NEW HAMPSHIRE ALTERATION OF TERRAIN PERMIT APPLICATION FOR THE ANTRIM WIND PARK PROJECT IN ANTRIM, NEW HAMPSHIRE

Submitted to:

NEW HAMPSHIRE SITE EVALUATION COMMITTEE

Submitted by:

Antrim Wind Energy
155 Fleet St.
Portsmouth, NH 03801-0065

Prepared by:

TRC

10 Maxwell Drive

Clifton Park, NY 12065

January 2012

Application Elements

(From Item #7 of the Application Form)

- **Copy of the signed application form**

  Exhibit 1

- **Copy of the check**

  Exhibit 2

- **Copy of the USGS map with the property boundaries outlined (1" = 2000' scale)**

  Exhibit 3

- **Copy of the proof of delivery to the municipality**

  The Town of Antrim Board of Selectmen will be provided with a copy of the entire SEC application at the time it is filed. The Applicant will file a copy of the return receipt or other documentation of receipt by the Town with the SEC and has reserved Appendix 8 of the SEC application for this purpose.

- **Application checklist**

  Exhibit 4

- **Narrative of the project with a summary table of the peak discharge rate for the off-site discharge points**

  See Stormwater Management Narrative (Exhibit 5)

- **Web GIS printout – with the "Surface Water Impairments" layer turned on**

  Exhibit 3

- **Web GIS printouts – with the AoT screening layers turned on**

  Exhibit 3

- **NHB letter**

  Exhibit 6

- **The Web Soil Survey Map with the project's watershed outlined**

  See Civil Design Drawings (Exhibit 7A of the SEC Application) Sheet WS-3

- **Aerial Photograph (1" = 2000' scale with the site boundaries outlined)**

  Exhibit 3

- **Photographs representative of the site**

  Exhibit 7

- **Groundwater Recharge Volume calculations**

  See Stormwater Management Narrative (Exhibit 5) Section 4.1.2

- **BMP worksheets**

  See Stormwater Management Narrative (Exhibit 5) Appendix B
- **Drainage analysis**

  See Stormwater Management Narrative (Exhibit 5) Appendix A
- **Riprap apron or other energy dissipation or stability calculations**

  See Stormwater Management Narrative (Exhibit 5) Appendix C
- **Site Specific Soil Survey report**

  Not applicable—waiver requested. See Exhibit 8 for Waiver Request
- **Infiltration Feasibility Report**

  Not applicable— See Stormwater Management Narrative (Exhibit 5) Section 4.1.3
- **Registration and Notification Form for Storm Water Infiltration to Groundwater**

  Not applicable— See Stormwater Management Narrative (Exhibit 5) Section 4.1.3
- **Inspection and maintenance manual with long term maintenance agreements**

  See Post-Construction Stormwater Management, Inspection, & Maintenance Plan (Exhibit 9).
- **Source control plan**

  Not applicable, per NH DES Environmental Fact Sheet WDDWGB225: The project will use best management practices (BMPs) so that there will be no contact between regulated substances and precipitation/ runoff from any portion of the site.
- **One set of design plans on 24" x 36" white paper**

  See Civil Design Drawings (Exhibit 7A of the SEC Application)
- **Pre- & post-development color coded soil plans**

  See Civil Design Drawings (Exhibit 7A of the SEC Application) Sheet WS-3
- **Pre- & post-development drainage area plans on 24" x 36" white paper**

  See Civil Design Drawings (Exhibit 7A of the SEC Application) Sheets WS1 & WS2
- **100-year Floodplain Report**

  Not applicable. The project is not within a 100-year floodplain.

Exhibit 1

Application Form

ALTERATION OF TERRAIN APPLICATION

R.S.A. 485-A:17
Department of Environmental Services - Water Division
29 Hazen Drive, PO Box 95
Concord, New Hampshire 03302-0095

Application Date: 1/31/12

File Number (DES use): ________________

ANTRIM WINDPARK	212-27, 30, & 34; 235-14; 236-1; 236-2; 239-1
Name of Project	Map & Lot Number
ANTRIM, NH	HILLSBOROUGH
Location of Project (town)	County

Check Project Type:

☐Excavation ☒Commercial ☐School ☐Agricultural ☐Landfill
☐Residential ☐Golf Course ☐Municipal ☐Land Conversion ☐Other *specify*

1. Applicant Information (the desired permit holder)

ANTRIM WIND ENERGY, LLC	generate@eolian-energy.com	
Name of Applicant	Email address (optional)	
JOHN B. KENWORTHY	603-570-4842	
Contact Name	Telephone Number	
155 FLEET ST.	603-457-0065	
Mailing Address	Fax Number	
PORTSMOUTH	NH	03801-4050
City/Town	State	Zip Code

2. Property Owner Information

SEE EXHIBIT 11		
Name of Property Owner (if different from applicant)	Email address (optional)	
Contact Name	Telephone Number	
Mailing Address	Fax Number	
City/Town	State	Zip Code

3. Agent Information

TRC	JSBROWN@TRCSOLUTIONS.COM	
Agent Company	Email address	
JOSHUA BROWN	518-688-3146	
Contact Name	Telephone Number	
10 MAXWELL DR.	518-348-1194	
Mailing Address	Fax Number	
CLIFTON PARK	NY	12065
City/Town	State	Zip Code

4. Provide a *short* description of the project below (do not reply "see attached"):

Construct 10 wind turbines and associated infrastructure, including access roads, a collection system, an operations and maintenance building, and a substation in Antrim, NH.

5. If any work was done prior to receiving a permit, describe it below:

Installation of metorological tower (2009).

6. Please answer the questions below – no field should be left blank, if not applicable, state "NA":

A. Date a copy of the *complete* application was sent to the municipality[1]: 1/31/12

B. Total area of disturbance: 2,522,124square feet

C. Additional impervious cover as a result of the project: 500,940 square feet (use "-" sign for a reduced amount)
Total impervious cover for project: 500,940 square feet

D. Total Undisturbed cover: 566,280 _____ square feet

E. Number of lots proposed: 0

F. Total length of roadway: 21,120 feet

G. Select plan type submitted: ☐ Land Conversion ☐ Excavation, grading, and reclamation
☐ Steep Slope ☒ Detailed Development Plan

H. Name of receiving waters: NORTH BRANCH RIVER; WILLARD POND, GREGG LAKE, UNNAMED STREAM
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: Gregg Lake: Chlorophyll-a; Phosphorus (total) (enter "NA" if no pollutants are listed). For more guidance see:
http://des.nh.gov/organization/divisions/water/wmb/tmdl/documents/onestop_gis_wgc_ref_guide.pdf

I. Name of designated river: NA (enter "NA" if not within a designated river corridor)
Date a copy of the *complete* application was sent to the Local Advisory Committee (LAC) [1]: NA

J. Name of species identified by the Natural Heritage Bureau as threatened or endangered or of concern:
See attached NHB letter of 8/3/11.

K. Cut volume N/A cubic feet and fill volume N/A cubic feet within the 100-year floodplain
(enter "NA" if not within the floodplain)

L. Is the project within a Water Supply Intake Protection Area (WSIPA)? YES☐ NO☒
Is the project within a Groundwater Protection Area (GPA)? YES☐ NO☒
Are the well setbacks outlined in *Env-Wq 1508.02 being met*? YES☒ NO☐

Guidance document titled "*Using DES'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.

M. Is the project a High Load area, in accordance with Env-Wq 1502.26? YES☐ NO☒
If yes, specify type of high load land use or activity? _____

N. Other State Permits/Approvals

Total wetland impact 8,349 square feet. Enter "NA" if no wetland permit required.
Status of filing or if permitted, state permit number: pending (e.g., NA, not yet applied, pending, 2010-0001)

Status of shoreland application or if permitted, state permit number: NA (e.g., NA, not yet applied, pending, 2010-0002).
If project is in protected shoreland but exempt, state "exempt" and state why exempt.

Status of large or small community well approval or if approved, state date of the Well Siting Approval letter: NA
(e.g., NA, not yet applied, pending, 12/1/2010).

Status of large groundwater withdrawal application or if approved, state permit number: NA (e.g., NA, not yet applied, pending, LGWP-2010-0001).

List other DES permits required and state their status? Pending: SEC Permit; 401 Water Quality; Dredge and Fill

O. If you have had a pre-application meeting with AoT staff, state his or her name(s): CRAIG RENNIE *Attach a copy of the meeting minutes*

[1] – A copy of the application, including all items in #7, must be sent to the applicable municipality and, if applicable, to the local rivers management advisory committee (LAC) at the same time (or before) filing this AoT permit application. Provide proof of delivery is required, in accordance with Env-Wq 1503.05(c)(4).

7. In the order listed, please include the following as part of your application, if applicable:

CHECK ALL THAT APPLY

Loose:

- ☒ This signed application form – des.nh.gov/organization/divisions/water/aot/index.htm
- ☒ 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)
- ☒ A copy of the pre-application meeting minutes, if you had a pre-application meeting with AoT staff.

Bind in a report in the following order:

- ☒ Copy of the signed application form
- ☒ Copy of the check
- ☒ Copy of the USGS map with the property boundaries outlined (1" = 2,000' scale)
- ☒ Copy of the proof of delivery to the municipality and LAC, if applicable (e.g., copy of the certified mail receipts)
- ☒ Application Checklist – des.nh.gov/organization/divisions/water/aot/index.htm
- ☒ 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 - www2.des.state.nh.us/gis/onestop/
- ☒ Web GIS printouts – with the AoT screening layers turned on - www2.des.state.nh.us/gis/onestop/
- ☒ 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)
- ☐ Registration and Notification Form for Storm Water Infiltration to Groundwater (for underground systems only, including drywells and trenches) – (http://des.nh.gov/organization/divisions/water/dwgb/dwspp/gw_discharge)
- ☒ Inspection and maintenance manual with long term maintenance agreements
- ☐ 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 – submitted as a separate report:

- ☐ All information required in Env-Wq 1503.09

8. Signature Required:

[signature]	1/26/17	John B. Kenworthy
Signature of applicant or applicant's agent	Date	Name of applicant or applicant's agent
Signature of owner or owner's agent, if different from applicant	Date	Name of owner or owner's agent, if different from applicant

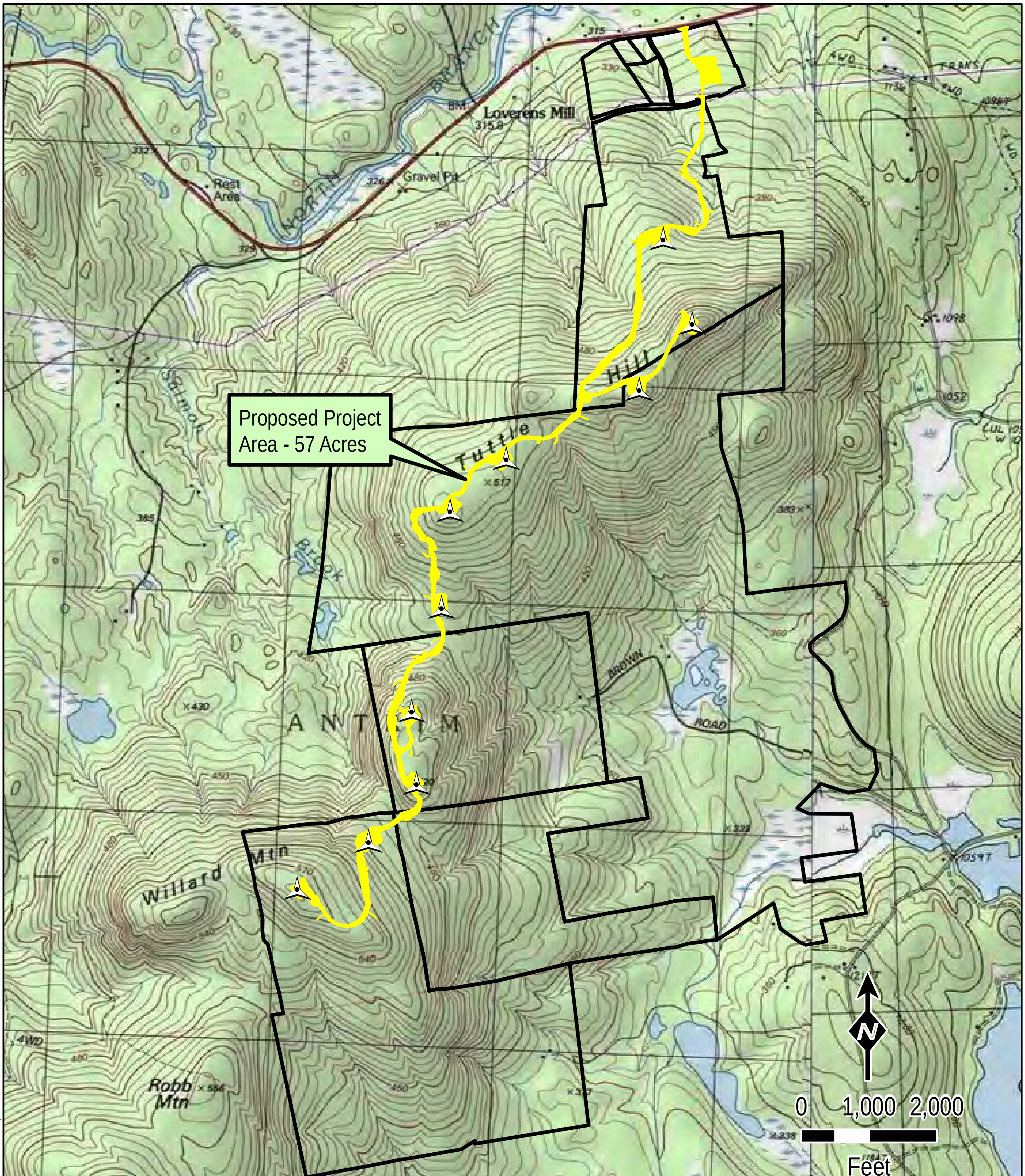
Note: In accordance with Env-Wq 1503.20(e), within one week after permit approval, the applicant shall submit a copy of all approved documents to the department in PDF format on a CD.

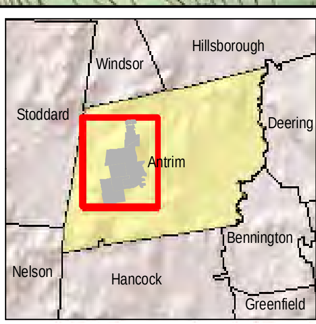
Exhibit 2

Copy of the Application Check

Exhibit 3

Project Mapping





Legend

Proposed WTG

Proposed Project Area - 57 Acres

Project Parcels

EOLIAN RENEWABLE ENERGY

ANTRIM WIND ENERGY PROJECT

354 KEENE ROAD, ANTRIM, NH

Project Location Map

Produced by: TRC | 1/3/2012

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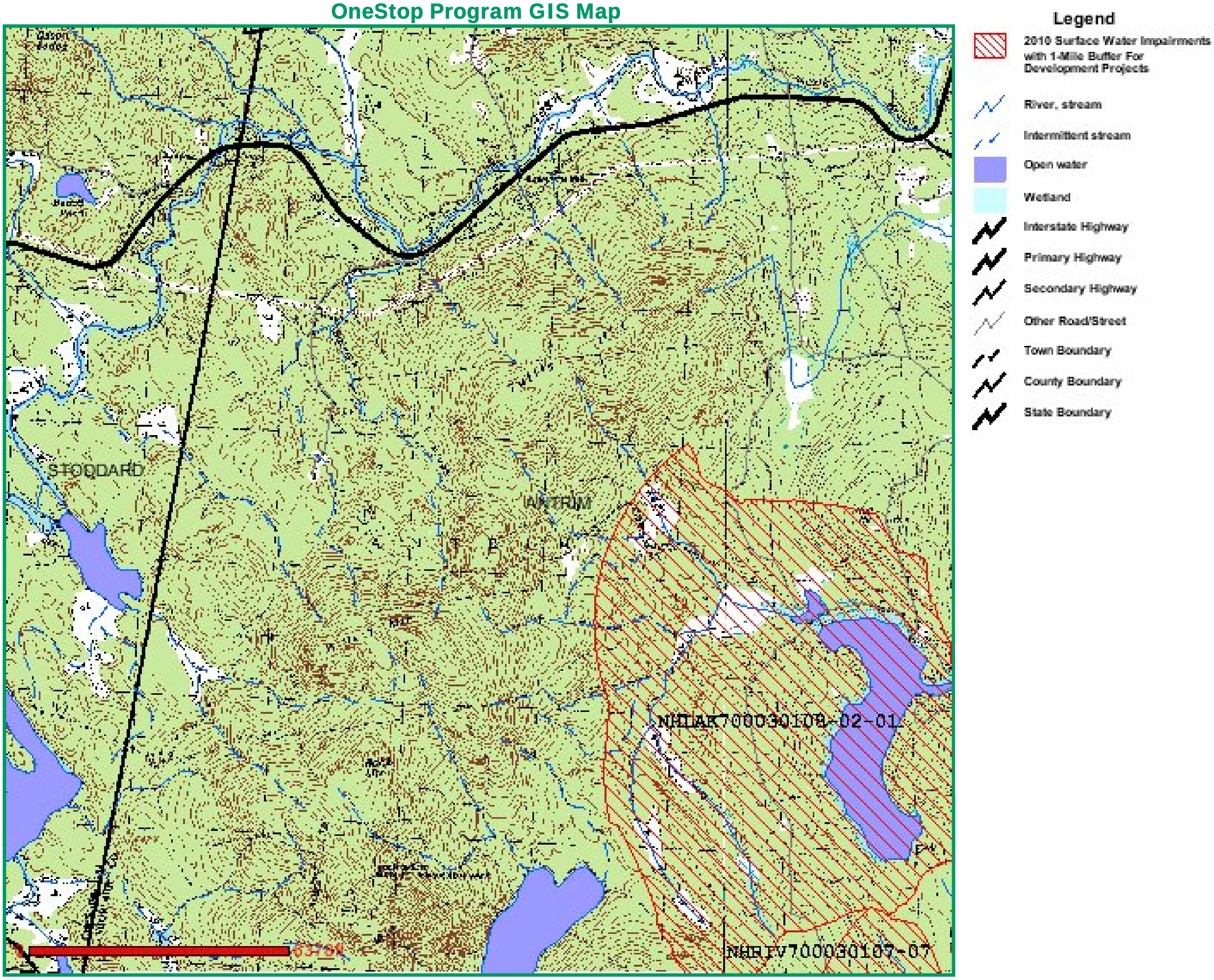
New Hampshire Department of Environmental Services

OneStop Program GIS

OneStop Program GIS Map

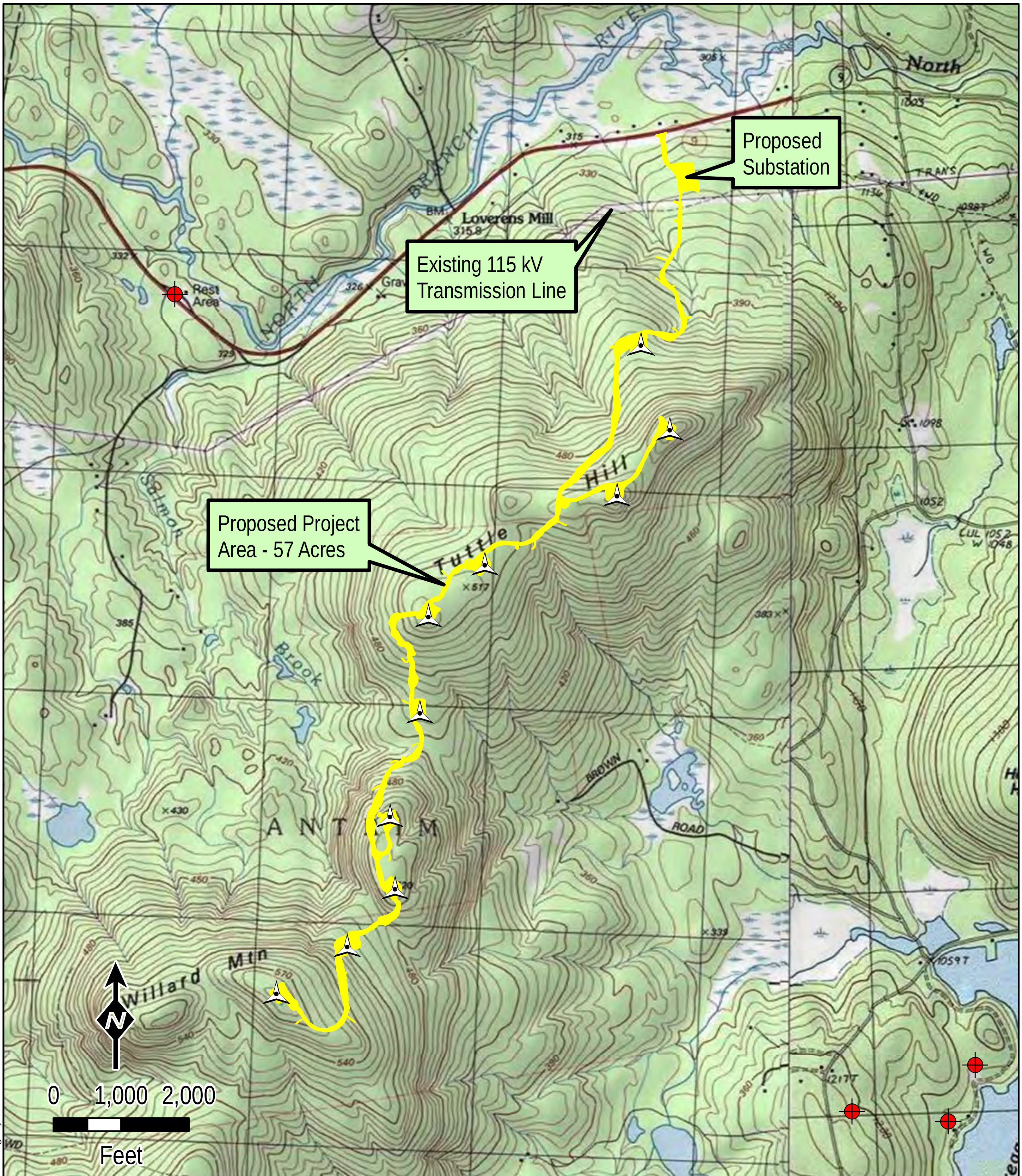


Map Scale = 1 : 60951 (1" = 1 miles or 5079 feet)

The information contained in the OneStop Program GIS is the best available according to the procedures and standards of each of the contributing programs and of the GIS. The different programs are regularly maintaining the information in their databases. As a result, the GIS may not always provide access to all existing information, and it may occasionally contain unintentional inaccuracies. The Department can not be responsible for the misuse or misinterpretation of the information presented by this system.

Map prepared 1/3/2012 9:56:30 AM

Developed in cooperation with NH GRANIT



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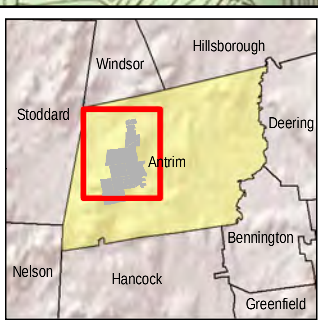


Legend

- Proposed WTG
- Proposed Project Area
- Public Water Supply
- Wellhead Protection Area *
- Aquifer Saturated Thickness Contour *
- Aquifer Transmissity *

** no features within map extents*

*** There are no Groundwater Classification Areas GAA or GA1 or Water Supply Intakes in Antrim*

EOLIAN RENEWABLE ENERGY

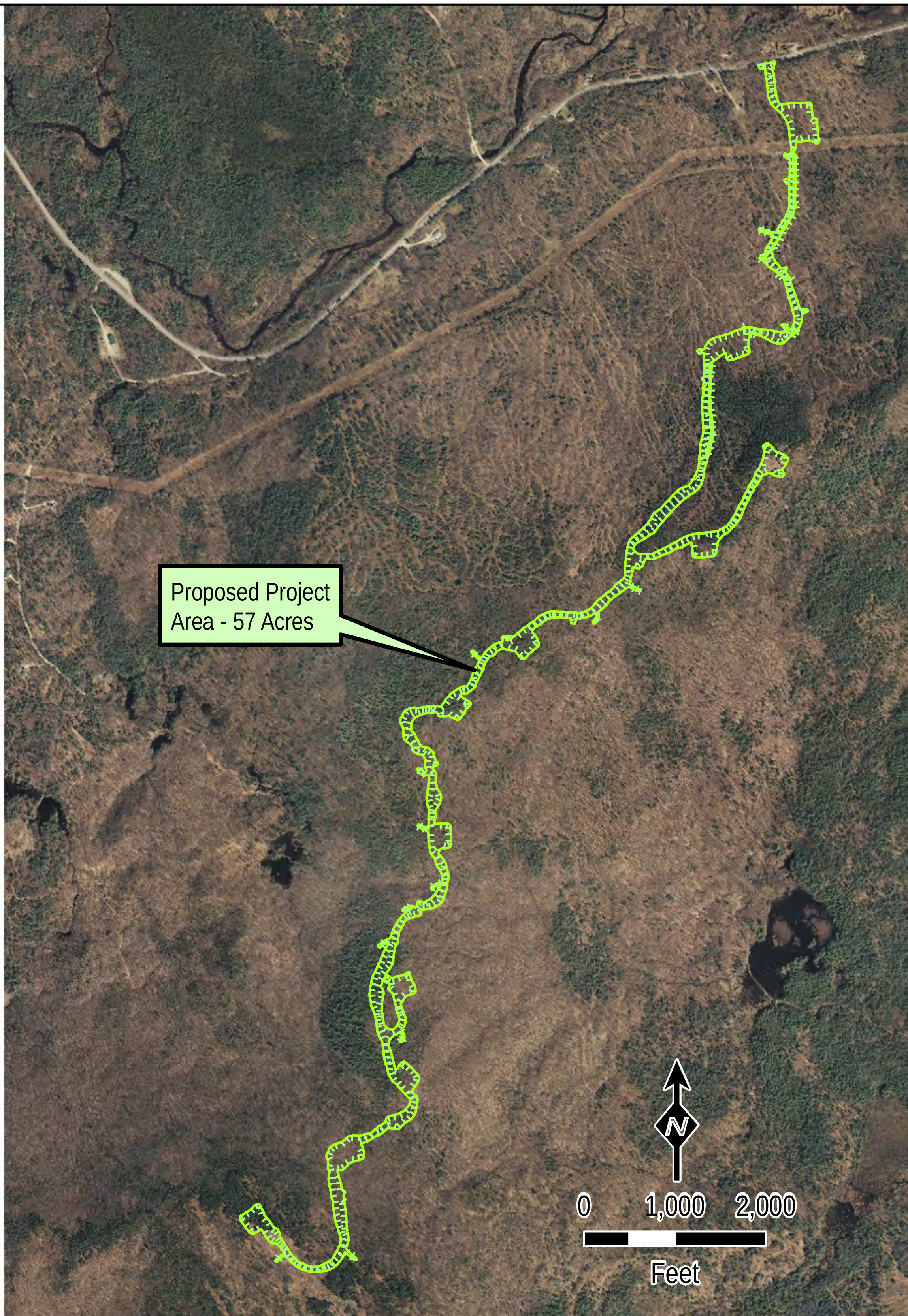
ANTRIM WIND ENERGY PROJECT

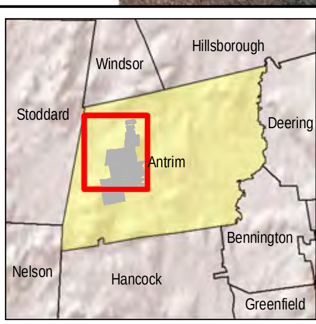
354 KEENE ROAD, ANTRIM, NH

Project Area with NH DES Alteration of Terrain Screening Layers

Produced by: TRC | 1/23/2012

Source: NH Department of Environmental Services Drinking Water and Groundwater Bureau





Legend

Proposed Project Area - 57 Acres

EOLIAN RENEWABLE ENERGY

ANTRIM WIND ENERGY PROJECT

354 KEENE ROAD, ANTRIM, NH

Project Location Map

Produced by: TRC | 1/23/2012

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Exhibit 4

Application Checklist

ALTERATION OF TERRAIN
APPLICATION CHECKLIST
R.S.A. 485-A:17
Department of Environmental Services - Water Division
29 Hazen Drive, PO Box 95
Concord, New Hampshire 03302-0095

CHECK the box if the item has been provided and please be sure to review your application, prior to submitting. If an item does not apply, please state why. Don't forget to review section 7 on the application form as well.

Checks for the design plans:

☒ Plans printed on 34 - 36" by 22 - 24" on 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. ***N/A per ENV-WQ 1508.19(a)***
☐ Check to see if any proposed ponds need state Dam permits. For more information see:
h*ttp://des.nh.gov/organization/divisions/water/dam/documents/damdef.pdf* ***N/A; no ponds proposed.***

Provide the following details on the plans, as applicable:
☒ Typical roadway x-section
☐ Detention basin with inverts noted on the outlet structure ***N/A; no ponds proposed.***
☒ 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. ***N/A; no storm drain inlets utilized.***
☒ Hay bale barriers
☒ Stone check dams
☒ Gravel construction exit
☒ The treatment BMPs proposed
☐ Any innovative BMPs proposed ***None proposed.***

Construction Sequence/Erosion Control Notes
☒ Note that perimeter controls shall be installed prior to earth moving operations.
☒ 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.

Checks for the design plans (continued):

☒ 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."
For example: *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.
For example: *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 November 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. ***N/A; no lots proposed.***

Checks for the drainage analyses: *Please double-side your 8 ½" x 11" sheets where possible. However, please do not reduce the text such that more than one page fits on one side.*

☒ PE stamp

☒ 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.

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, does this number make sense? 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. Does this number make sense?

Checks for the drainage analyses (continued):

☒ 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. ***N/A; no artificial berms proposed.***
☐ Check the outlet structure proposed and make sure it matches that modeled ***N/A; none proposed.***
☒ Check to see if the total areas in the pre and post analyses are same
☒ Check to make sure the correct rainfall amount and NRCS storm type was modeled (Coos, Carroll, and Grafton counties are Type II, all others Type III).

Checks for the 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 sub-catchment boundaries
☒ Roadway station numbers
☒ Culverts and other conveyance structures

Checks for the 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 ***N/A; soil survey not done,waiver requested.***
☒ 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: ***N/A; project is not an extraction project.***

☐ 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.htm

Exhibit 5

Stormwater Management Narrative

ANTRIM WINDPARK PROJECT

Alteration of Terrain
Permit Application

Stormwater Management Narrative

Submitted to:

New Hampshire Department of Environmental Services

prepared by

TRC
249 Western Avenue
Augusta, ME 04330
(207) 621-7000

Project # 186317

January 2011

STATE OF NEW HAMPSHIRE
DANIEL
T.
BUTLER
No. 8105
LICENSED
PROFESSIONAL ENGINEER

1/24/12

TABLE OF CONTENTS

APPENDICES

1.0 ANTRIM WINDPARK PROJECT

The proposed Antrim Windpark Project is a wind energy generation facility to be located in Antrim, New Hampshire. The project will include construction of ten (10) wind turbine generators, a substation, and associated access roads, crane pads, and stormwater management facilities. The proposed site is generally linear, running approximately north to south along the ridge top of Tuttle Hill and Willard Mountain and spanning several individually owned parcels. The site will be accessed from State Route 9 (Keene Road). Approximately 4.0 miles of gravel road will be constructed.

Within the project area, approximately 57.9 acres will be disturbed during construction. Following construction, approximately 46.4 acres will be restored and revegetated including roadway shoulders and side slopes, and much of the construction pad area at the tower locations. Approximately 11.5 acres will remain as permanently developed area including the access road, substation yards, crane pads, and tower foundations.

2.0 EXISTING CONDITIONS

2.1 Land Cover

The project site is predominantly unimproved and heavily wooded. The ridge can be accessed in several places by rough trails or 4WD roads. Evidence of past logging activities is clear in some areas. Public Service of New Hampshire (PSNH) maintains a right-of-way that crosses the northerly part of the site.

2.2 Soils

Soil information used in stormwater analysis was obtained from the Natural Resources Conservation Service (NRCS) medium intensity soil survey of Hillsborough County, New Hampshire. The information was downloaded from the NRCS Web Soil Survey website. See Appendix D for copies of this information. The Hydrologic Soil Groups (HSG) of the soils are classified by Technical Release TR-55 of the Natural Resources Conservation Service (formerly the Soil Conservation Service). Table 1 below summarizes the soils identified on or adjacent to the site.

Table 1. Site Soils

Symbol	Soil Type	HSG
77C, 77D	Marlow stony loam	C
160B, 160C	Tunbridge-Lyman-Monadnock complex, stony	C
161C, 161D	Lyman-Tunbridge rock outcrop complex	C
399	Rock outcrop	D

2.3 Site Topography/Hydrology

The proposed project generally follows the ridge top from Tuttle Hill to Willard Mountain, with the land sloping primarily northwesterly and southeasterly. Slopes range from approximately 2 percent at the ridge top and saddles to approximately 50 percent along the steeper natural slopes. Elevations across the area that would be developed for the windpark range from approximately 1,050 to 1,900 feet above mean sea level. The project will run along the divide between four (4) watersheds. Currently runoff flows overland northwesterly to North Branch River, northeasterly to an unnamed watershed, southeasterly to Gregg Lake, and southerly to Willard Pond.

The two-foot contour information shown on the plans is based on an aerial survey performed by James W. Sewell Co. in 2011.

2.4 Downstream Waterbodies

As shown on the Watershed Plan, the project site straddles four (4) watersheds. Runoff from Watershed 1W flows northwesterly, under Route 9, to the North Branch River. Runoff from Watershed 2W flows northeasterly to an unnamed stream, which continues to its confluence with North Branch River at Steels Pond, and then on to Franklin Pierce Lake. Runoff from Watershed 3W flows southeasterly to Gregg Lake. And finally, runoff from Watershed 4W flows southerly to Willard Pond. In addition, several wetlands, vernal pools, and intermittent streams were identified on site during a natural resources survey performed by TRC in 2011.

3.0 PROPOSED DEVELOPMENT DESCRIPTION

This project involves the construction of a 10-turbine wind energy generation facility, including a 1.64 acre crushed stone yard area (PSNH substation, collector substation, and Operation & Maintenance building parking area), a 4.0 mile crushed stone access road, 10 graveled wind turbine generator construction areas, a 34kV collector system, and an associated stormwater management system.

3.1 Alterations to Land Cover

The substation yards are located approximately at STA. 8+00. They are located adjacent to the existing PSNH transmission corridor to minimize the amount of clearing required for the new lines. Both yards will be constructed to PSNH standards, with an open-graded crushed stone surface, two (2) control houses, an Operations & Maintenance building, and associated parking area and stormwater management facilities. The entire yard will be surrounded with a security fence.

An access road, with two (2) spur roads, will be constructed from the project entrance at Route 9 to its termination at WTG-10. The total length will be approximately 4.0 miles. The first 900 feet of the road will be paved, per PSNH standards, and the remainder will be constructed of crushed stone. From STA. 0+00 to STA. 37+12, the road will be constructed with a width of 16 feet. The remainder of the road will have a construction width of 34 feet to accommodate the crane. The road will have a maximum slope of 12%, with the exception of two short lengths where it reaches 13%. It will be graded with a mono-pitched cross slope of 2%. Side slopes will be constructed at a slope of 2H:1V to minimize the footprint. Upon completion of construction, the road width will be reduced to 16 feet along its entire length by revegetating a 9-foot shoulder on both sides. The side slopes will also be permanently stabilized and revegetated.

A gravel wind turbine construction area will be built at each WTG location. These areas will be approximately 0.9 acres, and will provide room for a 6000 square foot crane pad, a 20-foot diameter concrete tower foundation, and a turbine assembly area. These locations will also be used as staging and laydown areas during construction. After construction, a significant portion of each of these areas will be revegetated, leaving the 6,000 square foot crane pad as impervious area. See Sheet C-20 for a reclamation detail.

A 34.5 kV collector system will be constructed from the turbines to the collector sub-station. Beginning at WTG-10, the collector system will be constructed underground, under the roadway. It will remain underground to STA. 64+50. From STA. 64+50 to STA. 42+00 the collector system will run overhead, roughly parallel to the road. At STA. 42+00 it goes back underground to STA. 36+30, while in the vicinity of WTG-1. It then returns to overhead to STA. 11+15. From STA. 11+15, it will run underground to the substation.

3.2 Alterations to Natural Drainage Ways

The stormwater management system has been designed to minimize impacts to the existing natural drainage ways. Because much of the road will be constructed on the crest of the ridge, overall drainage patterns and directions of flow will remain generally the same. A permeable road base (rock sandwich) will be provided at appropriate locations to maintain sheet flow conditions and provide hydraulic connectivity between wetlands. Where steep roadway/ditch slopes will impede the effectiveness of a permeable road base, culverts have been spaced every 100 feet in order to minimize channelization of runoff. In addition, oversized culverts will be installed in locations where animals are likely to want to cross under the roadway.

The roadway will cross two (2) identified streams. The first stream crossing is located near STA. 2+25. In this area, the road is in approximately 10 feet of cut. This is necessary in order to meet the maximum slope requirement of 12% for construction and delivery vehicles. As such, impacts to the stream cannot be avoided. The second crossing is located near STA. 18+75. For this crossing, culvert SD-4 will be a 3-sided concrete box culvert designed to comply with NHDES stream crossing guidelines. A culvert cross section detail is provided on Sheet C-24.

The project has been laid out to minimize wetland impacts to the greatest extent practicable. However, construction will result in approximately 0.189 acres of wetland impacts.

4.0 REGULATORY REQUIREMENTS

This Stormwater Management Narrative has been prepared as part of an NHDES Alteration of Terrain Permit application. As such, the project has been designed to meet the standards set forth in the "New Hampshire Code of Administrative Rules, Chapter Env-Wq 1500 Alteration of Terrain", as well as the "New Hampshire Stormwater Manual (Volumes 1, 2, and 3) –December 2008".

4.1 Runoff Quantity Control

Design requirements for runoff quantity control are included in Chapter 2 of the New Hampshire Stormwater Manual (SWM).

4.1.1 Watershed Analysis: Pre- v. Post-development

Because this project will result in a relatively small amount of new impervious area distributed between four (4) expansive, largely undeveloped watersheds, it is unlikely that the development will result in a significant increase in runoff compared to the pre-development condition. When this issue was discussed during the pre-application meeting held with NHDES, it was concluded that a curve number (CN) comparison between the pre- and post-development conditions would be an acceptable substitute for a formal stormwater runoff analysis. The study demonstrated that neither the composite CNs nor the times of concentration (Tc) will change as a result of this project, in any of the four (4) watersheds. Therefore, it is reasonable to conclude that construction of the windpark will not result in an increase in peak rates of runoff from the site.

See Appendix A for CN and Tc calculations. Minutes from the pre-application meeting are included in this application.

4.1.2 Groundwater Recharge Volume

The Groundwater Recharge Volume (GRV) criterion is a standard implemented to protect groundwater resources. The volume is calculated by the equation:

$$GRV = A_i * R_d$$

Where A_i represents the Effective Impervious Area created by the development. Because this project will create no effective impervious area, the GRV is also zero, and no infiltration is required.

4.1.3 Infiltration Feasibility Report

No infiltration is proposed for this project. Therefore an Infiltration Feasibility report has not been prepared.

4.1.4 Channel Protection

The Channel Protection criterion is intended to prevent erosion and sedimentation of streams, downstream receiving waters, and wetlands. Based on the Watershed Analysis described in section 4.1.1 above, the 2-year, 24-hour post-development peak flow rates and runoff volumes will not increase significantly from the pre-development condition as a result of the project. Therefore, no runoff quantity controls are required.

4.1.5 Peak Control

The Peak Control criterion is intended to prevent off-site impacts due to an increase in the peak rate of runoff resulting from a development. Based on the Watershed Analysis described in section 4.1.1 above, the 10-year and 50-year, 24-hour post-development peak flow rates are not anticipated to increase significantly as a result of the project. Therefore, no runoff detention facilities are required.

4.2 Runoff Quality Control

Design requirements for runoff quality control are included in Chapters 2 and 4 of the New Hampshire Stormwater Manual (SWM). However, since the New Hampshire stormwater regulations do not address the atypical nature of a linear project such as this, the Maine Stormwater Management (Chapter 500) rules were used as a secondary reference. Under Chapter 500 rules for a linear project, a stormwater management system is required to capture and treat the water quality volume of runoff from at least 75% of the impervious area and 50% of the total developed area. For this project, the impervious area and developed area are equal because all revegetated areas will return to a natural condition (no landscaping).

To address the applicable water quality treatment standards for this project, the stormwater management system incorporates a combination of roadway buffers, ditch turnout buffers, treatment swales, and bioretention basins. The proposed stormwater management system provides treatment for the water quality volume of runoff from 81% of the new impervious area.

4.2.1 Water Quality Volume

The Water Quality Volume (WQV) is the amount of runoff from a rainfall event that is required to be captured and treated by a pollutant removal device. The volume is based on the first one (1) inch of rainfall. For this project, WQV calculations are required for the water quality swales and bioretention basins. Refer to Appendix B for all WQV calculations.

4.2.2 Water Quality Flow

The Water Quality Flow (WQF) is the flow rate used for sizing flow-through water quality treatment devices. Calculation of the WQF is based on the WQV. For this project, WQF calculations are required for the water quality swales. Refer to Appendix B for all WQF calculations.

4.2.3 Roadway Buffers

Roadway buffers are the preferred method of water quality treatment for this project. Since the access roads are the predominant design feature, roadway buffers are well-suited to the site. They are especially suitable because of their low-impact, low maintenance characteristics. The design criteria for roadway buffers include; 1) a length of 50 feet for a single lane of traffic, and 2) a maximum slope of 20%. The buffers delineated on the design plans incorporate 9 feet of revegetated shoulder and 20 feet of embankment slope (roughly 60% of the total length). Due to the challenging topography and remoteness of the site, the criteria are not always strictly adhered to. For example, in some cases the crane pad area must drain across the road or the buffer slope somewhat exceeds 20%. In these situations the buffer length has been increased to 75 feet.

4.2.4 Ditch Turnout Buffers

Ditch turnout buffers are proposed for areas where the roadway is not approximately parallel to the contours, but the slopes are suitable for buffers. These are reasonably low impact and low maintenance devices. The design criteria for this method are vague and difficult to interpret, so engineering judgment was used in the design. The buffer length is determined by the size of the contributing area, with a slope no greater than 15%. The level spreader length must be from 20 to 50 feet in length. Refer to Appendix B for ditch turnout buffer calculations.

4.2.5 Small Pervious Area Buffers

Small pervious area buffers are proposed for wind turbine locations where the revegetated construction area can be graded to act as a buffer for the permanent impervious areas. These locations include WTG-2, 5, 9, and 10. The design criteria in the NHSWM were followed.

4.2.6 Treatment Swales

Treatment swales are proposed in areas that are too steep for buffers. Design of these swales is a multi-step procedure. First, the WQV and WQF were calculated using the methodologies described in the guidance documents. Second, a worksheet was created using *FlowMaster V8i* software. For this analysis, swale parameters and discharge (WQF) were used as input. The software applies the Manning's formula to calculate the normal depth and velocity. Finally an appropriate length was used with the velocity such that the minimum residence time of 10 minutes was achieved. The swales were then checked for adequate capacity and stability. A HydroCAD model was created for this step using the design parameters determined in the first part of the process, and the 10-year, 24-hour storm. Because the contributing subcatchments (designated with an SW-_) are relatively small, a minimum Tc of 6 minutes was assumed. Refer to Appendix B for treatment swale calculations.

4.2.7 Bioretention Basins

Two (2) bioretention basins are proposed for the substation yard area. The WQV was calculated using the methodology described in the guidance documents, and an appropriately sized basin was designed. Both basins will be underdrained to avoid any potential infiltration difficulties. Refer to Appendix B for bioretention basin calculations.

4.3 Conveyance and Stabilization

Conveyance features utilized in this project include culverts, permeable road base, and open roadside ditches. All conveyance features were designed in accordance with the appropriate criteria described in the guidance documents. Subcatchments delineated for conveyance analysis are designated with a number such as 1.3, which indicates that it is the 3rd subcatchment delineated in watershed WS-1.

4.3.1 Culvert Sizing

HydroCAD software (see section 5.1 below) was used to determine appropriate culvert sizes. Contributing subcatchments were delineated on the Stormwater Management Plan and modeled with the analysis software. The 25-year, 24-hour storm event was used as the basis for culvert sizing. A minimum diameter of 15 inches was used in most cases, in order to minimize the blockage potential between inspection and maintenance visits. However, 12 inch culverts are proposed for the steeper areas where they are placed every 100 feet. See Appendix D for the *HydroCAD* reports.

4.3.2 Permeable Road Base

Permeable road base is a specialized road based constructed of coarse rock that allows runoff to pass freely under the road. The runoff is discharged as sheet flow, minimizing or eliminating the need for culverts. Permeable road base is proposed for: 1) reasonably flat lengths of roadway where bypass is less likely, 2) areas where the road is in a fill condition to minimize channelization of runoff, and 3) areas where the roadway crosses wetlands and maintaining hydrologic/hydraulic connectivity is desirable. Refer to Sheet C-24 for details.

4.3.3 Outlet Protection

Plunge pools are the predominant means of outlet protection proposed for this project. They have been designed based on the guidance in Section 4-6.6 of the NHSWM. While the level spreaders are intended as part of a water quality device, they also perform as outlet protection. In addition, permanent check dams are provided for certain channel outlets where anticipated design flows are small. Refer to Sheet C-24 for details.

4.3.4 Ditch protection

Armoring for the roadside channels is proposed where steep slopes will lead to erosive velocities under vegetated conditions. As a general rule, any channel steeper than 8% will not be capable of supporting vegetation. The 10-year, 24-hour storm event was used as the basis for stabilization design. After the steep slopes were identified, contributing subcatchments were modeled in *HydroCAD* to determine the design flow. Then, a worksheet was created using *FlowMaster V8i* software. The input parameters included the ditch cross-section, longitudinal and side slopes, design flow, and a roughness coefficient. The roughness coefficient of the riprap was calculated using guidance found in the Maine DEP "Erosion and Sediment Control BMPs – March, 2003", Section E-6 – Riprap Waterways. The software then calculated the normal depth and velocity of the flow. The roughness coefficient (based on the D_{50}) was selected based on the flow depth, and the velocity was calculated. Refer to Appendix D for the HydroCAD reports and Appendix C for riprap sizing calculations.

4.3.5 Slope Stabilization

An embankment slope of 2H:1V was used during site design in order to minimize the footprint and impacts of the project. These slopes will be stabilized with erosion control blankets, loam, and seed. See Sheet C-22 for details.

5.0 RUNOFF ANALYSIS

As described in section 4.1.1 above, runoff analysis for this project does not include a standard comparison of pre-development v. post-development conditions. However, a Stormwater Management Plan (post-development) has been prepared in order to illustrate the design assumptions applied when developing the water quality treatment and conveyance features described above.

The Stormwater Management Plan for the proposed project includes 2-foot contours, cover types, soil groups, watershed boundaries, time of concentration flow lines, existing features, and drainage way as well as the locations of proposed buildings, roads, other above ground structures and the stormwater management system.

Stormwater analysis calculations are provided in Appendix D. The analyses include computations for determining the times of concentration and travel times for the subcatchments, as well as the HydroCAD output which includes composite CN calculations, peak discharge calculations for the design storms, and routing calculations.

5.1 Methodology

Stormwater runoff was estimated using HydroCAD, Version 9.0. HydroCAD is based on methodologies developed by the United States Department of Agriculture Soil Conservation Service (USDA-SCS), namely *Urban Hydrology for Small Watersheds*, Technical Release 55 and Technical Release 20 (TR-55 and TR-20), in conjunction with other hydrologic and hydraulic calculations. Based on site specific information, including land cover, slopes, soils, and rainfall data, the program estimates inflow and outflow hydrographs for a watershed. The USDA-SCS is now called the Natural Resources Conservation Service (USDA-NRCS).

5.1.1 Rainfall Data

Storm events modeled for the runoff analyses assumed precipitation events with a 24-hour duration having a Type III rainfall distribution, with return frequencies of 2, 10, 25, and 50 years. The corresponding precipitation depths for these storm events are 2.8, 4.2, 5.0, and 5.6 inches, respectively. The rainfall distribution type is based on Figure B-2 of the NRCS TR-55 manual (1986). Rainfall amounts are based on Appendix A of the NHSWM, Volume 2 (2008).

5.1.2 Curve Number Computations

Runoff curve numbers are based on the land cover and soils of the project site. Cover types for the site were determined from aerial photography and site visits, and are indicated on the Watershed and Stormwater Management Plans.

The soil classifications and hydrologic soil groups within the area to be developed were obtained from the Natural Resources Conservation Service (NRCS) medium intensity soil survey of Hillsborough County, New Hampshire. The information was downloaded from the NRCS Web Soil Survey website. See Appendix D for copies off this information. The Hydrologic Soil Groups (HSG) of the soils are classified by Technical Release TR-55 of the NRCS (formerly the Soil Conservation Service).

The runoff curve numbers are taken from a look-up table within the *HydroCAD* program. According to software documentation, this table is based on Table 2-2 of the SCS/NRCS TR-55 publication. The only curve number that is not referenced directly from TR55 is the one used for the substation yard. An engineering study was conducted by TRC Environmental Corporation (TRC), detailing the "typical" cross section and surface materials of a substation yard covered with gravel and crushed stone to calculate its permeability rate. The study was reviewed by John Simon, a USDA-NRCS engineer in Maine. The conclusions of this report were used as the basis of an agreement between CMP and MDEP that a CN value of 55 may be used for substations constructed on soils mapped as HSG "A", "B", "C", and a CN value of 60 must be used when the area is mapped as HSG "D". A copy of the letter agreement is included at the back of the stormwater calculations (Appendix D).

5.1.3 Time of Concentration Calculations

Time of concentration was calculated using USDA-SCS TR-55 methodologies for each sub-catchment considering the hydrologic flow lengths, slope, vegetative cover, surface roughness, and each stage-storage relationship. The type and length of each hydrologic flow line for determining time of concentration and travel times in the area to be developed are indicated on the Stormwater Management Plans. The maximum sheet flow length used for this analysis was 100 feet. Shallow concentrated flow lengths varied for each sub-watershed and were extended until they reached the end of the sub-watershed or until it reached a concentrated flow channel. A summary of the input data used to estimate the time of concentration for each subcatchment is provided in the runoff analysis calculations in Appendix D.

5.1.4 Travel Time Calculations

The travel time for each sub-catchment was calculated using a spreadsheet based on equations prepared by the USDA-NRCS. These times were then input directly into *HydroCAD*. The spreadsheets are included with the runoff analysis calculations in Appendix D.

5.1.5 Reservoir Routing Calculations

Reservoir routing calculations are included in the HydroCAD output. The "dynamic storage-indication" method was used in the peak runoff analysis to model the reaches and ponds more accurately.

5.1.6 Peak Discharge Calculations

Peak discharge calculations are included in the *HydroCAD* output. The Alteration of Terrain Permit application requires analysis of 2, 10, and 50-year storm events. The 25-year event is also included for culvert sizing.

6.0 CONCLUSIONS

The information in this report demonstrates that as proposed, the Antrim Windpark Project will meet the stormwater management requirements of Chapter Env-Wq 1500 Alteration of Terrain. It has been shown that groundwater recharge and quantity control of runoff from the project will not be required because no significant increase in runoff is anticipated. It has also been shown that the proposed water quality treatment measures provide adequate treatment of runoff from the site, and that nearby natural resources are protected.

APPENDIX A

Watershed Analysis Calculations

PROJECT:	Eolian Renewable Energy LLC	Calculated By:	PMM
	Antrim Wind Project	Checked By:	PGT
Proj. No.:	186317.0000.0000	Date:	
	Time of Concentration Summary		

Time of Concentration Equations:

1. Where $T_t := \frac{0.007 \cdot (N \cdot L)^{0.8}}{P_2^{0.5} \cdot S^{0.4}}$	from SCS TR-55.	For Sheet Flow (300 feet or less)
2. Where $V := 20.3282 \cdot \sqrt{S}$	from the SCS Upland Method *Channel Flow Chart*	For Shallow Concentrated Flow (Paved surfaces)
3. Where $T_t := \frac{L}{3600 \cdot V}$	from the SCS Upland Method *Channel Flow Chart*	Travel time equation
4. Where $V := 16.1345 \cdot \sqrt{S}$	from the SCS Upland Method *Channel Flow Chart*	For Shallow Concentrated Flow (Unpaved surfaces)
5. Where: $v = 7 \sqrt{S}$	from the SCS Upland Method *Channel Flow Chart*	For Shallow Concentrated Flow (Short Grass Pasture)
6. Where: $v = 5 \sqrt{S}$	from the SCS Upland Method *Channel Flow Chart*	For Shallow Concentrated Flow (Woodland)
7. Where $V := 12 \cdot \sqrt{S}$	from the SCS Upland Method *Channel Flow Chart*	For Channel Flow - Waterways and Swamps, No Channels
8. Where $V := 15 \cdot \sqrt{S}$	from the SCS Upland Method *Channel Flow Chart*	For Channel Flow - Grassed Waterways and Roadside Ditches
9. Where $V := 21 \cdot \sqrt{S}$	from the SCS Upland Method *Channel Flow Chart*	For Channel Flow - Small Tributary & Swamp w/Channels
10. Where $V := 35 \cdot \sqrt{S}$	from the SCS Upland Method *Channel Flow Chart*	For Channel Flow - Large Tributary
11. Where $V := 60 \cdot \sqrt{S}$	from the SCS Upland Method *Channel Flow Chart*	For Channel Flow - Main River
12. Where $V := \frac{1.49 \cdot R^{.667} \cdot \sqrt{S}}{N}$		For Channel Flow - Culvert Flow

13. Where P_2 = 2-Year, 24 Hour Rainfall (in) (Antrim, NH: P2= 2.8 inches)

Mannings Roughness Coefficients Table

Surface Description	n - value
Smooth surfaces	0.011
Crush Stone/Substation Yards	0.025
Fallow	0.050
Cultivated: Residue<=20%	0.060
Cultivated: Residue>=20%	0.170
Grass: Short	0.150
Grass: Dense	0.240
Grass: Bermuda	0.410
Range	0.130
Woods: Light underbrush	0.400
Woods: Dense underbrush	0.800

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	November 10, 2011
Watershed:	**1W - Pre and Post**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.4								
Length, ft	150								
P2 , in	2.8								
Slope, ft/ft	0.053								
T_t^1, hr	0.358								0.3584
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity^4, ft/sec									
T_t^3, hr									0.0000
Woodland									
Length, ft		1550							
Slope, ft/ft		0.290							
Velocity^5, ft/sec		2.6926							
T_t^3, hr		0.160							0.1599
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity^6, ft/sec									
T_t^3, hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity^7, ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft			1950	1245					
Slope, ft/ft			0.036	0.072					
Velocity^8, ft/sec			3.984	5.635					
T_t, hr			0.136	0.061					0.1973
Large Tributary									
Length, ft					8425				
Slope, ft/ft					0.026				
Velocity^8, ft/sec					5.644				
T_t, hr					0.415				0.4147
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity^{11}, ft/sec									
Length, L, ft									
T_t, hr									0.0000
								HR	1.130
								Min	**67.82**

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PROJECT:	Antrim Wind Project
Project No:	186317.0000.0000
Subject:	Curve Number Comparison
Calculated By:	PMM
Checked By:	PGT
Date:	December 6, 2011
Revised Date:	

Assumptions:

Runoff curve numbers for cover types as referenced from Table 2-2c USDA, 1986, Urban Hydrology for Small Watersheds: TR55.
Land cover types as referenced from recent aerial photography and site visits.
Soil types and hydrologic soil groups are referenced from the NRCS Web Soil Survey for Hillsborough County, NH

Pre-development (1W - North Branch River Watershed)

Cover Description	Hydrologic Soil Group	Land Area (acres)	Land Area % of total	CN	Product of CN x Area
Buildings	A	0.016	0.00%	98	1.568
	B	0.374	0.02%	98	36.652
	C	0.278	0.02%	98	27.244
	D	0.010	0.00%	98	0.980
	Unclassified	0.110	0.01%	98	10.780
Other Impervious	A	1.837	0.11%	76	139.612
	B	2.685	0.16%	85	228.225
	C	1.753	0.11%	89	156.017
	D	0.655	0.04%	91	59.605
	Unclassified	0.920	0.06%	91	83.720
	Pavement	3.281	0.20%	98	321.538
Meadow, Good Condition	A	12.831	0.77%	30	384.930
	B	13.799	0.83%	58	800.342
	C	37.423	2.25%	71	2657.033
	D	5.959	0.36%	78	464.802
	Unclassified	0.577	0.03%	78	45.006
Woods, Good Condition	A	66.513	4.00%	30	1995.390
	B	152.463	9.16%	55	8385.465
	C	1282.411	77.04%	70	89768.770
	D	53.855	3.24%	77	4146.835
	Unclassified	26.934	1.62%	77	2073.918
Total Watershed =		1664.684	100.00%		111788.432
				Weighted CN =	**67**

Post-development (1W - North Branch River Watershed)

Cover Description	Hydrologic Soil Group	Land Area (acres)	Land Area % of total	CN	Product of CN x Area
Buildings	A	0.016	0.00%	98	1.568
	B	0.374	0.02%	98	36.652
	C	0.364	0.02%	98	35.672
	D	0.010	0.00%	98	0.980
	Unclassified	0.110	0.01%	98	10.780
Other Impervious	A	1.837	0.11%	76	139.612
	B	2.685	0.16%	85	228.225
	C	9.844	0.59%	89	876.116
	D	0.769	0.05%	91	69.979
	Unclassified	0.920	0.06%	91	83.720
	Pavement	3.281	0.20%	98	321.538
Meadow, Good Condition	A	12.831	0.77%	30	384.930
	B	13.799	0.83%	58	800.342
	C	64.485	3.88%	71	4578.435
	D	6.170	0.37%	78	481.260
	Unclassified	0.577	0.03%	78	45.006
Woods, Good Condition	A	66.513	4.00%	30	1995.390
	B	152.463	9.16%	55	8385.465
	C	1246.019	74.90%	70	87221.330
	D	53.540	3.22%	77	4122.580
	Unclassified	26.934	1.62%	77	2073.918
Total Watershed =		1663.541	100.00%		111893.498
				Weighted CN =	**67**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	November 10, 2011
Watershed:	**2W - Pre and Post**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.4								
Length, ft	150								
P2 , in	2.8								
Slope, ft/ft	0.1								
T_t[1], hr	0.278								0.2780
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity[4], ft/sec									
T_t[3], hr									0.0000
Woodland									
Length, ft		2760							
Slope, ft/ft		0.092							
Velocity[5], ft/sec		1.5166							
T_t[3], hr		0.506							0.5055
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.0000
								HR	0.784
								Min	**47.01**

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PROJECT:	Antrim Wind Project
Project No:	186317.0000.0000
Subject:	Curve Number Comparison
Calculated By:	PMM
Checked By:	PGT
Date:	December 6, 2011
Revised Date:	

Assumptions:

Runoff curve numbers for cover types as referenced from Table 2-2c USDA, 1986, Urban Hydrology for Small Watersheds: TR55.
Land cover types as referenced from recent aerial photography and site visits.
Soil types and hydrologic soil groups are referenced from the NRCS Web Soil Survey for Hillsborough County, NH

Pre-development (2W - Unnamed Watershed)

Cover Description	Hydrologic Soil Group	Land Area (acres)	Land Area % of total	CN	Product of CN x Area
Buildings	A	0	0%	98	0.000
	B	0.038	0.01%	98	3.724
	C	0.204	0.03%	98	19.992
	D	0	0%	98	0.000
	Unclassified	0	0%	98	0.000
Other Impervious	A	0.894	0.15%	76	67.944
	B	0.614	0.10%	85	52.190
	C	2.068	0.35%	89	184.052
	D	0.318	0.05%	91	28.938
	Unclassified	0	0%	91	0.000
Meadow, Good Condition	A	1.770	0.30%	30	53.100
	B	6.372	1.07%	58	369.576
	C	7.926	1.33%	71	562.746
	D	44.214	7.43%	78	3448.692
	Unclassified	0	0%	78	0.000
Woods, Good Condition	A	28.548	4.79%	30	856.440
	B	27.101	4.55%	55	1490.555
	C	430.277	72.26%	70	30119.390
	D	45.093	7.57%	77	3472.161
	Unclassified	0	0%	77	0.000
Total Watershed =		595.437	100.00%		40729.500
				Weighted CN =	**68**

Post-development (2W - Unnamed Watershed)

Cover Description	Hydrologic Soil Group	Land Area (acres)	Land Area % of total	CN	Product of CN x Area
Buildings	A	0	0%	98	0.000
	B	0.038	0.01%	98	3.724
	C	0.204	0.03%	98	19.992
	D	0	0%	98	0.000
	Unclassified	0	0%	98	0.000
Other Impervious	A	0.894	0.15%	76	67.944
	B	0.614	0.10%	85	52.190
	C	2.281	0.38%	89	203.009
	D	0.318	0.05%	91	28.938
	Unclassified	0	0%	91	0.000
Meadow, Good Condition	A	1.770	0.30%	30	53.100
	B	6.372	1.07%	58	369.576
	C	8.692	1.46%	71	617.132
	D	44.996	7.56%	78	3509.688
	Unclassified	0	0%	78	0.000
Woods, Good Condition	A	28.548	4.79%	30	856.440
	B	27.101	4.55%	55	1490.555
	C	429.554	72.14%	70	30068.780
	D	44.046	7.40%	77	3391.542
	Unclassified	0	0%	77	0.000
Total Watershed =		595.428	100.00%		40732.610
				Weighted CN =	**68**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	November 10, 2011
Watershed:	**3W - Pre and Post**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.4								
Length, ft	150								
P2 , in	2.8								
Slope, ft/ft	0.033								
T_t[1], hr	0.433								0.4331
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity[4], ft/sec									
T_t[3], hr									0.0000
Woodland									
Length, ft		765	630						
Slope, ft/ft		0.052	0.087						
Velocity[5], ft/sec		1.1402	1.4748						
T_t[3], hr		0.186	0.119						0.3050
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft				4925					
Slope, ft/ft				0.004					
Velocity[8], ft/sec				1.328					
T_t, hr				1.030					1.0300
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	1.768
Min	**106.09**

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PROJECT:	Antrim Wind Project
Project No:	186317.0000.0000
Subject:	Curve Number Comparison
Calculated By:	PMM
Checked By:	PGT
Date:	December 6, 2011
Revised Date:	

Assumptions:

Runoff curve numbers for cover types as referenced from Table 2-2c USDA, 1986, Urban Hydrology for Small Watersheds: TR55.
Land cover types as referenced from recent aerial photography and site visits.
Soil types and hydrologic soil groups are referenced from the NRCS Web Soil Survey for Hillsborough County, NH

Pre-development (3W - Gregg Lake Watershed)

Cover Description	Hydrologic Soil Group	Land Area (acres)	Land Area % of total	CN	Product of CN x Area
Buildings	A	0	0%	98	0.000
	B	0.135	0.01%	98	13.230
	C	0.781	0.04%	98	76.538
	D	0	0%	98	0.000
	Unclassified	0	0%	98	0.000
Other Impervious	A	0.304	0.02%	76	23.104
	B	3.282	0.16%	85	278.970
	C	9.071	0.45%	89	807.319
	D	0.057	0.00%	91	5.187
	Unclassified	0	0%	91	0.000
Meadow, Good Condition	A	1.389	0.07%	30	41.670
	B	13.053	0.65%	58	757.074
	C	53.756	2.69%	71	3816.676
	D	28.798	1.44%	78	2246.244
	Unclassified	57.362	2.87%	78	4474.236
Woods, Good Condition	A	42.100	2.11%	30	1263.000
	B	606.658	30.37%	55	33366.190
	C	1103.235	55.22%	70	77226.450
	D	29.079	1.46%	77	2239.083
	Unclassified	48.668	2.44%	77	3747.436
Total Watershed =		1997.728	100.00%		130382.407
				Weighted CN =	**65**

Post-development (3W - Gregg Lake Watershed)

Cover Description	Hydrologic Soil Group	Land Area (acres)	Land Area % of total	CN	Product of CN x Area
Buildings	A	0	0.0%	98	0.000
	B	0.135	0.01%	98	13.230
	C	0.781	0.04%	98	76.538
	D	0	0%	98	0.000
	Unclassified	0	0%	98	0.000
Other Impervious	A	0.304	0.02%	76	23.104
	B	3.282	0.16%	85	278.970
	C	11.345	0.57%	89	1009.705
	D	0.489	0.02%	91	44.499
	Unclassified	0	0%	91	0.000
Meadow, Good Condition	A	1.389	0.07%	30	41.670
	B	13.053	0.65%	58	757.074
	C	68.410	3.42%	71	4857.110
	D	30.862	1.54%	78	2407.236
	Unclassified	57.362	2.87%	78	4474.236
Woods, Good Condition	A	42.100	2.11%	30	1263.000
	B	606.658	30.36%	55	33366.190
	C	1086.743	54.38%	70	76072.010
	D	26.837	1.34%	77	2066.449
	Unclassified	48.668	2.44%	77	3747.436
Total Watershed =		1998.418	100.00%		130498.457
				Weighted CN =	**65**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	November 10, 2011
Watershed:	**4W - Pre and Post**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.4								
Length, ft	150								
P2 , in	2.8								
Slope, ft/ft	0.033								
T_t[1], hr	0.433								0.4331
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity[4], ft/sec									
T_t[3], hr									0.0000
Woodland									
Length, ft		880	525						
Slope, ft/ft		0.072	0.21						
Velocity[5], ft/sec		1.3416	2.2913						
T_t[3], hr		0.182	0.064						0.2458
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft				3700	1250				
Slope, ft/ft				0.114	0.048				
Velocity[8], ft/sec				7.090	4.601				
T_t, hr				0.145	0.075				0.2204
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.899
Min	**53.96**

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PROJECT:	Antrim Wind Project
Project No:	186317.0000.0000
Subject:	Curve Number Comparison
Calculated By:	PMM
Checked By:	PGT
Date:	December 6, 2011
Revised Date:	

Assumptions:

Runoff curve numbers for cover types as referenced from Table 2-2c USDA, 1986, Urban Hydrology for Small Watersheds: TR55.
Land cover types as referenced from recent aerial photography and site visits.
Soil types and hydrologic soil groups are referenced from the NRCS Web Soil Survey for Hillsborough County, NH

Pre-development (4W - Willard Pond Watershed)

Cover Description	Hydrologic Soil Group	Land Area (acres)	Land Area % of total	CN	Product of CN x Area
Buildings	A	0.000	0.00%	98	0.000
	B	0.000	0.00%	98	0.000
	C	0.000	0.00%	98	0.000
	D	0.000	0.00%	98	0.000
	Unclassified	0.000	0.00%	98	0.000
Other Impervious	A	0.249	0.03%	76	18.924
	B	0.266	0.04%	85	22.610
	C	0.000	0.00%	89	0.000
	D	0.000	0.00%	91	0.000
	Unclassified	0.000	0.00%	91	0.000
Meadow, Good Condition	A	0.175	0.02%	30	5.250
	B	0.183	0.03%	58	10.614
	C	10.268	1.43%	71	729.028
	D	2.589	0.36%	78	201.942
	Unclassified	0	0.00%	78	0.000
Woods, Good Condition	A	5.362	0.75%	30	160.860
	B	150.231	20.98%	55	8262.705
	C	524.666	73.28%	70	36726.620
	D	14.793	2.07%	77	1139.061
	Unclassified	7.170	1.00%	77	552.090
Total Watershed =		715.952	100.00%		47829.704
				Weighted CN =	**67**

Post-development (4W - Willard Pond Watershed)

Cover Description	Hydrologic Soil Group	Land Area (acres)	Land Area % of total	CN	Product of CN x Area
Buildings	A	0.000	0.00%	98	0.000
	B	0	0.00%	98	0.000
	C	0	0.00%	98	0.000
	D	0.000	0.00%	98	0.000
	Unclassified	0.000	0.00%	98	0.000
Other Impervious	A	0.249	0.03%	76	18.924
	B	0.266	0.04%	85	22.610
	C	0.037	0.01%	89	3.293
	D	0.000	0.00%	91	0.000
	Unclassified	0.000	0.00%	91	0.000
Meadow, Good Condition	A	0.175	0.02%	30	5.250
	B	0.183	0.03%	58	10.614
	C	11.055	1.54%	71	784.905
	D	2.596	0.36%	78	202.488
	Unclassified	0.000	0.00%	78	0.000
Woods, Good Condition	A	5.362	0.75%	30	160.860
	B	150.231	20.97%	55	8262.705
	C	524.302	73.18%	70	36701.140
	D	14.785	2.06%	77	1138.445
	Unclassified	7.170	1.00%	77	552.090
Total Watershed =		716.411	100.00%		47863.324
				Weighted CN =	**67**

APPENDIX B

Water Quality Calculations

Summary Table (2 pages)

Ditch Turnout Buffer Calculations (3 pages)

Treatment Swale Calculations (20 pages)

Bioretention Basin Calculations (1 page)

PROJECT:	**Eolian Renewable Energy, LLC**	**Calculated By:** PMM
	Antrim Windpower Project	**Checked By:** PGT
TRC Project:	**186317.0000.0000**	**Date:** December 1, 2011
		Revised: January 11, 2012

GENERAL BMP WATER QUALITY STANDARDS CALCULATIONS SUMMARY

Impervious area calculations based on:

Final Roadway Width: 16'	1W - North Branch River Watershed
Crane Pad Area = 70' X 85'	2W - Unnamed Watershed
Foundation Area: D = 50'	3W - Gregg Lake Watershed
	4W - Willard Pond Watershed

Roadway						Vegetated Buffer				Treatment Swale						Comments
Section ID	Watershed	Length (ft)	Treated Impervious Area (ac)	Untreated Impervious Area (ac)	BMP ID	Buffer Type	Average Slope	Hydrologic Soil Group	Land Cover	Water Quality Flow (cfs)	Swale Length (ft)	Swale Base Width (ft)	Longitudinal Slope	Velocity (ft/s)	Hydraulic Residence Time (min.)	
Ridge Road																
STA 0+00 L to STA 5+50	1W	550		0.202	-											Deep cut, close to ROW
STA 5+50 to STA 11+00	1W	550		0.202	-											Too close to wetland
SUBSTATION	1W		1.610	0.101	BR1 & 2											Bioretention Systems
STA 11+00 to STA 13+50	1W	250		0.092	-											Too close to ROW
STA 13+50 to STA 17+00	1W	350	0.119		B-1	Ditch Turnout	0.11	C	Wooded							
STA 17+00 to STA 18+50	1W	150	0.055		B-2	Roadway	0.10	C	-							
STA 18+50 to STA 20+00	1W	150		0.055	-											Stream crossing
STA 20+00 to STA 24+25	1W	425	0.156		SW-1					0.16	150	3	0.0075	0.25	10.0	
STA 24+25 to STA 28+25	1W	400	0.147		B-3	Roadway	0.12	C	-							
STA 28+25 to STA 29+50	1W	125		0.046	-											Adjacent to stream
STA 29+50 to STA 32+00	1W	250	0.092		B-4	Ditch Turnout	0.15	C	Wooded							
STA 32+00 to STA 35+55	1W	355	0.130		SW-2					0.13	130	3	0.005	0.20	10.8	
STA 35+55 to STA 41+75	1W	620	0.228		B-5	Roadway	0.12	C	-							
WTG-1	1W		0.182		B-5											
STA 41+75 to STA 45+00	1W	325	0.119		B-6	Ditch Turnout	0.11	C	Wooded							
STA 45+00 to STA 66+75	1W	2175	0.799		B-7	Roadway	0.22	C								
STA 66+75 to STA 68+50	1W	Intersection		0.186	-											Too close to property line
North Spur Road																
STA 0+00 to STA 1+00	1W	See Intersection above														
STA 1+00 to STA 2+25	1W	125		0.046												
STA 2+25 to STA 21+00	1W	1875	0.699		B-25	Roadway	0.25	C	-							
WTG-2	2W		0.182		WTG-2	Small Area	0.05	C	Meadow							
WTG-3	3W		0.182		B-25	Roadway	0.25	C	-							
Ridge Road (Continued)																
STA 68+50 to STA 70+50	3W	200	0.073		SW-3					0.08	130	3	0.01	0.21	10.3	
STA 70+50 to STA 74+25	3W	375	0.138		B-8	Roadway	0.16	D	-							
STA 74+25 to STA 75+00	3W	75		0.028	-											Too close to wetland
STA 75+00 to STA 77+35	3W	235	0.086		SW-4					0.09	125	3	0.0075	0.20	10.4	
STA 77+35 to STA 81+00	3W	365	0.134		B-9	Ditch Turnout	0.09	C	Wooded							
STA 81+00 to STA 85+00	1W	400	0.147		B-10	Roadway	0.08	C	-							
WTG-4	1W		0.182		B-10											
STA 85+00 to STA 87+25	1W	225	0.083		B-11	Ditch Turnout	0.11	C	Wooded							
STA 87+25 to STA 89+00	1W	175	0.064		B-12	Roadway	0.15	C	-							
STA 89+00 to STA 92+25	1W	325	0.119		SW-5					0.12	120	3	0.005	0.20	10.0	
STA 92+25 to STA 99+00	1W	675		0.248	-											Too close to wetlands
WTG-5	1W		0.182		WTG-5	Small Area	0.03	C	Meadow							
STA 99+00 to STA 103+00	1W	400	0.147		B-13	Roadway	0.25	C	-							
STA 103+00 to STA 104+50	1W	150		0.055	-											Too Steep
STA 104+50 to STA 107+00	1W	250	0.092		SW-6					0.11	120	4	0.0075	0.20	10.0	
STA 107+00 to STA 111+75	1W	475		0.174	-											Too steep, near wetland

PROJECT:	Eolian Renewable Energy, LLC	Calculated By:	PMM
	Antrim Windpower Project	Checked By:	
TRC Project:	186317.0000.0000	Date:	December 1, 2011
		Revised:	

GENERAL BMP WATER QUALITY STANDARDS CALCULATIONS SUMMARY

Impervious area calculations based on:

Final Roadway Width: 16'	1W - North Branch River Watershed
Crane Pad Area = 70' X 85'	2W - Unnamed Watershed
Tower Foundation: D = 20'	3W - Gregg Lake Watershed
	4W - Willard Pond Watershed

Roadway						Vegetated Buffer				Treatment Swale						Comments
Section ID	Watershed	Length (ft)	Treated Impervious Area (ac)	Untreated Impervious Area (ac)	BMP ID	Buffer Type	Average Slope	Hydrologic Soil Group	Land Cover	Water Quality Flow (cfs)	Swale Length (ft)	Swale Base Width (ft)	Longitudinal Slope	Velocity (ft/s)	Hydraulic Residence Time (min.)	
STA 111+75 to STA 113+50	1W	175	0.064		SW-7					0.07	120	3	0.0075	0.19	10.5	
STA 113+50 to STA 115+50	1W	200	0.073		B-14	Roadway	0.12	C	-							
WTG-6	3W		0.182		B-14											
STA 115+50 to STA 117+50	1W	200		0.073	-											Too steep
STA 117+50 to STA 119+00	1W	150	0.055		B-15	Roadway	0.15	C	-							
STA 119+00 to STA 119+75	1W	75		0.028	-											
STA 119+75 to STA 123+00	1W	325	0.119		SW-8					0.12	135	3	0.0075	0.22	10.2	
STA 123+00 to STA 124+25	1W	125		0.046	-											Too steep
STA 124+25 to STA 126+00	1W	175	0.064		SW-9					0.07	120	3	0.0075	0.19	10.5	
STA 126+00 to STA 128+50	1W	250	0.092		B-16	Roadway	0.25	C	-							
STA 128+50 to STA 131+50	1W	300	0.110		SW-10					0.11	135	3	0.0075	0.22	10.2	
STA 131+50 to STA 145+25	1W	1375	0.505		B-17	Roadway	0.25	C	-							
Spur Road 2																
STA 0+50 to STA 2+00	3W	150	0.133		SW-11					0.13	125	3	0.005	0.2	10.4	
STA 2+00 to STA 4+75	3W	275	0.101		B-18	Roadway	0.20	C	-							
STA 4+75 to STA 7+65	1W	290	0.107		B-19	Roadway	0.20	C	-							
WTG-7	3W		0.182		B-20	Roadway	0.15	C	-							
Ridge Road 1 (Continued)																
WTG-8	3W		0.182		WTG-8	Small Area	0.12	C	Meadow							
STA 145+25 to STA 147+00	1W	175		0.064	-											
STA 147+00 to STA 149+00	3W	200		0.073	-											Steep, near wetland
STA 149+00 to STA 150+25	3W	125	0.046		B-21	Roadway	0.3	C	Meadow							
STA 150+25 to STA 163+25	3W	1300		0.478												Steep, near wetland
WTG-9	3W		0.182		WTG-9	Small Area	0.03	C	Meadow							
STA 163+25 to STA 169+50	3W	625	0.230		B-22	Roadway	0.25	C	-							
STA 169+50 to STA 173+75	3W	425	0.156		SW-12					0.16	150	3	0.0075	0.25	10.0	
STA 173+75 to STA 177+00	4W	325	0.119		B-23	Roadway	0.10	C	-							
STA 177+00 to STA 179+50	4W	250	0.092		SW-13					0.09	125	3	0.0075	0.20	10.4	
STA 179+50 to STA 183+18	4W	318	0.117		B-24	Roadway	0.20	C	-							
WTG-10	4W		0.182		WTG-10	Small Area	0.03	C	Meadow							
SUBTOTAL:			9.240	2.197												

Total New Impervious Area:	11.437	(= Treated New Impervious + Untreated New Impervious)
Percent Treated:	80.8%	(= Treated New Impervious / Total New Impervious)

PROJECT:	**Eolian Renewable Energy, LLC**	**Calculated By:**	PMM
	Antrim Windpower Project	**Checked By:**	PGT
TRC Project:	**186317.0000.0000**	**Date:**	
		Revised:	

WATER QUALITY STANDARDS CALCULATIONS

DITCH TURNOUT BUFFER B-1 (Subcatchment WQ4)

Total Contributing Area, A = 10,063 sf

For Buffer Area:

Cover = Forested
HSG = C
S = 11%

1. Calculate buffer length for minimum level spreader length, L_{LS} = 20 feet:

L_1 = 151 ft $L_1 = (15\ ft/1000\ sf) * A$
L_2 = 22 ft $L_2 = 2\ ft * S$
L_{Total} = 173 ft $L_{Total} = L_1 + L_2$

2. CalculateTotal Buffer Area:

A_{Total} = 3459 sf $A_{Total} = L_{Total} * 20\ ft$

3. Calculate Buffer Length for Various Level Spreader Lengths:

L_{LS} = 25 ft
L_{Buffer} = 138 ft $L_{Buffer} = A_{Total}/L_{LS}$

L_{LS} = 30 ft
L_{Buffer} = 115 ft

L_{LS} = 35 ft
L_{Buffer} = 99 ft

USE: L_{LS} = **30 ft**
L_{Buffer} = **115 ft**

DITCH TURNOUT BUFFER B-4 (Subcatchment WQ6)

Total Contributing Area, A = 11,920 sf

For Buffer Area:

Cover = Forested
HSG = C
S = 15%

1. Calculate buffer length for minimum level spreader length, L_{LS} = 20 feet:

L_1 = 179 ft $L_1 = (15\ ft/1000\ sf) * A$
L_2 = 30 ft $L_2 = 2\ ft * S$
L_{Total} = 209 ft $L_{Total} = L_1 + L_2$

2. CalculateTotal Buffer Area:

A_{Total} = 4176 sf $A_{Total} = L_{Total} * 20\ ft$

3. Calculate Buffer Length for Various Level Spreader Lengths:

L_{LS} = 25 ft
L_{Buffer} = 167 ft $L_{Buffer} = A_{Total}/L_{LS}$

L_{LS} = 30 ft
L_{Buffer} = 139 ft

L_{LS} = 35 ft
L_{Buffer} = 119 ft

USE: L_{LS} = **35 ft**
L_{Buffer} = **120 ft**

PROJECT:	**Eolian Renewable Energy, LLC**	**Calculated By:**	PMM
	Antrim Windpower Project	**Checked By:**	PGT
TRC Project:	**186317.0000.0000**	**Date:**	
		Revised:	

WATER QUALITY STANDARDS CALCULATIONS

DITCH TURNOUT BUFFER B-6 (Subcatchment WQ8)

Total Contributing Area, A = 16,850 sf

For Buffer Area:

Cover = Forested
HSG = C
S = 11%

1. Calculate buffer length for minimum level spreader length, L_{LS} = 20 feet:

L_1 = 253 ft L_1 = (15 ft/1000 sf) * A
L_2 = 22 ft L_2 = 2 ft * S
L_{Total} = 275 ft $L_{Total} = L_1 + L_2$

2. CalculateTotal Buffer Area:

A_{Total} = 5495 sf $A_{Total} = L_{Total}$ * 20 ft

3. Calculate Buffer Length for Various Level Spreader Lengths:

L_{LS} = 30 ft
L_{Buffer} = 183 ft $L_{Buffer} = A_{Total}/L_{LS}$

L_{LS} = 40 ft
L_{Buffer} = 137 ft

L_{LS} = 50 ft
L_{Buffer} = 110 ft

USE: **L_{LS} = 30 ft**
L_{Buffer} = 185 ft

DITCH TURNOUT BUFFER B-9 (Subcatchment WQ11)

Total Contributing Area, A = 16,823 sf

For Buffer Area:

Cover = Forested
HSG = C
S = 9%

1. Calculate buffer length for minimum level spreader length, L_{LS} = 20 feet:

L_1 = 252 ft L_1 = (15 ft/1000 sf) * A
L_2 = 18 ft L_2 = 2 ft * S
L_{Total} = 270 ft $L_{Total} = L_1 + L_2$

2. CalculateTotal Buffer Area:

A_{Total} = 5407 sf $A_{Total} = L_{Total}$ * 20 ft

3. Calculate Buffer Length for Various Level Spreader Lengths:

L_{LS} = 25 ft
L_{Buffer} = 216 ft $L_{Buffer} = A_{Total}/L_{LS}$

L_{LS} = 30 ft
L_{Buffer} = 180 ft

L_{LS} = 40 ft
L_{Buffer} = 135 ft

USE: **L_{LS} = 40 ft**
L_{Buffer} = 135 ft

PROJECT:	**Eolian Renewable Energy, LLC**	**Calculated By:**	PMM
	Antrim Windpower Project	**Checked By:**	PGT
TRC Project:	**186317.0000.0000**	**Date:**	
		Revised:	

WATER QUALITY STANDARDS CALCULATIONS

DITCH TURNOUT BUFFER B-11 (Subcatchment WQ12)

Total Contributing Area, A = 9,650 sf

For Buffer Area:

Cover = Forested
HSG = C
S = 11%

1. Calculate buffer length for minimum level spreader length, L_{LS} = 20 feet:

L_1 = 145 ft L_1 = (15 ft/1000 sf) * A
L_2 = 22 ft L_2 = 2 ft * S
L_{Total} = 167 ft $L_{Total} = L_1 + L_2$

2. CalculateTotal Buffer Area:

A_{Total} = 3335 sf $A_{Total} = L_{Total}$ * 20 ft

3. Calculate Buffer Length for Various Level Spreader Lengths:

L_{LS} = 25 ft
L_{Buffer} = 133 ft $L_{Buffer} = A_{Total}/L_{LS}$

L_{LS} = 30 ft
L_{Buffer} = 111 ft

L_{LS} = 35 ft
L_{Buffer} = 95 ft

USE: L_{LS} = **25 ft**
L_{Buffer} = **135 ft**

DITCH TURNOUT BUFFER

Total Contributing Area, A = sf

For Buffer Area:

Cover =
HSG =
S =

1. Calculate buffer length for minimum level spreader length, L_{LS} = 20 feet:

L_1 = 0 ft L_1 = (15 ft/1000 sf) * A
L_2 = 0 ft L_2 = 2 ft * S
L_{Total} = 0 ft $L_{Total} = L_1 + L_2$

2. CalculateTotal Buffer Area:

A_{Total} = 0 sf $A_{Total} = L_{Total}$ * 20 ft

3. Calculate Buffer Length for Various Level Spreader Lengths:

L_{LS} = ft
L_{Buffer} = #DIV/0! ft $L_{Buffer} = A_{Total}/L_{LS}$

L_{LS} = ft
L_{Buffer} = #DIV/0! ft

L_{LS} = ft
L_{Buffer} = #DIV/0! ft

USE: L_{LS} = **ft**
L_{Buffer} = **ft**

PROJECT:	**Eolian Renewable Energy, LLC**	**Calculated By:**	PMM
	Antrim Windpower Project	**Checked By:**	PGT
TRC Project:	**186317.0000.0000**	**Date:**	
		Revised:	

WATER QUALITY STANDARDS CALCULATIONS

TREATMENT SWALE SW-1

WATER QUALITY VOLUME (WQV) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.412**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.156**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.38		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.39		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.16	ac.-in.	WQV = P * Rv * A
	WQV =	**584**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.39	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	91.7		$CN = 1000/[10+5P+10Q-10(Q^2+1.25*Q*P)^{0.5}]$
Potential Max. Retention, S (in.)	S =	0.90	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.18	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.18		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	630	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.16**	**cfs**	WQF = q_u * WQV

TREATMENT SWALE SW-2

WATER QUALITY VOLUME (WQV) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.268**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.130**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.49		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.49		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.13	ac.-in.	WQV = P * Rv * A
	WQV =	**473**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.49	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	93.7		$CN = 1000/[10+5P+10Q-10(Q^2+1.25*Q*P)^{0.5}]$
Potential Max. Retention, S (in.)	S =	0.67	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.13	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.13		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	640	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.13**	**cfs**	WQF = q_u * WQV

Worksheet for SW-1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.00750	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.16	ft³/s

Results

Normal Depth	0.18	ft
Flow Area	0.64	ft²
Wetted Perimeter	4.15	ft
Hydraulic Radius	0.16	ft
Top Width	4.09	ft
Critical Depth	0.04	ft
Critical Slope	0.94604	ft/ft
Velocity	0.25	ft/s
Velocity Head	0.00	ft
Specific Energy	0.18	ft
Froude Number	0.11	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.18	ft
Critical Depth	0.04	ft
Channel Slope	0.00750	ft/ft
Critical Slope	0.94604	ft/ft

Worksheet for SW-2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.00500	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.13	ft^3/s

Results

Normal Depth	0.18	ft
Flow Area	0.64	ft^2
Wetted Perimeter	4.15	ft
Hydraulic Radius	0.16	ft
Top Width	4.09	ft
Critical Depth	0.04	ft
Critical Slope	0.99010	ft/ft
Velocity	0.20	ft/s
Velocity Head	0.00	ft
Specific Energy	0.18	ft
Froude Number	0.09	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.18	ft
Critical Depth	0.04	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.99010	ft/ft

PROJECT:	**Eolian Renewable Energy, LLC**	**Calculated By:**	PMM
	Antrim Windpower Project	**Checked By:**	PGT
TRC Project:	**186317.0000.0000**	**Date:**	
		Revised:	

WATER QUALITY STANDARDS CALCULATIONS

TREATMENT SWALE SW-3

WATER QUALITY VOLUME (WQV) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.309**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.073**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.24		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.26		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.08	ac.-in.	WQV = P * Rv * A
	WQV =	**295**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.26	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	88.3		CN = 1000/[10+5P+10Q-10(Q^2+1.25*Q*P)$^{0.5}$]
Potential Max. Retention, S (in.)	S =	1.32	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.26	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.26		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	620	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.08**	**cfs**	WQF = q_u * WQV

TREATMENT SWALE SW-4

WATER QUALITY VOLUME (WQV) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.250**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.086**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.34		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.36		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.09	ac.-in.	WQV = P * Rv * A
	WQV =	**326**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.36	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	91.0		CN = 1000/[10+5P+10Q-10(Q^2+1.25*Q*P)$^{0.5}$]
Potential Max. Retention, S (in.)	S =	0.99	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.20	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.20		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	625	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.09**	**cfs**	WQF = q_u * WQV

Worksheet for SW-3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.01000	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.08	ft^3/s

Results

Normal Depth	0.11	ft
Flow Area	0.37	ft^2
Wetted Perimeter	3.71	ft
Hydraulic Radius	0.10	ft
Top Width	3.67	ft
Critical Depth	0.03	ft
Critical Slope	1.09773	ft/ft
Velocity	0.21	ft/s
Velocity Head	0.00	ft
Specific Energy	0.11	ft
Froude Number	0.12	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.11	ft
Critical Depth	0.03	ft
Channel Slope	0.01000	ft/ft
Critical Slope	1.09773	ft/ft

Worksheet for SW-4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.00750	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.09	ft³/s

Results

Normal Depth	0.13	ft
Flow Area	0.44	ft²
Wetted Perimeter	3.82	ft
Hydraulic Radius	0.12	ft
Top Width	3.78	ft
Critical Depth	0.03	ft
Critical Slope	1.07143	ft/ft
Velocity	0.20	ft/s
Velocity Head	0.00	ft
Specific Energy	0.13	ft
Froude Number	0.11	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.13	ft
Critical Depth	0.03	ft
Channel Slope	0.00750	ft/ft
Critical Slope	1.07143	ft/ft

PROJECT:	**Eolian Renewable Energy, LLC**	**Calculated By:**	PMM
	Antrim Windpower Project	**Checked By:**	PGT
TRC Project:	**186317.0000.0000**	**Date:**	
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WATER QUALITY STANDARDS CALCULATIONS

TREATMENT SWALE SW-5

WATER QUALITY VOLUME (WQV) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.396**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.119**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.30		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.32		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.13	ac.-in.	WQV = P * Rv * A
	WQV =	**461**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.32	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	90.0		CN = 1000/[10+5P+10Q-10(Q^2+1.25*Q*P)$^{0.5}$]
Potential Max. Retention, S (in.)	S =	1.11	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.22	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.22		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	625	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.12**	**cfs**	WQF = q_u * WQV

TREATMENT SWALE SW-6

WATER QUALITY VOLUME (WQV) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.591**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.092**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.16		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.19		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.11	ac.-in.	WQV = P * Rv * A
	WQV =	**408**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.19	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	85.7		CN = 1000/[10+5P+10Q-10(Q^2+1.25*Q*P)$^{0.5}$]
Potential Max. Retention, S (in.)	S =	1.67	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.33	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.33		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	610	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.11**	**cfs**	WQF = q_u * WQV

Worksheet for SW-5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.00500	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.12	ft^3/s

Results

Normal Depth	0.17	ft
Flow Area	0.61	ft^2
Wetted Perimeter	4.10	ft
Hydraulic Radius	0.15	ft
Top Width	4.04	ft
Critical Depth	0.04	ft
Critical Slope	1.00681	ft/ft
Velocity	0.20	ft/s
Velocity Head	0.00	ft
Specific Energy	0.17	ft
Froude Number	0.09	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.17	ft
Critical Depth	0.04	ft
Channel Slope	0.00500	ft/ft
Critical Slope	1.00681	ft/ft

Worksheet for SW-6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.00750	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	4.00	ft
Discharge	0.11	ft³/s

Results

Normal Depth	0.12	ft
Flow Area	0.55	ft²
Wetted Perimeter	4.79	ft
Hydraulic Radius	0.11	ft
Top Width	4.75	ft
Critical Depth	0.03	ft
Critical Slope	1.08626	ft/ft
Velocity	0.20	ft/s
Velocity Head	0.00	ft
Specific Energy	0.13	ft
Froude Number	0.10	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.12	ft
Critical Depth	0.03	ft
Channel Slope	0.00750	ft/ft
Critical Slope	1.08626	ft/ft

PROJECT:	**Eolian Renewable Energy, LLC**	**Calculated By:**	PMM
	Antrim Windpower Project	**Checked By:**	PGT
TRC Project:	**186317.0000.0000**	**Date:**	
		Revised:	

WATER QUALITY STANDARDS CALCULATIONS

TREATMENT SWALE SW-7

WATER QUALITY VOLUME (WQV) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.254**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.064**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.25		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.28		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.07	ac.-in.	WQV = P * Rv * A
	WQV =	**255**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.28	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	88.8		CN = 1000/[10+5P+10Q-10(Q^2+1.25*Q*P)$^{0.5}$]
Potential Max. Retention, S (in.)	S =	1.27	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.25	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.25		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	615	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.07**	**cfs**	WQF = q_u * WQV

TREATMENT SWALE SW-8

WATER QUALITY VOLUME (WQV) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.367**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.119**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.32		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.34		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.13	ac.-in.	WQV = P * Rv * A
	WQV =	**455**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.34	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	90.6		CN = 1000/[10+5P+10Q-10(Q^2+1.25*Q*P)$^{0.5}$]
Potential Max. Retention, S (in.)	S =	1.04	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.21	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.21		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	625	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.12**	**cfs**	WQF = q_u * WQV

Worksheet for SW-7

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.00750	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.07	ft³/s

Results

Normal Depth	0.11	ft
Flow Area	0.38	ft²
Wetted Perimeter	3.71	ft
Hydraulic Radius	0.10	ft
Top Width	3.68	ft
Critical Depth	0.03	ft
Critical Slope	1.12920	ft/ft
Velocity	0.19	ft/s
Velocity Head	0.00	ft
Specific Energy	0.11	ft
Froude Number	0.10	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.11	ft
Critical Depth	0.03	ft
Channel Slope	0.00750	ft/ft
Critical Slope	1.12920	ft/ft

Worksheet for SW-8

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.00750	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.12	ft³/s

Results

Normal Depth	0.15	ft
Flow Area	0.53	ft²
Wetted Perimeter	3.98	ft
Hydraulic Radius	0.13	ft
Top Width	3.93	ft
Critical Depth	0.04	ft
Critical Slope	1.00815	ft/ft
Velocity	0.22	ft/s
Velocity Head	0.00	ft
Specific Energy	0.15	ft
Froude Number	0.11	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.04	ft
Channel Slope	0.00750	ft/ft
Critical Slope	1.00815	ft/ft

PROJECT:	**Eolian Renewable Energy, LLC**		**Calculated By:**	PMM
	Antrim Windpower Project		**Checked By:**	PGT
TRC Project:	**186317.0000.0000**		**Date:**	
			Revised:	

WATER QUALITY STANDARDS CALCULATIONS

TREATMENT SWALE SW-9

WATER QUALITY VOLUME (WQV) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.183**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.064**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.35		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.36		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.07	ac.-in.	WQV = P * Rv * A
	WQV =	**242**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.36	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	91.1		CN = $1000/[10+5P+10Q-10(Q^2+1.25*Q*P)^{0.5}]$
Potential Max. Retention, S (in.)	S =	0.97	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.19	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.19		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	625	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.07**	**cfs**	WQF = q_u * WQV

TREATMENT SWALE SW-10

WATER QUALITY VOLUME (WQV) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.294**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.110**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.37		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.39		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.11	ac.-in.	WQV = P * Rv * A
	WQV =	**413**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS
Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.39	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	91.6		CN = $1000/[10+5P+10Q-10(Q^2+1.25*Q*P)^{0.5}]$
Potential Max. Retention, S (in.)	S =	0.91	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.18	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.18		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	625	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.11**	**cfs**	WQF = q_u * WQV

Worksheet for SW-9

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.00750	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.07	ft³/s

Results

Normal Depth	0.11	ft
Flow Area	0.38	ft²
Wetted Perimeter	3.71	ft
Hydraulic Radius	0.10	ft
Top Width	3.68	ft
Critical Depth	0.03	ft
Critical Slope	1.12920	ft/ft
Velocity	0.19	ft/s
Velocity Head	0.00	ft
Specific Energy	0.11	ft
Froude Number	0.10	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.11	ft
Critical Depth	0.03	ft
Channel Slope	0.00750	ft/ft
Critical Slope	1.12920	ft/ft

Worksheet for SW-10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.00750	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.11	ft³/s

Results

Normal Depth	0.15	ft
Flow Area	0.50	ft²
Wetted Perimeter	3.93	ft
Hydraulic Radius	0.13	ft
Top Width	3.88	ft
Critical Depth	0.03	ft
Critical Slope	1.02484	ft/ft
Velocity	0.22	ft/s
Velocity Head	0.00	ft
Specific Energy	0.15	ft
Froude Number	0.11	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.03	ft
Channel Slope	0.00750	ft/ft
Critical Slope	1.02484	ft/ft

PROJECT:	**Eolian Renewable Energy, LLC**		**Calculated By:**	PMM
	Antrim Windpower Project		**Checked By:**	PGT
TRC Project:	**186317.0000.0000**		**Date:**	
			Revised:	

WATER QUALITY STANDARDS CALCULATIONS

TREATMENT SWALE SW-11

WATER QUALITY VOLUME (WQV) CALCULATIONS

Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.183**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.133**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.73		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.70		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.13	ac.-in.	WQV = P * Rv * A
	WQV =	**468**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS

Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.70	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	97.0		$CN = 1000/[10+5P+10Q-10(Q^2+1.25*Q*P)^{0.5}]$
Potential Max. Retention, S (in.)	S =	0.31	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.06	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.06		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	650	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.13**	**cfs**	WQF = q_u * WQV

TREATMENT SWALE SW-12

WATER QUALITY VOLUME (WQV) CALCULATIONS

Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.514**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.156**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.30		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.32		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.17	ac.-in.	WQV = P * Rv * A
	WQV =	**603**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS

Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.32	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	90.1		$CN = 1000/[10+5P+10Q-10(Q^2+1.25*Q*P)^{0.5}]$
Potential Max. Retention, S (in.)	S =	1.10	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.22	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.22		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	625	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.16**	**cfs**	WQF = q_u * WQV

Worksheet for SW-11

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.00500	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.13	ft^3/s

Results

Normal Depth	0.18	ft
Flow Area	0.64	ft^2
Wetted Perimeter	4.15	ft
Hydraulic Radius	0.16	ft
Top Width	4.09	ft
Critical Depth	0.04	ft
Critical Slope	0.99010	ft/ft
Velocity	0.20	ft/s
Velocity Head	0.00	ft
Specific Energy	0.18	ft
Froude Number	0.09	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.18	ft
Critical Depth	0.04	ft
Channel Slope	0.00500	ft/ft
Critical Slope	0.99010	ft/ft

Worksheet for SW-12

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.00750	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.16	ft³/s

Results

Normal Depth	0.18	ft
Flow Area	0.64	ft²
Wetted Perimeter	4.15	ft
Hydraulic Radius	0.16	ft
Top Width	4.09	ft
Critical Depth	0.04	ft
Critical Slope	0.94604	ft/ft
Velocity	0.25	ft/s
Velocity Head	0.00	ft
Specific Energy	0.18	ft
Froude Number	0.11	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.18	ft
Critical Depth	0.04	ft
Channel Slope	0.00750	ft/ft
Critical Slope	0.94604	ft/ft

PROJECT:	**Eolian Renewable Energy, LLC**		**Calculated By:**	PMM
	Antrim Windpower Project		**Checked By:**	PGT
TRC Project:	**186317.0000.0000**		**Date:**	
			Revised:	

WATER QUALITY STANDARDS CALCULATIONS

TREATMENT SWALE SW-13

WATER QUALITY VOLUME (WQV) CALCULATIONS

Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.274**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.092**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.34		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.35		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.10	ac.-in.	WQV = P * Rv * A
	WQV =	**350**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS

Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =	**6**	min.	
	Tc =	0.10	hours	
Water Quality Depth, Q (in)	Q =	0.35	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	90.8		$CN = 1000/[10+5P+10Q-10(Q^2+1.25*Q*P)^{0.5}]$
Potential Max. Retention, S (in.)	S =	1.01	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	0.20	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	0.20		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =	625	cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**0.09**	**cfs**	WQF = q_u * WQV

TREATMENT SWALE SW-

WATER QUALITY VOLUME (WQV) CALCULATIONS

Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =		ac.	
Impervious Contributing Area, Ai (ac)	Ai =		ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	#DIV/0!		I = Ai / A
Runoff Coefficient, Rv	Rv =	#DIV/0!		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	#DIV/0!	ac.-in.	WQV = P * Rv * A
	WQV =	**#DIV/0!**	**cu. ft.**	

WATER QUALITY FLOW (WQF) CALCULATIONS

Based on treatment of the first 1 inch of rainfall

Time of Concentration (hours):	Tc =		min.	
	Tc =	0.00	hours	
Water Quality Depth, Q (in)	Q =	#DIV/0!	in.	Q = WQV / A
Water Quality Depth Curve Number, CN	CN =	#DIV/0!		$CN = 1000/[10+5P+10Q-10(Q^2+1.25*Q*P)^{0.5}]$
Potential Max. Retention, S (in.)	S =	#DIV/0!	in.	S = (1000 / CN) - 10
Initial Abstraction, Ia (in.)	Ia =	#DIV/0!	in.	Ia = 0.2 * S
Ratio of Ia / P	Ia / P =	#DIV/0!		

USE Tc and (Ia / P) with TR-55 Exhibit 4-II or 4-III to determine Unit Peak Discharge, q_u

Unit Peak Discharge, q_u (cfs/sq.mi./in)	qu =		cfs/sq.mi./in	From TR-55 Exhibit 4-III
Calculate Water Quality Flow, WQF (cfs)	**WQF =**	**#DIV/0!**	**cfs**	WQF = q_u * WQV

Worksheet for SW-13

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.150	
Channel Slope	0.00750	ft/ft
Left Side Slope	3.00	ft/ft (H:V)
Right Side Slope	3.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	0.09	ft^3/s

Results

Normal Depth	0.13	ft
Flow Area	0.44	ft^2
Wetted Perimeter	3.82	ft
Hydraulic Radius	0.12	ft
Top Width	3.78	ft
Critical Depth	0.03	ft
Critical Slope	1.07143	ft/ft
Velocity	0.20	ft/s
Velocity Head	0.00	ft
Specific Energy	0.13	ft
Froude Number	0.11	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.13	ft
Critical Depth	0.03	ft
Channel Slope	0.00750	ft/ft
Critical Slope	1.07143	ft/ft

PROJECT:	**Eolian Renewable Energy, LLC**	**Calculated By:**	PMM
	Antrim Windpower Project	**Checked By:**	PGT
TRC Project:	**186317.0000.0000**	**Date:**	
		Revised:	

WATER QUALITY STANDARDS CALCULATIONS

BIORETENTION BASIN BR-1

WATER QUALITY VOLUME (WQV) CALCULATIONS

Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**1.006**	ac.	
Impervious Contributing Area, Ai (ac)	Ai =	**0.895**	ac.	
Rainfall Depth, P (in)	P =	**1.0**	in.	
Percent Impervious Area, I	I =	0.89		I = Ai / A
Runoff Coefficient, Rv	Rv =	0.85		Rv = 0.05 + (0.9 * I)
Water Quality Volume, WQV (ac.-in)	WQV =	0.86	ac.-in.	WQV = P * Rv * A
	WQV =	**3,107**	**cu. ft.**	

Basin Sizing Calculations

Ponding Storage

Water Surface Area, A_1 (sq.ft.)	A_1 =	**3,400**	sq. ft.	
Basin Base Area, A_2 (sq. ft.)	A_2 =	**2,735**	sq. ft.	
Ponding Depth, d (ft.)	d =	0.5	ft.	
Storage Volume, V_1 (cu. ft.)	V_1 =	1,534	cu. ft.	$V_1 = ((A_1 + A_2) / 2) * d$

Soil Filter Bed Storage

Soil Filter Depth, D (ft.)	D =	**1.5**	ft.	
Soil Filter Porosity, n	n =	0.4		
Storage Volume, V_2 (cu. ft.)	V_2 =	1,641	cu. ft.	$V_2 = A_2 * D * n$
Total Storage Volume, V_T (cu. ft.)	**V_T =**	**3,175**	**cu. ft.**	$V_T = V_1 + V_2$

BIORETENTION BASIN BR-2

WATER QUALITY VOLUME (WQV) CALCULATIONS

Based on treatment of the first 1 inch of rainfall

Total Contributing Area, A (ac)	A =	**0.986**	ac.		0.463
Impervious Contributing Area, Ai (ac)	Ai =	**0.715**	ac.		0.45
Rainfall Depth, P (in)	P =	**1.0**	in.		
Percent Impervious Area, I	I =	0.73		I = Ai / A	
Runoff Coefficient, Rv	Rv =	0.70		Rv = 0.05 + (0.9 * I)	
Water Quality Volume, WQV (ac.-in)	WQV =	0.69	ac.-in.	WQV = P * Rv * A	
	WQV =	**2,515**	**cu. ft.**		1554

BASIN SIZING CALCULATIONS

Ponding Storage

Water Surface Area, A_1 (sq.ft.)	A_1 =	**3,160**	sq. ft.	
Basin Base Area, A_2 (sq. ft.)	A_2 =	**2,050**	sq. ft.	
Ponding Depth, d (ft.)	d =	0.5	ft.	
Storage Volume, V_1 (cu. ft.)	V_1 =	1,303	cu. ft.	$V_1 = ((A_1 + A_2) / 2) * d$

Soil Filter Bed Storage

Soil Filter Depth, D (ft.)	D =	**1.5**	ft.	
Soil Filter Porosity, n	n =	0.4		
Storage Volume, V_2 (cu. ft.)	V_2 =	1,230	cu. ft.	$V_2 = A_2 * D * n$
Total Storage Volume, V_T (cu. ft.)	**V_T =**	**2,533**	**cu. ft.**	$V_T = V_1 + V_2$

APPENDIX C

Conveyance and Stabilization Calculations

PROJECT:	Eolian Renewable Energy, LLC	Calculated By:	PMM
	Antrim Windpower Project	Checked By:	PGT
TRC Project:	186317.0000.0000	Date:	December 17, 2011
		Revised:	

RIPRAP CHANNEL PROTECTION CALCULATIONS

1. Channel riprap design is based on criteria published by Maine DEP in "Maine Erosion and Sediment Control BMPs" (2003). Refer to Section E-6 Riprap Waterways.
2. All channels with slopes greater than 8% require riprap reinforcement.
3. Flows and velocities are based on a 10-year design storm event. Flows are determined using "HydroCAD" software. Velocities and flow depths are determined using "FlowMaster" software unless otherwise indicated.

4. Riprap Manning's "n" calculation based on:

$$n = \frac{y^{1/8}}{[21.6*\log_{10}(y/D_{50})+14.0]}$$

LOCATION	HydroCAD Node	Q_{10} (cfs)	Flow Depth, y (ft)	Minimum D_{50} (ft)	Manning's "n"	V_{10} (fps)	Comments
Sta 0+00 to Sta 2+50 R	1.1R	5.87	0.51	0.50	0.065	3.83	Velocity and depth from HydroCAD model
Sta 2+50 to Sta 5+75 R	1.2R	4.44	0.48	0.50	0.067	3.16	Velocity and depth from HydroCAD model
Sta 0+00 to Sta 2+50 L	1.1	-	-	0.50	-	-	Only a small portion of SC 1.1 contributes to channel flow. Use D_{50}=6" for simplified construction.
Sta 2+50 to Sta 5+00 L	1.3	2.05	0.33	0.50	0.086	2.37	
Sta 8+50 to Sta 10+25 R	1.2R	4.44	0.48	0.50	0.067	3.16	Velocity and depth from HydroCAD model
Sta 9+00 to Sta 10+25 L	1.5	3.93	0.44	0.50	0.070	3.13	
Sta 12+25 to Sta 13+50 R	1.4A	0.45	0.14	0.25	0.091	1.40	
Sta 13+50 to Sta 16+00 R	WQ4	0.62	0.16	0.25	0.081	1.68	
Sta 12+25 to Sta 16+00 L	1.5	3.93	0.44	0.50	0.071	3.13	
Sta 19+00 to Sta 24+50 R	WQ5	0.98	0.19	0.25	0.071	2.14	
Sta 19+00 to Sta 24+00 L	1.6	-	-	0.25	-	-	Only a small portion of SC 1.6 contributes to channel flow. Assume equivalent to WQ5.
Sta 32+00 to Sta 35+50 R	WQ7	0.69	0.17	0.25	0.078	1.79	
Sta 32+00 to Sta 36+00 L	1.6	10.0	0.63	0.50	0.059	4.92	Based on contributing area, assume flow is 25% of Q_{10} for SC1.6
Sta 41+75 R (Slope)	1.8/6P	17.0	0.58	0.83	0.088	6.88	Design based on Q25
Sta 45+00 to Sta 49+50 L	1.9	8.42	0.58	0.50	0.061	4.58	Assumes full flow to all culverts
Sta 54+00 to Sta 57+50 L	1.10	9.63	0.61	0.50	0.059	4.87	Assumes full flow to all culverts
Sta 57+50 to Sta 63+50 L	1.11	5.40	0.48	0.50	0.067	3.77	
Sta 63+50 to Sta 66+75 L	1.12	1.54	0.23	0.25	0.062	2.72	Use D_{50}=6" for simplified construction.
Sta 68+00 to Sta 69+75 L	WQ9	0.65	0.16	0.25	0.081	1.71	
Sta 68+00 to Sta 69+75 R				0.25			Small contributing area. Assume equivalent to WQ9.
Sta 77+50 to Sta 80+25 L	WQ11	0.76	0.18	0.25	0.074	1.80	
Sta 77+00 to Sta 80+25 R	-	-	-	-	-	-	Small contributing area. Assume equivalent to WQ11.
Sta 97+00 to Sta 98+50 R	-	-	-	0.25	-	-	Minimal contributing area.
Sta 101+75 to Sta 103+25 L	-	-	-	0.25	-	-	Minimal contributing area.
Sta 104+25 to Sta 106+50 L	-	-	-	0.25	-	-	Minimal contributing area.
Sta 111+50 to Sta 113+25 L	-	-	-	0.25	-	-	Minimal contributing area.
Sta 120+00 to Sta 123+00 R	WQ16	0.84	0.18	0.25	0.074	1.98	
Sta 124+50 to Sta 126+00 R	WQ17	0.42	0.14	0.25	0.091	1.36	
Sta 119+75 to Sta 126+00 L	-	-	-	0.25	-	-	Small contributing area. Assume equivalent to WQ16 &17.
Sta 128+00 to Sta 131+50 L	1.15	2.64	0.29	0.25	0.055	3.50	
Sta 128+50 to Sta 131+50 R	WQ18	0.70	0.17	0.25	0.077	1.81	
Sta 131+50 to Sta 137+00 L	1.16	2.40	0.28	0.25	0.057	3.31	
Sta 137+00 to Sta 139+00 L	1.17	0.33	0.13	0.25	0.099	1.19	
Sta 1+00 to Sta 3+25 L	3.2	0.53	0.15	0.25	0.086	1.53	
Sta 145+75 to Sta 147+00 R	-	-	-	0.25	-	-	Small contributing area. Assume equivalent to SC3.2.
Sta 157+25 to Sta 163+25 R	3.3	9.71	0.62	0.50	0.059	4.88	
Sta 158+00 to Sta 163+25 L	-	-	-	0.50	-	-	Small contributing area. Use D_{50}=6" for simplified construction.
Sta 163+25 to Sta 167+75 R	3.4	5.81	0.50	0.50	0.066	3.90	Assumes full flow to all culverts
Sta 167+75 to Sta 172+50 R	3.5	4.35	0.44	0.50	0.071	3.40	
Sta 169+50 to Sta 173+50 L	WQ20	1.13	0.20	0.25	0.068	2.30	
Sta 177+00 to Sta 179+25 L	WQ21	0.63	0.16	0.25	0.081	1.69	
Sta 178+00 to Sta 179+25 R	-	-	-	0.25	-	-	Small contributing area. Assume equivalent to WQ21.
Sta 179+00 to Sta 181+25 L	-	-	-	0.25	-	-	Small contributing area. Assume equivalent to WQ21.

