STORMWATER MANAGEMENT REPORT

THE PLAZA – PHASE 2
DAYCARE CENTER
881 ROOSEVELT TRAIL, WINDHAM

A. Narrative

Martin Lippman is proposing to further develop property located at 881 Roosevelt Trail in Windham with a new daycare facility. This will be the second phase of his project named "The Plaza". Phase 1, which was approved by the Town in November of 2016, included the construction of a 4,800 square foot retail/office building with associated parking, utilities and stormwater infrastructure. Phase 2 of the development consists of the construction of a 4,960 square foot daycare facility with associated parking, utilities and stormwater infrastructure. Phase 2 also includes a 163-foot paved extension of the access road included in the Phase 1 design. As part of the overall project, the access road will eventually be extended to Roosevelt Trial to provide a second access location for the development and a future phase will be proposed to the south of the proposed daycare center. This roadway has been roughly installed to subgrade to provide access for earth movement activities associated with providing level building pads for Phase 2 and for a future phase. This road will not be finish graded and paved until the property is fully developed.

The properties associated with the overall project are identified as Lots 19A, 20 and 21 on the Town of Windham Assessors Map 18, have a total area of approximately 7.65 acres, and are located in the Commercial District 1 zoning district. The property currently contains a hearing aid business building with associated paved parking to north and a former garden center to the south. The project will be served by public water, two new on-site private septic tanks connecting into a septic field that will be constructed as part of Phase 1 and underground electrical, telephone, data and natural gas service. In general, the site drains either to the northeast onto the abutting property, to the south to Outlet Brook and a small portion of the site draining to Roosevelt Trail. Outlet Brook drains westerly across Roosevelt Trail eventually discharging into Sebago Lake Basin. The Sebago Lake watershed has been defined by the Maine Department of Environmental Protection as a lake watershed most-at-risk.

B. Alterations to Land Cover

Prior to construction activities associated with the project, the site consisted of approximately 35,465 square feet of impervious surfaces including the hearing aid business, the garden center with associated greenhouses, a garage and an old foundation. The proposed development including both Phase 1 and Phase 2 will remove approximately 2,385 square feet of that impervious area while the remaining 33,080 square feet will remain or will be rebuilt as impervious surface. The project in the post development condition will consist of approximately 82,400 square feet of total impervious surface resulting in a net increase of 46,935 square feet. The project will also consist of an additional 81,505 square feet of new landscaped areas resulting in a total new developed area of 128,440 square feet. The site had varying slopes

through the property. Prior to earth movement operations on the property, there were areas of flat slopes and other areas at the center of the site and along Outlet Brook that exceeded a 20% slope. Soils on the property are primarily Hinckley loamy sand with an area of Sebago mucky peat located in the vicinity of Outlet Brook as identified on the Medium Intensity Soil Maps for Cumberland County, Maine published by the Natural Resources Conservation Service. The two soils within the proposed development are in the hydrologic soil groups "A" and "A/D" respectively, as indicated on the attached watershed maps. For stormwater modeling purposes the "A/D" soil was modeled as a "D" soil since its natural condition is group "D".

C. Methodology and Modeling Assumptions

The proposed stormwater management system has been designed utilizing Best Management Practices to maintain existing drainage patterns while providing stormwater quality improvement measures. The goal of the storm drainage system design is to remove potential stormwater pollutants while attenuating the post-development peak runoff rates. The method utilized to predict the surface water runoff rates in this analysis is a computer program entitled HydroCAD, which is based on the same methods that were originally developed by the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service, and utilized in the TR-20 modeling program. Peak rates of runoff are forecasted based upon land use, hydrologic soil conditions, vegetative cover, contributing watershed area, time of concentration, rainfall data, storage volumes of detention basins and the hydraulic capacity of structures. The computer model predicts the amount of runoff as a function of time, with the ability to include the attenuation effect due to dams, lakes, large wetlands, floodplains and constructed stormwater management basins. The input data for rainfalls with statistical recurrence frequencies of 2-, 10- and 25 years was obtained from Appendix H of the Maine Department of Environmental Protection, Chapter 500 Stormwater Management, last revised in 2015. The National Weather Service developed four synthetic storm types to simulate rainfall patterns around the country. For analysis in Cumberland County, Maine, the type III rainfall pattern with a 24-hour duration is appropriate.

D. Basic Standards

The project is required by the Town and the Maine Department of Environmental Protection (MDEP) to provide permanent and temporary Erosion Control Best Management Practices. These methods are outlined in detail in the plan set.

E. General Standard

The Windham Land Use Ordinance requires that projects requiring Major Site Plan Review shall comply with Section 4B(2) and Section 4B(3) of the General Standards of the MDEP Chapter 500 Stormwater Management. This document outlines the requirement of the project to provide stormwater quality treatment for no less than 95% of the new impervious surface and 80% of the total new developed area associated with the project.

The approved stormwater infrastructure for Phase 1 of this development consisted of an underdrained soil filter basin located between the parking lot and Roosevelt Trail. To provide the additional required stormwater treatment and quantity control, another larger filter basin is proposed to the south of the development. This basin has been designed to provide treatment

for the daycare facility parking, its associated landscaped area, the disturbed area associated with the leveling of the future phases site south of the proposed daycare center and a portion of the access road. The basin has been oversized to provide stormwater treatment for an assumed impervious footprint that may be created as part of the future phase. The treatment calculations included with this report only reflect this portion of the site as vegetated landscaped area. Once the applicant decides to move forward with the third phase, additional treatment calculations will be provided.

As indicated in the treatment calculations, the proposed water quality treatment will exceed the treatment requirements for the new impervious and developed areas in order to provide quantity control for the project. Calculations can be found on the Watershed Maps and enclosed in this report.

F. Flooding Standard

The Windham Land Use Ordinance requires that projects requiring Site Plan Review shall detain, retain or result in the infiltration of stormwater from the 24-hour storms of the 2-year, 10-year and 25-year frequencies such that the peak flows of stomwater from the project site do not exceed the peak flows of stormwater prior to undertaking the project. To maintain these rates, two underdrained filter basins have been proposed as part of the stormwater infrastructure.

The first study point (SP-1) is the location where stormwater is collected and discharges the property to the northeast. The second study point (SP-2) is where Outlet Brook leaves the property westerly through an existing 48" culvert beneath Roosevelt Trail. This flow eventually discharges into the Sebago Lake Basin. The third study point (SP-3) is where a small watershed drains onto Roosevelt Trail. The following tables summarize the analysis:

Table 1 – Peak Rates of Stormwater Runoff

Study Point	2-Year (cfs)		10-Year (cfs)		25-Year (cfs)	
	Pre	Post	Pre	Post	Pre	Post
SP-1	0.32	0.00	1.69	0.01	3.28	0.08
SP-2	2.50	1.90	4.92	4.60	7.10	6.92
SP-3	0.08	0.06	0.20	0.10	0.30	0.13

The removal of existing impervious surface and the installation of the two filter basins reduces the peak rates of runoff at all study points. The watershed maps showing pre-development and post-development drainage patterns are included in the plan set and the computations performed with the HydroCAD software program are included as an attachment to this report.

G. Phosphorous Standard

Outlet Brook which is located along the southern property boundary drains westerly across Roosevelt Trail eventually discharging to Sebago Lake Basin. Since the Sebago Lake watershed has been defined by the Maine Department of Environmental Protection as a lake watershed most-at-risk and there is more than 20,000 square feet of new impervious surface, the Phosphorous Standard must be met. According to Section 4D(1) Phosphorous Standard of the MDEP Chapter 500 Stormwater Management document, if the watershed is not severely

blooming and the total impervious surface for the site is less than 3 acres or 5 acres of developed area, the General Standards can be met as an alternative to producing the phosphorous export calculations. We have decided to use the alternative standard for this project.

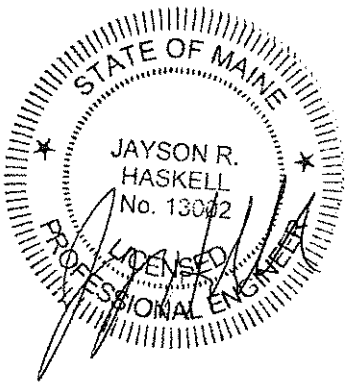
H. Maintenance of common facilities or property

The owner of the facility will be responsible for the maintenance of the stormwater facilities. Enclosed is an Inspection, Maintenance and Housekeeping Plan for the project.

Prepared by:

DM ROMA CONSULTING ENGINEERS

Jayson R. Haskell, P.E.
Project Manager



Map Scale: 1:2,200 if printed on A landscape (11" x 8.5") sheet.

N

Meters: 0 30 60 120 180

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 19N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Lines

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

Soil Rating Points

- A
- A/D
- B
- B/D
- C
- C/D
- D
- Not rated or not available

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 1:24,000.

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

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

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

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

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

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

Soil Survey Area: Cumberland County and Part of Oxford County, Maine
Survey Area Data: Version 12, Sep 15, 2016

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

Date(s) aerial images were photographed: Jun 20, 2010—Jul 18, 2010

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Cumberland County and Part of Oxford County, Maine (ME005)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
HIB	Hinckley loamy sand, 3 to 8 percent slopes	A	6.4	60.4%
HIC	Hinckley loamy sand, 8 to 15 percent slopes	A	2.2	20.9%
Sp	Sebago mucky peat	A/D	2.0	18.7%
Totals for Area of Interest			**10.6**	**100.0%**

Description

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

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

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

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

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

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

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

Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: None Specified

Tie-break Rule: Higher

STORMWATER TREATMENT CALCULATIONS

THE PLAZA - ROOSEVELT TRAIL, WINDHAM, ME

Proposed Development

Total Post Development Impervious Area=	82,400	sf
Credit for Existing Impervious Area To Be Removed=	2,385	sf
Credit for Proposed Impervious over Existing Impervious Area*=	33,080	sf
New Impervious Area =	**46,935**	**sf**
New Landscaped Area =	81,505	sf
New Developed Area =	**128,440**	**sf**

Treatment Calculations

Watershed Treated	**Impervious Area Treated (SF)**	**Landscaped Area Treated (SF)**	**Treatment Device**
WS-11	5,090	0	Roof Dripedge
WS-12	24,275	18,850	Filter Basin 1
WS-14	7,910	5,480	Filter Basin 2
WS-20	12,110	79,795	Filter Basin 1
Total	**49,385**	**104,125**	

Required New Impervious Area Treatment (95%)=	44,588	sf
Total Impervious Area Treated =	**49,385**	**sf**
% of New Impervious Area Treated =	**105.2%**	**> 95%**

