Stormwater Report

Building 1 Parking Lot Re-paving Project

12 Howland Road
Fairhaven, MA

Prepared for:
Nye Lubricants, Inc.
12 Howland Road
Fairhaven, MA 02719

Prepared by:
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Project Summary

Nye Lubricants, Inc (Nye) is filing this Notice of Intent (NOI) for the repaving of the parking area south and southwest of Building 1 at the site described by the Fairhaven Assessor's Department as Map 19 Lot 100, also known as 12 Howland Road. This Stormwater Report is being filed in support of the NOI application Nye has made for this project. Nye has retained Reis Asphalt & Landscaping, Inc. as the third-party contractor to remove and replace aggregated material (asphalt) within the project locus at roughly 25,362 sq. ft.

The proposed stormwater control system is designed with multiple stormwater treatment and conveyance Best Management Practices (BMPs) that will capture and treat runoff from the developed site as well as protect the existing on-site wetland resource areas including the Acushnet River Riverfront area. The stormwater management system has been designed in compliance with the Massachusetts Stormwater Management Policy.

The hydrologic conditions were compared for the existing conditions and the proposed conditions using HydroCAD v. 10.0. The existing conditions were divided into two subcatchments, which correspond to a single discharge point. The proposed conditions maintained the two subcatchments with the same two discharge points for analysis to appropriately model the stormwater BMPs with their associated tributary areas. Both the Existing Watershed and Proposed Watershed plans are included with this report. The existing land-cover is pavement, in fair condition (CN= 98) with a small a small area vegetative cover, in good condition (CN= 61). The proposed land cover will remain mostly pavement in good condition, but with a reduction in the total impervious surface and an increase in the permeable surface, covered with vegetation (CN = 61)).

Stormwater Control and Peak Flow Attenuation

No new untreated discharges will be created as a result of the proposed work and the post development peak discharges will be reduced for all storm events.

	Peak Flow (cfs)		
	Existing Discharge Point		
Storm Event	**2 yr storm**	**10 yr storm**	**100 yr storm**
Existing	2.20	3.30	5.11
Proposed	1.58	2.85	4.45
Reduction	0.62	0.45	0.66

	Runoff Volume (acre-ft)		
	Proposed Discharge Point		
Storm Events	**2 yr storm**	**10 yr storm**	**100 yr storm**

Existing	0.135	0.212	0.335
Proposed	0.041	0.093	0.191
Reduction	0.094	.119	0.144

Soil Information

Soils at the project site area are classified as Urban Soils. The soils are classified by the Natural Resources Conservation Service, and the information was gathered through their WebSoil Survey. For the sake of our modeling and design efforts, based on the hand auger explorations performed below the initial loam horizon, the soils were consistent as mapped, urban fill materials, relatively granular and somewhat dense. In order to proceed with the design, we have characterized the soils as a loam, which is a hydrologic soil group B, which a hydraulic conductivity rating of 0.52 in/hr. Loamy soils per the USDA are medium textured soils, with generally greater than 28% silt but less than 50% silt and predominantly sandy with less than 52% sand. This is consistent with the native soils from the glacial outwash that has occurred along the Acushnet River that we have experienced throughout our work in the harbor.

Hand auger soil explorations were conducted by Apex Companies, LLC in August 2019. Due to the limited nature of the hand augering, we will recommend soils be verified on site during the implementation process and any significant variations in the soils be immediately brought to the attention of the engineer.

Long Term Pollution Prevention Plan

The proposed BMP improvements will be effective in source control and pollution prevention. TSS removal rates will be met and even exceeded areas through the use of LID techniques, vegetated filter strips, raingardens and stormwater recharge. As shown on the attached TSS Removal Rate Sheet, we will reduce TSS by 91%. The pretreatment for the infiltration practices is vegetated filter strip, which will slow the velocity of the water and help settle out large sediment. Attached with this report is a Long-Term Pollution Prevention Plan which references and builds off the Operation and Maintenance Plan prepared for the stormwater BMPs designed for this project as well Spill Prevention Control and Countermeasure Plan, prepared by Woodard and Curran, dated December 4, 2017.

Construction Period Pollution Prevention Plan

Nye Lubricants will be responsible for managing its third-party contractors to comply with the program set forth below. Patrick Norton, as Regulatory Affairs Specialist, will be responsible for ensuring compliance. Mr. Norton or the contractor's designated foreman shall be responsible for verifying daily that erosion and sedimentation controls are properly in place prior to the start of work for the day. The O&M activity log, which is provided in the Operation and Maintenance Plan, shall be used and completed daily with those erosion inspections.

Only the work shown on the accompanying contract plan shall be performed and erosion controls placed in the locations shown on those plans and in the manner presented shall remain functional and effective throughout the duration of the work.

Due to the limited nature of the proposed work, there are no temporary stormwater BMPs proposed for the construction process, however the permanent BMPs will not be installed until after the site has been stabilized (i.e. re-paved) to prevent the accumulation of sediment and debris from the construction process.

In order to maintain the integrity of the water quality in the area and to prevent illicit discharges from entering wetland resource areas surrounding the project site, the following construction sequencing shall be followed:

1. Mobilize to site and develop a staging area within uplands, away from any resource areas.
2. Place environmental protection devices inclusive of siltation fencing and straw bales, as indicated on the project drawings.
3. Clear within work limits only the necessary vegetation.
4. Existing Asphalt has already been ground, but verify subgrade is properly prepared to receive paving course
5. Place subgrade material at elevations specified.
6. Excavate top and subsoil within work area to grade.
7. Place binder course on proposed paved area
8. Place wearing (top) course on proposed paved area
9. Excavate swale and raingarden footprints.
10. Place bioretention soil mix as specified.
11. Loam and seed in swale and filter strip as specified.
12. Place plantings in raingardens as specified.
13. Monitor settlement during construction process.
14. Remove silt and collected debris from environmental protection devices.
15. Verify site has been stabilized, remove erosion controls
16. Demobilize from site.

Stormwater Management Policy Compliance

The proposed stormwater management systems for the Building 1 Re-paving project have been designed in compliance with the Stormwater Management Standards of the Massachusetts DEP. The proposed stormwater BMPs have been designed to protect surface and ground water resources and wetlands. The following describes compliance with each of the Standards of the Massachusetts Stormwater Management Policy handbooks, Volumes 1, 2, and 3 (2008).

As listed and required under the Massachusetts DEP Stormwater Policy Manual, there are ten (10) Stormwater Management Standards required for projects falling under its jurisdiction. The ten standards and how compliance with each will be achieved are discussed below:

1. No new stormwater conveyances (e.g. outfalls) may discharge untreated stormwater directly to or cause erosion in wetlands or waters of the Commonwealth. The project is a redevelopment and will not create any new stormwater conveyances. All runoff from the re-paving areas in this project area shall have been effectively treated through a treatment train of structural BMPs prior to any discharge to the resource areas.

2. Stormwater Management systems shall be designed so that post-development peak discharge rates do not exceed pre-development peak discharge rates. This Standard may be waived for discharges to land subject to coastal storm flowage as defined in 310 CMR 10.04. For all the design storms modeled, the 2, 10- and 100-year storm events, the peak flows and volumes for each discharge design point are less than or equal to the pre-development peak rates as required by Standard 2. The 2, 10 and 100 year storm events summary flows are shown in the table below.

	Peak Flow (cfs)		
	Existing Discharge Point		
Storm Event	**2 yr storm**	**10 yr storm**	**100 yr storm**
Existing	2.20	3.30	5.11
Proposed	1.58	2.85	4.45
Reduction	0.62	0.45	0.66

3. Loss of annual recharge to groundwater shall be eliminated or minimized through the use of infiltration measures including environmentally sensitive site design, low impact development techniques, storm water best management practices, and good operation and maintenance. At a minimum, the annual recharge from the post-development site shall approximate the annual recharge from the pre-development conditions based on the soil type. This Standard is met when the stormwater management system is designed to infiltrate the required recharge volume as determined in accordance with the Massachusetts Stormwater Handbook.

The Building 1 Re-paving project utilizes vegetated filter strips, swales, and raingardens for recharge of the runoff generated by the paved driveway area. The amount of stormwater recharged through the proposed designs will exceed the required recharge volume as determined by the Massachusetts Stormwater Handbook, employed the "Simple Dynamic" method (as described in Volume 3 of the 2008 Massachusetts Stormwater Management Handbook) to size the infiltration BMPs. The HydroCAD computer model created for this project based on TR-20 was used for the analysis. The simple dynamic analysis accounts for the fact that stormwater is exfiltrating from the BMP at the same time that the voids (storage area) are filling. The required recharge volume and drawdown time for all BMPs are shown in the attached Tables 1, 2, and 3. All calculations were performed as shown in Volume 3 of the Massachusetts Stormwater Management Policy.

