662	70	Woods, Good, HSG C
166,565	77	Woods, Good, HSG D
498,444	72	Weighted Average
496,345		99.58% Pervious Area
2,099		0.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
11.1	800	0.0575	1.20		**Shallow Concentrated Flow, Shallow Conc** Woodland Kv= 5.0 fps
20.4	850	Total			

Summary for Subcatchment 2S: Design Pt. 2

Runoff = 4.07 cfs @ 12.29 hrs, Volume= 0.403 af, Depth> 2.23"

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 25 yr Rainfall=5.40"

Area (sf)	CN	Description
2,040	98	Paved parking, HSG A
5,422	68	<50% Grass cover, Poor, HSG A
79,970	70	Woods, Good, HSG C
6,447	77	Woods, Good, HSG D
589	30	Woods, Good, HSG A
94,468	71	Weighted Average
92,428		97.84% Pervious Area
2,040		2.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	575	0.0834	1.44		**Shallow Concentrated Flow, Shallow Conc** Woodland Kv= 5.0 fps
1.3	125	0.0050	1.63	0.98	**Channel Flow, Channel/Edge of Road** Area= 0.6 sf Perim= 3.0' r= 0.20' n= 0.022 Earth, clean & straight
20.2	750	Total			

Summary for Subcatchment 3S: Design Pt. 3

Runoff = 6.27 cfs @ 12.18 hrs, Volume= 0.522 af, Depth> 2.23"

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 25 yr Rainfall=5.40"

Area (sf)	CN	Description
106,513	70	Woods, Good, HSG C
15,519	77	Woods, Good, HSG D
122,032	71	Weighted Average
122,032		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	425	0.0635	1.26		**Shallow Concentrated Flow, Shallow Conc** Woodland Kv= 5.0 fps
12.7	475	Total			

Summary for Subcatchment 4S: Design Pt. 4

Runoff = 3.76 cfs @ 12.34 hrs, Volume= 0.402 af, Depth> 1.53"

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 yr Rainfall=5.40"

Area (sf)	CN	Description
69,719	55	Woods, Good, HSG B
67,777	70	Woods, Good, HSG C
137,496	62	Weighted Average
137,496		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet**
					Woods: Light underbrush n= 0.400 P2= 3.20"
9.9	375	0.0160	0.63		**Shallow Concentrated Flow, Shallow Conc**
					Woodland Kv= 5.0 fps
22.2	425	Total			

Summary for Subcatchment 1S: Design Pt. 1

Runoff = 31.15 cfs @ 12.29 hrs, Volume= 3.083 af, Depth> 3.23"

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 100 yr Rainfall=6.60"

Area (sf)	CN	Description
2,099	98	Paved parking, HSG A
6,989	39	>75% Grass cover, Good, HSG A
14,129	55	Woods, Good, HSG B
308,662	70	Woods, Good, HSG C
166,565	77	Woods, Good, HSG D
498,444	72	Weighted Average
496,345		99.58% Pervious Area
2,099		0.42% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.3	50	0.0400	0.09		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
11.1	800	0.0575	1.20		**Shallow Concentrated Flow, Shallow Conc** Woodland Kv= 5.0 fps
20.4	850	Total			

Summary for Subcatchment 2S: Design Pt. 2

Runoff = 5.75 cfs @ 12.28 hrs, Volume= 0.567 af, Depth> 3.13"

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 yr Rainfall=6.60"

Area (sf)	CN	Description
2,040	98	Paved parking, HSG A
5,422	68	<50% Grass cover, Poor, HSG A
79,970	70	Woods, Good, HSG C
6,447	77	Woods, Good, HSG D
589	30	Woods, Good, HSG A
94,468	71	Weighted Average
92,428		97.84% Pervious Area
2,040		2.16% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	575	0.0834	1.44		**Shallow Concentrated Flow, Shallow Conc** Woodland Kv= 5.0 fps
1.3	125	0.0050	1.63	0.98	**Channel Flow, Channel/Edge of Road** Area= 0.6 sf Perim= 3.0' r= 0.20' n= 0.022 Earth, clean & straight
20.2	750	Total			

Summary for Subcatchment 3S: Design Pt. 3

Runoff = 8.84 cfs @ 12.18 hrs, Volume= 0.734 af, Depth> 3.14"

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 yr Rainfall=6.60"

Area (sf)	CN	Description
106,513	70	Woods, Good, HSG C
15,519	77	Woods, Good, HSG D
122,032	71	Weighted Average
122,032		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.1	50	0.0800	0.12		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	425	0.0635	1.26		**Shallow Concentrated Flow, Shallow Conc** Woodland Kv= 5.0 fps
12.7	475	Total			

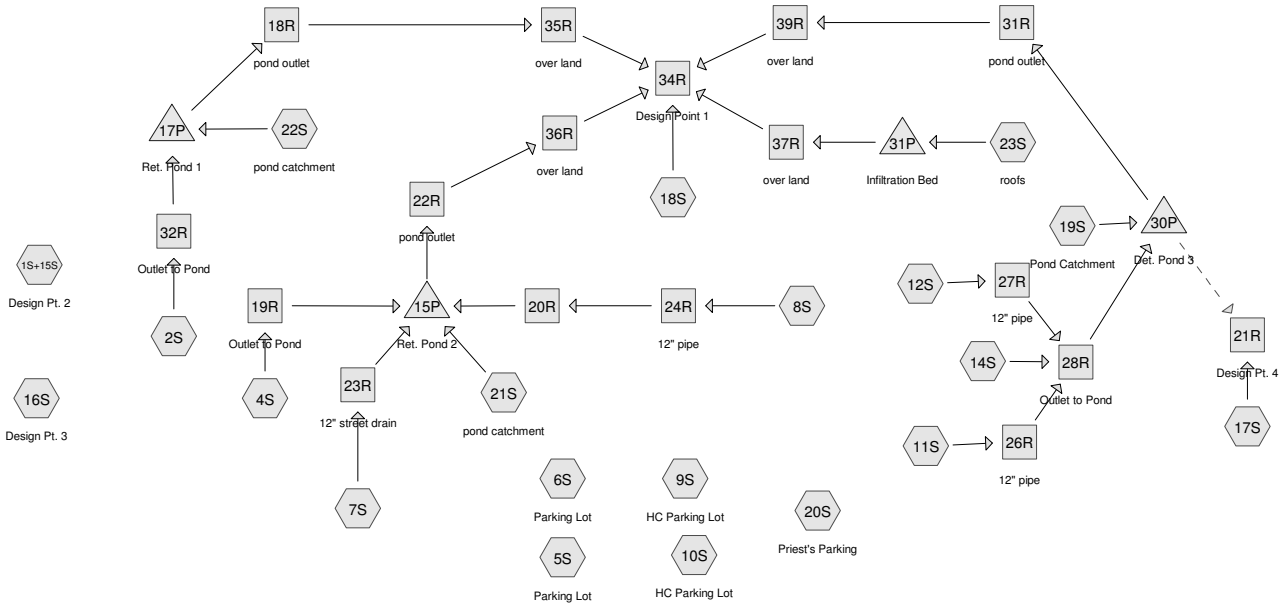
Summary for Subcatchment 4S: Design Pt. 4

Runoff = 5.79 cfs @ 12.33 hrs, Volume= 0.602 af, Depth> 2.29"

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 yr Rainfall=6.60"

Area (sf)	CN	Description
69,719	55	Woods, Good, HSG B
67,777	70	Woods, Good, HSG C
137,496	62	Weighted Average
137,496		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet**
					Woods: Light underbrush n= 0.400 P2= 3.20"
9.9	375	0.0160	0.63		**Shallow Concentrated Flow, Shallow Conc**
					Woodland Kv= 5.0 fps
22.2	425	Total			



Subcat Reach Pond Link

Routing Diagram for 5041prop-3
Prepared by Markey & Rubin, Inc.

Summary for Subcatchment 1S+15S: Design Pt. 2

Runoff = 1.20 cfs @ 12.32 hrs, Volume= 0.140 af, Depth> 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
	69,866	70	Woods, Good, HSG C
	6,447	77	Woods, Good, HSG D
*	4,220	98	
	1,192	39	>75% Grass cover, Good, HSG A
	470	30	Woods, Good, HSG A
	1,651	74	>75% Grass cover, Good, HSG C
	83,846	71	Weighted Average
	79,626		94.97% Pervious Area
	4,220		5.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	575	0.0834	1.44		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
1.3	125	0.0050	1.63	0.98	**Channel Flow, Gutter/edge of Road** Area= 0.6 sf Perim= 3.0' r= 0.20' n= 0.022
20.2	750	Total			

Summary for Subcatchment 2S:

Runoff = 0.66 cfs @ 12.25 hrs, Volume= 0.067 af, Depth> 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	7,053	98	Paved
	7,521	74	>75% Grass cover, Good, HSG C
	7,119	70	Woods, Good, HSG C
	2,889	77	Woods, Good, HSG D
	396	80	>75% Grass cover, Good, HSG D
	24,978	80	Weighted Average
	17,925		71.76% Pervious Area
	7,053		28.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.20"
3.3	275	0.0764	1.38		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
0.7	110	0.0492	2.63	0.26	**Channel Flow, Gutter** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
1.4	160	0.0500	1.94	0.01	**Pipe Channel,** 1.0" Round Area= 0.0 sf Perim= 0.3' r= 0.02' n= 0.013 Corrugated PE, smooth interior
17.7	595	Total			

Summary for Subcatchment 4S:

Runoff = 2.74 cfs @ 12.10 hrs, Volume= 0.202 af, Depth> 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	11,870	98	Road
*	5,585	98	Sidewalk
*	871	98	Roofs
*	414	98	Fishpond
	24,404	80	>75% Grass cover, Good, HSG D
	3,559	74	>75% Grass cover, Good, HSG C
	11,026	77	Woods, Good, HSG D
	4,971	70	Woods, Good, HSG C
	62,700	84	Weighted Average
	43,960		70.11% Pervious Area
	18,740		29.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
0.6	50	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrattion** Short Grass Pasture Kv= 7.0 fps
2.1	250	0.0280	1.98	0.20	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
7.0	350	Total			

Summary for Subcatchment 5S: Parking Lot

Runoff = 0.43 cfs @ 12.38 hrs, Volume= 0.054 af, Depth> 0.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	27,927	70	Porous Paved , HSG C
	4,671	77	Woods, Good, HSG D
	32,598	71	Weighted Average
	32,598		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	50	0.0150	0.03		**Sheet Flow, Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 3.20"
0.1	20	0.5000	4.95		**Shallow Concentrated Flow, Shallow concentration** Short Grass Pasture Kv= 7.0 fps
0.3	70	0.0444	4.28		**Shallow Concentrated Flow, Shallow Concentration** Paved Kv= 20.3 fps
0.2	20	0.0200	1.67	0.17	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
24.7	160	Total			

Summary for Subcatchment 6S: Parking Lot

Runoff = 1.12 cfs @ 12.09 hrs, Volume= 0.081 af, Depth> 1.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
2,893	80	>75% Grass cover, Good, HSG D
7,544	70	Woods, Good, HSG C
26,311	77	Woods, Good, HSG D
36,748	76	Weighted Average
36,748		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	20	0.0100	0.09		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
0.4	90	0.0400	4.06		**Shallow Concentrated Flow, Shallow Concentration** Paved Kv= 20.3 fps
1.6	220	0.0364	2.26	0.23	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
5.6	330	Total			

Summary for Subcatchment 7S:

Runoff = 1.48 cfs @ 12.08 hrs, Volume= 0.103 af, Depth> 2.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	8,839	98	Road
*	4,285	98	Sidewalk
*	449	98	Fishpond
	12,414	80	>75% Grass cover, Good, HSG D
	25,987	89	Weighted Average
	12,414		47.77% Pervious Area
	13,573		52.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
0.4	75	0.0400	3.22		**Shallow Concentrated Flow, Shallow Concentration** Unpaved Kv= 16.1 fps
0.6	90	0.0400	2.37	0.24	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
5.3	215	Total			

Summary for Subcatchment 8S:

Runoff = 1.38 cfs @ 12.09 hrs, Volume= 0.099 af, Depth> 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	8,746	98	Road
*	3,980	98	Sidewalk
*	353	98	Fishpond
	5,561	74	>75% Grass cover, Good, HSG C
	8,342	80	>75% Grass cover, Good, HSG D
	26,982	87	Weighted Average
	13,903		51.53% Pervious Area
	13,079		48.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
1.2	100	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentration** Short Grass Pasture Kv= 7.0 fps
0.7	90	0.0322	2.12	0.21	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
6.2	240	Total			

Summary for Subcatchment 9S: HC Parking Lot

Runoff = 0.10 cfs @ 12.02 hrs, Volume= 0.006 af, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	2,718	77	Porous Pavement, HSG D
	2,718		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	100	0.0290	3.46		**Shallow Concentrated Flow, Shallow Conc.** Paved Kv= 20.3 fps
0.4	50	0.0290	2.02	0.20	**Channel Flow, Gutter** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
0.9	150	Total			

Summary for Subcatchment 10S: HC Parking Lot

Runoff = 0.06 cfs @ 12.02 hrs, Volume= 0.004 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	2,691	70	Porous Paved, HSG C
	2,691		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	190	0.0368	3.89		**Shallow Concentrated Flow, Shallow Conc.** Paved Kv= 20.3 fps

Summary for Subcatchment 11S:

Runoff = 0.93 cfs @ 12.10 hrs, Volume= 0.067 af, Depth> 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	7,020	98	Road
*	1,895	98	Sidewalk
	12,054	74	>75% Grass cover, Good, HSG C
	20,969	84	Weighted Average
	12,054		57.48% Pervious Area
	8,915		42.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow**
					Grass: Short n= 0.150 P2= 3.20"
0.4	30	0.0400	1.40		**Shallow Concentrated Flow, Shallow Conc.**
					Short Grass Pasture Kv= 7.0 fps
1.8	190	0.0222	1.76	0.18	**Channel Flow, Gutter**
					Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
6.5	270	Total			

Summary for Subcatchment 12S:

Runoff = 0.89 cfs @ 12.09 hrs, Volume= 0.064 af, Depth> 1.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	5,554	98	Road
*	1,702	98	Sidewalk
	9,446	80	>75% Grass cover, Good, HSG D
	16,702	88	Weighted Average
	9,446		56.56% Pervious Area
	7,256		43.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet**
					Grass: Short n= 0.150 P2= 3.20"
0.4	30	0.0400	1.40		**Shallow Concentrated Flow, Shallow Conc.**
					Short Grass Pasture Kv= 7.0 fps
1.5	160	0.0219	1.75	0.18	**Channel Flow, Gutter**
					Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
6.2	240	Total			

Summary for Subcatchment 14S:

Runoff = 1.97 cfs @ 12.05 hrs, Volume= 0.128 af, Depth> 1.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	12,392	98	Road
*	5,594	98	Sidewalk
	16,907	74	>75% Grass cover, Good, HSG C
	1,707	80	>75% Grass cover, Good, HSG D
	36,600	86	Weighted Average
	18,614		50.86% Pervious Area
	17,986		49.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.30		**Sheet Flow, Sheet**
					Grass: Short n= 0.150 P2= 3.20"
0.3	40	0.1200	2.42		**Shallow Concentrated Flow, Shallow Conc.**
					Short Grass Pasture Kv= 7.0 fps
0.6	65	0.0200	1.67	0.17	**Channel Flow, Gutter**
					Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
3.6	155	Total			

Summary for Pond 15P: Ret. Pond 2

Inflow Area = 3.019 ac, 34.52% Impervious, Inflow Depth > 1.75" for 2 yr event
Inflow = 5.97 cfs @ 12.10 hrs, Volume= 0.440 af
Outflow = 0.10 cfs @ 10.19 hrs, Volume= 0.122 af, Atten= 98%, Lag= 0.0 min
Discarded = 0.10 cfs @ 10.19 hrs, Volume= 0.122 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 252.71' @ 20.80 hrs Surf.Area= 5,679 sf Storage= 14,017 cf

Plug-Flow detention time= 305.5 min calculated for 0.122 af (28% of inflow)
Center-of-Mass det. time= 171.0 min (995.9 - 824.8)

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	23,481 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	1,565	0	0
250.00	2,609	4,174	4,174
252.00	3,849	6,458	10,632
254.00	9,000	12,849	23,481

Device	Routing	Invert	Outlet Devices
#1	Primary	253.00'	**2.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600
			Limited to weir flow at low heads
#2	Primary	253.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	248.00'	**0.10 cfs Exfiltration at all elevations**

Discarded OutFlow Max=0.10 cfs @ 10.19 hrs HW=248.06' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=248.00' (Free Discharge)
├**1=Orifice/Grate** (Controls 0.00 cfs)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment 16S: Design Pt. 3

Runoff = 0.76 cfs @ 12.21 hrs, Volume= 0.078 af, Depth> 0.82"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
5,679	74	>75% Grass cover, Good, HSG C
43,449	70	Woods, Good, HSG C
49,128	70	Weighted Average
49,128		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	350	0.0429	1.04		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
13.5	400	Total			

Summary for Pond 17P: Ret. Pond 1

Inflow Area = 0.673 ac, 24.05% Impervious, Inflow Depth > 1.21" for 2 yr event
Inflow = 0.66 cfs @ 12.26 hrs, Volume= 0.068 af
Outflow = 0.11 cfs @ 13.13 hrs, Volume= 0.068 af, Atten= 83%, Lag= 52.6 min
Discarded = 0.05 cfs @ 11.73 hrs, Volume= 0.050 af
Primary = 0.06 cfs @ 13.13 hrs, Volume= 0.018 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 236.92' @ 13.13 hrs Surf.Area= 1,570 sf Storage= 1,144 cf

Plug-Flow detention time= 134.3 min calculated for 0.068 af (100% of inflow)
Center-of-Mass det. time= 132.9 min (986.8 - 853.9)

Volume	Invert	Avail.Storage	Storage Description
#1	236.00'	6,025 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
236.00	913	0	0
237.00	1,626	1,270	1,270
238.00	2,380	2,003	3,273
239.00	3,124	2,752	6,025

Device	Routing	Invert	Outlet Devices
#1	Primary	237.70'	**2.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	238.00'	**6.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

#3	Discarded	236.00'	**0.05 cfs Exfiltration at all elevations**
#4	Primary	236.50'	**2.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.05 cfs @ 11.73 hrs HW=236.03' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.06 cfs @ 13.13 hrs HW=236.92' (Free Discharge)
├**1=Orifice/Grate** (Controls 0.00 cfs)
├**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**4=Orifice/Grate** (Orifice Controls 0.06 cfs @ 2.80 fps)

Summary for Subcatchment 17S:

Runoff = 0.71 cfs @ 12.41 hrs, Volume= 0.107 af, Depth> 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	78	98	Sidewalk
*	2,790	98	Roof
	20,542	61	>75% Grass cover, Good, HSG B
	17,042	74	>75% Grass cover, Good, HSG C
	47,421	55	Woods, Good, HSG B
	20,323	70	Woods, Good, HSG C
	108,196	63	Weighted Average
	105,328		97.35% Pervious Area
	2,868		2.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.9	375	0.0160	0.63		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
22.2	425	Total			