Required New Developed Area Treatment (80%) =	102,752	sf
New Landscaped/Disturbed Area Treated =	104,125	sf
Total Developed Area Treated =	**153,510**	**sf**
% of New Developed Area Treated =	**119.5%**	**> 80%**

Filter Basin FB-1 Sizing Calculations

Tributary Impervious Area=	36,385	sf	(WS-12 & 20)
Tributary Landscaped Area=	98,645	sf	(WS-12 & 20)

Channel Protection Volume (CPV) Calculation

CPV (Required) = 1.0"xImpervious Area + 0.4"xLandscaped Area

CPV (Required) = 6,320 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
190	4985	0
191	6,750	5,868
192	11,775	15,130
193	14,150	28,093

Outlet of Pond Set @ 191.5

Storage Volume @Outlet 10,499 **cf > Required**

Filter Bottom Calculation

Filter Area (Required) = 5%xImpervious Area + 2%xLandscaped Area

Filter Area Required = 3,792 **sf**

Filter Area Provided = 4,985 **sf > Required**

Filter Basin FB-2 Sizing Calculations

Tributary Impervious Area=	7,910	sf	(WS-14)
Tributary Landscaped Area=	5,480	sf	(WS-14)

Channel Protection Volume (CPV) Calculation

CPV (Required) = 1.0"xImpervious Area + 0.4"xLandscaped Area

CPV (Required) = 842 cf

Stage Storage Volume

Elevation	Area (sf)	Storage (cf)
203	510	0
204	1,315	913
204.5	1,740	1,676

Outlet of Pond Set @ 203.95

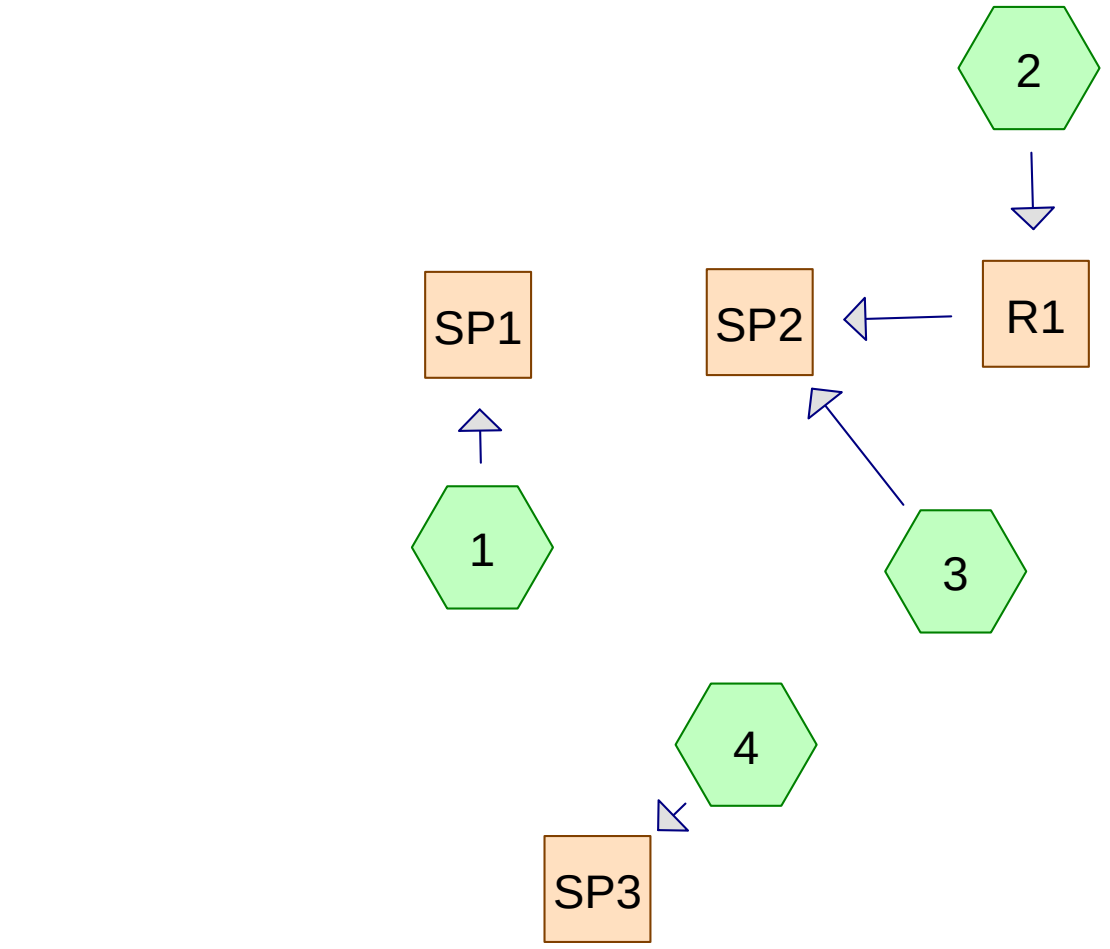
Storage Volume @Outlet 867 **cf > Required**

Filter Bottom Calculation

Filter Area (Required) = 5%xImpervious Area + 2%xLandscaped Area

Filter Area Required = 505 **sf**

Filter Area Provided = 510 **sf > Required**



Subcat Reach Pond Link

Routing Diagram for 15025-PRE

Prepared by DM Roma Consulting Engineers, Printed 2/2/2017

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

Subcatchment 1: Runoff Area=136,175 sf 12.29% Impervious Runoff Depth>1.40"
Flow Length=455' Tc=22.5 min CN=57 Runoff=3.28 cfs 0.364 af

Subcatchment 2: Runoff Area=134,660 sf 4.89% Impervious Runoff Depth>1.39"
Flow Length=606' Tc=29.2 min CN=57 Runoff=2.91 cfs 0.358 af

Subcatchment 3: Runoff Area=79,220 sf 26.90% Impervious Runoff Depth>3.37"
Flow Length=414' Tc=8.5 min CN=80 Runoff=6.93 cfs 0.511 af

Subcatchment 4: Runoff Area=4,210 sf 8.67% Impervious Runoff Depth>2.54"
Flow Length=36' Slope=0.0200 '/' Tc=6.0 min CN=71 Runoff=0.30 cfs 0.020 af

Reach R1: Avg. Flow Depth=0.52' Max Vel=0.83 fps Inflow=2.91 cfs 0.358 af
n=0.070 L=319.0' S=0.0050 '/' Capacity=91.48 cfs Outflow=2.79 cfs 0.353 af

Reach SP1: Inflow=3.28 cfs 0.364 af
Outflow=3.28 cfs 0.364 af

Reach SP2: Inflow=7.10 cfs 0.864 af
Outflow=7.10 cfs 0.864 af

Reach SP3: Inflow=0.30 cfs 0.020 af
Outflow=0.30 cfs 0.020 af

Summary for Subcatchment 1:

Runoff = 3.28 cfs @ 12.35 hrs, Volume= 0.364 af, Depth> 1.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	16,730	98	Pavement and Buildings
	46,585	68	<50% Grass cover, Poor, HSG A
	50,760	36	Woods, Fair, HSG A
	22,100	48	Brush, Poor, HSG A
	136,175	57	Weighted Average
	119,445		87.71% Pervious Area
	16,730		12.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	112	0.0350	0.21		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.10"
0.6	63	0.0600	1.71		**Shallow Concentrated Flow, B TO C** Short Grass Pasture Kv= 7.0 fps
13.2	280	0.0050	0.35		**Shallow Concentrated Flow, C TO D** Woodland Kv= 5.0 fps
22.5	455	Total			

Summary for Subcatchment 2:

Runoff = 2.91 cfs @ 12.46 hrs, Volume= 0.358 af, Depth> 1.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
	70,040	36	Woods, Fair, HSG A
	54,495	79	Woods, Fair, HSG D
	3,540	68	<50% Grass cover, Poor, HSG A
*	6,585	98	Water Surface
	134,660	57	Weighted Average
	128,075		95.11% Pervious Area
	6,585		4.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	150	0.0500	0.12		**Sheet Flow, A TO B** Woods: Light underbrush n= 0.400 P2= 3.10"
7.1	302	0.0200	0.71		**Shallow Concentrated Flow, B TO C** Woodland Kv= 5.0 fps
1.2	154	0.0050	2.18	91.62	**Trap/Vee/Rect Channel Flow, C TO D** Bot.W=5.00' D=3.00' Z= 3.0 '/' Top.W=23.00' n= 0.070

29.2	606	Total

Summary for Subcatchment 3:

Runoff = 6.93 cfs @ 12.12 hrs, Volume= 0.511 af, Depth> 3.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	15,060	98	Pavement and Buildings
	7,285	96	Gravel surface, HSG A
	2,300	36	Woods, Fair, HSG A
	10,890	79	Woods, Fair, HSG D
	34,810	68	<50% Grass cover, Poor, HSG A
	2,625	89	<50% Grass cover, Poor, HSG D
*	6,250	98	Water Surface
	79,220	80	Weighted Average
	57,910		73.10% Pervious Area
	21,310		26.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.8	95	0.0700	0.27		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.10"
0.6	40	0.0500	1.12		**Shallow Concentrated Flow, B TO C** Woodland Kv= 5.0 fps
2.1	279	0.0050	2.18	91.62	**Trap/Vee/Rect Channel Flow, C TO D** Bot.W=5.00' D=3.00' Z= 3.0 '/' Top.W=23.00' n= 0.070
8.5	414	Total			

Summary for Subcatchment 4:

Runoff = 0.30 cfs @ 12.09 hrs, Volume= 0.020 af, Depth> 2.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	365	98	Pavement
	3,845	68	<50% Grass cover, Poor, HSG A
	4,210	71	Weighted Average
	3,845		91.33% Pervious Area
	365		8.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.4	36	0.0200	0.14		**Sheet Flow, A TO B**
					Grass: Short n= 0.150 P2= 3.10"
1.6					**Direct Entry, 6 MINUTE MIN. TC**
6.0	36	Total			

Summary for Reach R1:

Inflow Area = 3.091 ac, 4.89% Impervious, Inflow Depth > 1.39" for 25-Year event
Inflow = 2.91 cfs @ 12.46 hrs, Volume= 0.358 af
Outflow = 2.79 cfs @ 12.65 hrs, Volume= 0.353 af, Atten= 4%, Lag= 11.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.83 fps, Min. Travel Time= 6.4 min
Avg. Velocity = 0.41 fps, Avg. Travel Time= 13.0 min

Peak Storage= 1,079 cf @ 12.54 hrs
Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 3.00' Flow Area= 42.0 sf, Capacity= 91.48 cfs

