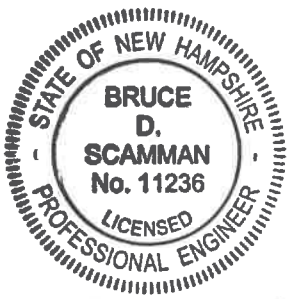
NHDES Alteration of Terrain (AoT) Application, Stormwater Management Plan, & Drainage Calculations Summary

TURBOCAM International
Route 9/ Redemption Road (Site)
Barrington, NH 03825

September 13, 2019
Revised: February 26, 2020



2/26/20

Prepared for: TURBOCAM International
607 Calef Highway
Barrington, NH 03825

Prepared by: Emanuel Engineering, Inc.
Bruce Scamman, PE
118 Portsmouth Avenue, Suite A202
Stratham, NH 03885

EMANUEL ENGINEERING

civil & structural consultants, land planners

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WWW.EMANUELENGINEERING.COM

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civil & structural consultants, land planners

118 Portsmouth Ave. A202, Stratham, NH 03885 P: 603-772-4400 F: 603-772-4487 www.emanuelengineering.com

ALTERATION OF TERRAIN PERMIT APPLICATION

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

Water Division/ Alteration of Terrain Bureau/ Land Resources Management

Check the Status of your Application: www.des.nh.gov/onestop

RSA/ Rule: RSA 485-A:17, Env-Wq 1500

Administrative Use Only	Administrative Use Only	Administrative Use Only	File Number:
			Check No.
			Amount:
			Initials:

1. APPLICANT INFORMATION (INTENDED PERMIT HOLDER)			
Applicant Name: TURBOCAM International	Contact Name: Eliot Wilkins		
Email: Eliot.Wilkins@turbocam.com	Daytime Telephone: (603) 978-5030		
Mailing Address: 607 Calef Highway			
Town/City: Barrington	State: NH	Zip Code: 03825	
2. APPLICANT'S AGENT INFORMATION If none, check here: ☒			
Business Name:	Contact Name:		
Email:	Daytime Telephone:		
Address:			
Town/City:	State:	Zip Code:	
3. PROPERTY OWNER INFORMATION (IF DIFFERENT FROM APPLICANT)			
Applicant Name: RRB5, LLC	Contact Name: Eliot Wilkins		
Email: Eliot.Wilkins@turbocam.com	Daytime Telephone: (603) 978-5030		
Mailing Address: 607 Calef Highway			
Town/City: Barrington	State: NH	Zip Code: 03825	
4. PROPERTY OWNER'S AGENT INFORMATION If none, check here: ☒			
Business Name:	Contact Name:		
Email:	Daytime Telephone:		
Address:			
Town/City:	State:	Zip Code:	
5. CONSULTANT INFORMATION If none, check here: ☐			
Engineering Firm: Emanuel Engineering, Inc.	Contact Name: Bruce Scamman		
Email: bscamman@emanuelengineering.com	Daytime Telephone: 603-772-4400		
Address: 118 Portsmouth Avenue			
Town/City: Stratham	State: NH	Zip Code: 03885	

6. PROJECT TYPE

☐ Excavation Only ☐ Residential ☐ Commercial ☐ Golf Course ☐ School ☐ Municipal
☐ Agricultural ☐ Land Conversion ☒ Other: Light Indust.

7. PROJECT LOCATION INFORMATION

Project Name: TurboCAM International

Street/Road Address: Route 9

Town/City: Barrington	County: Strafford

Tax Map: 233 & 234	Block:	Lot Number: L233:77;L234:1.2&1.4	Unit:

Location Coordinates: 43.216236,-71.02123 ☒ Latitude/Longitude ☐ UTM ☐ State Plane

Post-development, will the proposed project withdraw from or directly discharge to any of the following? If yes, identify the purpose.

1. Stream or Wetland Purpose: Site Drainage	☒ Yes ☐ No	☐ Withdrawal	☒ Discharge
2. Man-made pond created by impounding a stream or wetland Purpose:	☐ Yes ☒ No	☐ Withdrawal	☐ Discharge
3. Unlined pond dug into the water table Purpose:	☐ Yes ☒ No	☐ Withdrawal	☐ Discharge

Post-development, will the proposed project discharge to:

- A surface water impaired for phosphorus and/or nitrogen? ☒ No ☐ **Yes - include information to demonstrate that project will not cause net increase in phosphorus and/or nitrogen**
- A Class A surface water or Outstanding Resource Water? ☒ No ☐ **Yes - include information to demonstrate that project will not cause net increase in phosphorus and/or nitrogen**
- A lake or pond not covered previously? ☒ No ☐ **Yes - include information to demonstrate that project will not cause net increase in phosphorus in the lake or pond**

Is the project a High Load area? ☐ Yes ☒ No
If yes, specify the type of high load land use or activity: _____

Is the project within a Water Supply Intake Protection Area (WSIPA)? ☒ Yes ☐ No
Is the project within a Groundwater Protection Area (GPA)? ☒ Yes ☐ No
Will the well setbacks identified in Env-Wq 1508.02 be met? ☐ Yes ☒ No

Note: Guidance document titled "*Using NHDES's OneStop WebGIS to Locate Protection Areas*" is available online. For more details on the restrictions in these areas, read Chapter 3.1 in Volume 2 of the NH Stormwater Manual.

Is any part of the property within the 100-year floodplain? ☐ Yes ☒ No
If yes: Cut volume: N/A cubic feet within the 100-year floodplain
Fill volume: N/A cubic feet within the 100-year floodplain

☐ Project **IS** within **¼ mile of a designated river** Name of River:
☒ Project is **NOT** within ¼ mile of a designated river

☐ Project **IS** within **a Coastal/Great Bay Region community - include info required by Env-Wq 1503.08(l) if applicable**
☒ Project is **NOT** within a Coastal/Great Bay Region community

8. BRIEF PROJECT DESCRIPTION (PLEASE DO NOT REPLY "SEE ATTACHED")

The intent of this project is to construct one light industrial building (27,715 SF footprint) used for training and educational purposes with associated parking, utilities, and drainage.

9. IF APPLICABLE, DESCRIBE ANY WORK STARTED PRIOR TO RECEIVING PERMIT

N/A

10. ADDITIONAL REQUIRED INFORMATION

A. Date a copy of the application was sent to the municipality as required by Env-Wq 1503.05(e)[1]: 9/13/2019.
(Attach proof of delivery)

B. Date a copy of the application was sent to the local river advisory committee if required by Env-Wq 1503.05(e)[2]: / / .
(Attach proof of delivery)

C. Type of plan required: ☐ Land Conversion ☒ Detailed Development ☐ Excavation, Grading & Reclamation ☐ Steep Slope

D. Additional plans required: ☒ Stormwater Drainage & Hydrologic Soil Groups ☐ Source Control ☐ Chloride Management

E. Total area of disturbance: 221,350 square feet

F. Additional impervious cover as a result of the project: 87,925 square feet (use the "-" symbol to indicate a net reduction in impervious coverage).
Total final impervious cover: 87,925 square feet

G. Total undisturbed cover: +/- 338,229 square feet

H. Number of lots proposed: 0

I. Total length of roadway: 0 linear feet

J. Name(s) of receiving water(s): Wetlands

K. Identify all other NHDES permits required for the project, and for each indicate whether an application has been filed and is pending, or if the required approval has been issued provide the permit number, registration date, or approval letter number, as applicable.

Type of Approval	Application Filed?	Status	
		Pending	If Issued:
1. Water Supply Approval	☐ Yes ☒ No ☐ N/A	☐	Permit number:
2. Wetlands Permit	☐ Yes ☐ No ☒ N/A	☐	Permit number:
3. Shoreland Permit	☐ Yes ☐ No ☒ N/A	☐	Permit number:
4. UIC Registration	☐ Yes ☐ No ☒ N/A	☐	Registration date:
5. Large/Small Community Well Approval	☐ Yes ☐ No ☒ N/A	☐	Approval letter date:
6. Large Groundwater Withdrawal Permit	☐ Yes ☐ No ☒ N/A	☐	Permit number:
7. Other: Septic	☒ Yes ☐ No	☒	Permit number:

L. List all species identified by the Natural Heritage Bureau as threatened or endangered or of concern:
Blanding's Turtle (Emydoidea blandingii), dwarf huckleberry (Gaylussacia bigeloviana)

M. Using NHDES's Web GIS OneStop program (www2.des.state.nh.us/gis/onestop/), with the Surface Water Impairment layer turned on, list the impairments identified for each receiving water. If no pollutants are listed, enter "N/A."
N/A

N. Did the applicant/applicant's agent have a pre-application meeting with AOT staff? ☐ Yes ☒ No
If yes, name of staff member:

[1] Env-Wq 1503.05(c)(6), requires proof that a completed application form, checklist, plans and specifications, and all other supporting materials have been sent or delivered to the governing body of each municipality in which the project is proposed.

[2] Env-Wq 1503.05(c)(6), requires proof that a completed application form, checklist, plans and specifications, and all other supporting materials have been sent or delivered to the Local River Advisory Committee, if the project is within ¼ mile of a designated river.

O. Will blasting of bedrock be required? ☒ Yes ☐ No If yes, estimated quantity of blast rock: 10,000 cubic yards
If yes, standard blasting BMP notes must be placed on the plans, available at:
http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-10-12.pdf

NOTE: If greater than 5,000 cubic yards of blast rock will be generated, a groundwater monitoring program must be developed and submitted to NHDES. Contact AOT staff for additional detail.

11. CHECK ALL APPLICATION ATTACHMENTS THAT APPLY (SUBMIT WITH APPLICATION IN ORDER LISTED)

LOOSE:

- ☒ Signed application form: des.nh.gov/organization/divisions/water/aot/index.htm (with attached proof(s) of delivery)
- ☒ Check for the application fee: des.nh.gov/organization/divisions/water/aot/fees.htm
- ☒ Color copy of a USGS map with the property boundaries outlined (1" = 2,000' scale)
- ☒ If Applicant is not the property owner, proof that the applicant will have a legal right to undertake the project on the property if a permit is issued to the applicant.

BIND IN A REPORT IN THE FOLLOWING ORDER:

- ☒ Copy of the signed application form & application checklist (des.nh.gov/organization/divisions/water/aot/index.htm)
- ☒ Copy of the check
- ☒ Copy of the USGS map with the property boundaries outlined (1" = 2,000' scale)
- ☒ Narrative of the project with a summary table of the peak discharge rate for the off-site discharge points
- ☒ Web GIS printout with the "Surface Water Impairments" layer turned on - http://www4.des.state.nh.us/onestopdatamapper/onestopmapper.aspx
- ☒ Web GIS printouts with the AOT screening layers turned on - http://www4.des.state.nh.us/onestopdatamapper/onestopmapper.aspx
- ☒ NHB letter using DataCheck Tool – www.nhdfl.org/about-forests-and-lands/bureaus/natural-heritage-bureau/
- ☒ The Web Soil Survey Map with project's watershed outlined – websoilsurvey.nrcs.usda.gov
- ☒ Aerial photograph (1" = 2,000' scale with the site boundaries outlined)
- ☒ Photographs representative of the site
- ☒ Groundwater Recharge Volume calculations (one worksheet for each permit application): des.nh.gov/organization/divisions/water/aot/documents/bmp_worksh.xls
- ☒ BMP worksheets (one worksheet for each treatment system): des.nh.gov/organization/divisions/water/aot/documents/bmp_worksh.xls
- ☒ Drainage analysis, stamped by a professional engineer (see Application Checklist for details)
- ☒ Riprap apron or other energy dissipation or stability calculations
- ☒ Site Specific Soil Survey report, stamped and with a certification note prepared by the soil scientist that the survey was done in accordance with the Site Specific Soil Mapping standards, *Site-Specific Soil Mapping Standards for NH & VT, SSSNNE Special Publication No. 3*.
- ☒ Infiltration Feasibility Report (example online) [Env-Wq 1503.08(f)(3)]
- ☒ Registration and Notification Form for Storm Water Infiltration to Groundwater (UIC Registration-for underground systems only, including drywells and trenches): (http://des.nh.gov/organization/divisions/water/dwgb/dwspp/gw_discharge)
- ☒ Inspection and maintenance manual with, if applicable, long term maintenance agreements [Env-Wq 1503.08(g)]
- ☒ Source control plan

PLANS:

- ☒ One set of design plans on 34 - 36" by 22 - 24" white paper (see Application Checklist for details)
- ☒ Pre & post-development color coded soil plans on 11" x 17" (see Application Checklist for details)
- ☒ Pre & post-development drainage area plans on 34 - 36" by 22 - 24" white paper (see Application Checklist for details)

100-YEAR FLOODPLAIN REPORT:

- ☒ All information required in Env-Wq 1503.09, submitted as a separate report.

ADDITIONAL INFORMATION RE: NUTRIENTS, CLIMATE

- ☐ See Checklist for Details

☒ **REVIEW APPLICATION FOR COMPLETENESS & CONFIRM INFORMATION LISTED ON THE APPLICATION IS INCLUDED WITH SUBMITTAL.**

12. REQUIRED SIGNATURES

_____ By initialing here, I acknowledge that I am required by Env-Wq 1503.20(e) to submit a copy of all approved documents to the department in PDF format on a CD within one week after permit approval.

By signing below, I certify that:

- The information contained in or otherwise submitted with this application is true, complete, and not misleading to the best of my knowledge and belief;
- I understand that the submission of false, incomplete, or misleading information constitutes grounds for the department to deny the application, revoke any permit that is granted based on the information, and/or refer the matter to the board of professional engineers established by RSA 310-A:3 if I am a professional engineer; and
- I understand that I am subject to the penalties specified in New Hampshire law for falsification in official matters, currently RSA 641.

☐ **APPLICANT** ☐ **APPLICANT'S AGENT**:

Signature:_____ Date: _____

Name (print or type): _____ Title: _____

☐ PROPERTY OWNER ☐ PROPERTY OWNER'S AGENT:

Signature:_____ Date: _____

Name (print or type): _____ Title: _____

ATTACHMENT A:
ALTERATION OF TERRAIN PERMIT APPLICATION CHECKLIST

Check the box to indicate the item has been provided or provide an explanation why the item does not apply.

DESIGN PLANS

☒ Plans printed on 34 - 36" by 22 - 24" white paper

☒ PE stamp

☒ Wetland delineation

☒ Temporary erosion control measures

☒ Treatment for all stormwater runoff from impervious surfaces such as roadways (including gravel roadways), parking areas, and non-residential roof runoff. Guidance on treatment BMPs can be found in Volume 2, Chapter 4 of the NH Stormwater Management Manual.

☒ Pre-existing 2-foot contours

☒ Proposed 2-foot contours

☐ Drainage easements protecting the drainage/treatment structures

☒ Compliance with the Wetlands Bureau, RSA 482- A http://des.nh.gov/organization/divisions/water/wetlands/index.htm. Note that artificial detention in wetlands is not allowed.

☒ Compliance with the Comprehensive Shoreland Protection Act, RSA 483-B. http://des.nh.gov/organization/divisions/water/wetlands/cspa

☐ Benches. Benching is needed if you have more than 20 feet change in elevation on a 2:1 slope, 30 feet change in elevation on a 3:1 slope, 40 feet change in elevation on a 4:1 slope.

☒ Check to see if any proposed ponds need state Dam permits. http://des.nh.gov/organization/divisions/water/dam/documents/damdef.pdf

DETAILS

☒ Typical roadway x-section

☒ Detention basin with inverts noted on the outlet structure

☐ Stone berm level spreader

☒ Outlet protection – riprap aprons

☒ A general installation detail for an erosion control blanket

☒ Silt fences or mulch berm

☒ Storm drain inlet protection. Note that since hay bales must be embedded 4 inches into the ground, they are not to be used on hard surfaces such as pavement.

☒ Hay bale barriers

☒ Stone check dams

☒ Gravel construction exit

☒ Temporary sediment trap

☒ The treatment BMP's proposed

☒ Any innovative BMP's proposed

CONSTRUCTION SEQUENCE/EROSION CONTROL

☒ Note that the project is to be managed in a manner that meets the requirements and intent of RSA 430:53 and Chapter Agr 3800 relative to invasive species.

☒ Note that perimeter controls shall be installed prior to earth moving operations.

☒ Note that temporary water diversion (swales, basins, etc) must be used as necessary until areas are stabilized.

☒ Note that ponds and swales shall be installed early on in the construction sequence (before rough grading the site).

☒ Note that all ditches and swales shall be stabilized prior to directing runoff to them.

☒ Note that all roadways and parking lots shall be stabilized within 72 hours of achieving finished grade.

☒ Note that all cut and fill slopes shall be seeded/loamed within 72 hours of achieving finished grade

☒ Note that all erosion controls shall be inspected weekly AND after every half-inch of rainfall.

☒ Note the limits on the open area allowed, see Env-Wq 1505.02 for detailed information.

Example note: The smallest practical area shall be disturbed during construction, but in no case shall exceed 5 acres at any one time before disturbed areas are stabilized.

☒ Note the definition of the word “stable”

Example note: An area shall be considered stable if one of the following has occurred:

- Base course gravels have been installed in areas to be paved.
- A minimum of 85 percent vegetated growth has been established.
- A minimum of 3 inches of non-erosive material such stone or riprap has been installed.
- Or, erosion control blankets have been properly installed.

☒ Note the limit of time an area may be exposed
Example note: All areas shall be stabilized within 45 days of initial disturbance.

☒ Provide temporary and permanent seeding specifications. (Reed canary grass is listed in the Green Book; however, this is a problematic species according to the Wetlands Bureau and therefore should not be specified)

☒ Provide winter construction notes that meet or exceed our standards.

Standard Winter Notes:

- All proposed vegetated areas that do not exhibit a minimum of 85 percent vegetative growth by October 15, or which are disturbed after October 15, shall be stabilized by seeding and installing erosion control blankets on slopes greater than 3:1, and seeding and placing 3 to 4 tons of mulch per acre, secured with anchored netting, elsewhere. The installation of erosion control blankets or mulch and netting shall not occur over accumulated snow or on frozen ground and shall be completed in advance of thaw or spring melt events.
- All ditches or swales which do not exhibit a minimum of 85 percent vegetative growth by October 15, or which are disturbed after October 15, shall be stabilized temporarily with stone or erosion control blankets appropriate for the design flow conditions.
- After October 15, incomplete road or parking surfaces, where work has stopped for the winter season, shall be protected with a minimum of 3 inches of crushed gravel per NHDOT item 304.3.

☐ Note at the end of the construction sequence that “Lot disturbance, other than that shown on the approved plans, shall not commence until after the roadway has the base course to design elevation and the associated drainage is complete and stable.” – This note is applicable to single/duplex family subdivisions, when lot development is not part of the permit.

DRAINAGE ANALYSES

Please double-side 8 ½” x 11” sheets where possible but, **do not** reduce the text such that more than one page fits on one side.

☒ PE stamp

☒ Rainfall amount obtained from the Northeast Regional Climate Center- http://precip.eas.cornell.edu/. Include extreme precipitation table as obtained from the above referenced website.

☒ Drainage analyses, in the following order:

- Pre-development analysis: Drainage diagram.
- Pre-development analysis: Area Listing and Soil Listing.
- Pre-development analysis: Node listing 1-year (if applicable), 2-year, 10-year and 50-year.
- Pre-development analysis: Full summary of the 10-year storm.
- Post-development analysis: Drainage diagram.
- Post-development analysis: Area Listing and Soil Listing.
- Post-development analysis: Node listing for the 2-year, 10-year and 50-year.
- Post-development analysis: Full summary of the 10-year storm.

☒ Review the Area Listing and Soil Listing reports

- Hydrologic soil groups (HSG) match the HSGs on the soil maps provided.
- There is the same or less HSG A soil area after development (check for each HSG).
- There is the same or less “woods” cover in the post-development.
- Undeveloped land was assumed to be in “good” condition.
- The amount of impervious cover in the analyses is correct.

Note: A good check is to subtract the total impervious area used in the pre analysis from the total impervious area used in the post-analysis. For residential projects without demolition occurring, a good check is to take this change in impervious area, subtract out the roadway and divide the remaining by the number of houses/units proposed. Do these numbers make sense?

☒ Check the storage input used to model the ponds.

☒ Check to see if the artificial berms pass the 50-year storm, i.e., make sure the constructed berms on ponds are not overtopped.

☒ Check the outlet structure proposed and make sure it matches that modeled.

☒ Check to see if the total areas in the pre and post analyses are same.

☒ Confirm the correct NRCS storm type was modeled (Coos, Carroll & Grafton counties are Type II, all others Type III).

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PRE- AND POST-DEVELOPMENT DRAINAGE AREA PLANS

☒ Plans printed on 34 - 36” by 22 - 24” on white paper.

☒ Submit these plans separate from the soil plans.

☒ A north arrow.

☒ A scale.

☒ Labeled subcatchments, reaches and ponds.

☒ Tc lines.

☒ A clear delineation of the subcatchment boundaries.

☐ Roadway station numbers.

☒ Culverts and other conveyance structures.

PRE AND POST-DEVELOPMENT COLOR-CODED SOIL PLANS

☒ 11” x 17”sheets suitable, as long as it is readable.

☒ Submit these plans separate from the drainage area plans.

☒ A north arrow.

☒ A scale.

☒ Name of the soil scientist who performed the survey and date the soil survey took place.

☒ 2-foot contours (5-foot contours if application is for a gravel pit) as well as other surveyed features.

☒ Delineation of the soil boundaries and wetland boundaries.

☒ Delineation of the subcatchment boundaries.

☒ Soil series symbols (e.g., 26).

☒ A key or legend which identifies each soil series symbol and its associated soil series name (e.g., 26 = Windsor).

☒ The hydrologic soil group color coding (A = Green, B = yellow, C= orange, D=red, Water=blue, & Impervious = gray).

Please note that excavation projects (e.g., gravel pits) have similar requirements to that above, however the following are common exceptions/additions:

☐ Drainage report is not needed if site does not have off-site flow.

☐ 5 foot contours allowed rather than 2 foot.

☐ No PE stamp needed on the plans.

☐ Add a note to the plans that the applicant must submit to the Department of Environmental Services a written update of the project and revised plans documenting the project status every five years from the date of the Alteration of Terrain permit.

☐ Add reclamation notes.

See NRCS publication titled: *Vegetating New Hampshire Sand and Gravel Pits* for a good resource, it is posted online at: http://des.nh.gov/organization/divisions/water/aot/categories/publications.

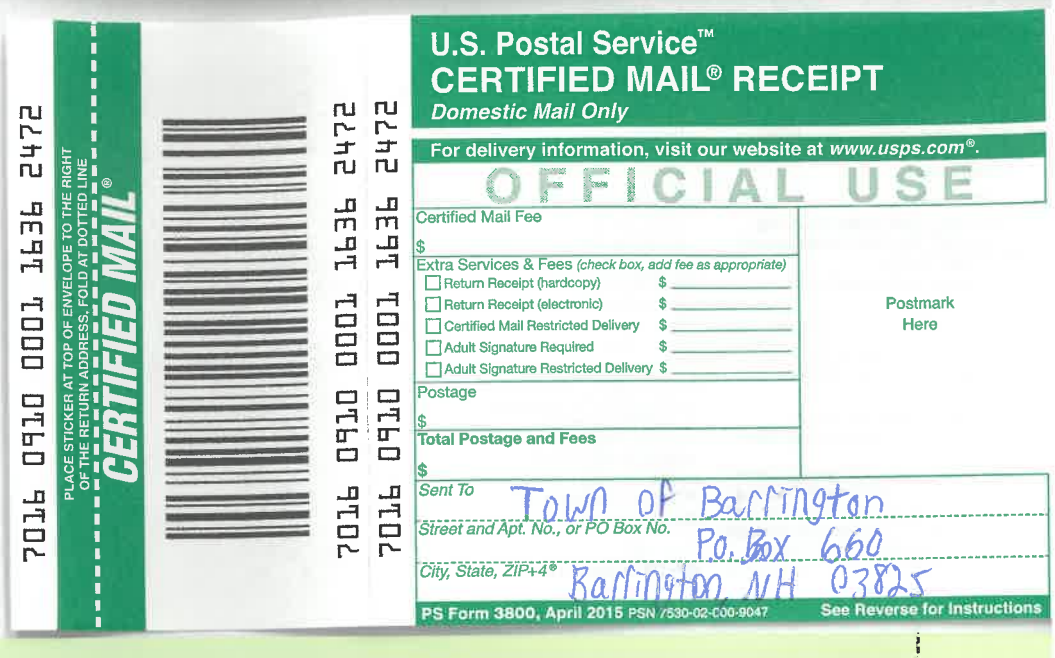
ADDITIONAL INFORMATION RE: NUTRIENTS, CLIMATE

☐ If project will discharge stormwater to a surface water impaired for phosphorus and/or nitrogen, include information to demonstrate that project will not cause net increase in phosphorus and/or nitrogen.

☐ If project will discharge stormwater to a Class A surface water or Outstanding Resource Water, include information to demonstrate that project will not cause net increase in phosphorus and/or nitrogen.

☐ If project will discharge stormwater to a lake or pond not covered previously, include information to demonstrate that project will not cause net increase in phosphorus in the lake or pond.

☐ If project is within a Coastal/Great Bay Region community, include info required by Env-Wq 1503.08(l) if applicable.



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PLACE STICKER AT TOP OF ENVELOPE TO THE RIGHT OF THE RETURN ADDRESS, FOLD AT DOTTED LINE

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- ☐ Return Receipt (electronic) $
- ☐ Certified Mail Restricted Delivery $
- ☐ Adult Signature Required $
- ☐ Adult Signature Restricted Delivery $

Postage
$

Total Postage and Fees
$

Postmark Here

Sent To Town of Barrington
Street and Apt. No., or PO Box No. P.O. Box 660
City, State, ZIP+4® Barrington, NH 03825

PS Form 3800, April 2015 PSN 7530-02-000-9047 See Reverse for Instructions

SENDER: *COMPLETE THIS SECTION*

- Complete items 1, 2, and 3.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Town of Barrington
P.O. Box 660
Barrington, NH 03825

9590 9402 3387 7227 5452 58

2. Article Number *(Transfer from service label)*

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X ☐ Agent ☐ Addressee

B. Received by *(Printed Name)*

C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
- ☐ Adult Signature
- ☐ Adult Signature Restricted Delivery
- ☐ Certified Mail®
- ☐ Certified Mail Restricted Delivery
- ☐ Collect on Delivery
- ☐ Collect on Delivery Restricted Delivery
- ☐ Insured Mail
- ☐ Insured Mail Restricted Delivery (over $500)
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- ☐ Return Receipt for Merchandise
- ☐ Signature Confirmation™
- ☐ Signature Confirmation Restricted Delivery

PS Form 3811, July 2015 PSN 7530-02-000-9053 Domestic Return Receipt

Invoice	Invoice Date	Description	Amount	Discount	Net Amount
	9/16/2019	AOT FOR RRB5	1,750.00	0.00	1,750.00

No: 94431 9/16/2019 TREASURER, STATE OF NEW HAMPSHIRE **Amount:** 1,750.00

THE REVERSE SIDE OF THIS DOCUMENT INCLUDES MICROPRINTED ENDORSEMENT LINES AND ARTIFICIAL WATERMARK - HOLD AT AN ANGLE TO VIEW

TURBOCAM, INC.
SUITE 200
607 CALEF HIGHWAY
BARRINGTON, NH 03825

Citizens Bank
NEW HAMPSHIRE

54-153
114

94431

Date: 9/16/2019 No: 94431 Amount: **********1,750.00

One Thousand Seven Hundred Fifty and no/100 Base**********

Pay to the Order of TREASURER, STATE OF NEW HAMPSHIRE

TURBOCAM, INC.

HEAT SENSITIVE COLOR FADES WITH HEAT

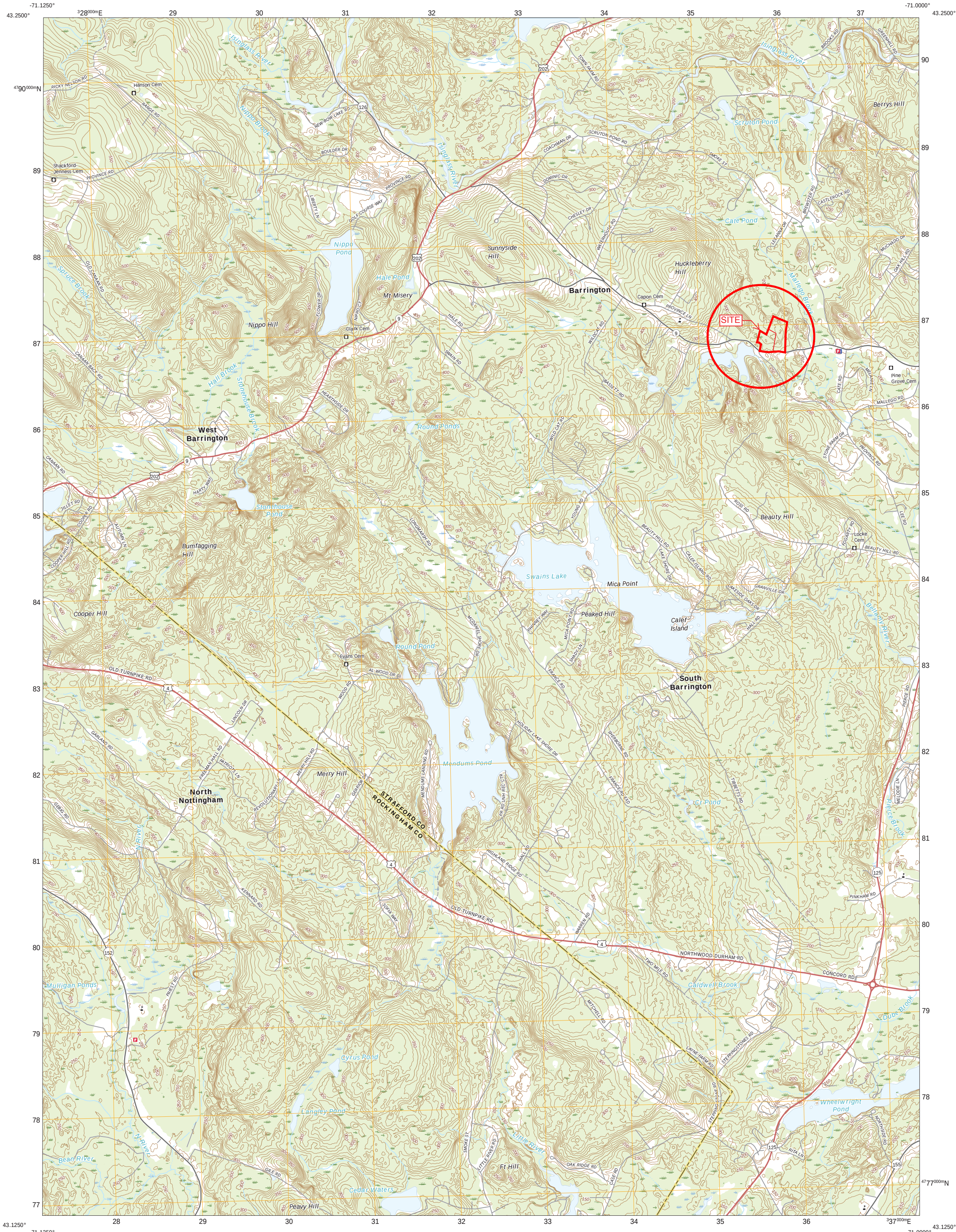
⑈094431⑈ ⑆011401533⑆ 331307955?⑈

USGS science for a changing world

U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

The National Map
US Topo

BARRINGTON QUADRANGLE
NEW HAMPSHIRE
7.5-MINUTE SERIES



Produced by the United States Geological Survey
North American Datum of 1983 (NAD83)
World Geodetic System of 1984 (WGS84). Projection and 1 000-meter grid: Universal Transverse Mercator, Zone 19T
This map is not a legal document. Boundaries may be generalized for this map scale. Private lands within government reservations may not be shown. Obtain permission before entering private lands.

Imagery .... NAIP, July 2016 - October 2016
Roads .... U.S. Census Bureau, 2017
Names .... GNIS, 1980 - 2016
Hydrography .... National Hydrography Dataset, 2005 - 2015
Contours .... National Elevation Dataset, 2008 - 2012
Boundaries .... Multiple sources; see metadata file 2016 - 2017
Wetlands .... FWS National Wetlands Inventory 1985 - 2012

UTM GRID AND 2017 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
NORTH AMERICAN VERTICAL DATUM OF 1988

This map was produced to conform with the National Geospatial Program US Topo Product Standard, 2011.
A metadata file associated with this product is draft version 0.6.18

QUADRANGLE LOCATION

ADJOINING QUADRANGLES
1 Parker Mountain
2 Baxter Lake
3 Rochester
4 Northwood
5 Dover West
6 Mount Pawtuckaway
7 Epping
8 Newmarket

ROAD CLASSIFICATION
Expressway — Local Connector
Secondary Hwy — Local Road
Ramp — 4WD
Interstate Route — US Route — State Route

BARRINGTON, NH
2018

EXISTING CONDITIONS

The TURBOCAM International site is shown on Barrington Tax Map 233 Lot 77, and Tax Map 234 Lot 1.2 & 1.4. It is located on the northeast side of Route 9 and west side of Redemption Road in Barrington, New Hampshire. The existing combined lot has an area of 12.8 acres. For storm-water modeling purposes, the existing lot was modeled along with a portion of Redemption Road, and Tax Map 234 Lot 1.5 in-which storm-water runoff is affected by; totaling an area of 16.6 acres. Tax Map 233 Lot 77 is currently multiple cleared, vacant lots with a gravel driveway loop. Tax Map 234 Lots 1.2 & 1.4 are currently vacant, wooded lots. The intent of this project is to construct one light industrial building used for training and educational purposes with associated parking, utilities, and drainage. Additionally, a majority of the existing gravel driveway is to be paved. The parcel is bounded northerly by Christopher and Suzanne Kelliher (residential) and by the Town of Barrington (vacant), easterly by Redemption Road, southerly by Franklin Pierce Highway (Route 9), southwesterly by Robert and Rebecca Litchfield (residential), and westerly by Daniel and Cristin Wagner (residential).

Approximately 40% of the site has been cleared and is grass or ledge on the northern half of the site. The majority of the undisturbed portion of the lot is woods, wetlands, and ledge. The existing combined site's percent of impervious cover is 2.6%.

The existing combined site has 5 points of discharge for storm-water: to the northwest of Tax Map 233 Lot 77, to the southeast of Tax Map 234 Lot 1.2 (south of the gravel drive entrance), to the southeast of Tax Map 234 Lot 1.2 (north of the gravel drive entrance), and two different locations to the northeast of the Redemption Road roundabout near Tax Map 234 Lot 1.5. There is a high point on site on the eastern edge of Tax Map 233 Lot 77, near the property line with Tax Map 234 Lot 1.2. At this point, a small portion of the storm-water generally flows south, into the wetlands from a high point elevation of 256.00 feet to the low point elevation of 205.50. Runoff from this area flows directly into the wetlands to the south and through the culvert under Redemption Road. The rest of the runoff from this high point generally flows northeast, into the wetlands, into the swale along Redemption Road, and ultimately northeast off-site. To the northeast of the gravel drive, between the gravel drive and Lot 1.4, most of the storm-water generally flows south to a culvert under Redemption Road from a high point elevation of 243.00 feet to a low point elevation of 204.41 feet. To the East side of the lot line between Lots 1.2 & 1.4, the storm-water mostly flows south from a high point elevation of

256.00 to a swale on the North side of Redemption Road flowing Northeast off site to the Northern-most part of the roundabout at a low point elevation of 210.00.

Site specific soils were delineated on site by Luke Hurley of Gove Environmental Services, Inc. on August 28, 2019. Wetlands were delineated by Jones & Beach Engineers, Inc. in April 2019.

PROPOSED DEVELOPMENT

Proposed improvements for Tax Map 233 Lot 77 and Tax Map 234 Lots 1.2 &1.4 include the construction of a 27,715 square foot building, a new septic system, a net increase of +/- 58,850 square feet of new traditional pavement, a drip edge along the perimeter of the proposed building to collect stormwater from the roof, one bioswale (PP108) to filter and retain stormwater, two bioswale-ISR systems (BR1, BR2), one +/-8,500 square feet subsurface infiltration system (SI1), and associated utilities to service the building. The storm-water treatment systems vary in size (length, width, and depth) as determined by the inflow areas which will discharge storm-water into each unit. Additionally, Tax Map 234 Lots 1.4 is to be logged and stumped to within 50' of the wetlands (+/-61,500 square feet). The proposed combined site impervious area is 14.8% of the site.

BIORETENTION-ISR

An innovative bioswale system with an anaerobic internal storage reservoir (ISR) was designed pursuant to RSA485-A:9 Class Surface Waters and Env-WQ 1503.11(i) requiring a BMP that provides the highest level of pollutant removal including bioretention-ISR with amended soils. The design and sizing of a bioswale-ISR was based on research and development by Roseen and Stone 2013 funded by EPA Region 1 and detailed in the technical memorandum by Roseen (2013)[1]. The bioswale-ISR was designed and constructed based on the concepts of using the functional mechanisms of a gravel wetland, and replicating them in the footprint of a standard bioretention system. From the surface, the system does not look any different than a standard bioretention system. However, in the subsurface it incorporates an anaerobic internal storage reservoir (ISR) in the same sense that is accomplished in a gravel wetland. Of primary

[1] Roseen, R. (2013). Design and Sizing of Innovative Bioretention-ISR System. Stratham, NH, Waterstone Engineering: 7.

significance in this design is the ISR, the long circuitous flow path, and the volume contained in the ISR. A traditional bioretention system has approximately 2 feet of vertical filter path length as it moves through the bioretention soil media prior to exiting by underdrain or exfiltration. A gravel wetland typically has at least a 30' horizontal flow path through the anaerobic ISR. The ratio of the ISR/WQV should be at minimum 0.1 and is the crucial element of the design in that it is based on the phenomena that nitrate is heavily first flush weighted, and should wash off in the beginning of a storm event, or a small fraction of the WQV. Additionally, the system contains a bioretention soil mix (BSM) comprised of: 65% sand, 30% loam, and 5% water treatment residuals (WTR) with a final organic matter content of 8-12%. Specific details on BSM composition are listed in the design specifications.

DRAINAGE ANALYSIS AND DESIGN

The purpose of the drainage analysis is two-fold:

- The first is to analyze the pre-development runoff flows through the site.
- The second purpose is to evaluate the impact of the proposed development on drainage patterns and flows.

The goal of the drainage design is to:

- Design a storm-water and treatment system to adequately handle the post-development runoff peak and volume.
- Minimize or eliminate erosion and sedimentation during construction and after development.

METHOD

The storm-water runoff analysis for the site was based on the Town of Barrington's regulations which require a 2-year, 10-year, 25-year, and 50-year 24-hour storm events to be modeled. Additionally, the 1" water quality storm was also monitored. The analysis was performed as required by the State of New Hampshire Department of Environmental Services using the U.S. Soil Conservation Service's TR-20 runoff procedure from which the TR-55 method was developed. As described in the TR-55 manual, it is a "...procedure to calculate storm runoff, peak rate of discharge, hydrographs and storage volumes required for floodwater

reservoirs. The model begins with a rainfall amount uniformly imposed on the watershed over a specified time distribution. Mass rainfall is converted to mass runoff using a runoff curve number (CN). CN is based on soils, plant cover, impervious area, interception, and surface storage. Runoff is then transformed into a hydrograph (a graph showing the properties of runoff flow with respect to time)[2] by using the unit hydrograph theory (a given one-day rainfall produces a 1-inch depth of runoff over the given drainage area) and routing procedures that depend on runoff travel time through segments of the watershed" (subcatchments). Modeling calculations were performed with a HydroCAD software package.

PRE-DEVELOPMENT RUNOFF

The pre-development work site was modeled as a 16.59 acre area where, storm-water modeling and calculations for Barrington Tax Map 233 Lot 77 were performed in conjuncture with Barrington Tax Map 234 Lot 1.2, 1.4, and 1.5.

The subject area was divided into fourteen separate subcatchment areas to model the storm-water flows most accurately, and are shown on sheet SW1 included in this report.

Subcatchment ES1 represents the area on the northwestern portion of Lot 77. This area is comprised of grass, woods, and wetland cover. Per review by NHDES on November 22, 2019, ES1 is now modeled as the combined area formerly modeled as subcatchment's ES1 and ES2.

Subcatchment ES1 flows east along the surface into the large wetland area in the northwest portion of the site which continues to run southeast down along the wetland finger (Reach ER72 & ER73) and eventually off-site to the southeast (Link L200).

Subcatchment ES3 represents the area on the northern portion of Lot 77. This area is comprised of grass, woods, and wetland cover.

Subcatchment ES3 flows north along the surface into the small wetland area in the northeast corner of the site which continues to run north, off-site (Link L100).

Subcatchment ES4 represents the area just north of the existing gravel drive loop. This area is comprised of grass and gravel cover.

Subcatchment ES4 flows southeast along the surface, channelizing in the western portion of the existing gravel drive loop (Reach ER71) which continues to run south into the wetland

[2] Introduction to Hydrology, Viessman ET. Al. Second Edition, 1972 New York, IEP.

finger in the center of the site (Reach ER72 & ER73), the wetland finger flows to the southeast, eventually off-site to the southeast (Link L200).

Subcatchment ES5 represents the area just northwest of the existing gravel drive loop. This area is comprised of grass and gravel cover.

Subcatchment ES5 flows south along the surface, channelizing in the western portion of the existing gravel drive loop (Reach ER71) which continues to run south into the wetland finger in the center of the site (Reach ER72 & ER73), the wetland finger flows to the southeast, eventually off-site to the southeast (Link L200).

Subcatchment ES6 represents the area on the northeast portion of Lot 77 and the northwest portion of Lot 1.2. This area is comprised of grass, woods, gravel, and wetland cover.

Subcatchment ES6 flows southeast along the surface, channelizing in the western portion of the existing gravel drive loop (Reach ER71) which continues to run south into the wetland finger in the center of the site (Reach ER72 & ER73), the wetland finger flows to the southeast, eventually off-site to the southeast (Link L200).

Subcatchment ES7 represents the area in the northeast portion of Lot 1.4 and most of the northern portion of Lot 1.2. This area is comprised of woods and wetland cover. Per review by NHDES on November 22, 2019, ES7 is now modeled as the combined area formerly modeled as subcatchment's ES7 and ES8.

Subcatchment ES7 flows northeast along the surface into the south corner of the central-north wetlands. Continuing to run northeast along the wetland (Pond EP81), it then begins to run west along the wetland finger (Reach ER81) into a swale along the northern side Redemption Road (Reach ER84 & ER85) and eventually off site, southeast at the northern point of the Redemption Road roundabout (Link L400).

Subcatchment ES9 represents the western portion of Lot 1.5, north of the Redemption Road roundabout. This area is comprised of grass, woods, wetland, and impervious asphalt cover.

Subcatchment ES9 flows south along the surface, into the wetland finger and continues to run southeast into a swale along the northern side of Redemption Road (Reach ER85) and eventually off site, southeast at the northern point of the Redemption Road roundabout (Link L400).

Subcatchment ES10 represents a majority of the northern area of Lot 1.4. This subcatchment, along with Link L300, are to be ignored for this predevelopment drainage study as they were created for use in future projects.

Subcatchment ES11 represents the area on the south-middle portion of Lot 1.5, north of the Redemption Road roundabout. This area is comprised of grass, woods, and impervious asphalt cover.

Subcatchment ES11 flows southeast along the surface, into an existing swale along the northern side of Redemption Road and eventually off site, southeast at the northern point of the Redemption Road roundabout (Link L400).

Subcatchment ES12 represents the area on the northeast portion of Lot 1.2, north of Redemption Road. This area is comprised of grass, woods, wetlands, and impervious asphalt cover.

Subcatchment ES12 flows southeast along the surface, into a swale along the northern side of Redemption Road (Reach ER84 & ER85) and eventually off site, southeast at the northern point of the Redemption Road roundabout (Link L400).

Subcatchment ES13 represents the area on the south-central portion of Lot 1.4, north of Redemption Road. This area is comprised of grass, woods, and impervious asphalt cover.

Subcatchment ES13 flows southeast along the surface, into a swale along the northern side of Redemption Road (Reach ER83, ER84, & ER85) and eventually off site, southeast at the northern point of the Redemption Road roundabout (Link L400).

Subcatchment ES14 represents the area on the southwest portion of Lot 1.4 and southeast portion of Lot 1.2. This area is comprised of grass, woods, and impervious asphalt cover.

Subcatchment ES14 flows south along the surface, into an existing swale along the northern side of Redemption Road flowing southwest and eventually off-site, southeast at the east-side entrance of the gravel drive (Link L500).

Subcatchment ES15 represents the area on the south-central portion of Lot 1.4. This area is comprised of grass, woods, gravel, wetlands, and impervious asphalt cover.

Subcatchment ES15 flows southeast along the surface, channelizing on the existing gravel drive. It continues to flow into an existing swale at the southern-end of the gravel drive, where it eventually flows off-site, at the northwest-side entrance of Redemption Road (Link L200).

Subcatchment ES16 represents the area on the western portion of Lot 1.4 and southwest portion of Lot 77. This area is comprised of grass, woods, and wetland cover.

Subcatchment ES16 flows southeast along the surface, into the most-westerly wetland finger, located near the Redemption Road entrance, and eventually off-site, southeast at the west-side entrance of the gravel drive (Link L200).

The storm-water calculations were modeled with good grass cover, good woodlands, gravel areas, and impervious asphalt cover. Wetland areas were modeled with their respective Site Specific Soil Survey and cover type. The attached HydroCAD worksheets outline specific details on the flows, volumes, times, and flow conditions.

POST-DEVELOPMENT RUNOFF

The post-development site was also modeled as a 16.59 acre site which has been divided into twenty-five subcatchment areas, and are shown on sheet SW2 – Post development Drainage Plan included in this report. Previously modeled subcatchments PS2, PS5, PS18, PS21, and PS27 were combined with other subcatchments, therefore are not present in the updated drainage calculations.

Subcatchment PS1 represents the area on the northwestern portion of Lot 77. This area is comprised of grass, woods, and wetland cover. Per review by NHDES on November 22, 2019, PS1 is now modeled as the combined area formerly modeled as subcatchment's PS1 and PS2.

Subcatchment PS1 flows east along the surface into the large wetland area in the northwest portion of the site which continues to run southeast down along the wetland finger (Reach ER72 & ER73) and eventually off-site to the southeast (Link L200).

Subcatchment PS3 represents the area on the northern portion of Lot 77. This area is comprised of grass, woods, and wetland cover.

Subcatchment PS3 flows north along the surface into the small wetland area in the northeast corner of the site which continues to run north, off-site (Link L100). Water from this wetland flow back onto the site, southwest of where it flowed off the site. It then continues to run southeast down along the wetland finger (Reach ER70, ER72 & ER73) and eventually off-site to the southeast (Link L200).

Subcatchment PS4 represents the lower north-corner of Lot 77 and northeast portion of Lot 1.2. This area is comprised of pavement, building, grass, and woods cover.

Subcatchment PS4 flows south along the surface to the proposed swale, into the proposed bioswale-ISR system (Pond BR1). From there, stormwater is runs into a catch basin (Pond CB5) and is piped south to the subsurface infiltration system (Pond SI1). At this point stormwater infiltrates into the groundwater. However, in larger storm events, stormwater overflows through an HDPE pipe to the south, into the wetlands (Reach ER73) where it runs southeast, off-site (Link L200).

Subcatchment PS6 represents the area in the northeast portion of Lot 1.4 and a majority of the northern portion of Lot 1.2. This area is comprised of woods and wetland cover. Per review by NHDES on November 22, 2019, PS6 is now modeled as the combined area formerly modeled as subcatchment's PS6 and PS7.

Subcatchment PS6 flows northeast along the surface into the south corner of the central-north wetlands which continues to run northeast along the wetland (Pond EP81) then begins to run west along the wetland finger (Reach ER81) into a swale along the northern side of Redemption Road (Reach ER85) and eventually off site, southeast at the northern point of the Redemption Road roundabout (Link L400).

Subcatchment PS7 represents the eastern corner of Lot 1.4. This area is comprised of grass and impervious asphalt cover.

Subcatchment PS7 flows along the surface to a silt sock (to be maintained after construction has completed), which will slow down water in smaller storm events. Stormwater will back up and flow over the silt sock, continuing to flow along the swales along Redemption Road (Reach ER84 & ER85) and eventually off site, southeast at the northern point of the Redemption Road roundabout (Link L400).

Subcatchment PS8 represents the western portion of Lot 1.5, north of the Redemption Road roundabout. This area is comprised of grass, woods, wetland, and impervious asphalt cover.

Subcatchment PS8 flows south along the surface, into the wetland finger and continues to run southeast into a swale along the northern side of Redemption Road (Reach ER85) and eventually off site, southeast at the northern point of the Redemption Road roundabout (Link L400).

Subcatchment PS9 represents a majority of the northern area of Lot 1.5, same area as Subcatchment ES10. Subcatchment PS9, along with Link L300 are to be ignored for this predevelopment drainage study as they were created for use in future projects.

Subcatchment PS10 represents the area on the south-middle portion of Lot 1.5, north of the Redemption Road roundabout. This area is comprised of grass, woods, and impervious asphalt cover.

Subcatchment PS10 flows southeast along the surface, into a swale along the northern side of Redemption Road and eventually off site, southeast at the northern point of the Redemption Road roundabout (Link L400).

Subcatchment PS11 represents the area on the northeast portion of Lot 1.4, north of Redemption Road. This area is comprised of grass, woods, and wetlands cover.

Subcatchment PS11 flows southeast along the surface, being directed into the proposed stormwater detention along the northern side of Redemption Road (Pond PP109) by a silt sock (to be maintained after construction has completed). Stormwater eventually backs up in this area, and overflows out from the weir of the detention. Stormwater then flows to a different silt sock (to be maintained after construction has completed), which will slow down water in smaller storm events. Stormwater will back up and flow over the silt sock, continuing to flow along the swales along Redemption Road (Reach ER84 & ER85) and eventually off site, southeast at the northern point of the Redemption Road roundabout (Link L400).

Subcatchment PS12 represents the area on the south-central portion of Lot 1.4, north of Redemption Road. This area is comprised of grass, woods, and impervious asphalt cover.

Subcatchment PS12 flows southeast along the surface into the proposed stormwater detention along the northern side of Redemption Road (Pond PP109). Stormwater eventually backs up in this area, and overflows out from the weir of the detention. Stormwater then flows to a silt sock (to be maintained after construction has completed), which will slow down water in smaller storm events. Stormwater will back up and flow over the silt sock, continuing to flow along the swales along Redemption Road (Reach ER84 & ER85) and eventually off site, southeast at the northern point of the Redemption Road roundabout (Link L400).

Subcatchment PS13 represents the area just north of the proposed driveway entrance. This area is comprised of grass, woods, and impervious asphalt cover.

Subcatchment PS13 flows south along the surface where it reaches a swale on the north side of the proposed driveway entrance (Reach ER82). This directs the flow into the proposed stormwater detention along the northern side of Redemption Road (Pond PP109). Stormwater eventually backs up in this area, and overflows out from the weir of the detention. Stormwater then flows to a silt sock (to be maintained after construction has completed), which will slow down water in smaller storm events. Stormwater will back up and flow over the silt sock, continuing to flow along the swales along Redemption Road (Reach ER84 & ER85) and eventually off site, southeast at the northern point of the Redemption Road roundabout (Link L400).

Subcatchment PS14 represents the area of the parking lot east of the proposed building at the intersection of the driveway/parking lot. This area is comprised of traditional pavement and grass cover.

Subcatchment PS14 flows into the swale south of the proposed driveway (Reach PR62), and into bioswale "A" (Pond PP108). From there, the storm-water will overflow into a catch basin (Pond PCB2), continuing south out of the catch basin through a 12" HDPE pipe, which daylights into riprap, ultimately flowing east along the proposed riprap swale (Reach PR63) off-site (Link L500).

Subcatchment PS15 represents the northeast corner of the proposed building, along with the drip edge located on the perimeter of this portion of the building. This area is comprised of building (impervious roof) and stone cover.

Subcatchment PS15 flows off the roof, enters into the drip edge area (Pond DE1) where it flows out of a series of underdrains into the proposed bioswale-ISR system (Pond BR1). From there, stormwater is runs into a catch basin (Pond CB5) and is piped south to the subsurface infiltration system (Pond SI1). At this point stormwater infiltrates into the groundwater. However, in larger storm events, stormwater overflows through an HDPE pipe to the south, into the wetlands (Reach ER73) where it runs southeast, off-site (Link L200).

Subcatchment PS16 represents the northwest corner of the proposed building, along with the drip edge, located on the perimeter of this portion of the building. This area is comprised of building (impervious roof) and stone cover.

Subcatchment PS16 flows off the roof, enters into the drip edge area (Pond DE2) where it flows out of a series of underdrains into the proposed bioswale-ISR system (Pond BR1). From

there, stormwater is runs into a catch basin (Pond CB5) and is piped south to the subsurface infiltration system (Pond SI1). At this point stormwater infiltrates into the groundwater. However, in larger storm events, stormwater overflows through an HDPE pipe to the south, into the wetlands (Reach ER73) where it runs southeast, off-site (Link L200).

Subcatchment PS17 represents the area west of the proposed building. This area is comprised of grass and traditional pavement cover.

Subcatchment PS17 flows into a catch basin centered in the subcatchment (Pond PCB4), continuing to flow east through a series of catch basins and manholes (Ponds PPT3 & PMH1) into the proposed bioswale -ISR system (Pond BR2). From there, stormwater is piped west to the subsurface infiltration system (Pond SI1). At this point stormwater infiltrates into the groundwater. However, in larger storm events, stormwater overflows through an HDPE pipe to the south, into the wetlands (Reach ER73) where it runs southeast, off-site (Link L200).

Subcatchment PS19 represents the southwest corner of the proposed building, along with the drip edge located on the perimeter of this portion of the building. This area is comprised of building (impervious roof) and stone cover.

Subcatchment PS19 flows off the roof, enters into the drip edge (Pond DE3) where it flows out of an underdrain into a catch basin (Pond PPT3). From there, it continues to flow east into a manhole (Pond PMH1) before finally flowing into the bioswale-ISR system (Pond BR2). From there, stormwater is piped west to the subsurface infiltration system (Pond SI1). At this point stormwater infiltrates into the groundwater. However, in larger storm events, stormwater overflows through an HDPE pipe to the south, into the wetlands (Reach ER73) where it runs southeast, off-site (Link L200).

Subcatchment PS20 represents the pavement area at the southwest corner of the proposed building. This area is comprised of grass and traditional pavement cover.

Subcatchment PS20 flows into a catch basin (Pond PPT3). From there, it continues to flow east into a manhole (Pond PMH1) before finally flowing into the bioswale-ISR system (Pond BR2). From there, stormwater is piped west to the subsurface infiltration system (Pond SI1). At this point stormwater infiltrates into the groundwater. However, in larger storm events, stormwater overflows through an HDPE pipe to the south, into the wetlands (Reach ER73) where it runs southeast, off-site (Link L200).

Subcatchment PS22 represents the southeast corner of the proposed building, along with the drip edge located on the perimeter of this portion of the building. This area is comprised of building (impervious roof) and stone cover.

Subcatchment PS22 flows off the roof, enters into the drip edge (Pond DE4) where it flows into the bioswale-ISR system (Pond BR2). From there, stormwater is piped west to the subsurface infiltration system (Pond SI1). At this point stormwater infiltrates into the groundwater. However, in larger storm events, stormwater overflows through an HDPE pipe to the south, into the wetlands (Reach ER73) where it runs southeast, off-site (Link L200).

Subcatchment PS23 represents the bottom portion of the large wetland area in the northwest area of the site, as well as a portion of the loading area on the south side of the building. This area is comprised of grass, woods, and wetlands cover.

Subcatchment PS23 flows southwest along the surface until it reaches the southern edge of the large wetland area in the northwest portion of the site (Reach ER73). It continues to flow southeast, off-site (Link L200).

Subcatchment PS24 represents majority of the southwest portion of Lot 77. This area is comprised of grass, woods and wetlands cover.

Subcatchment PS24 flows southeast along the surface, into the most-westerly wetland finger, located near the Redemption Road entrance, and eventually off-site, southeast at the west-side entrance of the gravel drive (Link L200).

Subcatchment PS25 represents the area southeast of the proposed building on the north side of Redemption Road, where the entrance to the existing gravel drive is. This area is comprised of grass, woods and wetlands cover.

Subcatchment PS25 flows south along the surface where it reaches the southern edge of the large wetland area in the northwest portion of the site. It continues to flow southeast, off-site (Link L200).

Subcatchment PS26 represents the area on the north side of the existing gravel drive entrance, east of the proposed building. This area is comprised of grass, woods and traditional pavement cover.

Subcatchment PS26 flows east along the surface, channelizing in a swale on the north side of Redemption Road. Eventually, flowing south, offsite (Link L500).

Subcatchment PS28 represents the area on the southern-edge of the proposed driveway entrance. This area is comprised of grass and traditional pavement cover.

Subcatchment PS28 flows east along the surface where it will channelize in the swale on the south side of the proposed driveway entrance. The storm-water will continue to flow east, beside the driveway entrance, and into bioswale “A” (Pond PP108). From there, the storm-water will overflow into a catch basin (Pond PCB2), continuing south out of the catch basin through a 12" HDPE pipe, which daylights into riprap, ultimately flowing east along the proposed riprap swale (Reach PR63) off-site (Link L500).

Subcatchment PS29 represents the area south of the proposed driveway entrance, in the area of the proposed bioswale along Redemption Road. This are is comprised of grass, woods and traditional pavement cover.

Subcatchment PS29 flows east along the surface and into bioswale “A” (Pond PP108). From there, the storm-water will overflow into a catch basin (Pond PCB2), continuing south out of the catch basin through a 12" HDPE pipe, which daylights into riprap, ultimately flowing east along the proposed riprap swale (Reach PR63) off-site (Link L500).

Subcatchment PS30 represents the area just southeast of the proposed building. This area is comprised of grass and traditional pavement cover.

Subcatchment PS30 flows mostly into the proposed swale to the south, along the parking lot. From there it flows east into the proposed bioswale-ISR system (Pond BR2). From there, stormwater is piped west to the subsurface infiltration system (Pond SI1). At this point stormwater infiltrates into the groundwater. However, in larger storm events, stormwater overflows through an HDPE pipe to the south, into the wetlands (Reach ER73) where it runs southeast, off-site (Link L200).

The storm-water calculations for the proposed site were modeled with good grass cover, good woodlands, stone cover, impervious gravel cover, porous pavement, and impervious paved parking lot and roof cover. Wetland areas were modeled with their respective Site Specific Soil Survey and cover type. The HydroCAD worksheets outline specific details on the flows and flow conditions.

For exfiltration under the subsurface infiltration system, and bioswale, the infiltration rate was determined using the Default Values method as described in Env-Wq 1504.14(c). A safety factor of two was used.

The proposed development on the site increased the impervious area by +/-87,925 square feet from predevelopment.

The 1-inch Water Quality Volume (WQV), 2-year, 10-year, 25-year, and 50-year twenty four-hour storm events have been modeled to verify the operability of the storm-water management system, to meet state and local regulations, and to ensure adequate freeboard on the storm-water management structures.

The post-development HydroCAD storm-water flow calculations show decreased storm-water peak flows and volumes for the 1-inch, 2-year, 10-year, 25-year, and 50-year storm events for the site.

The storm-water flow summaries are detailed in the HydroCAD calculations showing the net decrease in runoff at each point of discharge. Each point of discharge has been subtotaled to compare the pre-development and post-development discharges from the same geographical areas of the parcel and shown on the Storm-water Summary sheet as Link L100 (west of the site), Link L200 (southwest corner of the site), Link L300 (northeast of the site), Link L400 (northeast of the site, end of Redemption Road roundabout), and Link L500 (southeast of site, north of existing gravel drive entrance).

STORMWATER/DRAINAGE SUMMARY

EMANUEL ENGINEERING, INC.

JOB: 19-020 CFA - TurboCAM

DATE: 2/25/2020

ENGINEER: JJM

PEAK FLOWS FROM HYDROCAD

Subcatchment Area	Storm Quality 1"		2-Year Storm 3.07"		10-Year Storm 4.61"		25-Year Storm 5.83"		50-Year Storm 6.97"	
	Pre (CFS)	Post (CFS)	Pre (CFS)	Post (CFS)	Pre (CFS)	Post (CFS)	Pre (CFS)	Post (CFS)	Pre (CFS)	Post (CFS)
POINTS OF DISCHARGE										
LINK 200L	0.00	0.00	0.05	0.04	0.70	0.52	2.46	1.78	4.75	4.64
LINK 300L	0.00	0.00	0.01	0.01	0.08	0.08	0.34	0.34	0.84	0.84
LINK 400L	0.00	0.00	0.26	0.26	1.21	1.16	2.42	2.02	3.73	3.52
LINK 500L	0.00	0.00	0.13	0.06	0.77	0.38	1.41	0.71	2.01	1.18
FLOW TOTALS (CFS)	**0.00**	**0.00**	**0.45**	**0.37**	**2.76**	**2.14**	**6.63**	**4.85**	**11.33**	**10.18**
Net Increase/(Decrease) (CFS)		**0.00**		**(0.08)**		**(0.62)**		**(1.78)**		**(1.15)**

VOLUMES FROM HYDROCAD

Subcatchment Area	Storm Quality 1"		2-Year Storm 3.07"		10-Year Storm 4.61"		25-Year Storm 5.83"		50-Year Storm 6.97"	
	Pre (AF)	Post (AF)	Pre (AF)	Post (AF)	Pre (AF)	Post (AF)	Pre (AF)	Post (AF)	Pre (AF)	Post (AF)
POINTS OF DISCHARGE										
LINK 200L	0.000	0.000	0.040	0.032	0.262	0.205	0.548	0.465	0.884	0.846
LINK 300L	0.000	0.000	0.003	0.003	0.041	0.041	0.097	0.097	0.163	0.163
LINK 400L	0.000	0.000	0.100	0.052	0.443	0.307	0.788	0.658	1.151	1.027
LINK 500L	0.000	0.000	0.034	0.045	0.106	0.121	0.180	0.191	0.258	0.263
Voume TOTALS (AF)	**0.000**	**0.000**	**0.177**	**0.132**	**0.852**	**0.674**	**1.613**	**1.411**	**2.456**	**2.299**
Net Increase/(Decrease) (AF)		**0.000**		**(0.045)**		**(0.178)**		**(0.202)**		**(0.157)**

STORMWATER ANALYSIS AREA WORKSHEET

EMANUEL ENGINEERING INC.

JOB: 19-020 CFA - TurboCAM
DATE: 2/6/2020
ENGINEER: MCV

PRE DEVELOPMENT DRAINAGE AREAS:

SOIL TYPE	*SOIL GROUP*	*CN#*	***SUBCAT ES1*** *Area (SF)*	***SUBCAT ES3*** *Area (SF)*	***SUBCAT ES4*** *Area (SF)*	***SUBCAT ES5*** *Area (SF)*	***SUBCAT ES6*** *Area (SF)*	***SUBCAT ES7*** *Area (SF)*	***SUBCAT ES9*** *Area (SF)*
Grass	A	39	0	0	0	0	0	0	9,841
	B	61	0	0	0	0	0	0	0
	C	74	0	0	0	0	0	0	0
Woods	A	30	56,403	12,689	9,025	13,071	26,865	0	2,369
	B	55	8,020	0	0	0	3,861	0	13,310
	C	70	36,985	3,241	0	0	26,009	84,458	24,652
Pavement	A	98	0	0	0	0	0	0	5,551
	B	98	0	0	0	0	0	0	0
Total Area (SF)			**101,408**	**15,930**	**9,025**	**13,071**	**56,735**	**84,458**	**55,723**
Total Area (Acres)			**2.33**	**0.37**	**0.21**	**0.30**	**1.30**	**1.94**	**1.28**

Total Impervious (SF)			**0**	**0**	**0**	**0**	**0**	**0**	**5,551**
Impervious (Acres)			**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.00**	**0.13**

SUBCAT ES10 *Area (SF)*	***SUBCAT ES11*** *Area (SF)*	***SUBCAT ES12*** *Area (SF)*	***SUBCAT ES12A*** *Area (SF)*	***SUBCAT ES13*** *Area (SF)*	***SUBCAT ES14*** *Area (SF)*	***SUBCAT ES15*** *Area (SF)*	***SUBCAT ES16*** *Area (SF)*	***TOTAL AREA*** *(SF)*
31,198	9,251	869	8,600	9,045	13,418	0	13,397	**95,619**
0	0	1,648	0	2,932	0	0	0	**4,580**
0	0	0	0	0	0	0	0	**0**
23,985	0	16,115	0	17,458	8,782	43,592	29,498	**259,852**
0	0	1,651	0	0	0	0	0	**26,842**
19,689	4,095	12,250	0	18,383	26,352	27,802	32,875	**316,792**
0	2,085	0	2,121	2,266	5,681	272	0	**17,975**
0	0	0	0	996	0	0	0	**996**
74,872	**15,431**	**32,533**	**10,721**	**51,080**	**54,233**	**71,666**	**75,770**	**722,656**
1.72	**0.35**	**0.75**	**0.25**	**1.17**	**1.25**	**1.65**	**1.74**	**16.59**

0	**2,085**	**0**	**2,121**	**3,262**	**5,681**	**272**	**0**	**18,971**
0.00	**0.05**	**0.00**	**0.05**	**0.07**	**0.13**	**0.01**	**0.00**	**0.44**

STORMWATER ANALYSIS AREA WORKSHEET

EMANUEL ENGINEERING INC.

JOB: 19-020 CFA - TurboCAM
DATE: 2/6/2020
ENGINEER: JJM

POST DEVELOPMENT DRAINAGE AREAS:

SOIL TYPE	*SOIL GROUP*	*CN#*	***SUBCAT PS1*** *Area (SF)*	***SUBCAT PS3*** *Area (SF)*	***SUBCAT PS4*** *Area (SF)*	***SUBCAT PS6*** *Area (SF)*	***SUBCAT PS7*** *Area (SF)*	***SUBCAT PS8*** *Area (SF)*	***SUBCAT PS9*** *Area (SF)*	***SUBCAT PS10*** *Area (SF)*
Grass	A	39	18,898	16,928	1,166	0	8,600	9,841	31,198	9,251
	B	61	3,788	0		0	0	0	0	0
	C	74	0	0	6,755	2,618	0	0	0	0
Woods	A	30	39,435	271		0	0	2,369	23,985	0
	B	55	3,580	0		0	0	13,310	0	0
	C	70	36,257	3,241	21,381	62,199	0	24,652	19,689	4,095
Gravel	A	96	0	0		0	0	0	0	0
	B	96	0	0		0	0	0	0	0
	C	96	0	0		0	0	0	0	0
Pavement	A	98	0	0	5,324	0	2,121	5,551	0	2,085
	B	98	0	0		0	0	0	0	0
	C	98	0	0	4,744	0	0	0	0	0
Buildings	A	98	0	0	1,200	0	0	0	0	0
	B	98	0	0		0	0	0	0	0
	C	98	0	0		0	0	0	0	0
Crushed Stone	A		0	0		0	0	0	0	0
	B		0	0		0	0	0	0	0
	C		0	0		0	0	0	0	0
Total Area (SF)			**101,958**	**20,440**	**40,570**	**64,817**	**10,721**	**55,723**	**74,872**	**15,431**
Area (Acres)			**2.34**	**0.47**	**0.93**	**1.49**	**0.25**	**1.28**	**1.72**	**0.35**

Total Impervious (SF)			**0**	**0**	**11,268**	**0**	**2,121**	**5,551**	**0**	**2,085**
Impervious (Acres)			**0.00**	**0.00**	**0.26**	**0.00**	**0.05**	**0.13**	**0.00**	**0.05**

SUBCAT PS11 *Area (SF)*	***SUBCAT PS12*** *Area (SF)*	***SUBCAT PS13*** *Area (SF)*	***SUBCAT PS14*** *Area (SF)*	***SUBCAT PS15*** *Area (SF)*	***SUBCAT PS16*** *Area (SF)*	***SUBCAT PS17*** *Area (SF)*	***SUBCAT PS19*** *Area (SF)*	***SUBCAT PS20*** *Area (SF)*
9,190	22,740	2,871	0	0	0	1,103		877
1,648	2,934	0	0	0	0	0	0	0
8,273	17,678	14,723	2,277	0	0	0	0	0
8,389	0	0	0	0	0	0	0	0
1,651	0	0	0	0	0	0	0	0
3,977	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0	0
0	3,055	1,307	0	0	0	12,190	0	3,745
0	996	0	0	0	0	0	0	0
0	0	2,321	5,451	0	0	0	0	0
0	0	0	0	0	4,898	0	6,250	0
0	0	0	0	0	0	0	0	0
0	0	0	0	7,785	1,330	0	0	0
0	0	0	0	0	204	0	484	0
0	0	0	0	0	0	0	0	0
0	0	0	0	503	195	0	0	0
33,128	**47,403**	**21,222**	**7,728**	**8,288**	**6,627**	**13,293**	**6,734**	**4,622**
0.76	**1.09**	**0.49**	**0.18**	**0.19**	**0.15**	**0.31**	**0.15**	**0.11**

0	**4,051**	**3,628**	**5,451**	**7,785**	**6,228**	**12,190**	**6,250**	**3,745**
0.00	**0.09**	**0.08**	**0.13**	**0.18**	**0.14**	**0.28**	**0.14**	**0.09**

SUBCAT PS22 *Area (SF)*	***SUBCAT PS23*** *Area (SF)*	***SUBCAT PS24*** *Area (SF)*	***SUBCAT PS25*** *Area (SF)*	***SUBCAT PS26*** *Area (SF)*	***SUBCAT PS28*** *Area (SF)*	***SUBCAT PS29*** *Area (SF)*	***SUBCAT PS30*** *Area (SF)*	***TOTAL AREA*** *(SF)*
0	4,828	13,397	15,044	9,291	2,867	3,827	5,352	**187,269**
0	2,502	0	0	0	0	0		**10,872**
	0	0	0	179	1,387	0	4,610	**58,500**
0	603	29,498	8,960	701	0	2,526	0	**116,737**
0	2,009	0	0	0	0	0	0	**20,550**
0	3,393	32,875	4,533	2,046	0	1,627	0	**219,965**
0	0	0	1,441	0	0	0	0	**1,441**
0	0	0	0	0	0	0	0	**0**
0	0	0	0	0	0	0	0	**0**
0	0	0	302	4,077	1,756	2,293	11,054	**54,860**
0	0	0	0	0	0	0	0	**996**
0	0	0	0	0	3,689	0	5,681	**21,886**
103	0	0	0	0	0	0	0	**12,451**
0	0	0	0	0	0	0	0	**0**
6,147	0	0	0	0	0	0	0	**15,262**
0	0	0	0	0	0	0	0	**688**
0	0	0	0	0	0	0	0	**0**
480	0	0	0	0	0	0	0	**1,178**
6,730	**13,335**	**75,770**	**30,280**	**16,294**	**9,699**	**10,273**	**26,697**	**722,655**
0.15	**0.31**	**1.74**	**0.70**	**0.37**	**0.22**	**0.24**	**0.61**	**16.59**

6,250	**0**	**0**	**1,743**	**4,077**	**5,445**	**2,293**	**16,735**	**106,896**
0.14	**0.00**	**0.00**	**0.04**	**0.09**	**0.13**	**0.05**	**0.38**	**2.45**

Surface Water Impairments

Legend

- Surface Waters with Impairn 2016 with Quarter Mile Buffe
- Watersheds with Chloride Impairments 2016
- Parcels - polygons

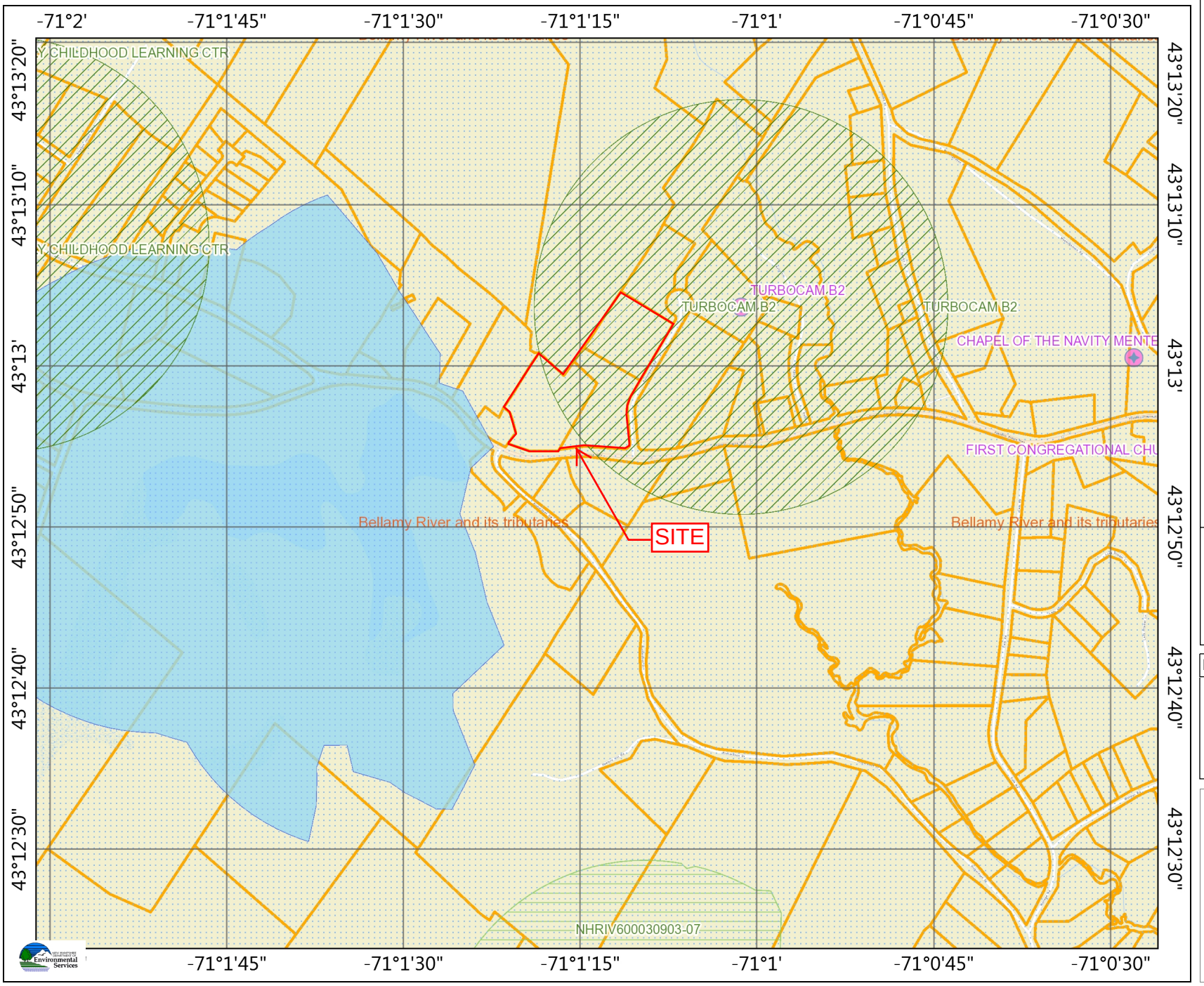
Map Scale

1: 10,000

Map Generated: 5/3/2019

Notes

AoT Screening Layers



Legend

- Coastal and Great Bay Regi Communities
- Designated Rivers Quarterm Buffer
- Public Water Supply Wells
- Groundwater Classification A GA1
- Groundwater Classification A GA2
- Water Supply Intake Protect Areas
- Wellhead Protection Areas
- Lakes with a Quarter Mile Bu
- All Features
- All Lakes, with a Quarter Mil Buffer
- Outstanding Resource Wate Watersheds
- Surface Waters with Impairm 2016 with Quarter Mile Buffe
- Watersheds with Chloride Impairments 2016
- Parcels - polygons

Map Scale

1: 10,000

Map Generated: 5/3/2019

Notes

CONFIDENTIAL – NH Dept. of Environmental Services review

Memo

NH Natural Heritage Bureau
NHB Datacheck Results Letter

To: Jonathan MacBride, Emanuel Engineering, Inc.
118 Portsmouth Avenue
Stratham, NH 03885

From: Amy Lamb, NH Natural Heritage Bureau
Date: 9/9/2019 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau
NHB File ID: NHB19-2805 Town: Barrington Location: Tax Maps: Map 233 Lot 77 & Map 244 Lots 1.2, 1.4, 1.5, and 1.6
Description: Construct a 100'x250' light industrial building with associate drainage, porous pavement, utilities, septic, etc.
cc: Kim Tuttle

As requested, I have searched our database for records of rare species and exemplary natural communities, with the following results.

