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STORMWATER POLLUTION PREVENTION PLAN (SWPPP)
FOR CONSTRUCTION ACTIVITIES AMENDMENT

PREPARED FOR

SOLO HOLIDAYS LLC SUBDIVISION
PROPOSED SUBDIVISION
OUR JOB NO. D25-093

LOCATION: **TOWN OF SAUGERTIES- ULSTER COUNTY, NY**
PROPERTY OFF OF COTTONTAIL LANE AND NYS RT. 212,
SBL 27.2-8-28 & 32.110

OWNER: **SOLOHS NY LLC**
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ATHENS, NY 12015
Email: kk@solohs.com
Tel: (347) 720-9740

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DATE: **01 SEPT. 2026**

_____
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PREFACE

At the appropriate time, the Owners Certification, Electronic Notice of Intent Form (eNOI), and Electronic Notice of Termination Form (eNOT) shall be signed by one (1) of the following persons:

A. Corporation - By (1) a president, vice-president, secretary, or treasurer of the corporation in charge of a principal business function, or any other person authorized to and who performs similar policy or decision-making functions for the corporation; or (2) the manager of one or more manufacturing, production or operating facilities, provided the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for permit application requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures;

B. Partnership or Sole Proprietorship - By a general partner or the proprietor.

C. Municipality, State, Federal or Other Public Agency - By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a federal agency includes (1) the chief executive officer of the agency, or (2) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency.

The Stormwater Pollution Prevention Plan (SWPPP) and other information requested by the NYSDEC or local agency shall be signed by one of the persons described above or by the following:

A. Duly Authorized Representative - A person is a duly authorized representative only if:

1. The authorization is made in writing by a person described in A, B or C above.

2. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, such as the position of plant manager, operator of a well or a well field, superintendent, or position of equivalent responsibility or an individual or position having overall responsibility for environmental matters for the company.

3. The written authorization shall be attached to the SWPPP

Inspection reports, if required, shall be signed by the Qualified Inspector that performs the inspection.

The MS4 SWPPP Acceptance form can be found in Appendix 2.

It shall constitute a permit violation if an incorrect and/or improper signatory authorizes any required forms, SWPPP and/or inspection reports.

The Owner shall sign the following certification:

OWNER'S CERTIFICATION FORM

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

Firm/Project Name: _____

Address of Project Site: _____

_____

Tax Map Number: _____

Owner's Name & Title: _____

Owner's Address: _____

_____

Signature: _____

Date: _____

All Contractors and Subcontractors of the operator or owner shall sign a copy of the following certification statement before undertaking any construction activity at the project site:

CONTRACTOR(S) AND SUBCONTRACTOR(S) CERTIFICATION

Project: SOLO HOLIDAYS LLC- PROPOSED SUBDIVISION– Saugerties, N.Y.

Contracting Firm Name: _____

Address: _____

Phone/Fax Numbers: _____

Specific Elements of SWPPP that Contractor/Subcontractor is responsible for:

_____

_____

Trained Contractor responsible for SWPPP implementation and maintenance:

Name and Title of Individual: _____

Date of last training: _____

"I hereby certify under penalty of law that I understand and agree to comply with the requirements of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the requirements of the most current version of the New York State Pollutant Discharge Elimination System (SPDES) Construction General Permit (CGP) for Stormwater Discharges from Construction Activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

Authorized Individual: _____

Title: _____

Signature: _____

Date: _____

1.) EXECUTIVE SUMMARY

The subject property is located off NYS Route 212 and Cottontail Lane in the Town of Saugerties, Ulster County, New York. The project site consists of approximately 77 +/- acres of predominantly wooded land containing existing wetland features and associated natural drainage areas.

The proposed action consists of the subdivision and development of the property into nine (9) residential lots. Access to the proposed lots will be provided by a private road constructed to serve the subdivision, with individual driveways extending from the private road to the proposed residential building sites.

Each residential lot will be independently served by an on-site private water supply well and individual subsurface sanitary sewage disposal (septic) system. The proposed lots, building areas, access improvements, wells, and septic systems will be located and designed with consideration for the existing topography, wooded character of the property, wetland features, required setbacks, and applicable Town and regulatory requirements.

The development has been designed to limit disturbance to the overall 77-acre property, with the total anticipated land disturbance calculated at approximately 9.8 acres. Accordingly, a substantial majority of the property will remain outside the proposed limits of disturbance and will retain its existing wooded and natural character.

a. **Water Quality –** The proposed stormwater ponds provide 0.158 ac-ft of the 0.118 ac-ft required water quality volume.

b. **Water Quantity -** The proposed stormwater ponds provides the following water quantity measures.

SUMMARY TABLE
COMPARISON OF PRE & MITIGATED POST-DEVELOPMENT PEAK RUNOFF FLOWS

Study Point	1	2	10	25	100
Outlet 1 - Pre	20.4	33.9	80.1	111.2	160.3
Outlet 1 - Post	15.2	26.7	64.8	91.5	131.8

Study Point	1	2	10	25	100
Outlet 2 - Pre	15.4	23.3	48.7	65.2	90.9
Outlet 2 - Post	11.1	16.5	38.5	51.3	70.9

Table shows post development flows have been mitigated to be at or below pre-development levels with the use of the stormwater management pond constructed.

2.) INTRODUCTION

The proposed subdivision of the 77 +/- acres property into nine (9) residential lots. Along with the private represents a low-density residential subdivision, with development concentrated within defined portions of the property while maintaining substantial areas of existing vegetation and minimizing impacts to the site's natural and wetland features.

The project will be built in one continuous phase and will disturb approximately 9.8+/- acres of land. **Figure 2** of this report shows the proposed site layout.

Technical standards used to develop the project were taken from the latest edition of the New York State Stormwater Management Design Manual and the New York Standards and Specifications for Erosion and Sediment Control. The SWPPP report was also prepared in accordance with good engineering practice.

3.) SPDES GP-0-25-001 CONSTRUCTION STORMWATER DISCHARGES

This portion of the SWPPP summarizes the contents of General Permit GP-0-25-001 and notes how each section applies, or doesn't apply, to this specific construction project. A full copy of SPDES GP-0-25-001 can also be found in Appendix 1 of this report for reference.

PART I – HOW TO OBTAIN COVERAGE AND GENERAL REQUIREMENTS

To be covered under this permit, the owner or operator must meet all eligibility requirements in Part I.A. and follow the requirements for obtaining permit coverage in Part I.D., F., or G.

A. ELIGIBILITY REQUIREMENTS

For a common plan of development or sale, the phase(s) that meets the eligibility requirements may obtain coverage under this permit even if other phase(s) of the same common plan of development or sale do not meet the eligibility requirements and require an individual SPDES permit.

1. The owner's or operator's construction activities involve soil disturbances of:

    a. one or more acres;

    b. less than one acre, but part of a larger common plan with over one acre of disturbance;

c. less than one acre where NYSDEC has determined that a SPDES permit is required for stormwater discharges based on the potential to violate water quality standards;

2. Discharges associated with another SPDES permit:

3. If construction activities may adversely affect a species that is endangered or threatened:
4. If construction activities have the potential to affect an historic property:

5. If construction activities are subject to SEQR, documentation shall be provided showing that SEQR has been satisfied:

6. If construction activities are not subject to SEQR, but subject to the equivalent environmental review from another New York State or federal agency, documentation shall be provided showing that requirements of these agencies have been satisfied:

7. If construction activities require Uniform Procedures Act (UPA) Permits from NYSDEC, or the equivalent from another New York State or federal agency, the owner or operator must:

   a. obtain all such necessary permits;

   b. receive notification from NYSDEC excepting Part I.A.7.a.

8. Construction activities are **<u>not eligible</u>** if they meet the following criteria in Part I.A.8.a. or b.:

   a. For linear transportation and/or utility projects:

   b. For all other types of projects, the construction activities meet **<u>all three</u>** of the following criteria:

      i. are within the watershed of surface waters of the State classified as AA or AA-S:
      ii. are undertaken on land with no existing impervious cover:

      iii. disturb one or more acres of *steep slope*:

Appendix B – Table 1 lists construction activities that require the preparation of a SWPPP that only includes Erosion and Sediment Controls, or what we would call a "Basic SWPPP".

Appendix B – Table 2 lists construction activities that require preparation of a SWPPP that also includes Post-Construction Stormwater Management Practices (SMPs), or what we would call a "Full SWPPP".

B. TYPES OF DISCHARGES AUTHORIZED

1. The following stormwater discharges are authorized under this permit:

   a. Stormwater discharges, including stormwater runoff, snowmelt runoff, and surface runoff and drainage, associated with construction activity, are authorized under this permit provided that appropriate stormwater controls are designed, installed, and maintained in accordance with Part II. and Part III. of the GP.

   b. Stormwater discharges from construction support activities at the construction site (including concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, and borrow areas) if the following requirements are met:

      i. The support activity is directly related to the construction site required to have permit coverage for stormwater discharges; and

      ii. The support activity is not a commercial operation, nor does it serve multiple unrelated construction sites; and

      iii. The support activity does not continue to operate beyond the completion of the construction activity at the site it supports; and

      iv. Stormwater controls are implemented in accordance with Part II. and Part III. for discharges from the support activity areas.

2. The following non-stormwater discharges associated with construction activity are authorized under this permit:

   a. Non-stormwater discharges listed in 6 NYCRR 750-1.2(a)(29)(vi), with the following exception: "Discharges from firefighting activities are authorized only when the firefighting activities are emergencies/unplanned"; and

   b. Non-stormwater discharges of waters to which other components have not been added that are used in accordance with the SWPPP to control dust or irrigate vegetation in stabilized areas; and

   c. Uncontaminated discharges from dewatering operations

3. Authorized discharges of stormwater or authorized discharges of non-stormwater, commingled with a discharge authorized by a different SPDES permit and/or a discharge that does not require SPDES permit authorization, are also authorized under this permit.

C. PROHIBITED DISCHARGES

1. Non-stormwater discharges prohibited under this permit include but are not limited to:

   a. Wastewater from washout of concrete; and

   b. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials; and

   c. Fuels, oils, and/or other pollutants used in vehicle and equipment operation and maintenance; and

   d. Soaps, solvents, or detergents used in vehicle and equipment washing or external building washdown; and

   e. Toxic or hazardous substances from a spill or other release.

D. ELECTRONIC NOTICE OF INTENT (eNOI) SUBMITTAL

To receive authorization, the *owner or operator* must submit a complete eNOI. The eNOI contains questions to: ensure eligibility requirements have been met; obtain owner or operator contact information; obtain the total area to be disturbed and the existing/future impervious areas (rounded to the nearest tenth of an acre); confirm Traditional Land Use Control MS4 Operator jurisdiction over construction projects; satisfy the EPA eRule requirements; confirm that the Water Quality-Based Effluent Limitations have been met; demonstrate consideration of the future risks due to climate change and confirm that the other Stormwater Pollution Prevention Plan (SWPPP) requirements have been met.

1. An eNOI may be submitted for:

   a. construction activities that are not part of a common plan of development or sale; or

   b. an entire common plan of development or sale; or

   c. separate phase(s) of a common plan of development or sale if the following requirements are met:

i. the common plan of development or sale meets the eligibility requirements of Part I.A.5. or 6.; and

ii. the phase(s) meet(s) all other eligibility requirements of Part I.A.; and

iii. Part III.C. Required SWPPP Components by Project Type is based on the common plan of development or sale, not the phase(s); or

d. tree clearing that is associated with, or will support, a renewable energy generation, transmission, or storage project that meets Part I.A.5. and 6., if the tree clearing:

i. meets all other eligibility requirements of Part I.A.; and

ii. will occur in NYSDEC's Regions 3-9; and

iii. is not within ¼ mile of a bat hibernaculum protected pursuant to 6 NYCRR Part 182; and

iv. will occur between November 1st and March 31st.

2. As prerequisites for submitting an eNOI, the owner or operator must:

a. Prepare a SWPPP in accordance with the requirements: and

b. Upload the required signed forms as follows:

i. for all eNOIs:

1. upload the signed SWPPP Preparer Form; and

2. upload the signed Owner/Operator Certification Form; and

ii. If an eNOI includes construction activities within the municipal boundary(ies)of Traditional Land Use Control MS4 Operator(s) that will discharge to the MS4(s):

1. determine if the Traditional Land Use Control MS4 Operator(s) has review authority. A Traditional Land Use Control MS4 Operator does not have review authority where:

a. The owner or operator of the construction activities in Part I.D.2.b.ii. is the same entity as the Traditional Land Use Control MS4 Operator listed in said Part, or

b. there is a statute exempting the owner or operator from zoning review by the Traditional Land Use MS4 Operator, or

c. there is no such statute per Part I.D.2.b.ii.1.b., the Traditional Land Use Control MS4 Operator concludes, after a public hearing, that it does not have zoning review authority in accordance with Legal Memorandum LU14 updated January 2020 "Governmental Immunity from Zoning and Other Legislation; and

2. if the Traditional Land Use Control MS4 Operator(s) have review authority, submit the SWPPP to the Traditional Land Use Control MS4 Operator(s) for review and have:

a. if outside the municipal boundaries of NYC: the MS4 SWPPP Acceptance Form, GP-0-25-001 – Appendix G, signed by the principal executive officer or ranking elected official from the Traditional Land Use Control MS4 Operator, or by a duly authorized representative of that person in accordance with Part VII.J.2; or

b. if within the municipal boundaries of NYC: The City of New York Department of Environmental Protection (NYC DEP) SWPPP Acceptance/Approval Form, GP-0-25-001 – Appendix H, signed by the principal executive officer or ranking elected official from the Traditional Land Use Control MS4 Operator, or by a duly authorized representative of that person in accordance with Part VII.J.2; and – **N/A**

3. if the Traditional Land Use Control MS4 Operator <u>does not</u> have review authority, have the MS4 No Jurisdiction Form, GP-0-25-001, Appendix I, signed by the principal executive officer or ranking elected official from the Traditional Land Use Control MS4 Operator, or by a duly authorized representative of that person in accordance with Part VII.J.2.

3. Submitting an eNOI:

a. The owner or operator must submit a complete Notice of Intent electronically using a NYSDEC approved form.

b. The owner or operator is authorized to commence construction activity as of the authorization date indicated in the Letter of

Authorization (LOA), which is sent by NYSDEC after a complete eNOI is submitted.

i. If an eNOI is received for a SWPPP that deviates from one of the technical standards but demonstrates equivalence in accordance with Part III.B.1.a.ii. or Part III.B.2.b.ii., if the SWPPP includes construction activities that are not within the municipal boundary(ies) of Traditional Land Use Control MS4 Operator(s), and/or if the SWPPP includes construction activities within the municipal boundary(ies) of Traditional Land Use Control MS4 Operator(s) that do not have review authority in accordance with Part I.D.2.b.ii.1., the authorization date indicated in the LOA will be 60 business days after the eNOI submission date.

c. If Traditional Land Use Control MS4 Operator(s) have review authority in accordance with Part I.D.2.b.ii.2., the owner or operator must, within five business days of receipt of the LOA, send an electronic copy of the LOA to the Traditional Land Use Control MS4 Operator(s) with review authority.

E. GENERAL REQUIREMENTS FOR OWNERS OR OPERATORS WITH PERMIT COVERAGE

1. As of the date the LOA is received, the owner or operator must make the eNOI, SWPPP, and LOA available for review and copying. When applicable, if an updated LOA is received, the owner or operator must make the updated LOA available as of that date for review and copying.

2. The owner or operator must ensure compliance with all requirements of this permit and that the provisions of the SWPPP, including any changes made to the SWPPP, are properly implemented and maintained from the commencement of construction activity until:

   a. All areas of disturbance have achieved final stabilization; and

   b. the owner's or operator's coverage under this permit is terminated in accordance with Part V.A.5.a.

3. As of the date of the commencement of construction activities, until Part I.E.2.a. and b. have been met, the owner or operator must maintain at the construction site a copy of:

   a. all documentation necessary to demonstrate eligibility with this permit; and

b. this permit; and

c. the SWPPP; and

d. the signed SWPPP Preparer Certification Form; and

e. the signed MS4 SWPPP Acceptance Form, or signed NYCDEP SWPPP Acceptance/Approval Form, or signed MS4 No Jurisdiction Form (when applicable); and

f. the signed Owner/Operator Certification Form; and

g. the eNOI; and

h. the LOA; and

i. the LOA transmittal to the Traditional Land Use Control MS4 Operator in accordance with Part I.D.3.c. (when applicable).

4. The owner or operator must maintain at the construction site, until Part I.E.2.a. and b. (final stabilization and permit termination) have been met, as of the date the documents become final or are received, a copy of the:

a. responsible contractor's or subcontractor's certification statement(s); and

b. inspection reports (as applicable); and

c. Request to Disturb Greater Than Five Acres and the Authorization Letter to Disturb Greater Than Five Acres in (when applicable); and

d. Request to Continue Coverage and the Letter of Continued Coverage (LOCC) (when applicable); and

e. The updated LOA(s) (when applicable).

5. The owner or operator must maintain the documents in Part I.E.3. and 4. in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection. The documents must be paper documents unless electronic documents are accessible to the inspector during an inspection to the same extent as a paper copy stored at the site would be. If electronic documents are kept on site, the owner or operator must maintain functional equipment on site available to an

inspector during normal hours of operation such that an inspector may view the electronic documents in a format that can be read in a similar manner as a paper record and in a legally dependable format with no less evidentiary value than their paper equivalent.

6. The owner or operator must meet the following requirements prior to disturbing more than five acres of soil at any one time:

   a. The owner or operator must submit a written Request to Disturb Greater Than Five Acres to:

      i. NYSDEC's Regional Office Division of Water staff based on the project location if a Traditional Land Use Control MS4 Operator does not have review authority in accordance with Part I.D.2.b.ii.1.; or

      ii. The Traditional Land Use Control MS4 Operator, if a Traditional Land Use Control MS4 Operator has review authority in accordance with Part I.D.2.b.ii.1.; or

      iii. NYSDEC's Regional Office Division of Water staff based on the project location, and each involved Traditional Land Use Control MS4 Operator, if the project spans multiple municipalities with more than one Traditional Land Use Control MS4 Operator involved with review authority in accordance with Part I.D.2.b.ii.1.

   b. The written Request to Disturb Greater Than Five Acres must include:

      i. The SPDES permit identification number (Permit ID); and

      ii. The full technical justification demonstrating why alternative methods of construction that would result in five acres of soil disturbance or less at one time are not feasible; and

      iii. The phasing plan for the project and sequencing plans for all phases from the SWPPP in accordance with Part III.B.1.d; and

      iv. Plans with locations and details of erosion and sediment control practices such that the heightened concern for erosion when disturbing greater than five acres at one time has been addressed; and

      v. Acknowledgement that "the owner and operator will comply with the requirements of Part IV.C.2.b."; and

vi. Acknowledgement that "the owner and operator will comply with the requirements of Part II.B.1.b."

c. The owner or operator must be in receipt of an Authorization Letter to Disturb Greater Than Five Acres, which will include when the authorization begins and ends and indicates a maximum area (acres) of soil disturbance allowed at any one time, from:

i. NYSDEC, if Part I.E.6.a.i. or iii. apply; or

ii. The Traditional Land Use Control MS4 Operator, if Part I.E.6.a.ii. applies.

7. Upon a finding of significant non-compliance with the practices described in the SWPPP or violation of this permit, NYSDEC may order an immediate stop to all construction activity at the site until the non-compliance is remedied. The stop work order must be in writing, describe the non-compliance in detail, and be sent to the owner or operator.

8. If any human remains or archaeological remains are encountered during excavation, the owner or operator must immediately cease, or cause to cease, all construction activity in the area of the remains and notify the appropriate Regional Water Engineer (RWE). The Construction activity shall not resume until written permission to do so has been received from the RWE.

9. To be authorized to implement modifications to the information previously submitted in the eNOI, the owner or operator must:

a. notify NYSDEC via email at Stormwater_info@dec.ny.gov requesting access to update the eNOI; and

b. update the eNOI to reflect the modifications and resubmit the eNOI in accordance with Part I.D.; and

c. receive an updated LOA.

9. The eNOI, SWPPP, LOA, updated LOAs (when applicable), and inspection reports required by this permit are public documents that the owner or operator must make available for review and copying by any person within five business days of the owner or operator receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

F. PERMIT COVERAGE FOR DISCHARGES AUTHROIZED UNDER GP-0-25-001

G. CHANGE OF OWNER OR OPERATOR

When applicable:

1. When property ownership changes, or when there is a change in operational control over the construction plans and specifications, the following process applies:

   a. The new owner or operator must meet the applicable prerequisites for submitting an eNOI in accordance with Part I.D.2.;

   b. The new owner or operator must submit an eNOI in accordance with Part I.D.3.;

   c. Permit coverage for the new owner or operator will be effective upon receipt of the LOA in accordance with Part I.D.3.b.;

   d. The new owner or operator, upon receipt of their LOA, must provide their Permit ID to the original owner or operator;

   e. If the original owner or operator will no longer be the owner or operator of the construction activity identified in the original owner's or operator's eNOI, the original owner or operator, upon receipt of the new owner's or operator's Permit ID in accordance with Part I.G.1.d., must submit to NYSDEC a completed eNOT to terminate coverage in accordance with Part V. that includes the name and Permit ID of the new owner or operator; or

   f. If the original owner or operator maintains ownership of a portion of the construction activity, the original owner or operator must maintain their coverage under the permit by modifying their eNOI; modifications to the eNOI must include:

      i. the revised area of disturbance and/or impervious area(s);

      ii. the revised SMP information, if applicable;

      iii. a narrative description of what has changed;

      iv. the new owner's or operator's Permit ID for the portion of the project removed from the eNOI.

      Owners or operators must follow Part I.E.9. to modify the eNOI.

PART II – WATER QUALITY-BASED EFFLUENT LIMITATIONS

A. MAINTAINING WATER QUALITY

NYSDEC expects that compliance with the requirements of this permit will control discharges necessary to meet applicable water quality standards. It shall be a violation of the ECL for any discharge to either cause or contribute to a violation of the following water quality standards as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York:

1. There must be no increase in turbidity that will cause a substantial visible contrast to natural conditions; and

2. There must be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There must be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

If there is evidence indicating that the stormwater discharges authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the water quality standard, the owner or operator must take appropriate corrective action in accordance with Part IV.C.5. of this permit and document in accordance with Part IV.C.4. of this permit. To address the water quality standard violation the owner or operator must include and implement appropriate controls in the SWPPP to correct the problem or obtain an individual SPDES permit.

If, despite compliance with the requirements of this permit, it is demonstrated that the stormwater discharges authorized by this permit are causing or contributing to a violation of water quality standards, or if NYSDEC determines that a modification of this permit is necessary to prevent a violation of water quality standards, the authorized discharges will no longer be eligible for coverage under this permit, and the owner or operator must obtain an individual SPDES permit prior to further discharges from the construction site.

B. EFFLUENT LIMITATIONS APPLICABLE TO DISCHARGES FROM CONSTRUCTION ACTIVITIES

Discharges authorized by this permit must achieve, at a minimum, the effluent limitations in items (a)-(e) below. These limitations represent the degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The owner or operator must select, design, install, implement, and maintain control measures to minimize the discharge of pollutants and prevent a violation of the water quality standards. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in items (a)-(e) below and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control (BB), dated November 2016, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the owner or operator must include in SWPPP the reason(s) for the deviation, or alternative design, and provide information in the SWPPP demonstrating that the deviation or alternative design is equivalent to the technical standard.

   a. **Erosion and Sediment Controls.** At a minimum, erosion and sediment controls must be selected, designed, installed, implemented, and maintained to:

      i. Minimize soil erosion through application of runoff control and soil stabilization control measure to minimize pollutant discharges; and

      ii. Control stormwater discharges, including both peak flow rates and total stormwater volume, to minimize channel and streambank erosion and scour in the immediate vicinity of the discharge points; and

      iii. Minimize the amount of soil exposed during construction activity; and

      iv. Minimize the disturbance of steep slope; and

      v. Minimize sediment discharges from the site; and

      vi. Provide and maintain natural buffers around surface waters, direct stormwater to vegetated areas and maximize stormwater infiltration to reduce pollutant discharges, unless infeasible; and

      vii. Minimize soil compaction. Minimizing soil compaction is not required where the intended function of a specific area of the site dictates that it be compacted; and

viii. Unless infeasible, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover; and

ix. Minimize dust. On areas of exposed soil, minimize dust through the appropriate application of water or other dust suppression techniques to control the generation of pollutants that could be discharged from the site.

b. **Soil Stabilization.** In areas where soil disturbance activity has ceased, whether permanently or temporarily ceased, **the application of soil stabilization measures must be initiated by the end of the next business day and completed within 14 calendar days from the date the current soil disturbance activity ceased.** For construction sites that directly discharge to one of the 303(d) segments listed in Appendix D, or are located in one of the watersheds listed in Appendix C, or are authorized to disturb greater than five acres in accordance with Part I.E.5.a.viii, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven calendar days from the date the soil disturbance activity ceased.

c. **Dewatering.** Discharges from dewatering activities, including discharges from dewatering of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures.** Select, design, install, implement, and maintain effective pollution prevention measures to minimize the discharge of pollutants and prevent a violation of the water quality standards. At a minimum, such measures must be selected, designed, installed, implemented, and maintained to:

i. Minimize the discharge of pollutants from equipment and vehicle washing, wheel wash water, and other wash waters. Soaps, detergents and solvents cannot be used; and

ii. Minimize the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, hazardous and toxic waste, and other materials present on the site to precipitation and to stormwater. Minimization of exposure is not required in cases where the exposure to precipitation and to stormwater will not result in a discharge of pollutants, or where exposure of a specific material or

product poses little risk of stormwater contamination (such as final products and materials intended for outdoor use); and

iii. Prevent the discharge of pollutants from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Surface Outlets.** When discharging from basins and impoundments, the surface outlets must be designed, constructed, and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion at or below the outlet does not occur.

C. POST-CONSTURUCTION STORMWATER MANAGEMENT PRACTICE (SMP) REQUIREMENTS

1. The owner or operator of a construction activity that requires post-construction SMPs must select, design, install, implement, and maintain the SMPs to meet the performance criteria in the New York State Stormwater Management Design Manual (DM). Where SMPs are not designed in conformance with the performance criteria in the DM the owner or operator must include in the SWPPP the reason(s) for the deviations or alternative design and provide information which demonstrates that the deviation or alternative design is equivalent to the technical standard.

2. The owner or operator of a construction activity that requires SMPs must design the practice to meet the applicable sizing criteria in Part II.C.2.a., b., c., or d.

a. **Sizing Criteria for New Development**

i. Runoff Reduction Volume (RRv) and Water Quality Volume (WQv):

1. Reduce the total WQv by application of RR techniques and standard SMPs with RRv capacity. The total WQv must be calculated in accordance with the criteria in the DM; or

2. Minimum RRv and Treatment of Remaining Total WQv: Construction activities that cannot meet the requirements above due to site limitations must direct runoff from all newly constructed impervious areas to a RR technique or standard SMP with RRv capacity unless infeasible. The specific site limitations that

prevent the reduction of 100% of the WQv must be documented in the SWPPP. For each impervious area that is not directed to a RR technique or standard SMP with RRv capacity the SWPPP must include documentation which demonstrates that all options were considered and for each option explain why it is considered infeasible. In no case shall the runoff reduction achieved from the newly constructed impervious areas be less than the minimum RRv calculated using the DM.

ii. Channel Protection Volume (CPv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event, remaining after runoff reduction. Where a CPv control orifice is provided, the minimum orifice size must be 3 inches, with acceptable external trash rack or orifice protection. The CPv requirement does not apply when:

1. Reduction of the entire CPv is achieved by application of runoff reduction techniques or infiltration systems; or

2. The 1-year post development peak discharge is less than or equal to 2.0 cfs without detention or velocity controls; or

3. The site directly discharges into a 5th order or larger water body or tidal waters, where the increase in smaller flows will not impact the stream bank or channel integrity. However, the point of discharge must be adequately protected against scour and erosion by the increased peak discharge.

iii. Overbank Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24 hour peak discharge rate (Qp) to pre-development rates. The Qp requirement does not apply when:

1. The site directly discharges to tidal waters or 5th order or larger streams, or

2. A downstream analysis reveals that overbank control is not required.

iv. Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24 hour peak discharge rate (Qf) to pre-development rates. The Qf requirement does not apply when:

1. The site directly discharges to tidal waters or 5th order or larger streams, or

2. A downstream analysis reveals that extreme control is not required.

b. **Sizing Criteria for New Development in Enhanced Phosphorus Removal Watersheds**

Project site is not located within an enhanced phosphorus removal watershed; therefore, this section does not apply.

c. **Sizing Criteria for Redevelopment Activity**

Project site is not a redevelopment project; therefore, this section does not apply.

PART III – STORMWATER POLLUTION PREVENTION PLAN (SWPPP)

A. GENERAL SWPPP REQUIREMENTS

1. The SWPPP that has been prepared must be implemented by the owner or operator of all construction activity covered by this permit. All authorized discharges are identified in the SWPPP. The SWPPP documents the control measures and practices that will be used to meet the effluent limitations in Part II.B.

2. The SWPPP must demonstrate consideration in narrative format of the future physical risks due to climate change pursuant to the Community Risk and Resiliency Act (CRRA), 6 NYCRR Part 490, and associated guidance.

a. The owner or operator must consider the following physical risks due to climate change:

(i) increasing temperature; and

(ii) increasing precipitation; and

(iii) increasing variability in precipitation, including chance of drought; and

(iv) increasing frequency and severity of flooding; and

(v) rising sea level; and

(vi) increasing storm surge; and

(vii) shifting ecology.

For each of the following:

(i) overall site planning; and

(ii) location, elevation, and sizing of:

(a) control measures and practices; and

(b) conveyance system(s); and

(c) detention system(s).

3. The SWPPP must describe the erosion and sediment control practices and where required, SMPs that will be used and/or constructed to reduce the pollutants in stormwater discharges and to assure compliance with the requirements of this permit. In addition, the SWPPP must identify potential sources of pollution which may reasonably be expected to affect the quality of stormwater discharges.

4. All SWPPPs that require the SMP component (Full SWPPP) in accordance with Part III.B.2. must be prepared by a qualified professional.

5. The owner or operator must keep the SWPPP current so that, at all times, it accurately documents the erosion and sediment control practices that are being used or will be used during construction, and all SMPs that will be constructed on the site. At a minimum, the owner or operator must modify the SWPPP, including construction drawings:

a. whenever the current provisions prove to be ineffective in minimizing pollutants in stormwater discharges from the site; and

b. whenever there is a change in design, construction, or operation at the construction site that has or could have an effect on the discharge of pollutants; and

c. to address issues or deficiencies identified during an inspection by the qualified inspector, NYSDEC, or other regulatory authority; and

d. to document the final construction conditions in an as-built drawing.

6. NYSDEC may notify the owner or operator at any time that the SWPPP does not meet one or more of the minimum requirements of this permit. The notification must be in writing and identify the provisions of the SWPPP that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by NYSDEC, the owner or operator must make the required changes to the SWPPP and submit written notification to NYSDEC that the changes have been made. If the owner or operator does not respond to NYSDEC's comments in the specified time frame, NYSDEC may suspend the owner's or operator's coverage under this permit or require the owner or operator to obtain coverage under an individual SPDES permit.

7. Prior to the commencement of construction activity, the owner or operator must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting, and maintaining the erosion and sediment control practices included in the SWPPP and the contractor(s) and subcontractor(s) that will be responsible for constructing the SMPs included in the SWPPP. The owner or operator must have each of the contractors and subcontractors identify at least one person from their company to be trained contractor that will be responsible for implementation of the SWPPP. The owner or operator must ensure that at least one trained contractor is on site daily when soil disturbance activities are being performed.

The owner or operator must have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before the commencement of construction activities:

> "I hereby certify under penalty of law that I understand and agree to comply with the requirements of the SWPPP and agree to implement any corrective actions identified by the qualified inspector during a site inspection. I also understand that the owner or operator must comply with the requirements of the most current version of the New York State Pollutant Discharge Elimination System (SPDES) Construction General Permit (CGP) for Stormwater Discharges from Construction Activities and that it is unlawful for any person to cause or contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true,

including the possibility of fine and imprisonment for knowing violations"

In addition to providing the certification statement above, the certification page must also identify the specific elements of the SWPPP that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the trained contractor responsible for SWPPP implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The owner or operator must attach the certification statement(s) to the copy of the SWPPP that is maintained at the construction site. If new or additional contractors are hired to implement measures identified in the SWPPP after the commencement of construction activities, they must also sign the certification statement and provide the information listed above prior to performing construction activities.

Prior to commencement of the construction activity, the Owner or Operator shall identify the Contractor(s) and Subcontractor(s) that will be responsible for installing and maintaining the erosion and sediment control practices included in the SWPPP. The Owner or Operator shall have the Contractor(s) identify at least one (1) person from their company that will be responsible for implementation of the SWPPP. This person shall be known as the *trained contractor* (see the "Definitions" section of the General Permit). The Owner or Operator shall ensure that at least one (1) trained contractor is on site daily when soil disturbance activities are being performed.

The Owner or Operator shall have each of the Contractor(s) and Subcontractor(s) identified above sign the certification statement found at the front of this report before they commence any construction activity.

B. REQUIRED SWPPP CONTENTS

1. Erosion and sediment control component – A Full SWPPP has been prepared that includes erosion and sediment control practices that are in conformance with, or equivalent to, the "Blue Book".

2. SMP component – The owner/operator of a construction activity identified in Table 2 of Appendix B must prepare a SWPPP that includes SMPs (Full SWPPP).

C. REQUIRED SWPPP COMPONENTS BY PROJECT TYPE

Owners or operators of construction activities identified in Table 1 of Appendix B are required to prepare a (basic) SWPPP that only includes erosion and sediment

control practices designed in accordance with Part III.B.1. Owners or operators of construction activities identified in Table 2 of Appendix B must prepare a (full) SWPPP that also includes SMPs designed in accordance with Part III.B.2 or 3.

For the entire area of disturbance, including the entire common plan of development or sale, if applicable, the owner or operator must evaluate every bullet from Appendix B Table 1 and Table 2 separately. If bullets from both Table 1 and Table 2 apply, the SWPPP must include erosion and sediment control practices for all construction activities, but SMPs for only those portions of the construction activities that fall under Table 2 bullet(s).

PART IV – INSPECTION AND MAINTENANCE REQUIREMENTS

A. GENERAL CONSTRUCTION AND MAINTENANCE REQUIREMENTS

The owner or operator must ensure that all erosion and sediment control practices, including pollution prevention measures, and all SMPs identified in the SWPPP, are inspected and maintained in accordance with Part IV.B. and C.

B. CONTRACTOR MAINTENANCE INSPECTION REQUIREMENTS

1. The owner or operator of each construction activity, identified in Tables 1 and 2 of Appendix B, must have a ***trained contractor*** inspect the erosion and sediment control practices and pollution prevention measures being implemented within the active work area ***daily*** to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor must:

    a. If the corrective action does not require engineering design:

        i. begin implementing corrective actions within one business day; and

        ii. complete the corrective actions within five business days; or

    b. If the corrective action requires engineering design:

        i. begin the engineering design process within five business days; and

        ii. complete the corrective action in a reasonable time frame but no later than within 60 calendar days.

2. For construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization

measures have been applied to all disturbed areas, the trained contractor can stop conducting the maintenance inspections in accordance with Part IV.B.1. The trained contractor must begin conducting the maintenance inspections in accordance with Part IV.B.1. as soon as soil disturbance activities resume.

3. For construction sites where soil disturbance activities have been shut down with partial project completion, the trained contractor can stop conducting the maintenance inspections in accordance with Part IV.B.1. if all areas disturbed as of the project shutdown date have achieved final stabilization and all SMPs required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational.

C. QUALIFIED INSPECTOR INSPECTION REQUIREMENTS

1. With the exception of the following construction activities identified in Tables 1 and 2 of Appendix B, a *qualified inspector* must conduct site inspections for all other construction activities identified in Tables 1 and 2 of Appendix B.

   a. the construction of a single-family residential subdivision with 25% or less impervious cover at total site build-out that involves a soil disturbance of one (1) or more acres of land, but less than or equal to five (5) acres, and is not located in one of the watersheds listed in Appendix C, and not directly discharging to one of the 303(d) segments listed in Appendix D; and

   b. the construction of a single-family home that involves soil disturbances of one (1) or more acres of land, but less than or equal to five (5) acres, and is not located in one of the watersheds listed in Appendix C, and not directly discharging to one of the 303(d) segments listed in Appendix D; and

   c. Construction on agricultural property that involves soil disturbances of one (1) or more acres, but less than five (5) acres; and

   d. Construction activities located in the New York City Watershed located east of the Hudson River, see Appendix C Figure 1, that involve soil disturbances of 5,000 square feet or more, but less than one acre.

2. The qualified inspector must conduct site inspections in accordance with the following timetable:

a. Construction sites where soil disturbance activities are on-going, the qualified inspector must conduct a site inspection at least once every seven calendar days; or

b. Construction sites where soil disturbance activities are on-going and the owner or operator has received authorization to disturb greater than five acres of soil at any one time, the qualified inspector must conduct at least two site inspections every seven calendar days. The two inspections must be separated by a minimum of two full calendar days; or

c. Construction sites where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and temporary stabilization measures have been applied to all disturbed areas, the qualified inspector must conduct a site inspection at least once every thirty calendar days. The owner or operator must notify the DOW SPDES Program contact at the Regional Office or in areas under the jurisdiction of a Traditional Land Use Control MS4 Operator, the MS4 Operator by hard copy or email prior to reducing the inspection frequency and again by hard copy or email prior to re-commencing construction; or

d. Construction sites where soil disturbance activities have been shut down with partial project completion, the requirement to have the qualified inspector conduct inspections ceases if all areas disturbed as of the project shutdown date have achieved final stabilization and all SMPs required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational. The owner or operator must notify the DOW SPDES Program contact at the Regional Office or in areas under the jurisdiction of a Traditional Land Use Control MS4 Operator, the MS4 Operator by hard copy or email prior to the shutdown and again by hard copy or email prior to re-commencing construction. If soil disturbance activities are not resumed within two years from the date of shutdown the owner or operator must terminate coverage; or

e. Construction sites involving soil disturbance of 1 or more acres that directly discharge to one of the 303(d) segments listed in Appendix D of the permit or is located in one of the watersheds listed in Appendix C of the permit, the qualified inspector must conduct at least two site inspections every seven calendar days. The two inspections must be separated by a minimum of two full calendar days.

3. At a minimum the qualified inspector must inspect:

a. all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness; and

b. all SMPs under construction to ensure that they are constructed in conformance with the SWPPP; and

c. all areas of disturbance that have not achieved final stabilization; and

d. all points of discharge to surface waters of eh State located within, or immediately adjacent to, the property boundaries of the construction site; and

e. all points of discharge from the construction site.

4. The qualified inspector must prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report must include and/or address all of the items listed in Part IV.C.4.a.-n. of the General Permit.

5. Within one business day of the completion of an inspection the qualified inspector must notify the owner or operator and the contractor or subcontractor of any corrective actions that need to be taken. The contractor or subcontractor must:

   a. if the corrective action does not require engineering design:

      i. begin implementing corrective actions within 1 business day; and

      ii. complete the corrective actions within 5 business days; or

   b. if the corrective action requires engineering design:

      i. begin the engineering design process within 5 business days; and

      ii. complete the corrective action in a reasonable time frame but no later than within 60 calendar days.

6. All inspection reports must be signed by the qualified inspector. All inspection reports must be maintained on site with the SWPPP.

PART V – HOW TO TERMINATE CGP COVERAGE

A. ELECTRONIC NOTICE OF TERMINATION (eNOT) SUBMITTAL

The eNOT contains questions to ensure requirements in Part V.A. have been met.

1. An owner or operator must terminate coverage when one or more of the following requirements have been met:

    a. Total project completion:

        i. all construction activity identified in the SWPPP has been completed; and

        ii. all areas of disturbance have achieved final stabilization; and

        iii. all temporary, structural erosion and sediment control measures have been removed; and

        iv. all SMPs have been constructed in conformance with the SWPPP and are operational; and

        v. an as-built drawing has been prepared; or

    b. Planned shutdown with partial project completion:

        i. all soil disturbance activities have ceased; and

        ii. all areas disturbed as of the project shutdown date have achieved final stabilization; and

        iii. all temporary, structural erosion and sediment control measures have been removed; and

        iv. all SMPs required for the completed portion of the project have been constructed in conformance with the SWPPP and are operational; and

        v. an as-built drawing has been prepared; or

    c. In accordance with Part I.G., Change of Owner or Operator; or

    d. The owner or operator has obtained coverage under an alternative general SPDES permit or an individual SPDES permit.

2. For construction activities that require qualified inspector inspections in accordance with Part IV.C.1. and have met Part V.A.1.a. or b., the owner or operator must have the qualified inspector perform a final site inspection prior to submitting the eNOT. The qualified inspector must, by signing the "Final Stabilization" and "Post-Construction Stormwater Practice(s)" certification statements on the eNOT, certify that all requirements in Part V.A.1.a. or b. have been achieved.

3. For construction activities that are subject to the review authority of Traditional Land Use Control MS4 Operator(s) in accordance with Part I.D.2.b.ii.1. and meet Part V.A.1.a. or b., the owner or operator must have the Traditional Land Use Control MS4 Operator(s) sign the "MS4 Acceptance" statement on the eNOT in accordance with the requirements in Part VII.J. A Traditional Land Use Control MS4 Operator official, by signing this statement, determined that it is acceptable for the owner or operator to submit the eNOT in accordance with the requirements of this Part. A Traditional Land Use Control MS4 Operator can make this determination by performing a final site inspection themselves or by accepting the qualified inspector's final site inspection certification(s) when required by Part V.A.2.

4. For construction activities that require SMP's and meet Part V.A.1.a. or b., the owner or operator must, prior to submitting the eNOT, ensure one of the following:

    a. SMPs that were constructed by a private entity, but will be owned, operated, and maintained by a public entity, the SMP(s) and any right-of-way(s) needed to operate and maintain such practice(s) have been deeded to the municipality in which the practice(s) is located; or

    b. SMPs that are privately owned, but will be operated and maintained by a public entity, an executed operation and maintenance agreement is in place with the municipality that will operate and maintain the SMP(s); or

    c. SMPs that are privately owned, the owner or operator has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with operation and maintenance plan, such as a deed covenant in the owner or operator's deed of record; or

    d. SMPs that are owned by a public or private institution, government agency or authority, or public utility, the owner or operator has policies and procedures in place that ensure operation and

maintenance of the practices in accordance with the operation and maintenance plan.

5. An owner or operator that has met the requirements of Part V.A.1.,2., 3., and 4. must request termination of coverage under this permit by submitting a complete Notice of Termination form electronically using a NYSDEC approved form.

   a. The owner's or operator's coverage is terminated as of the termination date indicated in the Letter of Termination (LOT), which is sent by NYSDEC after a complete eNOT is submitted.

PART VI – RECORD RETENTION AND REPORTING

A. RECORD RETENTION

The owner or operator must retain a copy of the documents listed in Part I.E.3. and a copy of the LOT for a period of at least five years from the date that NYSDEC accepts a complete NOT submitted in accordance with Part V.

B. REPORTING

Except for the eNOI, the signature forms associated with the eNOI, and the eNOT, all other written correspondence requested by NYSDEC, including individual permit applications, must be sent to the address of the appropriate DOW (SPDES) Program contact at the Regional Office listed in Appendix E of the General Permit.

PART VII – STANDARD PERMIT REQUIRMENTS

The Owner and/or Operator should read and become familiar with the Standard Permit Requirements listed in Part VII.A. through S. of the General Permit (see Appendix 1 of this report). This Part of the General Permit discusses topics entitled:

A. Duty to Comply
B. Need to Halt or Reduce Activity Not a Defense
C. Penalties
D. False Statements
E. Re-Opener Clause
F. Duty to Mitigate
G. Requiring Another General Permit or Individual SPDES Permit
H. Duty to Provide Information
I. Extension
J. Signatories and Certification
K. Inspection and Entry
L. Confidentiality of Information

M. Other Permits May Be Required
N. NYSDEC Orders or Civil Decrees/Judgements
O. Property Rights
P. Compliance with Interstate Standards
Q. Oil and Hazardous Substance Liability
R. Severability
S. NYSDEC Approved Forms

4. EXISTING SITE CONDITIONS

A. SOILS AND TESTING

On-site and off-site soil disturbances for the proposed project will be limited to an area that encompasses approximately 9.8 acres. Figure 3 shows the existing topography, general soil type boundaries, and hydrologic soil groups that exist on and near the project site.

According to the Ulster County Soil Survey, development will occur in areas with the following soil types:

Arnot Channery Silt Loams, 0 to 8% (AcB) is characterized as being shallow and somewhat excessively well drained. It typically has a limiting layer of lithic bedrock between 10" and 20". This soil is classified as hydrologic soil group D.

Arnot Oquga Rock outcrop Complex, Very Steep (ARF) has slopes between 35% and 70%. It is also characterized as being shallow and somewhat excessively drained. It typically has a limiting layer of lithic bedrock between 10" and 20". This soil is classified as hydrologic soil group D.

Atherton Silt Loam (At) is generally a deep, gravelly soil with little slopes. It is characterized by poorly drained soil but has typically more than 80" to a restrictive feature. Its hydrologic soil group is B/D

Canadaigua Silt Loam (Cc) is a silty loam soil with very little slopes on the surface. It is classified as poorly drained soil and has more than 80" to a restrictive feature. It rarely floods but frequently ponds. The soil hydrologic group is C/D

Oquaga-Arnot Rock Outcrop Complex, Sloping (ORC) is a stoney silt loam with surface slopes between 8% and 15%. It has a restrictive depth of 20" to 40" to lithic bedrock. It is classified as a well drained soil within hydrologic soil group C.

Appendix 3 contains a more complete description of the soils within the development area, along with suitability and limitations for various uses with regards to stormwater management practices. Actual deep soil tests and infiltration tests were not necessary, given our past experience working on the project site for the previous site construction.

B. PRE-DEVELOPMENT DRAINAGE AREA

The property is divided into 5 main drainage areas that combine for an approximate area of 104 acres. The five drainage areas flow off the site at five different outlet locations. Of the five drainage areas, only two will be affected by the proposed site development. These are Outlets 1 and 2, which will be used as study points for the pre- and post-development runoff analysis. Figure #4 of this report shows the pre-developed drainage areas, soil types, and outlet locations.

5. PROPOSED SITE CONDITIONS

A. PRESERVATION OF NATURAL RESOURCES

As previously noted, construction of the proposed project and appurtenant site improvements will disturb approximately 9.8 acres. Clearing and grading will be limited to only those areas needed for the construction of the buildings, parking areas, utilities, and stormwater management areas.

B. REDUCTION OF IMPERVIOUS COVER

The following measures have been proposed for the project to minimize the amount of impervious cover to be created:

- Based on the Town of Saugerties Zoning Law the proposed project would be allowed to have a maximum of 30% lot coverage (buildings & structures). The proposed project has an average lot coverage of 4%, which is significantly below the allowable impervious cover.
- The building sizes were designed to minimize the building footprints.

C. POST DEVELOPMENT IMPERVIOUS SURFACES

Figure 2 provided earlier within this report shows the Post-Development Site Plan. Figure 5 shows the Post Development drainage areas for the design of the project. The construction of the access roads, buildings, sidewalks, and paved parking area will create approximately 2.95 acres of impervious surfaces on the project site.

6. WATER QUALITY VOLUME (WQv)

In order to be in compliance with SPDES General Permit No. GP-0-25-001, the SWPPP is required to address issues associated with stormwater quality from the proposed construction site. The unified stormwater sizing criteria, found in the "New York State Stormwater Management Design Manual", was used to meet pollutant removal goals.

The WQv is designed to improve water quality sizing to capture and treat 90% of the average annual stormwater runoff volume. The following equation and calculations were performed to determine the minimum WQv required for the drainage area that includes the new impervious surfaces to be created that discharge into the existing stormwater management pond previously designed and constructed. Please note that the total impervious area used in the calculation includes both on-site and off-site areas that flow through the stormwater management pond.

WQv = [(P)(Rv)(A)]/12
Rv = 0.05 + 0.009 (I)
I = % of impervious cover
P = 90% rainfall event, figure 4.1 of the NYS Stormwater Design Manual
A = site area

Drainage Areas 1A-2F – New Impervious Area
WQv = [(P)(Rv)(A)]/12
I = 2.9 acres/61.4 acres = 4.3%
Rv = 0.05 + 0.009 (4.3) = 0.09
P = 1.6"
WQv = [(1.6)(0.09)(9.8)]/12 = 0.118. ac-ft

A. PROPOSED STORMWATER PONDS

Three proposed stormwater ponds are being used to account for the Water Quality Volume requirement. Pond 1 is located within the roundabout at the end of the proposed road. Pond 2 is located along the road, near the mid-point. Pond 3 is located near the road entrance to NYS Route 212. Their storage volumes for the 90% annual storm event were calculated using stormwater runoff calculation software and are shown below.

SMP	WQv Storage (ac-ft)
Bio-Retention Pond 1	0.006
Bio-Retention Pond 2	0.054
Dry Pond 1	0.098
Total	0.158

Note the total WQv storage is greater than the WQv requirement.

7. RUNOFF REDUCTION VOLUME (RRv)

Runoff Reduction Volume (RRv) criteria were added to the 2010 version of the Design Manual. The concept of runoff reduction is to utilize green infrastructure techniques and

standard SMP's closer to the source to help replicate pre-development hydrology during smaller, more frequent storm events.

RRv = [(P)(Rv)(A)(S)]/12
Rv = 0.05 + 0.009 (I)
I = % of impervious cover
P = 90% rainfall event, figure 4.1 of the NYS Stormwater Design Manual
A = site area
S = Specific Reduction factor (0.2 for D soils, 0.3 for C soils, 0.23 avg)

Drainage Areas 1A-2F – New Impervious Area

WQv = [(P)(Rv)(A)]/12
I = 100%
Rv = 0.05 + 0.009 (100) = 0.95
P = 1.6"
WQv = [(1.6)(0.95)(2.9)(0.23)]/12 = 0.086 ac-ft

Note the total storage volume for the 90% annual storm is greater than the RRv requirement.

8. STORMWATER QUANTITY MANAGEMENT

A. PREFACE

In order to be in compliance with SPDES General Permit Number GP-0-25-001, the SWPPP is required to address issues associated with stormwater quantity from the proposed construction site. This section of the report describes the standards and criteria used to develop stormwater quantity control measures.

B. PRE-DEVELOPMENT RUNOFF CALCULATIONS

Prior to performing a hydrologic analysis of the pre-development drainage area for the project site, the runoff curve number (CN) and the time of concentration (Tc) were determined using the soil types, vegetative covers, slopes and drainage patterns of the study area. Figure 4 shows the pre-development site conditions and the drainage area boundaries.

These values were then used to calculate hydrographs for various return periods. Calculations were performed using the TR-20 hydrology techniques developed by the Soil Conservation Service, along with a computer aided design program entitled "HydroCAD, Version 10.0-26" developed by Applied Microcomputer Systems. Site specific rainfall depths and rainfall distribution curves were obtained from the Northeast Regional Climate Center. Table 1 shows the rainfall input parameters used for each return period. The 90% rainfall value was taken from Figure 4.1 of the New York State Stormwater Management Design Manual.

TABLE 1 - STORM EVENT PARAMETERS

Storm Frequency (Years)	Rainfall (Inches/24 Hours)
90%	1.60
1	2.72
2	3.38
10	5.35
25	6.58
100	8.48

The drainage area was routed to two major outlet points for analysis, which were tributary streams to the Hudson River.

Table 2 provides a summary of pre-development peak flows, which were calculated at the study outlet point using the HydroCAD software program.

TABLE 2
PRE-DEVELOPMENT PEAK RUNOFF FLOWS

	Storm Event (cfs)				
Study Point	1	2	10	25	100
Outlet 1	20.4	33.9	80.1	111.2	160.3
Outlet 2	15.4	23.3	48.7	65.2	90.9

HydroCAD output sheets of all calculations for the pre-development conditions can be found in Appendix 4 of this report.

C. POST-DEVELOPMENT RUNOFF CALCULATIONS

The proposed project will result in an increased amount of impervious area; therefore, it will cause runoff rates and volumes to increase. In order to protect against negative impacts downstream of the project site, mitigation measures will be implemented.

The stormwater ponds SMP selected to address stormwater quality issues, previously discussed in this report, will also provide mitigation for stormwater quantity. The next few sections of this report describe the methods used to reduce the runoff rates.

D. STREAM CHANNEL PROTECTION VOLUME (CPv)

The CPv is designed to protect stream channels from erosion by providing 24-hour extended detention of the one year 24-hour storm event.

The CPv requirement is not necessary on sites where the following occurs:

- Reduction of the CPv is achieved at a site through the use of green infrastructure or infiltration systems.
- The site discharges directly to tidal waters or fifth order or larger streams.

The following equations and calculations were performed to determine the CPv required for this project site:

The first step was to determine the value of the unit peak discharge (qu) using TR-55 and Type II rainfall distribution.

- Initial abstraction (Ia) for a weighted CN of 73 for the project site is 0.740
- Ia/P where P = one year storm event = 0.740/2.72 = 0.272
- Time of concentration (Tc) = 27 minutes
- Using the above data with applicable charts, qu = 464 csm/in.

Knowing qu and time for detention is equal to 24 hours, we determined the value of peak outflow discharge (qo)/peak inflow discharge (qi) by using the applicable chart (qo/qi) = 0.040.

We then determined the value of Vs/Vr, where Vs is equal to the channel protection storage (CPv) and Vr is equal to the volume of runoff in inches.

$$Vs/Vr = 0.68 - 1.43\ (qo/qi) + 1.64\ (qo/qi)^2 - 0.804\ (qo/qi)^3$$
$$Vs/Vr = 0.68 - 1.43\ (0.04) + 1.64\ (0.04)^2 - 0.804\ (0.04)^3$$
$$Vs/Vr = 0.638$$

The runoff Q (in.) was determined by using the HydroCAD program and the following calculation:

$$Q(in) = \frac{\text{Total Storm Volume x 12 in/ft}}{\text{Area}}$$
$$Q(in) = \frac{\text{3.016 acre-feet x 12 in/ft}}{\text{52.4 acres}}$$
$$Q(in) = 0.69 \text{ inches}$$

Solving for Vs:

Vs = CPv = 0.638 (0.69”) (1’/12”) (52.4 acre) = 1.92 acre-feet required

Note Channel Protection Volume not achieved, but we do not believe this will have a lead to erosion and sedimentation issues.

E. OVERBANK (Qp) AND EXTREME (Qf) FLOOD CONTROL

The purpose of the overbank flood control (Qp) requirement is to prevent an increase in the frequency and magnitude of out-of-bank flooding that can result from development. The pre- and post-development peak runoff rates from a 10-year 24-hour storm event are compared in this exercise. Note Qp does not apply to sites that discharge directly to tidal waters or fifth order streams.

Similarly, the purpose of the extreme flood control (Qf) requirement is to prevent an increased risk of flood damage from large storm events, maintain the existing boundaries of the flood plain, and to protect the physical integrity of stormwater management practices. The pre- and post-development peak runoff rates from a 100-year 24-hour storm event are compared in this exercise. Note Qf can be waived if the site discharges directly to tidal waters or fifth order streams.

F. MITIGATED POST-DEVELOPMENT HYDROLOGIC ANALYSIS

HydroCAD was used to model the post-development flows through each drainage subarea and the existing wet pond SMP noted in this report to the study point. Table 3 provides a summary of the mitigated post-development peak flow rates calculated.

TABLE 3
MITIGATED POST-DEVELOPMENT PEAK RUNOFF FLOWS

	Storm Event (cfs)				
Study Point	1	2	10	25	100
Outlet 1	15.2	26.7	64.8	91.5	131.8
Outlet 2	11.1	16.5	38.5	51.3	70.9

Computer printouts of all calculations performed using the HydroCAD software for the mitigated post development analysis has been provided in Appendix 5 of this report.

G. COMPARISON OF PRE AND MITIGATED POST-DEVELOPMENT

Table 4 compares the pre-development flows to the mitigated post-development flows calculated for the study point.

TABLE 4
COMPARISON OF PRE & MITIGATED POST-DEVELOPMENT PEAK RUNOFF FLOWS

Study Point	1	2	10	25	100
Outlet 1 - Pre	20.4	33.9	80.1	111.2	160.3
Outlet 1 - Post	15.2	26.7	64.8	91.5	131.8

Study Point	1	2	10	25	100
Outlet 2 - Pre	15.4	23.3	48.7	65.2	90.9
Outlet 2 - Post	11.1	16.5	38.5	51.3	70.9

Table 4 shows that with the existing wet pond SMP constructed, post-development peak runoff rates can be reduced to be at or below pre-development levels. Therefore, implementing this SWPPP will satisfactorily mitigate the impacts of development on stormwater quantity to downstream properties and water courses.

9. EROSION AND SEDIMENT CONTROL MEASURES

A. PREFACE

This section of the SWPPP describes the temporary and permanent structural and vegetative measures which are to be implemented for soil stabilization, runoff control and sediment control.

B. TEMPORARY EROSION AND SEDIMENT CONTROLS

The following temporary erosion and sediment control measures are to be implemented for this project, along with a description of the timing of initial placement and the duration that each practice shall remain in place.

1. Resource Protection - The limit of the proposed project disturbance shall be marked out in the field prior to beginning any construction activities. Existing vegetated grass areas along the perimeter of the site which are suitable for filtering strips and buffers for existing natural drainage systems shall be protected. Protection shall also be provided for the existing wet pond located on-site.

2. Stabilized Construction Entrance – A Stabilized construction entrance shall be constructed at all points of ingress and egress to the construction site in order to prevent the tracking of sediments off-site and onto public right-of-ways. Sediments which are tracked off-site shall be removed or cleaned on a daily basis. The stabilized

entrances shall be constructed prior to beginning any on-site construction activities, and shall remain in place for the project duration.

3. Stabilized Construction Routes - Stabilized construction routes, vehicle parking areas and equipment parking areas shall be constructed as work progress. This will be accomplished either by using gravel over geotextile fabric or maintaining vegetative cover.

4. Clean Runoff Diversion - Swales shall be constructed to prevent clean runoff from entering disturbed areas. The clean runoff shall be directed to a stabilized area. Temporary measures used to divert the clean runoff shall remain in place until the disturbed areas have been stabilized.

5. Sediment Laden Runoff Diversion - Temporary earth dikes and/or swales shall be constructed to divert sediment laden water from disturbed areas to a sediment trapping device. The measures used to divert the water shall remain in place until the disturbed area has been stabilized.

6. Silt Fences - Silt fences shall be installed to reduce runoff velocities and to interrupt sediment laden runoff from disturbed areas. The fences shall be installed prior to disturbing the area and shall remain in place until the disturbed area has been stabilized. Silt fences shall not be installed in areas which have a concentration of water flowing towards the barrier. Fences should only be installed where erosion occurs in the form of sheet flow. Staked haybales may be used as a replacement for silt fencing.

7. Sediment Traps - Sediment traps shall be constructed to intercept sediment laden runoff and to trap the sediments before entering drainage paths. These traps shall be constructed prior to any site grading or filling. The traps shall be cleaned out when accumulations reach half of the overall trap depth.

8. Check Dams - Stone check dams shall be constructed across drainage paths which are experiencing erosion due to increased runoff velocities. The stone check dams shall be spaced at the intervals necessary to reduce velocities to below erosive conditions.

9. Temporary Waterway Crossings - Temporary waterway crossings shall be constructed across waterways and drainage paths to provide access for vehicles and equipment. The temporary crossings shall be removed as soon as their function is completed. Temporary

waterway crossings shall not be used to maintain traffic for the general public.

10. Limit Disturbance - The initial clearing and disturbance should be limited to that necessary to install pre-construction erosion control measures. Once construction begins, limit the disturbance to that necessary for the immediate construction activity.

11. Stockpile Protection - Stockpiles of soil shall be located away from drainage paths and water bodies and shall be provided with silt fencing around the down slope perimeter. Stockpiles which are to remain unchanged for a period exceeding 14 days shall be covered or stabilized with seed and mulch.

12. Dust Control - Dust created from land disturbing activities shall be controlled to prevent surface and air movement, which may cause off-site damage, traffic safety concerns, and health hazards. Acceptable measures to be implemented are vegetative cover, mulch, water sprinkling and wind barriers. The use of spray adhesives to control dust is not an acceptable measure, since water quality goals may be compromised.

13. Temporary Seed and Mulch - Temporary seed and mulch shall be placed over all disturbed areas so that no disturbed area is left exposed for 15 days or more. This includes disturbed areas where work has been delayed or temporarily ceased during construction that may be disturbed again at a later date.

14. Storm Drain Inlet Protection – Storm drain inlet protection measures shall be installed to prevent sediment laden water from entering the storm drain system through inlets. These measures shall be installed as soon as the construction of the inlet is completed and shall remain in place until the area has been stabilized.

The site plan drawings and Appendix 6 of this SWPPP provide general locations, details, and dimensions for the temporary erosion and sediment control measures expected to be sufficient. However, the Owner and Contractor will be fully responsible for adjusting the Erosion and Sediment Control Plan as necessary in the field to accomplish the goals described above.

C. PERMANENT EROSION AND SEDIMENT CONTROLS

The following permanent erosion and sediment control measures are to be implemented for this project.

1. Grassed Lined Swales - Grass lined swales shall be constructed in locations where channel slopes are less than 5% and the runoff velocities are below 4 fps in order to control erosion from concentrated flows.

2. Stone Lined Swales - Stone lined swales shall be constructed in locations where channel slopes are greater than 5% and where the runoff velocities are expected to be above 4 fps.

3. Rock Outlet Protection - Rip-rap outlet protection shall be provided at the outlets of all culverts and drains in order to reduce runoff velocities, depths and energy. Outlet protection shall be extended as needed to protect downstream reaches from erosion.

4. Surface Roughening - Bare soil surfaces shall be roughened by using equipment with tracks to provide horizontal grooves. Roughening the soil will aid in the establishment of vegetative cover from seed, increase infiltration, reduce runoff velocities, and reduce erosion by trapping sediments.

5. Soil Restoration - Areas which have been compacted by construction vehicles, storage of materials and land grading activities shall be de-compacted. The first phase will involve deep ripping the soil followed by deep subsoiling. This shall be completed prior to establishing vegetation.

6. Permanent Seed and Straw Mulch – Perennial grass seed and straw mulch shall be applied to disturbed areas where work has been completed as soon as possible, but in no case longer than 14 days, to prevent erosion and to begin the stabilization process.

7. Subsurface Drains – Subsurface drains shall be constructed to collect runoff from areas to be conveyed to a stabilized outfall point or to another drainage structure.

The site plan drawings prepared for this project provide locations, details, and dimensions of the permanent erosion and sediment control measures to be implemented for this project.

10. ADDITIONAL STORMWATER CONTROL MEASURES

A. PREFACE

Previous sections of this SWPPP described stormwater control measures to be implemented for this project to prevent stormwater discharges associated with construction activities from becoming a source of pollution. This section of the SWPPP describes control measures which are to be implemented to prevent construction and waste materials expected to be stored on-site from becoming a source of pollution in stormwater discharges.

B. CONSTRUCTION AND WASTE MATERIALS

The following control measures are to be implemented for construction and waste materials expected to be stored on the project site.

1. Waste Materials - Construction waste materials and litter shall be collected and stored in dumpsters and/or covered containers. Collected materials shall be hauled to an approved sanitary landfill for disposal. Dumpsters and containers shall meet local and state waste management rules and regulations. On-site personnel shall be instructed by the individual responsible for handling waste materials as to the proper procedures for disposal.

2. Sanitary Wastes - Sanitary wastes shall be collected from portable toilets at a minimum of once per week by a licensed sanitary contractor. Collected waste materials shall be hauled to an approved waste treatment facility for disposal. All state and local rules and regulations regarding these units shall be satisfied.

3. Hazardous Wastes - Hazardous waste materials shall be kept in their original containers and stored in a location approved by the manufacturer. The location and methods used for storage shall also minimize the risk of exposure to stormwater discharges. Original labels and material safety data sheets shall be retained by the individual responsible for handling these materials. Disposal of hazardous materials shall be in compliance with all local, state and federal regulations.

4. Spills - Spills of waste materials shall be cleaned up immediately upon discovery. Manufacturers' recommended methods for spill cleanups shall be maintained on-site and all personnel shall be instructed as to the location of the information, procedures, and

cleanup supplies. Spills of toxic or hazardous materials shall be reported to the appropriate state and/or local agencies.

5. Petroleum Products - Petroleum products shall be stored in clearly labeled sealed containers and in a location which will minimize the risks of exposure to stormwater discharges. All on-site vehicles and equipment shall be inspected regularly for leaks and repairs shall be made upon any discoveries.

6. Fertilizers - Fertilizers shall be applied in the amounts suggested by the manufacturer and stored in a location which shall minimize the risks of exposure. Fertilizers shall be worked into the soil to reduce exposure to stormwater.

7. Concrete Washout - Pre-fabricated containers or self-installed concrete washout facilities shall be used to consolidate solids and to prevent runoff from becoming a source of pollution. Self-installed concrete washouts should preferably be built below grade and provided with a minimum 10-mil thickness plastic liner to prevent leaching into the ground.

8. Good Housekeeping - In addition to the controls specified above and in previous sections, the following "good housekeeping" measures shall also be applied:

   a. Minimize the amount of materials stored on the project site to that necessary to complete the job.
   b. Store materials in a neat and orderly manner.
   c. Store materials in or under enclosures to minimize exposure to various weather conditions.
   d. Proper use and disposal of materials.
   e. Frequently inspect and maintain control measures.
   f. Update records for materials stored on-site.

11. CONSTRUCTION SCHEDULE

This section of the SWPPP describes the intended sequence of construction activities to be completed at the project site.

GENERAL CONSTRUCTION SCHEDULE

1. Obtain site plan approval and all other applicable permits.

2. The limit of disturbance shall be marked out in the field, along with the protection limits of various resources for each phase of construction.

3. A pre-construction meeting shall be held with the owner/operator, general contractor and qualified trained individual, site work contractor and the site engineer or qualified professional in charge of the SWPPP inspections. Pre-construction meeting documents found in the Construction Site Log Book shall be completed.

4. Clear areas for the installation of stabilized construction entrances, construction routes, parking areas, perimeter sediment controls and temporary sediment traps (if needed) for each phase of construction.

5. Construct the controls specified in number 4 above.

6. Prior to beginning any other construction site activities, a pre-construction site assessment shall be completed by the SWPPP inspector.

7. Clear areas which are to be worked within the next 14 days.

8. Install stormwater runoff diversions and other applicable control measures.

9. Limit the amount of excavation and grading to that needed to complete the immediate construction activity. If applicable, no more than 5 acres of soil shall be disturbed at any one time without prior written approval from NYSDEC or MS4 jurisdiction.

10. Stabilize areas which will remain unchanged for 14 days or more and areas where work has been completed.

11. Repeat numbers 7 - 10 until work is completed.

12. Inspections shall be performed by a qualified professional one (1) time every seven (7) days, or twice (2) per week if more than 5 acres is disturbed at one time.

13. Complete the final site grading once all of the construction activities involving the disturbance of soils has been completed.

14. Stabilize the site after the final site grading.

15. Stormwater runoff can now be allowed to enter the constructed stormwater treatment areas.

16. Remove temporary erosion and sediment control measures after the site has stabilized.

17. Final site stabilization will occur approximately 9 months after the construction phase has been completed.

18. Qualified professional shall conduct a final site inspection and submit the NOT form.

12. IMPLEMENTATION AND MAINTENANCE SCHEDULES

A. PREFACE

This section of the SWPPP report describes measures to ensure continuous and effective operation of the erosion and sediment controls and for each post construction control practice, as well as to who is responsible for the implementation.

B. MAINTAIN CURRENT SWPPP

The owner/operator shall amend the SWPPP whenever there is a significant change in design, construction, operation or maintenance which may have the potential for discharging pollutants to receiving waters from storm drainage. The SWPPP shall also be amended for the following reasons:

1. A copy of the latest site plan drawings shall be maintained along with this SWPPP report.

2. The SWPPP proves to be ineffective in eliminating or minimizing pollutants from sources identified in the SWPPP report or by this General Permit.

3. The SWPPP proves to be ineffective in achieving the general objectives of controlling pollutants in stormwater discharges associated with the construction activity.

4. The SWPPP fails to address or identify a requirement of this General Permit.

5. Identify any new contractor or sub-contractor who is responsible for implementing any measure of the SWPPP.

C. SITE INSPECTIONS

Once construction activities have commenced, site inspections shall be conducted by a qualified inspector at least every seven (7) calendar days. The following information shall be recorded during each inspection:

1. Permit identification number, date and time of inspection, along with name and title of person performing the inspection.

2. Description of the weather and soil conditions at the time of inspection.

3. Description of the runoff at all points of discharge from the site.

4. On a site map, indicate the extent of all disturbed areas and drainage pathways.

5. Indicate on the map all site areas which are expected to be disturbed or have significant work performed within the next 14 days.

6. Indicate on the map all areas of the site that have undergone temporary or permanent stabilization.

7. Indicate all disturbed areas that have not undergone active site work during the previous 14-day period.

8. Inspect all sediment control practices and record the amount of sediment accumulations as a percentage of the total design capacity.

9. Inspect all erosion and sediment control practices and record any maintenance requirements.

10. Identify any evidence of rill or gully erosion occurring on slopes.

11. Identify the loss of any stabilizing vegetation or seed and mulch.

12. Record any excessive deposition of sediment or ponding water along barrier or diversion systems.

13. Record the depth of sediments within containment structures, any erosion near outlet and overflow structures, and verify the ability of perforated riser pipes to pass water.

14. Record all deficiencies with the implementation of this SWPPP.

15. Digital photographs, with date stamp, of practices that need corrective actions. Attach paper color copies to inspection reports being maintained on-site within seven (7) days. Also take photos of practices after corrective actions have been completed.

Please note that sites which have received authorization to disturb greater than 5 acres of soil at any one time, shall have the qualified inspector conduct at least two (2) site inspections every seven (7) calendar days. The two inspections shall be separated by at least two (2) full calendar days.

The qualified inspector shall notify the owner and the contractor of any corrective actions that need to be taken within one business day of completing the inspection. The contractor shall begin implementing the corrective actions within one (1) business day of notification and shall complete in a reasonable time frame.

The operator shall maintain a record of all inspection reports in a Construction Site Log Book, which shall be maintained on-site and be made available to the NYSDEC upon request. A copy of the Construction Site Log Book can be found in Appendix 7 of this report, which includes inspection forms.

The Owner and identified Contractor shall be fully responsible for inspecting the site daily to ensure that measures are effective at all times, especially after storm events.

Please note that the qualified inspector will need to certify post stormwater management construction, therefore, additional inspections may be required during the construction of these items.

D. MONITORING

The NYSDEC may require monitoring of discharges from the permitted construction activity, at their sole discretion. NYSDEC shall notify the permittee in writing of the basis for requiring the monitoring, the parameters and frequency at which such monitoring shall occur and the associated reporting requirements, if any.

E. IMPLEMENTATION RESPONSIBILITIES

The Owner/Operator of this project site is fully responsible for the overall implementation of this SWPPP.

F. POST CONSTRUCTION MAINTENANCE PLAN

In order to ensure continuous and effective operation of each post construction control practice, the following maintenance plan shall be implemented.

POST CONSTRUCTION MAINTENANCE PLAN

1. Implementation Responsibilities - The Owner of the project site is fully responsible for the implementation of this maintenance plan. In the event that ownership is transferred, the current Owner is responsible for informing the new Owner of the maintenance responsibilities in writing.

2. Description of Maintenance Tasks - The following maintenance tasks shall be conducted.

    a. Maintenance checklists for the stormwater pond have been provided in Appendix 8 of this report. The checklist describes the tasks that need to be completed, along with the associated time intervals that each task shall be performed.

    b. Subsurface drains and catch basins shall be inspected monthly and after major storm events. Catch basins shall be pumped out when sediment accumulation is 6" deep.

    c. The site shall be inspected after major storm events and monthly for signs of erosion. Areas which are experiencing erosion shall be repaired and provided with additional vegetative or structural erosion control measures. For example, open channels experiencing erosion shall be provided with check dams and vegetated sloped areas may require erosion control blankets.

    d. Required maintenance or repairs shall be performed immediately to ensure practices are functioning as designed.

3. Description of Applicable Easements - Since the Town is an MS4 Operator they will be responsible for on-going inspections of the stormwater management facilities to make sure the owner or operator is following the operation and maintenance plan. Therefore, the owner and the Town will need to enter into a Stormwater Management Access Agreement.

4. Funding Source - The Owner of the project site is responsible for funding the implementation of this Maintenance Plan.

5. Vegetative Cover Requirements - The following vegetative cover requirements shall be applied:

   a. Grassed areas shall be provided with a minimum of 80% ground cover. Bare areas shall be re-seeded and mulched. The use of fertilizers shall be kept to a minimum.

   b. Vegetation within the stormwater pond extended detention area shall be kept to a height of less than 18".

   c. Replace dead or dying vegetation within the aquatic bench of the stormwater pond. Perform routine pruning and plant thinning as necessary.

   d. Grassed lined swales shall maintain a minimum grass height of 6". A tall fescue or Kentucky bluegrass cover type is recommended.

6. Access and Safety - The maintenance access roads shall be mowed regularly to allow for vehicle access.

7. Disposal of Sediments - Sediments removed from the stormwater systems are generally not considered hazardous materials, unless a spill of a toxic or hazardous material has occurred, and can be safely disposed of through land applications or landfilling. In the event that a spill of a toxic or hazardous material has occurred, sediments removed shall be tested before determining a proper disposal procedure.

8. Evidence of Permits - A copy of all applicable local and non-local permits for the project site shall be maintained at the site and at the Town of Saugerties Building Department.

9. Evidence of Legal Agreements – If applicable, a copy of all necessary legal agreements, such as easements, right-of-ways, maintenance agreements, covenants and land trusts shall be maintained at the site.

13. DEVIATION FROM NYSDEC REQUIREMENTS

The current NYSDEC design manual states that the minimum Runoff Reduction Volume must be provided; however, the existing permit was obtained and the existing stormwater wet pond SMP was constructed prior to that requirement. The Water Quality Volume provided in the existing wet pond exceeds the minimum required and it satisfies the intended purpose of providing the WQv closer to the source to help replicate pre-development hydrology.

Our office believes all other aspects of the project with regards to stormwater is in compliance with the requirements of GP-0-25-001. Therefore, our office is only requesting the Town of Saugerties to continue to allow the use of the existing stormwater pond to satisfy the WQv without the addition of RRv.

14. CONCLUSION

Praetorius and Conrad, P.C. believes that stormwater management and erosion and sediment control issues relating to this project will be mitigated to the maximum extent practicable and in substantial compliance with the intent of GP-0-25-001 with the implementation of this SWPPP.

NORTH

SCALE: 1"=2000'

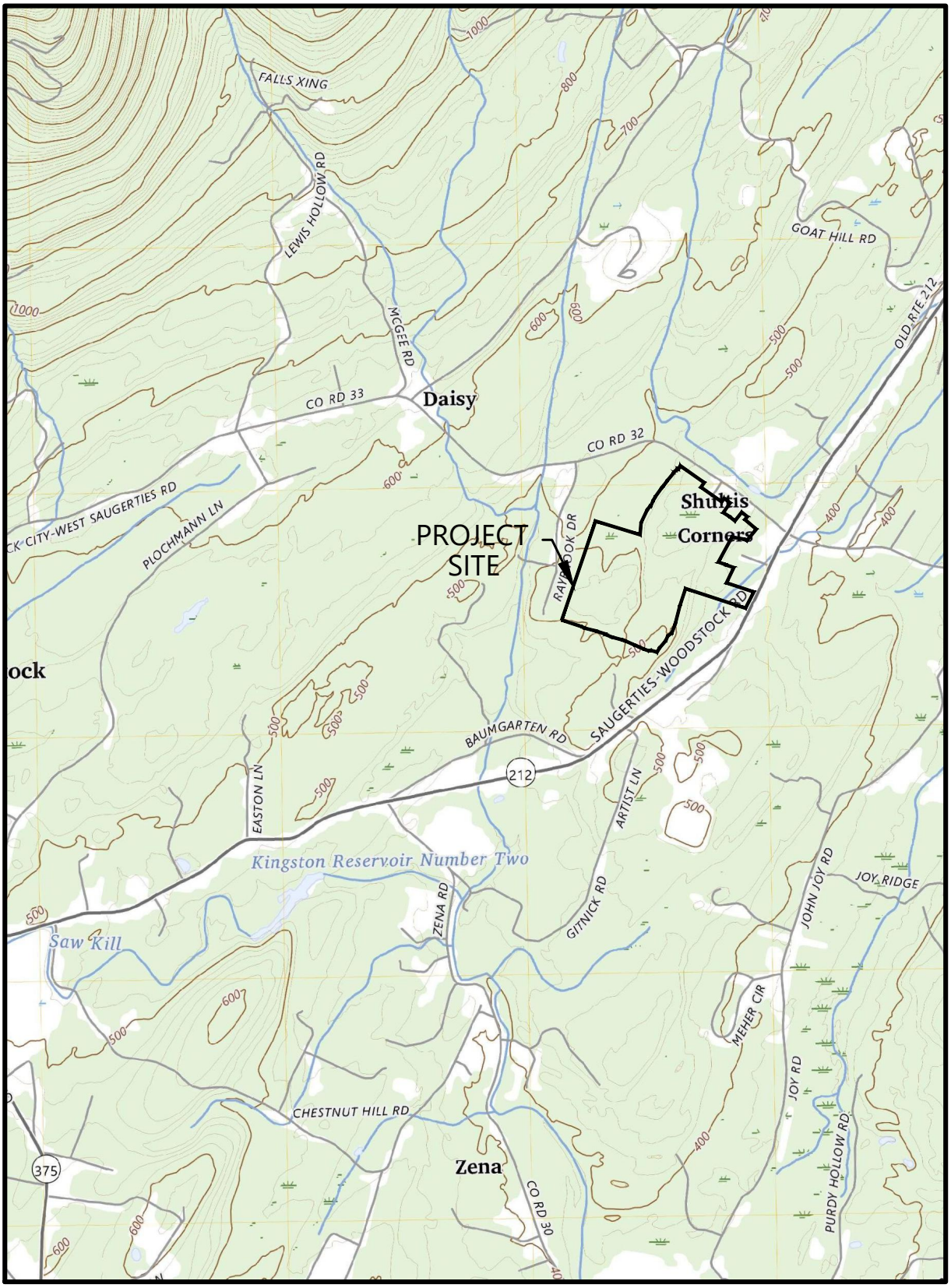

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FIGURE 1

SOLO HOLIDAYS LLC, COTTONTAIL LANE
PROJECT LOCATION MAP

SOURCE: U.S.G.S. WOODSTOCK QUADRANGLE

FIGURE 2

SOLO HOLIDAYS LLC, COTTONTAIL LANE
PROPOSED SITE PLAN

SCALE: 1" = 300'

NOTE:
BASE MAPPING TAKEN FROM A MAP ENTITLED "ALTA/NSPS LAND TITLE BOUNDARY SURVEY OF THE LANDS OF KAMPGROUNDS OF AMERICA, INC.", DATED "26 OCTOBER 2021 AND UPDATED 13 JUNE 2025" , BY AUSFELD & WALDRUFF LAND SURVEYORS LLP.

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FIGURE 3

SOLO HOLIDAYS LLC, COTTONTAIL LANE
EXISTING SITE PLAN

SCALE: 1" = 300'

NOTE:
BASE MAPPING TAKEN FROM A MAP ENTITLED "ALTA/NSPS LAND TITLE BOUNDARY SURVEY OF THE LANDS OF KAMPGROUNDS OF AMERICA, INC.", DATED "26 OCTOBER 2021 AND UPDATED 13 JUNE 2025" , BY AUSFELD & WALDRUFF LAND SURVEYORS LLP.

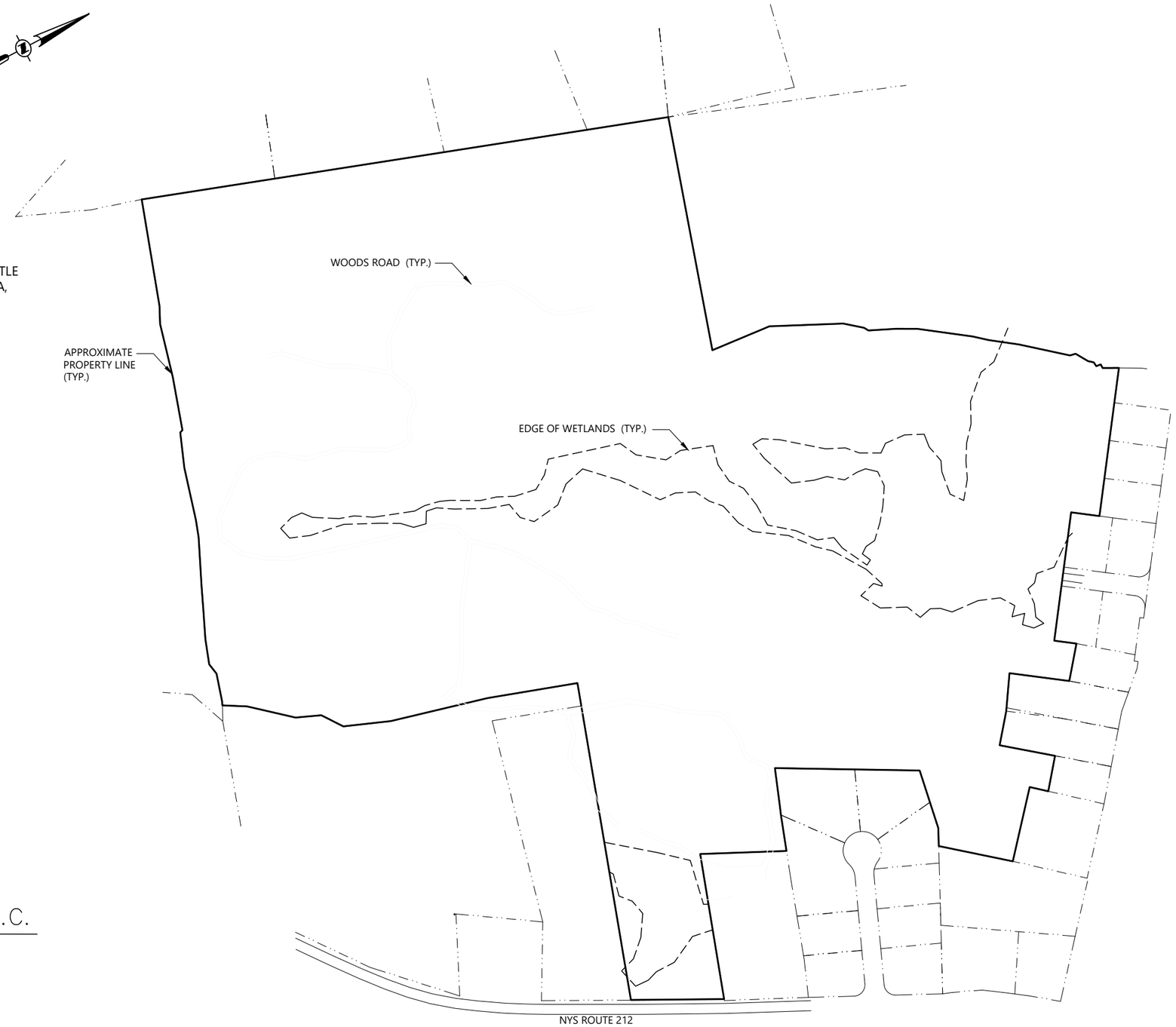

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FIGURE 4

SOLO HOLIDAYS LLC, COTTONTAIL LANE
EXISTING DRAINAGE AREAS AND SOIL TYPES

SCALE: 1" = 300'

SOIL TYPES

- AcB = ARNOT CHANNERY SILT LOAMS, 0 TO 8% SLOPES
- ARF = ARNOT OQUGA ROCK OUTCROP COMPLEX, VERY STEEP
- At = ATHERTON SILT LOAM
- Cc = CANANDAIGUA SILT LOAM
- CgB = CASTILE GRAVELLY SILT LOAM, 3 TO 8% SLOPES
- Gp = GRAVEL PIT
- MTB = MORRIS-TULLER COMPLEX, GENTLY SLOPING, VERY BOULDERY
- ORC = OQUAGA-ARNOT ROCK OUTCROP COMPLEX, SLOPING
- TkB = TUNKHANNOCK GRAVELLY LOAM, 3 TO 8% SLOPES
- TkC = TUNKHANNOCK GRAVELLY LOAM, ROLLING

LEGEND

- = DRAINAGE AREA BOUNDARY
- = SOIL TYPE BOUNDARY
- = PROJECT SITE BOUNDARY
- = WETLAND BOUNDARY
- 1 = DRAINAGE AREA

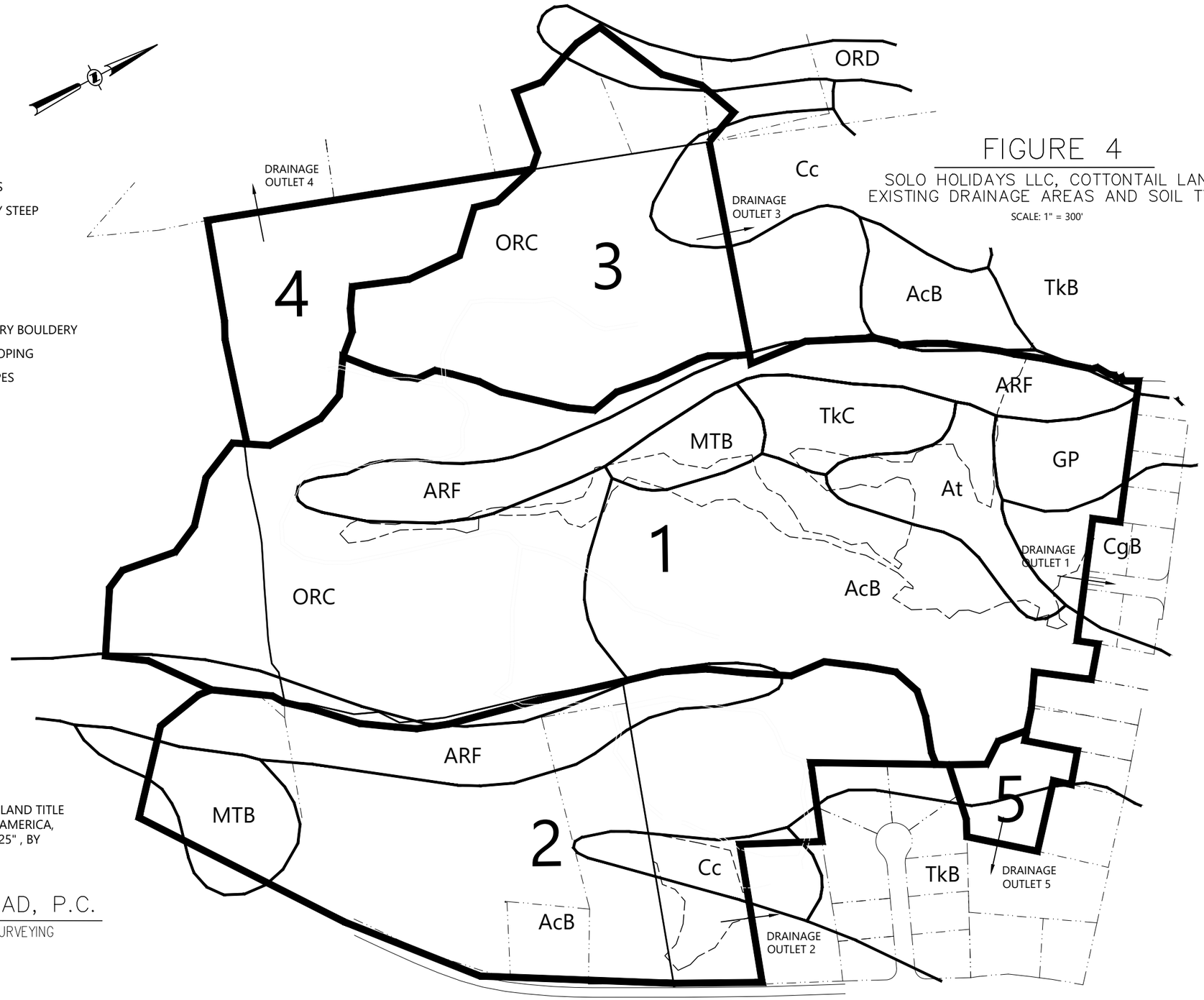

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FIGURE 5

SOLO HOLIDAYS LLC, COTTONTAIL LANE
MITIGATED DRAINAGE AREAS

SCALE: 1" = 300'

LEGEND

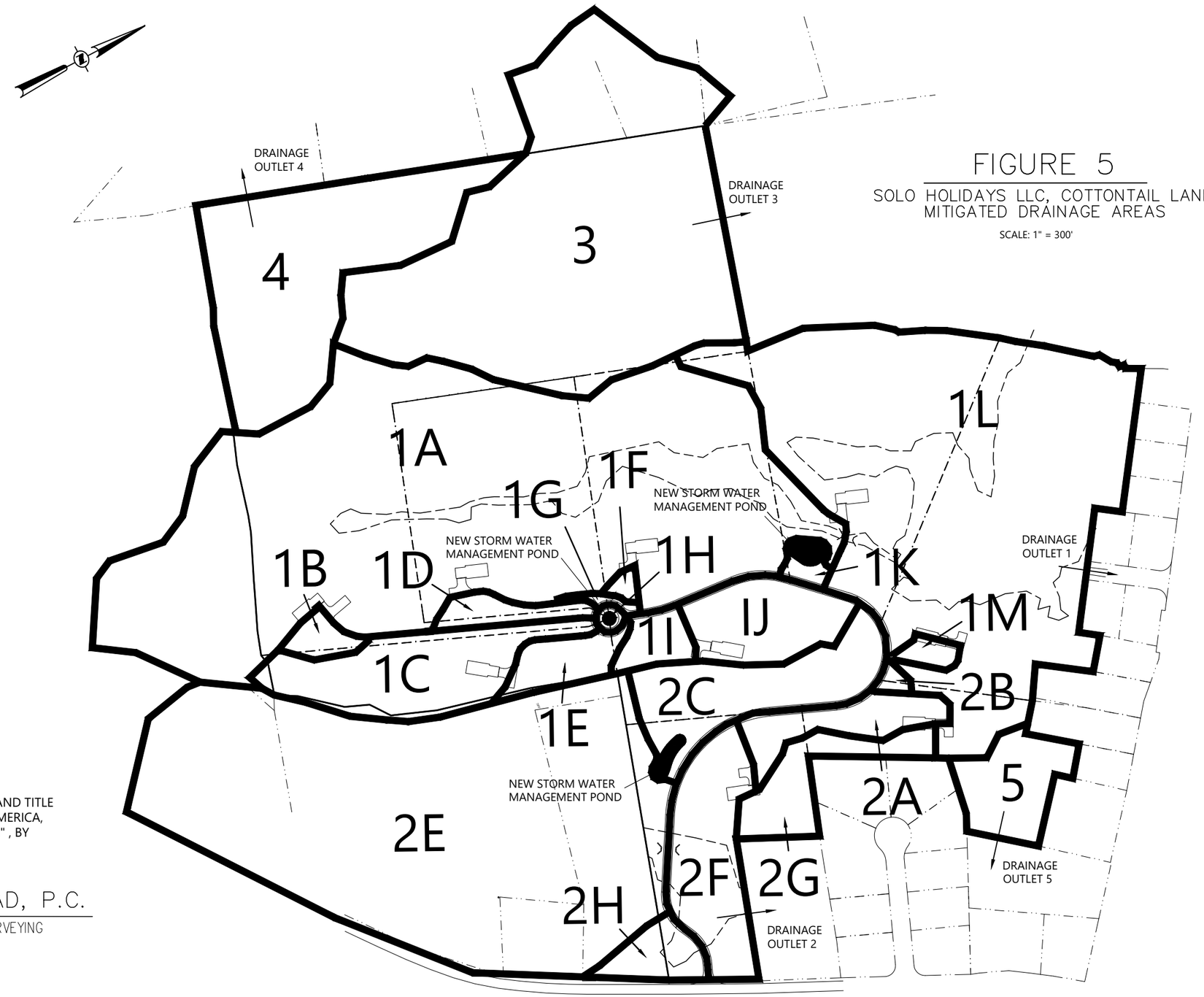
= DRAINAGE AREA BOUNDARY

= PROJECT SITE BOUNDARY

= WETLAND BOUNDARY

= PROPOSED LOT LINE

1 = DRAINAGE AREA



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APPENDIX 1

NYSDEC SPDES GENERAL PERMIT

GP-0-25-001

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL
CONSERVATION (NYSDEC)

SPDES GENERAL PERMIT
FOR STORMWATER DISCHARGES

From

CONSTRUCTION ACTIVITY

Permit No. GP-0-25-001

Construction General Permit (CGP)

Issued Pursuant to Article 17, Titles 7, 8 and Article 70

of the Environmental Conservation Law

Effective Date: January 29, 2025 Expiration Date: January 28, 2030

Scott E. Sheeley

Chief Permit Administrator

Scott E. Sheeley JAN. 29, 2025

Authorized Signature Date

Address: NYSDEC
Division of Environmental Permits
625 Broadway, 4th Floor
Albany, N.Y. 12233-1750

PREFACE

Pursuant to Section 402 of the Clean Water Act (CWA), and 40 CFR 122.26(b)(14)(x), (15)(i), and (15)(ii), *stormwater discharges* from certain *construction activities* are unlawful unless they are authorized by a National Pollutant Discharge Elimination System (NPDES) permit or by a state permit program. New York State administers the approved State Pollutant Discharge Elimination System (SPDES) program with permits issued in accordance with the New York State Environmental Conservation Law (ECL) Article 17, Titles 7 and 8, and Article 70, as well as 6 NYCRR Parts 621 and 750.

C*onstruction activities* constitute construction of a *point source* and, therefore, pursuant to ECL sections 17-0505, 17-0701, and 17-0803, the *owner or operator* must have coverage under a SPDES permit prior to *commencement of construction activities*. The *owner or operator* cannot wait until there is an actual *discharge* from the *construction site* to obtain permit coverage.

***Note: The italicized words/phrases within this permit are defined in Appendix A.**

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
SPDES CONSTRUCTION GENERAL PERMIT (CGP) GP-0-25-001
FOR STORMWATER DISCHARGES FROM CONSTRUCTION ACTIVITIES

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Part I. How to Obtain Coverage and General Requirements

To be covered under this permit, the *owner or operator* must meet all eligibility requirements in Part I.A. and follow the requirements for obtaining permit coverage in Part I.D., F., or G.

A. Eligibility Requirements

For a *common plan of development or sale*, the *phase(s)* that meet the eligibility requirements in Part I.A. may obtain coverage under this permit even if other *phase(s)* of the same *common plan of development or sale* do not meet the eligibility requirements and require an individual SPDES permit.

1. The *owner's or operator's construction activities* involve soil disturbances of:

    a. one or more acres; or

    b. less than one acre which are part of a *common plan of development or sale* that will ultimately disturb one or more acres; or

    c. less than one acre where NYSDEC has determined that a SPDES permit is required for *stormwater discharges* based on the potential for contribution to a violation of a *water quality standard* or for significant contribution of pollutants to *surface waters of the State*.

        i. 5,000 square feet or more, but less than one acre, and are in the New York City Watershed located east of the Hudson River, Appendix C Figure 1; or

        ii. 20,000 square feet or more, but less than one acre, within the municipal boundaries of the City of New York (NYC); or

        iii. less than 20,000 square feet which are part of a *common plan of development or sale* that will ultimately disturb 20,000 square feet or more, but less than one acre, within the municipal boundaries of NYC; or

        iv. that creates 5,000 square feet or more of *impervious area* within the municipal boundaries of NYC.

2. *Discharges* from the *owner's or operator's construction activities* are/were not:

    a. already covered by a different SPDES permit; or

    b. covered under a different SPDES permit that was denied, terminated, or revoked; or

    c. identified in an expired individual SPDES permit that was not renewed; or

    d. required to obtain an individual SPDES permit or another general SPDES permit in accordance with Part VII.K.

3. If *construction activities* may adversely affect a species that is endangered or threatened, the *owner or operator* must obtain a:

    a. permit issued pursuant to 6 NYCRR Part 182 for the project; or

    b. letter issued by NYSDEC of non-jurisdiction pursuant to 6 NYCRR Part 182 for the project.

4. If *construction activities* have the potential to affect an *historic property*, the *owner or operator* must obtain one of the following:

    a. documentation that the *construction activity* is not within an archeological buffer area indicated on the sensitivity map, and that the *construction activity* is not located on or immediately adjacent to a property listed or determined to be eligible for listing on the National or State Registers of Historic Places, and that there is no new permanent building on the *construction site* within the following distances from a building, structure, or object that is more than 50 years old, or if there is such a new permanent building on the *construction site* within those parameters that NYS Office of Parks, Recreation and Historic Preservation (OPRHP), a Historic Preservation Commission of a Certified Local Government, or a qualified preservation professional has determined that the building, structure, or object more than 50 years old is not historically/archeologically significant:

        i. 1-5 acres of disturbance - 20 feet; or

        ii. 5-20 acres of disturbance - 50 feet; or

iii. 20+ acres of disturbance - 100 feet.

b. NYSDEC consultation form sent to OPRHP,[1] and copied to NYSDEC's Agency Historic Preservation Officer (APO), and

i. the State Environmental Quality Review Act (SEQR) Environmental Assessment Form (EAF) with a negative declaration or the Findings Statement, with documentation of OPRHP's agreement with the resolution; or

ii. documentation from OPRHP that the *construction activity* will result in No Impact; or

iii. documentation from OPRHP providing a determination of No Adverse Impact; or

iv. a Letter of Resolution signed by the *owner or operator*, OPRHP and the DEC APO which allows for this *construction activity* to be eligible for coverage under the general permit in terms of the State Historic Preservation Act (SHPA).

c. documentation of satisfactory compliance with Section 106 of the National Historic Preservation Act for a coterminous project area:

i. No Affect; or

ii. No Adverse Affect; or

iii. Executed Memorandum of Agreement.

d. documentation that SHPA Section 14.09 has been completed by NYSDEC or another state agency.

5. If *construction activities* are subject to SEQR, the *owner or operator* must obtain documentation that SEQR has been satisfied.

6. If *construction activities* are not subject to SEQR, but subject to the equivalent environmental review from another New York State or federal agency, the

[1] The consultation form can be submitted, along with other project information, through OPRHP's Cultural Resource Information System (CRIS) portal. If submitted through CRIS, paper copies of the consultation form need not be mailed.

owner or operator must obtain documentation that project review, pursuant to a process equivalent to SEQR from another New York State or federal agency, has been satisfied.

7. If *construction activities* require Uniform Procedures Act (UPA) Permits (see 6 NYCRR Part 621) from NYSDEC, or the equivalent from another New York State or federal agency, the *owner or operator* must:

    a. obtain all such necessary permits; or

    b. receive notification from NYSDEC pursuant to 6 NYCRR 621.3(a)(4) excepting Part I.A.7.a.

8. *Construction activities* are not eligible if they meet the following criteria in Part I.A.8.a. or b.:

    a. For linear transportation and linear utility project types, the *construction activities*:

        i. are within the watershed of *surface waters of the State* classified as AA or AA-S identified utilizing the Stormwater Interactive Map on NYSDEC's website; and

        ii. are undertaken on land with no existing *impervious cover*; and

        iii. disturb two or more acres of *steep slope*.

    b. For all other project types, the *construction activities*:

        i. are within the watershed of *surface waters of the State* classified as AA or AA-S identified utilizing the Stormwater Interactive Map on NYSDEC's website; and

        ii. are undertaken on land with no existing *impervious cover*; and

        iii. disturb one or more acres of *steep slope*.

B. Types of *Discharges* Authorized

1. The following *stormwater discharges* are authorized under this permit:

    a. *Stormwater discharges*, including *stormwater* runoff, snowmelt runoff, and surface runoff and drainage, associated with *construction activity*, are authorized under this permit provided that appropriate *stormwater* controls are designed, installed, and maintained in accordance with Part II. and Part III.

    b. *Stormwater discharges* from construction support activities at the *construction site* (including concrete or asphalt batch plants, equipment staging yards, material storage areas, excavated material disposal areas, and borrow areas) if the following requirements are met:

        i. The support activity is directly related to the *construction site* required to have permit coverage for *stormwater discharges*; and

        ii. The support activity is not a commercial operation, nor does it serve multiple unrelated *construction sites*; and

        iii. The support activity does not continue to operate beyond the completion of the *construction activity* at the site it supports; and

        iv. *Stormwater* controls are implemented in accordance with Part II. and Part III. for *discharges* from the support activity areas.

2. The following non-*stormwater discharges* associated with *construction activity* are authorized under this permit:

    a. Non-*stormwater discharges* listed in 6 NYCRR 750-1.2(a)(29)(vi), with the following exception: "*Discharges* from firefighting activities are authorized only when the firefighting activities are emergencies/unplanned"; and

    b. Non-*stormwater discharges* of waters to which other components have not been added that are used in accordance with the *SWPPP* to control dust or irrigate vegetation in stabilized areas; and

    c. Uncontaminated *discharges* from *dewatering* operations

3. Authorized *discharges* of *stormwater* or authorized *discharges* of non-*stormwater*, commingled with a *discharge* authorized by a different SPDES permit and/or a *discharge* that does not require SPDES permit authorization, are also authorized under this permit.

C. Prohibited *Discharges*

1. Non-*stormwater discharges* prohibited under this permit include but are not limited to:

    a. Wastewater from washout of concrete; and

    b. Wastewater from washout and cleanout of stucco, paint, form release oils, curing compounds, and other construction materials; and

    c. Fuels, oils, or other *pollutants* used in vehicle and equipment operation and maintenance; and

    d. Soaps, solvents, or detergents used in vehicle and equipment washing or external building washdown; and

    e. Toxic or hazardous substances from a spill or other release.

D. Electronic Notice of Intent (eNOI) Submittal

To receive authorization in accordance with Part I.D.3.b., the *owner or operator* must submit a complete eNOI in accordance with the requirements in Part I.D. The eNOI contains questions to: ensure eligibility requirements in Part I.A. have been met; obtain *owner or operator* contact information; obtain the total area to be disturbed and the existing/future *impervious areas* (rounded to the nearest tenth of an acre); confirm *Traditional Land Use Control MS4 Operator* jurisdiction over construction projects; satisfy the EPA eRule requirements; confirm that the Water Quality-Based Effluent Limitations in Part II. have been met; demonstrate consideration of the future risks due to climate change in accordance with Part III.A.2.; and confirm that the other *Stormwater Pollution Prevention Plan (SWPPP)* requirements in Part III. have been met.

1. An eNOI may be submitted for:

    a. *construction activities* that are not part of a *common plan of development or sale*; or

b. an entire *common plan of development or sale*; or

c. separate *phase(s)* of a *common plan of development or sale* if the following requirements are met:

   i. the *common plan of development or sale* meets the eligibility requirements of Part I.A.5. or 6.; and

   ii. the *phase(s)* meet(s) all other eligibility requirements of Part I.A.; and

   iii. Part III.C. Required *SWPPP* Components by Project Type is based on the *common plan of development or sale*, not the *phase(s)*; or

d. *tree clearing* that is associated with, or will support, a *renewable energy* generation, transmission, or storage project that meets Part I.A.5. and 6., if the *tree clearing*:

   i. meets all other eligibility requirements of Part I.A.; and

   ii. will occur in NYSDEC's Regions 3-9; and

   iii. is not within ¼ mile of a bat hibernaculum protected pursuant to 6 NYCRR Part 182; and

   iv. will occur between November 1st and March 31st.

2. As prerequisites for submitting an eNOI, the *owner or operator* must:

   a. prepare a *SWPPP* for Part I.D.1.a., b., c., or d. in accordance with Part III.; and

   b. based on the following criteria, upload the following signature forms signed in accordance with Part VII.J. to the eNOI prior to submission:

      i. for all eNOIs:

         1. the SWPPP Preparer Certification Form, Appendix F, signed by the *SWPPP* preparer; and

2. the Owner/Operator Certification Form, Appendix J, signed by the *owner or operator*; and

ii. if an eNOI includes *construction activities* within the municipal boundary(ies) of *Traditional Land Use Control MS4 Operator(s)* that will *discharge* to the *MS4(s)*:

1. determine if the *Traditional Land Use Control MS4 Operator(s)* have review authority. A *Traditional Land Use Control MS4 Operator* does not have review authority where:

a. the *owner or operator* of the *construction activities* in Part I.D.2.b.ii. is the same entity as the *Traditional Land Use Control MS4 Operator* identified in Part I.D.2.b.ii.; or

b. there is a statute exempting the *owner or operator* from zoning review by the *Traditional Land Use Control MS4 Operator*; or

c. there is no such statute per Part I.D.2.b.ii.1.b., the *Traditional Land Use Control MS4 Operator* concludes, after public hearing, that it does not have zoning review authority in accordance with Legal Memorandum LU14 Updated January 2020 “Governmental Immunity from Zoning and Other Legislation”; and

2. if the *Traditional Land Use Control MS4 Operator(s)* have review authority, submit the *SWPPP* to the *Traditional Land Use Control MS4 Operator(s)* for review and have:

a. if outside the municipal boundaries of NYC: the MS4 SWPPP Acceptance Form, Appendix G, signed by the principal executive officer or ranking elected official from the *Traditional Land Use Control MS4 Operator,* or by a duly authorized representative of that person in accordance with Part VII.J.2.; or

b. if within the municipal boundaries of NYC: The City of New York Department of Environmental Protection (NYCDEP) SWPPP Acceptance/Approval Form, Appendix H, signed by the principal executive officer or ranking elected official from the Traditional Land Use Control MS4 Operator, or by a duly authorized representative of that person in accordance with Part VII.J.2.; and

3. if the *Traditional Land Use Control MS4 Operator* does not have review authority, have the MS4 No Jurisdiction Form, Appendix I, signed by the principal executive officer or ranking elected official from the *Traditional Land Use Control MS4 Operator,* or by a duly authorized representative of that person in accordance with Part VII.J.2.

3. Submitting an eNOI:

a. The *owner or operator* must submit a complete Notice of Intent electronically using a NYSDEC approved form.[2]

b. The *owner or operator* is authorized to *commence construction activity* as of the authorization date indicated in the Letter of Authorization (LOA), which is sent by NYSDEC after a complete eNOI is submitted.

i. If an eNOI is received for a *SWPPP* that deviates from one of the technical standards but demonstrates *equivalence* in accordance with Part III.B.1.a.ii. or Part III.B.2.b.ii., if the *SWPPP* includes *construction activities* that are not within the municipal boundary(ies) of *Traditional Land Use Control MS4 Operator(s)*, and/or if the *SWPPP* includes *construction activities* within the municipal boundary(ies) of *Traditional Land Use Control MS4 Operator(s)* that do not have review authority in accordance with Part I.D.2.b.ii.1., the authorization date indicated in the LOA will be 60 business days after the eNOI submission date.

[2] Unless NYSDEC grants a waiver in accordance with 40 CFR 127.15(c) or (d). All waiver requests must be submitted to Stormwater_info@dec.ny.gov or NYSDEC, Bureau of Water Permits, 625 Broadway, 4th Floor, Albany, New York 12233-3505.

c. If *Traditional Land Use Control MS4 Operator(s)* have review authority in accordance with Part I.D.2.b.ii.2., the *owner or operator* must, within five business days of receipt of the LOA, send an electronic copy of the LOA to the *Traditional Land Use Control MS4 Operator(s)* with review authority.

E. General Requirements for *Owners or Operators* with Permit Coverage

1. As of the date the LOA is received, the *owner or operator* must make the eNOI, *SWPPP*, and LOA available for review and copying in accordance with the requirements in Part VII.H. When applicable, as of the date an updated LOA is received, the *owner or operator* must make the updated LOA available for review and copying in accordance with the requirements in Part VII.H.

2. The *owner or operator* must ensure compliance with all requirements of this permit and that the provisions of the *SWPPP*, including any changes made to the *SWPPP* in accordance with Part III.A.5., are properly implemented and maintained from the *commencement of construction activity* until:

   a. all areas of disturbance have achieved *final stabilization;* and

   b. the owner's or operator's coverage under this permit is terminated in accordance with Part V.A.5.a.

3. As of the date of the *commencement of construction activities* until Part I.E.2.a. and b. have been met, the *owner or operator* must maintain at the *construction site*, a copy of:

   a. all documentation necessary to demonstrate eligibility with this permit; and

   b. this permit; and

   c. the *SWPPP*; and

   d. the signed SWPPP Preparer Certification Form; and

   e. the signed MS4 SWPPP Acceptance Form or signed NYCDEP SWPPP Acceptance/Approval Form or signed MS4 No Jurisdiction Form (when applicable); and

   f. the signed Owner/Operator Certification Form; and

g. the eNOI; and

h. the LOA; and

i. the LOA transmittal to the Traditional Land Use Control MS4 Operator in accordance with Part I.D.3.c. (when applicable).

4. The *owner or operator* must maintain at the *construction site*, until Part I.E.2.a. and b. have been met, as of the date the documents become final or are received, a copy of the:

   a. responsible contractor's or subcontractor's certification statement(s) in accordance with Part III.A.7.; and

   b. inspection reports in accordance with Part IV.C.4. and 6.; and

   c. Request to Disturb Greater Than Five Acres and the Authorization Letter to Disturb Greater Than Five Acres in accordance with Part I.E.6. (when applicable); and

   d. Request to Continue Coverage and the Letter of Continued Coverage (LOCC) in accordance with Part I.F.2. and 4. (when applicable); and

   e. The updated LOA(s) in accordance with Part I.E.9. (when applicable).

5. The *owner or operator* must maintain the documents in Part I.E.3. and 4. in a secure location, such as a job trailer, on-site construction office, or mailbox with lock. The secure location must be accessible during normal business hours to an individual performing a compliance inspection. The documents must be paper documents unless electronic documents are accessible to the inspector during an inspection to the same extent as a paper copy stored at the site would be. If electronic documents are kept on site, the *owner or operator* must maintain functional equipment on site available to an inspector during normal hours of operation such that an inspector may view the electronic documents in a format that can be read in a similar manner as a paper record and in a legally dependable format with no less evidentiary value than their paper equivalent.

6. The *owner or operator* must meet the following requirements prior to disturbing greater than five acres of soil at any one time:

   a. The *owner or operator* must submit a written Request to Disturb Greater Than Five Acres to:

i. NYSDEC's Regional Office Division of Water staff based on the project location, Appendix E, if a *Traditional Land Use Control MS4 Operator* does not have review authority in accordance with Part I.D.2.b.ii.1.; or

ii. the *Traditional Land Use Control MS4 Operator*, if a *Traditional Land Use Control MS4 Operator* has review authority in accordance with Part I.D.2.b.ii.1.; or

iii. NYSDEC's Regional Office Division of Water staff based on the project location, Appendix E, and each involved *Traditional Land Use Control MS4 Operator*, if the project spans multiple municipalities with more than one *Traditional Land Use Control MS4 Operator* involved with review authority in accordance with Part I.D.2.b.ii.1.

b. The written Request to Disturb Greater Than Five Acres must include:

i. The SPDES permit identification number (Permit ID); and

ii. Full technical justification demonstrating why alternative methods of construction that would result in five acres of soil disturbance or less at any one time are not feasible; and

iii. The phasing plan for the project and sequencing plans for all *phases* from the *SWPPP* in accordance with Part III.B.1.d.; and

iv. Plans with locations and details of erosion and sediment control practices such that the heightened concern for erosion when disturbing greater than five acres at one time has been addressed; and

v. Acknowledgment that "the *owner or operator* will comply with the requirements in Part IV.C.2.b."; and

vi. Acknowledgment that "the *owner or operator* will comply with the requirements in Part II.B.1.b."

c. The *owner or operator* must be in receipt of an Authorization Letter to Disturb Greater Than Five Acres, which will include when the

authorization begins and ends and indicate a maximum area (acres) of soil disturbance allowed at any one time, from:

i. NYSDEC, if Part I.E.6.a.i. or iii. apply; or

ii. the *Traditional Land Use Control MS4 Operator*, if Part I.E.6.a.ii. applies.

7. Upon a finding of significant non-compliance with the practices described in the *SWPPP* or violation of this permit, NYSDEC may order an immediate stop to all *construction activity* at the site until the non-compliance is remedied. The stop work order must be in writing, describe the non-compliance in detail, and be sent to the *owner or operator*.

8. If any human remains or archaeological remains are encountered during excavation, the *owner or operator* must immediately cease, or cause to cease, all *construction activity* in the area of the remains and notify the appropriate Regional Water Engineer (RWE).[3] *Construction activity* shall not resume until written permission to do so has been received from the RWE.

9. To be authorized to implement modifications to the information previously submitted in the eNOI, the *owner or operator* must:

   a. notify NYSDEC via email at Stormwater_info@dec.ny.gov requesting access to update the eNOI; and

   b. update the eNOI to reflect the modifications and resubmit the eNOI in accordance with Part I.D.; and

   c. receive an updated LOA.

10. The eNOI, *SWPPP*, LOA, updated LOAs (when applicable), and inspection reports required by this permit are public documents that the *owner or operator* must make available for review and copying by any person within five business days of the *owner or operator* receiving a written request by any such person to review these documents. Copying of documents will be done at the requester's expense.

[3] The Regional Water Manager where a DEC Region does not have a RWE.

F. Permit Coverage for *Discharges* Authorized Under GP-0-20-001

When applicable:

1. Upon the effective date of this permit, an *owner or operator* of *a construction activity*, with coverage under GP-0-20-001, will have interim coverage under GP-0-25-001 for 45 calendar days starting on the effective date of GP-0-25-001 so long as the *owner or operator* maintains compliance with all applicable requirements of this permit.

2. Within 30 calendar days of the effective date of this permit, the *owner or operator*, with coverage under GP-0-20-001, must submit a complete Request to Continue Coverage electronically using a NYSDEC approved form,[4] which contains the information identified in Part I.F.3. below, if:

   a. the *owner or operator* continues to implement the SMP component in conformance with the technical standards in place at the time of initial project authorization; and

   b. the *owner or operator* will comply with all non-design requirements of GP-0-25-001.

3. The Request to Continue Coverage form contains questions to: ensure eligibility requirements in Part I.A. have been met; verify *owner or operator* contact information; verify the permit identification number; verify the original eNOI submission ID, if applicable; verify Part I.F.2.a. and b.; verify the version of the Design Manual that the technical/design components conform to; and receive an updated Owner/Operator Certification Form, Appendix I.

4. The *owner or operator* has obtained continued coverage under GP-0-25-001 as of the date indicated in the LOCC, which is sent by NYSDEC after a complete Request to Continue Coverage form is submitted.

5. If the owner or operator does not submit the Request to Continue Coverage form in accordance with Part I.F.2. and 3., coverage under this permit is automatically terminated after interim coverage expires.

[4] Unless NYSDEC grants a waiver in accordance with 40 CFR 127.15(c) or (d). All waiver requests must be submitted to Stormwater_info@dec.ny.gov or NYSDEC, Bureau of Water Permits, 625 Broadway, 4th Floor, Albany, New York 12233-3505.

G. Change of *Owner or Operator*

When applicable:

1. When property ownership changes, or when there is a change in operational control over the construction plans and specifications, the following process applies:

    a. The new *owner or operator* must meet the applicable prerequisites for submitting an eNOI in accordance with Part I.D.2.; and

    b. The new *owner or operator* must submit an eNOI in accordance with Part I.D.3.; and

    c. Permit coverage for the new *owner or operator* will be effective upon receipt of the LOA in accordance with Part I.D.3.b.; and

    d. The new *owner or operator*, upon receipt of their LOA, must provide their Permit ID to the original *owner or operator*; and

    e. If the original *owner or operator* will no longer be the *owner or operator* of the *construction activity* identified in the original *owner's or operator's* eNOI, the original *owner or operator*, upon receipt of the new *owner's or operator's* Permit ID in accordance with Part I.G.1.d., must submit to NYSDEC a completed eNOT in accordance with Part V. that includes the name and Permit ID of the new *owner or operator*; or

    f. If the original *owner or operator* maintains ownership of a portion of the *construction activity*, the original *owner or operator* must maintain their coverage under the permit by modifying their eNOI; modifications to the eNOI must include:

        i. the revised area of disturbance and/or *impervious area(s)*; and

        ii. the revised SMP information, if applicable; and

        iii. a narrative description of what has changed; and

        iv. the new *owner's or operator's* Permit ID for the portion of the project removed from the eNOI.

    Owners or operators must follow Part I.E.9. to modify the eNOI.

Part II. Water Quality-Based Effluent Limitations

A. Maintaining Water Quality

NYSDEC expects that compliance with the requirements of this permit will control *discharge*s necessary to meet applicable *water quality standards*. It shall be a violation of the *ECL* for any *discharge* to either cause or contribute to a violation of the following *water quality standards* as contained in Parts 700 through 705 of Title 6 of the Official Compilation of Codes, Rules and Regulations of the State of New York:

1. There must be no increase in turbidity that will cause a substantial visible contrast to natural conditions; and

2. There must be no increase in suspended, colloidal or settleable solids that will cause deposition or impair the waters for their best usages; and

3. There must be no residue from oil and floating substances, nor visible oil film, nor globules of grease.

If there is evidence indicating that the *stormwater discharge*s authorized by this permit are causing, have the reasonable potential to cause, or are contributing to a violation of the *water quality standard,* the *owner or operator* must take appropriate corrective action in accordance with Part IV.C.5. of this permit and document in accordance with Part IV.C.4. of this permit. To address the *water quality standard* violation the *owner or operator* must include and implement appropriate controls in the *SWPPP* to correct the problem or obtain an individual SPDES permit.

If, despite compliance with the requirements of this permit, it is demonstrated that the *stormwater discharge*s authorized by this permit are causing or contributing to a violation of *water quality standards*, or if NYSDEC determines that a modification of this permit is necessary to prevent a violation of *water quality standards*, the authorized *discharge*s will no longer be eligible for coverage under this permit, and the *owner or operator* must obtain an individual SPDES permit prior to further *discharges* from the *construction site*.

B. Effluent Limitations Applicable to *Discharges* from *Construction Activities*

*Discharge*s authorized by this permit must achieve, at a minimum, the effluent limitations in Part II.B.1.a., b., c., d., and e. These limitations represent the

degree of effluent reduction attainable by the application of best practicable technology currently available.

1. Erosion and Sediment Control Requirements - The *owner or operator* must select, design, install, implement, and maintain control measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. The selection, design, installation, implementation, and maintenance of these control measures must meet the non-numeric effluent limitations in Part II.B.1.a., b., c., d., and e. and be in accordance with the New York State Standards and Specifications for Erosion and Sediment Control (BB), dated November 2016, using sound engineering judgment. Where control measures are not designed in conformance with the design criteria included in the technical standard, the *owner or operator* must include in *SWPPP* the reason(s) for the deviation, or alternative design, and provide information in the *SWPPP* demonstrating that the deviation or alternative design is *equivalent* to the technical standard.

    a. **Erosion and Sediment Controls.** At a minimum, erosion and sediment controls must be selected, designed, installed, implemented, and maintained to:

        i. *Minimize* soil erosion through application of runoff control and soil stabilization control measure to *minimize pollutant discharge*s; and

        ii. Control *stormwater discharge*s, including both peak flow rates and total *stormwater* volume, to *minimize* channel and *streambank* erosion and scour in the immediate vicinity of the *discharge* points; and

        iii. *Minimize* the amount of soil exposed during *construction activity*; and

        iv. *Minimize* the disturbance of *steep slope*; and

        v. *Minimize* sediment *discharge*s from the site; and

        vi. Provide and maintain *natural buffers* around surface waters, direct *stormwater* to vegetated areas and maximize *stormwater* infiltration to reduce *pollutant discharge*s, unless *infeasible*; and

        vii. *Minimize* soil compaction. *Minimizing* soil compaction is not required

where the intended function of a specific area of the site dictates that it be compacted; and

viii. Unless *infeasible*, preserve a sufficient amount of topsoil to complete soil restoration and establish a uniform, dense vegetative cover; and

ix. *Minimize* dust. On areas of exposed soil, *minimize* dust through the appropriate application of water or other dust suppression techniques to control the generation of *pollutants* that could be discharged from the site.

b. **Soil Stabilization**. In areas where soil disturbance activity has ceased, whether permanently or *temporarily ceased*, the application of soil stabilization measures must be initiated by the end of the next business day and completed within 14 calendar days from the date the current soil disturbance activity ceased. For *construction sites* that *directly discharge* to one of the 303(d) segments listed in Appendix D, or are located in one of the watersheds listed in Appendix C, or are authorized to disturb greater than five acres in accordance with Part I.E.5.a.viii., the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven calendar days from the date the soil disturbance activity ceased.

c. **Dewatering**. *Discharge*s from *dewatering* activities, including *discharge*s from *dewatering* of trenches and excavations, must be managed by appropriate control measures.

d. **Pollution Prevention Measures**. Select, design, install, implement, and maintain effective pollution prevention measures to *minimize* the *discharge* of *pollutants* and prevent a violation of the *water quality standards*. At a minimum, such measures must be selected, designed, installed, implemented, and maintained to:

i. *Minimize* the *discharge* of *pollutants* from equipment and vehicle washing, wheel wash water, and other wash waters. Soaps, detergents and solvents cannot be used; and

ii. *Minimize* the exposure of building materials, building products, construction wastes, trash, landscape materials, fertilizers, pesticides, herbicides, detergents, sanitary waste, hazardous and toxic waste, and other materials present on the site to precipitation

and to *stormwater*. *Minimization* of exposure is not required in cases where the exposure to precipitation and to *stormwater* will not result in a *discharge* of *pollutants*, or where exposure of a specific material or product poses little risk of *stormwater* contamination (such as final products and materials intended for outdoor use); and

iii. Prevent the *discharge* of *pollutants* from spills and leaks and implement chemical spill and leak prevention and response procedures.

e. **Surface Outlets.** When discharging from basins and impoundments, the surface outlets must be designed, constructed, and maintained in such a manner that sediment does not leave the basin or impoundment and that erosion at or below the outlet does not occur.

C. Post-Construction Stormwater Management Practice (SMP) Requirements

1. The *owner or operator* of a *construction activity* that requires post-construction SMPs, in accordance with Part III.C., must select, design, install, implement, and maintain the SMPs to meet the *performance criteria* in the New York State Stormwater Management Design Manual, dated July 31, 2024 (DM), using sound engineering judgment. Where SMPs are not designed in conformance with the *performance criteria* in the DM, the *owner or operator* must include in the *SWPPP* the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. The *owner or operator* of a *construction activity*, that requires SMPs in accordance with Part III.C., must design the practices to meet the applicable *sizing criteria* in Part II.C.2.a., b., c., or d.

a. Sizing Criteria for *New Development*

i. Runoff Reduction Volume (RRv) and Water Quality Volume (WQv):

1. Reduce the total WQv by application of RR techniques and standard SMPs with RRv capacity. The total WQv must be calculated in accordance with the criteria in Section 4.2 of the DM; or

2. Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the requirements in Part II.C.2.a.i.1. due to *site limitations* must direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv must be documented in the *SWPPP*. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the *SWPPP* must include documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible*.

   In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 4.4 of the DM. The remaining portion of the total WQv that cannot be reduced must be treated by application of standard SMPs.

ii. Channel Protection Volume (CPv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event, remaining after runoff reduction. Where a CPv control orifice is provided, the minimum orifice size must be 3 inches, with acceptable external trash rack or orifice protection. The CPv requirement does not apply when:

   1. Reduction of the entire CPv is achieved by application of runoff reduction techniques or infiltration systems; or

   2. The 1-year post-development peak *discharge* is less than or equal to 2.0 cfs without detention or velocity controls; or

   3. The site *directly discharges* into a fifth order or larger water body (stream, river, or lake), or tidal waters, where the increase in smaller flows will not impact the stream bank or channel integrity. However, the point of *discharge* must be adequately protected against scour and erosion by the increased peak *discharge*.

iii. *Overbank* Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:

1. the site *directly discharges* to tidal waters or fifth order or larger streams, or

2. A downstream analysis reveals that *overbank* control is not required.

iv. Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:

1. the site *directly discharges* to tidal waters or fifth order or larger streams, or

2. A downstream analysis reveals that *overbank* control is not required.

b. *Sizing Criteria* for *New Development* in Enhanced Phosphorus Removal Watersheds

i. Runoff Reduction Volume (RRv) and Water Quality Volume (WQv):

1. Reduce the WQv by application of RR techniques and standard SMPs with RRv capacity. The total WQv is the runoff volume from the 1-year, 24-hour design storm over the post-developed watershed and must be calculated in accordance with the criteria in Section 4.3 of the DM; or

2. Minimum RRv and Treatment of Remaining Total WQv: *Construction activities* that cannot meet the criteria in Part II.C.2.b.i.1. due to *site limitations* must direct runoff from all newly constructed *impervious areas* to a RR technique or standard SMP with RRv capacity unless *infeasible*. The specific *site limitations* that prevent the reduction of 100% of the WQv must be documented in the *SWPPP*. For each *impervious area* that is not directed to a RR technique or standard SMP with RRv capacity, the *SWPPP* must include

documentation which demonstrates that all options were considered and for each option explains why it is considered *infeasible.*

In no case shall the runoff reduction achieved from the newly constructed *impervious areas* be less than the Minimum RRv as calculated using the criteria in Section 4.5 of the DM. The remaining portion of the total WQv that cannot be reduced must be treated by application of standard SMPs.

ii. Channel Protection Volume (CPv): Provide 24 hour extended detention of the post-developed 1-year, 24-hour storm event, remaining after runoff reduction. Where a CPv control orifice is provided, the minimum orifice size must be 3 inches, with acceptable external trash rack or orifice protection. The CPv requirement does not apply when:

1. Reduction of the entire CPv is achieved by application of runoff reduction techniques or infiltration systems; or

2. The 1-year post-development peak *discharge* is less than or equal to 2.0 cfs; or

3. The site *directly discharges* to tidal waters, or a fifth order or larger water body (stream, river, or lake) where the increase in smaller flows will not impact the stream bank or channel integrity. However, the point of *discharge* must be adequately protected against scour and erosion by the increased peak *discharge*.

iii. *Overbank* Flood Control Criteria (Qp): Requires storage to attenuate the post-development 10-year, 24-hour peak *discharge* rate (Qp) to predevelopment rates. The Qp requirement does not apply when:

1. the site *directly discharges* to tidal waters or fifth order or larger streams; or

2. A downstream analysis reveals that *overbank* control is not required.

iv. Extreme Flood Control Criteria (Qf): Requires storage to attenuate the post-development 100-year, 24-hour peak *discharge* rate (Qf) to predevelopment rates. The Qf requirement does not apply when:

1. the site *directly discharges* to tidal waters or fifth order or larger streams; or

2. A downstream analysis reveals that *overbank* control is not required.

c. *Sizing Criteria* for *Redevelopment Activity*

i. Water Quality Volume (WQv): The WQv treatment objective for *redevelopment activity* must be addressed by one of the following options, as outlined in Section 9.2.1. *Redevelopment activities* located in an Enhanced Phosphorus Removal Watershed (see Part III.B.3. and Appendix C) must calculate the WQv in accordance with Section 4.3 of the DM. All other *redevelopment activities* must calculate the WQv in accordance with Section 4.2 of the DM.

1. Reduce the existing *impervious cover* by a minimum of 25% of the total disturbed, *impervious area*. The Soil Restoration criteria in Section 5.1.6 of the DM must be applied to all newly created pervious areas; or

2. Capture and treat 100% of the required WQv, for a minimum of 25% of the disturbed redevelopment *impervious area*, by implementation of standard SMPs or reduced by application of runoff reduction techniques; or

3. Capture and treat 100% of the required WQv, for a minimum of 75% of the disturbed redevelopment *impervious area*, by implementation of a volume-based alternative SMP, as defined in Section 9.4 of the DM; or

4. Capture and treat 100% of the required WQv, for a minimum of 75% of the disturbed redevelopment *impervious area*, by implementation of a flow-through alternative SMP sized to treat the peak rate of runoff from the WQv design storm; or

5. Application of a combination of 1 through 4 above that provide a weighted average of at least two of the above methods. Application of this method must be in accordance with the criteria in Section 9.2.1(A)(V) of the DM; or

6. If there is an existing SMP located on the site that captures and treats runoff from the *impervious area* that is being disturbed, the WQv treatment option selected must, at a minimum, provide treatment equal to the treatment that was being provided by the existing practice(s) if that treatment is greater than the treatment required by options 1 through 5 above.

ii. Channel Protection Volume (CPv) is not required if there is 0% change to hydrology that increases the *discharge* rate and volume from the project site.

iii. *Overbank* Flood Control (Qp) is not required if there is 0% change to hydrology that increases the *discharge* rate from the project site.

iv. Extreme Flood Control (Qf) is not required if there is 0% change to hydrology that increases the *discharge* rate from the project site.

d. *Sizing Criteria* for Combination of *Redevelopment Activity* and *New Development*

Construction projects, that include both *new development* and *redevelopment activity*, must use SMPs that meet the *sizing criteria* calculated as an aggregate of the *sizing criteria* in Part II.C.2.a. or b. for the *new development* portion of the project and Part II.C.2.c. for the *redevelopment activity* portion of the project.

Part III. Stormwater Pollution Prevention Plan (SWPPP)

A. General *SWPPP* Requirements

1. A *SWPPP* must be prepared and implemented by the *owner or operator* of all *construction activity* covered by this permit. All authorized *discharges* must be identified in the *SWPPP*. The *SWPPP* must document the selection, design, installation, implementation and maintenance of the control measures and

practices that will be used to meet the effluent limitations in Part II.B. and, where applicable, the SMP requirements in Part II.C.

2. The *SWPPP* must demonstrate consideration in narrative format of the future physical risks due to climate change pursuant to the Community Risk and Resiliency Act (CRRA), 6 NYCRR Part 490, and associated guidance.

    a. The owner or operator must consider:

        i. the following physical risks due to climate change:

            (i) increasing temperature; and

            (ii) increasing precipitation; and

            (iii) increasing variability in precipitation, including chance of drought; and

            (iv) increasing frequency and severity of flooding; and

            (v) rising sea level; and

            (vi) increasing storm surge; and

            (vii) shifting ecology.

        ii. for each of the following:

            (i) overall site planning; and

            (ii) location, elevation, and sizing of:

                a. control measures and practices; and

                b. conveyance system(s); and

                c. detention system(s).

3. The *SWPPP* must describe the erosion and sediment control practices and where required, SMPs that will be used and/or constructed to reduce the *pollutants* in *stormwater discharges* and to assure compliance with the

requirements of this permit. In addition, the *SWPPP* must identify potential sources of pollution which may reasonably be expected to affect the quality of *stormwater discharges*.

4. All *SWPPPs*, that require the SMP component in accordance with Part III.B.2., must be prepared by a *qualified professional*.

5. The *owner or operator* must keep the *SWPPP* current so that, at all times, it accurately documents the erosion and sediment control practices that are being used or will be used during construction, and all SMPs that will be constructed on the site. At a minimum, the *owner or operator* must modify the *SWPPP*, including construction drawings:

   a. whenever the current provisions prove to be ineffective in *minimizing pollutants* in *stormwater discharges* from the site; and

   b. whenever there is a change in design, construction, or operation at the *construction site* that has or could have an effect on the *discharge* of *pollutants*; and

   c. to address issues or deficiencies identified during an inspection by the *qualified inspector,* NYSDEC, or other regulatory authority; and

   d. to document the final construction conditions in an as-built drawing.

6. NYSDEC may notify the *owner or operator* at any time that the *SWPPP* does not meet one or more of the minimum requirements of this permit. The notification must be in writing and identify the provisions of the *SWPPP* that require modification. Within fourteen (14) calendar days of such notification, or as otherwise indicated by NYSDEC, the *owner or operator* must make the required changes to the *SWPPP* and submit written notification to NYSDEC that the changes have been made. If the *owner or operator* does not respond to NYSDEC's comments in the specified time frame, NYSDEC may suspend the *owner's or operator's* coverage under this permit or require the *owner or operator* to obtain coverage under an individual SPDES permit in accordance with Part II.D.4.

7. Prior to the *commencement of construction activity*, the *owner or operator* must identify the contractor(s) and subcontractor(s) that will be responsible for installing, constructing, repairing, replacing, inspecting, and maintaining the erosion and sediment control practices included in the *SWPPP* and the

contractor(s) and subcontractor(s) that will be responsible for constructing the SMPs included in the *SWPPP*. The *owner or operator* must have each of the contractors and subcontractors identify at least one person from their company to be *trained contractor* that will be responsible for implementation of the *SWPPP*. The *owner or operator* must ensure that at least one *trained contractor* is on site daily when soil disturbance activities are being performed.

The *owner or operator* must have each of the contractors and subcontractors identified above sign a copy of the following certification statement below before the *commencement of construction activities*:

> "I hereby certify under penalty of law that I understand and agree to comply with the requirements of the *SWPPP* and agree to implement any corrective actions identified by the *qualified inspector* during a site inspection. I also understand that the *owner or operator* must comply with the requirements of the most current version of the New York State Pollutant Discharge Elimination System (SPDES) Construction General Permit (CGP) for Stormwater Discharges from Construction Activities and that it is unlawful for any person to cause or contribute to a violation of *water quality standards*. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for knowing violations"

In addition to providing the certification statement above, the certification page must also identify the specific elements of the *SWPPP* that each contractor and subcontractor will be responsible for and include the name and title of the person providing the signature; the name and title of the *trained contractor* responsible for *SWPPP* implementation; the name, address and telephone number of the contracting firm; the address (or other identifying description) of the site; and the date the certification statement is signed. The *owner or operator* must attach the certification statement(s) to the copy of the *SWPPP* that is maintained at the *construction site*. If new or additional contractors are hired to implement measures identified in the *SWPPP* after the *commencement of construction activities*, they must also sign the certification statement and provide the information listed above prior to performing *construction activities*.

B. Required *SWPPP* Contents

1. Erosion and sediment control component - The *owner or operator* must prepare a *SWPPP* that includes erosion and sediment control practices.

   a. Erosion and sediment control practices must be designed:

      i. in conformance with the BB; or

      ii. *equivalent* to the BB if deviating from Part III.B.1.a.i.

   b. If the erosion and sediment control practices are designed in conformance with Part III.B.1.a.ii., the *SWPPP* must include a demonstration of *equivalence* to the BB.

   c. At a minimum, the erosion and sediment control component of the *SWPPP* must include the following:

      i. Background information about the scope of the project, including the location, type and size of project; and

      ii. A site map/construction drawing(s) with north arrows for the project, including a general location map. At a minimum, the site map must show the total site area; all improvements; areas of disturbance; areas that will not be disturbed; existing vegetation; on-site and adjacent off-site surface water(s); floodplain/floodway boundaries; wetlands and drainage patterns that could be affected by the *construction activity*; existing and final contours; locations of different soil types with boundaries; material, waste, borrow or equipment storage areas located on adjacent properties; and location(s) of the *stormwater discharge*(s) and receiving surface water(s); and

      iii. A description of the soil(s) present at the site, including an identification of the Hydrologic Soil Group (HSG); and

      iv. A phasing plan for the project and sequencing plans for all *phases*, both of which must address clearing and grubbing, excavation and grading, utility and infrastructure installation, *final stabilization*,

and any other *construction activity* at the site that will result in soil disturbance.

1. The phasing plan must include:

    a. a map delineating and labeling the limits of soil disturbance for all *phases* of a project; and

    b. a table identifying the order and intended schedule of when each *phase* will begin and end its sequencing plan. The table must identify the total disturbed area for each *phase* at any one time and the total disturbed area for the overall project at any one time all on one timeline showing all overlapping quantities of disturbed area at any one time; and

2. A sequencing plan for a specific *phase* must include:

    a. a table indicating the order and intended schedule of *construction activities* within a *phase*, and corresponding construction drawings with a description of the work to be performed; and

    b. all permanent and *temporary stabilization* measures; and

v. A description of the minimum erosion and sediment control practices to be installed or implemented for each *construction activity* that will result in soil disturbance. Include a schedule that identifies the timing of initial placement or implementation of each erosion and sediment control practice and the minimum time frames that each practice should remain in place or be implemented; and

vi. A site map/construction drawing(s) showing the specific location(s), size(s), and length(s) of each erosion and sediment control practice; and

vii. The dimensions, material specifications, installation details, and operation and maintenance requirements for all erosion and sediment control practices. Include the location and sizing of any

temporary sediment basins and structural practices that will be used to divert flows from exposed soils; and

viii. A maintenance inspection schedule for the contractor(s) and subcontractor(s) identified in Part III.A.7. to ensure continuous and effective operation of the erosion and sediment control practices. The maintenance inspection schedule must be in accordance with the requirements in the BB technical standard; and

ix. A description of the pollution prevention measures that will be used to control litter, construction chemicals and construction debris from becoming a *pollutant* source in the *stormwater discharges*; and

x. A description and location of any *stormwater discharges* associated with industrial activity other than construction at the site, including, but not limited to, *stormwater discharges* from asphalt plants and concrete plants located on the *construction site*; and

xi. Identification of any elements of the design that are not in conformance with the design criteria in the BB technical standard. Include the reason for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the technical standard.

2. SMP component – The *owner or operator* of *construction activity* identified in Table 2 of Appendix B must prepare a *SWPPP* that includes SMPs.

   a. SMPs must be designed in conformance with the applicable *sizing criteria* in Part II.C.2.a., c., or d.; and

   b. SMPs must be designed in conformance with the *performance criteria*:

      i. in the DM; or

      ii. *equivalent* to the DM if deviating from Part III.B.2.b.i.; or

      iii. in the New York State Stormwater Management Design Manual, dated January 2015 (2015 Design Manual), or *equivalent* to it, if the following criteria are met:

1. The eNOI is submitted in accordance with Part I.D. before January 29, 2027 for *construction activities* that are either:

    a. subject to governmental review and approval:

        i. where the *owner or operator* made any application to that governmental entity prior to the effective date of this permit; and

        ii. such application included a *SWPPP* developed using the 2015 Design Manual or *equivalent* to it; or

    b. not subject to governmental review and approval:

        i. where a fiscal allocation for the *construction activities* has been developed and approved by a governmental entity; and

        ii. the *SWPPP* was developed using the 2015 Design Manual or *equivalent* to it; and

c. If SMPs are designed in conformance with Part III.B.2.b.ii., the *SWPPP* must include the reason(s) for the deviation or alternative design and a demonstration of *equivalence* to the DM; and

d. If SMPs are designed in conformance with Part III.B.2.b.iii., the *SWPPP* must include supporting information or documentation demonstrating that Part III.B.2.b.iii.1.a. or b. apply; and

e. The SMP component of the *SWPPP* must include the following:

    i. Identification of all SMPs to be constructed as part of the project, including which option the SMP designs conform to, either Part III.B.2.b.i., ii., or iii. Include the dimensions, material specifications and installation details for each SMP; and

    ii. A site map/construction drawing(s) showing the specific location and size of each SMP; and

iii. A Stormwater Modeling and Analysis Report that includes:

(i) Map(s) showing pre-development conditions, including watershed/subcatchments boundaries, flow paths/routing, and design points; and

(ii) Map(s) showing post-development conditions, including watershed/subcatchments boundaries, flow paths/routing, design points and SMPs; and

(iii) Results of *stormwater* modeling (i.e. hydrology and hydraulic analysis) for the required storm events. Include supporting calculations (model runs), methodology, and a summary table that compares pre- and post-development runoff rates and volumes for the different storm events; and

(iv) Summary table, with supporting calculations, which demonstrates that each SMP has been designed in conformance with the *sizing criteria* included in the DM; and

(v) Identification of any *sizing criteria* that is not required based on the requirements included in Part II.C.; and

(vi) Identification of any elements of the design that are not in conformance with the *performance criteria* in the DM. Include the reason(s) for the deviation or alternative design and provide information which demonstrates that the deviation or alternative design is *equivalent* to the DM.

iv. Soil testing results and locations (test pits, borings); and

v. Infiltration test results, when required in accordance with Part III.B.2.a.; and

vi. An operations and maintenance plan that includes inspection and maintenance schedules and actions to ensure continuous and effective operation of each SMP. The plan must identify the entity

that will be responsible for the long-term operation and maintenance of each practice; and

3. Enhanced Phosphorus Removal Standards - The *owner or operator* of *construction activity* identified in Table 2 of Appendix B that is located in a watershed identified in Appendix C must prepare a *SWPPP* that includes SMPs designed in conformance with the applicable *sizing criteria* in Part II.C.2.b., c., or d. and the *performance criteria* Enhanced Phosphorus Removal Standards included in the DM. At a minimum, the SMP component of the *SWPPP* must meet the requirements of Part III.B.2.

C. Required *SWPPP* Components by Project Type

Owners or operators of *construction activities*, identified in Table 1 of Appendix B, are required to prepare a *SWPPP* that only includes erosion and sediment control practices designed in accordance with Part III.B.1. *Owners or operators* of the *construction activities*, identified in Table 2 of Appendix B, must prepare a *SWPPP* that also includes SMPs designed in accordance with Part III.B.2 or 3.

For the entire area of disturbance, including the entire *common plan of development or sale* if applicable, the owner or operator must evaluate every bullet from Appendix B Table 1 and Table 2 separately. If bullets from both Table 1 and Table 2 apply, the *SWPPP* must include erosion and sediment control practices for all *construction activities* but SMPs for only those portions of the *construction activities* that fall under Table 2 bullet(s).

Part IV. Inspection and Maintenance Requirements

A. General Construction Site Inspection and Maintenance Requirements

1. The *owner or operator* must ensure that all erosion and sediment control practices (including pollution prevention measures), and all SMPs identified in the *SWPPP*, are inspected and maintained in accordance with Part IV.B. and C.

B. Contractor Maintenance Inspection Requirements

1. The *owner or operator* of each *construction activity*, identified in Tables 1 and 2 of Appendix B, must have a *trained contractor* inspect the erosion and sediment control practices and pollution prevention measures being

implemented within the active work area daily to ensure that they are being maintained in effective operating condition at all times. If deficiencies are identified, the contractor must:

a. if the corrective action does not require engineering design:

   i. begin implementing corrective actions within one business day; and

   ii. complete the corrective actions within five business days; or

b. if the corrective action requires engineering design:

   i. begin the engineering design process within five business days; and

   ii. complete the corrective action in a reasonable time frame but no later than within 60 calendar days.

2. For *construction sites* where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *trained contractor* can stop conducting the maintenance inspections in accordance with Part IV.B.1. The *trained contractor* must begin conducting the maintenance inspections in accordance with Part IV.B.1. as soon as soil disturbance activities resume.

3. For *construction sites* where soil disturbance activities have been shut down with partial project completion, the *trained contractor* can stop conducting the maintenance inspections in accordance with Part IV.B.1. if all areas disturbed as of the project shutdown date have achieved *final stabilization* <u>and</u> all SMPs required for the completed portion of the project have been constructed in conformance with the *SWPPP* and are operational.

C. *Qualified Inspector* Inspection Requirements

1. With the exception of the following *construction activities* identified in Tables 1 and 2 of Appendix B, a *qualified inspector* must conduct site inspections for all other *construction activities* identified in Tables 1 and 2 of Appendix B:

   a. the construction of a single-family residential subdivision with 25% or less *impervious cover* at total site build-out that involves a soil disturbance of one (1) or more acres of land but less than or equal to five (5) acres and is

not located in one of the watersheds listed in Appendix C and not *directly discharging* to one of the 303(d) segments listed in Appendix D; and

b. the construction of a single-family home that involves soil disturbances of one (1) or more acres but less than or equal to five (5) acres and is not located in one of the watersheds listed in Appendix C and not *directly discharging* to one of the 303(d) segments listed in Appendix D; and

c. construction on *agricultural property* that involves soil disturbances of one (1) or more acres but less than five (5) acres; and

d. *construction activities* located in the New York City Watershed located east of the Hudson River, see Appendix C Figure 1, that involve soil disturbances of 5,000 square feet or more, but less than one acre.

2. The *qualified inspector* must conduct site inspections in accordance with the following timetable:

   a. For *construction sites* where soil disturbance activities are on-going, the *qualified inspector* must conduct a site inspection at least once every seven (7) calendar days; or

   b. For *construction sites* where soil disturbance activities are on-going and the *owner or operator* has received authorization in accordance with Part I.E.6. to disturb greater than five (5) acres of soil at any one time, the *qualified inspector* must conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections must be separated by a minimum of two (2) full calendar days; or

   c. For *construction sites* where soil disturbance activities have been temporarily suspended (e.g. winter shutdown) and *temporary stabilization* measures have been applied to all disturbed areas, the *qualified inspector* must conduct a site inspection at least once every thirty (30) calendar days. The *owner or operator* must notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix E) or, in areas under the jurisdiction of a *Traditional Land Use Control MS4 Operator,* the *Traditional Land Use Control MS4 Operator* (provided the *Traditional Land Use Control MS4 Operator* is not the *owner or operator* of the *construction activity*) by hard copy or email prior to reducing the inspections to this frequency and again by hard copy or email prior to re-commencing construction; or

d. For *construction sites* where soil disturbance activities have been shut down with partial project completion, the requirement to have the *qualified inspector* conduct inspections ceases if all areas disturbed as of the project shutdown date have achieved *final stabilization* and all SMPs required for the completed portion of the project have been constructed in conformance with the *SWPPP* and are operational. The *owner or operator* must notify the DOW Water (SPDES) Program contact at the Regional Office (see contact information in Appendix E) or, in areas subject to the review authority of *Traditional Land Use Control MS4 Operator(s)* in accordance with Part I.D.2.b.ii.1., the *Traditional Land Use Control MS4 Operator(s)* (provided the *Traditional Land Use Control MS4 Operator(s)* are not the *owners or operators* of the *construction activity*) in writing prior to the shutdown and again in writing prior to resuming *construction activity*. If soil disturbance activities are not resumed within 2 years from the date of shutdown, the *owner or operator* must terminate coverage by meeting the requirements of Part V; or

e. For *construction sites* involving soil disturbance of one (1) or more acres that *directly discharge* to one of the 303(d) segments listed in Appendix D or is located in one of the watersheds listed in Appendix C, the *qualified inspector* must conduct at least two (2) site inspections every seven (7) calendar days. The two (2) inspections must be separated by a minimum of two (2) full calendar days.

3. At a minimum, the *qualified inspector* must inspect:

   a. all erosion and sediment control practices and pollution prevention measures to ensure integrity and effectiveness; and

   b. all SMPs under construction to ensure that they are constructed in conformance with the *SWPPP*; and

   c. all areas of disturbance that have not achieved *final stabilization*; and

   d. all points of *discharge* to *surface waters of the State* located within, or immediately adjacent to, the property boundaries of the *construction site*; and

   e. all points of *discharge* from the *construction site*.

4. The *qualified inspector* must prepare an inspection report subsequent to each and every inspection. At a minimum, the inspection report must include and/or address all of the following, for all *construction activities* except those listed in Part IV.C.1.:

   a. Permit identification number; and

   b. Date and time of inspection; and

   c. Name and title of person(s) performing inspection; and

   d. A description of the weather and soil conditions (e.g. dry, wet, saturated) at the time of the inspection, including the temperature at the time of the inspection; and

   e. A description of the condition of the runoff at all points of *discharge* from the *construction site*. This must include identification of any *discharges* of sediment from the *construction site*. Include *discharges* from conveyance systems (i.e. pipes, culverts, ditches, etc.) and overland flow; and

   f. A description of the condition of all *surface waters of the State* located within, or immediately adjacent to, the property boundaries of the *construction site* which receive runoff from disturbed areas. This must include identification of any *discharges* of sediment to the *surface waters of the State*; and

   g. Identification of all erosion and sediment control practices and pollution prevention measures that need repair or maintenance; and

   h. Identification of all erosion and sediment control practices and pollution prevention measures that were not installed properly or are not functioning as designed and need to be reinstalled or replaced; and

   i. Description and sketch (map) of areas with active soil disturbance activity, areas that have been disturbed but are inactive at the time of the inspection, and areas that have been stabilized (temporary and/or final) since the last inspection; and

   j. Estimates, in square feet or acres, of the following areas:

i. Total area with active soil disturbance (not requiring either *temporary stabilization* or *final stabilization*); and

ii. Total area with inactive soil disturbance (requiring either *temporary stabilization* or *final stabilization*); and

iii. Total area that has achieved *temporary stabilization*; and

iv. Total area that has achieved *final stabilization*; and

k. Current stage of construction of all SMPs and identification of all *construction activity* on site that is not in conformance with the *SWPPP* and technical standards; and

l. Corrective action(s) that must be taken to install, repair, replace or maintain erosion and sediment control practices and pollution prevention measures; and to correct deficiencies identified with the construction of the SMP(s); and

m. Identification and status of all corrective actions that were required by previous inspection; and

n. Digital photographs, with date stamp, that clearly show the condition of all practices that have been identified as needing corrective actions. The *qualified inspector* must attach color copies of the digital photographs to the inspection report being maintained onsite within seven (7) calendar days of the date of the inspection. The *qualified inspector* must also take digital photographs, with date stamp, that clearly show the condition of the practice(s) after the corrective action has been completed. The *qualified inspector* must attach paper color copies of the digital photographs to the inspection report that documents the completion of the corrective action work within seven (7) calendar days of that inspection.

5. Within one business day of the completion of an inspection, the *qualified inspector* must notify the *owner or operator*, and appropriate contractor or subcontractor identified in Part III.A.7., of any corrective actions that need to be taken. The contractor or subcontractor must:

   a. if the corrective action does not require engineering design:

i. begin implementing corrective actions within one business day; and

ii. complete the corrective actions within five business days; or

b. if the corrective action requires engineering design:

i. begin the engineering design process within five business days; and

ii. complete the corrective action in a reasonable time frame but no later than within 60 calendar days.

6. All inspection reports must be signed by the *qualified inspector.* In accordance with Part I.E.3., the inspection reports must be maintained on site with the *SWPPP*.

Part V. How to Terminate CGP Coverage

A. Electronic Notice of Termination (eNOT) Submittal

The eNOT contains questions to ensure requirements in Part V.A. have been met.

1. An *owner or operator* must terminate coverage when one or more of the following requirements have been met:

a. Total project completion:

i. all *construction activity* identified in the *SWPPP* has been completed; and

ii. all areas of disturbance have achieved *final stabilization*; and

iii. all temporary, structural erosion and sediment control measures have been removed; and

iv. all SMPs have been constructed in conformance with the *SWPPP* and are operational; and

v. an as-built drawing has been prepared; or

b. Planned shutdown with partial project completion:

   i. all soil disturbance activities have ceased; and

   ii. all areas disturbed as of the project shutdown date have achieved *final stabilization*; and

   iii. all temporary, structural erosion and sediment control measures have been removed; and

   iv. all SMPs required for the completed portion of the project have been constructed in conformance with the *SWPPP* and are operational; and

   v. an as-built drawing has been prepared; or

c. In accordance with Part I.G. Change of Owner or Operator; or

d. The *owner or operator* has obtained coverage under an alternative general SPDES permit or an individual SPDES permit.

2. For *construction activities* that require *qualified inspector* inspections in accordance with Part IV.C.1. and have met Part V.A.1.a. or b., the *owner or operator* must have the *qualified inspector* perform a final site inspection prior to submitting the eNOT. The *qualified inspector* must, by signing the "Final Stabilization" and "Post-Construction Stormwater Management Practice(s)" certification statements on the eNOT, certify that all the requirements in Part V.A.1.a. or b. have been achieved.

3. For *construction activities* that are subject to the review authority of *Traditional Land Use Control MS4 Operator(s)* in accordance with Part I.D.2.b.ii.1. and meet Part V.A.1.a. or b., the *owner or operator* must have the *Traditional Land Use Control MS4 Operator(s)* sign the "MS4 Acceptance" statement on the eNOT in accordance with the requirements in Part VII.J. A *Traditional Land Use Control MS4 Operator* official, by signing this statement, determined that it is acceptable for the *owner or operator* to submit the eNOT in accordance with the requirements of this Part. A *Traditional Land Use Control MS4 Operator* can make this determination by performing a final site inspection themselves or by accepting the *qualified inspector*'s final site inspection certification(s) when required in Part V.A.2.

4. For *construction activities* that require SMPs and meet Part V.A.1.a. or b., the *owner or operator* must, prior to submitting the eNOT, ensure one of the following:

    a. for SMP(s) that were constructed by a private entity, but will be owned, operated, and maintained by a public entity, the SMP(s) and any right-of-way(s) needed to operate and maintain such practice(s) have been deeded to the municipality in which the practice(s) is located; or

    b. for SMP(s) that are privately owned, but will be operated and maintained by a public entity, an executed operation and maintenance agreement is in place with the municipality that will operate and maintain the SMP(s); or

    c. for SMP(s) that are privately owned, the *owner or operator* has a mechanism in place that requires operation and maintenance of the practice(s) in accordance with the operation and maintenance plan, such as a deed covenant in the *owner or operator's* deed of record; or

    d. for SMP(s) that are owned by a public or private institution (e.g. school, university, hospital), government agency or authority, or public utility, the *owner or operator* has policies and procedures in place that ensure operation and maintenance of the practices in accordance with the operation and maintenance plan.

5. An *owner or operator* that has met the requirements of Part V.A.1., 2., 3., and 4. must request termination of coverage under this permit by submitting a complete Notice of Termination form electronically using a NYSDEC approved form.[5]

    a. The owner's or operator's coverage is terminated as of the termination date indicated in the Letter of Termination (LOT), which is sent by NYSDEC after a complete eNOT is submitted.

[5] Unless NYSDEC grants a waiver in accordance with 40 CFR 127.15(c) or (d). All waiver requests must be submitted to Stormwater_info@dec.ny.gov or NYSDEC, Bureau of Water Permits, 625 Broadway, 4th Floor, Albany, New York 12233-3505.

Part VI. Record Retention and Reporting

A. Record Retention

The *owner or operator* must retain a copy of the documents listed in Part I.E.3. and a copy of the LOT for a period of at least five years from the date that NYSDEC accepts a complete NOT submitted in accordance with Part V.

B. Reporting

Except for the eNOI, the signature forms associated with the eNOI, and the eNOT, all other written correspondence requested by NYSDEC, including individual permit applications, must be sent to the address of the appropriate DOW (SPDES) Program contact at the Regional Office listed in Appendix E.

Part VII. Standard Permit Requirements

For the purposes of this permit, examples of contractors and subcontractors include: third-party maintenance and construction contractors.

A. Duty to Comply

The *owner or operator*, and all contractors or subcontractors, must comply with all requirements of this permit. Any non-compliance with the requirements of this permit constitutes a violation of the New York State Environmental Conservation Law (ECL), and its implementing regulations, and is grounds for enforcement action. Filing of a request for termination of coverage under this permit, or a notification of planned changes or anticipated non-compliance, does not limit, diminish or stay compliance with any requirements of this permit.

B. Need to Halt or Reduce Activity Not a Defense

The necessity to halt or reduce the *construction activity* regulated by this permit, in order to maintain compliance with the requirements of this permit, must not be a defense in an enforcement action.

C. Penalties

There are substantial criminal, civil, and administrative penalties associated with violating the requirements of this permit. Fines of up to $37,500 per day for each

violation and imprisonment for up to 15 years may be assessed depending upon the nature and degree of the offense.

D. False Statements

Any person who knowingly makes any false material statement, representation, or certification in any application, record, report, or other document filed or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance must, upon conviction, be punished in accordance with ECL §71-1933 and or New York State Penal Law Articles 175 and 210.

E. Re-Opener Clause

Upon issuance of this permit, a determination has been made on the basis of a submitted Notice of Intent, plans, or other available information, that compliance with the specified permit requirements will reasonably protect classified water use and assure compliance with applicable *water quality standards*. Satisfaction of the requirements of this permit notwithstanding, if operation pursuant to this permit causes or contributes to a condition in contravention of State *water quality standards* or guidance values, or if NYSDEC determines that a modification is necessary to prevent impairment of the best use of the waters or to assure maintenance of *water quality standards* or compliance with other provisions of ECL Article 17 or the Clean Water Act (CWA), or any regulations adopted pursuant thereto, NYSDEC may require such modification and the Commissioner may require abatement action to be taken by the *owner or operator* and may also prohibit such operation until the modification has been implemented.

F. Duty to Mitigate

The *owner or operator*, and its contractors and subcontractors, must take all reasonable steps to *minimize* or prevent any *discharge* in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment.

G. Requiring Another General Permit or Individual SPDES Permit

NYSDEC may require any *owner or operator* authorized to *discharge* in accordance with this permit to apply for and obtain an individual SPDES permit or apply for authorization to *discharge* in accordance with another general SPDES permit.

1. Cases where an individual SPDES permit or authorization to discharge in accordance with another general SPDES permit may be required include, but is not limited to the following:

a. the *owner or operator* is not in compliance with the conditions of this permit or does not meet the requirements for coverage under this permit; and

b. a change has occurred in the availability of demonstrated technology or practices for the control or abatement of *pollutants* applicable to the *point source*; and

c. new effluent limitation guidelines or new source performance standards are promulgated that are applicable to *point sources* authorized to *discharge* in accordance with this permit; and

d. existing effluent limitation guidelines or new source performance standards that are applicable to *point sources* authorized to *discharge* in accordance with this permit are modified; and

e. a water quality management plan containing requirements applicable to such *point sources* is approved by NYSDEC; and

f. circumstances have changed since the time of the request to be covered so that the *owner or operator* is no longer appropriately controlled under this permit, or either a temporary or permanent reduction or elimination of the authorized *discharge* is necessary; and

g. the *discharge* is in violation of section 17-0501 of the ECL; and

h. the *discharge(s)* is a significant contributor of *pollutants*. In making this determination, NYSDEC may consider the following factors:

    i. the location of the *discharge(s)* with respect to *surface waters of the State*; and

    ii. the size of the *discharge(s)*; and

    iii. the quantity and nature of the *pollutants discharged* to *surface waters of the State*; and

    iv. other relevant factors including compliance with other provisions of ECL Article 17, or the CWA.

2. When NYSDEC requires any *owner or operator* authorized by this permit to apply for an individual SPDES permit as provided for in this subdivision, it must notify the *owner or operator* in writing that a permit application is required. This notice must include a brief statement of the reasons for this decision, an application

form, a statement setting a time for the *owner or operator* to file the application for an individual SPDES permit, and a deadline, not sooner than 180 days from the *owner's or operator's* receipt of the notification letter, whereby the authorization to *discharge* under this permit must be terminated. NYSDEC may grant additional time upon demonstration, to the satisfaction of the RWE,[6] that additional time to apply for an alternative authorization is necessary or where NYSDEC has not provided a permit determination in accordance with 6 NYCRR Part 621.

3. When an individual SPDES permit is issued to an *owner or operator* authorized to *discharge* under this permit for the same *discharge(s)*, this permit authorization for *construction activities* authorized under the individual SPDES permit is automatically terminated on the effective date of the individual SPDES permit unless termination is earlier in accordance with 6 NYCRR Part 750.

H. Duty to Provide Information

The *owner or operator* must furnish to NYSDEC, within five business days, unless otherwise set forth by NYSDEC, any information that NYSDEC may request to determine whether cause exists to determine compliance with this permit or to determine whether cause exists for requiring an individual SPDES permit in accordance with 6 NYCRR 750-1.21(e) (see Part VII.G. Requiring Another General Permit or Individual Permit).

The *owner or operator* must make available to NYSDEC, for inspection and copying, or furnish to NYSDEC within 25 business days of receipt of a NYSDEC request for such information, any information retained in accordance with this permit.

Except for Part I.D.4. and 5. and Part I.G., the following applies: where the *owner or operator* becomes aware that it failed to submit any relevant facts on the Notice of Intent, or submitted incorrect information in a Notice of Intent or in any report to NYSDEC, the *owner or operator* must submit such facts or corrected information to NYSDEC within five business days.

I. Extension

In the event a new permit is not issued and effective prior to the expiration of this permit, and this permit is extended pursuant to the State Administrative Procedure Act and 6 NYCRR Part 621, then the *owner or operator* with coverage under this permit may continue to operate and *discharge* in accordance with the requirements of this permit until a new permit is issued and effective.

[6] The Regional Water Manager where a DEC Region does not have a RWE.

J. Signatories and Certification

The Notice of Intent, Notice of Termination, and reports required by this permit must be signed as provided in 40 CFR §122.22.

1. All Notices of Intent and Notices of Termination must be signed as follows:

   a. For a corporation. By a responsible corporate officer. For the purpose of this section, a responsible corporate officer means:

      (i) a president, secretary, treasurer, or vice-president of the corporation in charge of a principal business function, or any other person who performs similar policy- or decision-making functions for the corporation; or

      (ii) the manager of one or more manufacturing, production or operating facilities, provided, the manager is authorized to make management decisions which govern the operation of the regulated facility including having the explicit or implicit duty of making major capital investment recommendations, and initiating and directing other comprehensive measures to assure long term environmental compliance with environmental laws and regulations; the manager can ensure that the necessary systems are established or actions taken to gather complete and accurate information for Notice of Intent or Notice of Termination requirements; and where authority to sign documents has been assigned or delegated to the manager in accordance with corporate procedures.

      Note: NYSDEC does not require specific assignments or delegations of authority to responsible corporate officers identified in 40 CFR §122.22(a)(1)(i). NYSDEC will presume that these responsible corporate officers have the requisite authority to sign the Notice of Intent or Notice of Termination unless the corporation has notified NYSDEC to the contrary. Corporate procedures governing authority to sign a Notice of Intent or Notice of Termination may provide for assignment or delegation to applicable corporate positions under 40 CFR §122.22(a)(1)(ii) rather than to specific individuals.

   b. For a partnership or sole proprietorship. By a general partner or the proprietor, respectively.

c. For a municipality, State, Federal, or other public agency. By either a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes:

   1. the chief executive officer of the agency; or

   2. a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. All reports required by this permit, and other information requested by NYSDEC, must be signed by a person described in Part VII.J.1., or by a duly authorized representative of that person. A person is a duly authorized representative only if:

   a. The authorization is made in writing by a person described in Part VII.J.1. or using the Duly Authorized Form, found on the DEC website; and

   b. The authorization specifies either an individual or a position having responsibility for the overall operation of the regulated facility or activity, position of equivalent responsibility, or an individual or position having overall responsibility for environmental matters for the company. (A duly authorized representative may thus be either a named individual or any individual occupying a named position); and

   c. The written authorization is submitted to NYSDEC.

3. Changes to authorization. If an authorization under Part VII.J.2. is no longer accurate because a different individual or position has responsibility for the overall operation of the *construction activity*, a new authorization satisfying the requirements of Part VII.J.2. must be submitted to NYSDEC prior to or together with any reports, information, or applications to be signed by an authorized representative.

4. Certification. Any person signing a document under Part VII.J.1. or 2. must make the following certification:

   I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who

manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

5. Electronic reporting. If documents described in Part VII.J.1. or 2. are submitted electronically by or on behalf of the *construction activity* with coverage under this permit, any person providing the electronic signature for such documents must meet all relevant requirements of this section, and must ensure that all of the relevant requirements of 40 CFR Part 3 (including, in all cases, subpart D to Part 3) (Cross-Media Electronic Reporting) and 40 CFR Part 127 (NPDES Electronic Reporting Requirements) are met for that submission.

K. Inspection and Entry

The *owner or operator* must allow NYSDEC, the USEPA Regional Administrator, the applicable county health department, or any authorized representatives of those entities, or, in the case of a *construction site* which *discharges* through an *MS4*, an authorized representative of the *MS4* receiving the *discharge*, upon the presentation of credentials and other documents as may be required by law, to:

1. enter upon the *owner's or operator's* premises where a regulated facility or activity is located or conducted or where records must be kept under the requirements of this permit; and

2. have access to and copy at reasonable times, any records that must be kept under the requirements of this permit, including records required to be maintained for purposes of operation and maintenance; and

3. inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices or operations regulated or required under this permit; and

4. sample or monitor at reasonable times, for the purposes of assuring general SPDES permit compliance or as otherwise authorized by the CWA or ECL, any substances or parameters at any location; and

5. enter upon the property of any contributor to the regulated facility or activity under authority of the *owner or operator*.

L. Confidentiality of Information

The following must not be held confidential: this permit, the fact sheet for this permit, the name and address of any *owner or operator*, effluent data, the Notice of Intent, and information regarding the need to obtain an individual permit or an alternative general SPDES permit. This includes information submitted on forms themselves and any attachments used to supply information required by the forms (except information submitted on usage of substances). Upon the request of the *owner or operator*, NYSDEC must make determinations of confidentiality in accordance with 6 NYCRR Part 616, except as set forth in the previous sentence. Any information accorded confidential status must be disclosed to the Regional Administrator upon his or her written request. Prior to disclosing such information to the Regional Administrator, NYSDEC will notify the Regional Administrator of the confidential status of such information.

M. Other Permits May Be Required

Nothing in this permit relieves the *owner or operator* from a requirement to obtain any other permits required by law.

N. NYSDEC Orders or Civil Decrees/Judgments

The issuance of this permit by the NYSDEC, and the coverage under this permit by the *owner or operator*, does not supersede, revoke, or rescind any existing order on consent or civil Decree/Judgment, or modification to any such documents or to any order issued by the Commissioner, or any of the terms, conditions, or requirements contained in such order or modification therefore, unless expressly noted.

O. Property Rights

Coverage under this permit does not convey any property rights in either real or personal property, or any exclusive privileges, nor does it authorize any injury to private property or any invasion of personal rights, nor any infringement of Federal, State, or local laws or regulations, nor does it obviate the necessity of obtaining the assent of any other jurisdiction as required by law for the *discharge* authorized.

P. Compliance with Interstate Standards

If the *construction activity* covered by this permit originates within the jurisdiction of an interstate water pollution control agency, then the *construction activity* must also comply with any applicable effluent standards or *water quality standards* promulgated by that interstate agency and as set forth in this permit for such *construction activities*.

Q. Oil and Hazardous Substance Liability

Coverage under this permit does not affect the imposition of responsibilities upon, or the institution of any legal action against, the *owner or operator* under section 311 of the CWA, which must be in conformance with regulations promulgated pursuant to section 311 governing the applicability of section 311 of the CWA to *discharges* from facilities with *NPDES* permits, nor must such issuance preclude the institution of any legal action or relieve the *owner or operator* from any responsibilities, liabilities, or penalties to which the *owner or operator* is or may be subject pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. section 9601 et seq. (CERCLA).

R. Severability

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit, must not be affected thereby.

S. NYSDEC Approved Forms

The *owner or operator* must provide all relevant information that is requested by NYSDEC, and required by this permit, on all NYSDEC approved forms.

APPENDIX A – Abbreviations and Definitions

Abbreviations

APO – Agency Preservation Officer
BB – New York State Standards and Specifications for Erosion and Sediment Control (Blue Book), dated November 2016
BMP – Best Management Practice
CPESC – Certified Professional in Erosion and Sediment Control
CPv – Channel Protection Volume
CWA – Clean Water Act (or the Federal Water Pollution Control Act, 33 U.S.C. §1251 et seq)
DM – New York State Stormwater Management Design Manual (Design Manual), dated July 31, 2024
DOW – Division of Water
EAF – Environmental Assessment Form
ECL – chapter 43-B of the Consolidated Laws of the State of New York, entitled the Environmental Conservation Law
EPA – U.S. Environmental Protection Agency
HSG – Hydrologic Soil Group
MS4 – Municipal Separate Storm Sewer System
NOI – Notice of Intent
NOT – Notice of Termination
NPDES – National Pollutant Discharge Elimination System
NYC – The City of New York
NYCDEP – The City of New York Department of Environmental Protection
NYSDEC – The New York State Department of Environmental Conservation
OPRHP – Office of Parks, Recreation and Historic Places
Qf – Extreme Flood
Qp – Overbank Flood
RR – Runoff Reduction
RRv – Runoff Reduction Volume
RWE – Regional Water Engineer
SEQR – State Environmental Quality Review Act
SHPA – State Historic Preservation Act
SMP – Post-Construction Stormwater Management Practice
SPDES – State Pollutant Discharge Elimination System
SWPPP – Stormwater Pollution Prevention Plan
TMDL – Total Maximum Daily Load
UPA – Uniform Procedures Act
USDA – United States Department of Agriculture
WQv – Water Quality Volume

Definitions

All definitions in this section are solely for the purposes of this permit. If a word is not italicized in the permit, use its common definition.

Agricultural Building – a structure designed and constructed to house farm implements, hay, grain, poultry, livestock or other horticultural products; excluding any structure designed, constructed or used, in whole or in part, for human habitation, as a place of employment where agricultural products are processed, treated or packaged, or as a place used by the public.

Agricultural Property – the land for construction of a barn, *agricultural building*, silo, stockyard, pen or other structural practices identified in Table II in the "Agricultural Best Management Practice Systems Catalogue" (dated June 2023).

Alter Hydrology from Pre- to Post-Development Conditions – the post-development peak flow rate(s) has increased by more than 5% of the pre-developed condition for the design storm of interest (e.g. 10 yr and 100 yr).

Combined Sewer System – a sewer system which conveys sewage and *stormwater* through a single pipe system to a publicly owned treatment works.

Commence (Commencement of) Construction Activities – the initial disturbance of soils associated with clearing, grading or excavation activities; or other construction related activities that disturb or expose soils such as demolition, stockpiling of fill material, and the initial installation of erosion and sediment control practices required in the *SWPPP*. See definition for "*Construction Activity(ies)*" also.

Common Plan of Development or Sale – a contiguous area where multiple separate and distinct *construction activities* are occurring, or may occur, under one plan. The "common plan" of development or sale is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, marketing plan, advertisement, drawing, permit application, State Environmental Quality Review Act (SEQR) environmental assessment form or other documents, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating *construction activities* may occur on a specific plot. A *common plan of development or sale* is comprised of two or more *phases*.

Common plan of development or sale does not include separate and distinct *construction activities* that are occurring, or may occur, under one plan that are at least 1/4 mile apart provided any interconnecting road, pipeline or utility project that is part of the same "common plan" is not concurrently being disturbed.

Construction Activity(ies) – identified within 40 CFR 122.26(b)(14)(x), 122.26(b)(15)(i), and 122.26(b)(15)(ii), any clearing, grading, excavation, filling, demolition or stockpiling activities that result in soil disturbance. Clearing activities can include, but are not limited to, mechanized logging equipment operation, the cutting and skidding of trees, stump removal and/or brush root removal.

Construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, or original purpose of a facility, which is excluded from the calculation of the soil disturbance for a project. Routine maintenance includes, but is not limited to:

- Re-grading of gravel roads or parking lots; and
- Cleaning and shaping of existing roadside ditches and culverts that maintains the approximate original line and grade, and maintains or improves the hydraulic capacity of the ditch; and
- Replacement of existing culverts that maintains the approximate original line and grade, and maintains or improves the hydraulic capacity of a ditch; and
- Replacement of existing bridges that maintains the approximate original line and grade, and maintains or improves the hydraulic capacity beneath the bridges; and
- Cleaning and shaping of existing roadside ditches that does not maintain the approximate original grade, hydraulic capacity and purpose of the ditch if the changes to the line and grade, hydraulic capacity or purpose of the ditch are installed to improve water quality and quantity controls (e.g. installing grass lined ditch); and
- Placement of aggregate shoulder backing that stabilizes the transition between the road shoulder and the ditch or *embankment*; and
- Full depth milling and filling of existing asphalt pavements, replacement of concrete pavement slabs, and similar work that does not expose soil or disturb the bottom six (6) inches of subbase material; and
- Long-term use of equipment storage areas at or near highway maintenance facilities; and
- Removal of sediment from the edge of the highway to restore a previously existing sheet-flow drainage connection from the highway surface to the highway ditch or *embankment*; and
- Existing use of Canal Corp owned upland disposal sites for the canal, and
- Replacement of curbs, gutters, sidewalks and guide rail posts; and
- Maintenance of ski trails including brush hog use and mowing; and
- Above ground snowmaking pipe replacement; and
- Replacement of existing utility poles; etc.

Construction Site – the land area where *construction activity(ies)* will occur. See also the definitions for "*Commence (Commencement of) Construction Activities"* and "*Common Plan of Development or Sale."*

Dewatering – the act of draining rainwater and/or groundwater from building foundations, vaults or excavations/trenches.

Directly Discharge(s)(ing) (to a specific surface waterbody) – runoff flows from a *construction site* by overland flow and the first point of *discharge* is the specific surface waterbody, or runoff flows from a *construction site* to a separate storm sewer system and the first point of *discharge* from the separate storm sewer system is the specific surface waterbody.

Discharge(s)(d) – any addition of any *pollutant* to waters of the State through an outlet or *point source*.

Embankment – an earthen or rock slope that supports a road/highway.

Equivalent (Equivalence) – the practice or measure meets all the performance, longevity, maintenance, and safety objectives of the technical standard and will provide an equal or greater degree of water quality protection.

Final Stabilization – all soil disturbance activities have ceased and a uniform, perennial vegetative cover with a density of eighty (80) percent over the entire pervious surface has been established; or other *equivalent* stabilization measures, such as permanent landscape mulches, rock rip-rap or washed/crushed stone have been applied on all disturbed areas that are not covered by permanent structures, concrete or pavement.

Historic Property – any building, structure, site, object or district that is listed on the State or National Registers of Historic Places or is determined to be eligible for listing on the State or National Registers of Historic Places.

Impervious Area (Cover) – all impermeable surfaces that cannot effectively infiltrate rainfall. This includes paved, concrete and compacted gravel surfaces (i.e. parking lots, driveways, roads, runways and sidewalks); building rooftops and miscellaneous impermeable structures such as patios, pools, and sheds.

Infeasible – not technologically possible, or not economically practicable and achievable considering best industry practices.

Minimize(ing)(ation) – reduce and/or eliminate to the extent achievable using control measures (including best management practices) that are technologically available and economically practicable and achievable in light of best industry practices.

Municipal Separate Storm Sewer System (MS4) - a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

1. owned or operated by a State, city, town, village, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, *stormwater*, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA, that *discharges* to *surface waters of the State*; and

2. designed or used for collecting or conveying *stormwater*; and

3. which is not a *combined sewer system*; and

4. which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2.

Natural Buffer(s) – an undisturbed area with natural cover running along a surface water (e.g. wetland, stream, river, lake, etc.).

New Development – any land disturbance that does not meet the definition of *Redevelopment Activity* included in this appendix.

New York State Erosion and Sediment Control Certificate Program – a certificate program that establishes and maintains a process to identify and recognize individuals who are capable of developing, designing, inspecting and maintaining erosion and sediment control plans on projects that disturb soils in New York State. The certificate program is administered by the New York State Conservation District Employees Association.

Nonpoint Source(s) – any source of water pollution or *pollutants* which is not a discrete conveyance or *point source* permitted pursuant to Title 7 or 8 of Article 17 of the Environmental Conservation Law (see ECL Section 17-1403).

Overbank – flow events that exceed the capacity of the stream channel and spill out into the adjacent floodplain.

Owner or Operator – the person, persons, or legal entity which owns or leases the property on which the *construction activity* is occurring; an entity that has operational control over the construction plans and specifications, including the ability to make modifications to the plans and specifications; and/or an entity that has day-to-day operational control of those activities at a project that are necessary to ensure compliance with the permit requirements.

Performance Criteria – the six performance criteria for each group of SMPs in Chapters 5 and 6 of the technical standard, New York State Stormwater Management Design Manual (DM), dated July 31, 2024. These include feasibility, conveyance, pretreatment, treatment, landscaping, and maintenance. It does not include the *Sizing Criteria* (i.e. WQv, RRv, CPv, Qp and Qf) in Part I.C.2. of the permit.

Phase – a defined area in which *construction activities* are occurring or will occur separate from other defined area(s).

Point Source – any discernible, confined, and discrete conveyance, including but not limited to any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, vessel or other floating craft, or landfill leachate collection system from which *pollutants* are or may be *discharged*.

Pollutant(s) – dredged spoil, filter backwash, solid waste, incinerator residue, sewage, garbage, sewage sludge, munitions, chemical wastes, biological materials, radioactive materials, heat, wrecked or discarded equipment, rock, sand and industrial, municipal, agricultural waste and ballast *discharged* into water; which may cause or might reasonably be expected to cause pollution of the waters of the state in contravention of the standards or guidance values adopted as provided in 6 NYCRR Parts 700 et seq.

Qualified Inspector – a person that is knowledgeable in the principles and practices of erosion and sediment control, such as a licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, *New York State Erosion and Sediment Control Certificate Program* holder or other NYSDEC endorsed individual(s).

It can also mean someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided that person has training in the principles and practices of erosion and sediment control. Training in the principles and practices of erosion and sediment control means that the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect has received four (4) hours of NYSDEC endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other NYSDEC endorsed entity. After receiving the initial training, the individual working under the direct supervision of the licensed Professional Engineer or Registered Landscape Architect shall receive four (4) hours of training every three (3) years.

It can also mean a person that meets the *Qualified Professional* qualifications in addition to the *Qualified Inspector* qualifications.

Note: Inspections of any SMPs that include structural components, such as a dam for an impoundment, shall be performed by a licensed Professional Engineer.

Qualified Professional – a person that is knowledgeable in the principles and practices of *stormwater* management and treatment, such as a licensed Professional Engineer, Registered Landscape Architect or other NYSDEC endorsed individual(s). Individuals preparing *SWPPPs* that require the SMP component must have an understanding of the principles of hydrology, water quality management practice design, water quantity control design, and, in many cases, the principles of hydraulics. All components of the *SWPPP* that involve the practice of engineering, as defined by the NYS Education Law (see Article 145), shall be prepared by, or under the direct supervision of, a professional engineer licensed to practice in the State of New York.

Redevelopment Activity(ies) – the disturbance and reconstruction of existing *impervious area*, including *impervious areas* that were removed from a project site within five (5) years of preliminary project plan submission to the local government (i.e. site plan, subdivision, etc.).

Renewable Energy – electricity or thermal energy generated by renewable energy systems through use of the following technologies: solar thermal, photovoltaics, on land and offshore wind, hydroelectric, geothermal electric, geothermal ground source heat, tidal energy, wave energy, ocean thermal, and fuel cells which do not utilize a fossil fuel resource in the process of generating electricity.

Site Limitations – site conditions that prevent the use of an infiltration technique and or infiltration of the total WQv. Typical *site limitations* include: seasonal high groundwater, shallow depth to bedrock, and soils with an infiltration rate less than 0.5 inches/hour. The existence of *site limitations* shall be confirmed and documented using actual field testing (i.e. test pits, soil borings, and infiltration test) or using information from the most current United States Department of Agriculture (USDA) Soil Survey for the County where the project is located.

Sizing Criteria – the criteria included in Part I.C.2 of the permit that are used to size SMPs. The criteria include; Water Quality Volume (WQv), Runoff Reduction Volume (RRv), Channel Protection Volume (Cpv), *Overbank* Flood (Qp), and Extreme Flood (Qf).

Steep Slope – land area designated on the current United States Department of Agriculture (USDA) Soil Survey as Soil Slope Phase D, (provided the map unit name or description is inclusive of slopes greater than 25%), or Soil Slope Phase E or F, (regardless of the map unit name), or a combination of the three designations.

Stormwater – that portion of precipitation that, once having fallen to the ground, is in excess of the evaporative or infiltrative capacity of soils, or the retentive capacity of surface features, which flows or will flow off the land by surface runoff to waters of the State.

Streambank – the terrain alongside the bed of a creek or stream. The bank consists of the sides of the channel, between which the flow is confined.

Stormwater Pollution Prevention Plan (SWPPP) – a project specific report, including construction drawings, that among other things: describes the *construction activity(ies)*, identifies the potential sources of pollution at the *construction site*; describes and shows the *stormwater* controls that will be used to control the *pollutants* (i.e. erosion and sediment controls; for many projects, includes SMPs); and identifies procedures the *owner or operator* will implement to comply with the requirements of the permit. See Part III of the permit for a complete description of the information that must be included in the *SWPPP*.

Surface Waters of the State – shall be construed to include lakes, bays, sounds, ponds, impounding reservoirs, springs, rivers, streams, creeks, estuaries, marshes, inlets, canals, the Atlantic ocean within the territorial seas of the state of New York and all other bodies of surface water, natural or artificial, inland or coastal, fresh or salt, public or private (except those private waters that do not combine or effect a junction with natural surface waters), which are wholly or partially within or bordering the state or within its jurisdiction. Waters of the state are further defined in 6 NYCRR Parts 800 to 941.

Temporarily Ceased – an existing disturbed area will not be disturbed again within 14 calendar days of the previous soil disturbance.

Temporary Stabilization – exposed soil has been covered with material(s) as set forth in the technical standard, New York Standards and Specifications for Erosion and Sediment Control, to prevent the exposed soil from eroding. The materials can include, but are not limited to, mulch, seed and mulch, and erosion control mats (e.g. jute twisted yarn, excelsior wood fiber mats).

Total Maximum Daily Load (TMDL) – the sum of the allowable loads of a single *pollutant* from all contributing point and *nonpoint source*s. It is a calculation of the maximum amount of a *pollutant* that a waterbody can receive and still meet *water quality standards*, and an allocation of that amount to the *pollutant's* sources. A TMDL stipulates Waste Load Allocations (WLA) for *point source discharges*, Load Allocations (LA) for *nonpoint source*s, and a margin of safety (MOS).

Traditional Land Use Control MS4 Operator – a city, town, or village with land use control authority that is authorized to *discharge* under New York State DEC's SPDES General Permit For Stormwater Discharges from Municipal Separate Stormwater Sewer Systems (MS4s) or the City of New York's Individual SPDES Permit for their Municipal Separate Storm Sewer Systems (NY-0287890).

Trained Contractor – an employee from the contracting (construction) company, identified in Part III.A.7., that has received four (4) hours of NYSDEC endorsed training

in proper erosion and sediment control principles from a Soil and Water Conservation District, or other NYSDEC endorsed entity. After receiving the initial training, the *trained contractor* shall receive four (4) hours of training every three (3) years.

It can also mean an employee from the contracting (construction) company, identified in Part III.A.7., that meets the *qualified inspector* qualifications (e.g. licensed Professional Engineer, Certified Professional in Erosion and Sediment Control (CPESC), Registered Landscape Architect, *New York State Erosion and Sediment Control Certificate Program* holder, or someone working under the direct supervision of, and at the same company as, the licensed Professional Engineer or Registered Landscape Architect, provided they have received four (4) hours of NYSDEC endorsed training in proper erosion and sediment control principles from a Soil and Water Conservation District, or other NYSDEC endorsed entity).

The *trained contractor* is responsible for the day-to-day implementation of the *SWPPP*.

Tree Clearing – *construction activities* limited to felling and removal of trees.

Tree clearing does not include hand felling and leaving the trees in place with no support from mechanized equipment, which is not considered *construction activity* requiring coverage under this permit.

Water Quality Standard – such measures of purity or quality for any waters in relation to their reasonable and necessary use as promulgated in 6 NYCRR Part 700 et seq.

APPENDIX B – Required SWPPP Components by Project Type

Table 1
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A *SWPPP* THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following *construction activities* that involve soil disturbances of one (1) or more acres of land, but less than five (5) acres:

- Single-family home not located in one of the watersheds listed in Appendix C and not *directly discharging* to one of the 303(d) segments listed in Appendix D
- Single-family residential subdivisions with 25% or less *impervious cover* at total site build-out and not located in one of the watersheds listed in Appendix C and not *directly discharging* to one of the 303(d) segments listed in Appendix D
- Construction of a barn or other *agricultural building*, silo, stock yard or pen.
- Structural agricultural conservation practices as identified in Table II in the "Agricultural Best Management Practice Systems Catalogue" (dated June 2023) that include construction or reconstruction of *impervious area* or *alter hydrology from pre- to post-development* conditions.

The following *construction activities* that involve soil disturbances between five thousand (5000) square feet and one (1) acre of land:

- All construction activities located in the New York City Watershed located east of the Hudson River, see Appendix C Figure 1, that involve soil disturbances between five thousand (5,000) square feet and one (1) acre of land.

Within the municipal boundaries of NYC:

- Stand-alone road reconstruction, where the total soil disturbance from only that road construction, is less than one (1) acre of land.

The following *construction activities*:

- Installation of underground linear utilities; such as gas lines, fiber-optic cable, cable TV, electric, telephone, sewer mains, and water mains
- Environmental enhancement projects, such as wetland mitigation, *stormwater* retrofits, stream restoration, and resiliency projects that reconstruct shoreline areas to address sea level rise
- Pond construction
- Linear bike paths running through areas with vegetative cover, including bike paths surfaced with an *impervious cover*
- Cross-country ski trails, walking/hiking trails, and mountain biking trails, including a de minimis parking lot (maximum 10 spaces total, sized for passenger cars) with 35 feet minimum preservation of undisturbed area downgradient from the parking lot
- Dam rehabilitation (the structure of the dam itself)
- Sidewalks, bike paths, or walking paths, surfaced with an *impervious cover*, that are not part of residential, commercial, or institutional development;
- Sidewalks, bike paths, or walking paths, surfaced with an *impervious cover*, that include incidental shoulder or curb work along an existing highway to support construction of the sidewalk, bike path, or walking path.

Table 1 (Continued)
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A *SWPPP* THAT ONLY INCLUDES EROSION AND SEDIMENT CONTROLS

The following *construction activities*:

- Slope stabilization
- Slope flattening that changes the grade of the site, but does not significantly change the runoff characteristics
- Spoil areas that will be covered with vegetation
- Vegetated open space (i.e. recreational parks, lawns, meadows, fields, downhill ski trails) that do not *alter hydrology from pre- to post-development* conditions
- Athletic fields (natural grass) that do not include the construction or reconstruction of *impervious area* and do not *alter hydrology from pre- to post-development* conditions
- Demolition where vegetation will be established, and no *redevelopment activity* is planned[1]
- Installation or replacement of either an overhead electric transmission line or a ski lift tower that does not include the construction of permanent access roads or parking areas surfaced with *impervious cover*.
- Solar array field areas that have tables elevated off the ground, spaced one table width apart, do not *alter hydrology from pre- to post-development conditions*, and address water quality volume and runoff reduction volume by maintaining sheet flow on slopes less than 8%.
- Structural agricultural conservation practices as identified in Table II in the "Agricultural Best Management Practice Systems Catalogue" (dated June 2023) that do not include construction or reconstruction of *impervious area* and do not *alter hydrology from pre- to post-development* conditions.
- Temporary access roads, median crossovers, detour roads, lanes, or other temporary *impervious areas* that will be restored to pre-construction conditions once the *construction activity* is complete (in this context, "temporary" means the *impervious area* will be in place for two years or less)
- Other *construction activities* that do not include the construction or reconstruction of *impervious area*, and do not *alter hydrology from pre- to post-development* conditions, and are not listed in Table 2.

1. If the site is redeveloped in the future, a new eNOI must be submitted.

Table 2
CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A *SWPPP* THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES (SMPS)

The following *construction activities*:

- Single-family home located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix D
- Single-family home that disturbs five (5) or more acres of land
- Single-family residential subdivisions located in one of the watersheds listed in Appendix C or *directly discharging* to one of the 303(d) segments listed in Appendix D
- Single-family residential subdivisions that involve soil disturbances of between one (1) and five (5) acres of land with greater than 25% *impervious cover* at total site build-out
- Single-family residential subdivisions that involve soil disturbances of between 20,000 square feet and one (1) acre of land within the municipal boundaries of NYC with greater than 25% *impervious cover* at total site build-out
- Single-family residential subdivisions that involve soil disturbances of five (5) or more acres of land, and single-family residential subdivisions that involve soil disturbances of less than five (5) acres that are part of a *common plan of development or sale* that will ultimately disturb five (5) or more acres of land
- Multi-family residential developments; includes duplexes, townhomes, condominiums, senior housing complexes, apartment complexes, and mobile home parks
- Creation of 5,000 square feet or more of *impervious area* in the municipal boundaries of NYC
- Airports
- Amusement parks
- Breweries, cideries, and wineries, including establishments constructed on agricultural land
- Campgrounds
- Cemeteries that include the construction or reconstruction of *impervious area* (>5% of disturbed area) or *alter the hydrology from pre- to post-development* conditions
- Commercial developments
- Churches and other places of worship
- Construction of a barn or other *agricultural building* (e.g. silo) that involves soil disturbance greater than five acres.
- Structural agricultural conservation practices as identified in Table II in the “Agricultural Best Management Practice Systems Catalogue” (dated June 2023) that involves soil disturbance greater than five acres and include the construction or reconstruction of *impervious area* or *alter hydrology from pre- to post-development* conditions.
- Facility buildings, including ski lodges, restroom buildings, pumphouses, ski lift terminals, and maintenance and groomer garages
- Institutional development; includes hospitals, prisons, schools and colleges
- Industrial facilities; includes industrial parks
- Landfills; including creation of landfills or capping landfills.
- Municipal facilities; includes highway garages, transfer stations, office buildings, POTWs, water treatment plants, and water storage tanks
- Golf courses
- Office complexes

Table 2 (Continued)

CONSTRUCTION ACTIVITIES THAT REQUIRE THE PREPARATION OF A *SWPPP* THAT INCLUDES POST-CONSTRUCTION STORMWATER MANAGEMENT PRACTICES (SMPS)

The following *construction activities*:

- Permanent laydown yards and equipment storage lots
- Playgrounds that include the construction or reconstruction of *impervious area*
- Sports complexes
- Racetracks; includes racetracks with earthen (dirt) surfaces
- Road construction or reconstruction, outside the municipal boundaries of NYC
- Road construction within the municipal boundaries of NYC
- Stand-alone road reconstruction, within the municipal boundaries of NYC where the total soil disturbance from that road reconstruction involves soil disturbance of one (1) acre or more of land
- Parking lot construction or reconstruction (as with all Table 2 bullets, this includes parking lots constructed as part of the *construction activities* listed in Table 1, unless a Table 1 bullet specifies otherwise)
- Athletic fields (natural grass) that include the construction or reconstruction of *impervious area* (>5% of disturbed area) or *alter the hydrology from pre- to post-development* conditions
- Athletic fields with artificial turf
- Permanent access roads, parking areas, substations, compressor stations, and well drilling pads, surfaced with *impervious cover,* and constructed as part of an overhead electric transmission line, wind-power, cell tower, oil or gas well drilling, sewer or water main, ski lift, or other linear utility project
- Sidewalks, bike paths, or walking paths, surfaced with an *impervious cover*, that are part of a residential, commercial or institutional development
- Sidewalks, bike paths, or walking paths, surfaced with an *impervious cover*, that are part of highway construction or reconstruction
- Solar array field areas on slopes greater than 8% that cannot maintain sheet flow using management practices identified in the BB or the DM
- Solar array field areas on slopes less than 8% that will *alter the hydrology from pre- to post-development* conditions
- Solar array field areas with tables that are not elevated high enough to achieve *final stabilization* beneath the tables
- Traditional *impervious areas* associated with solar development (e.g. roads, buildings, transformers)
- Utility pads surfaced with *impervious cover*, including electric vehicle charging stations
- All other *construction activities* that include the construction or reconstruction of *impervious area* <u>or</u> *alter the hydrology from pre- to post-development* conditions, <u>and</u> are not listed in Table 1

APPENDIX C – Watersheds Requiring Enhanced Phosphorus Removal

Watersheds where *owners or operators* of *construction activities* identified in Table 2 of Appendix B must prepare a *SWPPP* that includes SMPs designed in conformance with the Enhanced Phosphorus Removal Standards included in the DM technical standard.