5.00' x 3.00' deep channel, n= 0.070
Side Slope Z-value= 3.0 '/' Top Width= 23.00'
Length= 319.0' Slope= 0.0050 '/'
Inlet Invert= 0.00', Outlet Invert= -1.59'

‡

Summary for Reach SP1:

Inflow Area = 3.126 ac, 12.29% Impervious, Inflow Depth > 1.40" for 25-Year event
Inflow = 3.28 cfs @ 12.35 hrs, Volume= 0.364 af
Outflow = 3.28 cfs @ 12.35 hrs, Volume= 0.364 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP2:

Inflow Area = 4.910 ac, 13.04% Impervious, Inflow Depth > 2.11" for 25-Year event
Inflow = 7.10 cfs @ 12.12 hrs, Volume= 0.864 af
Outflow = 7.10 cfs @ 12.12 hrs, Volume= 0.864 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

Summary for Reach SP3:

Inflow Area = 0.097 ac, 8.67% Impervious, Inflow Depth > 2.54" for 25-Year event
Inflow = 0.30 cfs @ 12.09 hrs, Volume= 0.020 af
Outflow = 0.30 cfs @ 12.09 hrs, Volume= 0.020 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs

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

Subcatchment 1: Runoff Area=136,175 sf 12.29% Impervious Runoff Depth>0.23"
Flow Length=455' Tc=22.5 min CN=57 Runoff=0.32 cfs 0.060 af

Subcatchment 2: Runoff Area=134,660 sf 4.89% Impervious Runoff Depth>0.23"
Flow Length=606' Tc=29.2 min CN=57 Runoff=0.29 cfs 0.059 af

Subcatchment 3: Runoff Area=79,220 sf 26.90% Impervious Runoff Depth>1.22"
Flow Length=414' Tc=8.5 min CN=80 Runoff=2.50 cfs 0.185 af

Subcatchment 4: Runoff Area=4,210 sf 8.67% Impervious Runoff Depth>0.74"
Flow Length=36' Slope=0.0200 '/' Tc=6.0 min CN=71 Runoff=0.08 cfs 0.006 af

Reach R1: Avg. Flow Depth=0.13' Max Vel=0.36 fps Inflow=0.29 cfs 0.059 af
n=0.070 L=319.0' S=0.0050 '/' Capacity=91.48 cfs Outflow=0.25 cfs 0.057 af

Reach SP1: Inflow=0.32 cfs 0.060 af
Outflow=0.32 cfs 0.060 af

Reach SP2: Inflow=2.50 cfs 0.242 af
Outflow=2.50 cfs 0.242 af

Reach SP3: Inflow=0.08 cfs 0.006 af
Outflow=0.08 cfs 0.006 af

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

Subcatchment 1: Runoff Area=136,175 sf 12.29% Impervious Runoff Depth>0.79"
Flow Length=455' Tc=22.5 min CN=57 Runoff=1.69 cfs 0.207 af

Subcatchment 2: Runoff Area=134,660 sf 4.89% Impervious Runoff Depth>0.79"
Flow Length=606' Tc=29.2 min CN=57 Runoff=1.51 cfs 0.203 af

Subcatchment 3: Runoff Area=79,220 sf 26.90% Impervious Runoff Depth>2.37"
Flow Length=414' Tc=8.5 min CN=80 Runoff=4.91 cfs 0.360 af

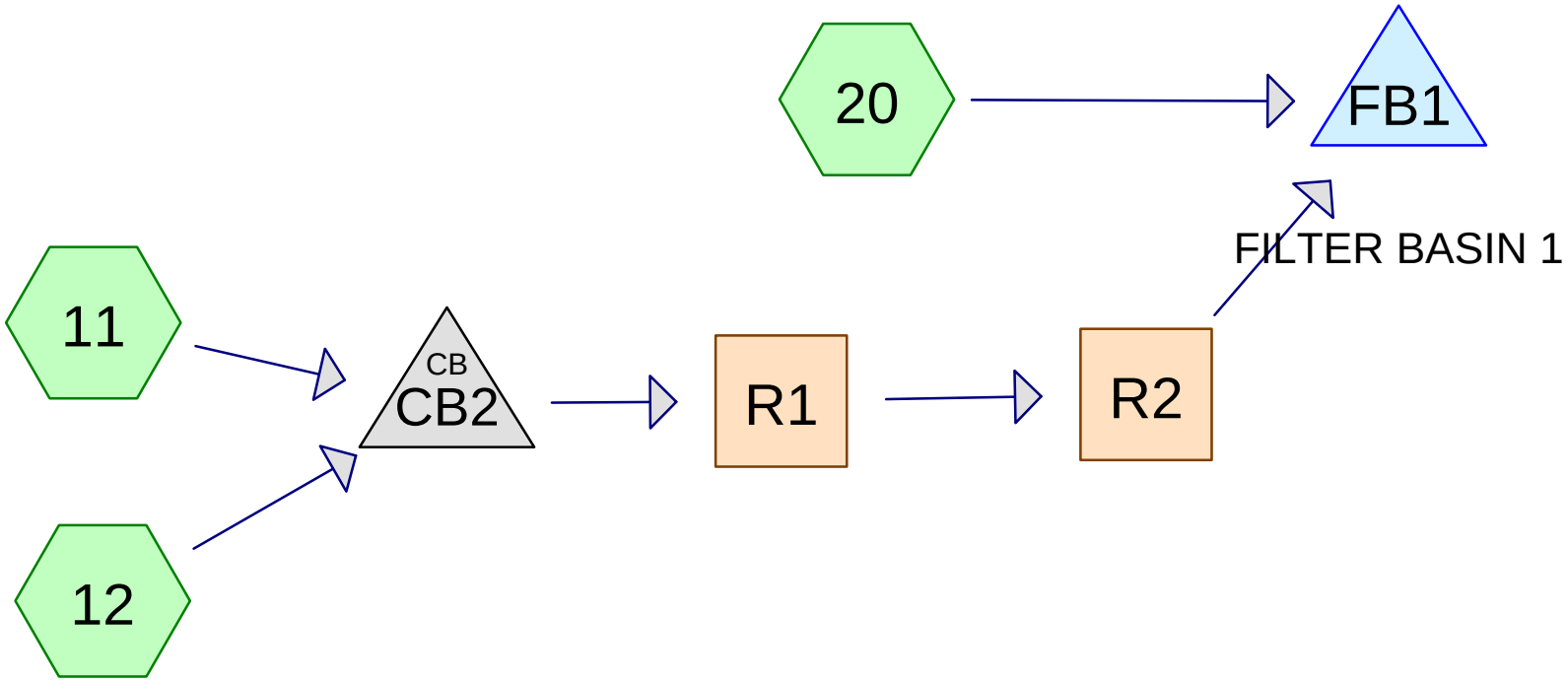
Subcatchment 4: Runoff Area=4,210 sf 8.67% Impervious Runoff Depth>1.67"
Flow Length=36' Slope=0.0200 '/' Tc=6.0 min CN=71 Runoff=0.20 cfs 0.013 af

Reach R1: Avg. Flow Depth=0.35' Max Vel=0.66 fps Inflow=1.51 cfs 0.203 af
n=0.070 L=319.0' S=0.0050 '/' Capacity=91.48 cfs Outflow=1.41 cfs 0.200 af

Reach SP1: Inflow=1.69 cfs 0.207 af
Outflow=1.69 cfs 0.207 af

Reach SP2: Inflow=4.92 cfs 0.559 af
Outflow=4.92 cfs 0.559 af

Reach SP3: Inflow=0.20 cfs 0.013 af
Outflow=0.20 cfs 0.013 af



Subcat Reach Pond Link

Routing Diagram for 15025-POST-POND SIZING
Prepared by DM Roma Consulting Engineers, Printed 2/2/2017

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

Subcatchment 11: Runoff Area=5,090 sf 100.00% Impervious Runoff Depth>5.15"
Tc=6.0 min CN=98 Runoff=0.65 cfs 0.050 af

Subcatchment 12: Runoff Area=48,920 sf 49.62% Impervious Runoff Depth>2.36"
Flow Length=360' Tc=8.8 min CN=69 Runoff=2.96 cfs 0.221 af

Subcatchment 20: Runoff Area=94,560 sf 12.81% Impervious Runoff Depth>0.74"
Flow Length=476' Tc=6.0 min CN=47 Runoff=1.40 cfs 0.134 af

Reach R1: Avg. Flow Depth=0.34' Max Vel=3.58 fps Inflow=3.57 cfs 0.271 af
n=0.025 L=178.0' S=0.0225 '/' Capacity=132.45 cfs Outflow=3.47 cfs 0.271 af

Reach R2: Avg. Flow Depth=0.37' Max Vel=3.01 fps Inflow=3.47 cfs 0.271 af
n=0.025 L=70.0' S=0.0150 '/' Capacity=123.53 cfs Outflow=3.43 cfs 0.270 af

Pond CB2: Peak Elev=198.09' Inflow=3.57 cfs 0.271 af
12.0" Round Culvert n=0.013 L=33.0' S=0.0212 '/' Outflow=3.57 cfs 0.271 af

Pond FB1: FILTER BASIN 1 Peak Elev=191.27' Storage=7,880 cf Inflow=4.75 cfs 0.405 af
Primary=0.45 cfs 0.301 af Secondary=0.00 cfs 0.000 af Outflow=0.45 cfs 0.301 af

Summary for Subcatchment 11:

Runoff = 0.65 cfs @ 12.09 hrs, Volume= 0.050 af, Depth> 5.15"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	5,090	98	Building
	5,090		100.00% Impervious Area

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

Summary for Subcatchment 12:

Runoff = 2.96 cfs @ 12.13 hrs, Volume= 0.221 af, Depth> 2.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	24,275	98	Pavement and Building
	18,850	39	>75% Grass cover, Good, HSG A
	5,795	48	Brush, Poor, HSG A
	48,920	69	Weighted Average
	24,645		50.38% Pervious Area
	24,275		49.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.5	68	0.0400	0.20		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.10"
2.9	175	0.0200	0.99		**Shallow Concentrated Flow, B TO C** Short Grass Pasture Kv= 7.0 fps
0.4	117	0.0100	4.54	3.56	**Pipe Channel, C TO D** 12.0" Round Area= 0.8 sf Perim= 3.1' r= 0.25' n= 0.013
8.8	360	Total			

Summary for Subcatchment 20:

Runoff = 1.40 cfs @ 12.12 hrs, Volume= 0.134 af, Depth> 0.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	12,110	98	Pavement
	79,075	39	>75% Grass cover, Good, HSG A
	720	80	>75% Grass cover, Good, HSG D
	2,655	36	Woods, Fair, HSG A
	94,560	47	Weighted Average
	82,450		87.19% Pervious Area
	12,110		12.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.2	66	0.0100	0.94		**Sheet Flow, A TO B** Smooth surfaces n= 0.011 P2= 3.10"
1.0	22	0.3300	0.38		**Sheet Flow, B TO C** Grass: Short n= 0.150 P2= 3.10"
3.3	140	0.0100	0.70		**Shallow Concentrated Flow, C TO D** Short Grass Pasture Kv= 7.0 fps
0.3	178	0.0225	9.47	132.53	**Trap/Vee/Rect Channel Flow, D TO E** Bot.W=2.00' D=2.00' Z= 2.0 & 3.0 '/' Top.W=12.00' n= 0.025
0.2	70	0.0075	5.46	87.35	**Trap/Vee/Rect Channel Flow, E TO F** Bot.W=2.00' D=2.00' Z= 3.0 '/' Top.W=14.00' n= 0.025
6.0	476	Total			

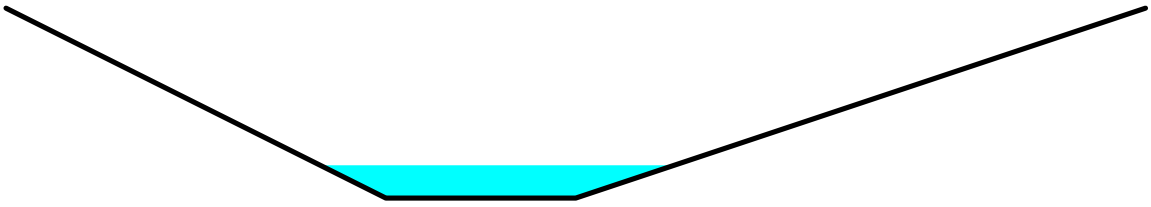
Summary for Reach R1:

Inflow Area = 1.240 ac, 54.37% Impervious, Inflow Depth > 2.62" for 25-Year event
Inflow = 3.57 cfs @ 12.12 hrs, Volume= 0.271 af
Outflow = 3.47 cfs @ 12.15 hrs, Volume= 0.271 af, Atten= 3%, Lag= 1.7 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.58 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.16 fps, Avg. Travel Time= 2.5 min

Peak Storage= 175 cf @ 12.13 hrs
Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 2.00' Flow Area= 14.0 sf, Capacity= 132.45 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 2.0 3.0 '/' Top Width= 12.00'
Length= 178.0' Slope= 0.0225 '/'
Inlet Invert= 196.00', Outlet Invert= 192.00'



Summary for Reach R2:

Inflow Area = 1.240 ac, 54.37% Impervious, Inflow Depth > 2.62" for 25-Year event
Inflow = 3.47 cfs @ 12.15 hrs, Volume= 0.271 af
Outflow = 3.43 cfs @ 12.16 hrs, Volume= 0.270 af, Atten= 1%, Lag= 0.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Max. Velocity= 3.01 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 1.00 fps, Avg. Travel Time= 1.2 min

Peak Storage= 81 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 123.53 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 70.0' Slope= 0.0150 '/'
Inlet Invert= 0.00', Outlet Invert= -1.05'

Summary for Pond CB2:

Inflow Area = 1.240 ac, 54.37% Impervious, Inflow Depth > 2.62" for 25-Year event
Inflow = 3.57 cfs @ 12.12 hrs, Volume= 0.271 af
Outflow = 3.57 cfs @ 12.12 hrs, Volume= 0.271 af, Atten= 0%, Lag= 0.0 min
Primary = 3.57 cfs @ 12.12 hrs, Volume= 0.271 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 198.09' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	196.70'	**12.0" Round Culvert** L= 33.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 196.70' / 196.00' S= 0.0212 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf

Primary OutFlow Max=3.47 cfs @ 12.12 hrs HW=198.04' (Free Discharge)
1=Culvert (Inlet Controls 3.47 cfs @ 4.42 fps)

Summary for Pond FB1: FILTER BASIN 1

Inflow Area = 3.411 ac, 27.92% Impervious, Inflow Depth > 1.42" for 25-Year event
Inflow = 4.75 cfs @ 12.15 hrs, Volume= 0.405 af
Outflow = 0.45 cfs @ 14.28 hrs, Volume= 0.301 af, Atten= 90%, Lag= 127.5 min
Primary = 0.45 cfs @ 14.28 hrs, Volume= 0.301 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 191.27' @ 14.28 hrs Surf.Area= 8,111 sf Storage= 7,880 cf

Plug-Flow detention time= 175.5 min calculated for 0.301 af (74% of inflow)
Center-of-Mass det. time= 109.1 min (923.9 - 814.8)

Volume	Invert	Avail.Storage	Storage Description
#1	190.00'	28,093 cf	**Custom Stage Data (Prismatic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
190.00	4,985	0	0
191.00	6,750	5,868	5,868
192.00	11,775	9,263	15,130
193.00	14,150	12,963	28,093

Device	Routing	Invert	Outlet Devices
#1	Primary	187.70'	**12.0" Round Culvert** L= 29.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 187.70' / 187.50' S= 0.0069 '/' Cc= 0.900 n= 0.013, Flow Area= 0.79 sf
#2	Device 1	190.00'	**2.410 in/hr Exfiltration over Surface area**
#3	Device 1	191.50'	**13.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	191.85'	**10.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.45 cfs @ 14.28 hrs HW=191.27' (Free Discharge)
└**1=Culvert** (Passes 0.45 cfs of 6.63 cfs potential flow)
  └**2=Exfiltration** (Exfiltration Controls 0.45 cfs)
  └**3=Orifice/Grate** (Controls 0.00 cfs)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=190.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

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

Subcatchment 11: Runoff Area=5,090 sf 100.00% Impervious Runoff Depth>2.68"
Tc=6.0 min CN=98 Runoff=0.34 cfs 0.026 af

Subcatchment 12: Runoff Area=48,920 sf 49.62% Impervious Runoff Depth>0.65"
Flow Length=360' Tc=8.8 min CN=69 Runoff=0.73 cfs 0.061 af

Subcatchment 20: Runoff Area=94,560 sf 12.81% Impervious Runoff Depth>0.04"
Flow Length=476' Tc=6.0 min CN=47 Runoff=0.02 cfs 0.008 af

Reach R1: Avg. Flow Depth=0.17' Max Vel=2.44 fps Inflow=1.03 cfs 0.087 af
n=0.025 L=178.0' S=0.0225 '/' Capacity=132.45 cfs Outflow=1.00 cfs 0.087 af

Reach R2: Avg. Flow Depth=0.19' Max Vel=2.06 fps Inflow=1.00 cfs 0.087 af
n=0.025 L=70.0' S=0.0150 '/' Capacity=123.53 cfs Outflow=0.97 cfs 0.087 af

Pond CB2: Peak Elev=197.23' Inflow=1.03 cfs 0.087 af
12.0" Round Culvert n=0.013 L=33.0' S=0.0212 '/' Outflow=1.03 cfs 0.087 af

Pond FB1: FILTER BASIN 1 Peak Elev=190.17' Storage=872 cf Inflow=0.97 cfs 0.094 af
Primary=0.29 cfs 0.094 af Secondary=0.00 cfs 0.000 af Outflow=0.29 cfs 0.094 af

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

Subcatchment 11: Runoff Area=5,090 sf 100.00% Impervious Runoff Depth>4.05"
Tc=6.0 min CN=98 Runoff=0.51 cfs 0.039 af

Subcatchment 12: Runoff Area=48,920 sf 49.62% Impervious Runoff Depth>1.53"
Flow Length=360' Tc=8.8 min CN=69 Runoff=1.89 cfs 0.143 af

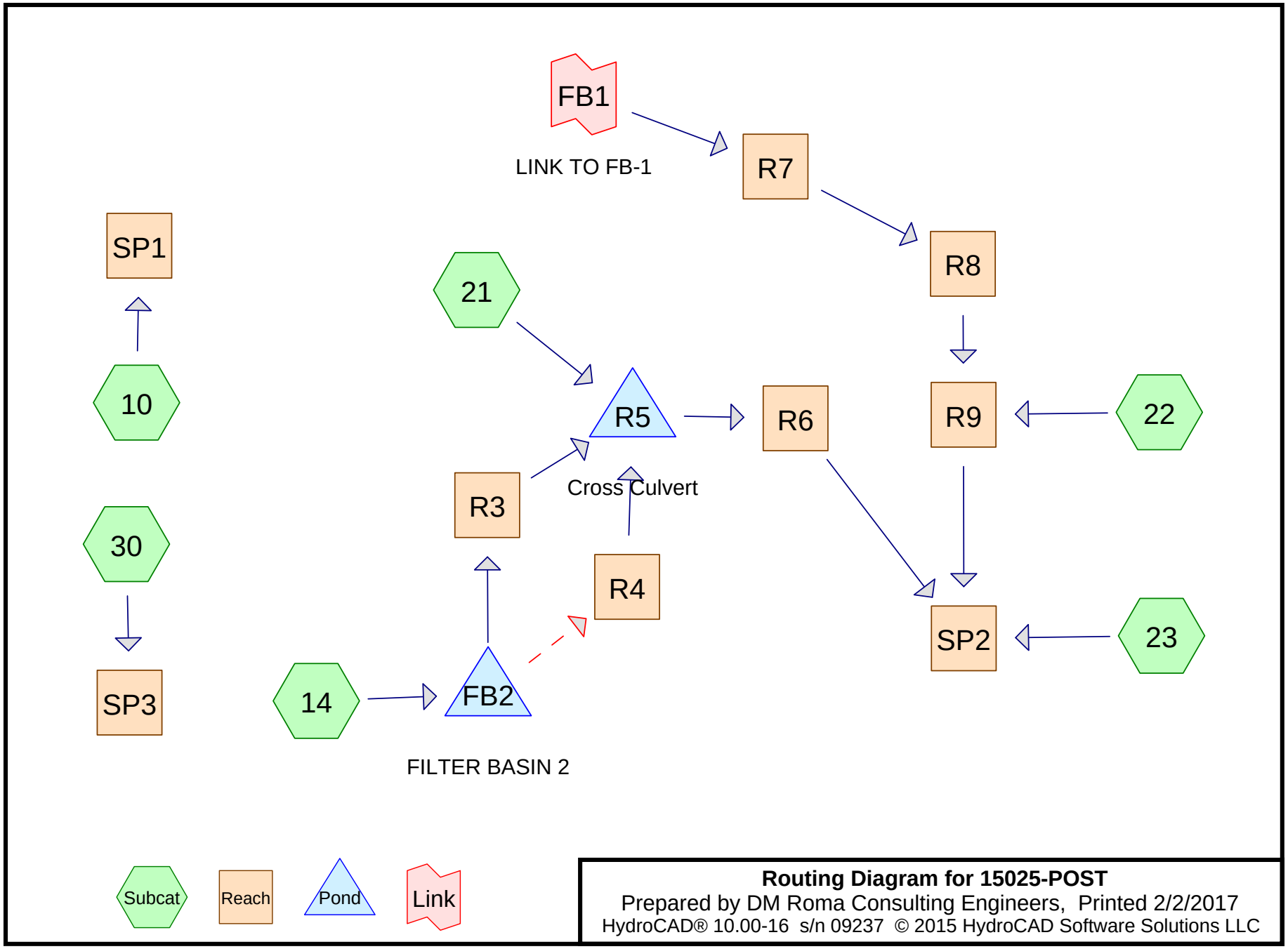
Subcatchment 20: Runoff Area=94,560 sf 12.81% Impervious Runoff Depth>0.34"
Flow Length=476' Tc=6.0 min CN=47 Runoff=0.39 cfs 0.062 af