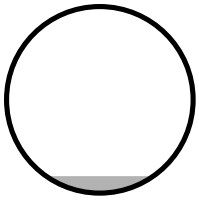
Summary for Reach 18R: pond outlet

Inflow Area = 0.673 ac, 24.05% Impervious, Inflow Depth = 0.31" for 2 yr event
Inflow = 0.06 cfs @ 13.13 hrs, Volume= 0.018 af
Outflow = 0.06 cfs @ 13.14 hrs, Volume= 0.018 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.72 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.37 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 13.14 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 233.17', Outlet Invert= 232.97'



Summary for Subcatchment 18S:

Runoff = 4.69 cfs @ 12.08 hrs, Volume= 0.362 af, Depth> 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
5,384	39	>75% Grass cover, Good, HSG A
191	61	>75% Grass cover, Good, HSG B
51,556	74	>75% Grass cover, Good, HSG C
3,108	77	Woods, Good, HSG D
4,710	30	Woods, Good, HSG A
13,938	55	Woods, Good, HSG B
163,979	70	Woods, Good, HSG C
242,866	69	Weighted Average
242,866		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.30		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"
2.0	180	0.0944	1.54		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
4.7	230	Total			

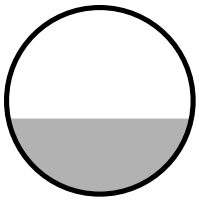
Summary for Reach 19R: Outlet to Pond

Inflow Area = 1.439 ac, 29.89% Impervious, Inflow Depth > 1.68" for 2 yr event
Inflow = 2.74 cfs @ 12.10 hrs, Volume= 0.202 af
Outflow = 2.74 cfs @ 12.11 hrs, Volume= 0.201 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 9.20 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.38 fps, Avg. Travel Time= 0.2 min

Peak Storage= 15 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.97 cfs

12.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0500 '/'
Inlet Invert= 257.50', Outlet Invert= 255.00'



Summary for Subcatchment 19S: Pond Catchment

Runoff = 0.60 cfs @ 12.03 hrs, Volume= 0.040 af, Depth> 0.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
1,756	61	>75% Grass cover, Good, HSG B
19,265	74	>75% Grass cover, Good, HSG C
21,021	73	Weighted Average
21,021		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3000	0.44		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"

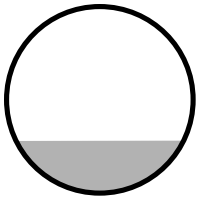
Summary for Reach 20R:

Inflow Area = 0.619 ac, 48.47% Impervious, Inflow Depth > 1.91" for 2 yr event
Inflow = 1.38 cfs @ 12.10 hrs, Volume= 0.099 af
Outflow = 1.37 cfs @ 12.11 hrs, Volume= 0.099 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.59 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.66 fps, Avg. Travel Time= 0.8 min

Peak Storage= 24 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.97 cfs

12.0" Round Pipe
n= 0.013
Length= 130.0' Slope= 0.0500 '/'
Inlet Invert= 261.53', Outlet Invert= 255.03'



Summary for Subcatchment 20S: Priest's Parking

Runoff = 0.06 cfs @ 12.02 hrs, Volume= 0.004 af, Depth> 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	2,605	70	Porous Paved, HSG C
	2,605		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0447	1.65		**Sheet Flow, Shallow Conc.** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0400	2.37	0.24	**Channel Flow, Gutter** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
0.7	80	Total			

Summary for Reach 21R: Design Pt. 4

Inflow Area = 2.484 ac, 2.65% Impervious, Inflow Depth > 0.52" for 2 yr event
Inflow = 0.71 cfs @ 12.41 hrs, Volume= 0.107 af
Outflow = 0.71 cfs @ 12.41 hrs, Volume= 0.107 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 21S: pond catchment

Runoff = 0.58 cfs @ 12.03 hrs, Volume= 0.037 af, Depth> 1.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
8,020	74	>75% Grass cover, Good, HSG C
7,800	80	>75% Grass cover, Good, HSG D
15,820	77	Weighted Average
15,820		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3000	0.44		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"

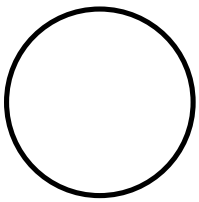
Summary for Reach 22R: pond outlet

Inflow Area = 3.019 ac, 34.52% Impervious, Inflow Depth = 0.00" for 2 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013
Length= 25.0' Slope= 0.0200 '/'
Inlet Invert= 251.50', Outlet Invert= 251.00'



Summary for Subcatchment 22S: pond catchment

Runoff = 0.00 cfs @ 12.40 hrs, Volume= 0.001 af, Depth> 0.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

Area (sf)	CN	Description
2,930	39	>75% Grass cover, Good, HSG A
1,420	74	>75% Grass cover, Good, HSG C
4,350	50	Weighted Average
4,350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	50	0.5000	0.54		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"

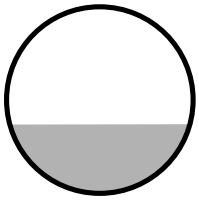
Summary for Reach 23R: 12" street drain

Inflow Area = 0.597 ac, 52.23% Impervious, Inflow Depth > 2.08" for 2 yr event
Inflow = 1.48 cfs @ 12.08 hrs, Volume= 0.103 af
Outflow = 1.47 cfs @ 12.10 hrs, Volume= 0.103 af, Atten= 1%, Lag= 1.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.57 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.91 fps, Avg. Travel Time= 2.2 min

Peak Storage= 66 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013
Length= 250.0' Slope= 0.0200 '/'
Inlet Invert= 258.00', Outlet Invert= 253.00'



Summary for Subcatchment 23S: roofs

Runoff = 3.12 cfs @ 12.00 hrs, Volume= 0.206 af, Depth> 2.97"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 2 yr Rainfall=3.20"

	Area (sf)	CN	Description
*	21,520	98	Temple
*	14,690	98	Auditorium
	36,210	98	Weighted Average
	36,210		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	50	0.3000	15.53	1.55	**Channel Flow, roof runoff** Area= 0.1 sf Perim= 1.2' r= 0.08' n= 0.010
0.2	100	0.0200	8.34	6.55	**Pipe Channel, pipes** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010

0.3 150 Total

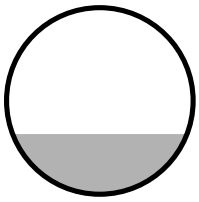
Summary for Reach 24R: 12" pipe

Inflow Area = 0.619 ac, 48.47% Impervious, Inflow Depth > 1.91" for 2 yr event
Inflow = 1.38 cfs @ 12.09 hrs, Volume= 0.099 af
Outflow = 1.38 cfs @ 12.10 hrs, Volume= 0.099 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.33 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.22 fps, Avg. Travel Time= 0.9 min

Peak Storage= 26 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.32'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.17 cfs

12.0" Round Pipe
n= 0.013
Length= 120.0' Slope= 0.0300 '/'
Inlet Invert= 265.42', Outlet Invert= 261.82'



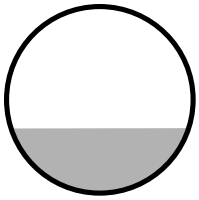
Summary for Reach 26R: 12" pipe

Inflow Area = 0.481 ac, 42.52% Impervious, Inflow Depth > 1.68" for 2 yr event
Inflow = 0.93 cfs @ 12.10 hrs, Volume= 0.067 af
Outflow = 0.92 cfs @ 12.12 hrs, Volume= 0.067 af, Atten= 1%, Lag= 1.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.81 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.39 fps, Avg. Travel Time= 2.2 min

Peak Storage= 45 cf @ 12.11 hrs
Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013
Length= 185.0' Slope= 0.0100 '/'
Inlet Invert= 0.00', Outlet Invert= -1.85'



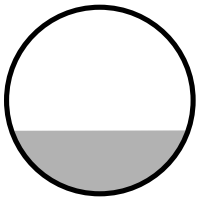
Summary for Reach 27R: 12" pipe

Inflow Area = 0.383 ac, 43.44% Impervious, Inflow Depth > 1.99" for 2 yr event
Inflow = 0.89 cfs @ 12.09 hrs, Volume= 0.064 af
Outflow = 0.88 cfs @ 12.11 hrs, Volume= 0.064 af, Atten= 1%, Lag= 1.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.76 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.31 fps, Avg. Travel Time= 2.2 min

Peak Storage= 41 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013
Length= 174.0' Slope= 0.0100 '/'
Inlet Invert= 0.00', Outlet Invert= -1.74'



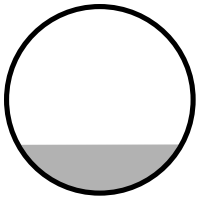
Summary for Reach 28R: Outlet to Pond

Inflow Area = 1.705 ac, 45.99% Impervious, Inflow Depth > 1.83" for 2 yr event
Inflow = 3.49 cfs @ 12.08 hrs, Volume= 0.259 af
Outflow = 3.49 cfs @ 12.08 hrs, Volume= 0.259 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 9.53 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.32 fps, Avg. Travel Time= 0.3 min

Peak Storage= 18 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 23.49 cfs

18.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0500 '/'
Inlet Invert= 257.50', Outlet Invert= 255.00'



Summary for Pond 30P: Det. Pond 3

Inflow Area = 2.188 ac, 35.84% Impervious, Inflow Depth > 1.64" for 2 yr event
Inflow = 3.99 cfs @ 12.08 hrs, Volume= 0.299 af
Outflow = 0.18 cfs @ 15.57 hrs, Volume= 0.175 af, Atten= 96%, Lag= 209.4 min
Discarded = 0.06 cfs @ 10.16 hrs, Volume= 0.073 af
Primary = 0.12 cfs @ 15.57 hrs, Volume= 0.101 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 255.32' @ 15.57 hrs Surf.Area= 3,692 sf Storage= 7,721 cf

Plug-Flow detention time= 323.6 min calculated for 0.175 af (58% of inflow)
Center-of-Mass det. time= 212.6 min (1,039.9 - 827.3)

Volume	Invert	Avail.Storage	Storage Description
#1	252.00'	27,469 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
252.00	1,021	0	0
254.00	2,562	3,583	3,583
256.00	4,270	6,832	10,415
258.00	6,157	10,427	20,842
259.00	7,097	6,627	27,469

Device	Routing	Invert	Outlet Devices
#1	Primary	257.50'	**6.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600 Limited to weir flow at low heads
#2	Secondary	258.00'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	252.00'	**0.06 cfs Exfiltration at all elevations**
#4	Primary	254.00'	**2.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.06 cfs @ 10.16 hrs HW=252.07' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.12 cfs @ 15.57 hrs HW=255.32' (Free Discharge)
├**1=Orifice/Grate** (Controls 0.00 cfs)
└**4=Orifice/Grate** (Orifice Controls 0.12 cfs @ 5.36 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=252.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 31P: Infiltration Bed

Inflow Area = 0.831 ac,100.00% Impervious, Inflow Depth > 2.97" for 2 yr event
Inflow = 3.12 cfs @ 12.00 hrs, Volume= 0.206 af
Outflow = 0.13 cfs @ 10.27 hrs, Volume= 0.178 af, Atten= 96%, Lag= 0.0 min
Discarded = 0.13 cfs @ 10.27 hrs, Volume= 0.178 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 261.62' @ 14.03 hrs Surf.Area= 0.063 ac Storage= 0.094 af

Plug-Flow detention time= 243.5 min calculated for 0.178 af (86% of inflow)
Center-of-Mass det. time= 182.6 min (933.7 - 751.1)

Volume	Invert	Avail.Storage	Storage Description
#1	258.00'	0.156 af	**45.00'W x 54.00'L x 7.00'H Prismatoid** 0.390 af Overall x 40.0% Voids
#2	260.00'	0.025 af	**Cultec R-900HD** x 7 Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap Row Length Adjustment= +2.25' x 17.61 sf x 6 rows
		0.181 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	264.00'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 264.00' / 263.60' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Discarded	258.00'	**0.13 cfs Exfiltration at all elevations**

Discarded OutFlow Max=0.13 cfs @ 10.27 hrs HW=258.07' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=258.00' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)

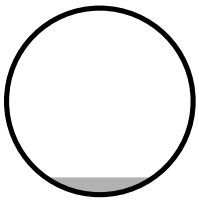
Summary for Reach 31R: pond outlet

Inflow Area = 2.188 ac, 35.84% Impervious, Inflow Depth > 0.56" for 2 yr event
Inflow = 0.12 cfs @ 15.57 hrs, Volume= 0.101 af
Outflow = 0.12 cfs @ 15.59 hrs, Volume= 0.101 af, Atten= 0%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.17 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 3.04 fps, Avg. Travel Time= 0.9 min

Peak Storage= 6 cf @ 15.58 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.47 cfs

12.0" Round Pipe
n= 0.013
Length= 167.0' Slope= 0.0329 '/'
Inlet Invert= 253.00', Outlet Invert= 247.50'



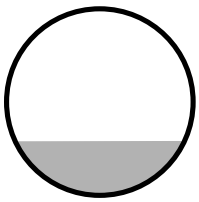
Summary for Reach 32R: Outlet to Pond

Inflow Area = 0.573 ac, 28.24% Impervious, Inflow Depth > 1.40" for 2 yr event
Inflow = 0.66 cfs @ 12.25 hrs, Volume= 0.067 af
Outflow = 0.66 cfs @ 12.26 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.46 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.43 fps, Avg. Travel Time= 0.4 min

Peak Storage= 6 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 34.0' Slope= 0.0100 '/'
Inlet Invert= 238.04', Outlet Invert= 237.70'



Summary for Reach 34R: Design Point 1

Inflow Area = 12.286 ac, 22.95% Impervious, Inflow Depth > 0.47" for 2 yr event
Inflow = 4.69 cfs @ 12.08 hrs, Volume= 0.480 af
Outflow = 4.69 cfs @ 12.08 hrs, Volume= 0.480 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

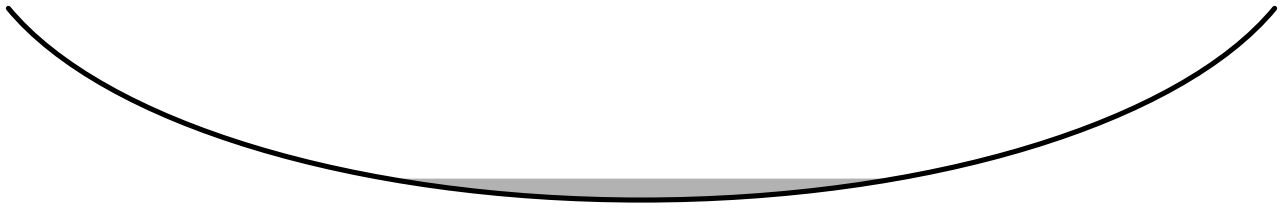
Summary for Reach 35R: over land

Inflow Area = 0.673 ac, 24.05% Impervious, Inflow Depth = 0.31" for 2 yr event
Inflow = 0.06 cfs @ 13.14 hrs, Volume= 0.018 af
Outflow = 0.06 cfs @ 13.21 hrs, Volume= 0.018 af, Atten= 0%, Lag= 4.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.49 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.36 fps, Avg. Travel Time= 3.2 min

Peak Storage= 9 cf @ 13.17 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 7.08 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.040 Earth, cobble bottom, clean sides
Length= 70.0' Slope= 0.0143 '/'
Inlet Invert= 0.00', Outlet Invert= -1.00'



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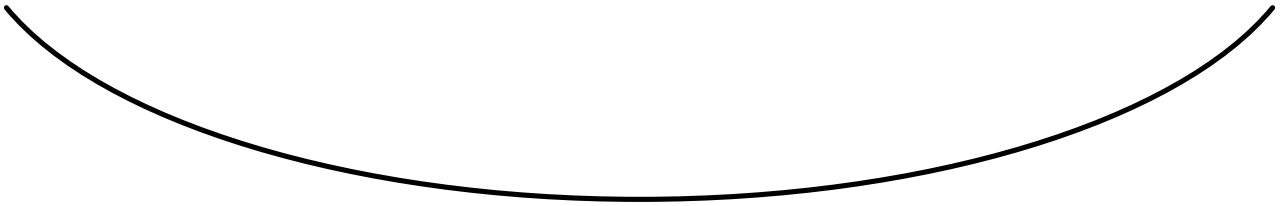
Summary for Reach 36R: over land

Inflow Area = 3.019 ac, 34.52% Impervious, Inflow Depth = 0.00" for 2 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 0.25' Flow Area= 0.8 sf, Capacity= 3.94 cfs

5.00' x 0.25' deep Parabolic Channel, n= 0.040 Earth, cobble bottom, clean sides
Length= 90.0' Slope= 0.1778 '/'
Inlet Invert= 0.00', Outlet Invert= -16.00'



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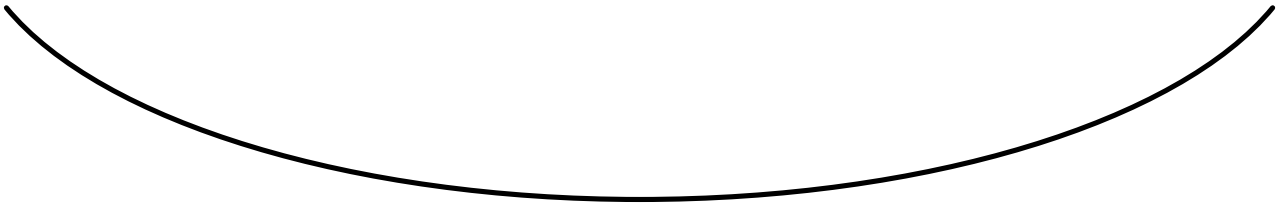
Summary for Reach 37R: over land

Inflow Area = 0.831 ac,100.00% Impervious, Inflow Depth = 0.00" for 2 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 24.99 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.040
Length= 90.0' Slope= 0.1778 '/'
Inlet Invert= 0.00', Outlet Invert= -16.00'



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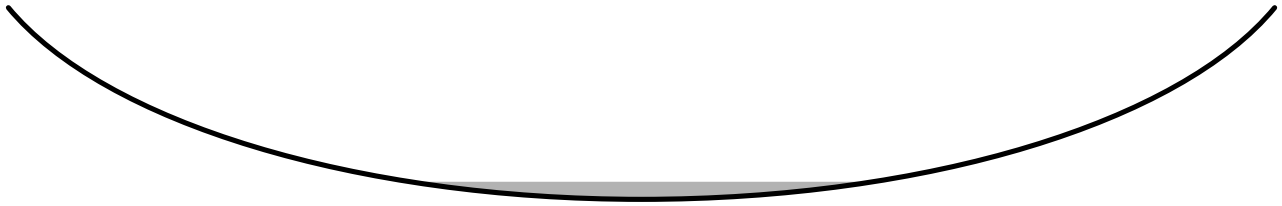
Summary for Reach 39R: over land