4. Stormwater management systems shall be designed to remove 80% of the average annual post-construction load of Total Suspended Solids (TSS). This Standard is met when:

a. *Suitable practices for source control and pollution prevention are identified in a long-term pollution prevention plan, and thereafter are implemented and maintained;*

b. Structural stormwater best management practices are sized to capture the required water quality volume determined in accordance with the Massachusetts Stormwater Handbook; and
c. Pretreatment is provided in accordance with the Massachusetts Stormwater Handbook.

Pretreatment is provided for all proposed stormwater BMPs building. The pretreatment BMP used for the is a vegetated filter strip, which is a minimum of 8 feet wide, as required in Volume 2 of the 2008 Massachusetts Stormwater Management Handbook. The water quality treatment volume for all BMPs is shown in the attached Tables 4 and 5. All calculations were performed as shown in Volume 3 of the Massachusetts Stormwater Management Policy. The 80% required removal rate for total suspended solids (TSS) will be achieved with the implementation of vegetated filter strips, swales and bioretention rain gardens. The cumulative total of the structural BMPs exceed the target 80% removal. Detailed TSS removal calculations are attached.

An Operation and Maintenance Plan has been prepared as a separate document and is intended to serve as a long-term pollution prevention plan for the Stormwater BMP Improvement Project development. This long-term O&M Plan has been developed to ensure that the proposed stormwater management systems are properly maintained and function as designed.

5. For land uses with higher potential pollutant loads, source control and pollution prevention shall be implemented in accordance with the Massachusetts Stormwater Handbook to eliminate or reduce the discharge of stormwater runoff from such land uses to the maximum extent practicable. If through source control and or pollution prevention all land uses with higher potential pollutant loads cannot be completely protected from exposure to rain, snow, snow melt, and stormwater runoff, the proponent shall use the specific structural stormwater BMPs determined by the Department to be suitable for such uses as provided in the Massachusetts Stormwater Handbook. Stormwater Discharges from land uses with higher potential pollutant loads shall also comply with the requirements of the Massachusetts Clean Waters Act, M. GL c. 21, §§26-53 and the regulations promulgated thereunder at 314 CMR 3. 00, 314 CMR4.00, and 314 CMR 5.00.

The land area involved in this project are not designated as Land Uses with Higher Potential Pollutant Loads. The proposed project represents less than a ½ acre of impermeable surface, and while the area was historically used for unloading materials used in Nye's processes, Nye has committed to moving that operation to another side of the building away from the resource area. Furthermore, that unloading process is governed by their Spill Control and Countermeasure Plan that they have in place.

6. Stormwater discharges with the Zone I or Interim Wellhead Protection Area of a public water supply, and stormwater discharges near or to any other critical areas, require the use of the specific source control and pollution prevention measures and the specific structural stormwater best management practices determined by the Department to be suitable for managing discharges to such areas, as provided in the Massachusetts Stormwater Handbook. A discharge is near a critical area if there is a strong likelihood of a significant impact occurring to Said area, taking into account site-specific factors. Stormwater discharges to Outstanding Resource Waters and Special Resource Waters shall be removed and set back from the receiving water or wetland and receive the highest and best practical method of treatment. A "storm water discharge" as defined in 314 CMR 3.04(2) (a) 1 or (b) to an Outstanding Resource Water or Special

Resource Water shall comply with 314 CMR 3.00 and 314 CMR 4.00. Stormwater discharges to a Zone I or Zone A are prohibited unless essential to the operation of a public water supply.

The discharges for this project are not located within a Zone II or an Internet Wellhead Protection Area, or discharge to a critical area. The project does propose a treatment train of structural practices to reduce runoff impacts to the wetland resource areas.

7. A redevelopment project is required to meet the following Storm water Management Standards only to the maximum extent practicable: Standard 2, Standard 3, and the pretreatment and structural best management practice requirements of Standards 4, 5, and 6. Existing Storm water discharges shall comply with Standards 1 only to the maximum extent practicable. A redevelopment project shall also comply with all other requirements of the Storm water Management Standards and improve existing conditions.

This Project is a re-development project, involving the re-paving of an existing paved area. It has been designed to meet all the applicable Stormwater Management Standards and is an improvement upon existing conditions by reducing the amount of impermeable cover and providing structural BMPs.

8. A plan to control construction-related impacts including erosion, sedimentation and other pollutant sources during construction and land disturbance activities (construction period erosion, sedimentation, and pollution prevention plan) shall be developed and implemented.

In order to maintain the integrity of the water quality in the area and to prevent illicit discharges from entering into wetland resource areas surrounding the project site, a construction sequencing plan and construction methodology plans have been developed and are included with this filing.

9. A long-term operation and maintenance plan shall be developed and implemented to ensure that stormwater management systems function as designed.

A site-specific Operation and Maintenance Manual (O&M Manual) is included as part of this report. The draft manual details procedures for maintain the Stormwater BMPs as well as schedules and troubleshooting issues. The O&M manual defines the parties responsible the execution of the procedures detailed within it.

10. All illicit discharges to the stormwater management system are prohibited.

There are no known or suspected illicit discharge within the immediate project site area. No illicit discharges shall be made, and a compliance statement is provided with the Stormwater Report as required by the MA DEP Stormwater Management Policy Manual.

Table 1 Required Recharge Volume
Nye Lubricants, Inc. , 12 Howland Road, Fairhaven, MA
As shown in Vol 3. Chapter 1 Page 15 of the Massachusetts Stormwater Handbook
Required Recharge Volume determined by the following equation:

$R_v = F \times A_{imp}$ where:

R_v	Required Recharge Volume
F	Target Depth Factor
A_{imp}	Impervious Area

Given:
NRCS Hydrologic Soil Type - B
Target Depth Factor = 0.35 inch

Subcatchment	A_{imp} $ft.^2$	A_{imp} acre	F inch	R_v acre-ft	R_v $ft.^3$
1	6,300	0.14	0.35	0.0042	183.75
2	14,000	0.32	0.35	0.0094	408.3333
Totals for the developed site	20300.00	0.47	0.60	0.01	592.08

Table 2 Simple Dynamic Method for Recharge
Nye Lubricants, Inc. , 12 Howland Road, Fairhaven, MA
As shown in Vol 3. Chapter 1 Page 19 of the Massachusetts Stormwater Handbook
Using the following equations
$A = R_v / (D+KT)$
$V = A \times D$
where

R_v	Required Recharge Volume
A	Minimum Req'd surface area of the bottom of the infiltration structure
V	Storage Volume
D	depth of the infiltration facility
K	Rawls rate for saturated hydraulic conductivity
T	allowable drawdown

Use

k=	0.52	in/hr
T	2	hours

Subcatchment	R_v ft.^{3}	D ft	A ft.^{2}	V_{req} ft.^{3}	Receiving Recharge Facility	$V_{provided}$ ft.^{3}	$V_{provided} > V_{req}$ Yes/No
1	183.75	2.00	88.06	176.12	Raingarden 1	273	Yes
2	408.33	2.00	195.69	391.37	Raingarden 2	609	Yes

Totals for the developed site	592.08	N/A	283.75	567.49	N/A	882.00	Yes

Table 3 Drawdown
Nye Lubricants, Inc. , 12 Howland Road, Fairhaven, MA

Using the following equations
$Time_{drawdown} = R_v/(K^* Bottom\ Area)$
As shown in Vol 3. Chapter 1 Page 25 of the Massachusetts Stormwater Handbook

$Time_{drawdown}$	Drawdown time for Infiltration BMP, must be < 72 hours
R_v	Required Recharge Volume
Bottom area	Bottom Area of Recharge Structure
K	Rawls rate for saturated hydraulic conductivity
K=	0.52 in/hr

Subcatchment	R_v $ft.^3$	Bottom Area $ft.^2$	$Time_{drawdown}$ hours	$Time_{drawdown}$ < 72 hours Yes/No
1	183.75	335	12.66	Yes
2	408.3333	600	15.71	Yes
Totals	592.08	935.00	28.36	Yes