Comments: Contact NHB if there will be impacts to wetlands as a result of this project. If no wetland impacts are proposed, then NHB has no concerns about the proposal. Contact the NH Fish & Game Department to address wildlife concerns.

Plant species	State[1]	Federal	Notes
dwarf huckleberry (*Gaylussacia bigeloviana*)	T	--	The primary threats are changes to this species' peatland habitat, including changes to local hydrology, increased nutrient input from stormwater runoff, and sedimentation from nearby disturbance.

Vertebrate species	State[1]	Federal	Notes
Blanding's Turtle (*Emydoidea blandingii*)	E	--	Contact the NH Fish & Game Dept (see below).

[1]Codes: "E" = Endangered, "T" = Threatened, "SC" = Special Concern, "--" = an exemplary natural community, or a rare species tracked by NH Natural Heritage that has not yet been added to the official state list. An asterisk (*) indicates that the most recent report for that occurrence was more than 20 years ago.

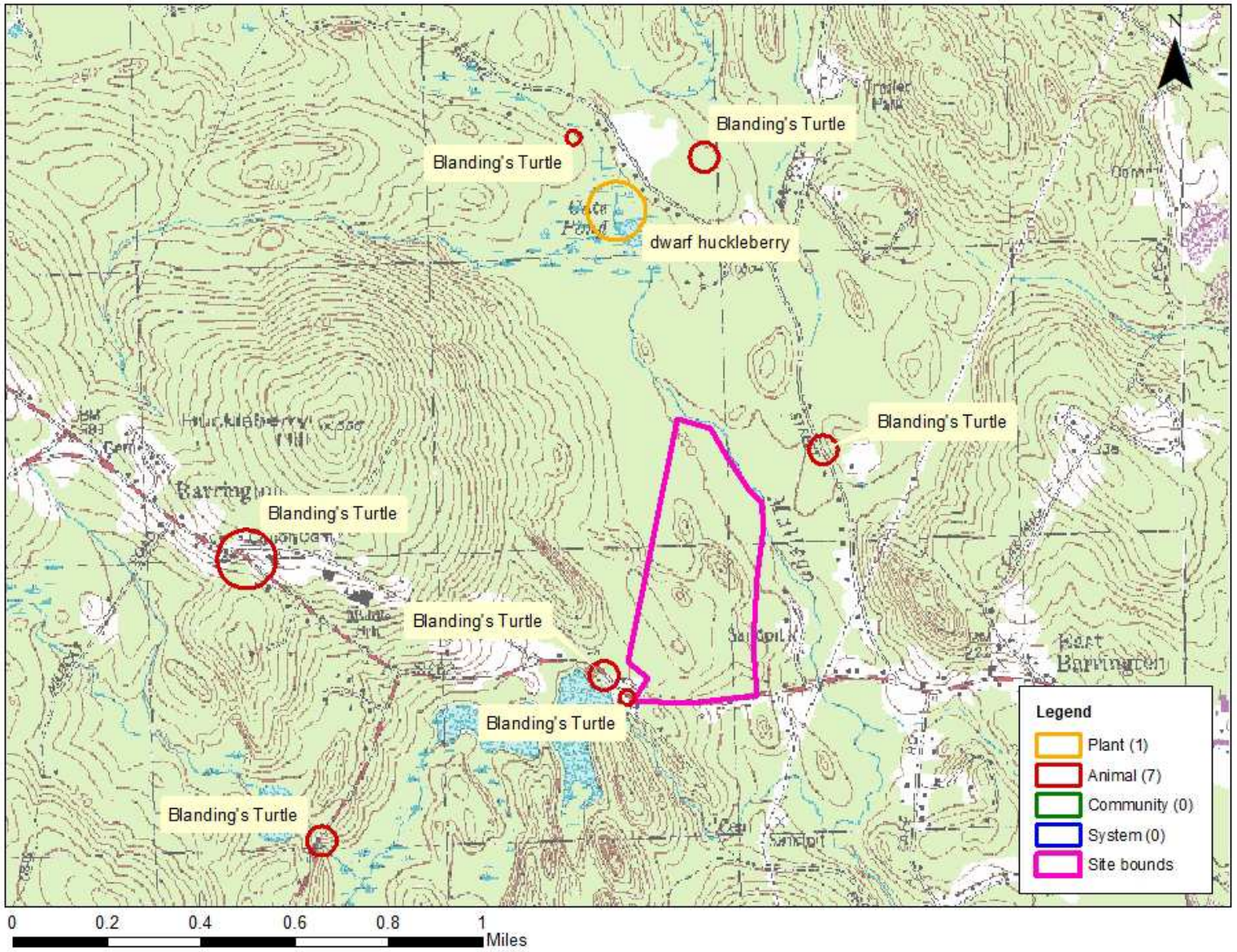
Contact for all animal reviews: Kim Tuttle, NH F&G, (603) 271-6544.

A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. An on-site survey would provide better information on what species and communities are indeed present.

Department of Natural and Cultural Resources
Division of Forests and Lands
(603) 271-2214 fax: 271-6488

DNCR/NHB
172 Pembroke Rd.
Concord, NH 03301

NHB19-2805


Blanding's Turtle
Blanding's Turtle
dwarf huckleberry
Blanding's Turtle
Blanding's Turtle
Blanding's Turtle
Blanding's Turtle
Blanding's Turtle
Legend
Plant (1)
Animal (7)
Community (0)
System (0)
Site bounds
0
0.2
0.4
0.6
0.8
1
Miles

New Hampshire Natural Heritage Bureau - Plant Record

dwarf huckleberry (*Gaylussacia bigeloviana*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Threatened	State:	Imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank:	Fair quality, condition and/or landscape context ('C' on a scale of A-D).
Comments on Rank:	Single individual documented.
Detailed Description:	2007: One shrub with 7 stems, averaging 35 cm in height.2002: Searched for but not found. 1962: Specimen collected.
General Area:	2007: 27+ associated species identified. Invasive species: *Frangula alnus* (alder-buckthorn).1962: Bog.
General Comments:	2002: Cate's Pond is behind private homes. The pond edge contains thick 6-7 ft high shrubs, very hard to get to water edge. Next surveyors should enter the pond from north end, following the brook. Look in September. (fruits=hairy).
Management Comments:	

Location

Survey Site Name: Cate Pond
Managed By:

County: Strafford
Town(s): Barrington
Size: 7.7 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2007: Go west on Rte. 9 from E. Barrington to Smoke. St. Turn north on Smoke St. Park at ball field parking lot. Walk SE through woods to Cates Pond edge (43.23023N 71.02295W).2002: Enter the pond from the north end, following the brook.1962: In bog at north end of Cates Pond. From East Barrington, go west on Rte. 9, take right on Smoke St, about 1 mile up road. Pond is on the left.

Dates documented

First reported: 1962-06-25 Last reported: 2007-09-12

New Hampshire Natural Heritage Bureau - Animal Record

Blanding's Turtle (*Emydoidea blandingii*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2000: Area 561: 1 turtle.
General Area:
General Comments: 2000: Area 561: Shell fragments were found in woods adjacent to Young Road at stream crossing.
Management Comments:

Location

Survey Site Name: Swains Lake
Managed By:

County: Strafford
Town(s): Barrington
Size: 1.9 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2000: Area 561: Stream crossing at Young Road.

Dates documented

First reported:	2000-07-06	Last reported:	2000-07-06

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Blanding's Turtle (*Emydoidea blandingii*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2006: Area 11698: 1 adult seen.
General Area: 2006: Area 11698: Sandy roadside.
General Comments:
Management Comments:

Location

Survey Site Name: Swains Lake
Managed By:

County: Strafford
Town(s): Barrington
Size: 7.7 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2006: Area 11698: Route 9 across from Province Lane on road with sandy edges.

Dates documented

First reported: 2006-05-18 Last reported: 2006-05-18

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Blanding's Turtle (*Emydoidea blandingii*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2010: Area 12755: 1 adult female observed injured on road.
General Area: 2010: Area 12755: Crossing road next to pond.
General Comments: 2010: Area 12755: Turtle was sent to rehab after injury.
Management Comments:

Location

Survey Site Name: Swains Lake
Managed By: Goodwill

County: Strafford
Town(s): Barrington
Size: 1.9 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2010: Area 12755: Rte. 9 at Richardson Pond, Barrington.

Dates documented

First reported:	2010-07-19	Last reported:	2010-07-19

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Blanding's Turtle (*Emydoidea blandingii*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2012: Area 13046: 2 adult females observed, nesting.
General Area: 2012: Area 13046: Sand piles in town maintenance area.
General Comments: 2012: Area 13046: "The piles have been there for many years. It is dirt/sand with chunks of asphalt and rocks. Some of the hills have a good amount of growth on them. I believe it is dumped there by the road maintenance people but I am not sure. The hills are not identical year after year, and there are makeshift paths for driving trucks up and around the hills. The turtle nest is destroyed. The town must have dug up the area where the nest was and some other areas at the site."
Management Comments:

Location

Survey Site Name: Scruton Pond
Managed By: Town of Barrington Land

County: Strafford
Town(s): Barrington
Size: 1.9 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2012: Area 13046: From Rte. 9 in Barrington, turn onto Smoke Street (across from Barrington Public Safety Building) and go past the town transfer station. BYA baseball fields are after the transfer station on the right. Turn into the parking lot and follow the driveway to the right all the way to the back. The T-ball fields will be on your left and the dirt piles on your right.

Dates documented

First reported: 2012-06-07 Last reported: 2012-06-07

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Blanding's Turtle (*Emydoidea blandingii*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2013: Area 13421: 1 adult observed, sex unknown.
General Area: 2013: Area 13421: Roadside, coniferous forest.
General Comments:
Management Comments:

Location

Survey Site Name: Swains Lake
Managed By: Goodwill

County: Strafford
Town(s): Barrington
Size: .4 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2013: Area 13421: Route 9, Barrington at the parking entrance to the Goodwill Conservation Area.

Dates documented

First reported:	2013-06-08	Last reported:	2013-06-08

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Blanding's Turtle (*Emydoidea blandingii*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2015: Area 14043: 1 adult female observed, laying eggs.
General Area: 2015: Area 14043: Sandy residential driveway. Surrounded by wetlands, pond, and forest.
General Comments:
Management Comments:

Location

Survey Site Name: Scruton Pond
Managed By:

County: Strafford
Town(s): Barrington
Size: .4 acres
Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2015: Area 14043: 16 Chrissy Circle, Barrington.

Dates documented

First reported:	2015-06-18	Last reported:	2015-06-18

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

New Hampshire Natural Heritage Bureau - Animal Record

Blanding's Turtle (*Emydoidea blandingii*)

Legal Status		Conservation Status	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	Listed Endangered	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2015: Area 14088: 1 adult female observed.
General Area: 2015: Area 14088: Roadside near construction zone.
General Comments:
Management Comments:

Location

Survey Site Name: Scruton Pond
Managed By:

County: Strafford
Town(s): Barrington
Size: 1.9 acres Elevation:

Precision: Within (but not necessarily restricted to) the area indicated on the map.

Directions: 2015: Area 14088: Smoke Street, Barrington.

Dates documented

First reported: 2015-06-09 Last reported: 2015-06-09

The New Hampshire Fish & Game Department has jurisdiction over rare wildlife in New Hampshire. Please contact them at 11 Hazen Drive, Concord, NH 03301 or at (603) 271-2461.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for Strafford County, New Hampshire

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (https://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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Contents

How Soil Surveys Are Made

Soil surveys are made to provide information about the soils and miscellaneous areas in a specific area. They include a description of the soils and miscellaneous areas and their location on the landscape and tables that show soil properties and limitations affecting various uses. Soil scientists observed the steepness, length, and shape of the slopes; the general pattern of drainage; the kinds of crops and native plants; and the kinds of bedrock. They observed and described many soil profiles. A soil profile is the sequence of natural layers, or horizons, in a soil. The profile extends from the surface down into the unconsolidated material in which the soil formed or from the surface down to bedrock. The unconsolidated material is devoid of roots and other living organisms and has not been changed by other biological activity.

Currently, soils are mapped according to the boundaries of major land resource areas (MLRAs). MLRAs are geographically associated land resource units that share common characteristics related to physiography, geology, climate, water resources, soils, biological resources, and land uses (USDA, 2006). Soil survey areas typically consist of parts of one or more MLRA.

The soils and miscellaneous areas in a survey area occur in an orderly pattern that is related to the geology, landforms, relief, climate, and natural vegetation of the area. Each kind of soil and miscellaneous area is associated with a particular kind of landform or with a segment of the landform. By observing the soils and miscellaneous areas in the survey area and relating their position to specific segments of the landform, a soil scientist develops a concept, or model, of how they were formed. Thus, during mapping, this model enables the soil scientist to predict with a considerable degree of accuracy the kind of soil or miscellaneous area at a specific location on the landscape.

Commonly, individual soils on the landscape merge into one another as their characteristics gradually change. To construct an accurate soil map, however, soil scientists must determine the boundaries between the soils. They can observe only a limited number of soil profiles. Nevertheless, these observations, supplemented by an understanding of the soil-vegetation-landscape relationship, are sufficient to verify predictions of the kinds of soil in an area and to determine the boundaries.

Soil scientists recorded the characteristics of the soil profiles that they studied. They noted soil color, texture, size and shape of soil aggregates, kind and amount of rock fragments, distribution of plant roots, reaction, and other features that enable them to identify soils. After describing the soils in the survey area and determining their properties, the soil scientists assigned the soils to taxonomic classes (units). Taxonomic classes are concepts. Each taxonomic class has a set of soil characteristics with precisely defined limits. The classes are used as a basis for comparison to classify soils systematically. Soil taxonomy, the system of taxonomic classification used in the United States, is based mainly on the kind and character of soil properties and the arrangement of horizons within the profile. After the soil

scientists classified and named the soils in the survey area, they compared the individual soils with similar soils in the same taxonomic class in other areas so that they could confirm data and assemble additional data based on experience and research.

The objective of soil mapping is not to delineate pure map unit components; the objective is to separate the landscape into landforms or landform segments that have similar use and management requirements. Each map unit is defined by a unique combination of soil components and/or miscellaneous areas in predictable proportions. Some components may be highly contrasting to the other components of the map unit. The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The delineation of such landforms and landform segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, onsite investigation is needed to define and locate the soils and miscellaneous areas.

Soil scientists make many field observations in the process of producing a soil map. The frequency of observation is dependent upon several factors, including scale of mapping, intensity of mapping, design of map units, complexity of the landscape, and experience of the soil scientist. Observations are made to test and refine the soil-landscape model and predictions and to verify the classification of the soils at specific locations. Once the soil-landscape model is refined, a significantly smaller number of measurements of individual soil properties are made and recorded. These measurements may include field measurements, such as those for color, depth to bedrock, and texture, and laboratory measurements, such as those for content of sand, silt, clay, salt, and other components. Properties of each soil typically vary from one point to another across the landscape.

Observations for map unit components are aggregated to develop ranges of characteristics for the components. The aggregated values are presented. Direct measurements do not exist for every property presented for every map unit component. Values for some properties are estimated from combinations of other properties.

While a soil survey is in progress, samples of some of the soils in the area generally are collected for laboratory analyses and for engineering tests. Soil scientists interpret the data from these analyses and tests as well as the field-observed characteristics and the soil properties to determine the expected behavior of the soils under different uses. Interpretations for all of the soils are field tested through observation of the soils in different uses and under different levels of management. Some interpretations are modified to fit local conditions, and some new interpretations are developed to meet local needs. Data are assembled from other sources, such as research information, production records, and field experience of specialists. For example, data on crop yields under defined levels of management are assembled from farm records and from field or plot experiments on the same kinds of soil.

Predictions about soil behavior are based not only on soil properties but also on such variables as climate and biological activity. Soil conditions are predictable over long periods of time, but they are not predictable from year to year. For example, soil scientists can predict with a fairly high degree of accuracy that a given soil will have a high water table within certain depths in most years, but they cannot predict that a high water table will always be at a specific level in the soil on a specific date.

After soil scientists located and identified the significant natural bodies of soil in the survey area, they drew the boundaries of these bodies on aerial photographs and

identified each as a specific map unit. Aerial photographs show trees, buildings, fields, roads, and rivers, all of which help in locating boundaries accurately.

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.

Map Scale: 1:4,560 if printed on A portrait (8.5" x 11") sheet.

N

Meters
0 50 100 200 300

Feet
0 200 400 800 1200

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: Strafford County, New Hampshire
Survey Area Data: Version 18, Sep 5, 2018

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

Date(s) aerial images were photographed: Aug 28, 2015—May 15, 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
GlB	Gloucester fine sandy loam, 3 to 8 percent slopes	1.7	3.1%
HaB	Hinckley loamy sand, 3 to 8 percent slopes	15.3	28.5%
HaC	Hinckley loamy sand, 8 to 15 percent slopes	9.6	17.9%
HbE	Hinckley loamy sand, 15 to 60 percent slopes	15.9	29.8%
HgB	Hollis-Gloucester very rocky fine sandy loams, 3 to 8 percent slopes	1.7	3.1%
LrB	Leicester-Ridgebury fine sandy loams, 3 to 8 percent slopes, very stony	4.8	9.0%
Mp	Freetown and Swansea mucky peats, 0 to 2 percent slopes	2.7	5.1%
Sb	Saugatuck loamy sand	1.9	3.5%
Totals for Area of Interest		**53.5**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas

are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

Strafford County, New Hampshire

GIB—Gloucester fine sandy loam, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9d73
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Gloucester and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Gloucester

Setting

Parent material: Till

Typical profile

H1 - 0 to 14 inches: fine sandy loam
H2 - 14 to 28 inches: very gravelly loamy sand
H3 - 28 to 40 inches: very gravelly coarse sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 2s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Acton

Percent of map unit: 5 percent
Hydric soil rating: No

Hollis

Percent of map unit: 5 percent
Hydric soil rating: No

Not named pan

Percent of map unit: 5 percent
Hydric soil rating: No

HaB—Hinckley loamy sand, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2svm8
Elevation: 0 to 1,430 feet
Mean annual precipitation: 36 to 53 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 250 days
Farmland classification: Not prime farmland

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Kames, outwash terraces, outwash deltas, outwash plains, eskers, moraines, kame terraces
Landform position (two-dimensional): Summit, backslope, footslope, shoulder
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, riser, tread
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 3 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Very low (about 3.0 inches)

Interpretive groups

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

Minor Components

Windsor

Percent of map unit: 8 percent
Landform: Kames, eskers, moraines, outwash terraces, outwash deltas, kame terraces, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, riser, tread
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Outwash terraces, outwash deltas, kame terraces, outwash plains, moraines
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Side slope, base slope, head slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

Agawam

Percent of map unit: 2 percent
Landform: Kames, eskers, moraines, outwash terraces, outwash deltas, kame terraces, outwash plains
Landform position (two-dimensional): Summit, shoulder, backslope, footslope
Landform position (three-dimensional): Nose slope, side slope, base slope, crest, riser, tread
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

HaC—Hinckley loamy sand, 8 to 15 percent slopes

Map Unit Setting

National map unit symbol: 2svm9
Elevation: 0 to 1,480 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Kames, eskers, moraines, outwash terraces, outwash deltas, kame terraces, outwash plains
Landform position (two-dimensional): Shoulder, toeslope, footslope, backslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser
Down-slope shape: Linear, concave, convex
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 8 to 15 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 4e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Merrimac

Percent of map unit: 5 percent
Landform: Kames, eskers, moraines, outwash terraces, outwash plains
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Side slope, crest, head slope, nose slope, riser
Down-slope shape: Convex
Across-slope shape: Convex
Hydric soil rating: No

Windsor

Percent of map unit: 5 percent
Landform: Kames, eskers, moraines, kame terraces, outwash plains, outwash terraces, outwash deltas
Landform position (two-dimensional): Shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Nose slope, side slope, crest, head slope, riser
Down-slope shape: Linear, concave, convex
Across-slope shape: Convex, linear, concave
Hydric soil rating: No

Sudbury

Percent of map unit: 5 percent
Landform: Kame terraces, outwash plains, moraines, outwash deltas, outwash terraces
Landform position (two-dimensional): Backslope, footslope
Landform position (three-dimensional): Base slope, tread
Down-slope shape: Concave, linear
Across-slope shape: Linear, concave
Hydric soil rating: No

HbE—Hinckley loamy sand, 15 to 60 percent slopes

Map Unit Setting

National map unit symbol: 2svmh
Elevation: 0 to 890 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hinckley and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hinckley

Setting

Landform: Eskers, moraines, outwash terraces, outwash deltas, kame terraces, outwash plains, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Crest, nose slope, side slope, head slope, riser
Down-slope shape: Linear, convex, concave
Across-slope shape: Convex, linear, concave
Parent material: Sandy and gravelly glaciofluvial deposits derived from gneiss and/or granite and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 8 inches: loamy sand
Bw1 - 8 to 11 inches: gravelly loamy sand
Bw2 - 11 to 16 inches: gravelly loamy sand
BC - 16 to 19 inches: very gravelly loamy sand
C - 19 to 65 inches: very gravelly sand

Properties and qualities

Slope: 15 to 60 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to very high (1.42 to 99.90 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Windsor

Percent of map unit: 10 percent
Landform: Moraines, outwash terraces, outwash plains, outwash deltas, kame terraces, kames, eskers
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, crest, nose slope, head slope, riser
Down-slope shape: Convex, linear, concave
Across-slope shape: Linear, convex, concave
Hydric soil rating: No

Merrimac

Percent of map unit: 5 percent
Landform: Eskers, moraines, outwash terraces, outwash plains, kames
Landform position (two-dimensional): Backslope
Landform position (three-dimensional): Side slope, head slope, crest, nose slope, riser
Down-slope shape: Concave, linear, convex
Across-slope shape: Linear, convex, concave
Hydric soil rating: No

HgB—Hollis-Gloucester very rocky fine sandy loams, 3 to 8 percent slopes

Map Unit Setting

National map unit symbol: 9d7v
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 140 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Hollis and similar soils: 50 percent
Gloucester and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Hollis

Setting

Parent material: Till

Typical profile

H1 - 0 to 14 inches: very stony fine sandy loam
H2 - 14 to 18 inches: bedrock

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 10 to 20 inches to lithic bedrock
Natural drainage class: Well drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 6.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 2.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Hydric soil rating: No

Description of Gloucester

Setting

Parent material: Till

Typical profile

H1 - 0 to 14 inches: very stony fine sandy loam

H2 - 14 to 28 inches: very gravelly loamy sand
H3 - 28 to 40 inches: very gravelly coarse sand

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (6.00 to 20.00 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Low (about 3.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: A
Hydric soil rating: No

Minor Components

Rock outcrop

Percent of map unit: 10 percent
Hydric soil rating: No

Not named

Percent of map unit: 5 percent
Hydric soil rating: No

Acton

Percent of map unit: 3 percent
Hydric soil rating: No

Leicester

Percent of map unit: 2 percent
Landform: Depressions
Hydric soil rating: Yes

LrB—Leicester-Ridgebury fine sandy loams, 3 to 8 percent slopes, very stony

Map Unit Setting

National map unit symbol: 2xffs
Elevation: 100 to 1,160 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days

Farmland classification: Not prime farmland

Map Unit Composition

Leicester, very stony, and similar soils: 60 percent
Ridgebury, very stony, and similar soils: 30 percent
Minor components: 10 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Leicester, Very Stony

Setting

Landform: Ground moraines, drainageways, hills, depressions
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave, linear
Across-slope shape: Concave
Parent material: Coarse-loamy melt-out till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 7 inches: fine sandy loam
Bg - 7 to 18 inches: fine sandy loam
BC - 18 to 24 inches: fine sandy loam
C1 - 24 to 39 inches: gravelly fine sandy loam
C2 - 39 to 65 inches: gravelly fine sandy loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Description of Ridgebury, Very Stony

Setting

Landform: Drumlins, depressions, drainageways, hills, ground moraines
Landform position (two-dimensional): Toeslope, footslope
Landform position (three-dimensional): Base slope, head slope
Down-slope shape: Concave
Across-slope shape: Concave

Parent material: Coarse-loamy lodgment till derived from gneiss, granite, and/or schist

Typical profile

Oe - 0 to 1 inches: moderately decomposed plant material
A - 1 to 6 inches: fine sandy loam
Bw - 6 to 10 inches: sandy loam
Bg - 10 to 19 inches: gravelly sandy loam
Cd - 19 to 66 inches: gravelly sandy loam

Properties and qualities

Slope: 3 to 8 percent
Percent of area covered with surface fragments: 1.6 percent
Depth to restrictive feature: 15 to 35 inches to densic material
Natural drainage class: Poorly drained
Runoff class: Very high
Capacity of the most limiting layer to transmit water (Ksat): Very low to moderately low (0.00 to 0.14 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: None
Salinity, maximum in profile: Nonsaline (0.0 to 1.9 mmhos/cm)
Available water storage in profile: Low (about 3.0 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6s
Hydrologic Soil Group: D
Hydric soil rating: Yes

Minor Components

Woodbridge, very stony

Percent of map unit: 5 percent
Landform: Ground moraines, drumlins, hills
Landform position (two-dimensional): Summit, backslope, footslope
Landform position (three-dimensional): Side slope, crest
Down-slope shape: Convex
Across-slope shape: Linear
Hydric soil rating: No

Walpole

Percent of map unit: 3 percent
Landform: Outwash terraces, drainageways, depressions
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman, very stony

Percent of map unit: 2 percent
Landform: Hills, ground moraines, drumlins, depressions, drainageways
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Mp—Freetown and Swansea mucky peats, 0 to 2 percent slopes

Map Unit Setting

National map unit symbol: 2w68w
Elevation: 10 to 940 feet
Mean annual precipitation: 36 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 145 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Freetown and similar soils: 50 percent
Swansea and similar soils: 30 percent
Minor components: 20 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Freetown

Setting

Landform: Marshes, kettles, depressions, swamps, bogs
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Moderately decomposed organic material

Typical profile

Oe1 - 0 to 2 inches: mucky peat
Oe2 - 2 to 79 inches: mucky peat

Properties and qualities

Slope: 0 to 2 percent
Percent of area covered with surface fragments: 0.0 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: Very high (about 20.3 inches)

Interpretive groups

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

Description of Swansea

Setting

Landform: Kettles, swamps, bogs, depressions, marshes
Down-slope shape: Concave
Across-slope shape: Concave
Parent material: Moderately decomposed organic material over sandy and gravelly glaciofluvial deposits

Typical profile

Oe1 - 0 to 12 inches: mucky peat
Oe2 - 12 to 25 inches: mucky peat
Cg - 25 to 79 inches: sand

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Very poorly drained
Runoff class: Negligible
Capacity of the most limiting layer to transmit water (Ksat): Moderately low to high (0.14 to 14.17 in/hr)
Depth to water table: About 0 to 6 inches
Frequency of flooding: None
Frequency of ponding: Frequent
Available water storage in profile: High (about 11.7 inches)

Interpretive groups

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

Minor Components

Natchaug

Percent of map unit: 10 percent
Landform: Depressions, depressions, depressions
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Scarboro

Percent of map unit: 4 percent
Landform: Depressions, outwash deltas, drainageways, outwash terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Whitman

Percent of map unit: 4 percent
Landform: Hills, depressions
Landform position (two-dimensional): Toeslope
Landform position (three-dimensional): Base slope
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Maybid

Percent of map unit: 2 percent
Landform: Marine terraces
Landform position (three-dimensional): Tread
Down-slope shape: Concave
Across-slope shape: Concave
Hydric soil rating: Yes

Sb—Saugatuck loamy sand

Map Unit Setting

National map unit symbol: 9d8r
Elevation: 300 to 1,000 feet
Mean annual precipitation: 27 to 71 inches
Mean annual air temperature: 39 to 55 degrees F
Frost-free period: 125 to 240 days
Farmland classification: Not prime farmland

Map Unit Composition

Saugatuck and similar soils: 85 percent
Minor components: 15 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Saugatuck

Setting

Landform: Outwash terraces
Parent material: Outwash

Typical profile

H1 - 0 to 4 inches: loamy sand
H2 - 4 to 7 inches: sand
H3 - 7 to 26 inches: loamy sand
H4 - 26 to 42 inches: sand

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: 10 to 16 inches to undefined
Natural drainage class: Poorly drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.60 to 2.00 in/hr)
Depth to water table: About 0 to 12 inches
Frequency of flooding: None
Frequency of ponding: None
Available water storage in profile: Very low (about 1.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified

Land capability classification (nonirrigated): 4w
Hydrologic Soil Group: B/D
Hydric soil rating: Yes

Minor Components

Not named wet
Percent of map unit: 15 percent
Landform: Outwash terraces
Hydric soil rating: Yes

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bing maps

Notes

Project: TurboCAM International
Job#: 19-020
Location: Barrington, NH
Date: 05-06-19
Scale: 1"=2000'

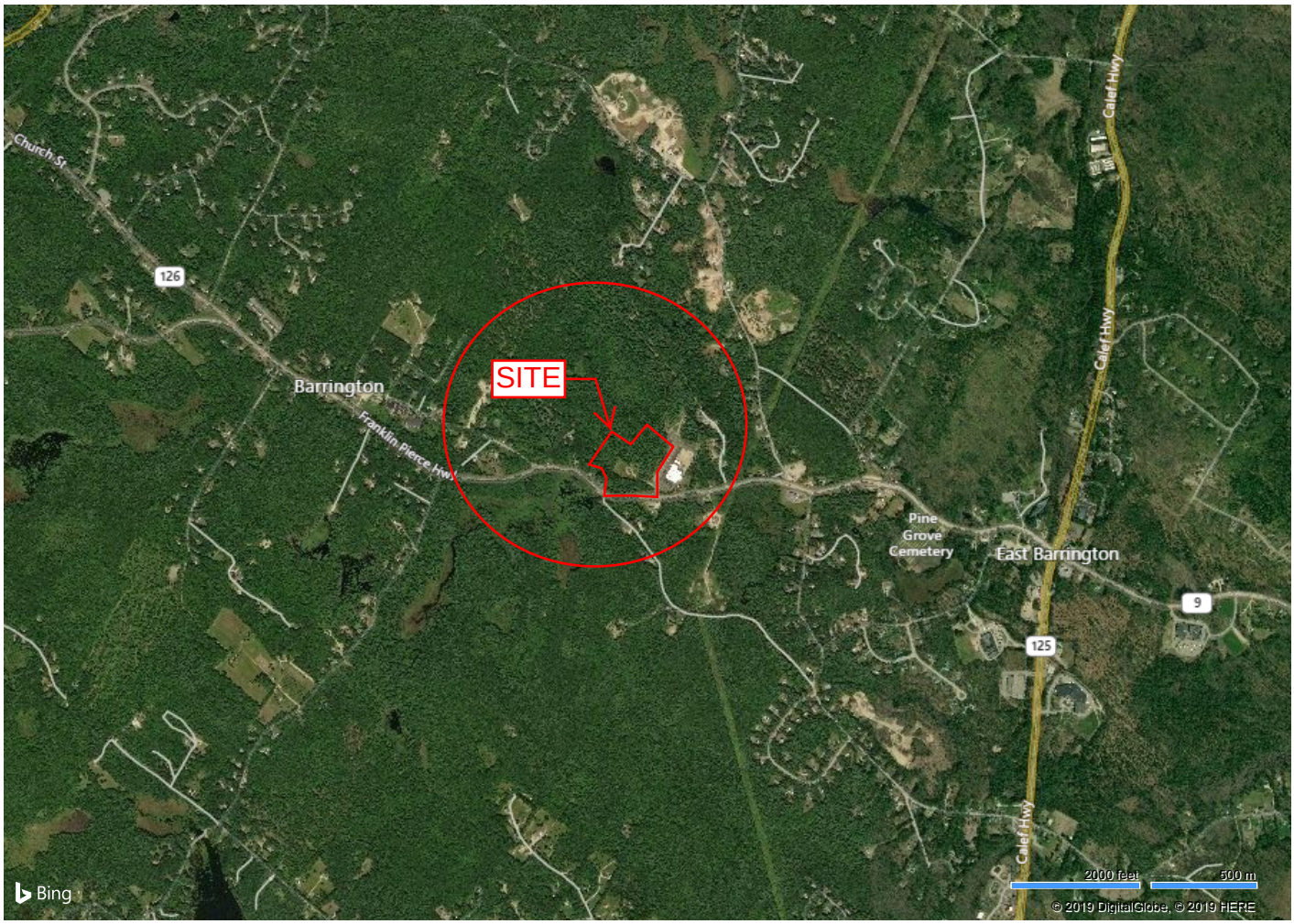



Photo taken on northeast side of gravel loop facing east


Photo taken on northeast side of gravel loop facing northwest


Photo taken on northeast side of gravel loop facing southeast


Photo taken on northeast side of gravel loop facing east


Photo taken on northside of gravel loop facing southwest


Photo taken on north side of gravel loop facing west


Photo taken on north side of loop facing southeast towards entrance

Groundwater Recharge Volume (GRV) Calculation

1.18	ac	Area of HSG A soil that was replaced by impervious cover	0.40"
-	ac	Area of HSG B soil that was replaced by impervious cover	0.25"
0.88	ac	Area of HSG C soil that was replaced by impervious cover	0.10"
-	ac	Area of HSG D soil or impervious cover that was replaced by impervious cover	0.0"
0.27	inches	Rd = weighted groundwater recharge depth	
0.5603	ac-in	GRV = AI * Rd	
2,034	cf	GRV conversion (ac-in x 43,560 sf/ac x 1ft/12")	

Provide calculations below showing that the project meets the groundwater recharge requirements (Env-Wq 1507.04):

Per HydroCAD calculations, the following volumes were recharged:

Storm event:	Volume:
2-year Storm	13,591 cf (3.744 ac-in)

All storm events greater than a 2-year storm exceed the 2,034 cubic feet of groundwater recharge.

FILTRATION PRACTICE DESIGN CRITERIA
(Env-Wq 1508.07)

Type/Node Name: **Bioswale "A" (Node PP108)**

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable

Yes		Have you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.07(a)?	
0.64	ac	A = Area draining to the practice	
0.30	ac	A_I = Impervious area draining to the practice	
0.48	decimal	I = percent impervious area draining to the practice, in decimal form	
0.48	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.30	ac-in	WQV= 1" x Rv x A	
1,105	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
276	cf	25% x WQV (check calc for sediment forebay volume)	
828	cf	75% x WQV (check calc for surface sand filter volume)	
Stone Forebay		Method of Pretreatment? (not required for clean or roof runoff)	
378	cf	V_{SED} = sediment forebay volume, if used for pretreatment	← ≥ 25%WQV
920	sf	A_{SA} = surface area of the practice	
N/A	iph	$Ksat_{DESIGN}$ = design infiltration rate[1]	
Yes	Yes/No	If Ksat (prior to factor of safety) is < 0.50 iph, has an underdrain been provided?	
-	hours	T_{DRAIN} = drain time = V / (A_{SA} * I_{DESIGN})	← ≤ 72-hrs
212.80	feet	E_{FC} = elevation of the bottom of the filter course material[2]	
211.80	feet	E_{UD} = invert elevation of the underdrain (UD), if applicable	
217.00	feet	E_{SHWT} = elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
215.42	feet	E_{ROCK} = elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
1.00	feet	$D_{FC\ to\ UD}$ = depth to UD from the bottom of the filter course	← ≥ 1'
(2.62)	feet	$D_{FC\ to\ ROCK}$ = depth to bedrock from the bottom of the filter course	← ≥ 1'
(4.20)	feet	$D_{FC\ to\ SHWT}$ = depth to SHWT from the bottom of the filter course	← ≥ 1'
216.43	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
217.80	ft	Elevation of the top of the practice	
YES		50 peak elevation ≤ Elevation of the top of the practice	← yes

If a surface sand filter or underground sand filter is proposed:

YES	ac	Drainage Area check.	← < 10 ac
	cf	V = volume of storage[3] (attach a stage-storage table)	← ≥ 75%WQV
	inches	D_{FC} = filter course thickness	← 18", or 24" if within GPA
Sheet		Note what sheet in the plan set contains the filter course specification	
	Yes/No	Access grate provided?	← yes

If a bioretention area is proposed:

YES	ac	Drainage Area no larger than 5 ac?	← **yes**
3,982	cf	V = volume of storage[3] (attach a stage-storage table)	← **≥ WQV**
24.0	inches	D_{FC} = filter course thickness	← **18", or 24" if within GPA**
Sheet	D5	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	← **≥3:1**
Sheet	-	Note what sheet in the plan set contains the planting plans and surface cover	

If porous pavement is proposed:

		Type of pavement proposed (concrete? Asphalt? Pavers? Etc)	
	acres	A_{SA} = surface area of the pervious pavement	
	:1	ratio of the contributing area to the pervious surface area	← **≤ 5:1**
	inches	D_{FC} = filter course thickness	← **12", or 18" if within GPA**
Sheet		Note what sheet in the plan set contains the filter course spec.	← **304.1 sand**

1. Rate of the limiting layer (either the filter course or the underlying soil). $Ksat_{design}$ includes factor of safey. See Env-Wq 1504.14 for guidance on determining the infiltration rate.

2. See lines 34, 40 and 48 for required depths of filter media.

3. Volume without depending on infiltration. The volume includes the storage above the filter (but below the invert of the outlet stucture, if any), the filter media voids, and the pretreatment area. The storage above the filter media shall not include the volume above the outlet structure, if any.

Designer's Notes:

Stage-Area-Storage for Pond PP108: Bioswale "A"

Elevation (feet)	Surface (sq-ft)	Storage (cubic-feet)
211.55	920	0
211.65	920	28
211.75	920	55
211.85	920	83
211.95	920	110
212.05	920	138
212.15	920	166
212.25	920	193
212.35	920	221
212.45	920	248
212.55	920	276
212.65	920	304
212.75	920	331
212.85	920	359
212.95	920	386
213.05	920	414
213.15	920	442
213.25	920	469
213.35	920	497
213.45	920	524
213.55	920	552
213.65	920	580
213.75	920	607
213.85	920	635
213.95	920	662
214.05	920	690
214.15	920	718
214.25	920	745
214.35	920	773
214.45	920	800
214.55	920	828
214.65	920	856
214.75	920	883
214.85	1,870	944
214.95	1,931	1,042
215.05	1,991	1,146
215.15	2,052	1,256
215.25	2,112	1,372
215.35	2,173	1,495
215.45	2,233	1,623
215.55	2,294	1,757
215.65	2,354	1,898
215.75	2,415	2,044
215.85	2,479	2,197
215.95	2,546	2,356
216.05	2,614	2,522
216.15	2,681	2,695
216.25	2,749	2,874
216.35	2,816	3,060
216.45	2,884	3,253
216.55	2,951	3,453
216.65	3,019	3,660
216.75	**3,086**	**3,873**
216.85	**3,120**	**3,982**
216.95	3,120	3,982
217.05	3,120	3,982
217.15	3,120	3,982
217.25	3,120	3,982
217.35	3,120	3,982
217.45	3,120	3,982
217.55	3,120	3,982
217.65	3,120	3,982
217.75	3,120	3,982

FILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.06)

Type/Node Name: BR1 Biowale-ISR

Rev. 2/11/2020

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable

		Have you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.06(b)?	
1.25	ac	A = Area draining to the practice[1]	
0.89	ac	A_I = Impervious area draining to the practice	
0.71	decimal	I = percent impervious area draining to the practice, in decimal form	
0.69	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
0.86	ac-in	WQV= 1" x Rv x A	
3,135	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
784	cf	25% x WQV (check calc for sediment forebay volume)	
2,351	cf	75% x WQV (check calc for surface sand filter volume)	
catch basin prefilters		Method of Pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = sediment forebay volume, if used for pretreatment	← ≥ 25%WQV
900	sf	A_{SA} = surface area of the practice	
3.00	iph	I_{DESIGN} = design infiltration rate[2]	
Yes	Yes/No	If I_{DESIGN} is < 0.50 iph, has an underdrain been provided?	
13.9	hours	T_{DRAIN} = drain time = V / (A_{SA} * I_{DESIGN})	← ≤ 72-hrs
226.00	feet	E_{FC} = elevation of the bottom of the filter course material	
	feet	E_{UD} = invert elevation of the underdrain (UD), if applicable	
222.75	feet	E_{BTM} = elevation of the bottom of the practice (i.e., bottom of the stone reservoir).	
	feet	E_{SHWT} = elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
	feet	E_{ROCK} = elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
	feet	$D_{FC\ to\ UD}$ = depth to UD from the bottom of the filter course[3]	← ≥ 1'
	feet	$D_{FC\ to\ ROCK}$ = depth to bedrock from the bottom of the filter course[3]	← ≥ 1'
	feet	$D_{FC\ to\ SHWT}$ = depth to SHWT from the bottom of the filter course[3]	← ≥ 1'
	feet	$D_{BTM\ to\ SHWT}$ = depth to SHWT from the bottom of the practice[3]	← ≥ 2'
229.66	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
230.00	ft	Elevation of the top of the practice	
YES		10 peak elevation ≤ Elevation of the top of the practice	← yes

If a surface sand filter is proposed:

	ac	Drainage Area check.	← < 10 ac
	cf	V = volume of storage[4, 5] (attach a stage-storage table)	← ≥ 75%WQV
	inches	D_{FC} = filter course thickness	← 18"
Sheet		Note what sheet in the plan set contains the filter course specification	
	Yes/No	Access grate provided?	← yes
		The filter shall not be covered in grass. What is covering the filter?	

If an underground sand filter is proposed:

	ac	Drainage Area check.	← < 10 ac
	cf	V = volume of storage[4, 5] (attach a stage-storage table)	← ≥ 75%WQV
	inches	D_{FC} = filter course thickness	← 24"
Sheet		Note what sheet in the plan set contains the filter course specification	
	Yes/No	Access grate provided?	← yes

If a bioretention area is proposed:

YES	ac	Drainage Area no larger than 5 ac?	← yes
2,450	cf	V = volume of storage[4, 5] (attach a stage-storage table)	← ≥ WQV
24.0	inches	D_{FC} = filter course thickness	← 18"
Sheet	D1	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	← ≥2:1
Sheet	D2	Note what sheet in the plan set contains the planting plans and surface cover	

If porous pavement is proposed:

		Type of pavement proposed (concrete? Asphalt? Pavers? Etc)	
	acres	A_{SA} = surface area of the pervious pavement	
-	:1	ratio of the contributing area to the pervious surface area	← 5:1
	inches	D_{FC} = filter course thickness	← 12"
Sheet		Note what sheet in the plan set contains the filter course spec.	← 304.1 sand

1. If the practice is a tree box filter, the drainage area shall be < 0.1 acre

2. Rate of the limiting layer (either the filter course or the underlying soil). See Vol. 2 of the NH Stormwater Manual, Ch. 2-4, for guidance on determining the infiltration rate.

3. If not within a GPA or WSIPA: SHWT/Bedrock must be at least 1 foot below the filter course material (or an underdrain must drain the SHWT to at least one foot below the filter course material). If within a GPA or WSIPA: SHWT must be at least two feet below the bottom of the practice OR the filter course material must be at least twice as thick as required and the SHWT must be at least one foot below the filter course material.

4. Volume without depending on infiltration. The storage above the filter media shall not include the volume above the outlet structure, if any.

5. The volume includes the storage above the filter but below the invert of the outlet structure (if any), the filter media voids, and the pretreatment area.

Designer's Notes:

Stage-Area-Storage for Pond BR1: Bioswale-ISR 1 (CB5)

Elevation (feet)	Storage (cubic-feet)
226.00	0
226.05	6
226.10	13
226.15	19
226.20	26
226.25	32
226.30	38
226.35	45
226.40	51
226.45	58
226.50	64
226.55	70
226.60	77
226.65	83
226.70	90
226.75	96
226.80	102
226.85	109
226.90	115
226.95	122
227.00	128
227.05	134
227.10	141
227.15	147
227.20	154
227.25	160
227.30	166
227.35	173
227.40	179
227.45	186
227.50	192
227.55	198
227.60	205
227.65	211
227.70	218
227.75	224
227.80	230
227.85	237
227.90	243
227.95	250
228.00	256
228.05	302
228.10	350
228.15	399
228.20	451
228.25	504
228.30	560
228.35	617
228.40	676
228.45	737
228.50	800
228.55	864
228.60	931
228.65	999
228.70	1,070
228.75	1,142
228.80	1,216
228.85	1,292
228.90	1,370
228.95	1,449
229.00	1,531
229.05	1,614
229.10	1,700
229.15	1,787
229.20	1,876
229.25	1,967
229.30	2,060
229.35	2,154
229.40	2,251
229.45	2,349
229.50	2,450
229.55	2,552
229.60	2,656
229.65	2,762
229.70	2,870
229.75	2,979
229.80	3,091
229.85	3,204
229.90	3,320
229.95	3,437
230.00	**3,556**

FILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.06)

Type/Node Name: BR2 Biowale-ISR

Rev. 2/11/2020

Enter the type of filtration practice (e.g., bioretention system) and the node name in the drainage analysis, if applicable

		Have you reviewed the restrictions on unlined systems outlined in Env-Wq 1508.06(b)?	
1.23	ac	A = Area draining to the practice[1]	
1.09	ac	A_I = Impervious area draining to the practice	
0.89	decimal	I = percent impervious area draining to the practice, in decimal form	
0.85	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
1.04	ac-in	WQV= 1" x Rv x A	
3,784	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
946	cf	25% x WQV (check calc for sediment forebay volume)	
2,838	cf	75% x WQV (check calc for surface sand filter volume)	
catch basin prefilters		Method of Pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = sediment forebay volume, if used for pretreatment	← ≥ 25%WQV
920	sf	A_{SA} = surface area of the practice	
3.00	iph	I_{DESIGN} = design infiltration rate[2]	
Yes	Yes/No	If I_{DESIGN} is < 0.50 iph, has an underdrain been provided?	
16.5	hours	T_{DRAIN} = drain time = V / (A_{SA} * I_{DESIGN})	← ≤ 72-hrs
227.00	feet	E_{FC} = elevation of the bottom of the filter course material	
	feet	E_{UD} = invert elevation of the underdrain (UD), if applicable	
223.75	feet	E_{BTM} = elevation of the bottom of the practice (i.e., bottom of the stone reservoir).	
	feet	E_{SHWT} = elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
	feet	E_{ROCK} = elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
	feet	$D_{FC\ to\ UD}$ = depth to UD from the bottom of the filter course[3]	← ≥ 1'
	feet	$D_{FC\ to\ ROCK}$ = depth to bedrock from the bottom of the filter course[3]	← ≥ 1'
	feet	$D_{FC\ to\ SHWT}$ = depth to SHWT from the bottom of the filter course[3]	← ≥ 1'
	feet	$D_{BTM\ to\ SHWT}$ = depth to SHWT from the bottom of the practice[3]	← ≥ 2'
230.78	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
231.00	ft	Elevation of the top of the practice	
YES		10 peak elevation ≤ Elevation of the top of the practice	← yes

If a surface sand filter is proposed:

	ac	Drainage Area check.	← < 10 ac
	cf	V = volume of storage[4, 5] (attach a stage-storage table)	← ≥ 75%WQV
	inches	D_{FC} = filter course thickness	← 18"
Sheet		Note what sheet in the plan set contains the filter course specification	
	Yes/No	Access grate provided?	← yes
		The filter shall not be covered in grass. What is covering the filter?	

If an underground sand filter is proposed:

	ac	Drainage Area check.	← < 10 ac
	cf	V = volume of storage[4, 5] (attach a stage-storage table)	← ≥ 75%WQV
	inches	D_{FC} = filter course thickness	← 24"
Sheet		Note what sheet in the plan set contains the filter course specification	
	Yes/No	Access grate provided?	← yes

If a bioretention area is proposed:

YES	ac	Drainage Area no larger than 5 ac?	← yes
2,844	cf	V = volume of storage[4, 5] (attach a stage-storage table)	← ≥ WQV
24.0	inches	D_{FC} = filter course thickness	← 18"
Sheet	D1	Note what sheet in the plan set contains the filter course specification	
3.0	:1	Pond side slopes	← ≥2:1
Sheet	D2	Note what sheet in the plan set contains the planting plans and surface cover	

If porous pavement is proposed:

		Type of pavement proposed (concrete? Asphalt? Pavers? Etc)	
	acres	A_{SA} = surface area of the pervious pavement	
-	:1	ratio of the contributing area to the pervious surface area	← 5:1
	inches	D_{FC} = filter course thickness	← 12"
Sheet		Note what sheet in the plan set contains the filter course spec.	← 304.1 sand

1. If the practice is a tree box filter, the drainage area shall be < 0.1 acre

2. Rate of the limiting layer (either the filter course or the underlying soil). See Vol. 2 of the NH Stormwater Manual, Ch. 2-4, for guidance on determining the infiltration rate.

3. If not within a GPA or WSIPA: SHWT/Bedrock must be at least 1 foot below the filter course material (or an underdrain must drain the SHWT to at least one foot below the filter course material). If within a GPA or WSIPA: SHWT must be at least two feet below the bottom of the practice OR the filter course material must be at least twice as thick as required and the SHWT must be at least one foot below the filter course material.

4. Volume without depending on infiltration. The storage above the filter media shall not include the volume above the outlet structure, if any.

5. The volume includes the storage above the filter but below the invert of the outlet structure (if any), the filter media voids, and the pretreatment area.

Designer's Notes:

Stage-Area-Storage for Pond BR2: Bioswale - ISR 2 (CB3)

Elevation (feet)	Storage (cubic-feet)
227.00	0
227.05	12
227.10	23
227.15	35
227.20	46
227.25	58
227.30	69
227.35	80
227.40	92
227.45	103
227.50	115
227.55	127
227.60	138
227.65	150
227.70	161
227.75	173
227.80	184
227.85	195
227.90	207
227.95	218
228.00	230
228.05	242
228.10	253
228.15	265
228.20	276
228.25	288
228.30	299
228.35	310
228.40	322
228.45	333
228.50	345
228.55	357
228.60	368
228.65	380
228.70	391
228.75	403
228.80	414
228.85	425
228.90	437
228.95	448
229.00	460
229.05	463
229.10	471
229.15	484
229.20	503
229.25	527
229.30	556
229.35	590
229.40	630
229.45	674
229.50	724
229.55	780
229.60	840
229.65	906
229.70	977
229.75	1,053
229.80	1,134
229.85	1,221
229.90	1,313
229.95	1,410
230.00	1,513
230.05	1,620
230.10	1,731
230.15	1,848
230.20	1,968
230.25	2,094
230.30	2,224
230.35	2,358
230.40	2,497
230.45	2,640
230.50	2,788
230.55	2,940
230.60	3,096
230.65	3,258
230.70	3,423
230.75	3,594
230.80	3,769
230.85	3,948
230.90	4,132
230.95	4,320
231.00	**4,513**

DESIGN MEMORANDUM

FROM: Robert Roseen, PE, PHD, D.WRE, Waterstone Engineering

DATE: February 5, 2020

RE: Residence Time Calculations for Bioretention-Internal Storage Reservoir, Turbocam, Barrington, NH

As per design guidance for the Innovative Bioretention-ISR System, the residence time for the anaerobic internal storage reservoirs (BR1 and BR2) are based on findings from a 2013 EPA study (Roseen and Stone 2013[1]) and design and sizing technical memo[2] written following that study. Sizing guidance is detailed below.

Outlet Control Sizing and Bypass

An outlet control feature must be included to regulate the release of the system. Because the system contains high infiltration rate soils it needs to be slowed for contaminant removal. The primary outlet structure and its hydraulic rating curve are based on a calculated release rate by orifice control to drain the WQV in 24-48 hrs. For orifice diameter calculations refer to the NY Stormwater Manual (2001) or HDS 5 (FHWA, 2005) for details.

Equation 1:

$$Q = CA(2gh)^{0.5}$$

- Q= flow
- C= orifice coefficient, 0.6 for round
- A= orifice area
- G= gravity
- H, hydraulic head over orifice

Equation 2:

$$Q = \frac{W_{QV}}{T_d}$$

- Q= flow
- W_{QV}= water quality volume
- T_d= drain time, 24-48 hrs

A high flow bypass is typically located similar to any bioretention system with an overflow at the end of the system. A dome grate or raised catchbasin are common. This system was built with 4" of ponding depth however up to 12" is common for bioretention systems.

[1] Roseen, R. and R. Stone (2013). Evaluation and Optimization of the Effectiveness of Stormwater Control Measures for Nitrogen Removal, Final Report. Boston, MA, University of New Hampshire Stormwater Center, Geosyntec Consultants, USEPA Region 1.

[2] Roseen, R. (2013). Design and Sizing of Innovative Bioretention-ISR System. Stratham, NH, Waterstone Engineering**:** 7.

Table 1: Residence time calculations for BR1 and BR2

Parameter	Symbol	Units	BR1	BR2	Notes
Water Quality Volume	WQV	ft^3	3,150	3,774	
Water Quality Flow	WQF	cfs	0.036	0.044	WQV/T
Discharge Coef.	C	unitless	0.6	0.6	Orifice Plate
Orifice Area	A	ft^2	0.0045	0.0054	
Drain Time	T	days	1	1	
Gravitational Acceleration	g	ft/s^2	32.2	32.2	
Driving Head	h	ft	2.8	2.8	h = davg+dBSM+dpea-gravel
Discharge	Q	gpm	16.3	19.6	
Diameter	D	ft	0.08	0.08	
Diameter	D	in	0.91	0.99	
D rounded to nearest		in	1	1	use pipe with min 1" diameter

INFILTRATION PRACTICE DESIGN CRITERIA (Env-Wq 1508.05)

Type/Node Name: **S1: Infiltration System**

Rev. 12/17/2019 Note: WQV calculation uses a HydroCAD-derived 0.15" runoff depth

YES		Have you reviewed Env-Wq 1508.05(a) to ensure that infiltration is allowed?	
2.48	ac	A = Area draining to the practice	
1.98	ac	A_I = Impervious area draining to the practice	
0.80	decimal	I = percent impervious area draining to the practice, in decimal form	
0.77	unitless	Rv = Runoff coefficient = 0.05 + (0.9 x I)	
1.91	ac-in	WQV= 1" x Rv x A	
6,919	cf	WQV conversion (ac-in x 43,560 sf/ac x 1ft/12")	
1,730	cf	25% x WQV (check calc for sediment forebay volume)	
Bioretention BR1, BR2		Method of pretreatment? (not required for clean or roof runoff)	
	cf	V_{SED} = sediment forebay volume, if used for pretreatment	← ≥ 25%WQV
20,126	cf	V = volume[1] (attach a stage-storage table)	← ≥ WQV
8,500	sf	A_{SA} = surface area of the bottom of the pond	
3.00	iph	I_{DESIGN} = design infiltration rate[2]	
3.3	hours	T_{DRAIN} = drain time = V / (A_{SA} * I_{DESIGN})	← ≤ 72-hrs
224.17	feet	E_{BTM} = elevation of the bottom of the practice	
220.00	feet	E_{SHWT} = elevation of SHWT (if none found, enter the lowest elevation of the test pit)	
220.00	feet	E_{ROCK} = elevation of bedrock (if none found, enter the lowest elevation of the test pit)	
4.17	feet	D_{SHWT} = separation from SHWT[3]	← ≥ *[3]
4.2	feet	D_{ROCK} = separation from bedrock[3]	← ≥ *[3]
6.00	ft	D_T = depth of trench, if trench proposed	← 4 - 10 ft
YES	Yes/No	If a trench or underground system is proposed, observation well provided	
1/2" to 1 1/2" drainage stone, 40% voids		If a trench is proposed, material in trench	
		If a basin is proposed, basin floor material	
	Yes/No	If a basin is proposed, the perimeter should be curvilinear.	
	:1	If a basin is proposed, pond side slopes	← ≥3:1
227.12	ft	Peak elevation of the 10-year storm event (infiltration can be used in analysis)	
229.05	ft	Peak elevation of the 50-year storm event (infiltration can be used in analysis)	
230.08	ft	Elevation of the top of the practice (if a basin, this is the elevation of the berm)	
YES		10 peak elevation ≤ Elevation of the top of the trench?	← yes
YES		If a basin is proposed, 50-year peak elevation ≤ Elevation of berm?	← yes

1. Volume below the lowest invert of the outlet structure and excludes forebay volume
2. See NH Stormwater Manual, Vol.2, Ch.2-4, for guidance on determining the infiltration rate
3. 1' separation if treatment not required; 4' for treatment in GPAs & WSIPAs; & 3' in all other areas.

Stage-Area-Storage for Pond SI1: Subsurface Infiltration

Elevation (feet)	Wetted (sq-ft)	Storage (cubic-feet)
224.17	8,500	0
224.27	8,533	340
224.37	8,565	680
224.47	8,598	1,020
224.57	8,631	1,360
224.67	8,663	1,700
224.77	8,696	2,040
224.87	8,729	2,380
224.97	8,761	2,720
225.07	8,794	3,060
225.17	8,827	3,400
225.27	8,860	3,740
225.37	8,892	4,080
225.47	8,925	4,420
225.57	8,958	4,760
225.67	8,990	5,100
225.77	9,023	5,440
225.87	9,056	5,780
225.97	9,088	6,120
226.07	9,121	6,460
226.17	9,154	6,800
226.27	9,186	7,140
226.37	9,219	7,480
226.47	9,252	7,820
226.57	9,284	8,160
226.67	9,317	8,500
226.77	9,350	8,840
226.87	9,382	9,180
226.97	9,415	9,520
227.07	9,448	9,860
227.17	9,480	10,200
227.27	9,513	10,540
227.37	9,546	10,880
227.47	9,579	11,220
227.57	9,611	11,560
227.67	9,644	11,900
227.77	9,677	12,240
227.87	9,709	12,580
227.97	9,742	12,920
228.07	9,775	13,260
228.17	9,807	13,600
228.27	9,840	13,940
228.37	9,873	14,280
228.47	9,905	14,620
228.57	9,938	14,960
228.67	9,971	15,300
228.77	10,003	15,640
228.87	10,036	15,979
228.97	10,069	16,319
229.07	10,101	16,662
229.17	10,134	17,006
229.27	10,167	17,350
229.37	10,199	17,695
229.47	10,232	18,039
229.57	10,265	18,384
229.67	10,298	18,728
229.77	10,330	19,072
229.87	10,363	19,414
229.97	10,396	19,752
230.07	**10,428**	**20,092**
230.17	**10,432**	**20,126**
230.27	10,432	20,126
230.37	10,432	20,126

Extreme Precipitation Tables

Northeast Regional Climate Center

Data represents point estimates calculated from partial duration series. All precipitation amounts are displayed in inches.

Smoothing	No
State	New Hampshire
Location	
Longitude	71.019 degrees West
Latitude	43.216 degrees North
Elevation	0 feet
Date/Time	Fri, 17 May 2019 15:13:11 -0400

Extreme Precipitation Estimates

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.26	0.40	0.49	0.66	0.81	1.00	**1yr**	0.70	0.98	1.13	1.57	1.99	2.55	2.80	**1yr**	2.26	2.69	3.11	3.83	4.40	**1yr**
2yr	0.32	0.49	0.60	0.82	1.01	1.19	**2yr**	0.87	1.16	1.38	1.85	2.39	3.07	3.41	**2yr**	2.71	3.28	3.78	4.51	5.13	**2yr**
5yr	0.37	0.57	0.70	0.96	1.23	1.47	**5yr**	1.06	1.44	1.71	2.29	2.93	3.87	4.36	**5yr**	3.42	4.19	4.81	5.68	6.42	**5yr**
10yr	0.41	0.64	0.79	1.10	1.42	1.72	**10yr**	1.23	1.69	2.01	2.69	3.42	4.61	5.25	**10yr**	4.08	5.05	5.78	6.76	7.61	**10yr**
25yr	0.49	0.74	0.92	1.31	1.73	2.13	**25yr**	1.49	2.09	2.49	3.33	4.21	5.83	6.72	**25yr**	5.16	6.47	7.37	8.53	9.53	**25yr**
50yr	0.55	0.84	1.04	1.50	2.01	2.51	**50yr**	1.74	2.45	2.92	3.92	4.92	6.97	8.11	**50yr**	6.17	7.80	8.86	10.17	11.31	**50yr**
100yr	0.63	0.94	1.18	1.71	2.34	2.95	**100yr**	2.02	2.89	3.44	4.62	5.76	8.32	9.78	**100yr**	7.37	9.41	10.65	12.14	13.42	**100yr**
200yr	0.71	1.07	1.35	1.96	2.73	3.48	**200yr**	2.36	3.40	4.05	5.44	6.74	9.95	11.80	**200yr**	8.80	11.35	12.80	14.49	15.93	**200yr**
500yr	0.85	1.26	1.62	2.35	3.35	4.32	**500yr**	2.89	4.22	5.03	6.76	8.30	12.60	15.14	**500yr**	11.15	14.56	16.35	18.33	20.01	**500yr**

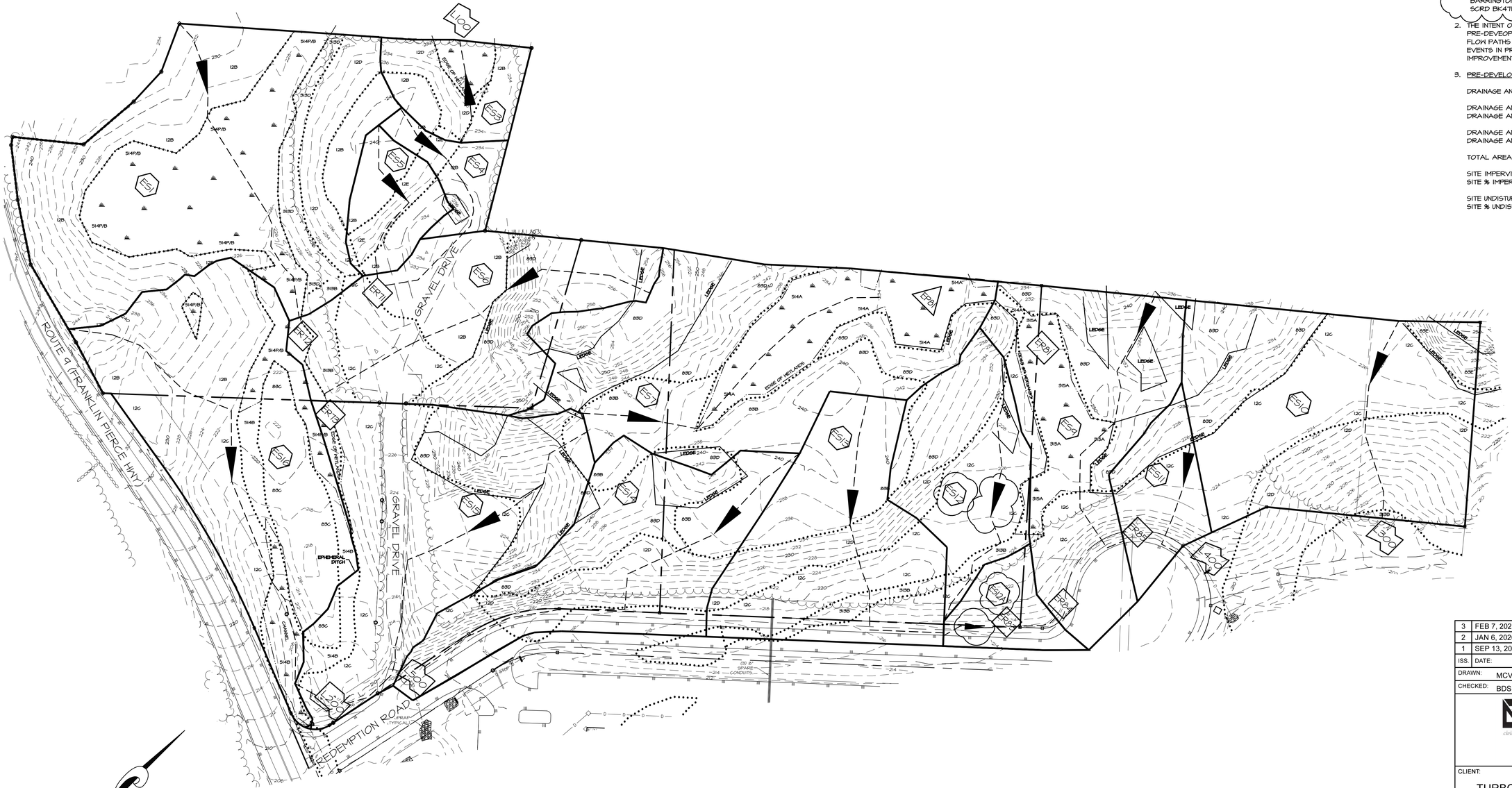
Lower Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.23	0.36	0.44	0.60	0.73	0.90	**1yr**	0.63	0.88	0.92	1.25	1.52	1.95	2.48	**1yr**	1.73	2.38	2.90	3.29	3.91	**1yr**
2yr	0.31	0.48	0.59	0.81	0.99	1.18	**2yr**	0.86	1.15	1.35	1.81	2.33	2.97	3.31	**2yr**	2.63	3.18	3.66	4.39	5.01	**2yr**
5yr	0.35	0.54	0.67	0.92	1.16	1.40	**5yr**	1.01	1.37	1.61	2.13	2.76	3.57	4.00	**5yr**	3.16	3.84	4.45	5.32	5.97	**5yr**
10yr	0.38	0.59	0.73	1.02	1.32	1.60	**10yr**	1.14	1.56	1.81	2.42	3.11	4.07	4.61	**10yr**	3.60	4.43	5.14	6.15	6.80	**10yr**
25yr	0.44	0.67	0.83	1.19	1.57	1.91	**25yr**	1.35	1.87	2.12	2.83	3.62	4.83	5.54	**25yr**	4.28	5.33	6.24	7.46	8.22	**25yr**
50yr	0.49	0.74	0.92	1.33	1.79	2.19	**50yr**	1.54	2.14	2.38	3.19	4.06	5.49	6.36	**50yr**	4.86	6.12	7.22	8.62	9.50	**50yr**
100yr	0.55	0.83	1.03	1.49	2.05	2.51	**100yr**	1.77	2.46	2.67	3.59	4.53	6.23	7.29	**100yr**	5.52	7.01	8.36	9.95	10.85	**100yr**
200yr	0.61	0.92	1.16	1.68	2.35	2.88	**200yr**	2.03	2.82	3.00	4.03	5.06	7.06	8.78	**200yr**	6.25	8.44	9.70	11.50	12.43	**200yr**
500yr	0.72	1.06	1.37	1.99	2.83	3.48	**500yr**	2.44	3.41	3.52	4.71	5.88	8.29	10.64	**500yr**	7.33	10.23	11.81	13.93	14.80	**500yr**

Upper Confidence Limits

	5min	10min	15min	30min	60min	120min		1hr	2hr	3hr	6hr	12hr	24hr	48hr		1day	2day	4day	7day	10day	
1yr	0.28	0.43	0.53	0.71	0.87	1.07	**1yr**	0.75	1.05	1.23	1.72	2.17	2.76	3.04	**1yr**	2.44	2.92	3.36	4.12	4.75	**1yr**
2yr	0.33	0.50	0.62	0.84	1.03	1.24	**2yr**	0.89	1.21	1.46	1.93	2.49	3.19	3.54	**2yr**	2.82	3.40	3.92	4.64	5.28	**2yr**
5yr	0.39	0.60	0.75	1.02	1.30	1.57	**5yr**	1.13	1.53	1.83	2.46	3.15	4.18	4.72	**5yr**	3.70	4.54	5.19	6.03	6.85	**5yr**
10yr	0.46	0.70	0.87	1.21	1.57	1.90	**10yr**	1.35	1.86	2.21	2.99	3.79	5.17	5.89	**10yr**	4.58	5.66	6.44	7.36	8.35	**10yr**
25yr	0.56	0.84	1.05	1.50	1.97	2.44	**25yr**	1.70	2.39	2.84	3.88	4.85	6.86	7.89	**25yr**	6.07	7.59	8.56	9.68	10.69	**25yr**
50yr	0.64	0.98	1.22	1.75	2.36	2.94	**50yr**	2.03	2.87	3.44	4.72	5.87	8.51	9.88	**50yr**	7.53	9.50	10.63	11.87	13.05	**50yr**
100yr	0.75	1.13	1.42	2.05	2.81	3.54	**100yr**	2.43	3.46	4.16	5.75	7.12	10.55	12.37	**100yr**	9.34	11.89	13.18	14.58	15.91	**100yr**
200yr	0.87	1.31	1.66	2.41	3.36	4.28	**200yr**	2.90	4.19	5.05	7.02	8.62	13.13	14.97	**200yr**	11.62	14.39	16.36	17.88	19.44	**200yr**
500yr	1.07	1.59	2.04	2.97	4.22	5.48	**500yr**	3.64	5.36	6.51	9.14	11.12	17.58	20.04	**500yr**	15.56	19.27	21.76	23.47	25.36	**500yr**

Powered by ACIS Northeast Regional Climate Center



GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

NOTES:

1. OWNER OF RECORD:
   TAX MAP 233 LOT 77 & TAX MAP 234 LOTS 1.2 & 1.4
   KREBS, LLC
   607 CALEF HIGHWAY, SUITE 200
   BARRINGTON, NH 03825
   SCRD BK4719 P60827
2. THE INTENT OF THIS PLAN IS TO CALCULATE PRE-DEVELOPMENT SUBCATCHMENT AREAS AND FLOW PATHS FOR MODELING VARIOUS STORM EVENTS IN PREPARATION FOR SITE IMPROVEMENTS.
3. PRE-DEVELOPMENT DRAINAGE AREA CALCS:

   DRAINAGE ANALYSIS TOTAL AREA = 722,655 SF

   DRAINAGE ANALYSIS IMPERVIOUS = 18,971 SF
   DRAINAGE ANALYSIS % IMPERVIOUS = 2.63%

   DRAINAGE ANALYSIS UNDISTURBED = 722,655 SF
   DRAINAGE ANALYSIS % UNDISTURBED = 100%

   TOTAL AREA OF SITE = 559,579 SF

   SITE IMPERVIOUS AREA = 0 SF
   SITE % IMPERVIOUS = 0%

   SITE UNDISTURBED AREA = 559,579 SF
   SITE % UNDISTURBED = 100%

ISS.	DATE:	DESCRIPTION OF ISSUE:	CHK.
3	FEB 7, 2020	FOR APPROVAL	
2	JAN 6, 2020	FOR APPROVAL	
1	SEP 13, 2019	FOR APPROVAL	

DRAWN: MCV	DESIGN: MCV
CHECKED: BDS	CHECKED: BDS

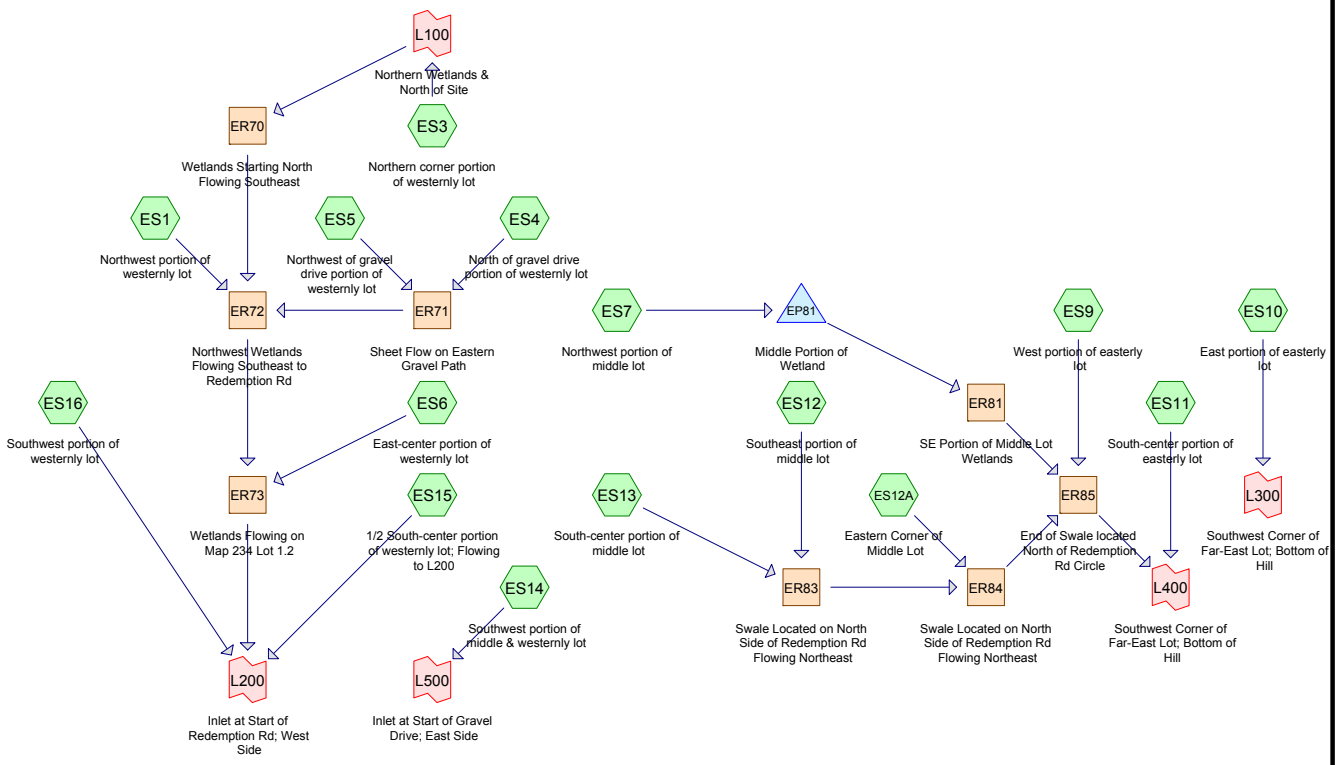
EMANUEL ENGINEERING
civil & structural consultants, land planners
118 Portsmouth Avenue, A202
Stratham, NH 03885
P: 603-772-4400 F: 603-772-4487
www.emanuelengineering.com