Inflow Area = 2.188 ac, 35.84% Impervious, Inflow Depth > 0.56" for 2 yr event
Inflow = 0.12 cfs @ 15.59 hrs, Volume= 0.101 af
Outflow = 0.12 cfs @ 15.64 hrs, Volume= 0.101 af, Atten= 0%, Lag= 3.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.26 fps, Min. Travel Time= 1.8 min
Avg. Velocity = 1.20 fps, Avg. Travel Time= 1.9 min

Peak Storage= 13 cf @ 15.61 hrs
Average Depth at Peak Storage= 0.05'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 20.41 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.040
Length= 135.0' Slope= 0.1185 '/'
Inlet Invert= 247.50', Outlet Invert= 231.50'



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Summary for Subcatchment 1S+15S: Design Pt. 2

Runoff = 2.57 cfs @ 12.29 hrs, Volume= 0.279 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
	69,866	70	Woods, Good, HSG C
	6,447	77	Woods, Good, HSG D
*	4,220	98	
	1,192	39	>75% Grass cover, Good, HSG A
	470	30	Woods, Good, HSG A
	1,651	74	>75% Grass cover, Good, HSG C
	83,846	71	Weighted Average
	79,626		94.97% Pervious Area
	4,220		5.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	575	0.0834	1.44		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
1.3	125	0.0050	1.63	0.98	**Channel Flow, Gutter/edge of Road** Area= 0.6 sf Perim= 3.0' r= 0.20' n= 0.022
20.2	750	Total			

Summary for Subcatchment 2S:

Runoff = 1.17 cfs @ 12.25 hrs, Volume= 0.117 af, Depth> 2.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	7,053	98	Paved
	7,521	74	>75% Grass cover, Good, HSG C
	7,119	70	Woods, Good, HSG C
	2,889	77	Woods, Good, HSG D
	396	80	>75% Grass cover, Good, HSG D
	24,978	80	Weighted Average
	17,925		71.76% Pervious Area
	7,053		28.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.20"
3.3	275	0.0764	1.38		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
0.7	110	0.0492	2.63	0.26	**Channel Flow, Gutter** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
1.4	160	0.0500	1.94	0.01	**Pipe Channel,** 1.0" Round Area= 0.0 sf Perim= 0.3' r= 0.02' n= 0.013 Corrugated PE, smooth interior
17.7	595	Total			

Summary for Subcatchment 4S:

Runoff = 4.57 cfs @ 12.10 hrs, Volume= 0.337 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	11,870	98	Road
*	5,585	98	Sidewalk
*	871	98	Roofs
*	414	98	Fishpond
	24,404	80	>75% Grass cover, Good, HSG D
	3,559	74	>75% Grass cover, Good, HSG C
	11,026	77	Woods, Good, HSG D
	4,971	70	Woods, Good, HSG C
	62,700	84	Weighted Average
	43,960		70.11% Pervious Area
	18,740		29.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
0.6	50	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrattion** Short Grass Pasture Kv= 7.0 fps
2.1	250	0.0280	1.98	0.20	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
7.0	350	Total			

Summary for Subcatchment 5S: Parking Lot

Runoff = 0.92 cfs @ 12.37 hrs, Volume= 0.108 af, Depth> 1.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	27,927	70	Porous Paved , HSG C
	4,671	77	Woods, Good, HSG D
	32,598	71	Weighted Average
	32,598		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	50	0.0150	0.03		**Sheet Flow, Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 3.20"
0.1	20	0.5000	4.95		**Shallow Concentrated Flow, Shallow concentration** Short Grass Pasture Kv= 7.0 fps
0.3	70	0.0444	4.28		**Shallow Concentrated Flow, Shallow Concentration** Paved Kv= 20.3 fps
0.2	20	0.0200	1.67	0.17	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
24.7	160	Total			

Summary for Subcatchment 6S: Parking Lot

Runoff = 2.13 cfs @ 12.09 hrs, Volume= 0.150 af, Depth> 2.13"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
2,893	80	>75% Grass cover, Good, HSG D
7,544	70	Woods, Good, HSG C
26,311	77	Woods, Good, HSG D
36,748	76	Weighted Average
36,748		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	20	0.0100	0.09		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
0.4	90	0.0400	4.06		**Shallow Concentrated Flow, Shallow Concentration** Paved Kv= 20.3 fps
1.6	220	0.0364	2.26	0.23	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
5.6	330	Total			

Summary for Subcatchment 7S:

Runoff = 2.31 cfs @ 12.08 hrs, Volume= 0.164 af, Depth> 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	8,839	98	Road
*	4,285	98	Sidewalk
*	449	98	Fishpond
	12,414	80	>75% Grass cover, Good, HSG D
	25,987	89	Weighted Average
	12,414		47.77% Pervious Area
	13,573		52.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
0.4	75	0.0400	3.22		**Shallow Concentrated Flow, Shallow Concentration** Unpaved Kv= 16.1 fps
0.6	90	0.0400	2.37	0.24	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
5.3	215	Total			

Summary for Subcatchment 8S:

Runoff = 2.21 cfs @ 12.09 hrs, Volume= 0.160 af, Depth> 3.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	8,746	98	Road
*	3,980	98	Sidewalk
*	353	98	Fishpond
	5,561	74	>75% Grass cover, Good, HSG C
	8,342	80	>75% Grass cover, Good, HSG D
	26,982	87	Weighted Average
	13,903		51.53% Pervious Area
	13,079		48.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
1.2	100	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentration** Short Grass Pasture Kv= 7.0 fps
0.7	90	0.0322	2.12	0.21	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
6.2	240	Total			

Summary for Subcatchment 9S: HC Parking Lot

Runoff = 0.19 cfs @ 12.02 hrs, Volume= 0.011 af, Depth> 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	2,718	77	Porous Pavement, HSG D
	2,718		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	100	0.0290	3.46		**Shallow Concentrated Flow, Shallow Conc.** Paved Kv= 20.3 fps
0.4	50	0.0290	2.02	0.20	**Channel Flow, Gutter** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
0.9	150	Total			

Summary for Subcatchment 10S: HC Parking Lot

Runoff = 0.14 cfs @ 12.02 hrs, Volume= 0.009 af, Depth> 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	2,691	70	Porous Paved, HSG C
	2,691		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	190	0.0368	3.89		**Shallow Concentrated Flow, Shallow Conc.** Paved Kv= 20.3 fps

Summary for Subcatchment 11S:

Runoff = 1.56 cfs @ 12.09 hrs, Volume= 0.113 af, Depth> 2.81"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	7,020	98	Road
*	1,895	98	Sidewalk
	12,054	74	>75% Grass cover, Good, HSG C
	20,969	84	Weighted Average
	12,054		57.48% Pervious Area
	8,915		42.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow**
					Grass: Short n= 0.150 P2= 3.20"
0.4	30	0.0400	1.40		**Shallow Concentrated Flow, Shallow Conc.**
					Short Grass Pasture Kv= 7.0 fps
1.8	190	0.0222	1.76	0.18	**Channel Flow, Gutter**
					Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
6.5	270	Total			

Summary for Subcatchment 12S:

Runoff = 1.40 cfs @ 12.09 hrs, Volume= 0.102 af, Depth> 3.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	5,554	98	Road
*	1,702	98	Sidewalk
	9,446	80	>75% Grass cover, Good, HSG D
	16,702	88	Weighted Average
	9,446		56.56% Pervious Area
	7,256		43.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet**
					Grass: Short n= 0.150 P2= 3.20"
0.4	30	0.0400	1.40		**Shallow Concentrated Flow, Shallow Conc.**
					Short Grass Pasture Kv= 7.0 fps
1.5	160	0.0219	1.75	0.18	**Channel Flow, Gutter**
					Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
6.2	240	Total			

Summary for Subcatchment 14S:

Runoff = 3.20 cfs @ 12.05 hrs, Volume= 0.210 af, Depth> 3.00"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	12,392	98	Road
*	5,594	98	Sidewalk
	16,907	74	>75% Grass cover, Good, HSG C
	1,707	80	>75% Grass cover, Good, HSG D
	36,600	86	Weighted Average
	18,614		50.86% Pervious Area
	17,986		49.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.30		**Sheet Flow, Sheet**
					Grass: Short n= 0.150 P2= 3.20"
0.3	40	0.1200	2.42		**Shallow Concentrated Flow, Shallow Conc.**
					Short Grass Pasture Kv= 7.0 fps
0.6	65	0.0200	1.67	0.17	**Channel Flow, Gutter**
					Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
3.6	155	Total			

Summary for Pond 15P: Ret. Pond 2

Inflow Area = 3.019 ac, 34.52% Impervious, Inflow Depth > 2.89" for 10 yr event
Inflow = 9.78 cfs @ 12.10 hrs, Volume= 0.728 af
Outflow = 1.59 cfs @ 12.60 hrs, Volume= 0.365 af, Atten= 84%, Lag= 30.0 min
Discarded = 0.10 cfs @ 8.92 hrs, Volume= 0.133 af
Primary = 1.49 cfs @ 12.60 hrs, Volume= 0.232 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 253.10' @ 12.60 hrs Surf.Area= 6,677 sf Storage= 16,411 cf

Plug-Flow detention time= 215.1 min calculated for 0.365 af (50% of inflow)
Center-of-Mass det. time= 102.5 min (913.3 - 810.8)

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	23,481 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	1,565	0	0
250.00	2,609	4,174	4,174
252.00	3,849	6,458	10,632
254.00	9,000	12,849	23,481

Device	Routing	Invert	Outlet Devices
#1	Primary	253.00'	**2.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600
			Limited to weir flow at low heads
#2	Primary	253.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	248.00'	**0.10 cfs Exfiltration at all elevations**

Discarded OutFlow Max=0.10 cfs @ 8.92 hrs HW=248.06' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=1.51 cfs @ 12.60 hrs HW=253.10' (Free Discharge)
├**1=Orifice/Grate** (Orifice Controls 1.51 cfs @ 1.51 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment 16S: Design Pt. 3

Runoff = 1.68 cfs @ 12.20 hrs, Volume= 0.157 af, Depth> 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
5,679	74	>75% Grass cover, Good, HSG C
43,449	70	Woods, Good, HSG C
49,128	70	Weighted Average
49,128		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	350	0.0429	1.04		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
13.5	400	Total			

Summary for Pond 17P: Ret. Pond 1

Inflow Area = 0.673 ac, 24.05% Impervious, Inflow Depth > 2.16" for 10 yr event
Inflow = 1.20 cfs @ 12.25 hrs, Volume= 0.121 af
Outflow = 0.15 cfs @ 13.38 hrs, Volume= 0.113 af, Atten= 87%, Lag= 67.9 min
Discarded = 0.05 cfs @ 11.02 hrs, Volume= 0.058 af
Primary = 0.10 cfs @ 13.38 hrs, Volume= 0.055 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 237.57' @ 13.38 hrs Surf.Area= 2,054 sf Storage= 2,315 cf

Plug-Flow detention time= 182.4 min calculated for 0.113 af (93% of inflow)
Center-of-Mass det. time= 147.0 min (985.4 - 838.4)

Volume	Invert	Avail.Storage	Storage Description
#1	236.00'	6,025 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
236.00	913	0	0
237.00	1,626	1,270	1,270
238.00	2,380	2,003	3,273
239.00	3,124	2,752	6,025

Device	Routing	Invert	Outlet Devices
#1	Primary	237.70'	**2.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	238.00'	**6.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64

#3	Discarded	236.00'	**0.05 cfs Exfiltration at all elevations**
#4	Primary	236.50'	**2.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.05 cfs @ 11.02 hrs HW=236.03' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.10 cfs @ 13.38 hrs HW=237.57' (Free Discharge)
├**1=Orifice/Grate** (Controls 0.00 cfs)
├**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**4=Orifice/Grate** (Orifice Controls 0.10 cfs @ 4.78 fps)

Summary for Subcatchment 17S:

Runoff = 2.03 cfs @ 12.35 hrs, Volume= 0.247 af, Depth> 1.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	78	98	Sidewalk
*	2,790	98	Roof
	20,542	61	>75% Grass cover, Good, HSG B
	17,042	74	>75% Grass cover, Good, HSG C
	47,421	55	Woods, Good, HSG B
	20,323	70	Woods, Good, HSG C
	108,196	63	Weighted Average
	105,328		97.35% Pervious Area
	2,868		2.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.9	375	0.0160	0.63		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
22.2	425	Total			

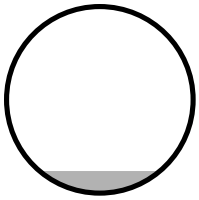
Summary for Reach 18R: pond outlet

Inflow Area = 0.673 ac, 24.05% Impervious, Inflow Depth = 0.99" for 10 yr event
Inflow = 0.10 cfs @ 13.38 hrs, Volume= 0.055 af
Outflow = 0.10 cfs @ 13.39 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.02 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 1.66 fps, Avg. Travel Time= 0.2 min

Peak Storage= 1 cf @ 13.38 hrs
Average Depth at Peak Storage= 0.12'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 233.17', Outlet Invert= 232.97'



Summary for Subcatchment 18S:

Runoff = 10.59 cfs @ 12.08 hrs, Volume= 0.744 af, Depth> 1.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
5,384	39	>75% Grass cover, Good, HSG A
191	61	>75% Grass cover, Good, HSG B
51,556	74	>75% Grass cover, Good, HSG C
3,108	77	Woods, Good, HSG D
4,710	30	Woods, Good, HSG A
13,938	55	Woods, Good, HSG B
163,979	70	Woods, Good, HSG C
242,866	69	Weighted Average
242,866		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.30		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"
2.0	180	0.0944	1.54		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
4.7	230	Total			

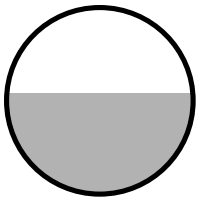
Summary for Reach 19R: Outlet to Pond

Inflow Area = 1.439 ac, 29.89% Impervious, Inflow Depth > 2.81" for 10 yr event
Inflow = 4.57 cfs @ 12.10 hrs, Volume= 0.337 af
Outflow = 4.57 cfs @ 12.10 hrs, Volume= 0.337 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.49 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.79 fps, Avg. Travel Time= 0.2 min

Peak Storage= 22 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.97 cfs

12.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0500 '/'
Inlet Invert= 257.50', Outlet Invert= 255.00'



Summary for Subcatchment 19S: Pond Catchment

Runoff = 1.23 cfs @ 12.03 hrs, Volume= 0.076 af, Depth> 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
1,756	61	>75% Grass cover, Good, HSG B
19,265	74	>75% Grass cover, Good, HSG C
21,021	73	Weighted Average
21,021		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3000	0.44		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"

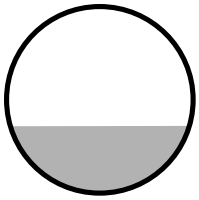
Summary for Reach 20R:

Inflow Area = 0.619 ac, 48.47% Impervious, Inflow Depth > 3.09" for 10 yr event
Inflow = 2.20 cfs @ 12.10 hrs, Volume= 0.160 af
Outflow = 2.20 cfs @ 12.10 hrs, Volume= 0.160 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.67 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.96 fps, Avg. Travel Time= 0.7 min

Peak Storage= 33 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.97 cfs

12.0" Round Pipe
n= 0.013
Length= 130.0' Slope= 0.0500 '/'
Inlet Invert= 261.53', Outlet Invert= 255.03'



Summary for Subcatchment 20S: Priest's Parking

Runoff = 0.14 cfs @ 12.01 hrs, Volume= 0.008 af, Depth> 1.67"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	2,605	70	Porous Paved, HSG C
	2,605		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0447	1.65		**Sheet Flow, Shallow Conc.** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0400	2.37	0.24	**Channel Flow, Gutter** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
0.7	80	Total			

Summary for Reach 21R: Design Pt. 4

Inflow Area = 2.484 ac, 2.65% Impervious, Inflow Depth > 1.19" for 10 yr event
Inflow = 2.03 cfs @ 12.35 hrs, Volume= 0.247 af
Outflow = 2.03 cfs @ 12.35 hrs, Volume= 0.247 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 21S: pond catchment

Runoff = 1.09 cfs @ 12.03 hrs, Volume= 0.067 af, Depth> 2.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
8,020	74	>75% Grass cover, Good, HSG C
7,800	80	>75% Grass cover, Good, HSG D
15,820	77	Weighted Average
15,820		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3000	0.44		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"

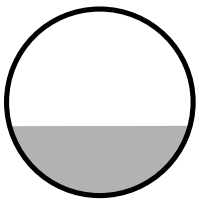
Summary for Reach 22R: pond outlet

Inflow Area = 3.019 ac, 34.52% Impervious, Inflow Depth > 0.92" for 10 yr event
Inflow = 1.49 cfs @ 12.60 hrs, Volume= 0.232 af
Outflow = 1.49 cfs @ 12.60 hrs, Volume= 0.232 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.59 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 2.85 fps, Avg. Travel Time= 0.1 min

Peak Storage= 7 cf @ 12.60 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013
Length= 25.0' Slope= 0.0200 '/'
Inlet Invert= 251.50', Outlet Invert= 251.00'



Summary for Subcatchment 22S: pond catchment

Runoff = 0.03 cfs @ 12.07 hrs, Volume= 0.004 af, Depth> 0.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

Area (sf)	CN	Description
2,930	39	>75% Grass cover, Good, HSG A
1,420	74	>75% Grass cover, Good, HSG C
4,350	50	Weighted Average
4,350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	50	0.5000	0.54		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"

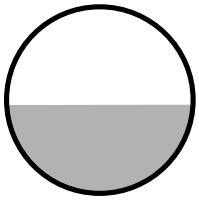
Summary for Reach 23R: 12" street drain

Inflow Area = 0.597 ac, 52.23% Impervious, Inflow Depth > 3.29" for 10 yr event
Inflow = 2.31 cfs @ 12.08 hrs, Volume= 0.164 af
Outflow = 2.29 cfs @ 12.10 hrs, Volume= 0.164 af, Atten= 1%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.26 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 2.13 fps, Avg. Travel Time= 2.0 min

Peak Storage= 92 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013
Length= 250.0' Slope= 0.0200 '/'
Inlet Invert= 258.00', Outlet Invert= 253.00'



Summary for Subcatchment 23S: roofs

Runoff = 4.42 cfs @ 12.00 hrs, Volume= 0.295 af, Depth> 4.26"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 10 yr Rainfall=4.50"

	Area (sf)	CN	Description
*	21,520	98	Temple
*	14,690	98	Auditorium
	36,210	98	Weighted Average
	36,210		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	50	0.3000	15.53	1.55	**Channel Flow, roof runoff** Area= 0.1 sf Perim= 1.2' r= 0.08' n= 0.010
0.2	100	0.0200	8.34	6.55	**Pipe Channel, pipes** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010