Reach R1: Avg. Flow Depth=0.27' Max Vel=3.16 fps Inflow=2.36 cfs 0.183 af
n=0.025 L=178.0' S=0.0225 '/' Capacity=132.45 cfs Outflow=2.29 cfs 0.182 af

Reach R2: Avg. Flow Depth=0.30' Max Vel=2.66 fps Inflow=2.29 cfs 0.182 af
n=0.025 L=70.0' S=0.0150 '/' Capacity=123.53 cfs Outflow=2.26 cfs 0.182 af

Pond CB2: Peak Elev=197.59' Inflow=2.36 cfs 0.183 af
12.0" Round Culvert n=0.013 L=33.0' S=0.0212 '/' Outflow=2.36 cfs 0.183 af

Pond FB1: FILTER BASIN 1 Peak Elev=190.69' Storage=3,841 cf Inflow=2.61 cfs 0.244 af
Primary=0.35 cfs 0.234 af Secondary=0.00 cfs 0.000 af Outflow=0.35 cfs 0.234 af



Routing Diagram for 15025-POST

Prepared by DM Roma Consulting Engineers, Printed 2/2/2017

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment10: Runoff Area=17,295 sf 0.00% Impervious Runoff Depth=0.49"
Flow Length=96' Slope=0.0100 '/' Tc=12.7 min CN=41 Runoff=0.08 cfs 0.016 af

Subcatchment14: Runoff Area=13,390 sf 59.07% Impervious Runoff Depth=3.02"
Flow Length=102' Slope=0.0200 '/' Tc=6.0 min CN=74 Runoff=1.07 cfs 0.077 af

Subcatchment21: Runoff Area=62,915 sf 37.88% Impervious Runoff Depth=3.02"
Flow Length=164' Slope=0.0500 '/' Tc=8.5 min CN=74 Runoff=4.62 cfs 0.363 af

Subcatchment22: Runoff Area=76,385 sf 8.62% Impervious Runoff Depth=2.83"
Flow Length=606' Tc=29.2 min CN=72 Runoff=3.31 cfs 0.414 af

Subcatchment23: Runoff Area=34,625 sf 33.60% Impervious Runoff Depth=3.02"
Flow Length=370' Tc=6.0 min CN=74 Runoff=2.76 cfs 0.200 af

Subcatchment30: Runoff Area=1,095 sf 85.39% Impervious Runoff Depth>4.54"
Tc=6.0 min CN=89 Runoff=0.13 cfs 0.010 af

Reach R3: Avg. Flow Depth=0.08' Max Vel=2.70 fps Inflow=0.51 cfs 0.077 af
n=0.025 L=88.0' S=0.0650 '/' Capacity=257.15 cfs Outflow=0.50 cfs 0.077 af

Reach R4: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.020 L=261.0' S=0.0400 '/' Capacity=115.86 cfs Outflow=0.00 cfs 0.000 af

Reach R6: Avg. Flow Depth=0.07' Max Vel=1.91 fps Inflow=4.02 cfs 0.440 af
n=0.025 L=137.0' S=0.0400 '/' Capacity=129.03 cfs Outflow=3.98 cfs 0.440 af

Reach R7: Avg. Flow Depth=0.02' Max Vel=0.66 fps Inflow=0.45 cfs 0.301 af
n=0.025 L=123.0' S=0.0200 '/' Capacity=91.24 cfs Outflow=0.45 cfs 0.301 af

Reach R8: Avg. Flow Depth=0.18' Max Vel=0.45 fps Inflow=0.45 cfs 0.301 af
n=0.070 L=59.0' S=0.0049 '/' Capacity=90.84 cfs Outflow=0.45 cfs 0.301 af

Reach R9: Avg. Flow Depth=0.59' Max Vel=0.89 fps Inflow=3.66 cfs 0.715 af
n=0.070 L=319.0' S=0.0050 '/' Capacity=91.48 cfs Outflow=3.54 cfs 0.715 af

Reach SP1: Inflow=0.08 cfs 0.016 af
Outflow=0.08 cfs 0.016 af

Reach SP2: Inflow=6.92 cfs 1.355 af
Outflow=6.92 cfs 1.355 af

Reach SP3: Inflow=0.13 cfs 0.010 af
Outflow=0.13 cfs 0.010 af

Pond FB2: FILTER BASIN 2 Peak Elev=204.06' Storage=999 cf Inflow=1.07 cfs 0.077 af
Primary=0.51 cfs 0.077 af Secondary=0.00 cfs 0.000 af Outflow=0.51 cfs 0.077 af

Pond R5: Cross Culvert Peak Elev=193.17' Storage=1,069 cf Inflow=4.69 cfs 0.440 af
15.0" Round Culvert n=0.013 L=57.0' S=0.0053 '/' Outflow=4.02 cfs 0.440 af

Link R5-Year Primary Outflow Imported from 15025-POST-POND SIZING~Pond FB1.hce Inflow=0.45 cfs 0.301 af
Area= 3.411 ac 27.92% Imperv. Primary=0.45 cfs 0.301 af

Summary for Subcatchment 10:

Runoff = 0.08 cfs @ 12.42 hrs, Volume= 0.016 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

Area (sf)	CN	Description
12,960	39	>75% Grass cover, Good, HSG A
3,785	48	Brush, Poor, HSG A
550	36	Woods, Fair, HSG A
17,295	41	Weighted Average
17,295		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	96	0.0100	0.13		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.10"

Summary for Subcatchment 14:

Runoff = 1.07 cfs @ 12.09 hrs, Volume= 0.077 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	7,910	98	Pavement
	5,480	39	>75% Grass cover, Good, HSG A
	13,390	74	Weighted Average
	5,480		40.93% Pervious Area
	7,910		59.07% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.6	42	0.0200	1.14		**Sheet Flow, A TO B** Smooth surfaces n= 0.011 P2= 3.10"
0.3	60	0.0200	2.87		**Shallow Concentrated Flow, B TO C** Paved Kv= 20.3 fps
5.1					**Direct Entry, 6 MINUTE MIN. TC**
6.0	102	Total			

Summary for Subcatchment 21:

Runoff = 4.62 cfs @ 12.12 hrs, Volume= 0.363 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	23,830	98	Pavement and Building
*	6,625	96	Gravel
	19,000	39	>75% Grass cover, Good, HSG A
	13,460	68	<50% Grass cover, Poor, HSG A
	62,915	74	Weighted Average
	39,085		62.12% Pervious Area
	23,830		37.88% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.0	120	0.0500	0.25		**Sheet Flow, A TO B** Grass: Short n= 0.150 P2= 3.10"
0.5	44	0.0500	1.57		**Shallow Concentrated Flow, B TO C** Short Grass Pasture Kv= 7.0 fps
8.5	164	Total			

Summary for Subcatchment 22:

Runoff = 3.31 cfs @ 12.42 hrs, Volume= 0.414 af, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
	5,700	39	>75% Grass cover, Good, HSG A
	1,590	80	>75% Grass cover, Good, HSG D
	10,340	36	Woods, Fair, HSG A
	52,170	79	Woods, Fair, HSG D
*	6,585	98	Water Surface
	76,385	72	Weighted Average
	69,800		91.38% Pervious Area
	6,585		8.62% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	150	0.0500	0.12		**Sheet Flow, A TO B** Woods: Light underbrush n= 0.400 P2= 3.10"
7.1	302	0.0200	0.71		**Shallow Concentrated Flow, B TO C** Woodland Kv= 5.0 fps
1.2	154	0.0050	2.18	91.62	**Trap/Vee/Rect Channel Flow, C TO D** Bot.W=5.00' D=3.00' Z= 3.0 '/' Top.W=23.00' n= 0.070
29.2	606	Total			

Summary for Subcatchment 23:

Runoff = 2.76 cfs @ 12.09 hrs, Volume= 0.200 af, Depth= 3.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	5,385	98	Pavement
	7,255	39	>75% Grass cover, Good, HSG A
	3,700	80	>75% Grass cover, Good, HSG D
	2,735	36	Woods, Fair, HSG A
	9,300	79	Woods, Fair, HSG D
*	6,250	98	Water Surface
	34,625	74	Weighted Average
	22,990		66.40% Pervious Area
	11,635		33.60% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.9	100	0.0400	1.79		**Sheet Flow, A TO B** Smooth surfaces n= 0.011 P2= 3.10"
0.2	47	0.5000	4.95		**Shallow Concentrated Flow, B TO C** Short Grass Pasture Kv= 7.0 fps
1.0	69	0.0500	1.12		**Shallow Concentrated Flow, C TO D** Woodland Kv= 5.0 fps
1.2	154	0.0050	2.18	91.62	**Trap/Vee/Rect Channel Flow, D TO E** Bot.W=5.00' D=3.00' Z= 3.0 '/' Top.W=23.00' n= 0.070
2.7					**Direct Entry, 6 MINUTE MIN. TC**
6.0	370	Total			

Summary for Subcatchment 30:

Runoff = 0.13 cfs @ 12.09 hrs, Volume= 0.010 af, Depth> 4.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Type III 24-hr 25-Year Rainfall=5.80"

	Area (sf)	CN	Description
*	935	98	Pavement
	160	39	>75% Grass cover, Good, HSG A
	1,095	89	Weighted Average
	160		14.61% Pervious Area
	935		85.39% Impervious Area

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

Summary for Reach R3:

Inflow Area = 0.307 ac, 59.07% Impervious, Inflow Depth = 3.02" for 25-Year event
Inflow = 0.51 cfs @ 12.29 hrs, Volume= 0.077 af
Outflow = 0.50 cfs @ 12.31 hrs, Volume= 0.077 af, Atten= 2%, Lag= 1.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 2.70 fps, Min. Travel Time= 0.5 min
Avg. Velocity = 1.24 fps, Avg. Travel Time= 1.2 min