- Entire New York City Watershed located east of the Hudson River – Figure 1
- Onondaga Lake Watershed – Figure 2
- Greenwood Lake Watershed – Figure 3
- Oscawana Lake Watershed – Figure 4
- Kinderhook Lake Watershed – Figure 5

Figure 1 - New York City Watershed East of the Hudson

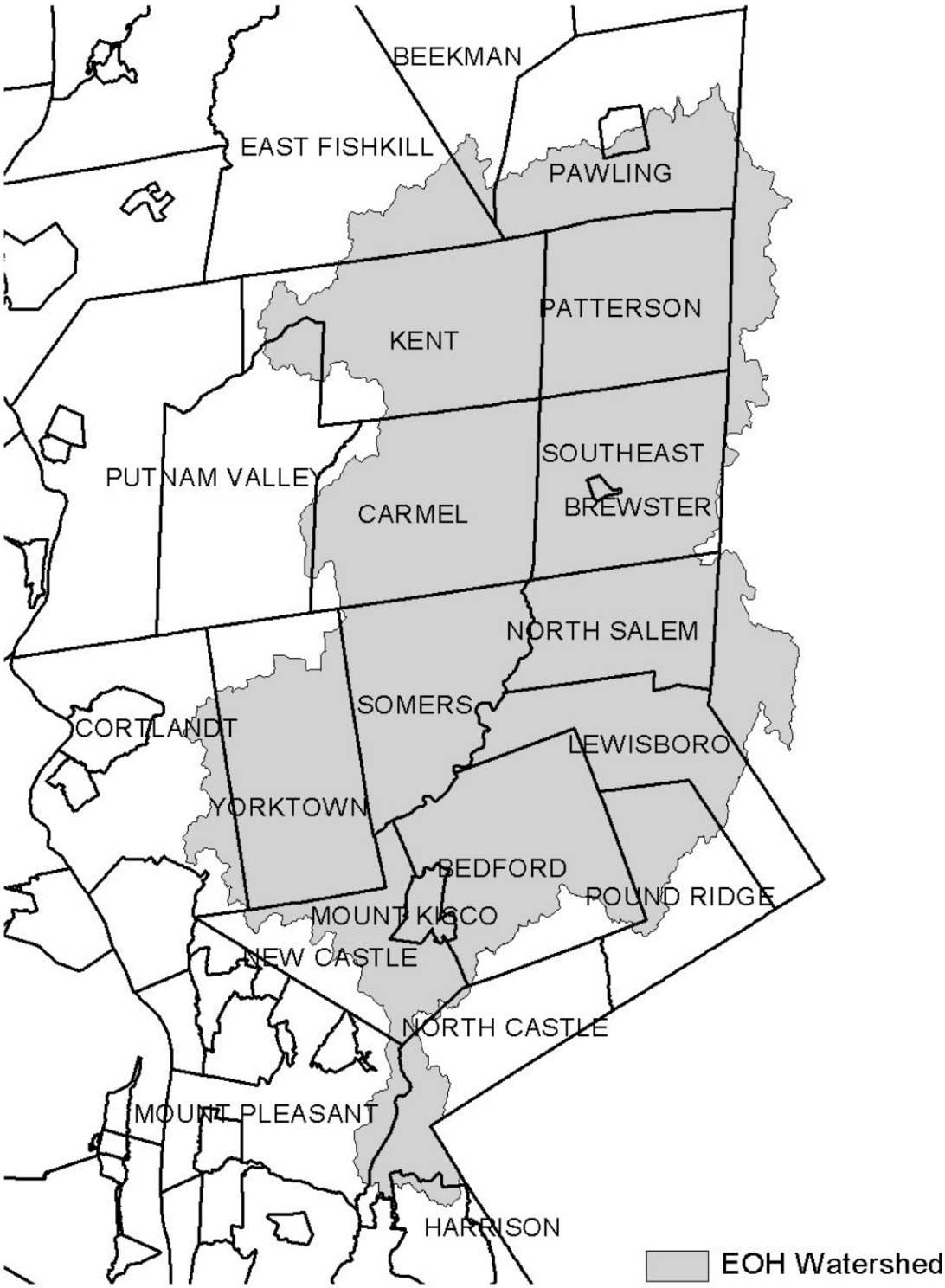


Figure 2 - Onondaga Lake Watershed

Figure 3 - Greenwood Lake Watershed

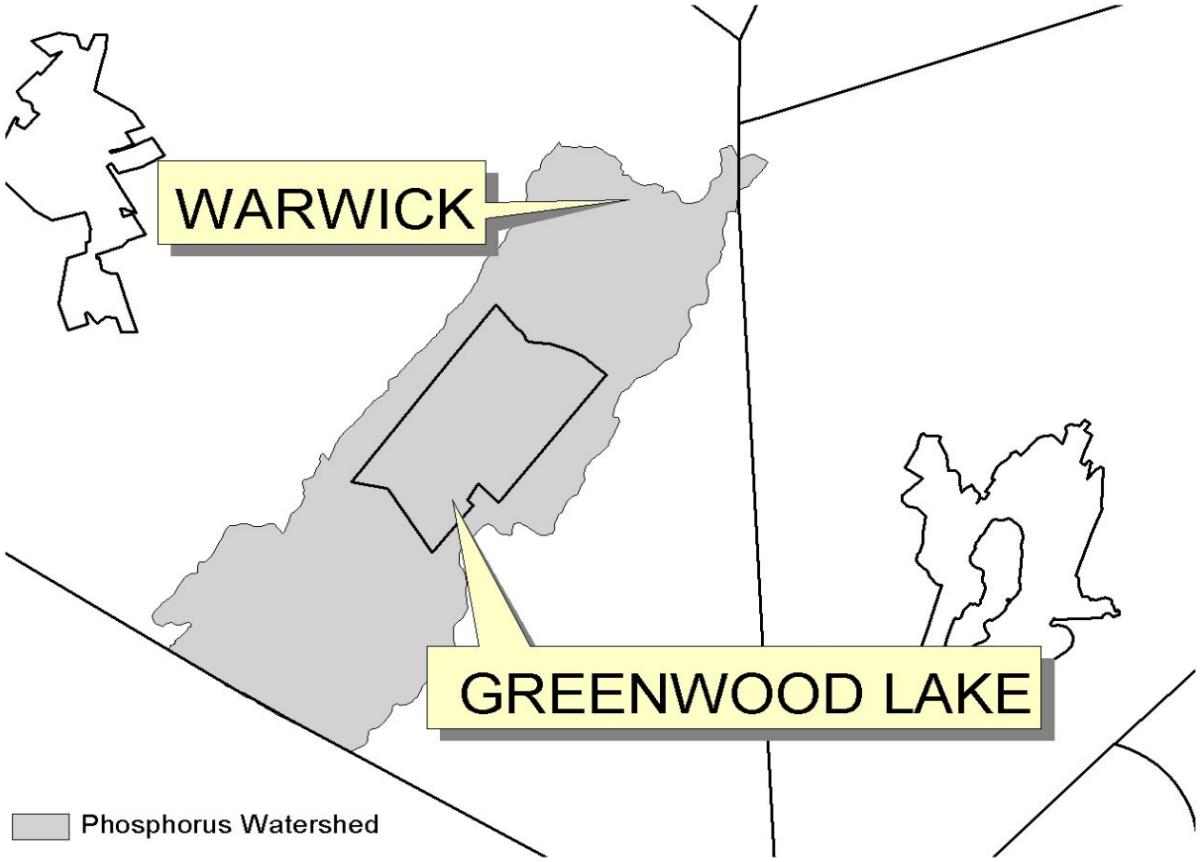


Figure 4 - Oscawana Lake Watershed

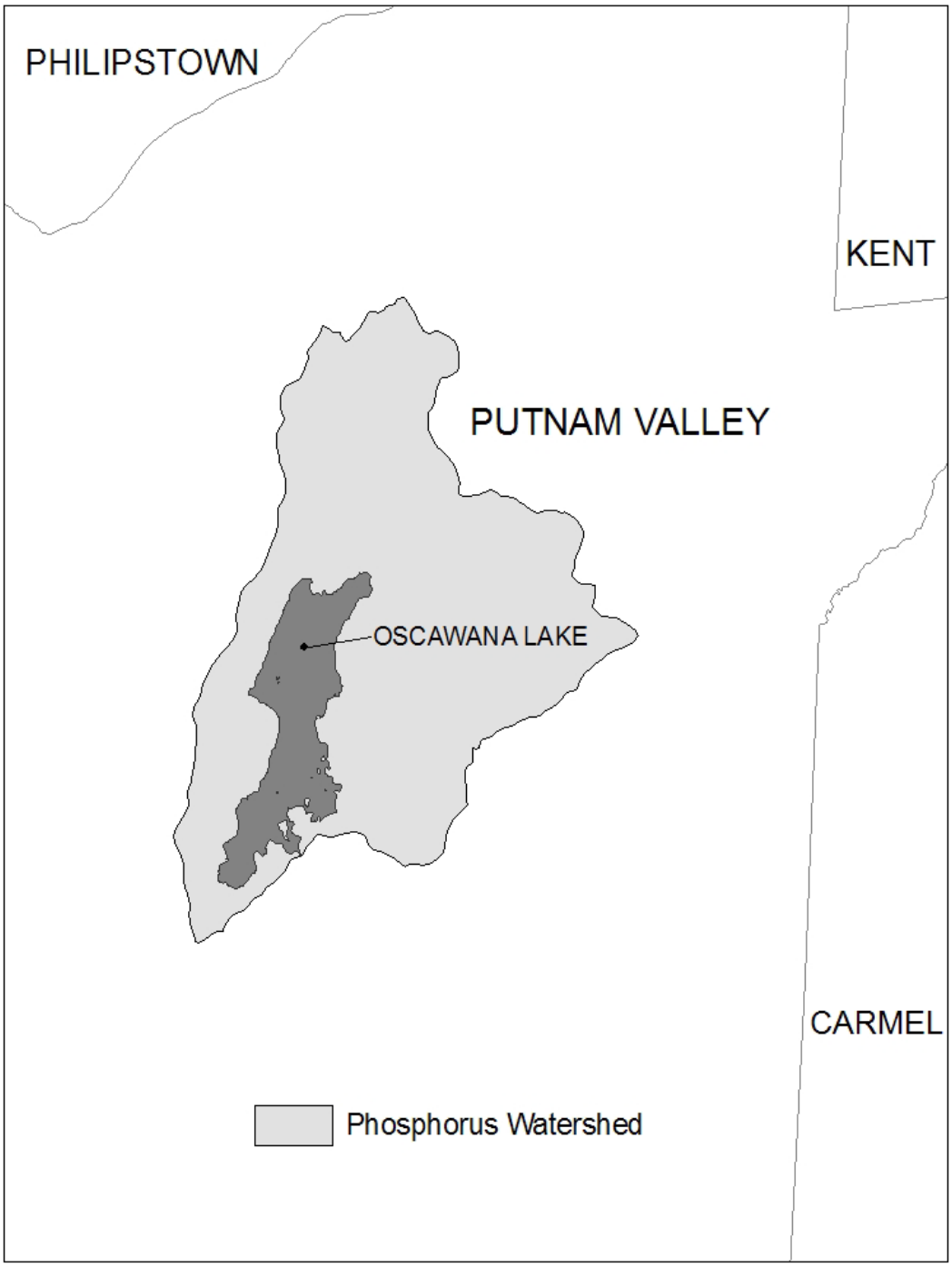
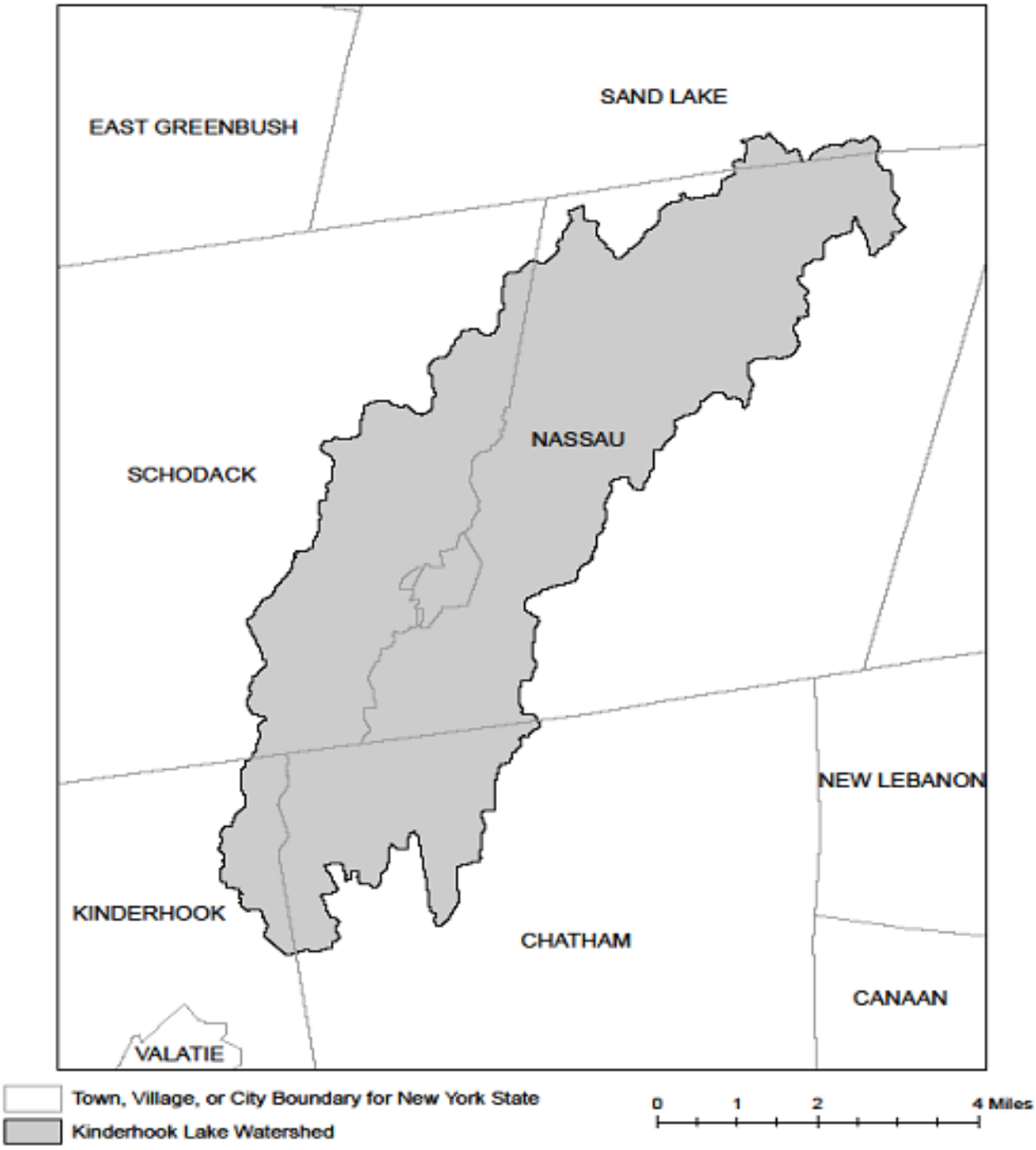


Figure 5 - Kinderhook Lake Watershed



APPENDIX D – Impaired Waterbodies (by Construction Related Pollutants)

List of waterbodies impaired by *pollutants* related to *construction activity*, including turbidity, silt/sediment, and nutrients (e.g. nitrogen, phosphorus). This list is a subset of "The Final New York State 2018 Section 303(d) List of Impaired Waters Requiring a TMDL" dated June 2020.

County	Waterbody	Pollutant
Albany	Ann Lee (Shakers) Pond, Stump Pond (1201-0096)	Phosphorus
Albany	Lawsons Lake (1301-0235)	Phosphorus
Allegany	Amity Lake, Saunders Pond (0403-0054)	Phosphorus
Allegany	Andover Pond (0403-0056)	Phosphorus
Bronx	Reservoir No.1/Lake Isle (1702-0075)	Phosphorus
Bronx	Van Cortlandt Lake (1702-0008)	Phosphorus
Broome	Blueberry, Laurel Lakes (1404-0033)	Phosphorus
Broome	Fly Pond, Deer Lake (1404-0038)	Phosphorus
Broome	Minor Tribs to Lower Susquehanna (0603-0044)	Phosphorus
Broome	Whitney Point Lake/Reservoir (0602-0004)	Phosphorus
Cattaraugus	Allegheny River/Reservoir (0201-0023)	Phosphorus
Cattaraugus	Beaver Lake/Alma Pond (0201-0073)	Phosphorus
Cattaraugus	Case Lake (0201-0020)	Phosphorus
Cattaraugus	Linlyco/Club Pond (0201-0035)	Phosphorus
Cayuga	Duck Lake (0704-0025)	Phosphorus
Cayuga	Owasco Inlet, Upper, and tribs (0706-0014)	Nutrients
Chautauqua	Chadakoin River and tribs (0202-0018)	Phosphorus
Chautauqua	Hulburt/Clymer Pond (0202-0079)	Phosphorus
Chautauqua	Middle Cassadaga Lake (0202-0002)	Phosphorus
Clinton	Great Chazy River, Lower, Main Stem (1002-0001)	Silt/Sediment
Columbia	Robinson Pond (1308-0003)	Phosphorus
Cortland	Dean Pond (0602-0077)	Phosphorus
Dutchess	Fallkill Creek (1301-0087)	Phosphorus
Dutchess	Hillside Lake (1304-0001)	Phosphorus
Dutchess	Wappingers Lake (1305-0001)	Phosphorus
Dutchess	Wappingers Lake (1305-0001)	Silt/Sediment
Erie	Beeman Creek and tribs (0102-0030)	Phosphorus
Erie	Delaware Park Pond (0101-0026)	Phosphorus
Erie	Ellicott Creek, Lower, and tribs (0102-0018)	Phosphorus
Erie	Ellicott Creek, Lower, and tribs (0102-0018)	Silt/Sediment
Erie	Green Lake (0101-0038)	Phosphorus
Erie	Little Sister Creek, Lower, and tribs (0104-0045)	Phosphorus
Erie	Murder Creek, Lower, and tribs (0102-0031)	Phosphorus

Erie	Rush Creek and tribs (0104-0018)	Phosphorus
Erie	Scajaquada Creek, Lower, and tribs (0101-0023)	Phosphorus
Erie	Scajaquada Creek, Middle, and tribs (0101-0033)	Phosphorus
Erie	Scajaquada Creek, Upper, and tribs (0101-0034)	Phosphorus
Erie	South Branch Smoke Cr, Lower, and tribs (0101-0036)	Phosphorus
Erie	South Branch Smoke Cr, Lower, and tribs (0101-0036)	Silt/Sediment
Genesee	Bigelow Creek and tribs (0402-0016)	Phosphorus
Genesee	Black Creek, Middle, and minor tribs (0402 0028)	Phosphorus
Genesee	Black Creek, Upper, and minor tribs (0402-0048)	Phosphorus
Genesee	Bowen Brook and tribs (0102-0036)	Phosphorus
Genesee	LeRoy Reservoir (0402-0003)	Phosphorus
Genesee	Mill Pond (0402-0050)	Phosphorus
Genesee	Oak Orchard Cr, Upper, and tribs (0301-0014)	Phosphorus
Genesee	Oatka Creek, Middle, and minor tribs (0402-0031)	Phosphorus
Genessee	Tonawanda Cr, Middle, Main Stem (0102-0002)	Phosphorus
Greene	Schoharie Reservoir (1202-0012)	Silt/Sediment
Greene	Sleepy Hollow Lake (1301-0059)	Silt/Sediment
Herkimer	Steele Creek tribs (1201-0197)	Phosphorus
Herkimer	Steele Creek tribs (1201-0197)	Silt/Sediment
Kings	Hendrix Creek (1701-0006) 18	Nitrogen
Kings	Prospect Park Lake (1701-0196)	Phosphorus
Lewis	Mill Creek/South Branch, and tribs (0801-0200)	Nutrients
Livingston	Christie Creek and tribs (0402-0060)	Phosphorus
Livingston	Conesus Lake (0402-0004)	Phosphorus
Livingston	Mill Creek and minor tribs (0404-0011)	Silt/Sediment
Monroe	Black Creek, Lower, and minor tribs (0402-0033)	Phosphorus
Monroe	Buck Pond (0301-0017)	Phosphorus
Monroe	Cranberry Pond (0301-0016)	Phosphorus
Monroe	Durand, Eastman Lakes (0302-0037)	Phosphorus
Monroe	Lake Ontario Shoreline, Western (0301-0069) 9	Phosphorus
Monroe	Long Pond (0301-0015)	Phosphorus
Monroe	Mill Creek and tribs (0302-0025)	Phosphorus 2
Monroe	Mill Creek/Blue Pond Outlet and tribs (0402-0049)	Phosphorus
Monroe	Minor Tribs to Irondequoit Bay (0302-0038)	Phosphorus
Monroe	Rochester Embayment - East (0302-0002) [9]	Phosphorus
Monroe	Rochester Embayment - West (0301-0068) 9	Phosphorus
Monroe	Shipbuilders Creek and tribs (0302-0026)	Phosphorus 2
Monroe	Thomas Creek/White Brook and tribs (0302-0023)	Phosphorus

Nassau	Bannister Creek/Bay (1701-0380)	Nitrogen
Nassau	Beaver Lake (1702-0152)	Phosphorus
Nassau	Browswere Bay (1701-0383)	Nitrogen
Nassau	Camaans Pond (1701-0052)	Phosphorus
Nassau	East Meadow Brook, Upper, and tribs (1701-0211)	Silt/Sediment
Nassau	East Rockaway Channel (1701-0381)	Nitrogen
Nassau	Glen Cove Creek, Lower, and tribs (1702-0146)	Silt/Sediment
Nassau	Grant Park Pond (1701-0054)	Phosphorus
Nassau	Hempstead Bay, Broad Channel (1701-0032)	Nitrogen
Nassau	Hempstead Lake (1701-0015)	Phosphorus
Nassau	Hewlett Bay (1701-0382)	Nitrogen
Nassau	Hog Island Channel (1701-0220)	Nitrogen
Nassau	Massapequa Creek, Upper, and tribs (1701-0174)	Phosphorus
Nassau	Milburn/Parsonage Creeks, Upp, and tribs (1701-0212)	Phosphorus
Nassau	Reynolds Channel, East (1701-0215) [12]	Nitrogen
Nassau	Reynolds Channel, West (1701-0216) 12	Nitrogen
Nassau	Tidal Tribs to Hempstead Bay (1701-0218)	Nitrogen
Nassau	Tribs (fresh) to East Bay (1701-0204)	Silt/Sediment
Nassau	Tribs (fresh) to East Bay (1701-0204)	Phosphorus
Nassau	Tribs to Smith Pond/Halls Pond (1701-0221)	Phosphorus
Nassau	Woodmere Channel (1701-0219)	Nitrogen
New York	Harlem Meer (1702-0103)	Phosphorus
New York	The Lake in Central Park (1702-0105)	Phosphorus
Niagara	Bergholtz Creek and tribs (0101-0004)	Phosphorus
Niagara	Hyde Park Lake (0101-0030)	Phosphorus
Niagara	Lake Ontario Shoreline, Western (0301-0053) 9	Phosphorus
Niagara	Lake Ontario Shoreline, Western (0301-0072) 9	Phosphorus
Oneida	Ballou, Nail Creeks (1201-0203)	Phosphorus
Onondaga	Ley Creek and tribs (0702-0001) 10	Nutrients (phosphorus)
Onondaga	Minor Tribs to Onondaga Lake (0702-0022) 10	Nutrients (phosphorus)
Onondaga	Minor Tribs to Onondaga Lake (0702-0022) 10	Nitrogen (NH3, NO2)
Onondaga	Onondaga Creek, Lower (0702-0023) 10	Nutrients (phosphorus)
Onondaga	Onondaga Creek, Lower, and tribs (0702-0023)	Turbidity
Onondaga	Onondaga Creek, Middle, and tribs (0702-0004)	Turbidity
Onondaga	Onondaga Creek, Upper, and tribs (0702-0024)	Turbidity
Ontario	Great Brook and minor tribs (0704-0034)	Phosphorus 2
Ontario	Great Brook and minor tribs (0704-0034)	Silt/Sediment

Ontario	Hemlock Lake Outlet and minor tribs (0402-0013)	Phosphorus
Ontario	Honeoye Lake (0402-0032)	Phosphorus
Orange	Brown Pond Reservoir (1303-0013)	Phosphorus
Orange	Lake Washington (1303-0012)	Phosphorus
Orange	Minor Tribs to Middle Wallkill (1306-0061)	Phosphorus
Orange	Monhagen Brook and tribs (1306-0074)	Phosphorus
Orange	Orange Lake (1301-0008) [16]	Phosphorus
Orange	Quaker Creek and tribs (1306-0025)	Phosphorus
Orange	Wallkill River, Middle, Main Stem (1306-0038)	Phosphorus
Orange	Wallkill River, Upper, and Minor tribs (1306-0017)	Phosphorus
Orleans	Glenvwood Lake (0301-0041)	Phosphorus
Orleans	Lake Ontario Shoreline, Western (0301-0070) 9	Phosphorus
Orleans	Lake Ontario Shoreline, Western (0301-0071) 9	Phosphorus
Oswego	Lake Neatahwanta (0701-0018)	Nutrients (phosphorus)
Oswego	Pleasant Lake (0703-0047)	Phosphorus
Putnam	Lost Lake, Putnam Lake (1302-0053)	Phosphorus
Putnam	Minor Tribs to Croton Falls Reservoir (1302-0001)	Phosphorus
Queens	Bergen Basin (1701-0009) 18	Nitrogen
Queens	Jamaica Bay, Eastern, and tribs, Queens (1701-0005) 18	Nitrogen
Queens	Kissena Lake (1702-0258)	Phosphorus
Queens	Meadow Lake (1702-0030)	Phosphorus
Queens	Shellbank Basin (1701-0001) 18	Nitrogen
Queens	Willow Lake (1702-0031)	Phosphorus
Rensselaer	Nassau Lake (1310-0001)	Phosphorus
Rensselaer	Snyders Lake (1301-0043)	Phosphorus
Richmond	Grassmere Lake/Bradys Pond (1701-0357)	Phosphorus
Rockland	Congers Lake, Swartout Lake (1501-0019)	Phosphorus
Rockland	Rockland Lake (1501-0021)	Phosphorus
Saratoga	Ballston Lake (1101-0036)	Phosphorus
Saratoga	Dwaas Kill and tribs (1101-0007)	Phosphorus
Saratoga	Dwaas Kill and tribs (1101-0007)	Silt/Sediment
Saratoga	Lake Lonely (1101-0034)	Phosphorus
Saratoga	Round Lake (1101-0060)	Phosphorus
Saratoga	Tribs to Lake Lonely (1101-0001)	Phosphorus
Schenectady	Collins Lake (1201-0077)	Phosphorus
Schenectady	Duane Lake (1311-0006)	Phosphorus
Schenectady Lake	Mariaville Lake (1201-0113)	Phosphorus
Schuyler	Cayuta Lake (0603-0005)	Phosphorus

Seneca	Reeder Creek and tribs (0705-0074)	Phosphorus
St.Lawrence	Black Lake Outlet, Black Lake (0906-0001)	Phosphorus
St.Lawrence	Fish Creek and minor tribs (0906-0026)	Phosphorus
Steuben	Smith Pond (0502-0012)	Phosphorus
Suffolk	Agawam Lake (1701-0117)	Phosphorus
Suffolk	Big/Little Fresh Ponds (1701-0125)	Phosphorus
Suffolk	Canaan Lake (1701-0018)	Phosphorus
Suffolk	Canaan Lake (1701-0018)	Silt/Sediment
Suffolk	Fresh Pond (1701-0241)	Phosphorus
Suffolk	Great South Bay, East (1701-0039)	Nitrogen
Suffolk	Great South Bay, Middle (1701-0040)	Nitrogen
Suffolk	Great South Bay, West (1701-0173)	Nitrogen
Suffolk	Lake Ronkonkoma (1701-0020)	Phosphorus
Suffolk	Mattituck/Marratooka Pond (1701-0129)	Phosphorus
Suffolk	Mill and Seven Ponds (1701-0113)	Phosphorus
Suffolk	Millers Pond (1702-0013)	Phosphorus
Suffolk	Moriches Bay, East (1701-0305)	Nitrogen
Suffolk	Moriches Bay, West (1701-0038)	Nitrogen
Suffolk	Quantuck Bay (1701-0042)	Nitrogen
Suffolk	Shinnecock Bay and Inlet (1701-0033)	Nitrogen
Suffolk	Tidal Tribs to West Moriches Bay (1701-0312)	Nitrogen
Sullivan	Bodine, Mongomery Lakes (1401-0091)	Phosphorus
Sullivan	Davies Lake (1402-0047)	Phosphorus
Sullivan	Evens Lake (1402-0004)	Phosphorus
Sullivan	Pleasure Lake (1402-0055)	Phosphorus
Sullivan	Swan Lake (1401-0063)	Phosphorus
Tompkins	Cayuga Lake, Southern End (0705-0040)	Phosphorus
Tompkins	Cayuga Lake, Southern End (0705-0040)	Silt/Sediment
Ulster	Ashokan Reservoir (1307-0004)	Silt/Sediment
Ulster	Esopus Creek, Lower, Main Stem (1307-0010) [17]	Turbidity
Ulster	Esopus Creek, Middle, Main Stem (1307-0003) 17	Turbidity
Ulster	Esopus Creek, Upper, and minor tribs (1307-0007)[3]	Silt/Sediment
Ulster	Wallkill River, Lower, Main Stem (1306-0027)	Phosphorus
Warren	Hague Brook and tribs (1006-0006)	Silt/Sediment
Warren	Huddle/Finkle Brooks and tribs (1006-0003)	Silt/Sediment
Warren	Indian Brook and tribs (1006-0002)	Silt/Sediment
Warren	Lake George (1006-0016) and tribs	Silt/Sediment
Warren	Tribs to Lake George, East Shore (1006-0020)	Silt/Sediment
Warren	Tribs to Lake George, Lk.George Village (1006-0008)	Silt/Sediment

Washington	Wood Cr/Champlain Canal and tribs (1005-0036)	Phosphorus
Westchester	Lake Katonah (1302-0136)	Phosphorus
Westchester	Lake Lincolndale (1302-0089)	Phosphorus
Westchester	Lake Meahagh (1301-0053)	Phosphorus
Westchester	Lake Mohegan (1301-0149)	Phosphorus
Westchester	Lake Shenorock (1302-0083)	Phosphorus
Westchester	Mamaroneck River, Lower (1702-0071)	Silt/Sediment
Westchester	Mamaroneck River, Upp, & minor tribs (1702-0123)	Silt/Sediment
Westchester	Saw Mill River (1301-0007)	Phosphorus
Westchester	Saw Mill River, Middle, and tribs (1301-0100)	Phosphorus
Westchester	Sheldrake River (1702-0069)	Phosphorus
Westchester	Sheldrake River (1702-0069)	Silt/Sedimnt
Westchester	Silver Lake (1702-0040)	Phosphorus
Westchester	Teatown Lake (1302-0150)	Phosphorus
Westchester	Truesdale Lake (1302-0054)	Phosphorus
Westchester	Wallace Pond (1301-0140)	Phosphorus

APPENDIX E – List of NYSDEC Regional Offices

Region	Covering the following counties:	DIVISION OF ENVIRONMENTAL PERMITS (DEP) Permit Administrators	DIVISION OF WATER (DOW) Water (SPDES) Program
1	Nassau and Suffolk	50 Circle Road Stony Brook, NY 11790 Tel. (631) 444-0365	50 Circle Road Stony Brook, NY 11790-3409 Tel. (631) 444-0405
2	Bronx, Kings, New York, Queens and Richmond	1 Hunters Point Plaza, 47-40 21st St. Long Island City, NY 11101-5407 Tel. (718) 482-4997	1 Hunters Point Plaza, 47-40 21st St. Long Island City, NY 11101-5407 Tel. (718) 482-4933
3	Dutchess, Orange, Putnam, Rockland, Sullivan, Ulster and Westchester	21 South Putt Corners Road New Paltz, NY 12561-1696 Tel. (845) 256-3059	220 White Plains Road, Suite 110 Tel. (914) 428 - 2505
4	Albany, Columbia, Delaware, Greene, Montgomery, Otsego, Rensselaer, Schenectady and Schoharie	1130 North Westcott Road Schenectady, NY 12306-2014 Tel. (518) 357-2069	1130 North Westcott Road Schenectady, NY 12306-2014 Tel. (518) 357-2045
5	Clinton, Essex, Franklin, Fulton, Hamilton, Saratoga, Warren and Washington	1115 State Route 86, Po Box 296 Ray Brook, NY 12977-0296 Tel. (518) 897-1234	232 Golf Course Road Warrensburg, NY 12885-1172 Tel. (518) 623-1200
6	HERKIMER, JEFFERSON, LEWIS, ONEIDA AND ST. LAWRENCE	STATE OFFICE BUILDING 317 WASHINGTON STREET WATERTOWN, NY 13601-3787 TEL. (315) 785-2245	STATE OFFICE BUILDING 207 GENESEE STREET UTICA, NY 13501-2885 TEL. (315) 793-2554
7	BROOME, CAYUGA, CHENANGO, CORTLAND, MADISON, ONONDAGA, OSWEGO, TIOGA AND TOMPKINS	5786 WIDEWATERS PARKWAY SYRACUSE, NY 13214-1867 TEL. (315) 426-7438	5786 WIDEWATERS PARKWAY SYRACUSE, NY 13214-1867 TEL. (315) 426-7500
8	CHEMUNG, GENESEE, LIVINGSTON, MONROE, ONTARIO, ORLEANS, SCHUYLER, SENECA, STEUBEN, WAYNE AND YATES	6274 EAST AVON-LIMA ROADAVON, NY 14414-9519 TEL. (585) 226-2466	6274 EAST AVON-LIMA RD. AVON, NY 14414-9519 TEL. (585) 226-2466
9	ALLEGANY, CATTARAUGUS, CHAUTAUQUA, ERIE, NIAGARA AND WYOMING	700 DELAWARE AVENUE BUFFALO, NY 14209-2999 TEL. (716) 851-7165	700 DELAWARE AVENUE BUFFALO, NY 14209-2999 TEL. (716) 851-7070

APPENDIX F – SWPPP Preparer Certification Form

The SWPPP Preparer Certification Form required by this permit begins on the following page.

SWPPP Preparer Certification Form

SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-25-001 (CGP)

(In accordance with CGP Part I.D.2.b., the completed form must be attached to the eNOI and submitted to NYSDEC electronically.)

Project/Site Name:

eNOI Submission ID:

Owner/Operator Name:

Certification Statement – SWPPP Preparer

I hereby certify that the Stormwater Pollution Prevention Plan (SWPPP) has been prepared in accordance with the requirements of GP-0-25-001. I certify under penalty of law that the SWPPP and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

SWPPP Preparer First Name MI SWPPP Preparer Last Name

Signature Date

APPENDIX G – MS4 SWPPP Acceptance Form

The MS4 SWPPP Acceptance Form required by this permit begins on the following page.

MS4 SWPPP Acceptance Form

for construction activities seeking authorization under the

SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-25-001 (CGP)

(In accordance with CGP Part I.D.2.b., the completed form must be attached to the eNOI and submitted to NYSDEC electronically.)

I. Project Owner/Operator Information
1. Owner/Operator Name:
2. Contact Person:
3. Street Address:
4. City/State/Zip:
II. Project Site Information
5. Project/Site Name:
6. Street Address:
7. City/State/Zip:
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance Information
8. SWPPP Reviewed by:
9. Title/Position:
10. Date Final SWPPP Reviewed and Accepted:
IV. Regulated MS4 Information
11. Name of MS4 Operator:
12. MS4 SPDES Permit Identification Number: NYR20A
13. Street Address:
14. City/State/Zip:
15. Telephone Number:

MS4 SWPPP Acceptance Form - continued

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in section II. of this form has been reviewed and meets the substantive requirements in the SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-25-001 (CGP). Note: The MS4 Operator, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 Operator does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name[1]:

Title/Position:

Signature:

Date:

VI. Additional Information

[1] Printed name of the principal executive officer or ranking elected official for the MS4 Operator or their duly authorized representative in accordance with CGP Part VII.J.2.

APPENDIX H – NYCDEP SWPPP Acceptance/Approval Form

The City of New York Department of Environmental Protection (NYCDEP) SWPPP Acceptance/Approval form required by this permit begins on the following page.

THE CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
Bureau of Environmental Planning and Analysis
59-17 Junction Blvd., 9th Floor; Flushing, NY 11373

SWPPP Acceptance/Approval

Application Number:

I. Project Owner/Operator Information
1. Owner/Operator Name:
2. Contact Person:
3. Street Address:
4. City/State/Zip:
II. Project Site Information
5. Project/Site Name:
6. Street Address:
7. City/State/Zip:
III. Stormwater Pollution Prevention Plan (SWPPP) Review and Acceptance/Approval
8. SWPPP Reviewed by:
9. Title/Position: /
10. Date Final SWPPP Reviewed and Accepted:
11. Acceptance/Approval Expiration Date:
IV. Regulated MS4 Information for projects that require coverage under the NY State Pollution Discharge Elimination System General Permit for Stormwater Discharges from Construction Activity
12. Name of MS4: *CITY OF NEW YORK*
13. MS4 SPDES Permit Identification Number: *NY-0287890*
14. Contact Person:
15. Street Address: *59-17 Junction Blvd. 9th Floor*
16. City/State/Zip: *Flushing, NY 11373*
17. Telephone Number:

Projects in the MS4 area must submit a copy of this SWPPP Acceptance with a Notice of Intent for coverage under the NY SPDES General Permit for Stormwater Discharges from Construction Activity to: NYS Department of Environmental Conservation, Division of Water; 625 Broadway, 4th Floor; Albany, New York 12233-3505.

V. Certification Statement - MS4 Official (principal executive officer or ranking elected official) or Duly Authorized Representative

I hereby certify that the final Stormwater Pollution Prevention Plan (SWPPP) for the construction project identified in question 5 has been reviewed and meets the substantive requirements in the SPDES General Permit For Stormwater Discharges from Municipal Separate Storm Sewer Systems (MS4s).

Note: The MS4, through the acceptance of the SWPPP, assumes no responsibility for the accuracy and adequacy of the design included in the SWPPP. In addition, review and acceptance of the SWPPP by the MS4 does not relieve the owner/operator or their SWPPP preparer of responsibility or liability for errors or omissions in the plan.

Printed Name:

Title/Position:

Signature:

Date:

VI. Conditions of Acceptance/Approval and Additional Information

Projects in the MS4 area must submit a copy of this SWPPP Acceptance with a Notice of Intent for coverage under the NY SPDES General Permit for Stormwater Discharges from Construction Activity to: NYS Department of Environmental Conservation, Division of Water; 625 Broadway, 4th Floor; Albany, New York 12233-3505.

APPENDIX I – MS4 No Jurisdiction Form

The MS4 No Jurisdiction Form required by this permit begins on the following page.

MS4 No Jurisdiction Form

for construction activities seeking authorization under the

SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-25-001 (CGP)

(In accordance with CGP Part I.D.2.b., the completed form must be attached to the eNOI and submitted to NYSDEC electronically.)

I. Project Owner/Operator Information

a. Owner/Operator Name:

b. Contact Person:

c. Street Address:

d. City/State/Zip:

II. Project Site Information

a. Project/Site Name:

b. Street Address:

c. City/State/Zip:

d. eNOI Submission ID:

III. Traditional Land Use Control MS4 Operator Information

a. Name of MS4 Operator:

b. MS4 SPDES Permit ID Number: NYR20A

c. Street Address:

d. City/State/Zip:

e. Telephone Number:

IV. Certification Statement

In accordance with CGP Part I.D.2.b.ii.3., I hereby certify that the Traditional Land Use Control MS4 Operator identified in section III. of this form does not have review authority over the construction project identified in section II. of this form, which is owned/operated by the entity identified in section I. of this form. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

a. Printed name of the principal executive officer or ranking elected official for the MS4 Operator or their duly authorized representative in accordance with CGP Part VII.J.2.:

b. Title/Position:

c. Signature:

d. Date:

APPENDIX J – Owner/Operator Certification Form

The Owner/Operator Certification Form required by this permit begins on the following page.

Owner/Operator Certification Form

SPDES General Permit for Stormwater Discharges from Construction Activity, GP-0-25-001 (CGP)

(In accordance with CGP Part I.D.2.b. or Part I.F.2. and 3., the completed form must be attached to the eNOI or the Request to Continue Coverage, and submitted to NYSDEC electronically.

Project/Site Name: _____

eNOI Submission ID: _____

eNOI Submitted by: **Owner/Operator** **SWPPP Preparer** **Other**

Certification Statement - Owner/Operator

I hereby certify that I read, and will comply with, the GP-0-25-001 permit requirements. I understand that authorization to discharge under the permit for the project/site named above is dependent on receipt of a Letter of Authorization (LOA) or a Letter of Continued Coverage (LOCC) from the New York State Department of Environmental Conservation (NYSDEC) in accordance with CGP Part I.D.3.b. or Part I.F.4. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Owner/Operator First Name MI Owner/Operator Last Name

_____

Signature

_____

Date

Revised: January 2025

APPENDIX 2

MS4 SWPPP ACCEPTANCE FORM

ELECTRONIC NOTICE OF INTENT FORM (eNOI)

1. **MS4 ACCEPTANCE FORM**

   The MS4 Acceptance form will be available when received from the New York State Department of Environmental Consevation.

2. **CONSTRUCTION GENERAL PERMIT ELECTRONIC NOTICE OF INTENT (CGP eNOI)**

   The CGP eNOI is available to submit following the instructions at:

   https://dec.ny.gov/environmental-protection/water/water-quality/stormwater/construction-activity-permit

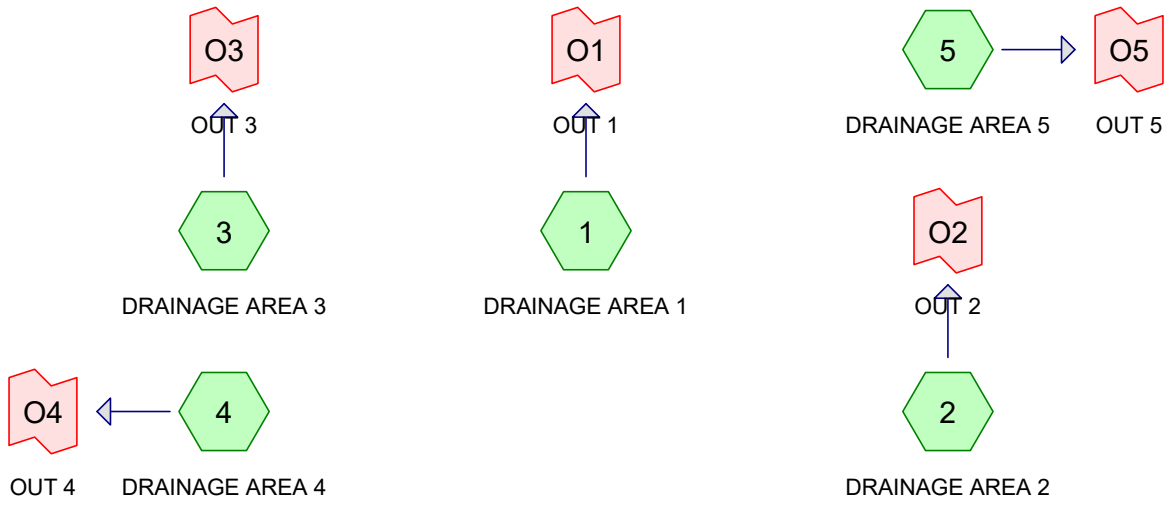
   The form will be available after submission.

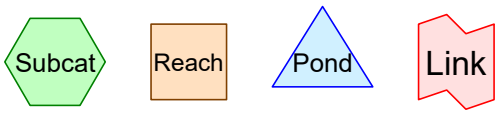
APPENDIX 3

SOIL TYPE DESCRIPTIONS

APPENDIX 4

PRE-DEVELOPMENT HYDROLOGIC ANALYSIS





Routing Diagram for SOLOHS-PRE
Prepared by {enter your company name here}, Printed 8/28/2026
HydroCAD® 10.00-26 s/n 02036 © 2020 HydroCAD Software Solutions LLC

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: DRAINAGE AREA 1 Runoff Area=2,283,420 sf 0.00% Impervious Runoff Depth=0.69"
Flow Length=2,736' Tc=26.9 min CN=73 Runoff=20.35 cfs 3.016 af

Subcatchment 2: DRAINAGE AREA 2 Runoff Area=1,247,550 sf 0.00% Impervious Runoff Depth=0.93"
Flow Length=825' Tc=30.1 min CN=78 Runoff=15.40 cfs 2.229 af

Subcatchment 3: DRAINAGE AREA 3 Runoff Area=663,807 sf 0.00% Impervious Runoff Depth=0.69"
Flow Length=590' Tc=19.9 min CN=73 Runoff=6.98 cfs 0.877 af

Subcatchment 4: DRAINAGE AREA 4 Runoff Area=272,371 sf 0.00% Impervious Runoff Depth=0.69"
Flow Length=376' Tc=15.4 min CN=73 Runoff=3.25 cfs 0.360 af

Subcatchment 5: DRAINAGE AREA 5 Runoff Area=69,632 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=340' Tc=16.6 min CN=62 Runoff=0.16 cfs 0.039 af

Link O1: OUT 1 Inflow=20.35 cfs 3.016 af
Primary=20.35 cfs 3.016 af

Link O2: OUT 2 Inflow=15.40 cfs 2.229 af
Primary=15.40 cfs 2.229 af

Link O3: OUT 3 Inflow=6.98 cfs 0.877 af
Primary=6.98 cfs 0.877 af

Link O4: OUT 4 Inflow=3.25 cfs 0.360 af
Primary=3.25 cfs 0.360 af

Link O5: OUT 5 Inflow=0.16 cfs 0.039 af
Primary=0.16 cfs 0.039 af

Total Runoff Area = 104.150 ac Runoff Volume = 6.521 af Average Runoff Depth = 0.75"
100.00% Pervious = 104.150 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1: DRAINAGE AREA 1

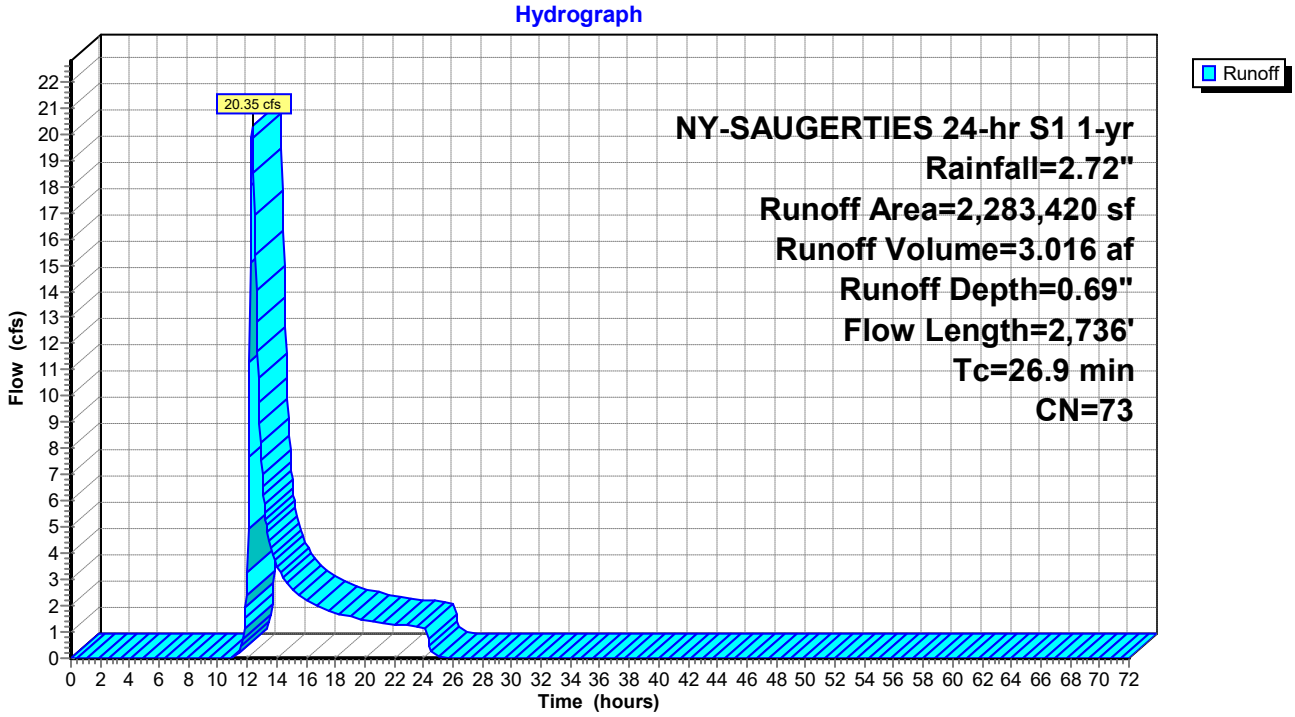
Runoff = 20.35 cfs @ 12.35 hrs, Volume= 3.016 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

Area (sf)	CN	Description
165,953	36	Woods, Fair, HSG A
26,975	60	Woods, Fair, HSG B
870,524	73	Woods, Fair, HSG C
1,219,968	79	Woods, Fair, HSG D
2,283,420	73	Weighted Average
2,283,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	100	0.0750	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.1	533	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
9.5	2,103	0.0600	3.67		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
26.9	2,736	Total			

Subcatchment 1: DRAINAGE AREA 1



Summary for Subcatchment 2: DRAINAGE AREA 2

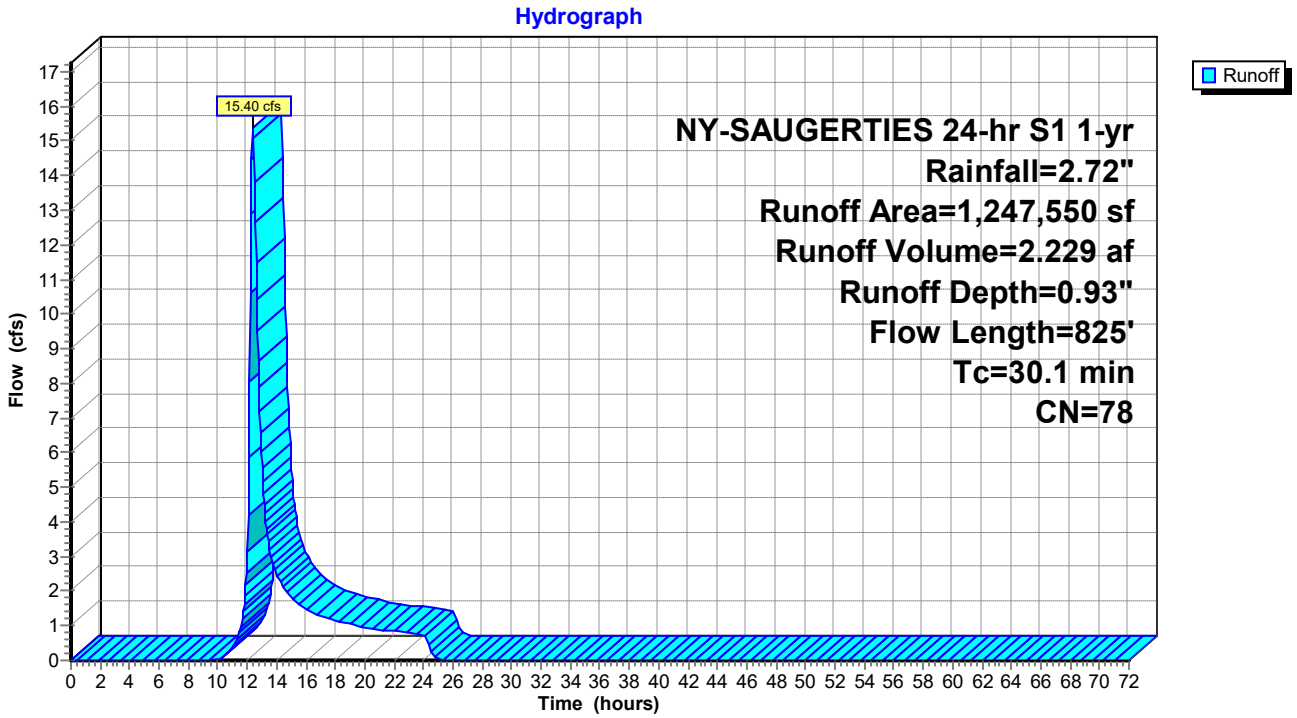
Runoff = 15.40 cfs @ 12.38 hrs, Volume= 2.229 af, Depth= 0.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

Area (sf)	CN	Description
5,625	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
73,172	73	Woods, Fair, HSG C
1,168,753	79	Woods, Fair, HSG D
1,247,550	78	Weighted Average
1,247,550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
15.6	725	0.0240	0.77		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
30.1	825	Total			

Subcatchment 2: DRAINAGE AREA 2



Summary for Subcatchment 3: DRAINAGE AREA 3

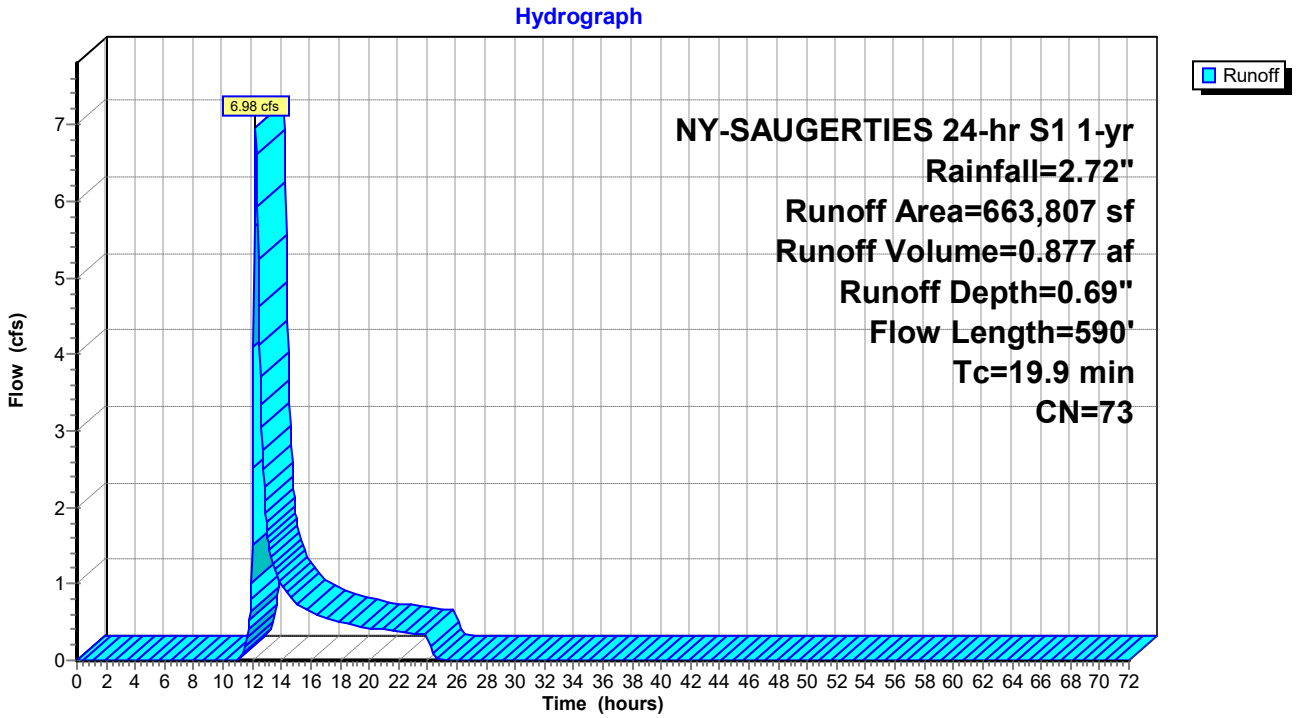
Runoff = 6.98 cfs @ 12.25 hrs, Volume= 0.877 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
663,807	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
663,807	73	Weighted Average
663,807		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.4	490	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	590	Total			

Subcatchment 3: DRAINAGE AREA 3



Summary for Subcatchment 4: DRAINAGE AREA 4

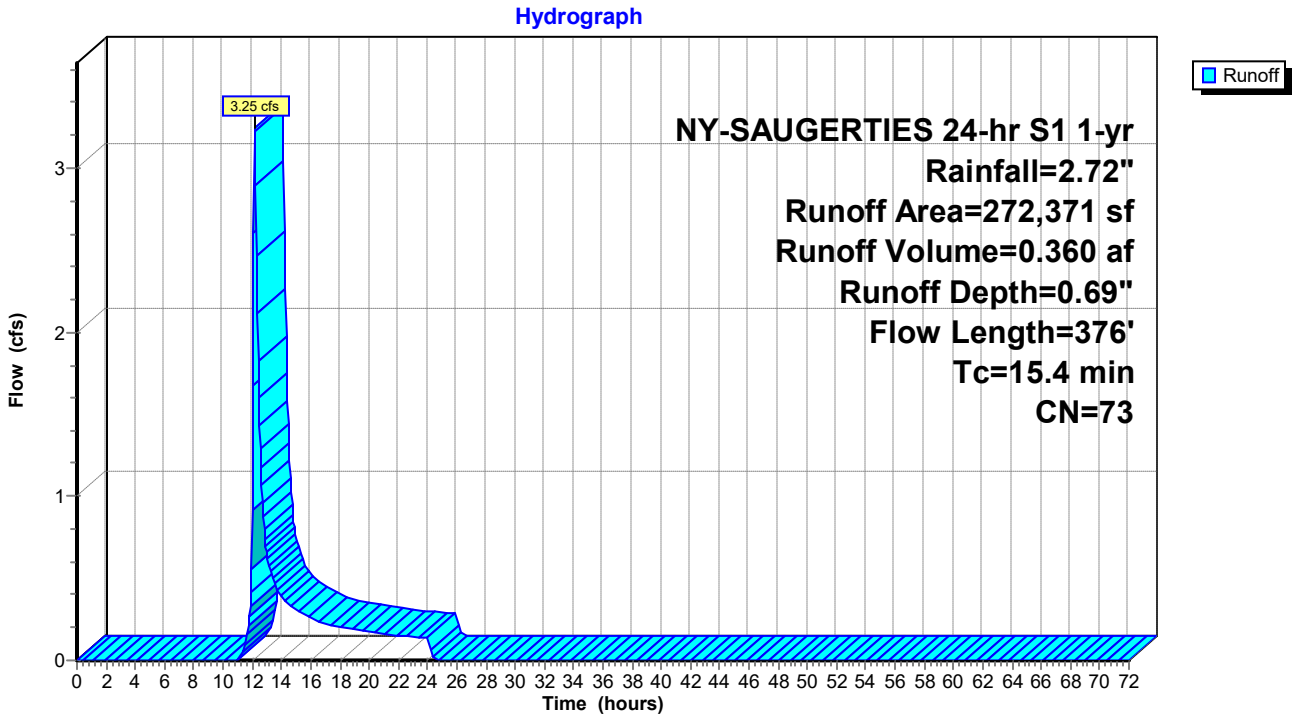
Runoff = 3.25 cfs @ 12.18 hrs, Volume= 0.360 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
272,371	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
272,371	73	Weighted Average
272,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0700	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.7	276	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.4	376	Total			

Subcatchment 4: DRAINAGE AREA 4



Summary for Subcatchment 5: DRAINAGE AREA 5

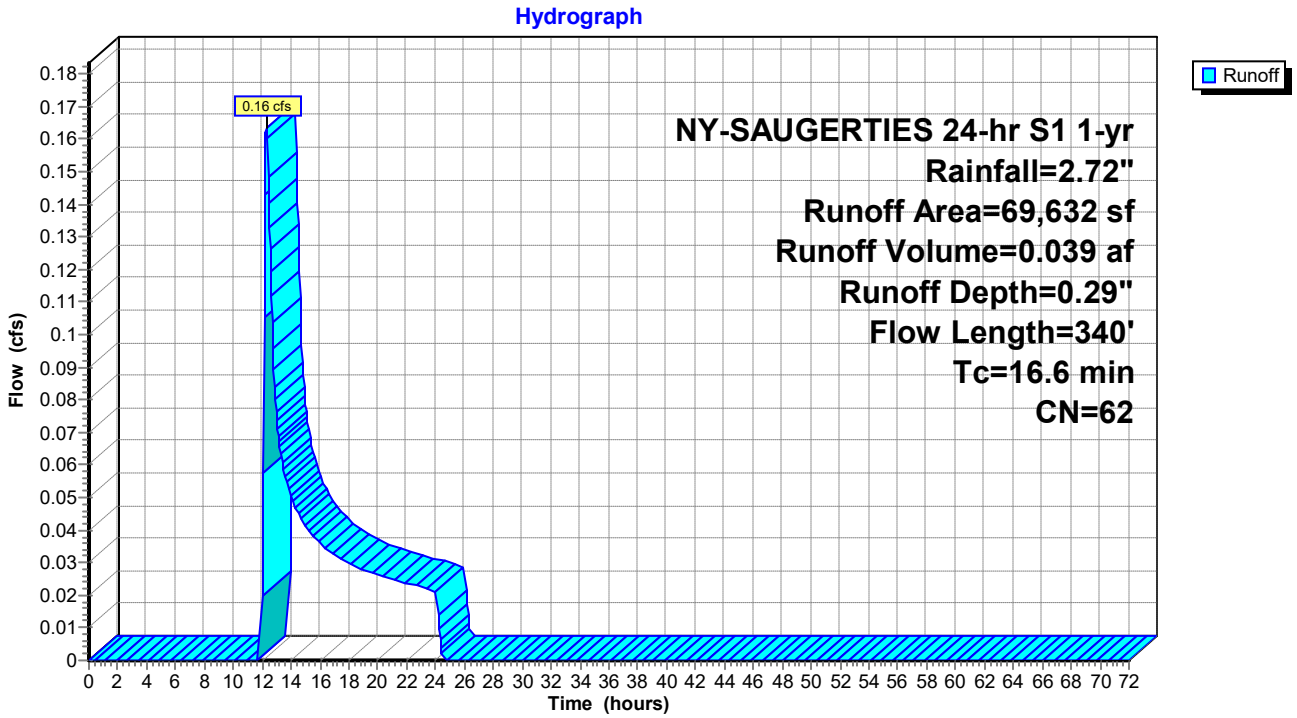
Runoff = 0.16 cfs @ 12.28 hrs, Volume= 0.039 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

Area (sf)	CN	Description
27,631	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
42,001	79	Woods, Fair, HSG D
69,632	62	Weighted Average
69,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0540	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.6	240	0.0930	1.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.6	340	Total			

Subcatchment 5: DRAINAGE AREA 5

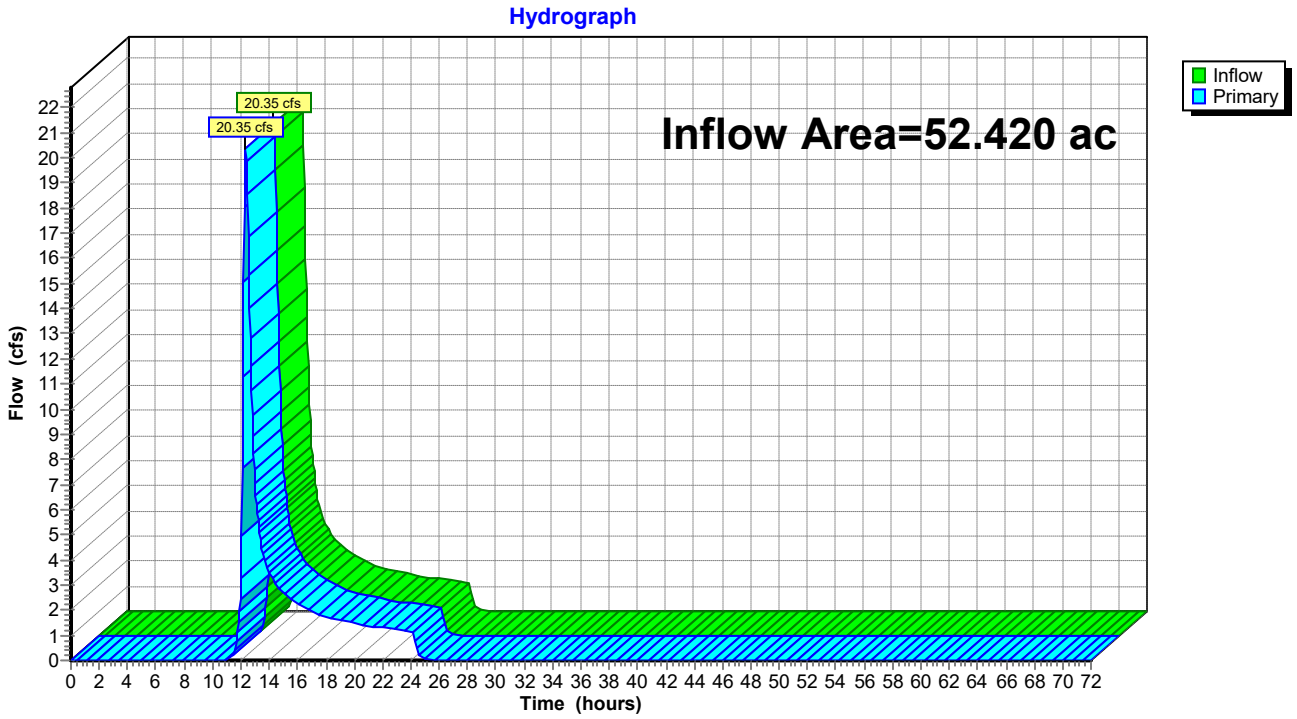


Summary for Link O1: OUT 1

Inflow Area = 52.420 ac, 0.00% Impervious, Inflow Depth = 0.69" for 1-yr event
Inflow = 20.35 cfs @ 12.35 hrs, Volume= 3.016 af
Primary = 20.35 cfs @ 12.35 hrs, Volume= 3.016 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O1: OUT 1

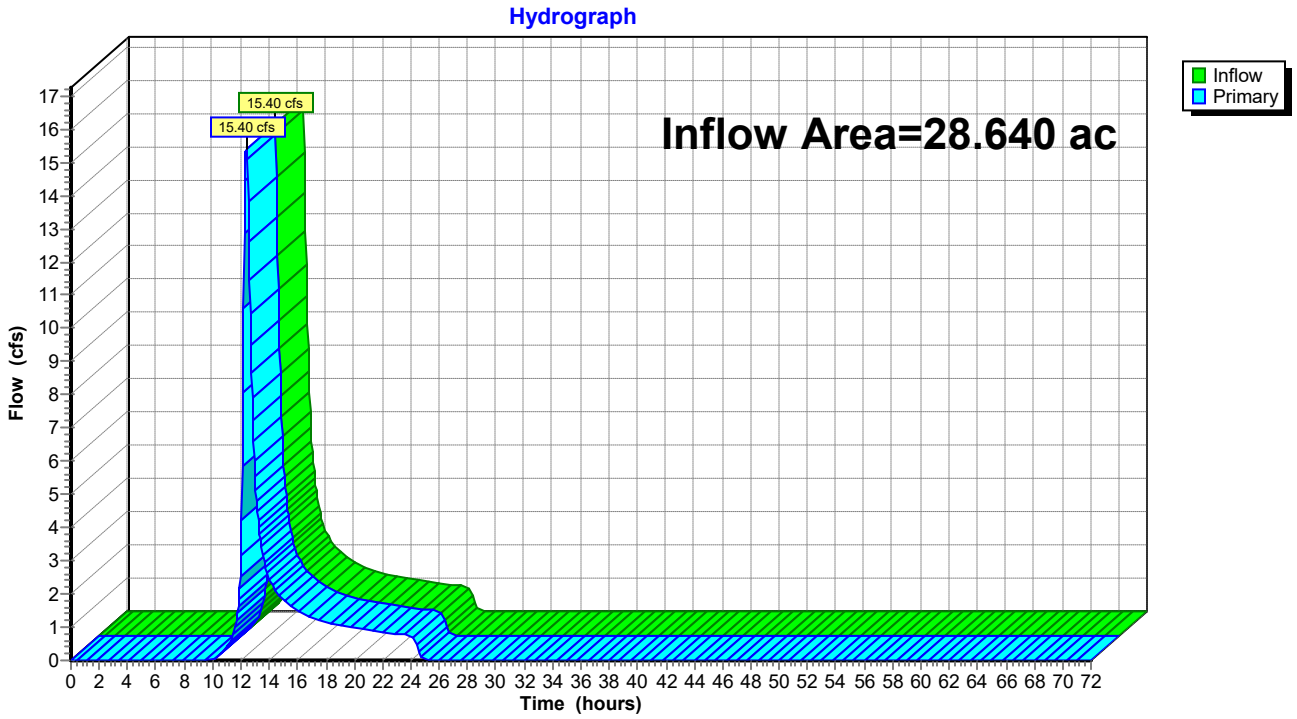


Summary for Link O2: OUT 2

Inflow Area = 28.640 ac, 0.00% Impervious, Inflow Depth = 0.93" for 1-yr event
Inflow = 15.40 cfs @ 12.38 hrs, Volume= 2.229 af
Primary = 15.40 cfs @ 12.38 hrs, Volume= 2.229 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O2: OUT 2

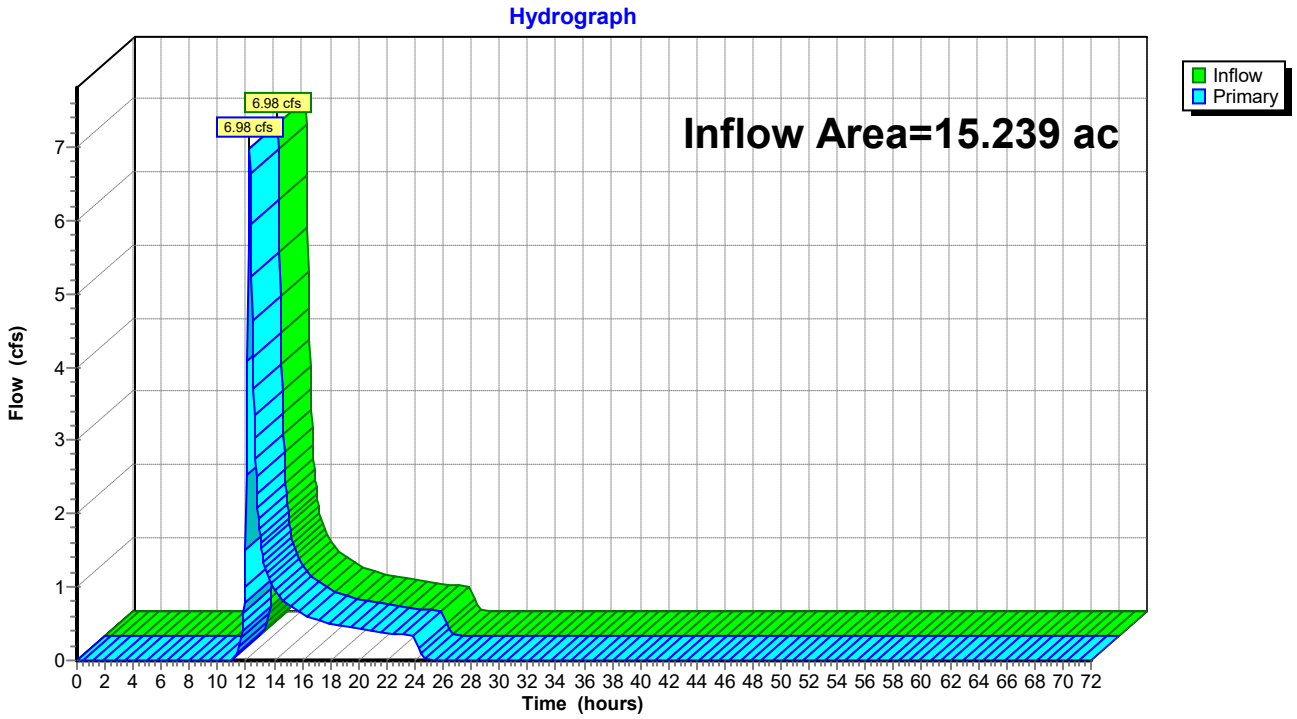


Summary for Link O3: OUT 3

Inflow Area = 15.239 ac, 0.00% Impervious, Inflow Depth = 0.69" for 1-yr event
Inflow = 6.98 cfs @ 12.25 hrs, Volume= 0.877 af
Primary = 6.98 cfs @ 12.25 hrs, Volume= 0.877 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O3: OUT 3

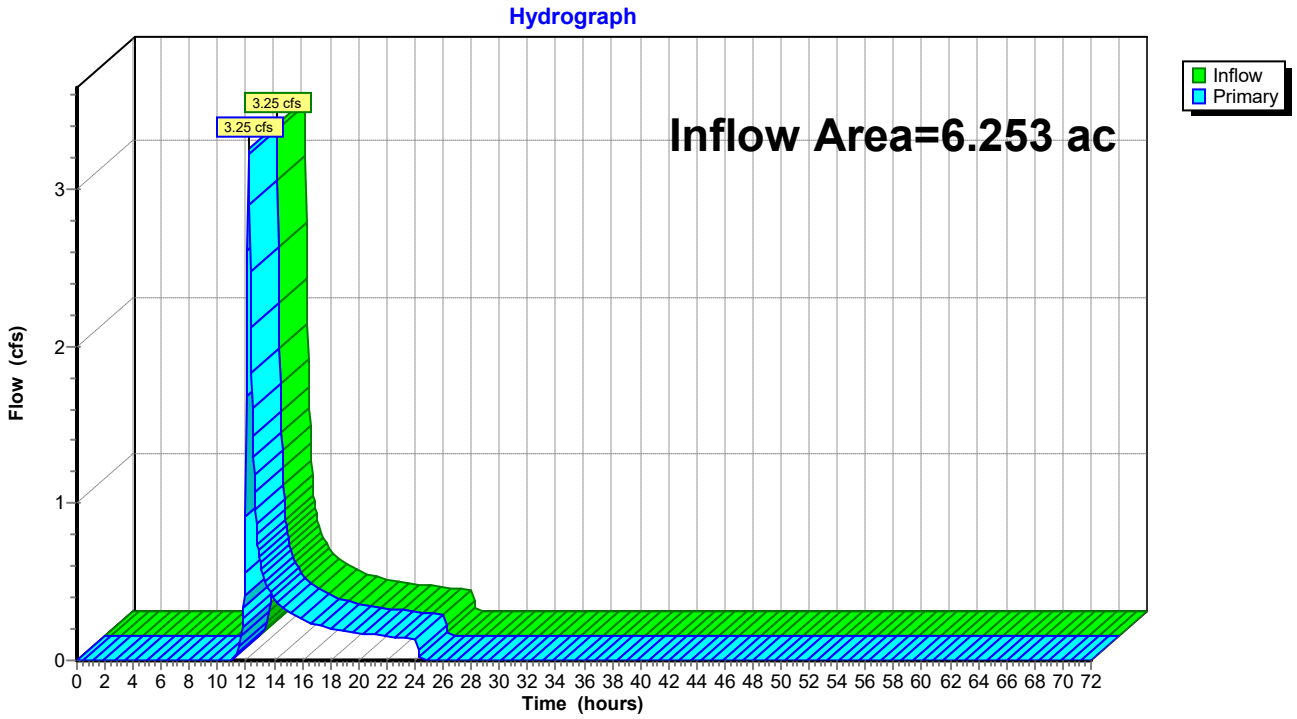


Summary for Link O4: OUT 4

Inflow Area = 6.253 ac, 0.00% Impervious, Inflow Depth = 0.69" for 1-yr event
Inflow = 3.25 cfs @ 12.18 hrs, Volume= 0.360 af
Primary = 3.25 cfs @ 12.18 hrs, Volume= 0.360 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O4: OUT 4

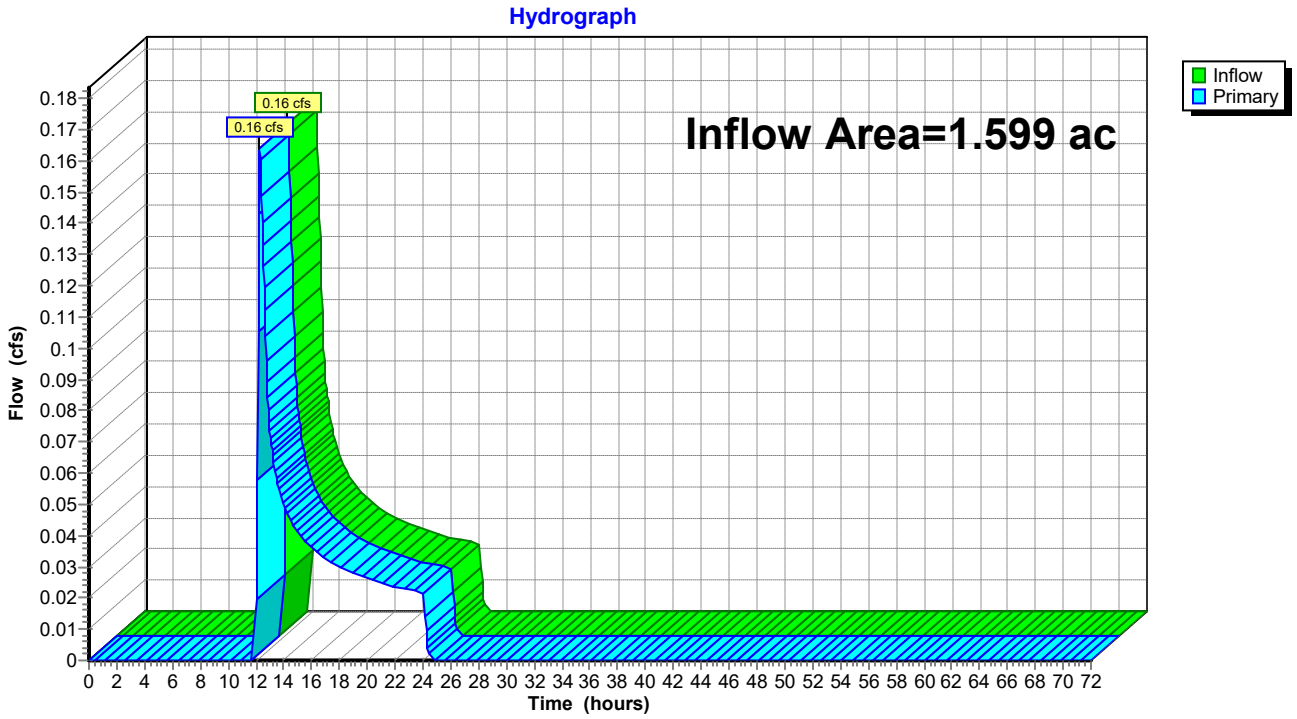


Summary for Link O5: OUT 5

Inflow Area = 1.599 ac, 0.00% Impervious, Inflow Depth = 0.29" for 1-yr event
Inflow = 0.16 cfs @ 12.28 hrs, Volume= 0.039 af
Primary = 0.16 cfs @ 12.28 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O5: OUT 5



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: DRAINAGE AREA 1 Runoff Area=2,283,420 sf 0.00% Impervious Runoff Depth=1.10"
Flow Length=2,736' Tc=26.9 min CN=73 Runoff=33.87 cfs 4.804 af

Subcatchment 2: DRAINAGE AREA 2 Runoff Area=1,247,550 sf 0.00% Impervious Runoff Depth=1.41"
Flow Length=825' Tc=30.1 min CN=78 Runoff=23.29 cfs 3.358 af

Subcatchment 3: DRAINAGE AREA 3 Runoff Area=663,807 sf 0.00% Impervious Runoff Depth=1.10"
Flow Length=590' Tc=19.9 min CN=73 Runoff=11.62 cfs 1.397 af

Subcatchment 4: DRAINAGE AREA 4 Runoff Area=272,371 sf 0.00% Impervious Runoff Depth=1.10"
Flow Length=376' Tc=15.4 min CN=73 Runoff=5.47 cfs 0.573 af

Subcatchment 5: DRAINAGE AREA 5 Runoff Area=69,632 sf 0.00% Impervious Runoff Depth=0.56"
Flow Length=340' Tc=16.6 min CN=62 Runoff=0.49 cfs 0.075 af

Link O1: OUT 1 Inflow=33.87 cfs 4.804 af
Primary=33.87 cfs 4.804 af

Link O2: OUT 2 Inflow=23.29 cfs 3.358 af
Primary=23.29 cfs 3.358 af

Link O3: OUT 3 Inflow=11.62 cfs 1.397 af
Primary=11.62 cfs 1.397 af

Link O4: OUT 4 Inflow=5.47 cfs 0.573 af
Primary=5.47 cfs 0.573 af

Link O5: OUT 5 Inflow=0.49 cfs 0.075 af
Primary=0.49 cfs 0.075 af

Total Runoff Area = 104.150 ac Runoff Volume = 10.206 af Average Runoff Depth = 1.18"
100.00% Pervious = 104.150 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1: DRAINAGE AREA 1

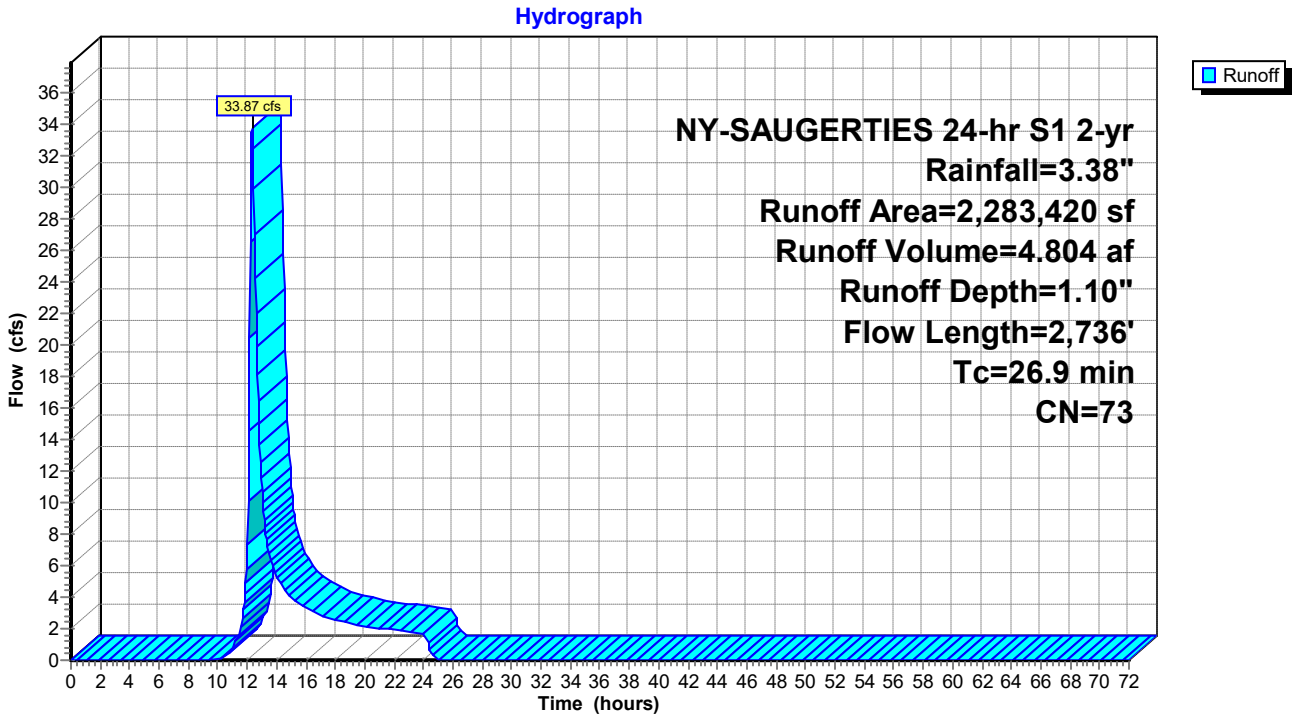
Runoff = 33.87 cfs @ 12.34 hrs, Volume= 4.804 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

Area (sf)	CN	Description
165,953	36	Woods, Fair, HSG A
26,975	60	Woods, Fair, HSG B
870,524	73	Woods, Fair, HSG C
1,219,968	79	Woods, Fair, HSG D
2,283,420	73	Weighted Average
2,283,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	100	0.0750	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.1	533	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
9.5	2,103	0.0600	3.67		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
26.9	2,736	Total			

Subcatchment 1: DRAINAGE AREA 1



Summary for Subcatchment 2: DRAINAGE AREA 2

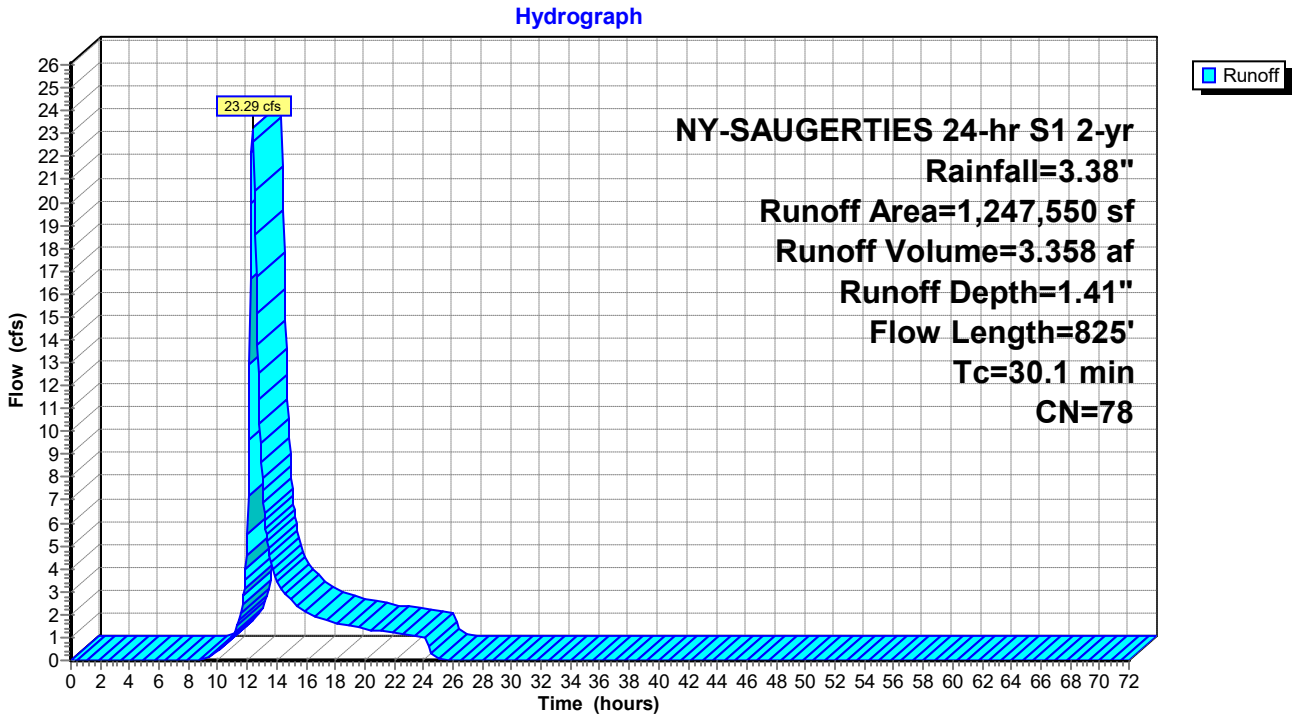
Runoff = 23.29 cfs @ 12.37 hrs, Volume= 3.358 af, Depth= 1.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

Area (sf)	CN	Description
5,625	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
73,172	73	Woods, Fair, HSG C
1,168,753	79	Woods, Fair, HSG D
1,247,550	78	Weighted Average
1,247,550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
15.6	725	0.0240	0.77		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
30.1	825	Total			

Subcatchment 2: DRAINAGE AREA 2



Summary for Subcatchment 3: DRAINAGE AREA 3

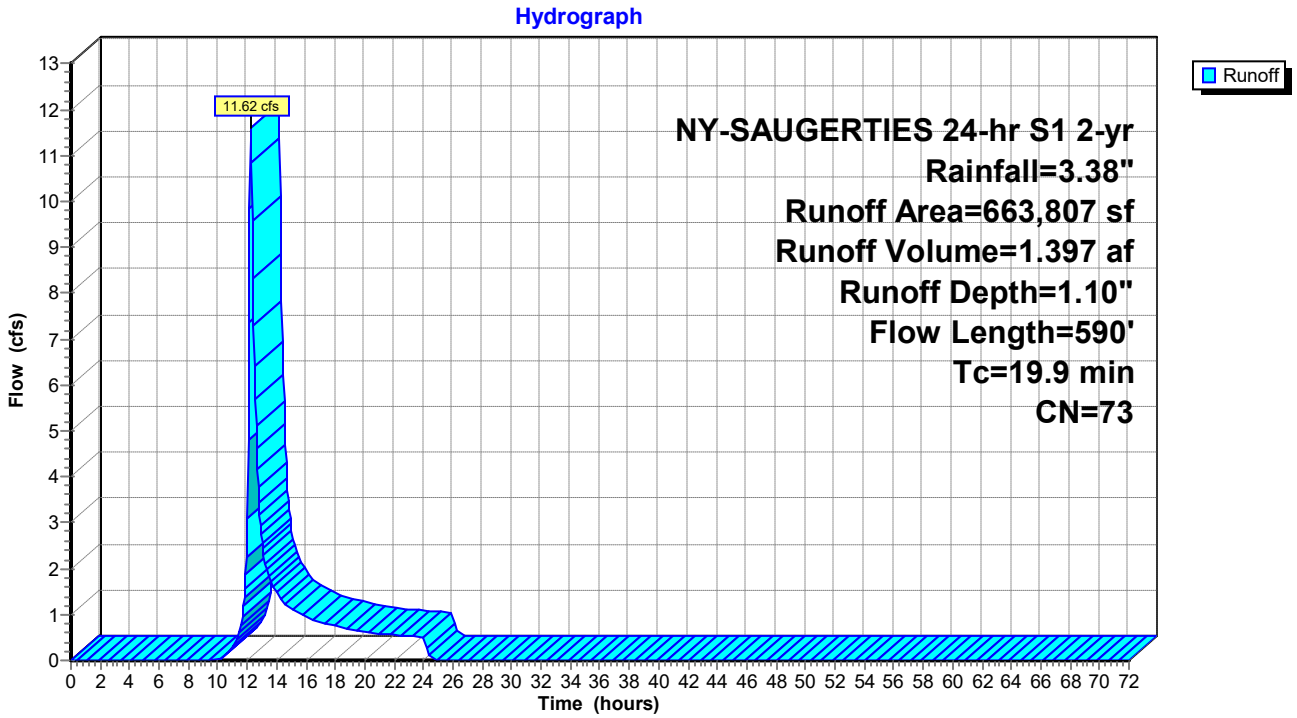
Runoff = 11.62 cfs @ 12.24 hrs, Volume= 1.397 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
663,807	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
663,807	73	Weighted Average
663,807		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.4	490	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	590	Total			

Subcatchment 3: DRAINAGE AREA 3



Summary for Subcatchment 4: DRAINAGE AREA 4

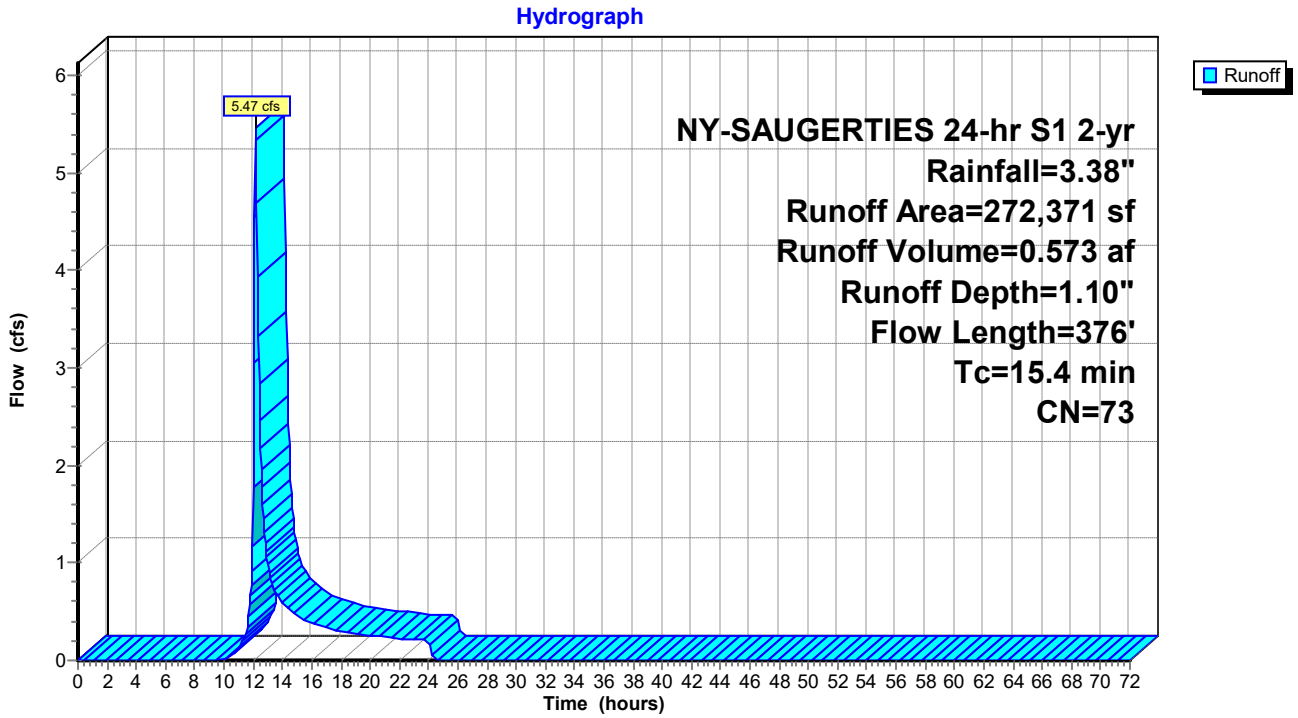
Runoff = 5.47 cfs @ 12.17 hrs, Volume= 0.573 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
272,371	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
272,371	73	Weighted Average
272,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0700	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.7	276	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.4	376	Total			

Subcatchment 4: DRAINAGE AREA 4



Summary for Subcatchment 5: DRAINAGE AREA 5

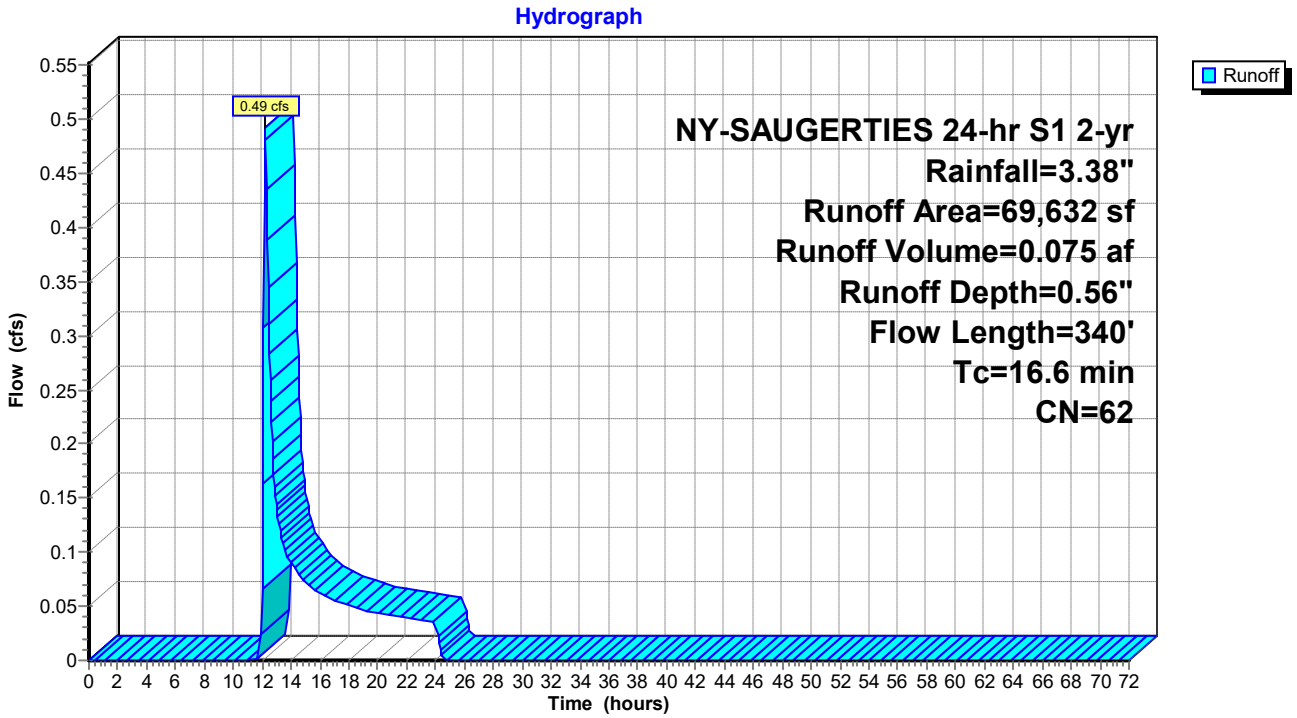
Runoff = 0.49 cfs @ 12.22 hrs, Volume= 0.075 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

Area (sf)	CN	Description
27,631	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
42,001	79	Woods, Fair, HSG D
69,632	62	Weighted Average
69,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0540	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.6	240	0.0930	1.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.6	340	Total			

Subcatchment 5: DRAINAGE AREA 5

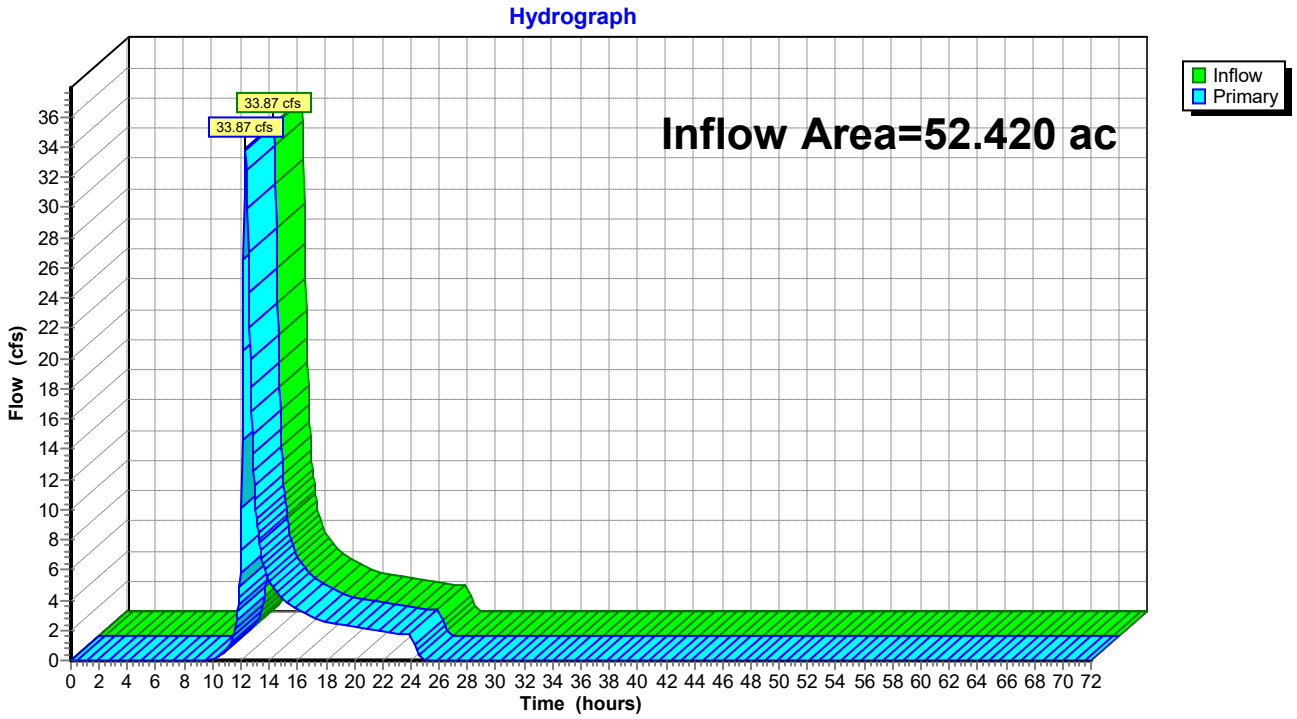


Summary for Link O1: OUT 1

Inflow Area = 52.420 ac, 0.00% Impervious, Inflow Depth = 1.10" for 2-yr event
Inflow = 33.87 cfs @ 12.34 hrs, Volume= 4.804 af
Primary = 33.87 cfs @ 12.34 hrs, Volume= 4.804 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O1: OUT 1

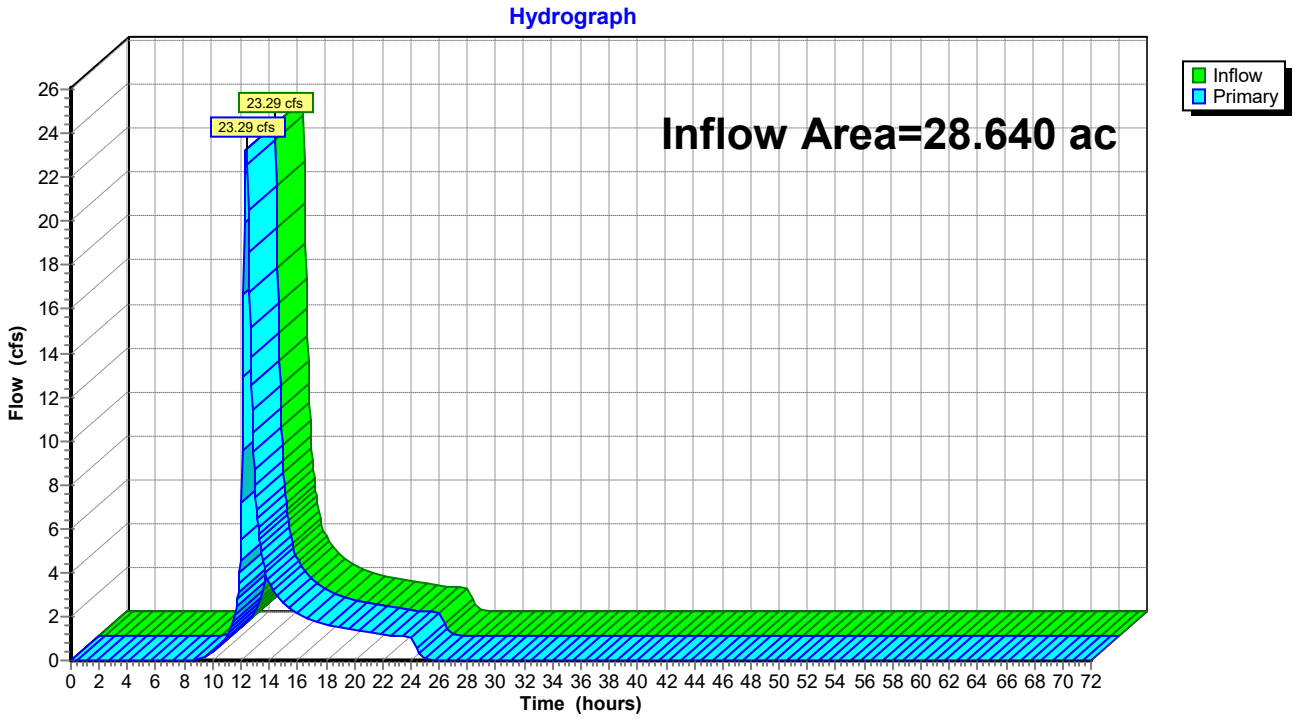


Summary for Link O2: OUT 2

Inflow Area = 28.640 ac, 0.00% Impervious, Inflow Depth = 1.41" for 2-yr event
Inflow = 23.29 cfs @ 12.37 hrs, Volume= 3.358 af
Primary = 23.29 cfs @ 12.37 hrs, Volume= 3.358 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O2: OUT 2

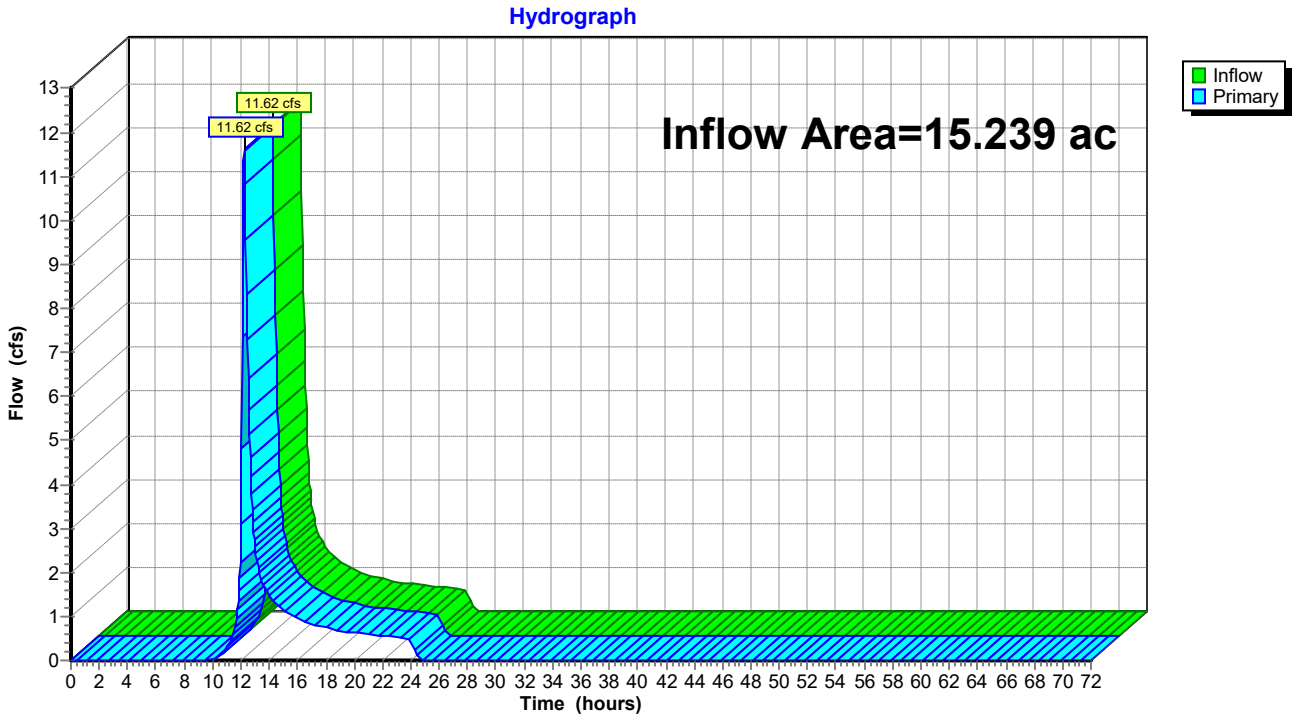


Summary for Link O3: OUT 3

Inflow Area = 15.239 ac, 0.00% Impervious, Inflow Depth = 1.10" for 2-yr event
Inflow = 11.62 cfs @ 12.24 hrs, Volume= 1.397 af
Primary = 11.62 cfs @ 12.24 hrs, Volume= 1.397 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O3: OUT 3

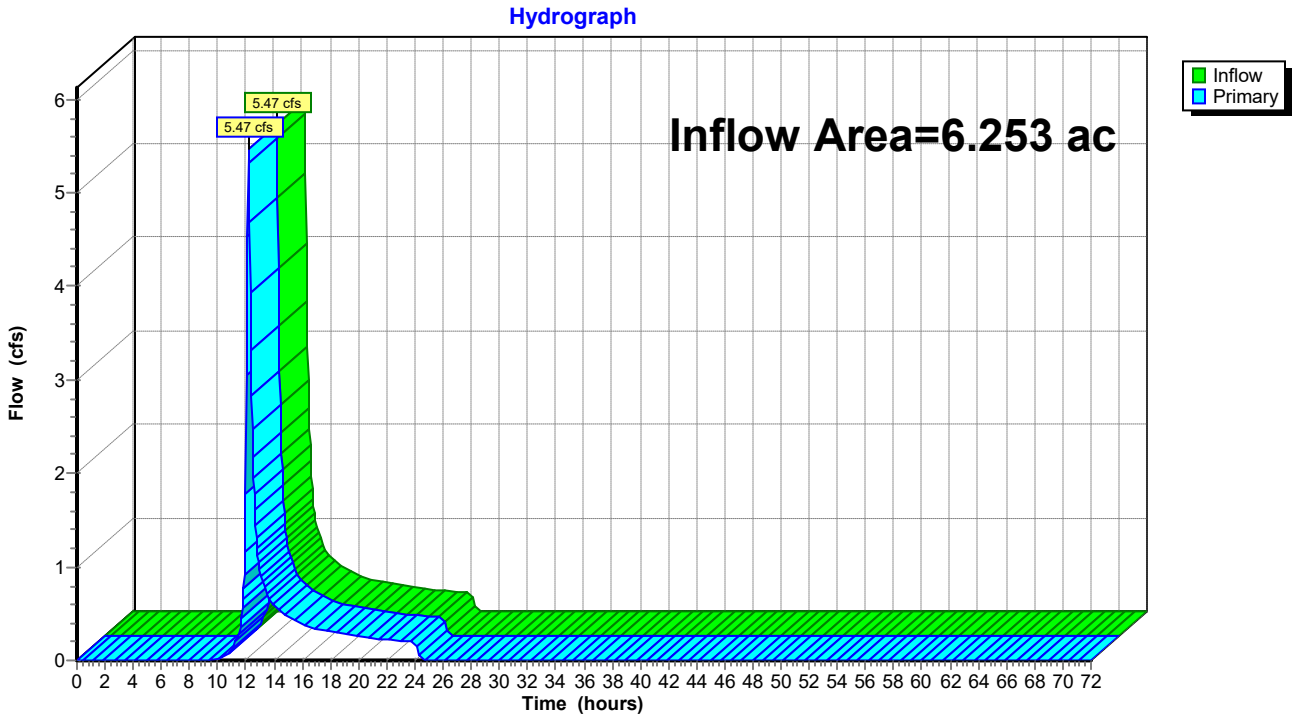


Summary for Link O4: OUT 4

Inflow Area = 6.253 ac, 0.00% Impervious, Inflow Depth = 1.10" for 2-yr event
Inflow = 5.47 cfs @ 12.17 hrs, Volume= 0.573 af
Primary = 5.47 cfs @ 12.17 hrs, Volume= 0.573 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O4: OUT 4

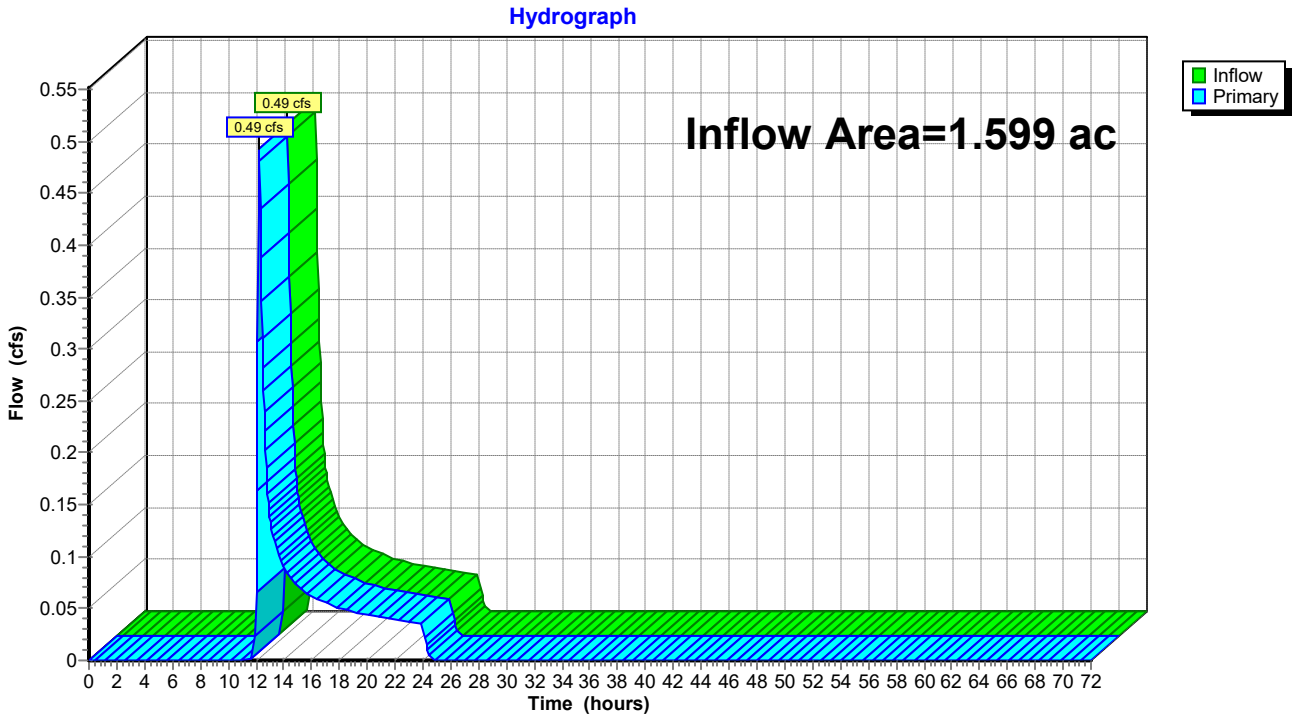


Summary for Link O5: OUT 5

Inflow Area = 1.599 ac, 0.00% Impervious, Inflow Depth = 0.56" for 2-yr event
Inflow = 0.49 cfs @ 12.22 hrs, Volume= 0.075 af
Primary = 0.49 cfs @ 12.22 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O5: OUT 5



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: DRAINAGE AREA 1 Runoff Area=2,283,420 sf 0.00% Impervious Runoff Depth=2.56"
Flow Length=2,736' Tc=26.9 min CN=73 Runoff=80.08 cfs 11.174 af

Subcatchment 2: DRAINAGE AREA 2 Runoff Area=1,247,550 sf 0.00% Impervious Runoff Depth=3.01"
Flow Length=825' Tc=30.1 min CN=78 Runoff=48.72 cfs 7.187 af

Subcatchment 3: DRAINAGE AREA 3 Runoff Area=663,807 sf 0.00% Impervious Runoff Depth=2.56"
Flow Length=590' Tc=19.9 min CN=73 Runoff=27.43 cfs 3.248 af

Subcatchment 4: DRAINAGE AREA 4 Runoff Area=272,371 sf 0.00% Impervious Runoff Depth=2.56"
Flow Length=376' Tc=15.4 min CN=73 Runoff=12.92 cfs 1.333 af

Subcatchment 5: DRAINAGE AREA 5 Runoff Area=69,632 sf 0.00% Impervious Runoff Depth=1.66"
Flow Length=340' Tc=16.6 min CN=62 Runoff=1.90 cfs 0.221 af

Link O1: OUT 1 Inflow=80.08 cfs 11.174 af
Primary=80.08 cfs 11.174 af

Link O2: OUT 2 Inflow=48.72 cfs 7.187 af
Primary=48.72 cfs 7.187 af

Link O3: OUT 3 Inflow=27.43 cfs 3.248 af
Primary=27.43 cfs 3.248 af

Link O4: OUT 4 Inflow=12.92 cfs 1.333 af
Primary=12.92 cfs 1.333 af

Link O5: OUT 5 Inflow=1.90 cfs 0.221 af
Primary=1.90 cfs 0.221 af

Total Runoff Area = 104.150 ac Runoff Volume = 23.164 af Average Runoff Depth = 2.67"
100.00% Pervious = 104.150 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1: DRAINAGE AREA 1

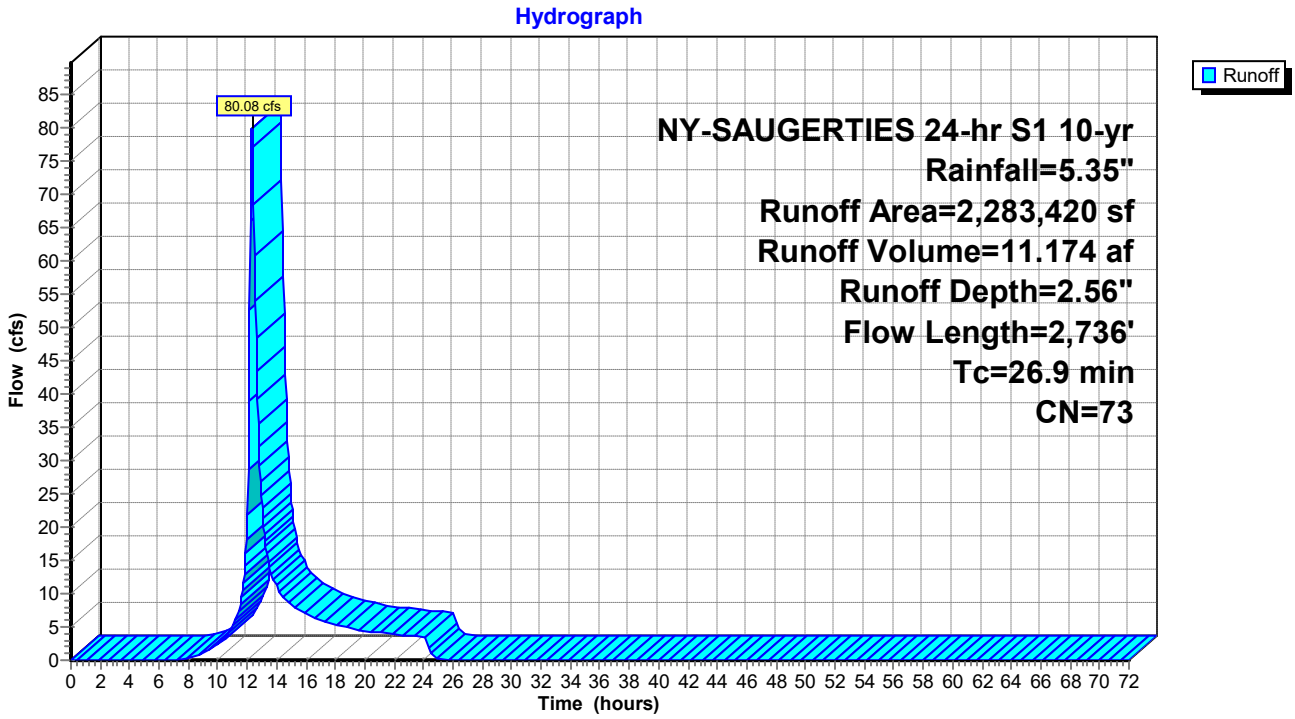
Runoff = 80.08 cfs @ 12.32 hrs, Volume= 11.174 af, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

Area (sf)	CN	Description
165,953	36	Woods, Fair, HSG A
26,975	60	Woods, Fair, HSG B
870,524	73	Woods, Fair, HSG C
1,219,968	79	Woods, Fair, HSG D
2,283,420	73	Weighted Average
2,283,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	100	0.0750	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.1	533	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
9.5	2,103	0.0600	3.67		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
26.9	2,736	Total			

Subcatchment 1: DRAINAGE AREA 1



Summary for Subcatchment 2: DRAINAGE AREA 2

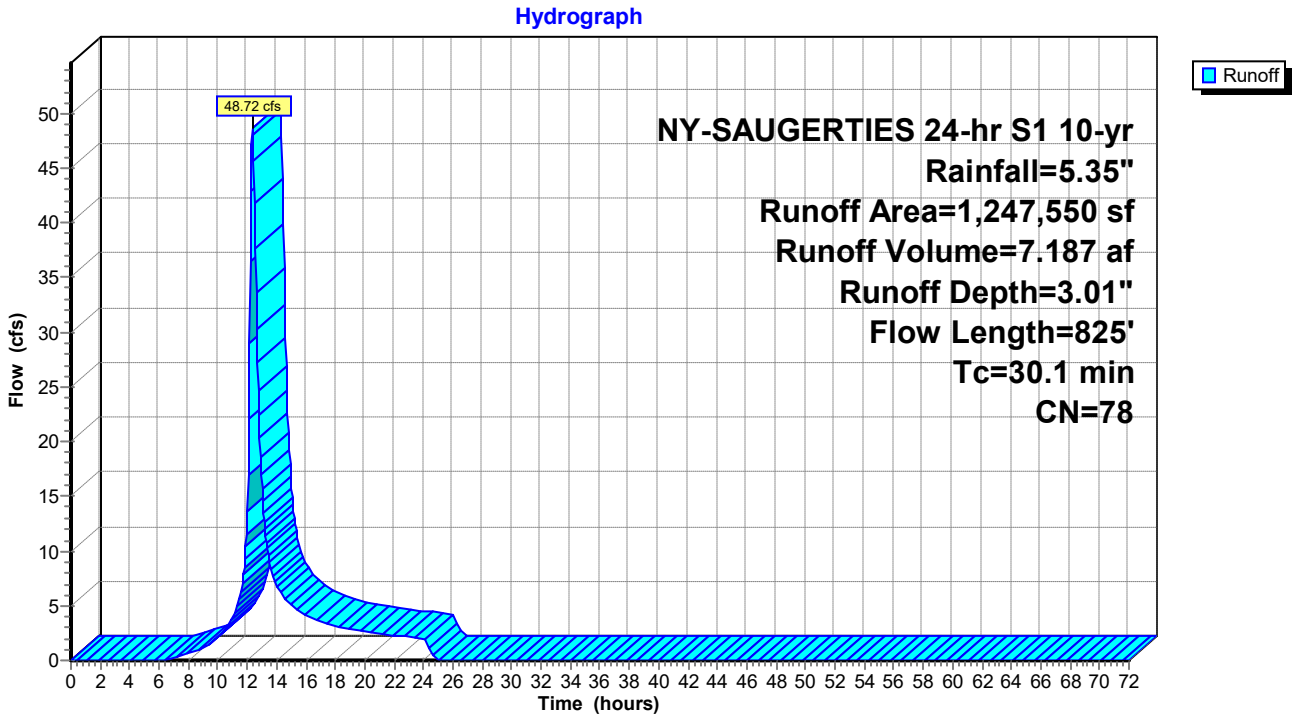
Runoff = 48.72 cfs @ 12.36 hrs, Volume= 7.187 af, Depth= 3.01"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

Area (sf)	CN	Description
5,625	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
73,172	73	Woods, Fair, HSG C
1,168,753	79	Woods, Fair, HSG D
1,247,550	78	Weighted Average
1,247,550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
15.6	725	0.0240	0.77		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
30.1	825	Total			

Subcatchment 2: DRAINAGE AREA 2



Summary for Subcatchment 3: DRAINAGE AREA 3

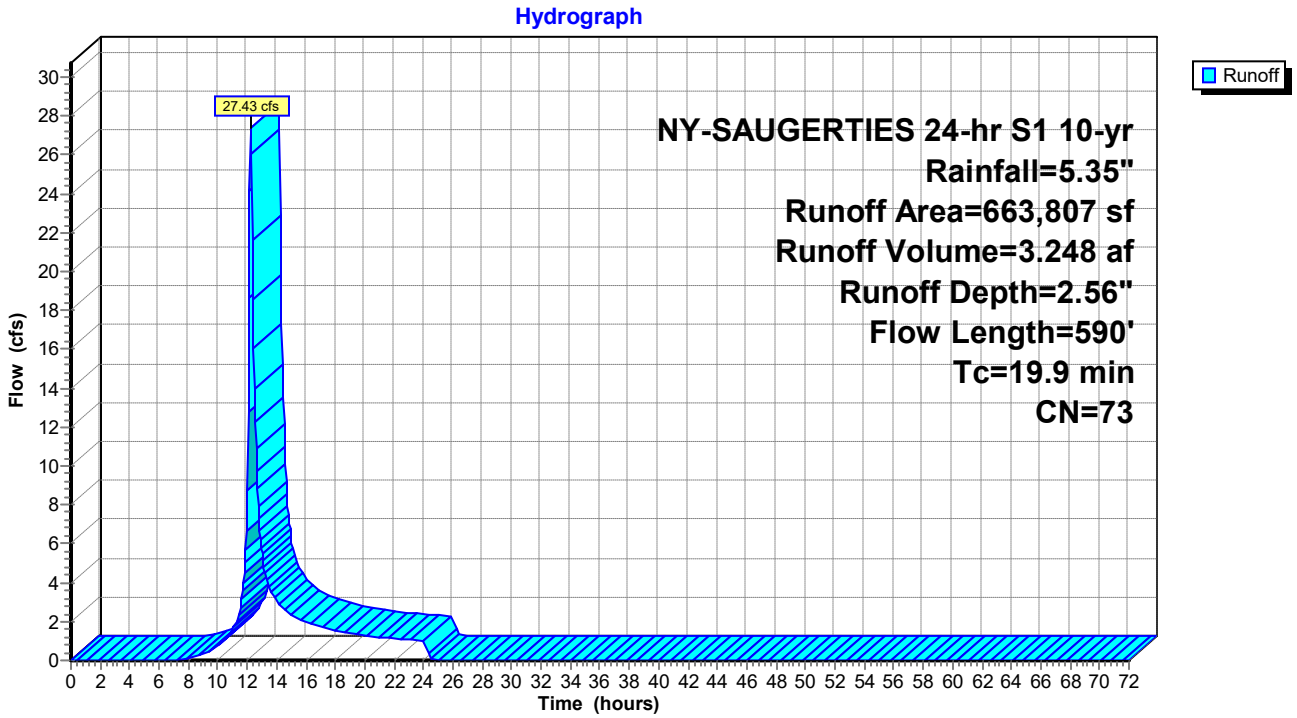
Runoff = 27.43 cfs @ 12.23 hrs, Volume= 3.248 af, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
663,807	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
663,807	73	Weighted Average
663,807		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.4	490	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	590	Total			

Subcatchment 3: DRAINAGE AREA 3



Summary for Subcatchment 4: DRAINAGE AREA 4

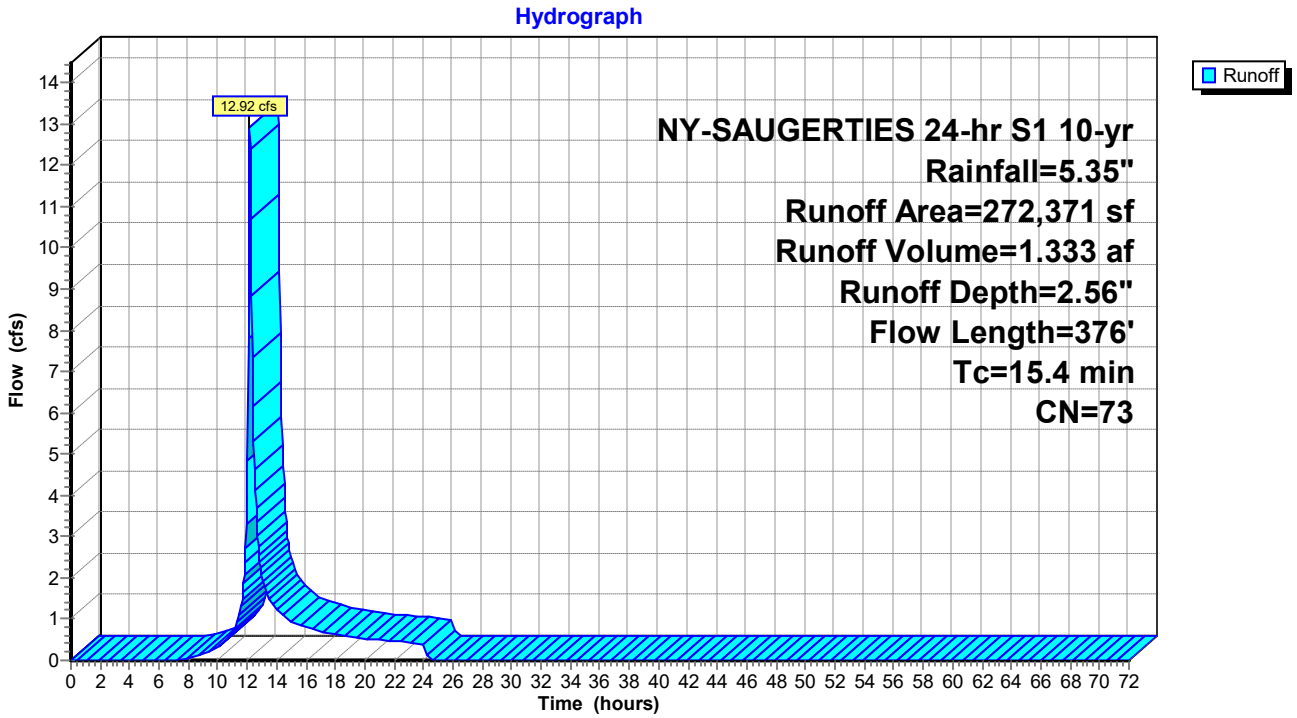
Runoff = 12.92 cfs @ 12.17 hrs, Volume= 1.333 af, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
272,371	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
272,371	73	Weighted Average
272,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0700	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.7	276	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.4	376	Total			

Subcatchment 4: DRAINAGE AREA 4



Summary for Subcatchment 5: DRAINAGE AREA 5

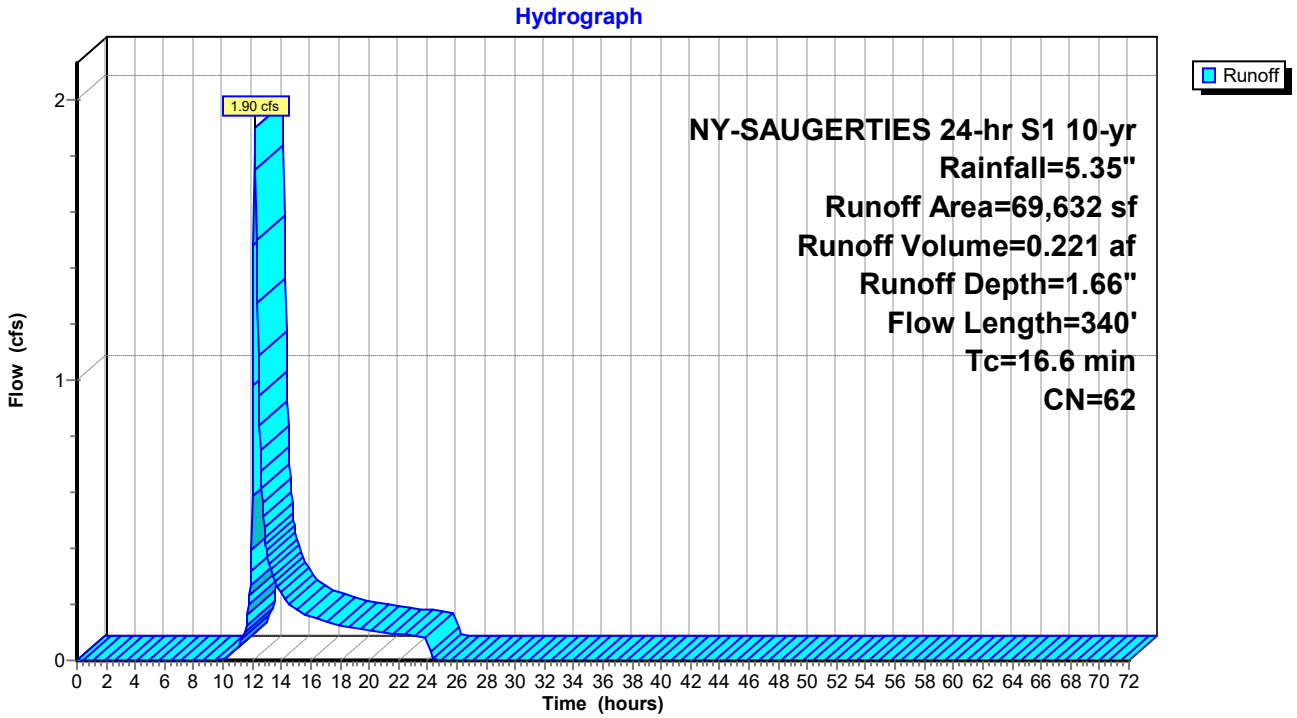
Runoff = 1.90 cfs @ 12.19 hrs, Volume= 0.221 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

Area (sf)	CN	Description
27,631	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
42,001	79	Woods, Fair, HSG D
69,632	62	Weighted Average
69,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0540	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.6	240	0.0930	1.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.6	340	Total			

Subcatchment 5: DRAINAGE AREA 5

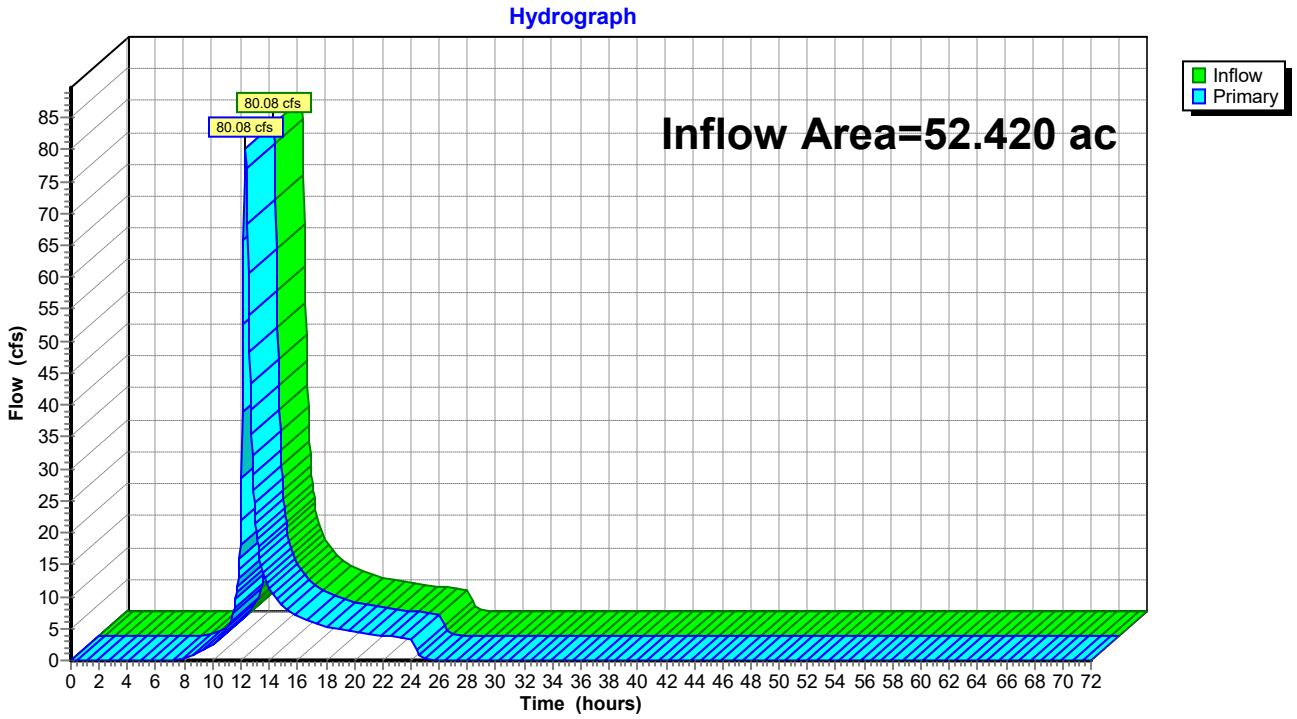


Summary for Link O1: OUT 1

Inflow Area = 52.420 ac, 0.00% Impervious, Inflow Depth = 2.56" for 10-yr event
Inflow = 80.08 cfs @ 12.32 hrs, Volume= 11.174 af
Primary = 80.08 cfs @ 12.32 hrs, Volume= 11.174 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O1: OUT 1

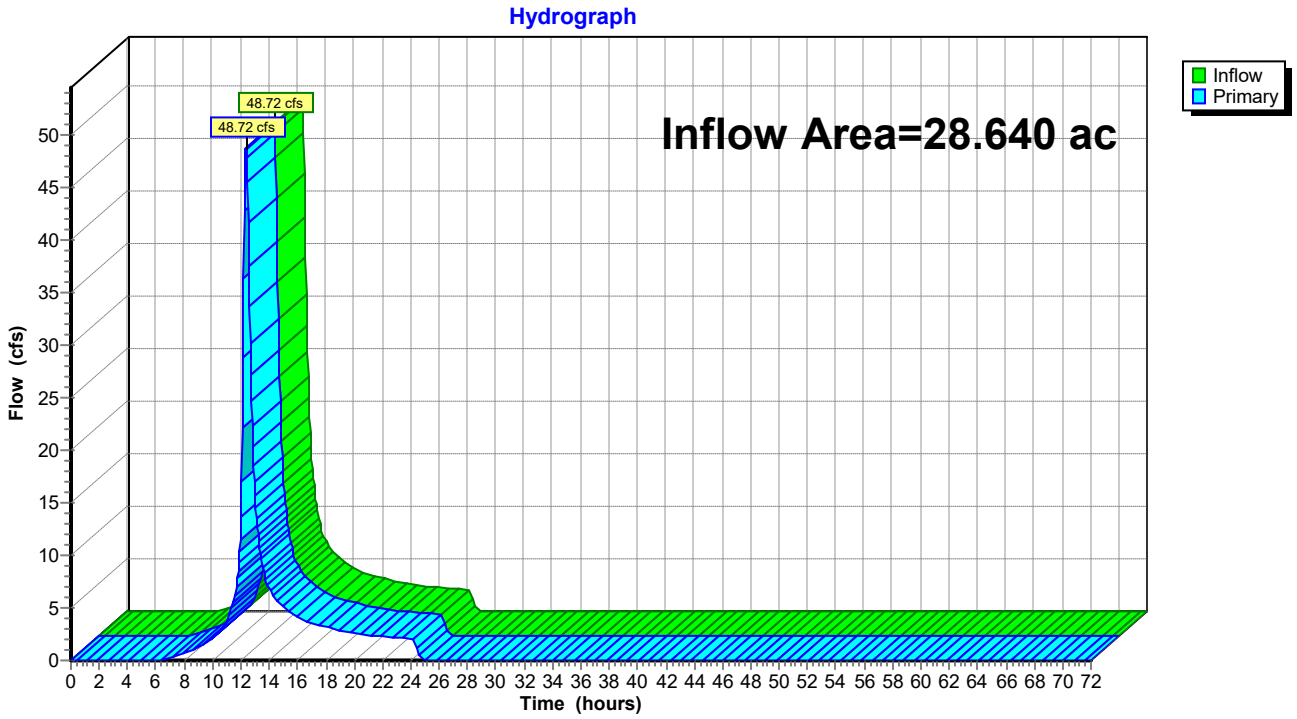


Summary for Link O2: OUT 2

Inflow Area = 28.640 ac, 0.00% Impervious, Inflow Depth = 3.01" for 10-yr event
Inflow = 48.72 cfs @ 12.36 hrs, Volume= 7.187 af
Primary = 48.72 cfs @ 12.36 hrs, Volume= 7.187 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O2: OUT 2

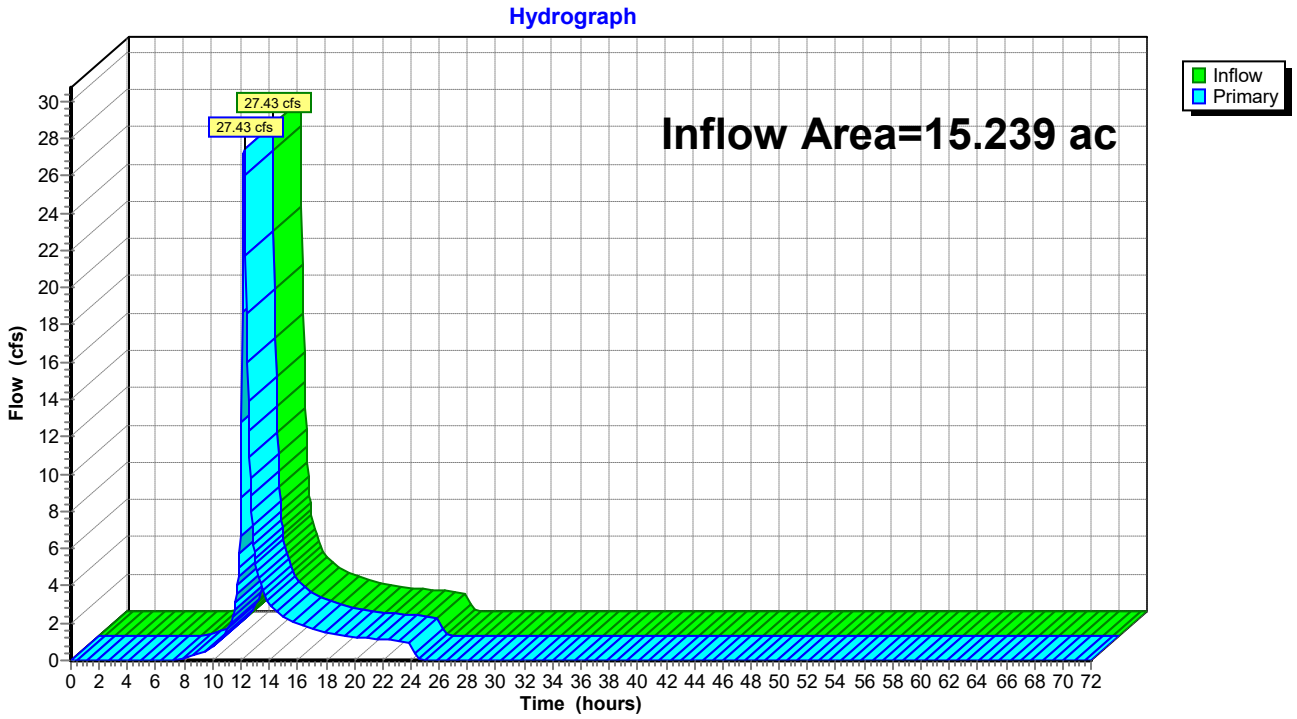


Summary for Link O3: OUT 3

Inflow Area = 15.239 ac, 0.00% Impervious, Inflow Depth = 2.56" for 10-yr event
Inflow = 27.43 cfs @ 12.23 hrs, Volume= 3.248 af
Primary = 27.43 cfs @ 12.23 hrs, Volume= 3.248 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O3: OUT 3

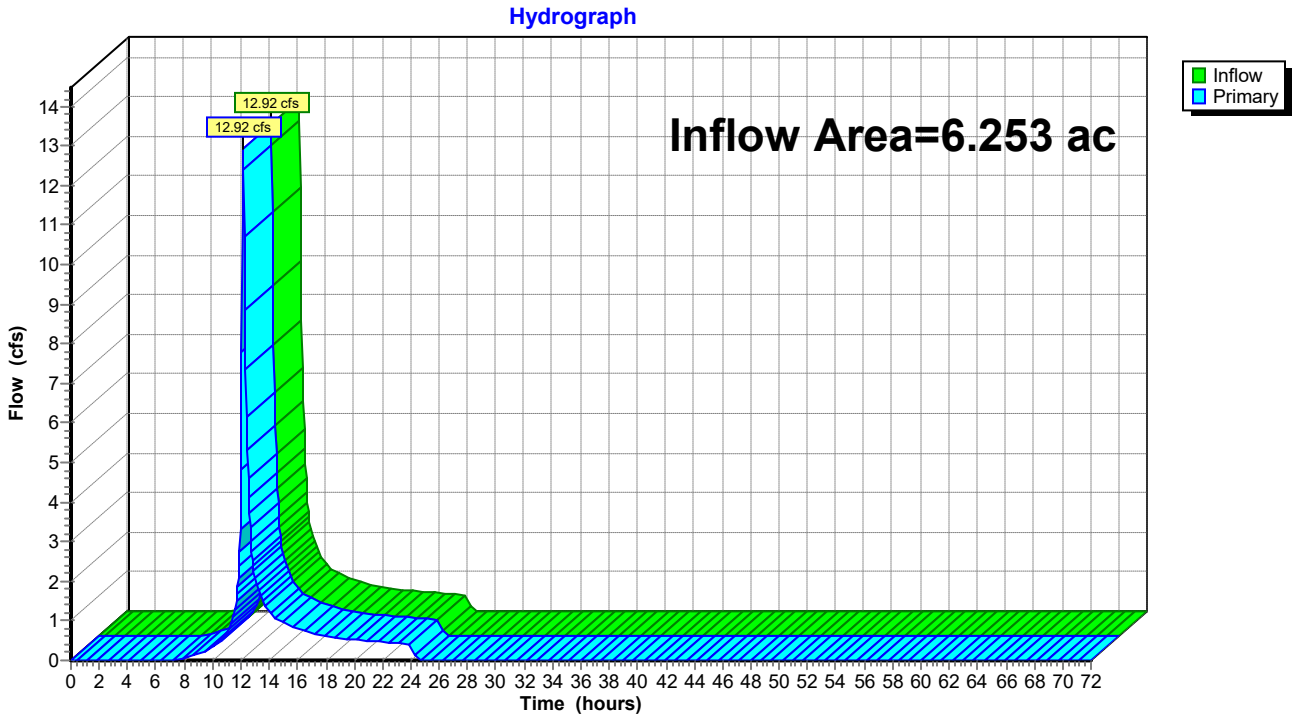


Summary for Link O4: OUT 4

Inflow Area = 6.253 ac, 0.00% Impervious, Inflow Depth = 2.56" for 10-yr event
Inflow = 12.92 cfs @ 12.17 hrs, Volume= 1.333 af
Primary = 12.92 cfs @ 12.17 hrs, Volume= 1.333 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O4: OUT 4

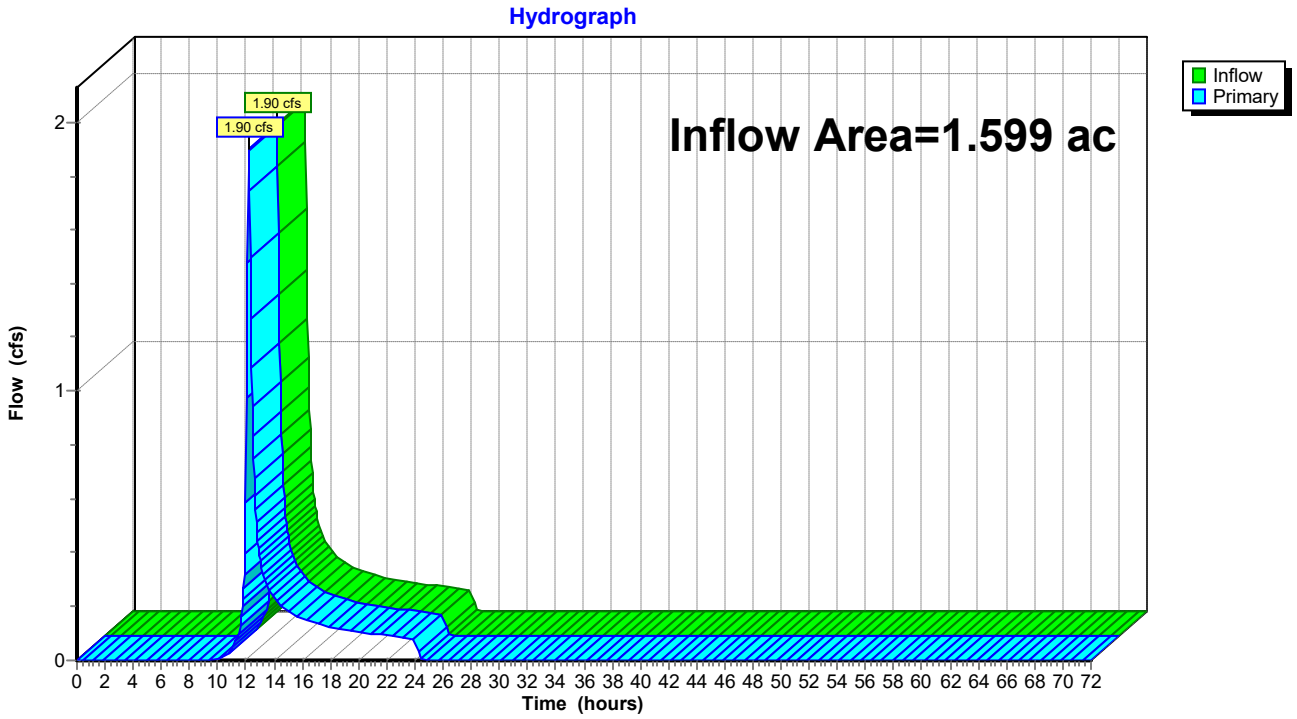


Summary for Link O5: OUT 5

Inflow Area = 1.599 ac, 0.00% Impervious, Inflow Depth = 1.66" for 10-yr event
Inflow = 1.90 cfs @ 12.19 hrs, Volume= 0.221 af
Primary = 1.90 cfs @ 12.19 hrs, Volume= 0.221 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O5: OUT 5



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: DRAINAGE AREA 1 Runoff Area=2,283,420 sf 0.00% Impervious Runoff Depth=3.58"
Flow Length=2,736' Tc=26.9 min CN=73 Runoff=111.16 cfs 15.620 af

Subcatchment 2: DRAINAGE AREA 2 Runoff Area=1,247,550 sf 0.00% Impervious Runoff Depth=4.10"
Flow Length=825' Tc=30.1 min CN=78 Runoff=65.24 cfs 9.775 af

Subcatchment 3: DRAINAGE AREA 3 Runoff Area=663,807 sf 0.00% Impervious Runoff Depth=3.58"
Flow Length=590' Tc=19.9 min CN=73 Runoff=38.17 cfs 4.541 af

Subcatchment 4: DRAINAGE AREA 4 Runoff Area=272,371 sf 0.00% Impervious Runoff Depth=3.58"
Flow Length=376' Tc=15.4 min CN=73 Runoff=17.93 cfs 1.863 af

Subcatchment 5: DRAINAGE AREA 5 Runoff Area=69,632 sf 0.00% Impervious Runoff Depth=2.50"
Flow Length=340' Tc=16.6 min CN=62 Runoff=2.95 cfs 0.333 af

Link O1: OUT 1 Inflow=111.16 cfs 15.620 af
Primary=111.16 cfs 15.620 af

Link O2: OUT 2 Inflow=65.24 cfs 9.775 af
Primary=65.24 cfs 9.775 af

Link O3: OUT 3 Inflow=38.17 cfs 4.541 af
Primary=38.17 cfs 4.541 af

Link O4: OUT 4 Inflow=17.93 cfs 1.863 af
Primary=17.93 cfs 1.863 af

Link O5: OUT 5 Inflow=2.95 cfs 0.333 af
Primary=2.95 cfs 0.333 af

Total Runoff Area = 104.150 ac Runoff Volume = 32.132 af Average Runoff Depth = 3.70"
100.00% Pervious = 104.150 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1: DRAINAGE AREA 1

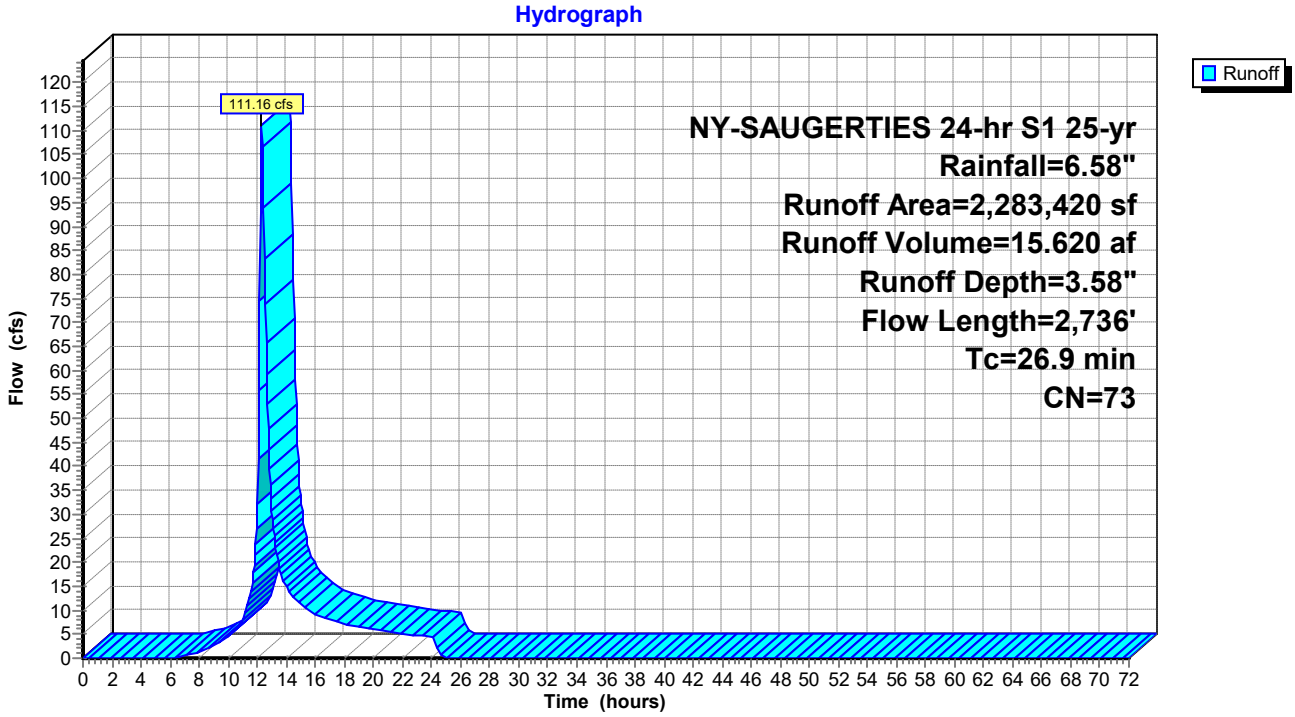
Runoff = 111.16 cfs @ 12.32 hrs, Volume= 15.620 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

Area (sf)	CN	Description
165,953	36	Woods, Fair, HSG A
26,975	60	Woods, Fair, HSG B
870,524	73	Woods, Fair, HSG C
1,219,968	79	Woods, Fair, HSG D
2,283,420	73	Weighted Average
2,283,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	100	0.0750	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.1	533	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
9.5	2,103	0.0600	3.67		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
26.9	2,736	Total			

Subcatchment 1: DRAINAGE AREA 1



Summary for Subcatchment 2: DRAINAGE AREA 2

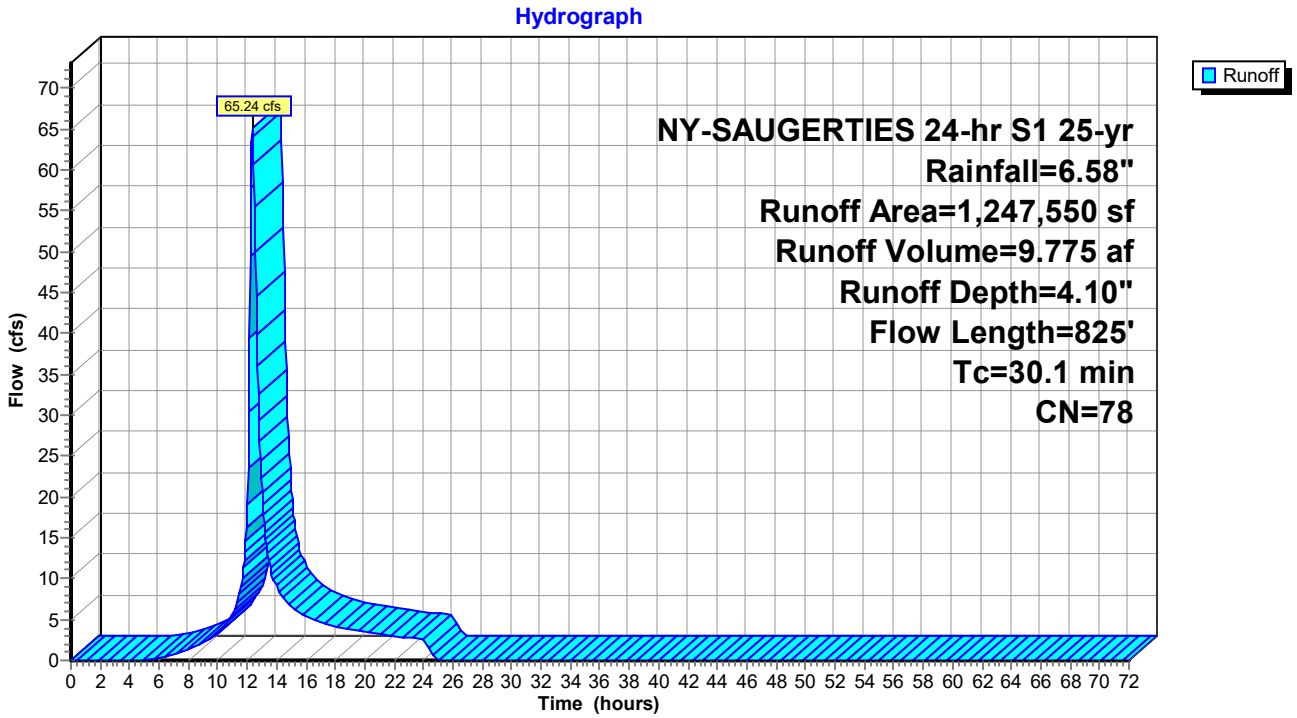
Runoff = 65.24 cfs @ 12.36 hrs, Volume= 9.775 af, Depth= 4.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

Area (sf)	CN	Description
5,625	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
73,172	73	Woods, Fair, HSG C
1,168,753	79	Woods, Fair, HSG D
1,247,550	78	Weighted Average
1,247,550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
15.6	725	0.0240	0.77		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
30.1	825	Total			

Subcatchment 2: DRAINAGE AREA 2



Summary for Subcatchment 3: DRAINAGE AREA 3

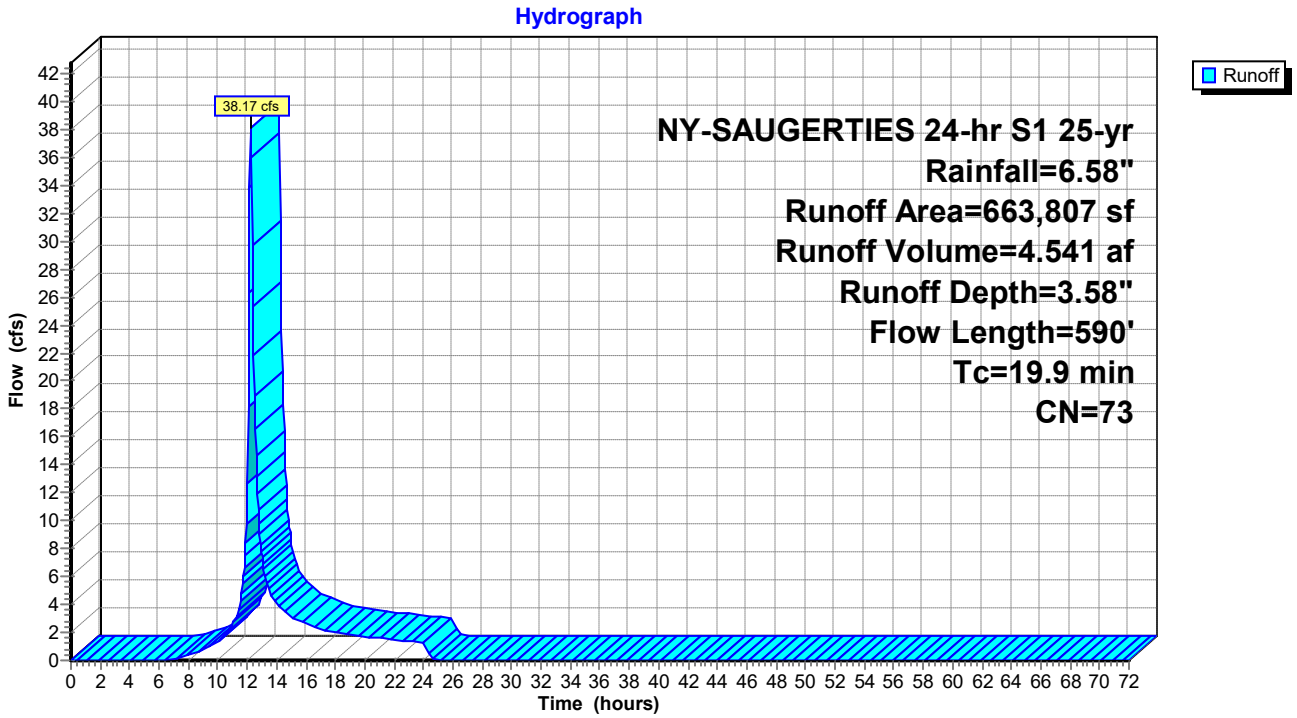
Runoff = 38.17 cfs @ 12.22 hrs, Volume= 4.541 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
663,807	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
663,807	73	Weighted Average
663,807		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.4	490	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	590	Total			

Subcatchment 3: DRAINAGE AREA 3



Summary for Subcatchment 4: DRAINAGE AREA 4

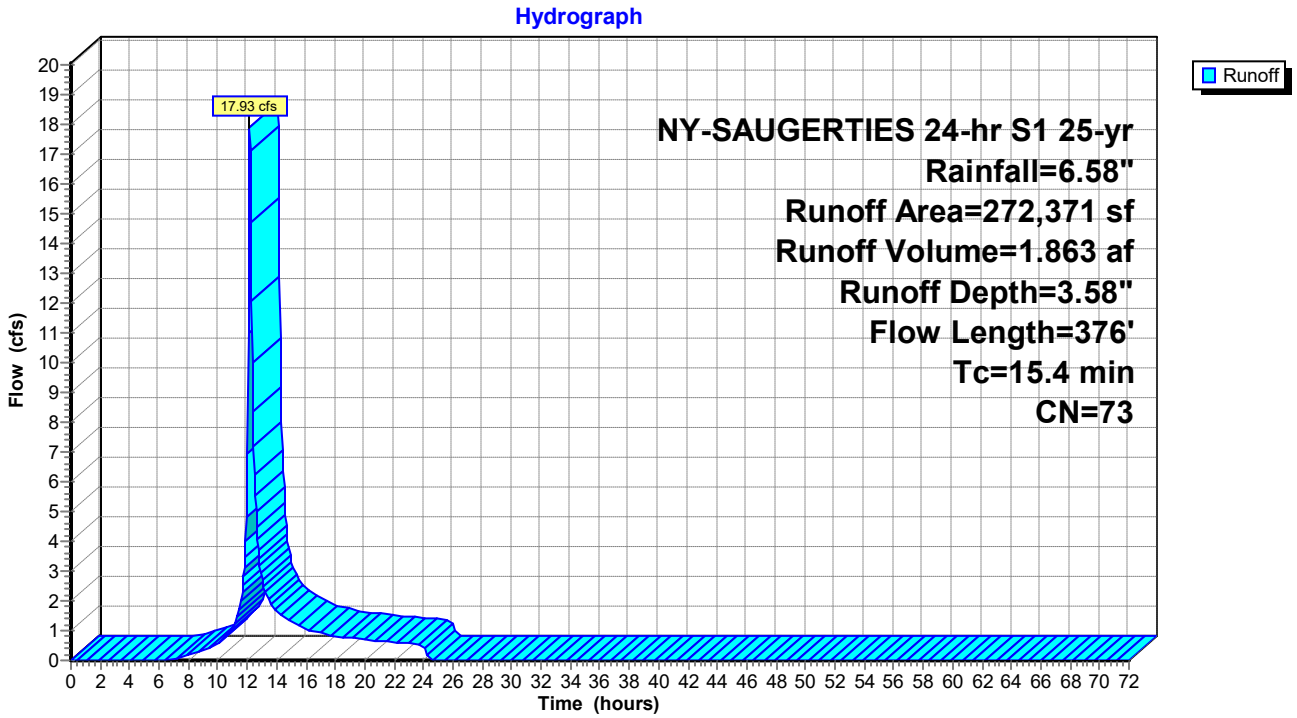
Runoff = 17.93 cfs @ 12.16 hrs, Volume= 1.863 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
272,371	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
272,371	73	Weighted Average
272,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0700	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.7	276	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.4	376	Total			

Subcatchment 4: DRAINAGE AREA 4



Summary for Subcatchment 5: DRAINAGE AREA 5

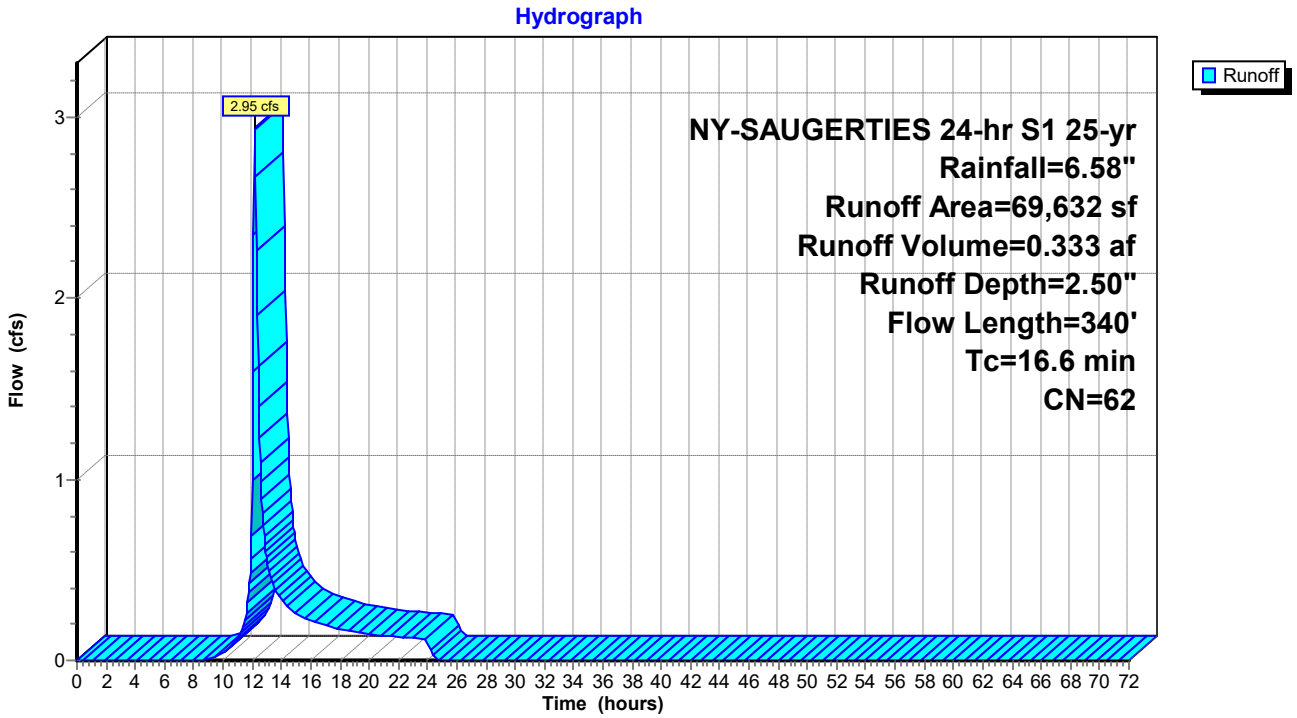
Runoff = 2.95 cfs @ 12.19 hrs, Volume= 0.333 af, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

Area (sf)	CN	Description
27,631	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
42,001	79	Woods, Fair, HSG D
69,632	62	Weighted Average
69,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0540	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.6	240	0.0930	1.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.6	340	Total			

Subcatchment 5: DRAINAGE AREA 5

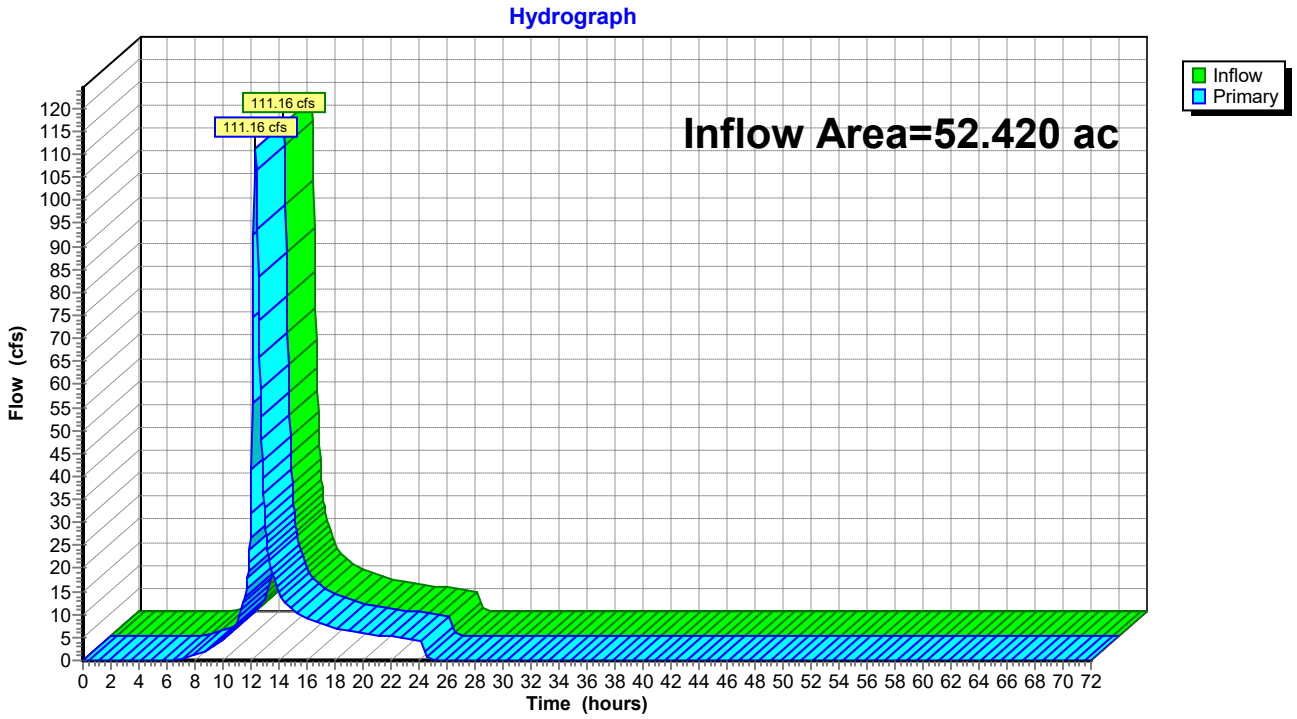


Summary for Link O1: OUT 1

Inflow Area = 52.420 ac, 0.00% Impervious, Inflow Depth = 3.58" for 25-yr event
Inflow = 111.16 cfs @ 12.32 hrs, Volume= 15.620 af
Primary = 111.16 cfs @ 12.32 hrs, Volume= 15.620 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O1: OUT 1

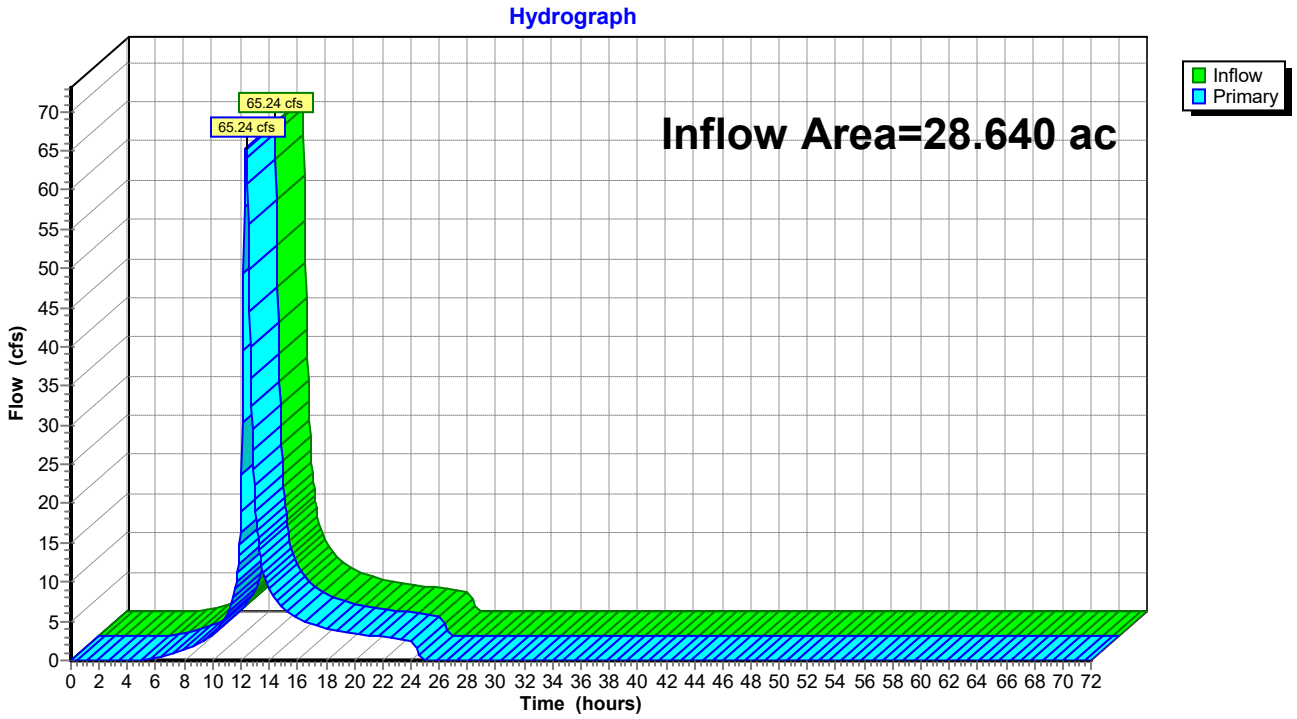


Summary for Link O2: OUT 2

Inflow Area = 28.640 ac, 0.00% Impervious, Inflow Depth = 4.10" for 25-yr event
Inflow = 65.24 cfs @ 12.36 hrs, Volume= 9.775 af
Primary = 65.24 cfs @ 12.36 hrs, Volume= 9.775 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O2: OUT 2

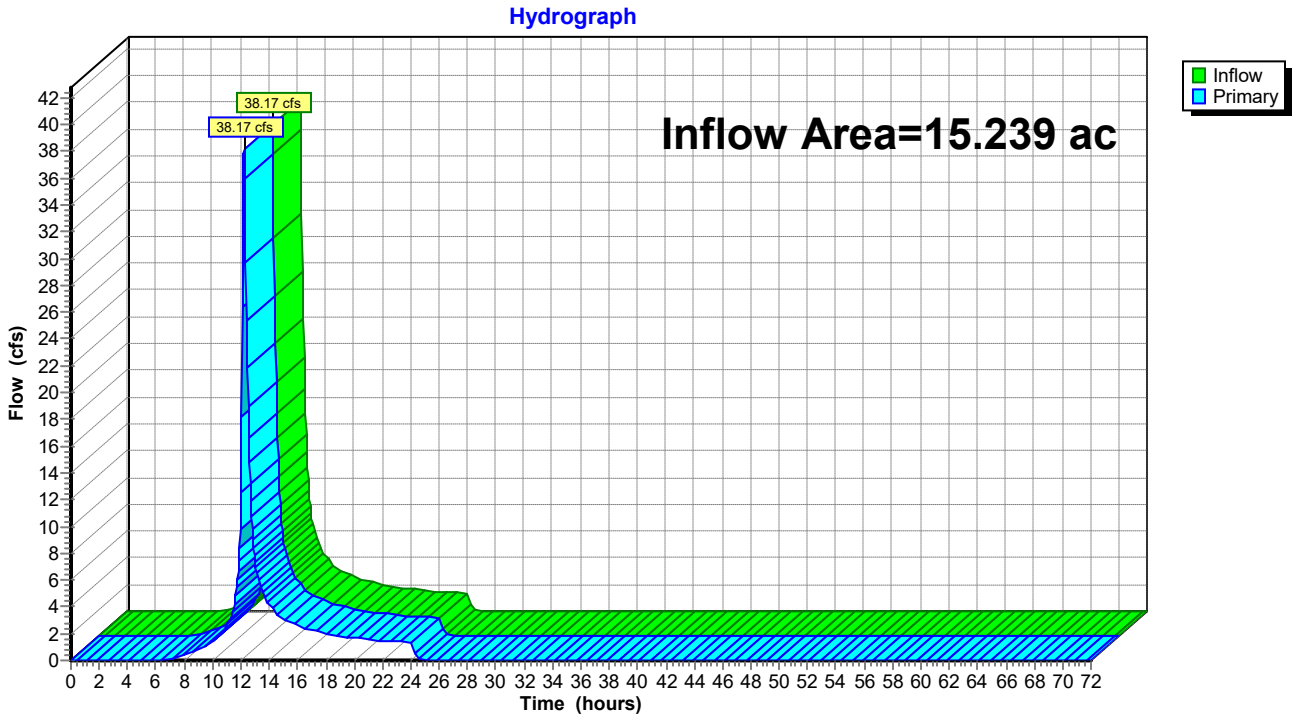


Summary for Link O3: OUT 3

Inflow Area = 15.239 ac, 0.00% Impervious, Inflow Depth = 3.58" for 25-yr event
Inflow = 38.17 cfs @ 12.22 hrs, Volume= 4.541 af
Primary = 38.17 cfs @ 12.22 hrs, Volume= 4.541 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O3: OUT 3

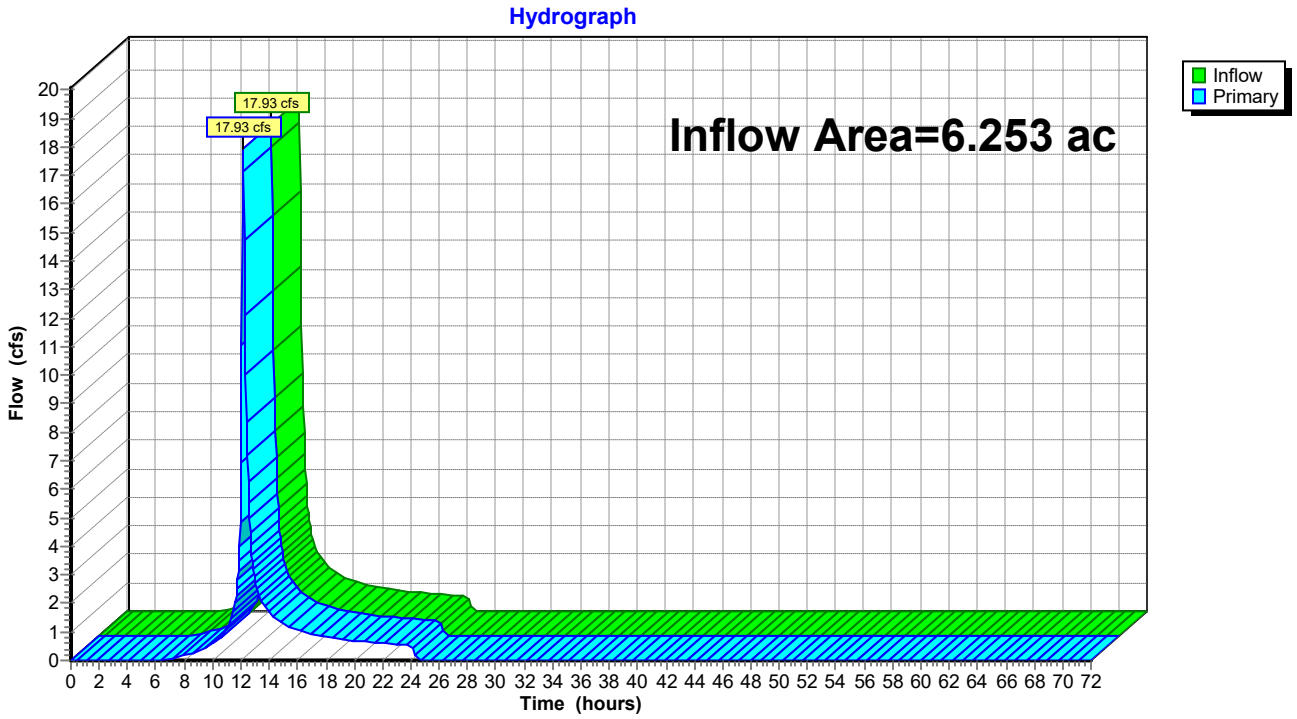


Summary for Link O4: OUT 4

Inflow Area = 6.253 ac, 0.00% Impervious, Inflow Depth = 3.58" for 25-yr event
Inflow = 17.93 cfs @ 12.16 hrs, Volume= 1.863 af
Primary = 17.93 cfs @ 12.16 hrs, Volume= 1.863 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O4: OUT 4

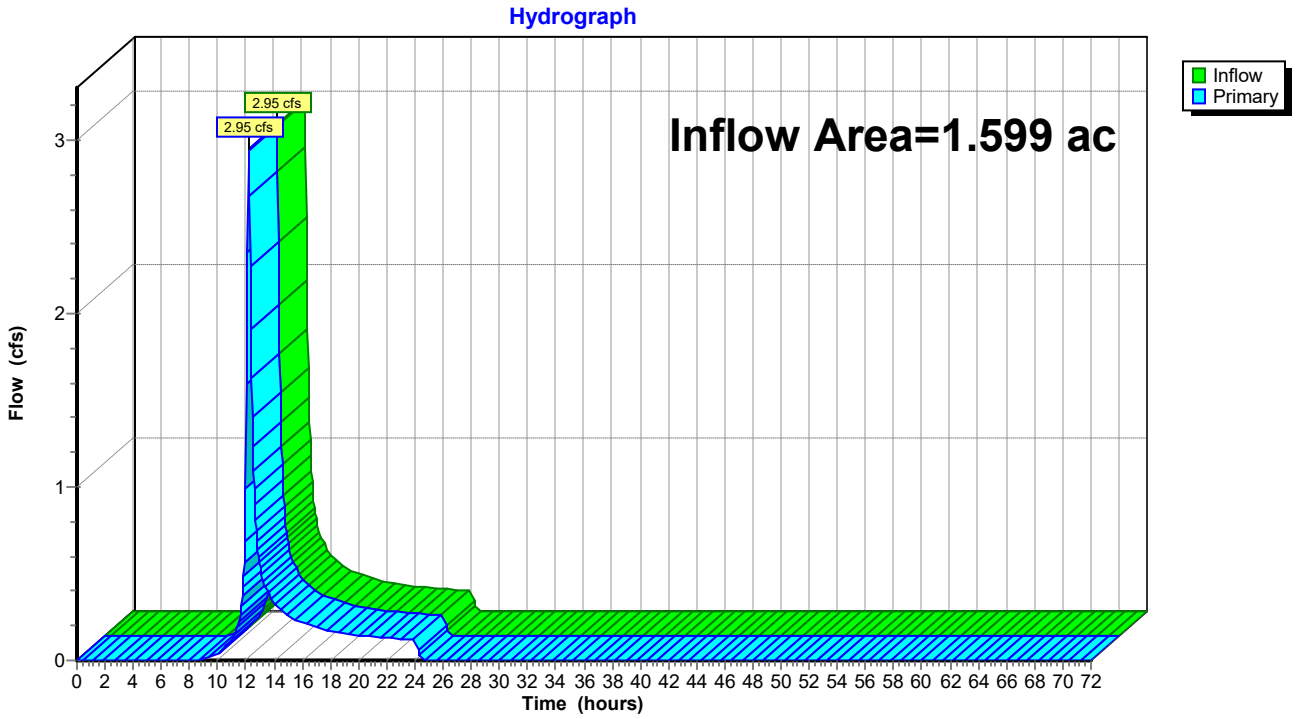


Summary for Link O5: OUT 5

Inflow Area = 1.599 ac, 0.00% Impervious, Inflow Depth = 2.50" for 25-yr event
Inflow = 2.95 cfs @ 12.19 hrs, Volume= 0.333 af
Primary = 2.95 cfs @ 12.19 hrs, Volume= 0.333 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O5: OUT 5



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: DRAINAGE AREA 1 Runoff Area=2,283,420 sf 0.00% Impervious Runoff Depth=5.24"
Flow Length=2,736' Tc=26.9 min CN=73 Runoff=160.34 cfs 22.879 af

Subcatchment 2: DRAINAGE AREA 2 Runoff Area=1,247,550 sf 0.00% Impervious Runoff Depth=5.84"
Flow Length=825' Tc=30.1 min CN=78 Runoff=90.86 cfs 13.929 af

Subcatchment 3: DRAINAGE AREA 3 Runoff Area=663,807 sf 0.00% Impervious Runoff Depth=5.24"
Flow Length=590' Tc=19.9 min CN=73 Runoff=55.05 cfs 6.651 af

Subcatchment 4: DRAINAGE AREA 4 Runoff Area=272,371 sf 0.00% Impervious Runoff Depth=5.24"
Flow Length=376' Tc=15.4 min CN=73 Runoff=25.86 cfs 2.729 af

Subcatchment 5: DRAINAGE AREA 5 Runoff Area=69,632 sf 0.00% Impervious Runoff Depth=3.93"
Flow Length=340' Tc=16.6 min CN=62 Runoff=4.69 cfs 0.524 af

Link O1: OUT 1 Inflow=160.34 cfs 22.879 af
Primary=160.34 cfs 22.879 af

Link O2: OUT 2 Inflow=90.86 cfs 13.929 af
Primary=90.86 cfs 13.929 af

Link O3: OUT 3 Inflow=55.05 cfs 6.651 af
Primary=55.05 cfs 6.651 af

Link O4: OUT 4 Inflow=25.86 cfs 2.729 af
Primary=25.86 cfs 2.729 af

Link O5: OUT 5 Inflow=4.69 cfs 0.524 af
Primary=4.69 cfs 0.524 af

Total Runoff Area = 104.150 ac Runoff Volume = 46.713 af Average Runoff Depth = 5.38"
100.00% Pervious = 104.150 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1: DRAINAGE AREA 1

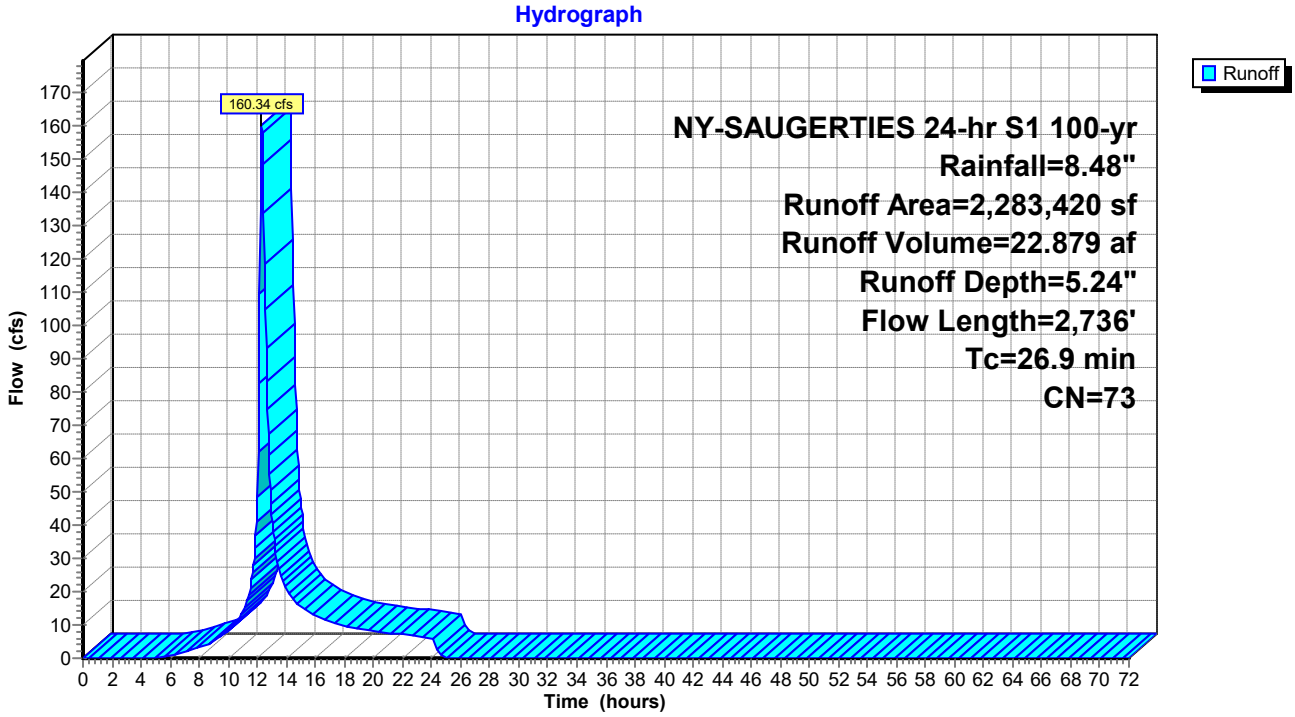
Runoff = 160.34 cfs @ 12.31 hrs, Volume= 22.879 af, Depth= 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

Area (sf)	CN	Description
165,953	36	Woods, Fair, HSG A
26,975	60	Woods, Fair, HSG B
870,524	73	Woods, Fair, HSG C
1,219,968	79	Woods, Fair, HSG D
2,283,420	73	Weighted Average
2,283,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	100	0.0750	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.1	533	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
9.5	2,103	0.0600	3.67		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
26.9	2,736	Total			

Subcatchment 1: DRAINAGE AREA 1



Summary for Subcatchment 2: DRAINAGE AREA 2

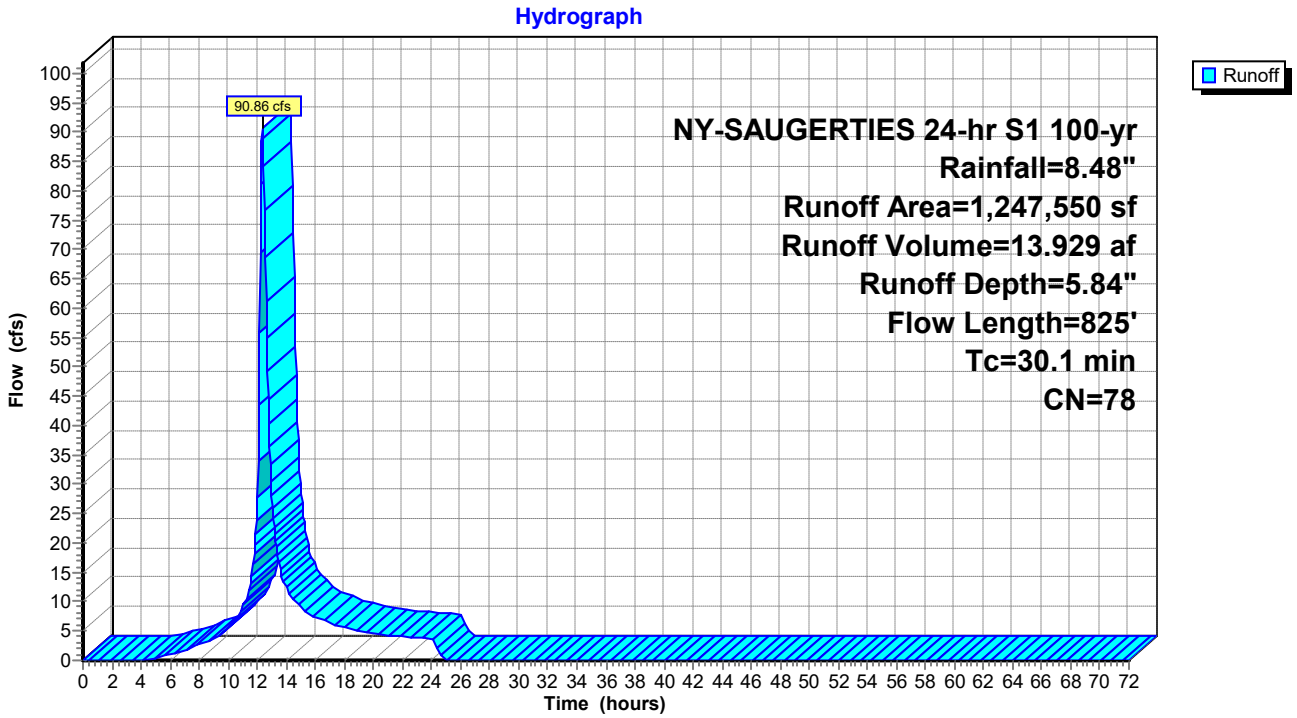
Runoff = 90.86 cfs @ 12.35 hrs, Volume= 13.929 af, Depth= 5.84"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

Area (sf)	CN	Description
5,625	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
73,172	73	Woods, Fair, HSG C
1,168,753	79	Woods, Fair, HSG D
1,247,550	78	Weighted Average
1,247,550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
15.6	725	0.0240	0.77		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
30.1	825	Total			

Subcatchment 2: DRAINAGE AREA 2



Summary for Subcatchment 3: DRAINAGE AREA 3

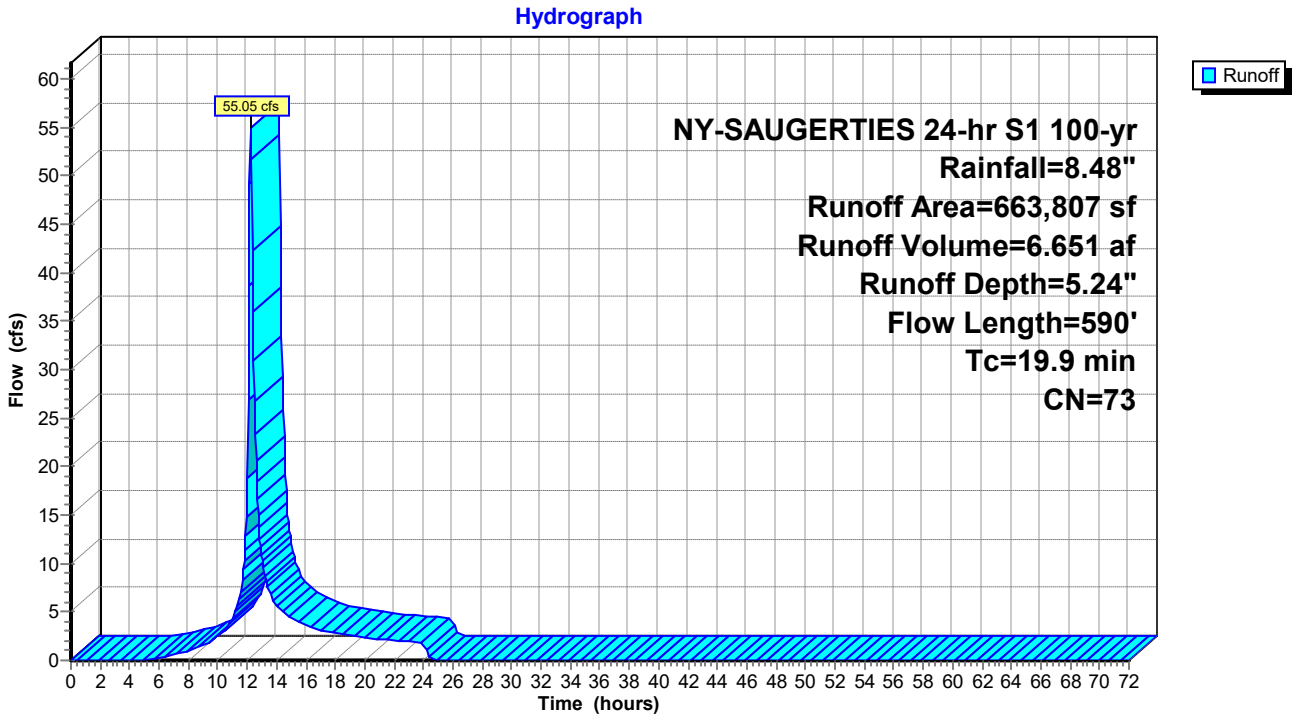
Runoff = 55.05 cfs @ 12.22 hrs, Volume= 6.651 af, Depth= 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
663,807	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
663,807	73	Weighted Average
663,807		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.4	490	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	590	Total			

Subcatchment 3: DRAINAGE AREA 3



Summary for Subcatchment 4: DRAINAGE AREA 4

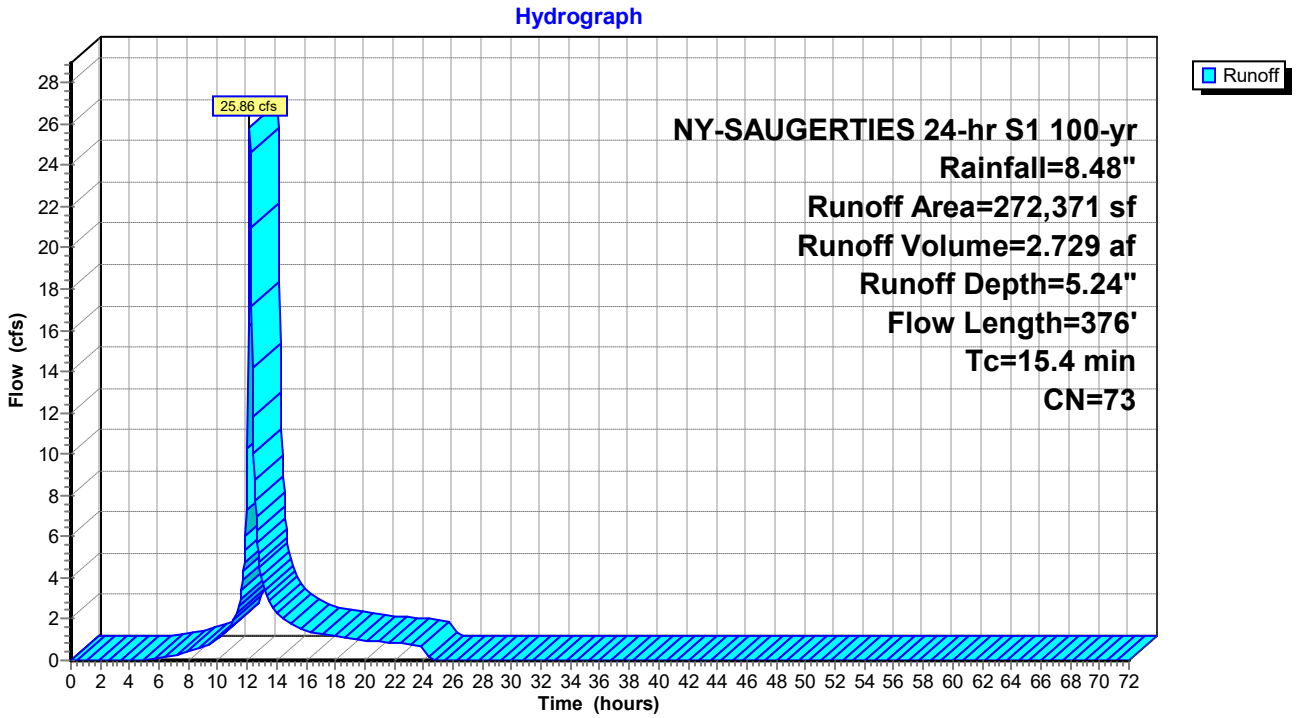
Runoff = 25.86 cfs @ 12.16 hrs, Volume= 2.729 af, Depth= 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
272,371	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
272,371	73	Weighted Average
272,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0700	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.7	276	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.4	376	Total			

Subcatchment 4: DRAINAGE AREA 4



Summary for Subcatchment 5: DRAINAGE AREA 5

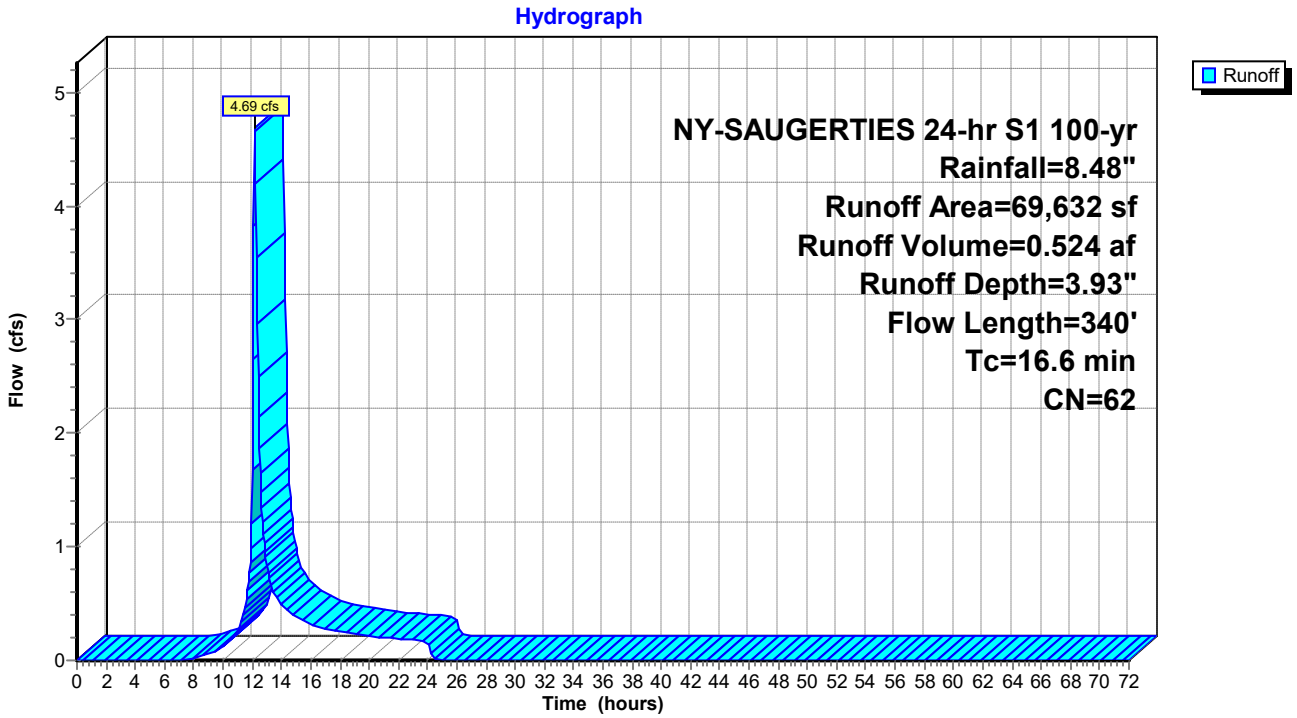
Runoff = 4.69 cfs @ 12.18 hrs, Volume= 0.524 af, Depth= 3.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