0.3 150 Total

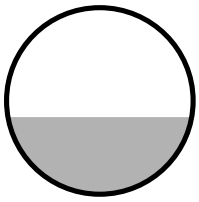
Summary for Reach 24R: 12" pipe

Inflow Area = 0.619 ac, 48.47% Impervious, Inflow Depth > 3.10" for 10 yr event
Inflow = 2.21 cfs @ 12.09 hrs, Volume= 0.160 af
Outflow = 2.20 cfs @ 12.10 hrs, Volume= 0.160 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.20 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.47 fps, Avg. Travel Time= 0.8 min

Peak Storage= 37 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.17 cfs

12.0" Round Pipe
n= 0.013
Length= 120.0' Slope= 0.0300 '/'
Inlet Invert= 265.42', Outlet Invert= 261.82'



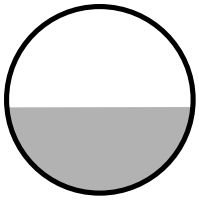
Summary for Reach 26R: 12" pipe

Inflow Area = 0.481 ac, 42.52% Impervious, Inflow Depth > 2.81" for 10 yr event
Inflow = 1.56 cfs @ 12.09 hrs, Volume= 0.113 af
Outflow = 1.55 cfs @ 12.11 hrs, Volume= 0.113 af, Atten= 1%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.38 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.55 fps, Avg. Travel Time= 2.0 min

Peak Storage= 65 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013
Length= 185.0' Slope= 0.0100 '/'
Inlet Invert= 0.00', Outlet Invert= -1.85'



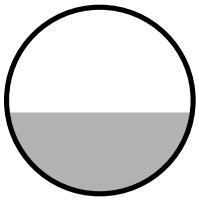
Summary for Reach 27R: 12" pipe

Inflow Area = 0.383 ac, 43.44% Impervious, Inflow Depth > 3.19" for 10 yr event
Inflow = 1.40 cfs @ 12.09 hrs, Volume= 0.102 af
Outflow = 1.39 cfs @ 12.11 hrs, Volume= 0.102 af, Atten= 1%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.26 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.46 fps, Avg. Travel Time= 2.0 min

Peak Storage= 57 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013
Length= 174.0' Slope= 0.0100 '/'
Inlet Invert= 0.00', Outlet Invert= -1.74'



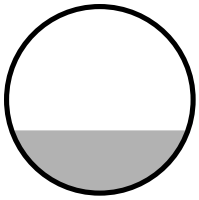
Summary for Reach 28R: Outlet to Pond

Inflow Area = 1.705 ac, 45.99% Impervious, Inflow Depth > 2.99" for 10 yr event
Inflow = 5.71 cfs @ 12.08 hrs, Volume= 0.425 af
Outflow = 5.70 cfs @ 12.08 hrs, Volume= 0.425 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 10.96 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.70 fps, Avg. Travel Time= 0.2 min

Peak Storage= 26 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 23.49 cfs

18.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0500 '/'
Inlet Invert= 257.50', Outlet Invert= 255.00'



Summary for Pond 30P: Det. Pond 3

Inflow Area = 2.188 ac, 35.84% Impervious, Inflow Depth > 2.75" for 10 yr event
Inflow = 6.72 cfs @ 12.07 hrs, Volume= 0.501 af
Outflow = 0.23 cfs @ 15.98 hrs, Volume= 0.243 af, Atten= 97%, Lag= 234.3 min
Discarded = 0.06 cfs @ 8.89 hrs, Volume= 0.080 af
Primary = 0.17 cfs @ 15.98 hrs, Volume= 0.163 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 256.80' @ 15.98 hrs Surf.Area= 5,024 sf Storage= 14,127 cf

Plug-Flow detention time= 341.3 min calculated for 0.243 af (48% of inflow)
Center-of-Mass det. time= 225.9 min (1,039.0 - 813.1)

Volume	Invert	Avail.Storage	Storage Description
#1	252.00'	27,469 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
252.00	1,021	0	0
254.00	2,562	3,583	3,583
256.00	4,270	6,832	10,415
258.00	6,157	10,427	20,842
259.00	7,097	6,627	27,469

Device	Routing	Invert	Outlet Devices
#1	Primary	257.50'	**6.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600 Limited to weir flow at low heads
#2	Secondary	258.00'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	252.00'	**0.06 cfs Exfiltration at all elevations**
#4	Primary	254.00'	**2.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.06 cfs @ 8.89 hrs HW=252.07' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.17 cfs @ 15.98 hrs HW=256.80' (Free Discharge)
├**1=Orifice/Grate** (Controls 0.00 cfs)
└**4=Orifice/Grate** (Orifice Controls 0.17 cfs @ 7.93 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=252.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 31P: Infiltration Bed

Inflow Area = 0.831 ac,100.00% Impervious, Inflow Depth > 4.26" for 10 yr event
Inflow = 4.42 cfs @ 12.00 hrs, Volume= 0.295 af
Outflow = 0.13 cfs @ 9.09 hrs, Volume= 0.192 af, Atten= 97%, Lag= 0.0 min
Discarded = 0.13 cfs @ 9.09 hrs, Volume= 0.192 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 263.83' @ 15.26 hrs Surf.Area= 0.057 ac Storage= 0.155 af

Plug-Flow detention time= 252.8 min calculated for 0.192 af (65% of inflow)
Center-of-Mass det. time= 150.4 min (894.9 - 744.5)

Volume	Invert	Avail.Storage	Storage Description
#1	258.00'	0.156 af	**45.00'W x 54.00'L x 7.00'H Prismatoid** 0.390 af Overall x 40.0% Voids
#2	260.00'	0.025 af	**Cultec R-900HD** x 7 Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap Row Length Adjustment= +2.25' x 17.61 sf x 6 rows
		0.181 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	264.00'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 264.00' / 263.60' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Discarded	258.00'	**0.13 cfs Exfiltration at all elevations**

Discarded OutFlow Max=0.13 cfs @ 9.09 hrs HW=258.07' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=258.00' (Free Discharge)
└**1=Culvert** (Controls 0.00 cfs)

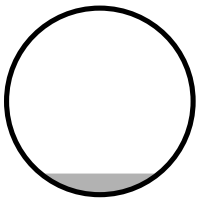
Summary for Reach 31R: pond outlet

Inflow Area = 2.188 ac, 35.84% Impervious, Inflow Depth > 0.89" for 10 yr event
Inflow = 0.17 cfs @ 15.98 hrs, Volume= 0.163 af
Outflow = 0.17 cfs @ 16.00 hrs, Volume= 0.163 af, Atten= 0%, Lag= 1.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.56 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 3.49 fps, Avg. Travel Time= 0.8 min

Peak Storage= 8 cf @ 15.99 hrs
Average Depth at Peak Storage= 0.11'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.47 cfs

12.0" Round Pipe
n= 0.013
Length= 167.0' Slope= 0.0329 '/'
Inlet Invert= 253.00', Outlet Invert= 247.50'



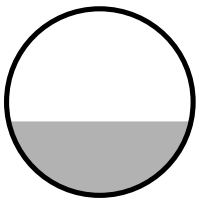
Summary for Reach 32R: Outlet to Pond

Inflow Area = 0.573 ac, 28.24% Impervious, Inflow Depth > 2.45" for 10 yr event
Inflow = 1.17 cfs @ 12.25 hrs, Volume= 0.117 af
Outflow = 1.17 cfs @ 12.25 hrs, Volume= 0.117 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.07 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.63 fps, Avg. Travel Time= 0.3 min

Peak Storage= 10 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.39'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 34.0' Slope= 0.0100 '/'
Inlet Invert= 238.04', Outlet Invert= 237.70'



Summary for Reach 34R: Design Point 1

Inflow Area = 12.286 ac, 22.95% Impervious, Inflow Depth > 1.17" for 10 yr event
Inflow = 10.64 cfs @ 12.08 hrs, Volume= 1.193 af
Outflow = 10.64 cfs @ 12.08 hrs, Volume= 1.193 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

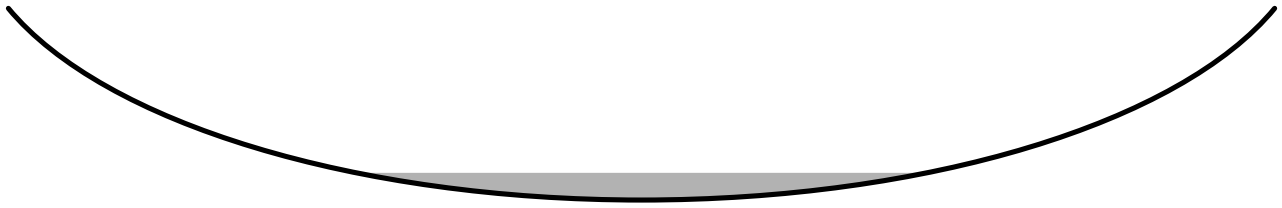
Summary for Reach 35R: over land

Inflow Area = 0.673 ac, 24.05% Impervious, Inflow Depth = 0.99" for 10 yr event
Inflow = 0.10 cfs @ 13.39 hrs, Volume= 0.055 af
Outflow = 0.10 cfs @ 13.44 hrs, Volume= 0.055 af, Atten= 0%, Lag= 3.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.58 fps, Min. Travel Time= 2.0 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 2.6 min

Peak Storage= 13 cf @ 13.41 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 7.08 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.040 Earth, cobble bottom, clean sides
Length= 70.0' Slope= 0.0143 '/'
Inlet Invert= 0.00', Outlet Invert= -1.00'



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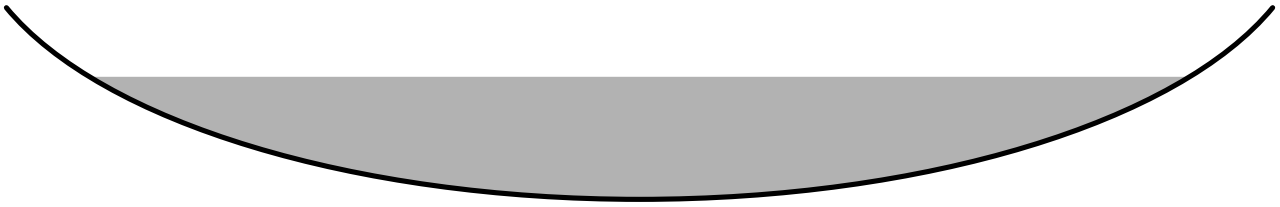
Summary for Reach 36R: over land

Inflow Area = 3.019 ac, 34.52% Impervious, Inflow Depth > 0.92" for 10 yr event
Inflow = 1.49 cfs @ 12.60 hrs, Volume= 0.232 af
Outflow = 1.49 cfs @ 12.61 hrs, Volume= 0.232 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.51 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.74 fps, Avg. Travel Time= 0.9 min

Peak Storage= 38 cf @ 12.60 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 0.25' Flow Area= 0.8 sf, Capacity= 3.94 cfs

5.00' x 0.25' deep Parabolic Channel, n= 0.040 Earth, cobble bottom, clean sides
Length= 90.0' Slope= 0.1778 '/'
Inlet Invert= 0.00', Outlet Invert= -16.00'



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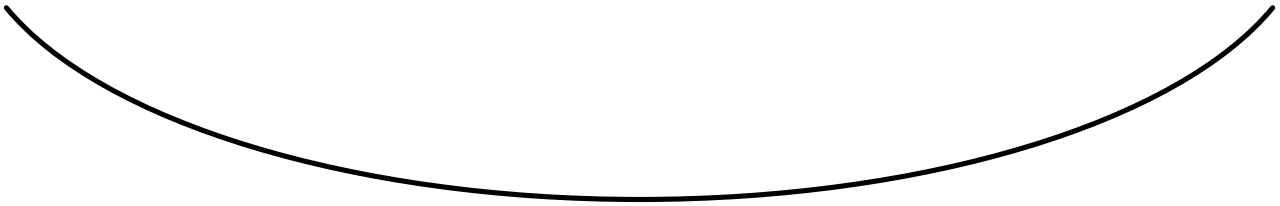
Summary for Reach 37R: over land

Inflow Area = 0.831 ac,100.00% Impervious, Inflow Depth = 0.00" for 10 yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 24.99 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.040
Length= 90.0' Slope= 0.1778 '/'
Inlet Invert= 0.00', Outlet Invert= -16.00'



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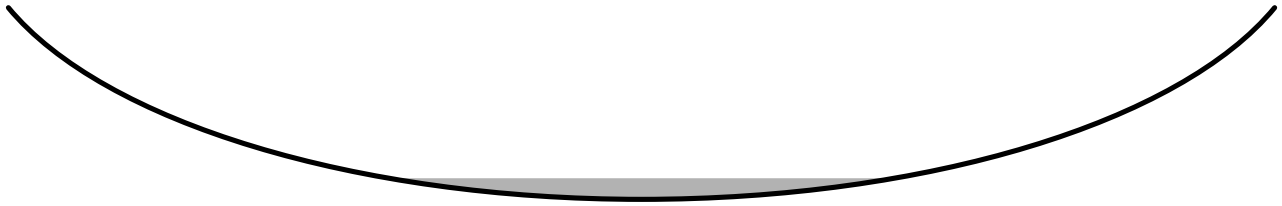
Summary for Reach 39R: over land

Inflow Area = 2.188 ac, 35.84% Impervious, Inflow Depth > 0.89" for 10 yr event
Inflow = 0.17 cfs @ 16.00 hrs, Volume= 0.163 af
Outflow = 0.17 cfs @ 16.04 hrs, Volume= 0.162 af, Atten= 0%, Lag= 2.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.41 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 1.38 fps, Avg. Travel Time= 1.6 min

Peak Storage= 17 cf @ 16.02 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 20.41 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.040
Length= 135.0' Slope= 0.1185 '/'
Inlet Invert= 247.50', Outlet Invert= 231.50'



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Summary for Subcatchment 1S+15S: Design Pt. 2

Runoff = 3.63 cfs @ 12.28 hrs, Volume= 0.387 af, Depth> 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
	69,866	70	Woods, Good, HSG C
	6,447	77	Woods, Good, HSG D
*	4,220	98	
	1,192	39	>75% Grass cover, Good, HSG A
	470	30	Woods, Good, HSG A
	1,651	74	>75% Grass cover, Good, HSG C
	83,846	71	Weighted Average
	79,626		94.97% Pervious Area
	4,220		5.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	575	0.0834	1.44		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
1.3	125	0.0050	1.63	0.98	**Channel Flow, Gutter/edge of Road** Area= 0.6 sf Perim= 3.0' r= 0.20' n= 0.022
20.2	750	Total			

Summary for Subcatchment 2S:

Runoff = 1.55 cfs @ 12.25 hrs, Volume= 0.155 af, Depth> 3.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	7,053	98	Paved
	7,521	74	>75% Grass cover, Good, HSG C
	7,119	70	Woods, Good, HSG C
	2,889	77	Woods, Good, HSG D
	396	80	>75% Grass cover, Good, HSG D
	24,978	80	Weighted Average
	17,925		71.76% Pervious Area
	7,053		28.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.20"
3.3	275	0.0764	1.38		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
0.7	110	0.0492	2.63	0.26	**Channel Flow, Gutter** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
1.4	160	0.0500	1.94	0.01	**Pipe Channel,** 1.0" Round Area= 0.0 sf Perim= 0.3' r= 0.02' n= 0.013 Corrugated PE, smooth interior
17.7	595	Total			

Summary for Subcatchment 4S:

Runoff = 5.87 cfs @ 12.10 hrs, Volume= 0.436 af, Depth> 3.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	11,870	98	Road
*	5,585	98	Sidewalk
*	871	98	Roofs
*	414	98	Fishpond
	24,404	80	>75% Grass cover, Good, HSG D
	3,559	74	>75% Grass cover, Good, HSG C
	11,026	77	Woods, Good, HSG D
	4,971	70	Woods, Good, HSG C
	62,700	84	Weighted Average
	43,960		70.11% Pervious Area
	18,740		29.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
0.6	50	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrattion** Short Grass Pasture Kv= 7.0 fps
2.1	250	0.0280	1.98	0.20	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
7.0	350	Total			

Summary for Subcatchment 5S: Parking Lot

Runoff = 1.29 cfs @ 12.35 hrs, Volume= 0.150 af, Depth> 2.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	27,927	70	Porous Paved , HSG C
	4,671	77	Woods, Good, HSG D
	32,598	71	Weighted Average
	32,598		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	50	0.0150	0.03		**Sheet Flow, Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 3.20"
0.1	20	0.5000	4.95		**Shallow Concentrated Flow, Shallow concentration** Short Grass Pasture Kv= 7.0 fps
0.3	70	0.0444	4.28		**Shallow Concentrated Flow, Shallow Concentration** Paved Kv= 20.3 fps
0.2	20	0.0200	1.67	0.17	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
24.7	160	Total			

Summary for Subcatchment 6S: Parking Lot

Runoff = 2.88 cfs @ 12.08 hrs, Volume= 0.201 af, Depth> 2.87"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

Area (sf)	CN	Description
2,893	80	>75% Grass cover, Good, HSG D
7,544	70	Woods, Good, HSG C
26,311	77	Woods, Good, HSG D
36,748	76	Weighted Average
36,748		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	20	0.0100	0.09		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
0.4	90	0.0400	4.06		**Shallow Concentrated Flow, Shallow Concentration** Paved Kv= 20.3 fps
1.6	220	0.0364	2.26	0.23	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
5.6	330	Total			

Summary for Subcatchment 7S:

Runoff = 2.88 cfs @ 12.08 hrs, Volume= 0.206 af, Depth> 4.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	8,839	98	Road
*	4,285	98	Sidewalk
*	449	98	Fishpond
	12,414	80	>75% Grass cover, Good, HSG D
	25,987	89	Weighted Average
	12,414		47.77% Pervious Area
	13,573		52.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
0.4	75	0.0400	3.22		**Shallow Concentrated Flow, Shallow Concentration** Unpaved Kv= 16.1 fps
0.6	90	0.0400	2.37	0.24	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
5.3	215	Total			

Summary for Subcatchment 8S:

Runoff = 2.78 cfs @ 12.09 hrs, Volume= 0.203 af, Depth> 3.94"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	8,746	98	Road
*	3,980	98	Sidewalk
*	353	98	Fishpond
	5,561	74	>75% Grass cover, Good, HSG C
	8,342	80	>75% Grass cover, Good, HSG D
	26,982	87	Weighted Average
	13,903		51.53% Pervious Area
	13,079		48.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
1.2	100	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentration** Short Grass Pasture Kv= 7.0 fps
0.7	90	0.0322	2.12	0.21	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
6.2	240	Total			

Summary for Subcatchment 9S: HC Parking Lot

Runoff = 0.26 cfs @ 12.01 hrs, Volume= 0.015 af, Depth> 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	2,718	77	Porous Pavement, HSG D
	2,718		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	100	0.0290	3.46		**Shallow Concentrated Flow, Shallow Conc.** Paved Kv= 20.3 fps
0.4	50	0.0290	2.02	0.20	**Channel Flow, Gutter** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
0.9	150	Total			

Summary for Subcatchment 10S: HC Parking Lot

Runoff = 0.20 cfs @ 12.01 hrs, Volume= 0.012 af, Depth> 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	2,691	70	Porous Paved, HSG C
	2,691		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	190	0.0368	3.89		**Shallow Concentrated Flow, Shallow Conc.** Paved Kv= 20.3 fps