Peak Storage= 17 cf @ 12.25 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 2.00' Flow Area= 16.0 sf, Capacity= 257.15 cfs

2.00' x 2.00' deep channel, n= 0.025
Side Slope Z-value= 3.0 '/' Top Width= 14.00'
Length= 88.0' Slope= 0.0650 '/'
Inlet Invert= 0.00', Outlet Invert= -5.72'

Summary for Reach R4:

Inflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 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 @ 5.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 0.50' Flow Area= 15.0 sf, Capacity= 115.86 cfs

20.00' x 0.50' deep channel, n= 0.020
Side Slope Z-value= 20.0 '/' Top Width= 40.00'
Length= 261.0' Slope= 0.0400 '/'
Inlet Invert= 0.00', Outlet Invert= -10.44'

‡

Summary for Reach R6:

Inflow Area = 1.752 ac, 41.60% Impervious, Inflow Depth = 3.02" for 25-Year event
Inflow = 4.02 cfs @ 12.20 hrs, Volume= 0.440 af
Outflow = 3.98 cfs @ 12.24 hrs, Volume= 0.440 af, Atten= 1%, Lag= 2.1 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 1.91 fps, Min. Travel Time= 1.2 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 3.8 min

Peak Storage= 289 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 0.50' Flow Area= 20.0 sf, Capacity= 129.03 cfs

30.00' x 0.50' deep channel, n= 0.025
Side Slope Z-value= 20.0 '/' Top Width= 50.00'
Length= 137.0' Slope= 0.0400 '/'
Inlet Invert= 0.00', Outlet Invert= -5.48'

‡

Summary for Reach R7:

Inflow Area = 3.411 ac, 27.92% Impervious, Inflow Depth > 1.06" for 25-Year event
Inflow = 0.45 cfs @ 14.28 hrs, Volume= 0.301 af
Outflow = 0.45 cfs @ 14.36 hrs, Volume= 0.301 af, Atten= 0%, Lag= 5.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.66 fps, Min. Travel Time= 3.1 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 4.4 min

Peak Storage= 84 cf @ 14.31 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 0.50' Flow Area= 20.0 sf, Capacity= 91.24 cfs

30.00' x 0.50' deep channel, n= 0.025
Side Slope Z-value= 20.0 '/' Top Width= 50.00'
Length= 123.0' Slope= 0.0200 '/'
Inlet Invert= 0.00', Outlet Invert= -2.46'

‡

Summary for Reach R8:

Inflow Area = 3.411 ac, 27.92% Impervious, Inflow Depth = 1.06" for 25-Year event
Inflow = 0.45 cfs @ 14.36 hrs, Volume= 0.301 af
Outflow = 0.45 cfs @ 14.42 hrs, Volume= 0.301 af, Atten= 0%, Lag= 3.6 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.45 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.30 fps, Avg. Travel Time= 3.3 min

Peak Storage= 60 cf @ 14.38 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 3.00' Flow Area= 42.0 sf, Capacity= 90.84 cfs

5.00' x 3.00' deep channel, n= 0.070
Side Slope Z-value= 3.0 '/' Top Width= 23.00'
Length= 59.0' Slope= 0.0049 '/'
Inlet Invert= 0.00', Outlet Invert= -0.29'

‡

Summary for Reach R9:

Inflow Area = 5.164 ac, 21.36% Impervious, Inflow Depth = 1.66" for 25-Year event
Inflow = 3.66 cfs @ 12.42 hrs, Volume= 0.715 af
Outflow = 3.54 cfs @ 12.60 hrs, Volume= 0.715 af, Atten= 3%, Lag= 10.5 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Max. Velocity= 0.89 fps, Min. Travel Time= 6.0 min
Avg. Velocity = 0.32 fps, Avg. Travel Time= 16.6 min

Peak Storage= 1,271 cf @ 12.50 hrs
Average Depth at Peak Storage= 0.59'
Bank-Full Depth= 3.00' Flow Area= 42.0 sf, Capacity= 91.48 cfs

5.00' x 3.00' deep channel, n= 0.070 Sluggish weedy reaches w/pools
Side Slope Z-value= 3.0 '/' Top Width= 23.00'
Length= 319.0' Slope= 0.0050 '/'
Inlet Invert= 0.00', Outlet Invert= -1.59'

‡

Summary for Reach SP1:

Inflow Area = 0.397 ac, 0.00% Impervious, Inflow Depth = 0.49" for 25-Year event
Inflow = 0.08 cfs @ 12.42 hrs, Volume= 0.016 af
Outflow = 0.08 cfs @ 12.42 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach SP2:

Inflow Area = 7.711 ac, 27.22% Impervious, Inflow Depth = 2.11" for 25-Year event
Inflow = 6.92 cfs @ 12.27 hrs, Volume= 1.355 af
Outflow = 6.92 cfs @ 12.27 hrs, Volume= 1.355 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Summary for Reach SP3:

Inflow Area = 0.025 ac, 85.39% Impervious, Inflow Depth > 4.54" for 25-Year event
Inflow = 0.13 cfs @ 12.09 hrs, Volume= 0.010 af
Outflow = 0.13 cfs @ 12.09 hrs, Volume= 0.010 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind+Trans method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

Summary for Pond FB2: FILTER BASIN 2

Inflow Area = 0.307 ac, 59.07% Impervious, Inflow Depth = 3.02" for 25-Year event
Inflow = 1.07 cfs @ 12.09 hrs, Volume= 0.077 af
Outflow = 0.51 cfs @ 12.29 hrs, Volume= 0.077 af, Atten= 52%, Lag= 11.7 min
Primary = 0.51 cfs @ 12.29 hrs, Volume= 0.077 af
Secondary = 0.00 cfs @ 5.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 204.06' @ 12.29 hrs Surf.Area= 1,369 sf Storage= 999 cf

Plug-Flow detention time= 107.9 min calculated for 0.077 af (100% of inflow)
Center-of-Mass det. time= 107.8 min (938.2 - 830.4)

Volume	Invert	Avail.Storage	Storage Description
#1	203.00'	1,676 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
203.00	510	0	0
204.00	1,315	913	913
204.50	1,740	764	1,676

Device	Routing	Invert	Outlet Devices
#1	Primary	200.73'	**8.0" Round Culvert** L= 162.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 200.73' / 198.90' S= 0.0113 '/' Cc= 0.900 n= 0.013, Flow Area= 0.35 sf
#2	Device 1	203.00'	**2.410 in/hr Exfiltration over Surface area**
#3	Device 1	203.95'	**13.1" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#4	Secondary	204.10'	**5.0' long x 6.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 5.00 5.50 Coef. (English) 2.37 2.51 2.70 2.68 2.68 2.67 2.65 2.65 2.65 2.65 2.66 2.66 2.67 2.69 2.72 2.76 2.83

Primary OutFlow Max=0.51 cfs @ 12.29 hrs HW=204.06' (Free Discharge)
└**1=Culvert** (Passes 0.51 cfs of 1.86 cfs potential flow)
  └**2=Exfiltration** (Exfiltration Controls 0.08 cfs)
  └**3=Orifice/Grate** (Weir Controls 0.43 cfs @ 1.10 fps)

Secondary OutFlow Max=0.00 cfs @ 5.00 hrs HW=203.00' (Free Discharge)
└**4=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Summary for Pond R5: Cross Culvert

Inflow Area = 1.752 ac, 41.60% Impervious, Inflow Depth = 3.02" for 25-Year event
Inflow = 4.69 cfs @ 12.12 hrs, Volume= 0.440 af
Outflow = 4.02 cfs @ 12.20 hrs, Volume= 0.440 af, Atten= 14%, Lag= 4.7 min
Primary = 4.02 cfs @ 12.20 hrs, Volume= 0.440 af

Routing by Stor-Ind method, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs
Peak Elev= 193.17' @ 12.20 hrs Surf.Area= 1,182 sf Storage= 1,069 cf

Plug-Flow detention time= 5.8 min calculated for 0.440 af (100% of inflow)
Center-of-Mass det. time= 5.6 min (857.1 - 851.5)

Volume	Invert	Avail.Storage	Storage Description
#1	191.80'	8,874 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
191.80	50	0	0
192.00	545	59	59
194.00	1,635	2,180	2,239
196.00	5,000	6,635	8,874

Device	Routing	Invert	Outlet Devices
#1	Primary	191.80'	**15.0" Round Culvert** L= 57.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 191.80' / 191.50' S= 0.0053 '/' Cc= 0.900 n= 0.013, Flow Area= 1.23 sf

Primary OutFlow Max=4.02 cfs @ 12.20 hrs HW=193.17' (Free Discharge)
└**1=Culvert** (Inlet Controls 4.02 cfs @ 3.27 fps)

Summary for Link FB1: LINK TO FB-1

Inflow Area = 3.411 ac, 27.92% Impervious, Inflow Depth > 1.06" for 25-Year event
Inflow = 0.45 cfs @ 14.28 hrs, Volume= 0.301 af
Primary = 0.45 cfs @ 14.28 hrs, Volume= 0.301 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 5.00-48.00 hrs, dt= 0.05 hrs

25-Year Primary Outflow Imported from 15025-POST-POND SIZING~Pond FB1.hce

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment10: Runoff Area=17,295 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=96' Slope=0.0100 '/' Tc=12.7 min CN=41 Runoff=0.00 cfs 0.000 af

Subcatchment14: Runoff Area=13,390 sf 59.07% Impervious Runoff Depth=0.97"
Flow Length=102' Slope=0.0200 '/' Tc=6.0 min CN=74 Runoff=0.32 cfs 0.025 af

Subcatchment21: Runoff Area=62,915 sf 37.88% Impervious Runoff Depth=0.97"
Flow Length=164' Slope=0.0500 '/' Tc=8.5 min CN=74 Runoff=1.39 cfs 0.117 af

Subcatchment22: Runoff Area=76,385 sf 8.62% Impervious Runoff Depth=0.87"
Flow Length=606' Tc=29.2 min CN=72 Runoff=0.93 cfs 0.127 af

Subcatchment23: Runoff Area=34,625 sf 33.60% Impervious Runoff Depth=0.97"
Flow Length=370' Tc=6.0 min CN=74 Runoff=0.84 cfs 0.064 af

Subcatchment30: Runoff Area=1,095 sf 85.39% Impervious Runoff Depth=1.99"
Tc=6.0 min CN=89 Runoff=0.06 cfs 0.004 af