Worksheet for SC1.3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.086	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	2.05	ft^3/s

Results

Normal Depth	0.33	ft
Flow Area	0.86	ft^2
Wetted Perimeter	3.46	ft
Hydraulic Radius	0.25	ft
Top Width	3.30	ft
Critical Depth	0.29	ft
Critical Slope	0.18457	ft/ft
Velocity	2.37	ft/s
Velocity Head	0.09	ft
Specific Energy	0.41	ft
Froude Number	0.82	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.33	ft
Critical Depth	0.29	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.18457	ft/ft

Worksheet for SC1.5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.070	
Channel Slope	0.10000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	3.93	ft³/s

Results

Normal Depth	0.44	ft
Flow Area	1.26	ft²
Wetted Perimeter	3.96	ft
Hydraulic Radius	0.32	ft
Top Width	3.75	ft
Critical Depth	0.42	ft
Critical Slope	0.11116	ft/ft
Velocity	3.13	ft/s
Velocity Head	0.15	ft
Specific Energy	0.59	ft
Froude Number	0.95	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.44	ft
Critical Depth	0.42	ft
Channel Slope	0.10000	ft/ft
Critical Slope	0.11116	ft/ft

Worksheet for SC1.4A

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.091	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	0.45	ft³/s

Results

Normal Depth	0.14	ft
Flow Area	0.32	ft²
Wetted Perimeter	2.63	ft
Hydraulic Radius	0.12	ft
Top Width	2.57	ft
Critical Depth	0.11	ft
Critical Slope	0.26590	ft/ft
Velocity	1.40	ft/s
Velocity Head	0.03	ft
Specific Energy	0.17	ft
Froude Number	0.69	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.14	ft
Critical Depth	0.11	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.26590	ft/ft

Worksheet for WQ4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.081	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	0.62	ft³/s

Results

Normal Depth	0.16	ft
Flow Area	0.37	ft²
Wetted Perimeter	2.71	ft
Hydraulic Radius	0.14	ft
Top Width	2.64	ft
Critical Depth	0.14	ft
Critical Slope	0.19901	ft/ft
Velocity	1.68	ft/s
Velocity Head	0.04	ft
Specific Energy	0.20	ft
Froude Number	0.79	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.16	ft
Critical Depth	0.14	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.19901	ft/ft

Worksheet for WQ5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.071	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	0.98	ft³/s

Results

Normal Depth	0.19	ft
Flow Area	0.46	ft²
Wetted Perimeter	2.86	ft
Hydraulic Radius	0.16	ft
Top Width	2.77	ft
Critical Depth	0.18	ft
Critical Slope	0.14141	ft/ft
Velocity	2.14	ft/s
Velocity Head	0.07	ft
Specific Energy	0.26	ft
Froude Number	0.93	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.19	ft
Critical Depth	0.18	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.14141	ft/ft

Worksheet for SC1.6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.059	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	10.00	ft^3/s

Results

Normal Depth	0.63	ft
Flow Area	2.03	ft^2
Wetted Perimeter	4.80	ft
Hydraulic Radius	0.42	ft
Top Width	4.50	ft
Critical Depth	0.72	ft
Critical Slope	0.06957	ft/ft
Velocity	4.92	ft/s
Velocity Head	0.38	ft
Specific Energy	1.00	ft
Froude Number	1.29	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.63	ft
Critical Depth	0.72	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.06957	ft/ft

Worksheet for WQ7

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.078	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	0.69	ft³/s

Results

Normal Depth	0.17	ft
Flow Area	0.39	ft²
Wetted Perimeter	2.74	ft
Hydraulic Radius	0.14	ft
Top Width	2.66	ft
Critical Depth	0.15	ft
Critical Slope	0.18111	ft/ft
Velocity	1.79	ft/s
Velocity Head	0.05	ft
Specific Energy	0.22	ft
Froude Number	0.83	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.17	ft
Critical Depth	0.15	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.18111	ft/ft

Worksheet for SC1.8/6P

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.088	
Channel Slope	0.50000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	3.00	ft
Discharge	17.00	ft³/s

Results

Normal Depth	0.59	ft
Flow Area	2.47	ft²
Wetted Perimeter	5.64	ft
Hydraulic Radius	0.44	ft
Top Width	5.36	ft
Critical Depth	0.83	ft
Critical Slope	0.14420	ft/ft
Velocity	6.88	ft/s
Velocity Head	0.74	ft
Specific Energy	1.33	ft
Froude Number	1.79	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.59	ft
Critical Depth	0.83	ft
Channel Slope	0.50000	ft/ft
Critical Slope	0.14420	ft/ft

Worksheet for SC1.9

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.061	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	8.42	ft^3/s

Results

Normal Depth	0.58	ft
Flow Area	1.84	ft^2
Wetted Perimeter	4.60	ft
Hydraulic Radius	0.40	ft
Top Width	4.33	ft
Critical Depth	0.65	ft
Critical Slope	0.07608	ft/ft
Velocity	4.58	ft/s
Velocity Head	0.33	ft
Specific Energy	0.91	ft
Froude Number	1.24	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.58	ft
Critical Depth	0.65	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.07608	ft/ft

Worksheet for SC1.10

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.059	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	9.63	ft³/s

Results

Normal Depth	0.61	ft
Flow Area	1.98	ft²
Wetted Perimeter	4.74	ft
Hydraulic Radius	0.42	ft
Top Width	4.45	ft
Critical Depth	0.71	ft
Critical Slope	0.06992	ft/ft
Velocity	4.87	ft/s
Velocity Head	0.37	ft
Specific Energy	0.98	ft
Froude Number	1.29	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.61	ft
Critical Depth	0.71	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.06992	ft/ft

Worksheet for SC1.11

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.067	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	5.40	ft^3/s

Results

Normal Depth	0.48	ft
Flow Area	1.43	ft^2
Wetted Perimeter	4.16	ft
Hydraulic Radius	0.34	ft
Top Width	3.93	ft
Critical Depth	0.51	ft
Critical Slope	0.09745	ft/ft
Velocity	3.77	ft/s
Velocity Head	0.22	ft
Specific Energy	0.70	ft
Froude Number	1.10	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.48	ft
Critical Depth	0.51	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.09745	ft/ft

Worksheet for SC1.12

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.062	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	1.57	ft^3/s

Results

Normal Depth	0.23	ft
Flow Area	0.57	ft^2
Wetted Perimeter	3.04	ft
Hydraulic Radius	0.19	ft
Top Width	2.93	ft
Critical Depth	0.25	ft
Critical Slope	0.09995	ft/ft
Velocity	2.73	ft/s
Velocity Head	0.12	ft
Specific Energy	0.35	ft
Froude Number	1.09	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.23	ft
Critical Depth	0.25	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.09995	ft/ft

Worksheet for WQ9

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.081	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	0.65	ft³/s

Results

Normal Depth	0.16	ft
Flow Area	0.38	ft²
Wetted Perimeter	2.73	ft
Hydraulic Radius	0.14	ft
Top Width	2.65	ft
Critical Depth	0.14	ft
Critical Slope	0.19736	ft/ft
Velocity	1.71	ft/s
Velocity Head	0.05	ft
Specific Energy	0.21	ft
Froude Number	0.80	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.16	ft
Critical Depth	0.14	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.19736	ft/ft

Worksheet for WQ11

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.074	
Channel Slope	0.10000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	0.76	ft^3/s

Results

Normal Depth	0.18	ft
Flow Area	0.42	ft^2
Wetted Perimeter	2.80	ft
Hydraulic Radius	0.15	ft
Top Width	2.72	ft
Critical Depth	0.16	ft
Critical Slope	0.16032	ft/ft
Velocity	1.80	ft/s
Velocity Head	0.05	ft
Specific Energy	0.23	ft
Froude Number	0.80	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.18	ft
Critical Depth	0.16	ft
Channel Slope	0.10000	ft/ft
Critical Slope	0.16032	ft/ft

Worksheet for SC1.16

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.057	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	2.40	ft³/s

Results

Normal Depth	0.28	ft
Flow Area	0.72	ft²
Wetted Perimeter	3.26	ft
Hydraulic Radius	0.22	ft
Top Width	3.13	ft
Critical Depth	0.32	ft
Critical Slope	0.07917	ft/ft
Velocity	3.31	ft/s
Velocity Head	0.17	ft
Specific Energy	0.45	ft
Froude Number	1.21	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.28	ft
Critical Depth	0.32	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.07917	ft/ft

Worksheet for WQ17

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.091	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	0.42	ft³/s

Results

Normal Depth	0.14	ft
Flow Area	0.31	ft²
Wetted Perimeter	2.61	ft
Hydraulic Radius	0.12	ft
Top Width	2.54	ft
Critical Depth	0.11	ft
Critical Slope	0.26925	ft/ft
Velocity	1.36	ft/s
Velocity Head	0.03	ft
Specific Energy	0.16	ft
Froude Number	0.69	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.14	ft
Critical Depth	0.11	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.26925	ft/ft

Worksheet for SC1.15

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.055	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	2.64	ft³/s

Results

Normal Depth	0.29	ft
Flow Area	0.76	ft²
Wetted Perimeter	3.31	ft
Hydraulic Radius	0.23	ft
Top Width	3.17	ft
Critical Depth	0.34	ft
Critical Slope	0.07268	ft/ft
Velocity	3.50	ft/s
Velocity Head	0.19	ft
Specific Energy	0.48	ft
Froude Number	1.26	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.29	ft
Critical Depth	0.34	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.07268	ft/ft

Worksheet for WQ18

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.077	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	0.70	ft³/s

Results

Normal Depth	0.17	ft
Flow Area	0.39	ft²
Wetted Perimeter	2.74	ft
Hydraulic Radius	0.14	ft
Top Width	2.66	ft
Critical Depth	0.15	ft
Critical Slope	0.17608	ft/ft
Velocity	1.81	ft/s
Velocity Head	0.05	ft
Specific Energy	0.22	ft
Froude Number	0.84	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.17	ft
Critical Depth	0.15	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.17608	ft/ft

Worksheet for SC1.16

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.053	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	3.29	ft³/s

Results

Normal Depth	0.32	ft
Flow Area	0.86	ft²
Wetted Perimeter	3.45	ft
Hydraulic Radius	0.25	ft
Top Width	3.29	ft
Critical Depth	0.38	ft
Critical Slope	0.06536	ft/ft
Velocity	3.84	ft/s
Velocity Head	0.23	ft
Specific Energy	0.55	ft
Froude Number	1.33	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.32	ft
Critical Depth	0.38	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.06536	ft/ft

Worksheet for SC1.17

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.099	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	0.33	ft³/s

Results

Normal Depth	0.12	ft
Flow Area	0.28	ft²
Wetted Perimeter	2.55	ft
Hydraulic Radius	0.11	ft
Top Width	2.50	ft
Critical Depth	0.09	ft
Critical Slope	0.33316	ft/ft
Velocity	1.19	ft/s
Velocity Head	0.02	ft
Specific Energy	0.15	ft
Froude Number	0.63	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.12	ft
Critical Depth	0.09	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.33316	ft/ft

Worksheet for SC3.2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.086	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	0.53	ft^3/s

Results

Normal Depth	0.15	ft
Flow Area	0.35	ft^2
Wetted Perimeter	2.67	ft
Hydraulic Radius	0.13	ft
Top Width	2.60	ft
Critical Depth	0.12	ft
Critical Slope	0.23060	ft/ft
Velocity	1.53	ft/s
Velocity Head	0.04	ft
Specific Energy	0.19	ft
Froude Number	0.74	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.15	ft
Critical Depth	0.12	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.23060	ft/ft

Worksheet for SC3.3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.059	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	9.71	ft³/s

Results

Normal Depth	0.62	ft
Flow Area	1.99	ft²
Wetted Perimeter	4.75	ft
Hydraulic Radius	0.42	ft
Top Width	4.46	ft
Critical Depth	0.71	ft
Critical Slope	0.06984	ft/ft
Velocity	4.88	ft/s
Velocity Head	0.37	ft
Specific Energy	0.99	ft
Froude Number	1.29	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.62	ft
Critical Depth	0.71	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.06984	ft/ft

Worksheet for SC3.4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.066	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	5.81	ft³/s

Results

Normal Depth	0.50	ft
Flow Area	1.49	ft²
Wetted Perimeter	4.23	ft
Hydraulic Radius	0.35	ft
Top Width	3.99	ft
Critical Depth	0.53	ft
Critical Slope	0.09361	ft/ft
Velocity	3.90	ft/s
Velocity Head	0.24	ft
Specific Energy	0.73	ft
Froude Number	1.12	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.50	ft
Critical Depth	0.53	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.09361	ft/ft

Worksheet for SC3.5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.071	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	4.35	ft^3/s

Results

Normal Depth	0.44	ft
Flow Area	1.28	ft^2
Wetted Perimeter	3.98	ft
Hydraulic Radius	0.32	ft
Top Width	3.77	ft
Critical Depth	0.45	ft
Critical Slope	0.11274	ft/ft
Velocity	3.40	ft/s
Velocity Head	0.18	ft
Specific Energy	0.62	ft
Froude Number	1.03	
Flow Type	Supercritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.44	ft
Critical Depth	0.45	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.11274	ft/ft

Worksheet for WQ20

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.068	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	1.13	ft³/s

Results

Normal Depth	0.20	ft
Flow Area	0.49	ft²
Wetted Perimeter	2.91	ft
Hydraulic Radius	0.17	ft
Top Width	2.81	ft
Critical Depth	0.20	ft
Critical Slope	0.12672	ft/ft
Velocity	2.30	ft/s
Velocity Head	0.08	ft
Specific Energy	0.29	ft
Froude Number	0.97	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.20	ft
Critical Depth	0.20	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.12672	ft/ft

Worksheet for WQ21

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Roughness Coefficient	0.081	
Channel Slope	0.12000	ft/ft
Left Side Slope	2.00	ft/ft (H:V)
Right Side Slope	2.00	ft/ft (H:V)
Bottom Width	2.00	ft
Discharge	0.63	ft³/s

Results

Normal Depth	0.16	ft
Flow Area	0.37	ft²
Wetted Perimeter	2.72	ft
Hydraulic Radius	0.14	ft
Top Width	2.64	ft
Critical Depth	0.14	ft
Critical Slope	0.19845	ft/ft
Velocity	1.69	ft/s
Velocity Head	0.04	ft
Specific Energy	0.20	ft
Froude Number	0.79	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	ft
Length	0.00	ft
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	ft
Profile Description		
Profile Headloss	0.00	ft
Downstream Velocity	Infinity	ft/s
Upstream Velocity	Infinity	ft/s
Normal Depth	0.16	ft
Critical Depth	0.14	ft
Channel Slope	0.12000	ft/ft
Critical Slope	0.19845	ft/ft

APPENDIX D

Runoff Analysis Calculations and Report

Rainfall and Soils Data (12 pages)

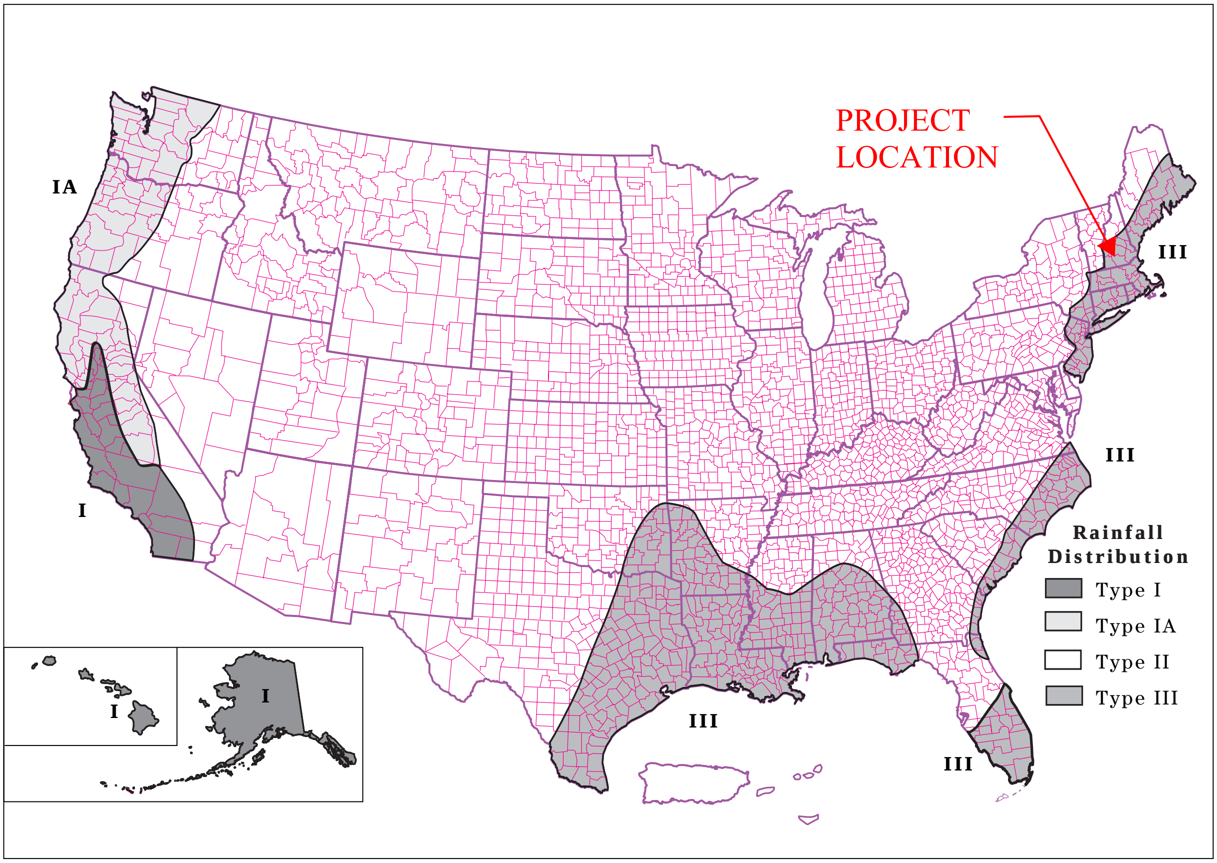
Water Quality Model (HydroCAD) (71 pages)

Time of Concentration Calculations (21 pages)

Runoff Conveyance Model (HydroCAD) (152 pages)

MDEP Letter (2 pages)

Figure B-2 Approximate geographic boundaries for NRCS (SCS) rainfall distributions



Rainfall data sources

This section lists the most current 24-hour rainfall data published by the National Weather Service (NWS) for various parts of the country. Because NWS Technical Paper 40 (TP-40) is out of print, the 24-hour rainfall maps for areas east of the 105th meridian are included here as figures B-3 through B-8. For the area generally west of the 105th meridian, TP-40 has been superseded by NOAA Atlas 2, the Precipitation-Frequency Atlas of the Western United States, published by the National Ocean and Atmospheric Administration.

East of 105th meridian

Hershfield, D.M. 1961. Rainfall frequency atlas of the United States for durations from 30 minutes to 24 hours and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 40. Washington, DC. 155 p.

West of 105th meridian

Miller, J.F., R.H. Frederick, and R.J. Tracey. 1973. Precipitation-frequency atlas of the Western United States. Vol. I Montana; Vol. II, Wyoming; Vol III, Colorado; Vol. IV, New Mexico; Vol V, Idaho; Vol. VI, Utah; Vol. VII, Nevada; Vol. VIII, Arizona; Vol. IX, Washington; Vol. X, Oregon; Vol. XI, California. U.S. Dept. of Commerce, National Weather Service, NOAA Atlas 2. Silver Spring, MD.

Alaska

Miller, John F. 1963. Probable maximum precipitation and rainfall-frequency data for Alaska for areas to 400 square miles, durations to 24 hours and return periods from 1 to 100 years. U.S. Dept. of Commerce, Weather Bur. Tech. Pap. No. 47. Washington, DC. 69 p.

Hawaii

Weather Bureau. 1962. Rainfall-frequency atlas of the Hawaiian Islands for areas to 200 square miles, durations to 24 hours and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 43. Washington, DC. 60 p.

Puerto Rico and Virgin Islands

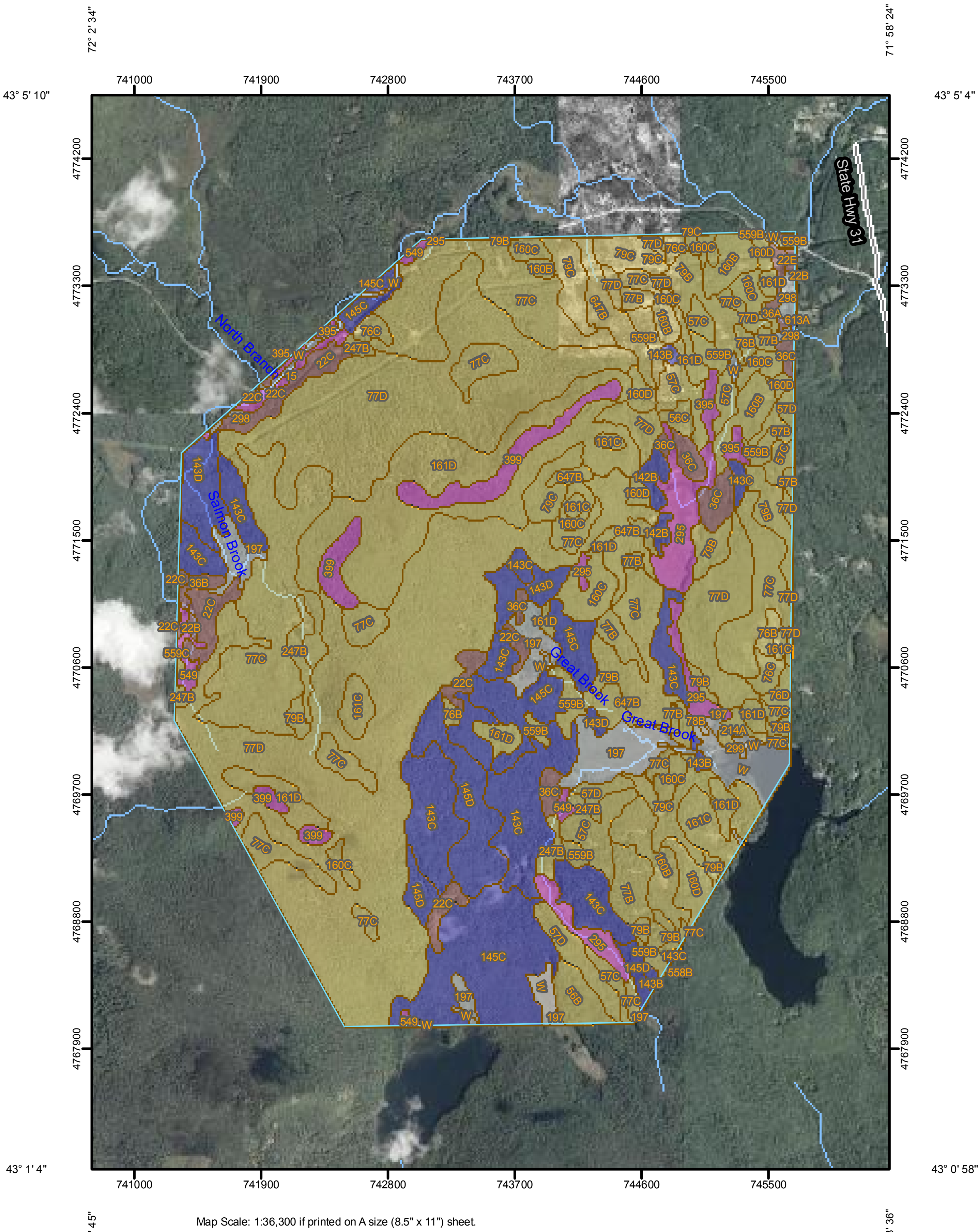
Weather Bureau. 1961. Generalized estimates of probable maximum precipitation and rainfall-frequency data for Puerto Rico and Virgin Islands for areas to 400 square miles, durations to 24 hours, and return periods from 1 to 100 years. U.S. Dept. Commerce, Weather Bur. Tech. Pap. No. 42. Washington, DC. 94 P.

* FROM: New Hampshire Stormwater Manual, Volume 2, Appendix A (2008)

TOWN	24-hour SCS Rainfall* 1 yr	2 yr	10 yr	25 yr	50 yr	100 yr
ACWORTH	2.3	2.7	4.1	4.8	5.4	6.1
ALBANY	2.7	3.2	4.8	5.5	6.1	6.4
ALEXANDRIA	2.4	2.7	4.1	4.9	5.3	6.0
ALLENSTOWN	2.5	2.9	4.3	5.1	5.6	6.3
ALSTEAD	2.3	2.7	4.1	4.9	5.4	6.1
ALTON	2.4	2.9	4.2	5.1	5.5	6.2
AMHERST	2.5	2.9	4.3	5.1	5.7	6.4
ANDOVER	2.3	2.8	4.1	4.9	5.4	6.0
ANTRIM	2.4	2.8	4.2	5.0	5.6	6.2
ASHLAND	2.4	2.8	4.2	5.0	5.4	6.0
ATKINSON	2.5	3.0	4.4	5.2	5.8	6.5
ATKINSON & GILMANTON ACADEMY GRANT	2.3	2.5	3.8	4.6	4.9	5.4
AUBURN	2.5	3.0	4.3	5.1	5.7	6.4
BARNSTEAD	2.4	2.9	4.2	5.1	5.6	6.2
BARRINGTON	2.5	3.0	4.3	5.1	5.7	6.3
BARTLETT	3.0	3.5	5.1	5.9	6.4	7.0
BATH	2.3	2.5	3.9	4.7	5.0	5.7
BEAN'S GRANT2.80	3.6	4.5	5.9	6.4	7.2	
BEAN'S PURCHASE	3.0	3.7	5.2	6.1	6.6	7.2
BEDFORD	2.5	2.9	4.3	5.1	5.7	6.4
BELMONT	2.4	2.8	4.2	5.0	5.5	6.1
BENNINGTON	2.4	2.8	4.2	5.0	5.6	6.3
BENTON	2.3	2.6	4.0	4.8	5.1	5.8
BERLIN	2.5	3.2	4.4	5.0	5.6	6.2
BETHLEHEM EAST	2.4	3.3	4.5	5.2	6.0	6.6
BETHLEHEM WEST	2.4	2.8	4.0	4.9	5.2	5.9
BOSCAWEN	2.4	2.8	4.2	5.0	5.5	6.1
BOW	2.4	2.9	4.2	5.0	5.6	6.3
BRADFORD	2.3	2.8	4.1	4.9	5.5	6.1
BRENTWOOD	2.6	3.0	4.3	5.2	5.7	6.4
BRIDGEWATER	2.4	2.7	4.1	4.9	5.4	6.0
BRISTOL	2.4	2.7	4.1	4.9	5.4	6.0
BROOKFIELD	2.4	2.9	4.2	5.2	5.5	6.2
BROOKLINE	2.5	2.9	4.3	5.1	5.7	6.4
CAMBRIDGE	2.5	2.8	4.0	4.9	5.2	6.0
CAMPTON	2.4	2.8	4.2	4.9	5.3	6.0
CANAAN	2.3	2.6	4.0	4.8	5.3	5.9
CANDIA	2.5	3.0	4.3	5.1	5.7	6.3
CANTERBURY	2.4	2.8	4.2	5.0	5.5	6.2
CARROLL	2.5	3.2	4.5	5.1	6.0	6.4
CENTER HARBOR	2.4	2.8	4.2	5.0	5.4	6.0
CHANDLER'S PURCHASE	2.8	3.6	5.0	5.8	6.4	7.1

*Rainfall data is interpolated from *Technical Paper No. 40 (TP40) Rainfall Frequency Atlas of the Eastern United States* . Other data may be used (e.g., *Atlas of Precipitation Extremes for the Northeastern United States and Southeastern Canada* by Cornell University, Northeast Regional Climate Center, September, 1993.)

Hydrologic Soil Group—Hillsborough County, New Hampshire, Western Part
(Antrim Wind Project)



Map Scale: 1:36,300 if printed on A size (8.5" x 11") sheet.

N

Meters
0 300 600 1,200 1,800

Feet
0 1,000 2,000 4,000 6,000

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

A

A/D

B

B/D

C

C/D

D

Not rated or not available

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:36,300 if printed on A size (8.5" × 11") sheet.

The soil surveys that comprise your AOI were mapped at 1:20,000.

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

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

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

Soil Survey Area: Hillsborough County, New Hampshire, Western Part
Survey Area Data: Version 11, Oct 27, 2009

Date(s) aerial images were photographed: Data not available.

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

Hydrologic Soil Group

Hydrologic Soil Group— Summary by Map Unit — Hillsborough County, New Hampshire, Western Part (NH602)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
15	Searsport muck	D	12.9	0.3%
22B	Colton loamy sand, 3 to 8 percent slopes	A	5.2	0.1%
22C	Colton loamy sand, 8 to 15 percent slopes	A	95.5	1.9%
22E	Colton loamy sand, 15 to 50 percent slopes	A	5.0	0.1%
27B	Groveton very fine sandy loam, 0 to 5 percent slopes	B	0.4	0.0%
36A	Adams loamy sand, 0 to 3 percent slopes	A	5.0	0.1%
36B	Adams loamy sand, 3 to 8 percent slopes	A	8.5	0.2%
36C	Adams loamy sand, 8 to 15 percent slopes	A	55.7	1.1%
36E	Adams loamy sand, 15 to 50 percent slopes	A	1.5	0.0%
56B	Becket fine sandy loam, 3 to 8 percent slopes	C	30.1	0.6%
56C	Becket fine sandy loam, 8 to 15 percent slopes	C	10.3	0.2%
57B	Becket stony fine sandy loam, 3 to 8 percent slopes	C	12.1	0.2%
57C	Becket stony fine sandy loam, 8 to 15 percent slopes	C	108.8	2.1%
57D	Becket stony fine sandy loam, 15 to 25 percent slopes	C	52.2	1.0%
76B	Marlow loam, 3 to 8 percent slopes	C	18.8	0.4%
76C	Marlow loam, 8 to 15 percent slopes	C	28.2	0.6%
76D	Marlow loam, 15 to 25 percent slopes	C	10.1	0.2%
77B	Marlow stony loam, 3 to 8 percent slopes	C	75.2	1.5%
77C	Marlow stony loam, 8 to 15 percent slopes	C	680.8	13.3%
77D	Marlow stony loam, 15 to 35 percent slopes	C	1,387.4	27.2%
78B	Peru loam, 3 to 8 percent slopes	C	6.8	0.1%
79B	Peru stony loam, 0 to 8 percent slopes	C	125.9	2.5%
79C	Peru stony loam, 8 to 15 percent slopes	C	123.3	2.4%
142B	Monadnock fine sandy loam, 3 to 8 percent slopes	B	21.8	0.4%
143B	Monadnock stony fine sandy loam, 3 to 8 percent slopes	B	11.5	0.2%
143C	Monadnock stony fine sandy loam, 8 to 15 percent slopes	B	337.5	6.6%

Hydrologic Soil Group— Summary by Map Unit — Hillsborough County, New Hampshire, Western Part (NH602)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
143D	Monadnock stony fine sandy loam, 15 to 35 percent slope s	B	82.1	1.6%
145C	Monadnock very bouldery fine sandy loam, 8 to 15 percen t slopes	B	282.0	5.5%
145D	Monadnock very bouldery fine sandy loam, 15 to 35 perce nt slopes	B	116.0	2.3%
160B	Tunbridge-Lyman-Monadnock complex, stony, 3 to 8 percen t slopes	C	121.7	2.4%
160C	Tunbridge-Lyman-Monadnock complex, stony, 8 to 15 perce nt slopes	C	104.4	2.0%
160D	Tunbridge-Lyman-Monadnock complex, stony, 15 to 25 perc ent slopes	C	54.2	1.1%
161C	Lyman-Tunbridge-Rock outcrop complex, 3 to 15 percent s lopes	C	83.4	1.6%
161D	Lyman-Tunbridge-Rock outcrop complex, 15 to 35 percent slopes	C	377.0	7.4%
197	Borohemists, ponded		119.0	2.3%
214A	Naumburg fine sandy loam, 0 to 3 percent slopes	C	10.9	0.2%
247B	Lyme stony loam, 0 to 5 percent slopes	C	41.9	0.8%
295	Greenwood mucky peat	D	109.1	2.1%
298	Pits, gravel		15.2	0.3%
299	Udorthents, smoothed		3.0	0.1%
395	Chocorua mucky peat	D	20.8	0.4%
399	Rock outcrop	D	93.1	1.8%
549	Peacham stony muck	D	23.0	0.4%
558B	Skerry fine sandy loam, 3 to 8 percent slopes	C	0.0	0.0%
559B	Skerry stony fine sandy loam, 0 to 8 percent slopes	C	69.6	1.4%
559C	Skerry stony fine sandy loam, 8 to 15 percent slopes	C	0.1	0.0%
613A	Croghan loamy fine sand, 0 to 3 percent slopes	B	1.3	0.0%
647B	Pillsbury stony loam, 0 to 5 percent slopes	C	69.3	1.4%
W	Water		79.5	1.6%
Totals for Area of Interest			**5,107.0**	**100.0%**

Description

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

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

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

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

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

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

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

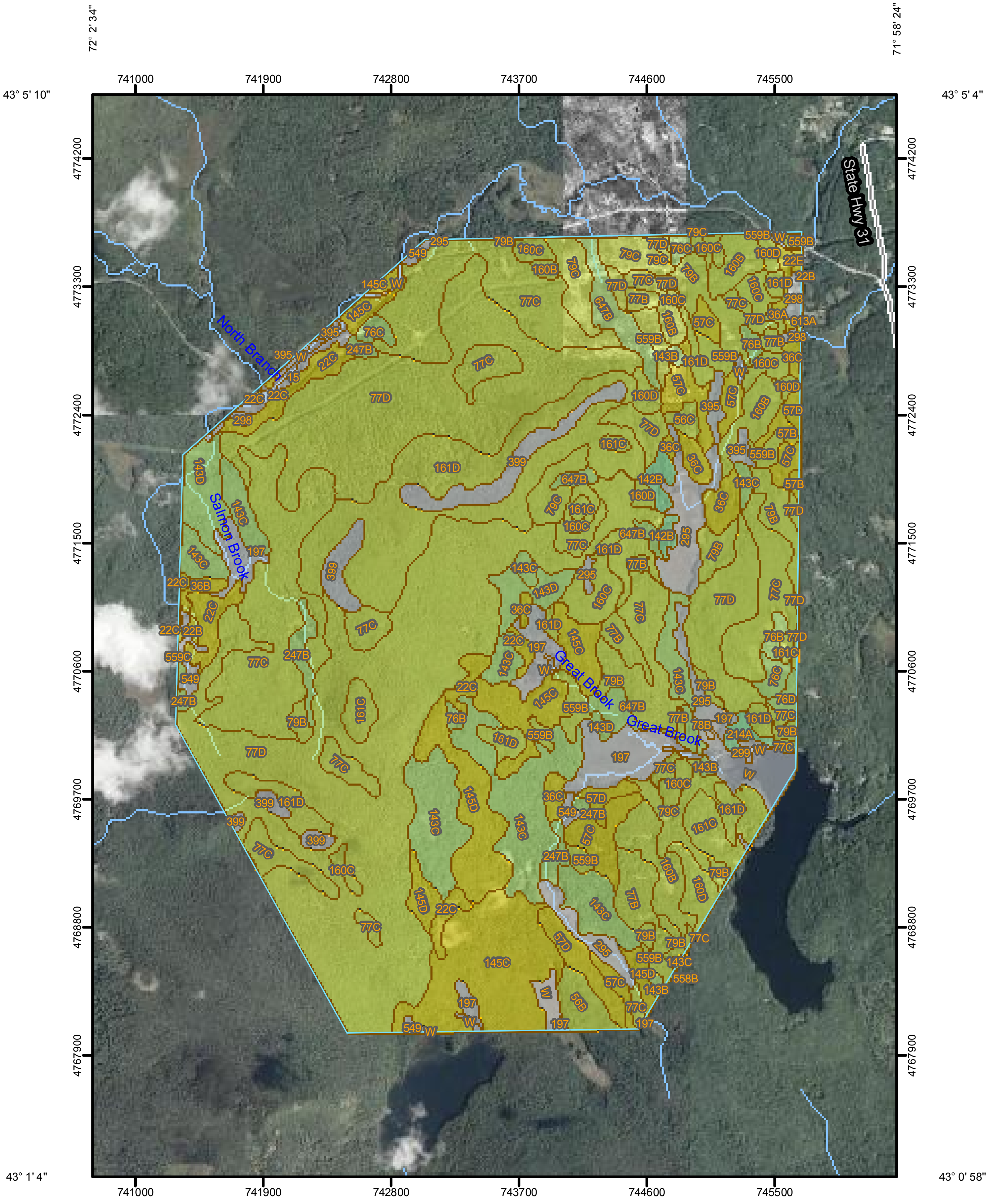
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

K Factor, Whole Soil—Hillsborough County, New Hampshire, Western Part
(Antrim Wind Project)



Map Scale: 1:36,300 if printed on A size (8.5" x 11") sheet.

N

Meters
0 300 600 1,200 1,800

Feet
0 1,000 2,000 4,000 6,000

MAP LEGEND

Area of Interest (AOI)

Area of Interest (AOI)

Soils

Soil Map Units

Soil Ratings

.02

.05

.10

.15

.17

.20

.24

.28

.32

.37

.43

.49

.55

.64

Not rated or not available

Political Features

Cities

Water Features

Streams and Canals

Transportation

Rails

Interstate Highways

US Routes

Major Roads

Local Roads

MAP INFORMATION

Map Scale: 1:36,300 if printed on A size (8.5" × 11") sheet.

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Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: UTM Zone 18N NAD83

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Soil Survey Area: Hillsborough County, New Hampshire, Western Part
Survey Area Data: Version 11, Oct 27, 2009

Date(s) aerial images were photographed: Data not available.

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.

K Factor, Whole Soil

K Factor, Whole Soil— Summary by Map Unit — Hillsborough County, New Hampshire, Western Part (NH602)				
Map unit symbol	Map unit name	Rating	Acres in AOI	Percent of AOI
15	Searsport muck		12.9	0.3%
22B	Colton loamy sand, 3 to 8 percent slopes	.17	5.2	0.1%
22C	Colton loamy sand, 8 to 15 percent slopes	.17	95.5	1.9%
22E	Colton loamy sand, 15 to 50 percent slopes	.17	5.0	0.1%
27B	Groveton very fine sandy loam, 0 to 5 percent slopes	.32	0.4	0.0%
36A	Adams loamy sand, 0 to 3 percent slopes	.17	5.0	0.1%
36B	Adams loamy sand, 3 to 8 percent slopes	.17	8.5	0.2%
36C	Adams loamy sand, 8 to 15 percent slopes	.17	55.7	1.1%
36E	Adams loamy sand, 15 to 50 percent slopes	.17	1.5	0.0%
56B	Becket fine sandy loam, 3 to 8 percent slopes	.20	30.1	0.6%
56C	Becket fine sandy loam, 8 to 15 percent slopes	.20	10.3	0.2%
57B	Becket stony fine sandy loam, 3 to 8 percent slopes	.17	12.1	0.2%
57C	Becket stony fine sandy loam, 8 to 15 percent slopes	.17	108.8	2.1%
57D	Becket stony fine sandy loam, 15 to 25 percent slopes	.17	52.2	1.0%
76B	Marlow loam, 3 to 8 percent slopes	.24	18.8	0.4%
76C	Marlow loam, 8 to 15 percent slopes	.24	28.2	0.6%
76D	Marlow loam, 15 to 25 percent slopes	.24	10.1	0.2%
77B	Marlow stony loam, 3 to 8 percent slopes	.20	75.2	1.5%
77C	Marlow stony loam, 8 to 15 percent slopes	.20	680.8	13.3%
77D	Marlow stony loam, 15 to 35 percent slopes	.20	1,387.4	27.2%
78B	Peru loam, 3 to 8 percent slopes	.24	6.8	0.1%
79B	Peru stony loam, 0 to 8 percent slopes	.20	125.9	2.5%
79C	Peru stony loam, 8 to 15 percent slopes	.20	123.3	2.4%
142B	Monadnock fine sandy loam, 3 to 8 percent slopes	.28	21.8	0.4%
143B	Monadnock stony fine sandy loam, 3 to 8 percent slopes	.24	11.5	0.2%
143C	Monadnock stony fine sandy loam, 8 to 15 percent slopes	.24	337.5	6.6%

K Factor, Whole Soil— Summary by Map Unit — Hillsborough County, New Hampshire, Western Part (NH602)				
Map unit symbol	**Map unit name**	**Rating**	**Acres in AOI**	**Percent of AOI**
143D	Monadnock stony fine sandy loam, 15 to 35 percent slope s	.24	82.1	1.6%
145C	Monadnock very bouldery fine sandy loam, 8 to 15 percen t slopes	.17	282.0	5.5%
145D	Monadnock very bouldery fine sandy loam, 15 to 35 perce nt slopes	.17	116.0	2.3%
160B	Tunbridge-Lyman-Monadnock complex, stony, 3 to 8 percen t slopes	.20	121.7	2.4%
160C	Tunbridge-Lyman-Monadnock complex, stony, 8 to 15 perce nt slopes	.20	104.4	2.0%
160D	Tunbridge-Lyman-Monadnock complex, stony, 15 to 25 perc ent slopes	.20	54.2	1.1%
161C	Lyman-Tunbridge-Rock outcrop complex, 3 to 15 percent s lopes	.20	83.4	1.6%
161D	Lyman-Tunbridge-Rock outcrop complex, 15 to 35 percent slopes	.20	377.0	7.4%
197	Borohemists, ponded		119.0	2.3%
214A	Naumburg fine sandy loam, 0 to 3 percent slopes	.28	10.9	0.2%
247B	Lyme stony loam, 0 to 5 percent slopes	.24	41.9	0.8%
295	Greenwood mucky peat		109.1	2.1%
298	Pits, gravel		15.2	0.3%
299	Udorthents, smoothed		3.0	0.1%
395	Chocorua mucky peat		20.8	0.4%
399	Rock outcrop		93.1	1.8%
549	Peacham stony muck		23.0	0.4%
558B	Skerry fine sandy loam, 3 to 8 percent slopes	.24	0.0	0.0%
559B	Skerry stony fine sandy loam, 0 to 8 percent slopes	.20	69.6	1.4%
559C	Skerry stony fine sandy loam, 8 to 15 percent slopes	.20	0.1	0.0%
613A	Croghan loamy fine sand, 0 to 3 percent slopes	.17	1.3	0.0%
647B	Pillsbury stony loam, 0 to 5 percent slopes	.24	69.3	1.4%
W	Water		79.5	1.6%
Totals for Area of Interest			**5,107.0**	**100.0%**

Description

Erosion factor K indicates the susceptibility of a soil to sheet and rill erosion by water. Factor K is one of six factors used in the Universal Soil Loss Equation (USLE) and the Revised Universal Soil Loss Equation (RUSLE) to predict the average annual rate of soil loss by sheet and rill erosion in tons per acre per year. The estimates are based primarily on percentage of silt, sand, and organic matter and on soil structure and saturated hydraulic conductivity (Ksat). Values of K range from 0.02 to 0.69. Other factors being equal, the higher the value, the more susceptible the soil is to sheet and rill erosion by water.

"Erosion factor Kw (whole soil)" indicates the erodibility of the whole soil. The estimates are modified by the presence of rock fragments.

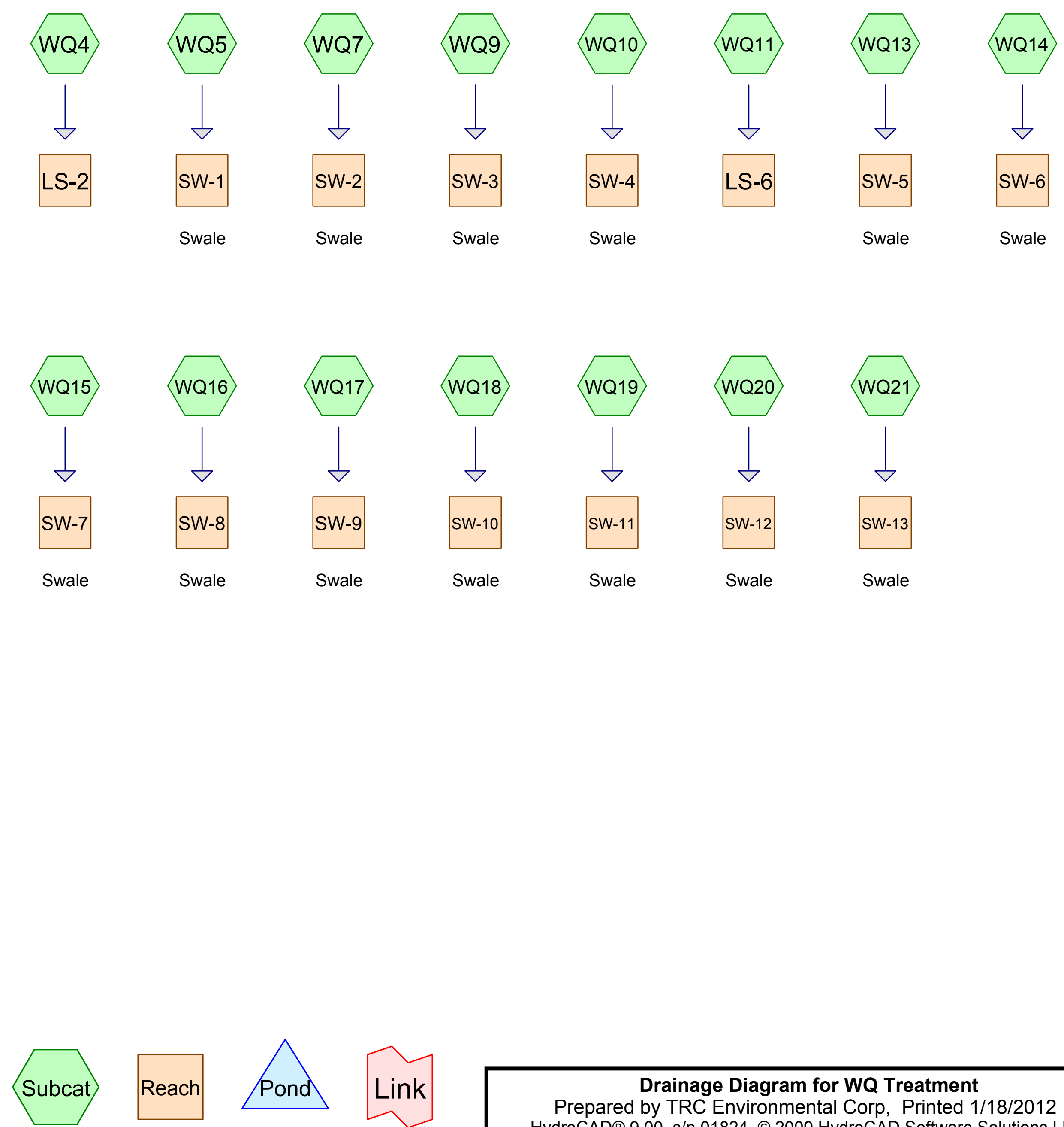
Rating Options

Aggregation Method: Dominant Condition

Component Percent Cutoff: *None Specified*

Tie-break Rule: Higher

Layer Options: Surface Layer



Drainage Diagram for WQ Treatment
Prepared by TRC Environmental Corp, Printed 1/18/2012
HydroCAD® 9.00 s/n 01824 © 2009 HydroCAD Software Solutions LLC

Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
2.838	71	Meadow, non-grazed, HSG C (WQ13, WQ14, WQ15, WQ16, WQ17, WQ18, WQ19, WQ20, WQ21, WQ4, WQ5, WQ7, WQ9)
0.347	78	Meadow, non-grazed, HSG D (WQ10, WQ11)
1.436	89	Gravel roads, HSG C (WQ13, WQ14, WQ15, WQ16, WQ17, WQ18, WQ19, WQ20, WQ21, WQ4, WQ5, WQ7, WQ9)
0.178	91	Gravel roads, HSG D (WQ10, WQ11)

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
4.274	HSG C	WQ13, WQ14, WQ15, WQ16, WQ17, WQ18, WQ19, WQ20, WQ21, WQ4, WQ5, WQ7, WQ9
0.525	HSG D	WQ10, WQ11
0.000	Other	

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentWQ10: Runoff Area=0.250 ac 0.00% Impervious Runoff Depth=1.22"
Tc=6.0 min CN=82 Runoff=0.35 cfs 0.025 af

SubcatchmentWQ11: Runoff Area=0.275 ac 0.00% Impervious Runoff Depth=1.22"
Tc=6.0 min CN=82 Runoff=0.39 cfs 0.028 af

SubcatchmentWQ13: Runoff Area=0.396 ac 0.00% Impervious Runoff Depth=0.88"
Tc=6.0 min CN=76 Runoff=0.39 cfs 0.029 af

SubcatchmentWQ14: Runoff Area=0.591 ac 0.00% Impervious Runoff Depth=0.78"
Tc=6.0 min CN=74 Runoff=0.50 cfs 0.039 af

SubcatchmentWQ15: Runoff Area=0.254 ac 0.00% Impervious Runoff Depth=0.88"
Tc=6.0 min CN=76 Runoff=0.25 cfs 0.019 af

SubcatchmentWQ16: Runoff Area=0.367 ac 0.00% Impervious Runoff Depth=0.93"
Tc=6.0 min CN=77 Runoff=0.38 cfs 0.029 af

SubcatchmentWQ17: Runoff Area=0.183 ac 0.00% Impervious Runoff Depth=0.93"
Tc=6.0 min CN=77 Runoff=0.19 cfs 0.014 af

SubcatchmentWQ18: Runoff Area=0.294 ac 0.00% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=78 Runoff=0.33 cfs 0.024 af

SubcatchmentWQ19: Runoff Area=0.183 ac 0.00% Impervious Runoff Depth=1.35"
Tc=6.0 min CN=84 Runoff=0.29 cfs 0.021 af

SubcatchmentWQ20: Runoff Area=0.514 ac 0.00% Impervious Runoff Depth=0.88"
Tc=6.0 min CN=76 Runoff=0.50 cfs 0.038 af

SubcatchmentWQ21: Runoff Area=0.274 ac 0.00% Impervious Runoff Depth=0.93"
Tc=6.0 min CN=77 Runoff=0.29 cfs 0.021 af

SubcatchmentWQ4: Runoff Area=0.231 ac 0.00% Impervious Runoff Depth=1.16"
Tc=6.0 min CN=81 Runoff=0.31 cfs 0.022 af

SubcatchmentWQ5: Runoff Area=0.411 ac 0.00% Impervious Runoff Depth=0.99"
Tc=6.0 min CN=78 Runoff=0.46 cfs 0.034 af

SubcatchmentWQ7: Runoff Area=0.268 ac 0.00% Impervious Runoff Depth=1.10"
Tc=6.0 min CN=80 Runoff=0.34 cfs 0.025 af

SubcatchmentWQ9: Runoff Area=0.308 ac 0.00% Impervious Runoff Depth=0.83"
Tc=6.0 min CN=75 Runoff=0.28 cfs 0.021 af

Reach LS-2: Inflow=0.31 cfs 0.022 af
Outflow=0.31 cfs 0.022 af

Reach LS-6: Inflow=0.39 cfs 0.028 af
Outflow=0.39 cfs 0.028 af

Reach SW-1: Swale Avg. Depth=0.27' Max Vel=0.36 fps Inflow=0.46 cfs 0.034 af
n=0.130 L=150.0' S=0.0075 '/' Capacity=10.41 cfs Outflow=0.36 cfs 0.034 af

Reach SW-10: Swale Avg. Depth=0.23' Max Vel=0.30 fps Inflow=0.33 cfs 0.024 af
n=0.140 L=135.0' S=0.0074 '/' Capacity=9.59 cfs Outflow=0.25 cfs 0.024 af

Reach SW-11: Swale Avg. Depth=0.24' Max Vel=0.24 fps Inflow=0.29 cfs 0.021 af
n=0.150 L=125.0' S=0.0050 '/' Capacity=7.38 cfs Outflow=0.22 cfs 0.021 af

Reach SW-12: Swale Avg. Depth=0.28' Max Vel=0.37 fps Inflow=0.50 cfs 0.038 af
n=0.130 L=150.0' S=0.0075 '/' Capacity=10.41 cfs Outflow=0.40 cfs 0.038 af

Reach SW-13: Swale Avg. Depth=0.22' Max Vel=0.28 fps Inflow=0.29 cfs 0.021 af
n=0.150 L=125.0' S=0.0080 '/' Capacity=9.30 cfs Outflow=0.22 cfs 0.021 af

Reach SW-2: Swale Avg. Depth=0.25' Max Vel=0.28 fps Inflow=0.34 cfs 0.025 af
n=0.130 L=130.0' S=0.0050 '/' Capacity=8.48 cfs Outflow=0.26 cfs 0.025 af

Reach SW-3: Swale Avg. Depth=0.20' Max Vel=0.30 fps Inflow=0.28 cfs 0.021 af
n=0.150 L=130.0' S=0.0100 '/' Capacity=10.40 cfs Outflow=0.22 cfs 0.021 af

Reach SW-4: Swale Avg. Depth=0.25' Max Vel=0.31 fps Inflow=0.35 cfs 0.025 af
n=0.140 L=125.0' S=0.0072 '/' Capacity=9.45 cfs Outflow=0.28 cfs 0.025 af

Reach SW-5: Swale Avg. Depth=0.27' Max Vel=0.29 fps Inflow=0.39 cfs 0.029 af
n=0.130 L=120.0' S=0.0050 '/' Capacity=8.48 cfs Outflow=0.31 cfs 0.029 af

Reach SW-6: Swale Avg. Depth=0.25' Max Vel=0.35 fps Inflow=0.50 cfs 0.039 af
n=0.130 L=120.0' S=0.0075 '/' Capacity=12.16 cfs Outflow=0.41 cfs 0.039 af

Reach SW-7: Swale Avg. Depth=0.20' Max Vel=0.26 fps Inflow=0.25 cfs 0.019 af
n=0.150 L=120.0' S=0.0075 '/' Capacity=9.00 cfs Outflow=0.19 cfs 0.019 af

Reach SW-8: Swale Avg. Depth=0.25' Max Vel=0.32 fps Inflow=0.38 cfs 0.029 af
n=0.140 L=135.0' S=0.0074 '/' Capacity=9.59 cfs Outflow=0.30 cfs 0.029 af

Reach SW-9: Swale Avg. Depth=0.17' Max Vel=0.24 fps Inflow=0.19 cfs 0.014 af
n=0.150 L=120.0' S=0.0075 '/' Capacity=9.00 cfs Outflow=0.14 cfs 0.014 af

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentWQ10: Runoff Area=0.250 ac 0.00% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=82 Runoff=0.70 cfs 0.049 af

SubcatchmentWQ11: Runoff Area=0.275 ac 0.00% Impervious Runoff Depth=2.37"
Tc=6.0 min CN=82 Runoff=0.76 cfs 0.054 af

SubcatchmentWQ13: Runoff Area=0.396 ac 0.00% Impervious Runoff Depth=1.89"
Tc=6.0 min CN=76 Runoff=0.87 cfs 0.062 af

SubcatchmentWQ14: Runoff Area=0.591 ac 0.00% Impervious Runoff Depth=1.74"
Tc=6.0 min CN=74 Runoff=1.19 cfs 0.086 af

SubcatchmentWQ15: Runoff Area=0.254 ac 0.00% Impervious Runoff Depth=1.89"
Tc=6.0 min CN=76 Runoff=0.56 cfs 0.040 af

SubcatchmentWQ16: Runoff Area=0.367 ac 0.00% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=77 Runoff=0.84 cfs 0.060 af

SubcatchmentWQ17: Runoff Area=0.183 ac 0.00% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=77 Runoff=0.42 cfs 0.030 af

SubcatchmentWQ18: Runoff Area=0.294 ac 0.00% Impervious Runoff Depth=2.05"
Tc=6.0 min CN=78 Runoff=0.70 cfs 0.050 af

SubcatchmentWQ19: Runoff Area=0.183 ac 0.00% Impervious Runoff Depth=2.55"
Tc=6.0 min CN=84 Runoff=0.54 cfs 0.039 af

SubcatchmentWQ20: Runoff Area=0.514 ac 0.00% Impervious Runoff Depth=1.89"
Tc=6.0 min CN=76 Runoff=1.13 cfs 0.081 af

SubcatchmentWQ21: Runoff Area=0.274 ac 0.00% Impervious Runoff Depth=1.97"
Tc=6.0 min CN=77 Runoff=0.63 cfs 0.045 af

SubcatchmentWQ4: Runoff Area=0.231 ac 0.00% Impervious Runoff Depth=2.29"
Tc=6.0 min CN=81 Runoff=0.62 cfs 0.044 af

SubcatchmentWQ5: Runoff Area=0.411 ac 0.00% Impervious Runoff Depth=2.05"
Tc=6.0 min CN=78 Runoff=0.98 cfs 0.070 af

SubcatchmentWQ7: Runoff Area=0.268 ac 0.00% Impervious Runoff Depth=2.21"
Tc=6.0 min CN=80 Runoff=0.69 cfs 0.049 af

SubcatchmentWQ9: Runoff Area=0.308 ac 0.00% Impervious Runoff Depth=1.82"
Tc=6.0 min CN=75 Runoff=0.65 cfs 0.047 af

Reach LS-2: Inflow=0.62 cfs 0.044 af
Outflow=0.62 cfs 0.044 af

Reach LS-6:
Inflow=0.76 cfs 0.054 af
Outflow=0.76 cfs 0.054 af

Reach SW-1: Swale
Avg. Depth=0.42' Max Vel=0.46 fps Inflow=0.98 cfs 0.070 af
n=0.130 L=150.0' S=0.0075 '/' Capacity=10.41 cfs Outflow=0.83 cfs 0.070 af

Reach SW-10: Swale
Avg. Depth=0.36' Max Vel=0.39 fps Inflow=0.70 cfs 0.050 af
n=0.140 L=135.0' S=0.0074 '/' Capacity=9.59 cfs Outflow=0.59 cfs 0.050 af

Reach SW-11: Swale
Avg. Depth=0.36' Max Vel=0.30 fps Inflow=0.54 cfs 0.039 af
n=0.150 L=125.0' S=0.0050 '/' Capacity=7.38 cfs Outflow=0.44 cfs 0.039 af

Reach SW-12: Swale
Avg. Depth=0.46' Max Vel=0.48 fps Inflow=1.13 cfs 0.081 af
n=0.130 L=150.0' S=0.0075 '/' Capacity=10.41 cfs Outflow=0.96 cfs 0.081 af

Reach SW-13: Swale
Avg. Depth=0.35' Max Vel=0.37 fps Inflow=0.63 cfs 0.045 af
n=0.150 L=125.0' S=0.0080 '/' Capacity=9.30 cfs Outflow=0.53 cfs 0.045 af

Reach SW-2: Swale
Avg. Depth=0.38' Max Vel=0.36 fps Inflow=0.69 cfs 0.049 af
n=0.130 L=130.0' S=0.0050 '/' Capacity=8.48 cfs Outflow=0.57 cfs 0.049 af

Reach SW-3: Swale
Avg. Depth=0.34' Max Vel=0.41 fps Inflow=0.65 cfs 0.047 af
n=0.150 L=130.0' S=0.0100 '/' Capacity=10.40 cfs Outflow=0.55 cfs 0.047 af

Reach SW-4: Swale
Avg. Depth=0.37' Max Vel=0.39 fps Inflow=0.70 cfs 0.049 af
n=0.140 L=125.0' S=0.0072 '/' Capacity=9.45 cfs Outflow=0.59 cfs 0.049 af

Reach SW-5: Swale
Avg. Depth=0.44' Max Vel=0.39 fps Inflow=0.87 cfs 0.062 af
n=0.130 L=120.0' S=0.0050 '/' Capacity=8.48 cfs Outflow=0.74 cfs 0.062 af

Reach SW-6: Swale
Avg. Depth=0.42' Max Vel=0.47 fps Inflow=1.19 cfs 0.086 af
n=0.130 L=120.0' S=0.0075 '/' Capacity=12.16 cfs Outflow=1.05 cfs 0.086 af

Reach SW-7: Swale
Avg. Depth=0.33' Max Vel=0.35 fps Inflow=0.56 cfs 0.040 af
n=0.150 L=120.0' S=0.0075 '/' Capacity=9.00 cfs Outflow=0.47 cfs 0.040 af

Reach SW-8: Swale
Avg. Depth=0.40' Max Vel=0.42 fps Inflow=0.84 cfs 0.060 af
n=0.140 L=135.0' S=0.0074 '/' Capacity=9.59 cfs Outflow=0.71 cfs 0.060 af

Reach SW-9: Swale
Avg. Depth=0.28' Max Vel=0.32 fps Inflow=0.42 cfs 0.030 af
n=0.150 L=120.0' S=0.0075 '/' Capacity=9.00 cfs Outflow=0.34 cfs 0.030 af

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentWQ10: Runoff Area=0.250 ac 0.00% Impervious Runoff Depth=3.08"
Tc=6.0 min CN=82 Runoff=0.90 cfs 0.064 af

SubcatchmentWQ11: Runoff Area=0.275 ac 0.00% Impervious Runoff Depth=3.08"
Tc=6.0 min CN=82 Runoff=0.99 cfs 0.071 af

SubcatchmentWQ13: Runoff Area=0.396 ac 0.00% Impervious Runoff Depth=2.54"
Tc=6.0 min CN=76 Runoff=1.17 cfs 0.084 af

SubcatchmentWQ14: Runoff Area=0.591 ac 0.00% Impervious Runoff Depth=2.36"
Tc=6.0 min CN=74 Runoff=1.63 cfs 0.116 af

SubcatchmentWQ15: Runoff Area=0.254 ac 0.00% Impervious Runoff Depth=2.54"
Tc=6.0 min CN=76 Runoff=0.75 cfs 0.054 af

SubcatchmentWQ16: Runoff Area=0.367 ac 0.00% Impervious Runoff Depth=2.62"
Tc=6.0 min CN=77 Runoff=1.13 cfs 0.080 af

SubcatchmentWQ17: Runoff Area=0.183 ac 0.00% Impervious Runoff Depth=2.62"
Tc=6.0 min CN=77 Runoff=0.56 cfs 0.040 af

SubcatchmentWQ18: Runoff Area=0.294 ac 0.00% Impervious Runoff Depth=2.71"
Tc=6.0 min CN=78 Runoff=0.93 cfs 0.066 af

SubcatchmentWQ19: Runoff Area=0.183 ac 0.00% Impervious Runoff Depth=3.27"
Tc=6.0 min CN=84 Runoff=0.70 cfs 0.050 af

SubcatchmentWQ20: Runoff Area=0.514 ac 0.00% Impervious Runoff Depth=2.54"
Tc=6.0 min CN=76 Runoff=1.52 cfs 0.109 af

SubcatchmentWQ21: Runoff Area=0.274 ac 0.00% Impervious Runoff Depth=2.62"
Tc=6.0 min CN=77 Runoff=0.84 cfs 0.060 af

SubcatchmentWQ4: Runoff Area=0.231 ac 0.00% Impervious Runoff Depth=2.99"
Tc=6.0 min CN=81 Runoff=0.81 cfs 0.057 af

SubcatchmentWQ5: Runoff Area=0.411 ac 0.00% Impervious Runoff Depth=2.71"
Tc=6.0 min CN=78 Runoff=1.31 cfs 0.093 af

SubcatchmentWQ7: Runoff Area=0.268 ac 0.00% Impervious Runoff Depth=2.89"
Tc=6.0 min CN=80 Runoff=0.91 cfs 0.065 af

SubcatchmentWQ9: Runoff Area=0.308 ac 0.00% Impervious Runoff Depth=2.45"
Tc=6.0 min CN=75 Runoff=0.88 cfs 0.063 af

Reach LS-2: Inflow=0.81 cfs 0.057 af
Outflow=0.81 cfs 0.057 af

Reach LS-6: Inflow=0.99 cfs 0.071 af
Outflow=0.99 cfs 0.071 af

Reach SW-1: Swale Avg. Depth=0.50' Max Vel=0.50 fps Inflow=1.31 cfs 0.093 af
n=0.130 L=150.0' S=0.0075 '/' Capacity=10.41 cfs Outflow=1.12 cfs 0.093 af

Reach SW-10: Swale Avg. Depth=0.43' Max Vel=0.43 fps Inflow=0.93 cfs 0.066 af
n=0.140 L=135.0' S=0.0074 '/' Capacity=9.59 cfs Outflow=0.79 cfs 0.066 af

Reach SW-11: Swale Avg. Depth=0.41' Max Vel=0.32 fps Inflow=0.70 cfs 0.050 af
n=0.150 L=125.0' S=0.0050 '/' Capacity=7.38 cfs Outflow=0.57 cfs 0.050 af

Reach SW-12: Swale Avg. Depth=0.54' Max Vel=0.53 fps Inflow=1.52 cfs 0.109 af
n=0.130 L=150.0' S=0.0075 '/' Capacity=10.41 cfs Outflow=1.32 cfs 0.109 af

Reach SW-13: Swale Avg. Depth=0.41' Max Vel=0.41 fps Inflow=0.84 cfs 0.060 af
n=0.150 L=125.0' S=0.0080 '/' Capacity=9.30 cfs Outflow=0.72 cfs 0.060 af

Reach SW-2: Swale Avg. Depth=0.45' Max Vel=0.39 fps Inflow=0.91 cfs 0.065 af
n=0.130 L=130.0' S=0.0050 '/' Capacity=8.48 cfs Outflow=0.76 cfs 0.065 af

Reach SW-3: Swale Avg. Depth=0.40' Max Vel=0.45 fps Inflow=0.88 cfs 0.063 af
n=0.150 L=130.0' S=0.0100 '/' Capacity=10.40 cfs Outflow=0.76 cfs 0.063 af

Reach SW-4: Swale Avg. Depth=0.43' Max Vel=0.42 fps Inflow=0.90 cfs 0.064 af
n=0.140 L=125.0' S=0.0072 '/' Capacity=9.45 cfs Outflow=0.77 cfs 0.064 af

Reach SW-5: Swale Avg. Depth=0.52' Max Vel=0.42 fps Inflow=1.17 cfs 0.084 af
n=0.130 L=120.0' S=0.0050 '/' Capacity=8.48 cfs Outflow=1.01 cfs 0.084 af

Reach SW-6: Swale Avg. Depth=0.50' Max Vel=0.53 fps Inflow=1.63 cfs 0.116 af
n=0.130 L=120.0' S=0.0075 '/' Capacity=12.16 cfs Outflow=1.46 cfs 0.116 af

Reach SW-7: Swale Avg. Depth=0.40' Max Vel=0.39 fps Inflow=0.75 cfs 0.054 af
n=0.150 L=120.0' S=0.0075 '/' Capacity=9.00 cfs Outflow=0.64 cfs 0.054 af

Reach SW-8: Swale Avg. Depth=0.48' Max Vel=0.46 fps Inflow=1.13 cfs 0.080 af
n=0.140 L=135.0' S=0.0074 '/' Capacity=9.59 cfs Outflow=0.97 cfs 0.080 af

Reach SW-9: Swale Avg. Depth=0.33' Max Vel=0.35 fps Inflow=0.56 cfs 0.040 af
n=0.150 L=120.0' S=0.0075 '/' Capacity=9.00 cfs Outflow=0.47 cfs 0.040 af

Time span=0.00-36.00 hrs, dt=0.02 hrs, 1801 points
Runoff by SCS TR-20 method, UH=SCS
Reach routing by Dyn-Stor-Ind method - Pond routing by Dyn-Stor-Ind method

SubcatchmentWQ10: Runoff Area=0.250 ac 0.00% Impervious Runoff Depth=3.62"
Tc=6.0 min CN=82 Runoff=1.05 cfs 0.075 af

SubcatchmentWQ11: Runoff Area=0.275 ac 0.00% Impervious Runoff Depth=3.62"
Tc=6.0 min CN=82 Runoff=1.16 cfs 0.083 af

SubcatchmentWQ13: Runoff Area=0.396 ac 0.00% Impervious Runoff Depth=3.04"
Tc=6.0 min CN=76 Runoff=1.41 cfs 0.100 af

SubcatchmentWQ14: Runoff Area=0.591 ac 0.00% Impervious Runoff Depth=2.85"
Tc=6.0 min CN=74 Runoff=1.97 cfs 0.140 af

SubcatchmentWQ15: Runoff Area=0.254 ac 0.00% Impervious Runoff Depth=3.04"
Tc=6.0 min CN=76 Runoff=0.90 cfs 0.064 af

SubcatchmentWQ16: Runoff Area=0.367 ac 0.00% Impervious Runoff Depth=3.13"
Tc=6.0 min CN=77 Runoff=1.35 cfs 0.096 af

SubcatchmentWQ17: Runoff Area=0.183 ac 0.00% Impervious Runoff Depth=3.13"
Tc=6.0 min CN=77 Runoff=0.67 cfs 0.048 af

SubcatchmentWQ18: Runoff Area=0.294 ac 0.00% Impervious Runoff Depth=3.23"
Tc=6.0 min CN=78 Runoff=1.11 cfs 0.079 af

SubcatchmentWQ19: Runoff Area=0.183 ac 0.00% Impervious Runoff Depth=3.82"
Tc=6.0 min CN=84 Runoff=0.81 cfs 0.058 af

SubcatchmentWQ20: Runoff Area=0.514 ac 0.00% Impervious Runoff Depth=3.04"
Tc=6.0 min CN=76 Runoff=1.83 cfs 0.130 af

SubcatchmentWQ21: Runoff Area=0.274 ac 0.00% Impervious Runoff Depth=3.13"
Tc=6.0 min CN=77 Runoff=1.01 cfs 0.072 af

SubcatchmentWQ4: Runoff Area=0.231 ac 0.00% Impervious Runoff Depth=3.52"
Tc=6.0 min CN=81 Runoff=0.95 cfs 0.068 af

SubcatchmentWQ5: Runoff Area=0.411 ac 0.00% Impervious Runoff Depth=3.23"
Tc=6.0 min CN=78 Runoff=1.55 cfs 0.111 af

SubcatchmentWQ7: Runoff Area=0.268 ac 0.00% Impervious Runoff Depth=3.42"
Tc=6.0 min CN=80 Runoff=1.07 cfs 0.076 af

SubcatchmentWQ9: Runoff Area=0.308 ac 0.00% Impervious Runoff Depth=2.94"
Tc=6.0 min CN=75 Runoff=1.06 cfs 0.076 af

Reach LS-2: Inflow=0.95 cfs 0.068 af
Outflow=0.95 cfs 0.068 af

Reach LS-6: Inflow=1.16 cfs 0.083 af
Outflow=1.16 cfs 0.083 af

Reach SW-1: Swale Avg. Depth=0.55' Max Vel=0.53 fps Inflow=1.55 cfs 0.111 af
n=0.130 L=150.0' S=0.0075 '/' Capacity=10.41 cfs Outflow=1.35 cfs 0.111 af

Reach SW-10: Swale Avg. Depth=0.48' Max Vel=0.45 fps Inflow=1.11 cfs 0.079 af
n=0.140 L=135.0' S=0.0074 '/' Capacity=9.59 cfs Outflow=0.95 cfs 0.079 af

Reach SW-11: Swale Avg. Depth=0.45' Max Vel=0.34 fps Inflow=0.81 cfs 0.058 af
n=0.150 L=125.0' S=0.0050 '/' Capacity=7.38 cfs Outflow=0.67 cfs 0.058 af

Reach SW-12: Swale Avg. Depth=0.60' Max Vel=0.56 fps Inflow=1.83 cfs 0.130 af
n=0.130 L=150.0' S=0.0075 '/' Capacity=10.41 cfs Outflow=1.60 cfs 0.130 af

Reach SW-13: Swale Avg. Depth=0.46' Max Vel=0.43 fps Inflow=1.01 cfs 0.072 af
n=0.150 L=125.0' S=0.0080 '/' Capacity=9.30 cfs Outflow=0.87 cfs 0.072 af

Reach SW-2: Swale Avg. Depth=0.49' Max Vel=0.41 fps Inflow=1.07 cfs 0.076 af
n=0.130 L=130.0' S=0.0050 '/' Capacity=8.48 cfs Outflow=0.91 cfs 0.076 af

Reach SW-3: Swale Avg. Depth=0.45' Max Vel=0.48 fps Inflow=1.06 cfs 0.076 af
n=0.150 L=130.0' S=0.0100 '/' Capacity=10.40 cfs Outflow=0.93 cfs 0.076 af

Reach SW-4: Swale Avg. Depth=0.47' Max Vel=0.44 fps Inflow=1.05 cfs 0.075 af
n=0.140 L=125.0' S=0.0072 '/' Capacity=9.45 cfs Outflow=0.92 cfs 0.075 af

Reach SW-5: Swale Avg. Depth=0.58' Max Vel=0.45 fps Inflow=1.41 cfs 0.100 af
n=0.130 L=120.0' S=0.0050 '/' Capacity=8.48 cfs Outflow=1.23 cfs 0.100 af

Reach SW-6: Swale Avg. Depth=0.56' Max Vel=0.56 fps Inflow=1.97 cfs 0.140 af
n=0.130 L=120.0' S=0.0075 '/' Capacity=12.16 cfs Outflow=1.79 cfs 0.140 af

Reach SW-7: Swale Avg. Depth=0.44' Max Vel=0.41 fps Inflow=0.90 cfs 0.064 af
n=0.150 L=120.0' S=0.0075 '/' Capacity=9.00 cfs Outflow=0.78 cfs 0.064 af

Reach SW-8: Swale Avg. Depth=0.53' Max Vel=0.48 fps Inflow=1.35 cfs 0.096 af
n=0.140 L=135.0' S=0.0074 '/' Capacity=9.59 cfs Outflow=1.17 cfs 0.096 af

Reach SW-9: Swale Avg. Depth=0.37' Max Vel=0.37 fps Inflow=0.67 cfs 0.048 af
n=0.150 L=120.0' S=0.0075 '/' Capacity=9.00 cfs Outflow=0.57 cfs 0.048 af

Summary for Subcatchment WQ10:

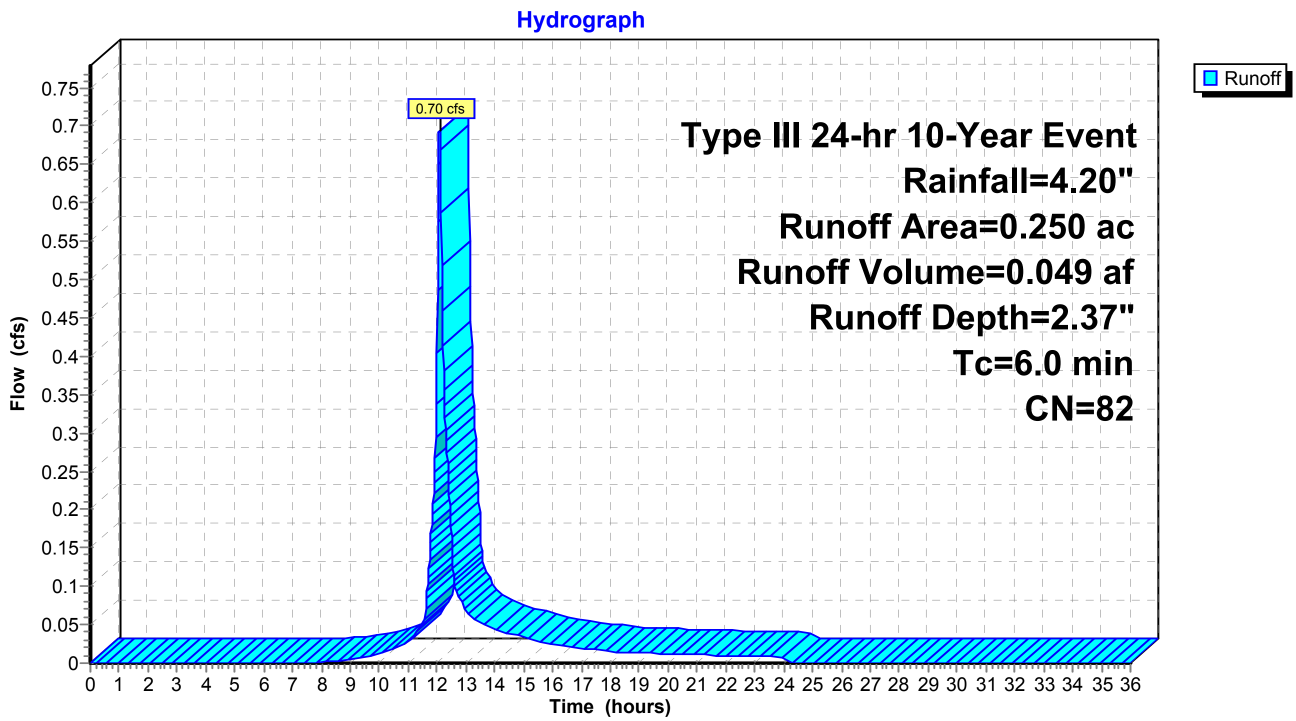
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 0.049 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.086	91	Gravel roads, HSG D
0.164	78	Meadow, non-grazed, HSG D
0.250	82	Weighted Average
0.250		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ10:



Summary for Subcatchment WQ11:

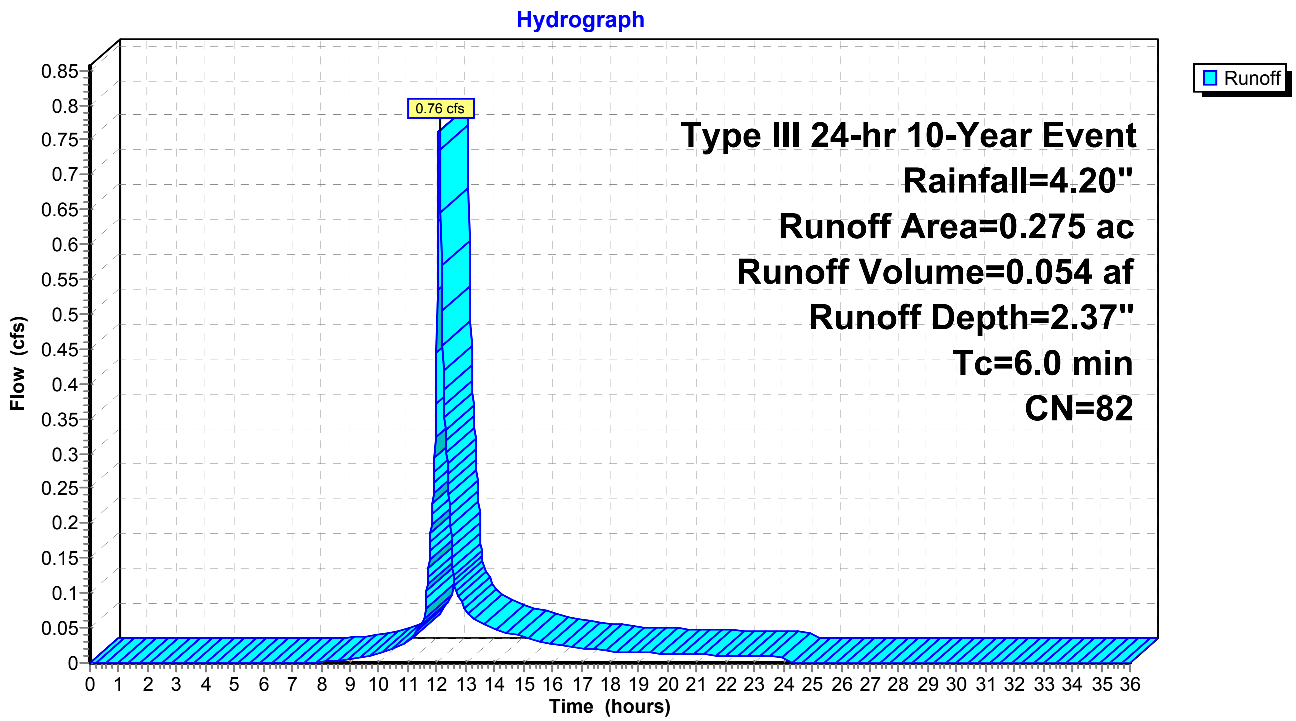
Runoff = 0.76 cfs @ 12.09 hrs, Volume= 0.054 af, Depth= 2.37"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.092	91	Gravel roads, HSG D
0.183	78	Meadow, non-grazed, HSG D
0.275	82	Weighted Average
0.275		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ11:



Summary for Subcatchment WQ13:

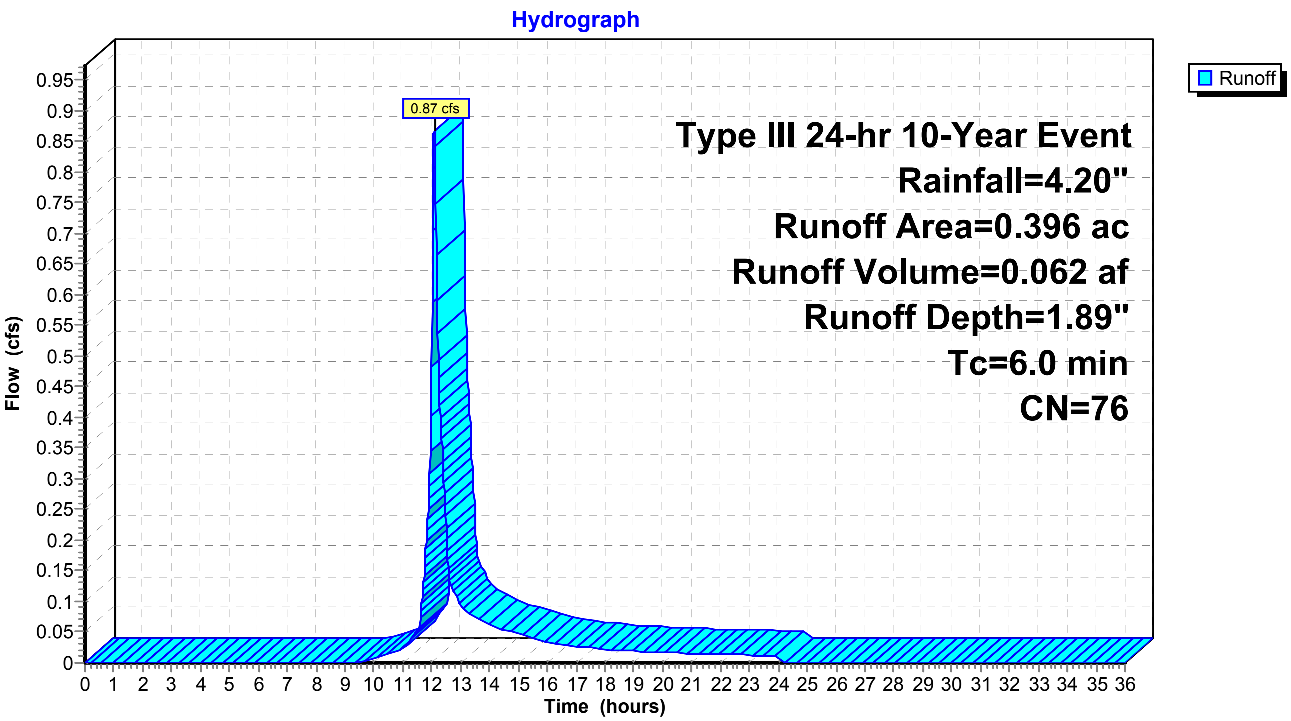
Runoff = 0.87 cfs @ 12.09 hrs, Volume= 0.062 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.119	89	Gravel roads, HSG C
0.277	71	Meadow, non-grazed, HSG C
0.396	76	Weighted Average
0.396		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ13:



Summary for Subcatchment WQ14:

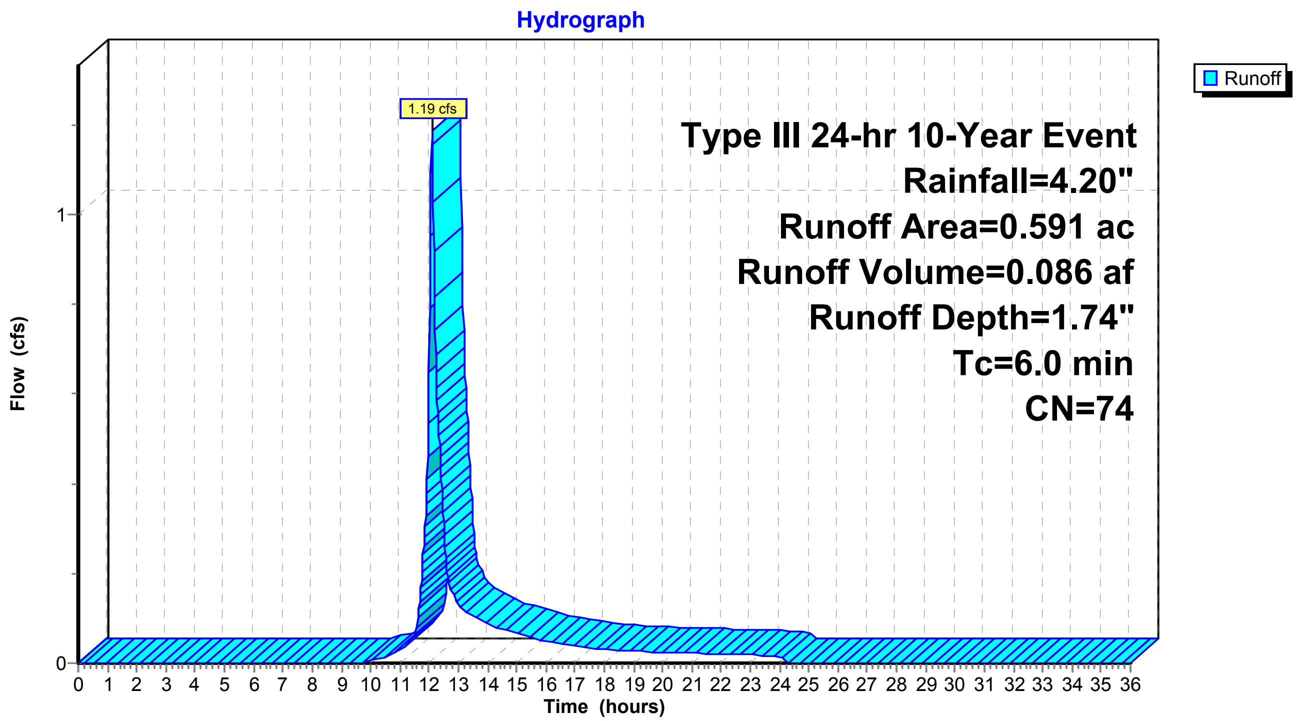
Runoff = 1.19 cfs @ 12.09 hrs, Volume= 0.086 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.092	89	Gravel roads, HSG C
0.499	71	Meadow, non-grazed, HSG C
0.591	74	Weighted Average
0.591		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ14:



Summary for Subcatchment WQ15:

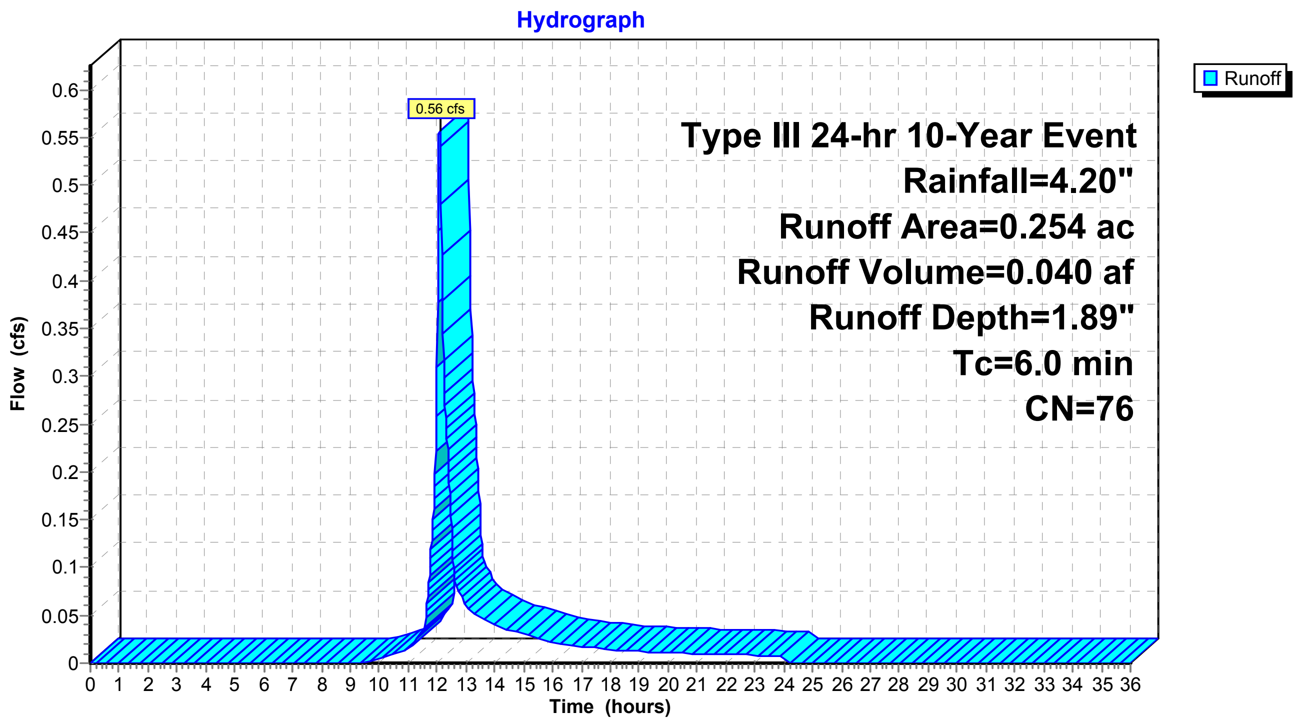
Runoff = 0.56 cfs @ 12.09 hrs, Volume= 0.040 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.064	89	Gravel roads, HSG C
0.190	71	Meadow, non-grazed, HSG C
0.254	76	Weighted Average
0.254		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ15:



Summary for Subcatchment WQ16:

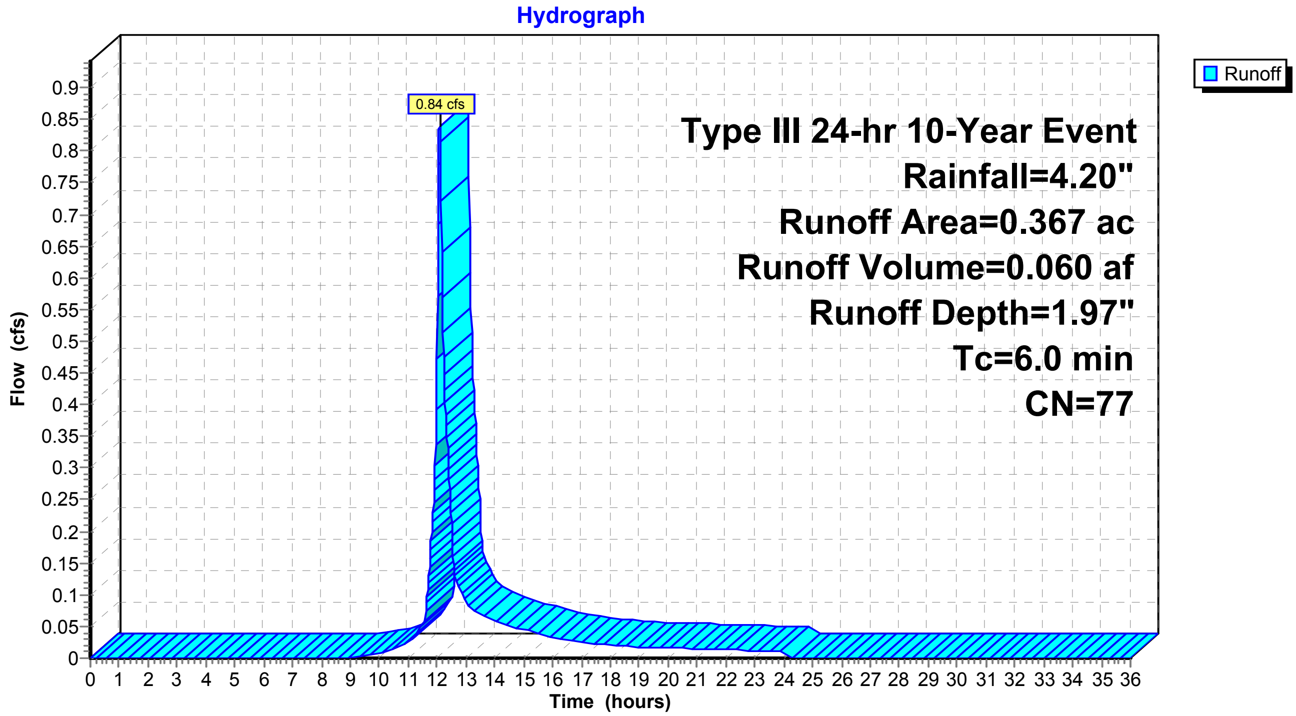
Runoff = 0.84 cfs @ 12.09 hrs, Volume= 0.060 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.119	89	Gravel roads, HSG C
0.248	71	Meadow, non-grazed, HSG C
0.367	77	Weighted Average
0.367		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ16:



Summary for Subcatchment WQ17:

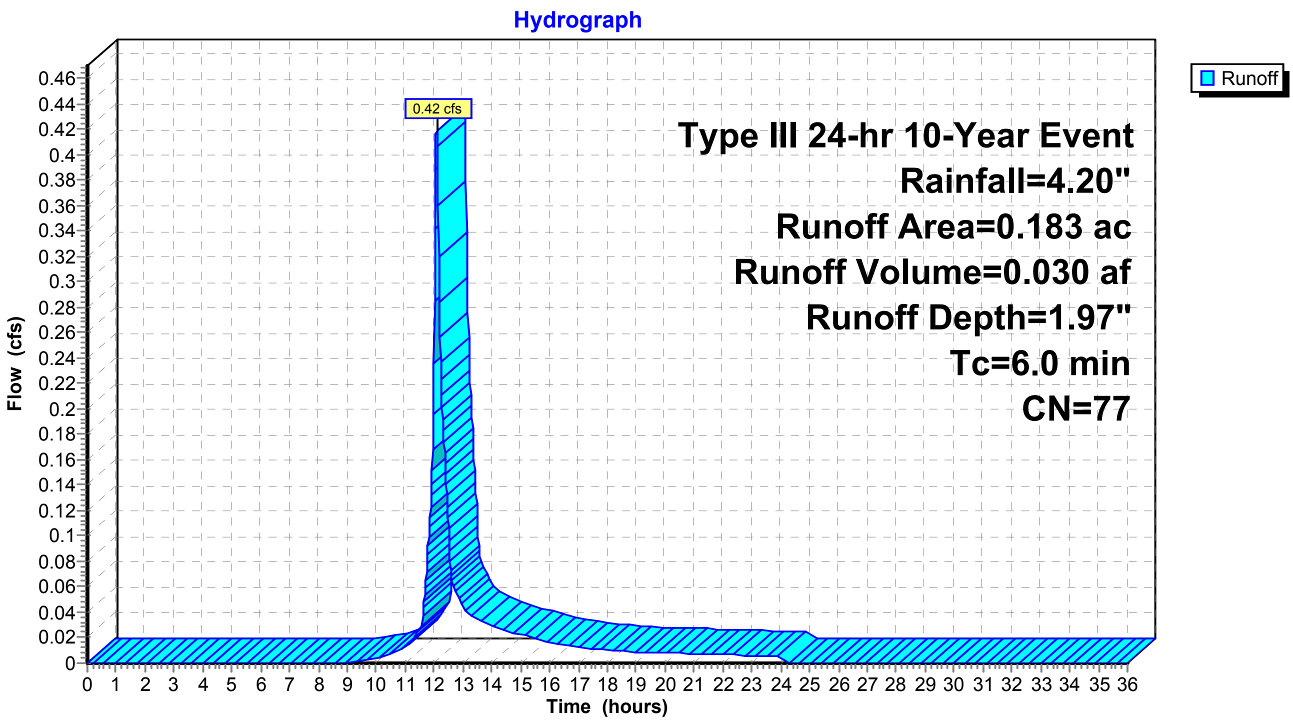
Runoff = 0.42 cfs @ 12.09 hrs, Volume= 0.030 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.064	89	Gravel roads, HSG C
0.119	71	Meadow, non-grazed, HSG C
0.183	77	Weighted Average
0.183		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ17:



Summary for Subcatchment WQ18:

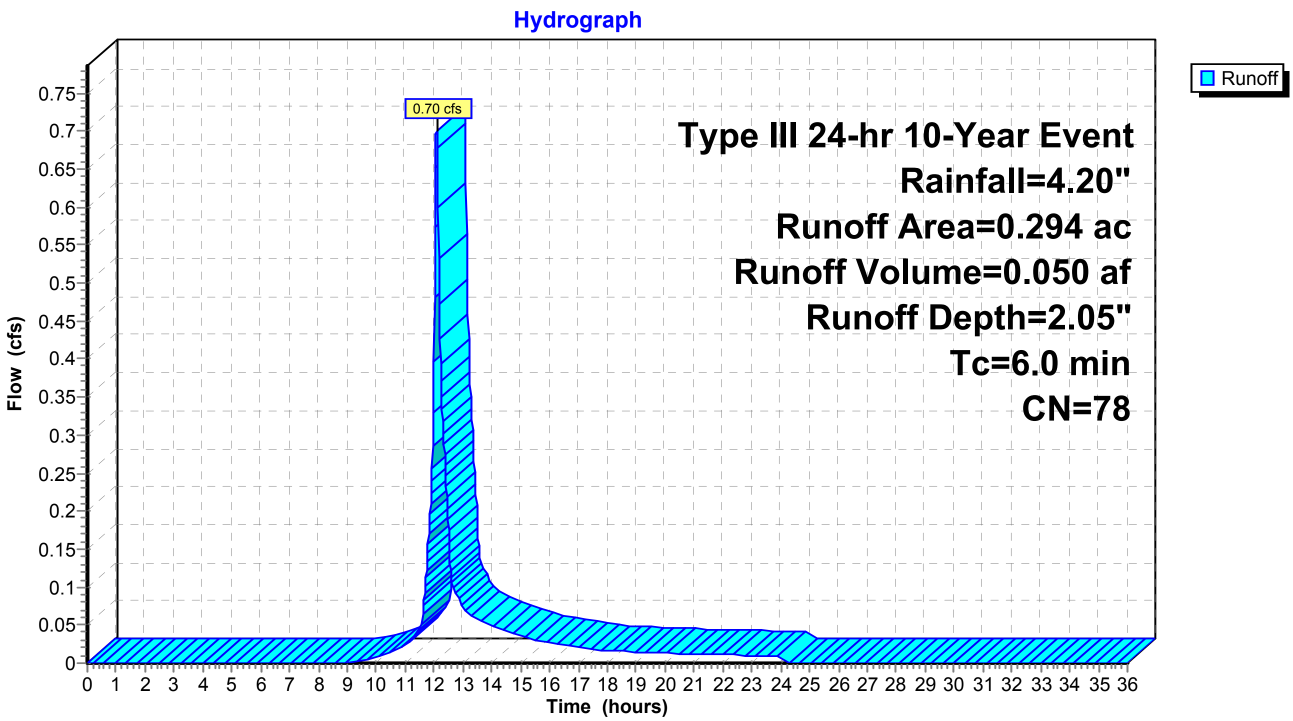
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 0.050 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.110	89	Gravel roads, HSG C
0.184	71	Meadow, non-grazed, HSG C
0.294	78	Weighted Average
0.294		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ18:



Summary for Subcatchment WQ19:

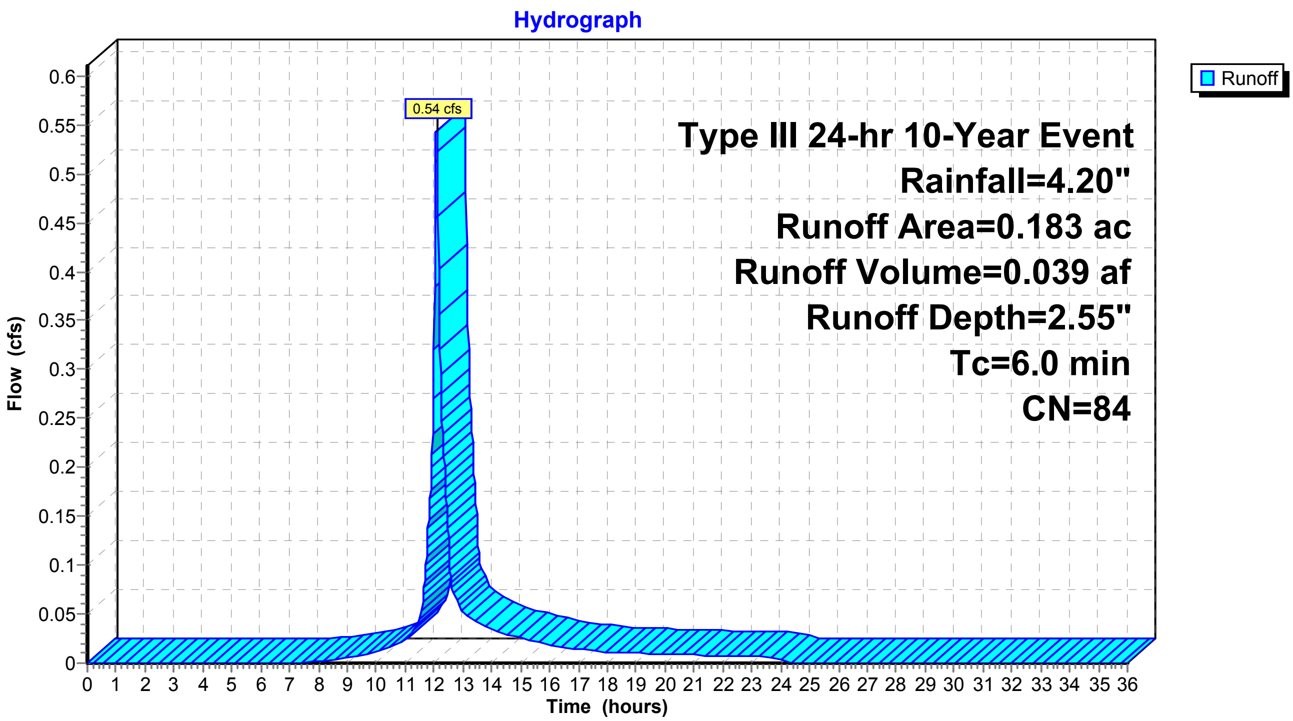
Runoff = 0.54 cfs @ 12.09 hrs, Volume= 0.039 af, Depth= 2.55"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.133	89	Gravel roads, HSG C
0.050	71	Meadow, non-grazed, HSG C
0.183	84	Weighted Average
0.183		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ19:



Summary for Subcatchment WQ20:

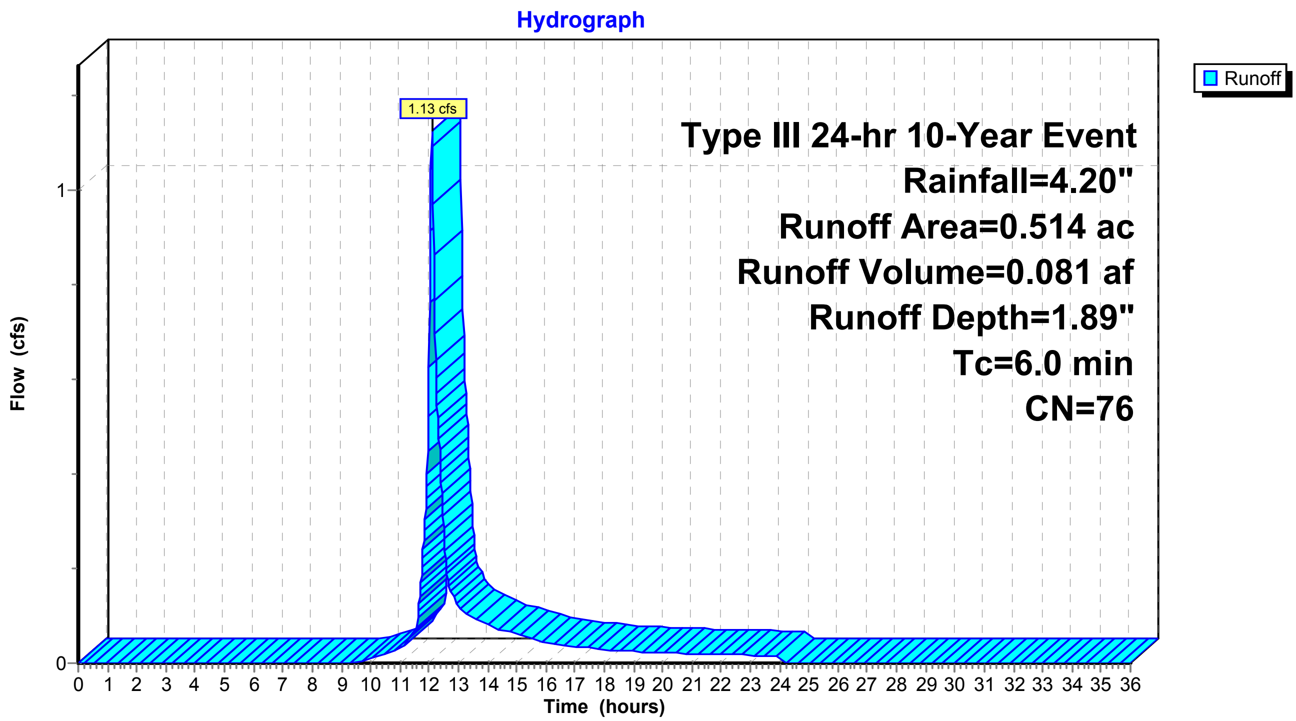
Runoff = 1.13 cfs @ 12.09 hrs, Volume= 0.081 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.156	89	Gravel roads, HSG C
0.358	71	Meadow, non-grazed, HSG C
0.514	76	Weighted Average
0.514		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ20:



Summary for Subcatchment WQ21:

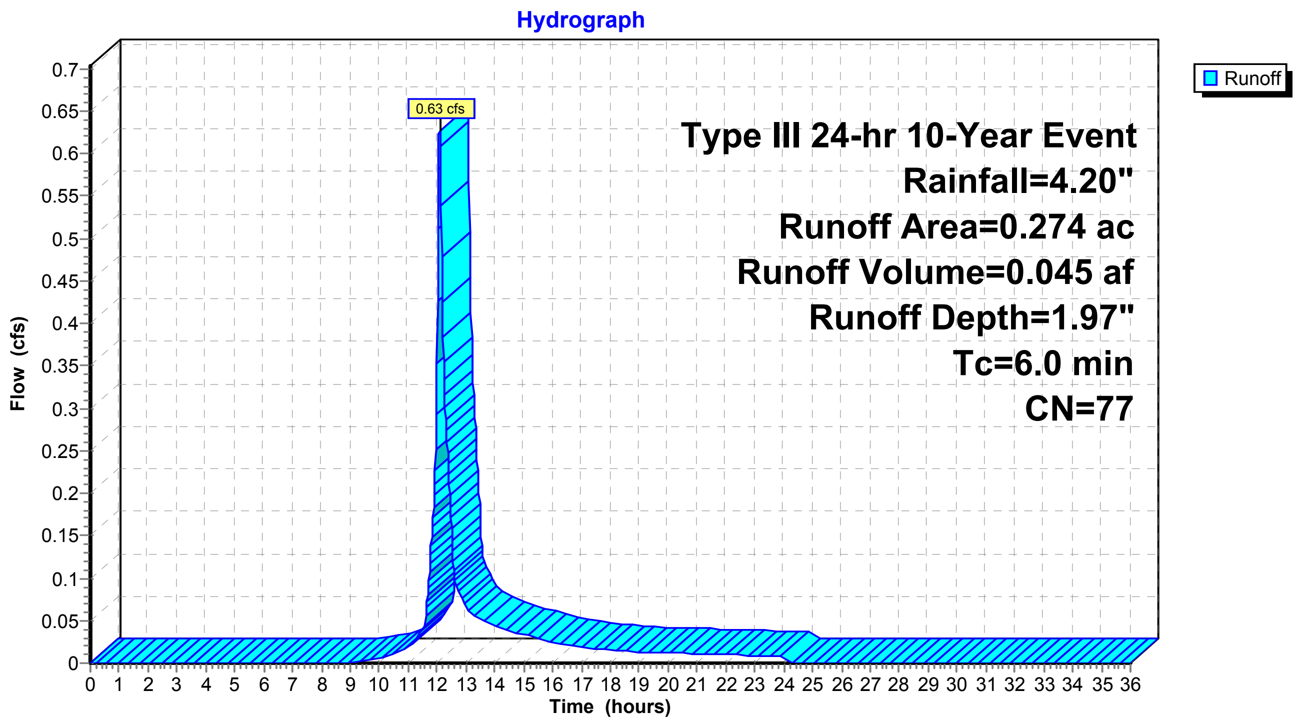
Runoff = 0.63 cfs @ 12.09 hrs, Volume= 0.045 af, Depth= 1.97"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.092	89	Gravel roads, HSG C
0.182	71	Meadow, non-grazed, HSG C
0.274	77	Weighted Average
0.274		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ21:



Summary for Subcatchment WQ4:

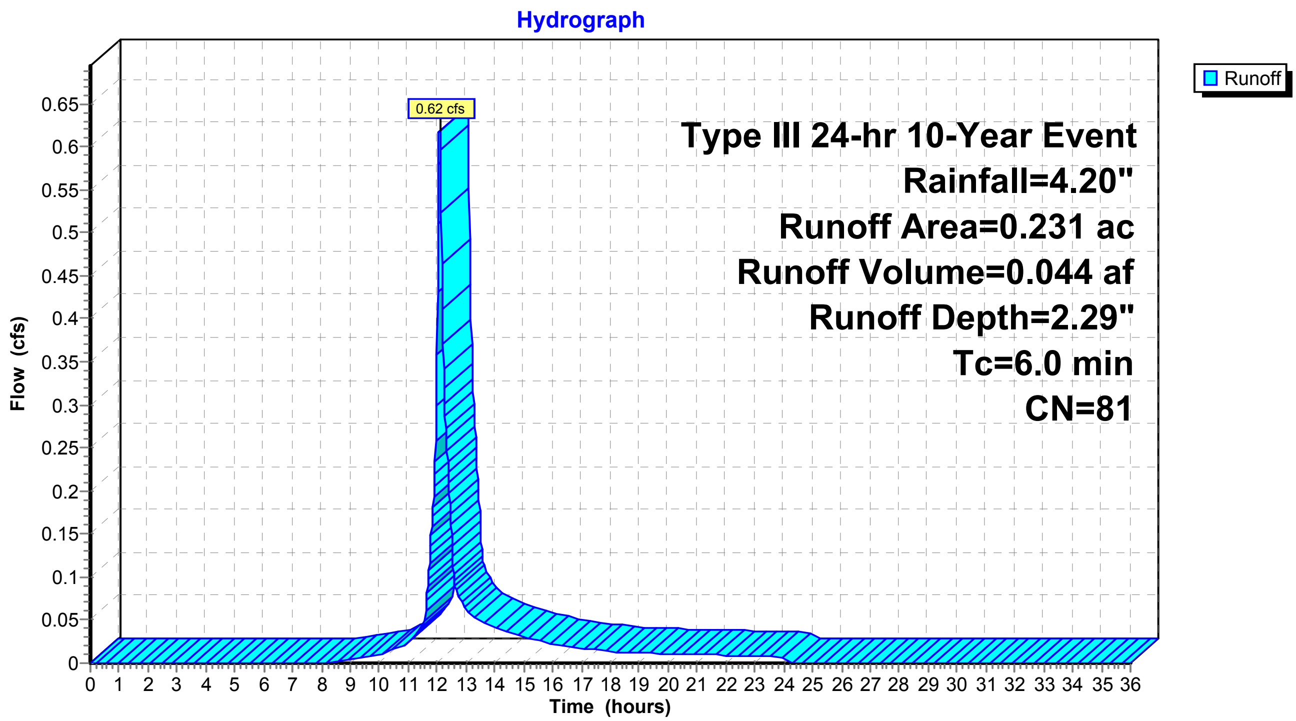
Runoff = 0.62 cfs @ 12.09 hrs, Volume= 0.044 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.128	89	Gravel roads, HSG C
0.103	71	Meadow, non-grazed, HSG C
0.231	81	Weighted Average
0.231		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ4:



Summary for Subcatchment WQ5:

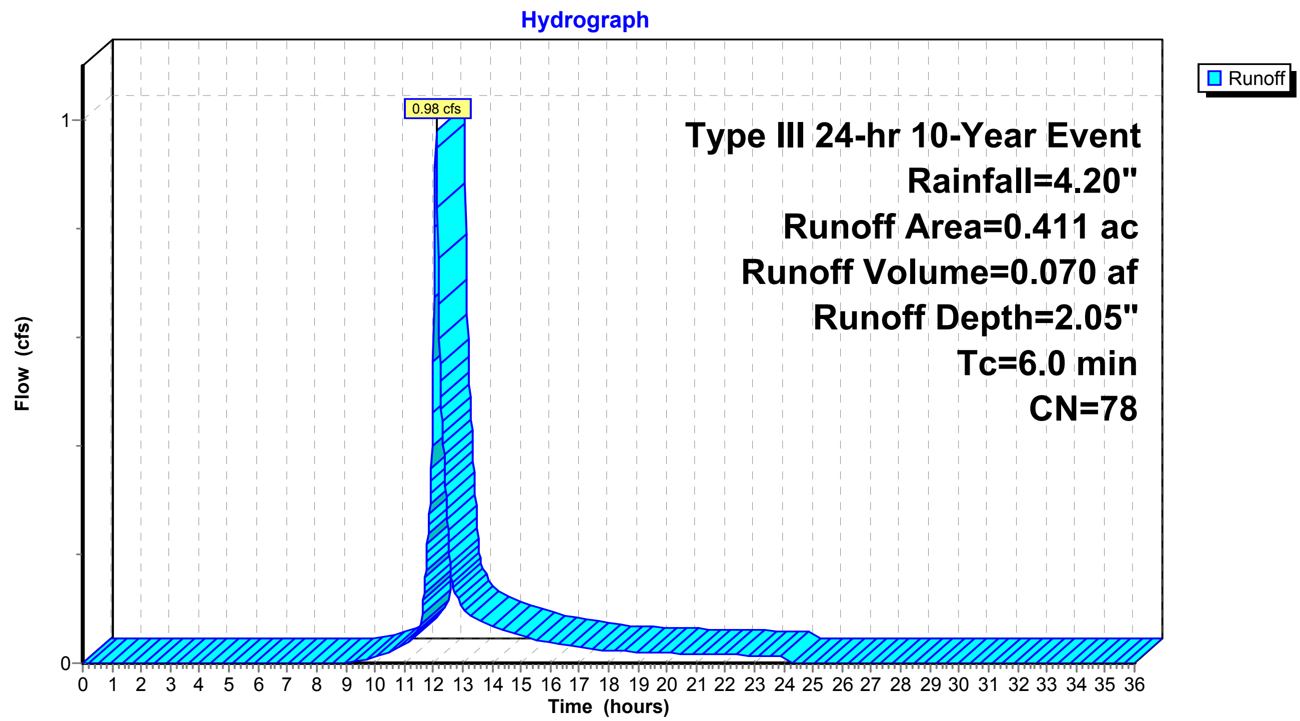
Runoff = 0.98 cfs @ 12.09 hrs, Volume= 0.070 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.156	89	Gravel roads, HSG C
0.255	71	Meadow, non-grazed, HSG C
0.411	78	Weighted Average
0.411		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ5:



Summary for Subcatchment WQ7:

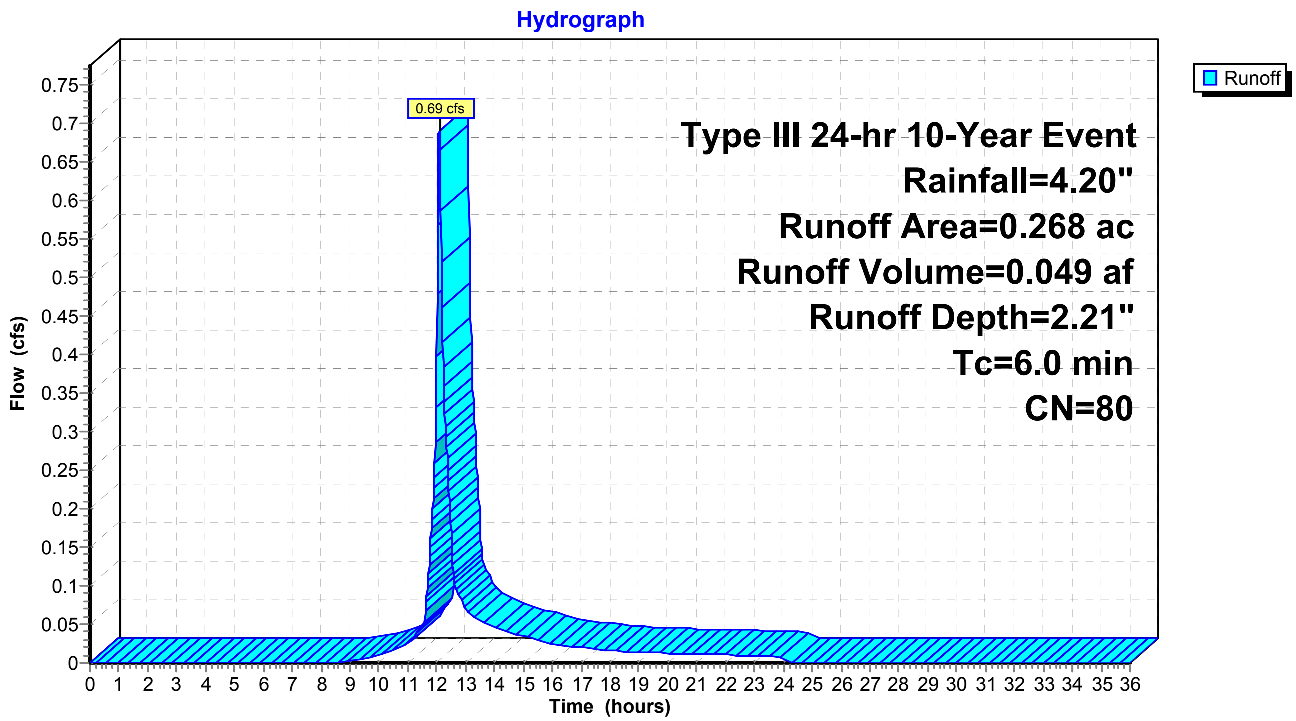
Runoff = 0.69 cfs @ 12.09 hrs, Volume= 0.049 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.130	89	Gravel roads, HSG C
0.138	71	Meadow, non-grazed, HSG C
0.268	80	Weighted Average
0.268		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ7:



Summary for Subcatchment WQ9:

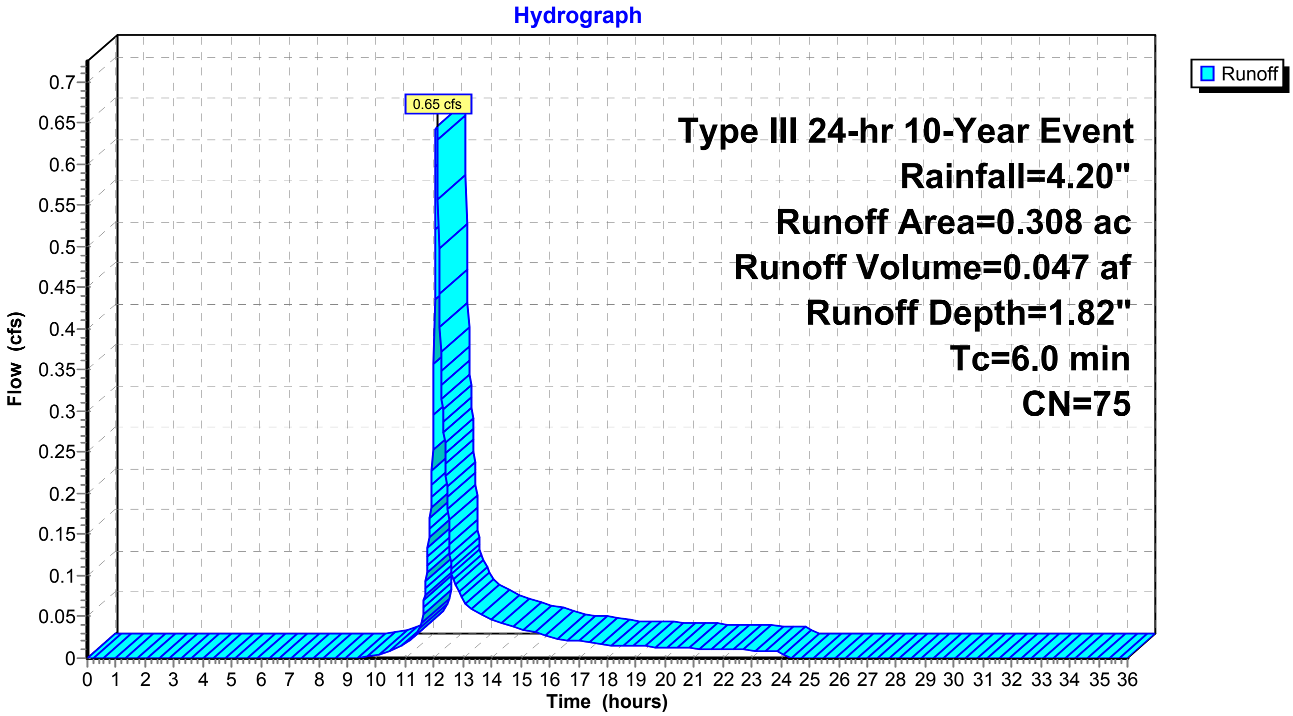
Runoff = 0.65 cfs @ 12.09 hrs, Volume= 0.047 af, Depth= 1.82"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.073	89	Gravel roads, HSG C
0.235	71	Meadow, non-grazed, HSG C
0.308	75	Weighted Average
0.308		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ9:

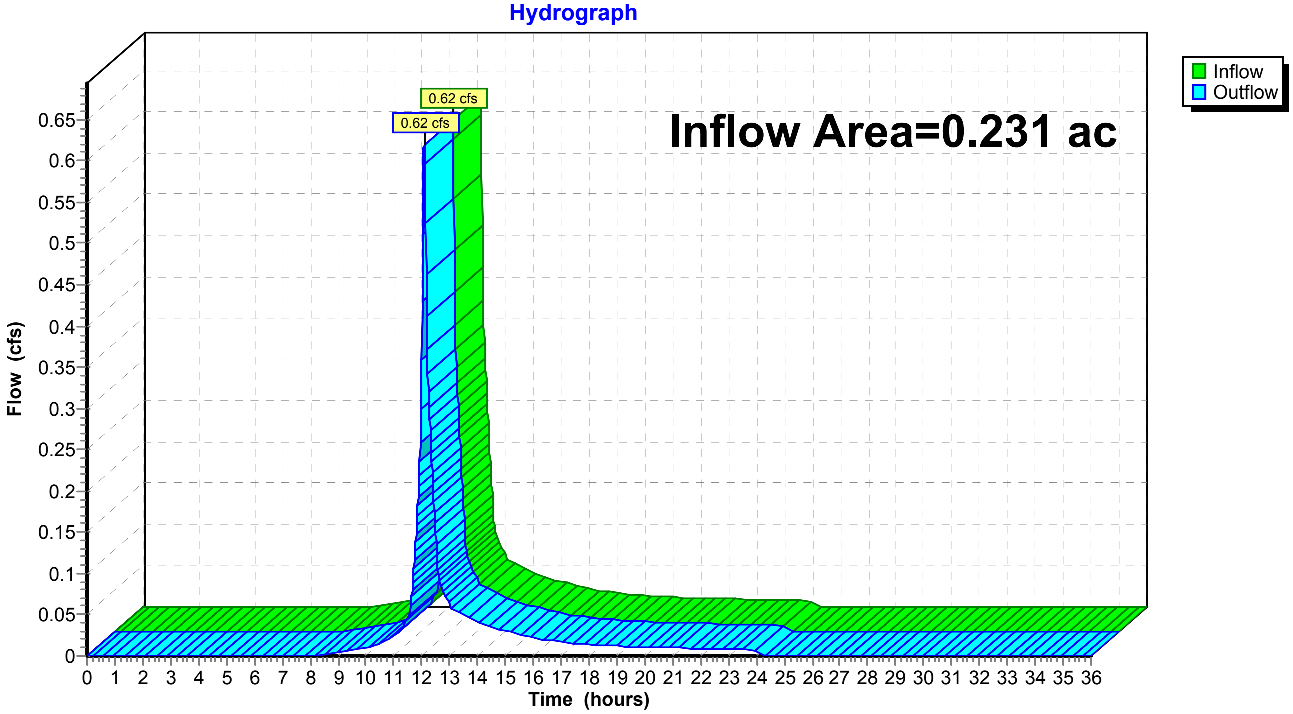


Summary for Reach LS-2:

Inflow Area =	0.231 ac,	0.00% Impervious, Inflow Depth = 2.29"	for 10-Year Event event	
Inflow =	0.62 cfs @	12.09 hrs, Volume=	0.044 af	
Outflow =	0.62 cfs @	12.09 hrs, Volume=	0.044 af,	Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

Reach LS-2:

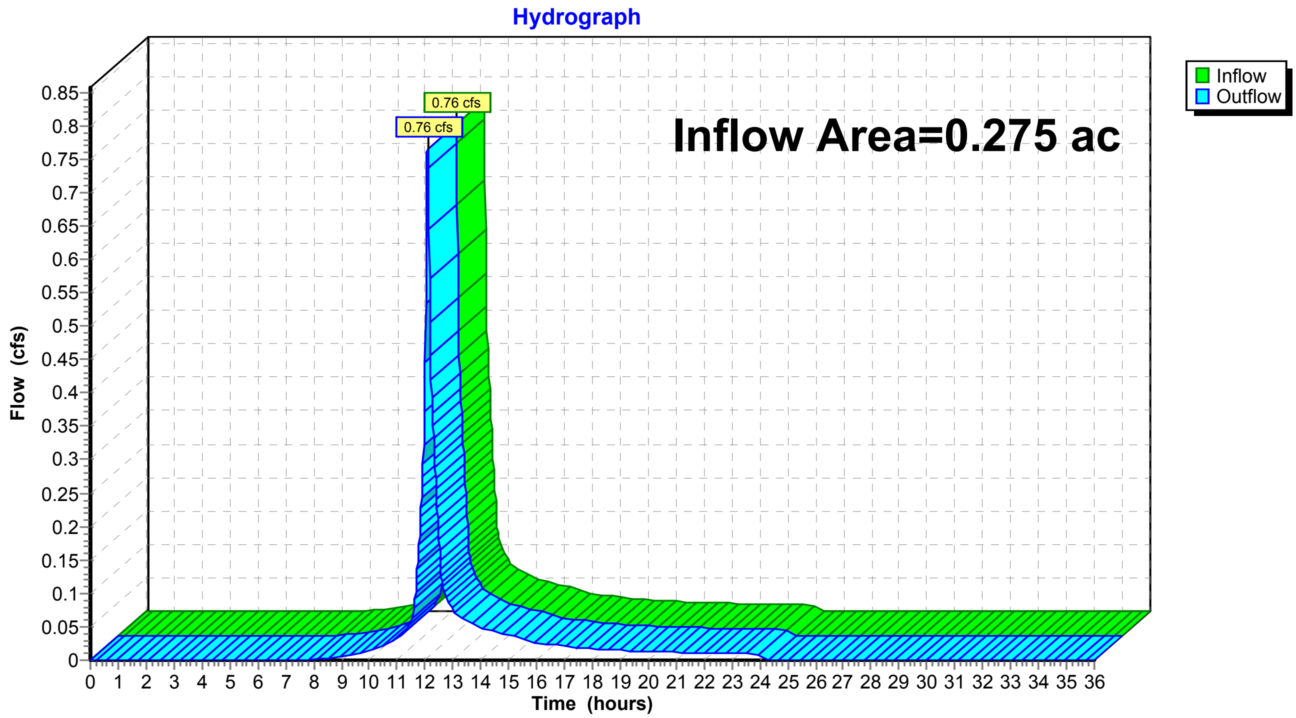


Summary for Reach LS-6:

Inflow Area = 0.275 ac, 0.00% Impervious, Inflow Depth = 2.37" for 10-Year Event event
Inflow = 0.76 cfs @ 12.09 hrs, Volume= 0.054 af
Outflow = 0.76 cfs @ 12.09 hrs, Volume= 0.054 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

Reach LS-6:



Summary for Reach SW-1: Swale

Inflow Area = 0.411 ac, 0.00% Impervious, Inflow Depth = 2.05" for 10-Year Event event
Inflow = 0.98 cfs @ 12.09 hrs, Volume= 0.070 af
Outflow = 0.83 cfs @ 12.14 hrs, Volume= 0.070 af, Atten= 16%, Lag= 3.2 min

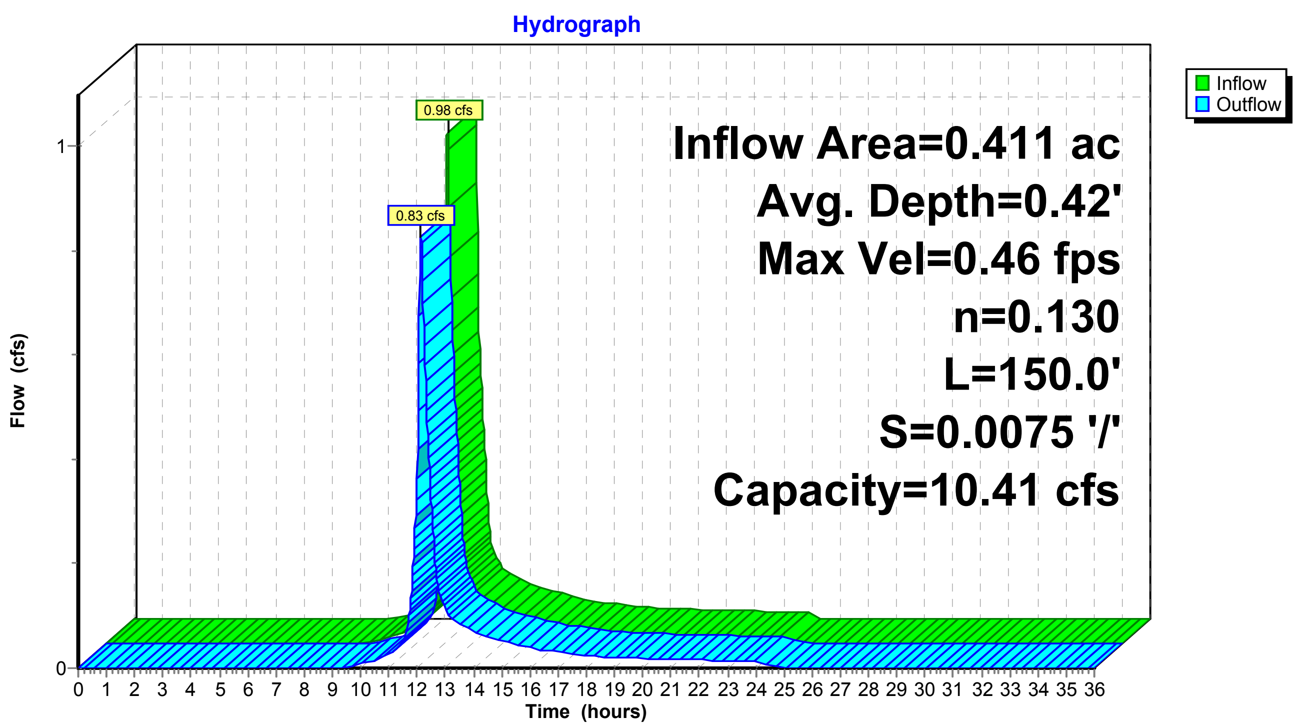
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.46 fps, Min. Travel Time= 5.4 min
Avg. Velocity = 0.13 fps, Avg. Travel Time= 18.7 min

Peak Storage= 269 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 10.41 cfs

3.00' x 1.50' deep channel, n= 0.130
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 150.0' Slope= 0.0075 '/'
Inlet Invert= 1,206.50', Outlet Invert= 1,205.37'

‡

Reach SW-1: Swale



Summary for Reach SW-10: Swale

Inflow Area = 0.294 ac, 0.00% Impervious, Inflow Depth = 2.05" for 10-Year Event event
Inflow = 0.70 cfs @ 12.09 hrs, Volume= 0.050 af
Outflow = 0.59 cfs @ 12.15 hrs, Volume= 0.050 af, Atten= 17%, Lag= 3.3 min

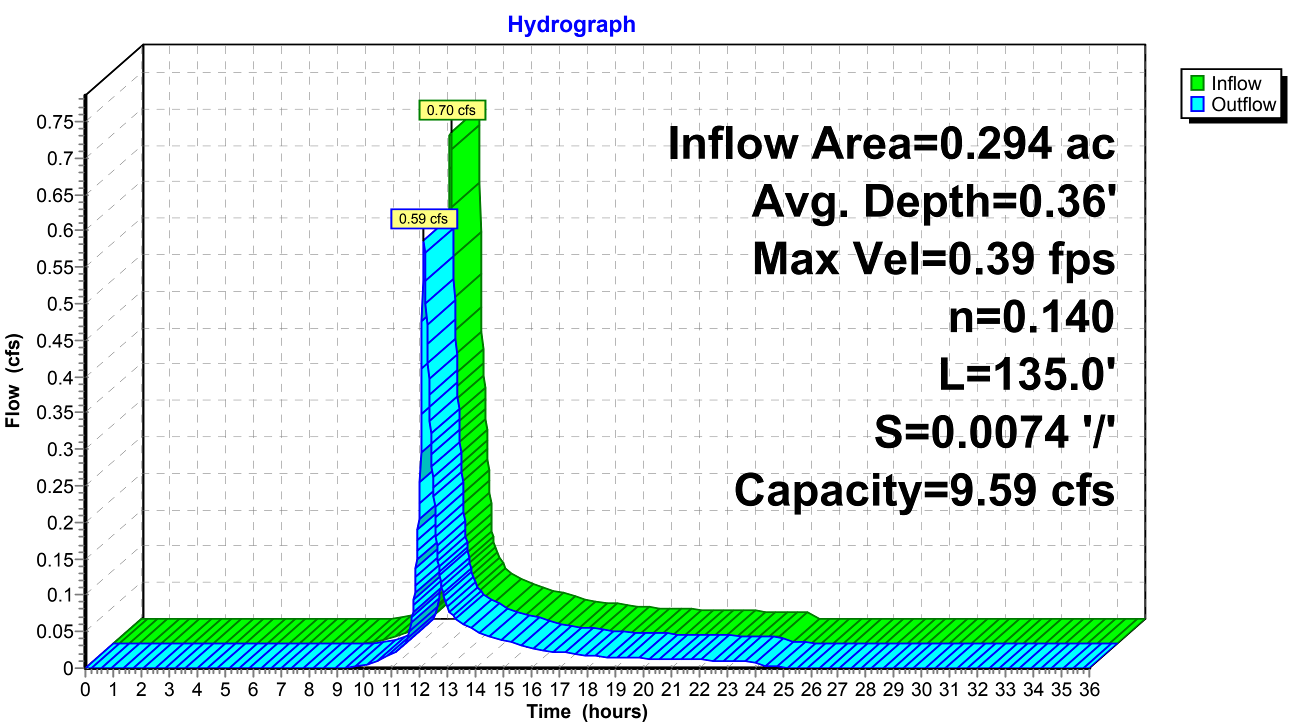
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.39 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 19.7 min

Peak Storage= 202 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.59 cfs

3.00' x 1.50' deep channel, n= 0.140
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 135.0' Slope= 0.0074 '/'
Inlet Invert= 1,571.00', Outlet Invert= 1,570.00'

‡

Reach SW-10: Swale



Summary for Reach SW-11: Swale

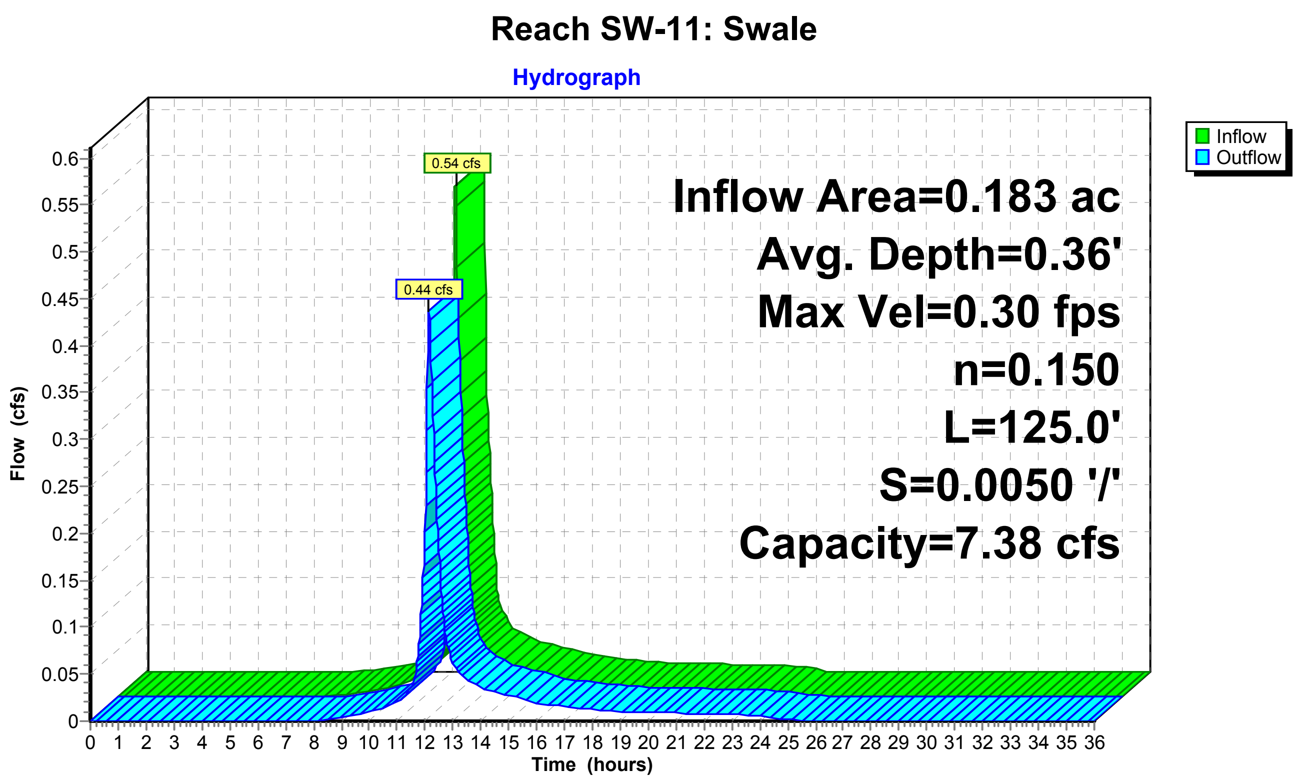
Inflow Area = 0.183 ac, 0.00% Impervious, Inflow Depth = 2.55" for 10-Year Event event
Inflow = 0.54 cfs @ 12.09 hrs, Volume= 0.039 af
Outflow = 0.44 cfs @ 12.15 hrs, Volume= 0.039 af, Atten= 20%, Lag= 3.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.30 fps, Min. Travel Time= 7.0 min
Avg. Velocity = 0.08 fps, Avg. Travel Time= 25.0 min

Peak Storage= 182 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.36'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 7.38 cfs

3.00' x 1.50' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 125.0' Slope= 0.0050 '/'
Inlet Invert= 1,688.00', Outlet Invert= 1,687.37'

‡



Summary for Reach SW-12: Swale

Inflow Area = 0.514 ac, 0.00% Impervious, Inflow Depth = 1.89" for 10-Year Event event
Inflow = 1.13 cfs @ 12.09 hrs, Volume= 0.081 af
Outflow = 0.96 cfs @ 12.14 hrs, Volume= 0.081 af, Atten= 15%, Lag= 3.1 min

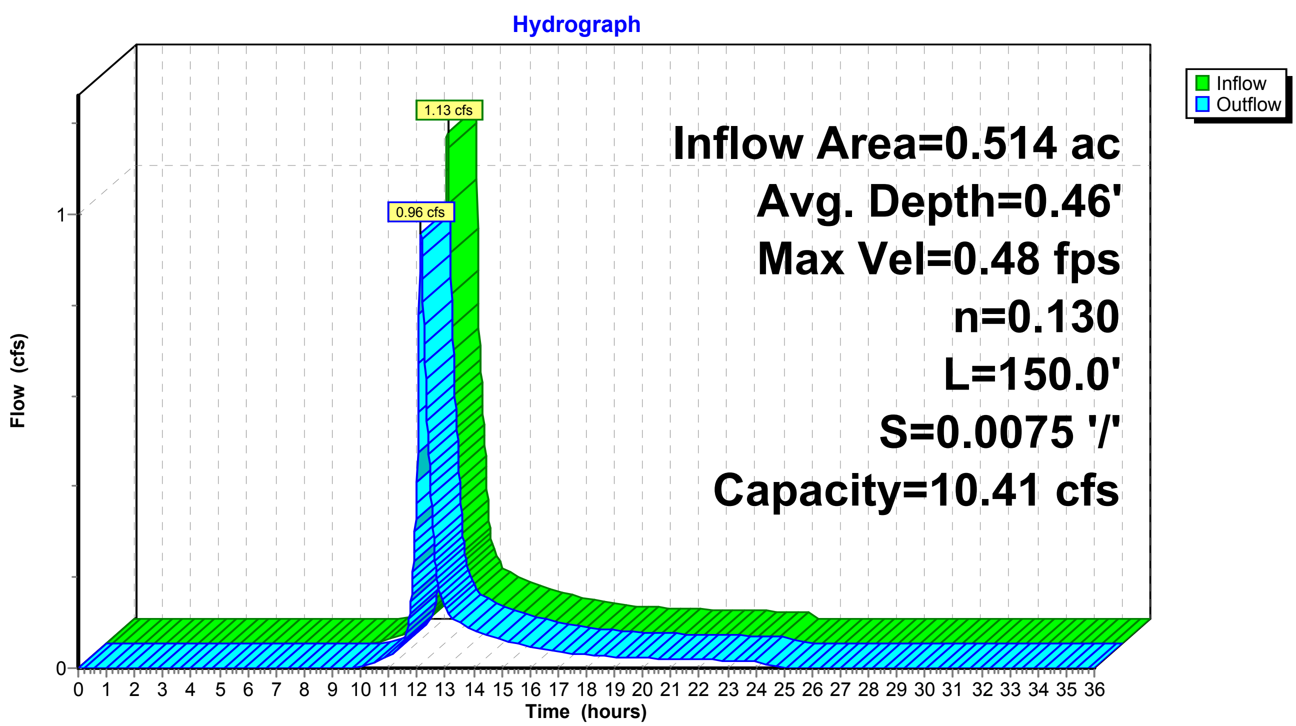
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.48 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 0.14 fps, Avg. Travel Time= 17.7 min

Peak Storage= 298 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.46'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 10.41 cfs

3.00' x 1.50' deep channel, n= 0.130
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 150.0' Slope= 0.0075 '/'
Inlet Invert= 1,787.00', Outlet Invert= 1,785.87'

‡

Reach SW-12: Swale



Summary for Reach SW-13: Swale

Inflow Area = 0.274 ac, 0.00% Impervious, Inflow Depth = 1.97" for 10-Year Event event
Inflow = 0.63 cfs @ 12.09 hrs, Volume= 0.045 af
Outflow = 0.53 cfs @ 12.14 hrs, Volume= 0.045 af, Atten= 16%, Lag= 3.3 min

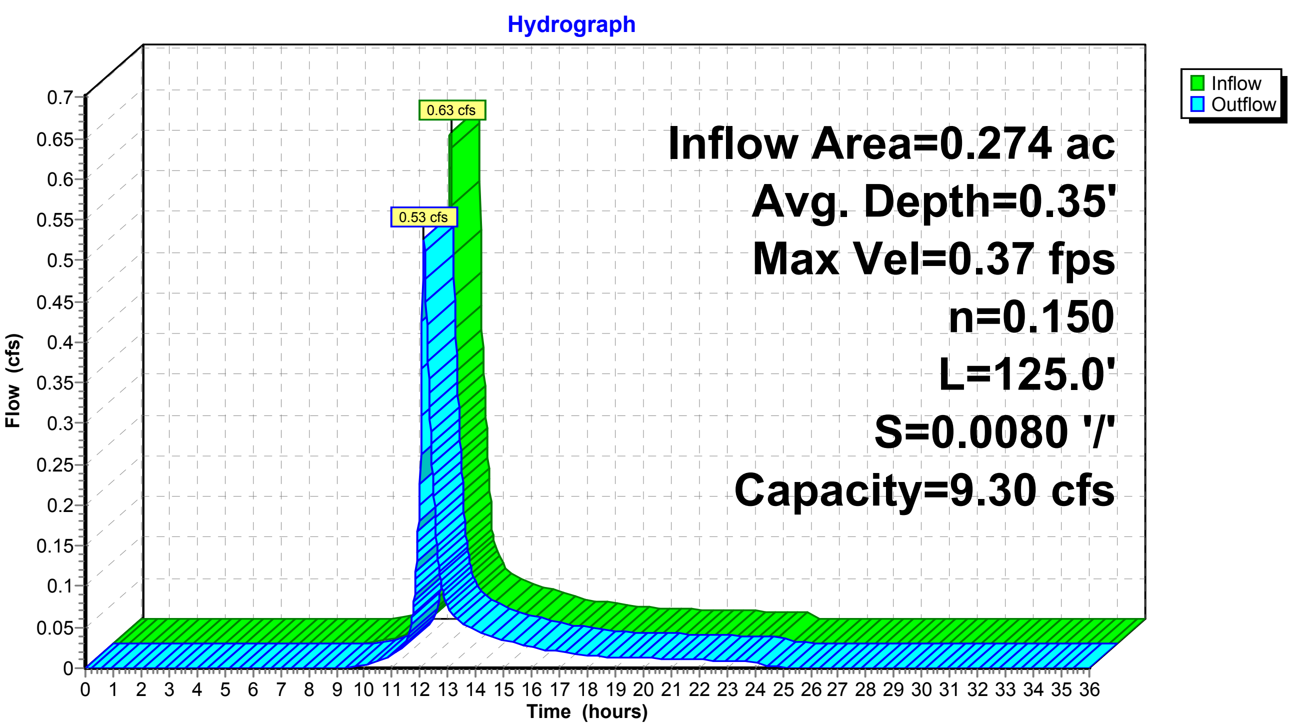
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.37 fps, Min. Travel Time= 5.6 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 19.1 min

Peak Storage= 177 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.35'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.30 cfs

3.00' x 1.50' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 125.0' Slope= 0.0080 '/'
Inlet Invert= 1,849.00', Outlet Invert= 1,848.00'

‡

Reach SW-13: Swale



Summary for Reach SW-2: Swale

Inflow Area = 0.268 ac, 0.00% Impervious, Inflow Depth = 2.21" for 10-Year Event event
Inflow = 0.69 cfs @ 12.09 hrs, Volume= 0.049 af
Outflow = 0.57 cfs @ 12.15 hrs, Volume= 0.049 af, Atten= 18%, Lag= 3.4 min

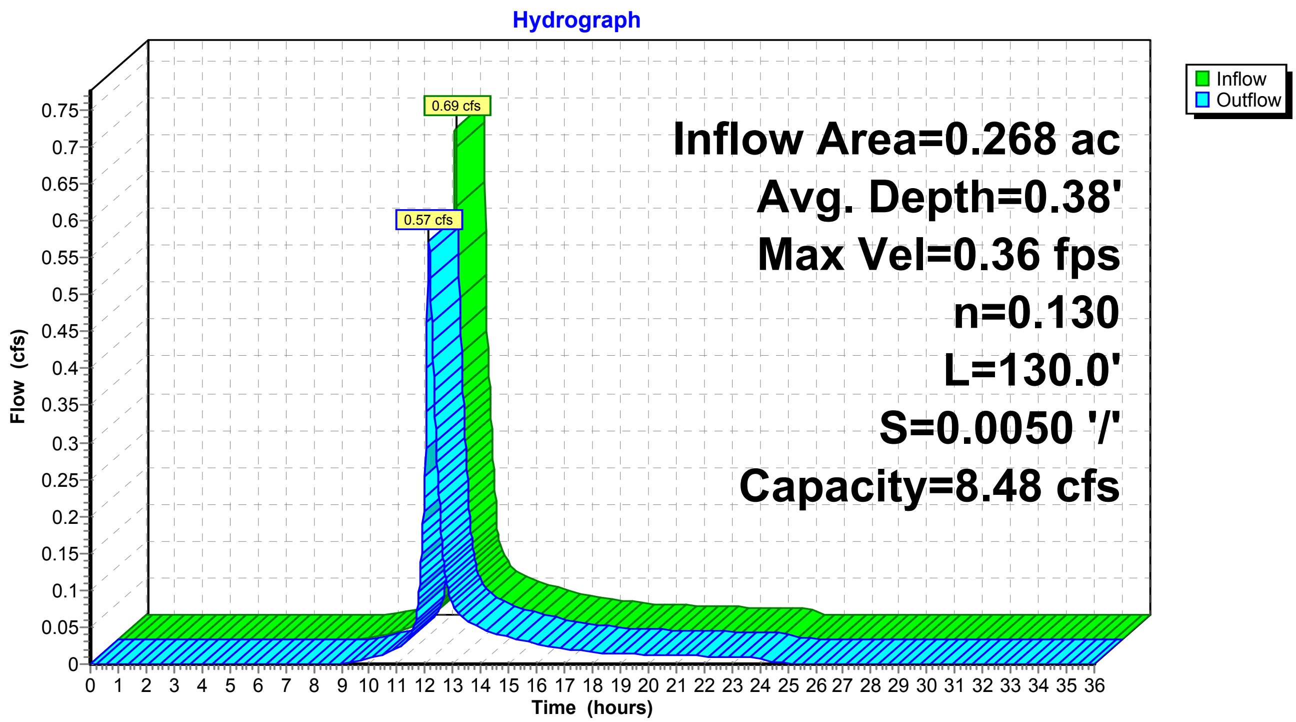
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.36 fps, Min. Travel Time= 6.1 min
Avg. Velocity = 0.10 fps, Avg. Travel Time= 21.2 min

Peak Storage= 208 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.38'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 8.48 cfs

3.00' x 1.50' deep channel, n= 0.130
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 130.0' Slope= 0.0050 '/'
Inlet Invert= 1,354.00', Outlet Invert= 1,353.35'

‡

Reach SW-2: Swale



Summary for Reach SW-3: Swale

Inflow Area = 0.308 ac, 0.00% Impervious, Inflow Depth = 1.82" for 10-Year Event event
Inflow = 0.65 cfs @ 12.09 hrs, Volume= 0.047 af
Outflow = 0.55 cfs @ 12.14 hrs, Volume= 0.047 af, Atten= 15%, Lag= 3.2 min

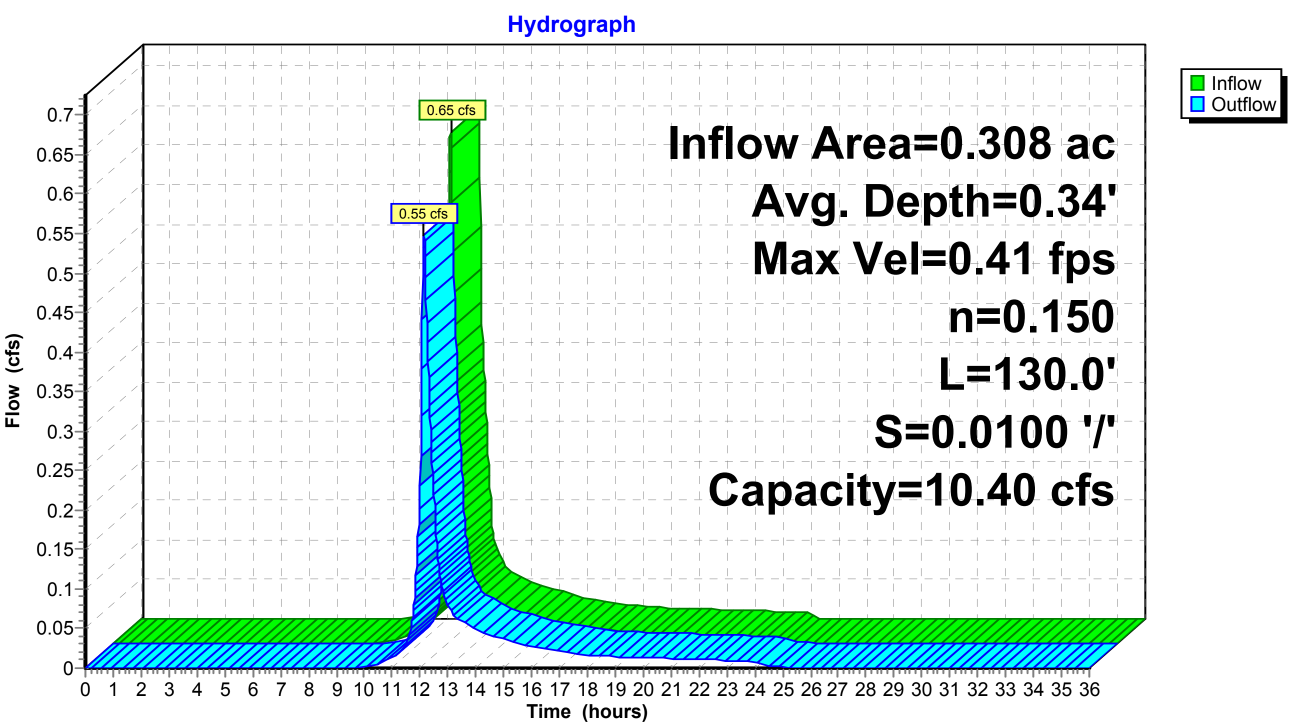
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.41 fps, Min. Travel Time= 5.3 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 17.9 min

Peak Storage= 175 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.34'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 10.40 cfs

3.00' x 1.50' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 130.0' Slope= 0.0100 '/'
Inlet Invert= 1,758.00', Outlet Invert= 1,756.70'

‡

Reach SW-3: Swale



Summary for Reach SW-4: Swale

Inflow Area = 0.250 ac, 0.00% Impervious, Inflow Depth = 2.37" for 10-Year Event event
Inflow = 0.70 cfs @ 12.09 hrs, Volume= 0.049 af
Outflow = 0.59 cfs @ 12.14 hrs, Volume= 0.049 af, Atten= 15%, Lag= 3.1 min

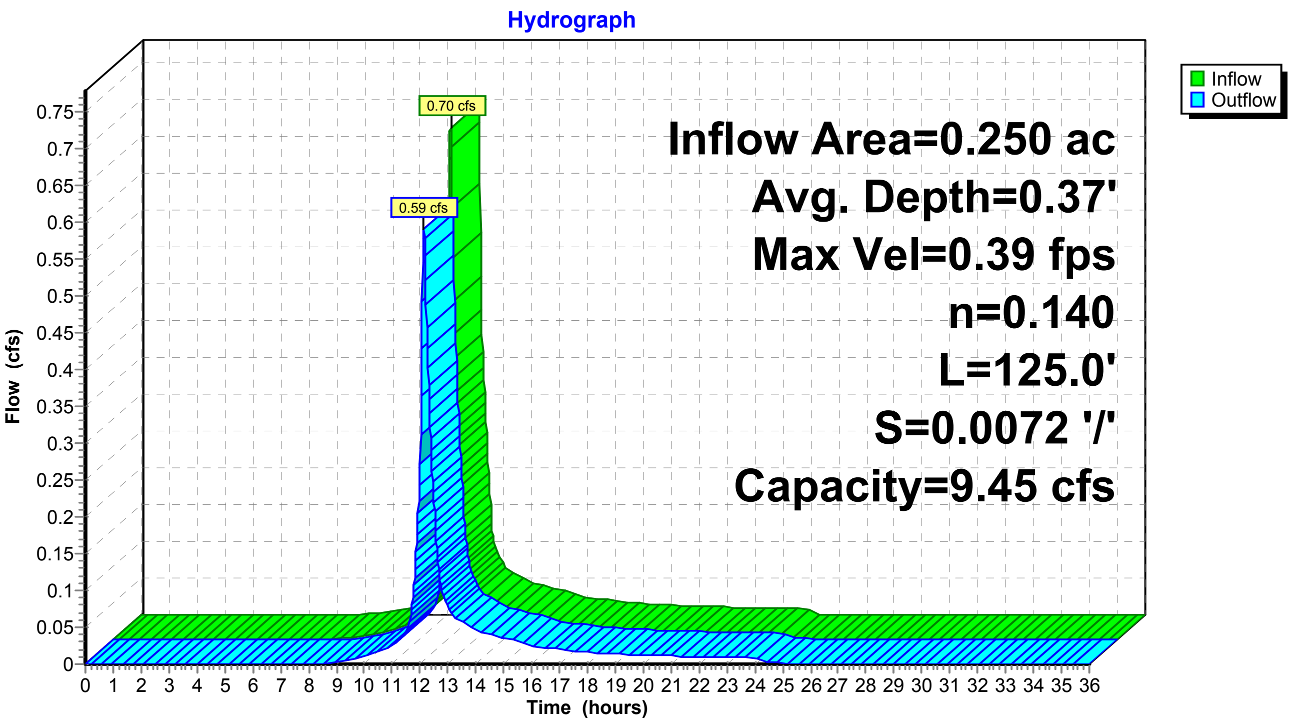
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.39 fps, Min. Travel Time= 5.4 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 18.8 min

Peak Storage= 189 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.37'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.45 cfs

3.00' x 1.50' deep channel, n= 0.140
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 125.0' Slope= 0.0072 '/'
Inlet Invert= 1,628.00', Outlet Invert= 1,627.10'

‡

Reach SW-4: Swale



Summary for Reach SW-5: Swale

Inflow Area = 0.396 ac, 0.00% Impervious, Inflow Depth = 1.89" for 10-Year Event event
Inflow = 0.87 cfs @ 12.09 hrs, Volume= 0.062 af
Outflow = 0.74 cfs @ 12.14 hrs, Volume= 0.062 af, Atten= 15%, Lag= 3.1 min

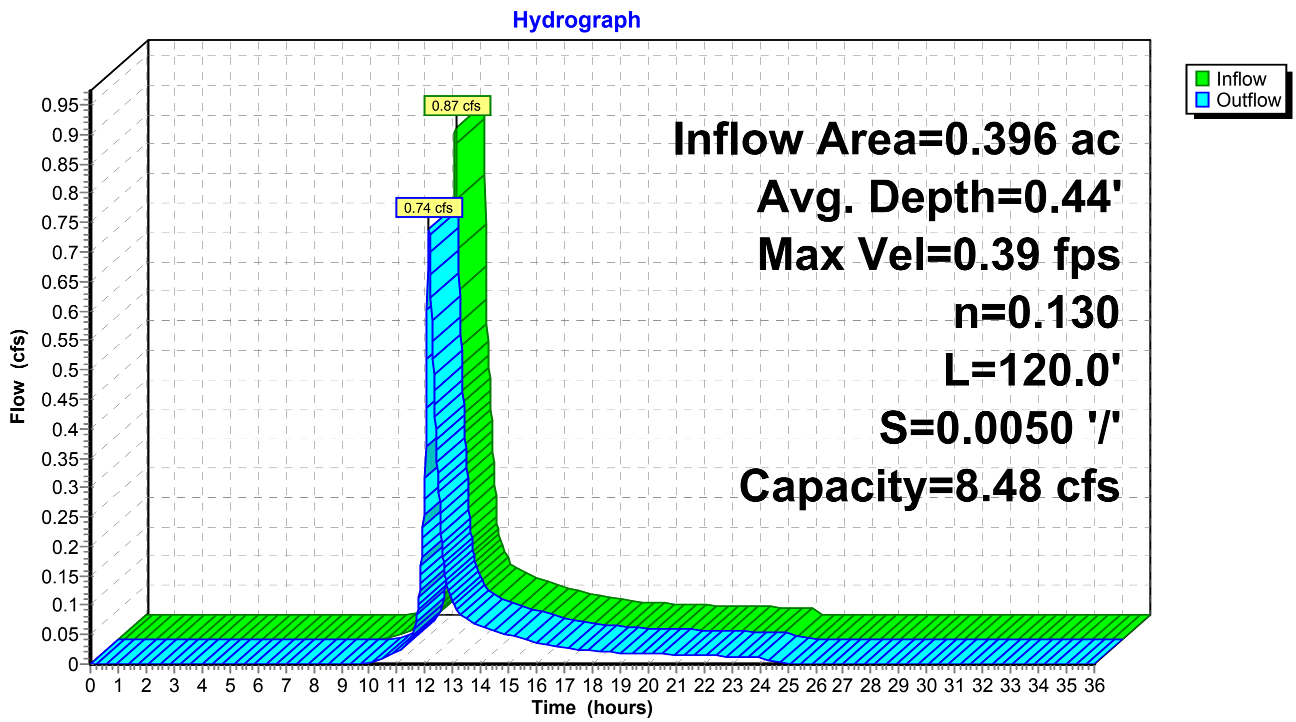
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.39 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 17.6 min

Peak Storage= 230 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.44'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 8.48 cfs

3.00' x 1.50' deep channel, n= 0.130
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 120.0' Slope= 0.0050 '/'
Inlet Invert= 1,682.50', Outlet Invert= 1,681.90'

‡

Reach SW-5: Swale



Summary for Reach SW-6: Swale

Inflow Area = 0.591 ac, 0.00% Impervious, Inflow Depth = 1.74" for 10-Year Event event
Inflow = 1.19 cfs @ 12.09 hrs, Volume= 0.086 af
Outflow = 1.05 cfs @ 12.14 hrs, Volume= 0.086 af, Atten= 12%, Lag= 2.7 min

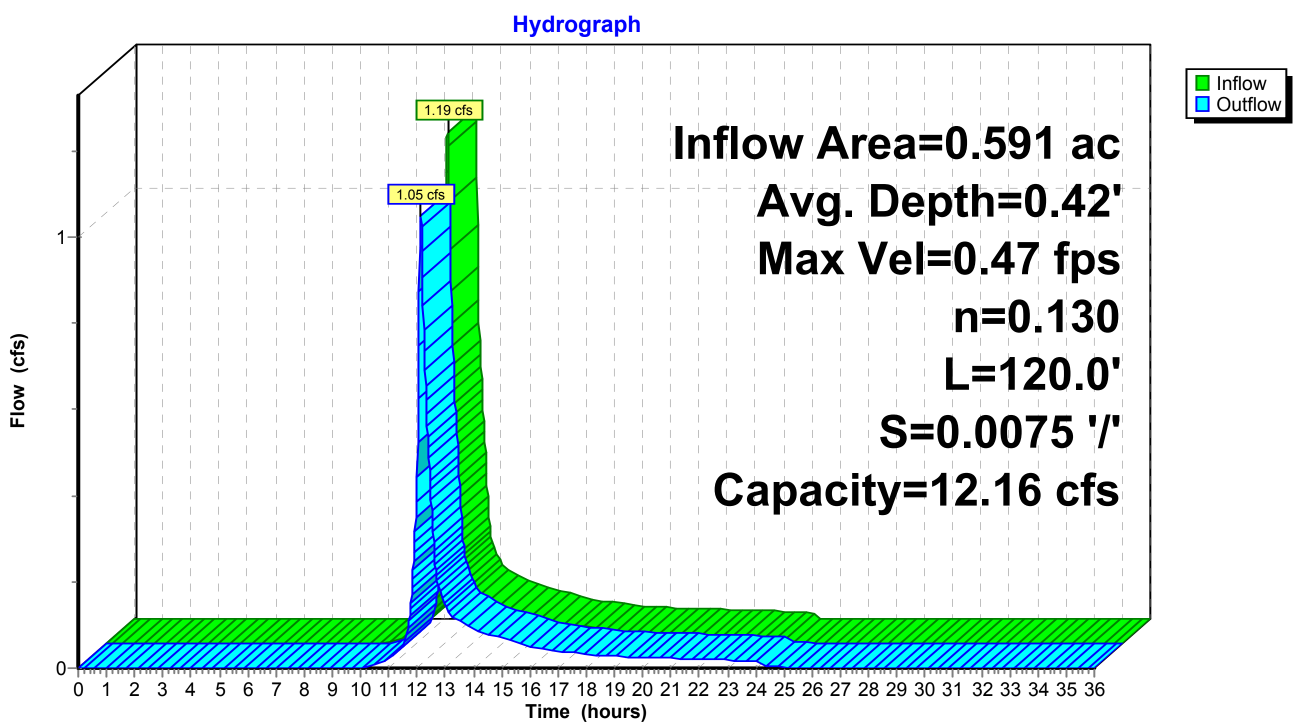
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.47 fps, Min. Travel Time= 4.2 min
Avg. Velocity = 0.14 fps, Avg. Travel Time= 14.5 min

Peak Storage= 265 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.42'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 12.16 cfs

4.00' x 1.50' deep channel, n= 0.130
Side Slope Z-value= 3.0 '/' Top Width= 13.00'
Length= 120.0' Slope= 0.0075 '/'
Inlet Invert= 1,579.50', Outlet Invert= 1,578.60'

‡

Reach SW-6: Swale



Summary for Reach SW-7: Swale

Inflow Area = 0.254 ac, 0.00% Impervious, Inflow Depth = 1.89" for 10-Year Event event
Inflow = 0.56 cfs @ 12.09 hrs, Volume= 0.040 af
Outflow = 0.47 cfs @ 12.15 hrs, Volume= 0.040 af, Atten= 17%, Lag= 3.3 min

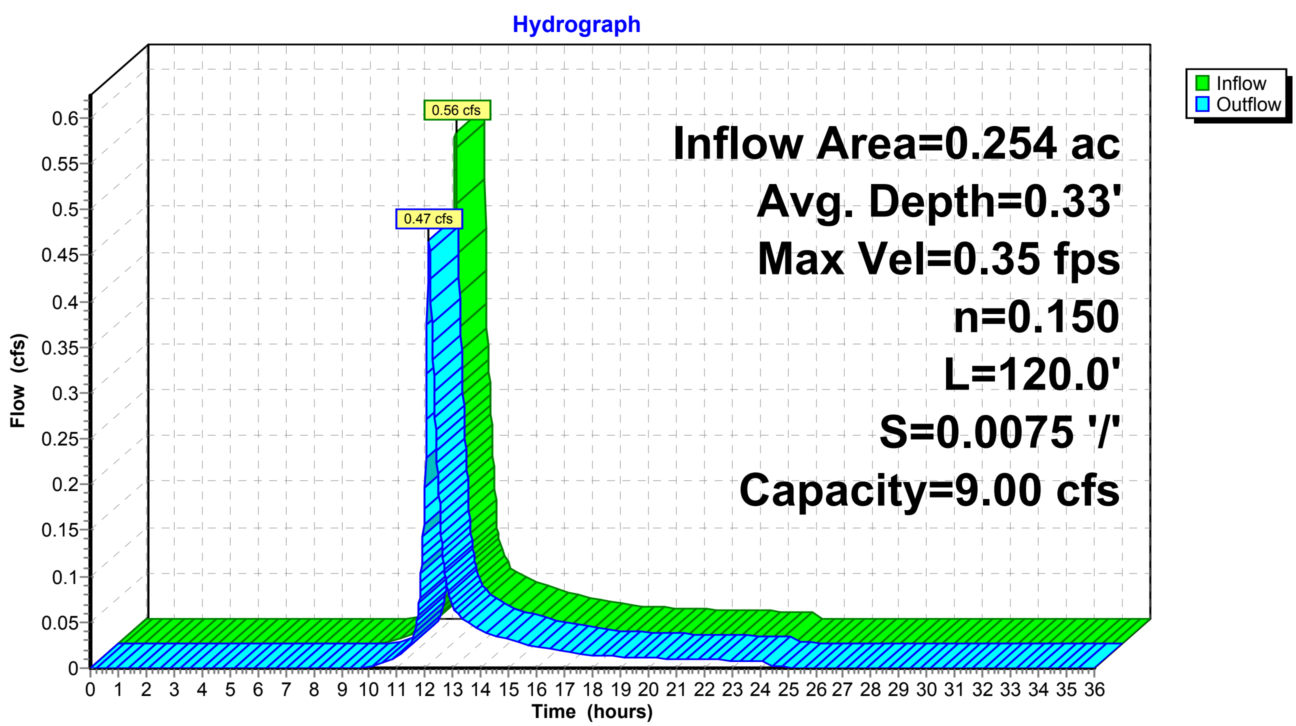
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.35 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.10 fps, Avg. Travel Time= 19.3 min

Peak Storage= 160 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.00 cfs

3.00' x 1.50' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 120.0' Slope= 0.0075 '/'
Inlet Invert= 1,503.00', Outlet Invert= 1,502.10'

‡

Reach SW-7: Swale



Summary for Reach SW-8: Swale

Inflow Area = 0.367 ac, 0.00% Impervious, Inflow Depth = 1.97" for 10-Year Event event
Inflow = 0.84 cfs @ 12.09 hrs, Volume= 0.060 af
Outflow = 0.71 cfs @ 12.14 hrs, Volume= 0.060 af, Atten= 16%, Lag= 3.2 min

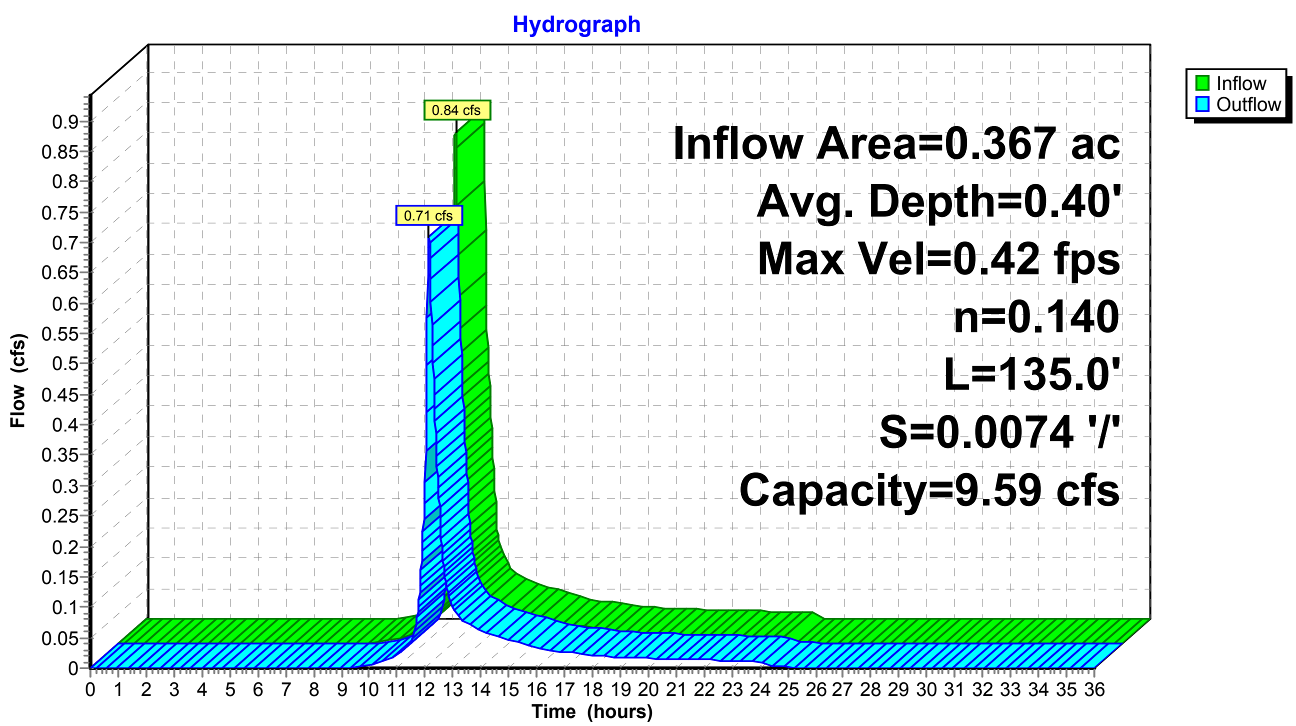
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.42 fps, Min. Travel Time= 5.4 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 18.5 min

Peak Storage= 230 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.59 cfs

3.00' x 1.50' deep channel, n= 0.140
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 135.0' Slope= 0.0074 '/'
Inlet Invert= 1,471.00', Outlet Invert= 1,470.00'

‡

Reach SW-8: Swale



Summary for Reach SW-9: Swale

Inflow Area = 0.183 ac, 0.00% Impervious, Inflow Depth = 1.97" for 10-Year Event event
Inflow = 0.42 cfs @ 12.09 hrs, Volume= 0.030 af
Outflow = 0.34 cfs @ 12.15 hrs, Volume= 0.030 af, Atten= 18%, Lag= 3.5 min

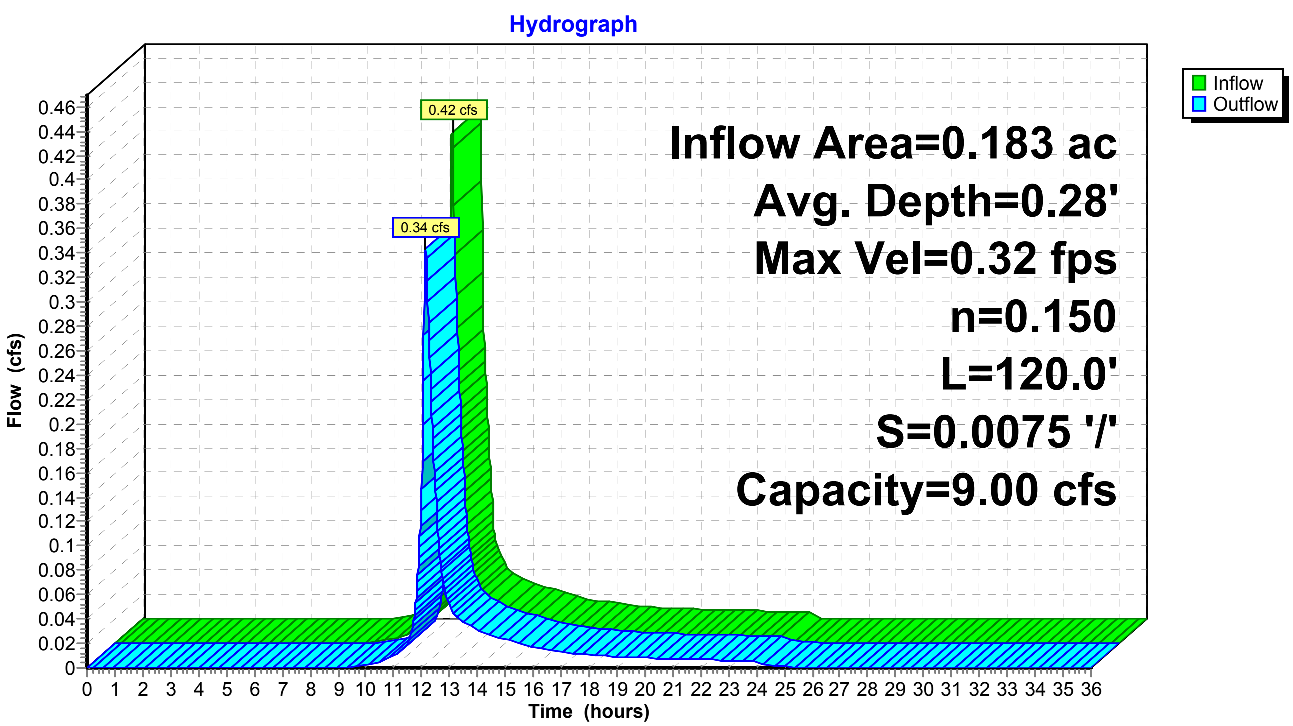
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.32 fps, Min. Travel Time= 6.3 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 21.2 min

Peak Storage= 129 cf @ 12.15 hrs, Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.00 cfs

3.00' x 1.50' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 120.0' Slope= 0.0075 '/'
Inlet Invert= 1,521.00', Outlet Invert= 1,520.10'

‡

Reach SW-9: Swale



Summary for Subcatchment WQ10:

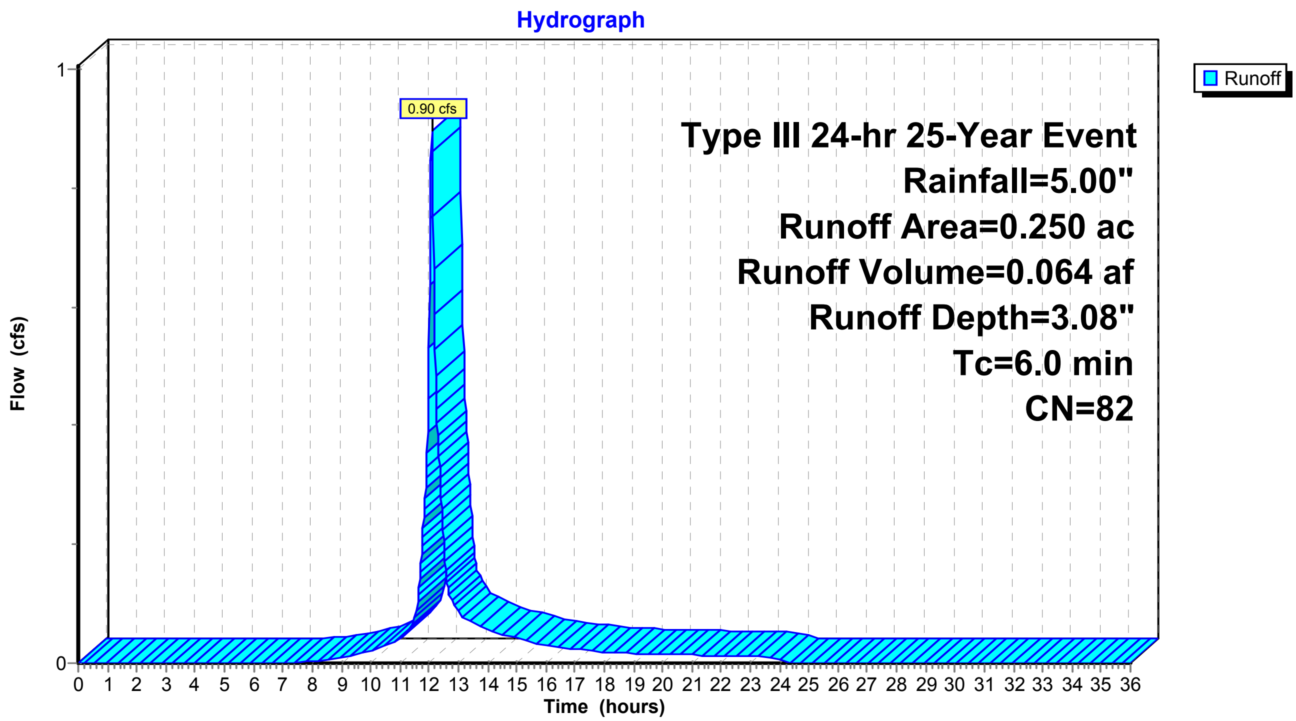
Runoff = 0.90 cfs @ 12.09 hrs, Volume= 0.064 af, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.086	91	Gravel roads, HSG D
0.164	78	Meadow, non-grazed, HSG D
0.250	82	Weighted Average
0.250		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ10:



Summary for Subcatchment WQ11:

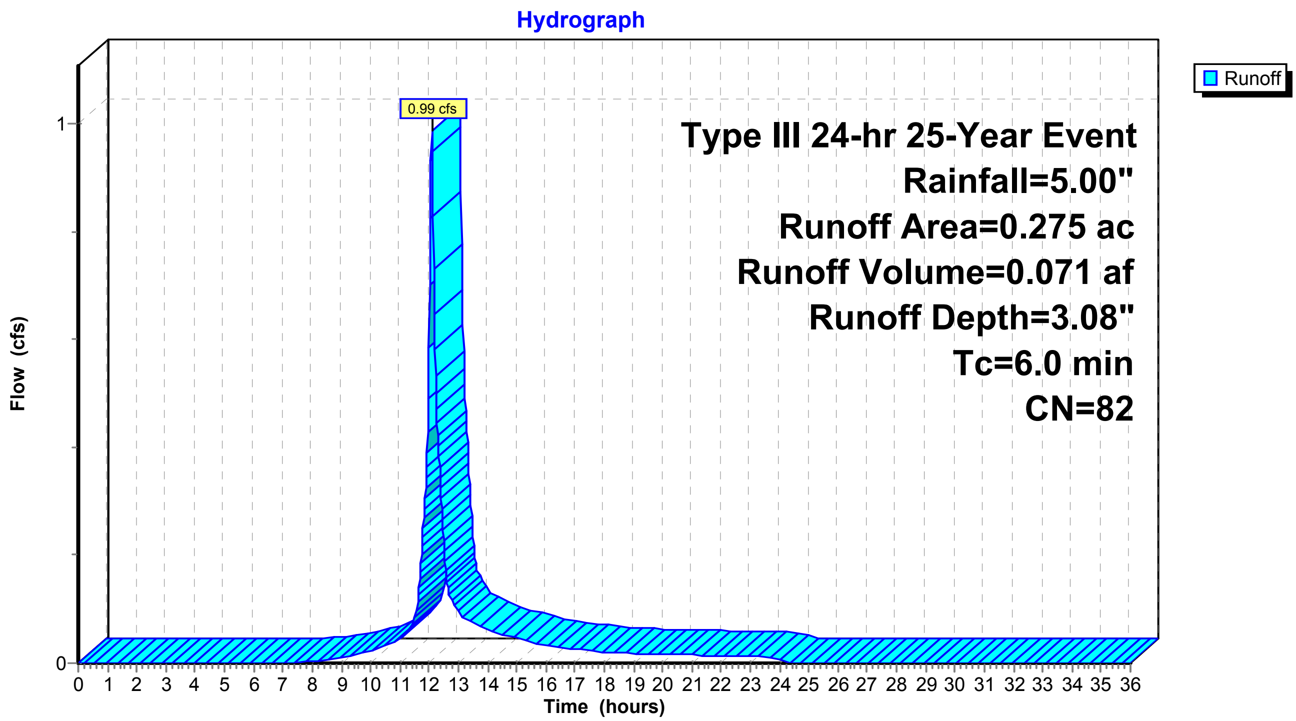
Runoff = 0.99 cfs @ 12.09 hrs, Volume= 0.071 af, Depth= 3.08"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.092	91	Gravel roads, HSG D
0.183	78	Meadow, non-grazed, HSG D
0.275	82	Weighted Average
0.275		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ11:



Summary for Subcatchment WQ13:

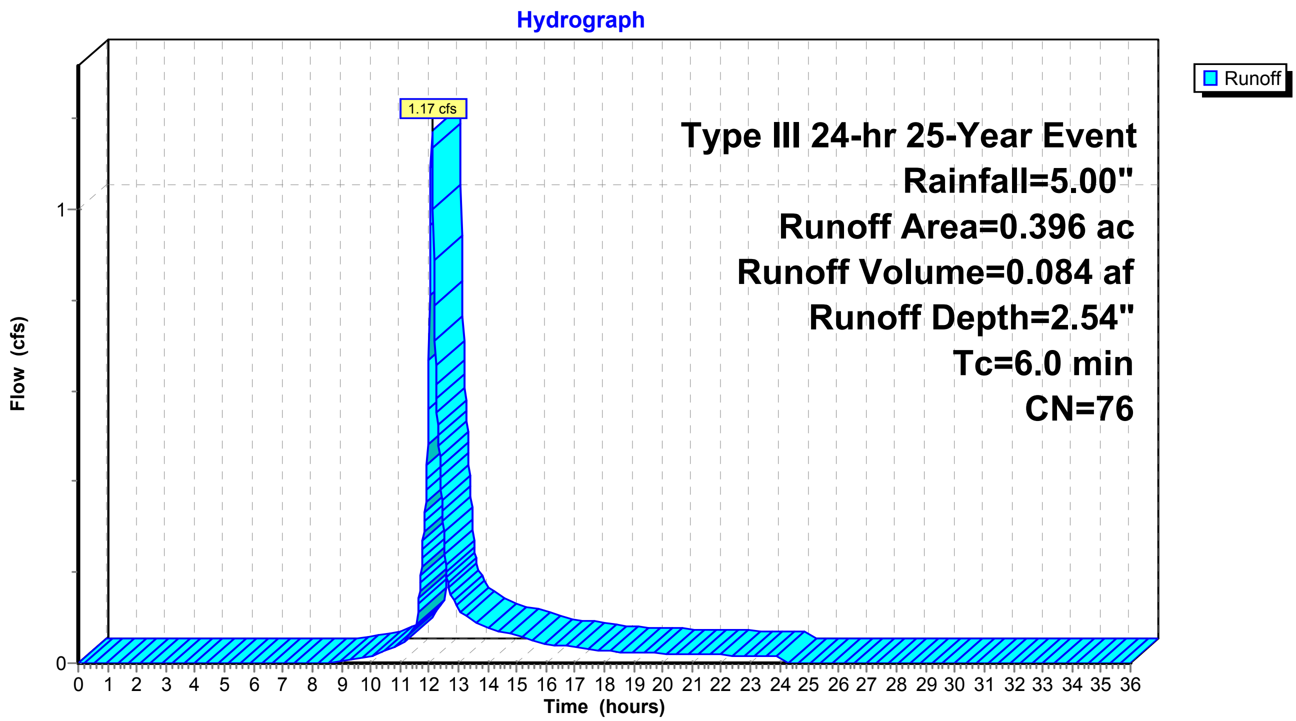
Runoff = 1.17 cfs @ 12.09 hrs, Volume= 0.084 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.119	89	Gravel roads, HSG C
0.277	71	Meadow, non-grazed, HSG C
0.396	76	Weighted Average
0.396		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ13:



Summary for Subcatchment WQ14:

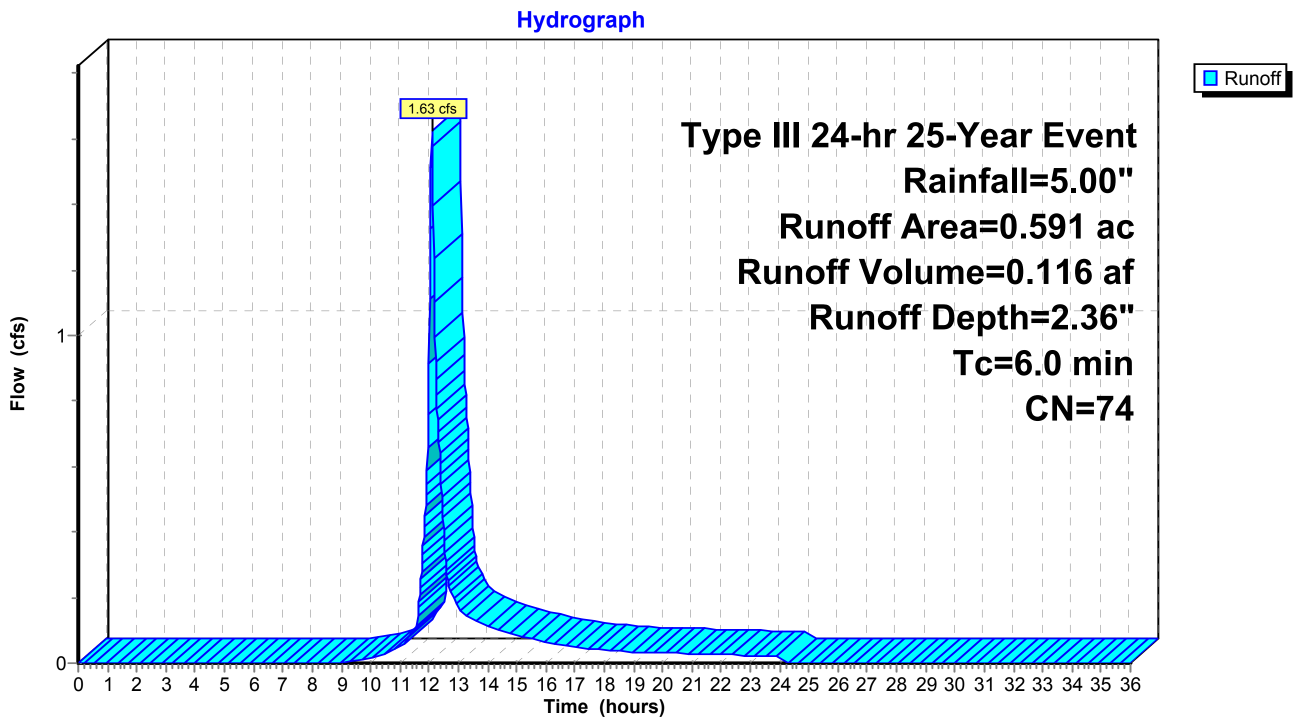
Runoff = 1.63 cfs @ 12.09 hrs, Volume= 0.116 af, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.092	89	Gravel roads, HSG C
0.499	71	Meadow, non-grazed, HSG C
0.591	74	Weighted Average
0.591		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ14:



Summary for Subcatchment WQ15:

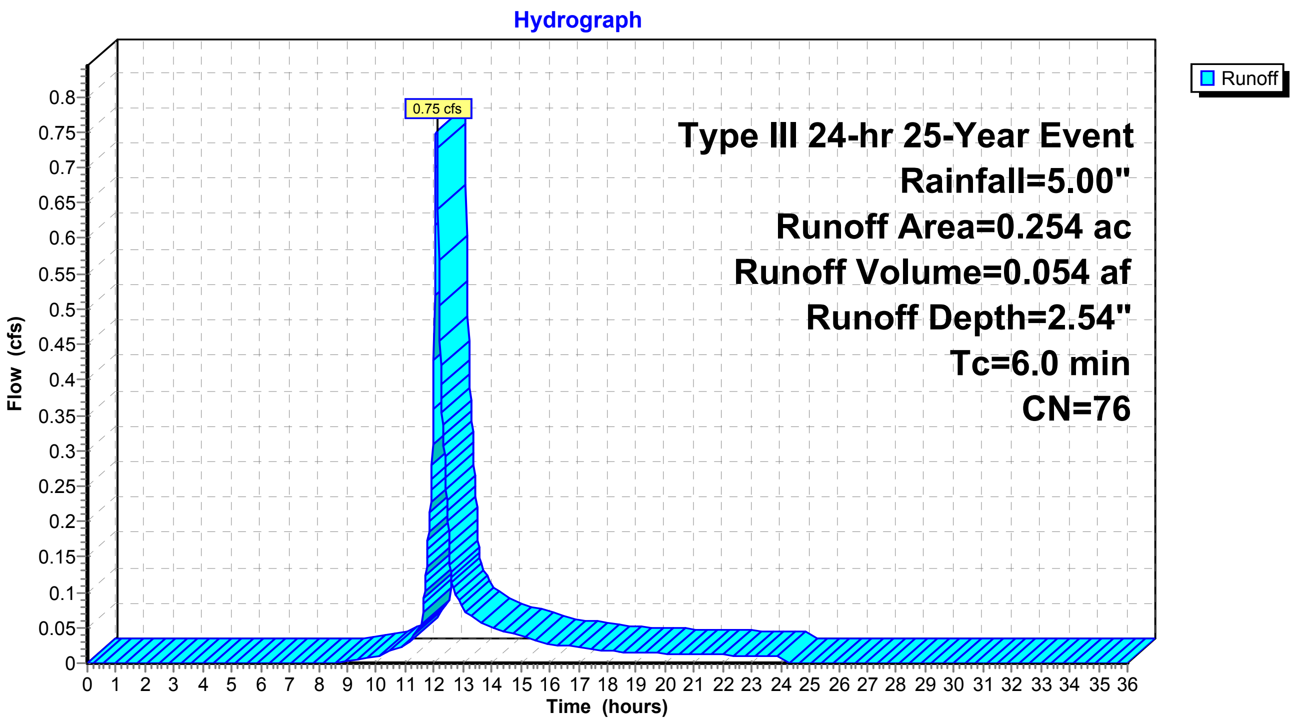
Runoff = 0.75 cfs @ 12.09 hrs, Volume= 0.054 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.064	89	Gravel roads, HSG C
0.190	71	Meadow, non-grazed, HSG C
0.254	76	Weighted Average
0.254		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ15:



Summary for Subcatchment WQ16:

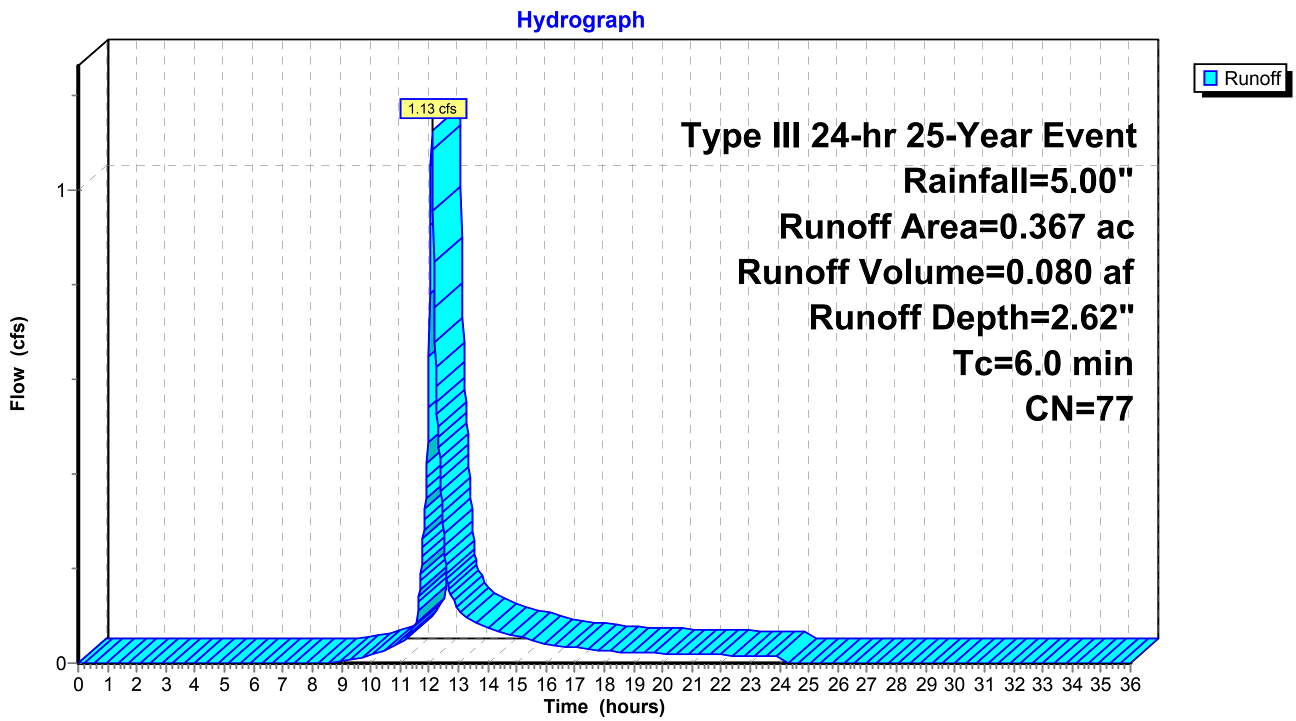
Runoff = 1.13 cfs @ 12.09 hrs, Volume= 0.080 af, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.119	89	Gravel roads, HSG C
0.248	71	Meadow, non-grazed, HSG C
0.367	77	Weighted Average
0.367		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ16:



Summary for Subcatchment WQ17:

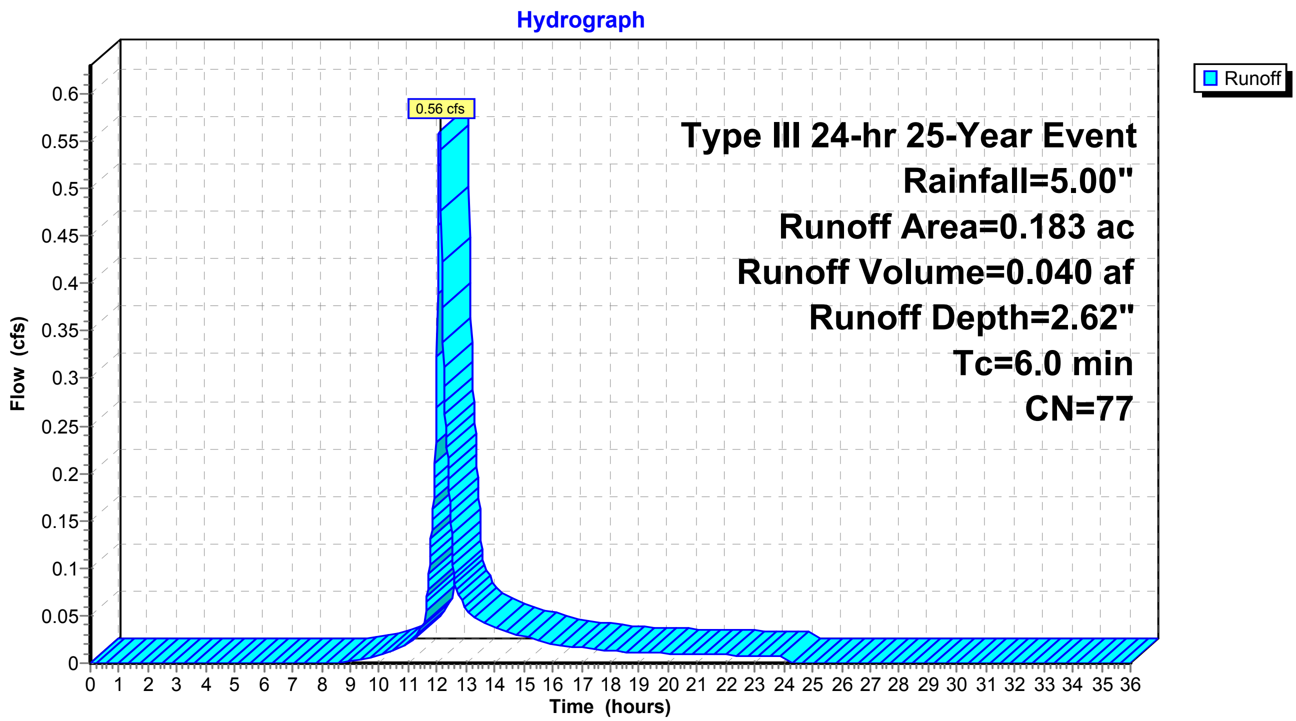
Runoff = 0.56 cfs @ 12.09 hrs, Volume= 0.040 af, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.064	89	Gravel roads, HSG C
0.119	71	Meadow, non-grazed, HSG C
0.183	77	Weighted Average
0.183		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ17:



Summary for Subcatchment WQ18:

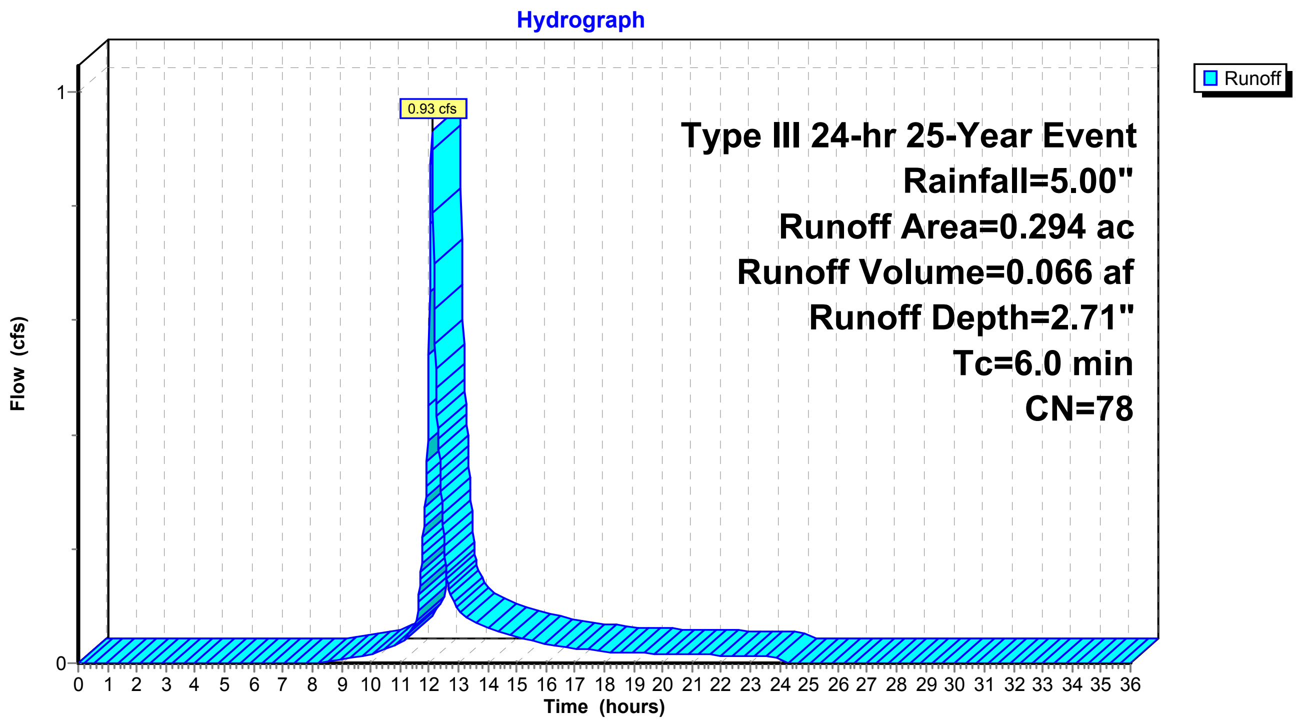
Runoff = 0.93 cfs @ 12.09 hrs, Volume= 0.066 af, Depth= 2.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.110	89	Gravel roads, HSG C
0.184	71	Meadow, non-grazed, HSG C
0.294	78	Weighted Average
0.294		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ18:



Summary for Subcatchment WQ19:

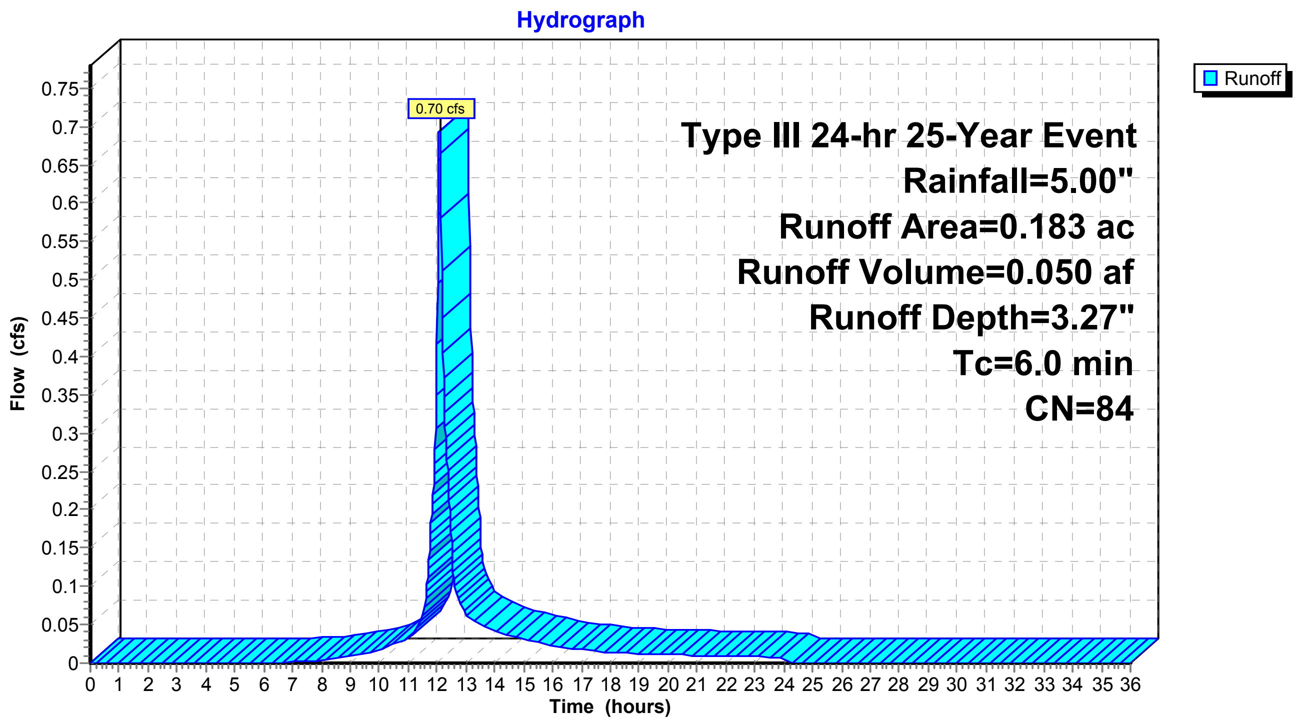
Runoff = 0.70 cfs @ 12.09 hrs, Volume= 0.050 af, Depth= 3.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.133	89	Gravel roads, HSG C
0.050	71	Meadow, non-grazed, HSG C
0.183	84	Weighted Average
0.183		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ19:



Summary for Subcatchment WQ20:

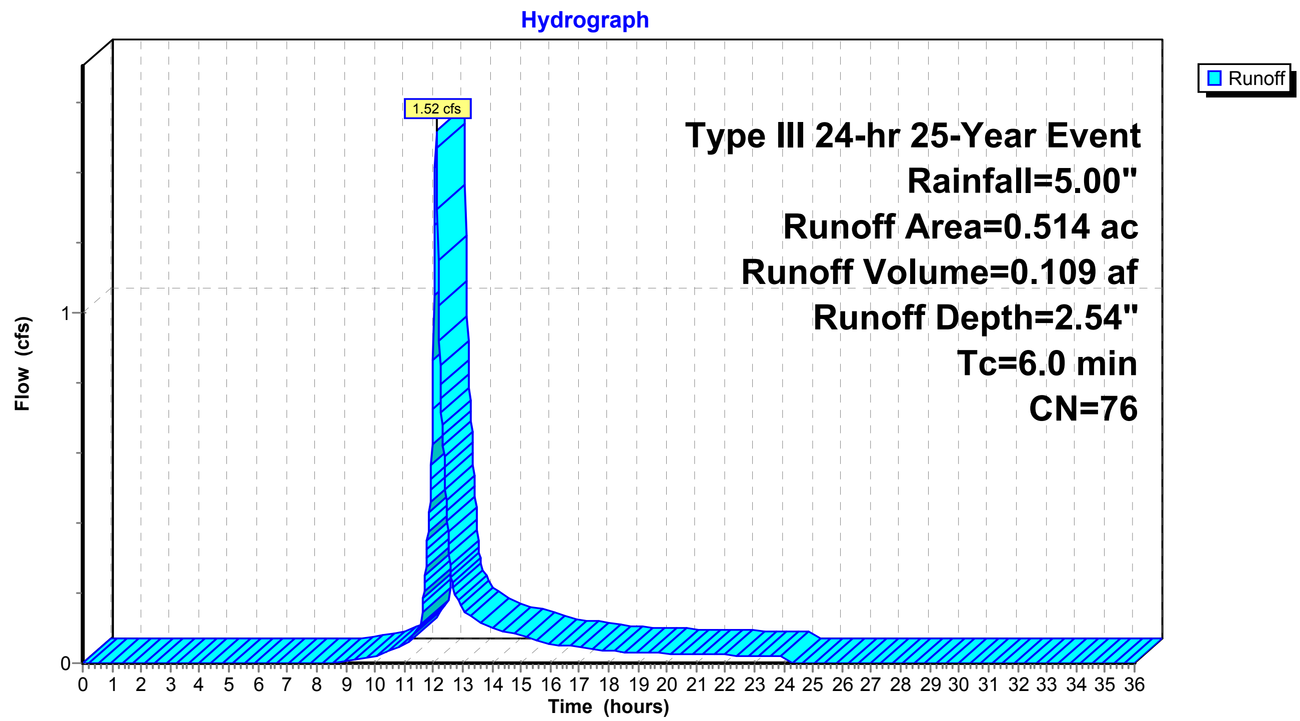
Runoff = 1.52 cfs @ 12.09 hrs, Volume= 0.109 af, Depth= 2.54"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.156	89	Gravel roads, HSG C
0.358	71	Meadow, non-grazed, HSG C
0.514	76	Weighted Average
0.514		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ20:



Summary for Subcatchment WQ21:

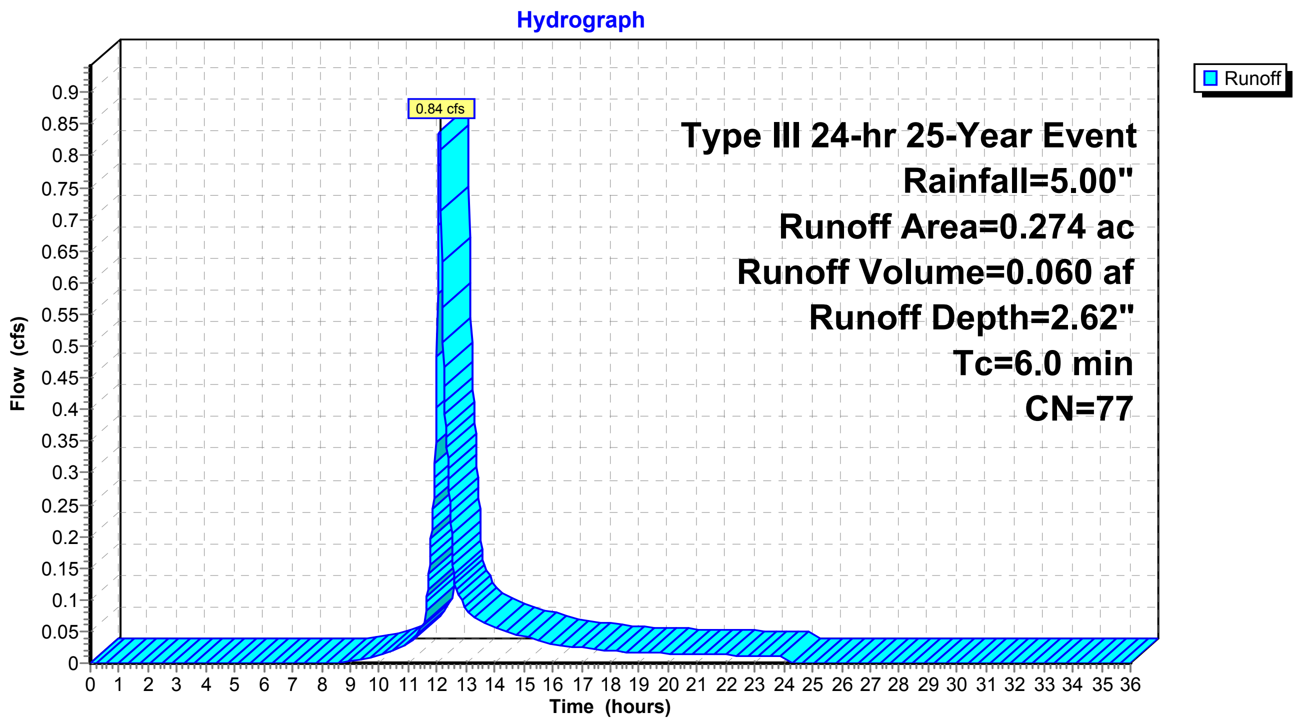
Runoff = 0.84 cfs @ 12.09 hrs, Volume= 0.060 af, Depth= 2.62"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.092	89	Gravel roads, HSG C
0.182	71	Meadow, non-grazed, HSG C
0.274	77	Weighted Average
0.274		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ21:



Summary for Subcatchment WQ4:

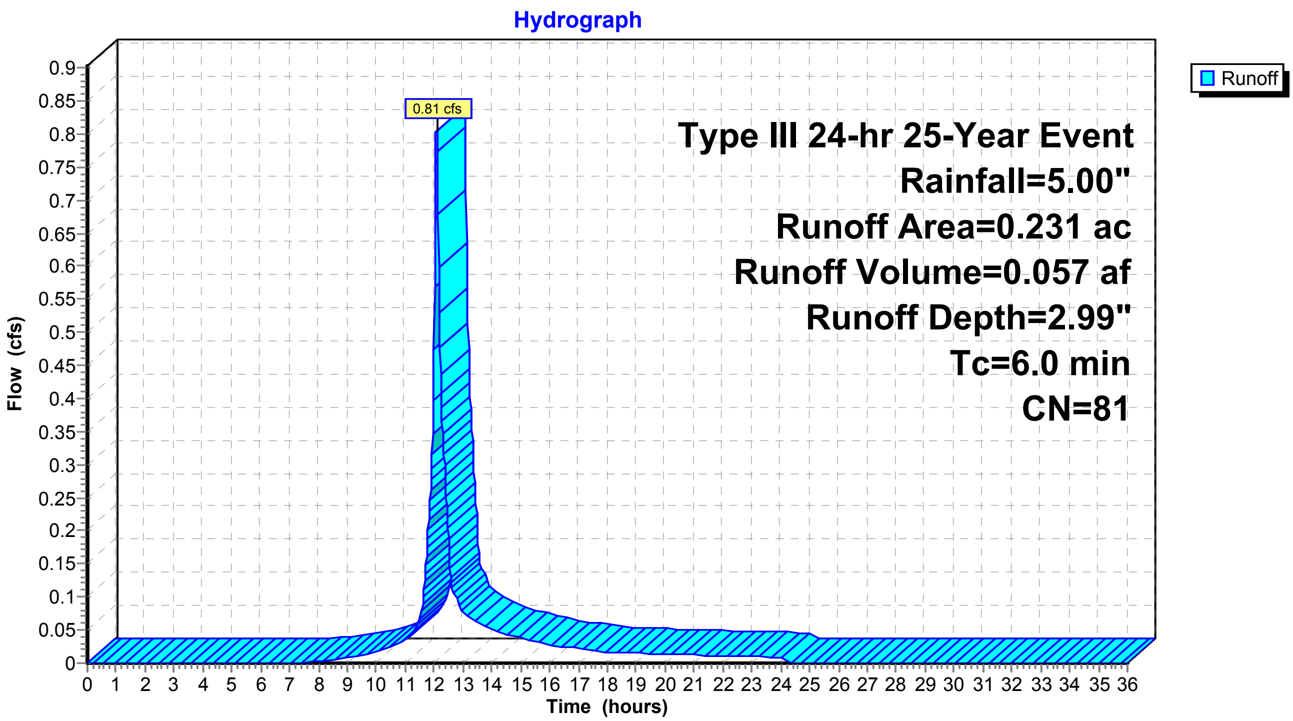
Runoff = 0.81 cfs @ 12.09 hrs, Volume= 0.057 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.128	89	Gravel roads, HSG C
0.103	71	Meadow, non-grazed, HSG C
0.231	81	Weighted Average
0.231		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ4:



Summary for Subcatchment WQ5:

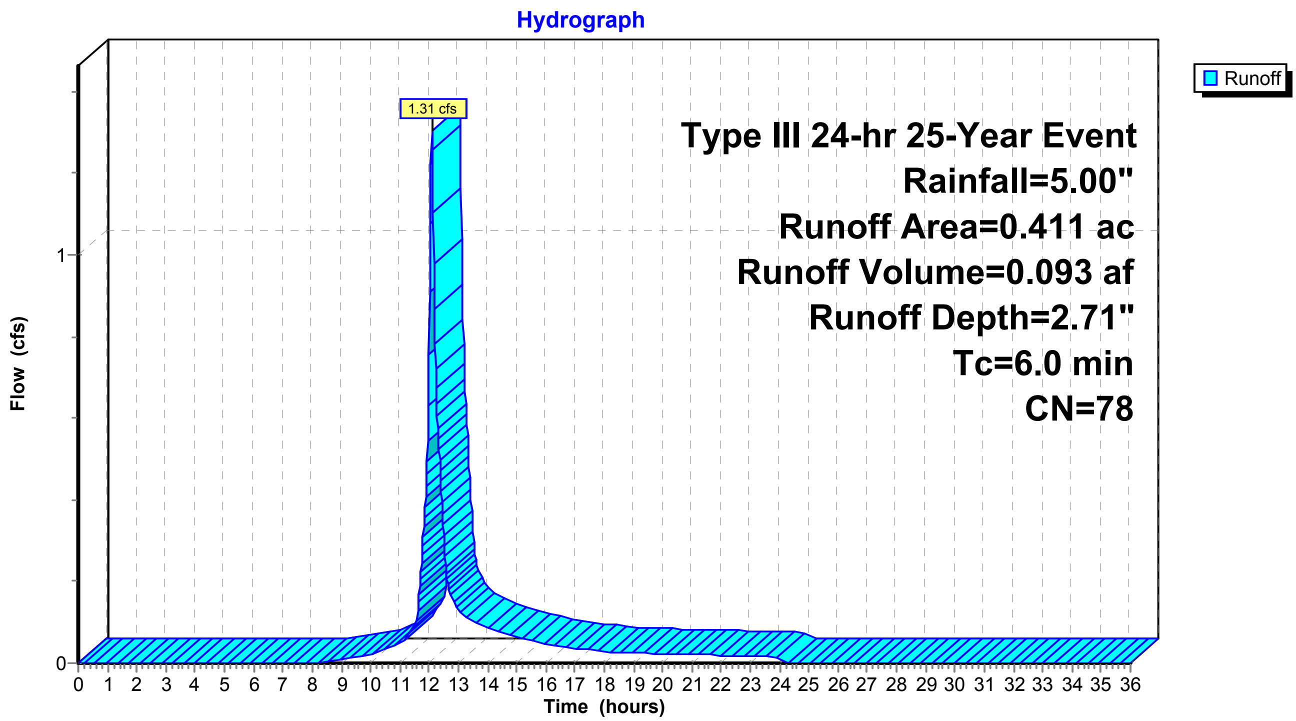
Runoff = 1.31 cfs @ 12.09 hrs, Volume= 0.093 af, Depth= 2.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.156	89	Gravel roads, HSG C
0.255	71	Meadow, non-grazed, HSG C
0.411	78	Weighted Average
0.411		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ5:



Summary for Subcatchment WQ7:

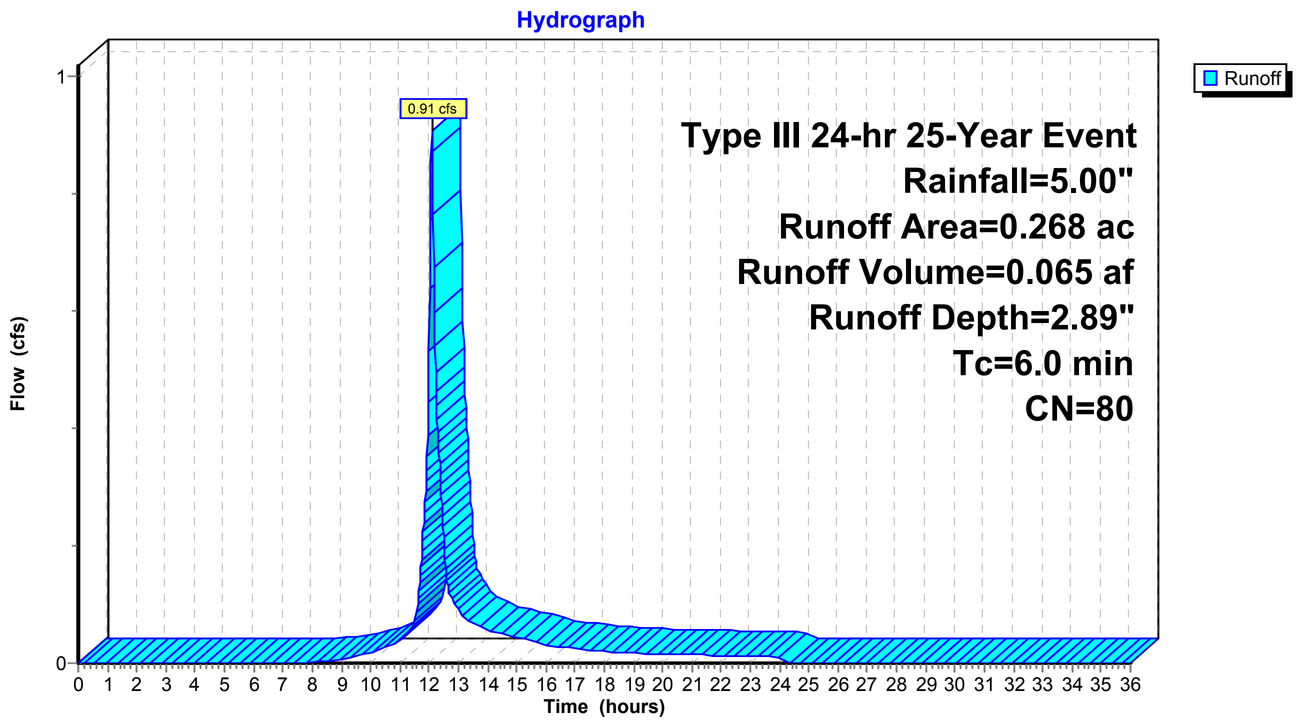
Runoff = 0.91 cfs @ 12.09 hrs, Volume= 0.065 af, Depth= 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.130	89	Gravel roads, HSG C
0.138	71	Meadow, non-grazed, HSG C
0.268	80	Weighted Average
0.268		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ7:



Summary for Subcatchment WQ9:

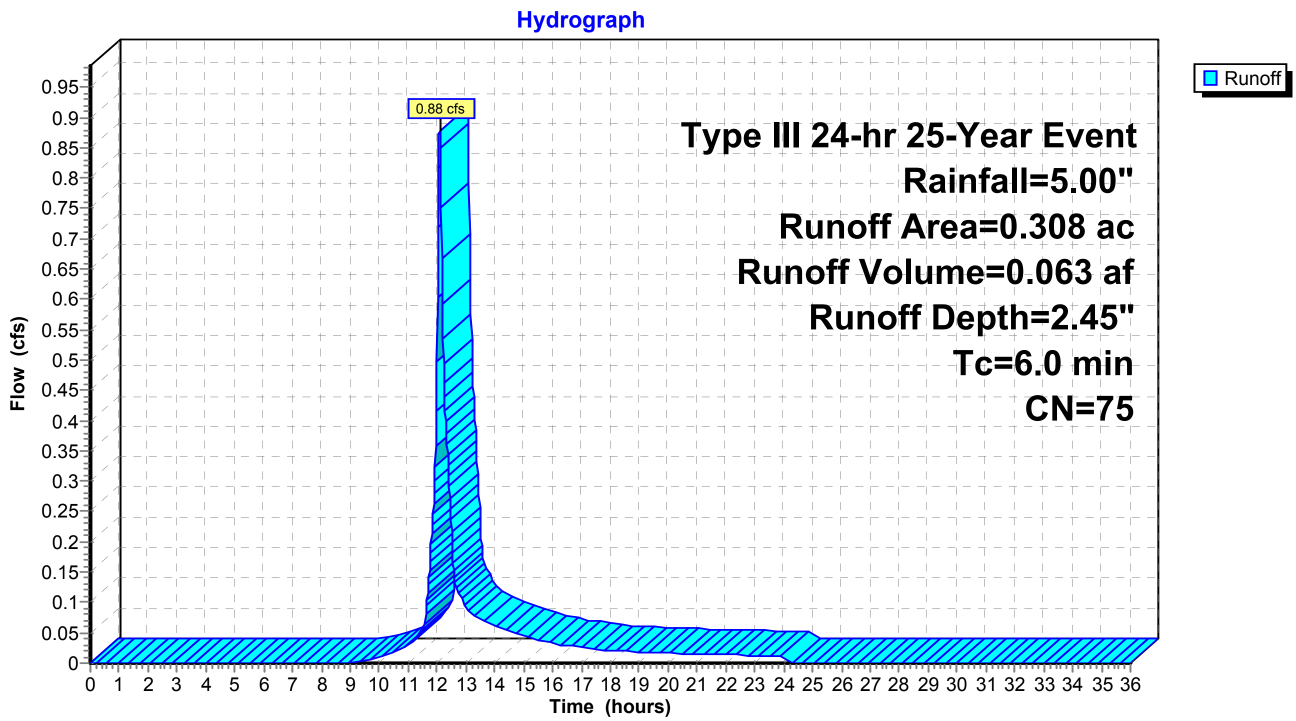
Runoff = 0.88 cfs @ 12.09 hrs, Volume= 0.063 af, Depth= 2.45"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.073	89	Gravel roads, HSG C
0.235	71	Meadow, non-grazed, HSG C
0.308	75	Weighted Average
0.308		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment WQ9:

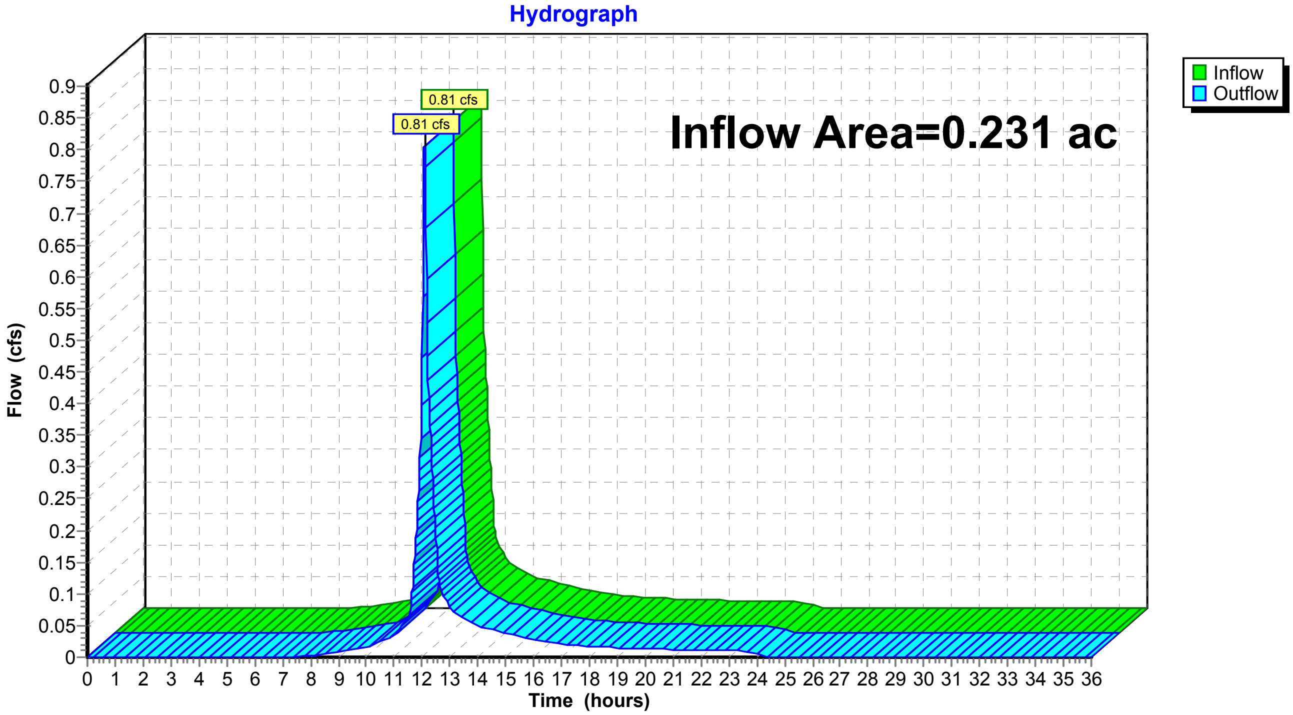


Summary for Reach LS-2:

Inflow Area = 0.231 ac, 0.00% Impervious, Inflow Depth = 2.99" for 25-Year Event event
Inflow = 0.81 cfs @ 12.09 hrs, Volume= 0.057 af
Outflow = 0.81 cfs @ 12.09 hrs, Volume= 0.057 af, Atten= 0%, Lag= 0.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

Reach LS-2:

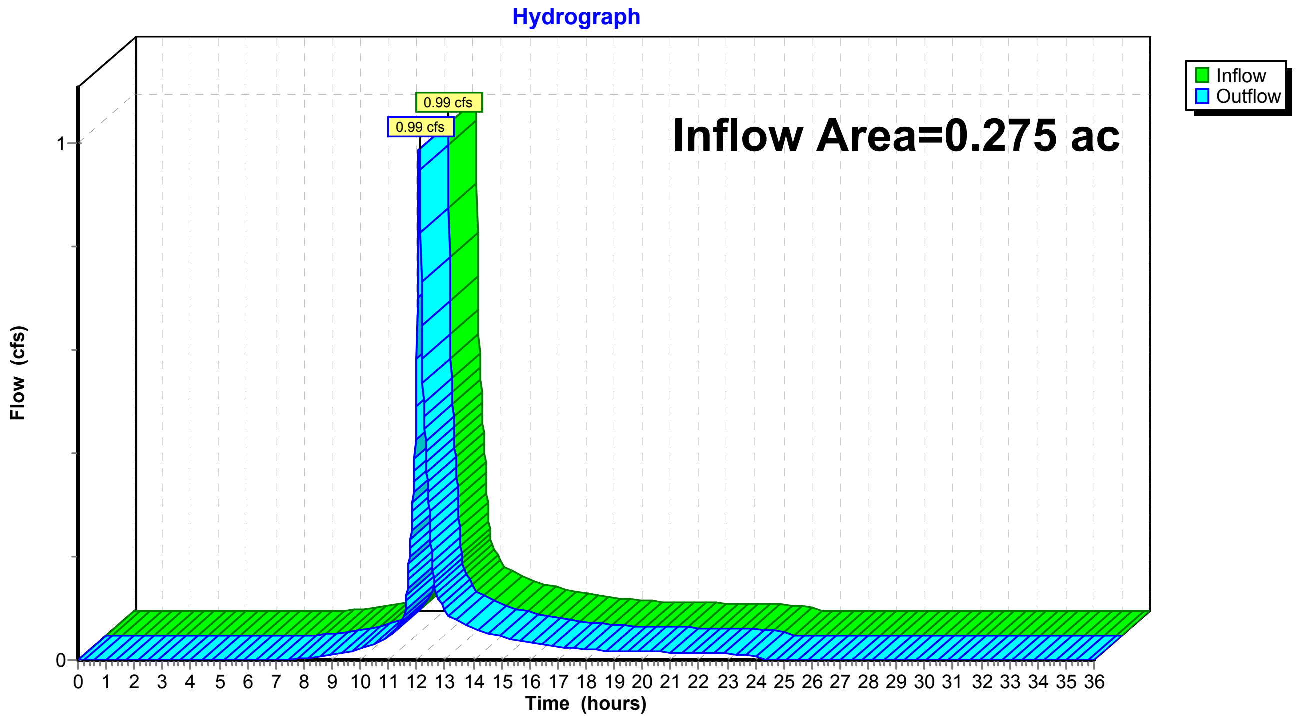


Summary for Reach LS-6:

Inflow Area =	0.275 ac,	0.00% Impervious, Inflow Depth = 3.08"	for 25-Year Event event	
Inflow =	0.99 cfs @	12.09 hrs, Volume=	0.071 af	
Outflow =	0.99 cfs @	12.09 hrs, Volume=	0.071 af, Atten= 0%, Lag= 0.0 min	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs

Reach LS-6:



Summary for Reach SW-1: Swale

Inflow Area = 0.411 ac, 0.00% Impervious, Inflow Depth = 2.71" for 25-Year Event event
Inflow = 1.31 cfs @ 12.09 hrs, Volume= 0.093 af
Outflow = 1.12 cfs @ 12.14 hrs, Volume= 0.093 af, Atten= 14%, Lag= 3.0 min

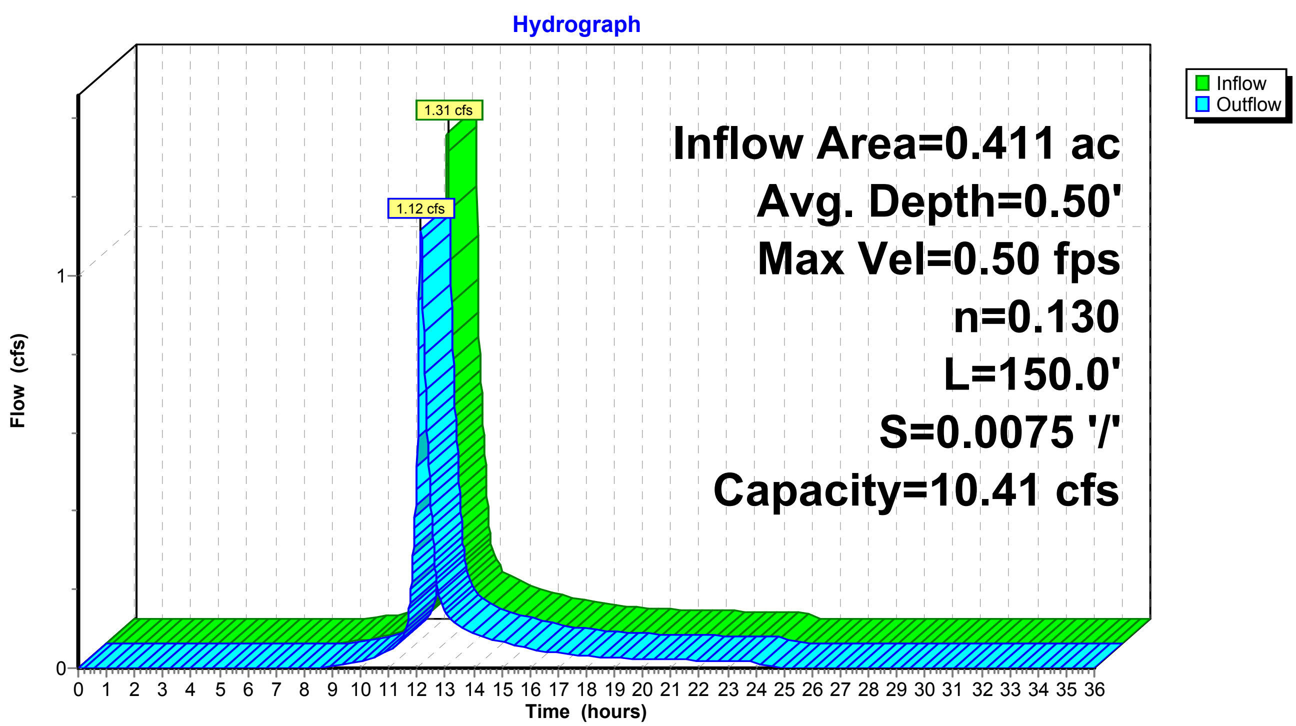
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.50 fps, Min. Travel Time= 5.0 min
Avg. Velocity = 0.14 fps, Avg. Travel Time= 17.4 min

Peak Storage= 333 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 10.41 cfs

3.00' x 1.50' deep channel, n= 0.130
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 150.0' Slope= 0.0075 '/'
Inlet Invert= 1,206.50', Outlet Invert= 1,205.37'

‡

Reach SW-1: Swale



Summary for Reach SW-10: Swale

Inflow Area = 0.294 ac, 0.00% Impervious, Inflow Depth = 2.71" for 25-Year Event event
Inflow = 0.93 cfs @ 12.09 hrs, Volume= 0.066 af
Outflow = 0.79 cfs @ 12.14 hrs, Volume= 0.066 af, Atten= 15%, Lag= 3.1 min

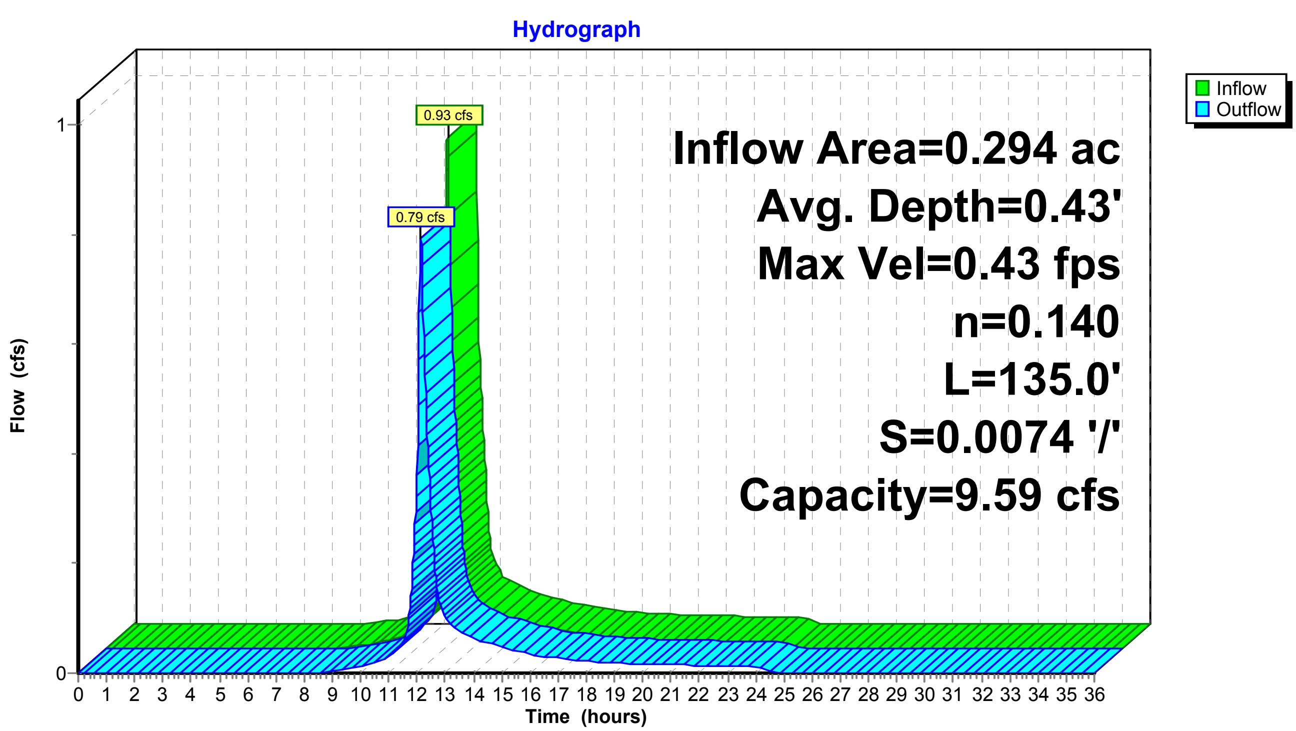
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.43 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 18.3 min

Peak Storage= 249 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.59 cfs

3.00' x 1.50' deep channel, n= 0.140
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 135.0' Slope= 0.0074 '/'
Inlet Invert= 1,571.00', Outlet Invert= 1,570.00'

‡

Reach SW-10: Swale



Summary for Reach SW-11: Swale

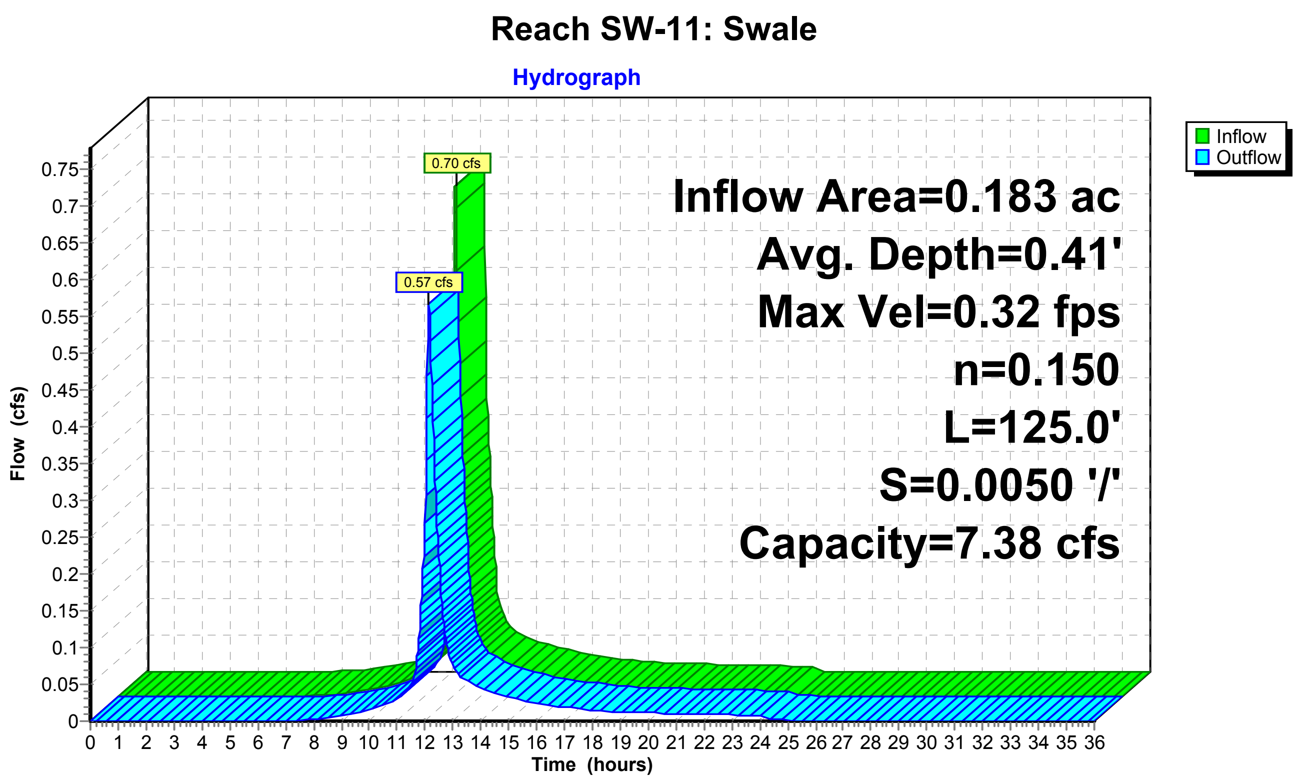
Inflow Area = 0.183 ac, 0.00% Impervious, Inflow Depth = 3.27" for 25-Year Event event
Inflow = 0.70 cfs @ 12.09 hrs, Volume= 0.050 af
Outflow = 0.57 cfs @ 12.14 hrs, Volume= 0.050 af, Atten= 18%, Lag= 3.5 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.32 fps, Min. Travel Time= 6.4 min
Avg. Velocity = 0.09 fps, Avg. Travel Time= 23.4 min