Summary for Subcatchment 11S:

Runoff = 2.00 cfs @ 12.09 hrs, Volume= 0.146 af, Depth> 3.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	7,020	98	Road
*	1,895	98	Sidewalk
	12,054	74	>75% Grass cover, Good, HSG C
	20,969	84	Weighted Average
	12,054		57.48% Pervious Area
	8,915		42.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow**
					Grass: Short n= 0.150 P2= 3.20"
0.4	30	0.0400	1.40		**Shallow Concentrated Flow, Shallow Conc.**
					Short Grass Pasture Kv= 7.0 fps
1.8	190	0.0222	1.76	0.18	**Channel Flow, Gutter**
					Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
6.5	270	Total			

Summary for Subcatchment 12S:

Runoff = 1.76 cfs @ 12.09 hrs, Volume= 0.129 af, Depth> 4.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	5,554	98	Road
*	1,702	98	Sidewalk
	9,446	80	>75% Grass cover, Good, HSG D
	16,702	88	Weighted Average
	9,446		56.56% Pervious Area
	7,256		43.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet**
					Grass: Short n= 0.150 P2= 3.20"
0.4	30	0.0400	1.40		**Shallow Concentrated Flow, Shallow Conc.**
					Short Grass Pasture Kv= 7.0 fps
1.5	160	0.0219	1.75	0.18	**Channel Flow, Gutter**
					Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
6.2	240	Total			

Summary for Subcatchment 14S:

Runoff = 4.05 cfs @ 12.05 hrs, Volume= 0.269 af, Depth> 3.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	12,392	98	Road
*	5,594	98	Sidewalk
	16,907	74	>75% Grass cover, Good, HSG C
	1,707	80	>75% Grass cover, Good, HSG D
	36,600	86	Weighted Average
	18,614		50.86% Pervious Area
	17,986		49.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.30		**Sheet Flow, Sheet**
					Grass: Short n= 0.150 P2= 3.20"
0.3	40	0.1200	2.42		**Shallow Concentrated Flow, Shallow Conc.**
					Short Grass Pasture Kv= 7.0 fps
0.6	65	0.0200	1.67	0.17	**Channel Flow, Gutter**
					Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
3.6	155	Total			

Summary for Pond 15P: Ret. Pond 2

Inflow Area = 3.019 ac, 34.52% Impervious, Inflow Depth > 3.72" for 25 yr event
Inflow = 12.47 cfs @ 12.09 hrs, Volume= 0.935 af
Outflow = 3.27 cfs @ 12.48 hrs, Volume= 0.573 af, Atten= 74%, Lag= 23.0 min
Discarded = 0.10 cfs @ 8.27 hrs, Volume= 0.139 af
Primary = 3.17 cfs @ 12.48 hrs, Volume= 0.433 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 253.43' @ 12.48 hrs Surf.Area= 7,543 sf Storage= 18,801 cf

Plug-Flow detention time= 176.9 min calculated for 0.573 af (61% of inflow)
Center-of-Mass det. time= 74.5 min (878.3 - 803.8)

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	23,481 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	1,565	0	0
250.00	2,609	4,174	4,174
252.00	3,849	6,458	10,632
254.00	9,000	12,849	23,481

Device	Routing	Invert	Outlet Devices
#1	Primary	253.00'	**2.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600
			Limited to weir flow at low heads
#2	Primary	253.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	248.00'	**0.10 cfs Exfiltration at all elevations**

Discarded OutFlow Max=0.10 cfs @ 8.27 hrs HW=248.06' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=3.17 cfs @ 12.48 hrs HW=253.43' (Free Discharge)
├**1=Orifice/Grate** (Orifice Controls 3.17 cfs @ 3.17 fps)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Subcatchment 16S: Design Pt. 3

Runoff = 2.40 cfs @ 12.19 hrs, Volume= 0.219 af, Depth> 2.33"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

Area (sf)	CN	Description
5,679	74	>75% Grass cover, Good, HSG C
43,449	70	Woods, Good, HSG C
49,128	70	Weighted Average
49,128		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	350	0.0429	1.04		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
13.5	400	Total			

Summary for Pond 17P: Ret. Pond 1

Inflow Area = 0.673 ac, 24.05% Impervious, Inflow Depth > 2.88" for 25 yr event
Inflow = 1.59 cfs @ 12.25 hrs, Volume= 0.162 af
Outflow = 0.77 cfs @ 12.58 hrs, Volume= 0.150 af, Atten= 52%, Lag= 20.0 min
Discarded = 0.05 cfs @ 10.45 hrs, Volume= 0.060 af
Primary = 0.72 cfs @ 12.58 hrs, Volume= 0.089 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 237.74' @ 12.58 hrs Surf.Area= 2,183 sf Storage= 2,677 cf

Plug-Flow detention time= 171.6 min calculated for 0.149 af (92% of inflow)
Center-of-Mass det. time= 133.6 min (964.4 - 830.8)

Volume	Invert	Avail.Storage	Storage Description
#1	236.00'	6,025 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
236.00	913	0	0
237.00	1,626	1,270	1,270
238.00	2,380	2,003	3,273
239.00	3,124	2,752	6,025

Device	Routing	Invert	Outlet Devices
#1	Primary	237.70'	**2.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	238.00'	**6.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3 Discarded 236.00' **0.05 cfs Exfiltration at all elevations**
#4 Primary 236.50' **2.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.05 cfs @ 10.45 hrs HW=236.03' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=0.71 cfs @ 12.58 hrs HW=237.74' (Free Discharge)
├**1=Orifice/Grate** (Weir Controls 0.60 cfs @ 0.64 fps)
├**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**4=Orifice/Grate** (Orifice Controls 0.11 cfs @ 5.18 fps)

Summary for Subcatchment 17S:

Runoff = 3.13 cfs @ 12.33 hrs, Volume= 0.364 af, Depth> 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	78	98	Sidewalk
*	2,790	98	Roof
	20,542	61	>75% Grass cover, Good, HSG B
	17,042	74	>75% Grass cover, Good, HSG C
	47,421	55	Woods, Good, HSG B
	20,323	70	Woods, Good, HSG C
	108,196	63	Weighted Average
	105,328		97.35% Pervious Area
	2,868		2.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.9	375	0.0160	0.63		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
22.2	425	Total			

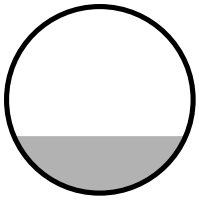
Summary for Reach 18R: pond outlet

Inflow Area = 0.673 ac, 24.05% Impervious, Inflow Depth = 1.59" for 25 yr event
Inflow = 0.72 cfs @ 12.58 hrs, Volume= 0.089 af
Outflow = 0.72 cfs @ 12.58 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.55 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.77 fps, Avg. Travel Time= 0.2 min

Peak Storage= 4 cf @ 12.58 hrs
Average Depth at Peak Storage= 0.30'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 233.17', Outlet Invert= 232.97'



Summary for Subcatchment 18S:

Runoff = 15.21 cfs @ 12.07 hrs, Volume= 1.046 af, Depth> 2.25"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

Area (sf)	CN	Description
5,384	39	>75% Grass cover, Good, HSG A
191	61	>75% Grass cover, Good, HSG B
51,556	74	>75% Grass cover, Good, HSG C
3,108	77	Woods, Good, HSG D
4,710	30	Woods, Good, HSG A
13,938	55	Woods, Good, HSG B
163,979	70	Woods, Good, HSG C
242,866	69	Weighted Average
242,866		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.30		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"
2.0	180	0.0944	1.54		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
4.7	230	Total			

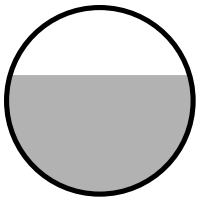
Summary for Reach 19R: Outlet to Pond

Inflow Area = 1.439 ac, 29.89% Impervious, Inflow Depth > 3.63" for 25 yr event
Inflow = 5.87 cfs @ 12.10 hrs, Volume= 0.436 af
Outflow = 5.87 cfs @ 12.10 hrs, Volume= 0.436 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 11.09 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.01 fps, Avg. Travel Time= 0.2 min

Peak Storage= 26 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.64'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.97 cfs

12.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0500 '/'
Inlet Invert= 257.50', Outlet Invert= 255.00'



Summary for Subcatchment 19S: Pond Catchment

Runoff = 1.70 cfs @ 12.03 hrs, Volume= 0.104 af, Depth> 2.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

Area (sf)	CN	Description
1,756	61	>75% Grass cover, Good, HSG B
19,265	74	>75% Grass cover, Good, HSG C
21,021	73	Weighted Average
21,021		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3000	0.44		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"

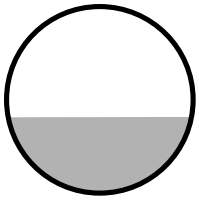
Summary for Reach 20R:

Inflow Area = 0.619 ac, 48.47% Impervious, Inflow Depth > 3.94" for 25 yr event
Inflow = 2.78 cfs @ 12.10 hrs, Volume= 0.203 af
Outflow = 2.77 cfs @ 12.10 hrs, Volume= 0.203 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 9.23 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.14 fps, Avg. Travel Time= 0.7 min

Peak Storage= 39 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.97 cfs

12.0" Round Pipe
n= 0.013
Length= 130.0' Slope= 0.0500 '/'
Inlet Invert= 261.53', Outlet Invert= 255.03'



Summary for Subcatchment 20S: Priest's Parking

Runoff = 0.20 cfs @ 12.01 hrs, Volume= 0.012 af, Depth> 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	2,605	70	Porous Paved, HSG C
	2,605		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0447	1.65		**Sheet Flow, Shallow Conc.** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0400	2.37	0.24	**Channel Flow, Gutter** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
0.7	80	Total			

Summary for Reach 21R: Design Pt. 4

Inflow Area = 2.484 ac, 2.65% Impervious, Inflow Depth > 1.76" for 25 yr event
Inflow = 3.13 cfs @ 12.33 hrs, Volume= 0.364 af
Outflow = 3.13 cfs @ 12.33 hrs, Volume= 0.364 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 21S: pond catchment

Runoff = 1.46 cfs @ 12.03 hrs, Volume= 0.090 af, Depth> 2.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

Area (sf)	CN	Description
8,020	74	>75% Grass cover, Good, HSG C
7,800	80	>75% Grass cover, Good, HSG D
15,820	77	Weighted Average
15,820		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3000	0.44		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"

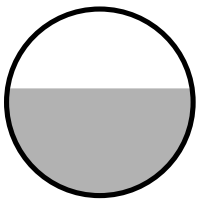
Summary for Reach 22R: pond outlet

Inflow Area = 3.019 ac, 34.52% Impervious, Inflow Depth > 1.72" for 25 yr event
Inflow = 3.17 cfs @ 12.48 hrs, Volume= 0.433 af
Outflow = 3.17 cfs @ 12.48 hrs, Volume= 0.433 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.78 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.33 fps, Avg. Travel Time= 0.1 min

Peak Storage= 12 cf @ 12.48 hrs
Average Depth at Peak Storage= 0.58'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013
Length= 25.0' Slope= 0.0200 '/'
Inlet Invert= 251.50', Outlet Invert= 251.00'



Summary for Subcatchment 22S: pond catchment

Runoff = 0.08 cfs @ 12.04 hrs, Volume= 0.007 af, Depth> 0.86"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

Area (sf)	CN	Description
2,930	39	>75% Grass cover, Good, HSG A
1,420	74	>75% Grass cover, Good, HSG C
4,350	50	Weighted Average
4,350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	50	0.5000	0.54		**Sheet Flow, Sheet**
					Grass: Short n= 0.150 P2= 3.20"

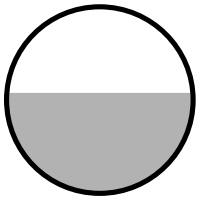
Summary for Reach 23R: 12" street drain

Inflow Area = 0.597 ac, 52.23% Impervious, Inflow Depth > 4.15" for 25 yr event
Inflow = 2.88 cfs @ 12.08 hrs, Volume= 0.206 af
Outflow = 2.86 cfs @ 12.09 hrs, Volume= 0.206 af, Atten= 1%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.62 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.25 fps, Avg. Travel Time= 1.9 min

Peak Storage= 108 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013
Length= 250.0' Slope= 0.0200 '/'
Inlet Invert= 258.00', Outlet Invert= 253.00'



Summary for Subcatchment 23S: roofs

Runoff = 5.31 cfs @ 12.00 hrs, Volume= 0.358 af, Depth> 5.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 25 yr Rainfall=5.40"

	Area (sf)	CN	Description
*	21,520	98	Temple
*	14,690	98	Auditorium
	36,210	98	Weighted Average
	36,210		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	50	0.3000	15.53	1.55	**Channel Flow, roof runoff**
					Area= 0.1 sf Perim= 1.2' r= 0.08' n= 0.010
0.2	100	0.0200	8.34	6.55	**Pipe Channel, pipes**
					12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25'
					n= 0.010

0.3 150 Total

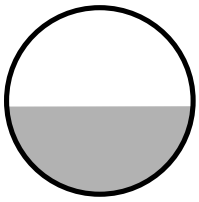
Summary for Reach 24R: 12" pipe

Inflow Area = 0.619 ac, 48.47% Impervious, Inflow Depth > 3.94" for 25 yr event
Inflow = 2.78 cfs @ 12.09 hrs, Volume= 0.203 af
Outflow = 2.78 cfs @ 12.10 hrs, Volume= 0.203 af, Atten= 0%, Lag= 0.5 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.65 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.62 fps, Avg. Travel Time= 0.8 min

Peak Storage= 44 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.17 cfs

12.0" Round Pipe
n= 0.013
Length= 120.0' Slope= 0.0300 '/'
Inlet Invert= 265.42', Outlet Invert= 261.82'



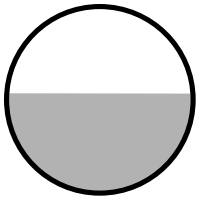
Summary for Reach 26R: 12" pipe

Inflow Area = 0.481 ac, 42.52% Impervious, Inflow Depth > 3.63" for 25 yr event
Inflow = 2.00 cfs @ 12.09 hrs, Volume= 0.146 af
Outflow = 1.99 cfs @ 12.11 hrs, Volume= 0.146 af, Atten= 1%, Lag= 1.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.66 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.65 fps, Avg. Travel Time= 1.9 min

Peak Storage= 79 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.53'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013
Length= 185.0' Slope= 0.0100 '/'
Inlet Invert= 0.00', Outlet Invert= -1.85'



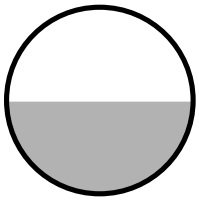
Summary for Reach 27R: 12" pipe

Inflow Area = 0.383 ac, 43.44% Impervious, Inflow Depth > 4.05" for 25 yr event
Inflow = 1.76 cfs @ 12.09 hrs, Volume= 0.129 af
Outflow = 1.75 cfs @ 12.11 hrs, Volume= 0.129 af, Atten= 1%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.51 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.55 fps, Avg. Travel Time= 1.9 min

Peak Storage= 67 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.49'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013
Length= 174.0' Slope= 0.0100 '/'
Inlet Invert= 0.00', Outlet Invert= -1.74'



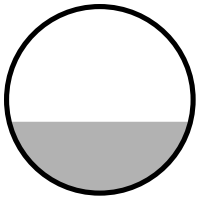
Summary for Reach 28R: Outlet to Pond

Inflow Area = 1.705 ac, 45.99% Impervious, Inflow Depth > 3.83" for 25 yr event
Inflow = 7.26 cfs @ 12.08 hrs, Volume= 0.544 af
Outflow = 7.26 cfs @ 12.08 hrs, Volume= 0.544 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 11.72 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.93 fps, Avg. Travel Time= 0.2 min

Peak Storage= 31 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 23.49 cfs

18.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0500 '/'
Inlet Invert= 257.50', Outlet Invert= 255.00'



Summary for Pond 30P: Det. Pond 3

Inflow Area = 2.188 ac, 35.84% Impervious, Inflow Depth > 3.56" for 25 yr event
Inflow = 8.66 cfs @ 12.07 hrs, Volume= 0.648 af
Outflow = 0.52 cfs @ 14.06 hrs, Volume= 0.300 af, Atten= 94%, Lag= 119.6 min
Discarded = 0.06 cfs @ 8.23 hrs, Volume= 0.084 af
Primary = 0.46 cfs @ 14.06 hrs, Volume= 0.217 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 257.51' @ 14.06 hrs Surf.Area= 5,694 sf Storage= 17,937 cf

Plug-Flow detention time= 329.6 min calculated for 0.300 af (46% of inflow)
Center-of-Mass det. time= 212.9 min (1,019.0 - 806.1)

Volume	Invert	Avail.Storage	Storage Description
#1	252.00'	27,469 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
252.00	1,021	0	0
254.00	2,562	3,583	3,583
256.00	4,270	6,832	10,415
258.00	6,157	10,427	20,842
259.00	7,097	6,627	27,469

Device	Routing	Invert	Outlet Devices
#1	Primary	257.50'	**6.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600 Limited to weir flow at low heads
#2	Secondary	258.00'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	252.00'	**0.06 cfs Exfiltration at all elevations**
#4	Primary	254.00'	**2.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.06 cfs @ 8.23 hrs HW=252.07' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=0.35 cfs @ 14.06 hrs HW=257.51' (Free Discharge)
├**1=Orifice/Grate** (Weir Controls 0.15 cfs @ 0.32 fps)
└**4=Orifice/Grate** (Orifice Controls 0.19 cfs @ 8.91 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=252.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 31P: Infiltration Bed

Inflow Area = 0.831 ac,100.00% Impervious, Inflow Depth > 5.16" for 25 yr event
Inflow = 5.31 cfs @ 12.00 hrs, Volume= 0.358 af
Outflow = 0.58 cfs @ 12.49 hrs, Volume= 0.241 af, Atten= 89%, Lag= 29.4 min
Discarded = 0.13 cfs @ 8.55 hrs, Volume= 0.199 af
Primary = 0.45 cfs @ 12.49 hrs, Volume= 0.042 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 264.33' @ 12.49 hrs Surf.Area= 0.056 ac Storage= 0.167 af

Plug-Flow detention time= 219.5 min calculated for 0.241 af (67% of inflow)
Center-of-Mass det. time= 120.0 min (861.5 - 741.5)

Volume	Invert	Avail.Storage	Storage Description
#1	258.00'	0.156 af	**45.00'W x 54.00'L x 7.00'H Prismatoid** 0.390 af Overall x 40.0% Voids
#2	260.00'	0.025 af	**Cultec R-900HD** x 7 Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap Row Length Adjustment= +2.25' x 17.61 sf x 6 rows
		0.181 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	264.00'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 264.00' / 263.60' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Discarded	258.00'	**0.13 cfs Exfiltration at all elevations**