Reach R3: Avg. Flow Depth=0.02' Max Vel=1.16 fps Inflow=0.05 cfs 0.025 af
n=0.025 L=88.0' S=0.0650 '/' Capacity=257.15 cfs Outflow=0.05 cfs 0.025 af

Reach R4: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.020 L=261.0' S=0.0400 '/' Capacity=115.86 cfs Outflow=0.00 cfs 0.000 af

Reach R6: Avg. Flow Depth=0.03' Max Vel=1.21 fps Inflow=1.26 cfs 0.142 af
n=0.025 L=137.0' S=0.0400 '/' Capacity=129.03 cfs Outflow=1.23 cfs 0.142 af

Reach R7: Avg. Flow Depth=0.02' Max Vel=0.56 fps Inflow=0.29 cfs 0.094 af
n=0.025 L=123.0' S=0.0200 '/' Capacity=91.24 cfs Outflow=0.29 cfs 0.094 af

Reach R8: Avg. Flow Depth=0.14' Max Vel=0.38 fps Inflow=0.29 cfs 0.094 af
n=0.070 L=59.0' S=0.0049 '/' Capacity=90.84 cfs Outflow=0.29 cfs 0.094 af

Reach R9: Avg. Flow Depth=0.31' Max Vel=0.62 fps Inflow=1.22 cfs 0.221 af
n=0.070 L=319.0' S=0.0050 '/' Capacity=91.48 cfs Outflow=1.15 cfs 0.221 af

Reach SP1: Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Reach SP2: Inflow=1.90 cfs 0.427 af
Outflow=1.90 cfs 0.427 af

Reach SP3: Inflow=0.06 cfs 0.004 af
Outflow=0.06 cfs 0.004 af

Pond FB2: FILTER BASIN 2 Peak Elev=203.49' Storage=343 cf Inflow=0.32 cfs 0.025 af
Primary=0.05 cfs 0.025 af Secondary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.025 af

Pond R5: Cross Culvert Peak Elev=192.44' Storage=355 cf Inflow=1.43 cfs 0.142 af
15.0" Round Culvert n=0.013 L=57.0' S=0.0053 '/' Outflow=1.26 cfs 0.142 af

Link 2-Year Primary Outflow Imported from 15025-POST-POND SIZING~Pond FB1.hce Inflow=0.29 cfs 0.094 af
Area= 3.411 ac 27.92% Imperv. Primary=0.29 cfs 0.094 af

Time span=5.00-48.00 hrs, dt=0.05 hrs, 861 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment10: Runoff Area=17,295 sf 0.00% Impervious Runoff Depth=0.18"
Flow Length=96' Slope=0.0100 '/' Tc=12.7 min CN=41 Runoff=0.01 cfs 0.006 af

Subcatchment14: Runoff Area=13,390 sf 59.07% Impervious Runoff Depth=2.05"
Flow Length=102' Slope=0.0200 '/' Tc=6.0 min CN=74 Runoff=0.72 cfs 0.053 af

Subcatchment21: Runoff Area=62,915 sf 37.88% Impervious Runoff Depth=2.05"
Flow Length=164' Slope=0.0500 '/' Tc=8.5 min CN=74 Runoff=3.08 cfs 0.247 af

Subcatchment22: Runoff Area=76,385 sf 8.62% Impervious Runoff Depth=1.89"
Flow Length=606' Tc=29.2 min CN=72 Runoff=2.18 cfs 0.277 af

Subcatchment23: Runoff Area=34,625 sf 33.60% Impervious Runoff Depth=2.05"
Flow Length=370' Tc=6.0 min CN=74 Runoff=1.86 cfs 0.136 af

Subcatchment30: Runoff Area=1,095 sf 85.39% Impervious Runoff Depth>3.39"
Tc=6.0 min CN=89 Runoff=0.10 cfs 0.007 af

Reach R3: Avg. Flow Depth=0.03' Max Vel=1.60 fps Inflow=0.12 cfs 0.053 af
n=0.025 L=88.0' S=0.0650 '/' Capacity=257.15 cfs Outflow=0.12 cfs 0.053 af

Reach R4: Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.020 L=261.0' S=0.0400 '/' Capacity=115.86 cfs Outflow=0.00 cfs 0.000 af

Reach R6: Avg. Flow Depth=0.05' Max Vel=1.66 fps Inflow=2.77 cfs 0.299 af
n=0.025 L=137.0' S=0.0400 '/' Capacity=129.03 cfs Outflow=2.71 cfs 0.299 af

Reach R7: Avg. Flow Depth=0.02' Max Vel=0.60 fps Inflow=0.35 cfs 0.234 af
n=0.025 L=123.0' S=0.0200 '/' Capacity=91.24 cfs Outflow=0.35 cfs 0.234 af

Reach R8: Avg. Flow Depth=0.16' Max Vel=0.41 fps Inflow=0.35 cfs 0.234 af
n=0.070 L=59.0' S=0.0049 '/' Capacity=90.84 cfs Outflow=0.35 cfs 0.234 af

Reach R9: Avg. Flow Depth=0.47' Max Vel=0.79 fps Inflow=2.50 cfs 0.511 af
n=0.070 L=319.0' S=0.0050 '/' Capacity=91.48 cfs Outflow=2.40 cfs 0.511 af

Reach SP1: Inflow=0.01 cfs 0.006 af
Outflow=0.01 cfs 0.006 af

Reach SP2: Inflow=4.60 cfs 0.946 af
Outflow=4.60 cfs 0.946 af

Reach SP3: Inflow=0.10 cfs 0.007 af
Outflow=0.10 cfs 0.007 af

Pond FB2: FILTER BASIN 2 Peak Elev=203.97' Storage=879 cf Inflow=0.72 cfs 0.053 af
Primary=0.12 cfs 0.053 af Secondary=0.00 cfs 0.000 af Outflow=0.12 cfs 0.053 af

Pond R5: Cross Culvert Peak Elev=192.84' Storage=707 cf Inflow=3.13 cfs 0.299 af
15.0" Round Culvert n=0.013 L=57.0' S=0.0053 '/' Outflow=2.77 cfs 0.299 af

Link 0-Year Primary Outflow Imported from 15025-POST-POND SIZING~Pond FB1.hce Inflow=0.35 cfs 0.234 af
Area= 3.411 ac 27.92% Imperv. Primary=0.35 cfs 0.234 af

INSPECTION, MAINTENANCE, AND HOUSEKEEPING PLAN

THE PLAZA-PHASE 2
DAYCARE FACILITY
881 ROOSEVELT TRAIL, WINDHAM, MAINE

Responsible Party

Owner: Martin Lippman
71 Stuart Shores Road
Standish, Maine 04084

The owner is responsible for the maintenance of all stormwater management structures and related site components and the keeping of a maintenance log book with service records. Records of all inspections and maintenance work performed must be kept on file with the owner and retained for a minimum of five years. The maintenance log will be made available to the Town and Maine Department of Environmental Protection (MDEP) upon request. At a minimum, the maintenance of stormwater management systems will be performed on the prescribed schedule.

The procedures outlined in this plan are provided as a general overview of the anticipated practices to be utilized on this site. In some instances, additional measures may be required due to unexpected conditions. *The Maine Erosion and Sedimentation Control BMP* and *Stormwater Management for Maine: Best Management Practices* Manuals published by the MDEP should be referenced for additional information.

During Construction

1. **Inspection and Corrective Action:** It is the contractor's responsibility to comply with the inspection and maintenance procedures outlined in this section. Inspection shall occur on all disturbed and impervious areas, erosion control measures, material storage areas that are exposed to precipitation, and locations where vehicles enter or exit the site. These areas shall be inspected at least once a week as well as 24 hours before and after a storm event and prior to completing permanent stabilization measures. A person with knowledge of erosion and stormwater control, including the standards and conditions in the permit, shall conduct the inspections.

2. **Maintenance:** Erosion controls shall be maintained in effective operating condition until areas are permanently stabilized. If best management practices (BMPs) need to be repaired, the repair work should be initiated upon discovery of the problem but no later than the end of the next workday. If BMPs need to be maintained or modified, additional BMPs are necessary, or other corrective action is needed, implementation must be completed within seven calendar days and prior to any rainfall event.

3. **Documentation:** A report summarizing the inspections and any corrective action taken must be maintained on site. The log must include the name(s) and qualifications of the person making the inspections; the date(s) of the inspections; and the major observations about the operation and maintenance of erosion and sedimentation controls, materials storage areas, and vehicle access points to the parcel. Major observations must include BMPs that need maintenance, BMPs that failed to operate as designed or proved inadequate for a particular location, and location(s) where additional BMPs are needed. For each BMP requiring maintenance, BMP needing replacement, and location needing additional BMPs, note in the log the corrective action taken and when it was taken. The log must be made accessible to MDEP staff, and a copy must be provided upon request. The owner shall retain a copy of the log for a period of at least three years from the completion of permanent stabilization.

Houskeeping

1. **Spill prevention:** Controls must be used to prevent pollutants from construction and waste materials on site to enter stormwater, which includes storage practices to minimize exposure of the materials to stormwater. The site contractor or operator must develop, and implement as necessary, appropriate spill prevention, containment, and response planning measures.

2. **Groundwater protection:** During construction, liquid petroleum products and other hazardous materials with the potential to contaminate groundwater may not be stored or handled in areas of the site draining to an infiltration area. An "infiltration area" is any area of the site that by design or as a result of soils, topography and other relevant factors accumulates runoff that infiltrates into the soil. Dikes, berms, sumps, and other forms of secondary containment that prevent discharge to groundwater may be used to isolate portions of the site for the purposes of storage and handling of these materials. Any project proposing infiltration of stormwater must provide adequate pre-treatment of stormwater prior to discharge of stormwater to the infiltration area, or provide for treatment within the infiltration area, in order to prevent the accumulation of fines, reduction in infiltration rate, and consequent flooding and destabilization.

3. **Fugitive sediment and dust:** Actions must be taken to ensure that activities do not result in noticeable erosion of soils or fugitive dust emissions during or after construction. Oil may not be used for dust control, but other water additives may be considered as needed. A stabilized construction entrance (SCE) should be included to minimize tracking of mud and sediment. If off-site tracking occurs, public roads should be swept immediately and no less than once a week and prior to significant storm events. Operations during dry months, that experience fugitive dust problems, should wet down unpaved access roads once a week or more frequently as needed with a water additive to suppress fugitive sediment and dust.

4. **Debris and other materials:** Minimize the exposure of construction debris, building and landscaping materials, trash, fertilizers, pesticides, herbicides, detergents, sanitary waste

and other materials to precipitation and stormwater runoff. These materials must be prevented from becoming a pollutant source.