Table 4 Water Quality Volume

Nye Lubricants, Inc. , 12 Howland Road, Fairhaven, MA

As shown in Vol 3. Chapter 1 Page 32 of the Massachusetts Stormwater Handbook

$V_{WQ} = (D_{WQ}/12 \text{ in/ft})*(A_{imp}*43{,}560 \text{ ft.}^2/\text{acre})$

where

V_{WQ}	Water Quality Volume
D_{WQ}	Water Quality Depth
A_{imp}	Impervious Area

D_{WQ} 0.5 in

Subcatchment	**A_{imp}**	**A_{imp}**	**V_{WQ}**	**$V_{provided}$**	**$V_{provided} > V_{req}$**
	ft.^{2}	**acre**	**ft.^{3}**	**ft.^{3}**	**Yes/No**
1	6,300	0.14	262.50	273	Yes
2	14,000	0.32	583.33	609	Yes
Totals	20,300	0.47	846	882	Yes

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: 12 Howland Road, Fairhaven, MA

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)
Vegetated Filter Strip >25 feet	0.10	1.00	0.10	0.90
Rain Garden	0.90	0.90	0.81	0.09
	0.00	0.09	0.00	0.09
	0.00	0.09	0.00	0.09
	0.00	0.09	0.00	0.09

Total TSS Removal = 91%

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

Project: Bldg 1 Re-paving
Prepared By: Apex Companies, LLC
Date: 8/8/2019

*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

Soil Map—Bristol County, Massachusetts, Southern Part
(Nye Lubricants)

Map Scale: 1:2,290 if printed on A portrait (8.5" x 11") 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 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 1:20,000.

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: Bristol County, Massachusetts, Southern Part
Survey Area Data: Version 12, Sep 7, 2018

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

Date(s) aerial images were photographed: Dec 31, 2009—Jul 3, 2017

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

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
602	Urban land	16.6	99.0%
607	Water, saline	0.2	1.0%
Totals for Area of Interest		**16.8**	**100.0%**

Bristol County, Massachusetts, Southern Part

602—Urban land

Map Unit Setting

National map unit symbol: v5ry
Frost-free period: 120 to 200 days
Farmland classification: Not prime farmland

Map Unit Composition

Urban land: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Urban Land

Setting

Parent material: Excavated and filled land

Minor Components

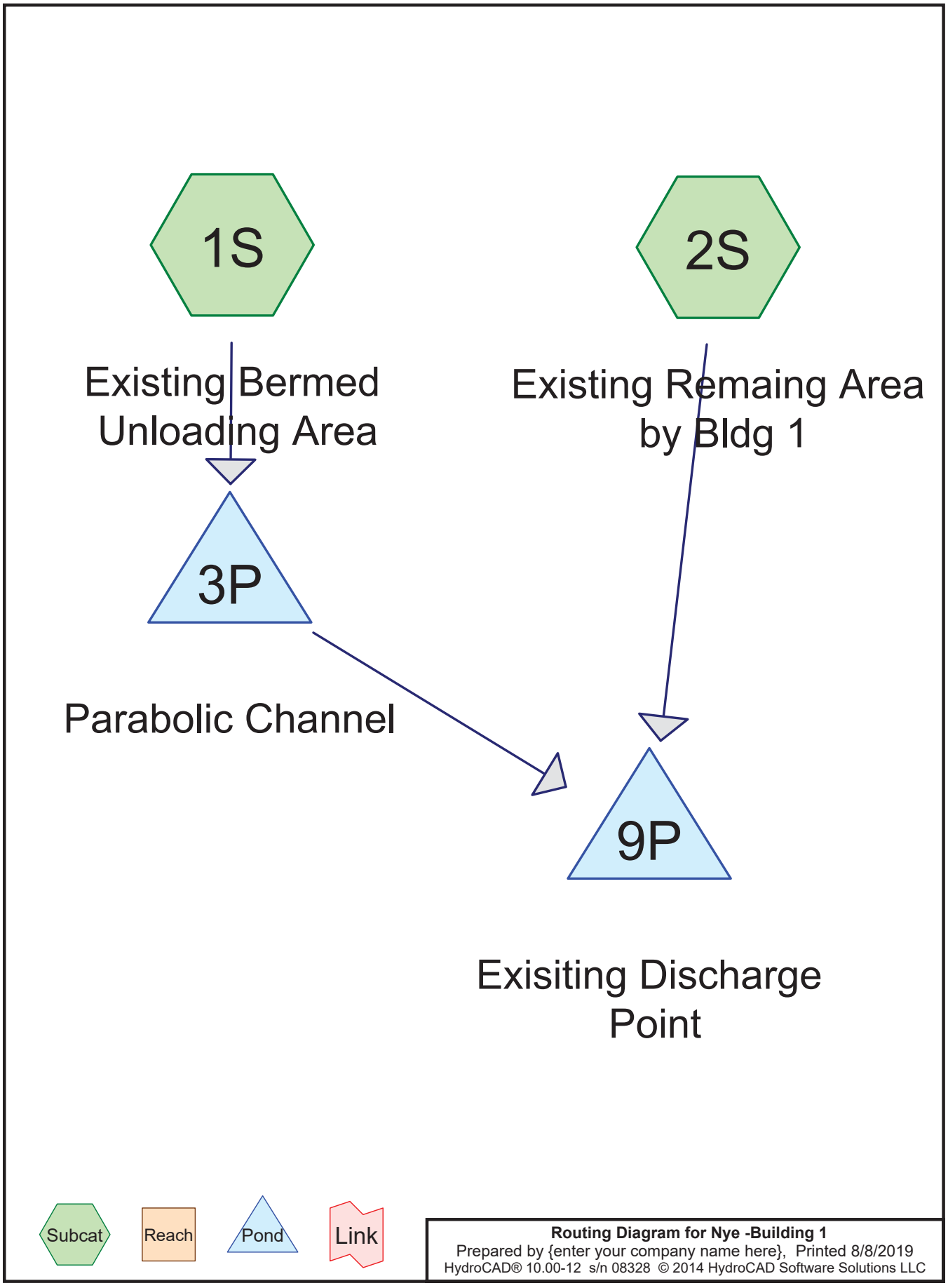
Udorthents

Percent of map unit: 15 percent
Hydric soil rating: Unranked

Data Source Information

Soil Survey Area: Bristol County, Massachusetts, Southern Part
Survey Area Data: Version 12, Sep 7, 2018

Existing Conditions HydroCAD Model
Nye Lubricants Building 1 Repaving Project



Routing Diagram for Nye -Building 1
Prepared by {enter your company name here}, Printed 8/8/2019

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.149	61	>75% Grass cover, Good, HSG B (1S, 2S)
0.581	98	Paved parking, HSG B (1S, 2S)
0.730	**90**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.730	HSG B	1S, 2S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.730		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.149	0.000	0.000	0.000	0.149	>75% Grass cover, Good	1S, 2S
0.000	0.581	0.000	0.000	0.000	0.581	Paved parking	1S, 2S
0.000	**0.730**	**0.000**	**0.000**	**0.000**	**0.730**	**TOTAL AREA**	

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

Subcatchment 1S: Existing Bermed Runoff Area=8,500 sf 74.12% Impervious Runoff Depth>2.05"
Flow Length=150' Slope=0.0200 '/' Tc=1.7 min CN=88 Runoff=0.54 cfs 0.033 af

Subcatchment 2S: Existing Remaing Area Runoff Area=23,300 sf 81.55% Impervious Runoff Depth>2.31"
Flow Length=180' Slope=0.0200 '/' Tc=1.9 min CN=91 Runoff=1.64 cfs 0.103 af

Pond 3P: Parabolic Channel Peak Elev=101.10' Storage=0.002 af Inflow=0.54 cfs 0.033 af
Outflow=0.56 cfs 0.032 af

Pond 9P: Exisiting Discharge Point Inflow=2.20 cfs 0.135 af
Primary=2.20 cfs 0.135 af

Total Runoff Area = 0.730 ac Runoff Volume = 0.136 af Average Runoff Depth = 2.24"
20.44% Pervious = 0.149 ac 79.56% Impervious = 0.581 ac

Summary for Subcatchment 1S: Existing Bermed Unloading Area

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.54 cfs @ 12.03 hrs, Volume= 0.033 af, Depth> 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Storm Rainfall=3.40"

Area (sf)	CN	Description
2,200	61	>75% Grass cover, Good, HSG B
6,300	98	Paved parking, HSG B
8,500	88	Weighted Average
2,200		25.88% Pervious Area
6,300		74.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0200	1.49		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"

Summary for Subcatchment 2S: Existing Remaing Area by Bldg 1

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.64 cfs @ 12.03 hrs, Volume= 0.103 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 2 yr Storm Rainfall=3.40"