Discarded OutFlow Max=0.13 cfs @ 8.55 hrs HW=258.07' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=0.44 cfs @ 12.49 hrs HW=264.33' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.44 cfs @ 1.96 fps)

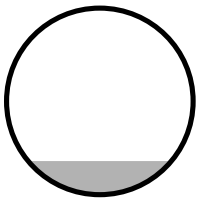
Summary for Reach 31R: pond outlet

Inflow Area = 2.188 ac, 35.84% Impervious, Inflow Depth > 1.19" for 25 yr event
Inflow = 0.46 cfs @ 14.06 hrs, Volume= 0.217 af
Outflow = 0.46 cfs @ 14.08 hrs, Volume= 0.216 af, Atten= 0%, Lag= 1.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.76 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 3.75 fps, Avg. Travel Time= 0.7 min

Peak Storage= 16 cf @ 14.07 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.47 cfs

12.0" Round Pipe
n= 0.013
Length= 167.0' Slope= 0.0329 '/'
Inlet Invert= 253.00', Outlet Invert= 247.50'



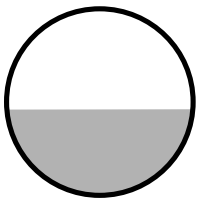
Summary for Reach 32R: Outlet to Pond

Inflow Area = 0.573 ac, 28.24% Impervious, Inflow Depth > 3.23" for 25 yr event
Inflow = 1.55 cfs @ 12.25 hrs, Volume= 0.155 af
Outflow = 1.55 cfs @ 12.25 hrs, Volume= 0.154 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.38 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.73 fps, Avg. Travel Time= 0.3 min

Peak Storage= 12 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 34.0' Slope= 0.0100 '/'
Inlet Invert= 238.04', Outlet Invert= 237.70'



Summary for Reach 34R: Design Point 1

Inflow Area = 12.286 ac, 22.95% Impervious, Inflow Depth > 1.78" for 25 yr event
Inflow = 15.32 cfs @ 12.07 hrs, Volume= 1.825 af
Outflow = 15.32 cfs @ 12.07 hrs, Volume= 1.825 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

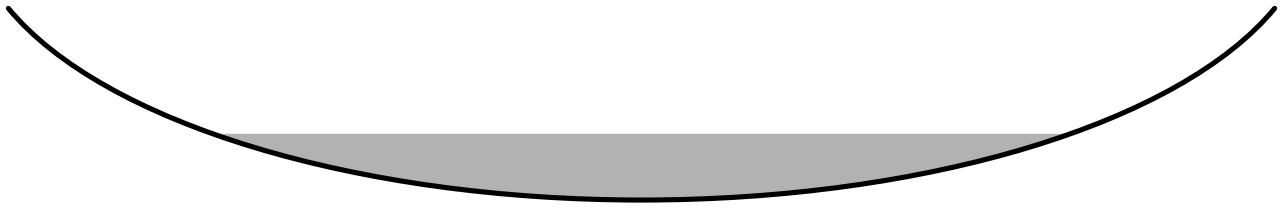
Summary for Reach 35R: over land

Inflow Area = 0.673 ac, 24.05% Impervious, Inflow Depth = 1.59" for 25 yr event
Inflow = 0.72 cfs @ 12.58 hrs, Volume= 0.089 af
Outflow = 0.71 cfs @ 12.62 hrs, Volume= 0.089 af, Atten= 1%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.05 fps, Min. Travel Time= 1.1 min
Avg. Velocity = 0.50 fps, Avg. Travel Time= 2.3 min

Peak Storage= 47 cf @ 12.60 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 7.08 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.040 Earth, cobble bottom, clean sides
Length= 70.0' Slope= 0.0143 '/'
Inlet Invert= 0.00', Outlet Invert= -1.00'



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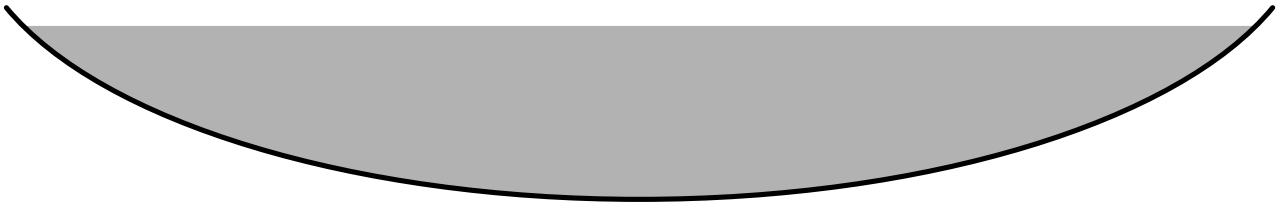
Summary for Reach 36R: over land

Inflow Area = 3.019 ac, 34.52% Impervious, Inflow Depth > 1.72" for 25 yr event
Inflow = 3.17 cfs @ 12.48 hrs, Volume= 0.433 af
Outflow = 3.17 cfs @ 12.49 hrs, Volume= 0.433 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.42 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.04 fps, Avg. Travel Time= 0.7 min

Peak Storage= 65 cf @ 12.48 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 0.25' Flow Area= 0.8 sf, Capacity= 3.94 cfs

5.00' x 0.25' deep Parabolic Channel, n= 0.040 Earth, cobble bottom, clean sides
Length= 90.0' Slope= 0.1778 '/'
Inlet Invert= 0.00', Outlet Invert= -16.00'



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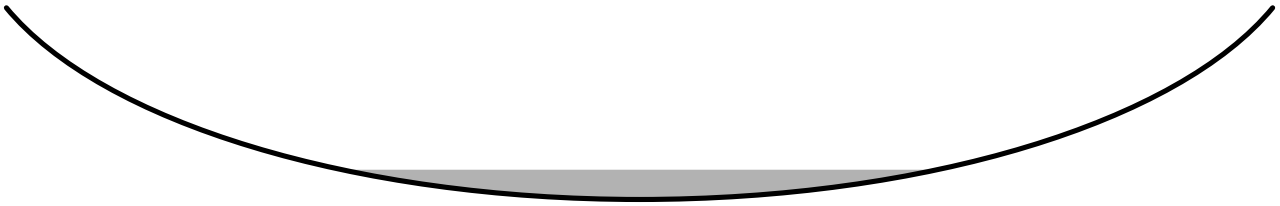
Summary for Reach 37R: over land

Inflow Area = 0.831 ac,100.00% Impervious, Inflow Depth = 0.60" for 25 yr event
Inflow = 0.45 cfs @ 12.49 hrs, Volume= 0.042 af
Outflow = 0.45 cfs @ 12.52 hrs, Volume= 0.042 af, Atten= 0%, Lag= 1.3 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 2.18 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.25 fps, Avg. Travel Time= 1.2 min

Peak Storage= 18 cf @ 12.50 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 24.99 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.040
Length= 90.0' Slope= 0.1778 '/'
Inlet Invert= 0.00', Outlet Invert= -16.00'



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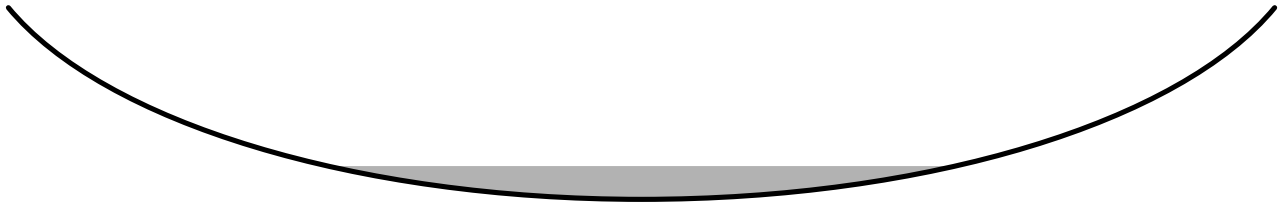
Summary for Reach 39R: over land

Inflow Area = 2.188 ac, 35.84% Impervious, Inflow Depth > 1.19" for 25 yr event
Inflow = 0.46 cfs @ 14.08 hrs, Volume= 0.216 af
Outflow = 0.46 cfs @ 14.11 hrs, Volume= 0.216 af, Atten= 0%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.91 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 1.49 fps, Avg. Travel Time= 1.5 min

Peak Storage= 32 cf @ 14.09 hrs
Average Depth at Peak Storage= 0.09'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 20.41 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.040
Length= 135.0' Slope= 0.1185 '/'
Inlet Invert= 247.50', Outlet Invert= 231.50'



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Summary for Subcatchment 1S+15S: Design Pt. 2

Runoff = 5.13 cfs @ 12.28 hrs, Volume= 0.541 af, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
	69,866	70	Woods, Good, HSG C
	6,447	77	Woods, Good, HSG D
*	4,220	98	
	1,192	39	>75% Grass cover, Good, HSG A
	470	30	Woods, Good, HSG A
	1,651	74	>75% Grass cover, Good, HSG C
	83,846	71	Weighted Average
	79,626		94.97% Pervious Area
	4,220		5.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
6.6	575	0.0834	1.44		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
1.3	125	0.0050	1.63	0.98	**Channel Flow, Gutter/edge of Road** Area= 0.6 sf Perim= 3.0' r= 0.20' n= 0.022
20.2	750	Total			

Summary for Subcatchment 2S:

Runoff = 2.05 cfs @ 12.24 hrs, Volume= 0.206 af, Depth> 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	7,053	98	Paved
	7,521	74	>75% Grass cover, Good, HSG C
	7,119	70	Woods, Good, HSG C
	2,889	77	Woods, Good, HSG D
	396	80	>75% Grass cover, Good, HSG D
	24,978	80	Weighted Average
	17,925		71.76% Pervious Area
	7,053		28.24% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet Flow** Woods: Light underbrush n= 0.400 P2= 3.20"
3.3	275	0.0764	1.38		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
0.7	110	0.0492	2.63	0.26	**Channel Flow, Gutter** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
1.4	160	0.0500	1.94	0.01	**Pipe Channel,** 1.0" Round Area= 0.0 sf Perim= 0.3' r= 0.02' n= 0.013 Corrugated PE, smooth interior
17.7	595	Total			

Summary for Subcatchment 4S:

Runoff = 7.61 cfs @ 12.10 hrs, Volume= 0.570 af, Depth> 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	11,870	98	Road
*	5,585	98	Sidewalk
*	871	98	Roofs
*	414	98	Fishpond
	24,404	80	>75% Grass cover, Good, HSG D
	3,559	74	>75% Grass cover, Good, HSG C
	11,026	77	Woods, Good, HSG D
	4,971	70	Woods, Good, HSG C
	62,700	84	Weighted Average
	43,960		70.11% Pervious Area
	18,740		29.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
0.6	50	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentrattion** Short Grass Pasture Kv= 7.0 fps
2.1	250	0.0280	1.98	0.20	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
7.0	350	Total			

Summary for Subcatchment 5S: Parking Lot

Runoff = 1.83 cfs @ 12.35 hrs, Volume= 0.210 af, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	27,927	70	Porous Paved , HSG C
	4,671	77	Woods, Good, HSG D
	32,598	71	Weighted Average
	32,598		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1	50	0.0150	0.03		**Sheet Flow, Sheet Flow** Woods: Dense underbrush n= 0.800 P2= 3.20"
0.1	20	0.5000	4.95		**Shallow Concentrated Flow, Shallow concentration** Short Grass Pasture Kv= 7.0 fps
0.3	70	0.0444	4.28		**Shallow Concentrated Flow, Shallow Concentration** Paved Kv= 20.3 fps
0.2	20	0.0200	1.67	0.17	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
24.7	160	Total			

Summary for Subcatchment 6S: Parking Lot

Runoff = 3.91 cfs @ 12.08 hrs, Volume= 0.274 af, Depth> 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
2,893	80	>75% Grass cover, Good, HSG D
7,544	70	Woods, Good, HSG C
26,311	77	Woods, Good, HSG D
36,748	76	Weighted Average
36,748		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.6	20	0.0100	0.09		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
0.4	90	0.0400	4.06		**Shallow Concentrated Flow, Shallow Concentration** Paved Kv= 20.3 fps
1.6	220	0.0364	2.26	0.23	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
5.6	330	Total			

Summary for Subcatchment 7S:

Runoff = 3.64 cfs @ 12.08 hrs, Volume= 0.264 af, Depth> 5.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	8,839	98	Road
*	4,285	98	Sidewalk
*	449	98	Fishpond
	12,414	80	>75% Grass cover, Good, HSG D
	25,987	89	Weighted Average
	12,414		47.77% Pervious Area
	13,573		52.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
0.4	75	0.0400	3.22		**Shallow Concentrated Flow, Shallow Concentration** Unpaved Kv= 16.1 fps
0.6	90	0.0400	2.37	0.24	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
5.3	215	Total			

Summary for Subcatchment 8S:

Runoff = 3.55 cfs @ 12.09 hrs, Volume= 0.263 af, Depth> 5.09"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	8,746	98	Road
*	3,980	98	Sidewalk
*	353	98	Fishpond
	5,561	74	>75% Grass cover, Good, HSG C
	8,342	80	>75% Grass cover, Good, HSG D
	26,982	87	Weighted Average
	13,903		51.53% Pervious Area
	13,079		48.47% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow** Grass: Short n= 0.150 P2= 3.20"
1.2	100	0.0400	1.40		**Shallow Concentrated Flow, Shallow Concentration** Short Grass Pasture Kv= 7.0 fps
0.7	90	0.0322	2.12	0.21	**Channel Flow, Channel Flow** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
6.2	240	Total			

Summary for Subcatchment 9S: HC Parking Lot

Runoff = 0.35 cfs @ 12.01 hrs, Volume= 0.021 af, Depth> 4.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	2,718	77	Porous Pavement, HSG D
	2,718		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	100	0.0290	3.46		**Shallow Concentrated Flow, Shallow Conc.** Paved Kv= 20.3 fps
0.4	50	0.0290	2.02	0.20	**Channel Flow, Gutter** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
0.9	150	Total			

Summary for Subcatchment 10S: HC Parking Lot

Runoff = 0.29 cfs @ 12.01 hrs, Volume= 0.017 af, Depth> 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	2,691	70	Porous Paved, HSG C
	2,691		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	190	0.0368	3.89		**Shallow Concentrated Flow, Shallow Conc.** Paved Kv= 20.3 fps

Summary for Subcatchment 11S:

Runoff = 2.59 cfs @ 12.09 hrs, Volume= 0.191 af, Depth> 4.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	7,020	98	Road
*	1,895	98	Sidewalk
	12,054	74	>75% Grass cover, Good, HSG C
	20,969	84	Weighted Average
	12,054		57.48% Pervious Area
	8,915		42.52% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet Flow**
					Grass: Short n= 0.150 P2= 3.20"
0.4	30	0.0400	1.40		**Shallow Concentrated Flow, Shallow Conc.**
					Short Grass Pasture Kv= 7.0 fps
1.8	190	0.0222	1.76	0.18	**Channel Flow, Gutter**
					Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
6.5	270	Total			

Summary for Subcatchment 12S:

Runoff = 2.23 cfs @ 12.09 hrs, Volume= 0.166 af, Depth> 5.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	5,554	98	Road
*	1,702	98	Sidewalk
	9,446	80	>75% Grass cover, Good, HSG D
	16,702	88	Weighted Average
	9,446		56.56% Pervious Area
	7,256		43.44% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.3	50	0.0400	0.20		**Sheet Flow, Sheet**
					Grass: Short n= 0.150 P2= 3.20"
0.4	30	0.0400	1.40		**Shallow Concentrated Flow, Shallow Conc.**
					Short Grass Pasture Kv= 7.0 fps
1.5	160	0.0219	1.75	0.18	**Channel Flow, Gutter**
					Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
6.2	240	Total			

Summary for Subcatchment 14S:

Runoff = 5.20 cfs @ 12.05 hrs, Volume= 0.349 af, Depth> 4.98"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	12,392	98	Road
*	5,594	98	Sidewalk
	16,907	74	>75% Grass cover, Good, HSG C
	1,707	80	>75% Grass cover, Good, HSG D
	36,600	86	Weighted Average
	18,614		50.86% Pervious Area
	17,986		49.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.30		**Sheet Flow, Sheet**
					Grass: Short n= 0.150 P2= 3.20"
0.3	40	0.1200	2.42		**Shallow Concentrated Flow, Shallow Conc.**
					Short Grass Pasture Kv= 7.0 fps
0.6	65	0.0200	1.67	0.17	**Channel Flow, Gutter**
					Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
3.6	155	Total			

Summary for Pond 15P: Ret. Pond 2

Inflow Area = 3.019 ac, 34.52% Impervious, Inflow Depth > 4.84" for 100 yr event
Inflow = 16.06 cfs @ 12.09 hrs, Volume= 1.218 af
Outflow = 7.58 cfs @ 12.27 hrs, Volume= 0.856 af, Atten= 53%, Lag= 10.9 min
Discarded = 0.10 cfs @ 7.39 hrs, Volume= 0.147 af
Primary = 7.48 cfs @ 12.27 hrs, Volume= 0.709 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 253.76' @ 12.27 hrs Surf.Area= 8,377 sf Storage= 21,378 cf

Plug-Flow detention time= 150.7 min calculated for 0.855 af (70% of inflow)
Center-of-Mass det. time= 59.0 min (855.6 - 796.6)

Volume	Invert	Avail.Storage	Storage Description
#1	248.00'	23,481 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
248.00	1,565	0	0
250.00	2,609	4,174	4,174
252.00	3,849	6,458	10,632
254.00	9,000	12,849	23,481

Device	Routing	Invert	Outlet Devices
#1	Primary	253.00'	**2.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600
			Limited to weir flow at low heads
#2	Primary	253.50'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	248.00'	**0.10 cfs Exfiltration at all elevations**

Discarded OutFlow Max=0.10 cfs @ 7.39 hrs HW=248.06' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=7.48 cfs @ 12.27 hrs HW=253.76' (Free Discharge)
├**1=Orifice/Grate** (Orifice Controls 4.19 cfs @ 4.19 fps)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 3.29 cfs @ 1.27 fps)

Summary for Subcatchment 16S: Design Pt. 3

Runoff = 3.41 cfs @ 12.19 hrs, Volume= 0.308 af, Depth> 3.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
5,679	74	>75% Grass cover, Good, HSG C
43,449	70	Woods, Good, HSG C
49,128	70	Weighted Average
49,128		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.9	50	0.0600	0.10		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
5.6	350	0.0429	1.04		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
13.5	400	Total			

Summary for Pond 17P: Ret. Pond 1

Inflow Area = 0.673 ac, 24.05% Impervious, Inflow Depth > 3.89" for 100 yr event
Inflow = 2.13 cfs @ 12.24 hrs, Volume= 0.218 af
Outflow = 1.65 cfs @ 12.39 hrs, Volume= 0.203 af, Atten= 23%, Lag= 8.9 min
Discarded = 0.05 cfs @ 9.71 hrs, Volume= 0.064 af
Primary = 1.60 cfs @ 12.39 hrs, Volume= 0.140 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 237.80' @ 12.39 hrs Surf.Area= 2,226 sf Storage= 2,801 cf