Area (sf)	CN	Description
27,631	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
42,001	79	Woods, Fair, HSG D
69,632	62	Weighted Average
69,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0540	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.6	240	0.0930	1.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.6	340	Total			

Subcatchment 5: DRAINAGE AREA 5

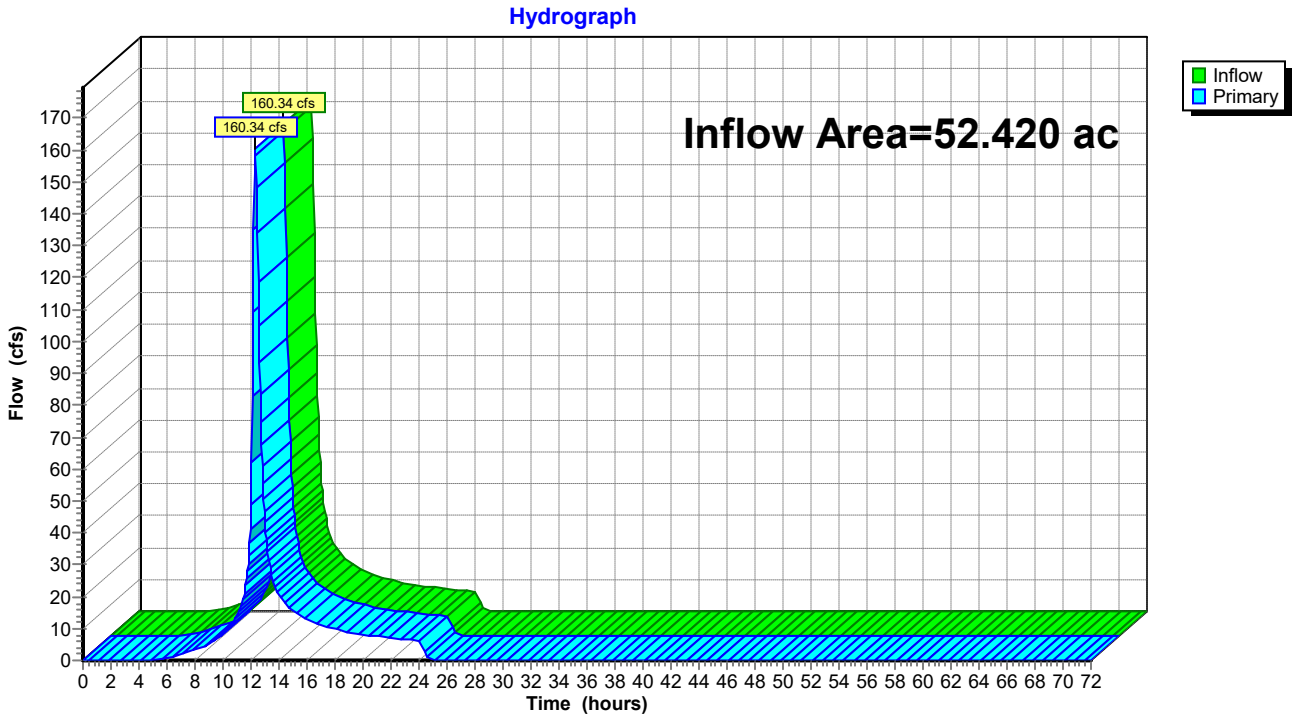


Summary for Link O1: OUT 1

Inflow Area = 52.420 ac, 0.00% Impervious, Inflow Depth = 5.24" for 100-yr event
Inflow = 160.34 cfs @ 12.31 hrs, Volume= 22.879 af
Primary = 160.34 cfs @ 12.31 hrs, Volume= 22.879 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O1: OUT 1

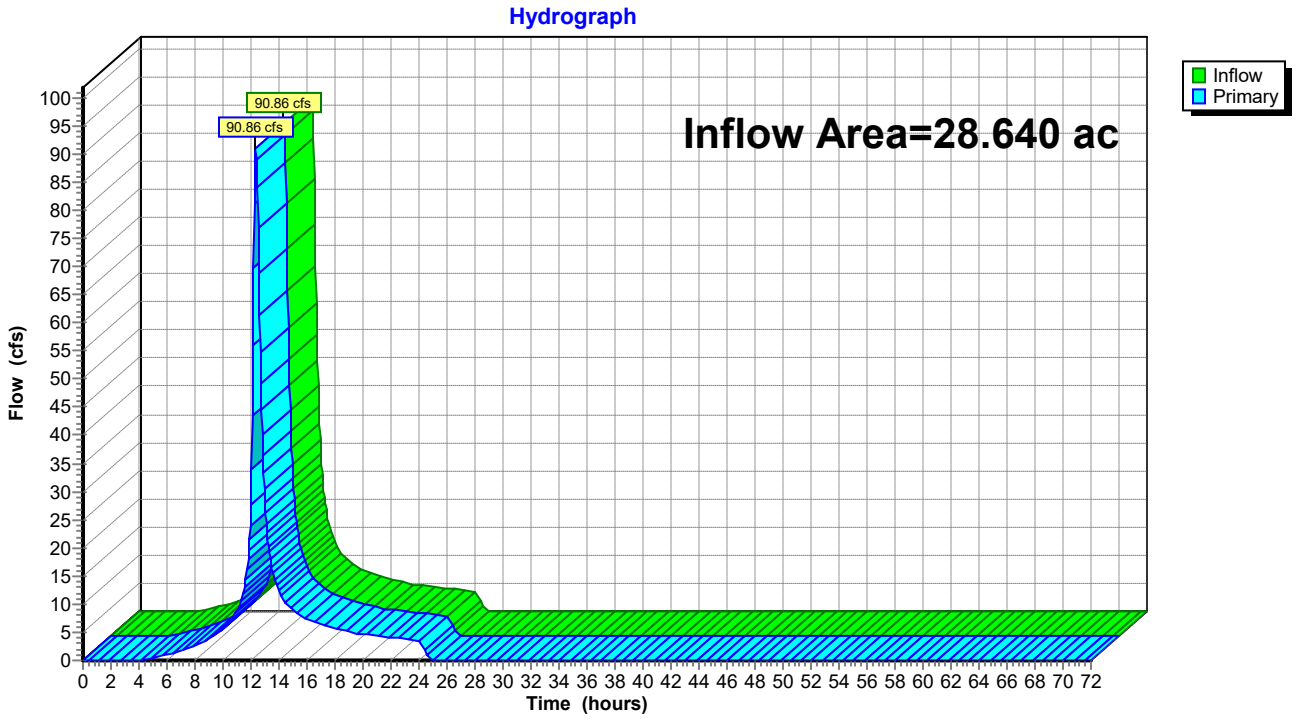


Summary for Link O2: OUT 2

Inflow Area = 28.640 ac, 0.00% Impervious, Inflow Depth = 5.84" for 100-yr event
Inflow = 90.86 cfs @ 12.35 hrs, Volume= 13.929 af
Primary = 90.86 cfs @ 12.35 hrs, Volume= 13.929 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O2: OUT 2

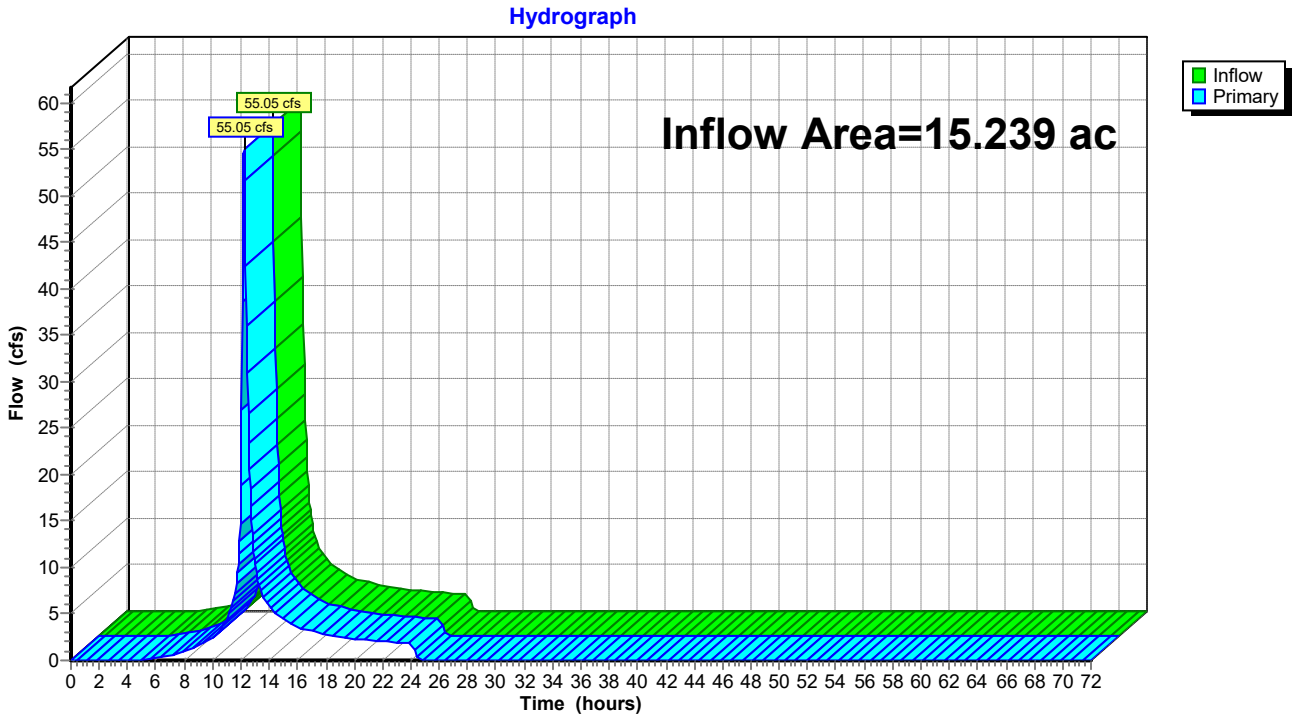


Summary for Link O3: OUT 3

Inflow Area = 15.239 ac, 0.00% Impervious, Inflow Depth = 5.24" for 100-yr event
Inflow = 55.05 cfs @ 12.22 hrs, Volume= 6.651 af
Primary = 55.05 cfs @ 12.22 hrs, Volume= 6.651 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O3: OUT 3

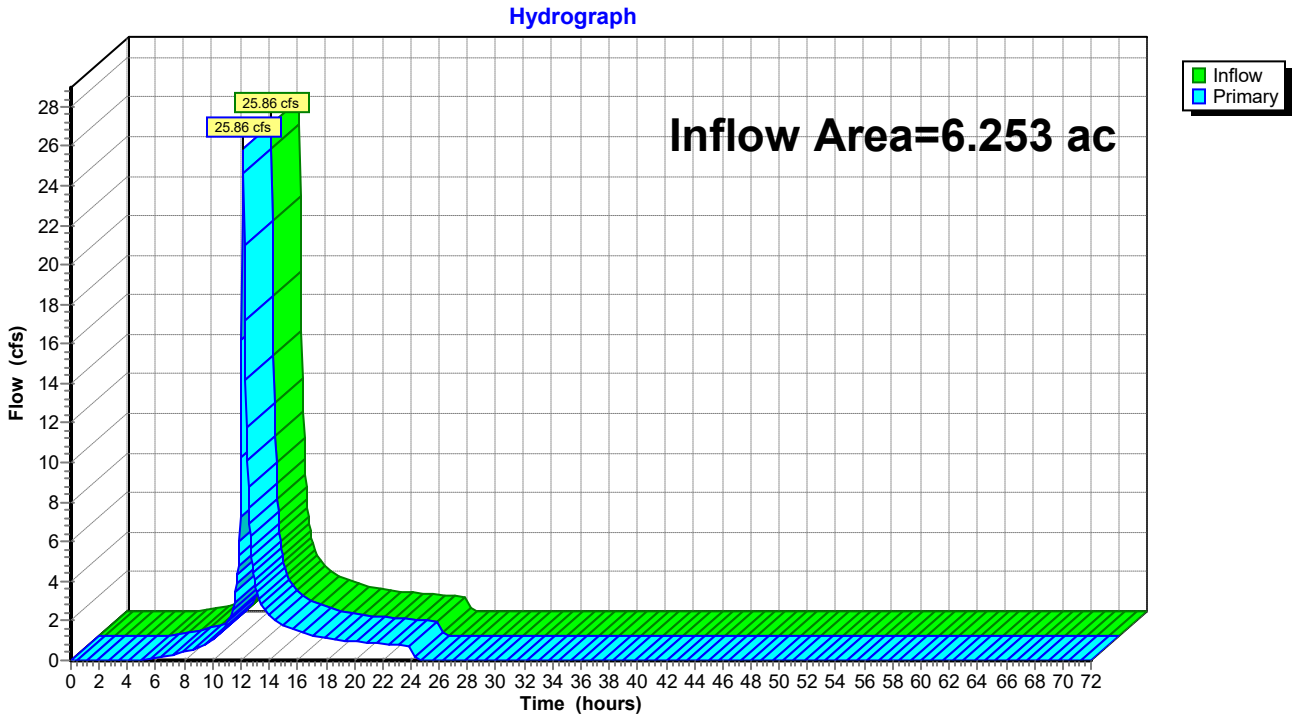


Summary for Link O4: OUT 4

Inflow Area = 6.253 ac, 0.00% Impervious, Inflow Depth = 5.24" for 100-yr event
Inflow = 25.86 cfs @ 12.16 hrs, Volume= 2.729 af
Primary = 25.86 cfs @ 12.16 hrs, Volume= 2.729 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O4: OUT 4

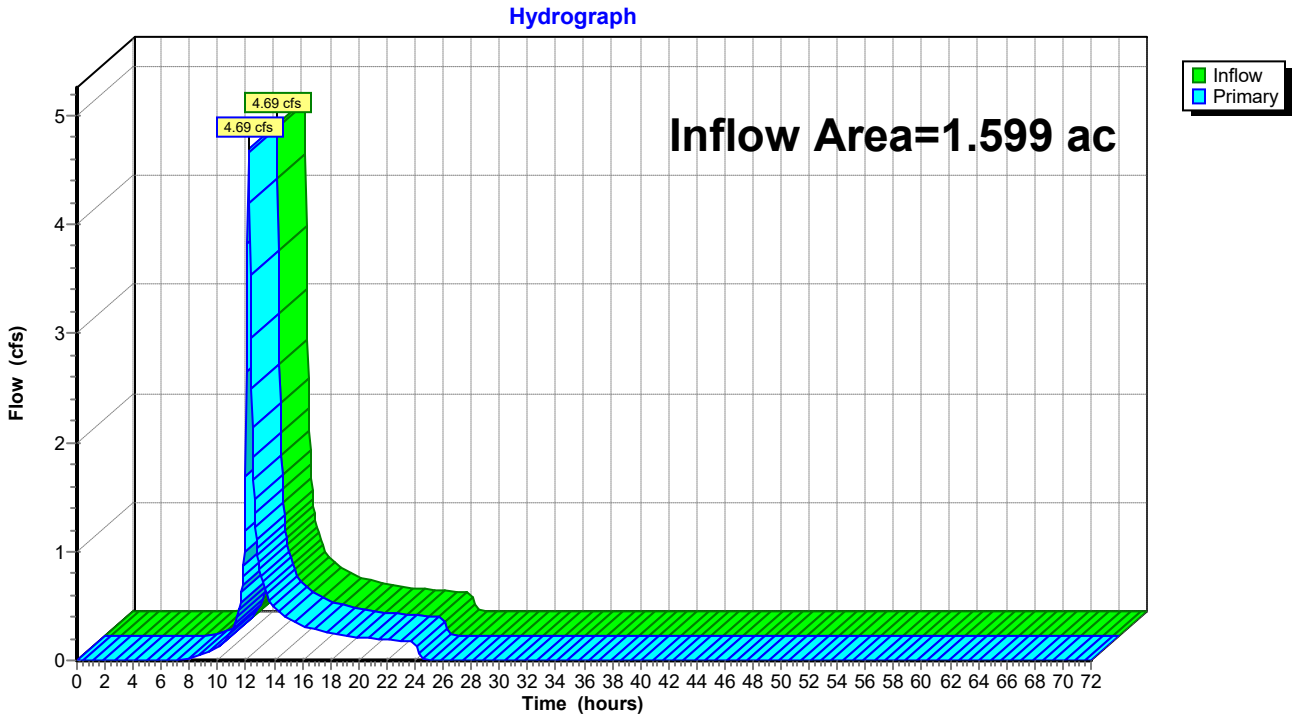


Summary for Link O5: OUT 5

Inflow Area = 1.599 ac, 0.00% Impervious, Inflow Depth = 3.93" for 100-yr event
Inflow = 4.69 cfs @ 12.18 hrs, Volume= 0.524 af
Primary = 4.69 cfs @ 12.18 hrs, Volume= 0.524 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O5: OUT 5



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1: DRAINAGE AREA 1 Runoff Area=2,283,420 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=2,736' Tc=26.9 min CN=73 Runoff=2.34 cfs 0.709 af

Subcatchment 2: DRAINAGE AREA 2 Runoff Area=1,247,550 sf 0.00% Impervious Runoff Depth=0.28"
Flow Length=825' Tc=30.1 min CN=78 Runoff=3.44 cfs 0.664 af

Subcatchment 3: DRAINAGE AREA 3 Runoff Area=663,807 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=590' Tc=19.9 min CN=73 Runoff=0.76 cfs 0.206 af

Subcatchment 4: DRAINAGE AREA 4 Runoff Area=272,371 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=376' Tc=15.4 min CN=73 Runoff=0.34 cfs 0.085 af

Subcatchment 5: DRAINAGE AREA 5 Runoff Area=69,632 sf 0.00% Impervious Runoff Depth=0.02"
Flow Length=340' Tc=16.6 min CN=62 Runoff=0.00 cfs 0.003 af

Link O1: OUT 1 Inflow=2.34 cfs 0.709 af
Primary=2.34 cfs 0.709 af

Link O2: OUT 2 Inflow=3.44 cfs 0.664 af
Primary=3.44 cfs 0.664 af

Link O3: OUT 3 Inflow=0.76 cfs 0.206 af
Primary=0.76 cfs 0.206 af

Link O4: OUT 4 Inflow=0.34 cfs 0.085 af
Primary=0.34 cfs 0.085 af

Link O5: OUT 5 Inflow=0.00 cfs 0.003 af
Primary=0.00 cfs 0.003 af

Total Runoff Area = 104.150 ac Runoff Volume = 1.667 af Average Runoff Depth = 0.19"
100.00% Pervious = 104.150 ac 0.00% Impervious = 0.000 ac

Summary for Subcatchment 1: DRAINAGE AREA 1

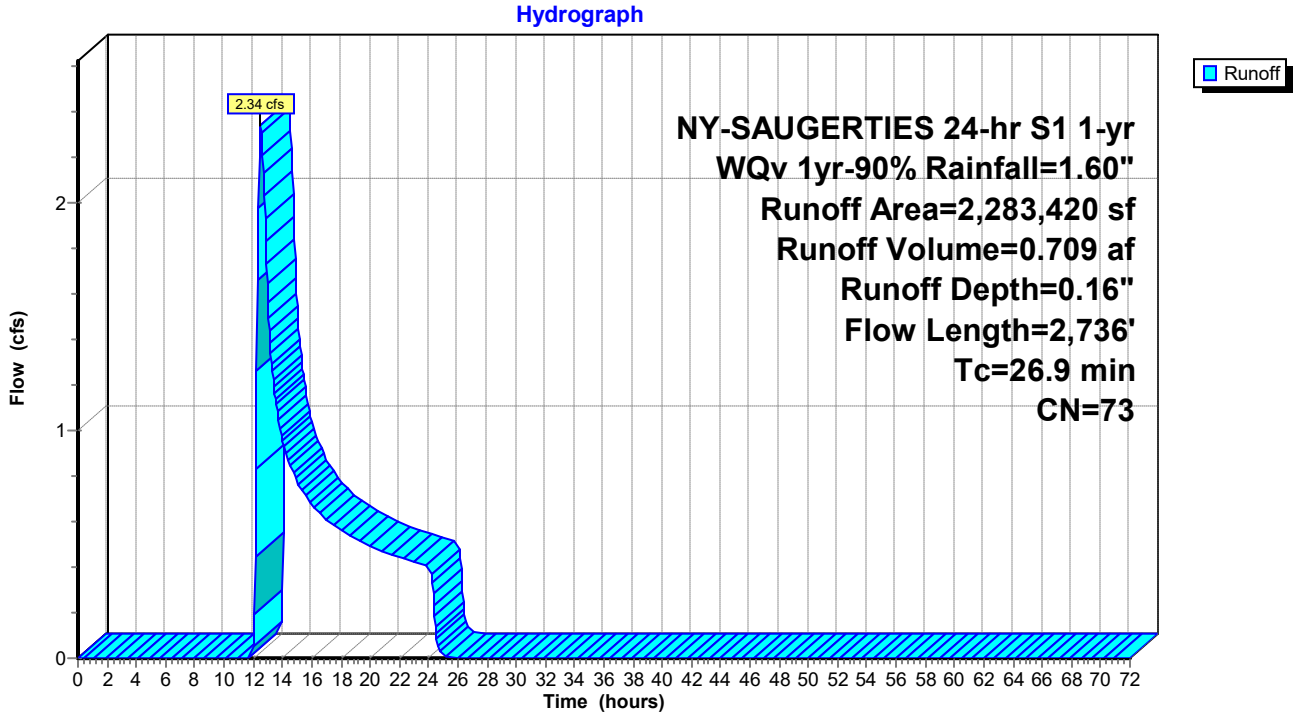
Runoff = 2.34 cfs @ 12.50 hrs, Volume= 0.709 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

Area (sf)	CN	Description
165,953	36	Woods, Fair, HSG A
26,975	60	Woods, Fair, HSG B
870,524	73	Woods, Fair, HSG C
1,219,968	79	Woods, Fair, HSG D
2,283,420	73	Weighted Average
2,283,420		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.3	100	0.0750	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.1	533	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
9.5	2,103	0.0600	3.67		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
26.9	2,736	Total			

Subcatchment 1: DRAINAGE AREA 1



Summary for Subcatchment 2: DRAINAGE AREA 2

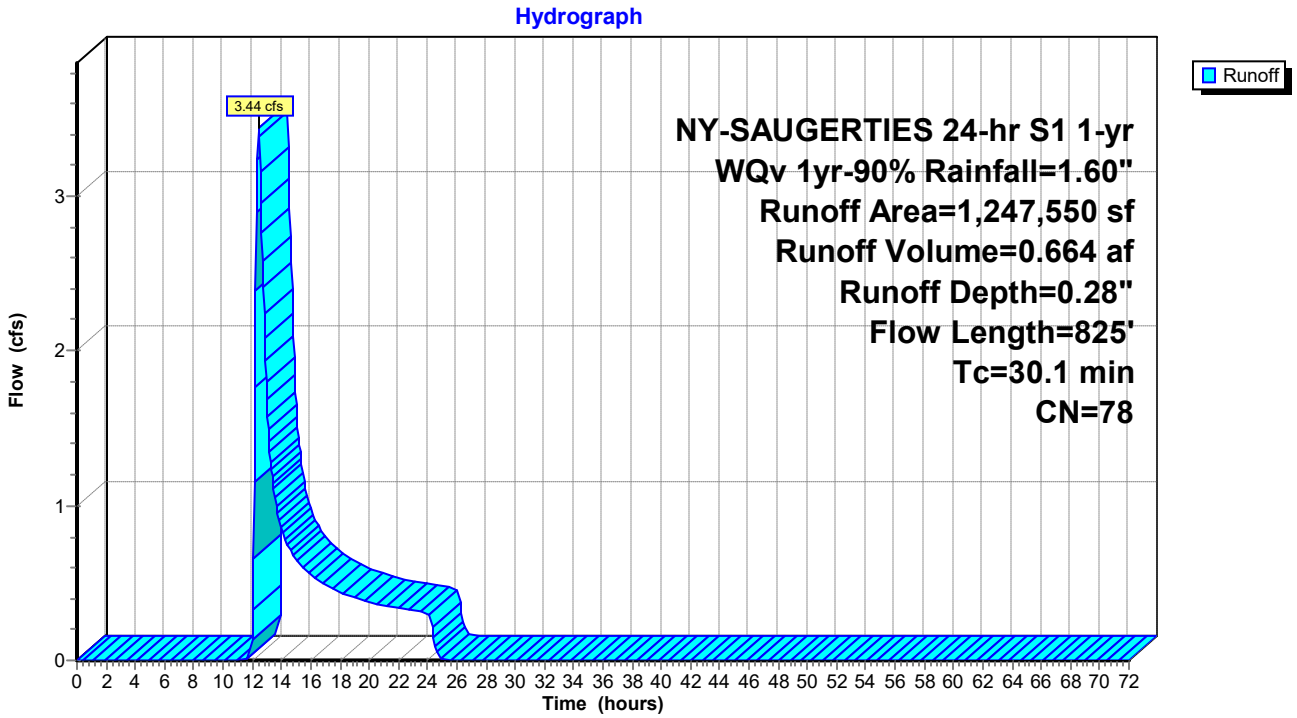
Runoff = 3.44 cfs @ 12.43 hrs, Volume= 0.664 af, Depth= 0.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

Area (sf)	CN	Description
5,625	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
73,172	73	Woods, Fair, HSG C
1,168,753	79	Woods, Fair, HSG D
1,247,550	78	Weighted Average
1,247,550		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
15.6	725	0.0240	0.77		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
30.1	825	Total			

Subcatchment 2: DRAINAGE AREA 2



Summary for Subcatchment 3: DRAINAGE AREA 3

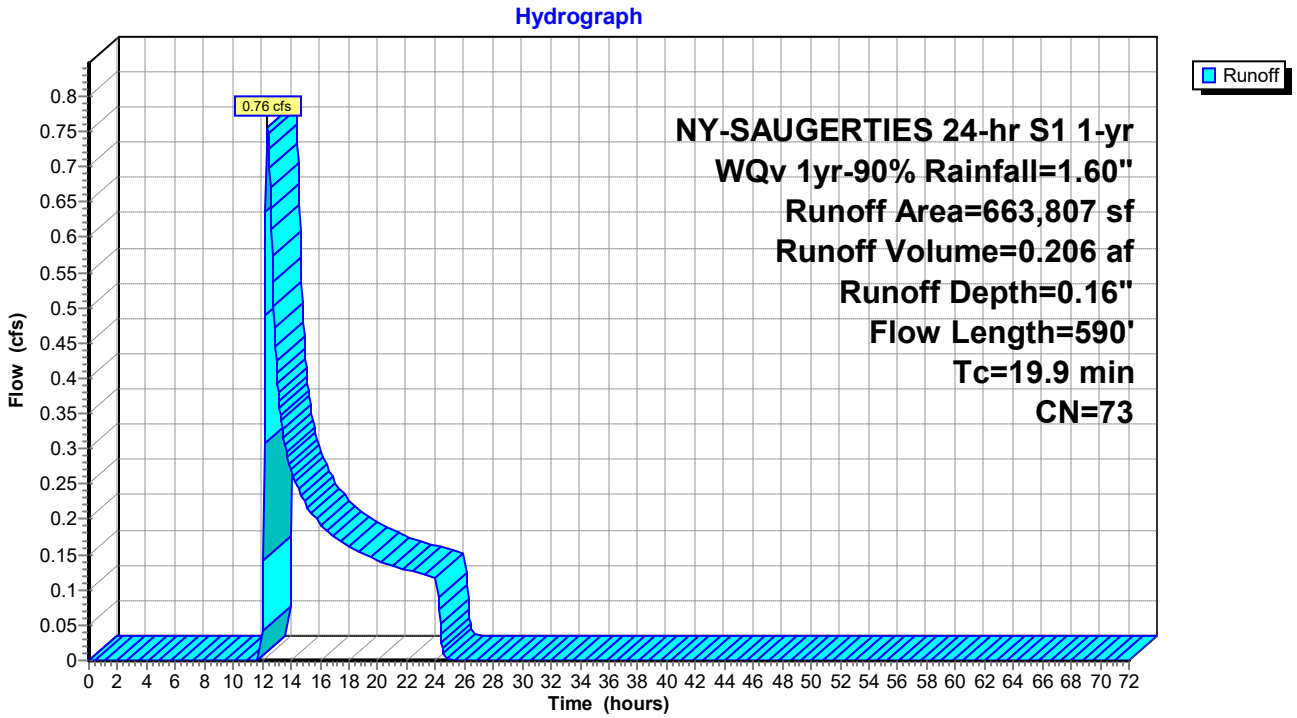
Runoff = 0.76 cfs @ 12.36 hrs, Volume= 0.206 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
663,807	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
663,807	73	Weighted Average
663,807		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.4	490	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	590	Total			

Subcatchment 3: DRAINAGE AREA 3



Summary for Subcatchment 4: DRAINAGE AREA 4

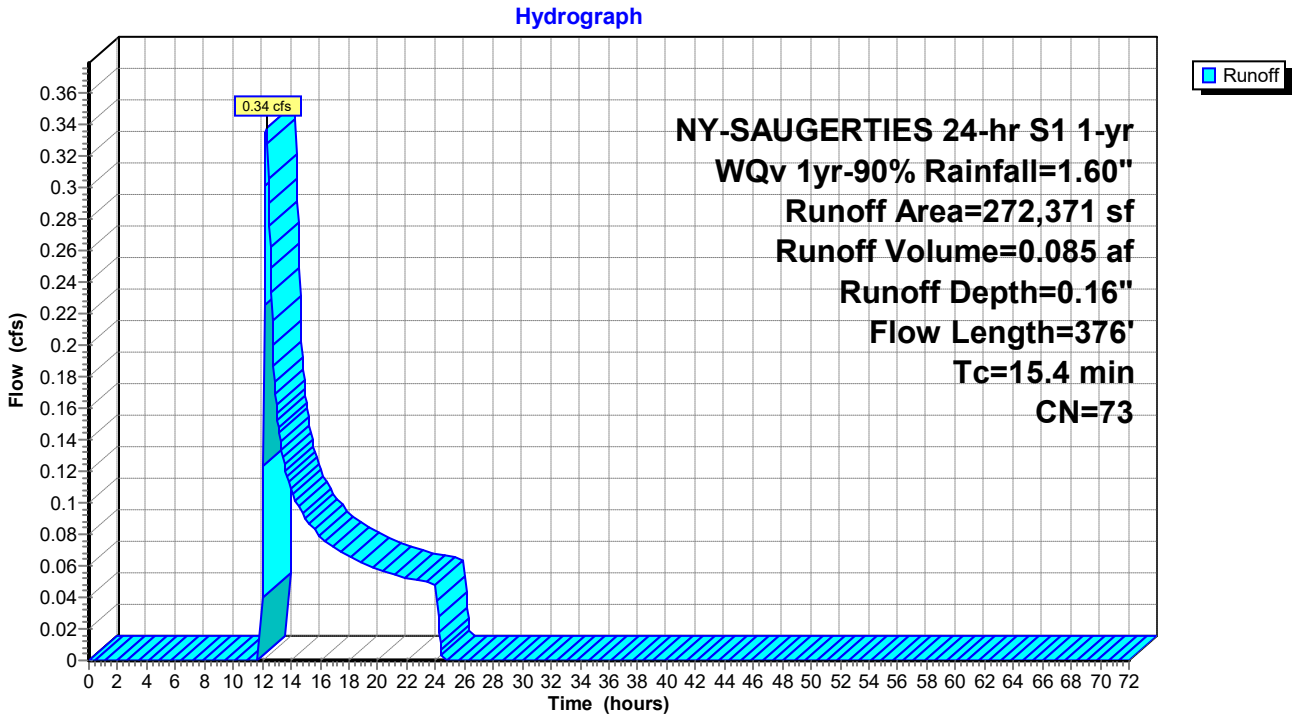
Runoff = 0.34 cfs @ 12.27 hrs, Volume= 0.085 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
272,371	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
272,371	73	Weighted Average
272,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0700	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.7	276	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.4	376	Total			

Subcatchment 4: DRAINAGE AREA 4



Summary for Subcatchment 5: DRAINAGE AREA 5

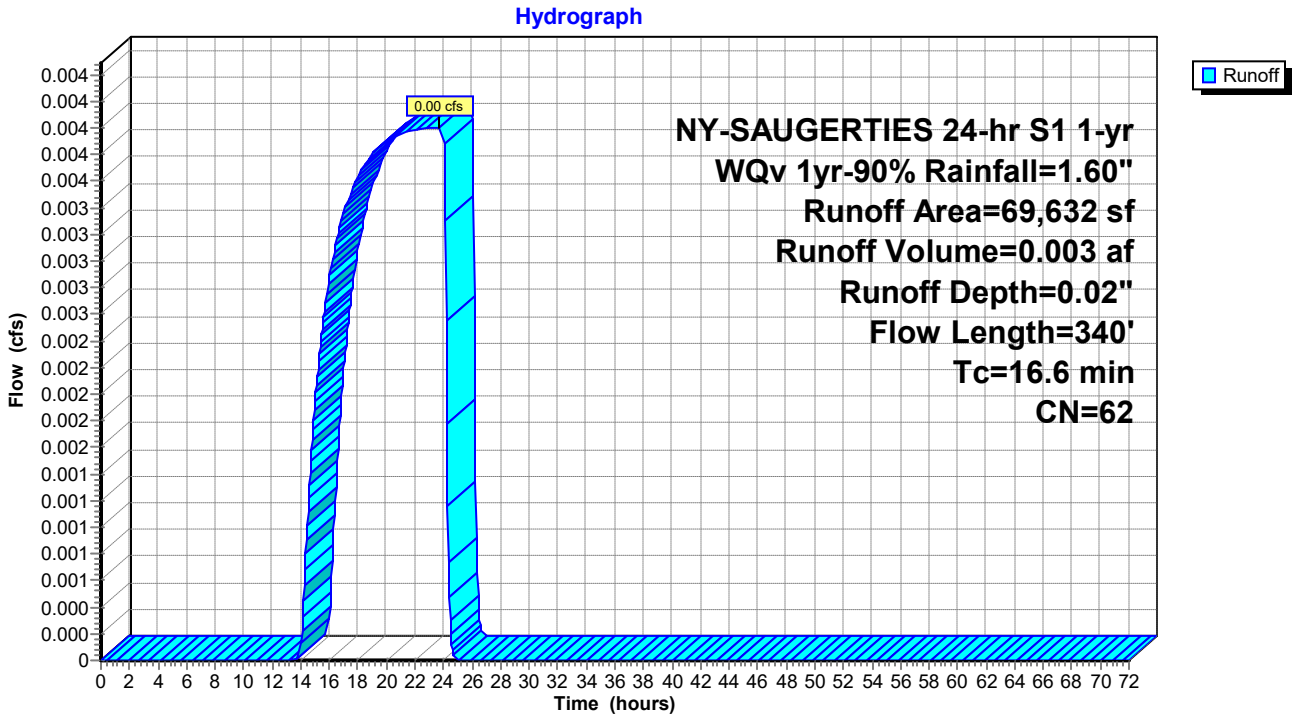
Runoff = 0.00 cfs @ 23.64 hrs, Volume= 0.003 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

Area (sf)	CN	Description
27,631	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
42,001	79	Woods, Fair, HSG D
69,632	62	Weighted Average
69,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0540	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.6	240	0.0930	1.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.6	340	Total			

Subcatchment 5: DRAINAGE AREA 5

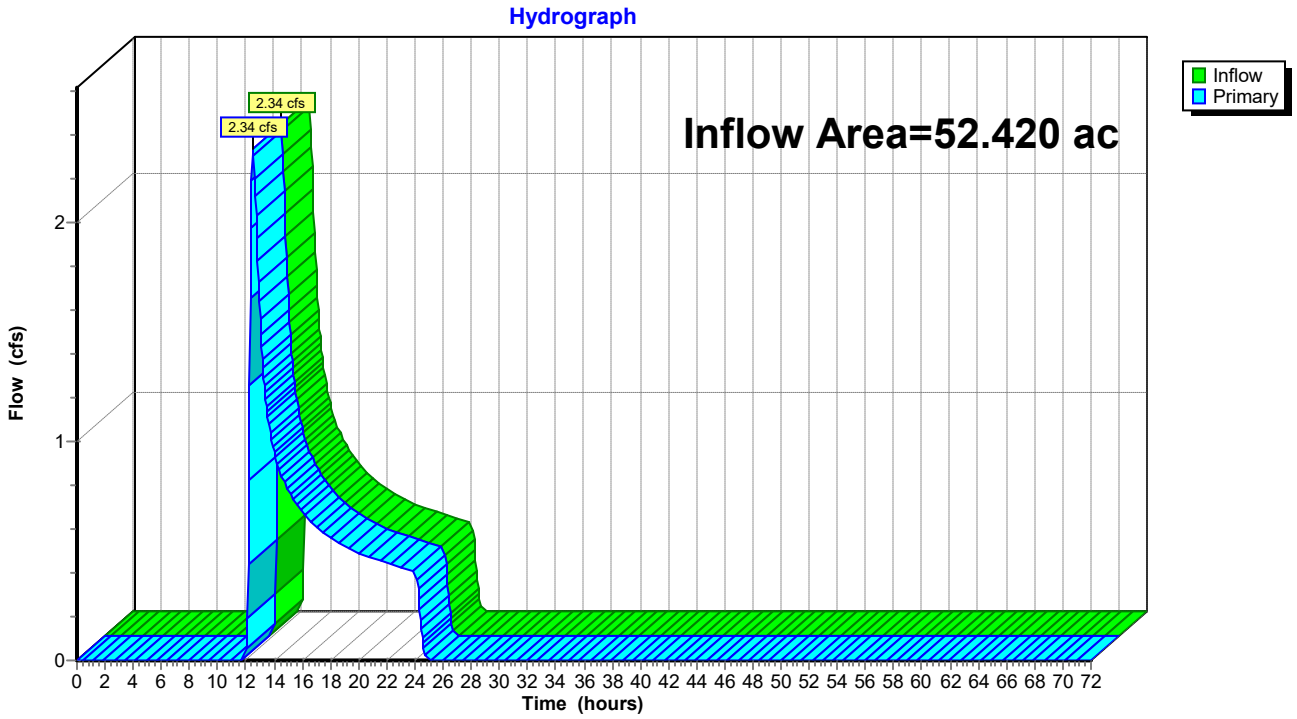


Summary for Link O1: OUT 1

Inflow Area = 52.420 ac, 0.00% Impervious, Inflow Depth = 0.16" for WQv 1yr-90% event
Inflow = 2.34 cfs @ 12.50 hrs, Volume= 0.709 af
Primary = 2.34 cfs @ 12.50 hrs, Volume= 0.709 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O1: OUT 1

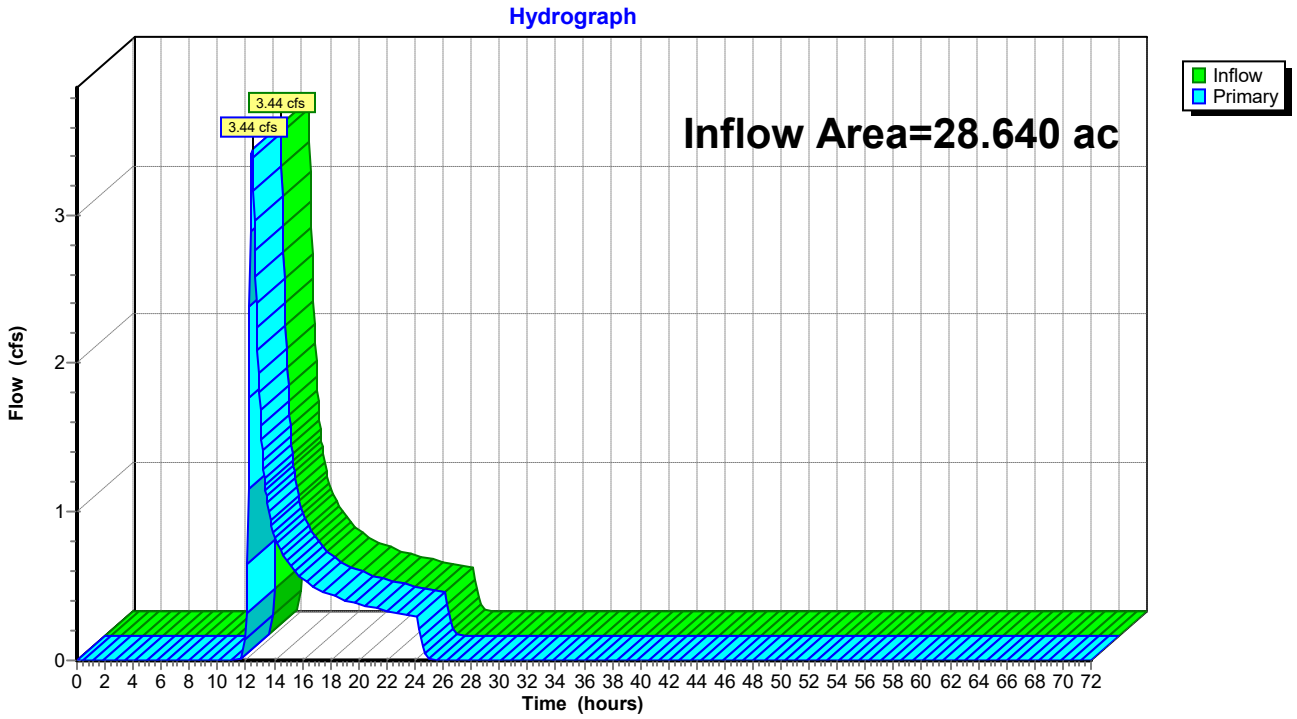


Summary for Link O2: OUT 2

Inflow Area = 28.640 ac, 0.00% Impervious, Inflow Depth = 0.28" for WQv 1yr-90% event
Inflow = 3.44 cfs @ 12.43 hrs, Volume= 0.664 af
Primary = 3.44 cfs @ 12.43 hrs, Volume= 0.664 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O2: OUT 2

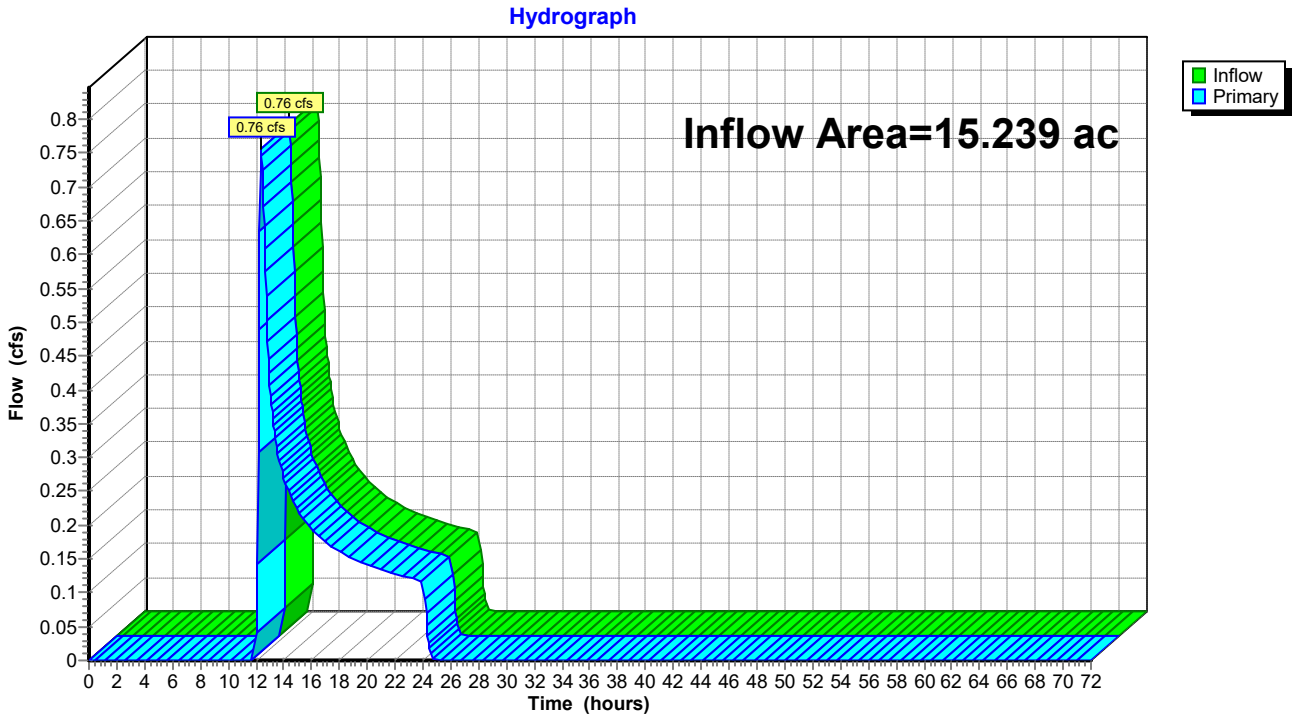


Summary for Link O3: OUT 3

Inflow Area = 15.239 ac, 0.00% Impervious, Inflow Depth = 0.16" for WQv 1yr-90% event
Inflow = 0.76 cfs @ 12.36 hrs, Volume= 0.206 af
Primary = 0.76 cfs @ 12.36 hrs, Volume= 0.206 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O3: OUT 3

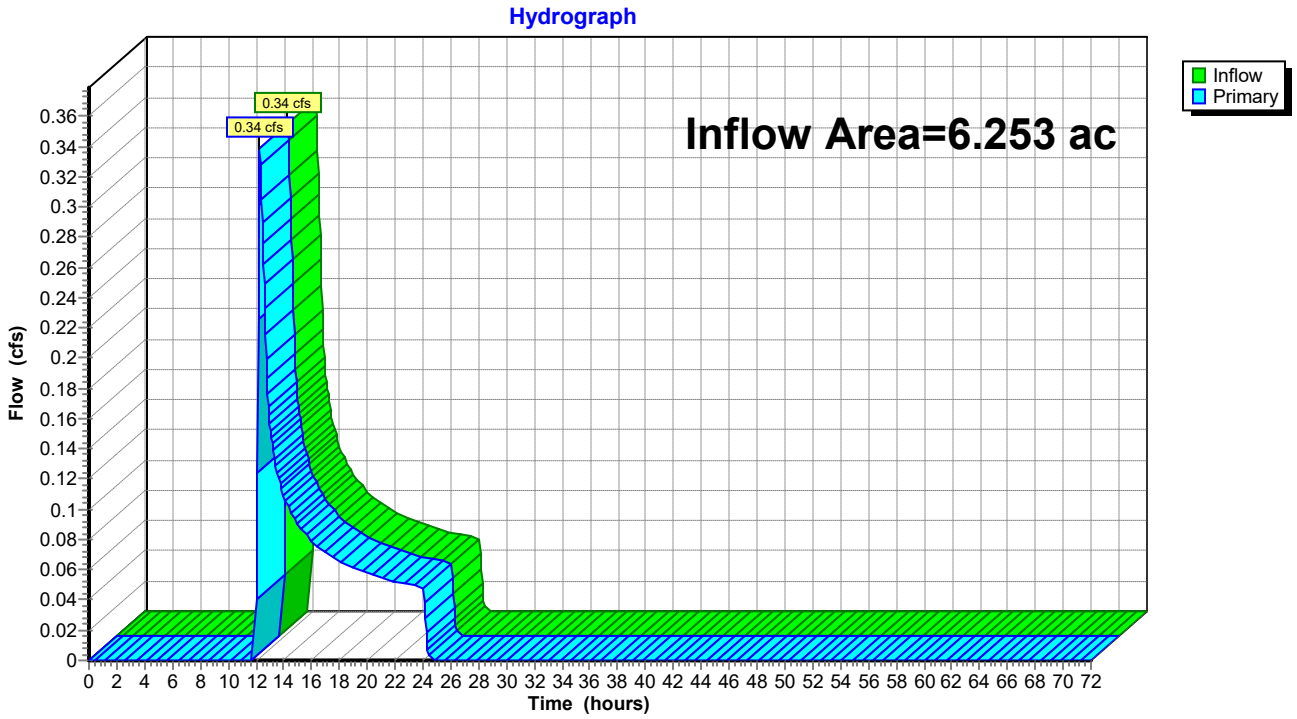


Summary for Link O4: OUT 4

Inflow Area = 6.253 ac, 0.00% Impervious, Inflow Depth = 0.16" for WQv 1yr-90% event
Inflow = 0.34 cfs @ 12.27 hrs, Volume= 0.085 af
Primary = 0.34 cfs @ 12.27 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O4: OUT 4

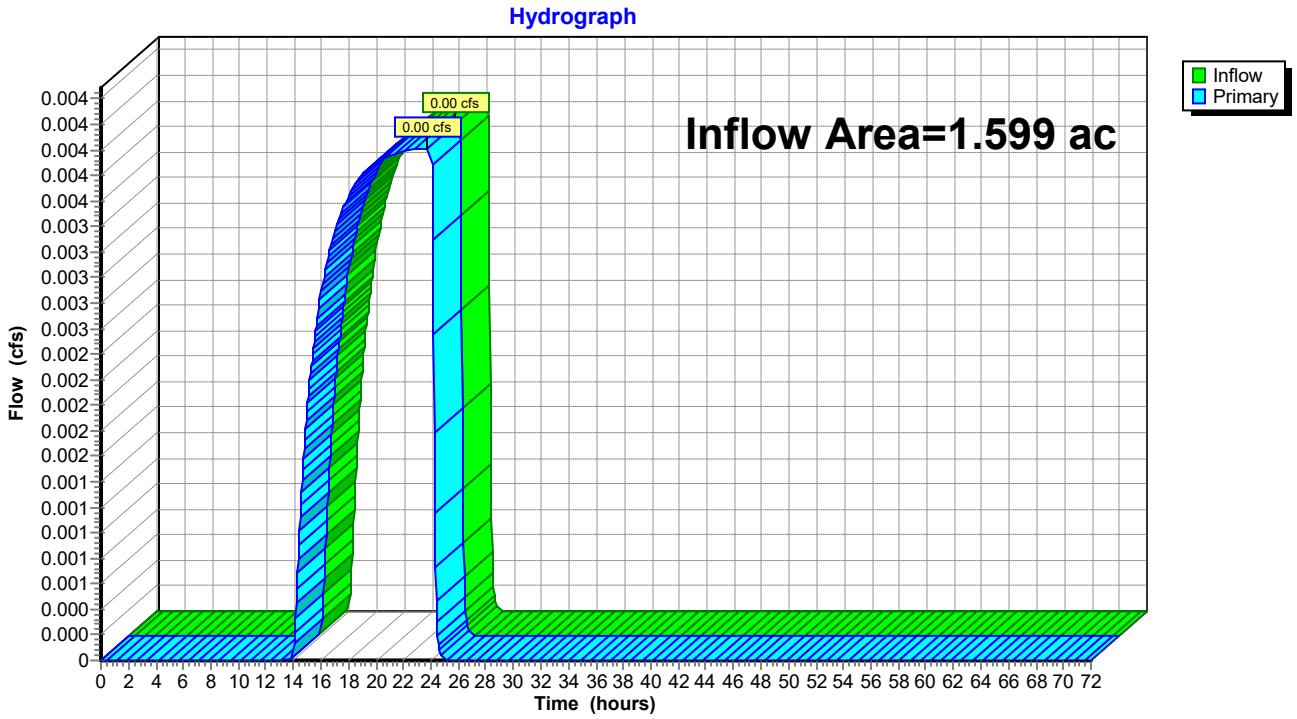


Summary for Link O5: OUT 5

Inflow Area = 1.599 ac, 0.00% Impervious, Inflow Depth = 0.02" for WQv 1yr-90% event
Inflow = 0.00 cfs @ 23.64 hrs, Volume= 0.003 af
Primary = 0.00 cfs @ 23.64 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

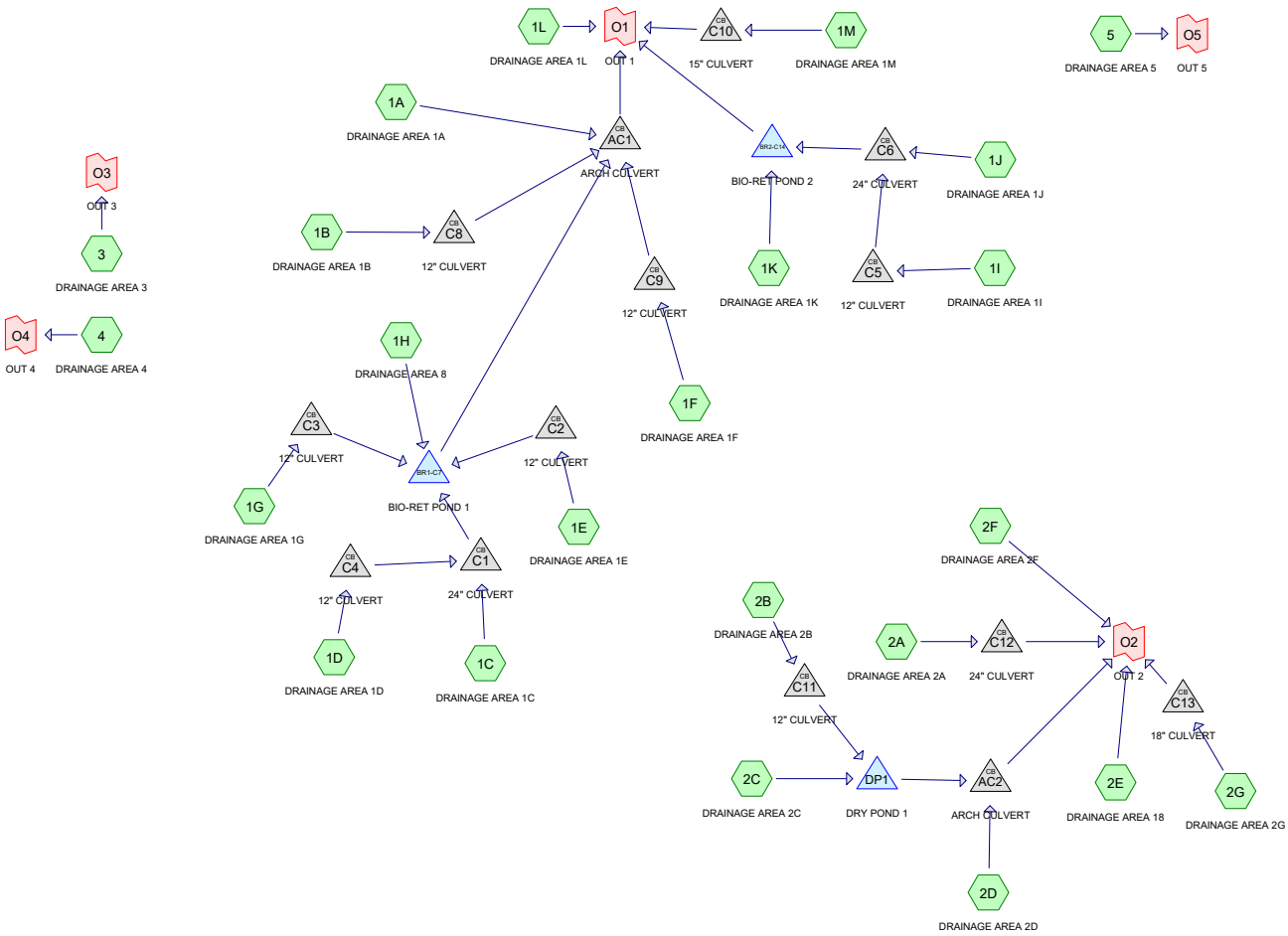
Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O5: OUT 5



APPENDIX 5

MITIGATED POST DEVELOPMENT HYDROLOGIC ANALYSIS



Subcat Reach Pond Link

Routing Diagram for SOLOHS-POST

Prepared by {enter your company name here}, Printed 8/31/2026

HydroCAD® 10.00-26 s/n 02036 © 2020 HydroCAD Software Solutions LLC

Pipe Listing (all nodes)

Line#	Node Number	In-Invert (feet)	Out-Invert (feet)	Length (feet)	Slope (ft/ft)	n	Diam/Width (inches)	Height (inches)	Inside-Fill (inches)
1	AC1	453.90	451.40	60.0	0.0417	0.013	96.0	43.0	0.0
2	AC2	429.90	429.20	40.0	0.0175	0.013	96.0	43.0	0.0
3	BR1-C7	474.00	470.00	280.0	0.0143	0.013	18.0	0.0	0.0
4	BR2-C14	454.00	452.00	38.0	0.0526	0.013	18.0	0.0	0.0
5	C1	480.00	479.50	36.0	0.0139	0.013	24.0	0.0	0.0
6	C10	448.25	447.50	67.0	0.0112	0.013	15.0	0.0	0.0
7	C11	458.00	456.00	40.0	0.0500	0.013	12.0	0.0	0.0
8	C12	444.00	443.50	30.0	0.0167	0.013	24.0	0.0	0.0
9	C13	432.50	431.00	56.0	0.0268	0.013	18.0	0.0	0.0
10	C2	479.00	478.50	40.0	0.0125	0.013	12.0	0.0	0.0
11	C3	479.00	478.50	40.0	0.0125	0.013	12.0	0.0	0.0
12	C4	481.20	481.00	20.0	0.0100	0.013	12.0	0.0	0.0
13	C5	476.60	476.30	20.0	0.0150	0.013	12.0	0.0	0.0
14	C6	463.00	457.00	100.0	0.0600	0.013	24.0	0.0	0.0
15	C8	498.00	497.00	73.0	0.0137	0.013	12.0	0.0	0.0
16	C9	479.00	478.50	35.0	0.0143	0.013	12.0	0.0	0.0

Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: DRAINAGE AREA 1A Runoff Area=1,089,015 sf 2.10% Impervious Runoff Depth=0.83"
Flow Length=2,185' Tc=36.9 min CN=76 Runoff=10.33 cfs 1.732 af

Subcatchment 1B: DRAINAGE AREA 1B Runoff Area=18,084 sf 6.10% Impervious Runoff Depth=0.78"
Flow Length=160' Tc=28.8 min CN=75 Runoff=0.18 cfs 0.027 af

Subcatchment 1C: DRAINAGE AREA 1C Runoff Area=139,425 sf 6.89% Impervious Runoff Depth=0.83"
Flow Length=945' Tc=40.6 min CN=76 Runoff=1.25 cfs 0.222 af

Subcatchment 1D: DRAINAGE AREA 1D Runoff Area=27,532 sf 19.67% Impervious Runoff Depth=0.99"
Flow Length=480' Tc=17.2 min CN=79 Runoff=0.49 cfs 0.052 af

Subcatchment 1E: DRAINAGE AREA 1E Runoff Area=39,104 sf 9.78% Impervious Runoff Depth=0.83"
Flow Length=490' Tc=24.1 min CN=76 Runoff=0.47 cfs 0.062 af

Subcatchment 1F: DRAINAGE AREA 1F Runoff Area=5,854 sf 14.23% Impervious Runoff Depth=1.16"
Flow Length=100' Tc=11.4 min CN=82 Runoff=0.16 cfs 0.013 af

Subcatchment 1G: DRAINAGE AREA 1G Runoff Area=5,726 sf 41.51% Impervious Runoff Depth=1.50"
Flow Length=200' Tc=7.5 min CN=87 Runoff=0.24 cfs 0.016 af

Subcatchment 1H: DRAINAGE AREA 8 Runoff Area=4,559 sf 53.41% Impervious Runoff Depth=1.73"
Flow Length=45' Tc=0.4 min CN=90 Runoff=0.29 cfs 0.015 af

Subcatchment 1I: DRAINAGE AREA 1I Runoff Area=27,574 sf 10.31% Impervious Runoff Depth=1.10"
Flow Length=260' Tc=15.0 min CN=81 Runoff=0.61 cfs 0.058 af

Subcatchment 1J: DRAINAGE AREA 1J Runoff Area=85,839 sf 12.46% Impervious Runoff Depth=1.16"
Flow Length=480' Tc=9.3 min CN=82 Runoff=2.49 cfs 0.191 af

Subcatchment 1K: DRAINAGE AREA 1K Runoff Area=13,922 sf 13.09% Impervious Runoff Depth=1.16"
Flow Length=100' Tc=4.2 min CN=82 Runoff=0.52 cfs 0.031 af

Subcatchment 1L: DRAINAGE AREA 1L Runoff Area=792,979 sf 2.18% Impervious Runoff Depth=0.38"
Flow Length=1,370' Tc=24.1 min CN=65 Runoff=2.84 cfs 0.583 af

Subcatchment 1M: DRAINAGE AREA 1M Runoff Area=10,047 sf 17.03% Impervious Runoff Depth=1.22"
Flow Length=185' Tc=10.3 min CN=83 Runoff=0.30 cfs 0.024 af

Subcatchment 2A: DRAINAGE AREA 2A Runoff Area=58,418 sf 18.29% Impervious Runoff Depth=1.22"
Flow Length=560' Tc=15.0 min CN=83 Runoff=1.46 cfs 0.137 af

Subcatchment 2B: DRAINAGE AREA 2B Runoff Area=5,939 sf 29.70% Impervious Runoff Depth=1.36"
Flow Length=80' Tc=10.2 min CN=85 Runoff=0.20 cfs 0.015 af

Subcatchment 2C: DRAINAGE AREA 2C Runoff Area=130,540 sf 7.90% Impervious Runoff Depth=1.10"
Flow Length=870' Tc=16.7 min CN=81 Runoff=2.71 cfs 0.275 af

Subcatchment 2D: DRAINAGE AREA 2D Runoff Area=858,381 sf 0.51% Impervious Runoff Depth=0.99"
Flow Length=1,470' Tc=43.3 min CN=79 Runoff=9.15 cfs 1.623 af

Subcatchment 2E: DRAINAGE AREA 18 Runoff Area=121,293 sf 11.99% Impervious Runoff Depth=1.04"
Flow Length=610' Tc=16.4 min CN=80 Runoff=2.38 cfs 0.242 af

Subcatchment 2F: DRAINAGE AREA 2F Runoff Area=61,323 sf 0.00% Impervious Runoff Depth=0.69"
Flow Length=250' Tc=13.7 min CN=73 Runoff=0.78 cfs 0.081 af

Subcatchment 2G: DRAINAGE AREA 2G Runoff Area=35,456 sf 7.82% Impervious Runoff Depth=1.10"
Flow Length=300' Tc=21.0 min CN=81 Runoff=0.65 cfs 0.075 af

Subcatchment 3: DRAINAGE AREA 3 Runoff Area=663,807 sf 0.00% Impervious Runoff Depth=0.69"
Flow Length=590' Tc=19.9 min CN=73 Runoff=6.98 cfs 0.877 af

Subcatchment 4: DRAINAGE AREA 4 Runoff Area=272,371 sf 0.00% Impervious Runoff Depth=0.69"
Flow Length=376' Tc=15.4 min CN=73 Runoff=3.25 cfs 0.360 af

Subcatchment 5: DRAINAGE AREA 5 Runoff Area=69,632 sf 0.00% Impervious Runoff Depth=0.29"
Flow Length=340' Tc=16.6 min CN=62 Runoff=0.16 cfs 0.039 af

Pond AC1: ARCH CULVERT Peak Elev=454.52' Inflow=12.44 cfs 2.140 af
96.0" x 43.0", R=52.0" Arch Culvert n=0.013 L=60.0' S=0.0417 '/' Outflow=12.44 cfs 2.140 af

Pond AC2: ARCH CULVERT Peak Elev=430.40' Inflow=9.15 cfs 1.730 af
96.0" x 43.0", R=52.0" Arch Culvert n=0.013 L=40.0' S=0.0175 '/' Outflow=9.15 cfs 1.730 af

Pond BR1-C7: BIO-RET POND 1 Peak Elev=477.25' Storage=314 cf Inflow=1.93 cfs 0.367 af
Outflow=1.93 cfs 0.367 af

Pond BR2-C14: BIO-RET POND 2 Peak Elev=457.57' Storage=5,695 cf Inflow=3.29 cfs 0.280 af
Outflow=0.36 cfs 0.280 af

Pond C1: 24" CULVERT Peak Elev=480.50' Inflow=1.46 cfs 0.274 af
24.0" Round Culvert n=0.013 L=36.0' S=0.0139 '/' Outflow=1.46 cfs 0.274 af

Pond C10: 15" CULVERT Peak Elev=448.50' Inflow=0.30 cfs 0.024 af
15.0" Round Culvert n=0.013 L=67.0' S=0.0112 '/' Outflow=0.30 cfs 0.024 af

Pond C11: 12" CULVERT Peak Elev=458.22' Inflow=0.20 cfs 0.015 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0500 '/' Outflow=0.20 cfs 0.015 af

Pond C12: 24" CULVERT Peak Elev=444.50' Inflow=1.46 cfs 0.137 af
24.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=1.46 cfs 0.137 af

Pond C13: 18" CULVERT Peak Elev=432.86' Inflow=0.65 cfs 0.075 af
18.0" Round Culvert n=0.013 L=56.0' S=0.0268 '/' Outflow=0.65 cfs 0.075 af

Pond C2: 12" CULVERT Peak Elev=479.34' Inflow=0.47 cfs 0.062 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=0.47 cfs 0.062 af

Pond C3: 12" CULVERT Peak Elev=479.24' Inflow=0.24 cfs 0.016 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=0.24 cfs 0.016 af

Pond C4: 12" CULVERT Peak Elev=481.58' Inflow=0.49 cfs 0.052 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0100 '/' Outflow=0.49 cfs 0.052 af

Pond C5: 12" CULVERT Peak Elev=476.99' Inflow=0.61 cfs 0.058 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0150 '/' Outflow=0.61 cfs 0.058 af

Pond C6: 24" CULVERT Peak Elev=463.73' Inflow=3.00 cfs 0.249 af
24.0" Round Culvert n=0.013 L=100.0' S=0.0600 '/' Outflow=3.00 cfs 0.249 af

Pond C8: 12" CULVERT Peak Elev=498.21' Inflow=0.18 cfs 0.027 af
12.0" Round Culvert n=0.013 L=73.0' S=0.0137 '/' Outflow=0.18 cfs 0.027 af

Pond C9: 12" CULVERT Peak Elev=479.19' Inflow=0.16 cfs 0.013 af
12.0" Round Culvert n=0.013 L=35.0' S=0.0143 '/' Outflow=0.16 cfs 0.013 af

Pond DP1: DRY POND 1 Peak Elev=438.57' Storage=8,229 cf Inflow=2.85 cfs 0.291 af
Outflow=0.20 cfs 0.108 af

Link O1: OUT 1 Inflow=15.18 cfs 3.026 af
Primary=15.18 cfs 3.026 af

Link O2: OUT 2 Inflow=11.14 cfs 2.265 af
Primary=11.14 cfs 2.265 af

Link O3: OUT 3 Inflow=6.98 cfs 0.877 af
Primary=6.98 cfs 0.877 af

Link O4: OUT 4 Inflow=3.25 cfs 0.360 af
Primary=3.25 cfs 0.360 af

Link O5: OUT 5 Inflow=0.16 cfs 0.039 af
Primary=0.16 cfs 0.039 af

Total Runoff Area = 104.151 ac Runoff Volume = 6.750 af Average Runoff Depth = 0.78"
97.19% Pervious = 101.228 ac 2.81% Impervious = 2.923 ac

Summary for Subcatchment 1A: DRAINAGE AREA 1A

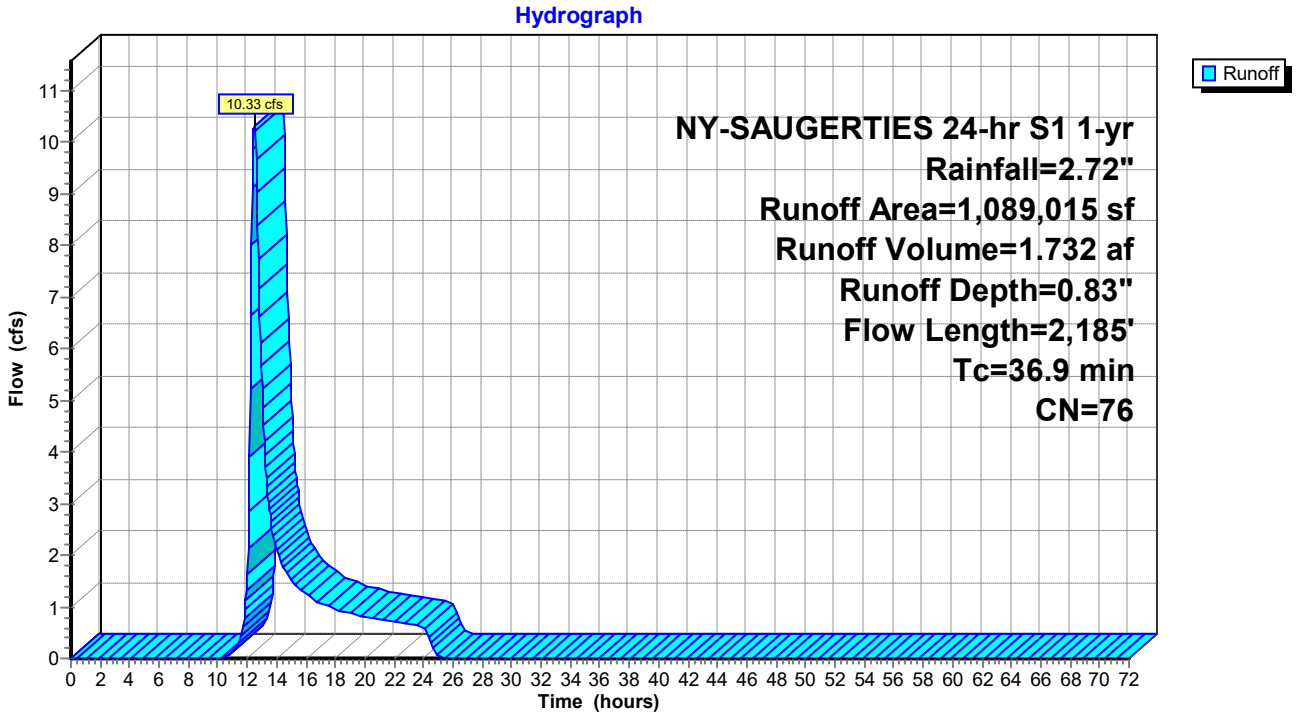
Runoff = 10.33 cfs @ 12.49 hrs, Volume= 1.732 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	853	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	620,284	73	Woods, Fair, HSG C
	391,737	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	20,528	74	>75% Grass cover, Good, HSG C
	32,734	80	>75% Grass cover, Good, HSG D
*	14,227	98	Paved roads w/curbs & sewers, HSG A-D
*	8,652	98	Roofs, HSG A-D
	1,089,015	76	Weighted Average
	1,066,136		97.90% Pervious Area
	22,879		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0800	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
13.4	650	0.0260	0.81		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
3.0	360	0.0180	2.01		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
1.3	260	0.0480	3.29		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
1.0	170	0.0350	2.81		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
2.9	380	0.0210	2.17		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
3.3	265	0.0080	1.34		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
36.9	2,185	Total			

Subcatchment 1A: DRAINAGE AREA 1A



Summary for Subcatchment 1B: DRAINAGE AREA 1B

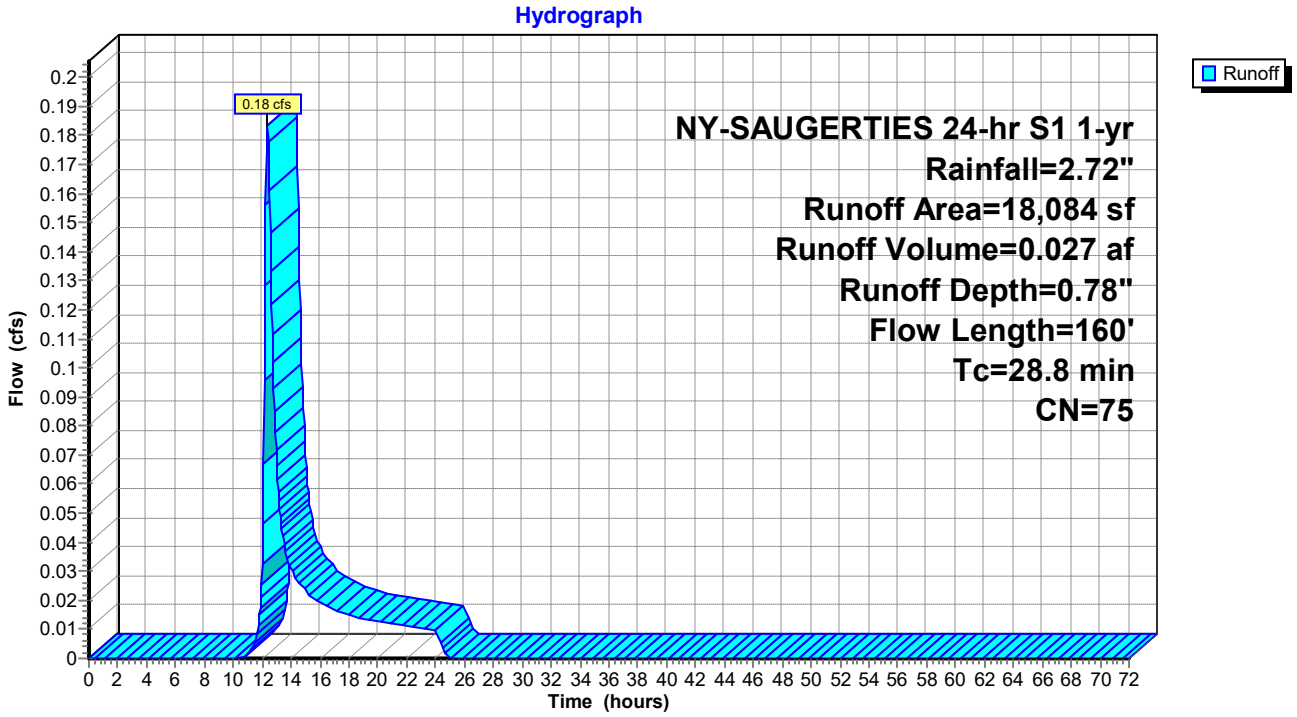
Runoff = 0.18 cfs @ 12.37 hrs, Volume= 0.027 af, Depth= 0.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	14,107	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	2,873	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
*	1,104	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	18,084	75	Weighted Average
	16,980		93.90% Pervious Area
	1,104		6.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.6	100	0.0100	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.0	10	0.4000	9.49		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
28.8	160	Total			

Subcatchment 1B: DRAINAGE AREA 1B



Summary for Subcatchment 1C: DRAINAGE AREA 1C

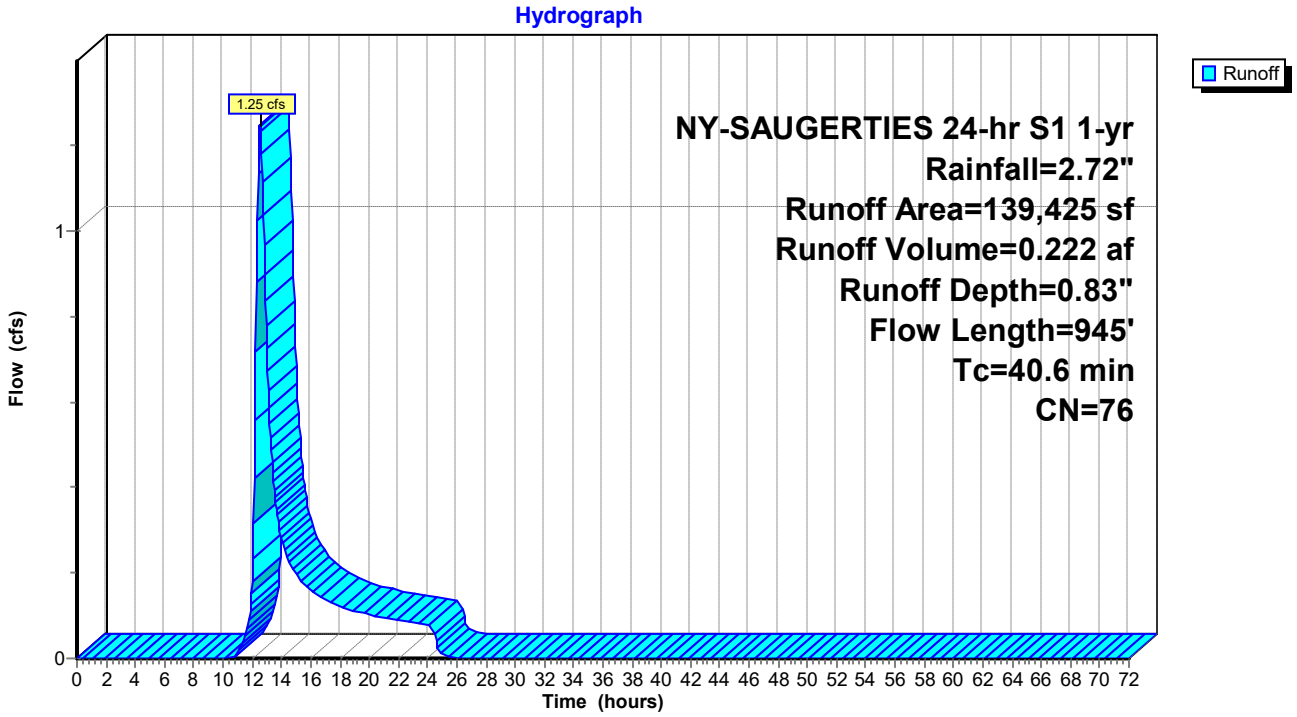
Runoff = 1.25 cfs @ 12.53 hrs, Volume= 0.222 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	97,071	73	Woods, Fair, HSG C
	20,322	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	12,079	74	>75% Grass cover, Good, HSG C
	347	80	>75% Grass cover, Good, HSG D
*	6,722	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	139,425	76	Weighted Average
	129,819		93.11% Pervious Area
	9,606		6.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
9.9	350	0.0140	0.59		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.1	80	0.0630	1.25		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
5.5	220	0.0180	0.67		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
3.2	185	0.0380	0.97		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.0	10	0.2000	6.71		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
40.6	945	Total			

Subcatchment 1C: DRAINAGE AREA 1C



Summary for Subcatchment 1D: DRAINAGE AREA 1D

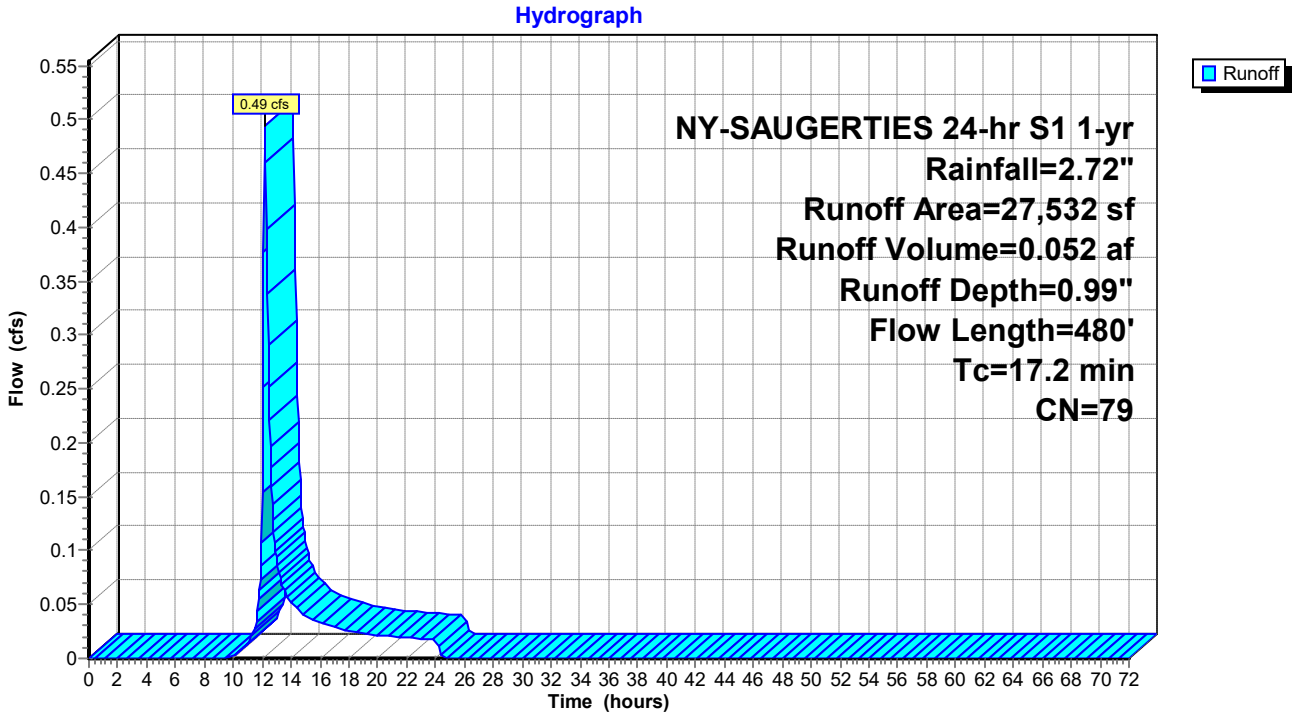
Runoff = 0.49 cfs @ 12.20 hrs, Volume= 0.052 af, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	8,093	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	13,157	74	>75% Grass cover, Good, HSG C
	867	80	>75% Grass cover, Good, HSG D
*	5,415	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	27,532	79	Weighted Average
	22,117		80.33% Pervious Area
	5,415		19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	8	0.0630	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
1.5	17	0.0590	0.19		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
12.6	75	0.0400	0.10		**Sheet Flow, C-D** Woods: Light underbrush n= 0.400 P2= 3.38"
0.6	30	0.0330	0.91		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.2	40	0.0500	3.35		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
1.8	220	0.0180	2.01		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
0.4	90	0.0780	4.19		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
17.2	480	Total			

Subcatchment 1D: DRAINAGE AREA 1D



Summary for Subcatchment 1E: DRAINAGE AREA 1E

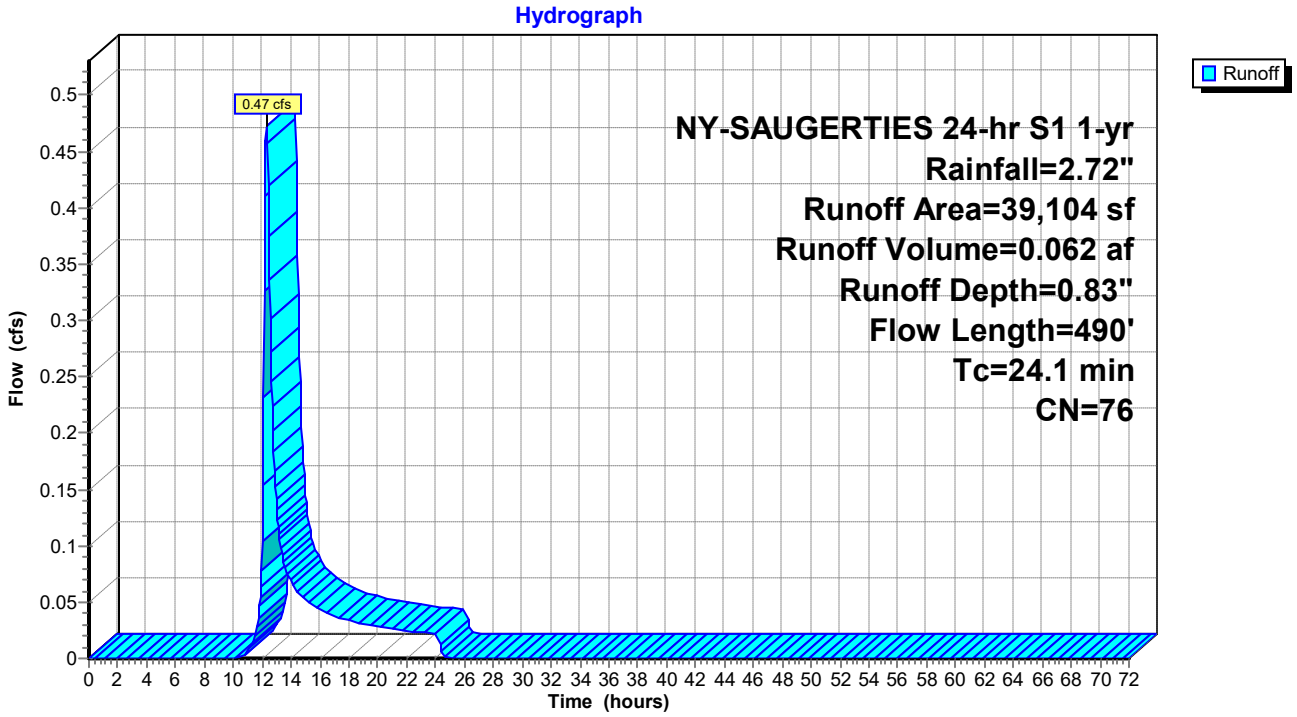
Runoff = 0.47 cfs @ 12.30 hrs, Volume= 0.062 af, Depth= 0.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	27,062	73	Woods, Fair, HSG C
	1,441	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	4,681	74	>75% Grass cover, Good, HSG C
	2,095	80	>75% Grass cover, Good, HSG D
*	3,825	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	39,104	76	Weighted Average
	35,279		90.22% Pervious Area
	3,825		9.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.6	110	0.0550	1.17		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	280	0.0390	2.96		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
24.1	490	Total			

Subcatchment 1E: DRAINAGE AREA 1E



Summary for Subcatchment 1F: DRAINAGE AREA 1F

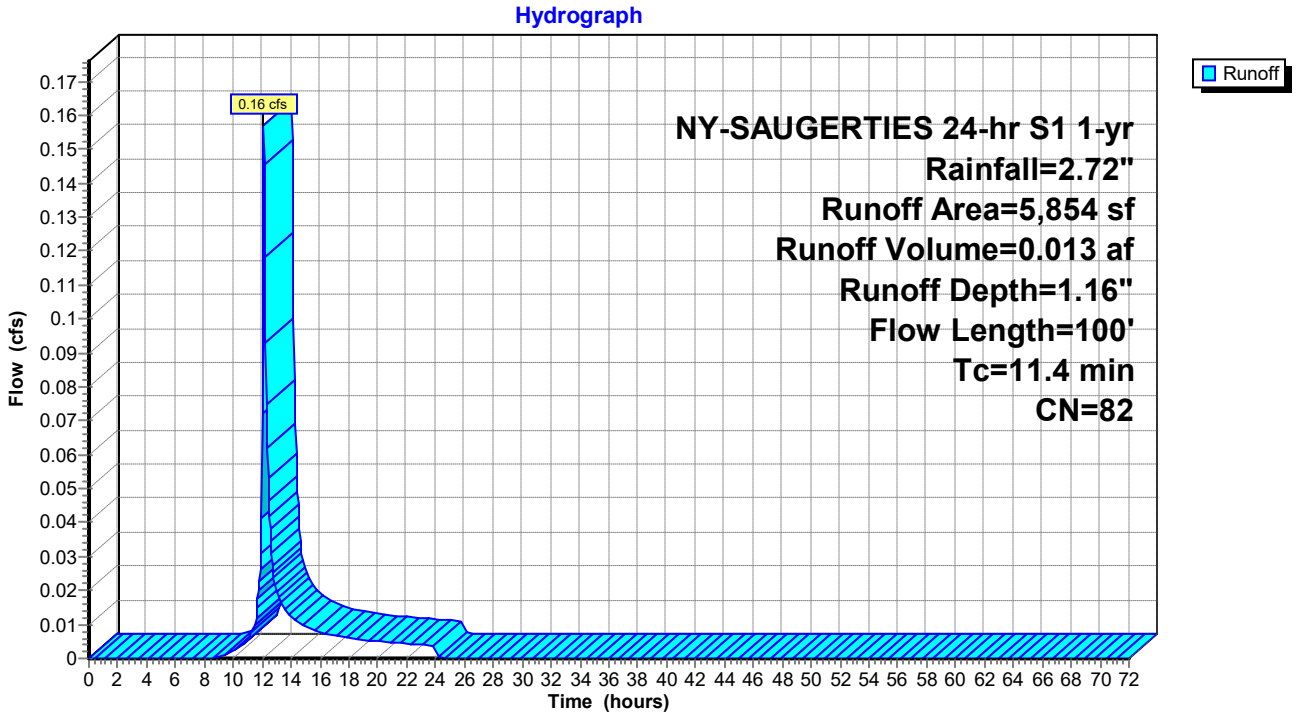
Runoff = 0.16 cfs @ 12.11 hrs, Volume= 0.013 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	2,009	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,012	80	>75% Grass cover, Good, HSG D
*	833	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,854	82	Weighted Average
	5,021		85.77% Pervious Area
	833		14.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	30	0.0670	0.22		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
7.0	40	0.0500	0.10		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.38"
2.2	30	0.0670	0.22		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.38"
11.4	100	Total			

Subcatchment 1F: DRAINAGE AREA 1F



Summary for Subcatchment 1G: DRAINAGE AREA 1G

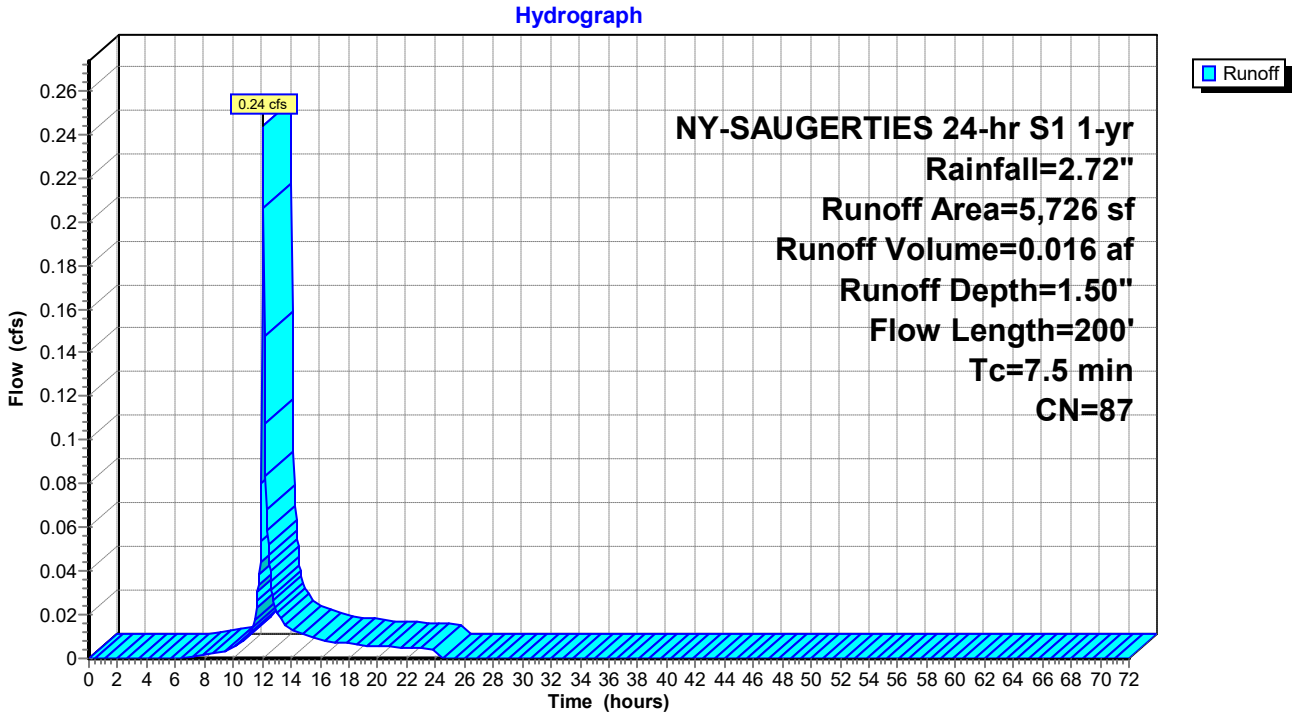
Runoff = 0.24 cfs @ 12.06 hrs, Volume= 0.016 af, Depth= 1.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	521	74	>75% Grass cover, Good, HSG C
	2,828	80	>75% Grass cover, Good, HSG D
*	2,377	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,726	87	Weighted Average
	3,349		58.49% Pervious Area
	2,377		41.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	5	0.1000	1.48		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
6.8	95	0.0420	0.23		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.6	100	0.0400	3.00		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
7.5	200	Total			

Subcatchment 1G: DRAINAGE AREA 1G



Summary for Subcatchment 1H: DRAINAGE AREA 8

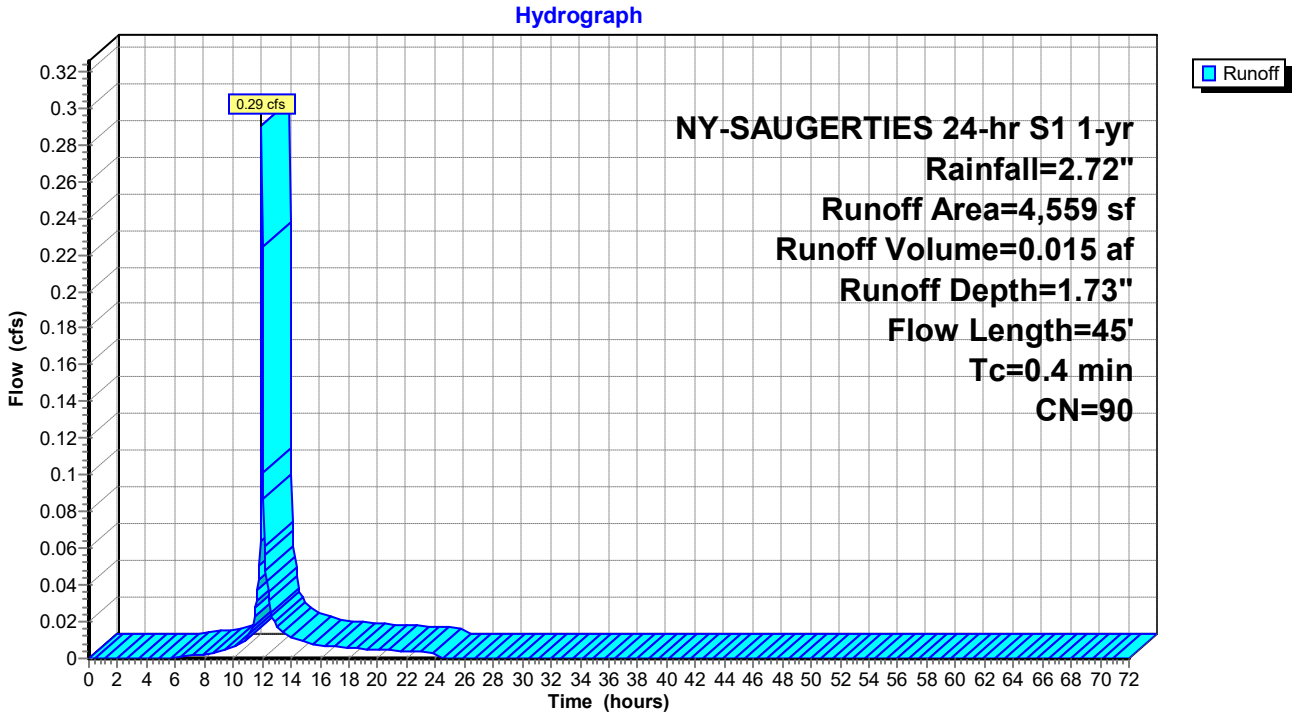
Runoff = 0.29 cfs @ 11.96 hrs, Volume= 0.015 af, Depth= 1.73"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	2,124	80	>75% Grass cover, Good, HSG D
*	2,435	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	4,559	90	Weighted Average
	2,124		46.59% Pervious Area
	2,435		53.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0250	1.12		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
0.1	25	0.3200	3.25		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.38"
0.4	45	Total			

Subcatchment 1H: DRAINAGE AREA 8



Summary for Subcatchment 1I: DRAINAGE AREA 1I

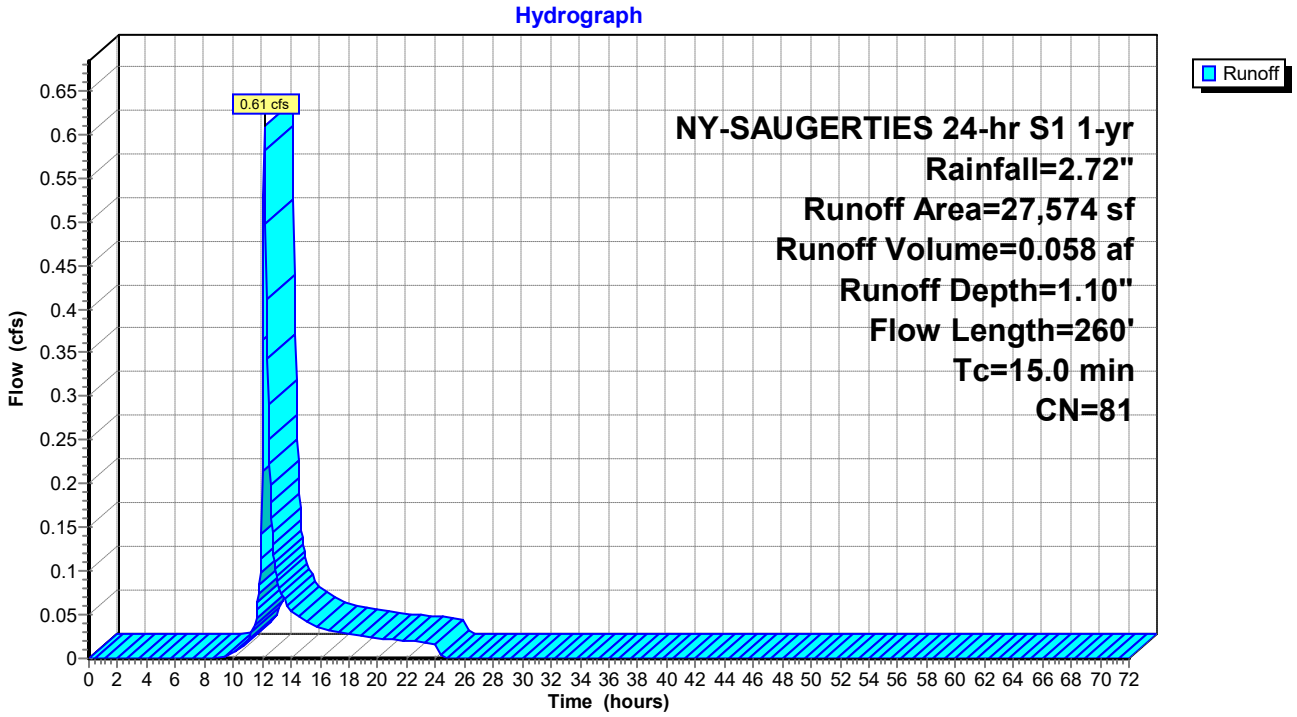
Runoff = 0.61 cfs @ 12.16 hrs, Volume= 0.058 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	686	73	Woods, Fair, HSG C
	20,704	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,341	80	>75% Grass cover, Good, HSG D
*	2,843	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	27,574	81	Weighted Average
	24,731		89.69% Pervious Area
	2,843		10.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0600	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
0.9	70	0.0710	1.33		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	90	0.0330	2.72		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
15.0	260	Total			

Subcatchment 1I: DRAINAGE AREA 1I



Summary for Subcatchment 1J: DRAINAGE AREA 1J

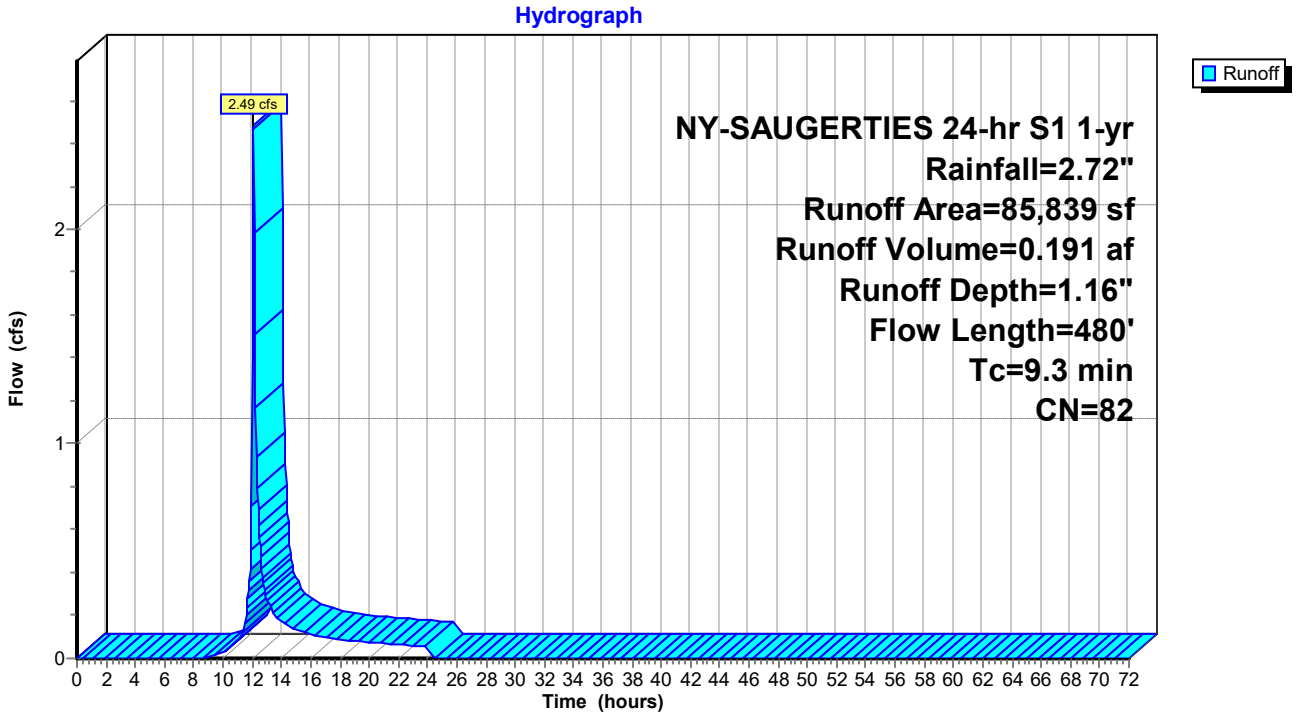
Runoff = 2.49 cfs @ 12.09 hrs, Volume= 0.191 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	52,694	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	22,447	80	>75% Grass cover, Good, HSG D
*	7,814	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	85,839	82	Weighted Average
	75,141		87.54% Pervious Area
	10,698		12.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	10	0.0500	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
0.6	50	0.0300	1.45		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.38"
2.5	30	0.0500	0.20		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.38"
2.3	10	0.0500	0.07		**Sheet Flow, D-E** Woods: Light underbrush n= 0.400 P2= 3.38"
1.2	70	0.0360	0.95		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
1.7	310	0.0420	3.07		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
9.3	480	Total			

Subcatchment 1J: DRAINAGE AREA 1J



Summary for Subcatchment 1K: DRAINAGE AREA 1K

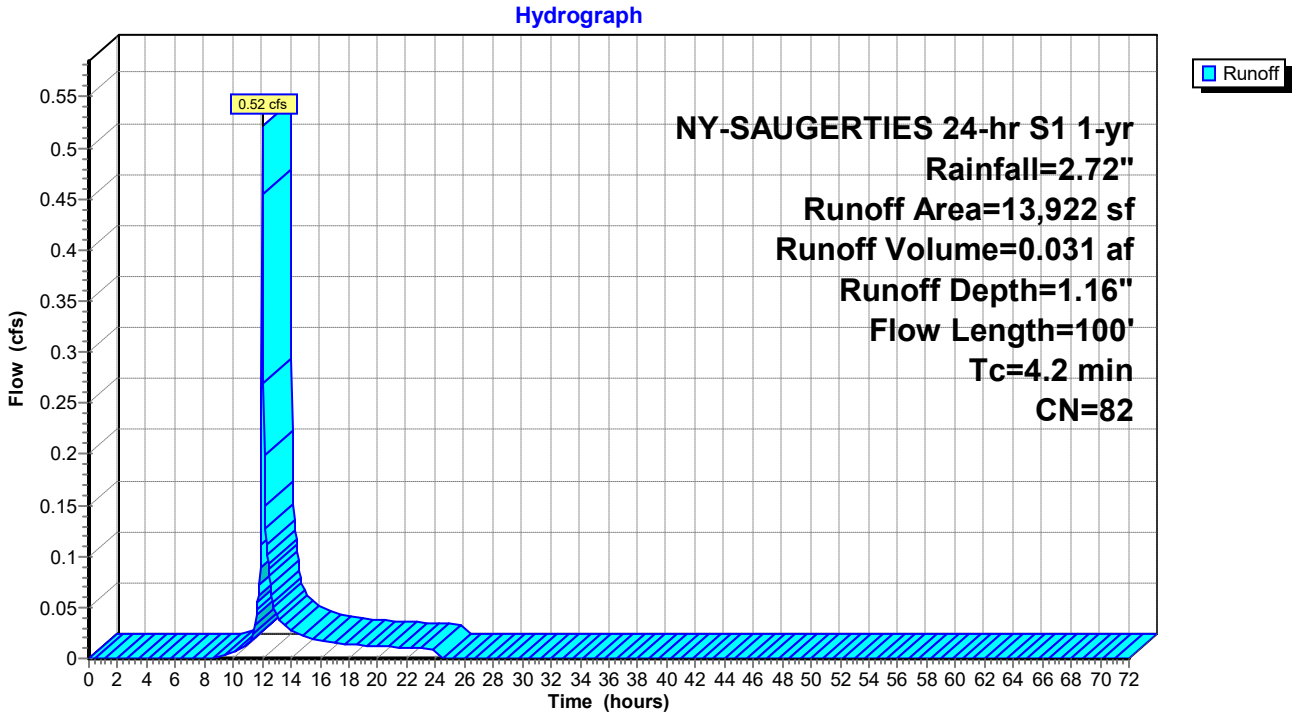
Runoff = 0.52 cfs @ 12.02 hrs, Volume= 0.031 af, Depth= 1.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	12,099	80	>75% Grass cover, Good, HSG D
*	1,823	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	13,922	82	Weighted Average
	12,099		86.91% Pervious Area
	1,823		13.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	15	0.0330	1.18		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
4.0	85	0.1290	0.36		**Sheet Flow, B-C**
					Grass: Short n= 0.150 P2= 3.38"
4.2	100	Total			

Subcatchment 1K: DRAINAGE AREA 1K



Summary for Subcatchment 1L: DRAINAGE AREA 1L

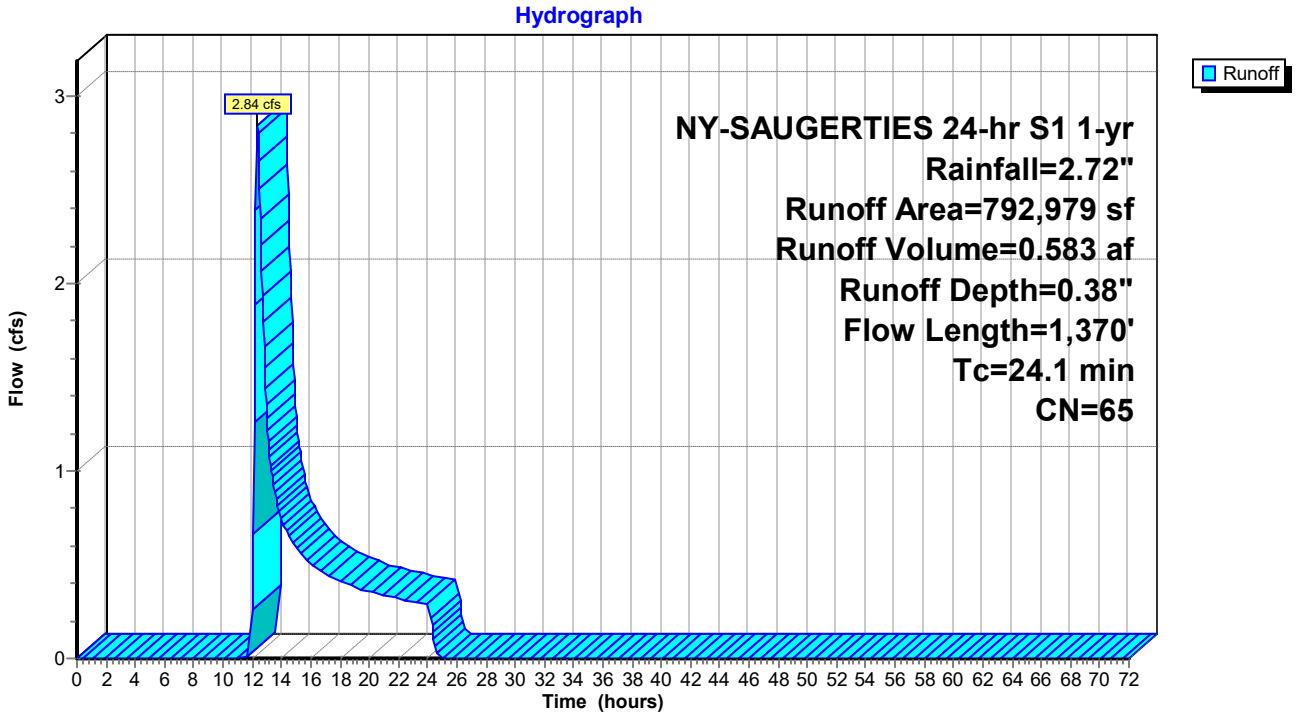
Runoff = 2.84 cfs @ 12.36 hrs, Volume= 0.583 af, Depth= 0.38"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	162,840	36	Woods, Fair, HSG A
	218,251	60	Woods, Fair, HSG B
	3,820	73	Woods, Fair, HSG C
	357,922	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	2,373	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	30,455	80	>75% Grass cover, Good, HSG D
*	11,550	98	Paved roads w/curbs & sewers, HSG A-D
*	5,768	98	Roofs, HSG A-D
	792,979	65	Weighted Average
	775,661		97.82% Pervious Area
	17,318		2.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.1400	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
3.3	310	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
11.2	960	0.0090	1.42		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
24.1	1,370	Total			

Subcatchment 1L: DRAINAGE AREA 1L



Summary for Subcatchment 1M: DRAINAGE AREA 1M

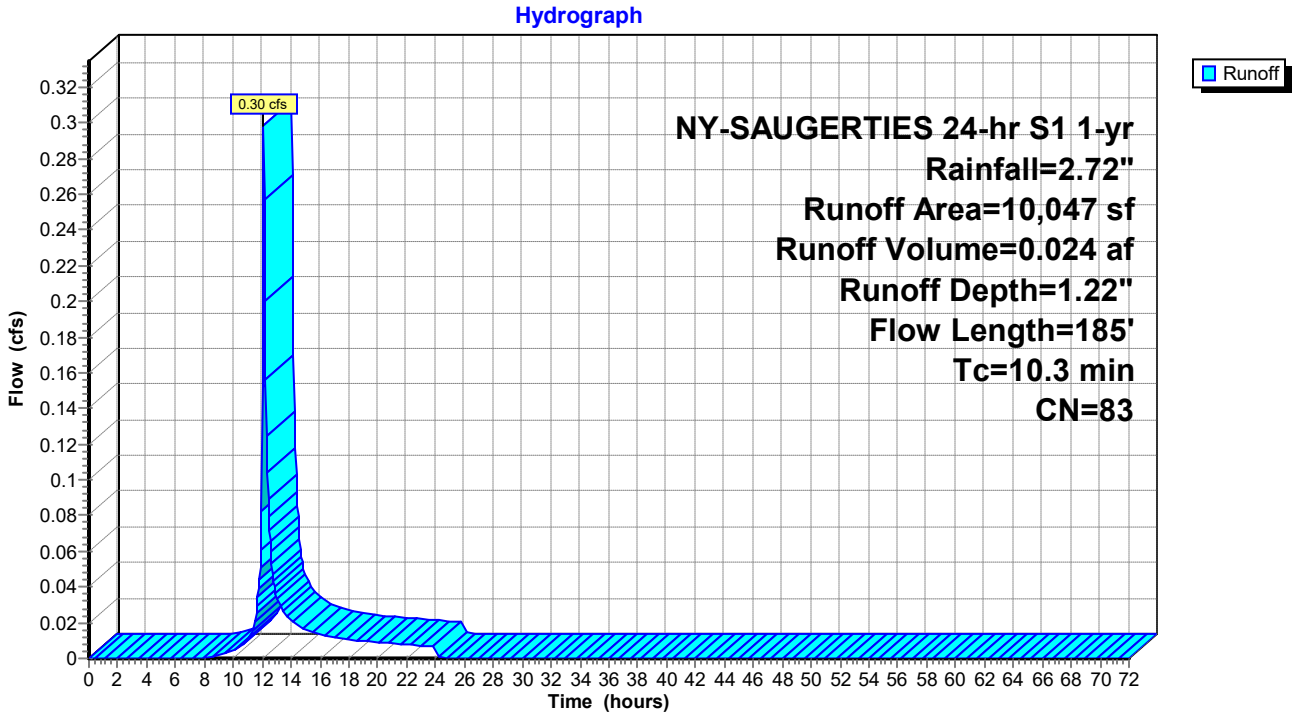
Runoff = 0.30 cfs @ 12.10 hrs, Volume= 0.024 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	3,810	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	4,526	80	>75% Grass cover, Good, HSG D
*	1,711	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	10,047	83	Weighted Average
	8,336		82.97% Pervious Area
	1,711		17.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0330	1.09		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
2.4	20	0.0250	0.14		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
7.0	65	0.1310	0.16		**Sheet Flow, C-D** Woods: Light underbrush n= 0.400 P2= 3.38"
0.7	90	0.0220	2.22		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
10.3	185	Total			

Subcatchment 1M: DRAINAGE AREA 1M



Summary for Subcatchment 2A: DRAINAGE AREA 2A

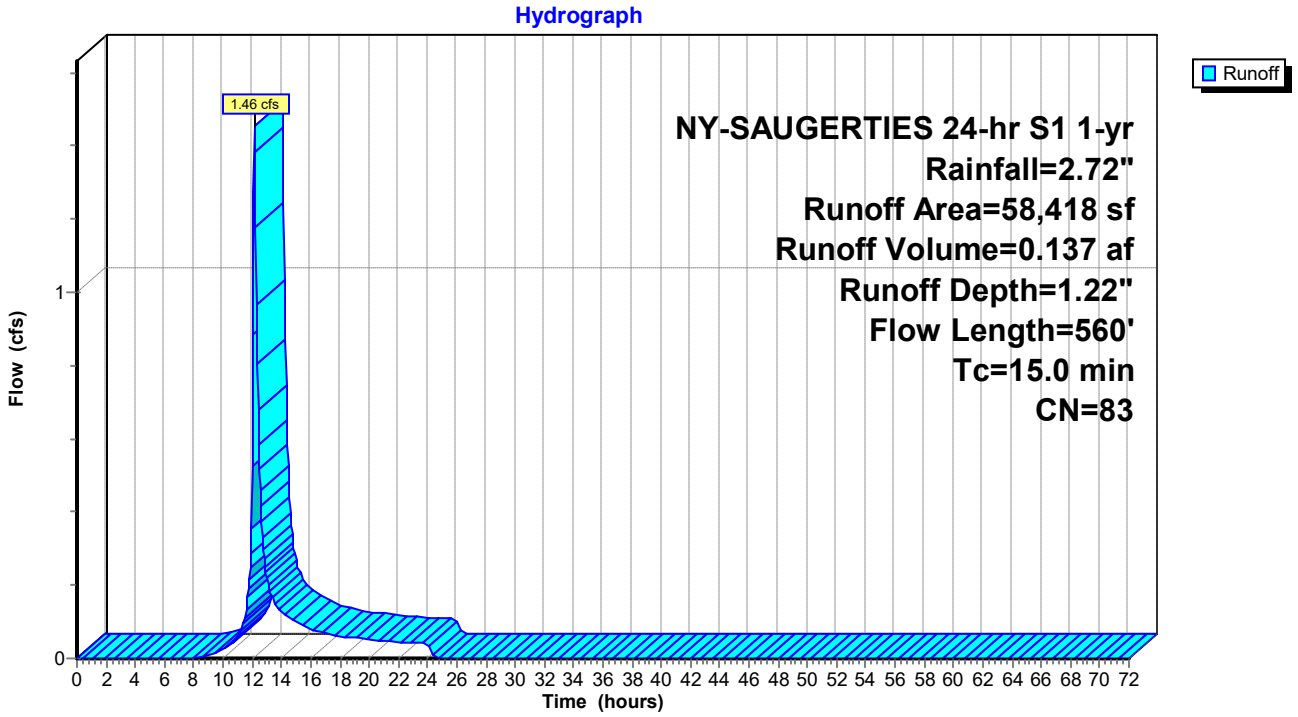
Runoff = 1.46 cfs @ 12.16 hrs, Volume= 0.137 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	22,949	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	24,787	80	>75% Grass cover, Good, HSG D
*	7,798	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	58,418	83	Weighted Average
	47,736		81.71% Pervious Area
	10,682		18.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	7	0.0710	1.38		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
7.5	93	0.0320	0.21		**Sheet Flow, B-C**
					Grass: Short n= 0.150 P2= 3.38"
0.8	150	0.0430	3.11		**Shallow Concentrated Flow, C-D**
					Grassed Waterway Kv= 15.0 fps
6.4	280	0.0210	0.72		**Shallow Concentrated Flow, D-E**
					Woodland Kv= 5.0 fps
0.2	30	0.0330	2.72		**Shallow Concentrated Flow, E-F**
					Grassed Waterway Kv= 15.0 fps
15.0	560	Total			

Subcatchment 2A: DRAINAGE AREA 2A



Summary for Subcatchment 2B: DRAINAGE AREA 2B

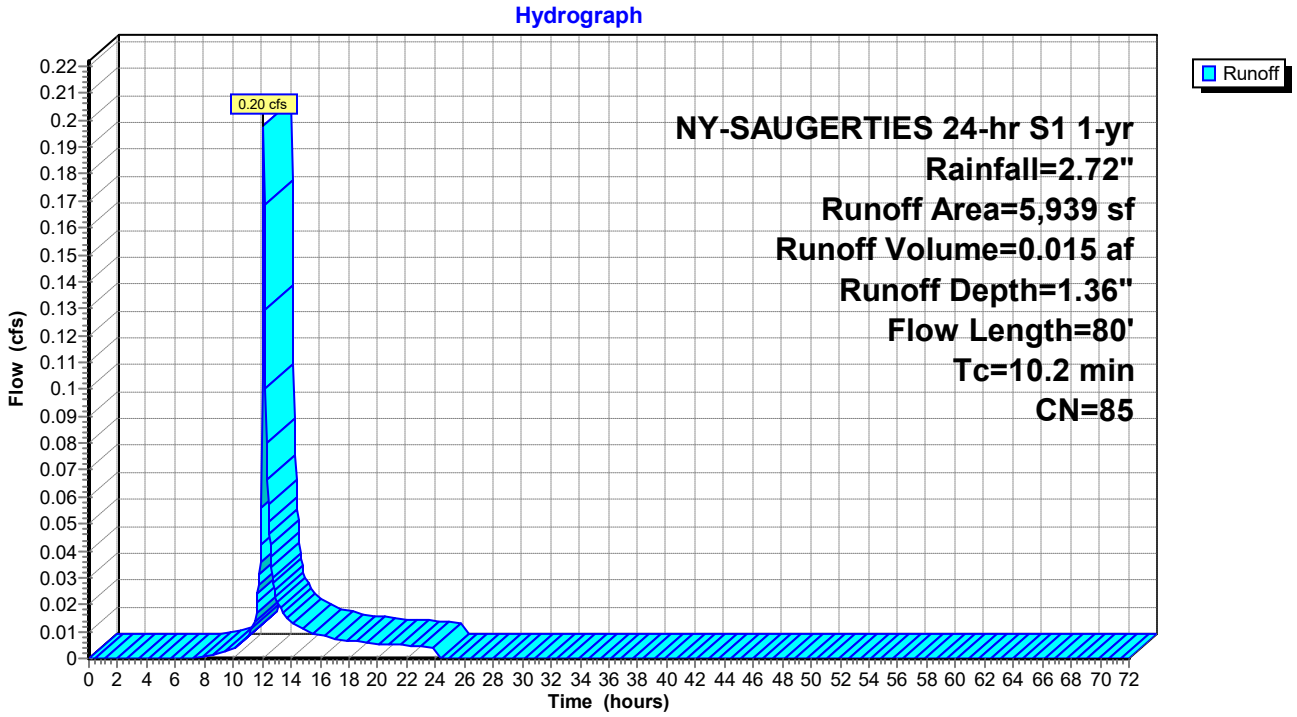
Runoff = 0.20 cfs @ 12.10 hrs, Volume= 0.015 af, Depth= 1.36"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	1,167	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,008	80	>75% Grass cover, Good, HSG D
*	1,764	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,939	85	Weighted Average
	4,175		70.30% Pervious Area
	1,764		29.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	35	0.0290	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.4	45	0.1330	0.32		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
10.2	80	Total			

Subcatchment 2B: DRAINAGE AREA 2B



Summary for Subcatchment 2C: DRAINAGE AREA 2C

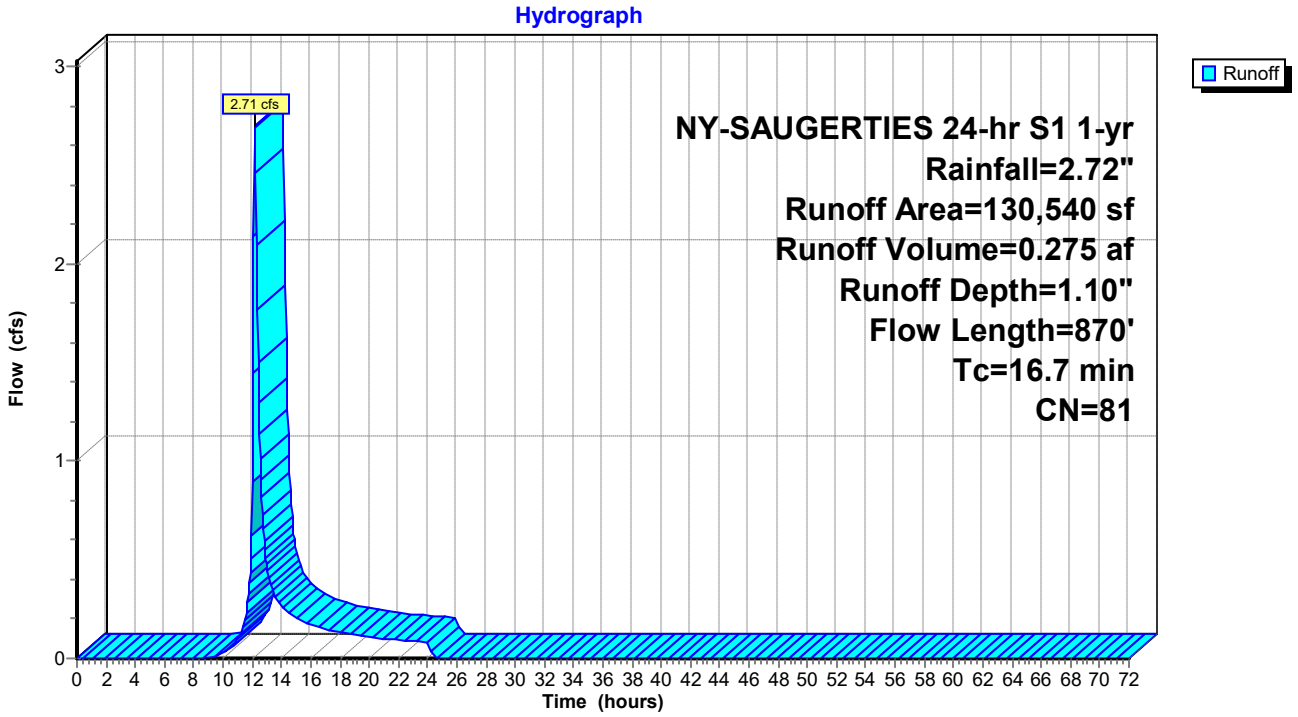
Runoff = 2.71 cfs @ 12.19 hrs, Volume= 0.275 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	92,203	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	28,020	80	>75% Grass cover, Good, HSG D
*	10,317	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	130,540	81	Weighted Average
	120,223		92.10% Pervious Area
	10,317		7.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0900	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.7	210	0.0190	2.07		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
0.1	30	0.1670	6.13		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
3.5	530	0.0280	2.51		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
16.7	870	Total			

Subcatchment 2C: DRAINAGE AREA 2C



Summary for Subcatchment 2D: DRAINAGE AREA 2D

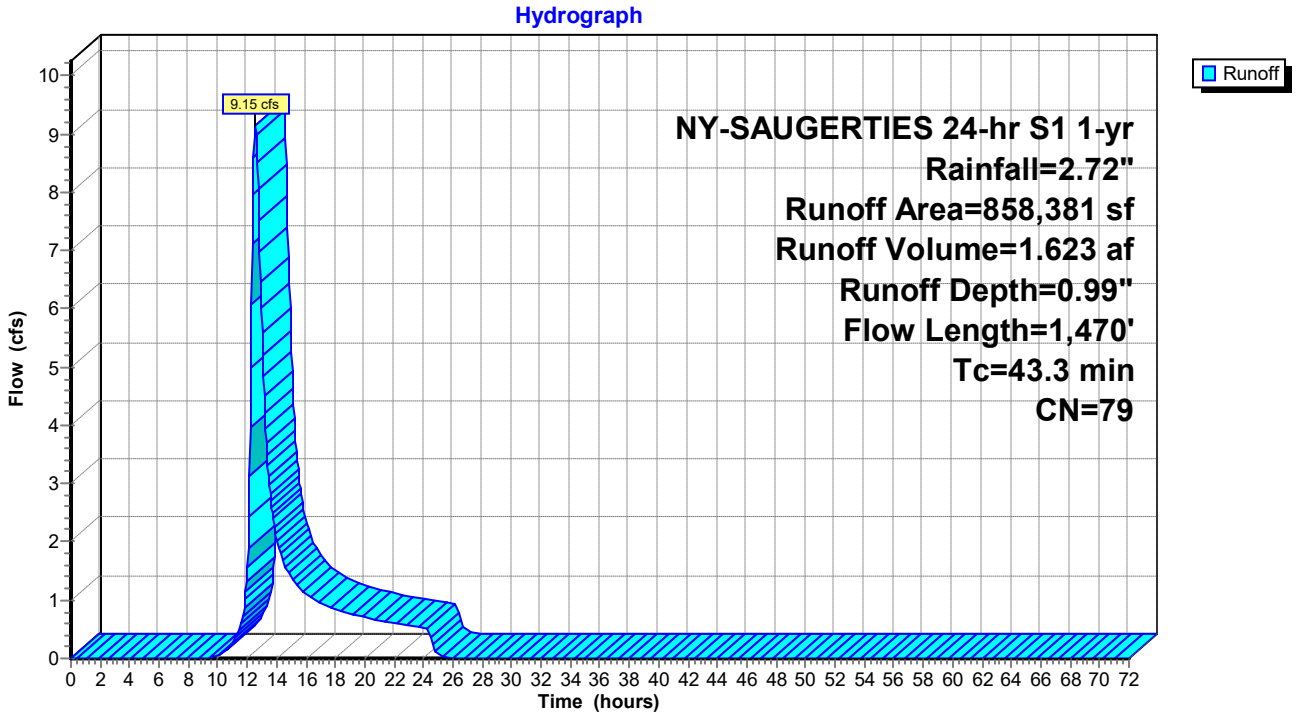
Runoff = 9.15 cfs @ 12.56 hrs, Volume= 1.623 af, Depth= 0.99"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	34,292	73	Woods, Fair, HSG C
	808,098	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	3,863	74	>75% Grass cover, Good, HSG C
	7,734	80	>75% Grass cover, Good, HSG D
*	4,394	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	858,381	79	Weighted Average
	853,987		99.49% Pervious Area
	4,394		0.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1300	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
0.6	50	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
32.8	1,320	0.0180	0.67		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
43.3	1,470	Total			

Subcatchment 2D: DRAINAGE AREA 2D



Summary for Subcatchment 2E: DRAINAGE AREA 18

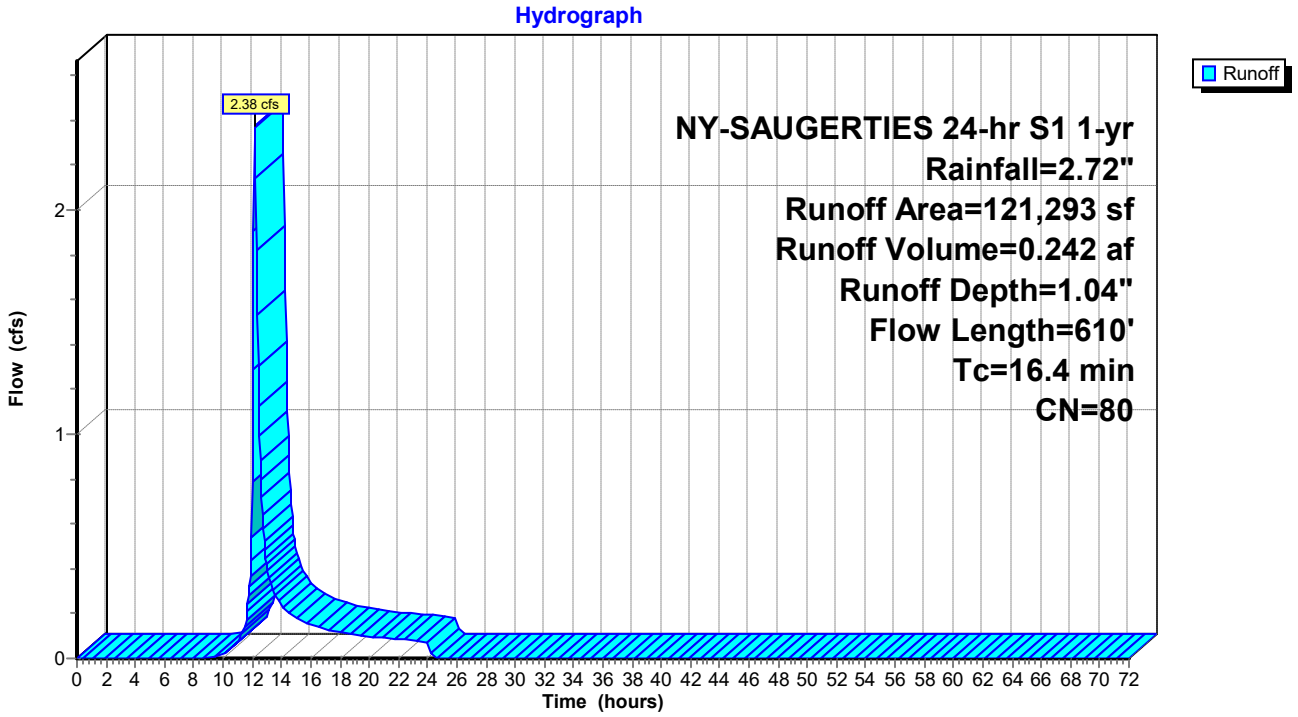
Runoff = 2.38 cfs @ 12.18 hrs, Volume= 0.242 af, Depth= 1.04"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	23,515	73	Woods, Fair, HSG C
	54,460	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	3,737	74	>75% Grass cover, Good, HSG C
	25,044	80	>75% Grass cover, Good, HSG D
*	11,653	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	121,293	80	Weighted Average
	106,756		88.01% Pervious Area
	14,537		11.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0830	1.42		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
6.1	94	0.0530	0.25		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.8	220	0.2270	4.76		**Shallow Concentrated Flow, C-D** Nearly Bare & Untilled Kv= 10.0 fps
0.1	40	0.2000	6.71		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
9.3	250	0.0080	0.45		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
16.4	610	Total			

Subcatchment 2E: DRAINAGE AREA 18



Summary for Subcatchment 2F: DRAINAGE AREA 2F

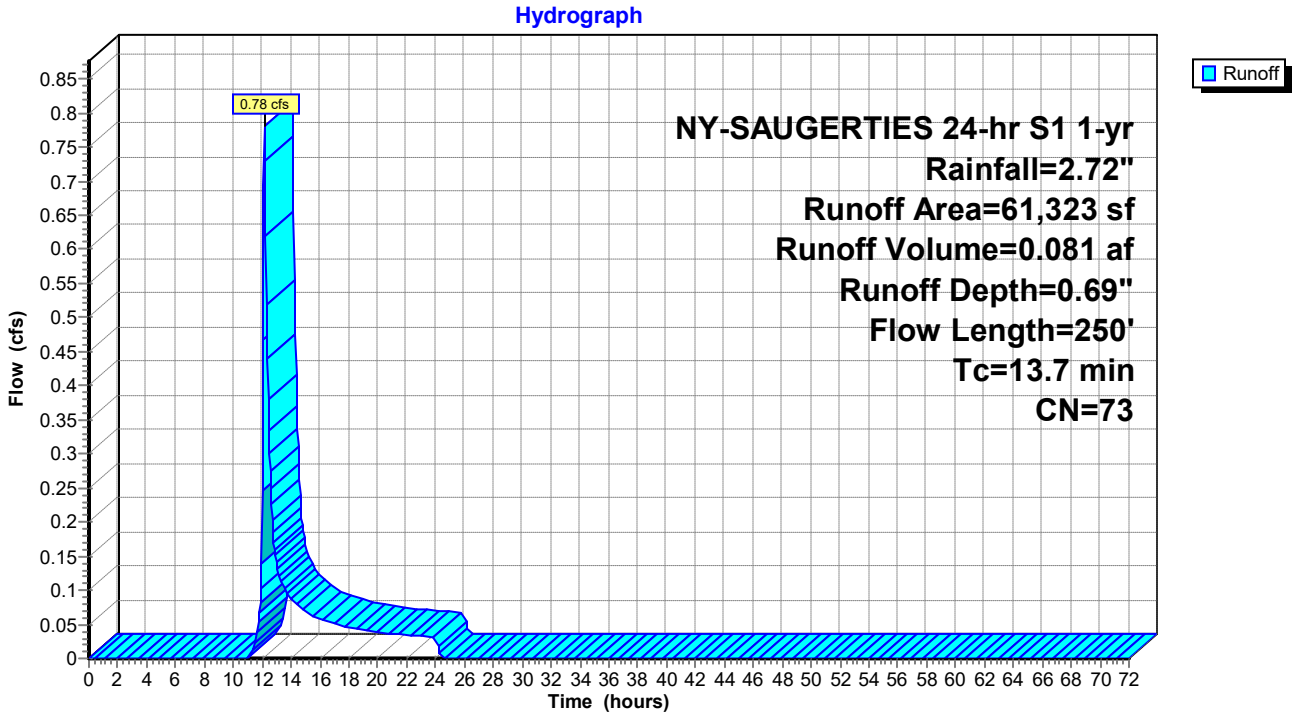
Runoff = 0.78 cfs @ 12.16 hrs, Volume= 0.081 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	5,624	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	4,622	73	Woods, Fair, HSG C
	47,954	79	Woods, Fair, HSG D
	3,123	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
*	0	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	61,323	73	Weighted Average
	61,323		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0800	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.7	150	0.0870	1.47		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
13.7	250	Total			

Subcatchment 2F: DRAINAGE AREA 2F



Summary for Subcatchment 2G: DRAINAGE AREA 2G

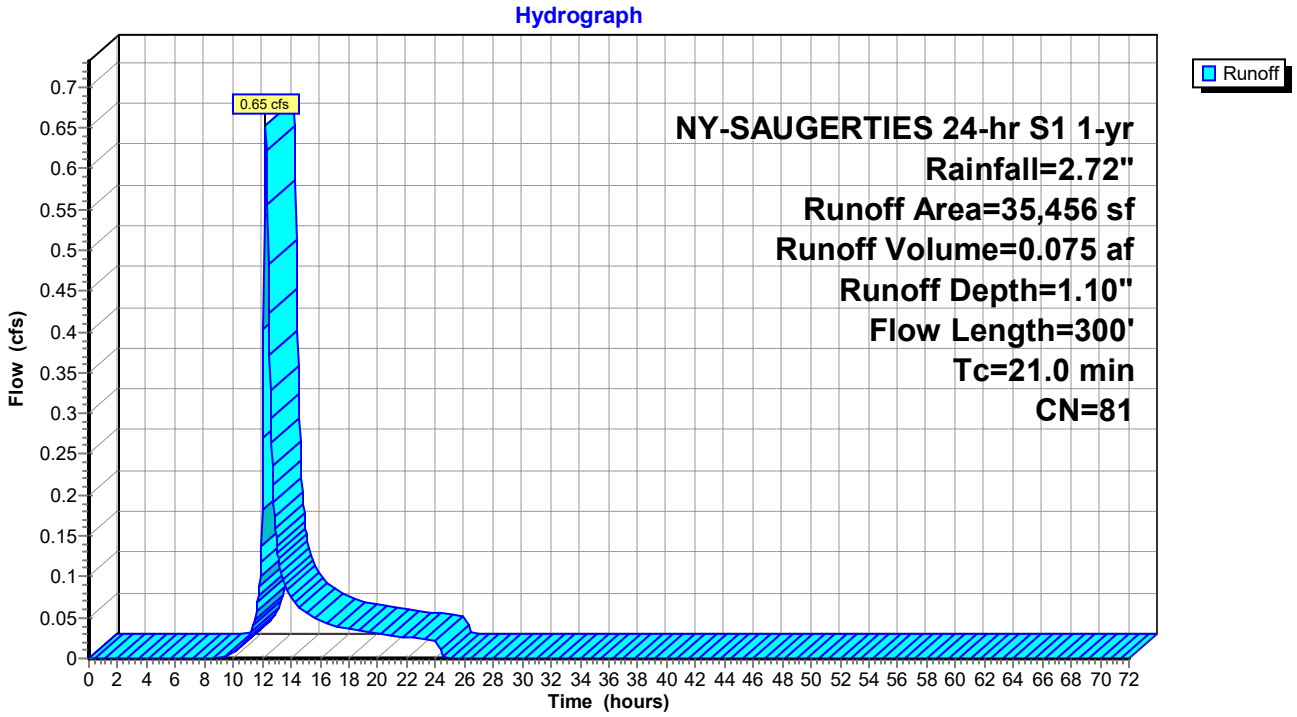
Runoff = 0.65 cfs @ 12.25 hrs, Volume= 0.075 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	27,880	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	4,802	80	>75% Grass cover, Good, HSG D
*	2,774	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	35,456	81	Weighted Average
	32,682		92.18% Pervious Area
	2,774		7.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0300	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
3.1	190	0.0420	1.02		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	10	0.0300	2.60		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
21.0	300	Total			

Subcatchment 2G: DRAINAGE AREA 2G



Summary for Subcatchment 3: DRAINAGE AREA 3

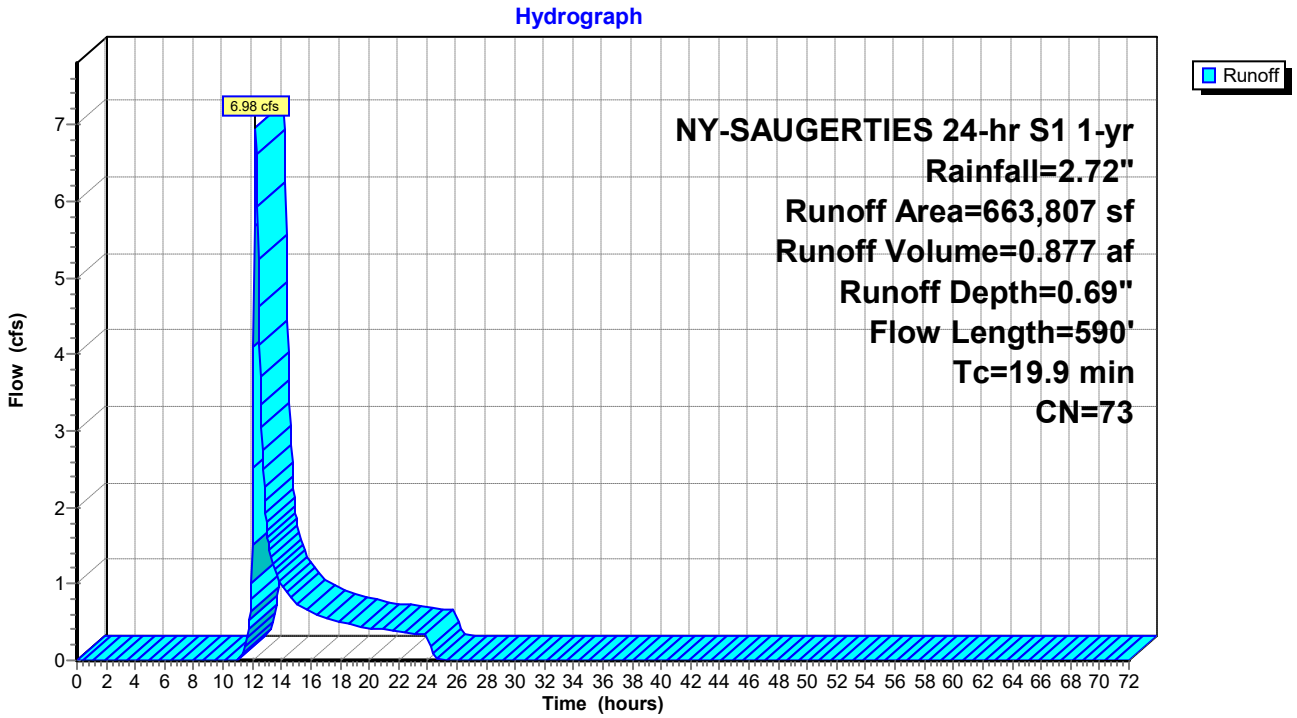
Runoff = 6.98 cfs @ 12.25 hrs, Volume= 0.877 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
663,807	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
663,807	73	Weighted Average
663,807		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.4	490	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	590	Total			

Subcatchment 3: DRAINAGE AREA 3



Summary for Subcatchment 4: DRAINAGE AREA 4

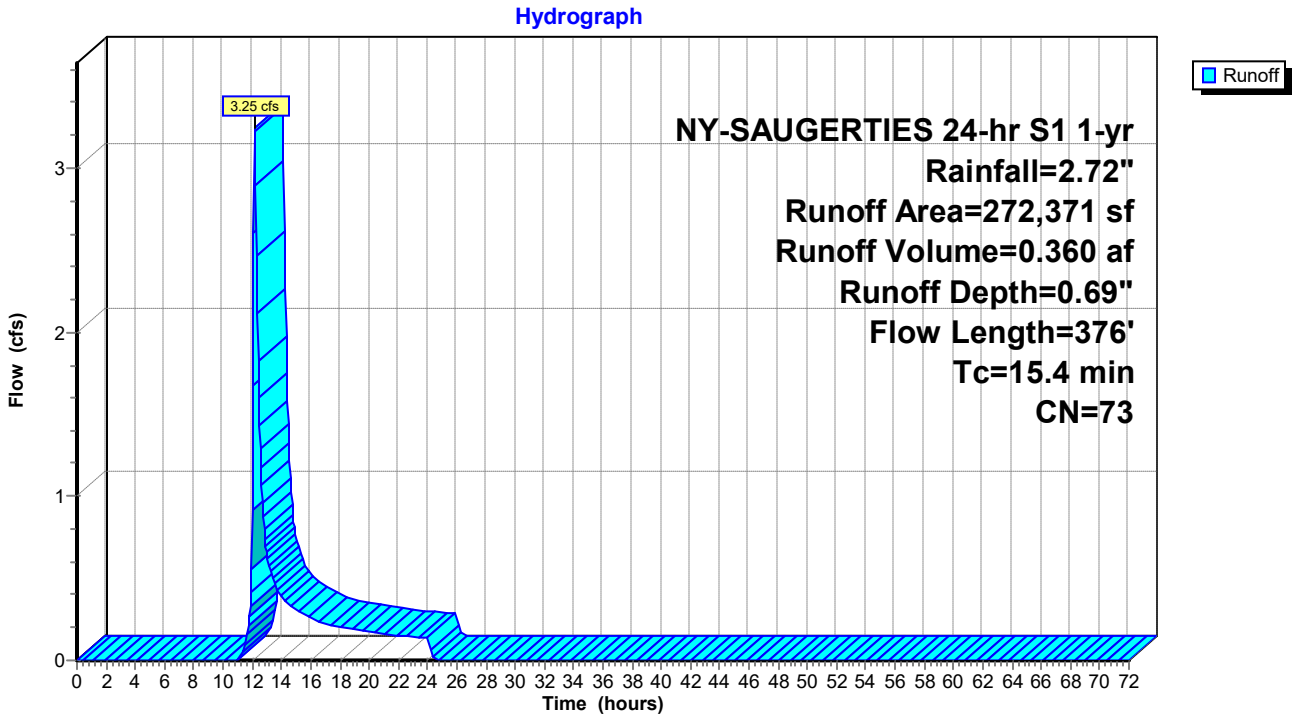
Runoff = 3.25 cfs @ 12.18 hrs, Volume= 0.360 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
272,371	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
272,371	73	Weighted Average
272,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0700	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.7	276	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.4	376	Total			

Subcatchment 4: DRAINAGE AREA 4



Summary for Subcatchment 5: DRAINAGE AREA 5

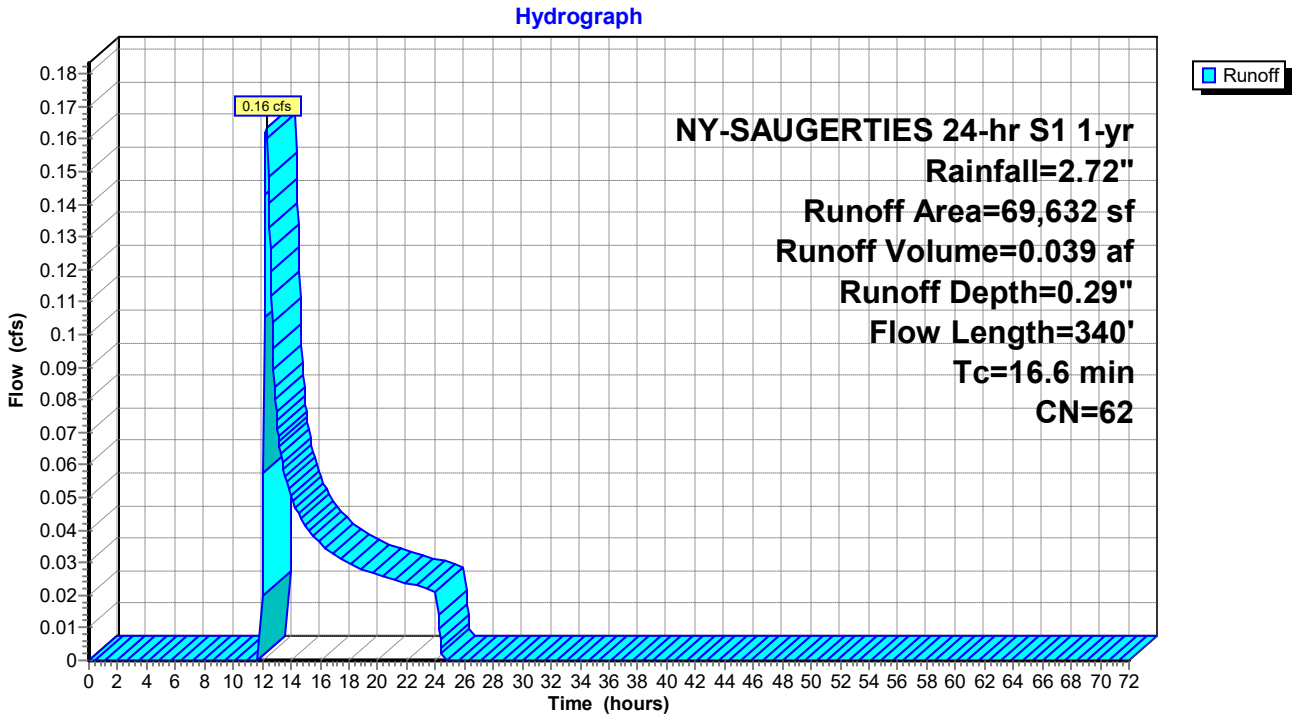
Runoff = 0.16 cfs @ 12.28 hrs, Volume= 0.039 af, Depth= 0.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr Rainfall=2.72"

Area (sf)	CN	Description
27,631	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
42,001	79	Woods, Fair, HSG D
69,632	62	Weighted Average
69,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0540	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.6	240	0.0930	1.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.6	340	Total			

Subcatchment 5: DRAINAGE AREA 5



Summary for Pond AC1: ARCH CULVERT

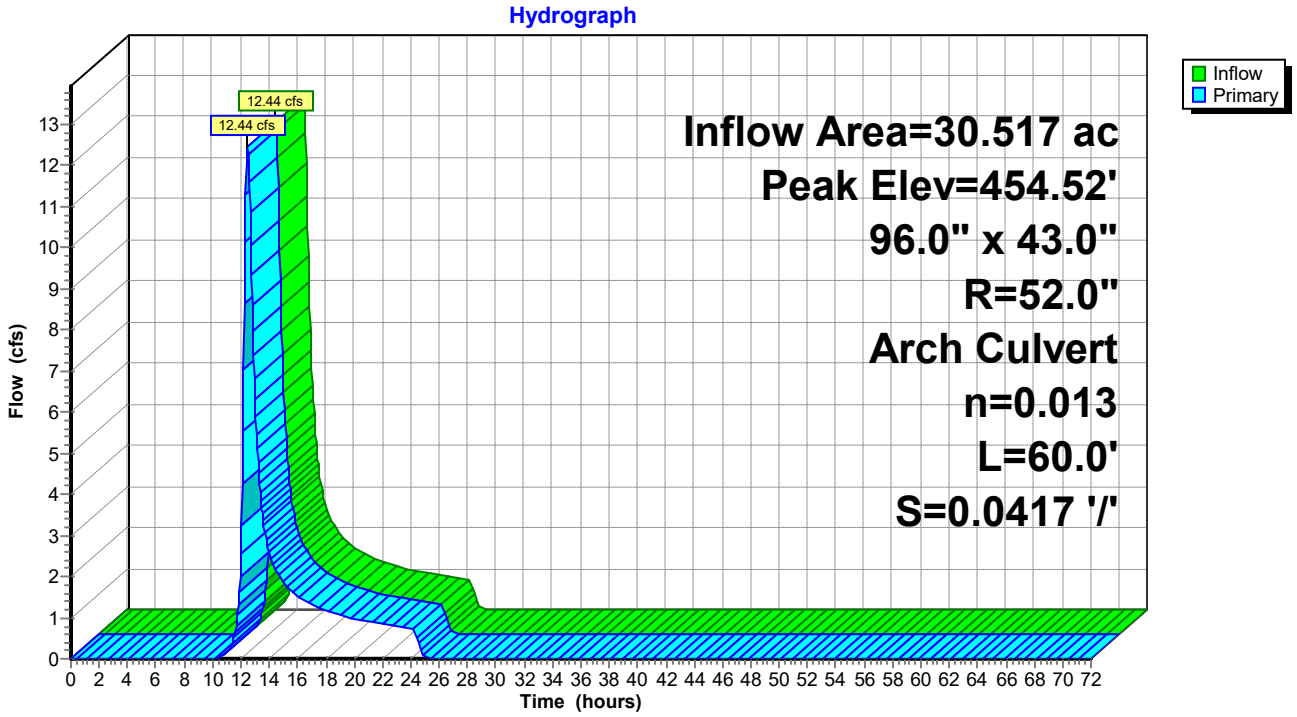
Inflow Area = 30.517 ac, 3.65% Impervious, Inflow Depth = 0.84" for 1-yr event
Inflow = 12.44 cfs @ 12.48 hrs, Volume= 2.140 af
Outflow = 12.44 cfs @ 12.48 hrs, Volume= 2.140 af, Atten= 0%, Lag= 0.0 min
Primary = 12.44 cfs @ 12.48 hrs, Volume= 2.140 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 454.52' @ 12.48 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	453.90'	**96.0" W x 43.0" H, R=52.0" Arch Culvert** L= 60.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 453.90' / 451.40' S= 0.0417 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 22.75 sf

Primary OutFlow Max=12.39 cfs @ 12.48 hrs HW=454.51' (Free Discharge)
└**1=Culvert** (Inlet Controls 12.39 cfs @ 2.52 fps)

Pond AC1: ARCH CULVERT



Summary for Pond AC2: ARCH CULVERT

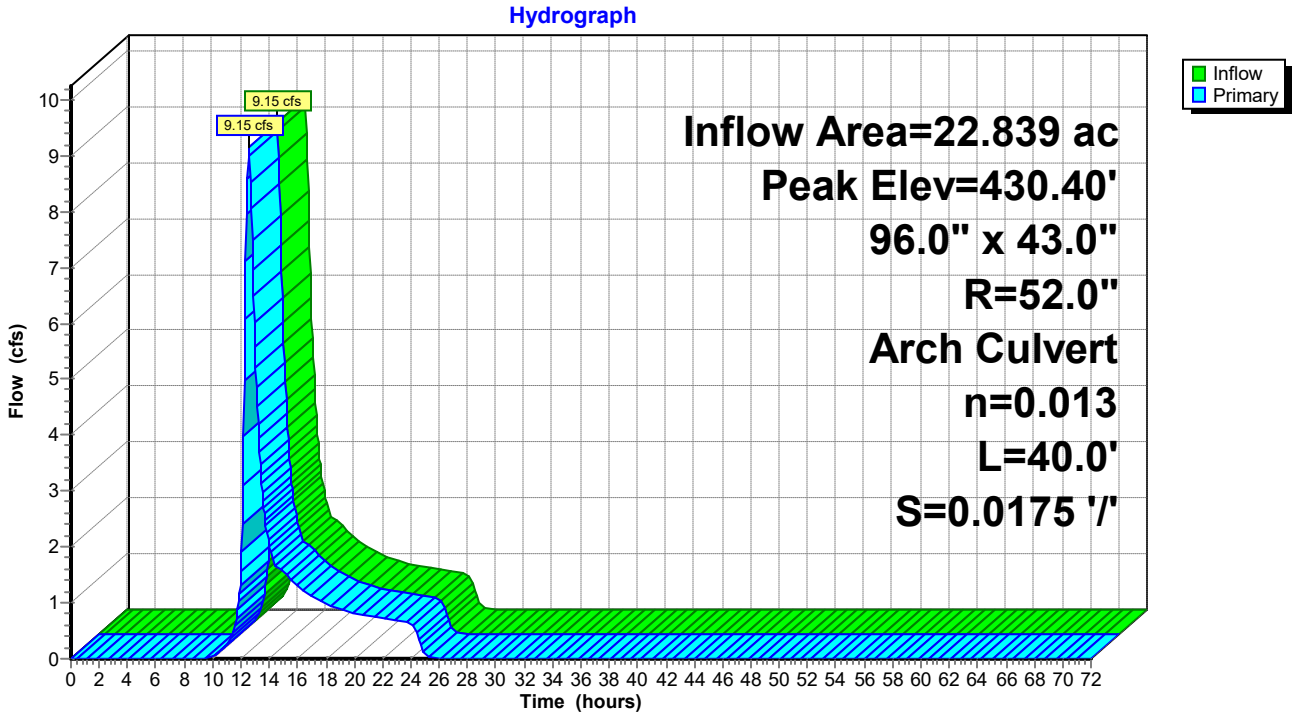
Inflow Area = 22.839 ac, 1.66% Impervious, Inflow Depth = 0.91" for 1-yr event
Inflow = 9.15 cfs @ 12.56 hrs, Volume= 1.730 af
Outflow = 9.15 cfs @ 12.56 hrs, Volume= 1.730 af, Atten= 0%, Lag= 0.0 min
Primary = 9.15 cfs @ 12.56 hrs, Volume= 1.730 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 430.40' @ 12.56 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	429.90'	**96.0" W x 43.0" H, R=52.0" Arch Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 429.90' / 429.20' S= 0.0175 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 22.75 sf

Primary OutFlow Max=9.13 cfs @ 12.56 hrs HW=430.40' (Free Discharge)
└**1=Culvert** (Inlet Controls 9.13 cfs @ 2.28 fps)

Pond AC2: ARCH CULVERT



Summary for Pond BR1-C7: BIO-RET POND 1

Inflow Area = 4.967 ac, 10.94% Impervious, Inflow Depth = 0.89" for 1-yr event
Inflow = 1.93 cfs @ 12.40 hrs, Volume= 0.367 af
Outflow = 1.93 cfs @ 12.40 hrs, Volume= 0.367 af, Atten= 0%, Lag= 0.5 min
Primary = 1.93 cfs @ 12.40 hrs, Volume= 0.367 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 477.25' @ 12.40 hrs Surf.Area= 363 sf Storage= 314 cf

Plug-Flow detention time= 21.8 min calculated for 0.367 af (100% of inflow)
Center-of-Mass det. time= 22.7 min (937.2 - 914.5)

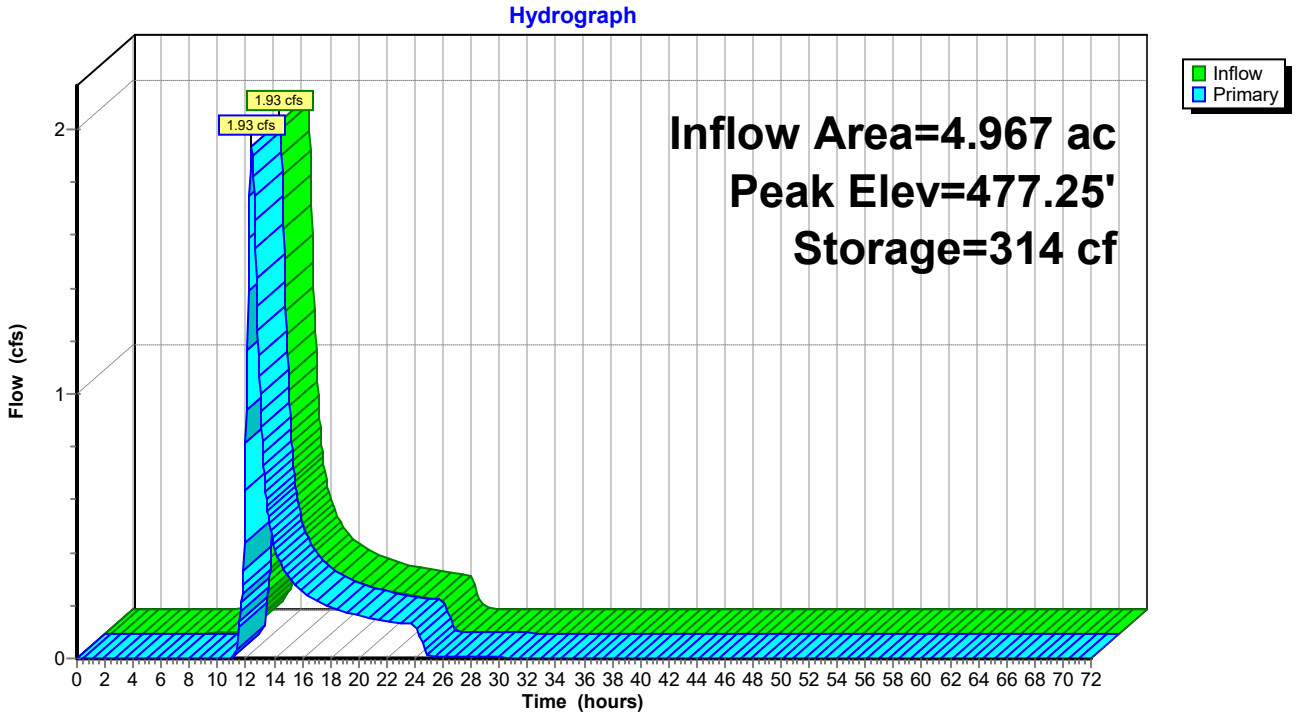
Volume	Invert	Avail.Storage	Storage Description
#1	476.00'	2,275 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
476.00	154	0	0	154
478.00	531	647	647	551
480.00	1,134	1,627	2,275	1,187

Device	Routing	Invert	Outlet Devices
#1	Primary	474.00'	**18.0" Round Culvert** L= 280.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 474.00' / 470.00' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	477.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	476.00'	**0.500 in/hr Exfiltration over Wetted area above 474.00'** Conductivity to Groundwater Elevation = 446.00' Excluded Wetted area = 0 sf

Primary OutFlow Max=1.93 cfs @ 12.40 hrs HW=477.25' (Free Discharge)
└─**1=Culvert** (Passes 1.93 cfs of 10.62 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 1.92 cfs @ 1.63 fps)
  └─**3=Exfiltration** (Controls 0.00 cfs)

Pond BR1-C7: BIO-RET POND 1



Summary for Pond BR2-C14: BIO-RET POND 2

Inflow Area = 2.923 ac, 12.07% Impervious, Inflow Depth = 1.15" for 1-yr event
Inflow = 3.29 cfs @ 12.09 hrs, Volume= 0.280 af
Outflow = 0.36 cfs @ 13.22 hrs, Volume= 0.280 af, Atten= 89%, Lag= 67.8 min
Primary = 0.36 cfs @ 13.22 hrs, Volume= 0.280 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 457.57' @ 13.22 hrs Surf.Area= 4,180 sf Storage= 5,695 cf

Plug-Flow detention time= 775.3 min calculated for 0.280 af (100% of inflow)
Center-of-Mass det. time= 775.1 min (1,650.9 - 875.8)

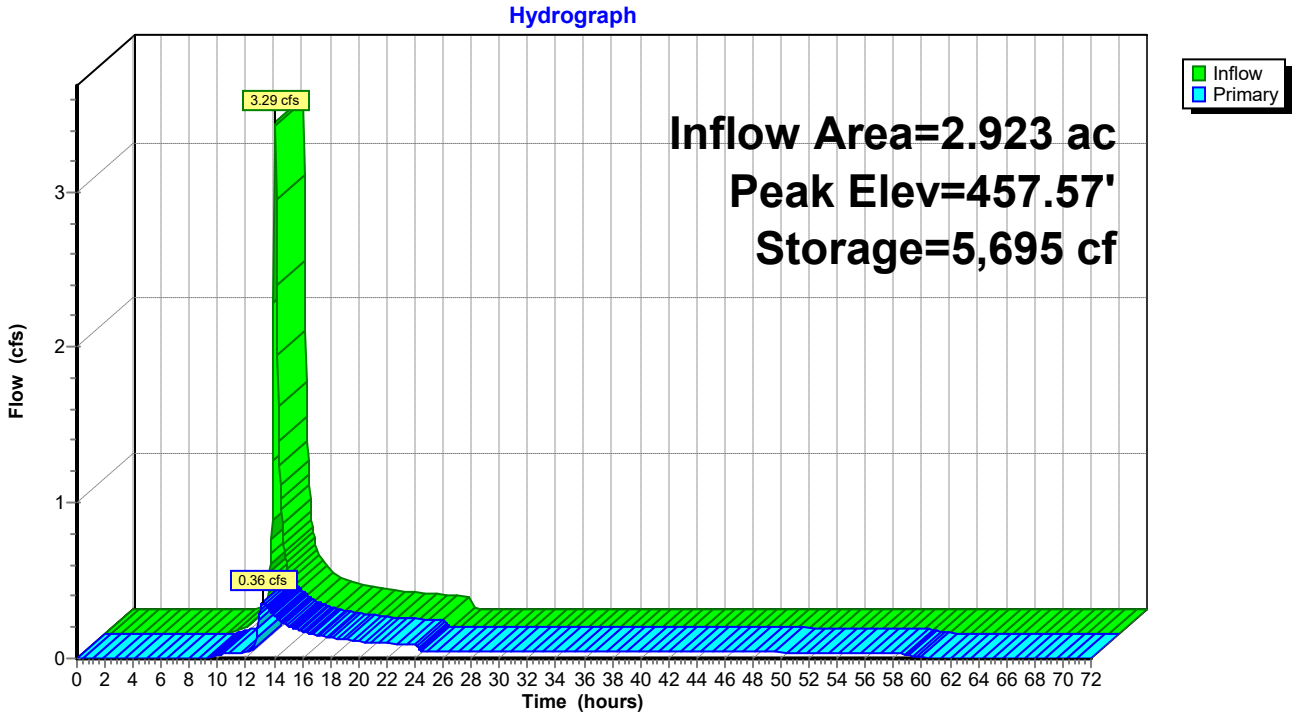
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	18,159 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
456.00	3,090	217.0	0	0	3,090
458.00	4,505	254.7	7,551	7,551	4,582
460.00	6,146	292.4	10,609	18,159	6,312

Device	Routing	Invert	Outlet Devices
#1	Primary	454.00'	**18.0" Round Culvert** L= 38.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 454.00' / 452.00' S= 0.0526 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	457.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	456.00'	**0.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 432.00'

Primary OutFlow Max=0.35 cfs @ 13.22 hrs HW=457.57' (Free Discharge)
└─**1=Culvert** (Passes 0.35 cfs of 14.30 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 0.30 cfs @ 0.88 fps)
  └─**3=Exfiltration** (Controls 0.05 cfs)

Pond BR2-C14: BIO-RET POND 2



Summary for Pond C1: 24" CULVERT

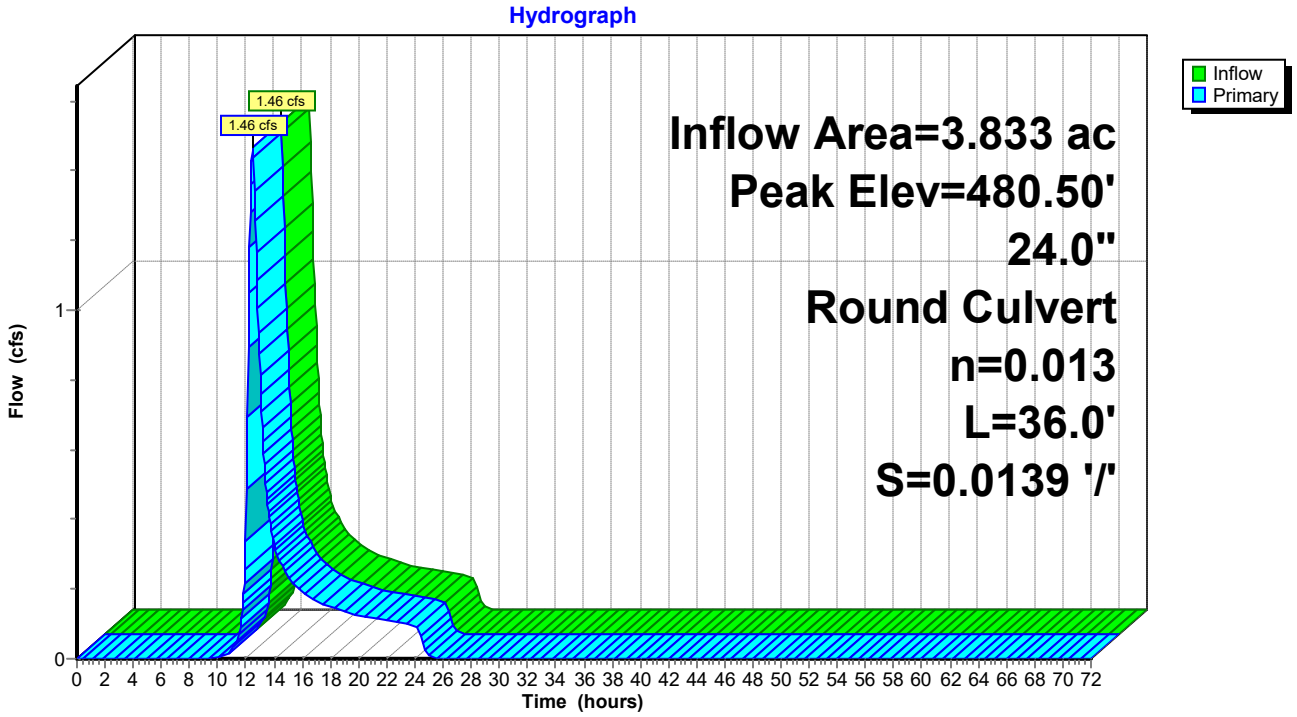
Inflow Area = 3.833 ac, 9.00% Impervious, Inflow Depth = 0.86" for 1-yr event
Inflow = 1.46 cfs @ 12.49 hrs, Volume= 0.274 af
Outflow = 1.46 cfs @ 12.49 hrs, Volume= 0.274 af, Atten= 0%, Lag= 0.0 min
Primary = 1.46 cfs @ 12.49 hrs, Volume= 0.274 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 480.50' @ 12.49 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	480.00'	**24.0" Round Culvert** L= 36.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 480.00' / 479.50' S= 0.0139 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=1.46 cfs @ 12.49 hrs HW=480.50' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.46 cfs @ 2.40 fps)

Pond C1: 24" CULVERT



Summary for Pond C10: 15" CULVERT

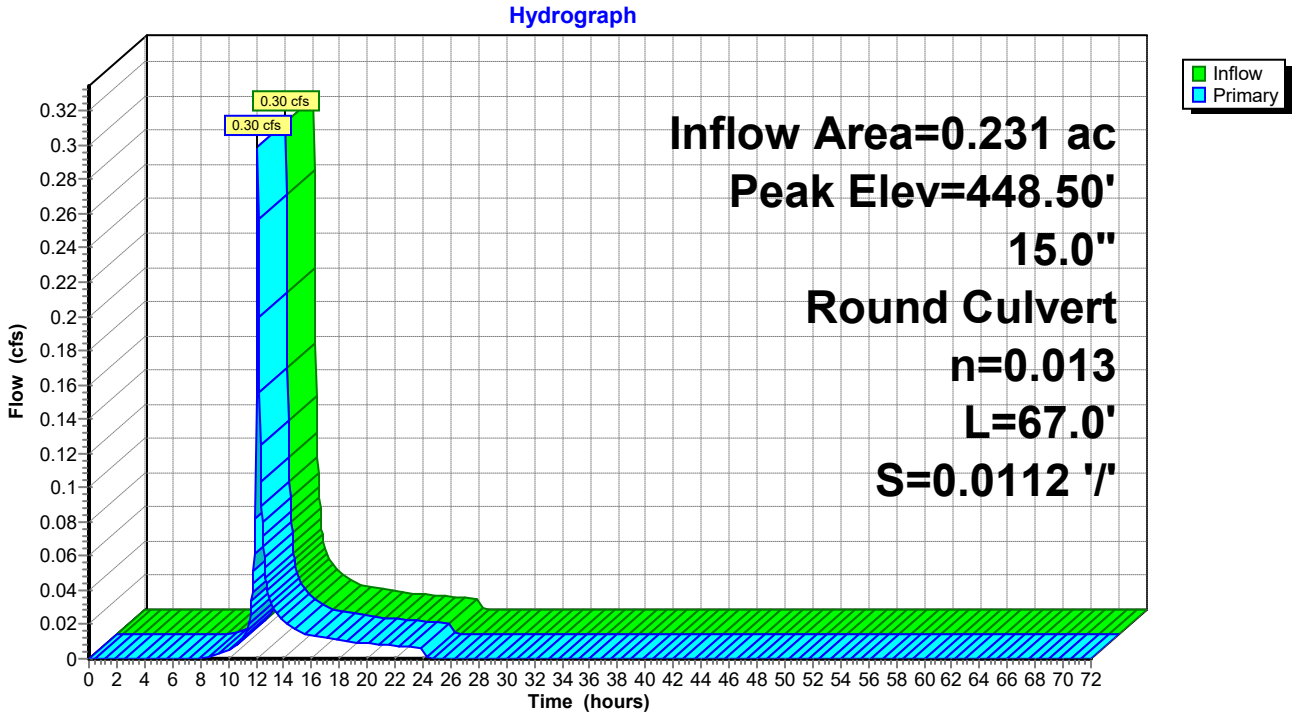
Inflow Area = 0.231 ac, 17.03% Impervious, Inflow Depth = 1.22" for 1-yr event
Inflow = 0.30 cfs @ 12.10 hrs, Volume= 0.024 af
Outflow = 0.30 cfs @ 12.10 hrs, Volume= 0.024 af, Atten= 0%, Lag= 0.0 min
Primary = 0.30 cfs @ 12.10 hrs, Volume= 0.024 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 448.50' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	448.25'	**15.0" Round Culvert** L= 67.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 448.25' / 447.50' S= 0.0112 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.30 cfs @ 12.10 hrs HW=448.50' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.30 cfs @ 1.70 fps)

Pond C10: 15" CULVERT



Summary for Pond C11: 12" CULVERT

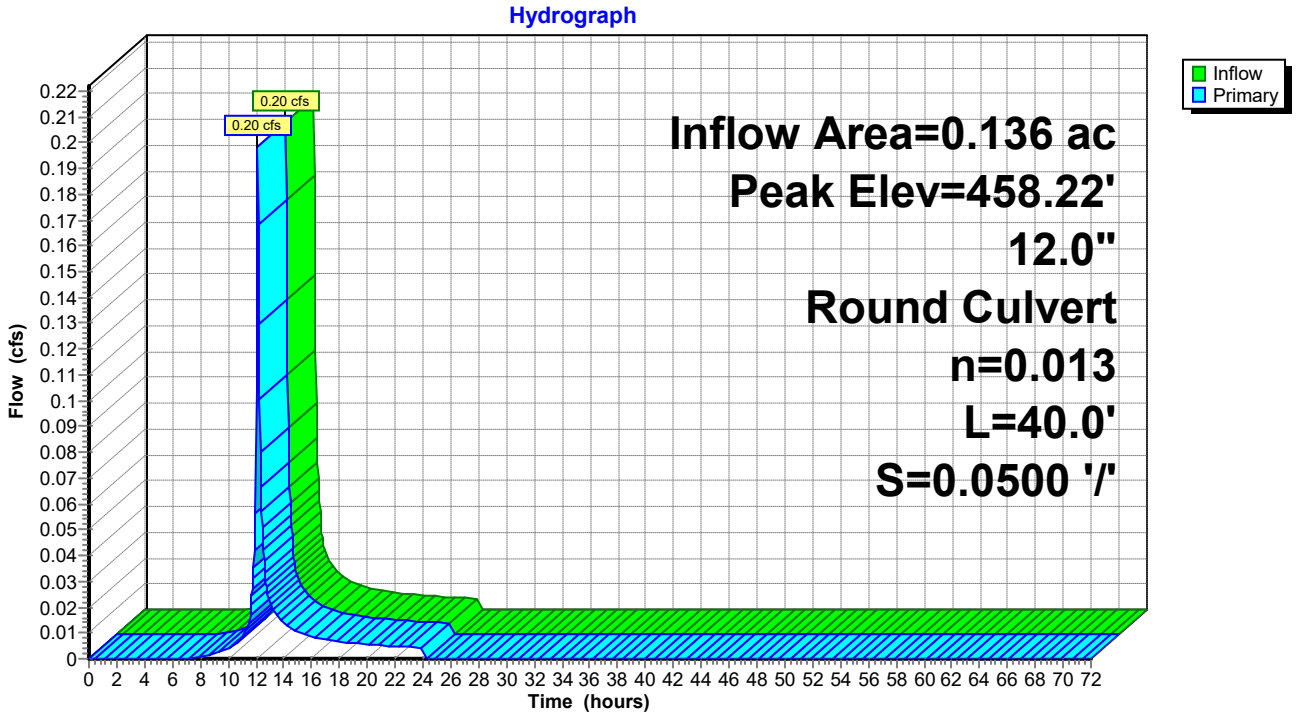
Inflow Area = 0.136 ac, 29.70% Impervious, Inflow Depth = 1.36" for 1-yr event
Inflow = 0.20 cfs @ 12.10 hrs, Volume= 0.015 af
Outflow = 0.20 cfs @ 12.10 hrs, Volume= 0.015 af, Atten= 0%, Lag= 0.0 min
Primary = 0.20 cfs @ 12.10 hrs, Volume= 0.015 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 458.22' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	458.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 458.00' / 456.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.20 cfs @ 12.10 hrs HW=458.22' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.20 cfs @ 1.58 fps)

Pond C11: 12" CULVERT



Summary for Pond C12: 24" CULVERT

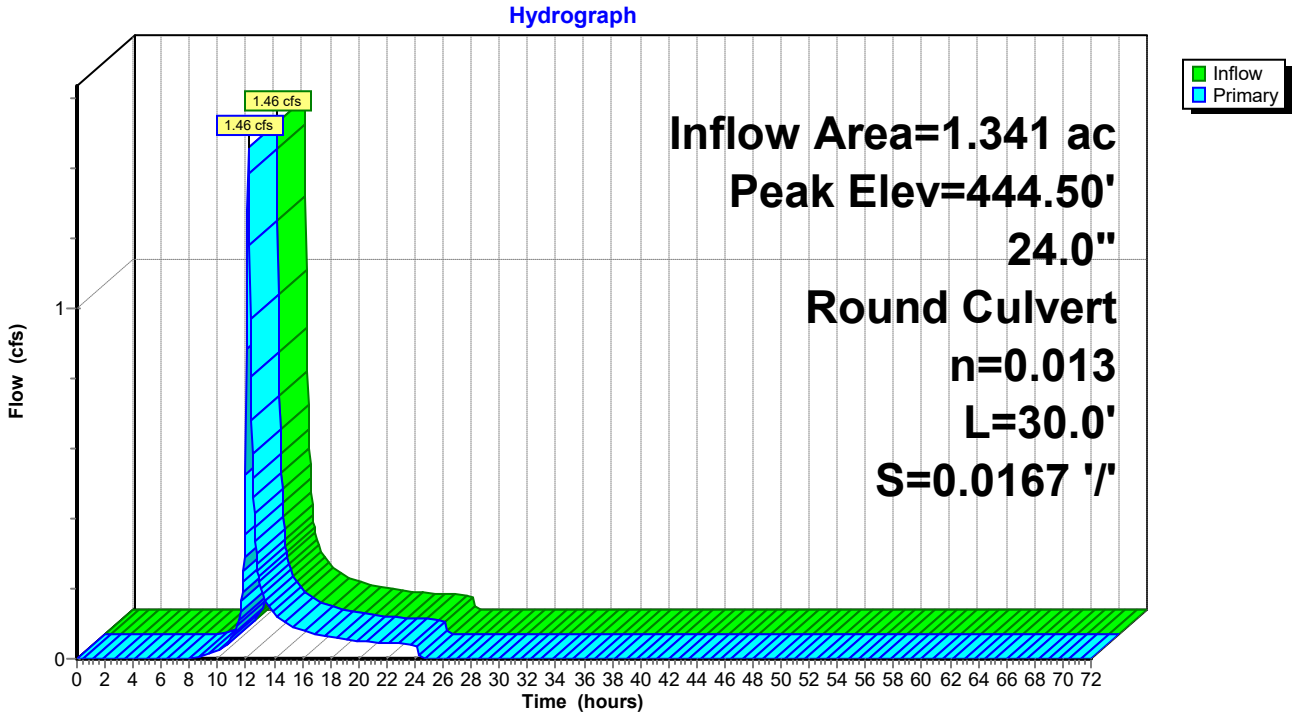
Inflow Area = 1.341 ac, 18.29% Impervious, Inflow Depth = 1.22" for 1-yr event
Inflow = 1.46 cfs @ 12.16 hrs, Volume= 0.137 af
Outflow = 1.46 cfs @ 12.16 hrs, Volume= 0.137 af, Atten= 0%, Lag= 0.0 min
Primary = 1.46 cfs @ 12.16 hrs, Volume= 0.137 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 444.50' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	444.00'	**24.0" Round Culvert** L= 30.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 444.00' / 443.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=1.44 cfs @ 12.16 hrs HW=444.49' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.44 cfs @ 2.39 fps)

Pond C12: 24" CULVERT



Summary for Pond C13: 18" CULVERT

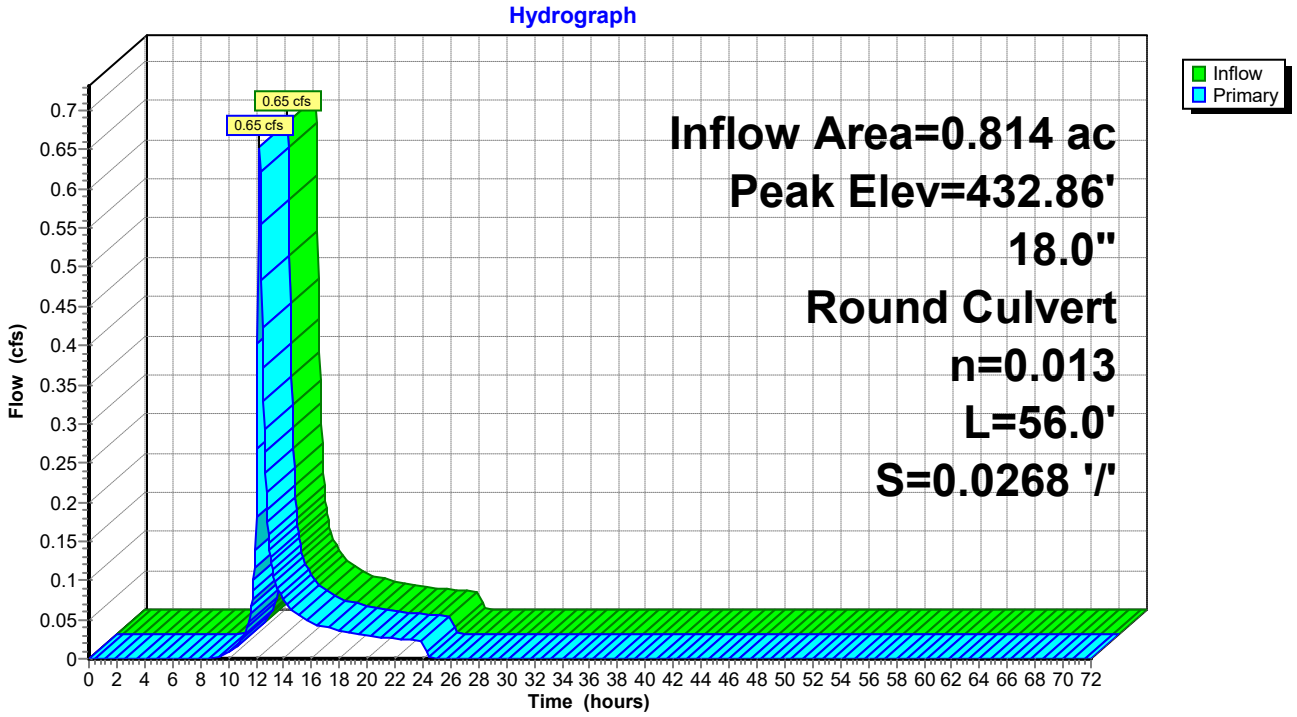
Inflow Area = 0.814 ac, 7.82% Impervious, Inflow Depth = 1.10" for 1-yr event
Inflow = 0.65 cfs @ 12.25 hrs, Volume= 0.075 af
Outflow = 0.65 cfs @ 12.25 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min
Primary = 0.65 cfs @ 12.25 hrs, Volume= 0.075 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 432.86' @ 12.25 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	**18.0" Round Culvert** L= 56.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 432.50' / 431.00' S= 0.0268 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.65 cfs @ 12.25 hrs HW=432.86' (Free Discharge)
└─**1=Culvert** (Inlet Controls 0.65 cfs @ 2.03 fps)

Pond C13: 18" CULVERT



Summary for Pond C2: 12" CULVERT

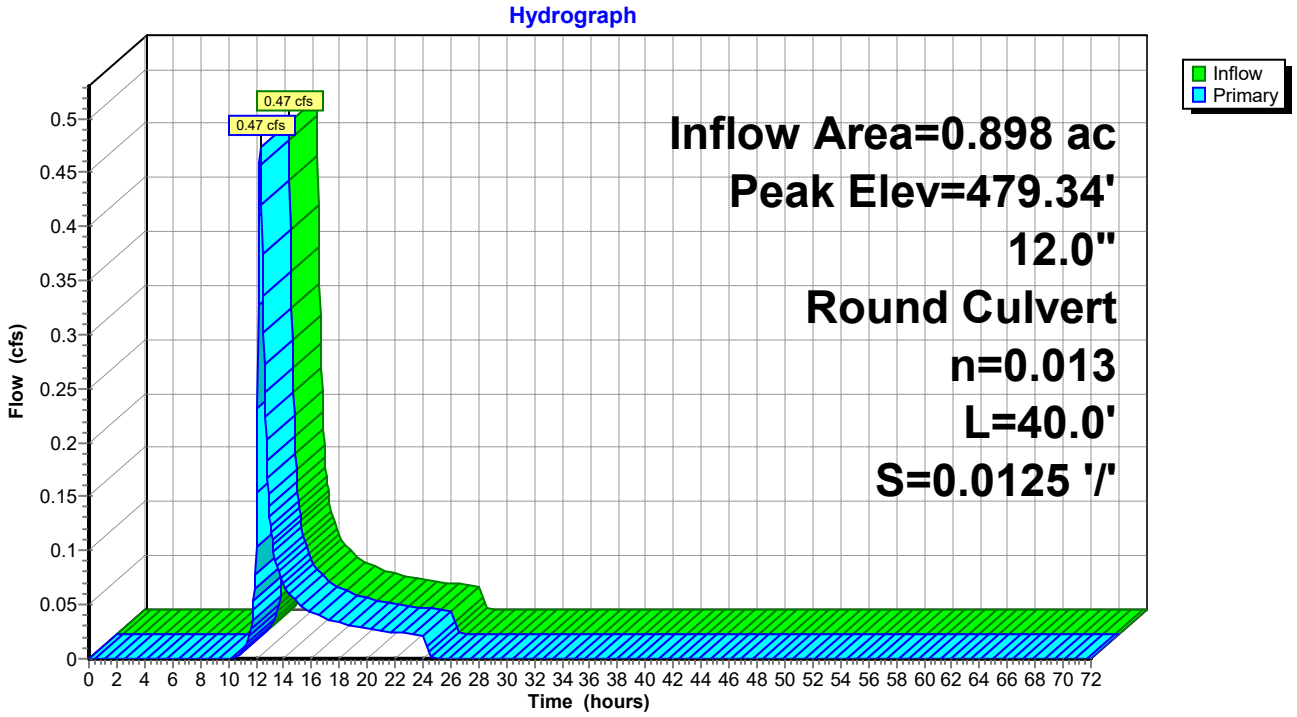
Inflow Area = 0.898 ac, 9.78% Impervious, Inflow Depth = 0.83" for 1-yr event
Inflow = 0.47 cfs @ 12.30 hrs, Volume= 0.062 af
Outflow = 0.47 cfs @ 12.30 hrs, Volume= 0.062 af, Atten= 0%, Lag= 0.0 min
Primary = 0.47 cfs @ 12.30 hrs, Volume= 0.062 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.34' @ 12.30 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.47 cfs @ 12.30 hrs HW=479.34' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.47 cfs @ 1.99 fps)

Pond C2: 12" CULVERT



Summary for Pond C3: 12" CULVERT

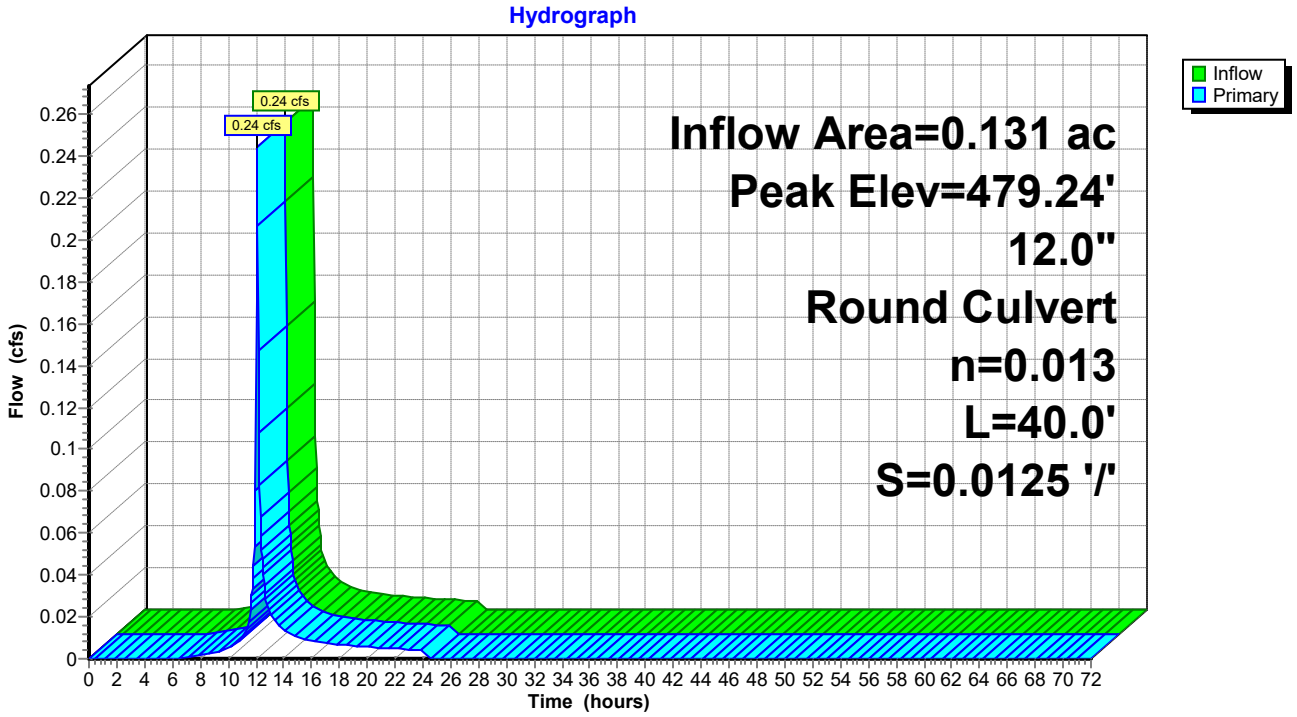
Inflow Area = 0.131 ac, 41.51% Impervious, Inflow Depth = 1.50" for 1-yr event
Inflow = 0.24 cfs @ 12.06 hrs, Volume= 0.016 af
Outflow = 0.24 cfs @ 12.06 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min
Primary = 0.24 cfs @ 12.06 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.24' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.24 cfs @ 12.06 hrs HW=479.24' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.24 cfs @ 1.66 fps)

Pond C3: 12" CULVERT



Summary for Pond C4: 12" CULVERT

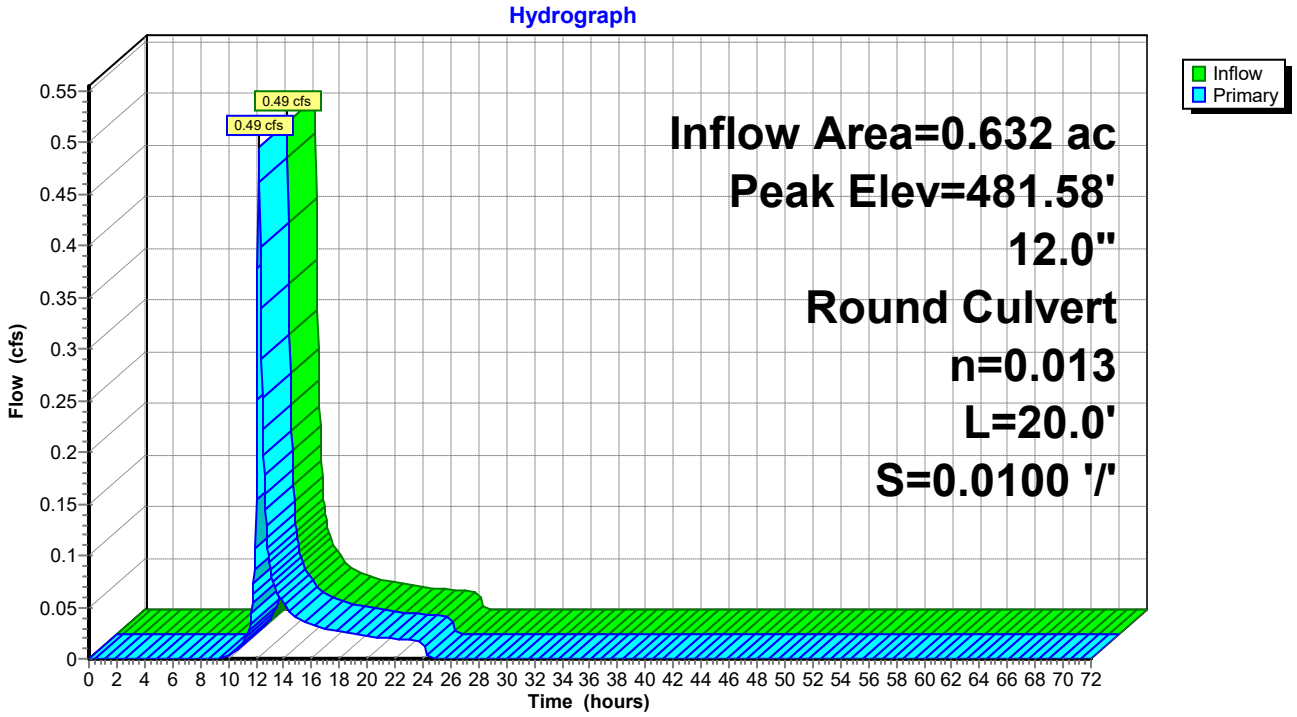
Inflow Area = 0.632 ac, 19.67% Impervious, Inflow Depth = 0.99" for 1-yr event
Inflow = 0.49 cfs @ 12.20 hrs, Volume= 0.052 af
Outflow = 0.49 cfs @ 12.20 hrs, Volume= 0.052 af, Atten= 0%, Lag= 0.0 min
Primary = 0.49 cfs @ 12.20 hrs, Volume= 0.052 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 481.58' @ 12.20 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	481.20'	**12.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 481.20' / 481.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.49 cfs @ 12.20 hrs HW=481.58' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.49 cfs @ 2.69 fps)

Pond C4: 12" CULVERT



Summary for Pond C5: 12" CULVERT

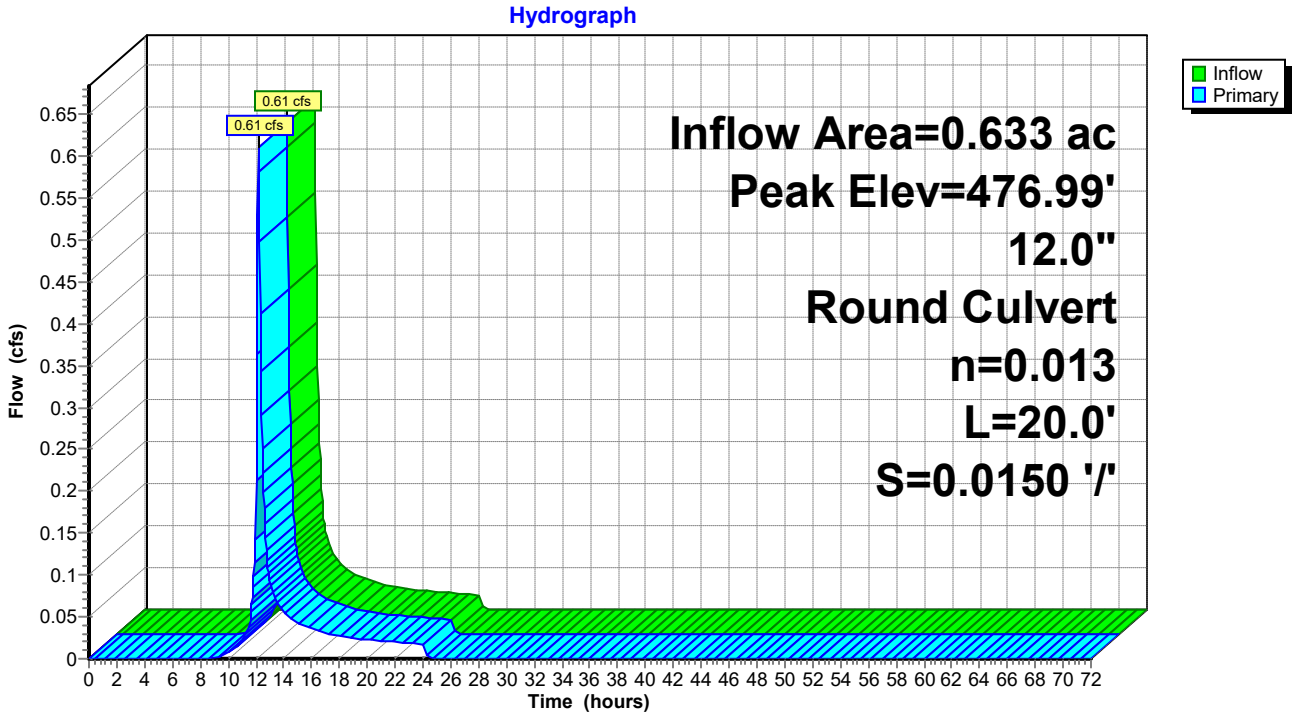
Inflow Area = 0.633 ac, 10.31% Impervious, Inflow Depth = 1.10" for 1-yr event
Inflow = 0.61 cfs @ 12.16 hrs, Volume= 0.058 af
Outflow = 0.61 cfs @ 12.16 hrs, Volume= 0.058 af, Atten= 0%, Lag= 0.0 min
Primary = 0.61 cfs @ 12.16 hrs, Volume= 0.058 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 476.99' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	476.60'	**12.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 476.60' / 476.30' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.60 cfs @ 12.16 hrs HW=476.99' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.60 cfs @ 2.12 fps)