Area (sf)	CN	Description
4,300	61	>75% Grass cover, Good, HSG B
19,000	98	Paved parking, HSG B
23,300	91	Weighted Average
4,300		18.45% Pervious Area
19,000		81.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0200	1.49		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.9	180	Total			

Summary for Pond 3P: Parabolic Channel

[93] Warning: Storage range exceeded by 0.10'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.195 ac, 74.12% Impervious, Inflow Depth > 2.05" for 2 yr Storm event
Inflow = 0.54 cfs @ 12.03 hrs, Volume= 0.033 af
Outflow = 0.56 cfs @ 12.04 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.5 min
Primary = 0.56 cfs @ 12.04 hrs, Volume= 0.032 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 101.10' @ 12.04 hrs Surf.Area= 0.000 ac Storage= 0.002 af

Plug-Flow detention time= 27.7 min calculated for 0.032 af (95% of inflow)
Center-of-Mass det. time= 11.9 min (787.8 - 776.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.002 af	**18.0"W x 12.0"H x 90.00'L Parabolic Arch**

Device	Routing	Invert	Outlet Devices
#1	Primary	100.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.54 cfs @ 12.04 hrs HW=101.08' (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.54 cfs @ 2.76 fps)

Summary for Pond 9P: Exisiting Discharge Point

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.730 ac, 79.56% Impervious, Inflow Depth > 2.21" for 2 yr Storm event
Inflow = 2.20 cfs @ 12.04 hrs, Volume= 0.135 af
Primary = 2.20 cfs @ 12.04 hrs, Volume= 0.135 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind 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 1S: Existing Bermed Runoff Area=8,500 sf 74.12% Impervious Runoff Depth>3.28"
Flow Length=150' Slope=0.0200 '/' Tc=1.7 min CN=88 Runoff=0.85 cfs 0.053 af

Subcatchment 2S: Existing Remaing Area Runoff Area=23,300 sf 81.55% Impervious Runoff Depth>3.58"
Flow Length=180' Slope=0.0200 '/' Tc=1.9 min CN=91 Runoff=2.48 cfs 0.160 af

Pond 3P: Parabolic Channel Peak Elev=101.56' Storage=0.002 af Inflow=0.85 cfs 0.053 af
Outflow=0.86 cfs 0.052 af

Pond 9P: Exisiting Discharge Point Inflow=3.30 cfs 0.212 af
Primary=3.30 cfs 0.212 af

Total Runoff Area = 0.730 ac Runoff Volume = 0.213 af Average Runoff Depth = 3.50"
20.44% Pervious = 0.149 ac 79.56% Impervious = 0.581 ac

Summary for Subcatchment 1S: Existing Bermed Unloading Area

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.85 cfs @ 12.03 hrs, Volume= 0.053 af, Depth> 3.28"

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 storm Rainfall=4.80"

Area (sf)	CN	Description
2,200	61	>75% Grass cover, Good, HSG B
6,300	98	Paved parking, HSG B
8,500	88	Weighted Average
2,200		25.88% Pervious Area
6,300		74.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0200	1.49		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"

Summary for Subcatchment 2S: Existing Remaing Area by Bldg 1

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.48 cfs @ 12.03 hrs, Volume= 0.160 af, Depth> 3.58"

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 storm Rainfall=4.80"

Area (sf)	CN	Description
4,300	61	>75% Grass cover, Good, HSG B
19,000	98	Paved parking, HSG B
23,300	91	Weighted Average
4,300		18.45% Pervious Area
19,000		81.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0200	1.49		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.9	180	Total			

Summary for Pond 3P: Parabolic Channel

[93] Warning: Storage range exceeded by 0.56'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.195 ac, 74.12% Impervious, Inflow Depth > 3.28" for 10 yr storm event
Inflow = 0.85 cfs @ 12.03 hrs, Volume= 0.053 af
Outflow = 0.86 cfs @ 12.02 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min
Primary = 0.86 cfs @ 12.02 hrs, Volume= 0.052 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 101.56' @ 12.02 hrs Surf.Area= 0.000 ac Storage= 0.002 af

Plug-Flow detention time= 20.7 min calculated for 0.052 af (97% of inflow)
Center-of-Mass det. time= 9.7 min (774.3 - 764.6)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.002 af	**18.0"W x 12.0"H x 90.00'L Parabolic Arch**

Device	Routing	Invert	Outlet Devices
#1	Primary	100.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.81 cfs @ 12.02 hrs HW=101.49' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.81 cfs @ 4.15 fps)

Summary for Pond 9P: Exisiting Discharge Point

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.730 ac, 79.56% Impervious, Inflow Depth > 3.48" for 10 yr storm event
Inflow = 3.30 cfs @ 12.03 hrs, Volume= 0.212 af
Primary = 3.30 cfs @ 12.03 hrs, Volume= 0.212 af, Atten= 0%, Lag= 0.0 min

Routing by Stor-Ind 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 1S: Existing Bermed Runoff Area=8,500 sf 74.12% Impervious Runoff Depth>5.29"
Flow Length=150' Slope=0.0200 '/' Tc=1.7 min CN=88 Runoff=1.33 cfs 0.086 af

Subcatchment 2S: Existing Remaing Area Runoff Area=23,300 sf 81.55% Impervious Runoff Depth>5.61"
Flow Length=180' Slope=0.0200 '/' Tc=1.9 min CN=91 Runoff=3.79 cfs 0.250 af

Pond 3P: Parabolic Channel Peak Elev=102.69' Storage=0.002 af Inflow=1.33 cfs 0.086 af
Outflow=1.33 cfs 0.085 af

Pond 9P: Exisiting Discharge Point Inflow=5.11 cfs 0.335 af
Primary=5.11 cfs 0.335 af

Total Runoff Area = 0.730 ac Runoff Volume = 0.336 af Average Runoff Depth = 5.53"
20.44% Pervious = 0.149 ac 79.56% Impervious = 0.581 ac

Summary for Subcatchment 1S: Existing Bermed Unloading Area

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.33 cfs @ 12.03 hrs, Volume= 0.086 af, Depth> 5.29"

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 storm Rainfall=7.00"

Area (sf)	CN	Description
2,200	61	>75% Grass cover, Good, HSG B
6,300	98	Paved parking, HSG B
8,500	88	Weighted Average
2,200		25.88% Pervious Area
6,300		74.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0200	1.49		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"

Summary for Subcatchment 2S: Existing Remaing Area by Bldg 1

[49] Hint: Tc<2dt may require smaller dt

Runoff = 3.79 cfs @ 12.03 hrs, Volume= 0.250 af, Depth> 5.61"

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 storm Rainfall=7.00"

Area (sf)	CN	Description
4,300	61	>75% Grass cover, Good, HSG B
19,000	98	Paved parking, HSG B
23,300	91	Weighted Average
4,300		18.45% Pervious Area
19,000		81.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0200	1.49		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.9	180	Total			

Summary for Pond 3P: Parabolic Channel

[82] Warning: Early inflow requires earlier time span
[93] Warning: Storage range exceeded by 1.69'

Inflow Area = 0.195 ac, 74.12% Impervious, Inflow Depth > 5.29" for 100 yr storm event
Inflow = 1.33 cfs @ 12.03 hrs, Volume= 0.086 af
Outflow = 1.33 cfs @ 12.03 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min
Primary = 1.33 cfs @ 12.03 hrs, Volume= 0.085 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 102.69' @ 12.03 hrs Surf.Area= 0.000 ac Storage= 0.002 af

Plug-Flow detention time= 14.7 min calculated for 0.084 af (98% of inflow)
Center-of-Mass det. time= 7.5 min (761.4 - 754.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.002 af	**18.0"W x 12.0"H x 90.00'L Parabolic Arch**

Device	Routing	Invert	Outlet Devices
#1	Primary	100.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.27 cfs @ 12.03 hrs HW=102.56' (Free Discharge)
1=Orifice/Grate (Orifice Controls 1.27 cfs @ 6.48 fps)