CLIENT:
TURBOCAM INTERNATIONAL
607 CALEF HIGHWAY
BARRINGTON, NH 03825

SEAL:

TITLE:
PRE-DEVELOPMENT DRAINAGE PLAN
FOR
TAX MAP 233 LOTS 1.2, 1.4, AND 77
TURBOCAM INTERNATIONAL
ROUTE 9 (SITE)
BARRINGTON, NH 03825
& TOWN OF BARRINGTON
PO BOX 660
BARRINGTON, NH 03825

PROJECT:	SCALE:	SHEET:
19-020	1"=60'	SW1



Subcat Reach Pond Link

Routing Diagram for Turbocam Predevelopment 01-31-20
Prepared by Microsoft, Printed 2/7/2020

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
5.965	30	Woods, Good, HSG A (ES1, ES10, ES12, ES13, ES14, ES15, ES16, ES3, ES4, ES5, ES6, ES9)
2.195	39	>75% Grass cover, Good, HSG A (ES10, ES11, ES12, ES12A, ES13, ES14, ES16, ES9)
0.616	55	Woods, Good, HSG B (ES1, ES12, ES6, ES9)
0.105	61	>75% Grass cover, Good, HSG B (ES12, ES13)
7.273	70	Woods, Good, HSG C (ES1, ES10, ES11, ES12, ES13, ES14, ES15, ES16, ES3, ES6, ES7, ES9)
0.413	98	Paved parking, HSG A (ES11, ES12A, ES13, ES14, ES15, ES9)
0.023	98	Paved parking, HSG B (ES13)
16.590	**52**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
8.573	HSG A	ES1, ES10, ES11, ES12, ES12A, ES13, ES14, ES15, ES16, ES3, ES4, ES5, ES6, ES9
0.744	HSG B	ES1, ES12, ES13, ES6, ES9
7.273	HSG C	ES1, ES10, ES11, ES12, ES13, ES14, ES15, ES16, ES3, ES6, ES7, ES9
0.000	HSG D	
0.000	Other	
16.590		**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
2.195	0.105	0.000	0.000	0.000	2.300	>75% Grass cover, Good	ES10, ES11, ES12, ES12A, ES13, ES14, ES16, ES9
0.413	0.023	0.000	0.000	0.000	0.436	Paved parking	ES11, ES12A, ES13, ES14, ES15, ES9
5.965	0.616	7.273	0.000	0.000	13.854	Woods, Good	ES1, ES10, ES11, ES12, ES13, ES14, ES15, ES16, ES3, ES4, ES5, ES6, ES7, ES9
8.573	**0.744**	**7.273**	**0.000**	**0.000**	**16.590**	**TOTAL AREA**	

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ES1: Northwest portion of Runoff Area=101,408 sf 0.00% Impervious Runoff Depth=0.41"
Flow Length=373' Tc=15.4 min CN=47 Runoff=0.21 cfs 0.079 af

Subcatchment ES10: East portion of Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=235' Tc=14.8 min CN=44 Runoff=0.08 cfs 0.041 af

Subcatchment ES11: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=0.79"
Flow Length=151' Tc=11.4 min CN=55 Runoff=0.15 cfs 0.023 af

Subcatchment ES12: Southeast portion of Runoff Area=32,533 sf 0.00% Impervious Runoff Depth=0.45"
Flow Length=340' Tc=21.6 min CN=48 Runoff=0.08 cfs 0.028 af

Subcatchment ES12A: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=0.59"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.06 cfs 0.012 af

Subcatchment ES13: South-center portion Runoff Area=51,080 sf 6.39% Impervious Runoff Depth=0.64"
Flow Length=357' Tc=26.6 min CN=52 Runoff=0.23 cfs 0.062 af

Subcatchment ES14: Southwest portion of Runoff Area=54,233 sf 10.48% Impervious Runoff Depth=1.02"
Flow Length=531' Tc=12.7 min CN=59 Runoff=0.77 cfs 0.106 af

Subcatchment ES15: 1/2 South-center Runoff Area=71,666 sf 0.38% Impervious Runoff Depth=0.37"
Flow Length=457' Tc=20.8 min CN=46 Runoff=0.11 cfs 0.050 af

Subcatchment ES16: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=0.49"
Flow Length=569' Tc=18.4 min CN=49 Runoff=0.23 cfs 0.072 af

Subcatchment ES3: Northern corner portion Runoff Area=15,930 sf 0.00% Impervious Runoff Depth=0.10"
Flow Length=130' Slope=0.0400 '/' Tc=10.8 min CN=38 Runoff=0.00 cfs 0.003 af

Subcatchment ES4: North of gravel drive Runoff Area=9,025 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=215' Tc=11.7 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment ES5: Northwest of gravel Runoff Area=13,071 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=100' Tc=11.2 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment ES6: East-center portion of Runoff Area=56,735 sf 0.00% Impervious Runoff Depth=0.54"
Flow Length=417' Tc=14.2 min CN=50 Runoff=0.23 cfs 0.059 af

Subcatchment ES7: Northwest portion of Runoff Area=84,458 sf 0.00% Impervious Runoff Depth=1.75"
Flow Length=398' Tc=23.9 min CN=70 Runoff=1.86 cfs 0.283 af

Subcatchment ES9: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=1.20"
Flow Length=344' Tc=12.7 min CN=62 Runoff=1.01 cfs 0.128 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.00' Max Vel=0.31 fps Inflow=0.00 cfs 0.003 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.00 cfs 0.003 af

Reach ER71: Sheet Flow on Eastern Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.240 L=210.0' S=0.0548 '/' Capacity=50.29 cfs Outflow=0.00 cfs 0.000 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.02' Max Vel=0.49 fps Inflow=0.21 cfs 0.082 af
n=0.035 L=140.0' S=0.0250 '/' Capacity=699.46 cfs Outflow=0.20 cfs 0.082 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.02' Max Vel=0.75 fps Inflow=0.39 cfs 0.141 af
n=0.035 L=340.0' S=0.0382 '/' Capacity=771.38 cfs Outflow=0.38 cfs 0.141 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.18' Max Vel=0.11 fps Inflow=0.42 cfs 0.189 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=0.31 cfs 0.189 af

Reach ER83: Swale Located on North Avg. Flow Depth=0.06' Max Vel=0.58 fps Inflow=0.31 cfs 0.090 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=123.09 cfs Outflow=0.31 cfs 0.090 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.08' Max Vel=0.67 fps Inflow=0.34 cfs 0.102 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=0.34 cfs 0.102 af

Reach ER85: End of Swale located Avg. Flow Depth=0.17' Max Vel=1.39 fps Inflow=1.06 cfs 0.420 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=1.06 cfs 0.420 af

Pond EP81: Middle Portion of Wetland Peak Elev=233.68' Storage=5,093 cf Inflow=1.86 cfs 0.283 af
Outflow=0.42 cfs 0.189 af

Link L100: Northern Wetlands & North of Site Inflow=0.00 cfs 0.003 af
Primary=0.00 cfs 0.003 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=0.70 cfs 0.262 af
Primary=0.70 cfs 0.262 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.08 cfs 0.041 af
Primary=0.08 cfs 0.041 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=1.21 cfs 0.443 af
Primary=1.21 cfs 0.443 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=0.77 cfs 0.106 af
Primary=0.77 cfs 0.106 af

Total Runoff Area = 16.590 ac Runoff Volume = 0.947 af Average Runoff Depth = 0.68"
97.37% Pervious = 16.154 ac 2.63% Impervious = 0.436 ac

Summary for Subcatchment ES1: Northwest portion of westernly lot

Runoff = 0.21 cfs @ 12.48 hrs, Volume= 0.079 af, Depth= 0.41"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
56,403	30	Woods, Good, HSG A
8,020	55	Woods, Good, HSG B
36,985	70	Woods, Good, HSG C
101,408	47	Weighted Average
101,408		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0700	0.11		**Sheet Flow, Woodland Flow** Woods: Light underbrush n= 0.400 P2= 3.07"
0.9	65	0.0600	1.22		**Shallow Concentrated Flow, Woodland Flow** Woodland Kv= 5.0 fps
6.9	258	0.0155	0.62		**Shallow Concentrated Flow, Wetland flow** Woodland Kv= 5.0 fps
15.4	373	Total			

Summary for Subcatchment ES10: East portion of easterly lot

Runoff = 0.08 cfs @ 12.61 hrs, Volume= 0.041 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
31,198	39	>75% Grass cover, Good, HSG A
23,985	30	Woods, Good, HSG A
19,689	70	Woods, Good, HSG C
74,872	44	Weighted Average
74,872		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	50	0.0200	0.07		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
1.0	135	0.1850	2.15		**Shallow Concentrated Flow, steep woods** Woodland Kv= 5.0 fps
14.8	235	Total			

Summary for Subcatchment ES11: South-center portion of easterly lot

Runoff = 0.15 cfs @ 12.13 hrs, Volume= 0.023 af, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
9,251	39	>75% Grass cover, Good, HSG A
4,095	70	Woods, Good, HSG C
2,085	98	Paved parking, HSG A
15,431	55	Weighted Average
13,346		86.49% Pervious Area
2,085		13.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
0.7	101	0.1240	2.46		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
11.4	151	Total			

Summary for Subcatchment ES12: Southeast portion of middle lot

Runoff = 0.08 cfs @ 12.55 hrs, Volume= 0.028 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
869	39	>75% Grass cover, Good, HSG A
1,648	61	>75% Grass cover, Good, HSG B
16,115	30	Woods, Good, HSG A
1,651	55	Woods, Good, HSG B
12,250	70	Woods, Good, HSG C
32,533	48	Weighted Average
32,533		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	50	0.0100	0.05		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
3.0	160	0.0313	0.88		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
1.8	95	0.0300	0.87		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
0.2	35	0.1500	2.71		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
21.6	340	Total			

Summary for Subcatchment ES12A: Eastern Corner of Middle Lot

Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.012 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
8,600	39	>75% Grass cover, Good, HSG A
2,121	98	Paved parking, HSG A
10,721	51	Weighted Average
8,600		80.22% Pervious Area
2,121		19.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.07"
2.0	85	0.0100	0.70		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
7.7	135	Total			

Summary for Subcatchment ES13: South-center portion of middle lot

Runoff = 0.23 cfs @ 12.44 hrs, Volume= 0.062 af, Depth= 0.64"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
9,045	39	>75% Grass cover, Good, HSG A
2,932	61	>75% Grass cover, Good, HSG B
17,458	30	Woods, Good, HSG A
18,383	70	Woods, Good, HSG C
2,266	98	Paved parking, HSG A
996	98	Paved parking, HSG B
51,080	52	Weighted Average
47,818		93.61% Pervious Area
3,262		6.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.9	50	0.0050	0.04		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.8	100	0.0350	0.94		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
0.6	79	0.2280	2.39		**Shallow Concentrated Flow, steep woods** Woodland Kv= 5.0 fps
2.3	128	0.0352	0.94		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
26.6	357	Total			

Summary for Subcatchment ES14: Southwest portion of middle & westernly lot

Revised areas for grass and woods cover 11-26-19

Runoff = 0.77 cfs @ 12.15 hrs, Volume= 0.106 af, Depth= 1.02"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
13,418	39	>75% Grass cover, Good, HSG A
26,352	70	Woods, Good, HSG C
5,681	98	Paved parking, HSG A
8,782	30	Woods, Good, HSG A
54,233	59	Weighted Average
48,552		89.52% Pervious Area
5,681		10.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
2.1	127	0.0394	0.99		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
1.4	110	0.0677	1.30		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
0.5	244	0.0287	8.72	401.21	**Trap/Vee/Rect Channel Flow, Swale flow** Bot.W=12.00' D=2.00' Z= 8.0 & 3.0 '/' Top.W=34.00' n= 0.035 Earth, dense weeds
12.7	531	Total			

Summary for Subcatchment ES15: 1/2 South-center portion of westernly lot; Flowing to L200

Runoff = 0.11 cfs @ 12.64 hrs, Volume= 0.050 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
43,592	30	Woods, Good, HSG A
27,802	70	Woods, Good, HSG C
272	98	Paved parking, HSG A
71,666	46	Weighted Average
71,394		99.62% Pervious Area
272		0.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
0.3	35	0.1710	2.07		**Shallow Concentrated Flow, steep woods** Woodland Kv= 5.0 fps
2.7	147	0.0340	0.92		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
0.2	31	0.2500	2.50		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
0.1	72	0.1110	9.63	616.02	**Trap/Vee/Rect Channel Flow, Swale flow** Bot.W=14.00' D=1.00' Z= 50.0 '/' Top.W=114.00' n= 0.035
9.5	72	0.0833	0.13		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
0.8	50	0.0400	1.00		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
20.8	457	Total			

Summary for Subcatchment ES16: Southwest portion of westernly lot

Runoff = 0.23 cfs @ 12.37 hrs, Volume= 0.072 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
13,397	39	>75% Grass cover, Good, HSG A
29,498	30	Woods, Good, HSG A
32,875	70	Woods, Good, HSG C
75,770	49	Weighted Average
75,770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
4.2	370	0.0875	1.48		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
3.5	149	0.0201	0.71		**Shallow Concentrated Flow, Woods/wetlands flow** Woodland Kv= 5.0 fps
18.4	569	Total			

Summary for Subcatchment ES3: Northern corner portion of westernly lot

Runoff = 0.00 cfs @ 21.06 hrs, Volume= 0.003 af, Depth= 0.10"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
12,689	30	Woods, Good, HSG A
3,241	70	Woods, Good, HSG C
15,930	38	Weighted Average
15,930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.3	80	0.0400	1.00		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
10.8	130	Total			

Summary for Subcatchment ES4: North of gravel drive portion of westernly lot

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
9,025	30	Woods, Good, HSG A
9,025		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
2.2	125	0.0360	0.95		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
0.8	40	0.0250	0.79		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
11.7	215	Total			

Summary for Subcatchment ES5: Northwest of gravel drive portion of westernly lot

[45] Hint: Runoff=Zero

Runoff = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Depth= 0.00"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
13,071	30	Woods, Good, HSG A
13,071		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
0.5	50	0.1200	1.73		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
11.2	100	Total			

Summary for Subcatchment ES6: East-center portion of westernly lot

Runoff = 0.23 cfs @ 12.23 hrs, Volume= 0.059 af, Depth= 0.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
26,865	30	Woods, Good, HSG A
3,861	55	Woods, Good, HSG B
26,009	70	Woods, Good, HSG C
56,735	50	Weighted Average
56,735		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.0	125	0.1680	2.05		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
2.0	122	0.0410	1.01		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
1.0	70	0.0571	1.19		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
0.7	50	0.0600	1.22		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
14.2	417	Total			

Summary for Subcatchment ES7: Northwest portion of middle lot

Runoff = 1.86 cfs @ 12.29 hrs, Volume= 0.283 af, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
84,458	70	Woods, Good, HSG C
84,458		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	50	0.0200	0.07		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.1	82	0.0610	1.23		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
10.2	266	0.0075	0.43		**Shallow Concentrated Flow, Wetland flow** Woodland Kv= 5.0 fps
23.9	398	Total			

Summary for Subcatchment ES9: West portion of easterly lot

Runoff = 1.01 cfs @ 12.14 hrs, Volume= 0.128 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
9,841	39	>75% Grass cover, Good, HSG A
2,369	30	Woods, Good, HSG A
24,652	70	Woods, Good, HSG C
5,551	98	Paved parking, HSG A
13,310	55	Woods, Good, HSG B
55,723	62	Weighted Average
50,172		90.04% Pervious Area
5,551		9.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.5	105	0.0524	1.14		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
1.9	99	0.0303	0.87		**Shallow Concentrated Flow, Wetland flow** Woodland Kv= 5.0 fps
0.6	90	0.1440	2.66		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
12.7	344	Total			

Summary for Reach ER70: Wetlands Starting North Flowing Southeast

Inflow Area = 0.366 ac, 0.00% Impervious, Inflow Depth = 0.10" for 10-yr event
Inflow = 0.00 cfs @ 21.06 hrs, Volume= 0.003 af
Outflow = 0.00 cfs @ 21.28 hrs, Volume= 0.003 af, Atten= 0%, Lag= 13.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.31 fps, Min. Travel Time= 18.8 min
Avg. Velocity = 0.31 fps, Avg. Travel Time= 18.8 min

Peak Storage= 4 cf @ 21.28 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 64.0 sf, Capacity= 328.04 cfs

16.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 8.0 '/' Top Width= 48.00'
Length= 350.0' Slope= 0.0100 '/'
Inlet Invert= 226.00', Outlet Invert= 222.50'

‡

Summary for Reach ER71: Sheet Flow on Eastern Gravel Path

Inflow Area = 0.507 ac, 0.00% Impervious, Inflow Depth = 0.00" for 10-yr event
Inflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.00 fps, Min. Travel Time= 0.0 min
Avg. Velocity = 0.00 fps, Avg. Travel Time= 0.0 min

Peak Storage= 0 cf @ 0.00 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 50.29 cfs

4.00' x 2.00' deep channel, n= 0.240 Sheet flow over Dense Grass
Side Slope Z-value= 6.0 '/' Top Width= 28.00'
Length= 210.0' Slope= 0.0548 '/'
Inlet Invert= 233.50', Outlet Invert= 222.00'

‡

Summary for Reach ER72: Northwest Wetlands Flowing Southeast to Redemption Rd

[62] Hint: Exceeded Reach ER70 OUTLET depth by 0.02' @ 12.58 hrs
[62] Hint: Exceeded Reach ER71 OUTLET depth by 0.52' @ 12.58 hrs

Inflow Area = 3.201 ac, 0.00% Impervious, Inflow Depth = 0.31" for 10-yr event
Inflow = 0.21 cfs @ 12.48 hrs, Volume= 0.082 af
Outflow = 0.20 cfs @ 12.58 hrs, Volume= 0.082 af, Atten= 2%, Lag= 6.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.49 fps, Min. Travel Time= 4.7 min
Avg. Velocity = 0.49 fps, Avg. Travel Time= 4.7 min

Peak Storage= 58 cf @ 12.58 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 2.00' Flow Area= 82.0 sf, Capacity= 699.46 cfs

25.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 8.0 '/' Top Width= 57.00'
Length= 140.0' Slope= 0.0250 '/'
Inlet Invert= 222.50', Outlet Invert= 219.00'

‡

Summary for Reach ER73: Wetlands Flowing on Map 234 Lot 1.2

[62] Hint: Exceeded Reach ER72 OUTLET depth by 0.01' @ 12.99 hrs

Inflow Area = 4.503 ac, 0.00% Impervious, Inflow Depth = 0.37" for 10-yr event
Inflow = 0.39 cfs @ 12.45 hrs, Volume= 0.141 af
Outflow = 0.38 cfs @ 12.57 hrs, Volume= 0.141 af, Atten= 2%, Lag= 7.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.75 fps, Min. Travel Time= 7.6 min
Avg. Velocity = 0.61 fps, Avg. Travel Time= 9.2 min

Peak Storage= 172 cf @ 12.57 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 2.00' Flow Area= 76.0 sf, Capacity= 771.38 cfs

20.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 9.0 '/' Top Width= 56.00'
Length= 340.0' Slope= 0.0382 '/'
Inlet Invert= 219.00', Outlet Invert= 206.00'

‡

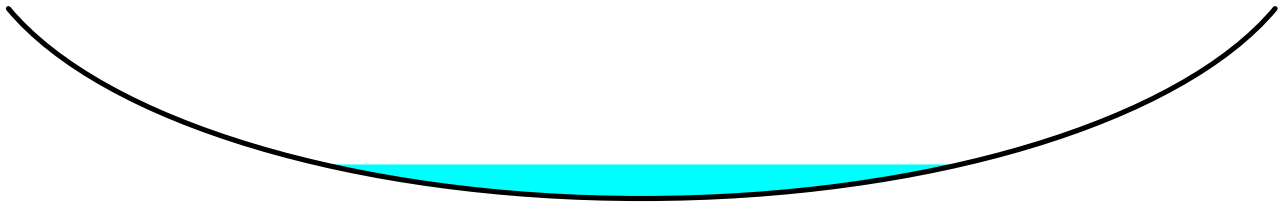
Summary for Reach ER81: SE Portion of Middle Lot Wetlands

Inflow Area = 1.939 ac, 0.00% Impervious, Inflow Depth > 1.17" for 10-yr event
Inflow = 0.42 cfs @ 13.30 hrs, Volume= 0.189 af
Outflow = 0.31 cfs @ 14.38 hrs, Volume= 0.189 af, Atten= 25%, Lag= 64.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.11 fps, Min. Travel Time= 54.7 min
Avg. Velocity = 0.05 fps, Avg. Travel Time= 123.2 min

Peak Storage= 1,023 cf @ 14.38 hrs
Average Depth at Peak Storage= 0.18'
Bank-Full Depth= 1.00' Flow Area= 36.7 sf, Capacity= 13.04 cfs

55.00' x 1.00' deep Parabolic Channel, n= 0.750
Length= 370.0' Slope= 0.0554 '/'
Inlet Invert= 233.00', Outlet Invert= 212.50'



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Summary for Reach ER83: Swale Located on North Side of Redemption Rd Flowing Northeast

Inflow Area = 1.919 ac, 3.90% Impervious, Inflow Depth = 0.56" for 10-yr event
Inflow = 0.31 cfs @ 12.44 hrs, Volume= 0.090 af
Outflow = 0.31 cfs @ 12.50 hrs, Volume= 0.090 af, Atten= 1%, Lag= 3.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.58 fps, Min. Travel Time= 4.1 min
Avg. Velocity = 0.34 fps, Avg. Travel Time= 6.8 min

Peak Storage= 75 cf @ 12.50 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 123.09 cfs

8.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 140.0' Slope= 0.0071 '/'
Inlet Invert= 214.00', Outlet Invert= 213.00'

‡

Summary for Reach ER84: Swale Located on North Side of Redemption Rd Flowing Northeast

Inflow Area = 2.166 ac, 5.71% Impervious, Inflow Depth = 0.57" for 10-yr event
Inflow = 0.34 cfs @ 12.48 hrs, Volume= 0.102 af
Outflow = 0.34 cfs @ 12.54 hrs, Volume= 0.102 af, Atten= 1%, Lag= 3.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.67 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 0.40 fps, Avg. Travel Time= 5.8 min

Peak Storage= 71 cf @ 12.54 hrs
Average Depth at Peak Storage= 0.08'
Bank-Full Depth= 3.00' Flow Area= 45.0 sf, Capacity= 239.10 cfs

6.00' x 3.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 24.00'
Length= 140.0' Slope= 0.0071 '/'
Inlet Invert= 212.00', Outlet Invert= 211.00'

‡

Summary for Reach ER85: End of Swale located North of Redemption Rd Circle

[62] Hint: Exceeded Reach ER84 OUTLET depth by 0.14' @ 12.13 hrs

Inflow Area = 5.384 ac, 4.66% Impervious, Inflow Depth > 0.94" for 10-yr event
Inflow = 1.06 cfs @ 12.15 hrs, Volume= 0.420 af
Outflow = 1.06 cfs @ 12.15 hrs, Volume= 0.420 af, Atten= 0%, Lag= 0.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 1.39 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.69 fps, Avg. Travel Time= 1.8 min

Peak Storage= 57 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 4.00' Flow Area= 64.0 sf, Capacity= 528.23 cfs

4.00' x 4.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 28.00'
Length= 75.0' Slope= 0.0133 '/'
Inlet Invert= 211.00', Outlet Invert= 210.00'

Summary for Pond EP81: Middle Portion of Wetland

Inflow Area = 1.939 ac, 0.00% Impervious, Inflow Depth = 1.75" for 10-yr event
Inflow = 1.86 cfs @ 12.29 hrs, Volume= 0.283 af
Outflow = 0.42 cfs @ 13.30 hrs, Volume= 0.189 af, Atten= 78%, Lag= 60.2 min
Primary = 0.42 cfs @ 13.30 hrs, Volume= 0.189 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 233.68' @ 13.30 hrs Surf.Area= 5,837 sf Storage= 5,093 cf

Plug-Flow detention time= 278.2 min calculated for 0.189 af (67% of inflow)
Center-of-Mass det. time= 144.7 min (1,053.2 - 908.5)

Volume	Invert	Avail.Storage	Storage Description
#1	232.00'	7,132 cf	**Wetland Low Point (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
232.00	520	90.0	0	0	520
233.00	3,700	245.0	1,869	1,869	4,655
234.00	7,000	381.0	5,263	7,132	11,438

Device	Routing	Invert	Outlet Devices
#1	Primary	233.50'	**2.0' long x 21.0' breadth Weir Between ES8-ES9**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.42 cfs @ 13.30 hrs HW=233.68' TW=233.13' (Dynamic Tailwater)
1=Weir Between ES8-ES9 (Weir Controls 0.42 cfs @ 1.14 fps)

Summary for Link L100: Northern Wetlands & North of Site

Inflow Area = 0.366 ac, 0.00% Impervious, Inflow Depth = 0.10" for 10-yr event
Inflow = 0.00 cfs @ 21.06 hrs, Volume= 0.003 af
Primary = 0.00 cfs @ 21.06 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link L200: Inlet at Start of Redemption Rd; West Side

Inflow Area = 7.888 ac, 0.08% Impervious, Inflow Depth = 0.40" for 10-yr event
Inflow = 0.70 cfs @ 12.55 hrs, Volume= 0.262 af
Primary = 0.70 cfs @ 12.55 hrs, Volume= 0.262 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link L300: Southwest Corner of Far-East Lot; Bottom of Hill

Inflow Area = 1.719 ac, 0.00% Impervious, Inflow Depth = 0.29" for 10-yr event
Inflow = 0.08 cfs @ 12.61 hrs, Volume= 0.041 af
Primary = 0.08 cfs @ 12.61 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link L400: Southwest Corner of Far-East Lot; Bottom of Hill

Inflow Area = 5.738 ac, 5.21% Impervious, Inflow Depth > 0.93" for 10-yr event
Inflow = 1.21 cfs @ 12.15 hrs, Volume= 0.443 af
Primary = 1.21 cfs @ 12.15 hrs, Volume= 0.443 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link L500: Inlet at Start of Gravel Drive; East Side

Inflow Area = 1.245 ac, 10.48% Impervious, Inflow Depth = 1.02" for 10-yr event
Inflow = 0.77 cfs @ 12.15 hrs, Volume= 0.106 af
Primary = 0.77 cfs @ 12.15 hrs, Volume= 0.106 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ES1: Northwest portion of Runoff Area=101,408 sf 0.00% Impervious Runoff Depth=4.95"
Flow Length=373' Tc=15.4 min CN=47 Runoff=6.25 cfs 0.960 af

Subcatchment ES10: East portion of Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=4.44"
Flow Length=235' Tc=14.8 min CN=44 Runoff=4.12 cfs 0.636 af

Subcatchment ES11: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=6.28"
Flow Length=151' Tc=11.4 min CN=55 Runoff=1.39 cfs 0.185 af

Subcatchment ES12: Southeast portion of Runoff Area=32,533 sf 0.00% Impervious Runoff Depth=5.12"
Flow Length=340' Tc=21.6 min CN=48 Runoff=1.82 cfs 0.319 af

Subcatchment ES12A: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=5.62"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.99 cfs 0.115 af

Subcatchment ES13: South-center portion Runoff Area=51,080 sf 6.39% Impervious Runoff Depth=5.79"
Flow Length=357' Tc=26.6 min CN=52 Runoff=2.99 cfs 0.565 af

Subcatchment ES14: Southwest portion of Runoff Area=54,233 sf 10.48% Impervious Runoff Depth=6.92"
Flow Length=531' Tc=12.7 min CN=59 Runoff=5.21 cfs 0.718 af

Subcatchment ES15: 1/2 South-center Runoff Area=71,666 sf 0.38% Impervious Runoff Depth=4.78"
Flow Length=457' Tc=20.8 min CN=46 Runoff=3.75 cfs 0.655 af

Subcatchment ES16: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=5.29"
Flow Length=569' Tc=18.4 min CN=49 Runoff=4.70 cfs 0.766 af

Subcatchment ES3: Northern corner portion Runoff Area=15,930 sf 0.00% Impervious Runoff Depth=3.40"
Flow Length=130' Slope=0.0400 '/' Tc=10.8 min CN=38 Runoff=0.70 cfs 0.104 af

Subcatchment ES4: North of gravel drive Runoff Area=9,025 sf 0.00% Impervious Runoff Depth=2.01"
Flow Length=215' Tc=11.7 min CN=30 Runoff=0.17 cfs 0.035 af

Subcatchment ES5: Northwest of gravel Runoff Area=13,071 sf 0.00% Impervious Runoff Depth=2.01"
Flow Length=100' Tc=11.2 min CN=30 Runoff=0.24 cfs 0.050 af

Subcatchment ES6: East-center portion of Runoff Area=56,735 sf 0.00% Impervious Runoff Depth=5.45"
Flow Length=417' Tc=14.2 min CN=50 Runoff=4.04 cfs 0.592 af

Subcatchment ES7: Northwest portion of Runoff Area=84,458 sf 0.00% Impervious Runoff Depth=8.60"
Flow Length=398' Tc=23.9 min CN=70 Runoff=7.75 cfs 1.390 af

Subcatchment ES9: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=7.39"
Flow Length=344' Tc=12.7 min CN=62 Runoff=5.72 cfs 0.788 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.06' Max Vel=0.61 fps Inflow=0.70 cfs 0.104 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.56 cfs 0.104 af

Reach ER71: Sheet Flow on Eastern Avg. Flow Depth=0.17' Max Vel=0.39 fps Inflow=0.41 cfs 0.085 af
n=0.240 L=210.0' S=0.0548 '/' Capacity=50.29 cfs Outflow=0.33 cfs 0.085 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.15' Max Vel=1.82 fps Inflow=7.07 cfs 1.149 af
n=0.035 L=140.0' S=0.0250 '/' Capacity=699.46 cfs Outflow=7.04 cfs 1.149 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.19' Max Vel=2.62 fps Inflow=10.99 cfs 1.741 af
n=0.035 L=340.0' S=0.0382 '/' Capacity=771.38 cfs Outflow=10.84 cfs 1.741 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.68' Max Vel=0.27 fps Inflow=8.60 cfs 1.296 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=5.61 cfs 1.296 af

Reach ER83: Swale Located on North Avg. Flow Depth=0.33' Max Vel=1.59 fps Inflow=4.75 cfs 0.884 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=123.09 cfs Outflow=4.74 cfs 0.884 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.41' Max Vel=1.76 fps Inflow=5.16 cfs 0.999 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=5.15 cfs 0.999 af

Reach ER85: End of Swale located Avg. Flow Depth=0.70' Max Vel=3.12 fps Inflow=13.29 cfs 3.083 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=13.29 cfs 3.083 af

Pond EP81: Middle Portion of Wetland Peak Elev=234.89' Storage=7,132 cf Inflow=7.75 cfs 1.390 af
Outflow=8.60 cfs 1.296 af

Link L100: Northern Wetlands & North of Site Inflow=0.70 cfs 0.104 af
Primary=0.70 cfs 0.104 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=19.19 cfs 3.162 af
Primary=19.19 cfs 3.162 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=4.12 cfs 0.636 af
Primary=4.12 cfs 0.636 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=14.07 cfs 3.269 af
Primary=14.07 cfs 3.269 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=5.21 cfs 0.718 af
Primary=5.21 cfs 0.718 af

Total Runoff Area = 16.590 ac Runoff Volume = 7.879 af Average Runoff Depth = 5.70"
97.37% Pervious = 16.154 ac 2.63% Impervious = 0.436 ac

Summary for Subcatchment ES1: Northwest portion of westernly lot

Runoff = 6.25 cfs @ 12.17 hrs, Volume= 0.960 af, Depth= 4.95"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
56,403	30	Woods, Good, HSG A
8,020	55	Woods, Good, HSG B
36,985	70	Woods, Good, HSG C
101,408	47	Weighted Average
101,408		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0700	0.11		**Sheet Flow, Woodland Flow** Woods: Light underbrush n= 0.400 P2= 3.07"
0.9	65	0.0600	1.22		**Shallow Concentrated Flow, Woodland Flow** Woodland Kv= 5.0 fps
6.9	258	0.0155	0.62		**Shallow Concentrated Flow, Wetland flow** Woodland Kv= 5.0 fps
15.4	373	Total			

Summary for Subcatchment ES10: East portion of easterly lot

Runoff = 4.12 cfs @ 12.16 hrs, Volume= 0.636 af, Depth= 4.44"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
31,198	39	>75% Grass cover, Good, HSG A
23,985	30	Woods, Good, HSG A
19,689	70	Woods, Good, HSG C
74,872	44	Weighted Average
74,872		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	50	0.0200	0.07		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
1.0	135	0.1850	2.15		**Shallow Concentrated Flow, steep woods** Woodland Kv= 5.0 fps
14.8	235	Total			

Summary for Subcatchment ES11: South-center portion of easterly lot

Runoff = 1.39 cfs @ 12.11 hrs, Volume= 0.185 af, Depth= 6.28"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
9,251	39	>75% Grass cover, Good, HSG A
4,095	70	Woods, Good, HSG C
2,085	98	Paved parking, HSG A
15,431	55	Weighted Average
13,346		86.49% Pervious Area
2,085		13.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
0.7	101	0.1240	2.46		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
11.4	151	Total			

Summary for Subcatchment ES12: Southeast portion of middle lot

Runoff = 1.82 cfs @ 12.26 hrs, Volume= 0.319 af, Depth= 5.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
869	39	>75% Grass cover, Good, HSG A
1,648	61	>75% Grass cover, Good, HSG B
16,115	30	Woods, Good, HSG A
1,651	55	Woods, Good, HSG B
12,250	70	Woods, Good, HSG C
32,533	48	Weighted Average
32,533		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	50	0.0100	0.05		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
3.0	160	0.0313	0.88		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
1.8	95	0.0300	0.87		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
0.2	35	0.1500	2.71		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
21.6	340	Total			

Summary for Subcatchment ES12A: Eastern Corner of Middle Lot

Runoff = 0.99 cfs @ 12.06 hrs, Volume= 0.115 af, Depth= 5.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
8,600	39	>75% Grass cover, Good, HSG A
2,121	98	Paved parking, HSG A
10,721	51	Weighted Average
8,600		80.22% Pervious Area
2,121		19.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.07"
2.0	85	0.0100	0.70		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
7.7	135	Total			

Summary for Subcatchment ES13: South-center portion of middle lot

Runoff = 2.99 cfs @ 12.32 hrs, Volume= 0.565 af, Depth= 5.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
9,045	39	>75% Grass cover, Good, HSG A
2,932	61	>75% Grass cover, Good, HSG B
17,458	30	Woods, Good, HSG A
18,383	70	Woods, Good, HSG C
2,266	98	Paved parking, HSG A
996	98	Paved parking, HSG B
51,080	52	Weighted Average
47,818		93.61% Pervious Area
3,262		6.39% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.9	50	0.0050	0.04		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.8	100	0.0350	0.94		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
0.6	79	0.2280	2.39		**Shallow Concentrated Flow, steep woods** Woodland Kv= 5.0 fps
2.3	128	0.0352	0.94		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
26.6	357	Total			

Summary for Subcatchment ES14: Southwest portion of middle & westernly lot

Revised areas for grass and woods cover 11-26-19

Runoff = 5.21 cfs @ 12.12 hrs, Volume= 0.718 af, Depth= 6.92"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
13,418	39	>75% Grass cover, Good, HSG A
26,352	70	Woods, Good, HSG C
5,681	98	Paved parking, HSG A
8,782	30	Woods, Good, HSG A
54,233	59	Weighted Average
48,552		89.52% Pervious Area
5,681		10.48% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
2.1	127	0.0394	0.99		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
1.4	110	0.0677	1.30		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
0.5	244	0.0287	8.72	401.21	**Trap/Vee/Rect Channel Flow, Swale flow** Bot.W=12.00' D=2.00' Z= 8.0 & 3.0 '/' Top.W=34.00' n= 0.035 Earth, dense weeds
12.7	531	Total			

Summary for Subcatchment ES15: 1/2 South-center portion of westernly lot; Flowing to L200

Runoff = 3.75 cfs @ 12.25 hrs, Volume= 0.655 af, Depth= 4.78"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
43,592	30	Woods, Good, HSG A
27,802	70	Woods, Good, HSG C
272	98	Paved parking, HSG A
71,666	46	Weighted Average
71,394		99.62% Pervious Area
272		0.38% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.2	50	0.0800	0.12		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
0.3	35	0.1710	2.07		**Shallow Concentrated Flow, steep woods** Woodland Kv= 5.0 fps
2.7	147	0.0340	0.92		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
0.2	31	0.2500	2.50		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
0.1	72	0.1110	9.63	616.02	**Trap/Vee/Rect Channel Flow, Swale flow** Bot.W=14.00' D=1.00' Z= 50.0 '/' Top.W=114.00' n= 0.035
9.5	72	0.0833	0.13		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
0.8	50	0.0400	1.00		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
20.8	457	Total			

Summary for Subcatchment ES16: Southwest portion of westerly lot

Runoff = 4.70 cfs @ 12.21 hrs, Volume= 0.766 af, Depth= 5.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
13,397	39	>75% Grass cover, Good, HSG A
29,498	30	Woods, Good, HSG A
32,875	70	Woods, Good, HSG C
75,770	49	Weighted Average
75,770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
4.2	370	0.0875	1.48		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
3.5	149	0.0201	0.71		**Shallow Concentrated Flow, Woods/wetlands flow** Woodland Kv= 5.0 fps
18.4	569	Total			

Summary for Subcatchment ES3: Northern corner portion of westerly lot

Runoff = 0.70 cfs @ 12.11 hrs, Volume= 0.104 af, Depth= 3.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
12,689	30	Woods, Good, HSG A
3,241	70	Woods, Good, HSG C
15,930	38	Weighted Average
15,930		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.3	80	0.0400	1.00		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
10.8	130	Total			

Summary for Subcatchment ES4: North of gravel drive portion of westernly lot

Runoff = 0.17 cfs @ 12.15 hrs, Volume= 0.035 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
9,025	30	Woods, Good, HSG A
9,025		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
2.2	125	0.0360	0.95		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
0.8	40	0.0250	0.79		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
11.7	215	Total			

Summary for Subcatchment ES5: Northwest of gravel drive portion of westernly lot

Runoff = 0.24 cfs @ 12.13 hrs, Volume= 0.050 af, Depth= 2.01"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
13,071	30	Woods, Good, HSG A
13,071		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, Woods**
					Woods: Light underbrush n= 0.400 P2= 3.07"
0.5	50	0.1200	1.73		**Shallow Concentrated Flow, Woods**
					Woodland Kv= 5.0 fps
11.2	100	Total			

Summary for Subcatchment ES6: East-center portion of westernly lot

Runoff = 4.04 cfs @ 12.15 hrs, Volume= 0.592 af, Depth= 5.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
26,865	30	Woods, Good, HSG A
3,861	55	Woods, Good, HSG B
26,009	70	Woods, Good, HSG C
56,735	50	Weighted Average
56,735		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow, Woods**
					Woods: Light underbrush n= 0.400 P2= 3.07"
1.0	125	0.1680	2.05		**Shallow Concentrated Flow, Woods**
					Woodland Kv= 5.0 fps
2.0	122	0.0410	1.01		**Shallow Concentrated Flow, Woods**
					Woodland Kv= 5.0 fps
1.0	70	0.0571	1.19		**Shallow Concentrated Flow, Woods**
					Woodland Kv= 5.0 fps
0.7	50	0.0600	1.22		**Shallow Concentrated Flow, Woods**
					Woodland Kv= 5.0 fps
14.2	417	Total			

Summary for Subcatchment ES7: Northwest portion of middle lot

Runoff = 7.75 cfs @ 12.28 hrs, Volume= 1.390 af, Depth= 8.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
84,458	70	Woods, Good, HSG C
84,458		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	50	0.0200	0.07		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.1	82	0.0610	1.23		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
10.2	266	0.0075	0.43		**Shallow Concentrated Flow, Wetland flow** Woodland Kv= 5.0 fps
23.9	398	Total			

Summary for Subcatchment ES9: West portion of easterly lot

Runoff = 5.72 cfs @ 12.12 hrs, Volume= 0.788 af, Depth= 7.39"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 500-yr 500-yr Rainfall=12.60"

Area (sf)	CN	Description
9,841	39	>75% Grass cover, Good, HSG A
2,369	30	Woods, Good, HSG A
24,652	70	Woods, Good, HSG C
5,551	98	Paved parking, HSG A
13,310	55	Woods, Good, HSG B
55,723	62	Weighted Average
50,172		90.04% Pervious Area
5,551		9.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.5	105	0.0524	1.14		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
1.9	99	0.0303	0.87		**Shallow Concentrated Flow, Wetland flow** Woodland Kv= 5.0 fps
0.6	90	0.1440	2.66		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
12.7	344	Total			

Summary for Reach ER70: Wetlands Starting North Flowing Southeast

Inflow Area = 0.366 ac, 0.00% Impervious, Inflow Depth = 3.40" for 500-yr event
Inflow = 0.70 cfs @ 12.11 hrs, Volume= 0.104 af
Outflow = 0.56 cfs @ 12.21 hrs, Volume= 0.104 af, Atten= 21%, Lag= 6.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.61 fps, Min. Travel Time= 9.5 min
Avg. Velocity = 0.33 fps, Avg. Travel Time= 17.8 min

Peak Storage= 317 cf @ 12.21 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 2.00' Flow Area= 64.0 sf, Capacity= 328.04 cfs

16.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 8.0 '/' Top Width= 48.00'
Length= 350.0' Slope= 0.0100 '/'
Inlet Invert= 226.00', Outlet Invert= 222.50'

‡

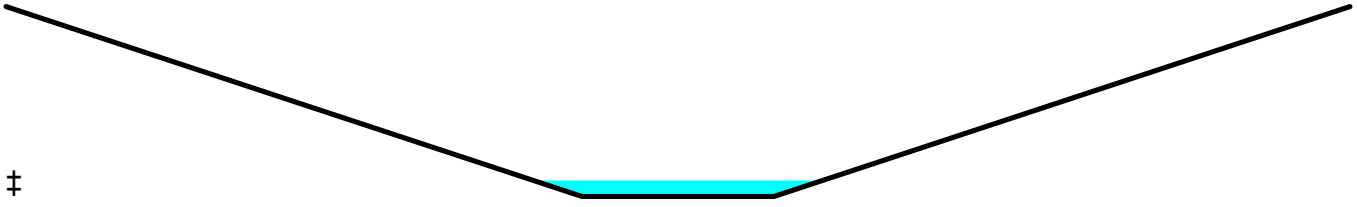
Summary for Reach ER71: Sheet Flow on Eastern Gravel Path

Inflow Area = 0.507 ac, 0.00% Impervious, Inflow Depth = 2.01" for 500-yr event
Inflow = 0.41 cfs @ 12.14 hrs, Volume= 0.085 af
Outflow = 0.33 cfs @ 12.27 hrs, Volume= 0.085 af, Atten= 20%, Lag= 8.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.39 fps, Min. Travel Time= 9.0 min
Avg. Velocity = 0.20 fps, Avg. Travel Time= 17.3 min

Peak Storage= 177 cf @ 12.27 hrs
Average Depth at Peak Storage= 0.17'
Bank-Full Depth= 2.00' Flow Area= 32.0 sf, Capacity= 50.29 cfs

4.00' x 2.00' deep channel, n= 0.240 Sheet flow over Dense Grass
Side Slope Z-value= 6.0 '/' Top Width= 28.00'
Length= 210.0' Slope= 0.0548 '/'
Inlet Invert= 233.50', Outlet Invert= 222.00'



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Summary for Reach ER72: Northwest Wetlands Flowing Southeast to Redemption Rd

[62] Hint: Exceeded Reach ER70 OUTLET depth by 0.09' @ 12.18 hrs
[62] Hint: Exceeded Reach ER71 OUTLET depth by 0.55' @ 11.80 hrs

Inflow Area = 3.201 ac, 0.00% Impervious, Inflow Depth = 4.31" for 500-yr event
Inflow = 7.07 cfs @ 12.17 hrs, Volume= 1.149 af
Outflow = 7.04 cfs @ 12.19 hrs, Volume= 1.149 af, Atten= 0%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 1.82 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.72 fps, Avg. Travel Time= 3.3 min

Peak Storage= 541 cf @ 12.19 hrs
Average Depth at Peak Storage= 0.15'
Bank-Full Depth= 2.00' Flow Area= 82.0 sf, Capacity= 699.46 cfs

25.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 8.0 '/' Top Width= 57.00'
Length= 140.0' Slope= 0.0250 '/'
Inlet Invert= 222.50', Outlet Invert= 219.00'

‡

Summary for Reach ER73: Wetlands Flowing on Map 234 Lot 1.2

[62] Hint: Exceeded Reach ER72 OUTLET depth by 0.04' @ 12.23 hrs

Inflow Area = 4.503 ac, 0.00% Impervious, Inflow Depth = 4.64" for 500-yr event
Inflow = 10.99 cfs @ 12.18 hrs, Volume= 1.741 af
Outflow = 10.84 cfs @ 12.20 hrs, Volume= 1.741 af, Atten= 1%, Lag= 1.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 2.62 fps, Min. Travel Time= 2.2 min
Avg. Velocity = 0.99 fps, Avg. Travel Time= 5.7 min

Peak Storage= 1,409 cf @ 12.20 hrs
Average Depth at Peak Storage= 0.19'
Bank-Full Depth= 2.00' Flow Area= 76.0 sf, Capacity= 771.38 cfs

20.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 9.0 '/' Top Width= 56.00'
Length= 340.0' Slope= 0.0382 '/'
Inlet Invert= 219.00', Outlet Invert= 206.00'

‡

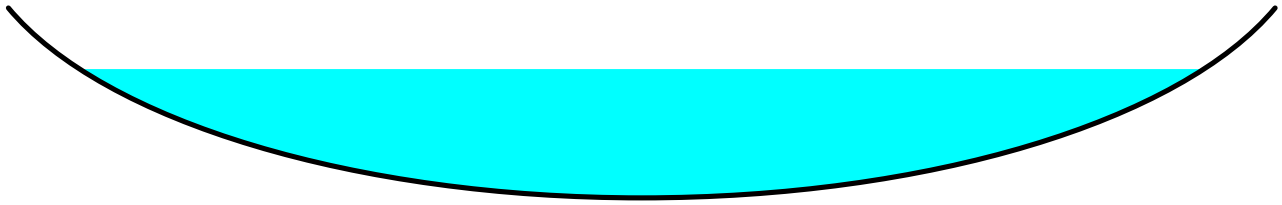
Summary for Reach ER81: SE Portion of Middle Lot Wetlands

Inflow Area = 1.939 ac, 0.00% Impervious, Inflow Depth = 8.02" for 500-yr event
Inflow = 8.60 cfs @ 12.29 hrs, Volume= 1.296 af
Outflow = 5.61 cfs @ 12.50 hrs, Volume= 1.296 af, Atten= 35%, Lag= 12.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.27 fps, Min. Travel Time= 22.5 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 78.8 min

Peak Storage= 7,561 cf @ 12.50 hrs
Average Depth at Peak Storage= 0.68'
Bank-Full Depth= 1.00' Flow Area= 36.7 sf, Capacity= 13.04 cfs

55.00' x 1.00' deep Parabolic Channel, n= 0.750
Length= 370.0' Slope= 0.0554 '/'
Inlet Invert= 233.00', Outlet Invert= 212.50'



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Summary for Reach ER83: Swale Located on North Side of Redemption Rd Flowing Northeast

Inflow Area = 1.919 ac, 3.90% Impervious, Inflow Depth = 5.53" for 500-yr event
Inflow = 4.75 cfs @ 12.30 hrs, Volume= 0.884 af
Outflow = 4.74 cfs @ 12.31 hrs, Volume= 0.884 af, Atten= 0%, Lag= 1.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 1.59 fps, Min. Travel Time= 1.5 min
Avg. Velocity = 0.64 fps, Avg. Travel Time= 3.6 min

Peak Storage= 417 cf @ 12.31 hrs
Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 2.00' Flow Area= 28.0 sf, Capacity= 123.09 cfs

8.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 20.00'
Length= 140.0' Slope= 0.0071 '/'
Inlet Invert= 214.00', Outlet Invert= 213.00'

‡

Summary for Reach ER84: Swale Located on North Side of Redemption Rd Flowing Northeast

Inflow Area = 2.166 ac, 5.71% Impervious, Inflow Depth = 5.54" for 500-yr event
Inflow = 5.16 cfs @ 12.30 hrs, Volume= 0.999 af
Outflow = 5.15 cfs @ 12.32 hrs, Volume= 0.999 af, Atten= 0%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 1.76 fps, Min. Travel Time= 1.3 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 3.1 min

Peak Storage= 410 cf @ 12.32 hrs
Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 3.00' Flow Area= 45.0 sf, Capacity= 239.10 cfs

6.00' x 3.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 24.00'
Length= 140.0' Slope= 0.0071 '/'
Inlet Invert= 212.00', Outlet Invert= 211.00'

‡

Summary for Reach ER85: End of Swale located North of Redemption Rd Circle

[62] Hint: Exceeded Reach ER84 OUTLET depth by 0.32' @ 12.14 hrs

Inflow Area = 5.384 ac, 4.66% Impervious, Inflow Depth = 6.87" for 500-yr event
Inflow = 13.29 cfs @ 12.32 hrs, Volume= 3.083 af
Outflow = 13.29 cfs @ 12.33 hrs, Volume= 3.083 af, Atten= 0%, Lag= 0.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 3.12 fps, Min. Travel Time= 0.4 min
Avg. Velocity = 0.98 fps, Avg. Travel Time= 1.3 min

Peak Storage= 320 cf @ 12.33 hrs
Average Depth at Peak Storage= 0.70'
Bank-Full Depth= 4.00' Flow Area= 64.0 sf, Capacity= 528.23 cfs

4.00' x 4.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 28.00'
Length= 75.0' Slope= 0.0133 '/'
Inlet Invert= 211.00', Outlet Invert= 210.00'

Summary for Pond EP81: Middle Portion of Wetland

[93] Warning: Storage range exceeded by 0.89'
[90] Warning: Qout>Qin may require Finer Routing or smaller dt
[87] Warning: Oscillations may require Finer Routing or smaller dt

Inflow Area = 1.939 ac, 0.00% Impervious, Inflow Depth = 8.60" for 500-yr event
Inflow = 7.75 cfs @ 12.28 hrs, Volume= 1.390 af
Outflow = 8.60 cfs @ 12.29 hrs, Volume= 1.296 af, Atten= 0%, Lag= 0.4 min
Primary = 8.60 cfs @ 12.29 hrs, Volume= 1.296 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 234.89' @ 12.29 hrs Surf.Area= 7,000 sf Storage= 7,132 cf

Plug-Flow detention time= 93.0 min calculated for 1.296 af (93% of inflow)
Center-of-Mass det. time= 54.8 min (904.9 - 850.0)

Volume	Invert	Avail.Storage	Storage Description
#1	232.00'	7,132 cf	**Wetland Low Point (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
232.00	520	90.0	0	0	520
233.00	3,700	245.0	1,869	1,869	4,655
234.00	7,000	381.0	5,263	7,132	11,438

Device	Routing	Invert	Outlet Devices
#1	Primary	233.50'	**2.0' long x 21.0' breadth Weir Between ES8-ES9** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=8.60 cfs @ 12.29 hrs HW=234.89' TW=233.60' (Dynamic Tailwater)
1=Weir Between ES8-ES9 (Weir Controls 8.60 cfs @ 3.09 fps)

Summary for Link L100: Northern Wetlands & North of Site

Inflow Area = 0.366 ac, 0.00% Impervious, Inflow Depth = 3.40" for 500-yr event
Inflow = 0.70 cfs @ 12.11 hrs, Volume= 0.104 af
Primary = 0.70 cfs @ 12.11 hrs, Volume= 0.104 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link L200: Inlet at Start of Redemption Rd; West Side

Inflow Area = 7.888 ac, 0.08% Impervious, Inflow Depth = 4.81" for 500-yr event
Inflow = 19.19 cfs @ 12.21 hrs, Volume= 3.162 af
Primary = 19.19 cfs @ 12.21 hrs, Volume= 3.162 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link L300: Southwest Corner of Far-East Lot; Bottom of Hill

Inflow Area = 1.719 ac, 0.00% Impervious, Inflow Depth = 4.44" for 500-yr event
Inflow = 4.12 cfs @ 12.16 hrs, Volume= 0.636 af
Primary = 4.12 cfs @ 12.16 hrs, Volume= 0.636 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link L400: Southwest Corner of Far-East Lot; Bottom of Hill

Inflow Area = 5.738 ac, 5.21% Impervious, Inflow Depth = 6.84" for 500-yr event
Inflow = 14.07 cfs @ 12.30 hrs, Volume= 3.269 af
Primary = 14.07 cfs @ 12.30 hrs, Volume= 3.269 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Summary for Link L500: Inlet at Start of Gravel Drive; East Side

Inflow Area = 1.245 ac, 10.48% Impervious, Inflow Depth = 6.92" for 500-yr event
Inflow = 5.21 cfs @ 12.12 hrs, Volume= 0.718 af
Primary = 5.21 cfs @ 12.12 hrs, Volume= 0.718 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ES1: Northwest portion of Runoff Area=101,408 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=373' Tc=15.4 min CN=47 Runoff=0.00 cfs 0.000 af

Subcatchment ES10: East portion of Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=235' Tc=14.8 min CN=44 Runoff=0.00 cfs 0.000 af

Subcatchment ES11: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=0.00"
Flow Length=151' Tc=11.4 min CN=55 Runoff=0.00 cfs 0.000 af

Subcatchment ES12: Southeast portion of Runoff Area=32,533 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=340' Tc=21.6 min CN=48 Runoff=0.00 cfs 0.000 af

Subcatchment ES12A: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=0.00"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.00 cfs 0.000 af

Subcatchment ES13: South-center portion Runoff Area=51,080 sf 6.39% Impervious Runoff Depth=0.00"
Flow Length=357' Tc=26.6 min CN=52 Runoff=0.00 cfs 0.000 af

Subcatchment ES14: Southwest portion of Runoff Area=54,233 sf 10.48% Impervious Runoff Depth=0.00"
Flow Length=531' Tc=12.7 min CN=59 Runoff=0.00 cfs 0.000 af

Subcatchment ES15: 1/2 South-center Runoff Area=71,666 sf 0.38% Impervious Runoff Depth=0.00"
Flow Length=457' Tc=20.8 min CN=46 Runoff=0.00 cfs 0.000 af

Subcatchment ES16: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=569' Tc=18.4 min CN=49 Runoff=0.00 cfs 0.000 af

Subcatchment ES3: Northern corner portion Runoff Area=15,930 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=130' Slope=0.0400 '/' Tc=10.8 min CN=38 Runoff=0.00 cfs 0.000 af

Subcatchment ES4: North of gravel drive Runoff Area=9,025 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=215' Tc=11.7 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment ES5: Northwest of gravel Runoff Area=13,071 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=100' Tc=11.2 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment ES6: East-center portion of Runoff Area=56,735 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=417' Tc=14.2 min CN=50 Runoff=0.00 cfs 0.000 af

Subcatchment ES7: Northwest portion of Runoff Area=84,458 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=398' Tc=23.9 min CN=70 Runoff=0.00 cfs 0.001 af

Subcatchment ES9: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=0.00"
Flow Length=344' Tc=12.7 min CN=62 Runoff=0.00 cfs 0.000 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.00 cfs 0.000 af

Reach ER71: Sheet Flow on Eastern Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.240 L=210.0' S=0.0548 '/' Capacity=50.29 cfs Outflow=0.00 cfs 0.000 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=140.0' S=0.0250 '/' Capacity=699.46 cfs Outflow=0.00 cfs 0.000 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=340.0' S=0.0382 '/' Capacity=771.38 cfs Outflow=0.00 cfs 0.000 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=0.00 cfs 0.000 af

Reach ER83: Swale Located on North Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=123.09 cfs Outflow=0.00 cfs 0.000 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=0.00 cfs 0.000 af

Reach ER85: End of Swale located Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=0.00 cfs 0.000 af

Pond EP81: Middle Portion of Wetland Peak Elev=232.06' Storage=32 cf Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.000 af

Link L100: Northern Wetlands & North of Site Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 16.590 ac Runoff Volume = 0.001 af Average Runoff Depth = 0.00"
97.37% Pervious = 16.154 ac 2.63% Impervious = 0.436 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ES1: Northwest portion of Runoff Area=101,408 sf 0.00% Impervious Runoff Depth=0.05"
Flow Length=373' Tc=15.4 min CN=47 Runoff=0.01 cfs 0.011 af

Subcatchment ES10: East portion of Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=0.02"
Flow Length=235' Tc=14.8 min CN=44 Runoff=0.01 cfs 0.003 af

Subcatchment ES11: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=0.21"
Flow Length=151' Tc=11.4 min CN=55 Runoff=0.01 cfs 0.006 af

Subcatchment ES12: Southeast portion of Runoff Area=32,533 sf 0.00% Impervious Runoff Depth=0.07"
Flow Length=340' Tc=21.6 min CN=48 Runoff=0.01 cfs 0.004 af

Subcatchment ES12A: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=0.12"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.00 cfs 0.003 af

Subcatchment ES13: South-center portion Runoff Area=51,080 sf 6.39% Impervious Runoff Depth=0.14"
Flow Length=357' Tc=26.6 min CN=52 Runoff=0.02 cfs 0.014 af

Subcatchment ES14: Southwest portion of Runoff Area=54,233 sf 10.48% Impervious Runoff Depth=0.33"
Flow Length=531' Tc=12.7 min CN=59 Runoff=0.13 cfs 0.034 af

Subcatchment ES15: 1/2 South-center Runoff Area=71,666 sf 0.38% Impervious Runoff Depth=0.04"
Flow Length=457' Tc=20.8 min CN=46 Runoff=0.01 cfs 0.006 af

Subcatchment ES16: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=0.09"
Flow Length=569' Tc=18.4 min CN=49 Runoff=0.01 cfs 0.012 af

Subcatchment ES3: Northern corner portion Runoff Area=15,930 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=130' Slope=0.0400 '/' Tc=10.8 min CN=38 Runoff=0.00 cfs 0.000 af

Subcatchment ES4: North of gravel drive Runoff Area=9,025 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=215' Tc=11.7 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment ES5: Northwest of gravel Runoff Area=13,071 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=100' Tc=11.2 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment ES6: East-center portion of Runoff Area=56,735 sf 0.00% Impervious Runoff Depth=0.10"
Flow Length=417' Tc=14.2 min CN=50 Runoff=0.01 cfs 0.011 af

Subcatchment ES7: Northwest portion of Runoff Area=84,458 sf 0.00% Impervious Runoff Depth=0.75"
Flow Length=398' Tc=23.9 min CN=70 Runoff=0.78 cfs 0.122 af

Subcatchment ES9: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=0.43"
Flow Length=344' Tc=12.7 min CN=62 Runoff=0.26 cfs 0.045 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.00 cfs 0.000 af

Reach ER71: Sheet Flow on Eastern Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.240 L=210.0' S=0.0548 '/' Capacity=50.29 cfs Outflow=0.00 cfs 0.000 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.00' Max Vel=0.49 fps Inflow=0.01 cfs 0.011 af
n=0.035 L=140.0' S=0.0250 '/' Capacity=699.46 cfs Outflow=0.01 cfs 0.011 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.00' Max Vel=0.61 fps Inflow=0.03 cfs 0.022 af
n=0.035 L=340.0' S=0.0382 '/' Capacity=771.38 cfs Outflow=0.03 cfs 0.022 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.08' Max Vel=0.07 fps Inflow=0.06 cfs 0.028 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=0.05 cfs 0.028 af

Reach ER83: Swale Located on North Avg. Flow Depth=0.01' Max Vel=0.26 fps Inflow=0.02 cfs 0.018 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=123.09 cfs Outflow=0.02 cfs 0.018 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.01' Max Vel=0.34 fps Inflow=0.02 cfs 0.021 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=0.02 cfs 0.021 af

Reach ER85: End of Swale located Avg. Flow Depth=0.07' Max Vel=0.84 fps Inflow=0.26 cfs 0.094 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=0.26 cfs 0.094 af

Pond EP81: Middle Portion of Wetland Peak Elev=233.55' Storage=4,343 cf Inflow=0.78 cfs 0.122 af
Outflow=0.06 cfs 0.028 af

Link L100: Northern Wetlands & North of Site Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=0.05 cfs 0.040 af
Primary=0.05 cfs 0.040 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.01 cfs 0.003 af
Primary=0.01 cfs 0.003 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.26 cfs 0.100 af
Primary=0.26 cfs 0.100 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=0.13 cfs 0.034 af
Primary=0.13 cfs 0.034 af

Total Runoff Area = 16.590 ac Runoff Volume = 0.271 af Average Runoff Depth = 0.20"
97.37% Pervious = 16.154 ac 2.63% Impervious = 0.436 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ES1: Northwest portion of Runoff Area=101,408 sf 0.00% Impervious Runoff Depth=0.41"
Flow Length=373' Tc=15.4 min CN=47 Runoff=0.21 cfs 0.079 af

Subcatchment ES10: East portion of Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=235' Tc=14.8 min CN=44 Runoff=0.08 cfs 0.041 af

Subcatchment ES11: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=0.79"
Flow Length=151' Tc=11.4 min CN=55 Runoff=0.15 cfs 0.023 af

Subcatchment ES12: Southeast portion of Runoff Area=32,533 sf 0.00% Impervious Runoff Depth=0.45"
Flow Length=340' Tc=21.6 min CN=48 Runoff=0.08 cfs 0.028 af

Subcatchment ES12A: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=0.59"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.06 cfs 0.012 af

Subcatchment ES13: South-center portion Runoff Area=51,080 sf 6.39% Impervious Runoff Depth=0.64"
Flow Length=357' Tc=26.6 min CN=52 Runoff=0.23 cfs 0.062 af

Subcatchment ES14: Southwest portion of Runoff Area=54,233 sf 10.48% Impervious Runoff Depth=1.02"
Flow Length=531' Tc=12.7 min CN=59 Runoff=0.77 cfs 0.106 af

Subcatchment ES15: 1/2 South-center Runoff Area=71,666 sf 0.38% Impervious Runoff Depth=0.37"
Flow Length=457' Tc=20.8 min CN=46 Runoff=0.11 cfs 0.050 af

Subcatchment ES16: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=0.49"
Flow Length=569' Tc=18.4 min CN=49 Runoff=0.23 cfs 0.072 af

Subcatchment ES3: Northern corner portion Runoff Area=15,930 sf 0.00% Impervious Runoff Depth=0.10"
Flow Length=130' Slope=0.0400 '/' Tc=10.8 min CN=38 Runoff=0.00 cfs 0.003 af

Subcatchment ES4: North of gravel drive Runoff Area=9,025 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=215' Tc=11.7 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment ES5: Northwest of gravel Runoff Area=13,071 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=100' Tc=11.2 min CN=30 Runoff=0.00 cfs 0.000 af

Subcatchment ES6: East-center portion of Runoff Area=56,735 sf 0.00% Impervious Runoff Depth=0.54"
Flow Length=417' Tc=14.2 min CN=50 Runoff=0.23 cfs 0.059 af

Subcatchment ES7: Northwest portion of Runoff Area=84,458 sf 0.00% Impervious Runoff Depth=1.75"
Flow Length=398' Tc=23.9 min CN=70 Runoff=1.86 cfs 0.283 af

Subcatchment ES9: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=1.20"
Flow Length=344' Tc=12.7 min CN=62 Runoff=1.01 cfs 0.128 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.00' Max Vel=0.31 fps Inflow=0.00 cfs 0.003 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.00 cfs 0.003 af

Reach ER71: Sheet Flow on Eastern Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.240 L=210.0' S=0.0548 '/' Capacity=50.29 cfs Outflow=0.00 cfs 0.000 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.02' Max Vel=0.49 fps Inflow=0.21 cfs 0.082 af
n=0.035 L=140.0' S=0.0250 '/' Capacity=699.46 cfs Outflow=0.20 cfs 0.082 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.02' Max Vel=0.75 fps Inflow=0.39 cfs 0.141 af
n=0.035 L=340.0' S=0.0382 '/' Capacity=771.38 cfs Outflow=0.38 cfs 0.141 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.18' Max Vel=0.11 fps Inflow=0.42 cfs 0.189 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=0.31 cfs 0.189 af

Reach ER83: Swale Located on North Avg. Flow Depth=0.06' Max Vel=0.58 fps Inflow=0.31 cfs 0.090 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=123.09 cfs Outflow=0.31 cfs 0.090 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.08' Max Vel=0.67 fps Inflow=0.34 cfs 0.102 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=0.34 cfs 0.102 af

Reach ER85: End of Swale located Avg. Flow Depth=0.17' Max Vel=1.39 fps Inflow=1.06 cfs 0.420 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=1.06 cfs 0.420 af

Pond EP81: Middle Portion of Wetland Peak Elev=233.68' Storage=5,093 cf Inflow=1.86 cfs 0.283 af
Outflow=0.42 cfs 0.189 af

Link L100: Northern Wetlands & North of Site Inflow=0.00 cfs 0.003 af
Primary=0.00 cfs 0.003 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=0.70 cfs 0.262 af
Primary=0.70 cfs 0.262 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.08 cfs 0.041 af
Primary=0.08 cfs 0.041 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=1.21 cfs 0.443 af
Primary=1.21 cfs 0.443 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=0.77 cfs 0.106 af
Primary=0.77 cfs 0.106 af

Total Runoff Area = 16.590 ac Runoff Volume = 0.947 af Average Runoff Depth = 0.68"
97.37% Pervious = 16.154 ac 2.63% Impervious = 0.436 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ES1: Northwest portion of Runoff Area=101,408 sf 0.00% Impervious Runoff Depth=0.86"
Flow Length=373' Tc=15.4 min CN=47 Runoff=0.79 cfs 0.167 af

Subcatchment ES10: East portion of Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=0.67"
Flow Length=235' Tc=14.8 min CN=44 Runoff=0.34 cfs 0.097 af

Subcatchment ES11: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=1.42"
Flow Length=151' Tc=11.4 min CN=55 Runoff=0.32 cfs 0.042 af

Subcatchment ES12: Southeast portion of Runoff Area=32,533 sf 0.00% Impervious Runoff Depth=0.93"
Flow Length=340' Tc=21.6 min CN=48 Runoff=0.26 cfs 0.058 af

Subcatchment ES12A: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=1.13"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.18 cfs 0.023 af

Subcatchment ES13: South-center portion Runoff Area=51,080 sf 6.39% Impervious Runoff Depth=1.20"
Flow Length=357' Tc=26.6 min CN=52 Runoff=0.57 cfs 0.117 af

Subcatchment ES14: Southwest portion of Runoff Area=54,233 sf 10.48% Impervious Runoff Depth=1.73"
Flow Length=531' Tc=12.7 min CN=59 Runoff=1.41 cfs 0.180 af

Subcatchment ES15: 1/2 South-center Runoff Area=71,666 sf 0.38% Impervious Runoff Depth=0.80"
Flow Length=457' Tc=20.8 min CN=46 Runoff=0.43 cfs 0.109 af

Subcatchment ES16: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=0.99"
Flow Length=569' Tc=18.4 min CN=49 Runoff=0.73 cfs 0.144 af

Subcatchment ES3: Northern corner portion Runoff Area=15,930 sf 0.00% Impervious Runoff Depth=0.35"
Flow Length=130' Slope=0.0400 '/' Tc=10.8 min CN=38 Runoff=0.02 cfs 0.011 af

Subcatchment ES4: North of gravel drive Runoff Area=9,025 sf 0.00% Impervious Runoff Depth=0.06"
Flow Length=215' Tc=11.7 min CN=30 Runoff=0.00 cfs 0.001 af

Subcatchment ES5: Northwest of gravel Runoff Area=13,071 sf 0.00% Impervious Runoff Depth=0.06"
Flow Length=100' Tc=11.2 min CN=30 Runoff=0.00 cfs 0.001 af

Subcatchment ES6: East-center portion of Runoff Area=56,735 sf 0.00% Impervious Runoff Depth=1.06"
Flow Length=417' Tc=14.2 min CN=50 Runoff=0.68 cfs 0.115 af

Subcatchment ES7: Northwest portion of Runoff Area=84,458 sf 0.00% Impervious Runoff Depth=2.67"
Flow Length=398' Tc=23.9 min CN=70 Runoff=2.79 cfs 0.432 af

Subcatchment ES9: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=1.98"
Flow Length=344' Tc=12.7 min CN=62 Runoff=1.71 cfs 0.211 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.00' Max Vel=0.31 fps Inflow=0.02 cfs 0.011 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.01 cfs 0.011 af

Reach ER71: Sheet Flow on Eastern Avg. Flow Depth=0.01' Max Vel=0.10 fps Inflow=0.00 cfs 0.002 af
n=0.240 L=210.0' S=0.0548 '/' Capacity=50.29 cfs Outflow=0.00 cfs 0.002 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.04' Max Vel=0.77 fps Inflow=0.79 cfs 0.180 af
n=0.035 L=140.0' S=0.0250 '/' Capacity=699.46 cfs Outflow=0.77 cfs 0.180 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.05' Max Vel=1.19 fps Inflow=1.40 cfs 0.295 af
n=0.035 L=340.0' S=0.0382 '/' Capacity=771.38 cfs Outflow=1.32 cfs 0.295 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.28' Max Vel=0.15 fps Inflow=1.25 cfs 0.338 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=0.84 cfs 0.338 af

Reach ER83: Swale Located on North Avg. Flow Depth=0.12' Max Vel=0.83 fps Inflow=0.82 cfs 0.175 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=123.09 cfs Outflow=0.81 cfs 0.175 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.15' Max Vel=0.95 fps Inflow=0.89 cfs 0.198 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=0.89 cfs 0.198 af

Reach ER85: End of Swale located Avg. Flow Depth=0.25' Max Vel=1.76 fps Inflow=2.12 cfs 0.746 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=2.12 cfs 0.746 af

Pond EP81: Middle Portion of Wetland Peak Elev=233.88' Storage=6,305 cf Inflow=2.79 cfs 0.432 af
Outflow=1.25 cfs 0.338 af

Link L100: Northern Wetlands & North of Site Inflow=0.02 cfs 0.011 af
Primary=0.02 cfs 0.011 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=2.46 cfs 0.548 af
Primary=2.46 cfs 0.548 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.34 cfs 0.097 af
Primary=0.34 cfs 0.097 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=2.42 cfs 0.788 af
Primary=2.42 cfs 0.788 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=1.41 cfs 0.180 af
Primary=1.41 cfs 0.180 af

Total Runoff Area = 16.590 ac Runoff Volume = 1.706 af Average Runoff Depth = 1.23"
97.37% Pervious = 16.154 ac 2.63% Impervious = 0.436 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ES1: Northwest portion of Runoff Area=101,408 sf 0.00% Impervious Runoff Depth=1.39"
Flow Length=373' Tc=15.4 min CN=47 Runoff=1.57 cfs 0.270 af

Subcatchment ES10: East portion of Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=1.14"
Flow Length=235' Tc=14.8 min CN=44 Runoff=0.84 cfs 0.163 af

Subcatchment ES11: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=2.10"
Flow Length=151' Tc=11.4 min CN=55 Runoff=0.49 cfs 0.062 af

Subcatchment ES12: Southeast portion of Runoff Area=32,533 sf 0.00% Impervious Runoff Depth=1.48"
Flow Length=340' Tc=21.6 min CN=48 Runoff=0.48 cfs 0.092 af

Subcatchment ES12A: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=1.74"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.30 cfs 0.036 af

Subcatchment ES13: South-center portion Runoff Area=51,080 sf 6.39% Impervious Runoff Depth=1.83"
Flow Length=357' Tc=26.6 min CN=52 Runoff=0.93 cfs 0.179 af

Subcatchment ES14: Southwest portion of Runoff Area=54,233 sf 10.48% Impervious Runoff Depth=2.49"
Flow Length=531' Tc=12.7 min CN=59 Runoff=2.01 cfs 0.258 af

Subcatchment ES15: 1/2 South-center Runoff Area=71,666 sf 0.38% Impervious Runoff Depth=1.31"
Flow Length=457' Tc=20.8 min CN=46 Runoff=0.88 cfs 0.179 af

Subcatchment ES16: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=1.56"
Flow Length=569' Tc=18.4 min CN=49 Runoff=1.31 cfs 0.226 af

Subcatchment ES3: Northern corner portion Runoff Area=15,930 sf 0.00% Impervious Runoff Depth=0.69"
Flow Length=130' Slope=0.0400 '/' Tc=10.8 min CN=38 Runoff=0.06 cfs 0.021 af

Subcatchment ES4: North of gravel drive Runoff Area=9,025 sf 0.00% Impervious Runoff Depth=0.21"
Flow Length=215' Tc=11.7 min CN=30 Runoff=0.00 cfs 0.004 af

Subcatchment ES5: Northwest of gravel Runoff Area=13,071 sf 0.00% Impervious Runoff Depth=0.21"
Flow Length=100' Tc=11.2 min CN=30 Runoff=0.01 cfs 0.005 af

Subcatchment ES6: East-center portion of Runoff Area=56,735 sf 0.00% Impervious Runoff Depth=1.65"
Flow Length=417' Tc=14.2 min CN=50 Runoff=1.18 cfs 0.179 af

Subcatchment ES7: Northwest portion of Runoff Area=84,458 sf 0.00% Impervious Runoff Depth=3.59"
Flow Length=398' Tc=23.9 min CN=70 Runoff=3.63 cfs 0.581 af

Subcatchment ES9: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=2.78"
Flow Length=344' Tc=12.7 min CN=62 Runoff=2.36 cfs 0.296 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.01' Max Vel=0.31 fps Inflow=0.06 cfs 0.021 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.04 cfs 0.021 af

Reach ER71: Sheet Flow on Eastern Avg. Flow Depth=0.02' Max Vel=0.11 fps Inflow=0.01 cfs 0.009 af
n=0.240 L=210.0' S=0.0548 '/' Capacity=50.29 cfs Outflow=0.01 cfs 0.009 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.06' Max Vel=1.02 fps Inflow=1.58 cfs 0.299 af
n=0.035 L=140.0' S=0.0250 '/' Capacity=699.46 cfs Outflow=1.56 cfs 0.299 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.08' Max Vel=1.53 fps Inflow=2.68 cfs 0.478 af
n=0.035 L=340.0' S=0.0382 '/' Capacity=771.38 cfs Outflow=2.59 cfs 0.478 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.37' Max Vel=0.18 fps Inflow=3.45 cfs 0.487 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=1.49 cfs 0.487 af