Plug-Flow detention time= 142.9 min calculated for 0.203 af (93% of inflow)
Center-of-Mass det. time= 107.7 min (930.5 - 822.8)

Volume	Invert	Avail.Storage	Storage Description
#1	236.00'	6,025 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
236.00	913	0	0
237.00	1,626	1,270	1,270
238.00	2,380	2,003	3,273
239.00	3,124	2,752	6,025

Device	Routing	Invert	Outlet Devices
#1	Primary	237.70'	**2.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600 Limited to weir flow at low heads
#2	Primary	238.00'	**6.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60

Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3 Discarded 236.00' **0.05 cfs Exfiltration at all elevations**
#4 Primary 236.50' **2.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.05 cfs @ 9.71 hrs HW=236.03' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.05 cfs)

Primary OutFlow Max=1.60 cfs @ 12.39 hrs HW=237.80' (Free Discharge)
├**1=Orifice/Grate** (Orifice Controls 1.49 cfs @ 1.49 fps)
├**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)
└**4=Orifice/Grate** (Orifice Controls 0.12 cfs @ 5.30 fps)

Summary for Subcatchment 17S:

Runoff = 4.77 cfs @ 12.31 hrs, Volume= 0.536 af, Depth> 2.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	78	98	Sidewalk
*	2,790	98	Roof
	20,542	61	>75% Grass cover, Good, HSG B
	17,042	74	>75% Grass cover, Good, HSG C
	47,421	55	Woods, Good, HSG B
	20,323	70	Woods, Good, HSG C
	108,196	63	Weighted Average
	105,328		97.35% Pervious Area
	2,868		2.65% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	50	0.0200	0.07		**Sheet Flow, Sheet** Woods: Light underbrush n= 0.400 P2= 3.20"
9.9	375	0.0160	0.63		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
22.2	425	Total			

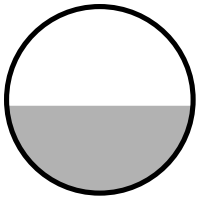
Summary for Reach 18R: pond outlet

Inflow Area = 0.673 ac, 24.05% Impervious, Inflow Depth > 2.49" for 100 yr event
Inflow = 1.60 cfs @ 12.39 hrs, Volume= 0.140 af
Outflow = 1.60 cfs @ 12.39 hrs, Volume= 0.140 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.41 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.97 fps, Avg. Travel Time= 0.2 min

Peak Storage= 7 cf @ 12.39 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 233.17', Outlet Invert= 232.97'



Summary for Subcatchment 18S:

Runoff = 21.78 cfs @ 12.07 hrs, Volume= 1.480 af, Depth> 3.19"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
5,384	39	>75% Grass cover, Good, HSG A
191	61	>75% Grass cover, Good, HSG B
51,556	74	>75% Grass cover, Good, HSG C
3,108	77	Woods, Good, HSG D
4,710	30	Woods, Good, HSG A
13,938	55	Woods, Good, HSG B
163,979	70	Woods, Good, HSG C
242,866	69	Weighted Average
242,866		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.7	50	0.1200	0.30		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"
2.0	180	0.0944	1.54		**Shallow Concentrated Flow, Shallow Conc.** Woodland Kv= 5.0 fps
4.7	230	Total			

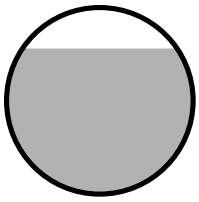
Summary for Reach 19R: Outlet to Pond

Inflow Area = 1.439 ac, 29.89% Impervious, Inflow Depth > 4.76" for 100 yr event
Inflow = 7.61 cfs @ 12.10 hrs, Volume= 0.570 af
Outflow = 7.60 cfs @ 12.10 hrs, Volume= 0.570 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 11.55 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.26 fps, Avg. Travel Time= 0.2 min

Peak Storage= 33 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.78'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.97 cfs

12.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0500 '/'
Inlet Invert= 257.50', Outlet Invert= 255.00'



Summary for Subcatchment 19S: Pond Catchment

Runoff = 2.36 cfs @ 12.03 hrs, Volume= 0.144 af, Depth> 3.59"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
1,756	61	>75% Grass cover, Good, HSG B
19,265	74	>75% Grass cover, Good, HSG C
21,021	73	Weighted Average
21,021		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3000	0.44		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"

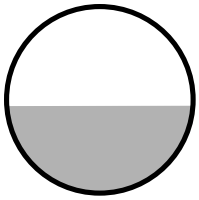
Summary for Reach 20R:

Inflow Area = 0.619 ac, 48.47% Impervious, Inflow Depth > 5.09" for 100 yr event
Inflow = 3.54 cfs @ 12.09 hrs, Volume= 0.263 af
Outflow = 3.53 cfs @ 12.10 hrs, Volume= 0.263 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 9.84 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 3.34 fps, Avg. Travel Time= 0.6 min

Peak Storage= 47 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.47'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 7.97 cfs

12.0" Round Pipe
n= 0.013
Length= 130.0' Slope= 0.0500 '/'
Inlet Invert= 261.53', Outlet Invert= 255.03'



Summary for Subcatchment 20S: Priest's Parking

Runoff = 0.28 cfs @ 12.01 hrs, Volume= 0.016 af, Depth> 3.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	2,605	70	Porous Paved, HSG C
	2,605		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0447	1.65		**Sheet Flow, Shallow Conc.** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0400	2.37	0.24	**Channel Flow, Gutter** Area= 0.1 sf Perim= 3.0' r= 0.03' n= 0.013
0.7	80	Total			

Summary for Reach 21R: Design Pt. 4

Inflow Area = 2.484 ac, 2.65% Impervious, Inflow Depth > 2.59" for 100 yr event
Inflow = 4.77 cfs @ 12.31 hrs, Volume= 0.536 af
Outflow = 4.77 cfs @ 12.31 hrs, Volume= 0.536 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

Summary for Subcatchment 21S: pond catchment

Runoff = 1.98 cfs @ 12.03 hrs, Volume= 0.121 af, Depth> 4.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
8,020	74	>75% Grass cover, Good, HSG C
7,800	80	>75% Grass cover, Good, HSG D
15,820	77	Weighted Average
15,820		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3000	0.44		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"

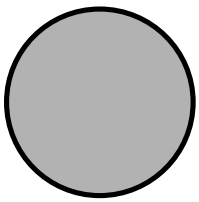
Summary for Reach 22R: pond outlet

Inflow Area = 3.019 ac, 34.52% Impervious, Inflow Depth > 2.82" for 100 yr event
Inflow = 7.48 cfs @ 12.27 hrs, Volume= 0.709 af
Outflow = 5.29 cfs @ 12.17 hrs, Volume= 0.709 af, Atten= 29%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 7.30 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 3.69 fps, Avg. Travel Time= 0.1 min

Peak Storage= 20 cf @ 12.18 hrs
Average Depth at Peak Storage= 1.00'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013
Length= 25.0' Slope= 0.0200 '/'
Inlet Invert= 251.50', Outlet Invert= 251.00'



Summary for Subcatchment 22S: pond catchment

Runoff = 0.17 cfs @ 12.03 hrs, Volume= 0.012 af, Depth> 1.45"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

Area (sf)	CN	Description
2,930	39	>75% Grass cover, Good, HSG A
1,420	74	>75% Grass cover, Good, HSG C
4,350	50	Weighted Average
4,350		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.6	50	0.5000	0.54		**Sheet Flow, Sheet** Grass: Short n= 0.150 P2= 3.20"

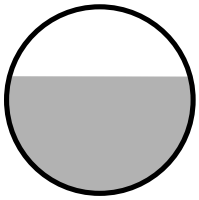
Summary for Reach 23R: 12" street drain

Inflow Area = 0.597 ac, 52.23% Impervious, Inflow Depth > 5.31" for 100 yr event
Inflow = 3.64 cfs @ 12.08 hrs, Volume= 0.264 af
Outflow = 3.62 cfs @ 12.09 hrs, Volume= 0.264 af, Atten= 1%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 6.98 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 2.40 fps, Avg. Travel Time= 1.7 min

Peak Storage= 130 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 5.04 cfs

12.0" Round Pipe
n= 0.013
Length= 250.0' Slope= 0.0200 '/'
Inlet Invert= 258.00', Outlet Invert= 253.00'



Summary for Subcatchment 23S: roofs

Runoff = 6.51 cfs @ 12.00 hrs, Volume= 0.441 af, Depth> 6.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Type III 24-hr 100 yr Rainfall=6.60"

	Area (sf)	CN	Description
*	21,520	98	Temple
*	14,690	98	Auditorium
	36,210	98	Weighted Average
	36,210		100.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	50	0.3000	15.53	1.55	**Channel Flow, roof runoff** Area= 0.1 sf Perim= 1.2' r= 0.08' n= 0.010
0.2	100	0.0200	8.34	6.55	**Pipe Channel, pipes** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.010

0.3 150 Total

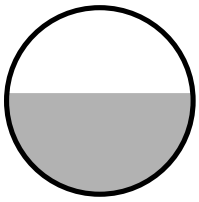
Summary for Reach 24R: 12" pipe

Inflow Area = 0.619 ac, 48.47% Impervious, Inflow Depth > 5.09" for 100 yr event
Inflow = 3.55 cfs @ 12.09 hrs, Volume= 0.263 af
Outflow = 3.54 cfs @ 12.09 hrs, Volume= 0.263 af, Atten= 0%, Lag= 0.4 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.13 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 2.79 fps, Avg. Travel Time= 0.7 min

Peak Storage= 52 cf @ 12.09 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.17 cfs

12.0" Round Pipe
n= 0.013
Length= 120.0' Slope= 0.0300 '/'
Inlet Invert= 265.42', Outlet Invert= 261.82'



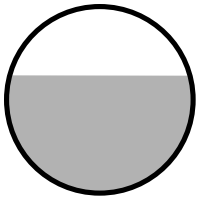
Summary for Reach 26R: 12" pipe

Inflow Area = 0.481 ac, 42.52% Impervious, Inflow Depth > 4.76" for 100 yr event
Inflow = 2.59 cfs @ 12.09 hrs, Volume= 0.191 af
Outflow = 2.57 cfs @ 12.11 hrs, Volume= 0.191 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.94 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.75 fps, Avg. Travel Time= 1.8 min

Peak Storage= 96 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.63'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013
Length= 185.0' Slope= 0.0100 '/'
Inlet Invert= 0.00', Outlet Invert= -1.85'



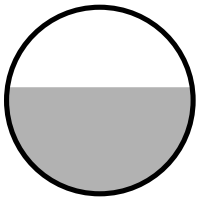
Summary for Reach 27R: 12" pipe

Inflow Area = 0.383 ac, 43.44% Impervious, Inflow Depth > 5.20" for 100 yr event
Inflow = 2.23 cfs @ 12.09 hrs, Volume= 0.166 af
Outflow = 2.22 cfs @ 12.11 hrs, Volume= 0.166 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.78 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.65 fps, Avg. Travel Time= 1.8 min

Peak Storage= 81 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013
Length= 174.0' Slope= 0.0100 '/'
Inlet Invert= 0.00', Outlet Invert= -1.74'



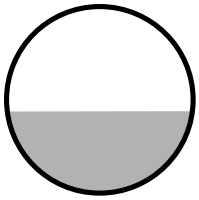
Summary for Reach 28R: Outlet to Pond

Inflow Area = 1.705 ac, 45.99% Impervious, Inflow Depth > 4.96" for 100 yr event
Inflow = 9.34 cfs @ 12.08 hrs, Volume= 0.705 af
Outflow = 9.33 cfs @ 12.08 hrs, Volume= 0.705 af, Atten= 0%, Lag= 0.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 12.53 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 4.20 fps, Avg. Travel Time= 0.2 min

Peak Storage= 37 cf @ 12.08 hrs
Average Depth at Peak Storage= 0.66'
Bank-Full Depth= 1.50' Flow Area= 1.8 sf, Capacity= 23.49 cfs

18.0" Round Pipe
n= 0.013
Length= 50.0' Slope= 0.0500 '/'
Inlet Invert= 257.50', Outlet Invert= 255.00'



Summary for Pond 30P: Det. Pond 3

Inflow Area = 2.188 ac, 35.84% Impervious, Inflow Depth > 4.66" for 100 yr event
Inflow = 11.28 cfs @ 12.07 hrs, Volume= 0.850 af
Outflow = 3.77 cfs @ 12.38 hrs, Volume= 0.483 af, Atten= 67%, Lag= 18.8 min
Discarded = 0.06 cfs @ 7.36 hrs, Volume= 0.088 af
Primary = 3.71 cfs @ 12.38 hrs, Volume= 0.395 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 257.58' @ 12.38 hrs Surf.Area= 5,761 sf Storage= 18,341 cf

Plug-Flow detention time= 238.4 min calculated for 0.483 af (57% of inflow)
Center-of-Mass det. time= 131.6 min (930.4 - 798.8)

Volume	Invert	Avail.Storage	Storage Description
#1	252.00'	27,469 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
252.00	1,021	0	0
254.00	2,562	3,583	3,583
256.00	4,270	6,832	10,415
258.00	6,157	10,427	20,842
259.00	7,097	6,627	27,469

Device	Routing	Invert	Outlet Devices
#1	Primary	257.50'	**6.0" x 2.0" Horiz. Orifice/Grate X 36.00** C= 0.600 Limited to weir flow at low heads
#2	Secondary	258.00'	**10.0' long x 10.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.49 2.56 2.70 2.69 2.68 2.69 2.67 2.64
#3	Discarded	252.00'	**0.06 cfs Exfiltration at all elevations**
#4	Primary	254.00'	**2.0" Vert. Orifice/Grate** C= 0.600

Discarded OutFlow Max=0.06 cfs @ 7.36 hrs HW=252.07' (Free Discharge)
└**3=Exfiltration** (Exfiltration Controls 0.06 cfs)

Primary OutFlow Max=3.76 cfs @ 12.38 hrs HW=257.58' (Free Discharge)
├**1=Orifice/Grate** (Weir Controls 3.57 cfs @ 0.93 fps)
└**4=Orifice/Grate** (Orifice Controls 0.20 cfs @ 9.00 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=252.00' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond 31P: Infiltration Bed

Inflow Area = 0.831 ac,100.00% Impervious, Inflow Depth > 6.36" for 100 yr event
Inflow = 6.51 cfs @ 12.00 hrs, Volume= 0.441 af
Outflow = 1.97 cfs @ 12.23 hrs, Volume= 0.315 af, Atten= 70%, Lag= 13.8 min
Discarded = 0.13 cfs @ 7.92 hrs, Volume= 0.209 af
Primary = 1.84 cfs @ 12.23 hrs, Volume= 0.106 af

Routing by Stor-Ind method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Peak Elev= 264.74' @ 12.23 hrs Surf.Area= 0.056 ac Storage= 0.176 af

Plug-Flow detention time= 180.8 min calculated for 0.315 af (71% of inflow)
Center-of-Mass det. time= 87.3 min (825.8 - 738.5)

Volume	Invert	Avail.Storage	Storage Description
#1	258.00'	0.156 af	**45.00'W x 54.00'L x 7.00'H Prismatoid** 0.390 af Overall x 40.0% Voids
#2	260.00'	0.025 af	**Cultec R-900HD** x 7 Effective Size= 72.7"W x 48.0"H => 17.61 sf x 7.00'L = 123.3 cf Overall Size= 78.0"W x 48.0"H x 9.25'L with 2.25' Overlap Row Length Adjustment= +2.25' x 17.61 sf x 6 rows
		0.181 af	Total Available Storage

Device	Routing	Invert	Outlet Devices
#1	Primary	264.00'	**12.0" Round Culvert** L= 20.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 264.00' / 263.60' S= 0.0200 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Discarded	258.00'	**0.13 cfs Exfiltration at all elevations**

Discarded OutFlow Max=0.13 cfs @ 7.92 hrs HW=258.07' (Free Discharge)
└**2=Exfiltration** (Exfiltration Controls 0.13 cfs)

Primary OutFlow Max=1.84 cfs @ 12.23 hrs HW=264.74' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.84 cfs @ 2.94 fps)

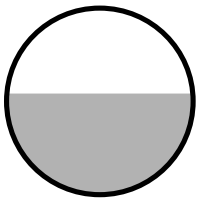
Summary for Reach 31R: pond outlet

Inflow Area = 2.188 ac, 35.84% Impervious, Inflow Depth > 2.17" for 100 yr event
Inflow = 3.71 cfs @ 12.38 hrs, Volume= 0.395 af
Outflow = 3.70 cfs @ 12.39 hrs, Volume= 0.395 af, Atten= 0%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 8.51 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 4.14 fps, Avg. Travel Time= 0.7 min

Peak Storage= 73 cf @ 12.38 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 6.47 cfs

12.0" Round Pipe
n= 0.013
Length= 167.0' Slope= 0.0329 '/'
Inlet Invert= 253.00', Outlet Invert= 247.50'



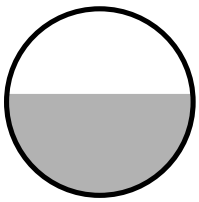
Summary for Reach 32R: Outlet to Pond

Inflow Area = 0.573 ac, 28.24% Impervious, Inflow Depth > 4.31" for 100 yr event
Inflow = 2.05 cfs @ 12.24 hrs, Volume= 0.206 af
Outflow = 2.05 cfs @ 12.25 hrs, Volume= 0.206 af, Atten= 0%, Lag= 0.2 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 4.70 fps, Min. Travel Time= 0.1 min
Avg. Velocity = 1.84 fps, Avg. Travel Time= 0.3 min

Peak Storage= 15 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 1.00' Flow Area= 0.8 sf, Capacity= 3.56 cfs

12.0" Round Pipe
n= 0.013 Corrugated PE, smooth interior
Length= 34.0' Slope= 0.0100 '/'
Inlet Invert= 238.04', Outlet Invert= 237.70'



Summary for Reach 34R: Design Point 1

Inflow Area = 12.286 ac, 22.95% Impervious, Inflow Depth > 2.76" for 100 yr event
Inflow = 23.35 cfs @ 12.09 hrs, Volume= 2.829 af
Outflow = 23.35 cfs @ 12.09 hrs, Volume= 2.829 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs

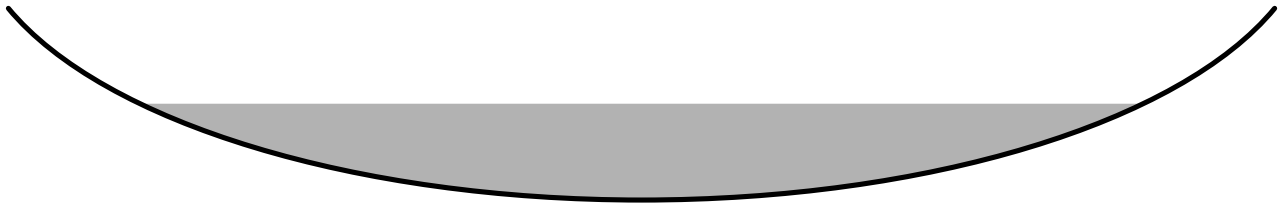
Summary for Reach 35R: over land

Inflow Area = 0.673 ac, 24.05% Impervious, Inflow Depth > 2.49" for 100 yr event
Inflow = 1.60 cfs @ 12.39 hrs, Volume= 0.140 af
Outflow = 1.60 cfs @ 12.42 hrs, Volume= 0.140 af, Atten= 0%, Lag= 1.6 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 1.35 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.57 fps, Avg. Travel Time= 2.0 min