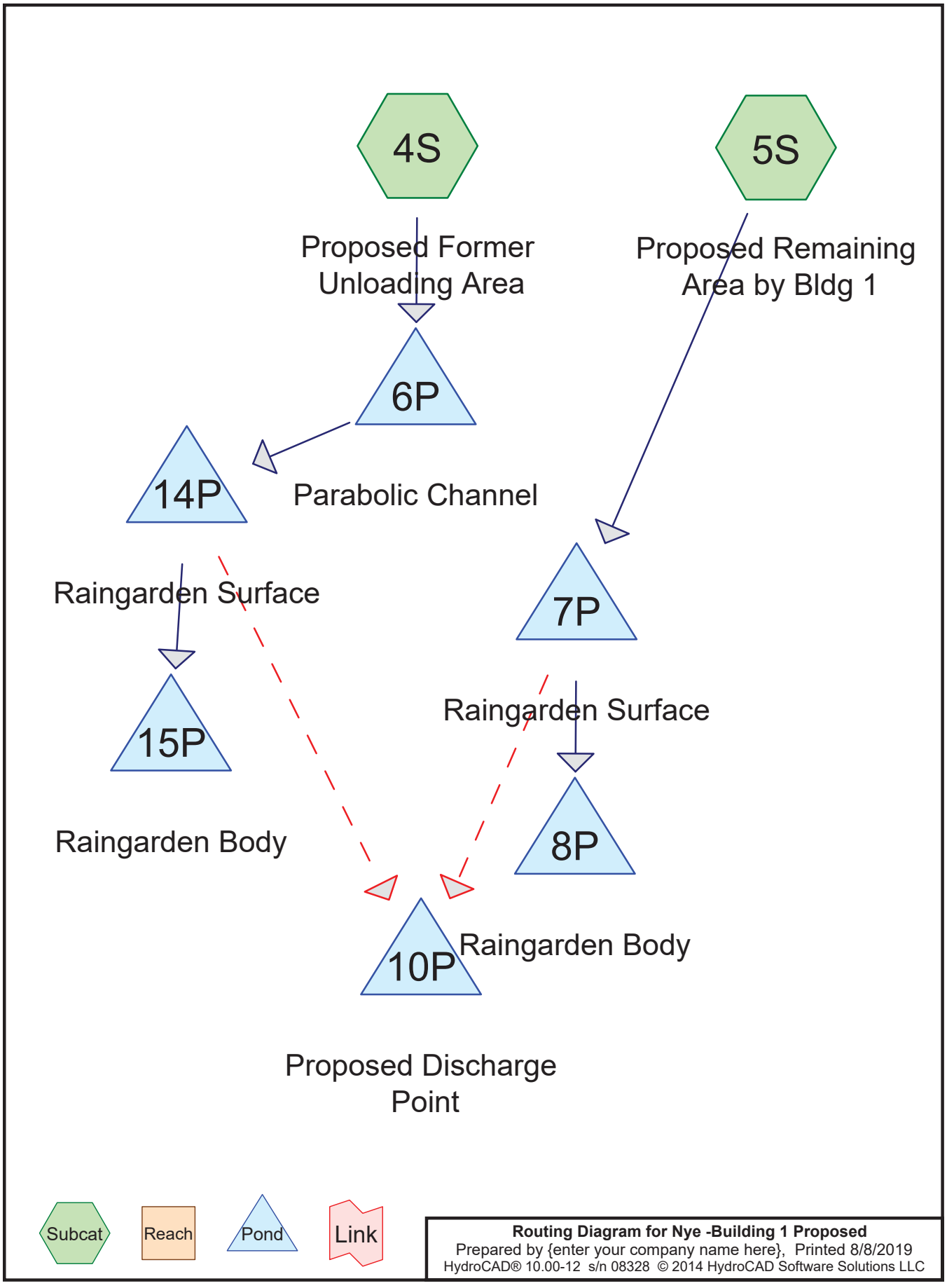
Summary for Pond 9P: Exisiting Discharge Point

[40] Hint: Not Described (Outflow=Inflow)

Inflow Area = 0.730 ac, 79.56% Impervious, Inflow Depth > 5.50" for 100 yr storm event
Inflow = 5.11 cfs @ 12.03 hrs, Volume= 0.335 af
Primary = 5.11 cfs @ 12.03 hrs, Volume= 0.335 af, Atten= 0%, Lag= 0.0 min

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

Proposed Conditions HydroCAD Model
Nye Lubricants Building 1 Repaving Project



Routing Diagram for Nye -Building 1 Proposed
Prepared by {enter your company name here}, Printed 8/8/2019
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
0.264	61	>75% Grass cover, Good, HSG B (4S, 5S)
0.466	98	Paved parking, HSG B (4S, 5S)
0.730	**85**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
0.000	HSG A	
0.730	HSG B	4S, 5S
0.000	HSG C	
0.000	HSG D	
0.000	Other	
0.730		**TOTAL AREA**

Ground Covers (all nodes)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.000	0.264	0.000	0.000	0.000	0.264	>75% Grass cover, Good	4S, 5S
0.000	0.466	0.000	0.000	0.000	0.466	Paved parking	4S, 5S
0.000	**0.730**	**0.000**	**0.000**	**0.000**	**0.730**	**TOTAL AREA**	

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 4S: Proposed Former Runoff Area=8,500 sf 74.12% Impervious Runoff Depth>2.05"
Flow Length=150' Slope=0.0200 '/' Tc=1.7 min CN=88 Runoff=0.54 cfs 0.033 af

Subcatchment 5S: Proposed Remaining Runoff Area=23,300 sf 60.09% Impervious Runoff Depth>1.65"
Flow Length=180' Slope=0.0200 '/' Tc=1.9 min CN=83 Runoff=1.22 cfs 0.074 af

Pond 6P: Parabolic Channel Peak Elev=101.10' Storage=0.002 af Inflow=0.54 cfs 0.033 af
Outflow=0.56 cfs 0.032 af

Pond 7P: Raingarden Surface Peak Elev=99.69' Storage=0.011 af Inflow=1.22 cfs 0.074 af
Primary=0.08 cfs 0.046 af Secondary=1.07 cfs 0.028 af Outflow=1.15 cfs 0.074 af

Pond 8P: Raingarden Body Peak Elev=588.08' Storage=0.014 af Inflow=0.08 cfs 0.046 af
Outflow=0.09 cfs 0.032 af

Pond 10P: Proposed Discharge Point Inflow=1.58 cfs 0.041 af
Primary=1.58 cfs 0.041 af

Pond 14P: Raingarden Surface Peak Elev=99.61' Storage=0.004 af Inflow=0.56 cfs 0.032 af
Primary=0.03 cfs 0.019 af Secondary=0.51 cfs 0.013 af Outflow=0.55 cfs 0.032 af

Pond 15P: Raingarden Body Peak Elev=460.43' Storage=273 cf Inflow=0.03 cfs 0.019 af
Outflow=0.03 cfs 0.013 af

Total Runoff Area = 0.730 ac Runoff Volume = 0.107 af Average Runoff Depth = 1.76"
36.16% Pervious = 0.264 ac 63.84% Impervious = 0.466 ac

Summary for Subcatchment 4S: Proposed Former Unloading Area

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.54 cfs @ 12.03 hrs, Volume= 0.033 af, Depth> 2.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Storm Rainfall=3.40"

Area (sf)	CN	Description
2,200	61	>75% Grass cover, Good, HSG B
6,300	98	Paved parking, HSG B
8,500	88	Weighted Average
2,200		25.88% Pervious Area
6,300		74.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0200	1.49		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"

Summary for Subcatchment 5S: Proposed Remaining Area by Bldg 1

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.22 cfs @ 12.04 hrs, Volume= 0.074 af, Depth> 1.65"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Type III 24-hr 2 yr Storm Rainfall=3.40"

Area (sf)	CN	Description
9,300	61	>75% Grass cover, Good, HSG B
14,000	98	Paved parking, HSG B
23,300	83	Weighted Average
9,300		39.91% Pervious Area
14,000		60.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0200	1.49		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.9	180	Total			

Summary for Pond 6P: Parabolic Channel

[93] Warning: Storage range exceeded by 0.10'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.195 ac, 74.12% Impervious, Inflow Depth > 2.05" for 2 yr Storm event
Inflow = 0.54 cfs @ 12.03 hrs, Volume= 0.033 af
Outflow = 0.56 cfs @ 12.04 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.5 min
Primary = 0.56 cfs @ 12.04 hrs, Volume= 0.032 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 101.10' @ 12.04 hrs Surf.Area= 0.000 ac Storage= 0.002 af

Plug-Flow detention time= 27.7 min calculated for 0.032 af (95% of inflow)
Center-of-Mass det. time= 11.9 min (787.8 - 776.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.002 af	**18.0"W x 12.0"H x 90.00'L Parabolic Arch**

Device	Routing	Invert	Outlet Devices
#1	Primary	100.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.54 cfs @ 12.04 hrs HW=101.08' (Free Discharge)
1=Orifice/Grate (Orifice Controls 0.54 cfs @ 2.76 fps)