Reach ER83: Swale Located on North Avg. Flow Depth=0.16' Max Vel=1.02 fps Inflow=1.40 cfs 0.271 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=123.09 cfs Outflow=1.39 cfs 0.271 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.20' Max Vel=1.15 fps Inflow=1.51 cfs 0.306 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=1.51 cfs 0.306 af

Reach ER85: End of Swale located Avg. Flow Depth=0.32' Max Vel=2.03 fps Inflow=3.28 cfs 1.089 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=3.27 cfs 1.089 af

Pond EP81: Middle Portion of Wetland Peak Elev=234.25' Storage=7,132 cf Inflow=3.63 cfs 0.581 af
Outflow=3.45 cfs 0.487 af

Link L100: Northern Wetlands & North of Site Inflow=0.06 cfs 0.021 af
Primary=0.06 cfs 0.021 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=4.75 cfs 0.884 af
Primary=4.75 cfs 0.884 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.84 cfs 0.163 af
Primary=0.84 cfs 0.163 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=3.73 cfs 1.151 af
Primary=3.73 cfs 1.151 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=2.01 cfs 0.258 af
Primary=2.01 cfs 0.258 af

Total Runoff Area = 16.590 ac Runoff Volume = 2.550 af Average Runoff Depth = 1.84"
97.37% Pervious = 16.154 ac 2.63% Impervious = 0.436 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 3
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment ES1: Northwest portion of Runoff Area=101,408 sf 0.00% Impervious Runoff Depth=4.95"
Flow Length=373' Tc=15.4 min CN=47 Runoff=6.25 cfs 0.960 af

Subcatchment ES10: East portion of Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=4.44"
Flow Length=235' Tc=14.8 min CN=44 Runoff=4.12 cfs 0.636 af

Subcatchment ES11: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=6.28"
Flow Length=151' Tc=11.4 min CN=55 Runoff=1.39 cfs 0.185 af

Subcatchment ES12: Southeast portion of Runoff Area=32,533 sf 0.00% Impervious Runoff Depth=5.12"
Flow Length=340' Tc=21.6 min CN=48 Runoff=1.82 cfs 0.319 af

Subcatchment ES12A: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=5.62"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.99 cfs 0.115 af

Subcatchment ES13: South-center portion Runoff Area=51,080 sf 6.39% Impervious Runoff Depth=5.79"
Flow Length=357' Tc=26.6 min CN=52 Runoff=2.99 cfs 0.565 af

Subcatchment ES14: Southwest portion of Runoff Area=54,233 sf 10.48% Impervious Runoff Depth=6.92"
Flow Length=531' Tc=12.7 min CN=59 Runoff=5.21 cfs 0.718 af

Subcatchment ES15: 1/2 South-center Runoff Area=71,666 sf 0.38% Impervious Runoff Depth=4.78"
Flow Length=457' Tc=20.8 min CN=46 Runoff=3.75 cfs 0.655 af

Subcatchment ES16: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=5.29"
Flow Length=569' Tc=18.4 min CN=49 Runoff=4.70 cfs 0.766 af

Subcatchment ES3: Northern corner portion Runoff Area=15,930 sf 0.00% Impervious Runoff Depth=3.40"
Flow Length=130' Slope=0.0400 '/' Tc=10.8 min CN=38 Runoff=0.70 cfs 0.104 af

Subcatchment ES4: North of gravel drive Runoff Area=9,025 sf 0.00% Impervious Runoff Depth=2.01"
Flow Length=215' Tc=11.7 min CN=30 Runoff=0.17 cfs 0.035 af

Subcatchment ES5: Northwest of gravel Runoff Area=13,071 sf 0.00% Impervious Runoff Depth=2.01"
Flow Length=100' Tc=11.2 min CN=30 Runoff=0.24 cfs 0.050 af

Subcatchment ES6: East-center portion of Runoff Area=56,735 sf 0.00% Impervious Runoff Depth=5.45"
Flow Length=417' Tc=14.2 min CN=50 Runoff=4.04 cfs 0.592 af

Subcatchment ES7: Northwest portion of Runoff Area=84,458 sf 0.00% Impervious Runoff Depth=8.60"
Flow Length=398' Tc=23.9 min CN=70 Runoff=7.75 cfs 1.390 af

Subcatchment ES9: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=7.39"
Flow Length=344' Tc=12.7 min CN=62 Runoff=5.72 cfs 0.788 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.06' Max Vel=0.61 fps Inflow=0.70 cfs 0.104 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.56 cfs 0.104 af

Reach ER71: Sheet Flow on Eastern Avg. Flow Depth=0.17' Max Vel=0.39 fps Inflow=0.41 cfs 0.085 af
n=0.240 L=210.0' S=0.0548 '/' Capacity=50.29 cfs Outflow=0.33 cfs 0.085 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.15' Max Vel=1.82 fps Inflow=7.07 cfs 1.149 af
n=0.035 L=140.0' S=0.0250 '/' Capacity=699.46 cfs Outflow=7.04 cfs 1.149 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.19' Max Vel=2.62 fps Inflow=10.99 cfs 1.741 af
n=0.035 L=340.0' S=0.0382 '/' Capacity=771.38 cfs Outflow=10.84 cfs 1.741 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.68' Max Vel=0.27 fps Inflow=8.60 cfs 1.296 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=5.61 cfs 1.296 af

Reach ER83: Swale Located on North Avg. Flow Depth=0.33' Max Vel=1.59 fps Inflow=4.75 cfs 0.884 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=123.09 cfs Outflow=4.74 cfs 0.884 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.41' Max Vel=1.76 fps Inflow=5.16 cfs 0.999 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=5.15 cfs 0.999 af

Reach ER85: End of Swale located Avg. Flow Depth=0.70' Max Vel=3.12 fps Inflow=13.29 cfs 3.083 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=13.29 cfs 3.083 af

Pond EP81: Middle Portion of Wetland Peak Elev=234.89' Storage=7,132 cf Inflow=7.75 cfs 1.390 af
Outflow=8.60 cfs 1.296 af

Link L100: Northern Wetlands & North of Site Inflow=0.70 cfs 0.104 af
Primary=0.70 cfs 0.104 af

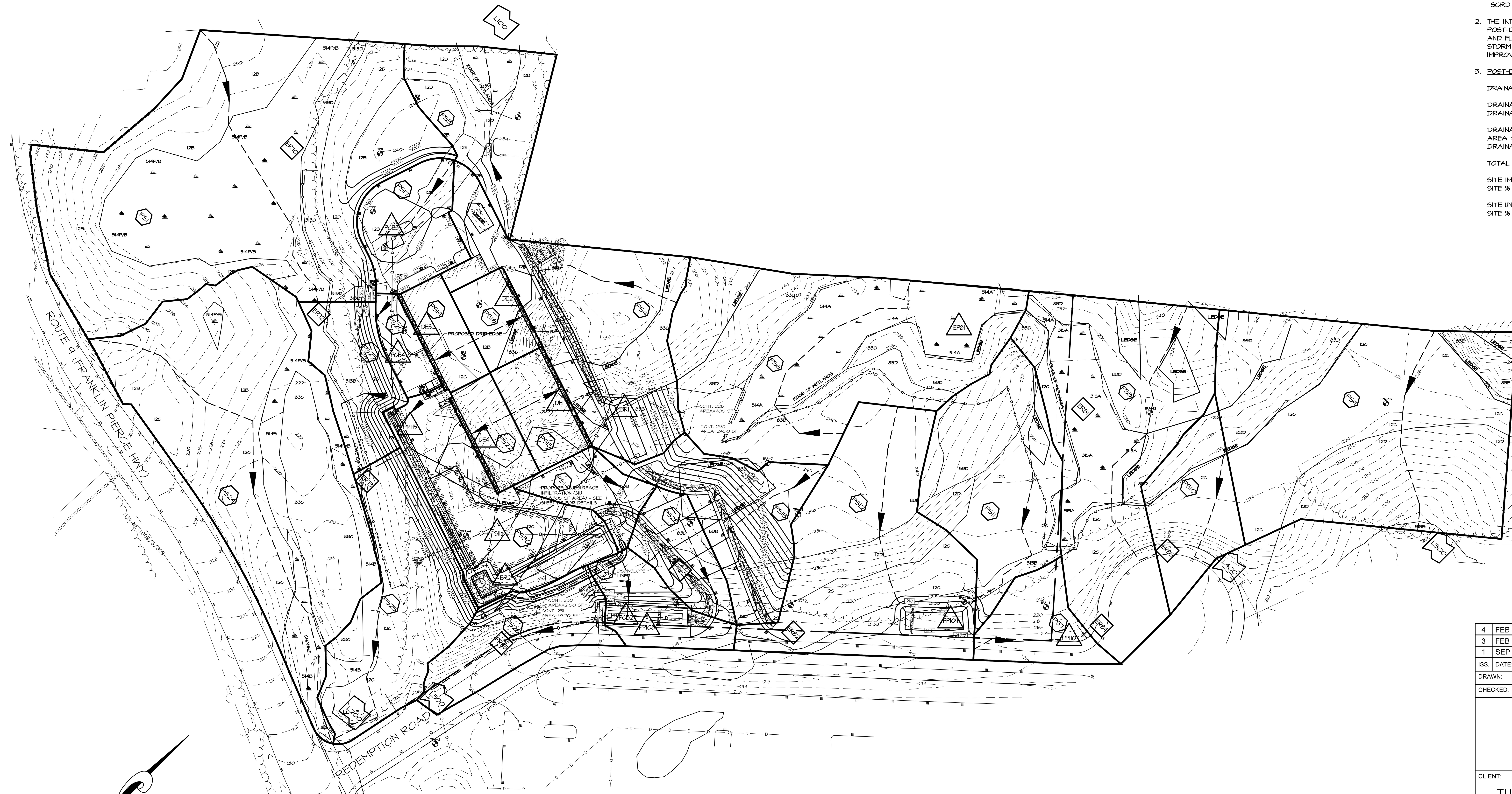
Link L200: Inlet at Start of Redemption Rd; West Side Inflow=19.19 cfs 3.162 af
Primary=19.19 cfs 3.162 af

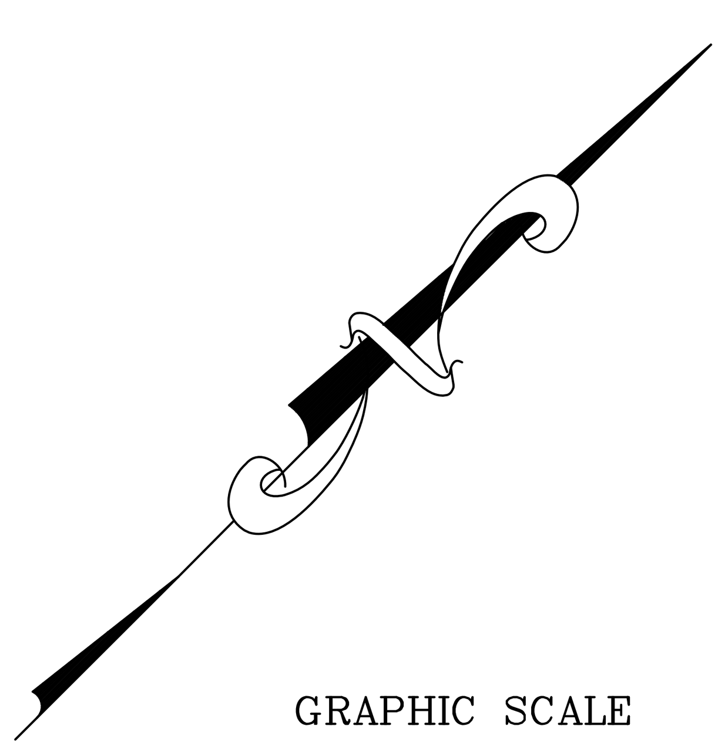
Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=4.12 cfs 0.636 af
Primary=4.12 cfs 0.636 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=14.07 cfs 3.269 af
Primary=14.07 cfs 3.269 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=5.21 cfs 0.718 af
Primary=5.21 cfs 0.718 af

Total Runoff Area = 16.590 ac Runoff Volume = 7.879 af Average Runoff Depth = 5.70"
97.37% Pervious = 16.154 ac 2.63% Impervious = 0.436 ac





GRAPHIC SCALE

60 0 30 60 120 240

(IN FEET)
1 inch = 60 ft.

NOTES:

1. OWNER OF RECORD:
   TAX MAP 233 LOT 77
   RRB5, LLC
   607 CALEF HIGHWAY, SUITE 200
   BARRINGTON, NH 03825
   SCRD BK4719 PG0827

2. THE INTENT OF THIS PLAN IS TO CALCULATE POST-DEVELOPMENT SUBCATCHMENT AREAS AND FLOW PATHS FOR MODELING VARIOUS STORM EVENTS IN PREPARATION FOR SITE IMPROVEMENTS.

3. POST-DEVELOPMENT DRAINAGE AREA CALCS:

   DRAINAGE ANALYSIS TOTAL AREA = 722,655 SF

   DRAINAGE ANALYSIS IMPERVIOUS = 106,896 SF
   DRAINAGE ANALYSIS % IMPERVIOUS = 14.79%

   DRAINAGE ANALYSIS UNDISTURBED AREA = ± 503,305 SF
   DRAINAGE ANALYSIS % UNDISTURBED = 69.37%

   TOTAL AREA OF SITE = 559,579 SF

   SITE IMPERVIOUS AREA = 87,925 SF
   SITE % IMPERVIOUS = 15.71%

   SITE UNDISTURBED AREA = ± 338,229 SF
   SITE % UNDISTURBED = 60.44%

ISS.	DATE:	DESCRIPTION OF ISSUE:	CHK.
4	FEB 25, 2020	FOR APPROVAL	
3	FEB 13, 2020	FOR APPROVAL	
1	SEP 13, 2019	FOR APPROVAL	

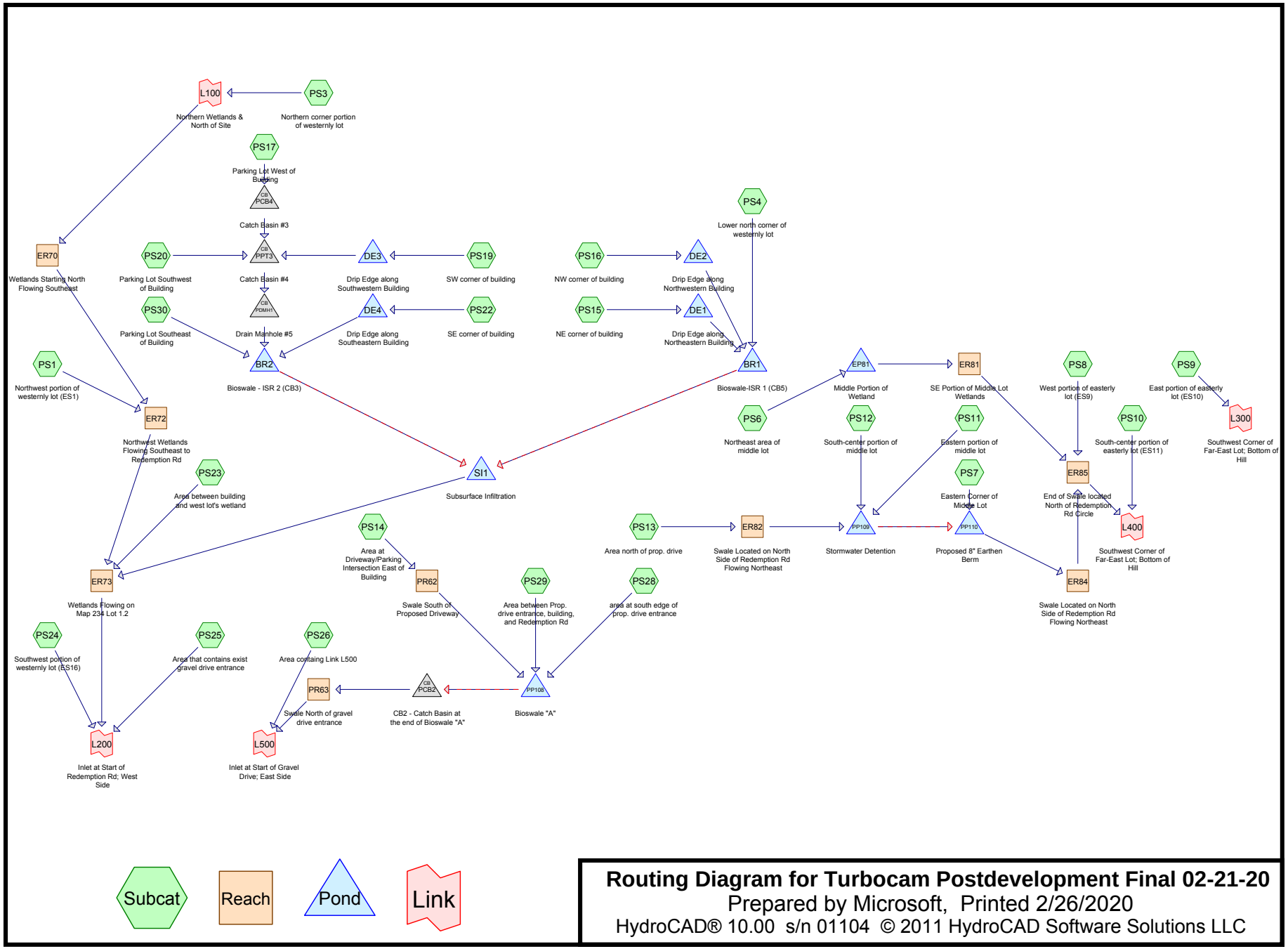
DRAWN: MCV/JJM	DESIGN: MCV
CHECKED: BDS	CHECKED: BDS

CLIENT:
TURBOCAM INTERNATIONAL
607 CALEF HIGHWAY
BARRINGTON, NH 03825

SEAL:

TITLE:
POST-DEVELOPMENT
DRAINAGE PLAN
FOR
TAX MAP 233 LOT 77
RRB5, LLC &
TURBOCAM INTERNATIONAL
ROUTE 9 / REDEMPTION ROAD (SITE)
BARRINGTON, NH 03825

PROJECT:	SCALE:	SHEET:
19-020	1"=60'	SW2



Routing Diagram for Turbocam Postdevelopment Final 02-21-20

Prepared by Microsoft, Printed 2/26/2020

HydroCAD® 10.00 s/n 01104 © 2011 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.680	30	Woods, Good, HSG A (PS1, PS11, PS23, PS24, PS25, PS26, PS29, PS3, PS8, PS9)
4.299	39	>75% Grass cover, Good, HSG A (PS1, PS10, PS11, PS12, PS13, PS17, PS20, PS23, PS24, PS25, PS26, PS28, PS29, PS3, PS30, PS4, PS7, PS8, PS9)
0.472	55	Woods, Good, HSG B (PS1, PS11, PS23, PS8)
0.250	61	>75% Grass cover, Good, HSG B (PS1, PS11, PS12, PS23)
5.050	70	Woods, Good, HSG C (PS1, PS10, PS11, PS23, PS24, PS25, PS26, PS29, PS3, PS4, PS6, PS8, PS9)
1.343	74	>75% Grass cover, Good, HSG C (PS11, PS12, PS13, PS14, PS26, PS28, PS30, PS4, PS6)
0.033	96	Gravel surface, HSG A (PS25)
1.259	98	Paved parking, HSG A (PS10, PS12, PS13, PS17, PS20, PS25, PS26, PS28, PS29, PS30, PS4, PS7, PS8)
0.023	98	Paved parking, HSG B (PS12)
0.502	98	Paved parking, HSG C (PS13, PS14, PS28, PS30, PS4)
0.286	98	Roofs, HSG A (PS16, PS19, PS22, PS4)
0.350	98	Roofs, HSG C (PS15, PS16, PS22)
0.016	98	Water Surface, 0% imp, HSG A (PS16, PS19)
0.027	98	Water Surface, 0% imp, HSG C (PS15, PS16, PS22)
16.590	**59**	**TOTAL AREA**

Soil Listing (all nodes)

Area (acres)	Soil Group	Subcatchment Numbers
8.573	HSG A	PS1, PS10, PS11, PS12, PS13, PS16, PS17, PS19, PS20, PS22, PS23, PS24, PS25, PS26, PS28, PS29, PS3, PS30, PS4, PS7, PS8, PS9
0.744	HSG B	PS1, PS11, PS12, PS23, PS8
7.273	HSG C	PS1, PS10, PS11, PS12, PS13, PS14, PS15, PS16, PS22, PS23, PS24, PS25, PS26, PS28, PS29, PS3, PS30, PS4, PS6, PS8, PS9
0.000	HSG D	
0.000	Other	
16.590		**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
4.299	0.250	1.343	0.000	0.000	5.892	>75% Grass cover, Good	PS1, PS10, PS11, PS12, PS13, PS14, PS17, PS20, PS23, PS24, PS25, PS26, PS28, PS29, PS3, PS30, PS4, PS6, PS7, PS8, PS9
1.259	0.023	0.502	0.000	0.000	1.785	Paved parking	PS10, PS12, PS13, PS14, PS17, PS20, PS25, PS26, PS28, PS29, PS30, PS4, PS7, PS8
0.286	0.000	0.350	0.000	0.000	0.636	Roofs	PS15, PS16, PS19, PS22, PS4
0.033	0.000	0.000	0.000	0.000	0.033	Gravel surface	PS25
2.680	0.472	5.050	0.000	0.000	8.201	Woods, Good	PS1, PS10, PS11, PS23, PS24, PS25, PS26,

Ground Covers (all nodes) (continued)

HSG-A (acres)	HSG-B (acres)	HSG-C (acres)	HSG-D (acres)	Other (acres)	Total (acres)	Ground Cover	Subcatchment Numbers
0.016	0.000	0.027	0.000	0.000	0.043	Water Surface, 0% imp	PS15, PS16, PS19, PS22
8.573	**0.744**	**7.273**	**0.000**	**0.000**	**16.590**	**TOTAL AREA**	

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	BR1	226.00	224.50	195.0	0.0077	0.010	6.0	0.0	0.0
2	BR1	227.67	226.20	195.0	0.0075	0.013	15.0	0.0	0.0
3	BR2	227.00	226.50	115.0	0.0043	0.010	6.0	0.0	0.0
4	BR2	228.75	228.00	115.0	0.0065	0.013	18.0	0.0	0.0
5	DE1	232.60	232.30	35.0	0.0086	0.010	6.0	0.0	0.0
6	DE2	232.50	232.40	40.0	0.0025	0.010	6.0	0.0	0.0
7	DE3	235.37	235.37	40.0	0.0000	0.010	8.0	0.0	0.0
8	DE4	234.37	234.37	100.0	0.0000	0.010	8.0	0.0	0.0
9	PCB2	211.70	211.10	115.0	0.0052	0.013	12.0	0.0	0.0
10	PCB4	232.37	232.03	135.0	0.0025	0.010	15.0	0.0	0.0
11	PDMH1	231.91	231.40	205.0	0.0025	0.010	15.0	0.0	0.0
12	PP108	211.80	211.80	80.0	0.0000	0.013	6.0	0.0	0.0
13	PPT3	232.03	231.91	50.0	0.0024	0.010	15.0	0.0	0.0
14	SI1	228.25	221.00	70.0	0.1036	0.010	12.0	0.0	0.0

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PS1: Northwest portion of Runoff Area=101,958 sf 0.00% Impervious Runoff Depth=0.45"
Flow Length=373' Tc=15.4 min CN=48 Runoff=0.26 cfs 0.088 af

Subcatchment PS10: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=0.79"
Flow Length=151' Tc=11.4 min CN=55 Runoff=0.15 cfs 0.023 af

Subcatchment PS11: Eastern portion of Runoff Area=33,128 sf 0.00% Impervious Runoff Depth=0.59"
Flow Length=312' Tc=20.7 min CN=51 Runoff=0.14 cfs 0.037 af

Subcatchment PS12: South-center portion Runoff Area=47,403 sf 8.55% Impervious Runoff Depth=0.96"
Flow Length=242' Tc=11.8 min CN=58 Runoff=0.64 cfs 0.087 af

Subcatchment PS13: Area north of prop. Runoff Area=21,222 sf 17.10% Impervious Runoff Depth=1.98"
Flow Length=245' Tc=8.9 min CN=73 Runoff=0.83 cfs 0.080 af

Subcatchment PS14: Area at Runoff Area=7,728 sf 70.54% Impervious Runoff Depth=3.60"
Flow Length=107' Tc=3.4 min CN=91 Runoff=0.70 cfs 0.053 af

Subcatchment PS15: NE corner of building Runoff Area=8,288 sf 93.93% Impervious Runoff Depth=4.37"
Flow Length=62' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.86 cfs 0.069 af

Subcatchment PS16: NW corner of building Runoff Area=6,627 sf 93.98% Impervious Runoff Depth=4.37"
Flow Length=62' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.68 cfs 0.055 af

Subcatchment PS17: Parking Lot West of Runoff Area=13,293 sf 91.70% Impervious Runoff Depth=3.82"
Flow Length=110' Tc=1.1 min CN=93 Runoff=1.29 cfs 0.097 af

Subcatchment PS19: SW corner of building Runoff Area=6,734 sf 92.81% Impervious Runoff Depth=4.37"
Flow Length=50' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.70 cfs 0.056 af

Subcatchment PS20: Parking Lot Runoff Area=4,622 sf 81.03% Impervious Runoff Depth=3.20"
Flow Length=88' Slope=0.0170 '/' Tc=1.0 min CN=87 Runoff=0.40 cfs 0.028 af

Subcatchment PS22: SE corner of building Runoff Area=6,730 sf 92.87% Impervious Runoff Depth=4.37"
Flow Length=50' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.70 cfs 0.056 af

Subcatchment PS23: Area between building Runoff Area=13,335 sf 0.00% Impervious Runoff Depth=0.69"
Flow Length=157' Tc=3.7 min CN=53 Runoff=0.15 cfs 0.018 af

Subcatchment PS24: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=0.49"
Flow Length=569' Tc=18.4 min CN=49 Runoff=0.23 cfs 0.072 af

Subcatchment PS25: Area that contains Runoff Area=30,280 sf 1.00% Impervious Runoff Depth=0.29"
Flow Length=386' Tc=7.5 min CN=44 Runoff=0.03 cfs 0.017 af

Subcatchment PS26: Area containg Link Runoff Area=16,294 sf 25.02% Impervious Runoff Depth=0.96"
Flow Length=252' Tc=5.0 min CN=58 Runoff=0.30 cfs 0.030 af

Subcatchment PS28: area at south edge of Runoff Area=9,699 sf 56.14% Impervious Runoff Depth=2.30"
Flow Length=168' Tc=0.9 min CN=77 Runoff=0.62 cfs 0.043 af

Subcatchment PS29: Area between Prop. Runoff Area=10,273 sf 22.32% Impervious Runoff Depth=0.79"
Flow Length=82' Tc=5.3 min CN=55 Runoff=0.13 cfs 0.016 af

Subcatchment PS3: Northern corner portion Runoff Area=20,440 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=222' Slope=0.0100 '/' Tc=11.7 min CN=44 Runoff=0.02 cfs 0.011 af

Subcatchment PS30: Parking Lot Runoff Area=26,697 sf 62.68% Impervious Runoff Depth=2.73"
Flow Length=248' Tc=1.5 min CN=82 Runoff=1.99 cfs 0.140 af

Subcatchment PS4: Lower north corner of Runoff Area=40,570 sf 27.77% Impervious Runoff Depth=2.38"
Flow Length=325' Tc=12.0 min CN=78 Runoff=1.73 cfs 0.185 af

Subcatchment PS6: Northeast area of Runoff Area=64,817 sf 0.00% Impervious Runoff Depth=1.75"
Flow Length=294' Tc=23.9 min CN=70 Runoff=1.43 cfs 0.217 af

Subcatchment PS7: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=0.59"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.06 cfs 0.012 af

Subcatchment PS8: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=1.20"
Flow Length=344' Tc=12.7 min CN=62 Runoff=1.01 cfs 0.128 af

Subcatchment PS9: East portion of easterly Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=235' Tc=14.8 min CN=44 Runoff=0.08 cfs 0.041 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.00' Max Vel=0.31 fps Inflow=0.02 cfs 0.011 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.02 cfs 0.011 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.02' Max Vel=0.45 fps Inflow=0.26 cfs 0.099 af
n=0.035 L=221.0' S=0.0158 '/' Capacity=556.72 cfs Outflow=0.25 cfs 0.099 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.02' Max Vel=0.66 fps Inflow=0.30 cfs 0.117 af
n=0.035 L=320.0' S=0.0406 '/' Capacity=795.12 cfs Outflow=0.28 cfs 0.117 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.14' Max Vel=0.09 fps Inflow=0.21 cfs 0.123 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=0.17 cfs 0.123 af

Reach ER82: Swale Located on North Avg. Flow Depth=0.07' Max Vel=1.04 fps Inflow=0.83 cfs 0.080 af
n=0.035 L=150.0' S=0.0200 '/' Capacity=265.19 cfs Outflow=0.79 cfs 0.080 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.04' Max Vel=0.41 fps Inflow=0.09 cfs 0.032 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=0.09 cfs 0.032 af

Reach ER85: End of Swale located Avg. Flow Depth=0.16' Max Vel=1.37 fps Inflow=1.01 cfs 0.283 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=1.01 cfs 0.283 af

Reach PR62: Swale South of Proposed Avg. Flow Depth=0.22' Max Vel=3.45 fps Inflow=0.70 cfs 0.053 af
n=0.022 L=130.0' S=0.0500 '/' Capacity=37.30 cfs Outflow=0.70 cfs 0.053 af

Reach PR63: Swale North of gravel Avg. Flow Depth=0.06' Max Vel=2.02 fps Inflow=0.15 cfs 0.091 af
n=0.022 L=80.0' S=0.0500 '/' Capacity=50.13 cfs Outflow=0.15 cfs 0.091 af

Pond BR1: Bioswale-ISR 1 (CB5) Peak Elev=229.65' Storage=2,756 cf Inflow=2.43 cfs 0.308 af
Primary=0.05 cfs 0.127 af Secondary=2.32 cfs 0.181 af Outflow=2.37 cfs 0.308 af

Pond BR2: Bioswale - ISR 2 (CB3) Peak Elev=230.80' Storage=3,754 cf Inflow=4.93 cfs 0.376 af
Primary=0.05 cfs 0.144 af Secondary=4.41 cfs 0.232 af Outflow=4.46 cfs 0.376 af

Pond DE1: Drip Edge along Northeastern Peak Elev=233.05' Storage=130 cf Inflow=0.86 cfs 0.069 af
6.0" Round Culvert x 2.00 n=0.010 L=35.0' S=0.0086 '/' Outflow=0.84 cfs 0.068 af

Pond DE2: Drip Edge along Northwestern Peak Elev=233.35' Storage=163 cf Inflow=0.68 cfs 0.055 af
6.0" Round Culvert n=0.010 L=40.0' S=0.0025 '/' Outflow=0.58 cfs 0.055 af

Pond DE3: Drip Edge along Southwestern Peak Elev=236.12' Storage=177 cf Inflow=0.70 cfs 0.056 af
8.0" Round Culvert n=0.010 L=40.0' S=0.0000 '/' Outflow=0.64 cfs 0.056 af

Pond DE4: Drip Edge along Southeastern Peak Elev=235.22' Storage=195 cf Inflow=0.70 cfs 0.056 af
8.0" Round Culvert n=0.010 L=100.0' S=0.0000 '/' Outflow=0.59 cfs 0.056 af

Pond EP81: Middle Portion of Wetland Peak Elev=233.61' Storage=4,706 cf Inflow=1.43 cfs 0.217 af
Outflow=0.21 cfs 0.123 af

Pond PCB2: CB2 - Catch Basin at the end of Bioswale "A" Peak Elev=211.92' Inflow=0.15 cfs 0.091 af
12.0" Round Culvert n=0.013 L=115.0' S=0.0052 '/' Outflow=0.15 cfs 0.091 af

Pond PCB4: Catch Basin #3 Peak Elev=233.27' Inflow=1.29 cfs 0.097 af
15.0" Round Culvert n=0.010 L=135.0' S=0.0025 '/' Outflow=1.29 cfs 0.097 af

Pond PDMH1: Drain Manhole #5 Peak Elev=232.82' Inflow=2.33 cfs 0.181 af
15.0" Round Culvert n=0.010 L=205.0' S=0.0025 '/' Outflow=2.33 cfs 0.181 af

Pond PP108: Bioswale "A" Peak Elev=215.83' Storage=2,172 cf Inflow=1.40 cfs 0.112 af
Primary=0.15 cfs 0.091 af Secondary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.091 af

Pond PP109: Stormwater Detention Peak Elev=213.56' Storage=3,613 cf Inflow=1.47 cfs 0.205 af
Discarded=0.10 cfs 0.182 af Primary=0.08 cfs 0.023 af Secondary=0.00 cfs 0.000 af Outflow=0.18 cfs 0.205 af

Pond PP110: Proposed 8" Earthen Berm Peak Elev=212.69' Storage=153 cf Inflow=0.09 cfs 0.035 af
Outflow=0.09 cfs 0.032 af

Pond PPT3: Catch Basin #4 Peak Elev=233.08' Inflow=2.33 cfs 0.181 af
15.0" Round Culvert n=0.010 L=50.0' S=0.0024 '/' Outflow=2.33 cfs 0.181 af

Pond SI1: Subsurface Infiltration Peak Elev=227.12' Storage=10,038 cf Inflow=6.48 cfs 0.684 af
Discarded=0.66 cfs 0.606 af Primary=0.00 cfs 0.000 af Outflow=0.66 cfs 0.606 af

Link L100: Northern Wetlands & North of Site Inflow=0.02 cfs 0.011 af
Primary=0.02 cfs 0.011 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=0.52 cfs 0.205 af
Primary=0.52 cfs 0.205 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.08 cfs 0.041 af
Primary=0.08 cfs 0.041 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=1.16 cfs 0.307 af
Primary=1.16 cfs 0.307 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=0.38 cfs 0.121 af
Primary=0.38 cfs 0.121 af

Total Runoff Area = 16.590 ac Runoff Volume = 1.661 af Average Runoff Depth = 1.20"
85.41% Pervious = 14.169 ac 14.59% Impervious = 2.421 ac

Summary for Subcatchment PS1: Northwest portion of westerly lot (ES1)

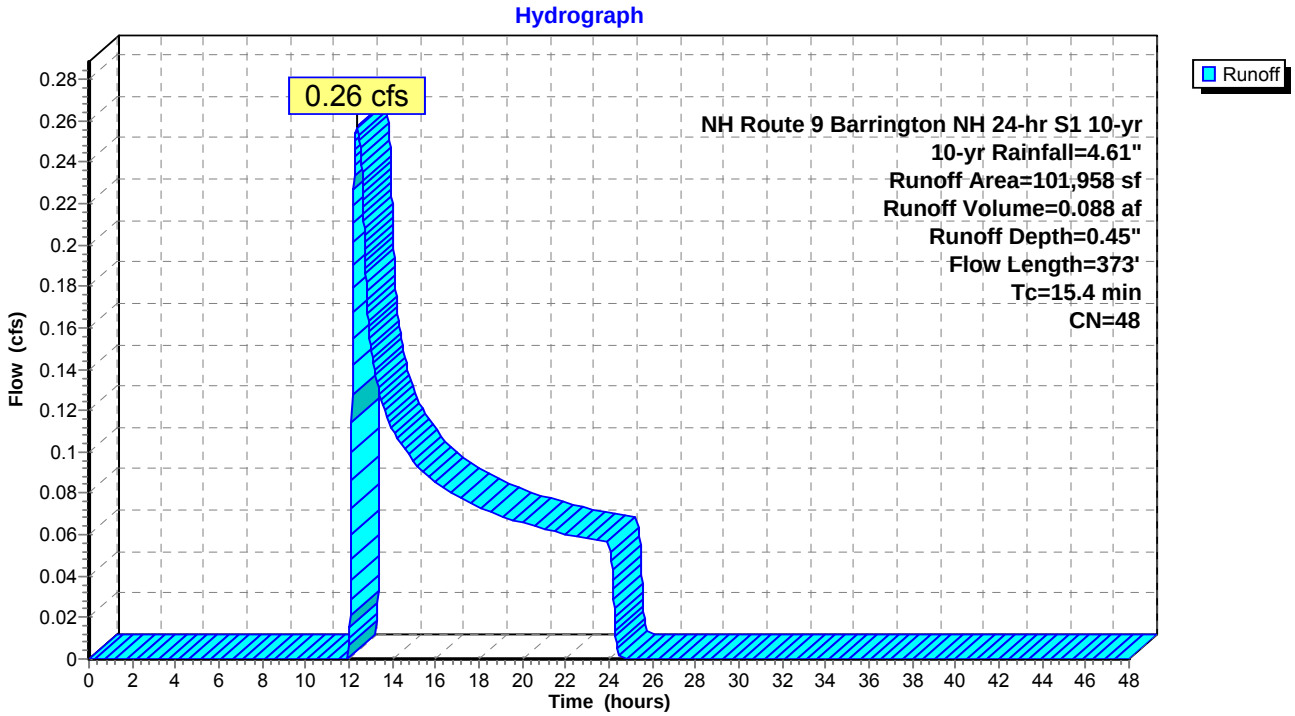
Runoff = 0.26 cfs @ 12.37 hrs, Volume= 0.088 af, Depth= 0.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
39,435	30	Woods, Good, HSG A
3,580	55	Woods, Good, HSG B
36,257	70	Woods, Good, HSG C
18,898	39	>75% Grass cover, Good, HSG A
3,788	61	>75% Grass cover, Good, HSG B
101,958	48	Weighted Average
101,958		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0700	0.11		**Sheet Flow, Woodland Flow** Woods: Light underbrush n= 0.400 P2= 3.07"
0.9	65	0.0600	1.22		**Shallow Concentrated Flow, Woodland Flow** Woodland Kv= 5.0 fps
6.9	258	0.0155	0.62		**Shallow Concentrated Flow, Wetland flow** Woodland Kv= 5.0 fps
15.4	373	Total			

Subcatchment PS1: Northwest portion of westerly lot (ES1)



Summary for Subcatchment PS10: South-center portion of easterly lot (ES11)

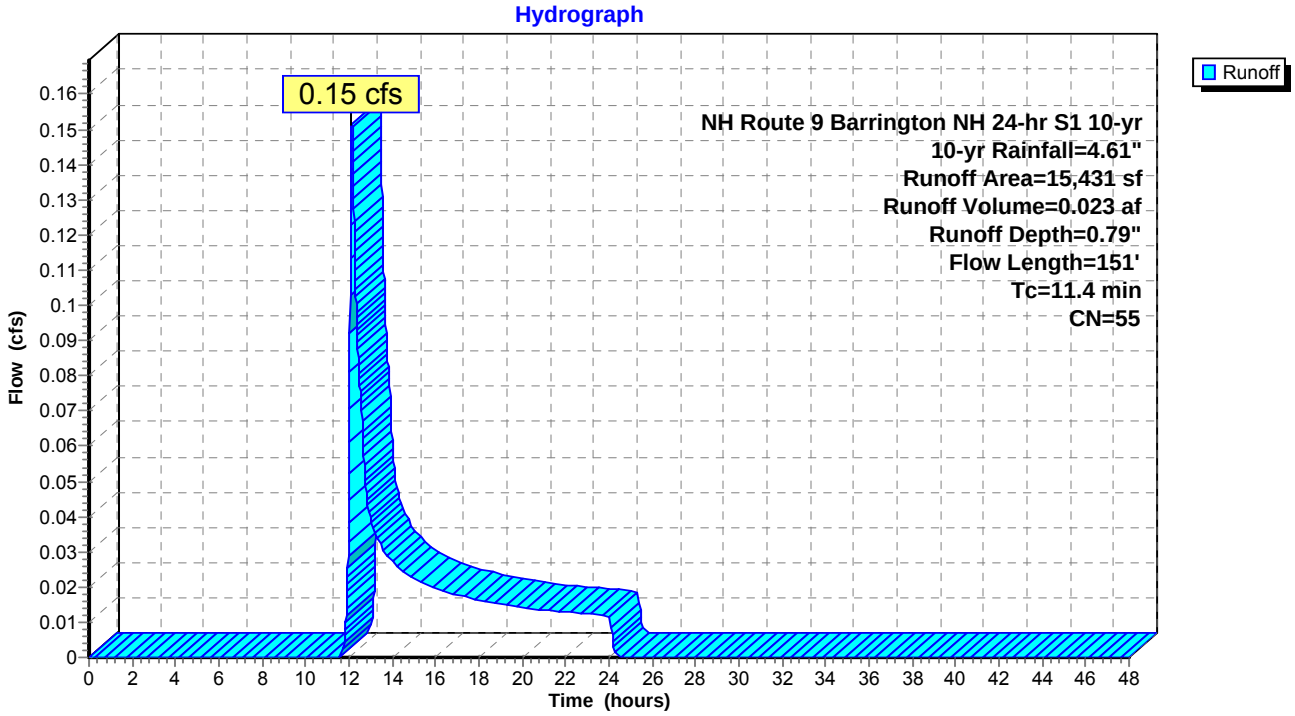
Runoff = 0.15 cfs @ 12.13 hrs, Volume= 0.023 af, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
9,251	39	>75% Grass cover, Good, HSG A
4,095	70	Woods, Good, HSG C
2,085	98	Paved parking, HSG A
15,431	55	Weighted Average
13,346		86.49% Pervious Area
2,085		13.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
0.7	101	0.1240	2.46		**Shallow Concentrated Flow, grass** Short Grass Pasture Kv= 7.0 fps
11.4	151	Total			

Subcatchment PS10: South-center portion of easterly lot (ES11)



Summary for Subcatchment PS11: Eastern portion of middle lot

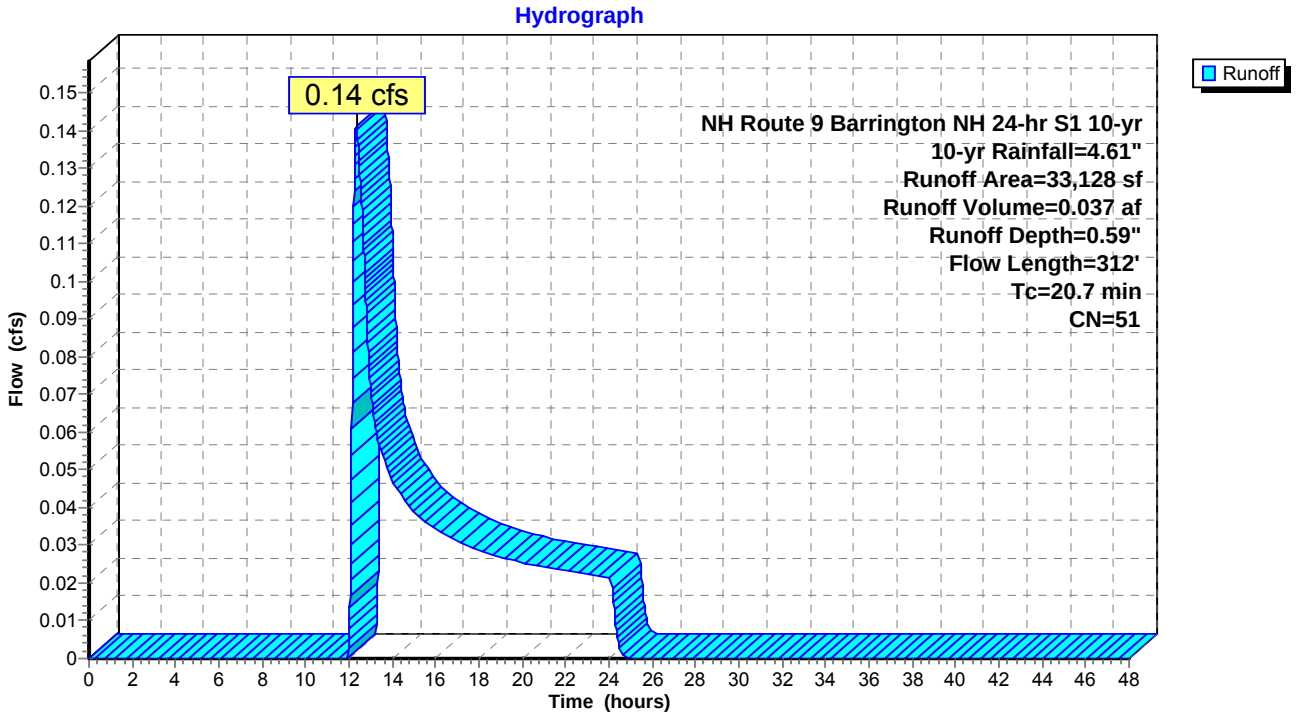
Runoff = 0.14 cfs @ 12.35 hrs, Volume= 0.037 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
9,190	39	>75% Grass cover, Good, HSG A
1,648	61	>75% Grass cover, Good, HSG B
8,273	74	>75% Grass cover, Good, HSG C
8,389	30	Woods, Good, HSG A
1,651	55	Woods, Good, HSG B
3,977	70	Woods, Good, HSG C
33,128	51	Weighted Average
33,128		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	50	0.0100	0.05		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
3.0	160	0.0313	0.88		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
1.0	80	0.0375	1.36		**Shallow Concentrated Flow, grass** Short Grass Pasture Kv= 7.0 fps
0.1	22	0.3333	4.04		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
20.7	312	Total			

Subcatchment PS11: Eastern portion of middle lot



Summary for Subcatchment PS12: South-center portion of middle lot

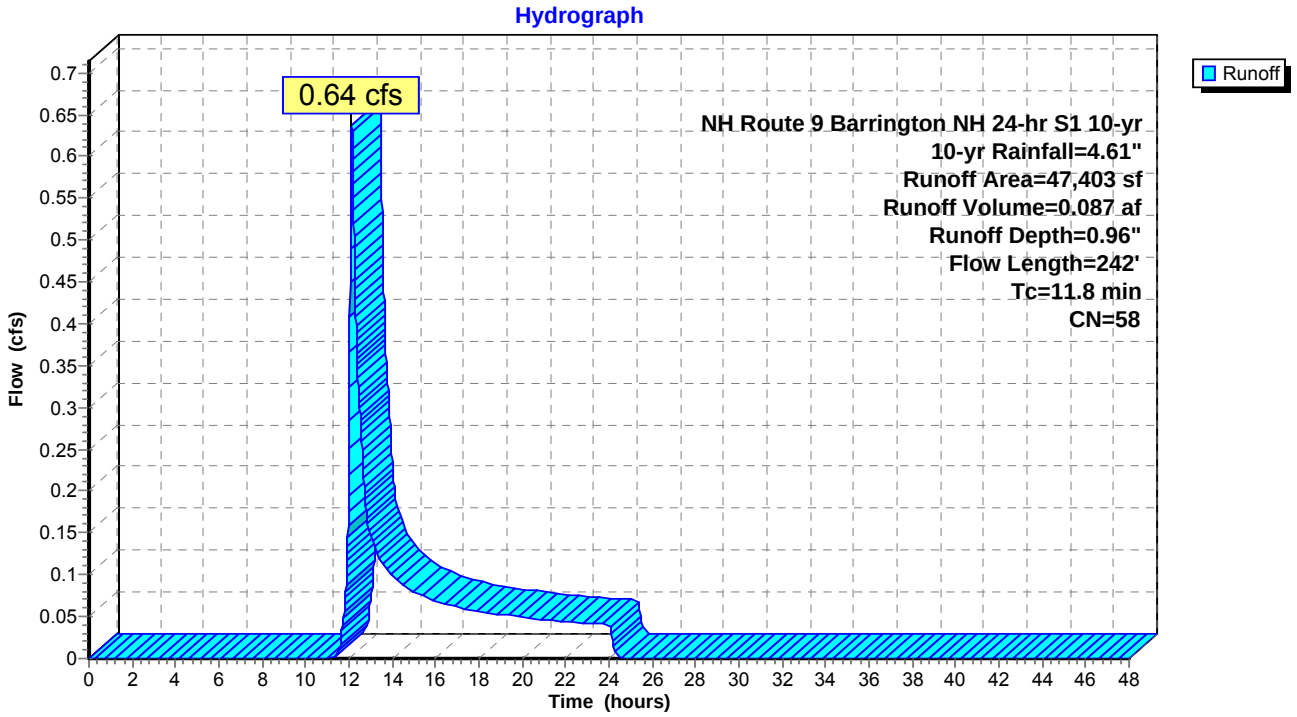
Runoff = 0.64 cfs @ 12.13 hrs, Volume= 0.087 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
22,740	39	>75% Grass cover, Good, HSG A
2,934	61	>75% Grass cover, Good, HSG B
17,678	74	>75% Grass cover, Good, HSG C
3,055	98	Paved parking, HSG A
996	98	Paved parking, HSG B
47,403	58	Weighted Average
43,352		91.45% Pervious Area
4,051		8.55% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.0	50	0.0050	0.08		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 3.07"
1.3	100	0.0350	1.31		**Shallow Concentrated Flow, grass** Short Grass Pasture Kv= 7.0 fps
0.4	72	0.2280	3.34		**Shallow Concentrated Flow, steep grass** Short Grass Pasture Kv= 7.0 fps
0.1	20	0.3333	4.04		**Shallow Concentrated Flow, grass** Short Grass Pasture Kv= 7.0 fps
11.8	242	Total			

Subcatchment PS12: South-center portion of middle lot



Summary for Subcatchment PS13: Area north of prop. drive

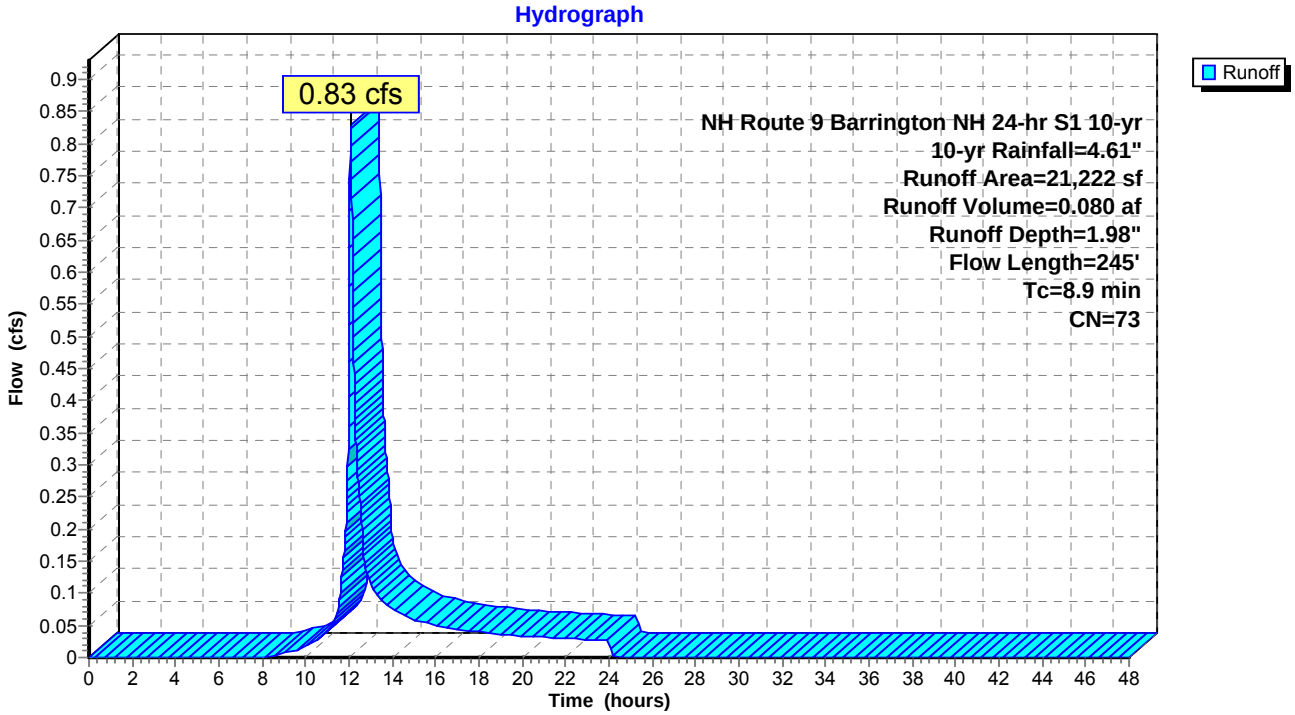
Runoff = 0.83 cfs @ 12.08 hrs, Volume= 0.080 af, Depth= 1.98"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
2,871	39	>75% Grass cover, Good, HSG A
14,723	74	>75% Grass cover, Good, HSG C
1,307	98	Paved parking, HSG A
2,321	98	Paved parking, HSG C
21,222	73	Weighted Average
17,594		82.90% Pervious Area
3,628		17.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.1	50	0.0600	0.10		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
0.6	82	0.1100	2.32		**Shallow Concentrated Flow, grass** Short Grass Pasture Kv= 7.0 fps
0.2	113	0.0500	10.74	57.05	**Trap/Vee/Rect Channel Flow, Swale flow** Bot.W=0.00' D=1.25' Z= 3.4 '/' Top.W=8.50' n= 0.022
8.9	245	Total			

Subcatchment PS13: Area north of prop. drive



Summary for Subcatchment PS14: Area at Driveway/Parking Intersection East of Building

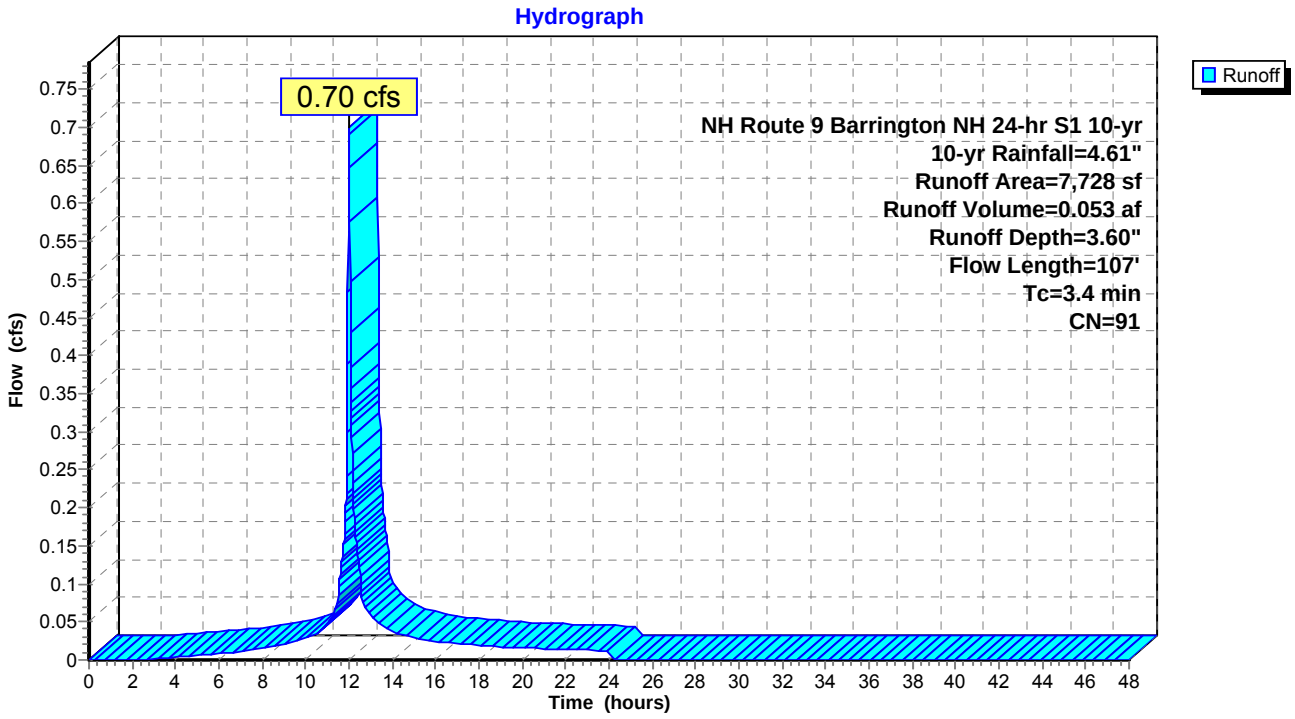
Runoff = 0.70 cfs @ 12.01 hrs, Volume= 0.053 af, Depth= 3.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
2,277	74	>75% Grass cover, Good, HSG C
5,451	98	Paved parking, HSG C
7,728	91	Weighted Average
2,277		29.46% Pervious Area
5,451		70.54% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
3.0	22	0.0200	0.12		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.07"
0.3	70	0.0400	4.06		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.1	15	0.0400	3.00		**Shallow Concentrated Flow, Grass** Grassed Waterway Kv= 15.0 fps
3.4	107	Total			

Subcatchment PS14: Area at Driveway/Parking Intersection East of Building



Summary for Subcatchment PS15: NE corner of building

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

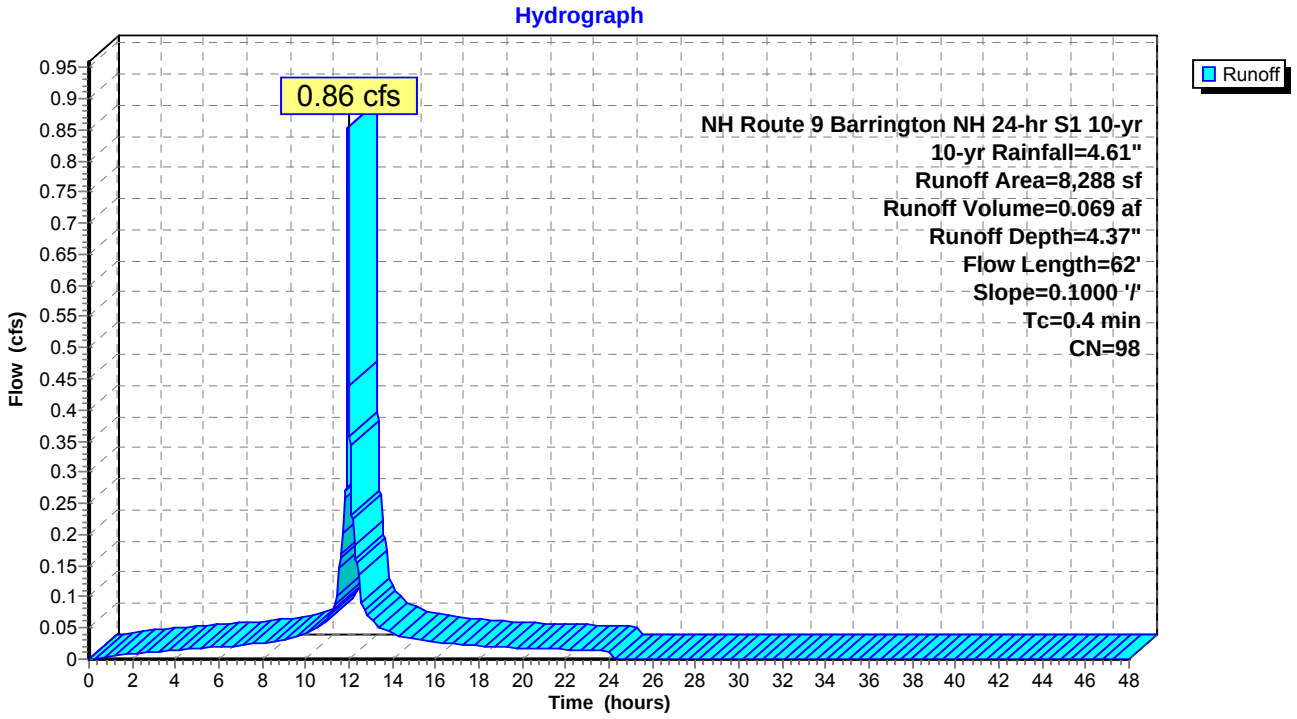
Runoff = 0.86 cfs @ 11.99 hrs, Volume= 0.069 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
503	98	Water Surface, 0% imp, HSG C
7,785	98	Roofs, HSG C
8,288	98	Weighted Average
503		6.07% Pervious Area
7,785		93.93% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	62	0.1000	2.33		**Sheet Flow, Roof** Smooth surfaces n= 0.011 P2= 3.07"

Subcatchment PS15: NE corner of building



Summary for Subcatchment PS16: NW corner of building

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

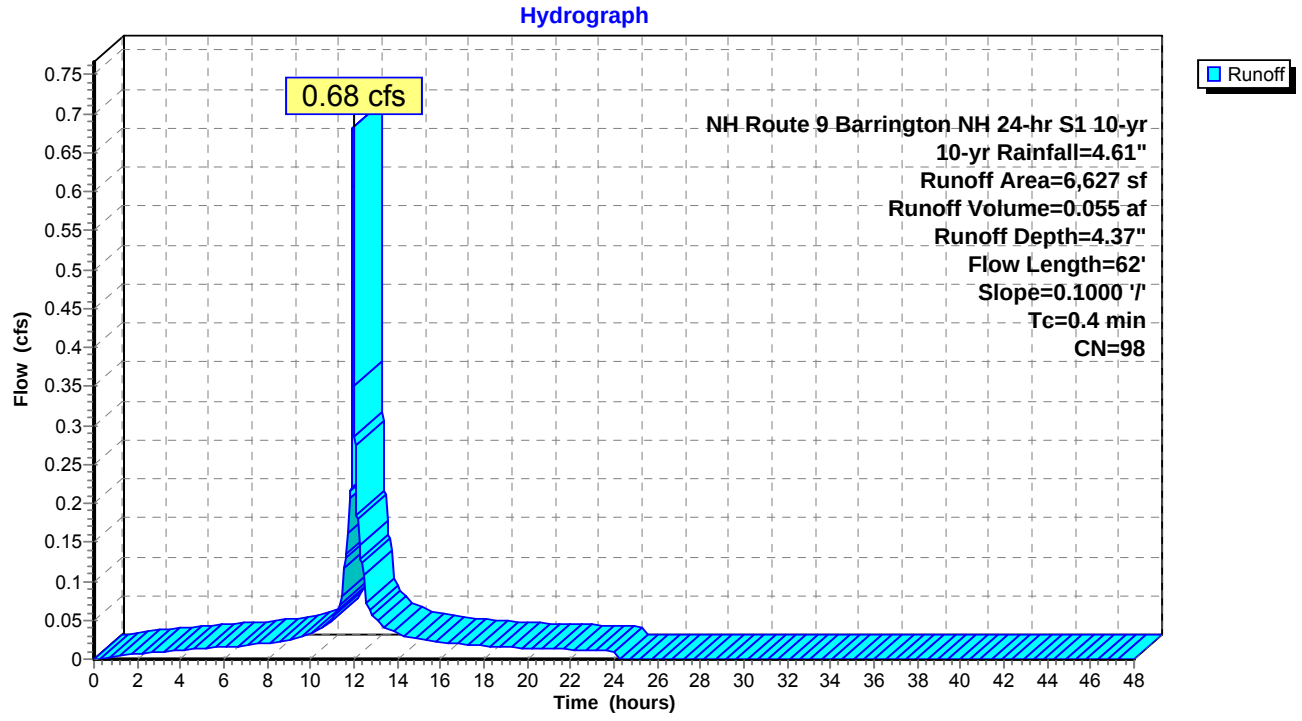
Runoff = 0.68 cfs @ 11.99 hrs, Volume= 0.055 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
195	98	Water Surface, 0% imp, HSG C
1,330	98	Roofs, HSG C
4,898	98	Roofs, HSG A
204	98	Water Surface, 0% imp, HSG A
6,627	98	Weighted Average
399		6.02% Pervious Area
6,228		93.98% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	62	0.1000	2.33		**Sheet Flow, Roof** Smooth surfaces n= 0.011 P2= 3.07"

Subcatchment PS16: NW corner of building



Summary for Subcatchment PS17: Parking Lot West of Building

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

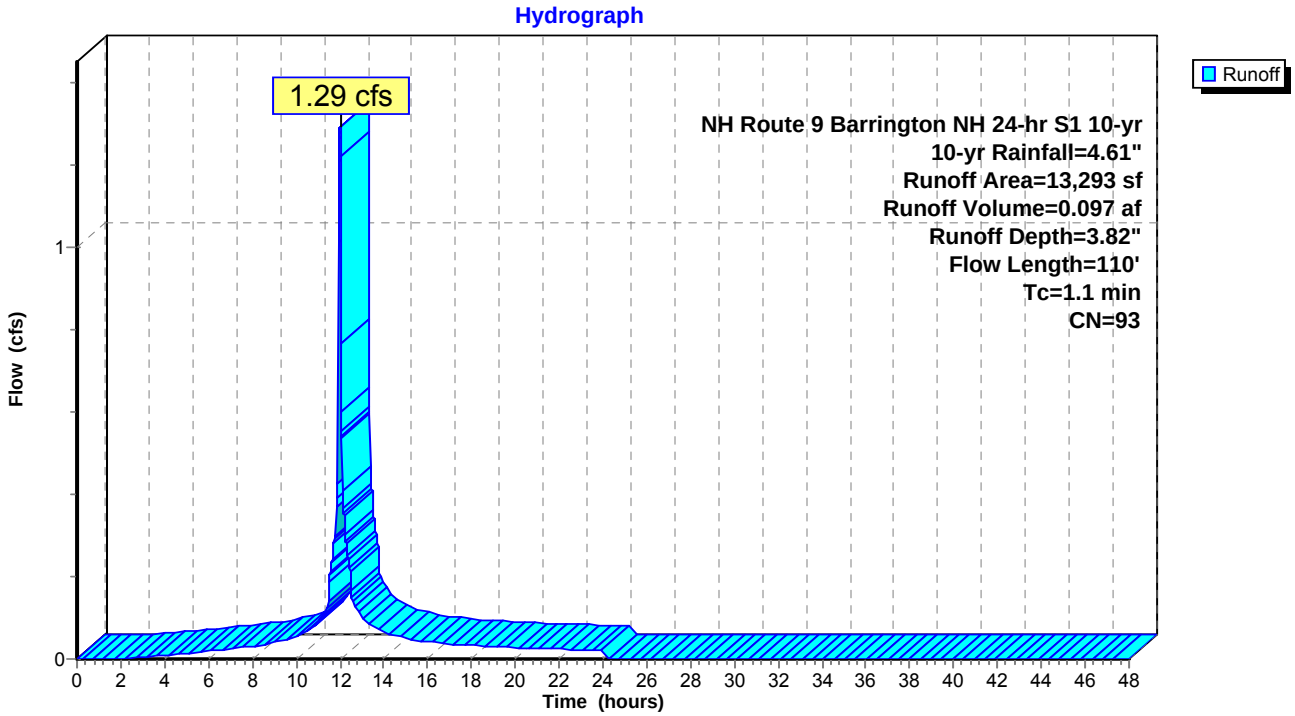
Runoff = 1.29 cfs @ 12.00 hrs, Volume= 0.097 af, Depth= 3.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
12,190	98	Paved parking, HSG A
1,103	39	>75% Grass cover, Good, HSG A
13,293	93	Weighted Average
1,103		8.30% Pervious Area
12,190		91.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.0100	2.03		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.3	35	0.0100	2.03		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.4	25	0.0200	0.99		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
1.1	110	Total			

Subcatchment PS17: Parking Lot West of Building



Summary for Subcatchment PS19: SW corner of building

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

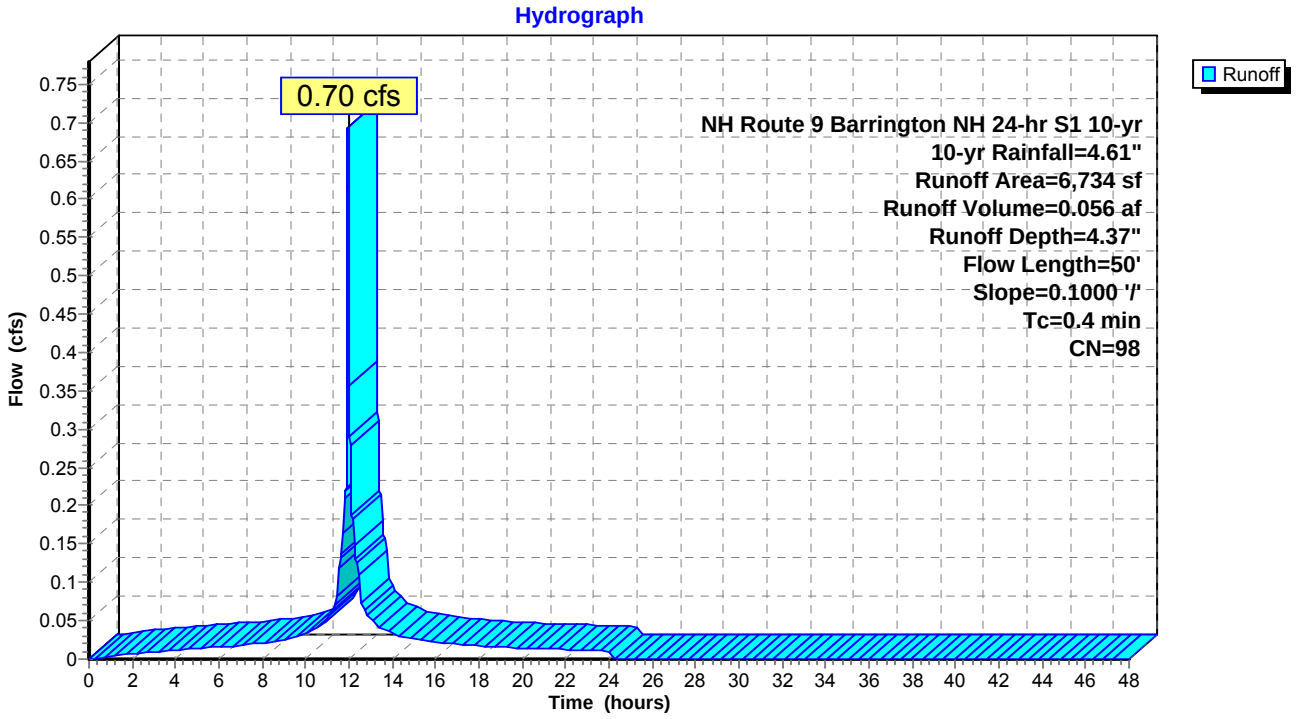
Runoff = 0.70 cfs @ 11.99 hrs, Volume= 0.056 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
6,250	98	Roofs, HSG A
484	98	Water Surface, 0% imp, HSG A
6,734	98	Weighted Average
484		7.19% Pervious Area
6,250		92.81% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.23		**Sheet Flow, Roof** Smooth surfaces n= 0.011 P2= 3.07"

Subcatchment PS19: SW corner of building



Summary for Subcatchment PS20: Parking Lot Southwest of Building

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

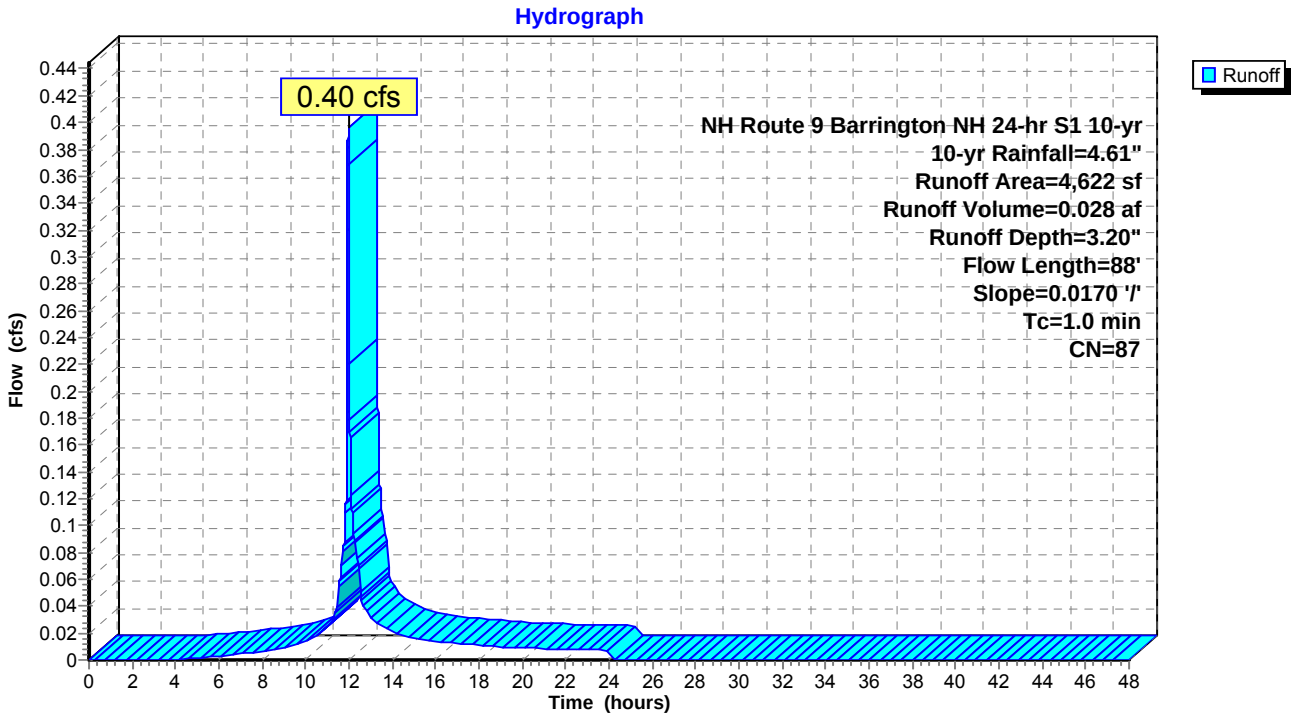
Runoff = 0.40 cfs @ 12.00 hrs, Volume= 0.028 af, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
3,745	98	Paved parking, HSG A
877	39	>75% Grass cover, Good, HSG A
4,622	87	Weighted Average
877		18.97% Pervious Area
3,745		81.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.8	50	0.0170	1.10		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.07"
0.2	38	0.0170	2.65		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
1.0	88	Total			