Peak Storage= 219 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 7.38 cfs

3.00' x 1.50' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 125.0' Slope= 0.0050 '/'
Inlet Invert= 1,688.00', Outlet Invert= 1,687.37'

‡



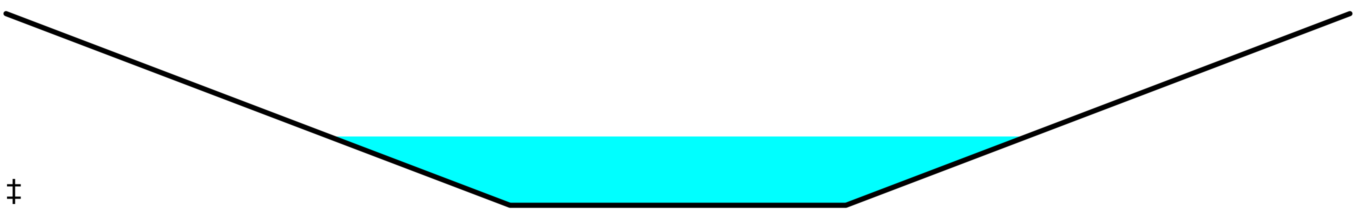
Summary for Reach SW-12: Swale

Inflow Area = 0.514 ac, 0.00% Impervious, Inflow Depth = 2.54" for 25-Year Event event
Inflow = 1.52 cfs @ 12.09 hrs, Volume= 0.109 af
Outflow = 1.32 cfs @ 12.14 hrs, Volume= 0.109 af, Atten= 14%, Lag= 2.9 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.53 fps, Min. Travel Time= 4.7 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 16.4 min

Peak Storage= 374 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.54'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 10.41 cfs

3.00' x 1.50' deep channel, n= 0.130
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 150.0' Slope= 0.0075 '/'
Inlet Invert= 1,787.00', Outlet Invert= 1,785.87'



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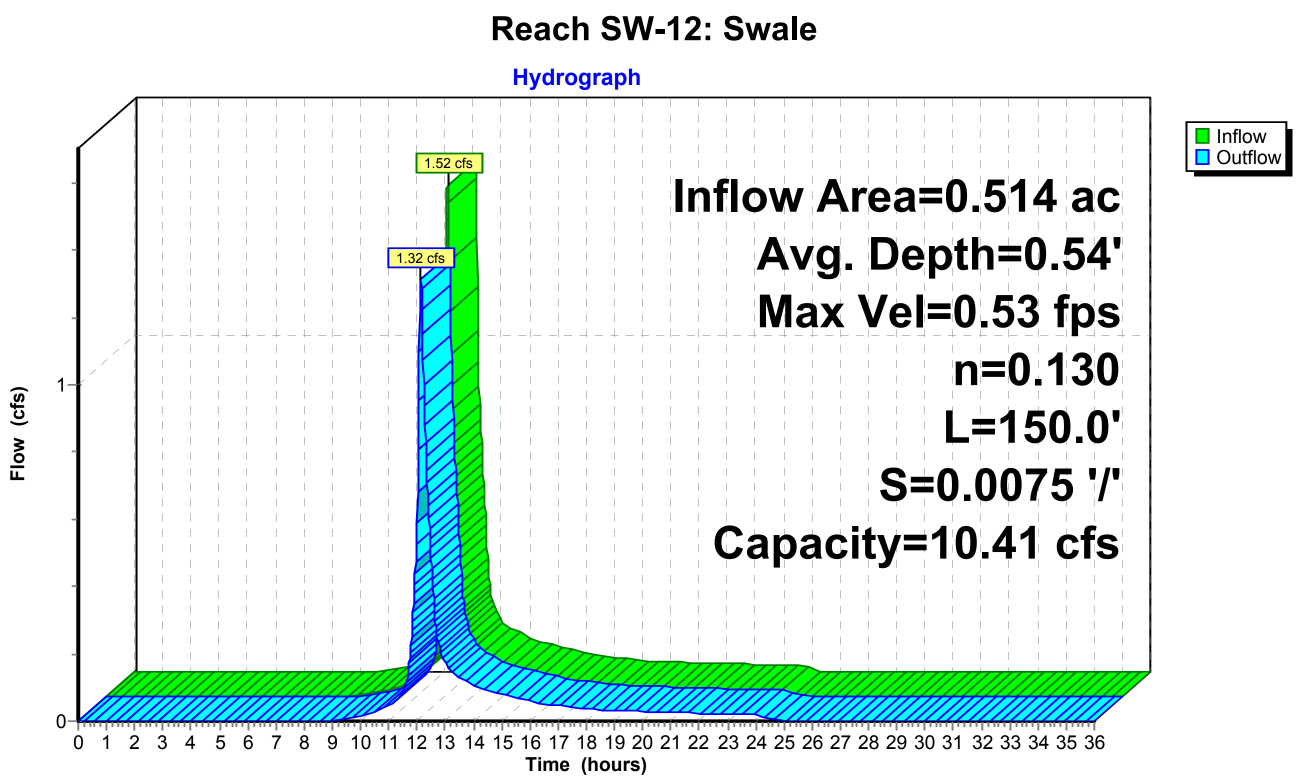


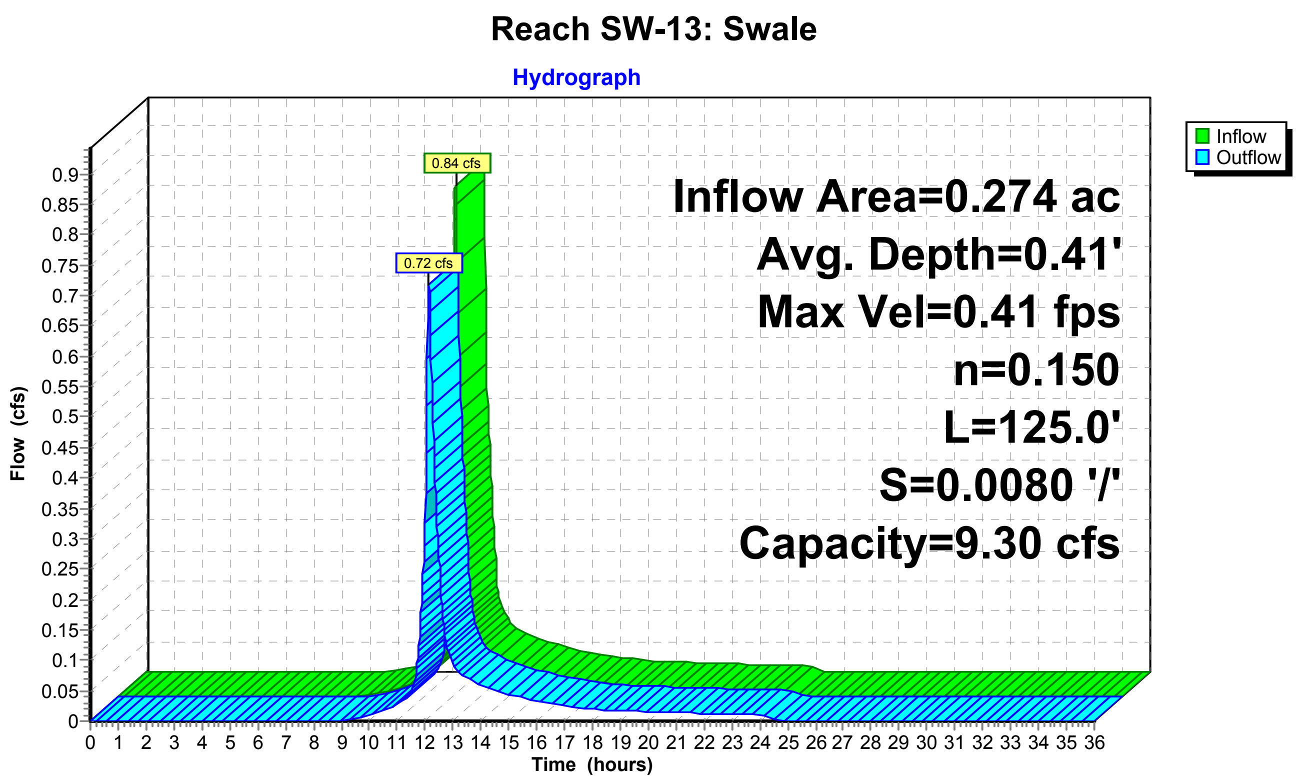
Summary for Reach SW-13: Swale

Inflow Area = 0.274 ac, 0.00% Impervious, Inflow Depth = 2.62" for 25-Year Event event
Inflow = 0.84 cfs @ 12.09 hrs, Volume= 0.060 af
Outflow = 0.72 cfs @ 12.14 hrs, Volume= 0.060 af, Atten= 15%, Lag= 3.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.41 fps, Min. Travel Time= 5.1 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 17.7 min

Peak Storage= 220 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.41'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.30 cfs

3.00' x 1.50' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 125.0' Slope= 0.0080 '/'
Inlet Invert= 1,849.00', Outlet Invert= 1,848.00'



Summary for Reach SW-2: Swale

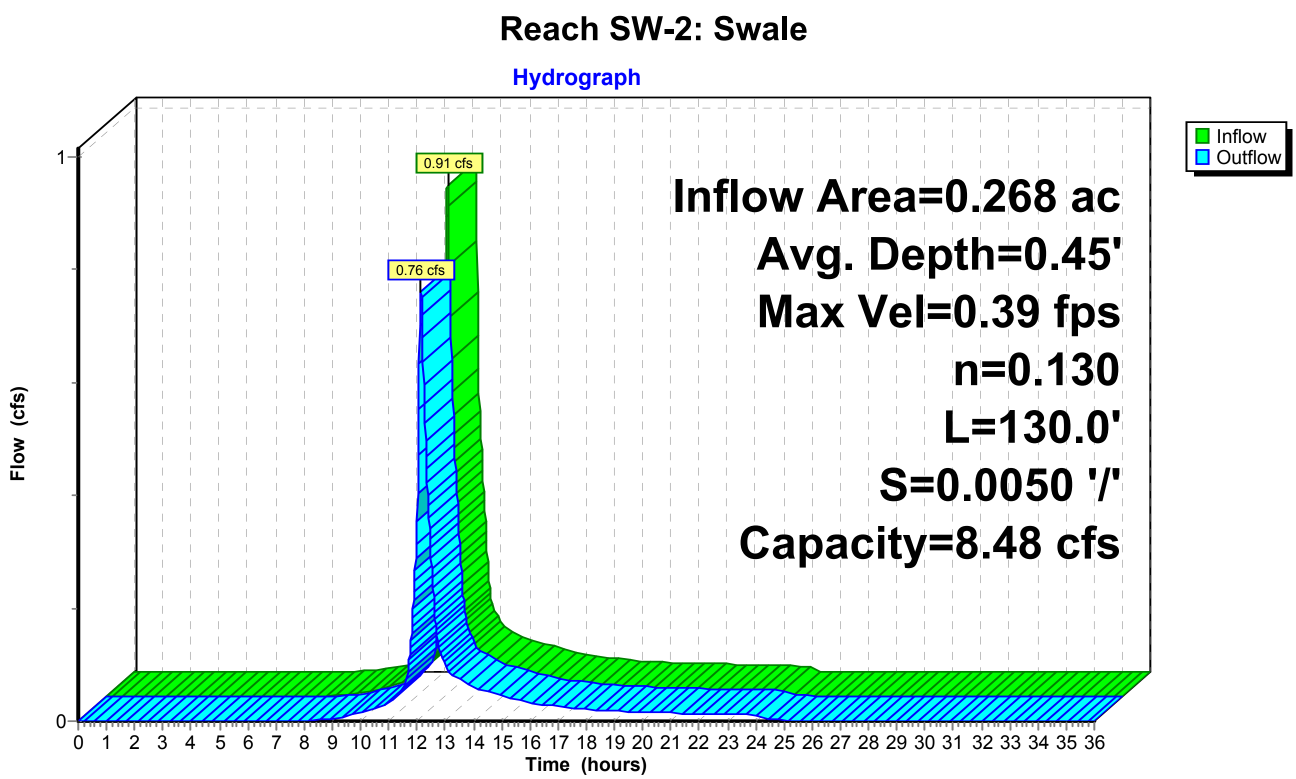
Inflow Area = 0.268 ac, 0.00% Impervious, Inflow Depth = 2.89" for 25-Year Event event
Inflow = 0.91 cfs @ 12.09 hrs, Volume= 0.065 af
Outflow = 0.76 cfs @ 12.14 hrs, Volume= 0.065 af, Atten= 16%, Lag= 3.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.39 fps, Min. Travel Time= 5.6 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 19.8 min

Peak Storage= 254 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.45'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 8.48 cfs

3.00' x 1.50' deep channel, n= 0.130
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 130.0' Slope= 0.0050 '/'
Inlet Invert= 1,354.00', Outlet Invert= 1,353.35'

‡



Summary for Reach SW-3: Swale

Inflow Area = 0.308 ac, 0.00% Impervious, Inflow Depth = 2.45" for 25-Year Event event
Inflow = 0.88 cfs @ 12.09 hrs, Volume= 0.063 af
Outflow = 0.76 cfs @ 12.14 hrs, Volume= 0.063 af, Atten= 14%, Lag= 2.9 min

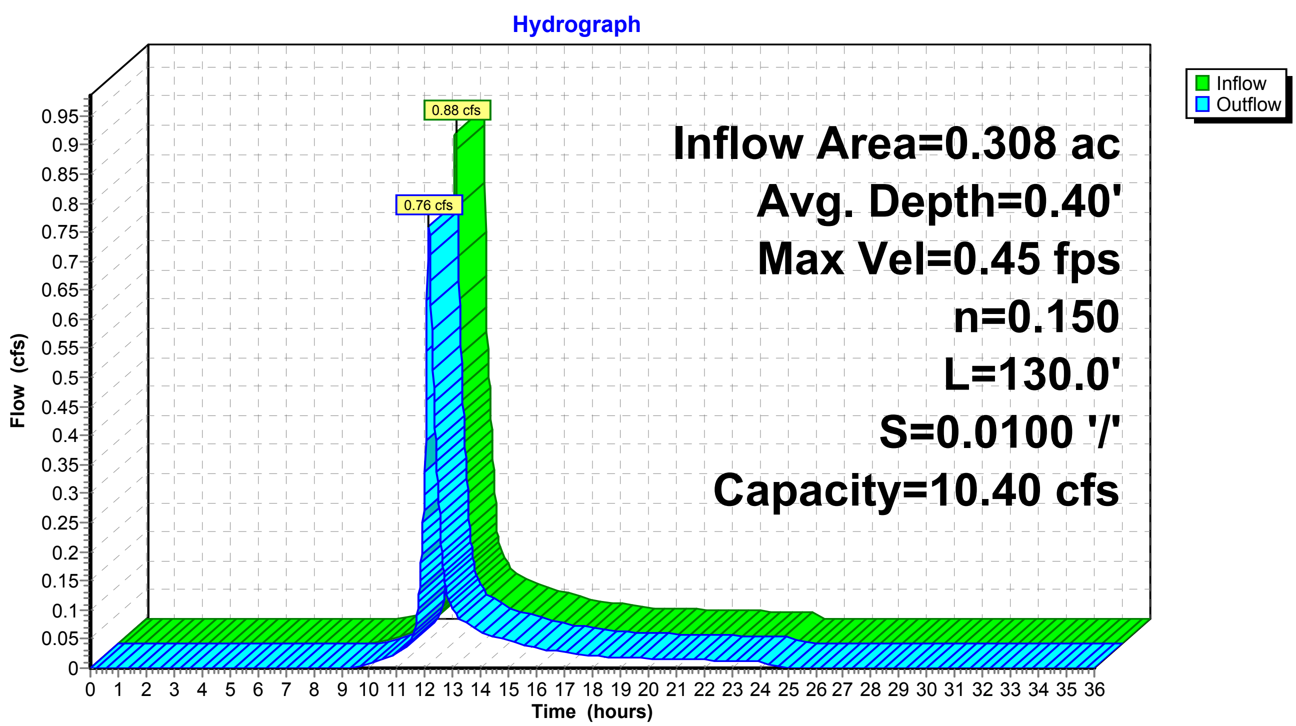
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.45 fps, Min. Travel Time= 4.8 min
Avg. Velocity = 0.13 fps, Avg. Travel Time= 16.5 min

Peak Storage= 220 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 10.40 cfs

3.00' x 1.50' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 130.0' Slope= 0.0100 '/'
Inlet Invert= 1,758.00', Outlet Invert= 1,756.70'

‡

Reach SW-3: Swale



Summary for Reach SW-4: Swale

Inflow Area = 0.250 ac, 0.00% Impervious, Inflow Depth = 3.08" for 25-Year Event event
Inflow = 0.90 cfs @ 12.09 hrs, Volume= 0.064 af
Outflow = 0.77 cfs @ 12.14 hrs, Volume= 0.064 af, Atten= 14%, Lag= 2.9 min

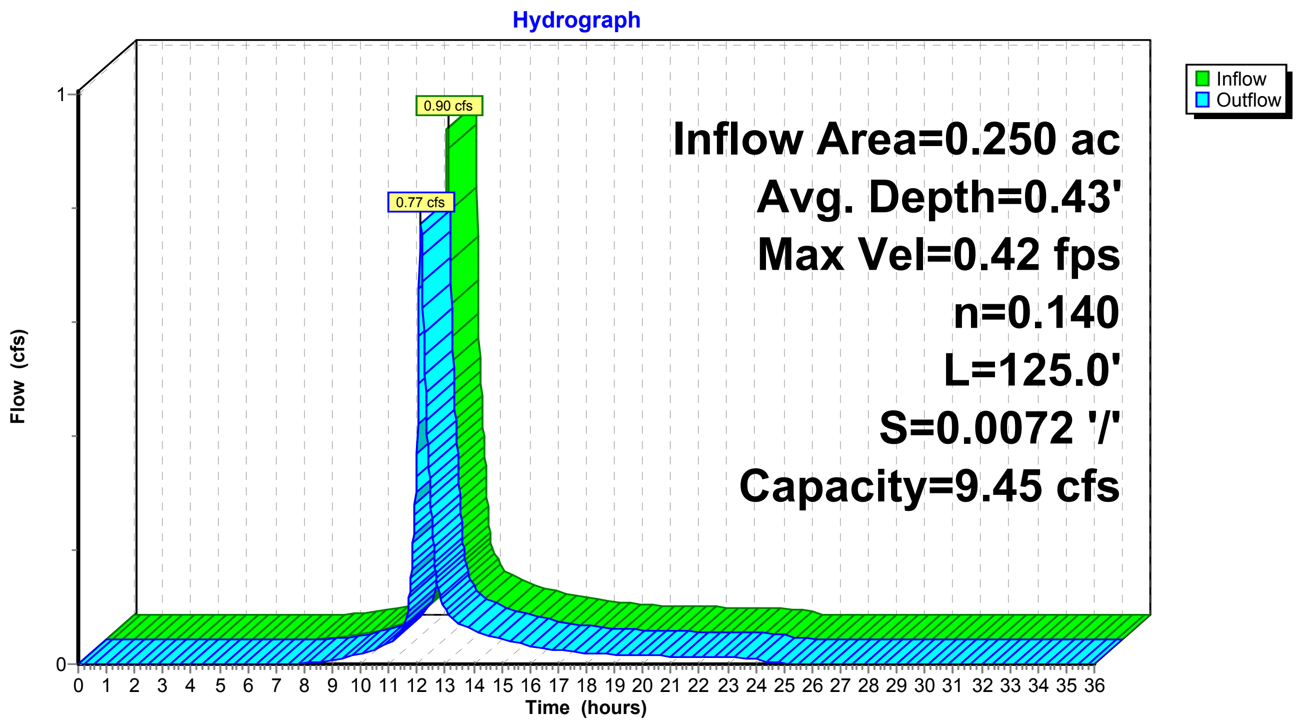
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.42 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 17.6 min

Peak Storage= 229 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.43'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.45 cfs

3.00' x 1.50' deep channel, n= 0.140
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 125.0' Slope= 0.0072 '/'
Inlet Invert= 1,628.00', Outlet Invert= 1,627.10'

‡

Reach SW-4: Swale



Summary for Reach SW-5: Swale

Inflow Area = 0.396 ac, 0.00% Impervious, Inflow Depth = 2.54" for 25-Year Event event
Inflow = 1.17 cfs @ 12.09 hrs, Volume= 0.084 af
Outflow = 1.01 cfs @ 12.14 hrs, Volume= 0.084 af, Atten= 14%, Lag= 2.9 min

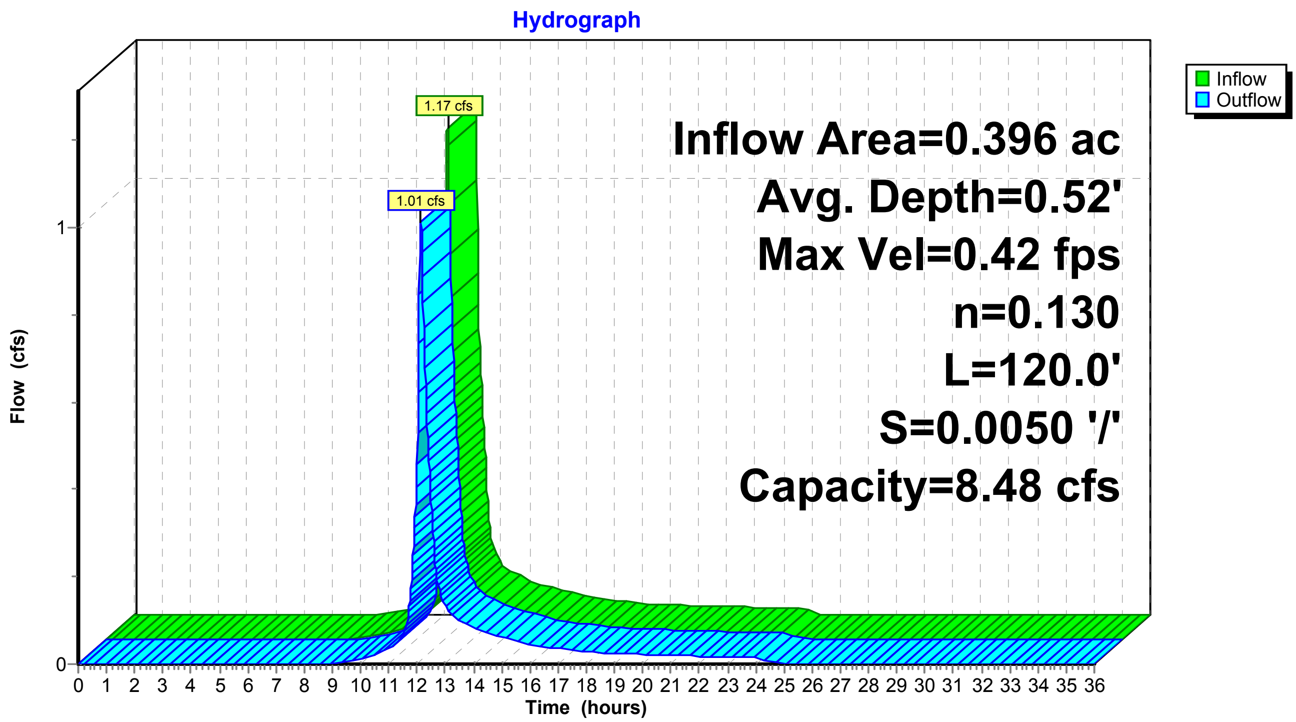
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.42 fps, Min. Travel Time= 4.7 min
Avg. Velocity = 0.12 fps, Avg. Travel Time= 16.3 min

Peak Storage= 287 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.52'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 8.48 cfs

3.00' x 1.50' deep channel, n= 0.130
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 120.0' Slope= 0.0050 '/'
Inlet Invert= 1,682.50', Outlet Invert= 1,681.90'

‡

Reach SW-5: Swale



Summary for Reach SW-6: Swale

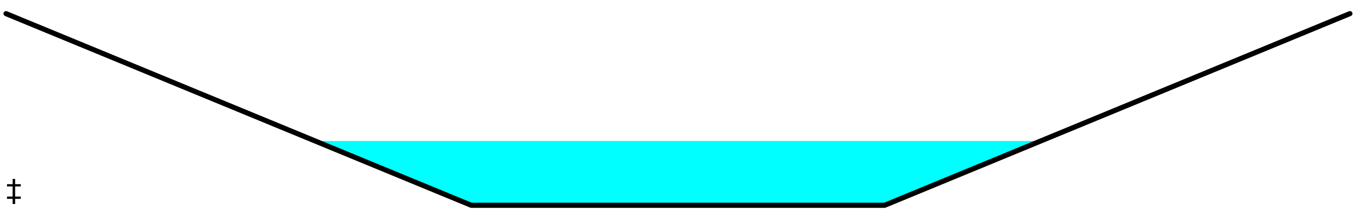
Inflow Area = 0.591 ac, 0.00% Impervious, Inflow Depth = 2.36" for 25-Year Event event
Inflow = 1.63 cfs @ 12.09 hrs, Volume= 0.116 af
Outflow = 1.46 cfs @ 12.13 hrs, Volume= 0.116 af, Atten= 10%, Lag= 2.4 min

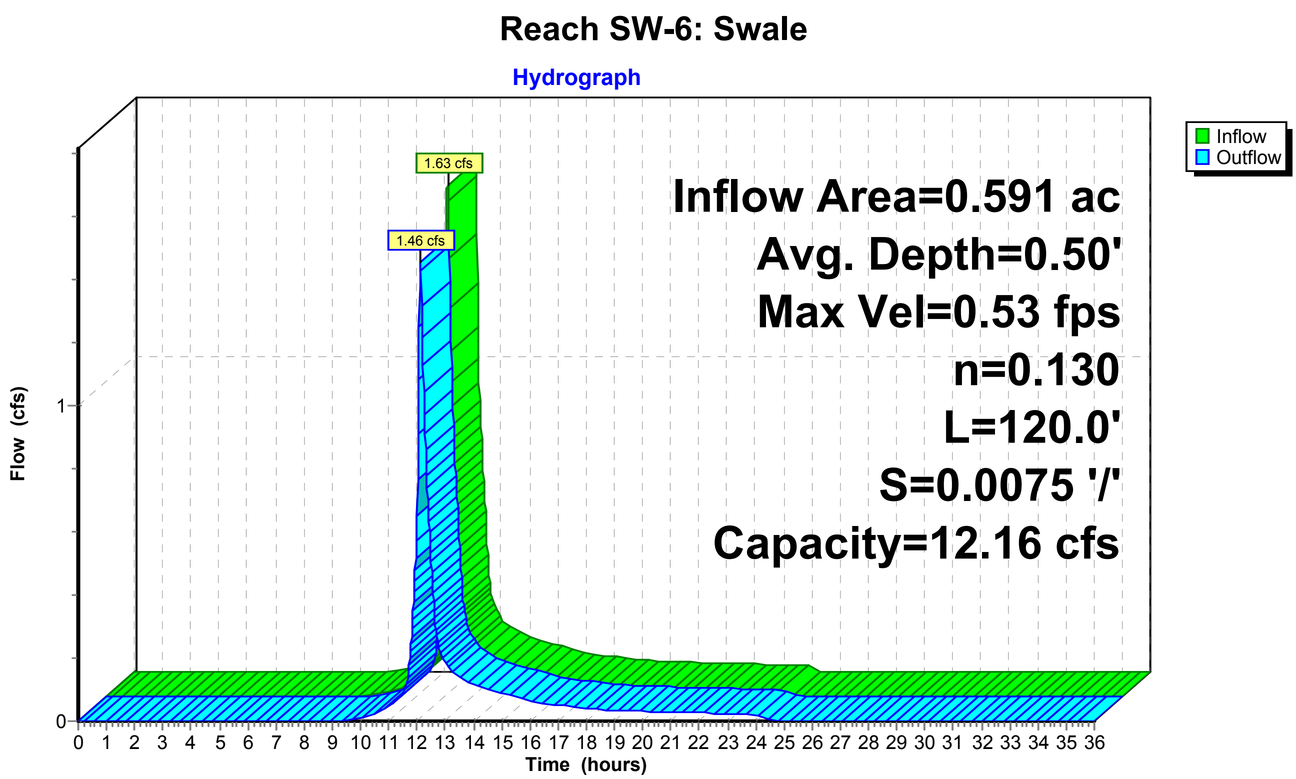
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.53 fps, Min. Travel Time= 3.8 min
Avg. Velocity = 0.15 fps, Avg. Travel Time= 13.4 min

Peak Storage= 334 cf @ 12.13 hrs, Average Depth at Peak Storage= 0.50'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 12.16 cfs

4.00' x 1.50' deep channel, n= 0.130
Side Slope Z-value= 3.0 '/' Top Width= 13.00'
Length= 120.0' Slope= 0.0075 '/'
Inlet Invert= 1,579.50', Outlet Invert= 1,578.60'

‡





Summary for Reach SW-7: Swale

Inflow Area = 0.254 ac, 0.00% Impervious, Inflow Depth = 2.54" for 25-Year Event event
Inflow = 0.75 cfs @ 12.09 hrs, Volume= 0.054 af
Outflow = 0.64 cfs @ 12.14 hrs, Volume= 0.054 af, Atten= 15%, Lag= 3.1 min

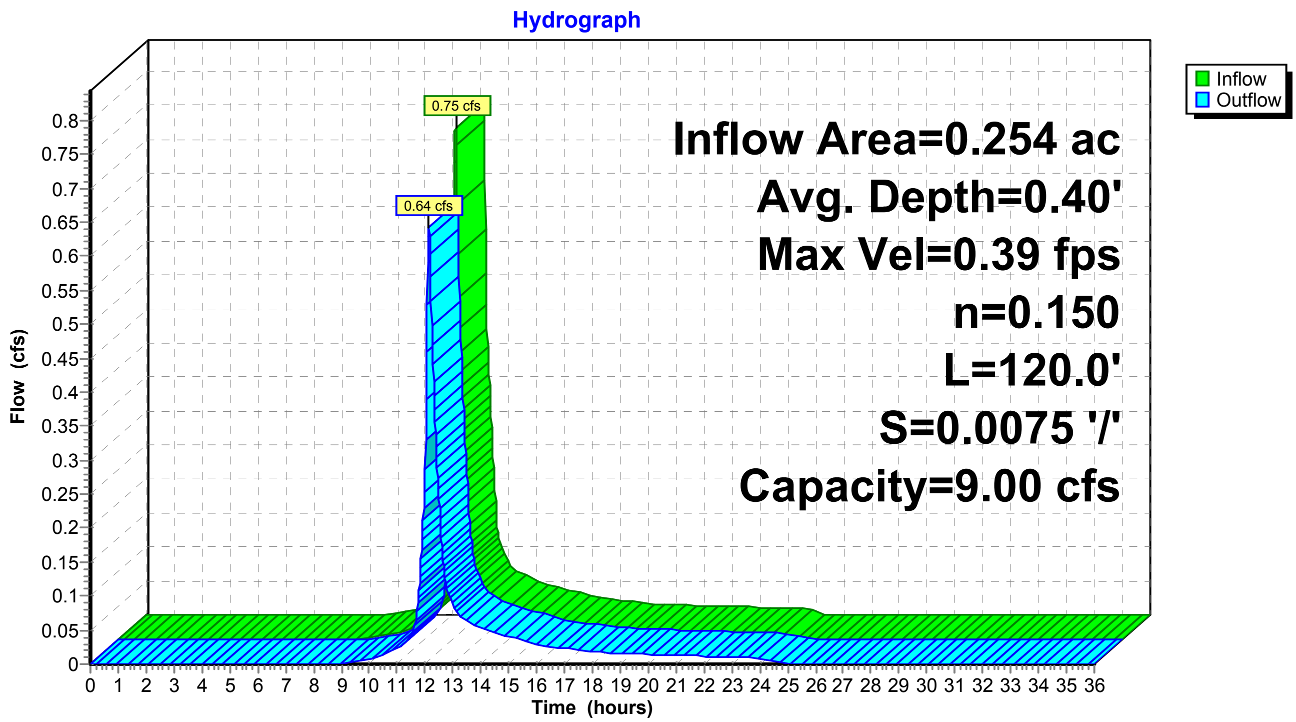
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.39 fps, Min. Travel Time= 5.2 min
Avg. Velocity = 0.11 fps, Avg. Travel Time= 17.9 min

Peak Storage= 199 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.40'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.00 cfs

3.00' x 1.50' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 120.0' Slope= 0.0075 '/'
Inlet Invert= 1,503.00', Outlet Invert= 1,502.10'

‡

Reach SW-7: Swale



Summary for Reach SW-8: Swale

Inflow Area = 0.367 ac, 0.00% Impervious, Inflow Depth = 2.62" for 25-Year Event event
Inflow = 1.13 cfs @ 12.09 hrs, Volume= 0.080 af
Outflow = 0.97 cfs @ 12.14 hrs, Volume= 0.080 af, Atten= 14%, Lag= 3.0 min

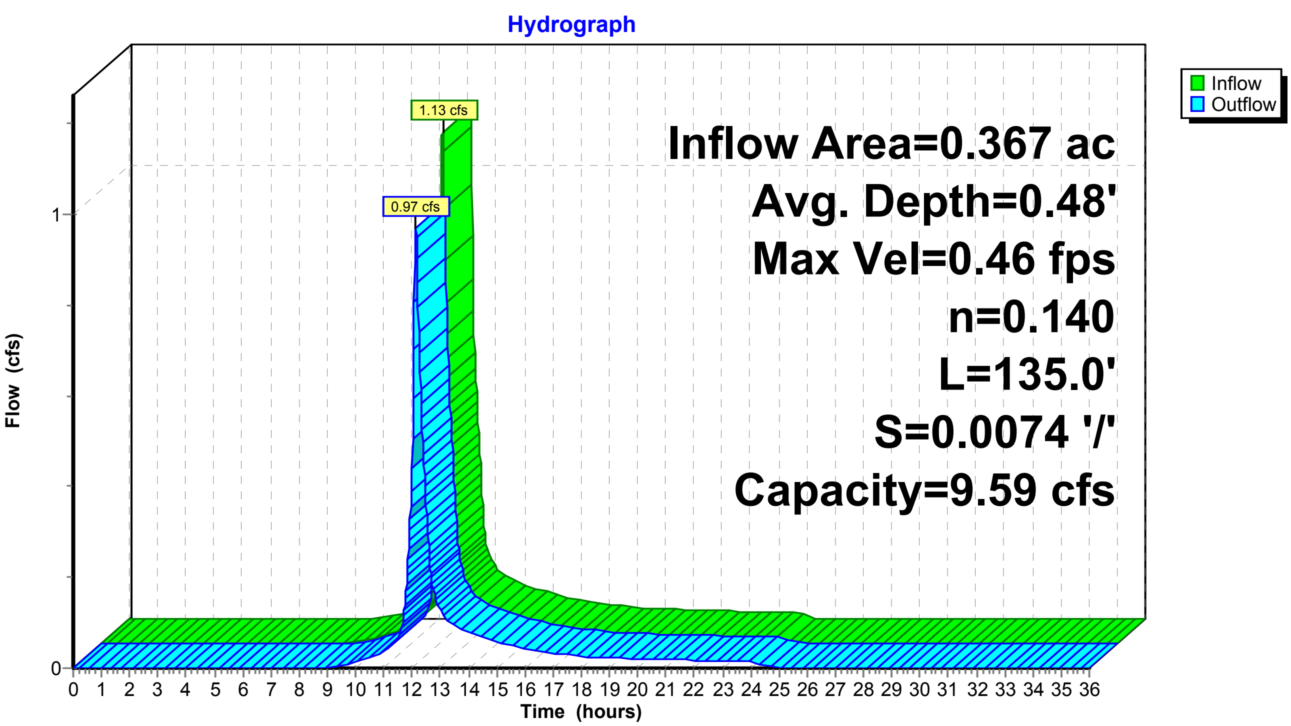
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.46 fps, Min. Travel Time= 4.9 min
Avg. Velocity = 0.13 fps, Avg. Travel Time= 17.2 min

Peak Storage= 287 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.59 cfs

3.00' x 1.50' deep channel, n= 0.140
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 135.0' Slope= 0.0074 '/'
Inlet Invert= 1,471.00', Outlet Invert= 1,470.00'

‡

Reach SW-8: Swale



Summary for Reach SW-9: Swale

Inflow Area = 0.183 ac, 0.00% Impervious, Inflow Depth = 2.62" for 25-Year Event event
Inflow = 0.56 cfs @ 12.09 hrs, Volume= 0.040 af
Outflow = 0.47 cfs @ 12.14 hrs, Volume= 0.040 af, Atten= 16%, Lag= 3.2 min

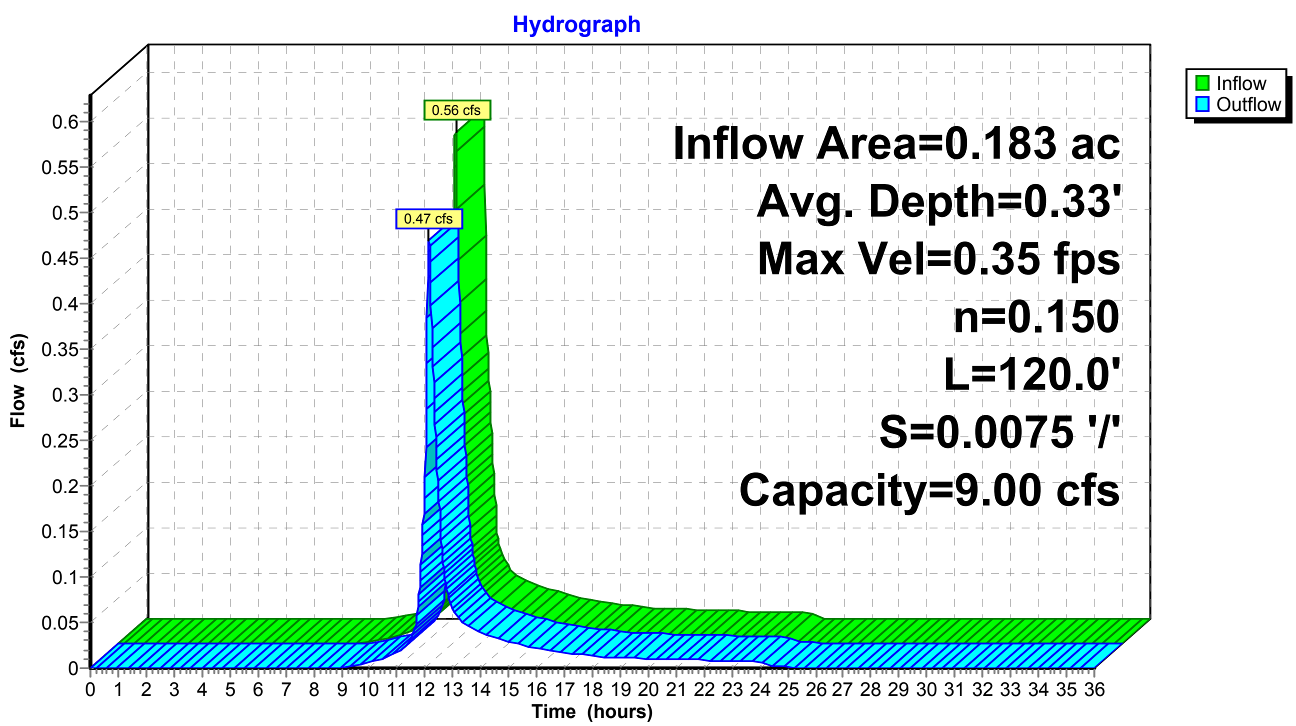
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.02 hrs
Max. Velocity= 0.35 fps, Min. Travel Time= 5.7 min
Avg. Velocity = 0.10 fps, Avg. Travel Time= 19.7 min

Peak Storage= 161 cf @ 12.14 hrs, Average Depth at Peak Storage= 0.33'
Bank-Full Depth= 1.50', Capacity at Bank-Full= 9.00 cfs

3.00' x 1.50' deep channel, n= 0.150
Side Slope Z-value= 3.0 '/' Top Width= 12.00'
Length= 120.0' Slope= 0.0075 '/'
Inlet Invert= 1,521.00', Outlet Invert= 1,520.10'

‡

Reach SW-9: Swale



PROJECT:	Eolian Renewable Energy LLC	Calculated By:	PMM
	Antrim Wind Project	Checked By:	PGT
Proj. No.:	186317.0000.0000	Date:	
	Time of Concentration Summary		

Time of Concentration Equations:

1. Where $T_t := \frac{0.007 \cdot (N \cdot L)^{0.8}}{P_2^{0.5} \cdot S^{0.4}}$ from SCS TR-55. For Sheet Flow (300 feet or less)

2. Where $V := 20.3282 \cdot \sqrt{S}$ from the SCS Upland Method *Channel Flow Chart* For Shallow Concentrated Flow (Paved surfaces)

3. Where $T_t := \frac{L}{3600 \cdot V}$ from the SCS Upland Method *Channel Flow Chart* Travel time equation

4. Where $V := 16.1345 \cdot \sqrt{S}$ from the SCS Upland Method *Channel Flow Chart* For Shallow Concentrated Flow (Unpaved surfaces)

5. Where: $v = 7 \sqrt{S}$ from the SCS Upland Method *Channel Flow Chart* For Shallow Concentrated Flow (Short Grass Pasture)

6. Where: $v = 5 \sqrt{S}$ from the SCS Upland Method *Channel Flow Chart* For Shallow Concentrated Flow (Woodland)

7. Where $V := 12 \cdot \sqrt{S}$ from the SCS Upland Method *Channel Flow Chart* For Channel Flow - Waterways and Swamps, No Channels

8. Where $V := 15 \cdot \sqrt{S}$ from the SCS Upland Method *Channel Flow Chart* For Channel Flow - Grassed Waterways and Roadside Ditches

9. Where $V := 21 \cdot \sqrt{S}$ from the SCS Upland Method *Channel Flow Chart* For Channel Flow - Small Tributary & Swamp w/Channels

10. Where $V := 35 \cdot \sqrt{S}$ from the SCS Upland Method *Channel Flow Chart* For Channel Flow - Large Tributary

11. Where $V := 60 \cdot \sqrt{S}$ from the SCS Upland Method *Channel Flow Chart* For Channel Flow - Main River

12. Where $V := \frac{1.49 \cdot R^{.667} \cdot \sqrt{S}}{N}$ For Channel Flow - Culvert Flow

13. Where P_2 = 2-Year, 24 Hour Rainfall (in) (Antrim, NH: P2= 2.8 inches)

Mannings Roughness Coefficients Table

Surface Description	n - value
Smooth surfaces	0.011
Crush Stone/Substation Yards	0.025
Fallow	0.050
Cultivated: Residue<=20%	0.060
Cultivated: Residue>=20%	0.170
Grass: Short	0.150
Grass: Dense	0.240
Grass: Bermuda	0.410
Range	0.130
Woods: Light underbrush	0.400
Woods: Dense underbrush	0.800

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.1 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.8								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.09								
T_t^1, hr	0.365								0.3650
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity^4, ft/sec									
T_t^3, hr									0.0000
Woodland									
Length, ft		1070			545	25			
Slope, ft/ft		0.094			0.092	0.4			
Velocity^5, ft/sec		1.5330			1.5166	3.1623			
T_t^3, hr		0.194			0.100	0.002			0.2959
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft			185						
Slope, ft/ft			0.081						
Velocity^6, ft/sec			3.415						
T_t^3, hr			0.015						0.0150
Grassed Waterways/Roadside Ditches									
Length, ft				510			245		
Slope, ft/ft				0.020			0.016		
Velocity^7, ft/sec				2.121			1.897		
T_t, hr				0.067			0.036		0.1027
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity^8, ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity^8, ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity^{11}, ft/sec									
Length, L, ft									
T_t, hr									0.0000
								HR	0.779
								Min	**46.72**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.3 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.025	0.24							
Length, ft	35	65							
P2 , in	2.8	2.8							
Slope, ft/ft	0.071	0.015							
T_t[1], hr	0.011	0.202							0.2129
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Unpaved									
Length, ft			170						
Slope, ft/ft			0.044						
Velocity[2], ft/sec			3.384						
T_t[3], hr			0.014						0.0140
Short Grass Pasture									
Length, ft				150					
Slope, ft/ft				0.113					
Velocity[4], ft/sec				2.3531					
T_t[3], hr				0.018					0.0177
Woodland									
Length, ft									
Slope, ft/ft									
Velocity[5], ft/sec									
T_t[3], hr									0.0000
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft					235				
Slope, ft/ft					0.119				
Velocity[8], ft/sec					7.244				
T_t, hr					0.009				0.0090
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.0000
								HR	0.254
								Min	**15.22**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.5 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.80								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.07								
T_t[1], hr	0.404								0.4036
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity[4], ft/sec									
T_t[3], hr									0.0000
Woodland									
Length, ft		540			190				
Slope, ft/ft		0.085			0.063				
Velocity[5], ft/sec		1.4577			1.2550				
T_t[3], hr		0.103			0.042				0.1450
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft			200	430		100			
Slope, ft/ft			0.035	0.102		0.11			
Velocity[7], ft/sec			2.806	4.791		4.975			
T_t, hr			0.020	0.025		0.006			0.0503
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.599
Min	**35.93**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.6 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.8								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.17								
T_t[1], hr	0.283								0.2830
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity[4], ft/sec									
T_t[3], hr									0.0000
Woodland									
Length, ft		1760							
Slope, ft/ft		0.262							
Velocity[5], ft/sec		2.5593							
T_t[3], hr		0.191							0.1910
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft			225						
Slope, ft/ft			0.071						
Velocity[8], ft/sec			5.596						
T_t, hr			0.011						0.0112
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.485
Min	**29.11**

PROJECT:	**Eolian Renewable Energy LLC**		**Calculated By:**	PMM
	Antrim Wind Project		**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**		**Date:**	
Subcatchment:	**1.7 - Post-development**		**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.025	0.24	0.8						
Length, ft	16	30	54						
P2 , in	2.8	2.8	2.8						
Slope, ft/ft	0.02	0.5	0.185						
T_t^1, hr	0.010	0.027	0.167						0.2035
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity^4, ft/sec									
T_t^3, hr									0.0000
Woodland									
Length, ft				645					
Slope, ft/ft				0.186					
Velocity^5, ft/sec				2.1564					
T_t^3, hr				0.083					0.0831
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity^6, ft/sec									
T_t^3, hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity^7, ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity^8, ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity^8, ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity^{11}, ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.287
Min	**17.20**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.8 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.8								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.23								
T_t^1, hr	0.251								0.2508
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
$Velocity^2$, ft/sec									
T_t^3, hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
$Velocity^2$, ft/sec									
T_t^3, hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
$Velocity^4$, ft/sec									
T_t^3, hr									0.0000
Woodland									
Length, ft		1240							
Slope, ft/ft		0.235							
$Velocity^5$, ft/sec		2.4238							
T_t^3, hr		0.142							0.1421
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
$Velocity^6$, ft/sec									
T_t^3, hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
$Velocity^7$, ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
$Velocity^8$, ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
$Velocity^8$, ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
$Velocity^{11}$, ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.393
Min	**23.57**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.9 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.025	0.24	0.8						
Length, ft	16	15	69						
P2 , in	2.8	2.8	2.8						
Slope, ft/ft	0.02	0.5	0.29						
T_t[1], hr	0.010	0.015	0.170						0.1949
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity[4], ft/sec									
T_t[3], hr									0.0000
Woodland									
Length, ft				175	500				
Slope, ft/ft				0.468	0.236				
Velocity[5], ft/sec				3.4205	2.4290				
T_t[3], hr				0.014	0.057				0.0714
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft						460			
Slope, ft/ft						0.124			
Velocity[7], ft/sec						5.282			
T_t, hr						0.024			0.0242
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.290
Min	**17.43**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.10 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.24								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.02								
T_t^1, hr	0.254								0.2543
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Unpaved									
Length, ft			16						
Slope, ft/ft			0.02						
Velocity^2, ft/sec			2.282						
T_t^3, hr			0.002						0.0019
Short Grass Pasture									
Length, ft		100		9	30				
Slope, ft/ft		0.08		0.02	0.5				
Velocity^4, ft/sec		1.9799		0.9899	4.9497				
T_t^3, hr		0.014		0.003	0.002				0.0182
Woodland									
Length, ft						725			
Slope, ft/ft						0.207			
Velocity^5, ft/sec						2.2749			
T_t^3, hr						0.089			0.0885
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity^6, ft/sec									
T_t^3, hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity^7, ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity^8, ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity^8, ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity^{11}, ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.363
Min	**21.78**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.11 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.025	0.24	0.8						
Length, ft	16	18	66						
P2 , in	2.8	2.8	2.8						
Slope, ft/ft	0.02	0.042	0.045						
T_t[1], hr	0.010	0.048	0.345						0.4030
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Short Grass Pasture									
Length, ft					50				
Slope, ft/ft					0.500				
Velocity[4], ft/sec					4.9497				
T_t[3], hr					0.003				0.0028
Woodland									
Length, ft				200					
Slope, ft/ft				0.195					
Velocity[5], ft/sec				2.2079					
T_t[3], hr				0.025					0.0252
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft						490			
Slope, ft/ft						0.12			
Velocity[7], ft/sec						5.196			
T_t, hr						0.026			0.0262
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.457
Min	**27.43**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.12 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.8								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.05								
T_t[1], hr	0.462								0.4617
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Short Grass Pasture									
Length, ft			55						
Slope, ft/ft			0.5						
Velocity[4], ft/sec			4.9497						
T_t[3], hr			0.003						0.0031
Woodland									
Length, ft		100							
Slope, ft/ft		0.210							
Velocity[5], ft/sec		2.2913							
T_t[3], hr		0.012							0.0121
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.0000
								HR	0.477
								Min	**28.62**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**3.1 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.8								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.06								
T_t^1, hr	0.429								0.4293
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity^4, ft/sec									
T_t^3, hr									0.0000
Woodland									
Length, ft		590							
Slope, ft/ft		0.218							
Velocity^5, ft/sec		2.3345							
T_t^3, hr		0.070							0.0702
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity^6, ft/sec									
T_t^3, hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity^7, ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity^8, ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity^8, ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity^{11}, ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.499
Min	**29.97**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.13 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.8								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.045								
T_t^1, hr	0.482								0.4816
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity^4, ft/sec									
T_t^3, hr									0.0000
Woodland									
Length, ft		175							
Slope, ft/ft		0.068							
Velocity^5, ft/sec		1.3038							
T_t^3, hr		0.037							0.0373
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity^6, ft/sec									
T_t^3, hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity^7, ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity^8, ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity^8, ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity^{11}, ft/sec									
Length, L, ft									
T_t, hr									0.0000
								HR	0.519
								Min	**31.13**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.14 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.8								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.100								
T_t[1], hr	0.350								0.3499
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.0000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity[4], ft/sec									
T_t[3], hr									0.0000
Woodland									
Length, ft		120							
Slope, ft/ft		0.017							
Velocity[5], ft/sec		0.6519							
T_t[3], hr		0.051							0.0511
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.401
Min	**24.06**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.15 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.24								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.05								
T_t^1, hr	0.176								0.1762
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t^3, hr									0.0000
Unpaved									
Length, ft			85						
Slope, ft/ft			0.024						
Velocity[2], ft/sec			2.500						
T_t^3, hr			0.009						0.0094
Short Grass Pasture									
Length, ft		95			80				
Slope, ft/ft		0.04			0.5				
Velocity[4], ft/sec		1.4000			4.9497				
T_t^3, hr		0.019			0.004				0.0233
Woodland									
Length, ft				145					
Slope, ft/ft				0.234					
Velocity[5], ft/sec				2.4187					
T_t^3, hr				0.017					0.0167
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t^3, hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft						300			
Slope, ft/ft						0.12			
Velocity[7], ft/sec						5.196			
T_t, hr						0.016			0.0160
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.242
Min	**14.50**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**1.16 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.8								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.10								
T_t^1, hr	0.350								0.3499
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity^2, ft/sec									
T_t^3, hr									0.0000
Short Grass Pasture									
Length, ft			25						
Slope, ft/ft			0.5						
Velocity^4, ft/sec			4.9497						
T_t^3, hr			0.001						0.0014
Woodland									
Length, ft		130							
Slope, ft/ft		0.154							
Velocity^5, ft/sec		1.9621							
T_t^3, hr		0.018							0.0184
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity^6, ft/sec									
T_t^3, hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft				300					
Slope, ft/ft				0.117					
Velocity^7, ft/sec				5.131					
T_t, hr				0.016					0.0162
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity^8, ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity^8, ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity^{11}, ft/sec									
Length, L, ft									
T_t, hr									0.0000
								HR	0.386
								Min	**23.16**

PROJECT:	Eolian Renewable Energy LLC	Calculated By:	PMM
	Antrim Wind Project	Checked By:	PGT
Proj. No.:	186317.0000.0000	Date:	
Subcatchment:	1.17 - Post-development	Revised:	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.8								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.13								
T_t^1, hr	0.315								0.3151
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
$Velocity^2$, ft/sec									
T_t^3, hr									0.0000
Unpaved									
Length, ft									
Slope, ft/ft									
$Velocity^2$, ft/sec									
T_t^3, hr									0.0000
Short Grass Pasture									
Length, ft		25							
Slope, ft/ft		0.5							
$Velocity^4$, ft/sec		4.9497							
T_t^3, hr		0.001							0.0014
Woodland									
Length, ft									
Slope, ft/ft									
$Velocity^5$, ft/sec									
T_t^3, hr									0.0000
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
$Velocity^6$, ft/sec									
T_t^3, hr									0.0000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
$Velocity^7$, ft/sec									
T_t, hr									0.0000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
$Velocity^8$, ft/sec									
T_t, hr									0.0000
Large Tributary									
Length, ft									
Slope, ft/ft									
$Velocity^8$, ft/sec									
T_t, hr									0.0000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
$Velocity^{11}$, ft/sec									
Length, L, ft									
T_t, hr									0.0000

HR	0.316
Min	**18.99**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**3.2 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.8								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.08								
T_t[1], hr	0.383								0.383
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.000
Short Grass Pasture									
Length, ft			15						
Slope, ft/ft			0.5						
Velocity[4], ft/sec			4.9497						
T_t[3], hr			0.001						0.001
Woodland									
Length, ft		15							
Slope, ft/ft		0.133							
Velocity[5], ft/sec		1.8235							
T_t[3], hr		0.002							0.002
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.000

HR	0.386
Min	**23.14**

PROJECT:	**Eolian Renewable Energy LLC**		**Calculated By:**	PMM
	Antrim Wind Project		**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**		**Date:**	
Subcatchment:	**3.3 - Post-development**		**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.025	0.24	0.8						
Length, ft	16	24	60						
P2 , in	2.8	2.8	2.8						
Slope, ft/ft	0.02	0.05	0.2						
T_t[1], hr	0.010	0.056	0.176						0.242
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.000
Short Grass Pasture									
Length, ft									
Slope, ft/ft									
Velocity[4], ft/sec									
T_t[3], hr									0.000
Woodland									
Length, ft				1280					
Slope, ft/ft				0.209					
Velocity[5], ft/sec				2.2858					
T_t[3], hr				0.156					0.156
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft					425				
Slope, ft/ft					0.028				
Velocity[6], ft/sec					2.008				
T_t[3], hr					0.059				0.059
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.000
								HR	0.456
								Min	**27.39**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**3.4 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.025	0.24	0.8						
Length, ft	16	35	49						
P2 , in	2.8	2.8	2.8						
Slope, ft/ft	0.02	0.171	0.204						
T_t[1], hr	0.010	0.047	0.149						0.205
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.000
Short Grass Pasture									
Length, ft					70				
Slope, ft/ft					0.5				
Velocity[4], ft/sec					4.9497				
T_t[3], hr					0.004				0.004
Woodland									
Length, ft				685					
Slope, ft/ft				0.178					
Velocity[5], ft/sec				2.1095					
T_t[3], hr				0.090					0.090
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.000

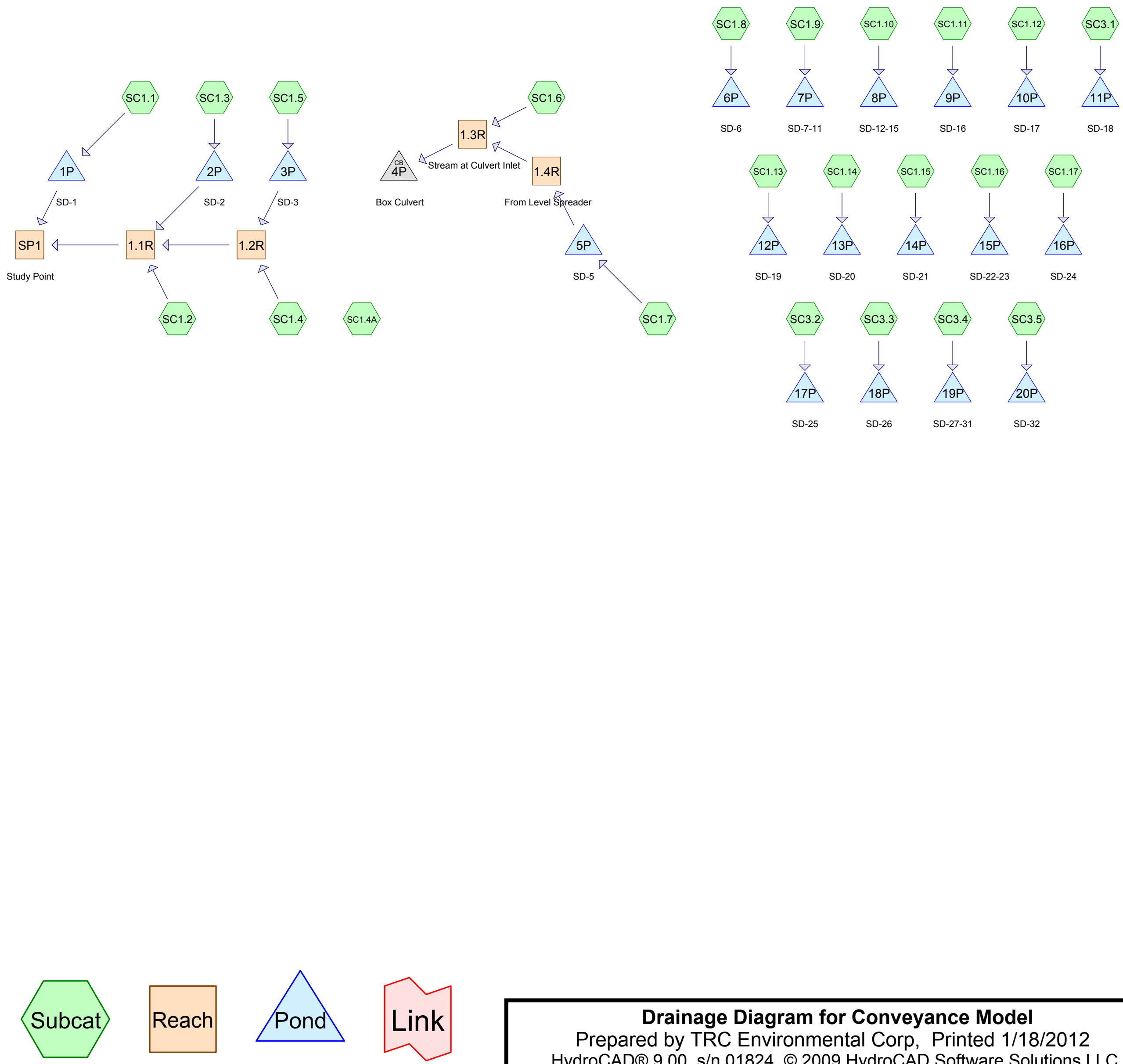
HR	0.299
Min	**17.94**

PROJECT:	**Eolian Renewable Energy LLC**	**Calculated By:**	PMM
	Antrim Wind Project	**Checked By:**	PGT
Proj. No.:	**186317.0000.0000**	**Date:**	
Subcatchment:	**3.5 - Post-development**	**Revised:**	

Time of Concentration Determination Worksheet, SCS Methods

	Seg 1	Seg 2	Seg 3	Seg 4	Seg 5	Seg 6	Seg 7	Seg 8	
SHEET FLOW									
Manning's No.	0.41								
Length, ft	100								
P2 , in	2.8								
Slope, ft/ft	0.17								
T_t[1], hr	0.166								0.166
SHALLOW CONCENTRATED FLOW									
Paved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.000
Unpaved									
Length, ft									
Slope, ft/ft									
Velocity[2], ft/sec									
T_t[3], hr									0.000
Short Grass Pasture									
Length, ft		75		15					
Slope, ft/ft		0.147		0.5					
Velocity[4], ft/sec		2.6838		4.9497					
T_t[3], hr		0.008		0.001					0.009
Woodland									
Length, ft			510						
Slope, ft/ft			0.137						
Velocity[5], ft/sec			1.8507						
T_t[3], hr			0.077						0.077
CHANNEL FLOW									
Waterways & Swamps, No Channels									
Length, ft									
Slope, ft/ft									
Velocity[6], ft/sec									
T_t[3], hr									0.000
Grassed Waterways/Roadside Ditches									
Length, ft									
Slope, ft/ft									
Velocity[7], ft/sec									
T_t, hr									0.000
Small Tributary & Swamp w/Channels									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.000
Large Tributary									
Length, ft									
Slope, ft/ft									
Velocity[8], ft/sec									
T_t, hr									0.000
Culvert									
Diameter, ft									
Area, ft^2									
Wetted Perimeter, ft									
Hydraulic Radius, R, ft									
Slope, ft/ft									
Manning's No.									
Velocity[11], ft/sec									
Length, L, ft									
T_t, hr									0.000

HR	0.251
Min	**15.06**



Drainage Diagram for Conveyance Model
Prepared by TRC Environmental Corp, Printed 1/18/2012
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Area Listing (all nodes)

Area (acres)	CN	Description (subcatchment-numbers)
1.619	55	Yard stone, HSG C (SC1.1, SC1.3)
116.518	70	Woods, Good, HSG C (SC1.1, SC1.10, SC1.11, SC1.12, SC1.13, SC1.14, SC1.15, SC1.16, SC1.17, SC1.3, SC1.4, SC1.5, SC1.6, SC1.7, SC1.8, SC1.9, SC3.1, SC3.2, SC3.3, SC3.4, SC3.5)
17.214	71	Meadow, non-grazed, HSG C (SC1.1, SC1.10, SC1.11, SC1.12, SC1.13, SC1.14, SC1.15, SC1.16, SC1.17, SC1.2, SC1.3, SC1.4, SC1.4A, SC1.5, SC1.6, SC1.7, SC1.8, SC1.9, SC3.2, SC3.3, SC3.4, SC3.5)
4.686	77	Woods, Good, HSG D (SC3.1)
0.492	78	Meadow, non-grazed, HSG D (SC3.1)
1.992	89	Gravel roads, HSG C (SC1.10, SC1.11, SC1.12, SC1.14, SC1.15, SC1.16, SC1.4, SC1.4A, SC1.6, SC1.7, SC1.9, SC3.1, SC3.3, SC3.4)
0.118	98	Paved roads w/curbs & sewers, HSG C (SC1.1)
0.318	98	Paved roads, HSG C (SC1.2, SC1.4)
0.086	98	Roofs, HSG C (SC1.3)

Soil Listing (all nodes)

Area (acres)	Soil Goup	Subcatchment Numbers
0.000	HSG A	
0.000	HSG B	
137.865	HSG C	SC1.1, SC1.10, SC1.11, SC1.12, SC1.13, SC1.14, SC1.15, SC1.16, SC1.17, SC1.2, SC1.3, SC1.4, SC1.4A, SC1.5, SC1.6, SC1.7, SC1.8, SC1.9, SC3.1, SC3.2, SC3.3, SC3.4, SC3.5
5.178	HSG D	SC3.1
0.000	Other	

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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

SubcatchmentSC1.1:	Runoff Area=16.719 ac 0.71% Impervious Runoff Depth=0.57" Tc=46.7 min CN=69 Runoff=4.12 cfs 0.788 af
SubcatchmentSC1.10:	Runoff Area=8.557 ac 0.00% Impervious Runoff Depth=0.65" Tc=21.8 min CN=71 Runoff=3.62 cfs 0.462 af
SubcatchmentSC1.11:	Runoff Area=5.297 ac 0.00% Impervious Runoff Depth=0.65" Tc=27.4 min CN=71 Runoff=2.05 cfs 0.286 af
SubcatchmentSC1.12:	Runoff Area=1.538 ac 0.00% Impervious Runoff Depth=0.65" Tc=28.6 min CN=71 Runoff=0.58 cfs 0.083 af
SubcatchmentSC1.13:	Runoff Area=2.416 ac 0.00% Impervious Runoff Depth=0.61" Tc=31.1 min CN=70 Runoff=0.81 cfs 0.122 af
SubcatchmentSC1.14:	Runoff Area=1.587 ac 0.00% Impervious Runoff Depth=0.65" Tc=24.1 min CN=71 Runoff=0.65 cfs 0.086 af
SubcatchmentSC1.15:	Runoff Area=1.898 ac 0.00% Impervious Runoff Depth=0.69" Tc=14.5 min CN=72 Runoff=1.03 cfs 0.109 af
SubcatchmentSC1.16:	Runoff Area=2.191 ac 0.00% Impervious Runoff Depth=0.65" Tc=23.2 min CN=71 Runoff=0.90 cfs 0.118 af
SubcatchmentSC1.17:	Runoff Area=0.278 ac 0.00% Impervious Runoff Depth=0.65" Tc=19.0 min CN=71 Runoff=0.12 cfs 0.015 af
SubcatchmentSC1.2:	Runoff Area=0.214 ac 32.71% Impervious Runoff Depth=1.10" Tc=6.0 min CN=80 Runoff=0.27 cfs 0.020 af
SubcatchmentSC1.3:	Runoff Area=1.981 ac 4.34% Impervious Runoff Depth=0.49" Tc=15.2 min CN=67 Runoff=0.63 cfs 0.081 af
SubcatchmentSC1.4:	Runoff Area=1.014 ac 24.46% Impervious Runoff Depth=0.99" Tc=6.0 min CN=78 Runoff=1.13 cfs 0.084 af
SubcatchmentSC1.4A:	Runoff Area=0.167 ac 0.00% Impervious Runoff Depth=1.16" Tc=6.0 min CN=81 Runoff=0.22 cfs 0.016 af
SubcatchmentSC1.5:	Runoff Area=4.600 ac 0.00% Impervious Runoff Depth=0.61" Tc=35.9 min CN=70 Runoff=1.44 cfs 0.232 af
SubcatchmentSC1.6:	Runoff Area=41.257 ac 0.00% Impervious Runoff Depth=0.61" Tc=29.1 min CN=70 Runoff=14.16 cfs 2.084 af
SubcatchmentSC1.7:	Runoff Area=5.355 ac 0.00% Impervious Runoff Depth=0.65" Tc=17.2 min CN=71 Runoff=2.48 cfs 0.289 af

SubcatchmentSC1.8: Runoff Area=12.525 ac 0.00% Impervious Runoff Depth=0.61"
Tc=23.6 min CN=70 Runoff=4.68 cfs 0.633 af

SubcatchmentSC1.9: Runoff Area=7.206 ac 0.00% Impervious Runoff Depth=0.61"
Tc=17.4 min CN=70 Runoff=3.03 cfs 0.364 af

SubcatchmentSC3.1: Runoff Area=9.148 ac 0.00% Impervious Runoff Depth=0.78"
Tc=30.0 min CN=74 Runoff=4.34 cfs 0.598 af

SubcatchmentSC3.2: Runoff Area=0.510 ac 0.00% Impervious Runoff Depth=0.61"
Tc=23.1 min CN=70 Runoff=0.19 cfs 0.026 af

SubcatchmentSC3.3: Runoff Area=10.036 ac 0.00% Impervious Runoff Depth=0.61"
Tc=27.4 min CN=70 Runoff=3.54 cfs 0.507 af

SubcatchmentSC3.4: Runoff Area=5.027 ac 0.00% Impervious Runoff Depth=0.61"
Tc=17.9 min CN=70 Runoff=2.09 cfs 0.254 af

SubcatchmentSC3.5: Runoff Area=3.522 ac 0.00% Impervious Runoff Depth=0.61"
Tc=15.1 min CN=70 Runoff=1.56 cfs 0.178 af

Reach 1.1R: Avg. Depth=0.29' Max Vel=2.85 fps Inflow=2.17 cfs 0.416 af
n=0.065 L=200.0' S=0.1100 '/' Capacity=96.75 cfs Outflow=2.17 cfs 0.416 af

Reach 1.2R: Avg. Depth=0.28' Max Vel=2.35 fps Inflow=1.68 cfs 0.316 af
n=0.067 L=670.0' S=0.0858 '/' Capacity=82.91 cfs Outflow=1.66 cfs 0.316 af

Reach 1.3R: Stream at Culvert Inlet Avg. Depth=0.76' Max Vel=5.17 fps Inflow=15.47 cfs 2.372 af
n=0.040 L=600.0' S=0.0713 '/' Capacity=49.53 cfs Outflow=15.42 cfs 2.372 af

Reach 1.4R: From Level Spreader Avg. Depth=0.10' Max Vel=0.14 fps Inflow=2.48 cfs 0.289 af
n=0.800 L=255.0' S=0.1412 '/' Capacity=1.53 cfs Outflow=1.42 cfs 0.289 af

Reach SP1: Study Point Avg. Depth=0.75' Max Vel=1.46 fps Inflow=6.01 cfs 1.204 af
n=0.069 L=20.0' S=0.0100 '/' Capacity=92.84 cfs Outflow=6.01 cfs 1.204 af

Pond 1P: SD-1 Peak Elev=1,043.19' Storage=140 cf Inflow=4.12 cfs 0.788 af
24.0" Round Culvert n=0.013 L=90.0' S=0.0083 '/' Outflow=4.12 cfs 0.788 af

Pond 2P: SD-2 Peak Elev=1,064.49' Storage=8 cf Inflow=0.63 cfs 0.081 af
15.0" Round Culvert n=0.013 L=28.0' S=0.0268 '/' Outflow=0.63 cfs 0.081 af

Pond 3P: SD-3 Peak Elev=1,122.67' Storage=54 cf Inflow=1.44 cfs 0.232 af
15.0" Round Culvert n=0.013 L=30.0' S=0.0083 '/' Outflow=1.43 cfs 0.232 af

Pond 4P: Box Culvert Peak Elev=1,199.53' Inflow=15.42 cfs 2.372 af
120.0" x 24.0" Box Culvert n=0.040 L=35.0' S=0.0714 '/' Outflow=15.42 cfs 2.372 af

Pond 5P: SD-5 Peak Elev=1,262.83' Storage=31 cf Inflow=2.48 cfs 0.289 af
18.0" Round Culvert n=0.013 L=38.0' S=0.0526 '/' Outflow=2.48 cfs 0.289 af

Pond 6P: SD-6 Peak Elev=1,423.06' Storage=258 cf Inflow=4.68 cfs 0.633 af
24.0" Round Culvert n=0.013 L=62.0' S=0.0282 '/' Outflow=4.67 cfs 0.633 af

Pond 7P: SD-7-11 Peak Elev=1,453.45' Storage=10 cf Inflow=3.03 cfs 0.364 af
12.0" Round Culvert x 5.00 n=0.013 L=60.0' S=0.0250 '/' Outflow=3.03 cfs 0.364 af

Pond 8P: SD-12-15 Peak Elev=1,558.06' Storage=9 cf Inflow=3.62 cfs 0.462 af
12.0" Round Culvert x 4.00 n=0.013 L=50.0' S=0.0200 '/' Outflow=3.62 cfs 0.462 af

Pond 9P: SD-16 Peak Elev=1,602.81' Storage=17 cf Inflow=2.05 cfs 0.286 af
15.0" Round Culvert n=0.013 L=50.0' S=0.8500 '/' Outflow=2.05 cfs 0.286 af

Pond 10P: SD-17 Peak Elev=1,675.40' Storage=7 cf Inflow=0.58 cfs 0.083 af
15.0" Round Culvert n=0.013 L=53.0' S=0.0943 '/' Outflow=0.58 cfs 0.083 af

Pond 11P: SD-18 Peak Elev=1,638.85' Storage=1,837 cf Inflow=4.34 cfs 0.598 af
36.0" Round Culvert n=0.013 L=80.0' S=0.1250 '/' Outflow=4.10 cfs 0.597 af

Pond 12P: SD-19 Peak Elev=1,681.07' Storage=397 cf Inflow=0.81 cfs 0.122 af
15.0" Round Culvert n=0.013 L=64.0' S=0.0094 '/' Outflow=0.78 cfs 0.119 af

Pond 13P: SD-20 Peak Elev=1,701.33' Storage=34 cf Inflow=0.65 cfs 0.086 af
36.0" Round Culvert n=0.013 L=65.0' S=0.0154 '/' Outflow=0.64 cfs 0.086 af

Pond 14P: SD-21 Peak Elev=1,563.55' Storage=7 cf Inflow=1.03 cfs 0.109 af
15.0" Round Culvert n=0.013 L=43.0' S=0.0233 '/' Outflow=1.03 cfs 0.109 af

Pond 15P: SD-22-23 Peak Elev=1,605.38' Storage=5 cf Inflow=0.90 cfs 0.118 af
12.0" Round Culvert x 2.00 n=0.013 L=50.0' S=0.0200 '/' Outflow=0.90 cfs 0.118 af

Pond 16P: SD-24 Peak Elev=1,671.18' Storage=2 cf Inflow=0.12 cfs 0.015 af
15.0" Round Culvert n=0.013 L=46.0' S=0.0217 '/' Outflow=0.12 cfs 0.015 af

Pond 17P: SD-25 Peak Elev=1,679.23' Storage=3 cf Inflow=0.19 cfs 0.026 af
15.0" Round Culvert n=0.013 L=50.0' S=0.0600 '/' Outflow=0.19 cfs 0.026 af

Pond 18P: SD-26 Peak Elev=1,600.78' Storage=729 cf Inflow=3.54 cfs 0.507 af
36.0" Round Culvert n=0.013 L=70.0' S=0.0429 '/' Outflow=3.47 cfs 0.507 af

Pond 19P: SD-27-31 Peak Elev=1,709.36' Storage=5 cf Inflow=2.09 cfs 0.254 af
12.0" Round Culvert x 5.00 n=0.013 L=70.0' S=0.0143 '/' Outflow=2.09 cfs 0.254 af

Pond 20P: SD-32 Peak Elev=1,763.69' Storage=10 cf Inflow=1.56 cfs 0.178 af
15.0" Round Culvert n=0.013 L=56.0' S=0.0893 '/' Outflow=1.56 cfs 0.178 af

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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

SubcatchmentSC1.1: Runoff Area=16.719 ac 0.71% Impervious Runoff Depth=1.40"
Tc=46.7 min CN=69 Runoff=11.79 cfs 1.948 af

SubcatchmentSC1.10: Runoff Area=8.557 ac 0.00% Impervious Runoff Depth=1.53"
Tc=21.8 min CN=71 Runoff=9.63 cfs 1.093 af

SubcatchmentSC1.11: Runoff Area=5.297 ac 0.00% Impervious Runoff Depth=1.53"
Tc=27.4 min CN=71 Runoff=5.40 cfs 0.677 af

SubcatchmentSC1.12: Runoff Area=1.538 ac 0.00% Impervious Runoff Depth=1.53"
Tc=28.6 min CN=71 Runoff=1.54 cfs 0.196 af

SubcatchmentSC1.13: Runoff Area=2.416 ac 0.00% Impervious Runoff Depth=1.46"
Tc=31.1 min CN=70 Runoff=2.21 cfs 0.295 af

SubcatchmentSC1.14: Runoff Area=1.587 ac 0.00% Impervious Runoff Depth=1.53"
Tc=24.1 min CN=71 Runoff=1.71 cfs 0.203 af

SubcatchmentSC1.15: Runoff Area=1.898 ac 0.00% Impervious Runoff Depth=1.60"
Tc=14.5 min CN=72 Runoff=2.64 cfs 0.253 af

SubcatchmentSC1.16: Runoff Area=2.191 ac 0.00% Impervious Runoff Depth=1.53"
Tc=23.2 min CN=71 Runoff=2.40 cfs 0.280 af

SubcatchmentSC1.17: Runoff Area=0.278 ac 0.00% Impervious Runoff Depth=1.53"
Tc=19.0 min CN=71 Runoff=0.33 cfs 0.036 af

SubcatchmentSC1.2: Runoff Area=0.214 ac 32.71% Impervious Runoff Depth=2.21"
Tc=6.0 min CN=80 Runoff=0.55 cfs 0.039 af

SubcatchmentSC1.3: Runoff Area=1.981 ac 4.34% Impervious Runoff Depth=1.27"
Tc=15.2 min CN=67 Runoff=2.05 cfs 0.210 af

SubcatchmentSC1.4: Runoff Area=1.014 ac 24.46% Impervious Runoff Depth=2.05"
Tc=6.0 min CN=78 Runoff=2.43 cfs 0.173 af

SubcatchmentSC1.4A: Runoff Area=0.167 ac 0.00% Impervious Runoff Depth=2.29"
Tc=6.0 min CN=81 Runoff=0.45 cfs 0.032 af

SubcatchmentSC1.5: Runoff Area=4.600 ac 0.00% Impervious Runoff Depth=1.46"
Tc=35.9 min CN=70 Runoff=3.93 cfs 0.562 af

SubcatchmentSC1.6: Runoff Area=41.257 ac 0.00% Impervious Runoff Depth=1.46"
Tc=29.1 min CN=70 Runoff=38.88 cfs 5.036 af

SubcatchmentSC1.7: Runoff Area=5.355 ac 0.00% Impervious Runoff Depth=1.53"
Tc=17.2 min CN=71 Runoff=6.64 cfs 0.684 af

Subcatchment SC1.8: Runoff Area=12.525 ac 0.00% Impervious Runoff Depth=1.46"
Tc=23.6 min CN=70 Runoff=12.94 cfs 1.529 af

Subcatchment SC1.9: Runoff Area=7.206 ac 0.00% Impervious Runoff Depth=1.46"
Tc=17.4 min CN=70 Runoff=8.42 cfs 0.880 af

Subcatchment SC3.1: Runoff Area=9.148 ac 0.00% Impervious Runoff Depth=1.74"
Tc=30.0 min CN=74 Runoff=10.39 cfs 1.330 af

Subcatchment SC3.2: Runoff Area=0.510 ac 0.00% Impervious Runoff Depth=1.46"
Tc=23.1 min CN=70 Runoff=0.53 cfs 0.062 af

Subcatchment SC3.3: Runoff Area=10.036 ac 0.00% Impervious Runoff Depth=1.46"
Tc=27.4 min CN=70 Runoff=9.71 cfs 1.225 af

Subcatchment SC3.4: Runoff Area=5.027 ac 0.00% Impervious Runoff Depth=1.46"
Tc=17.9 min CN=70 Runoff=5.81 cfs 0.614 af

Subcatchment SC3.5: Runoff Area=3.522 ac 0.00% Impervious Runoff Depth=1.46"
Tc=15.1 min CN=70 Runoff=4.35 cfs 0.430 af

Reach 1.1R: Avg. Depth=0.51' Max Vel=3.83 fps Inflow=5.87 cfs 0.984 af
n=0.065 L=200.0' S=0.1100 '/' Capacity=96.75 cfs Outflow=5.87 cfs 0.984 af

Reach 1.2R: Avg. Depth=0.48' Max Vel=3.16 fps Inflow=4.48 cfs 0.735 af
n=0.067 L=670.0' S=0.0858 '/' Capacity=82.91 cfs Outflow=4.44 cfs 0.735 af

Reach 1.3R: Stream at Culvert Inlet Avg. Depth=1.14' Max Vel=5.87 fps Inflow=43.18 cfs 5.720 af
n=0.040 L=600.0' S=0.0713 '/' Capacity=49.53 cfs Outflow=42.99 cfs 5.720 af

Reach 1.4R: From Level Spreader Avg. Depth=0.21' Max Vel=0.19 fps Inflow=6.61 cfs 0.684 af
n=0.800 L=255.0' S=0.1412 '/' Capacity=1.53 cfs Outflow=4.34 cfs 0.683 af

Reach SP1: Study Point Avg. Depth=1.30' Max Vel=1.97 fps Inflow=16.84 cfs 2.932 af
n=0.069 L=20.0' S=0.0100 '/' Capacity=92.84 cfs Outflow=16.84 cfs 2.932 af

Pond 1P: SD-1 Peak Elev=1,044.26' Storage=410 cf Inflow=11.79 cfs 1.948 af
24.0" Round Culvert n=0.013 L=90.0' S=0.0083 '/' Outflow=11.80 cfs 1.948 af

Pond 2P: SD-2 Peak Elev=1,064.88' Storage=20 cf Inflow=2.05 cfs 0.210 af
15.0" Round Culvert n=0.013 L=28.0' S=0.0268 '/' Outflow=2.05 cfs 0.210 af

Pond 3P: SD-3 Peak Elev=1,123.33' Storage=149 cf Inflow=3.93 cfs 0.562 af
15.0" Round Culvert n=0.013 L=30.0' S=0.0083 '/' Outflow=3.92 cfs 0.562 af

Pond 4P: Box Culvert Peak Elev=1,200.05' Inflow=42.99 cfs 5.720 af
120.0" x 24.0" Box Culvert n=0.040 L=35.0' S=0.0714 '/' Outflow=42.99 cfs 5.720 af

Pond 5P: SD-5 Peak Elev=1,263.72' Storage=124 cf Inflow=6.64 cfs 0.684 af
18.0" Round Culvert n=0.013 L=38.0' S=0.0526 '/' Outflow=6.61 cfs 0.684 af

Pond 6P: SD-6 Peak Elev=1,424.12' Storage=1,108 cf Inflow=12.94 cfs 1.529 af
24.0" Round Culvert n=0.013 L=62.0' S=0.0282 '/' Outflow=12.61 cfs 1.529 af

Pond 7P: SD-7-11 Peak Elev=1,453.82' Storage=24 cf Inflow=8.42 cfs 0.880 af
12.0" Round Culvert x 5.00 n=0.013 L=60.0' S=0.0250 '/' Outflow=8.42 cfs 0.880 af

Pond 8P: SD-12-15 Peak Elev=1,558.65' Storage=30 cf Inflow=9.63 cfs 1.093 af
12.0" Round Culvert x 4.00 n=0.013 L=50.0' S=0.0200 '/' Outflow=9.62 cfs 1.093 af

Pond 9P: SD-16 Peak Elev=1,603.96' Storage=83 cf Inflow=5.40 cfs 0.677 af
15.0" Round Culvert n=0.013 L=50.0' S=0.8500 '/' Outflow=5.40 cfs 0.677 af

Pond 10P: SD-17 Peak Elev=1,675.69' Storage=17 cf Inflow=1.54 cfs 0.196 af
15.0" Round Culvert n=0.013 L=53.0' S=0.0943 '/' Outflow=1.54 cfs 0.196 af

Pond 11P: SD-18 Peak Elev=1,639.36' Storage=3,794 cf Inflow=10.39 cfs 1.330 af
36.0" Round Culvert n=0.013 L=80.0' S=0.1250 '/' Outflow=9.81 cfs 1.330 af

Pond 12P: SD-19 Peak Elev=1,681.44' Storage=731 cf Inflow=2.21 cfs 0.295 af
15.0" Round Culvert n=0.013 L=64.0' S=0.0094 '/' Outflow=2.14 cfs 0.292 af

Pond 13P: SD-20 Peak Elev=1,701.54' Storage=81 cf Inflow=1.71 cfs 0.203 af
36.0" Round Culvert n=0.013 L=65.0' S=0.0154 '/' Outflow=1.71 cfs 0.203 af

Pond 14P: SD-21 Peak Elev=1,563.96' Storage=14 cf Inflow=2.64 cfs 0.253 af
15.0" Round Culvert n=0.013 L=43.0' S=0.0233 '/' Outflow=2.65 cfs 0.253 af

Pond 15P: SD-22-23 Peak Elev=1,605.66' Storage=11 cf Inflow=2.40 cfs 0.280 af
12.0" Round Culvert x 2.00 n=0.013 L=50.0' S=0.0200 '/' Outflow=2.40 cfs 0.280 af

Pond 16P: SD-24 Peak Elev=1,671.30' Storage=4 cf Inflow=0.33 cfs 0.036 af
15.0" Round Culvert n=0.013 L=46.0' S=0.0217 '/' Outflow=0.33 cfs 0.036 af

Pond 17P: SD-25 Peak Elev=1,679.38' Storage=5 cf Inflow=0.53 cfs 0.062 af
15.0" Round Culvert n=0.013 L=50.0' S=0.0600 '/' Outflow=0.53 cfs 0.062 af

Pond 18P: SD-26 Peak Elev=1,601.34' Storage=1,885 cf Inflow=9.71 cfs 1.225 af
36.0" Round Culvert n=0.013 L=70.0' S=0.0429 '/' Outflow=9.48 cfs 1.225 af

Pond 19P: SD-27-31 Peak Elev=1,709.65' Storage=12 cf Inflow=5.81 cfs 0.614 af
12.0" Round Culvert x 5.00 n=0.013 L=70.0' S=0.0143 '/' Outflow=5.81 cfs 0.614 af

Pond 20P: SD-32 Peak Elev=1,764.49' Storage=34 cf Inflow=4.35 cfs 0.430 af
15.0" Round Culvert n=0.013 L=56.0' S=0.0893 '/' Outflow=4.35 cfs 0.430 af

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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

SubcatchmentSC1.1: Runoff Area=16.719 ac 0.71% Impervious Runoff Depth=1.96"
Tc=46.7 min CN=69 Runoff=16.93 cfs 2.727 af

SubcatchmentSC1.10: Runoff Area=8.557 ac 0.00% Impervious Runoff Depth=2.12"
Tc=21.8 min CN=71 Runoff=13.55 cfs 1.509 af

SubcatchmentSC1.11: Runoff Area=5.297 ac 0.00% Impervious Runoff Depth=2.12"
Tc=27.4 min CN=71 Runoff=7.62 cfs 0.934 af

SubcatchmentSC1.12: Runoff Area=1.538 ac 0.00% Impervious Runoff Depth=2.12"
Tc=28.6 min CN=71 Runoff=2.17 cfs 0.271 af

SubcatchmentSC1.13: Runoff Area=2.416 ac 0.00% Impervious Runoff Depth=2.04"
Tc=31.1 min CN=70 Runoff=3.14 cfs 0.410 af

SubcatchmentSC1.14: Runoff Area=1.587 ac 0.00% Impervious Runoff Depth=2.12"
Tc=24.1 min CN=71 Runoff=2.41 cfs 0.280 af

SubcatchmentSC1.15: Runoff Area=1.898 ac 0.00% Impervious Runoff Depth=2.20"
Tc=14.5 min CN=72 Runoff=3.70 cfs 0.348 af

SubcatchmentSC1.16: Runoff Area=2.191 ac 0.00% Impervious Runoff Depth=2.12"
Tc=23.2 min CN=71 Runoff=3.38 cfs 0.386 af

SubcatchmentSC1.17: Runoff Area=0.278 ac 0.00% Impervious Runoff Depth=2.12"
Tc=19.0 min CN=71 Runoff=0.47 cfs 0.049 af

SubcatchmentSC1.2: Runoff Area=0.214 ac 32.71% Impervious Runoff Depth=2.89"
Tc=6.0 min CN=80 Runoff=0.73 cfs 0.052 af

SubcatchmentSC1.3: Runoff Area=1.981 ac 4.34% Impervious Runoff Depth=1.80"
Tc=15.2 min CN=67 Runoff=3.02 cfs 0.298 af

SubcatchmentSC1.4: Runoff Area=1.014 ac 24.46% Impervious Runoff Depth=2.71"
Tc=6.0 min CN=78 Runoff=3.23 cfs 0.229 af

SubcatchmentSC1.4A: Runoff Area=0.167 ac 0.00% Impervious Runoff Depth=2.99"
Tc=6.0 min CN=81 Runoff=0.58 cfs 0.042 af

SubcatchmentSC1.5: Runoff Area=4.600 ac 0.00% Impervious Runoff Depth=2.04"
Tc=35.9 min CN=70 Runoff=5.58 cfs 0.781 af

SubcatchmentSC1.6: Runoff Area=41.257 ac 0.00% Impervious Runoff Depth=2.04"
Tc=29.1 min CN=70 Runoff=55.23 cfs 7.001 af

SubcatchmentSC1.7: Runoff Area=5.355 ac 0.00% Impervious Runoff Depth=2.12"
Tc=17.2 min CN=71 Runoff=9.36 cfs 0.944 af

SubcatchmentSC1.8: Runoff Area=12.525 ac 0.00% Impervious Runoff Depth=2.04"
Tc=23.6 min CN=70 Runoff=18.40 cfs 2.125 af

SubcatchmentSC1.9: Runoff Area=7.206 ac 0.00% Impervious Runoff Depth=2.04"
Tc=17.4 min CN=70 Runoff=12.01 cfs 1.223 af

SubcatchmentSC3.1: Runoff Area=9.148 ac 0.00% Impervious Runoff Depth=2.36"
Tc=30.0 min CN=74 Runoff=14.25 cfs 1.802 af

SubcatchmentSC3.2: Runoff Area=0.510 ac 0.00% Impervious Runoff Depth=2.04"
Tc=23.1 min CN=70 Runoff=0.76 cfs 0.087 af

SubcatchmentSC3.3: Runoff Area=10.036 ac 0.00% Impervious Runoff Depth=2.04"
Tc=27.4 min CN=70 Runoff=13.83 cfs 1.703 af

SubcatchmentSC3.4: Runoff Area=5.027 ac 0.00% Impervious Runoff Depth=2.04"
Tc=17.9 min CN=70 Runoff=8.27 cfs 0.853 af

SubcatchmentSC3.5: Runoff Area=3.522 ac 0.00% Impervious Runoff Depth=2.04"
Tc=15.1 min CN=70 Runoff=6.20 cfs 0.598 af

Reach 1.1R: Avg. Depth=0.61' Max Vel=4.21 fps Inflow=8.20 cfs 1.359 af
n=0.065 L=200.0' S=0.1100 '/' Capacity=96.75 cfs Outflow=8.20 cfs 1.359 af

Reach 1.2R: Avg. Depth=0.57' Max Vel=3.48 fps Inflow=6.23 cfs 1.010 af
n=0.067 L=670.0' S=0.0858 '/' Capacity=82.91 cfs Outflow=6.19 cfs 1.010 af

Reach 1.3R: Stream at Culvert Inlet Avg. Depth=1.28' Max Vel=6.25 fps Inflow=61.38 cfs 7.945 af
n=0.040 L=600.0' S=0.0713 '/' Capacity=49.53 cfs Outflow=61.20 cfs 7.945 af

Reach 1.4R: From Level Spreader Avg. Depth=0.28' Max Vel=0.20 fps Inflow=9.22 cfs 0.944 af
n=0.800 L=255.0' S=0.1412 '/' Capacity=1.53 cfs Outflow=6.23 cfs 0.944 af

Reach SP1: Study Point Avg. Depth=1.55' Max Vel=2.17 fps Inflow=23.88 cfs 4.086 af
n=0.069 L=20.0' S=0.0100 '/' Capacity=92.84 cfs Outflow=23.88 cfs 4.086 af

Pond 1P: SD-1 Peak Elev=1,045.54' Storage=976 cf Inflow=16.93 cfs 2.727 af
24.0" Round Culvert n=0.013 L=90.0' S=0.0083 '/' Outflow=16.88 cfs 2.727 af

Pond 2P: SD-2 Peak Elev=1,065.09' Storage=28 cf Inflow=3.02 cfs 0.298 af
15.0" Round Culvert n=0.013 L=28.0' S=0.0268 '/' Outflow=3.02 cfs 0.298 af

Pond 3P: SD-3 Peak Elev=1,124.04' Storage=309 cf Inflow=5.58 cfs 0.781 af
15.0" Round Culvert n=0.013 L=30.0' S=0.0083 '/' Outflow=5.55 cfs 0.781 af

Pond 4P: Box Culvert Peak Elev=1,200.33' Inflow=61.20 cfs 7.945 af
120.0" x 24.0" Box Culvert n=0.040 L=35.0' S=0.0714 '/' Outflow=61.20 cfs 7.945 af

Pond 5P: SD-5 Peak Elev=1,264.64' Storage=320 cf Inflow=9.36 cfs 0.944 af
18.0" Round Culvert n=0.013 L=38.0' S=0.0526 '/' Outflow=9.22 cfs 0.944 af

Pond 6P: SD-6 Peak Elev=1,425.02' Storage=2,712 cf Inflow=18.40 cfs 2.125 af
24.0" Round Culvert n=0.013 L=62.0' S=0.0282 '/' Outflow=16.99 cfs 2.125 af

Pond 7P: SD-7-11 Peak Elev=1,454.15' Storage=41 cf Inflow=12.01 cfs 1.223 af
12.0" Round Culvert x 5.00 n=0.013 L=60.0' S=0.0250 '/' Outflow=12.00 cfs 1.223 af

Pond 8P: SD-12-15 Peak Elev=1,559.29' Storage=79 cf Inflow=13.55 cfs 1.509 af
12.0" Round Culvert x 4.00 n=0.013 L=50.0' S=0.0200 '/' Outflow=13.55 cfs 1.509 af

Pond 9P: SD-16 Peak Elev=1,605.25' Storage=241 cf Inflow=7.62 cfs 0.934 af
15.0" Round Culvert n=0.013 L=50.0' S=0.8500 '/' Outflow=7.56 cfs 0.934 af

Pond 10P: SD-17 Peak Elev=1,675.84' Storage=24 cf Inflow=2.17 cfs 0.271 af
15.0" Round Culvert n=0.013 L=53.0' S=0.0943 '/' Outflow=2.17 cfs 0.271 af

Pond 11P: SD-18 Peak Elev=1,639.63' Storage=5,099 cf Inflow=14.25 cfs 1.802 af
36.0" Round Culvert n=0.013 L=80.0' S=0.1250 '/' Outflow=13.39 cfs 1.802 af

Pond 12P: SD-19 Peak Elev=1,681.65' Storage=985 cf Inflow=3.14 cfs 0.410 af
15.0" Round Culvert n=0.013 L=64.0' S=0.0094 '/' Outflow=3.01 cfs 0.407 af

Pond 13P: SD-20 Peak Elev=1,701.64' Storage=114 cf Inflow=2.41 cfs 0.280 af
36.0" Round Culvert n=0.013 L=65.0' S=0.0154 '/' Outflow=2.41 cfs 0.280 af

Pond 14P: SD-21 Peak Elev=1,564.25' Storage=21 cf Inflow=3.70 cfs 0.348 af
15.0" Round Culvert n=0.013 L=43.0' S=0.0233 '/' Outflow=3.70 cfs 0.348 af

Pond 15P: SD-22-23 Peak Elev=1,605.82' Storage=16 cf Inflow=3.38 cfs 0.386 af
12.0" Round Culvert x 2.00 n=0.013 L=50.0' S=0.0200 '/' Outflow=3.38 cfs 0.386 af

Pond 16P: SD-24 Peak Elev=1,671.36' Storage=5 cf Inflow=0.47 cfs 0.049 af
15.0" Round Culvert n=0.013 L=46.0' S=0.0217 '/' Outflow=0.47 cfs 0.049 af

Pond 17P: SD-25 Peak Elev=1,679.46' Storage=7 cf Inflow=0.76 cfs 0.087 af
15.0" Round Culvert n=0.013 L=50.0' S=0.0600 '/' Outflow=0.76 cfs 0.087 af

Pond 18P: SD-26 Peak Elev=1,601.63' Storage=2,759 cf Inflow=13.83 cfs 1.703 af
36.0" Round Culvert n=0.013 L=70.0' S=0.0429 '/' Outflow=13.40 cfs 1.703 af

Pond 19P: SD-27-31 Peak Elev=1,709.81' Storage=16 cf Inflow=8.27 cfs 0.853 af
12.0" Round Culvert x 5.00 n=0.013 L=70.0' S=0.0143 '/' Outflow=8.27 cfs 0.853 af

Pond 20P: SD-32 Peak Elev=1,765.38' Storage=91 cf Inflow=6.20 cfs 0.598 af
15.0" Round Culvert n=0.013 L=56.0' S=0.0893 '/' Outflow=6.18 cfs 0.598 af

Time span=0.00-36.00 hrs, dt=0.01 hrs, 3601 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

SubcatchmentSC1.1: Runoff Area=16.719 ac 0.71% Impervious Runoff Depth=2.40"
Tc=46.7 min CN=69 Runoff=21.03 cfs 3.349 af

SubcatchmentSC1.10: Runoff Area=8.557 ac 0.00% Impervious Runoff Depth=2.58"
Tc=21.8 min CN=71 Runoff=16.66 cfs 1.840 af

SubcatchmentSC1.11: Runoff Area=5.297 ac 0.00% Impervious Runoff Depth=2.58"
Tc=27.4 min CN=71 Runoff=9.37 cfs 1.139 af

SubcatchmentSC1.12: Runoff Area=1.538 ac 0.00% Impervious Runoff Depth=2.58"
Tc=28.6 min CN=71 Runoff=2.66 cfs 0.331 af

SubcatchmentSC1.13: Runoff Area=2.416 ac 0.00% Impervious Runoff Depth=2.49"
Tc=31.1 min CN=70 Runoff=3.87 cfs 0.502 af

SubcatchmentSC1.14: Runoff Area=1.587 ac 0.00% Impervious Runoff Depth=2.58"
Tc=24.1 min CN=71 Runoff=2.97 cfs 0.341 af

SubcatchmentSC1.15: Runoff Area=1.898 ac 0.00% Impervious Runoff Depth=2.67"
Tc=14.5 min CN=72 Runoff=4.53 cfs 0.422 af

SubcatchmentSC1.16: Runoff Area=2.191 ac 0.00% Impervious Runoff Depth=2.58"
Tc=23.2 min CN=71 Runoff=4.15 cfs 0.471 af

SubcatchmentSC1.17: Runoff Area=0.278 ac 0.00% Impervious Runoff Depth=2.58"
Tc=19.0 min CN=71 Runoff=0.57 cfs 0.060 af

SubcatchmentSC1.2: Runoff Area=0.214 ac 32.71% Impervious Runoff Depth=3.42"
Tc=6.0 min CN=80 Runoff=0.86 cfs 0.061 af

SubcatchmentSC1.3: Runoff Area=1.981 ac 4.34% Impervious Runoff Depth=2.23"
Tc=15.2 min CN=67 Runoff=3.81 cfs 0.369 af

SubcatchmentSC1.4: Runoff Area=1.014 ac 24.46% Impervious Runoff Depth=3.23"
Tc=6.0 min CN=78 Runoff=3.84 cfs 0.273 af

SubcatchmentSC1.4A: Runoff Area=0.167 ac 0.00% Impervious Runoff Depth=3.52"
Tc=6.0 min CN=81 Runoff=0.69 cfs 0.049 af

SubcatchmentSC1.5: Runoff Area=4.600 ac 0.00% Impervious Runoff Depth=2.49"
Tc=35.9 min CN=70 Runoff=6.90 cfs 0.955 af

SubcatchmentSC1.6: Runoff Area=41.257 ac 0.00% Impervious Runoff Depth=2.49"
Tc=29.1 min CN=70 Runoff=68.22 cfs 8.566 af

SubcatchmentSC1.7: Runoff Area=5.355 ac 0.00% Impervious Runoff Depth=2.58"
Tc=17.2 min CN=71 Runoff=11.51 cfs 1.151 af

SubcatchmentSC1.8: Runoff Area=12.525 ac 0.00% Impervious Runoff Depth=2.49"
Tc=23.6 min CN=70 Runoff=22.72 cfs 2.601 af

SubcatchmentSC1.9: Runoff Area=7.206 ac 0.00% Impervious Runoff Depth=2.49"
Tc=17.4 min CN=70 Runoff=14.84 cfs 1.496 af

SubcatchmentSC3.1: Runoff Area=9.148 ac 0.00% Impervious Runoff Depth=2.85"
Tc=30.0 min CN=74 Runoff=17.26 cfs 2.174 af

SubcatchmentSC3.2: Runoff Area=0.510 ac 0.00% Impervious Runoff Depth=2.49"
Tc=23.1 min CN=70 Runoff=0.93 cfs 0.106 af

SubcatchmentSC3.3: Runoff Area=10.036 ac 0.00% Impervious Runoff Depth=2.49"
Tc=27.4 min CN=70 Runoff=17.08 cfs 2.084 af

SubcatchmentSC3.4: Runoff Area=5.027 ac 0.00% Impervious Runoff Depth=2.49"
Tc=17.9 min CN=70 Runoff=10.22 cfs 1.044 af

SubcatchmentSC3.5: Runoff Area=3.522 ac 0.00% Impervious Runoff Depth=2.49"
Tc=15.1 min CN=70 Runoff=7.66 cfs 0.731 af

Reach 1.1R: Avg. Depth=0.67' Max Vel=4.44 fps Inflow=9.96 cfs 1.657 af
n=0.065 L=200.0' S=0.1100 '/' Capacity=96.75 cfs Outflow=9.95 cfs 1.657 af

Reach 1.2R: Avg. Depth=0.63' Max Vel=3.67 fps Inflow=7.52 cfs 1.228 af
n=0.067 L=670.0' S=0.0858 '/' Capacity=82.91 cfs Outflow=7.48 cfs 1.228 af

Reach 1.3R: Stream at Culvert Inlet Avg. Depth=1.40' Max Vel=6.44 fps Inflow=75.80 cfs 9.717 af
n=0.040 L=600.0' S=0.0713 '/' Capacity=49.53 cfs Outflow=75.58 cfs 9.717 af

Reach 1.4R: From Level Spreader Avg. Depth=0.34' Max Vel=0.21 fps Inflow=11.12 cfs 1.151 af
n=0.800 L=255.0' S=0.1412 '/' Capacity=1.53 cfs Outflow=7.74 cfs 1.151 af

Reach SP1: Study Point Avg. Depth=1.71' Max Vel=2.28 fps Inflow=29.02 cfs 5.007 af
n=0.069 L=20.0' S=0.0100 '/' Capacity=92.84 cfs Outflow=29.02 cfs 5.007 af

Pond 1P: SD-1 Peak Elev=1,046.69' Storage=1,908 cf Inflow=21.03 cfs 3.349 af
24.0" Round Culvert n=0.013 L=90.0' S=0.0083 '/' Outflow=20.65 cfs 3.349 af

Pond 2P: SD-2 Peak Elev=1,065.33' Storage=39 cf Inflow=3.81 cfs 0.369 af
15.0" Round Culvert n=0.013 L=28.0' S=0.0268 '/' Outflow=3.80 cfs 0.369 af

Pond 3P: SD-3 Peak Elev=1,124.73' Storage=548 cf Inflow=6.90 cfs 0.955 af
15.0" Round Culvert n=0.013 L=30.0' S=0.0083 '/' Outflow=6.78 cfs 0.955 af

Pond 4P: Box Culvert Peak Elev=1,200.53' Inflow=75.58 cfs 9.717 af
120.0" x 24.0" Box Culvert n=0.040 L=35.0' S=0.0714 '/' Outflow=75.58 cfs 9.717 af

Pond 5P: SD-5 Peak Elev=1,265.49' Storage=619 cf Inflow=11.51 cfs 1.151 af
18.0" Round Culvert n=0.013 L=38.0' S=0.0526 '/' Outflow=11.12 cfs 1.151 af

Pond 6P: SD-6 Peak Elev=1,425.74' Storage=4,823 cf Inflow=22.72 cfs 2.601 af
24.0" Round Culvert n=0.013 L=62.0' S=0.0282 '/' Outflow=19.78 cfs 2.601 af

Pond 7P: SD-7-11 Peak Elev=1,454.49' Storage=66 cf Inflow=14.84 cfs 1.496 af
12.0" Round Culvert x 5.00 n=0.013 L=60.0' S=0.0250 '/' Outflow=14.83 cfs 1.496 af

Pond 8P: SD-12-15 Peak Elev=1,559.94' Storage=167 cf Inflow=16.66 cfs 1.840 af
12.0" Round Culvert x 4.00 n=0.013 L=50.0' S=0.0200 '/' Outflow=16.64 cfs 1.840 af

Pond 9P: SD-16 Peak Elev=1,606.67' Storage=378 cf Inflow=9.37 cfs 1.139 af
15.0" Round Culvert n=0.013 L=50.0' S=0.8500 '/' Outflow=9.38 cfs 1.139 af

Pond 10P: SD-17 Peak Elev=1,675.96' Storage=31 cf Inflow=2.66 cfs 0.331 af
15.0" Round Culvert n=0.013 L=53.0' S=0.0943 '/' Outflow=2.66 cfs 0.331 af

Pond 11P: SD-18 Peak Elev=1,639.81' Storage=6,172 cf Inflow=17.26 cfs 2.174 af
36.0" Round Culvert n=0.013 L=80.0' S=0.1250 '/' Outflow=16.15 cfs 2.174 af

Pond 12P: SD-19 Peak Elev=1,681.83' Storage=1,245 cf Inflow=3.87 cfs 0.502 af
15.0" Round Culvert n=0.013 L=64.0' S=0.0094 '/' Outflow=3.64 cfs 0.498 af

Pond 13P: SD-20 Peak Elev=1,701.72' Storage=141 cf Inflow=2.97 cfs 0.341 af
36.0" Round Culvert n=0.013 L=65.0' S=0.0154 '/' Outflow=2.96 cfs 0.341 af

Pond 14P: SD-21 Peak Elev=1,564.56' Storage=32 cf Inflow=4.53 cfs 0.422 af
15.0" Round Culvert n=0.013 L=43.0' S=0.0233 '/' Outflow=4.52 cfs 0.422 af

Pond 15P: SD-22-23 Peak Elev=1,605.98' Storage=20 cf Inflow=4.15 cfs 0.471 af
12.0" Round Culvert x 2.00 n=0.013 L=50.0' S=0.0200 '/' Outflow=4.15 cfs 0.471 af

Pond 16P: SD-24 Peak Elev=1,671.40' Storage=6 cf Inflow=0.57 cfs 0.060 af
15.0" Round Culvert n=0.013 L=46.0' S=0.0217 '/' Outflow=0.57 cfs 0.060 af

Pond 17P: SD-25 Peak Elev=1,679.52' Storage=8 cf Inflow=0.93 cfs 0.106 af
15.0" Round Culvert n=0.013 L=50.0' S=0.0600 '/' Outflow=0.93 cfs 0.106 af

Pond 18P: SD-26 Peak Elev=1,601.83' Storage=3,524 cf Inflow=17.08 cfs 2.084 af
36.0" Round Culvert n=0.013 L=70.0' S=0.0429 '/' Outflow=16.47 cfs 2.084 af

Pond 19P: SD-27-31 Peak Elev=1,709.96' Storage=22 cf Inflow=10.22 cfs 1.044 af
12.0" Round Culvert x 5.00 n=0.013 L=70.0' S=0.0143 '/' Outflow=10.22 cfs 1.044 af

Pond 20P: SD-32 Peak Elev=1,766.40' Storage=158 cf Inflow=7.66 cfs 0.731 af
15.0" Round Culvert n=0.013 L=56.0' S=0.0893 '/' Outflow=7.77 cfs 0.731 af

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)
1	1P	1,042.00	1,041.25	90.0	0.0083	0.013	24.0	0.0
2	2P	1,064.00	1,063.25	28.0	0.0268	0.013	15.0	0.0
3	3P	1,122.00	1,121.75	30.0	0.0083	0.013	15.0	0.0
4	4P	1,199.00	1,196.50	35.0	0.0714	0.040	120.0	24.0
5	5P	1,262.00	1,260.00	38.0	0.0526	0.013	18.0	0.0
6	6P	1,422.00	1,420.25	62.0	0.0282	0.013	24.0	0.0
7	7P	1,453.00	1,451.50	60.0	0.0250	0.013	12.0	0.0
8	8P	1,557.50	1,556.50	50.0	0.0200	0.013	12.0	0.0
9	9P	1,602.00	1,559.50	50.0	0.8500	0.013	15.0	0.0
10	10P	1,675.00	1,670.00	53.0	0.0943	0.013	15.0	0.0
11	11P	1,638.00	1,628.00	80.0	0.1250	0.013	36.0	0.0
12	12P	1,680.60	1,680.00	64.0	0.0094	0.013	15.0	0.0
13	13P	1,701.00	1,700.00	65.0	0.0154	0.013	36.0	0.0
14	14P	1,563.00	1,562.00	43.0	0.0233	0.013	15.0	0.0
15	15P	1,605.00	1,604.00	50.0	0.0200	0.013	12.0	0.0
16	16P	1,671.00	1,670.00	46.0	0.0217	0.013	15.0	0.0
17	17P	1,679.00	1,676.00	50.0	0.0600	0.013	15.0	0.0
18	18P	1,600.00	1,597.00	70.0	0.0429	0.013	36.0	0.0
19	19P	1,709.00	1,708.00	70.0	0.0143	0.013	12.0	0.0
20	20P	1,763.00	1,758.00	56.0	0.0893	0.013	15.0	0.0

Summary for Subcatchment SC1.1:

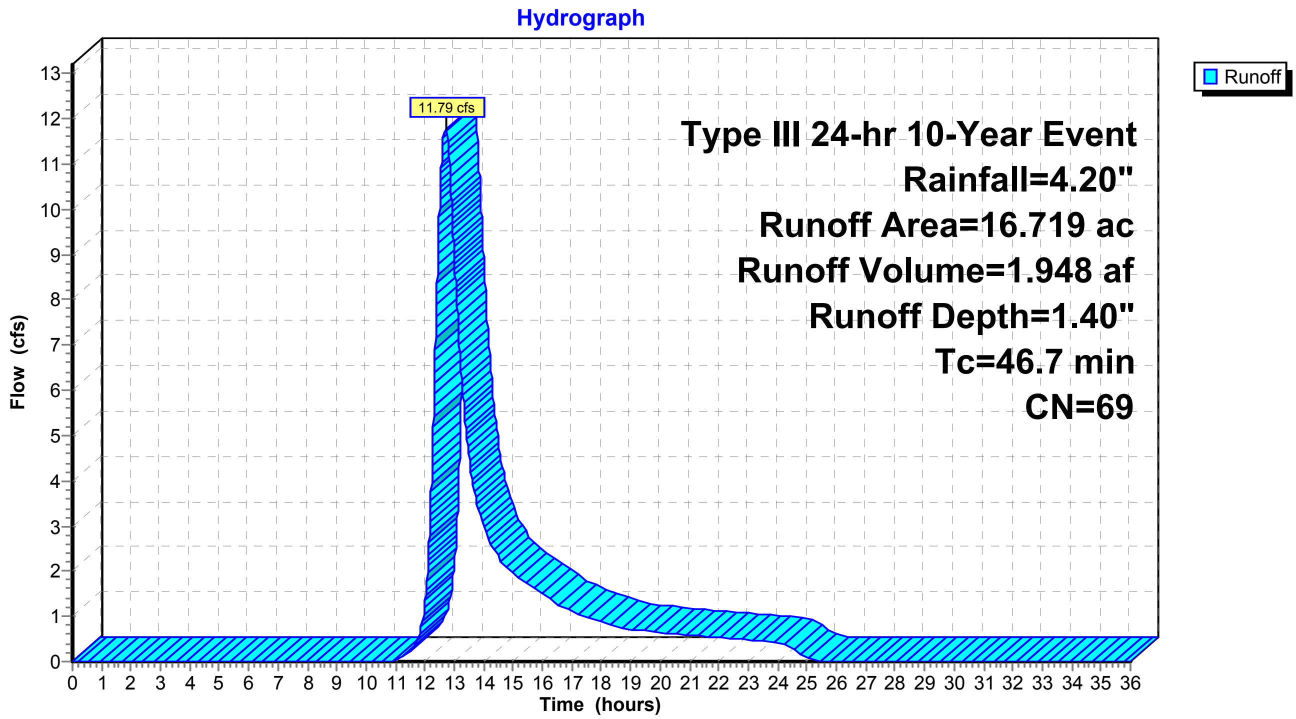
Runoff = 11.79 cfs @ 12.71 hrs, Volume= 1.948 af, Depth= 1.40"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

	Area (ac)	CN	Description
	13.069	70	Woods, Good, HSG C
	2.462	71	Meadow, non-grazed, HSG C
	0.118	98	Paved roads w/curbs & sewers, HSG C
*	1.070	55	Yard stone, HSG C
	16.719	69	Weighted Average
	16.601		99.29% Pervious Area
	0.118		0.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.7					**Direct Entry, See spreadsheet**

Subcatchment SC1.1:



Summary for Subcatchment SC1.10:

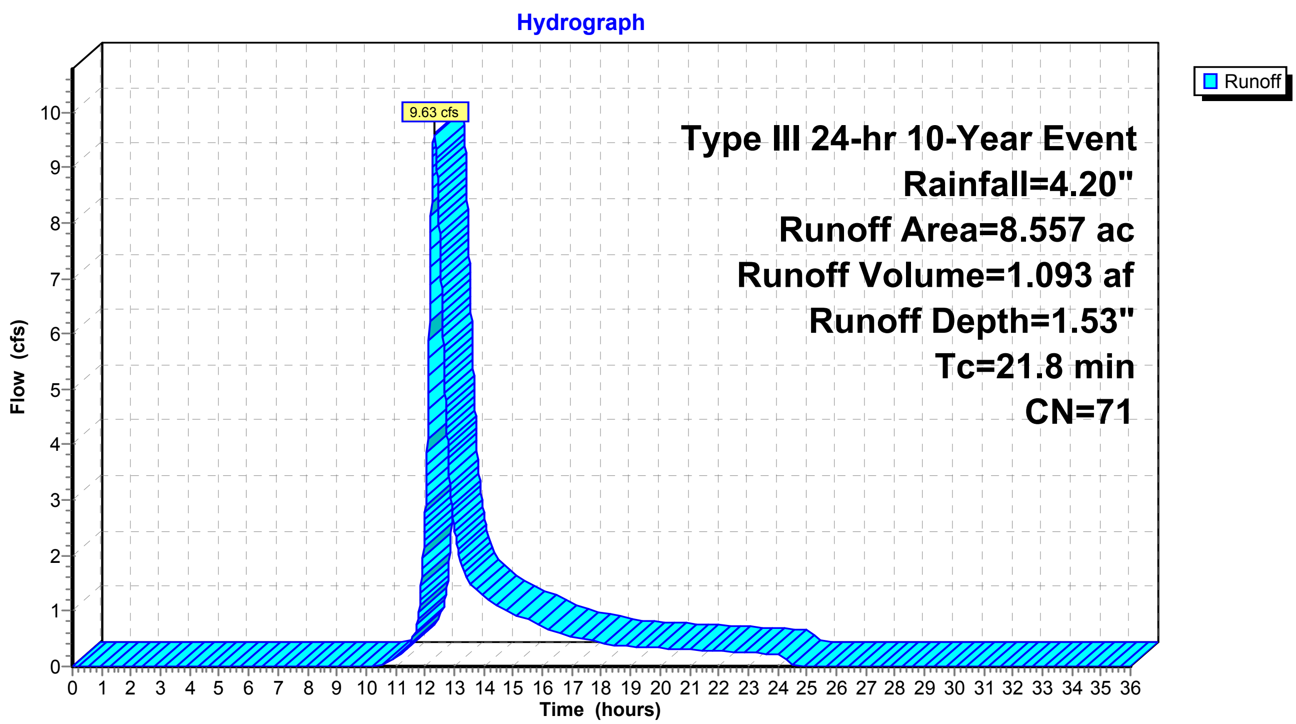
Runoff = 9.63 cfs @ 12.33 hrs, Volume= 1.093 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
6.492	70	Woods, Good, HSG C
1.567	71	Meadow, non-grazed, HSG C
0.498	89	Gravel roads, HSG C
8.557	71	Weighted Average
8.557		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.8					**Direct Entry, See spreadsheet**

Subcatchment SC1.10:



Summary for Subcatchment SC1.11:

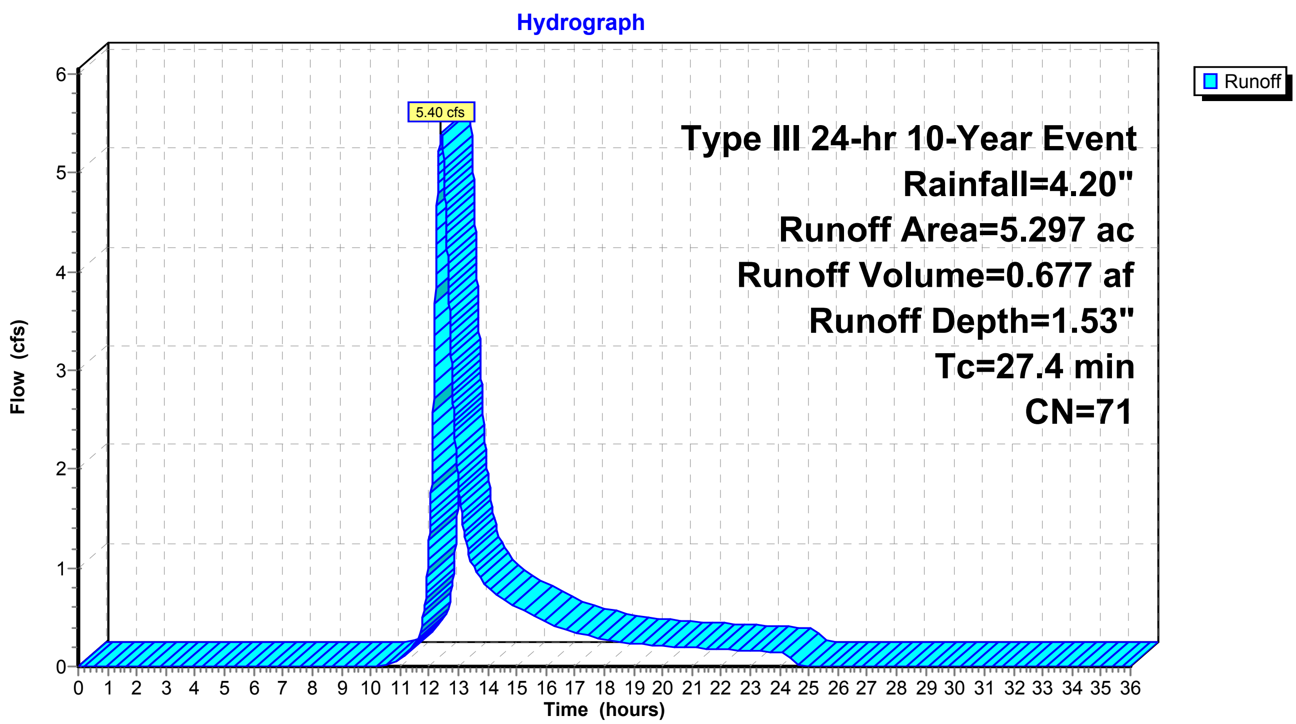
Runoff = 5.40 cfs @ 12.40 hrs, Volume= 0.677 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
4.038	70	Woods, Good, HSG C
1.081	71	Meadow, non-grazed, HSG C
0.178	89	Gravel roads, HSG C
5.297	71	Weighted Average
5.297		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.4					**Direct Entry, See spreadsheet**

Subcatchment SC1.11:



Summary for Subcatchment SC1.12:

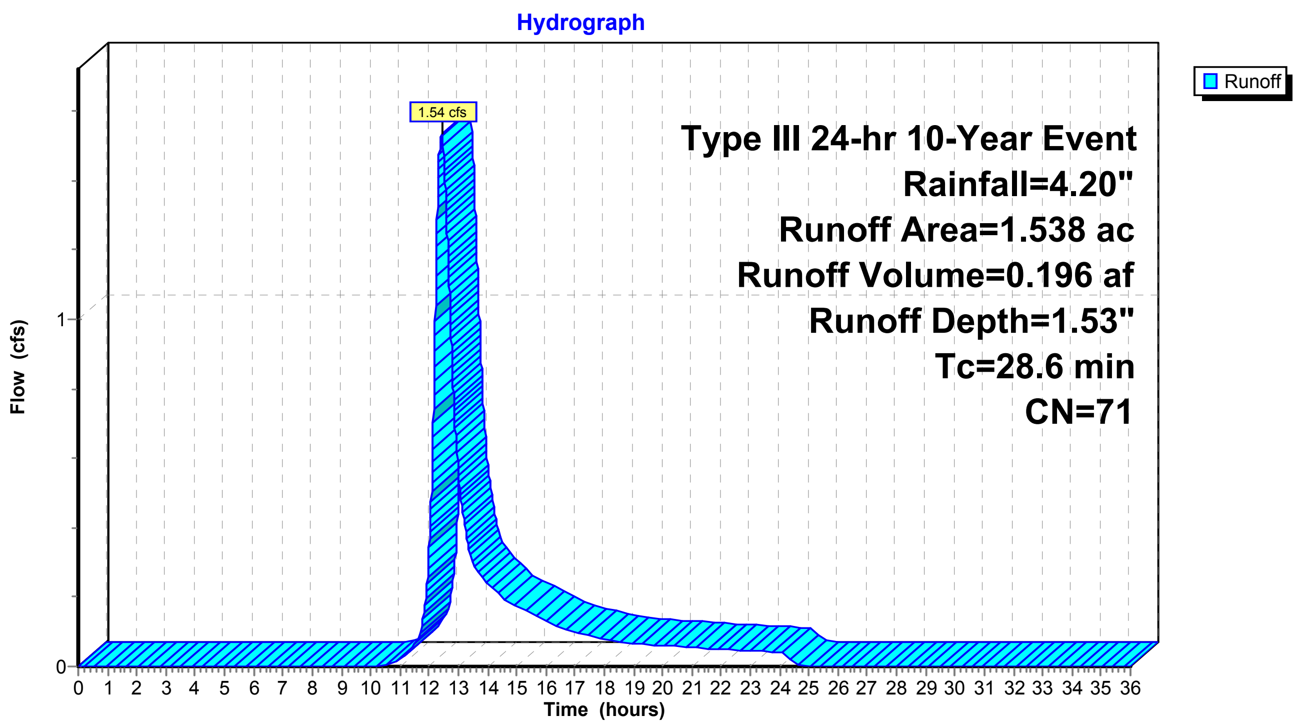
Runoff = 1.54 cfs @ 12.43 hrs, Volume= 0.196 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.916	70	Woods, Good, HSG C
0.547	71	Meadow, non-grazed, HSG C
0.075	89	Gravel roads, HSG C
1.538	71	Weighted Average
1.538		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.6					**Direct Entry, See spreadsheet**

Subcatchment SC1.12:



Summary for Subcatchment SC1.13:

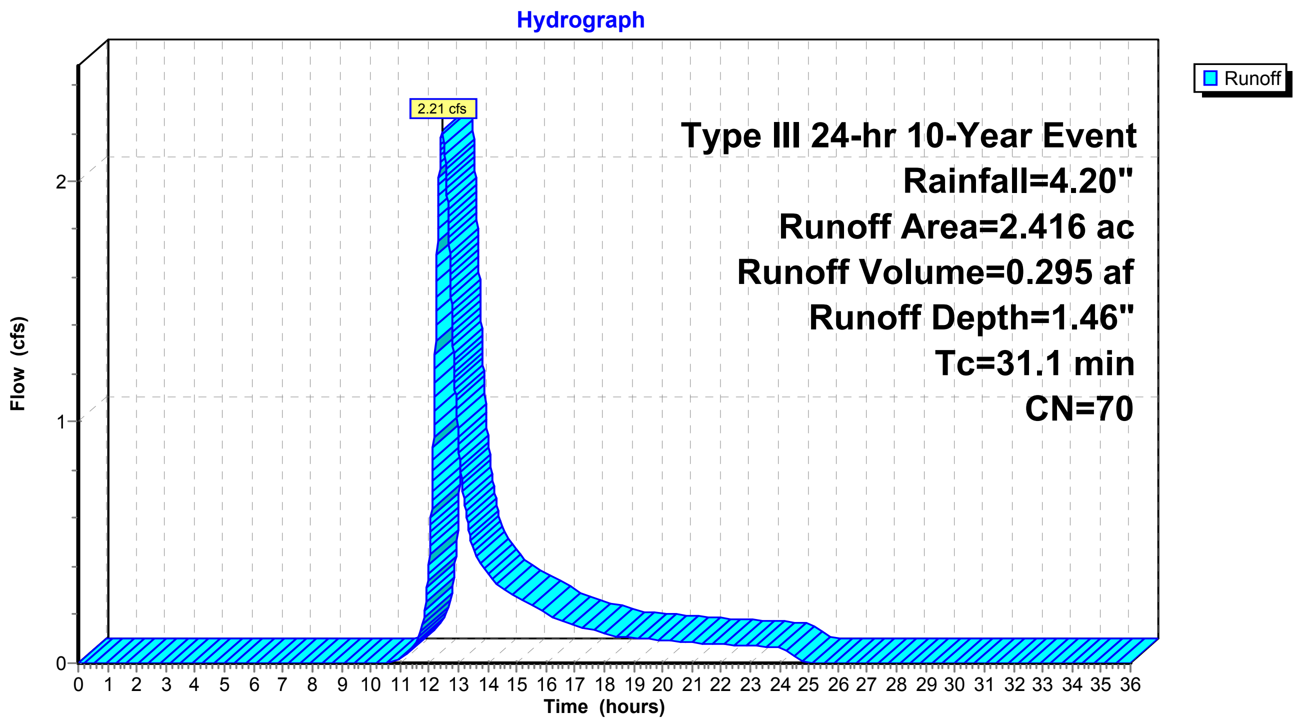
Runoff = 2.21 cfs @ 12.47 hrs, Volume= 0.295 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
1.885	70	Woods, Good, HSG C
0.531	71	Meadow, non-grazed, HSG C
2.416	70	Weighted Average
2.416		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.1					**Direct Entry, See spreadsheet**

Subcatchment SC1.13:



Summary for Subcatchment SC1.14:

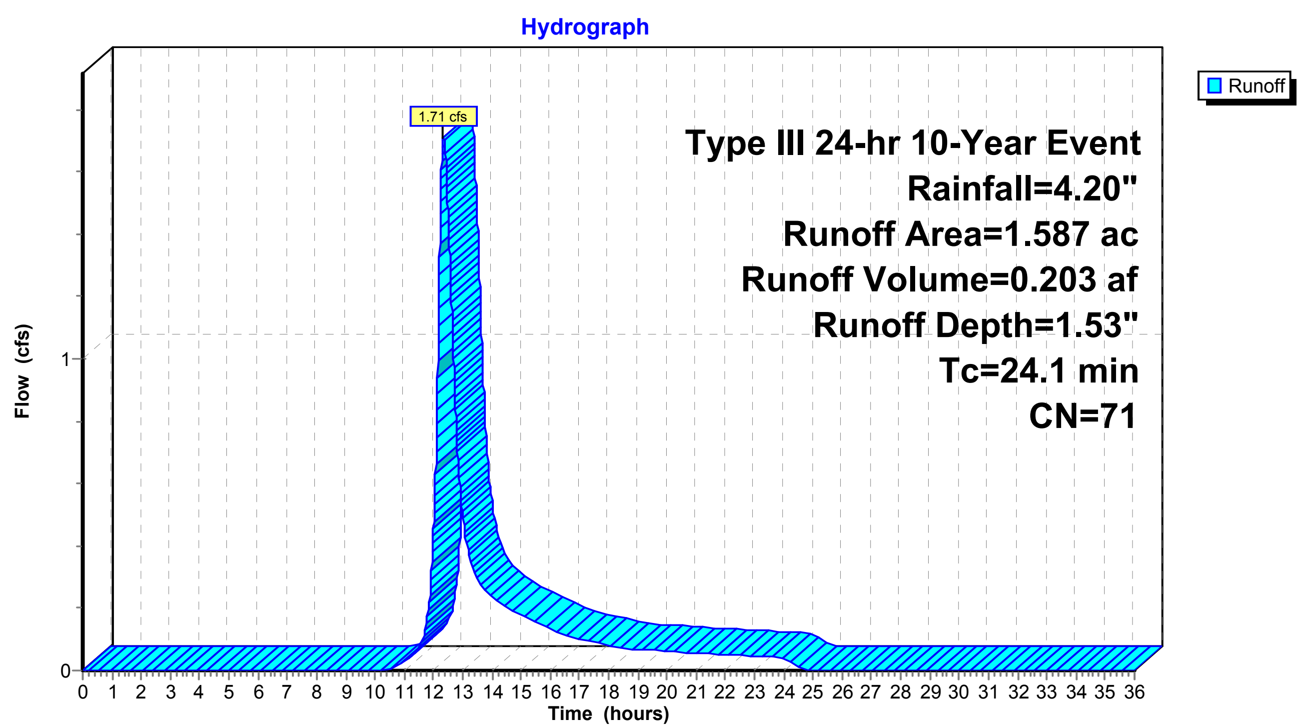
Runoff = 1.71 cfs @ 12.35 hrs, Volume= 0.203 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.623	70	Woods, Good, HSG C
0.888	71	Meadow, non-grazed, HSG C
0.076	89	Gravel roads, HSG C
1.587	71	Weighted Average
1.587		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1					**Direct Entry, See spreadsheet**

Subcatchment SC1.14:



Summary for Subcatchment SC1.15:

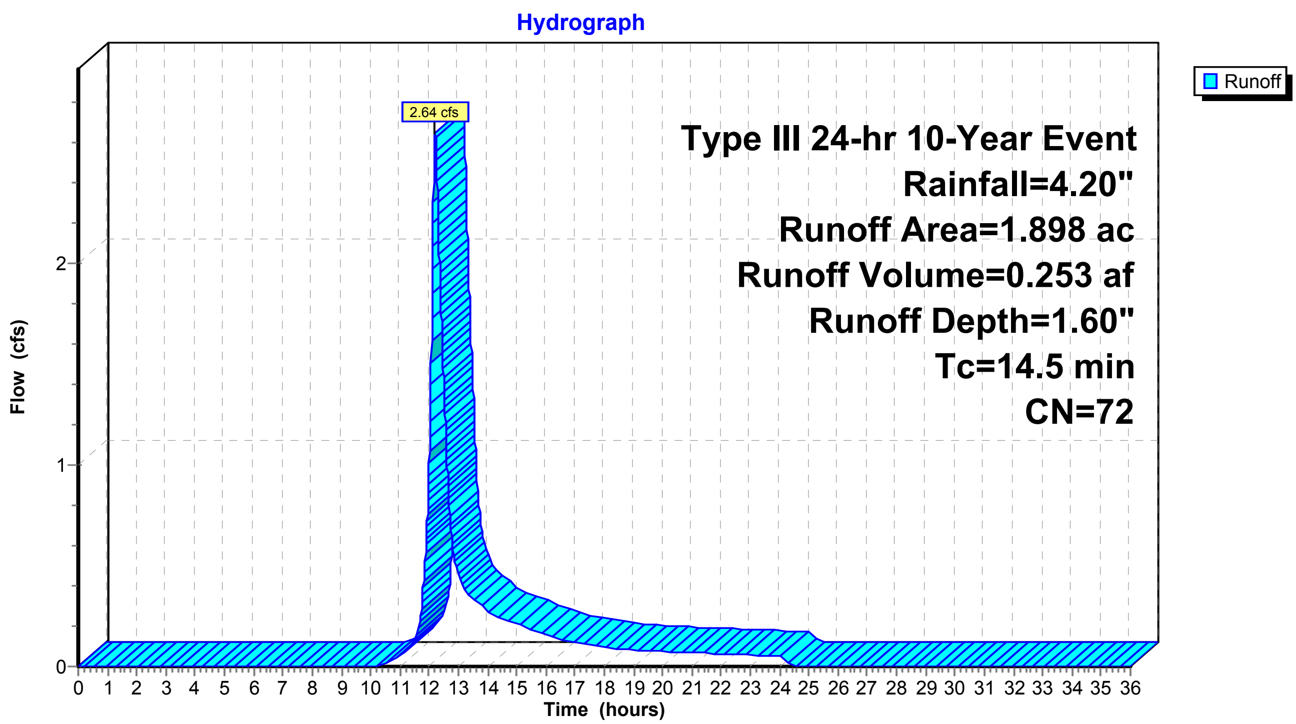
Runoff = 2.64 cfs @ 12.21 hrs, Volume= 0.253 af, Depth= 1.60"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.806	70	Woods, Good, HSG C
0.955	71	Meadow, non-grazed, HSG C
0.137	89	Gravel roads, HSG C
1.898	72	Weighted Average
1.898		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry, See spreadsheet**

Subcatchment SC1.15:



Summary for Subcatchment SC1.16:

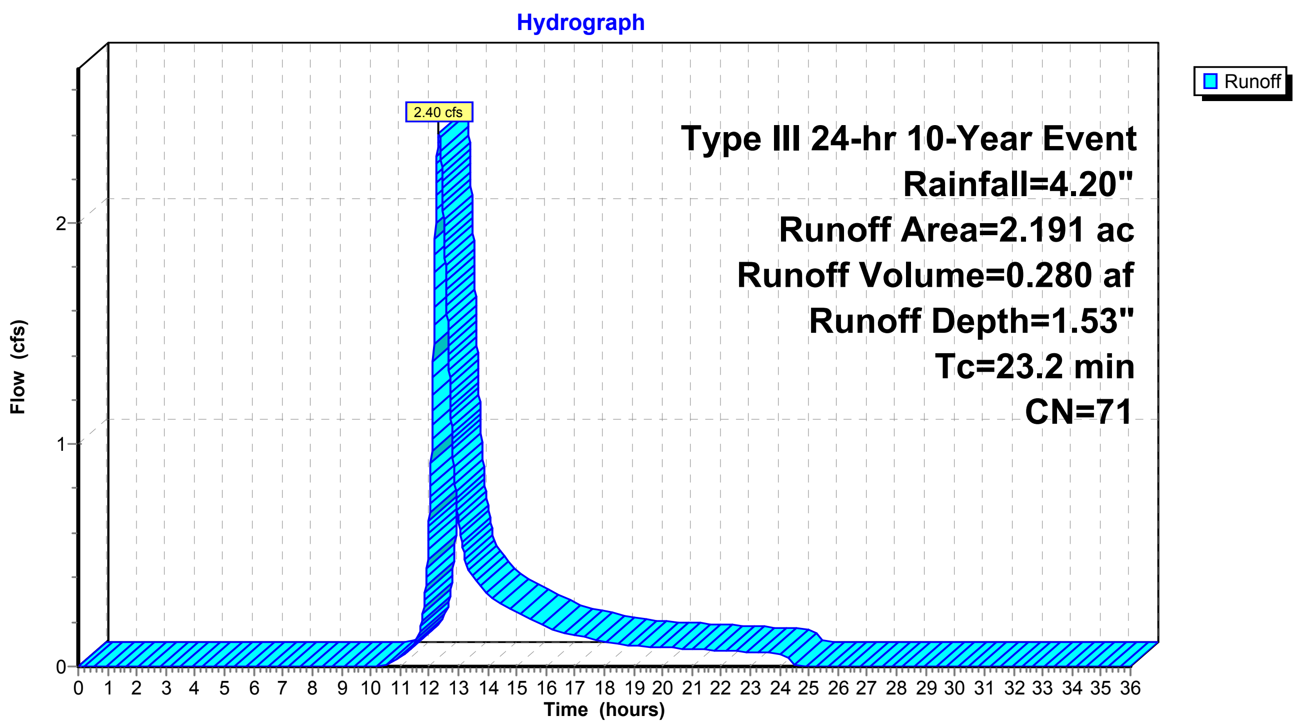
Runoff = 2.40 cfs @ 12.35 hrs, Volume= 0.280 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
1.222	70	Woods, Good, HSG C
0.864	71	Meadow, non-grazed, HSG C
0.105	89	Gravel roads, HSG C
2.191	71	Weighted Average
2.191		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.2					**Direct Entry, See spreadsheet**

Subcatchment SC1.16:



Summary for Subcatchment SC1.17:

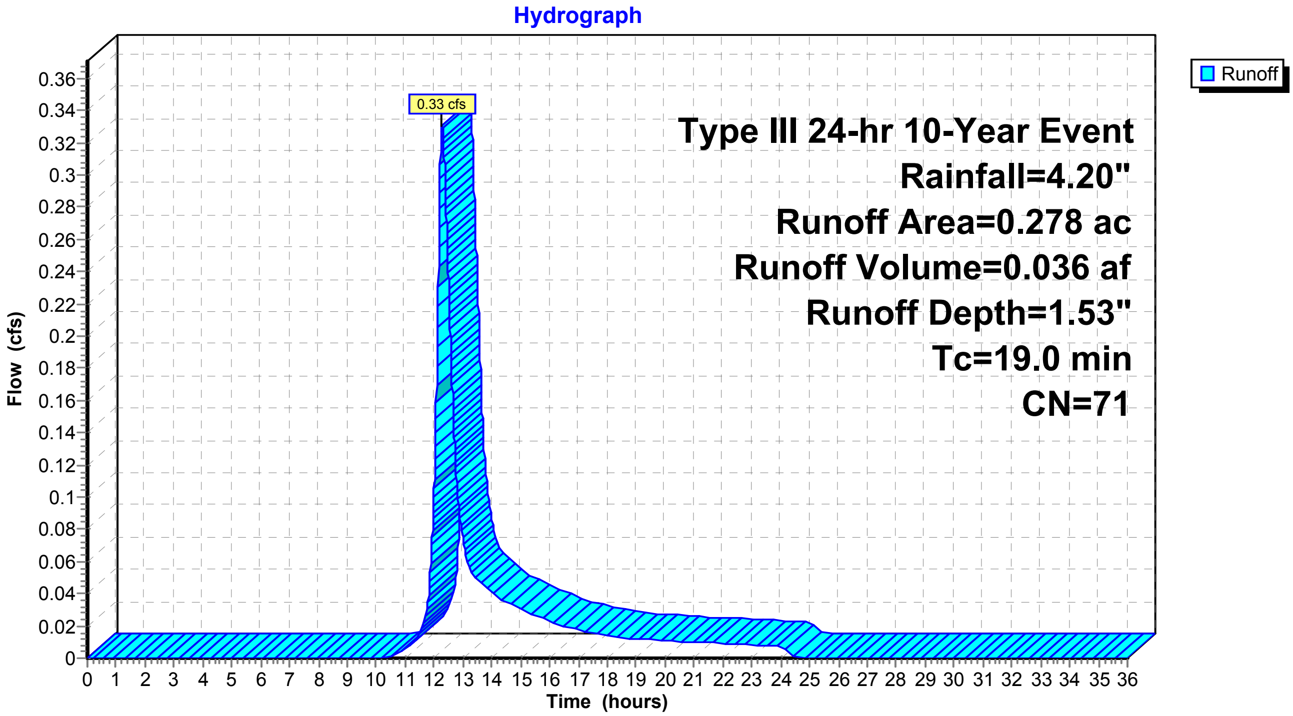
Runoff = 0.33 cfs @ 12.27 hrs, Volume= 0.036 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.119	70	Woods, Good, HSG C
0.159	71	Meadow, non-grazed, HSG C
0.278	71	Weighted Average
0.278		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0					**Direct Entry, See spreadsheet**

Subcatchment SC1.17:



Summary for Subcatchment SC1.2:

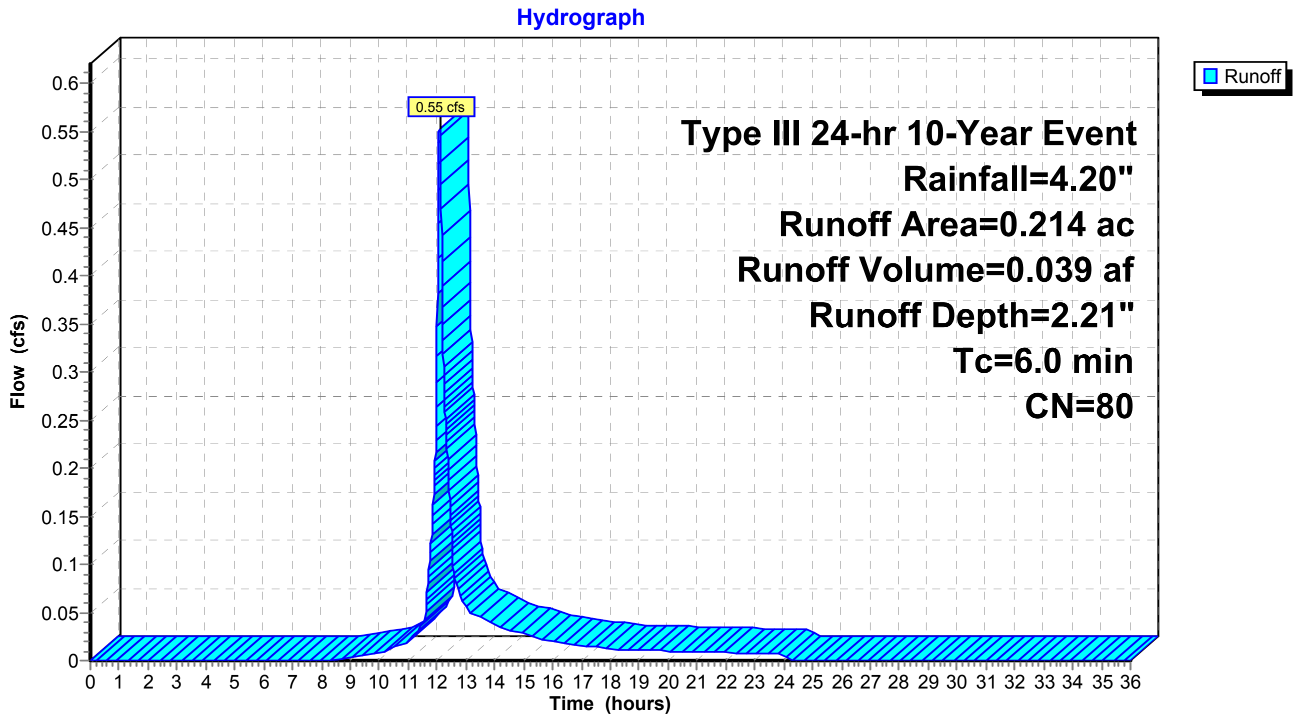
Runoff = 0.55 cfs @ 12.09 hrs, Volume= 0.039 af, Depth= 2.21"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.070	98	Paved roads, HSG C
0.144	71	Meadow, non-grazed, HSG C
0.214	80	Weighted Average
0.144		67.29% Pervious Area
0.070		32.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment SC1.2:



Summary for Subcatchment SC1.3:

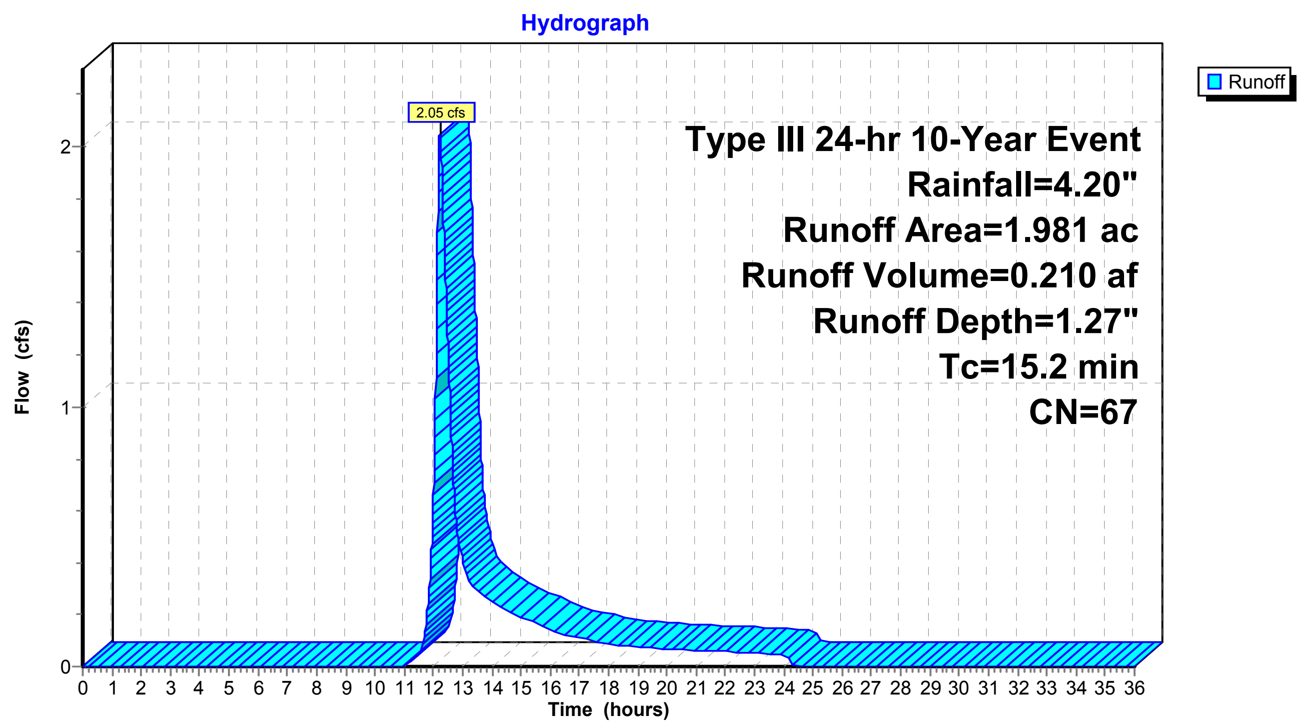
Runoff = 2.05 cfs @ 12.23 hrs, Volume= 0.210 af, Depth= 1.27"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

	Area (ac)	CN	Description
	0.681	70	Woods, Good, HSG C
	0.665	71	Meadow, non-grazed, HSG C
*	0.549	55	Yard stone, HSG C
	0.086	98	Roofs, HSG C
	1.981	67	Weighted Average
	1.895		95.66% Pervious Area
	0.086		4.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2					**Direct Entry, See spreadsheet**

Subcatchment SC1.3:



Summary for Subcatchment SC1.4:

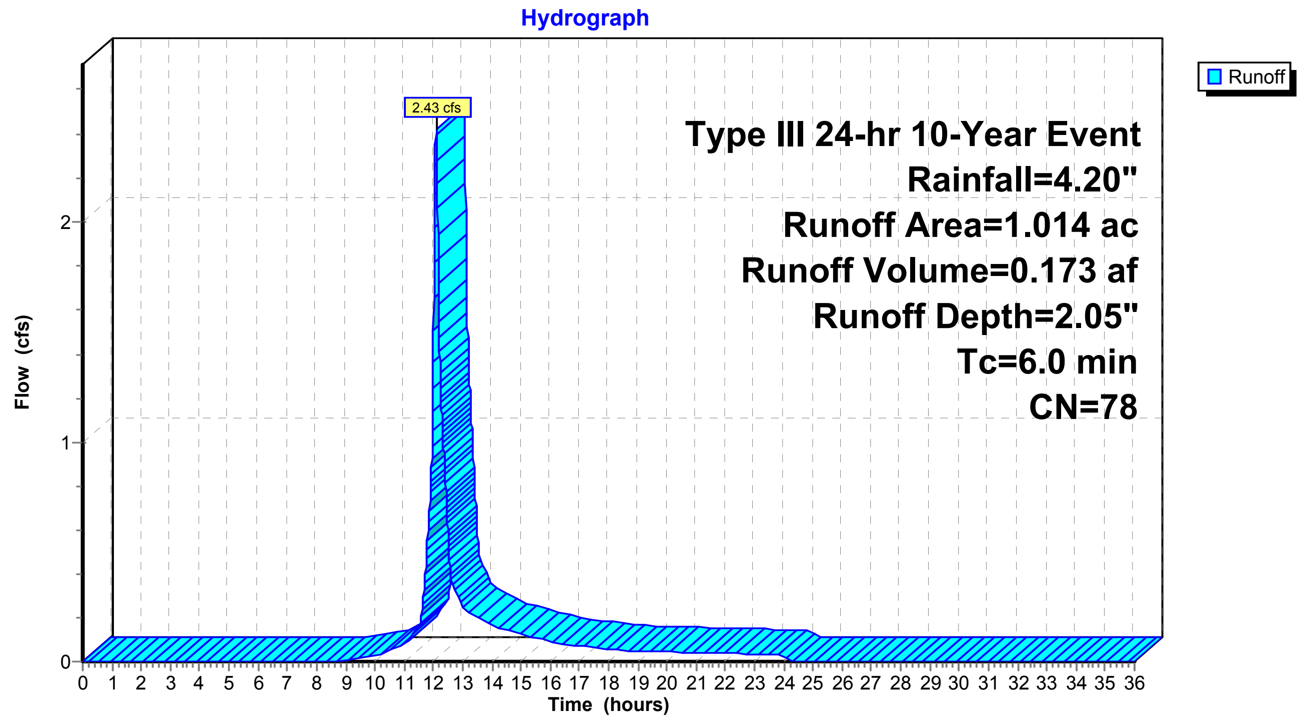
Runoff = 2.43 cfs @ 12.09 hrs, Volume= 0.173 af, Depth= 2.05"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

	Area (ac)	CN	Description
	0.275	70	Woods, Good, HSG C
	0.445	71	Meadow, non-grazed, HSG C
*	0.248	98	Paved roads, HSG C
	0.046	89	Gravel roads, HSG C
	1.014	78	Weighted Average
	0.766		75.54% Pervious Area
	0.248		24.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment SC1.4:



Summary for Subcatchment SC1.4A:

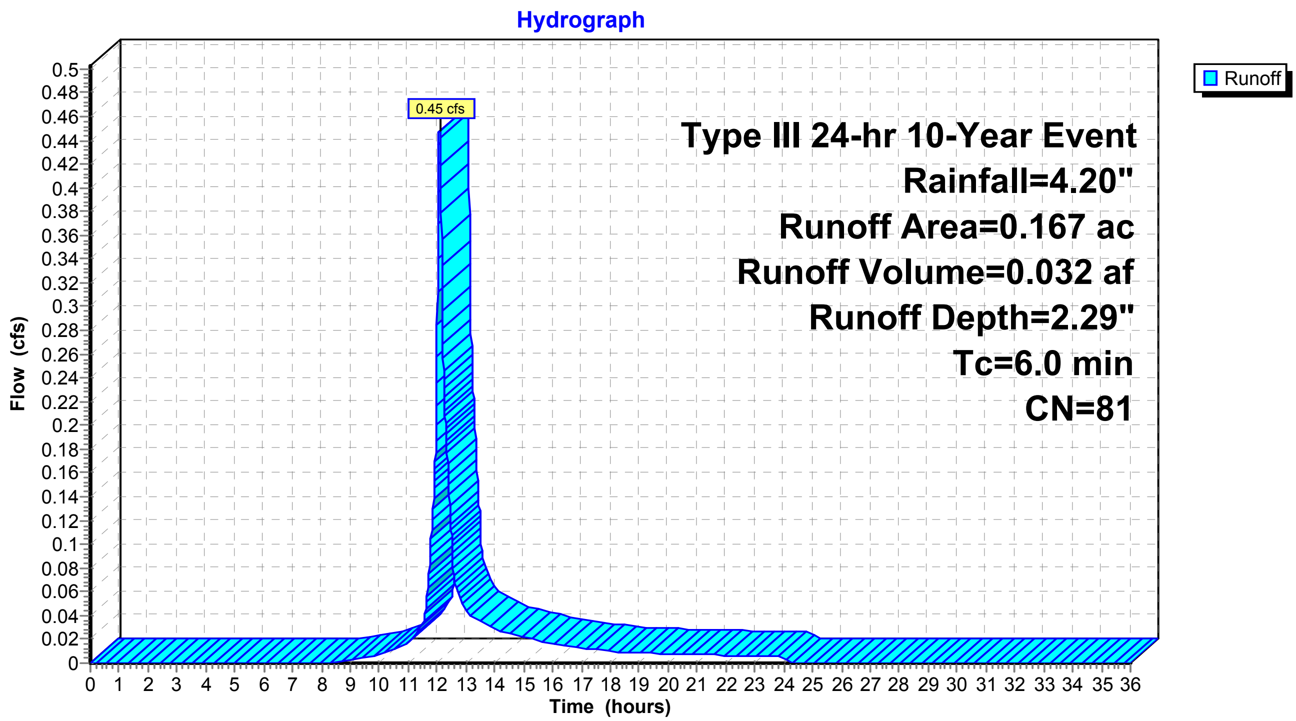
Runoff = 0.45 cfs @ 12.09 hrs, Volume= 0.032 af, Depth= 2.29"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.075	71	Meadow, non-grazed, HSG C
0.092	89	Gravel roads, HSG C
0.167	81	Weighted Average
0.167		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment SC1.4A:



Summary for Subcatchment SC1.5:

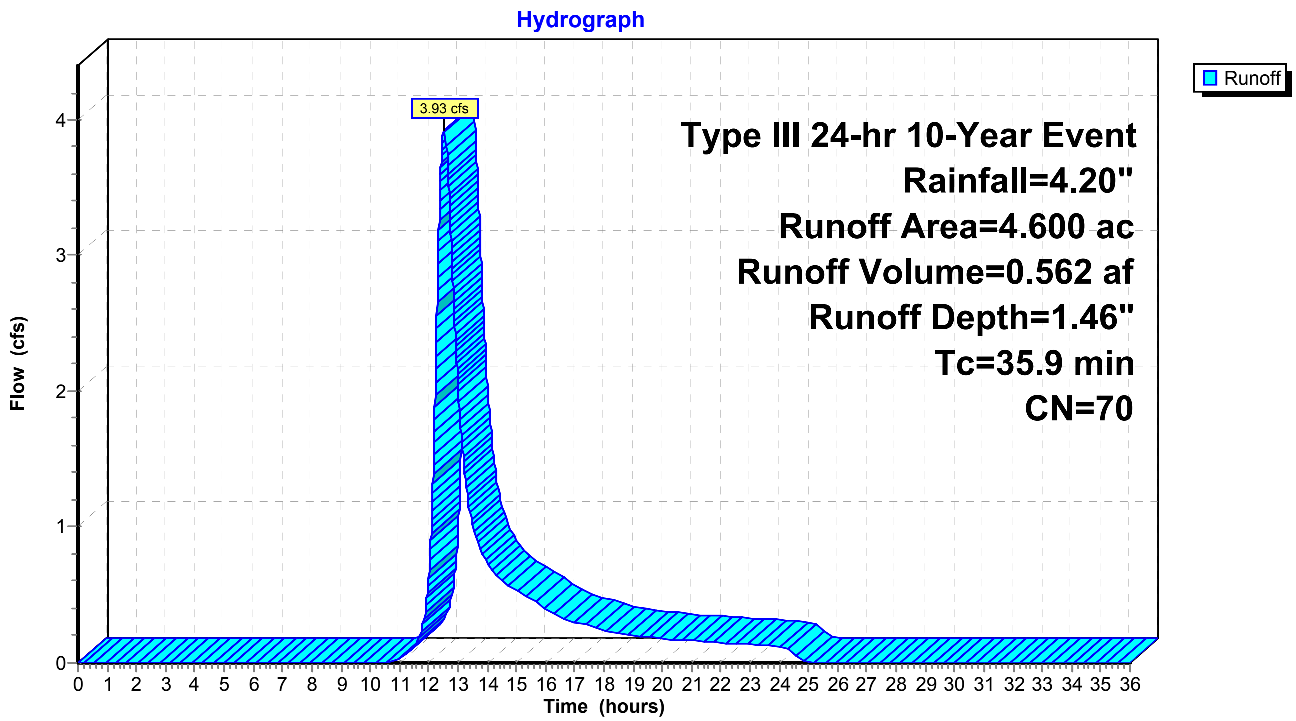
Runoff = 3.93 cfs @ 12.53 hrs, Volume= 0.562 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
4.028	70	Woods, Good, HSG C
0.572	71	Meadow, non-grazed, HSG C
4.600	70	Weighted Average
4.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.9					**Direct Entry, See spreadsheet**

Subcatchment SC1.5:



Summary for Subcatchment SC1.6:

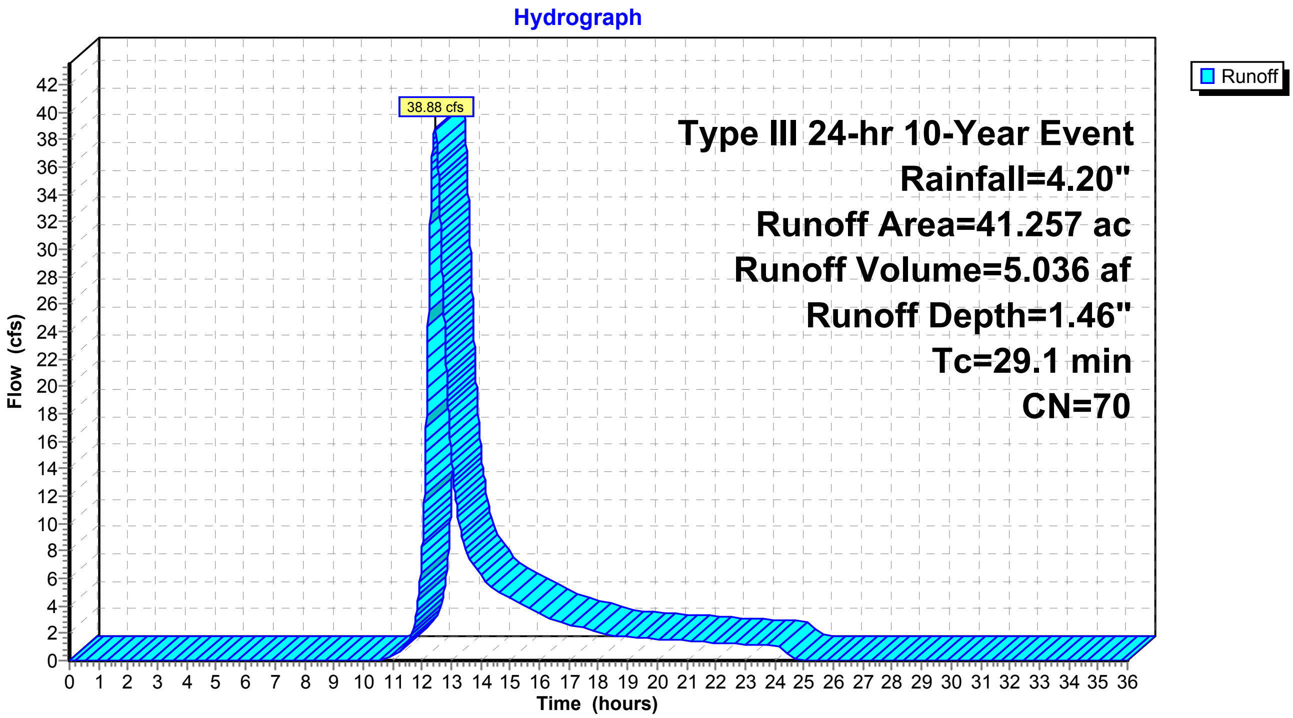
Runoff = 38.88 cfs @ 12.44 hrs, Volume= 5.036 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
39.420	70	Woods, Good, HSG C
0.285	89	Gravel roads, HSG C
1.552	71	Meadow, non-grazed, HSG C
41.257	70	Weighted Average
41.257		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1					**Direct Entry, See spreadsheet**

Subcatchment SC1.6:



Summary for Subcatchment SC1.7:

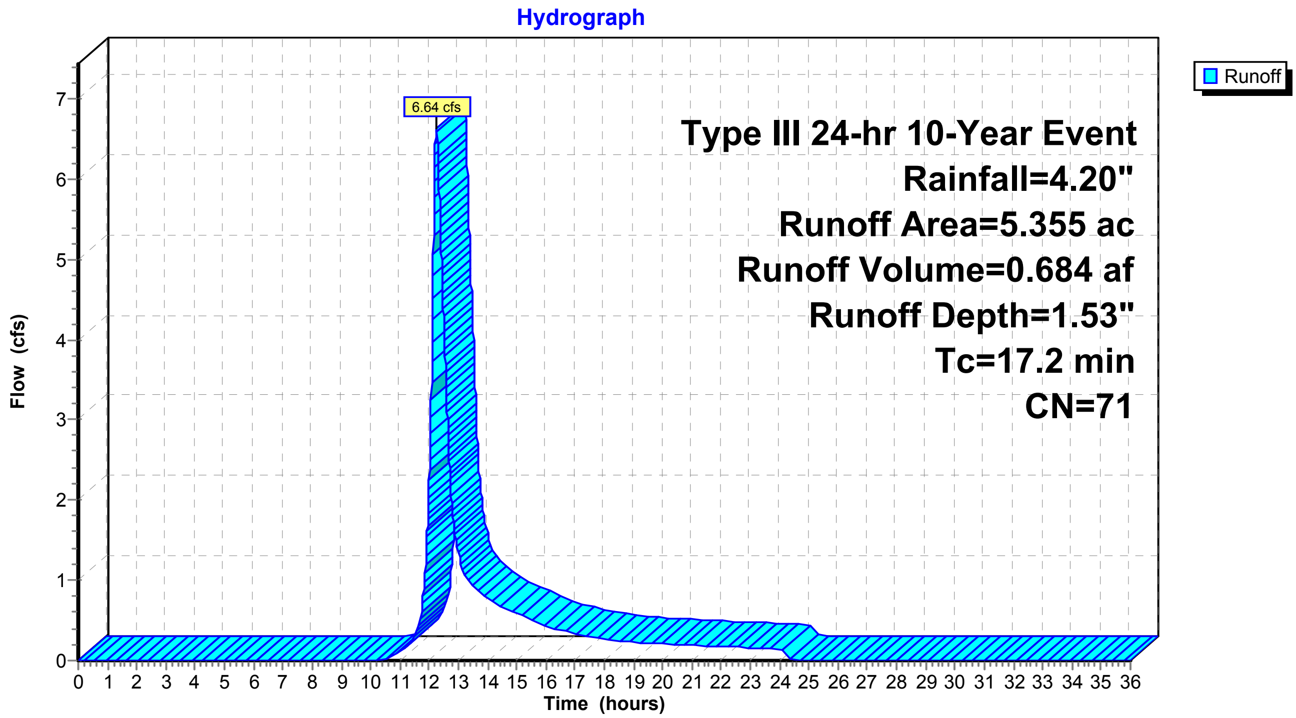
Runoff = 6.64 cfs @ 12.25 hrs, Volume= 0.684 af, Depth= 1.53"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
4.514	70	Woods, Good, HSG C
0.216	89	Gravel roads, HSG C
0.625	71	Meadow, non-grazed, HSG C
5.355	71	Weighted Average
5.355		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.2					**Direct Entry, See spreadsheet**

Subcatchment SC1.7:



Summary for Subcatchment SC1.8:

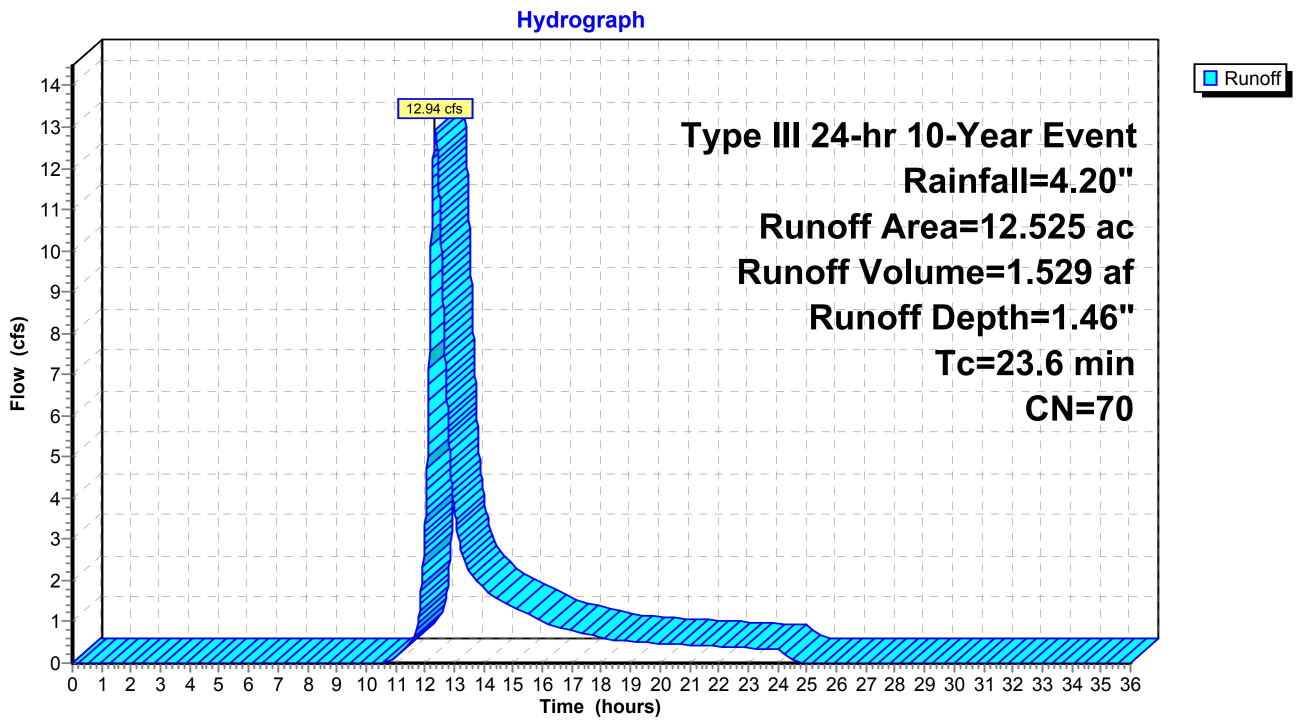
Runoff = 12.94 cfs @ 12.35 hrs, Volume= 1.529 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
11.358	70	Woods, Good, HSG C
1.167	71	Meadow, non-grazed, HSG C
12.525	70	Weighted Average
12.525		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6					**Direct Entry, See spreadsheet**

Subcatchment SC1.8:



Summary for Subcatchment SC1.9:

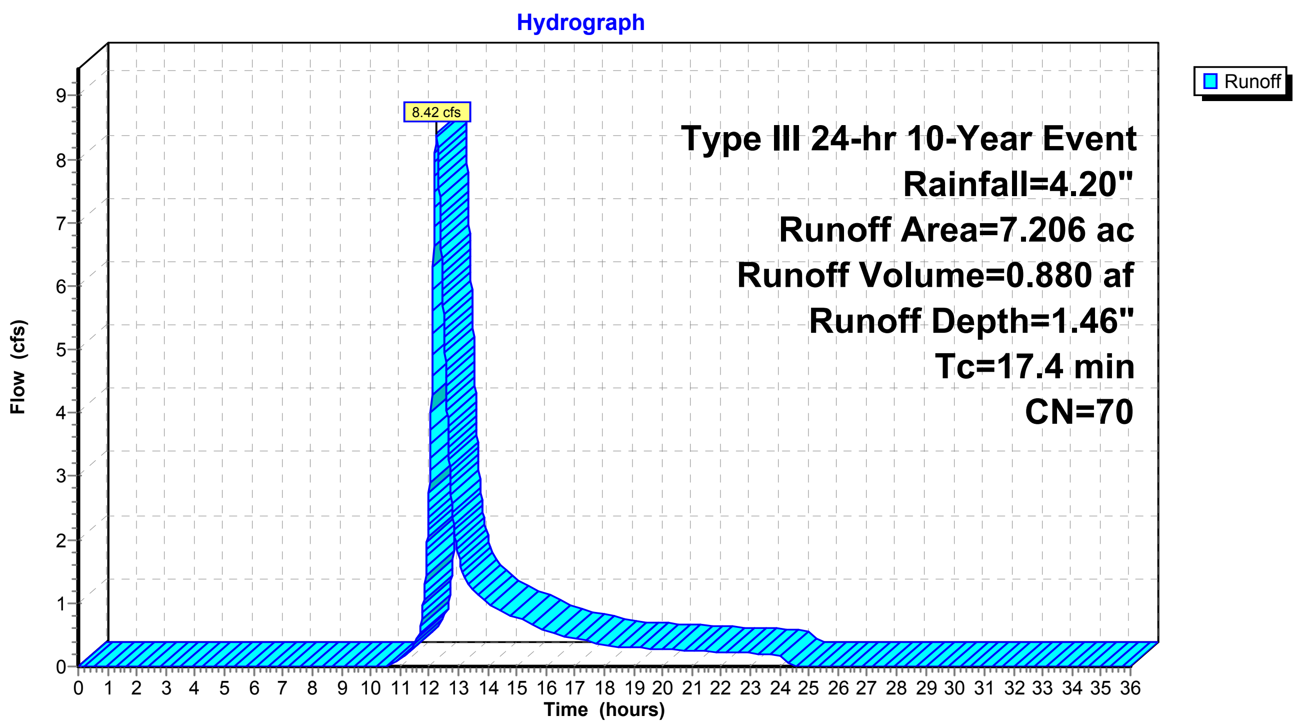
Runoff = 8.42 cfs @ 12.25 hrs, Volume= 0.880 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
6.694	70	Woods, Good, HSG C
0.451	71	Meadow, non-grazed, HSG C
0.061	89	Gravel roads, HSG C
7.206	70	Weighted Average
7.206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, See spreadsheet**

Subcatchment SC1.9:



Summary for Subcatchment SC3.1:

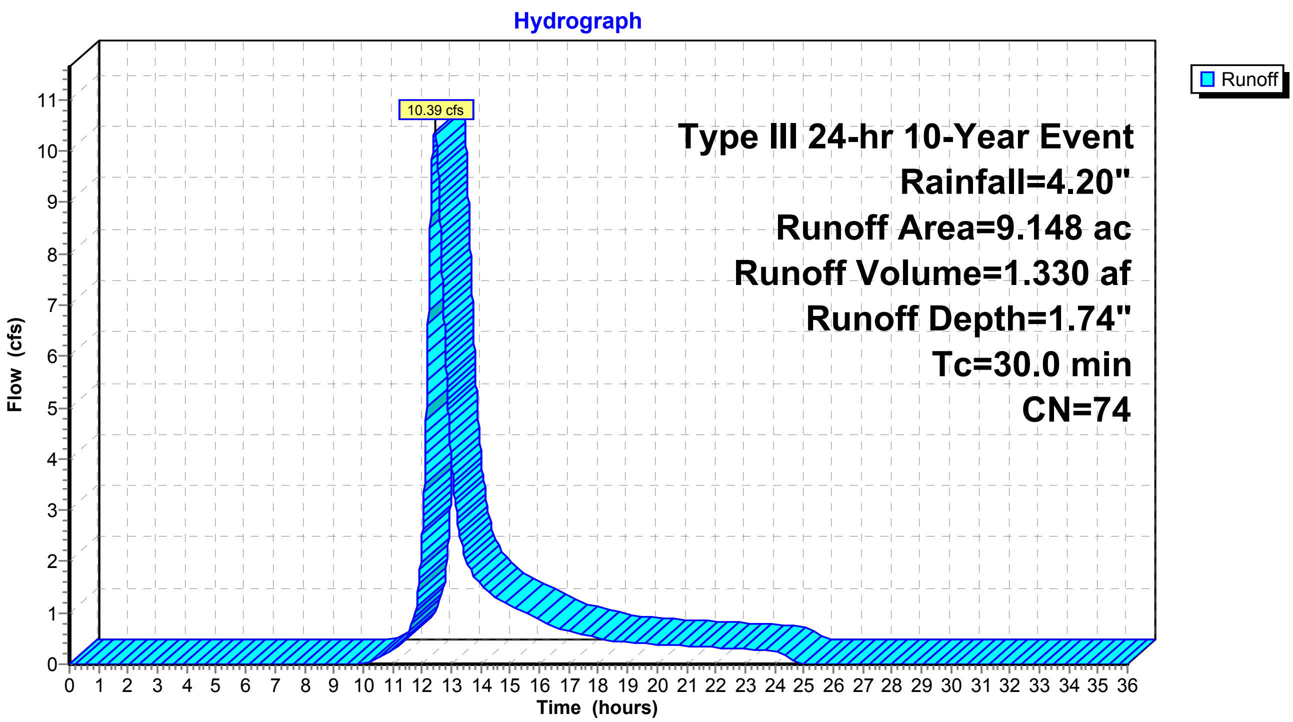
Runoff = 10.39 cfs @ 12.43 hrs, Volume= 1.330 af, Depth= 1.74"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
3.839	70	Woods, Good, HSG C
0.131	89	Gravel roads, HSG C
4.686	77	Woods, Good, HSG D
0.492	78	Meadow, non-grazed, HSG D
9.148	74	Weighted Average
9.148		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry, See spreadsheet**

Subcatchment SC3.1:



Summary for Subcatchment SC3.2:

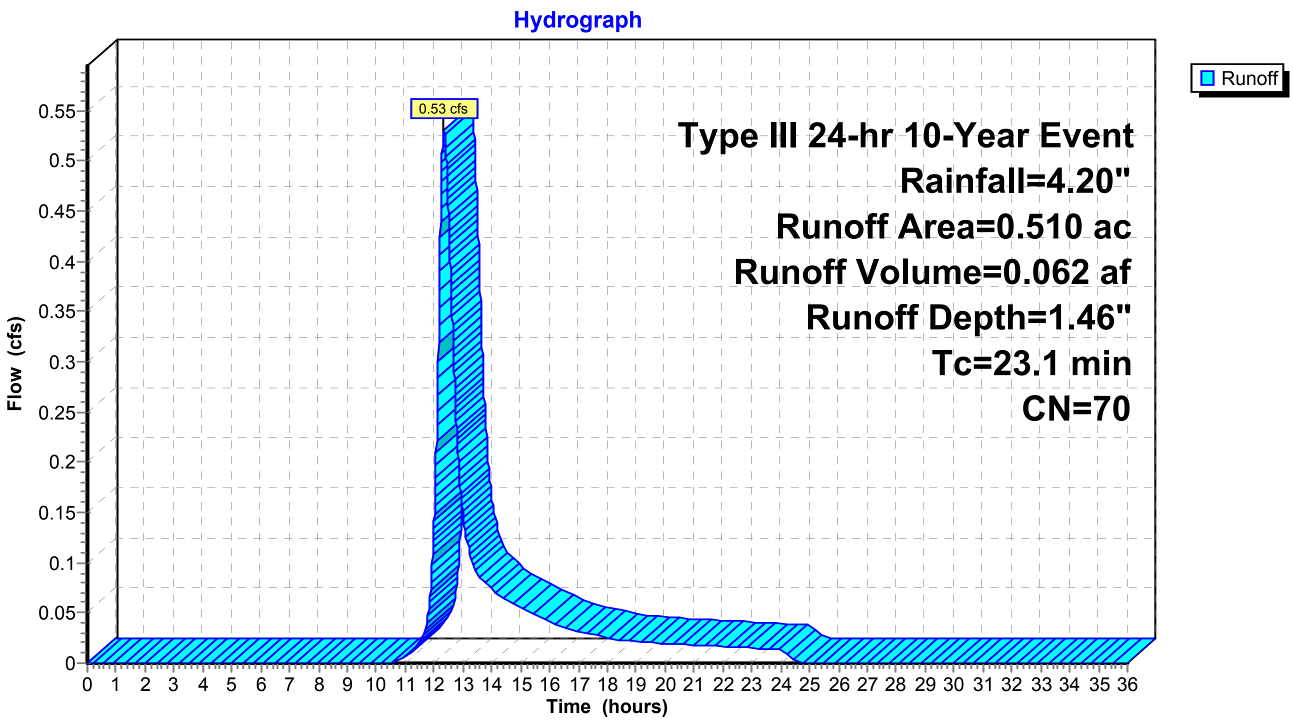
Runoff = 0.53 cfs @ 12.35 hrs, Volume= 0.062 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
0.372	70	Woods, Good, HSG C
0.138	71	Meadow, non-grazed, HSG C
0.510	70	Weighted Average
0.510		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.1					**Direct Entry, See spreadsheet**

Subcatchment SC3.2:



Summary for Subcatchment SC3.3:

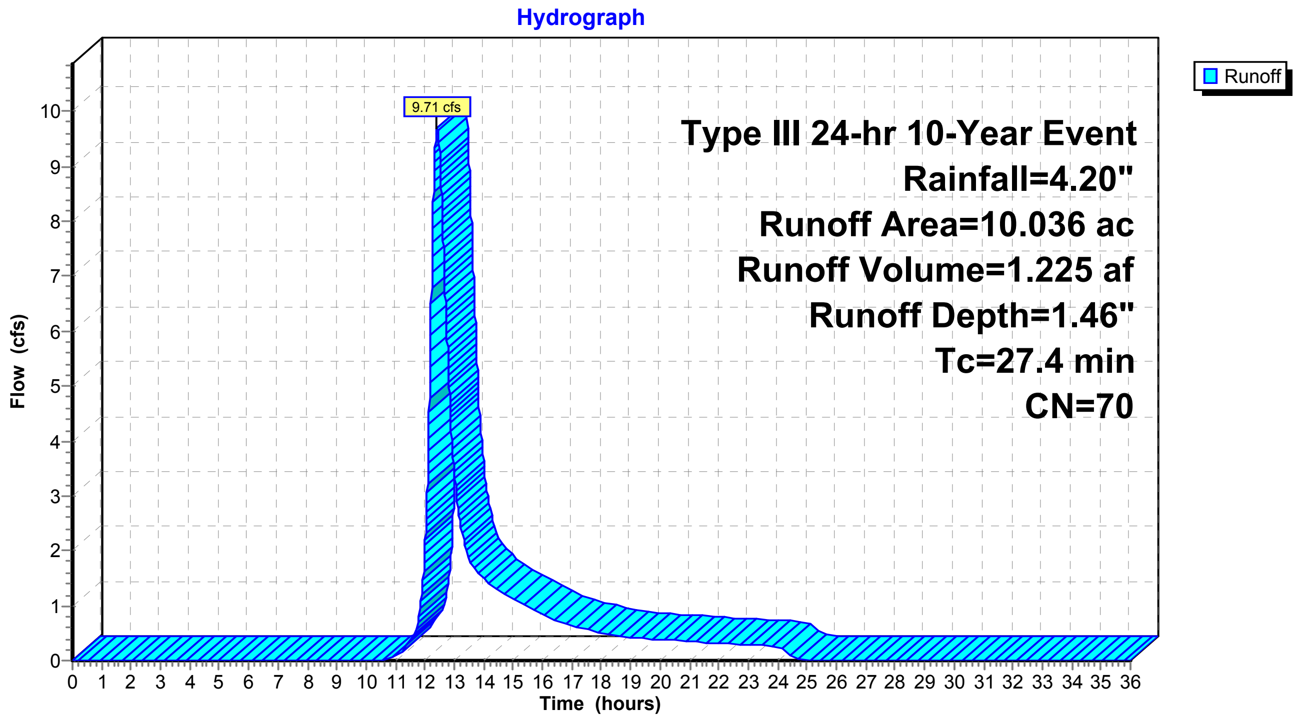
Runoff = 9.71 cfs @ 12.40 hrs, Volume= 1.225 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
8.861	70	Woods, Good, HSG C
1.116	71	Meadow, non-grazed, HSG C
0.059	89	Gravel roads, HSG C
10.036	70	Weighted Average
10.036		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.4					**Direct Entry, See spreadsheet**

Subcatchment SC3.3:



Summary for Subcatchment SC3.4:

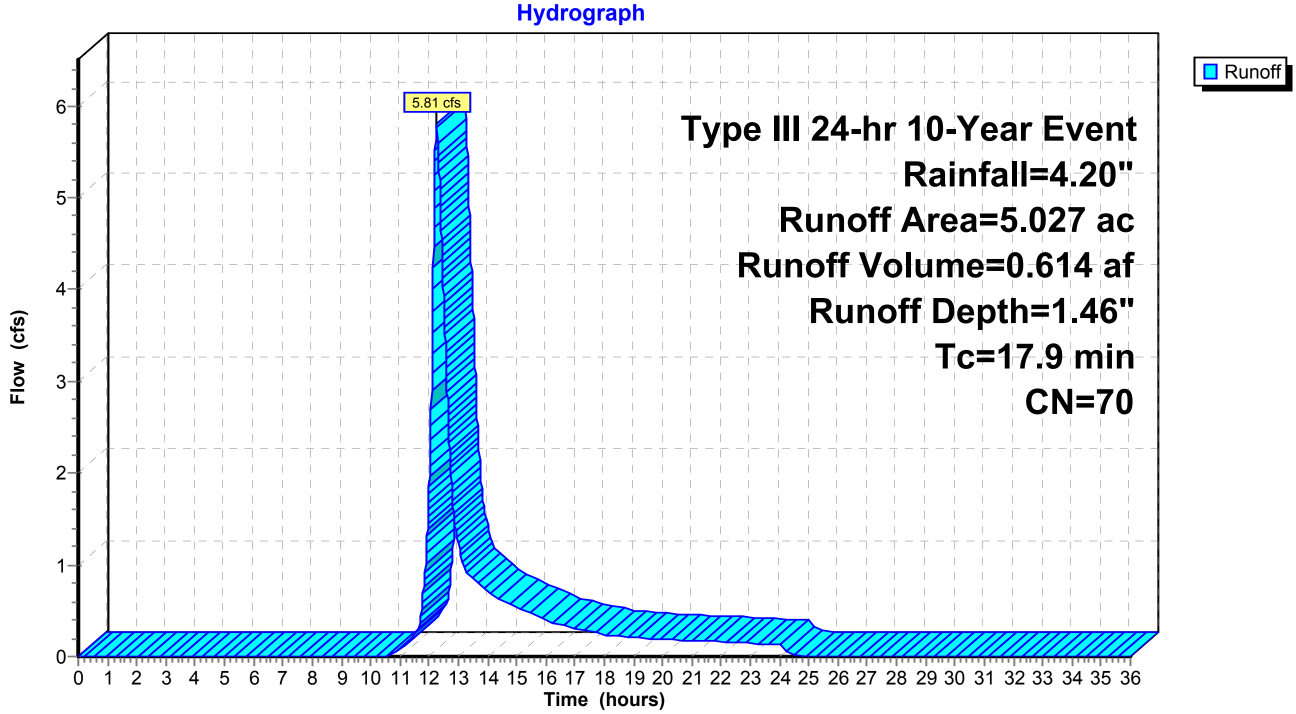
Runoff = 5.81 cfs @ 12.27 hrs, Volume= 0.614 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
4.217	70	Woods, Good, HSG C
0.777	71	Meadow, non-grazed, HSG C
0.033	89	Gravel roads, HSG C
5.027	70	Weighted Average
5.027		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9					**Direct Entry, See spreadsheet**

Subcatchment SC3.4:



Summary for Subcatchment SC3.5:

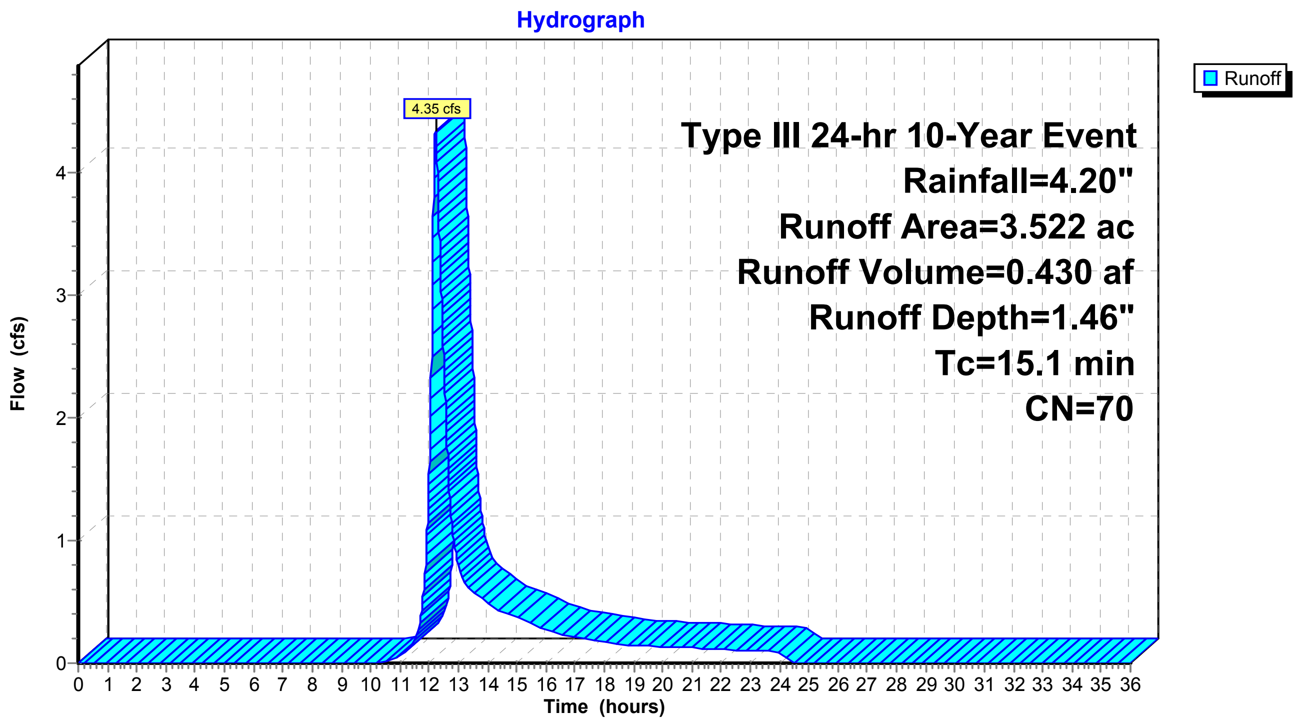
Runoff = 4.35 cfs @ 12.22 hrs, Volume= 0.430 af, Depth= 1.46"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 10-Year Event Rainfall=4.20"

Area (ac)	CN	Description
3.089	70	Woods, Good, HSG C
0.433	71	Meadow, non-grazed, HSG C
3.522	70	Weighted Average
3.522		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.1					**Direct Entry, See spreadsheet**

Subcatchment SC3.5:



Summary for Reach 1.1R:

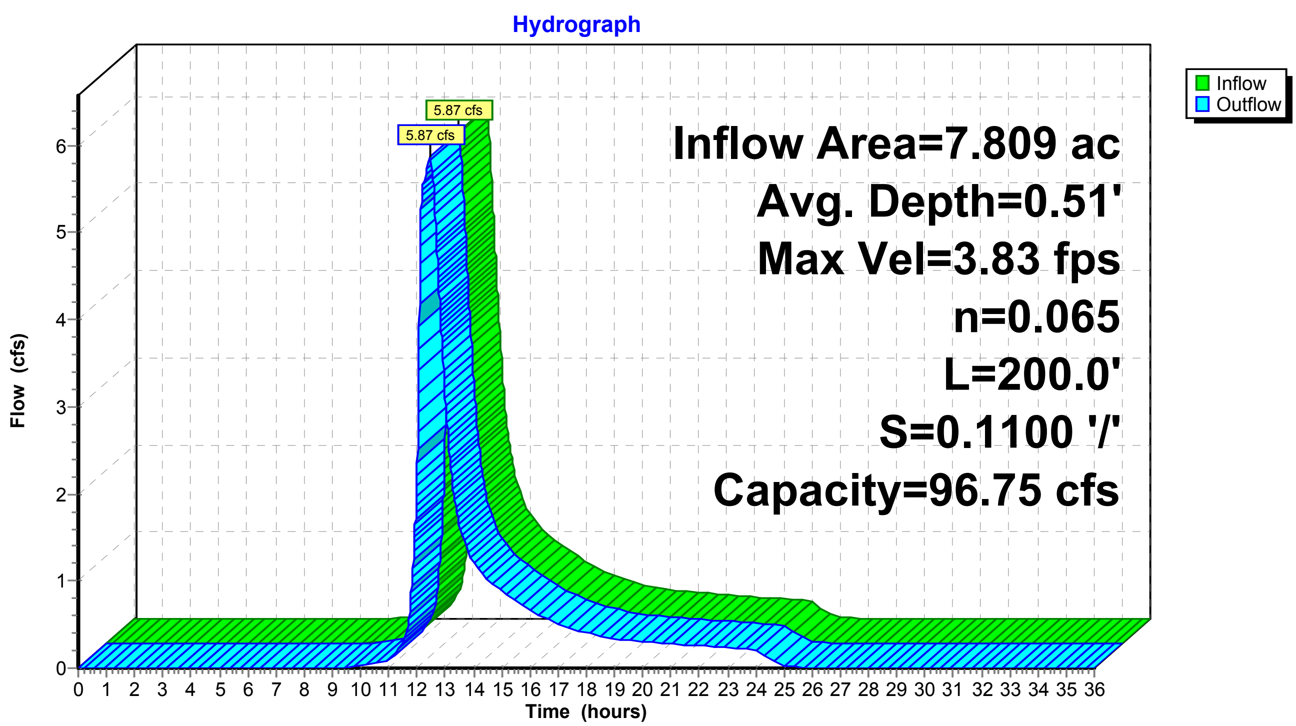
Inflow Area = 7.809 ac, 5.17% Impervious, Inflow Depth = 1.51" for 10-Year Event event
Inflow = 5.87 cfs @ 12.44 hrs, Volume= 0.984 af
Outflow = 5.87 cfs @ 12.45 hrs, Volume= 0.984 af, Atten= 0%, Lag= 0.6 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 3.83 fps, Min. Travel Time= 0.9 min
Avg. Velocity = 1.46 fps, Avg. Travel Time= 2.3 min

Peak Storage= 306 cf @ 12.45 hrs, Average Depth at Peak Storage= 0.51'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 96.75 cfs

2.00' x 2.00' deep channel, n= 0.065
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 200.0' Slope= 0.1100 '/'
Inlet Invert= 1,064.00', Outlet Invert= 1,042.00'

Reach 1.1R:



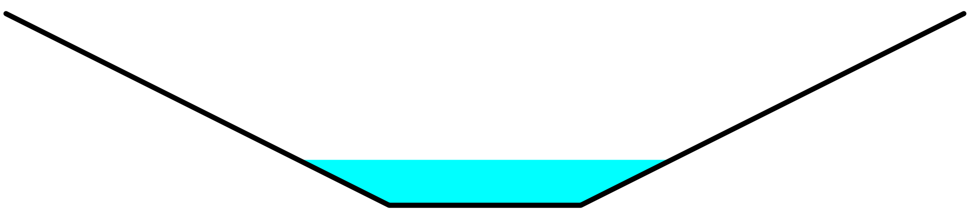
Summary for Reach 1.2R:

Inflow Area = 5.614 ac, 4.42% Impervious, Inflow Depth = 1.57" for 10-Year Event event
Inflow = 4.48 cfs @ 12.49 hrs, Volume= 0.735 af
Outflow = 4.44 cfs @ 12.53 hrs, Volume= 0.735 af, Atten= 1%, Lag= 2.3 min

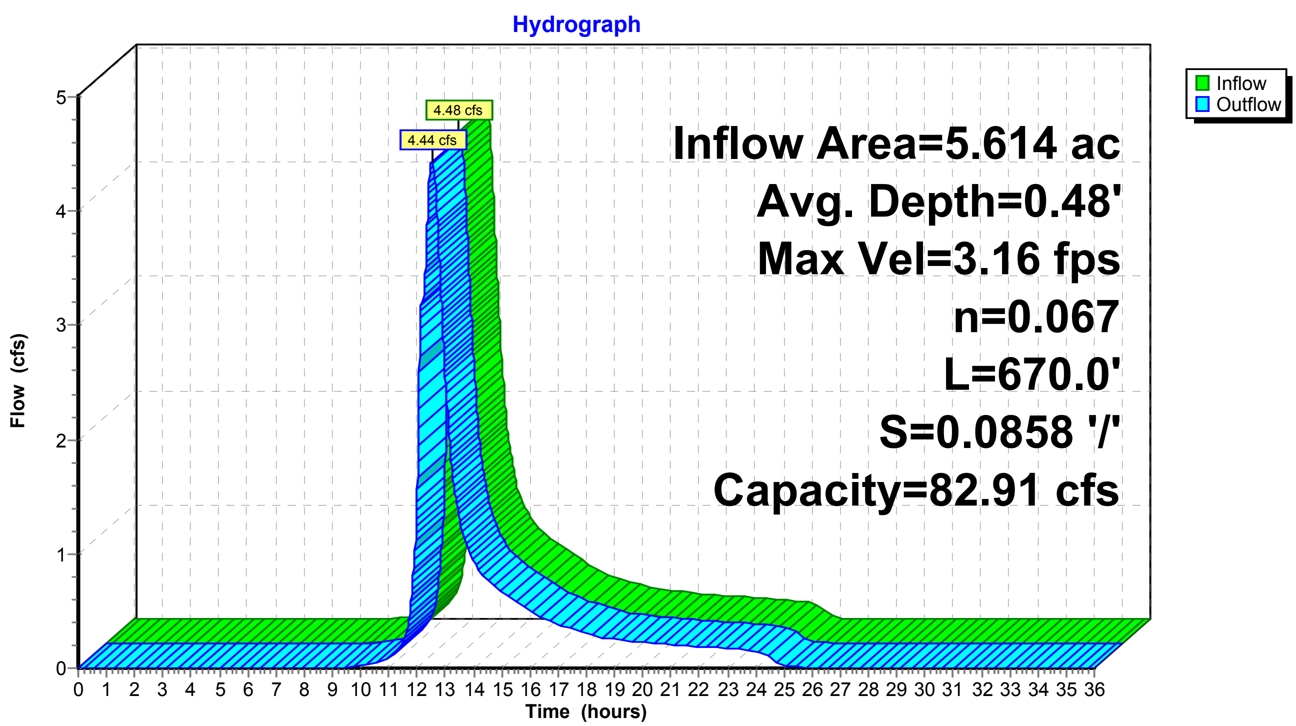
Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 3.16 fps, Min. Travel Time= 3.5 min
Avg. Velocity = 1.22 fps, Avg. Travel Time= 9.1 min

Peak Storage= 939 cf @ 12.53 hrs, Average Depth at Peak Storage= 0.48'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 82.91 cfs

2.00' x 2.00' deep channel, n= 0.067
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 670.0' Slope= 0.0858 '/'
Inlet Invert= 1,121.50', Outlet Invert= 1,064.00'



Reach 1.2R:



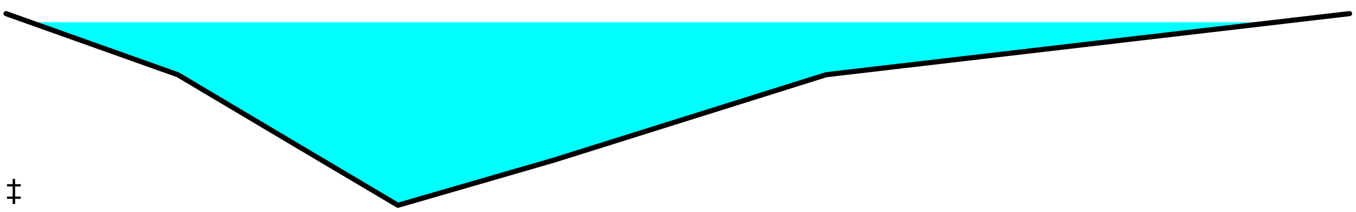
Summary for Reach 1.3R: Stream at Culvert Inlet

Inflow Area = 46.612 ac, 0.00% Impervious, Inflow Depth = 1.47" for 10-Year Event event
Inflow = 43.18 cfs @ 12.45 hrs, Volume= 5.720 af
Outflow = 42.99 cfs @ 12.46 hrs, Volume= 5.720 af, Atten= 0%, Lag= 1.0 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 5.87 fps, Min. Travel Time= 1.7 min
Avg. Velocity = 2.20 fps, Avg. Travel Time= 4.5 min

Peak Storage= 4,393 cf @ 12.46 hrs, Average Depth at Peak Storage= 1.14'
Defined Flood Depth= 3.00', Capacity at Flood Depth= 277.60 cfs
Bank-Full Depth= 1.19', Capacity at Bank-Full= 49.53 cfs

Custom cross-section, Length= 600.0' Slope= 0.0713 '/' (101 Elevation Intervals)
Constant n= 0.040 Mountain streams
Inlet Invert= 1,242.00', Outlet Invert= 1,199.19'

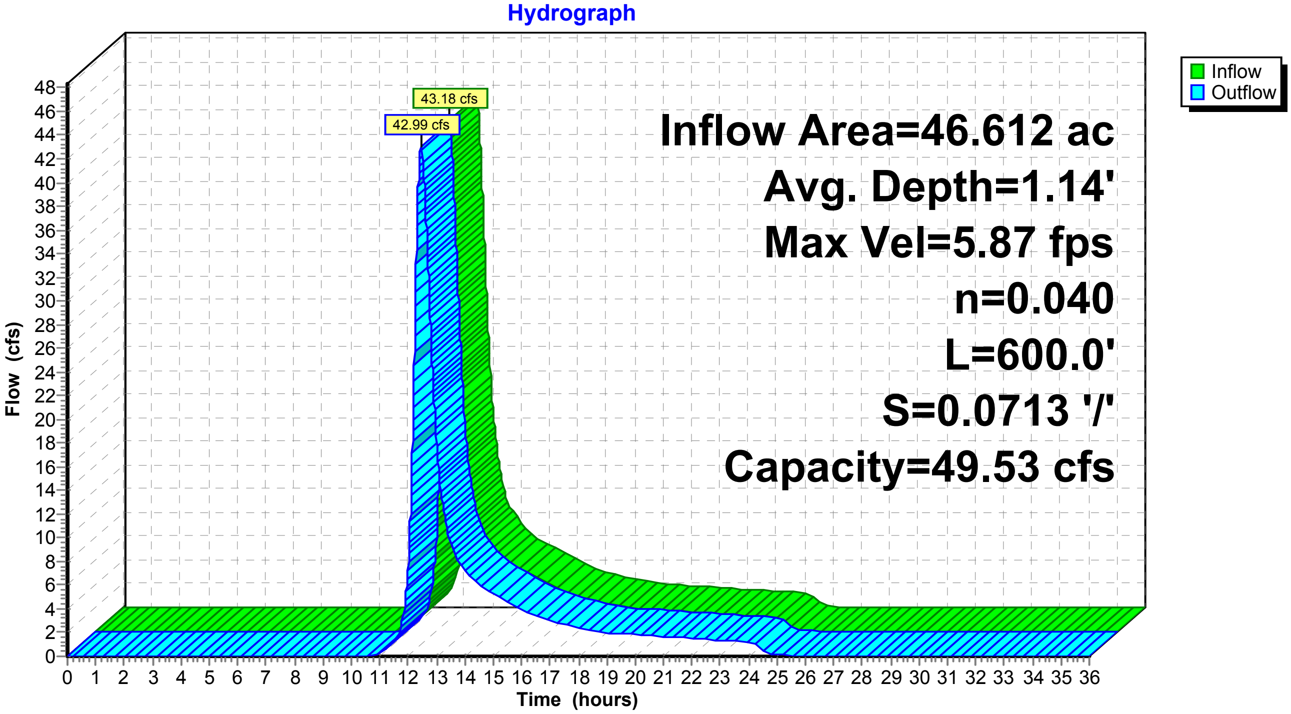


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	1,200.38	0.00
2.19	1,200.00	0.38
3.65	1,199.58	0.80
5.00	1,199.19	1.19
6.99	1,199.47	0.91
10.46	1,200.00	0.38
17.14	1,200.38	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.28	0.4	3.0	249	1.09
0.39	0.8	4.1	480	2.65
0.81	3.4	8.4	2,034	18.29
1.19	8.2	17.4	4,931	49.53

Reach 1.3R: Stream at Culvert Inlet



Summary for Reach 1.4R: From Level Spreader

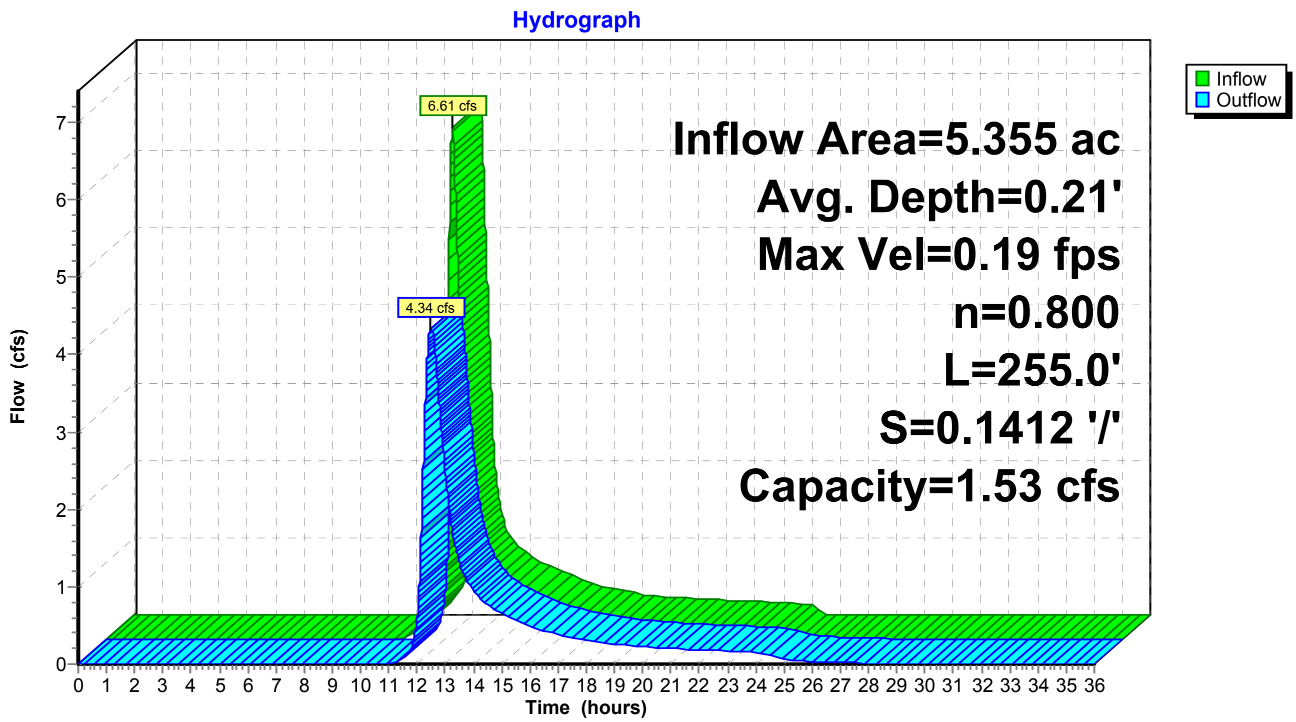
Inflow Area = 5.355 ac, 0.00% Impervious, Inflow Depth = 1.53" for 10-Year Event event
Inflow = 6.61 cfs @ 12.26 hrs, Volume= 0.684 af
Outflow = 4.34 cfs @ 12.50 hrs, Volume= 0.683 af, Atten= 34%, Lag= 14.3 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.19 fps, Min. Travel Time= 22.1 min
Avg. Velocity = 0.05 fps, Avg. Travel Time= 78.7 min

Peak Storage= 5,737 cf @ 12.50 hrs, Average Depth at Peak Storage= 0.21'
Bank-Full Depth= 0.10', Capacity at Bank-Full= 1.53 cfs

100.00' x 0.10' deep channel, n= 0.800
Side Slope Z-value= 50.0 '/' Top Width= 110.00'
Length= 255.0' Slope= 0.1412 '/'
Inlet Invert= 1,258.00', Outlet Invert= 1,222.00'

Reach 1.4R: From Level Spreader



Summary for Reach SP1: Study Point

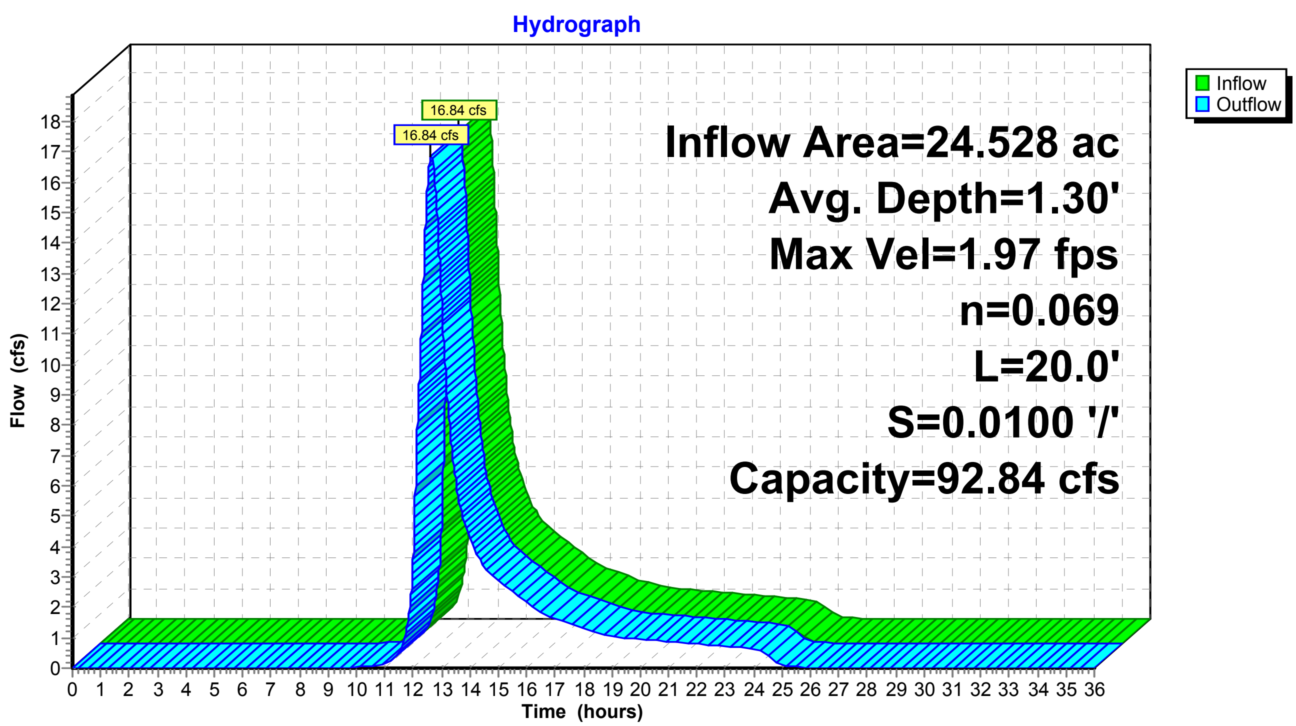
Inflow Area = 24.528 ac, 2.13% Impervious, Inflow Depth = 1.43" for 10-Year Event event
Inflow = 16.84 cfs @ 12.63 hrs, Volume= 2.932 af
Outflow = 16.84 cfs @ 12.64 hrs, Volume= 2.932 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 1.97 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.68 fps, Avg. Travel Time= 0.5 min

Peak Storage= 171 cf @ 12.64 hrs, Average Depth at Peak Storage= 1.30'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 92.84 cfs

4.00' x 3.00' deep channel, n= 0.069
Side Slope Z-value= 2.0 '/' Top Width= 16.00'
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 1,042.00', Outlet Invert= 1,041.80'

Reach SP1: Study Point



Summary for Pond 1P: SD-1

Inflow Area = 16.719 ac, 0.71% Impervious, Inflow Depth = 1.40" for 10-Year Event event
Inflow = 11.79 cfs @ 12.71 hrs, Volume= 1.948 af
Outflow = 11.80 cfs @ 12.72 hrs, Volume= 1.948 af, Atten= 0%, Lag= 0.5 min
Primary = 11.80 cfs @ 12.72 hrs, Volume= 1.948 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,044.26' @ 12.70 hrs Surf.Area= 331 sf Storage= 410 cf
Flood Elev= 1,047.00' Surf.Area= 1,575 sf Storage= 2,345 cf

Plug-Flow detention time= 0.8 min calculated for 1.948 af (100% of inflow)
Center-of-Mass det. time= 0.7 min (898.9 - 898.2)

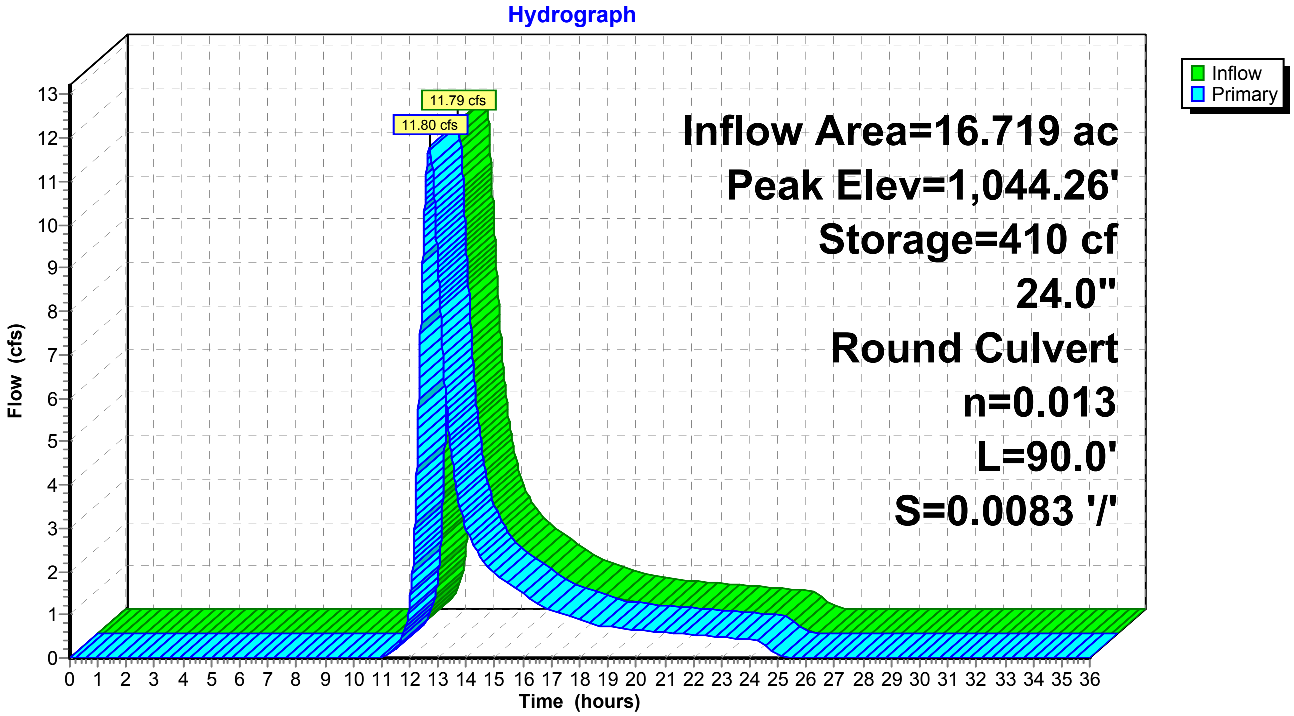
Volume	Invert	Avail.Storage	Storage Description
#1	1,042.00'	2,345 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,042.00	65	35.0	0	0	65
1,044.00	290	70.0	328	328	376
1,046.00	665	105.0	929	1,258	894
1,047.00	1,575	180.0	1,088	2,345	2,601

Device	Routing	Invert	Outlet Devices
#1	Primary	1,042.00'	**24.0" Round SD-1** L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,041.25' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=11.80 cfs @ 12.72 hrs HW=1,044.26' TW=1,043.29' (Dynamic Tailwater)
└─**1=SD-1** (Inlet Controls 11.80 cfs @ 3.75 fps)

Pond 1P: SD-1


Hydrograph
Inflow
Primary
11.79 cfs
11.80 cfs
Inflow Area=16.719 ac
Peak Elev=1,044.26'
Storage=410 cf
24.0"
Round Culvert
n=0.013
L=90.0'
S=0.0083 '/'
Flow (cfs)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Summary for Pond 2P: SD-2

Inflow Area = 1.981 ac, 4.34% Impervious, Inflow Depth = 1.27" for 10-Year Event event
Inflow = 2.05 cfs @ 12.23 hrs, Volume= 0.210 af
Outflow = 2.05 cfs @ 12.23 hrs, Volume= 0.210 af, Atten= 0%, Lag= 0.0 min
Primary = 2.05 cfs @ 12.23 hrs, Volume= 0.210 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,064.88' @ 12.23 hrs Surf.Area= 34 sf Storage= 20 cf

Plug-Flow detention time= 0.3 min calculated for 0.210 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (875.2 - 874.9)

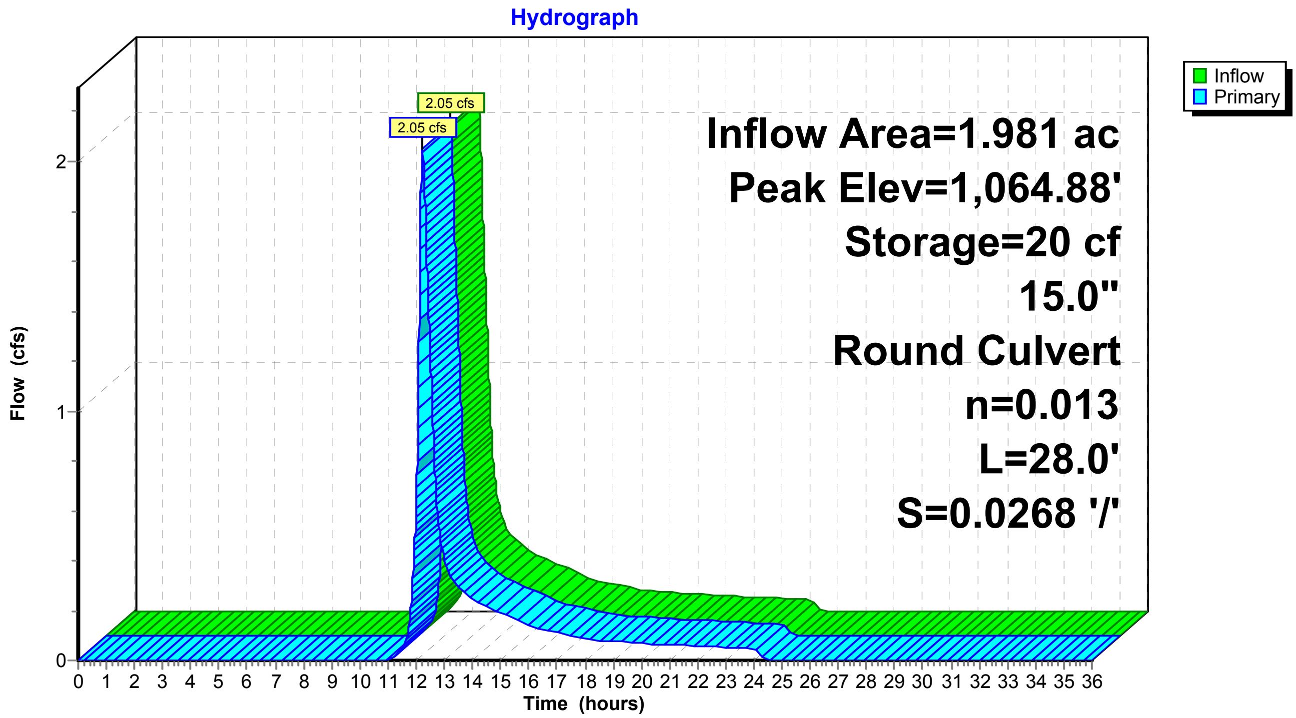
Volume	Invert	Avail.Storage	Storage Description
#1	1,064.00'	195 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,064.00	12	15.0	0	0	12
1,066.00	80	35.0	82	82	106
1,067.00	150	50.0	113	195	216

Device	Routing	Invert	Outlet Devices
#1	Primary	1,064.00'	**15.0" Round SD-2** L= 28.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,063.25' S= 0.0268 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.05 cfs @ 12.23 hrs HW=1,064.88' TW=1,064.49' (Dynamic Tailwater)
↑—**1=SD-2** (Outlet Controls 2.05 cfs @ 3.13 fps)

Pond 2P: SD-2


Hydrograph
Inflow
Primary
2.05 cfs
2.05 cfs
Inflow Area=1.981 ac
Peak Elev=1,064.88'
Storage=20 cf
15.0"
Round Culvert
n=0.013
L=28.0'
S=0.0268 '/'
Flow (cfs)
0
1
2
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Summary for Pond 3P: SD-3

Inflow Area = 4.600 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-Year Event event
Inflow = 3.93 cfs @ 12.53 hrs, Volume= 0.562 af
Outflow = 3.92 cfs @ 12.56 hrs, Volume= 0.562 af, Atten= 0%, Lag= 1.5 min
Primary = 3.92 cfs @ 12.56 hrs, Volume= 0.562 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,123.33' @ 12.56 hrs Surf.Area= 180 sf Storage= 149 cf

Plug-Flow detention time= 0.8 min calculated for 0.561 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (886.1 - 885.3)

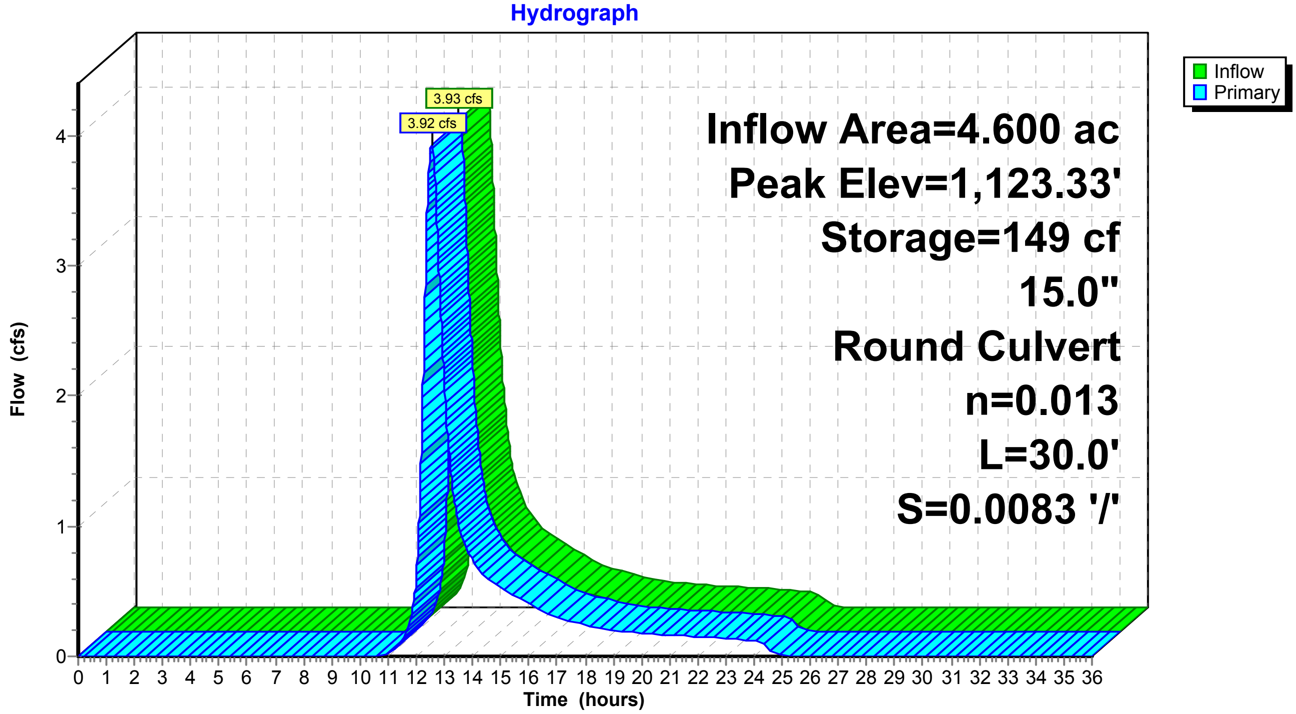
Volume	Invert	Avail.Storage	Storage Description
#1	1,122.00'	666 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,122.00	55	30.0	0	0	55
1,124.00	270	70.0	298	298	389
1,125.00	475	90.0	368	666	656

Device	Routing	Invert	Outlet Devices
#1	Primary	1,122.00'	**15.0" Round SD-3** L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,121.75' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.92 cfs @ 12.56 hrs HW=1,123.33' TW=1,121.97' (Dynamic Tailwater)
↑—**1=SD-3** (Inlet Controls 3.92 cfs @ 3.20 fps)

Pond 3P: SD-3


Hydrograph
Inflow
Primary
3.93 cfs
3.92 cfs
Inflow Area=4.600 ac
Peak Elev=1,123.33'
Storage=149 cf
15.0"
Round Culvert
n=0.013
L=30.0'
S=0.0083 '/'
Flow (cfs)
0
1
2
3
4
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Summary for Pond 4P: Box Culvert

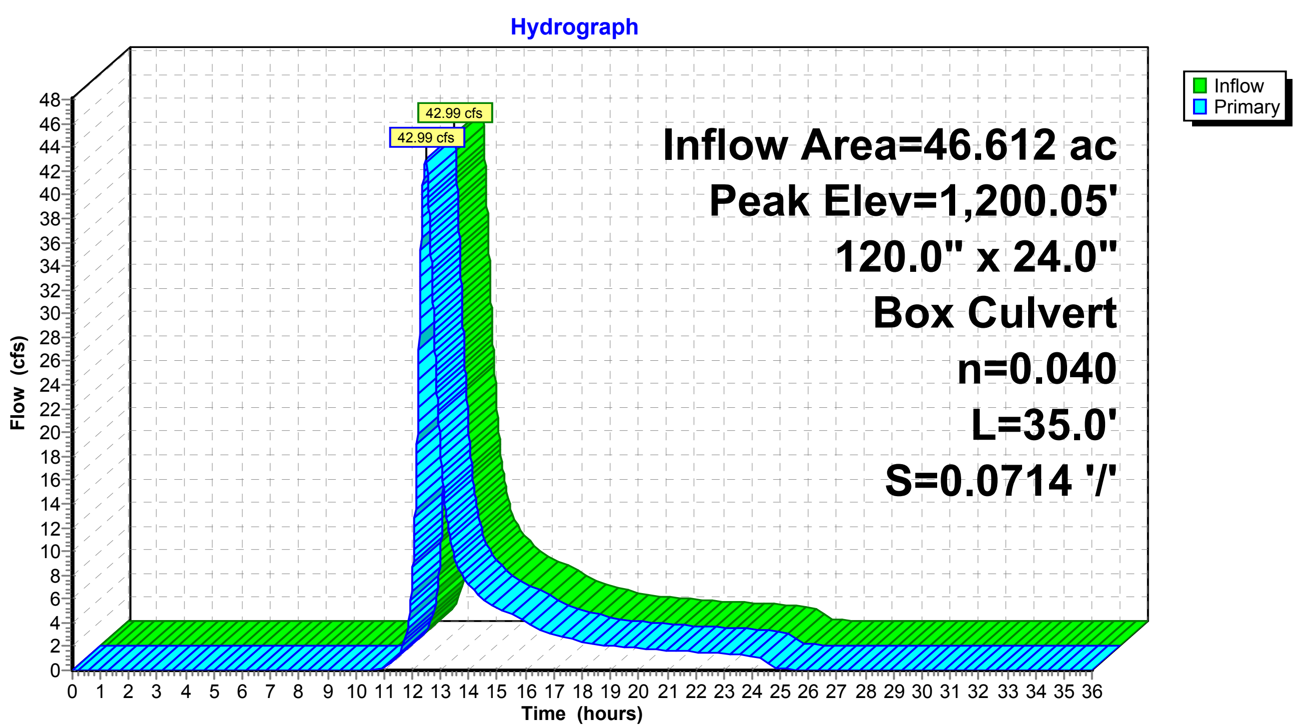
Inflow Area =	46.612 ac,	0.00% Impervious, Inflow Depth =	1.47"	for 10-Year Event event
Inflow =	42.99 cfs @	12.46 hrs, Volume=	5.720 af	
Outflow =	42.99 cfs @	12.46 hrs, Volume=	5.720 af,	Atten= 0%, Lag= 0.0 min
Primary =	42.99 cfs @	12.46 hrs, Volume=	5.720 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,200.05' @ 12.46 hrs
Flood Elev= 1,200.38'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,199.00'	**120.0" W x 24.0" H Box SD-4** L= 35.0' Box, headwall w/3 rounded edges, Ke= 0.200 Outlet Invert= 1,196.50' S= 0.0714 '/' Cc= 0.900 n= 0.040 Mountain streams

Primary OutFlow Max=42.98 cfs @ 12.46 hrs HW=1,200.05' (Free Discharge)
└─**1=SD-4** (Inlet Controls 42.98 cfs @ 4.11 fps)

Pond 4P: Box Culvert



Summary for Pond 5P: SD-5

Inflow Area =	5.355 ac,	0.00% Impervious,	Inflow Depth = 1.53"	for 10-Year Event event	
Inflow =	6.64 cfs @	12.25 hrs,	Volume=	0.684 af	
Outflow =	6.61 cfs @	12.26 hrs,	Volume=	0.684 af,	Atten= 0%, Lag= 0.7 min
Primary =	6.61 cfs @	12.26 hrs,	Volume=	0.684 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,263.72' @ 12.26 hrs Surf.Area= 154 sf Storage= 124 cf
Flood Elev= 1,266.00' Surf.Area= 525 sf Storage= 859 cf

Plug-Flow detention time= 0.3 min calculated for 0.684 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (865.4 - 865.1)

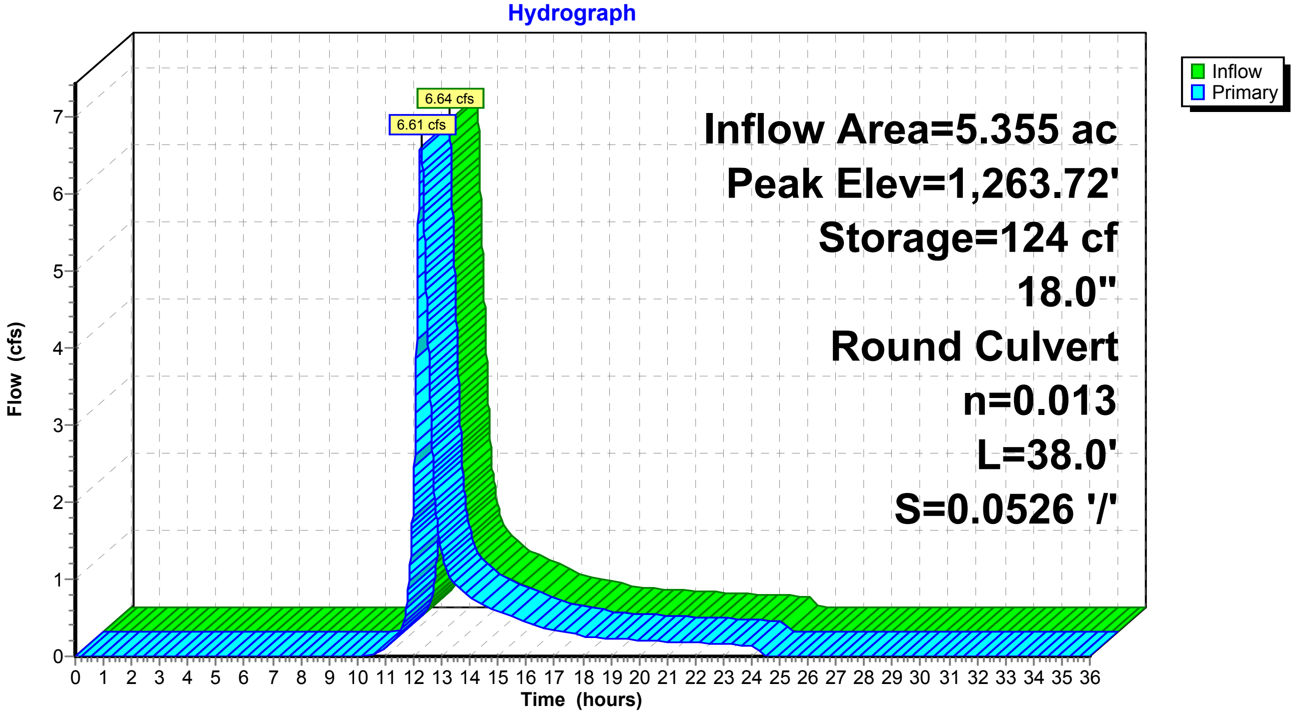
Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	859 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,262.00	15	15.0	0	0	15
1,264.00	190	60.0	172	172	294
1,266.00	525	100.0	687	859	828

Device	Routing	Invert	Outlet Devices
#1	Primary	1,262.00'	**18.0" Round SD-5** L= 38.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,260.00' S= 0.0526 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=6.61 cfs @ 12.26 hrs HW=1,263.72' TW=1,258.16' (Dynamic Tailwater)
└**1=SD-5** (Inlet Controls 6.61 cfs @ 3.74 fps)

Pond 5P: SD-5


Hydrograph
Inflow
Primary
6.64 cfs
6.61 cfs
Inflow Area=5.355 ac
Peak Elev=1,263.72'
Storage=124 cf
18.0"
Round Culvert
n=0.013
L=38.0'
S=0.0526 '/'
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36

Summary for Pond 6P: SD-6

Inflow Area =	12.525 ac,	0.00% Impervious,	Inflow Depth = 1.46"	for 10-Year Event event	
Inflow =	12.94 cfs @	12.35 hrs,	Volume=	1.529 af	
Outflow =	12.61 cfs @	12.40 hrs,	Volume=	1.529 af,	Atten= 3%, Lag= 3.2 min
Primary =	12.61 cfs @	12.40 hrs,	Volume=	1.529 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,424.12' @ 12.40 hrs Surf.Area= 1,219 sf Storage= 1,108 cf

Plug-Flow detention time= 1.1 min calculated for 1.529 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (875.0 - 873.9)

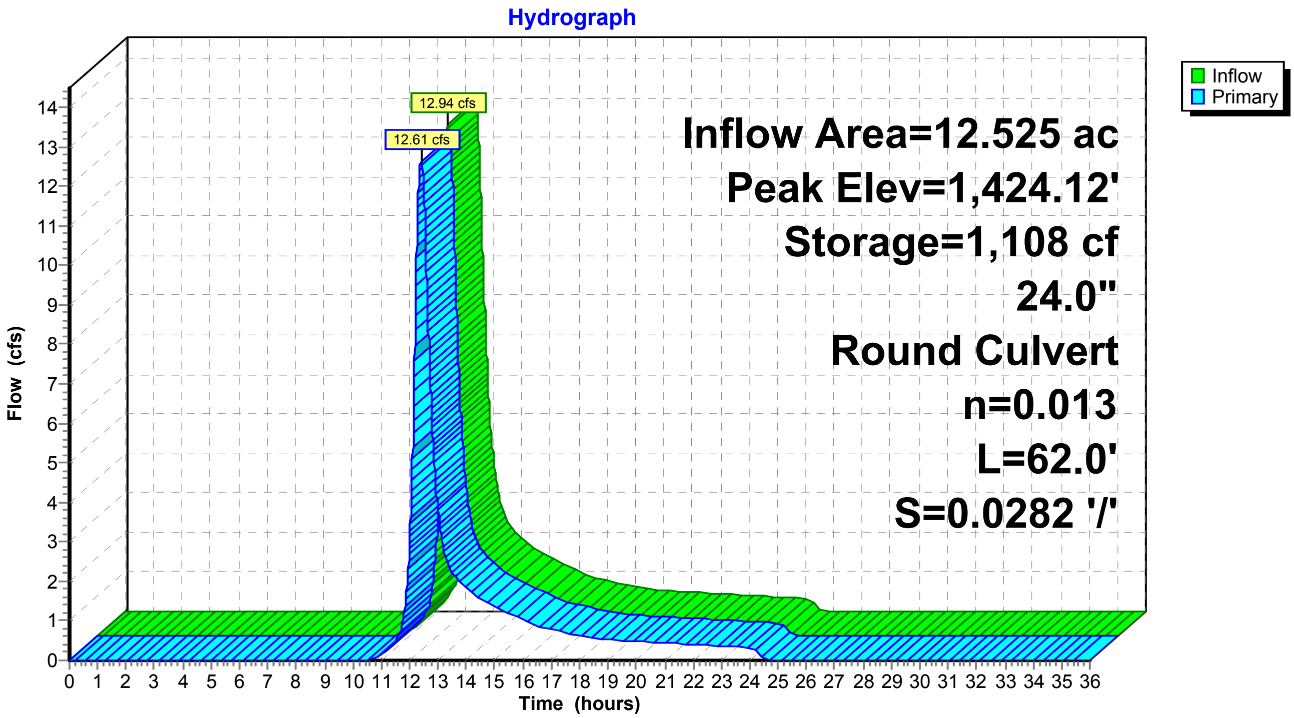
Volume	Invert	Avail.Storage	Storage Description
#1	1,422.00'	5,794 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,422.00	75	55.0	0	0	75
1,424.00	1,100	390.0	975	975	11,946
1,426.00	4,025	975.0	4,819	5,794	75,506

Device	Routing	Invert	Outlet Devices
#1	Primary	1,422.00'	**24.0" Round SD-6** L= 62.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,420.25' S= 0.0282 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=12.61 cfs @ 12.40 hrs HW=1,424.11' (Free Discharge)
└─**1=SD-6** (Inlet Controls 12.61 cfs @ 4.01 fps)

Pond 6P: SD-6


Hydrograph
Inflow
Primary
12.94 cfs
12.61 cfs
Inflow Area=12.525 ac
Peak Elev=1,424.12'
Storage=1,108 cf
24.0"
Round Culvert
n=0.013
L=62.0'
S=0.0282 '/'
Flow (cfs)
Time (hours)

Summary for Pond 7P: SD-7-11

Inflow Area = 7.206 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-Year Event event
Inflow = 8.42 cfs @ 12.25 hrs, Volume= 0.880 af
Outflow = 8.42 cfs @ 12.25 hrs, Volume= 0.880 af, Atten= 0%, Lag= 0.0 min
Primary = 8.42 cfs @ 12.25 hrs, Volume= 0.880 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,453.82' @ 12.25 hrs Surf.Area= 46 sf Storage= 24 cf

Plug-Flow detention time= 0.2 min calculated for 0.880 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (868.2 - 868.1)