Summary for Pond 7P: Raingarden Surface

Inflow Area = 0.535 ac, 60.09% Impervious, Inflow Depth > 1.65" for 2 yr Storm event
Inflow = 1.22 cfs @ 12.04 hrs, Volume= 0.074 af
Outflow = 1.15 cfs @ 12.07 hrs, Volume= 0.074 af, Atten= 6%, Lag= 1.7 min
Primary = 0.08 cfs @ 12.07 hrs, Volume= 0.046 af
Secondary = 1.07 cfs @ 12.07 hrs, Volume= 0.028 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 99.69' @ 12.07 hrs Surf.Area= 0.018 ac Storage= 0.011 af

Plug-Flow detention time= 30.5 min calculated for 0.074 af (100% of inflow)
Center-of-Mass det. time= 30.3 min (820.8 - 790.5)

Volume	Invert	Avail.Storage	Storage Description
#1	99.00'	0.012 af	**10.00'W x 60.00'L x 0.75'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	99.00'	**4.200 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Secondary	99.50'	**5.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.08 cfs @ 12.07 hrs HW=99.68' (Free Discharge)
└**1=Exfiltration** (Controls 0.08 cfs)

Secondary OutFlow Max=1.02 cfs @ 12.07 hrs HW=99.68' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 1.02 cfs @ 1.14 fps)

Summary for Pond 8P: Raingarden Body

[93] Warning: Storage range exceeded by 489.08'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=63)
[78] Warning: Submerged Pond 7P Primary device # 1 by 489.08'
[81] Warning: Exceeded Pond 7P by 488.57' @ 13.40 hrs

Inflow Area = 0.535 ac, 60.09% Impervious, Inflow Depth > 1.03" for 2 yr Storm event
Inflow = 0.08 cfs @ 12.07 hrs, Volume= 0.046 af
Outflow = 0.09 cfs @ 13.40 hrs, Volume= 0.032 af, Atten= 0%, Lag= 80.0 min
Discarded = 0.09 cfs @ 13.40 hrs, Volume= 0.032 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 588.08' @ 13.40 hrs Surf.Area= 0.028 ac Storage= 0.014 af

Plug-Flow detention time= 155.0 min calculated for 0.032 af (69% of inflow)
Center-of-Mass det. time= 74.8 min (945.3 - 870.5)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	0.014 af	**10.00'W x 60.00'L x 2.00'H Prismatoid Z=2.0** 0.041 af Overall x 35.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	97.00'	**0.520 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=0.09 cfs @ 13.40 hrs HW=588.08' (Free Discharge)
└**1=Exfiltration** (Controls 0.09 cfs)

Summary for Pond 10P: Proposed Discharge Point

[40] Hint: Not Described (Outflow=Inflow)

Inflow = 1.58 cfs @ 12.06 hrs, Volume= 0.041 af
Primary = 1.58 cfs @ 12.06 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min

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

Summary for Pond 14P: Raingarden Surface

Inflow Area = 0.195 ac, 74.12% Impervious, Inflow Depth > 1.96" for 2 yr Storm event
Inflow = 0.56 cfs @ 12.04 hrs, Volume= 0.032 af
Outflow = 0.55 cfs @ 12.05 hrs, Volume= 0.032 af, Atten= 3%, Lag= 0.7 min
Primary = 0.03 cfs @ 12.05 hrs, Volume= 0.019 af
Secondary = 0.51 cfs @ 12.05 hrs, Volume= 0.013 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 99.61' @ 12.05 hrs Surf.Area= 0.007 ac Storage= 0.004 af

Plug-Flow detention time= 28.6 min calculated for 0.032 af (100% of inflow)
Center-of-Mass det. time= 28.4 min (816.2 - 787.8)

Volume	Invert	Avail.Storage	Storage Description
#1	99.00'	0.005 af	**12.00'W x 20.00'L x 0.75'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	99.00'	**4.200 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Secondary	99.50'	**5.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.03 cfs @ 12.05 hrs HW=99.61' (Free Discharge)
└**1=Exfiltration** (Controls 0.03 cfs)

Secondary OutFlow Max=0.51 cfs @ 12.05 hrs HW=99.61' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.51 cfs @ 0.90 fps)

Summary for Pond 15P: Raingarden Body

[93] Warning: Storage range exceeded by 361.43'
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=61)
[78] Warning: Submerged Pond 14P Primary device # 1 by 361.43'
[81] Warning: Exceeded Pond 14P by 360.92' @ 13.60 hrs

Inflow Area = 0.195 ac, 74.12% Impervious, Inflow Depth > 1.15" for 2 yr Storm event
Inflow = 0.03 cfs @ 12.05 hrs, Volume= 0.019 af
Outflow = 0.03 cfs @ 13.60 hrs, Volume= 0.013 af, Atten= 0%, Lag= 92.8 min
Discarded = 0.03 cfs @ 13.60 hrs, Volume= 0.013 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 460.43' @ 13.60 hrs Surf.Area= 560 sf Storage= 273 cf

Plug-Flow detention time= 159.7 min calculated for 0.012 af (66% of inflow)
Center-of-Mass det. time= 76.8 min (949.2 - 872.5)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	273 cf	**12.00'W x 20.00'L x 2.00'H Prismatoid Z=2.0** 779 cf Overall x 35.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	97.00'	**0.520 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=0.03 cfs @ 13.60 hrs HW=460.43' (Free Discharge)
↑**1=Exfiltration** (Controls 0.03 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 4S: Proposed Former Runoff Area=8,500 sf 74.12% Impervious Runoff Depth>3.28"
Flow Length=150' Slope=0.0200 '/' Tc=1.7 min CN=88 Runoff=0.85 cfs 0.053 af

Subcatchment 5S: Proposed Remaining Runoff Area=23,300 sf 60.09% Impervious Runoff Depth>2.81"
Flow Length=180' Slope=0.0200 '/' Tc=1.9 min CN=83 Runoff=2.05 cfs 0.125 af

Pond 6P: Parabolic Channel Peak Elev=101.56' Storage=0.002 af Inflow=0.85 cfs 0.053 af
Outflow=0.86 cfs 0.052 af

Pond 7P: Raingarden Surface Peak Elev=99.78' Storage=0.012 af Inflow=2.05 cfs 0.125 af
Primary=0.08 cfs 0.060 af Secondary=2.04 cfs 0.065 af Outflow=2.12 cfs 0.125 af

Pond 8P: Raingarden Body Peak Elev=857.62' Storage=0.014 af Inflow=0.08 cfs 0.060 af
Outflow=0.13 cfs 0.045 af

Pond 10P: Proposed Discharge Point Inflow=2.85 cfs 0.093 af
Primary=2.85 cfs 0.093 af

Pond 14P: Raingarden Surface Peak Elev=99.65' Storage=0.004 af Inflow=0.86 cfs 0.052 af
Primary=0.03 cfs 0.024 af Secondary=0.81 cfs 0.028 af Outflow=0.84 cfs 0.052 af

Pond 15P: Raingarden Body Peak Elev=622.52' Storage=273 cf Inflow=0.03 cfs 0.024 af
Outflow=0.04 cfs 0.018 af

Total Runoff Area = 0.730 ac Runoff Volume = 0.179 af Average Runoff Depth = 2.94"
36.16% Pervious = 0.264 ac 63.84% Impervious = 0.466 ac

Summary for Subcatchment 4S: Proposed Former Unloading Area

[49] Hint: Tc<2dt may require smaller dt

Runoff = 0.85 cfs @ 12.03 hrs, Volume= 0.053 af, Depth> 3.28"

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 storm Rainfall=4.80"

Area (sf)	CN	Description
2,200	61	>75% Grass cover, Good, HSG B
6,300	98	Paved parking, HSG B
8,500	88	Weighted Average
2,200		25.88% Pervious Area
6,300		74.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0200	1.49		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"

Summary for Subcatchment 5S: Proposed Remaining Area by Bldg 1

[49] Hint: Tc<2dt may require smaller dt

Runoff = 2.05 cfs @ 12.04 hrs, Volume= 0.125 af, Depth> 2.81"

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 storm Rainfall=4.80"

Area (sf)	CN	Description
9,300	61	>75% Grass cover, Good, HSG B
14,000	98	Paved parking, HSG B
23,300	83	Weighted Average
9,300		39.91% Pervious Area
14,000		60.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0200	1.49		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.9	180	Total			

Summary for Pond 6P: Parabolic Channel

[93] Warning: Storage range exceeded by 0.56'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.195 ac, 74.12% Impervious, Inflow Depth > 3.28" for 10 yr storm event
Inflow = 0.85 cfs @ 12.03 hrs, Volume= 0.053 af
Outflow = 0.86 cfs @ 12.02 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min
Primary = 0.86 cfs @ 12.02 hrs, Volume= 0.052 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 101.56' @ 12.02 hrs Surf.Area= 0.000 ac Storage= 0.002 af