5. **Excavation de-watering:** Excavation de-watering is the removal of water from trenches, foundations, coffer dams, ponds, and other areas within the construction area that retain water after excavation. In most cases the collected water is heavily silted and hinders correct and safe construction practices. The collected water removed from the ponded area, either through gravity or pumping, must be spread through natural wooded buffers or removed to areas that are specifically designed to collect the maximum amount of sediment possible, like a cofferdam sedimentation basin. Avoid allowing the water to flow over disturbed areas of the site. Equivalent measures may be taken if approved by the Department.

6. **Authorized Non-stormwater discharges:** Identify and prevent contamination by non-stormwater discharges. Where allowed non-stormwater discharges exist, they must be identified and steps should be taken to ensure the implementation of appropriate pollution prevention measures for the non-stormwater component(s) of the discharge. Authorized non-stormwater discharges are:
   (a) Discharges from firefighting activity;
   (b) Fire hydrant flushings;
   (c) Vehicle washwater if detergents are not used and washing is limited to the exterior of vehicles (engine, undercarriage and transmission washing is prohibited);
   (d) Dust control runoff in accordance with permit conditions and Appendix (C)(3);
   (e) Routine external building washdown, not including surface paint removal, that does not involve detergents;
   (f) Pavement washwater (where spills/leaks of toxic or hazardous materials have not occurred, unless all spilled material had been removed) if detergents are not used;
   (g) Uncontaminated air conditioning or compressor condensate;
   (h) Uncontaminated groundwater or spring water;
   (i) Foundation or footer drain-water where flows are not contaminated;
   (j) Uncontaminated excavation dewatering (see requirements in Appendix C(5));
   (k) Potable water sources including waterline flushings; and
   (l) Landscape irrigation.

7. **Unauthorized non-stormwater discharges:** Approval from the MDEP does not authorize a discharge that is mixed with a source of non-stormwater, other than those discharges in compliance with Section 6 above. Specifically, the MDEP's approval does not authorize discharges of the following:
   (a) Wastewater from the washout or cleanout of concrete, stucco, paint, form release oils, curing compounds or other construction materials;
   (b) Fuels, oils or other pollutants used in vehicle and equipment operation and maintenance;
   (c) Soaps, solvents, or detergents used in vehicle and equipment washing; and
   (d) Toxic or hazardous substances from a spill or other release.

Post construction

1. **Inspection and Corrective Action:** All measures must be maintained by the owner in effective operating condition. A qualified third party inspector hired by the owner shall at least annually inspect the stormwater management facilities. This person should have knowledge of erosion and stormwater control including the standards and conditions of the site's approvals. The inspector shall be certified through the MDEP to inspect the stormwater infrastructure. The following areas, facilities, and measures must be inspected, and identified deficiencies must be corrected. Areas, facilities, and measures other than those listed below may also require inspection on a specific site.

   A. **Vegetated Areas:** Inspect vegetated areas, particularly slopes and embankments, early in the growing season or after heavy rains to identify active or potential erosion problems. Replant bare areas or areas with sparse growth. Where rill is evident, armor the area with an appropriate lining or divert the erosive flows to on-site areas able to withstand the concentrated flows.

   B. **Ditches, Swales, and Open Channels:** Inspect ditches, swales, and other open channels in the spring, late fall, and after heavy rains to remove any obstructions to flow, remove accumulated sediments and debris, control vegetative growth that could obstruct flow, and repair any erosion of the ditch lining. Vegetated ditches must be mowed at least annually or otherwise maintained to control the growth of woody vegetation and maintain flow capacity. Any woody vegetation growing through riprap linings must also be removed. Repair any slumping side slopes as soon as practicable. If the ditch has a riprap lining, replace riprap on areas where any underlying filter fabric or underdrain gravel is showing through the stone or where stones have dislodged. The channel must receive adequate routine maintenance to maintain capacity and prevent or correct any erosion of the channel's bottom or side slopes.

   C. **Culverts:** Inspect culverts in the spring, late fall, and after heavy rains to remove any obstructions to flow; remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit; and to repair any erosion damage at the culvert's inlet and outlet.

   D. **Catch Basins and Outlet Structures:** Inspect and, if required, clean out catch basins at least once a year, preferably in early spring. Clean out must include the removal and legal disposal of any accumulated sediments and debris at the bottom of the basin, at any inlet grates, at any inflow channels to the basin, and at any pipes between basins. If the basin outlet is designed to trap floatable materials, then remove the floating debris and any floating oils (using oil-absorptive pads).

   E. **Underdrained Filter Basin:** Basin should be inspected semi-annually and following major storm events for the first year and every six months thereafter. The basin should drain within 48 hours following a one-inch storm and if a larger storm fills the

system to overflow, it shall drain within 36 to 60 hours. If ponding exceeds 48 hours, the top of the filter bed must be rototilled to reestablish the soil's filtration capacity. If water ponds on the surface of the bed for more than 72 hours, the top several inches of the filter shall be replaced with fresh material. Inspect for debris and sediment build up in the forebay and basin and remove as needed. Mowing of the basin can only occur semi-annually to a height of no less than 6 inches utilizing a hand-held string trimmer or push-mower. Any bare areas or erosion rills shall be repaired with new filter media or sandy loam then seeded and mulched. The basin should also be inspected annually for destabilization of side slopes, embankment settling and other signs of structural failure.

F. Regular Maintenance: Clear accumulations of winter sand along parking areas at least once a year, preferably in the spring. Accumulations on pavement may be removed by pavement sweeping. Accumulations of sand along pavement shoulders may be removed by grading excess sand to the pavement edge and removing it manually or by a front-end loader.

G. Documentation: Keep a log (report) summarizing inspections, maintenance, and any corrective actions taken. The log must include 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, indicate where the sediment and debris was disposed after removal. The log must be made accessible to Town staff upon request. The permittee shall retain a copy of the log for a period of at least five years from the completion of permanent stabilization. Attached is a sample log.

Re-certification

As a requirement of the Town, the stormwater infrastructure shall be inspected yearly by a qualified third party inspector. The third party inspector shall perform an initial inspection to determine the status of the stormwater management facilities. If the initial inspection identifies any deficiencies with the facilities, the same third party inspector shall re-inspect the facilities after they have been maintained or repaired to determine if they are performing as intended. Once the site is satisfactory, the third party inspector shall submit the Annual Stormwater Management Facilities Certification form and report to the Office of Code Enforcement. The certification form shall be submitted to the Town prior to May 1 of each year. A copy of the approval form has been included at the end of this document.

As a requirement of the MDEP, a certification of the following items must be submitted within three months of the expiration of each five-year interval from the date of issuance of the permit.

(a) **Identification and repair of erosion problems**. All areas of the project site have been inspected for areas of erosion, and appropriate steps have been taken to permanently stabilize these areas.

(b) **Inspection and repair of stormwater control system**. All aspects of the stormwater control system have been inspected for damage, wear, and malfunction, and appropriate steps have been taken to repair or replace the system, or portions of the system.

(c) **Maintenance**. The erosion and stormwater maintenance plan for the site is being implemented as written, or modifications to the plan have been submitted to and approved by the Department, and the maintenance log is being maintained.

Duration of Maintenance

Perform maintenance as described.

MAINTENANCE LOG

THE PLAZA-PHASE 2
DAYCARE FACILITY
881 ROOSEVELT TRAIL, WINDHAM, MAINE

The following stormwater management and erosion control items shall be inspected and maintained as prescribed in the Maintenance Plan with recommended frequencies as identified below. The owner is responsible for keeping this maintenance log on file for a minimum of five years and shall provide a copy to the Town and Maine Department of Environmental Protection upon request. Inspections are to be performed by a qualified third party inspector and all corrective actions shall be performed by personnel familiar with stormwater management systems and erosion controls.

Maintenance Item	Maintenance Event	Date Performed	Responsible Personnel	Comments
Ditches, swales, and other open channels	Inspect after major rainfall event producing 1" of rain in two hours.			
	Inspect for erosion or slumping & repair			
	Mowed at least annually.			
Culverts	Inspect semiannually and after major rainfall.			
	Repair erosion at inlet or outlet of pipe.			
	Repair displaced riprap.			
	Clean accumulated sediment in culverts when >20% full.			
Catch Basins and Outlet Structures	Inspect to ensure that structure is properly draining.			
	Remove accumulated sediment semiannually.			
	Inspect grates/inlets and remove debris as needed.			
Underdrained Filter Basins	Check after each rainfall event to ensure that pond drains within 24-48 hours.			
	Replace top several inches of filter if pond does not drain within 72 hours.			
	Mow grass no more than twice a year to no less than 6 inches in height.			
	Inspect semi-annually for erosion or sediment accumulation and repair as necessary.			

APPENDIX 1

Annual Stormwater Management Facilities Certification
(to be sent to Municipal Enforcement Authority)

I, _____ (print or type name), certify the following:

1. I am making this annual stormwater management facilities certification for the following property: _____ (print or type name of subdivision, condominium or other development) located at _____ (print or type address), (the "property");

2. The owner, operator, tenant, lessee or homeowners' association of the property is: _____ (name(s) of owner, operator, tenant, lessee, homeowners' association or other party having control over the property);

3. I am the owner, operator, tenant, lessee or president of the homeowners' association, or am a qualified third party inspector hired by the same (circle one);

4. I have knowledge of erosion and stormwater control and have reviewed the approved post-construction stormwater management plan for the property;

5. On _____, 20__, I inspected or had inspected by _____ _____, a qualified third-party inspector, the stormwater management facilities, including but not limited to parking areas, catch basins, drainage swales, detention basins and ponds, pipes and related structures required by the approved post-construction stormwater management plan for the property;

6. At the time of my inspection of the stormwater management facilities on the property, I or the qualified third-party inspector identified the following need(s) for routine maintenance or deficiencies in the stormwater management facilities:

_____
_____
_____
_____
_____

7. On _____, 20__, I took or had taken the following routine maintenance or the following corrective action(s) to address the deficiencies in the stormwater management facilities stated in 6 above:

_____
_____
_____
_____
_____

8. As of the date of this certification, the stormwater management facilities are functioning as intended by the approved post-construction stormwater management plan for the property

Date:_____, 20__. By:_____
Signature

_____
Print Name

STATE OF MAINE
_____, ss _____, 20__

Personally appeared the above-named _____, the _____ of _____, and acknowledged the foregoing annual certification to be said person's free act and deed in said capacity.

Before me,

_____
Notary Public/Attorney at Law

Print Name: _____

Mail this certification to the Town of Windham at the following address:

Office of Code Enforcement
Town of Windham
8 School Road
Windham, ME 04062