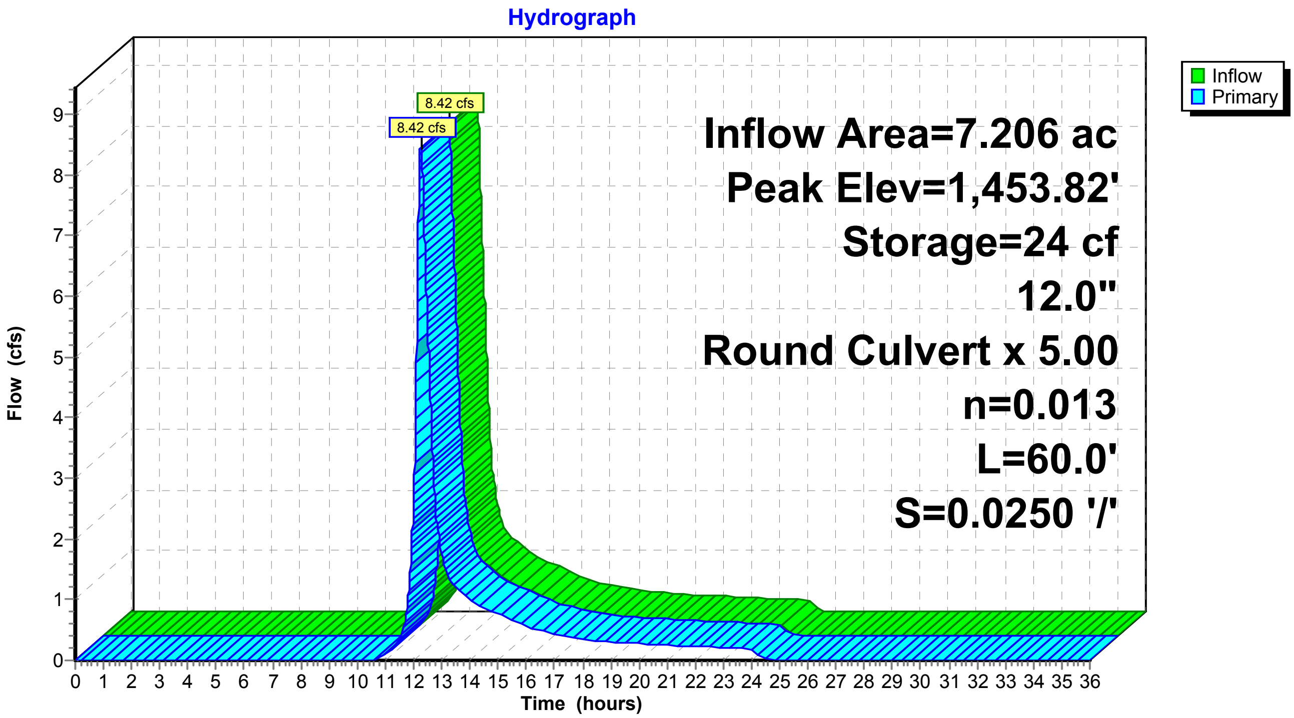
Volume	Invert	Avail.Storage	Storage Description
#1	1,453.00'	273 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,453.00	15	15.0	0	0	15
1,454.00	55	30.0	33	33	73
1,456.00	200	60.0	240	273	306

Device	Routing	Invert	Outlet Devices
#1	Primary	1,453.00'	**12.0" Round SD-7 X 5.00** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,451.50' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=8.42 cfs @ 12.25 hrs HW=1,453.82' (Free Discharge)
↑—**1=SD-7** (Inlet Controls 8.42 cfs @ 2.44 fps)

Pond 7P: SD-7-11



Summary for Pond 8P: SD-12-15

Inflow Area = 8.557 ac, 0.00% Impervious, Inflow Depth = 1.53" for 10-Year Event event
Inflow = 9.63 cfs @ 12.33 hrs, Volume= 1.093 af
Outflow = 9.62 cfs @ 12.33 hrs, Volume= 1.093 af, Atten= 0%, Lag= 0.1 min
Primary = 9.62 cfs @ 12.33 hrs, Volume= 1.093 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,558.65' @ 12.33 hrs Surf.Area= 54 sf Storage= 30 cf

Plug-Flow detention time= 0.1 min calculated for 1.093 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (869.4 - 869.4)

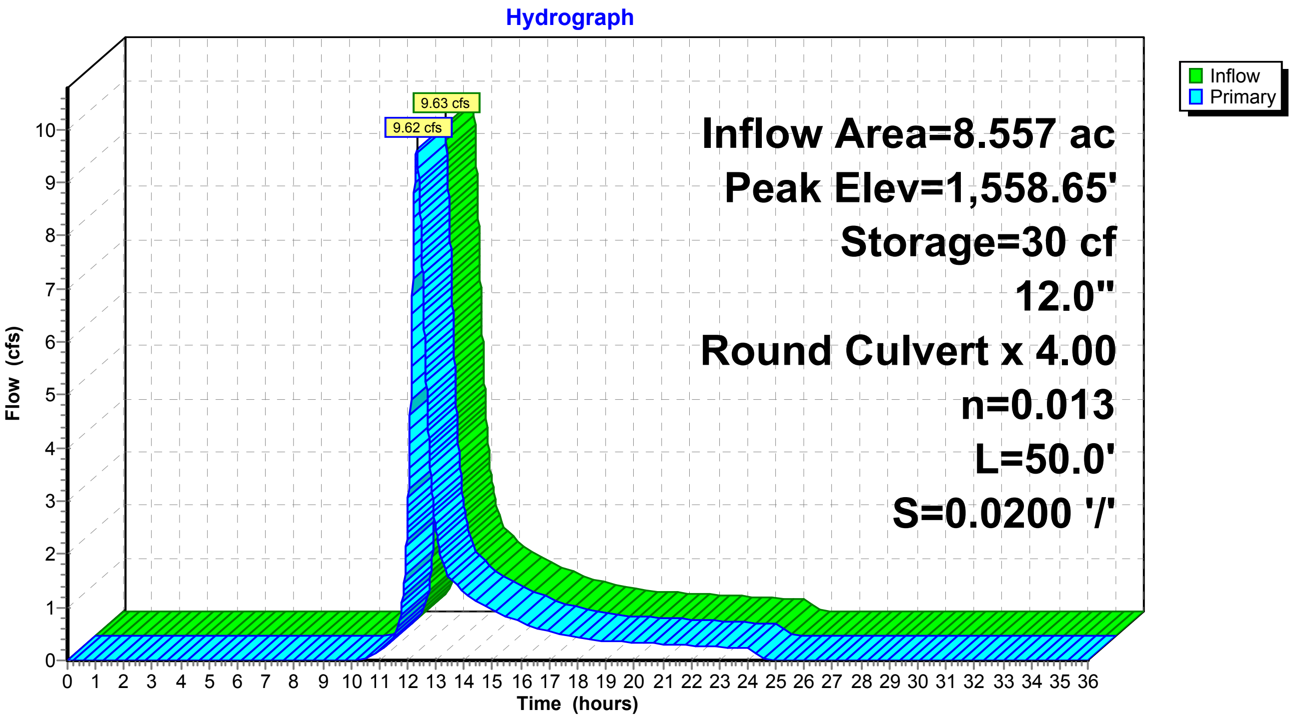
Volume	Invert	Avail.Storage	Storage Description
#1	1,557.50'	798 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,557.50	10	10.0	0	0	10
1,558.00	20	18.0	7	7	29
1,560.00	175	55.0	169	177	256
1,562.00	470	85.0	621	798	619

Device	Routing	Invert	Outlet Devices
#1	Primary	1,557.50'	**12.0" Round SD-12 X 4.00** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,556.50' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=9.62 cfs @ 12.33 hrs HW=1,558.65' (Free Discharge)
└─**1=SD-12** (Inlet Controls 9.62 cfs @ 3.06 fps)

Pond 8P: SD-12-15



Summary for Pond 9P: SD-16

Inflow Area = 5.297 ac, 0.00% Impervious, Inflow Depth = 1.53" for 10-Year Event event
Inflow = 5.40 cfs @ 12.40 hrs, Volume= 0.677 af
Outflow = 5.40 cfs @ 12.42 hrs, Volume= 0.677 af, Atten= 0%, Lag= 1.1 min
Primary = 5.40 cfs @ 12.42 hrs, Volume= 0.677 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,603.96' @ 12.42 hrs Surf.Area= 88 sf Storage= 83 cf
Flood Elev= 1,606.00' Surf.Area= 210 sf Storage= 378 cf

Plug-Flow detention time= 0.2 min calculated for 0.676 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (874.8 - 874.6)

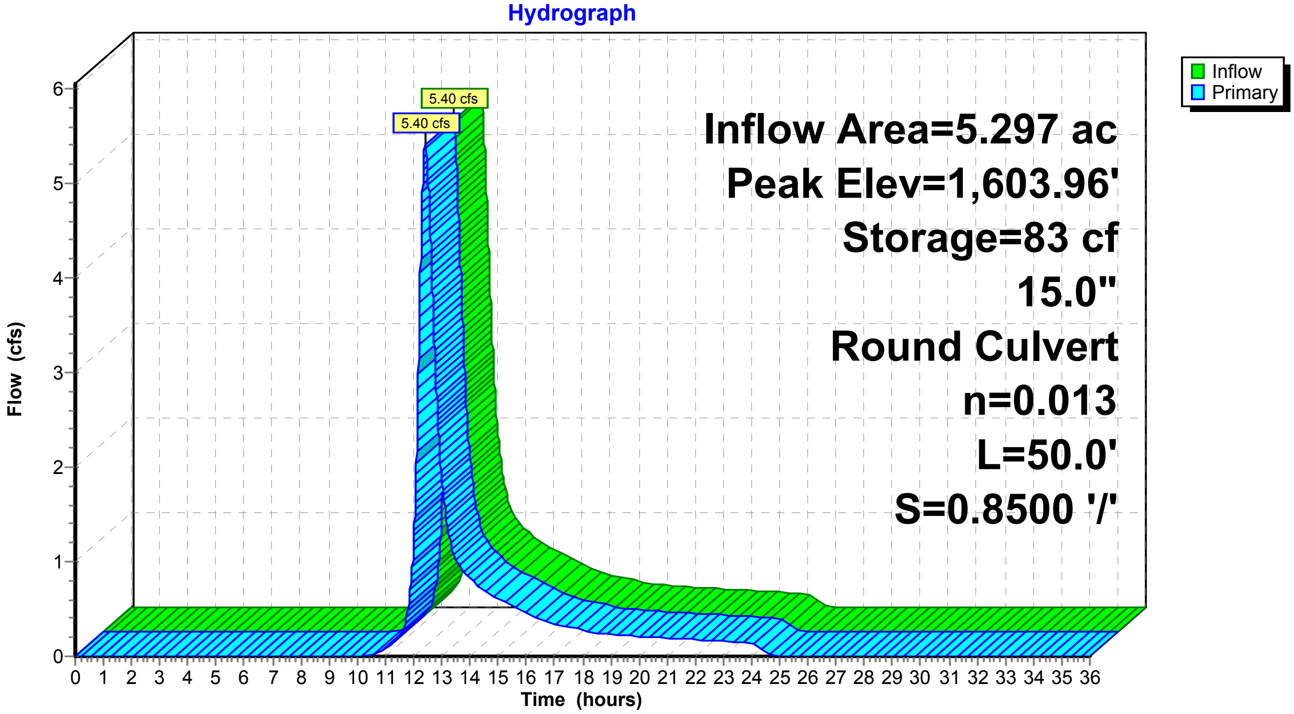
Volume	Invert	Avail.Storage	Storage Description
#1	1,602.00'	378 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,602.00	10	12.0	0	0	10
1,604.00	90	40.0	87	87	137
1,606.00	210	65.0	292	378	371

Device	Routing	Invert	Outlet Devices
#1	Primary	1,602.00'	**15.0" Round SD-16** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,559.50' S= 0.8500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=5.40 cfs @ 12.42 hrs HW=1,603.96' (Free Discharge)
└─**1=SD-16** (Inlet Controls 5.40 cfs @ 4.40 fps)

Pond 9P: SD-16


Hydrograph
Inflow
Primary
5.40 cfs
5.40 cfs
Inflow Area=5.297 ac
Peak Elev=1,603.96'
Storage=83 cf
15.0"
Round Culvert
n=0.013
L=50.0'
S=0.8500 '/'
Flow (cfs)
0
1
2
3
4
5
6
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Summary for Pond 10P: SD-17

Inflow Area = 1.538 ac, 0.00% Impervious, Inflow Depth = 1.53" for 10-Year Event event
Inflow = 1.54 cfs @ 12.43 hrs, Volume= 0.196 af
Outflow = 1.54 cfs @ 12.43 hrs, Volume= 0.196 af, Atten= 0%, Lag= 0.2 min
Primary = 1.54 cfs @ 12.43 hrs, Volume= 0.196 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,675.69' @ 12.43 hrs Surf.Area= 43 sf Storage= 17 cf

Plug-Flow detention time= 0.3 min calculated for 0.196 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (875.9 - 875.7)

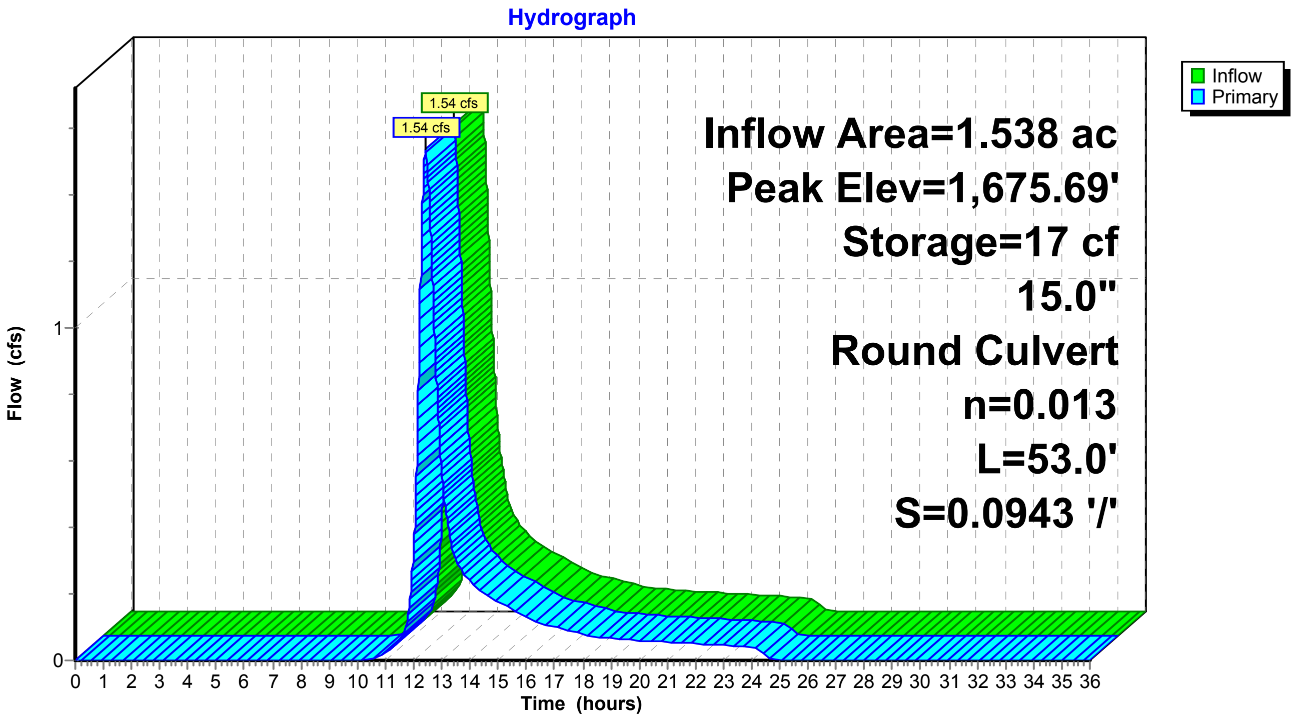
Volume	Invert	Avail.Storage	Storage Description
#1	1,675.00'	295 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,675.00	10	10.0	0	0	10
1,676.00	65	35.0	33	33	102
1,678.00	210	60.0	261	295	314

Device	Routing	Invert	Outlet Devices
#1	Primary	1,675.00'	**15.0" Round SD-17** L= 53.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,670.00' S= 0.0943 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.54 cfs @ 12.43 hrs HW=1,675.69' (Free Discharge)
1=SD-17 (Inlet Controls 1.54 cfs @ 2.23 fps)

Pond 10P: SD-17



Summary for Pond 11P: SD-18

Inflow Area =	9.148 ac,	0.00% Impervious, Inflow Depth = 1.74" for 10-Year Event event			
Inflow =	10.39 cfs @	12.43 hrs,	Volume=	1.330 af	
Outflow =	9.81 cfs @	12.53 hrs,	Volume=	1.330 af,	Atten= 6%, Lag= 5.9 min
Primary =	9.81 cfs @	12.53 hrs,	Volume=	1.330 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,639.36' @ 12.53 hrs Surf.Area= 4,572 sf Storage= 3,794 cf

Plug-Flow detention time= 10.3 min calculated for 1.330 af (100% of inflow)
Center-of-Mass det. time= 10.2 min (878.8 - 868.6)

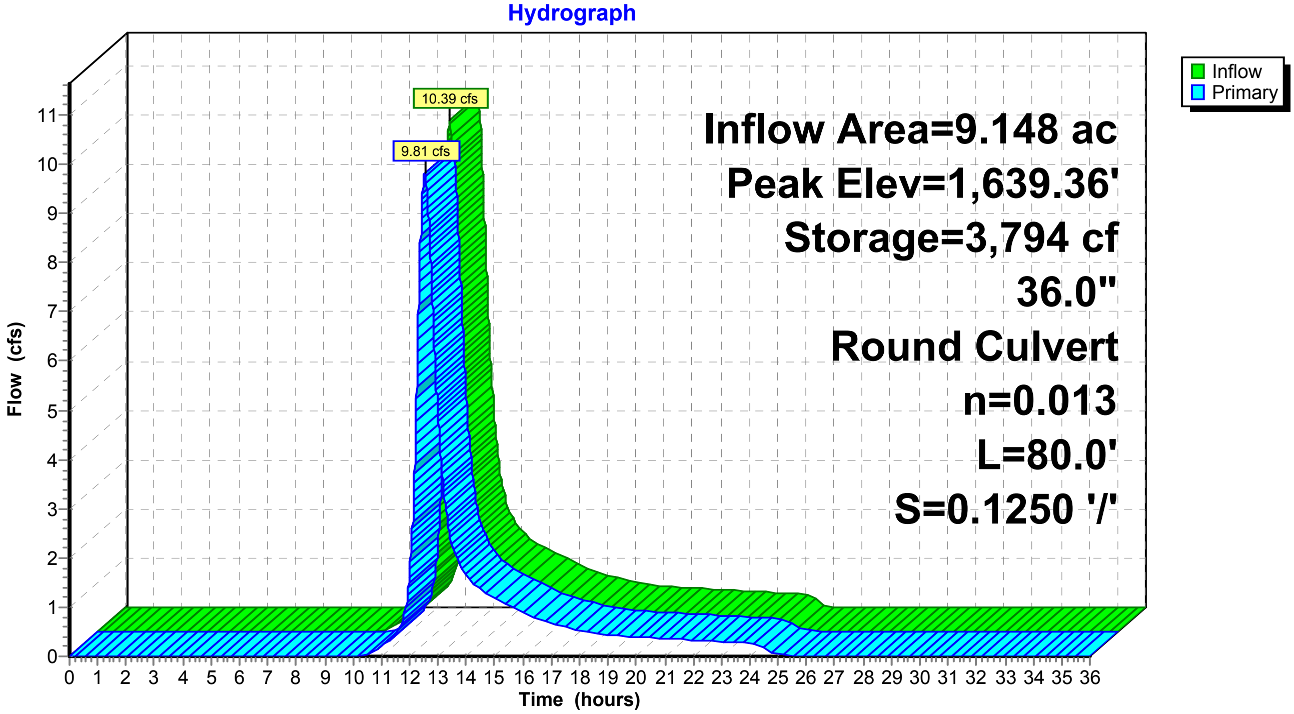
Volume	Invert	Avail.Storage	Storage Description
#1	1,638.00'	46,536 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,638.00	1,320	200.0	0	0	1,320
1,640.00	6,760	450.0	7,378	7,378	14,268
1,642.00	16,100	535.0	22,195	29,573	21,003
1,643.00	17,840	560.0	16,963	46,536	23,249

Device	Routing	Invert	Outlet Devices
#1	Primary	1,638.00'	**36.0" Round SD-18** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,628.00' S= 0.1250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=9.81 cfs @ 12.53 hrs HW=1,639.36' (Free Discharge)
└─**1=SD-18** (Inlet Controls 9.81 cfs @ 3.14 fps)

Pond 11P: SD-18



Summary for Pond 12P: SD-19

Inflow Area = 2.416 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-Year Event event
Inflow = 2.21 cfs @ 12.47 hrs, Volume= 0.295 af
Outflow = 2.14 cfs @ 12.54 hrs, Volume= 0.292 af, Atten= 3%, Lag= 4.1 min
Primary = 2.14 cfs @ 12.54 hrs, Volume= 0.292 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,681.44' @ 12.54 hrs Surf.Area= 1,096 sf Storage= 731 cf

Plug-Flow detention time= 15.7 min calculated for 0.292 af (99% of inflow)
Center-of-Mass det. time= 9.5 min (890.3 - 880.8)

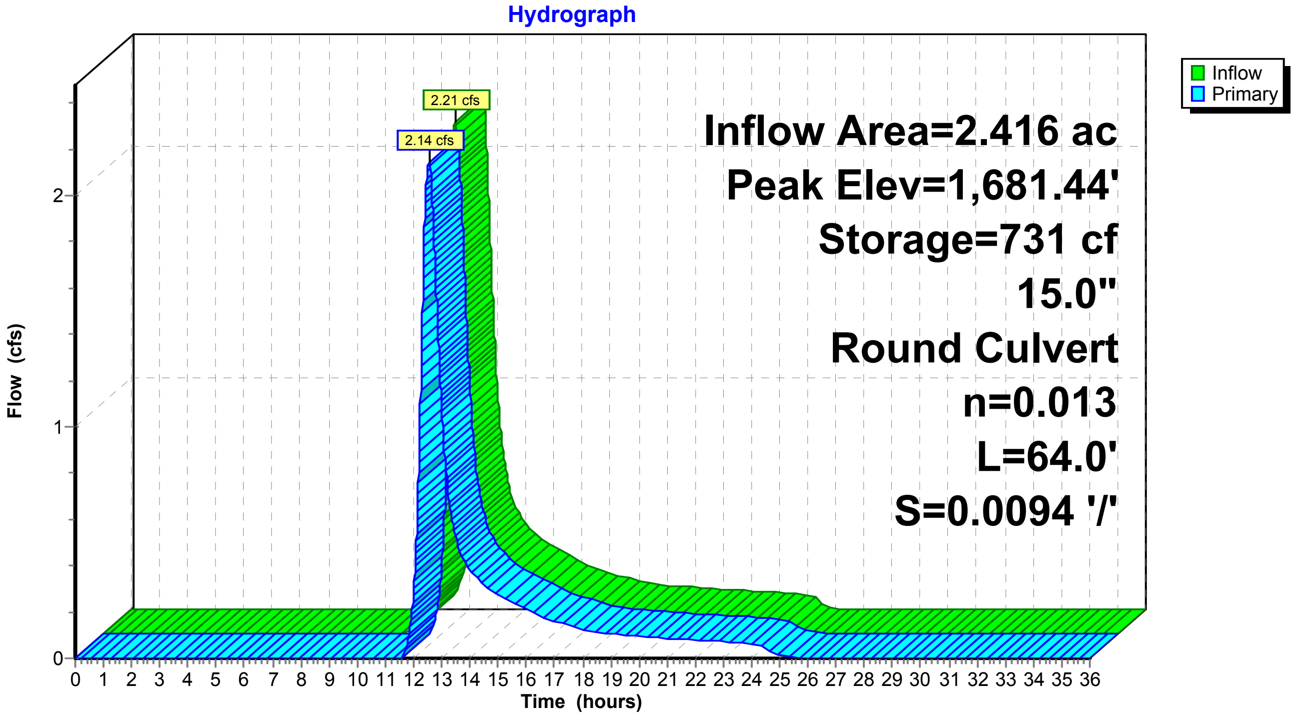
Volume	Invert	Avail.Storage	Storage Description
#1	1,680.00'	1,535 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,680.00	100	45.0	0	0	100
1,682.00	1,780	510.0	1,535	1,535	20,644

Device	Routing	Invert	Outlet Devices
#1	Primary	1,680.60'	**15.0" Round SD-19** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,680.00' S= 0.0094 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.14 cfs @ 12.54 hrs HW=1,681.44' (Free Discharge)
└—**1=SD-19** (Inlet Controls 2.14 cfs @ 2.46 fps)

Pond 12P: SD-19



Summary for Pond 13P: SD-20

Inflow Area = 1.587 ac, 0.00% Impervious, Inflow Depth = 1.53" for 10-Year Event event
Inflow = 1.71 cfs @ 12.35 hrs, Volume= 0.203 af
Outflow = 1.71 cfs @ 12.37 hrs, Volume= 0.203 af, Atten= 0%, Lag= 0.9 min
Primary = 1.71 cfs @ 12.37 hrs, Volume= 0.203 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,701.54' @ 12.37 hrs Surf.Area= 281 sf Storage= 81 cf

Plug-Flow detention time= 1.1 min calculated for 0.203 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (872.6 - 871.5)

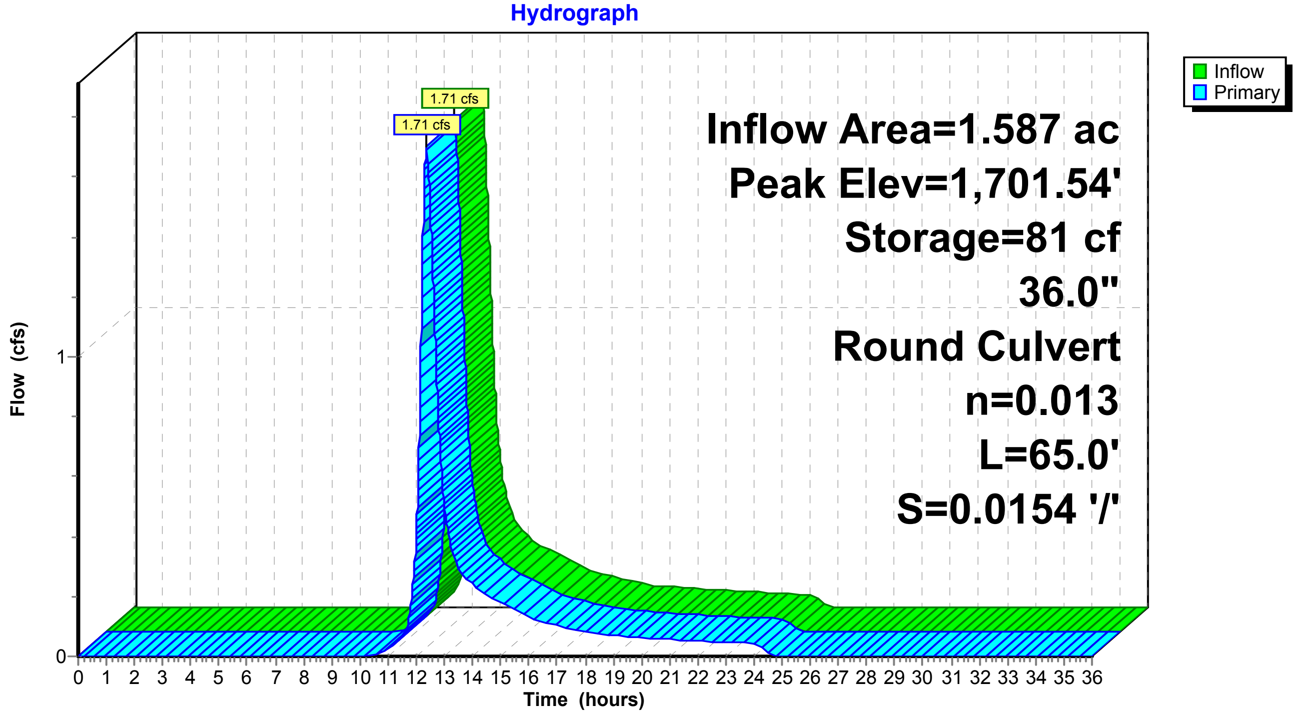
Volume	Invert	Avail.Storage	Storage Description
#1	1,701.00'	7,277 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,701.00	50	25.0	0	0	50
1,702.00	625	105.0	284	284	880
1,704.00	7,675	440.0	6,993	7,277	15,419

Device	Routing	Invert	Outlet Devices
#1	Primary	1,701.00'	**36.0" Round SD-20** L= 65.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,700.00' S= 0.0154 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=1.71 cfs @ 12.37 hrs HW=1,701.54' (Free Discharge)
1=SD-20 (Inlet Controls 1.71 cfs @ 1.97 fps)

Pond 13P: SD-20



Summary for Pond 14P: SD-21

Inflow Area = 1.898 ac, 0.00% Impervious, Inflow Depth = 1.60" for 10-Year Event event
Inflow = 2.64 cfs @ 12.21 hrs, Volume= 0.253 af
Outflow = 2.65 cfs @ 12.21 hrs, Volume= 0.253 af, Atten= 0%, Lag= 0.1 min
Primary = 2.65 cfs @ 12.21 hrs, Volume= 0.253 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,563.96' @ 12.21 hrs Surf.Area= 19 sf Storage= 14 cf

Plug-Flow detention time= 0.3 min calculated for 0.253 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (860.0 - 859.8)

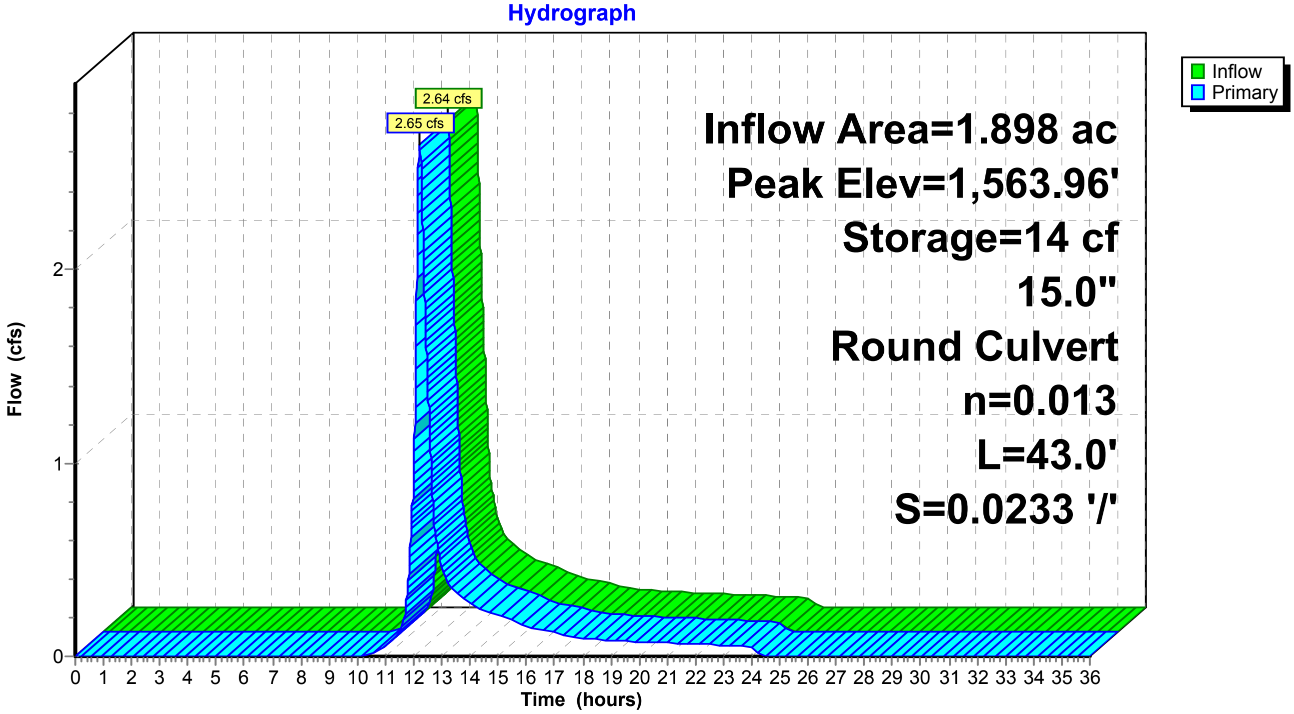
Volume	Invert	Avail.Storage	Storage Description
#1	1,563.00'	153 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,563.00	10	10.0	0	0	10
1,564.00	20	20.0	15	15	38
1,566.00	135	50.0	138	153	219

Device	Routing	Invert	Outlet Devices
#1	Primary	1,563.00'	**15.0" Round SD-21** L= 43.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,562.00' S= 0.0233 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.64 cfs @ 12.21 hrs HW=1,563.96' (Free Discharge)
1=SD-21 (Inlet Controls 2.64 cfs @ 2.63 fps)

Pond 14P: SD-21



Summary for Pond 15P: SD-22-23

Inflow Area = 2.191 ac, 0.00% Impervious, Inflow Depth = 1.53" for 10-Year Event event
Inflow = 2.40 cfs @ 12.35 hrs, Volume= 0.280 af
Outflow = 2.40 cfs @ 12.35 hrs, Volume= 0.280 af, Atten= 0%, Lag= 0.1 min
Primary = 2.40 cfs @ 12.35 hrs, Volume= 0.280 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,605.66' @ 12.35 hrs Surf.Area= 25 sf Storage= 11 cf

Plug-Flow detention time= 0.2 min calculated for 0.280 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (870.8 - 870.7)

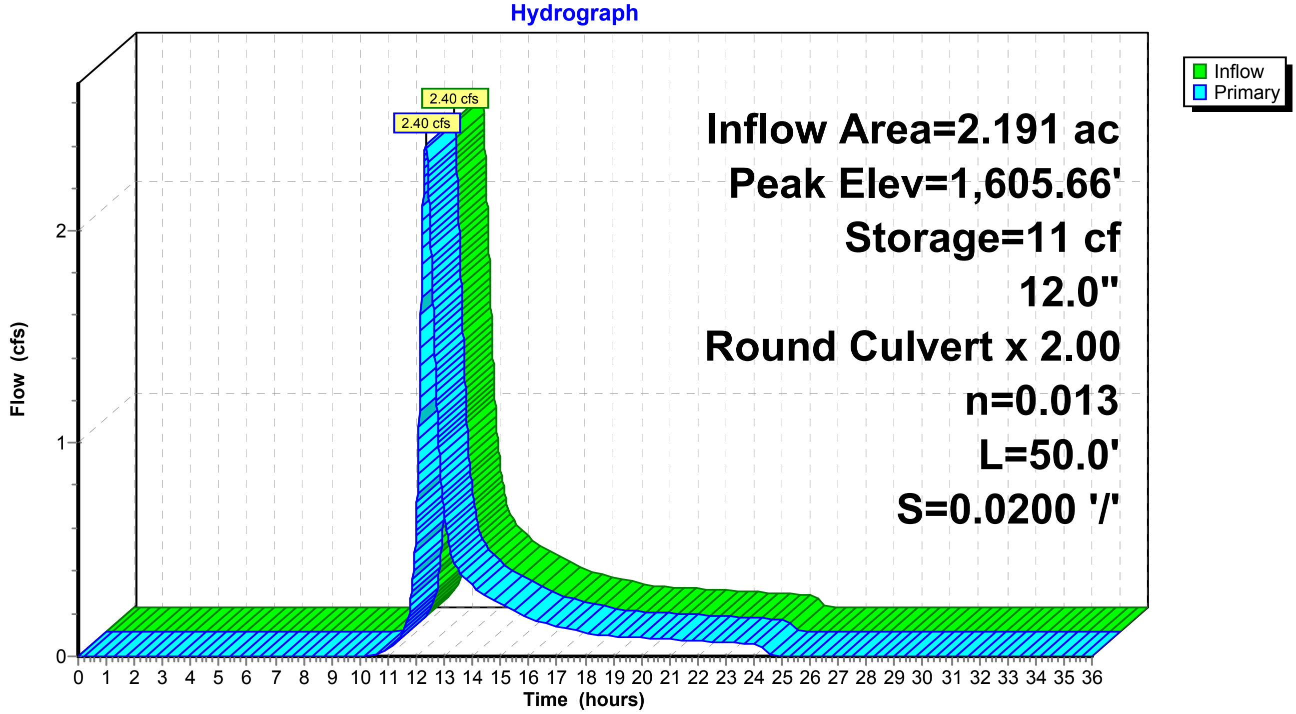
Volume	Invert	Avail.Storage	Storage Description
#1	1,605.00'	205 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,605.00	10	10.0	0	0	10
1,606.00	35	25.0	21	21	55
1,608.00	165	50.0	184	205	222

Device	Routing	Invert	Outlet Devices
#1	Primary	1,605.00'	**12.0" Round SD-22 X 2.00** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,604.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.40 cfs @ 12.35 hrs HW=1,605.66' (Free Discharge)
└─**1=SD-22** (Inlet Controls 2.40 cfs @ 2.18 fps)

Pond 15P: SD-22-23



Summary for Pond 16P: SD-24

Inflow Area = 0.278 ac, 0.00% Impervious, Inflow Depth = 1.53" for 10-Year Event event
Inflow = 0.33 cfs @ 12.27 hrs, Volume= 0.036 af
Outflow = 0.33 cfs @ 12.28 hrs, Volume= 0.036 af, Atten= 0%, Lag= 0.1 min
Primary = 0.33 cfs @ 12.28 hrs, Volume= 0.036 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,671.30' @ 12.28 hrs Surf.Area= 16 sf Storage= 4 cf

Plug-Flow detention time= 0.5 min calculated for 0.036 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (867.2 - 866.8)

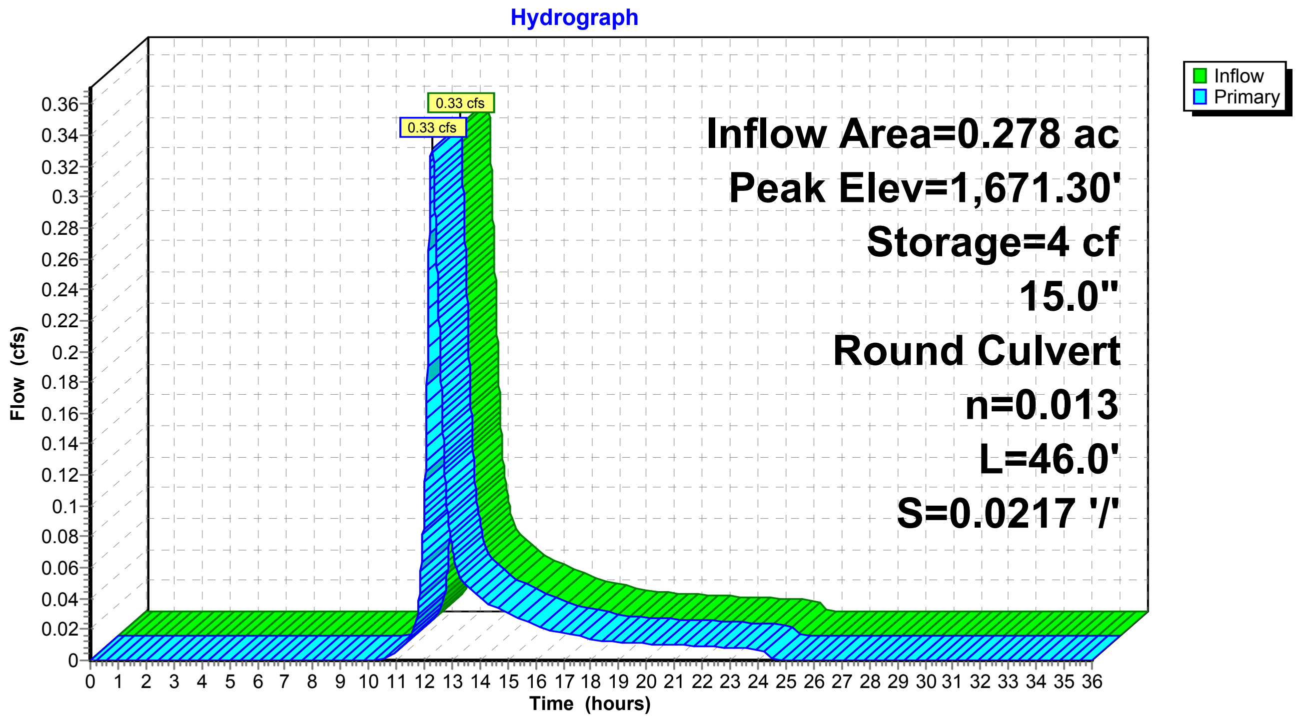
Volume	Invert	Avail.Storage	Storage Description
#1	1,671.00'	201 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,671.00	10	10.0	0	0	10
1,672.00	35	25.0	21	21	55
1,674.00	160	50.0	180	201	222

Device	Routing	Invert	Outlet Devices
#1	Primary	1,671.00'	**15.0" Round SD-24** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,670.00' S= 0.0217 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.33 cfs @ 12.28 hrs HW=1,671.30' (Free Discharge)
└─**1=SD-24** (Inlet Controls 0.33 cfs @ 1.47 fps)

Pond 16P: SD-24



Summary for Pond 17P: SD-25

Inflow Area = 0.510 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-Year Event event
Inflow = 0.53 cfs @ 12.35 hrs, Volume= 0.062 af
Outflow = 0.53 cfs @ 12.35 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.1 min
Primary = 0.53 cfs @ 12.35 hrs, Volume= 0.062 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,679.38' @ 12.35 hrs Surf.Area= 18 sf Storage= 5 cf

Plug-Flow detention time= 0.3 min calculated for 0.062 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (873.8 - 873.4)

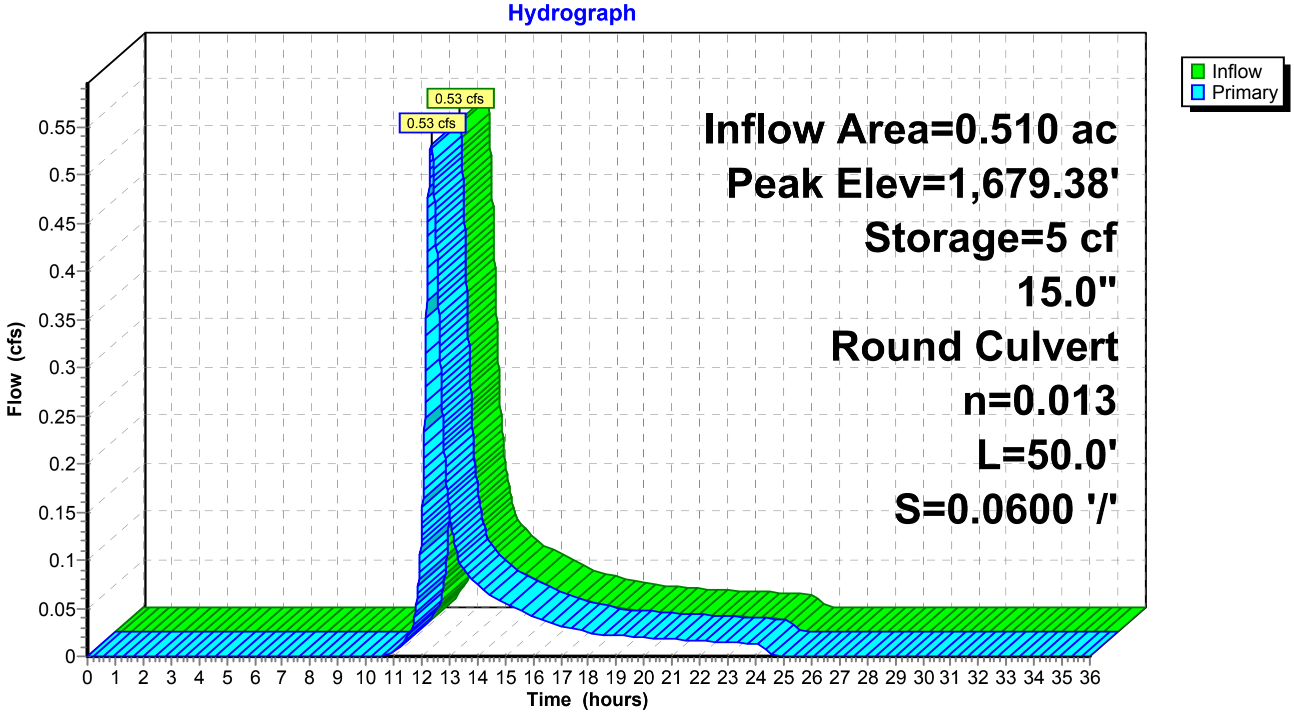
Volume	Invert	Avail.Storage	Storage Description
#1	1,679.00'	305 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,679.00	10	10.0	0	0	10
1,680.00	35	35.0	21	21	102
1,682.00	290	115.0	284	305	1,069

Device	Routing	Invert	Outlet Devices
#1	Primary	1,679.00'	**15.0" Round SD-25** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,676.00' S= 0.0600 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.53 cfs @ 12.35 hrs HW=1,679.38' (Free Discharge)
└─**1=SD-25** (Inlet Controls 0.53 cfs @ 1.66 fps)

Pond 17P: SD-25



Summary for Pond 18P: SD-26

Inflow Area = 10.036 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-Year Event event
Inflow = 9.71 cfs @ 12.40 hrs, Volume= 1.225 af
Outflow = 9.48 cfs @ 12.47 hrs, Volume= 1.225 af, Atten= 2%, Lag= 4.0 min
Primary = 9.48 cfs @ 12.47 hrs, Volume= 1.225 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,601.34' @ 12.47 hrs Surf.Area= 2,680 sf Storage= 1,885 cf

Plug-Flow detention time= 4.4 min calculated for 1.225 af (100% of inflow)
Center-of-Mass det. time= 4.4 min (881.8 - 877.4)

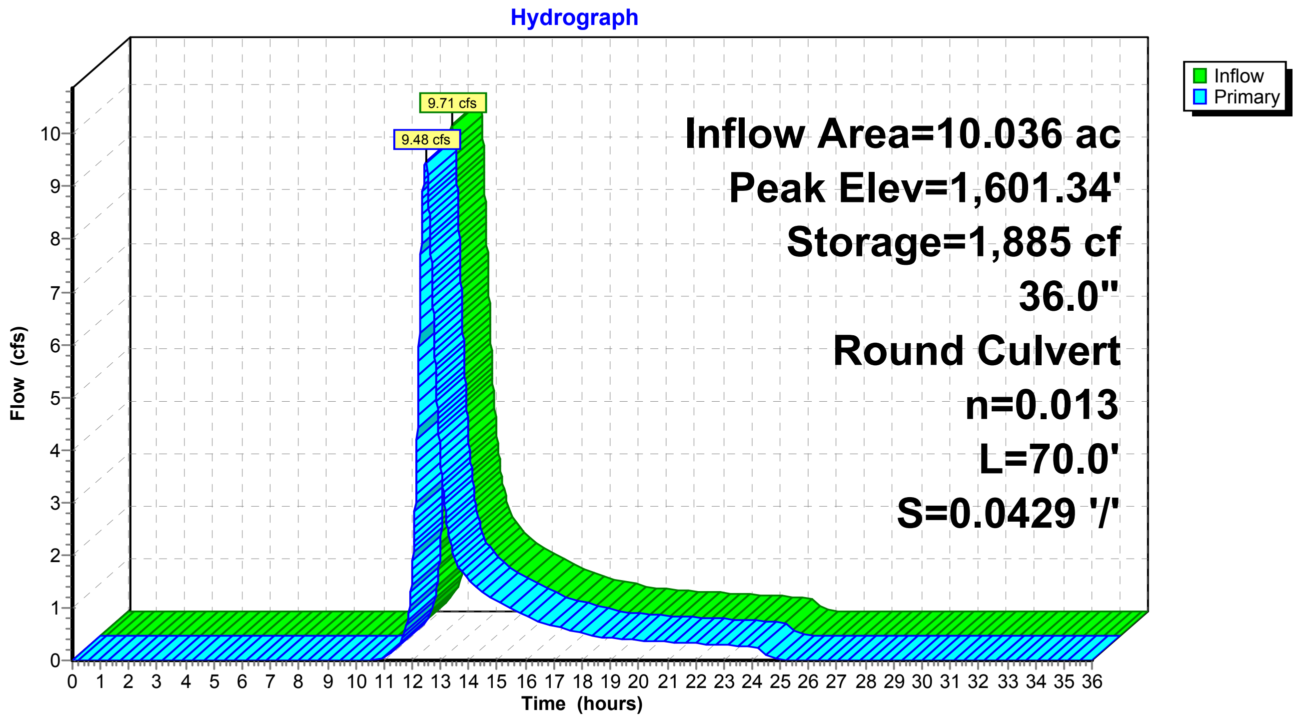
Volume	Invert	Avail.Storage	Storage Description
#1	1,600.00'	9,543 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,600.00	450	100.0	0	0	450
1,602.00	4,475	360.0	4,229	4,229	9,979
1,603.00	6,200	375.0	5,314	9,543	10,930

Device	Routing	Invert	Outlet Devices
#1	Primary	1,600.00'	**36.0" Round SD-26** L= 70.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,597.00' S= 0.0429 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=9.48 cfs @ 12.47 hrs HW=1,601.34' (Free Discharge)
└─**1=SD-26** (Inlet Controls 9.48 cfs @ 3.11 fps)

Pond 18P: SD-26



Summary for Pond 19P: SD-27-31

Inflow Area = 5.027 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-Year Event event
Inflow = 5.81 cfs @ 12.27 hrs, Volume= 0.614 af
Outflow = 5.81 cfs @ 12.27 hrs, Volume= 0.614 af, Atten= 0%, Lag= 0.0 min
Primary = 5.81 cfs @ 12.27 hrs, Volume= 0.614 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,709.65' @ 12.27 hrs Surf.Area= 27 sf Storage= 12 cf

Plug-Flow detention time= 0.1 min calculated for 0.613 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (868.7 - 868.6)

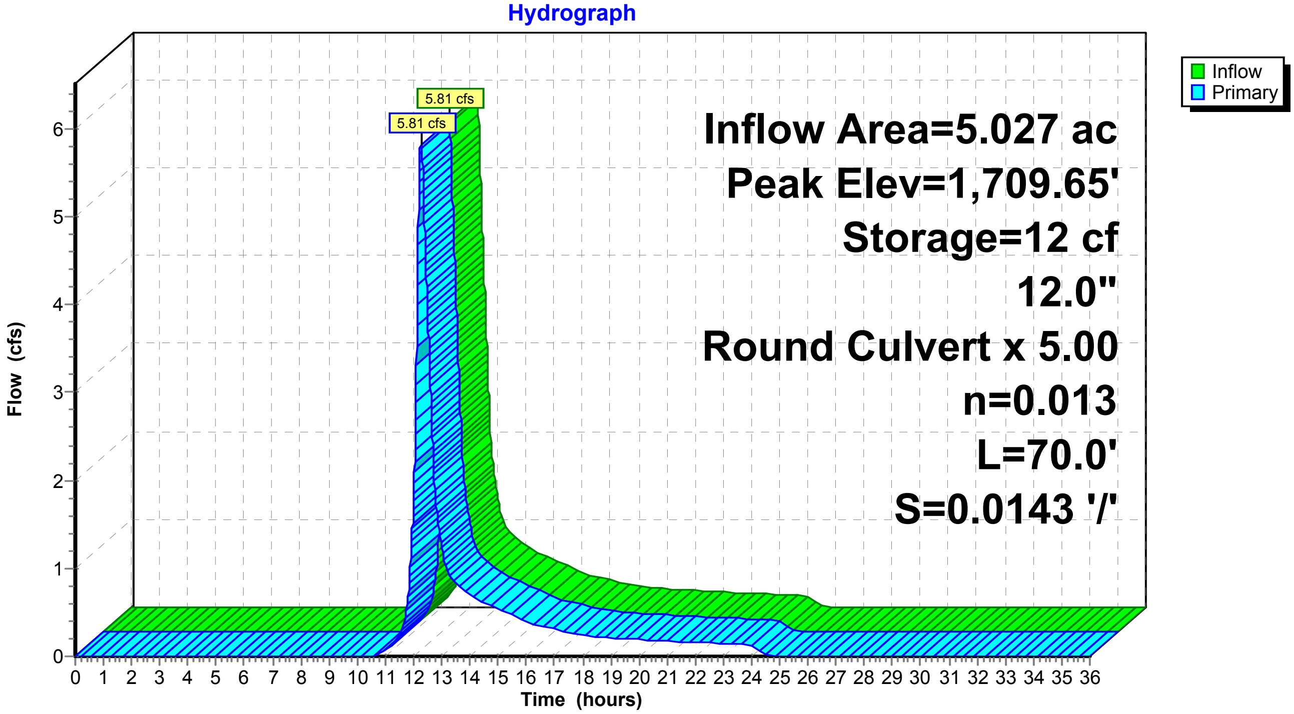
Volume	Invert	Avail.Storage	Storage Description
#1	1,709.00'	214 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,709.00	10	10.0	0	0	10
1,710.00	40	25.0	23	23	55
1,712.00	165	55.0	191	214	262

Device	Routing	Invert	Outlet Devices
#1	Primary	1,709.00'	**12.0" Round SD-27 X 5.00** L= 70.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,708.00' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=5.81 cfs @ 12.27 hrs HW=1,709.65' (Free Discharge)
↑—**1=SD-27** (Inlet Controls 5.81 cfs @ 2.16 fps)

Pond 19P: SD-27-31



Summary for Pond 20P: SD-32

Inflow Area = 3.522 ac, 0.00% Impervious, Inflow Depth = 1.46" for 10-Year Event event
Inflow = 4.35 cfs @ 12.22 hrs, Volume= 0.430 af
Outflow = 4.35 cfs @ 12.23 hrs, Volume= 0.430 af, Atten= 0%, Lag= 0.2 min
Primary = 4.35 cfs @ 12.23 hrs, Volume= 0.430 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,764.49' @ 12.23 hrs Surf.Area= 43 sf Storage= 34 cf

Plug-Flow detention time= 0.2 min calculated for 0.430 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (866.2 - 866.0)

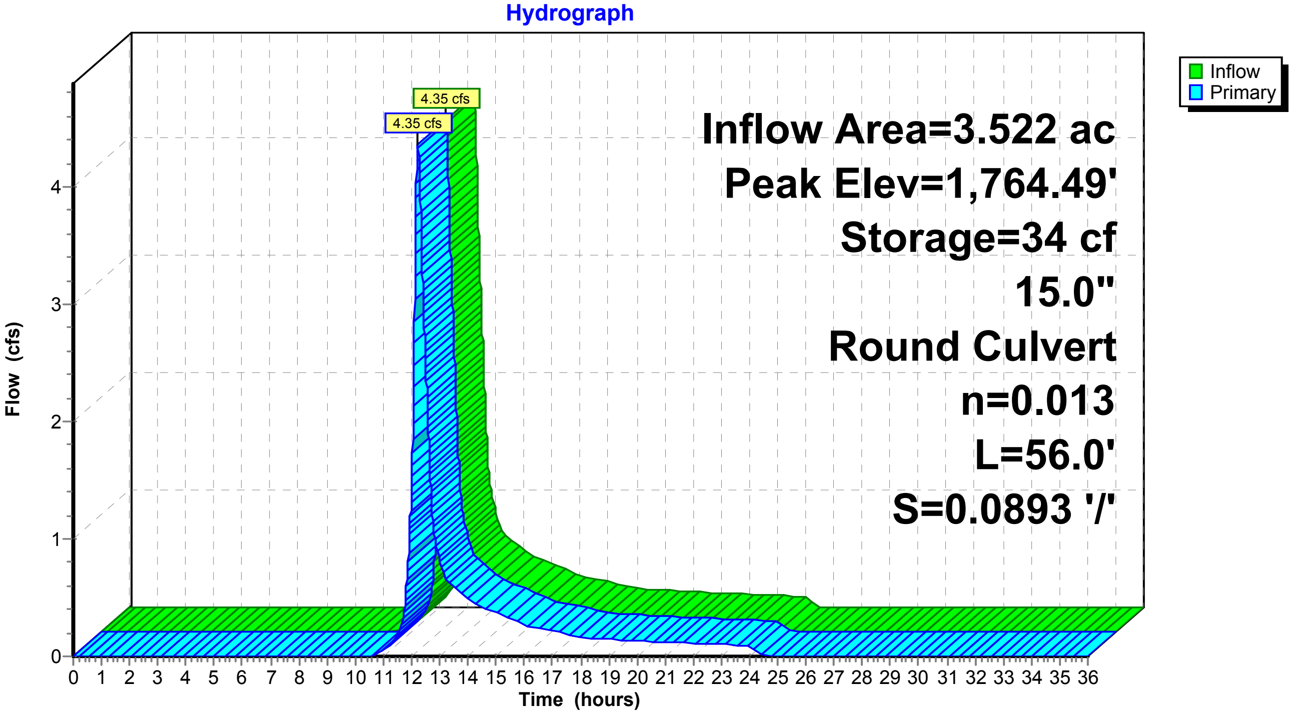
Volume	Invert	Avail.Storage	Storage Description
#1	1,763.00'	158 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,763.00	10	10.0	0	0	10
1,764.00	25	20.0	17	17	38
1,766.00	130	50.0	141	158	219

Device	Routing	Invert	Outlet Devices
#1	Primary	1,763.00'	**15.0" Round SD-32** L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,758.00' S= 0.0893 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=4.35 cfs @ 12.23 hrs HW=1,764.49' (Free Discharge)
└─**1=SD-32** (Inlet Controls 4.35 cfs @ 3.54 fps)

Pond 20P: SD-32



Summary for Subcatchment SC1.1:

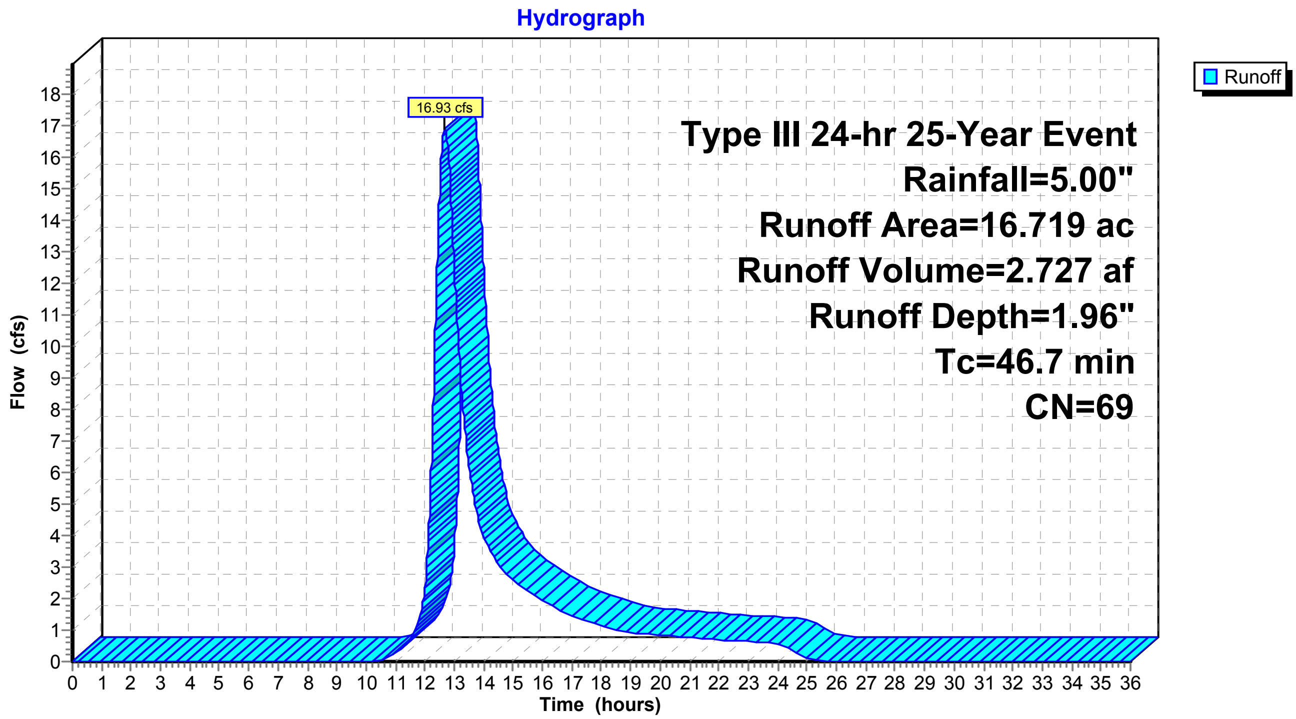
Runoff = 16.93 cfs @ 12.66 hrs, Volume= 2.727 af, Depth= 1.96"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

	Area (ac)	CN	Description
	13.069	70	Woods, Good, HSG C
	2.462	71	Meadow, non-grazed, HSG C
	0.118	98	Paved roads w/curbs & sewers, HSG C
*	1.070	55	Yard stone, HSG C
	16.719	69	Weighted Average
	16.601		99.29% Pervious Area
	0.118		0.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
46.7					**Direct Entry, See spreadsheet**

Subcatchment SC1.1:



Summary for Subcatchment SC1.10:

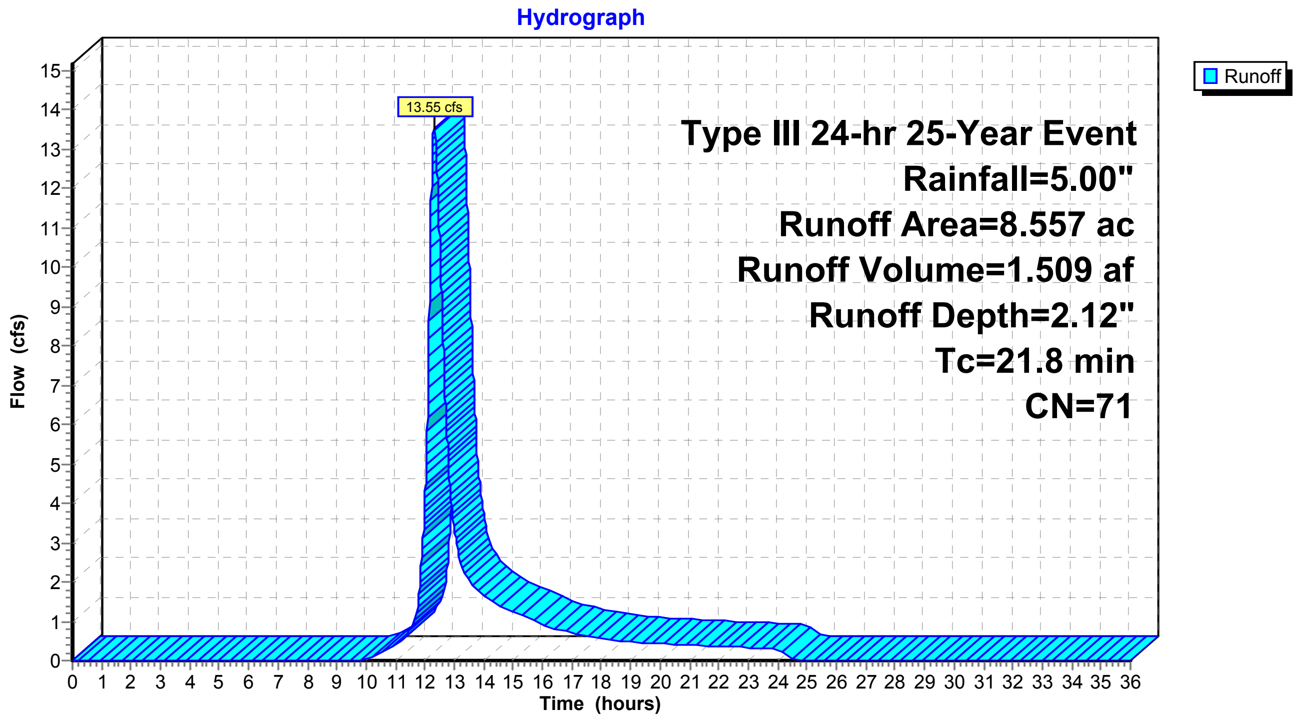
Runoff = 13.55 cfs @ 12.32 hrs, Volume= 1.509 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
6.492	70	Woods, Good, HSG C
1.567	71	Meadow, non-grazed, HSG C
0.498	89	Gravel roads, HSG C
8.557	71	Weighted Average
8.557		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
21.8					**Direct Entry, See spreadsheet**

Subcatchment SC1.10:



Summary for Subcatchment SC1.11:

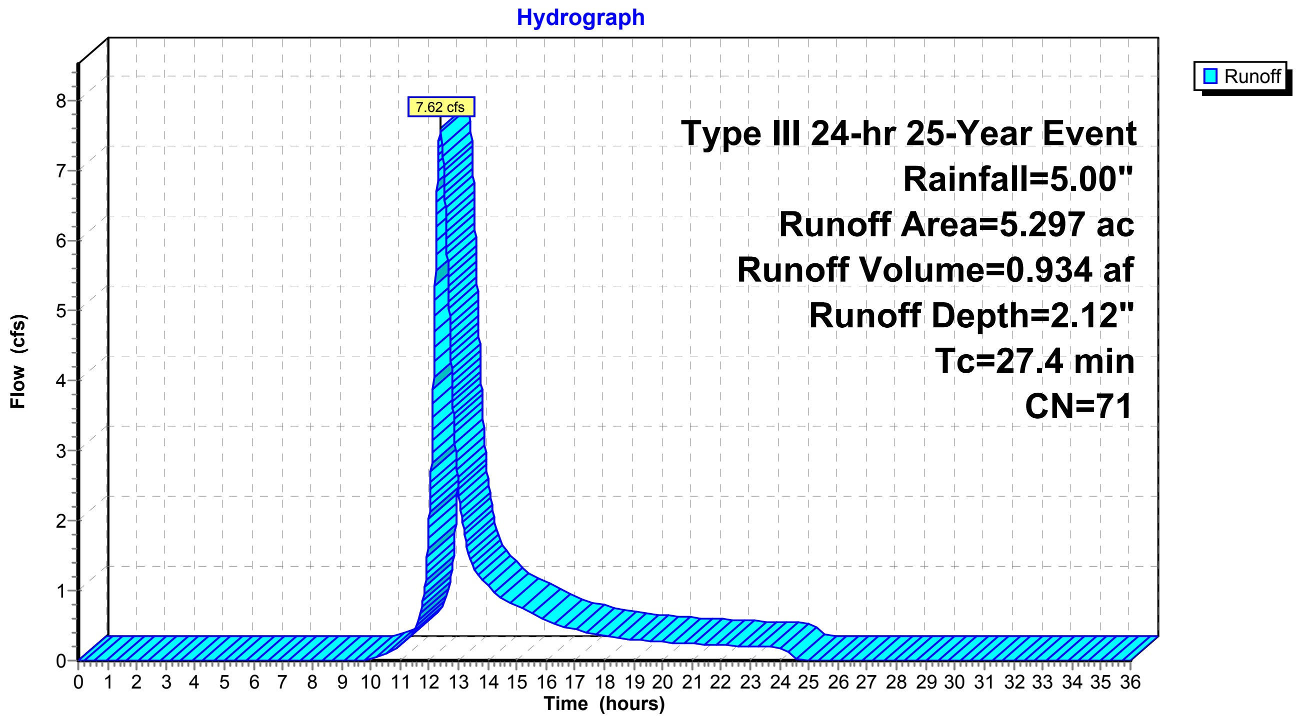
Runoff = 7.62 cfs @ 12.39 hrs, Volume= 0.934 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
4.038	70	Woods, Good, HSG C
1.081	71	Meadow, non-grazed, HSG C
0.178	89	Gravel roads, HSG C
5.297	71	Weighted Average
5.297		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.4					**Direct Entry, See spreadsheet**

Subcatchment SC1.11:



Summary for Subcatchment SC1.12:

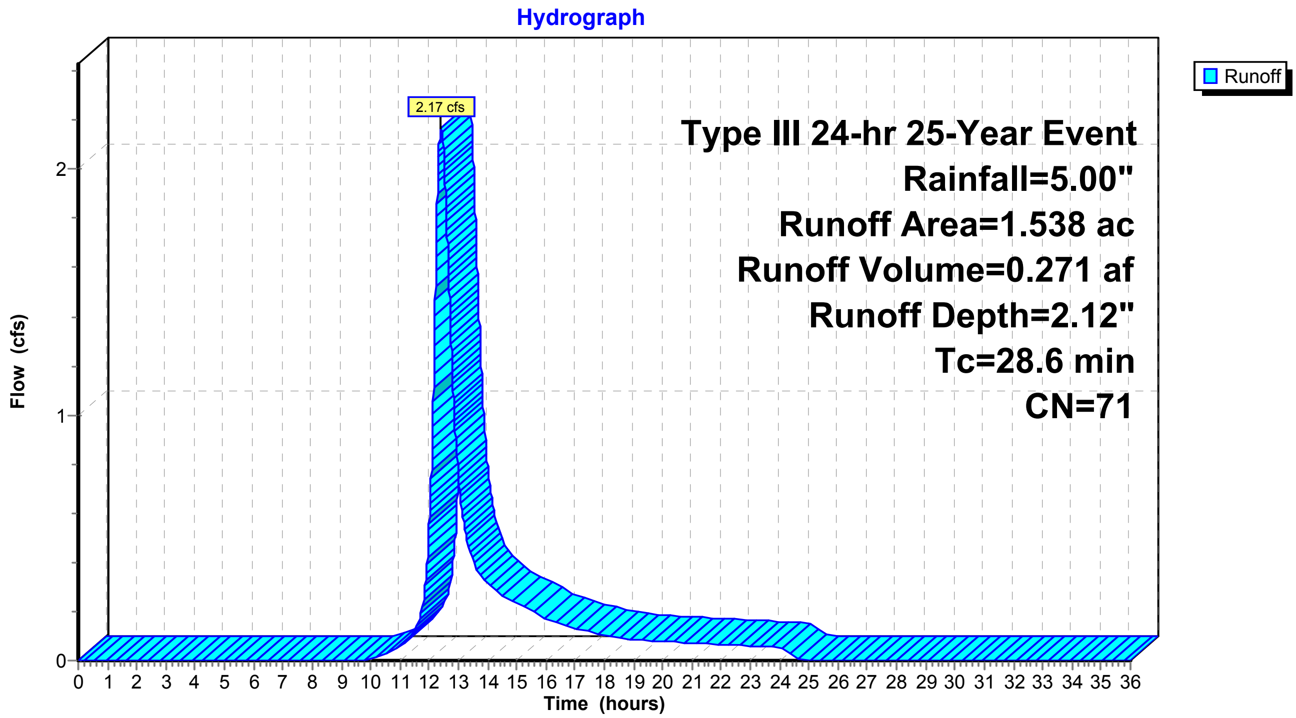
Runoff = 2.17 cfs @ 12.42 hrs, Volume= 0.271 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.916	70	Woods, Good, HSG C
0.547	71	Meadow, non-grazed, HSG C
0.075	89	Gravel roads, HSG C
1.538	71	Weighted Average
1.538		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
28.6					**Direct Entry, See spreadsheet**

Subcatchment SC1.12:



Summary for Subcatchment SC1.13:

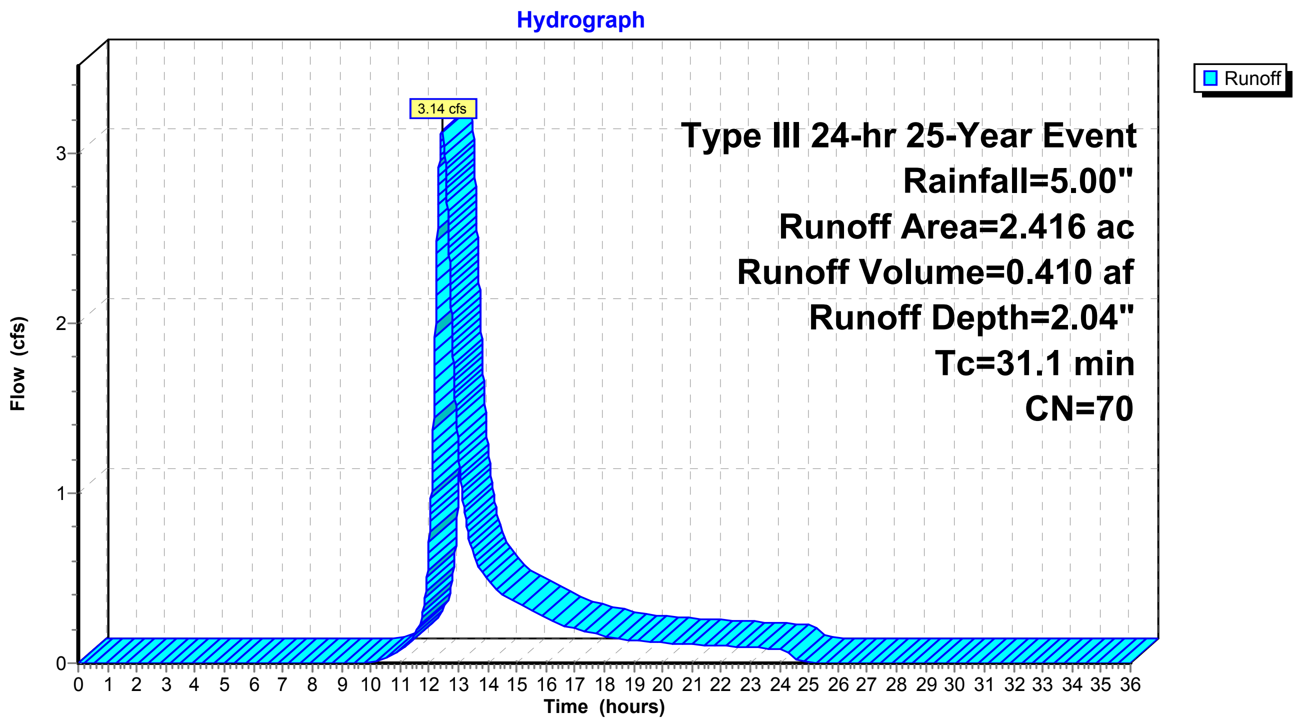
Runoff = 3.14 cfs @ 12.47 hrs, Volume= 0.410 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
1.885	70	Woods, Good, HSG C
0.531	71	Meadow, non-grazed, HSG C
2.416	70	Weighted Average
2.416		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
31.1					**Direct Entry, See spreadsheet**

Subcatchment SC1.13:



Summary for Subcatchment SC1.14:

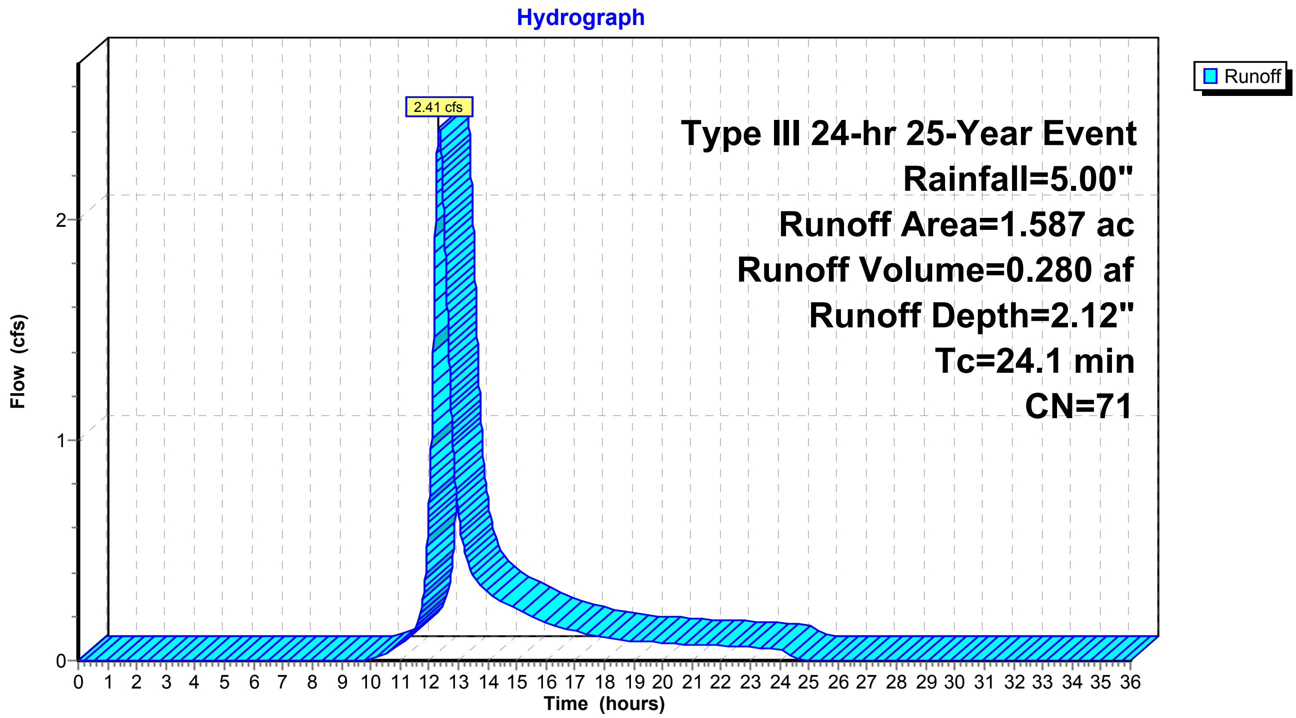
Runoff = 2.41 cfs @ 12.35 hrs, Volume= 0.280 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.623	70	Woods, Good, HSG C
0.888	71	Meadow, non-grazed, HSG C
0.076	89	Gravel roads, HSG C
1.587	71	Weighted Average
1.587		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
24.1					**Direct Entry, See spreadsheet**

Subcatchment SC1.14:



Summary for Subcatchment SC1.15:

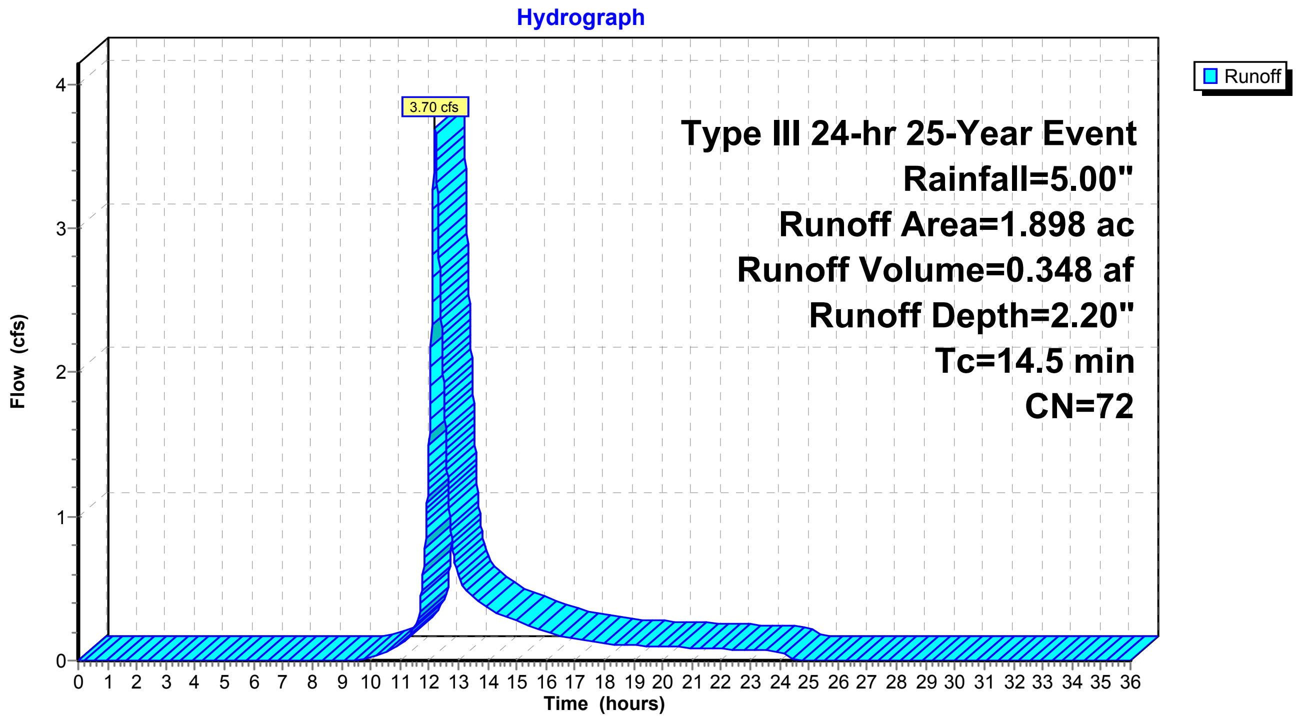
Runoff = 3.70 cfs @ 12.20 hrs, Volume= 0.348 af, Depth= 2.20"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.806	70	Woods, Good, HSG C
0.955	71	Meadow, non-grazed, HSG C
0.137	89	Gravel roads, HSG C
1.898	72	Weighted Average
1.898		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5					**Direct Entry, See spreadsheet**

Subcatchment SC1.15:



Summary for Subcatchment SC1.16:

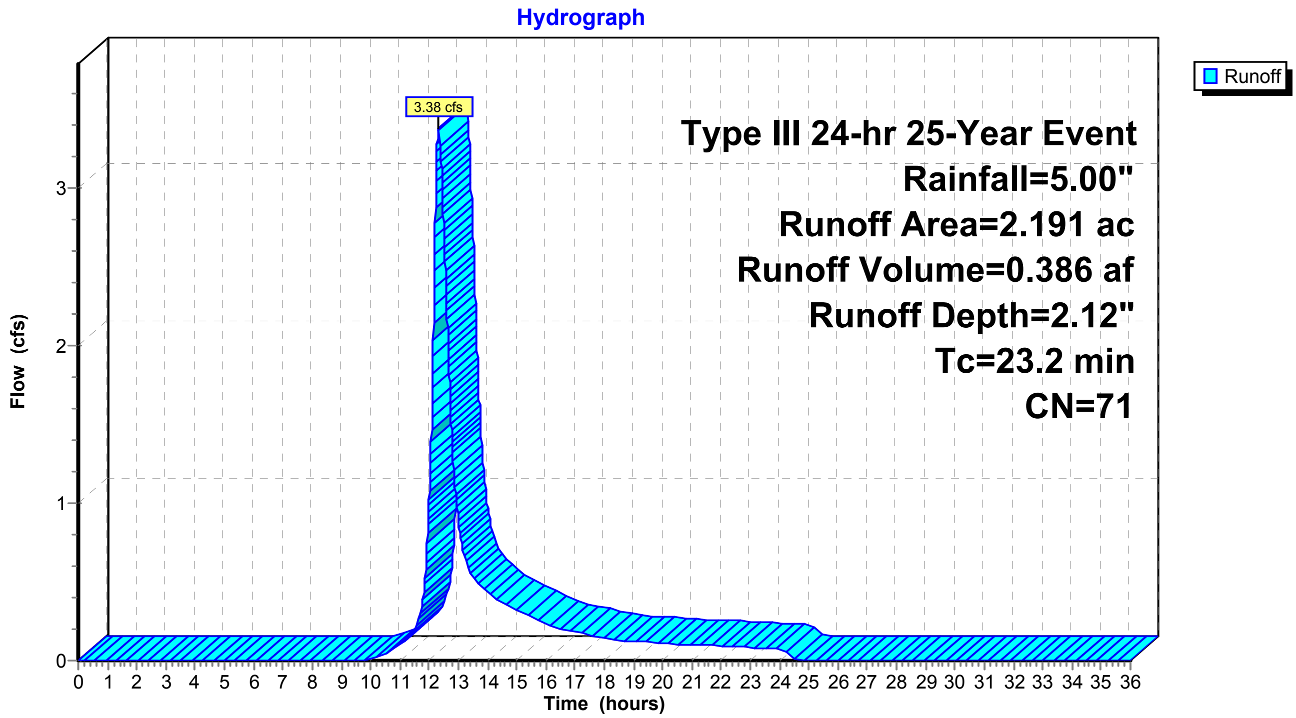
Runoff = 3.38 cfs @ 12.34 hrs, Volume= 0.386 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
1.222	70	Woods, Good, HSG C
0.864	71	Meadow, non-grazed, HSG C
0.105	89	Gravel roads, HSG C
2.191	71	Weighted Average
2.191		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.2					**Direct Entry, See spreadsheet**

Subcatchment SC1.16:



Summary for Subcatchment SC1.17:

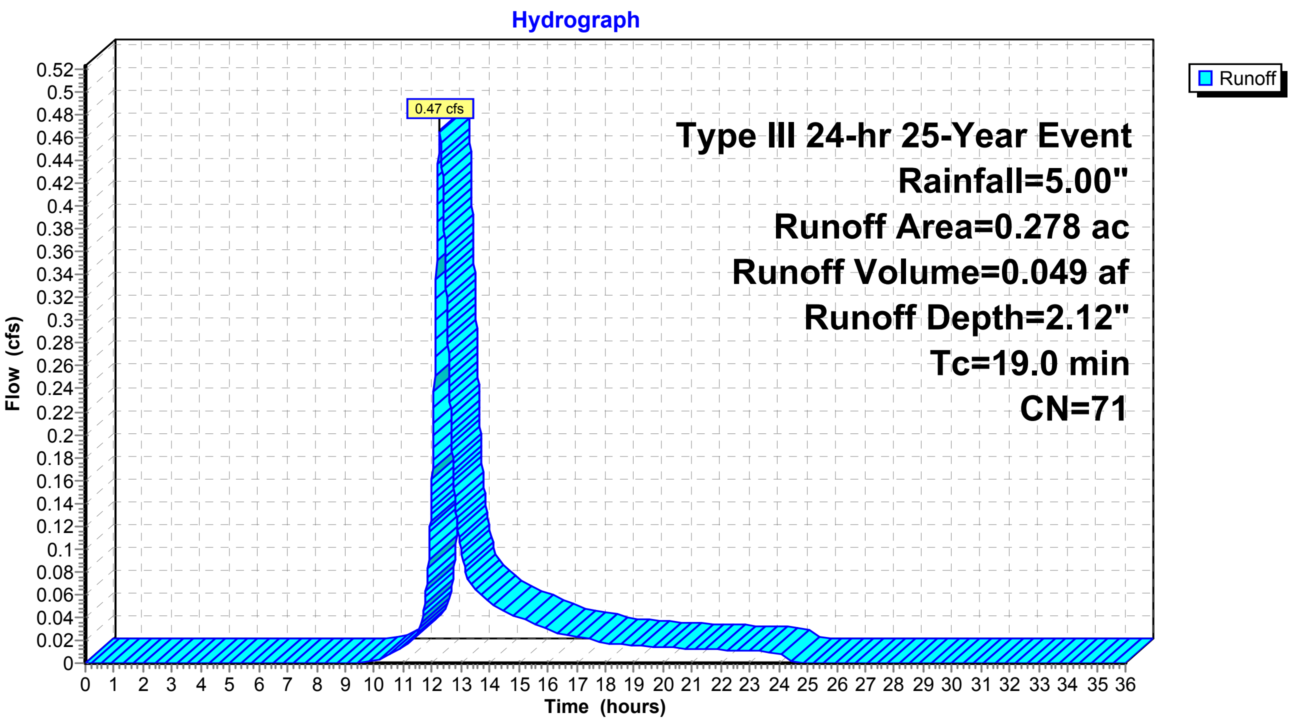
Runoff = 0.47 cfs @ 12.27 hrs, Volume= 0.049 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.119	70	Woods, Good, HSG C
0.159	71	Meadow, non-grazed, HSG C
0.278	71	Weighted Average
0.278		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
19.0					**Direct Entry, See spreadsheet**

Subcatchment SC1.17:



Summary for Subcatchment SC1.2:

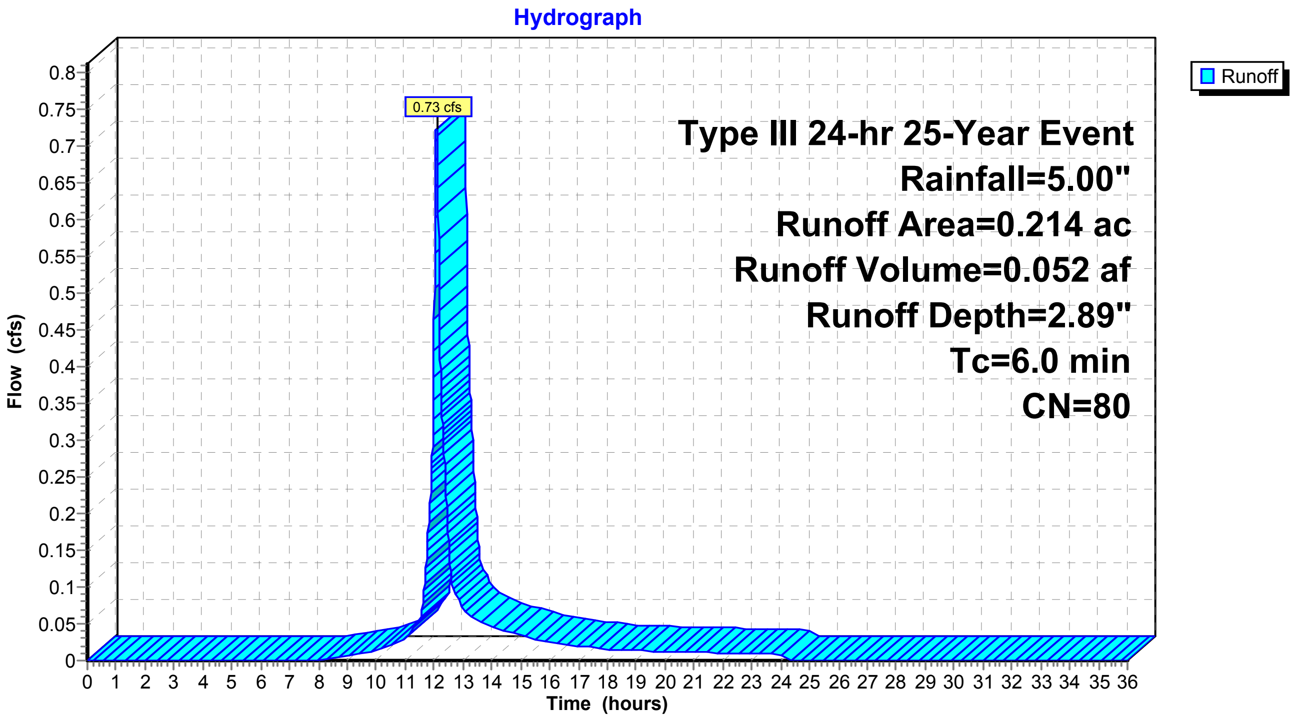
Runoff = 0.73 cfs @ 12.09 hrs, Volume= 0.052 af, Depth= 2.89"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.070	98	Paved roads, HSG C
0.144	71	Meadow, non-grazed, HSG C
0.214	80	Weighted Average
0.144		67.29% Pervious Area
0.070		32.71% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment SC1.2:



Summary for Subcatchment SC1.3:

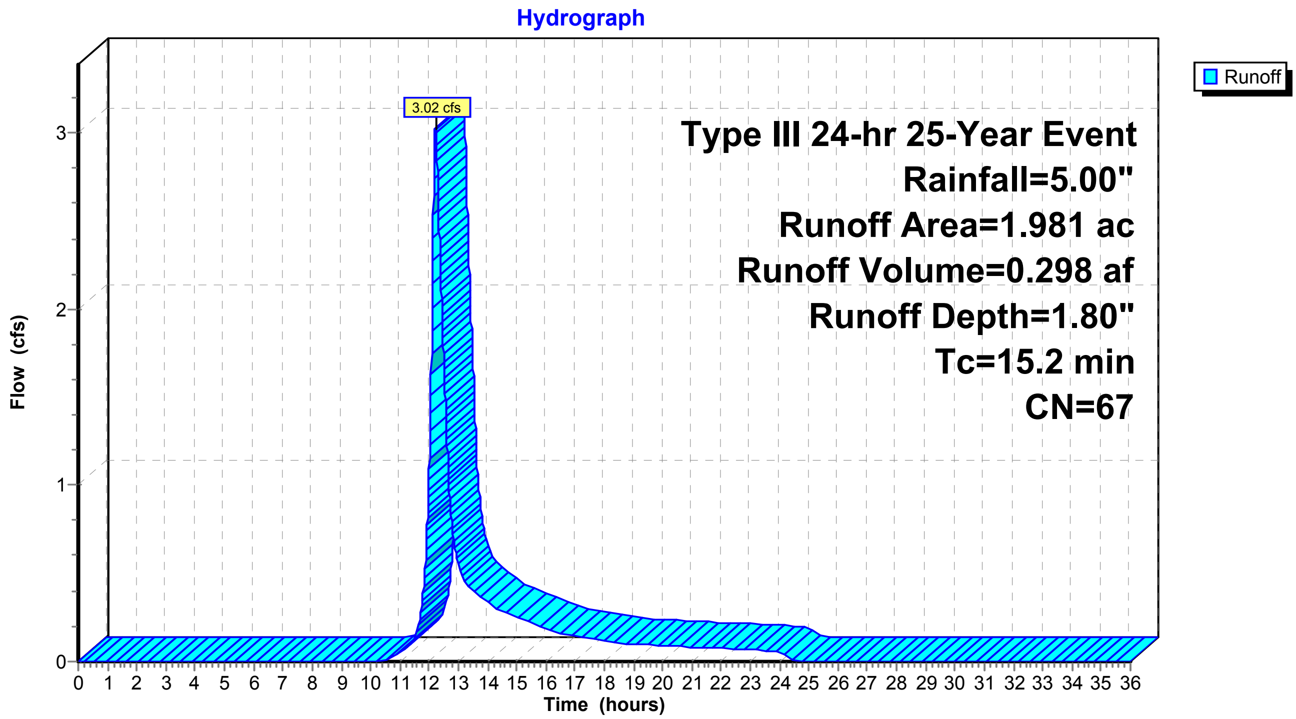
Runoff = 3.02 cfs @ 12.22 hrs, Volume= 0.298 af, Depth= 1.80"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

	Area (ac)	CN	Description
	0.681	70	Woods, Good, HSG C
	0.665	71	Meadow, non-grazed, HSG C
*	0.549	55	Yard stone, HSG C
	0.086	98	Roofs, HSG C
	1.981	67	Weighted Average
	1.895		95.66% Pervious Area
	0.086		4.34% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.2					**Direct Entry, See spreadsheet**

Subcatchment SC1.3:



Summary for Subcatchment SC1.4:

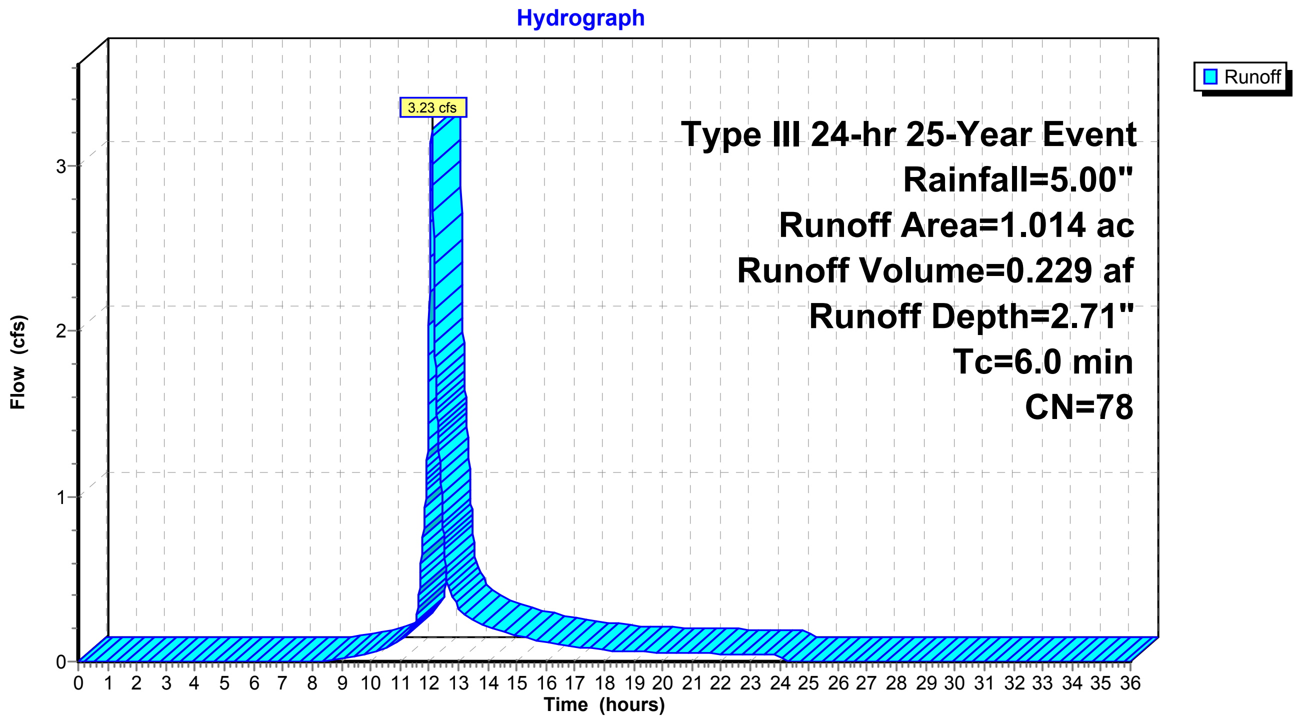
Runoff = 3.23 cfs @ 12.09 hrs, Volume= 0.229 af, Depth= 2.71"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

	Area (ac)	CN	Description
	0.275	70	Woods, Good, HSG C
	0.445	71	Meadow, non-grazed, HSG C
*	0.248	98	Paved roads, HSG C
	0.046	89	Gravel roads, HSG C
	1.014	78	Weighted Average
	0.766		75.54% Pervious Area
	0.248		24.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment SC1.4:



Summary for Subcatchment SC1.4A:

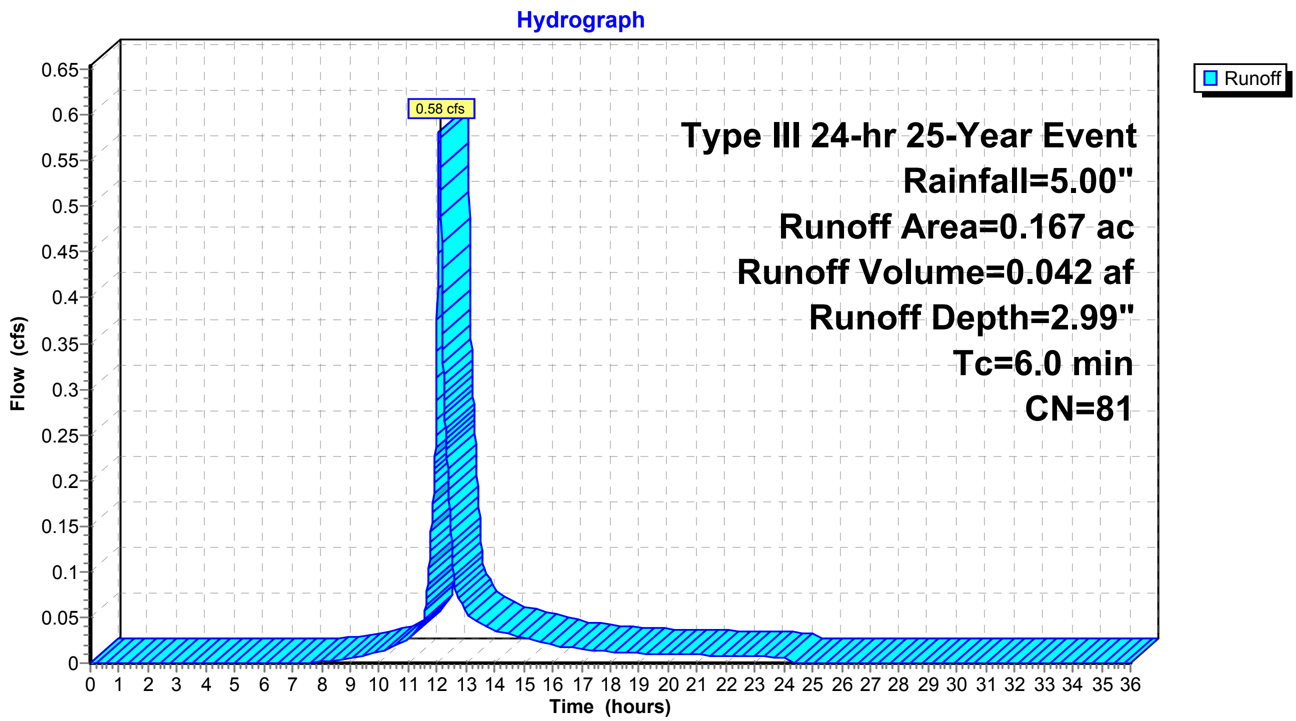
Runoff = 0.58 cfs @ 12.09 hrs, Volume= 0.042 af, Depth= 2.99"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.075	71	Meadow, non-grazed, HSG C
0.092	89	Gravel roads, HSG C
0.167	81	Weighted Average
0.167		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
6.0					**Direct Entry, Minimum**

Subcatchment SC1.4A:



Summary for Subcatchment SC1.5:

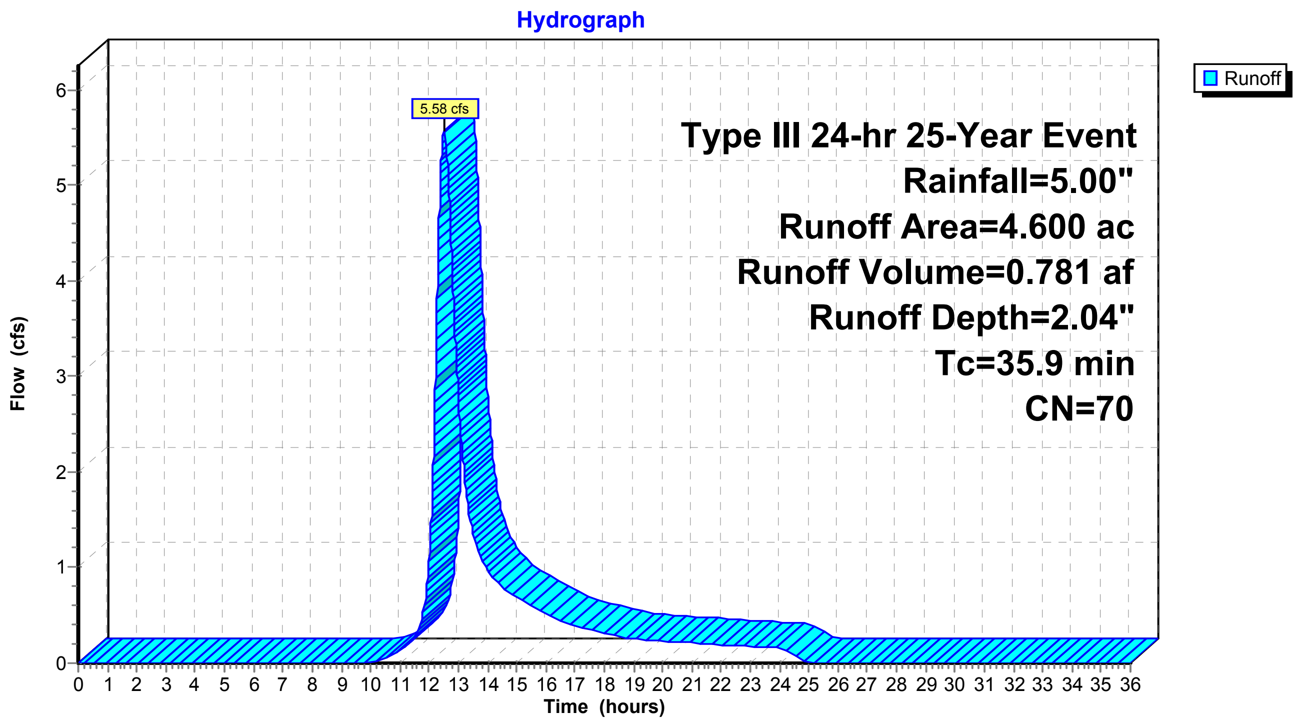
Runoff = 5.58 cfs @ 12.52 hrs, Volume= 0.781 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
4.028	70	Woods, Good, HSG C
0.572	71	Meadow, non-grazed, HSG C
4.600	70	Weighted Average
4.600		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
35.9					**Direct Entry, See spreadsheet**

Subcatchment SC1.5:



Summary for Subcatchment SC1.6:

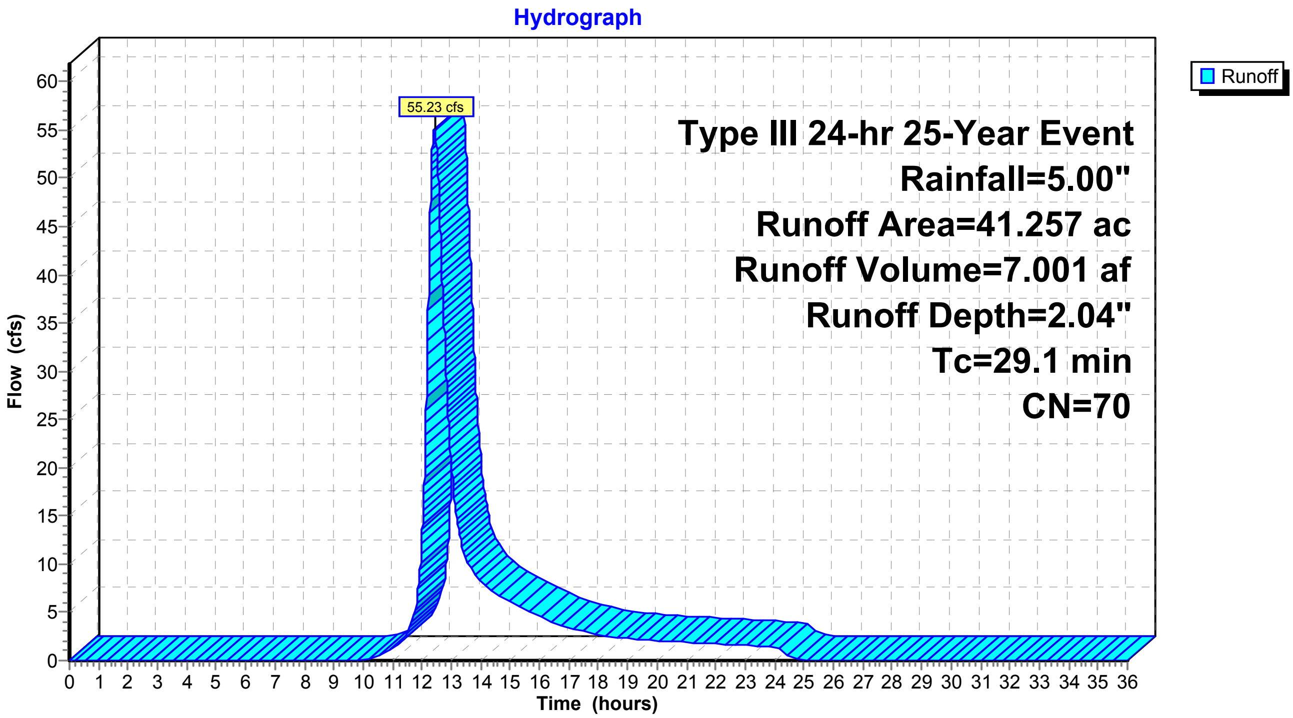
Runoff = 55.23 cfs @ 12.42 hrs, Volume= 7.001 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
39.420	70	Woods, Good, HSG C
0.285	89	Gravel roads, HSG C
1.552	71	Meadow, non-grazed, HSG C
41.257	70	Weighted Average
41.257		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
29.1					**Direct Entry, See spreadsheet**

Subcatchment SC1.6:



Summary for Subcatchment SC1.7:

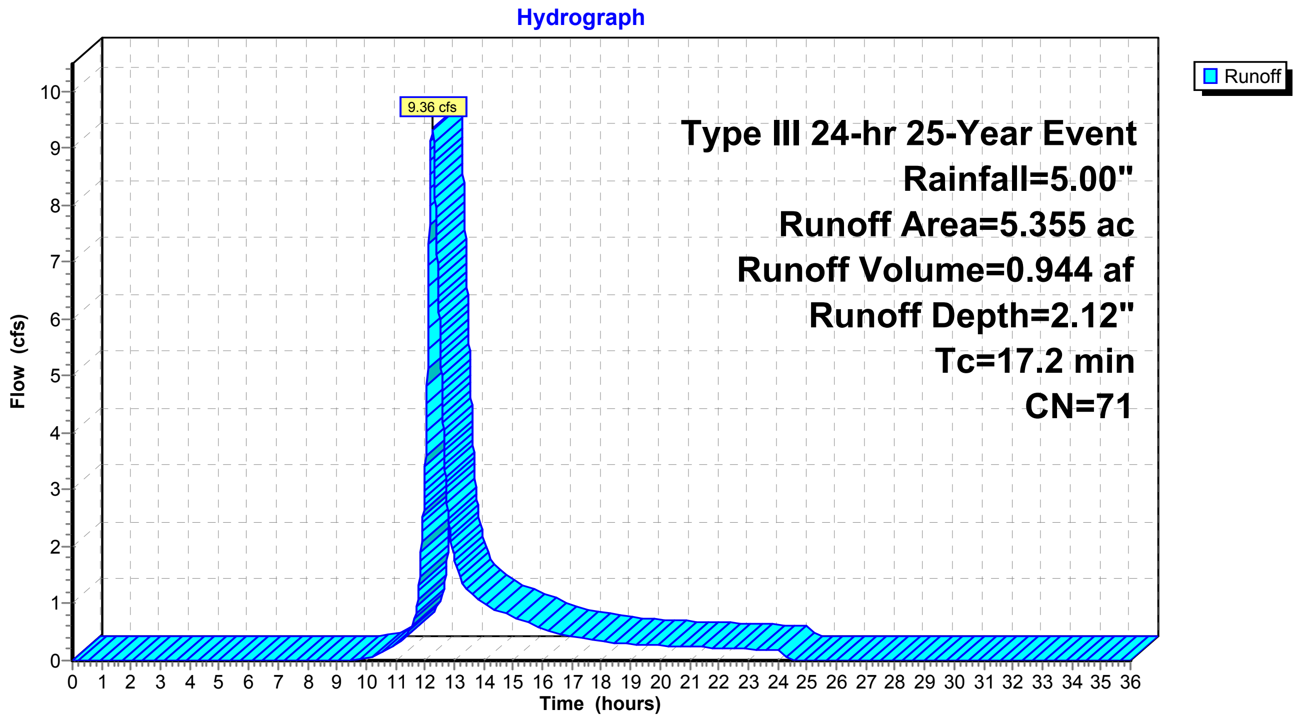
Runoff = 9.36 cfs @ 12.25 hrs, Volume= 0.944 af, Depth= 2.12"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
4.514	70	Woods, Good, HSG C
0.216	89	Gravel roads, HSG C
0.625	71	Meadow, non-grazed, HSG C
5.355	71	Weighted Average
5.355		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.2					**Direct Entry, See spreadsheet**

Subcatchment SC1.7:



Summary for Subcatchment SC1.8:

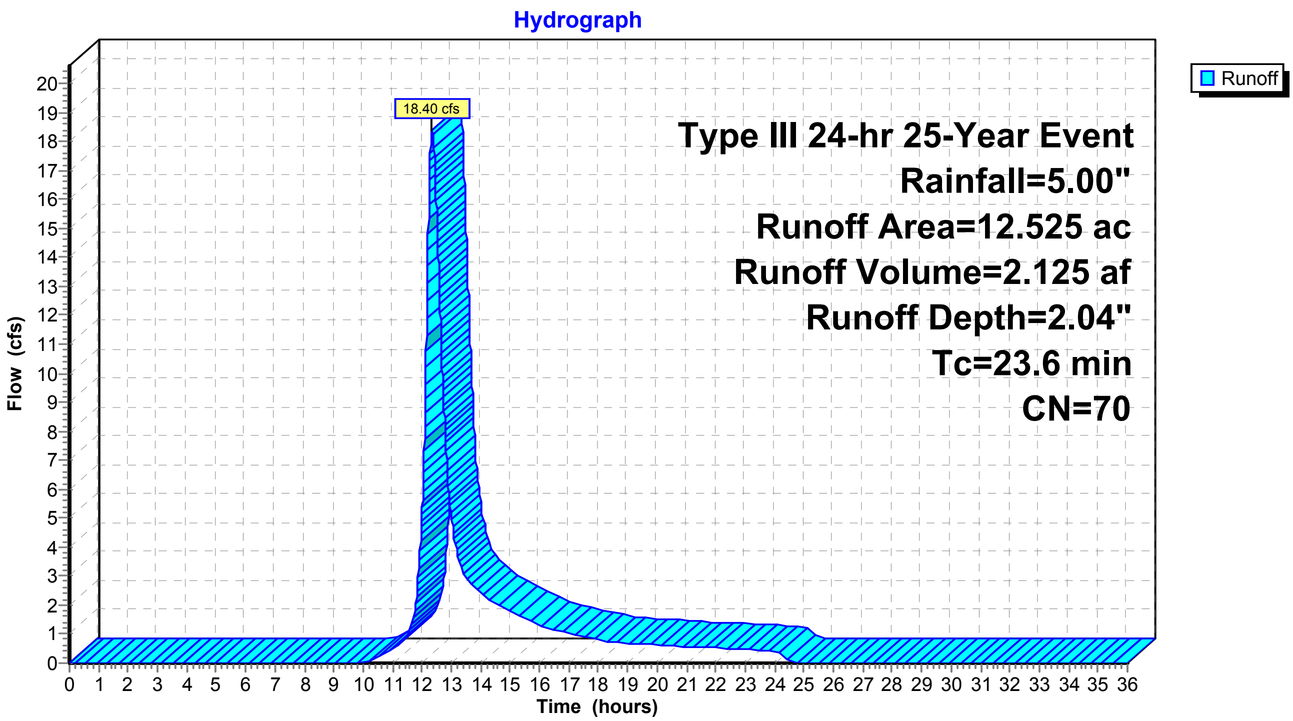
Runoff = 18.40 cfs @ 12.35 hrs, Volume= 2.125 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
11.358	70	Woods, Good, HSG C
1.167	71	Meadow, non-grazed, HSG C
12.525	70	Weighted Average
12.525		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.6					**Direct Entry, See spreadsheet**

Subcatchment SC1.8:



Summary for Subcatchment SC1.9:

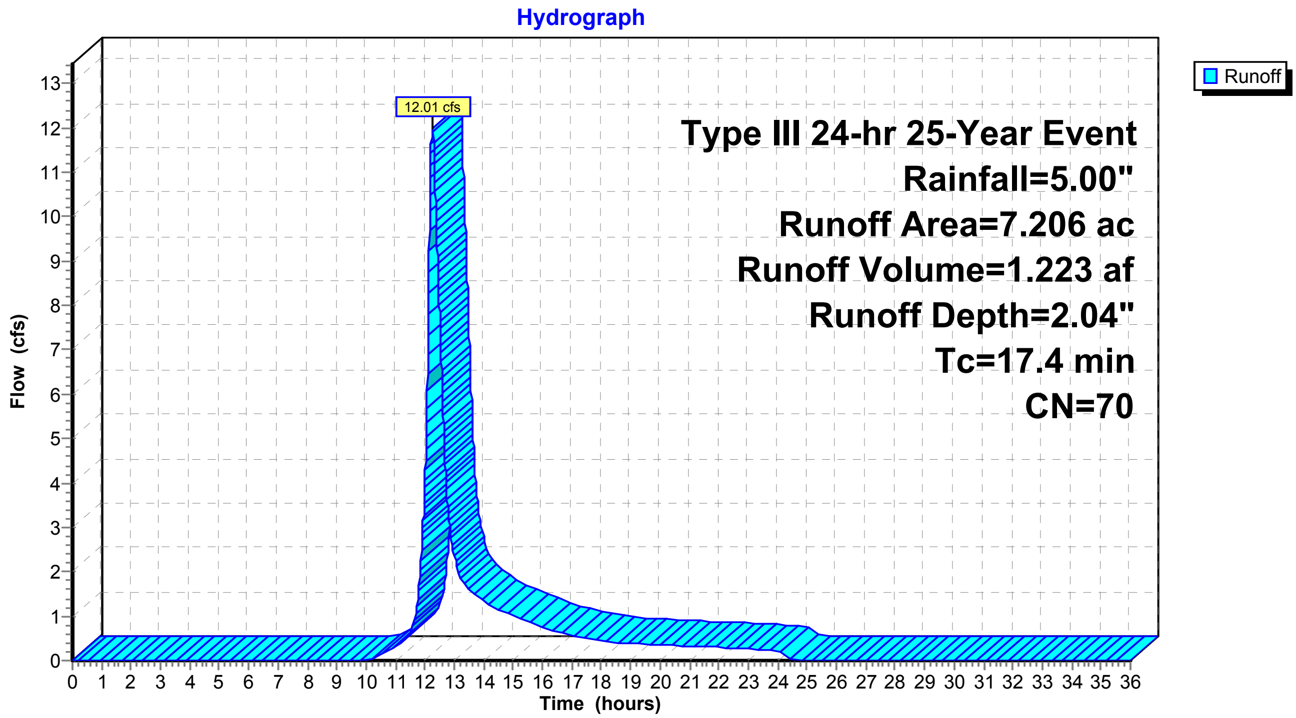
Runoff = 12.01 cfs @ 12.24 hrs, Volume= 1.223 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
6.694	70	Woods, Good, HSG C
0.451	71	Meadow, non-grazed, HSG C
0.061	89	Gravel roads, HSG C
7.206	70	Weighted Average
7.206		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.4					**Direct Entry, See spreadsheet**

Subcatchment SC1.9:



Summary for Subcatchment SC3.1:

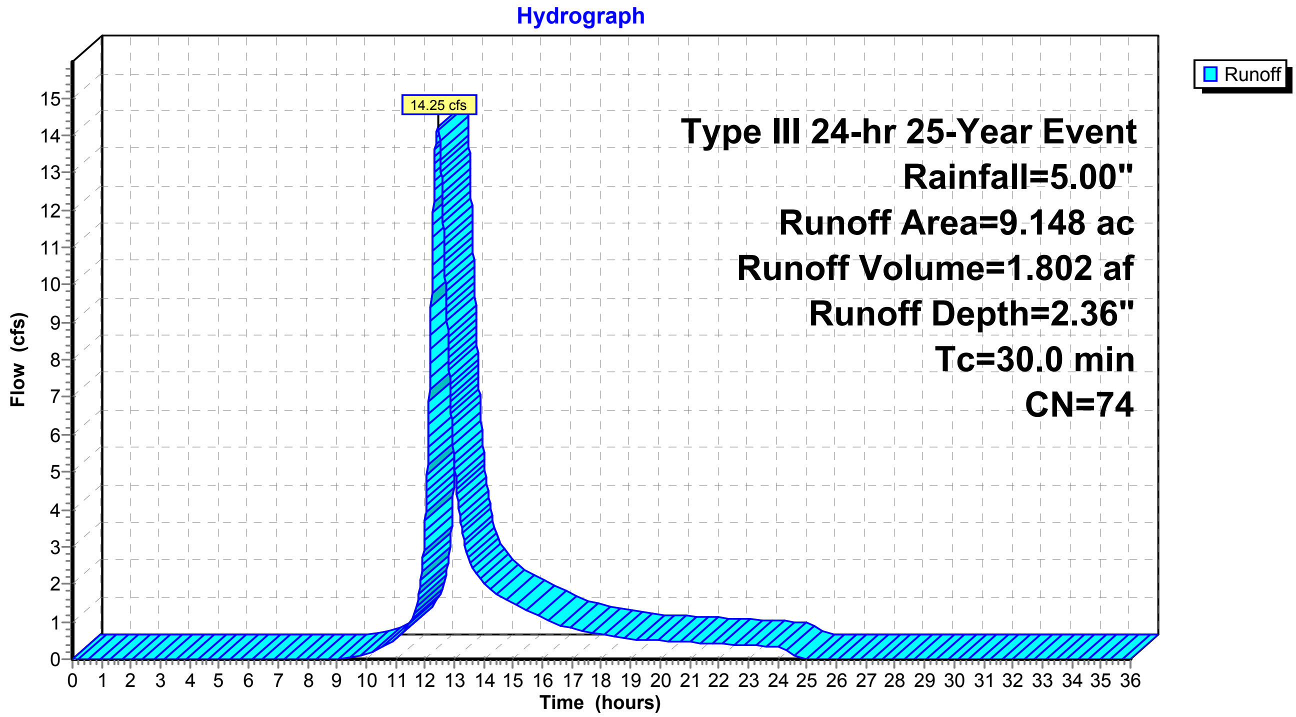
Runoff = 14.25 cfs @ 12.43 hrs, Volume= 1.802 af, Depth= 2.36"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
3.839	70	Woods, Good, HSG C
0.131	89	Gravel roads, HSG C
4.686	77	Woods, Good, HSG D
0.492	78	Meadow, non-grazed, HSG D
9.148	74	Weighted Average
9.148		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
30.0					**Direct Entry, See spreadsheet**

Subcatchment SC3.1:



Summary for Subcatchment SC3.2:

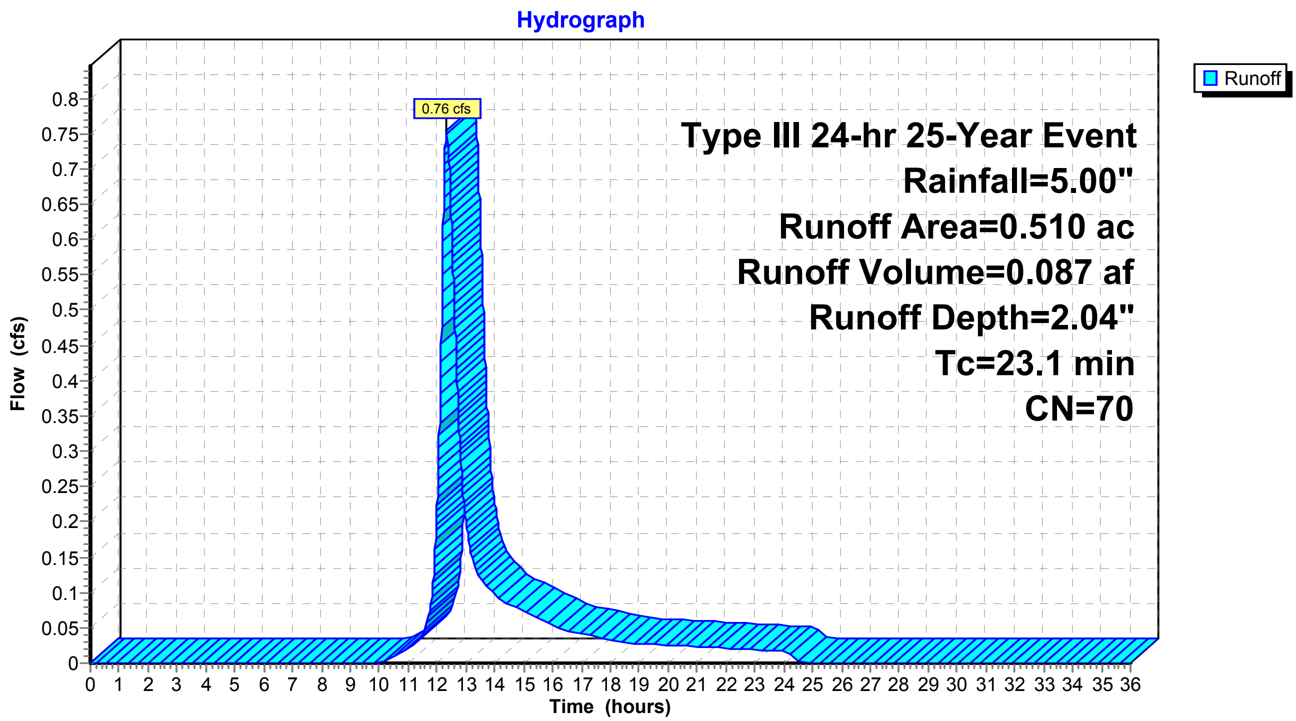
Runoff = 0.76 cfs @ 12.34 hrs, Volume= 0.087 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
0.372	70	Woods, Good, HSG C
0.138	71	Meadow, non-grazed, HSG C
0.510	70	Weighted Average
0.510		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
23.1					**Direct Entry, See spreadsheet**

Subcatchment SC3.2:



Summary for Subcatchment SC3.3:

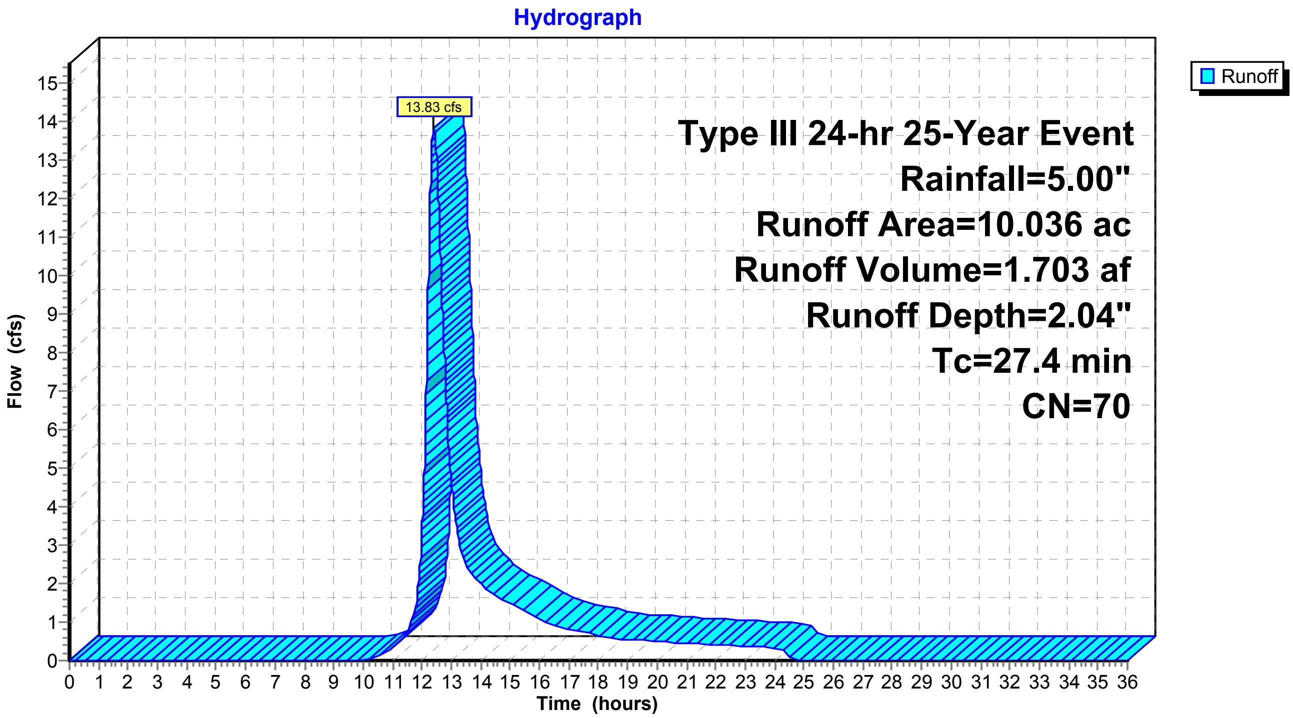
Runoff = 13.83 cfs @ 12.39 hrs, Volume= 1.703 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
8.861	70	Woods, Good, HSG C
1.116	71	Meadow, non-grazed, HSG C
0.059	89	Gravel roads, HSG C
10.036	70	Weighted Average
10.036		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.4					**Direct Entry, See spreadsheet**

Subcatchment SC3.3:



Summary for Subcatchment SC3.4:

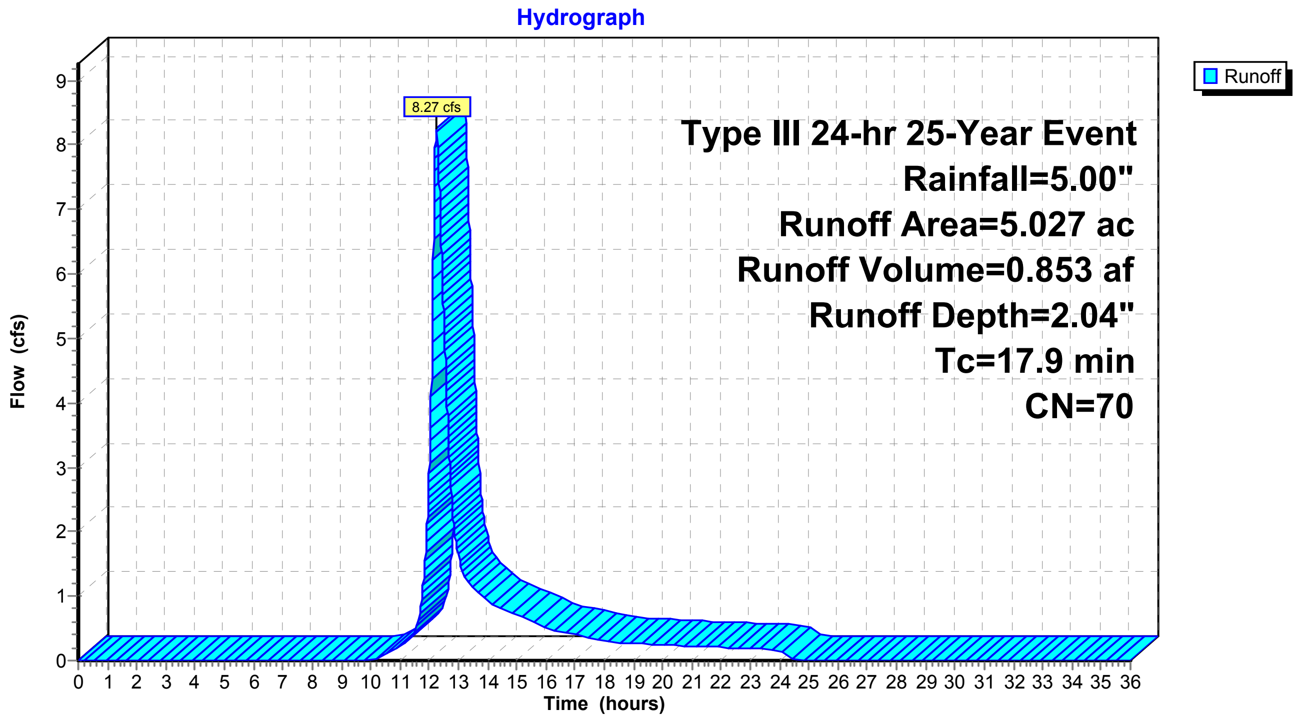
Runoff = 8.27 cfs @ 12.26 hrs, Volume= 0.853 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
4.217	70	Woods, Good, HSG C
0.777	71	Meadow, non-grazed, HSG C
0.033	89	Gravel roads, HSG C
5.027	70	Weighted Average
5.027		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.9					**Direct Entry, See spreadsheet**

Subcatchment SC3.4:



Summary for Subcatchment SC3.5:

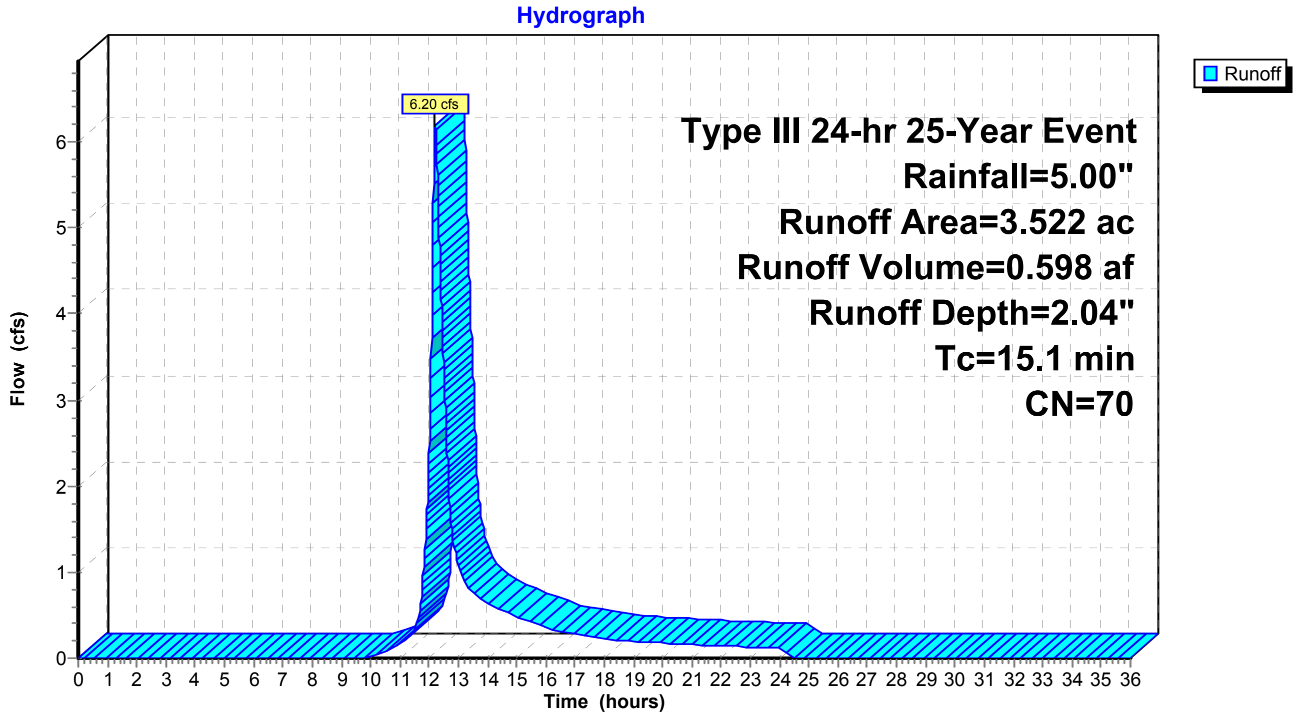
Runoff = 6.20 cfs @ 12.22 hrs, Volume= 0.598 af, Depth= 2.04"

Runoff by SCS TR-20 method, UH=SCS, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs
Type III 24-hr 25-Year Event Rainfall=5.00"

Area (ac)	CN	Description
3.089	70	Woods, Good, HSG C
0.433	71	Meadow, non-grazed, HSG C
3.522	70	Weighted Average
3.522		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
15.1					**Direct Entry, See spreadsheet**

Subcatchment SC3.5:



Summary for Reach 1.1R:

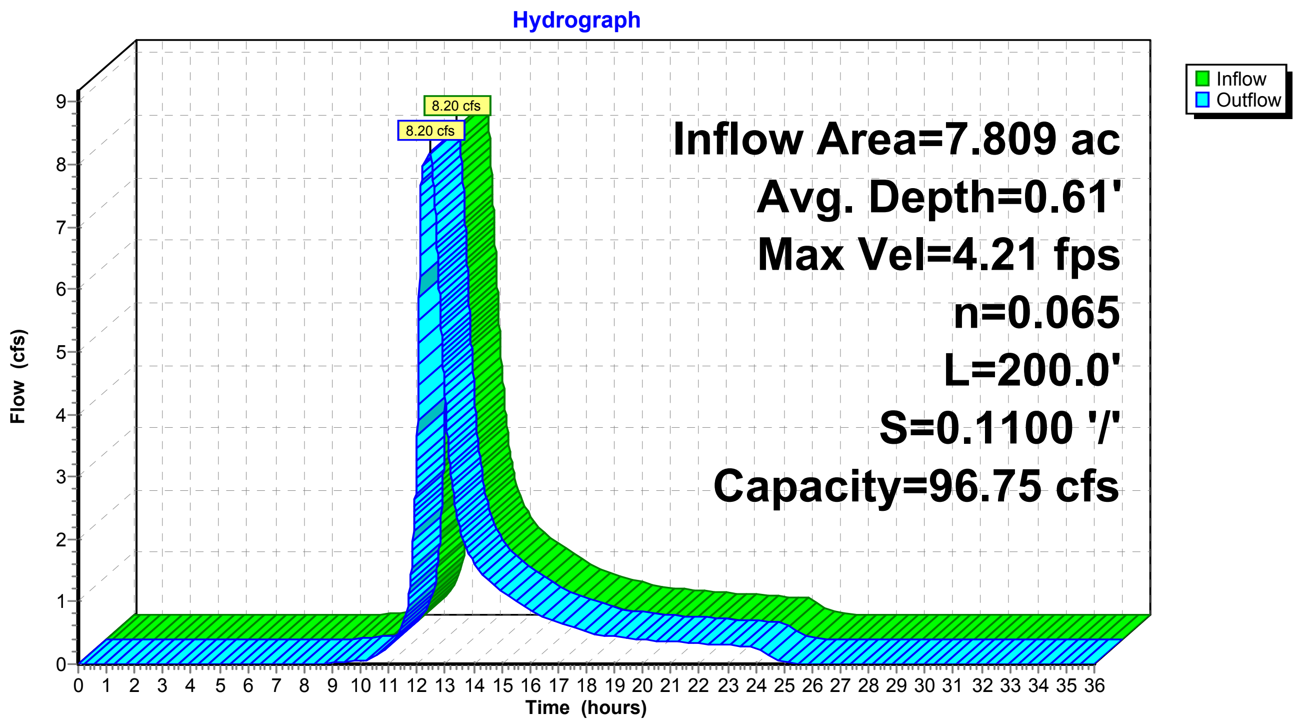
Inflow Area = 7.809 ac, 5.17% Impervious, Inflow Depth = 2.09" for 25-Year Event event
Inflow = 8.20 cfs @ 12.43 hrs, Volume= 1.359 af
Outflow = 8.20 cfs @ 12.44 hrs, Volume= 1.359 af, Atten= 0%, Lag= 0.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 4.21 fps, Min. Travel Time= 0.8 min
Avg. Velocity = 1.58 fps, Avg. Travel Time= 2.1 min

Peak Storage= 389 cf @ 12.44 hrs, Average Depth at Peak Storage= 0.61'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 96.75 cfs

2.00' x 2.00' deep channel, n= 0.065
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 200.0' Slope= 0.1100 '/'
Inlet Invert= 1,064.00', Outlet Invert= 1,042.00'

Reach 1.1R:



Summary for Reach 1.2R:

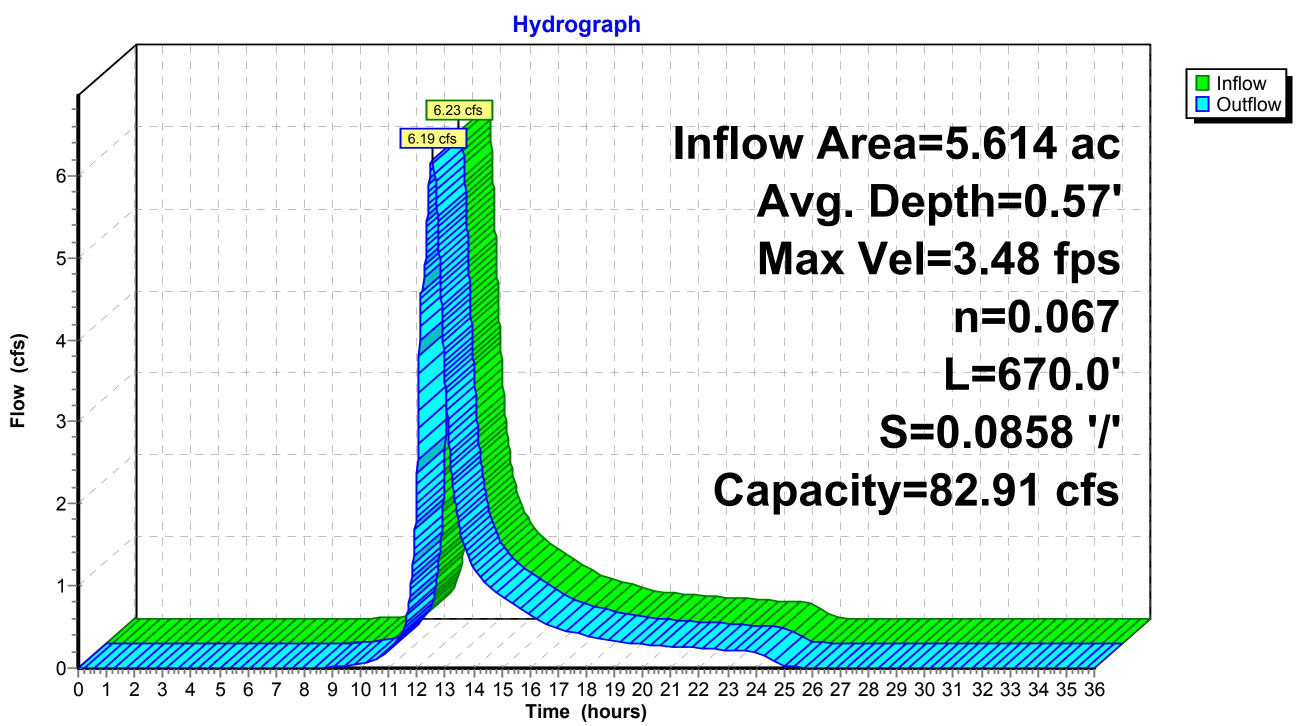
Inflow Area = 5.614 ac, 4.42% Impervious, Inflow Depth = 2.16" for 25-Year Event event
Inflow = 6.23 cfs @ 12.50 hrs, Volume= 1.010 af
Outflow = 6.19 cfs @ 12.53 hrs, Volume= 1.010 af, Atten= 1%, Lag= 2.2 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 3.48 fps, Min. Travel Time= 3.2 min
Avg. Velocity = 1.32 fps, Avg. Travel Time= 8.5 min

Peak Storage= 1,192 cf @ 12.53 hrs, Average Depth at Peak Storage= 0.57'
Bank-Full Depth= 2.00', Capacity at Bank-Full= 82.91 cfs

2.00' x 2.00' deep channel, n= 0.067
Side Slope Z-value= 2.0 '/' Top Width= 10.00'
Length= 670.0' Slope= 0.0858 '/'
Inlet Invert= 1,121.50', Outlet Invert= 1,064.00'

Reach 1.2R:



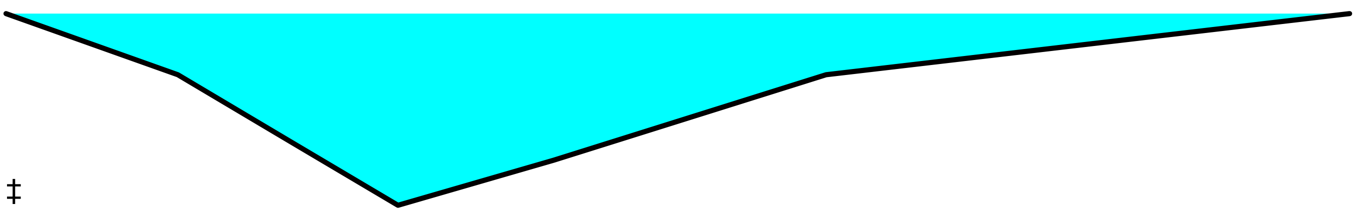
Summary for Reach 1.3R: Stream at Culvert Inlet

Inflow Area = 46.612 ac, 0.00% Impervious, Inflow Depth = 2.05" for 25-Year Event event
Inflow = 61.38 cfs @ 12.44 hrs, Volume= 7.945 af
Outflow = 61.20 cfs @ 12.45 hrs, Volume= 7.945 af, Atten= 0%, Lag= 1.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 6.25 fps, Min. Travel Time= 1.6 min
Avg. Velocity = 2.35 fps, Avg. Travel Time= 4.3 min

Peak Storage= 5,875 cf @ 12.45 hrs, Average Depth at Peak Storage= 1.28'
Defined Flood Depth= 3.00', Capacity at Flood Depth= 277.60 cfs
Bank-Full Depth= 1.19', Capacity at Bank-Full= 49.53 cfs

Custom cross-section, Length= 600.0' Slope= 0.0713 '/' (101 Elevation Intervals)
Constant n= 0.040 Mountain streams
Inlet Invert= 1,242.00', Outlet Invert= 1,199.19'

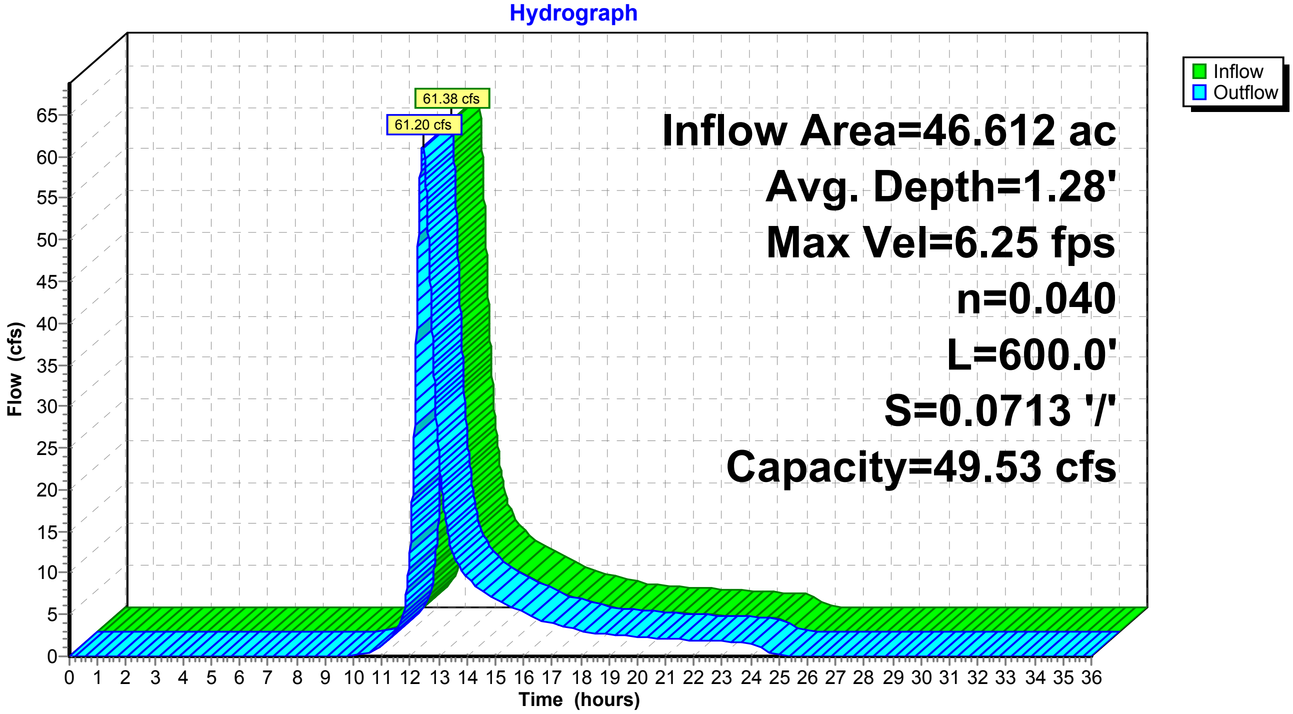


‡

Offset (feet)	Elevation (feet)	Chan.Depth (feet)
0.00	1,200.38	0.00
2.19	1,200.00	0.38
3.65	1,199.58	0.80
5.00	1,199.19	1.19
6.99	1,199.47	0.91
10.46	1,200.00	0.38
17.14	1,200.38	0.00

Depth (feet)	End Area (sq-ft)	Perim. (feet)	Storage (cubic-feet)	Discharge (cfs)
0.00	0.0	0.0	0	0.00
0.28	0.4	3.0	249	1.09
0.39	0.8	4.1	480	2.65
0.81	3.4	8.4	2,034	18.29
1.19	8.2	17.4	4,931	49.53

Reach 1.3R: Stream at Culvert Inlet



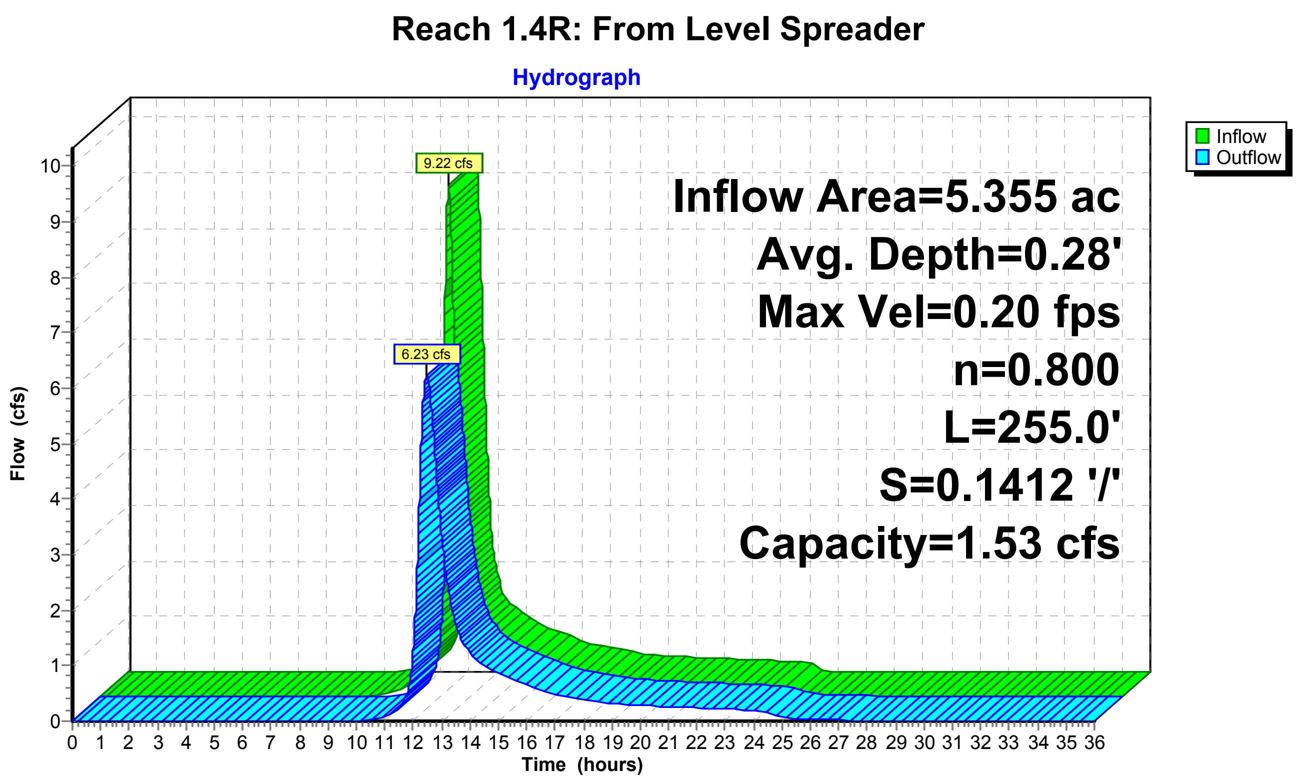
Summary for Reach 1.4R: From Level Spreader

Inflow Area = 5.355 ac, 0.00% Impervious, Inflow Depth = 2.12" for 25-Year Event event
Inflow = 9.22 cfs @ 12.27 hrs, Volume= 0.944 af
Outflow = 6.23 cfs @ 12.48 hrs, Volume= 0.944 af, Atten= 32%, Lag= 12.7 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 0.20 fps, Min. Travel Time= 20.9 min
Avg. Velocity = 0.06 fps, Avg. Travel Time= 71.9 min

Peak Storage= 7,806 cf @ 12.48 hrs, Average Depth at Peak Storage= 0.28'
Bank-Full Depth= 0.10', Capacity at Bank-Full= 1.53 cfs

100.00' x 0.10' deep channel, n= 0.800
Side Slope Z-value= 50.0 '/' Top Width= 110.00'
Length= 255.0' Slope= 0.1412 '/'
Inlet Invert= 1,258.00', Outlet Invert= 1,222.00'



Summary for Reach SP1: Study Point

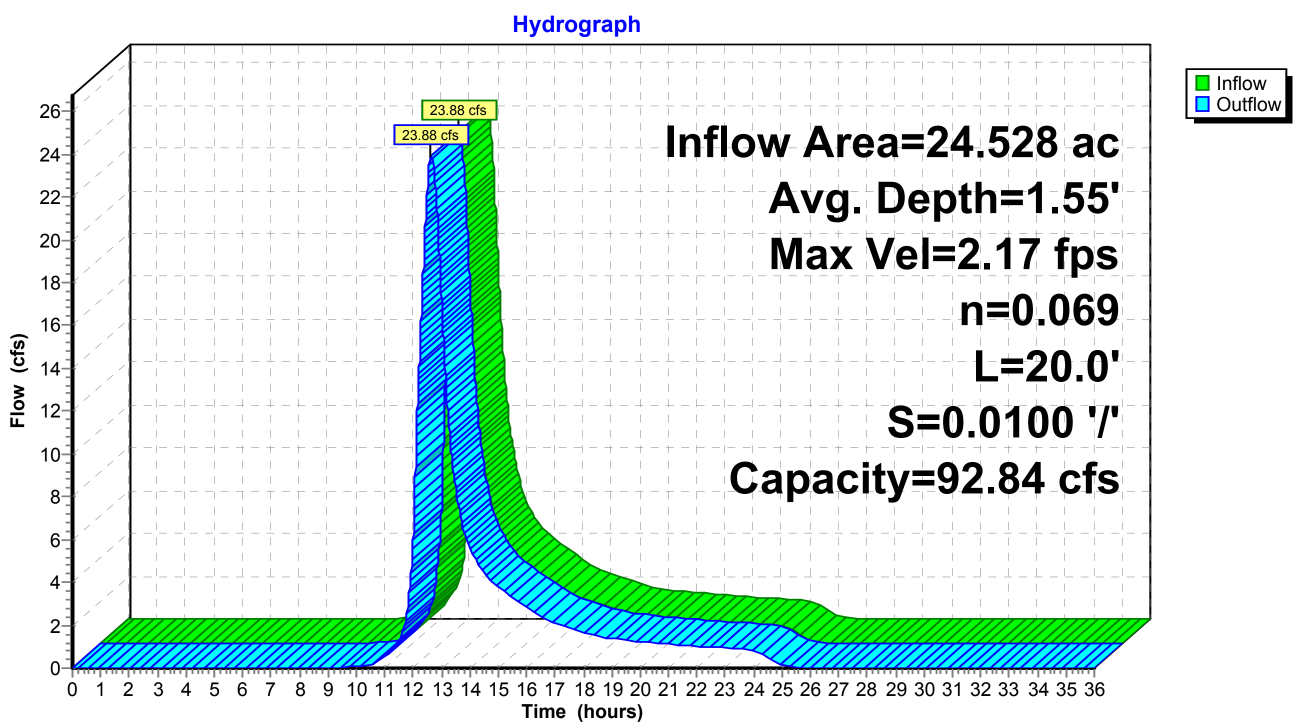
Inflow Area = 24.528 ac, 2.13% Impervious, Inflow Depth = 2.00" for 25-Year Event event
Inflow = 23.88 cfs @ 12.64 hrs, Volume= 4.086 af
Outflow = 23.88 cfs @ 12.64 hrs, Volume= 4.086 af, Atten= 0%, Lag= 0.1 min

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Max. Velocity= 2.17 fps, Min. Travel Time= 0.2 min
Avg. Velocity = 0.74 fps, Avg. Travel Time= 0.5 min

Peak Storage= 221 cf @ 12.64 hrs, Average Depth at Peak Storage= 1.55'
Bank-Full Depth= 3.00', Capacity at Bank-Full= 92.84 cfs

4.00' x 3.00' deep channel, n= 0.069
Side Slope Z-value= 2.0 '/' Top Width= 16.00'
Length= 20.0' Slope= 0.0100 '/'
Inlet Invert= 1,042.00', Outlet Invert= 1,041.80'

Reach SP1: Study Point



Summary for Pond 1P: SD-1

Inflow Area = 16.719 ac, 0.71% Impervious, Inflow Depth = 1.96" for 25-Year Event event
Inflow = 16.93 cfs @ 12.66 hrs, Volume= 2.727 af
Outflow = 16.88 cfs @ 12.72 hrs, Volume= 2.727 af, Atten= 0%, Lag= 3.2 min
Primary = 16.88 cfs @ 12.72 hrs, Volume= 2.727 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,045.54' @ 12.71 hrs Surf.Area= 565 sf Storage= 976 cf
Flood Elev= 1,047.00' Surf.Area= 1,575 sf Storage= 2,345 cf

Plug-Flow detention time= 0.7 min calculated for 2.726 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (888.7 - 888.0)

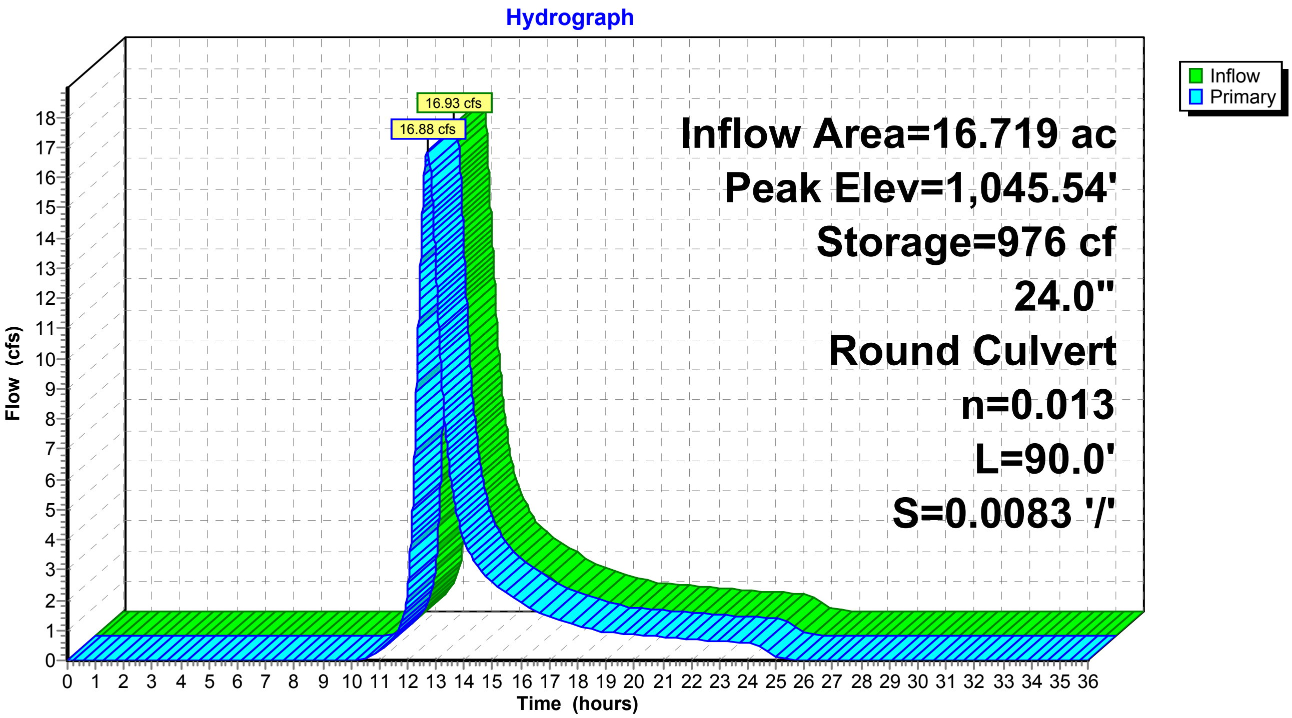
Volume	Invert	Avail.Storage	Storage Description
#1	1,042.00'	2,345 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,042.00	65	35.0	0	0	65
1,044.00	290	70.0	328	328	376
1,046.00	665	105.0	929	1,258	894
1,047.00	1,575	180.0	1,088	2,345	2,601

Device	Routing	Invert	Outlet Devices
#1	Primary	1,042.00'	**24.0" Round SD-1** L= 90.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,041.25' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=16.88 cfs @ 12.72 hrs HW=1,045.54' TW=1,043.54' (Dynamic Tailwater)
1=SD-1 (Inlet Controls 16.88 cfs @ 5.37 fps)

Pond 1P: SD-1


Hydrograph
Inflow
Primary
16.93 cfs
16.88 cfs
Inflow Area=16.719 ac
Peak Elev=1,045.54'
Storage=976 cf
24.0"
Round Culvert
n=0.013
L=90.0'
S=0.0083 '/'
Flow (cfs)
Time (hours)
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
28
29
30
31
32
33
34
35
36

Summary for Pond 2P: SD-2

Inflow Area = 1.981 ac, 4.34% Impervious, Inflow Depth = 1.80" for 25-Year Event event
Inflow = 3.02 cfs @ 12.22 hrs, Volume= 0.298 af
Outflow = 3.02 cfs @ 12.22 hrs, Volume= 0.298 af, Atten= 0%, Lag= 0.2 min
Primary = 3.02 cfs @ 12.22 hrs, Volume= 0.298 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,065.09' @ 12.22 hrs Surf.Area= 42 sf Storage= 28 cf

Plug-Flow detention time= 0.3 min calculated for 0.298 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (864.3 - 864.0)

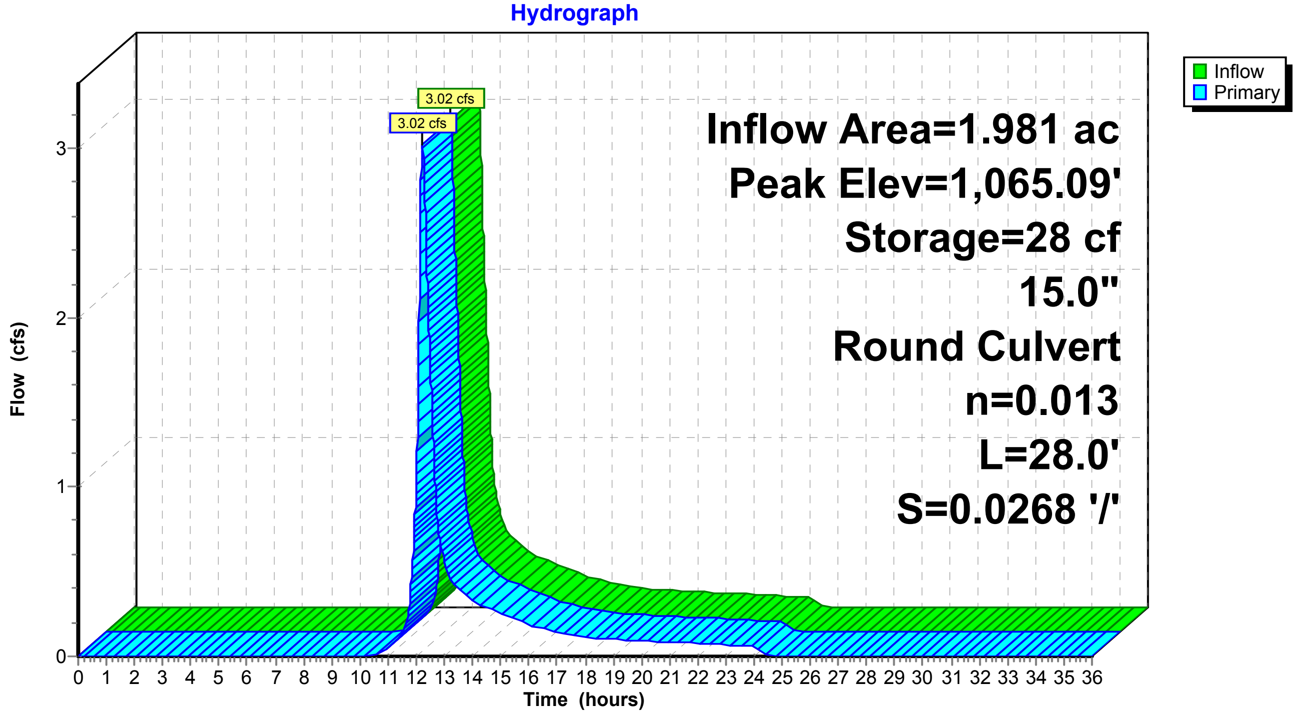
Volume	Invert	Avail.Storage	Storage Description
#1	1,064.00'	195 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,064.00	12	15.0	0	0	12
1,066.00	80	35.0	82	82	106
1,067.00	150	50.0	113	195	216

Device	Routing	Invert	Outlet Devices
#1	Primary	1,064.00'	**15.0" Round SD-2** L= 28.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,063.25' S= 0.0268 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.02 cfs @ 12.22 hrs HW=1,065.09' TW=1,064.60' (Dynamic Tailwater)
↑—**1=SD-2** (Inlet Controls 3.02 cfs @ 2.66 fps)

Pond 2P: SD-2


Hydrograph
Inflow
Primary
3.02 cfs
3.02 cfs
Inflow Area=1.981 ac
Peak Elev=1,065.09'
Storage=28 cf
15.0"
Round Culvert
n=0.013
L=28.0'
S=0.0268 '/'
Flow (cfs)
0
1
2
3
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36
Time (hours)

Summary for Pond 3P: SD-3

Inflow Area = 4.600 ac, 0.00% Impervious, Inflow Depth = 2.04" for 25-Year Event event
Inflow = 5.58 cfs @ 12.52 hrs, Volume= 0.781 af
Outflow = 5.55 cfs @ 12.56 hrs, Volume= 0.781 af, Atten= 1%, Lag= 2.4 min
Primary = 5.55 cfs @ 12.56 hrs, Volume= 0.781 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,124.04' @ 12.56 hrs Surf.Area= 277 sf Storage= 309 cf

Plug-Flow detention time= 0.9 min calculated for 0.781 af (100% of inflow)
Center-of-Mass det. time= 0.8 min (876.2 - 875.4)

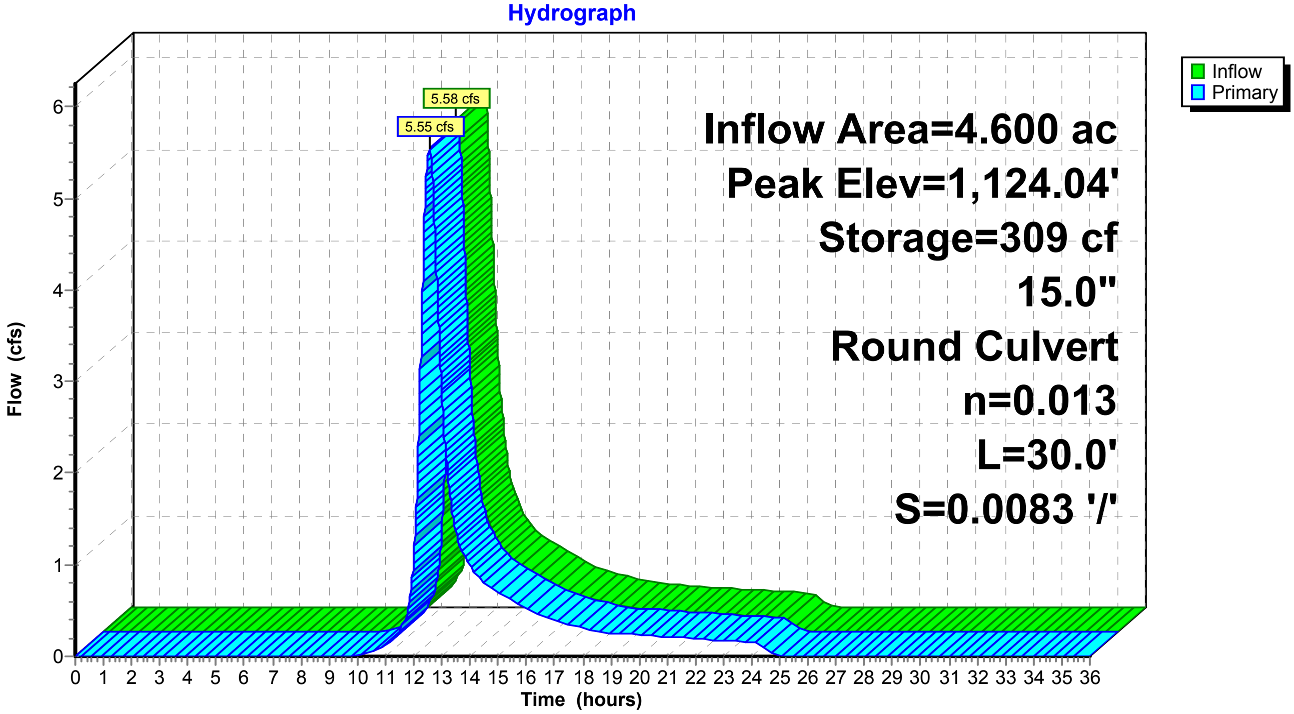
Volume	Invert	Avail.Storage	Storage Description
#1	1,122.00'	666 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,122.00	55	30.0	0	0	55
1,124.00	270	70.0	298	298	389
1,125.00	475	90.0	368	666	656

Device	Routing	Invert	Outlet Devices
#1	Primary	1,122.00'	**15.0" Round SD-3** L= 30.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,121.75' S= 0.0083 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=5.55 cfs @ 12.56 hrs HW=1,124.04' TW=1,122.07' (Dynamic Tailwater)
└─**1=SD-3** (Inlet Controls 5.55 cfs @ 4.52 fps)

Pond 3P: SD-3


Hydrograph
Inflow
Primary
5.58 cfs
5.55 cfs
Inflow Area=4.600 ac
Peak Elev=1,124.04'
Storage=309 cf
15.0"
Round Culvert
n=0.013
L=30.0'
S=0.0083 '/'
Flow (cfs)
0
1
2
3
4
5
6
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

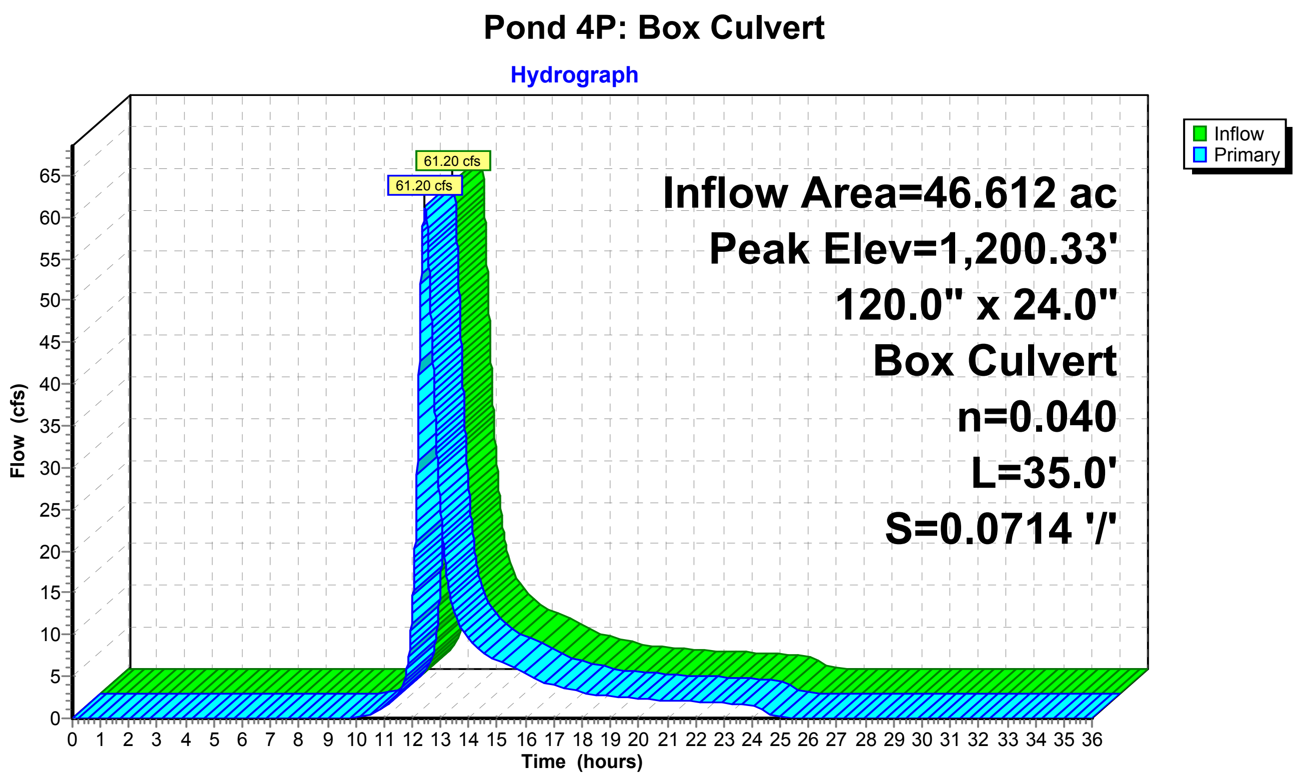
Summary for Pond 4P: Box Culvert

Inflow Area = 46.612 ac, 0.00% Impervious, Inflow Depth = 2.05" for 25-Year Event event
Inflow = 61.20 cfs @ 12.45 hrs, Volume= 7.945 af
Outflow = 61.20 cfs @ 12.45 hrs, Volume= 7.945 af, Atten= 0%, Lag= 0.0 min
Primary = 61.20 cfs @ 12.45 hrs, Volume= 7.945 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,200.33' @ 12.45 hrs
Flood Elev= 1,200.38'

Device	Routing	Invert	Outlet Devices
#1	Primary	1,199.00'	**120.0" W x 24.0" H Box SD-4** L= 35.0' Box, headwall w/3 rounded edges, Ke= 0.200 Outlet Invert= 1,196.50' S= 0.0714 '/' Cc= 0.900 n= 0.040 Mountain streams

Primary OutFlow Max=61.19 cfs @ 12.45 hrs HW=1,200.32' (Free Discharge)
└─**1=SD-4** (Inlet Controls 61.19 cfs @ 4.62 fps)



Summary for Pond 5P: SD-5

Inflow Area = 5.355 ac, 0.00% Impervious, Inflow Depth = 2.12" for 25-Year Event event
Inflow = 9.36 cfs @ 12.25 hrs, Volume= 0.944 af
Outflow = 9.22 cfs @ 12.27 hrs, Volume= 0.944 af, Atten= 1%, Lag= 1.5 min
Primary = 9.22 cfs @ 12.27 hrs, Volume= 0.944 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,264.64' @ 12.27 hrs Surf.Area= 278 sf Storage= 320 cf
Flood Elev= 1,266.00' Surf.Area= 525 sf Storage= 859 cf

Plug-Flow detention time= 0.3 min calculated for 0.944 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (855.8 - 855.5)

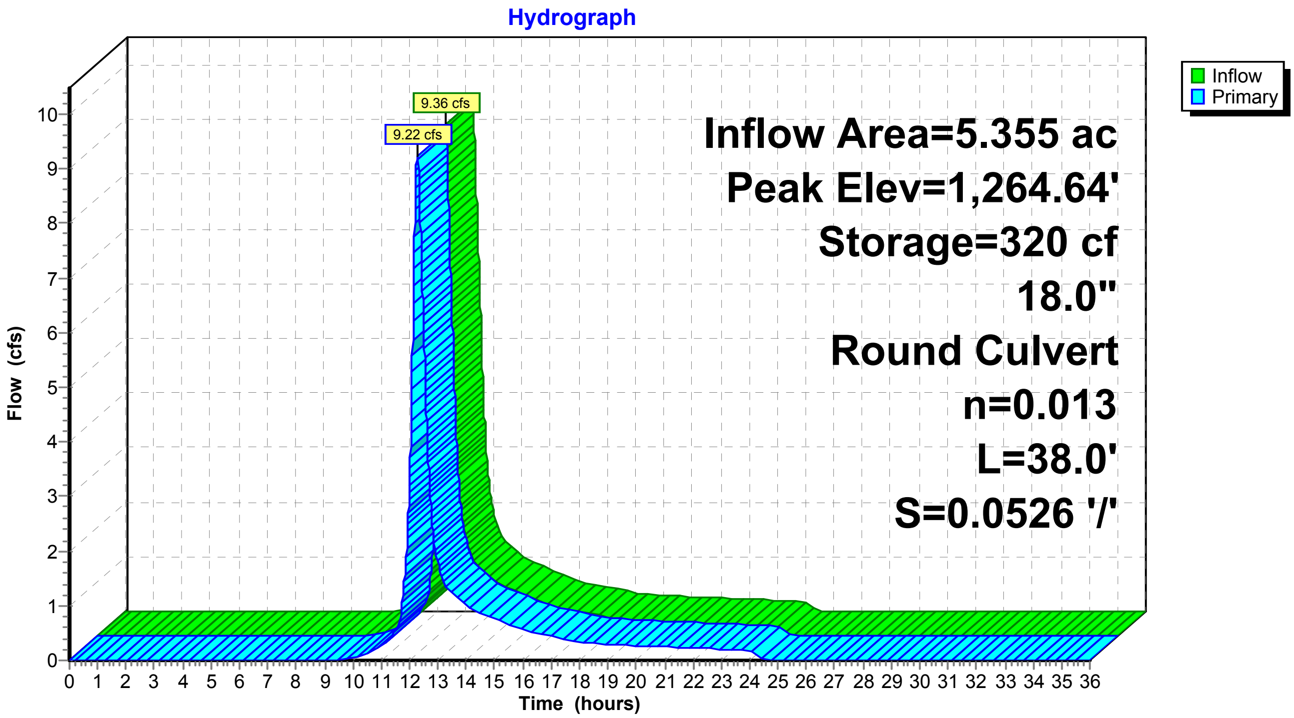
Volume	Invert	Avail.Storage	Storage Description
#1	1,262.00'	859 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,262.00	15	15.0	0	0	15
1,264.00	190	60.0	172	172	294
1,266.00	525	100.0	687	859	828

Device	Routing	Invert	Outlet Devices
#1	Primary	1,262.00'	**18.0" Round SD-5** L= 38.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,260.00' S= 0.0526 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=9.22 cfs @ 12.27 hrs HW=1,264.63' TW=1,258.22' (Dynamic Tailwater)
└─**1=SD-5** (Inlet Controls 9.22 cfs @ 5.22 fps)

Pond 5P: SD-5


Hydrograph
Inflow
Primary
9.36 cfs
9.22 cfs
Inflow Area=5.355 ac
Peak Elev=1,264.64'
Storage=320 cf
18.0"
Round Culvert
n=0.013
L=38.0'
S=0.0526 '/'
Flow (cfs)
0
1
2
3
4
5
6
7
8
9
10
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Summary for Pond 6P: SD-6

Inflow Area = 12.525 ac, 0.00% Impervious, Inflow Depth = 2.04" for 25-Year Event event
Inflow = 18.40 cfs @ 12.35 hrs, Volume= 2.125 af
Outflow = 16.99 cfs @ 12.44 hrs, Volume= 2.125 af, Atten= 8%, Lag= 5.5 min
Primary = 16.99 cfs @ 12.44 hrs, Volume= 2.125 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,425.02' @ 12.44 hrs Surf.Area= 2,370 sf Storage= 2,712 cf

Plug-Flow detention time= 1.5 min calculated for 2.125 af (100% of inflow)
Center-of-Mass det. time= 1.4 min (865.4 - 864.0)

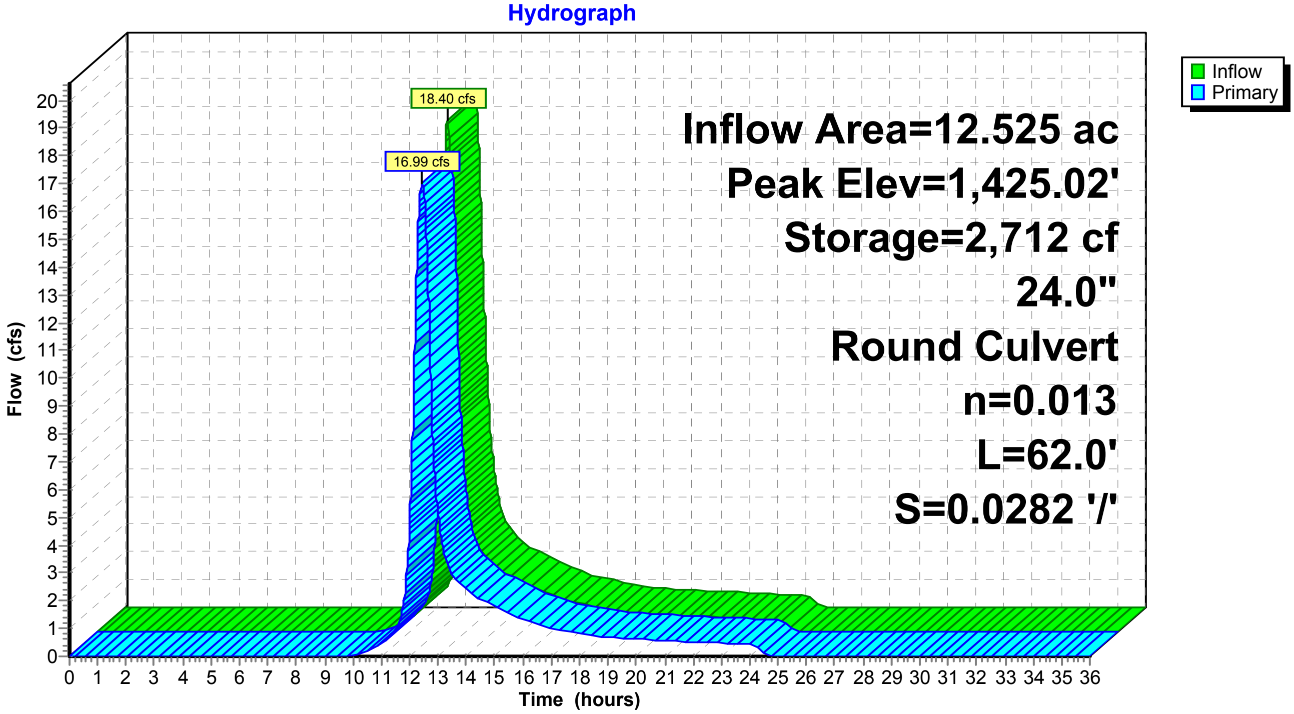
Volume	Invert	Avail.Storage	Storage Description
#1	1,422.00'	5,794 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,422.00	75	55.0	0	0	75
1,424.00	1,100	390.0	975	975	11,946
1,426.00	4,025	975.0	4,819	5,794	75,506

Device	Routing	Invert	Outlet Devices
#1	Primary	1,422.00'	**24.0" Round SD-6** L= 62.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,420.25' S= 0.0282 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=16.99 cfs @ 12.44 hrs HW=1,425.02' (Free Discharge)
1=SD-6 (Inlet Controls 16.99 cfs @ 5.41 fps)

Pond 6P: SD-6


Hydrograph
Inflow
Primary
18.40 cfs
16.99 cfs
Inflow Area=12.525 ac
Peak Elev=1,425.02'
Storage=2,712 cf
24.0"
Round Culvert
n=0.013
L=62.0'
S=0.0282 '/'
Flow (cfs)
Time (hours)

Summary for Pond 7P: SD-7-11

Inflow Area = 7.206 ac, 0.00% Impervious, Inflow Depth = 2.04" for 25-Year Event event
Inflow = 12.01 cfs @ 12.24 hrs, Volume= 1.223 af
Outflow = 12.00 cfs @ 12.25 hrs, Volume= 1.223 af, Atten= 0%, Lag= 0.3 min
Primary = 12.00 cfs @ 12.25 hrs, Volume= 1.223 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,454.15' @ 12.25 hrs Surf.Area= 63 sf Storage= 41 cf

Plug-Flow detention time= 0.2 min calculated for 1.223 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (858.3 - 858.2)

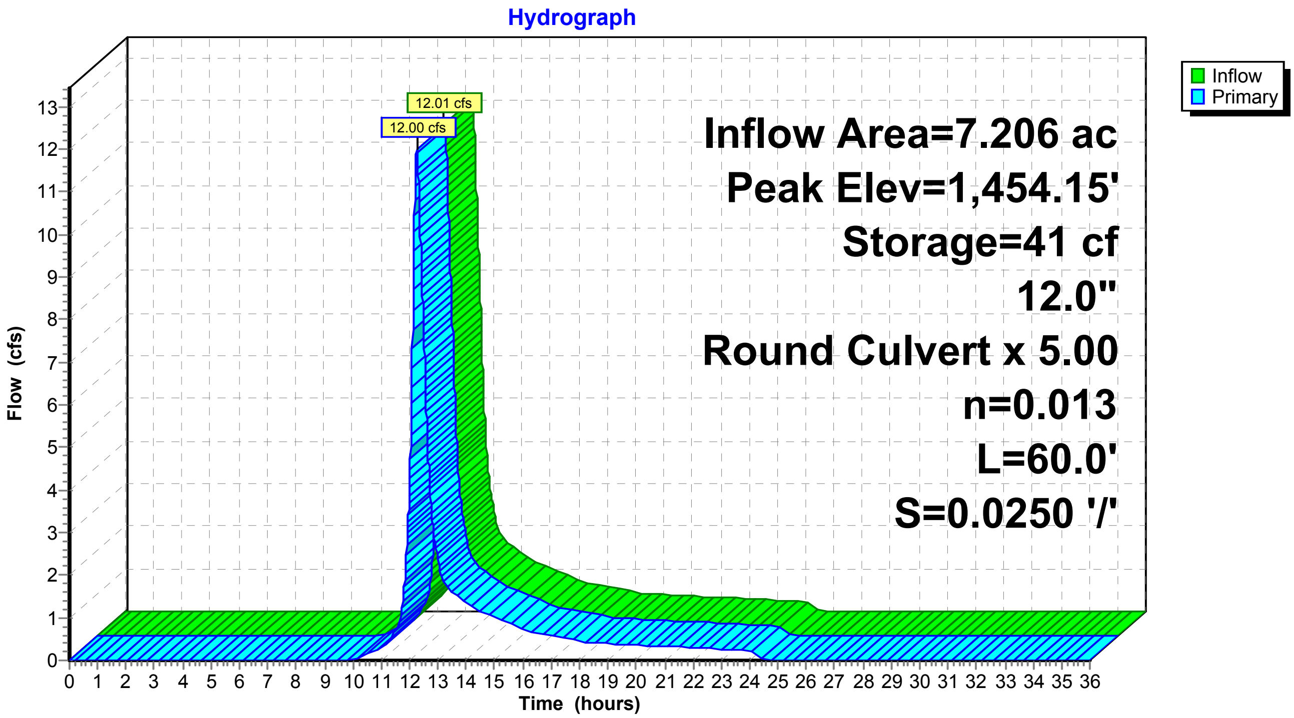
Volume	Invert	Avail.Storage	Storage Description
#1	1,453.00'	273 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,453.00	15	15.0	0	0	15
1,454.00	55	30.0	33	33	73
1,456.00	200	60.0	240	273	306

Device	Routing	Invert	Outlet Devices
#1	Primary	1,453.00'	**12.0" Round SD-7 X 5.00** L= 60.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,451.50' S= 0.0250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=12.00 cfs @ 12.25 hrs HW=1,454.15' (Free Discharge)
└**1=SD-7** (Inlet Controls 12.00 cfs @ 3.05 fps)

Pond 7P: SD-7-11



Summary for Pond 8P: SD-12-15

Inflow Area = 8.557 ac, 0.00% Impervious, Inflow Depth = 2.12" for 25-Year Event event
Inflow = 13.55 cfs @ 12.32 hrs, Volume= 1.509 af
Outflow = 13.55 cfs @ 12.32 hrs, Volume= 1.509 af, Atten= 0%, Lag= 0.4 min
Primary = 13.55 cfs @ 12.32 hrs, Volume= 1.509 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,559.29' @ 12.32 hrs Surf.Area= 102 sf Storage= 79 cf

Plug-Flow detention time= 0.2 min calculated for 1.509 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (859.8 - 859.7)

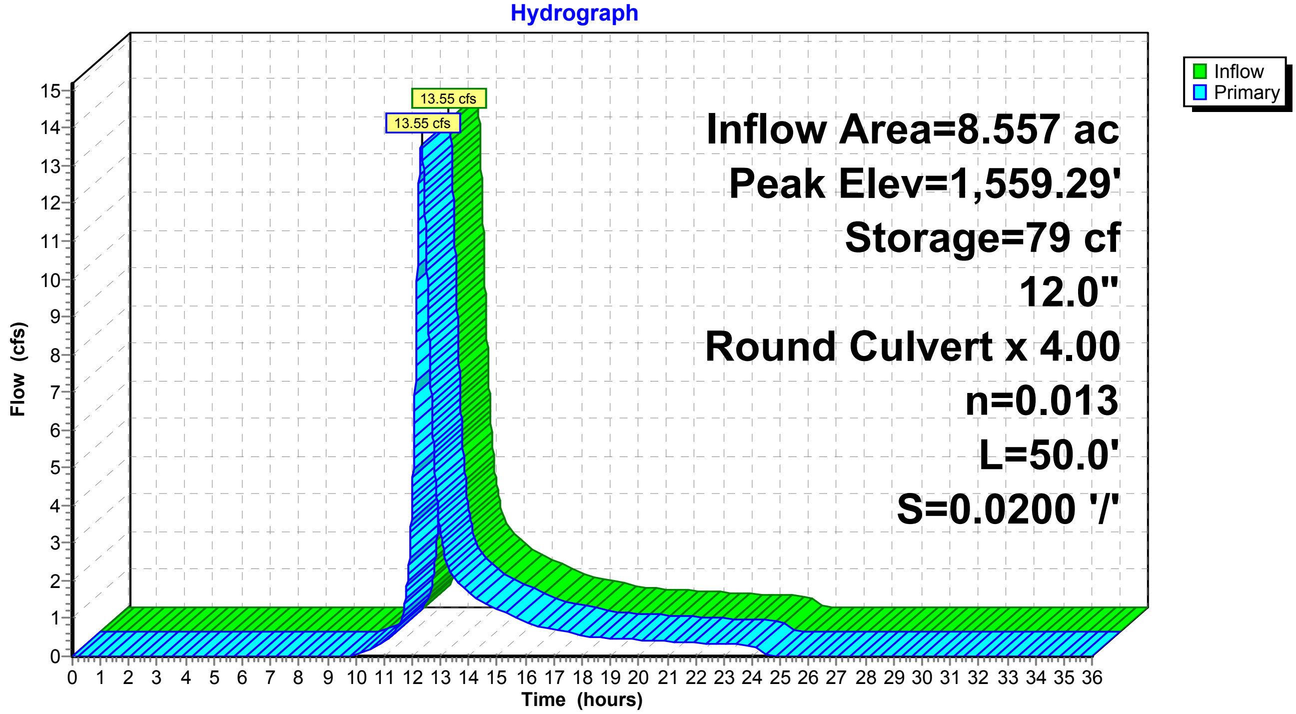
Volume	Invert	Avail.Storage	Storage Description
#1	1,557.50'	798 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,557.50	10	10.0	0	0	10
1,558.00	20	18.0	7	7	29
1,560.00	175	55.0	169	177	256
1,562.00	470	85.0	621	798	619

Device	Routing	Invert	Outlet Devices
#1	Primary	1,557.50'	**12.0" Round SD-12 X 4.00** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,556.50' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=13.55 cfs @ 12.32 hrs HW=1,559.29' (Free Discharge)
└─**1=SD-12** (Inlet Controls 13.55 cfs @ 4.31 fps)

Pond 8P: SD-12-15



Summary for Pond 9P: SD-16

Inflow Area = 5.297 ac, 0.00% Impervious, Inflow Depth = 2.12" for 25-Year Event event
Inflow = 7.62 cfs @ 12.39 hrs, Volume= 0.934 af
Outflow = 7.56 cfs @ 12.43 hrs, Volume= 0.934 af, Atten= 1%, Lag= 2.0 min
Primary = 7.56 cfs @ 12.43 hrs, Volume= 0.934 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,605.25' @ 12.43 hrs Surf.Area= 159 sf Storage= 241 cf
Flood Elev= 1,606.00' Surf.Area= 210 sf Storage= 378 cf

Plug-Flow detention time= 0.3 min calculated for 0.934 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (865.2 - 864.9)

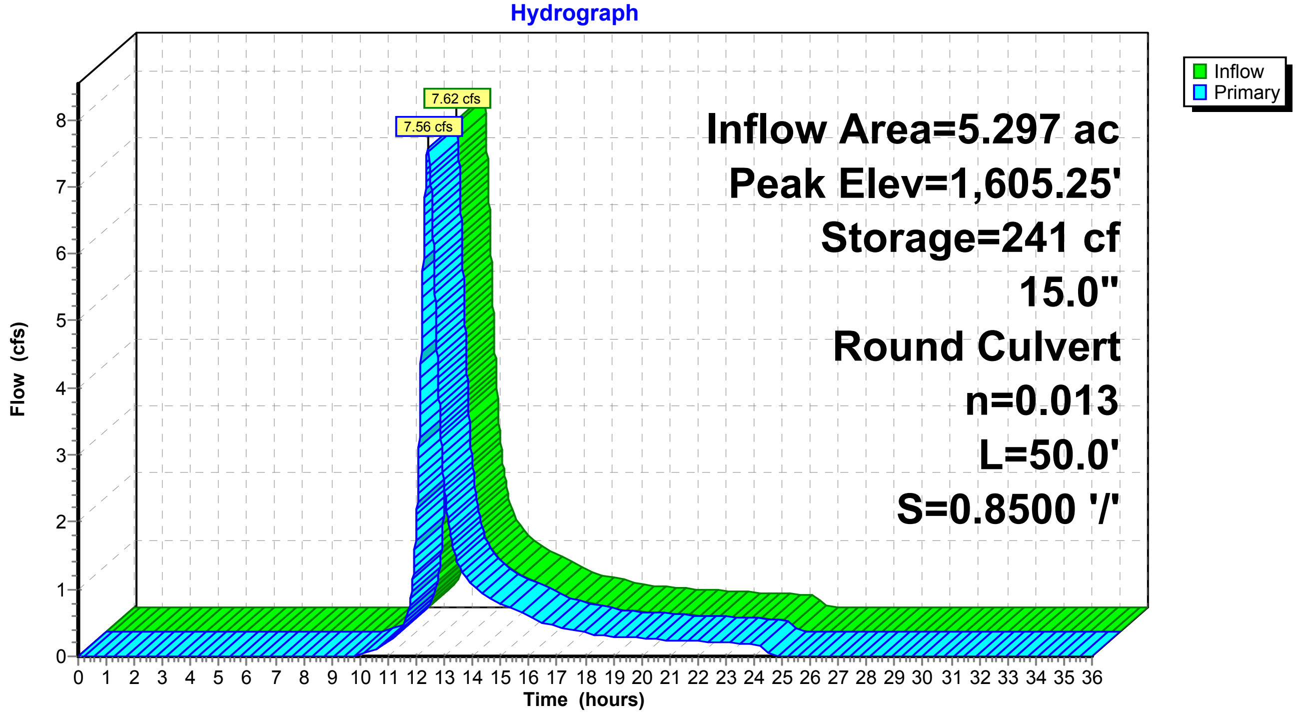
Volume	Invert	Avail.Storage	Storage Description
#1	1,602.00'	378 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,602.00	10	12.0	0	0	10
1,604.00	90	40.0	87	87	137
1,606.00	210	65.0	292	378	371

Device	Routing	Invert	Outlet Devices
#1	Primary	1,602.00'	**15.0" Round SD-16** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,559.50' S= 0.8500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=7.56 cfs @ 12.43 hrs HW=1,605.25' (Free Discharge)
└─**1=SD-16** (Inlet Controls 7.56 cfs @ 6.16 fps)

Pond 9P: SD-16


Hydrograph
Inflow
Primary
7.62 cfs
7.56 cfs
Inflow Area=5.297 ac
Peak Elev=1,605.25'
Storage=241 cf
15.0"
Round Culvert
n=0.013
L=50.0'
S=0.8500 '/'
Flow (cfs)
0
1
2
3
4
5
6
7
8
Time (hours)
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Summary for Pond 10P: SD-17

Inflow Area = 1.538 ac, 0.00% Impervious, Inflow Depth = 2.12" for 25-Year Event event
Inflow = 2.17 cfs @ 12.42 hrs, Volume= 0.271 af
Outflow = 2.17 cfs @ 12.42 hrs, Volume= 0.271 af, Atten= 0%, Lag= 0.2 min
Primary = 2.17 cfs @ 12.42 hrs, Volume= 0.271 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,675.84' @ 12.42 hrs Surf.Area= 53 sf Storage= 24 cf

Plug-Flow detention time= 0.2 min calculated for 0.271 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (866.3 - 866.0)

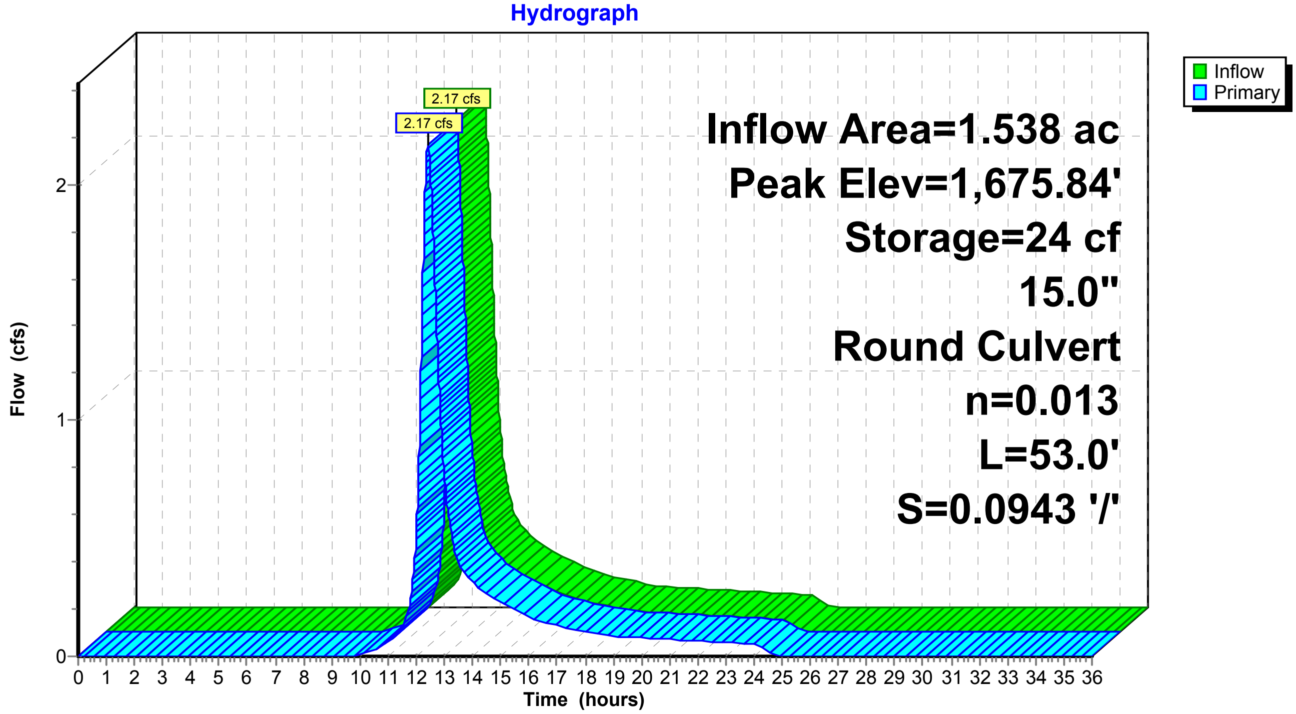
Volume	Invert	Avail.Storage	Storage Description
#1	1,675.00'	295 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,675.00	10	10.0	0	0	10
1,676.00	65	35.0	33	33	102
1,678.00	210	60.0	261	295	314

Device	Routing	Invert	Outlet Devices
#1	Primary	1,675.00'	**15.0" Round SD-17** L= 53.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,670.00' S= 0.0943 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.17 cfs @ 12.42 hrs HW=1,675.84' (Free Discharge)
└─**1=SD-17** (Inlet Controls 2.17 cfs @ 2.47 fps)

Pond 10P: SD-17



Summary for Pond 11P: SD-18

Inflow Area =	9.148 ac,	0.00% Impervious, Inflow Depth = 2.36"	for 25-Year Event event	
Inflow =	14.25 cfs @	12.43 hrs, Volume=	1.802 af	
Outflow =	13.39 cfs @	12.53 hrs, Volume=	1.802 af,	Atten= 6%, Lag= 5.8 min
Primary =	13.39 cfs @	12.53 hrs, Volume=	1.802 af	

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,639.63' @ 12.53 hrs Surf.Area= 5,419 sf Storage= 5,099 cf

Plug-Flow detention time= 9.5 min calculated for 1.802 af (100% of inflow)
Center-of-Mass det. time= 9.4 min (869.1 - 859.7)

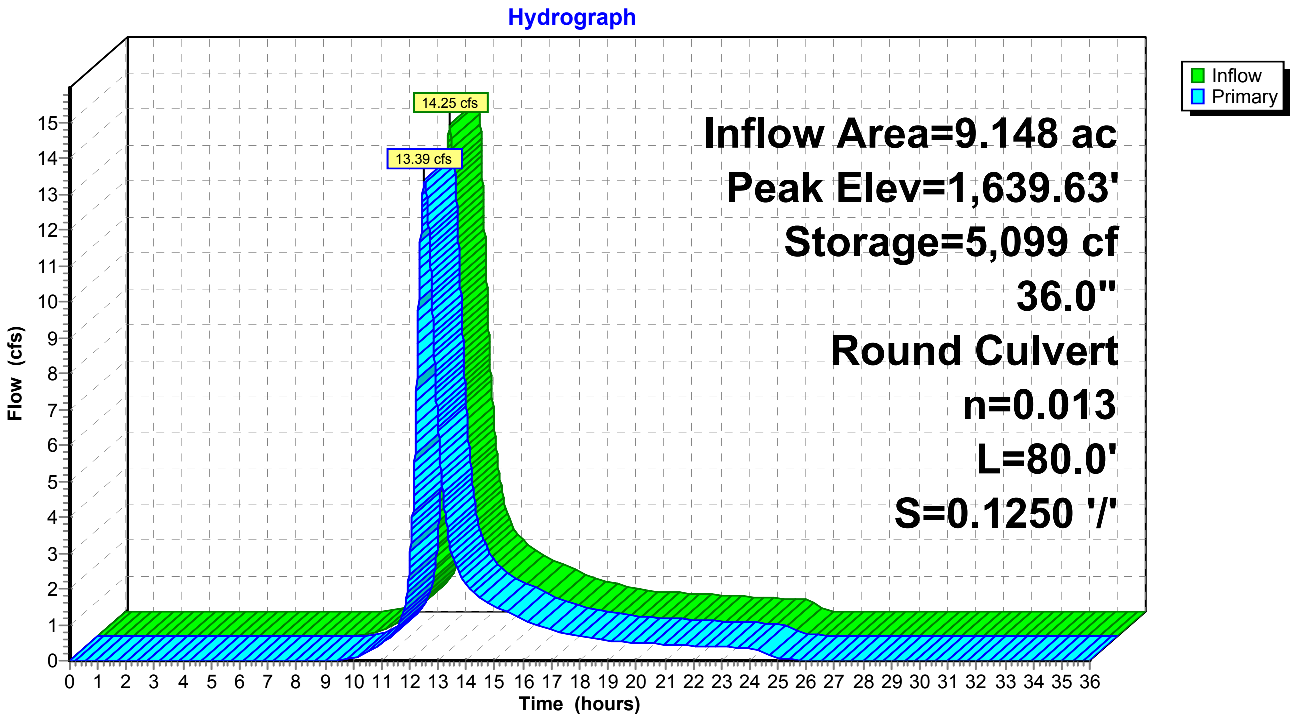
Volume	Invert	Avail.Storage	Storage Description
#1	1,638.00'	46,536 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,638.00	1,320	200.0	0	0	1,320
1,640.00	6,760	450.0	7,378	7,378	14,268
1,642.00	16,100	535.0	22,195	29,573	21,003
1,643.00	17,840	560.0	16,963	46,536	23,249

Device	Routing	Invert	Outlet Devices
#1	Primary	1,638.00'	**36.0" Round SD-18** L= 80.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,628.00' S= 0.1250 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=13.39 cfs @ 12.53 hrs HW=1,639.62' (Free Discharge)
1=SD-18 (Inlet Controls 13.39 cfs @ 3.43 fps)

Pond 11P: SD-18



Summary for Pond 12P: SD-19

Inflow Area = 2.416 ac, 0.00% Impervious, Inflow Depth = 2.04" for 25-Year Event event
Inflow = 3.14 cfs @ 12.47 hrs, Volume= 0.410 af
Outflow = 3.01 cfs @ 12.54 hrs, Volume= 0.407 af, Atten= 4%, Lag= 4.4 min
Primary = 3.01 cfs @ 12.54 hrs, Volume= 0.407 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,681.65' @ 12.54 hrs Surf.Area= 1,331 sf Storage= 985 cf

Plug-Flow detention time= 12.9 min calculated for 0.407 af (99% of inflow)
Center-of-Mass det. time= 8.5 min (879.4 - 870.9)

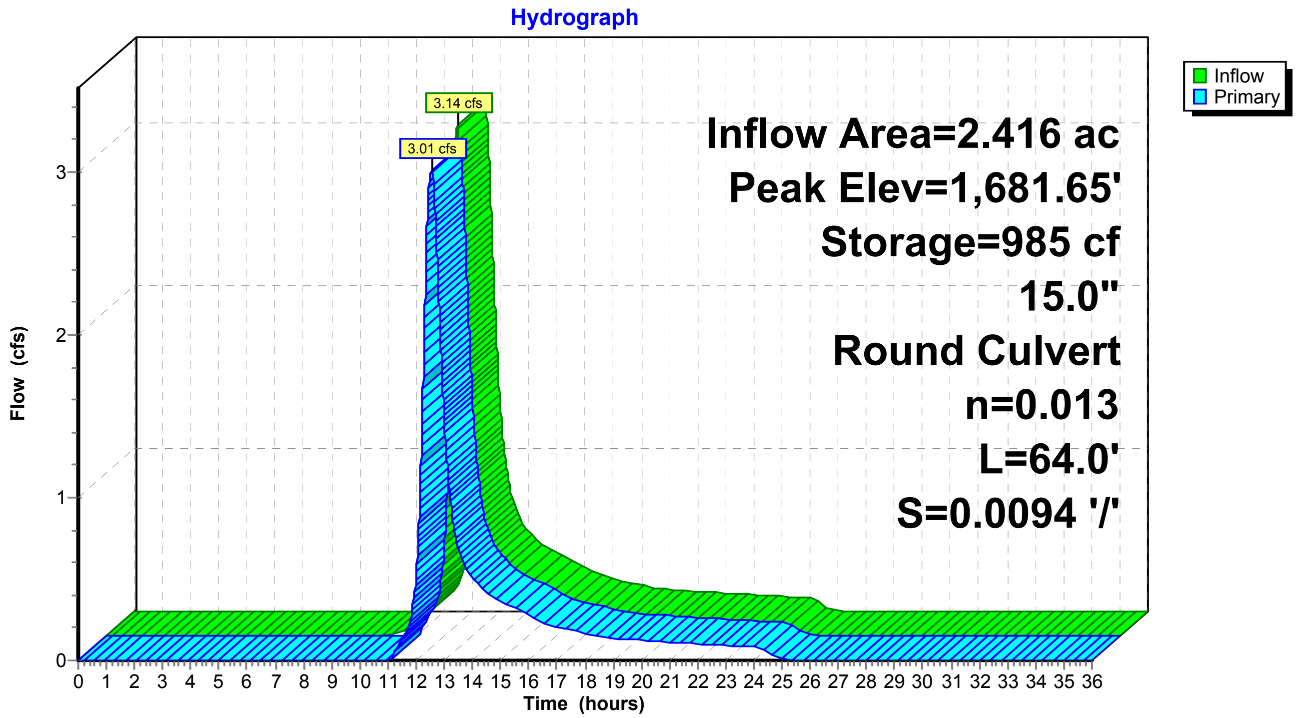
Volume	Invert	Avail.Storage	Storage Description
#1	1,680.00'	1,535 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,680.00	100	45.0	0	0	100
1,682.00	1,780	510.0	1,535	1,535	20,644

Device	Routing	Invert	Outlet Devices
#1	Primary	1,680.60'	**15.0" Round SD-19** L= 64.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,680.00' S= 0.0094 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.01 cfs @ 12.54 hrs HW=1,681.65' (Free Discharge)
└─**1=SD-19** (Inlet Controls 3.01 cfs @ 2.75 fps)

Pond 12P: SD-19



Summary for Pond 13P: SD-20

Inflow Area = 1.587 ac, 0.00% Impervious, Inflow Depth = 2.12" for 25-Year Event event
Inflow = 2.41 cfs @ 12.35 hrs, Volume= 0.280 af
Outflow = 2.41 cfs @ 12.36 hrs, Volume= 0.280 af, Atten= 0%, Lag= 0.8 min
Primary = 2.41 cfs @ 12.36 hrs, Volume= 0.280 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,701.64' @ 12.36 hrs Surf.Area= 347 sf Storage= 114 cf

Plug-Flow detention time= 1.1 min calculated for 0.280 af (100% of inflow)
Center-of-Mass det. time= 1.1 min (862.9 - 861.9)

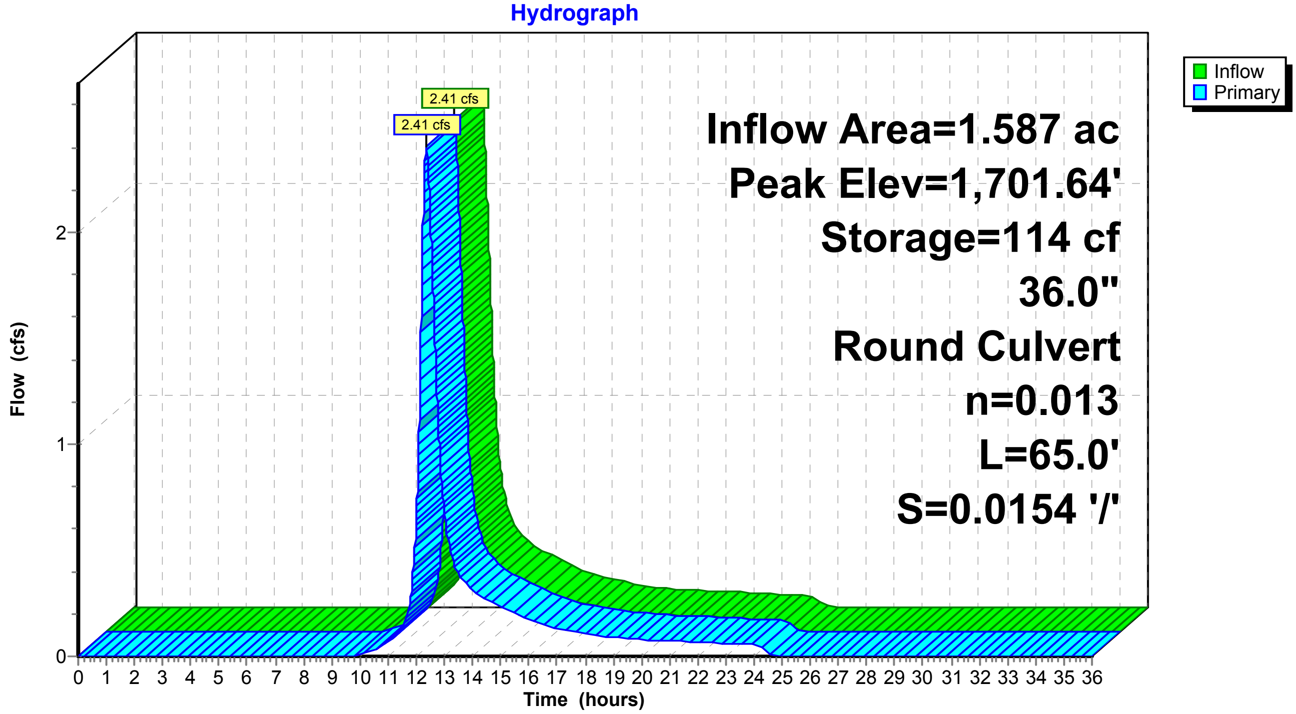
Volume	Invert	Avail.Storage	Storage Description
#1	1,701.00'	7,277 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,701.00	50	25.0	0	0	50
1,702.00	625	105.0	284	284	880
1,704.00	7,675	440.0	6,993	7,277	15,419

Device	Routing	Invert	Outlet Devices
#1	Primary	1,701.00'	**36.0" Round SD-20** L= 65.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,700.00' S= 0.0154 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=2.41 cfs @ 12.36 hrs HW=1,701.64' (Free Discharge)
└─**1=SD-20** (Inlet Controls 2.41 cfs @ 2.16 fps)

Pond 13P: SD-20



Summary for Pond 14P: SD-21

Inflow Area = 1.898 ac, 0.00% Impervious, Inflow Depth = 2.20" for 25-Year Event event
Inflow = 3.70 cfs @ 12.20 hrs, Volume= 0.348 af
Outflow = 3.70 cfs @ 12.21 hrs, Volume= 0.348 af, Atten= 0%, Lag= 0.3 min
Primary = 3.70 cfs @ 12.21 hrs, Volume= 0.348 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,564.25' @ 12.21 hrs Surf.Area= 29 sf Storage= 21 cf

Plug-Flow detention time= 0.2 min calculated for 0.348 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (850.6 - 850.4)

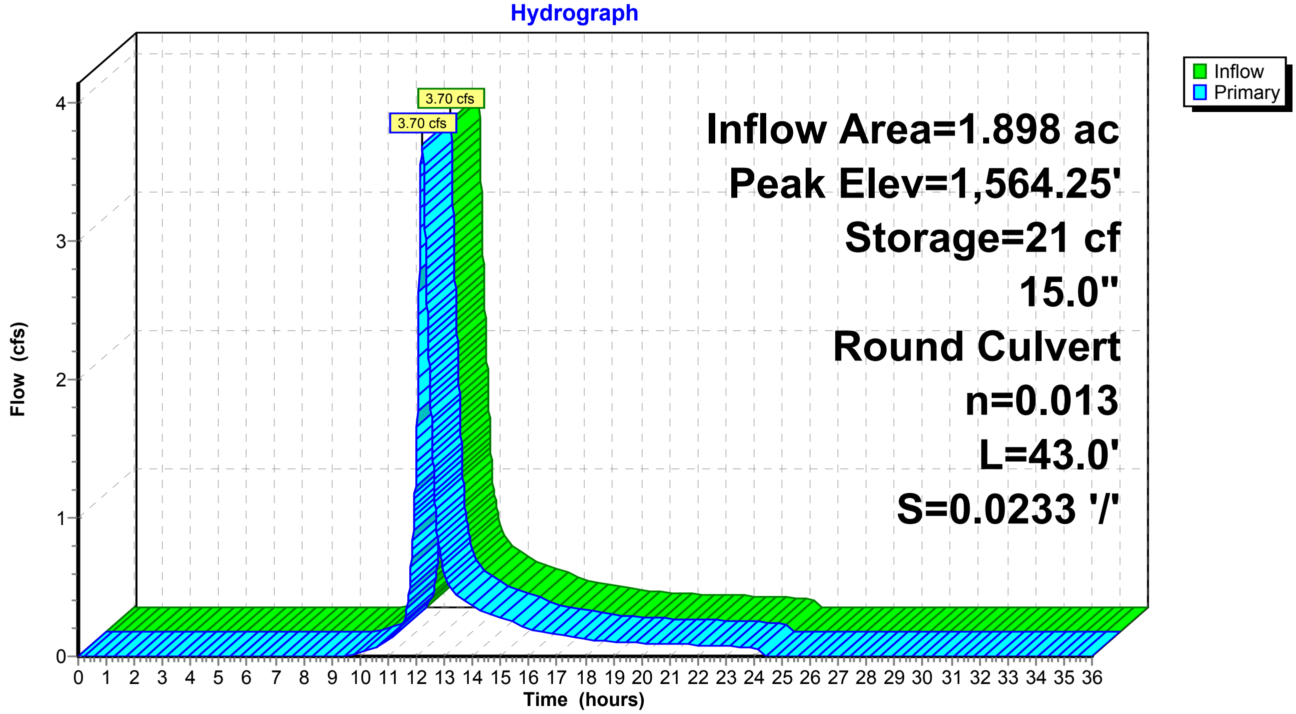
Volume	Invert	Avail.Storage	Storage Description
#1	1,563.00'	153 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,563.00	10	10.0	0	0	10
1,564.00	20	20.0	15	15	38
1,566.00	135	50.0	138	153	219

Device	Routing	Invert	Outlet Devices
#1	Primary	1,563.00'	**15.0" Round SD-21** L= 43.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,562.00' S= 0.0233 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.70 cfs @ 12.21 hrs HW=1,564.25' (Free Discharge)
↑—**1=SD-21** (Inlet Controls 3.70 cfs @ 3.01 fps)

Pond 14P: SD-21



Summary for Pond 15P: SD-22-23

Inflow Area = 2.191 ac, 0.00% Impervious, Inflow Depth = 2.12" for 25-Year Event event
Inflow = 3.38 cfs @ 12.34 hrs, Volume= 0.386 af
Outflow = 3.38 cfs @ 12.34 hrs, Volume= 0.386 af, Atten= 0%, Lag= 0.1 min
Primary = 3.38 cfs @ 12.34 hrs, Volume= 0.386 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,605.82' @ 12.34 hrs Surf.Area= 30 sf Storage= 16 cf

Plug-Flow detention time= 0.1 min calculated for 0.386 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (861.2 - 861.0)

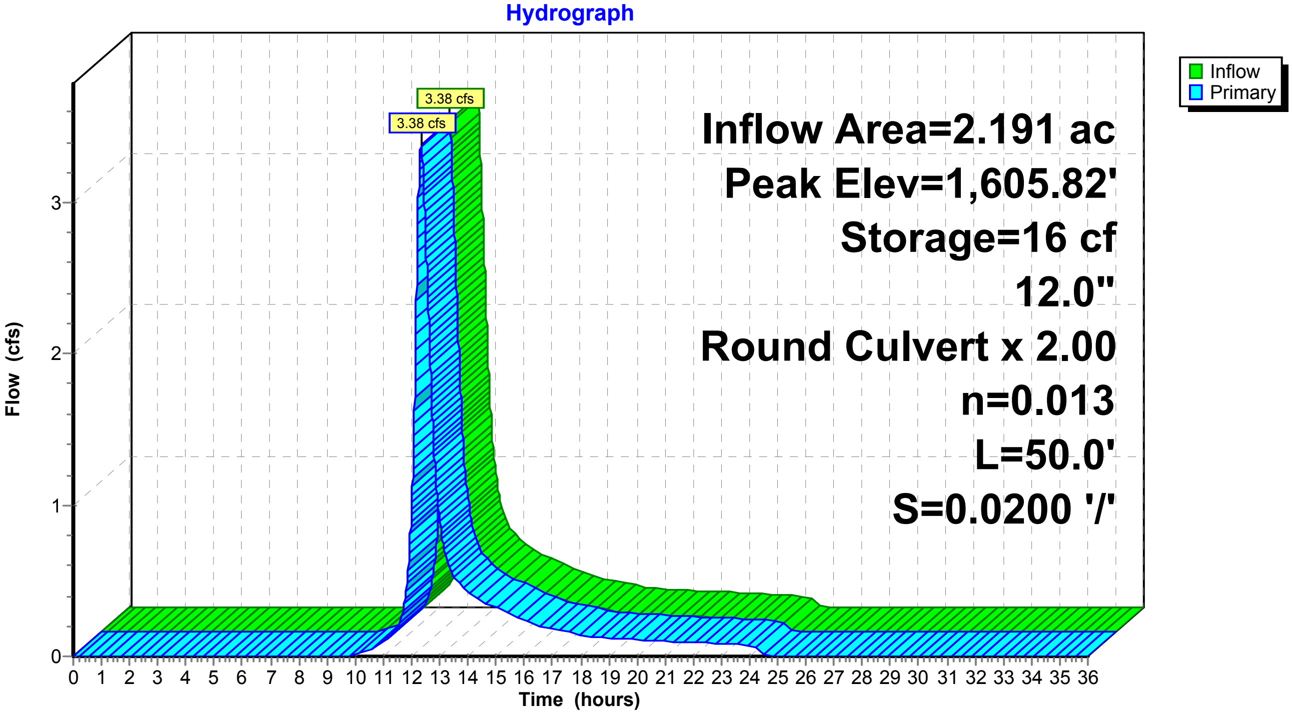
Volume	Invert	Avail.Storage	Storage Description
#1	1,605.00'	205 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,605.00	10	10.0	0	0	10
1,606.00	35	25.0	21	21	55
1,608.00	165	50.0	184	205	222

Device	Routing	Invert	Outlet Devices
#1	Primary	1,605.00'	**12.0" Round SD-22 X 2.00** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,604.00' S= 0.0200 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=3.38 cfs @ 12.34 hrs HW=1,605.82' (Free Discharge)
└─**1=SD-22** (Inlet Controls 3.38 cfs @ 2.44 fps)

Pond 15P: SD-22-23



Summary for Pond 16P: SD-24

Inflow Area = 0.278 ac, 0.00% Impervious, Inflow Depth = 2.12" for 25-Year Event event
Inflow = 0.47 cfs @ 12.27 hrs, Volume= 0.049 af
Outflow = 0.47 cfs @ 12.27 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.1 min
Primary = 0.47 cfs @ 12.27 hrs, Volume= 0.049 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,671.36' @ 12.27 hrs Surf.Area= 17 sf Storage= 5 cf

Plug-Flow detention time= 0.4 min calculated for 0.049 af (100% of inflow)
Center-of-Mass det. time= 0.4 min (857.5 - 857.1)

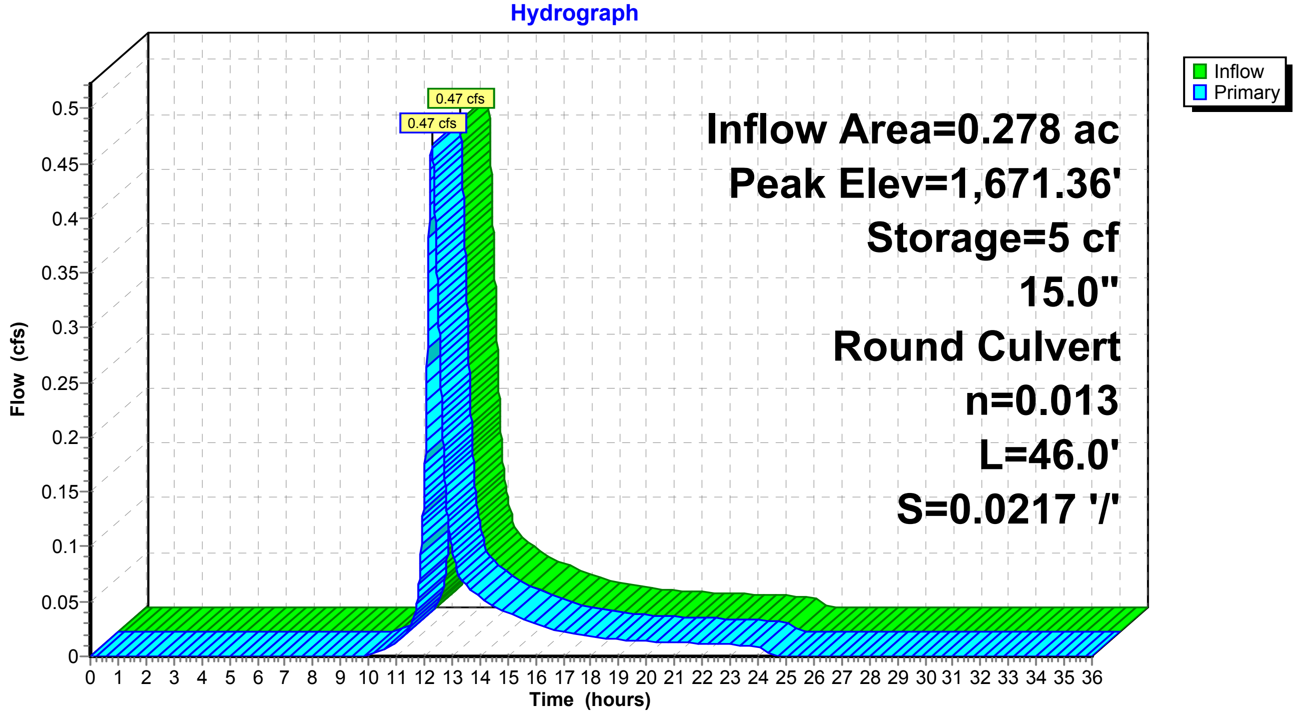
Volume	Invert	Avail.Storage	Storage Description
#1	1,671.00'	201 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,671.00	10	10.0	0	0	10
1,672.00	35	25.0	21	21	55
1,674.00	160	50.0	180	201	222

Device	Routing	Invert	Outlet Devices
#1	Primary	1,671.00'	**15.0" Round SD-24** L= 46.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,670.00' S= 0.0217 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.47 cfs @ 12.27 hrs HW=1,671.36' (Free Discharge)
↑**1=SD-24** (Inlet Controls 0.47 cfs @ 1.61 fps)

Pond 16P: SD-24



Summary for Pond 17P: SD-25

Inflow Area = 0.510 ac, 0.00% Impervious, Inflow Depth = 2.04" for 25-Year Event event
Inflow = 0.76 cfs @ 12.34 hrs, Volume= 0.087 af
Outflow = 0.76 cfs @ 12.34 hrs, Volume= 0.087 af, Atten= 0%, Lag= 0.1 min
Primary = 0.76 cfs @ 12.34 hrs, Volume= 0.087 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,679.46' @ 12.34 hrs Surf.Area= 20 sf Storage= 7 cf

Plug-Flow detention time= 0.3 min calculated for 0.087 af (100% of inflow)
Center-of-Mass det. time= 0.3 min (863.8 - 863.5)

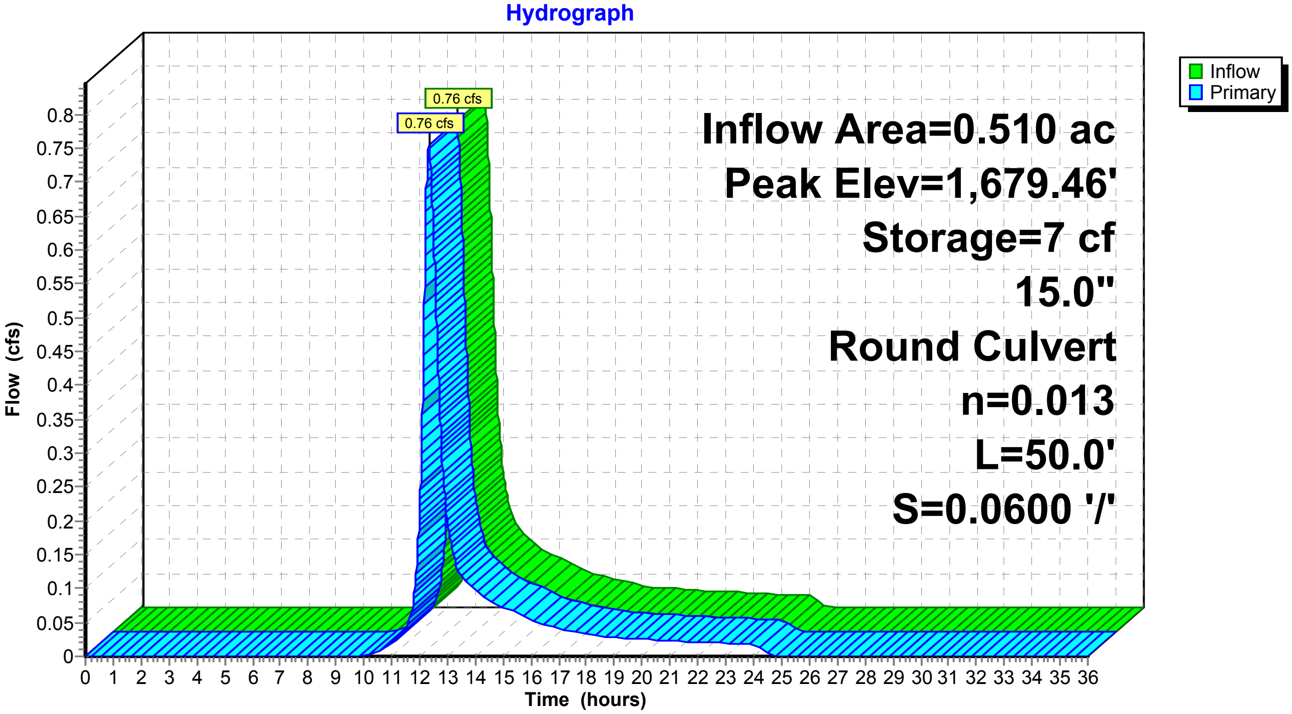
Volume	Invert	Avail.Storage	Storage Description
#1	1,679.00'	305 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,679.00	10	10.0	0	0	10
1,680.00	35	35.0	21	21	102
1,682.00	290	115.0	284	305	1,069

Device	Routing	Invert	Outlet Devices
#1	Primary	1,679.00'	**15.0" Round SD-25** L= 50.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,676.00' S= 0.0600 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=0.76 cfs @ 12.34 hrs HW=1,679.46' (Free Discharge)
↑—**1=SD-25** (Inlet Controls 0.76 cfs @ 1.83 fps)

Pond 17P: SD-25



Summary for Pond 18P: SD-26

Inflow Area = 10.036 ac, 0.00% Impervious, Inflow Depth = 2.04" for 25-Year Event event
Inflow = 13.83 cfs @ 12.39 hrs, Volume= 1.703 af
Outflow = 13.40 cfs @ 12.46 hrs, Volume= 1.703 af, Atten= 3%, Lag= 4.3 min
Primary = 13.40 cfs @ 12.46 hrs, Volume= 1.703 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,601.63' @ 12.46 hrs Surf.Area= 3,404 sf Storage= 2,759 cf

Plug-Flow detention time= 4.2 min calculated for 1.703 af (100% of inflow)
Center-of-Mass det. time= 4.1 min (871.6 - 867.5)

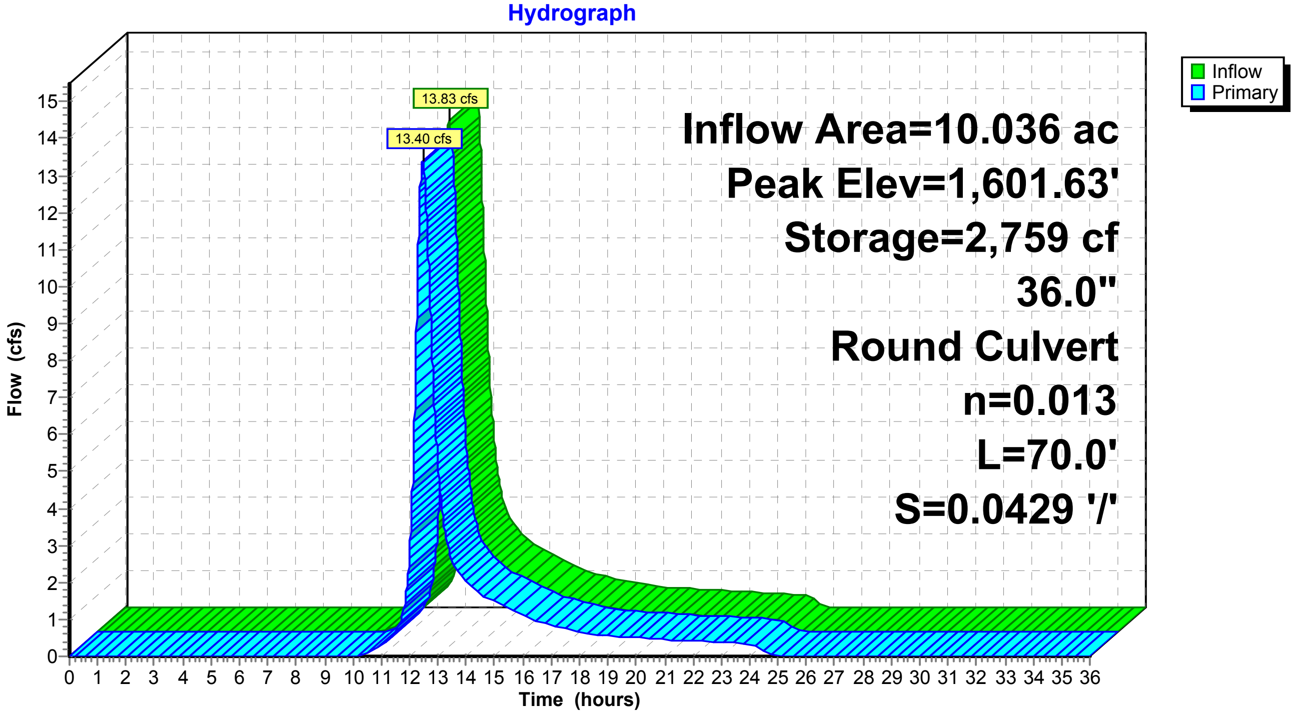
Volume	Invert	Avail.Storage	Storage Description
#1	1,600.00'	9,543 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,600.00	450	100.0	0	0	450
1,602.00	4,475	360.0	4,229	4,229	9,979
1,603.00	6,200	375.0	5,314	9,543	10,930

Device	Routing	Invert	Outlet Devices
#1	Primary	1,600.00'	**36.0" Round SD-26** L= 70.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,597.00' S= 0.0429 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=13.40 cfs @ 12.46 hrs HW=1,601.63' (Free Discharge)
└─**1=SD-26** (Inlet Controls 13.40 cfs @ 3.43 fps)

Pond 18P: SD-26



Summary for Pond 19P: SD-27-31

Inflow Area = 5.027 ac, 0.00% Impervious, Inflow Depth = 2.04" for 25-Year Event event
Inflow = 8.27 cfs @ 12.26 hrs, Volume= 0.853 af
Outflow = 8.27 cfs @ 12.26 hrs, Volume= 0.853 af, Atten= 0%, Lag= 0.1 min
Primary = 8.27 cfs @ 12.26 hrs, Volume= 0.853 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,709.81' @ 12.26 hrs Surf.Area= 33 sf Storage= 16 cf

Plug-Flow detention time= 0.1 min calculated for 0.853 af (100% of inflow)
Center-of-Mass det. time= 0.1 min (858.7 - 858.7)

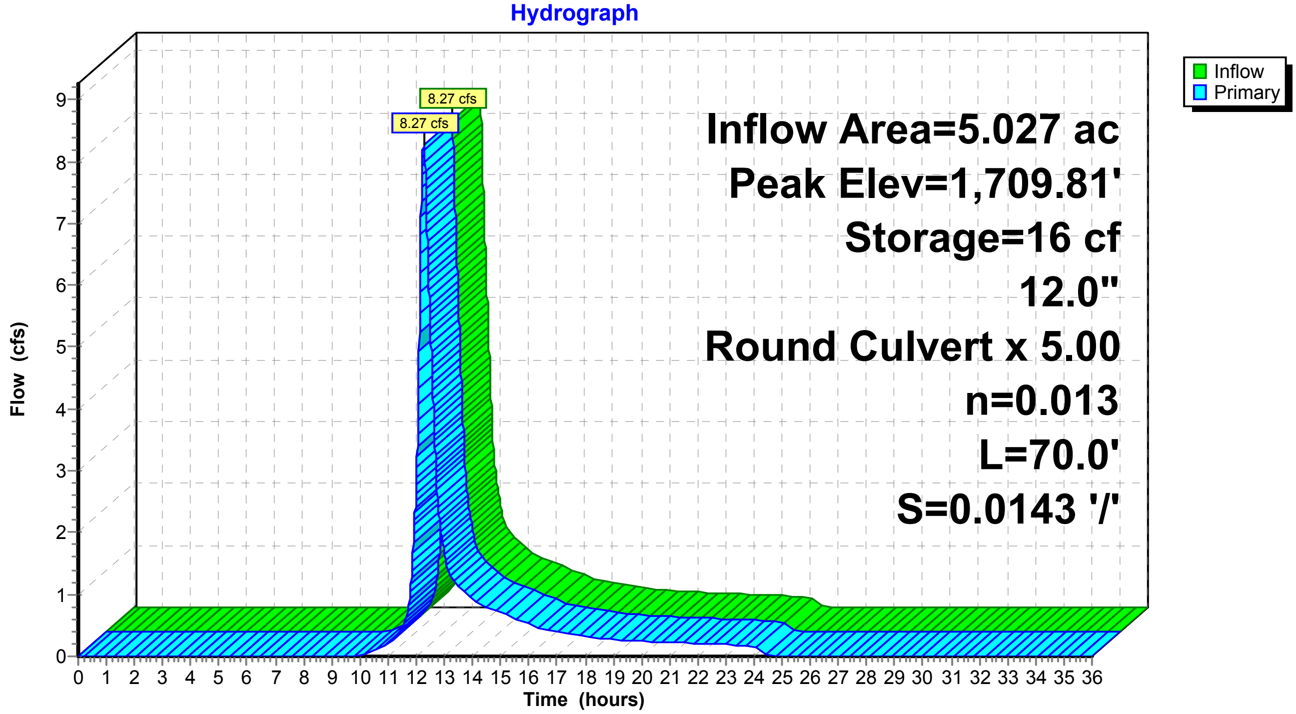
Volume	Invert	Avail.Storage	Storage Description
#1	1,709.00'	214 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,709.00	10	10.0	0	0	10
1,710.00	40	25.0	23	23	55
1,712.00	165	55.0	191	214	262

Device	Routing	Invert	Outlet Devices
#1	Primary	1,709.00'	**12.0" Round SD-27 X 5.00** L= 70.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,708.00' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=8.27 cfs @ 12.26 hrs HW=1,709.81' (Free Discharge)
↑—**1=SD-27** (Inlet Controls 8.27 cfs @ 2.42 fps)

Pond 19P: SD-27-31



Summary for Pond 20P: SD-32

Inflow Area = 3.522 ac, 0.00% Impervious, Inflow Depth = 2.04" for 25-Year Event event
Inflow = 6.20 cfs @ 12.22 hrs, Volume= 0.598 af
Outflow = 6.18 cfs @ 12.23 hrs, Volume= 0.598 af, Atten= 0%, Lag= 0.8 min
Primary = 6.18 cfs @ 12.23 hrs, Volume= 0.598 af

Routing by Dyn-Stor-Ind method, Time Span= 0.00-36.00 hrs, dt= 0.01 hrs / 3
Peak Elev= 1,765.38' @ 12.23 hrs Surf.Area= 89 sf Storage= 91 cf

Plug-Flow detention time= 0.2 min calculated for 0.597 af (100% of inflow)
Center-of-Mass det. time= 0.2 min (856.3 - 856.1)

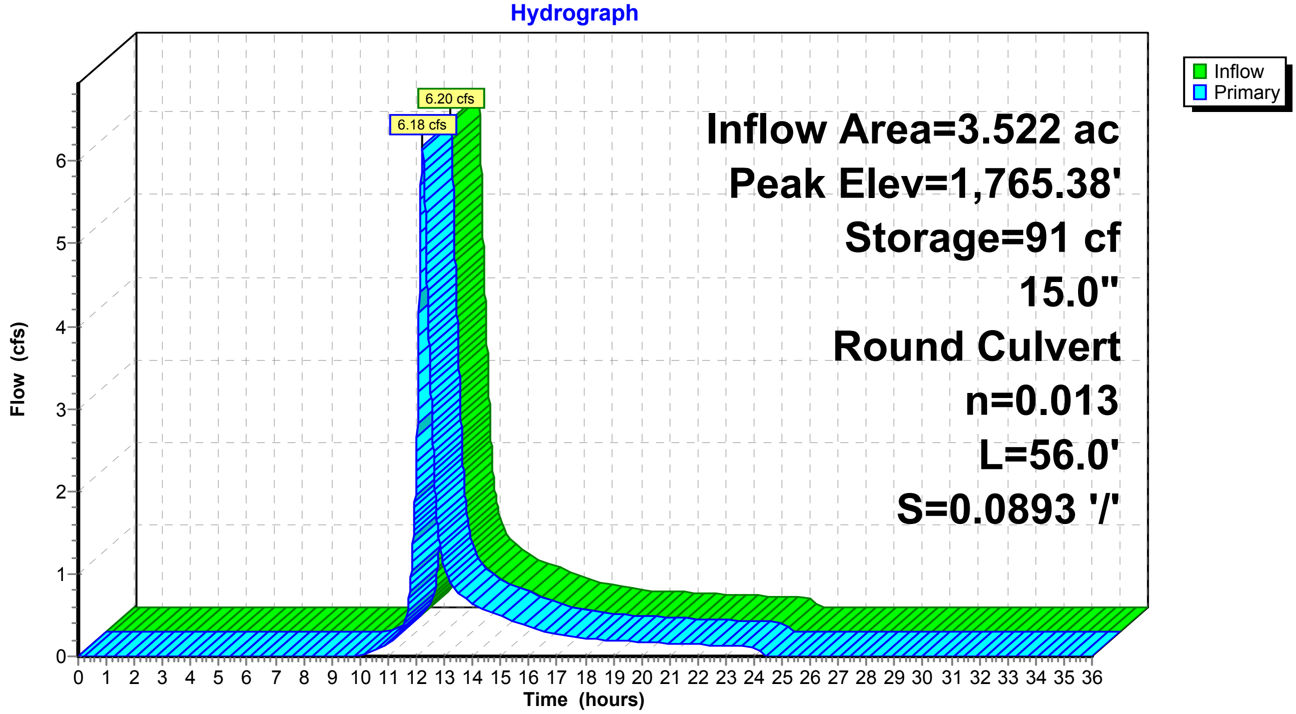
Volume	Invert	Avail.Storage	Storage Description
#1	1,763.00'	158 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
1,763.00	10	10.0	0	0	10
1,764.00	25	20.0	17	17	38
1,766.00	130	50.0	141	158	219

Device	Routing	Invert	Outlet Devices
#1	Primary	1,763.00'	**15.0" Round SD-32** L= 56.0' CPP, projecting, no headwall, Ke= 0.900 Outlet Invert= 1,758.00' S= 0.0893 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior

Primary OutFlow Max=6.17 cfs @ 12.23 hrs HW=1,765.38' (Free Discharge)
└─**1=SD-32** (Inlet Controls 6.17 cfs @ 5.03 fps)

Pond 20P: SD-32



STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION

‹ ELIAS BALDACCI
GOVERNOR

DAVIE
CO

June 5, 2008

Roy Koster
Central Maine Power
83 Edison Drive
Augusta, ME 04336

RE: DEP Stormwater Management Regulations and how they apply to Central Maine Power Company Substations and Switchyards

Dear Mr. Koster:

I am writing to provide clarification on how substations and switchyards designed by Central Maine Power Company (CMP) can meet DEP Stormwater Management rules, Chapter 500 and the Site Location of Development Law. This letter supersedes a previous DEP letter on this subject dated February 29, 2008 and is a follow-up to further discussions between CMP and DEP staff.