Subcatchment PS20: Parking Lot Southwest of Building



Summary for Subcatchment PS22: SE corner of building

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

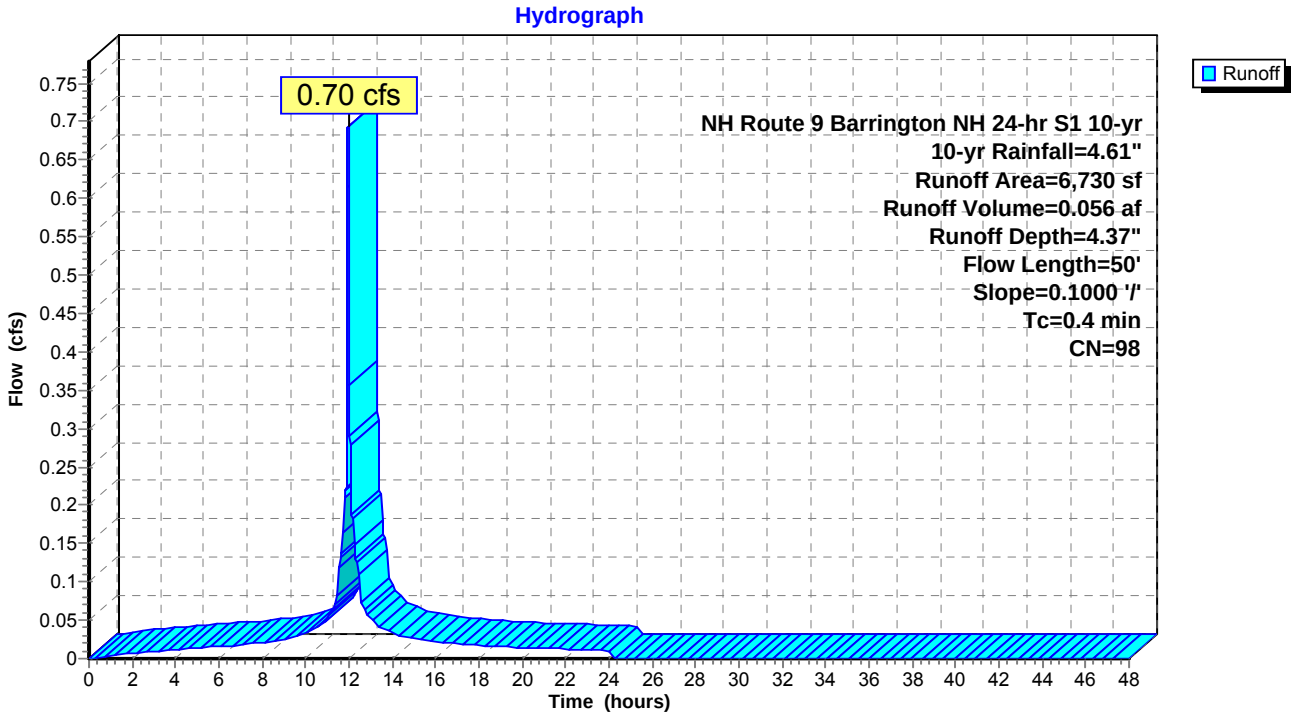
Runoff = 0.70 cfs @ 11.99 hrs, Volume= 0.056 af, Depth= 4.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
103	98	Roofs, HSG A
6,147	98	Roofs, HSG C
480	98	Water Surface, 0% imp, HSG C
6,730	98	Weighted Average
480		7.13% Pervious Area
6,250		92.87% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.4	50	0.1000	2.23		**Sheet Flow, Roof** Smooth surfaces n= 0.011 P2= 3.07"

Subcatchment PS22: SE corner of building



Summary for Subcatchment PS23: Area between building and west lot's wetland

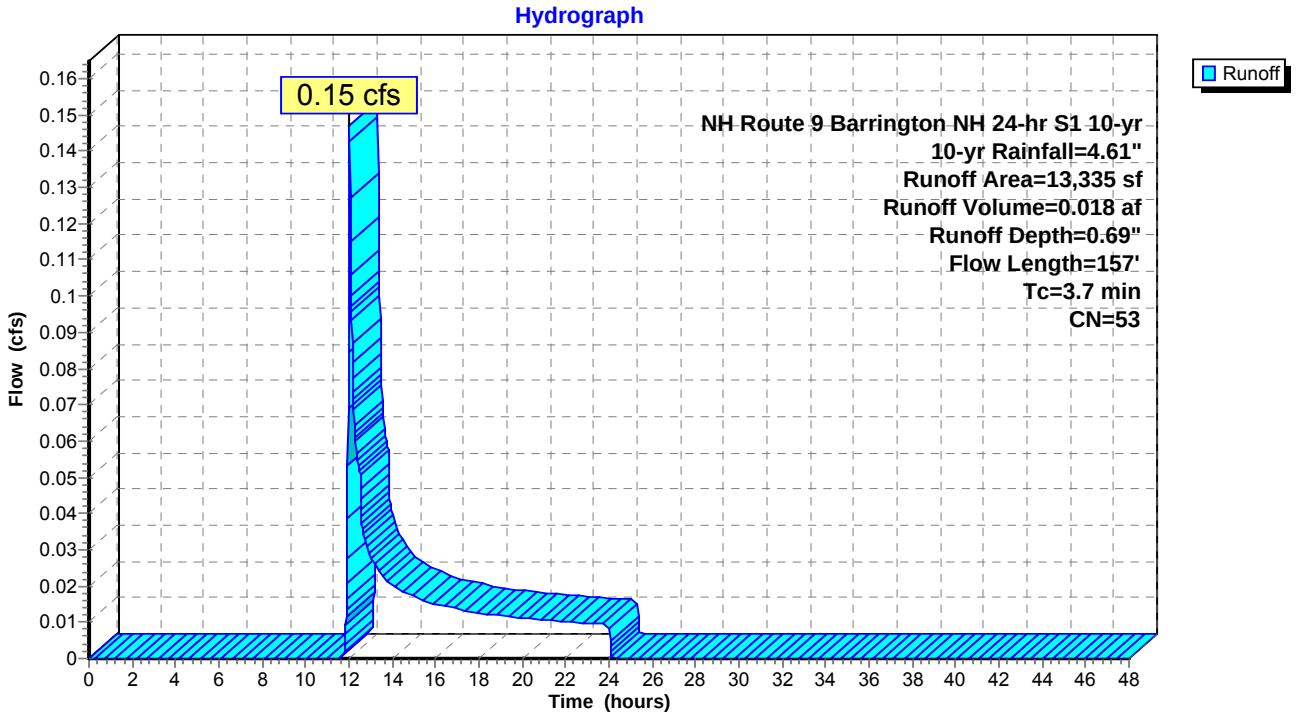
Runoff = 0.15 cfs @ 12.03 hrs, Volume= 0.018 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
4,828	39	>75% Grass cover, Good, HSG A
2,502	61	>75% Grass cover, Good, HSG B
603	30	Woods, Good, HSG A
2,009	55	Woods, Good, HSG B
3,393	70	Woods, Good, HSG C
13,335	53	Weighted Average
13,335		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	10	0.1500	0.24		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.07"
0.2	40	0.3330	4.04		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
0.3	25	0.0800	1.41		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
2.5	82	0.0122	0.55		**Shallow Concentrated Flow, Wetland flow** Woodland Kv= 5.0 fps
3.7	157	Total			

Subcatchment PS23: Area between building and west lot's wetland



Summary for Subcatchment PS24: Southwest portion of westernly lot (ES16)

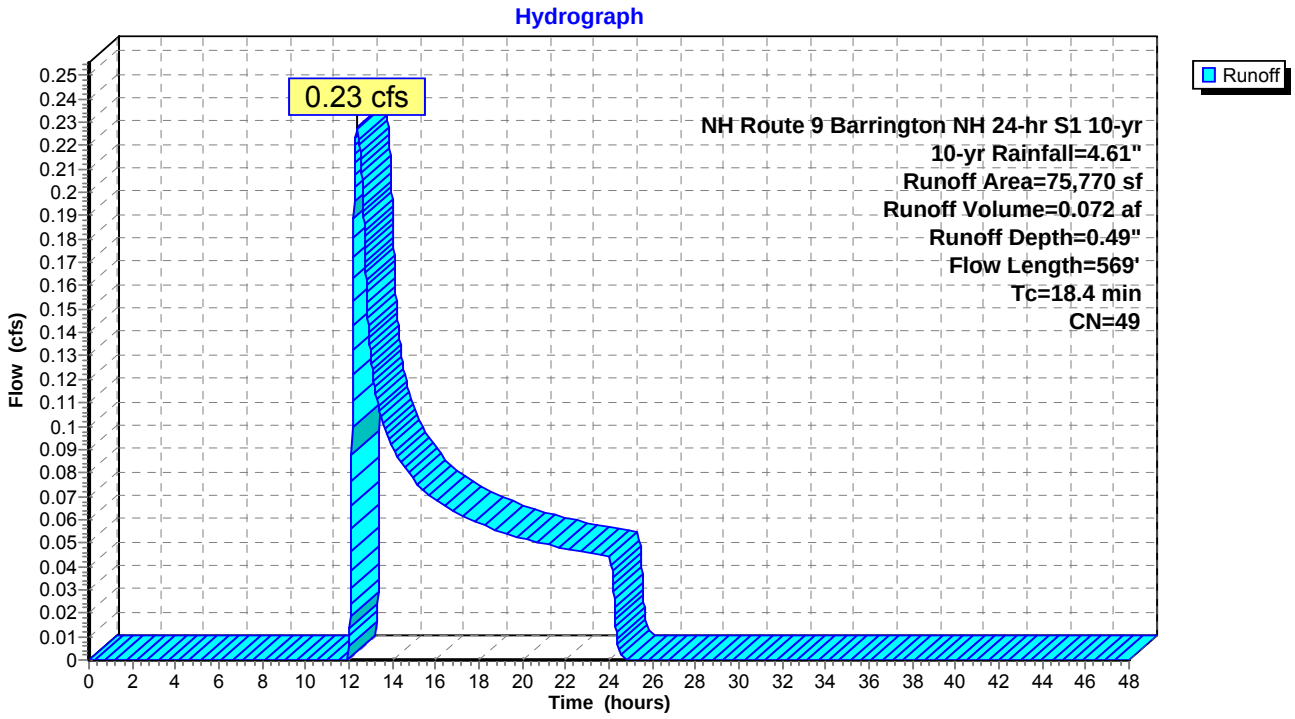
Runoff = 0.23 cfs @ 12.37 hrs, Volume= 0.072 af, Depth= 0.49"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
13,397	39	>75% Grass cover, Good, HSG A
29,498	30	Woods, Good, HSG A
32,875	70	Woods, Good, HSG C
75,770	49	Weighted Average
75,770		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
10.7	50	0.0300	0.08		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
4.2	370	0.0875	1.48		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
3.5	149	0.0201	0.71		**Shallow Concentrated Flow, Woods/wetlands flow** Woodland Kv= 5.0 fps
18.4	569	Total			

Subcatchment PS24: Southwest portion of westernly lot (ES16)



Summary for Subcatchment PS25: Area that contains exist gravel drive entrance

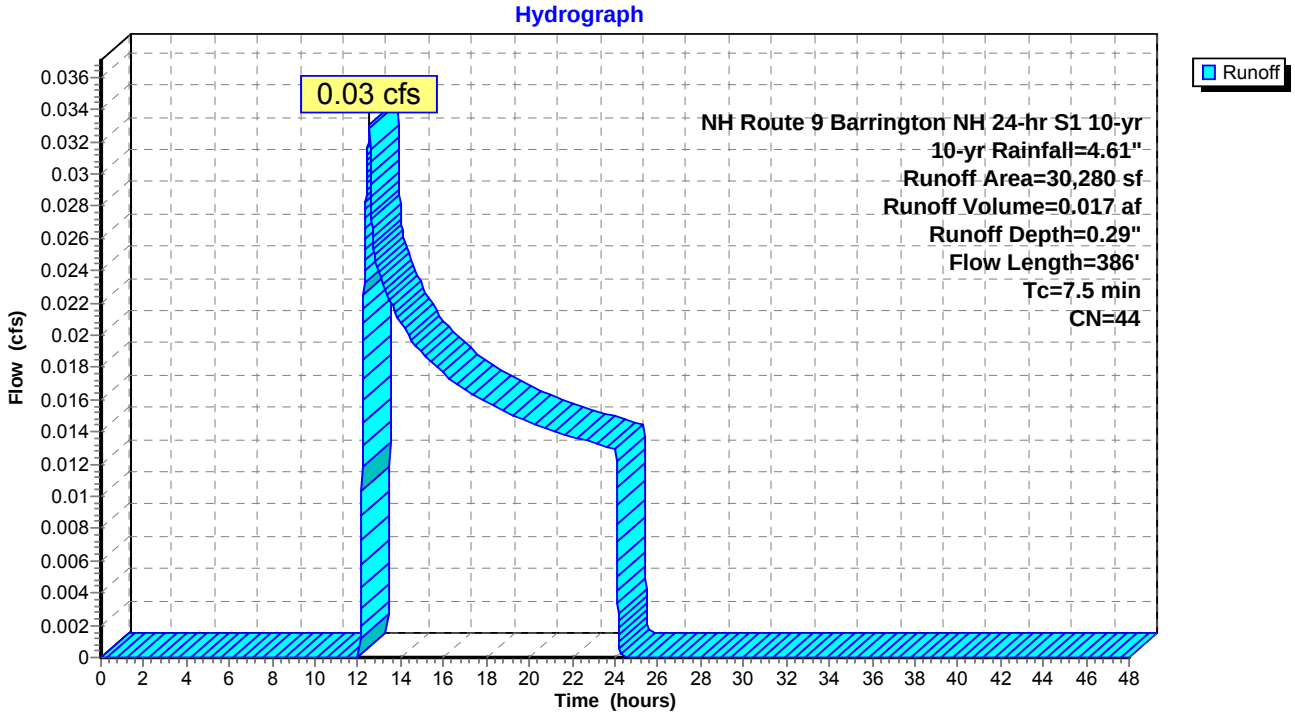
Runoff = 0.03 cfs @ 12.54 hrs, Volume= 0.017 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
15,044	39	>75% Grass cover, Good, HSG A
8,960	30	Woods, Good, HSG A
4,533	70	Woods, Good, HSG C
1,441	96	Gravel surface, HSG A
302	98	Paved parking, HSG A
30,280	44	Weighted Average
29,978		99.00% Pervious Area
302		1.00% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.9	50	0.3200	0.44		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.07"
5.6	336	0.0400	1.00		**Shallow Concentrated Flow, Grass swale/Wetland flow** Woodland Kv= 5.0 fps
7.5	386	Total			

Subcatchment PS25: Area that contains exist gravel drive entrance



Summary for Subcatchment PS26: Area containg Link L500

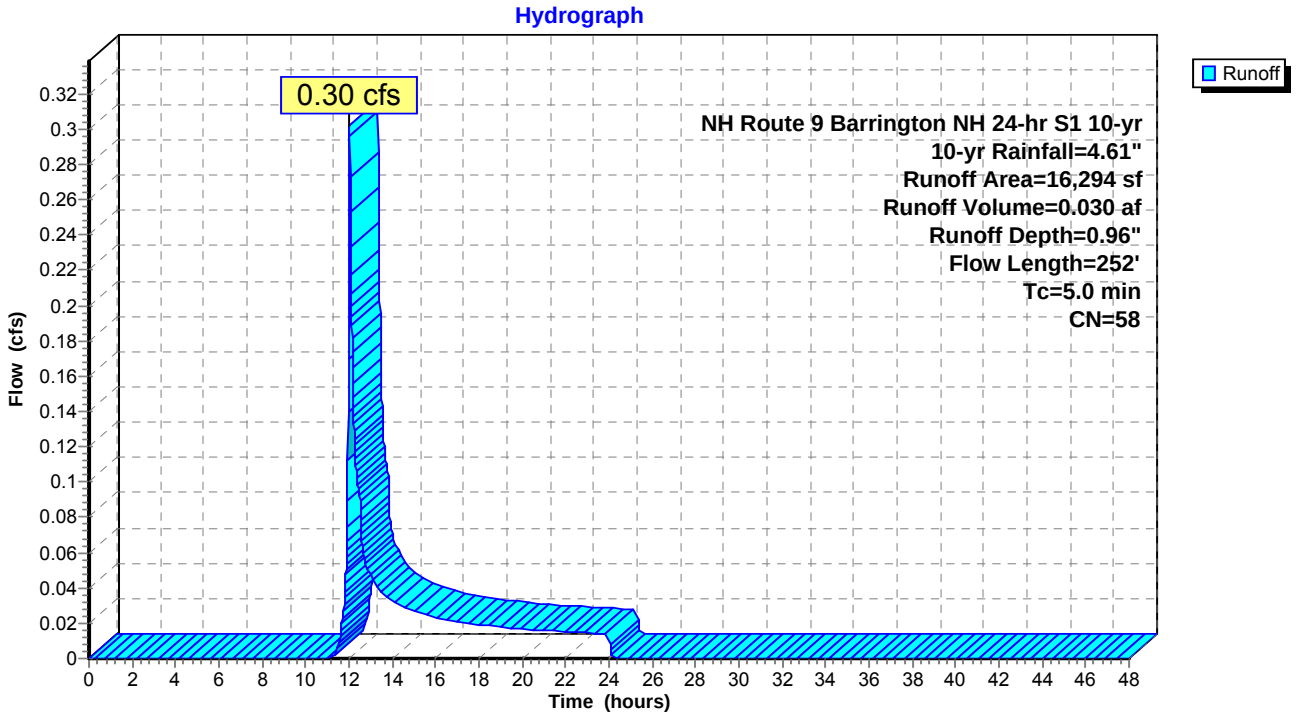
Runoff = 0.30 cfs @ 12.04 hrs, Volume= 0.030 af, Depth= 0.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
9,291	39	>75% Grass cover, Good, HSG A
179	74	>75% Grass cover, Good, HSG C
2,046	70	Woods, Good, HSG C
4,077	98	Paved parking, HSG A
701	30	Woods, Good, HSG A
16,294	58	Weighted Average
12,217		74.98% Pervious Area
4,077		25.02% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
4.5	22	0.2000	0.08		**Sheet Flow, Woods** Woods: Dense underbrush n= 0.800 P2= 3.07"
0.1	30	0.5000	4.95		**Shallow Concentrated Flow, grass** Short Grass Pasture Kv= 7.0 fps
0.4	200	0.0500	9.19	27.56	**Trap/Vee/Rect Channel Flow, Grass Swale** Bot.W=0.00' D=1.00' Z= 3.0 '/' Top.W=6.00' n= 0.022 Earth, clean & straight
5.0	252	Total			

Subcatchment PS26: Area containg Link L500



Summary for Subcatchment PS28: area at south edge of prop. drive entrance

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

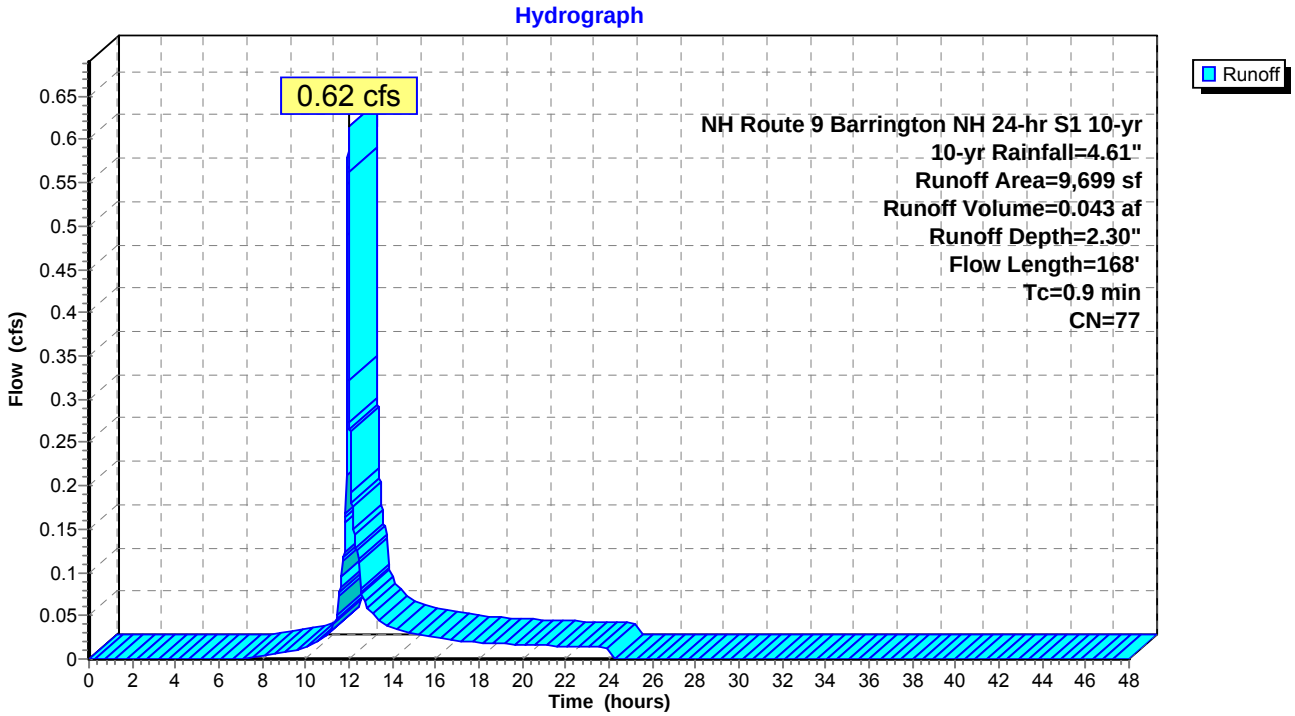
Runoff = 0.62 cfs @ 12.00 hrs, Volume= 0.043 af, Depth= 2.30"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
2,867	39	>75% Grass cover, Good, HSG A
1,387	74	>75% Grass cover, Good, HSG C
1,756	98	Paved parking, HSG A
3,689	98	Paved parking, HSG C
9,699	77	Weighted Average
4,254		43.86% Pervious Area
5,445		56.14% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.5	50	0.0500	1.69		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.07"
0.4	118	0.0700	5.37		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.9	168	Total			

Subcatchment PS28: area at south edge of prop. drive entrance



Summary for Subcatchment PS29: Area between Prop. drive entrance, building, and Redemption Rd

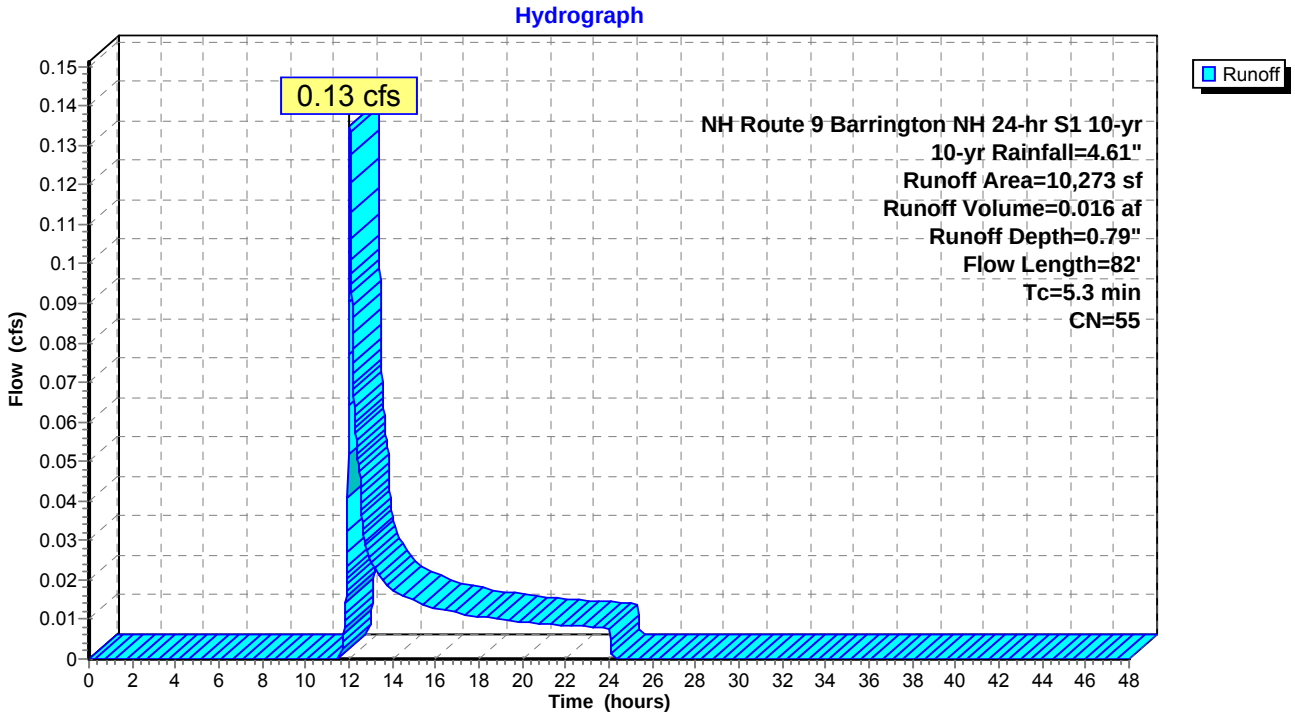
Runoff = 0.13 cfs @ 12.04 hrs, Volume= 0.016 af, Depth= 0.79"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
3,827	39	>75% Grass cover, Good, HSG A
2,526	30	Woods, Good, HSG A
1,627	70	Woods, Good, HSG C
2,293	98	Paved parking, HSG A
10,273	55	Weighted Average
7,980		77.68% Pervious Area
2,293		22.32% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.1	50	0.1900	0.16		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
0.1	12	0.1667	2.04		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
0.1	20	0.2500	3.50		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
5.3	82	Total			

Subcatchment PS29: Area between Prop. drive entrance, building, and Redemption Rd



Summary for Subcatchment PS3: Northern corner portion of westerly lot

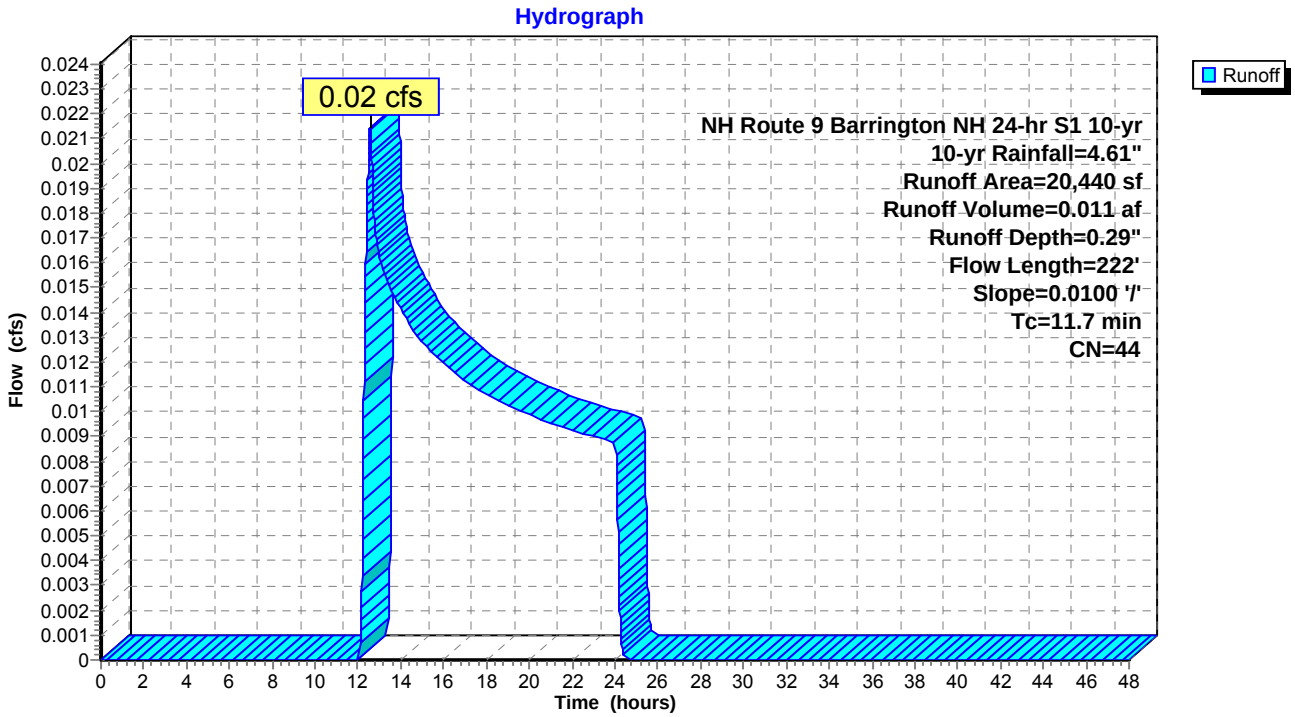
Runoff = 0.02 cfs @ 12.57 hrs, Volume= 0.011 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
16,928	39	>75% Grass cover, Good, HSG A
271	30	Woods, Good, HSG A
3,241	70	Woods, Good, HSG C
20,440	44	Weighted Average
20,440		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.6	50	0.0100	0.11		**Sheet Flow, grass** Grass: Short n= 0.150 P2= 3.07"
2.4	102	0.0100	0.70		**Shallow Concentrated Flow, grass** Short Grass Pasture Kv= 7.0 fps
1.7	70	0.0100	0.70		**Shallow Concentrated Flow, Wetland/Grass Flow** Short Grass Pasture Kv= 7.0 fps
11.7	222	Total			

Subcatchment PS3: Northern corner portion of westerly lot



Summary for Subcatchment PS30: Parking Lot Southeast of Building

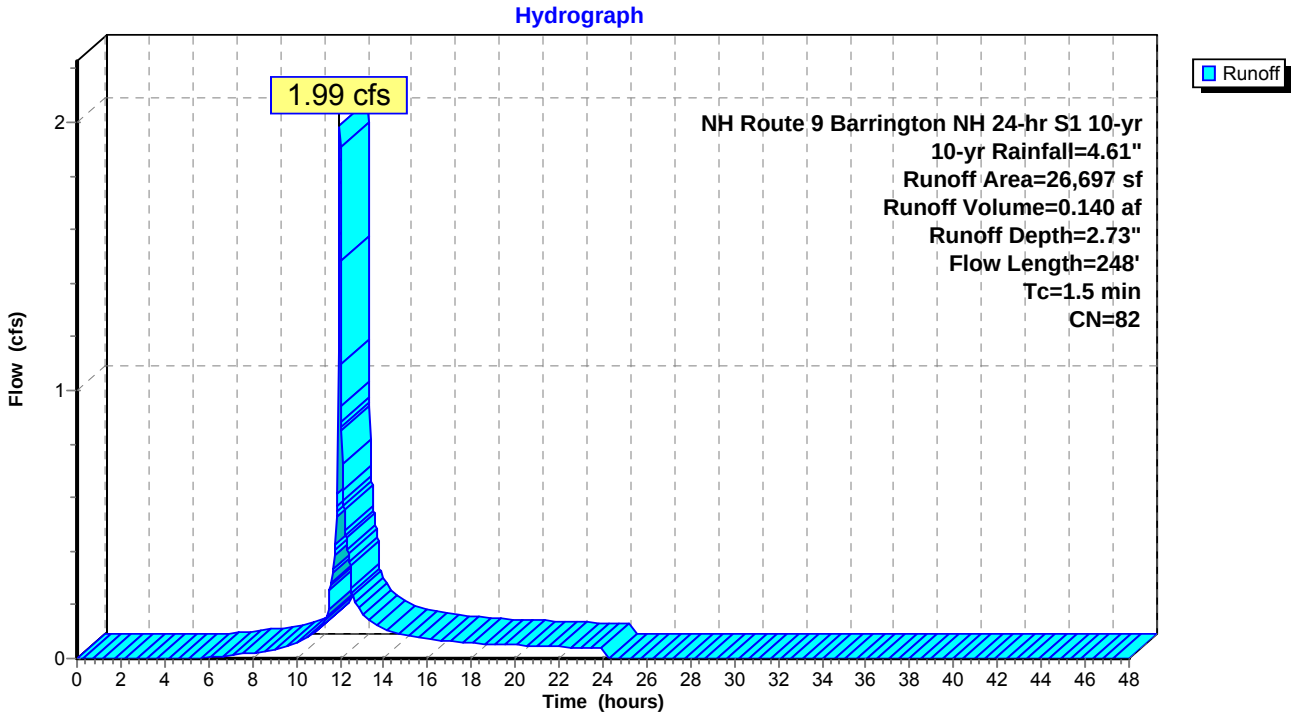
Runoff = 1.99 cfs @ 12.00 hrs, Volume= 0.140 af, Depth= 2.73"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
5,352	39	>75% Grass cover, Good, HSG A
4,610	74	>75% Grass cover, Good, HSG C
11,054	98	Paved parking, HSG A
5,681	98	Paved parking, HSG C
26,697	82	Weighted Average
9,962		37.32% Pervious Area
16,735		62.68% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.7	50	0.0200	1.17		**Sheet Flow, Pavement** Smooth surfaces n= 0.011 P2= 3.07"
0.1	13	0.0200	2.87		**Shallow Concentrated Flow, Pavement** Paved Kv= 20.3 fps
0.1	5	0.0300	1.21		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
0.6	180	0.0130	4.68	14.05	**Trap/Vee/Rect Channel Flow, Swale** Bot.W=0.00' D=1.00' Z= 3.0 '/' Top.W=6.00' n= 0.022 Earth, clean & straight
1.5	248	Total			

Subcatchment PS30: Parking Lot Southeast of Building



Summary for Subcatchment PS4: Lower north corner of westernly lot

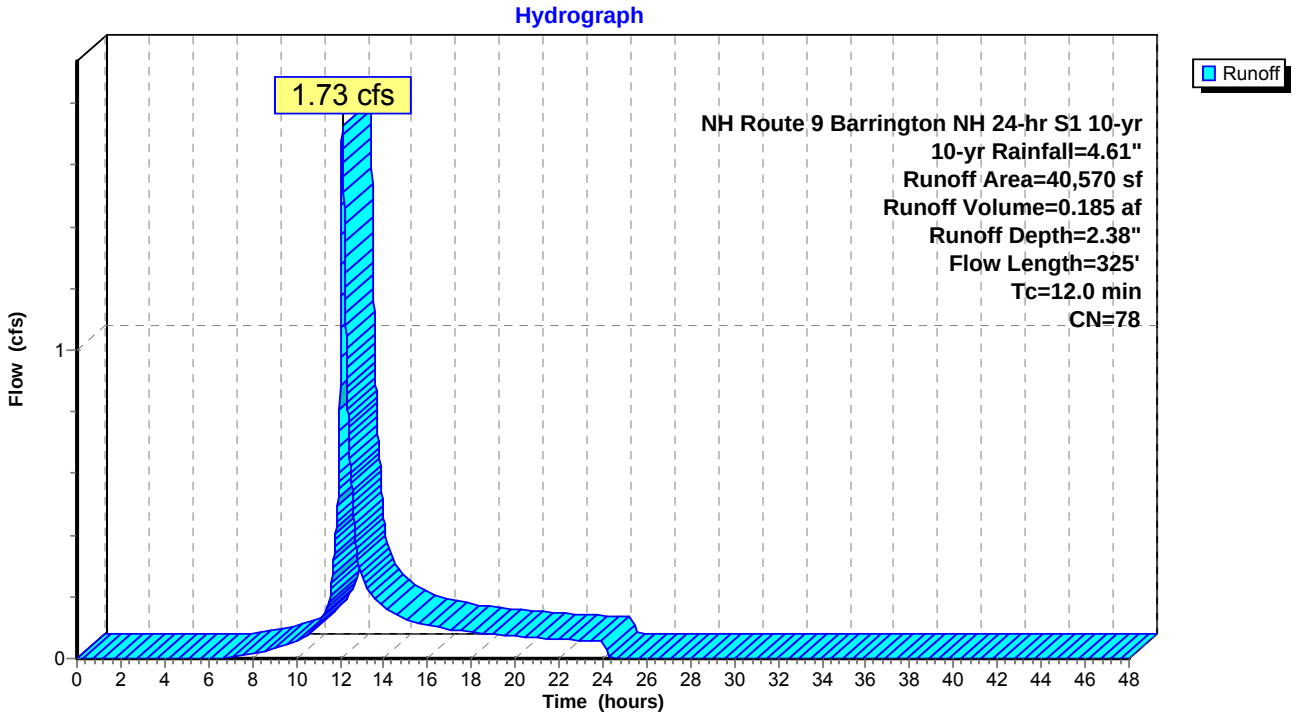
Runoff = 1.73 cfs @ 12.12 hrs, Volume= 0.185 af, Depth= 2.38"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
1,166	39	>75% Grass cover, Good, HSG A
6,755	74	>75% Grass cover, Good, HSG C
21,381	70	Woods, Good, HSG C
5,324	98	Paved parking, HSG A
4,744	98	Paved parking, HSG C
1,200	98	Roofs, HSG A
40,570	78	Weighted Average
29,302		72.23% Pervious Area
11,268		27.77% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.5	50	0.0400	0.09		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
0.8	39	0.0256	0.80		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
0.4	74	0.2200	3.28		**Shallow Concentrated Flow, grass** Short Grass Pasture Kv= 7.0 fps
1.3	162	0.0025	2.05	6.16	**Trap/Vee/Rect Channel Flow, Swale** Bot.W=0.00' D=1.00' Z= 3.0 '/' Top.W=6.00' n= 0.022 Earth, clean & straight
12.0	325	Total			

Subcatchment PS4: Lower north corner of westerly lot



Summary for Subcatchment PS6: Northeast area of middle lot

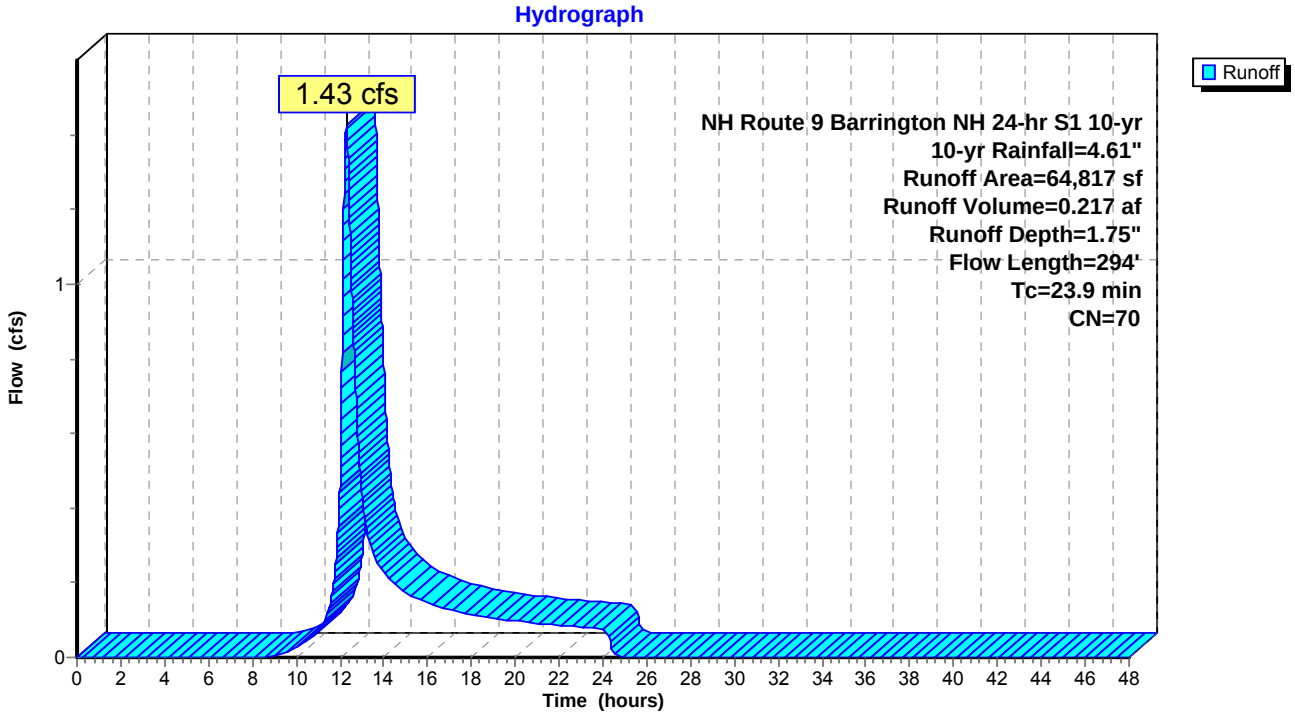
Runoff = 1.43 cfs @ 12.29 hrs, Volume= 0.217 af, Depth= 1.75"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
62,199	70	Woods, Good, HSG C
2,618	74	>75% Grass cover, Good, HSG C
64,817	70	Weighted Average
64,817		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
16.6	50	0.0100	0.05		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
0.5	42	0.0833	1.44		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
6.8	202	0.0099	0.50		**Shallow Concentrated Flow, Wetland flow** Woodland Kv= 5.0 fps
23.9	294	Total			

Subcatchment PS6: Northeast area of middle lot



Summary for Subcatchment PS7: Eastern Corner of Middle Lot

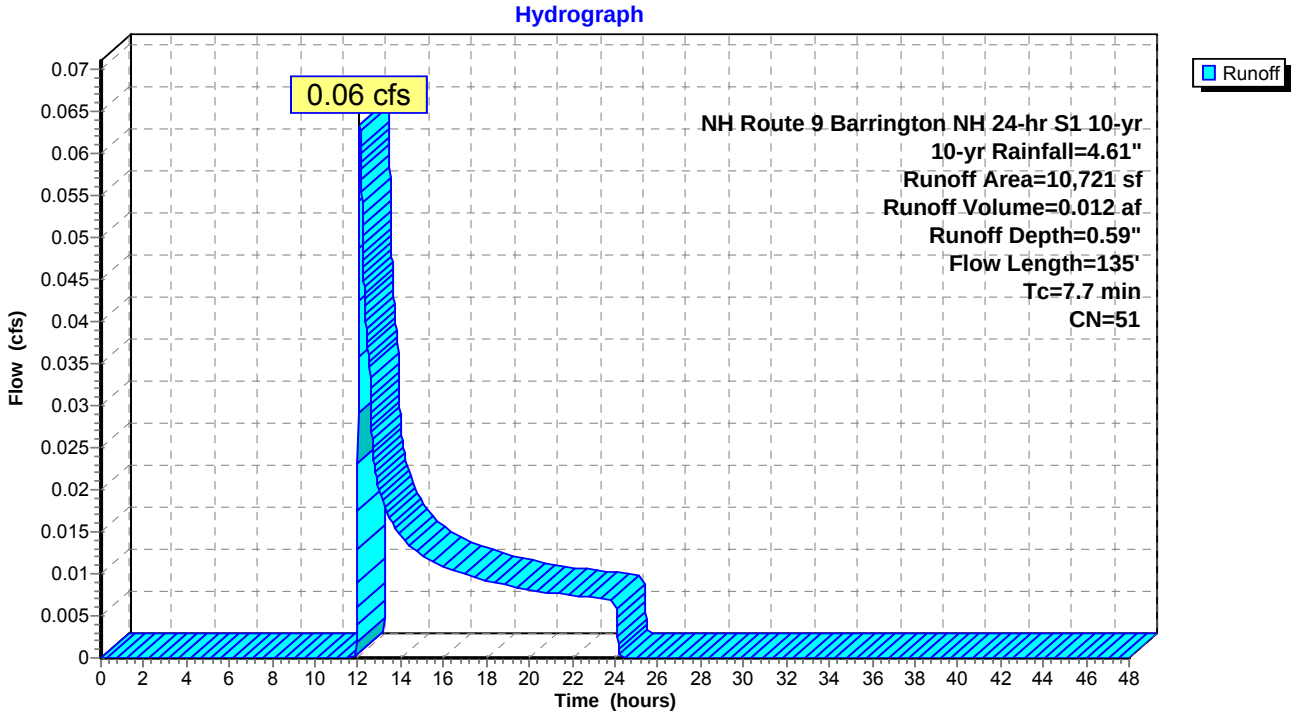
Runoff = 0.06 cfs @ 12.09 hrs, Volume= 0.012 af, Depth= 0.59"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
8,600	39	>75% Grass cover, Good, HSG A
2,121	98	Paved parking, HSG A
10,721	51	Weighted Average
8,600		80.22% Pervious Area
2,121		19.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
5.7	50	0.0200	0.15		**Sheet Flow, Grass** Grass: Short n= 0.150 P2= 3.07"
2.0	85	0.0100	0.70		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
7.7	135	Total			

Subcatchment PS7: Eastern Corner of Middle Lot



Summary for Subcatchment PS8: West portion of easterly lot (ES9)

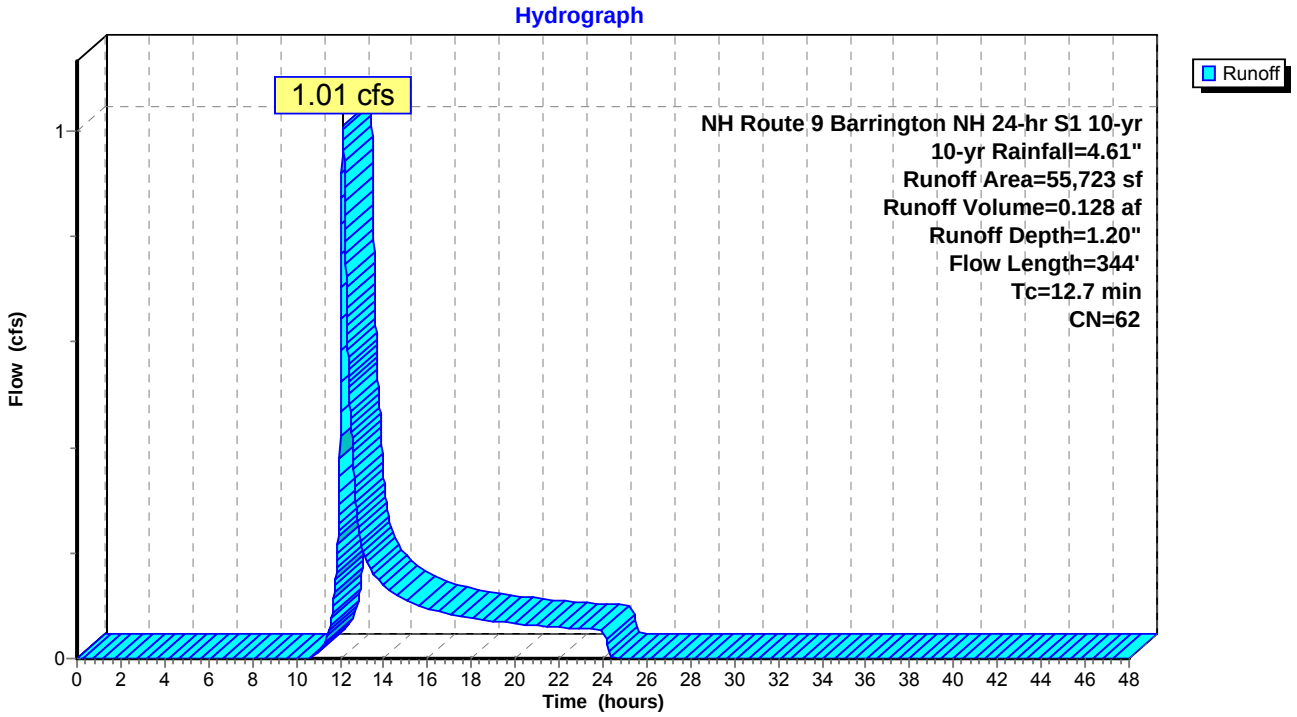
Runoff = 1.01 cfs @ 12.14 hrs, Volume= 0.128 af, Depth= 1.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
9,841	39	>75% Grass cover, Good, HSG A
2,369	30	Woods, Good, HSG A
13,310	55	Woods, Good, HSG B
24,652	70	Woods, Good, HSG C
5,551	98	Paved parking, HSG A
55,723	62	Weighted Average
50,172		90.04% Pervious Area
5,551		9.96% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
8.7	50	0.0500	0.10		**Sheet Flow, woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.5	105	0.0524	1.14		**Shallow Concentrated Flow, woods** Woodland Kv= 5.0 fps
1.9	99	0.0303	0.87		**Shallow Concentrated Flow, Wetland flow** Woodland Kv= 5.0 fps
0.6	90	0.1440	2.66		**Shallow Concentrated Flow, Grass** Short Grass Pasture Kv= 7.0 fps
12.7	344	Total			

Subcatchment PS8: West portion of easterly lot (ES9)



Summary for Subcatchment PS9: East portion of easterly lot (ES10)

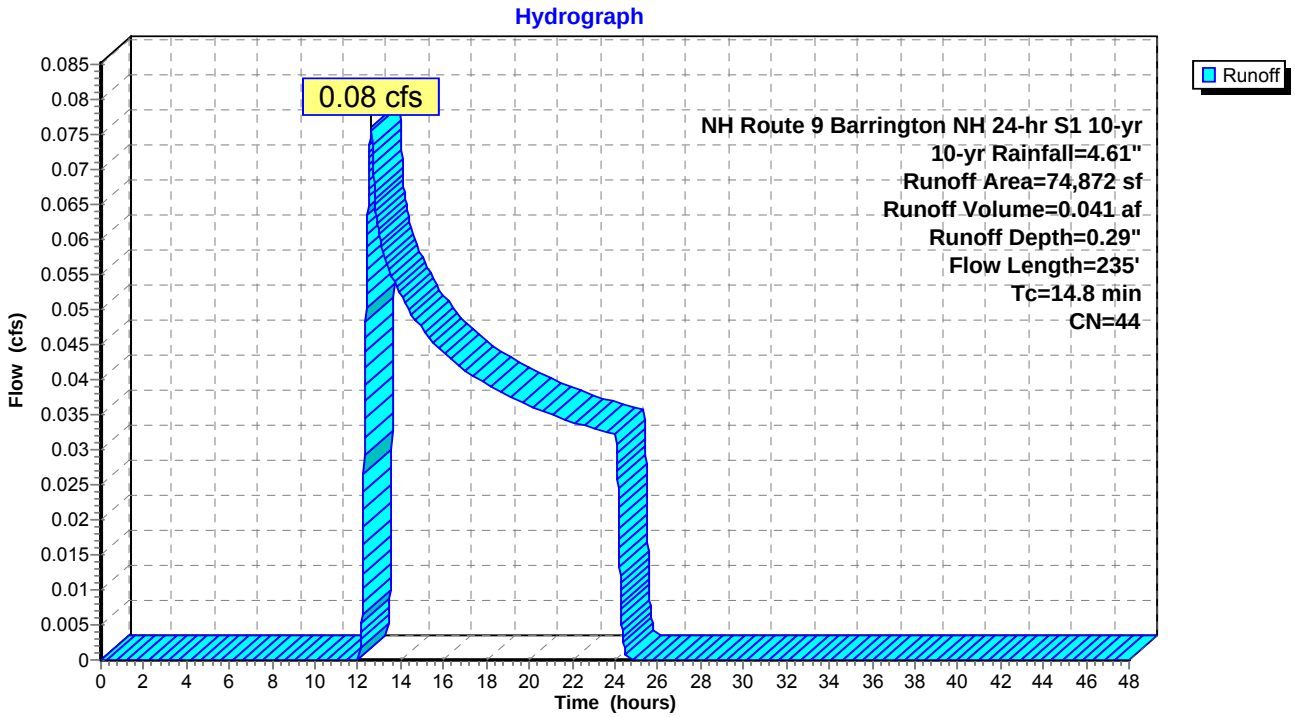
Runoff = 0.08 cfs @ 12.61 hrs, Volume= 0.041 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs
NH Route 9 Barrington NH 24-hr S1 10-yr 10-yr Rainfall=4.61"

Area (sf)	CN	Description
31,198	39	>75% Grass cover, Good, HSG A
23,985	30	Woods, Good, HSG A
19,689	70	Woods, Good, HSG C
74,872	44	Weighted Average
74,872		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.6	50	0.0200	0.07		**Sheet Flow, Woods** Woods: Light underbrush n= 0.400 P2= 3.07"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, Woods** Woodland Kv= 5.0 fps
1.0	135	0.1850	2.15		**Shallow Concentrated Flow, steep woods** Woodland Kv= 5.0 fps
14.8	235	Total			

Subcatchment PS9: East portion of easterly lot (ES10)



Summary for Reach ER70: Wetlands Starting North Flowing Southeast

Inflow Area = 0.469 ac, 0.00% Impervious, Inflow Depth = 0.29" for 10-yr event
Inflow = 0.02 cfs @ 12.57 hrs, Volume= 0.011 af
Outflow = 0.02 cfs @ 13.05 hrs, Volume= 0.011 af, Atten= 25%, Lag= 28.8 min

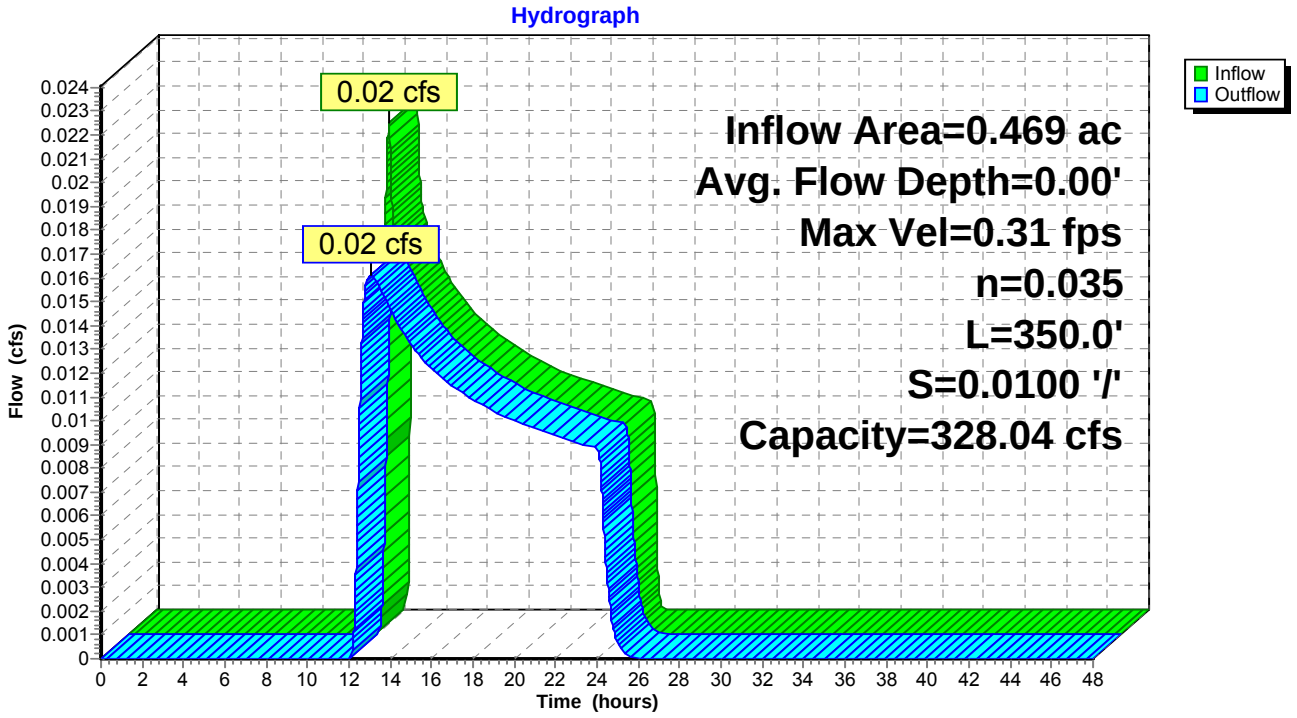
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.31 fps, Min. Travel Time= 18.8 min
Avg. Velocity = 0.31 fps, Avg. Travel Time= 18.8 min

Peak Storage= 18 cf @ 13.05 hrs
Average Depth at Peak Storage= 0.00'
Bank-Full Depth= 2.00' Flow Area= 64.0 sf, Capacity= 328.04 cfs

16.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 8.0 '/' Top Width= 48.00'
Length= 350.0' Slope= 0.0100 '/'
Inlet Invert= 226.00', Outlet Invert= 222.50'

‡

Reach ER70: Wetlands Starting North Flowing Southeast



Summary for Reach ER72: Northwest Wetlands Flowing Southeast to Redemption Rd

[62] Hint: Exceeded Reach ER70 OUTLET depth by 0.02' @ 12.50 hrs

Inflow Area = 2.810 ac, 0.00% Impervious, Inflow Depth = 0.42" for 10-yr event
Inflow = 0.26 cfs @ 12.37 hrs, Volume= 0.099 af
Outflow = 0.25 cfs @ 12.58 hrs, Volume= 0.099 af, Atten= 3%, Lag= 12.3 min

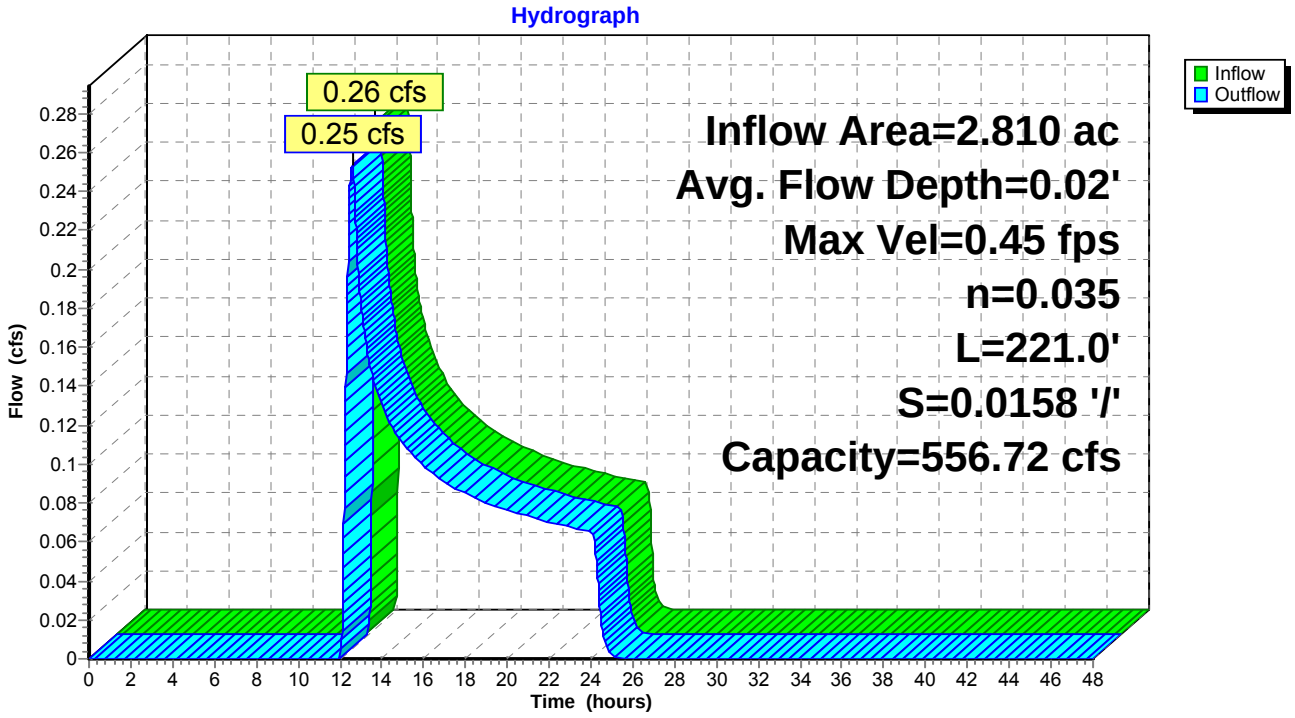
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.45 fps, Min. Travel Time= 8.3 min
Avg. Velocity = 0.39 fps, Avg. Travel Time= 9.4 min

Peak Storage= 126 cf @ 12.58 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 2.00' Flow Area= 82.0 sf, Capacity= 556.72 cfs

25.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 8.0 '/' Top Width= 57.00'
Length= 221.0' Slope= 0.0158 '/'
Inlet Invert= 222.50', Outlet Invert= 219.00'

‡

Reach ER72: Northwest Wetlands Flowing Southeast to Redemption Rd



Summary for Reach ER73: Wetlands Flowing on Map 234 Lot 1.2

[62] Hint: Exceeded Reach ER72 OUTLET depth by 0.01' @ 12.07 hrs

Inflow Area = 5.723 ac, 28.26% Impervious, Inflow Depth = 0.24" for 10-yr event
Inflow = 0.30 cfs @ 12.52 hrs, Volume= 0.117 af
Outflow = 0.28 cfs @ 12.65 hrs, Volume= 0.117 af, Atten= 6%, Lag= 7.7 min

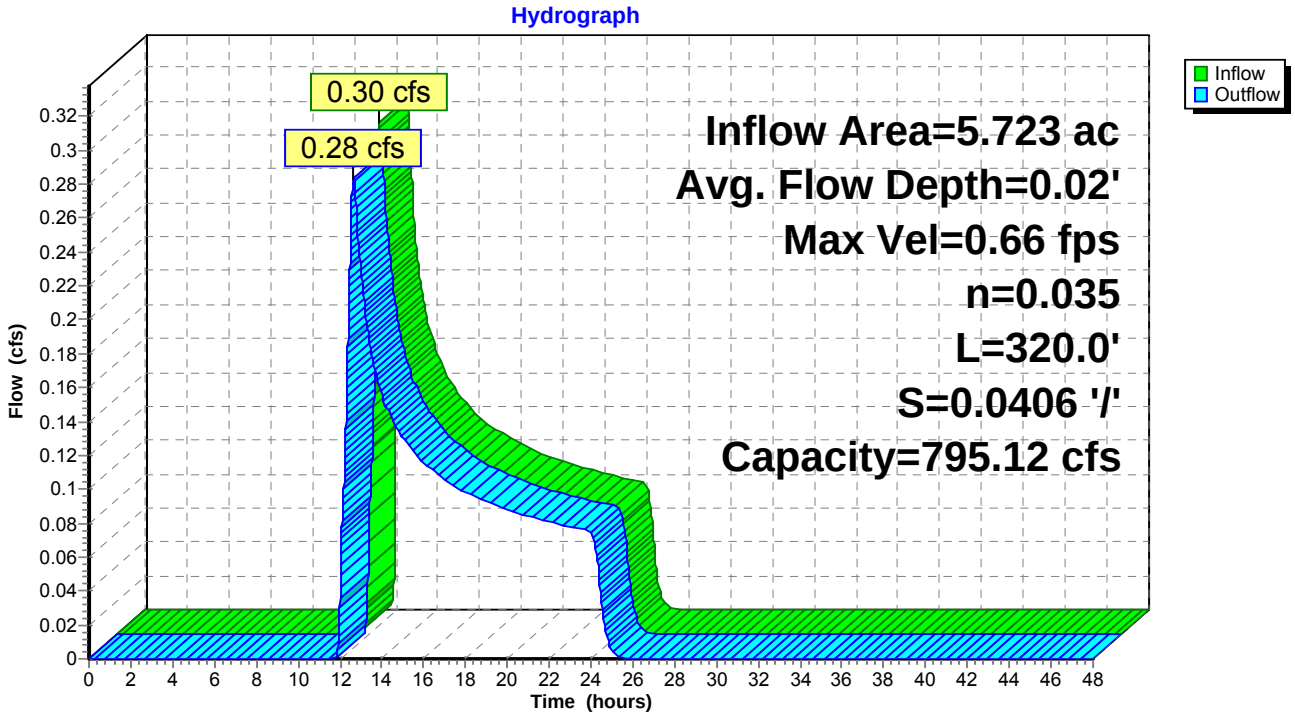
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.66 fps, Min. Travel Time= 8.0 min
Avg. Velocity = 0.63 fps, Avg. Travel Time= 8.5 min

Peak Storage= 136 cf @ 12.65 hrs
Average Depth at Peak Storage= 0.02'
Bank-Full Depth= 2.00' Flow Area= 76.0 sf, Capacity= 795.12 cfs

20.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 9.0 '/' Top Width= 56.00'
Length= 320.0' Slope= 0.0406 '/'
Inlet Invert= 219.00', Outlet Invert= 206.00'

‡

Reach ER73: Wetlands Flowing on Map 234 Lot 1.2



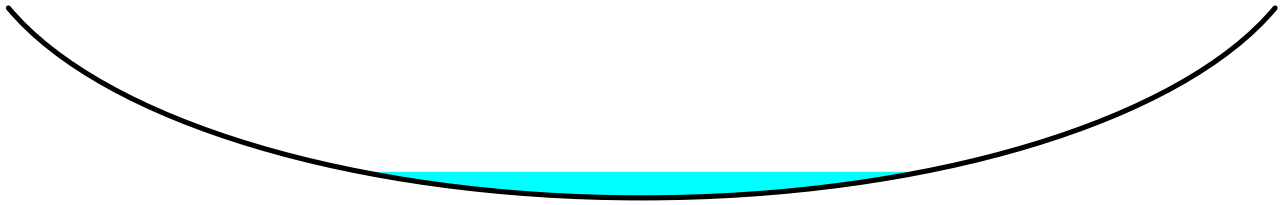
Summary for Reach ER81: SE Portion of Middle Lot Wetlands

Inflow Area = 1.488 ac, 0.00% Impervious, Inflow Depth > 0.99" for 10-yr event
Inflow = 0.21 cfs @ 14.29 hrs, Volume= 0.123 af
Outflow = 0.17 cfs @ 15.64 hrs, Volume= 0.123 af, Atten= 17%, Lag= 80.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.09 fps, Min. Travel Time= 65.5 min
Avg. Velocity = 0.05 fps, Avg. Travel Time= 136.2 min

Peak Storage= 679 cf @ 15.64 hrs
Average Depth at Peak Storage= 0.14'
Bank-Full Depth= 1.00' Flow Area= 36.7 sf, Capacity= 13.04 cfs

55.00' x 1.00' deep Parabolic Channel, n= 0.750
Length= 370.0' Slope= 0.0554 '/'
Inlet Invert= 233.00', Outlet Invert= 212.50'



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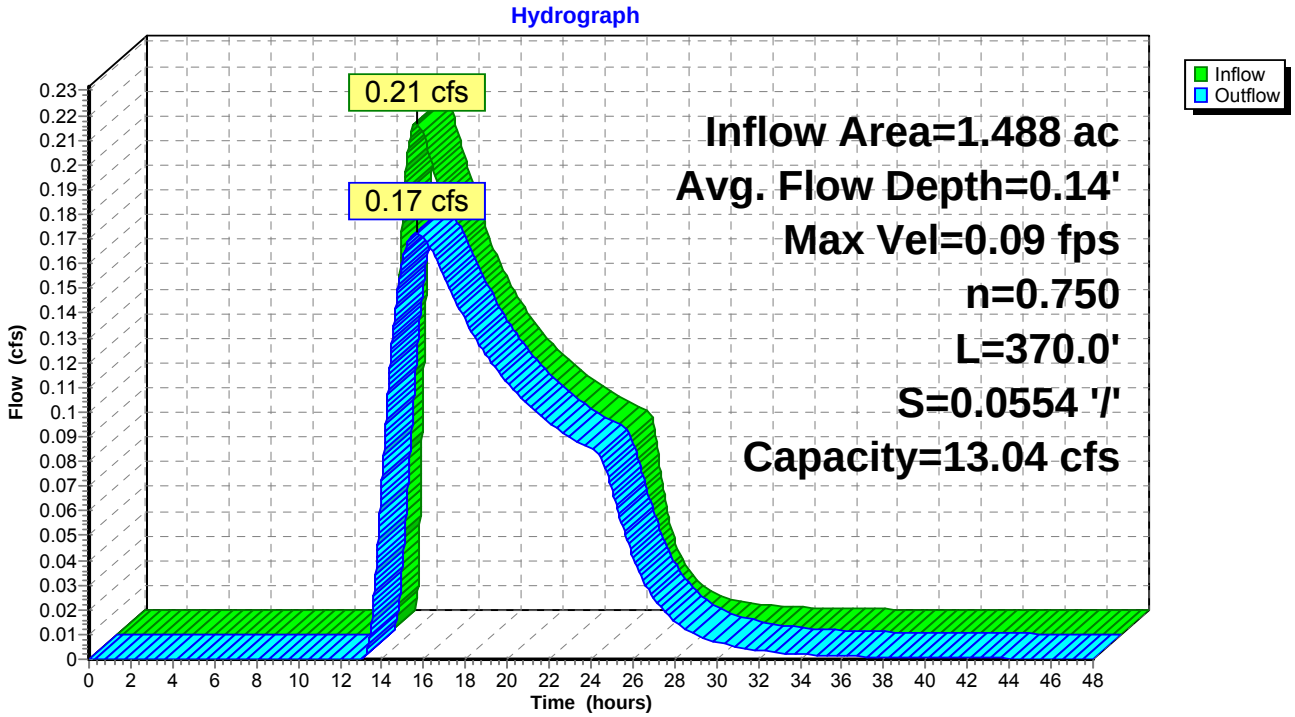
Reach ER81: SE Portion of Middle Lot Wetlands



Summary for Reach ER82: Swale Located on North Side of Redemption Rd Flowing Northeast

Inflow Area = 0.487 ac, 17.10% Impervious, Inflow Depth = 1.98" for 10-yr event
Inflow = 0.83 cfs @ 12.08 hrs, Volume= 0.080 af
Outflow = 0.79 cfs @ 12.10 hrs, Volume= 0.080 af, Atten= 5%, Lag= 1.6 min

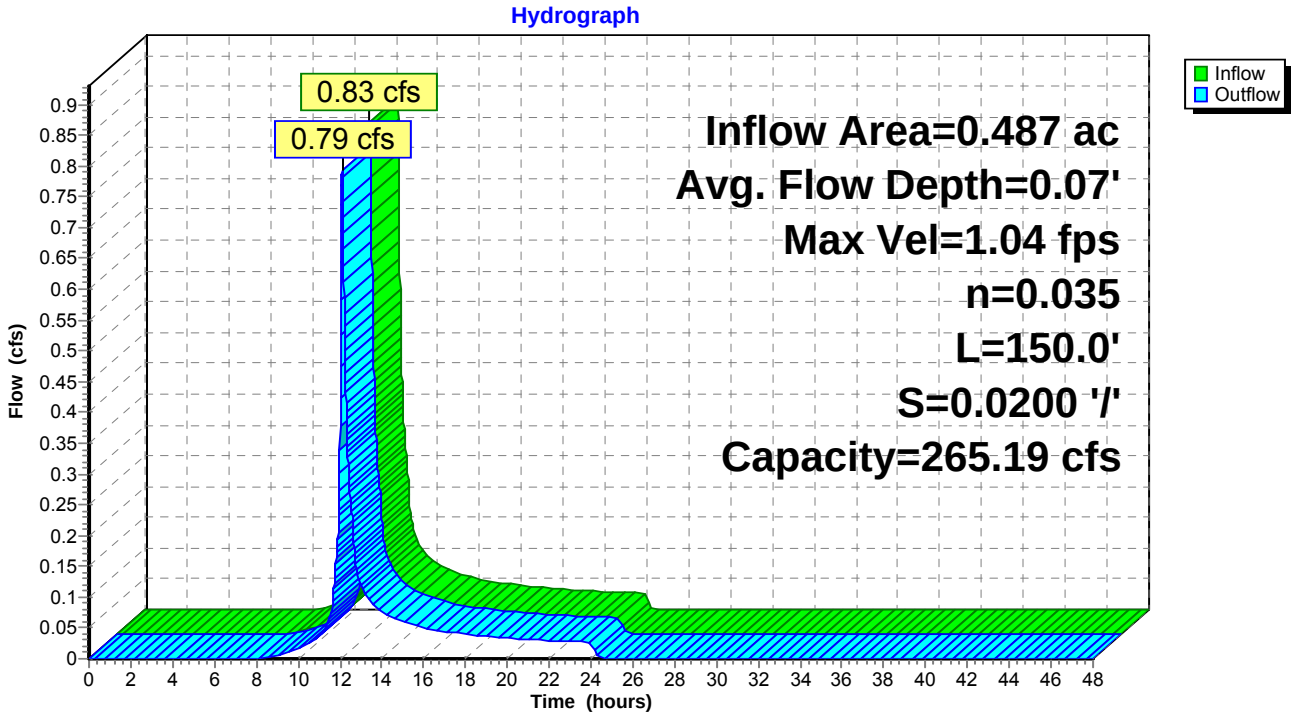
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.04 fps, Min. Travel Time= 2.4 min
Avg. Velocity = 0.46 fps, Avg. Travel Time= 5.4 min

Peak Storage= 114 cf @ 12.10 hrs
Average Depth at Peak Storage= 0.07'
Bank-Full Depth= 2.00' Flow Area= 36.0 sf, Capacity= 265.19 cfs

10.00' x 2.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 4.0 '/' Top Width= 26.00'
Length= 150.0' Slope= 0.0200 '/'
Inlet Invert= 217.00', Outlet Invert= 214.00'

‡

Reach ER82: Swale Located on North Side of Redemption Rd Flowing Northeast



Summary for Reach ER84: Swale Located on North Side of Redemption Rd Flowing Northeast

Inflow Area = 2.582 ac, 8.71% Impervious, Inflow Depth = 0.15" for 10-yr event
Inflow = 0.09 cfs @ 15.08 hrs, Volume= 0.032 af
Outflow = 0.09 cfs @ 15.14 hrs, Volume= 0.032 af, Atten= 0%, Lag= 3.6 min

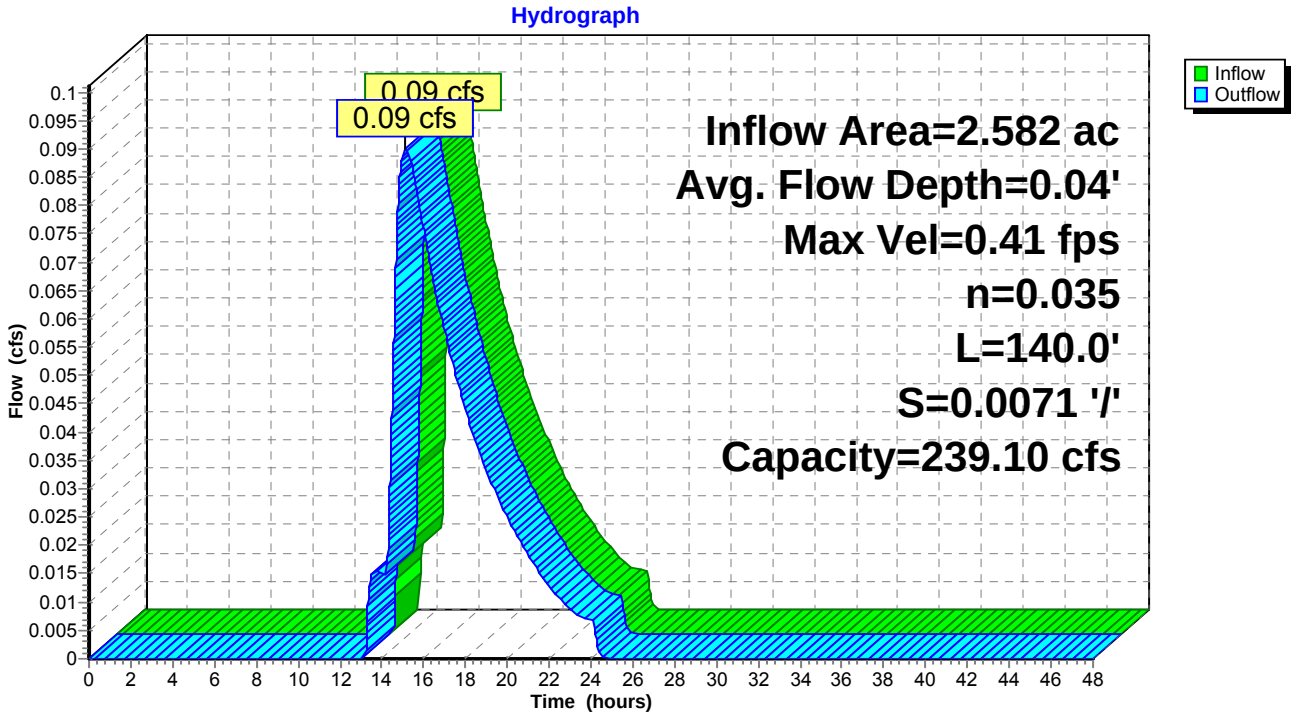
Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 0.41 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.35 fps, Avg. Travel Time= 6.7 min