Plug-Flow detention time= 20.7 min calculated for 0.052 af (97% of inflow)
Center-of-Mass det. time= 9.7 min (774.3 - 764.6)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.002 af	**18.0"W x 12.0"H x 90.00'L Parabolic Arch**

Device	Routing	Invert	Outlet Devices
#1	Primary	100.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=0.81 cfs @ 12.02 hrs HW=101.49' (Free Discharge)
└**1=Orifice/Grate** (Orifice Controls 0.81 cfs @ 4.15 fps)

Summary for Pond 7P: Raingarden Surface

[93] Warning: Storage range exceeded by 0.03'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.535 ac, 60.09% Impervious, Inflow Depth > 2.81" for 10 yr storm event
Inflow = 2.05 cfs @ 12.04 hrs, Volume= 0.125 af
Outflow = 2.12 cfs @ 12.05 hrs, Volume= 0.125 af, Atten= 0%, Lag= 0.9 min
Primary = 0.08 cfs @ 12.05 hrs, Volume= 0.060 af
Secondary = 2.04 cfs @ 12.05 hrs, Volume= 0.065 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 99.78' @ 12.05 hrs Surf.Area= 0.019 ac Storage= 0.012 af

Plug-Flow detention time= 25.9 min calculated for 0.125 af (100% of inflow)
Center-of-Mass det. time= 25.6 min (803.9 - 778.2)

Volume	Invert	Avail.Storage	Storage Description
#1	99.00'	0.012 af	**10.00'W x 60.00'L x 0.75'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	99.00'	**4.200 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Secondary	99.50'	**5.0' long x 1.0' 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

Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.08 cfs @ 12.05 hrs HW=99.78' (Free Discharge)
1=Exfiltration (Controls 0.08 cfs)

Secondary OutFlow Max=2.04 cfs @ 12.05 hrs HW=99.78' (Free Discharge)
2=Broad-Crested Rectangular Weir (Weir Controls 2.04 cfs @ 1.44 fps)

Summary for Pond 8P: Raingarden Body

[93] Warning: Storage range exceeded by 758.62'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=73)
[78] Warning: Submerged Pond 7P Primary device # 1 by 758.62'
[81] Warning: Exceeded Pond 7P by 758.02' @ 12.40 hrs

Inflow Area = 0.535 ac, 60.09% Impervious, Inflow Depth > 1.34" for 10 yr storm event
Inflow = 0.08 cfs @ 12.05 hrs, Volume= 0.060 af
Outflow = 0.13 cfs @ 12.40 hrs, Volume= 0.045 af, Atten= 0%, Lag= 21.0 min
Discarded = 0.13 cfs @ 12.40 hrs, Volume= 0.045 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 857.62' @ 12.40 hrs Surf.Area= 0.028 ac Storage= 0.014 af

Plug-Flow detention time= 149.1 min calculated for 0.045 af (75% of inflow)
Center-of-Mass det. time= 73.6 min (944.4 - 870.8)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	0.014 af	**10.00'W x 60.00'L x 2.00'H Prismatoid Z=2.0** 0.041 af Overall x 35.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	97.00'	**0.520 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=0.13 cfs @ 12.40 hrs HW=857.62' (Free Discharge)
1=Exfiltration (Controls 0.13 cfs)

Summary for Pond 10P: Proposed Discharge Point

[40] Hint: Not Described (Outflow=Inflow)

Inflow = 2.85 cfs @ 12.05 hrs, Volume= 0.093 af
Primary = 2.85 cfs @ 12.05 hrs, Volume= 0.093 af, Atten= 0%, Lag= 0.0 min

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

Summary for Pond 14P: Raingarden Surface

Inflow Area = 0.195 ac, 74.12% Impervious, Inflow Depth > 3.19" for 10 yr storm event
Inflow = 0.86 cfs @ 12.02 hrs, Volume= 0.052 af
Outflow = 0.84 cfs @ 12.04 hrs, Volume= 0.052 af, Atten= 2%, Lag= 1.4 min
Primary = 0.03 cfs @ 12.04 hrs, Volume= 0.024 af
Secondary = 0.81 cfs @ 12.04 hrs, Volume= 0.028 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 99.65' @ 12.04 hrs Surf.Area= 0.008 ac Storage= 0.004 af

Plug-Flow detention time= 24.7 min calculated for 0.052 af (100% of inflow)
Center-of-Mass det. time= 24.5 min (798.8 - 774.3)

Volume	Invert	Avail.Storage	Storage Description
#1	99.00'	0.005 af	**12.00'W x 20.00'L x 0.75'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	99.00'	**4.200 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Secondary	99.50'	**5.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.03 cfs @ 12.04 hrs HW=99.65' (Free Discharge)
└**1=Exfiltration** (Controls 0.03 cfs)

Secondary OutFlow Max=0.79 cfs @ 12.04 hrs HW=99.65' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 0.79 cfs @ 1.05 fps)

Summary for Pond 15P: Raingarden Body

[93] Warning: Storage range exceeded by 523.52'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=71)
[78] Warning: Submerged Pond 14P Primary device # 1 by 523.52'
[81] Warning: Exceeded Pond 14P by 522.98' @ 12.50 hrs

Inflow Area = 0.195 ac, 74.12% Impervious, Inflow Depth > 1.49" for 10 yr storm event
Inflow = 0.03 cfs @ 12.04 hrs, Volume= 0.024 af
Outflow = 0.04 cfs @ 12.50 hrs, Volume= 0.018 af, Atten= 0%, Lag= 27.4 min
Discarded = 0.04 cfs @ 12.50 hrs, Volume= 0.018 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 622.52' @ 12.50 hrs Surf.Area= 560 sf Storage= 273 cf

Plug-Flow detention time= 154.5 min calculated for 0.018 af (74% of inflow)
Center-of-Mass det. time= 75.6 min (943.1 - 867.5)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	273 cf	**12.00'W x 20.00'L x 2.00'H Prismatoid Z=2.0** 779 cf Overall x 35.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	97.00'	**0.520 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=0.04 cfs @ 12.50 hrs HW=622.52' (Free Discharge)
↑**1=Exfiltration** (Controls 0.04 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 4S: Proposed Former Runoff Area=8,500 sf 74.12% Impervious Runoff Depth>5.29"
Flow Length=150' Slope=0.0200 '/' Tc=1.7 min CN=88 Runoff=1.33 cfs 0.086 af

Subcatchment 5S: Proposed Remaining Runoff Area=23,300 sf 60.09% Impervious Runoff Depth>4.74"
Flow Length=180' Slope=0.0200 '/' Tc=1.9 min CN=83 Runoff=3.37 cfs 0.211 af

Pond 6P: Parabolic Channel Peak Elev=102.69' Storage=0.002 af Inflow=1.33 cfs 0.086 af
Outflow=1.33 cfs 0.085 af

Pond 7P: Raingarden Surface Peak Elev=99.89' Storage=0.012 af Inflow=3.37 cfs 0.211 af
Primary=0.08 cfs 0.071 af Secondary=3.34 cfs 0.136 af Outflow=3.42 cfs 0.207 af

Pond 8P: Raingarden Body Peak Elev=576.94' Storage=0.014 af Inflow=0.08 cfs 0.071 af
Outflow=0.09 cfs 0.056 af

Pond 10P: Proposed Discharge Point Inflow=4.45 cfs 0.191 af
Primary=4.45 cfs 0.191 af

Pond 14P: Raingarden Surface Peak Elev=99.71' Storage=0.005 af Inflow=1.33 cfs 0.085 af
Primary=0.03 cfs 0.029 af Secondary=1.30 cfs 0.054 af Outflow=1.33 cfs 0.083 af

Pond 15P: Raingarden Body Peak Elev=574.73' Storage=273 cf Inflow=0.03 cfs 0.029 af
Outflow=0.04 cfs 0.023 af

Total Runoff Area = 0.730 ac Runoff Volume = 0.298 af Average Runoff Depth = 4.89"
36.16% Pervious = 0.264 ac 63.84% Impervious = 0.466 ac

Summary for Subcatchment 4S: Proposed Former Unloading Area

[49] Hint: Tc<2dt may require smaller dt

Runoff = 1.33 cfs @ 12.03 hrs, Volume= 0.086 af, Depth> 5.29"

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 storm Rainfall=7.00"