Based on the report prepared by John Simon of Balance Engineering, dated March 8, 2008, regarding the stormwater runoff coefficient at CMP substations and switchyards, the required gravel fill and surface nature of these structures performs differently than most common construction practices and a modeling variance will be allowed for CMP substations and switchyards as follows:

When Flooding Standard requirements apply to a CMP project, modeling must demonstrate that peak runoff from the substation structure does not exceed predevelopment flow rates at the property line. Because of the permeability plus storage within the gravel fill and roughness of the crushed rock surface, the curve number (CN) specified in John Simon's report (March 2008) may be used for the substation area. As reported, a CN of 55 may be used for substations and switchyards that are built on areas that are mapped as HSG "A", "B", and "C", and a CN of 60 must be used when the area is mapped as HSG "D" for the HydroCAD model. However, all impervious surfaces will have to be added for an averaged curve number.

The General Standards of Chapter 500 (water quality) will be considered as met by the CMP substation/switchyard design specifications as long as the structure includes the typical CMP substation profile overlaying the natural ground surface. The soil layers within the CMP substation profile consist of 4 inches of crushed stone, 50:50 mix of 1.5" and 0.75" diameter stone overlaying 18 inches or more of gravel fill, MDOT 703.06 Type A. Saturation within the granular fill will detain and provide treatment for the one-inch design standard under that requirement. Groundwater can never be any higher than 18 inches below the top of the gravel fill. Other treatment considerations will need to be provided for all impervious structures anticipated on the substation and switchyard and for the roadway.

The Basic Standards of Chapter 500 (erosion and sedimentation control, inspection and maintenance, and housekeeping) will be met by the standard CMP substation and switchyard design specification and erosion control/construction plan as developed by CMP for each Stormwater Management application. These are minimum erosion control measures that will need to be maintained until the site is fully stabilized. However, based on site and weather conditions during construction, additional erosion control measures may be needed.

While there are several ways to approach the design standards discussed above, these must be considered the minimum requirements in meeting the Stormwater Management and Site Location of Development Laws. However, in some situations where the local hydrology and site conditions warrant more resource protection, additional BMPs may be required. Also, the access drive and associated roadside swales are included in the disturbed area for permitting purposes and the treatment of these areas must be addressed separately from the substation or switchyard and be treated with standard practices. The natural hydrology of these areas will need to be maintained and will have to meet all applicable standards as established in Chapter 500 (page 11, Section 5).

I hope this addresses your request and will make the DEP permitting process more straight forward. If you have further questions, please contact Marianne Hubert at (207) 287-4140.

Sincerely,

Don Witherill

Don Witherill, Director
Watershed Management Division
Bureau of Land and Water Quality

Cc: Marianne Hubert, PE, DEP program manager
Andy Fisk, DEP L&W Bureau Director
Dan Butler, PE, TRC
Gerry Mirabile, CMP

Exhibit 6

NHB Letter of 8/3/11

New Hampshire Natural Heritage Bureau
DRED - Division of Forests & Lands
PO Box 1856 -- 172 Pembroke Road, Concord, NH 03302-1856
(603) 271-2214

To: Josh Brown, TRC Solutions

From: Melissa Coppola, NHB-Environmental Information Specialist

Date: August 3, 2011

Subject: Antrim Rare Plant Surveys

Thanks for sending the natural community mapping for the proposed Antrim Wind Site. We recommend that you reconsider the classification of the area currently mapped as ***high elevation spruce fir forest***. This community is known to occur from 2500 to 4000 feet elevation, well above the elevation of this site.

Based on the information provided we suggest targeting the following rare plant species in the communities listed below.

- ***rich red oak rocky woods***
  sickle-pod (*Boechera canadensis*)
  smooth rock cress (*Boechera laevigata*)
  Carolina cranesbill (*Geranium carolinianum*)
  climbing fumitory (*Adlumia fungosa*)

- ***hemlock - beech - oak - pine forest***
  small whorled pogonia (*Isotria medeoloides*)

- ***red oak - pine rocky ridge***
  Douglas' knotweed (*Polygonum douglasii*)
  Smooth sandwort (*Minuartia glabra*)

- ***red spruce swamp***
  green adder's mouth (*Malaxis unifolia*)

Should you have any further questions, contact me at 603-271-2215 ext. 323 or at Melissa.Coppola@dred.state.nh.us.

Memo

NH Natural Heritage Bureau

To: James Kenworthy, Eolian Renewable Energy, LLC
55 Fleet St.
Portsmouth, NH 03801

From: Melissa Coppola, NH Natural Heritage Bureau
Date: 3/22/2010 (valid for one year from this date)
Re: Review by NH Natural Heritage Bureau

NHB File ID: NHB10-0644 Town: Antrim
Project type: Roads, Driveways, Bridges: Road construction, etc. Location: Tax Maps: 212-030, 212-027, 212-034, 211-004, 235-014

cc: Kim Tuttle

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

Comments: NHB has concerns about potential impacts to the exemplary natural community. Please send detailed site plans to mcoppola@dred.state.nh.us for further review.

Natural Community	**State[1]**	**Federal**	**Notes**
Inland Atlantic white cedar swamp	--	--	Changes to the hydrology of the wetland are the greatest threat facing the cedar swamp. Damming which causes pooling for extended periods can flood and drown existing trees, and drainage that results in lower water levels can lead to invasion by other species that can out compete -- and eventually eliminate -- Atlantic white cedar trees. Increased nutrient input from stormwater runoff could also deleteriously impact this acidic, low-nutrient plant community.

Vertebrate species	**State[1]**	**Federal**	**Notes**
Wood Turtle (*Glyptemys insculpta*)	SC	--	Contact the NH Fish & Game Dept (see below).

[1]Codes: "E" = Endangered, "T" = Threatened, "--" = 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.

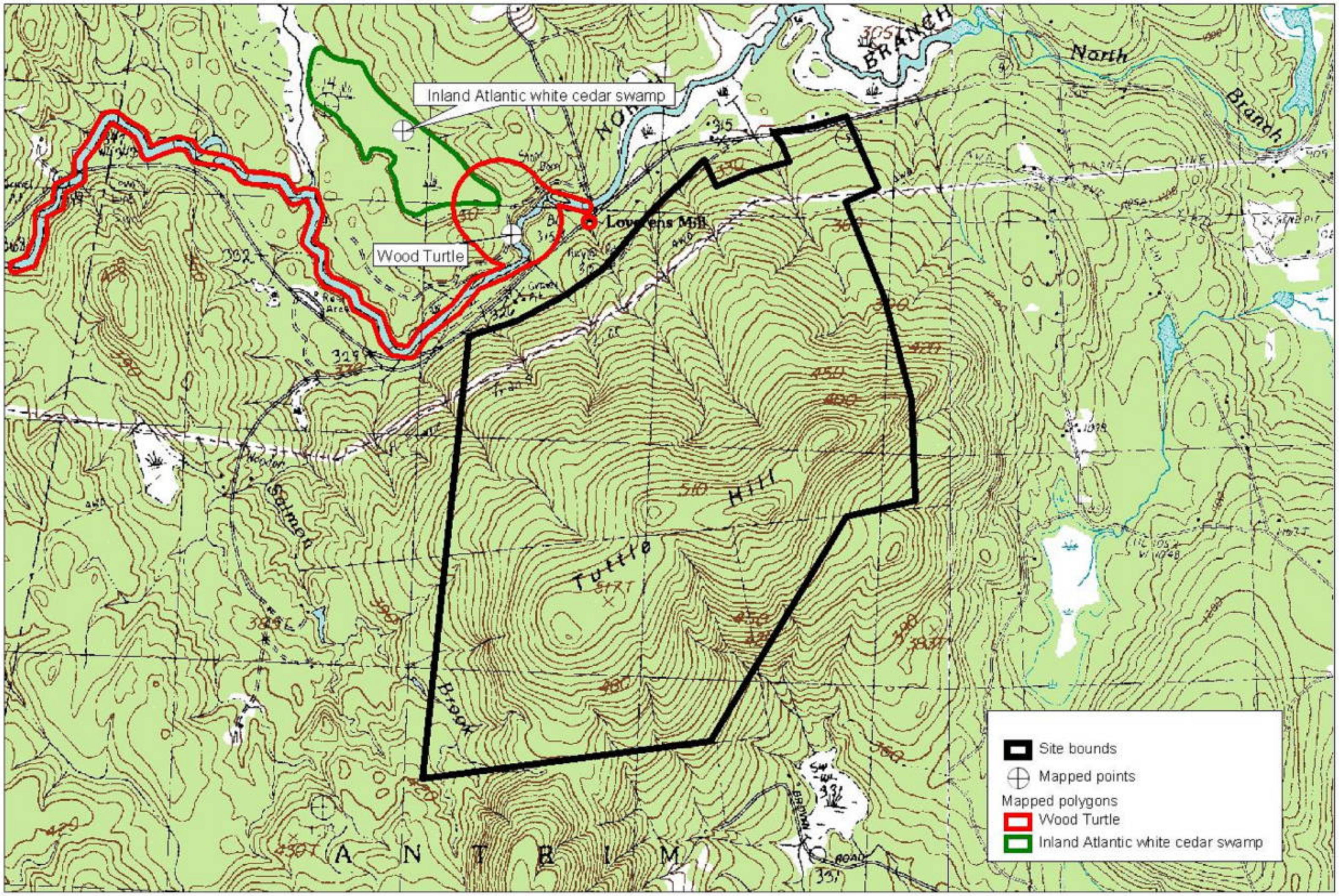
A negative result (no record in our database) does not mean that a sensitive species is not present. Our data can only tell you of known occurrences, based on information gathered by qualified biologists and reported to our office. However, many areas have never been surveyed, or have only been surveyed for certain species. For some purposes, including legal requirements for state wetland permits, the fact that no species of concern are known to be present is sufficient. However, an on-site survey would provide better information on what species and communities are indeed present.

NHB10-0644

NH NATURAL HERITAGE BUREAU

Known locations of rare species and exemplary natural communities

Note: Mapped locations are not always exact. Occurrences that are not in the vicinity of the project are not shown.



*Historical record

0.25 0 0.25 0.5 0.75 1 Miles

1:24000

Valid for one year from this date: 22 Mar 2010

New Hampshire Natural Heritage Bureau - Community Record

Inland Atlantic white cedar swamp

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Not ranked (need more information)
State:	Not listed	State:	Critically imperiled due to rarity or vulnerability

Description at this Location

Conservation Rank: Excellent quality, condition and lanscape context ('A' on a scale of A-D).

Comments on Rank: This site is probably the best, largest and most viable remaining cedar swamp in the western part of the state. It should remain among the highest conservation priorities in the state.

Detailed Description: 2006: Community observed and photographed. 2004: Community observed and photographed. 1993: *Chamaecyparis thyoides* (Atlantic white cedar) is the dominant tree with both *Acer rubrum* (red maple) and *Picea rubens* (red spruce) present in abundance. *Picea mariana* (black spruce) is scattered and less abundant. Occasionally, *Pinus strobus* (white pine) and *Betula alleghaniensis* (yellow birch) are also found. Dominant shrub species are *Gaylussacia baccata* (black huckleberry), *Nemopanthus mucronatus* (mountain holly), *Ilex laevigata* (smooth winterberry), and *Kalmia angustifolia* (sheep laurel). Common boreal components present are *Chamaedaphne calyculata* (leather-leaf), *Gaultheria hispidula* (creeping snowberry), and *Ledum groenlandicum* (Labrador-tea). The herbaceous layer is fairly abundant, although richness is somewhat limited. *Osmunda cinnamomea* (cinnamon fern), *Aralia nudicaulis* (wild sarsaparilla), *Maianthemum canadense* (Canada mayflower), *Sarracenia purpurea* (pitcher-plant) and *Carex trisperma* (three-seeded sedge) are commonly present. Sphagnum species are abundant. 1990: Has *Chamaecyparis thyoides*(Atlantic white cedar) to 14 inches dbh and a few larger individuals, abundant in areas away from streams. *Picea mariana* (black spruce), *Picea rubens* (red spruce), *Abies balsamea* (balsam fir), and *Acer rubrum* (red maple) also occur. Lesser amounts of *Pinus strobus* (white pine).

General Area: 1993: Soil type is a mucky peat, with the peat deposits averaging <1 meter. The soil is permanently saturated with a couple of obvious watercourses present. The pH of the groundwater is quite acidic with a range of 3.8-4.0. 1990: Purest and largest cedar around open black spruce bog (90 percent, 10-14 inches average range). Other areas 50-80 percent. Basin is surrounded by gradually sloping uplands which are punctuated by a number of small cliffs. 1961 (Baldwin): a fairly large boggy swamp with *Chamaecyparis thyoides* (Atlantic white cedar). Contains 6 stands of cedar.

General Comments: 1997: New community boundaries mapped based on 1993 field work. 1990: Encroaching urban development.

Management Comments:

Location

Survey Site Name: Loverens Mill Cedar Swamp
Managed By: Loverens Mill Preserve

County:	Hillsborough	USGS quad(s):	Stoddard (4307211)
Town(s):	Antrim	Lat, Long:	430433N, 0720142W
Size:	51.3 acres	Elevation:	1080 feet

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

Directions: From Hillsboro, take Rte. 9 south ca. 5 miles south to Holmes Hill Road. Turn right (north) onto Holmes Hill. Park on the right immediately after crossing the bridge over the river, at the TNC preserve sign kiosk. After ca. 900 feet there will be a gravel road on the left. This is the trailhead. Take the marked trail on this road, up past the old mill, and look for a turnoff to the right. Proceed down this trail (N-NW). The cedar swamp is at the bottom of the basin, to the north.

Dates documented

First reported: 1961 Last reported: 2006-06-13

Kimball, Ben, et al. 2006. Field visit to Loverens Mill Cedar Swamp Preserve on June 13.

Sperduto, D. & N. Ritter. 1994. Altantic White Cedar Wetlands of New Hampshire. Environmental Protection Agency, Boston, MA.

New Hampshire Natural Heritage Bureau - Animal Record

Wood Turtle (*Glyptemys insculpta*)

Legal Status		**Conservation Status**	
Federal:	Not listed	Global:	Apparently secure but with cause for concern
State:	SC	State:	Rare or uncommon

Description at this Location

Conservation Rank: Not ranked
Comments on Rank:

Detailed Description: 2008: Area 11603: 1 adult seen.2006: Area 11693: 1 adult seen.2005: Area 12135: 1 adult seen.2002: Area 12069: 1 observed.
General Area: 2005: Area 12135: Crossing highway towards North Branch of Contoocook River.2002: Area 12069: Near cedar swamp.
General Comments:
Management Comments:

Location

Survey Site Name: Loverens Mill
Managed By: The Nature Conservancy #2

County:	Hillsborough	USGS quad(s):	Stoddard (4307211)
Town(s):	Antrim	Lat, Long:	
Size:	84.4 acres	Elevation:	

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

Directions: 2008: Area 11603: TNC property at Loverens Mill Road.2002: Area 12069: Loverens Mill property near trail to cedar swamp.

Dates documented

First reported: 2002-07-28 Last reported: 2008-06-01

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.

Exhibit 7

Photographs Representative of the Site

PHOTOGRAPHS REPRESENTATIVE OF THE SITE

Typical Tuttle Hill scene near WTG 2.

Typical Tuttle Hill scene near WTG 3.

Typical Tuttle Hill scene near WTG 5.

Typical Tuttle Hill scene near WTG 8.

Typical Willard Mt. scene near WTG 9.

Typical Willard Mt. scene near WTG 10.

Exhibit 8

Site Specific Soil Survey Waiver Request

Waiver Request

Site Specific Soil Mapping

1509.03 (a) (4)

The New Hampshire Code of Administrative Rules, Chapter Env-Wq 1500 “Alteration of Terrain”, Part Env-Wq 1504 “Plans and Calculations”, Section Env-Wq 1504.09 (b) (2)b requires that a site-specific soil map be prepared in accordance with the Society of Soil Scientists of Northern New England (SSSNNE) Special Publication No. 3, Site-Specific Soil Mapping Standards for New Hampshire and Vermont, December 2006, for all proposed areas of disturbance.

1509.03 (a) (5)

The applicant is requesting a waiver of this rule as a result of a conversation with NHDES staff during the Alteration of Terrain (AoT) permit pre-application meeting. This waiver has been granted in the past for similar projects. According to the document referenced above, “Site specific soil mapping is conducted for very intensive land uses requiring very detailed information about soils, generally in small areas. … The information can be used in planning individual building sites, experimental agricultural plots, and other uses requiring detailed and precise knowledge of the soils and their variability.”

The proposed project is linear in nature, essentially a four (4) mile long crushed stone roadway that will connect ten (10) wind turbine generator sites. The project site lies predominantly along the top of a ridge, and straddles four (4) expansive, largely undeveloped watersheds. An examination of the Natural Resources Conservation Service (NRCS) Medium Intensity Soil Survey of Hillsborough County, NH indicates that the majority of the project will be built on Hydrologic Soil Group C soils. A relatively short length of road will be built on HSG D soils, through an area of ledge and outcrop. No infiltration BMPs are proposed for the stormwater management system. In addition, sensitive areas such as streams, wetlands and vernal pools have been mapped and are shown on the site plans. This is not the type of project for which a site-specific soil map is intended, nor would the information produced by such a study provide any real benefit. That level of detail is not required.

1509.03 (a) (6)

The waiver will not be temporary.

1509.03 (a) (7)

As an alternative to a site-specific soil map, the site plans have been prepared using delineations from the NRCS Medium Intensity Soil Survey obtained from the Web Soil Survey website.

1509.03 (a) (8)

The applicant believes that having the waiver granted will meet the criteria in Env-Wq 1509.04 for the following reasons:

1. *"Granting the request will not result in an adverse impact on the environment, public health, public safety, or abutting properties that is more significant than that which would result from complying with the rule."*
   Environmentally sensitive areas such as streams, wetlands and vernal pools have already been mapped in the project area, so no adverse impacts to the environment are anticipated as a result of the waiver. Due to the nature of the project, the waiver will have no bearing on public health and safety. The impact on abutting properties as a result of the proposed land use will not change as a result of the intensity of the soil study.

2. *"One or more of the following are satisfied:*
   a. *Granting the request is consistent with the intent and purpose of the rule being waived; or*
   b. *Strict compliance with the rule will provide no benefit to the public or the environment."*

   The applicant believes that both conditions are satisfied. In particular, strict compliance with the rule will provide no benefit to the public or the environment. The purpose of the waiver request is to allow the project to be based on a less intensive soil study, not to waive the requirement completely. NRCS soil surveys are commonly used as a basis for projects of this nature. In addition, sensitive areas such as streams, wetlands and vernal pools have already been mapped in the vicinity of the project. Therefore, a site-specific soil survey will not provide any additional benefit to the public or the environment.

Exhibit 9

Inspection and Maintenance Manual

ANTRIM WINDPARK PROJECT

POST-CONSTRUCTION STORMWATER MANAGEMENT INSPECTION & MAINTENANCE PLAN

The Antrim Windpark, including the 34.5kV collector substation and Operation and Maintenance facility, will be solely-owned, operated, and maintained by Antrim Wind Energy LLC, of Portsmouth New Hampshire. The 115kV substation will be owned, operated, and maintained by Public Service of New Hampshire (PSNH).

Antrim Wind Energy has designated the following individual(s) as the party responsible for inspection and maintenance of the stormwater management facilities:

Name: John B. Kenworthy

Address: Antrim Wind Energy, LLC
155 Fleet Street
Portsmouth, New Hampshire, 03801

E-mail: generate@eolian-energy.com

Phone: (603) 570-4842

Facilities to be Maintained

The stormwater management facilities to be maintained at the Antrim Windpark include:

- Permanent access road;
- Substations and associated swales, bioretention systems, and stabilized slopes;
- Forested and meadow buffers;
- Treatment swales;
- Conveyance swales;
- Permanent check dams
- Culverts with inlet and outlet protection;
- Revegetated areas and embankments.

General Inspection and Maintenance Requirements

Generally, the proposed facility will be operated and maintained in a manner consistent with good utility practices, including annual (at minimum) on-site inspections and maintenance of stormwater management system components, as needed. A post-construction maintenance and inspection log is provided.

Maintenance issues associated with specific areas and facilities at the windpark are identified in the following paragraphs.

Substation Yard Area

The substation yard and surrounding area will be inspected twice annually (at minimum). Any signs of existing or developing erosion, rutting, trash, or unwanted vegetation will be removed/repaired as needed. Vegetated areas will be mowed as needed.

Access Roadway

The access roadway will typically require little on-going maintenance, due to the limited use by heavy vehicles.

The roadway will be inspected annually (at minimum), and signs of existing or developing erosion, rutting, trash or unwanted vegetation will be removed/repaired as needed.

Revegetated Areas and Embankments

Revegetated areas and embankments will be inspected annually (at minimum) for signs of existing or developing erosion, rutting, trash, vegetation loss, or unwanted vegetation. Meadow areas will be mowed as needed to maintain a healthy stand of vegetation. Debris and accumulated sediment will be removed as needed. Any eroded areas will be repaired and replanted with vegetation similar to the surrounding area. The source of the erosion problem shall be identified and eliminated.

Bioretention Systems

The bioretention systems will be inspected at least twice annually, and following any rainfall event exceeding 2.5 inches in 24 hours. Maintenance or rehabilitation shall be performed as needed. Trash and debris shall be removed at each inspection.

System drawdown time shall be inspected annually (at minimum). If the system does not drain within 72 hours following a rainfall event, then a qualified professional will assess the condition of the facility to determine measures required to restore filtration function, including but not limited to removal of accumulated sediments or reconstruction of the filter media. Vegetation shall be inspected annually and maintained in a healthy condition. Pruning, removal and replacement of dead or diseased vegetation, and removal of invasive species shall be performed as needed.

Vegetated Buffers

Small Pervious Area Buffers

Small pervious area buffers are located adjacent to several of the permanent crane pad areas, and are designated as “WTG-_”.

The buffers will be inspected annually (at minimum) for signs of erosion, sediment build-up, or vegetation loss. Meadow buffers will be mowed as needed to maintain a healthy stand of vegetation. Debris and accumulated sediment will be removed as needed. Any eroded areas will be repaired and replanted with vegetation similar to the remaining buffer. The source of the erosion problem shall be identified and eliminated.

Roadway Buffers

Roadway buffers are located adjacent to the access road.

The buffers will be inspected annually (at minimum) for signs of erosion, sediment build-up, or vegetation loss. Meadow buffers will be mowed as needed to maintain a healthy stand of vegetation. Forested buffers will be maintained in an undisturbed condition, unless erosion occurs. Debris and accumulated sediment will be removed as needed. Any eroded areas will be repaired and replanted with vegetation similar to the remaining buffer. The source of the erosion problem shall be identified and eliminated.

Ditch Turnout Buffers

Ditch turnout buffers are located adjacent to the access road, and begin at a stone berm level spreader.

The buffers will be inspected annually (at minimum) for signs of erosion, sediment build-up, or vegetation loss. Forested buffers will be maintained in an undisturbed condition, unless erosion occurs. Debris and accumulated sediment will be removed as needed. Any eroded areas will be repaired and replanted with vegetation similar to the remaining buffer. The source of the erosion problem shall be identified and eliminated.

The stone berm level spreaders will be inspected annually (at minimum) for accumulation of sediment and debris, and for signs of erosion within the approach channel, spreader channel, or down-slope of the spreader. Debris will be removed whenever observed during inspection. Sediment will be removed when accumulation exceeds 25% of spreader channel depth. Vegetated areas will be mowed annually (at minimum), or as required to control growth of woody vegetation. Stone berm material will be replaced/level spreader will be repaired as needed. Spreader shall be reconstructed if down-slope channelization indicates that the spreader is not level or that discharge has become concentrated, and corrections cannot be made through minor regrading.

Treatment Swales

Treatment swales are located adjacent to the access road, and are designated as "SW-_".

Treatment swales will be inspected annually (at minimum) for signs of erosion, sediment accumulation, vegetation loss, and presence of invasive species. Swales will be mowed as needed. Vegetation shall not be cut shorter than 4 inches. Debris and accumulated sediment shall be removed, and eroded areas repaired, as needed. Invasive species and dead vegetation shall be removed when encountered.

Conveyance Swales

Conveyance swales are located directly adjacent to the access road. The site has both vegetated and riprap swales.

Conveyance swales will be inspected annually (at minimum) for signs of erosion, sediment accumulation, and condition of the surface lining. Repairs, including stone or vegetation replacement, will be made as needed. Vegetated swales will be mowed annually (at minimum) or as needed. Vegetation shall not be cut shorter than 4 inches. Debris and accumulated sediment shall be removed, and eroded areas repaired, as needed.

Conveyance swales that do not discharge via a culvert have been provided with outlet protection in the form of a plunge pool or permanent check dam. Outlet protection will be inspected annually (at minimum) for damage or deterioration. Repairs, including rebuilding or stone replacement, will be made immediately. Debris and accumulated sediment will be removed as needed.

Culverts

Culverts will be inspected annually (at minimum) for signs of blockage, damage or deterioration. Debris and accumulated sediment shall be removed as needed. Repairs to inlet and outlet protection, including rebuilding or stone replacement, will be made immediately.

Antrim Wind Park				
Stormwater Management System Inspection & Maintenance Log				
	Schedule		**Inspector Initials and Date**	**Inspector Comments**
	Minimum Inspection Frequency	**Maintenance Frequency**		
Revegetated Areas and Embankments:				
Inspect all revegetated areas and embankments for erosion, rutting, trash, vegetation loss, or unwanted vegetation	**Annual**			
Mow meadow areas to maintain vegetation		**As Needed**		
Remove debris and accumulated sediment		**As Needed**		
Repair eroded areas, replant vegetation, identify and eliminate source of erosion		**As Needed**		
Conveyance Swales:				
Inspect drainage swales for evidence of erosion, sediment accumulation, woody vegetation, and condition of surface lining	**Annual**			
Inspect plunge pools and permanent check dams	**Annual**			
Control vegetated growth and woody vegetation		**As Needed**		
Remove accumulated sediment/debris; repair eroded areas		**As Needed**		
Mow vegetated swales (no shorter than 4”)		**As Needed**		
Clean out any accumulation of sediment within the plunge pool and riprap aprons		**As Needed**		
Repair/rebuild plunge pools/check dams		**As Needed**		
Culverts:				
Inspect culvert inlet, outlet, and structure	**Annual**			
Remove accumulated sediments and debris at the inlet, at the outlet, and within the conduit		**As Needed**		
Repair any erosion damage at the culvert’s inlet and outlet		**As Needed**		

Antrim Wind Park				
Stormwater Management System Inspection & Maintenance Log				
	Schedule		**Inspector Initials and Date**	**Inspector Comments**
	Minimum Inspection Frequency	**Maintenance**		
Access Roadway:				
Inspect access road surfaces and shoulders for erosion, false ditches, and excess accumulation of sand that could impede water flow.	**Annual**			
Correct any erosion/rutting, remove trash and unwanted vegetation		**As Needed**		
Substation Yard Area:				
Inspect for existing or developing erosion, rutting, trash, and unwanted vegetation.	**Annual**			
Correct any erosion/rutting and/or remove trash and unwanted vegetation.		**As Needed**		
Bioretention Systems				
Inspect for proper functioning and any accumulated trash and debris	**Semi-Annual/ following any rainfall above 2.5 inches/24 hrs.**			
Inspect drawdown time and state of vegetation	**Annual**			
Contact qualified professional if drawdown time exceeds 72 hours		**As Needed**		
Maintain vegetation; prune, remove dead/diseased vegetation, remove invasive species		**As Needed**		

Antrim Wind Park				
Stormwater Management System Inspection & Maintenance Log				
	Schedule		**Inspector Initials and Date**	**Inspector Comments**
	Minimum Inspection Frequency	**Maintenance**		
Inspect for signs of erosion, sediment buildup, or vegetation loss	**Annual**			
Mow meadow buffers		**As Needed**		
Remove debris and accumulated sediment		**As Needed**		
Repair eroded areas and replant; identify and eliminate source of erosion problem		**As Needed**		
Roadway Buffers				
Inspect for signs of erosion, sediment buildup, or vegetation loss	**Annual**			
Mow meadow buffers		**As Needed**		
Remove debris and accumulated sediment		**As Needed**		
Repair eroded areas and replant; identify and eliminate source of erosion problem		**As Needed**		
Ditch Turnout Buffers				
Inspect for signs of erosion, sediment buildup, or vegetation loss	**Annual**			
Remove debris and accumulated sediment		**As Needed**		
Repair eroded areas and replant; identify and eliminate source of erosion problem		**As Needed**		
Inspect stone berm level spreaders for erosion, sediment buildup, debris		**As Needed**		
Remove debris		**As Needed**		

Antrim Wind Park				
Stormwater Management System Inspection & Maintenance Log				
	Schedule		**Inspector Initials and Date**	**Inspector Comments**
	Minimum Inspection Frequency	**Maintenance**		
Ditch Turnout Buffers (cont'd)				
Remove sediment		**When accumulation exceeds 25% of spreader channel depth**		
Mow vegetated areas/control woody growth		**Annual (min.)**		
Repair/replace stone berm material		**As Needed**		
Reconstruct spreader		**As Needed**		
Treatment Swales				
Inspect for erosion, sediment accumulation, vegetation loss, and invasive species	**Annual**			
Mow swale not less than 4"		**As Needed**		
Remove debris and accumulated sediment		**As Needed**		
Remove invasive species and dead vegetation		**As Needed**		

Maintenance Notes:

Exhibit 10

Pre-Application Meeting Minutes

Meeting Minutes

Project:	Antrim Wind Energy, LLC Wind Power Project		
TRC Project No.:	186317	Prepared by:	Patrick Martin, P.E. - TRC
Meeting Date:	November 1, 2011	Date Prepared:	November 15, 2011
Participants:	Craig Rennie - NHDES David Keddell - ACOE John Soininen - Eolian Drew Kenworthy - Eolian Josh Brown - TRC Patrick Martin, P.E. - TRC		
Purpose:	Antrim Wind Project NHDES Alteration of Terrain Pre-Application Meeting		

The following are the meeting notes from the stormwater pre-application meeting held at the NHDES offices on November 1, 2011. It is our understanding that the general discussion items listed below will be used as the basis for the design and permitting of this project.

General Items

TRC presented a plan of the project that showed the project area on a watershed level. The plan included existing features such as contours, wetlands and vernal pools, roads and structures, and soils identified by hydrologic soil group. The plan also showed the proposed roadway alignment and turbine locations.

- The applicant will need to file a Site Specific Soil Mapping Waiver request in order to base the design on the NRCS Medium Intensity Soil Survey information currently shown on the plan.

- NHDES does not consider an open-graded crushed rock road surface a type of permeable pavement. Additional water quality treatment measures will be required to address the runoff from these road surfaces.

- Instead of using riprap, slopes steeper than 3:1 can be vegetated if stabilized with erosion control blankets.

- NHDES encourages the use of stone mattresses (permeable subgrade) in roadway construction where possible. Where culverts are required, avoid concentration of flows as much as possible by using more culverts than typical to dissipate flow and minimize altering preconstruction conditions.

- Runoff quantity control will not likely be an issue given the small amounts of new impervious area to be created in large watersheds. TRC will prepare a runoff curve number (CN) comparison of the pre- and post-development conditions for review.

- The Anti-degradation Rules included in the New Hampshire Stormwater Manual, Volume 1, Chapter 5 can be disregarded. TRC will refer to the New Hampshire Code of Administrative Rules, specifically Chapter Env-Wq 1500 – Alteration of Terrain, for stormwater management design guidance.

- Stream rules will apply at all watercourse crossings, including the use of open-bottom culverts. Maintain connectivity between vernal pools and wetlands to the greatest extent practicable.

- Culverts for amphibian migration in upland areas between vernal pools and nearby wetlands should be considered.

- Post construction restoration of temporary road widths and cut/fill slopes will include soil/mulch placement and seeding.

- Plans need to show all temporary impact zones including staging and stockpile areas.

Respectfully Submitted,

Patrick M Martin, P.E.
Civil Engineer - TRC

Exhibit 11

Property Owner Information and Agreements

Antrim Wind Park Property Owners

Last Name	First Name	Map	Lot(s)	Address 1	Address 2	Town	State	Zip Code
Ott	Mike	212	027; 030; 034	354 Keene Road	P.O. Box 160	Antrim	NH	04330
Whittemore	Paul J.	236	002	15 Dartmouth Drive	P.O. Box 528	Auburn	NH	03032
Cotran	Steven R.	236	001	26 McIntosh Lane		Bedford	NH	03110
c/o Charles Bean III	Antrim Limited Partnership	235	014	477 Washington Street		Norwood	MA	02062
Paul and Helen Whittemore, Trustees	Whittemore Trust	239	001	P.O. Box 528		Auburn	NH	03032

ENV:
JACK KENWORTHY
EOLIAN RENEWABLE ENERGY LLC
155 FLEET ST
PORTSMOUTH NH
03801-4050

Doc # 1104944 Jan 26, 2011 12:13 PM
Book 8288 Page 0340 Page 1 of 9
Register of Deeds, Hillsborough County
Pamela D Coughlin

ANTRIM WIND ENERGY LLC (ANTRIM, NH – TAX MAP #236 /PARCEL #002-000 – PAUL WHITTEMORE

EXHIBIT C
MEMORANDUM OF LEASE

PARTIES TO LEASE:

LESSOR
Paul and Helen Whittemore
c/o Paul Whittemore
P.O. Box 528
Auburn, NH 03032

LESSEE
Antrim Wind Energy LLC
c/o Eolian Renewable Energy
155 Fleet Street
Portsmouth, New Hampshire 03801

PREMISES:

Lessor is the owner of that certain real property described in Exhibit A attached hereto ("Lessor's Land"). Lessor leases to Lessee all or a portion of Lessor's Property as depicted on the map attached hereto as Exhibit B (the "Leased Premises"), together with the non-exclusive right of ingress to and egress from Windpower Facilities (defined in the Lease) located on the Leased Premises, adjoining properties and elsewhere over and across the Leased Premises and Lessor's Land by means of existing roads and lanes, if any, or otherwise by such route or routes as Lessee may construct from time to time.

TERM OF LEASE:

Lease shall be for an initial term of twenty-five (25) years and shall commence on the Effective Date.

EXTENSION TERM:

Lessee shall have the option to renew the Lease for one additional twenty-five (25) year term.

ANTRIM WIND ENERGY LLC (ANTRIM, NH – TAX MAP #236 /PARCEL #002-000 – PAUL WHITTEMORE

DATED at Auburn NH, ______________ this 6 day of January, 2011.

By: Paul Whittemore
Name: Paul Whittemore
Its: Owner/Self

STATE OF NEW HAMPSHIRE

) ss.:

COUNTY OF Rockingham

On this 6th day of January 2011, before me, the undersigned, a Notary Public in and for said State, personally appeared Paul Whittemore, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his, signature on the instrument, the individual(s) or the person(s) upon behalf of which the individual acted, executed the instrument.

Denise M Pease
Notary Public

DENISE M. PEASE
MY COMMISSION EXPIRES AUG. 19, 2014
NOTARY PUBLIC
NEW HAMPSHIRE

DATED at Portsmouth, New Hampshire this 4 day of January 2011.

By: ______________
Name: John Kenworthy
Its: Manager

STATE OF NEW HAMPSHIRE

) ss.:

COUNTY OF ROCKINGHAM

On this 4 day of January, 2011, before me, the undersigned, a Notary Public in and for said State, personally appeared John Kenworthy, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his, signature on the instrument, the individual(s) or the person(s) upon behalf of which the individual acted, executed the instrument.

Katrina Ricker
Notary Public

KATRINA RICKER
MY COMMISSION EXPIRES MAR. 24, 2015
NOTARY PUBLIC
NEW HAMPSHIRE

EXHIBIT A to Memorandum of Lease

0009937 2000 FEB 24 AM 9:22

WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS:

That I, MARVIN W. CUDDIHY, a/k/a Marvin Cuddihy, an unremarried widow, of 19 Davisville Road, Wilton, in the County of Hillsborough and State of New Hampshire,

for consideration paid,

grants to PAUL WHITTEMORE and CAROLE WHITTEMORE, husband and wife, both of 29 Sagharbor Drive, Auburn, in the County of Rockingham and the State of New Hampshire, and HELEN WHITTEMORE, of P. O. Box 242, Antrim, in the County of Hillsborough and State of New Hampshire, all as joint tenants with rights of survivorship,

with WARRANTY covenants,

BK 6211 PG 1465

Two certain tracts or parcels of land with the buildings thereon, if any, situated in Antrim, in the County of Hillsborough and State of New Hampshire, bounded and described as follows:

TRACT I

Beginning at the Northeast corner of the tract at land now or formerly of John B. Jameson; thence Westerly by said Jameson land along the stone wall to land formerly of Helen C. Thayer; thence Southerly along a stone wall adjoining land of said Thayer to a stake and stones at land now or formerly of John B. Jameson; thence Easterly along said Jameson land to stone wall at a corner of land now or formerly of said Jameson and land now or formerly of John Cuddihy; thence Northerly along land of said Cuddihy and Jameson along stone wall to the point of beginning.

Containing thirty (30) acres, more or less, and being known as the Nesmith Pasture.

STATE OF NEW HAMPSHIRE
DEPARTMENT OF REVENUE ADMINISTRATION
REAL ESTATE TRANSFER TAX
***** THOUSAND 6 HUNDRED AND 00 DOLLARS
MO. DAY YR. 02/24/2000 421757 AMOUNT $ *****600.00
VOID IF ALTERED

The above premises are subject however to a right of way and privilege of roadway being built to land now or formerly of Helen C. Thayer or her heirs, executors or assigns, of thirty (30) feet in width at such point as possible for best construction, all as set forth in deed of Helen C. Thayer to John Cuddihy, dated August 6, 1914 and recorded in Volume 723, Page 336, of the Hillsborough County Registry of Deeds.

T R A C T II

Beginning at the Southwest corner of the premises at land now or formerly of one Harrington; thence Northerly by said Harrington land to land formerly of Alfred G. Holt, now or formerly of Arthur F. Holt and Gladys H. Warner; thence Easterly by land of said Holt-Warner to land now or formerly of Alvin Brown; thence Southerly by said Brown land and land formerly of James W. Jameson and of John Cuddihy to land now or formerly of R. B. Harrington; thence Westerly by said Harrington land to the place of beginning.

Containing one hundred ten (110) acres, more or less, and being known as the Mountain Pasture.

Meaning and intending to convey the same premises conveyed to Marvin Cuddihy and Sarah Cuddihy, as joint tenants with rights of survivorship, by deed of Alice E. Cuddihy, Mary I. Boynton and Matthew N. Cuddihy, dated October 12, 1965 and recorded in Volume 1853, Page 26, of the Hillsborough County Registry of Deeds. The said Sarah J. Cuddihy died on December 16, 1979 and her death certificate is to be recorded with the Hillsborough County Registry of Deeds. The grantor herein derives his title as surviving joint tenant.

BK6211PG1466

This conveyance is made subject to Current Use Classification recorded in Volume 3696, Page 136, of the Hillsborough County Registry of Deeds.

And I, Marvin W. Cuddihy, and unremarried widow, release to said Grantees my rights of Homestead and other interests in said premises.

Dated this 14th day of January, 2000.

Marvin W Cuddihy

Marvin W. Cuddihy

STATE OF NEW HAMPSHIRE

County of Hillsborough

The foregoing instrument was acknowledged before me this 14th day of January, 2000, by MARVIN W. CUDDIHY.

[signature]

Name Patricia C. Jacobsen

Title President

My Commission Expires: 12/26/2000

BK6211 PG1467

Doc # 1019268 Apr 29, 2010 2:41 PM
Book 8199 Page 0260 Page 1 of 3
Register of Deeds, Hillsborough County
Pamela D Coughlin

C/H
L-CHIP
HIA083348

#11 Blodgett, Makechnie & Lawrence

QUITCLAIM DEED

I, CAROLE WHITTEMORE, single woman, of Auburn, County of Rockingham and State of New Hampshire, for consideration paid, grant to PAUL J. WHITTEMORE, of 29 Sagharbor Drive (with a mailing address of P. O. Box 528), Town of Auburn, County of Rockingham and State of New Hampshire 03032-0528, and HELEN M. WHITTEMORE, of Brimstone Corner Road (with a mailing address of P. O. Box 242), Town of Antrim, County of Hillsborough and State of New Hampshire 03440-0242, as joint tenants with rights of survivorship, with **QUITCLAIM covenants**, all my right, title and interest in

Two certain tracts or parcels of land, with the buildings thereon, if any, situate in the Town of **Antrim**, in the County of Hillsborough and State of New Hampshire, bounded and described as follows:

Tract I

Beginning at the northeast corner of the tract at land now or formerly of John B. Jameson; thence running

WESTERLY by land of said Jameson along the stone wall to land formerly of Helen C. Thayer; thence running

SOUTHERLY by a stone wall adjoining land of said Thayer to a stake and stones at land now or formerly of John B. Jameson; thence running

EASTERLY by land of said Jameson to a stone wall at a corner of land now or formerly of said Jameson and land now or formerly of John Cuddihy; thence running

NORTHERLY by land of said Cuddihy and Jameson along a stone wall to the point of beginning.

Containing thirty (30) acres, more or less, and being known as the Nesmith Pasture.

The above premises are subject however to a right of way and privilege of roadway being built to land now or formerly of Helen C. Thayer or her heirs, executors or assigns, of thirty (30) feet in width at such point as possible for best construction, all as set forth in deed of Helen C. Thayer to John Cuddihy, dated August 6, 1914 and recorded in the Hillsborough County Registry of Deeds at Volume 723, Page 336.

Tract II

Beginning at the southwest corner of the premises at land now or formerly of one Harrington; thence running

NORTHERLY by land of said Harrington to land now or formerly of Arthur F. Holt and Gladys H. Warner; thence running

EASTERLY by land of said Holt-Warner to land now or formerly of Alvin Brown; thence running

SOUTHERLY by land of said Brown and land formerly of James W. Jameson and of John Cuddihy to land now or formerly of R. B. Harrington; thence running

WESTERLY by land of said Harrington to the place of beginning.

Containing one hundred ten (110) acres, more or less, and being known as the Mountain Pasture.

Meaning and intending to convey the grantor's interest in the premises conveyed to Paul Whittemore, Carole Whittemore and Helen Whittemore by deed of Marvin W. Cuddihy, dated January 14, 2000, recorded in the Hillsborough County Registry of Deeds at Book 6211, Page 1465.

The premises are conveyed subject to the notice of current use classification filed by the Town of Antrim in the Hillsborough County Registry of Deeds at Book 3696, Page 136.

This conveyance is exempt from the New Hampshire real estate transfer tax under the provisions of RSA 78-B:2,XIII as a transfer pursuant to a decree of divorce issued by the Merrimack Superior Court, Docket Number 07-M-0495 on July 10, 2007, and under the provisions of RSA 78-B:2,IX.

Signed this 21st day of April, 2009.

Carole J. Whittemore
Carole Whittemore

STATE OF NEW HAMPSHIRE
COUNTY OF ROCKINGHAM

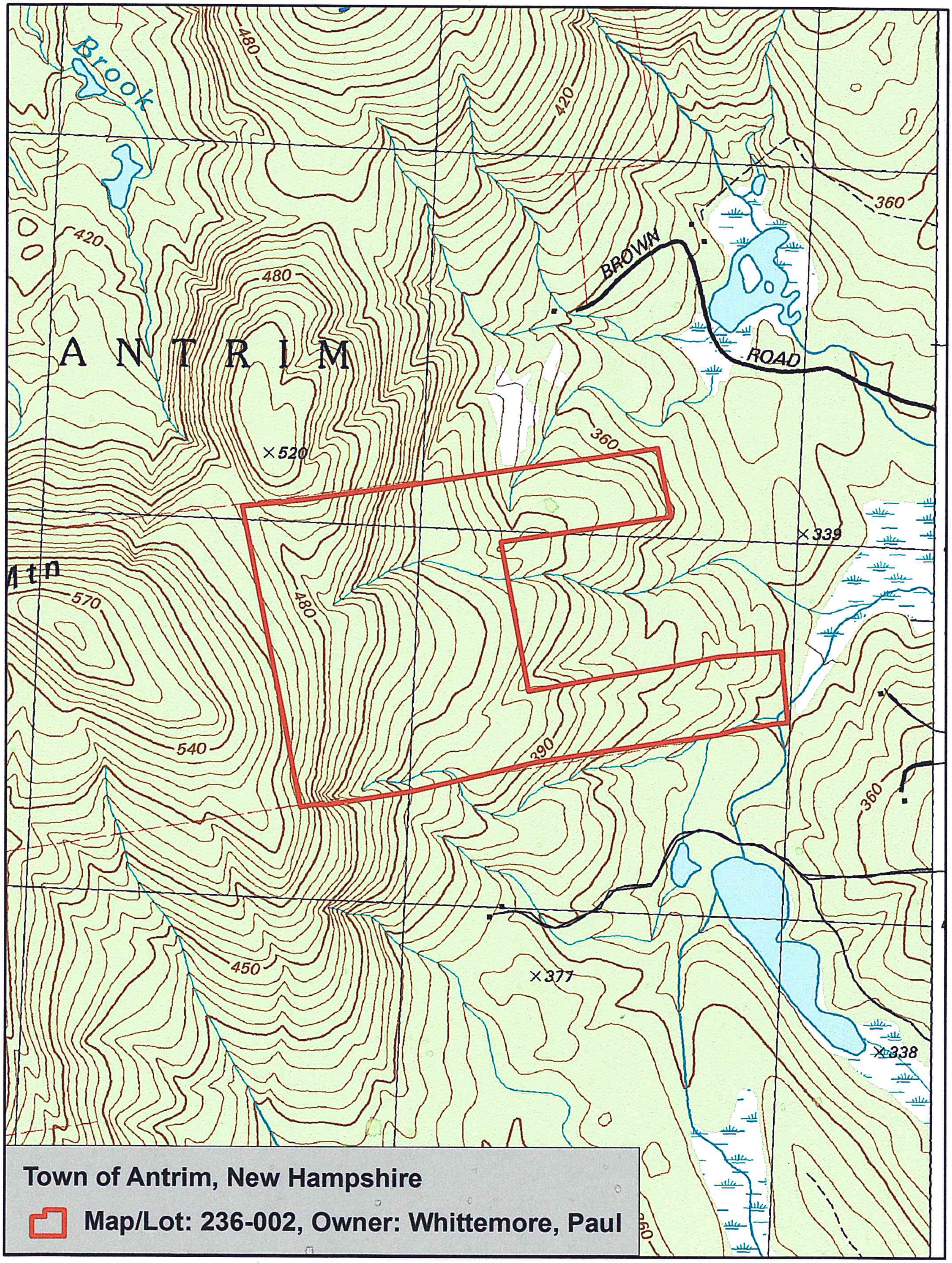
The foregoing instrument was acknowledged before me this 21 day of April, 2009, by Carole Whittemore.

Notary Public/Justice of the Peace

CAROL A. THEOS 1/30/2013
Printed Name Expiration Date

CAROL A. THEOS, Justice of the Peace
My Commission Expires January 30, 2013

CAROL A. THEOS JUSTICE OF THE PEACE NEW HAMPSHIRE



ORIGINAL NOT SUITABLE FOR
PROPER REPRODUCTION

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SHORT FORM OPTION AGREEMENT

Dr. Lyle J. Micheli and Mrs. Anne J. Micheli, whose mailing address is 319 Longwood Avenue, Boston, MA 02155 ("Grantor") and **Antrim Wind Energy LLC** a Delaware limited liability company having a mailing address at c/o Eolian Renewable Energy, LLC, 155 Fleet Street, Portsmouth, New Hampshire 03801 ("Grantee"), have entered into an option agreement dated September 8, 2011 (the "Option").

1. Grant of Option. For valuable consideration, Grantor has granted to Grantee the exclusive right and option to purchase an Easement encumbering the premises situated in the Town of Antrim, Hillsborough County, New Hampshire, being more particularly described in **Exhibit A** attached hereto (the "Property"), subject to the terms and conditions contained in this Option. The easement (the "Easement") shall be in the form attached hereto as **Exhibit B**.

2. Expiration Date. This Option shall expire two (2) years from the date hereof at 5:00 p.m. in the time zone in which the Property is located. For additional consideration, Grantee may postpone the expiration of this Option for an additional period of two (2) years.

3. Exercise of Option. This Option may be exercised by Grantee by giving written notice thereof to Grantor prior to the expiration of this Option.

4. Easement. Within thirty (30) days after the exercise of this Option, Grantor shall execute and deliver to Grantee an original of the Easement.

5. Due Diligence Inspections. Grantee, its agents, contractors, and subcontractors, may enter upon the Property at reasonable times prior to exercise of this Option, and prior to the granting of the Easement, in order to inspect the Property and/or to perform surveys and other physical inspections (collectively, the "Due Diligence Inspections"); provided, however, that the Grantee shall not perform any physical alterations to the Property without the written permission of the Grantor. In the event Grantee determines, in its sole discretion, that any one or more of the Due Diligence Inspections is not acceptable to Grantee, then Grantee may terminate this Option and be relieved of its obligations hereunder.

6. Failure to Exercise. In the event Grantee fails to exercise this Option before its expiration for any reason other than a default by Grantor, this option shall terminate, and none of the parties hereto shall have any further rights, claims, or obligations with respect to this Option.

8. **<u>Assignment</u>**. Grantee shall have the right to assign its rights and obligations under this Option without the consent of Grantor. All acts performable by Grantee under this Option may be performed by any assignee. Any assignment shall be in writing, acknowledged, and recorded in the Registry of Deeds in the county where the property is located. Such assignment shall relieve Grantee from the obligations of this Option.

9. **<u>Licenses and Permits</u>**. Grantor agrees that during the term of this Option, Grantee may attempt to obtain any licenses and/or permits relating to the Property which Grantee finds necessary or desirable for its contemplated use of the Property, and Grantor shall cooperate with Grantee in obtaining the same, at no expense to Grantor.

10. **<u>Notice</u>**. All notices pursuant to this Option shall be in writing and shall be delivered by hand, mailed overnight courier or by certified mail, postage prepaid, return receipt requested, to the following addresses:

(i) To the Grantor(s):
Dr. and Mrs. Lyle J. Micheli
319 Longwood Avenue
Boston, MA 02155

(ii) To the Grantee(s):
Antrim Wind Energy LLC
c/o Eolian Renewable Energy, LLC
155 Fleet Street
Portsmouth, New Hampshire 03801
Attention: Jack Kenworthy

with a copy to:

Jeffrey T. Selser, Esq.
Verrill Dana LLP
One Portland Square
Portland, Maine 04101

Notices shall be deemed given on the date mailed, or, if hand delivered, on the date of delivery. Either party may, by such manner of notice, substitute persons or addresses for notice other than those listed above.

11. **<u>Miscellaneous</u>**. This Option shall be binding upon and inure to the benefit of Grantor and Grantee, their successors and assigns. This Option is, and shall be, governed in all respects (including validity, construction, interpretation, and effect) by the laws of the State of New Hampshire, without giving effect to its principles or rules of conflict of laws to the extent that such principles or rules would require or permit the application of the laws of another jurisdiction. Should any provision of this Option for any reason be declared invalid or unenforceable, such decision shall not affect the validity or enforceability of any other provisions of this Option, which shall remain in full force and effect. This Option shall be recorded in the Registry of Deeds in the County in which the Property is located.

IN WITNESS WHEREOF, Grantor and Grantee have executed or caused this instrument to be executed as of the date first above written.

WITNESS:

GRANTOR(s)

DR. LYLE MICHELI

____

By: ______________________

MRS. ANNE J. MICHELI

____

By: ______________________

WITNESS:

GRANTEE
ANTRIM WIND ENERGY LLC

____

By: ______________________
Name: John B. Kenworthy
Its. Executive Officer

STATE OF Massachusetts
County of Suffolk, SS

September 16, 2011

Then personally appeared the above-named Lyle Micheli in his/her capacity as owner/joint tenant of the Property and acknowledged the foregoing instrument to be his/her free act and deed.

Dr. Lyle J. Micheli

Before me,

Notary Public

JILL E. MUISE
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
July 20, 2018

STATE OF Massachusetts
County of Suffolk, SS

September 16, 2011

Then personally appeared the above-named Anne J. Micheli in his/her capacity as owner/joint tenant of the Property and acknowledged the foregoing instrument to be his/her free act and deed.

Anne J. Micheli
Mrs. Anne J. Micheli

Before me,

Notary Public

JILL E. MUISE
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
July 20, 2018

STATE OF NEW HAMPSHIRE
County of Rockingham ss

Sept 8, 2011

Then personally appeared the above-named John B. Kenworthy in his/her capacity as Executive Officer of Antrim Wind Energy LLC and acknowledged the foregoing instrument to be his/her free act and deed in said capacity and the free act and deed of Antrim Wind Energy, LLC.

John B. Kenworthy

Before me,

Katrina Ricker
Notary Public

KATRINA RICKER
MY COMMISSION EXPIRES MAR. 24, 2015
NOTARY PUBLIC
NEW HAMPSHIRE

Exhibit A
Property Description and Map

A certain lot or parcel of land situated off Salmon Brook Road in the Town of Antrim, County of Hillsborough, and State of New Hampshire, more particularly described in the deed dated December 6 1996 and recorded at the Hillsborough County Registry of Deeds in Book 5774, Page 1777 and depicted on the map below.

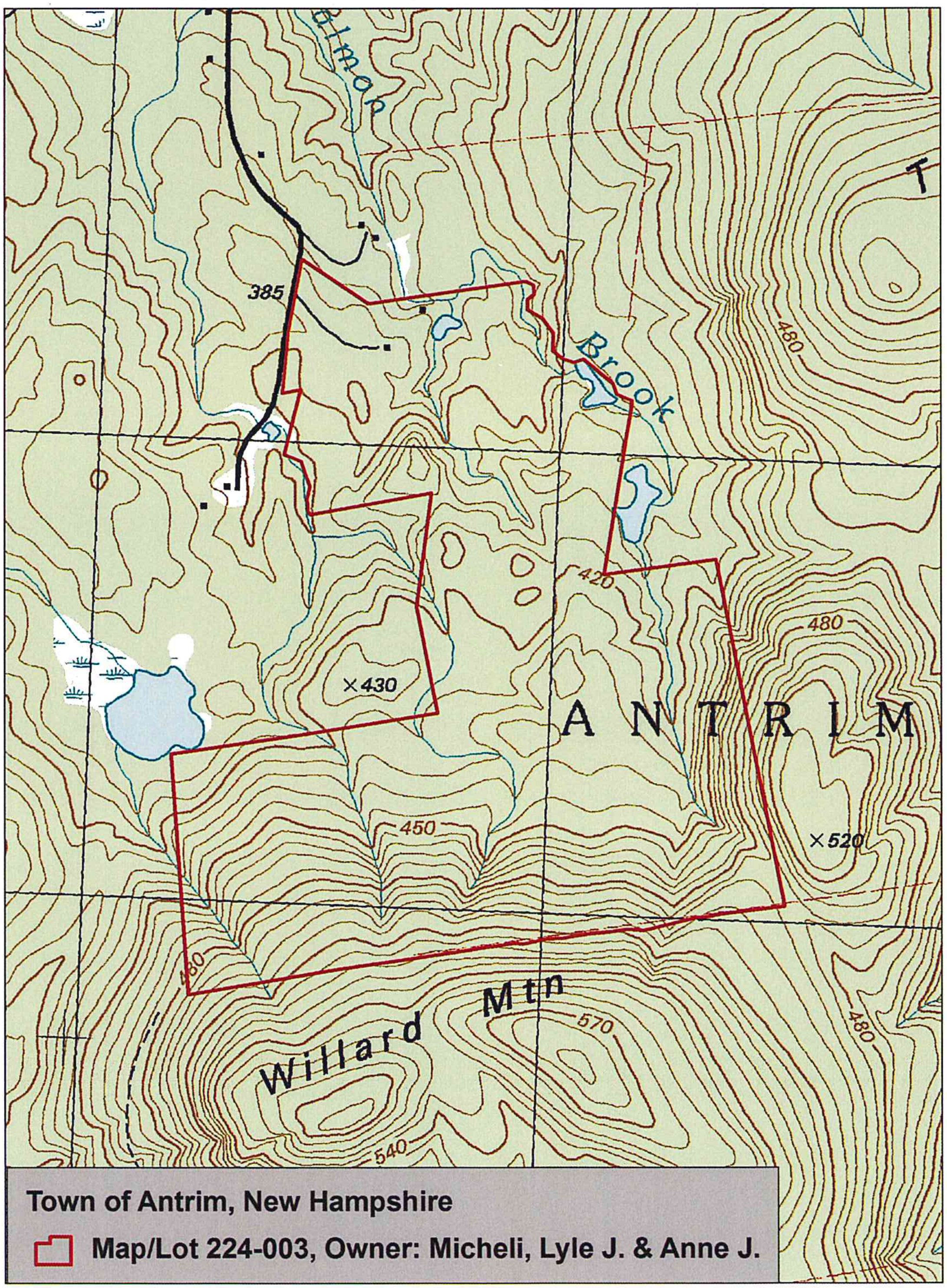


Exhibit B
Form of Easement

EASEMENT

THIS EASEMENT is made by Dr. Lyle J. Micheli and Mrs. Anne J. Micheli (collectively, "Grantor"), the owner(s) of a certain lot or parcel of land situated off Salmon Brook Road in the Town of Antrim, County of Hillsborough, and State of New Hampshire, more particularly described in the deed dated December 6 1996 and recorded at the Hillsborough County Registry of Deeds in Book 5774, Page 1777 (hereinafter referred to as the "Servient Land").

WHEREAS, Antrim Wind Energy LLC a Delaware limited liability company having a mailing address at c/o Eolian Renewable Energy, LLC, 155 Fleet Street, Portsmouth, New Hampshire 03801 ("Grantee"), plans to construct and operate a wind power project, including wind turbine generators and towers and related equipment, facilities, infrastructure and substructures (hereinafter referred to as the "Wind Power Project"), on lands near the Servient Land, including (without limitation) the lands described on the attached Exhibit A; and

WHEREAS, the Wind Power Project will emit sound including at levels that may exceed applicable state or local maximum sound level limits for the Servient Land, and may cast shadows onto or produce a shadow flicker effect at the Servient Land;

NOW, THEREFORE, for good and valuable consideration received, Grantor hereby grants an easement to Grantee for: (a) the right to have sound generated from the Wind Power Project impact the Servient Land and exceed otherwise applicable state or local maximum sound level limits applicable to locations on the Servient Land; (b) the right to cast shadows or shadow flicker from the Wind Power Project onto the Servient Land; and (c) the right to locate turbines closer than any minimum distance setback requirement to structures or property lines, including the right to have the blades of wind turbines overhang the Servient land;

This Easement shall expire on the earlier to occur of (a) fifty years after the date hereof, or (b) the date on which the Wind Power Project is fully decommissioned and has been abandoned or surrendered by Grantee (or its successors and/or assigns, as the case may be).

This Easement shall extend to, be binding upon and shall inure to the benefit of heirs, personal representatives, successors and assigns of the parties hereto. The burden of the easement hereby granted shall run with the Servient Land, until it expires as set forth above. The benefit of the easement hereby granted is not appurtenant to any particular property, but shall be transferable in whole or in part, and may be sold, leased, assigned, pledged, and mortgaged by Grantee, it being the intent of the parties that such benefit may be transferred to any successors or assignees of Grantee that own or operate the Wind Power Project, as it may be modified, divided or expanded.

As a condition of the grant of this Easement, Grantee agrees to indemnify, defend, and hold Grantor harmless from and against any and all damage, loss, claim, liability, or expense of any kind arising from any claim of bodily injury and/or physical or property damage of any kind present by third parties, and physical damage to or destruction of the Servient Land caused by Wind Power Project, except to the extent arising from the negligence or willful misconduct of Grantor.

The benefit of the easement hereby granted may be enforced by Grantee, its successors and assigns, by any appropriate legal or equitable remedy. In the event that Grantee, its successors or assigns, shall bring an action against Grantor, its successors or assigns, by reason of a breach or violation of this Easement by Grantor, its successors and assigns, the substantially prevailing party in such action shall be entitled to recover their reasonable attorneys' fees and court costs incurred in such action from the substantially non-prevailing party.

WITNESS our hands and seals this _____ day of ___________, 2011.

In the presence of: GRANTOR(s)

______________________________ ______________________________
Print: Dr. Lyle J. Micheli

______________________________ ______________________________
Print: Mrs. Anne J. Micheli

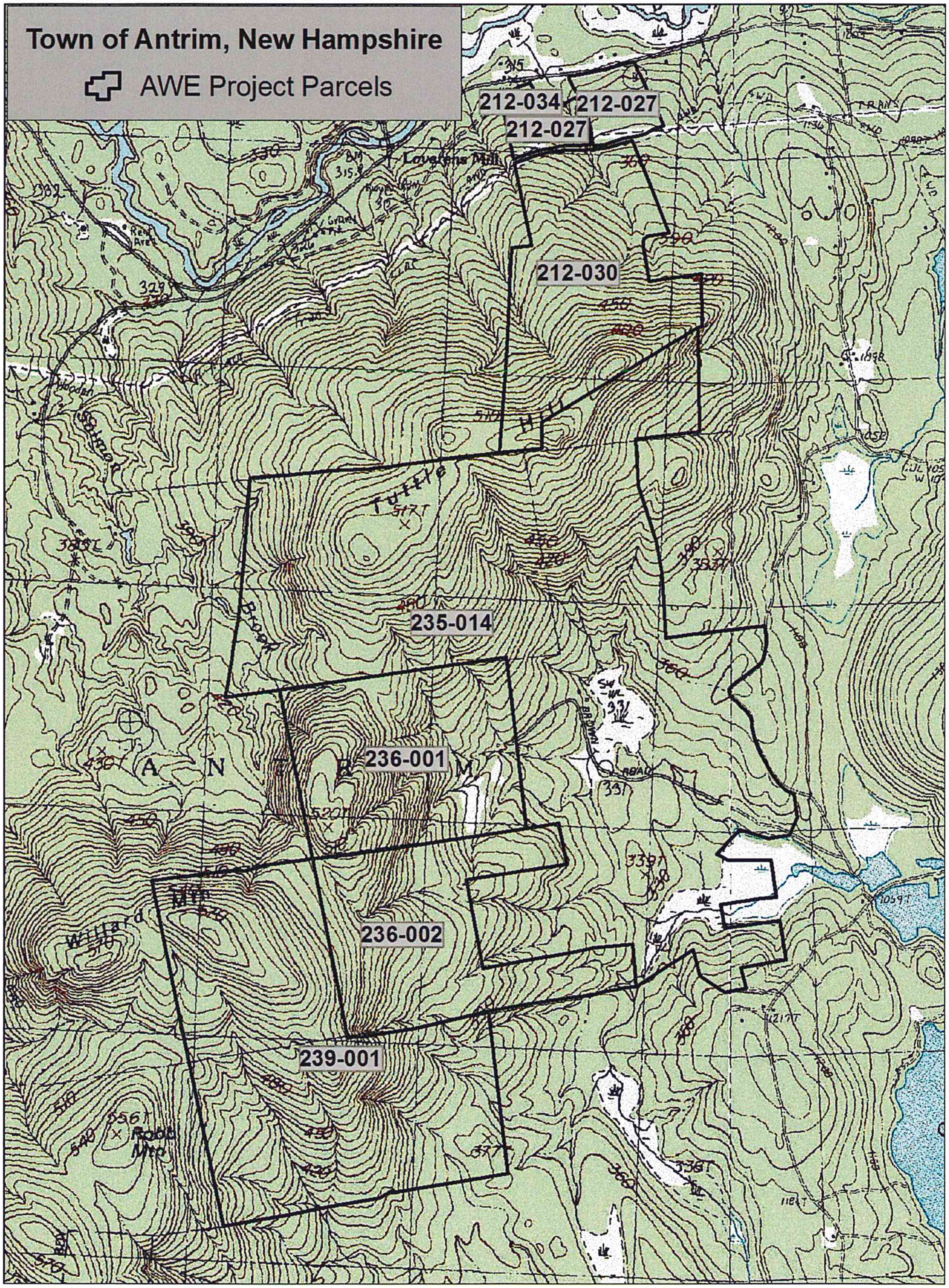
STATE OF __________________
COUNTY OF _________________ ___________, 20__

Personally appeared the above-named LYLE J. MICHELI and ANNE J. MICHELI and [severally] acknowledged the foregoing instrument to be his/her/their free act and deed.

Before me,

____
Notary Public
Print Name:____________________
My Commission Expires:_________

EXHIBIT A
Proposed Wind Power Project Lands
(not intended to be exhaustive)



Doc # 1028814 Jun 24, 2010 10:40 AM
Book 8214 Page 2699 Page 1 of 6
Register of Deeds, Hillsborough County
Pamela D Coughlin

EOLIAN RENEWABLE ENERGY LLC
155 FLEET ST.
PORTSMOUTH NH 03801
ATTN: JACK KENWORTHY

Antrim Wind (Antrim, NH – Map #212 Lot #'s 212-030-000; 212-027-000; 212-034-000 – Michael J. Ott)

EXHIBIT C
MEMORANDUM OF LEASE

PARTIES TO LEASE:

LESSOR
Michael J. Ott
P.O. Box 160
Antrim, New Hampshire 03440

LESSEE
Antrim Wind Energy LLC
c/o Eolian Renewable Energy
155 Fleet Street
Portsmouth, New Hampshire 03801

PREMISES: Lessor is the owner of that certain real property described in Exhibit A attached hereto ("Lessor's Land"). Lessor leases to Lessee all or a portion of Lessor's Property as depicted on the map attached hereto as Exhibit B (the "Leased Premises"), together with the non-exclusive right of ingress to and egress from Windpower Facilities (defined in the Lease) located on the Leased Premises, adjoining properties and elsewhere over and across the Leased Premises and Lessor's Land by means of existing roads and lanes, if any, or otherwise by such route or routes as Lessee may construct from time to time.

TERM OF LEASE: Lease shall be for an initial term of twenty-five (25) years and shall commence on the Effective Date.

EXTENSION TERM: Lessee shall have the option to renew the Lease for one additional twenty-five (25) year term.

Antrim Wind (Antrim, NH – Map #212 Lot #'s 212-030-000; 212-027-000; 212-034-000 – Michael J. Ott)

DATED at Portsmouth, New Hampshire this 18th day of December 2009.

Antrim Wind Energy LLC

By: ______________________

Name: John B. Kenworthy
Its: Manager

STATE OF NEW HAMPSHIRE
ss.:
COUNTY OF ~~HILLSBORO~~ Rockingham

On this 18th day of December, 2009, before me, the undersigned, a Notary Public in and for said State, personally appeared John B. Kenworthy, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his, signature on the instrument, the individual(s) or the person(s) upon behalf of which the individual acted, executed the instrument.

KATRINA NELSON, Notary Public
My Commission Expires May 18, 2010

______________________ Notary Public

DATED at Town Hall, Antrim NH this 24 day of December, 2009.

MICHAEL J.H. OTT

By: ______________________

Name: Michael J. H. Ott
Its: Self

STATE OF NEW HAMPSHIRE
ss.:
COUNTY OF HILLSBORO

On this 24 day of December, 2009 before me, the undersigned, a Notary Public in and for said State, personally appeared Michael J. H. Ott, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his, signature on the instrument, the individual(s) or the person(s) upon behalf of which the individual acted, executed the instrument.

NANCY E. TORRES
STATE OF NEW HAMPSHIRE
- MY - COMMISSION EXPIRES SEPTEMBER 23, 2014
NOTARY PUBLIC

Nancy E. Torres

______________________ Notary Public

EXHIBIT A to MEMORANDUM OF LEASE

6038778 2006 JUN -2 PM 2:37

9-60
9-61
9-64

AL7

Record and return to:
Craighead and Martin, PLLC
62 Stark Street
Manchester, NH 03101

22.39
2
24.39

STATE OF NEW HAMPSHIRE
DEPARTMENT OF REVENUE ADMINISTRATION
REAL ESTATE TRANSFER TAX
****2 THOUSAND 5 HUNDRED AND 20 DOLLARS
06/02/2006 773470 $ ****2520.00
VOID IF ALTERED

2520
TS

WARRANTY DEED

KNOW ALL MEN BY THESE PRESENTS, That, we, John A. Eddy and Laura C. Eddy, husband and wife, both of 763 Templeton Turnpike Road, Fitzwilliam, County of Cheshire, and State of New Hampshire, **for consideration paid,** grants to Michael James Hutchins Ott, a single person of 493 Ocean Boulevard, #24, Hampton, County of Rockingham, and State of New Hampshire, **with Warranty Covenants:**

9-60-33
9-61-205
9-64-2.5

The following four (4) tracts of land situated in Antrim, County of Hillsborough and State of New Hampshire:

Tract 1:

A certain tract of land situated in the northwest part of Antrim in the County of Hillsborough and State of New Hampshire, bounded and described as follows:

Beginning at the Northeast corner of the premises at a stake and stones by an old road leading from near the dwelling formerly occupied by Walter Buchanan to the dwelling of the late William R. Carr; thence

1. Westerly by the same old road about 101.5 rods to land formerly owned by the late Hiram Griffin; thence
2. Southerly by said Griffin land about 62 rods to the corner of the wall by land of the Steele heirs; thence
3. Easterly by said last mentioned land about 94 rods to the corner of the wall by land of the late William R. Carr; thence
4. Northerly by said Carr land about 19.5 rods to a stake and stones; thence

9-61-205
212-30-24 ac
9-60-33
212-27-39 ac
9-64-2.5
212-35-5.1 acC

BK7685PG0864

5. Easterly by said Carr land about 21.5 rods to a stake and stones; thence

6. Northerly by said Carr land about 49 rods to the first named bound.

Estimated to contain 43 acres, more or less.

<u>**Tract 2:**</u>

Also another tract of land situated in the northwest part of said Antrim, New Hampshire, bounded and described as follows:

Beginning at the Northeast corner of the premises; thence

1. Southerly by land formerly owned by Samuel Tuttle 52 rods; thence

2. Westerly by the wall by land formerly owned by Dodge to the Northwest corner of said Dodge land; thence

3. Southerly by said Dodge land to land formerly owned by Davis; thence

4. Westerly by said Davis land and land formerly owned by Handley to land formerly of Samuel Curtis; thence

5. Northerly and Easterly by said Curtis land to land formerly owned by John McClure, et al; thence

6. Easterly by said McClure land to land formerly owned by Samuel Weston; thence

7. Southerly by said Weston land to land formerly owned by Samuel Tuttle, et al, about 57 rods; thence

8. Easterly by said Tuttle land to the point of beginning.

Said to contain 150 acres, more or less.

<u>**Tract 3:**</u>

A certain tract of land with the buildings thereon, if any, situate in the north part of Antrim, Hillsborough County and State of New Hampshire, bounded and described as follows:

Beginning at the Northwest corner of the premises at a stake and stones by land formerly owned by John Dodge; thence

1. Southerly by said Dodge land to the old road leading from the former residence of William R. Carr to the former residence of Samuel Dinsmore, to a stake and stones; thence

2. Easterly by said road about 37 rods to stake and stones; thence

3. Northerly by land formerly owned by Chandler Boutelle to a stake and stones by land formerly owned by Grafton Curtice; thence

4. Westerly by said Curtice land to the bound first mentioned.

Estimated to contain 6.5 acres, more or less, but reserving to the Public Service Company of New Hampshire and those claiming under it, any pole rights it may have acquired.

Tract 4:

Also another tract adjoining the above tract, bounded and described as follows:

Beginning at a bound on the Southerly side of the Keene Road, State Highway, at an old roadway; thence

1. Easterly by said Keene Road to land formerly of William M. Conn; thence

2. Southerly by wall and said Conn land to land formerly of William Boutelle; thence

3. Westerly by said Boutelle land to a stake and stones; thence

4. Southerly by said Boutelle land to the Old Town Road; Thence

5. Westerly by said Old Road to road first above mentioned; thence

6. Northerly by said roadway to the bound of beginning.

Said premises are subject to the rights of the public of the State highway and rights heretofore conveyed to the Public Service Company of New Hampshire.

Subject to current use tax recorded with the said Registry of Deeds at Book 3696, Page 137.

This conveyance of the within described properties are not subject to homestead rights.

Meaning and intending to describe and convey the same premises conveyed to the within grantor by Warranty Deed of Donald H. Hardwick, Sr., dated June 10th, 1999, and recorded at the Hillsborough County Registry of Deeds at Book 6115 Page 1762.

SIGNED this 2nd day of June, 2006.

By: ______________________
John A. Eddy

By: ______________________
Laura C. Eddy

STATE OF NEW HAMPSHIRE
COUNTY OF HILLSBOROUGH

On this 2nd day of June, 2006, personally appeared the above-named John A. Eddy and Laura C. Eddy, known to me (or satisfactorily proven) to be the persons whose names are subscribed to the foregoing instrument, and acknowledged that they executed the same in that capacity, and for the purposes therein contained.

JOANNE C. CRAIGHEAD
MY COMMISSION EXPIRES NOV. 13, 2007
NOTARY PUBLIC
NEW HAMPSHIRE

____
Notary Public/~~Justice of the Peace~~
My commission expires:__________

BK 7685 PG 0867

ENV
EOLIAN RENEWABLE
ENERGY LLC
155 FLEET ST
PORTSMOUTH, NH
03801-4050

Doc # 1063367 Dec 23, 2010 1:38 PM
Book 8277 Page 0354 Page 1 of 4
Register of Deeds, Hillsborough County
Pamela D Coughlin

ANTRIM WIND ENERGY (ANTRIM, NH – TAX MAP #236 /PARCEL #001-000 – STEVEN R. COTRAN)

EXHIBIT C
MEMORANDUM OF LEASE

PARTIES TO LEASE:	LESSOR Mr. Steven R. Cotran 26 McIntosh Lane Bedford, NH 03110 LESSEE Antrim Wind Energy LLC c/o Eolian Renewable Energy 155 Fleet Street Portsmouth, New Hampshire 03801
PREMISES:	Lessor is the owner of that certain real property described in Exhibit A attached hereto ("Lessor's Land"). Lessor leases to Lessee all or a portion of Lessor's Property as depicted on the map attached hereto as Exhibit B (the "Leased Premises"), together with the non-exclusive right of ingress to and egress from Windpower Facilities (defined in the Lease) located on the Leased Premises, adjoining properties and elsewhere over and across the Leased Premises and Lessor's Land by means of existing roads and lanes, if any, or otherwise by such route or routes as Lessee may construct from time to time.
TERM OF LEASE:	Lease shall be for an initial term of twenty-five (25) years and shall commence on the Effective Date.
EXTENSION TERM:	Lessee shall have the option to renew the Lease for one additional twenty-five (25) year term.

ANTRIM WIND ENERGY (ANTRIM, NH – TAX MAP #236 /PARCEL #001-000 – STEVEN R. COTRAN)

DATED at Manchester, NH this 21st day of December, 2010.

By: Steven R Cotran
Name: Steven R. Cotran
Its: Self/landowner

STATE OF NEW HAMPSHIRE
) ss.:
COUNTY OF Hillsborough

On this 21st day of December, 2010, before me, the undersigned, a Notary Public in and for said State, personally appeared Steven R. Cotran, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his, signature on the instrument, the individual(s) or the person(s) upon behalf of which the individual acted, executed the instrument.

LAUREN A. KORANDA
MY COMMISSION EXPIRES OCT. 7, 2014
NOTARY PUBLIC
NEW HAMPSHIRE

Notary Public

DATED at Portsmouth, this 20 day of December, 2010.

By:
Name: John B. Kenworthy
Its: Manager

STATE OF NEW HAMPSHIRE
) ss.:
COUNTY OF ROCKINGHAM

On this 20th day of December, 2010, before me, the undersigned, a Notary Public in and for said State, personally appeared John B. Kenworthy, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his, signature on the instrument, the individual(s) or the person(s) upon behalf of which the individual acted, executed the instrument.

Notary Public Nicole Scamman

NICOLE SCAMMAN
MY COMMISSION EXPIRES JAN. 16, 2013
NOTARY PUBLIC
NEW HAMPSHIRE

EXHIBIT A to Memorandum of Lease

6065402 2006 SEP 13 AM 11: 11

McKenney + Bausha

10.39
2
12.39 NO TS

QUITCLAIM DEED

KNOW EVERYONE BY THESE PRESENTS

That Diane Cotran, single, of 83 Rosewell Road, Town of Bedford, Hillsborough County, State of New Hampshire, for consideration paid, grants to Steven R. Cotran, single, of 26 McIntosh Lane, Town of Bedford, Hillsborough County, State of New Hampshire, with ***quitclaim covenants***

A certain tract or parcel of land, with the buildings thereon, situated in the Town of Antrim, County of Hillsborough, State of New Hampshire, on Pigeon Mountain, being more particularly bounded and described as follows:

Containing one hundred thirty (130) acres, be the same more or less, and is Lot #21 in the Great right number five, drawn to the original right of Pierce and Moore, bounded on the north by land now or formerly of Artemus Brown, on the east by land now or formerly of George Brown, on the south by land now or formerly of Condry and others, and on the west by Hubbard Lot, so-called.

Meaning and intending to describe and convey the same premises conveyed to Diane Cotran, by Quitclaim Deed of Steven R. Cotran (a/k/a/ Steven Cotran) dated November 25, 1997 and recorded at Volume 5877, Page 1149, Hillsborough County Registry of Deeds.

This conveyance is made pursuant to the terms of the decree of divorce <u>In the Matter of Steven R. Cotran and Diane M. Cotran</u>, Hillsborough County Superior Court, and is therefore exempt from New Hampshire real estate transfer taxes pursuant to RSA 78-B:2, XIII.

The Grantor releases to the Grantee all rights of homestead and other interests therein.

Dated: 6/16/06

Diane Cotran L.S.
Diane Cotran

BK7737PG1502

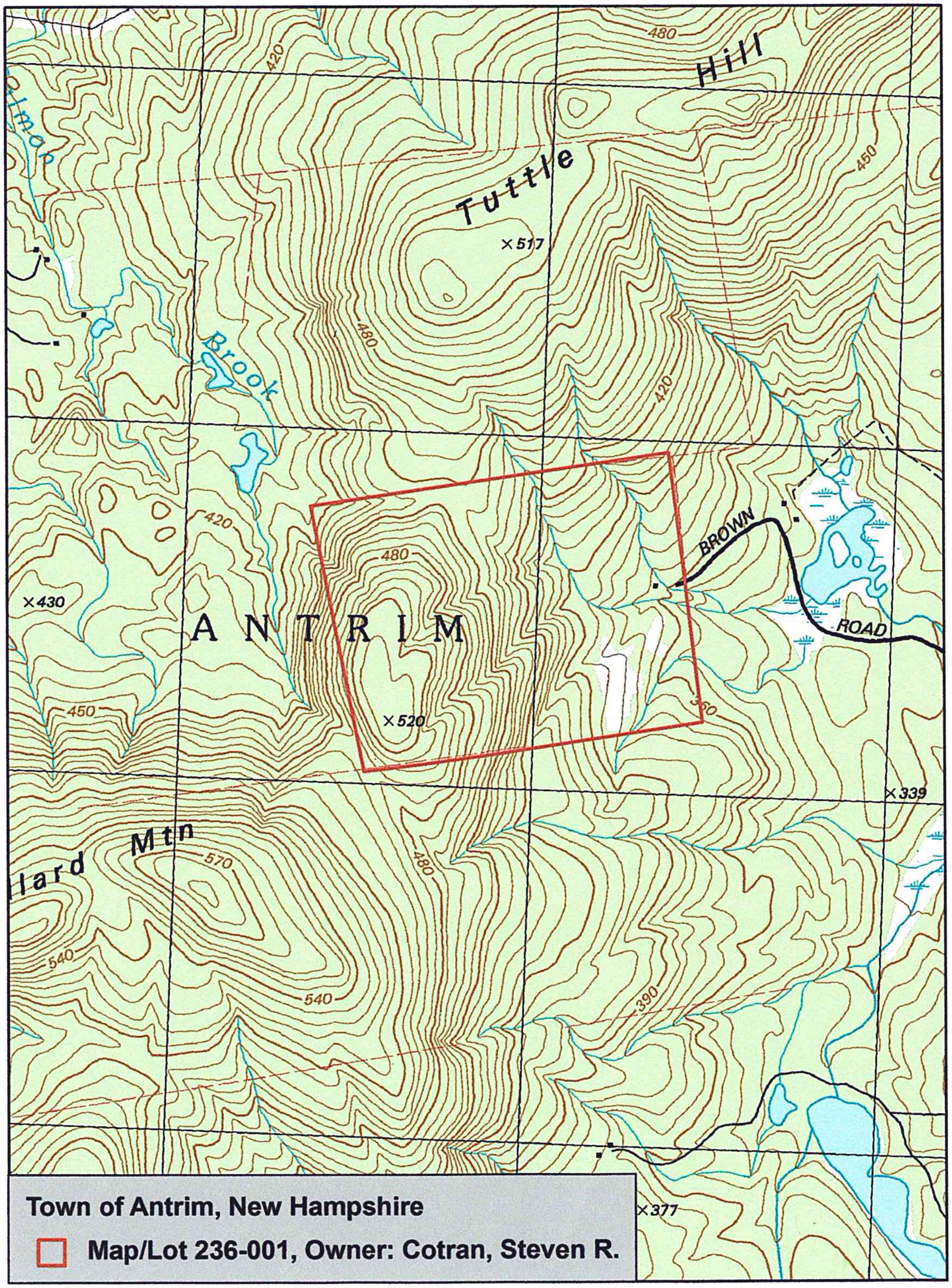
State of New Hampshire, County of Hillsborough June 16, 2006

Personally appeared Diane Cotran, known to me, or satisfactorily proven, to be the person whose name is subscribed to the foregoing instrument and acknowledged that s/he executed the same for the purposes therein contained.

Before me, [signature]
Justice of the Peace/~~Notary Public~~

CATHERINE P. BAUSHA
JUSTICE OF THE PEACE - NEW HAMPSHIRE
My Commission Expires February 22, 2011

EXHIBIT B to Memorandum of Lease



Verrill : Dana
490

Doc # 1026732 Jun 11, 2010 12:41 PM
Book 8211 Page 1362 Page 1 of 16
Register of Deeds, Hillsborough County
Pamela D Coughlin

Antrim Wind (Antrim, NH – Map # 235 Lot # 235-014-000 – Antrim Limited Partnership)

MEMORANDUM OF LEASE

PARTIES TO LEASE:	LESSOR Antrim Limited Partnership c/o Charles S. Bean III 477 Washington Street Norwood, Massachusetts 02062
	LESSEE Antrim Wind Energy, LLC c/o Eolian Renewable Energy, LLC 155 Fleet Street Portsmouth, New Hampshire 03801
PREMISES:	Lessor is the owner of that certain real property described in Exhibit A attached hereto ("Lessor's Land"). Lessor leases to Lessee all or a portion of Lessor's Property as depicted on the map attached hereto as Exhibit B (the "Leased Premises"), together with the non-exclusive right of ingress to and egress from Windpower Facilities (defined in the Lease) located on the Leased Premises, adjoining properties and elsewhere over and across the Leased Premises and Lessor's Land by means of existing roads and lanes, if any, or otherwise by such route or routes as Lessee may construct from time to time.
TERM OF LEASE:	Lease shall be for an initial term of twenty-five (25) years and shall commence on the Effective Date.
EXTENSION TERM:	Lessee shall have the option to renew the Lease for one additional twenty-five (25) year term.

DATED at Norwood, Massachusetts this 23rd day of April, 2010.

ANTRIM LIMITED PARTNERSHIP

By: ______________________

Name: Charles S. Bean III

Its: Manager of its General Partner, Bean Family, LLC

STATE OF MA)
) ss.:
COUNTY OF Norfolk)

On this 23rd day of April, 2010, before me, the undersigned, a Notary Public in and for said State, personally appeared Charles S. Bean III, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name(s) is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his, signature on the instrument, the individual(s) or the person(s) upon behalf of which the individual acted, executed the instrument.

Karen Ann Keefe
Notary Public

KAREN ANN KEEFE
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Oct. 8, 2015

NOTARY PUBLIC

EXHIBIT A to Memorandum of Lease

See attached deeds

Doc # 1018119 Apr 23, 2010 11:10 AM
Book 8197 Page 0116 Page 1 of 5
Register of Deeds, Hillsborough County
Pamela D Coughlin

C/H
L-CHIP
HIA082547

ENV
#290
Cushing & Dolan PC

STATE OF NEW HAMPSHIRE
DEPARTMENT OF REVENUE ADMINISTRATION
REAL ESTATE TRANSFER TAX
***** Thousand * Hundred 40 Dollars
DATE 04/23/2010 HI019875 AMOUNT $ ******40.00
VOID IF ALTERED

NEW HAMPSHIRE WARRANTY DEED

We, **Charles S. Bean, II, Elena A. Bean** and **Charles S. Bean, III**, Trustees of the **Antrim Realty Trust**, under Declaration of Trust dated December 23, 1994 and recorded with Hillsborough County Registry of Deeds at Book 5608, Page 1532.

For Consideration Paid

Grant to **Antrim Limited Partnership**, a Limited Partnership organized under the law of the Commonwealth of Massachusetts with a usual place of business of 477 Washington Street, Norwood, Norfolk County, Massachusetts

Two certain tracts of land situated in Antrim, in the County of Hillsborough, State of New Hampshire:

Tract #1:

With the buildings thereon, bounded and described as follows:

Beginning on the east line of the lot on the south side of the highway leading from Gregg's Pond to the Alvin Brown Farm, so called, at an iron pin at the corner of land of John Cuddihy and George P. Hildreth; thence south 86.5 degrees west, 19 rods north 63 degrees west, 25.5 rods by land of said Cuddihy to stake and stones; thence south, 35 degrees west, 30 rods by said Cuddihy's land to stakes and stones; then southeasterly 11 rods and easterly by said Cuddihy's land to land of George P. Hildreth; thence southerly by said Hildreth's land to land of John Cuddihy; thence westerly by said Cuddihy's land; thence southerly by said Cuddihy's land to a stake and stones on a rock; thence south, 86 degrees east, fifty rods to land of Frank M. Brooks; thence south, 9 degrees west, 5 rods and south, 5.25 degrees west 30 rods by land of said Brooks to the corner of a wall at land of C. H. Bass and being the southeast corner of the premises; thence north 86 degrees west, 41 rods by said Bass land to the corner of the wall; thence 2 degrees west, by the wall 19 rods to a lane; thence westerly and northwesterly by a stone wall at said land against the land of John Cuddihy 46 rods to a stake and stones; thence, 85 degrees west, 46 rods by said Cuddihy's land to stake and stones; thence north 7 degrees east, 37 rods to the corner of a wall; thence north, 87 degrees west, still by land of said Cuddihy 135 rods to the corner of the wall; thence north 6 degrees east, 80 rods by said Cuddihy's land to the corner of a wall at the land of Alvin Brown Estate; thence south 86 degrees east, 89 rods by said Brown land to a corner of the wall; thence north, 3 degrees east, 35 rods by said Brown land to the corner of the wall; thence north, 79.5 degrees west, 30 rods by said Brown land to a stake and stones; thence north, 7 degrees east, 151 rods by land of said Brown, crossing the highway to a corner of the wall; thence north, 84 degrees west, 58 rods by said Brown land to a stake and stones, thence north, 85 degrees west, 151 rods by land of said Alfred G. Holt to a stake and stones; thence north 85 degrees west, 49 rods by land of Eastern Lumber Company to a take and stones, thence north, 20 degrees east, 114 rods by land of W.K. Flint and still further north, 20 degrees east, 84 rods by land of H.W. Dustin to a corner of the wall being the northwest corner of the premises; thence south 81 degrees east, 110 rods to land of H.D. Tudor; thence south 85 degrees east, 107 rods by land of H.D. Tudor to a stone wall; thence south 83 degrees east, 14 rods and south, 80 degrees east, 30 rods by land of W. F. Adams to a stone wall; thence south 83 degrees east 86 rods by land of F.L. Proctor formerly of John E. Tenney to a stake and stones at land of George P. Craig being the northeast corner of the premises; thence south 11 degrees west, 43 rods by said Craig's land to a stake and stones; thence south 3.25 degrees east, 52 rods by said Craig's land to a stake and stones; thence south 2 degrees west, 27 rods by said Craig's land to a stake and stones; thence south 9.5 degrees west, 59 rods by said Craig's land to a stake and stones; thence south, 83.5 degrees east, 68 rods by said Craig's land to a stake and stones at land of Delia Flanders; thence south 7.5 degrees west. 40 rods by said Flanders land to a beech tree marked, at the highway leading from Gregg's Pond to the homestead of George P. Craig, then crossing the highway south, 7 degrees west, 36 rods to a stake and stones on the east side of said "Craig" highway, crossing said highway and continuing southeasterly along some 84 rods to a stone wall at land of George P. Hildreth; thence southerly along said wall 19.5 rods by land of said Hildreth; thence south 33 degrees west, 19 rods to the highway first mentioned opposite the place of beginning and containing 817 acres more or less reserving the Town of Antrim the highway rights as they now exist.

Tract #2:

Located on the northwesterly side of that highway leading from Gregg's Pond to Keene highway known as Route #9, and bounded and described as follows, to wit:

Beginning at the northeasterly corner of the premises at a stake and stones; thence southerly by the highway about forty (40) rods to a stake and stones at land formerly of Artemis Brown; thence northerly by said Brown land about forty (40) rods to land formerly of Caleb Clark to a stake and stones; thence easterly about twenty-five (25) rods to the bound first mentioned. Said premises contains three acres, be the same more or less. This tract adjoins track No. 1.

For grantor's title see deed of Charles S. Bean, II to Charles S. Bean, II, Elena A. Bean and Charles S. Bean, III, Trustees of the Antrim Realty Trust dated December 23, 1994 and recorded at Book 5608, Page 1544.

SIGNATURE PAGE TO FOLLOW

Charles S. Bean II, Tr. Elena A. Bean

CHARLES S. BEAN, II, TRUSTEE ELENA A. BEAN, TRUSTEE

ANPRIM REALTY TRUST

CHARLES S. BEAN, III, TRUSTEE

COMMONWEALTH OF MASSACHUSETTS

Norfolk, ss.

On this 16 day of April 2010, before me, the undersigned Notary Public, personally appeared **CHARLES S. BEAN, II, TRUSTEE** proved to me through satisfactory evidence of identification which was ☐ photo identification ☑ personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purposes on behalf of the Trust.

Karen Ann Keefe

Notary Public:
My Commission Expires:

KAREN ANN KEEFE
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Oct. 8, 2015

COMMONWEALTH OF MASSACHUSETTS

Norfolk, ss.

On this 16 day of April 2010, before me, the undersigned Notary Public, personally appeared **ELENA A. BEAN, TRUSTEE** proved to me through satisfactory evidence of identification which was ☐ photo identification ☑ personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purposes on behalf of the Trust.

Karen Ann Keefe

Notary Public:
My Commission Expires:

KAREN ANN KEEFE
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Oct. 8, 2015

COMMONWEALTH OF MASSACHUSETTS

Norfolk, ss.

On this 10 day of April 2010, before me, the undersigned Notary Public, personally appeared **CHARLES S. BEAN, III, TRUSTEE** proved to me through satisfactory evidence of identification which was ☐ photo identification ☑ personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purposes on behalf of the Trust.

Karen Ann Keefe

Notary Public:

My Commission Expires:

KAREN ANN KEEFE
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Oct. 8, 2015

Doc # 1020521 May 6, 2010 11:14 AM
Book 8201 Page 0787 Page 1 of 3
Register of Deeds, Hillsborough County
Pamela D Coughlin

C/H
L-CHIP
HIA084205

STATE OF NEW HAMPSHIRE
DEPARTMENT OF REVENUE ADMINISTRATION
REAL ESTATE TRANSFER TAX
***** Thousand * Hundred 40 Dollars
DATE 05/06/2010 HI020247 AMOUNT $ ******40.00
VOID IF ALTERED

Env
290
CUSHING + DOLAN

NEW HAMPSHIRE WARRANTY DEED

We, **Charles S. Bean, II**, **Elena A. Bean** and **Charles S. Bean, III**, Trustees of the **Antrim Realty Trust**, under Declaration of Trust dated December 23, 1994 and recorded with Hillsborough County Registry of Deeds at Book 5608, Page 1532.

For Consideration Paid

Grant to **Antrim Limited Partnership**, a Limited Partnership organized under the law of the Commonwealth of Massachusetts with a usual place of business of 477 Washington Street, Norwood, Norfolk County, Massachusetts

A certain tract of land situate in the west part of said Antrim, Hillsborough County and State of New Hampshire, containing fifty acres more or less, bounded on the north and west by land formerly of the Steel Heirs; on the south by land formerly owned by George Brown, now owned by Leon A. Bean and Hester Bean and land formerly owned by George P. Craig, now owned by Clark A. Craig and Sue K. Craig; on the east by land formerly owned by Lewis Simonds.

The within described premises were originally owned by John E. Tenney, later by Fred L. Proctor and more lately by Earl Smith and Ruth D. Smith.

For grantors' title see of Charles S. Bean, II a/k/a Charles S. Bean to Charles S. Bean, II, Elena A. Bean and Charles S. Bean, III, Trustees of Antrim Realty Trust dated December 23, 1994 recorded with the Hillsborough County Registry of Deeds at Book 5608, Page 1542.

ANTRIM REALTY TRUST

CHARLES S. BEAN, II, TRUSTEE ELENA A. BEAN, TRUSTEE

CHARLES S. BEAN, III, TRUSTEE

COMMONWEALTH OF MASSACHUSETTS

Norfolk, ss.

On this 16 day of April 2010, before me, the undersigned Notary Public, personally appeared **CHARLES S. BEAN, II, TRUSTEE** proved to me through satisfactory evidence of identification which was ☐ photo identification ☑ personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purposes on behalf of the Trust.

Karen Ann Keefe

Notary Public:
My Commission Expires:

KAREN ANN KEEFE
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Oct. 8, 2015

COMMONWEALTH OF MASSACHUSETTS

Norfolk, ss.

On this 16 day of April 2010, before me, the undersigned Notary Public, personally appeared **ELENA A. BEAN, TRUSTEE** proved to me through satisfactory evidence of identification which was ☐ photo identification ☑ personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purposes on behalf of the Trust.

Karen Ann Keefe

Notary Public:
My Commission Expires:

KAREN ANN KEEFE
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Oct. 8, 2015

COMMONWEALTH OF MASSACHUSETTS

Norfolk, ss.

On this 16 day of April 2010, before me, the undersigned Notary Public, personally appeared **CHARLES S. BEAN, III, TRUSTEE** proved to me through satisfactory evidence of identification which was ☐ photo identification ☑ personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purposes on behalf of the Trust.

Karen Ann Keefe

Notary Public:

My Commission Expires:

KAREN ANN KEEFE
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Oct. 8, 2015

KAREN ANN KEEFE NOTARY PUBLIC

Doc # 1020523 May 6, 2010 11:14 AM
Book 8201 Page 0793 Page 1 of 3
Register of Deeds, Hillsborough County
Pamela D Coughlin

Env / 290

CUSHING + DOLAN

NEW HAMPSHIRE WARRANTY DEED

We, **Charles S. Bean, II, Elena A. Bean** and **Charles S. Bean, III**, Trustees of the **Antrim Realty Trust**, under Declaration of Trust dated December 23, 1994 and recorded with Hillsborough County Registry of Deeds at Book 5608, Page 1532.

For Consideration Paid

Grant to **Antrim Limited Partnership**, a Limited Partnership organized under the law of the Commonwealth of Massachusetts with a usual place of business of 477 Washington Street, Norwood, Norfolk County, Massachusetts

The land with the buildings thereon situated in said Antrim, Hillsborough County, New Hampshire, bounded and described as follows:

Beginning at the northwest corner of the premises at a stake and stones; thence southerly by land of Charles F. Holt and Samuel A. Holt to a stake and stones; thence easterly on land of George Brown to a stake and stones; thence northerly on land of said Brown about forty (40) rods; thence westerly on land of said Brown about forty-one (41) rods; thence northerly on land of said Brown about one hundred forty (140) rods to a stake and stones; thence westerly on land of said Brown to the bounds first mentioned, containing seventy-five (75) acres more or less, excepting however from the above conveyance the sawable timber located upon the above described premises conveyed to Benjamin F. Tenney by said John A. Brown by deed of even date to be recorded herewith.

For grantors' title see deed of Charles S. Bean, II a/k/a Charles S. Bean to Charles S. Bean, II, Elena A. Bean and Charles S. Bean, III Trustees of Antrim Realty Trust dated December 23, 1994 and recorded with Hillsborough County Registry of Deeds at Book 5608, Page 1543.

ANTRIM REALTY TRUST

Charles S. Bean
CHARLES S. BEAN, II, TRUSTEE

Elena A. Bean
ELENA A. BEAN, TRUSTEE

CHARLES S. BEAN, III, TRUSTEE

COMMONWEALTH OF MASSACHUSETTS

Norfolk, ss.

On this 16 day of April 2010, before me, the undersigned Notary Public, personally appeared **CHARLES S. BEAN, II, TRUSTEE** proved to me through satisfactory evidence of identification which was ☐ photo identification ☑ personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purposes on behalf of the Trust.

Karen Ann Keefe
Notary Public:
My Commission Expires:

KAREN ANN KEEFE
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Oct. 8, 2015

COMMONWEALTH OF MASSACHUSETTS

Norfolk, ss.

On this 16 day of April 2010, before me, the undersigned Notary Public, personally appeared **ELENA A. BEAN, TRUSTEE** proved to me through satisfactory evidence of identification which was ☐ photo identification ☑ personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purposes on behalf of the Trust.

Karen Ann Keefe
Notary Public:
My Commission Expires:

KAREN ANN KEEFE
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Oct. 8, 2015

COMMONWEALTH OF MASSACHUSETTS

Norfolk, ss.

On this 16 day of April 2010, before me, the undersigned Notary Public, personally appeared **CHARLES S. BEAN, III, TRUSTEE** proved to me through satisfactory evidence of identification which was ☐ photo identification ☑ personal knowledge, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily for its stated purposes on behalf of the Trust.

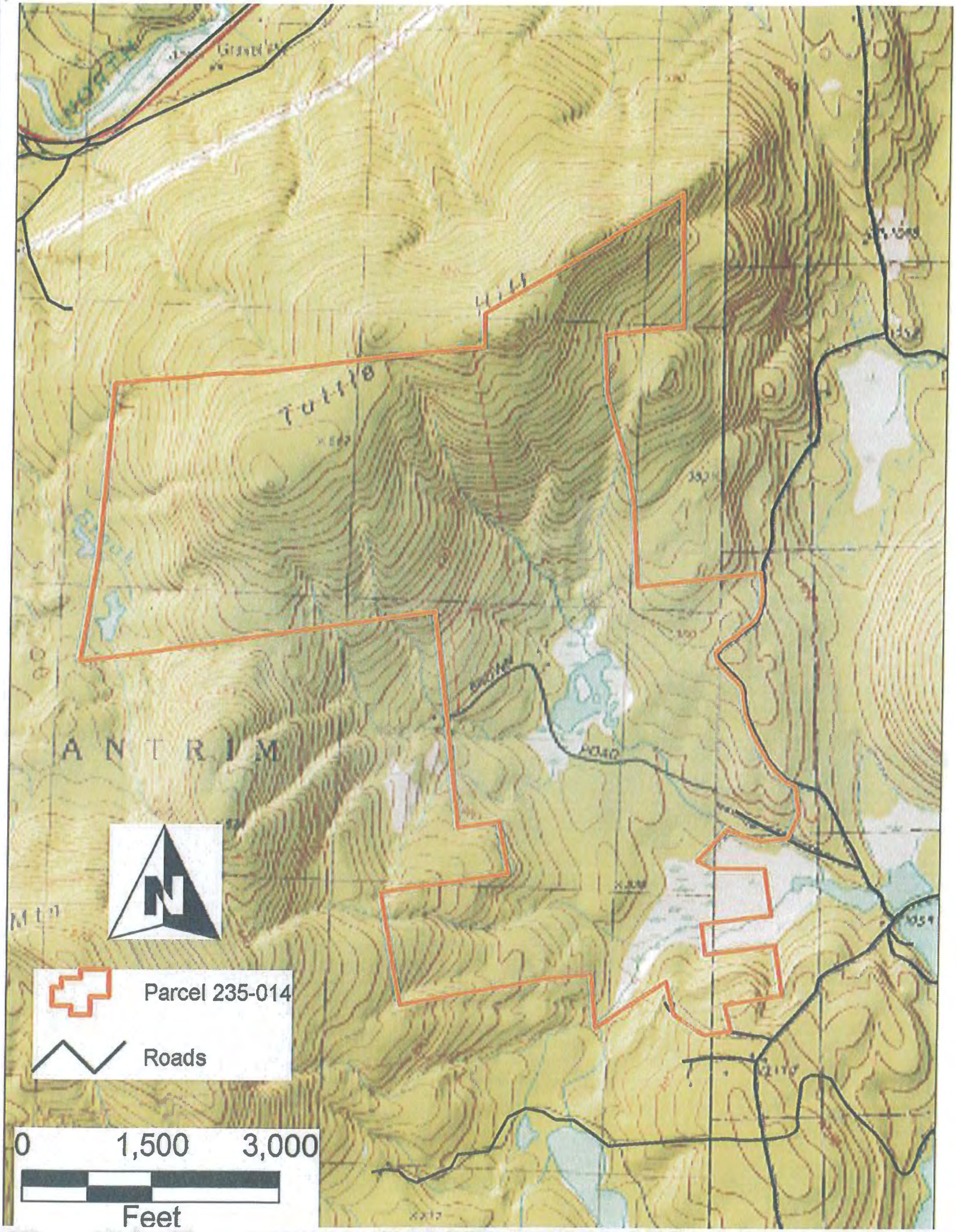
Karen Ann Keefe
Notary Public:
My Commission Expires:

KAREN ANN KEEFE
NOTARY PUBLIC
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires Oct. 8, 2015

KAREN ANN KEEFE NOTARY PUBLIC

EXHIBIT B to Memorandum of Lease

See attached map



Tuttle
Hill
ANTRIM
Mtn
ROAD
Parcel 235-014
Roads
0
1,500
3,000
Feet

Please return to
#11 Blodgett, Makechnie & Lawrence

Doc # 1114961 Mar 24, 2011 2:47 PM
Book 8304 Page 1113 Page 1 of 6
Register of Deeds, Hillsborough County
Pamela D Coughlin

ANTRIM WIND ENERGY LLC (ANTRIM, N.H. - TAX MAP #239/PARCEL #001-000-
ARTHUR WHITTEMORE, ET. AL., TRUSTEES OF WHITTEMORE TRUST)

MEMORANDUM OF LEASE

PARTIES TO LEASE:	<u>LESSOR</u> Helen M. Whittemore and Paul J. Whittemore, Trustees of the Whittemore Trust c/o Paul J. Whittemore P. O. Box 528 Auburn, New Hampshire 03032-0528
	<u>LESSEE</u> Antrim Wind Energy, LLC c/o Eolian renewable Energy 155 Fleet Street Portsmouth, New Hampshire 03801
PREMISES:	Lessor is the owner of that certain real property described in <u>Exhibit A</u> attached hereto ("Lessor's Land"). Lessor leases to Lessee all or a portion of Lessor's Property as depicted on the map attached hereto as <u>Exhibit B</u> (the "Leased Premises"), together with the non-exclusive right of ingress to and egress from Windpower Facilities (defined in the Lease) located on the Leased Premises, adjoining properties and elsewhere over and across the Leased Premises and Lessor's Land by means of existing roads and lanes, if any, or otherwise by such route or routes as Lessee may construct from time to time.
TERM OF LEASE:	Lease shall be for an initial term of twenty-five (25) years and shall commence on the Effective Date.
EXTENSION TERM:	Lessee shall have the option to renew the Lease for one additional twenty-five (25) year term.

CERTIFICATE OF TRUSTEE: The undersigned Trustees, as Trustees of the Whittemore Trust, under Indenture of Trust dated October 2, 1992, by Arthur F. Whittemore, Helen M. Whittemore and Paul J. Whittemore, and thereto have full and absolute power in said trust agreement to convey any interest in real estate and improvements thereon held in said trust and no purchaser or third party shall be bound to inquire whether the trustees have said power or are properly exercising said power or to see to the application of any trust asset paid to the Trustees for a conveyance thereof.

DATED at ______________________, ______________________, this 10 day of ~~January~~ February, 2011.

By: Paul J Whittemore
Name: Paul J. Whittemore
Its: Owner/Trustee

By: Helen M Whittemore
Name: Helen M. Whittemore
Its: Owner/Trustee

STATE OF NEW HAMPSHIRE
COUNTY OF Rockingham

On this 10th day of ~~January~~ FEBRUARY, 2011, before me, the undersigned, a Notary Public in and for said State, personally appeared Paul J. Whittemore, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his signature on the instrument, the individual or the person upon behalf of which the individual acted, executed the instrument.

Sharon A. Cann
Notary Public/Justice of the Peace
SHARON A. CANN
Printed Name Expiration Date

SHARON A. CANN
MY COMMISSION EXPIRES MAY 20, 2014
NOTARY PUBLIC
NEW HAMPSHIRE

STATE OF AZ
COUNTY OF MARICOPA

On this 22 day of ~~January~~ FEB, 2011, before me, the undersigned, a Notary Public in and for said State, personally appeared Helen M. Whittemore, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that she executed the same in her capacity, and that by her signature on the instrument, the individual or the person upon behalf of which the individual acted, executed the instrument.

JACK BOOMFIELD
Notary Public - Arizona
Maricopa County
Expires 09/19/2013

Notary Public
JACK Bloomfield 9/19/2013
Printed Name Expiration Date

DATED at Portsmouth, New Hampshire this 8 day of ~~January~~ March, 2011.

Antrim Wind Energy LLC

By: ______________________
Name: Jack Kenworthy (John)
Its: Manager

STATE OF NEW HAMPSHIRE
COUNTY OF ROCKINGHAM

On this 8 day of ~~January~~ March, 2011, before me, the undersigned, a Notary Public in and for said State, personally appeared Jack Kenworthy, personally known to me or proved to me on the basis of satisfactory evidence to be the individual whose name is subscribed to the within instrument and acknowledged to me that he executed the same in his capacity, and that by his signature on the instrument, the individual or the person upon behalf of which the individual acted, executed the instrument.

Katrina Ricker
Notary Public/Justice of the Peace

KATRINA Ricker 3/24/2015
Printed Name Expiration Date

KATRINA RICKER MY COMMISSION EXPIRES MAR. 24, 2015 NOTARY PUBLIC NEW HAMPSHIRE

EXHIBIT A to Memorandum of Lease

354837 93 OCT 13 AM 8:28

QUITCLAIM DEED

KNOW ALL MEN BY THESE PRESENTS:

That ARTHUR F. WHITTEMORE and HELEN M. WHITTEMORE, married, of Cuddihee Hill Road, Antrim, County of Hillsborough and State of New Hampshire,

for consideration paid,

grant to ARTHUR F. WHITTEMORE and HELEN M. WHITTEMORE, married, of Cuddihee Hill Road, Antrim, County of Hillsborough and State of New Hampshire, 03440, and PAUL J. WHITTEMORE, married, of 184 Emery Street, Berlin, County of Coos and State of New Hampshire, 03570, as Trustees of the Whittemore Trust, under Indenture of Trust, dated October 2, 1992,

with QUITCLAIM covenants,

Three certain tracts of land situated in the northwesterly part of Antrim, in the County of Hillsborough and State of New Hampshire, bounded and described as follows:

FIRST: Beginning at the Southeast corner of the premises at a beech tree, marked at the southwest corner of Tenney and Dutton's land; thence westerly, by land of Evans and Hayward to the Worthley pasture; thence northerly by said Worthley pasture to land of Samuel Holt; thence easterly by said Holt's land to land of Tenney and Dutton; thence southerly by said Tenney and Dutton's land to the first named bounds. Estimated to contain one hundred and twenty-one acres (121), more or less.

SECOND: Beginning at the northeast corner of the premises at the northwest corner of land formerly owned by John R. Hills; thence southerly by said land to John Hayward's land; thence westerly by land of said John Hayward and the "Allds Pasture", so-called, to land formerly owned by William Weston, deceased; thence northerly on land formerly owned by said Weston to the "Woodbury Pasture", so-called; thence easterly by said Woodbury Pasture to the bounds first mentioned. Containing one hundred thirteen (113) acres, more or less.

BK5480PG1134

-2-

THIRD: Beginning at the northwesterly corner of the premises at the corner of walls running southerly and westerly; thence southerly by land formerly of Lee and Holden to the southwest corner of the premises to land now or formerly of William Weston; thence easterly by land now or formerly of said Weston and land now or formerly of Worthley and Hill to the southeast corner of the premises at the corner of land now or formerly of Samuel Fletcher by the corner of walls; thence northerly by land now or formerly of said Fletcher and land now or formerly of Davis to the northeast corner at land formerly of Darias Hubbard; thence westerly by land formerly of said Hubbard to the bound first mentioned. Containing one hundred twenty-three (123) acres, and 36 rods, more or less.

This conveyance is made subject to all restrictions of record or otherwise, stipulations and agreements made or existing between any predecessor in title in reference to the said premises, so far as said matters concern the premises hereby conveyed.

For title of Arthur F. Whittemore and Helen M. Whittemore, reference is made to the deed from Francis R. Fellows, Ruth M. Fellows and Arthur F. Whittemore to Arthur F. Whittemore and Helen M. Whittemore, dated August 31, 1976 and recorded with the Hillsborough County Registry of Deeds in Book 2483, Page 432.

SIGNED this 2nd day of October, 1992.

STATE OF NEW HAMPSHIRE
DEPARTMENT OF REVENUE ADMINISTRATION
REAL ESTATE TRANSFER TAX
XXX THOUSAND XXX HUNDRED AND 40 DOLLARS
MO. DAY YR. 10 13 93 111107 AMOUNT $40 00
VOID IF ALTERED

Arthur F. Whittemore
Arthur F. Whittemore

Helen M. Whittemore
Helen M. Whittemore

STATE OF NEW HAMPSHIRE
COUNTY OF HILLSBOROUGH

October 2, 1992

Before me, the undersigned officer, personally appeared ARTHUR F. WHITTEMORE and HELEN M. WHITTEMORE, and acknowledged the foregoing to be their free act and deed.

Mark D. Fernald
Notary Public

My commission expires:____________

MARK D. FERNALD
COMMISSION EXPIRES 6/28/94

BK5480PG1135

BRIGHTON, FERNALD, TAFT & FALBY - PROFESSIONAL ASSOCIATION - PETERBOROUGH, N. H. 03458-0270

ANTRIM WIND ENERGY LLC (ANTRIM, NH TAX MAP #239, PARCEL #001-000 - WHITTEMORE TRUST.
EXHIBIT B TO MEMORANDUM OF LEASE