Pond C5: 12" CULVERT



Summary for Pond C6: 24" CULVERT

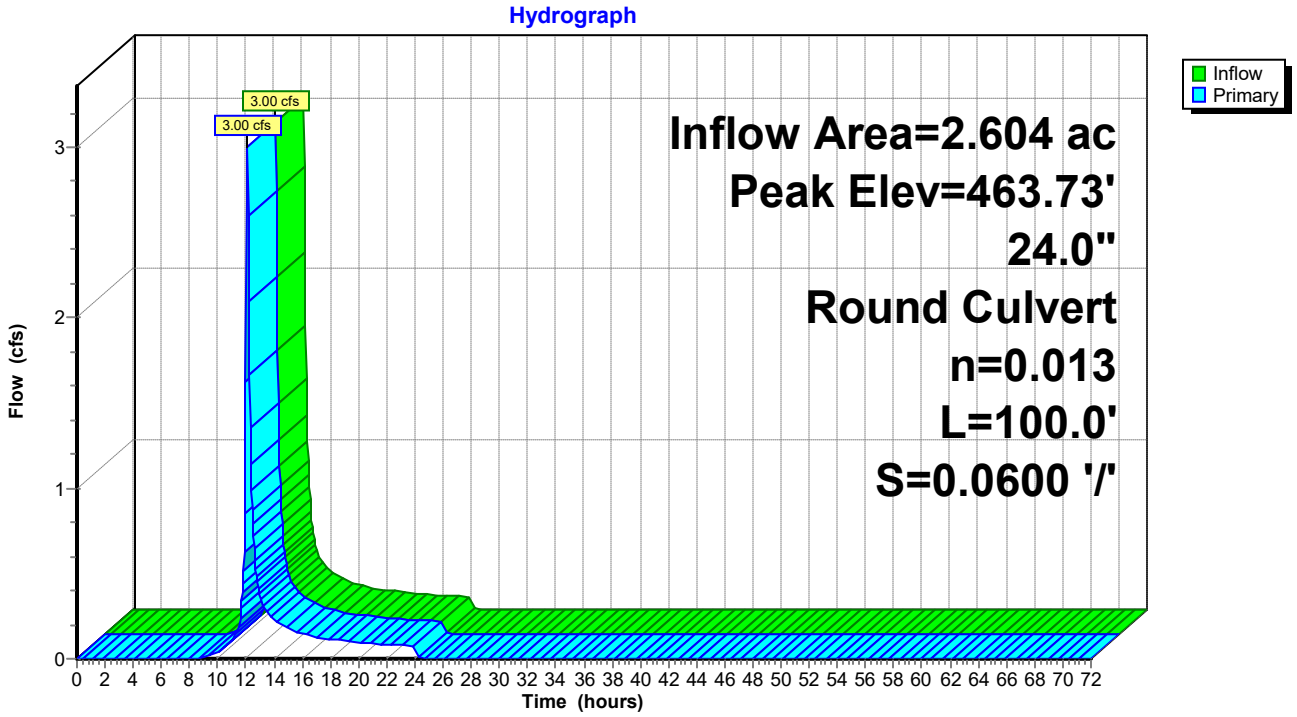
Inflow Area = 2.604 ac, 11.94% Impervious, Inflow Depth = 1.15" for 1-yr event
Inflow = 3.00 cfs @ 12.10 hrs, Volume= 0.249 af
Outflow = 3.00 cfs @ 12.10 hrs, Volume= 0.249 af, Atten= 0%, Lag= 0.0 min
Primary = 3.00 cfs @ 12.10 hrs, Volume= 0.249 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 463.73' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	463.00'	**24.0" Round Culvert** L= 100.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 463.00' / 457.00' S= 0.0600 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=2.97 cfs @ 12.10 hrs HW=463.72' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.97 cfs @ 2.90 fps)

Pond C6: 24" CULVERT



Summary for Pond C8: 12" CULVERT

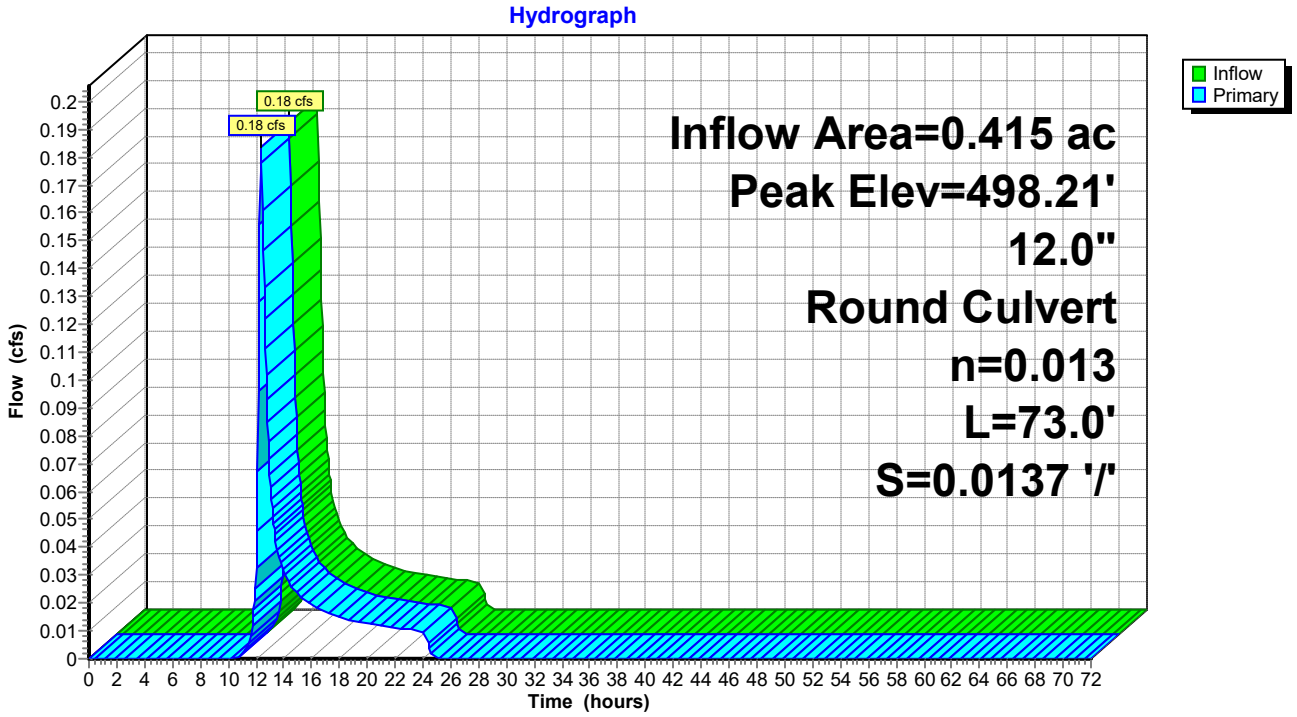
Inflow Area = 0.415 ac, 6.10% Impervious, Inflow Depth = 0.78" for 1-yr event
Inflow = 0.18 cfs @ 12.37 hrs, Volume= 0.027 af
Outflow = 0.18 cfs @ 12.37 hrs, Volume= 0.027 af, Atten= 0%, Lag= 0.0 min
Primary = 0.18 cfs @ 12.37 hrs, Volume= 0.027 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 498.21' @ 12.37 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	498.00'	**12.0" Round Culvert** L= 73.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 498.00' / 497.00' S= 0.0137 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.18 cfs @ 12.37 hrs HW=498.21' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.18 cfs @ 1.55 fps)

Pond C8: 12" CULVERT



Summary for Pond C9: 12" CULVERT

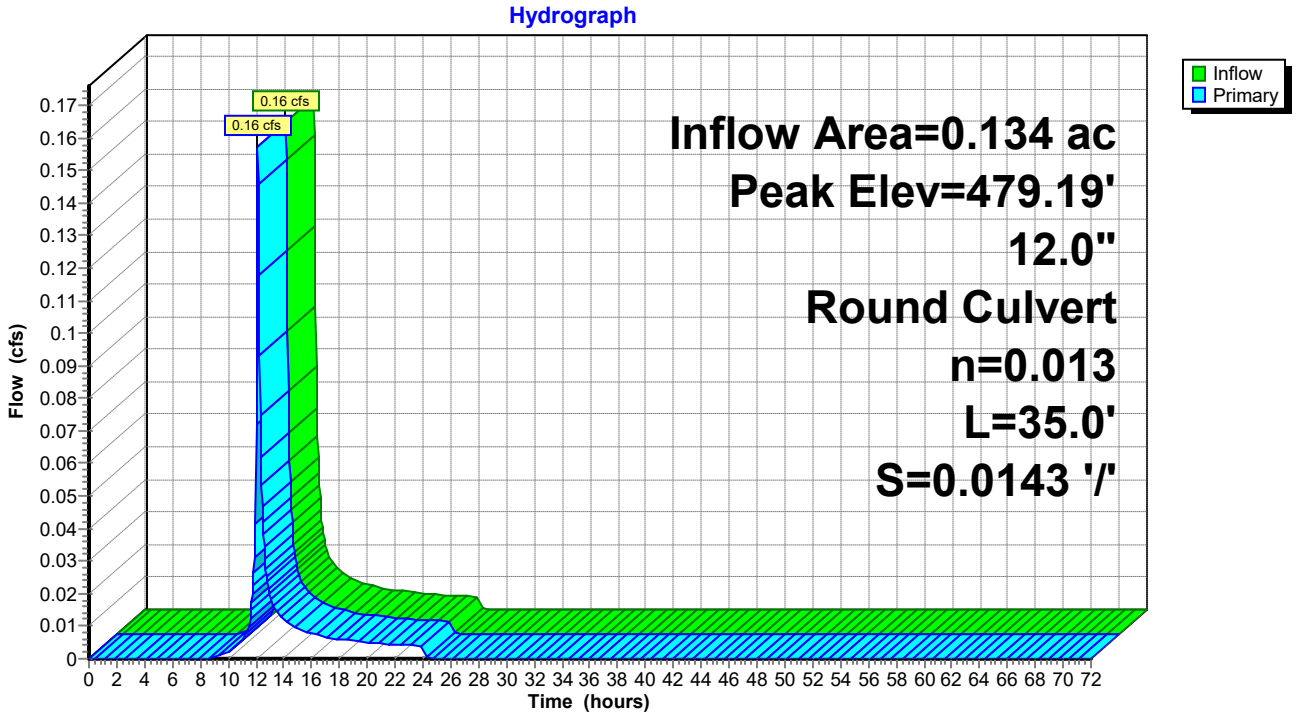
Inflow Area = 0.134 ac, 14.23% Impervious, Inflow Depth = 1.16" for 1-yr event
Inflow = 0.16 cfs @ 12.11 hrs, Volume= 0.013 af
Outflow = 0.16 cfs @ 12.11 hrs, Volume= 0.013 af, Atten= 0%, Lag= 0.0 min
Primary = 0.16 cfs @ 12.11 hrs, Volume= 0.013 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.19' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 35.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.15 cfs @ 12.11 hrs HW=479.19' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.15 cfs @ 1.48 fps)

Pond C9: 12" CULVERT



Summary for Pond DP1: DRY POND 1

Inflow Area = 3.133 ac, 8.85% Impervious, Inflow Depth = 1.11" for 1-yr event
Inflow = 2.85 cfs @ 12.18 hrs, Volume= 0.291 af
Outflow = 0.20 cfs @ 15.39 hrs, Volume= 0.108 af, Atten= 93%, Lag= 192.8 min
Primary = 0.20 cfs @ 15.39 hrs, Volume= 0.108 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 438.57' @ 15.39 hrs Surf.Area= 3,682 sf Storage= 8,229 cf

Plug-Flow detention time= 421.5 min calculated for 0.108 af (37% of inflow)
Center-of-Mass det. time= 255.3 min (1,139.6 - 884.3)

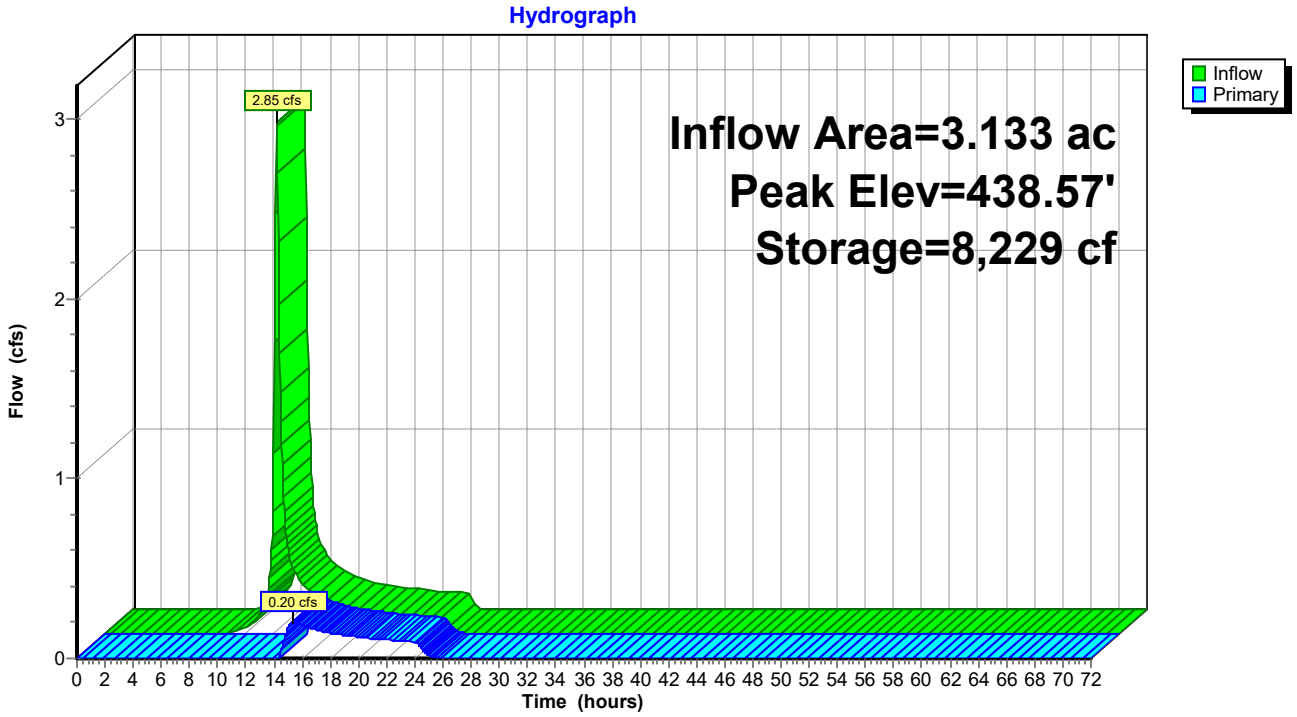
Volume	Invert	Avail.Storage	Storage Description
#1	434.00'	14,417 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
434.00	171	64.2	0	0	171
436.00	1,610	246.7	1,537	1,537	4,697
438.00	3,203	284.4	4,723	6,260	6,376
440.00	5,022	322.1	8,157	14,417	8,294

Device	Routing	Invert	Outlet Devices
#1	Primary	438.50'	**45.0 deg x 3.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.19 cfs @ 15.39 hrs HW=438.57' (Free Discharge)
└**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.19 cfs @ 0.86 fps)

Pond DP1: DRY POND 1

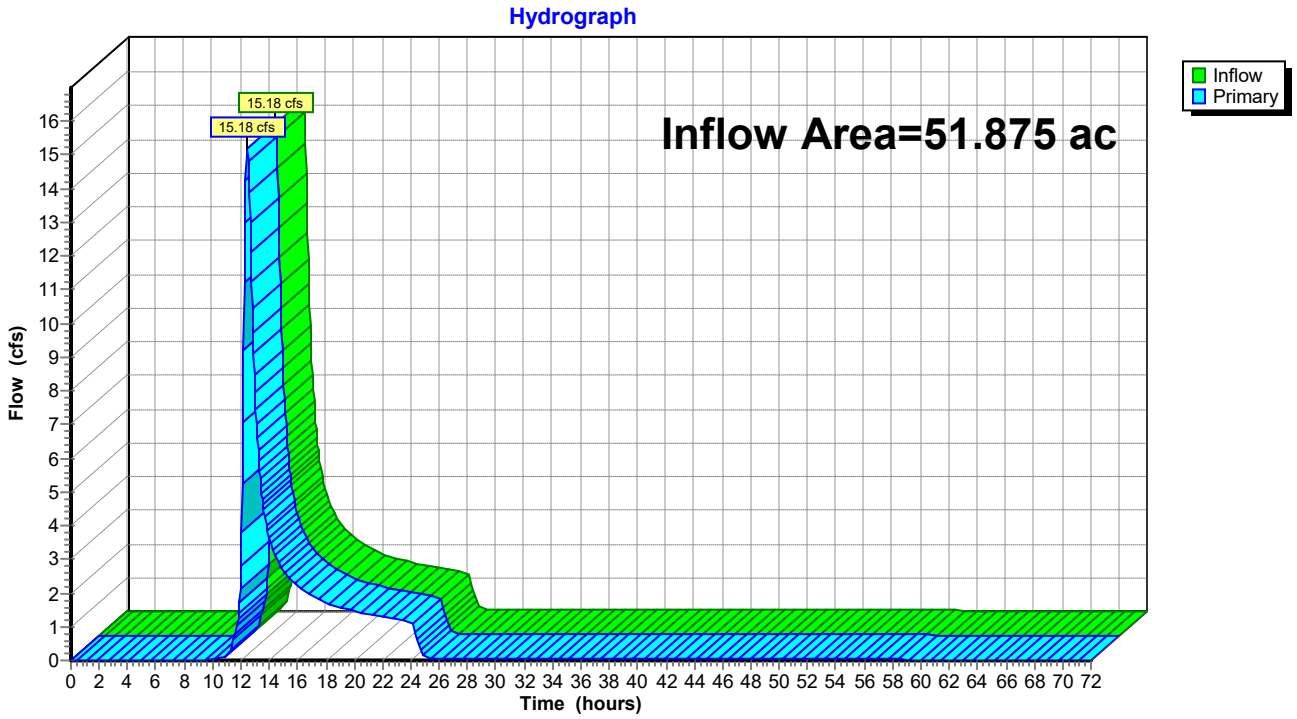


Summary for Link O1: OUT 1

Inflow Area = 51.875 ac, 3.67% Impervious, Inflow Depth = 0.70" for 1-yr event
Inflow = 15.18 cfs @ 12.45 hrs, Volume= 3.026 af
Primary = 15.18 cfs @ 12.45 hrs, Volume= 3.026 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O1: OUT 1

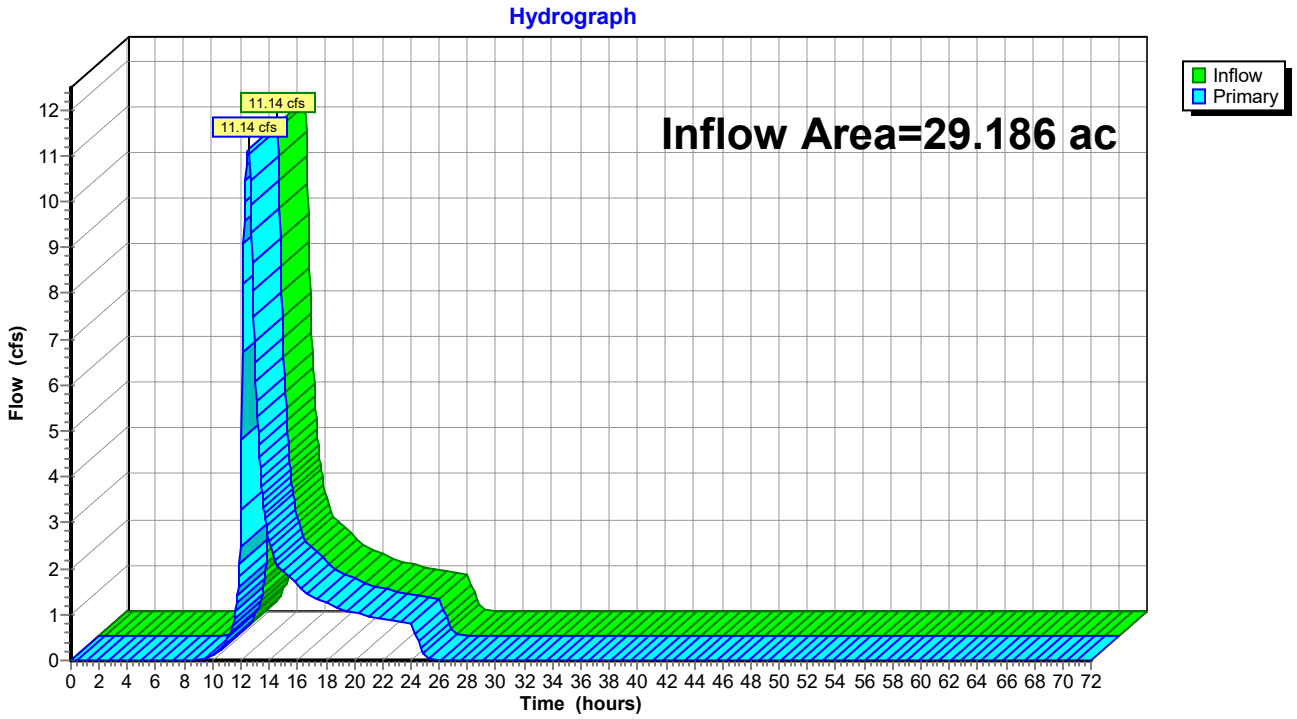


Summary for Link O2: OUT 2

Inflow Area = 29.186 ac, 3.50% Impervious, Inflow Depth = 0.93" for 1-yr event
Inflow = 11.14 cfs @ 12.50 hrs, Volume= 2.265 af
Primary = 11.14 cfs @ 12.50 hrs, Volume= 2.265 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O2: OUT 2

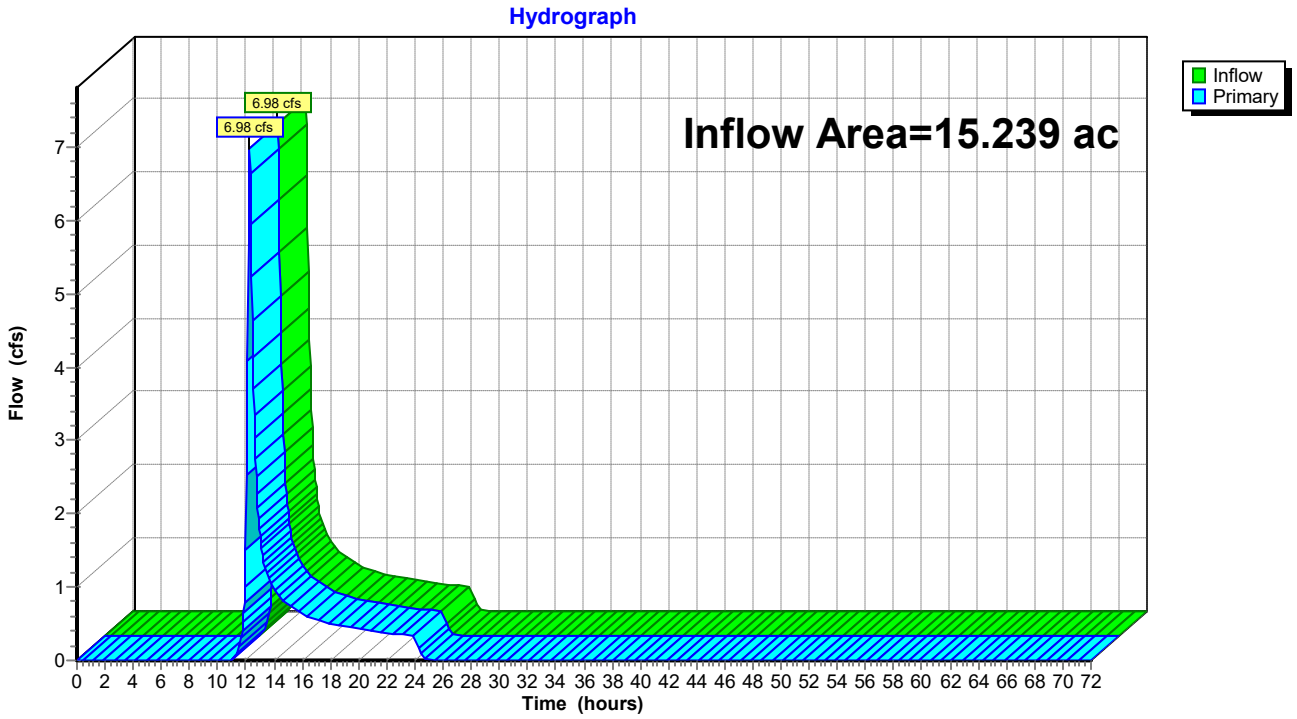


Summary for Link O3: OUT 3

Inflow Area = 15.239 ac, 0.00% Impervious, Inflow Depth = 0.69" for 1-yr event
Inflow = 6.98 cfs @ 12.25 hrs, Volume= 0.877 af
Primary = 6.98 cfs @ 12.25 hrs, Volume= 0.877 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O3: OUT 3

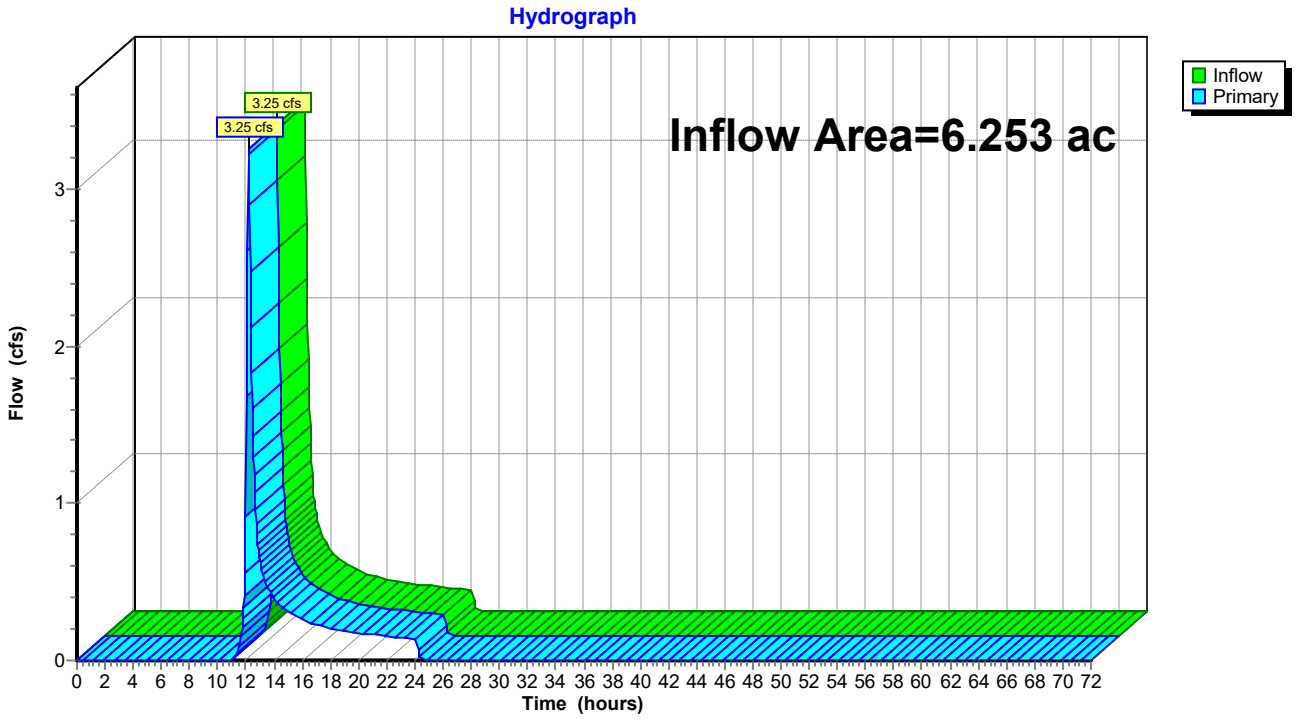


Summary for Link O4: OUT 4

Inflow Area = 6.253 ac, 0.00% Impervious, Inflow Depth = 0.69" for 1-yr event
Inflow = 3.25 cfs @ 12.18 hrs, Volume= 0.360 af
Primary = 3.25 cfs @ 12.18 hrs, Volume= 0.360 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O4: OUT 4

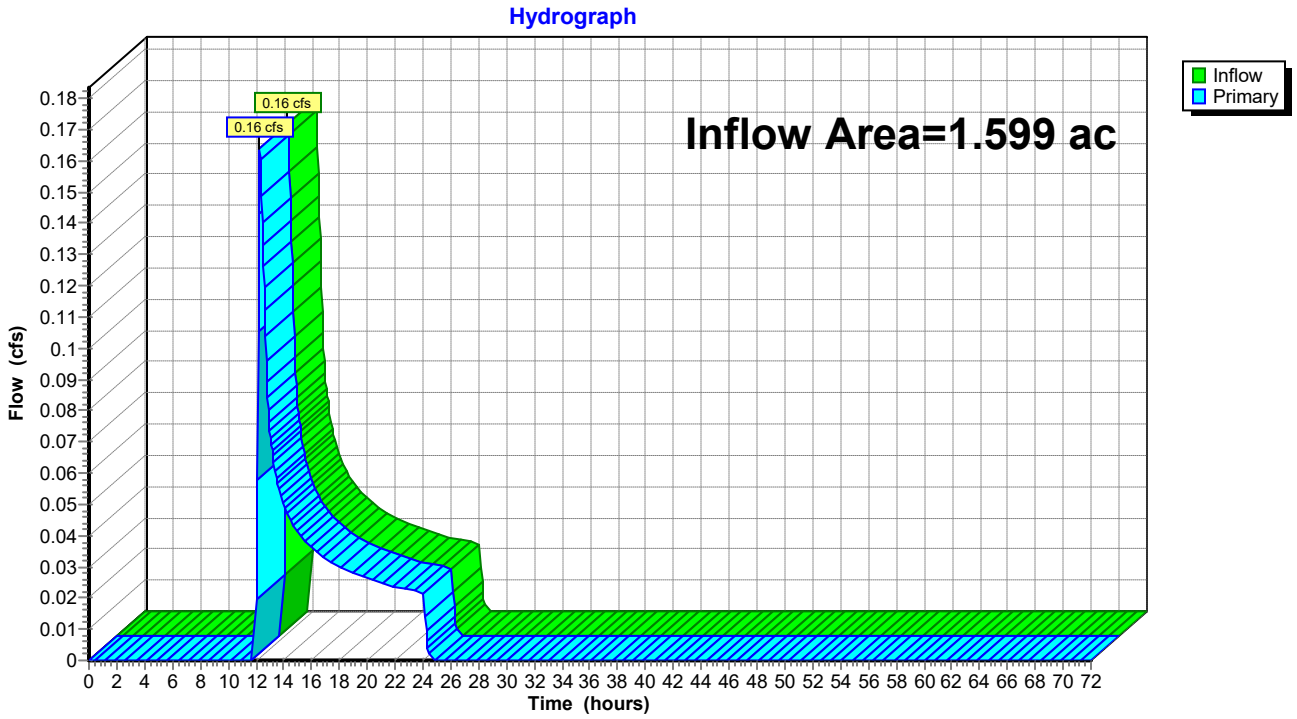


Summary for Link O5: OUT 5

Inflow Area = 1.599 ac, 0.00% Impervious, Inflow Depth = 0.29" for 1-yr event
Inflow = 0.16 cfs @ 12.28 hrs, Volume= 0.039 af
Primary = 0.16 cfs @ 12.28 hrs, Volume= 0.039 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O5: OUT 5



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: DRAINAGE AREA 1A Runoff Area=1,089,015 sf 2.10% Impervious Runoff Depth=1.28"
Flow Length=2,185' Tc=36.9 min CN=76 Runoff=16.14 cfs 2.664 af

Subcatchment 1B: DRAINAGE AREA 1B Runoff Area=18,084 sf 6.10% Impervious Runoff Depth=1.22"
Flow Length=160' Tc=28.8 min CN=75 Runoff=0.29 cfs 0.042 af

Subcatchment 1C: DRAINAGE AREA 1C Runoff Area=139,425 sf 6.89% Impervious Runoff Depth=1.28"
Flow Length=945' Tc=40.6 min CN=76 Runoff=1.95 cfs 0.341 af

Subcatchment 1D: DRAINAGE AREA 1D Runoff Area=27,532 sf 19.67% Impervious Runoff Depth=1.47"
Flow Length=480' Tc=17.2 min CN=79 Runoff=0.74 cfs 0.078 af

Subcatchment 1E: DRAINAGE AREA 1E Runoff Area=39,104 sf 9.78% Impervious Runoff Depth=1.28"
Flow Length=490' Tc=24.1 min CN=76 Runoff=0.74 cfs 0.096 af

Subcatchment 1F: DRAINAGE AREA 1F Runoff Area=5,854 sf 14.23% Impervious Runoff Depth=1.68"
Flow Length=100' Tc=11.4 min CN=82 Runoff=0.22 cfs 0.019 af

Subcatchment 1G: DRAINAGE AREA 1G Runoff Area=5,726 sf 41.51% Impervious Runoff Depth=2.07"
Flow Length=200' Tc=7.5 min CN=87 Runoff=0.33 cfs 0.023 af

Subcatchment 1H: DRAINAGE AREA 8 Runoff Area=4,559 sf 53.41% Impervious Runoff Depth=2.34"
Flow Length=45' Tc=0.4 min CN=90 Runoff=0.38 cfs 0.020 af

Subcatchment 1I: DRAINAGE AREA 1I Runoff Area=27,574 sf 10.31% Impervious Runoff Depth=1.61"
Flow Length=260' Tc=15.0 min CN=81 Runoff=0.88 cfs 0.085 af

Subcatchment 1J: DRAINAGE AREA 1J Runoff Area=85,839 sf 12.46% Impervious Runoff Depth=1.68"
Flow Length=480' Tc=9.3 min CN=82 Runoff=3.54 cfs 0.277 af

Subcatchment 1K: DRAINAGE AREA 1K Runoff Area=13,922 sf 13.09% Impervious Runoff Depth=1.68"
Flow Length=100' Tc=4.2 min CN=82 Runoff=0.75 cfs 0.045 af

Subcatchment 1L: DRAINAGE AREA 1L Runoff Area=792,979 sf 2.18% Impervious Runoff Depth=0.69"
Flow Length=1,370' Tc=24.1 min CN=65 Runoff=6.55 cfs 1.047 af

Subcatchment 1M: DRAINAGE AREA 1M Runoff Area=10,047 sf 17.03% Impervious Runoff Depth=1.76"
Flow Length=185' Tc=10.3 min CN=83 Runoff=0.42 cfs 0.034 af

Subcatchment 2A: DRAINAGE AREA 2A Runoff Area=58,418 sf 18.29% Impervious Runoff Depth=1.76"
Flow Length=560' Tc=15.0 min CN=83 Runoff=2.05 cfs 0.196 af

Subcatchment 2B: DRAINAGE AREA 2B Runoff Area=5,939 sf 29.70% Impervious Runoff Depth=1.91"
Flow Length=80' Tc=10.2 min CN=85 Runoff=0.27 cfs 0.022 af

Subcatchment 2C: DRAINAGE AREA 2C Runoff Area=130,540 sf 7.90% Impervious Runoff Depth=1.61"
Flow Length=870' Tc=16.7 min CN=81 Runoff=3.91 cfs 0.403 af

Subcatchment 2D: DRAINAGE AREA 2D Runoff Area=858,381 sf 0.51% Impervious Runoff Depth=1.47"
Flow Length=1,470' Tc=43.3 min CN=79 Runoff=13.60 cfs 2.419 af

Subcatchment 2E: DRAINAGE AREA 18 Runoff Area=121,293 sf 11.99% Impervious Runoff Depth=1.54"
Flow Length=610' Tc=16.4 min CN=80 Runoff=3.49 cfs 0.358 af

Subcatchment 2F: DRAINAGE AREA 2F Runoff Area=61,323 sf 0.00% Impervious Runoff Depth=1.10"
Flow Length=250' Tc=13.7 min CN=73 Runoff=1.30 cfs 0.129 af

Subcatchment 2G: DRAINAGE AREA 2G Runoff Area=35,456 sf 7.82% Impervious Runoff Depth=1.61"
Flow Length=300' Tc=21.0 min CN=81 Runoff=0.94 cfs 0.109 af

Subcatchment 3: DRAINAGE AREA 3 Runoff Area=663,807 sf 0.00% Impervious Runoff Depth=1.10"
Flow Length=590' Tc=19.9 min CN=73 Runoff=11.62 cfs 1.397 af

Subcatchment 4: DRAINAGE AREA 4 Runoff Area=272,371 sf 0.00% Impervious Runoff Depth=1.10"
Flow Length=376' Tc=15.4 min CN=73 Runoff=5.47 cfs 0.573 af

Subcatchment 5: DRAINAGE AREA 5 Runoff Area=69,632 sf 0.00% Impervious Runoff Depth=0.56"
Flow Length=340' Tc=16.6 min CN=62 Runoff=0.49 cfs 0.075 af

Pond AC1: ARCH CULVERT Peak Elev=454.73' Inflow=19.39 cfs 3.283 af
96.0" x 43.0", R=52.0" Arch Culvert n=0.013 L=60.0' S=0.0417 '/' Outflow=19.39 cfs 3.283 af

Pond AC2: ARCH CULVERT Peak Elev=430.56' Inflow=13.67 cfs 2.661 af
96.0" x 43.0", R=52.0" Arch Culvert n=0.013 L=40.0' S=0.0175 '/' Outflow=13.67 cfs 2.661 af

Pond BR1-C7: BIO-RET POND 1 Peak Elev=477.33' Storage=345 cf Inflow=2.99 cfs 0.558 af
Outflow=2.99 cfs 0.558 af

Pond BR2-C14: BIO-RET POND 2 Peak Elev=457.71' Storage=6,276 cf Inflow=4.70 cfs 0.406 af
Outflow=1.54 cfs 0.406 af

Pond C1: 24" CULVERT Peak Elev=480.63' Inflow=2.27 cfs 0.419 af
24.0" Round Culvert n=0.013 L=36.0' S=0.0139 '/' Outflow=2.27 cfs 0.419 af

Pond C10: 15" CULVERT Peak Elev=448.55' Inflow=0.42 cfs 0.034 af
15.0" Round Culvert n=0.013 L=67.0' S=0.0112 '/' Outflow=0.42 cfs 0.034 af

Pond C11: 12" CULVERT Peak Elev=458.26' Inflow=0.27 cfs 0.022 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0500 '/' Outflow=0.27 cfs 0.022 af

Pond C12: 24" CULVERT Peak Elev=444.59' Inflow=2.05 cfs 0.196 af
24.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=2.05 cfs 0.196 af

Pond C13: 18" CULVERT Peak Elev=432.93' Inflow=0.94 cfs 0.109 af
18.0" Round Culvert n=0.013 L=56.0' S=0.0268 '/' Outflow=0.94 cfs 0.109 af

Pond C2: 12" CULVERT Peak Elev=479.44' Inflow=0.74 cfs 0.096 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=0.74 cfs 0.096 af

Pond C3: 12" CULVERT Peak Elev=479.28' Inflow=0.33 cfs 0.023 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=0.33 cfs 0.023 af

Pond C4: 12" CULVERT Peak Elev=481.67' Inflow=0.74 cfs 0.078 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0100 '/' Outflow=0.74 cfs 0.078 af

Pond C5: 12" CULVERT Peak Elev=477.09' Inflow=0.88 cfs 0.085 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0150 '/' Outflow=0.88 cfs 0.085 af

Pond C6: 24" CULVERT Peak Elev=463.88' Inflow=4.28 cfs 0.362 af
24.0" Round Culvert n=0.013 L=100.0' S=0.0600 '/' Outflow=4.28 cfs 0.362 af

Pond C8: 12" CULVERT Peak Elev=498.27' Inflow=0.29 cfs 0.042 af
12.0" Round Culvert n=0.013 L=73.0' S=0.0137 '/' Outflow=0.29 cfs 0.042 af

Pond C9: 12" CULVERT Peak Elev=479.23' Inflow=0.22 cfs 0.019 af
12.0" Round Culvert n=0.013 L=35.0' S=0.0143 '/' Outflow=0.22 cfs 0.019 af

Pond DP1: DRY POND 1 Peak Elev=438.68' Storage=8,637 cf Inflow=4.10 cfs 0.424 af
Outflow=0.76 cfs 0.241 af

Link O1: OUT 1 Inflow=26.74 cfs 4.770 af
Primary=26.74 cfs 4.770 af

Link O2: OUT 2 Inflow=16.48 cfs 3.453 af
Primary=16.48 cfs 3.453 af

Link O3: OUT 3 Inflow=11.62 cfs 1.397 af
Primary=11.62 cfs 1.397 af

Link O4: OUT 4 Inflow=5.47 cfs 0.573 af
Primary=5.47 cfs 0.573 af

Link O5: OUT 5 Inflow=0.49 cfs 0.075 af
Primary=0.49 cfs 0.075 af

Total Runoff Area = 104.151 ac Runoff Volume = 10.450 af Average Runoff Depth = 1.20"
97.19% Pervious = 101.228 ac 2.81% Impervious = 2.923 ac

Summary for Subcatchment 1A: DRAINAGE AREA 1A

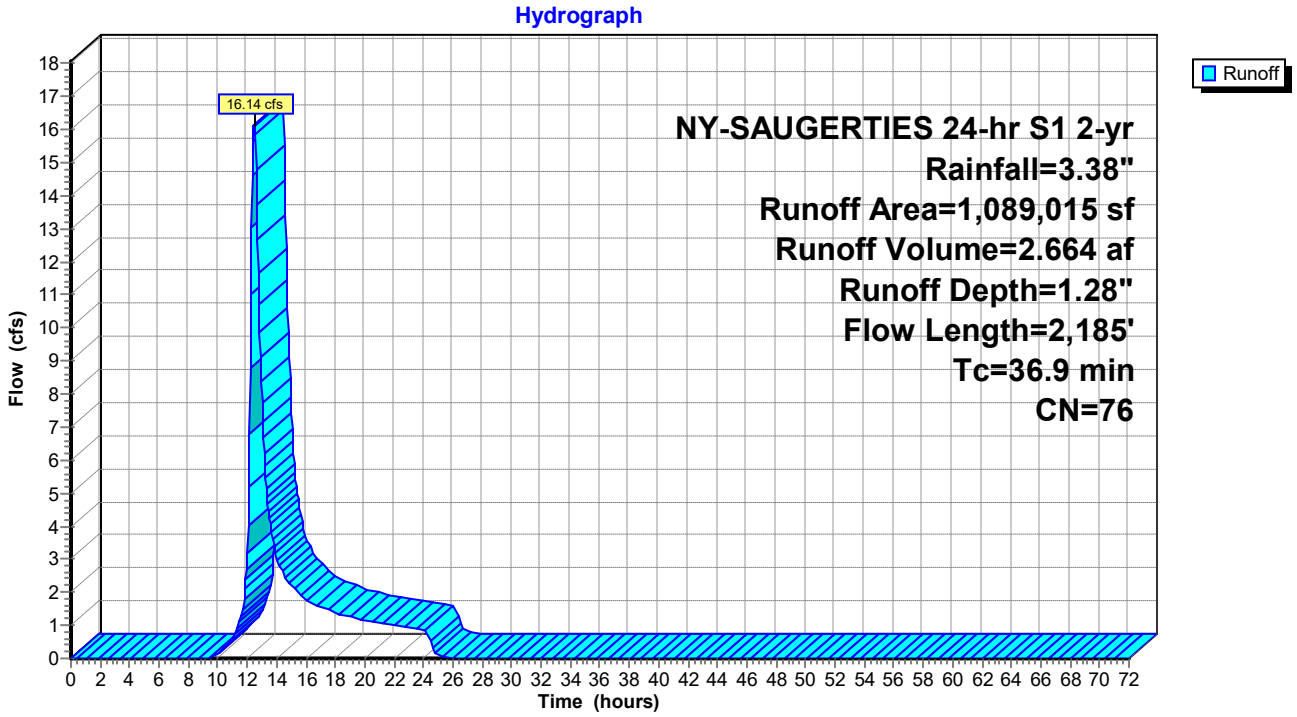
Runoff = 16.14 cfs @ 12.47 hrs, Volume= 2.664 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	853	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	620,284	73	Woods, Fair, HSG C
	391,737	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	20,528	74	>75% Grass cover, Good, HSG C
	32,734	80	>75% Grass cover, Good, HSG D
*	14,227	98	Paved roads w/curbs & sewers, HSG A-D
*	8,652	98	Roofs, HSG A-D
	1,089,015	76	Weighted Average
	1,066,136		97.90% Pervious Area
	22,879		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0800	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
13.4	650	0.0260	0.81		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
3.0	360	0.0180	2.01		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
1.3	260	0.0480	3.29		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
1.0	170	0.0350	2.81		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
2.9	380	0.0210	2.17		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
3.3	265	0.0080	1.34		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
36.9	2,185	Total			

Subcatchment 1A: DRAINAGE AREA 1A



Summary for Subcatchment 1B: DRAINAGE AREA 1B

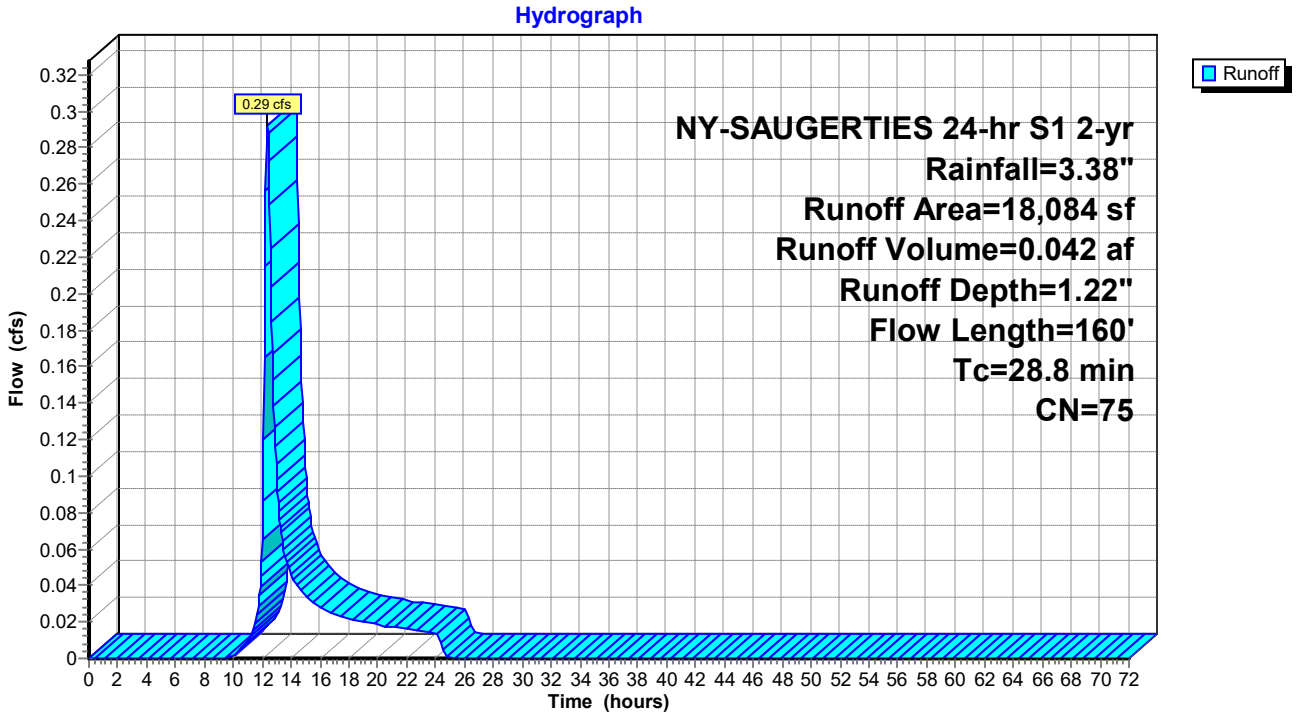
Runoff = 0.29 cfs @ 12.36 hrs, Volume= 0.042 af, Depth= 1.22"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	14,107	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	2,873	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
*	1,104	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	18,084	75	Weighted Average
	16,980		93.90% Pervious Area
	1,104		6.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.6	100	0.0100	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.0	10	0.4000	9.49		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
28.8	160	Total			

Subcatchment 1B: DRAINAGE AREA 1B



Summary for Subcatchment 1C: DRAINAGE AREA 1C

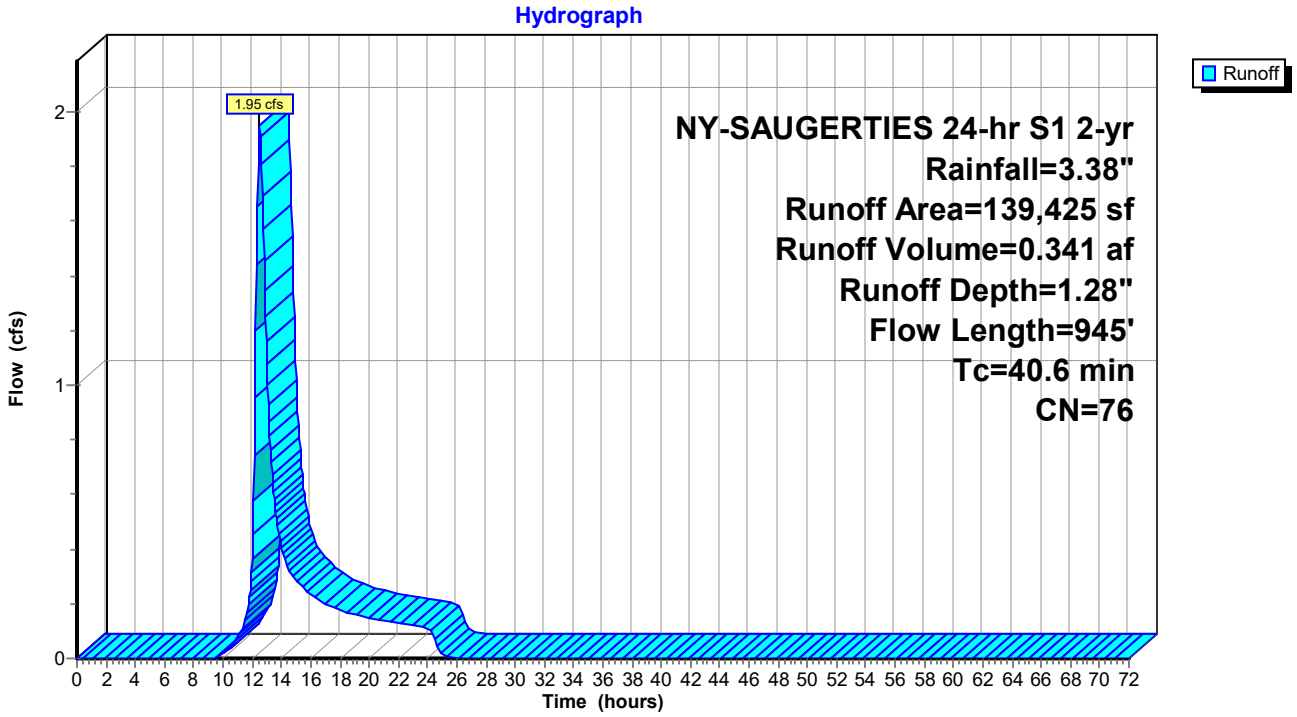
Runoff = 1.95 cfs @ 12.51 hrs, Volume= 0.341 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	97,071	73	Woods, Fair, HSG C
	20,322	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	12,079	74	>75% Grass cover, Good, HSG C
	347	80	>75% Grass cover, Good, HSG D
*	6,722	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	139,425	76	Weighted Average
	129,819		93.11% Pervious Area
	9,606		6.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
9.9	350	0.0140	0.59		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.1	80	0.0630	1.25		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
5.5	220	0.0180	0.67		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
3.2	185	0.0380	0.97		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.0	10	0.2000	6.71		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
40.6	945	Total			

Subcatchment 1C: DRAINAGE AREA 1C



Summary for Subcatchment 1D: DRAINAGE AREA 1D

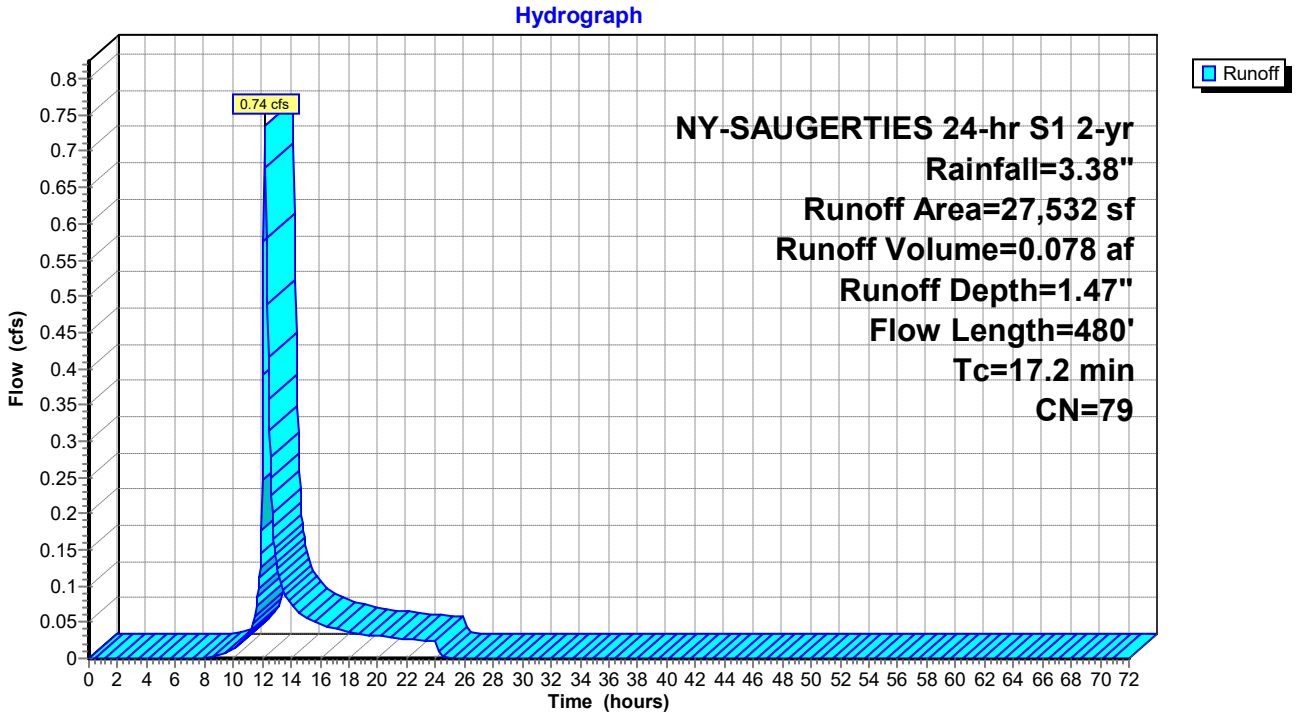
Runoff = 0.74 cfs @ 12.19 hrs, Volume= 0.078 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	8,093	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	13,157	74	>75% Grass cover, Good, HSG C
	867	80	>75% Grass cover, Good, HSG D
*	5,415	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	27,532	79	Weighted Average
	22,117		80.33% Pervious Area
	5,415		19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	8	0.0630	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
1.5	17	0.0590	0.19		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
12.6	75	0.0400	0.10		**Sheet Flow, C-D** Woods: Light underbrush n= 0.400 P2= 3.38"
0.6	30	0.0330	0.91		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.2	40	0.0500	3.35		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
1.8	220	0.0180	2.01		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
0.4	90	0.0780	4.19		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
17.2	480	Total			

Subcatchment 1D: DRAINAGE AREA 1D



Summary for Subcatchment 1E: DRAINAGE AREA 1E

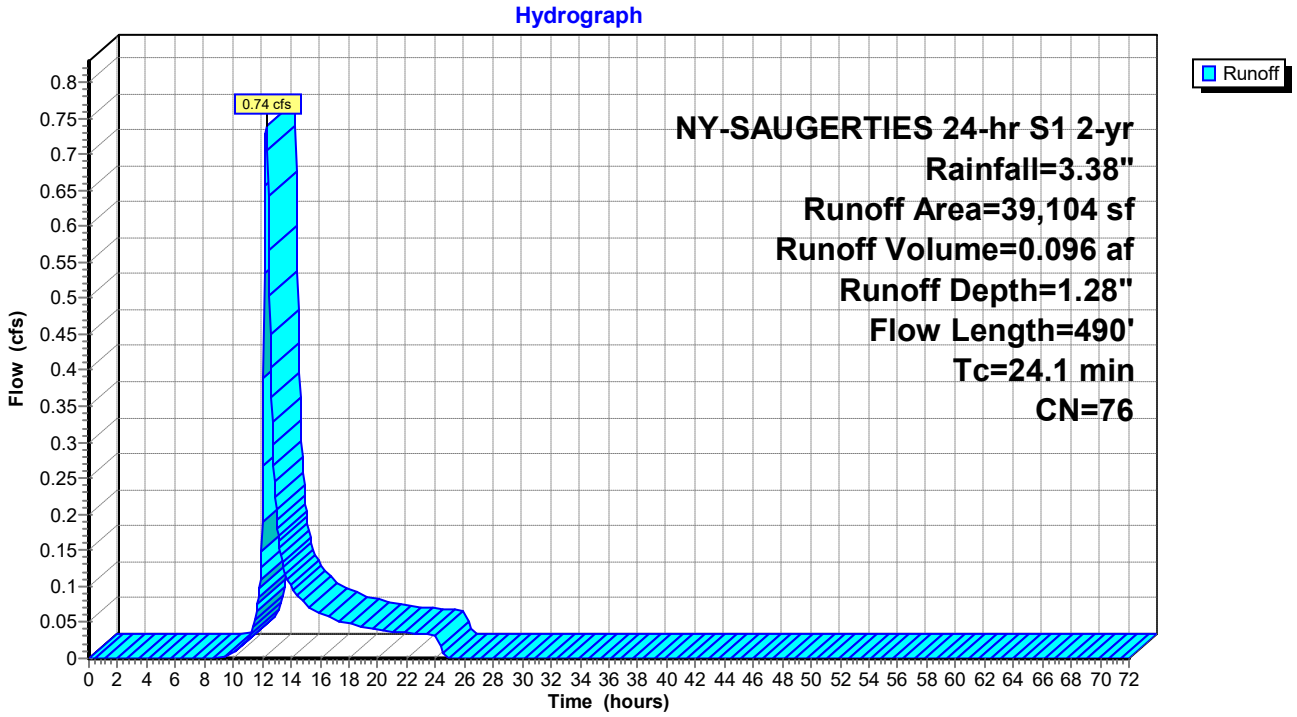
Runoff = 0.74 cfs @ 12.29 hrs, Volume= 0.096 af, Depth= 1.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	27,062	73	Woods, Fair, HSG C
	1,441	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	4,681	74	>75% Grass cover, Good, HSG C
	2,095	80	>75% Grass cover, Good, HSG D
*	3,825	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	39,104	76	Weighted Average
	35,279		90.22% Pervious Area
	3,825		9.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.6	110	0.0550	1.17		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	280	0.0390	2.96		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
24.1	490	Total			

Subcatchment 1E: DRAINAGE AREA 1E



Summary for Subcatchment 1F: DRAINAGE AREA 1F

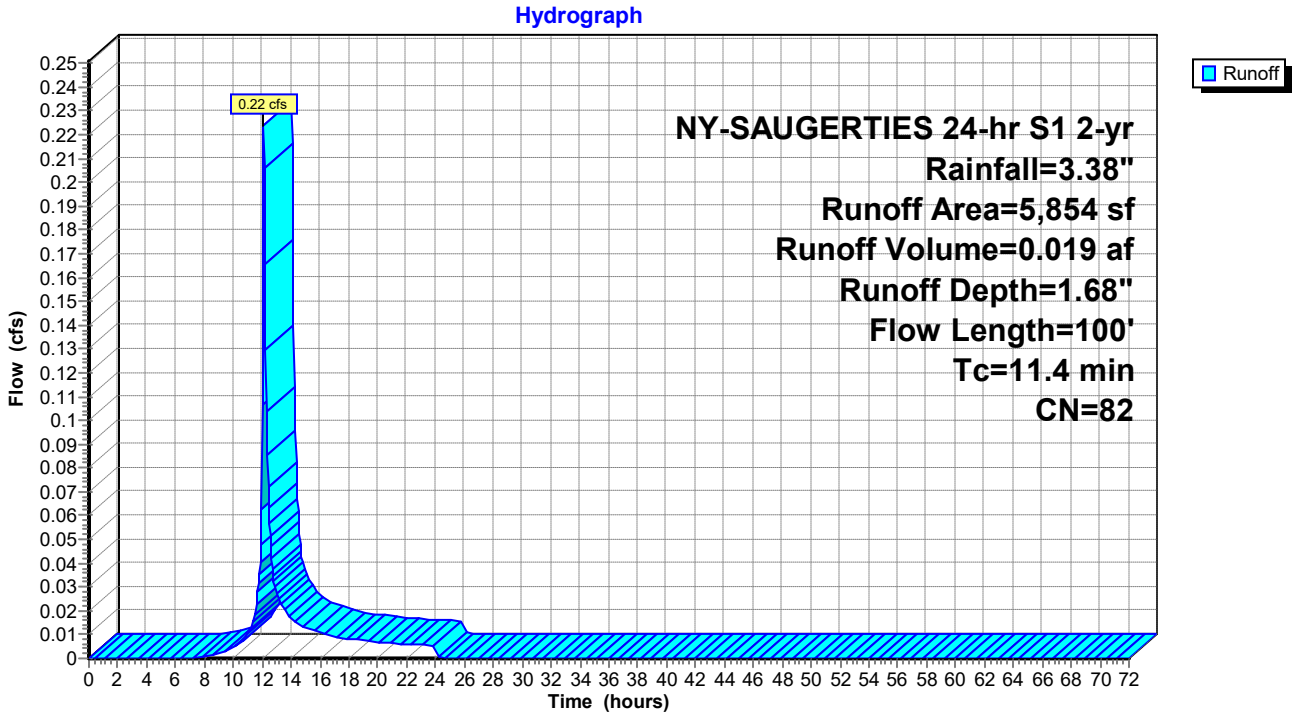
Runoff = 0.22 cfs @ 12.11 hrs, Volume= 0.019 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	2,009	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,012	80	>75% Grass cover, Good, HSG D
*	833	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,854	82	Weighted Average
	5,021		85.77% Pervious Area
	833		14.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	30	0.0670	0.22		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
7.0	40	0.0500	0.10		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.38"
2.2	30	0.0670	0.22		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.38"
11.4	100	Total			

Subcatchment 1F: DRAINAGE AREA 1F



Summary for Subcatchment 1G: DRAINAGE AREA 1G

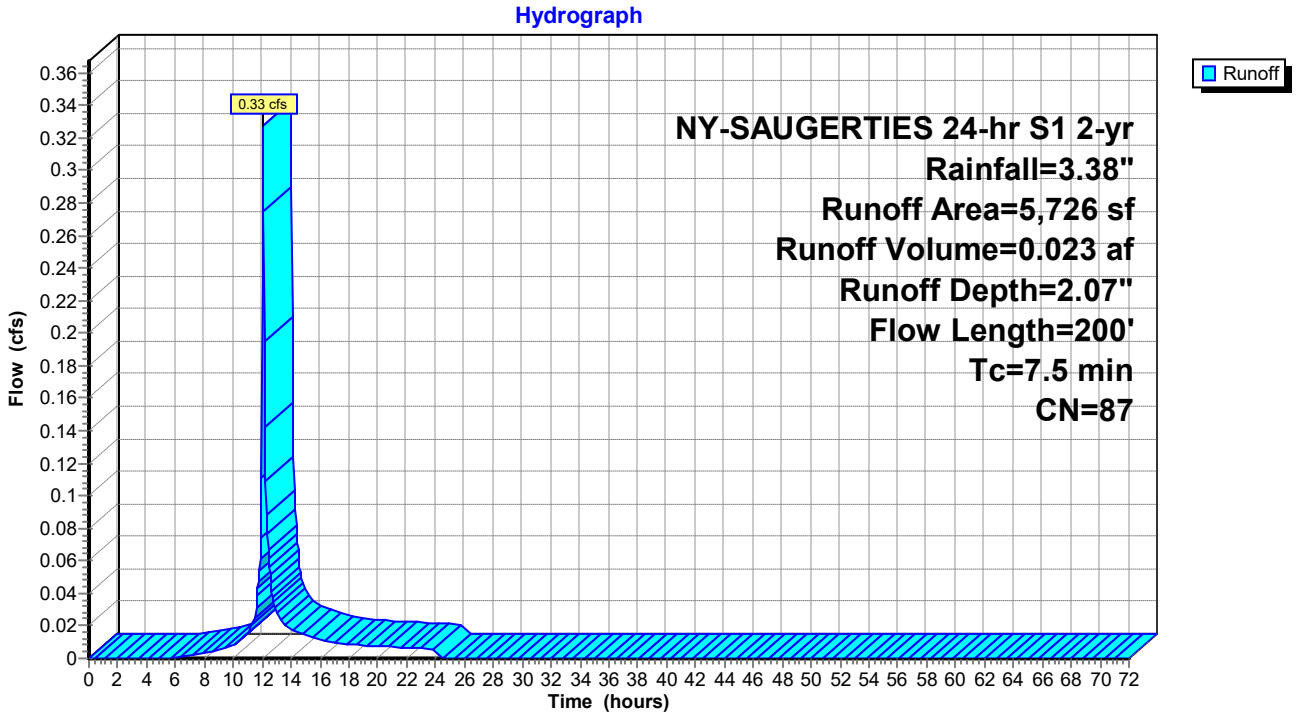
Runoff = 0.33 cfs @ 12.06 hrs, Volume= 0.023 af, Depth= 2.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	521	74	>75% Grass cover, Good, HSG C
	2,828	80	>75% Grass cover, Good, HSG D
*	2,377	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,726	87	Weighted Average
	3,349		58.49% Pervious Area
	2,377		41.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	5	0.1000	1.48		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
6.8	95	0.0420	0.23		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.6	100	0.0400	3.00		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
7.5	200	Total			

Subcatchment 1G: DRAINAGE AREA 1G



Summary for Subcatchment 1H: DRAINAGE AREA 8

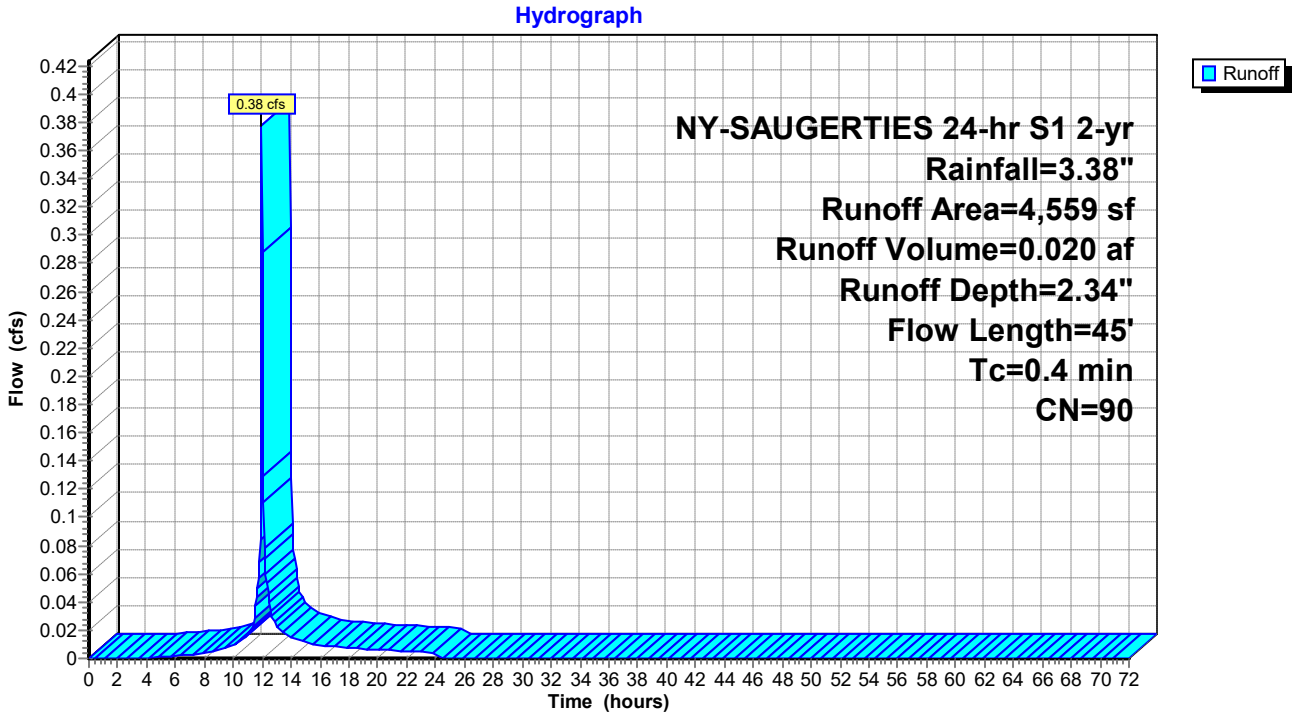
Runoff = 0.38 cfs @ 11.96 hrs, Volume= 0.020 af, Depth= 2.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	2,124	80	>75% Grass cover, Good, HSG D
*	2,435	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	4,559	90	Weighted Average
	2,124		46.59% Pervious Area
	2,435		53.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0250	1.12		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
0.1	25	0.3200	3.25		**Sheet Flow, B-C**
					Smooth surfaces n= 0.011 P2= 3.38"
0.4	45	Total			

Subcatchment 1H: DRAINAGE AREA 8



Summary for Subcatchment 1I: DRAINAGE AREA 1I

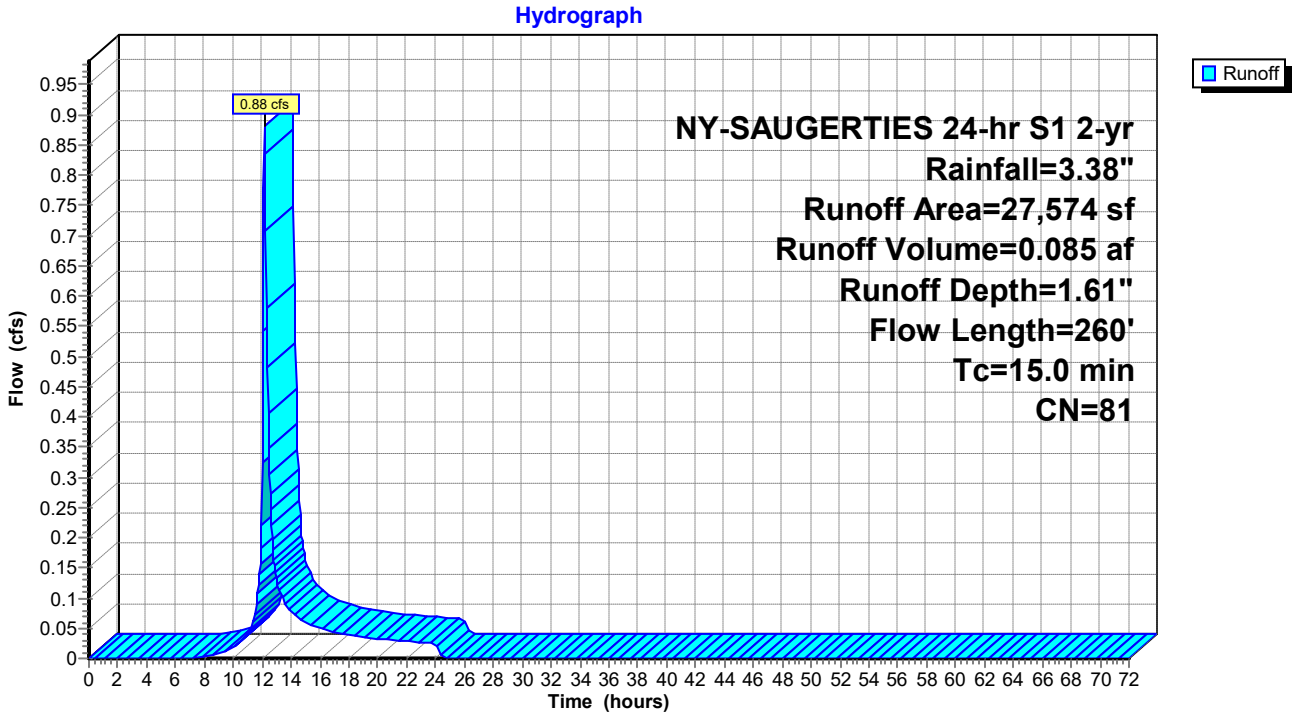
Runoff = 0.88 cfs @ 12.16 hrs, Volume= 0.085 af, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	686	73	Woods, Fair, HSG C
	20,704	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,341	80	>75% Grass cover, Good, HSG D
*	2,843	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	27,574	81	Weighted Average
	24,731		89.69% Pervious Area
	2,843		10.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0600	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
0.9	70	0.0710	1.33		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	90	0.0330	2.72		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
15.0	260	Total			

Subcatchment 1I: DRAINAGE AREA 1I



Summary for Subcatchment 1J: DRAINAGE AREA 1J

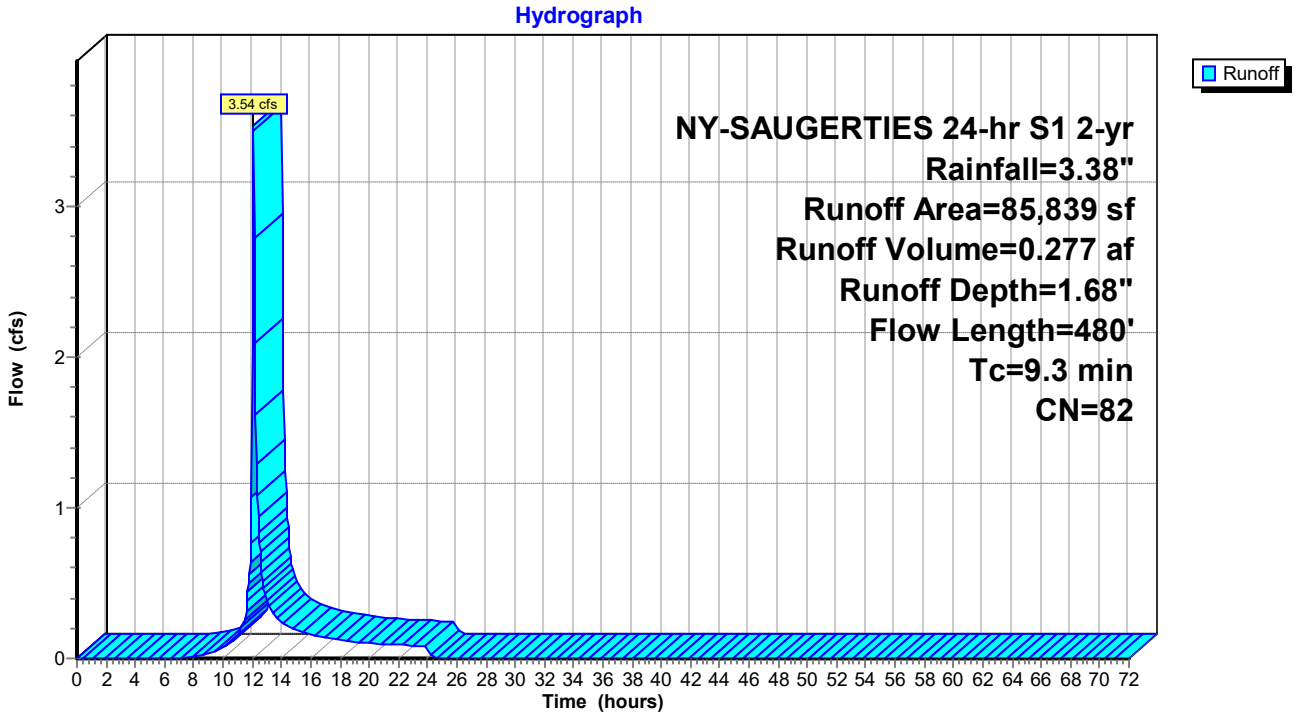
Runoff = 3.54 cfs @ 12.08 hrs, Volume= 0.277 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	52,694	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	22,447	80	>75% Grass cover, Good, HSG D
*	7,814	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	85,839	82	Weighted Average
	75,141		87.54% Pervious Area
	10,698		12.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	10	0.0500	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
0.6	50	0.0300	1.45		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.38"
2.5	30	0.0500	0.20		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.38"
2.3	10	0.0500	0.07		**Sheet Flow, D-E** Woods: Light underbrush n= 0.400 P2= 3.38"
1.2	70	0.0360	0.95		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
1.7	310	0.0420	3.07		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
9.3	480	Total			

Subcatchment 1J: DRAINAGE AREA 1J



Summary for Subcatchment 1K: DRAINAGE AREA 1K

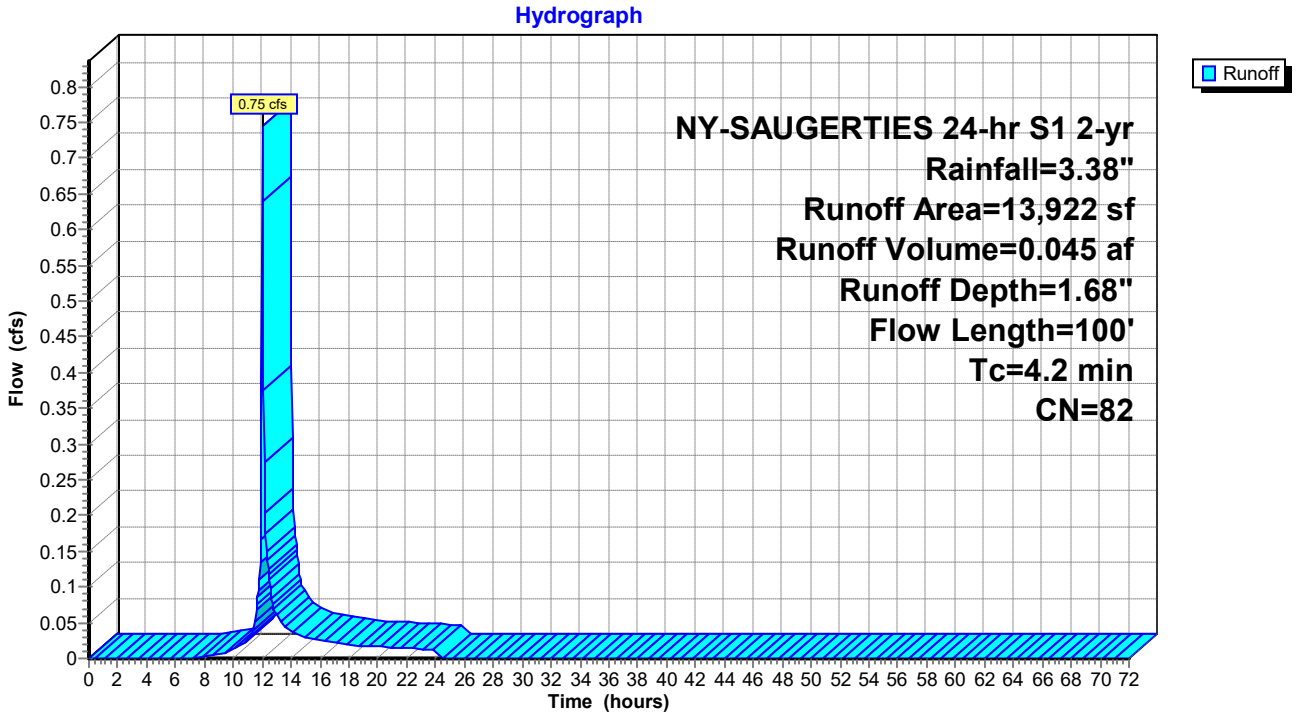
Runoff = 0.75 cfs @ 12.01 hrs, Volume= 0.045 af, Depth= 1.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	12,099	80	>75% Grass cover, Good, HSG D
*	1,823	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	13,922	82	Weighted Average
	12,099		86.91% Pervious Area
	1,823		13.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	15	0.0330	1.18		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
4.0	85	0.1290	0.36		**Sheet Flow, B-C**
					Grass: Short n= 0.150 P2= 3.38"
4.2	100	Total			

Subcatchment 1K: DRAINAGE AREA 1K



Summary for Subcatchment 1L: DRAINAGE AREA 1L

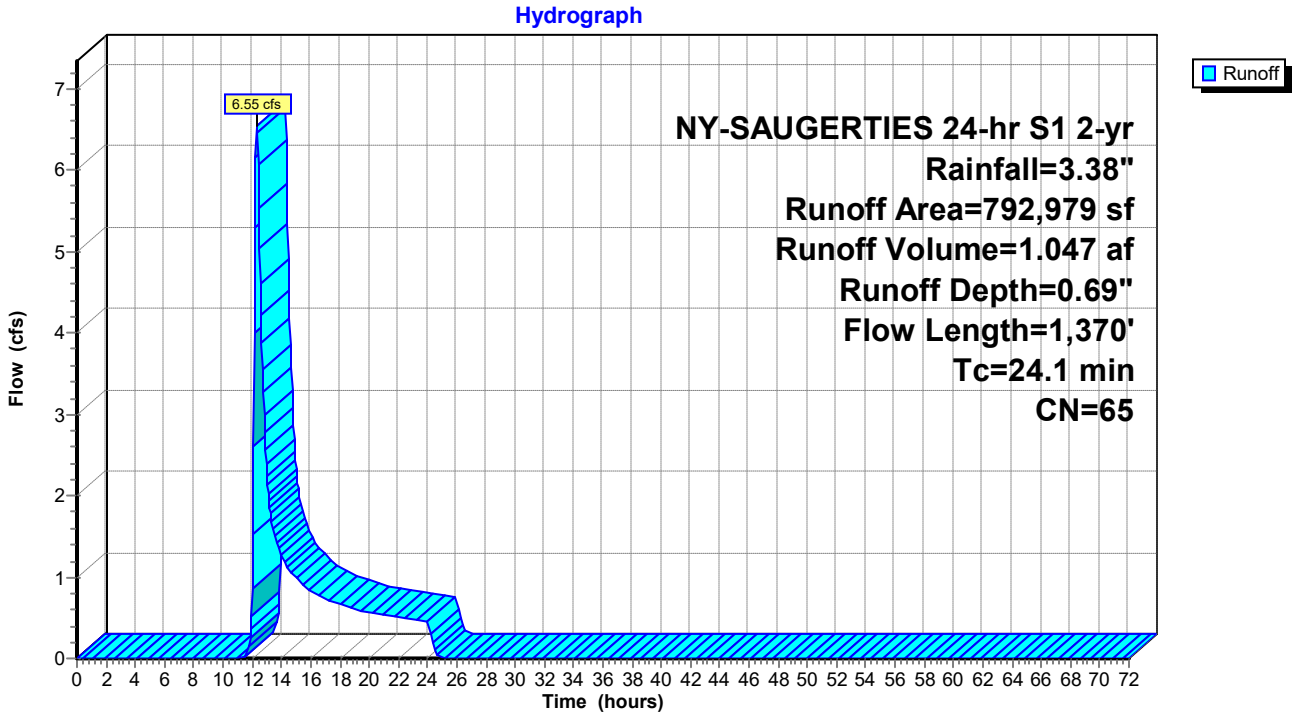
Runoff = 6.55 cfs @ 12.32 hrs, Volume= 1.047 af, Depth= 0.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	162,840	36	Woods, Fair, HSG A
	218,251	60	Woods, Fair, HSG B
	3,820	73	Woods, Fair, HSG C
	357,922	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	2,373	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	30,455	80	>75% Grass cover, Good, HSG D
*	11,550	98	Paved roads w/curbs & sewers, HSG A-D
*	5,768	98	Roofs, HSG A-D
	792,979	65	Weighted Average
	775,661		97.82% Pervious Area
	17,318		2.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.1400	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
3.3	310	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
11.2	960	0.0090	1.42		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
24.1	1,370	Total			

Subcatchment 1L: DRAINAGE AREA 1L



Summary for Subcatchment 1M: DRAINAGE AREA 1M

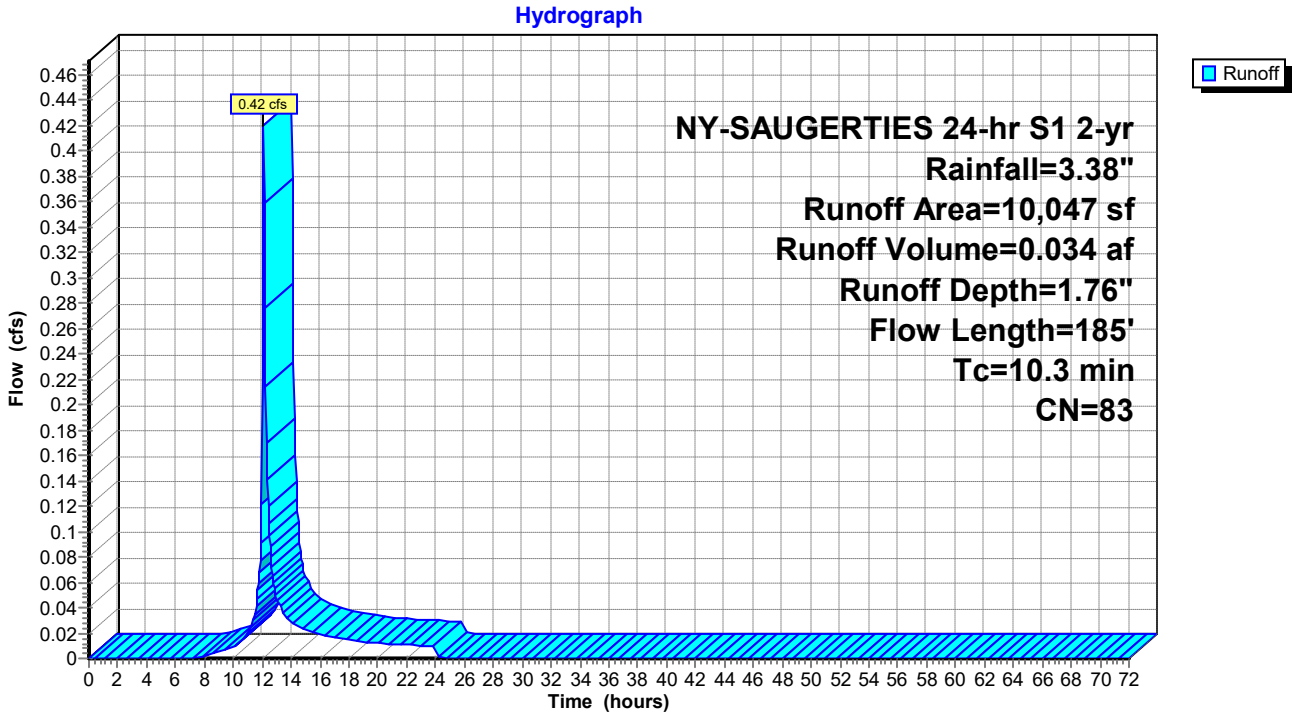
Runoff = 0.42 cfs @ 12.10 hrs, Volume= 0.034 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	3,810	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	4,526	80	>75% Grass cover, Good, HSG D
*	1,711	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	10,047	83	Weighted Average
	8,336		82.97% Pervious Area
	1,711		17.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0330	1.09		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
2.4	20	0.0250	0.14		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
7.0	65	0.1310	0.16		**Sheet Flow, C-D** Woods: Light underbrush n= 0.400 P2= 3.38"
0.7	90	0.0220	2.22		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
10.3	185	Total			

Subcatchment 1M: DRAINAGE AREA 1M



Summary for Subcatchment 2A: DRAINAGE AREA 2A

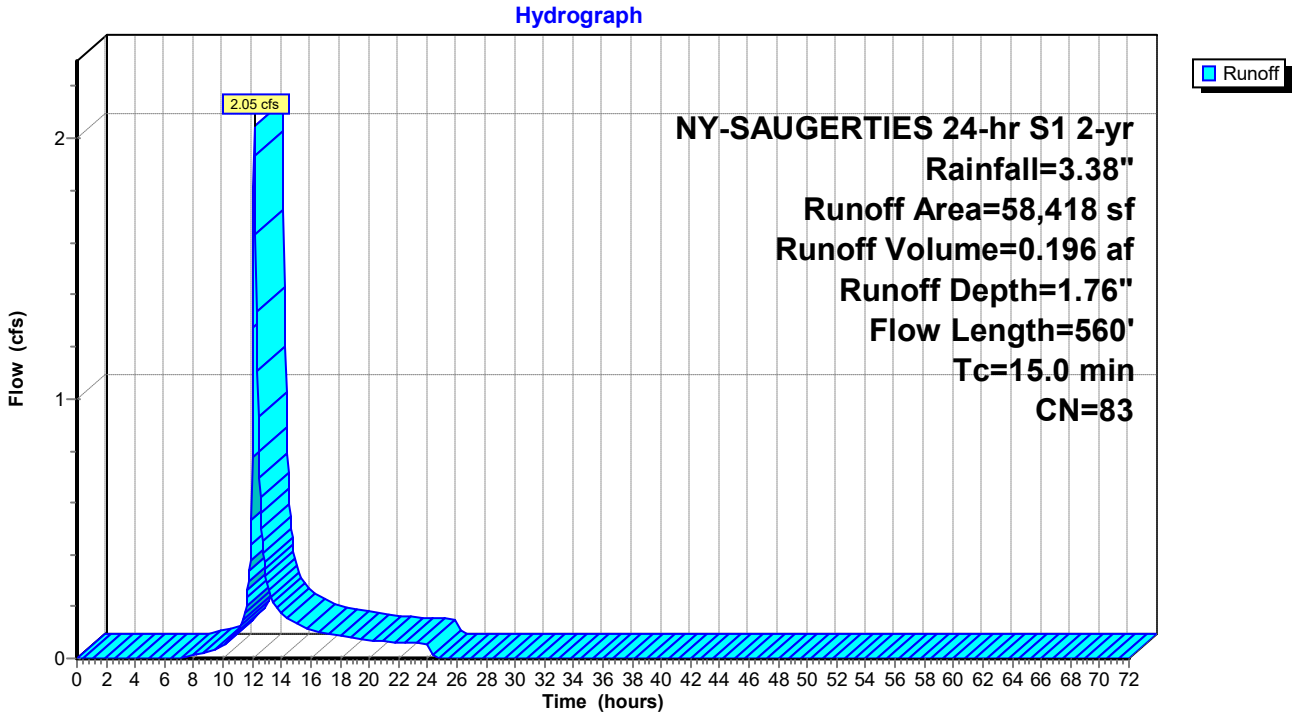
Runoff = 2.05 cfs @ 12.16 hrs, Volume= 0.196 af, Depth= 1.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	22,949	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	24,787	80	>75% Grass cover, Good, HSG D
*	7,798	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	58,418	83	Weighted Average
	47,736		81.71% Pervious Area
	10,682		18.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	7	0.0710	1.38		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
7.5	93	0.0320	0.21		**Sheet Flow, B-C**
					Grass: Short n= 0.150 P2= 3.38"
0.8	150	0.0430	3.11		**Shallow Concentrated Flow, C-D**
					Grassed Waterway Kv= 15.0 fps
6.4	280	0.0210	0.72		**Shallow Concentrated Flow, D-E**
					Woodland Kv= 5.0 fps
0.2	30	0.0330	2.72		**Shallow Concentrated Flow, E-F**
					Grassed Waterway Kv= 15.0 fps
15.0	560	Total			

Subcatchment 2A: DRAINAGE AREA 2A



Summary for Subcatchment 2B: DRAINAGE AREA 2B

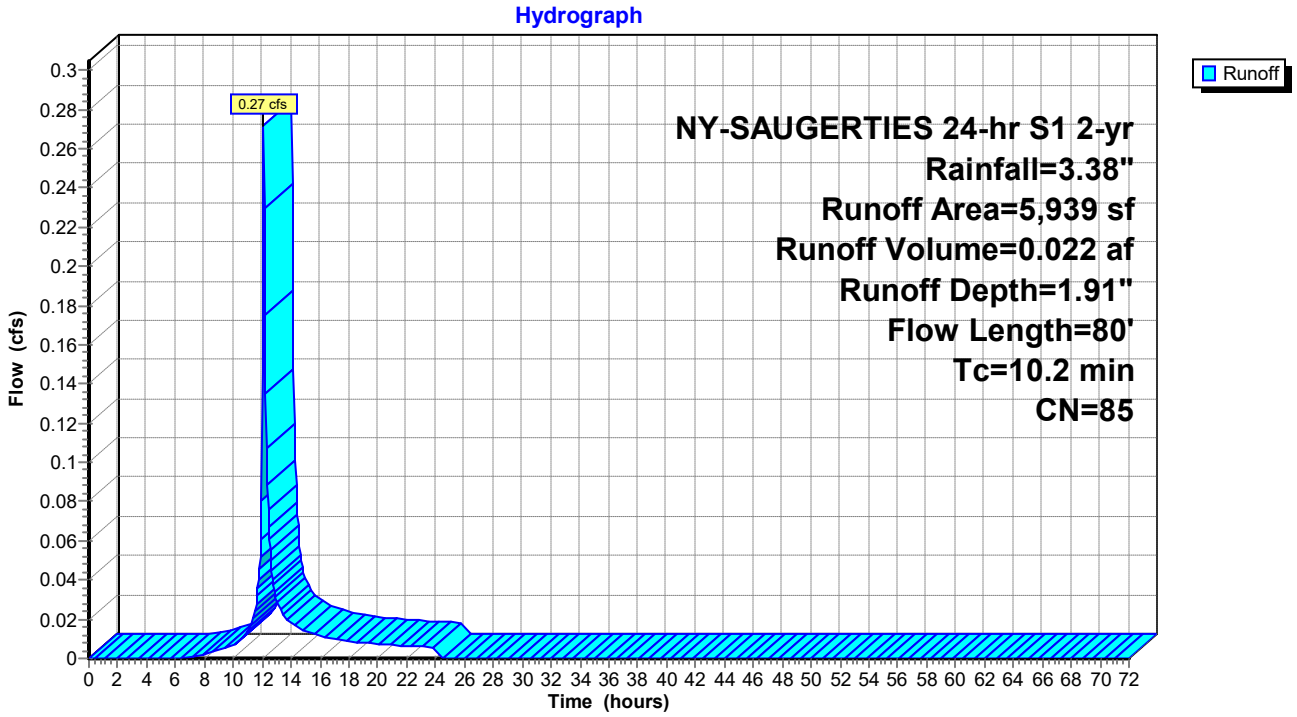
Runoff = 0.27 cfs @ 12.10 hrs, Volume= 0.022 af, Depth= 1.91"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	1,167	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,008	80	>75% Grass cover, Good, HSG D
*	1,764	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,939	85	Weighted Average
	4,175		70.30% Pervious Area
	1,764		29.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	35	0.0290	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.4	45	0.1330	0.32		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
10.2	80	Total			

Subcatchment 2B: DRAINAGE AREA 2B



Summary for Subcatchment 2C: DRAINAGE AREA 2C

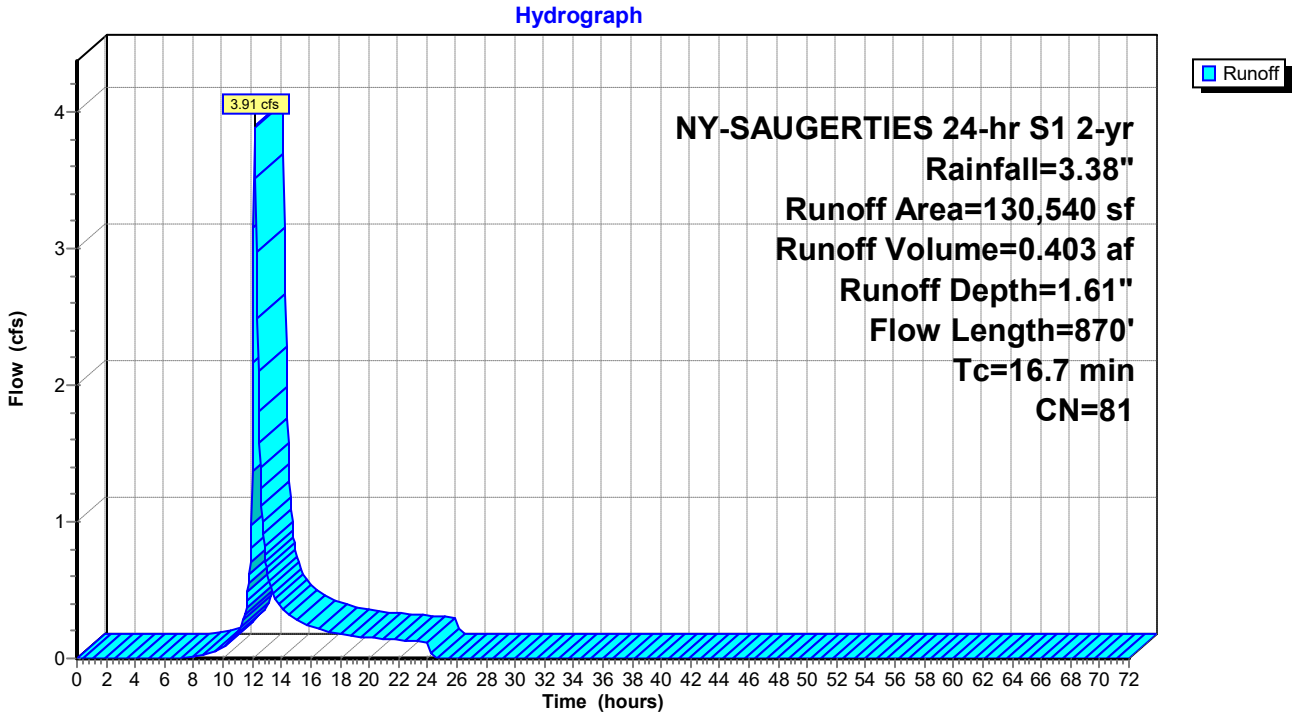
Runoff = 3.91 cfs @ 12.18 hrs, Volume= 0.403 af, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	92,203	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	28,020	80	>75% Grass cover, Good, HSG D
*	10,317	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	130,540	81	Weighted Average
	120,223		92.10% Pervious Area
	10,317		7.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0900	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.7	210	0.0190	2.07		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
0.1	30	0.1670	6.13		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
3.5	530	0.0280	2.51		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
16.7	870	Total			

Subcatchment 2C: DRAINAGE AREA 2C



Summary for Subcatchment 2D: DRAINAGE AREA 2D

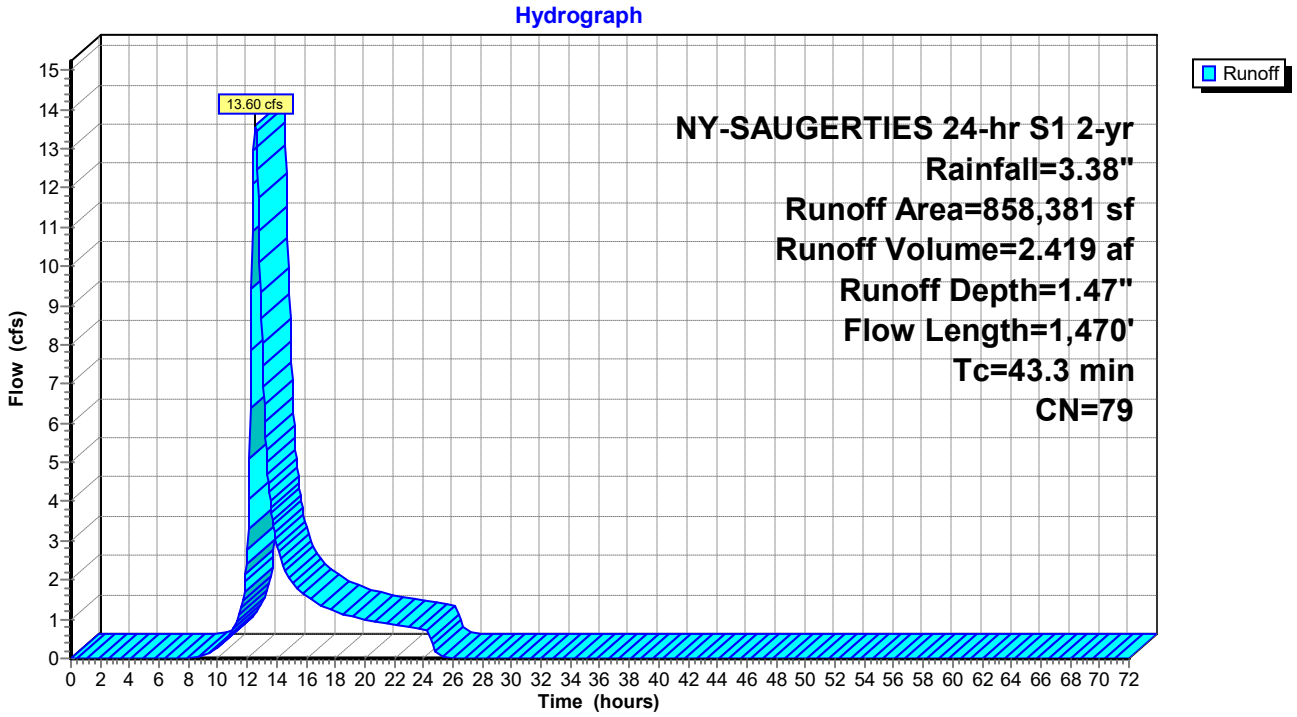
Runoff = 13.60 cfs @ 12.55 hrs, Volume= 2.419 af, Depth= 1.47"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	34,292	73	Woods, Fair, HSG C
	808,098	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	3,863	74	>75% Grass cover, Good, HSG C
	7,734	80	>75% Grass cover, Good, HSG D
*	4,394	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	858,381	79	Weighted Average
	853,987		99.49% Pervious Area
	4,394		0.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1300	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
0.6	50	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
32.8	1,320	0.0180	0.67		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
43.3	1,470	Total			

Subcatchment 2D: DRAINAGE AREA 2D



Summary for Subcatchment 2E: DRAINAGE AREA 18

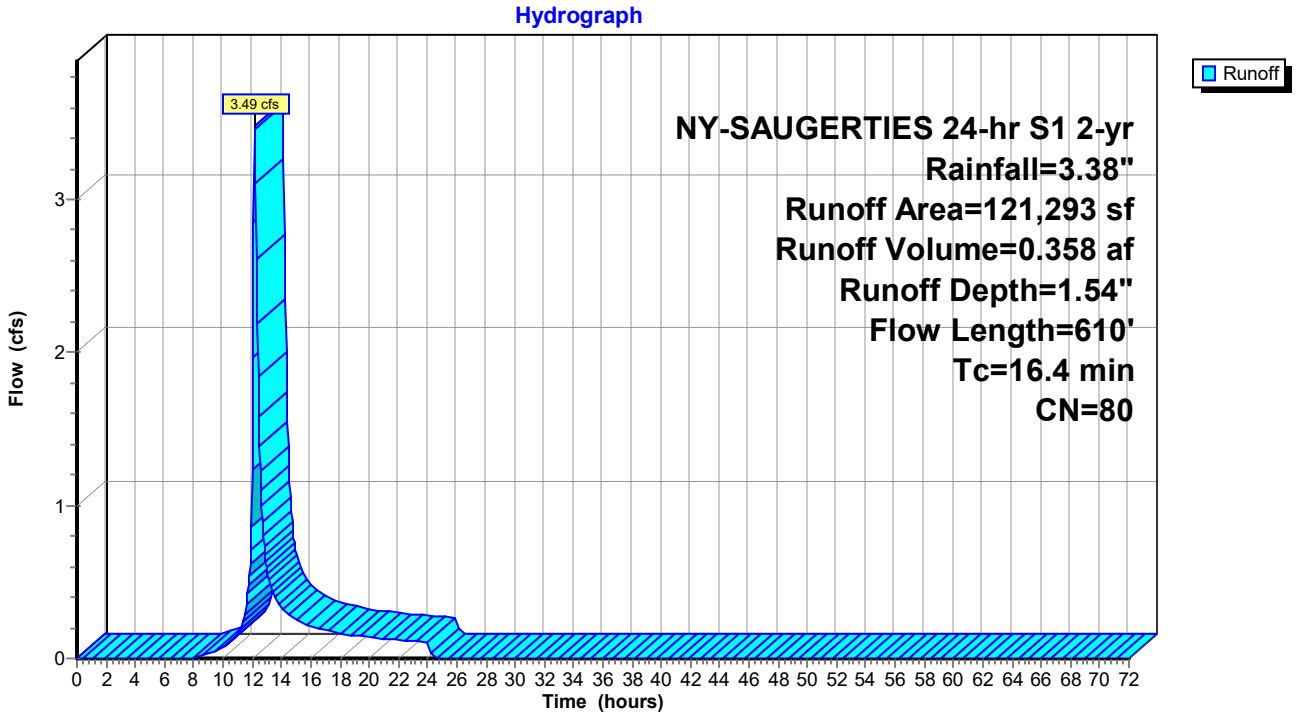
Runoff = 3.49 cfs @ 12.18 hrs, Volume= 0.358 af, Depth= 1.54"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	23,515	73	Woods, Fair, HSG C
	54,460	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	3,737	74	>75% Grass cover, Good, HSG C
	25,044	80	>75% Grass cover, Good, HSG D
*	11,653	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	121,293	80	Weighted Average
	106,756		88.01% Pervious Area
	14,537		11.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0830	1.42		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
6.1	94	0.0530	0.25		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.8	220	0.2270	4.76		**Shallow Concentrated Flow, C-D** Nearly Bare & Untilled Kv= 10.0 fps
0.1	40	0.2000	6.71		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
9.3	250	0.0080	0.45		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
16.4	610	Total			

Subcatchment 2E: DRAINAGE AREA 18



Summary for Subcatchment 2F: DRAINAGE AREA 2F

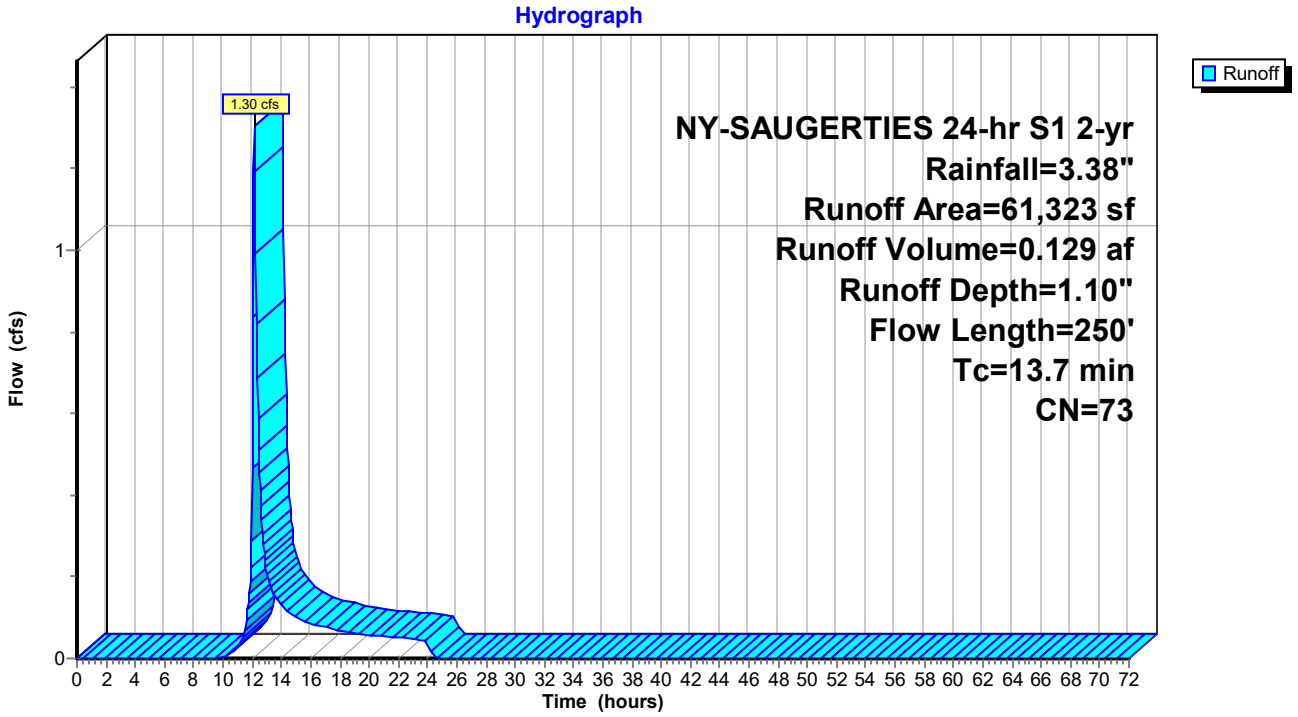
Runoff = 1.30 cfs @ 12.15 hrs, Volume= 0.129 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	5,624	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	4,622	73	Woods, Fair, HSG C
	47,954	79	Woods, Fair, HSG D
	3,123	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
*	0	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	61,323	73	Weighted Average
	61,323		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0800	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.7	150	0.0870	1.47		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
13.7	250	Total			

Subcatchment 2F: DRAINAGE AREA 2F



Summary for Subcatchment 2G: DRAINAGE AREA 2G

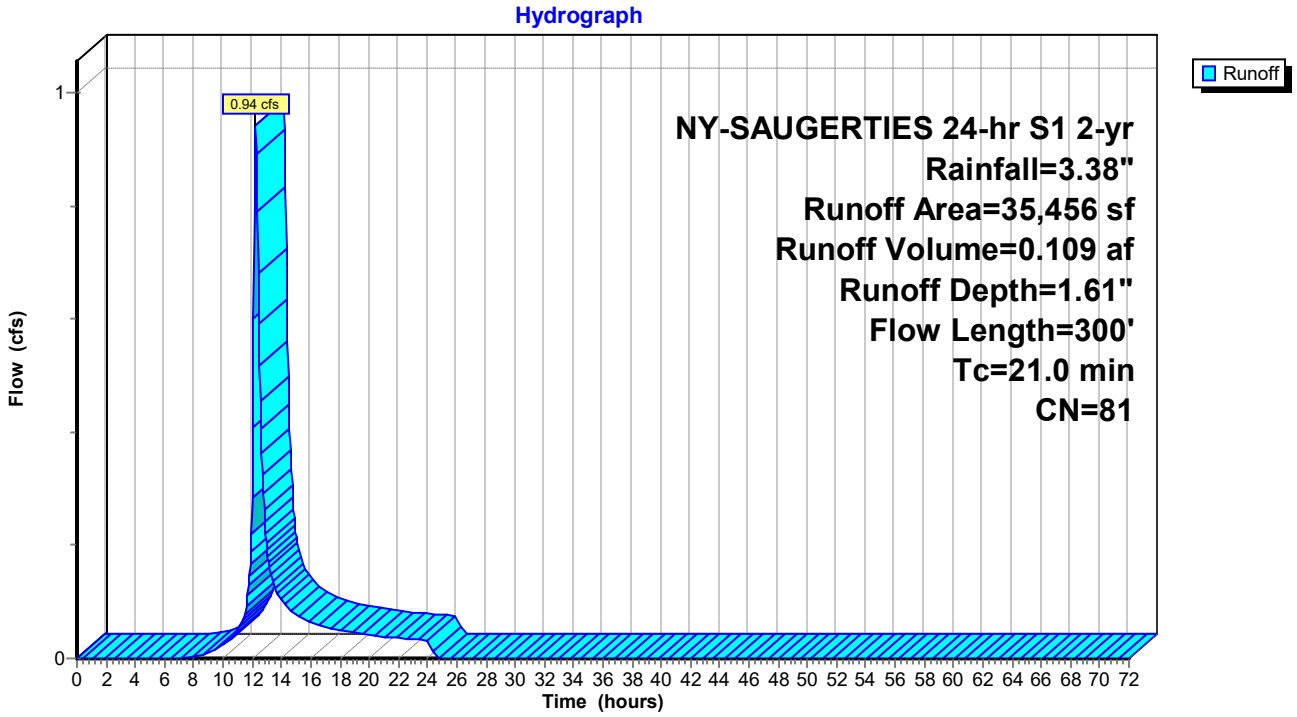
Runoff = 0.94 cfs @ 12.24 hrs, Volume= 0.109 af, Depth= 1.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	27,880	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	4,802	80	>75% Grass cover, Good, HSG D
*	2,774	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	35,456	81	Weighted Average
	32,682		92.18% Pervious Area
	2,774		7.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0300	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
3.1	190	0.0420	1.02		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	10	0.0300	2.60		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
21.0	300	Total			

Subcatchment 2G: DRAINAGE AREA 2G



Summary for Subcatchment 3: DRAINAGE AREA 3

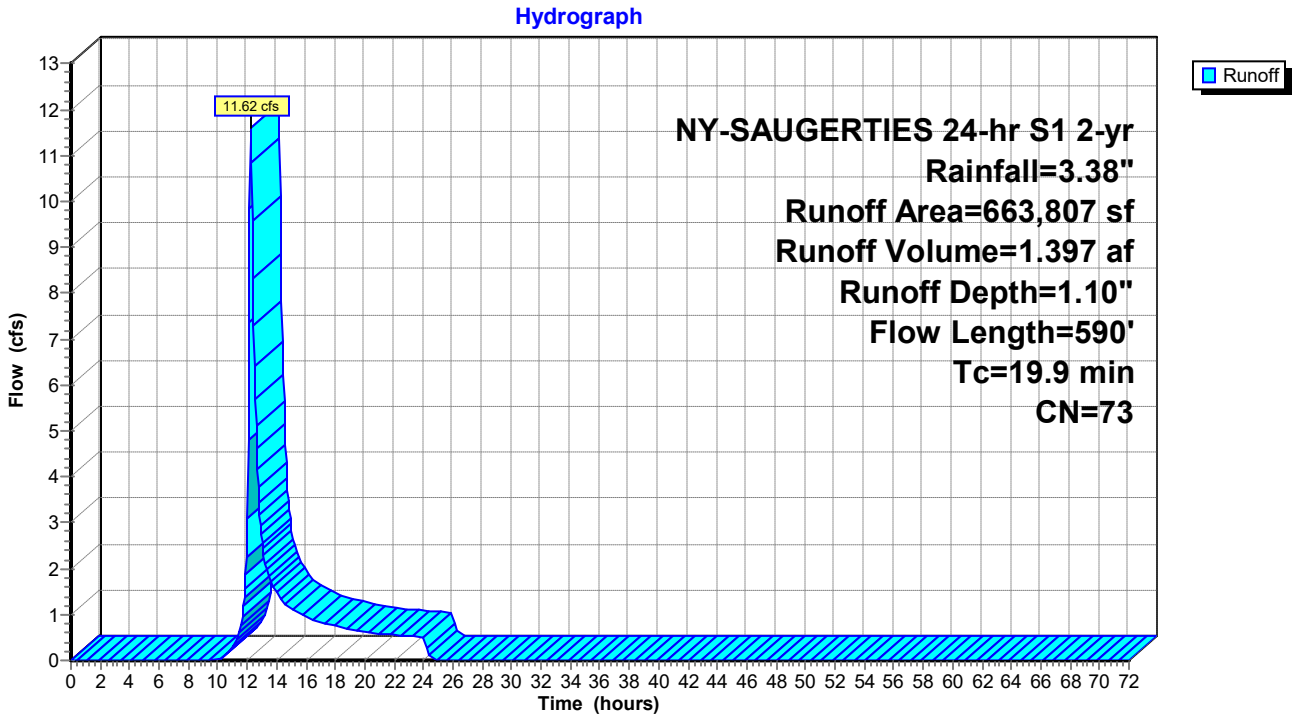
Runoff = 11.62 cfs @ 12.24 hrs, Volume= 1.397 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
663,807	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
663,807	73	Weighted Average
663,807		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.4	490	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	590	Total			

Subcatchment 3: DRAINAGE AREA 3



Summary for Subcatchment 4: DRAINAGE AREA 4

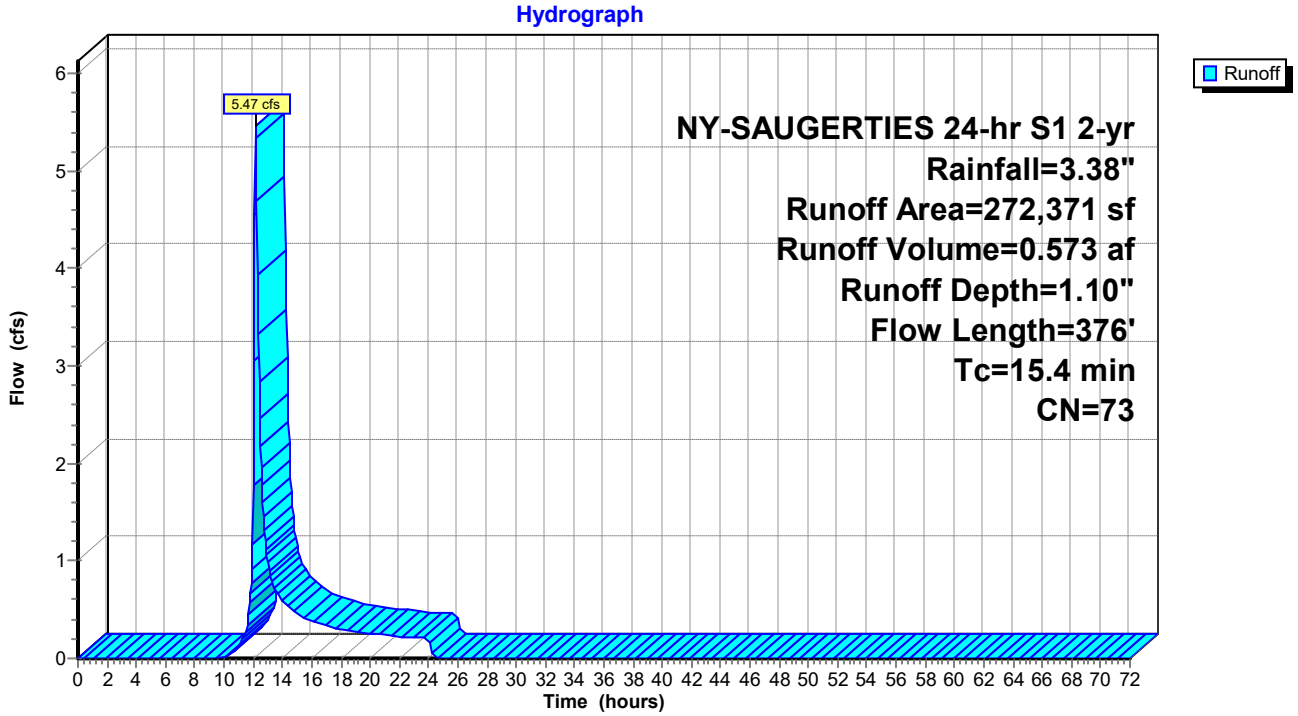
Runoff = 5.47 cfs @ 12.17 hrs, Volume= 0.573 af, Depth= 1.10"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
272,371	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
272,371	73	Weighted Average
272,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0700	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.7	276	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.4	376	Total			

Subcatchment 4: DRAINAGE AREA 4



Summary for Subcatchment 5: DRAINAGE AREA 5

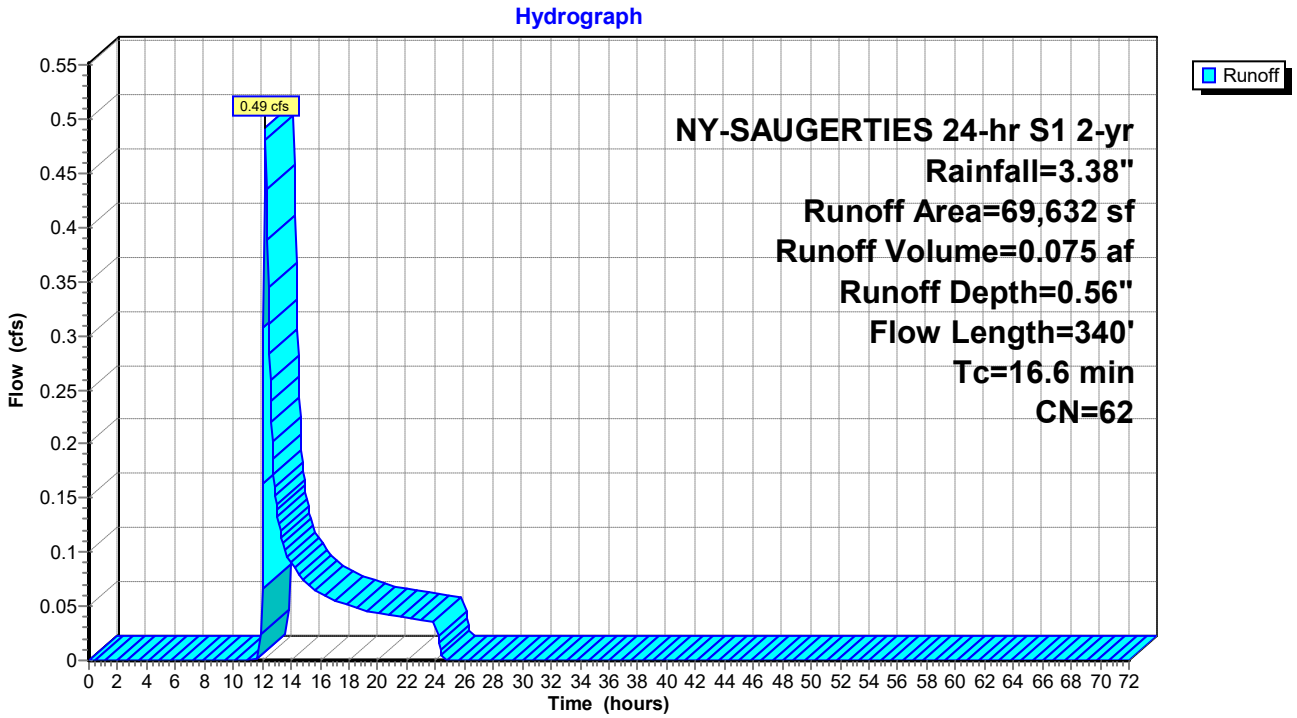
Runoff = 0.49 cfs @ 12.22 hrs, Volume= 0.075 af, Depth= 0.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 2-yr Rainfall=3.38"

Area (sf)	CN	Description
27,631	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
42,001	79	Woods, Fair, HSG D
69,632	62	Weighted Average
69,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0540	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.6	240	0.0930	1.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.6	340	Total			

Subcatchment 5: DRAINAGE AREA 5



Summary for Pond AC1: ARCH CULVERT

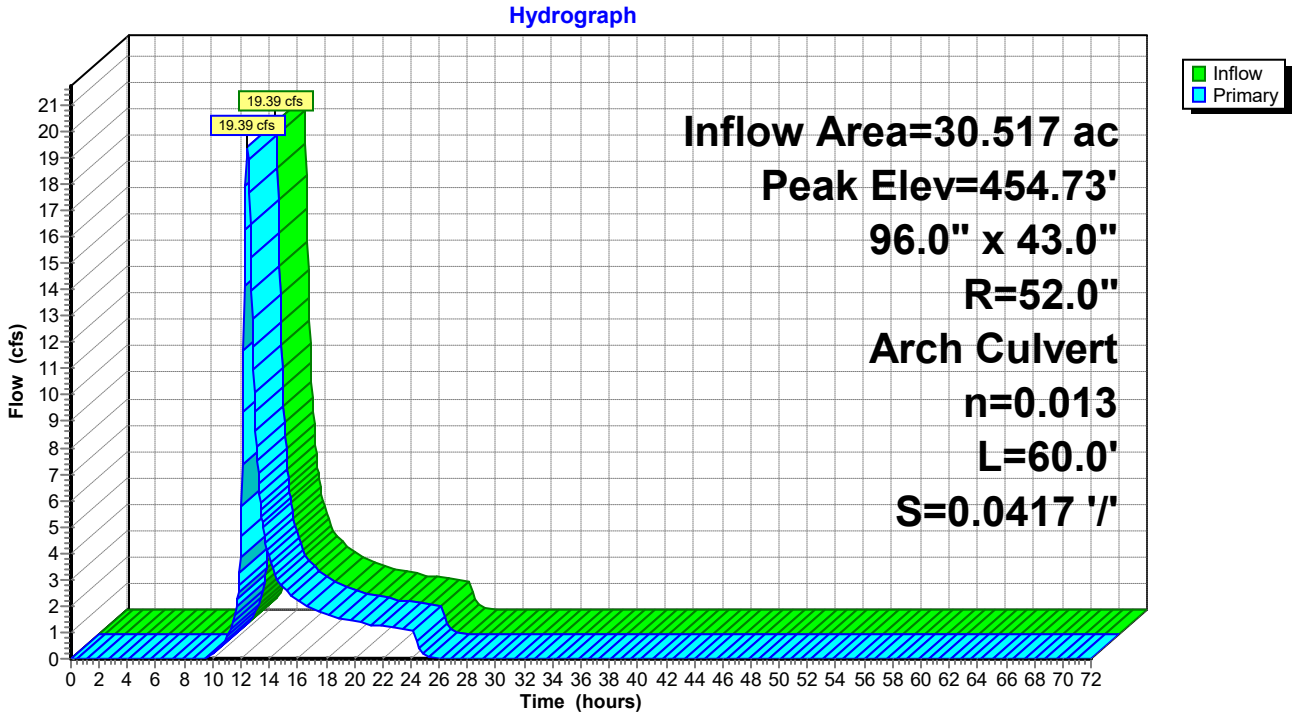
Inflow Area = 30.517 ac, 3.65% Impervious, Inflow Depth = 1.29" for 2-yr event
Inflow = 19.39 cfs @ 12.46 hrs, Volume= 3.283 af
Outflow = 19.39 cfs @ 12.46 hrs, Volume= 3.283 af, Atten= 0%, Lag= 0.0 min
Primary = 19.39 cfs @ 12.46 hrs, Volume= 3.283 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 454.73' @ 12.46 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	453.90'	**96.0" W x 43.0" H, R=52.0" Arch Culvert** L= 60.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 453.90' / 451.40' S= 0.0417 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 22.75 sf

Primary OutFlow Max=19.34 cfs @ 12.46 hrs HW=454.73' (Free Discharge)
└**1=Culvert** (Inlet Controls 19.34 cfs @ 2.92 fps)

Pond AC1: ARCH CULVERT



Summary for Pond AC2: ARCH CULVERT

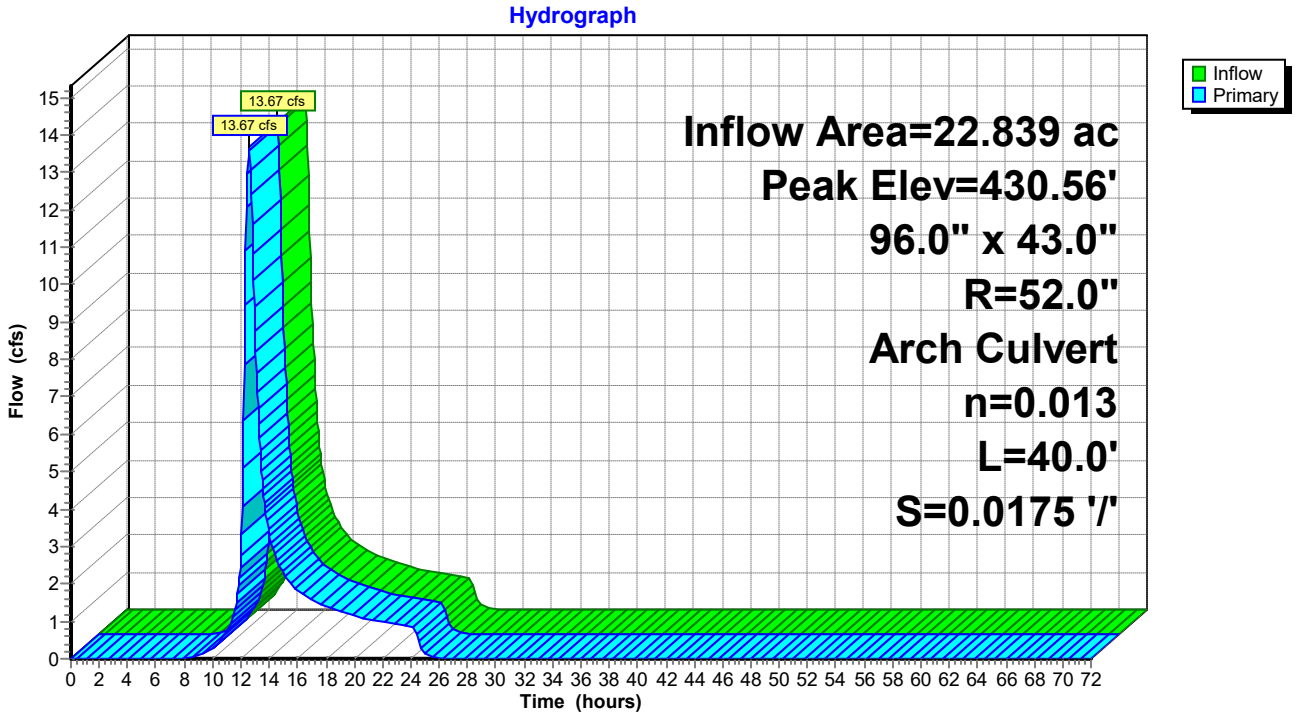
Inflow Area = 22.839 ac, 1.66% Impervious, Inflow Depth = 1.40" for 2-yr event
Inflow = 13.67 cfs @ 12.58 hrs, Volume= 2.661 af
Outflow = 13.67 cfs @ 12.58 hrs, Volume= 2.661 af, Atten= 0%, Lag= 0.0 min
Primary = 13.67 cfs @ 12.58 hrs, Volume= 2.661 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 430.56' @ 12.58 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	429.90'	**96.0" W x 43.0" H, R=52.0" Arch Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 429.90' / 429.20' S= 0.0175 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 22.75 sf

Primary OutFlow Max=13.63 cfs @ 12.58 hrs HW=430.56' (Free Discharge)
└**1=Culvert** (Inlet Controls 13.63 cfs @ 2.60 fps)

Pond AC2: ARCH CULVERT



Summary for Pond BR1-C7: BIO-RET POND 1

Inflow Area = 4.967 ac, 10.94% Impervious, Inflow Depth = 1.35" for 2-yr event
Inflow = 2.99 cfs @ 12.38 hrs, Volume= 0.558 af
Outflow = 2.99 cfs @ 12.39 hrs, Volume= 0.558 af, Atten= 0%, Lag= 0.4 min
Primary = 2.99 cfs @ 12.39 hrs, Volume= 0.558 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 477.33' @ 12.39 hrs Surf.Area= 380 sf Storage= 345 cf

Plug-Flow detention time= 16.4 min calculated for 0.558 af (100% of inflow)
Center-of-Mass det. time= 16.0 min (918.4 - 902.5)

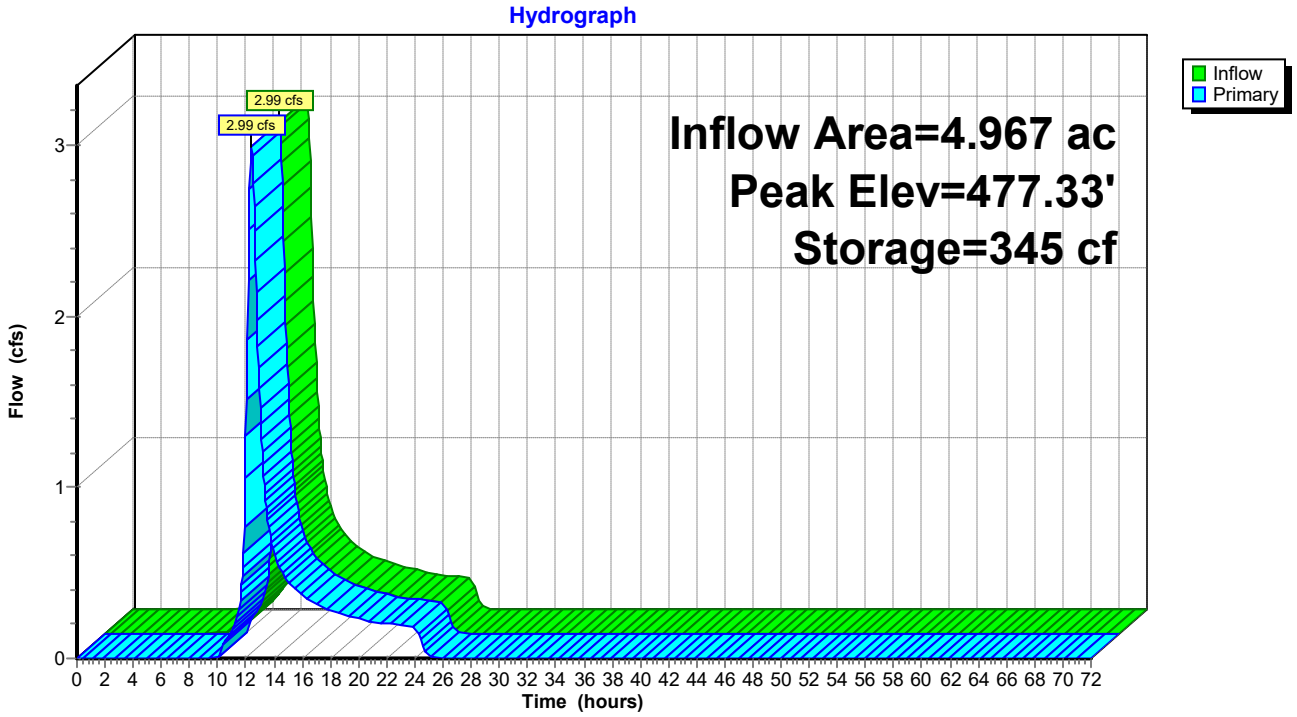
Volume	Invert	Avail.Storage	Storage Description
#1	476.00'	2,275 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
476.00	154	0	0	154
478.00	531	647	647	551
480.00	1,134	1,627	2,275	1,187

Device	Routing	Invert	Outlet Devices
#1	Primary	474.00'	**18.0" Round Culvert** L= 280.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 474.00' / 470.00' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	477.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	476.00'	**0.500 in/hr Exfiltration over Wetted area above 474.00'** Conductivity to Groundwater Elevation = 446.00' Excluded Wetted area = 0 sf

Primary OutFlow Max=2.98 cfs @ 12.39 hrs HW=477.33' (Free Discharge)
└─**1=Culvert** (Passes 2.98 cfs of 10.80 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 2.97 cfs @ 1.89 fps)
  └─**3=Exfiltration** (Controls 0.00 cfs)

Pond BR1-C7: BIO-RET POND 1



Summary for Pond BR2-C14: BIO-RET POND 2

Inflow Area = 2.923 ac, 12.07% Impervious, Inflow Depth = 1.67" for 2-yr event
Inflow = 4.70 cfs @ 12.08 hrs, Volume= 0.406 af
Outflow = 1.54 cfs @ 12.39 hrs, Volume= 0.406 af, Atten= 67%, Lag= 18.5 min
Primary = 1.54 cfs @ 12.39 hrs, Volume= 0.406 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 457.71' @ 12.39 hrs Surf.Area= 4,283 sf Storage= 6,276 cf

Plug-Flow detention time= 546.1 min calculated for 0.406 af (100% of inflow)
Center-of-Mass det. time= 545.9 min (1,410.4 - 864.5)

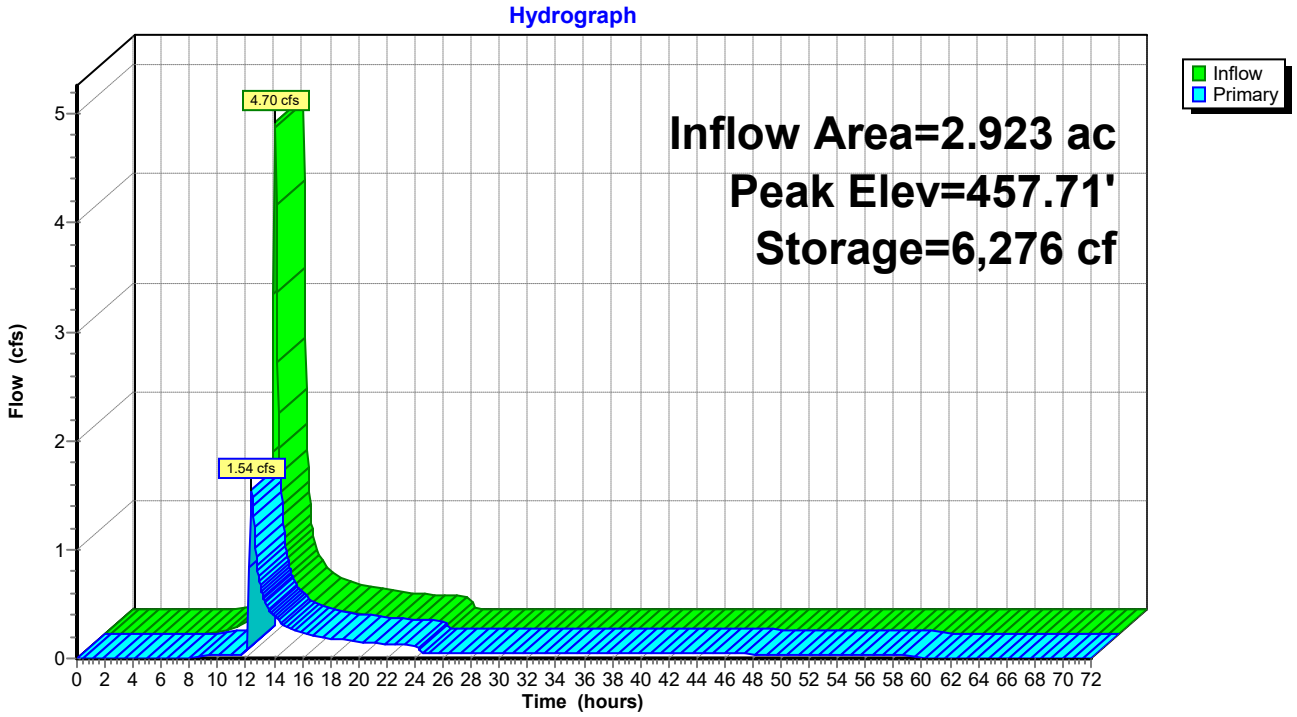
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	18,159 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
456.00	3,090	217.0	0	0	3,090
458.00	4,505	254.7	7,551	7,551	4,582
460.00	6,146	292.4	10,609	18,159	6,312

Device	Routing	Invert	Outlet Devices
#1	Primary	454.00'	**18.0" Round Culvert** L= 38.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 454.00' / 452.00' S= 0.0526 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	457.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	456.00'	**0.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 432.00'

Primary OutFlow Max=1.53 cfs @ 12.39 hrs HW=457.71' (Free Discharge)
└─**1=Culvert** (Passes 1.53 cfs of 14.64 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 1.48 cfs @ 1.50 fps)
  └─**3=Exfiltration** (Controls 0.05 cfs)

Pond BR2-C14: BIO-RET POND 2



Summary for Pond C1: 24" CULVERT

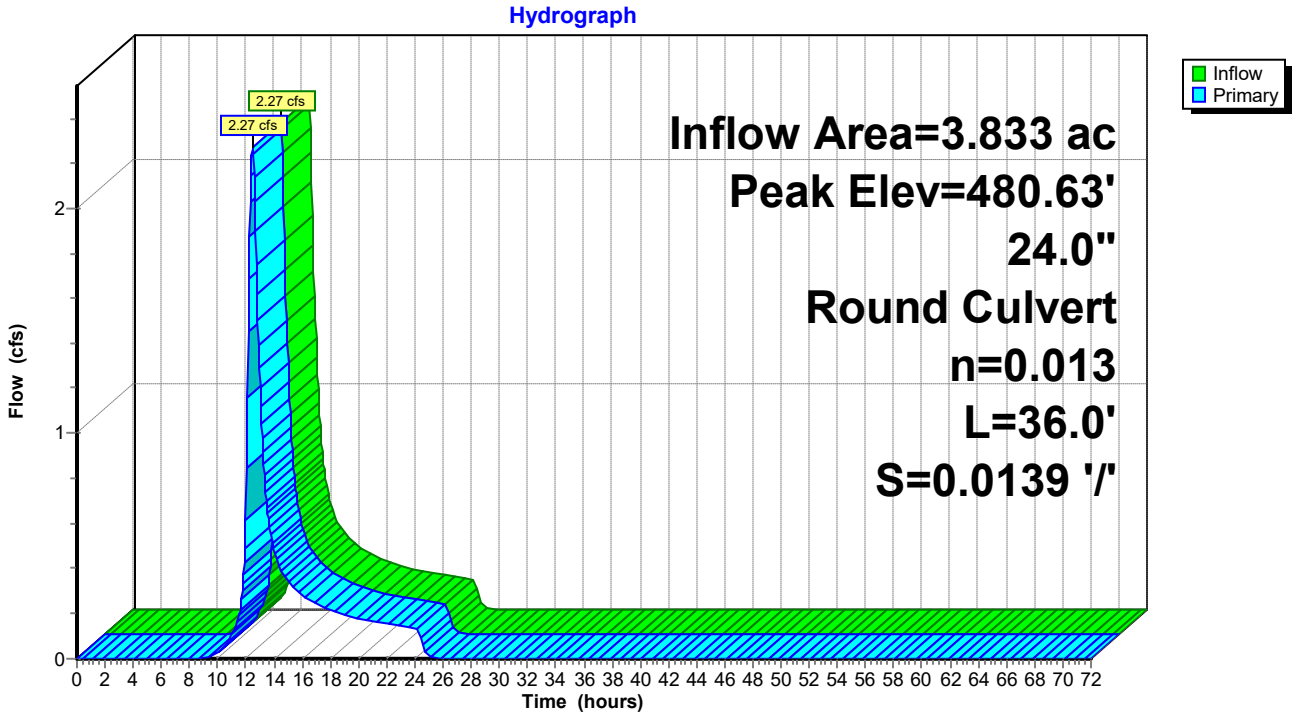
Inflow Area = 3.833 ac, 9.00% Impervious, Inflow Depth = 1.31" for 2-yr event
Inflow = 2.27 cfs @ 12.48 hrs, Volume= 0.419 af
Outflow = 2.27 cfs @ 12.48 hrs, Volume= 0.419 af, Atten= 0%, Lag= 0.0 min
Primary = 2.27 cfs @ 12.48 hrs, Volume= 0.419 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 480.63' @ 12.48 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	480.00'	**24.0" Round Culvert** L= 36.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 480.00' / 479.50' S= 0.0139 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=2.26 cfs @ 12.48 hrs HW=480.63' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.26 cfs @ 2.69 fps)

Pond C1: 24" CULVERT



Summary for Pond C10: 15" CULVERT

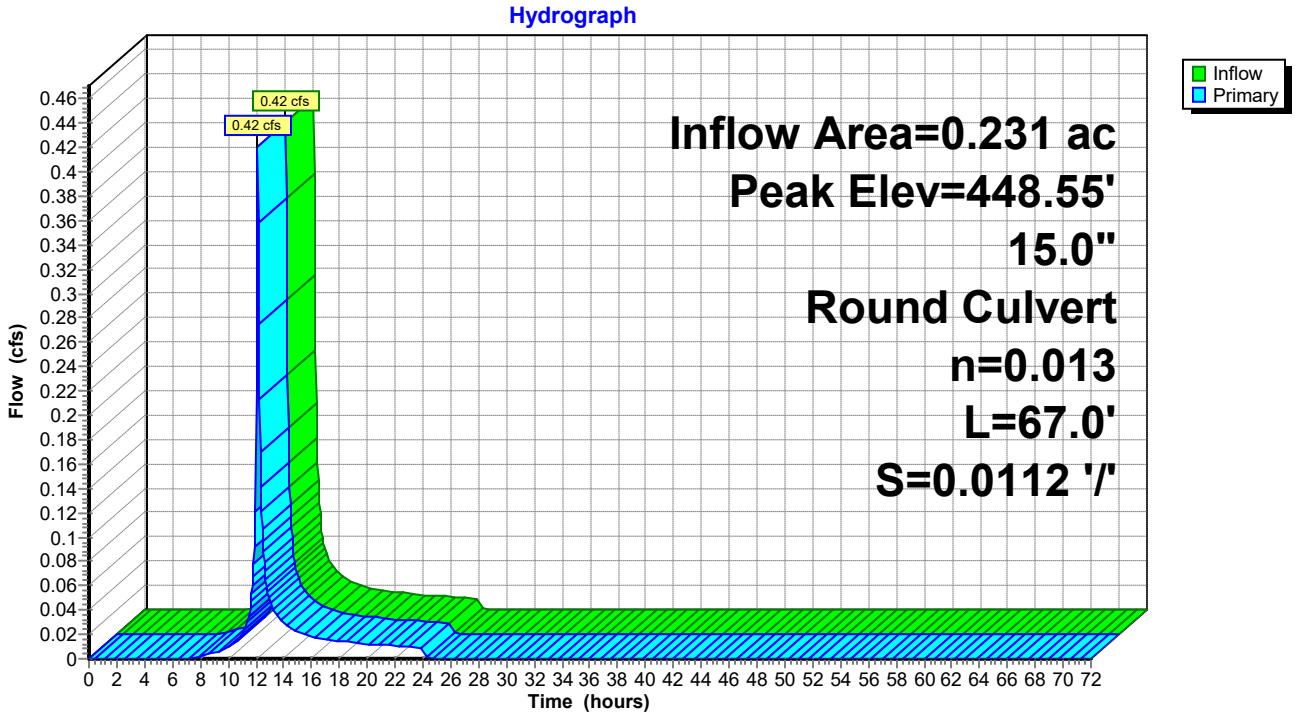
Inflow Area = 0.231 ac, 17.03% Impervious, Inflow Depth = 1.76" for 2-yr event
Inflow = 0.42 cfs @ 12.10 hrs, Volume= 0.034 af
Outflow = 0.42 cfs @ 12.10 hrs, Volume= 0.034 af, Atten= 0%, Lag= 0.0 min
Primary = 0.42 cfs @ 12.10 hrs, Volume= 0.034 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 448.55' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	448.25'	**15.0" Round Culvert** L= 67.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 448.25' / 447.50' S= 0.0112 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.42 cfs @ 12.10 hrs HW=448.55' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.42 cfs @ 1.86 fps)

Pond C10: 15" CULVERT



Summary for Pond C11: 12" CULVERT

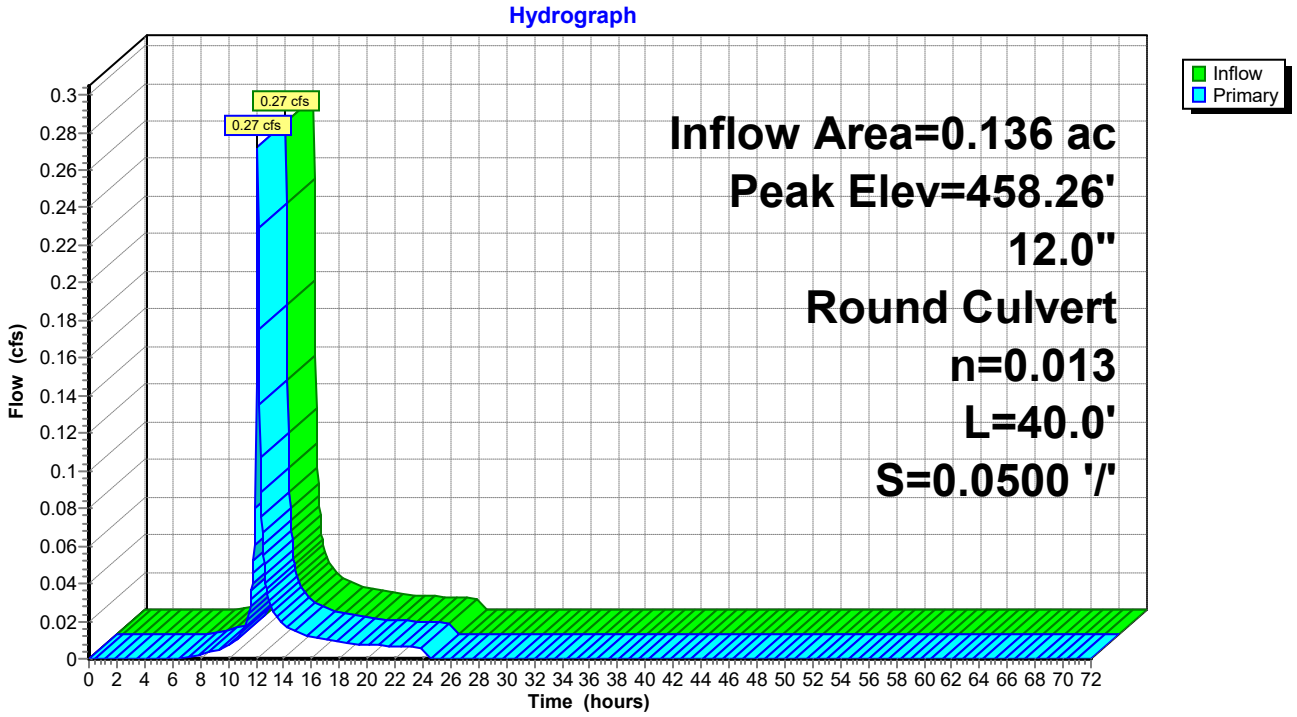
Inflow Area = 0.136 ac, 29.70% Impervious, Inflow Depth = 1.91" for 2-yr event
Inflow = 0.27 cfs @ 12.10 hrs, Volume= 0.022 af
Outflow = 0.27 cfs @ 12.10 hrs, Volume= 0.022 af, Atten= 0%, Lag= 0.0 min
Primary = 0.27 cfs @ 12.10 hrs, Volume= 0.022 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 458.26' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	458.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 458.00' / 456.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.27 cfs @ 12.10 hrs HW=458.25' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.27 cfs @ 1.72 fps)

Pond C11: 12" CULVERT



Summary for Pond C12: 24" CULVERT

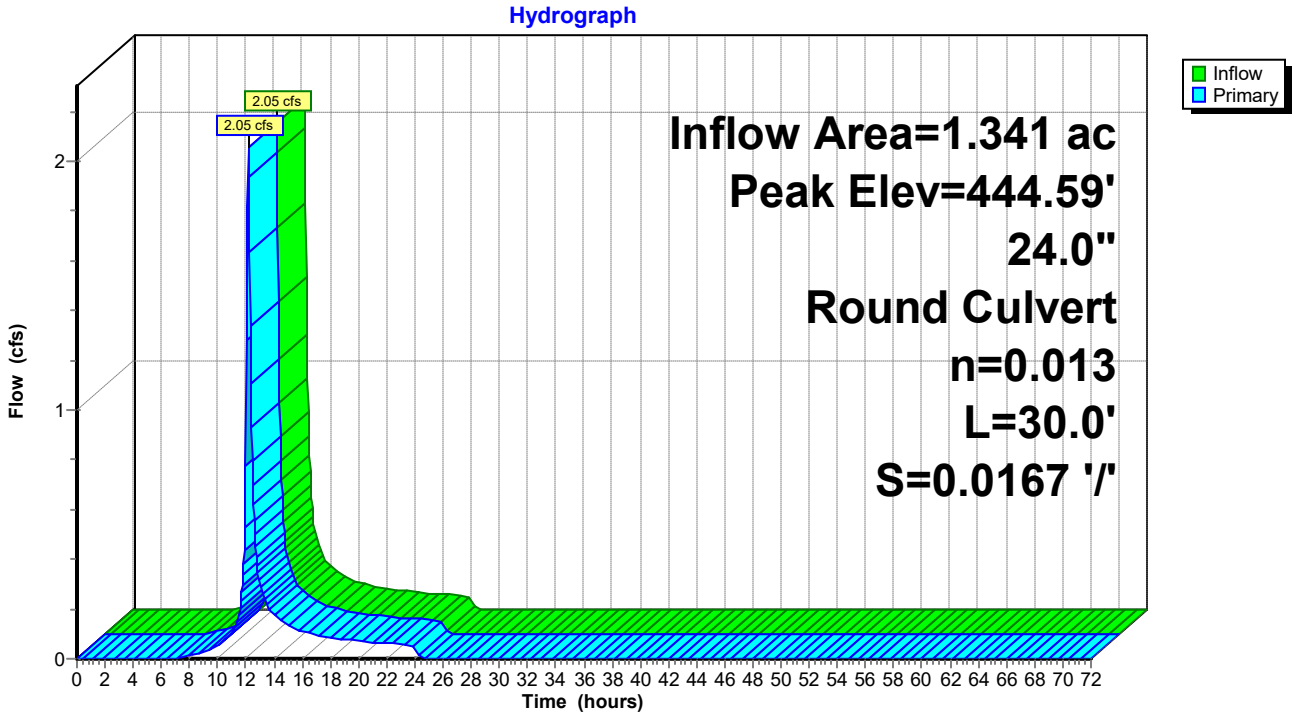
Inflow Area = 1.341 ac, 18.29% Impervious, Inflow Depth = 1.76" for 2-yr event
Inflow = 2.05 cfs @ 12.16 hrs, Volume= 0.196 af
Outflow = 2.05 cfs @ 12.16 hrs, Volume= 0.196 af, Atten= 0%, Lag= 0.0 min
Primary = 2.05 cfs @ 12.16 hrs, Volume= 0.196 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 444.59' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	444.00'	**24.0" Round Culvert** L= 30.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 444.00' / 443.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=2.03 cfs @ 12.16 hrs HW=444.59' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.03 cfs @ 2.62 fps)

Pond C12: 24" CULVERT



Summary for Pond C13: 18" CULVERT

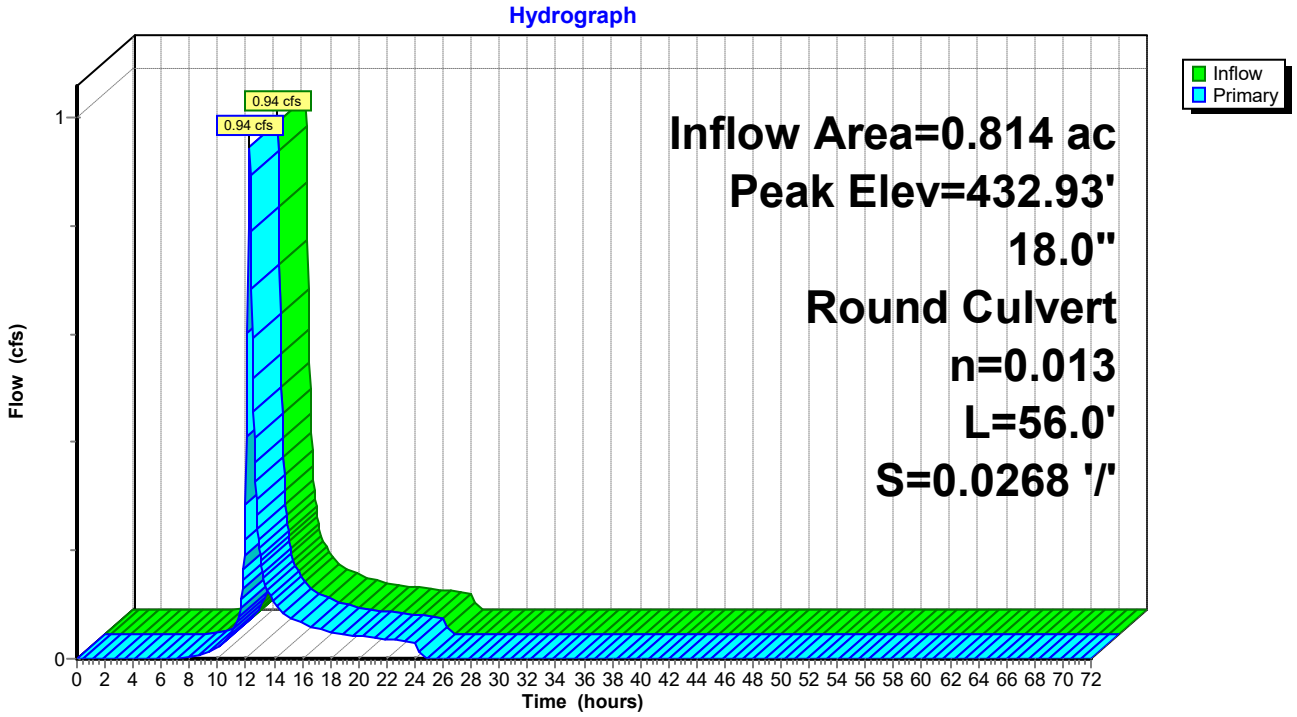
Inflow Area = 0.814 ac, 7.82% Impervious, Inflow Depth = 1.61" for 2-yr event
Inflow = 0.94 cfs @ 12.24 hrs, Volume= 0.109 af
Outflow = 0.94 cfs @ 12.24 hrs, Volume= 0.109 af, Atten= 0%, Lag= 0.0 min
Primary = 0.94 cfs @ 12.24 hrs, Volume= 0.109 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 432.93' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	**18.0" Round Culvert** L= 56.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 432.50' / 431.00' S= 0.0268 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.94 cfs @ 12.24 hrs HW=432.93' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.94 cfs @ 2.23 fps)

Pond C13: 18" CULVERT



Summary for Pond C2: 12" CULVERT

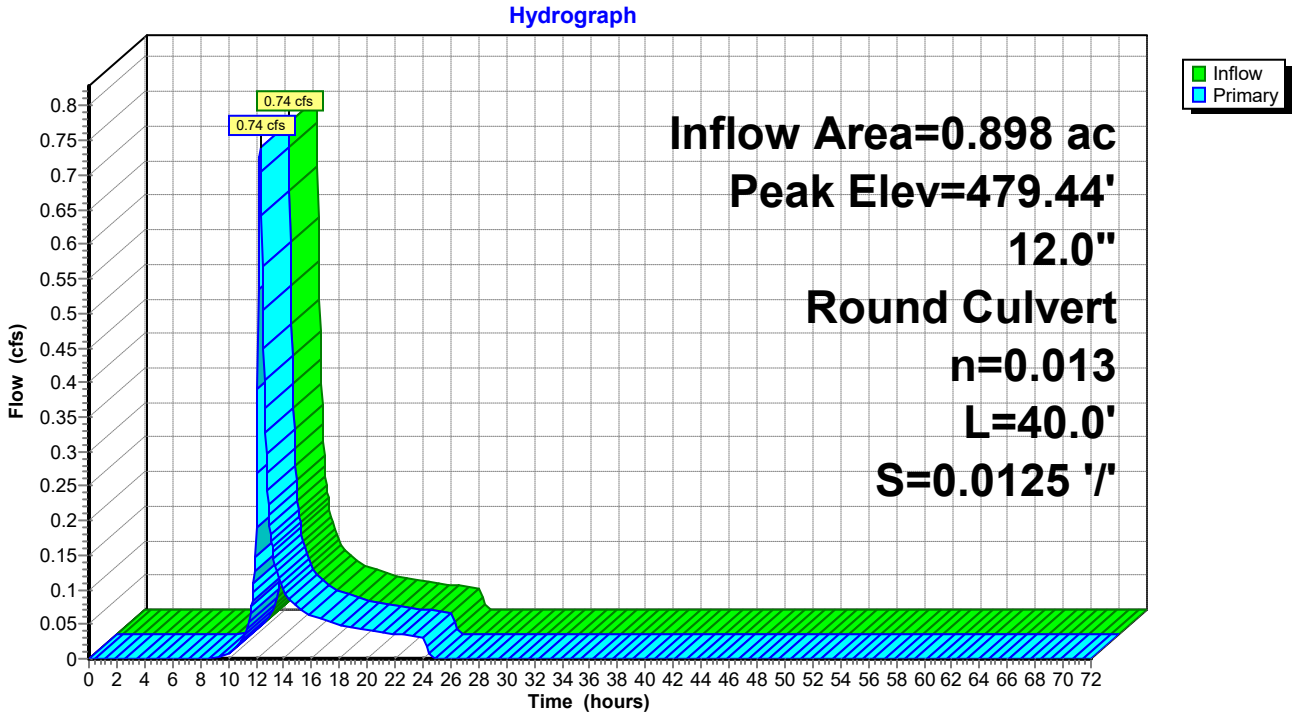
Inflow Area = 0.898 ac, 9.78% Impervious, Inflow Depth = 1.28" for 2-yr event
Inflow = 0.74 cfs @ 12.29 hrs, Volume= 0.096 af
Outflow = 0.74 cfs @ 12.29 hrs, Volume= 0.096 af, Atten= 0%, Lag= 0.0 min
Primary = 0.74 cfs @ 12.29 hrs, Volume= 0.096 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.44' @ 12.29 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.74 cfs @ 12.29 hrs HW=479.43' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.74 cfs @ 2.25 fps)

Pond C2: 12" CULVERT



Summary for Pond C3: 12" CULVERT

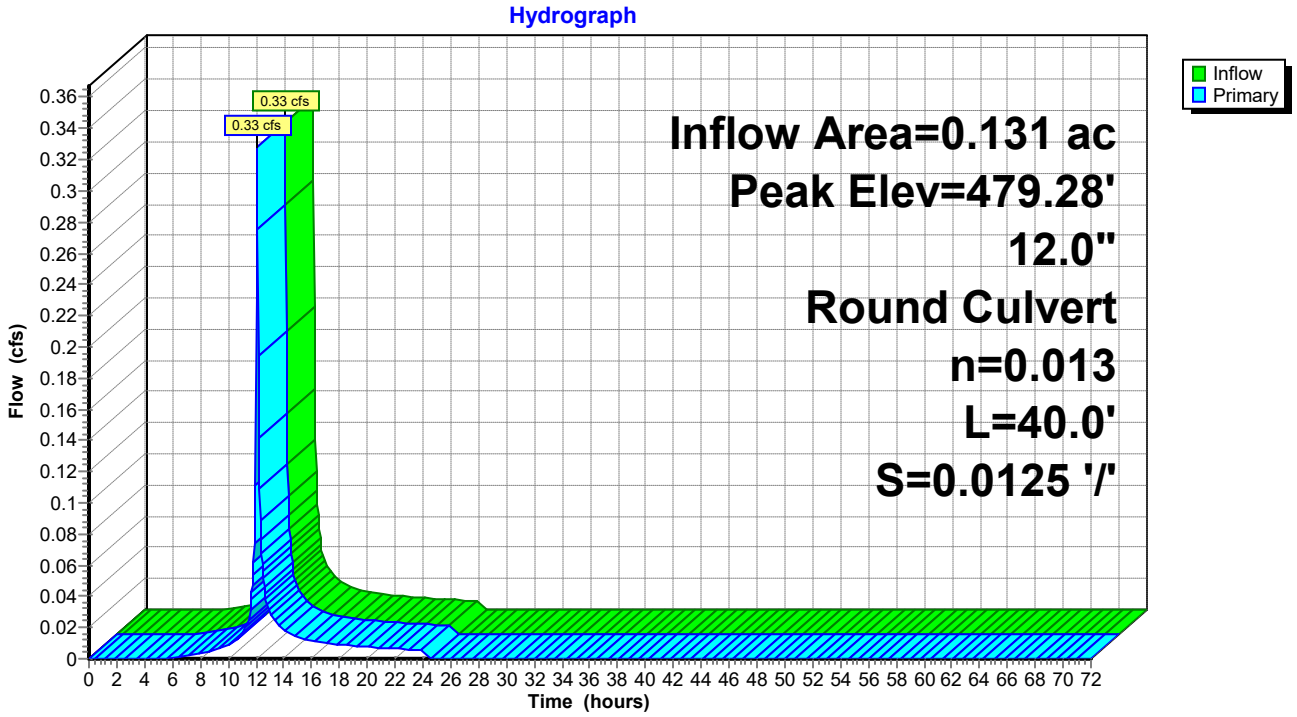
Inflow Area = 0.131 ac, 41.51% Impervious, Inflow Depth = 2.07" for 2-yr event
Inflow = 0.33 cfs @ 12.06 hrs, Volume= 0.023 af
Outflow = 0.33 cfs @ 12.06 hrs, Volume= 0.023 af, Atten= 0%, Lag= 0.0 min
Primary = 0.33 cfs @ 12.06 hrs, Volume= 0.023 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.28' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.32 cfs @ 12.06 hrs HW=479.28' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.32 cfs @ 1.79 fps)

Pond C3: 12" CULVERT



Summary for Pond C4: 12" CULVERT

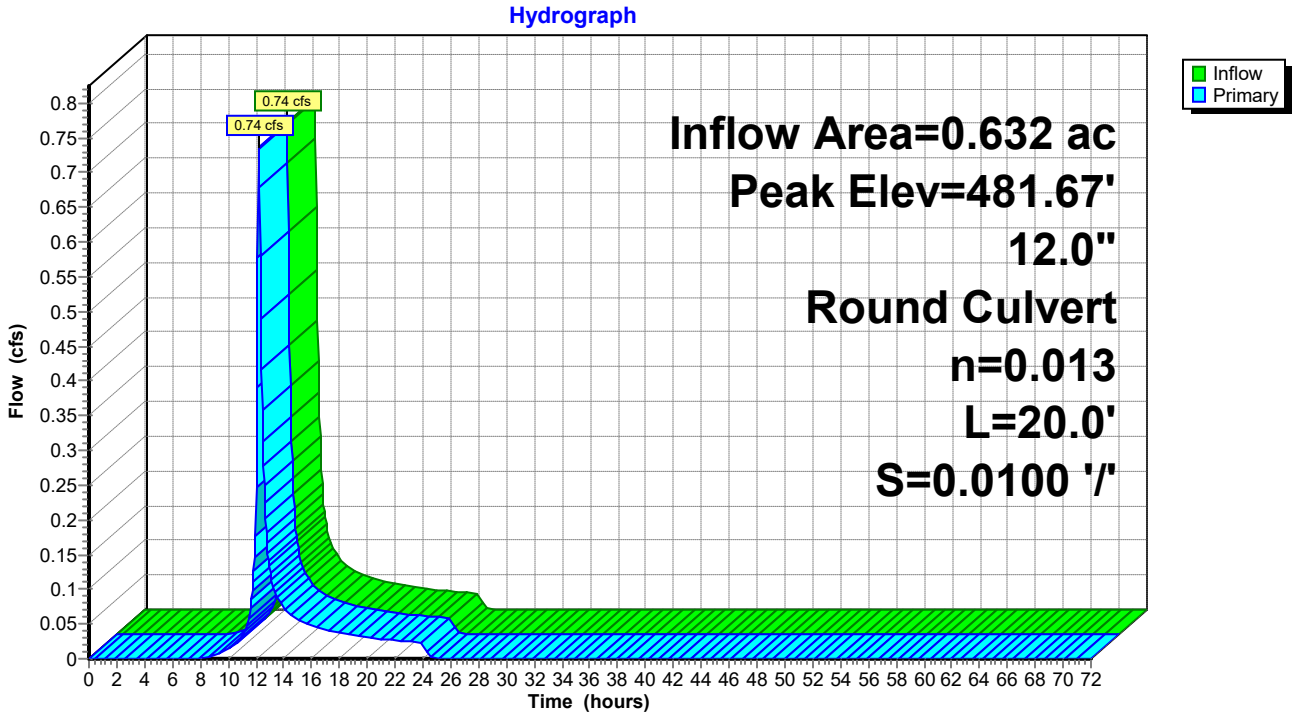
Inflow Area = 0.632 ac, 19.67% Impervious, Inflow Depth = 1.47" for 2-yr event
Inflow = 0.74 cfs @ 12.19 hrs, Volume= 0.078 af
Outflow = 0.74 cfs @ 12.19 hrs, Volume= 0.078 af, Atten= 0%, Lag= 0.0 min
Primary = 0.74 cfs @ 12.19 hrs, Volume= 0.078 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 481.67' @ 12.19 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	481.20'	**12.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 481.20' / 481.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.73 cfs @ 12.19 hrs HW=481.67' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.73 cfs @ 2.94 fps)

Pond C4: 12" CULVERT



Summary for Pond C5: 12" CULVERT

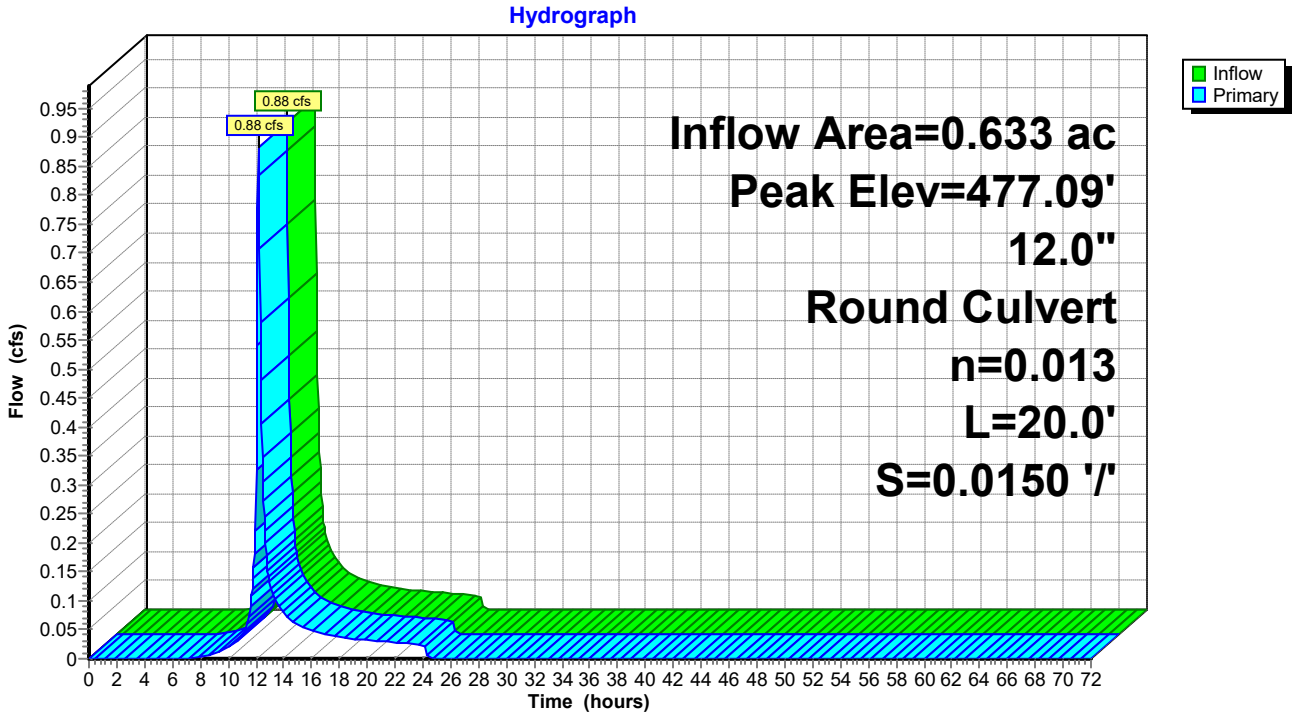
Inflow Area = 0.633 ac, 10.31% Impervious, Inflow Depth = 1.61" for 2-yr event
Inflow = 0.88 cfs @ 12.16 hrs, Volume= 0.085 af
Outflow = 0.88 cfs @ 12.16 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min
Primary = 0.88 cfs @ 12.16 hrs, Volume= 0.085 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 477.09' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	476.60'	**12.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 476.60' / 476.30' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.87 cfs @ 12.16 hrs HW=477.08' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.87 cfs @ 3.39 fps)

Pond C5: 12" CULVERT



Summary for Pond C6: 24" CULVERT

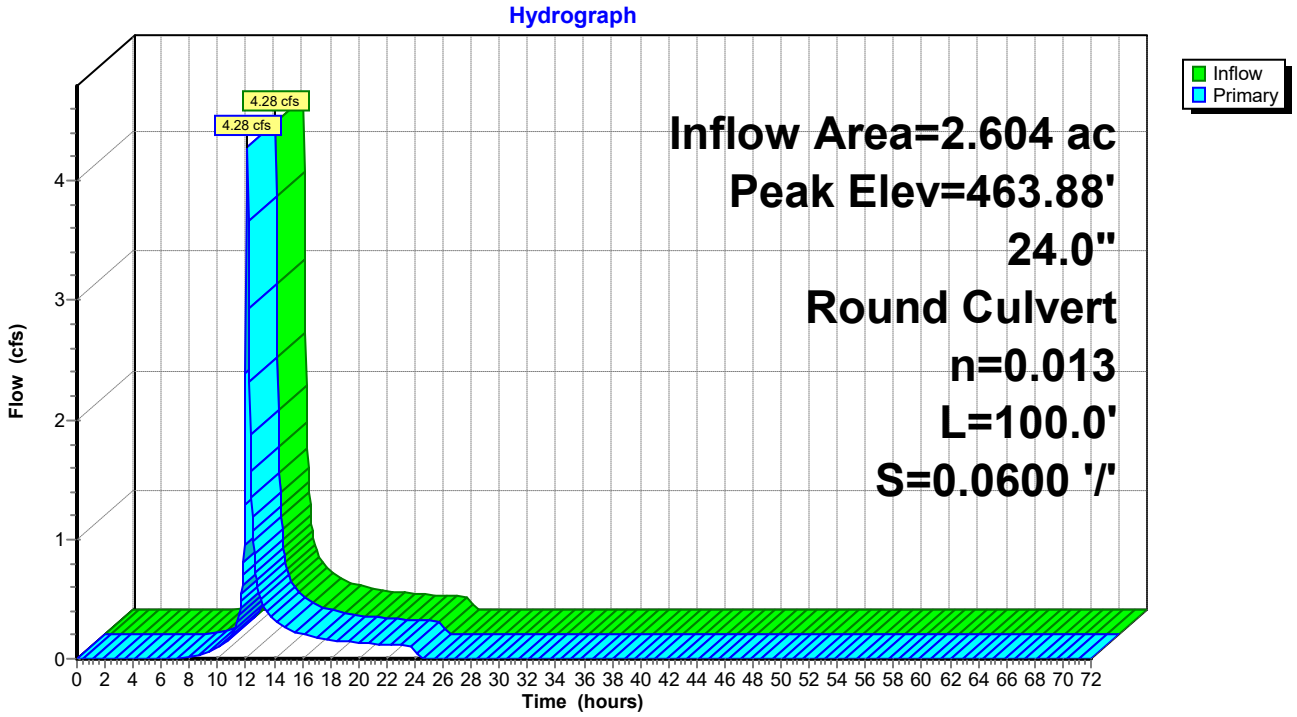
Inflow Area = 2.604 ac, 11.94% Impervious, Inflow Depth = 1.67" for 2-yr event
Inflow = 4.28 cfs @ 12.09 hrs, Volume= 0.362 af
Outflow = 4.28 cfs @ 12.09 hrs, Volume= 0.362 af, Atten= 0%, Lag= 0.0 min
Primary = 4.28 cfs @ 12.09 hrs, Volume= 0.362 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 463.88' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	463.00'	**24.0" Round Culvert** L= 100.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 463.00' / 457.00' S= 0.0600 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=4.23 cfs @ 12.09 hrs HW=463.88' (Free Discharge)
└**1=Culvert** (Inlet Controls 4.23 cfs @ 3.19 fps)

Pond C6: 24" CULVERT



Summary for Pond C8: 12" CULVERT

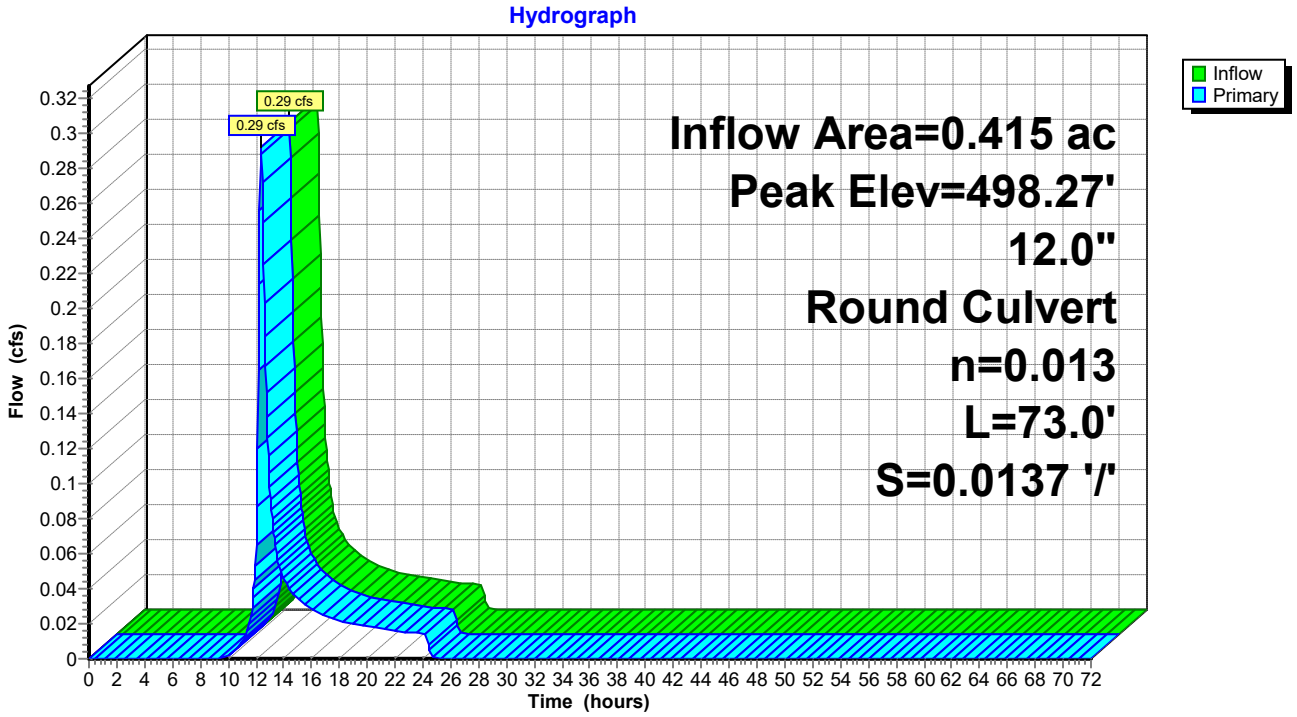
Inflow Area = 0.415 ac, 6.10% Impervious, Inflow Depth = 1.22" for 2-yr event
Inflow = 0.29 cfs @ 12.36 hrs, Volume= 0.042 af
Outflow = 0.29 cfs @ 12.36 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min
Primary = 0.29 cfs @ 12.36 hrs, Volume= 0.042 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 498.27' @ 12.36 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	498.00'	**12.0" Round Culvert** L= 73.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 498.00' / 497.00' S= 0.0137 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.29 cfs @ 12.36 hrs HW=498.26' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.29 cfs @ 1.75 fps)

Pond C8: 12" CULVERT



Summary for Pond C9: 12" CULVERT

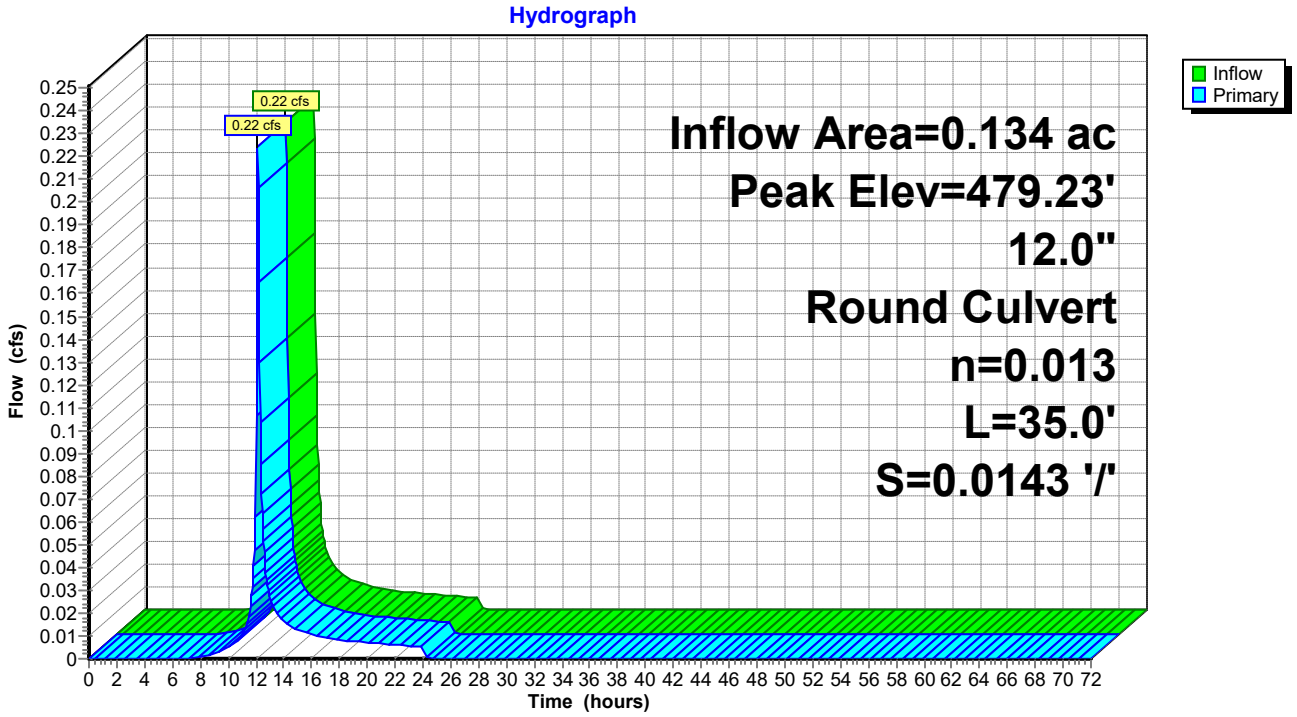
Inflow Area = 0.134 ac, 14.23% Impervious, Inflow Depth = 1.68" for 2-yr event
Inflow = 0.22 cfs @ 12.11 hrs, Volume= 0.019 af
Outflow = 0.22 cfs @ 12.11 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min
Primary = 0.22 cfs @ 12.11 hrs, Volume= 0.019 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.23' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 35.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.22 cfs @ 12.11 hrs HW=479.23' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.22 cfs @ 1.63 fps)

Pond C9: 12" CULVERT



Summary for Pond DP1: DRY POND 1

Inflow Area = 3.133 ac, 8.85% Impervious, Inflow Depth = 1.62" for 2-yr event
Inflow = 4.10 cfs @ 12.18 hrs, Volume= 0.424 af
Outflow = 0.76 cfs @ 12.89 hrs, Volume= 0.241 af, Atten= 81%, Lag= 42.4 min
Primary = 0.76 cfs @ 12.89 hrs, Volume= 0.241 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 438.68' @ 12.89 hrs Surf.Area= 3,777 sf Storage= 8,637 cf

Plug-Flow detention time= 286.5 min calculated for 0.241 af (57% of inflow)
Center-of-Mass det. time= 141.8 min (1,014.8 - 872.9)

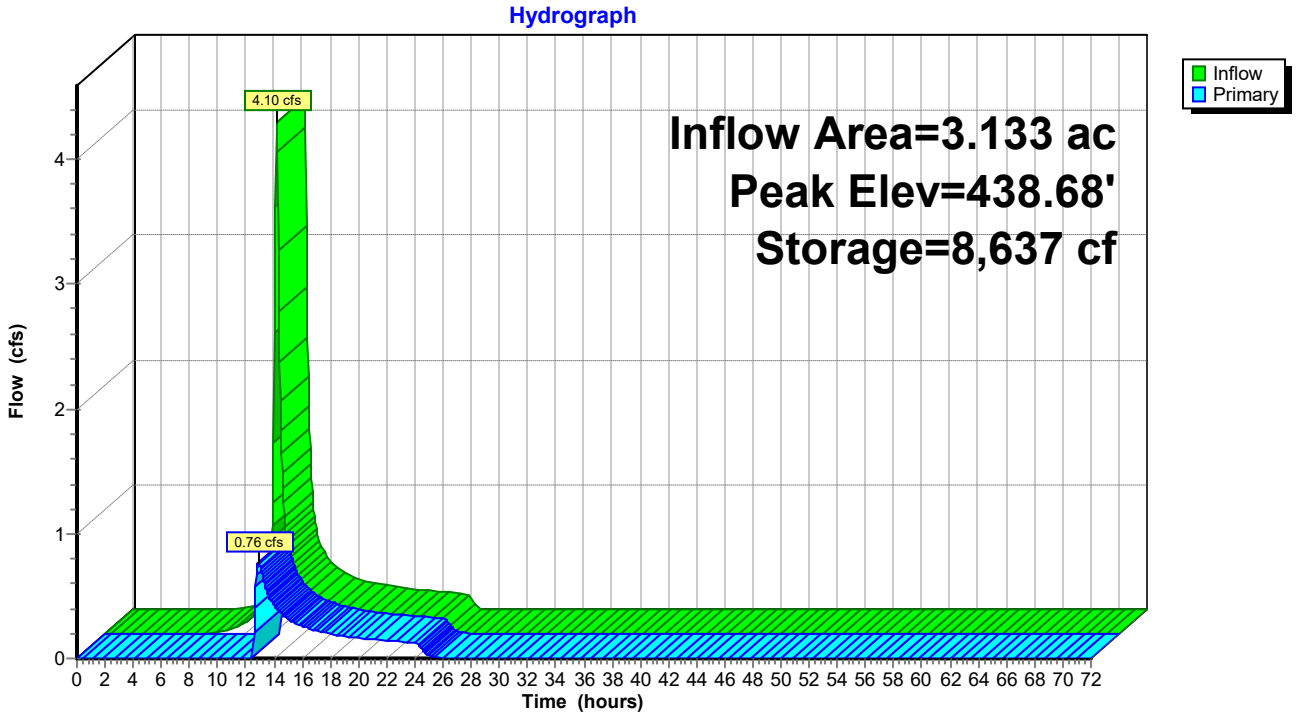
Volume	Invert	Avail.Storage	Storage Description
#1	434.00'	14,417 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
434.00	171	64.2	0	0	171
436.00	1,610	246.7	1,537	1,537	4,697
438.00	3,203	284.4	4,723	6,260	6,376
440.00	5,022	322.1	8,157	14,417	8,294

Device	Routing	Invert	Outlet Devices
#1	Primary	438.50'	**45.0 deg x 3.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.76 cfs @ 12.89 hrs HW=438.68' (Free Discharge)
└─**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 0.76 cfs @ 1.36 fps)

Pond DP1: DRY POND 1

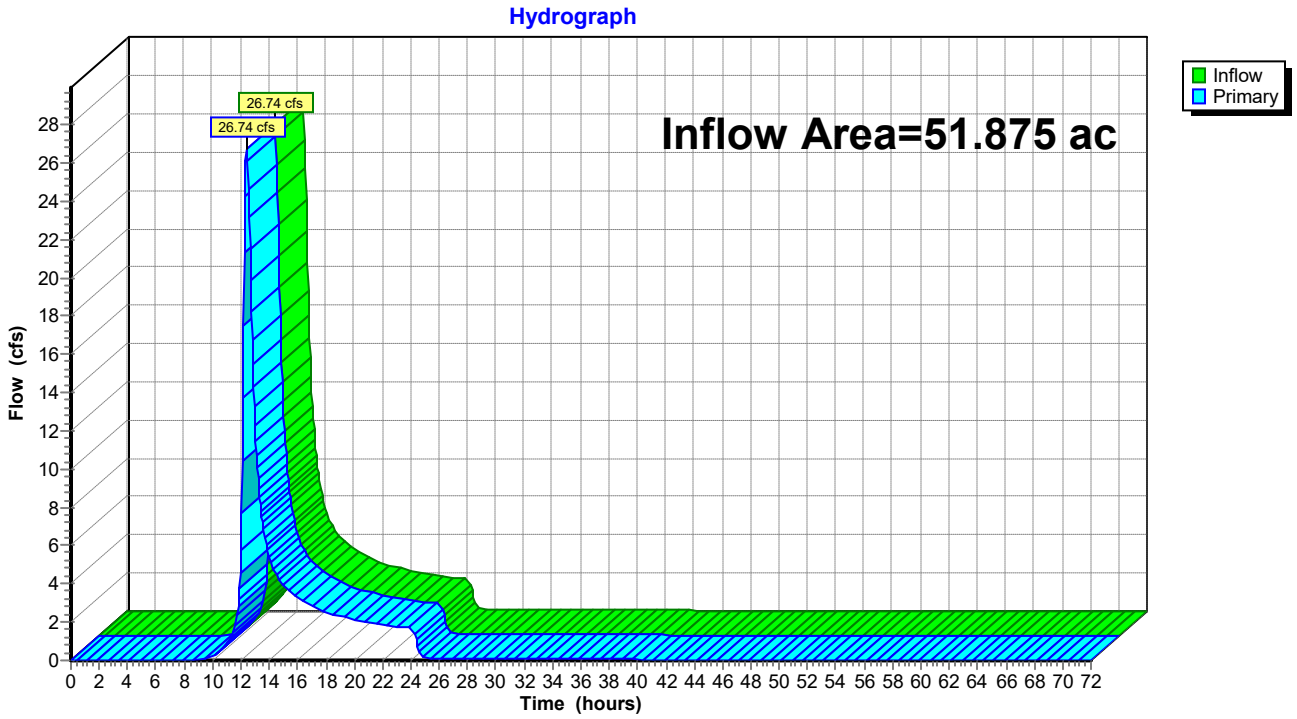


Summary for Link O1: OUT 1

Inflow Area = 51.875 ac, 3.67% Impervious, Inflow Depth = 1.10" for 2-yr event
Inflow = 26.74 cfs @ 12.41 hrs, Volume= 4.770 af
Primary = 26.74 cfs @ 12.41 hrs, Volume= 4.770 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O1: OUT 1

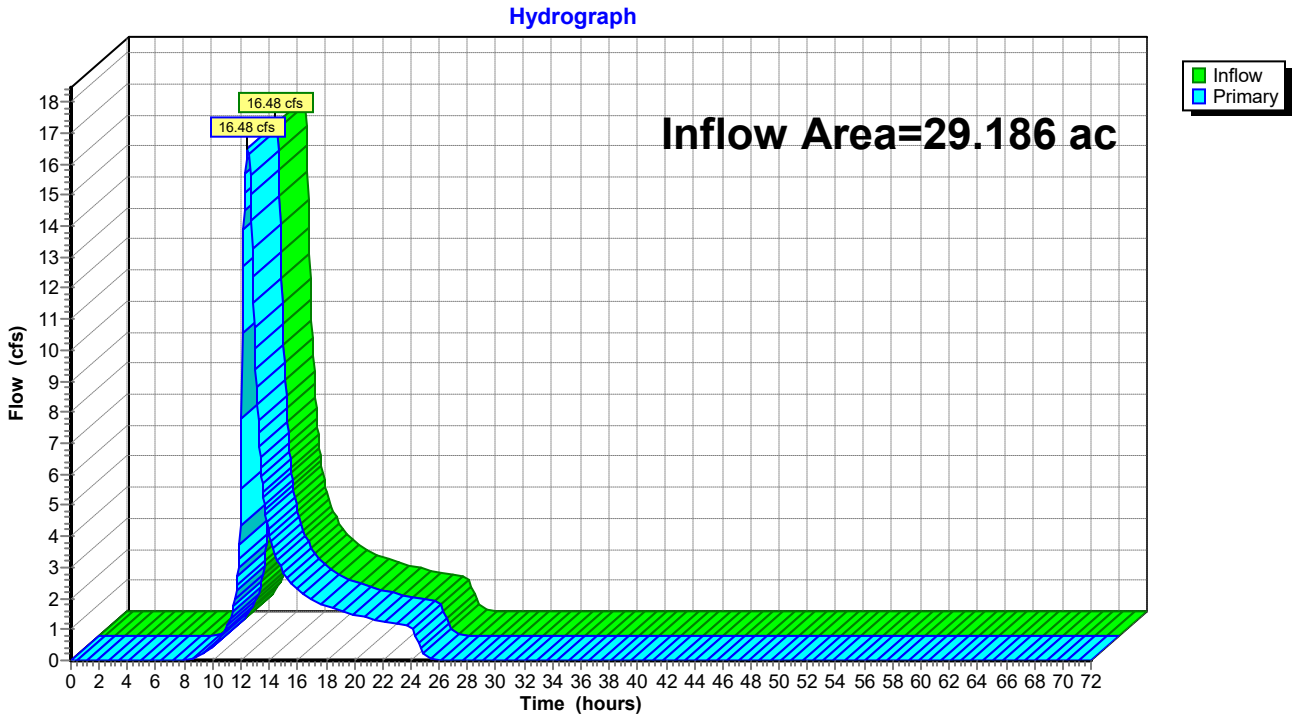


Summary for Link O2: OUT 2

Inflow Area = 29.186 ac, 3.50% Impervious, Inflow Depth = 1.42" for 2-yr event
Inflow = 16.48 cfs @ 12.49 hrs, Volume= 3.453 af
Primary = 16.48 cfs @ 12.49 hrs, Volume= 3.453 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O2: OUT 2

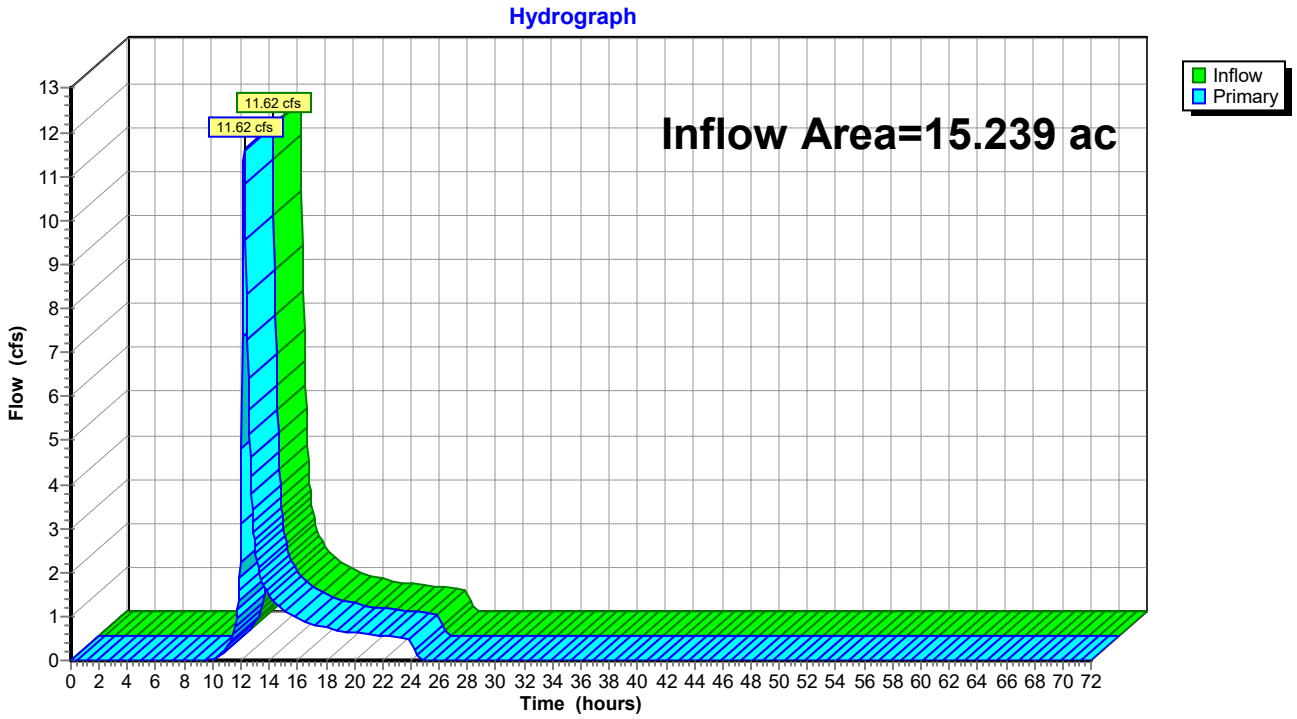


Summary for Link O3: OUT 3

Inflow Area = 15.239 ac, 0.00% Impervious, Inflow Depth = 1.10" for 2-yr event
Inflow = 11.62 cfs @ 12.24 hrs, Volume= 1.397 af
Primary = 11.62 cfs @ 12.24 hrs, Volume= 1.397 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O3: OUT 3