Peak Storage= 83 cf @ 12.40 hrs
Average Depth at Peak Storage= 0.25'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 7.08 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.040 Earth, cobble bottom, clean sides
Length= 70.0' Slope= 0.0143 '/'
Inlet Invert= 0.00', Outlet Invert= -1.00'



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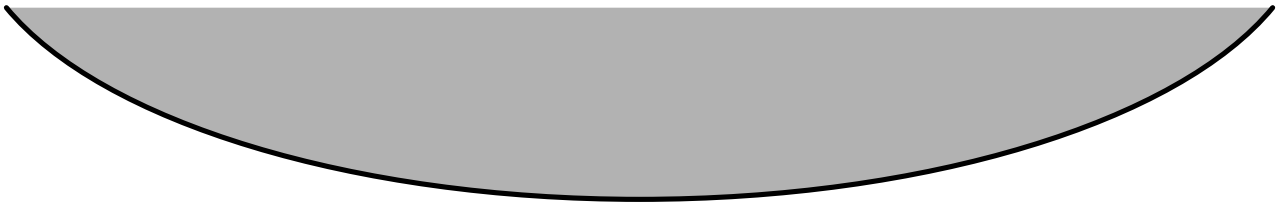
Summary for Reach 36R: over land

Inflow Area = 3.019 ac, 34.52% Impervious, Inflow Depth > 2.82" for 100 yr event
Inflow = 5.29 cfs @ 12.17 hrs, Volume= 0.709 af
Outflow = 5.16 cfs @ 12.18 hrs, Volume= 0.709 af, Atten= 2%, Lag= 0.7 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 5.10 fps, Min. Travel Time= 0.3 min
Avg. Velocity = 2.33 fps, Avg. Travel Time= 0.6 min

Peak Storage= 92 cf @ 12.18 hrs
Average Depth at Peak Storage= 0.29'
Bank-Full Depth= 0.25' Flow Area= 0.8 sf, Capacity= 3.94 cfs

5.00' x 0.25' deep Parabolic Channel, n= 0.040 Earth, cobble bottom, clean sides
Length= 90.0' Slope= 0.1778 '/'
Inlet Invert= 0.00', Outlet Invert= -16.00'



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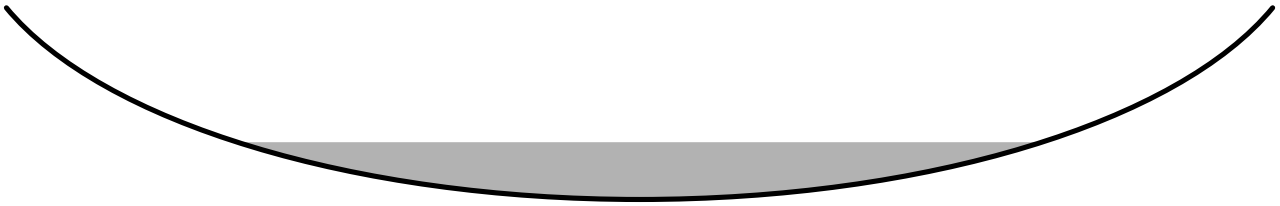
Summary for Reach 37R: over land

Inflow Area = 0.831 ac,100.00% Impervious, Inflow Depth = 1.53" for 100 yr event
Inflow = 1.84 cfs @ 12.23 hrs, Volume= 0.106 af
Outflow = 1.84 cfs @ 12.25 hrs, Volume= 0.106 af, Atten= 0%, Lag= 0.8 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.37 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.44 fps, Avg. Travel Time= 1.0 min

Peak Storage= 49 cf @ 12.24 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 24.99 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.040
Length= 90.0' Slope= 0.1778 '/'
Inlet Invert= 0.00', Outlet Invert= -16.00'



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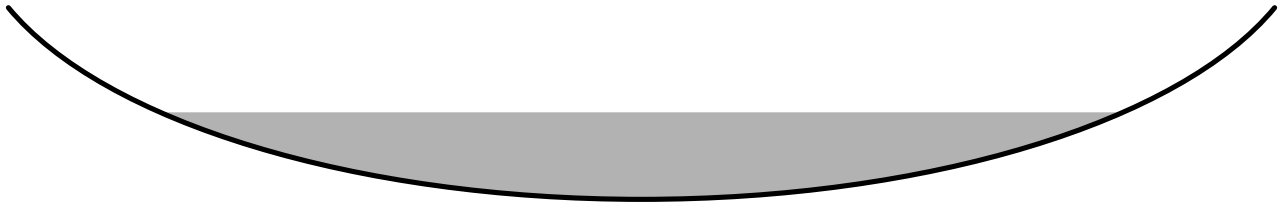
Summary for Reach 39R: over land

Inflow Area = 2.188 ac, 35.84% Impervious, Inflow Depth > 2.16" for 100 yr event
Inflow = 3.70 cfs @ 12.39 hrs, Volume= 0.395 af
Outflow = 3.69 cfs @ 12.41 hrs, Volume= 0.394 af, Atten= 0%, Lag= 1.1 min

Routing by Stor-Ind+Trans method, Time Span= 0.00-24.00 hrs, dt= 0.01 hrs
Max. Velocity= 3.62 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.66 fps, Avg. Travel Time= 1.4 min

Peak Storage= 137 cf @ 12.40 hrs
Average Depth at Peak Storage= 0.23'
Bank-Full Depth= 0.50' Flow Area= 3.3 sf, Capacity= 20.41 cfs

10.00' x 0.50' deep Parabolic Channel, n= 0.040
Length= 135.0' Slope= 0.1185 '/'
Inlet Invert= 247.50', Outlet Invert= 231.50'



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APPENDIX 4.5

DRAINAGE SKETCHES

STORMWATER MANAGEMENT SYSTEM OPERATIONS AND MAINTENANCE MANUAL

FOR

NEW ENGLAND SHIRDI SAI PARIVAAR TEMPLE
BOSTON ROAD
GROTON, MA

February 21, 2014

Prepared for:
NESSP, INC.
290 LITTLETON ROAD, UNIT 4
CHELMSFORD, MASSACHUSETTS

Prepared by:
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A.0 Introduction

In general, stormwater runoff from developed areas contains a number of contaminants which can have an adverse impact on receiving waters. The installation of stormwater management systems that are properly designed, installed and maintained can significantly reduce the point and non-point discharges from developed areas.

The stormwater management system can protect and enhance the stormwater runoff water quality through the removal of sediments and pollutants, and source control significantly reduces the amount of pollutants entering the system. Preventative maintenance of the system will include a comprehensive source reduction program of regular vacuuming and litter removal, prohibitions on the use of pesticides and maintenance of designated waste and recycling areas.

This long-term Stormwater Management System Operations and Maintenance (O&M) Manual, filed with the Town or Groton, shall be implemented at the New England Shirdi Sai Temple development site located on Boston Road to ensure that the stormwater management system functions as designed. The Owner possesses the primary responsibility for for overseeing and implementing the O&M plan and assigning a property manager who will be responsible for the proper operation and maintenance of the stormwater structures.

In case of the transfer of property ownership, future property owners shall be notified of the presence of the stormwater management system and the requirements for proper implementation of the O&M plan. This project will also subject to an Order of Conditions from the Groton Conservation Commission, a copy of which will be recorded at the Middlesex South Registry of Deeds and will run with the property to future owners.

Included in this manual is an overall site plan which identifies the locations of the key components of the stormwater management system and a log for tracking the inspections and maintenance.

A.1 Responsibility

The purpose of the Stormwater Operations and Maintenance Manual is to ensure the inspection of the system, removal of accumulated sediments, oils and debris, and implementation of corrective action and record keeping activities. The ongoing responsibility is the Owner, its successors and assigns. Adequate maintenance is defined in this document as good working condition.

Contact information is provided below:

Responsibility for Operation and Maintenance

Name:	NESSP, LLC
Address:	290 Littleton Road, Unit 4
City, State:	Chelmsford, Massachusetts
Contact:	Mahender Singh
Email:	msingh2000@yahoo.com

A.2 Documentation

An Inspection and Maintenance Record Log and Schedule shall be kept by the Owner or Property Manager summarizing inspections, maintenance, repairs and any corrective actions taken. The log will included the date on which each inspection or maintenance task was performed, a description of the inspection findings or maintenance completed, and the name of the inspector or maintenance personnel performing the task. If a maintenance task requires the clean-out of any sediments or debris, the location where the sediment and debris was disposed after removal will be indicated. Inspection and Maintenance Logs shall be kept on file at the property management office.

B.0 Maintenance Program

The Owner, Property Manager and maintenance staff shall conduct the Operation and Maintenance program set forth in this document. The Owner or Property Manager will ensure that inspections and record keeping are timely and accurate and that cleaning and maintenance are performed in accordance with the recommended frequency for each stormwater component. Inspection and Maintenance Log Forms (provided herein) shall include the date and amount of the last significant storm event

in excess of one (1) inch of rain in a 24-hour period, physical conditions of structures, depth of sediment in structures, evidence of overtopping or debris blockage and maintenance required of each structure. The estimated annual cost of the Maintenance Program is $1,500 to $3,000.

B.1 Inspection and Maintenance Frequency and Corrective Measures

The following areas, facilities and measures will be inspected by the Owner or Property Manager and maintained as specified below. Identified deficiencies will be corrected. Accumulated sediments and debris will be properly handled and disposed of off-site, in accordance with local, state and federal guidelines and regulations. Refer to the attached Stormwater Management O&M Plan for the location of the components of the stormwater management system.

B.1.1 Routine Maintenance Tasks

- Routine maintenance of lawns, gardens, and other landscaped areas shall occur as necessary to maintain the property in a neat and orderly fashion. Clippings and/or mulch shall not be washed into the drainage infrastructure.

- Maintenance of the Stormwater Management System shall be in accordance with the Operations and Maintenance Checklist below.

- Snow shall be stored on the site in designated areas.

- Good housekeeping – all areas should be kept free of trash and debris. Any storage of materials and waste products shall be inside or under cover. Fertilizers, herbicides and pesticides, if stored on site, shall be stored properly contained and under over. Storage of salt or deicing chemicals, if any, shall be on impervious area, covered and protected from runoff.

B.1.2 Porous Paving

- Porous Paving surfaces shall be monitored to ensure that the runoff drains properly after storms.

- Surfaces shall be cleaned using power washer to dislodge trapped particles and then vacuum swept.

- Surfaces must be inspected annually for deterioration.

- Exfiltration capability shall be checked at least once a year, and when found declining, measures are to be implemented to restore infiltration capacity including repaving if necessary.

B.1.3 Illicit Discharges

During construction, and all illicit connections from the property shall be cut and capped. The proposed site stormwater management system shall be checked for signs of illicit discharge during regular operation and maintenance activities. This will include but not be limited to checking for connections other than stormwater to the drainage system. Should connections other than stormwater be found, they will be immediately removed.

B.1.4 Parking Lot Sweeping

One effective nonstructural source control is street and parking lot sweeping. Private entities (e.g., commercial shopping areas or office parks) have street sweeping programs. Although intended to provide important nonpoint source pollution control, many street sweeping programs are not effective at capturing the peak sediment loads.

B.1.5 Catch Basins and Manholes

Regular maintenance is essential. Deep sump catch basins remain effective at removing pollutants only if they are cleaned out frequently. Once 50% of the sump volume is filled, the catch basin may not be able to retain additional sediment.

Inspect or clean deep sumps at least four times per year and at the end of the foliage and snow removal seasons. Sediments must also be removed four times per year or whenever the depth of deposits is greater than or equal to one half the depth from the bottom of the invert of the lowest pipe in the basin.

Clamshell buckets are typically used to remove sediment; however, vacuum trucks are preferable as they remove more trapped sediment than

clamshells. Vacuuming is also a speedier process and is less likely to damage the hood within the deep sump catch basin.

Always consider the safety of the staff cleaning deep sump catch basins.

Cleaning a deep sump catch basin within a road with active traffic or even within a parking lot is dangerous and a police detail may be necessary to safeguard workers.

Although catch basin debris often contains oil and hazardous material such as petroleum hydrocarbons and metals, MassDEP classifies them as solid waste. Unless there is evidence that they have been contaminated by a spill or other means, MassDEP does not routinely require catch basin cleanings to be tested before disposal. Contaminated catch basin cleanings must be evaluated in accordance with the Hazardous Waste Regulations, 310 CMR 30.000, and handled as hazardous waste.

In the absence of evidence of contamination, catch basin cleanings may be taken to a landfill of other facility permitted by MassDEP to accept solid waste, without any prior approval by MassDEP; however, some landfills may require testing before they are accepted.

B.1.6 Retention Ponds

Retention Ponds require regular inspection and maintenance to ensure no accumulation of silt, or any other foreign material, especially in both sediment forebays. Other materials, leaves or twigs, dead vegetation need removal on a regular basis. Discharge points with energy dissipaters require attention ensuring effectiveness. Vegetation within and surrounding ponds requires cutting and upkeep ensuring no erosion and stability of slopes and other areas by drainage devices.

All ponds should be inspected immediately after site construction ensuring vegetation and land forms are well established for long term stability. Once in normal service, the system should be inspected biannually until full confidence of the site stability is recognized. The site's maintenance manager can then revise the inspection schedule based on experience or local requirements.

B.1.7 Infiltration System – Storm Tech Recommendations

Regular inspection and maintenance are essential to assure a properly functioning system. Inspection is accomplished through the five (5)

inspection ports. These inspection ports allow inspection to be accomplished from the surface without the need for confined space entry. A stadia rod may be inserted to determine the depth of sediment. If upon visual inspection it is found that sediment has accumulated to an average depth exceeding three (3) inches, cleanout is required.

The system should be initially inspected immediately after the completion of the site's construction. While every effort should be made to prevent sediment from entering the system during construction, it is during this time that excess amounts of sediments are most likely to enter and stormwater system. Inspection and maintenance, if necessary should be performed prior to the contractor passing responsibility over to the site's owner. Once in normal service, the system should be inspected biannually until an understanding of the site's characteristics is developed. The site's maintenance manager can then revise the inspection schedule based on experience or local requirements.

B.2 Winter Maintenance Program

Ensure structures are not blocked by ice, snow, debris or trash during winter months. Snow storage locations must be designated and drainage from melting well understood to ensure no scouring or erosion. All locations must be outside of the 100-foot wetland buffer zone.

B.3 Fertilizer Selection and Use

The goal of fertilizer use should be to enhance the ground cover of the facility, yet not result in adverse water quality impacts. The following guidelines are recommended.

B.3.1 Fertilizer Selection

The selection of fertilizer should be based upon site-specific requirements. Recommendations for the fertilizer will be made upon completion of the project and actual tests of the soil mix. The benefit of the use of a soil mix is the ability of the soil to absorb and store nutrients for subsequent plant growth better than a sandy loam.

It is recommended that the soil be re-sampled every three (3) years and the plan adjusted accordingly.

In locations considered a sensitive natural area only slow-release organic low phosphorus fertilizers should be used in any landscaped areas to limit the amount of nutrients that could enter the stormwater management system.

B.3.2 Fertilizer Storage

Fertilizer should be stored in a weatherproof area with containers protected from damage. Fertilizer from any damaged containers should be placed in appropriate weatherproof containers.

B.3.3 Fertilizer Application

Fertilizer should be applied with appropriate mechanical equipment properly calibrated t meet the recommended application rates of the soil tests and manufacturer. The Owner or his agents should instruct personnel on the use of equipment and the proper measurement of the fertilizer.

Personnel assigned to application should be instructed that over-application of fertilizer is adverse to the landscaped areas and environment. Fertilizer should not be applied to steep slopes, saturated ground, during periods of precipitation, or immediately prior to major rain events.

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Appendix A

Stormwater Management System
Maintenance Program Summary Checklist

MARKEY & RUBIN, INC.
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Stormwater Management System Maintenance Program Summary Checklist					
		Frequency			
Item	Commentary	Monthly	Quarterly	Semi-Annual	Annual
Parking Lot Sweeping	Sweep to remove small debris and sediments; large debris should be removed by hand prior to sweeping actions.	X			
Catch Basins and Manholes	Inspect for sediment quarterly; inspect at tend of foliage and at end of snowmelt; remove upon accumulation		X		
Retention Ponds	Inspect monthly for first six months; inspect for sediment accumulation quarterly of first year - annually thereafter; inspect immediately after spills		X	X	
Infiltration System	Inspect for accumulated sediment immediately after construction; inspect semi-			X	

	annually thereafter				

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Appendix B

Stormwater Management System
Operation and Maintenance Forms

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STORM WATER MANAGEMENT SYSTEM
OPERATIONS AND MAINTENANCE MANUAL

CATCH BASINS/MANHOLES

NEW ENGLAND SHIRDI SAI TEMPLE

Name of Inspector: _____ Title of Inspector:

Inspector's Signature: _____

Inspection Date	Satisfactory			Location	Maintenance Needed and Description	Implementation Date of Maintenance
	Yes	No	N/A			

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STORM WATER MANAGEMENT SYSTEM
OPERATIONS AND MAINTENANCE MANUAL

RETENTION POND 1

NEW ENGLAND SHIRDI SAI TEMPLE

Name of Inspector: _____ Title of Inspector:

Inspector's Signature: _____

Inspection Date	Satisfactory			Location	Maintenance Needed and Description	Implementation Date of Maintenance
	Yes	No	N/A			

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STORM WATER MANAGEMENT SYSTEM
OPERATIONS AND MAINTENANCE MANUAL

RETENTION POND 2

NEW ENGLAND SHIRDI SAI TEMPLE

Name of Inspector: _____ Title of Inspector:

Inspector's Signature: _____

Inspection Date	Satisfactory			Location	Maintenance Needed and Description	Implementation Date of Maintenance
	Yes	No	N/A			

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STORM WATER MANAGEMENT SYSTEM
OPERATIONS AND MAINTENANCE MANUAL

RETENTION POND 3

NEW ENGLAND SHIRDI SAI TEMPLE

Name of Inspector: _____ Title of Inspector:

Inspector's Signature: _____

Inspection Date	Satisfactory			Location	Maintenance Needed and Description	Implementation Date of Maintenance
	Yes	No	N/A			

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STORM WATER MANAGEMENT SYSTEM
OPERATIONS AND MAINTENANCE MANUAL

INFILTRATION SYSTEM

NEW ENGLAND SHIRDI SAI TEMPLE

Name of Inspector: _____ Title of Inspector:

Inspector's Signature: _____

Inspection Date	Satisfactory			Location	Maintenance Needed and Description	Implementation Date of Maintenance
	Yes	No	N/A			