Peak Storage= 31 cf @ 15.14 hrs
Average Depth at Peak Storage= 0.04'
Bank-Full Depth= 3.00' Flow Area= 45.0 sf, Capacity= 239.10 cfs

6.00' x 3.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 24.00'
Length= 140.0' Slope= 0.0071 '/'
Inlet Invert= 212.00', Outlet Invert= 211.00'

‡

Reach ER84: Swale Located on North Side of Redemption Rd Flowing Northeast



Summary for Reach ER85: End of Swale located North of Redemption Rd Circle

[62] Hint: Exceeded Reach ER84 OUTLET depth by 0.16' @ 12.15 hrs

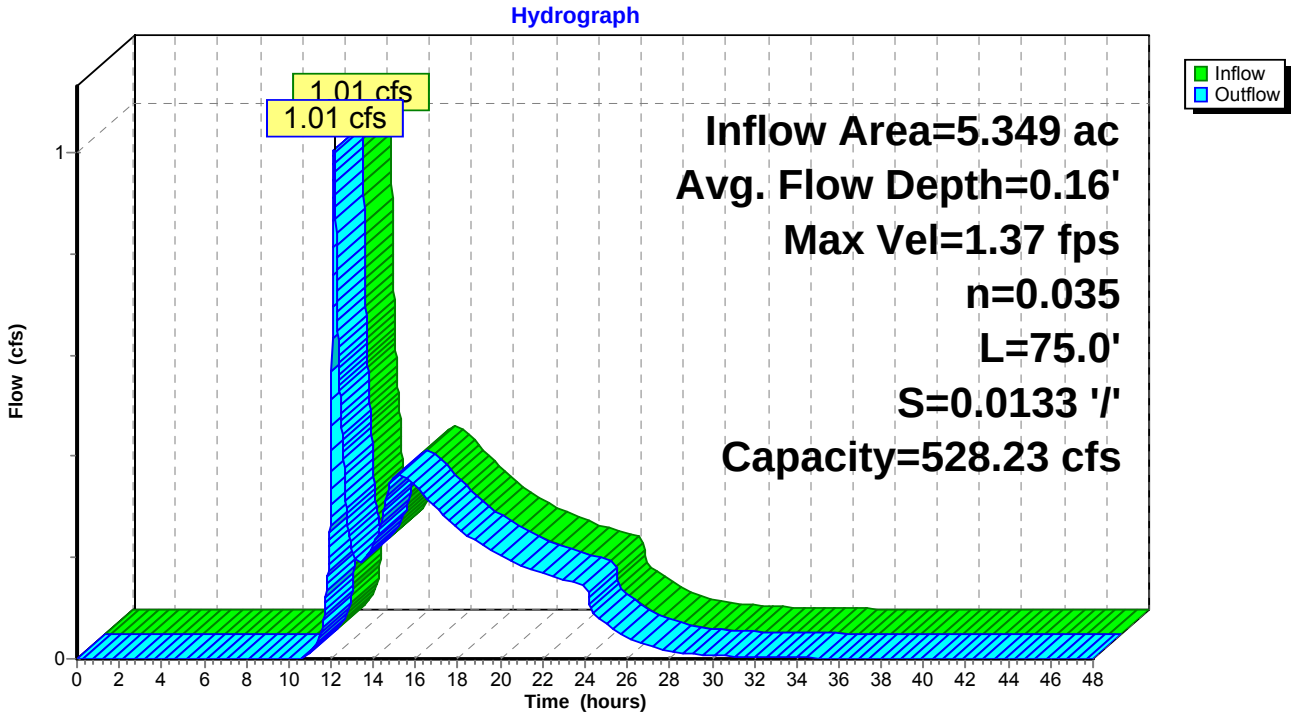
Inflow Area = 5.349 ac, 6.59% Impervious, Inflow Depth > 0.64" for 10-yr event
Inflow = 1.01 cfs @ 12.14 hrs, Volume= 0.283 af
Outflow = 1.01 cfs @ 12.15 hrs, Volume= 0.283 af, Atten= 0%, Lag= 0.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 1.37 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 0.65 fps, Avg. Travel Time= 1.9 min

Peak Storage= 55 cf @ 12.15 hrs
Average Depth at Peak Storage= 0.16'
Bank-Full Depth= 4.00' Flow Area= 64.0 sf, Capacity= 528.23 cfs

4.00' x 4.00' deep channel, n= 0.035 Earth, dense weeds
Side Slope Z-value= 3.0 '/' Top Width= 28.00'
Length= 75.0' Slope= 0.0133 '/'
Inlet Invert= 211.00', Outlet Invert= 210.00'

Reach ER85: End of Swale located North of Redemption Rd Circle



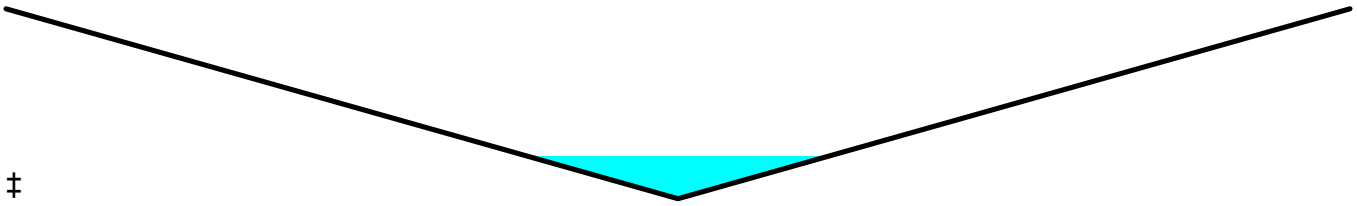
Summary for Reach PR62: Swale South of Proposed Driveway

Inflow Area = 0.177 ac, 70.54% Impervious, Inflow Depth = 3.60" for 10-yr event
Inflow = 0.70 cfs @ 12.01 hrs, Volume= 0.053 af
Outflow = 0.70 cfs @ 12.02 hrs, Volume= 0.053 af, Atten= 1%, Lag= 0.4 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 3.45 fps, Min. Travel Time= 0.6 min
Avg. Velocity = 1.41 fps, Avg. Travel Time= 1.5 min

Peak Storage= 26 cf @ 12.02 hrs
Average Depth at Peak Storage= 0.22'
Bank-Full Depth= 1.00' Flow Area= 4.0 sf, Capacity= 37.30 cfs

0.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 4.0 '/' Top Width= 8.00'
Length= 130.0' Slope= 0.0500 '/'
Inlet Invert= 224.00', Outlet Invert= 217.50'



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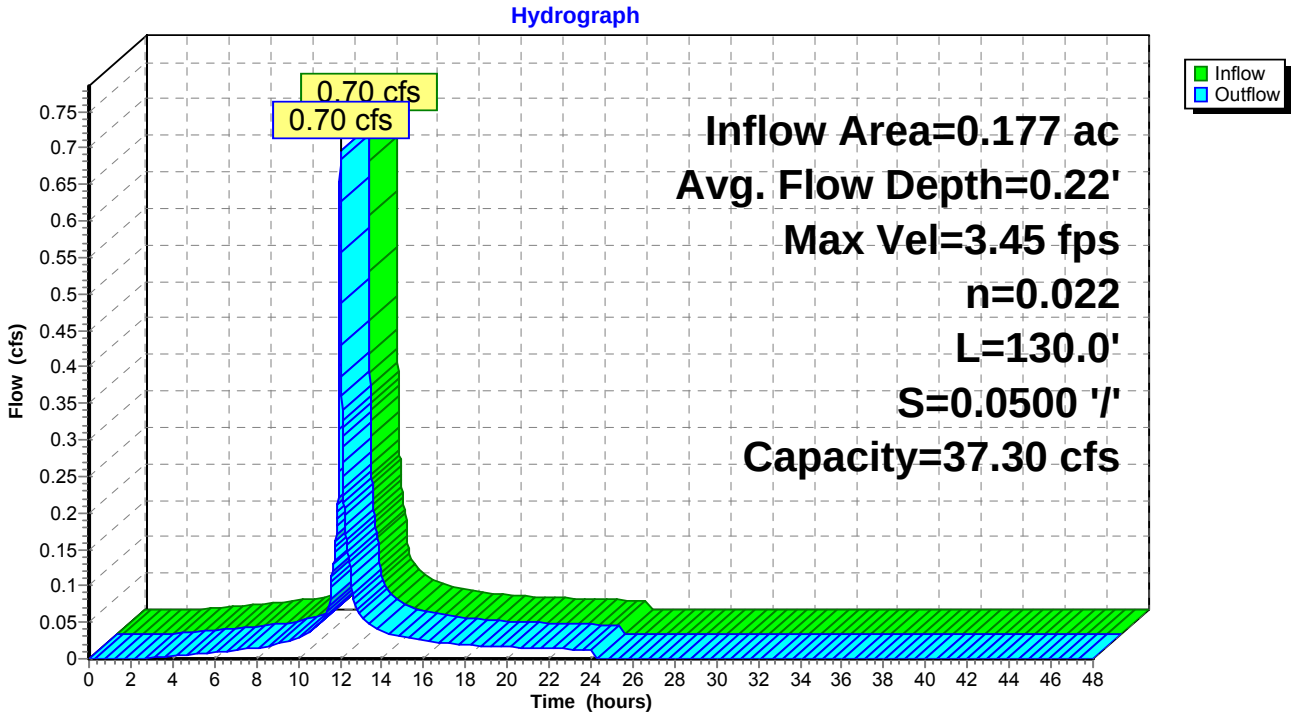
Reach PR62: Swale South of Proposed Driveway



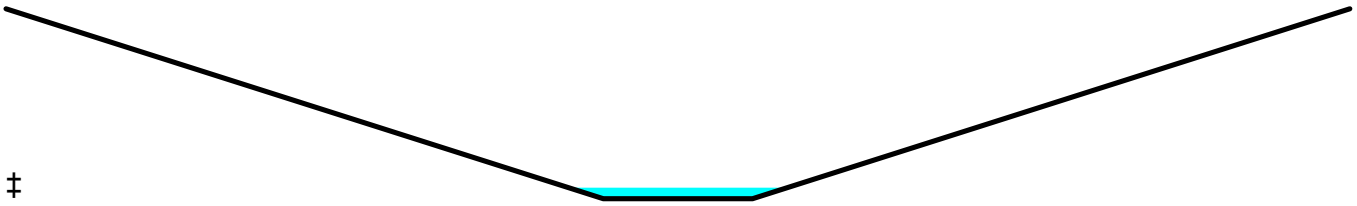
Summary for Reach PR63: Swale North of gravel drive entrance

Inflow Area = 0.636 ac, 47.61% Impervious, Inflow Depth = 1.72" for 10-yr event
Inflow = 0.15 cfs @ 12.91 hrs, Volume= 0.091 af
Outflow = 0.15 cfs @ 12.92 hrs, Volume= 0.091 af, Atten= 0%, Lag= 0.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Max. Velocity= 2.02 fps, Min. Travel Time= 0.7 min
Avg. Velocity = 1.21 fps, Avg. Travel Time= 1.1 min

Peak Storage= 6 cf @ 12.92 hrs
Average Depth at Peak Storage= 0.06'
Bank-Full Depth= 1.00' Flow Area= 5.0 sf, Capacity= 50.13 cfs

1.00' x 1.00' deep channel, n= 0.022 Earth, clean & straight
Side Slope Z-value= 4.0 '/' Top Width= 9.00'
Length= 80.0' Slope= 0.0500 '/'
Inlet Invert= 210.00', Outlet Invert= 206.00'



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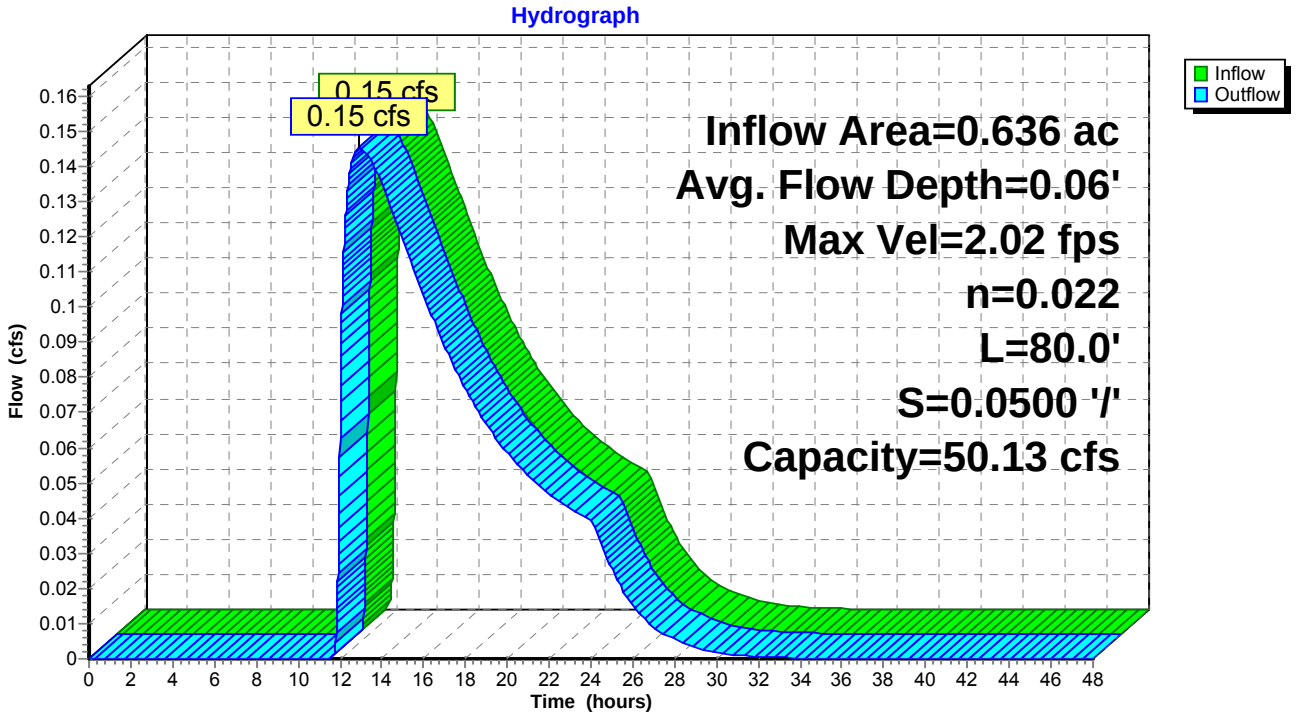
Reach PR63: Swale North of gravel drive entrance



Summary for Pond BR1: Bioswale-ISR 1 (CB5)

Inflow Area = 1.274 ac, 45.56% Impervious, Inflow Depth = 2.90" for 10-yr event
Inflow = 2.43 cfs @ 12.10 hrs, Volume= 0.308 af
Outflow = 2.37 cfs @ 12.11 hrs, Volume= 0.308 af, Atten= 2%, Lag= 1.0 min
Primary = 0.05 cfs @ 12.11 hrs, Volume= 0.127 af
Secondary = 2.32 cfs @ 12.11 hrs, Volume= 0.181 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 229.65' @ 12.11 hrs Surf.Area= 2,648 sf Storage= 2,756 cf
Flood Elev= 230.00' Surf.Area= 2,912 sf Storage= 3,556 cf

Plug-Flow detention time= 237.0 min calculated for 0.308 af (100% of inflow)
Center-of-Mass det. time= 237.1 min (1,062.8 - 825.8)

Volume	Invert	Avail.Storage	Storage Description
#1	226.00'	256 cf	**8.00'W x 64.00'L x 2.00'H 24" Bioretention Soil Mix** 1,024 cf Overall x 25.0% Voids
#2	228.00'	3,300 cf	**Surface Sloped Stage Storage (Prismatic)** Listed below (Recalc)
		3,556 cf	Total Available Storage

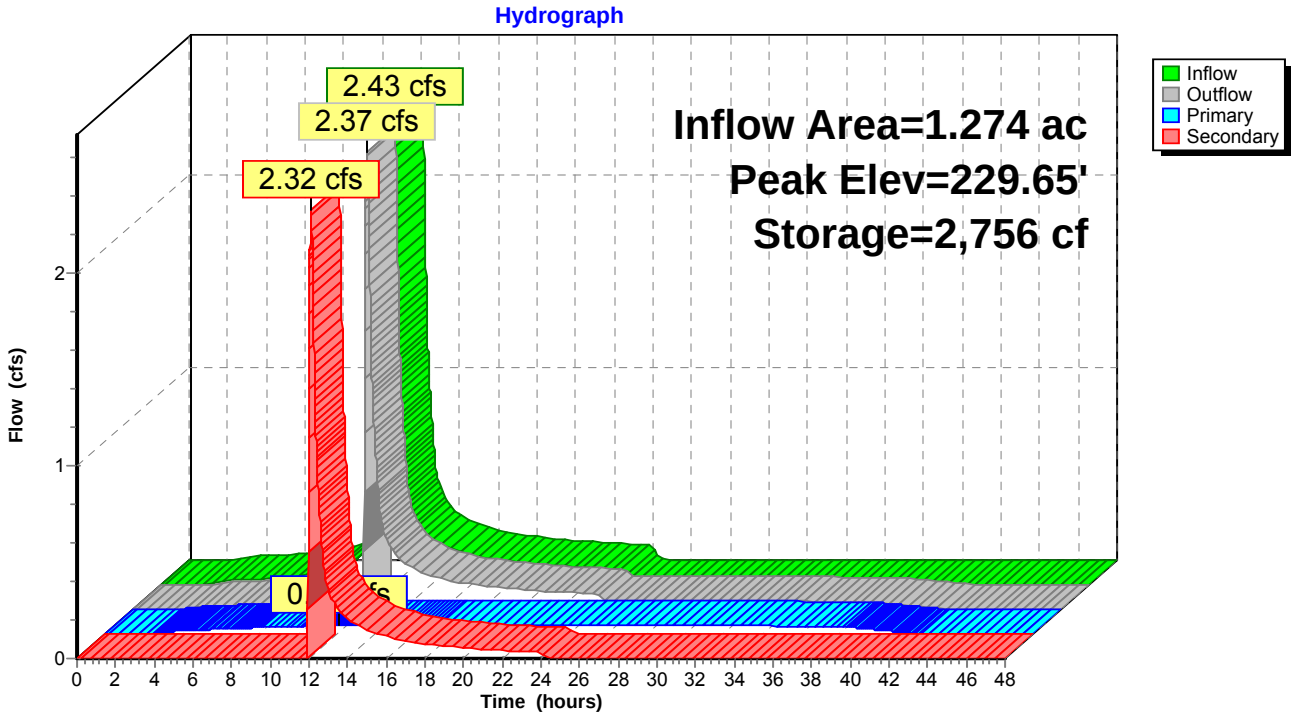
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
228.00	900	0	0
230.00	2,400	3,300	3,300

Device	Routing	Invert	Outlet Devices
#1	Primary	226.00'	**6.0" Round 6" SDR-35 Pipe** L= 195.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 226.00' / 224.50' S= 0.0077 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Device 1	226.00'	**1.0" Vert. Orifice/Grate** C= 0.600
#3	Secondary	227.67'	**15.0" Round 15" HDPE Pipe** L= 195.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 227.67' / 226.20' S= 0.0075 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf
#4	Device 3	229.50'	**48.0" Horiz. Bypass Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.05 cfs @ 12.11 hrs HW=229.65' TW=225.92' (Dynamic Tailwater)
└**1=6" SDR-35 Pipe** (Passes 0.05 cfs of 0.92 cfs potential flow)
└**2=Orifice/Grate** (Orifice Controls 0.05 cfs @ 9.14 fps)

Secondary OutFlow Max=2.32 cfs @ 12.11 hrs HW=229.65' TW=225.92' (Dynamic Tailwater)
└**3=15" HDPE Pipe** (Passes 2.32 cfs of 5.42 cfs potential flow)
└**4=Bypass Overflow** (Weir Controls 2.32 cfs @ 1.25 fps)

Pond BR1: Bioswale-ISR 1 (CB5)



Summary for Pond BR2: Bioswale - ISR 2 (CB3)

Inflow Area = 1.333 ac, 77.78% Impervious, Inflow Depth = 3.38" for 10-yr event
Inflow = 4.93 cfs @ 12.00 hrs, Volume= 0.376 af
Outflow = 4.46 cfs @ 12.01 hrs, Volume= 0.376 af, Atten= 10%, Lag= 0.8 min
Primary = 0.05 cfs @ 12.01 hrs, Volume= 0.144 af
Secondary = 4.41 cfs @ 12.01 hrs, Volume= 0.232 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 230.80' @ 12.01 hrs Surf.Area= 4,453 sf Storage= 3,754 cf
Flood Elev= 231.00' Surf.Area= 4,820 sf Storage= 4,513 cf

Plug-Flow detention time= 265.2 min calculated for 0.376 af (100% of inflow)
Center-of-Mass det. time= 264.9 min (1,070.7 - 805.8)

Volume	Invert	Avail.Storage	Storage Description
#1	227.00'	460 cf	**8.00'W x 115.00'L x 2.00'H 24" Bioretention Soil Mix** 1,840 cf Overall x 25.0% Voids
#2	229.00'	4,053 cf	**Surface Sloped Stage Storage (Prismatic)** Listed below (Recalc)
		4,513 cf	Total Available Storage

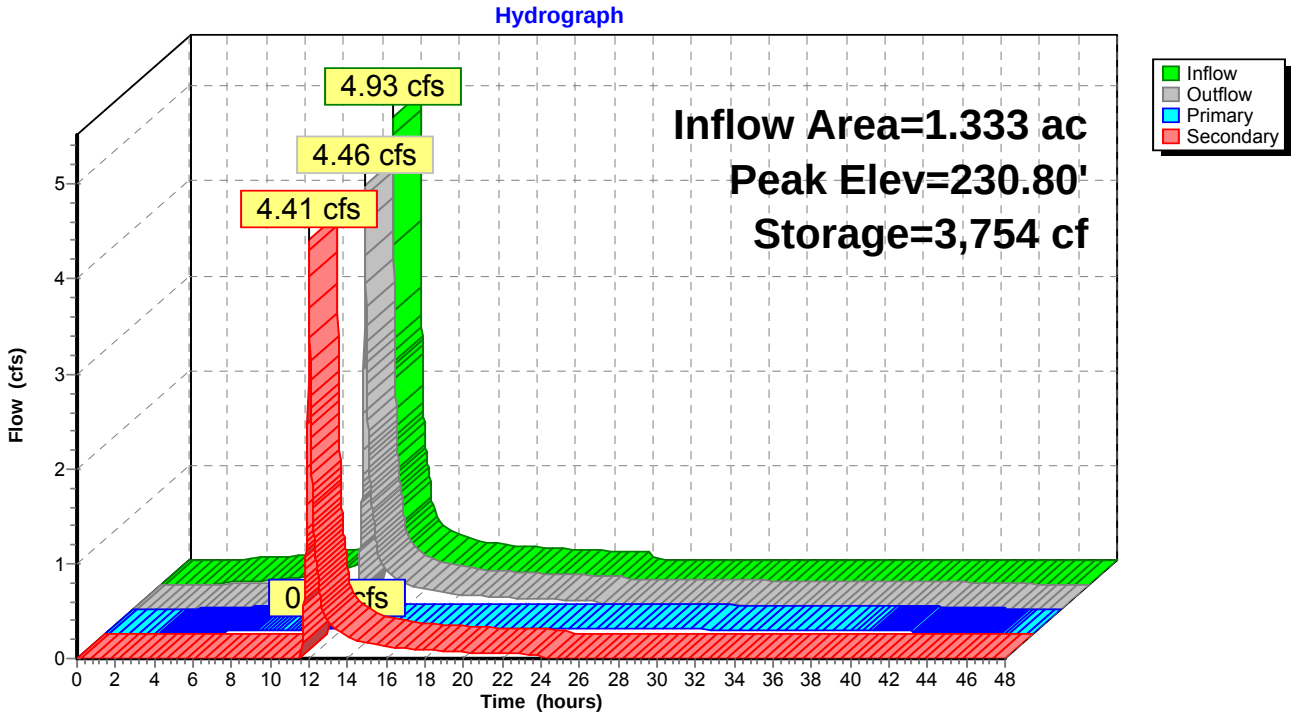
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
229.00	5	0	0
230.00	2,100	1,053	1,053
231.00	3,900	3,000	4,053

Device	Routing	Invert	Outlet Devices
#1	Primary	227.00'	**6.0" Round 6" SDR-35** L= 115.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 227.00' / 226.50' S= 0.0043 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf
#2	Device 1	227.00'	**1.0" Vert. 1" Orifice in Plate** C= 0.600
#3	Secondary	228.75'	**18.0" Round 18" HDPE Pipe** L= 115.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 228.75' / 228.00' S= 0.0065 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#4	Device 3	230.57'	**48.0" Horiz. Bypass Overflow** C= 0.600 Limited to weir flow at low heads

Primary OutFlow Max=0.05 cfs @ 12.01 hrs HW=230.80' TW=225.38' (Dynamic Tailwater)
↑**1=6" SDR-35** (Passes 0.05 cfs of 1.14 cfs potential flow)
↑**2=1" Orifice in Plate** (Orifice Controls 0.05 cfs @ 9.33 fps)

Secondary OutFlow Max=4.41 cfs @ 12.01 hrs HW=230.80' TW=225.38' (Dynamic Tailwater)
↑**3=18" HDPE Pipe** (Passes 4.41 cfs of 7.65 cfs potential flow)
↑**4=Bypass Overflow** (Weir Controls 4.41 cfs @ 1.55 fps)

Pond BR2: Bioswale - ISR 2 (CB3)



Summary for Pond DE1: Drip Edge along Northeastern Building

Inflow Area = 0.190 ac, 93.93% Impervious, Inflow Depth = 4.37" for 10-yr event
Inflow = 0.86 cfs @ 11.99 hrs, Volume= 0.069 af
Outflow = 0.84 cfs @ 12.00 hrs, Volume= 0.068 af, Atten= 2%, Lag= 0.6 min
Primary = 0.84 cfs @ 12.00 hrs, Volume= 0.068 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 233.05' @ 12.00 hrs Surf.Area= 503 sf Storage= 130 cf

Plug-Flow detention time= 24.2 min calculated for 0.068 af (99% of inflow)
Center-of-Mass det. time= 15.1 min (761.4 - 746.4)

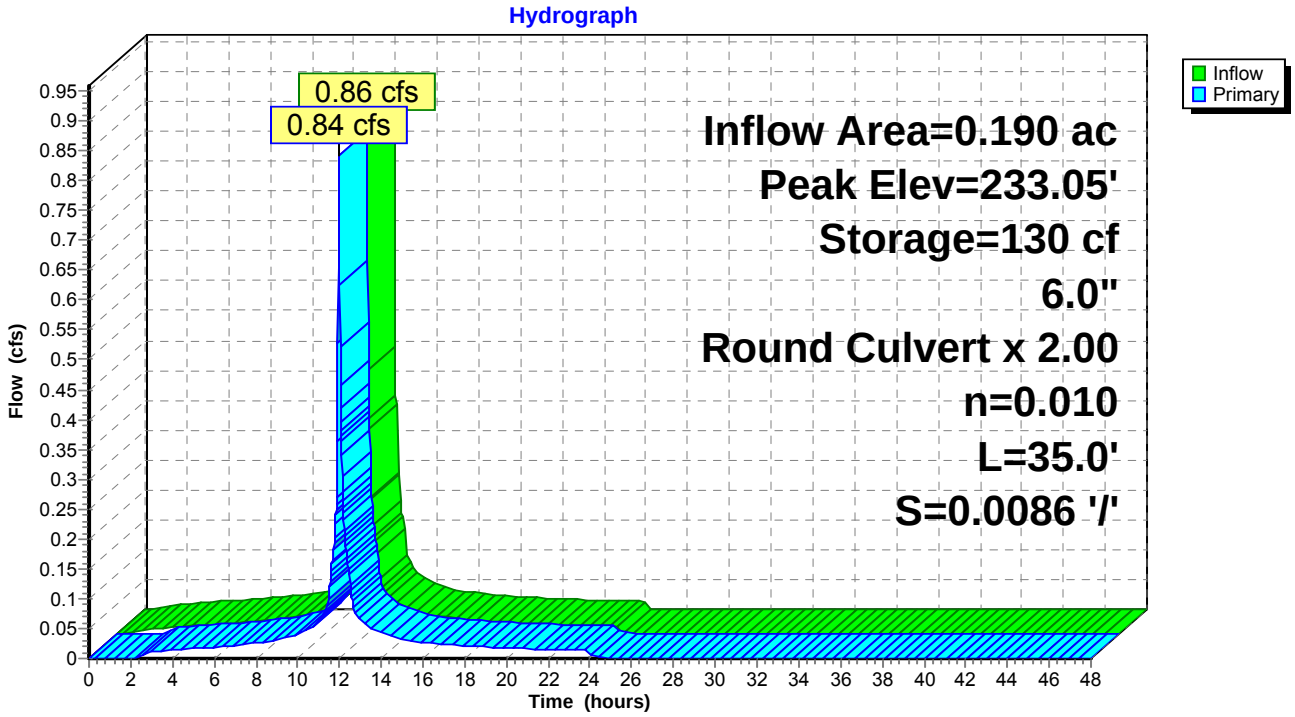
Volume	Invert	Avail.Storage	Storage Description
#1	232.40'	322 cf	**18" Thick Drip Edge (Prismatic)**Listed below (Recalc) 805 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
232.40	503	0	0
234.00	503	805	805

Device	Routing	Invert	Outlet Devices
#1	Primary	232.60'	**6.0" Round (2) 6" Underdrains X 2.00** L= 35.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 232.60' / 232.30' S= 0.0086 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.84 cfs @ 12.00 hrs HW=233.05' TW=229.62' (Dynamic Tailwater)
↑**1=(2) 6" Underdrains** (Inlet Controls 0.84 cfs @ 2.28 fps)

Pond DE1: Drip Edge along Northeastern Building



Summary for Pond DE2: Drip Edge along Northwestern Building

Inflow Area = 0.152 ac, 93.98% Impervious, Inflow Depth = 4.37" for 10-yr event
Inflow = 0.68 cfs @ 11.99 hrs, Volume= 0.055 af
Outflow = 0.58 cfs @ 12.00 hrs, Volume= 0.055 af, Atten= 16%, Lag= 0.7 min
Primary = 0.58 cfs @ 12.00 hrs, Volume= 0.055 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 233.35' @ 12.00 hrs Surf.Area= 399 sf Storage= 163 cf

Plug-Flow detention time= 25.7 min calculated for 0.055 af (99% of inflow)
Center-of-Mass det. time= 17.9 min (764.3 - 746.4)

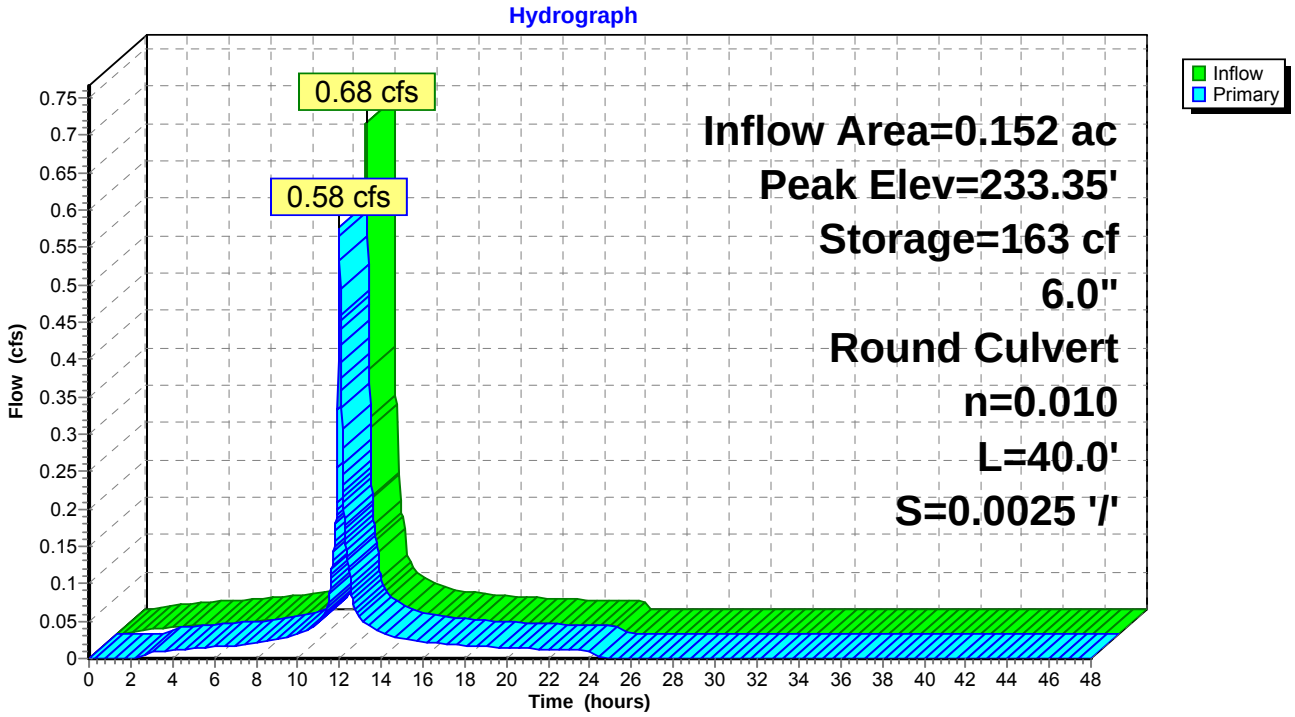
Volume	Invert	Avail.Storage	Storage Description
#1	232.33'	267 cf	**Drip Edge (Prismatic)**Listed below (Recalc) 666 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
232.33	399	0	0
234.00	399	666	666

Device	Routing	Invert	Outlet Devices
#1	Primary	232.50'	**6.0" Round (1) 6" Underdrains** L= 40.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 232.50' / 232.40' S= 0.0025 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.20 sf

Primary OutFlow Max=0.57 cfs @ 12.00 hrs HW=233.35' TW=229.62' (Dynamic Tailwater)
↑**1=(1) 6" Underdrains** (Barrel Controls 0.57 cfs @ 2.92 fps)

Pond DE2: Drip Edge along Northwestern Building



Summary for Pond DE3: Drip Edge along Southwestern Building

Inflow Area = 0.155 ac, 92.81% Impervious, Inflow Depth = 4.37" for 10-yr event
Inflow = 0.70 cfs @ 11.99 hrs, Volume= 0.056 af
Outflow = 0.64 cfs @ 12.00 hrs, Volume= 0.056 af, Atten= 8%, Lag= 0.5 min
Primary = 0.64 cfs @ 12.00 hrs, Volume= 0.056 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 236.12' @ 12.00 hrs Surf.Area= 484 sf Storage= 177 cf

Plug-Flow detention time= 34.2 min calculated for 0.056 af (99% of inflow)
Center-of-Mass det. time= 24.7 min (771.1 - 746.4)

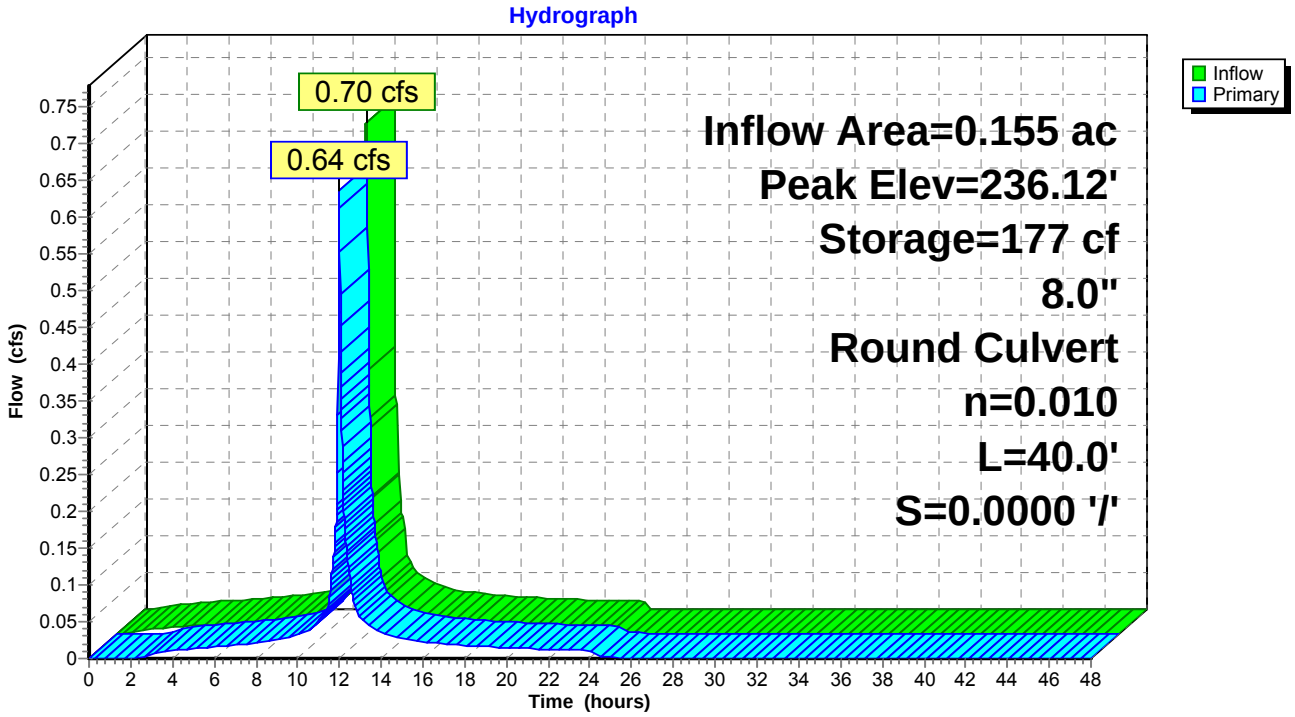
Volume	Invert	Avail.Storage	Storage Description
#1	235.20'	290 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc) 726 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
235.20	484	0	0
236.70	484	726	726

Device	Routing	Invert	Outlet Devices
#1	Primary	235.37'	**8.0" Round 8" Underdrain** L= 40.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 235.37' / 235.37' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.63 cfs @ 12.00 hrs HW=236.11' TW=233.08' (Dynamic Tailwater)
↑**1=8" Underdrain** (Barrel Controls 0.63 cfs @ 2.04 fps)

Pond DE3: Drip Edge along Southwestern Building



Summary for Pond DE4: Drip Edge along Southeastern Building

Inflow Area = 0.154 ac, 92.87% Impervious, Inflow Depth = 4.37" for 10-yr event
Inflow = 0.70 cfs @ 11.99 hrs, Volume= 0.056 af
Outflow = 0.59 cfs @ 12.00 hrs, Volume= 0.056 af, Atten= 15%, Lag= 0.6 min
Primary = 0.59 cfs @ 12.00 hrs, Volume= 0.056 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 235.22' @ 12.00 hrs Surf.Area= 480 sf Storage= 195 cf

Plug-Flow detention time= 36.5 min calculated for 0.056 af (99% of inflow)
Center-of-Mass det. time= 27.0 min (773.4 - 746.4)

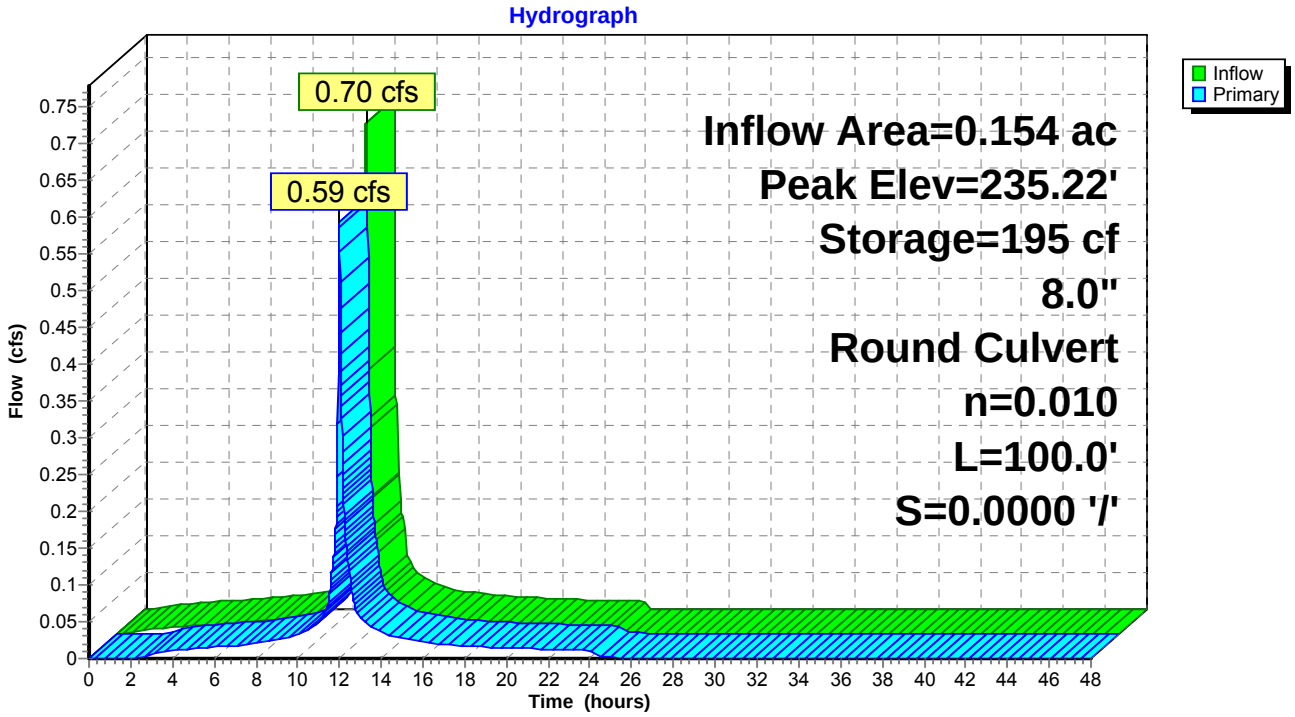
Volume	Invert	Avail.Storage	Storage Description
#1	234.20'	288 cf	**Drip Edge (Prismatic)**Listed below (Recalc) 720 cf Overall x 40.0% Voids

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
234.20	480	0	0
235.70	480	720	720

Device	Routing	Invert	Outlet Devices
#1	Primary	234.37'	**8.0" Round 8" Under Drain** L= 100.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 234.37' / 234.37' S= 0.0000 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.35 sf

Primary OutFlow Max=0.59 cfs @ 12.00 hrs HW=235.21' TW=230.79' (Dynamic Tailwater)
↑**1=8" Under Drain** (Barrel Controls 0.59 cfs @ 1.73 fps)

Pond DE4: Drip Edge along Southeastern Building



Summary for Pond EP81: Middle Portion of Wetland

Inflow Area = 1.488 ac, 0.00% Impervious, Inflow Depth = 1.75" for 10-yr event
Inflow = 1.43 cfs @ 12.29 hrs, Volume= 0.217 af
Outflow = 0.21 cfs @ 14.29 hrs, Volume= 0.123 af, Atten= 86%, Lag= 120.1 min
Primary = 0.21 cfs @ 14.29 hrs, Volume= 0.123 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 233.61' @ 14.29 hrs Surf.Area= 5,603 sf Storage= 4,706 cf

Plug-Flow detention time= 349.8 min calculated for 0.123 af (57% of inflow)
Center-of-Mass det. time= 194.1 min (1,102.6 - 908.5)

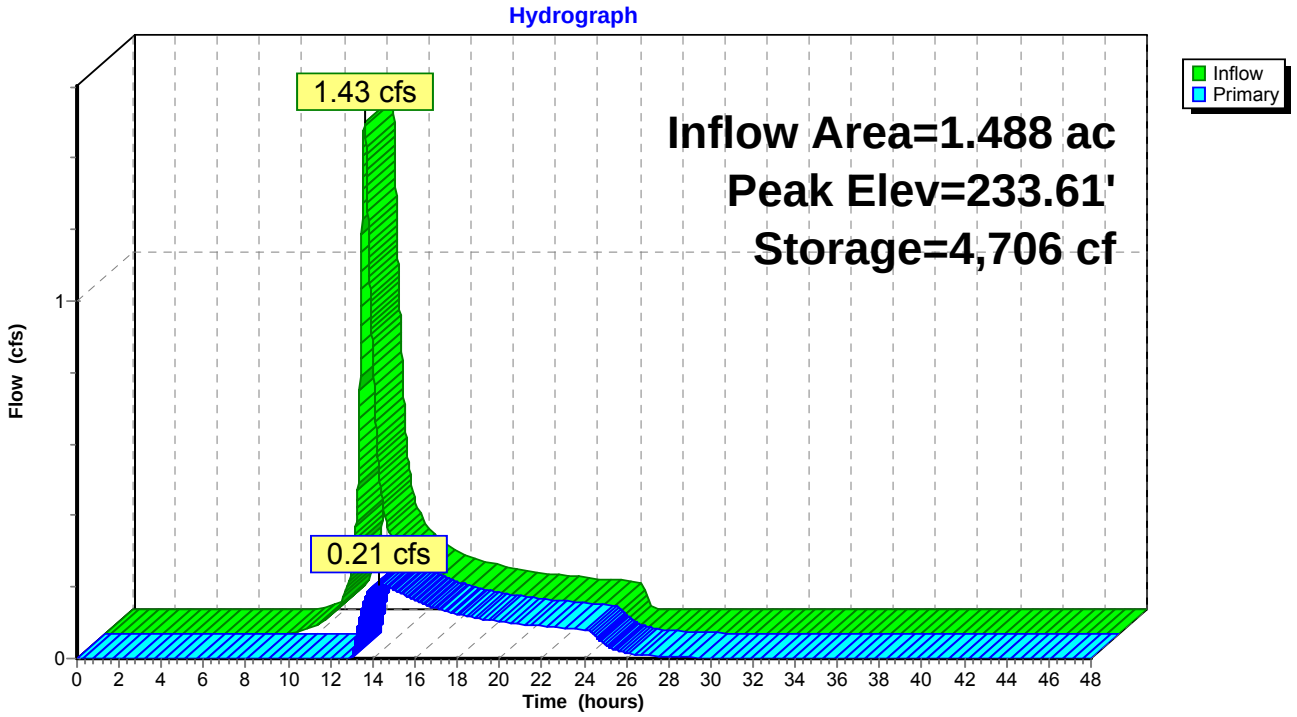
Volume	Invert	Avail.Storage	Storage Description
#1	232.00'	7,132 cf	**Wetland Low Point (Irregular)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
232.00	520	90.0	0	0	520
233.00	3,700	245.0	1,869	1,869	4,655
234.00	7,000	381.0	5,263	7,132	11,438

Device	Routing	Invert	Outlet Devices
#1	Primary	233.50'	**2.0' long x 21.0' breadth Weir Between ES8-ES9**
			Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60
			Coef. (English) 2.68 2.70 2.70 2.64 2.63 2.64 2.64 2.63

Primary OutFlow Max=0.21 cfs @ 14.29 hrs HW=233.61' TW=233.11' (Dynamic Tailwater)
↑—**1=Weir Between ES8-ES9** (Weir Controls 0.21 cfs @ 0.91 fps)

Pond EP81: Middle Portion of Wetland



Summary for Pond PCB2: CB2 - Catch Basin at the end of Bioswale "A"

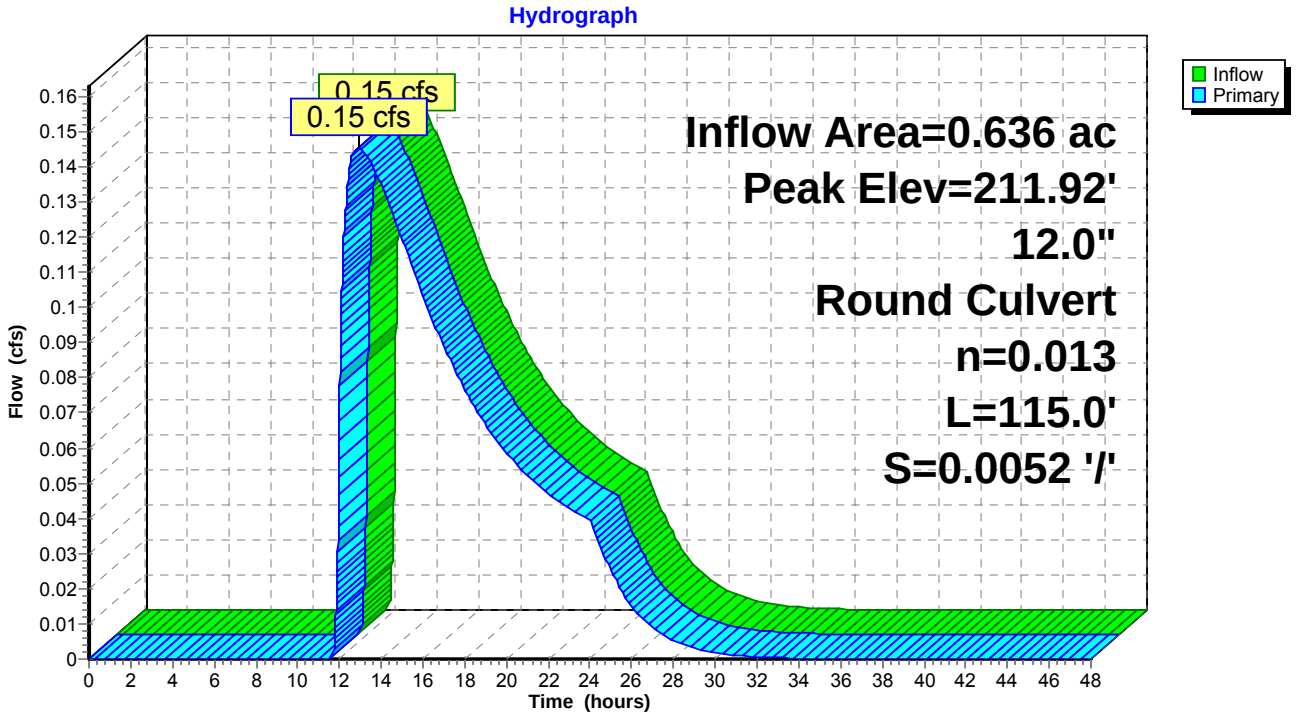
Inflow Area = 0.636 ac, 47.61% Impervious, Inflow Depth = 1.72" for 10-yr event
Inflow = 0.15 cfs @ 12.91 hrs, Volume= 0.091 af
Outflow = 0.15 cfs @ 12.91 hrs, Volume= 0.091 af, Atten= 0%, Lag= 0.0 min
Primary = 0.15 cfs @ 12.91 hrs, Volume= 0.091 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 211.92' @ 12.91 hrs
Flood Elev= 213.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	211.70'	**12.0" Round 12" HDPE Pipe** L= 115.0' CPP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 211.70' / 211.10' S= 0.0052 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.15 cfs @ 12.91 hrs HW=211.92' TW=210.06' (Dynamic Tailwater)
↑—**1=12" HDPE Pipe** (Barrel Controls 0.15 cfs @ 1.75 fps)

Pond PCB2: CB2 - Catch Basin at the end of Bioswale "A"



Summary for Pond PCB4: Catch Basin #3

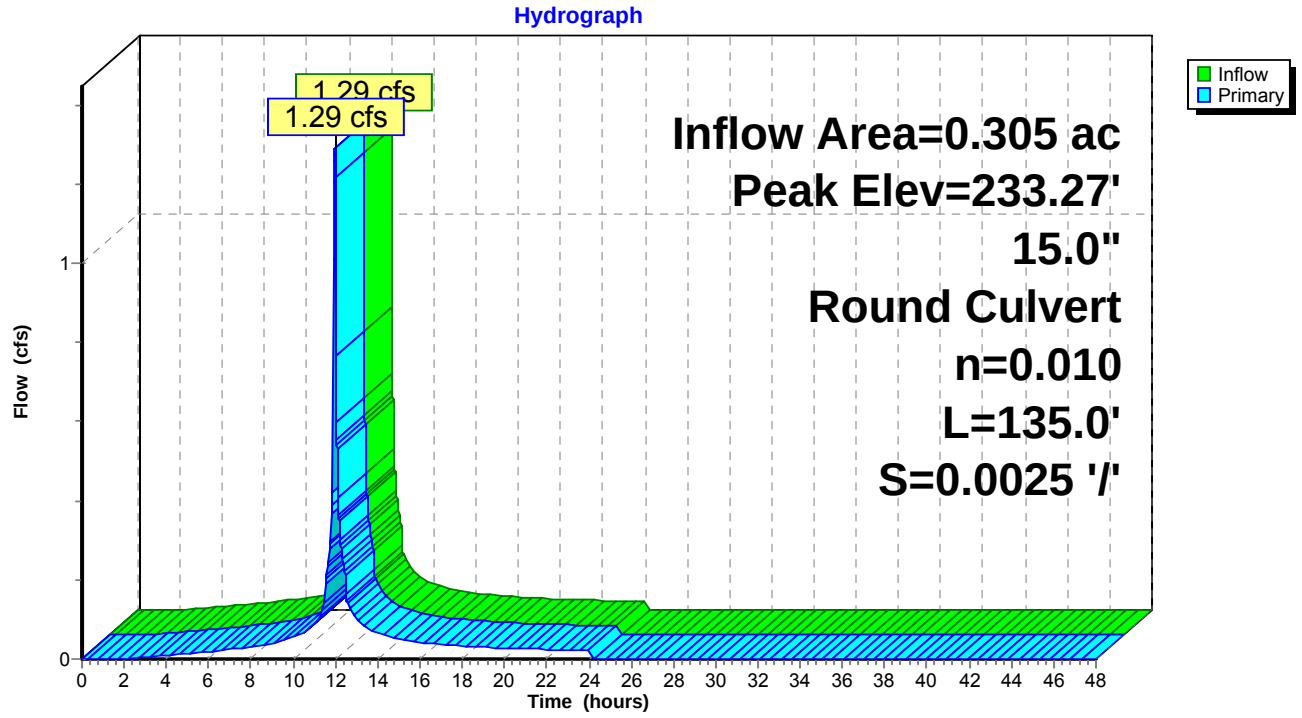
Inflow Area = 0.305 ac, 91.70% Impervious, Inflow Depth = 3.82" for 10-yr event
Inflow = 1.29 cfs @ 12.00 hrs, Volume= 0.097 af
Outflow = 1.29 cfs @ 12.00 hrs, Volume= 0.097 af, Atten= 0%, Lag= 0.0 min
Primary = 1.29 cfs @ 12.00 hrs, Volume= 0.097 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 233.27' @ 12.00 hrs
Flood Elev= 235.00'

Device	Routing	Invert	Outlet Devices
#1	Primary	232.37'	**15.0" Round 15" HDPE Pipe** L= 135.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 232.37' / 232.03' S= 0.0025 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.29 cfs @ 12.00 hrs HW=233.27' TW=233.08' (Dynamic Tailwater)
↑—**1=15" HDPE Pipe** (Outlet Controls 1.29 cfs @ 1.91 fps)

Pond PCB4: Catch Basin #3



Summary for Pond PDMH1: Drain Manhole #5

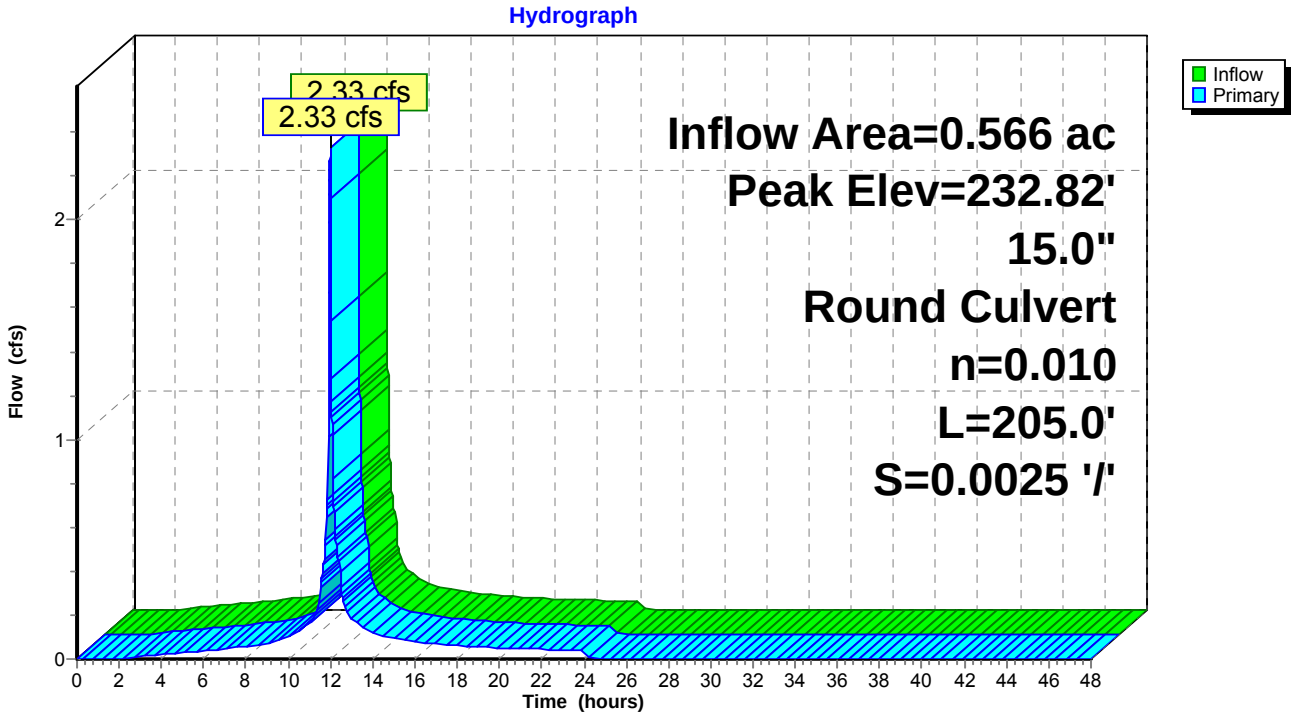
Inflow Area = 0.566 ac, 90.00% Impervious, Inflow Depth = 3.84" for 10-yr event
Inflow = 2.33 cfs @ 12.00 hrs, Volume= 0.181 af
Outflow = 2.33 cfs @ 12.00 hrs, Volume= 0.181 af, Atten= 0%, Lag= 0.0 min
Primary = 2.33 cfs @ 12.00 hrs, Volume= 0.181 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 232.82' @ 12.00 hrs
Flood Elev= 236.60'

Device	Routing	Invert	Outlet Devices
#1	Primary	231.91'	**15.0" Round 15" HDPE Pipe** L= 205.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 231.91' / 231.40' S= 0.0025 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.33 cfs @ 12.00 hrs HW=232.82' TW=230.79' (Dynamic Tailwater)
↑—**1=15" HDPE Pipe** (Barrel Controls 2.33 cfs @ 3.39 fps)

Pond PDMH1: Drain Manhole #5



Summary for Pond PP108: Bioswale "A"

Inflow Area = 0.636 ac, 47.61% Impervious, Inflow Depth = 2.10" for 10-yr event
Inflow = 1.40 cfs @ 12.00 hrs, Volume= 0.112 af
Outflow = 0.15 cfs @ 12.91 hrs, Volume= 0.091 af, Atten= 90%, Lag= 55.0 min
Primary = 0.15 cfs @ 12.91 hrs, Volume= 0.091 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 215.83' @ 12.91 hrs Surf.Area= 2,468 sf Storage= 2,172 cf
Flood Elev= 217.80' Surf.Area= 3,120 sf Storage= 3,982 cf

Plug-Flow detention time= 279.9 min calculated for 0.091 af (82% of inflow)
Center-of-Mass det. time= 190.0 min (1,036.6 - 846.6)

Volume	Invert	Avail.Storage	Storage Description
#1	211.55'	897 cf	**Bioretention Media (Prismatic)**Listed below 2,990 cf Overall x 30.0% Voids
#2	214.80'	3,085 cf	**Open Swale (Prismatic)**Listed below (Recalc)
		3,982 cf	Total Available Storage

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
211.55	920	0	0
214.80	920	2,990	2,990

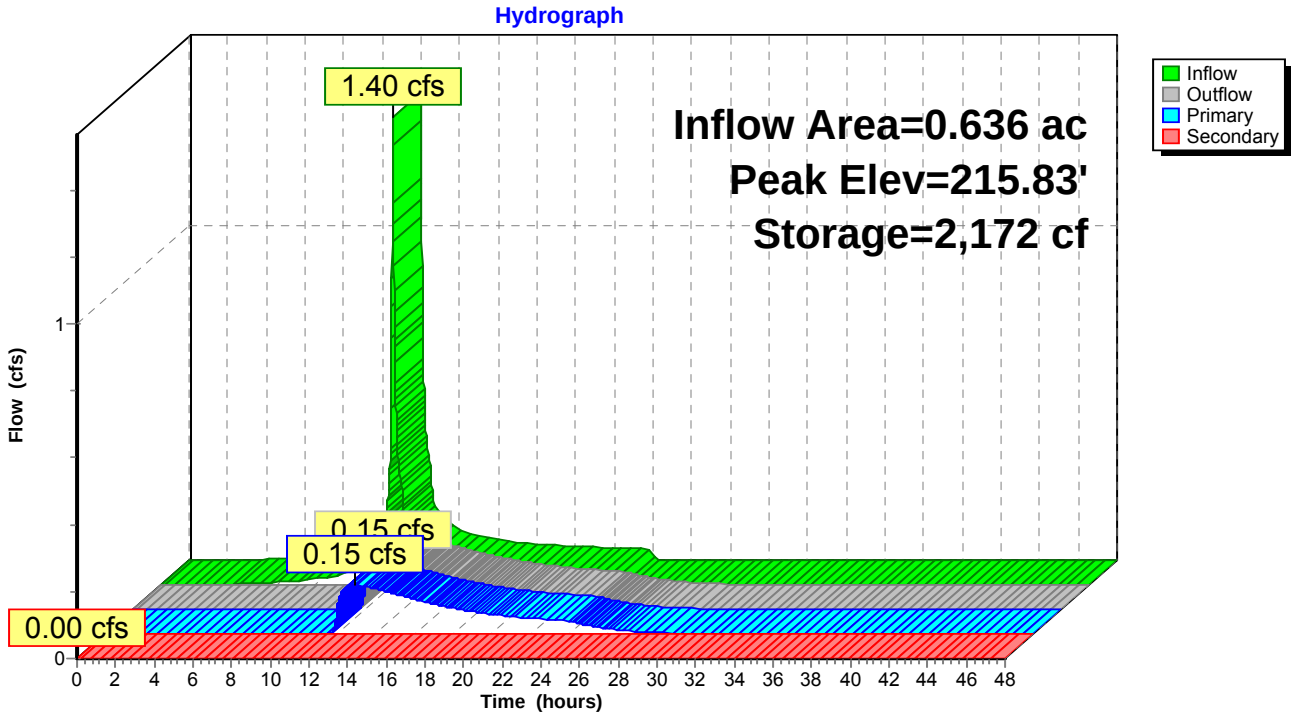
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
214.80	920	0	0
215.80	1,525	1,223	1,223
216.80	2,200	1,863	3,085

Device	Routing	Invert	Outlet Devices
#1	Primary	211.80'	**6.0" Round 6" Underdrain** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 211.80' / 211.80' S= 0.0000 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.20 sf
#2	Device 1	214.80'	**10.000 in/hr Exfiltration through Bioretention Media over Surface area above** Excluded Surface area = 1,840 sf
#3	Secondary	216.30'	**24.0" W x 4.0" H Vert. Knockouts in Catch Basin X 2.00** C= 0.600

Primary OutFlow Max=0.15 cfs @ 12.91 hrs HW=215.83' TW=211.92' (Dynamic Tailwater)
↑**1=6" Underdrain** (Passes 0.15 cfs of 1.03 cfs potential flow)
↑**2=Exfiltration through Bioretention Media** (Exfiltration Controls 0.15 cfs)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=211.55' TW=211.70' (Dynamic Tailwater)
↑**3=Knockouts in Catch Basin** (Controls 0.00 cfs)

Pond PP108: Bioswale "A"



Summary for Pond PP109: Stormwater Detention

Inflow Area = 2.336 ac, 7.55% Impervious, Inflow Depth = 1.05" for 10-yr event
Inflow = 1.47 cfs @ 12.12 hrs, Volume= 0.205 af
Outflow = 0.18 cfs @ 15.08 hrs, Volume= 0.205 af, Atten= 88%, Lag= 177.8 min
Discarded = 0.10 cfs @ 15.08 hrs, Volume= 0.182 af
Primary = 0.08 cfs @ 15.08 hrs, Volume= 0.023 af
Secondary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 213.56' @ 15.08 hrs Surf.Area= 2,829 sf Storage= 3,613 cf

Plug-Flow detention time= (not calculated: outflow precedes inflow)
Center-of-Mass det. time= 421.6 min (1,353.9 - 932.3)

Volume	Invert	Avail.Storage	Storage Description
#1	212.00'	5,200 cf	**Custom Stage Data (Conic)** Listed below

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
212.00	1,300	0	0	1,300
214.25	3,500	5,200	5,200	3,533

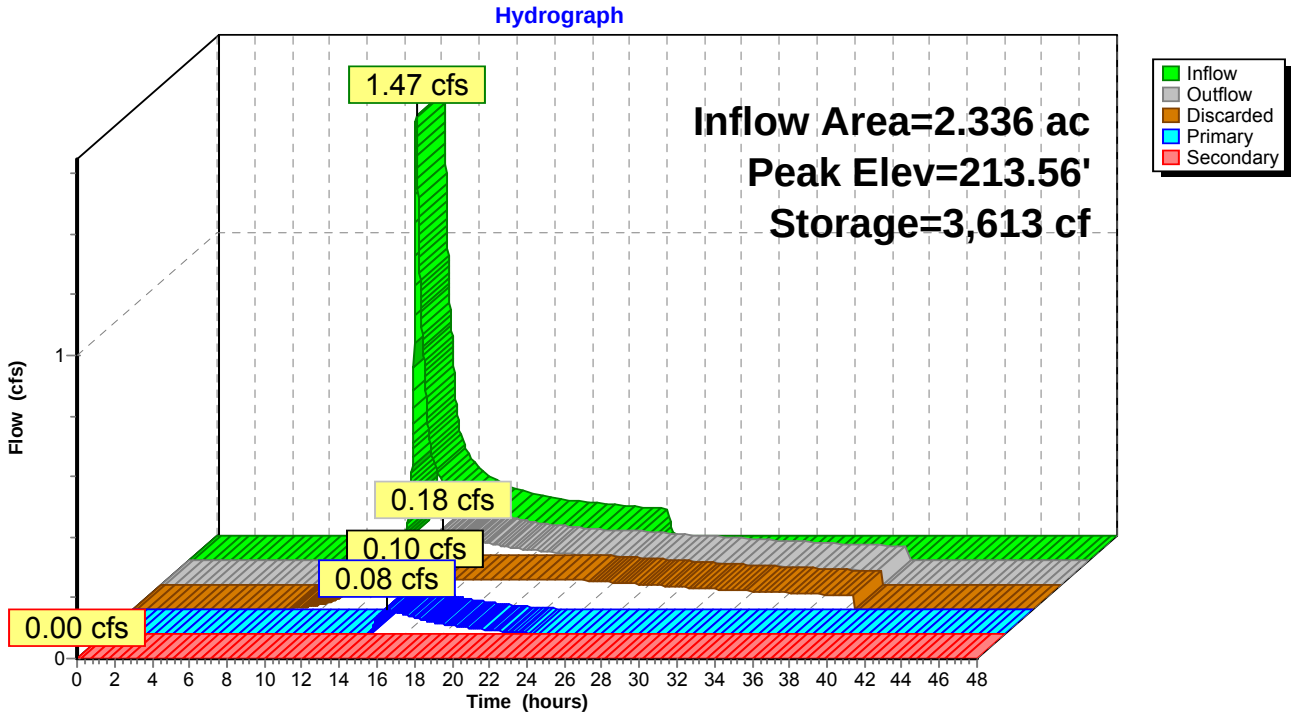
Device	Routing	Invert	Outlet Devices
#1	Primary	213.50'	**2.0' long x 3.0' breadth Broad-Crested Rectangular Weir** Head (feet) 0.20 0.40 0.60 0.80 1.00 1.20 1.40 1.60 1.80 2.00 2.50 3.00 3.50 4.00 4.50 Coef. (English) 2.44 2.58 2.68 2.67 2.65 2.64 2.64 2.68 2.68 2.72 2.81 2.92 2.97 3.07 3.32
#2	Secondary	214.00'	**60.0' long x 4.0' 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) 2.38 2.54 2.69 2.68 2.67 2.67 2.65 2.66 2.66 2.68 2.72 2.73 2.76 2.79 2.88 3.07 3.32
#3	Discarded	212.00'	**1.500 in/hr Exfiltration over Surface area**

Discarded OutFlow Max=0.10 cfs @ 15.08 hrs HW=213.56' (Free Discharge)
↑**3=Exfiltration** (Exfiltration Controls 0.10 cfs)

Primary OutFlow Max=0.08 cfs @ 15.08 hrs HW=213.56' TW=212.69' (Dynamic Tailwater)
↑**1=Broad-Crested Rectangular Weir** (Weir Controls 0.08 cfs @ 0.62 fps)

Secondary OutFlow Max=0.00 cfs @ 0.00 hrs HW=212.00' TW=212.00' (Dynamic Tailwater)
↑**2=Broad-Crested Rectangular Weir** (Controls 0.00 cfs)

Pond PP109: Stormwater Detention



Summary for Pond PP110: Proposed 8" Earthen Berm

Inflow Area = 2.582 ac, 8.71% Impervious, Inflow Depth = 0.16" for 10-yr event
Inflow = 0.09 cfs @ 15.07 hrs, Volume= 0.035 af
Outflow = 0.09 cfs @ 15.08 hrs, Volume= 0.032 af, Atten= 0%, Lag= 0.8 min
Primary = 0.09 cfs @ 15.08 hrs, Volume= 0.032 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 212.69' @ 15.08 hrs Surf.Area= 331 sf Storage= 153 cf

Plug-Flow detention time= 62.0 min calculated for 0.032 af (90% of inflow)
Center-of-Mass det. time= 28.5 min (1,030.3 - 1,001.7)

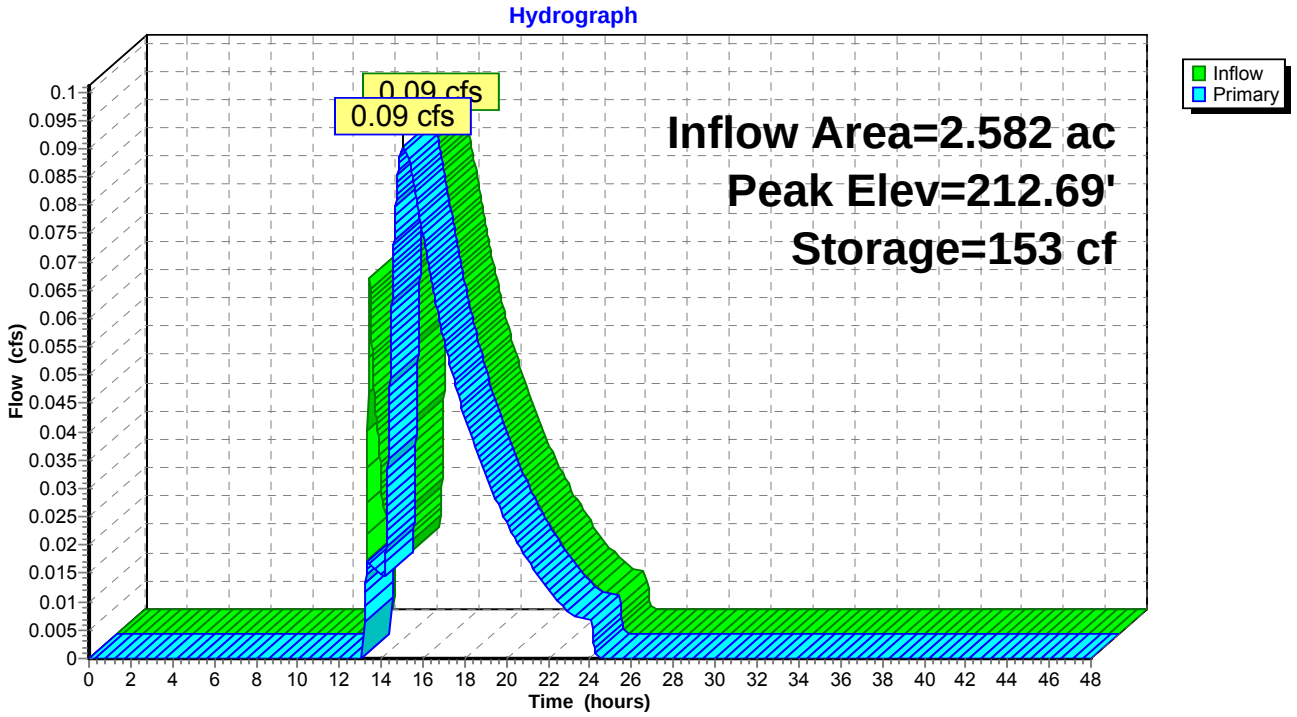
Volume	Invert	Avail.Storage	Storage Description
#1	212.00'	440 cf	**Custom Stage Data (Prismatic)**Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)
212.00	120	0	0
212.67	315	146	146
213.25	700	294	440

Device	Routing	Invert	Outlet Devices
#1	Primary	212.67'	**7.5' long Sharp-Crested Vee/Trap Weir** Cv= 2.62 (C= 3.28)

Primary OutFlow Max=0.09 cfs @ 15.08 hrs HW=212.69' TW=212.04' (Dynamic Tailwater)
↑—**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.09 cfs @ 0.51 fps)