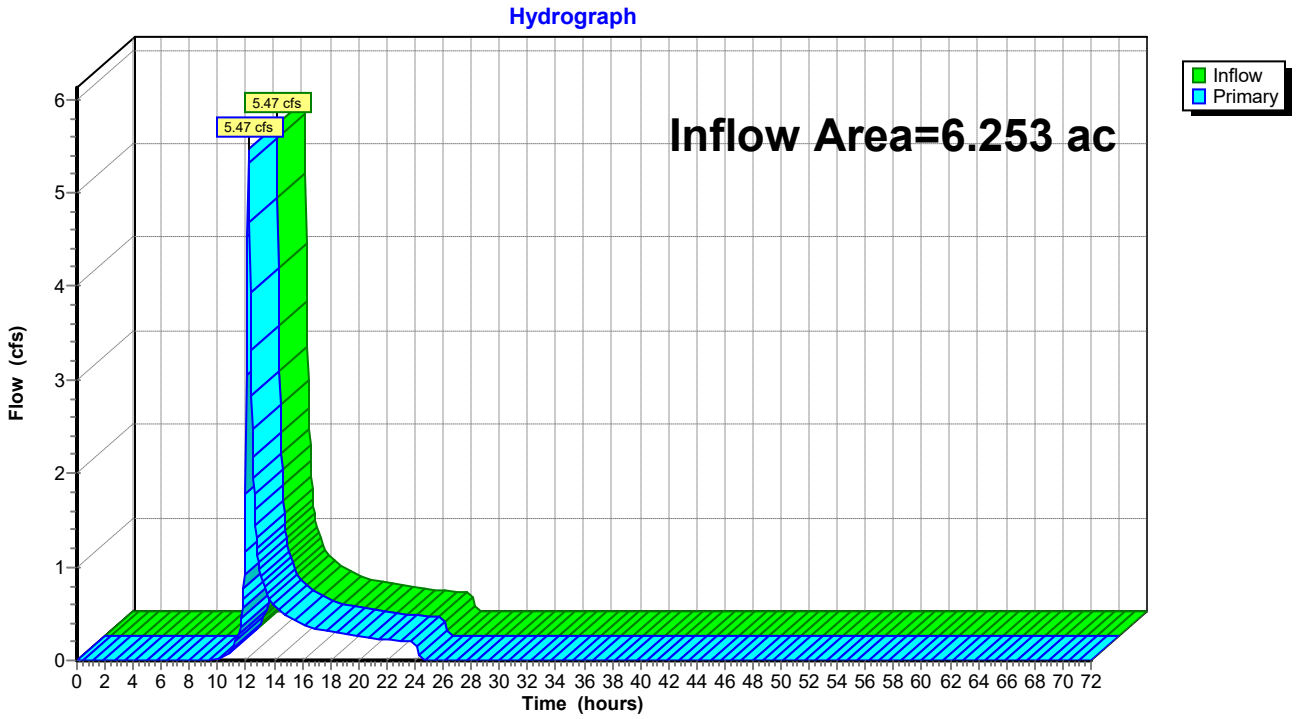


Summary for Link O4: OUT 4

Inflow Area = 6.253 ac, 0.00% Impervious, Inflow Depth = 1.10" for 2-yr event
Inflow = 5.47 cfs @ 12.17 hrs, Volume= 0.573 af
Primary = 5.47 cfs @ 12.17 hrs, Volume= 0.573 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O4: OUT 4

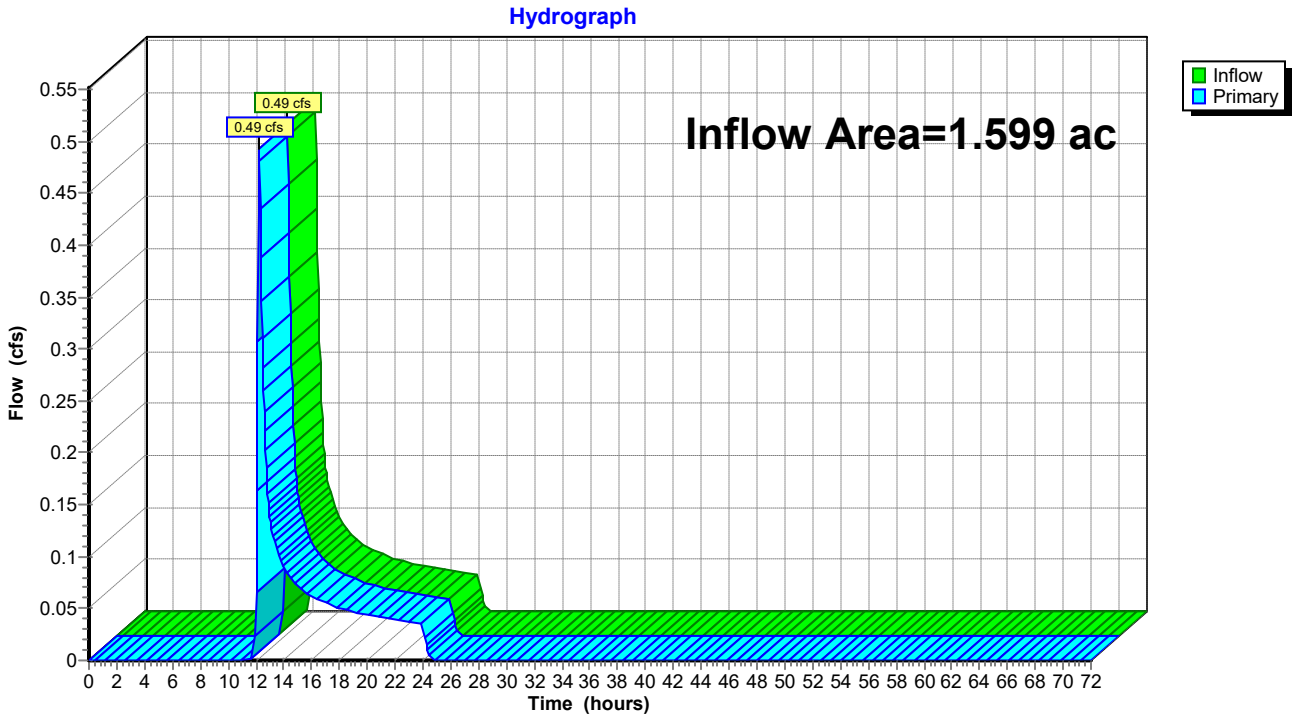


Summary for Link O5: OUT 5

Inflow Area = 1.599 ac, 0.00% Impervious, Inflow Depth = 0.56" for 2-yr event
Inflow = 0.49 cfs @ 12.22 hrs, Volume= 0.075 af
Primary = 0.49 cfs @ 12.22 hrs, Volume= 0.075 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O5: OUT 5



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: DRAINAGE AREA 1A Runoff Area=1,089,015 sf 2.10% Impervious Runoff Depth=2.83"
Flow Length=2,185' Tc=36.9 min CN=76 Runoff=35.31 cfs 5.889 af

Subcatchment 1B: DRAINAGE AREA 1B Runoff Area=18,084 sf 6.10% Impervious Runoff Depth=2.74"
Flow Length=160' Tc=28.8 min CN=75 Runoff=0.65 cfs 0.095 af

Subcatchment 1C: DRAINAGE AREA 1C Runoff Area=139,425 sf 6.89% Impervious Runoff Depth=2.83"
Flow Length=945' Tc=40.6 min CN=76 Runoff=4.28 cfs 0.754 af

Subcatchment 1D: DRAINAGE AREA 1D Runoff Area=27,532 sf 19.67% Impervious Runoff Depth=3.11"
Flow Length=480' Tc=17.2 min CN=79 Runoff=1.51 cfs 0.164 af

Subcatchment 1E: DRAINAGE AREA 1E Runoff Area=39,104 sf 9.78% Impervious Runoff Depth=2.83"
Flow Length=490' Tc=24.1 min CN=76 Runoff=1.62 cfs 0.211 af

Subcatchment 1F: DRAINAGE AREA 1F Runoff Area=5,854 sf 14.23% Impervious Runoff Depth=3.39"
Flow Length=100' Tc=11.4 min CN=82 Runoff=0.43 cfs 0.038 af

Subcatchment 1G: DRAINAGE AREA 1G Runoff Area=5,726 sf 41.51% Impervious Runoff Depth=3.90"
Flow Length=200' Tc=7.5 min CN=87 Runoff=0.58 cfs 0.043 af

Subcatchment 1H: DRAINAGE AREA 8 Runoff Area=4,559 sf 53.41% Impervious Runoff Depth=4.21"
Flow Length=45' Tc=0.4 min CN=90 Runoff=0.63 cfs 0.037 af

Subcatchment 1I: DRAINAGE AREA 1I Runoff Area=27,574 sf 10.31% Impervious Runoff Depth=3.30"
Flow Length=260' Tc=15.0 min CN=81 Runoff=1.73 cfs 0.174 af

Subcatchment 1J: DRAINAGE AREA 1J Runoff Area=85,839 sf 12.46% Impervious Runoff Depth=3.39"
Flow Length=480' Tc=9.3 min CN=82 Runoff=6.82 cfs 0.557 af

Subcatchment 1K: DRAINAGE AREA 1K Runoff Area=13,922 sf 13.09% Impervious Runoff Depth=3.39"
Flow Length=100' Tc=4.2 min CN=82 Runoff=1.44 cfs 0.090 af

Subcatchment 1L: DRAINAGE AREA 1L Runoff Area=792,979 sf 2.18% Impervious Runoff Depth=1.89"
Flow Length=1,370' Tc=24.1 min CN=65 Runoff=20.87 cfs 2.868 af

Subcatchment 1M: DRAINAGE AREA 1M Runoff Area=10,047 sf 17.03% Impervious Runoff Depth=3.49"
Flow Length=185' Tc=10.3 min CN=83 Runoff=0.79 cfs 0.067 af

Subcatchment 2A: DRAINAGE AREA 2A Runoff Area=58,418 sf 18.29% Impervious Runoff Depth=3.49"
Flow Length=560' Tc=15.0 min CN=83 Runoff=3.88 cfs 0.390 af

Subcatchment 2B: DRAINAGE AREA 2B Runoff Area=5,939 sf 29.70% Impervious Runoff Depth=3.69"
Flow Length=80' Tc=10.2 min CN=85 Runoff=0.50 cfs 0.042 af

Subcatchment 2C: DRAINAGE AREA 2C Runoff Area=130,540 sf 7.90% Impervious Runoff Depth=3.30"
Flow Length=870' Tc=16.7 min CN=81 Runoff=7.68 cfs 0.823 af

Subcatchment 2D: DRAINAGE AREA 2D Runoff Area=858,381 sf 0.51% Impervious Runoff Depth=3.11"
Flow Length=1,470' Tc=43.3 min CN=79 Runoff=27.86 cfs 5.099 af

Subcatchment 2E: DRAINAGE AREA 18 Runoff Area=121,293 sf 11.99% Impervious Runoff Depth=3.20"
Flow Length=610' Tc=16.4 min CN=80 Runoff=7.03 cfs 0.743 af

Subcatchment 2F: DRAINAGE AREA 2F Runoff Area=61,323 sf 0.00% Impervious Runoff Depth=2.56"
Flow Length=250' Tc=13.7 min CN=73 Runoff=3.08 cfs 0.300 af

Subcatchment 2G: DRAINAGE AREA 2G Runoff Area=35,456 sf 7.82% Impervious Runoff Depth=3.30"
Flow Length=300' Tc=21.0 min CN=81 Runoff=1.86 cfs 0.224 af

Subcatchment 3: DRAINAGE AREA 3 Runoff Area=663,807 sf 0.00% Impervious Runoff Depth=2.56"
Flow Length=590' Tc=19.9 min CN=73 Runoff=27.43 cfs 3.248 af

Subcatchment 4: DRAINAGE AREA 4 Runoff Area=272,371 sf 0.00% Impervious Runoff Depth=2.56"
Flow Length=376' Tc=15.4 min CN=73 Runoff=12.92 cfs 1.333 af

Subcatchment 5: DRAINAGE AREA 5 Runoff Area=69,632 sf 0.00% Impervious Runoff Depth=1.66"
Flow Length=340' Tc=16.6 min CN=62 Runoff=1.90 cfs 0.221 af

Pond AC1: ARCH CULVERT Peak Elev=455.30' Inflow=42.36 cfs 7.230 af
96.0" x 43.0", R=52.0" Arch Culvert n=0.013 L=60.0' S=0.0417 '/' Outflow=42.36 cfs 7.230 af

Pond AC2: ARCH CULVERT Peak Elev=431.05' Inflow=31.77 cfs 5.782 af
96.0" x 43.0", R=52.0" Arch Culvert n=0.013 L=40.0' S=0.0175 '/' Outflow=31.77 cfs 5.782 af

Pond BR1-C7: BIO-RET POND 1 Peak Elev=477.57' Storage=442 cf Inflow=6.46 cfs 1.208 af
Outflow=6.45 cfs 1.208 af

Pond BR2-C14: BIO-RET POND 2 Peak Elev=458.16' Storage=8,265 cf Inflow=9.09 cfs 0.822 af
Outflow=6.95 cfs 0.822 af

Pond C1: 24" CULVERT Peak Elev=480.97' Inflow=4.91 cfs 0.918 af
24.0" Round Culvert n=0.013 L=36.0' S=0.0139 '/' Outflow=4.91 cfs 0.918 af

Pond C10: 15" CULVERT Peak Elev=448.67' Inflow=0.79 cfs 0.067 af
15.0" Round Culvert n=0.013 L=67.0' S=0.0112 '/' Outflow=0.79 cfs 0.067 af

Pond C11: 12" CULVERT Peak Elev=458.35' Inflow=0.50 cfs 0.042 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0500 '/' Outflow=0.50 cfs 0.042 af

Pond C12: 24" CULVERT Peak Elev=444.84' Inflow=3.88 cfs 0.390 af
24.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=3.88 cfs 0.390 af

Pond C13: 18" CULVERT Peak Elev=433.12' Inflow=1.86 cfs 0.224 af
18.0" Round Culvert n=0.013 L=56.0' S=0.0268 '/' Outflow=1.86 cfs 0.224 af

Pond C2: 12" CULVERT Peak Elev=479.69' Inflow=1.62 cfs 0.211 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=1.62 cfs 0.211 af

Pond C3: 12" CULVERT Peak Elev=479.38' Inflow=0.58 cfs 0.043 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=0.58 cfs 0.043 af

Pond C4: 12" CULVERT Peak Elev=481.93' Inflow=1.51 cfs 0.164 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0100 '/' Outflow=1.51 cfs 0.164 af

Pond C5: 12" CULVERT Peak Elev=477.34' Inflow=1.73 cfs 0.174 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0150 '/' Outflow=1.73 cfs 0.174 af

Pond C6: 24" CULVERT Peak Elev=464.29' Inflow=8.28 cfs 0.731 af
24.0" Round Culvert n=0.013 L=100.0' S=0.0600 '/' Outflow=8.28 cfs 0.731 af

Pond C8: 12" CULVERT Peak Elev=498.41' Inflow=0.65 cfs 0.095 af
12.0" Round Culvert n=0.013 L=73.0' S=0.0137 '/' Outflow=0.65 cfs 0.095 af

Pond C9: 12" CULVERT Peak Elev=479.33' Inflow=0.43 cfs 0.038 af
12.0" Round Culvert n=0.013 L=35.0' S=0.0143 '/' Outflow=0.43 cfs 0.038 af

Pond DP1: DRY POND 1 Peak Elev=439.23' Storage=10,854 cf Inflow=8.07 cfs 0.865 af
Outflow=6.51 cfs 0.682 af

Link O1: OUT 1 Inflow=64.81 cfs 10.987 af
Primary=64.81 cfs 10.987 af

Link O2: OUT 2 Inflow=38.52 cfs 7.438 af
Primary=38.52 cfs 7.438 af

Link O3: OUT 3 Inflow=27.43 cfs 3.248 af
Primary=27.43 cfs 3.248 af

Link O4: OUT 4 Inflow=12.92 cfs 1.333 af
Primary=12.92 cfs 1.333 af

Link O5: OUT 5 Inflow=1.90 cfs 0.221 af
Primary=1.90 cfs 0.221 af

Total Runoff Area = 104.151 ac Runoff Volume = 23.410 af Average Runoff Depth = 2.70"
97.19% Pervious = 101.228 ac 2.81% Impervious = 2.923 ac

Summary for Subcatchment 1A: DRAINAGE AREA 1A

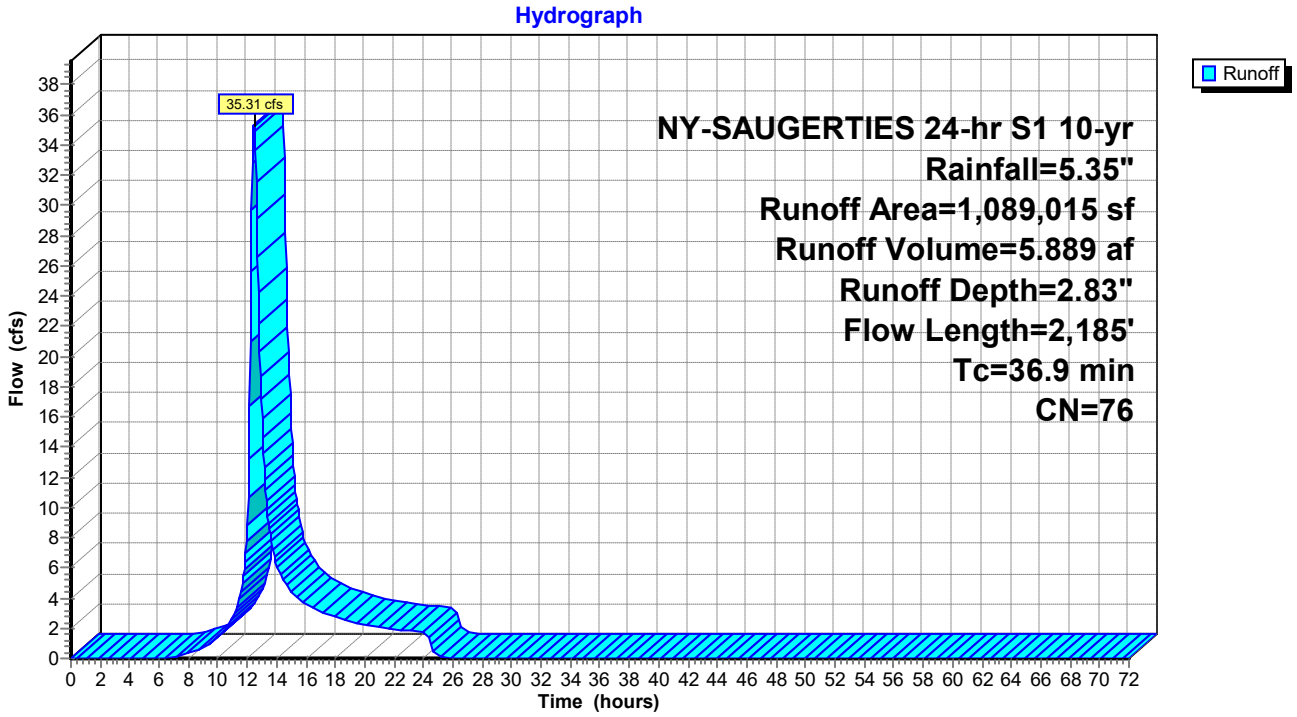
Runoff = 35.31 cfs @ 12.45 hrs, Volume= 5.889 af, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	853	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	620,284	73	Woods, Fair, HSG C
	391,737	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	20,528	74	>75% Grass cover, Good, HSG C
	32,734	80	>75% Grass cover, Good, HSG D
*	14,227	98	Paved roads w/curbs & sewers, HSG A-D
*	8,652	98	Roofs, HSG A-D
	1,089,015	76	Weighted Average
	1,066,136		97.90% Pervious Area
	22,879		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0800	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
13.4	650	0.0260	0.81		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
3.0	360	0.0180	2.01		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
1.3	260	0.0480	3.29		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
1.0	170	0.0350	2.81		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
2.9	380	0.0210	2.17		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
3.3	265	0.0080	1.34		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
36.9	2,185	Total			

Subcatchment 1A: DRAINAGE AREA 1A



Summary for Subcatchment 1B: DRAINAGE AREA 1B

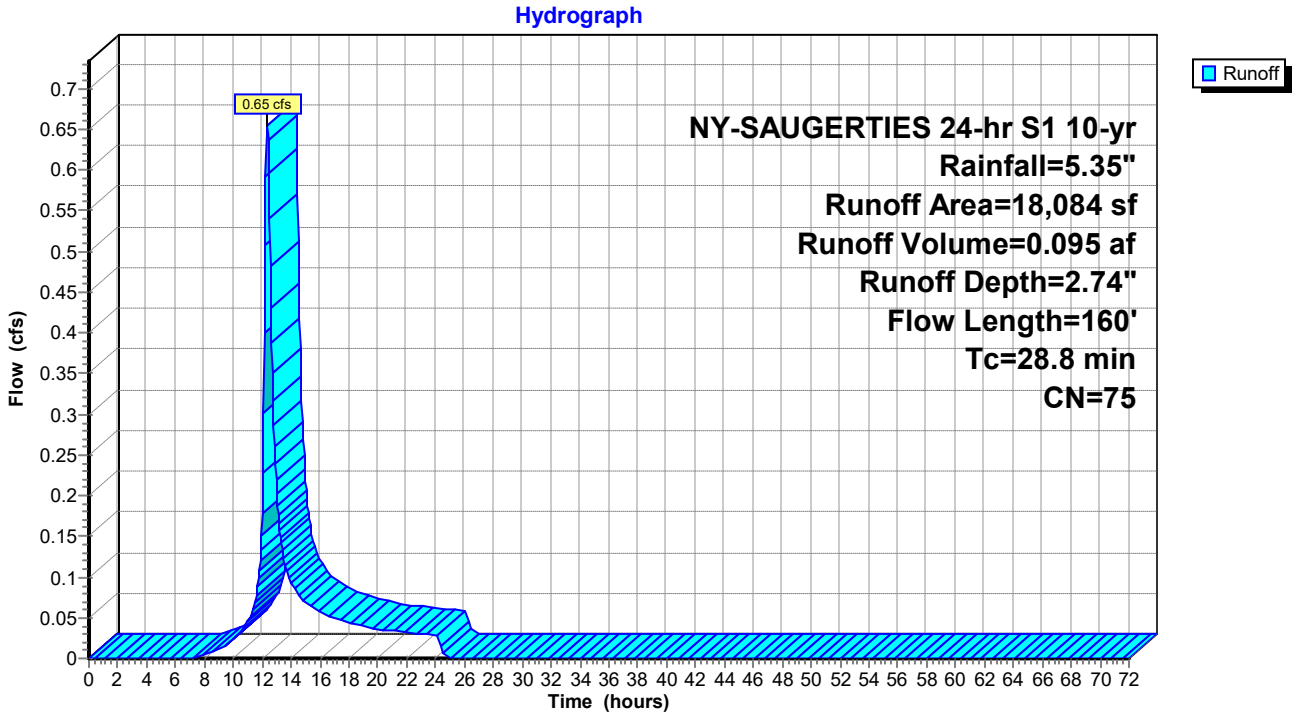
Runoff = 0.65 cfs @ 12.35 hrs, Volume= 0.095 af, Depth= 2.74"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	14,107	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	2,873	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
*	1,104	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	18,084	75	Weighted Average
	16,980		93.90% Pervious Area
	1,104		6.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.6	100	0.0100	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.0	10	0.4000	9.49		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
28.8	160	Total			

Subcatchment 1B: DRAINAGE AREA 1B



Summary for Subcatchment 1C: DRAINAGE AREA 1C

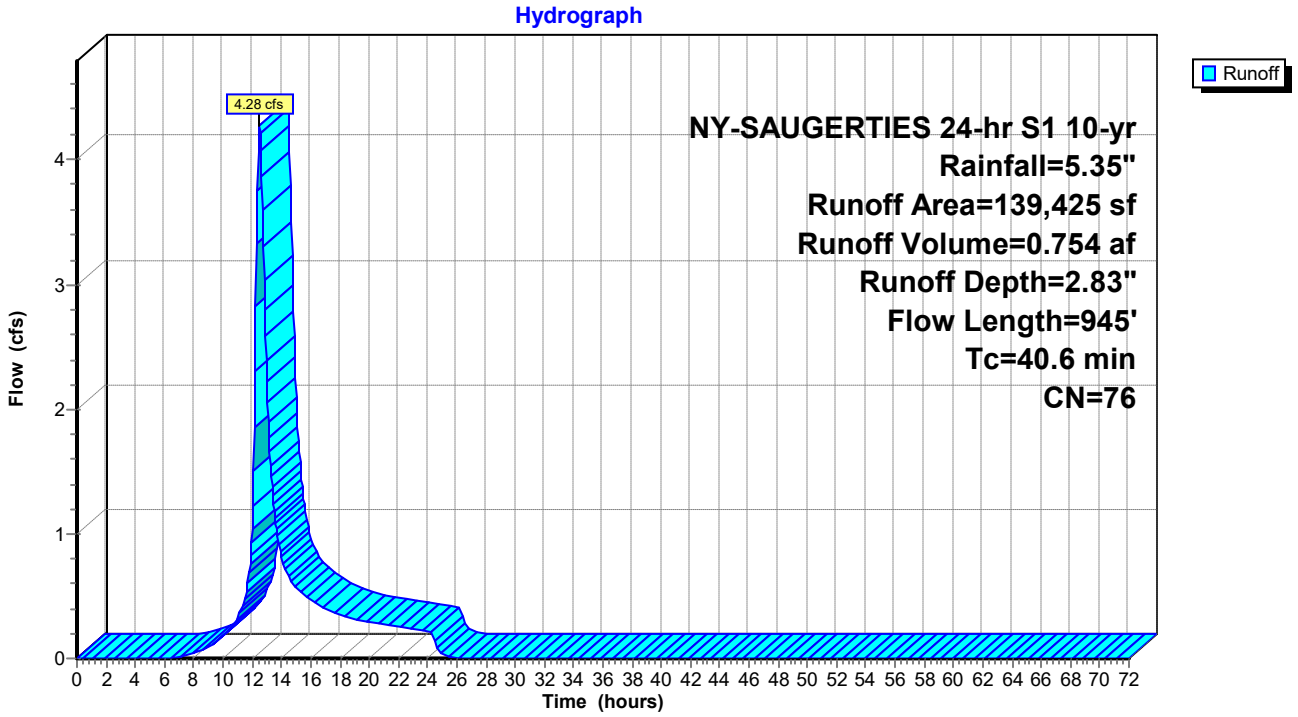
Runoff = 4.28 cfs @ 12.50 hrs, Volume= 0.754 af, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	97,071	73	Woods, Fair, HSG C
	20,322	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	12,079	74	>75% Grass cover, Good, HSG C
	347	80	>75% Grass cover, Good, HSG D
*	6,722	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	139,425	76	Weighted Average
	129,819		93.11% Pervious Area
	9,606		6.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
9.9	350	0.0140	0.59		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.1	80	0.0630	1.25		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
5.5	220	0.0180	0.67		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
3.2	185	0.0380	0.97		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.0	10	0.2000	6.71		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
40.6	945	Total			

Subcatchment 1C: DRAINAGE AREA 1C



Summary for Subcatchment 1D: DRAINAGE AREA 1D

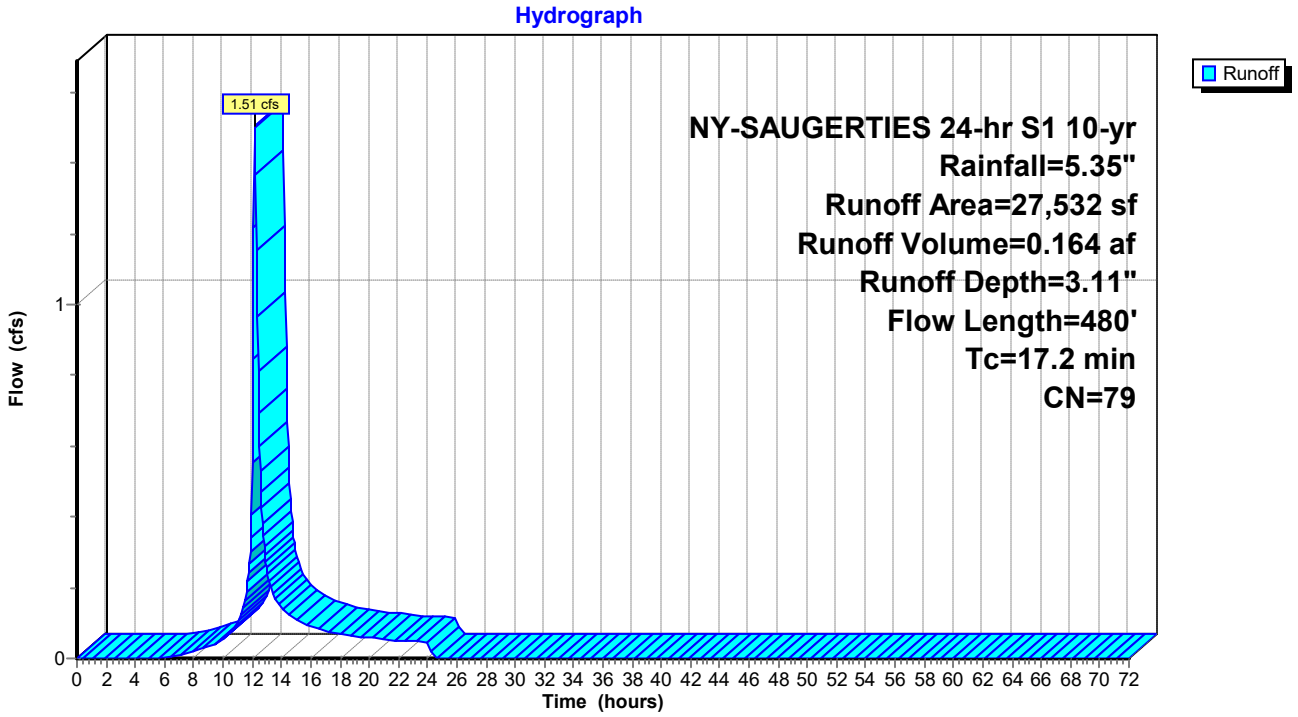
Runoff = 1.51 cfs @ 12.18 hrs, Volume= 0.164 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	8,093	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	13,157	74	>75% Grass cover, Good, HSG C
	867	80	>75% Grass cover, Good, HSG D
*	5,415	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	27,532	79	Weighted Average
	22,117		80.33% Pervious Area
	5,415		19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	8	0.0630	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
1.5	17	0.0590	0.19		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
12.6	75	0.0400	0.10		**Sheet Flow, C-D** Woods: Light underbrush n= 0.400 P2= 3.38"
0.6	30	0.0330	0.91		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.2	40	0.0500	3.35		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
1.8	220	0.0180	2.01		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
0.4	90	0.0780	4.19		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
17.2	480	Total			

Subcatchment 1D: DRAINAGE AREA 1D



Summary for Subcatchment 1E: DRAINAGE AREA 1E

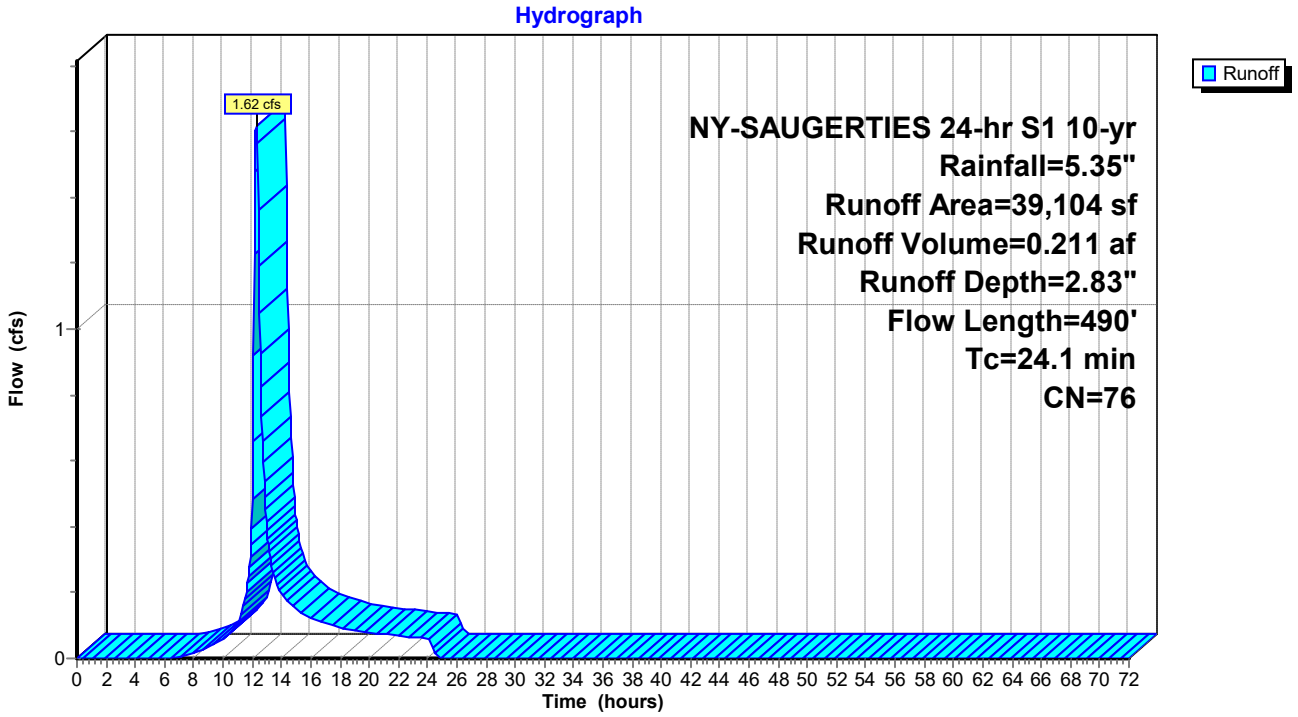
Runoff = 1.62 cfs @ 12.28 hrs, Volume= 0.211 af, Depth= 2.83"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	27,062	73	Woods, Fair, HSG C
	1,441	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	4,681	74	>75% Grass cover, Good, HSG C
	2,095	80	>75% Grass cover, Good, HSG D
*	3,825	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	39,104	76	Weighted Average
	35,279		90.22% Pervious Area
	3,825		9.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.6	110	0.0550	1.17		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	280	0.0390	2.96		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
24.1	490	Total			

Subcatchment 1E: DRAINAGE AREA 1E



Summary for Subcatchment 1F: DRAINAGE AREA 1F

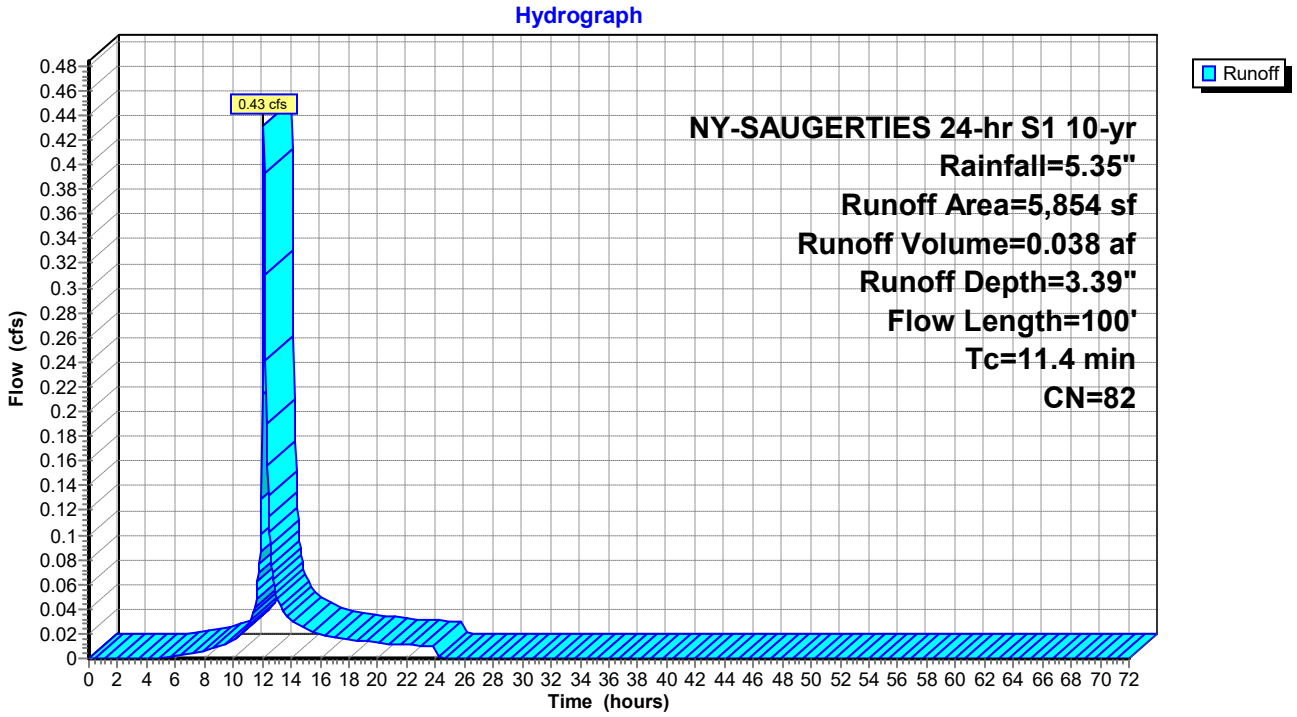
Runoff = 0.43 cfs @ 12.11 hrs, Volume= 0.038 af, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	2,009	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,012	80	>75% Grass cover, Good, HSG D
*	833	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,854	82	Weighted Average
	5,021		85.77% Pervious Area
	833		14.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	30	0.0670	0.22		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
7.0	40	0.0500	0.10		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.38"
2.2	30	0.0670	0.22		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.38"
11.4	100	Total			

Subcatchment 1F: DRAINAGE AREA 1F



Summary for Subcatchment 1G: DRAINAGE AREA 1G

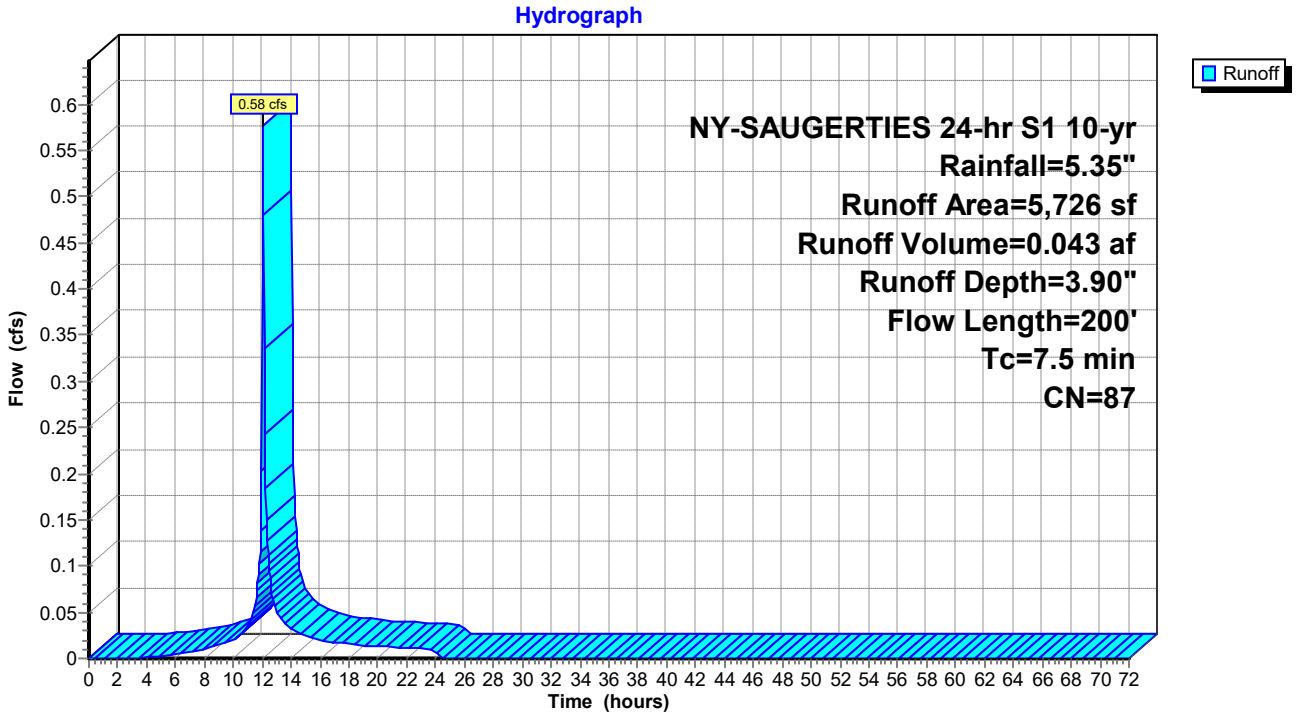
Runoff = 0.58 cfs @ 12.06 hrs, Volume= 0.043 af, Depth= 3.90"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	521	74	>75% Grass cover, Good, HSG C
	2,828	80	>75% Grass cover, Good, HSG D
*	2,377	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,726	87	Weighted Average
	3,349		58.49% Pervious Area
	2,377		41.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	5	0.1000	1.48		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
6.8	95	0.0420	0.23		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.6	100	0.0400	3.00		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
7.5	200	Total			

Subcatchment 1G: DRAINAGE AREA 1G



Summary for Subcatchment 1H: DRAINAGE AREA 8

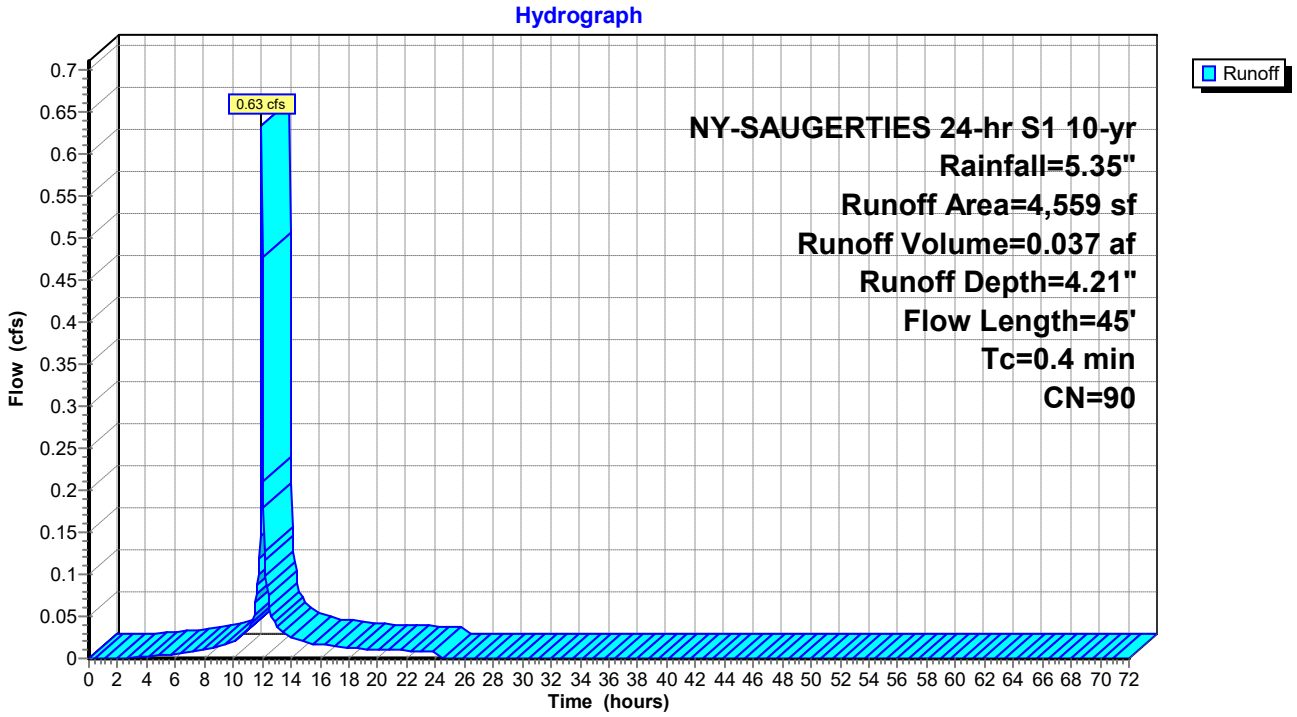
Runoff = 0.63 cfs @ 11.96 hrs, Volume= 0.037 af, Depth= 4.21"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	2,124	80	>75% Grass cover, Good, HSG D
*	2,435	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	4,559	90	Weighted Average
	2,124		46.59% Pervious Area
	2,435		53.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0250	1.12		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
0.1	25	0.3200	3.25		**Sheet Flow, B-C**
					Smooth surfaces n= 0.011 P2= 3.38"
0.4	45	Total			

Subcatchment 1H: DRAINAGE AREA 8



Summary for Subcatchment 1I: DRAINAGE AREA 1I

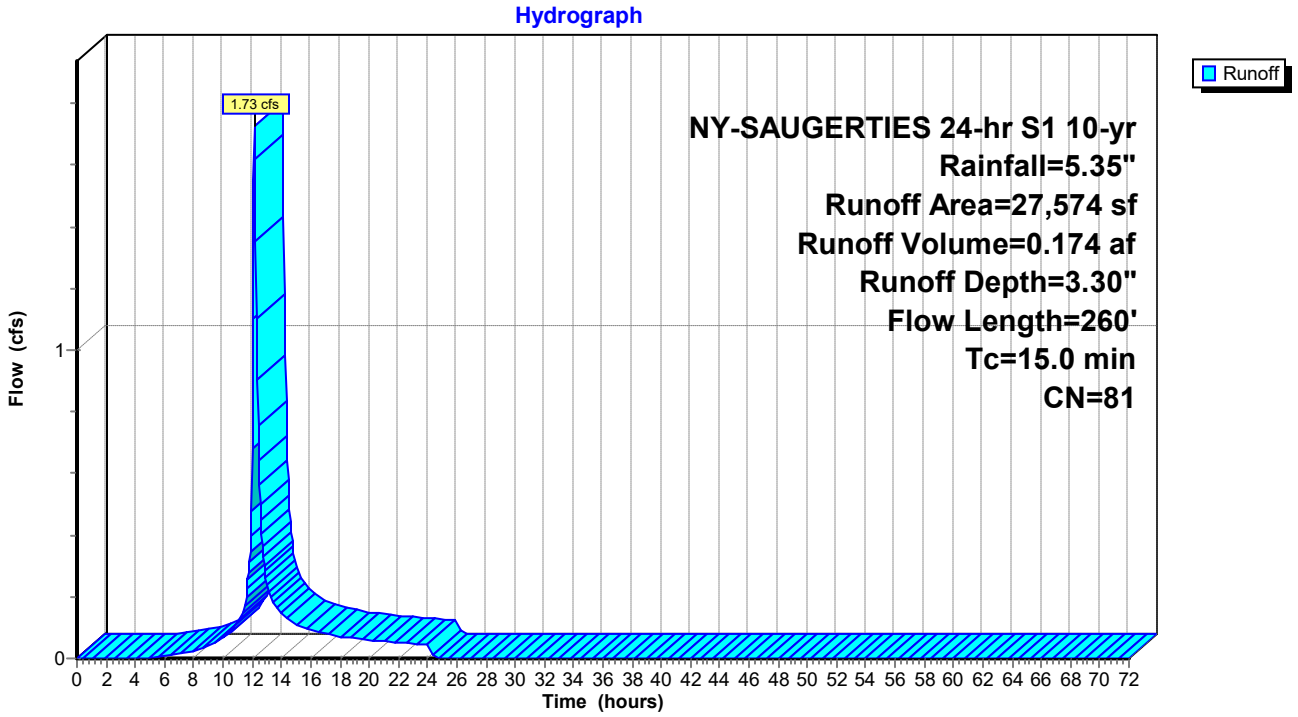
Runoff = 1.73 cfs @ 12.16 hrs, Volume= 0.174 af, Depth= 3.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	686	73	Woods, Fair, HSG C
	20,704	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,341	80	>75% Grass cover, Good, HSG D
*	2,843	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	27,574	81	Weighted Average
	24,731		89.69% Pervious Area
	2,843		10.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0600	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
0.9	70	0.0710	1.33		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	90	0.0330	2.72		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
15.0	260	Total			

Subcatchment 1I: DRAINAGE AREA 1I



Summary for Subcatchment 1J: DRAINAGE AREA 1J

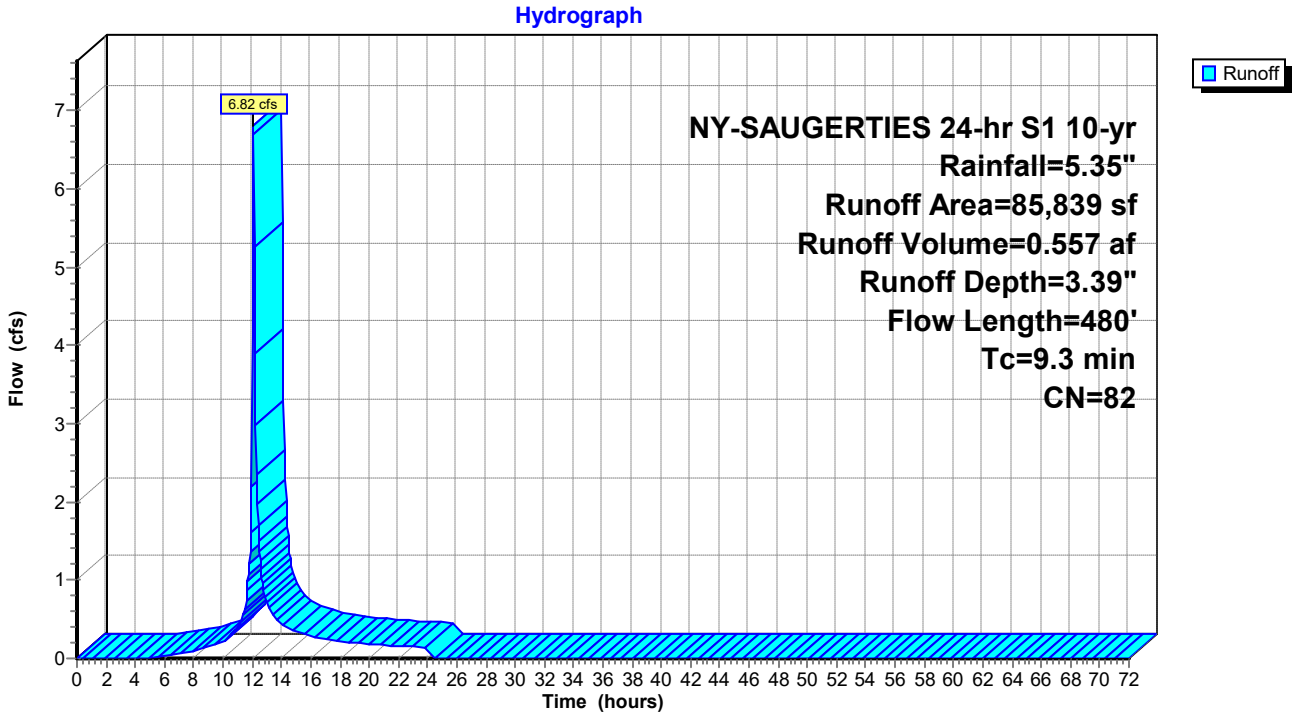
Runoff = 6.82 cfs @ 12.08 hrs, Volume= 0.557 af, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	52,694	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	22,447	80	>75% Grass cover, Good, HSG D
*	7,814	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	85,839	82	Weighted Average
	75,141		87.54% Pervious Area
	10,698		12.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	10	0.0500	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
0.6	50	0.0300	1.45		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.38"
2.5	30	0.0500	0.20		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.38"
2.3	10	0.0500	0.07		**Sheet Flow, D-E** Woods: Light underbrush n= 0.400 P2= 3.38"
1.2	70	0.0360	0.95		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
1.7	310	0.0420	3.07		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
9.3	480	Total			

Subcatchment 1J: DRAINAGE AREA 1J



Summary for Subcatchment 1K: DRAINAGE AREA 1K

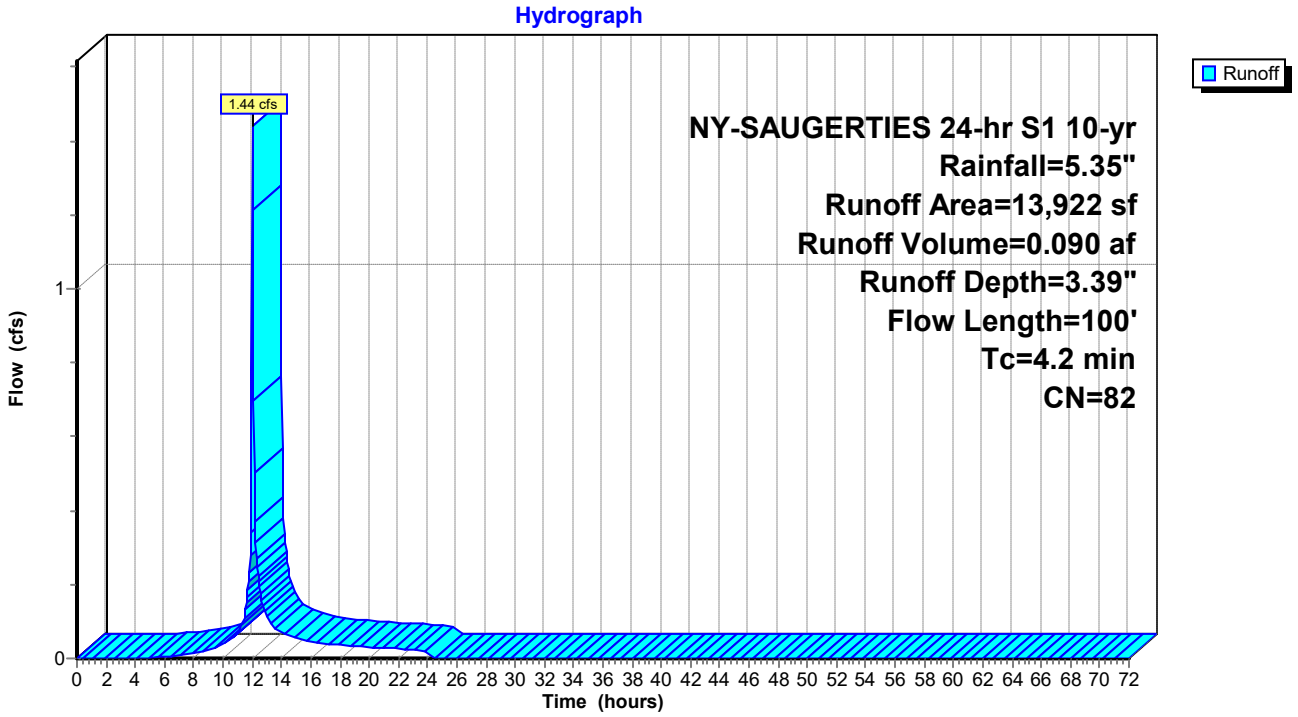
Runoff = 1.44 cfs @ 12.01 hrs, Volume= 0.090 af, Depth= 3.39"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	12,099	80	>75% Grass cover, Good, HSG D
*	1,823	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	13,922	82	Weighted Average
	12,099		86.91% Pervious Area
	1,823		13.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	15	0.0330	1.18		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
4.0	85	0.1290	0.36		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
4.2	100	Total			

Subcatchment 1K: DRAINAGE AREA 1K



Summary for Subcatchment 1L: DRAINAGE AREA 1L

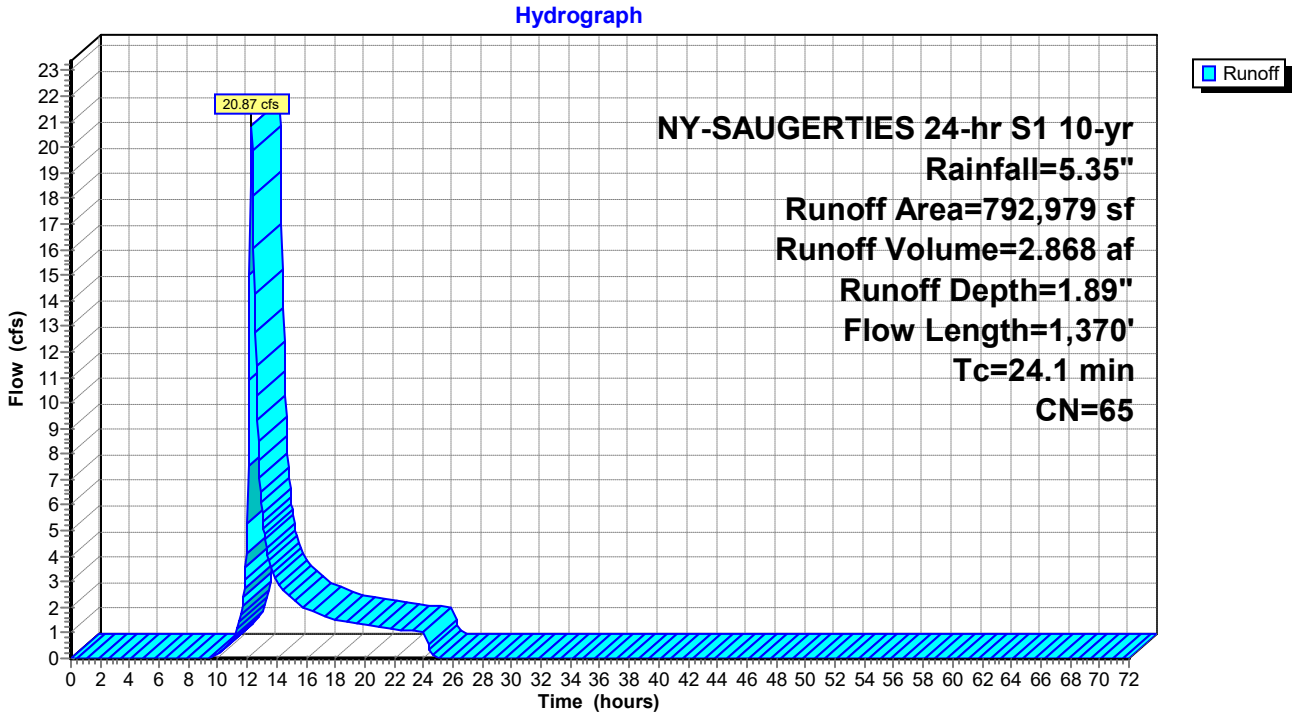
Runoff = 20.87 cfs @ 12.29 hrs, Volume= 2.868 af, Depth= 1.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	162,840	36	Woods, Fair, HSG A
	218,251	60	Woods, Fair, HSG B
	3,820	73	Woods, Fair, HSG C
	357,922	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	2,373	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	30,455	80	>75% Grass cover, Good, HSG D
*	11,550	98	Paved roads w/curbs & sewers, HSG A-D
*	5,768	98	Roofs, HSG A-D
	792,979	65	Weighted Average
	775,661		97.82% Pervious Area
	17,318		2.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.1400	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
3.3	310	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
11.2	960	0.0090	1.42		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
24.1	1,370	Total			

Subcatchment 1L: DRAINAGE AREA 1L



Summary for Subcatchment 1M: DRAINAGE AREA 1M

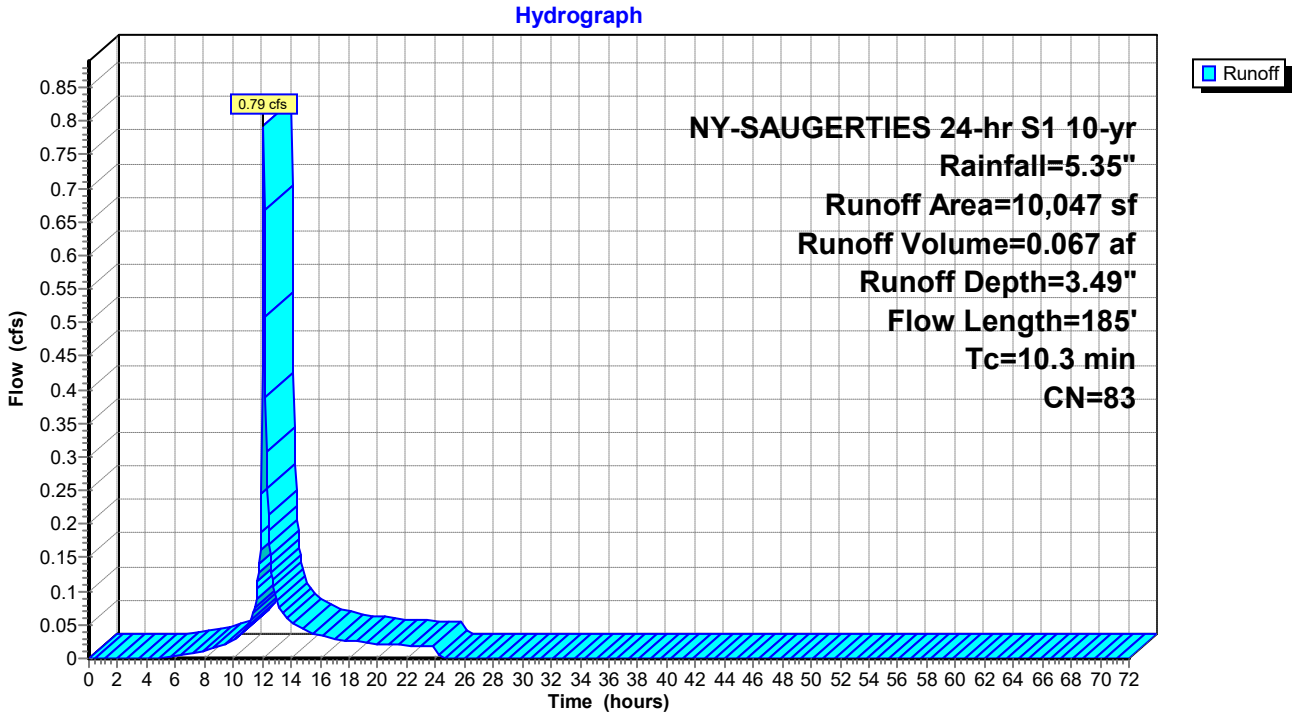
Runoff = 0.79 cfs @ 12.10 hrs, Volume= 0.067 af, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	3,810	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	4,526	80	>75% Grass cover, Good, HSG D
*	1,711	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	10,047	83	Weighted Average
	8,336		82.97% Pervious Area
	1,711		17.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0330	1.09		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
2.4	20	0.0250	0.14		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
7.0	65	0.1310	0.16		**Sheet Flow, C-D** Woods: Light underbrush n= 0.400 P2= 3.38"
0.7	90	0.0220	2.22		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
10.3	185	Total			

Subcatchment 1M: DRAINAGE AREA 1M



Summary for Subcatchment 2A: DRAINAGE AREA 2A

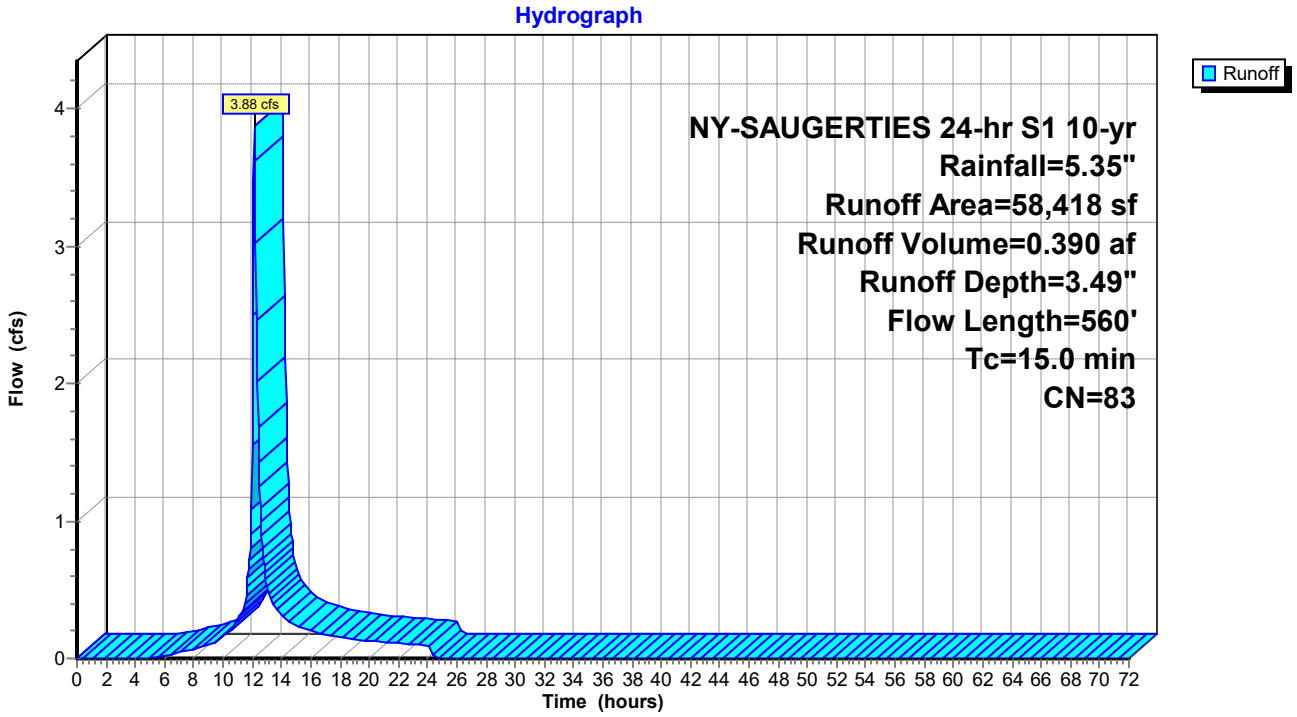
Runoff = 3.88 cfs @ 12.16 hrs, Volume= 0.390 af, Depth= 3.49"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	22,949	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	24,787	80	>75% Grass cover, Good, HSG D
*	7,798	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	58,418	83	Weighted Average
	47,736		81.71% Pervious Area
	10,682		18.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	7	0.0710	1.38		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
7.5	93	0.0320	0.21		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.8	150	0.0430	3.11		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
6.4	280	0.0210	0.72		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.2	30	0.0330	2.72		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
15.0	560	Total			

Subcatchment 2A: DRAINAGE AREA 2A



Summary for Subcatchment 2B: DRAINAGE AREA 2B

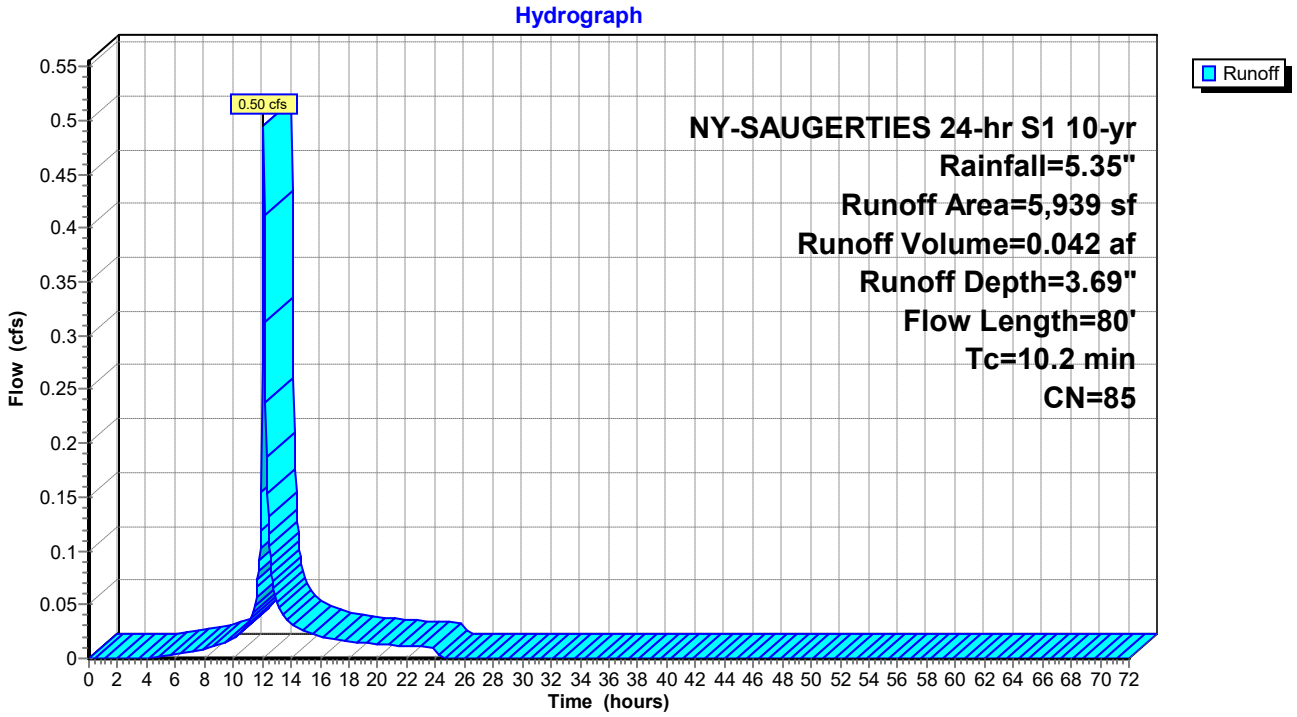
Runoff = 0.50 cfs @ 12.09 hrs, Volume= 0.042 af, Depth= 3.69"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	1,167	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,008	80	>75% Grass cover, Good, HSG D
*	1,764	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,939	85	Weighted Average
	4,175		70.30% Pervious Area
	1,764		29.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	35	0.0290	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.4	45	0.1330	0.32		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
10.2	80	Total			

Subcatchment 2B: DRAINAGE AREA 2B



Summary for Subcatchment 2C: DRAINAGE AREA 2C

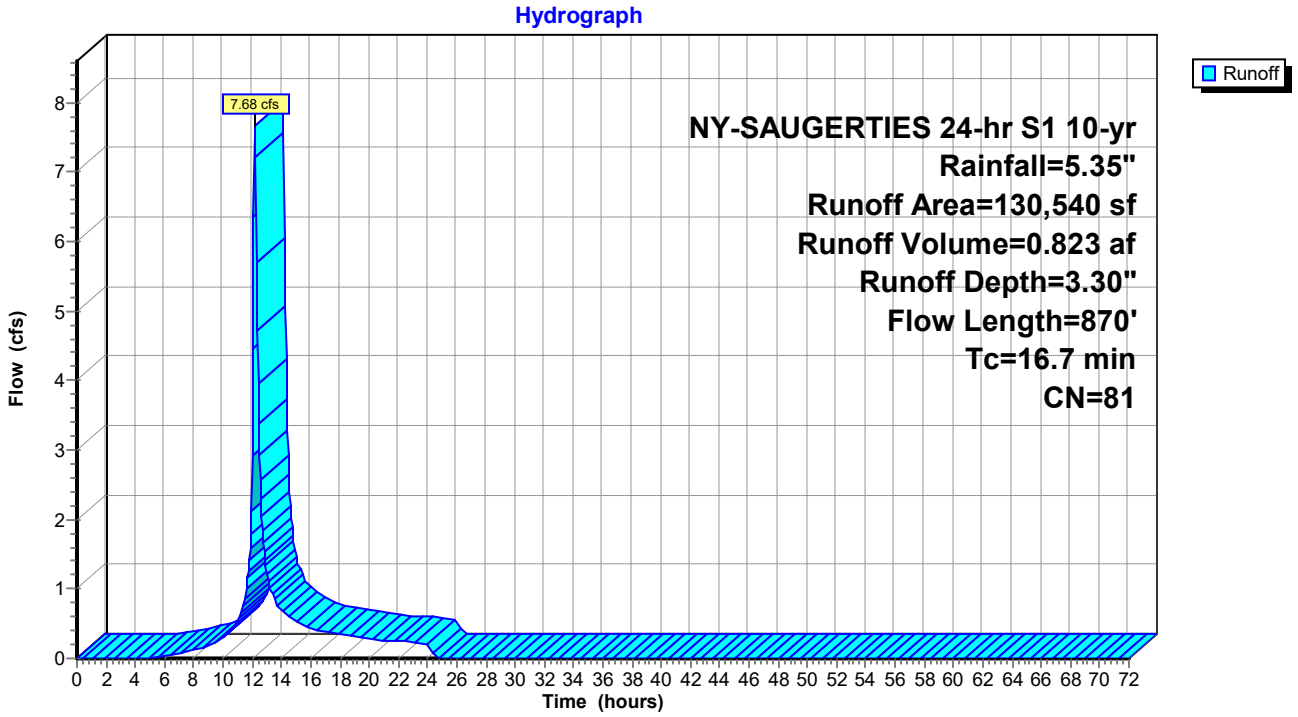
Runoff = 7.68 cfs @ 12.18 hrs, Volume= 0.823 af, Depth= 3.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	92,203	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	28,020	80	>75% Grass cover, Good, HSG D
*	10,317	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	130,540	81	Weighted Average
	120,223		92.10% Pervious Area
	10,317		7.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0900	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.7	210	0.0190	2.07		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
0.1	30	0.1670	6.13		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
3.5	530	0.0280	2.51		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
16.7	870	Total			

Subcatchment 2C: DRAINAGE AREA 2C



Summary for Subcatchment 2D: DRAINAGE AREA 2D

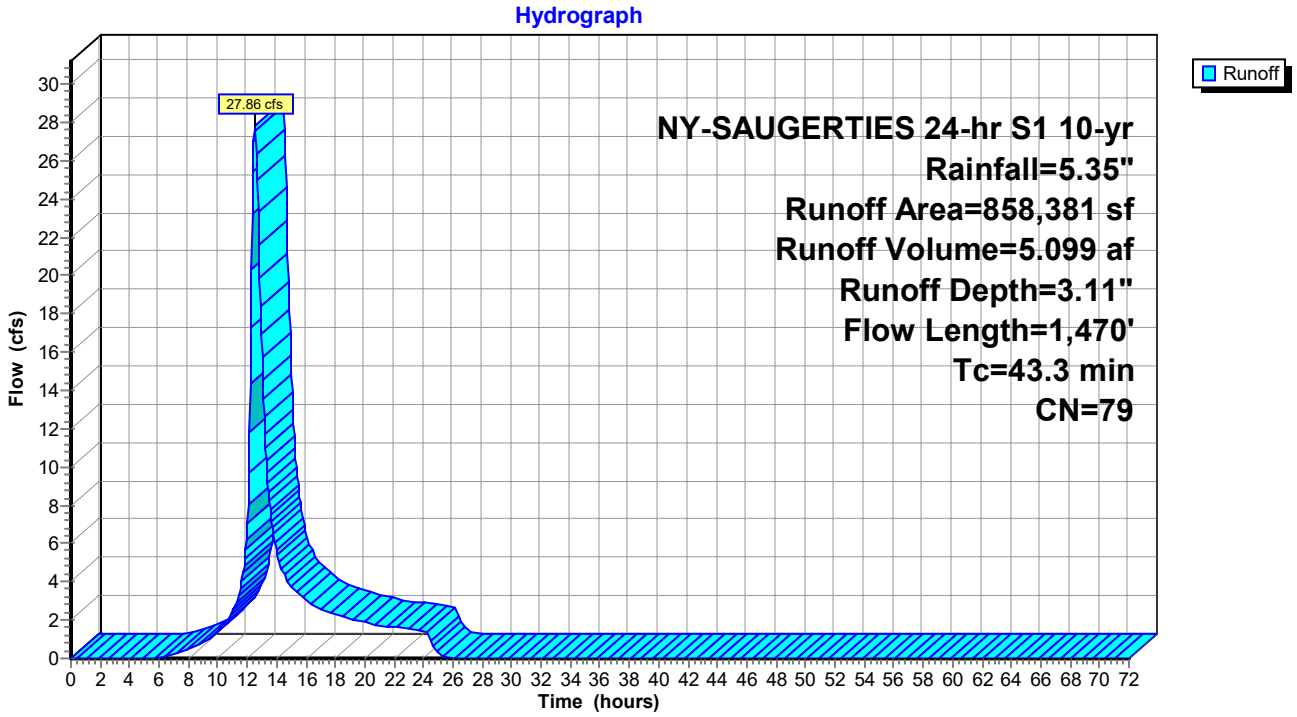
Runoff = 27.86 cfs @ 12.54 hrs, Volume= 5.099 af, Depth= 3.11"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	34,292	73	Woods, Fair, HSG C
	808,098	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	3,863	74	>75% Grass cover, Good, HSG C
	7,734	80	>75% Grass cover, Good, HSG D
*	4,394	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	858,381	79	Weighted Average
	853,987		99.49% Pervious Area
	4,394		0.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1300	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
0.6	50	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
32.8	1,320	0.0180	0.67		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
43.3	1,470	Total			

Subcatchment 2D: DRAINAGE AREA 2D



Summary for Subcatchment 2E: DRAINAGE AREA 18

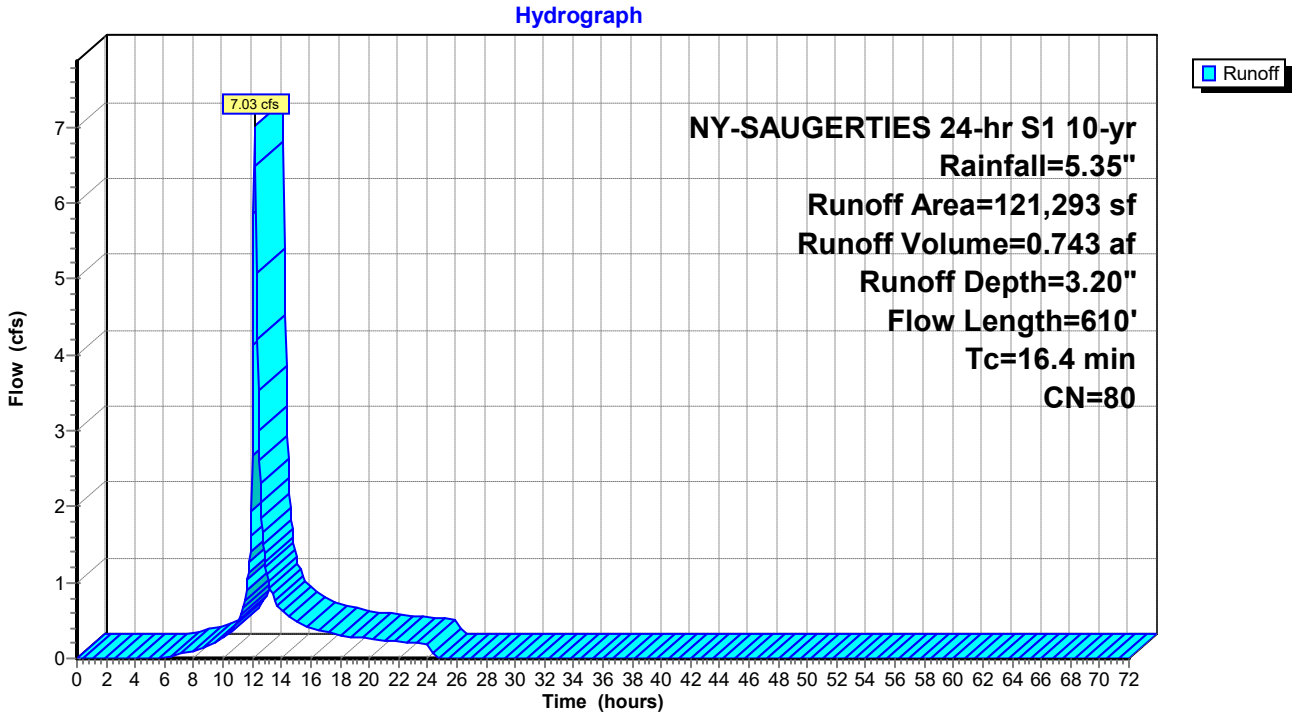
Runoff = 7.03 cfs @ 12.17 hrs, Volume= 0.743 af, Depth= 3.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	23,515	73	Woods, Fair, HSG C
	54,460	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	3,737	74	>75% Grass cover, Good, HSG C
	25,044	80	>75% Grass cover, Good, HSG D
*	11,653	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	121,293	80	Weighted Average
	106,756		88.01% Pervious Area
	14,537		11.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0830	1.42		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
6.1	94	0.0530	0.25		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.8	220	0.2270	4.76		**Shallow Concentrated Flow, C-D** Nearly Bare & Untilled Kv= 10.0 fps
0.1	40	0.2000	6.71		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
9.3	250	0.0080	0.45		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
16.4	610	Total			

Subcatchment 2E: DRAINAGE AREA 18



Summary for Subcatchment 2F: DRAINAGE AREA 2F

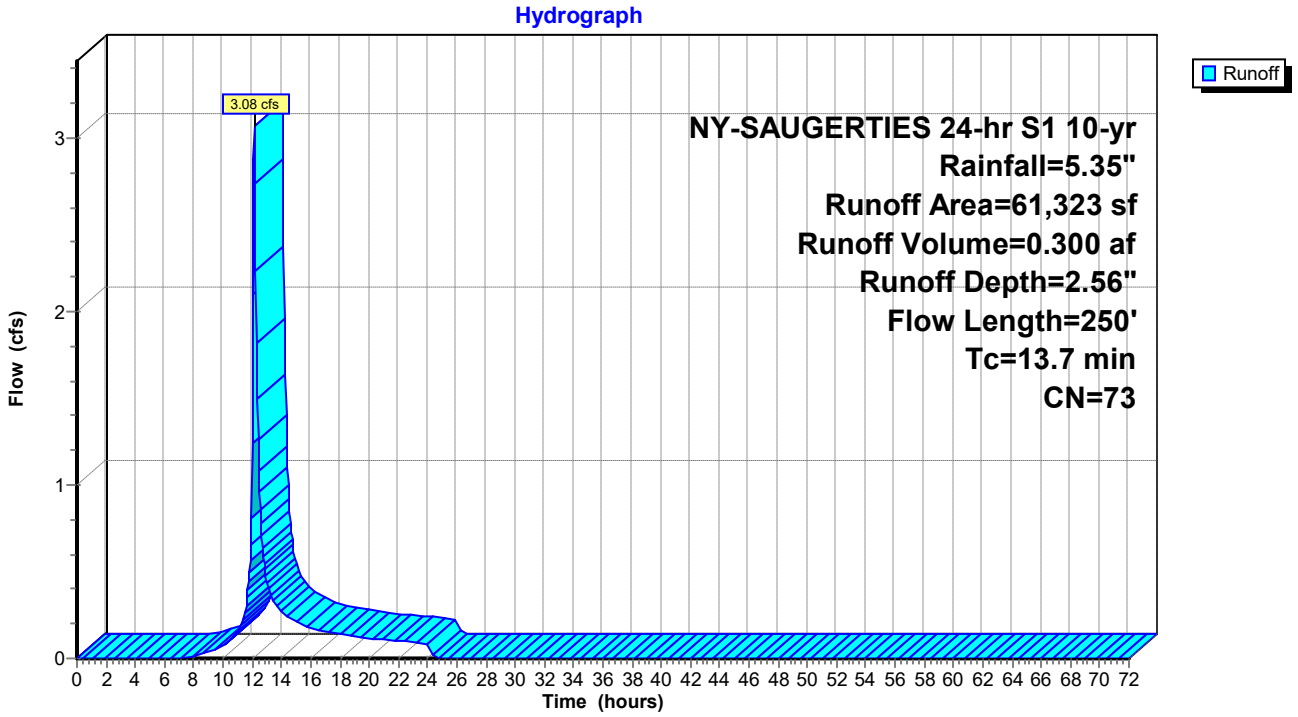
Runoff = 3.08 cfs @ 12.14 hrs, Volume= 0.300 af, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	5,624	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	4,622	73	Woods, Fair, HSG C
	47,954	79	Woods, Fair, HSG D
	3,123	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
*	0	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	61,323	73	Weighted Average
	61,323		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0800	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.7	150	0.0870	1.47		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
13.7	250	Total			

Subcatchment 2F: DRAINAGE AREA 2F



Summary for Subcatchment 2G: DRAINAGE AREA 2G

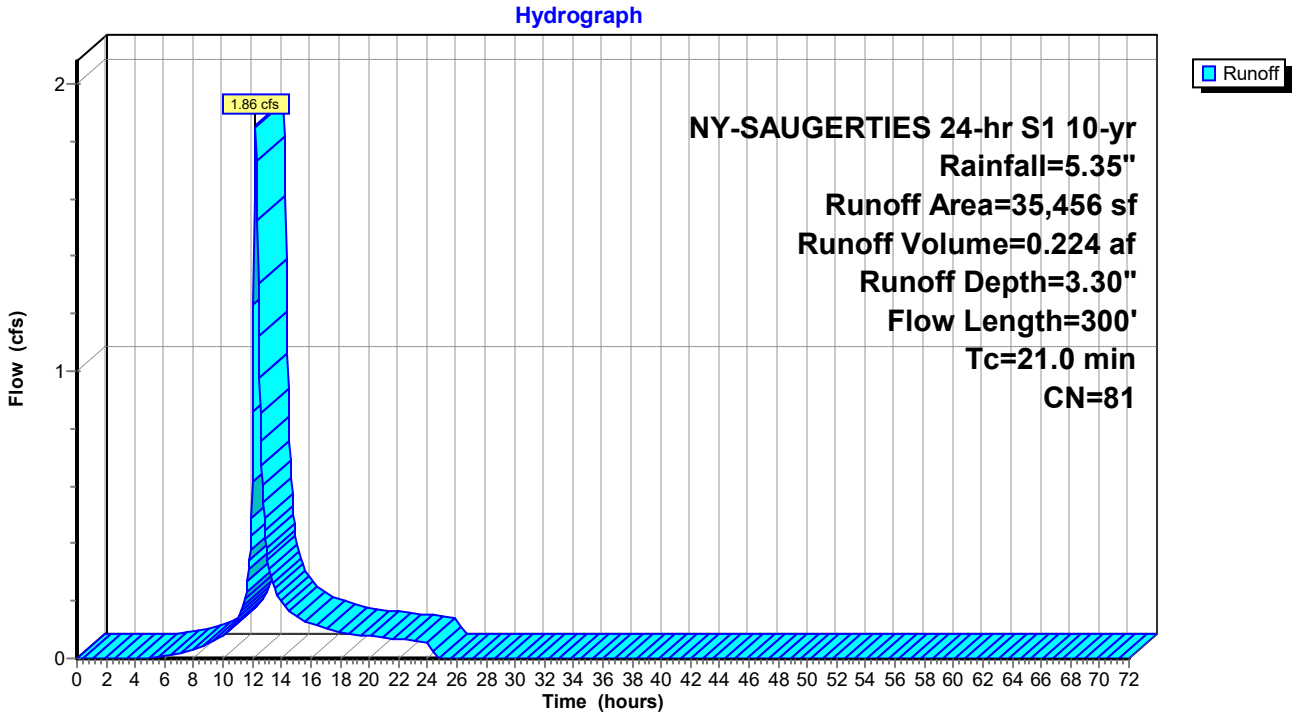
Runoff = 1.86 cfs @ 12.24 hrs, Volume= 0.224 af, Depth= 3.30"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	27,880	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	4,802	80	>75% Grass cover, Good, HSG D
*	2,774	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	35,456	81	Weighted Average
	32,682		92.18% Pervious Area
	2,774		7.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0300	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
3.1	190	0.0420	1.02		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	10	0.0300	2.60		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
21.0	300	Total			

Subcatchment 2G: DRAINAGE AREA 2G



Summary for Subcatchment 3: DRAINAGE AREA 3

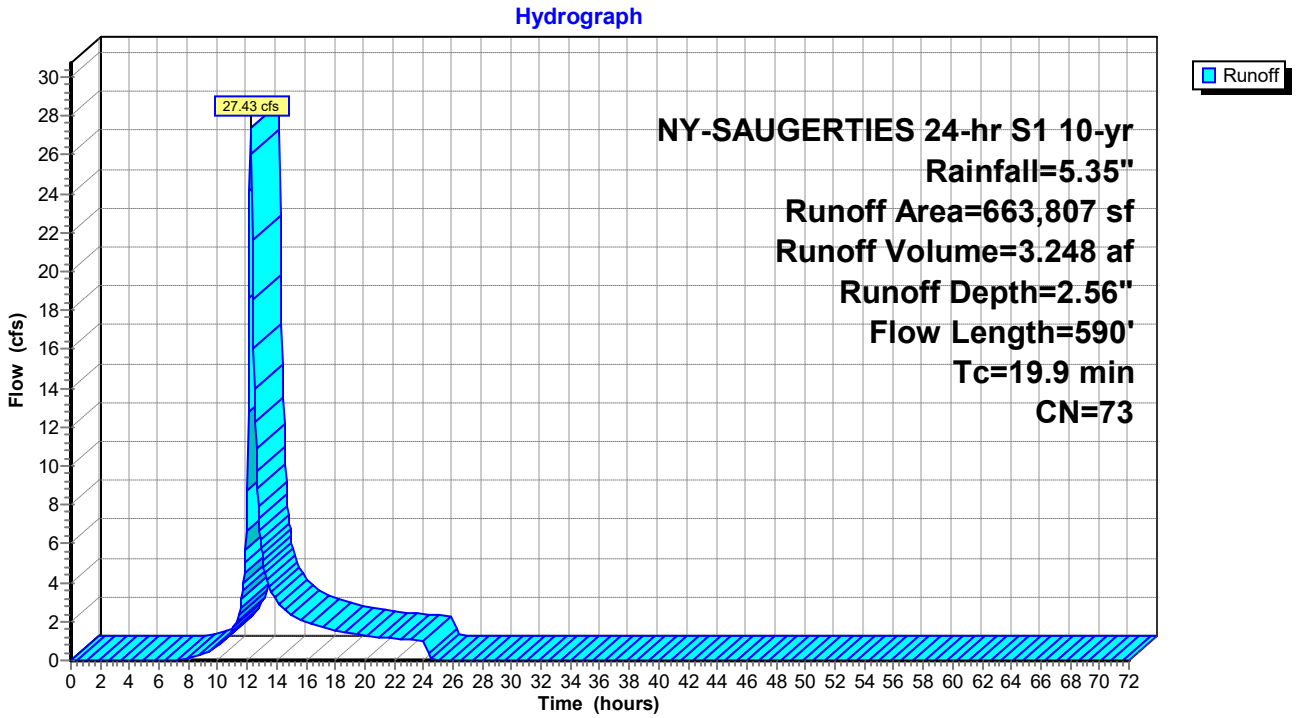
Runoff = 27.43 cfs @ 12.23 hrs, Volume= 3.248 af, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
663,807	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
663,807	73	Weighted Average
663,807		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.4	490	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	590	Total			

Subcatchment 3: DRAINAGE AREA 3



Summary for Subcatchment 4: DRAINAGE AREA 4

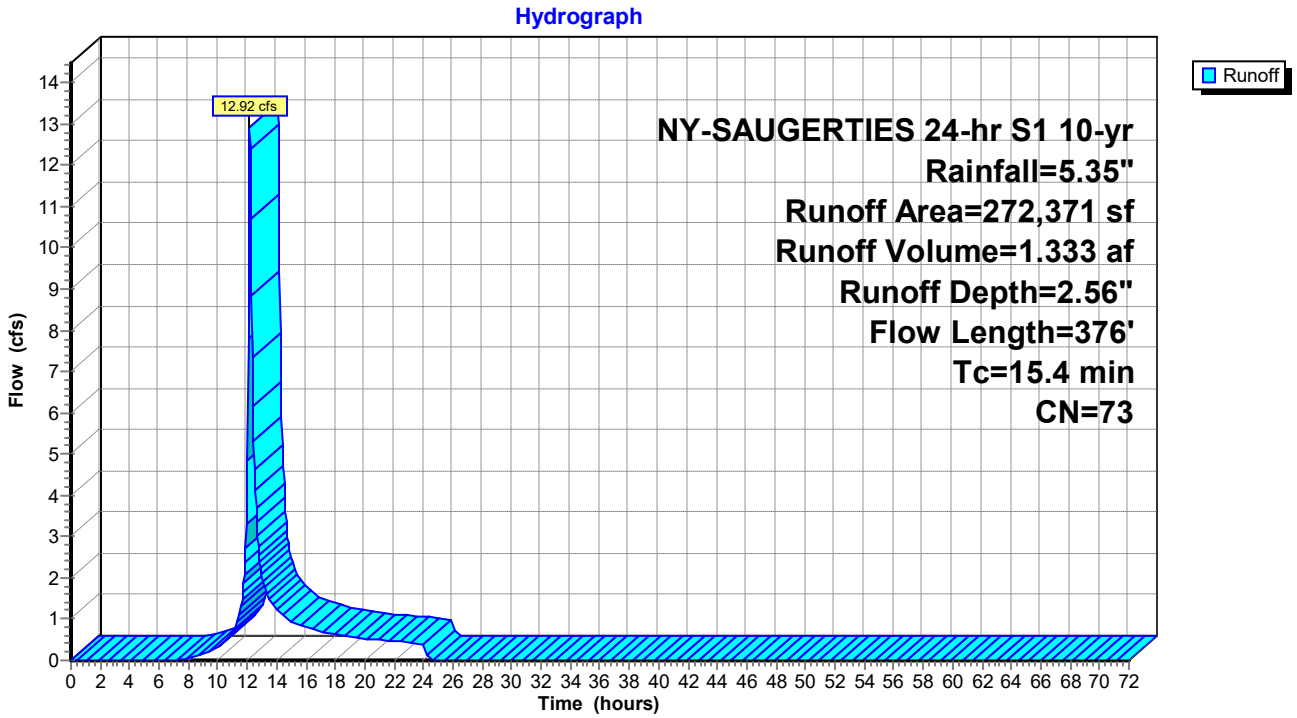
Runoff = 12.92 cfs @ 12.17 hrs, Volume= 1.333 af, Depth= 2.56"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
272,371	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
272,371	73	Weighted Average
272,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0700	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.7	276	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.4	376	Total			

Subcatchment 4: DRAINAGE AREA 4



Summary for Subcatchment 5: DRAINAGE AREA 5

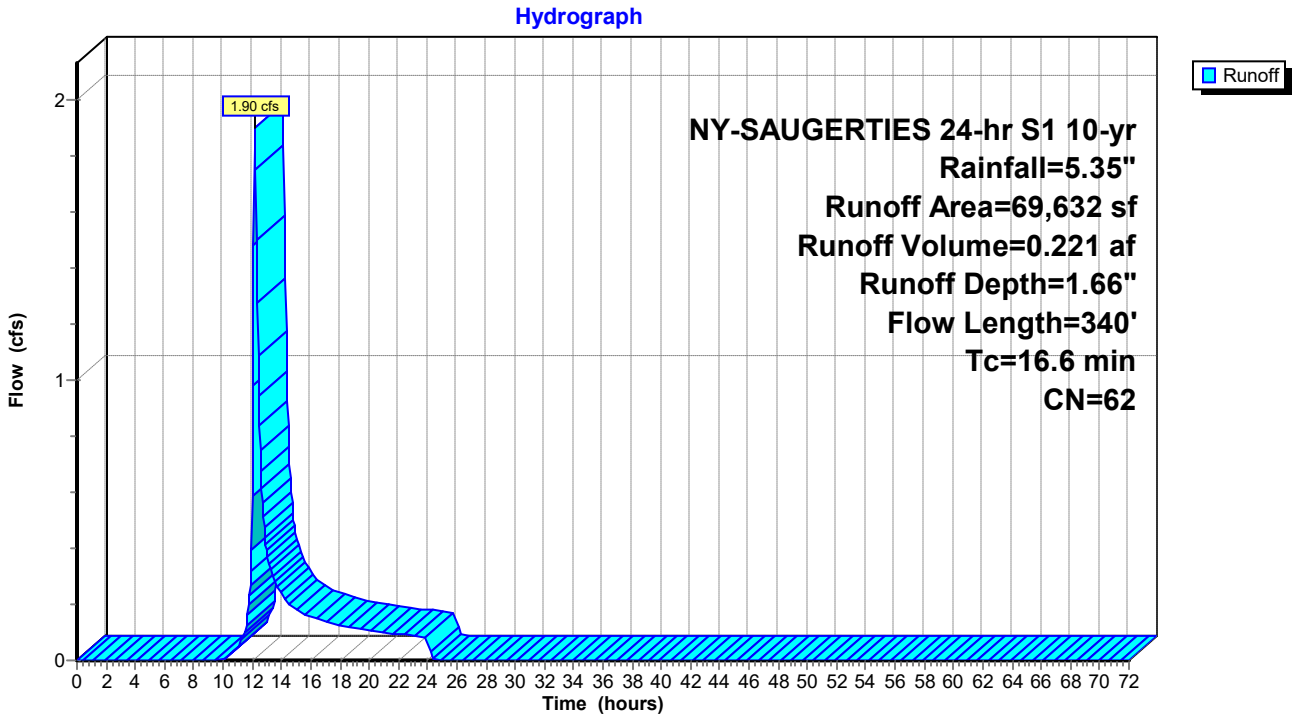
Runoff = 1.90 cfs @ 12.19 hrs, Volume= 0.221 af, Depth= 1.66"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 10-yr Rainfall=5.35"

Area (sf)	CN	Description
27,631	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
42,001	79	Woods, Fair, HSG D
69,632	62	Weighted Average
69,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0540	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.6	240	0.0930	1.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.6	340	Total			

Subcatchment 5: DRAINAGE AREA 5



Summary for Pond AC1: ARCH CULVERT

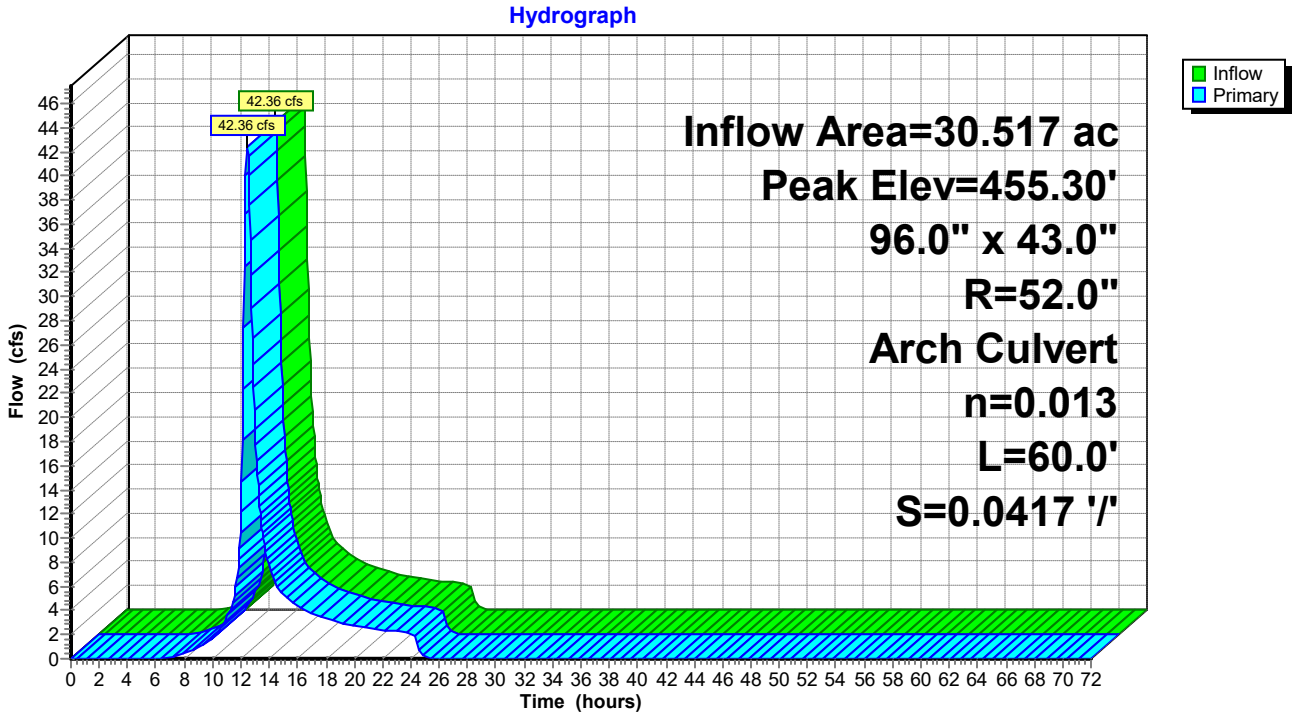
Inflow Area = 30.517 ac, 3.65% Impervious, Inflow Depth = 2.84" for 10-yr event
Inflow = 42.36 cfs @ 12.44 hrs, Volume= 7.230 af
Outflow = 42.36 cfs @ 12.44 hrs, Volume= 7.230 af, Atten= 0%, Lag= 0.0 min
Primary = 42.36 cfs @ 12.44 hrs, Volume= 7.230 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 455.30' @ 12.44 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	453.90'	**96.0" W x 43.0" H, R=52.0" Arch Culvert** L= 60.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 453.90' / 451.40' S= 0.0417 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 22.75 sf

Primary OutFlow Max=42.30 cfs @ 12.44 hrs HW=455.30' (Free Discharge)
└**1=Culvert** (Inlet Controls 42.30 cfs @ 3.82 fps)

Pond AC1: ARCH CULVERT



Summary for Pond AC2: ARCH CULVERT

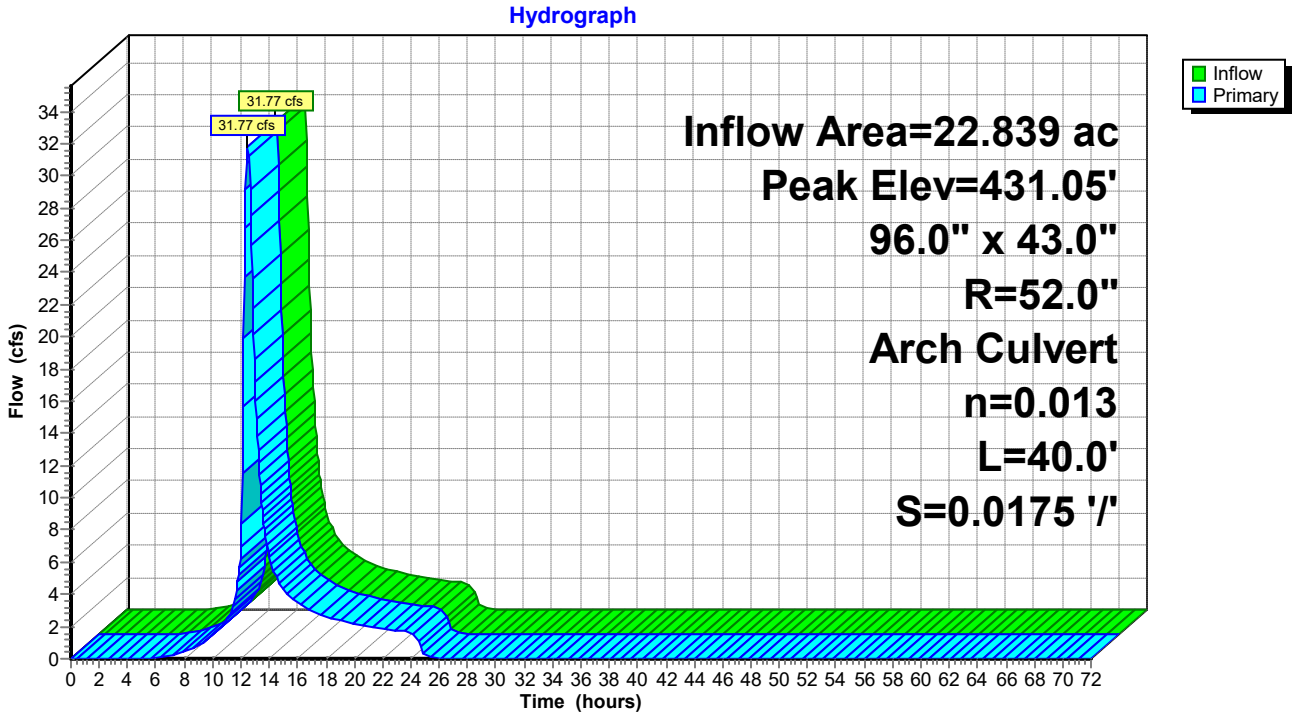
Inflow Area = 22.839 ac, 1.66% Impervious, Inflow Depth = 3.04" for 10-yr event
Inflow = 31.77 cfs @ 12.49 hrs, Volume= 5.782 af
Outflow = 31.77 cfs @ 12.49 hrs, Volume= 5.782 af, Atten= 0%, Lag= 0.0 min
Primary = 31.77 cfs @ 12.49 hrs, Volume= 5.782 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 431.05' @ 12.49 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	429.90'	**96.0" W x 43.0" H, R=52.0" Arch Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 429.90' / 429.20' S= 0.0175 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 22.75 sf

Primary OutFlow Max=31.72 cfs @ 12.49 hrs HW=431.05' (Free Discharge)
└**1=Culvert** (Inlet Controls 31.72 cfs @ 3.45 fps)

Pond AC2: ARCH CULVERT



Summary for Pond BR1-C7: BIO-RET POND 1

Inflow Area = 4.967 ac, 10.94% Impervious, Inflow Depth = 2.92" for 10-yr event
Inflow = 6.46 cfs @ 12.37 hrs, Volume= 1.208 af
Outflow = 6.45 cfs @ 12.38 hrs, Volume= 1.208 af, Atten= 0%, Lag= 1.0 min
Primary = 6.45 cfs @ 12.38 hrs, Volume= 1.208 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 477.57' @ 12.38 hrs Surf.Area= 431 sf Storage= 442 cf

Plug-Flow detention time= 7.6 min calculated for 1.208 af (100% of inflow)
Center-of-Mass det. time= 8.5 min (885.7 - 877.3)

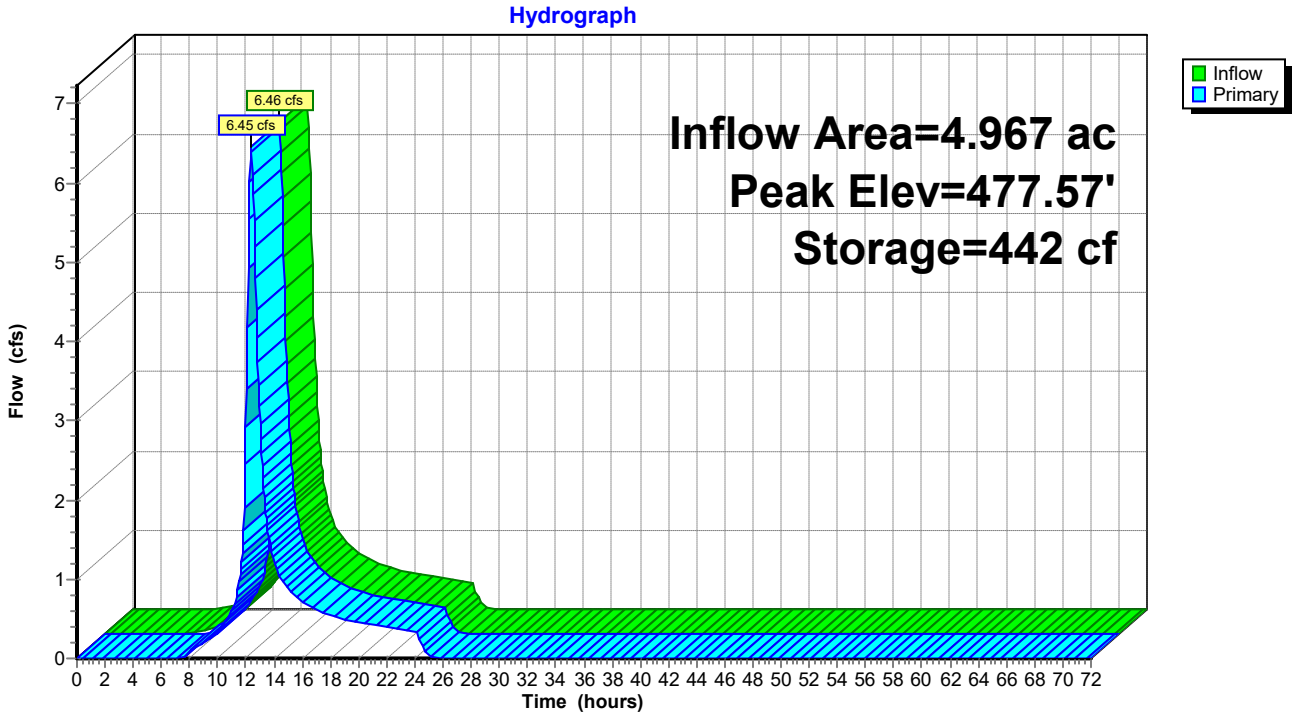
Volume	Invert	Avail.Storage	Storage Description
#1	476.00'	2,275 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
476.00	154	0	0	154
478.00	531	647	647	551
480.00	1,134	1,627	2,275	1,187

Device	Routing	Invert	Outlet Devices
#1	Primary	474.00'	**18.0" Round Culvert** L= 280.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 474.00' / 470.00' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	477.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	476.00'	**0.500 in/hr Exfiltration over Wetted area above 474.00'** Conductivity to Groundwater Elevation = 446.00' Excluded Wetted area = 0 sf

Primary OutFlow Max=6.43 cfs @ 12.38 hrs HW=477.57' (Free Discharge)
└─**1=Culvert** (Passes 6.43 cfs of 11.28 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 6.43 cfs @ 3.64 fps)
  └─**3=Exfiltration** (Controls 0.01 cfs)

Pond BR1-C7: BIO-RET POND 1



Summary for Pond BR2-C14: BIO-RET POND 2

Inflow Area = 2.923 ac, 12.07% Impervious, Inflow Depth = 3.37" for 10-yr event
Inflow = 9.09 cfs @ 12.08 hrs, Volume= 0.822 af
Outflow = 6.95 cfs @ 12.17 hrs, Volume= 0.822 af, Atten= 23%, Lag= 5.4 min
Primary = 6.95 cfs @ 12.17 hrs, Volume= 0.822 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 458.16' @ 12.17 hrs Surf.Area= 4,624 sf Storage= 8,265 cf

Plug-Flow detention time= 288.5 min calculated for 0.822 af (100% of inflow)
Center-of-Mass det. time= 288.3 min (1,128.7 - 840.4)

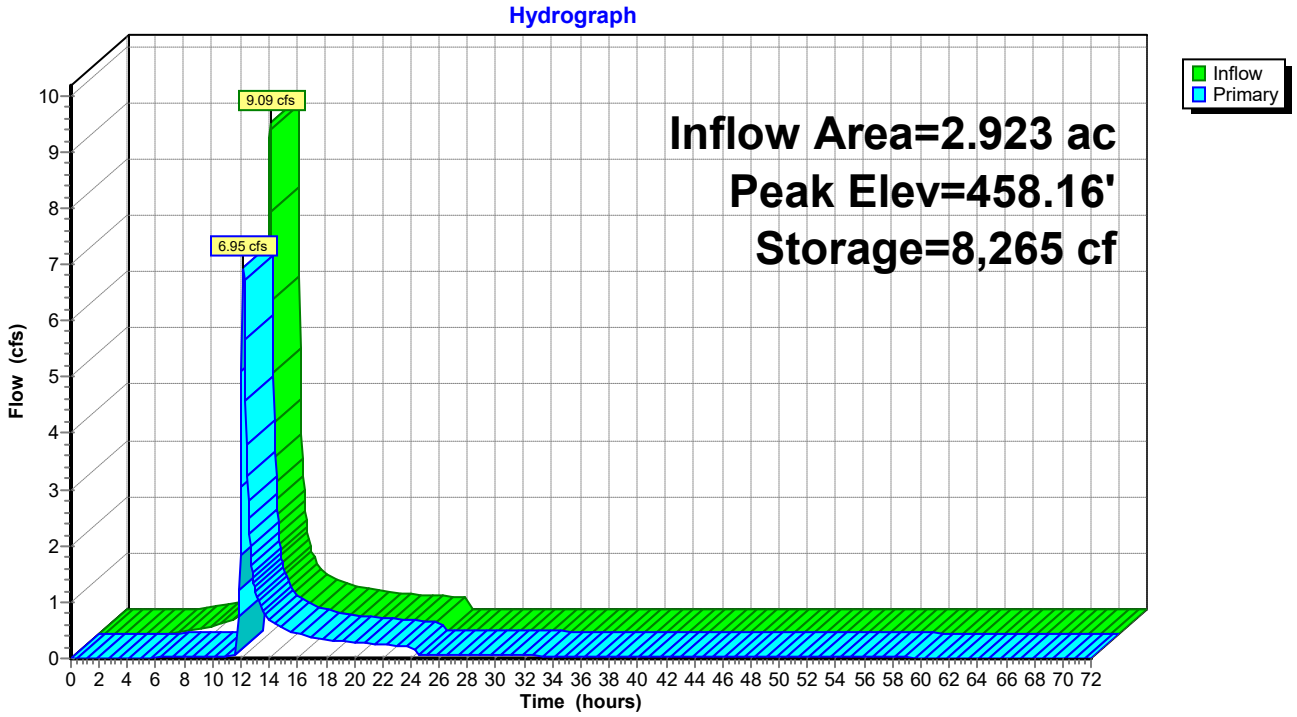
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	18,159 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
456.00	3,090	217.0	0	0	3,090
458.00	4,505	254.7	7,551	7,551	4,582
460.00	6,146	292.4	10,609	18,159	6,312

Device	Routing	Invert	Outlet Devices
#1	Primary	454.00'	**18.0" Round Culvert** L= 38.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 454.00' / 452.00' S= 0.0526 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	457.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	456.00'	**0.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 432.00'

Primary OutFlow Max=6.91 cfs @ 12.17 hrs HW=458.15' (Free Discharge)
└─**1=Culvert** (Passes 6.91 cfs of 15.69 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 6.85 cfs @ 3.88 fps)
  └─**3=Exfiltration** (Controls 0.06 cfs)

Pond BR2-C14: BIO-RET POND 2



Summary for Pond C1: 24" CULVERT

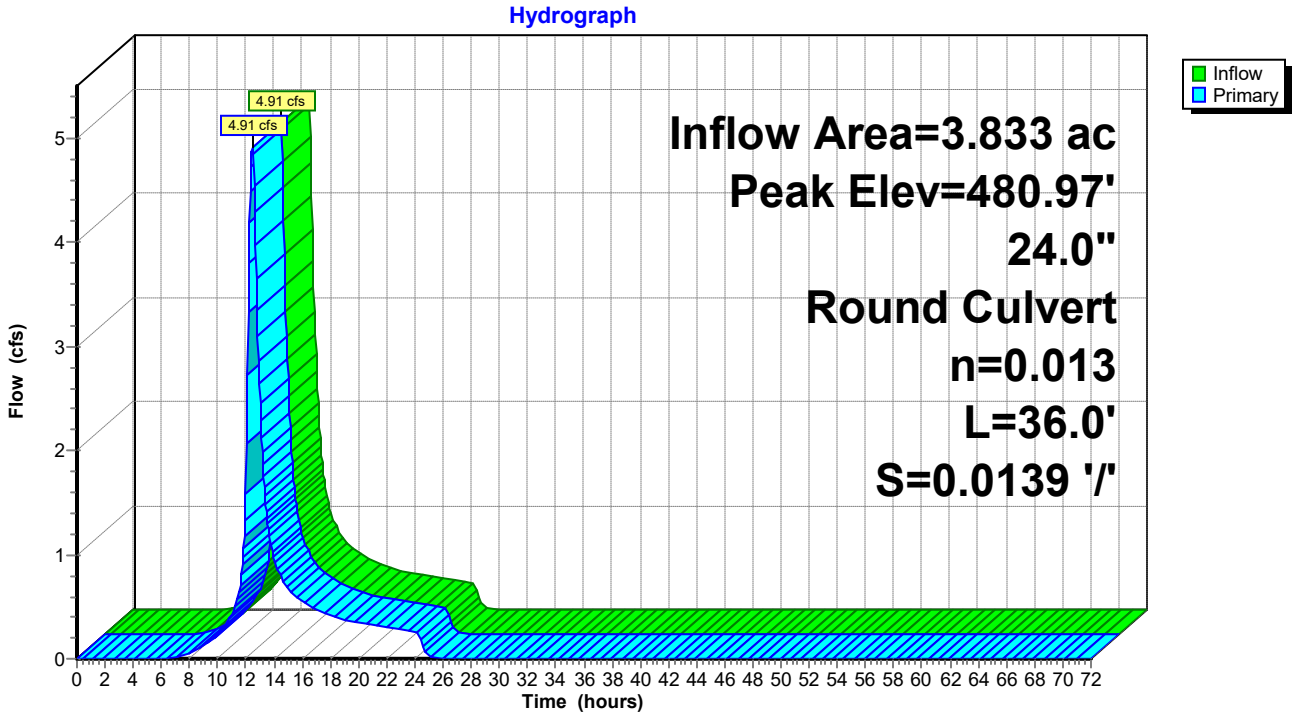
Inflow Area = 3.833 ac, 9.00% Impervious, Inflow Depth = 2.87" for 10-yr event
Inflow = 4.91 cfs @ 12.45 hrs, Volume= 0.918 af
Outflow = 4.91 cfs @ 12.45 hrs, Volume= 0.918 af, Atten= 0%, Lag= 0.0 min
Primary = 4.91 cfs @ 12.45 hrs, Volume= 0.918 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 480.97' @ 12.45 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	480.00'	**24.0" Round Culvert** L= 36.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 480.00' / 479.50' S= 0.0139 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=4.91 cfs @ 12.45 hrs HW=480.97' (Free Discharge)
└**1=Culvert** (Barrel Controls 4.91 cfs @ 4.76 fps)

Pond C1: 24" CULVERT



Summary for Pond C10: 15" CULVERT

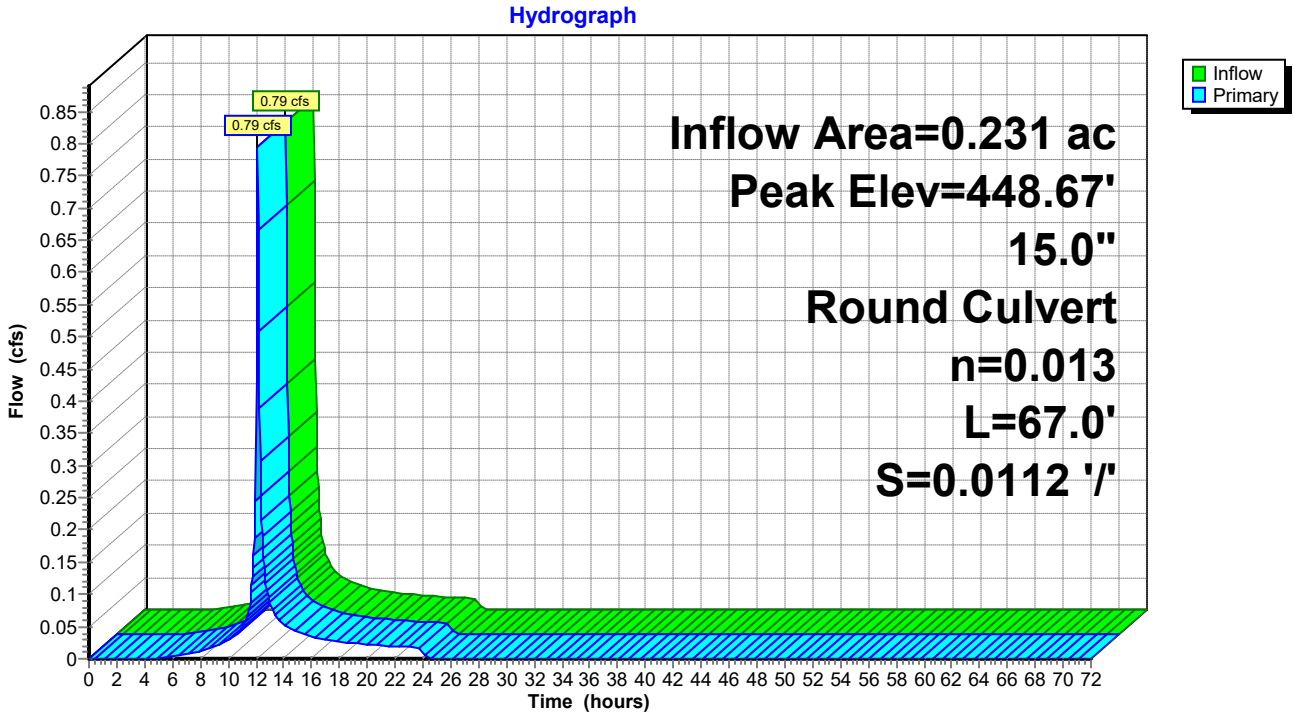
Inflow Area = 0.231 ac, 17.03% Impervious, Inflow Depth = 3.49" for 10-yr event
Inflow = 0.79 cfs @ 12.10 hrs, Volume= 0.067 af
Outflow = 0.79 cfs @ 12.10 hrs, Volume= 0.067 af, Atten= 0%, Lag= 0.0 min
Primary = 0.79 cfs @ 12.10 hrs, Volume= 0.067 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 448.67' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	448.25'	**15.0" Round Culvert** L= 67.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 448.25' / 447.50' S= 0.0112 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.79 cfs @ 12.10 hrs HW=448.67' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.79 cfs @ 2.20 fps)

Pond C10: 15" CULVERT



Summary for Pond C11: 12" CULVERT

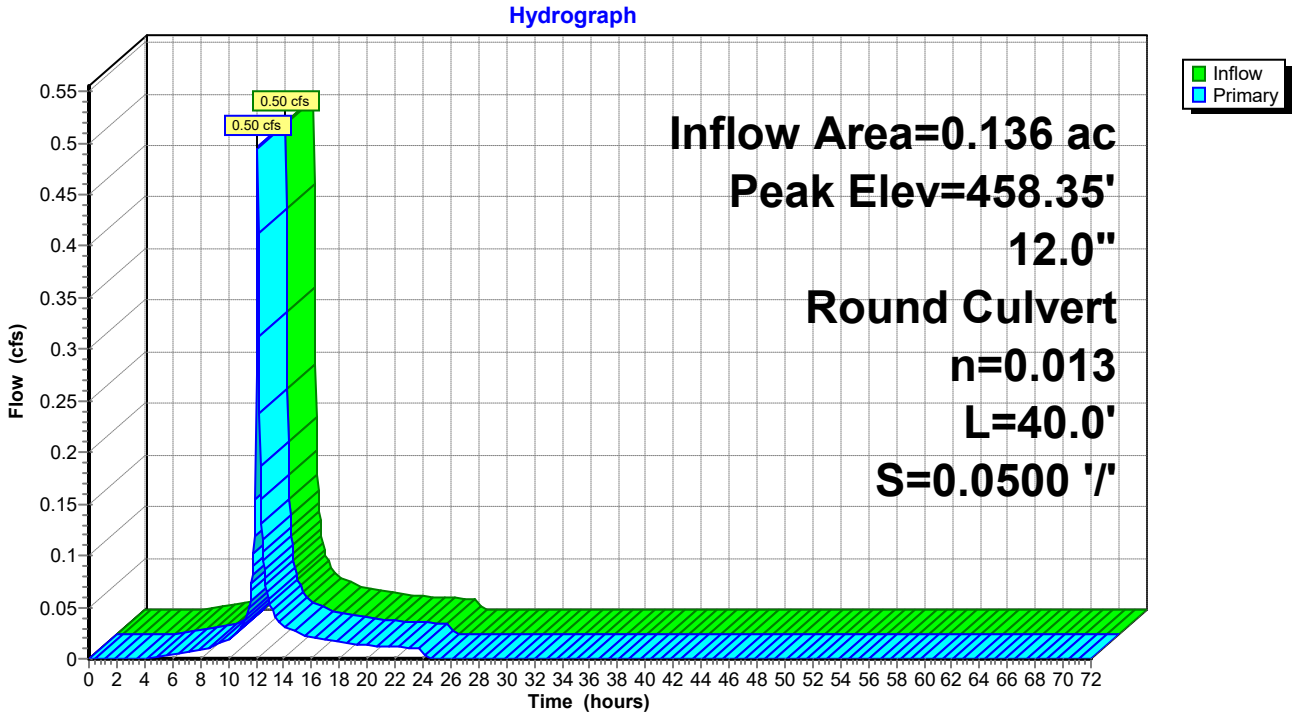
Inflow Area = 0.136 ac, 29.70% Impervious, Inflow Depth = 3.69" for 10-yr event
Inflow = 0.50 cfs @ 12.09 hrs, Volume= 0.042 af
Outflow = 0.50 cfs @ 12.09 hrs, Volume= 0.042 af, Atten= 0%, Lag= 0.0 min
Primary = 0.50 cfs @ 12.09 hrs, Volume= 0.042 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 458.35' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	458.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 458.00' / 456.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.49 cfs @ 12.09 hrs HW=458.35' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.49 cfs @ 2.01 fps)

Pond C11: 12" CULVERT



Summary for Pond C12: 24" CULVERT

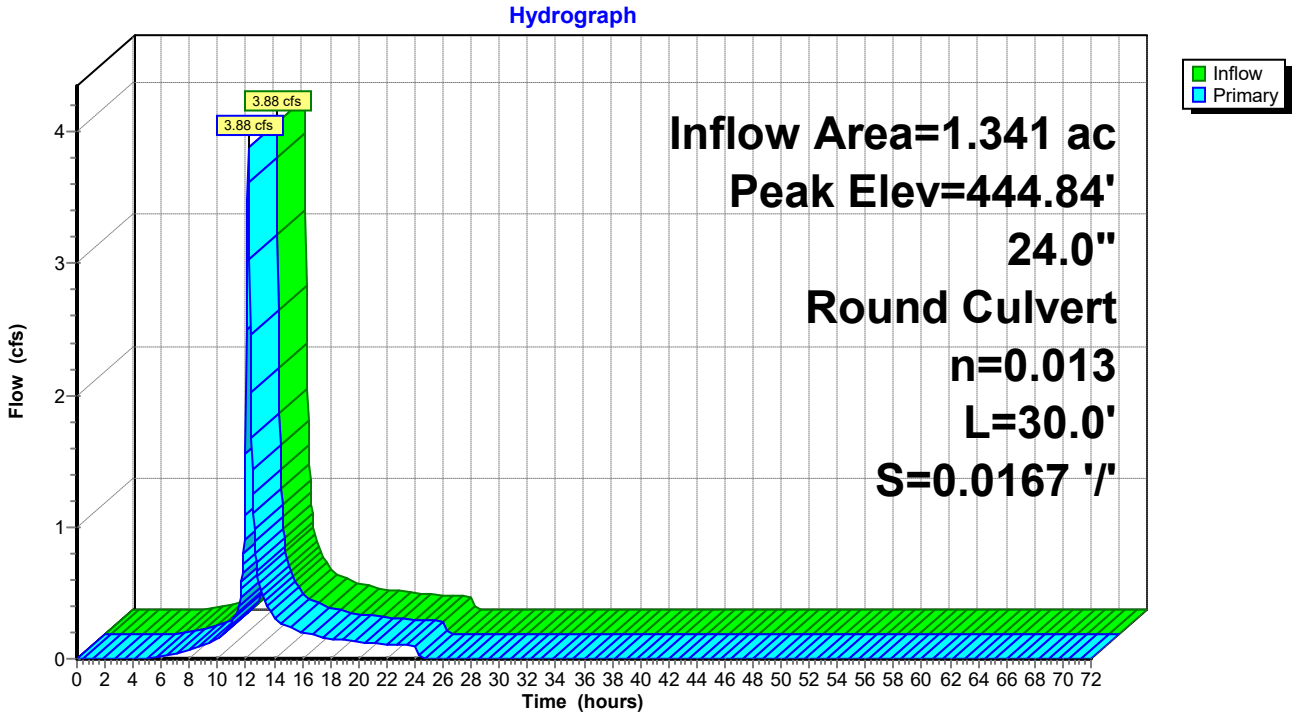
Inflow Area = 1.341 ac, 18.29% Impervious, Inflow Depth = 3.49" for 10-yr event
Inflow = 3.88 cfs @ 12.16 hrs, Volume= 0.390 af
Outflow = 3.88 cfs @ 12.16 hrs, Volume= 0.390 af, Atten= 0%, Lag= 0.0 min
Primary = 3.88 cfs @ 12.16 hrs, Volume= 0.390 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 444.84' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	444.00'	**24.0" Round Culvert** L= 30.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 444.00' / 443.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=3.85 cfs @ 12.16 hrs HW=444.83' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.85 cfs @ 3.11 fps)

Pond C12: 24" CULVERT



Summary for Pond C13: 18" CULVERT

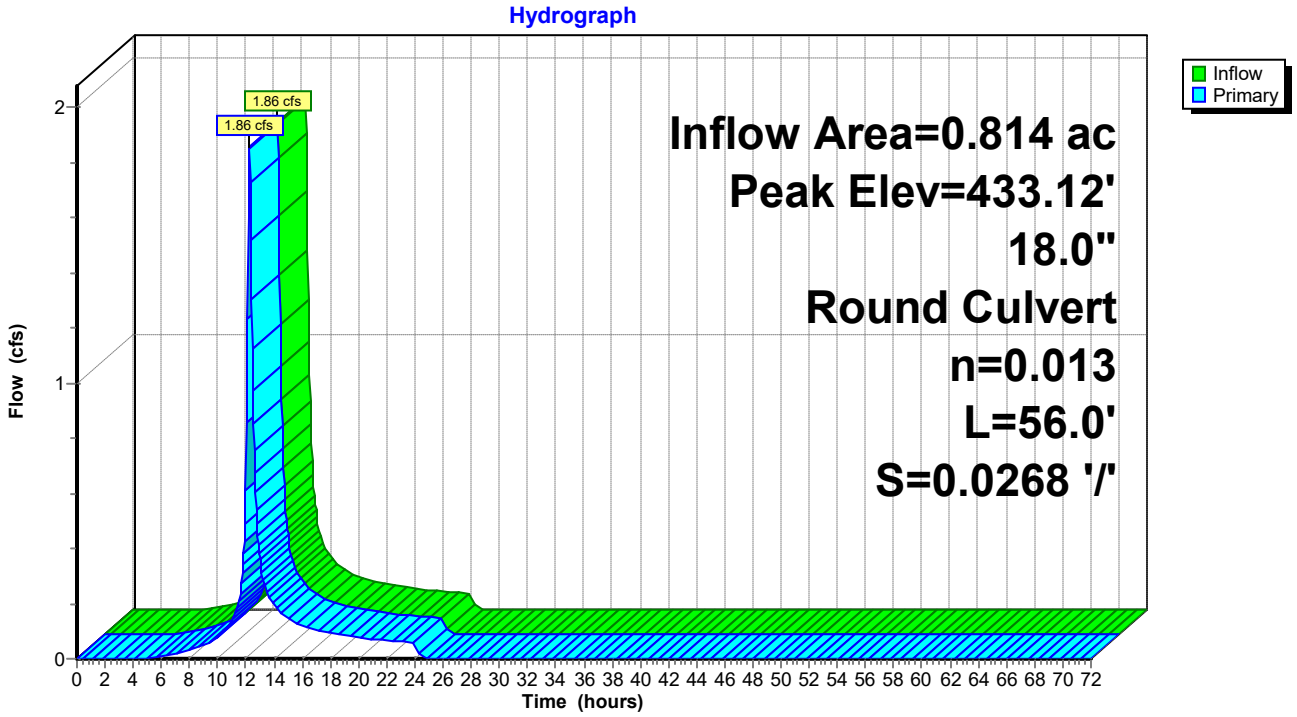
Inflow Area = 0.814 ac, 7.82% Impervious, Inflow Depth = 3.30" for 10-yr event
Inflow = 1.86 cfs @ 12.24 hrs, Volume= 0.224 af
Outflow = 1.86 cfs @ 12.24 hrs, Volume= 0.224 af, Atten= 0%, Lag= 0.0 min
Primary = 1.86 cfs @ 12.24 hrs, Volume= 0.224 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 433.12' @ 12.24 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	**18.0" Round Culvert** L= 56.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 432.50' / 431.00' S= 0.0268 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=1.84 cfs @ 12.24 hrs HW=433.12' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.84 cfs @ 2.68 fps)

Pond C13: 18" CULVERT



Summary for Pond C2: 12" CULVERT

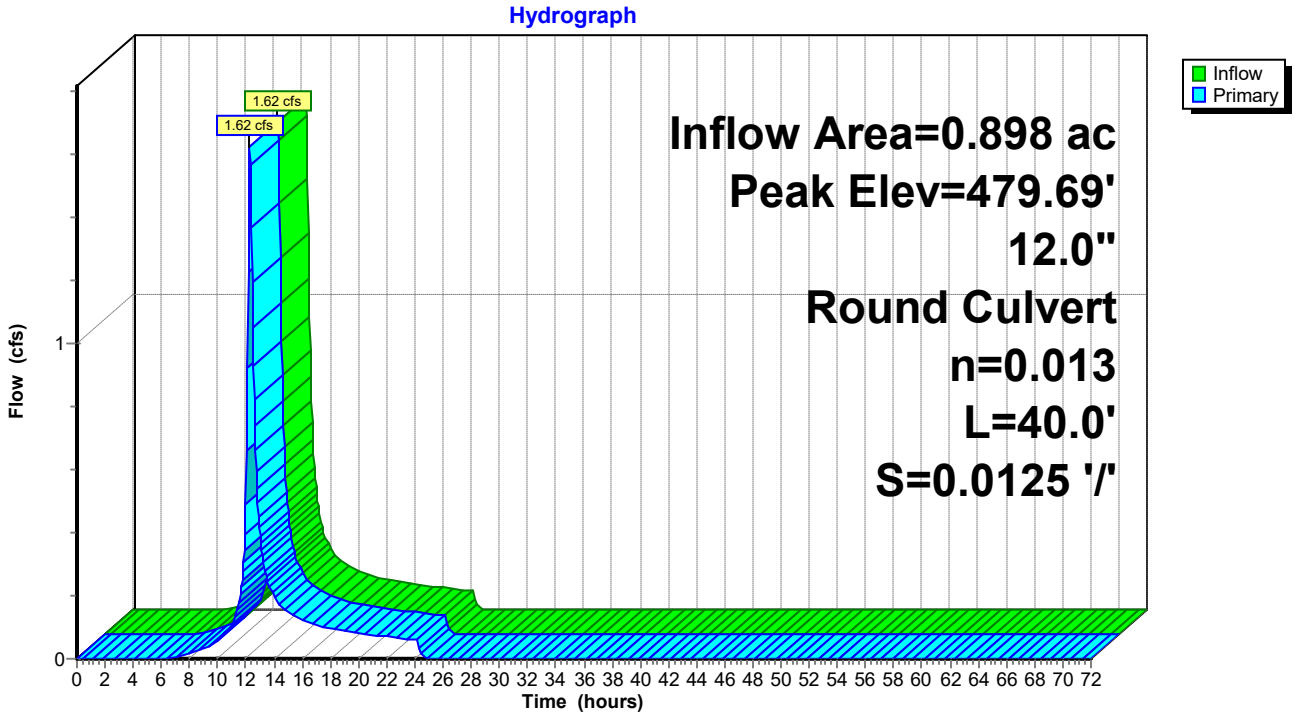
Inflow Area = 0.898 ac, 9.78% Impervious, Inflow Depth = 2.83" for 10-yr event
Inflow = 1.62 cfs @ 12.28 hrs, Volume= 0.211 af
Outflow = 1.62 cfs @ 12.28 hrs, Volume= 0.211 af, Atten= 0%, Lag= 0.0 min
Primary = 1.62 cfs @ 12.28 hrs, Volume= 0.211 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.69' @ 12.28 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.61 cfs @ 12.28 hrs HW=479.68' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.61 cfs @ 2.81 fps)

Pond C2: 12" CULVERT



Summary for Pond C3: 12" CULVERT

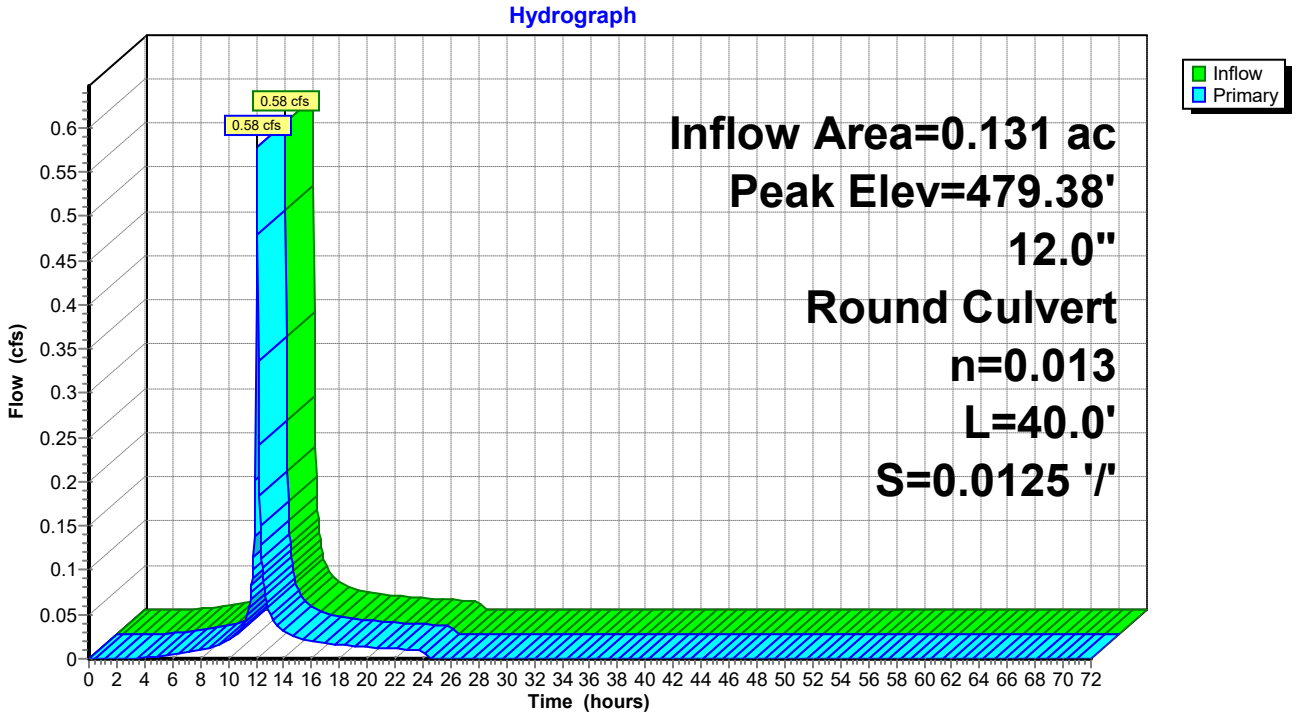
Inflow Area = 0.131 ac, 41.51% Impervious, Inflow Depth = 3.90" for 10-yr event
Inflow = 0.58 cfs @ 12.06 hrs, Volume= 0.043 af
Outflow = 0.58 cfs @ 12.06 hrs, Volume= 0.043 af, Atten= 0%, Lag= 0.0 min
Primary = 0.58 cfs @ 12.06 hrs, Volume= 0.043 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.38' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.56 cfs @ 12.06 hrs HW=479.38' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.56 cfs @ 2.09 fps)

Pond C3: 12" CULVERT



Summary for Pond C4: 12" CULVERT

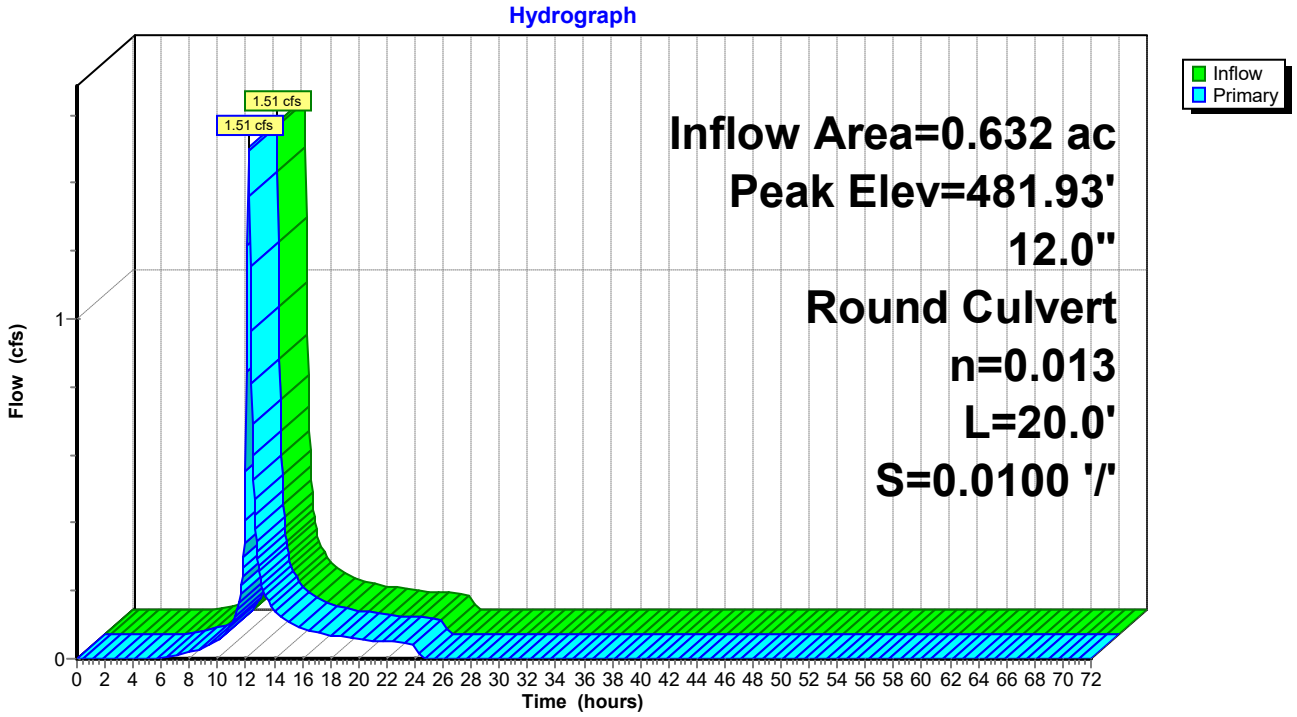
Inflow Area = 0.632 ac, 19.67% Impervious, Inflow Depth = 3.11" for 10-yr event
Inflow = 1.51 cfs @ 12.18 hrs, Volume= 0.164 af
Outflow = 1.51 cfs @ 12.18 hrs, Volume= 0.164 af, Atten= 0%, Lag= 0.0 min
Primary = 1.51 cfs @ 12.18 hrs, Volume= 0.164 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 481.93' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	481.20'	**12.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 481.20' / 481.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.49 cfs @ 12.18 hrs HW=481.92' (Free Discharge)
└**1=Culvert** (Barrel Controls 1.49 cfs @ 3.43 fps)

Pond C4: 12" CULVERT



Summary for Pond C5: 12" CULVERT

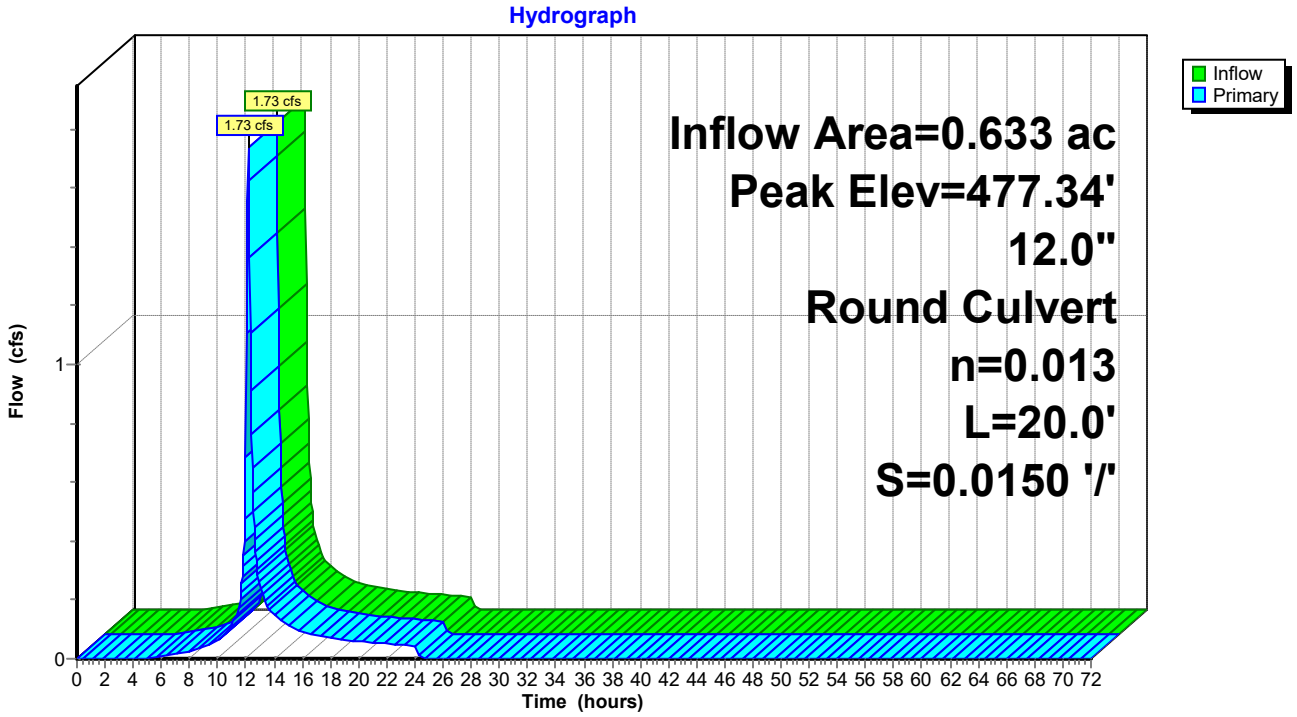
Inflow Area = 0.633 ac, 10.31% Impervious, Inflow Depth = 3.30" for 10-yr event
Inflow = 1.73 cfs @ 12.16 hrs, Volume= 0.174 af
Outflow = 1.73 cfs @ 12.16 hrs, Volume= 0.174 af, Atten= 0%, Lag= 0.0 min
Primary = 1.73 cfs @ 12.16 hrs, Volume= 0.174 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 477.34' @ 12.16 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	476.60'	**12.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 476.60' / 476.30' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.72 cfs @ 12.16 hrs HW=477.34' (Free Discharge)
└**1=Culvert** (Barrel Controls 1.72 cfs @ 3.87 fps)

Pond C5: 12" CULVERT



Summary for Pond C6: 24" CULVERT

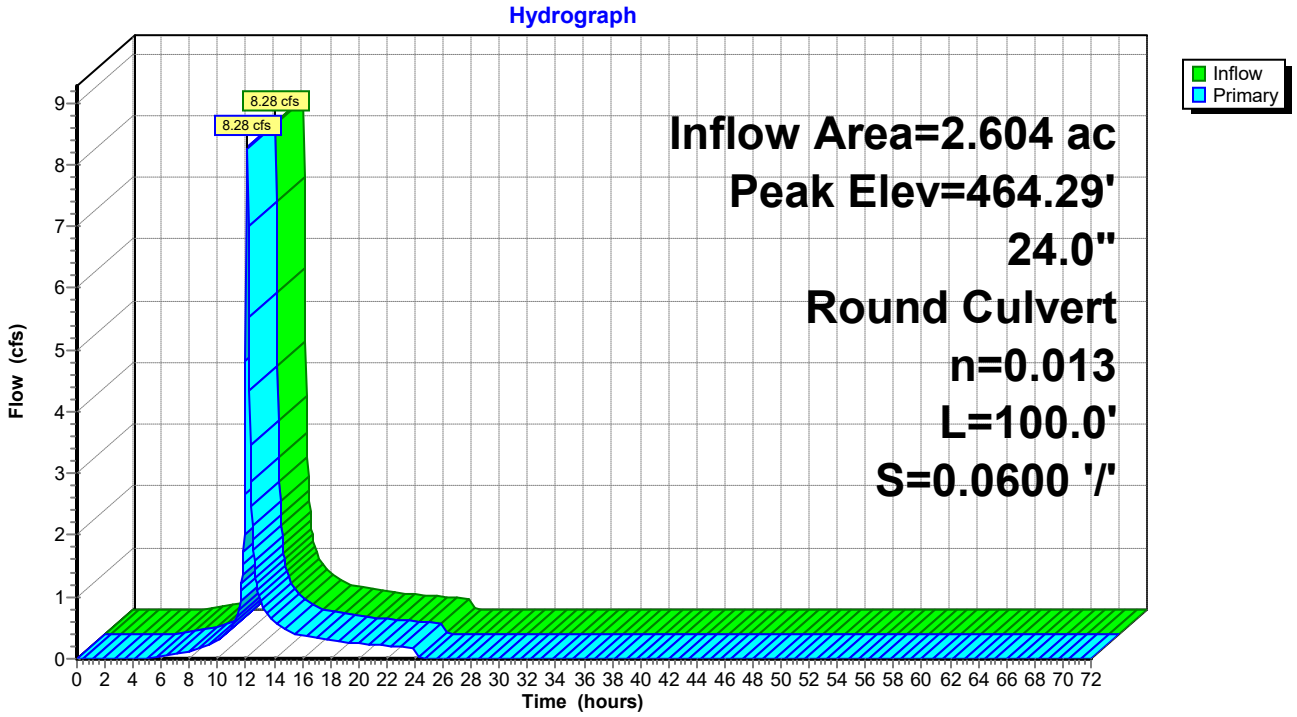
Inflow Area = 2.604 ac, 11.94% Impervious, Inflow Depth = 3.37" for 10-yr event
Inflow = 8.28 cfs @ 12.09 hrs, Volume= 0.731 af
Outflow = 8.28 cfs @ 12.09 hrs, Volume= 0.731 af, Atten= 0%, Lag= 0.0 min
Primary = 8.28 cfs @ 12.09 hrs, Volume= 0.731 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 464.29' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	463.00'	**24.0" Round Culvert** L= 100.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 463.00' / 457.00' S= 0.0600 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=8.15 cfs @ 12.09 hrs HW=464.28' (Free Discharge)
└**1=Culvert** (Inlet Controls 8.15 cfs @ 3.85 fps)

Pond C6: 24" CULVERT



Summary for Pond C8: 12" CULVERT

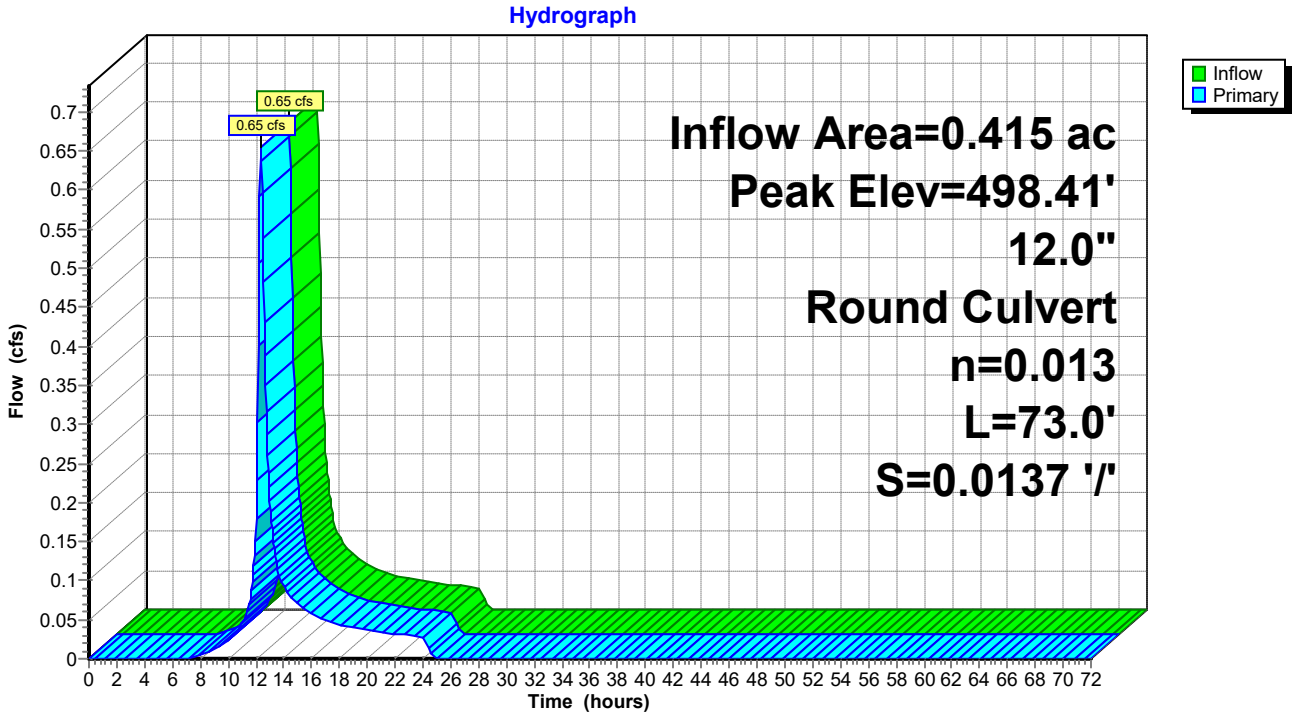
Inflow Area = 0.415 ac, 6.10% Impervious, Inflow Depth = 2.74" for 10-yr event
Inflow = 0.65 cfs @ 12.35 hrs, Volume= 0.095 af
Outflow = 0.65 cfs @ 12.35 hrs, Volume= 0.095 af, Atten= 0%, Lag= 0.0 min
Primary = 0.65 cfs @ 12.35 hrs, Volume= 0.095 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 498.41' @ 12.35 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	498.00'	**12.0" Round Culvert** L= 73.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 498.00' / 497.00' S= 0.0137 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.65 cfs @ 12.35 hrs HW=498.41' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.65 cfs @ 2.17 fps)

Pond C8: 12" CULVERT



Summary for Pond C9: 12" CULVERT

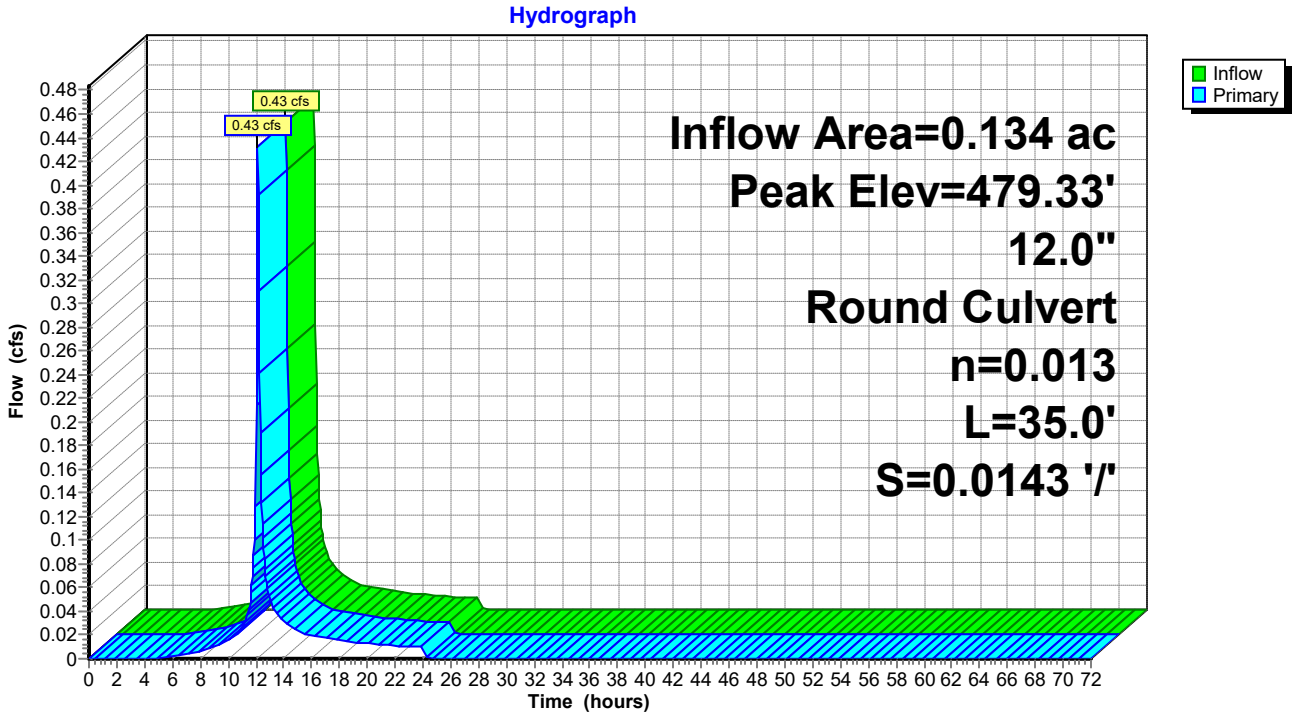
Inflow Area = 0.134 ac, 14.23% Impervious, Inflow Depth = 3.39" for 10-yr event
Inflow = 0.43 cfs @ 12.11 hrs, Volume= 0.038 af
Outflow = 0.43 cfs @ 12.11 hrs, Volume= 0.038 af, Atten= 0%, Lag= 0.0 min
Primary = 0.43 cfs @ 12.11 hrs, Volume= 0.038 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.33' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 35.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.42 cfs @ 12.11 hrs HW=479.32' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.42 cfs @ 1.93 fps)

Pond C9: 12" CULVERT



Summary for Pond DP1: DRY POND 1

Inflow Area = 3.133 ac, 8.85% Impervious, Inflow Depth = 3.31" for 10-yr event
Inflow = 8.07 cfs @ 12.17 hrs, Volume= 0.865 af
Outflow = 6.51 cfs @ 12.28 hrs, Volume= 0.682 af, Atten= 19%, Lag= 6.1 min
Primary = 6.51 cfs @ 12.28 hrs, Volume= 0.682 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 439.23' @ 12.28 hrs Surf.Area= 4,276 sf Storage= 10,854 cf

Plug-Flow detention time= 167.3 min calculated for 0.682 af (79% of inflow)
Center-of-Mass det. time= 70.4 min (919.0 - 848.6)

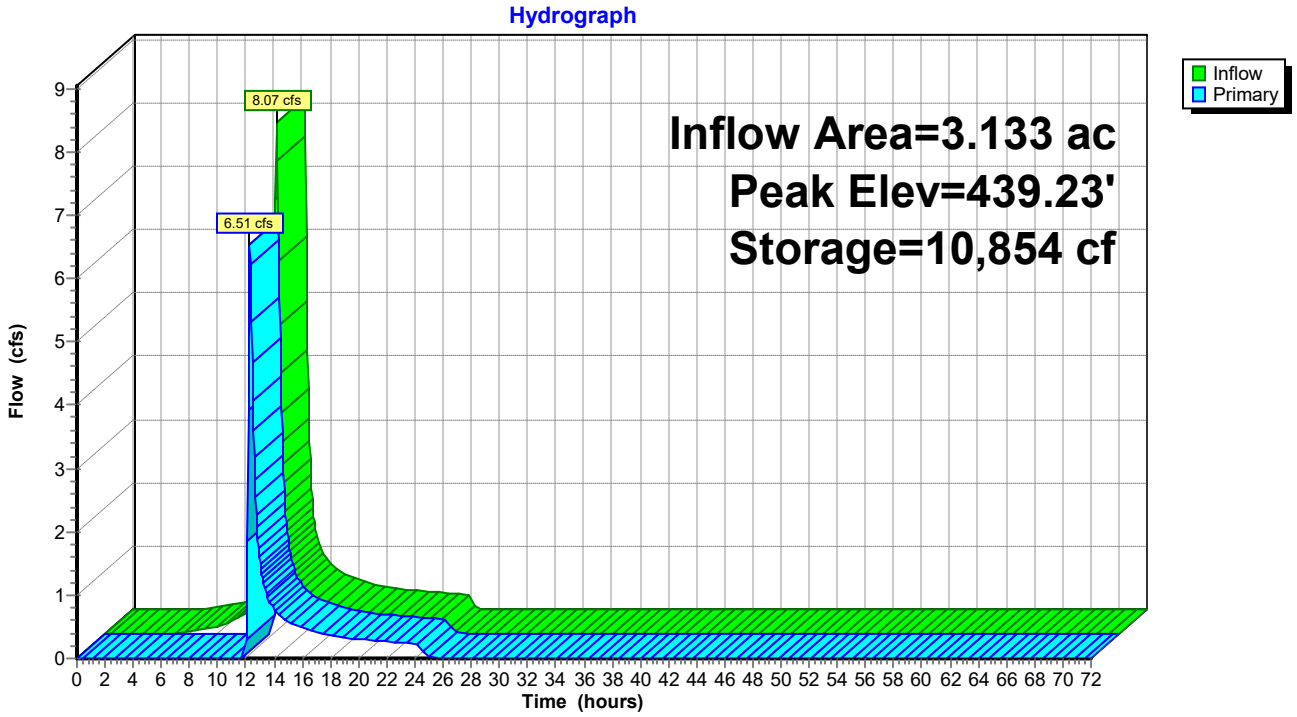
Volume	Invert	Avail.Storage	Storage Description
#1	434.00'	14,417 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
434.00	171	64.2	0	0	171
436.00	1,610	246.7	1,537	1,537	4,697
438.00	3,203	284.4	4,723	6,260	6,376
440.00	5,022	322.1	8,157	14,417	8,294

Device	Routing	Invert	Outlet Devices
#1	Primary	438.50'	**45.0 deg x 3.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=6.45 cfs @ 12.28 hrs HW=439.23' (Free Discharge)
└**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 6.45 cfs @ 2.68 fps)

Pond DP1: DRY POND 1

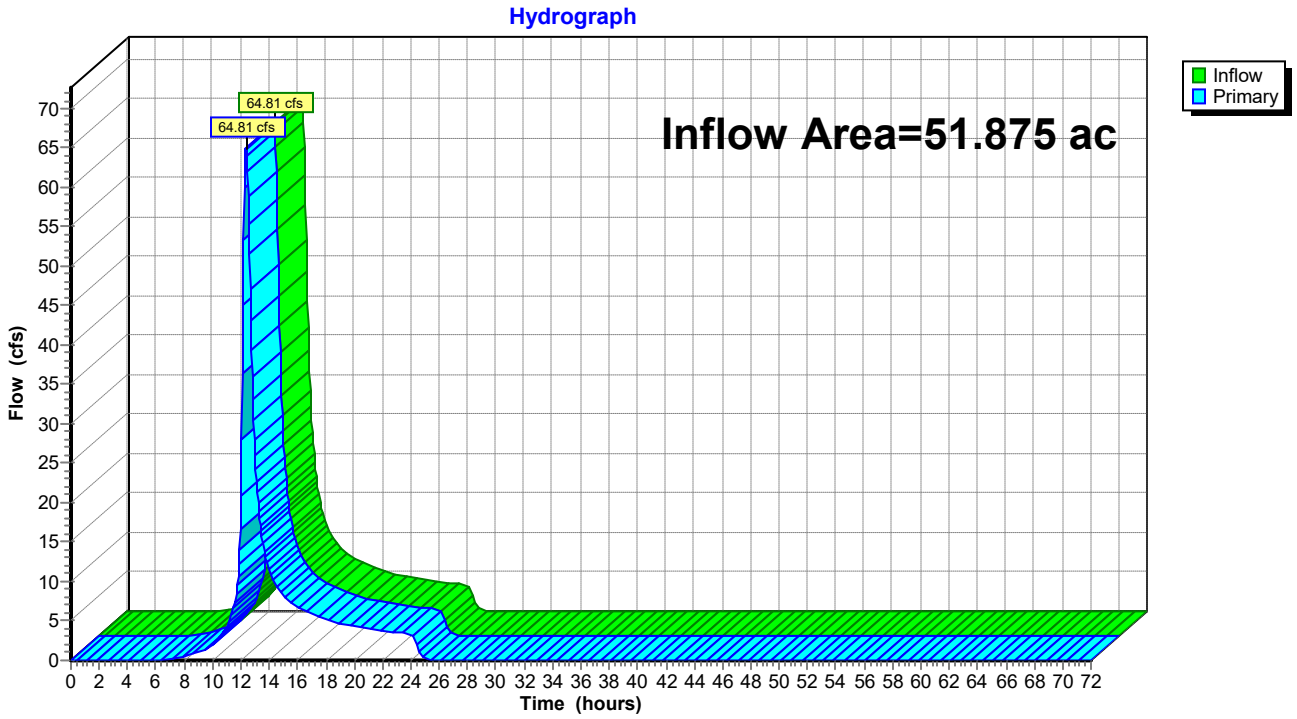


Summary for Link O1: OUT 1

Inflow Area = 51.875 ac, 3.67% Impervious, Inflow Depth = 2.54" for 10-yr event
Inflow = 64.81 cfs @ 12.35 hrs, Volume= 10.987 af
Primary = 64.81 cfs @ 12.35 hrs, Volume= 10.987 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O1: OUT 1

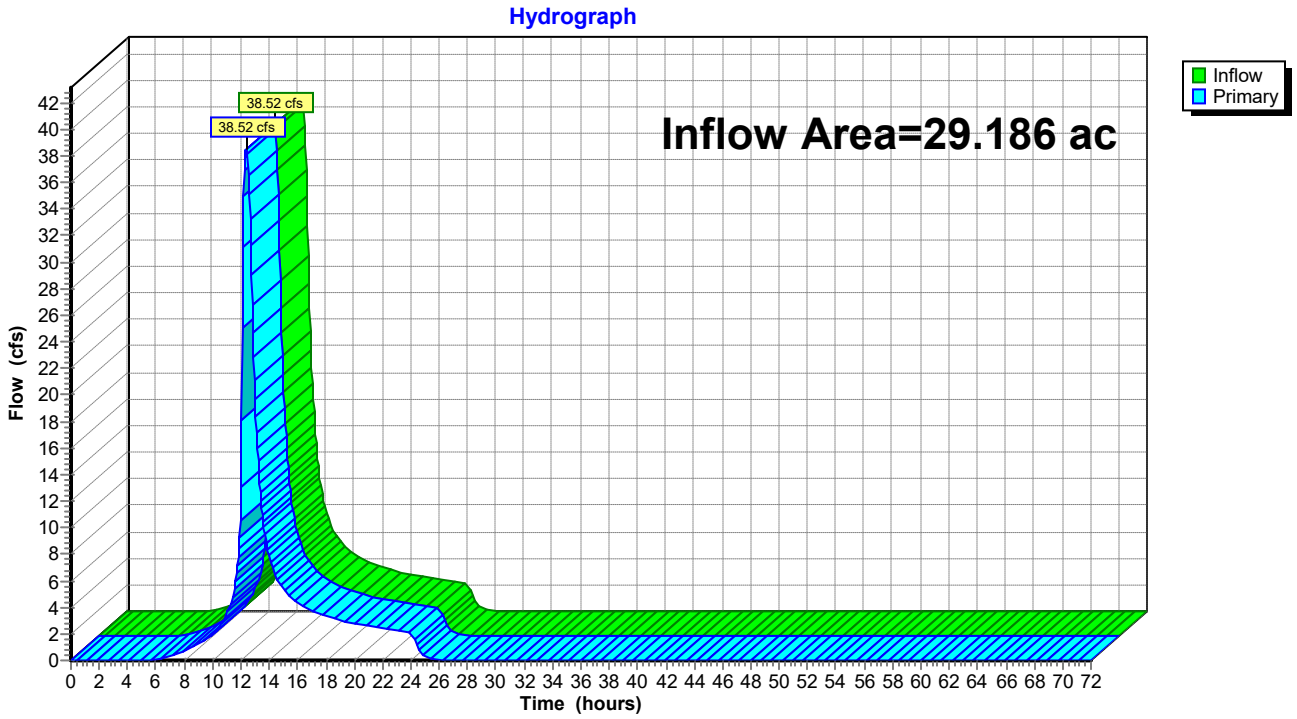


Summary for Link O2: OUT 2

Inflow Area = 29.186 ac, 3.50% Impervious, Inflow Depth = 3.06" for 10-yr event
Inflow = 38.52 cfs @ 12.39 hrs, Volume= 7.438 af
Primary = 38.52 cfs @ 12.39 hrs, Volume= 7.438 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O2: OUT 2

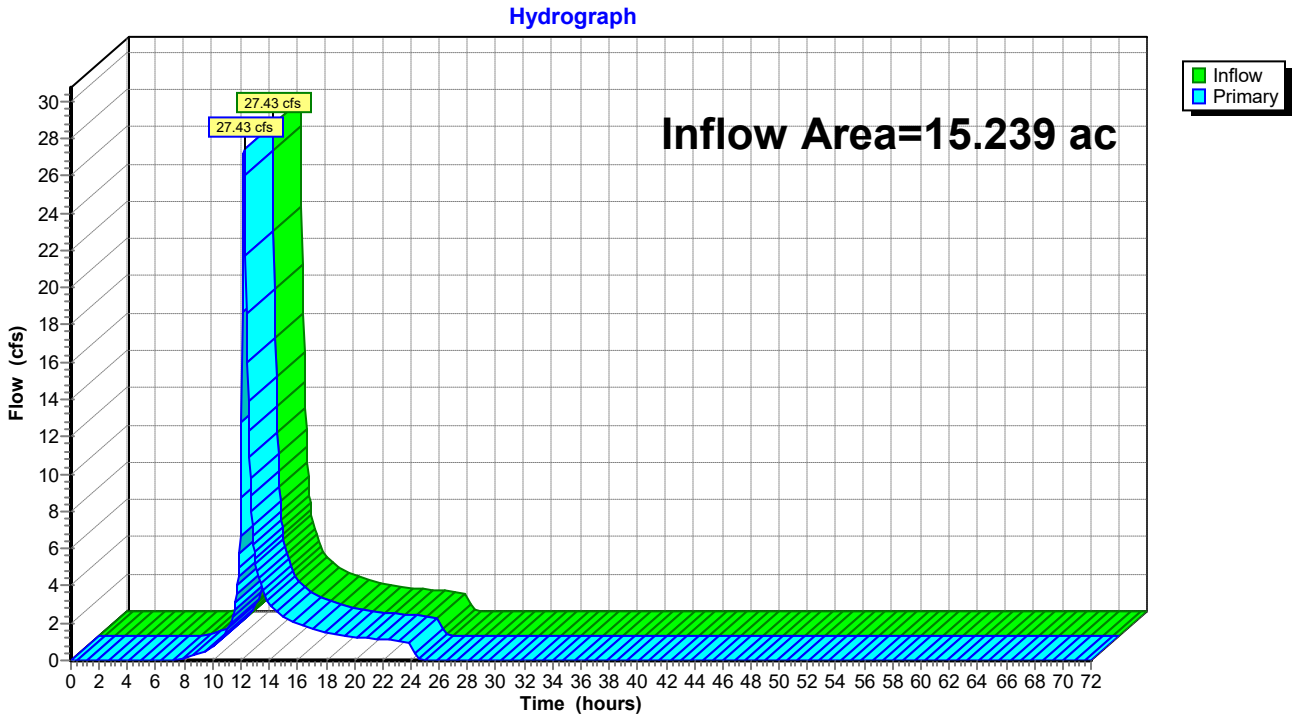


Summary for Link O3: OUT 3

Inflow Area = 15.239 ac, 0.00% Impervious, Inflow Depth = 2.56" for 10-yr event
Inflow = 27.43 cfs @ 12.23 hrs, Volume= 3.248 af
Primary = 27.43 cfs @ 12.23 hrs, Volume= 3.248 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O3: OUT 3

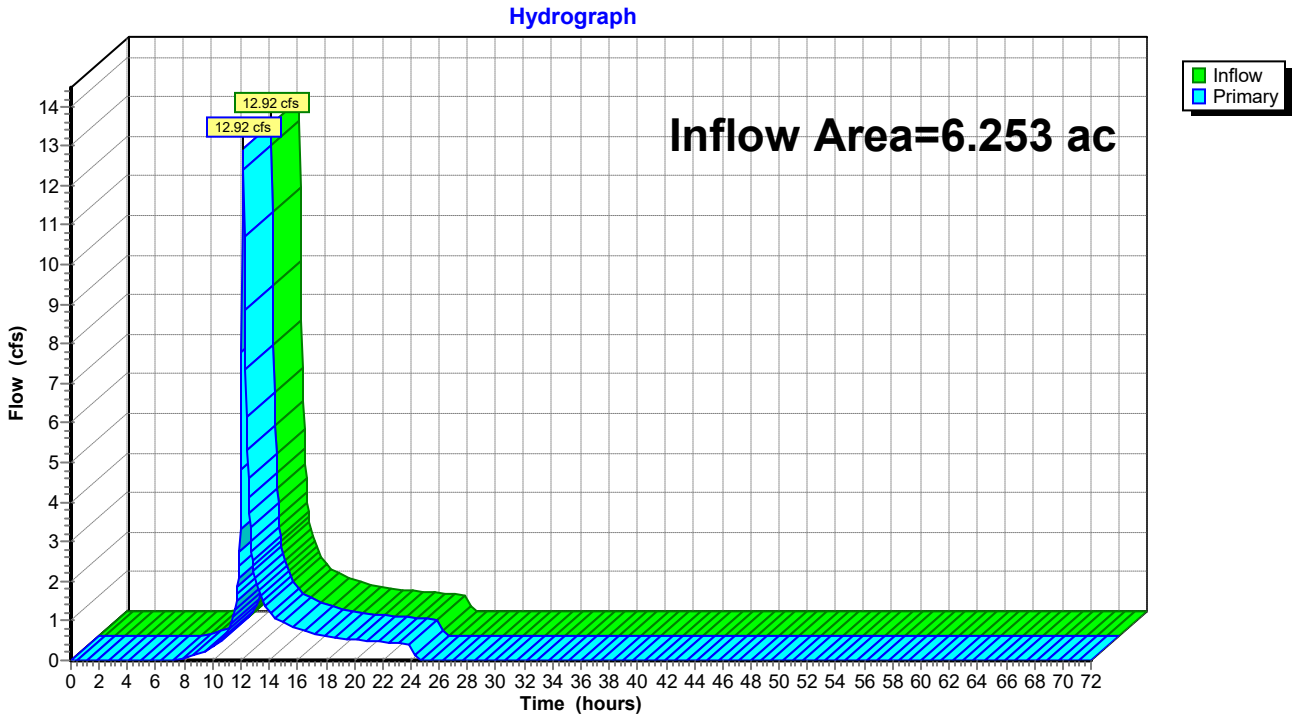


Summary for Link O4: OUT 4

Inflow Area = 6.253 ac, 0.00% Impervious, Inflow Depth = 2.56" for 10-yr event
Inflow = 12.92 cfs @ 12.17 hrs, Volume= 1.333 af
Primary = 12.92 cfs @ 12.17 hrs, Volume= 1.333 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O4: OUT 4

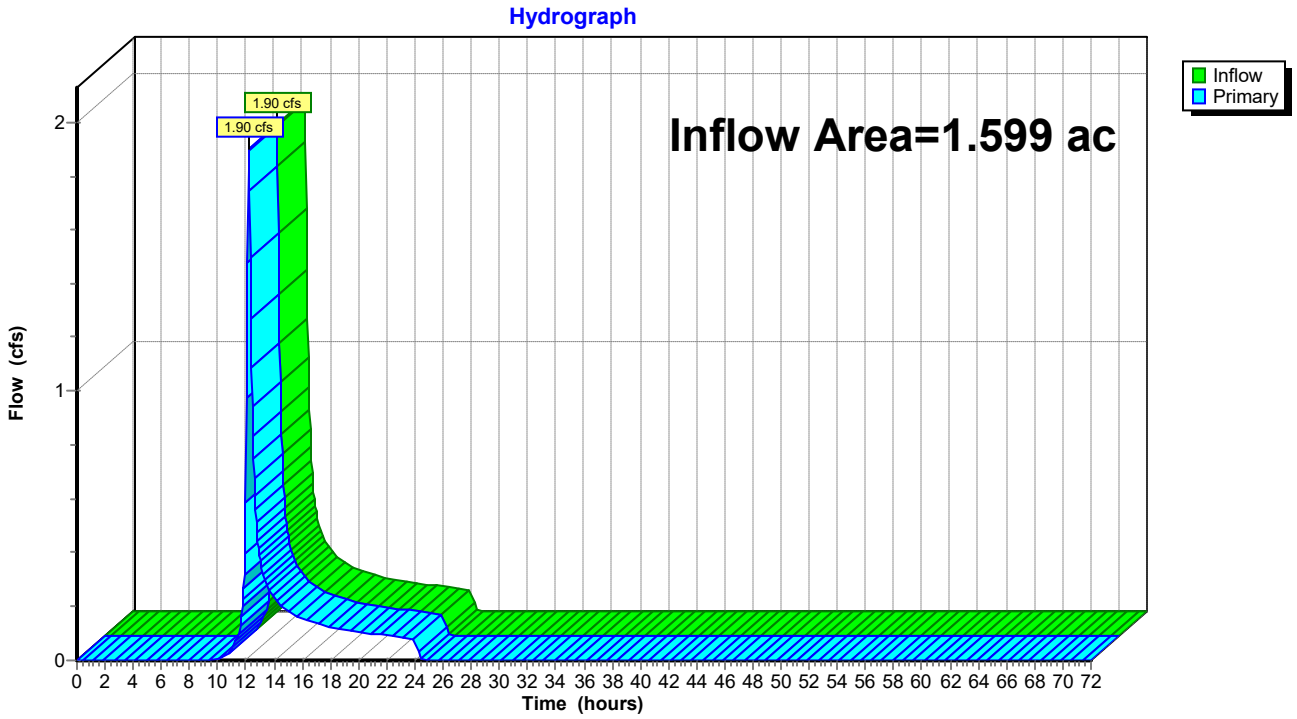


Summary for Link O5: OUT 5

Inflow Area = 1.599 ac, 0.00% Impervious, Inflow Depth = 1.66" for 10-yr event
Inflow = 1.90 cfs @ 12.19 hrs, Volume= 0.221 af
Primary = 1.90 cfs @ 12.19 hrs, Volume= 0.221 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O5: OUT 5



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: DRAINAGE AREA 1A Runoff Area=1,089,015 sf 2.10% Impervious Runoff Depth=3.89"
Flow Length=2,185' Tc=36.9 min CN=76 Runoff=47.96 cfs 8.095 af

Subcatchment 1B: DRAINAGE AREA 1B Runoff Area=18,084 sf 6.10% Impervious Runoff Depth=3.78"
Flow Length=160' Tc=28.8 min CN=75 Runoff=0.90 cfs 0.131 af

Subcatchment 1C: DRAINAGE AREA 1C Runoff Area=139,425 sf 6.89% Impervious Runoff Depth=3.89"
Flow Length=945' Tc=40.6 min CN=76 Runoff=5.82 cfs 1.036 af

Subcatchment 1D: DRAINAGE AREA 1D Runoff Area=27,532 sf 19.67% Impervious Runoff Depth=4.20"
Flow Length=480' Tc=17.2 min CN=79 Runoff=2.00 cfs 0.221 af

Subcatchment 1E: DRAINAGE AREA 1E Runoff Area=39,104 sf 9.78% Impervious Runoff Depth=3.89"
Flow Length=490' Tc=24.1 min CN=76 Runoff=2.20 cfs 0.291 af

Subcatchment 1F: DRAINAGE AREA 1F Runoff Area=5,854 sf 14.23% Impervious Runoff Depth=4.52"
Flow Length=100' Tc=11.4 min CN=82 Runoff=0.56 cfs 0.051 af

Subcatchment 1G: DRAINAGE AREA 1G Runoff Area=5,726 sf 41.51% Impervious Runoff Depth=5.07"
Flow Length=200' Tc=7.5 min CN=87 Runoff=0.73 cfs 0.056 af

Subcatchment 1H: DRAINAGE AREA 8 Runoff Area=4,559 sf 53.41% Impervious Runoff Depth=5.41"
Flow Length=45' Tc=0.4 min CN=90 Runoff=0.79 cfs 0.047 af

Subcatchment 1I: DRAINAGE AREA 1I Runoff Area=27,574 sf 10.31% Impervious Runoff Depth=4.42"
Flow Length=260' Tc=15.0 min CN=81 Runoff=2.28 cfs 0.233 af

Subcatchment 1J: DRAINAGE AREA 1J Runoff Area=85,839 sf 12.46% Impervious Runoff Depth=4.52"
Flow Length=480' Tc=9.3 min CN=82 Runoff=8.88 cfs 0.743 af

Subcatchment 1K: DRAINAGE AREA 1K Runoff Area=13,922 sf 13.09% Impervious Runoff Depth=4.52"
Flow Length=100' Tc=4.2 min CN=82 Runoff=1.88 cfs 0.120 af

Subcatchment 1L: DRAINAGE AREA 1L Runoff Area=792,979 sf 2.18% Impervious Runoff Depth=2.78"
Flow Length=1,370' Tc=24.1 min CN=65 Runoff=31.19 cfs 4.220 af

Subcatchment 1M: DRAINAGE AREA 1M Runoff Area=10,047 sf 17.03% Impervious Runoff Depth=4.63"
Flow Length=185' Tc=10.3 min CN=83 Runoff=1.03 cfs 0.089 af

Subcatchment 2A: DRAINAGE AREA 2A Runoff Area=58,418 sf 18.29% Impervious Runoff Depth=4.63"
Flow Length=560' Tc=15.0 min CN=83 Runoff=5.03 cfs 0.518 af

Subcatchment 2B: DRAINAGE AREA 2B Runoff Area=5,939 sf 29.70% Impervious Runoff Depth=4.85"
Flow Length=80' Tc=10.2 min CN=85 Runoff=0.63 cfs 0.055 af

Subcatchment 2C: DRAINAGE AREA 2C Runoff Area=130,540 sf 7.90% Impervious Runoff Depth=4.42"
Flow Length=870' Tc=16.7 min CN=81 Runoff=10.07 cfs 1.103 af

Subcatchment 2D: DRAINAGE AREA 2D Runoff Area=858,381 sf 0.51% Impervious Runoff Depth=4.20"
Flow Length=1,470' Tc=43.3 min CN=79 Runoff=37.09 cfs 6.900 af

Subcatchment 2E: DRAINAGE AREA 18 Runoff Area=121,293 sf 11.99% Impervious Runoff Depth=4.31"
Flow Length=610' Tc=16.4 min CN=80 Runoff=9.28 cfs 1.000 af

Subcatchment 2F: DRAINAGE AREA 2F Runoff Area=61,323 sf 0.00% Impervious Runoff Depth=3.58"
Flow Length=250' Tc=13.7 min CN=73 Runoff=4.27 cfs 0.419 af

Subcatchment 2G: DRAINAGE AREA 2G Runoff Area=35,456 sf 7.82% Impervious Runoff Depth=4.42"
Flow Length=300' Tc=21.0 min CN=81 Runoff=2.44 cfs 0.300 af

Subcatchment 3: DRAINAGE AREA 3 Runoff Area=663,807 sf 0.00% Impervious Runoff Depth=3.58"
Flow Length=590' Tc=19.9 min CN=73 Runoff=38.17 cfs 4.541 af

Subcatchment 4: DRAINAGE AREA 4 Runoff Area=272,371 sf 0.00% Impervious Runoff Depth=3.58"
Flow Length=376' Tc=15.4 min CN=73 Runoff=17.93 cfs 1.863 af

Subcatchment 5: DRAINAGE AREA 5 Runoff Area=69,632 sf 0.00% Impervious Runoff Depth=2.50"
Flow Length=340' Tc=16.6 min CN=62 Runoff=2.95 cfs 0.333 af

Pond AC1: ARCH CULVERT Peak Elev=455.63' Inflow=57.54 cfs 9.928 af
96.0" x 43.0", R=52.0" Arch Culvert n=0.013 L=60.0' S=0.0417 '/' Outflow=57.54 cfs 9.928 af

Pond AC2: ARCH CULVERT Peak Elev=431.30' Inflow=42.17 cfs 7.875 af
96.0" x 43.0", R=52.0" Arch Culvert n=0.013 L=40.0' S=0.0175 '/' Outflow=42.17 cfs 7.875 af

Pond BR1-C7: BIO-RET POND 1 Peak Elev=478.04' Storage=670 cf Inflow=8.74 cfs 1.651 af
Outflow=8.69 cfs 1.651 af

Pond BR2-C14: BIO-RET POND 2 Peak Elev=458.41' Storage=9,474 cf Inflow=11.86 cfs 1.096 af
Outflow=8.19 cfs 1.096 af

Pond C1: 24" CULVERT Peak Elev=481.17' Inflow=6.66 cfs 1.258 af
24.0" Round Culvert n=0.013 L=36.0' S=0.0139 '/' Outflow=6.66 cfs 1.258 af

Pond C10: 15" CULVERT Peak Elev=448.73' Inflow=1.03 cfs 0.089 af
15.0" Round Culvert n=0.013 L=67.0' S=0.0112 '/' Outflow=1.03 cfs 0.089 af

Pond C11: 12" CULVERT Peak Elev=458.40' Inflow=0.63 cfs 0.055 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0500 '/' Outflow=0.63 cfs 0.055 af

Pond C12: 24" CULVERT Peak Elev=444.97' Inflow=5.03 cfs 0.518 af
24.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=5.03 cfs 0.518 af

Pond C13: 18" CULVERT Peak Elev=433.22' Inflow=2.44 cfs 0.300 af
18.0" Round Culvert n=0.013 L=56.0' S=0.0268 '/' Outflow=2.44 cfs 0.300 af

Pond C2: 12" CULVERT Peak Elev=479.84' Inflow=2.20 cfs 0.291 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=2.20 cfs 0.291 af

Pond C3: 12" CULVERT Peak Elev=479.43' Inflow=0.73 cfs 0.056 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=0.73 cfs 0.056 af

Pond C4: 12" CULVERT Peak Elev=482.08' Inflow=2.00 cfs 0.221 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0100 '/' Outflow=2.00 cfs 0.221 af

Pond C5: 12" CULVERT Peak Elev=477.49' Inflow=2.28 cfs 0.233 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0150 '/' Outflow=2.28 cfs 0.233 af

Pond C6: 24" CULVERT Peak Elev=464.52' Inflow=10.80 cfs 0.976 af
24.0" Round Culvert n=0.013 L=100.0' S=0.0600 '/' Outflow=10.80 cfs 0.976 af

Pond C8: 12" CULVERT Peak Elev=498.48' Inflow=0.90 cfs 0.131 af
12.0" Round Culvert n=0.013 L=73.0' S=0.0137 '/' Outflow=0.90 cfs 0.131 af

Pond C9: 12" CULVERT Peak Elev=479.38' Inflow=0.56 cfs 0.051 af
12.0" Round Culvert n=0.013 L=35.0' S=0.0143 '/' Outflow=0.56 cfs 0.051 af

Pond DP1: DRY POND 1 Peak Elev=439.42' Storage=11,657 cf Inflow=10.58 cfs 1.158 af
Outflow=9.29 cfs 0.975 af

Link O1: OUT 1 Inflow=91.45 cfs 15.333 af
Primary=91.45 cfs 15.333 af

Link O2: OUT 2 Inflow=51.30 cfs 10.111 af
Primary=51.30 cfs 10.111 af

Link O3: OUT 3 Inflow=38.17 cfs 4.541 af
Primary=38.17 cfs 4.541 af

Link O4: OUT 4 Inflow=17.93 cfs 1.863 af
Primary=17.93 cfs 1.863 af

Link O5: OUT 5 Inflow=2.95 cfs 0.333 af
Primary=2.95 cfs 0.333 af

Total Runoff Area = 104.151 ac Runoff Volume = 32.364 af Average Runoff Depth = 3.73"
97.19% Pervious = 101.228 ac 2.81% Impervious = 2.923 ac

Summary for Subcatchment 1A: DRAINAGE AREA 1A

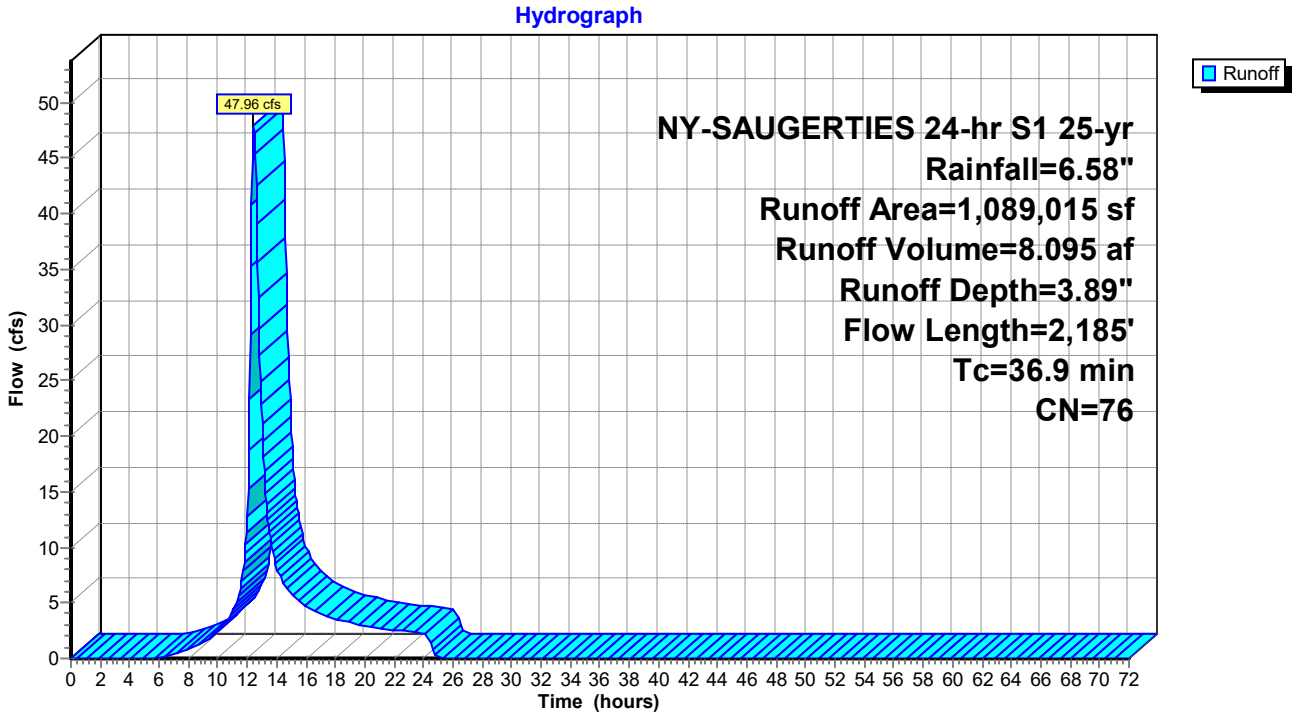
Runoff = 47.96 cfs @ 12.45 hrs, Volume= 8.095 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	853	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	620,284	73	Woods, Fair, HSG C
	391,737	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	20,528	74	>75% Grass cover, Good, HSG C
	32,734	80	>75% Grass cover, Good, HSG D
*	14,227	98	Paved roads w/curbs & sewers, HSG A-D
*	8,652	98	Roofs, HSG A-D
	1,089,015	76	Weighted Average
	1,066,136		97.90% Pervious Area
	22,879		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0800	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
13.4	650	0.0260	0.81		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
3.0	360	0.0180	2.01		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
1.3	260	0.0480	3.29		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
1.0	170	0.0350	2.81		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
2.9	380	0.0210	2.17		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
3.3	265	0.0080	1.34		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
36.9	2,185	Total			

Subcatchment 1A: DRAINAGE AREA 1A



Summary for Subcatchment 1B: DRAINAGE AREA 1B

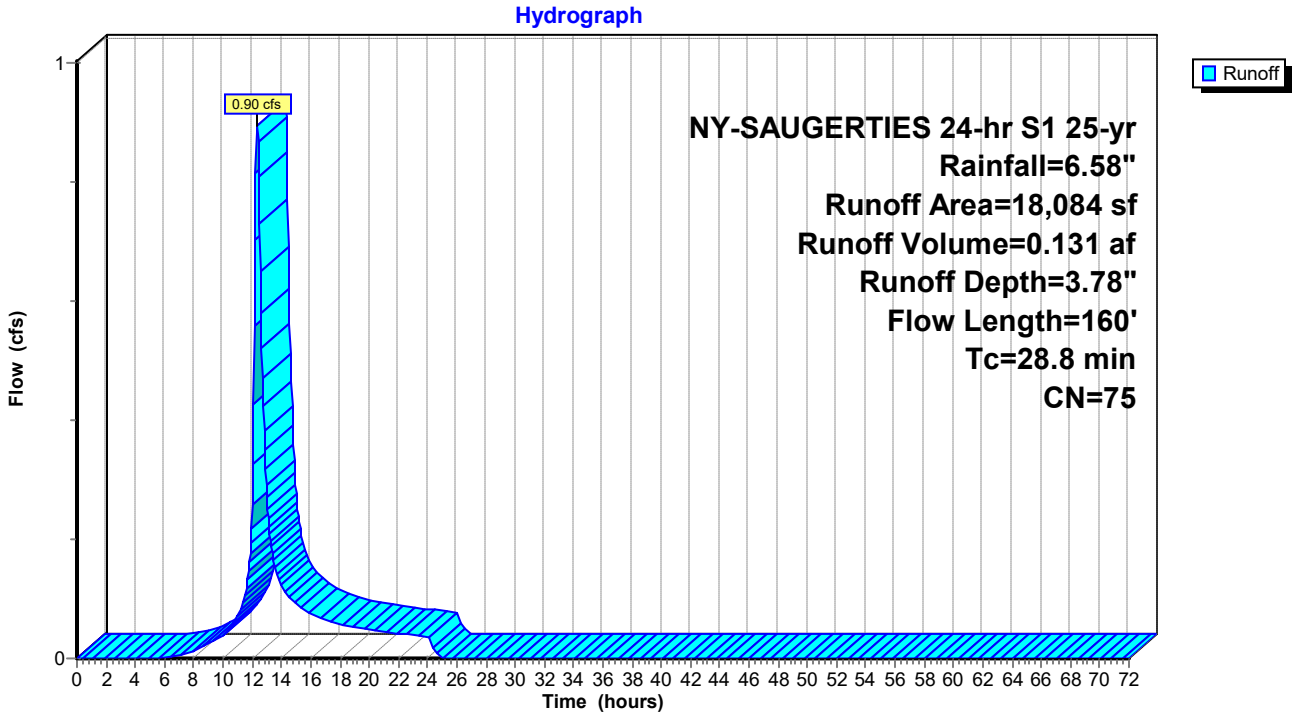
Runoff = 0.90 cfs @ 12.34 hrs, Volume= 0.131 af, Depth= 3.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	14,107	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	2,873	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
*	1,104	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	18,084	75	Weighted Average
	16,980		93.90% Pervious Area
	1,104		6.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.6	100	0.0100	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.0	10	0.4000	9.49		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
28.8	160	Total			