Area (sf)	CN	Description
2,200	61	>75% Grass cover, Good, HSG B
6,300	98	Paved parking, HSG B
8,500	88	Weighted Average
2,200		25.88% Pervious Area
6,300		74.12% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0200	1.49		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"

Summary for Subcatchment 5S: Proposed Remaining Area by Bldg 1

[49] Hint: Tc<2dt may require smaller dt

Runoff = 3.37 cfs @ 12.03 hrs, Volume= 0.211 af, Depth> 4.74"

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 100 yr storm Rainfall=7.00"

Area (sf)	CN	Description
9,300	61	>75% Grass cover, Good, HSG B
14,000	98	Paved parking, HSG B
23,300	83	Weighted Average
9,300		39.91% Pervious Area
14,000		60.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.7	150	0.0200	1.49		**Sheet Flow,** Smooth surfaces n= 0.011 P2= 3.20"
0.2	30	0.0200	2.87		**Shallow Concentrated Flow,** Paved Kv= 20.3 fps
1.9	180	Total			

Summary for Pond 6P: Parabolic Channel

[82] Warning: Early inflow requires earlier time span
[93] Warning: Storage range exceeded by 1.69'

Inflow Area = 0.195 ac, 74.12% Impervious, Inflow Depth > 5.29" for 100 yr storm event
Inflow = 1.33 cfs @ 12.03 hrs, Volume= 0.086 af
Outflow = 1.33 cfs @ 12.03 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min
Primary = 1.33 cfs @ 12.03 hrs, Volume= 0.085 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 102.69' @ 12.03 hrs Surf.Area= 0.000 ac Storage= 0.002 af

Plug-Flow detention time= 14.7 min calculated for 0.084 af (98% of inflow)
Center-of-Mass det. time= 7.5 min (761.4 - 754.0)

Volume	Invert	Avail.Storage	Storage Description
#1	100.00'	0.002 af	**18.0"W x 12.0"H x 90.00'L Parabolic Arch**

Device	Routing	Invert	Outlet Devices
#1	Primary	100.50'	**6.0" Vert. Orifice/Grate** C= 0.600

Primary OutFlow Max=1.27 cfs @ 12.03 hrs HW=102.56' (Free Discharge)
1=Orifice/Grate (Orifice Controls 1.27 cfs @ 6.48 fps)

Summary for Pond 7P: Raingarden Surface

[93] Warning: Storage range exceeded by 0.14'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.535 ac, 60.09% Impervious, Inflow Depth > 4.74" for 100 yr storm event
Inflow = 3.37 cfs @ 12.03 hrs, Volume= 0.211 af
Outflow = 3.42 cfs @ 12.02 hrs, Volume= 0.207 af, Atten= 0%, Lag= 0.0 min
Primary = 0.08 cfs @ 12.00 hrs, Volume= 0.071 af
Secondary = 3.34 cfs @ 12.02 hrs, Volume= 0.136 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 99.89' @ 12.02 hrs Surf.Area= 0.019 ac Storage= 0.012 af

Plug-Flow detention time= 21.3 min calculated for 0.207 af (98% of inflow)
Center-of-Mass det. time= 13.1 min (778.8 - 765.7)

Volume	Invert	Avail.Storage	Storage Description
#1	99.00'	0.012 af	**10.00'W x 60.00'L x 0.75'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	99.00'	**4.200 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Secondary	99.50'	**5.0' long x 1.0' 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

Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.08 cfs @ 12.00 hrs HW=99.88' (Free Discharge)
└**1=Exfiltration** (Controls 0.08 cfs)

Secondary OutFlow Max=3.13 cfs @ 12.02 hrs HW=99.88' (Free Discharge)
└**2=Broad-Crested Rectangular Weir** (Weir Controls 3.13 cfs @ 1.66 fps)

Summary for Pond 8P: Raingarden Body

[93] Warning: Storage range exceeded by 477.94'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=86)
[78] Warning: Submerged Pond 7P Primary device # 1 by 477.94'
[81] Warning: Exceeded Pond 7P by 477.06' @ 12.00 hrs

Inflow Area = 0.535 ac, 60.09% Impervious, Inflow Depth > 1.59" for 100 yr storm event
Inflow = 0.08 cfs @ 12.00 hrs, Volume= 0.071 af
Outflow = 0.09 cfs @ 12.00 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min
Discarded = 0.09 cfs @ 12.00 hrs, Volume= 0.056 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 576.94' @ 12.00 hrs Surf.Area= 0.028 ac Storage= 0.014 af

Plug-Flow detention time= 146.7 min calculated for 0.056 af (79% of inflow)
Center-of-Mass det. time= 73.7 min (914.2 - 840.6)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	0.014 af	**10.00'W x 60.00'L x 2.00'H Prismatoid Z=2.0** 0.041 af Overall x 35.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	97.00'	**0.520 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=0.09 cfs @ 12.00 hrs HW=576.94' (Free Discharge)
└**1=Exfiltration** (Controls 0.09 cfs)

Summary for Pond 10P: Proposed Discharge Point

[40] Hint: Not Described (Outflow=Inflow)

Inflow = 4.45 cfs @ 12.03 hrs, Volume= 0.191 af
Primary = 4.45 cfs @ 12.03 hrs, Volume= 0.191 af, Atten= 0%, Lag= 0.0 min

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

Summary for Pond 14P: Raingarden Surface

[88] Warning: Qout>Qin may require smaller dt or Finer Routing

Inflow Area = 0.195 ac, 74.12% Impervious, Inflow Depth > 5.20" for 100 yr storm event
Inflow = 1.33 cfs @ 12.03 hrs, Volume= 0.085 af
Outflow = 1.33 cfs @ 12.04 hrs, Volume= 0.083 af, Atten= 0%, Lag= 0.9 min
Primary = 0.03 cfs @ 12.04 hrs, Volume= 0.029 af
Secondary = 1.30 cfs @ 12.04 hrs, Volume= 0.054 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 99.71' @ 12.04 hrs Surf.Area= 0.008 ac Storage= 0.005 af

Plug-Flow detention time= 21.2 min calculated for 0.083 af (98% of inflow)
Center-of-Mass det. time= 14.7 min (776.1 - 761.4)

Volume	Invert	Avail.Storage	Storage Description
#1	99.00'	0.005 af	**12.00'W x 20.00'L x 0.75'H Prismatoid Z=2.0**

Device	Routing	Invert	Outlet Devices
#1	Primary	99.00'	**4.200 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'
#2	Secondary	99.50'	**5.0' long x 1.0' 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 Coef. (English) 2.69 2.72 2.75 2.85 2.98 3.08 3.20 3.28 3.31 3.30 3.31 3.32

Primary OutFlow Max=0.03 cfs @ 12.04 hrs HW=99.71' (Free Discharge)
↑—**1=Exfiltration** (Controls 0.03 cfs)

Secondary OutFlow Max=1.26 cfs @ 12.04 hrs HW=99.71' (Free Discharge)
↑—**2=Broad-Crested Rectangular Weir** (Weir Controls 1.26 cfs @ 1.22 fps)

Summary for Pond 15P: Raingarden Body

[93] Warning: Storage range exceeded by 475.73'
[88] Warning: Qout>Qin may require smaller dt or Finer Routing
[85] Warning: Oscillations may require smaller dt or Finer Routing (severity=85)
[78] Warning: Submerged Pond 14P Primary device # 1 by 475.72'
[81] Warning: Exceeded Pond 14P by 475.01' @ 12.05 hrs

Inflow Area = 0.195 ac, 74.12% Impervious, Inflow Depth > 1.79" for 100 yr storm event
Inflow = 0.03 cfs @ 12.04 hrs, Volume= 0.029 af
Outflow = 0.04 cfs @ 12.05 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.5 min
Discarded = 0.04 cfs @ 12.05 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 5.00-20.00 hrs, dt= 0.05 hrs
Peak Elev= 574.73' @ 12.05 hrs Surf.Area= 560 sf Storage= 273 cf

Plug-Flow detention time= 151.5 min calculated for 0.023 af (78% of inflow)
Center-of-Mass det. time= 75.0 min (916.3 - 841.3)

Volume	Invert	Avail.Storage	Storage Description
#1	97.00'	273 cf	**12.00'W x 20.00'L x 2.00'H Prismatoid Z=2.0** 779 cf Overall x 35.0% Voids

Device	Routing	Invert	Outlet Devices
#1	Discarded	97.00'	**0.520 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 0.00'

Discarded OutFlow Max=0.04 cfs @ 12.05 hrs HW=573.60' (Free Discharge)
1=Exfiltration (Controls 0.04 cfs)