Pond PP110: Proposed 8" Earthen Berm



Summary for Pond PPT3: Catch Basin #4

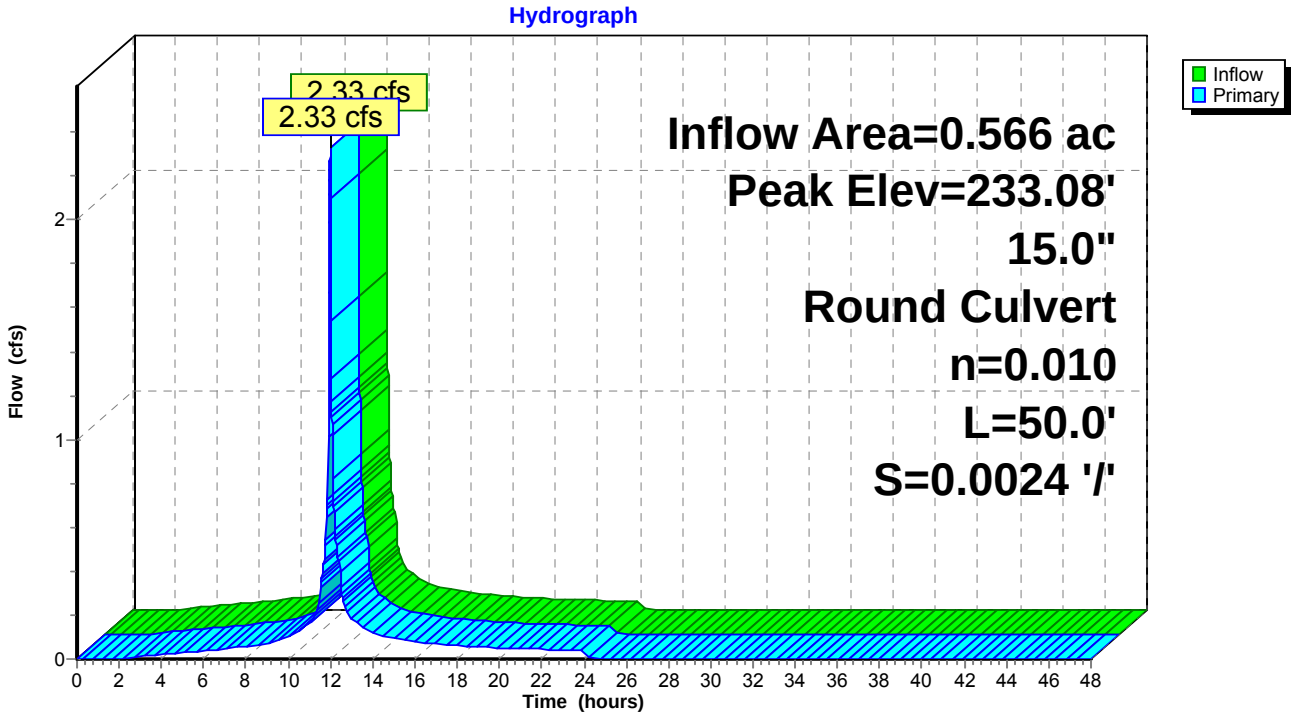
Inflow Area = 0.566 ac, 90.00% Impervious, Inflow Depth = 3.84" for 10-yr event
Inflow = 2.33 cfs @ 12.00 hrs, Volume= 0.181 af
Outflow = 2.33 cfs @ 12.00 hrs, Volume= 0.181 af, Atten= 0%, Lag= 0.0 min
Primary = 2.33 cfs @ 12.00 hrs, Volume= 0.181 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 233.08' @ 12.00 hrs
Flood Elev= 235.40'

Device	Routing	Invert	Outlet Devices
#1	Primary	232.03'	**15.0" Round 15" HDPE Pipe** L= 50.0' CPP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 232.03' / 231.91' S= 0.0024 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=2.33 cfs @ 12.00 hrs HW=233.08' TW=232.82' (Dynamic Tailwater)
↑—**1=15" HDPE Pipe** (Outlet Controls 2.33 cfs @ 2.85 fps)

Pond PPT3: Catch Basin #4



Summary for Pond SI1: Subsurface Infiltration

Inflow Area = 2.607 ac, 62.04% Impervious, Inflow Depth = 3.15" for 10-yr event
Inflow = 6.48 cfs @ 12.01 hrs, Volume= 0.684 af
Outflow = 0.66 cfs @ 13.41 hrs, Volume= 0.606 af, Atten= 90%, Lag= 83.6 min
Discarded = 0.66 cfs @ 13.41 hrs, Volume= 0.606 af
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs / 2
Peak Elev= 227.12' @ 13.41 hrs Surf.Area= 8,500 sf Storage= 10,038 cf
Flood Elev= 230.08' Surf.Area= 8,500 sf Storage= 20,126 cf

Plug-Flow detention time= 282.7 min calculated for 0.606 af (89% of inflow)
Center-of-Mass det. time= 140.9 min (1,208.0 - 1,067.1)

Volume	Invert	Avail.Storage	Storage Description
#1	224.17'	20,056 cf	**Subsurface Infiltration Reservoir (Conic)** Listed below (Recalc) 50,235 cf Overall - 96 cf Embedded = 50,139 cf x 40.0% Voids
#2	228.90'	71 cf	**12.0" D x 90.0'L Pipe Storage** Inside #1 96 cf Overall - 1.0" Wall Thickness = 71 cf
		20,126 cf	Total Available Storage

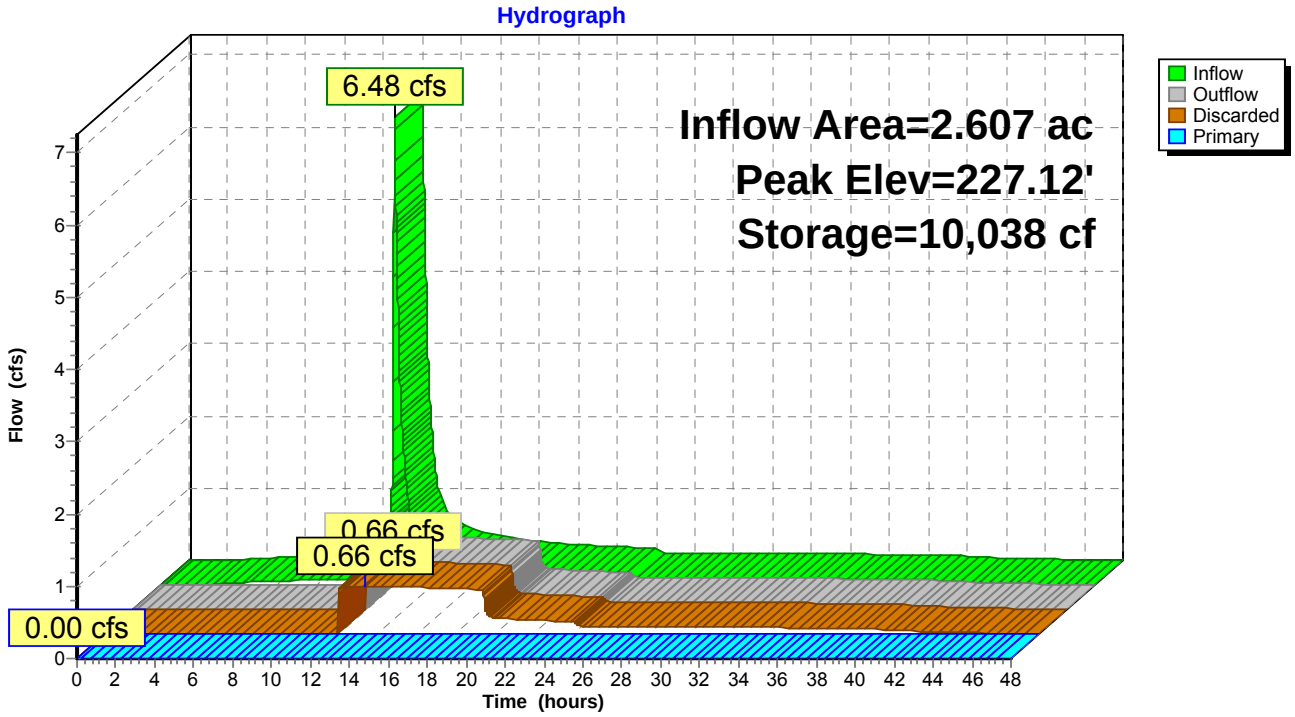
Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
224.17	8,500	0	0	8,500
230.08	8,500	50,235	50,235	10,432

Device	Routing	Invert	Outlet Devices
#1	Discarded	224.17'	**3.000 in/hr Exfiltration over Wetted area** Phase-In= 0.10'
#2	Primary	228.25'	**12.0" Round DMH/P5-Overflow** L= 70.0' CMP, end-section conforming to fill, Ke= 0.500 Inlet / Outlet Invert= 228.25' / 221.00' S= 0.1036 '/' Cc= 0.900 n= 0.010 PVC, smooth interior, Flow Area= 0.79 sf
#3	Device 1	225.17'	**2.5" Vert. 8' Dia. Dry Well Perforations X 36.00 columns** X 6 rows with 12.0" cc spacing C= 0.600

Discarded OutFlow Max=0.66 cfs @ 13.41 hrs HW=227.12' (Free Discharge)
↑**1=Exfiltration** (Exfiltration Controls 0.66 cfs)
↑**3=8' Dia. Dry Well Perforations** (Passes 0.66 cfs of 13.47 cfs potential flow)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=224.17' TW=219.00' (Dynamic Tailwater)
↑**2=DMH/P5-Overflow** (Controls 0.00 cfs)

Pond SI1: Subsurface Infiltration

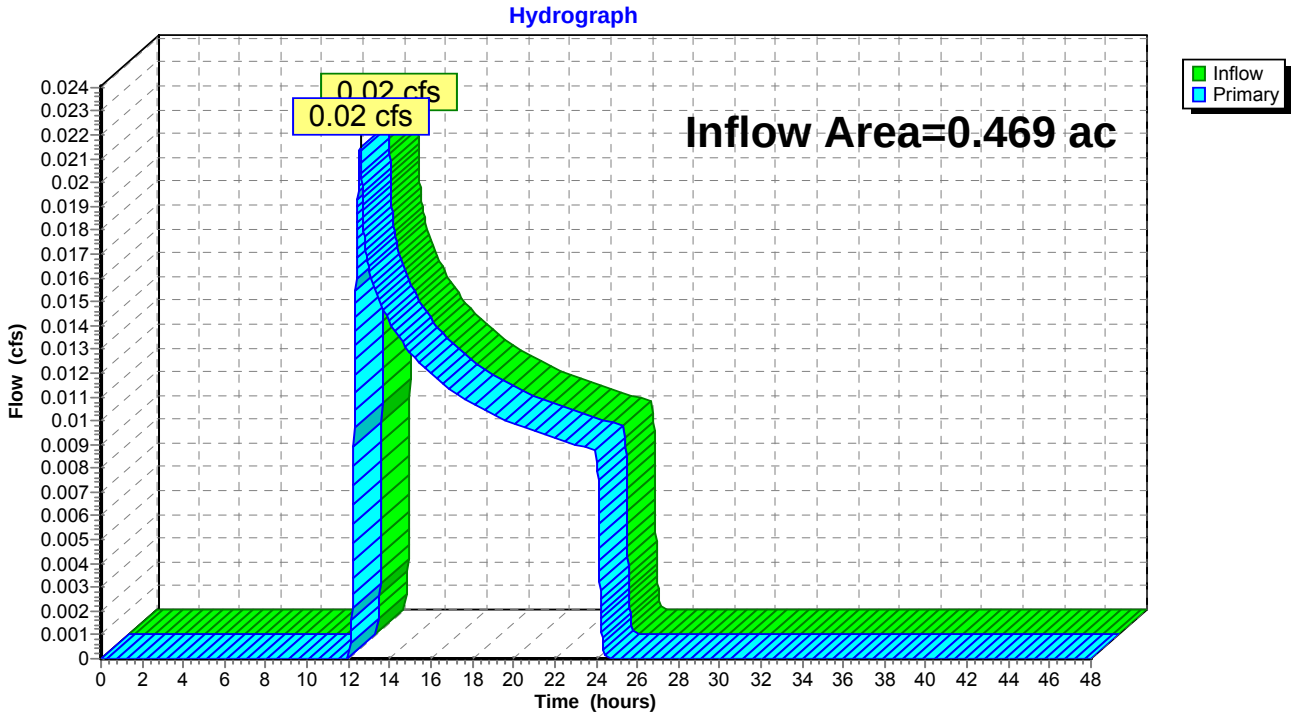


Summary for Link L100: Northern Wetlands & North of Site

Inflow Area = 0.469 ac, 0.00% Impervious, Inflow Depth = 0.29" for 10-yr event
Inflow = 0.02 cfs @ 12.57 hrs, Volume= 0.011 af
Primary = 0.02 cfs @ 12.57 hrs, Volume= 0.011 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L100: Northern Wetlands & North of Site

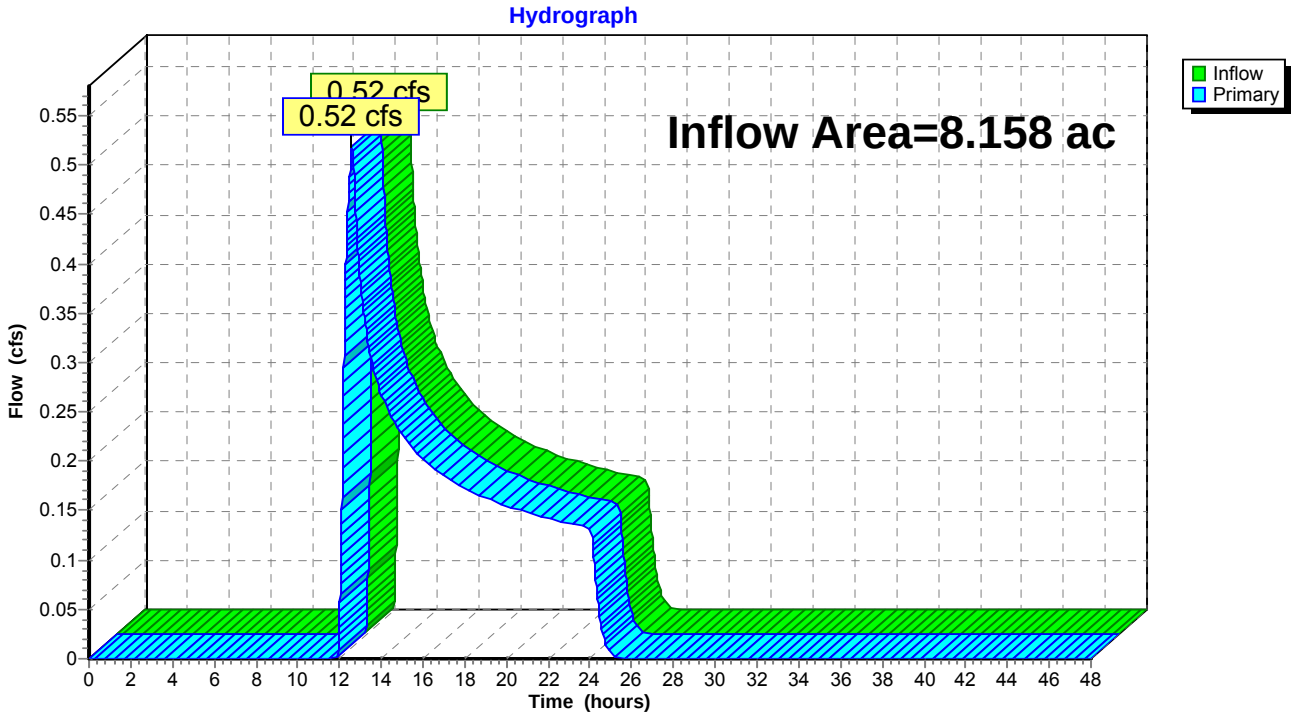


Summary for Link L200: Inlet at Start of Redemption Rd; West Side

Inflow Area = 8.158 ac, 19.91% Impervious, Inflow Depth = 0.30" for 10-yr event
Inflow = 0.52 cfs @ 12.58 hrs, Volume= 0.205 af
Primary = 0.52 cfs @ 12.58 hrs, Volume= 0.205 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L200: Inlet at Start of Redemption Rd; West Side

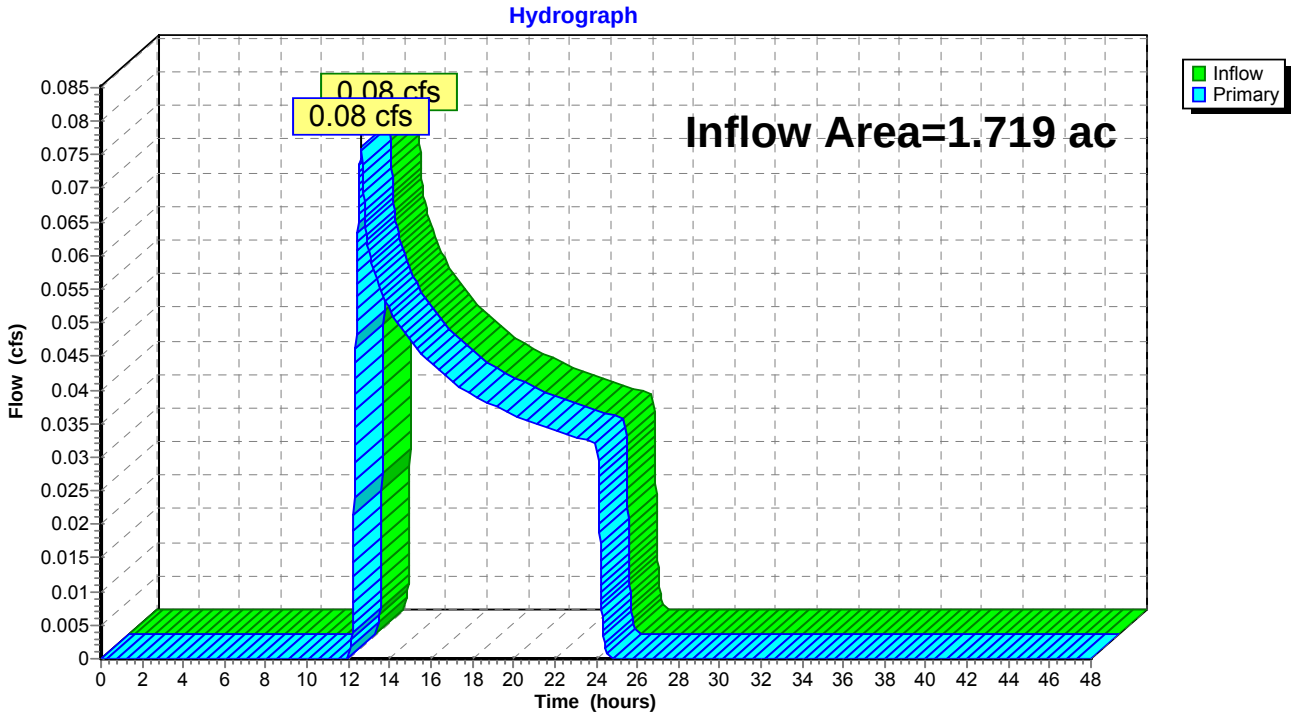


Summary for Link L300: Southwest Corner of Far-East Lot; Bottom of Hill

Inflow Area = 1.719 ac, 0.00% Impervious, Inflow Depth = 0.29" for 10-yr event
Inflow = 0.08 cfs @ 12.61 hrs, Volume= 0.041 af
Primary = 0.08 cfs @ 12.61 hrs, Volume= 0.041 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill

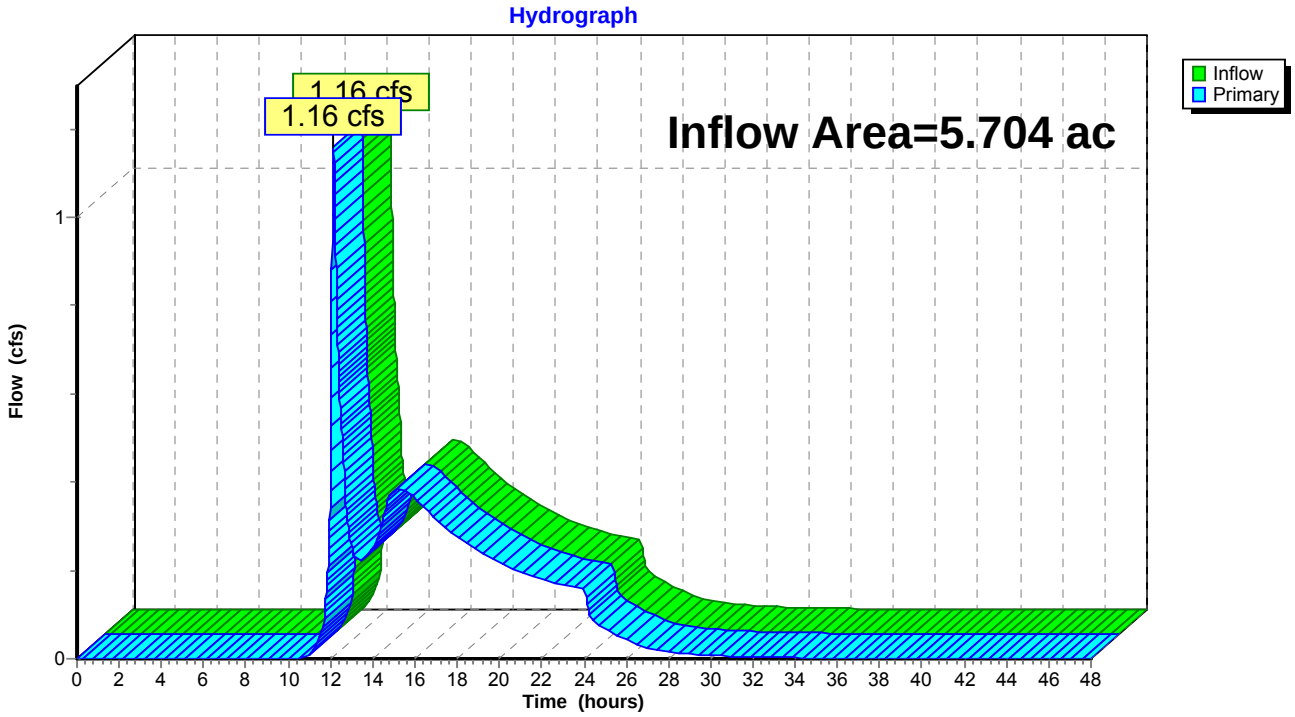


Summary for Link L400: Southwest Corner of Far-East Lot; Bottom of Hill

Inflow Area = 5.704 ac, 7.02% Impervious, Inflow Depth > 0.65" for 10-yr event
Inflow = 1.16 cfs @ 12.15 hrs, Volume= 0.307 af
Primary = 1.16 cfs @ 12.15 hrs, Volume= 0.307 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill

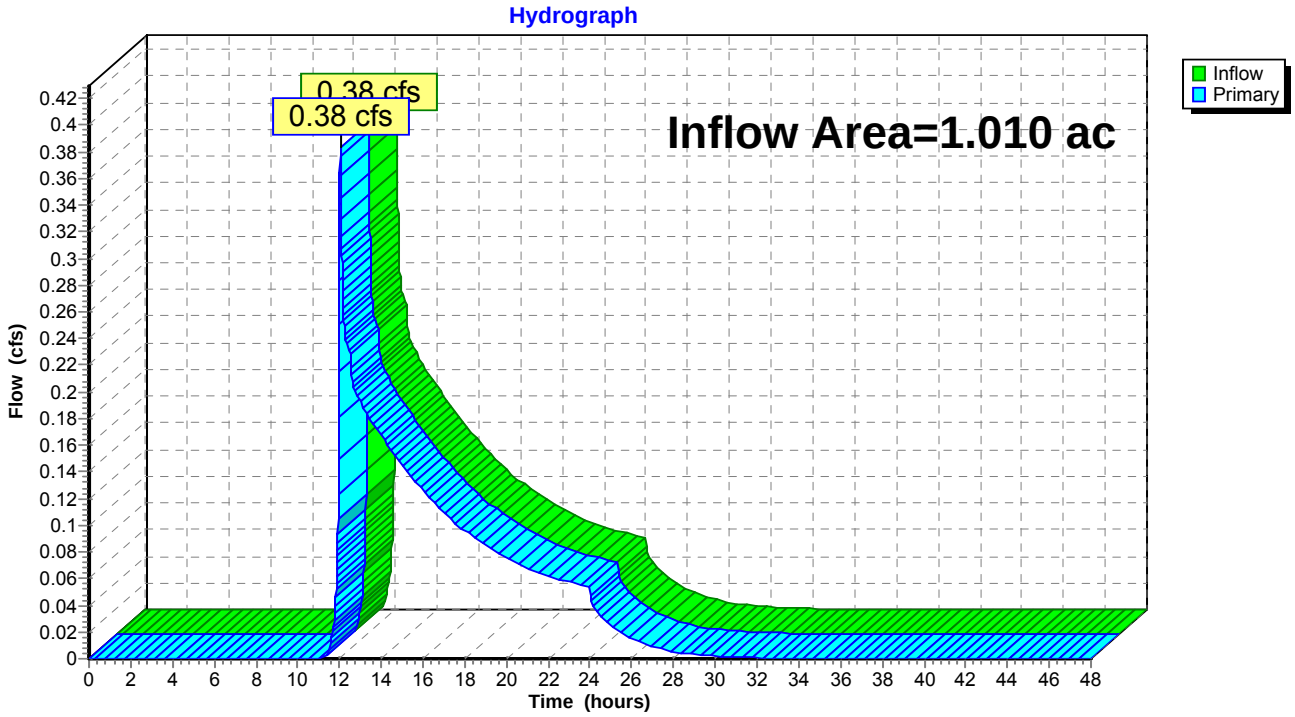


Summary for Link L500: Inlet at Start of Gravel Drive; East Side

Inflow Area = 1.010 ac, 39.25% Impervious, Inflow Depth = 1.44" for 10-yr event
Inflow = 0.38 cfs @ 12.04 hrs, Volume= 0.121 af
Primary = 0.38 cfs @ 12.04 hrs, Volume= 0.121 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-48.00 hrs, dt= 0.01 hrs

Link L500: Inlet at Start of Gravel Drive; East Side



Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PS1: Northwest portion of Runoff Area=101,958 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=373' Tc=15.4 min CN=48 Runoff=0.00 cfs 0.000 af

Subcatchment PS10: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=0.00"
Flow Length=151' Tc=11.4 min CN=55 Runoff=0.00 cfs 0.000 af

Subcatchment PS11: Eastern portion of Runoff Area=33,128 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=312' Tc=20.7 min CN=51 Runoff=0.00 cfs 0.000 af

Subcatchment PS12: South-center portion Runoff Area=47,403 sf 8.55% Impervious Runoff Depth=0.00"
Flow Length=242' Tc=11.8 min CN=58 Runoff=0.00 cfs 0.000 af

Subcatchment PS13: Area north of prop. Runoff Area=21,222 sf 17.10% Impervious Runoff Depth=0.02"
Flow Length=245' Tc=8.9 min CN=73 Runoff=0.00 cfs 0.001 af

Subcatchment PS14: Area at Runoff Area=7,728 sf 70.54% Impervious Runoff Depth=0.36"
Flow Length=107' Tc=3.4 min CN=91 Runoff=0.08 cfs 0.005 af

Subcatchment PS15: NE corner of building Runoff Area=8,288 sf 93.93% Impervious Runoff Depth=0.79"
Flow Length=62' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.19 cfs 0.013 af

Subcatchment PS16: NW corner of building Runoff Area=6,627 sf 93.98% Impervious Runoff Depth=0.79"
Flow Length=62' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.16 cfs 0.010 af

Subcatchment PS17: Parking Lot West of Runoff Area=13,293 sf 91.70% Impervious Runoff Depth=0.45"
Flow Length=110' Tc=1.1 min CN=93 Runoff=0.19 cfs 0.011 af

Subcatchment PS19: SW corner of building Runoff Area=6,734 sf 92.81% Impervious Runoff Depth=0.79"
Flow Length=50' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.16 cfs 0.010 af

Subcatchment PS20: Parking Lot Runoff Area=4,622 sf 81.03% Impervious Runoff Depth=0.22"
Flow Length=88' Slope=0.0170 '/' Tc=1.0 min CN=87 Runoff=0.03 cfs 0.002 af

Subcatchment PS22: SE corner of building Runoff Area=6,730 sf 92.87% Impervious Runoff Depth=0.79"
Flow Length=50' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.16 cfs 0.010 af

Subcatchment PS23: Area between building Runoff Area=13,335 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=157' Tc=3.7 min CN=53 Runoff=0.00 cfs 0.000 af

Subcatchment PS24: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=569' Tc=18.4 min CN=49 Runoff=0.00 cfs 0.000 af

Subcatchment PS25: Area that contains Runoff Area=30,280 sf 1.00% Impervious Runoff Depth=0.00"
Flow Length=386' Tc=7.5 min CN=44 Runoff=0.00 cfs 0.000 af

Subcatchment PS26: Area containg Link Runoff Area=16,294 sf 25.02% Impervious Runoff Depth=0.00"
Flow Length=252' Tc=5.0 min CN=58 Runoff=0.00 cfs 0.000 af

Subcatchment PS28: area at south edge of Runoff Area=9,699 sf 56.14% Impervious Runoff Depth=0.05"
Flow Length=168' Tc=0.9 min CN=77 Runoff=0.00 cfs 0.001 af

Subcatchment PS29: Area between Prop. Runoff Area=10,273 sf 22.32% Impervious Runoff Depth=0.00"
Flow Length=82' Tc=5.3 min CN=55 Runoff=0.00 cfs 0.000 af

Subcatchment PS3: Northern corner portion Runoff Area=20,440 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=222' Slope=0.0100 '/' Tc=11.7 min CN=44 Runoff=0.00 cfs 0.000 af

Subcatchment PS30: Parking Lot Runoff Area=26,697 sf 62.68% Impervious Runoff Depth=0.11"
Flow Length=248' Tc=1.5 min CN=82 Runoff=0.05 cfs 0.006 af

Subcatchment PS4: Lower north corner of Runoff Area=40,570 sf 27.77% Impervious Runoff Depth=0.06"
Flow Length=325' Tc=12.0 min CN=78 Runoff=0.01 cfs 0.005 af

Subcatchment PS6: Northeast area of Runoff Area=64,817 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=294' Tc=23.9 min CN=70 Runoff=0.00 cfs 0.001 af

Subcatchment PS7: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=0.00"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.00 cfs 0.000 af

Subcatchment PS8: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=0.00"
Flow Length=344' Tc=12.7 min CN=62 Runoff=0.00 cfs 0.000 af

Subcatchment PS9: East portion of easterly Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=0.00"
Flow Length=235' Tc=14.8 min CN=44 Runoff=0.00 cfs 0.000 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.00 cfs 0.000 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=221.0' S=0.0158 '/' Capacity=556.72 cfs Outflow=0.00 cfs 0.000 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=320.0' S=0.0406 '/' Capacity=795.12 cfs Outflow=0.00 cfs 0.000 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=0.00 cfs 0.000 af

Reach ER82: Swale Located on North Avg. Flow Depth=0.00' Max Vel=0.44 fps Inflow=0.00 cfs 0.001 af
n=0.035 L=150.0' S=0.0200 '/' Capacity=265.19 cfs Outflow=0.00 cfs 0.001 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=0.00 cfs 0.000 af

Reach ER85: End of Swale located Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=0.00 cfs 0.000 af

Reach PR62: Swale South of Proposed Avg. Flow Depth=0.10' Max Vel=1.99 fps Inflow=0.08 cfs 0.005 af
n=0.022 L=130.0' S=0.0500 '/' Capacity=37.30 cfs Outflow=0.08 cfs 0.005 af

Reach PR63: Swale North of gravel Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.022 L=80.0' S=0.0500 '/' Capacity=50.13 cfs Outflow=0.00 cfs 0.000 af

Pond BR1: Bioswale-ISR 1 (CB5) Peak Elev=228.06' Storage=312 cf Inflow=0.31 cfs 0.026 af
Primary=0.04 cfs 0.026 af Secondary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.026 af

Pond BR2: Bioswale - ISR 2 (CB3) Peak Elev=229.36' Storage=599 cf Inflow=0.50 cfs 0.038 af
Primary=0.04 cfs 0.038 af Secondary=0.00 cfs 0.000 af Outflow=0.04 cfs 0.038 af

Pond DE1: Drip Edge along Northeastern Peak Elev=232.78' Storage=76 cf Inflow=0.19 cfs 0.013 af
6.0" Round Culvert x 2.00 n=0.010 L=35.0' S=0.0086 '/' Outflow=0.18 cfs 0.012 af

Pond DE2: Drip Edge along Northwestern Peak Elev=232.77' Storage=71 cf Inflow=0.16 cfs 0.010 af
6.0" Round Culvert n=0.010 L=40.0' S=0.0025 '/' Outflow=0.13 cfs 0.009 af

Pond DE3: Drip Edge along Southwestern Peak Elev=235.67' Storage=92 cf Inflow=0.16 cfs 0.010 af
8.0" Round Culvert n=0.010 L=40.0' S=0.0000 '/' Outflow=0.12 cfs 0.009 af

Pond DE4: Drip Edge along Southeastern Peak Elev=234.71' Storage=97 cf Inflow=0.16 cfs 0.010 af
8.0" Round Culvert n=0.010 L=100.0' S=0.0000 '/' Outflow=0.11 cfs 0.009 af

Pond EP81: Middle Portion of Wetland Peak Elev=232.04' Storage=25 cf Inflow=0.00 cfs 0.001 af
Outflow=0.00 cfs 0.000 af

Pond PCB2: CB2 - Catch Basin at the end of Bioswale "A" Peak Elev=211.70' Inflow=0.00 cfs 0.000 af
12.0" Round Culvert n=0.013 L=115.0' S=0.0052 '/' Outflow=0.00 cfs 0.000 af

Pond PCB4: Catch Basin #3 Peak Elev=232.64' Inflow=0.19 cfs 0.011 af
15.0" Round Culvert n=0.010 L=135.0' S=0.0025 '/' Outflow=0.19 cfs 0.011 af

Pond PDMH1: Drain Manhole #5 Peak Elev=232.23' Inflow=0.34 cfs 0.023 af
15.0" Round Culvert n=0.010 L=205.0' S=0.0025 '/' Outflow=0.34 cfs 0.023 af

Pond PP108: Bioswale "A" Peak Elev=212.53' Storage=270 cf Inflow=0.08 cfs 0.006 af
Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Pond PP109: Stormwater Detention Peak Elev=212.00' Storage=0 cf Inflow=0.00 cfs 0.001 af
Discarded=0.00 cfs 0.001 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.001 af

Pond PP110: Proposed 8" Earthen Berm Peak Elev=212.00' Storage=0 cf Inflow=0.00 cfs 0.000 af
Outflow=0.00 cfs 0.000 af

Pond PPT3: Catch Basin #4 Peak Elev=232.39' Inflow=0.34 cfs 0.023 af
15.0" Round Culvert n=0.010 L=50.0' S=0.0024 '/' Outflow=0.34 cfs 0.023 af

Pond SI1: Subsurface Infiltration Peak Elev=224.98' Storage=2,769 cf Inflow=0.08 cfs 0.064 af
Discarded=0.00 cfs 0.000 af Primary=0.00 cfs 0.000 af Outflow=0.00 cfs 0.000 af

Link L100: Northern Wetlands & North of Site Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=0.00 cfs 0.000 af
Primary=0.00 cfs 0.000 af

Total Runoff Area = 16.590 ac Runoff Volume = 0.074 af Average Runoff Depth = 0.05"
85.41% Pervious = 14.169 ac 14.59% Impervious = 2.421 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PS1: Northwest portion of Runoff Area=101,958 sf 0.00% Impervious Runoff Depth=0.07"
Flow Length=373' Tc=15.4 min CN=48 Runoff=0.02 cfs 0.014 af

Subcatchment PS10: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=0.21"
Flow Length=151' Tc=11.4 min CN=55 Runoff=0.01 cfs 0.006 af

Subcatchment PS11: Eastern portion of Runoff Area=33,128 sf 0.00% Impervious Runoff Depth=0.12"
Flow Length=312' Tc=20.7 min CN=51 Runoff=0.01 cfs 0.008 af

Subcatchment PS12: South-center portion Runoff Area=47,403 sf 8.55% Impervious Runoff Depth=0.30"
Flow Length=242' Tc=11.8 min CN=58 Runoff=0.09 cfs 0.027 af

Subcatchment PS13: Area north of prop. Runoff Area=21,222 sf 17.10% Impervious Runoff Depth=0.90"
Flow Length=245' Tc=8.9 min CN=73 Runoff=0.40 cfs 0.037 af

Subcatchment PS14: Area at Runoff Area=7,728 sf 70.54% Impervious Runoff Depth=2.14"
Flow Length=107' Tc=3.4 min CN=91 Runoff=0.49 cfs 0.032 af

Subcatchment PS15: NE corner of building Runoff Area=8,288 sf 93.93% Impervious Runoff Depth=2.84"
Flow Length=62' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.66 cfs 0.045 af

Subcatchment PS16: NW corner of building Runoff Area=6,627 sf 93.98% Impervious Runoff Depth=2.84"
Flow Length=62' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.53 cfs 0.036 af

Subcatchment PS17: Parking Lot West of Runoff Area=13,293 sf 91.70% Impervious Runoff Depth=2.32"
Flow Length=110' Tc=1.1 min CN=93 Runoff=0.95 cfs 0.059 af

Subcatchment PS19: SW corner of building Runoff Area=6,734 sf 92.81% Impervious Runoff Depth=2.84"
Flow Length=50' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.54 cfs 0.037 af

Subcatchment PS20: Parking Lot Runoff Area=4,622 sf 81.03% Impervious Runoff Depth=1.80"
Flow Length=88' Slope=0.0170 '/' Tc=1.0 min CN=87 Runoff=0.27 cfs 0.016 af

Subcatchment PS22: SE corner of building Runoff Area=6,730 sf 92.87% Impervious Runoff Depth=2.84"
Flow Length=50' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.54 cfs 0.037 af

Subcatchment PS23: Area between building Runoff Area=13,335 sf 0.00% Impervious Runoff Depth=0.17"
Flow Length=157' Tc=3.7 min CN=53 Runoff=0.01 cfs 0.004 af

Subcatchment PS24: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=0.09"
Flow Length=569' Tc=18.4 min CN=49 Runoff=0.01 cfs 0.012 af

Subcatchment PS25: Area that contains Runoff Area=30,280 sf 1.00% Impervious Runoff Depth=0.02"
Flow Length=386' Tc=7.5 min CN=44 Runoff=0.00 cfs 0.001 af

Subcatchment PS26: Area containg Link Runoff Area=16,294 sf 25.02% Impervious Runoff Depth=0.30"
Flow Length=252' Tc=5.0 min CN=58 Runoff=0.04 cfs 0.009 af

Subcatchment PS28: area at south edge of Runoff Area=9,699 sf 56.14% Impervious Runoff Depth=1.12"
Flow Length=168' Tc=0.9 min CN=77 Runoff=0.35 cfs 0.021 af

Subcatchment PS29: Area between Prop. Runoff Area=10,273 sf 22.32% Impervious Runoff Depth=0.21"
Flow Length=82' Tc=5.3 min CN=55 Runoff=0.01 cfs 0.004 af

Subcatchment PS3: Northern corner portion Runoff Area=20,440 sf 0.00% Impervious Runoff Depth=0.02"
Flow Length=222' Slope=0.0100 '/' Tc=11.7 min CN=44 Runoff=0.00 cfs 0.001 af

Subcatchment PS30: Parking Lot Runoff Area=26,697 sf 62.68% Impervious Runoff Depth=1.43"
Flow Length=248' Tc=1.5 min CN=82 Runoff=1.22 cfs 0.073 af

Subcatchment PS4: Lower north corner of Runoff Area=40,570 sf 27.77% Impervious Runoff Depth=1.18"
Flow Length=325' Tc=12.0 min CN=78 Runoff=0.93 cfs 0.092 af

Subcatchment PS6: Northeast area of Runoff Area=64,817 sf 0.00% Impervious Runoff Depth=0.75"
Flow Length=294' Tc=23.9 min CN=70 Runoff=0.60 cfs 0.093 af

Subcatchment PS7: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=0.12"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.00 cfs 0.003 af

Subcatchment PS8: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=0.43"
Flow Length=344' Tc=12.7 min CN=62 Runoff=0.26 cfs 0.045 af

Subcatchment PS9: East portion of easterly Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=0.02"
Flow Length=235' Tc=14.8 min CN=44 Runoff=0.01 cfs 0.003 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.00' Max Vel=0.31 fps Inflow=0.00 cfs 0.001 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.00 cfs 0.001 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.00' Max Vel=0.39 fps Inflow=0.02 cfs 0.014 af
n=0.035 L=221.0' S=0.0158 '/' Capacity=556.72 cfs Outflow=0.02 cfs 0.014 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.00' Max Vel=0.63 fps Inflow=0.02 cfs 0.019 af
n=0.035 L=320.0' S=0.0406 '/' Capacity=795.12 cfs Outflow=0.02 cfs 0.019 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=0.00 cfs 0.000 af

Reach ER82: Swale Located on North Avg. Flow Depth=0.05' Max Vel=0.78 fps Inflow=0.40 cfs 0.037 af
n=0.035 L=150.0' S=0.0200 '/' Capacity=265.19 cfs Outflow=0.37 cfs 0.037 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.00' Max Vel=0.00 fps Inflow=0.00 cfs 0.000 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=0.00 cfs 0.000 af

Reach ER85: End of Swale located Avg. Flow Depth=0.07' Max Vel=0.84 fps Inflow=0.26 cfs 0.045 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=0.26 cfs 0.045 af

Reach PR62: Swale South of Proposed Avg. Flow Depth=0.20' Max Vel=3.16 fps Inflow=0.49 cfs 0.032 af
n=0.022 L=130.0' S=0.0500 '/' Capacity=37.30 cfs Outflow=0.49 cfs 0.032 af

Reach PR63: Swale North of gravel Avg. Flow Depth=0.03' Max Vel=1.40 fps Inflow=0.05 cfs 0.036 af
n=0.022 L=80.0' S=0.0500 '/' Capacity=50.13 cfs Outflow=0.05 cfs 0.036 af

Pond BR1: Bioswale-ISR 1 (CB5) Peak Elev=229.56' Storage=2,566 cf Inflow=1.53 cfs 0.171 af
Primary=0.05 cfs 0.120 af Secondary=0.55 cfs 0.050 af Outflow=0.60 cfs 0.171 af

Pond BR2: Bioswale - ISR 2 (CB3) Peak Elev=230.66' Storage=3,293 cf Inflow=3.40 cfs 0.220 af
Primary=0.05 cfs 0.135 af Secondary=1.12 cfs 0.085 af Outflow=1.17 cfs 0.220 af

Pond DE1: Drip Edge along Northeastern Peak Elev=232.97' Storage=115 cf Inflow=0.66 cfs 0.045 af
6.0" Round Culvert x 2.00 n=0.010 L=35.0' S=0.0086 '/' Outflow=0.65 cfs 0.044 af

Pond DE2: Drip Edge along Northwestern Peak Elev=233.14' Storage=130 cf Inflow=0.53 cfs 0.036 af
6.0" Round Culvert n=0.010 L=40.0' S=0.0025 '/' Outflow=0.45 cfs 0.035 af

Pond DE3: Drip Edge along Southwestern Peak Elev=235.99' Storage=154 cf Inflow=0.54 cfs 0.037 af
8.0" Round Culvert n=0.010 L=40.0' S=0.0000 '/' Outflow=0.49 cfs 0.036 af

Pond DE4: Drip Edge along Southeastern Peak Elev=235.06' Storage=166 cf Inflow=0.54 cfs 0.037 af
8.0" Round Culvert n=0.010 L=100.0' S=0.0000 '/' Outflow=0.47 cfs 0.036 af

Pond EP81: Middle Portion of Wetland Peak Elev=233.50' Storage=4,070 cf Inflow=0.60 cfs 0.093 af
Outflow=0.00 cfs 0.000 af

Pond PCB2: CB2 - Catch Basin at the end of Bioswale "A" Peak Elev=211.83' Inflow=0.05 cfs 0.036 af
12.0" Round Culvert n=0.013 L=115.0' S=0.0052 '/' Outflow=0.05 cfs 0.036 af

Pond PCB4: Catch Basin #3 Peak Elev=233.09' Inflow=0.95 cfs 0.059 af
15.0" Round Culvert n=0.010 L=135.0' S=0.0025 '/' Outflow=0.95 cfs 0.059 af

Pond PDMH1: Drain Manhole #5 Peak Elev=232.67' Inflow=1.71 cfs 0.111 af
15.0" Round Culvert n=0.010 L=205.0' S=0.0025 '/' Outflow=1.71 cfs 0.111 af

Pond PP108: Bioswale "A" Peak Elev=215.15' Storage=1,255 cf Inflow=0.82 cfs 0.057 af
Primary=0.05 cfs 0.036 af Secondary=0.00 cfs 0.000 af Outflow=0.05 cfs 0.036 af

Pond PP109: Stormwater Detention Peak Elev=212.38' Storage=875 cf Inflow=0.43 cfs 0.071 af
Discarded=0.06 cfs 0.071 af Primary=0.00 cfs 0.000 af Secondary=0.00 cfs 0.000 af Outflow=0.06 cfs 0.071 af

Pond PP110: Proposed 8" Earthen Berm Peak Elev=212.55' Storage=110 cf Inflow=0.00 cfs 0.003 af
Outflow=0.00 cfs 0.000 af

Pond PPT3: Catch Basin #4 Peak Elev=232.90' Inflow=1.71 cfs 0.111 af
15.0" Round Culvert n=0.010 L=50.0' S=0.0024 '/' Outflow=1.71 cfs 0.111 af

Pond SI1: Subsurface Infiltration Peak Elev=225.27' Storage=3,729 cf Inflow=1.29 cfs 0.391 af
Discarded=0.59 cfs 0.312 af Primary=0.00 cfs 0.000 af Outflow=0.59 cfs 0.312 af

Link L100: Northern Wetlands & North of Site Inflow=0.00 cfs 0.001 af
Primary=0.00 cfs 0.001 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=0.04 cfs 0.032 af
Primary=0.04 cfs 0.032 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.01 cfs 0.003 af
Primary=0.01 cfs 0.003 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.26 cfs 0.052 af
Primary=0.26 cfs 0.052 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=0.06 cfs 0.045 af
Primary=0.06 cfs 0.045 af

Total Runoff Area = 16.590 ac Runoff Volume = 0.714 af Average Runoff Depth = 0.52"
85.41% Pervious = 14.169 ac 14.59% Impervious = 2.421 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PS1: Northwest portion of Runoff Area=101,958 sf 0.00% Impervious Runoff Depth=0.45"
Flow Length=373' Tc=15.4 min CN=48 Runoff=0.26 cfs 0.088 af

Subcatchment PS10: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=0.79"
Flow Length=151' Tc=11.4 min CN=55 Runoff=0.15 cfs 0.023 af

Subcatchment PS11: Eastern portion of Runoff Area=33,128 sf 0.00% Impervious Runoff Depth=0.59"
Flow Length=312' Tc=20.7 min CN=51 Runoff=0.14 cfs 0.037 af

Subcatchment PS12: South-center portion Runoff Area=47,403 sf 8.55% Impervious Runoff Depth=0.96"
Flow Length=242' Tc=11.8 min CN=58 Runoff=0.64 cfs 0.087 af

Subcatchment PS13: Area north of prop. Runoff Area=21,222 sf 17.10% Impervious Runoff Depth=1.98"
Flow Length=245' Tc=8.9 min CN=73 Runoff=0.83 cfs 0.080 af

Subcatchment PS14: Area at Runoff Area=7,728 sf 70.54% Impervious Runoff Depth=3.60"
Flow Length=107' Tc=3.4 min CN=91 Runoff=0.70 cfs 0.053 af

Subcatchment PS15: NE corner of building Runoff Area=8,288 sf 93.93% Impervious Runoff Depth=4.37"
Flow Length=62' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.86 cfs 0.069 af

Subcatchment PS16: NW corner of building Runoff Area=6,627 sf 93.98% Impervious Runoff Depth=4.37"
Flow Length=62' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.68 cfs 0.055 af

Subcatchment PS17: Parking Lot West of Runoff Area=13,293 sf 91.70% Impervious Runoff Depth=3.82"
Flow Length=110' Tc=1.1 min CN=93 Runoff=1.29 cfs 0.097 af

Subcatchment PS19: SW corner of building Runoff Area=6,734 sf 92.81% Impervious Runoff Depth=4.37"
Flow Length=50' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.70 cfs 0.056 af

Subcatchment PS20: Parking Lot Runoff Area=4,622 sf 81.03% Impervious Runoff Depth=3.20"
Flow Length=88' Slope=0.0170 '/' Tc=1.0 min CN=87 Runoff=0.40 cfs 0.028 af

Subcatchment PS22: SE corner of building Runoff Area=6,730 sf 92.87% Impervious Runoff Depth=4.37"
Flow Length=50' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.70 cfs 0.056 af

Subcatchment PS23: Area between building Runoff Area=13,335 sf 0.00% Impervious Runoff Depth=0.69"
Flow Length=157' Tc=3.7 min CN=53 Runoff=0.15 cfs 0.018 af

Subcatchment PS24: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=0.49"
Flow Length=569' Tc=18.4 min CN=49 Runoff=0.23 cfs 0.072 af

Subcatchment PS25: Area that contains Runoff Area=30,280 sf 1.00% Impervious Runoff Depth=0.29"
Flow Length=386' Tc=7.5 min CN=44 Runoff=0.03 cfs 0.017 af

Subcatchment PS26: Area containg Link Runoff Area=16,294 sf 25.02% Impervious Runoff Depth=0.96"
Flow Length=252' Tc=5.0 min CN=58 Runoff=0.30 cfs 0.030 af

Subcatchment PS28: area at south edge of Runoff Area=9,699 sf 56.14% Impervious Runoff Depth=2.30"
Flow Length=168' Tc=0.9 min CN=77 Runoff=0.62 cfs 0.043 af

Subcatchment PS29: Area between Prop. Runoff Area=10,273 sf 22.32% Impervious Runoff Depth=0.79"
Flow Length=82' Tc=5.3 min CN=55 Runoff=0.13 cfs 0.016 af

Subcatchment PS3: Northern corner portion Runoff Area=20,440 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=222' Slope=0.0100 '/' Tc=11.7 min CN=44 Runoff=0.02 cfs 0.011 af

Subcatchment PS30: Parking Lot Runoff Area=26,697 sf 62.68% Impervious Runoff Depth=2.73"
Flow Length=248' Tc=1.5 min CN=82 Runoff=1.99 cfs 0.140 af

Subcatchment PS4: Lower north corner of Runoff Area=40,570 sf 27.77% Impervious Runoff Depth=2.38"
Flow Length=325' Tc=12.0 min CN=78 Runoff=1.73 cfs 0.185 af

Subcatchment PS6: Northeast area of Runoff Area=64,817 sf 0.00% Impervious Runoff Depth=1.75"
Flow Length=294' Tc=23.9 min CN=70 Runoff=1.43 cfs 0.217 af

Subcatchment PS7: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=0.59"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.06 cfs 0.012 af

Subcatchment PS8: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=1.20"
Flow Length=344' Tc=12.7 min CN=62 Runoff=1.01 cfs 0.128 af

Subcatchment PS9: East portion of easterly Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=235' Tc=14.8 min CN=44 Runoff=0.08 cfs 0.041 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.00' Max Vel=0.31 fps Inflow=0.02 cfs 0.011 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.02 cfs 0.011 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.02' Max Vel=0.45 fps Inflow=0.26 cfs 0.099 af
n=0.035 L=221.0' S=0.0158 '/' Capacity=556.72 cfs Outflow=0.25 cfs 0.099 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.02' Max Vel=0.66 fps Inflow=0.30 cfs 0.117 af
n=0.035 L=320.0' S=0.0406 '/' Capacity=795.12 cfs Outflow=0.28 cfs 0.117 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.14' Max Vel=0.09 fps Inflow=0.21 cfs 0.123 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=0.17 cfs 0.123 af

Reach ER82: Swale Located on North Avg. Flow Depth=0.07' Max Vel=1.04 fps Inflow=0.83 cfs 0.080 af
n=0.035 L=150.0' S=0.0200 '/' Capacity=265.19 cfs Outflow=0.79 cfs 0.080 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.04' Max Vel=0.41 fps Inflow=0.09 cfs 0.032 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=0.09 cfs 0.032 af

Reach ER85: End of Swale located Avg. Flow Depth=0.16' Max Vel=1.37 fps Inflow=1.01 cfs 0.283 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=1.01 cfs 0.283 af

Reach PR62: Swale South of Proposed Avg. Flow Depth=0.22' Max Vel=3.45 fps Inflow=0.70 cfs 0.053 af
n=0.022 L=130.0' S=0.0500 '/' Capacity=37.30 cfs Outflow=0.70 cfs 0.053 af

Reach PR63: Swale North of gravel Avg. Flow Depth=0.06' Max Vel=2.02 fps Inflow=0.15 cfs 0.091 af
n=0.022 L=80.0' S=0.0500 '/' Capacity=50.13 cfs Outflow=0.15 cfs 0.091 af

Pond BR1: Bioswale-ISR 1 (CB5) Peak Elev=229.65' Storage=2,756 cf Inflow=2.43 cfs 0.308 af
Primary=0.05 cfs 0.127 af Secondary=2.32 cfs 0.181 af Outflow=2.37 cfs 0.308 af

Pond BR2: Bioswale - ISR 2 (CB3) Peak Elev=230.80' Storage=3,754 cf Inflow=4.93 cfs 0.376 af
Primary=0.05 cfs 0.144 af Secondary=4.41 cfs 0.232 af Outflow=4.46 cfs 0.376 af

Pond DE1: Drip Edge along Northeastern Peak Elev=233.05' Storage=130 cf Inflow=0.86 cfs 0.069 af
6.0" Round Culvert x 2.00 n=0.010 L=35.0' S=0.0086 '/' Outflow=0.84 cfs 0.068 af

Pond DE2: Drip Edge along Northwestern Peak Elev=233.35' Storage=163 cf Inflow=0.68 cfs 0.055 af
6.0" Round Culvert n=0.010 L=40.0' S=0.0025 '/' Outflow=0.58 cfs 0.055 af

Pond DE3: Drip Edge along Southwestern Peak Elev=236.12' Storage=177 cf Inflow=0.70 cfs 0.056 af
8.0" Round Culvert n=0.010 L=40.0' S=0.0000 '/' Outflow=0.64 cfs 0.056 af

Pond DE4: Drip Edge along Southeastern Peak Elev=235.22' Storage=195 cf Inflow=0.70 cfs 0.056 af
8.0" Round Culvert n=0.010 L=100.0' S=0.0000 '/' Outflow=0.59 cfs 0.056 af

Pond EP81: Middle Portion of Wetland Peak Elev=233.61' Storage=4,706 cf Inflow=1.43 cfs 0.217 af
Outflow=0.21 cfs 0.123 af

Pond PCB2: CB2 - Catch Basin at the end of Bioswale "A" Peak Elev=211.92' Inflow=0.15 cfs 0.091 af
12.0" Round Culvert n=0.013 L=115.0' S=0.0052 '/' Outflow=0.15 cfs 0.091 af

Pond PCB4: Catch Basin #3 Peak Elev=233.27' Inflow=1.29 cfs 0.097 af
15.0" Round Culvert n=0.010 L=135.0' S=0.0025 '/' Outflow=1.29 cfs 0.097 af

Pond PDMH1: Drain Manhole #5 Peak Elev=232.82' Inflow=2.33 cfs 0.181 af
15.0" Round Culvert n=0.010 L=205.0' S=0.0025 '/' Outflow=2.33 cfs 0.181 af

Pond PP108: Bioswale "A" Peak Elev=215.83' Storage=2,172 cf Inflow=1.40 cfs 0.112 af
Primary=0.15 cfs 0.091 af Secondary=0.00 cfs 0.000 af Outflow=0.15 cfs 0.091 af

Pond PP109: Stormwater Detention Peak Elev=213.56' Storage=3,613 cf Inflow=1.47 cfs 0.205 af
Discarded=0.10 cfs 0.182 af Primary=0.08 cfs 0.023 af Secondary=0.00 cfs 0.000 af Outflow=0.18 cfs 0.205 af

Pond PP110: Proposed 8" Earthen Berm Peak Elev=212.69' Storage=153 cf Inflow=0.09 cfs 0.035 af
Outflow=0.09 cfs 0.032 af

Pond PPT3: Catch Basin #4 Peak Elev=233.08' Inflow=2.33 cfs 0.181 af
15.0" Round Culvert n=0.010 L=50.0' S=0.0024 '/' Outflow=2.33 cfs 0.181 af

Pond SI1: Subsurface Infiltration Peak Elev=227.12' Storage=10,038 cf Inflow=6.48 cfs 0.684 af
Discarded=0.66 cfs 0.606 af Primary=0.00 cfs 0.000 af Outflow=0.66 cfs 0.606 af

Link L100: Northern Wetlands & North of Site Inflow=0.02 cfs 0.011 af
Primary=0.02 cfs 0.011 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=0.52 cfs 0.205 af
Primary=0.52 cfs 0.205 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.08 cfs 0.041 af
Primary=0.08 cfs 0.041 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=1.16 cfs 0.307 af
Primary=1.16 cfs 0.307 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=0.38 cfs 0.121 af
Primary=0.38 cfs 0.121 af

Total Runoff Area = 16.590 ac Runoff Volume = 1.661 af Average Runoff Depth = 1.20"
85.41% Pervious = 14.169 ac 14.59% Impervious = 2.421 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PS1: Northwest portion of Runoff Area=101,958 sf 0.00% Impervious Runoff Depth=0.93"
Flow Length=373' Tc=15.4 min CN=48 Runoff=0.93 cfs 0.181 af

Subcatchment PS10: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=1.42"
Flow Length=151' Tc=11.4 min CN=55 Runoff=0.32 cfs 0.042 af

Subcatchment PS11: Eastern portion of Runoff Area=33,128 sf 0.00% Impervious Runoff Depth=1.13"
Flow Length=312' Tc=20.7 min CN=51 Runoff=0.38 cfs 0.072 af

Subcatchment PS12: South-center portion Runoff Area=47,403 sf 8.55% Impervious Runoff Depth=1.65"
Flow Length=242' Tc=11.8 min CN=58 Runoff=1.20 cfs 0.150 af

Subcatchment PS13: Area north of prop. Runoff Area=21,222 sf 17.10% Impervious Runoff Depth=2.95"
Flow Length=245' Tc=8.9 min CN=73 Runoff=1.20 cfs 0.120 af

Subcatchment PS14: Area at Runoff Area=7,728 sf 70.54% Impervious Runoff Depth=4.79"
Flow Length=107' Tc=3.4 min CN=91 Runoff=0.87 cfs 0.071 af

Subcatchment PS15: NE corner of building Runoff Area=8,288 sf 93.93% Impervious Runoff Depth=5.59"
Flow Length=62' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=1.03 cfs 0.089 af

Subcatchment PS16: NW corner of building Runoff Area=6,627 sf 93.98% Impervious Runoff Depth=5.59"
Flow Length=62' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.82 cfs 0.071 af

Subcatchment PS17: Parking Lot West of Runoff Area=13,293 sf 91.70% Impervious Runoff Depth=5.01"
Flow Length=110' Tc=1.1 min CN=93 Runoff=1.58 cfs 0.128 af

Subcatchment PS19: SW corner of building Runoff Area=6,734 sf 92.81% Impervious Runoff Depth=5.59"
Flow Length=50' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.83 cfs 0.072 af

Subcatchment PS20: Parking Lot Runoff Area=4,622 sf 81.03% Impervious Runoff Depth=4.35"
Flow Length=88' Slope=0.0170 '/' Tc=1.0 min CN=87 Runoff=0.50 cfs 0.039 af

Subcatchment PS22: SE corner of building Runoff Area=6,730 sf 92.87% Impervious Runoff Depth=5.59"
Flow Length=50' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.83 cfs 0.072 af

Subcatchment PS23: Area between building Runoff Area=13,335 sf 0.00% Impervious Runoff Depth=1.27"
Flow Length=157' Tc=3.7 min CN=53 Runoff=0.34 cfs 0.032 af

Subcatchment PS24: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=0.99"
Flow Length=569' Tc=18.4 min CN=49 Runoff=0.73 cfs 0.144 af

Subcatchment PS25: Area that contains Runoff Area=30,280 sf 1.00% Impervious Runoff Depth=0.67"
Flow Length=386' Tc=7.5 min CN=44 Runoff=0.16 cfs 0.039 af

Subcatchment PS26: Area containg Link Runoff Area=16,294 sf 25.02% Impervious Runoff Depth=1.65"
Flow Length=252' Tc=5.0 min CN=58 Runoff=0.56 cfs 0.051 af

Subcatchment PS28: area at south edge of Runoff Area=9,699 sf 56.14% Impervious Runoff Depth=3.33"
Flow Length=168' Tc=0.9 min CN=77 Runoff=0.84 cfs 0.062 af

Subcatchment PS29: Area between Prop. Runoff Area=10,273 sf 22.32% Impervious Runoff Depth=1.42"
Flow Length=82' Tc=5.3 min CN=55 Runoff=0.28 cfs 0.028 af

Subcatchment PS3: Northern corner portion Runoff Area=20,440 sf 0.00% Impervious Runoff Depth=0.67"
Flow Length=222' Slope=0.0100 '/' Tc=11.7 min CN=44 Runoff=0.10 cfs 0.026 af

Subcatchment PS30: Parking Lot Runoff Area=26,697 sf 62.68% Impervious Runoff Depth=3.83"
Flow Length=248' Tc=1.5 min CN=82 Runoff=2.62 cfs 0.196 af

Subcatchment PS4: Lower north corner of Runoff Area=40,570 sf 27.77% Impervious Runoff Depth=3.43"
Flow Length=325' Tc=12.0 min CN=78 Runoff=2.37 cfs 0.266 af

Subcatchment PS6: Northeast area of Runoff Area=64,817 sf 0.00% Impervious Runoff Depth=2.67"
Flow Length=294' Tc=23.9 min CN=70 Runoff=2.14 cfs 0.331 af

Subcatchment PS7: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=1.13"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.18 cfs 0.023 af

Subcatchment PS8: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=1.98"
Flow Length=344' Tc=12.7 min CN=62 Runoff=1.71 cfs 0.211 af

Subcatchment PS9: East portion of easterly Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=0.67"
Flow Length=235' Tc=14.8 min CN=44 Runoff=0.34 cfs 0.097 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.01' Max Vel=0.31 fps Inflow=0.10 cfs 0.026 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.07 cfs 0.026 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.05' Max Vel=0.72 fps Inflow=0.96 cfs 0.207 af
n=0.035 L=221.0' S=0.0158 '/' Capacity=556.72 cfs Outflow=0.90 cfs 0.207 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.04' Max Vel=1.08 fps Inflow=1.01 cfs 0.282 af
n=0.035 L=320.0' S=0.0406 '/' Capacity=795.12 cfs Outflow=0.97 cfs 0.282 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.22' Max Vel=0.13 fps Inflow=0.71 cfs 0.237 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=0.48 cfs 0.237 af

Reach ER82: Swale Located on North Avg. Flow Depth=0.09' Max Vel=1.20 fps Inflow=1.20 cfs 0.120 af
n=0.035 L=150.0' S=0.0200 '/' Capacity=265.19 cfs Outflow=1.15 cfs 0.120 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.13' Max Vel=0.90 fps Inflow=0.78 cfs 0.168 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=0.78 cfs 0.168 af

Reach ER85: End of Swale located Avg. Flow Depth=0.22' Max Vel=1.64 fps Inflow=1.71 cfs 0.616 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=1.71 cfs 0.616 af

Reach PR62: Swale South of Proposed Avg. Flow Depth=0.24' Max Vel=3.64 fps Inflow=0.87 cfs 0.071 af
n=0.022 L=130.0' S=0.0500 '/' Capacity=37.30 cfs Outflow=0.86 cfs 0.071 af

Reach PR63: Swale North of gravel Avg. Flow Depth=0.08' Max Vel=2.41 fps Inflow=0.25 cfs 0.140 af
n=0.022 L=80.0' S=0.0500 '/' Capacity=50.13 cfs Outflow=0.25 cfs 0.140 af

Pond BR1: Bioswale-ISR 1 (CB5) Peak Elev=229.68' Storage=2,826 cf Inflow=3.24 cfs 0.424 af
Primary=0.05 cfs 0.123 af Secondary=3.13 cfs 0.301 af Outflow=3.17 cfs 0.424 af

Pond BR2: Bioswale - ISR 2 (CB3) Peak Elev=230.84' Storage=3,895 cf Inflow=6.18 cfs 0.504 af
Primary=0.05 cfs 0.144 af Secondary=5.62 cfs 0.360 af Outflow=5.67 cfs 0.504 af

Pond DE1: Drip Edge along Northeastern Peak Elev=233.13' Storage=148 cf Inflow=1.03 cfs 0.089 af
6.0" Round Culvert x 2.00 n=0.010 L=35.0' S=0.0086 '/' Outflow=1.01 cfs 0.088 af

Pond DE2: Drip Edge along Northwestern Peak Elev=233.52' Storage=190 cf Inflow=0.82 cfs 0.071 af
6.0" Round Culvert n=0.010 L=40.0' S=0.0025 '/' Outflow=0.68 cfs 0.070 af

Pond DE3: Drip Edge along Southwestern Peak Elev=236.23' Storage=199 cf Inflow=0.83 cfs 0.072 af
8.0" Round Culvert n=0.010 L=40.0' S=0.0000 '/' Outflow=0.74 cfs 0.071 af

Pond DE4: Drip Edge along Southeastern Peak Elev=235.37' Storage=224 cf Inflow=0.83 cfs 0.072 af
8.0" Round Culvert n=0.010 L=100.0' S=0.0000 '/' Outflow=0.71 cfs 0.071 af

Pond EP81: Middle Portion of Wetland Peak Elev=233.76' Storage=5,557 cf Inflow=2.14 cfs 0.331 af
Outflow=0.71 cfs 0.237 af

Pond PCB2: CB2 - Catch Basin at the end of Bioswale "A" Peak Elev=211.99' Inflow=0.25 cfs 0.140 af
12.0" Round Culvert n=0.013 L=115.0' S=0.0052 '/' Outflow=0.25 cfs 0.140 af

Pond PCB4: Catch Basin #3 Peak Elev=233.41' Inflow=1.58 cfs 0.128 af
15.0" Round Culvert n=0.010 L=135.0' S=0.0025 '/' Outflow=1.58 cfs 0.128 af

Pond PDMH1: Drain Manhole #5 Peak Elev=232.94' Inflow=2.83 cfs 0.237 af
15.0" Round Culvert n=0.010 L=205.0' S=0.0025 '/' Outflow=2.83 cfs 0.237 af

Pond PP108: Bioswale "A" Peak Elev=216.32' Storage=3,002 cf Inflow=1.92 cfs 0.161 af
Primary=0.22 cfs 0.139 af Secondary=0.03 cfs 0.001 af Outflow=0.25 cfs 0.140 af

Pond PP109: Stormwater Detention Peak Elev=213.78' Storage=4,110 cf Inflow=2.55 cfs 0.341 af
Discarded=0.11 cfs 0.193 af Primary=0.73 cfs 0.148 af Secondary=0.00 cfs 0.000 af Outflow=0.84 cfs 0.341 af

Pond PP110: Proposed 8" Earthen Berm Peak Elev=212.77' Storage=181 cf Inflow=0.78 cfs 0.171 af
Outflow=0.78 cfs 0.168 af

Pond PPT3: Catch Basin #4 Peak Elev=233.22' Inflow=2.83 cfs 0.237 af
15.0" Round Culvert n=0.010 L=50.0' S=0.0024 '/' Outflow=2.83 cfs 0.237 af

Pond SI1: Subsurface Infiltration Peak Elev=228.58' Storage=14,987 cf Inflow=8.41 cfs 0.928 af
Discarded=0.69 cfs 0.807 af Primary=0.44 cfs 0.042 af Outflow=1.13 cfs 0.850 af

Link L100: Northern Wetlands & North of Site Inflow=0.10 cfs 0.026 af
Primary=0.10 cfs 0.026 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=1.78 cfs 0.465 af
Primary=1.78 cfs 0.465 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.34 cfs 0.097 af
Primary=0.34 cfs 0.097 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=2.02 cfs 0.658 af
Primary=2.02 cfs 0.658 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=0.71 cfs 0.191 af
Primary=0.71 cfs 0.191 af

Total Runoff Area = 16.590 ac Runoff Volume = 2.610 af Average Runoff Depth = 1.89"
85.41% Pervious = 14.169 ac 14.59% Impervious = 2.421 ac

Time span=0.00-48.00 hrs, dt=0.01 hrs, 4801 points x 2
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

Subcatchment PS1: Northwest portion of Runoff Area=101,958 sf 0.00% Impervious Runoff Depth=1.48"
Flow Length=373' Tc=15.4 min CN=48 Runoff=1.73 cfs 0.288 af

Subcatchment PS10: South-center portion Runoff Area=15,431 sf 13.51% Impervious Runoff Depth=2.10"
Flow Length=151' Tc=11.4 min CN=55 Runoff=0.49 cfs 0.062 af

Subcatchment PS11: Eastern portion of Runoff Area=33,128 sf 0.00% Impervious Runoff Depth=1.74"
Flow Length=312' Tc=20.7 min CN=51 Runoff=0.63 cfs 0.110 af

Subcatchment PS12: South-center portion Runoff Area=47,403 sf 8.55% Impervious Runoff Depth=2.39"
Flow Length=242' Tc=11.8 min CN=58 Runoff=1.73 cfs 0.217 af

Subcatchment PS13: Area north of prop. Runoff Area=21,222 sf 17.10% Impervious Runoff Depth=3.91"
Flow Length=245' Tc=8.9 min CN=73 Runoff=1.51 cfs 0.159 af

Subcatchment PS14: Area at Runoff Area=7,728 sf 70.54% Impervious Runoff Depth=5.91"
Flow Length=107' Tc=3.4 min CN=91 Runoff=1.00 cfs 0.087 af

Subcatchment PS15: NE corner of building Runoff Area=8,288 sf 93.93% Impervious Runoff Depth=6.73"
Flow Length=62' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=1.16 cfs 0.107 af

Subcatchment PS16: NW corner of building Runoff Area=6,627 sf 93.98% Impervious Runoff Depth=6.73"
Flow Length=62' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.93 cfs 0.085 af

Subcatchment PS17: Parking Lot West of Runoff Area=13,293 sf 91.70% Impervious Runoff Depth=6.14"
Flow Length=110' Tc=1.1 min CN=93 Runoff=1.80 cfs 0.156 af

Subcatchment PS19: SW corner of building Runoff Area=6,734 sf 92.81% Impervious Runoff Depth=6.73"
Flow Length=50' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.94 cfs 0.087 af

Subcatchment PS20: Parking Lot Runoff Area=4,622 sf 81.03% Impervious Runoff Depth=5.45"
Flow Length=88' Slope=0.0170 '/' Tc=1.0 min CN=87 Runoff=0.58 cfs 0.048 af

Subcatchment PS22: SE corner of building Runoff Area=6,730 sf 92.87% Impervious Runoff Depth=6.73"
Flow Length=50' Slope=0.1000 '/' Tc=0.4 min CN=98 Runoff=0.94 cfs 0.087 af

Subcatchment PS23: Area between building Runoff Area=13,335 sf 0.00% Impervious Runoff Depth=1.92"
Flow Length=157' Tc=3.7 min CN=53 Runoff=0.53 cfs 0.049 af

Subcatchment PS24: Southwest portion of Runoff Area=75,770 sf 0.00% Impervious Runoff Depth=1.56"
Flow Length=569' Tc=18.4 min CN=49 Runoff=1.31 cfs 0.226 af

Subcatchment PS25: Area that contains Runoff Area=30,280 sf 1.00% Impervious Runoff Depth=1.14"
Flow Length=386' Tc=7.5 min CN=44 Runoff=0.43 cfs 0.066 af

Subcatchment PS26: Area containg Link Runoff Area=16,294 sf 25.02% Impervious Runoff Depth=2.39"
Flow Length=252' Tc=5.0 min CN=58 Runoff=0.80 cfs 0.074 af

Subcatchment PS28: area at south edge of Runoff Area=9,699 sf 56.14% Impervious Runoff Depth=4.34"
Flow Length=168' Tc=0.9 min CN=77 Runoff=1.02 cfs 0.081 af

Subcatchment PS29: Area between Prop. Runoff Area=10,273 sf 22.32% Impervious Runoff Depth=2.10"
Flow Length=82' Tc=5.3 min CN=55 Runoff=0.43 cfs 0.041 af

Subcatchment PS3: Northern corner portion Runoff Area=20,440 sf 0.00% Impervious Runoff Depth=1.14"
Flow Length=222' Slope=0.0100 '/' Tc=11.7 min CN=44 Runoff=0.25 cfs 0.045 af

Subcatchment PS30: Parking Lot Runoff Area=26,697 sf 62.68% Impervious Runoff Depth=4.89"
Flow Length=248' Tc=1.5 min CN=82 Runoff=3.10 cfs 0.250 af

Subcatchment PS4: Lower north corner of Runoff Area=40,570 sf 27.77% Impervious Runoff Depth=4.45"
Flow Length=325' Tc=12.0 min CN=78 Runoff=2.92 cfs 0.345 af

Subcatchment PS6: Northeast area of Runoff Area=64,817 sf 0.00% Impervious Runoff Depth=3.59"
Flow Length=294' Tc=23.9 min CN=70 Runoff=2.79 cfs 0.446 af

Subcatchment PS7: Eastern Corner of Runoff Area=10,721 sf 19.78% Impervious Runoff Depth=1.74"
Flow Length=135' Tc=7.7 min CN=51 Runoff=0.30 cfs 0.036 af

Subcatchment PS8: West portion of Runoff Area=55,723 sf 9.96% Impervious Runoff Depth=2.78"
Flow Length=344' Tc=12.7 min CN=62 Runoff=2.36 cfs 0.296 af

Subcatchment PS9: East portion of easterly Runoff Area=74,872 sf 0.00% Impervious Runoff Depth=1.14"
Flow Length=235' Tc=14.8 min CN=44 Runoff=0.84 cfs 0.163 af

Reach ER70: Wetlands Starting North Avg. Flow Depth=0.03' Max Vel=0.39 fps Inflow=0.25 cfs 0.045 af
n=0.035 L=350.0' S=0.0100 '/' Capacity=328.04 cfs Outflow=0.17 cfs 0.045 af

Reach ER72: Northwest Wetlands Avg. Flow Depth=0.07' Max Vel=0.94 fps Inflow=1.84 cfs 0.332 af
n=0.035 L=221.0' S=0.0158 '/' Capacity=556.72 cfs Outflow=1.77 cfs 0.332 af

Reach ER73: Wetlands Flowing on Map Avg. Flow Depth=0.10' Max Vel=1.74 fps Inflow=3.48 cfs 0.553 af
n=0.035 L=320.0' S=0.0406 '/' Capacity=795.12 cfs Outflow=3.46 cfs 0.553 af

Reach ER81: SE Portion of Middle Lot Avg. Flow Depth=0.30' Max Vel=0.16 fps Inflow=1.40 cfs 0.352 af
n=0.750 L=370.0' S=0.0554 '/' Capacity=13.04 cfs Outflow=0.95 cfs 0.352 af

Reach ER82: Swale Located on North Avg. Flow Depth=0.11' Max Vel=1.32 fps Inflow=1.51 cfs 0.159 af
n=0.035 L=150.0' S=0.0200 '/' Capacity=265.19 cfs Outflow=1.47 cfs 0.159 af

Reach ER84: Swale Located on North Avg. Flow Depth=0.24' Max Vel=1.27 fps Inflow=2.03 cfs 0.317 af
n=0.035 L=140.0' S=0.0071 '/' Capacity=239.10 cfs Outflow=2.02 cfs 0.317 af

Reach ER85: End of Swale located Avg. Flow Depth=0.32' Max Vel=2.03 fps Inflow=3.27 cfs 0.965 af
n=0.035 L=75.0' S=0.0133 '/' Capacity=528.23 cfs Outflow=3.27 cfs 0.965 af

Reach PR62: Swale South of Proposed Avg. Flow Depth=0.26' Max Vel=3.76 fps Inflow=1.00 cfs 0.087 af
n=0.022 L=130.0' S=0.0500 '/' Capacity=37.30 cfs Outflow=0.99 cfs 0.087 af

Reach PR63: Swale North of gravel Avg. Flow Depth=0.15' Max Vel=3.40 fps Inflow=0.81 cfs 0.189 af
n=0.022 L=80.0' S=0.0500 '/' Capacity=50.13 cfs Outflow=0.81 cfs 0.189 af

Pond BR1: Bioswale-ISR 1 (CB5) Peak Elev=229.70' Storage=2,880 cf Inflow=3.91 cfs 0.536 af
Primary=0.05 cfs 0.124 af Secondary=3.80 cfs 0.412 af Outflow=3.84 cfs 0.536 af

Pond BR2: Bioswale - ISR 2 (CB3) Peak Elev=230.87' Storage=4,003 cf Inflow=7.18 cfs 0.626 af
Primary=0.05 cfs 0.146 af Secondary=6.59 cfs 0.480 af Outflow=6.64 cfs 0.626 af

Pond DE1: Drip Edge along Northeastern Peak Elev=233.20' Storage=162 cf Inflow=1.16 cfs 0.107 af
6.0" Round Culvert x 2.00 n=0.010 L=35.0' S=0.0086 '/' Outflow=1.13 cfs 0.106 af

Pond DE2: Drip Edge along Northwestern Peak Elev=233.66' Storage=212 cf Inflow=0.93 cfs 0.085 af
6.0" Round Culvert n=0.010 L=40.0' S=0.0025 '/' Outflow=0.75 cfs 0.085 af

Pond DE3: Drip Edge along Southwestern Peak Elev=236.33' Storage=218 cf Inflow=0.94 cfs 0.087 af
8.0" Round Culvert n=0.010 L=40.0' S=0.0000 '/' Outflow=0.85 cfs 0.086 af

Pond DE4: Drip Edge along Southeastern Peak Elev=235.46' Storage=243 cf Inflow=0.94 cfs 0.087 af
8.0" Round Culvert n=0.010 L=100.0' S=0.0000 '/' Outflow=0.81 cfs 0.086 af

Pond EP81: Middle Portion of Wetland Peak Elev=233.91' Storage=6,500 cf Inflow=2.79 cfs 0.446 af
Outflow=1.40 cfs 0.352 af

Pond PCB2: CB2 - Catch Basin at the end of Bioswale "A" Peak Elev=212.23' Inflow=0.81 cfs 0.189 af
12.0" Round Culvert n=0.013 L=115.0' S=0.0052 '/' Outflow=0.81 cfs 0.189 af

Pond PCB4: Catch Basin #3 Peak Elev=233.53' Inflow=1.80 cfs 0.156 af
15.0" Round Culvert n=0.010 L=135.0' S=0.0025 '/' Outflow=1.80 cfs 0.156 af

Pond PDMH1: Drain Manhole #5 Peak Elev=233.04' Inflow=3.26 cfs 0.290 af
15.0" Round Culvert n=0.010 L=205.0' S=0.0025 '/' Outflow=3.26 cfs 0.290 af

Pond PP108: Bioswale "A" Peak Elev=216.43' Storage=3,205 cf Inflow=2.36 cfs 0.209 af
Primary=0.24 cfs 0.166 af Secondary=0.57 cfs 0.023 af Outflow=0.81 cfs 0.189 af

Pond PP109: Stormwater Detention Peak Elev=214.00' Storage=4,631 cf Inflow=3.59 cfs 0.486 af
Discarded=0.11 cfs 0.200 af Primary=1.88 cfs 0.285 af Secondary=0.03 cfs 0.000 af Outflow=2.03 cfs 0.486 af

Pond PP110: Proposed 8" Earthen Berm Peak Elev=212.86' Storage=218 cf Inflow=2.04 cfs 0.321 af
Outflow=2.03 cfs 0.317 af

Pond PPT3: Catch Basin #4 Peak Elev=233.35' Inflow=3.26 cfs 0.290 af
15.0" Round Culvert n=0.010 L=50.0' S=0.0024 '/' Outflow=3.26 cfs 0.290 af

Pond SI1: Subsurface Infiltration Peak Elev=229.05' Storage=16,578 cf Inflow=9.89 cfs 1.161 af
Discarded=0.70 cfs 0.911 af Primary=2.03 cfs 0.172 af Outflow=2.74 cfs 1.083 af

Link L100: Northern Wetlands & North of Site Inflow=0.25 cfs 0.045 af
Primary=0.25 cfs 0.045 af

Link L200: Inlet at Start of Redemption Rd; West Side Inflow=4.64 cfs 0.846 af
Primary=4.64 cfs 0.846 af

Link L300: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=0.84 cfs 0.163 af
Primary=0.84 cfs 0.163 af

Link L400: Southwest Corner of Far-East Lot; Bottom of Hill Inflow=3.52 cfs 1.027 af
Primary=3.52 cfs 1.027 af

Link L500: Inlet at Start of Gravel Drive; East Side Inflow=1.18 cfs 0.263 af
Primary=1.18 cfs 0.263 af

Total Runoff Area = 16.590 ac Runoff Volume = 3.611 af Average Runoff Depth = 2.61"
85.41% Pervious = 14.169 ac 14.59% Impervious = 2.421 ac

PIPE OUTLET PROTECTION APRON DESIGN & d_{50} RIPRAP SIZING

Pipe PDL7 (Node SI1)

EMANUEL ENGINEERING, INC.
CIVIL & STRUCTURAL CONSULTANTS
118 PORTSMOUTH AVE.
STRATHAM, NH 03885
Tel: (603) 772-4400
Fax: (603) 772-4487

PROJECT NAME :	CFA - TurboCAM		
PROJECT # :	19-020		
BY :	JJM	CHECKED BY :	BDS
DATE :	2/7/2020	DATE :	2/7/2020

DOWNSTREAM CHANNEL (OR SPREADER) HYDRAULICS

Peak Discharge Required =	2.2	cfs	(major outet - use 50-year storm)
Channel Bottom Width =	3.0	Feet	
Hydraulic Gradient =	0.08790	Feet/Feet	
Left Side Slope =	10.0	:1(h:v)	
Right Side Slope =	10.0	:1(h:v)	
Depth of Flow =	1.000	Feet	
Manning's "n" =	0.0400		
Area =	13.00	Square Feet	
Wetted Perimeter =	23.10	Feet	
Hydraulic Radius =	0.56	Feet	
Top Width =	23.00	Feet	
Velocity =	7.51	Feet/Second	
Peak Discharge Determined =	97.6	cfs	

La AND W CALCULATIONS:

Culvert Diameter (Do) =	12.0	Inches
Tail Water Depth (TW)* =	0.20	Feet
Length of Apron (La) =	11	Feet
Width of Apron @ D.S End (W) =	14	Feet
Width of D.S. Apron if Channel (W) =	3.0	Feet

Assumes Channel Bottom at the Culvert Equals the Invert Outlet Elevation of the Pipe. If this is not the case, the calculations involving the Tailwater will have to be calculated by hand.