Subcatchment 1B: DRAINAGE AREA 1B



Summary for Subcatchment 1C: DRAINAGE AREA 1C

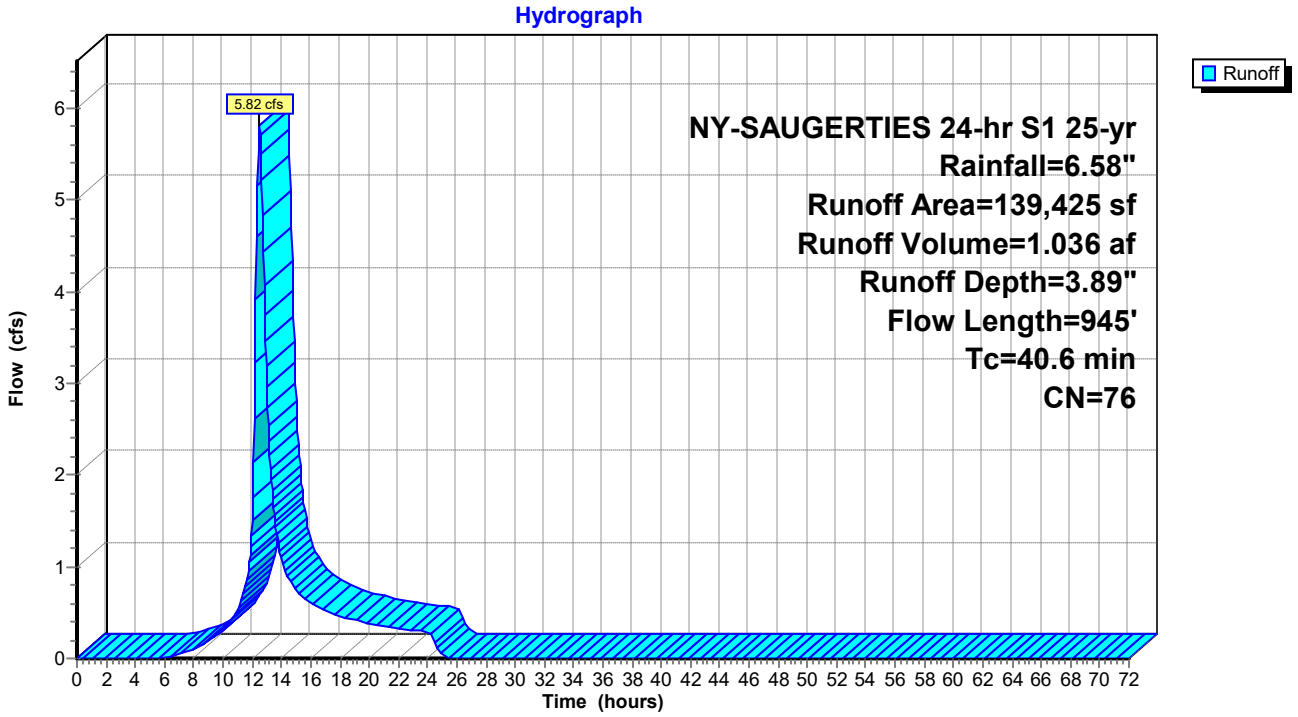
Runoff = 5.82 cfs @ 12.49 hrs, Volume= 1.036 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	97,071	73	Woods, Fair, HSG C
	20,322	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	12,079	74	>75% Grass cover, Good, HSG C
	347	80	>75% Grass cover, Good, HSG D
*	6,722	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	139,425	76	Weighted Average
	129,819		93.11% Pervious Area
	9,606		6.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
9.9	350	0.0140	0.59		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.1	80	0.0630	1.25		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
5.5	220	0.0180	0.67		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
3.2	185	0.0380	0.97		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.0	10	0.2000	6.71		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
40.6	945	Total			

Subcatchment 1C: DRAINAGE AREA 1C



Summary for Subcatchment 1D: DRAINAGE AREA 1D

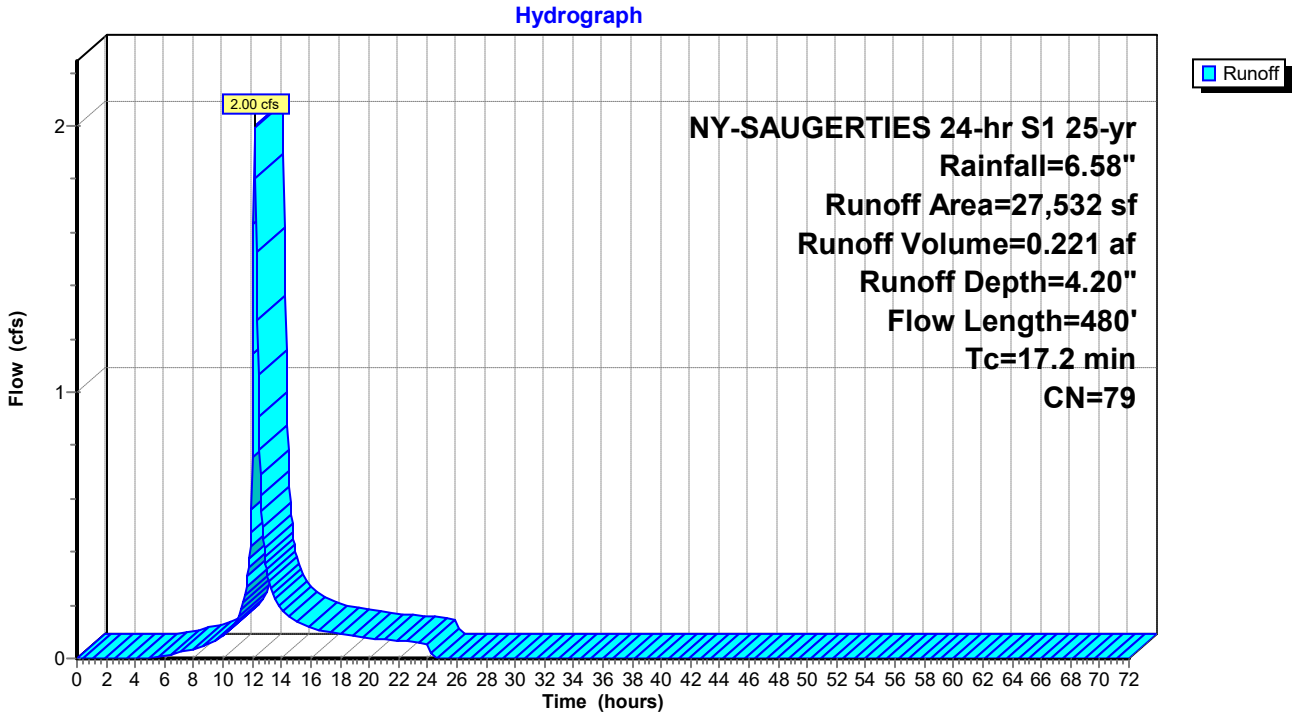
Runoff = 2.00 cfs @ 12.18 hrs, Volume= 0.221 af, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	8,093	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	13,157	74	>75% Grass cover, Good, HSG C
	867	80	>75% Grass cover, Good, HSG D
*	5,415	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	27,532	79	Weighted Average
	22,117		80.33% Pervious Area
	5,415		19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	8	0.0630	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
1.5	17	0.0590	0.19		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
12.6	75	0.0400	0.10		**Sheet Flow, C-D** Woods: Light underbrush n= 0.400 P2= 3.38"
0.6	30	0.0330	0.91		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.2	40	0.0500	3.35		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
1.8	220	0.0180	2.01		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
0.4	90	0.0780	4.19		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
17.2	480	Total			

Subcatchment 1D: DRAINAGE AREA 1D



Summary for Subcatchment 1E: DRAINAGE AREA 1E

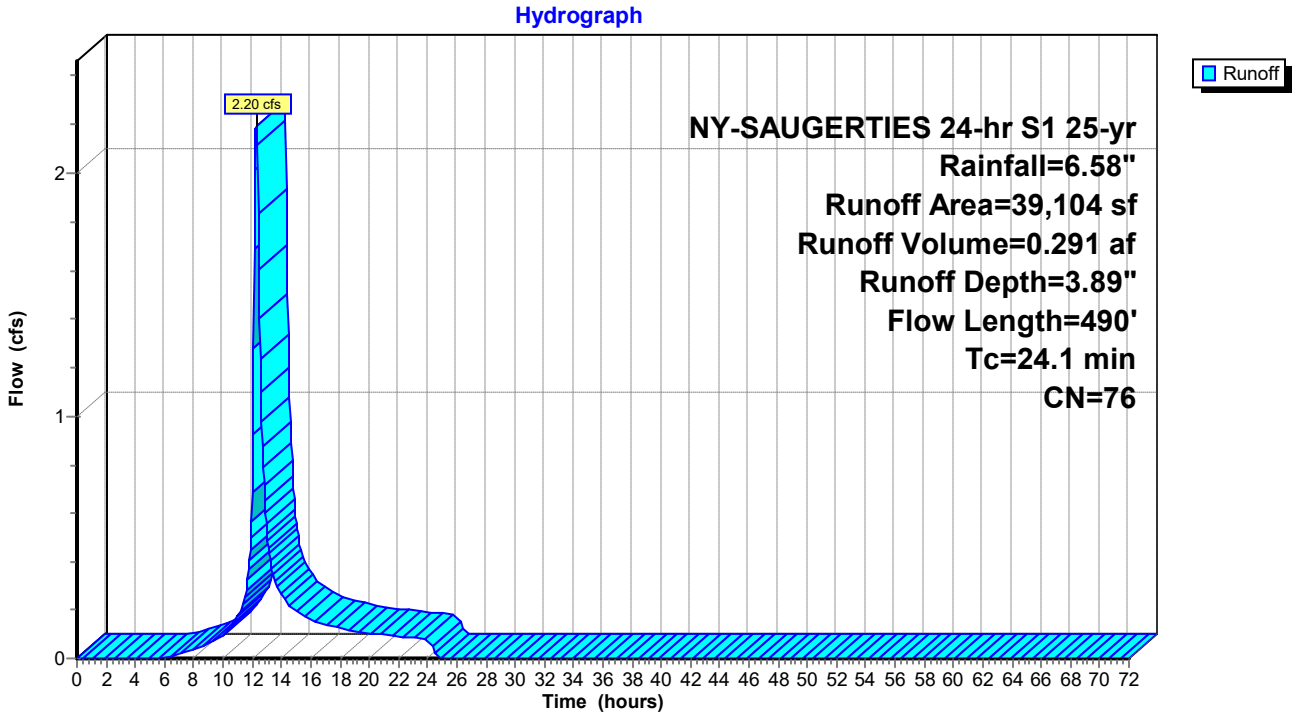
Runoff = 2.20 cfs @ 12.28 hrs, Volume= 0.291 af, Depth= 3.89"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	27,062	73	Woods, Fair, HSG C
	1,441	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	4,681	74	>75% Grass cover, Good, HSG C
	2,095	80	>75% Grass cover, Good, HSG D
*	3,825	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	39,104	76	Weighted Average
	35,279		90.22% Pervious Area
	3,825		9.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.6	110	0.0550	1.17		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	280	0.0390	2.96		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
24.1	490	Total			

Subcatchment 1E: DRAINAGE AREA 1E



Summary for Subcatchment 1F: DRAINAGE AREA 1F

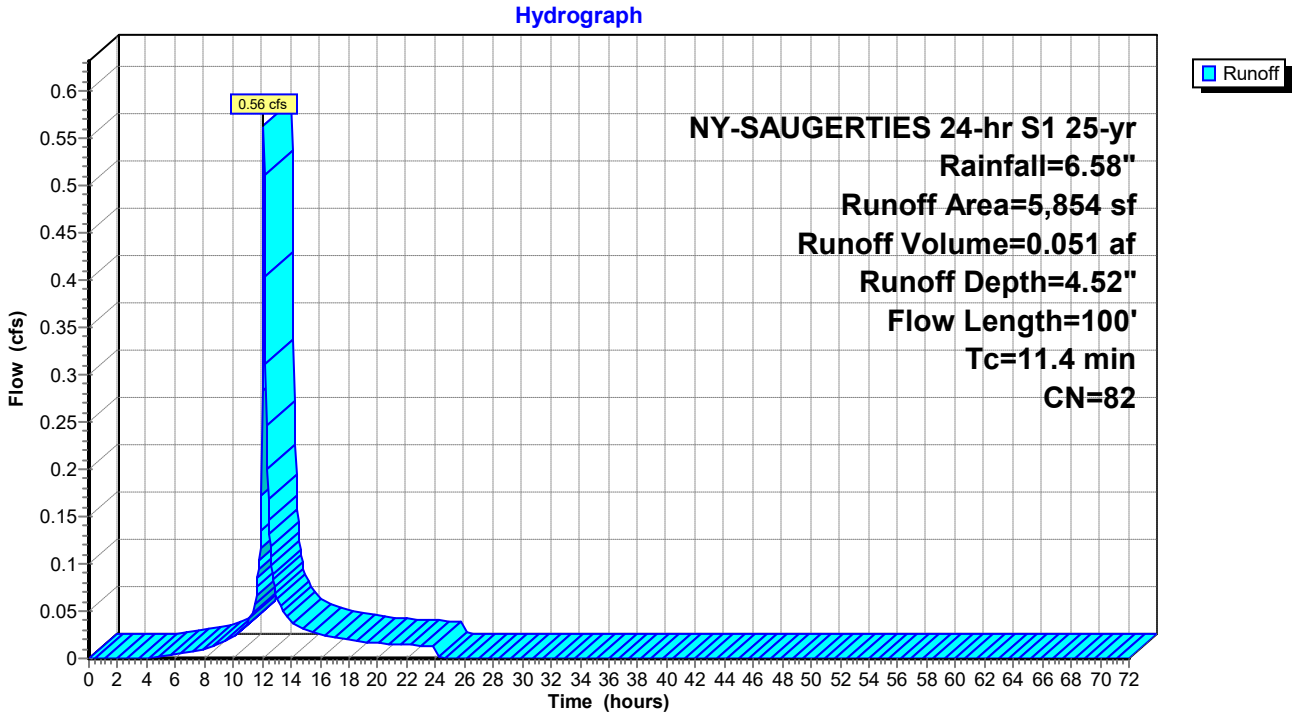
Runoff = 0.56 cfs @ 12.11 hrs, Volume= 0.051 af, Depth= 4.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	2,009	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,012	80	>75% Grass cover, Good, HSG D
*	833	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,854	82	Weighted Average
	5,021		85.77% Pervious Area
	833		14.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	30	0.0670	0.22		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
7.0	40	0.0500	0.10		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.38"
2.2	30	0.0670	0.22		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.38"
11.4	100	Total			

Subcatchment 1F: DRAINAGE AREA 1F



Summary for Subcatchment 1G: DRAINAGE AREA 1G

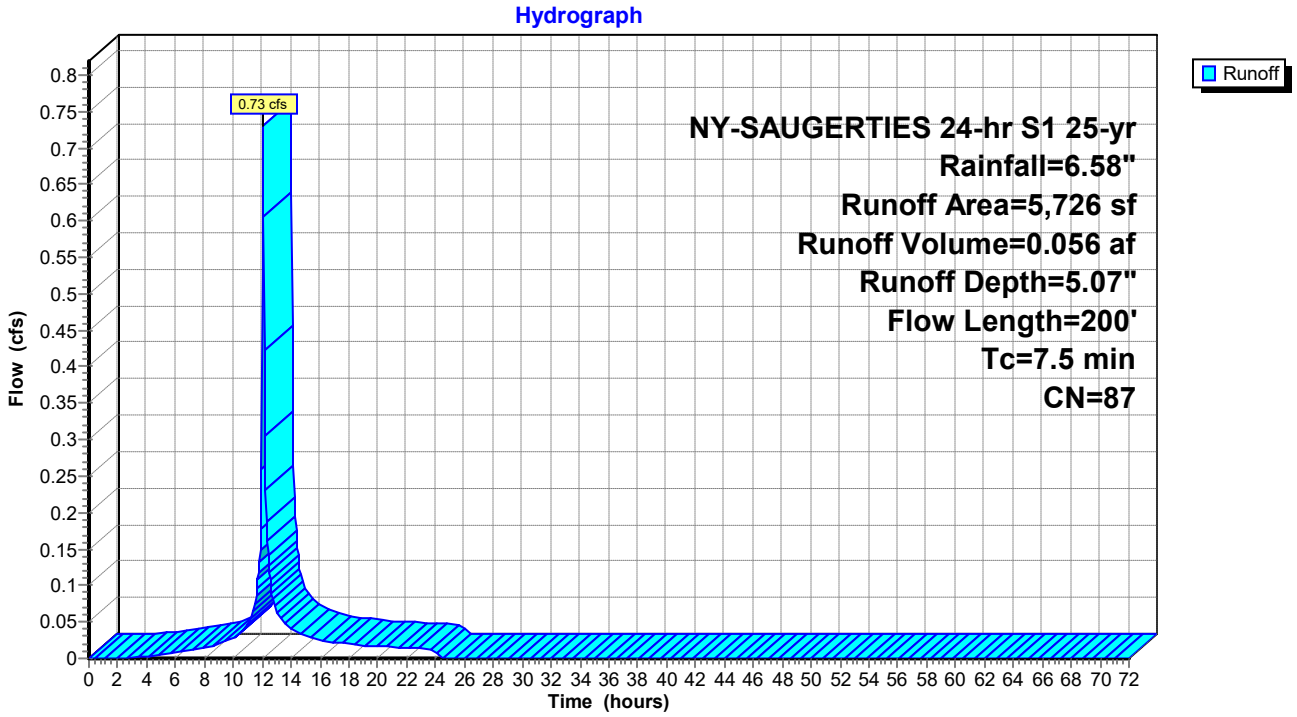
Runoff = 0.73 cfs @ 12.06 hrs, Volume= 0.056 af, Depth= 5.07"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	521	74	>75% Grass cover, Good, HSG C
	2,828	80	>75% Grass cover, Good, HSG D
*	2,377	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,726	87	Weighted Average
	3,349		58.49% Pervious Area
	2,377		41.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	5	0.1000	1.48		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
6.8	95	0.0420	0.23		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.6	100	0.0400	3.00		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
7.5	200	Total			

Subcatchment 1G: DRAINAGE AREA 1G



Summary for Subcatchment 1H: DRAINAGE AREA 8

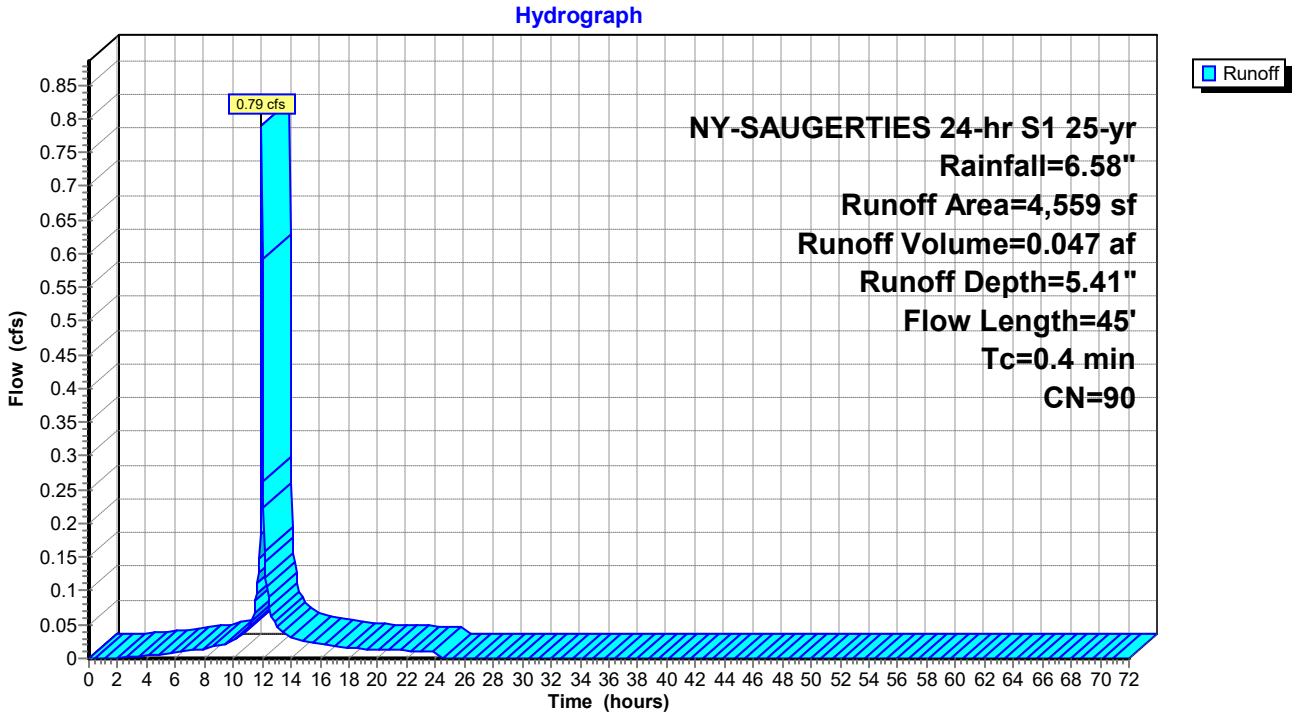
Runoff = 0.79 cfs @ 11.96 hrs, Volume= 0.047 af, Depth= 5.41"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	2,124	80	>75% Grass cover, Good, HSG D
*	2,435	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	4,559	90	Weighted Average
	2,124		46.59% Pervious Area
	2,435		53.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0250	1.12		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
0.1	25	0.3200	3.25		**Sheet Flow, B-C**
					Smooth surfaces n= 0.011 P2= 3.38"
0.4	45	Total			

Subcatchment 1H: DRAINAGE AREA 8



Summary for Subcatchment 1I: DRAINAGE AREA 1I

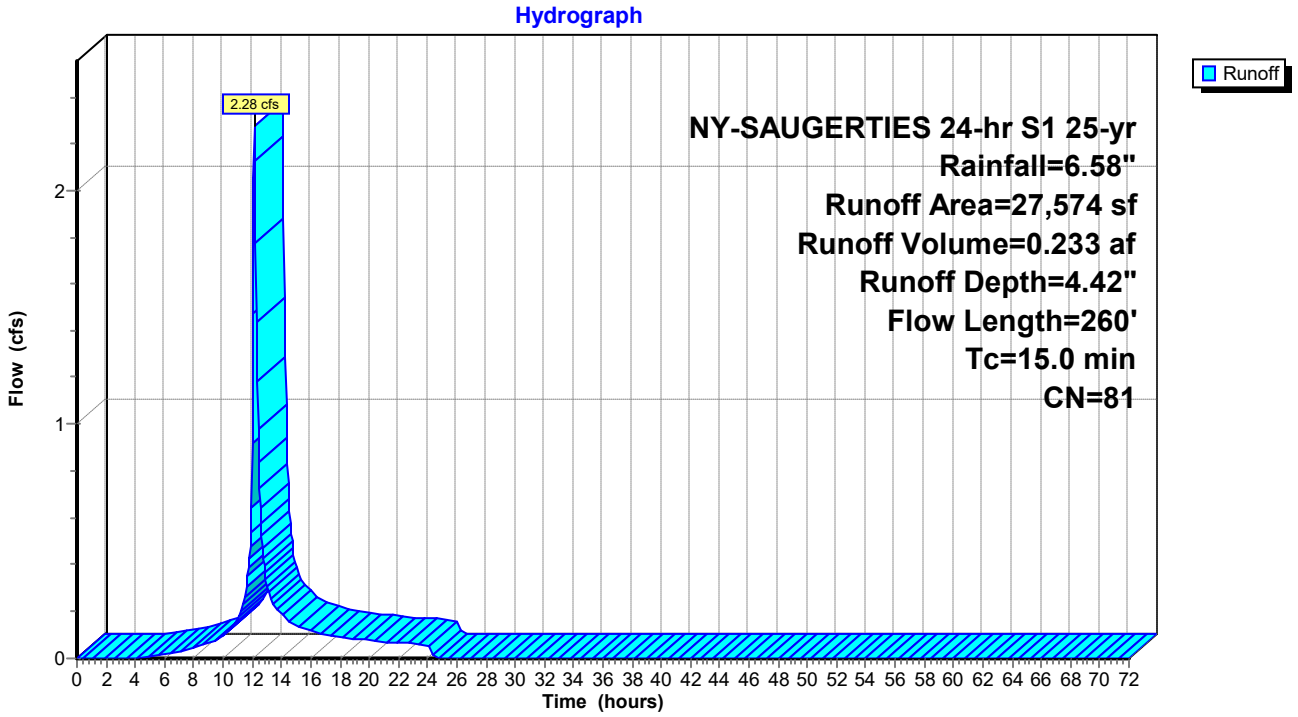
Runoff = 2.28 cfs @ 12.15 hrs, Volume= 0.233 af, Depth= 4.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	686	73	Woods, Fair, HSG C
	20,704	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,341	80	>75% Grass cover, Good, HSG D
*	2,843	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	27,574	81	Weighted Average
	24,731		89.69% Pervious Area
	2,843		10.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0600	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
0.9	70	0.0710	1.33		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	90	0.0330	2.72		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
15.0	260	Total			

Subcatchment 1I: DRAINAGE AREA 1I



Summary for Subcatchment 1J: DRAINAGE AREA 1J

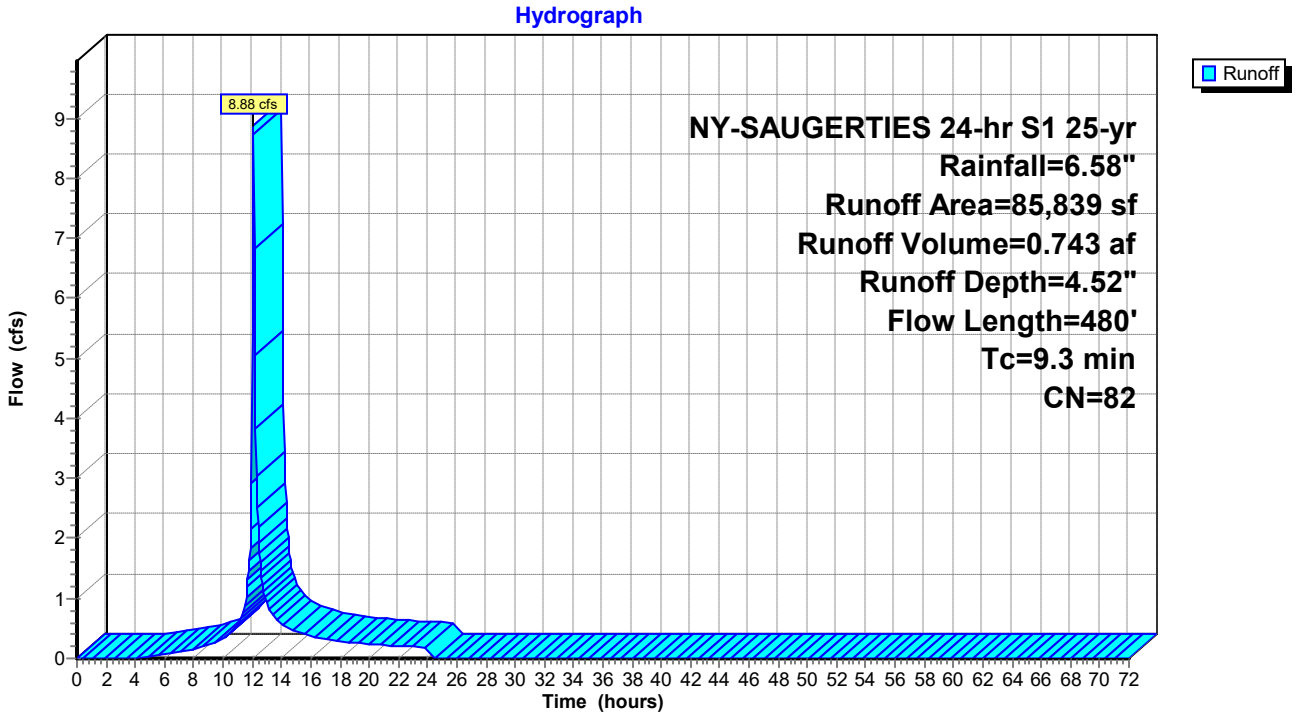
Runoff = 8.88 cfs @ 12.08 hrs, Volume= 0.743 af, Depth= 4.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	52,694	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	22,447	80	>75% Grass cover, Good, HSG D
*	7,814	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	85,839	82	Weighted Average
	75,141		87.54% Pervious Area
	10,698		12.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	10	0.0500	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
0.6	50	0.0300	1.45		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.38"
2.5	30	0.0500	0.20		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.38"
2.3	10	0.0500	0.07		**Sheet Flow, D-E** Woods: Light underbrush n= 0.400 P2= 3.38"
1.2	70	0.0360	0.95		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
1.7	310	0.0420	3.07		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
9.3	480	Total			

Subcatchment 1J: DRAINAGE AREA 1J



Summary for Subcatchment 1K: DRAINAGE AREA 1K

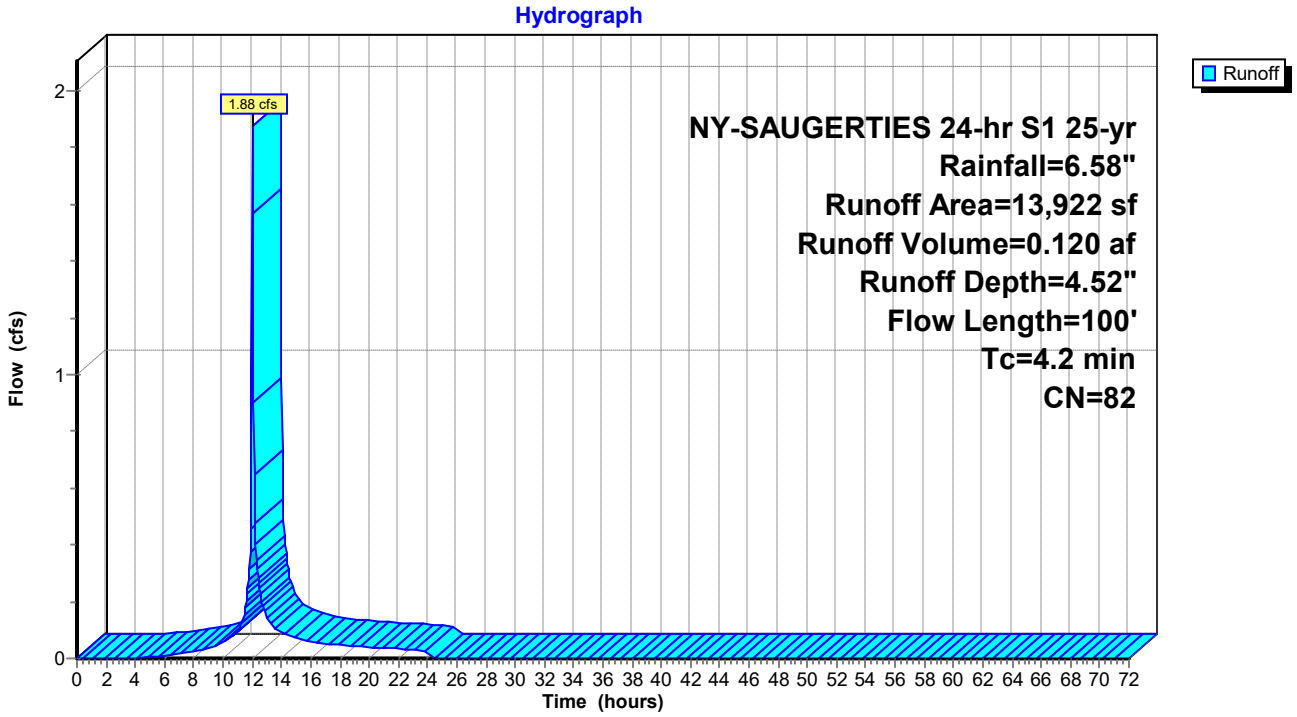
Runoff = 1.88 cfs @ 12.01 hrs, Volume= 0.120 af, Depth= 4.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	12,099	80	>75% Grass cover, Good, HSG D
*	1,823	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	13,922	82	Weighted Average
	12,099		86.91% Pervious Area
	1,823		13.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	15	0.0330	1.18		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
4.0	85	0.1290	0.36		**Sheet Flow, B-C**
					Grass: Short n= 0.150 P2= 3.38"
4.2	100	Total			

Subcatchment 1K: DRAINAGE AREA 1K



Summary for Subcatchment 1L: DRAINAGE AREA 1L

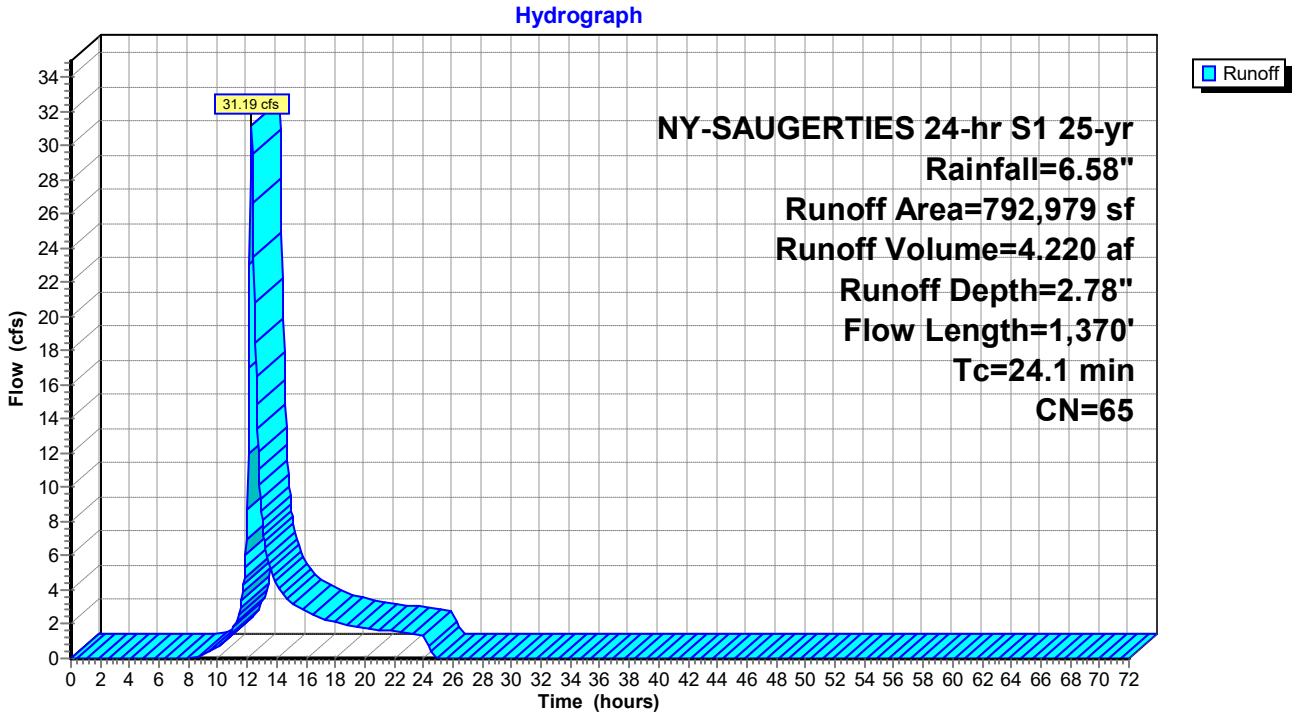
Runoff = 31.19 cfs @ 12.28 hrs, Volume= 4.220 af, Depth= 2.78"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	162,840	36	Woods, Fair, HSG A
	218,251	60	Woods, Fair, HSG B
	3,820	73	Woods, Fair, HSG C
	357,922	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	2,373	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	30,455	80	>75% Grass cover, Good, HSG D
*	11,550	98	Paved roads w/curbs & sewers, HSG A-D
*	5,768	98	Roofs, HSG A-D
	792,979	65	Weighted Average
	775,661		97.82% Pervious Area
	17,318		2.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.1400	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
3.3	310	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
11.2	960	0.0090	1.42		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
24.1	1,370	Total			

Subcatchment 1L: DRAINAGE AREA 1L



Summary for Subcatchment 1M: DRAINAGE AREA 1M

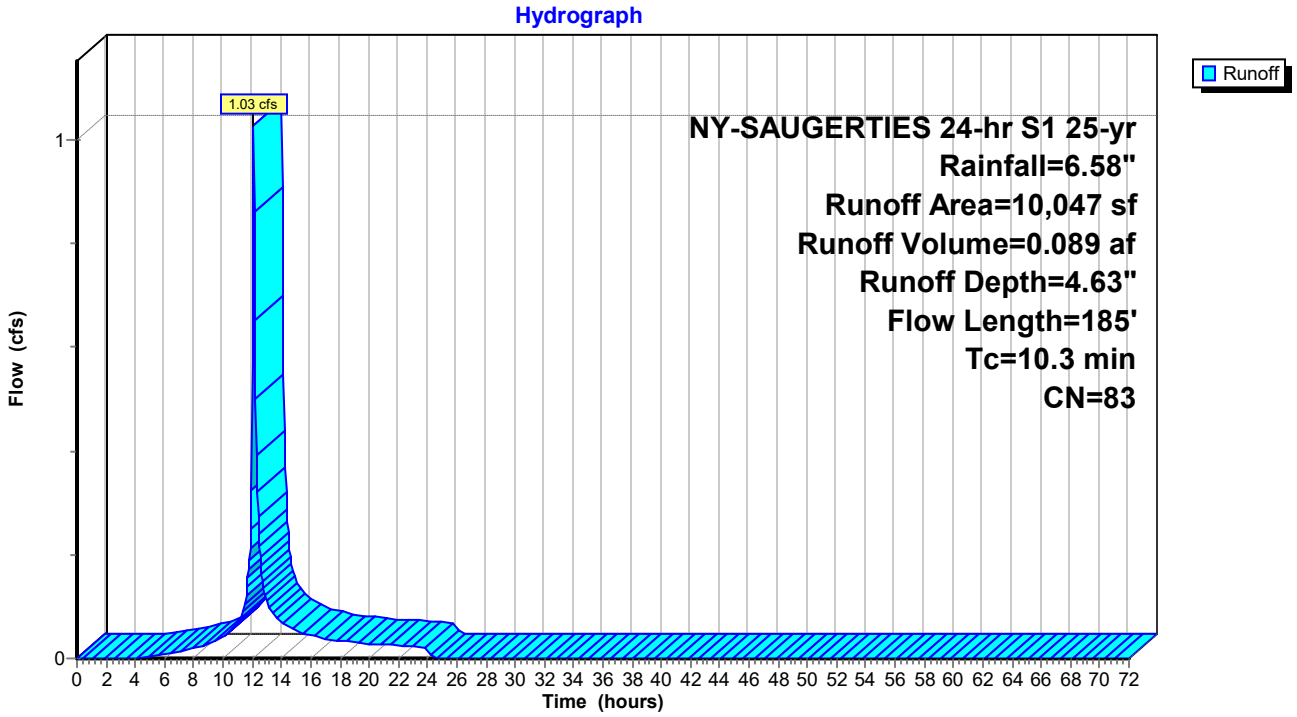
Runoff = 1.03 cfs @ 12.09 hrs, Volume= 0.089 af, Depth= 4.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	3,810	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	4,526	80	>75% Grass cover, Good, HSG D
*	1,711	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	10,047	83	Weighted Average
	8,336		82.97% Pervious Area
	1,711		17.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0330	1.09		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
2.4	20	0.0250	0.14		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
7.0	65	0.1310	0.16		**Sheet Flow, C-D** Woods: Light underbrush n= 0.400 P2= 3.38"
0.7	90	0.0220	2.22		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
10.3	185	Total			

Subcatchment 1M: DRAINAGE AREA 1M



Summary for Subcatchment 2A: DRAINAGE AREA 2A

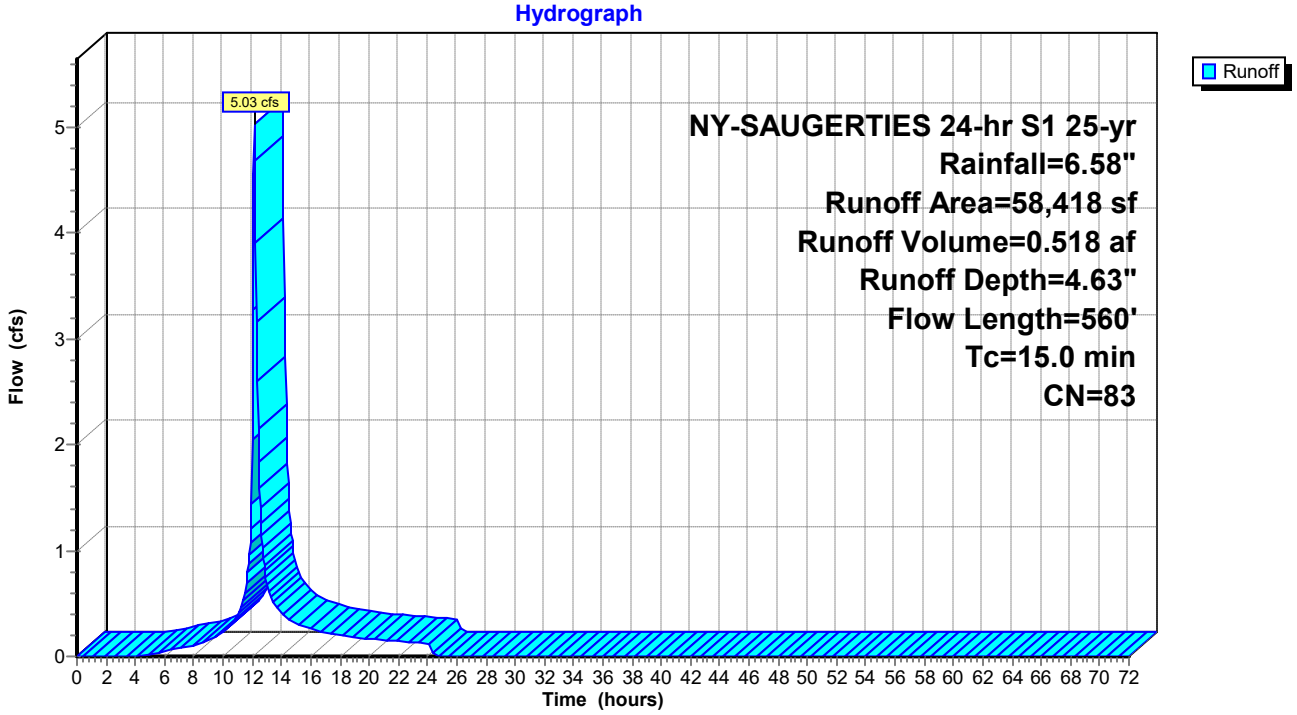
Runoff = 5.03 cfs @ 12.15 hrs, Volume= 0.518 af, Depth= 4.63"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	22,949	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	24,787	80	>75% Grass cover, Good, HSG D
*	7,798	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	58,418	83	Weighted Average
	47,736		81.71% Pervious Area
	10,682		18.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	7	0.0710	1.38		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
7.5	93	0.0320	0.21		**Sheet Flow, B-C**
					Grass: Short n= 0.150 P2= 3.38"
0.8	150	0.0430	3.11		**Shallow Concentrated Flow, C-D**
					Grassed Waterway Kv= 15.0 fps
6.4	280	0.0210	0.72		**Shallow Concentrated Flow, D-E**
					Woodland Kv= 5.0 fps
0.2	30	0.0330	2.72		**Shallow Concentrated Flow, E-F**
					Grassed Waterway Kv= 15.0 fps
15.0	560	Total			

Subcatchment 2A: DRAINAGE AREA 2A



Summary for Subcatchment 2B: DRAINAGE AREA 2B

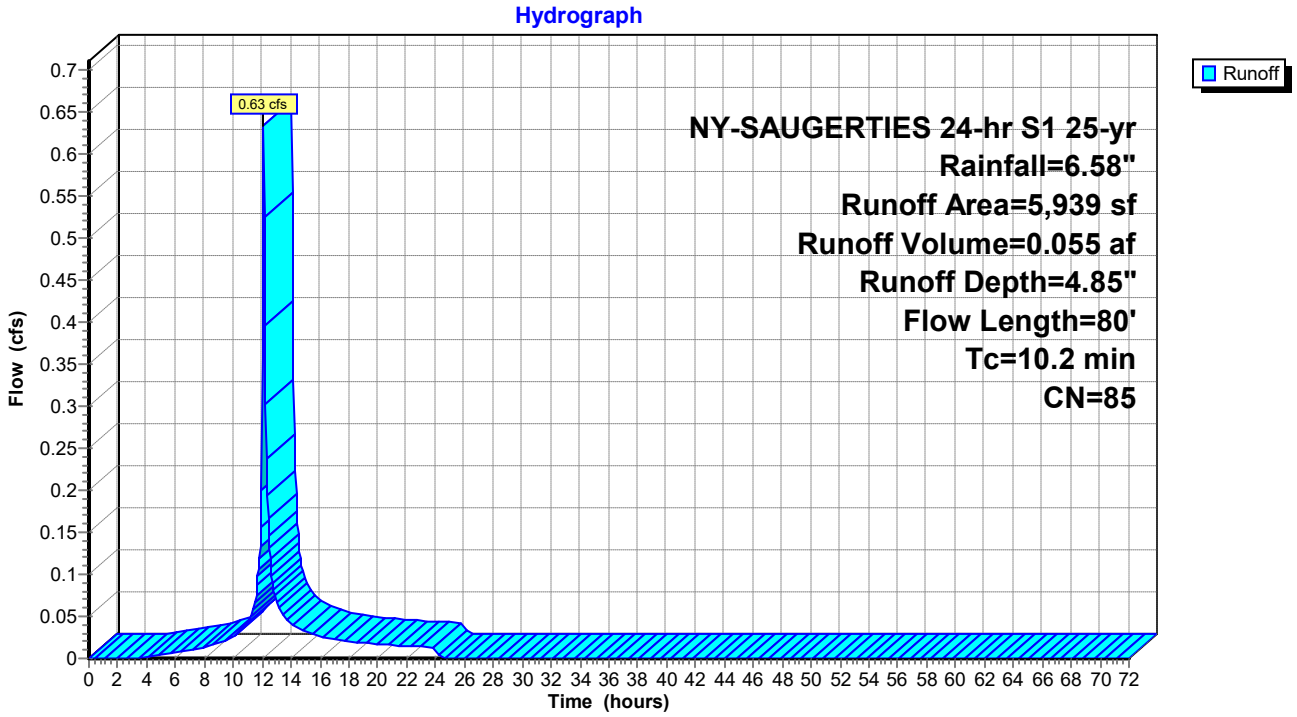
Runoff = 0.63 cfs @ 12.09 hrs, Volume= 0.055 af, Depth= 4.85"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	1,167	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,008	80	>75% Grass cover, Good, HSG D
*	1,764	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,939	85	Weighted Average
	4,175		70.30% Pervious Area
	1,764		29.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	35	0.0290	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.4	45	0.1330	0.32		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
10.2	80	Total			

Subcatchment 2B: DRAINAGE AREA 2B



Summary for Subcatchment 2C: DRAINAGE AREA 2C

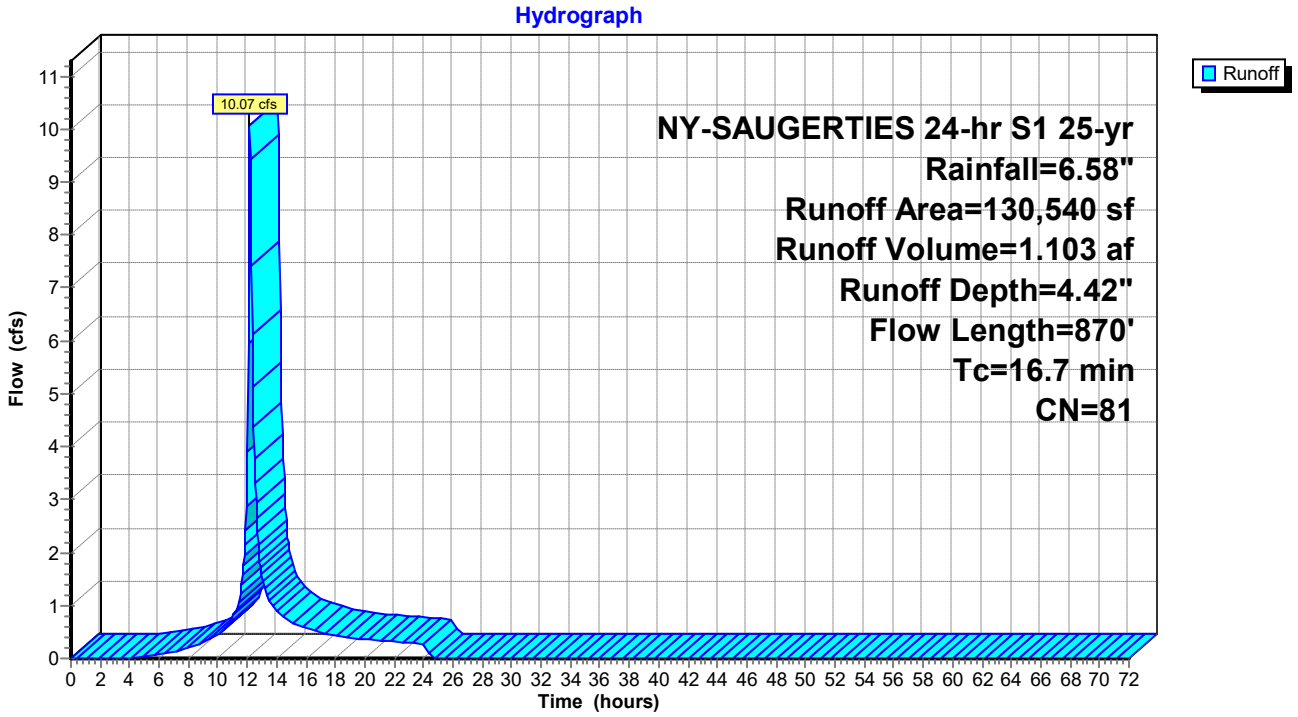
Runoff = 10.07 cfs @ 12.18 hrs, Volume= 1.103 af, Depth= 4.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	92,203	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	28,020	80	>75% Grass cover, Good, HSG D
*	10,317	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	130,540	81	Weighted Average
	120,223		92.10% Pervious Area
	10,317		7.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0900	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.7	210	0.0190	2.07		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
0.1	30	0.1670	6.13		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
3.5	530	0.0280	2.51		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
16.7	870	Total			

Subcatchment 2C: DRAINAGE AREA 2C



Summary for Subcatchment 2D: DRAINAGE AREA 2D

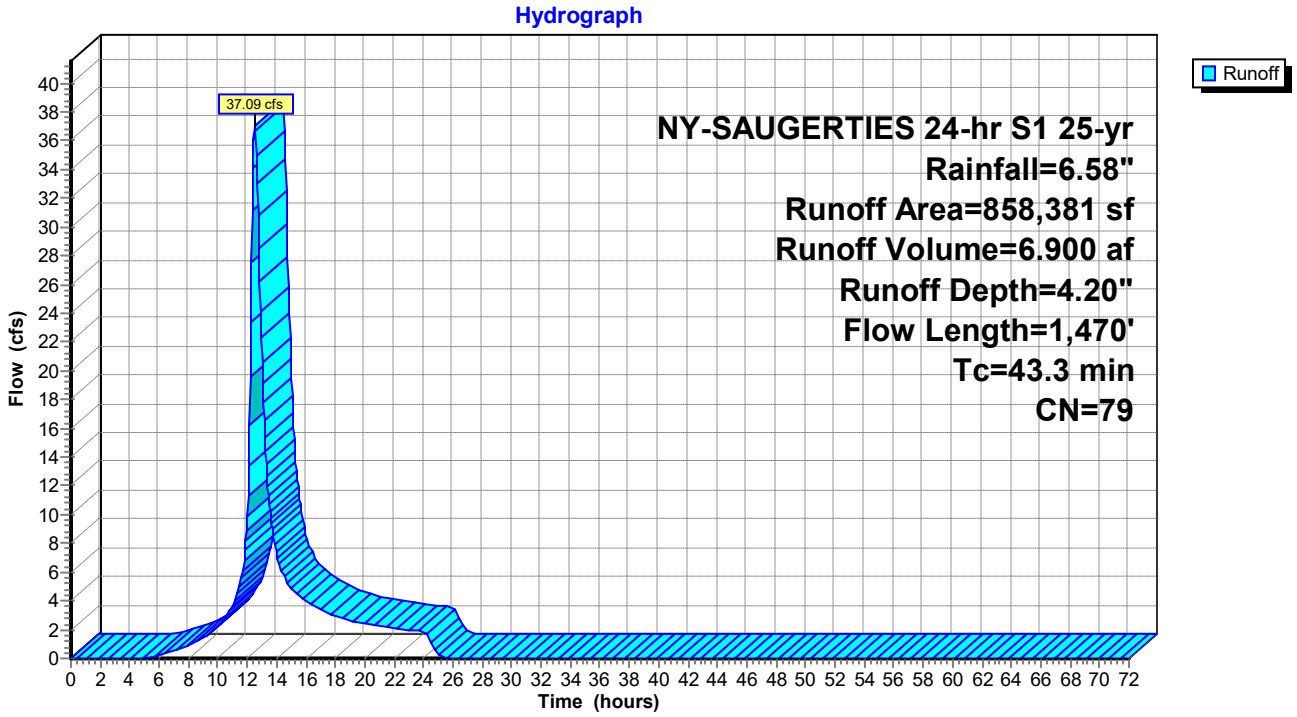
Runoff = 37.09 cfs @ 12.53 hrs, Volume= 6.900 af, Depth= 4.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	34,292	73	Woods, Fair, HSG C
	808,098	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	3,863	74	>75% Grass cover, Good, HSG C
	7,734	80	>75% Grass cover, Good, HSG D
*	4,394	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	858,381	79	Weighted Average
	853,987		99.49% Pervious Area
	4,394		0.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1300	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
0.6	50	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
32.8	1,320	0.0180	0.67		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
43.3	1,470	Total			

Subcatchment 2D: DRAINAGE AREA 2D



Summary for Subcatchment 2E: DRAINAGE AREA 18

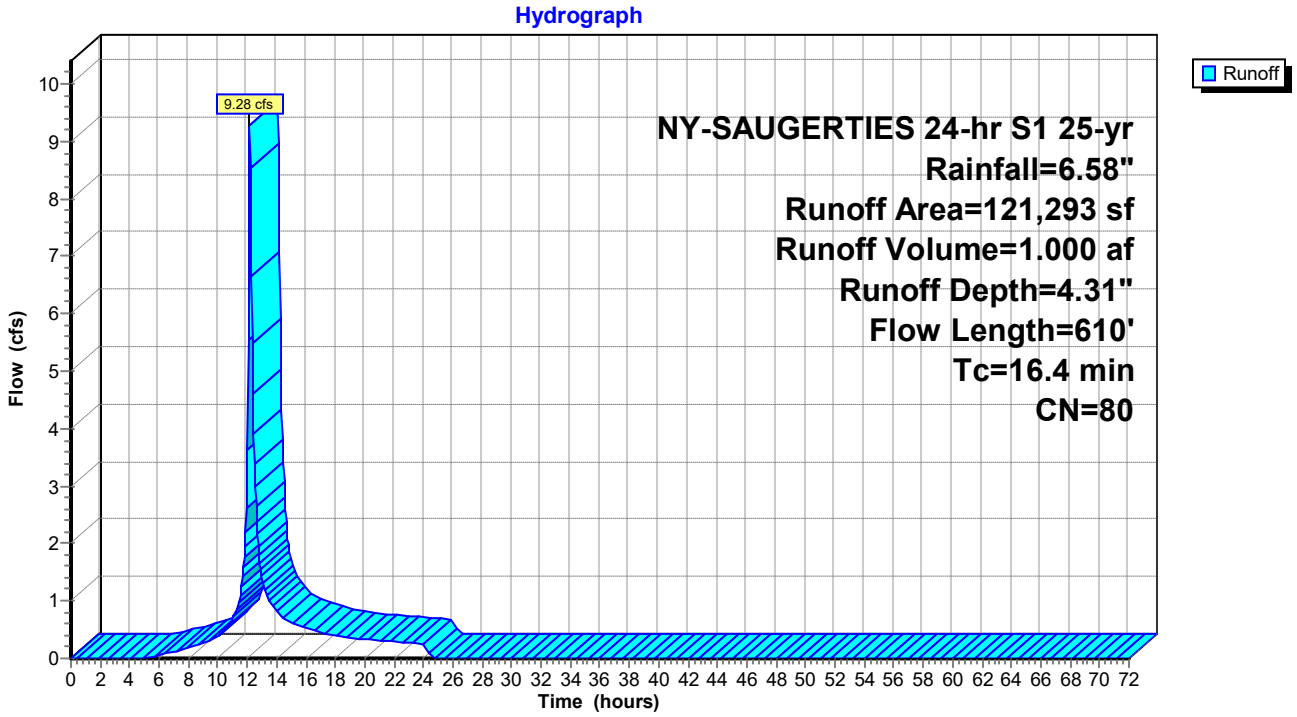
Runoff = 9.28 cfs @ 12.17 hrs, Volume= 1.000 af, Depth= 4.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	23,515	73	Woods, Fair, HSG C
	54,460	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	3,737	74	>75% Grass cover, Good, HSG C
	25,044	80	>75% Grass cover, Good, HSG D
*	11,653	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	121,293	80	Weighted Average
	106,756		88.01% Pervious Area
	14,537		11.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0830	1.42		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
6.1	94	0.0530	0.25		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.8	220	0.2270	4.76		**Shallow Concentrated Flow, C-D** Nearly Bare & Untilled Kv= 10.0 fps
0.1	40	0.2000	6.71		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
9.3	250	0.0080	0.45		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
16.4	610	Total			

Subcatchment 2E: DRAINAGE AREA 18



Summary for Subcatchment 2F: DRAINAGE AREA 2F

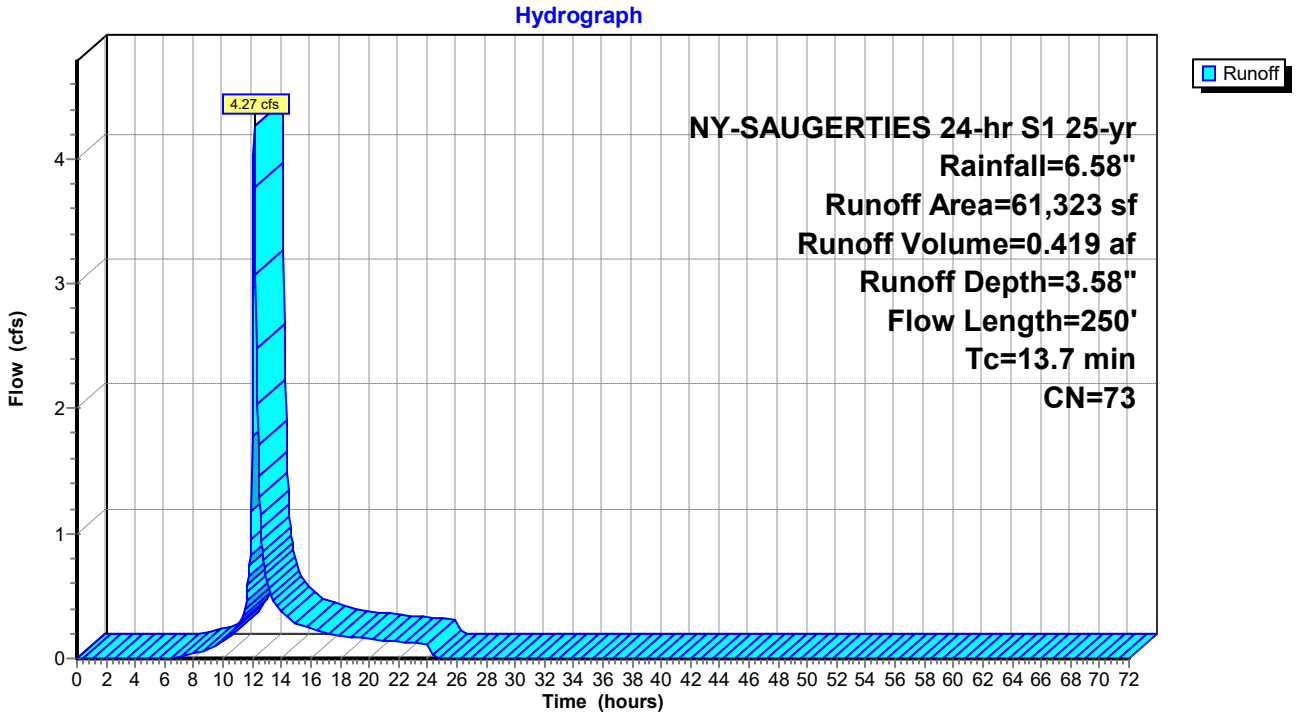
Runoff = 4.27 cfs @ 12.14 hrs, Volume= 0.419 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	5,624	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	4,622	73	Woods, Fair, HSG C
	47,954	79	Woods, Fair, HSG D
	3,123	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
*	0	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	61,323	73	Weighted Average
	61,323		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0800	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.7	150	0.0870	1.47		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
13.7	250	Total			

Subcatchment 2F: DRAINAGE AREA 2F



Summary for Subcatchment 2G: DRAINAGE AREA 2G

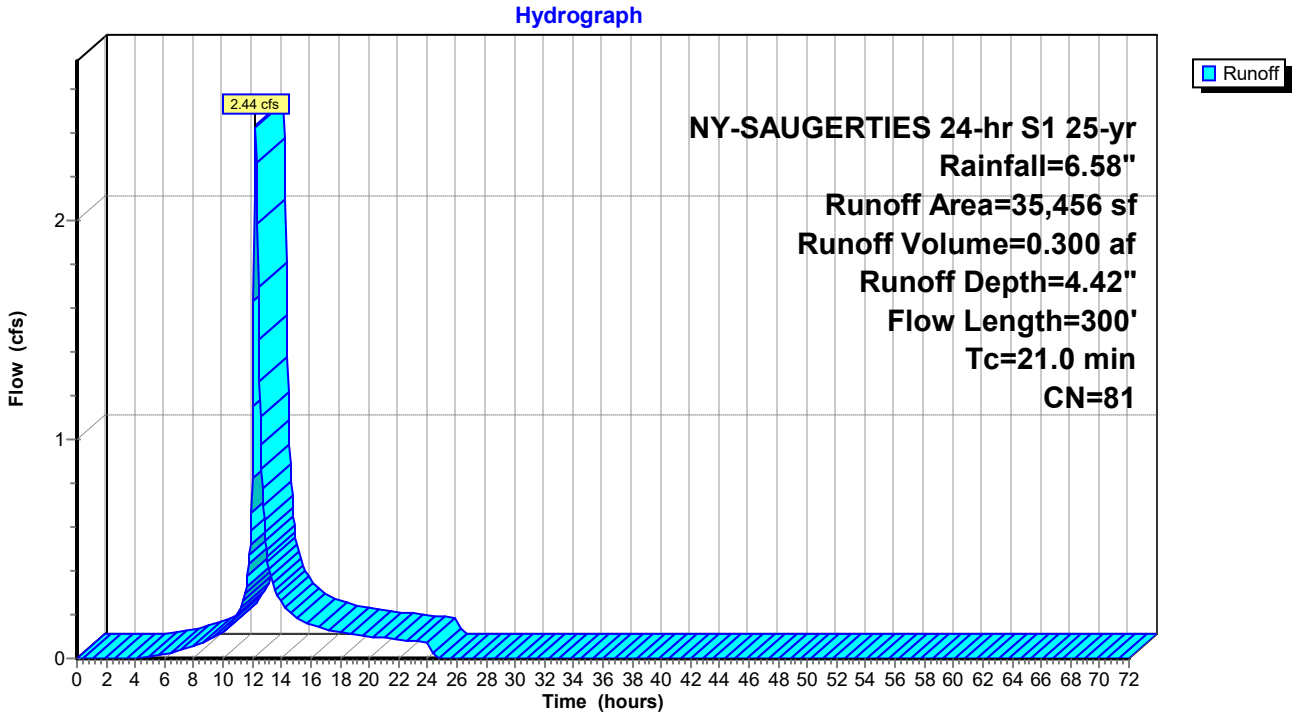
Runoff = 2.44 cfs @ 12.23 hrs, Volume= 0.300 af, Depth= 4.42"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	27,880	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	4,802	80	>75% Grass cover, Good, HSG D
*	2,774	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	35,456	81	Weighted Average
	32,682		92.18% Pervious Area
	2,774		7.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0300	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
3.1	190	0.0420	1.02		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	10	0.0300	2.60		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
21.0	300	Total			

Subcatchment 2G: DRAINAGE AREA 2G



Summary for Subcatchment 3: DRAINAGE AREA 3

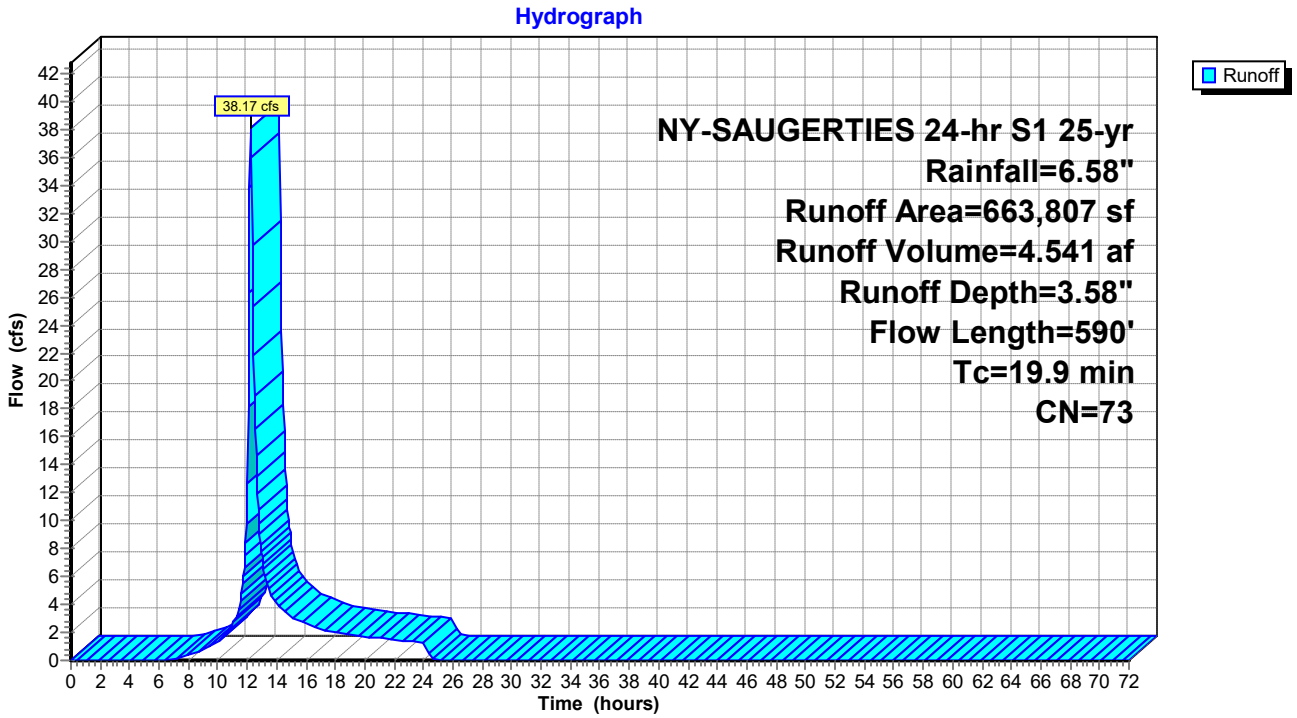
Runoff = 38.17 cfs @ 12.22 hrs, Volume= 4.541 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
663,807	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
663,807	73	Weighted Average
663,807		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.4	490	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	590	Total			

Subcatchment 3: DRAINAGE AREA 3



Summary for Subcatchment 4: DRAINAGE AREA 4

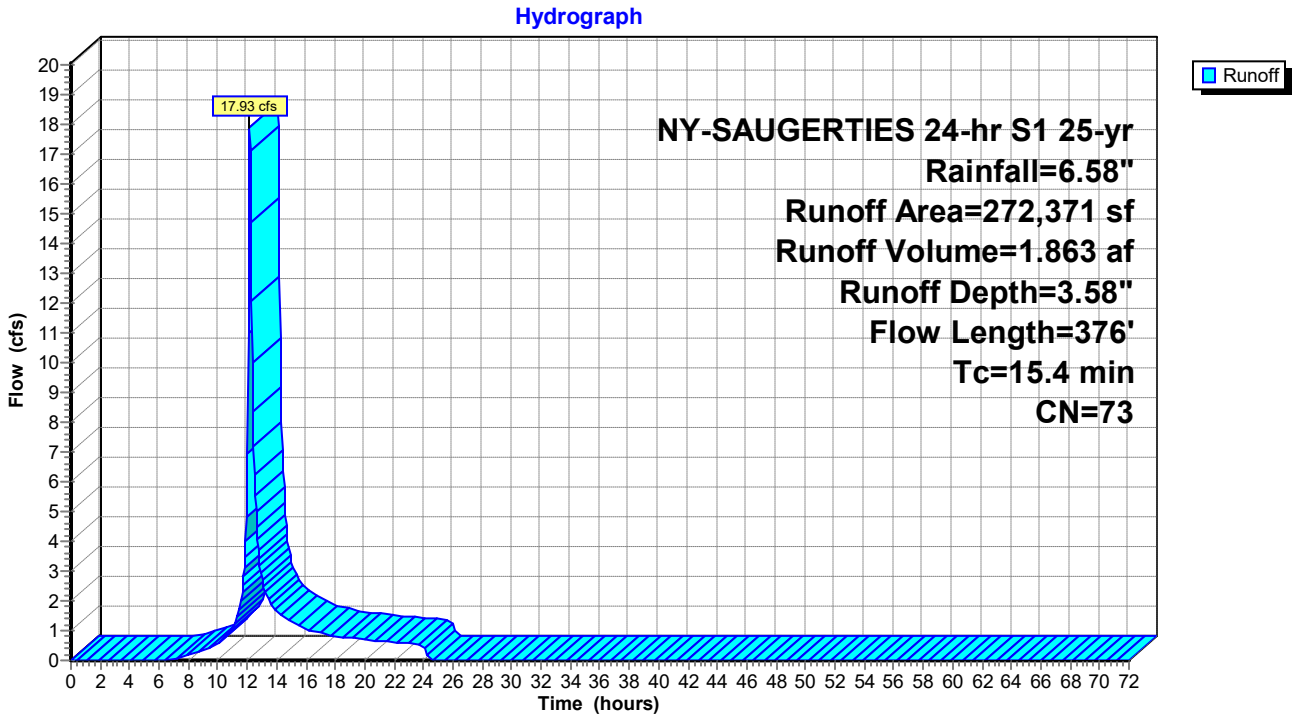
Runoff = 17.93 cfs @ 12.16 hrs, Volume= 1.863 af, Depth= 3.58"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
272,371	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
272,371	73	Weighted Average
272,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0700	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.7	276	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.4	376	Total			

Subcatchment 4: DRAINAGE AREA 4



Summary for Subcatchment 5: DRAINAGE AREA 5

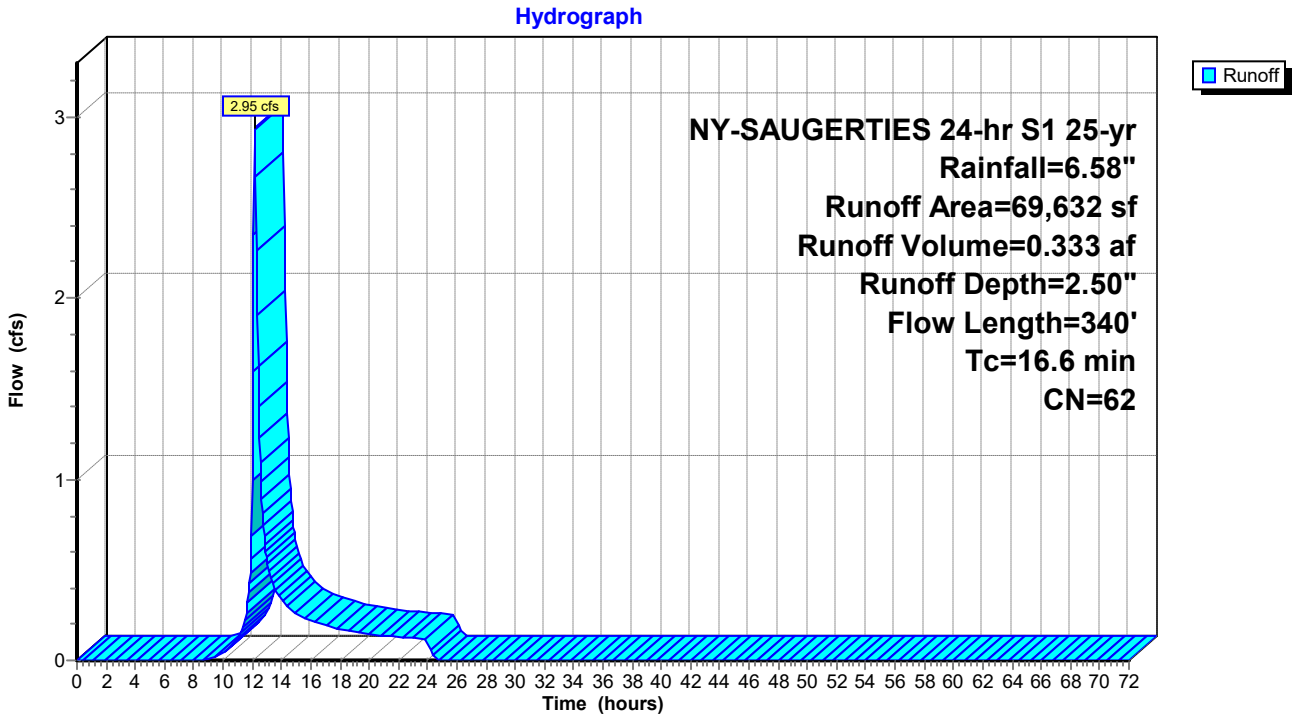
Runoff = 2.95 cfs @ 12.19 hrs, Volume= 0.333 af, Depth= 2.50"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 25-yr Rainfall=6.58"

Area (sf)	CN	Description
27,631	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
42,001	79	Woods, Fair, HSG D
69,632	62	Weighted Average
69,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0540	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.6	240	0.0930	1.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.6	340	Total			

Subcatchment 5: DRAINAGE AREA 5



Summary for Pond AC1: ARCH CULVERT

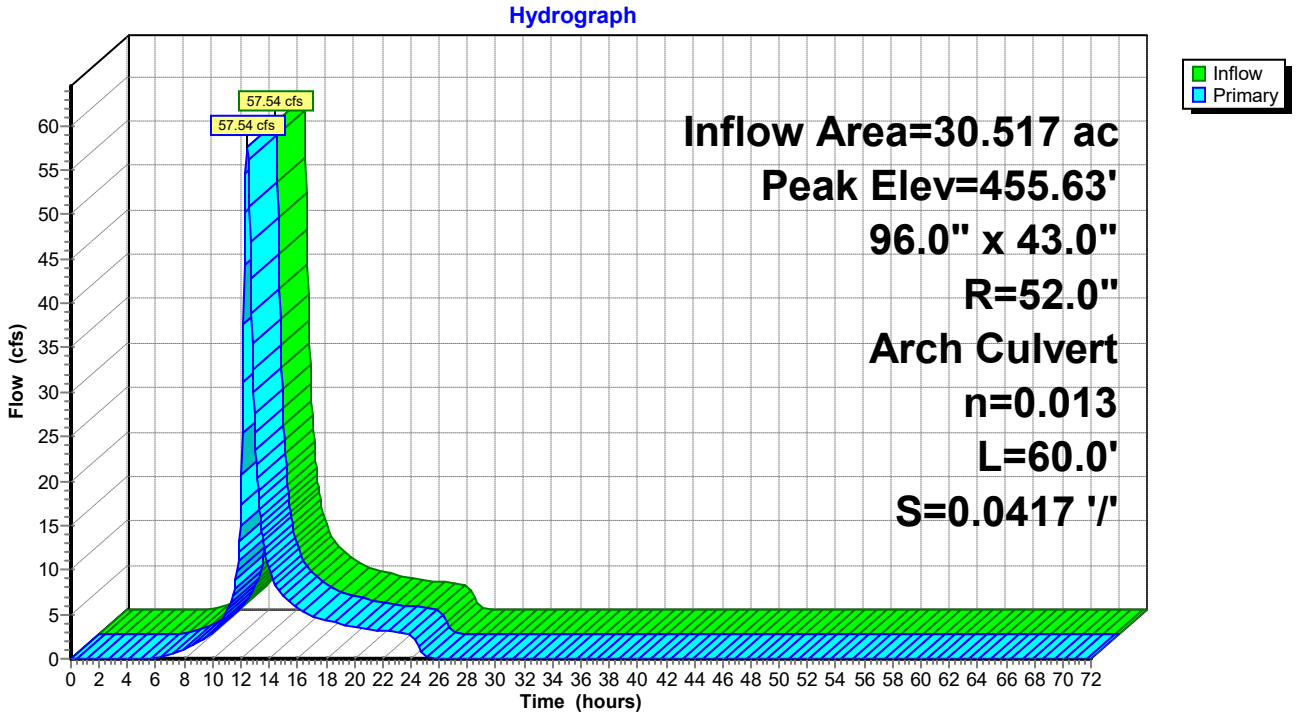
Inflow Area = 30.517 ac, 3.65% Impervious, Inflow Depth = 3.90" for 25-yr event
Inflow = 57.54 cfs @ 12.44 hrs, Volume= 9.928 af
Outflow = 57.54 cfs @ 12.44 hrs, Volume= 9.928 af, Atten= 0%, Lag= 0.0 min
Primary = 57.54 cfs @ 12.44 hrs, Volume= 9.928 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 455.63' @ 12.44 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	453.90'	**96.0" W x 43.0" H, R=52.0" Arch Culvert** L= 60.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 453.90' / 451.40' S= 0.0417 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 22.75 sf

Primary OutFlow Max=57.43 cfs @ 12.44 hrs HW=455.62' (Free Discharge)
└**1=Culvert** (Inlet Controls 57.43 cfs @ 4.26 fps)

Pond AC1: ARCH CULVERT



Summary for Pond AC2: ARCH CULVERT

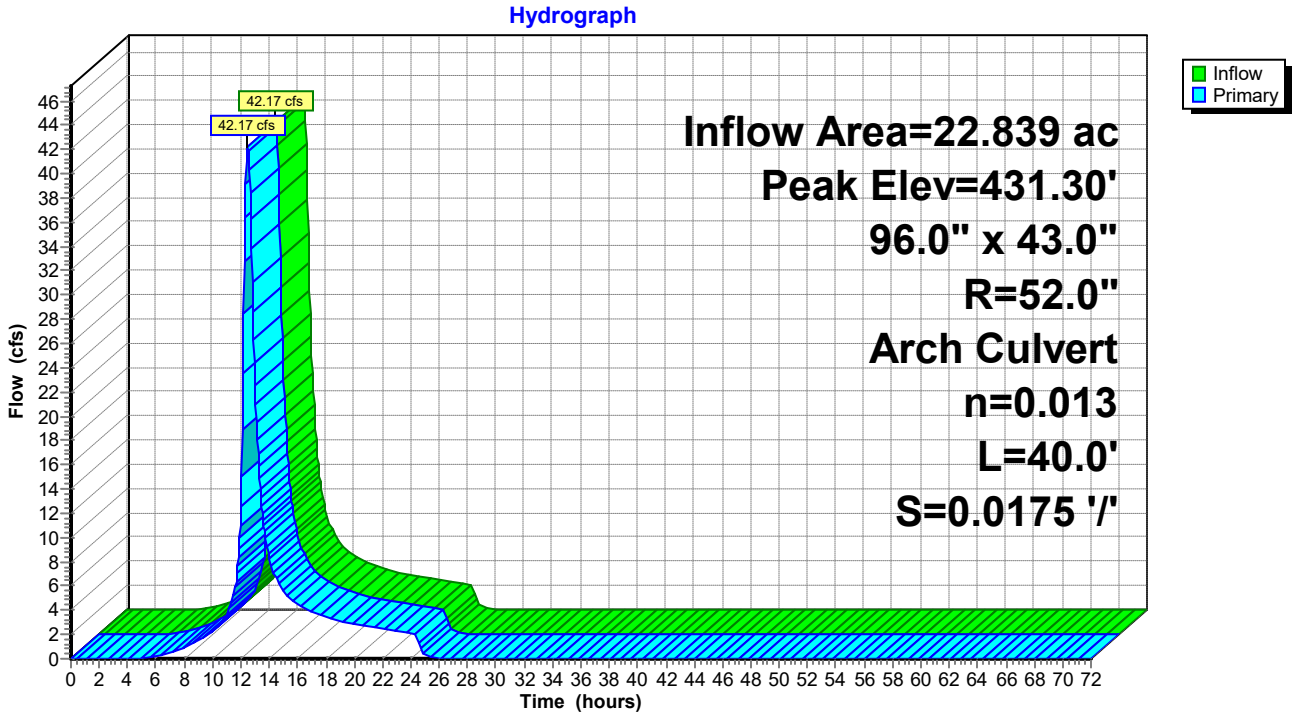
Inflow Area = 22.839 ac, 1.66% Impervious, Inflow Depth = 4.14" for 25-yr event
Inflow = 42.17 cfs @ 12.48 hrs, Volume= 7.875 af
Outflow = 42.17 cfs @ 12.48 hrs, Volume= 7.875 af, Atten= 0%, Lag= 0.0 min
Primary = 42.17 cfs @ 12.48 hrs, Volume= 7.875 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 431.30' @ 12.48 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	429.90'	**96.0" W x 43.0" H, R=52.0" Arch Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 429.90' / 429.20' S= 0.0175 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 22.75 sf

Primary OutFlow Max=42.10 cfs @ 12.48 hrs HW=431.29' (Free Discharge)
└**1=Culvert** (Inlet Controls 42.10 cfs @ 3.81 fps)

Pond AC2: ARCH CULVERT



Summary for Pond BR1-C7: BIO-RET POND 1

Inflow Area = 4.967 ac, 10.94% Impervious, Inflow Depth = 3.99" for 25-yr event
Inflow = 8.74 cfs @ 12.36 hrs, Volume= 1.651 af
Outflow = 8.69 cfs @ 12.40 hrs, Volume= 1.651 af, Atten= 1%, Lag= 2.1 min
Primary = 8.69 cfs @ 12.40 hrs, Volume= 1.651 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 478.04' @ 12.40 hrs Surf.Area= 541 sf Storage= 670 cf

Plug-Flow detention time= 7.0 min calculated for 1.651 af (100% of inflow)
Center-of-Mass det. time= 6.6 min (872.7 - 866.1)

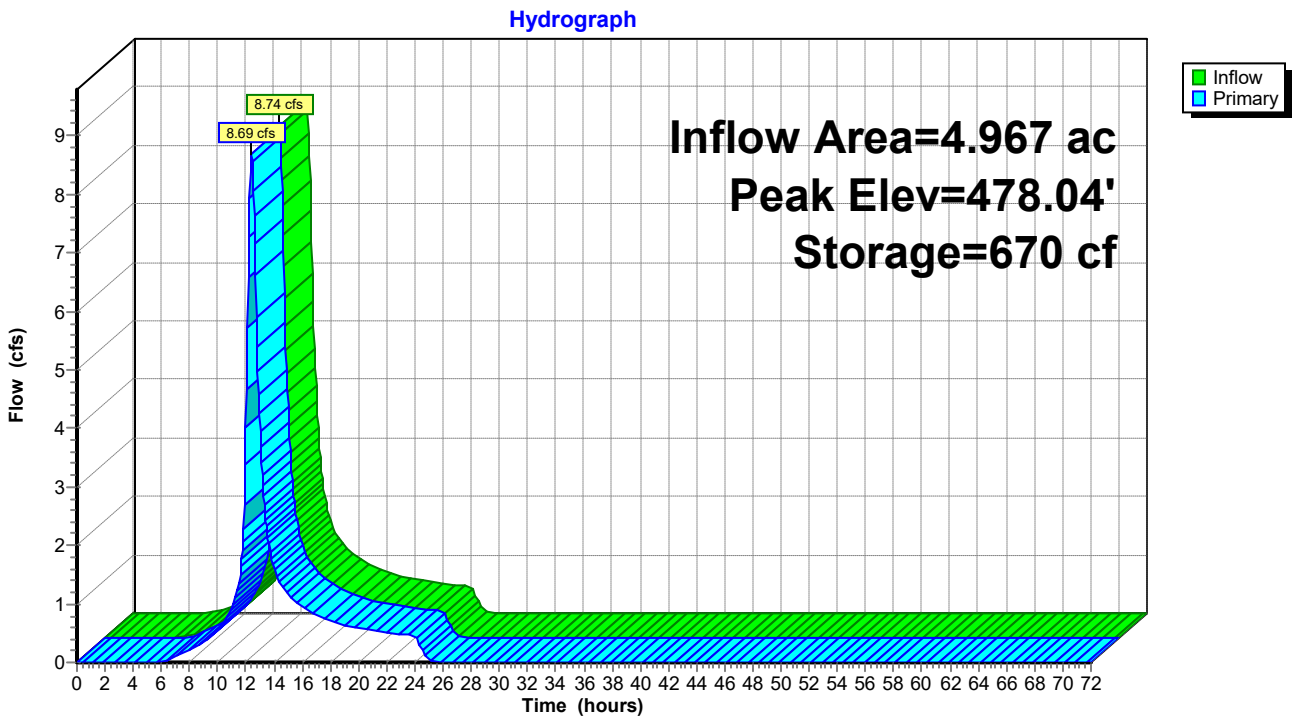
Volume	Invert	Avail.Storage	Storage Description
#1	476.00'	2,275 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
476.00	154	0	0	154
478.00	531	647	647	551
480.00	1,134	1,627	2,275	1,187

Device	Routing	Invert	Outlet Devices
#1	Primary	474.00'	**18.0" Round Culvert** L= 280.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 474.00' / 470.00' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	477.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	476.00'	**0.500 in/hr Exfiltration over Wetted area above 474.00'** Conductivity to Groundwater Elevation = 446.00' Excluded Wetted area = 0 sf

Primary OutFlow Max=8.69 cfs @ 12.40 hrs HW=478.04' (Free Discharge)
└─**1=Culvert** (Passes 8.69 cfs of 12.19 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 8.68 cfs @ 4.91 fps)
  └─**3=Exfiltration** (Controls 0.01 cfs)

Pond BR1-C7: BIO-RET POND 1



Summary for Pond BR2-C14: BIO-RET POND 2

Inflow Area = 2.923 ac, 12.07% Impervious, Inflow Depth = 4.50" for 25-yr event
Inflow = 11.86 cfs @ 12.08 hrs, Volume= 1.096 af
Outflow = 8.19 cfs @ 12.19 hrs, Volume= 1.096 af, Atten= 31%, Lag= 6.7 min
Primary = 8.19 cfs @ 12.19 hrs, Volume= 1.096 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 458.41' @ 12.19 hrs Surf.Area= 4,823 sf Storage= 9,474 cf

Plug-Flow detention time= 226.0 min calculated for 1.096 af (100% of inflow)
Center-of-Mass det. time= 225.8 min (1,055.6 - 829.8)

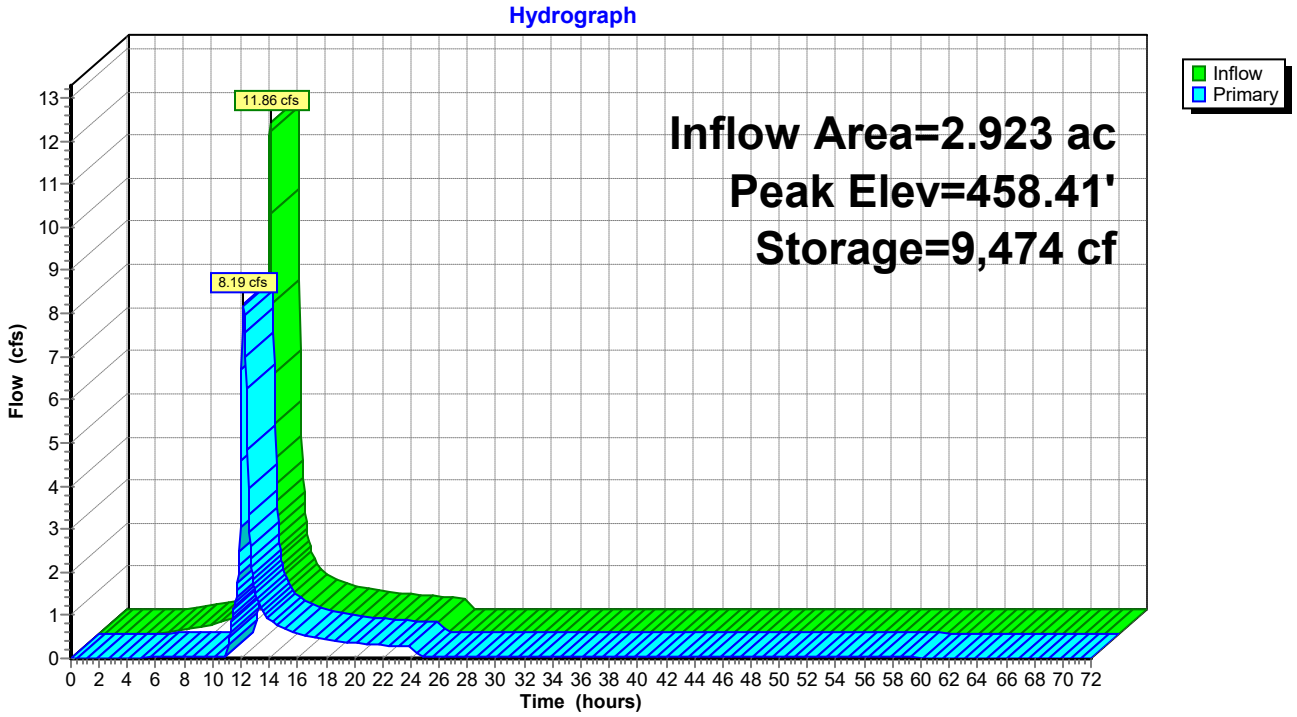
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	18,159 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
456.00	3,090	217.0	0	0	3,090
458.00	4,505	254.7	7,551	7,551	4,582
460.00	6,146	292.4	10,609	18,159	6,312

Device	Routing	Invert	Outlet Devices
#1	Primary	454.00'	**18.0" Round Culvert** L= 38.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 454.00' / 452.00' S= 0.0526 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	457.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	456.00'	**0.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 432.00'

Primary OutFlow Max=8.16 cfs @ 12.19 hrs HW=458.41' (Free Discharge)
└─**1=Culvert** (Passes 8.16 cfs of 16.27 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 8.10 cfs @ 4.59 fps)
  └─**3=Exfiltration** (Controls 0.06 cfs)

Pond BR2-C14: BIO-RET POND 2



Summary for Pond C1: 24" CULVERT

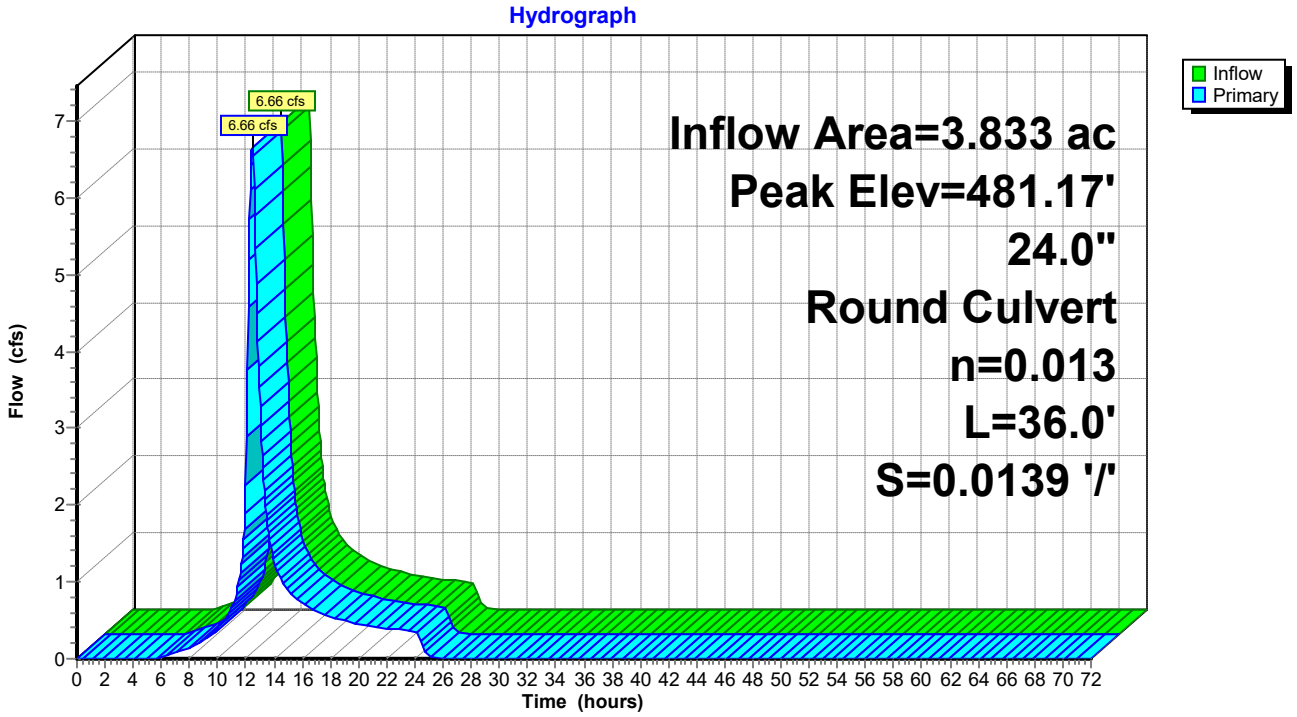
Inflow Area = 3.833 ac, 9.00% Impervious, Inflow Depth = 3.94" for 25-yr event
Inflow = 6.66 cfs @ 12.45 hrs, Volume= 1.258 af
Outflow = 6.66 cfs @ 12.45 hrs, Volume= 1.258 af, Atten= 0%, Lag= 0.0 min
Primary = 6.66 cfs @ 12.45 hrs, Volume= 1.258 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 481.17' @ 12.45 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	480.00'	**24.0" Round Culvert** L= 36.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 480.00' / 479.50' S= 0.0139 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=6.65 cfs @ 12.45 hrs HW=481.17' (Free Discharge)
└**1=Culvert** (Barrel Controls 6.65 cfs @ 5.04 fps)

Pond C1: 24" CULVERT



Summary for Pond C10: 15" CULVERT

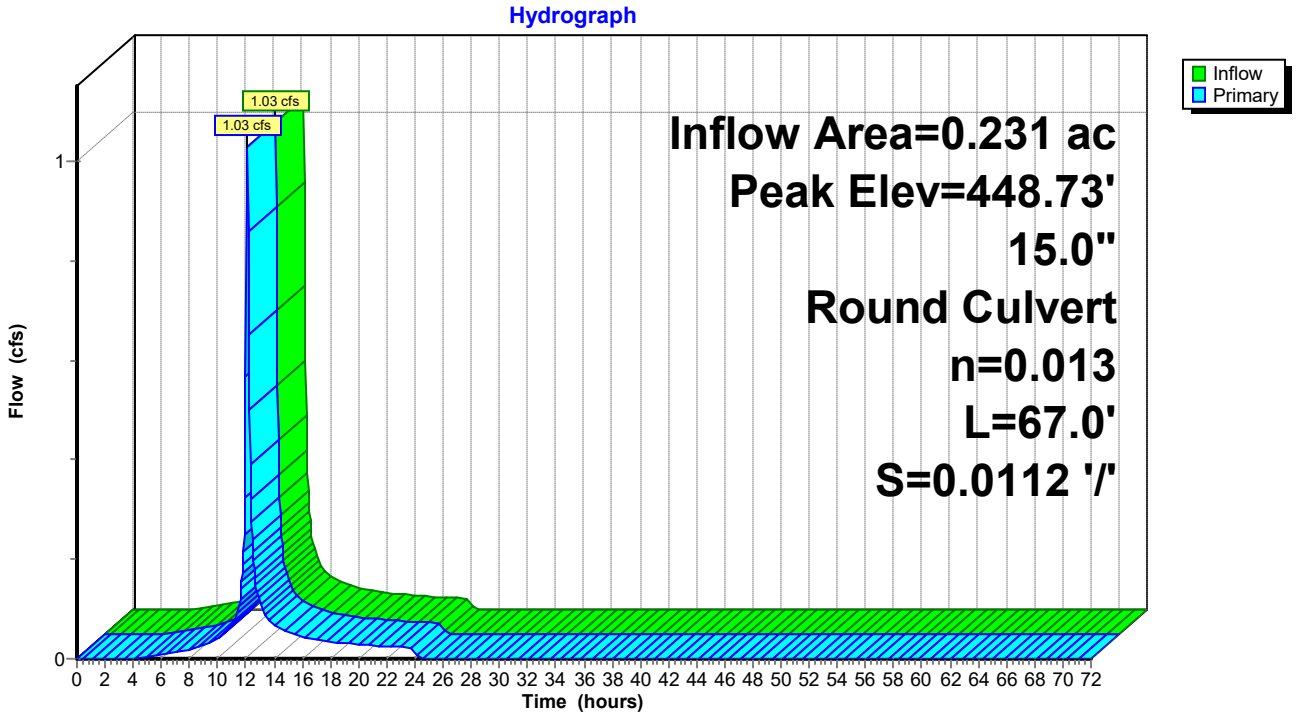
Inflow Area = 0.231 ac, 17.03% Impervious, Inflow Depth = 4.63" for 25-yr event
Inflow = 1.03 cfs @ 12.09 hrs, Volume= 0.089 af
Outflow = 1.03 cfs @ 12.09 hrs, Volume= 0.089 af, Atten= 0%, Lag= 0.0 min
Primary = 1.03 cfs @ 12.09 hrs, Volume= 0.089 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 448.73' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	448.25'	**15.0" Round Culvert** L= 67.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 448.25' / 447.50' S= 0.0112 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.02 cfs @ 12.09 hrs HW=448.73' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.02 cfs @ 2.35 fps)

Pond C10: 15" CULVERT



Summary for Pond C11: 12" CULVERT

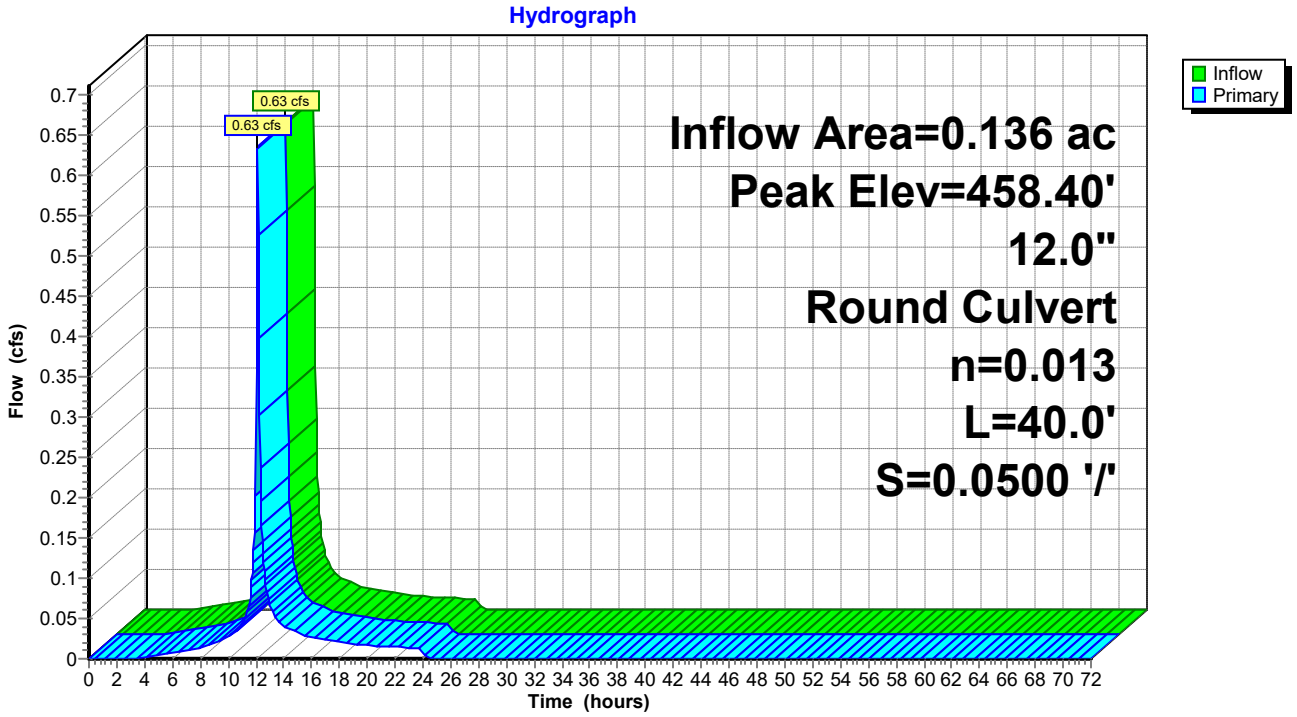
Inflow Area = 0.136 ac, 29.70% Impervious, Inflow Depth = 4.85" for 25-yr event
Inflow = 0.63 cfs @ 12.09 hrs, Volume= 0.055 af
Outflow = 0.63 cfs @ 12.09 hrs, Volume= 0.055 af, Atten= 0%, Lag= 0.0 min
Primary = 0.63 cfs @ 12.09 hrs, Volume= 0.055 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 458.40' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	458.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 458.00' / 456.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.62 cfs @ 12.09 hrs HW=458.40' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.62 cfs @ 2.15 fps)

Pond C11: 12" CULVERT



Summary for Pond C12: 24" CULVERT

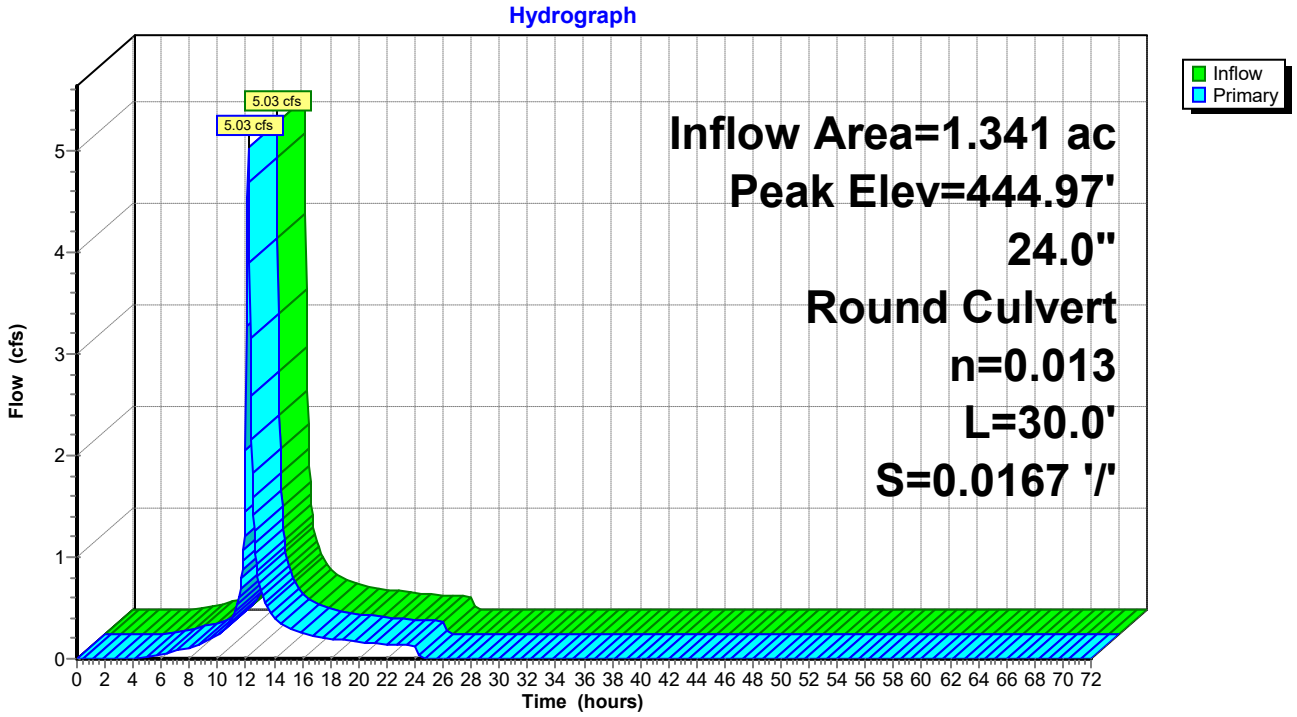
Inflow Area = 1.341 ac, 18.29% Impervious, Inflow Depth = 4.63" for 25-yr event
Inflow = 5.03 cfs @ 12.15 hrs, Volume= 0.518 af
Outflow = 5.03 cfs @ 12.15 hrs, Volume= 0.518 af, Atten= 0%, Lag= 0.0 min
Primary = 5.03 cfs @ 12.15 hrs, Volume= 0.518 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 444.97' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	444.00'	**24.0" Round Culvert** L= 30.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 444.00' / 443.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=5.00 cfs @ 12.15 hrs HW=444.97' (Free Discharge)
└**1=Culvert** (Barrel Controls 5.00 cfs @ 4.88 fps)

Pond C12: 24" CULVERT



Summary for Pond C13: 18" CULVERT

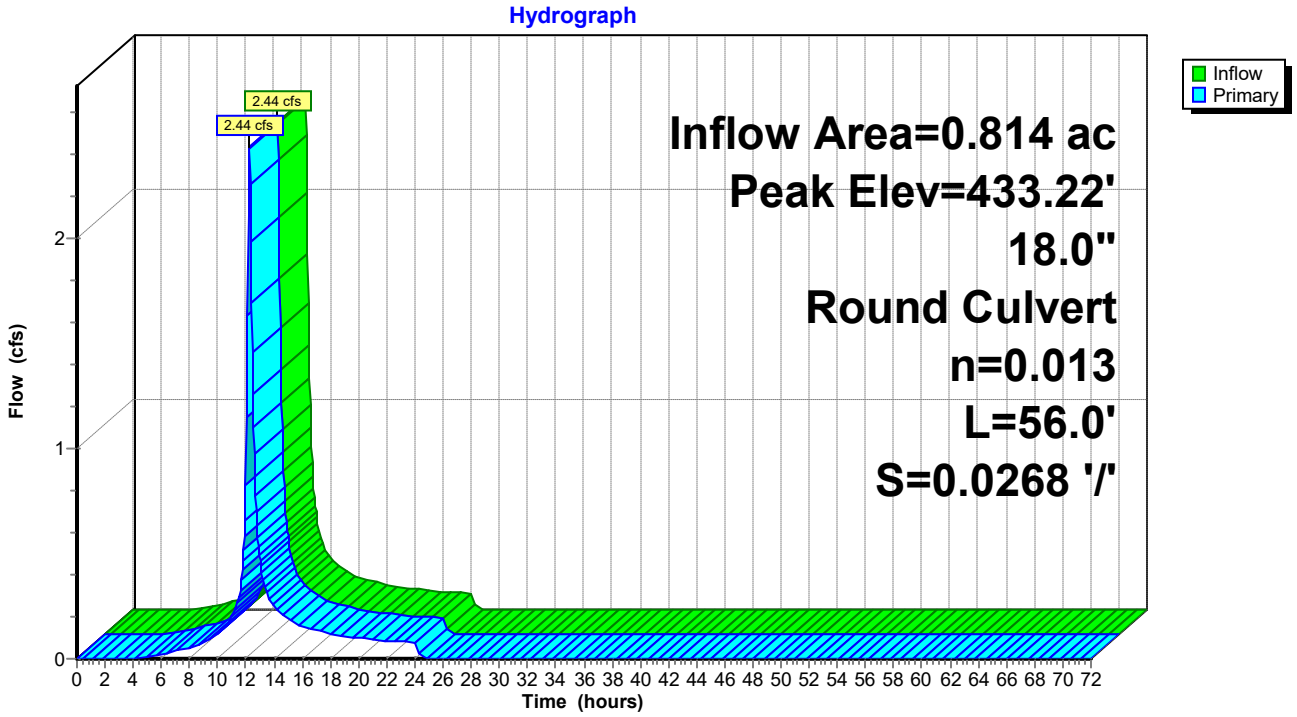
Inflow Area = 0.814 ac, 7.82% Impervious, Inflow Depth = 4.42" for 25-yr event
Inflow = 2.44 cfs @ 12.23 hrs, Volume= 0.300 af
Outflow = 2.44 cfs @ 12.23 hrs, Volume= 0.300 af, Atten= 0%, Lag= 0.0 min
Primary = 2.44 cfs @ 12.23 hrs, Volume= 0.300 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 433.22' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	**18.0" Round Culvert** L= 56.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 432.50' / 431.00' S= 0.0268 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=2.41 cfs @ 12.23 hrs HW=433.22' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.41 cfs @ 2.89 fps)

Pond C13: 18" CULVERT



Summary for Pond C2: 12" CULVERT

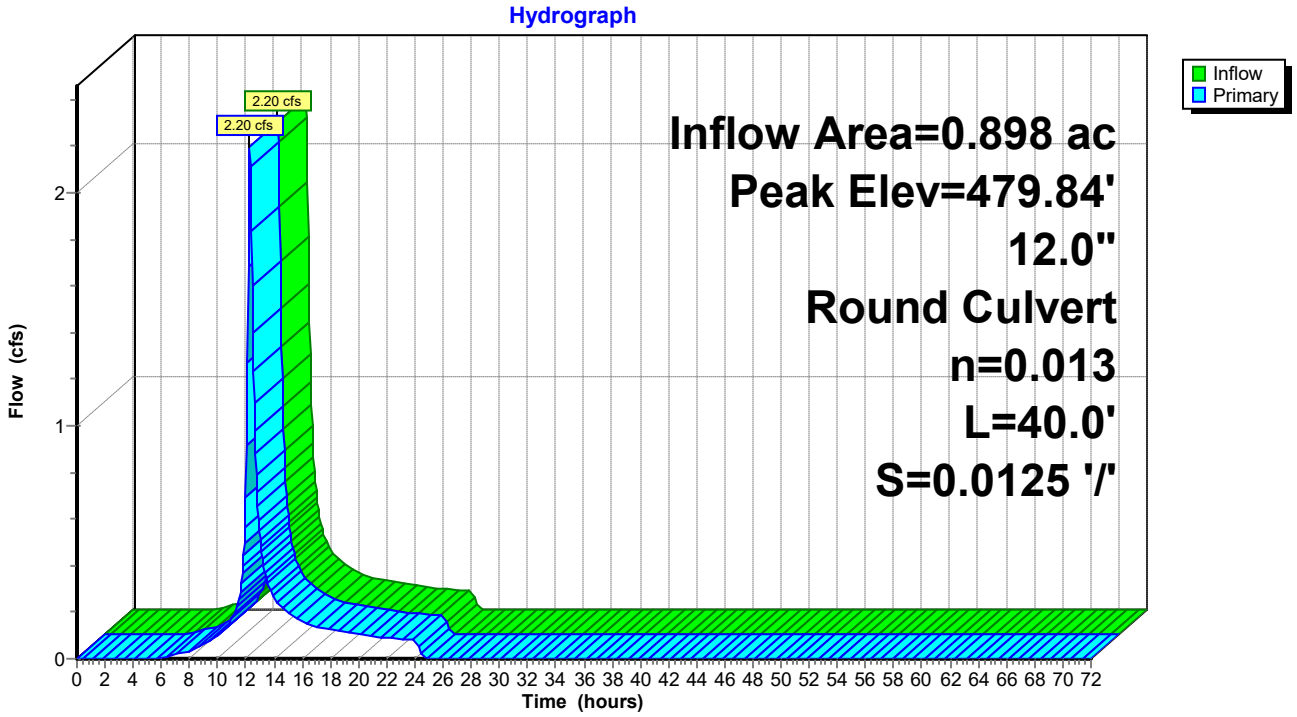
Inflow Area = 0.898 ac, 9.78% Impervious, Inflow Depth = 3.89" for 25-yr event
Inflow = 2.20 cfs @ 12.28 hrs, Volume= 0.291 af
Outflow = 2.20 cfs @ 12.28 hrs, Volume= 0.291 af, Atten= 0%, Lag= 0.0 min
Primary = 2.20 cfs @ 12.28 hrs, Volume= 0.291 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.84' @ 12.28 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.18 cfs @ 12.28 hrs HW=479.84' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.18 cfs @ 3.11 fps)

Pond C2: 12" CULVERT



Summary for Pond C3: 12" CULVERT

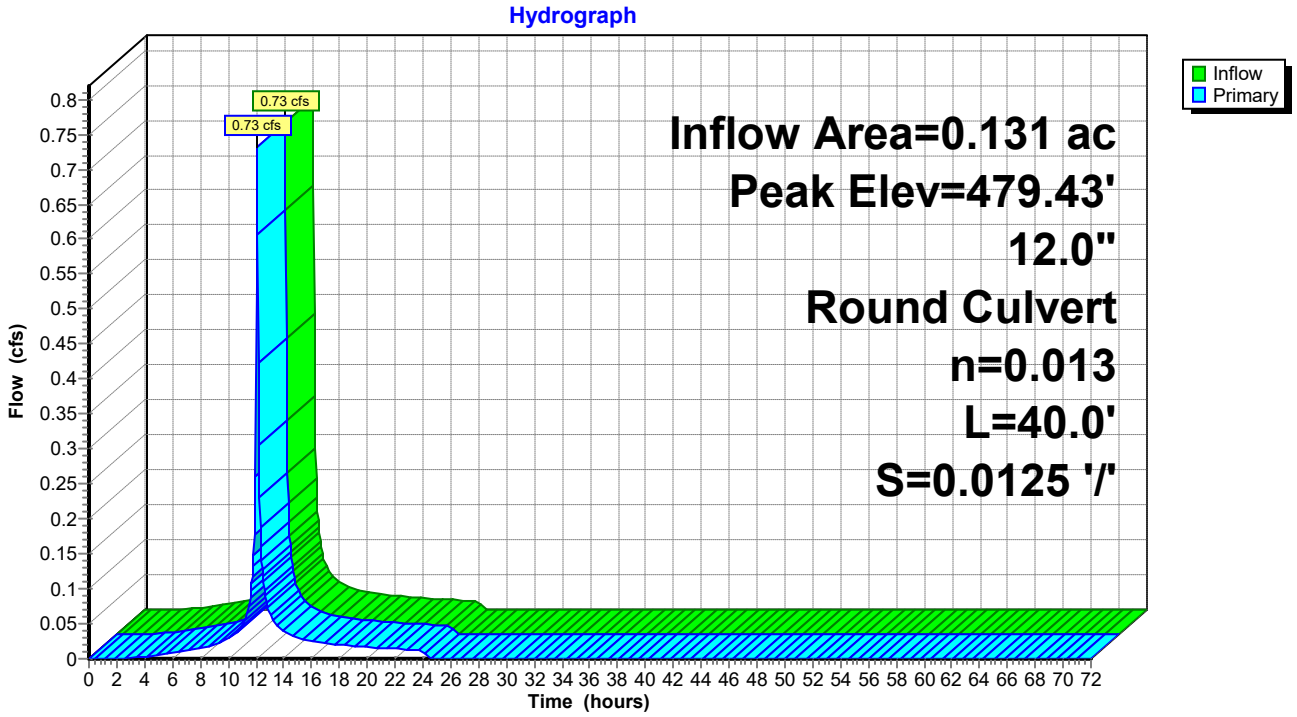
Inflow Area = 0.131 ac, 41.51% Impervious, Inflow Depth = 5.07" for 25-yr event
Inflow = 0.73 cfs @ 12.06 hrs, Volume= 0.056 af
Outflow = 0.73 cfs @ 12.06 hrs, Volume= 0.056 af, Atten= 0%, Lag= 0.0 min
Primary = 0.73 cfs @ 12.06 hrs, Volume= 0.056 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.43' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.71 cfs @ 12.06 hrs HW=479.43' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.71 cfs @ 2.23 fps)

Pond C3: 12" CULVERT



Summary for Pond C4: 12" CULVERT

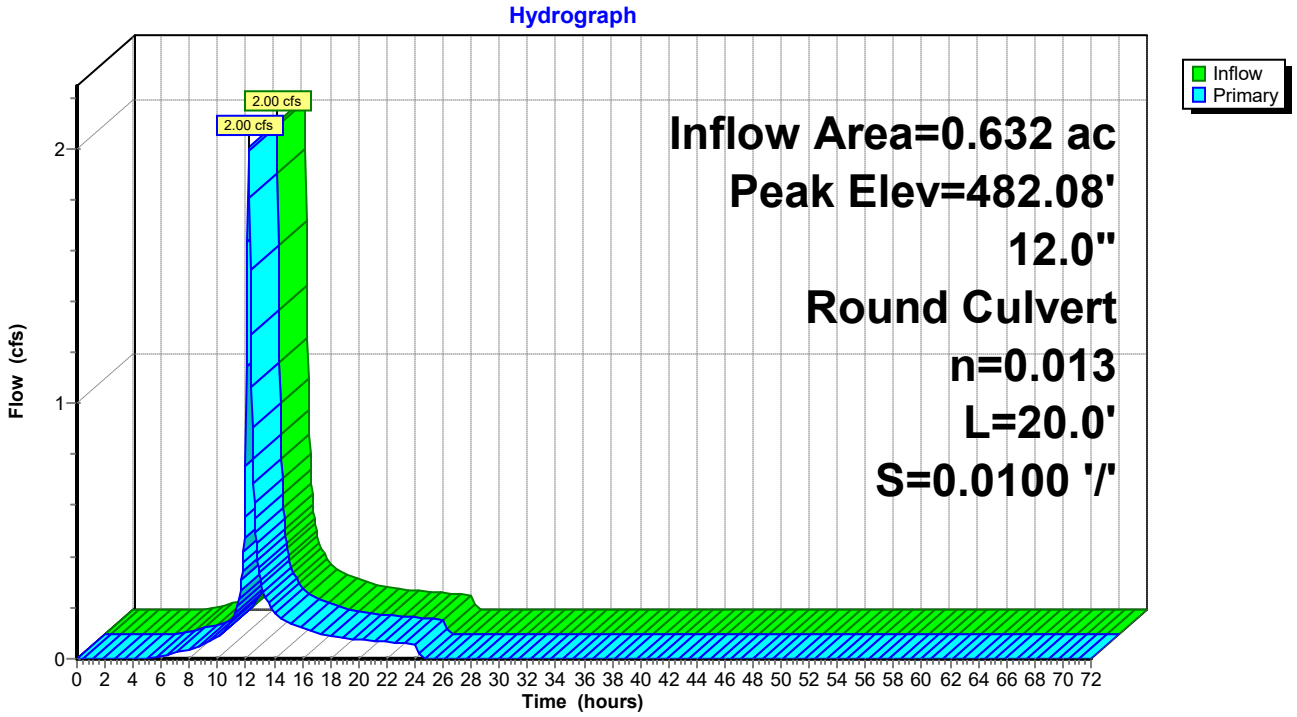
Inflow Area = 0.632 ac, 19.67% Impervious, Inflow Depth = 4.20" for 25-yr event
Inflow = 2.00 cfs @ 12.18 hrs, Volume= 0.221 af
Outflow = 2.00 cfs @ 12.18 hrs, Volume= 0.221 af, Atten= 0%, Lag= 0.0 min
Primary = 2.00 cfs @ 12.18 hrs, Volume= 0.221 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 482.08' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	481.20'	**12.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 481.20' / 481.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.98 cfs @ 12.18 hrs HW=482.07' (Free Discharge)
└**1=Culvert** (Barrel Controls 1.98 cfs @ 3.65 fps)

Pond C4: 12" CULVERT



Summary for Pond C5: 12" CULVERT

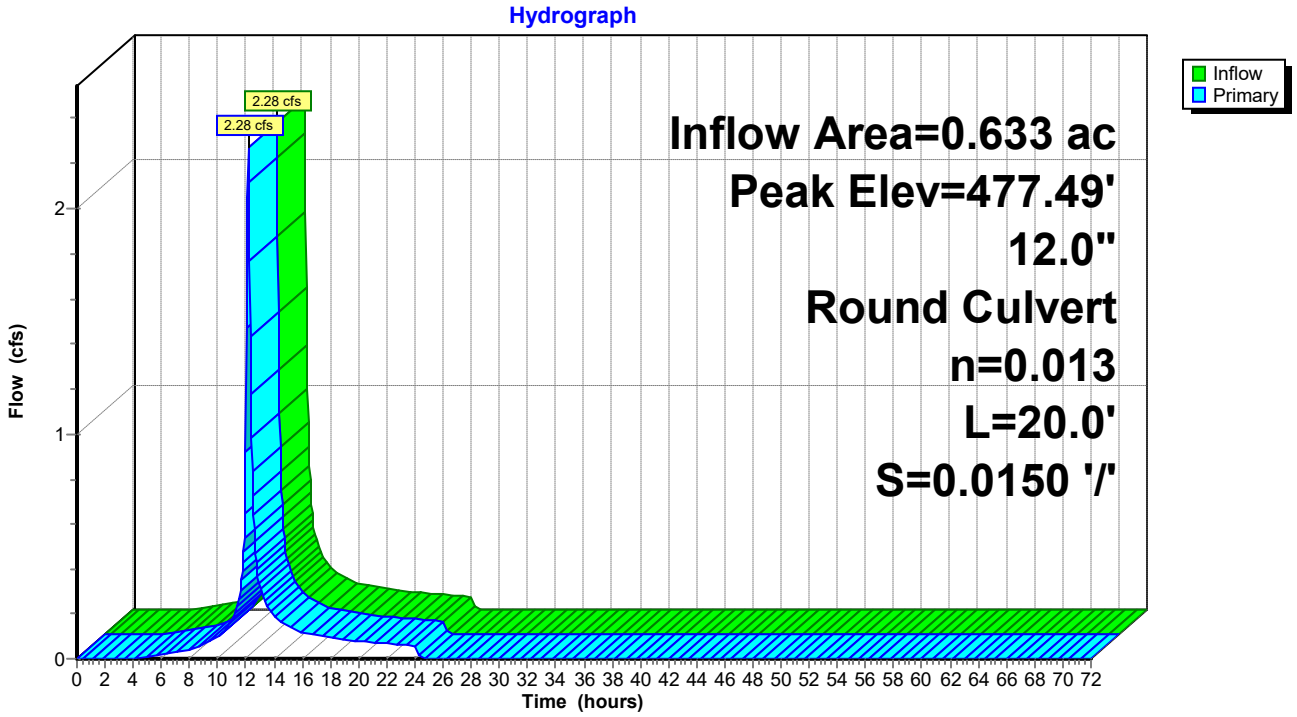
Inflow Area = 0.633 ac, 10.31% Impervious, Inflow Depth = 4.42" for 25-yr event
Inflow = 2.28 cfs @ 12.15 hrs, Volume= 0.233 af
Outflow = 2.28 cfs @ 12.15 hrs, Volume= 0.233 af, Atten= 0%, Lag= 0.0 min
Primary = 2.28 cfs @ 12.15 hrs, Volume= 0.233 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 477.49' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	476.60'	**12.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 476.60' / 476.30' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.26 cfs @ 12.15 hrs HW=477.49' (Free Discharge)
└**1=Culvert** (Barrel Controls 2.26 cfs @ 4.08 fps)

Pond C5: 12" CULVERT



Summary for Pond C6: 24" CULVERT

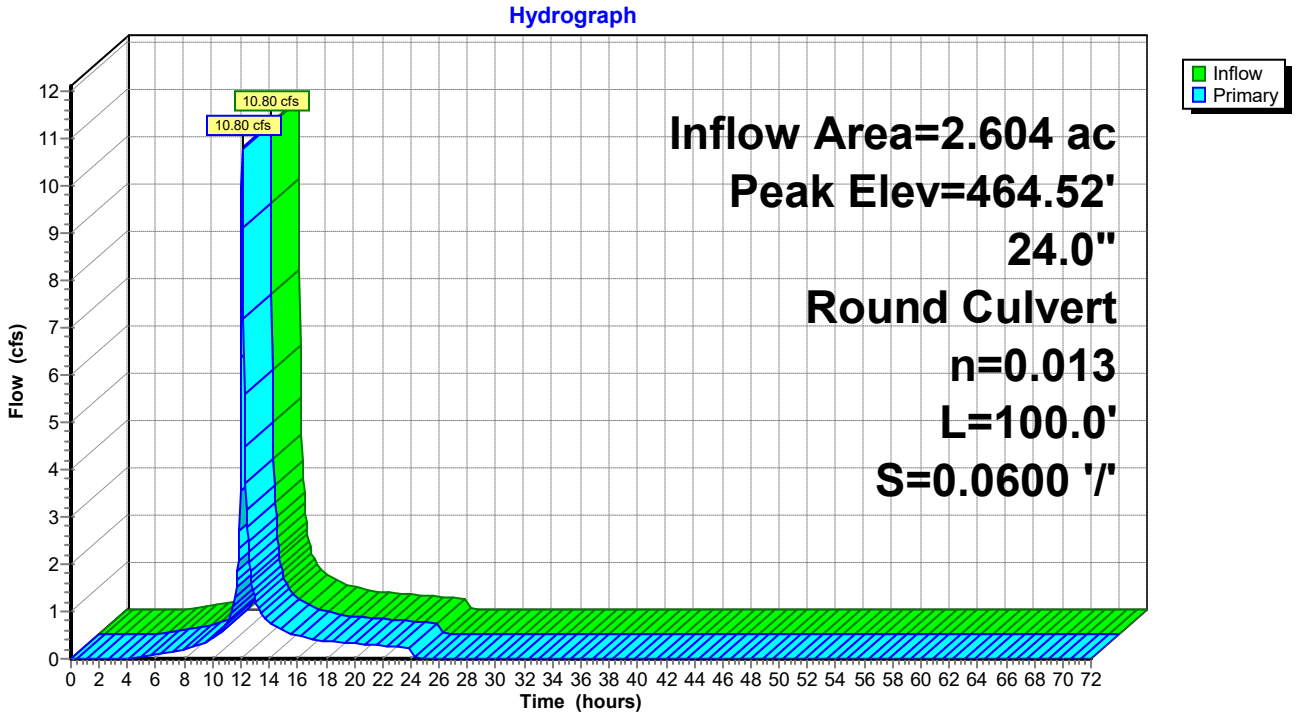
Inflow Area = 2.604 ac, 11.94% Impervious, Inflow Depth = 4.50" for 25-yr event
Inflow = 10.80 cfs @ 12.09 hrs, Volume= 0.976 af
Outflow = 10.80 cfs @ 12.09 hrs, Volume= 0.976 af, Atten= 0%, Lag= 0.0 min
Primary = 10.80 cfs @ 12.09 hrs, Volume= 0.976 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 464.52' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	463.00'	**24.0" Round Culvert** L= 100.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 463.00' / 457.00' S= 0.0600 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=10.63 cfs @ 12.09 hrs HW=464.51' (Free Discharge)
└**1=Culvert** (Inlet Controls 10.63 cfs @ 4.18 fps)

Pond C6: 24" CULVERT



Summary for Pond C8: 12" CULVERT

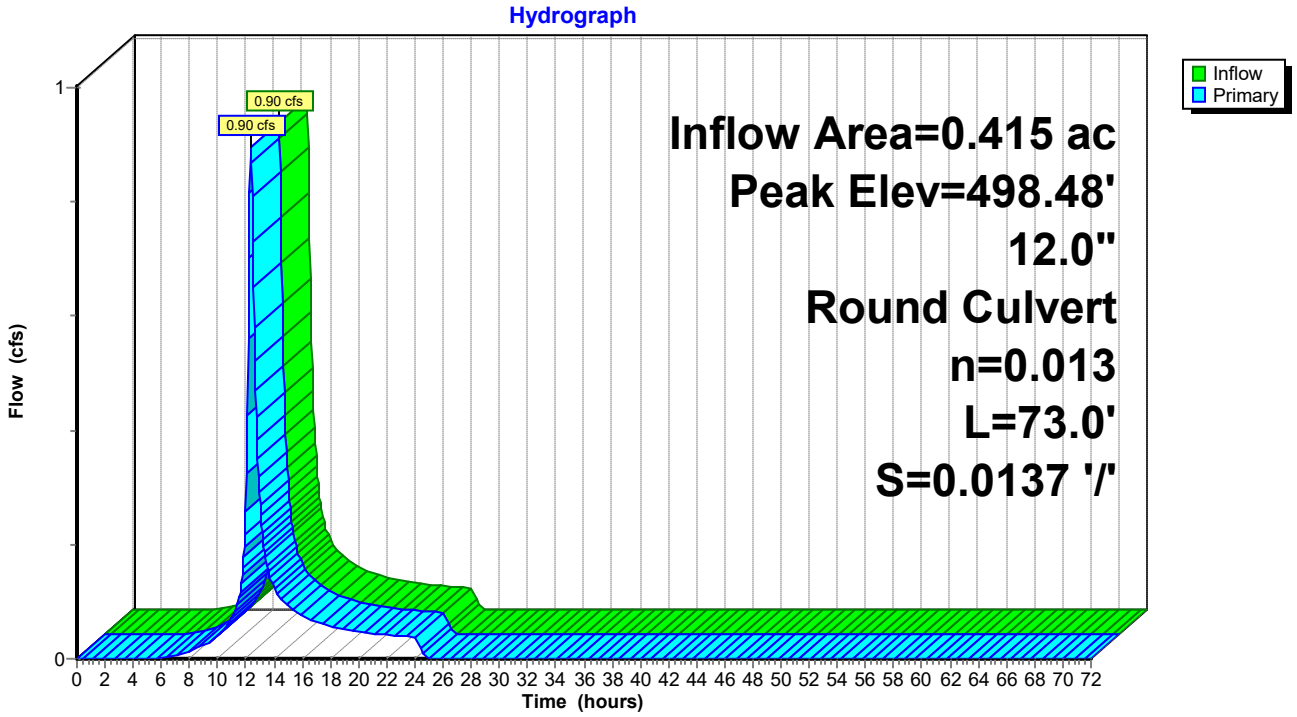
Inflow Area = 0.415 ac, 6.10% Impervious, Inflow Depth = 3.78" for 25-yr event
Inflow = 0.90 cfs @ 12.34 hrs, Volume= 0.131 af
Outflow = 0.90 cfs @ 12.34 hrs, Volume= 0.131 af, Atten= 0%, Lag= 0.0 min
Primary = 0.90 cfs @ 12.34 hrs, Volume= 0.131 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 498.48' @ 12.34 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	498.00'	**12.0" Round Culvert** L= 73.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 498.00' / 497.00' S= 0.0137 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.89 cfs @ 12.34 hrs HW=498.48' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.89 cfs @ 2.37 fps)

Pond C8: 12" CULVERT



Summary for Pond C9: 12" CULVERT

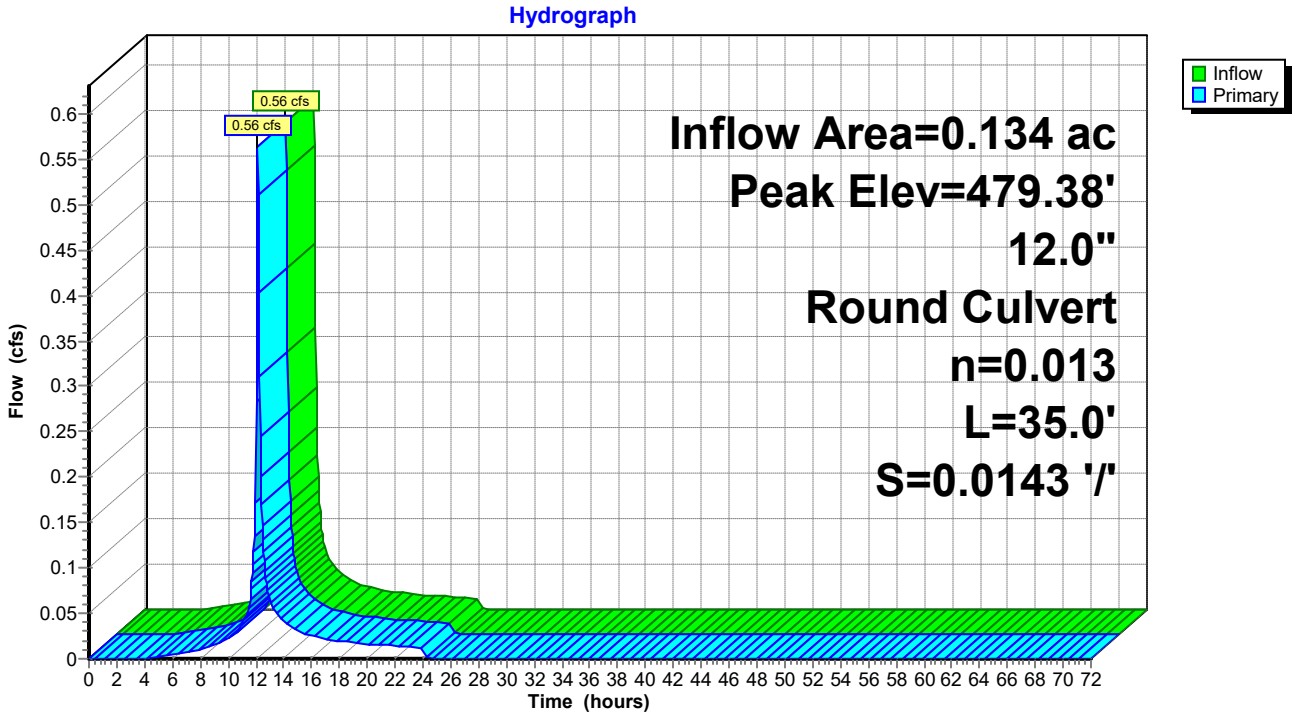
Inflow Area = 0.134 ac, 14.23% Impervious, Inflow Depth = 4.52" for 25-yr event
Inflow = 0.56 cfs @ 12.11 hrs, Volume= 0.051 af
Outflow = 0.56 cfs @ 12.11 hrs, Volume= 0.051 af, Atten= 0%, Lag= 0.0 min
Primary = 0.56 cfs @ 12.11 hrs, Volume= 0.051 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.38' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 35.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.55 cfs @ 12.11 hrs HW=479.37' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.55 cfs @ 2.08 fps)

Pond C9: 12" CULVERT



Summary for Pond DP1: DRY POND 1

Inflow Area = 3.133 ac, 8.85% Impervious, Inflow Depth = 4.43" for 25-yr event
Inflow = 10.58 cfs @ 12.17 hrs, Volume= 1.158 af
Outflow = 9.29 cfs @ 12.25 hrs, Volume= 0.975 af, Atten= 12%, Lag= 4.7 min
Primary = 9.29 cfs @ 12.25 hrs, Volume= 0.975 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 439.42' @ 12.25 hrs Surf.Area= 4,450 sf Storage= 11,657 cf

Plug-Flow detention time= 138.6 min calculated for 0.974 af (84% of inflow)
Center-of-Mass det. time= 60.5 min (898.4 - 837.9)

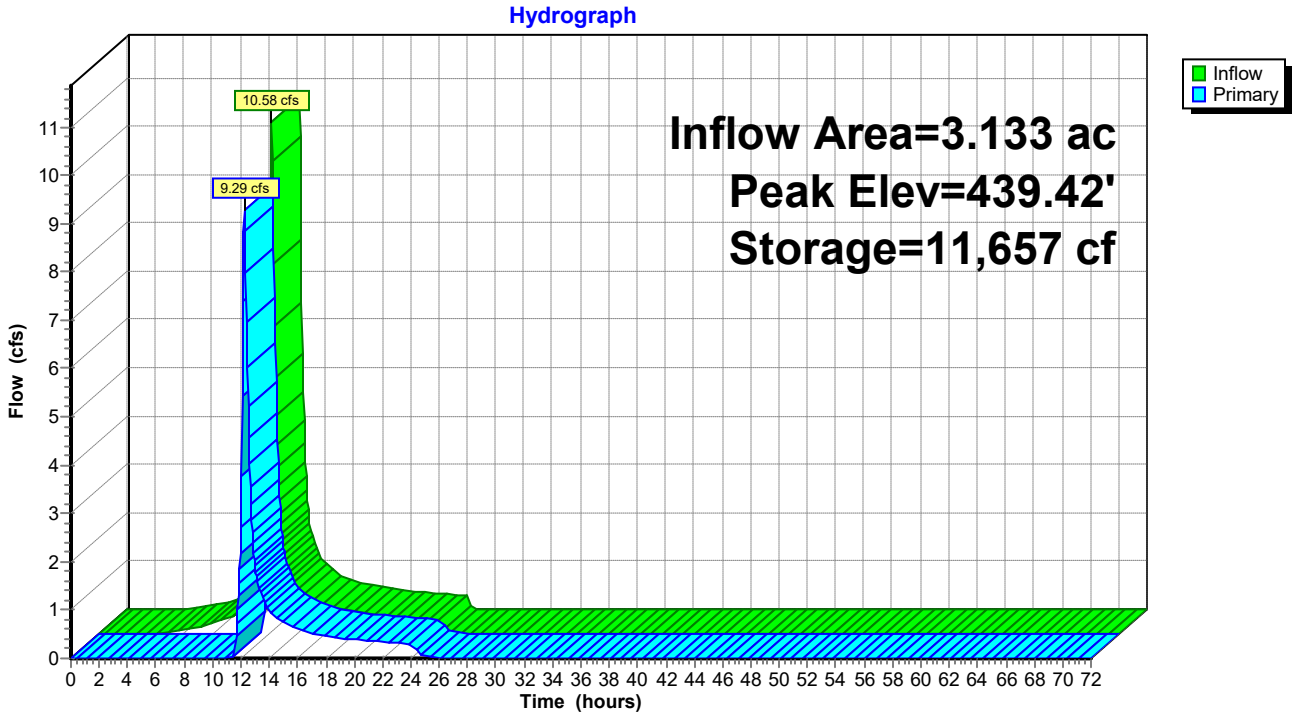
Volume	Invert	Avail.Storage	Storage Description
#1	434.00'	14,417 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
434.00	171	64.2	0	0	171
436.00	1,610	246.7	1,537	1,537	4,697
438.00	3,203	284.4	4,723	6,260	6,376
440.00	5,022	322.1	8,157	14,417	8,294

Device	Routing	Invert	Outlet Devices
#1	Primary	438.50'	**45.0 deg x 3.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=9.27 cfs @ 12.25 hrs HW=439.42' (Free Discharge)
└**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 9.27 cfs @ 2.99 fps)

Pond DP1: DRY POND 1

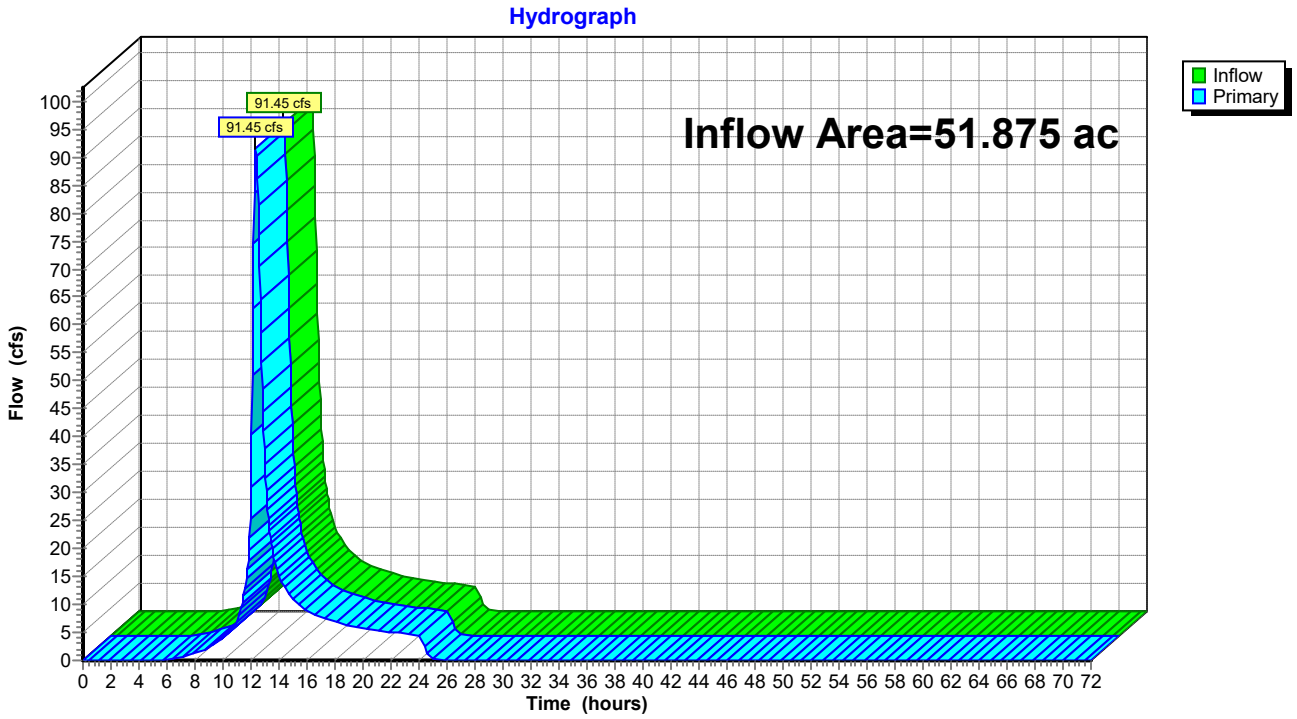


Summary for Link O1: OUT 1

Inflow Area = 51.875 ac, 3.67% Impervious, Inflow Depth = 3.55" for 25-yr event
Inflow = 91.45 cfs @ 12.36 hrs, Volume= 15.333 af
Primary = 91.45 cfs @ 12.36 hrs, Volume= 15.333 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O1: OUT 1

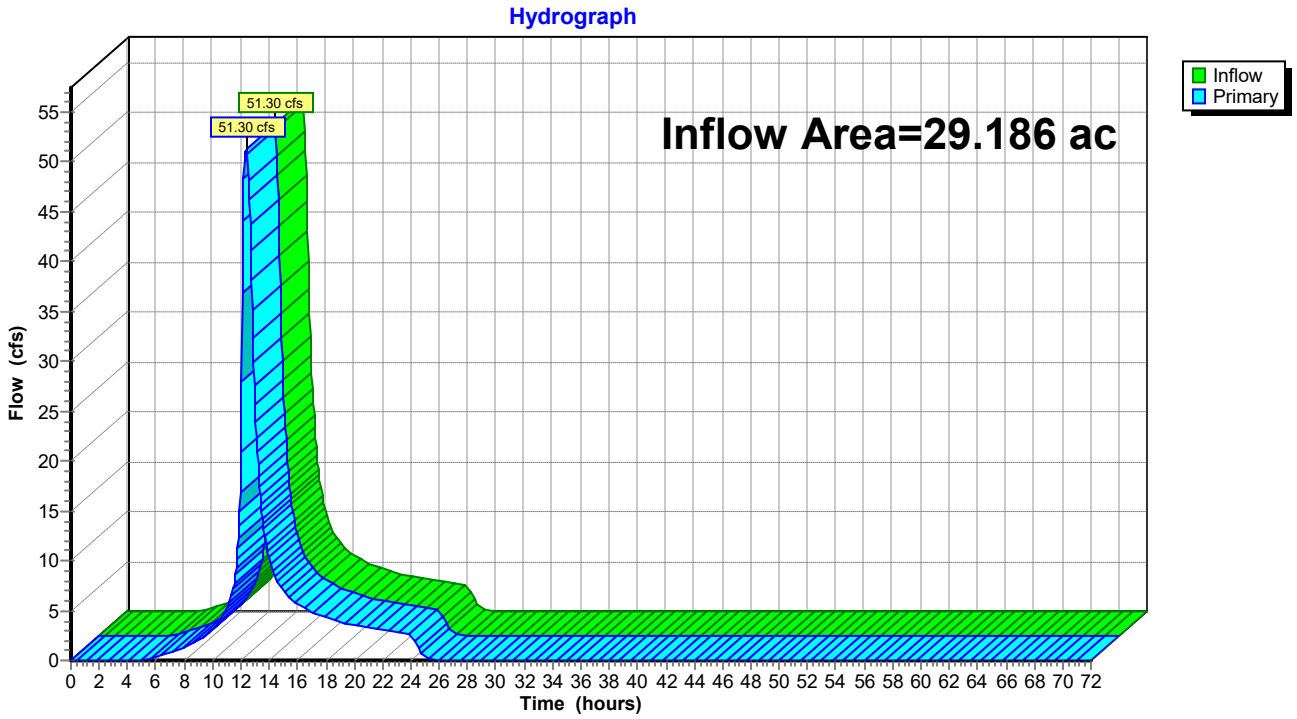


Summary for Link O2: OUT 2

Inflow Area = 29.186 ac, 3.50% Impervious, Inflow Depth = 4.16" for 25-yr event
Inflow = 51.30 cfs @ 12.36 hrs, Volume= 10.111 af
Primary = 51.30 cfs @ 12.36 hrs, Volume= 10.111 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O2: OUT 2

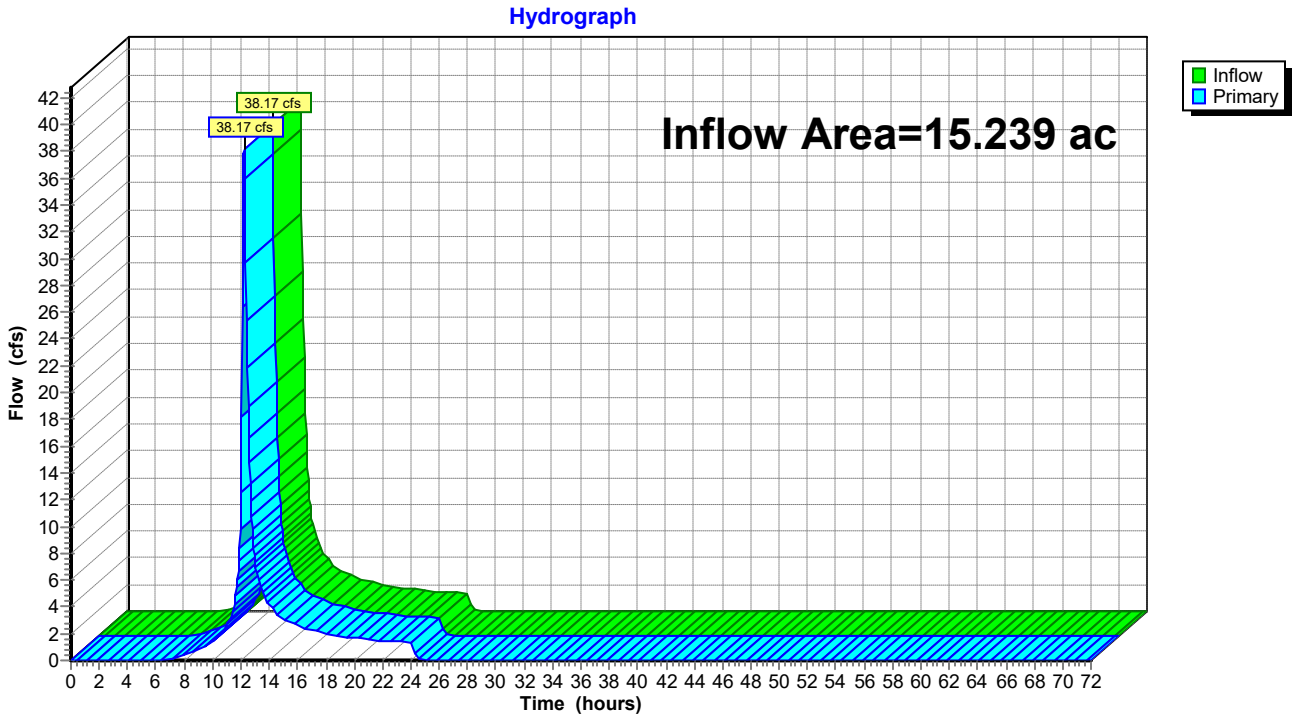


Summary for Link O3: OUT 3

Inflow Area = 15.239 ac, 0.00% Impervious, Inflow Depth = 3.58" for 25-yr event
Inflow = 38.17 cfs @ 12.22 hrs, Volume= 4.541 af
Primary = 38.17 cfs @ 12.22 hrs, Volume= 4.541 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O3: OUT 3

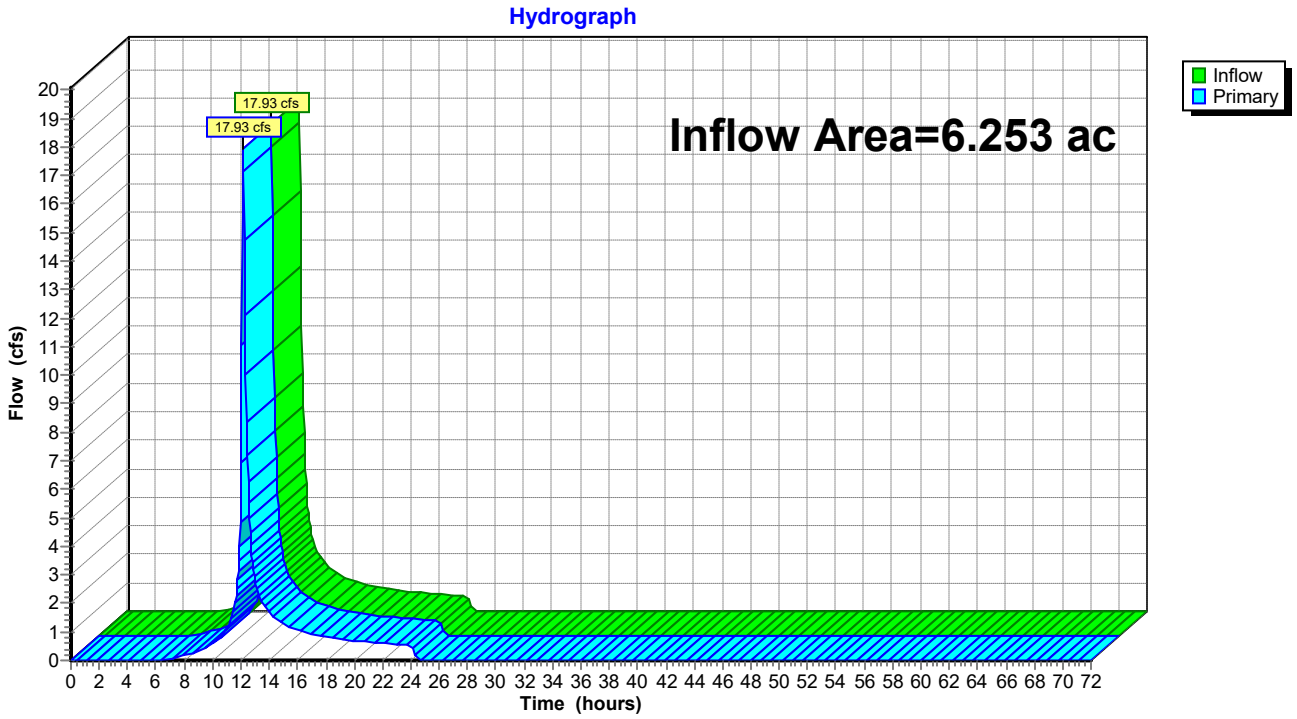


Summary for Link O4: OUT 4

Inflow Area = 6.253 ac, 0.00% Impervious, Inflow Depth = 3.58" for 25-yr event
Inflow = 17.93 cfs @ 12.16 hrs, Volume= 1.863 af
Primary = 17.93 cfs @ 12.16 hrs, Volume= 1.863 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O4: OUT 4

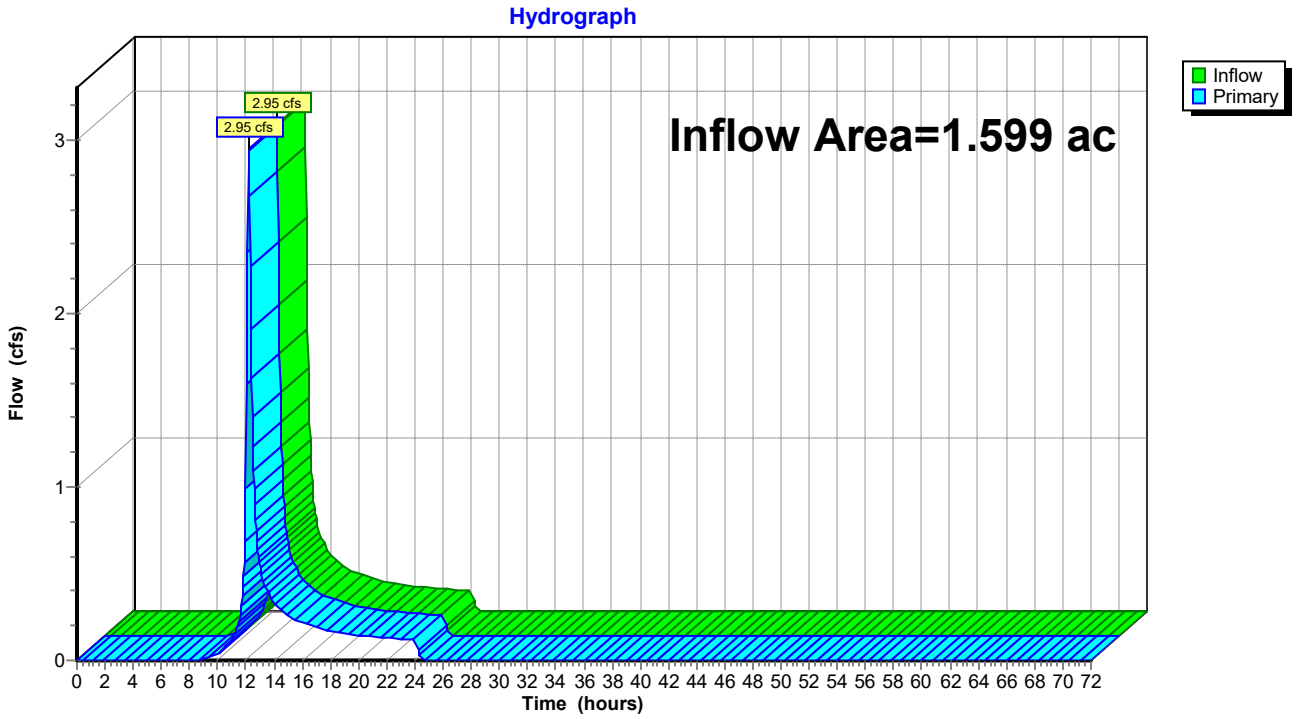


Summary for Link O5: OUT 5

Inflow Area = 1.599 ac, 0.00% Impervious, Inflow Depth = 2.50" for 25-yr event
Inflow = 2.95 cfs @ 12.19 hrs, Volume= 0.333 af
Primary = 2.95 cfs @ 12.19 hrs, Volume= 0.333 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O5: OUT 5



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: DRAINAGE AREA 1A Runoff Area=1,089,015 sf 2.10% Impervious Runoff Depth=5.60"
Flow Length=2,185' Tc=36.9 min CN=76 Runoff=67.72 cfs 11.660 af

Subcatchment 1B: DRAINAGE AREA 1B Runoff Area=18,084 sf 6.10% Impervious Runoff Depth=5.48"
Flow Length=160' Tc=28.8 min CN=75 Runoff=1.27 cfs 0.189 af

Subcatchment 1C: DRAINAGE AREA 1C Runoff Area=139,425 sf 6.89% Impervious Runoff Depth=5.60"
Flow Length=945' Tc=40.6 min CN=76 Runoff=8.21 cfs 1.493 af

Subcatchment 1D: DRAINAGE AREA 1D Runoff Area=27,532 sf 19.67% Impervious Runoff Depth=5.96"
Flow Length=480' Tc=17.2 min CN=79 Runoff=2.77 cfs 0.314 af

Subcatchment 1E: DRAINAGE AREA 1E Runoff Area=39,104 sf 9.78% Impervious Runoff Depth=5.60"
Flow Length=490' Tc=24.1 min CN=76 Runoff=3.11 cfs 0.419 af

Subcatchment 1F: DRAINAGE AREA 1F Runoff Area=5,854 sf 14.23% Impervious Runoff Depth=6.32"
Flow Length=100' Tc=11.4 min CN=82 Runoff=0.76 cfs 0.071 af

Subcatchment 1G: DRAINAGE AREA 1G Runoff Area=5,726 sf 41.51% Impervious Runoff Depth=6.92"
Flow Length=200' Tc=7.5 min CN=87 Runoff=0.97 cfs 0.076 af

Subcatchment 1H: DRAINAGE AREA 8 Runoff Area=4,559 sf 53.41% Impervious Runoff Depth=7.28"
Flow Length=45' Tc=0.4 min CN=90 Runoff=1.03 cfs 0.063 af

Subcatchment 1I: DRAINAGE AREA 1I Runoff Area=27,574 sf 10.31% Impervious Runoff Depth=6.20"
Flow Length=260' Tc=15.0 min CN=81 Runoff=3.11 cfs 0.327 af

Subcatchment 1J: DRAINAGE AREA 1J Runoff Area=85,839 sf 12.46% Impervious Runoff Depth=6.32"
Flow Length=480' Tc=9.3 min CN=82 Runoff=12.06 cfs 1.037 af

Subcatchment 1K: DRAINAGE AREA 1K Runoff Area=13,922 sf 13.09% Impervious Runoff Depth=6.32"
Flow Length=100' Tc=4.2 min CN=82 Runoff=2.55 cfs 0.168 af

Subcatchment 1L: DRAINAGE AREA 1L Runoff Area=792,979 sf 2.18% Impervious Runoff Depth=4.29"
Flow Length=1,370' Tc=24.1 min CN=65 Runoff=48.16 cfs 6.502 af

Subcatchment 1M: DRAINAGE AREA 1M Runoff Area=10,047 sf 17.03% Impervious Runoff Depth=6.44"
Flow Length=185' Tc=10.3 min CN=83 Runoff=1.39 cfs 0.124 af

Subcatchment 2A: DRAINAGE AREA 2A Runoff Area=58,418 sf 18.29% Impervious Runoff Depth=6.44"
Flow Length=560' Tc=15.0 min CN=83 Runoff=6.80 cfs 0.719 af

Subcatchment 2B: DRAINAGE AREA 2B Runoff Area=5,939 sf 29.70% Impervious Runoff Depth=6.68"
Flow Length=80' Tc=10.2 min CN=85 Runoff=0.85 cfs 0.076 af

Subcatchment 2C: DRAINAGE AREA 2C Runoff Area=130,540 sf 7.90% Impervious Runoff Depth=6.20"
Flow Length=870' Tc=16.7 min CN=81 Runoff=13.76 cfs 1.547 af

Subcatchment 2D: DRAINAGE AREA 2D Runoff Area=858,381 sf 0.51% Impervious Runoff Depth=5.96"
Flow Length=1,470' Tc=43.3 min CN=79 Runoff=51.34 cfs 9.781 af

Subcatchment 2E: DRAINAGE AREA 18 Runoff Area=121,293 sf 11.99% Impervious Runoff Depth=6.08"
Flow Length=610' Tc=16.4 min CN=80 Runoff=12.76 cfs 1.410 af

Subcatchment 2F: DRAINAGE AREA 2F Runoff Area=61,323 sf 0.00% Impervious Runoff Depth=5.24"
Flow Length=250' Tc=13.7 min CN=73 Runoff=6.16 cfs 0.614 af

Subcatchment 2G: DRAINAGE AREA 2G Runoff Area=35,456 sf 7.82% Impervious Runoff Depth=6.20"
Flow Length=300' Tc=21.0 min CN=81 Runoff=3.33 cfs 0.420 af

Subcatchment 3: DRAINAGE AREA 3 Runoff Area=663,807 sf 0.00% Impervious Runoff Depth=5.24"
Flow Length=590' Tc=19.9 min CN=73 Runoff=55.05 cfs 6.651 af

Subcatchment 4: DRAINAGE AREA 4 Runoff Area=272,371 sf 0.00% Impervious Runoff Depth=5.24"
Flow Length=376' Tc=15.4 min CN=73 Runoff=25.86 cfs 2.729 af

Subcatchment 5: DRAINAGE AREA 5 Runoff Area=69,632 sf 0.00% Impervious Runoff Depth=3.93"
Flow Length=340' Tc=16.6 min CN=62 Runoff=4.69 cfs 0.524 af

Pond AC1: ARCH CULVERT Peak Elev=456.10' Inflow=81.14 cfs 14.284 af
96.0" x 43.0", R=52.0" Arch Culvert n=0.013 L=60.0' S=0.0417 '/' Outflow=81.14 cfs 14.284 af

Pond AC2: ARCH CULVERT Peak Elev=431.64' Inflow=58.22 cfs 11.222 af
96.0" x 43.0", R=52.0" Arch Culvert n=0.013 L=40.0' S=0.0175 '/' Outflow=58.22 cfs 11.222 af

Pond BR1-C7: BIO-RET POND 1 Peak Elev=479.01' Storage=1,320 cf Inflow=12.30 cfs 2.364 af
Outflow=12.08 cfs 2.364 af

Pond BR2-C14: BIO-RET POND 2 Peak Elev=458.85' Storage=11,635 cf Inflow=16.12 cfs 1.532 af
Outflow=9.93 cfs 1.532 af

Pond C1: 24" CULVERT Peak Elev=481.45' Inflow=9.38 cfs 1.806 af
24.0" Round Culvert n=0.013 L=36.0' S=0.0139 '/' Outflow=9.38 cfs 1.806 af

Pond C10: 15" CULVERT Peak Elev=448.82' Inflow=1.39 cfs 0.124 af
15.0" Round Culvert n=0.013 L=67.0' S=0.0112 '/' Outflow=1.39 cfs 0.124 af

Pond C11: 12" CULVERT Peak Elev=458.47' Inflow=0.85 cfs 0.076 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0500 '/' Outflow=0.85 cfs 0.076 af

Pond C12: 24" CULVERT Peak Elev=445.17' Inflow=6.80 cfs 0.719 af
24.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=6.80 cfs 0.719 af

Pond C13: 18" CULVERT Peak Elev=433.36' Inflow=3.33 cfs 0.420 af
18.0" Round Culvert n=0.013 L=56.0' S=0.0268 '/' Outflow=3.33 cfs 0.420 af

Pond C2: 12" CULVERT Peak Elev=480.18' Inflow=3.11 cfs 0.419 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=3.11 cfs 0.419 af

Pond C3: 12" CULVERT Peak Elev=479.51' Inflow=0.97 cfs 0.076 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=0.97 cfs 0.076 af

Pond C4: 12" CULVERT Peak Elev=482.32' Inflow=2.77 cfs 0.314 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0100 '/' Outflow=2.77 cfs 0.314 af

Pond C5: 12" CULVERT Peak Elev=477.78' Inflow=3.11 cfs 0.327 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0150 '/' Outflow=3.11 cfs 0.327 af

Pond C6: 24" CULVERT Peak Elev=464.93' Inflow=14.69 cfs 1.364 af
24.0" Round Culvert n=0.013 L=100.0' S=0.0600 '/' Outflow=14.69 cfs 1.364 af

Pond C8: 12" CULVERT Peak Elev=498.59' Inflow=1.27 cfs 0.189 af
12.0" Round Culvert n=0.013 L=73.0' S=0.0137 '/' Outflow=1.27 cfs 0.189 af

Pond C9: 12" CULVERT Peak Elev=479.44' Inflow=0.76 cfs 0.071 af
12.0" Round Culvert n=0.013 L=35.0' S=0.0143 '/' Outflow=0.76 cfs 0.071 af

Pond DP1: DRY POND 1 Peak Elev=439.63' Storage=12,605 cf Inflow=14.45 cfs 1.623 af
Outflow=12.89 cfs 1.440 af

Link O1: OUT 1 Inflow=131.81 cfs 22.442 af
Primary=131.81 cfs 22.442 af

Link O2: OUT 2 Inflow=70.88 cfs 14.386 af
Primary=70.88 cfs 14.386 af

Link O3: OUT 3 Inflow=55.05 cfs 6.651 af
Primary=55.05 cfs 6.651 af

Link O4: OUT 4 Inflow=25.86 cfs 2.729 af
Primary=25.86 cfs 2.729 af

Link O5: OUT 5 Inflow=4.69 cfs 0.524 af
Primary=4.69 cfs 0.524 af

Total Runoff Area = 104.151 ac Runoff Volume = 46.915 af Average Runoff Depth = 5.41"
97.19% Pervious = 101.228 ac 2.81% Impervious = 2.923 ac

Summary for Subcatchment 1A: DRAINAGE AREA 1A

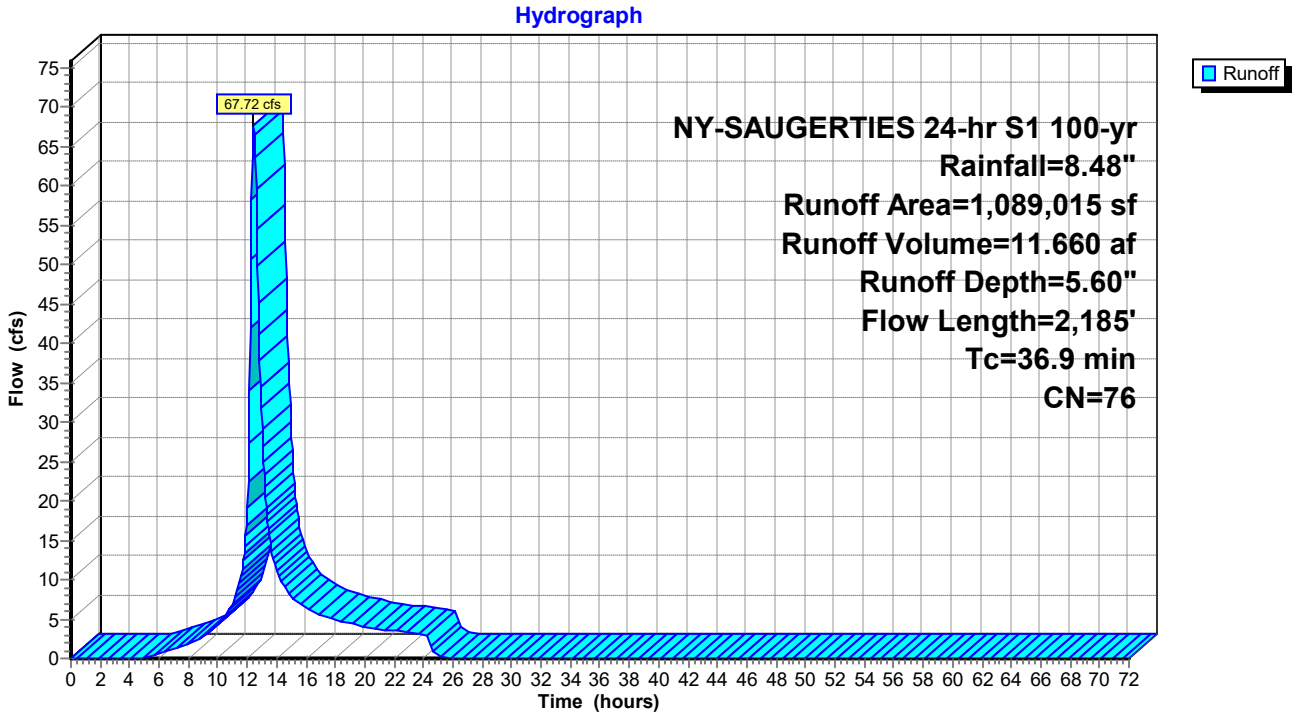
Runoff = 67.72 cfs @ 12.44 hrs, Volume= 11.660 af, Depth= 5.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	853	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	620,284	73	Woods, Fair, HSG C
	391,737	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	20,528	74	>75% Grass cover, Good, HSG C
	32,734	80	>75% Grass cover, Good, HSG D
*	14,227	98	Paved roads w/curbs & sewers, HSG A-D
*	8,652	98	Roofs, HSG A-D
	1,089,015	76	Weighted Average
	1,066,136		97.90% Pervious Area
	22,879		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0800	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
13.4	650	0.0260	0.81		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
3.0	360	0.0180	2.01		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
1.3	260	0.0480	3.29		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
1.0	170	0.0350	2.81		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
2.9	380	0.0210	2.17		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
3.3	265	0.0080	1.34		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
36.9	2,185	Total			

Subcatchment 1A: DRAINAGE AREA 1A



Summary for Subcatchment 1B: DRAINAGE AREA 1B

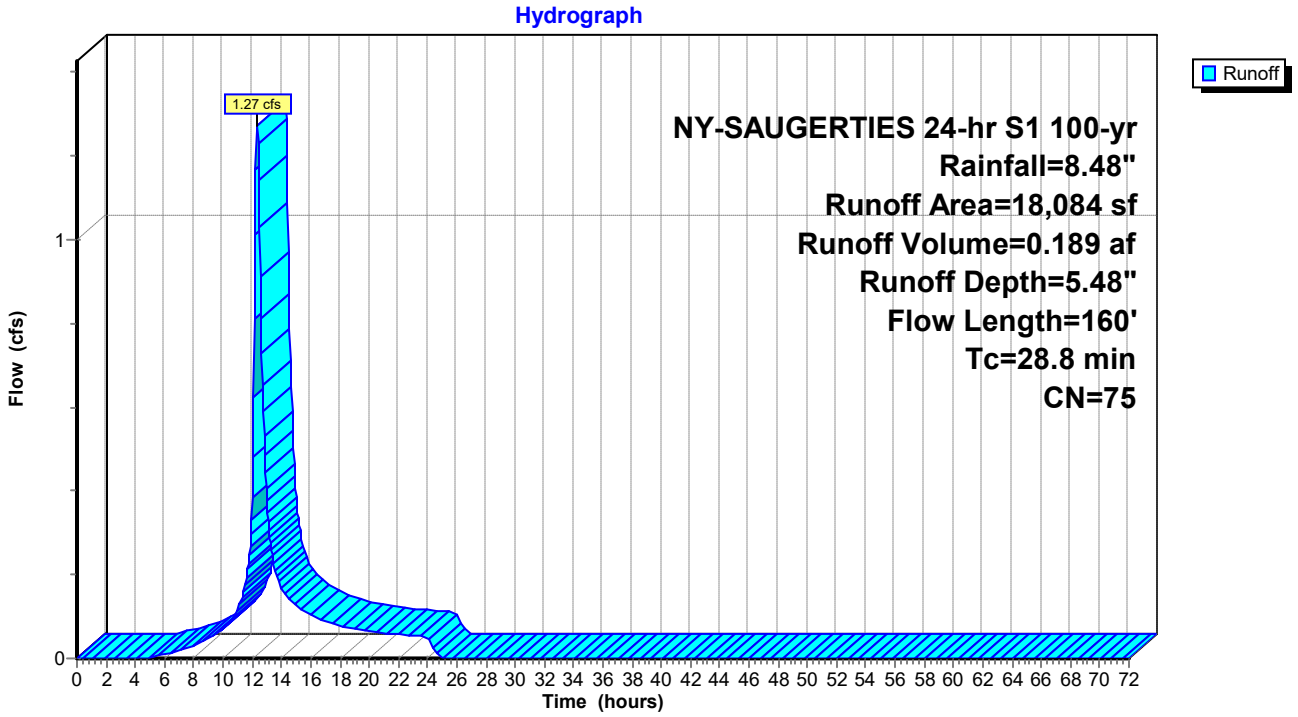
Runoff = 1.27 cfs @ 12.34 hrs, Volume= 0.189 af, Depth= 5.48"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	14,107	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	2,873	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
*	1,104	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	18,084	75	Weighted Average
	16,980		93.90% Pervious Area
	1,104		6.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.6	100	0.0100	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.0	10	0.4000	9.49		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
28.8	160	Total			

Subcatchment 1B: DRAINAGE AREA 1B



Summary for Subcatchment 1C: DRAINAGE AREA 1C

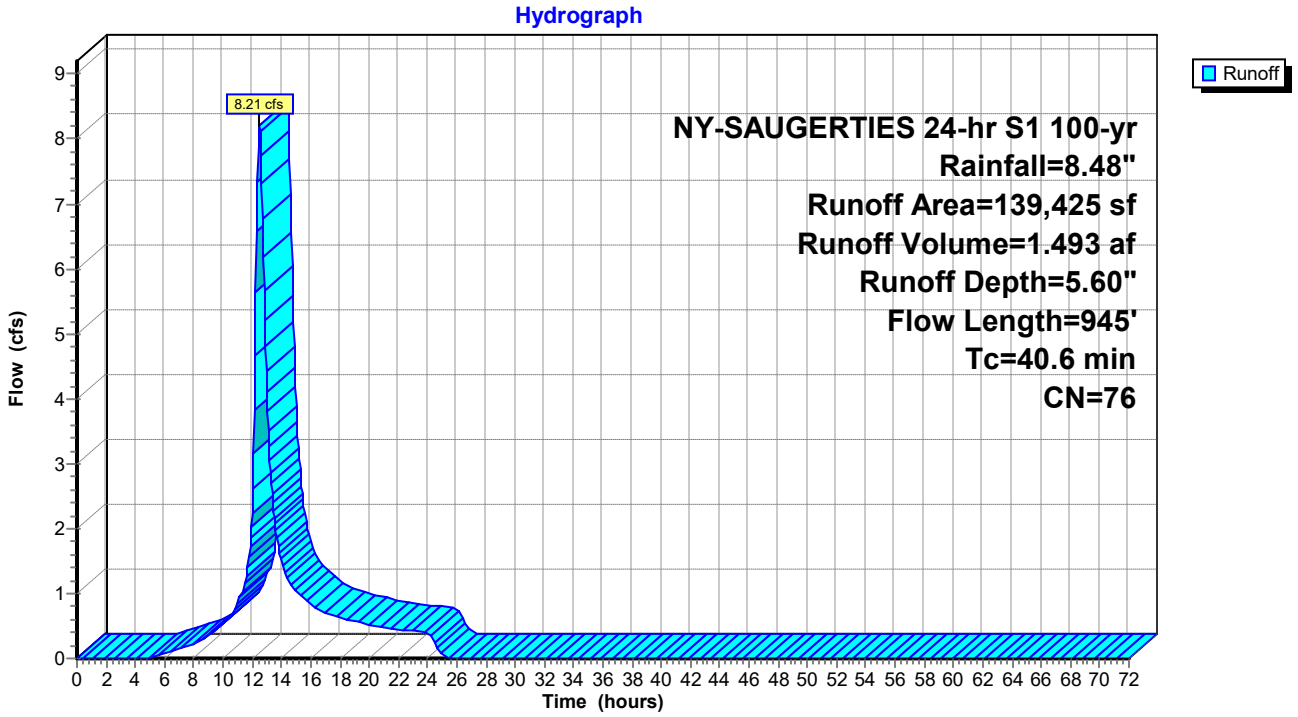
Runoff = 8.21 cfs @ 12.49 hrs, Volume= 1.493 af, Depth= 5.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	97,071	73	Woods, Fair, HSG C
	20,322	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	12,079	74	>75% Grass cover, Good, HSG C
	347	80	>75% Grass cover, Good, HSG D
*	6,722	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	139,425	76	Weighted Average
	129,819		93.11% Pervious Area
	9,606		6.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
9.9	350	0.0140	0.59		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.1	80	0.0630	1.25		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
5.5	220	0.0180	0.67		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
3.2	185	0.0380	0.97		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.0	10	0.2000	6.71		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
40.6	945	Total			

Subcatchment 1C: DRAINAGE AREA 1C



Summary for Subcatchment 1D: DRAINAGE AREA 1D

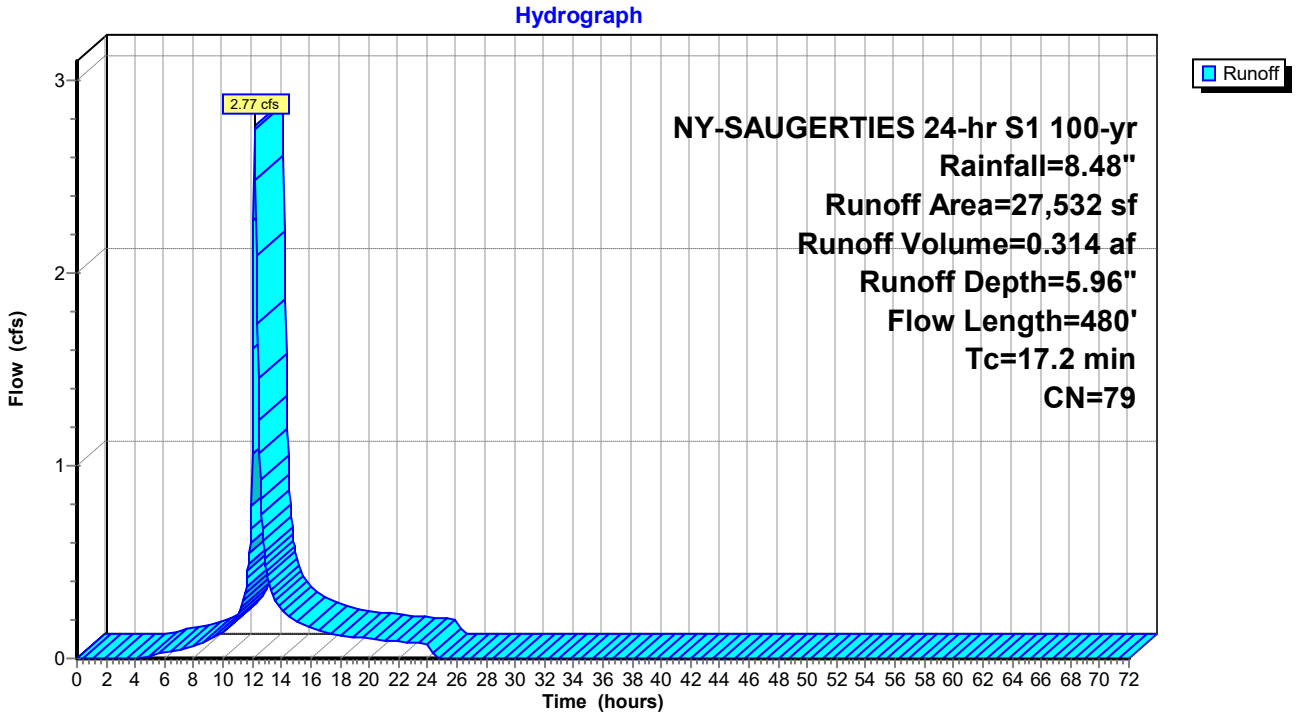
Runoff = 2.77 cfs @ 12.18 hrs, Volume= 0.314 af, Depth= 5.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	8,093	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	13,157	74	>75% Grass cover, Good, HSG C
	867	80	>75% Grass cover, Good, HSG D
*	5,415	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	27,532	79	Weighted Average
	22,117		80.33% Pervious Area
	5,415		19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	8	0.0630	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
1.5	17	0.0590	0.19		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
12.6	75	0.0400	0.10		**Sheet Flow, C-D** Woods: Light underbrush n= 0.400 P2= 3.38"
0.6	30	0.0330	0.91		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.2	40	0.0500	3.35		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
1.8	220	0.0180	2.01		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
0.4	90	0.0780	4.19		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
17.2	480	Total			

Subcatchment 1D: DRAINAGE AREA 1D



Summary for Subcatchment 1E: DRAINAGE AREA 1E

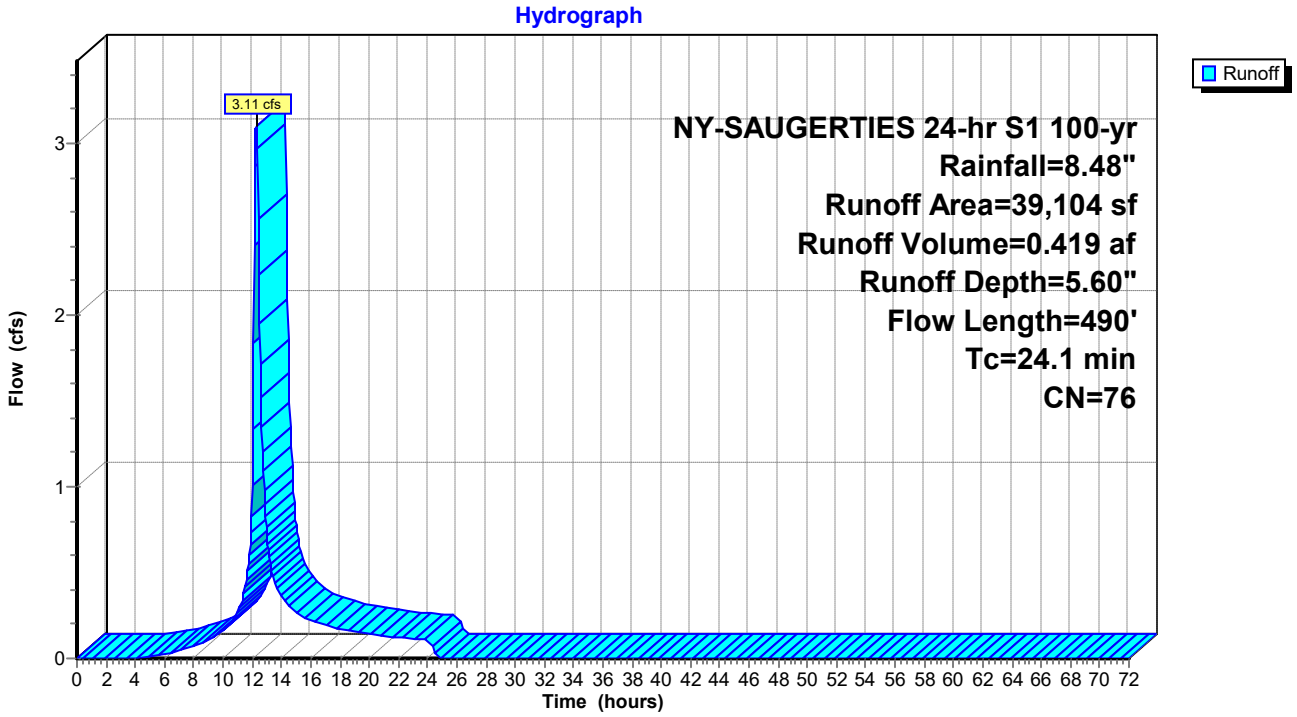
Runoff = 3.11 cfs @ 12.27 hrs, Volume= 0.419 af, Depth= 5.60"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	27,062	73	Woods, Fair, HSG C
	1,441	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	4,681	74	>75% Grass cover, Good, HSG C
	2,095	80	>75% Grass cover, Good, HSG D
*	3,825	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	39,104	76	Weighted Average
	35,279		90.22% Pervious Area
	3,825		9.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.6	110	0.0550	1.17		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	280	0.0390	2.96		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
24.1	490	Total			

Subcatchment 1E: DRAINAGE AREA 1E



Summary for Subcatchment 1F: DRAINAGE AREA 1F

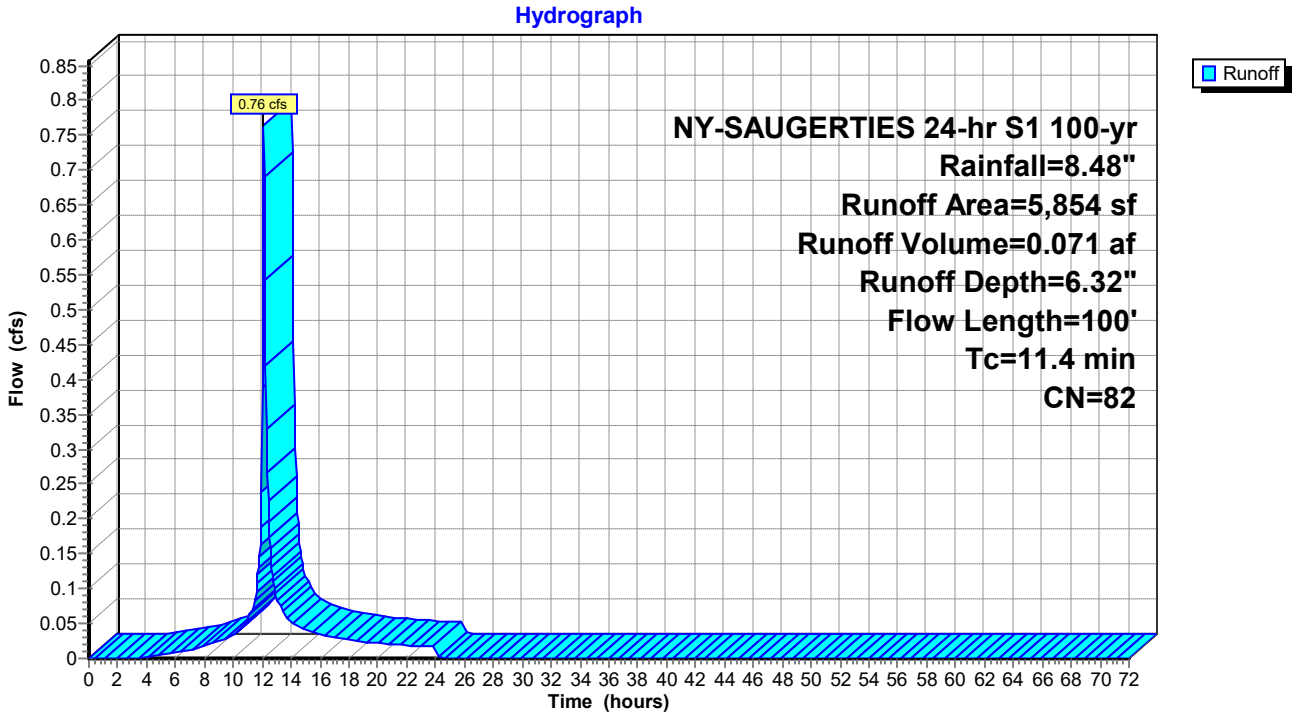
Runoff = 0.76 cfs @ 12.11 hrs, Volume= 0.071 af, Depth= 6.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	2,009	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,012	80	>75% Grass cover, Good, HSG D
*	833	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,854	82	Weighted Average
	5,021		85.77% Pervious Area
	833		14.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	30	0.0670	0.22		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
7.0	40	0.0500	0.10		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.38"
2.2	30	0.0670	0.22		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.38"
11.4	100	Total			

Subcatchment 1F: DRAINAGE AREA 1F



Summary for Subcatchment 1G: DRAINAGE AREA 1G

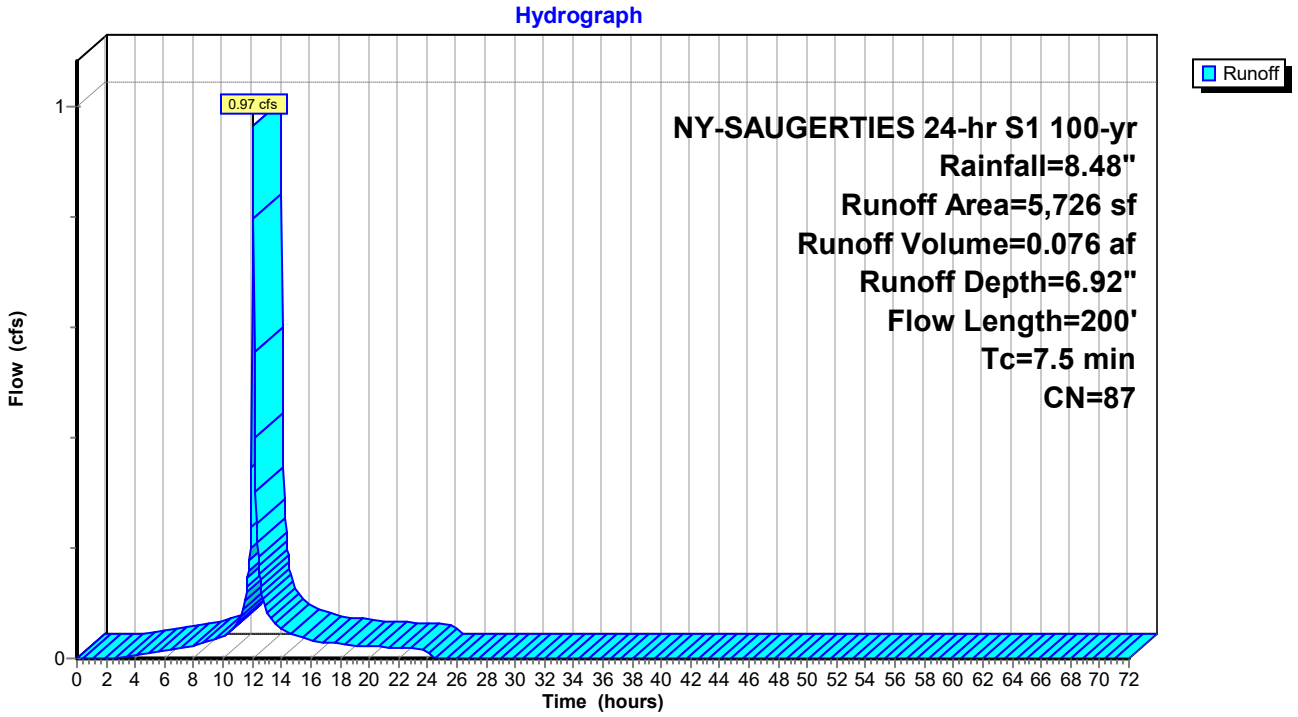
Runoff = 0.97 cfs @ 12.06 hrs, Volume= 0.076 af, Depth= 6.92"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	521	74	>75% Grass cover, Good, HSG C
	2,828	80	>75% Grass cover, Good, HSG D
*	2,377	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,726	87	Weighted Average
	3,349		58.49% Pervious Area
	2,377		41.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	5	0.1000	1.48		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
6.8	95	0.0420	0.23		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.6	100	0.0400	3.00		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
7.5	200	Total			

Subcatchment 1G: DRAINAGE AREA 1G



Summary for Subcatchment 1H: DRAINAGE AREA 8

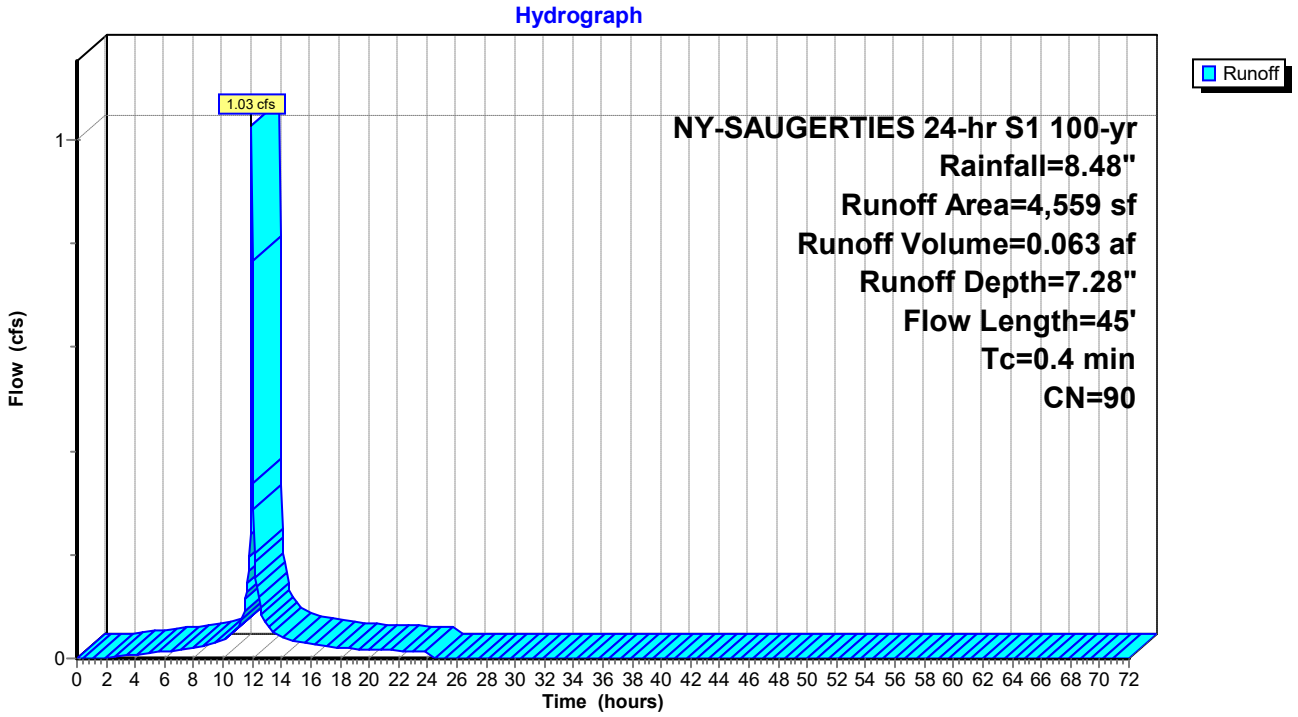
Runoff = 1.03 cfs @ 11.96 hrs, Volume= 0.063 af, Depth= 7.28"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	2,124	80	>75% Grass cover, Good, HSG D
*	2,435	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	4,559	90	Weighted Average
	2,124		46.59% Pervious Area
	2,435		53.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0250	1.12		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
0.1	25	0.3200	3.25		**Sheet Flow, B-C**
					Smooth surfaces n= 0.011 P2= 3.38"
0.4	45	Total			

Subcatchment 1H: DRAINAGE AREA 8



Summary for Subcatchment 1I: DRAINAGE AREA 1I

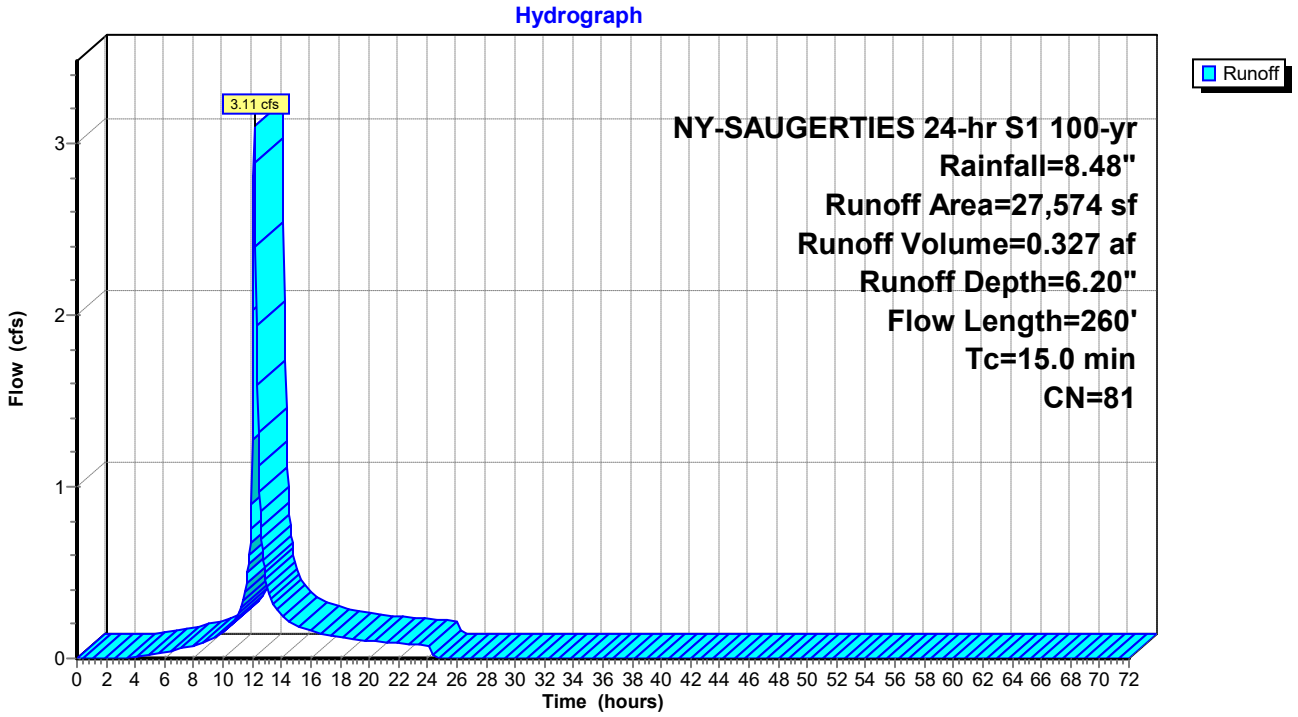
Runoff = 3.11 cfs @ 12.15 hrs, Volume= 0.327 af, Depth= 6.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	686	73	Woods, Fair, HSG C
	20,704	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,341	80	>75% Grass cover, Good, HSG D
*	2,843	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	27,574	81	Weighted Average
	24,731		89.69% Pervious Area
	2,843		10.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0600	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
0.9	70	0.0710	1.33		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	90	0.0330	2.72		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
15.0	260	Total			

Subcatchment 1I: DRAINAGE AREA 1I



Summary for Subcatchment 1J: DRAINAGE AREA 1J

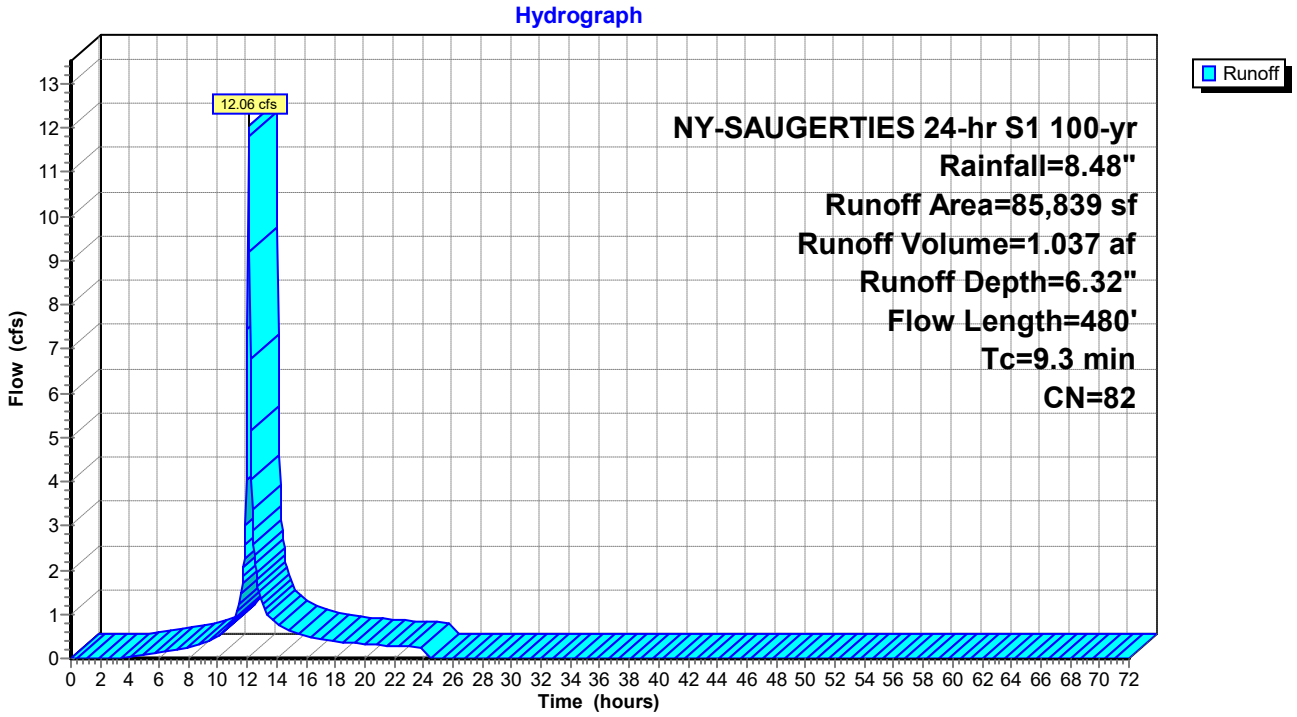
Runoff = 12.06 cfs @ 12.08 hrs, Volume= 1.037 af, Depth= 6.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	52,694	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	22,447	80	>75% Grass cover, Good, HSG D
*	7,814	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	85,839	82	Weighted Average
	75,141		87.54% Pervious Area
	10,698		12.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	10	0.0500	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
0.6	50	0.0300	1.45		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.38"
2.5	30	0.0500	0.20		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.38"
2.3	10	0.0500	0.07		**Sheet Flow, D-E** Woods: Light underbrush n= 0.400 P2= 3.38"
1.2	70	0.0360	0.95		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
1.7	310	0.0420	3.07		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
9.3	480	Total			

Subcatchment 1J: DRAINAGE AREA 1J



Summary for Subcatchment 1K: DRAINAGE AREA 1K

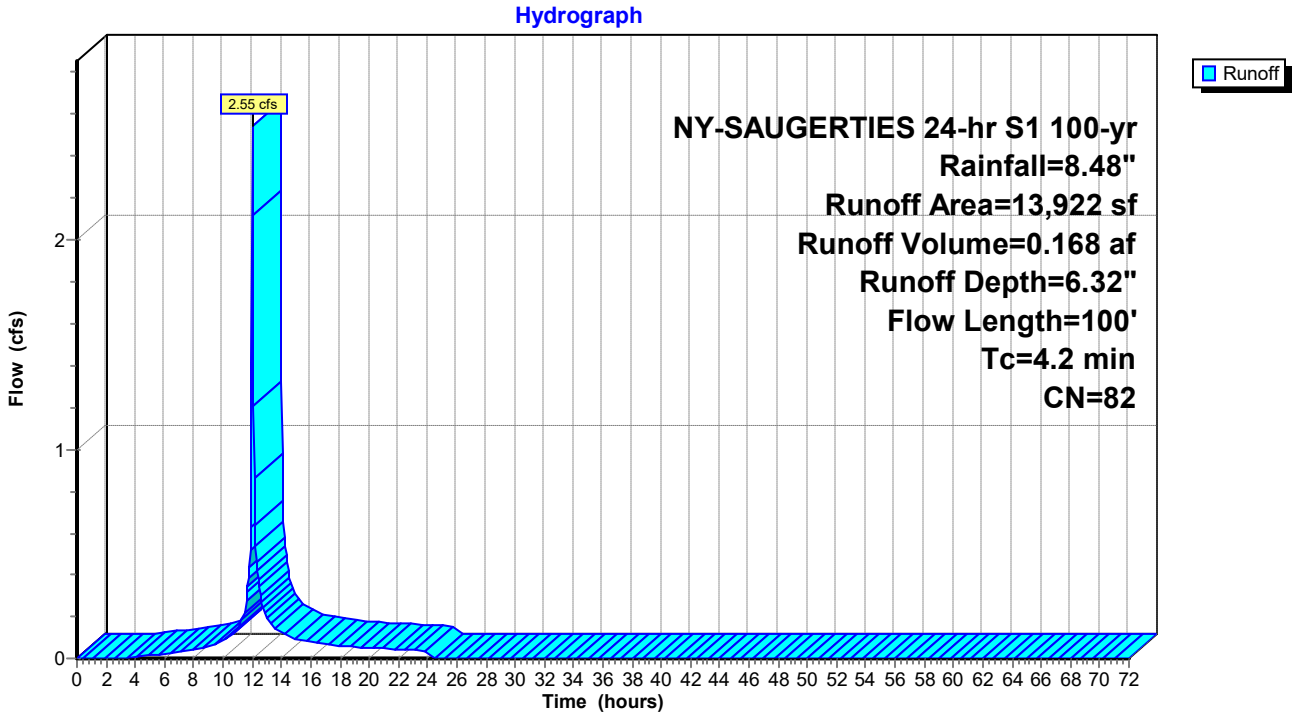
Runoff = 2.55 cfs @ 12.01 hrs, Volume= 0.168 af, Depth= 6.32"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	12,099	80	>75% Grass cover, Good, HSG D
*	1,823	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	13,922	82	Weighted Average
	12,099		86.91% Pervious Area
	1,823		13.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	15	0.0330	1.18		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
4.0	85	0.1290	0.36		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
4.2	100	Total			

Subcatchment 1K: DRAINAGE AREA 1K



Summary for Subcatchment 1L: DRAINAGE AREA 1L

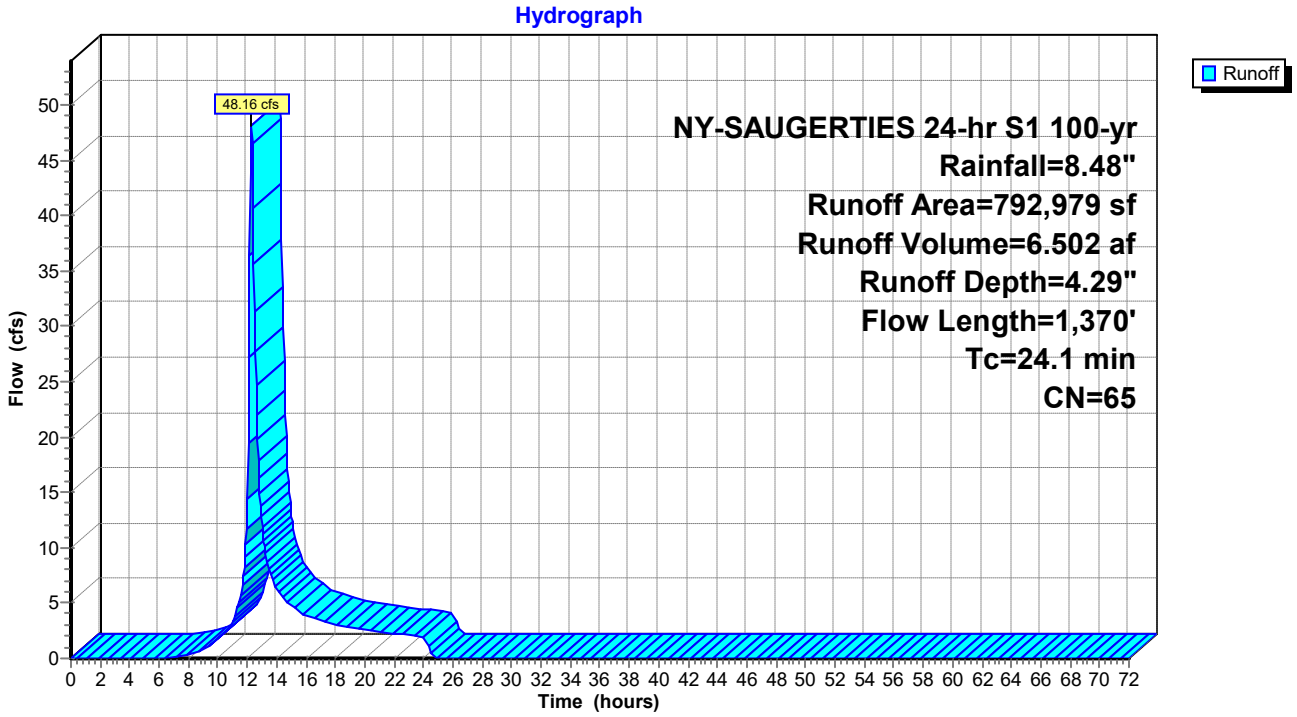
Runoff = 48.16 cfs @ 12.28 hrs, Volume= 6.502 af, Depth= 4.29"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	162,840	36	Woods, Fair, HSG A
	218,251	60	Woods, Fair, HSG B
	3,820	73	Woods, Fair, HSG C
	357,922	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	2,373	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	30,455	80	>75% Grass cover, Good, HSG D
*	11,550	98	Paved roads w/curbs & sewers, HSG A-D
*	5,768	98	Roofs, HSG A-D
	792,979	65	Weighted Average
	775,661		97.82% Pervious Area
	17,318		2.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.1400	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
3.3	310	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
11.2	960	0.0090	1.42		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
24.1	1,370	Total			

Subcatchment 1L: DRAINAGE AREA 1L



Summary for Subcatchment 1M: DRAINAGE AREA 1M

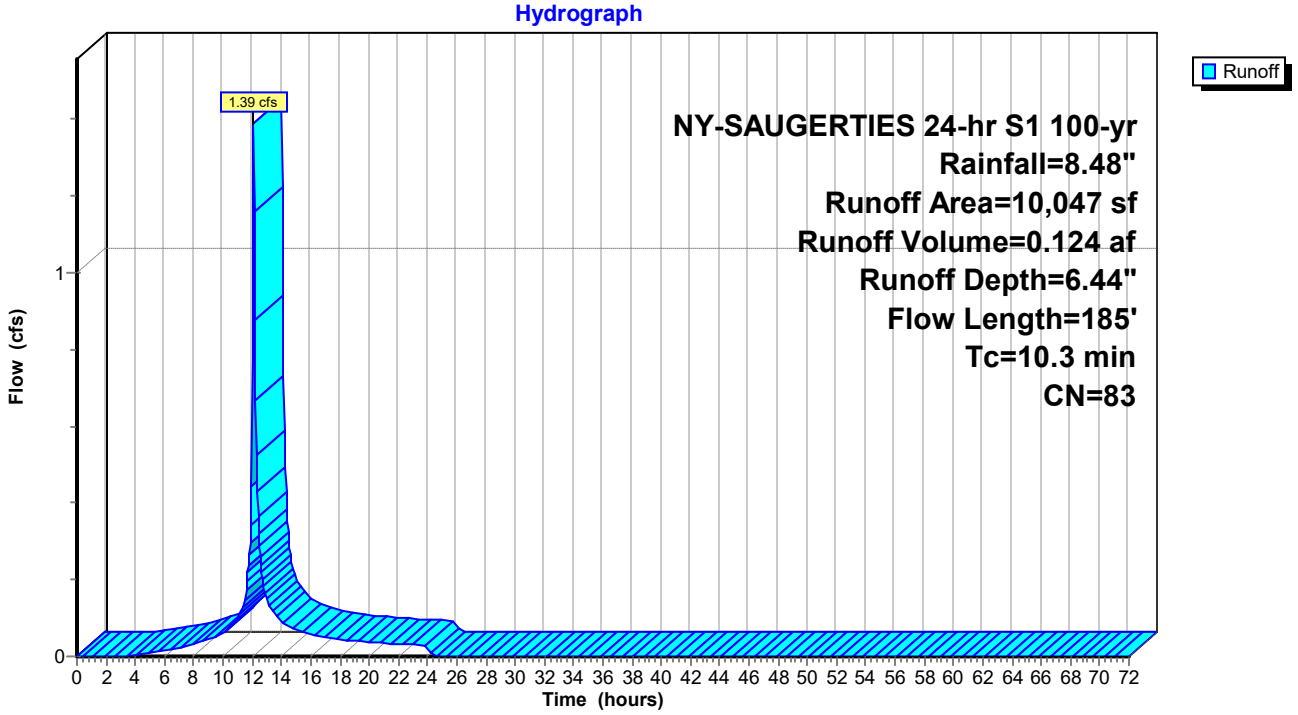
Runoff = 1.39 cfs @ 12.09 hrs, Volume= 0.124 af, Depth= 6.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	3,810	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	4,526	80	>75% Grass cover, Good, HSG D
*	1,711	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	10,047	83	Weighted Average
	8,336		82.97% Pervious Area
	1,711		17.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0330	1.09		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
2.4	20	0.0250	0.14		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
7.0	65	0.1310	0.16		**Sheet Flow, C-D** Woods: Light underbrush n= 0.400 P2= 3.38"
0.7	90	0.0220	2.22		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
10.3	185	Total			

Subcatchment 1M: DRAINAGE AREA 1M



Summary for Subcatchment 2A: DRAINAGE AREA 2A

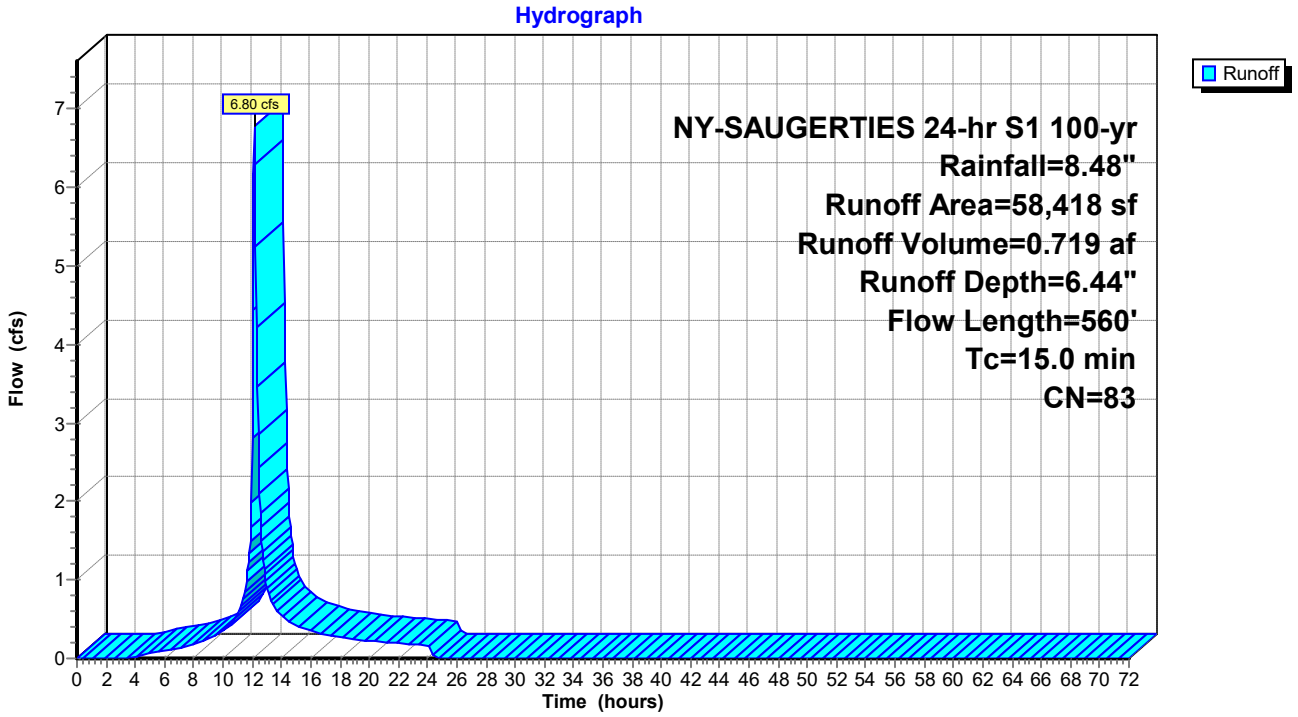
Runoff = 6.80 cfs @ 12.15 hrs, Volume= 0.719 af, Depth= 6.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	22,949	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	24,787	80	>75% Grass cover, Good, HSG D
*	7,798	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	58,418	83	Weighted Average
	47,736		81.71% Pervious Area
	10,682		18.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	7	0.0710	1.38		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
7.5	93	0.0320	0.21		**Sheet Flow, B-C**
					Grass: Short n= 0.150 P2= 3.38"
0.8	150	0.0430	3.11		**Shallow Concentrated Flow, C-D**
					Grassed Waterway Kv= 15.0 fps
6.4	280	0.0210	0.72		**Shallow Concentrated Flow, D-E**
					Woodland Kv= 5.0 fps
0.2	30	0.0330	2.72		**Shallow Concentrated Flow, E-F**
					Grassed Waterway Kv= 15.0 fps
15.0	560	Total			

Subcatchment 2A: DRAINAGE AREA 2A



Summary for Subcatchment 2B: DRAINAGE AREA 2B

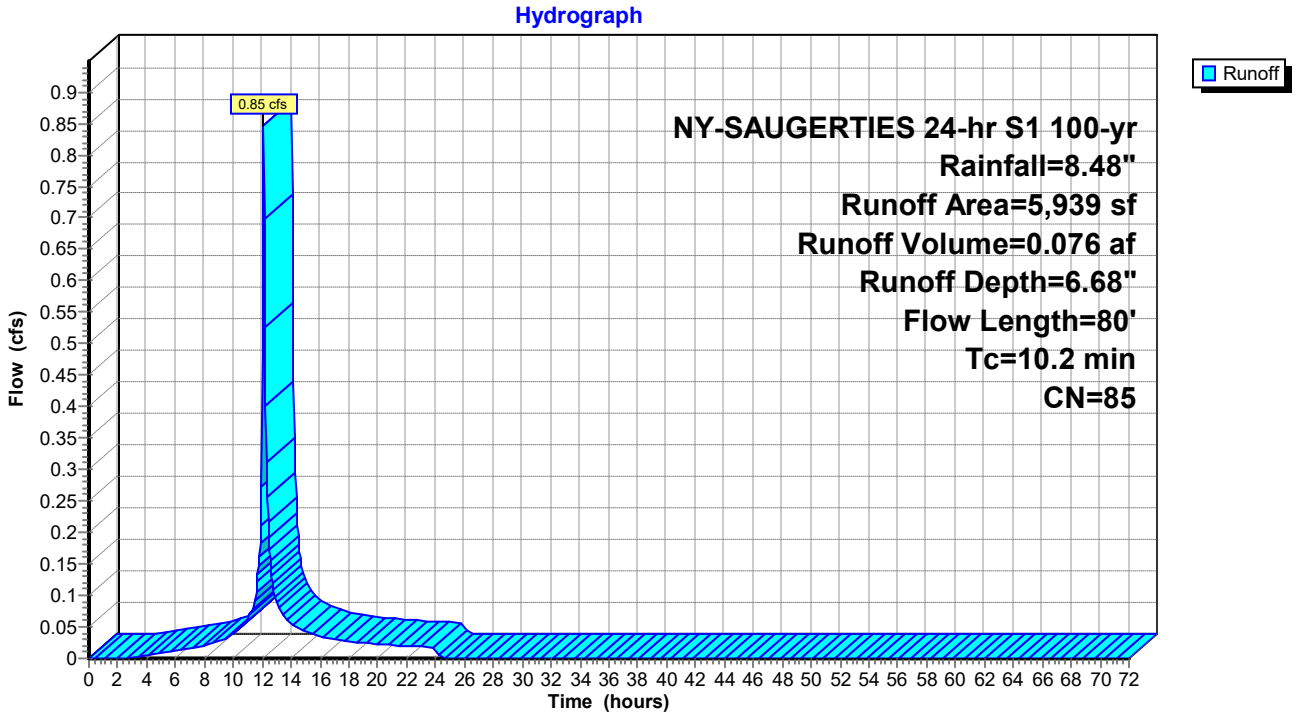
Runoff = 0.85 cfs @ 12.09 hrs, Volume= 0.076 af, Depth= 6.68"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	1,167	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,008	80	>75% Grass cover, Good, HSG D
*	1,764	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,939	85	Weighted Average
	4,175		70.30% Pervious Area
	1,764		29.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	35	0.0290	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.4	45	0.1330	0.32		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
10.2	80	Total			

Subcatchment 2B: DRAINAGE AREA 2B



Summary for Subcatchment 2C: DRAINAGE AREA 2C

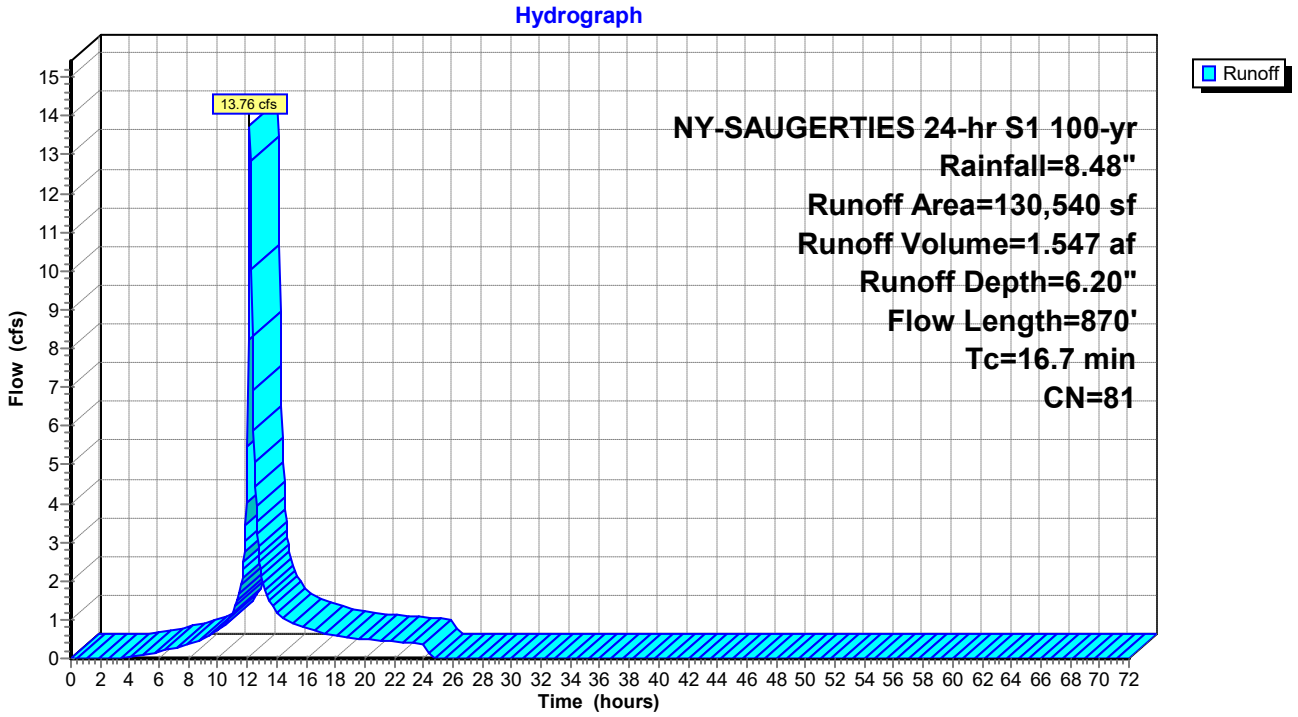
Runoff = 13.76 cfs @ 12.18 hrs, Volume= 1.547 af, Depth= 6.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	92,203	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	28,020	80	>75% Grass cover, Good, HSG D
*	10,317	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	130,540	81	Weighted Average
	120,223		92.10% Pervious Area
	10,317		7.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0900	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.7	210	0.0190	2.07		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
0.1	30	0.1670	6.13		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
3.5	530	0.0280	2.51		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
16.7	870	Total			

Subcatchment 2C: DRAINAGE AREA 2C



Summary for Subcatchment 2D: DRAINAGE AREA 2D

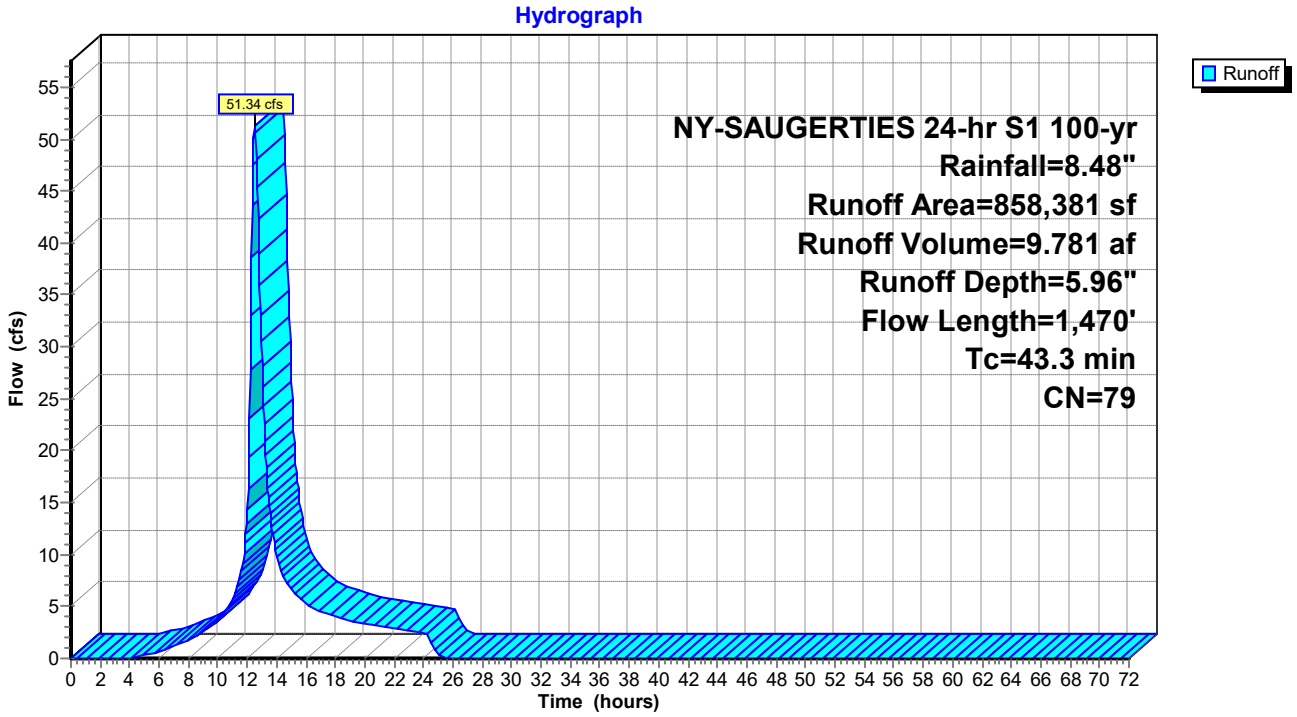
Runoff = 51.34 cfs @ 12.53 hrs, Volume= 9.781 af, Depth= 5.96"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	34,292	73	Woods, Fair, HSG C
	808,098	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	3,863	74	>75% Grass cover, Good, HSG C
	7,734	80	>75% Grass cover, Good, HSG D
*	4,394	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	858,381	79	Weighted Average
	853,987		99.49% Pervious Area
	4,394		0.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1300	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
0.6	50	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
32.8	1,320	0.0180	0.67		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
43.3	1,470	Total			

Subcatchment 2D: DRAINAGE AREA 2D



Summary for Subcatchment 2E: DRAINAGE AREA 18

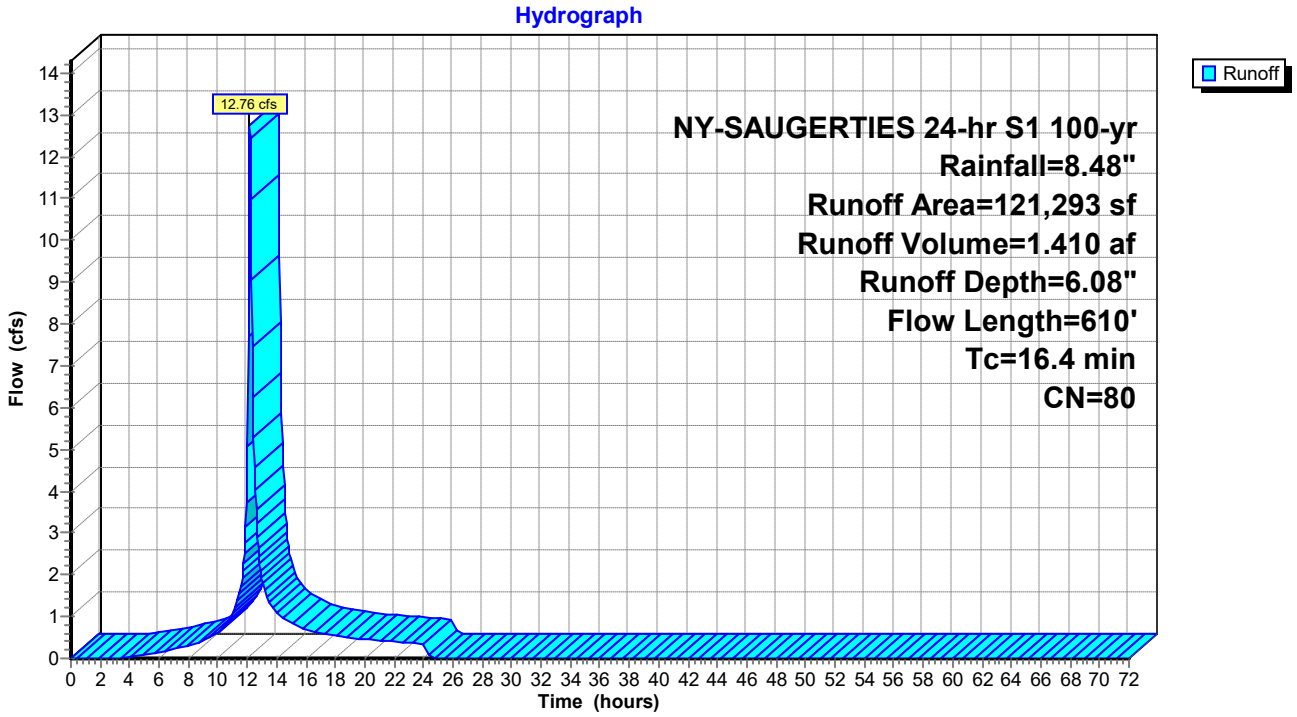
Runoff = 12.76 cfs @ 12.17 hrs, Volume= 1.410 af, Depth= 6.08"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	23,515	73	Woods, Fair, HSG C
	54,460	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	3,737	74	>75% Grass cover, Good, HSG C
	25,044	80	>75% Grass cover, Good, HSG D
*	11,653	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	121,293	80	Weighted Average
	106,756		88.01% Pervious Area
	14,537		11.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0830	1.42		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
6.1	94	0.0530	0.25		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.8	220	0.2270	4.76		**Shallow Concentrated Flow, C-D** Nearly Bare & Untilled Kv= 10.0 fps
0.1	40	0.2000	6.71		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
9.3	250	0.0080	0.45		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
16.4	610	Total			

Subcatchment 2E: DRAINAGE AREA 18



Summary for Subcatchment 2F: DRAINAGE AREA 2F

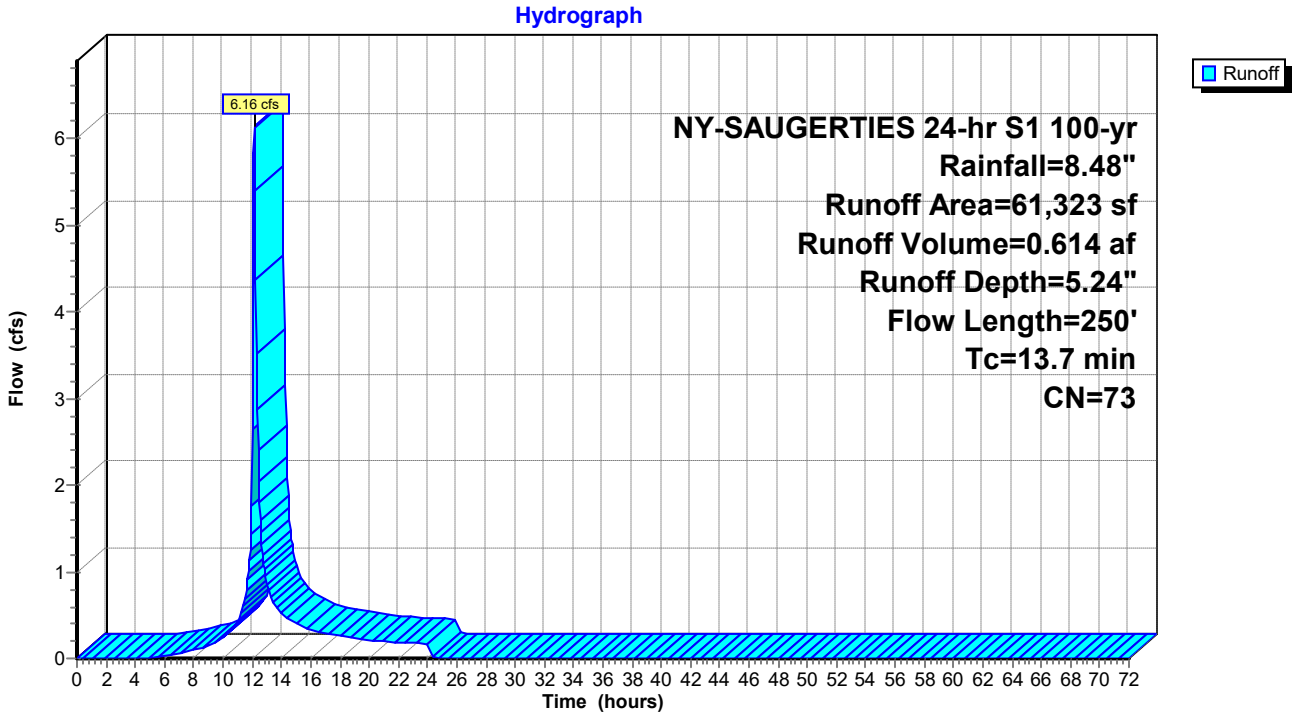
Runoff = 6.16 cfs @ 12.14 hrs, Volume= 0.614 af, Depth= 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	5,624	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	4,622	73	Woods, Fair, HSG C
	47,954	79	Woods, Fair, HSG D
	3,123	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
*	0	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	61,323	73	Weighted Average
	61,323		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0800	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.7	150	0.0870	1.47		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
13.7	250	Total			

Subcatchment 2F: DRAINAGE AREA 2F



Summary for Subcatchment 2G: DRAINAGE AREA 2G

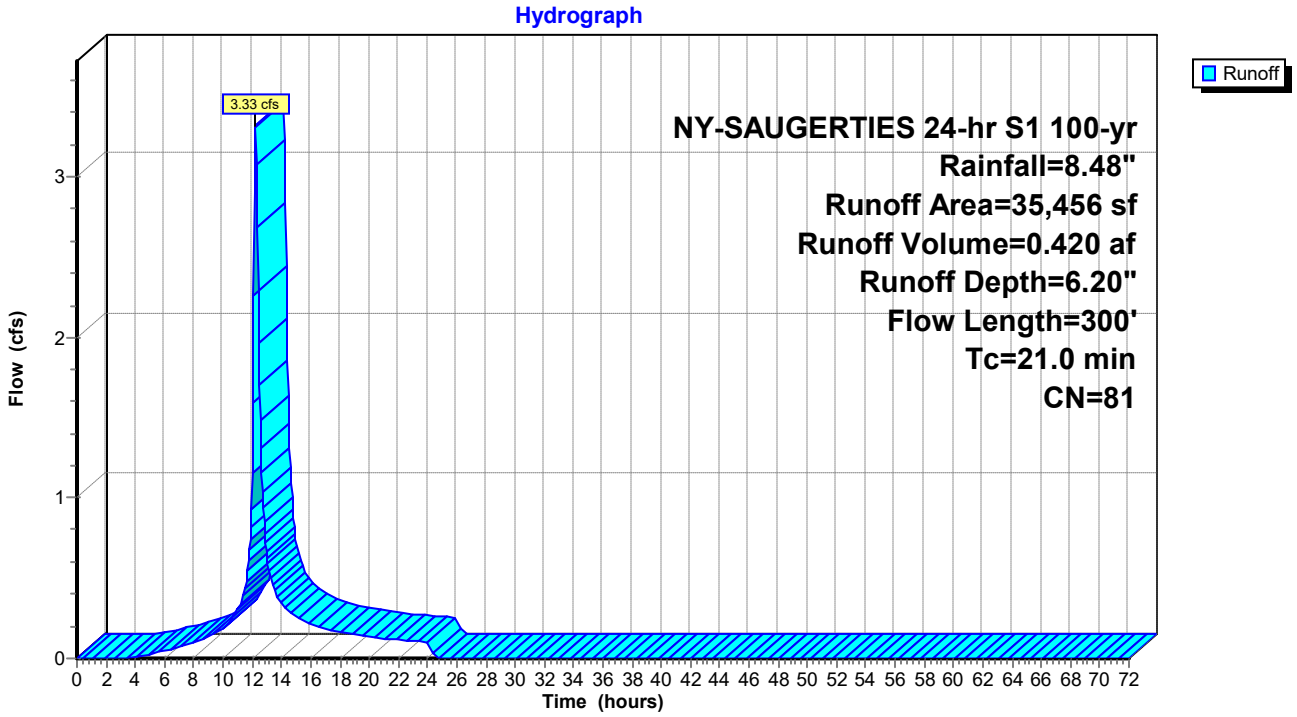
Runoff = 3.33 cfs @ 12.23 hrs, Volume= 0.420 af, Depth= 6.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	27,880	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	4,802	80	>75% Grass cover, Good, HSG D
*	2,774	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	35,456	81	Weighted Average
	32,682		92.18% Pervious Area
	2,774		7.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0300	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
3.1	190	0.0420	1.02		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	10	0.0300	2.60		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
21.0	300	Total			

Subcatchment 2G: DRAINAGE AREA 2G



Summary for Subcatchment 3: DRAINAGE AREA 3

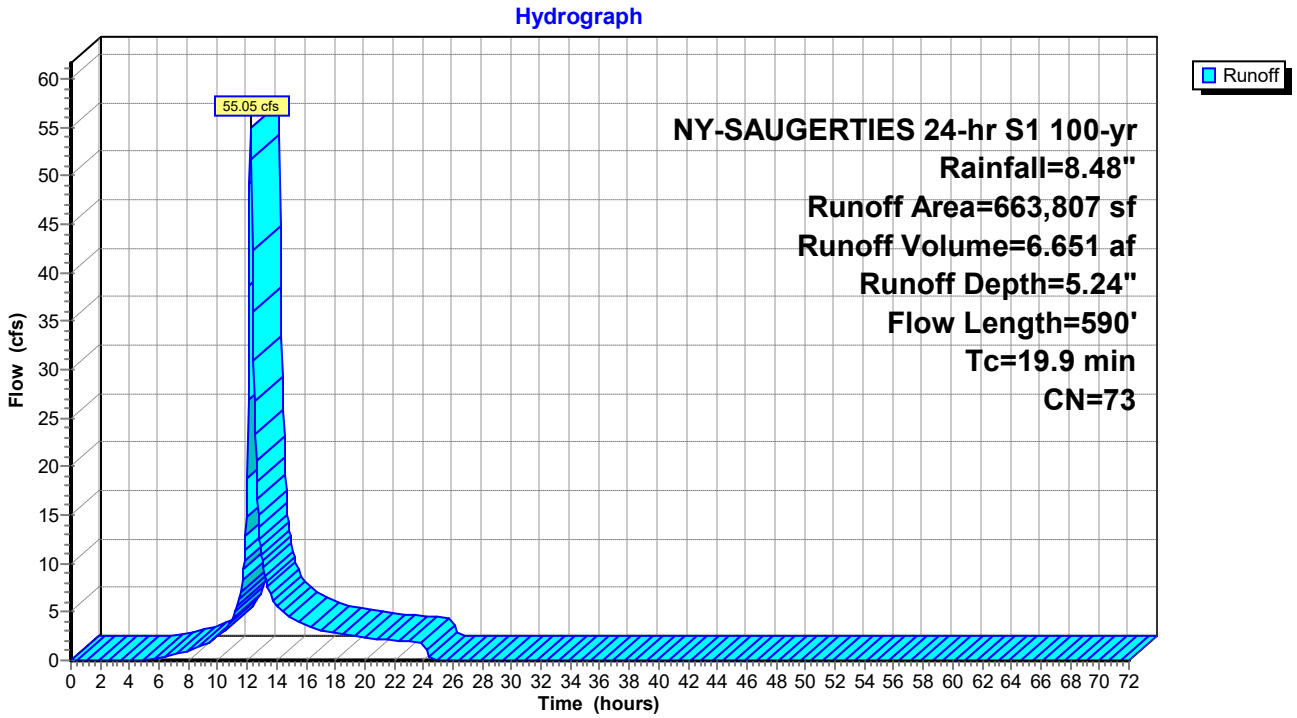
Runoff = 55.05 cfs @ 12.22 hrs, Volume= 6.651 af, Depth= 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
663,807	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
663,807	73	Weighted Average
663,807		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.4	490	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	590	Total			

Subcatchment 3: DRAINAGE AREA 3



Summary for Subcatchment 4: DRAINAGE AREA 4

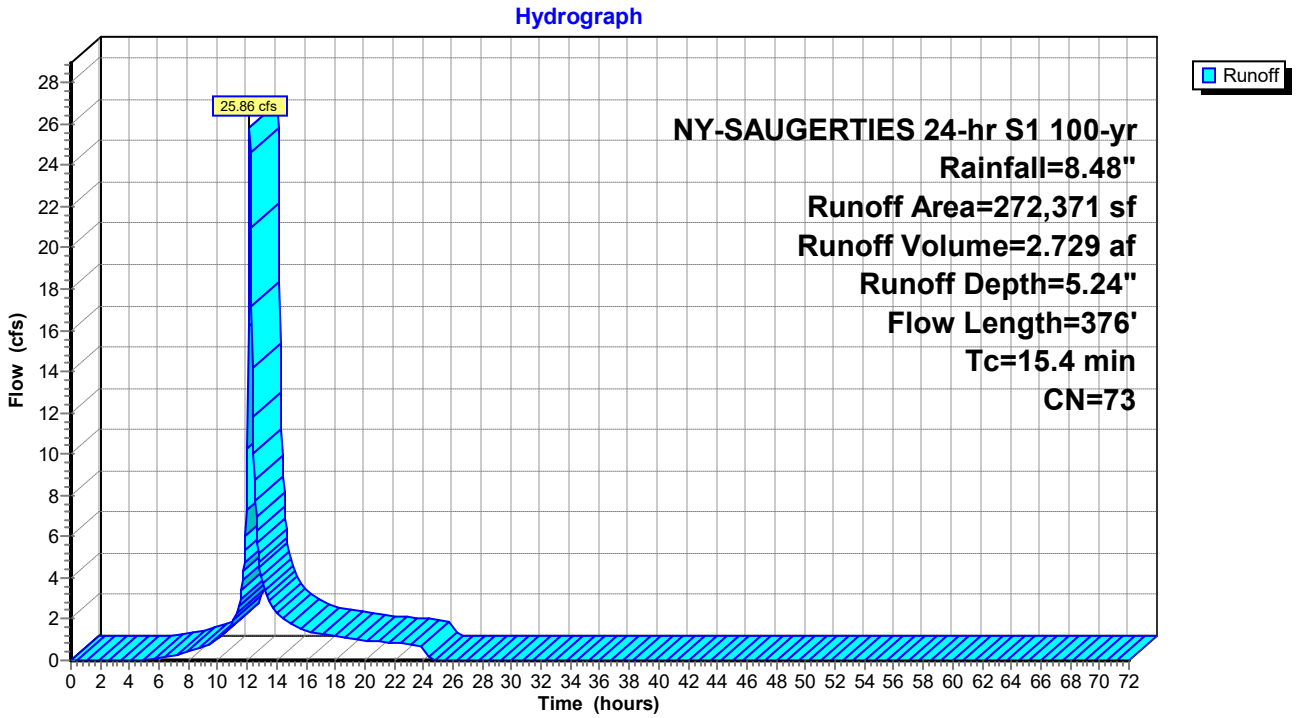
Runoff = 25.86 cfs @ 12.16 hrs, Volume= 2.729 af, Depth= 5.24"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
272,371	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
272,371	73	Weighted Average
272,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0700	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.7	276	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.4	376	Total			

Subcatchment 4: DRAINAGE AREA 4



Summary for Subcatchment 5: DRAINAGE AREA 5

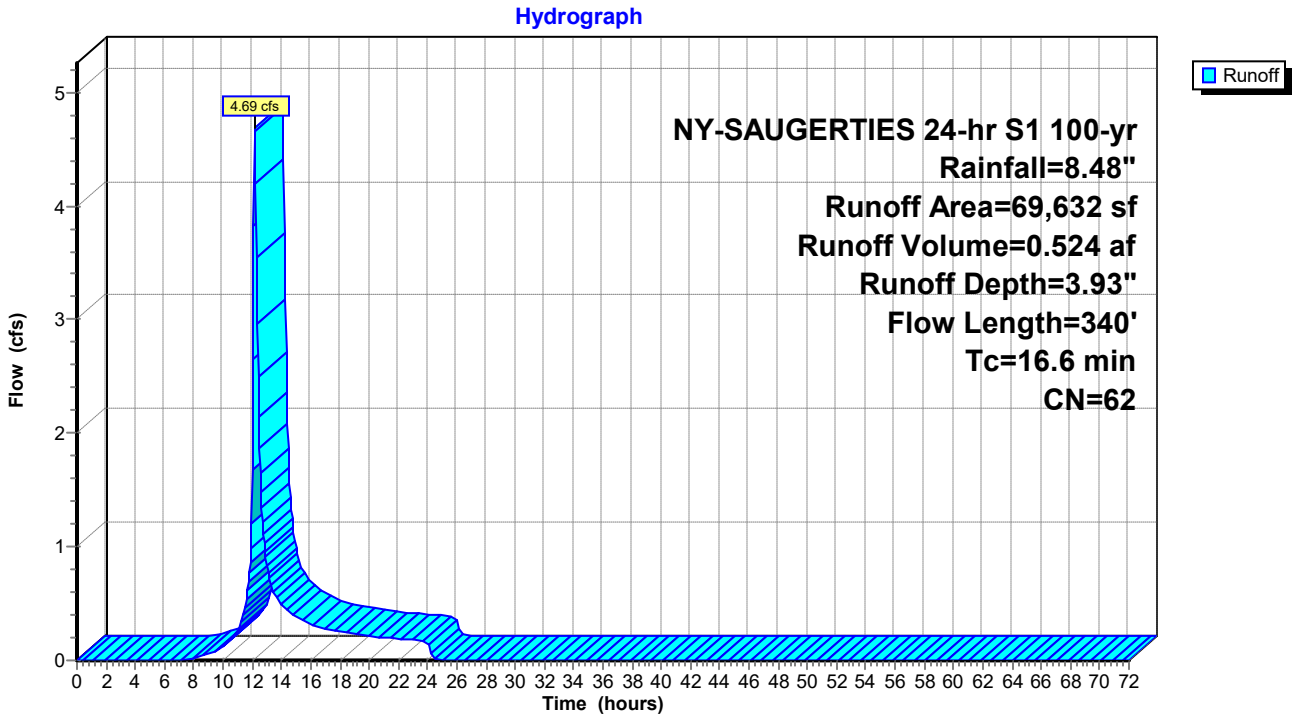
Runoff = 4.69 cfs @ 12.18 hrs, Volume= 0.524 af, Depth= 3.93"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 100-yr Rainfall=8.48"

Area (sf)	CN	Description
27,631	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
42,001	79	Woods, Fair, HSG D
69,632	62	Weighted Average
69,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0540	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.6	240	0.0930	1.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.6	340	Total			

Subcatchment 5: DRAINAGE AREA 5



Summary for Pond AC1: ARCH CULVERT

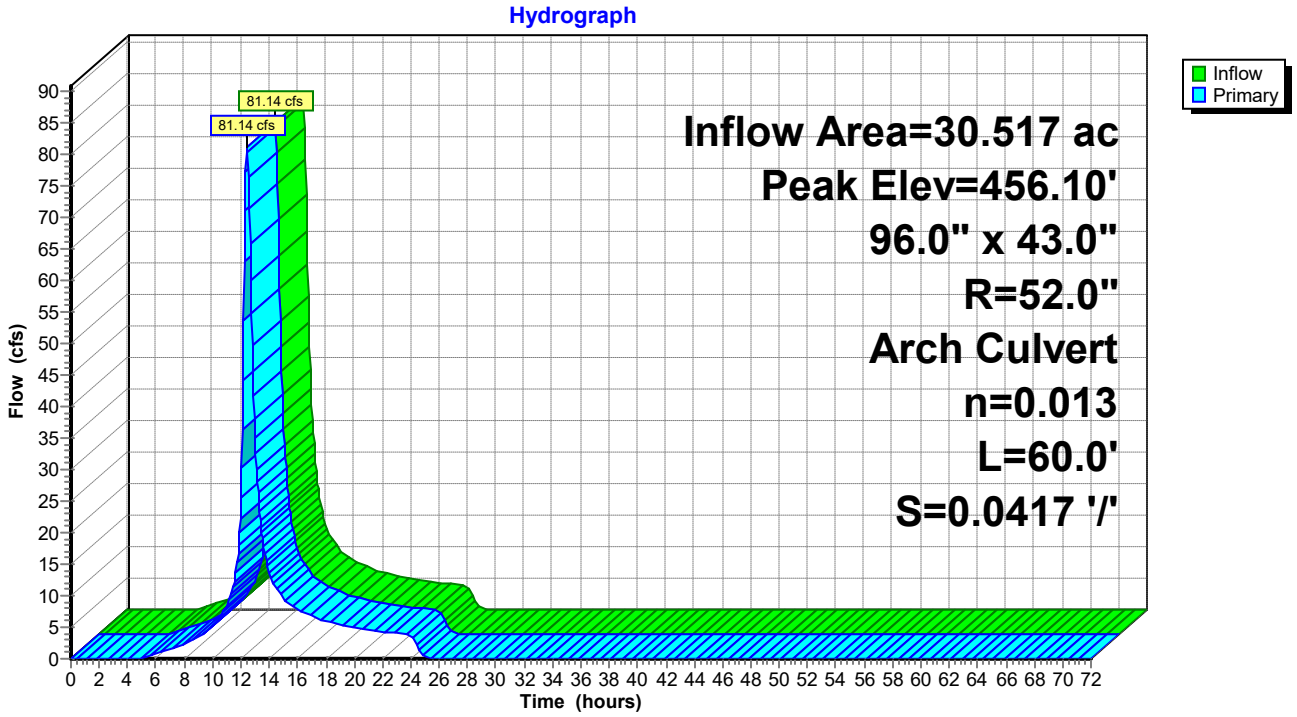
Inflow Area = 30.517 ac, 3.65% Impervious, Inflow Depth = 5.62" for 100-yr event
Inflow = 81.14 cfs @ 12.44 hrs, Volume= 14.284 af
Outflow = 81.14 cfs @ 12.44 hrs, Volume= 14.284 af, Atten= 0%, Lag= 0.0 min
Primary = 81.14 cfs @ 12.44 hrs, Volume= 14.284 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 456.10' @ 12.44 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	453.90'	**96.0" W x 43.0" H, R=52.0" Arch Culvert** L= 60.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 453.90' / 451.40' S= 0.0417 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 22.75 sf

Primary OutFlow Max=80.96 cfs @ 12.44 hrs HW=456.09' (Free Discharge)
└**1=Culvert** (Inlet Controls 80.96 cfs @ 4.86 fps)

Pond AC1: ARCH CULVERT



Summary for Pond AC2: ARCH CULVERT

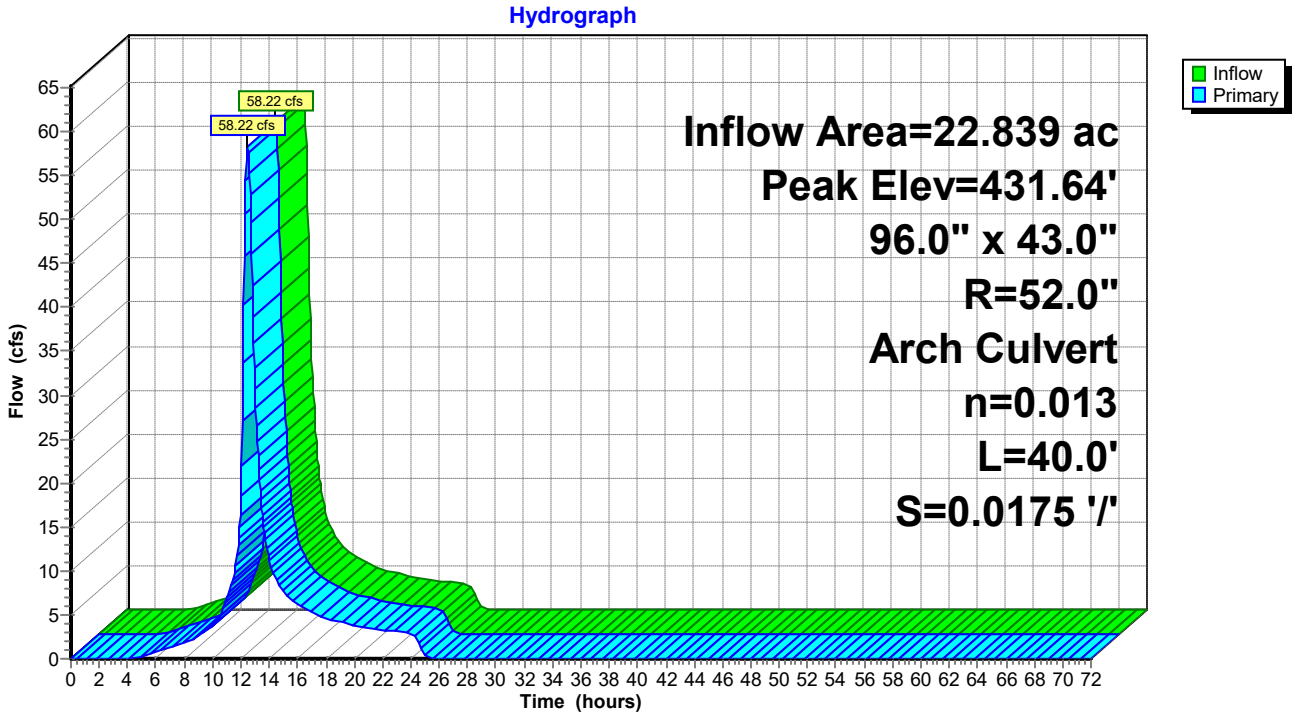
Inflow Area = 22.839 ac, 1.66% Impervious, Inflow Depth = 5.90" for 100-yr event
Inflow = 58.22 cfs @ 12.47 hrs, Volume= 11.222 af
Outflow = 58.22 cfs @ 12.47 hrs, Volume= 11.222 af, Atten= 0%, Lag= 0.0 min
Primary = 58.22 cfs @ 12.47 hrs, Volume= 11.222 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 431.64' @ 12.47 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	429.90'	**96.0" W x 43.0" H, R=52.0" Arch Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 429.90' / 429.20' S= 0.0175 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 22.75 sf

Primary OutFlow Max=58.05 cfs @ 12.47 hrs HW=431.64' (Free Discharge)
└**1=Culvert** (Inlet Controls 58.05 cfs @ 4.28 fps)

Pond AC2: ARCH CULVERT



Summary for Pond BR1-C7: BIO-RET POND 1

Inflow Area = 4.967 ac, 10.94% Impervious, Inflow Depth = 5.71" for 100-yr event
Inflow = 12.30 cfs @ 12.36 hrs, Volume= 2.364 af
Outflow = 12.08 cfs @ 12.42 hrs, Volume= 2.364 af, Atten= 2%, Lag= 4.0 min
Primary = 12.08 cfs @ 12.42 hrs, Volume= 2.364 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.01' @ 12.42 hrs Surf.Area= 808 sf Storage= 1,320 cf

Plug-Flow detention time= 5.5 min calculated for 2.364 af (100% of inflow)
Center-of-Mass det. time= 5.1 min (858.0 - 852.9)

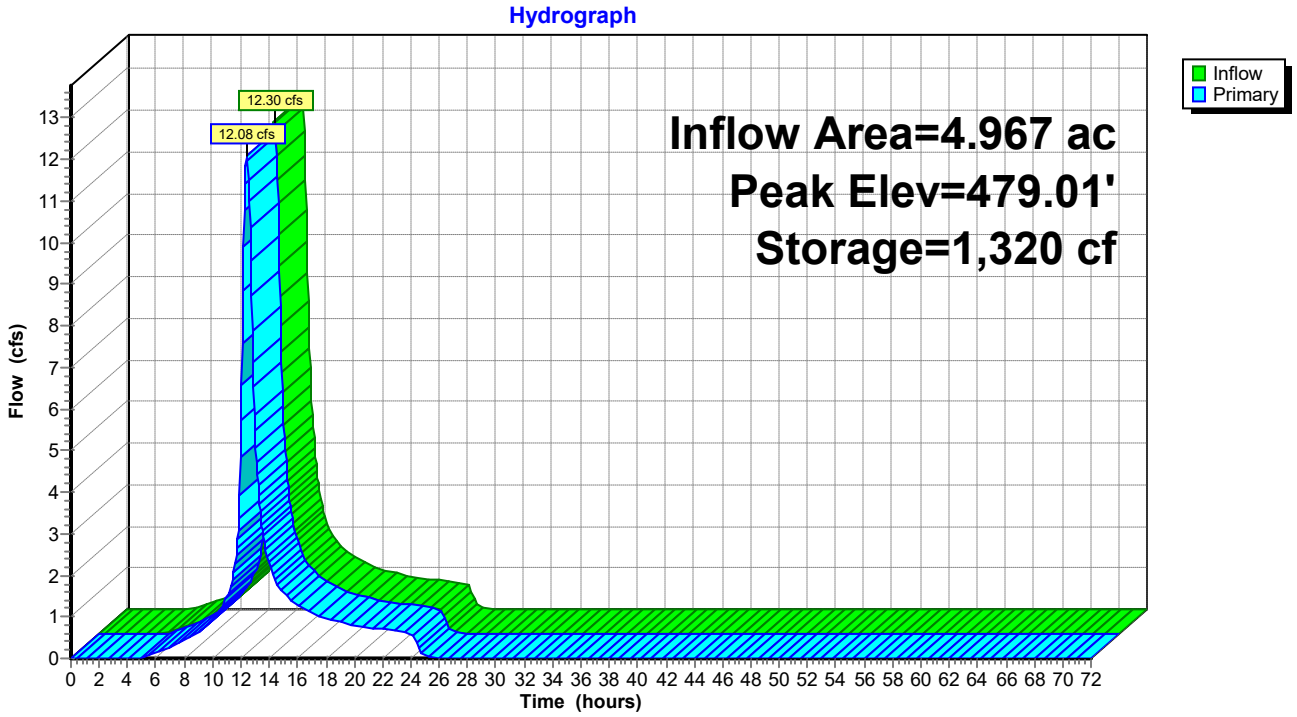
Volume	Invert	Avail.Storage	Storage Description
#1	476.00'	2,275 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
476.00	154	0	0	154
478.00	531	647	647	551
480.00	1,134	1,627	2,275	1,187

Device	Routing	Invert	Outlet Devices
#1	Primary	474.00'	**18.0" Round Culvert** L= 280.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 474.00' / 470.00' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	477.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	476.00'	**0.500 in/hr Exfiltration over Wetted area above 474.00'** Conductivity to Groundwater Elevation = 446.00' Excluded Wetted area = 0 sf

Primary OutFlow Max=12.05 cfs @ 12.42 hrs HW=479.00' (Free Discharge)
└─**1=Culvert** (Passes 12.05 cfs of 13.85 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 12.04 cfs @ 6.82 fps)
  └─**3=Exfiltration** (Controls 0.01 cfs)

Pond BR1-C7: BIO-RET POND 1



Summary for Pond BR2-C14: BIO-RET POND 2

Inflow Area = 2.923 ac, 12.07% Impervious, Inflow Depth = 6.29" for 100-yr event
Inflow = 16.12 cfs @ 12.08 hrs, Volume= 1.532 af
Outflow = 9.93 cfs @ 12.21 hrs, Volume= 1.532 af, Atten= 38%, Lag= 8.1 min
Primary = 9.93 cfs @ 12.21 hrs, Volume= 1.532 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 458.85' @ 12.21 hrs Surf.Area= 5,167 sf Storage= 11,635 cf

Plug-Flow detention time= 171.6 min calculated for 1.532 af (100% of inflow)
Center-of-Mass det. time= 171.4 min (988.8 - 817.4)

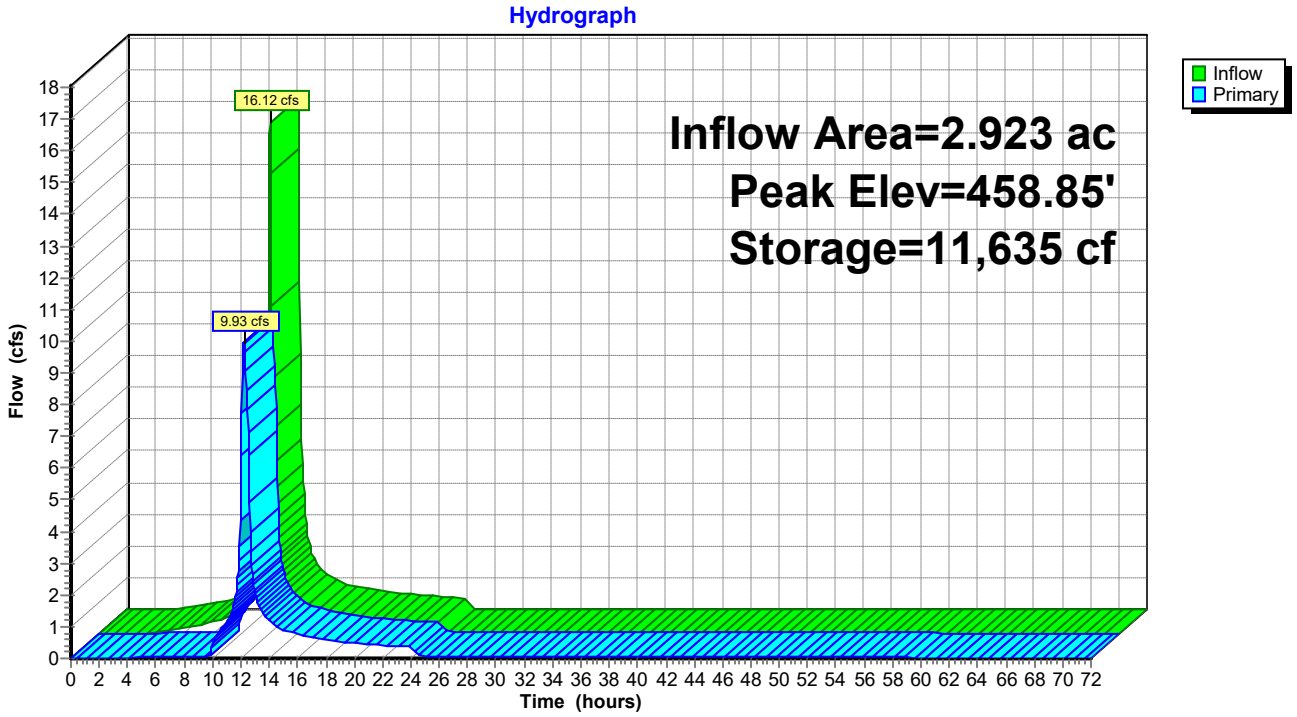
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	18,159 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
456.00	3,090	217.0	0	0	3,090
458.00	4,505	254.7	7,551	7,551	4,582
460.00	6,146	292.4	10,609	18,159	6,312

Device	Routing	Invert	Outlet Devices
#1	Primary	454.00'	**18.0" Round Culvert** L= 38.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 454.00' / 452.00' S= 0.0526 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	457.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	456.00'	**0.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 432.00'

Primary OutFlow Max=9.90 cfs @ 12.21 hrs HW=458.84' (Free Discharge)
└─**1=Culvert** (Passes 9.90 cfs of 17.20 cfs potential flow)
  ├─**2=Orifice/Grate** (Orifice Controls 9.84 cfs @ 5.57 fps)
  └─**3=Exfiltration** (Controls 0.07 cfs)

Pond BR2-C14: BIO-RET POND 2



Summary for Pond C1: 24" CULVERT

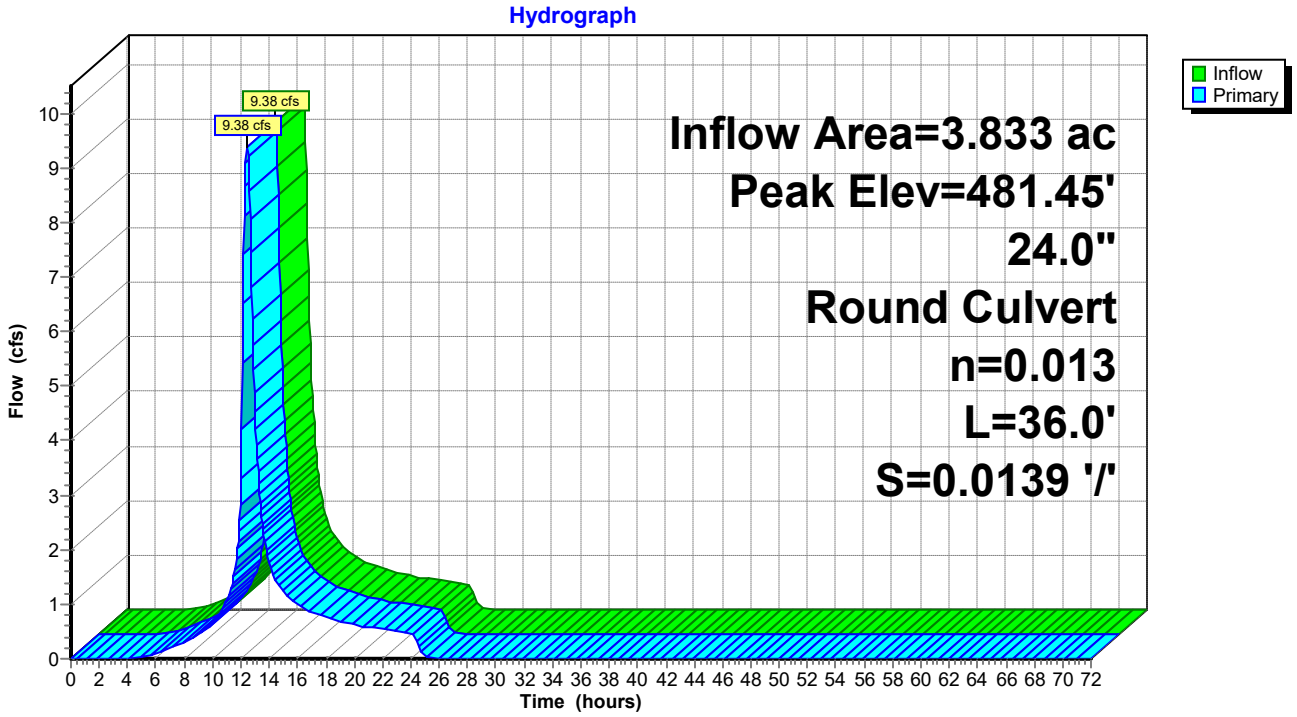
Inflow Area = 3.833 ac, 9.00% Impervious, Inflow Depth = 5.66" for 100-yr event
Inflow = 9.38 cfs @ 12.44 hrs, Volume= 1.806 af
Outflow = 9.38 cfs @ 12.44 hrs, Volume= 1.806 af, Atten= 0%, Lag= 0.0 min
Primary = 9.38 cfs @ 12.44 hrs, Volume= 1.806 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 481.45' @ 12.44 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	480.00'	**24.0" Round Culvert** L= 36.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 480.00' / 479.50' S= 0.0139 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=9.37 cfs @ 12.44 hrs HW=481.45' (Free Discharge)
└**1=Culvert** (Barrel Controls 9.37 cfs @ 5.38 fps)

Pond C1: 24" CULVERT



Summary for Pond C10: 15" CULVERT

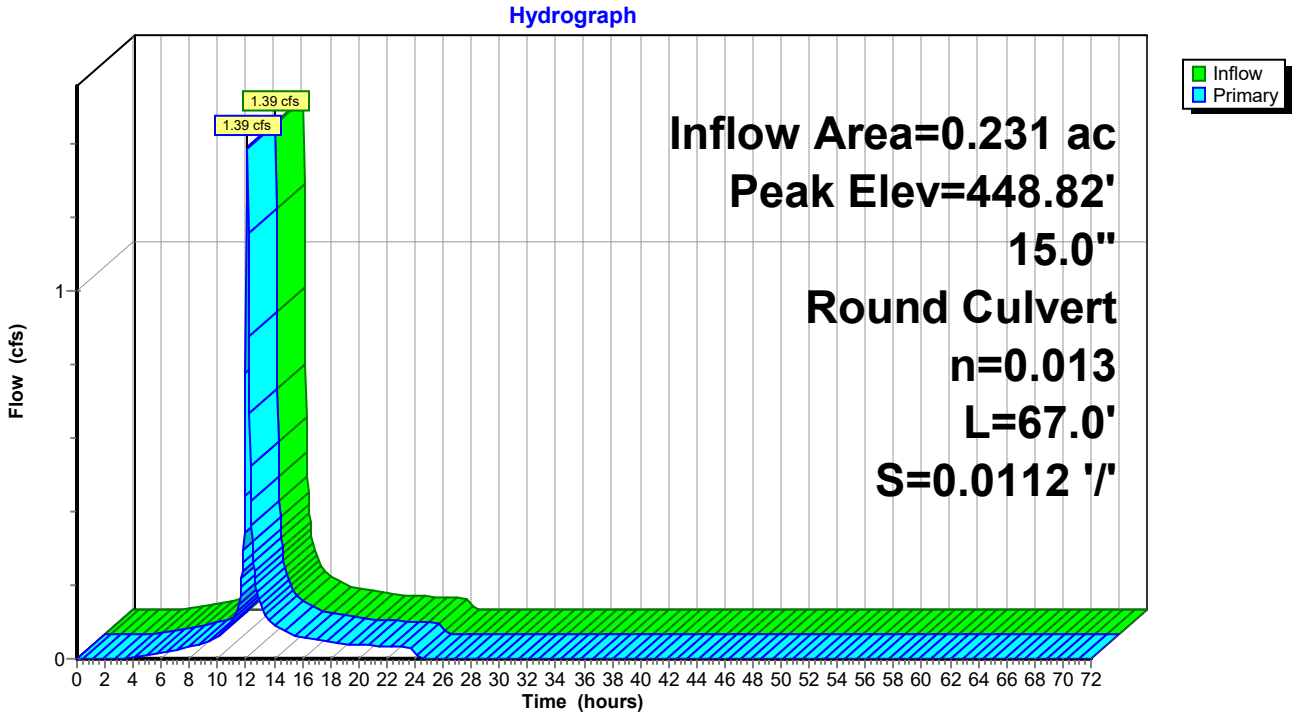
Inflow Area = 0.231 ac, 17.03% Impervious, Inflow Depth = 6.44" for 100-yr event
Inflow = 1.39 cfs @ 12.09 hrs, Volume= 0.124 af
Outflow = 1.39 cfs @ 12.09 hrs, Volume= 0.124 af, Atten= 0%, Lag= 0.0 min
Primary = 1.39 cfs @ 12.09 hrs, Volume= 0.124 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 448.82' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	448.25'	**15.0" Round Culvert** L= 67.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 448.25' / 447.50' S= 0.0112 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=1.37 cfs @ 12.09 hrs HW=448.81' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.37 cfs @ 2.55 fps)

Pond C10: 15" CULVERT



Summary for Pond C11: 12" CULVERT

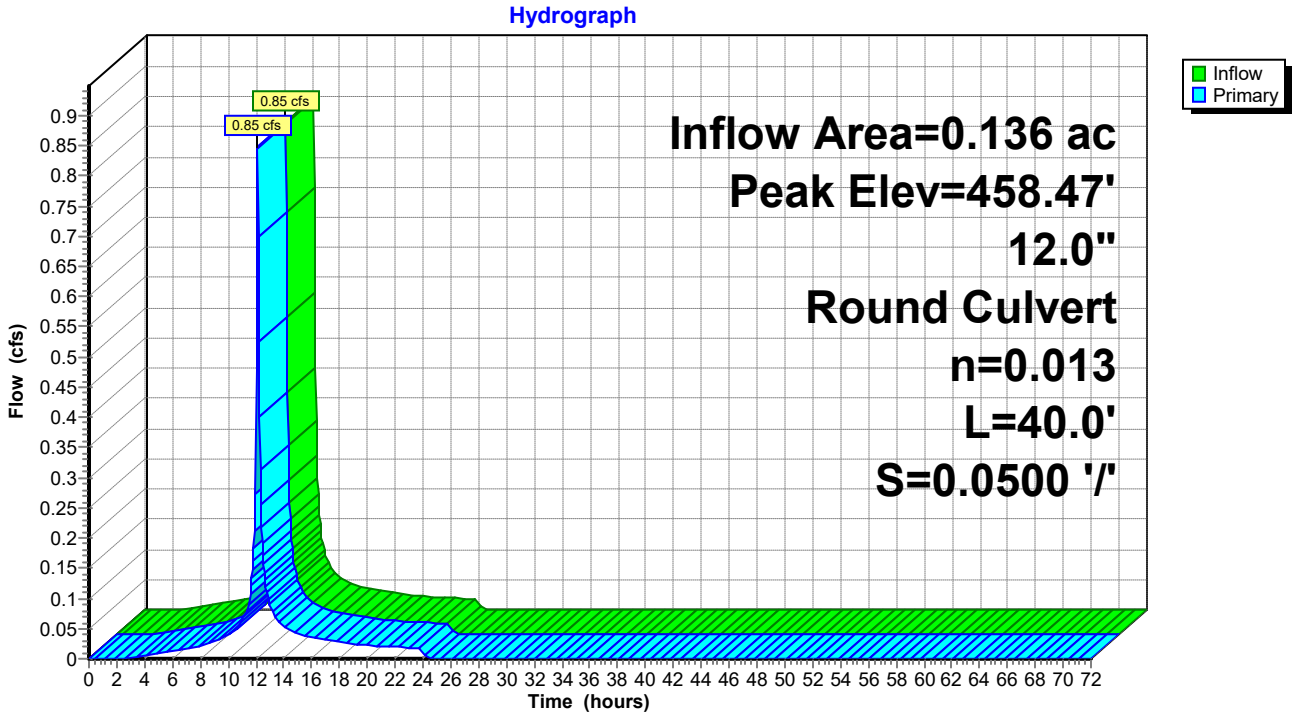
Inflow Area = 0.136 ac, 29.70% Impervious, Inflow Depth = 6.68" for 100-yr event
Inflow = 0.85 cfs @ 12.09 hrs, Volume= 0.076 af
Outflow = 0.85 cfs @ 12.09 hrs, Volume= 0.076 af, Atten= 0%, Lag= 0.0 min
Primary = 0.85 cfs @ 12.09 hrs, Volume= 0.076 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 458.47' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	458.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 458.00' / 456.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.83 cfs @ 12.09 hrs HW=458.47' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.83 cfs @ 2.32 fps)

Pond C11: 12" CULVERT



Summary for Pond C12: 24" CULVERT

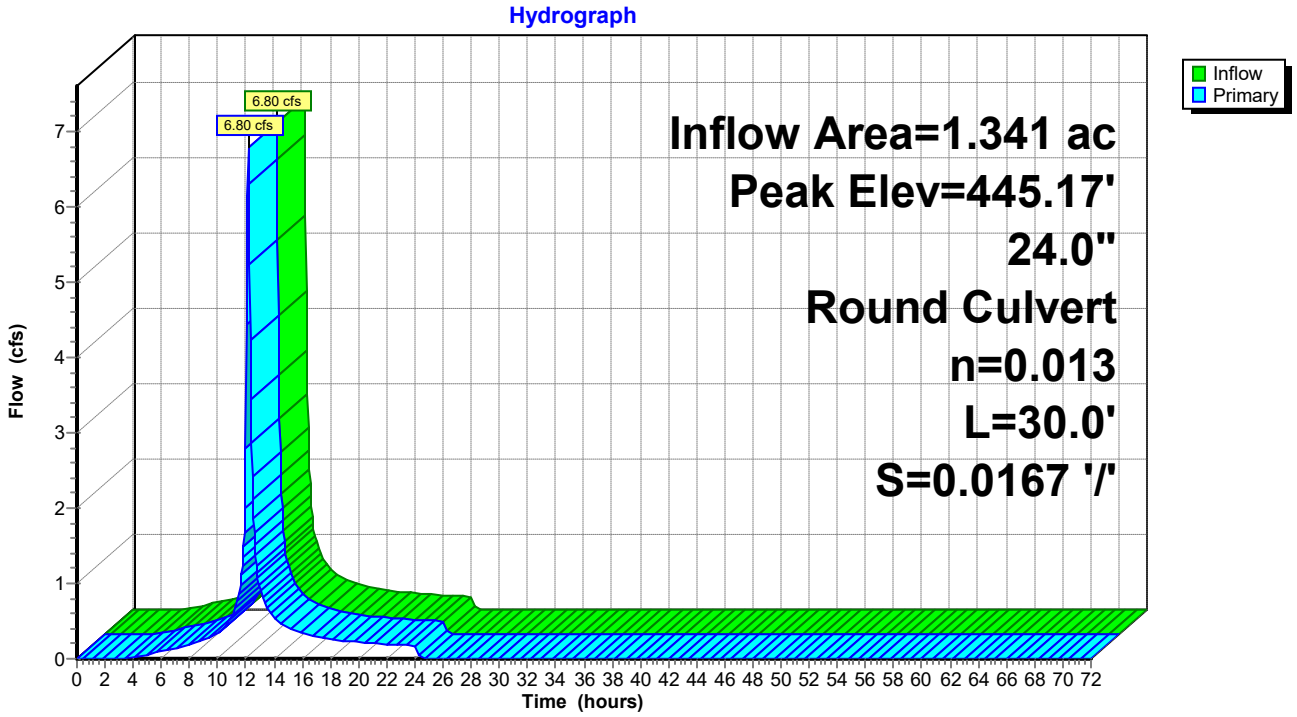
Inflow Area = 1.341 ac, 18.29% Impervious, Inflow Depth = 6.44" for 100-yr event
Inflow = 6.80 cfs @ 12.15 hrs, Volume= 0.719 af
Outflow = 6.80 cfs @ 12.15 hrs, Volume= 0.719 af, Atten= 0%, Lag= 0.0 min
Primary = 6.80 cfs @ 12.15 hrs, Volume= 0.719 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 445.17' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	444.00'	**24.0" Round Culvert** L= 30.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 444.00' / 443.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=6.76 cfs @ 12.15 hrs HW=445.16' (Free Discharge)
└**1=Culvert** (Barrel Controls 6.76 cfs @ 5.14 fps)

Pond C12: 24" CULVERT



Summary for Pond C13: 18" CULVERT

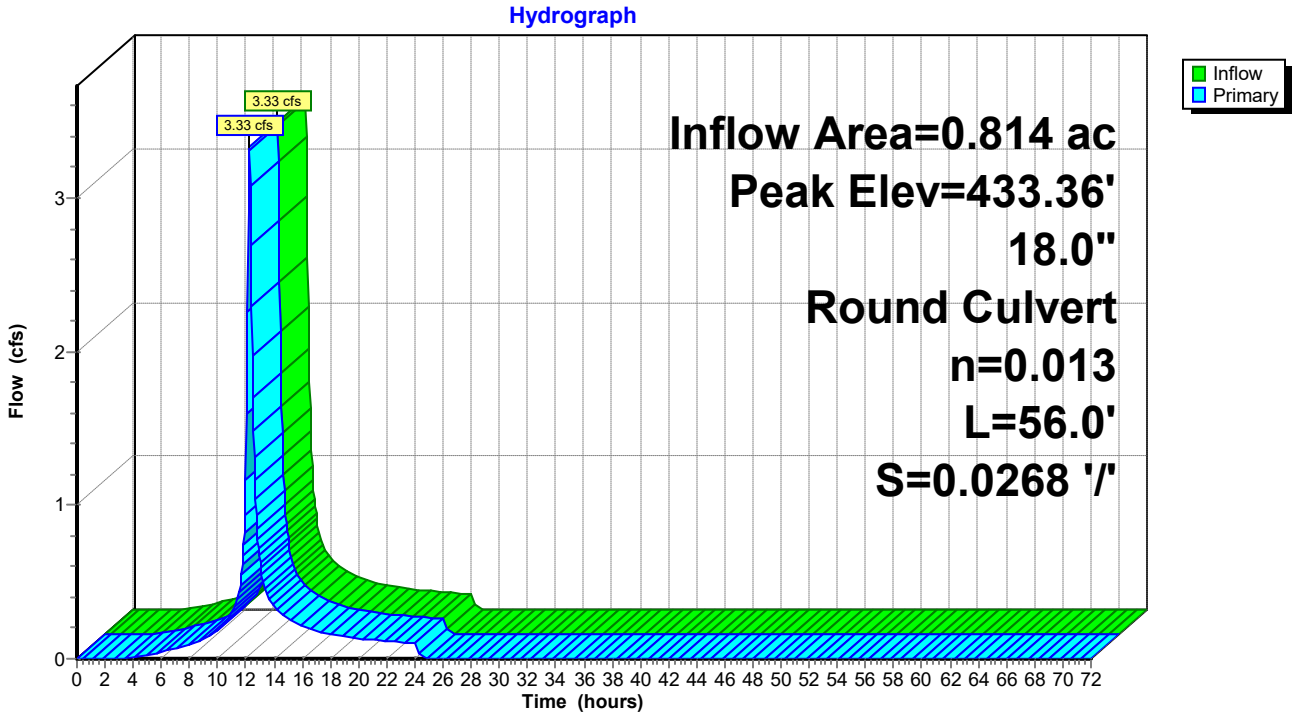
Inflow Area = 0.814 ac, 7.82% Impervious, Inflow Depth = 6.20" for 100-yr event
Inflow = 3.33 cfs @ 12.23 hrs, Volume= 0.420 af
Outflow = 3.33 cfs @ 12.23 hrs, Volume= 0.420 af, Atten= 0%, Lag= 0.0 min
Primary = 3.33 cfs @ 12.23 hrs, Volume= 0.420 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 433.36' @ 12.23 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	**18.0" Round Culvert** L= 56.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 432.50' / 431.00' S= 0.0268 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=3.30 cfs @ 12.23 hrs HW=433.36' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.30 cfs @ 3.15 fps)

Pond C13: 18" CULVERT



Summary for Pond C2: 12" CULVERT

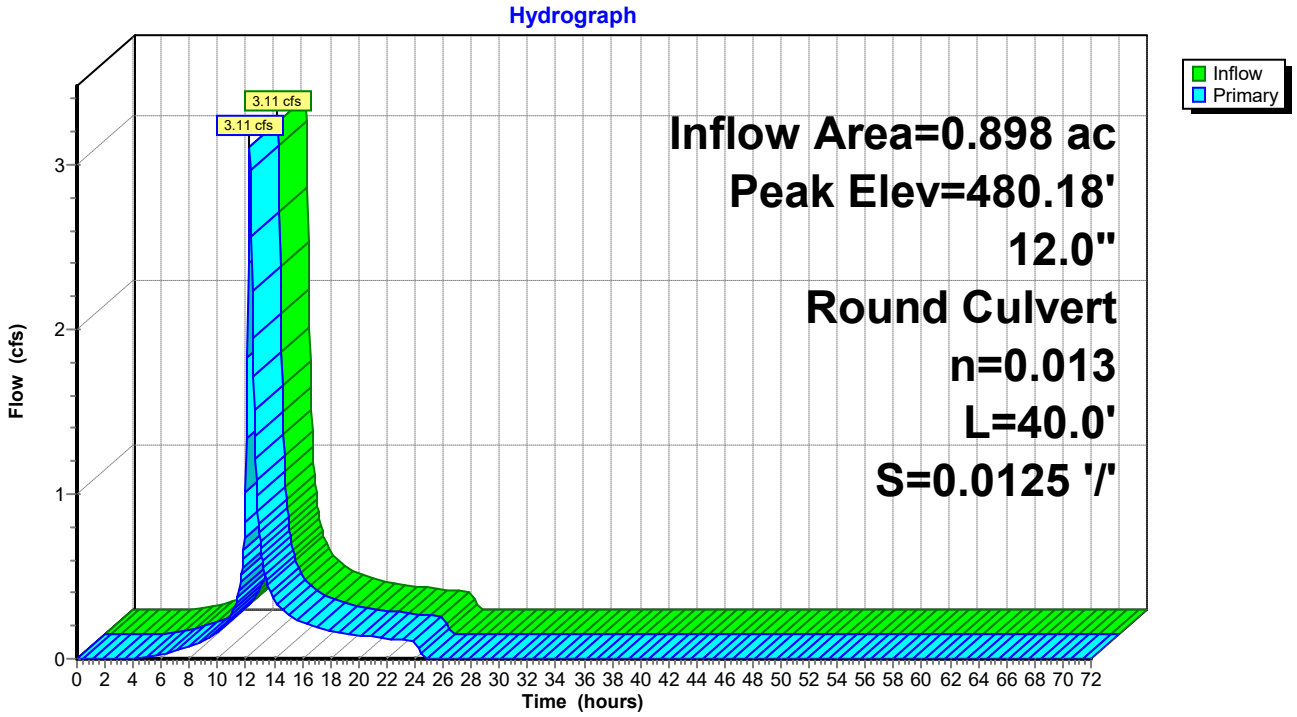
Inflow Area = 0.898 ac, 9.78% Impervious, Inflow Depth = 5.60" for 100-yr event
Inflow = 3.11 cfs @ 12.27 hrs, Volume= 0.419 af
Outflow = 3.11 cfs @ 12.27 hrs, Volume= 0.419 af, Atten= 0%, Lag= 0.0 min
Primary = 3.11 cfs @ 12.27 hrs, Volume= 0.419 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 480.18' @ 12.27 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.08 cfs @ 12.27 hrs HW=480.16' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.08 cfs @ 3.92 fps)

Pond C2: 12" CULVERT



Summary for Pond C3: 12" CULVERT

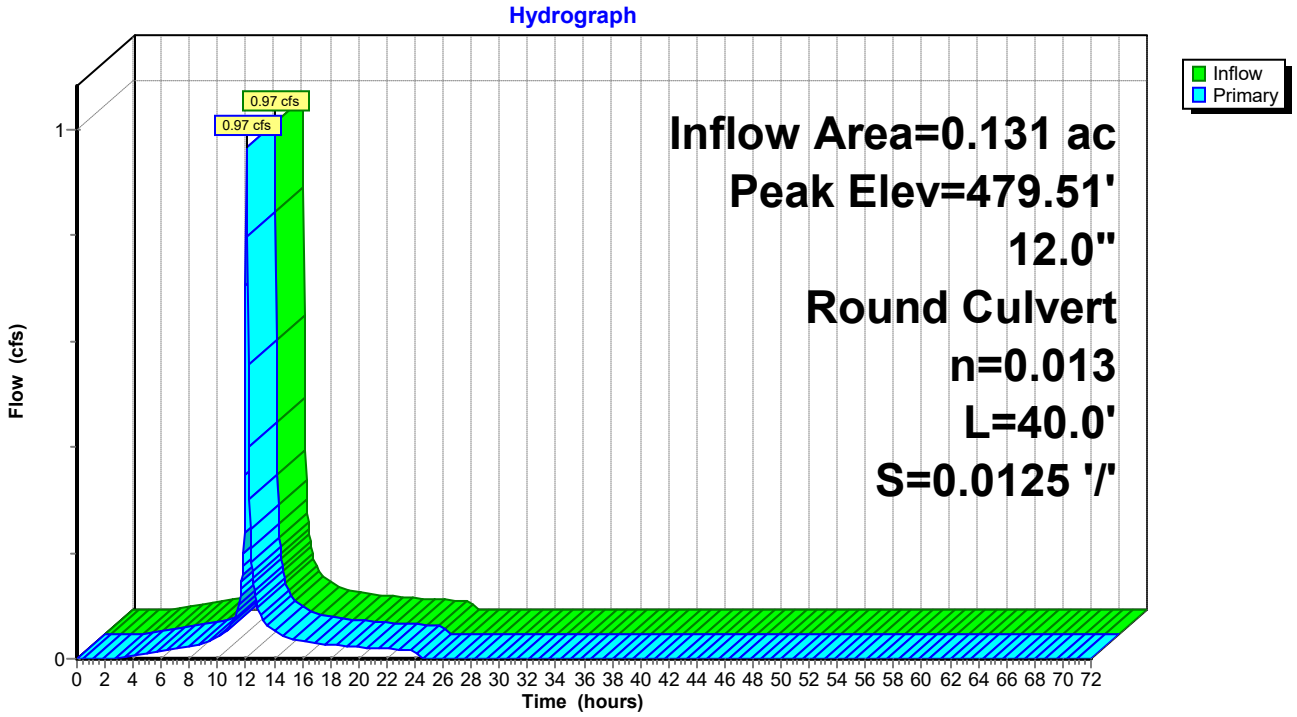
Inflow Area = 0.131 ac, 41.51% Impervious, Inflow Depth = 6.92" for 100-yr event
Inflow = 0.97 cfs @ 12.06 hrs, Volume= 0.076 af
Outflow = 0.97 cfs @ 12.06 hrs, Volume= 0.076 af, Atten= 0%, Lag= 0.0 min
Primary = 0.97 cfs @ 12.06 hrs, Volume= 0.076 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.51' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.94 cfs @ 12.06 hrs HW=479.50' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.94 cfs @ 2.41 fps)

Pond C3: 12" CULVERT



Summary for Pond C4: 12" CULVERT

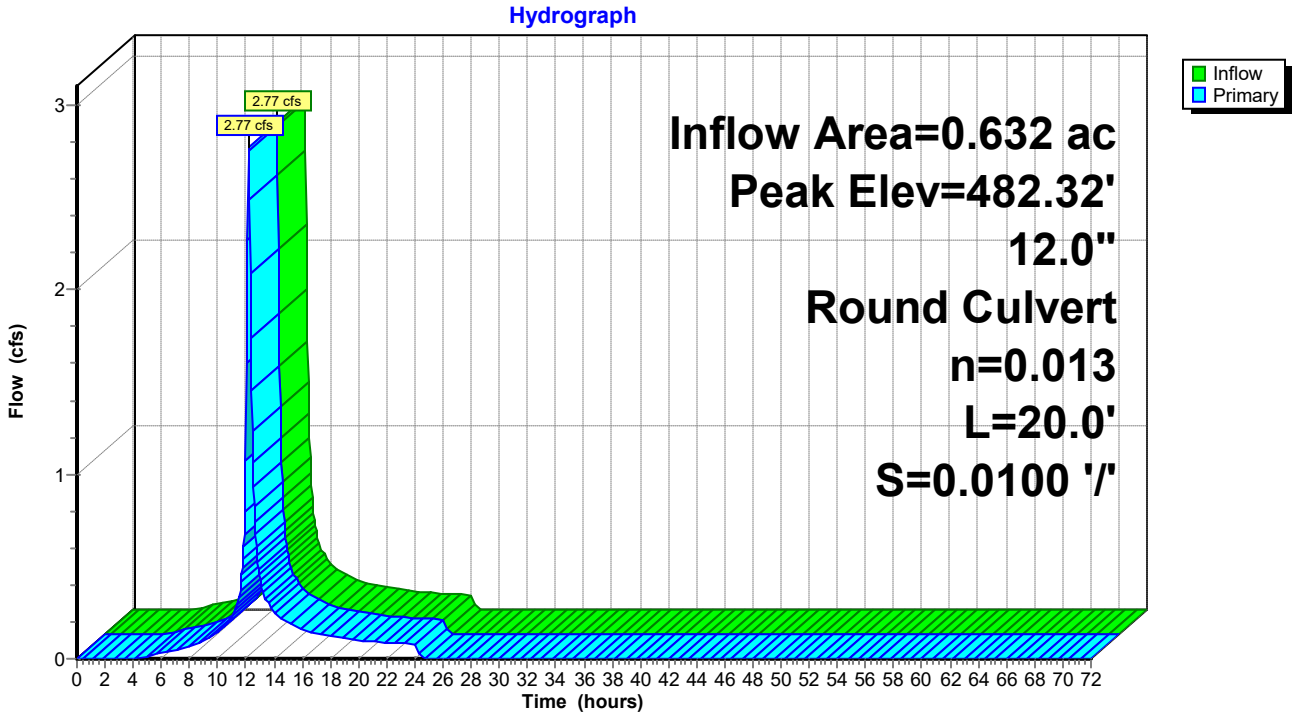
Inflow Area = 0.632 ac, 19.67% Impervious, Inflow Depth = 5.96" for 100-yr event
Inflow = 2.77 cfs @ 12.18 hrs, Volume= 0.314 af
Outflow = 2.77 cfs @ 12.18 hrs, Volume= 0.314 af, Atten= 0%, Lag= 0.0 min
Primary = 2.77 cfs @ 12.18 hrs, Volume= 0.314 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 482.32' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	481.20'	**12.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 481.20' / 481.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=2.74 cfs @ 12.18 hrs HW=482.30' (Free Discharge)
└**1=Culvert** (Barrel Controls 2.74 cfs @ 3.93 fps)

Pond C4: 12" CULVERT



Summary for Pond C5: 12" CULVERT

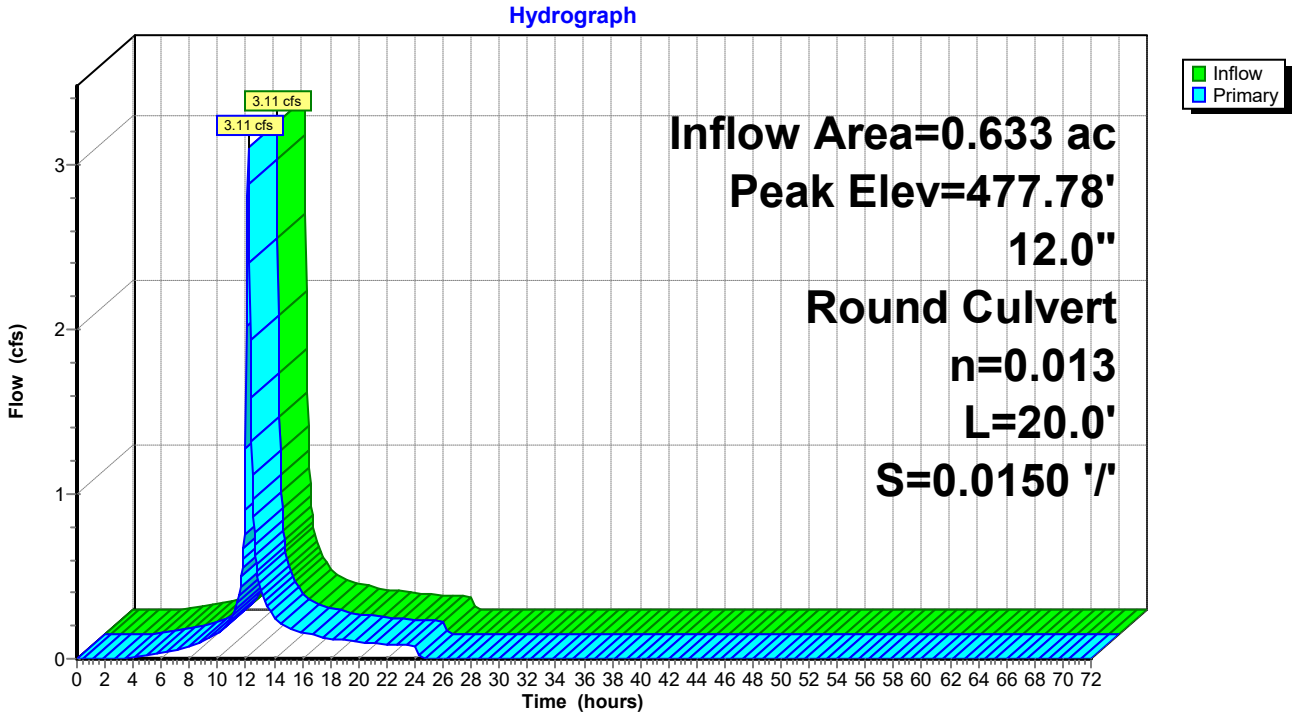
Inflow Area = 0.633 ac, 10.31% Impervious, Inflow Depth = 6.20" for 100-yr event
Inflow = 3.11 cfs @ 12.15 hrs, Volume= 0.327 af
Outflow = 3.11 cfs @ 12.15 hrs, Volume= 0.327 af, Atten= 0%, Lag= 0.0 min
Primary = 3.11 cfs @ 12.15 hrs, Volume= 0.327 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 477.78' @ 12.15 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	476.60'	**12.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 476.60' / 476.30' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=3.09 cfs @ 12.15 hrs HW=477.77' (Free Discharge)
└**1=Culvert** (Inlet Controls 3.09 cfs @ 3.94 fps)

Pond C5: 12" CULVERT



Summary for Pond C6: 24" CULVERT

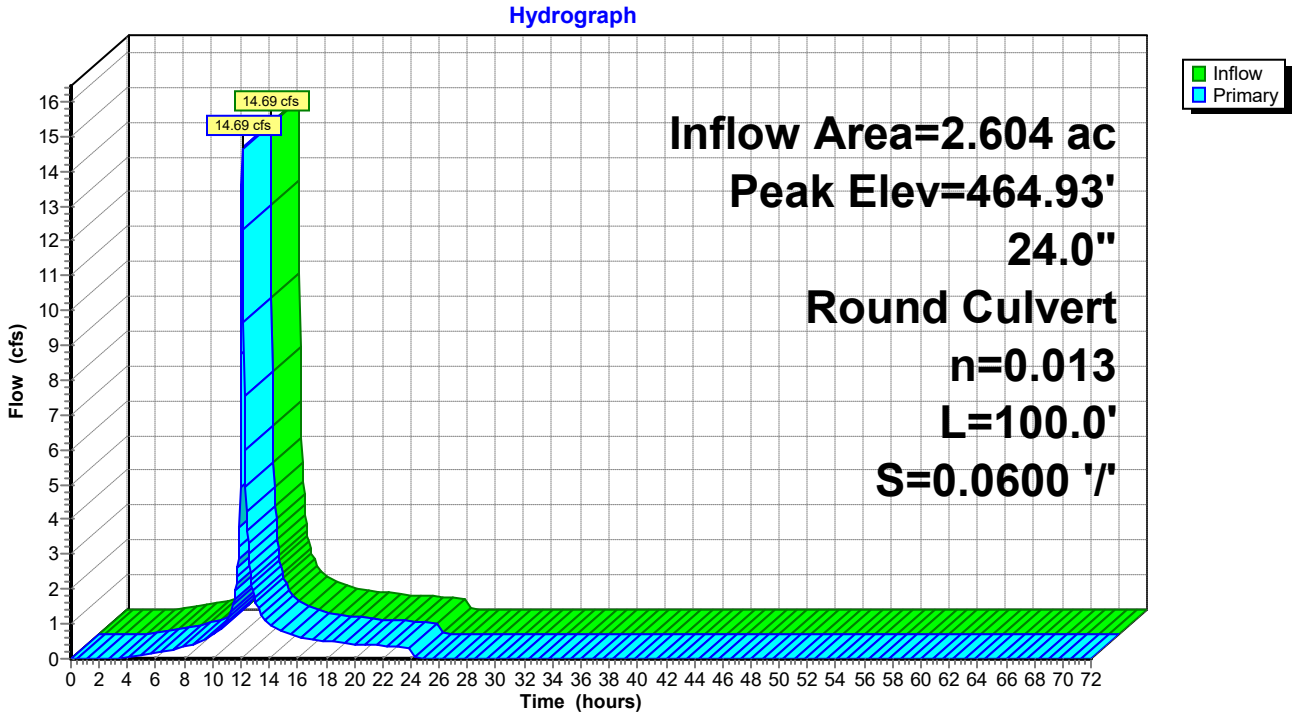
Inflow Area = 2.604 ac, 11.94% Impervious, Inflow Depth = 6.29" for 100-yr event
Inflow = 14.69 cfs @ 12.09 hrs, Volume= 1.364 af
Outflow = 14.69 cfs @ 12.09 hrs, Volume= 1.364 af, Atten= 0%, Lag= 0.0 min
Primary = 14.69 cfs @ 12.09 hrs, Volume= 1.364 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 464.93' @ 12.09 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	463.00'	**24.0" Round Culvert** L= 100.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 463.00' / 457.00' S= 0.0600 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=14.44 cfs @ 12.09 hrs HW=464.90' (Free Discharge)
└─**1=Culvert** (Inlet Controls 14.44 cfs @ 4.69 fps)

Pond C6: 24" CULVERT



Summary for Pond C8: 12" CULVERT

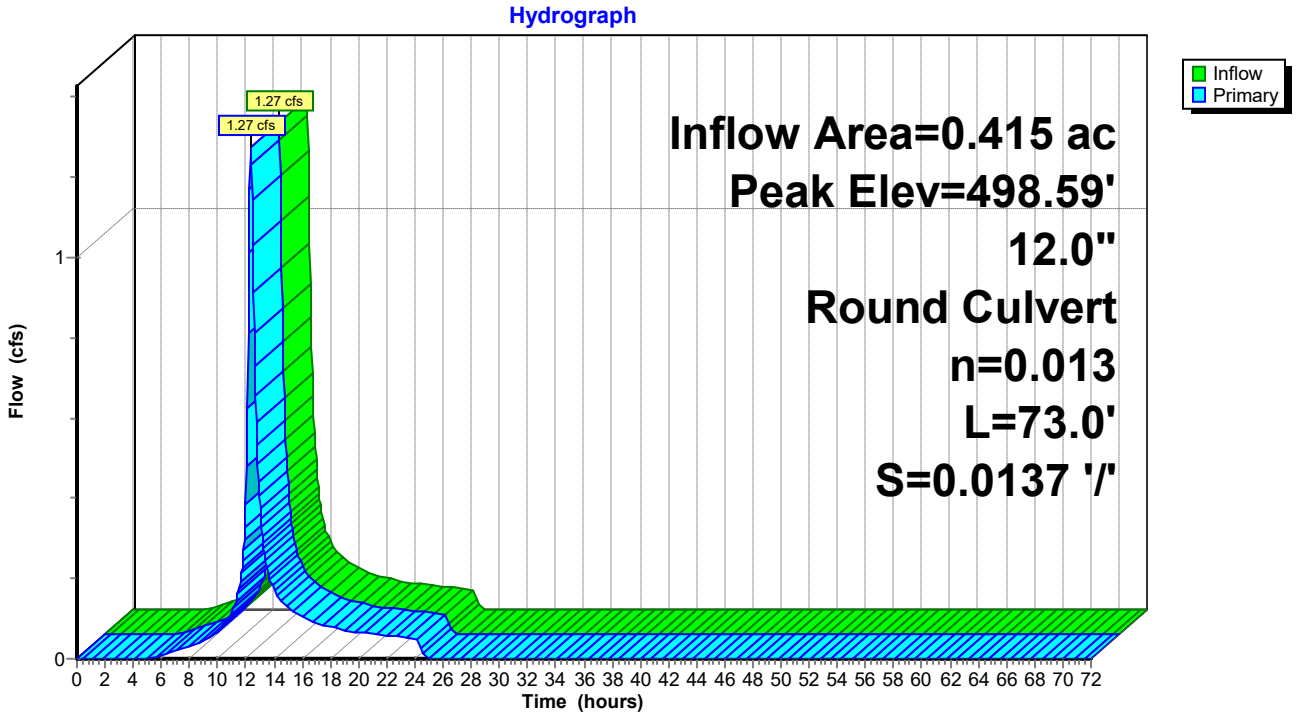
Inflow Area = 0.415 ac, 6.10% Impervious, Inflow Depth = 5.48" for 100-yr event
Inflow = 1.27 cfs @ 12.34 hrs, Volume= 0.189 af
Outflow = 1.27 cfs @ 12.34 hrs, Volume= 0.189 af, Atten= 0%, Lag= 0.0 min
Primary = 1.27 cfs @ 12.34 hrs, Volume= 0.189 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 498.59' @ 12.34 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	498.00'	**12.0" Round Culvert** L= 73.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 498.00' / 497.00' S= 0.0137 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=1.27 cfs @ 12.34 hrs HW=498.59' (Free Discharge)
└**1=Culvert** (Inlet Controls 1.27 cfs @ 2.62 fps)

Pond C8: 12" CULVERT



Summary for Pond C9: 12" CULVERT

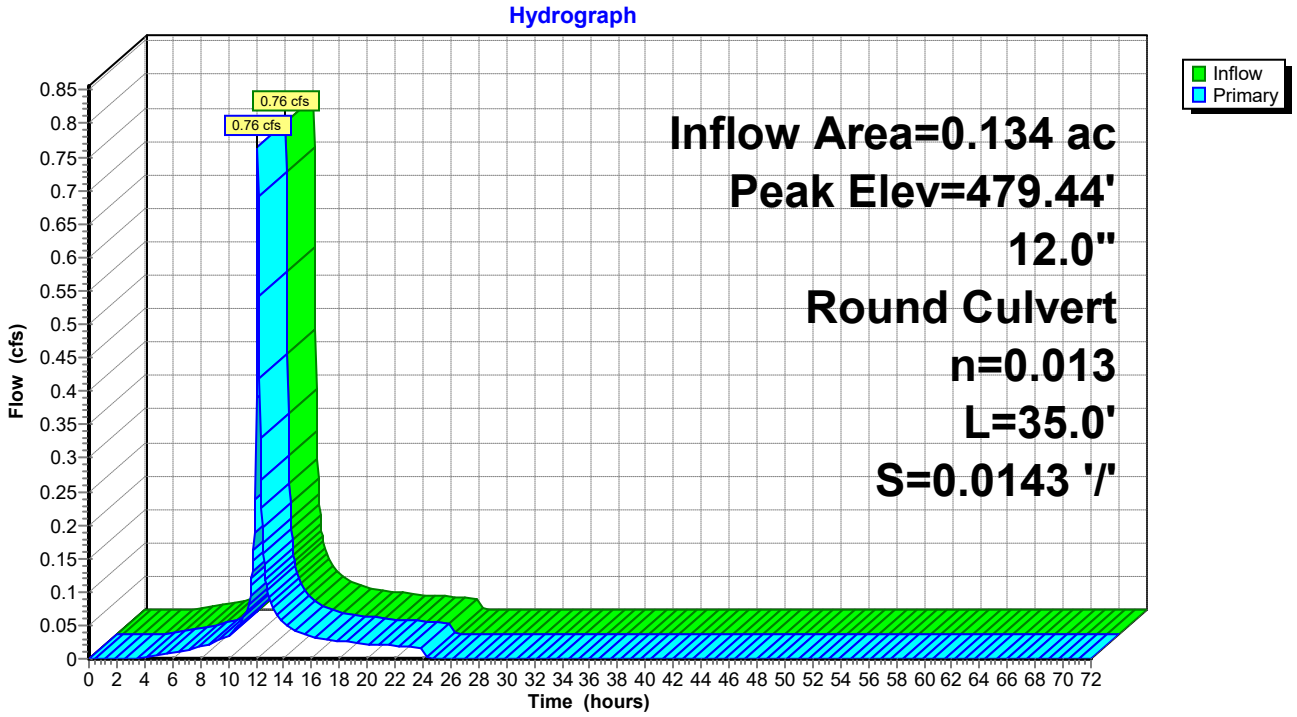
Inflow Area = 0.134 ac, 14.23% Impervious, Inflow Depth = 6.32" for 100-yr event
Inflow = 0.76 cfs @ 12.11 hrs, Volume= 0.071 af
Outflow = 0.76 cfs @ 12.11 hrs, Volume= 0.071 af, Atten= 0%, Lag= 0.0 min
Primary = 0.76 cfs @ 12.11 hrs, Volume= 0.071 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.44' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 35.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.75 cfs @ 12.11 hrs HW=479.44' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.75 cfs @ 2.26 fps)

Pond C9: 12" CULVERT



Summary for Pond DP1: DRY POND 1

Inflow Area = 3.133 ac, 8.85% Impervious, Inflow Depth = 6.22" for 100-yr event
Inflow = 14.45 cfs @ 12.17 hrs, Volume= 1.623 af
Outflow = 12.89 cfs @ 12.24 hrs, Volume= 1.440 af, Atten= 11%, Lag= 4.4 min
Primary = 12.89 cfs @ 12.24 hrs, Volume= 1.440 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 439.63' @ 12.24 hrs Surf.Area= 4,650 sf Storage= 12,605 cf

Plug-Flow detention time= 112.9 min calculated for 1.440 af (89% of inflow)
Center-of-Mass det. time= 52.3 min (877.7 - 825.3)

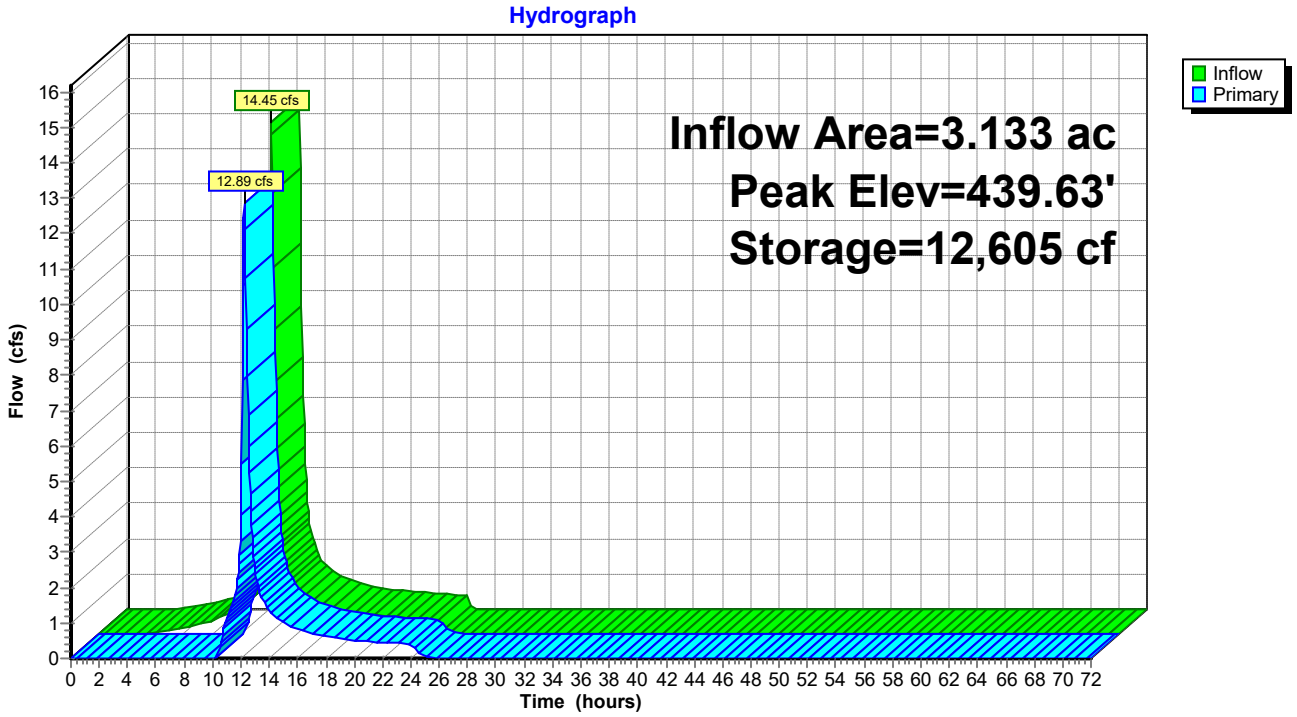
Volume	Invert	Avail.Storage	Storage Description
#1	434.00'	14,417 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
434.00	171	64.2	0	0	171
436.00	1,610	246.7	1,537	1,537	4,697
438.00	3,203	284.4	4,723	6,260	6,376
440.00	5,022	322.1	8,157	14,417	8,294

Device	Routing	Invert	Outlet Devices
#1	Primary	438.50'	**45.0 deg x 3.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=12.82 cfs @ 12.24 hrs HW=439.62' (Free Discharge)
└**1=Sharp-Crested Vee/Trap Weir** (Weir Controls 12.82 cfs @ 3.30 fps)

Pond DP1: DRY POND 1

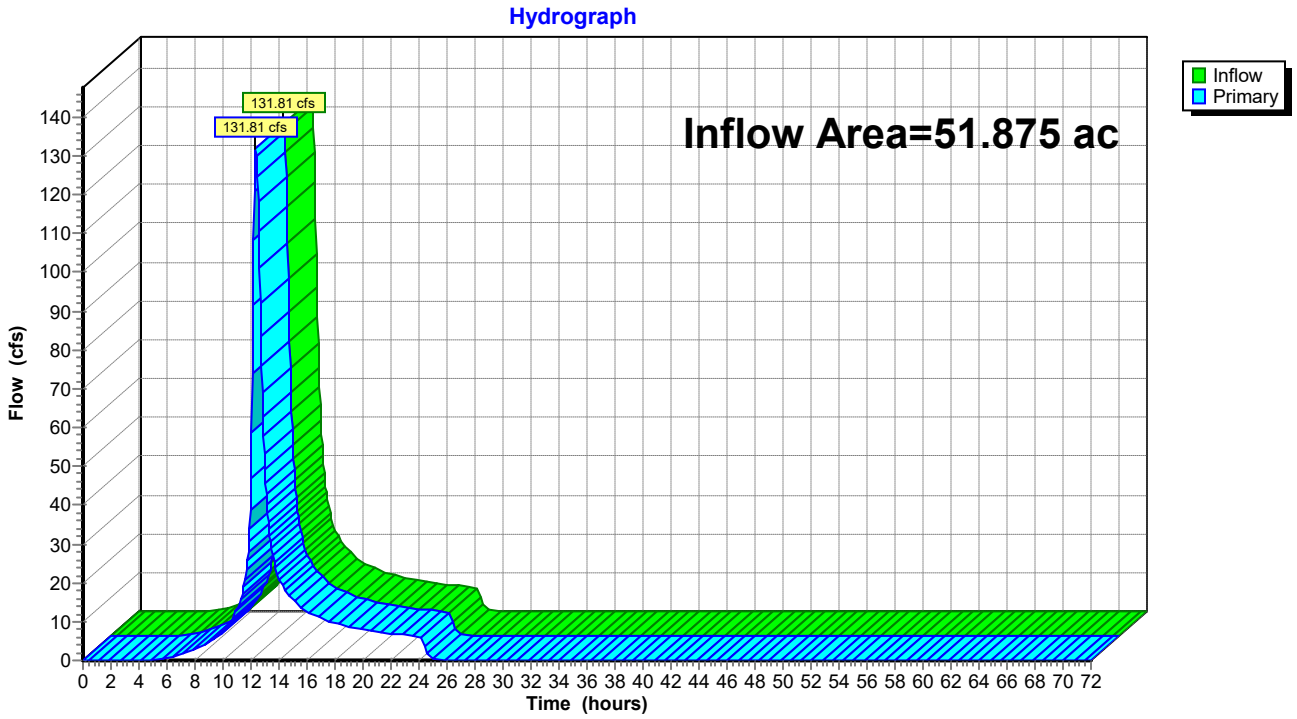


Summary for Link O1: OUT 1

Inflow Area = 51.875 ac, 3.67% Impervious, Inflow Depth = 5.19" for 100-yr event
Inflow = 131.81 cfs @ 12.35 hrs, Volume= 22.442 af
Primary = 131.81 cfs @ 12.35 hrs, Volume= 22.442 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O1: OUT 1

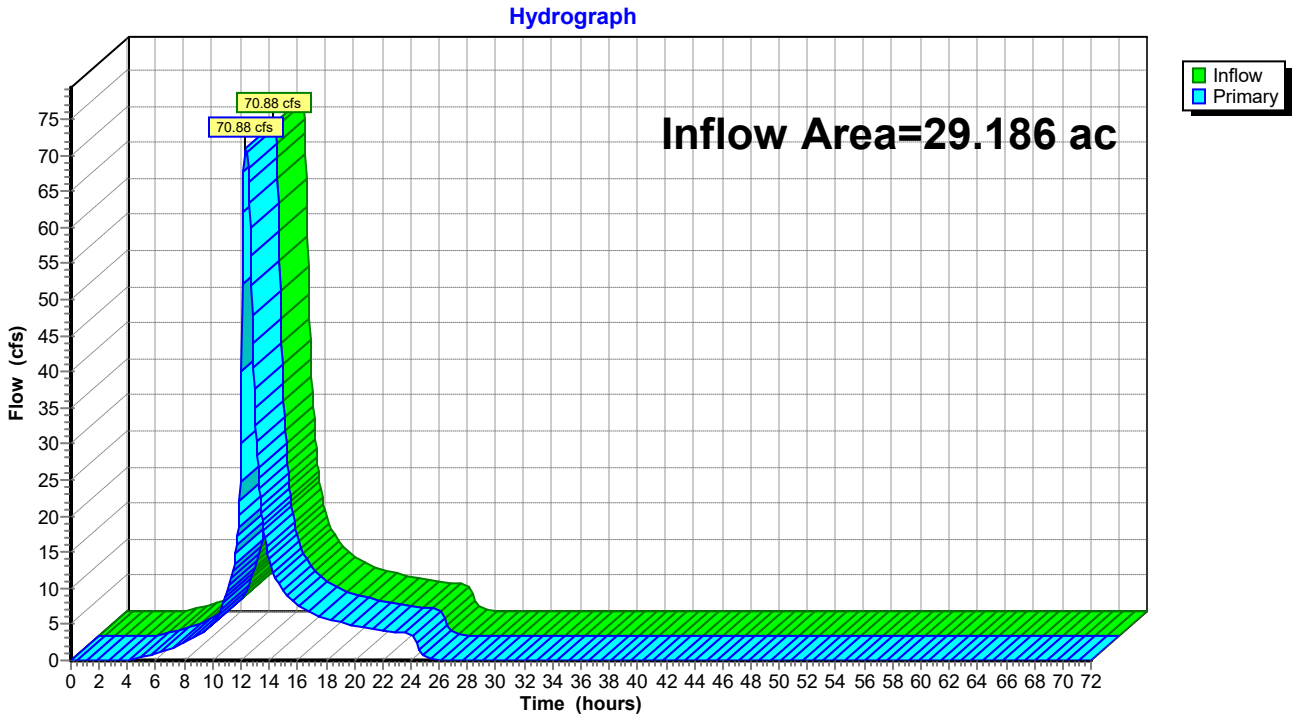


Summary for Link O2: OUT 2

Inflow Area = 29.186 ac, 3.50% Impervious, Inflow Depth = 5.91" for 100-yr event
Inflow = 70.88 cfs @ 12.35 hrs, Volume= 14.386 af
Primary = 70.88 cfs @ 12.35 hrs, Volume= 14.386 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O2: OUT 2

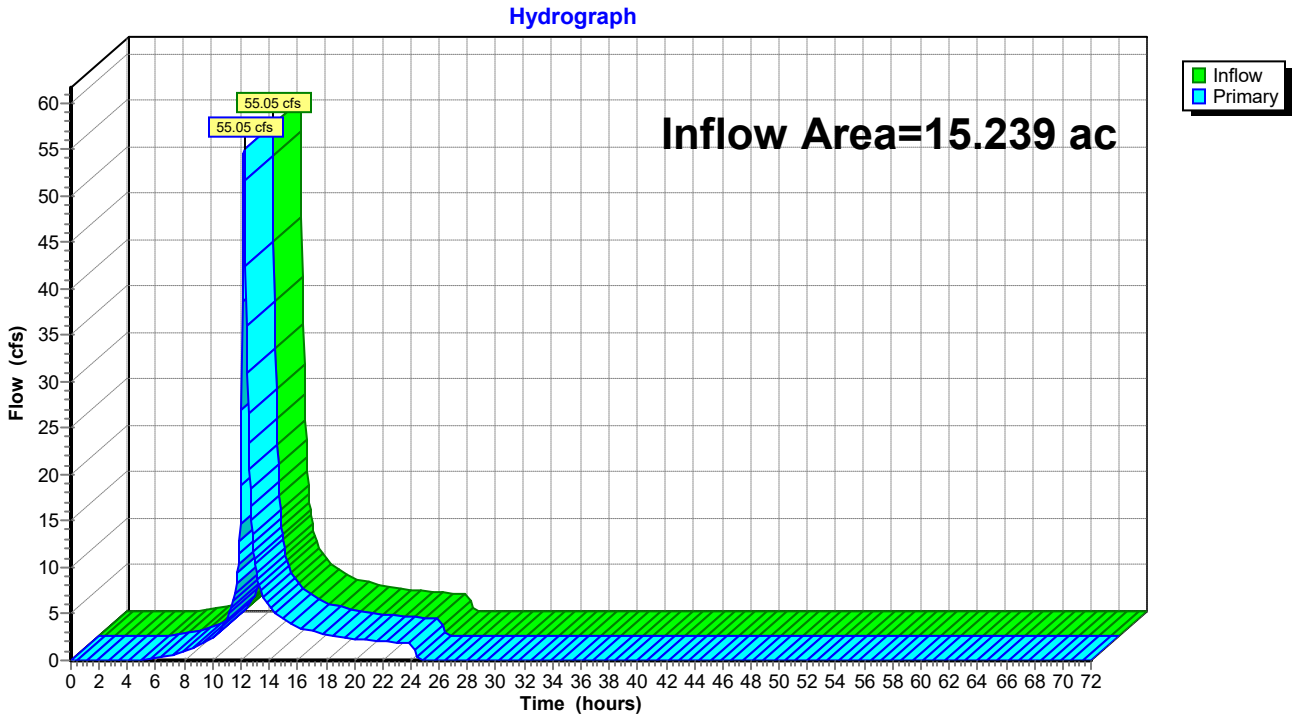


Summary for Link O3: OUT 3

Inflow Area = 15.239 ac, 0.00% Impervious, Inflow Depth = 5.24" for 100-yr event
Inflow = 55.05 cfs @ 12.22 hrs, Volume= 6.651 af
Primary = 55.05 cfs @ 12.22 hrs, Volume= 6.651 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O3: OUT 3

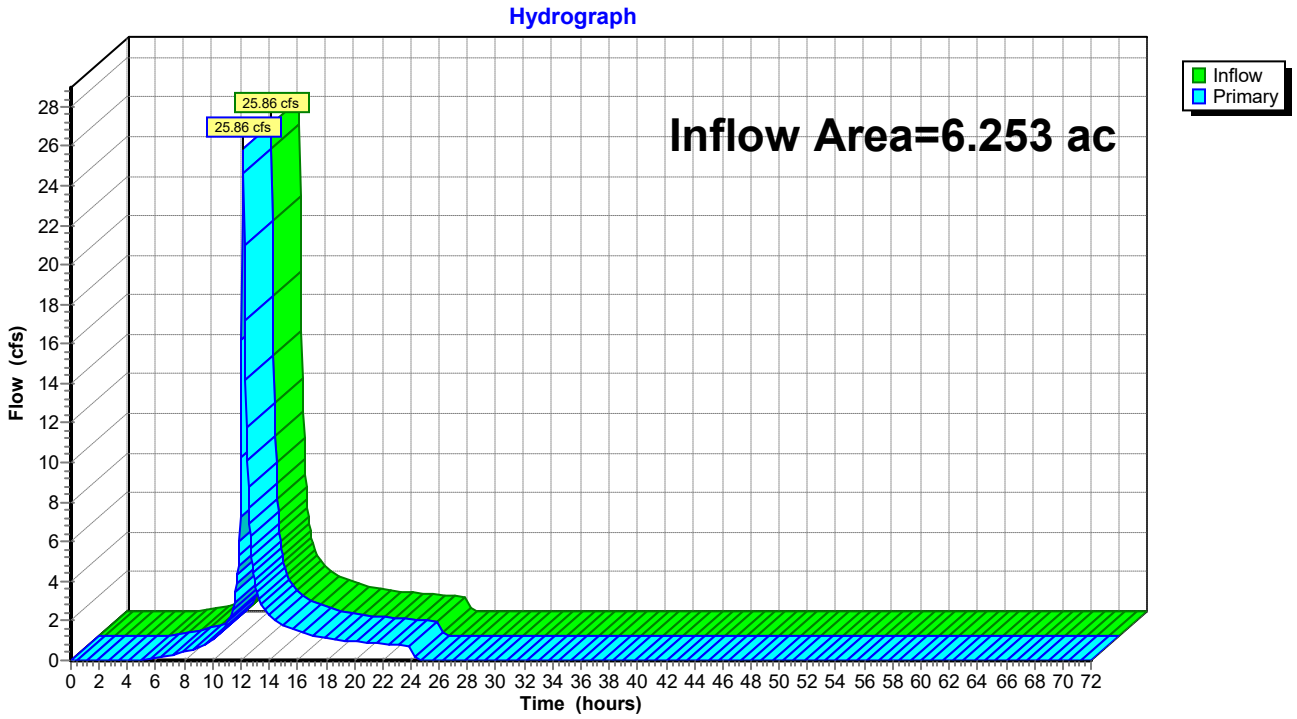


Summary for Link O4: OUT 4

Inflow Area = 6.253 ac, 0.00% Impervious, Inflow Depth = 5.24" for 100-yr event
Inflow = 25.86 cfs @ 12.16 hrs, Volume= 2.729 af
Primary = 25.86 cfs @ 12.16 hrs, Volume= 2.729 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O4: OUT 4

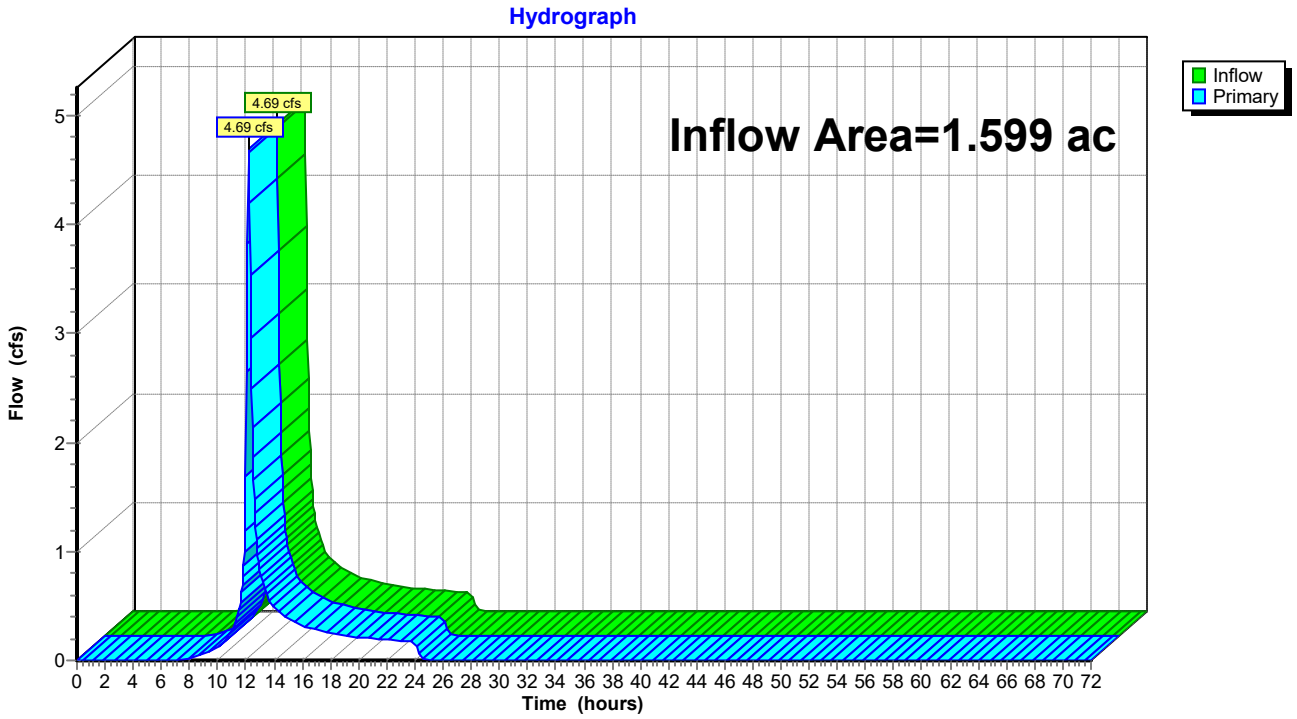


Summary for Link O5: OUT 5

Inflow Area = 1.599 ac, 0.00% Impervious, Inflow Depth = 3.93" for 100-yr event
Inflow = 4.69 cfs @ 12.18 hrs, Volume= 0.524 af
Primary = 4.69 cfs @ 12.18 hrs, Volume= 0.524 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O5: OUT 5



Time span=0.00-72.00 hrs, dt=0.05 hrs, 1441 points
Runoff by SCS TR-20 method, UH=SCS, Weighted-CN
Reach routing by Stor-Ind+Trans method - Pond routing by Stor-Ind method

Subcatchment 1A: DRAINAGE AREA 1A Runoff Area=1,089,015 sf 2.10% Impervious Runoff Depth=0.23"
Flow Length=2,185' Tc=36.9 min CN=76 Runoff=1.89 cfs 0.474 af

Subcatchment 1B: DRAINAGE AREA 1B Runoff Area=18,084 sf 6.10% Impervious Runoff Depth=0.20"
Flow Length=160' Tc=28.8 min CN=75 Runoff=0.03 cfs 0.007 af

Subcatchment 1C: DRAINAGE AREA 1C Runoff Area=139,425 sf 6.89% Impervious Runoff Depth=0.23"
Flow Length=945' Tc=40.6 min CN=76 Runoff=0.23 cfs 0.061 af

Subcatchment 1D: DRAINAGE AREA 1D Runoff Area=27,532 sf 19.67% Impervious Runoff Depth=0.31"
Flow Length=480' Tc=17.2 min CN=79 Runoff=0.12 cfs 0.016 af

Subcatchment 1E: DRAINAGE AREA 1E Runoff Area=39,104 sf 9.78% Impervious Runoff Depth=0.23"
Flow Length=490' Tc=24.1 min CN=76 Runoff=0.08 cfs 0.017 af

Subcatchment 1F: DRAINAGE AREA 1F Runoff Area=5,854 sf 14.23% Impervious Runoff Depth=0.40"
Flow Length=100' Tc=11.4 min CN=82 Runoff=0.05 cfs 0.004 af

Subcatchment 1G: DRAINAGE AREA 1G Runoff Area=5,726 sf 41.51% Impervious Runoff Depth=0.61"
Flow Length=200' Tc=7.5 min CN=87 Runoff=0.09 cfs 0.007 af

Subcatchment 1H: DRAINAGE AREA 8 Runoff Area=4,559 sf 53.41% Impervious Runoff Depth=0.76"
Flow Length=45' Tc=0.4 min CN=90 Runoff=0.13 cfs 0.007 af

Subcatchment 1I: DRAINAGE AREA 1I Runoff Area=27,574 sf 10.31% Impervious Runoff Depth=0.37"
Flow Length=260' Tc=15.0 min CN=81 Runoff=0.17 cfs 0.019 af

Subcatchment 1J: DRAINAGE AREA 1J Runoff Area=85,839 sf 12.46% Impervious Runoff Depth=0.40"
Flow Length=480' Tc=9.3 min CN=82 Runoff=0.75 cfs 0.066 af

Subcatchment 1K: DRAINAGE AREA 1K Runoff Area=13,922 sf 13.09% Impervious Runoff Depth=0.40"
Flow Length=100' Tc=4.2 min CN=82 Runoff=0.16 cfs 0.011 af

Subcatchment 1L: DRAINAGE AREA 1L Runoff Area=792,979 sf 2.18% Impervious Runoff Depth=0.05"
Flow Length=1,370' Tc=24.1 min CN=65 Runoff=0.08 cfs 0.070 af

Subcatchment 1M: DRAINAGE AREA 1M Runoff Area=10,047 sf 17.03% Impervious Runoff Depth=0.44"
Flow Length=185' Tc=10.3 min CN=83 Runoff=0.10 cfs 0.008 af

Subcatchment 2A: DRAINAGE AREA 2A Runoff Area=58,418 sf 18.29% Impervious Runoff Depth=0.44"
Flow Length=560' Tc=15.0 min CN=83 Runoff=0.47 cfs 0.049 af

Subcatchment 2B: DRAINAGE AREA 2B Runoff Area=5,939 sf 29.70% Impervious Runoff Depth=0.52"
Flow Length=80' Tc=10.2 min CN=85 Runoff=0.07 cfs 0.006 af

Subcatchment 2C: DRAINAGE AREA 2C Runoff Area=130,540 sf 7.90% Impervious Runoff Depth=0.37"
Flow Length=870' Tc=16.7 min CN=81 Runoff=0.77 cfs 0.092 af

Subcatchment 2D: DRAINAGE AREA 2D Runoff Area=858,381 sf 0.51% Impervious Runoff Depth=0.31"
Flow Length=1,470' Tc=43.3 min CN=79 Runoff=2.26 cfs 0.503 af

Subcatchment 2E: DRAINAGE AREA 18 Runoff Area=121,293 sf 11.99% Impervious Runoff Depth=0.34"
Flow Length=610' Tc=16.4 min CN=80 Runoff=0.63 cfs 0.078 af

Subcatchment 2F: DRAINAGE AREA 2F Runoff Area=61,323 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=250' Tc=13.7 min CN=73 Runoff=0.08 cfs 0.019 af

Subcatchment 2G: DRAINAGE AREA 2G Runoff Area=35,456 sf 7.82% Impervious Runoff Depth=0.37"
Flow Length=300' Tc=21.0 min CN=81 Runoff=0.19 cfs 0.025 af

Subcatchment 3: DRAINAGE AREA 3 Runoff Area=663,807 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=590' Tc=19.9 min CN=73 Runoff=0.76 cfs 0.206 af

Subcatchment 4: DRAINAGE AREA 4 Runoff Area=272,371 sf 0.00% Impervious Runoff Depth=0.16"
Flow Length=376' Tc=15.4 min CN=73 Runoff=0.34 cfs 0.085 af

Subcatchment 5: DRAINAGE AREA 5 Runoff Area=69,632 sf 0.00% Impervious Runoff Depth=0.02"
Flow Length=340' Tc=16.6 min CN=62 Runoff=0.00 cfs 0.003 af

Pond AC1: ARCH CULVERT Peak Elev=454.10' Inflow=2.31 cfs 0.592 af
96.0" x 43.0", R=52.0" Arch Culvert n=0.013 L=60.0' S=0.0417 '/' Outflow=2.31 cfs 0.592 af

Pond AC2: ARCH CULVERT Peak Elev=430.10' Inflow=2.26 cfs 0.503 af
96.0" x 43.0", R=52.0" Arch Culvert n=0.013 L=40.0' S=0.0175 '/' Outflow=2.26 cfs 0.503 af

Pond BR1-C7: BIO-RET POND 1 Peak Elev=477.08' Storage=256 cf Inflow=0.38 cfs 0.107 af
Outflow=0.38 cfs 0.107 af

Pond BR2-C14: BIO-RET POND 2 Peak Elev=456.71' Storage=2,353 cf Inflow=0.98 cfs 0.096 af
Outflow=0.04 cfs 0.096 af

Pond C1: 24" CULVERT Peak Elev=480.21' Inflow=0.28 cfs 0.077 af
24.0" Round Culvert n=0.013 L=36.0' S=0.0139 '/' Outflow=0.28 cfs 0.077 af

Pond C10: 15" CULVERT Peak Elev=448.39' Inflow=0.10 cfs 0.008 af
15.0" Round Culvert n=0.013 L=67.0' S=0.0112 '/' Outflow=0.10 cfs 0.008 af

Pond C11: 12" CULVERT Peak Elev=458.13' Inflow=0.07 cfs 0.006 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0500 '/' Outflow=0.07 cfs 0.006 af

Pond C12: 24" CULVERT Peak Elev=444.28' Inflow=0.47 cfs 0.049 af
24.0" Round Culvert n=0.013 L=30.0' S=0.0167 '/' Outflow=0.47 cfs 0.049 af

Pond C13: 18" CULVERT Peak Elev=432.69' Inflow=0.19 cfs 0.025 af
18.0" Round Culvert n=0.013 L=56.0' S=0.0268 '/' Outflow=0.19 cfs 0.025 af

Pond C2: 12" CULVERT Peak Elev=479.14' Inflow=0.08 cfs 0.017 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=0.08 cfs 0.017 af

Pond C3: 12" CULVERT Peak Elev=479.15' Inflow=0.09 cfs 0.007 af
12.0" Round Culvert n=0.013 L=40.0' S=0.0125 '/' Outflow=0.09 cfs 0.007 af

Pond C4: 12" CULVERT Peak Elev=481.38' Inflow=0.12 cfs 0.016 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0100 '/' Outflow=0.12 cfs 0.016 af

Pond C5: 12" CULVERT Peak Elev=476.80' Inflow=0.17 cfs 0.019 af
12.0" Round Culvert n=0.013 L=20.0' S=0.0150 '/' Outflow=0.17 cfs 0.019 af

Pond C6: 24" CULVERT Peak Elev=463.38' Inflow=0.89 cfs 0.085 af
24.0" Round Culvert n=0.013 L=100.0' S=0.0600 '/' Outflow=0.89 cfs 0.085 af

Pond C8: 12" CULVERT Peak Elev=498.08' Inflow=0.03 cfs 0.007 af
12.0" Round Culvert n=0.013 L=73.0' S=0.0137 '/' Outflow=0.03 cfs 0.007 af

Pond C9: 12" CULVERT Peak Elev=479.10' Inflow=0.05 cfs 0.004 af
12.0" Round Culvert n=0.013 L=35.0' S=0.0143 '/' Outflow=0.05 cfs 0.004 af

Pond DP1: DRY POND 1 Peak Elev=437.31' Storage=4,257 cf Inflow=0.82 cfs 0.098 af
Outflow=0.00 cfs 0.000 af

Link O1: OUT 1 Inflow=2.38 cfs 0.767 af
Primary=2.38 cfs 0.767 af

Link O2: OUT 2 Inflow=2.83 cfs 0.674 af
Primary=2.83 cfs 0.674 af

Link O3: OUT 3 Inflow=0.76 cfs 0.206 af
Primary=0.76 cfs 0.206 af

Link O4: OUT 4 Inflow=0.34 cfs 0.085 af
Primary=0.34 cfs 0.085 af

Link O5: OUT 5 Inflow=0.00 cfs 0.003 af
Primary=0.00 cfs 0.003 af

Total Runoff Area = 104.151 ac Runoff Volume = 1.832 af Average Runoff Depth = 0.21"
97.19% Pervious = 101.228 ac 2.81% Impervious = 2.923 ac

Summary for Subcatchment 1A: DRAINAGE AREA 1A

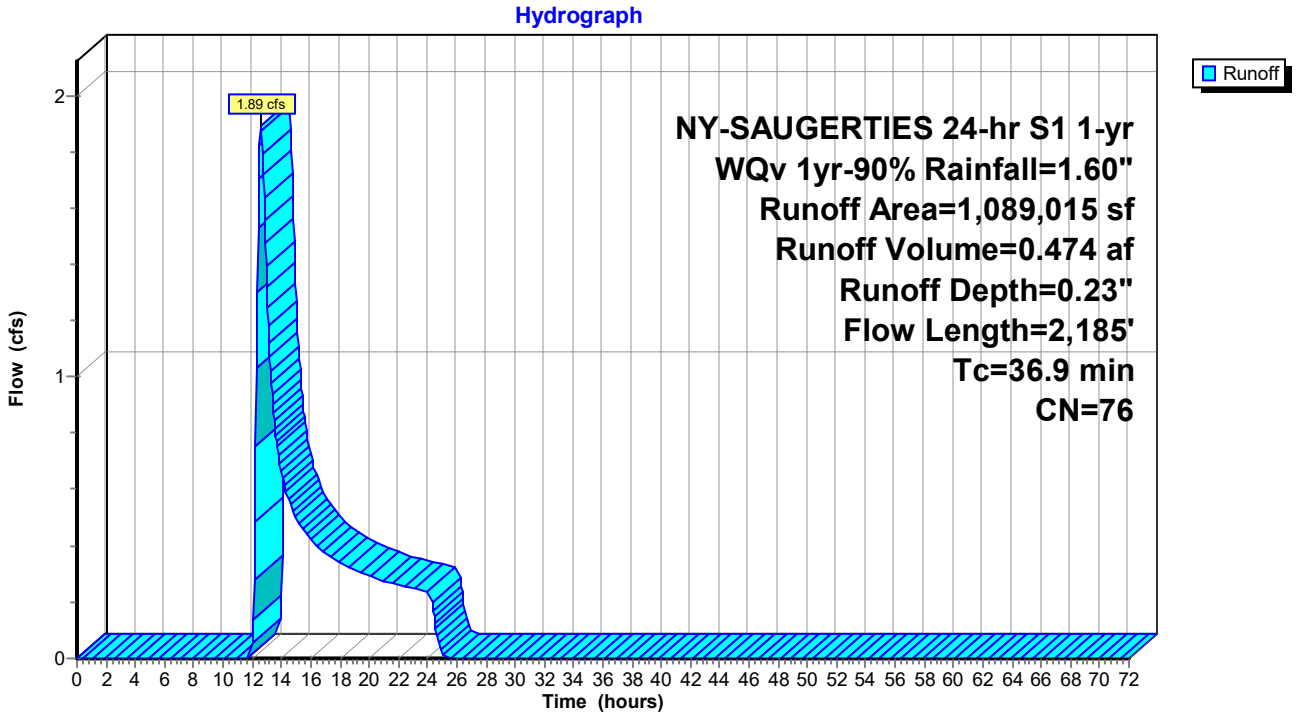
Runoff = 1.89 cfs @ 12.59 hrs, Volume= 0.474 af, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	853	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	620,284	73	Woods, Fair, HSG C
	391,737	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	20,528	74	>75% Grass cover, Good, HSG C
	32,734	80	>75% Grass cover, Good, HSG D
*	14,227	98	Paved roads w/curbs & sewers, HSG A-D
*	8,652	98	Roofs, HSG A-D
	1,089,015	76	Weighted Average
	1,066,136		97.90% Pervious Area
	22,879		2.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0800	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
13.4	650	0.0260	0.81		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
3.0	360	0.0180	2.01		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
1.3	260	0.0480	3.29		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
1.0	170	0.0350	2.81		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
2.9	380	0.0210	2.17		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
3.3	265	0.0080	1.34		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
36.9	2,185	Total			

Subcatchment 1A: DRAINAGE AREA 1A



Summary for Subcatchment 1B: DRAINAGE AREA 1B

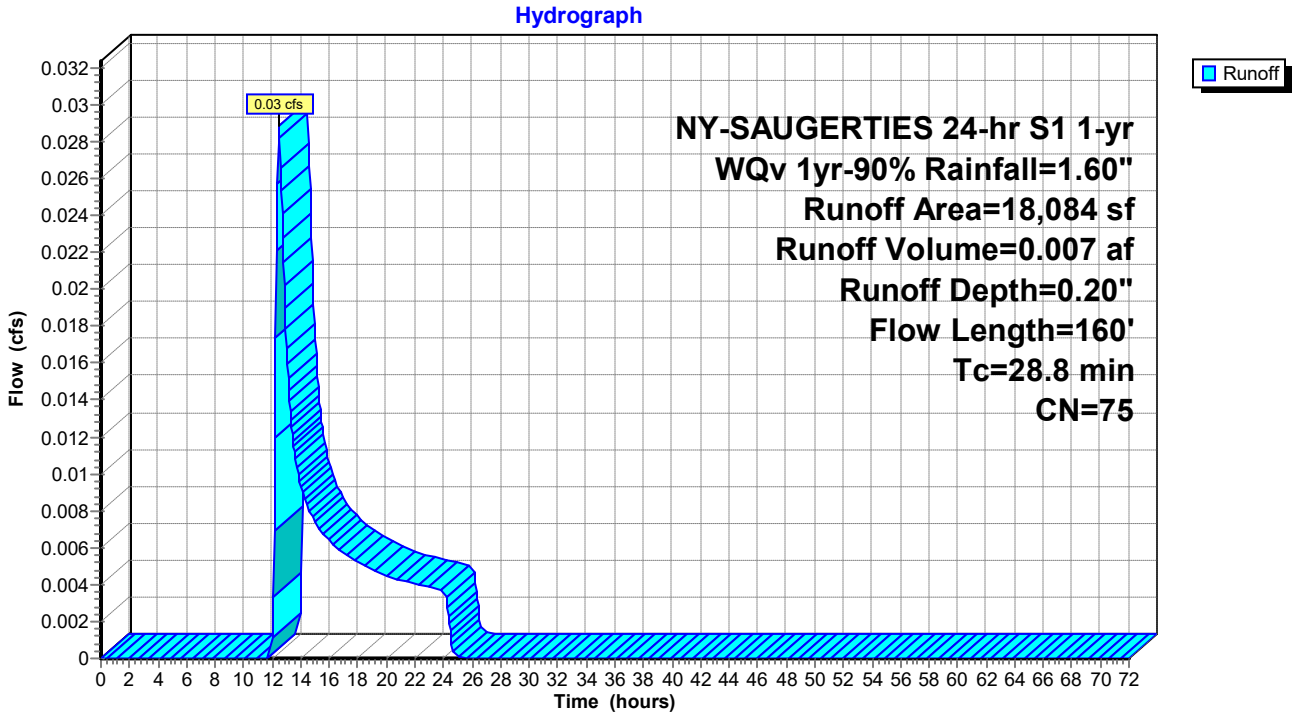
Runoff = 0.03 cfs @ 12.47 hrs, Volume= 0.007 af, Depth= 0.20"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	14,107	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	2,873	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
*	1,104	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	18,084	75	Weighted Average
	16,980		93.90% Pervious Area
	1,104		6.10% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
27.6	100	0.0100	0.06		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.2	50	0.0200	0.71		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.0	10	0.4000	9.49		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
28.8	160	Total			

Subcatchment 1B: DRAINAGE AREA 1B



Summary for Subcatchment 1C: DRAINAGE AREA 1C

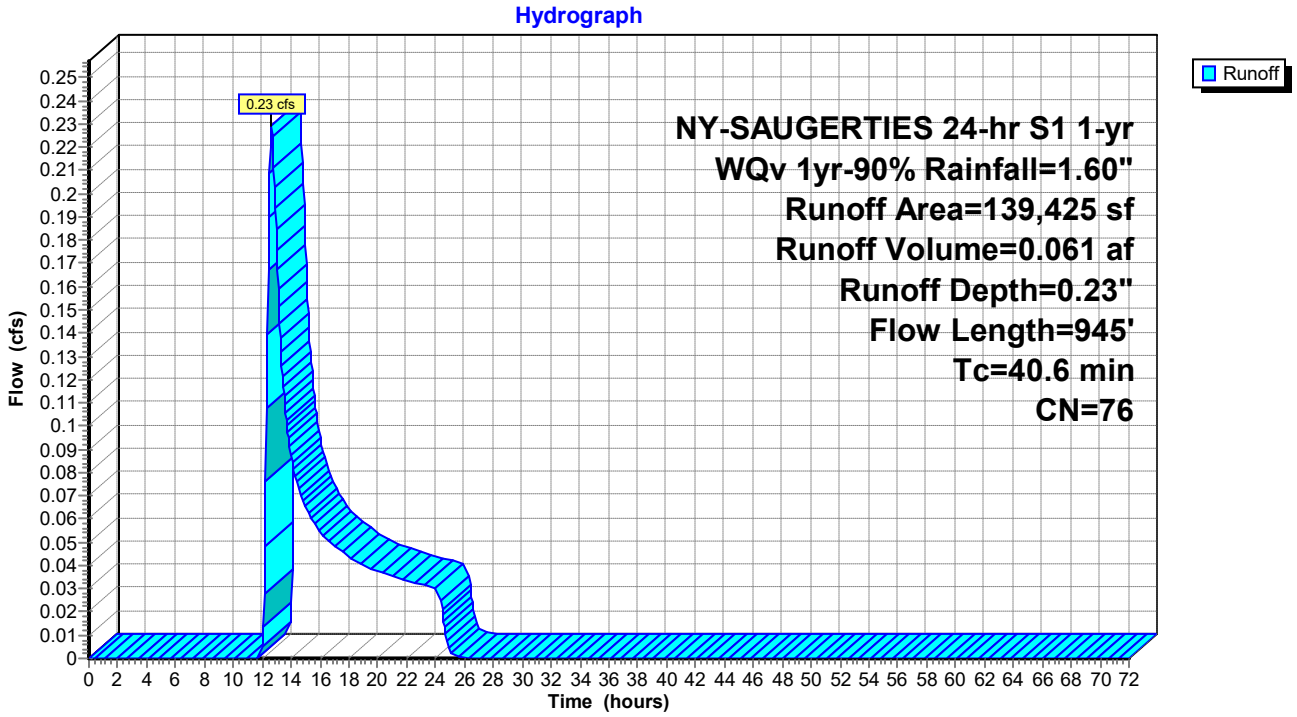
Runoff = 0.23 cfs @ 12.64 hrs, Volume= 0.061 af, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	97,071	73	Woods, Fair, HSG C
	20,322	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	12,079	74	>75% Grass cover, Good, HSG C
	347	80	>75% Grass cover, Good, HSG D
*	6,722	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	139,425	76	Weighted Average
	129,819		93.11% Pervious Area
	9,606		6.89% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
9.9	350	0.0140	0.59		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.1	80	0.0630	1.25		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
5.5	220	0.0180	0.67		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
3.2	185	0.0380	0.97		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
0.0	10	0.2000	6.71		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
40.6	945	Total			

Subcatchment 1C: DRAINAGE AREA 1C



Summary for Subcatchment 1D: DRAINAGE AREA 1D

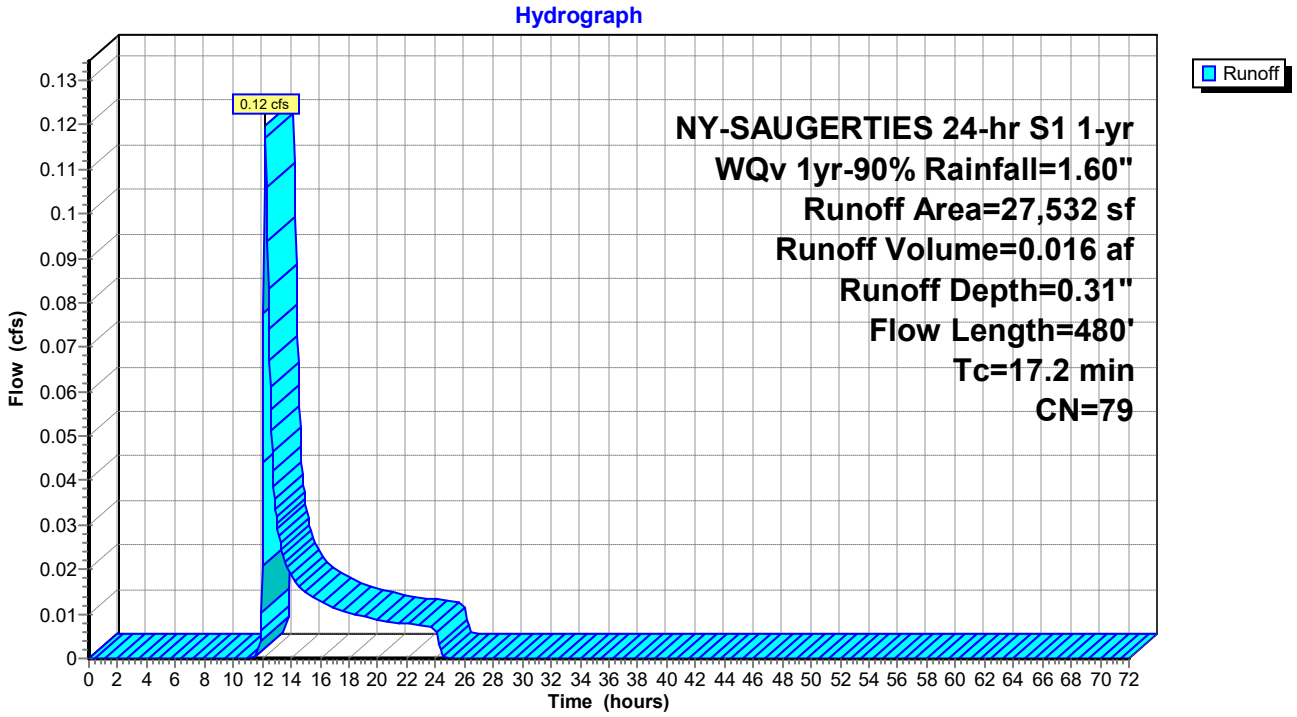
Runoff = 0.12 cfs @ 12.22 hrs, Volume= 0.016 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	8,093	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	13,157	74	>75% Grass cover, Good, HSG C
	867	80	>75% Grass cover, Good, HSG D
*	5,415	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	27,532	79	Weighted Average
	22,117		80.33% Pervious Area
	5,415		19.67% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	8	0.0630	1.35		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
1.5	17	0.0590	0.19		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
12.6	75	0.0400	0.10		**Sheet Flow, C-D** Woods: Light underbrush n= 0.400 P2= 3.38"
0.6	30	0.0330	0.91		**Shallow Concentrated Flow, D-E** Woodland Kv= 5.0 fps
0.2	40	0.0500	3.35		**Shallow Concentrated Flow, E-F** Grassed Waterway Kv= 15.0 fps
1.8	220	0.0180	2.01		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
0.4	90	0.0780	4.19		**Shallow Concentrated Flow, G-H** Grassed Waterway Kv= 15.0 fps
17.2	480	Total			

Subcatchment 1D: DRAINAGE AREA 1D



Summary for Subcatchment 1E: DRAINAGE AREA 1E

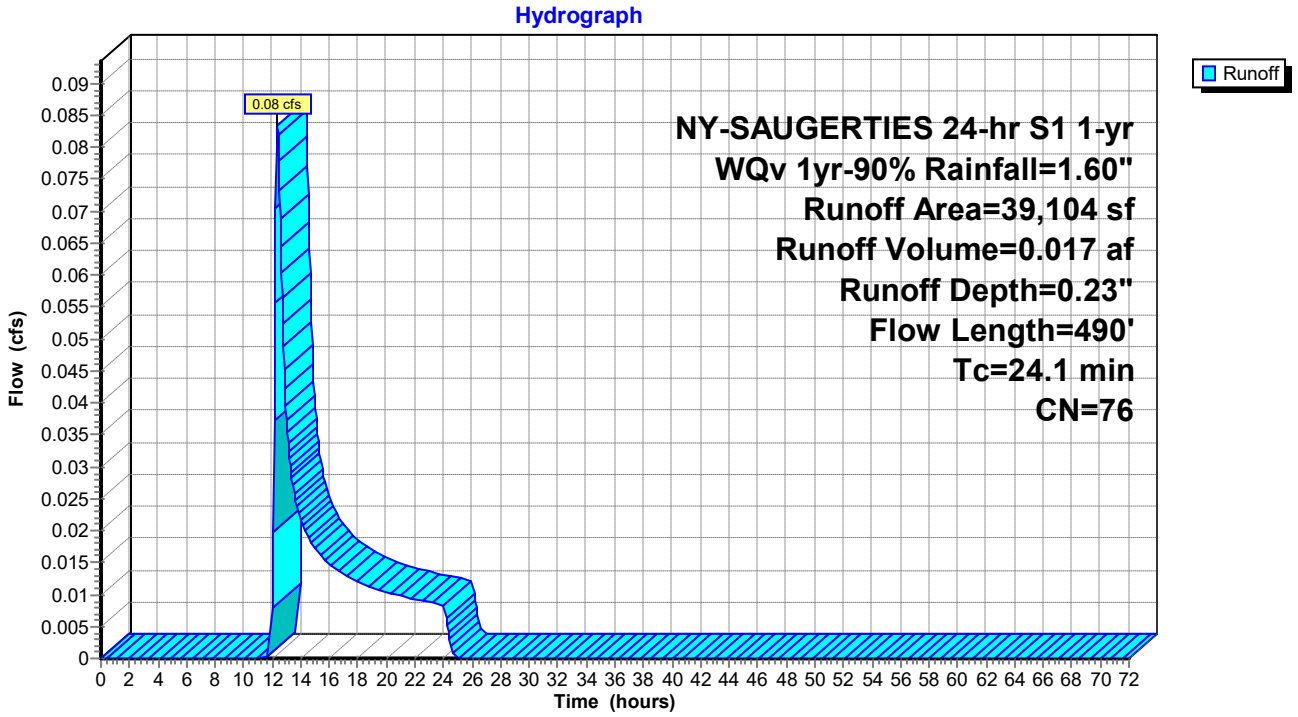
Runoff = 0.08 cfs @ 12.36 hrs, Volume= 0.017 af, Depth= 0.23"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	27,062	73	Woods, Fair, HSG C
	1,441	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	4,681	74	>75% Grass cover, Good, HSG C
	2,095	80	>75% Grass cover, Good, HSG D
*	3,825	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	39,104	76	Weighted Average
	35,279		90.22% Pervious Area
	3,825		9.78% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
20.9	100	0.0200	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.6	110	0.0550	1.17		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
1.6	280	0.0390	2.96		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
24.1	490	Total			

Subcatchment 1E: DRAINAGE AREA 1E



Summary for Subcatchment 1F: DRAINAGE AREA 1F

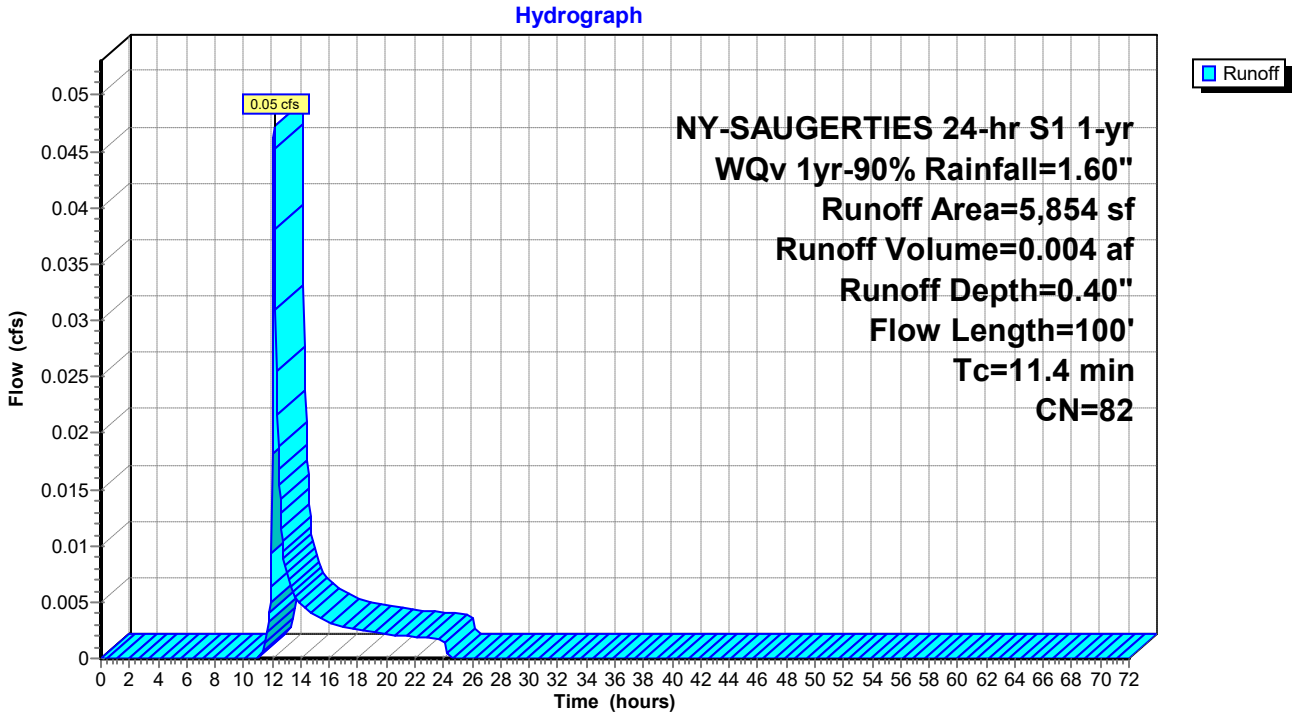
Runoff = 0.05 cfs @ 12.12 hrs, Volume= 0.004 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	2,009	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,012	80	>75% Grass cover, Good, HSG D
*	833	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,854	82	Weighted Average
	5,021		85.77% Pervious Area
	833		14.23% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
2.2	30	0.0670	0.22		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
7.0	40	0.0500	0.10		**Sheet Flow, B-C** Woods: Light underbrush n= 0.400 P2= 3.38"
2.2	30	0.0670	0.22		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.38"
11.4	100	Total			

Subcatchment 1F: DRAINAGE AREA 1F



Summary for Subcatchment 1G: DRAINAGE AREA 1G

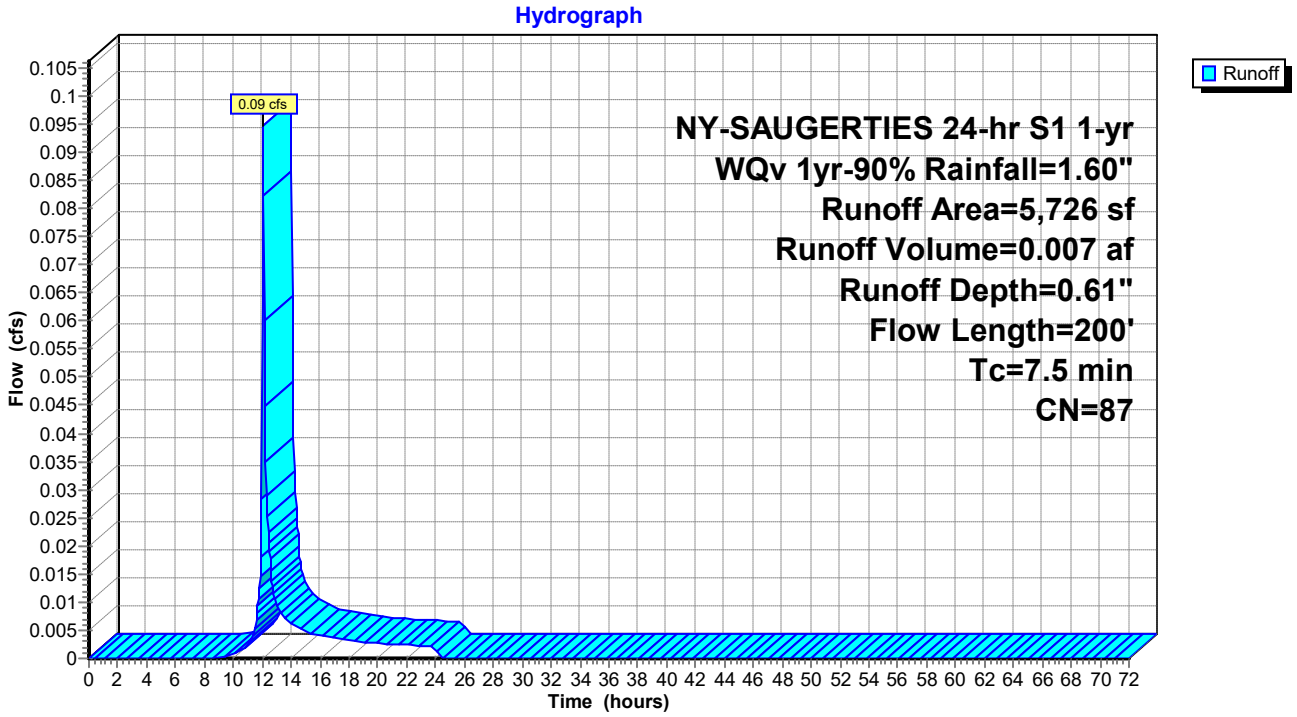
Runoff = 0.09 cfs @ 12.06 hrs, Volume= 0.007 af, Depth= 0.61"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	521	74	>75% Grass cover, Good, HSG C
	2,828	80	>75% Grass cover, Good, HSG D
*	2,377	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,726	87	Weighted Average
	3,349		58.49% Pervious Area
	2,377		41.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	5	0.1000	1.48		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
6.8	95	0.0420	0.23		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.6	100	0.0400	3.00		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
7.5	200	Total			

Subcatchment 1G: DRAINAGE AREA 1G



Summary for Subcatchment 1H: DRAINAGE AREA 8

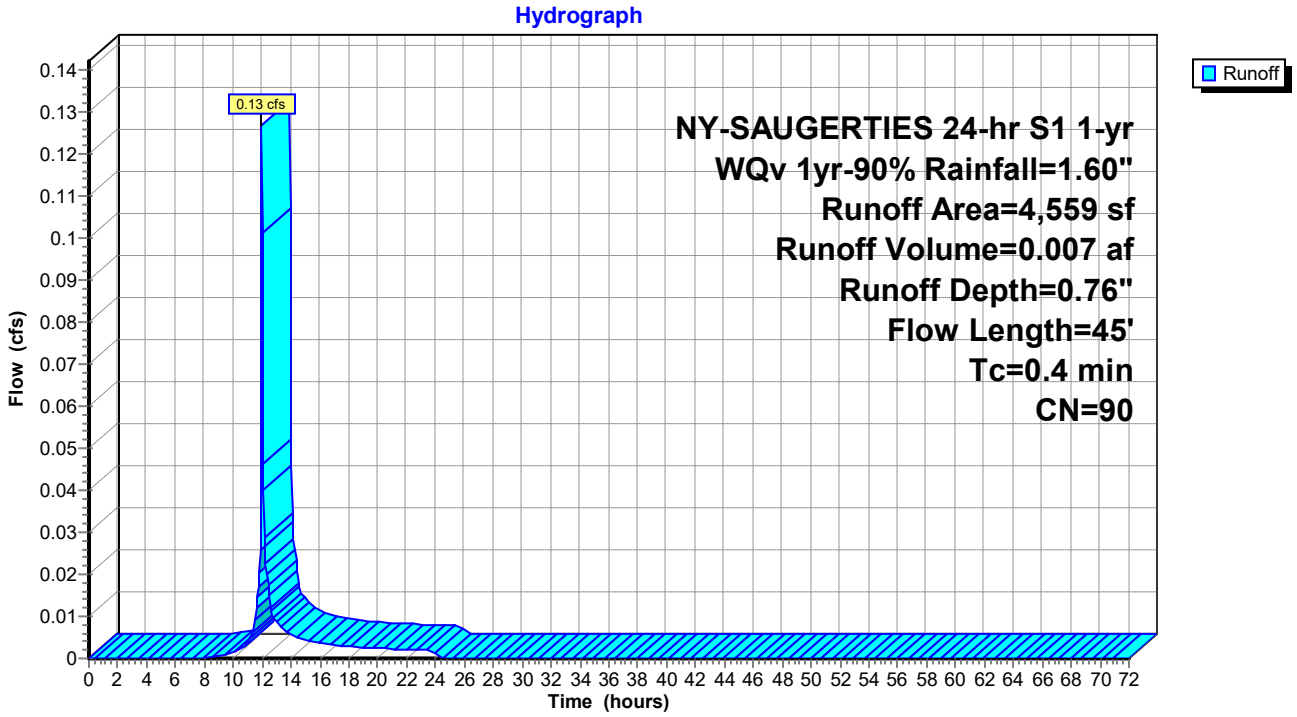
Runoff = 0.13 cfs @ 11.96 hrs, Volume= 0.007 af, Depth= 0.76"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	2,124	80	>75% Grass cover, Good, HSG D
*	2,435	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	4,559	90	Weighted Average
	2,124		46.59% Pervious Area
	2,435		53.41% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.3	20	0.0250	1.12		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
0.1	25	0.3200	3.25		**Sheet Flow, B-C**
					Smooth surfaces n= 0.011 P2= 3.38"
0.4	45	Total			

Subcatchment 1H: DRAINAGE AREA 8



Summary for Subcatchment 1I: DRAINAGE AREA 1I

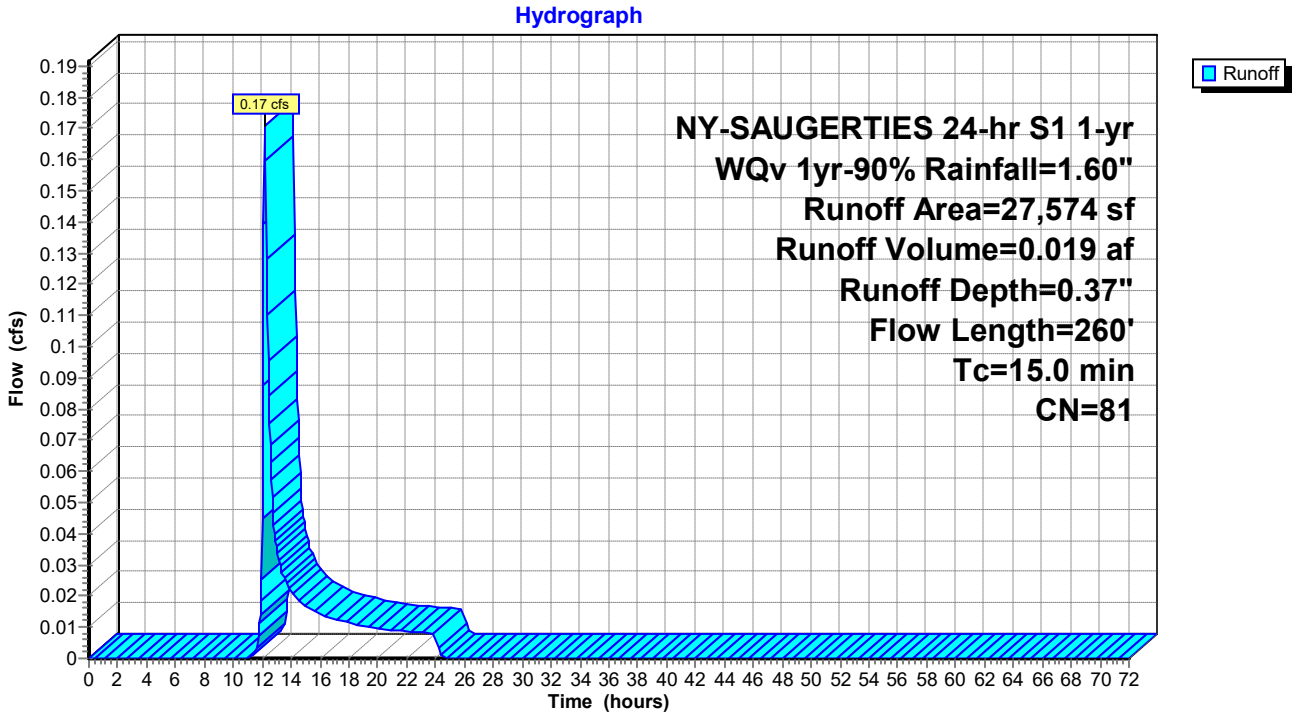
Runoff = 0.17 cfs @ 12.18 hrs, Volume= 0.019 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	686	73	Woods, Fair, HSG C
	20,704	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,341	80	>75% Grass cover, Good, HSG D
*	2,843	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	27,574	81	Weighted Average
	24,731		89.69% Pervious Area
	2,843		10.31% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
13.5	100	0.0600	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
0.9	70	0.0710	1.33		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.6	90	0.0330	2.72		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
15.0	260	Total			

Subcatchment 1I: DRAINAGE AREA 1I



Summary for Subcatchment 1J: DRAINAGE AREA 1J

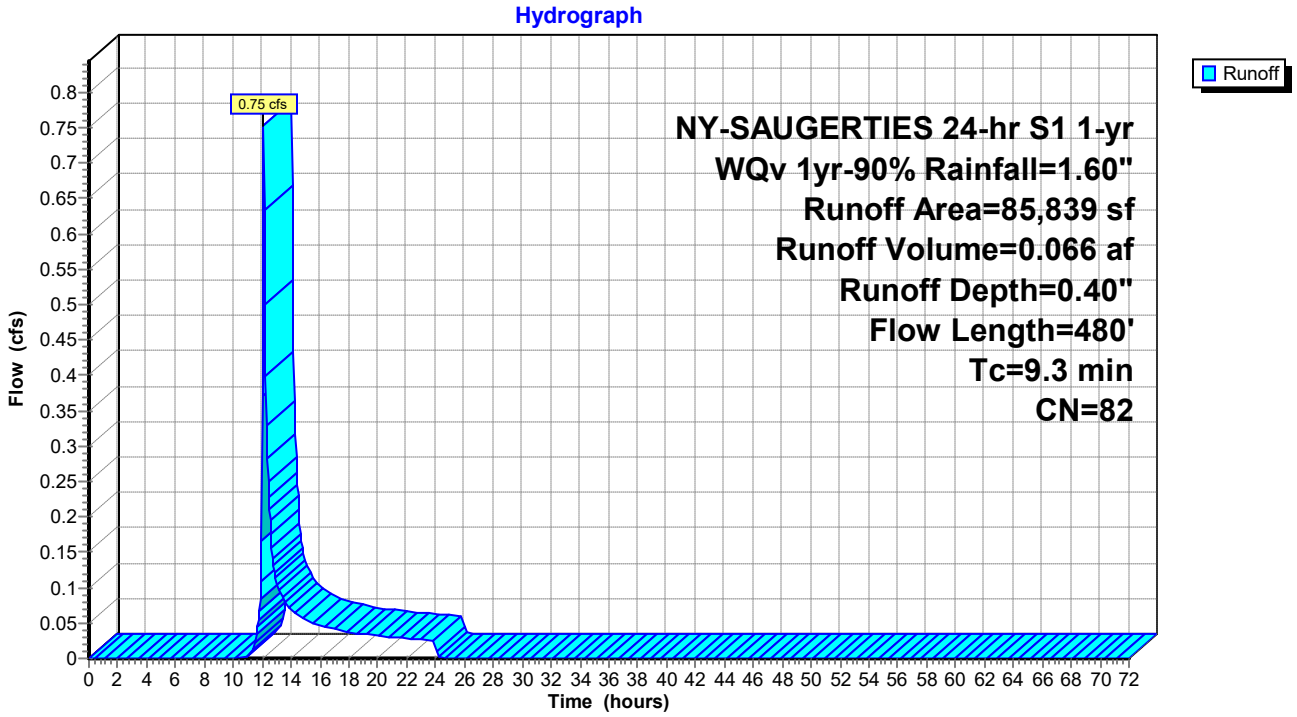
Runoff = 0.75 cfs @ 12.10 hrs, Volume= 0.066 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	52,694	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	22,447	80	>75% Grass cover, Good, HSG D
*	7,814	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	85,839	82	Weighted Average
	75,141		87.54% Pervious Area
	10,698		12.46% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
1.0	10	0.0500	0.16		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
0.6	50	0.0300	1.45		**Sheet Flow, B-C** Smooth surfaces n= 0.011 P2= 3.38"
2.5	30	0.0500	0.20		**Sheet Flow, C-D** Grass: Short n= 0.150 P2= 3.38"
2.3	10	0.0500	0.07		**Sheet Flow, D-E** Woods: Light underbrush n= 0.400 P2= 3.38"
1.2	70	0.0360	0.95		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
1.7	310	0.0420	3.07		**Shallow Concentrated Flow, F-G** Grassed Waterway Kv= 15.0 fps
9.3	480	Total			

Subcatchment 1J: DRAINAGE AREA 1J



Summary for Subcatchment 1K: DRAINAGE AREA 1K

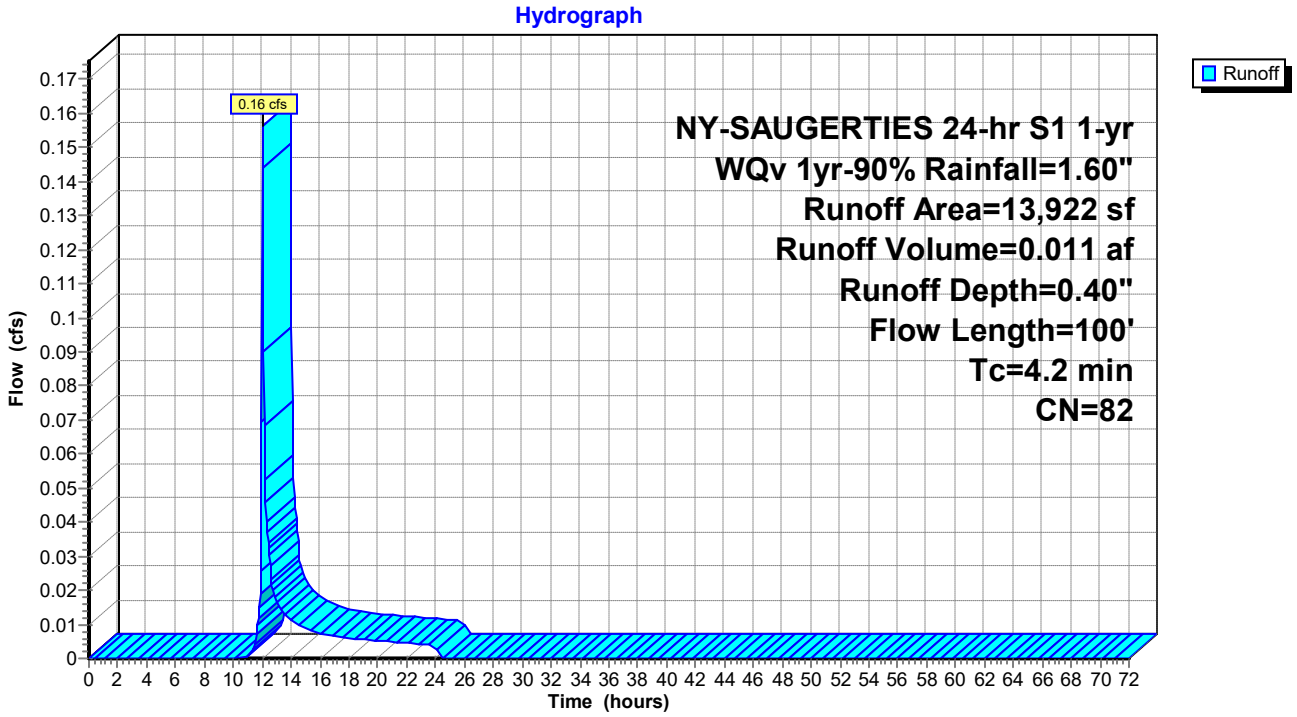
Runoff = 0.16 cfs @ 12.02 hrs, Volume= 0.011 af, Depth= 0.40"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	0	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	12,099	80	>75% Grass cover, Good, HSG D
*	1,823	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	13,922	82	Weighted Average
	12,099		86.91% Pervious Area
	1,823		13.09% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	15	0.0330	1.18		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
4.0	85	0.1290	0.36		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
4.2	100	Total			

Subcatchment 1K: DRAINAGE AREA 1K



Summary for Subcatchment 1L: DRAINAGE AREA 1L

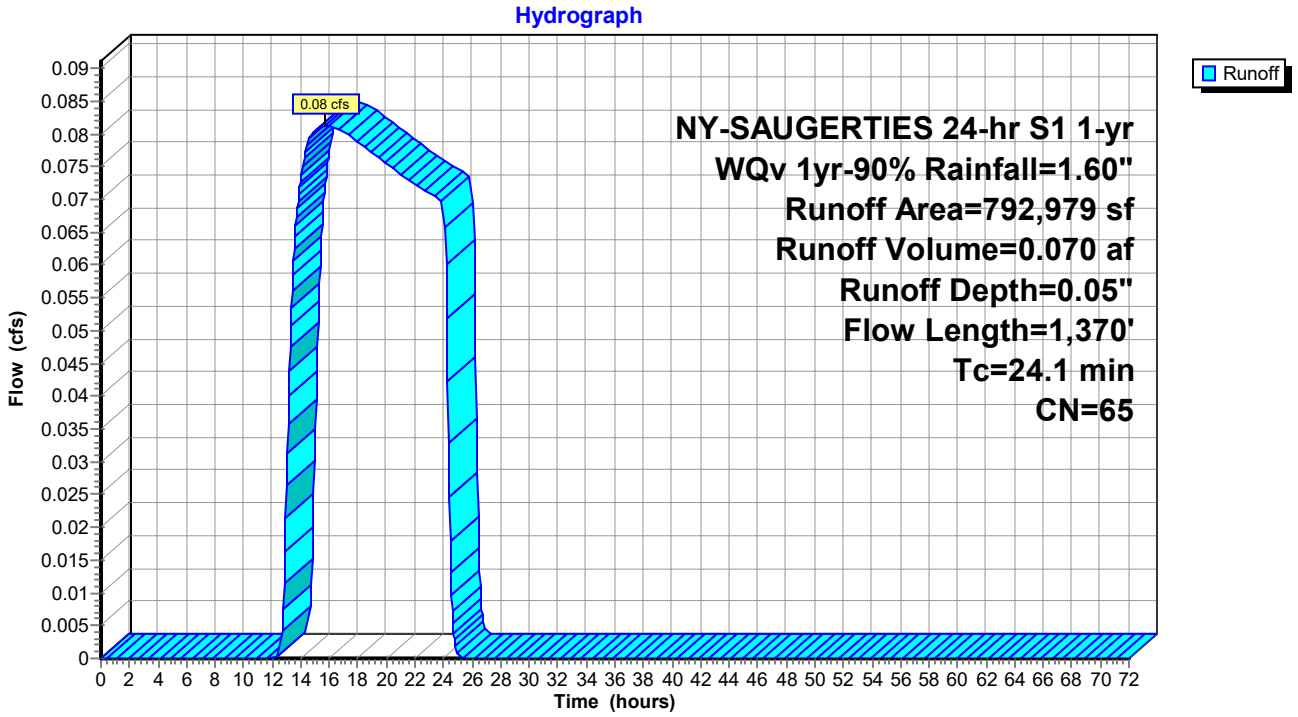
Runoff = 0.08 cfs @ 15.73 hrs, Volume= 0.070 af, Depth= 0.05"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	162,840	36	Woods, Fair, HSG A
	218,251	60	Woods, Fair, HSG B
	3,820	73	Woods, Fair, HSG C
	357,922	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	2,373	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	30,455	80	>75% Grass cover, Good, HSG D
*	11,550	98	Paved roads w/curbs & sewers, HSG A-D
*	5,768	98	Roofs, HSG A-D
	792,979	65	Weighted Average
	775,661		97.82% Pervious Area
	17,318		2.18% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.6	100	0.1400	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
3.3	310	0.1000	1.58		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
11.2	960	0.0090	1.42		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
24.1	1,370	Total			

Subcatchment 1L: DRAINAGE AREA 1L



Summary for Subcatchment 1M: DRAINAGE AREA 1M

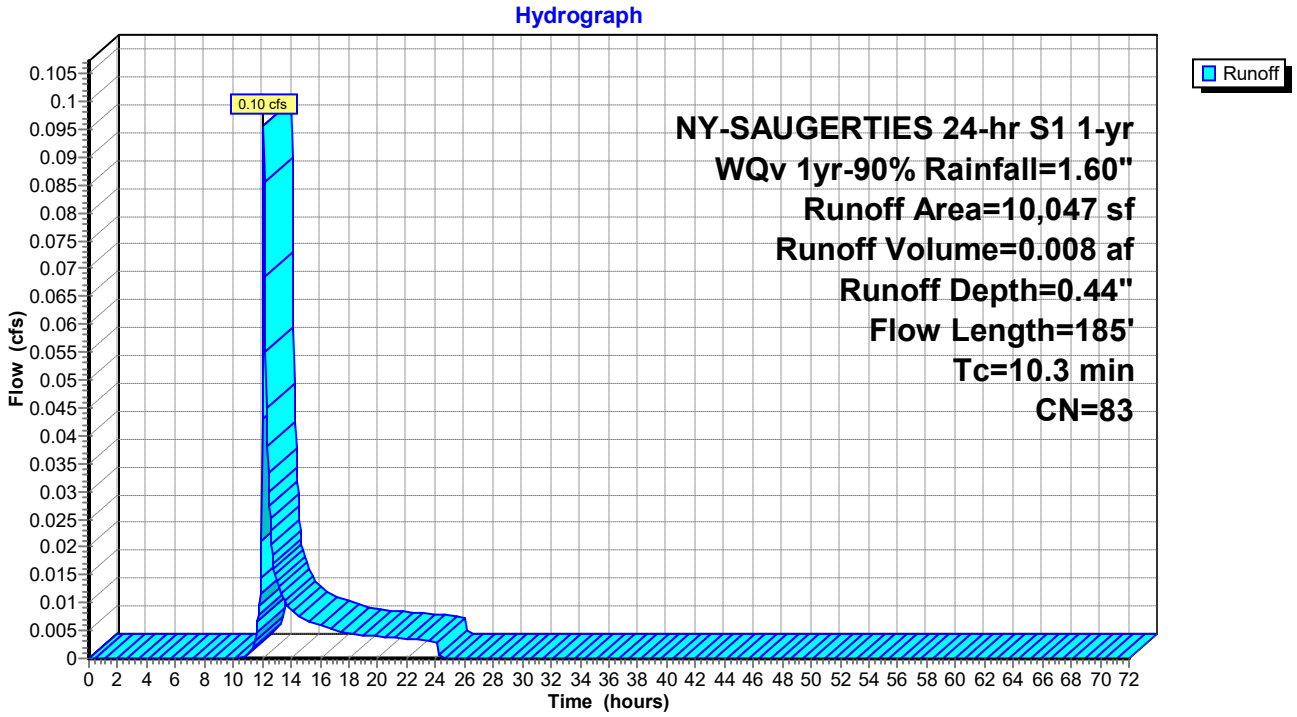
Runoff = 0.10 cfs @ 12.11 hrs, Volume= 0.008 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	3,810	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	4,526	80	>75% Grass cover, Good, HSG D
*	1,711	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	10,047	83	Weighted Average
	8,336		82.97% Pervious Area
	1,711		17.03% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.2	10	0.0330	1.09		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
2.4	20	0.0250	0.14		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
7.0	65	0.1310	0.16		**Sheet Flow, C-D** Woods: Light underbrush n= 0.400 P2= 3.38"
0.7	90	0.0220	2.22		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
10.3	185	Total			

Subcatchment 1M: DRAINAGE AREA 1M



Summary for Subcatchment 2A: DRAINAGE AREA 2A

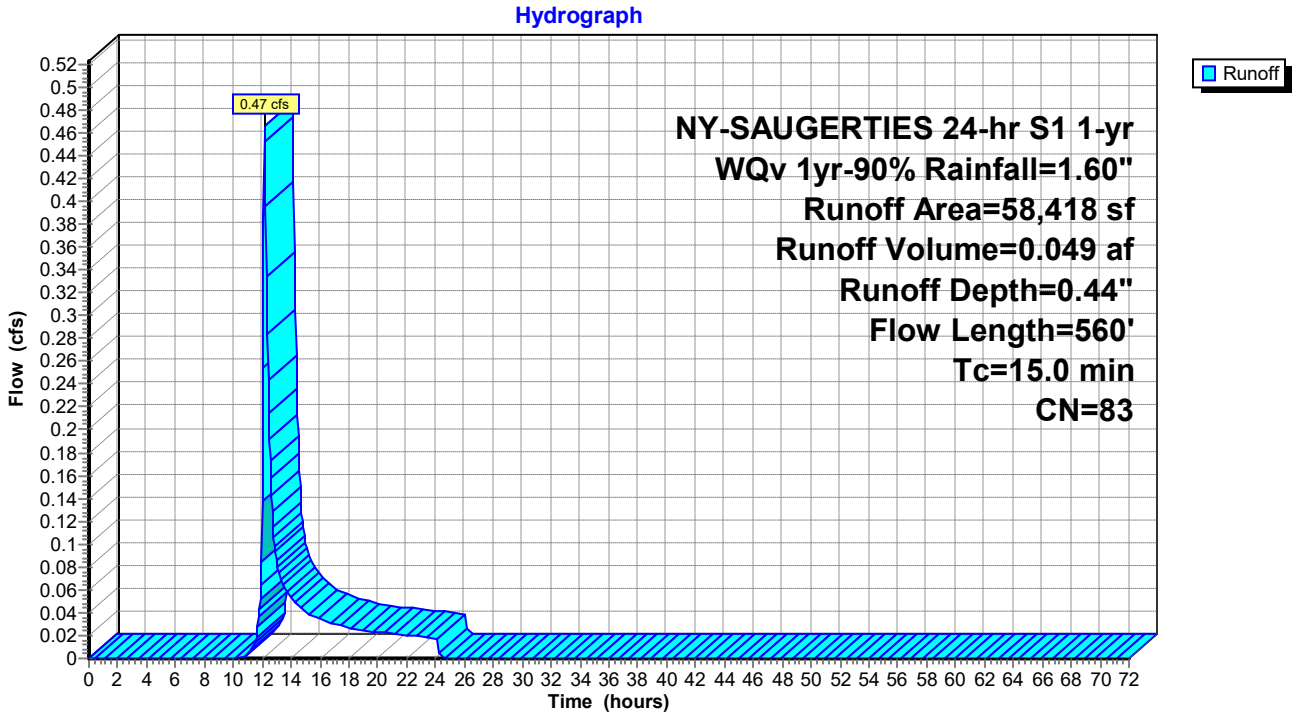
Runoff = 0.47 cfs @ 12.17 hrs, Volume= 0.049 af, Depth= 0.44"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	22,949	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	24,787	80	>75% Grass cover, Good, HSG D
*	7,798	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	58,418	83	Weighted Average
	47,736		81.71% Pervious Area
	10,682		18.29% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	7	0.0710	1.38		**Sheet Flow, A-B**
					Smooth surfaces n= 0.011 P2= 3.38"
7.5	93	0.0320	0.21		**Sheet Flow, B-C**
					Grass: Short n= 0.150 P2= 3.38"
0.8	150	0.0430	3.11		**Shallow Concentrated Flow, C-D**
					Grassed Waterway Kv= 15.0 fps
6.4	280	0.0210	0.72		**Shallow Concentrated Flow, D-E**
					Woodland Kv= 5.0 fps
0.2	30	0.0330	2.72		**Shallow Concentrated Flow, E-F**
					Grassed Waterway Kv= 15.0 fps
15.0	560	Total			

Subcatchment 2A: DRAINAGE AREA 2A



Summary for Subcatchment 2B: DRAINAGE AREA 2B

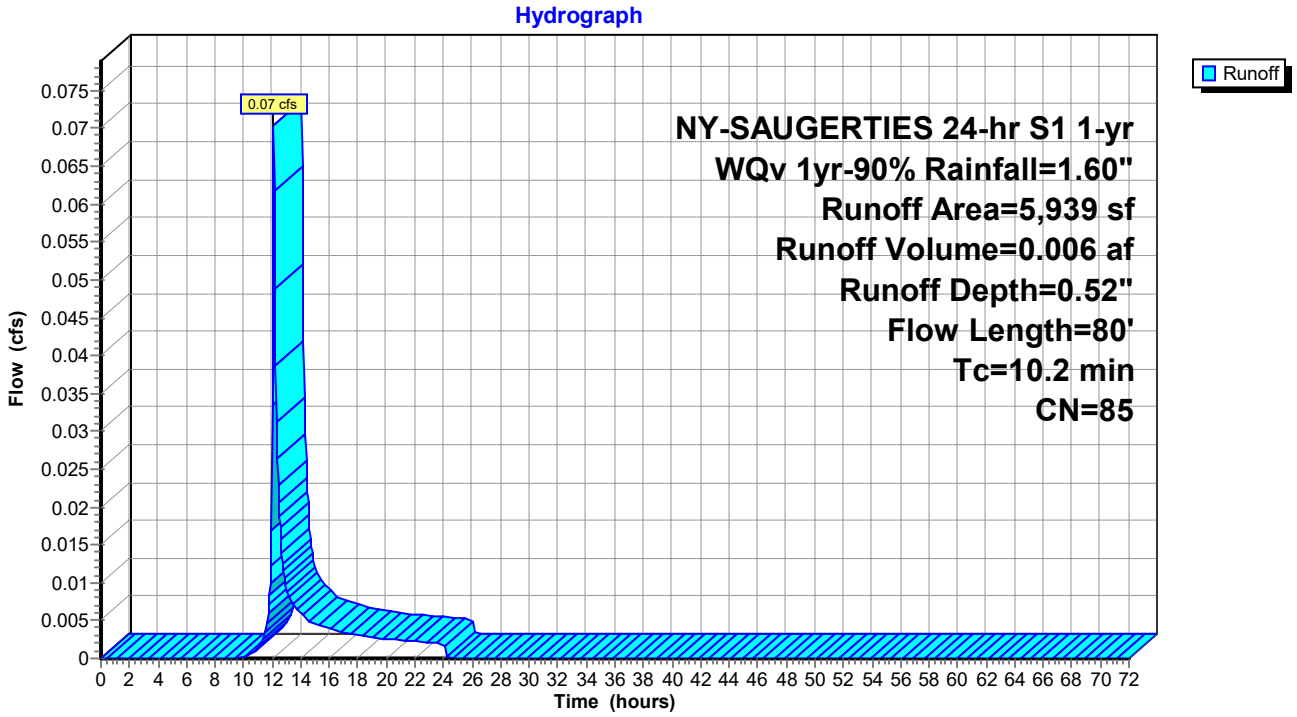
Runoff = 0.07 cfs @ 12.10 hrs, Volume= 0.006 af, Depth= 0.52"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	1,167	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	3,008	80	>75% Grass cover, Good, HSG D
*	1,764	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	5,939	85	Weighted Average
	4,175		70.30% Pervious Area
	1,764		29.70% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
7.8	35	0.0290	0.08		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.4	45	0.1330	0.32		**Sheet Flow, A-B** Grass: Short n= 0.150 P2= 3.38"
10.2	80	Total			

Subcatchment 2B: DRAINAGE AREA 2B



Summary for Subcatchment 2C: DRAINAGE AREA 2C

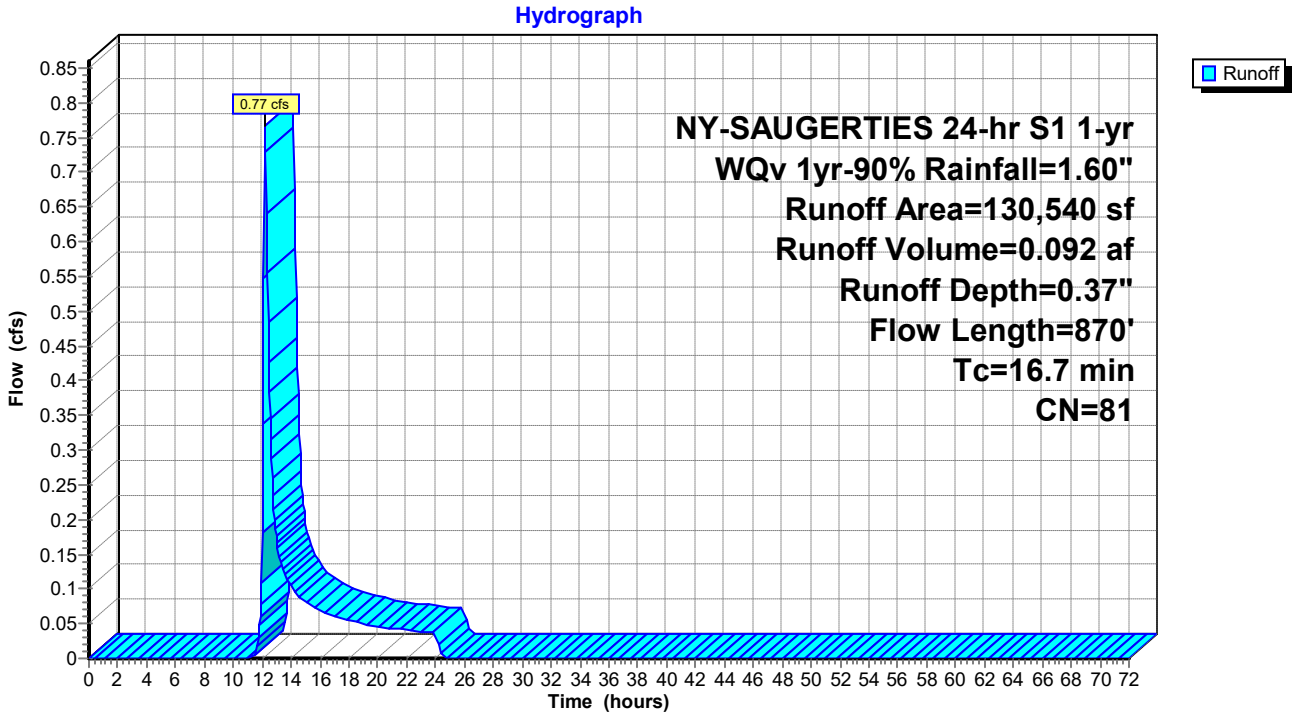
Runoff = 0.77 cfs @ 12.20 hrs, Volume= 0.092 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	92,203	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	28,020	80	>75% Grass cover, Good, HSG D
*	10,317	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	130,540	81	Weighted Average
	120,223		92.10% Pervious Area
	10,317		7.90% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
11.4	100	0.0900	0.15		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.7	210	0.0190	2.07		**Shallow Concentrated Flow, B-C** Grassed Waterway Kv= 15.0 fps
0.1	30	0.1670	6.13		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
3.5	530	0.0280	2.51		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
16.7	870	Total			