*If outletting to flat area use TW depth = 0.2 x Do

ROCK RIPRAP SIZE

d_{50} = 0.29 Feet or 3.43 Inches

$d_{50} = (0.02 \times Q^{4/3})/(Tw \times Do)$

Use D50=6", 18" deep

ROCK RIPRAP GRADATION (TABLE 7-24 OF NHDES HANDBOOK)

% of Weight Smaller Than The Given Size	Size of Stone in Inches		
100	5.2	to	6.9
85	4.5	to	6.2
50	3.4	to	5.2
15	1.0	to	1.7

Minimum Rock Riprap Blanket Thickness = 10.3 Inches

Minimum Six inch Sand/Gravel Bedding or Geotextile Fabric Required Under All Rock Riprap

FORMULAS USED (Reference NHDES HANDBOOK, Pages 7-114, 7-115)

Manning's Uniform Channel Flow -	Q = (A x 1.486 x R^(2/3) x S^(1/2))/"n"
Length of Apron (La) TW< Do/2 -	La = (1.8 x Q/Do^1.5) + 7 x Do
Length of Apron (La) TW>= Do/2 -	La = 3.0 x Q/Do^1.5 + 7 x Do
Width of Apron @ D.S End TW < Do/2 -	W = 3xDo + La
Width of Apron @ D.S End TW >= Do/2 -	W = 3xDo + 0.4 x La
Width of D.S. Apron if in Channel -	W = Channel Bottom Width
Width of Apron @ Culvert -	Wc = 3 x Do

PIPE OUTLET PROTECTION APRON DESIGN & d_{50} RIPRAP SIZING

Pipe PDL2 (Node PCB2)

EMANUEL ENGINEERING, INC.
CIVIL & STRUCTURAL CONSULTANTS
118 PORTSMOUTH AVE.
STRATHAM, NH 03885
Tel: (603) 772-4400
Fax: (603) 772-4487

PROJECT NAME :	CFA - TurboCAM		
PROJECT # :	19-020		
BY :	JJM	CHECKED BY :	BDS
DATE :	2/6/2020	DATE :	2/6/2020

DOWNSTREAM CHANNEL (OR SPREADER) HYDRAULICS

Peak Discharge Required =	0.2	cfs	(10-year storm)
Channel Bottom Width =	3.0	Feet	
Hydraulic Gradient =	0.00710	Feet/Feet	
Left Side Slope =	4.0	:1(h:v)	
Right Side Slope =	4.0	:1(h:v)	
Depth of Flow =	0.083	Feet	
Manning's "n" =	0.0400		
Area =	0.28	Square Feet	
Wetted Perimeter =	3.69	Feet	
Hydraulic Radius =	0.08	Feet	
Top Width =	3.67	Feet	
Velocity =	0.56	Feet/Second	
Peak Discharge Determined =	0.2	cfs	

La AND W CALCULATIONS:

Culvert Diameter (Do) =	12.0	Inches
Tail Water Depth (TW)* =	0.20	Feet
Length of Apron (La) =	7	Feet
Width of Apron @ D.S End (W) =	10	Feet
Width of D.S. Apron if Channel (W) =	3.0	Feet

Assumes Channel Bottom at the Culvert Equals the Invert Outlet Elevation of the Pipe. If this is not the case, the calculations involving the Tailwater will have to be calculated by hand.

*If outletting to flat area use TW depth = 0.2 x Do

ROCK RIPRAP SIZE

d_{50} = 0.01 Feet or 0.10 Inches

$d_{50} = (0.02 \times Q^{4/3})/(Tw \times Do)$

Use D50=4", 10' Long, 4' Wide, 12" Deep

ROCK RIPRAP GRADATION (TABLE 7-24 OF NHDES HANDBOOK)

% of Weight Smaller Than The Given Size	Size of Stone in Inches		
100	0.1	to	0.2
85	0.1	to	0.2
50	0.1	to	0.1
15	0.0	to	0.0

Minimum Rock Riprap Blanket Thickness = 6.0 Inches

Minimum Six inch Sand/Gravel Bedding or Geotextile Fabric Required Under All Rock Riprap

FORMULAS USED (Reference NHDES HANDBOOK, Pages 7-114, 7-115)

Manning's Uniform Channel Flow -	Q = (A x 1.486 x R^(2/3) x S^(1/2))/"n"
Length of Apron (La) TW< Do/2 -	La = (1.8 x Q/Do^1.5) + 7 x Do
Length of Apron (La) TW>= Do/2 -	La = 3.0 x Q/Do^1.5 + 7 x Do
Width of Apron @ D.S End TW < Do/2 -	W = 3xDo + La
Width of Apron @ D.S End TW >= Do/2 -	W = 3xDo + 0.4 x La
Width of D.S. Apron if in Channel -	W = Channel Bottom Width
Width of Apron @ Culvert -	Wc = 3 x Do

SOIL SURVEY REPORT
Turbocam Inc.
Barrington, NH

1. MAPPING STANDARDS

Site-Specific Soil Mapping Standards for New Hampshire and Vermont. SSSNNE Special Publication No. 3, Version 5.0, December 2017. This map product is within the technical standards of the National Cooperative Soil Survey. It is a special product, intended for the submission to the NH DES Alteration of Terrain. It was produced by a professional soil scientist and is not a product of the USDA Natural Resource Conservation Service.

2. DATE SOIL MAP PRODUCED
August 28, 2019

3. GEOGRAPHIC LOCATION AND SIZE OF SITE
The property consists of approximately 8 acres of mature forest and wetlands. This area of the site slopes from the west to the east.

4. PURPOSE OF THE SOIL MAP
The preparation of this map was requested by Emanuel Engineering, Inc.. The purpose was to meet the requirements of the NH Alteration of Terrain Bureau.

5. SOIL IDENTIFICATION LEGEND

SYMBOL	SOIL TAXONOMIC NAME	Hydrologic Soil Group
12	Hinckley	A
83	Hollis Canton Rock Outcrop	C/D, B
313	Deerfield	C
514/P	Leicester	C

SOIL MAP UNIT DESCRIPTIONS

12 The Hinckley series consists of very deep, excessively drained soils formed in Glaciofluvial materials. They are nearly level through very steep soils on outwash terraces, outwash plains, outwash deltas, kames, kame terraces, and eskers. Saturated hydraulic conductivity is high or very high. These soils are found on site on the side slopes. No ESHWT was found within 40" of the soil surface. Soil profile on site is loamy sand over sand and gravel.

83 This Hollis Canton Rock Outcrop map unit consists of gently sloping soils on uplands where the relief is affected by the underlying bedrock. The very deep, well drained Canton soil is in low pockets. The shallow, excessively drained Hollis soil is

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on the tops of hills and ridges or near rock outcrops. In many areas stones and boulders 10 inches to 10 feet in diameter cover 0 to 10 percent of the surface, A typical map unit is about 47 percent Canton soil, 18 percent Hollis soil, 10 percent Rock outcrop, and 25 percent other soils. These soils and areas of exposed bedrock are intermingled so closely that it was not practical to separate them at the scale used for mapping. Areas of the map unit are irregular in shape.

Onsite, the surface layer of the Hollis soil is black fine sandy loam. The subsoil is dark yellowish brown fine sandy loam. Bedrock is at a depth of 12-14 inches. No seasonal high water table was identified within 40" of the soil surface.

Typically, the surface layer of the Canton soil is black fine sandy loam. The subsurface is fine sandy loam over sandy loam to a depth of 60 inches or more. Typically significant ledge is not encountered with Canton.

313 The Deerfield series consists of very deep, moderately well drained soils formed in glaciofluvial deposits. They are nearly level to strongly sloping soils on terraces, deltas, and outwash plains. Slope ranges from 0 to 15 percent. Saturated hydraulic conductivity is high or very high. This series is consistent with the soils found on site meeting the Deerfield profile. No ESHWT was found between 15-40" of the soil surface and layers were dominated by loamy sand over sands.

514/P The Leicester series consists of very deep, poorly drained soils formed in coarse-loamy till. They are nearly level or gently sloping soils in drainage ways and low-lying positions on hills. Slope ranges from 0 to 8 percent. Permeability is moderate or moderately rapid in the surface layer and subsoil and moderate to rapid in the substratum

6. RESPONSIBLE SOIL SCIENTIST

Luke D. Hurley, C.S.S.

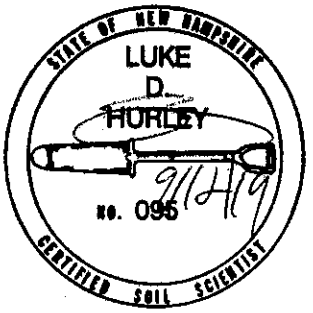
7. OTHER DISTINGUISHING FEATURES OF SITE
No distinguishing features were noted.

8. MAXIMUM SIZE OF LIMITING INCLUSIONS

No limiting inclusions were mapped

9. SPECIAL FEATURE SYMBOLS

No special feature symbols were used.



Infiltration Feasibility Report

TURBOCAM International
Route 9 / Redemption Road (Site)
Barrington, NH 03825

September 13, 2019
Revised: February 4, 2020

Prepared for: TURBOCAM International
607 Calef Highway
Barrington, NH 03825

Prepared by: Emanuel Engineering, Inc.
Bruce Scamman, PE
118 Portsmouth Avenue, Suite A202
Stratham, NH 03885
EEI Project # 19-020

The project proposes three different systems that require infiltration to function properly: porous pavement, bioretention areas, and a bioswale. Due to the large area that they cover, they have broken up into multiple sub groups. There are five porous pavement sub groups, five bioretention area subgroups, and one bioswale group. These eleven systems are identified on the plans as Porous Pavement "A" through "E", Bioretention Area "A" through "E", and Bioswale "A".

I. Location of the practice

Subsurface Infiltration "A" – this area is generally located on the eastern portion of the property, southeast of the proposed building, under the proposed pavement.

Bioswale "A" – this basin within the Redemption Road right-of-way, west of Redemption road, and just east of the lot.

II. Existing topography at the location of the practice

Subsurface Infiltration "A" – the existing topography within the bioretention area is relatively flat with a small portion of it being steeply sloped. Existing land cover includes woods.

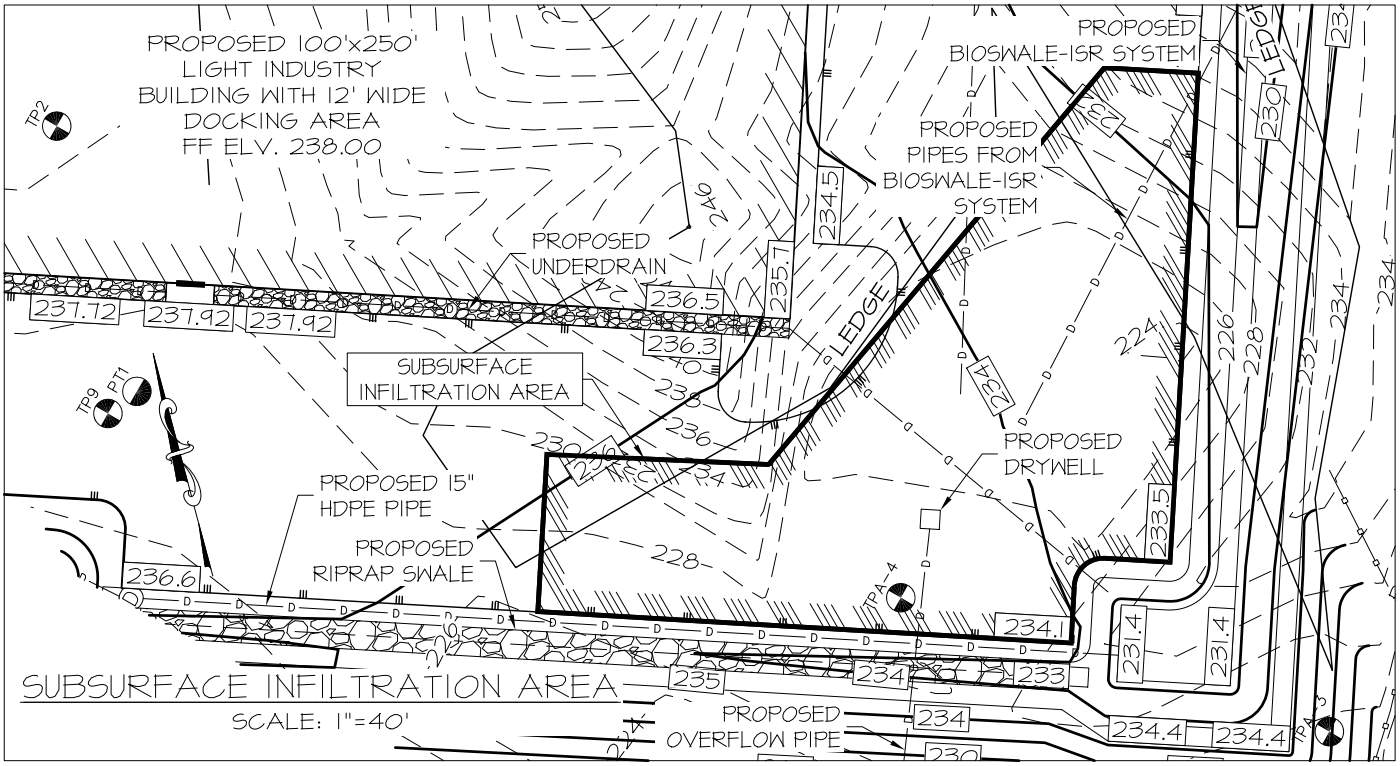
Bioswale "A" – the existing topography within the bioretention area is relatively flat, having a slope of about 2.5%. Existing land cover is grass.

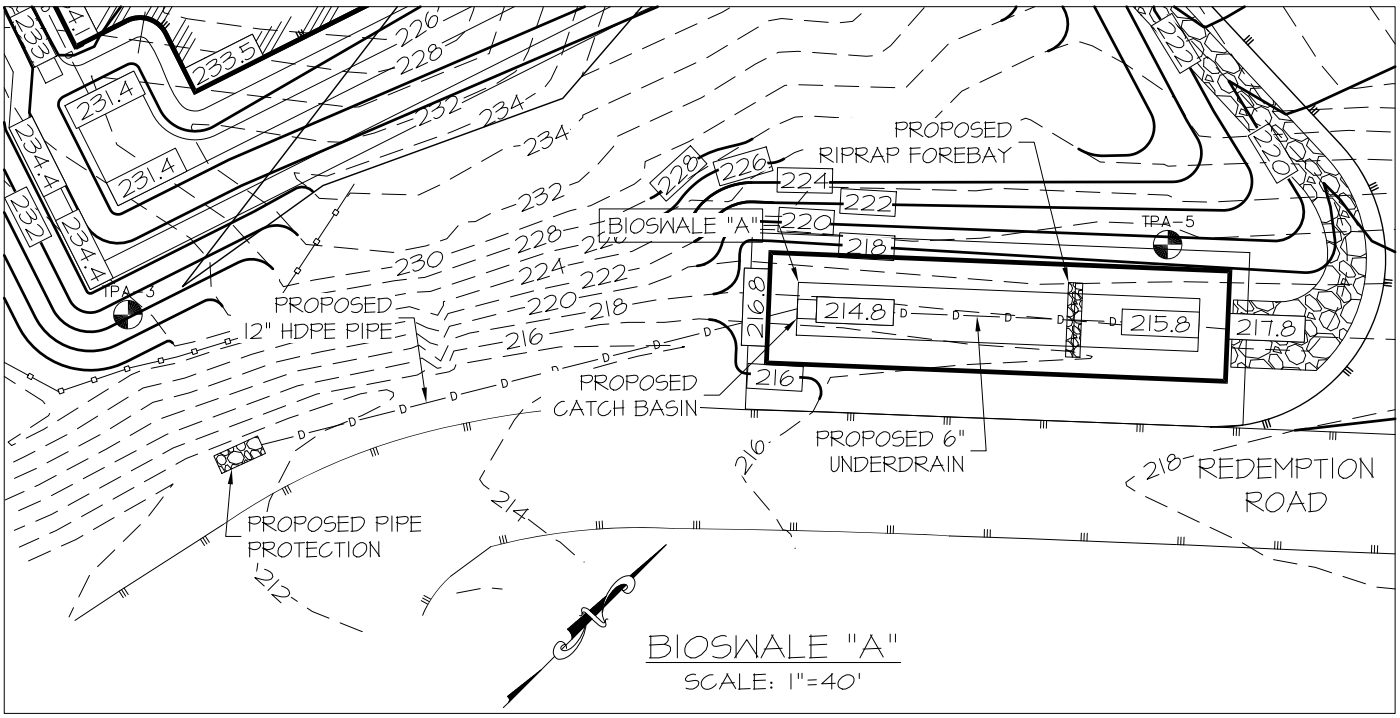
III. Test pit or boring locations

In accordance with Env-Wq 1504.13(c), NHDES requires that a minimum number of test pits or borings be dug or drilled in the location of the system, depending on the size of the proposed system.

Subsurface Infiltration "A" – this system is approximately 8,500 square feet in area, therefore 3 test pits were dug in the vicinity of the proposed practice. The pits are identified as TPA-3, TPA-4, and TP9 and are shown on the attached plan.

Bioswale "A" – this system is approximately 920 square feet in area, therefore 1 test pit was dug in the vicinity of the proposed practice. The pit is identified as TP A-5 and is shown on the attached plan.





EMANUEL ENGINEERING
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INFILTRATION FEASIBILITY TEST PIT SKETCH

FOR

TURBOCAM INTERNATIONAL
ROUTE 9 / REDEMPTION ROAD
BARRINGTON, NH 03825

DRAWN:	JJM	JOB #:	19-020
CHECKED:	BDS	SCALE:	1"=40'
DATE:	FEB 4, 2020	SHEET:	1 OF 1

IV. Seasonal high water table (SHWT) and bedrock elevations

Data for test pits 1 to 9 was collected on April 2, 2019 by Emanuel Engineering, Inc. Data for test pits A-1 to A-13 was collected on May 9, 2012 and June 26, 2012 by Jones & Beach Engineers, Inc.

Subsurface Infiltration "A" –

Bottom of Pond Elevation = 224.17'

TPA-3: Existing Surface Elevation of TP = 226.00'
SHWT = not observed
BEDROCK = not observed
Deepest Elevation of TP = 217.50'

TPA-4: Data not provided to Emanuel Engineering, Inc.

TP9: Existing Surface Elevation of TP = 226.00'
SHWT = 222.17
BEDROCK = not observed
Deepest Elevation of TP = 218.08'

Bioswale "A" –

Bottom of Pond Elevation = 211.55'

TP A-5 Existing Surface Elevation of TP = 221.00'
SHWT = 217.00'
BEDROCK = 215.42'
Deepest Elevation of TP = 215.42'

V. Profile descriptions

Data for test pits 1 to 9 was collected on April 2, 2019 by Emanuel Engineering, Inc. Data for test pit 9 shown below:

TEST PIT #9
ESHWT NOT OBSERVED, TERMINATED 96", NO REFUSAL, NO OBSERVED WATER, ROOTS 66";
0-24" 10YR 3/2 LOAM, GRANULAR, FRIABLE
24-36" 10YR 5/6 GRAVEL SANDY LOAM, GRANULAR, FRIABLE.
36-96" 10YR 6/6 GRAVELLY COBLLE SANDY LOAM, SINGLE GRAIN, LOOSE

Data for test pits A-1 to A-13 was collected on May 9, 2012 and June 26, 2012 by Jones & Beach Engineers, Inc. Data for test pits A-3 to A-5 shown below:

TEST PIT A-3
SHWT NOT OBSERVED, ROOTS TO 63", H2O NOT OBSERVED, REFUSAL NOT OBSERVED, PERC RATE = 2 MIN/INCH
0-7" TOPSOIL
7-24" 10YR 4/6 DARK YELLOWISH BROWN LOAMY SAND, GRANULAR, FRIABLE

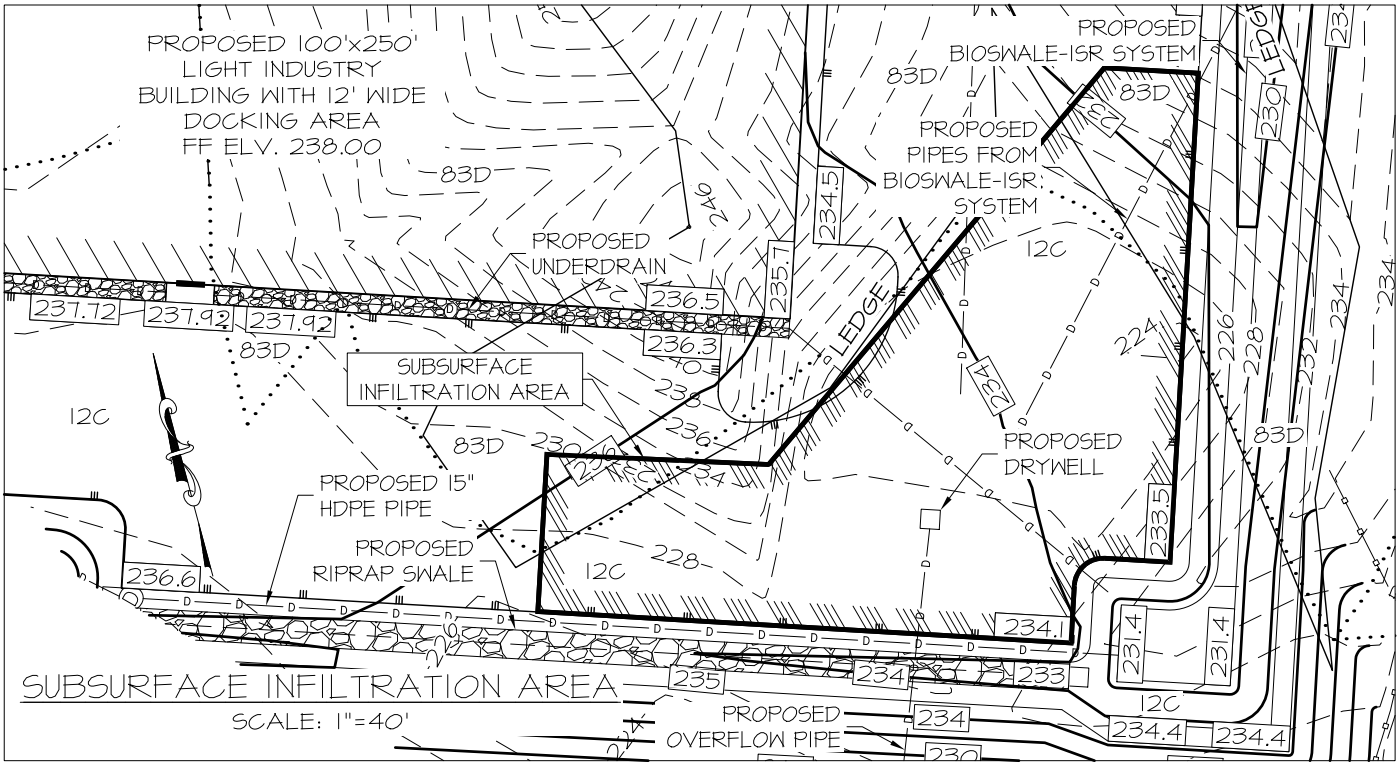
24-102" 10YR 5/6 YELLOWISH BROWN LOOSE GRAVEL WITH COBBLES, GRANULAR, FRIABLE

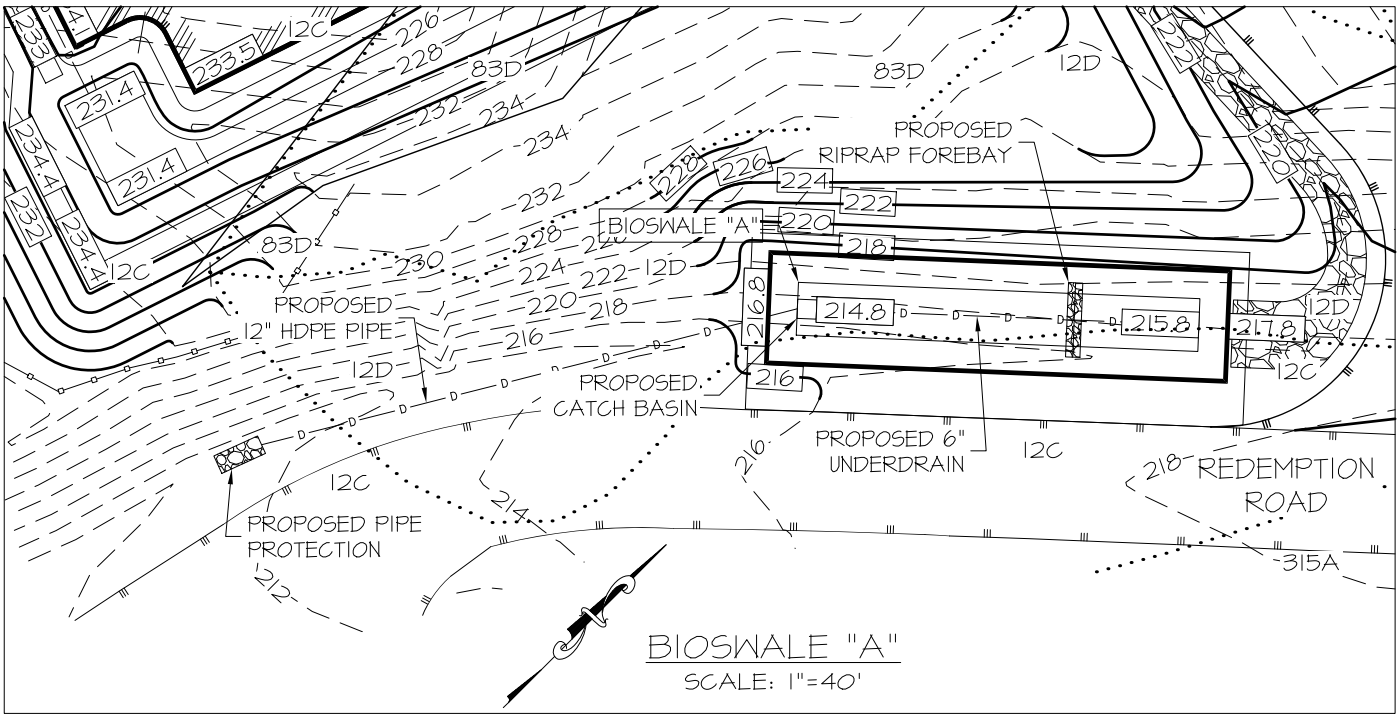
TEST PIT A-4
TEST PIT INFO NOT PROVIDED TO EMANUEL ENGINEERING, INC.

TEST PIT A-5
SHWT @ 48", ROOTS TO 48", H2O @ 58", REFUSAL @ 67", PERC RATE = 2 MIN/INCH
0-4" TOPSOIL
4-12" 10YR 3/6 DARK YELLOWISH BROWN FINE SANDY LOAM, GRANULAR, FRIABLE
12-19" 10YR 4/6 DARK YELLOWISH BROWN LOAMY SAND, GRANULAR, FRIABLE
19-38" 10YR 4/4 DARK YELLOWISH BROWN SINGLE GRAIN SAND, GRANULAR, FRIABLE
28-46" 7.5YR 3/4 DARK BROWN COARSE SAND, GRANULAR, FRIABLE
46-67" 2.5T 5/3 LIGHT OLIVE BROWN FINE SAND, GRANULAR, FRIABLE

VI. Soil plan in the area of the proposed practice(s)

(See attached drawings)





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INFILTRATION FEASIBILITY SOILS SKETCH

FOR

TURBOCAM INTERNATIONAL
ROUTE 9 / REDEMPTION ROAD
BARRINGTON, NH 03825

DRAWN:	JJM	JOB #:	19-020
CHECKED:	BDS	SCALE:	1"=40'
DATE:	FEB 4, 2020	SHEET:	1 OF 1

VII. Summary of [Default, Field Testing, or Lab Testing] data used to determine the infiltration rate

Subsurface Infiltration "A" – the infiltration rate was determined using the Default Values method described in Env-Wq 1504.14(c).

The basin is located within native material identified in the Soil Series survey as Hinckley soils.

Using Ksat Values for New Hampshire Soils, Society of Soil Scientist of Northern New England, Special Publication No.5, September 2009, the lowest value under the basin floor elevation is: 6 inches per hour.

After applying a factor of safety, the design rate used in the drainage analysis is 3 inches per hour.

Bioswale "A" – the infiltration rate was determined using the Default Values method described in Env-Wq 1504.14(c).

The basin is located within native material identified in the Soil Series survey as Hinckley soils.

Using Ksat Values for New Hampshire Soils, Society of Soil Scientist of Northern New England, Special Publication No.5, September 2009, the lowest value under the basin floor elevation is: 6 inches per hour.

After applying a factor of safety, the design rate used in the drainage analysis is 3 inches per hour.

NEW HAMPSHIRE DEPARTMENT OF Environmental Services

REGISTRATION AND NOTIFICATION FORM FOR STORM WATER INFILTRATION TO GROUNDWATER (5H1)

Groundwater Discharge Program

RSA/Rule: RSA 485-A:6, VII; 485:3, X; Env-Wq 402

Applicant Information

Name: TURBOCAM International Daytime Phone: (603) 978 - 5030
Mailing Address: 607 Calef Highway
City: Barrington State: New Hampshire Zip: 03825
Contact Person Name: Eliot Wilkins Email: Eliot.Wilkins@turbocam.com
Contact Person: Phone Number (603) 978-5030 Fax Number: _____

Facility Information

Facility Name: TURBOCAM International
Address: Route 9 / Redemption Road
City: Barrington State: New Hampshire Zip: 03825
Property Tax Map: 233 & 234 Lot # L233:77;L234:1.2&1.4
Latitude & Longitude of discharge location(s): 43.216236, -71.02123

Facility Owner Information (complete only if different than applicant)

Owner Name: Same as Applicant Daytime Phone : (___)___-_____
Mailing Address: _____
City: _____ State: _____ Zip: _____
Contact Person Name: _____ Email: _____
Contact Person: Phone Number _____ Fax Number: _____

Property Owner Information (complete only if different than applicant)

Owner Name: RRB5, LLC Daytime Phone: (603) 978 - 5030
Mailing Address: 607 Calef Highway
City: Barrington State: New Hampshire Zip: 03825
Contact Person Name: Eliot Wilkins Email: Eliot.Wilkins@turbocam.com
Contact Person: Phone Number (603) 978-5030 Fax Number: _____

Facility Operator's Information (complete only if different than applicant)

Owner Name: Same as Applicant Daytime Phone: (_____)_____-_____
Mailing Address: _____
City: _____ State: _____ Zip: _____

Complete this form if you are using a drywell or other subsurface infiltration structures to recharge storm water to the ground or groundwater. If a completed UIC registration form was submitted to the Alteration of Terrain Program for this project, then one is not required to be sent directly to the GWB.

REGISTRATION AND NOTIFICATION FORM FOR STORM WATER INFILTRATION TO GROUNDWATER (attach additional sheets, as necessary, for responses to questions below)

Please provide a complete description of the facility including historic uses, any former contamination and/or on-going remedial action at the site:

Map 233 Lot 77 was once used by the American Legion. There is currently a gravel drive that passes through Map 234 Lot 1.2 and ends on Map 233 Lot 77 as a loop. Within the loop, there is a flag pole. There are wetlands on the southern portions of Map 233 Lot 77 and Map 234 Lot 1.2, and on the western, northwestern, and northern portion of Map 234 Lot 1.4. There are intermittent ledge outcrops on the central portion of the combined Map 233 Lot 77 and Map 234 Lot 1.2 sites.

Please provide information concerning the location of the infiltration activity, include Locus map (i.e. USGS map):

Infiltration takes place in the subsurface infiltration area under the proposed pavement on the eastern portion of the site, to the southeast of the proposed building. The proposed leach field is centered, south of the proposed building.

Please describe the pretreatment system, if any, and capacity of the system:

For the subsurface infiltration, stormwater first flows into Pretex systems before being treated in the bioswale-ISR system, which is then piped to the subsurface infiltration area.

Please describe the materials and products used for the subsurface infiltration structure (i.e., pipe and stone leachfield, plastic chamber units, concrete drywell, etc.):

In the subsurface infiltration area, 3" minus crushed ledge wrapped in Mirafi 140N (on the side and top) is used as storage with a HDPE pipe conveying water from a concrete catch basin into the infiltration structure, and an HDPE pipe conveying water out of the structure as emergency overflow. The bioswale section consists of 24" of bioretention soil mix (60% NHDOT 304.1 sand, 20% wood chips, and 20% topsoil 3/4" minus screened loam), 3" AASHTO #8,14" AASHTO NO. 57, a 6" underdrain, and Mirafi 140N fabric to prevent soil migration. For subsurface infiltration and bioswale section details, see the detail sheets of the plan set. The leach field is made of concrete chambers. For leach field details, see sheet SD1.

Please describe the disposal method and location. Include a site plan showing: the infiltration structure, any other on-site infiltration structures, dimensions, depth to groundwater (if known), adjacent septic system(s), and Drinking water source(s):

For the subsurface infiltration area, stormwater first passes through bioswale-ISR system before flowing into the subsurface infiltration area, and infiltrating into the groundwater. In larger storm events, it overflows into a pipe leading the water offsite. See "Site Plan for TurboCAM International" plan set by Emanuel Engineering, Inc. for details on the aforementioned structures.

Please provide information concerning methods and schedule for periodic inspection and/or maintenance:

Please see attached plan documents entitled "Inspection and Maintenance Plan for TURBOCAM International, Route 9 / Redemption Road, Barrington, NH 03825, Prepared for: TURBOCAM International, 607 Calef Highway, Barrington, NH 03825. Prepared by: Emanuel Engineering, Inc. revised January 13, 2020.

Applicant/Owner Certification Statement and Signature

By signing this application the signer certifies that the information contained in or otherwise submitted with this application is true, complete and not misleading to the best of the signer's knowledge and belief.

By signing this application the signer understands that submission of false, incomplete or misleading information is grounds for:

- Denying the application;

- Revoking any application that is granted based on the information; and

- If the signer is acting as or on behalf of a listed engineer as defined in Env-C 502.10, debarring the listed engineer from the roster.

By signing the application the signer and applicant agree to comply with all applicable rules and conditions of this permit and to not discharge to the holding tank(s) until written permission from the department has been received.

_____ _____

Signature of Facility Owner or Contact **Date**

Inspection & Maintenance Plan

TURBOCAM International
Route 9 / Redemption Road (Site)
Barrington, NH 03825

September 13, 2019
Revised: January 6, 2020

Prepared for: TURBOCAM International
607 Calef Highway
Barrington, NH 03825

Prepared by: Emanuel Engineering, Inc.
Bruce Scamman, PE
118 Portsmouth Avenue, Suite A202
Stratham, NH 03885
EEI Project # 19-020

Contact: TURBOCAM International
Eliot Wilkins
607 Calef Highway
Barrington, NH 03825
(603)978-5030
Eliot.Wilkins@turbocam.com

Introduction

Emanuel Engineering, Inc. has prepared the following Stormwater Management System Inspection & Maintenance Plan for **Route 9 / Redemption Road, Barrington, New Hampshire**. The intent of this plan is to provide the client, **TURBOCAM International,** with a list of procedures that document the inspection and maintenance requirements of the Stormwater Management System for this site.

The following inspection and maintenance program is necessary in order to keep the Stormwater Management System functioning properly. By following the enclosed procedures the owners and property management will be able to maintain the functional design of the Stormwater Management System and maximize its ability to remove sediment and other contaminants from site generated stormwater runoff.

Stormwater Management System Components

The Stormwater Management System has been designed to mitigate both the quantity and quality of site-generated stormwater runoff. As a result, its design included the following elements:

Non-Structural Best Management Practices (BMP's)

Non-Structural best management practices (BMP's) are designed to minimize and/or remove contaminants before they enter the stormwater collection system. Several of these BMP's have been incorporated into the Stormwater Management System including pavement sweeping, reduced use of road salt, and litter/trash removal. These types of BMP's are a highly effective initial treatment measure for reducing stormwater pollutant loading.

Closed Drainage Collection and Piping System

The closed drainage system is designed to collect and convey stormwater runoff from the paved areas and infiltrate stormwater back into the water table. Stormwater is collected by catch basins located throughout the site. Key catch basins are designed with deep sumps to provide storage areas for sediment and control sediment outflow.

Source Control & Maintenance

The following are the areas to be accomplished and maintained because this site is considered a "High Load Area" from the maintenance and repair of vehicles on site. This plan is to provide to **TURBOCAM International** with an outline of best management practices (BMPs) and operations that are prohibited on site. Descriptions and maintenance requirements of BMPs and operations in this section were taken from the *New Hampshire Stormwater Manual, Volume 2* dated December 2008 (http://des.nh.gov/organization/commissioner/pip/publications/wd/documents/wd-08-20b.pdf). A log is attached at the end of this document for the owner or designee to confirm that best management practices are occurring on-site.

Street Sweeping

Street sweeping is a pollution prevention practice that removes sediment, debris and trash that accumulates along streets and roads from winter sanding practices and everyday use. Street sweeping is often performed to improve aesthetics and to reduce the export of sand to the drainage network and receiving waters. In addition to sediment, debris and trash, other pollutants that may be minimized through street sweeping include some nutrients, oxygen-demanding substances and trace metals.

Maintenance - At a minimum, street sweeping should be performed once annually for traditional pavement, preferably as soon as possible after the snow melts to reduce the amount of sand, grit, and debris and associated pollutants from winter sanding from entering surface waters.

Snow & Ice Management

To address the concerns associated with the application of chlorides and other deicing materials, NHDES recommends the development of a Road Salt and Deicing Minimization Plan when a development will create one acre or more of pavement, including parking lots and roadways. The plan should address the policies that the development will keep in place to minimize salt and other deicer use after the project has been completed. A component of the plan should include tracking the use of salt and other deicers for each storm event and compiling salt use data annually. See below for deicing application rate guidelines.

New Hampshire does not yet have salt reduction guidance, but recommends following the guidelines available in reference cited below.
Minnesota Snow and Ice Control handbook, available at:
http://www.mnltap.umn.edu/publications/handbooks/documents/snice_2012_wb.pdf

Deicing Application Rate Guidelines

24' of pavement (typical two-lane road)

These rates are not fixed values, but rather the low end of a range to be selected and adjusted by an agency according to its local conditions and experience.

			Lbs/ two-lane mile			
Pavement Temp. (°F) and Trend (↑↓)	Weather Condition	Maintenance Actions	Salt Prewetted/ Pretreated With Salt Brine	Salt Prewetted/ Pretreated With Other Blends	Dry Salt*	Winter Sand (abrasives)
>30° ↑	Snow	Plow, treat intersections only	80 (40/lane mile)	70	100*	Not recommended
	Frz. rain	Apply chemical	80 – 160	70 – 140	100 – 200*	Not recommended
30° ↓	Snow	Plow & apply chemical	80 – 160	70 – 140	100 – 200*	Not recommended
	Frz. rain	Apply chemical	150 – 200	130 – 180	180 – 240*	Not recommended
25 - 30° ↑	Snow	Plow & apply chemical	120 – 160	100 – 140	150 – 200*	Not recommended
	Frz. rain	Apply chemical	150 – 200	130 – 180	180 – 240*	Not recommended
25 - 30° ↓	Snow	Plow & apply chemical	120 – 160	100 – 140	150 – 200*	Not recommended
	Frz. rain	Apply chemical	160 – 240	140 – 210	200 – 300*	400
20 - 25° ↑	Snow or frz. rain	Plow & apply chemical	160 – 240	140 – 210	200 – 300*	400
20 - 25° ↓	Snow	Plow & apply chemical	200 – 280	175 – 250	250 – 350*	Not recommended
	Frz. rain	Apply chemical	240 – 320	210 – 280	300 – 400*	400
15 - 20° ↑	Snow	Plow & apply chemical	200 – 280	175 – 250	250 – 350*	Not recommended
	Frz. rain	Apply chemical	240 – 320	210 – 280	300 – 400*	400
15 - 20° ↓	Snow or Frz. rain	Plow & apply chemical	240 – 320	210 – 280	300 – 400*	500 for frz. rain
0 to 15° ↑↓	Snow	Plow, treat with blends, sand hazardous areas	Not recommended	300 – 400	Not recommended	500 – 750 spot treat as needed
< 0°	Snow	Plow, treat with blends, sand hazardous areas	Not recommended	400 – 600**	Not recommended	500 – 750 spot treat as needed

*Dry salt is not recommended. It is likely to blow off the road before it melts ice.

**A blend of 6 – 8 gal/ton $MgCl_2$ or $CaCl_2$ added to NaCl can melt ice as low as -10°.

Bioretention System (Bioswale, Bioswale Forebay, & Bioswale-ISR System)

A bioretention system is a type of filtration BMP designed to collect and filter moderate amounts of stormwater runoff using conditioned planting soil beds, gravel beds and vegetation within shallow depressions. The bioretention system may be designed with an underdrain, to collect treated water and convey it to discharge, or it may be designed to infiltrate the treated water directly to the subsoil. Bioretention cells are capable of reducing sediment, nutrients, oil and grease, and trace metals.

Maintenance -

- Systems should be inspected at least twice annually, and following any rainfall event exceeding 2.5 inches in a 24 hour period, with maintenance or rehabilitation conducted as warranted by such inspection.
- Pretreatment measures should be inspected at least twice annually, and cleaned of accumulated sediment as warranted by inspection, but no less than once annually.
- Trash and debris should be removed at each inspection.
- At least once annually, system should be inspected for drawdown time. If bioretention system does not drain within 72-hours following a rainfall event, then a qualified professional should assess the condition of the facility to determine measures required to restore filtration function or infiltration function (as applicable), including but not limited to removal of accumulated sediments or reconstruction of the filter media.
- Vegetation should be inspected at least annually, and maintained in healthy condition, including pruning, removal and replacement of dead or diseased vegetation, and removal of invasive species.

See "Checklist for Inspection of Bioswales", and "Inspection and Maintenance of Guidance for Bioswales" located at the end of this document.

Conveyance Swales

Conveyance swales are stabilized channels designed to convey runoff at non-erosive velocities. They may be stabilized using vegetation, riprap, or a combination, or with an alternative lining designed to accommodate design flows while protecting the integrity of the sides and bottom of the channel. Conveyance channels may provide incidental water quality benefits, but are not specifically designed to provide treatment.

Maintenance -

- Grassed channels should be inspected periodically (at least annually) for sediment accumulation, erosion, and condition of surface lining (vegetation or riprap). Repairs, including stone or vegetation replacement, should be made based on this inspection.
- Remove sediment and debris annually, or more frequently as warranted by inspection.
- Mow vegetated channels based on frequency specified by design. Mowing at least once per year is required to control establishment of woody vegetation. It is recommended to cut grass no shorter than 4 inches.

Outlet Protection

Outlet protection is typically provided at stormwater discharge conduits from structural best management practices to reduce the velocity of concentrated stormwater flows to prevent scour and minimize the potential for downstream erosion. Outlet protection is also provided where conduits discharge runoff into an in-ground stormwater management practice (e.g., pond or swale) to prevent scour where flow enters the BMP.

Maintenance - Inspect the outlet protection annually for damage and deterioration. Repair damages immediately.

Manicured Landscaped Areas – Litter Control

Landscaped areas tend to filter debris and contaminates that may block drainage systems and pollute the surface and ground waters.

Maintenance -

- Litter control and lawn maintenance involves removing litter such as trash, leaves, lawn clippings, pet wastes, oil and chemicals from streets, parking lots, and lawns before materials are transported into surface water.
- Litter control should be implemented as part of the daily grounds maintenance program.

Manicured Landscaped Areas – Fertilizer Management

Fertilizer management involves controlling the rate, timing, and method of fertilizer application so that the nutrients are taken up by the plants, thereby reducing the chance of polluting the surface and ground waters. Fertilizer management can be effective in reducing the amounts of phosphorus and nitrogen in runoff from landscape areas, particularly lawns. Soil tests should be conducted to determine fertilizer application rates.

Maintenance

- Have the soil tested by your landscaper or local Soil Conservation Service for nutrient requirements and follow the recommendations.
- Do not apply fertilizer to frozen ground.
- Clean up any fertilizer spills
- Do not allow fertilizer to be broadcast into water bodies.
- When fertilizing a lawn, water thoroughly, but do not create a situation where water runs off the surface of the lawn.

Catch Basin Cleaning

Catch basins collect stormwater, primarily from parking lots. The stormwater often contains sediment and contaminants. The catch basin sumps trap sediment, trace metals, nutrients, and hydrocarbons.

Maintenance -

- Remove leaves and debris from catch basin grates on an as-needed basis.
- Sumps should be cleaned on an annual basis to protect water quality. Catch basin debris shall be disposed of at a solid waste disposal site.

PreTX Pretreatment (Pretreatment Catch Basins)

Routine annual inspection and period maintenance is required for the effective operation of PreTX pretreatment catch basins.

The following maintenance items are required as needed for the PreTX pretreatment catch basins. The PreTX pretreatment catch basins (PT1, PT2, and PT3) are located upstream of the bioswale-ISR systems (BR1 and BR2). The PreTX catch basins are located prior to discharge to the bioswale-ISR systems and provide pretreatment for sediment, trash, and debris. The PreTX catch basins are deep sumps with a combination of baffle, weir, and screened grate to provide rigorous pretreatment intended to minimize maintenance within the bioswale-ISR systems. Overflow structures drain to the subsurface infiltration system located below the parking area. Maintenance elements included removal of trash and debris, sediment, periodic inspection of invasive species, and verification of proper infiltration and time to drain.

Subsurface Infiltration System

The subsurface infiltration system (SI1) is to be inspected at the center drywell with access via a solid manhole cover. Inspection access is located within the roadway in the event that inspections indicated failure to drain as designed.

See the "Checklist for Inspection of Catch Basins and Infiltration System", and "Inspection and Maintenance for Catch Basins and Roadway Infiltration" located at the end of this document.

Culverts, Drainage Pipes, and Roof Drains

Culverts, drainage pipes, and roof drains convey stormwater away from buildings, walkways, and parking areas.

Maintenance – Culverts, drainage pipes, and roof drains should be inspected semi-annually, or more often as needed, for accumulation of debris and structural integrity. Leaves and other debris should be removed from the inlet and outlet to insure the functionality of drainage structures. Debris shall be disposed of on the site where it will not concentrate back at the drainage structures or at a solid waste disposal facility.

Temporary Sediment Trap

A sediment trap is a small, temporary ponding area to intercept sediment-laden runoff from small disturbed areas. Intercepted runoff is retained long enough to allow for settling of the coarser sediment particles. A sediment trap is usually installed in a drainage swale or channel, at a storm drain or culvert inlet, or other points of discharge from a disturbed area.

Maintenance –

- Sediment traps should be inspected at least weekly during construction and after every storm (or daily during prolonged rainfall periods), to insure that they are functioning properly and are not damaged. Repairs should be made immediately.
- Sediment should be removed and the trap restored to original capacity when sediment has accumulated to 50% of the original volume.
- The materials removed from the trap should be properly disposed of and stabilized.
- Sediment trap outlets should be examined at the time of inspection for any damage, and repaired immediately if any such damage is observed.
- Geotextile fabric or stone used around a pipe-outlet riser should be checked periodically and replaced when the material has become clogged with sediment.

Invasive Species

Should any invasive species grow in the stormwater management practices, refer to the "Control of Invasive Plants" document provided after the Maintenance Logs of this document.

General Cleanup

Upon completion of the project, the contractor shall remove all temporary stormwater erosion control structures (i.e., temporary stone check dams, silt fence, etc.). Any sediment deposits remaining in place after the silt fence or filter barrier is no longer required shall be dressed to conform with the existing grade, prepared, and seeded. Culverts and catch basins shall be cleaned, removing any sediment that may have accumulated during construction.

Inspection & Maintenance Log

The following pages contain an Inspection & Maintenance Log and blank copy of the Stormwater Management System's Inspection & Maintenance Log. These forms are provided to **TURBOCAM International** with the inspection and maintenance of the **Route 9 / Redemption Road, Barrington, New Hampshire** Stormwater Management System.

Proper inspection, maintenance, and repair are key elements in maintaining a successful stormwater management program on a developed property. Programs should be implemented at all of the owner's properties to ensure permit compliance and the highest quality of stormwater discharge. Routine inspection can also reduce the potential for deterioration of infrastructure or a catastrophic event, like a breach of detention pond.

For the purpose of this Stormwater Management Program, a significant rainfall event is considered an event of three (3) inches in a 24-hour period or 0.5 inches in a one-hour period. It is anticipated that a short, intense event is likely to have a higher potential of erosion for the site than a longer, high volume event.

Applicant	Date
Town Planner	Date
Town Manager	Date

FILE: P:\2019 JOBS\19-020 CFA TurboCam - Civil Rt. 9\Documents\Permits\Alteration of Terrain\AoT Permit 01-07-20\Backup\19. Stormwater Maintenance Plan 01-07-20.doc

Stormwater Management System Inspection & Maintenance Log

TURBOCAM International at Route 9 / Redemption Road, Barrington, NH 03825

BMP/System Component	Date Inspected	Inspector	Cleaning/Repair Needed (*List Items/Comments)*	Date of Cleaning/Repair	Performed By

INSPECTION AND MAINTENANCE GUIDANCE FOR CATCH BASINS AND ROADWAY INFILTRATION

Routine annual inspection and period maintenance is required for the effective operation of pretreatment catch basins and infiltration systems. Deep sump catch basins provide pretreatment for the removal of sediment and debris prior to infiltration within the roadway stone reservoir. The following guidance is provided for corrective action and maintenance should a catch basin or infiltration system function inadequately. The Responsible Parties must maintain the catch basins and infiltration system in accordance with the minimum design standards. This page provides guidance on maintenance activities that are typically required for catch basins and infiltration system, along with a suggested frequency for each activity. Individual catch basins and infiltration systems may have more, or less, frequent maintenance needs, depending upon a variety of factors including: the occurrence of large storm events; overly wet or dry (i.e., drought) regional hydrologic conditions; and any changes or redevelopment in the upstream land use.

Activity	**Frequency**
Check to insure the catch basin or infiltration system drain completely after storm events	Annual Inspection
Check inlets and outlets for debris and high efficiency	
Check to see that the catch basin or infiltration system is draining completely within 48 hours after a rain event	
Check to see that the catch basin or infiltration system does not contain more than 6 inches accumulated materials in which case cleaning is required	
Check to see that the catch basin or infiltration system is not full of trash, debris, and floatables	
Inspect inlets and outlets to ensure good condition and no evidence of deterioration	
Repair or replace any damaged structural parts, inlets, outlets, grates	
If inspections indicate failure to drain within 72 hours then additional inspections of infiltration system may be warranted.	As Needed
Clean out inspection and cleaning of infiltration system can be conducted by vactor truck for removal of accumulated sediment and debris.	
This process is to be repeated until infiltration and proper drainage has been restored.	

CHECKLIST FOR INSPECTION OF CATCH BASINS AND INFILTRATION SYSTEM

Regular inspection and maintenance should **not** be necessary for the effective operation of infiltration system. The following guidance is provided for corrective action and maintenance should a infiltration system function inadequately.

Location:
Inspector:
Date: Time: Site Conditions:
Date Since Last Rain Event:

Inspection Items	Satisfactory (S) or Unsatisfactory (U)		Comments/Corrective Action
1. Complete drainage of catch basin or infiltration system within 48 hours after rain event	**S**	**U**	
2. Sediment accumulation on catch basin or infiltration system, 6" or less	**S**	**U**	
3. Clogging of catch basin or infiltration system surface	**S**	**U**	
4. Catch basin and infiltration system clear of debris	**S**	**U**	
5. Catch basin or infiltration system chamber empty of trash, debris, and floatables	**S**	**U**	
6. Clogging of inlet/outlet structures	**S**	**U**	
7. Cracking, spalling, or deterioration of concrete	**S**	**U**	
8. Inspection of cleanouts for infiltration system as needed if failure to drain	**S**	**U**	
9. Animal burrows	**S**	**U**	
10. Undesirable vegetation	**S**	**U**	
11. Undesirable odors	**S**	**U**	
12. Complaints from residents	**S**	**U**	
13. Public hazards noted	**S**	**U**	

Corrective Action Needed	Due Date
1.	
2.	
3.	

INSPECTION AND MAINTENANCE GUIDANCE FOR BIOSWALES

Maintenance of bioswales can typically be performed as part of standard landscaping. Regular inspection and maintenance is critical to the effective operation of bioswales to insure they remain clear of leaves and debris and free draining. This page provides guidance on maintenance activities that are typically required for these systems, along with the suggested frequency for each activity. Individual systems may have more, or less, frequent maintenance needs, depending on a variety of factors including the occurrence of large storm events, overly wet or dry (i.e., drought), regional hydrologic conditions, and the upstream land use.

INSPECTION ACTIVITIES

The most common maintenance activity is the removal of leaves from the system and bypass structure. Visual inspections are routine for system maintenance. This includes looking for standing water, accumulated leaves, holes in the soil media, signs of plant distress, and debris and sediment accumulation in the system. Mulch and/or vegetation coverage is integral to the performance of the system, including infiltration rate and nutrient uptake. Vegetation care is important to system productivity and health.

ACTIVITY	FREQUENCY
A record should be kept of the time for the system to drain completely after a storm event. The system should drain completely within 72 hours.	After every major storm in the first few months, then annually
Check to insure the filter surface remains well draining after storm events. **Remedy**: If filter bed is clogged, draining poorly, or standing water covers more than 15% of the surface 48 hours after a precipitation event, then remove top few inches of discolored material. Till or rake remaining material as needed.	
Check inlets and outlets for leaves and debris. **Remedy**: Rake in and around the system to clear it of debris. Also, clear the inlet and overflow if obstructed.	
Check for animal burrows and short circuiting in the system. **Remedy:** Soil erosion from short circuiting or animal boroughs should be repaired when they occur. The holes should be filled and lightly compacted	
Check to insure the filter bed does not contain more than 2 inches accumulated material **Remedy:** Remove sediment as necessary. If 2 inches or more of filter bed has been removed, replace media with either mulch or a (50% sand, 20% woodchips, 20% compost, 10% soil) mixture.	
During extended periods without rainfall, inspect plants for signs of distress. **Remedy:** Plants should be watered until established (typical only for first few months) or as needed thereafter.	
Inspect inlets and outlets to ensure good condition and no evidence of deterioration. Check to see if high-flow bypass is functioning. **Remedy:** Repair or replace any damaged structural parts, inlets, outlets, sidewalls.	Annually
Check for robust vegetation coverage throughout the system. **Remedy:** If at least 50 % vegetation coverage is not established after 2 years, reinforcement planting should be performed.	
Check for dead or dying plants, and general long term plant health. **Remedy:** This vegetation should be cut and removed from the system. If woody vegetation is present, care should be taken to remove dead or decaying plant material. Separation of herbaceous vegetation rootstock should occur when over-crowding is observed.	As needed

CHECKLIST FOR INSPECTION OF BIOSWALES

Location: Inspector:
Date: Time: Site Conditions:
Date Since Last Rain Event:

Inspection Items	Satisfactory (S) or Unsatisfactory (U)		Comments/Corrective Action
1. Initial Inspection After Planting and Mulching			
Plants are stable, roots not exposed	**S**	**U**	
Surface is at design level, typically 4" below overpass	**S**	**U**	
Overflow bypass / inlet (if available) is functional	**S**	**U**	
2. Debris Cleanup (1 time a year)			
Litter, leaves, and dead vegetation removed from the system	**S**	**U**	
Prune perennial vegetation	**S**	**U**	
3. Standing Water (1 time a year & after large storm events during first year)			
No evidence of standing water after 72 hours	**S**	**U**	
4. Short Circuiting & Erosion (1 time a year)			
No evidence of animal burrows or other holes	**S**	**U**	
No evidence of erosion	**S**	**U**	
5. Drought Conditions (as needed)			
Water plants as needed	**S**	**U**	
Dead or dying plants	**S**	**U**	
6. Overflow Bypass / Inlet Inspection (1 time a year & after large storm events during first year)			
No evidence of blockage or accumulated leaves	**S**	**U**	
Good condition, no need for repair	**S**	**U**	
7. Vegetation Coverage (1 time a year)			
50% coverage established throughout system by first year	**S**	**U**	
Robust coverage by year 2 or later	**S**	**U**	
8. Mulch Depth (if applicable) (1 time a year)			
Mulch at original design depth after tilling or replacement	**S**	**U**	
9. Vegetation Health (1 time a year)			
Dead or decaying plants removed from the system	**S**	**U**	

Corrective Action Needed	Due Date
1.	
2.	
3.	

CONTROL OF INVASIVE PLANTS

During maintenance activities, check for the presence of invasive plants and remove in a safe manner as described on the following pages. They should be controlled as described on the following pages.

Background:

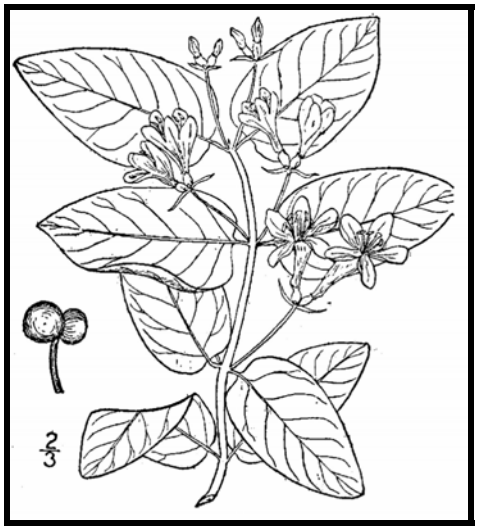
Invasive plants are introduced, alien, or non-native plants, which have been moved by people from their native habitat to a new area. Some exotic plants are imported for human use such as landscaping, erosion control, or food crops. They also can arrive as "hitchhikers" among shipments of other plants, seeds, packing materials, or fresh produce. Some exotic plants become invasive and cause harm by:

- becoming weedy and overgrown;
- killing established shade trees;
- obstructing pipes and drainage systems;
- forming dense beds in water;
- lowering water levels in lakes, streams, and wetlands;
- destroying natural communities;
- promoting erosion on stream banks and hillsides; and
- resisting control except by hazardous chemical.

UNIVERSITY of NEW HAMPSHIRE COOPERATIVE EXTENSION

Methods for Disposing Non-Native Invasive Plants

Prepared by the Invasives Species Outreach Group, volunteers interested in helping people control invasive plants. Assistance provided by the Piscataquog Land Conservancy and the NH Invasives Species Committee. Edited by Karen Bennett, Extension Forestry Professor and Specialist.



Tatarian honeysuckle
Lonicera tatarica
USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 3: 282.

Non-native invasive plants crowd out natives in natural and managed landscapes. They cost taxpayers billions of dollars each year from lost agricultural and forest crops, decreased biodiversity, impacts to natural resources and the environment, and the cost to control and eradicate them.

Invasive plants grow well even in less than desirable conditions such as sandy soils along roadsides, shaded wooded areas, and in wetlands. In ideal conditions, they grow and spread even faster. There are many ways to remove these non-native invasives, but once removed, care is needed to dispose the removed plant material so the plants don't grow where disposed.

Knowing how a particular plant reproduces indicates its method of spread and helps determine the appropriate disposal method. Most are spread by seed and are dispersed by wind, water, animals, or people. Some reproduce by vegetative means from pieces of stems or roots forming new plants. Others spread through both seed and vegetative means.

Because movement and disposal of viable plant parts is restricted (see NH Regulations), viable invasive parts can't be brought to most transfer stations in the state. Check with your transfer station to see if there is an approved, designated area for invasives disposal. This fact sheet gives recommendations for rendering plant parts non-viable.

Control of invasives is beyond the scope of this fact sheet. For information about control visit www.nhinvasives.org or contact your UNH Cooperative Extension office.

New Hampshire Regulations

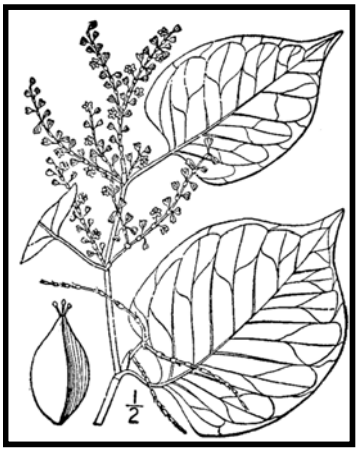
Prohibited invasive species shall only be disposed of in a manner that renders them nonliving and nonviable. (Agr. 3802.04)

No person shall collect, transport, import, export, move, buy, sell, distribute, propagate or transplant any living and viable portion of any plant species, which includes all of their cultivars and varieties, listed in Table 3800.1 of the New Hampshire prohibited invasive species list. (Agr 3802.01)

How and When to Dispose of Invasives?

To prevent seed from spreading remove invasive plants before seeds are set (produced). Some plants continue to grow, flower and set seed even after pulling or cutting. Seeds can remain viable in the ground for many years. If the plant has flowers or seeds, place the flowers and seeds in a heavy plastic bag "head first" at the weeding site and transport to the disposal site. The following are general descriptions of disposal methods. See the chart for recommendations by species.

Burning: Large woody branches and trunks can be used as firewood or burned in piles. For outside burning, a written fire permit from the local forest fire warden is required unless the ground is covered in snow. Brush larger than 5 inches in diameter can't be burned. Invasive plants with easily airborne seeds like black swallow-wort with mature seed pods (indicated by their brown color) shouldn't be burned as the seeds may disperse by the hot air created by the fire.



Japanese knotweed
Polygonum cuspidatum
USDA-NRCS PLANTS Database / Britton, N.L., and A. Brown. 1913. *An illustrated flora of the northern United States, Canada and the British Possessions*. Vol. 1: 676.

Bagging (solarization): Use this technique with softer-tissue plants. Use heavy black or clear plastic bags (contractor grade), making sure that no parts of the plants poke through. Allow the bags to sit in the sun for several weeks and on dark pavement for the best effect.

Tarping and Drying: Pile material on a sheet of plastic and cover with a tarp, fastening the tarp to the ground and monitoring it for escapes. Let the material dry for several weeks, or until it is clearly nonviable.

Chipping: Use this method for woody plants that don't reproduce vegetatively.

Burying: This is risky, but can be done with watchful diligence. Lay thick plastic in a deep pit before placing the cut up plant material in the hole. Place the material away from the edge of the plastic before covering it with more heavy plastic. Eliminate as much air as possible and toss in soil to weight down the material in the pit. Note that the top of the buried material should be at least three feet underground. Japanese knotweed should be at least 5 feet underground!

Drowning: Fill a large barrel with water and place soft-tissue plants in the water. Check after a few weeks and look for rotted plant material (roots, stems, leaves, flowers). Well-rotted plant material may be composted. A word of caution- seeds may still be viable after using this method. Do this before seeds are set. This method isn't used often. Be prepared for an awful stink!

Composting: Invasive plants can take root in compost. Don't compost any invasives unless you know there is no viable (living) plant material left. Use one of the above techniques (bagging, tarping, drying, chipping, or drowning) to render the plants nonviable before composting. Closely examine the plant before composting and avoid composting seeds.

Be diligent looking for seedlings for *years* in areas where removal and disposal took place.

Suggested Disposal Methods for Non-Native Invasive Plants

This table provides information concerning the disposal of removed invasive plant material. If the infestation is treated with herbicide and left in place, these guidelines don't apply. Don't bring invasives to a local transfer station, unless there is a designated area for their disposal, or they have been rendered non-viable. This listing includes wetland and upland plants from the New Hampshire Prohibited Invasive Species List. The disposal of aquatic plants isn't addressed.

<table>
<tr><th>Woody Plants</th><th>Method of Reproducing</th><th>Methods of Disposal</th></tr>
<tr><td rowspan="2">Norway maple
(Acer platanoides)
European barberry
(Berberis vulgaris)
Japanese barberry
(Berberis thunbergii)
autumn olive
(Elaeagnus umbellata)
burning bush
(Euonymus alatus)
Morrow's honeysuckle
(Lonicera morrowii)
Tatarian honeysuckle
(Lonicera tatarica)
showy bush honeysuckle
(Lonicera x bella)
common buckthorn
(Rhamnus cathartica)
glossy buckthorn
(Frangula alnus)</td><td rowspan="2">Fruit and Seeds
  </td><td>Prior to fruit/seed ripening
Seedlings and small plants
▪ Pull or cut and leave on site with roots exposed. No special care needed.
Larger plants
▪ Use as firewood.
▪ Make a brush pile.
▪ Chip.
▪ Burn.</td></tr>
<tr><td>After fruit/seed is ripe
Don't remove from site.
▪ Burn.
▪ Make a covered brush pile.
▪ Chip once all fruit has dropped from branches.
▪ Leave resulting chips on site and monitor.</td></tr>
<tr><td rowspan="2">oriental bittersweet
(Celastrus orbiculatus)
multiflora rose
(Rosa multiflora)</td><td rowspan="2">Fruits, Seeds, Plant Fragments
  </td><td>Prior to fruit/seed ripening
Seedlings and small plants
▪ Pull or cut and leave on site with roots exposed. No special care needed.
Larger plants
▪ Make a brush pile.
▪ Burn.</td></tr>
<tr><td>After fruit/seed is ripe
Don't remove from site.
▪ Burn.
▪ Make a covered brush pile.
▪ Chip – only after material has fully dried (1 year) and all fruit has dropped from branches. Leave resulting chips on site and monitor.</td></tr>
</table>

Non-Woody Plants	Method of Reproducing	Methods of Disposal
garlic mustard *(Alliaria petiolata)* spotted knapweed *(Centaurea maculosa)* ▪ Sap of related knapweed can cause skin irritation and tumors. Wear gloves when handling. black swallow-wort *(Cynanchum nigrum)* ▪ May cause skin rash. Wear gloves and long sleeves when handling. pale swallow-wort *(Cynanchum rossicum)* giant hogweed *(Heracleum mantegazzianum)* ▪ Can cause major skin rash. Wear gloves and long sleeves when handling. dame's rocket *(Hesperis matronalis)* perennial pepperweed *(Lepidium latifolium)* purple loosestrife *(Lythrum salicaria)* Japanese stilt grass *(Microstegium vimineum)* mile-a-minute weed *(Polygonum perfoliatum)*	**Fruits and Seeds**	**Prior to flowering** Depends on scale of infestation Small infestation ▪ Pull or cut plant and leave on site with roots exposed. Large infestation ▪ Pull or cut plant and pile. (You can pile onto or cover with plastic sheeting). ▪ Monitor. Remove any re-sprouting material. **During and following flowering** Do nothing until the following year or remove flowering heads and bag and let rot. Small infestation ▪ Pull or cut plant and leave on site with roots exposed. Large infestation ▪ Pull or cut plant and pile remaining material. (You can pile onto plastic or cover with plastic sheeting). ▪ Monitor. Remove any re-sprouting material.
common reed (*Phragmites australis*) Japanese knotweed *(Polygonum cuspidatum)* Bohemian knotweed *(Polygonum x bohemicum)*	**Fruits, Seeds, Plant Fragments** Primary means of spread in these species is by plant parts. Although all care should be given to preventing the dispersal of seed during control activities, the presence of seed doesn't materially influence disposal activities.	**Small infestation** ▪ Bag all plant material and let rot. ▪ Never pile and use resulting material as compost. ▪ Burn. **Large infestation** ▪ Remove material to unsuitable habitat (dry, hot and sunny or dry and shaded location) and scatter or pile. ▪ Monitor and remove any sprouting material. ▪ Pile, let dry, and burn.

January 2010

BMP Location Plan

Dated January 7, 2020