Subcatchment 2C: DRAINAGE AREA 2C



Summary for Subcatchment 2D: DRAINAGE AREA 2D

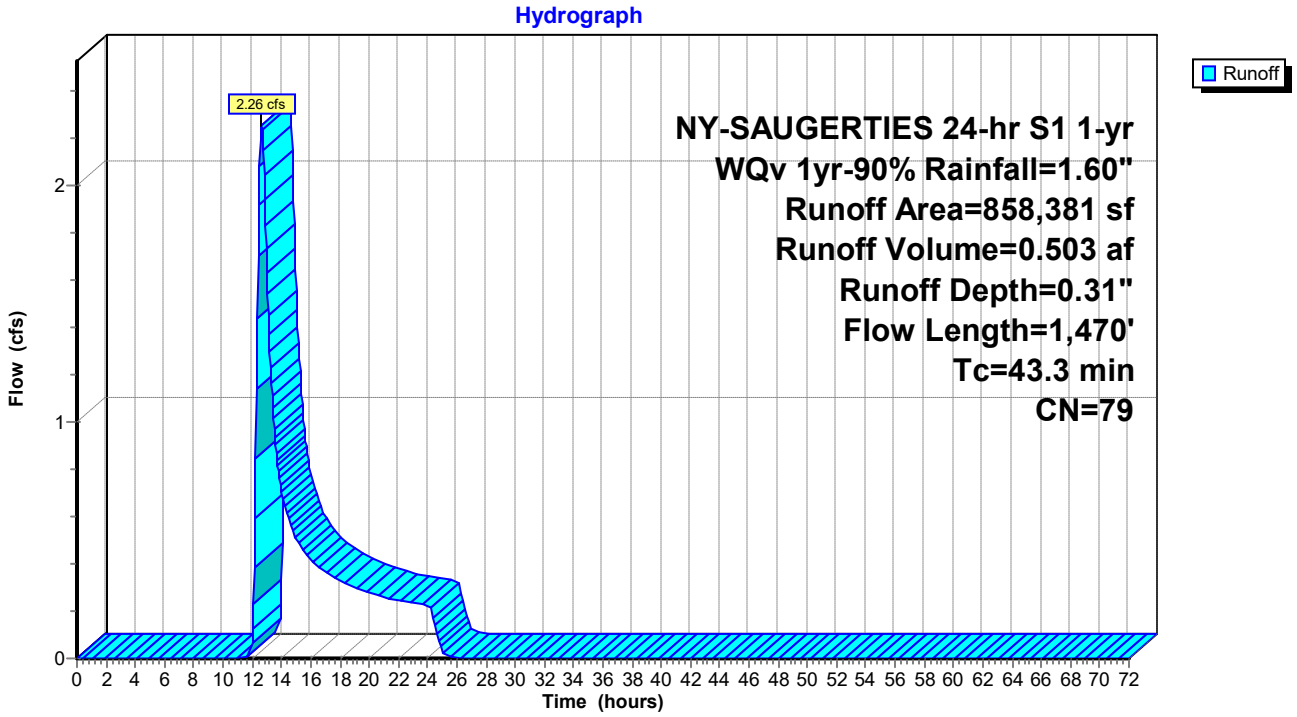
Runoff = 2.26 cfs @ 12.63 hrs, Volume= 0.503 af, Depth= 0.31"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	34,292	73	Woods, Fair, HSG C
	808,098	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	3,863	74	>75% Grass cover, Good, HSG C
	7,734	80	>75% Grass cover, Good, HSG D
*	4,394	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	858,381	79	Weighted Average
	853,987		99.49% Pervious Area
	4,394		0.51% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
9.9	100	0.1300	0.17		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
0.6	50	0.0800	1.41		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
32.8	1,320	0.0180	0.67		**Shallow Concentrated Flow, C-D** Woodland Kv= 5.0 fps
43.3	1,470	Total			

Subcatchment 2D: DRAINAGE AREA 2D



Summary for Subcatchment 2E: DRAINAGE AREA 18

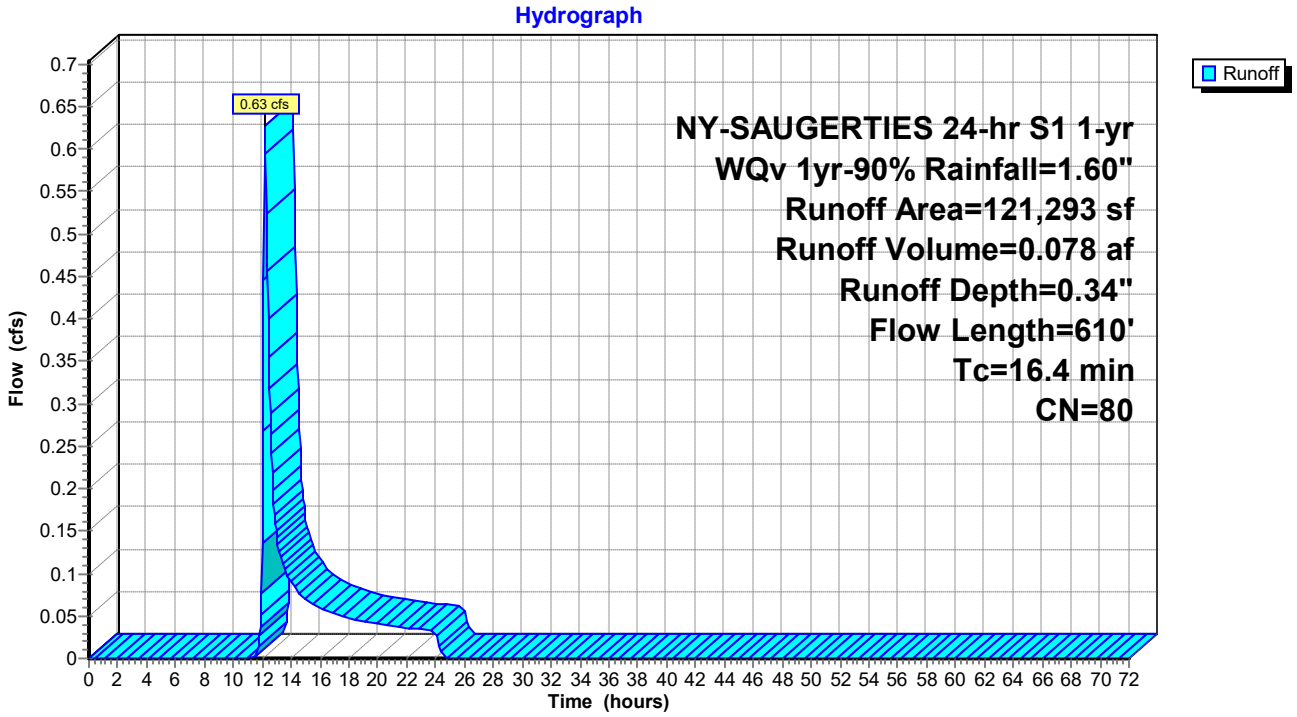
Runoff = 0.63 cfs @ 12.20 hrs, Volume= 0.078 af, Depth= 0.34"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	23,515	73	Woods, Fair, HSG C
	54,460	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	3,737	74	>75% Grass cover, Good, HSG C
	25,044	80	>75% Grass cover, Good, HSG D
*	11,653	98	Paved roads w/curbs & sewers, HSG A-D
*	2,884	98	Roofs, HSG A-D
	121,293	80	Weighted Average
	106,756		88.01% Pervious Area
	14,537		11.99% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
0.1	6	0.0830	1.42		**Sheet Flow, A-B** Smooth surfaces n= 0.011 P2= 3.38"
6.1	94	0.0530	0.25		**Sheet Flow, B-C** Grass: Short n= 0.150 P2= 3.38"
0.8	220	0.2270	4.76		**Shallow Concentrated Flow, C-D** Nearly Bare & Untilled Kv= 10.0 fps
0.1	40	0.2000	6.71		**Shallow Concentrated Flow, D-E** Grassed Waterway Kv= 15.0 fps
9.3	250	0.0080	0.45		**Shallow Concentrated Flow, E-F** Woodland Kv= 5.0 fps
16.4	610	Total			

Subcatchment 2E: DRAINAGE AREA 18



Summary for Subcatchment 2F: DRAINAGE AREA 2F

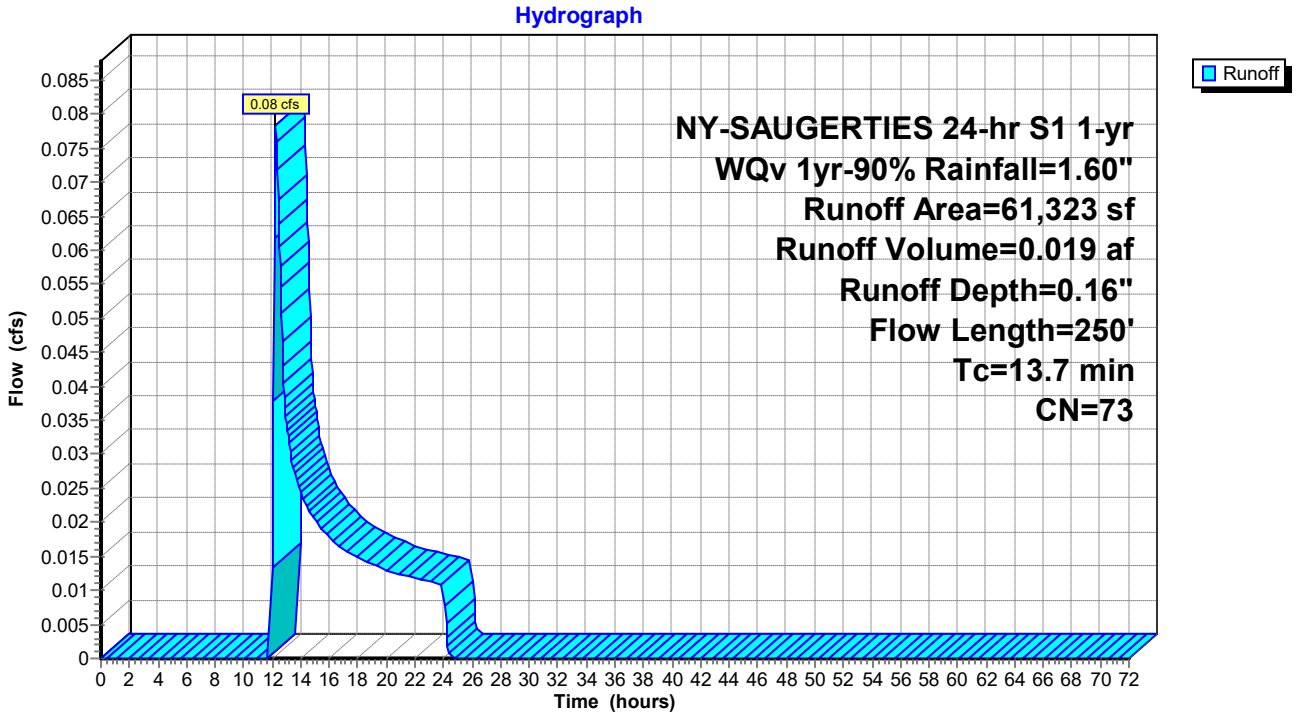
Runoff = 0.08 cfs @ 12.25 hrs, Volume= 0.019 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	5,624	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	4,622	73	Woods, Fair, HSG C
	47,954	79	Woods, Fair, HSG D
	3,123	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	0	80	>75% Grass cover, Good, HSG D
*	0	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	61,323	73	Weighted Average
	61,323		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.0	100	0.0800	0.14		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
1.7	150	0.0870	1.47		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
13.7	250	Total			

Subcatchment 2F: DRAINAGE AREA 2F



Summary for Subcatchment 2G: DRAINAGE AREA 2G

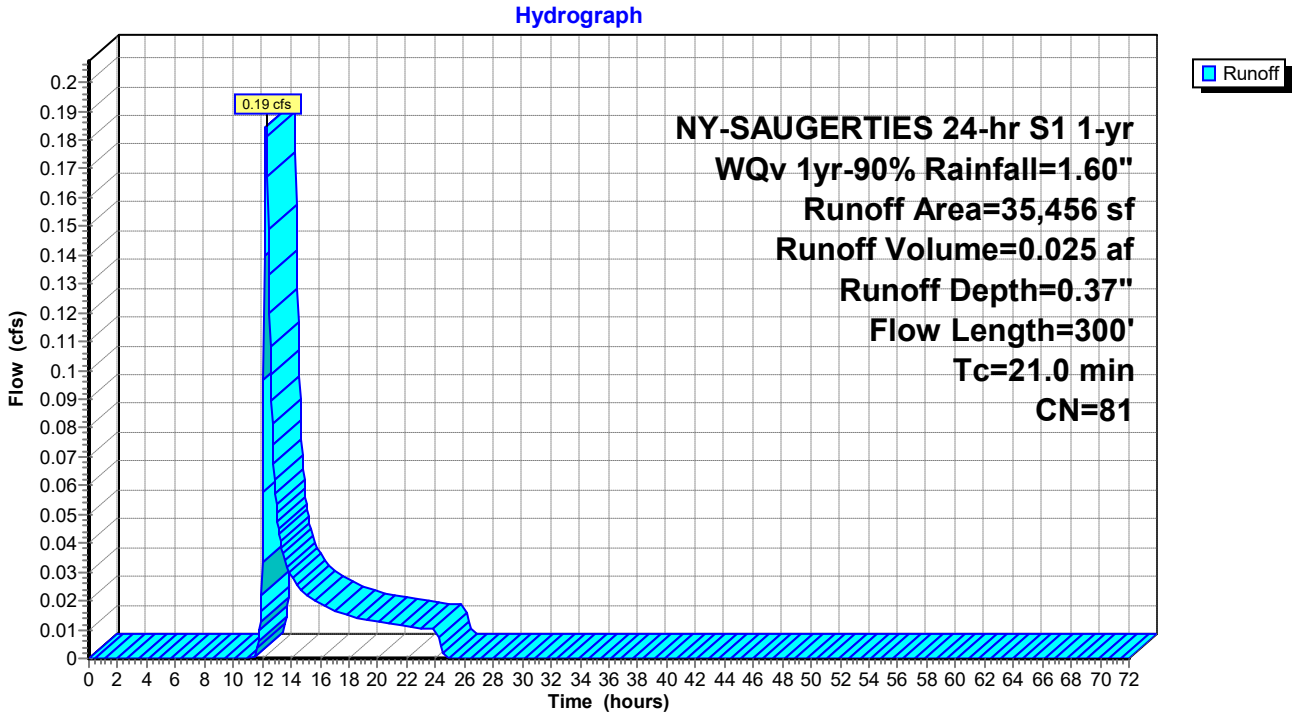
Runoff = 0.19 cfs @ 12.27 hrs, Volume= 0.025 af, Depth= 0.37"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

	Area (sf)	CN	Description
	0	36	Woods, Fair, HSG A
	0	60	Woods, Fair, HSG B
	0	73	Woods, Fair, HSG C
	27,880	79	Woods, Fair, HSG D
	0	39	>75% Grass cover, Good, HSG A
	0	61	>75% Grass cover, Good, HSG B
	0	74	>75% Grass cover, Good, HSG C
	4,802	80	>75% Grass cover, Good, HSG D
*	2,774	98	Paved roads w/curbs & sewers, HSG A-D
*	0	98	Roofs, HSG A-D
	35,456	81	Weighted Average
	32,682		92.18% Pervious Area
	2,774		7.82% Impervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
17.8	100	0.0300	0.09		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
3.1	190	0.0420	1.02		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
0.1	10	0.0300	2.60		**Shallow Concentrated Flow, C-D** Grassed Waterway Kv= 15.0 fps
21.0	300	Total			

Subcatchment 2G: DRAINAGE AREA 2G



Summary for Subcatchment 3: DRAINAGE AREA 3

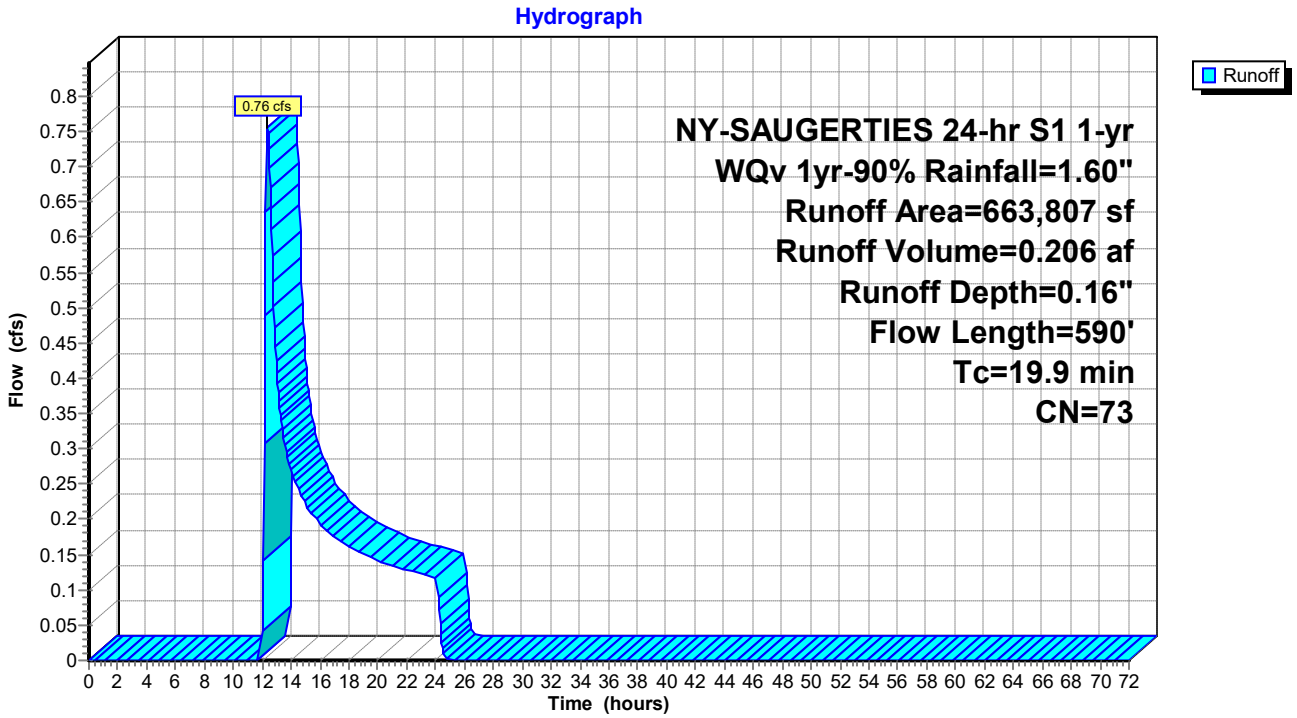
Runoff = 0.76 cfs @ 12.36 hrs, Volume= 0.206 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
663,807	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
663,807	73	Weighted Average
663,807		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.5	100	0.0500	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
5.4	490	0.0900	1.50		**Shallow Concentrated Flow,** Woodland Kv= 5.0 fps
19.9	590	Total			

Subcatchment 3: DRAINAGE AREA 3



Summary for Subcatchment 4: DRAINAGE AREA 4

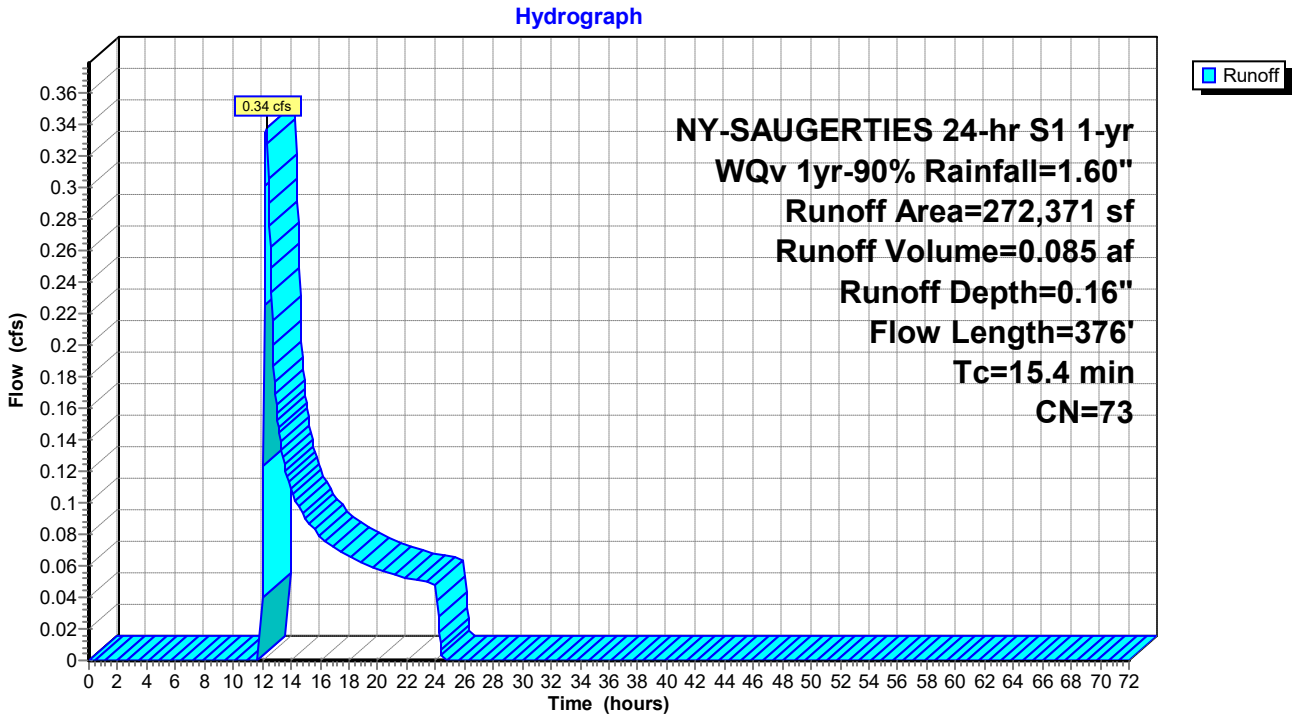
Runoff = 0.34 cfs @ 12.27 hrs, Volume= 0.085 af, Depth= 0.16"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

Area (sf)	CN	Description
0	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
272,371	73	Woods, Fair, HSG C
0	79	Woods, Fair, HSG D
272,371	73	Weighted Average
272,371		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
12.7	100	0.0700	0.13		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.7	276	0.1200	1.73		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
15.4	376	Total			

Subcatchment 4: DRAINAGE AREA 4



Summary for Subcatchment 5: DRAINAGE AREA 5

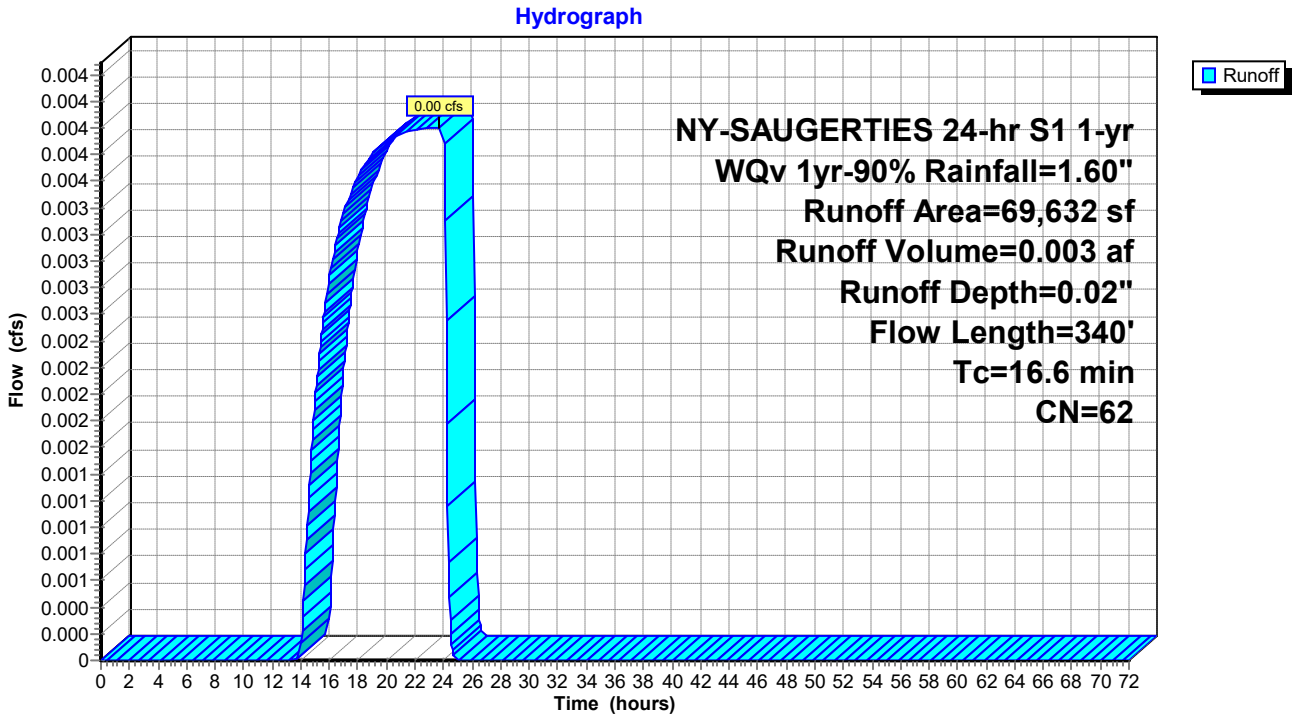
Runoff = 0.00 cfs @ 23.64 hrs, Volume= 0.003 af, Depth= 0.02"

Runoff by SCS TR-20 method, UH=SCS, Weighted-CN, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
NY-SAUGERTIES 24-hr S1 1-yr WQv 1yr-90% Rainfall=1.60"

Area (sf)	CN	Description
27,631	36	Woods, Fair, HSG A
0	60	Woods, Fair, HSG B
0	73	Woods, Fair, HSG C
42,001	79	Woods, Fair, HSG D
69,632	62	Weighted Average
69,632		100.00% Pervious Area

Tc (min)	Length (feet)	Slope (ft/ft)	Velocity (ft/sec)	Capacity (cfs)	Description
14.0	100	0.0540	0.12		**Sheet Flow, A-B** Woods: Light underbrush n= 0.400 P2= 3.38"
2.6	240	0.0930	1.52		**Shallow Concentrated Flow, B-C** Woodland Kv= 5.0 fps
16.6	340	Total			

Subcatchment 5: DRAINAGE AREA 5



Summary for Pond AC1: ARCH CULVERT

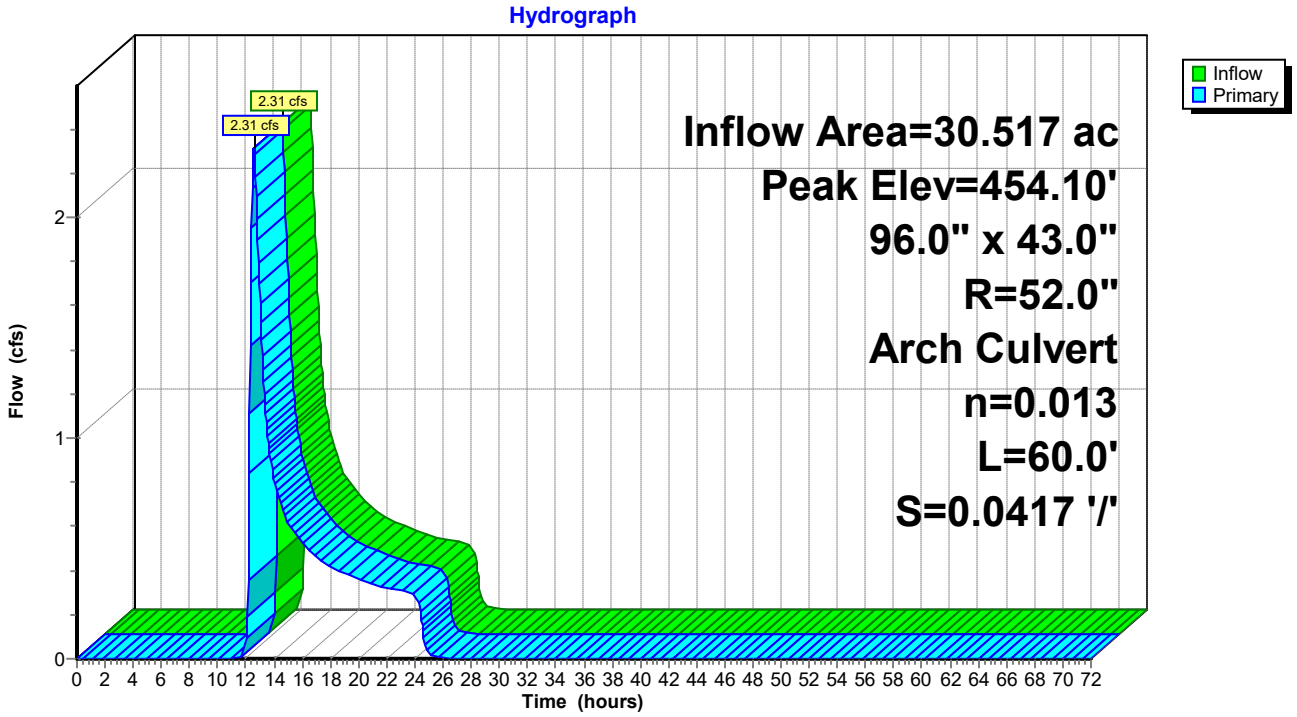
Inflow Area = 30.517 ac, 3.65% Impervious, Inflow Depth = 0.23" for WQv 1yr-90% event
Inflow = 2.31 cfs @ 12.58 hrs, Volume= 0.592 af
Outflow = 2.31 cfs @ 12.58 hrs, Volume= 0.592 af, Atten= 0%, Lag= 0.0 min
Primary = 2.31 cfs @ 12.58 hrs, Volume= 0.592 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 454.10' @ 12.58 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	453.90'	**96.0" W x 43.0" H, R=52.0" Arch Culvert** L= 60.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 453.90' / 451.40' S= 0.0417 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 22.75 sf

Primary OutFlow Max=2.30 cfs @ 12.58 hrs HW=454.10' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.30 cfs @ 1.44 fps)

Pond AC1: ARCH CULVERT



Summary for Pond AC2: ARCH CULVERT

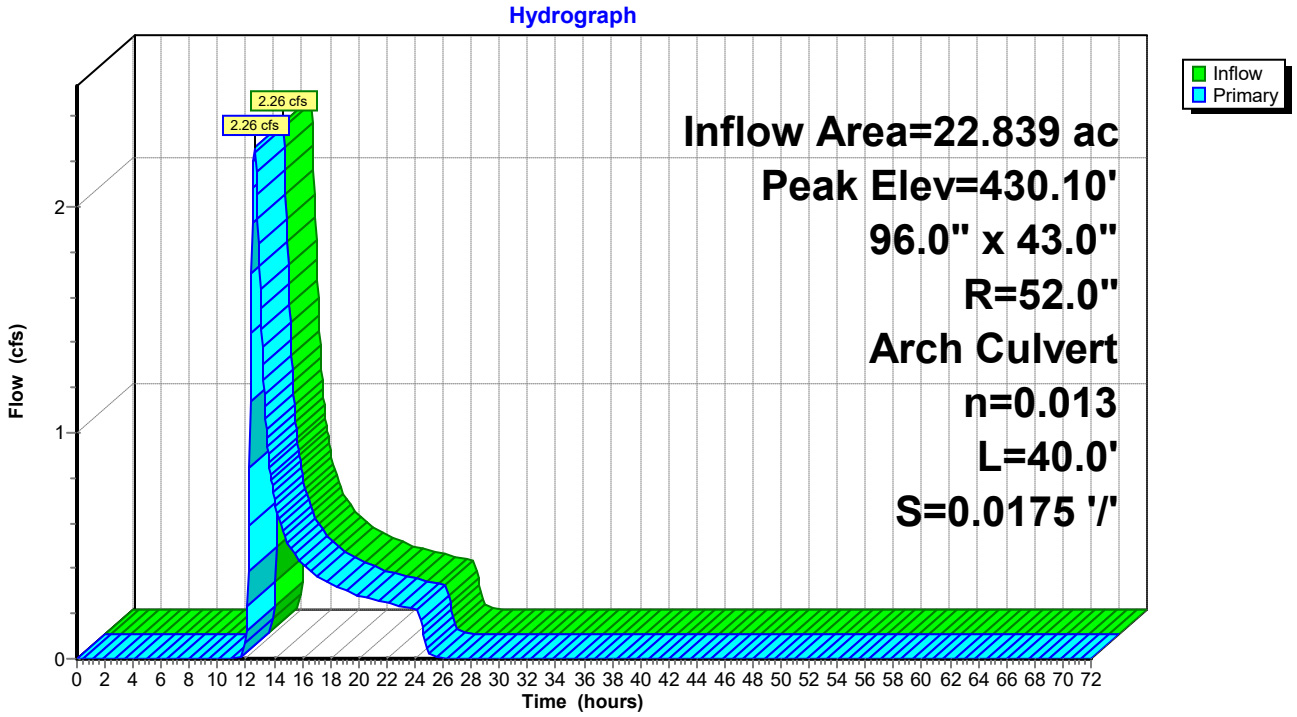
Inflow Area = 22.839 ac, 1.66% Impervious, Inflow Depth = 0.26" for WQv 1yr-90% event
Inflow = 2.26 cfs @ 12.63 hrs, Volume= 0.503 af
Outflow = 2.26 cfs @ 12.63 hrs, Volume= 0.503 af, Atten= 0%, Lag= 0.0 min
Primary = 2.26 cfs @ 12.63 hrs, Volume= 0.503 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 430.10' @ 12.63 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	429.90'	**96.0" W x 43.0" H, R=52.0" Arch Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 429.90' / 429.20' S= 0.0175 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 22.75 sf

Primary OutFlow Max=2.24 cfs @ 12.63 hrs HW=430.10' (Free Discharge)
└**1=Culvert** (Inlet Controls 2.24 cfs @ 1.43 fps)

Pond AC2: ARCH CULVERT



Summary for Pond BR1-C7: BIO-RET POND 1

Inflow Area = 4.967 ac, 10.94% Impervious, Inflow Depth = 0.26" for WQv 1yr-90% event
Inflow = 0.38 cfs @ 12.50 hrs, Volume= 0.107 af
Outflow = 0.38 cfs @ 12.51 hrs, Volume= 0.107 af, Atten= 0%, Lag= 0.8 min
Primary = 0.38 cfs @ 12.51 hrs, Volume= 0.107 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 477.08' @ 12.51 hrs Surf.Area= 330 sf Storage= 256 cf

Plug-Flow detention time= 71.5 min calculated for 0.107 af (100% of inflow)
Center-of-Mass det. time= 71.0 min (1,035.0 - 964.0)

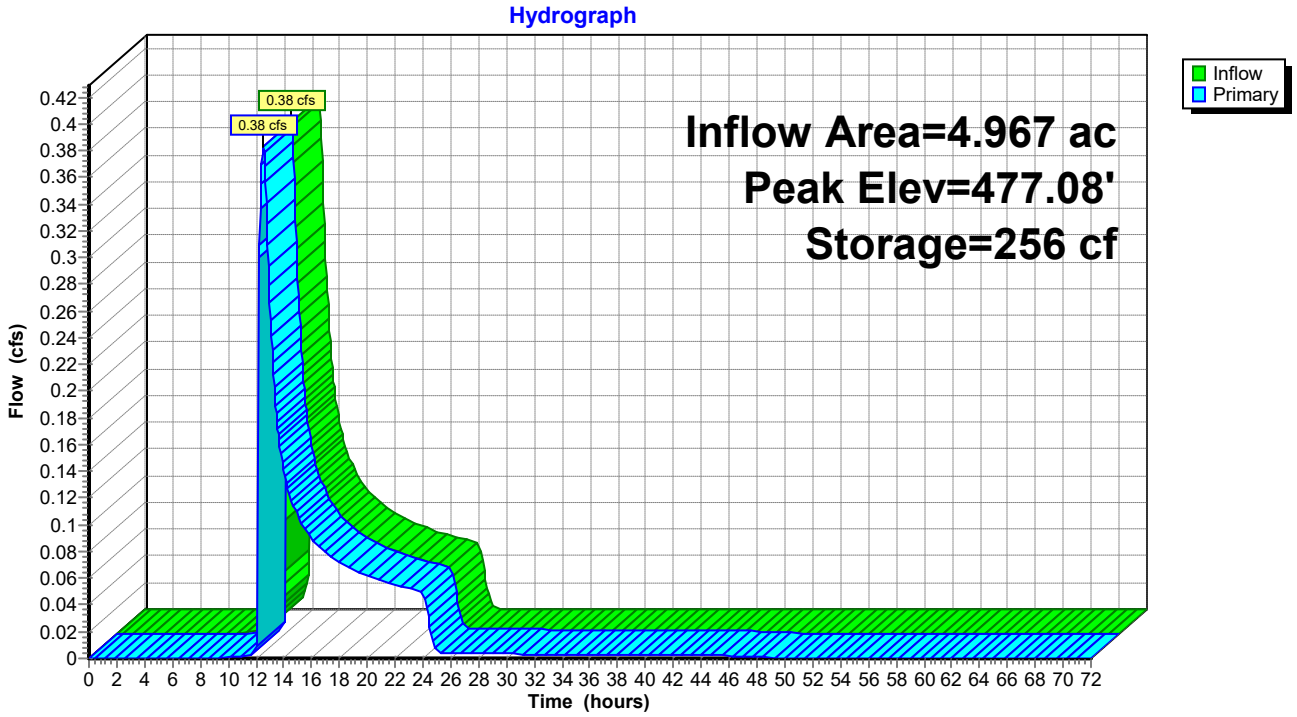
Volume	Invert	Avail.Storage	Storage Description
#1	476.00'	2,275 cf	**Custom Stage Data (Conic)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
476.00	154	0	0	154
478.00	531	647	647	551
480.00	1,134	1,627	2,275	1,187

Device	Routing	Invert	Outlet Devices
#1	Primary	474.00'	**18.0" Round Culvert** L= 280.0' CMP, projecting, no headwall, Ke= 0.900 Inlet / Outlet Invert= 474.00' / 470.00' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	477.00'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	476.00'	**0.500 in/hr Exfiltration over Wetted area above 474.00'** Conductivity to Groundwater Elevation = 446.00' Excluded Wetted area = 0 sf

Primary OutFlow Max=0.38 cfs @ 12.51 hrs HW=477.08' (Free Discharge)
└─**1=Culvert** (Passes 0.38 cfs of 10.26 cfs potential flow)
  ├─**2=Orifice/Grate** (Weir Controls 0.37 cfs @ 0.95 fps)
  └─**3=Exfiltration** (Controls 0.00 cfs)

Pond BR1-C7: BIO-RET POND 1



Summary for Pond BR2-C14: BIO-RET POND 2

Inflow Area = 2.923 ac, 12.07% Impervious, Inflow Depth = 0.39" for WQv 1yr-90% event
Inflow = 0.98 cfs @ 12.10 hrs, Volume= 0.096 af
Outflow = 0.04 cfs @ 21.57 hrs, Volume= 0.096 af, Atten= 96%, Lag= 568.3 min
Primary = 0.04 cfs @ 21.57 hrs, Volume= 0.096 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 456.71' @ 21.57 hrs Surf.Area= 3,561 sf Storage= 2,353 cf

Plug-Flow detention time= 638.4 min calculated for 0.096 af (100% of inflow)
Center-of-Mass det. time= 638.8 min (1,556.3 - 917.5)

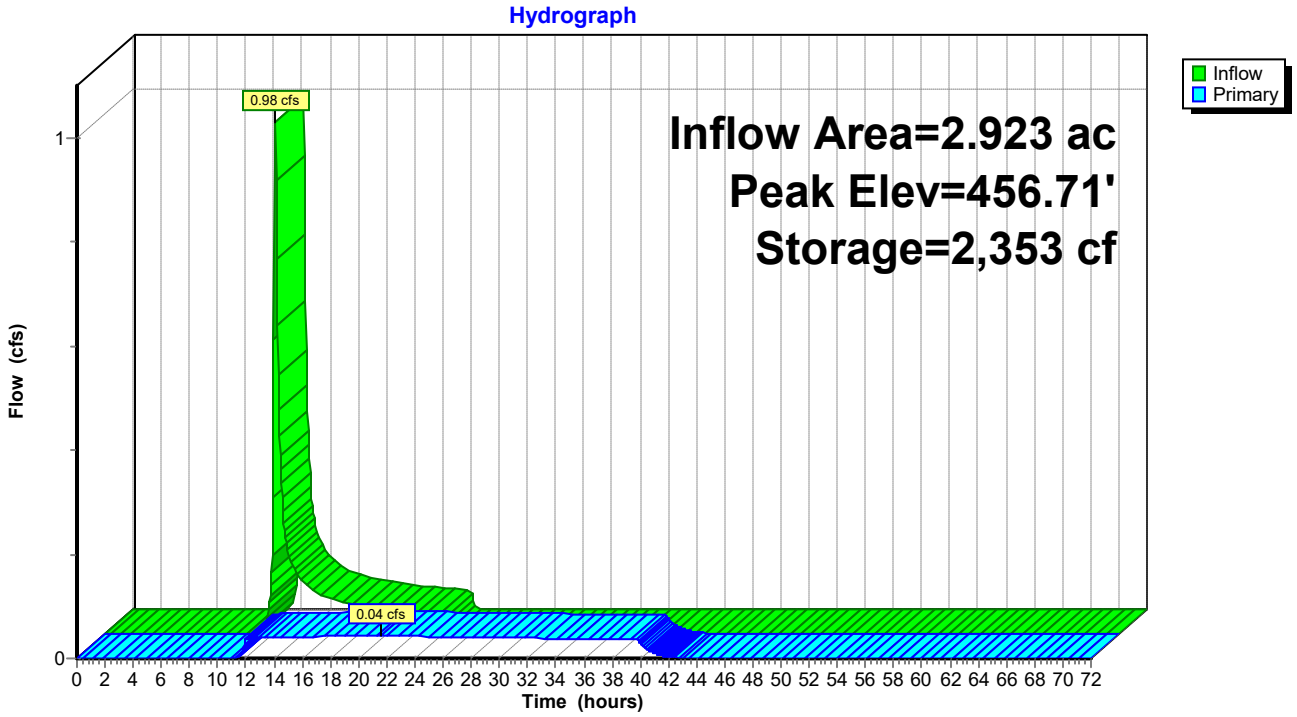
Volume	Invert	Avail.Storage	Storage Description
#1	456.00'	18,159 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
456.00	3,090	217.0	0	0	3,090
458.00	4,505	254.7	7,551	7,551	4,582
460.00	6,146	292.4	10,609	18,159	6,312

Device	Routing	Invert	Outlet Devices
#1	Primary	454.00'	**18.0" Round Culvert** L= 38.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 454.00' / 452.00' S= 0.0526 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf
#2	Device 1	457.50'	**18.0" Horiz. Orifice/Grate** C= 0.600 Limited to weir flow at low heads
#3	Device 1	456.00'	**0.500 in/hr Exfiltration over Surface area** Conductivity to Groundwater Elevation = 432.00'

Primary OutFlow Max=0.04 cfs @ 21.57 hrs HW=456.71' (Free Discharge)
└─**1=Culvert** (Passes 0.04 cfs of 11.91 cfs potential flow)
  ├─**2=Orifice/Grate** (Controls 0.00 cfs)
  └─**3=Exfiltration** (Controls 0.04 cfs)

Pond BR2-C14: BIO-RET POND 2



Summary for Pond C1: 24" CULVERT

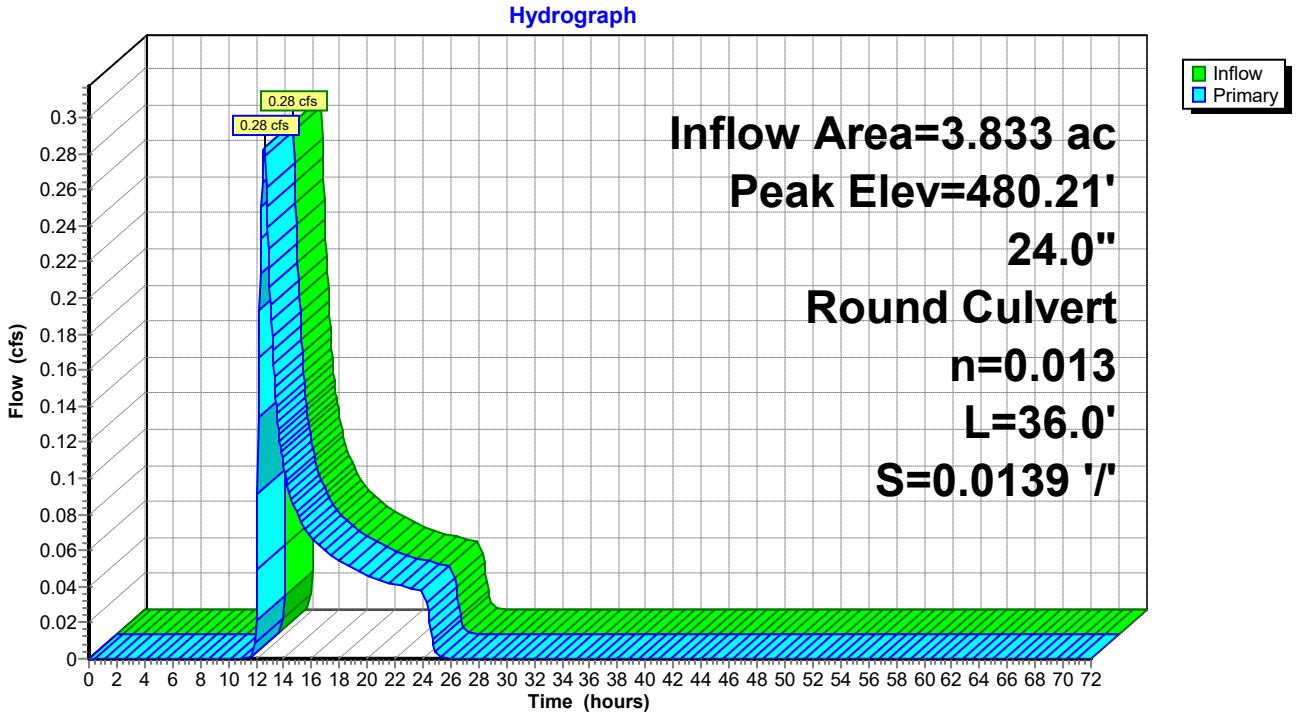
Inflow Area = 3.833 ac, 9.00% Impervious, Inflow Depth = 0.24" for WQv 1yr-90% event
Inflow = 0.28 cfs @ 12.60 hrs, Volume= 0.077 af
Outflow = 0.28 cfs @ 12.60 hrs, Volume= 0.077 af, Atten= 0%, Lag= 0.0 min
Primary = 0.28 cfs @ 12.60 hrs, Volume= 0.077 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 480.21' @ 12.60 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	480.00'	**24.0" Round Culvert** L= 36.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 480.00' / 479.50' S= 0.0139 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=0.28 cfs @ 12.60 hrs HW=480.21' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.28 cfs @ 1.57 fps)

Pond C1: 24" CULVERT



Summary for Pond C10: 15" CULVERT

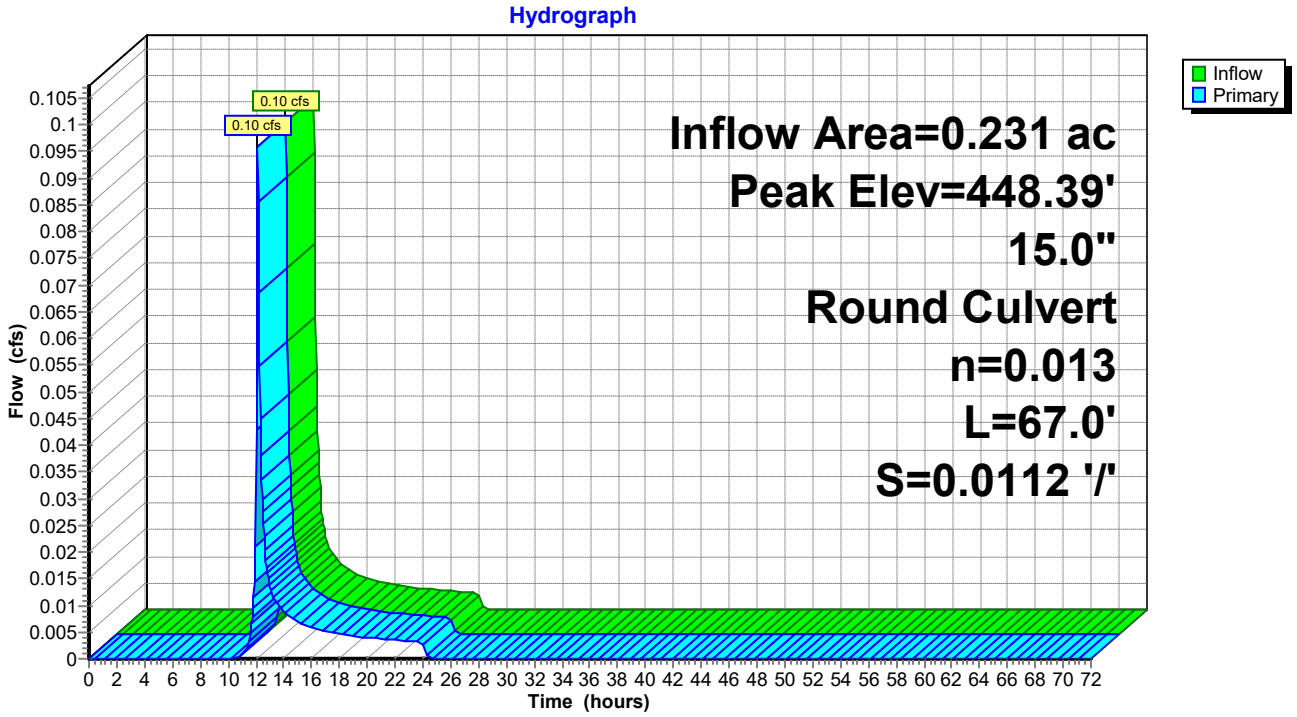
Inflow Area = 0.231 ac, 17.03% Impervious, Inflow Depth = 0.44" for WQv 1yr-90% event
Inflow = 0.10 cfs @ 12.11 hrs, Volume= 0.008 af
Outflow = 0.10 cfs @ 12.11 hrs, Volume= 0.008 af, Atten= 0%, Lag= 0.0 min
Primary = 0.10 cfs @ 12.11 hrs, Volume= 0.008 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 448.39' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	448.25'	**15.0" Round Culvert** L= 67.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 448.25' / 447.50' S= 0.0112 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.23 sf

Primary OutFlow Max=0.09 cfs @ 12.11 hrs HW=448.39' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.09 cfs @ 1.92 fps)

Pond C10: 15" CULVERT



Summary for Pond C11: 12" CULVERT

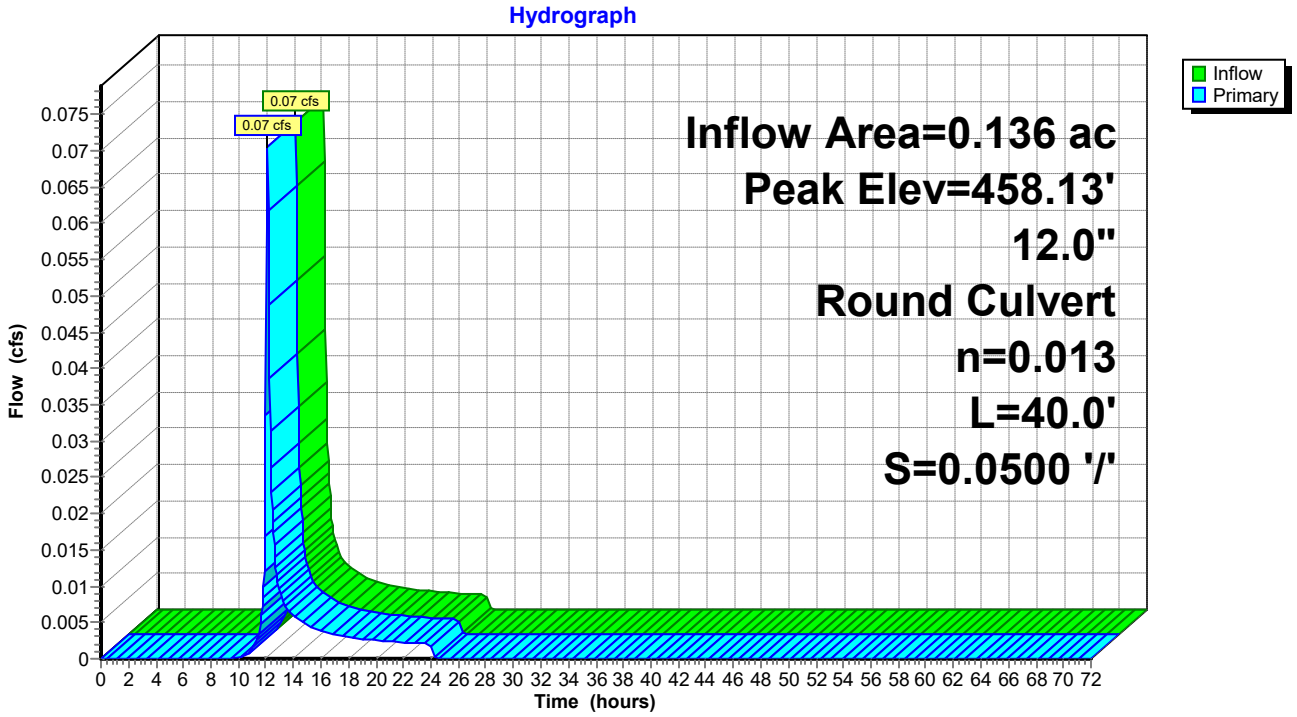
Inflow Area = 0.136 ac, 29.70% Impervious, Inflow Depth = 0.52" for WQv 1yr-90% event
Inflow = 0.07 cfs @ 12.10 hrs, Volume= 0.006 af
Outflow = 0.07 cfs @ 12.10 hrs, Volume= 0.006 af, Atten= 0%, Lag= 0.0 min
Primary = 0.07 cfs @ 12.10 hrs, Volume= 0.006 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 458.13' @ 12.10 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	458.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 458.00' / 456.00' S= 0.0500 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.07 cfs @ 12.10 hrs HW=458.13' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.07 cfs @ 1.21 fps)

Pond C11: 12" CULVERT



Summary for Pond C12: 24" CULVERT

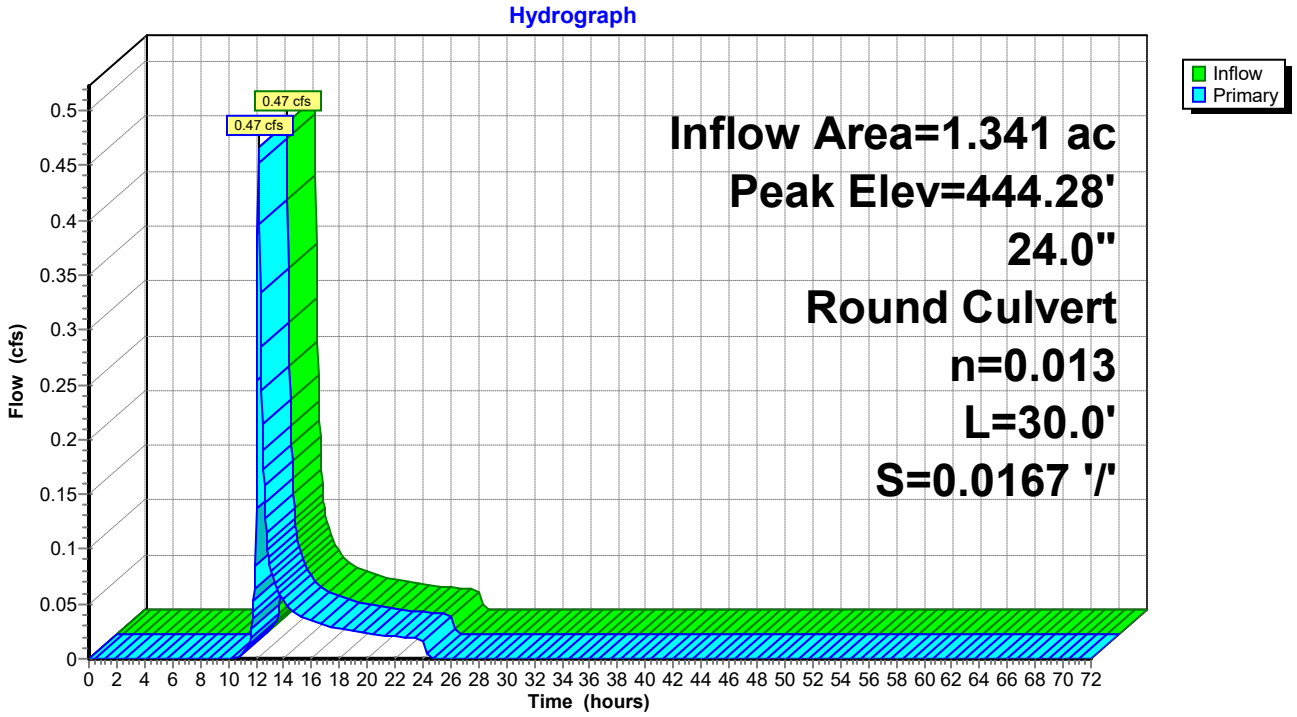
Inflow Area = 1.341 ac, 18.29% Impervious, Inflow Depth = 0.44" for WQv 1yr-90% event
Inflow = 0.47 cfs @ 12.17 hrs, Volume= 0.049 af
Outflow = 0.47 cfs @ 12.17 hrs, Volume= 0.049 af, Atten= 0%, Lag= 0.0 min
Primary = 0.47 cfs @ 12.17 hrs, Volume= 0.049 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 444.28' @ 12.17 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	444.00'	**24.0" Round Culvert** L= 30.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 444.00' / 443.50' S= 0.0167 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=0.46 cfs @ 12.17 hrs HW=444.27' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.46 cfs @ 1.78 fps)

Pond C12: 24" CULVERT



Summary for Pond C13: 18" CULVERT

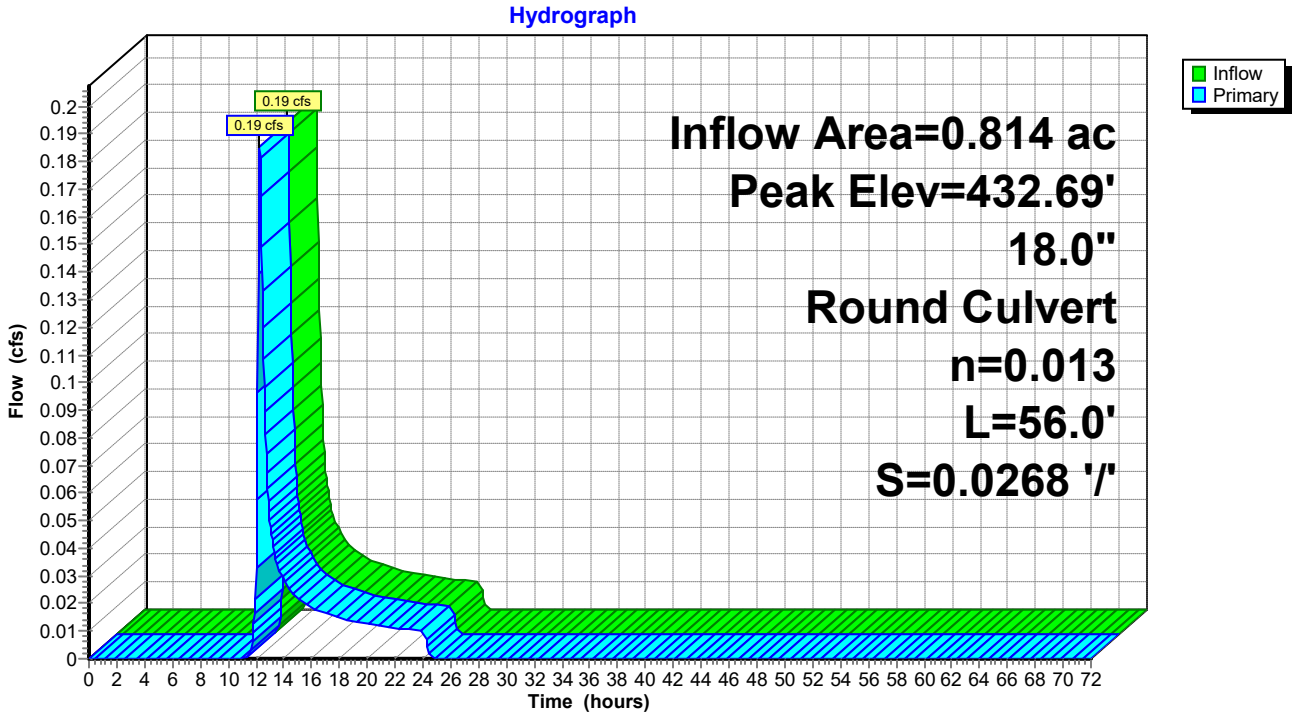
Inflow Area = 0.814 ac, 7.82% Impervious, Inflow Depth = 0.37" for WQv 1yr-90% event
Inflow = 0.19 cfs @ 12.27 hrs, Volume= 0.025 af
Outflow = 0.19 cfs @ 12.27 hrs, Volume= 0.025 af, Atten= 0%, Lag= 0.0 min
Primary = 0.19 cfs @ 12.27 hrs, Volume= 0.025 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 432.69' @ 12.27 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	432.50'	**18.0" Round Culvert** L= 56.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 432.50' / 431.00' S= 0.0268 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 1.77 sf

Primary OutFlow Max=0.18 cfs @ 12.27 hrs HW=432.69' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.18 cfs @ 1.46 fps)

Pond C13: 18" CULVERT



Summary for Pond C2: 12" CULVERT

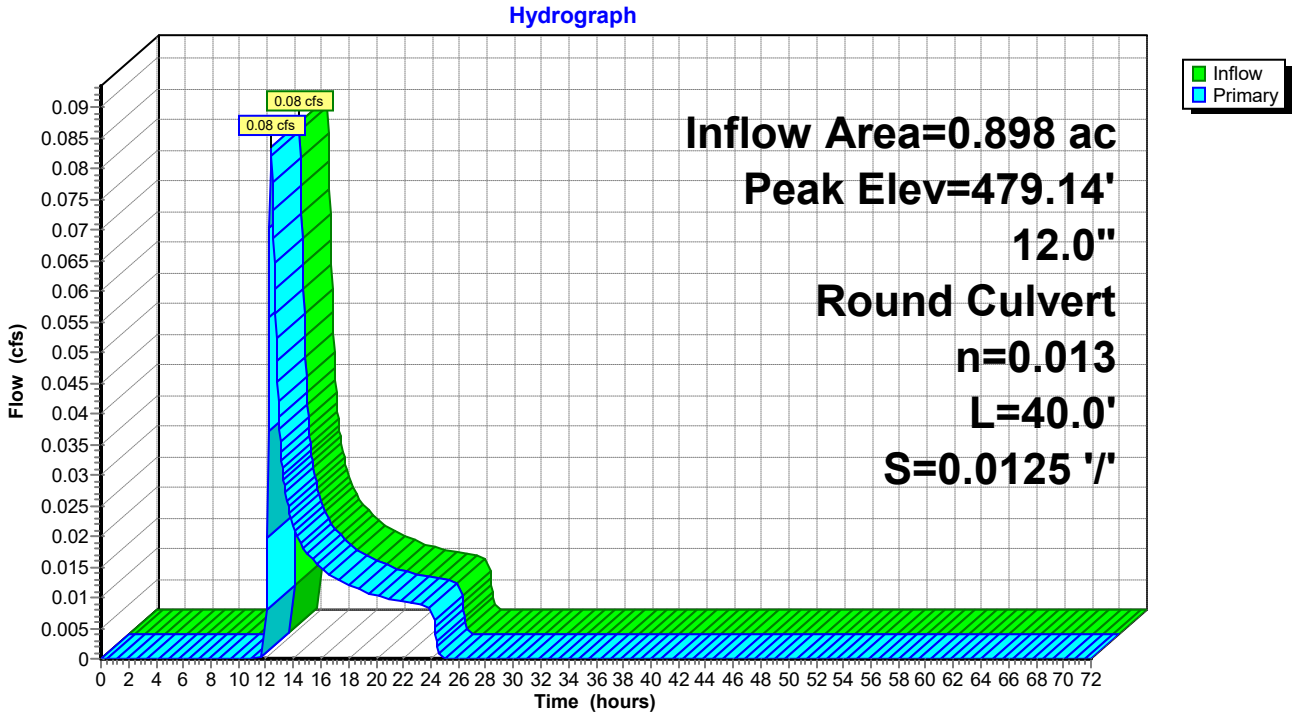
Inflow Area = 0.898 ac, 9.78% Impervious, Inflow Depth = 0.23" for WQv 1yr-90% event
Inflow = 0.08 cfs @ 12.36 hrs, Volume= 0.017 af
Outflow = 0.08 cfs @ 12.36 hrs, Volume= 0.017 af, Atten= 0%, Lag= 0.0 min
Primary = 0.08 cfs @ 12.36 hrs, Volume= 0.017 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.14' @ 12.36 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.08 cfs @ 12.36 hrs HW=479.14' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.08 cfs @ 1.27 fps)

Pond C2: 12" CULVERT



Summary for Pond C3: 12" CULVERT

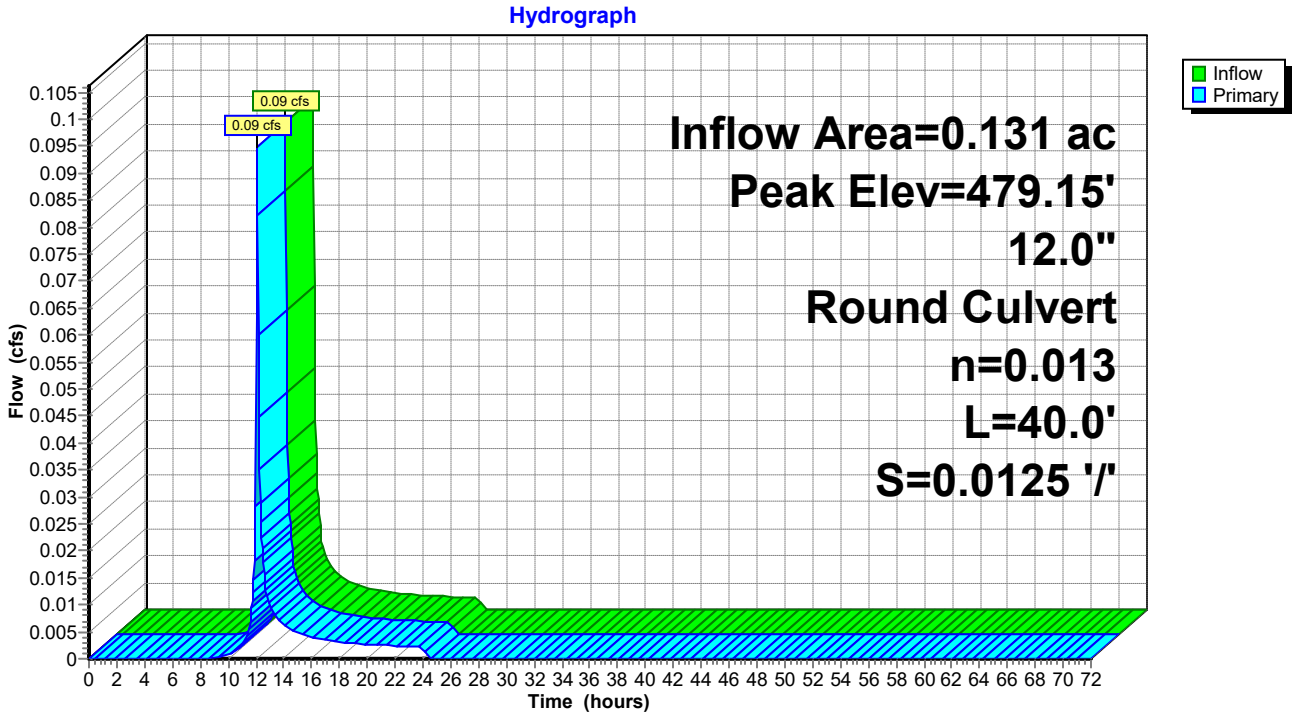
Inflow Area = 0.131 ac, 41.51% Impervious, Inflow Depth = 0.61" for WQv 1yr-90% event
Inflow = 0.09 cfs @ 12.06 hrs, Volume= 0.007 af
Outflow = 0.09 cfs @ 12.06 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min
Primary = 0.09 cfs @ 12.06 hrs, Volume= 0.007 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.15' @ 12.06 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 40.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0125 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.09 cfs @ 12.06 hrs HW=479.14' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.09 cfs @ 1.30 fps)

Pond C3: 12" CULVERT



Summary for Pond C4: 12" CULVERT

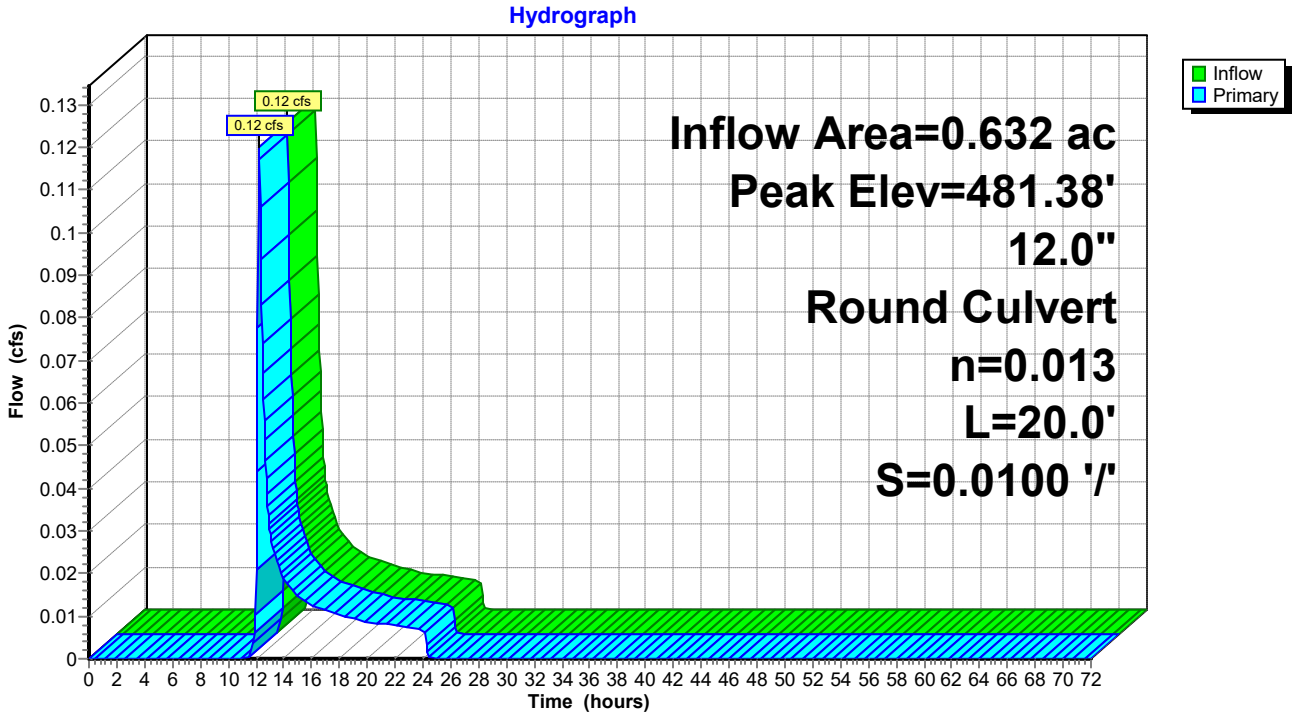
Inflow Area = 0.632 ac, 19.67% Impervious, Inflow Depth = 0.31" for WQv 1yr-90% event
Inflow = 0.12 cfs @ 12.22 hrs, Volume= 0.016 af
Outflow = 0.12 cfs @ 12.22 hrs, Volume= 0.016 af, Atten= 0%, Lag= 0.0 min
Primary = 0.12 cfs @ 12.22 hrs, Volume= 0.016 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 481.38' @ 12.22 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	481.20'	**12.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 481.20' / 481.00' S= 0.0100 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.12 cfs @ 12.22 hrs HW=481.38' (Free Discharge)
└**1=Culvert** (Barrel Controls 0.12 cfs @ 1.92 fps)

Pond C4: 12" CULVERT



Summary for Pond C5: 12" CULVERT

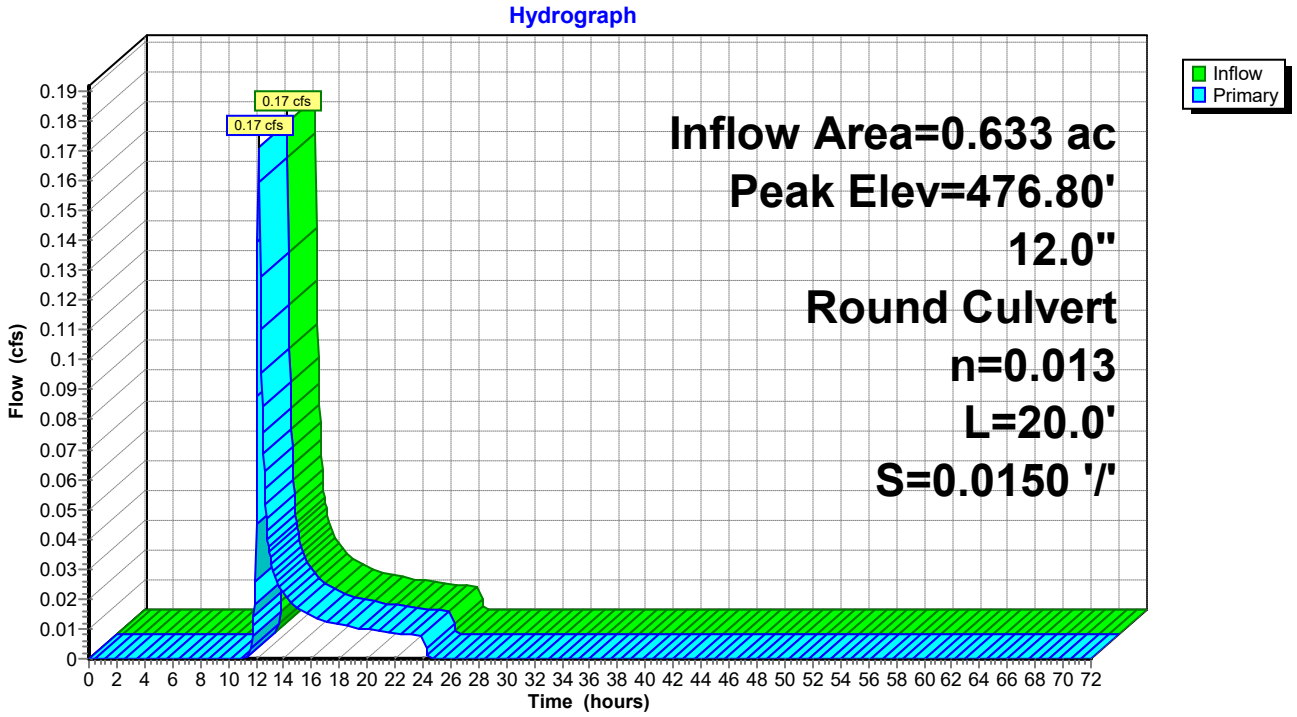
Inflow Area = 0.633 ac, 10.31% Impervious, Inflow Depth = 0.37" for WQv 1yr-90% event
Inflow = 0.17 cfs @ 12.18 hrs, Volume= 0.019 af
Outflow = 0.17 cfs @ 12.18 hrs, Volume= 0.019 af, Atten= 0%, Lag= 0.0 min
Primary = 0.17 cfs @ 12.18 hrs, Volume= 0.019 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 476.80' @ 12.18 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	476.60'	**12.0" Round Culvert** L= 20.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 476.60' / 476.30' S= 0.0150 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.17 cfs @ 12.18 hrs HW=476.80' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.17 cfs @ 1.52 fps)

Pond C5: 12" CULVERT



Summary for Pond C6: 24" CULVERT

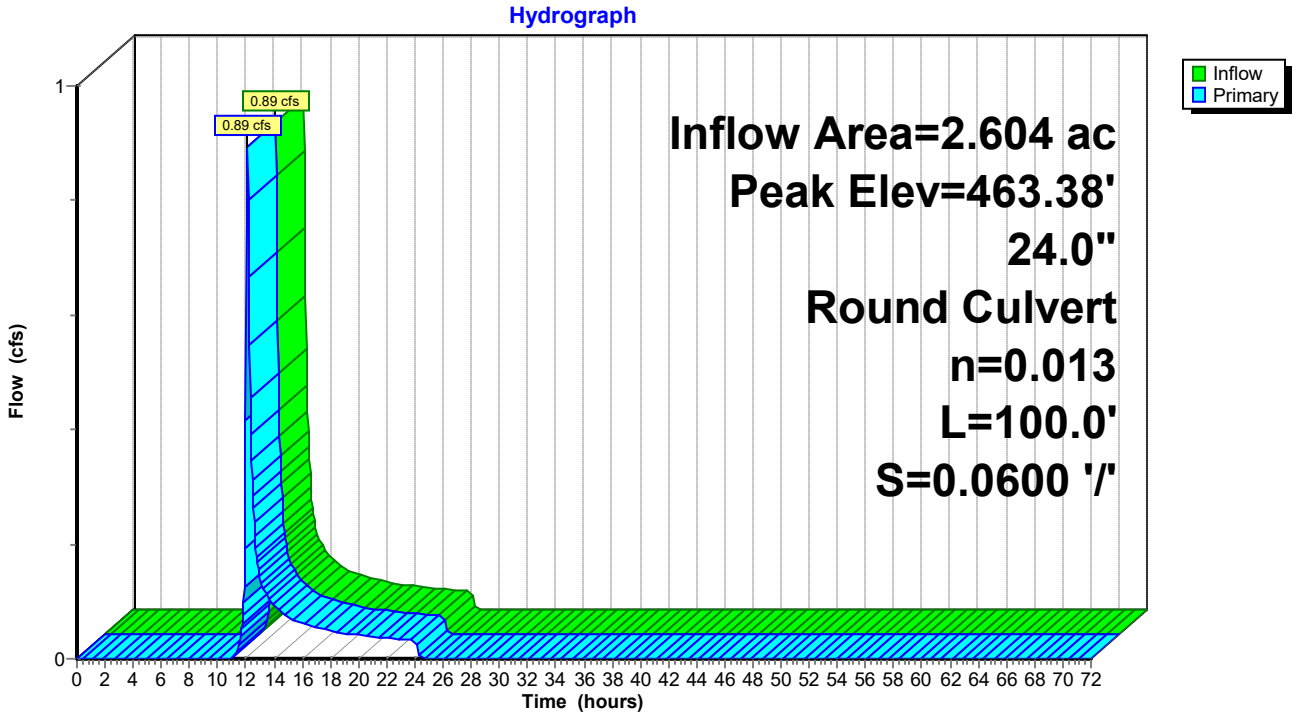
Inflow Area = 2.604 ac, 11.94% Impervious, Inflow Depth = 0.39" for WQv 1yr-90% event
Inflow = 0.89 cfs @ 12.11 hrs, Volume= 0.085 af
Outflow = 0.89 cfs @ 12.11 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min
Primary = 0.89 cfs @ 12.11 hrs, Volume= 0.085 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 463.38' @ 12.11 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	463.00'	**24.0" Round Culvert** L= 100.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 463.00' / 457.00' S= 0.0600 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 3.14 sf

Primary OutFlow Max=0.88 cfs @ 12.11 hrs HW=463.38' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.88 cfs @ 2.10 fps)

Pond C6: 24" CULVERT



Summary for Pond C8: 12" CULVERT

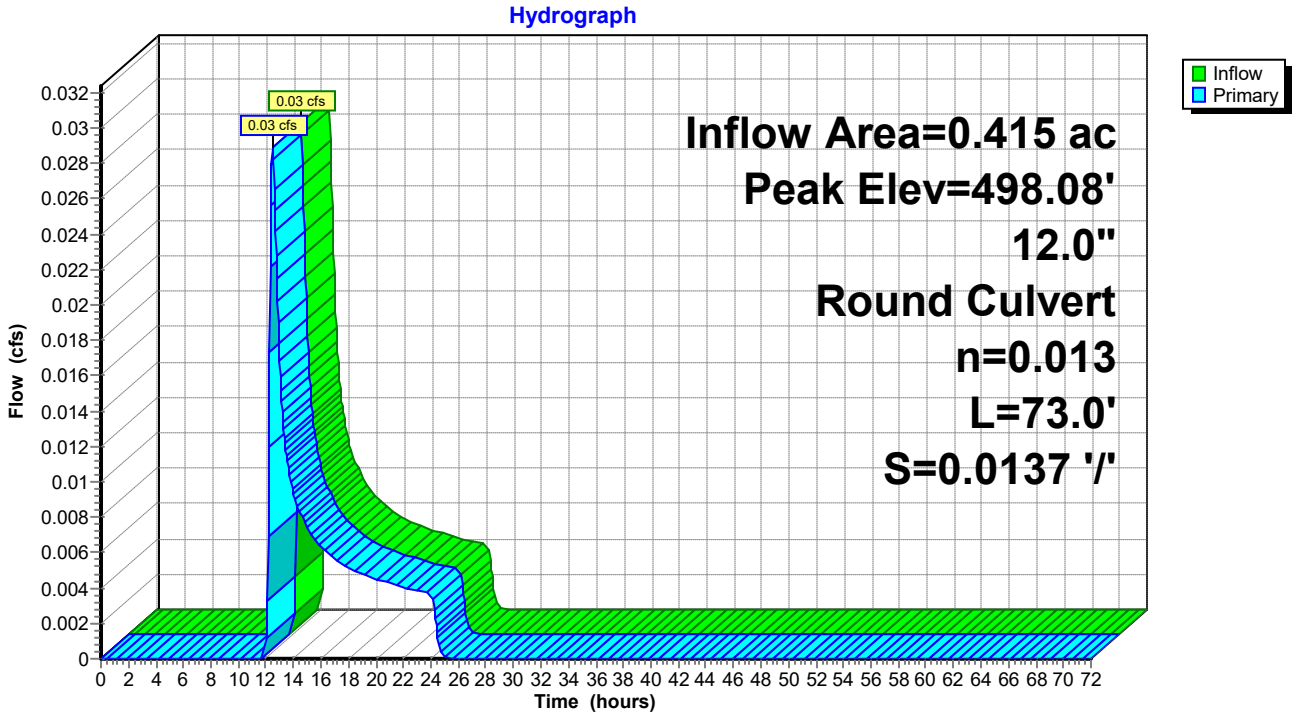
Inflow Area = 0.415 ac, 6.10% Impervious, Inflow Depth = 0.20" for WQv 1yr-90% event
Inflow = 0.03 cfs @ 12.47 hrs, Volume= 0.007 af
Outflow = 0.03 cfs @ 12.47 hrs, Volume= 0.007 af, Atten= 0%, Lag= 0.0 min
Primary = 0.03 cfs @ 12.47 hrs, Volume= 0.007 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 498.08' @ 12.47 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	498.00'	**12.0" Round Culvert** L= 73.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 498.00' / 497.00' S= 0.0137 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.03 cfs @ 12.47 hrs HW=498.08' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.03 cfs @ 0.97 fps)

Pond C8: 12" CULVERT



Summary for Pond C9: 12" CULVERT

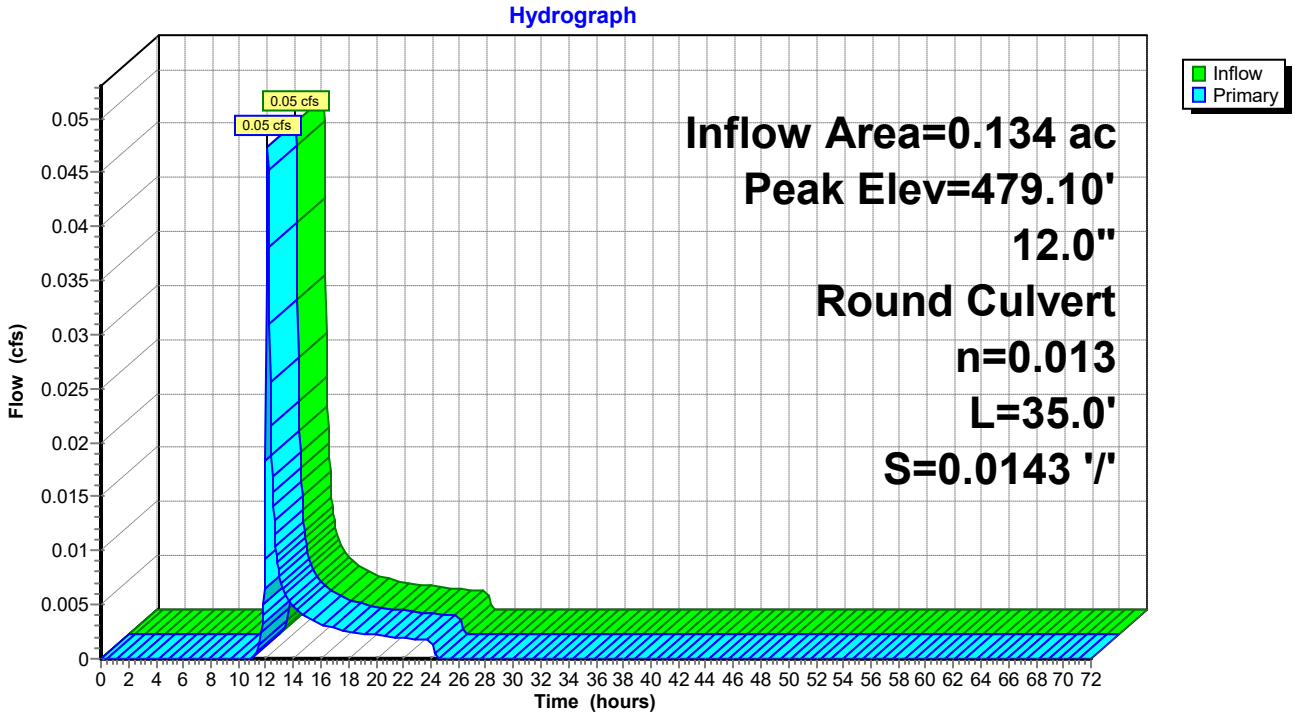
Inflow Area = 0.134 ac, 14.23% Impervious, Inflow Depth = 0.40" for WQv 1yr-90% event
Inflow = 0.05 cfs @ 12.12 hrs, Volume= 0.004 af
Outflow = 0.05 cfs @ 12.12 hrs, Volume= 0.004 af, Atten= 0%, Lag= 0.0 min
Primary = 0.05 cfs @ 12.12 hrs, Volume= 0.004 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 479.10' @ 12.12 hrs

Device	Routing	Invert	Outlet Devices
#1	Primary	479.00'	**12.0" Round Culvert** L= 35.0' CMP, square edge headwall, Ke= 0.500 Inlet / Outlet Invert= 479.00' / 478.50' S= 0.0143 '/' Cc= 0.900 n= 0.013 Corrugated PE, smooth interior, Flow Area= 0.79 sf

Primary OutFlow Max=0.05 cfs @ 12.12 hrs HW=479.10' (Free Discharge)
└**1=Culvert** (Inlet Controls 0.05 cfs @ 1.09 fps)

Pond C9: 12" CULVERT



Summary for Pond DP1: DRY POND 1

Inflow Area = 3.133 ac, 8.85% Impervious, Inflow Depth = 0.37" for WQv 1yr-90% event
Inflow = 0.82 cfs @ 12.20 hrs, Volume= 0.098 af
Outflow = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af, Atten= 100%, Lag= 0.0 min
Primary = 0.00 cfs @ 0.00 hrs, Volume= 0.000 af

Routing by Stor-Ind method, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs
Peak Elev= 437.31' @ 25.00 hrs Surf.Area= 2,590 sf Storage= 4,257 cf

Plug-Flow detention time= (not calculated: initial storage exceeds outflow)
Center-of-Mass det. time= (not calculated: no outflow)

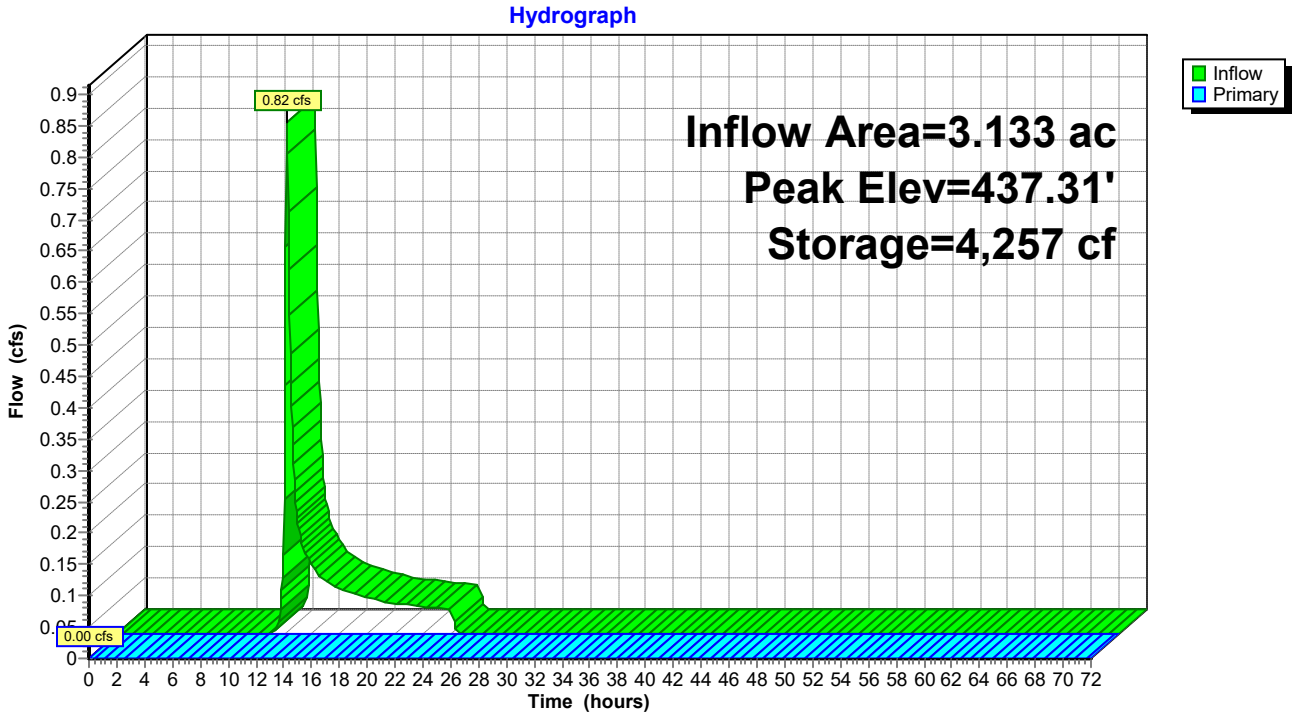
Volume	Invert	Avail.Storage	Storage Description
#1	434.00'	14,417 cf	**Custom Stage Data (Irregular)** Listed below (Recalc)

Elevation (feet)	Surf.Area (sq-ft)	Perim. (feet)	Inc.Store (cubic-feet)	Cum.Store (cubic-feet)	Wet.Area (sq-ft)
434.00	171	64.2	0	0	171
436.00	1,610	246.7	1,537	1,537	4,697
438.00	3,203	284.4	4,723	6,260	6,376
440.00	5,022	322.1	8,157	14,417	8,294

Device	Routing	Invert	Outlet Devices
#1	Primary	438.50'	**45.0 deg x 3.0' long Sharp-Crested Vee/Trap Weir** Cv= 2.56 (C= 3.20)

Primary OutFlow Max=0.00 cfs @ 0.00 hrs HW=434.00' (Free Discharge)
└**1=Sharp-Crested Vee/Trap Weir** (Controls 0.00 cfs)

Pond DP1: DRY POND 1

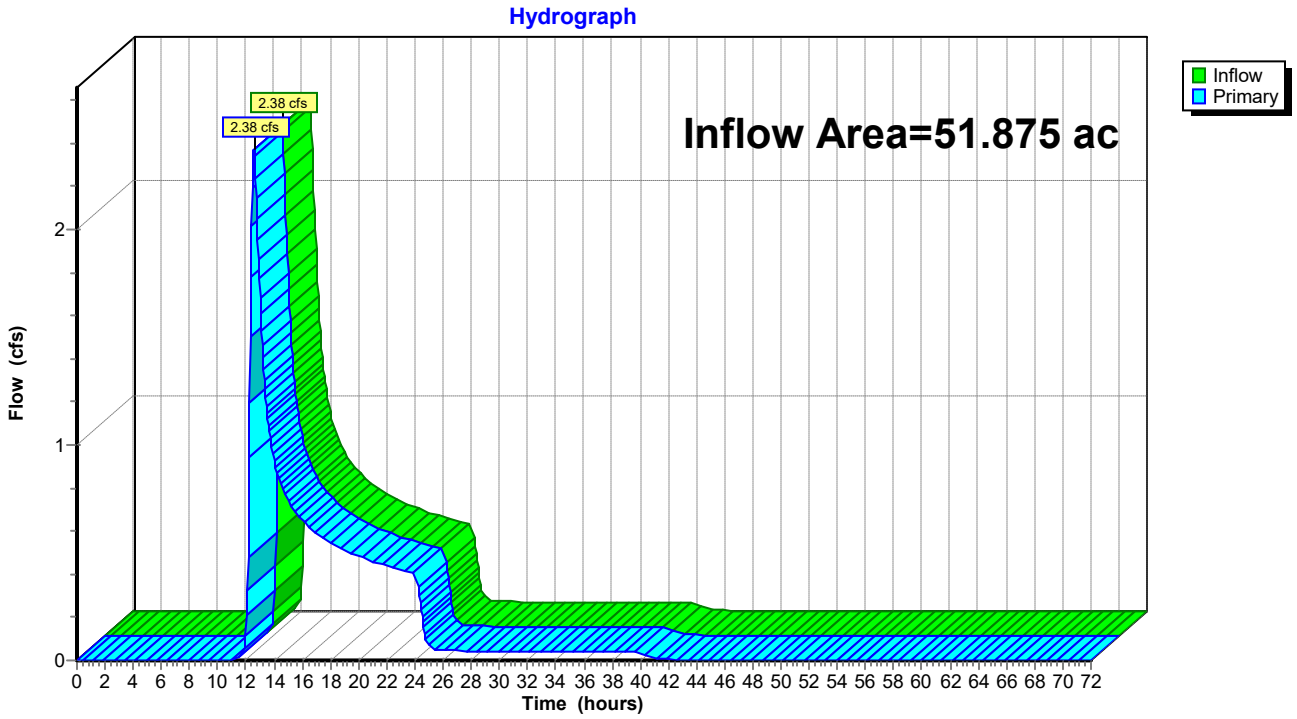


Summary for Link O1: OUT 1

Inflow Area = 51.875 ac, 3.67% Impervious, Inflow Depth = 0.18" for WQv 1yr-90% event
Inflow = 2.38 cfs @ 12.58 hrs, Volume= 0.767 af
Primary = 2.38 cfs @ 12.58 hrs, Volume= 0.767 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O1: OUT 1

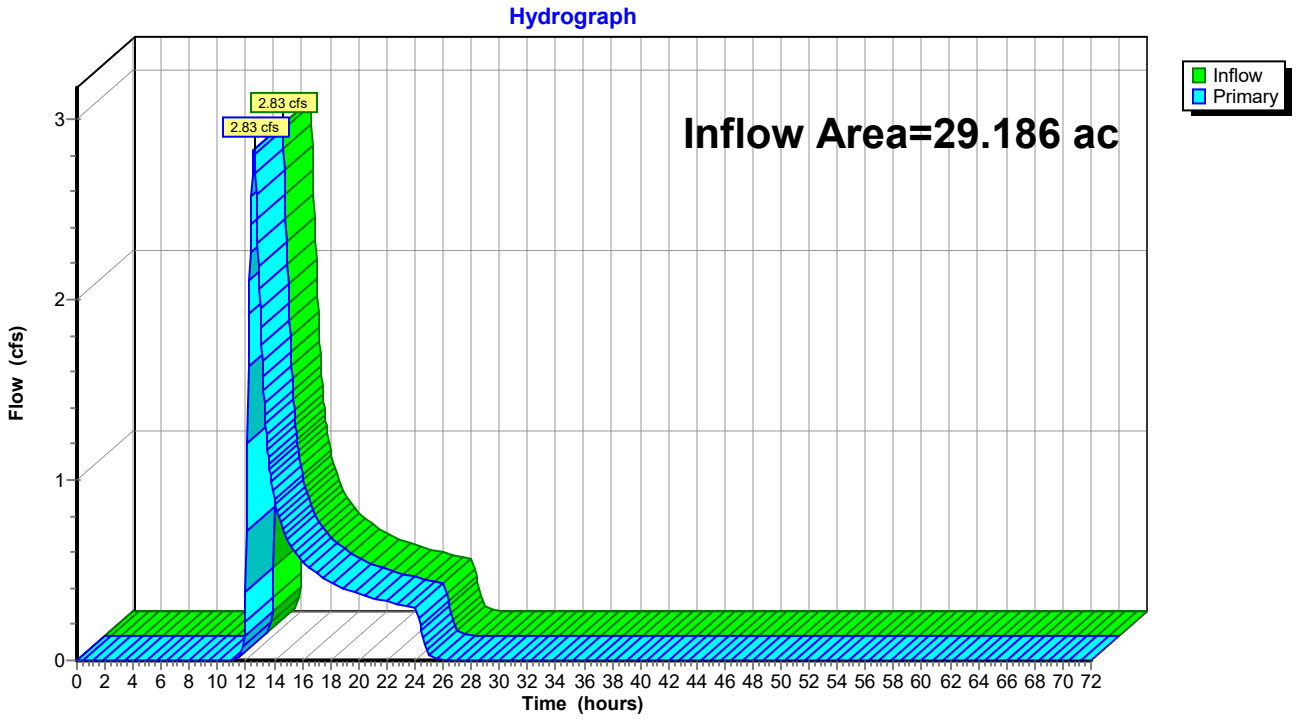


Summary for Link O2: OUT 2

Inflow Area = 29.186 ac, 3.50% Impervious, Inflow Depth = 0.28" for WQv 1yr-90% event
Inflow = 2.83 cfs @ 12.57 hrs, Volume= 0.674 af
Primary = 2.83 cfs @ 12.57 hrs, Volume= 0.674 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O2: OUT 2

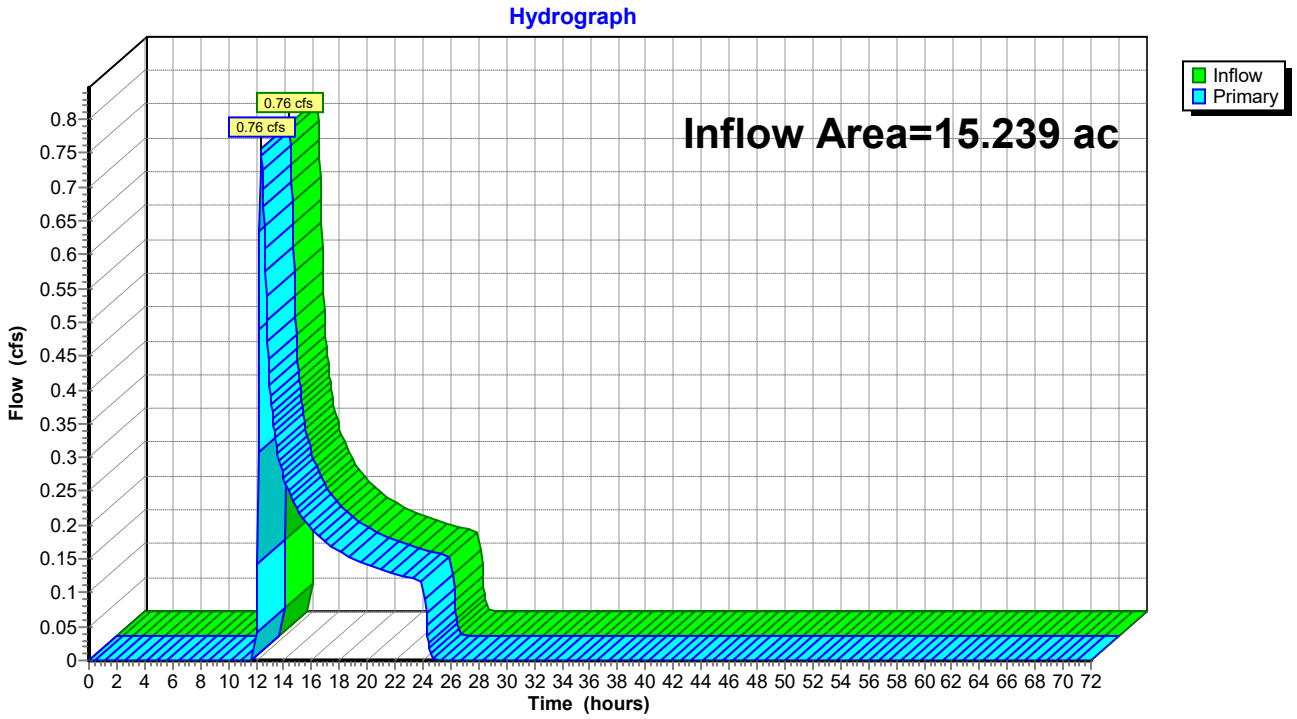


Summary for Link O3: OUT 3

Inflow Area = 15.239 ac, 0.00% Impervious, Inflow Depth = 0.16" for WQv 1yr-90% event
Inflow = 0.76 cfs @ 12.36 hrs, Volume= 0.206 af
Primary = 0.76 cfs @ 12.36 hrs, Volume= 0.206 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O3: OUT 3

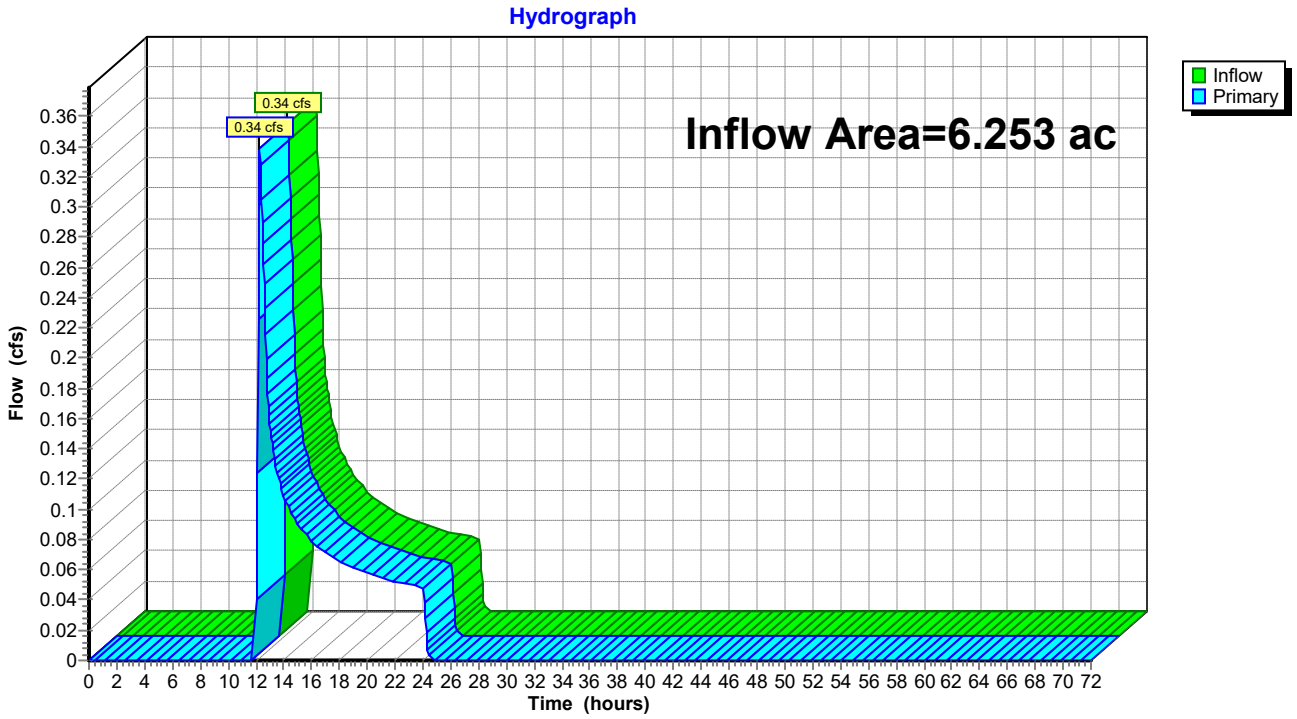


Summary for Link O4: OUT 4

Inflow Area = 6.253 ac, 0.00% Impervious, Inflow Depth = 0.16" for WQv 1yr-90% event
Inflow = 0.34 cfs @ 12.27 hrs, Volume= 0.085 af
Primary = 0.34 cfs @ 12.27 hrs, Volume= 0.085 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O4: OUT 4

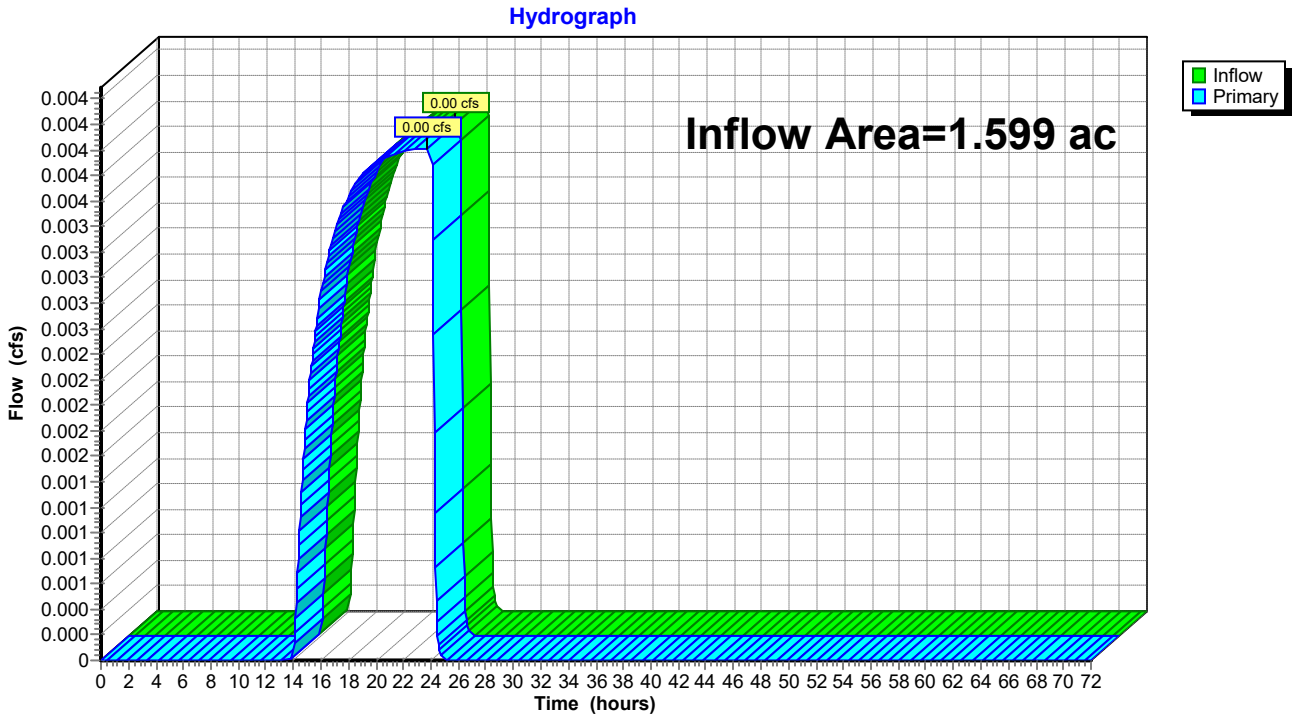


Summary for Link O5: OUT 5

Inflow Area = 1.599 ac, 0.00% Impervious, Inflow Depth = 0.02" for WQv 1yr-90% event
Inflow = 0.00 cfs @ 23.64 hrs, Volume= 0.003 af
Primary = 0.00 cfs @ 23.64 hrs, Volume= 0.003 af, Atten= 0%, Lag= 0.0 min

Primary outflow = Inflow, Time Span= 0.00-72.00 hrs, dt= 0.05 hrs

Link O5: OUT 5



APPENDIX 6

TEMPORARY EROSION AND SEDIEMNT CONTROL MEASURES

STANDARD AND SPECIFICATIONS FOR CONSTRUCTION ROAD STABILIZATION

Definition & Scope

The stabilization of temporary construction access routes, on-site vehicle transportation routes, and construction parking areas to control erosion on temporary construction routes and parking areas.

Conditions Where Practice Applies

All traffic routes and parking areas for temporary use by construction traffic.

Design Criteria

Construction roads should be located to reduce erosion potential, minimize impact on existing site resources, and maintain operations in a safe manner. Highly erosive soils, wet or rocky areas, and steep slopes should be avoided. Roads should be routed where seasonal water tables are deeper than 18 inches. Surface runoff and control should be in accordance with other standards.

Road Grade – A maximum grade of 12% is recommended, although grades up to 15% are possible for short distances.

Road Width – 12 foot minimum for one-way traffic or 24 foot minimum for two-way traffic.

Side Slope of Road Embankment – 2:1 or flatter.

Ditch Capacity – On-site roadside ditch and culvert capacities shall be the 10 yr. peak runoff.

Composition – Use a 6-inch layer of NYS DOT sub-base Types 1,2,3, 4 or equivalent as specified in NYSDOT Standard Specifications.

Construction Specifications

1. Clear and strip roadbed and parking areas of all vegetation, roots, and other objectionable material.

2. Locate parking areas on naturally flat areas as available. Keep grades sufficient for drainage, but not more than 2 to 3 percent.

3. Provide surface drainage and divert excess runoff to stabilized areas.

4. Maintain cut and fill slopes to 2:1 or flatter and stabilized with vegetation as soon as grading is accomplished.

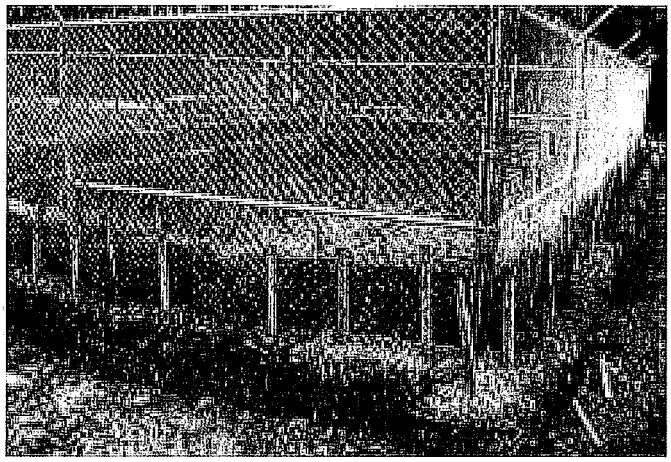
5. Spread 6-inch layer of sub-base material evenly over the full width of the road and smooth to avoid depressions.

6. Provide appropriate sediment control measures to prevent offsite sedimentation.

Maintenance

Inspect construction roads and parking areas periodically for condition of surface. Top dress with new gravel as needed. Check ditches for erosion and sedimentation after rainfall events. Maintain vegetation in a healthy, vigorous condition. Areas producing sediment should be treated immediately.

STANDARD AND SPECIFICATIONS FOR CONCRETE TRUCK WASHOUT



Definition & Scope

A temporary excavated or above ground lined constructed pit where concrete truck mixers and equipment can be washed after their loads have been discharged, to prevent highly alkaline runoff from entering storm drainage systems or leaching into soil.

Conditions Where Practice Applies

Washout facilities shall be provided for every project where concrete will be poured or otherwise formed on the site. This facility will receive highly alkaline wash water from the cleaning of chutes, mixers, hoppers, vibrators, placing equipment, trowels, and screeds. Under no circumstances will wash water from these operations be allowed to infiltrate into the soil or enter surface waters.

Design Criteria

Capacity: The washout facility should be sized to contain solids, wash water, and rainfall and sized to allow for the evaporation of the wash water and rainfall. Wash water shall be estimated at 7 gallons per chute and 50 gallons per hopper of the concrete pump truck and/or discharging drum. The minimum size shall be 8 feet by 8 feet at the bottom and 2 feet deep. If excavated, the side slopes shall be 2 horizontal to 1 vertical.

Location: Locate the facility a minimum of 100 feet from drainage swales, storm drain inlets, wetlands, streams and other surface waters. Prevent surface water from entering the structure except for the access road. Provide appropriate access with a gravel access road sloped down to the structure. Signs shall be placed to direct drivers to the facility after their load is discharged.

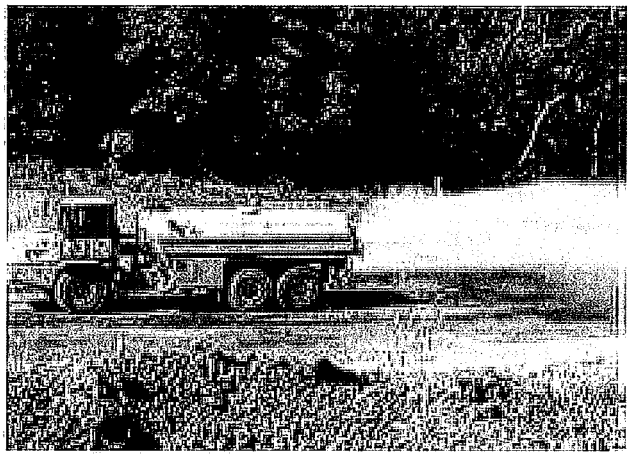
Liner: All washout facilities will be lined to prevent leaching of liquids into the ground. The liner shall be plastic sheeting with a minimum thickness of 10 mils with no holes or tears, and anchored beyond the top of the pit with an earthen berm, sand bags, stone, or other structural appurtenance except at the access point.

If pre-fabricated washouts are used they must ensure the capture and containment of the concrete wash and be sized based on the expected frequency of concrete pours. They shall be sited as noted in the location criteria.

Maintenance

- All concrete washout facilities shall be inspected daily. Damaged or leaking facilities shall be deactivated and repaired or replaced immediately. Excess rainwater that has accumulated over hardened concrete should be pumped to a stabilized area, such as a grass filter strip.
- Accumulated hardened material shall be removed when 75% of the storage capacity of the structure is filled. Any excess wash water shall be pumped into a containment vessel and properly disposed of off site.
- Dispose of the hardened material off-site in a construction/demolition landfill. On-site disposal may be allowed if this has been approved and accepted as part of the projects SWPPP. In that case, the material should be recycled as specified, or buried and covered with a minimum of 2 feet of clean compacted earthfill that is permanently stabilized to prevent erosion.
- The plastic liner shall be replaced with each cleaning of the washout facility.
- Inspect the project site frequently to ensure that no concrete discharges are taking place in non-designated areas.

STANDARD AND SPECIFICATIONS FOR DUST CONTROL



Definition & Scope

The control of dust resulting from land-disturbing activities, to prevent surface and air movement of dust from disturbed soil surfaces that may cause off-site damage, health hazards, and traffic safety problems.

Conditions Where Practice Applies

On construction roads, access points, and other disturbed areas subject to surface dust movement and dust blowing where off-site damage may occur if dust is not controlled.

Design Criteria

Construction operations should be scheduled to minimize the amount of area disturbed at one time. Buffer areas of vegetation should be left where practical. Temporary or permanent stabilization measures shall be installed. No specific design criteria is given; see construction specifications below for common methods of dust control.

Water quality must be considered when materials are selected for dust control. Where there is a potential for the material to wash off to a stream, ingredient information must be provided to the NYSDEC.

No polymer application shall take place without written approval from the NYSDEC.

Construction Specifications

A. **Non-driving Areas** – These areas use products and materials applied or placed on soil surfaces to prevent airborne migration of soil particles.

Vegetative Cover – For disturbed areas not subject to traffic, vegetation provides the most practical method of dust control (see Section 3).

Mulch (including gravel mulch) – Mulch offers a fast effective means of controlling dust. This can also include rolled erosion control blankets.

Spray adhesives – These are products generally composed of polymers in a liquid or solid form that are mixed with water to form an emulsion that is sprayed on the soil surface with typical hydroseeding equipment. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations for the specific soils on the site. In no case should the application of these adhesives be made on wet soils or if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators and others working with the material.

B. **Driving Areas** – These areas utilize water, polymer emulsions, and barriers to prevent dust movement from the traffic surface into the air.

Sprinkling – The site may be sprayed with water until the surface is wet. This is especially effective on haul roads and access route to provide short term limited dust control.

Polymer Additives – These polymers are mixed with water and applied to the driving surface by a water truck with a gravity feed drip bar, spray bar or automated distributor truck. The mixing ratios and application rates will be in accordance with the manufacturer's recommendations. Incorporation of the emulsion into the soil will be done to the appropriate depth based on expected traffic. Compaction after incorporation will be by vibratory roller to a minimum of 95%. The prepared surface shall be moist and no application of the polymer will be made if there is a probability of precipitation within 48 hours of its proposed use. Material Safety Data Sheets will be provided to all applicators working with the material.

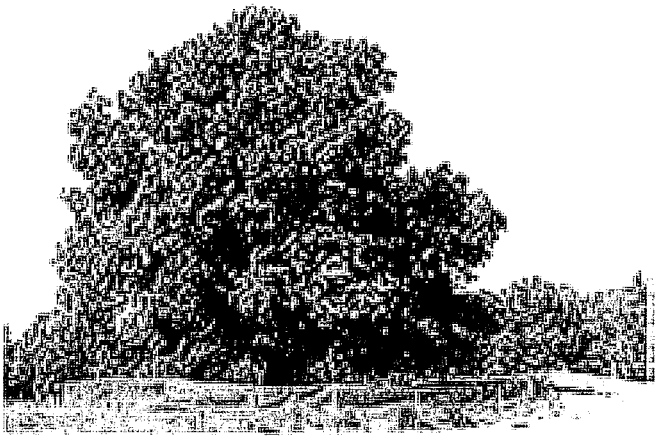
Barriers – Woven geo-textiles can be placed on the driving surface to effectively reduce dust throw and particle migration on haul roads. Stone can also be used for construction roads for effective dust control.

Windbreak – A silt fence or similar barrier can control air currents at intervals equal to ten times the barrier height. Preserve existing wind barrier vegetation as much as practical.

Maintenance

Maintain dust control measures through dry weather periods until all disturbed areas are stabilized.

STANDARD AND SPECIFICATIONS FOR PROTECTING VEGETATION DURING CONSTRUCTION



Definition & Scope

The protection of trees, shrubs, ground cover and other vegetation from damage by construction equipment. In order to preserve existing vegetation determined to be important for soil erosion control, water quality protection, shade, screening, buffers, wildlife habitat, wetland protection, and other values.

Conditions Where Practices Applies

On planned construction sites where valued vegetation exists and needs to be preserved.

Design Criteria

1. Planning Considerations

   A. Inventory:

      1) Property boundaries, topography, vegetation and soils information should be gathered. Identify potentially high erosion areas, areas with tree windthrow potential, etc. A vegetative cover type map should be made on a copy of a topographic map which shows other natural and manmade features. Vegetation that is desirable to preserve because of its value for screening, shade, critical erosion control, endangered species, aesthetics, etc., should be identified and marked on the map.

      2) Based upon this data, general statements should be prepared about the present condition, potential problem areas, and unique features of the property.

   B. Planning:

      1) After engineering plans (plot maps) are prepared, another field review should take place and recommendations made for the vegetation to be saved. Minor adjustments in location of roads, dwellings, and utilities may be needed. Construction on steep slopes, erodible soils, wetlands, and streams should be avoided. Clearing limits should be delineated (See "Determine Limits of Clearing and Grading" on page 2.2).

      2) Areas to be seeded and planted should be identified. Remaining vegetation should blend with their surroundings and/or provide special function such as a filter strip, buffer zone, or screen.

      3) Trees and shrubs of special seasonal interest, such as flowering dogwood, red maple, striped maple, serviceberry, or shadbush, and valuable potential shade trees should be identified and marked for special protective treatment as appropriate.

      4) Trees to be cut should be marked on the plans. If timber can be removed for salable products, a forester should be consulted for marketing advice.

      5) Trees that may become a hazard to people, personal property, or utilities should be removed. These include trees that are weak-wooded, disease-prone, subject to windthrow, or those that have severely damaged root systems.

      6) The vigor of remaining trees may be improved by a selective thinning. A forester should be consulted for implementing this practice.

2. Measures to Protect Vegetation

   A. Limit soil placement over existing tree and shrub roots to a maximum of 3 inches. Soils with loamy texture and good structure should be used.

   B. Use retaining walls and terraces to protect roots of trees and shrubs when grades are lowered. Lowered grades should start no closer than the dripline of the tree. For narrow-canopied trees and shrubs, the stem diameter in inches is converted to feet and doubled, such that a 10 inch tree should be protected to 20 feet.

   C. Trenching across tree root systems should be the same minimum distance from the trunk, as in "B". Tunnels under root systems for underground utilities should start 18 inches or deeper below the normal ground surface. Tree roots which must be severed should be cut clean. Backfill material that will be in contact with the roots should be topsoil or a prepared planting soil mixture.

   D. Construct sturdy fences, or barriers, of wood, steel, or other protective material around valuable

vegetation for protection from construction equipment. Place barriers far enough away from trees, but not less than the specifications in "B", so that tall equipment such as backhoes and dump trucks do not contact tree branches.

E. Construction limits should be identified and clearly marked to exclude equipment.

F. Avoid spills of oil/gas and other contaminants.

G. Obstructive and broken branches should be pruned properly. The branch collar on all branches whether living or dead should not be damaged. The 3 or 4 cut method should be used on all branches larger than two inches at the cut. First cut about one-third the way through the underside of the limb (about 6-12 inches from the tree trunk). Then (approximately an inch further out) make a second cut through the limb from the upper side. When the branch is removed, there is no splintering of the main tree trunk. Remove the stub. If the branch is larger than 5-6 inches in diameter, use the four cut system. Cuts 1 and 2 remain the same and cut 3 should be from the underside of the limb, on the outside of the branch collar. Cut 4 should be from the top and in alignment with the 3rd cut. Cut 3 should be 1/4 to 1/3 the way through the limb. This will prevent the bark from peeling down the trunk. Do not paint the cut surface.

H. Penalties for damage to valuable trees, shrubs, and herbaceous plants should be clearly spelled out in the contract.

PROTECTING TREES IN HEAVY USE AREAS

The compaction of soil over the roots of trees and shrubs by the trampling of recreationists, vehicular traffic, etc., reduces oxygen, water, and nutrient uptake by feeder roots. This weakens and may eventually kill the plants. Table 2.6 rates the "Susceptibility of Tree Species to Compaction."

Where heavy compaction is anticipated, apply and maintain a 3 to 4 inch layer of undecayed wood chips or 2 inches of No. 2 washed, crushed gravel. In addition, use of a wooden or plastic mat may be used to lessen compaction, if applicable.

Table 2.6
Susceptibility of Tree Species to Compaction[1]

Resistant:

Box elder	*Acer negundo*	Willows	*Salix spp.*
Green ash	*Fraxinus pennsylvanica*	Honey locust	*Gleditsia triacanthos*
Red elm	*Ulmus rubra*	Eastern cottonwood	*Populus deltoides*
Hawthornes	*Crataegus spp.*	Swamp white oak	*Quercus bicolor*
Bur oak	*Quercus macrocarpa*	Hophornbeam	*Ostrya virginiana*
Northern white cedar	*Thuja occidentalis*		

Intermediate:

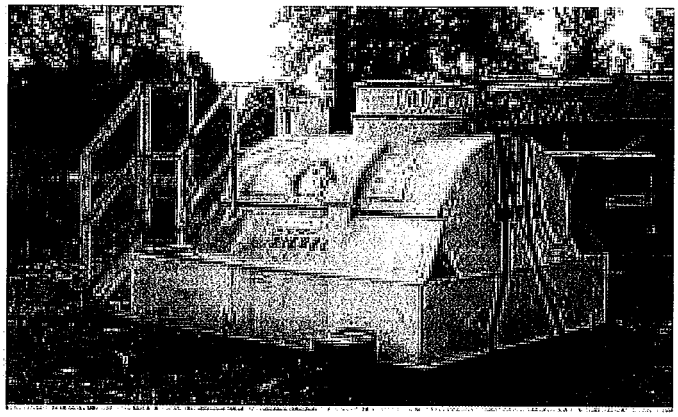
Red maple	*Acer rubrum*	Sweetgum	*Liquidambar styraciflua*
Silver maple	*Acer saccharinum*	Norway maple	*Acer platanoides*
Hackberry	*Celtis occidentalis*	Shagbark hickory	*Carya ovata*
Black gum	*Nyssa sylvatica*	London plane	*Platanus x hybrida*
Red oak	*Quercus rubra*	Pin oak	*Quercus palustris*
Basswood	*Tilia americana*		

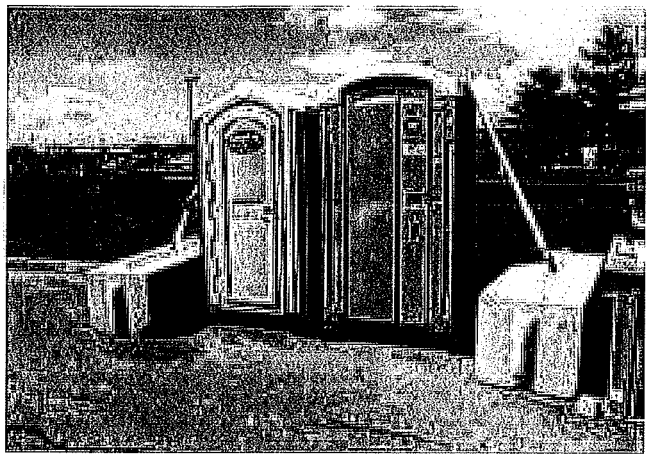
Susceptible:

Sugar maple	*Acer saccharum*	Austrian Pine	*Pinus nigra*
White pine	*Pinus strobus*	White ash	*Fraxinus americana*
Blue spruce	*Picea pungens*	Paper birch	*Betula papyrifera*
White oak	*Quercus alba*	Moutain ash	*Sorbus aucuparia*
Red pine	*Pinus resinosa*	Japanese maple	*Acer palmatum*

[1] If a tree species does not appear on the list, insufficient information is available to rate it for this purpose.

STANDARD AND SPECIFICATIONS FOR SITE POLLUTION PREVENTION





Definition & Scope

A collection of management practices intended to control non-sediment pollutants associated with construction activities to prevent the generation of pollutants due to improper handling, storage, and spills and prevent the movement of toxic substances from the site into surface waters.

Conditions Where Practice Applies

On all construction sites where the earth disturbance exceeds 5,000 square feet, and involves the use of fertilizers, pesticides, petroleum based chemicals, fuels and lubricants, as well as sealers, paints, cleared woody vegetation, garbage, and sanitary wastes.

Design Criteria

The variety of pollutants on a particular site and the severity of their impacts depend on factors such as the nature of the construction activity, the physical characteristics of the construction site, and the proximity of water bodies and conveyances to the pollutant source.

1. All state and federal regulations shall be followed for the storage, handling, application, usage, and disposal of pesticides, fertilizers, and petroleum products.

2. Vehicle and construction equipment staging and maintenance areas will be located away from all drainage ways with their parking areas graded so the runoff from these areas is collected, contained and treated prior to discharge from the site.

3. Provide sanitary facilities for on-site personnel.

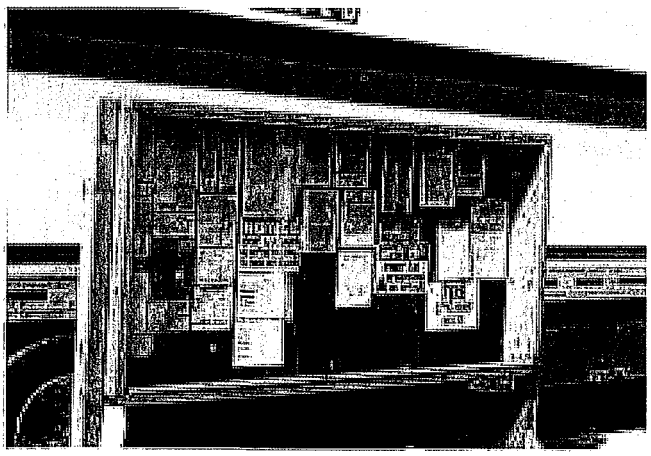
4. Store, cover, and isolate construction materials including topsoil, and chemicals, to prevent runoff of pollutants and contamination of groundwater and surface waters.

5. Develop and implement a spill prevention and control plan. The plan should include NYSDEC's spill reporting and initial notification requirements.

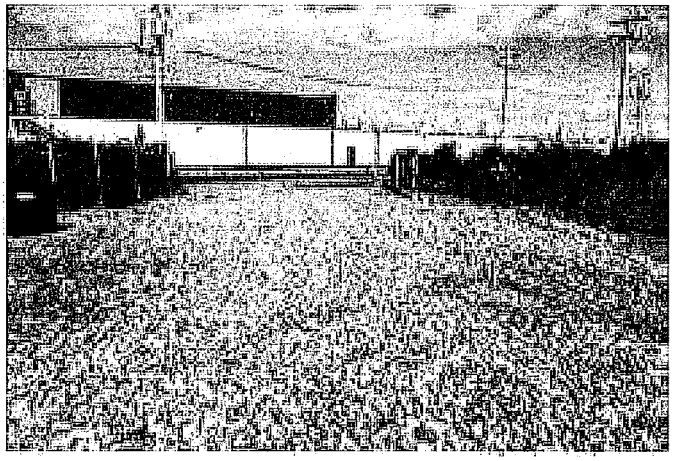
6. Provide adequate disposal for solid waste including woody debris, stumps, and other construction waste and include these methods and directions in the construction details on the site construction drawings. Fill, woody debris, stumps and construction waste shall not be placed in regulated wetlands, streams or other surface waters.

7. Distribute or post informational material regarding proper handling, spill response, spill kit location, and emergency actions to be taken, to all construction personnel.

8. Refueling equipment shall be located at least 100 feet from all wetlands, streams and other surface waters.



STANDARD AND SPECIFICATIONS FOR STABILIZED CONSTRUCTION ACCESS



Definition & Scope

A stabilized pad of aggregate underlain with geotextile located at any point where traffic will be entering or leaving a construction site to or from a public right-of-way, street, alley, sidewalk, or parking area. The purpose of stabilized construction access is to reduce or eliminate the tracking of sediment onto public rights-of-way or streets.

Conditions Where Practice Applies

A stabilized construction access shall be used at all points of construction ingress and egress.

Design Criteria

See Figure 2.1 on page 2.31 for details.

Aggregate Size: Use a matrix of 1-4 inch stone, or reclaimed or recycled concrete equivalent.

Thickness: Not less than six (6) inches.

Width: 12-foot minimum but not less than the full width of points where ingress or egress occurs. 24-foot minimum if there is only one access to the site.

Length: As required, but not less than 50 feet (except on a single residence lot where a 30 foot minimum would apply).

Geotextile: To be placed over the entire area to be covered with aggregate. Filter cloth will not be required on a single-family residence lot. Piping of surface water under entrance shall be provided as required. If piping is impossible, a mountable berm with 5:1 slopes will be permitted.

Criteria for Geotextile: The geotextile shall be woven or nonwoven fabric consisting only of continuous chain polymeric filaments or yarns of polyester. The fabric shall be inert to commonly encountered chemicals, hydro-carbons, mildew, rot resistant, and conform to the fabric properties as shown:

Fabric Properties[3]	Light Duty[1] Roads Grade Subgrade	Heavy Duty[2] Haul Roads Rough Graded	Test Method
Grab Tensile Strength (lbs)	200	220	ASTM D1682
Elongation at Failure (%)	50	60	ASTM D1682
Mullen Burst Strength (lbs)	190	430	ASTM D3786
Puncture Strength (lbs)	40	125	ASTM D751 Modified
Equivalent	40-80	40-80	US Std Sieve
Opening Size			CW-02215
Aggregate Depth	6	10	-

[1]Light Duty Road: Area sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Acceptable materials are Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

[2]Heavy Duty Road: Area sites with only rough grading, and where most travel would be multi-axle vehicles. Acceptable materials are Trevira Spunbond 1135, Mirafi 600X, or equivalent.

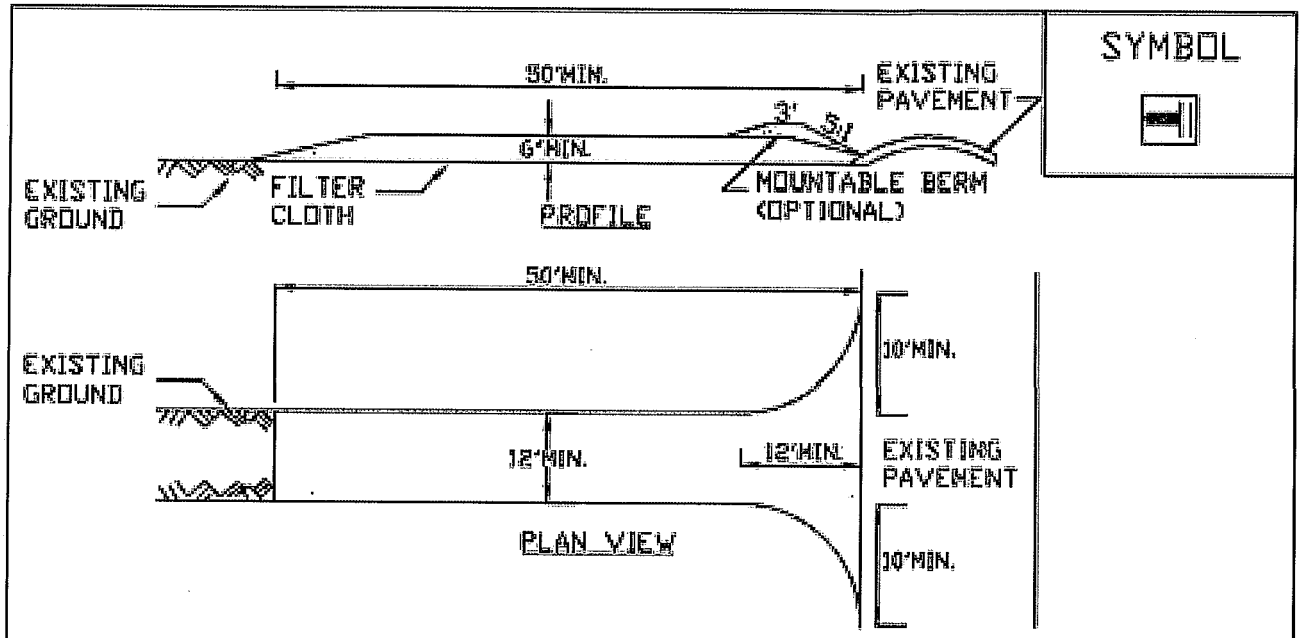
[3]Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

Maintenance

The access shall be maintained in a condition which will prevent tracking of sediment onto public rights-of-way or streets. This may require periodic top dressing with additional aggregate. All sediment spilled, dropped, or washed onto public rights-of-way must be removed immediately.

When necessary, wheels must be cleaned to remove sediment prior to entrance onto public rights-of-way. When washing is required, it shall be done on an area stabilized with aggregate, which drains into an approved sediment-trapping device. All sediment shall be prevented from entering storm drains, ditches, or watercourses.

Figure 2.1
Stabilized Construction Access



CONSTRUCTION SPECIFICATIONS

1. STONE SIZE - USE 1-4 INCH STONE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH - NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY-FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. GEOTEXTILE - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ACCESS SHALL BE PIPED BENEATH THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON A AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STABILIZED CONSTRUCTION ACCESS

STANDARD AND SPECIFICATIONS FOR TEMPORARY ACCESS WATERWAY CROSSING

Definition & Scope

A temporary access waterway crossing is a structure placed across a waterway to provide access for construction purposes for a period of less than one year. Consideration should be given to stream flow capacity and velocity anticipated during the period of time that the temporary structures will be in place. Temporary access crossings shall not be utilized to maintain traffic for the general public. The purpose of the temporary access waterway crossing is to provide safe, environmentally sound access across a waterway for construction equipment by establishing minimum standards and specifications for the design, construction, maintenance, and removal of the structure. This standard and specification may represent a channel constriction, thus, the temporary nature of waterway access crossing must be stressed. They should be planned to be in service for the shortest practical period of time and removed as soon as their function is completed.

Conditions Where Practice Applies

This standard and specification for temporary access waterway crossings is applicable in non-tidal waterways. It provides designs based on waterway geometry rather than the drainage area contributing to the point of crossing.

The principal consideration for development of the standard and specifications is concern for erosion and sediment control, tracking soil into waterways, blocking fish passage and destruction of aquatic habitat. Structural utility and safety must also be considered when designing temporary access waterway crossings to withstand expected loads.

The three types of standard temporary access waterway crossings are bridges, culverts, and fords.

General Requirements

1. In-Stream Excavation: In-Stream excavation shall be limited to only that necessary to allow installation of the standard methods as presented in Subsection "Temporary Access Waterway Crossing Methods."

2. Elimination of Fish Migration Barriers: Of the two basic methods presented in Subsection "Temporary Access Waterway Crossing Methods," bridges pose the least potential for creating barriers to aquatic migration. The construction of any specific crossing method as presented in Subsection "Temporary Access Waterway Crossing Methods," shall not cause a significant water level difference between the upstream and downstream water surface elevations. Fish spawning or migration within waterways generally occurs between October 1 to May 31 for water classified for trout and from March 15 to July 15 for other streams. Fish spawning or migration dates can vary across New York and restrictions imposed by the NYS Department of Environmental Conservation may vary and must be checked.

3. Crossing Alignment: The temporary waterway crossing shall be at right angles to the stream. Where approach conditions dictate, the crossing may vary 15 degrees from a line drawn perpendicular to the centerline of the stream at the intended crossing location.

4. Road Approaches: The centerline of both roadway approaches shall coincide with the crossing alignment centerline for a minimum distance of 50 feet from each bank of the waterway being crossed. If physical or right-of-way restraints preclude the 50 feet minimum, a shorter distance may be provided. All fill materials associated with the roadway approach shall be limited to a maximum height of 2 feet above the existing flood plain elevation.

5. Surface Water Diverting Structure: A water diverting structure such as a swale shall be constructed (across the roadway on both roadway approaches) 50 feet (maximum) on either side of the waterway crossing. This will prevent roadway surface runoff from directly entering the waterway. The 50 feet is measured from the top of the waterway bank. Design criteria for this diverting structure shall be in accordance with the "Standard and Specification" for

the individual design standard of choice. If the roadway approach is constructed with a reverse grade away from the waterway, a separate diverting structure is not required.

6. Road Width: All crossings shall have one traffic lane. The minimum width shall be 12 feet with a maximum width of 20 feet.

7. Time of Operation: All temporary crossing shall be removed within 14 calendar days after the structure is no longer needed. Unless prior written approval is obtained, all structures shall be removed within one year from the date of the installation.

8. Materials

A. Aggregate: There shall be no earth or soil materials used for construction within the waterway channel. NYS DOT specifications for coarse aggregate designation No. 4 (2" to 4"), also referenced as AASHTO designation No. 1, shall be the minimum acceptable aggregate size for temporary crossings. Larger aggregates will be allowed.

B. Filter Cloth: Filter cloth is a fabric consisting of either woven or nonwoven plastic, polypropylene, or nylon used to distribute the load, retain fines, allow increased drainage of the aggregate and reduce mixing of the aggregate with the subgrade soil. The designer shall specify the appropriate filter fabric/cloth for a specific use.

Temporary Access Waterway Crossing Methods

The following criteria for erosion and sediment control shall be considered when selecting a specific temporary access waterway crossing standard method:

1. Site aesthetics: Select a standard design method that will least disrupt the existing terrain of the stream reach. Consider the effort that will be required to restore the area after the temporary crossing is removed.

2. Site location: Locate the temporary crossing where there will be the least disturbance to the soils of the existing waterway banks. When possible, locate the crossing at a point receiving minimal surface runoff.

3. Physical site constraints: The physical constraints of a site may preclude the selection of one or more of the standard methods.

4. Time of year: The time of year may preclude the selection of one or more of the standard methods due to fish spawning or migration restrictions.

5. Vehicular loads and traffic patterns: Vehicular loads, traffic patterns, and frequency of crossing should be considered in choosing a specific method.

6. Maintenance of crossing: The standard methods will require various amounts of maintenance. The bridge method should require the least maintenance, whereas the ford method will probably require more intensive maintenance.

7. Removal of the Structure: Ease of removal and subsequent damage to the waterway should be primary factors in considering the choice of a standard method.

Temporary Access Bridge (Figure 2.2 on page 2.36)

A temporary access bridge is a structure made of wood, metal, or other materials, which provides access across a stream or waterway.

Considerations:

1. This is the preferred method for temporary access waterway crossings. Normally, bridge construction causes the least disturbance to the waterway bed and banks when compared to the other access waterway crossings.

2. Most bridges can be quickly removed and reused.

3. Temporary access bridges pose the least chance for interference with fish migration when compared to the other temporary access waterway crossings.

4. Span width will be limited by the length of the bridging material and weight of equipment that will drive over the temporary bridge. Spans of over 10 feet are difficult to construct.

5. Restrictions and Permits: A permit from the New York State Department of Environmental Conservation, Division of Environmental Permits, Regional Permit Administrator, will be needed to install and remove temporary access culverts in streams with a classification of C(T) and higher. Installation and removal may not be permitted during the period of time from the start of trout spawning until the eggs have hatched. In some instances, restrictions may also be applied to bass spawning waters.

Construction Specifications:

1. Restriction: Construction, use, or removal of a temporary access bridge will not normally have any time of year restrictions if construction, use, or

removal does not disturb the stream or its banks.

2. Bridge Placement: A temporary bridge structure shall be constructed at or above bank elevation to prevent the entrapment of floating materials and debris.

3. Abutments: Abutments shall be placed parallel to and on stable banks.

4. Bridge Span: Bridges shall be constructed to span the entire channel. If a footing, pier, or bridge support is constructed within the waterway, a stream- disturbance permit may be required.

5. Stringers: Stringers shall either be logs, saw timber, pre-stressed concrete beams, metal beams, or other approved materials.

6. Deck Material: Decking shall be of sufficient strength to support the anticipated load. All decking members shall be placed perpendicular to the stringers, butted tightly, and securely fastened to the stringers. Decking materials must be butted tightly to prevent any soil material tracked onto the bridge from falling into the waterway below.

7. Run Planks (optional): Run planking shall be securely fastened to the length of the span. One run plank shall be provided for each track of the equipment wheels. Although run planks are optional, they may be necessary to properly distribute loads.

8. Curbs or Fenders: Curbs or fenders may be installed along the outer sides of the deck. Curbs or fenders are an option, which will provide additional safety.

9. Bridge Anchors: Bridges shall be securely anchored at only one end using steel cable or chain. Anchoring at only one end will prevent channel obstruction in the event that floodwaters float the bridge. Acceptable anchors are large trees, large boulders, or driven steel anchors. Anchoring shall be sufficient to prevent the bridge from floating downstream and possibly causing an obstruction to the flow.

10. Stabilization: All areas disturbed during installation shall be stabilized within 14 calendar days of that disturbance in accordance with the Standard and Specification for Temporary Construction Area Seeding on page 4.58.

Bridge Maintenance Requirements

1. Inspection: Periodic inspection shall be performed by the user to ensure that the bridge, streambed, and streambanks are maintained and not damaged.

2. Maintenance: Maintenance shall be performed, as needed to ensure that the structure complies with the standard and specifications. This shall include removal and disposal of any trapped sediment or debris. Sediment shall be disposed of outside of the floodplain and stabilized.

Bridge Removal and Clean-Up Requirements

1. Removal: When the temporary bridge is no longer needed, all structures including abutments and other bridging materials shall be removed within 14 calendar days. In all cases, the bridge materials shall be removed within one year of installation.

2. Final Clean-Up: Final clean-up shall consist of removal of the temporary bridge from the waterway, protection of banks from erosion, and removal of all construction materials. All removed materials shall be stored outside the waterway floodplain.

3. Method: Removal of the bridge and clean-up of the area shall be accomplished without construction equipment working in the waterway channel.

4. Final Stabilization: All areas disturbed during removal shall be stabilized within 14 calendar days of that disturbance in accordance with the Standard and Specifications for Permanent Construction Area Planting on page 4.42.

Temporary Access Culvert (Figure 2.3 on page 2.37)

A temporary access culvert is a structure consisting of a section(s) of circular pipe, pipe arches, or oval pipes of reinforcing concrete, corrugated metal, or structural plate, which is used to convey flowing water through the crossing.

Considerations

1. Temporary culverts are used where a) the channel is too wide for normal bridge construction, b) anticipated loading may prove unsafe for single span bridges, or c) access is not needed from bank to bank.

2. This temporary waterway crossing method is normally preferred over a ford type of crossing, since disturbance to the waterway is only during construction and removal of the culvert.

3. Temporary culverts can be salvaged and reused.

Construction Specifications

1. Restrictions and Permits: A permit from the New York State Department of Environmental

Conservation, Division of Environmental Permits, Regional Permit Administrator, will be needed to install and remove temporary access culverts in streams with a classification of C(T) and higher. Installation and removal may not be permitted during the period of time from the start of trout spawning until the eggs have hatched. In some instances, restrictions may also be applied to bass spawning waters.

2. Culvert Strength: All culverts shall be strong enough to support their cross sectional area under maximum expected loads.

3. Culvert Size: The size of the culvert pipe shall be the largest pipe diameter that will fit into the existing channel without major excavation of the waterway channel or without major approach fills. If a channel width exceeds 3 feet, additional pipes may be used until the cross sectional area of the pipes is greater than 60 percent of the cross sectional area of the existing channel. The minimum size culvert that may be used is 12-inch diameter pipe.

4. Culvert Length: The culvert(s) shall extend a minimum of one foot beyond the upstream and downstream toe of the aggregate placed around the culvert. In no case shall the culvert exceed 40 feet in length.

5. Filter Cloth: Filter cloth shall be placed on the streambed and streambanks prior to placement of the pipe culvert(s) and aggregate. The filter cloth shall cover the streambed and extend a minimum six inches and a maximum one foot beyond the end of the culvert and bedding material. Filter cloth reduces settlement and improves crossing stability.

6. Culvert Placement: The invert elevation of the culvert shall be installed on the natural streambed grade to minimize interference with fish migration (free passage of fish).

7. Culvert Protection: The culvert(s) shall be covered with a minimum of one foot of aggregate. If multiple culverts are used, they shall be separated by at least 12 in. of compacted aggregate fill. At the minimum, the bedding and fill material used in the construction of the temporary access culvert crossings shall conform with the aggregate requirements cited in the General Requirements subsection.

8. Stabilization: All areas disturbed during culvert installation shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard for Permanent Construction Area Plantings.

Culvert Maintenance Requirements

1. Inspection: Periodic inspection shall be performed to ensure that the culverts, streambed, and streambanks are not damaged, and that sediment is not entering the stream or blocking fish passage or migration.

2. Maintenance: Maintenance shall be performed, as needed in a timely manner to ensure that structures are in compliance with this standard and specification. This shall include removal and disposal of any trapped sediment or debris. Sediment shall be disposed of and stabilized outside the waterway flood plain.

Culvert Removal and Clean-Up Requirements

1. Removal: When the crossing has served its purpose, all structures, including culverts, bedding, and filter cloth materials shall be removed within 14 calendar days. In all cases, the culvert materials shall
be removed within one year of installation. No structure shall be removed during the spawning season (generally October 1 through May 31 for trout waters and March 15 through July 15 for other waters).

2. Final Clean-Up: Final clean-up shall consist of removal of the temporary structure from the waterway, removal of all construction materials, restoration of original stream channel cross section, and protection of the streambanks from erosion. Removed material shall be stored outside of the waterway floodplain.

3. Method: Removal of the structure and clean-up of the area shall be accomplished without construction equipment working in the waterway channel.

4. Final Stabilization: All areas disturbed during culvert removal shall be stabilized within 14 calendar days of the disturbance in accordance with the Standard for Permanent Construction Area Plantings.

NOTE: Any temporary access crossing shall conform to the technical requirements of this Standard and Specifications as well as any specific requirement imposed by the New York State Department of Environmental Conservation and the US Army Corps of Engineers. Permits may be required for streambank disturbance.

Figure 2.2
Temporary Access Bridge

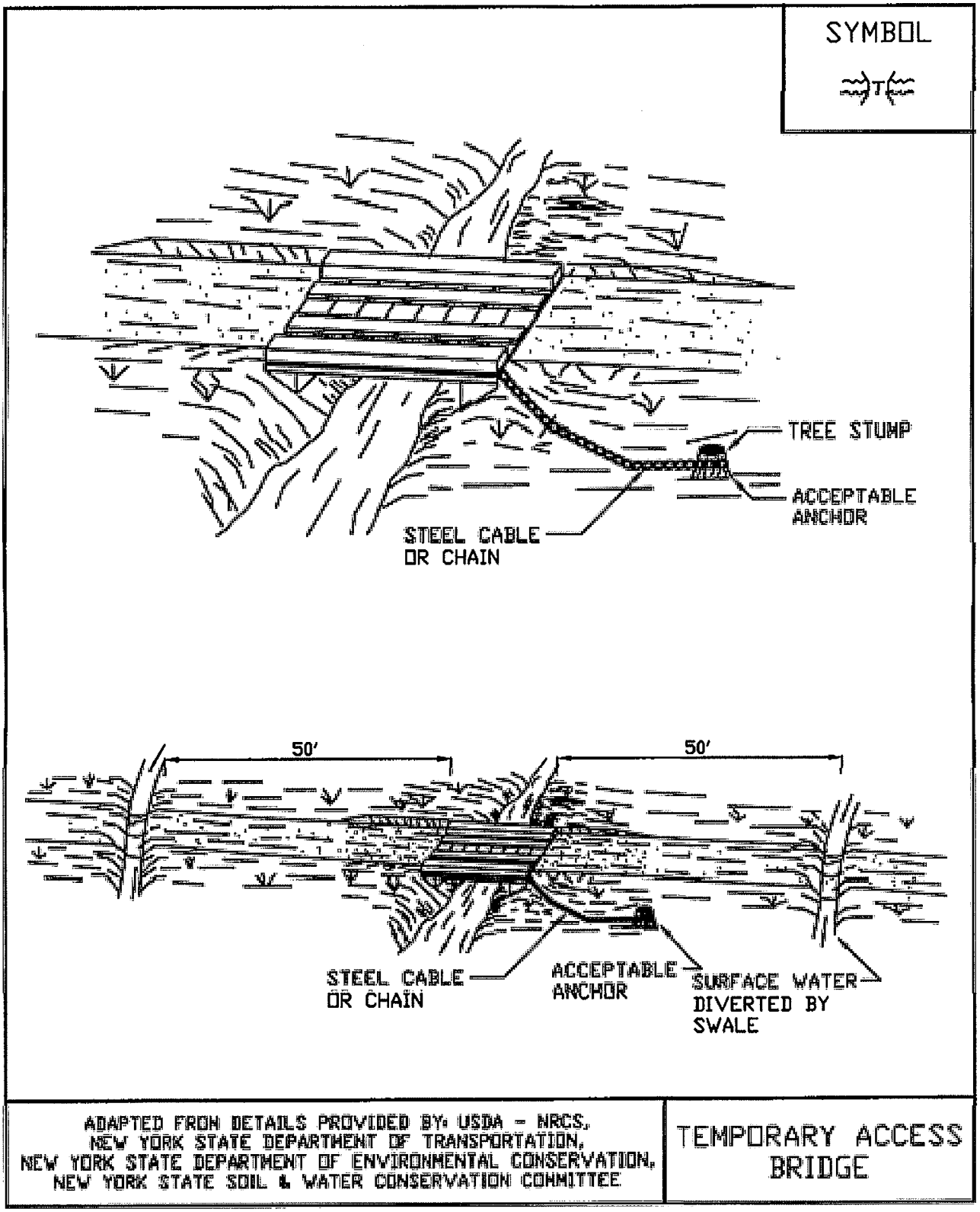
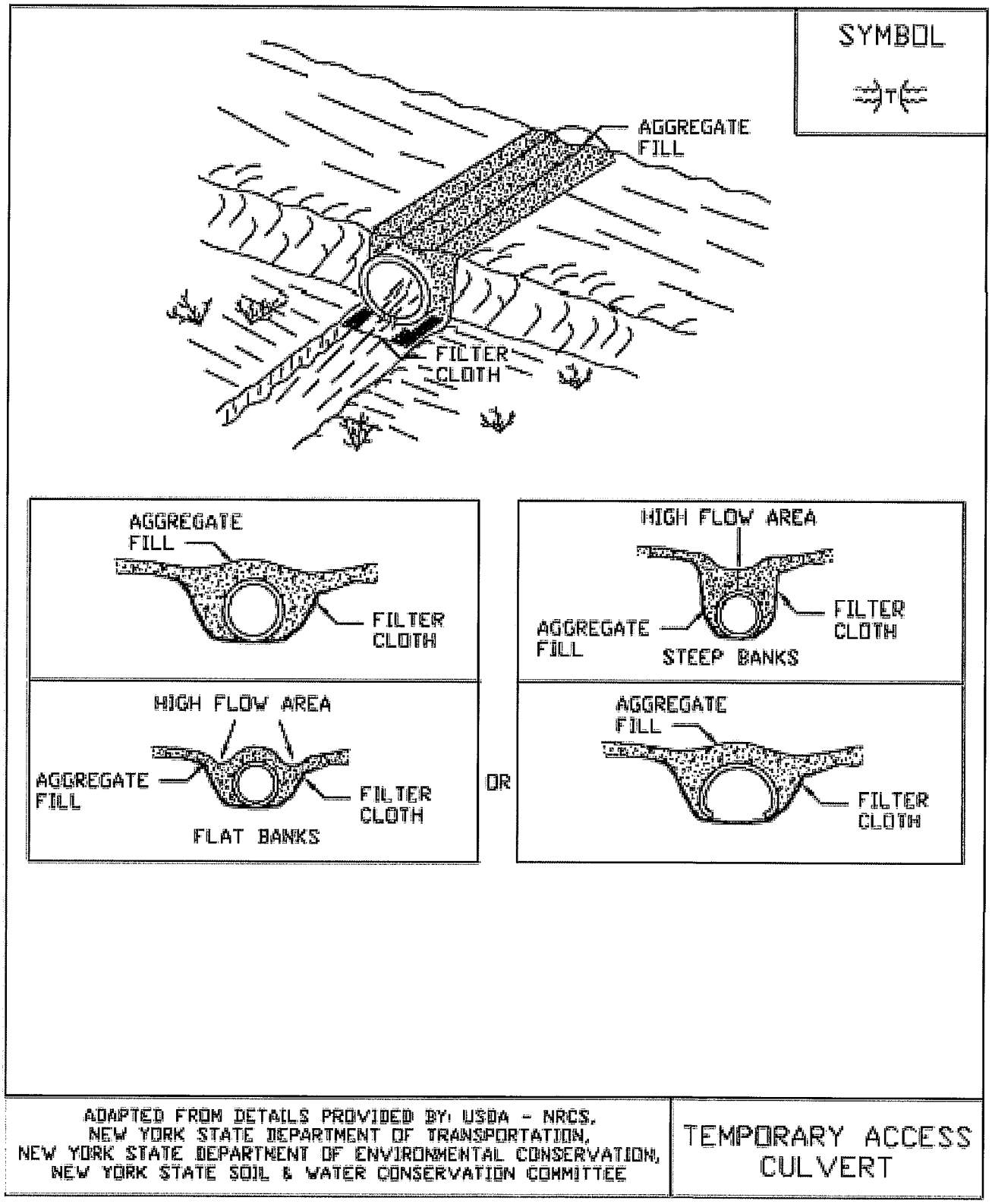


Figure 2.3
Temporary Access Culvert



STANDARD AND SPECIFICATIONS FOR WINTER STABILIZATION

Definition & Scope

A temporary site specific, enhanced erosion and sediment control plan to manage runoff and sediment at the site during construction activities in the winter months to protect off-site water resources.

Conditions Where Practice Applies

This standard applies to all construction activities involved with ongoing land disturbance and exposure between November 15th to the following April 1st.

Design Criteria

1. Prepare a snow management plan with adequate storage for snow and control of melt water, requiring cleared snow to be stored in a manner not affecting ongoing construction activities.

2. Enlarge and stabilize access points to provide for snow management and stockpiling. Snow management activities must not destroy or degrade installed erosion and sediment control practices.

3. A minimum 25 foot buffer shall be maintained from all perimeter controls such as silt fence. Mark silt fence with tall stakes that are visible above the snow pack.

4. Edges of disturbed areas that drain to a waterbody within 100 feet will have 2 rows of silt fence, 5 feet apart, installed on the contour.

5. Drainage structures must be kept open and free of snow and ice dams. All debris, ice dams, or debris from plowing operations, that restrict the flow of runoff and meltwater, shall be removed.

6. Sediment barriers must be installed at all appropriate perimeter and sensitive locations. Silt fence and other practices requiring earth disturbance must be installed before the ground freezes.

7. Soil stockpiles must be protected by the use of established vegetation, anchored straw mulch, rolled stabilization matting, or other durable covering. A barrier must be installed at least 15 feet from the toe of the stockpile to prevent soil migration and to capture loose soil.

8. In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures should be initiated by the end of the next business day and completed within three (3) days. Rolled erosion control blankets must be used on all slopes 3 horizontal to 1 vertical or steeper.

9. If straw mulch alone is used for temporary stabilization, it shall be applied at double the standard rate of 2 tons per acre, making the application rate 4 tons per acre. Other manufactured mulches should be applied at double the manufacturer's recommended rate.

10. To ensure adequate stabilization of disturbed soil in advance of a melt event, areas of disturbed soil should be stabilized at the end of each work day unless:

    a. work will resume within 24 hours in the same area and no precipitation is forecast or;

    b. the work is in disturbed areas that collect and retain runoff, such as open utility trenches, foundation excavations, or water management areas.

11. Use stone paths to stabilize access perimeters of buildings under construction and areas where construction vehicle traffic is anticipated. Stone paths should be a minimum 10 feet in width but wider as necessary to accommodate equipment.

Maintenance

The site shall be inspected frequently to ensure that the erosion and sediment control plan is performing its winter stabilization function. If the site will not have earth disturbing activities ongoing during the "winter season", **all** bare exposed soil must be stabilized by established vegetation, straw or other acceptable mulch, matting, rock, or other approved material such as rolled erosion control products. Seeding of areas with mulch cover is preferred but seeding alone is not acceptable for proper stabilization.

Compliance inspections must be performed and reports filed properly in accordance with the SWPPP for all sites under a winter shutdown.

References

1. Northeastern Illinois Soil and Sedimentation Control Steering Committee. October 1981. Procedures and Standards for Urban Soil Erosion and Sediment Control in Illinois.
2. J.F. Rushing, V.M. Moore, J.S. Tingle, Q. Mason, and T. McCaffery, 2005. Dust Abatement Methods for Lines of Communication and Base Camps in Temperate Climates. ERDC/GSL TR-05-23, October 2005.

STANDARD AND SPECIFICATIONS FOR CHECK DAM

Definition & Scope

Small barriers or dams constructed of stone, bagged sand or gravel, or other durable materials across a drainageway to reduce erosion in a drainage channel by reducing the velocity of flow in the channel.

Conditions Where Practice Applies

This practice is used as a **temporary** and, in some cases, a **permanent** measure to limit erosion by reducing velocities in open channels that are degrading or subject to erosion or where permanent stabilization is impractical due to short period of usefulness and time constraints of construction.

Design Criteria

Drainage Area: Maximum drainage area above the check dam shall not exceed two (2) acres.

Height: Not greater than 2 feet. Center shall be maintained 9 inches lower than abutments at natural ground elevation.

Side Slopes: Shall be 2:1 or flatter.

Spacing: The check dams shall be spaced as necessary in the channel so that the crest of the downstream dam is at the elevation of the toe of the upstream dam. This spacing is equal to the height of the check dam divided by the channel slope.

Therefore:

$$S = \frac{h}{s}$$

Where:

S = spacing interval (ft.)
h = height of check dam (ft.)
s = channel slope (ft./ft.)

Example:

For a channel with a 4% slope and 2 ft. high stone check dams, they are spaced as follows:

$$S = \frac{2\ \text{ft}}{0.04\ \frac{\text{ft}}{\text{ft}}} = 50\ \text{ft}$$

For stone check dams: Use a well graded stone matrix 2 to 9 inches in size (NYS – DOT Light Stone Fill meets these requirements).

The overflow of the check dams will be stabilized to resist erosion that might be caused by the check dam. See Figure 3.1 on page 3.3 for details.

Check dams should be anchored in the channel by a cutoff trench 1.5 ft. wide and 0.5 ft. deep and lined with filter fabric to prevent soil migration.

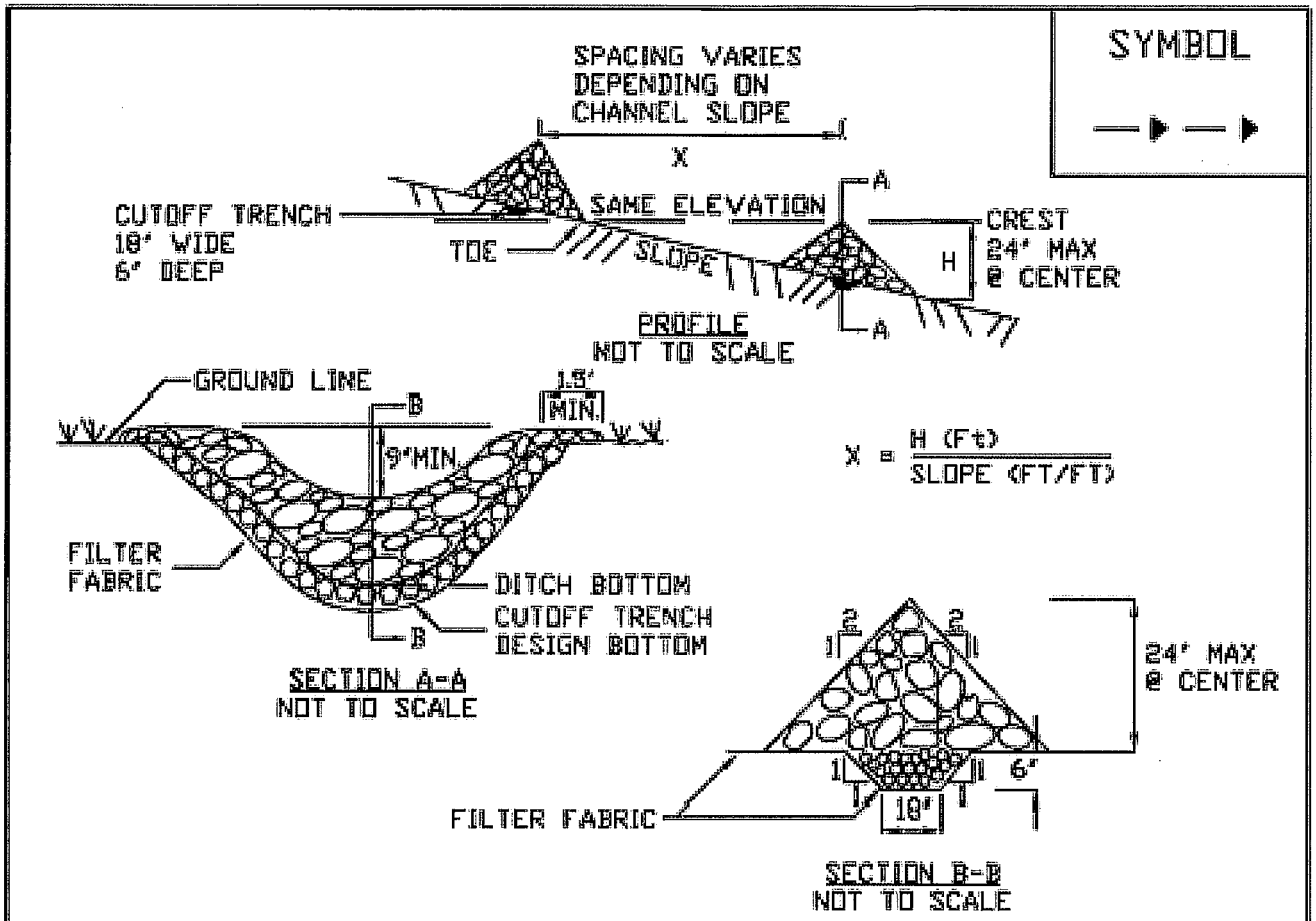
For filter sock or fiber roll check dams: The check dams will be anchored by staking the dam to the earth contact surface. The dam will extend to the top of the bank. The check dam will have a splash apron of NYS DOT #2 crushed stone extending a minimum 3 feet downstream from the dam and 1 foot up the sides of the channel. The compost and materials for a filter sock check dam shall meet the requirements shown in the standard for Compost Filter Sock on page 5.7.

Maintenance

The check dams should be inspected after each runoff event. Correct all damage immediately. If significant erosion has occurred between structures, a liner of stone or other suitable material should be installed in that portion of the channel or additional check dams added.

Remove sediment accumulated behind the dam as needed to allow channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam.

Figure 3.1
Stone Check Dam Detail



CONSTRUCTION SPECIFICATIONS

1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN IN THE PLAN.
2. SET SPACING OF CHECK DAMS TO ASSUME THAT THE ELEVATIONS OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUM OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.

MAXIMUM DRAINAGE AREA 2 ACRES.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STONE CHECK DAM

STANDARD AND SPECIFICATIONS FOR CONSTRUCTION DITCH

Definition & Scope

A **temporary** excavated drainage way to intercept sediment laden water and divert it to a sediment trapping device or to prevent runoff from entering disturbed areas by intercepting and diverting it to a stabilized outlet.

Conditions Where Practice Applies

Construction ditches are constructed:

1. to divert flows from entering a disturbed area.
2. intermittently across disturbed areas to shorten overland flow distances.
3. to direct sediment laden water along the base of slopes to a trapping device.
4. to transport offsite flows across disturbed areas such as rights-of-way.

Ditches collecting runoff from disturbed areas shall remain in place until the disturbed areas are permanently stabilized.

Design Criteria

See Figure 3.2 on page 3.6 for details.

General

	Ditch A	Ditch B
Drainage Area	<5 Ac	5-10 Ac
Bottom Width of Flow Channel	4 ft.	6 ft.
Depth of Flow Channel	1 ft.	1 ft.
Side Slopes	2:1 or flatter	2:1 or flatter
Grade	0.5% Min. 10% Max.	0.5% Min. 10% Max.

For drainage areas larger than 10 acres, refer to the Standard and Specification for Grassed Waterways on page 3.23 and 3.24.

Stabilization

Stabilization of the ditch shall be completed within 2 days of installation in accordance with the appropriate standard and specifications for vegetative stabilization or stabilization with mulch as determined by the time of year. The flow channel shall be stabilized as per the following criteria:

The seeding for vegetative stabilization shall be in accordance with the standard on Page 4.78. The seeded area will be mulched in accordance with the standard on Page 4.39.

Type of Treatment	Channel Grade[1]	Flow Channel	
		A (<5 Ac.)	B (5-10 Ac.)
1	0.5-3.0%	Seed & Straw Mulch	Seed & Straw Mulch
2	3.1-5.0%	Seed & Straw Mulch	Seed and cover with RECP[2], Sod, or lined with plastic or 2" stone
3	5.1-8.0%	Seed and cover with RECP[2], Sod, or line with plastic or 2 in. stone	Line with 4-8 in. rip-rap or, geotextile
4	8.1-10%	Line with 4-8 in. rip-rap or geotextile	Site Specific Design

1 In highly erodible soils, as defined by the local approving agency, refer to the next higher slope grade for type of stabilization.
2 Rolled Erosion Control Product.

Outlet

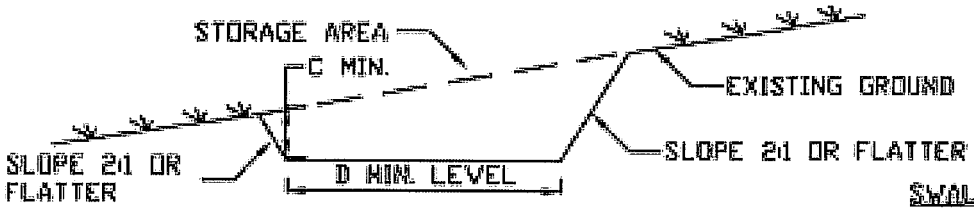
Ditch shall have an outlet that functions with a minimum of erosion, and dissipates runoff velocity prior to discharge off the site.

Runoff shall be conveyed to a sediment trapping device such as a sediment trap or sediment basin until the drainage area above the ditch is adequately stabilized.

The on-site location may need to be adusted to meet field conditions in order to utilize the most suitable outlet condition.

If a ditch is used to divert clean water flows from entering a disturbed area, a sediment trapping device may not be needed.

Figure 3.2
Construction Ditch Detail



CROSS SECTION

SYMBOL

A-2 / B-3

	SWALE A	SWALE B
C	1'	1'
D	4'	6'

POSITIVE DRAINAGE: 0.5% OR STEEPER DEPENDENT ON TOPOGRAPHY

OUTLET AS REQUIRED SEE ITEM 8 BELOW.

PLAN VIEW

CONSTRUCTION SPECIFICATIONS

1. ALL CONSTRUCTION DITCHES SHALL HAVE UNINTERUPTED POSITIVE GRADE TO AN OUTLET.
2. DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET DIRECTLY INTO AN UNDISTURBED STABILIZED AREA AT NON-EROSIVE VELOCITY.
4. ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE PROPER FUNCTIONING OF THE SWALE.
5. THE DITCH SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
6. FILLS SHALL BE COMPACTED BY EARTH MOVING EQUIPMENT.
7. ALL EARTH REMOVED AND NOT NEEDED FOR CONSTRUCTION SHALL BE PLACED SO THAT IT WILL NOT INTERFERE WITH THE FUNCTIONING OF THE DITCH.
8. STABILIZATION SHALL BE AS PER THE FLOW CHANNEL STABILIZATION CHART BELOW:

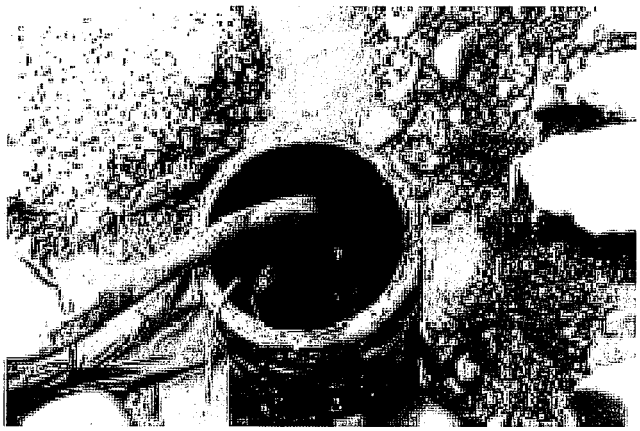
TYPE OF TREATMENT	CHANNEL GRADE	A(3 AC. OR LESS)	B(3 AC. -10AC)
1	0.5-3.0%	SEED AND STRAW MULCH	SEED AND STRAW MULCH
2	3.1-5.0%	SEED AND STRAW MULCH	SEED AND COVER USING RECP
3	5.1-8.0%	SEED AND COVER WITH RECP	LINED WITH 4-8" RIP-RAP OR GEOTEXTILE
4	8.1-10%	LINED WITH 4-8" RIP-RAP OR GEOTEXTILE	SITE SPECIFIC DESIGN

9. PERIODIC INSPECTION AND REQUIRED MAINTENANCE MUST BE PROVIDED AFTER EACH RAIN EVENT.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

CONSTRUCTION DITCH

STANDARD AND SPECIFICATIONS FOR DEWATERING SUMP PIT



Discharge of turbid water pumped from the standpipe should be to a sediment trap, sediment basin, filter bag or stabilized area, such as a filter strip. If water from the sump pit will be pumped directly to a storm drain system, filter cloth with an equivalent sieve size between 40-80 should be wrapped around the standpipe to ensure clean water discharge. It is recommended that ¼ to ½ inch hardware cloth be wrapped around and secured to the standpipe prior to attaching the filter cloth. This will increase the rate of water seepage into the standpipe.

Definition & Scope

A **temporary** pit which is constructed using pipe and stone for pumping excessive water from excavations to a suitable discharge area.

Conditions Where Practice Applies

Sump pits are constructed when water collects during the excavation phase of construction. This practice is particularly useful in urban areas during excavation for building foundations. It may also be necessary during construction activities that encounter high ground water tables in floodplain locations.

Design Criteria

The number of sump pits and their locations shall be determined by the contractor/engineer. A design is not required, but construction should conform to the general criteria outlined on Figure 3.3 on page 3.8.

A perforated vertical standpipe is placed in the center of the pit and surrounded with a stone screening material to collect filtered water. Water is then pumped from the center of the pipe to a suitable discharge area.

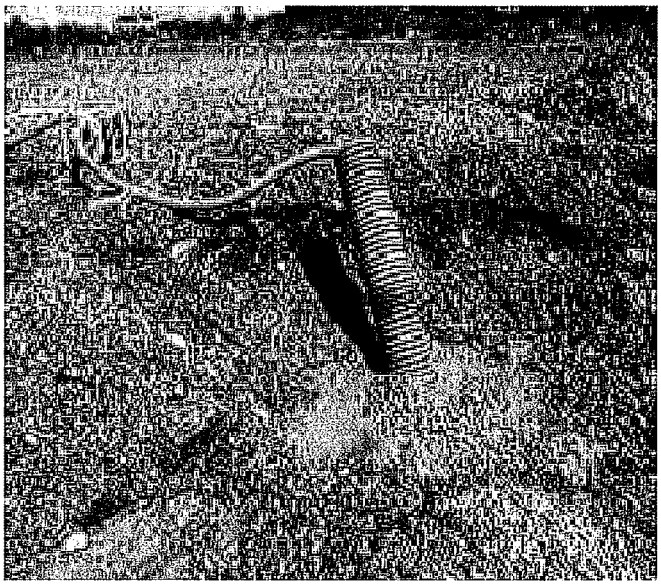
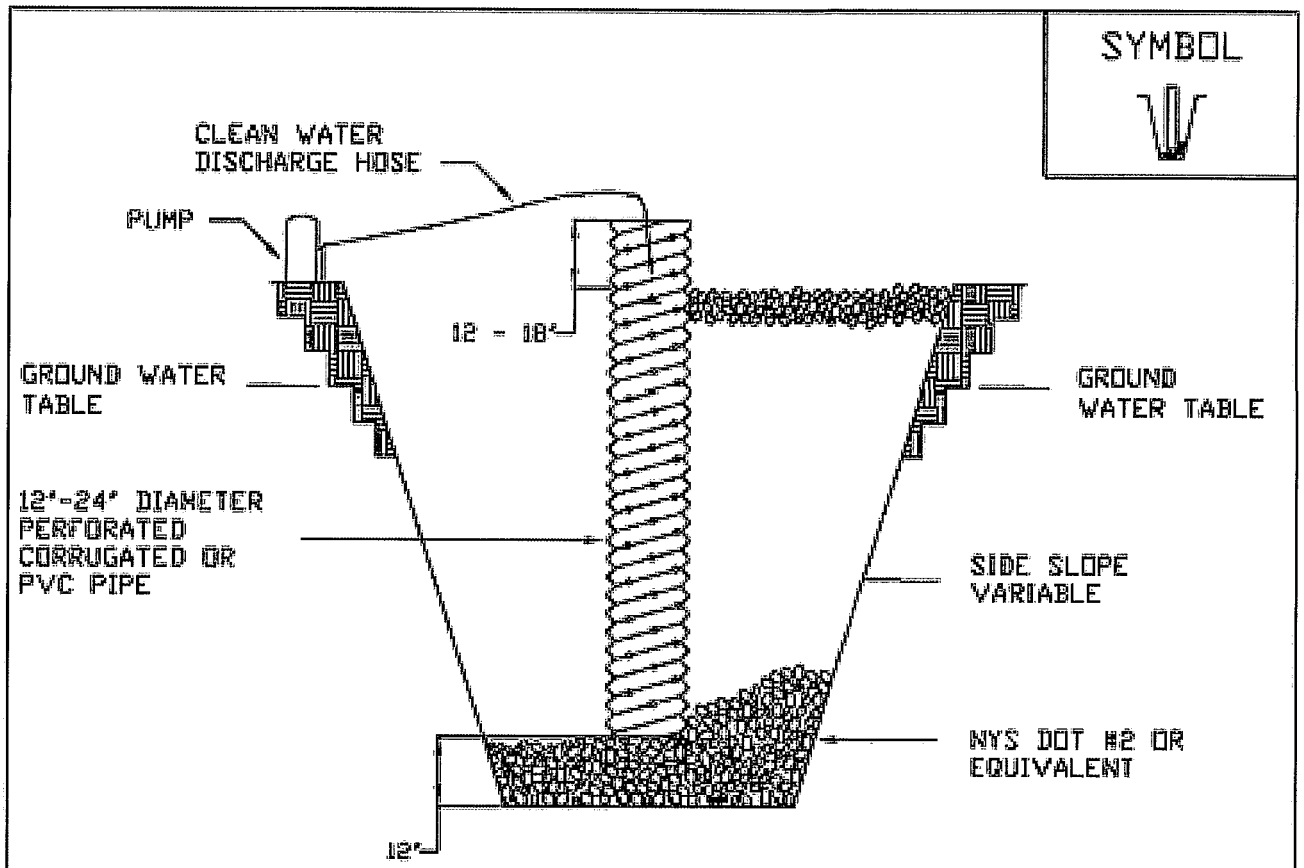


Figure 3.3
Dewatering Sump Pit Detail

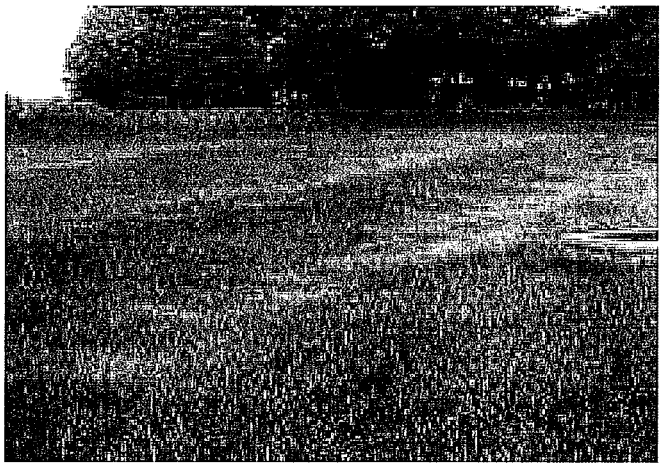


CONSTRUCTION SPECIFICATIONS

1. PIT DIMENSIONS ARE VARIABLE.
2. THE STANDPIPE SHOULD BE CONSTRUCTED BY PERFORATING A 12-24" DIAMETER CORRUGATED OR PVC PIPE.
3. A BASE OF NYS DOT #2 OR EQUIVALENT AGGREGATE SHOULD BE PLACED IN THE PIT TO A DEPTH OF 12". AFTER INSTALLING THE STANDPIPE, THE PIT SURROUNDING THE STANDPIPE SHOULD BE BACKFILLED WITH NYS DOT #2 OR EQUIVALENT AGGREGATE.
4. THE STANDPIPE SHOULD EXTEND 12-18" ABOVE THE LIP OF THE PIT.
5. IF DISCHARGE WILL BE PUMPED DIRECTLY TO A STORM DRAINAGE SYSTEM, THE STANDPIPE SHOULD BE WRAPPED WITH FILTERCLOTH BEFORE INSTALLATION. IT IS RECOMMENDED THAT 1/4"-1/2" HARDWARE CLOTH MAY BE PLACED AROUND THE STANDPIPE. PRIOR TO ATTACHING THE FILTERCLOTH.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	DEWATERING SUMP PIT

STANDARD AND SPECIFICATIONS FOR DIVERSION



Definition & Scope

A drainage way of parabolic or trapezoidal cross-section with a supporting ridge on the lower side that is constructed across the slope to intercept and convey runoff to stable outlets at non-erosive velocities.

Conditions Where Practice Applies

Diversions are used where:

1. Runoff from higher areas has potential for damaging properties, causing erosion, or interfering with, or preventing the establishment of, vegetation on lower areas.
2. Surface and/or shallow subsurface flow is damaging sloping upland.
3. The length of slopes needs to be reduced so that soil loss will be kept to a minimum.

Diversions are only applicable below stabilized or protected areas. Avoid establishment on slopes greater than fifteen percent. Diversions should be used with caution on soils subject to slippage. Construction of diversions shall be in compliance with state and local drainage and water laws.

Design Criteria

Location

Diversion location shall be determined by considering outlet conditions, topography, land use, soil type, length of slope, seep planes (when seepage is a problem), and the development layout.

Capacity

Peak rates of runoff values used in determining the capacity requirements shall be calculated using the most current hydrologic data from the Northeast Regional Climate Center in an appropriate model.

The constructed diversion shall have capacity to carry, as a minimum, the peak discharge from a 10 year frequency rainfall event with freeboard of not less than 0.3 feet.

Diversions designed to protect homes, schools, industrial buildings, roads, parking lots, and comparable high-risk areas, and those designed to function in connection with other structures, shall have sufficient capacity to carry peak runoff expected from a storm frequency consistent with the hazard involved.

Cross Section

The diversion channel shall be parabolic or trapezoidal in shape. Parabolic Diversion design charts are provided in Tables 3.2, 3.3 and 3.4 on pages 3.10, 3.12 and 3.13. The diversion shall be designed to have stable side slopes. The side slopes shall not be steeper than 2:1 and shall be flat enough to ensure ease of maintenance of the diversion and its protective vegetative cover.

The ridge shall have a minimum width of four feet at the design water elevation; a minimum of 0.3 feet freeboard and a reasonable settlement factor shall be provided.

Velocity and Grade

The permissible velocity for the specified method of stabilization will determine the maximum grade. Maximum permissible velocities of flow for the stated conditions of stabilization shall be as shown in Table 3.1 on page 3.10 of this standard.

Diversions are not usually applicable below high sediment producing areas unless land treatment practices or structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with, or before, the diversions.

Outlets

Each diversion must have an adequate outlet. The outlet may be a grassed waterway, vegetated or paved area, grade stabilization structure, flow spreader, flow diffuser, stable watercourse, or subsurface drain outlet. In all cases, the outlet must convey runoff to a point where outflow will not cause damage. Vegetated outlets shall be installed before diversion construction, if needed, to ensure establishment of

vegetative cover in the outlet channel.

The design elevation of the water surface in the diversion shall not be lower than the design elevation of the water surface in the outlet at their junction when both are operating at design flow.

Stabilization

Vegetated diversions shall be stabilized in accordance with the following tables.

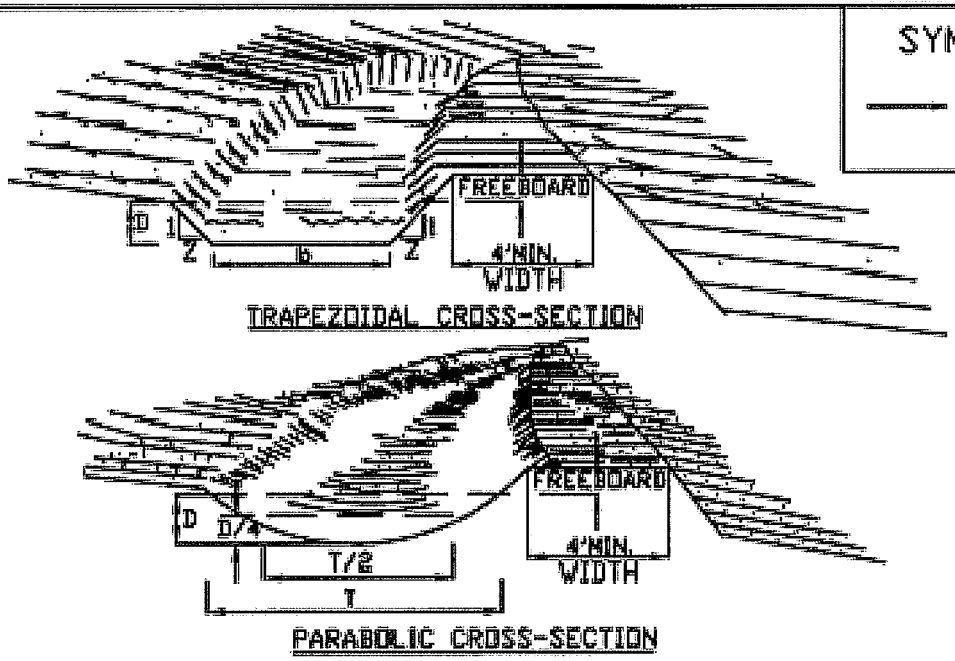
Table 3.1
Diversion Maximum Permissible Design Velocities Table

Soil Texture	Retardance and Cover	Permissible Velocity (ft / second) for Selected Channel Vegetation
Sand, Silt, Sandy loam, silty loam, loamy sand (ML, SM, SP, SW)	C-Kentucky 31 tall fescue and Kentucky bluegrass	3.0
	D-Annuals[1] Small grain (rye, oats, barley, millet) Ryegrass	2.5
Silty clay loam, Sandy clay loam (ML-CL, SC)	C-Kentucky 31 tall fescue and Kentucky bluegrass	4.0
	D-Annuals[1] Small grain (rye, oats, barley, millet) Ryegrass	3.5
Clay (CL)	C-Kentucky 31 tall fescue and Kentucky bluegrass	5.0
	D-Annuals[1] Small grain (rye, oats, barley, millet) Ryegrass	4.0
[1] Annuals—Use only as temporary protection until permanent vegetation is established.		

Table 3.2 - Retardance Factors for Various Grasses and Legumes Table

Retardance	Cover	Condition
A	Reed canarygrass	Excellent stand, tall (average 36 inches)
B	Smooth bromegrass	Good stand, mowed (average 12 to 15 inches)
	Tall fescue	Good stand, unmowed (average 18 inches)
	Grass-legume mixture—Timothy, smooth bromegrass, or Orchard grass with birdsfoot trefoil	Good stand, uncut (average 20 inches)
	Reed canarygrass	Good stand, mowed (average 12 to 15 inches)
	Tall fescue, with birdsfoot trefoil or ladino clover	Good stand, uncut (average 18 inches)
C	Redtop	Good stand, headed (15 to 20 inches)
	Grass-legume mixture—summer (Orchard grass, redtop, Annual ryegrass, and ladino or white clover)	Good stand, uncut (6 to 8 inches)
	Kentucky bluegrass	Good stand, headed (6 to 12 inches)
D	Red fescue	Good stand, headed (12 to 18 inches)
	Grass-legume mixture—fall, spring (Orchard grass, redtop, Annual ryegrass, and white or ladino clover)	Good stand, uncut (4 to 5 inches)

Figure 3.4
Diversion Detail



CONSTRUCTION SPECIFICATIONS

1. ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE PROPER FUNCTIONING OF THE DIVERSION.
2. THE DIVERSION SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN, AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
3. FILLS SHALL BE COMPACTED AS NEEDED TO PREVENT UNEQUAL SETTLEMENT THAT WOULD CAUSE DAMAGE IN THE COMPLETE DIVERSION.
4. ALL EARTH REMOVED AND NOT NEEDED IN CONSTRUCTION SHALL BE SPREAD OR DISPOSED OF SO THAT IT WILL NOT INTERFERE WITH THE FUNCTIONING OF THE DIVERSION.
5. STABILIZATION SHALL BE DONE ACCORDING TO THE APPROPRIATE STANDARD AND SPECIFICATIONS FOR VEGETATIVE PRACTICES.
   A. FOR DESIGN VELOCITIES OF LESS THAN 3.5 FT. PER. SEC., SEEDING AND MULCHING MAY BE USED FOR THE ESTABLISHMENT OF THE VEGETATION. IT IS RECOMMENDED THAT, WHEN CONDITIONS PERMIT, TEMPORARY DIVERSIONS OR OTHER MEANS SHOULD BE USED TO PREVENT WATER FROM ENTERING THE DIVERSION DURING THE ESTABLISHMENT OF THE VEGETATION.
   B. FOR DESIGN VELOCITIES OF MORE THAN 3.5 FT. PER. SEC., THE DIVERSION SHALL BE STABILIZED WITH SOD, WITH SEEDING PROTECTED BY JUTE OR EXCELSIOR MATTING OR WITH SEEDING AND MULCHING INCLUDING TEMPORARY DIVERSION OF THE WATER UNTIL THE VEGETATION IS ESTABLISHED.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	DIVERSION

Table 3.3
Parabolic Diversion Design, Without Freeboard Tables - 1 (USDA– NRCS)

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & C
GRADE, % - 0.50

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "C"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	9	1.6	1.6																								
20	11	1.6	1.7																								
25	14	1.6	1.7	9	1.9	2.1																					
30	17	1.6	1.7	11	1.9	2.2	8	2.2	2.5																		
35	20	1.6	1.7	12	1.9	2.3	9	2.1	2.6																		
40	22	1.6	1.7	14	1.9	2.3	11	2.1	2.7																		
45	25	1.5	1.7	16	1.8	2.3	12	2.0	2.8																		
50	28	1.5	1.7	18	1.8	2.4	13	2.0	2.8	10	2.4	3.2															
55	31	1.5	1.7	19	1.8	2.4	15	2.0	2.8	11	2.4	3.3															
60	33	1.5	1.7	21	1.8	2.4	16	2.0	2.8	11	2.4	3.3															
65	36	1.5	1.8	23	1.8	2.4	17	2.0	2.9	12	2.4	3.3															
70	39	1.5	1.7	24	1.8	2.4	18	2.0	2.9	13	2.3	3.4															
75	42	1.5	1.8	26	1.8	2.4	19	2.0	2.9	14	2.3	3.4	11	2.7	3.7												
80	46	1.5	1.8	28	1.8	2.4	21	2.0	2.9	15	2.3	3.4	12	2.7	3.8												
90	50	1.5	1.8	31	1.8	2.4	24	2.0	2.9	17	2.3	3.4	13	2.7	3.8												
100	55	1.5	1.8	35	1.8	2.4	26	2.0	2.9	19	2.3	3.5	15	2.4	3.9	12	3.0	4.1									
110	[illegible]			[illegible]			[illegible]			[illegible]			[illegible]														

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & C
GRADE, % - 1.0

V_1 based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "C"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	13	1.1	1.5	8	1.3	2.0																					
20	18	1.1	1.5	11	1.3	2.1	8	1.5	2.6																		
25	22	1.1	1.5	14	1.3	2.1	9	1.5	2.6	8	1.6	3.0															
30	27	1.1	1.5	17	1.3	2.1	11	1.5	2.7	9	1.6	3.0															
35	31	1.1	1.5	19	1.3	2.2	13	1.5	2.8	11	1.6	3.1	8	1.8	3.6												
40	35	1.1	1.5	22	1.3	2.1	15	1.4	2.8	12	1.5	3.1	9	1.8	3.7												
45	40	1.1	1.5	25	1.3	2.2	17	1.5	2.8	13	1.6	3.2	10	1.8	3.7												
50	44	1.1	1.5	28	1.3	2.2	19	1.4	2.8	15	1.6	3.2	11	1.8	3.7	9	2.0	4.2									
55	48	1.1	1.5	30	1.3	2.2	20	1.4	2.8	16	1.5	3.3	12	1.8	3.8	10	2.0	4.3									
60	53	1.1	1.5	33	1.3	2.2	22	1.4	2.8	18	1.5	3.3	14	1.7	3.8	10	2.0	4.3									
65	57	1.1	1.5	36	1.3	2.2	24	1.4	2.8	19	1.5	3.3	15	1.7	3.8	11	2.0	4.3	9	2.2	4.7						
70	61	1.1	1.5	38	1.3	2.2	26	1.4	2.8	21	1.5	3.3	16	1.7	3.9	12	2.0	4.4	10	2.2	4.7						
75	66	1.1	1.5	41	1.3	2.2	28	1.4	2.9	22	1.5	3.3	17	1.7	3.9	13	2.0	4.5	11	2.2	4.7						
80	70	1.1	1.5	44	1.3	2.2	29	1.4	2.9	24	1.5	3.3	18	1.7	3.9	14	2.0	4.6	11	2.2	4.9						
90	79	1.1	1.5	49	1.3	2.2	33	1.4	2.9	27	1.5	3.3	20	1.7	3.9	15	1.9	4.5	13	2.2	4.9	11	2.4	5.2			
100	87	1.1	1.5	55	1.3	2.2	37	1.4	2.9	29	1.5	3.3	22	1.7	3.9	17	1.9	4.5	14	2.2	4.9	12	2.4	5.3			

Table 3.4
Parabolic Diversion Design, Without Freeboard Tables - 2 (USDA– NRCS)

PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & C
GRADE, % - 1.5

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "C"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	17	0.9	1.4	11	1.1	1.9	8	1.2	2.4																		
20	23	0.9	1.4	15	1.0	1.9	10	1.2	2.5	7	1.4	3.0	5	1.5	3.4												
25	28	0.9	1.4	19	1.0	1.9	12	1.2	2.6	8	1.4	3.2	7	1.5	3.6												
30	34	0.9	1.4	22	1.0	1.9	15	1.2	2.6	10	1.3	3.2	8	1.5	3.6	7	1.6	4.0									
35	40	0.9	1.4	26	1.0	2.0	17	1.1	2.6	12	1.3	3.3	10	1.4	3.7	8	1.6	4.1									
40	45	0.9	1.4	30	1.0	1.9	20	1.2	2.6	14	1.3	3.3	11	1.4	3.7	9	1.6	4.2	7	1.8	4.6						
45	51	0.9	1.4	33	1.0	2.0	22	1.1	2.5	15	1.3	3.4	12	1.4	3.8	10	1.5	4.3	8	1.9	4.6						
50	56	0.9	1.4	37	1.0	2.0	25	1.1	2.7	17	1.3	3.4	14	1.4	3.9	11	1.5	4.3	9	1.8	4.8						
55	62	0.9	1.5	41	1.0	2.0	27	1.1	2.6	19	1.3	3.4	15	1.4	3.9	12	1.5	4.3	10	1.7	4.9	8	1.9	5.1			
60	67	0.9	1.5	44	1.0	2.0	30	1.1	2.7	20	1.3	3.4	16	1.4	3.9	14	1.5	4.4	11	1.7	4.9	9	1.9	5.2			
65	73	0.9	1.5	48	1.0	2.0	32	1.1	2.7	22	1.3	3.4	18	1.4	3.9	15	1.5	4.4	11	1.7	5.0	10	1.9	5.3			
70	78	0.9	1.5	51	1.0	2.0	34	1.1	2.7	24	1.3	3.4	19	1.4	3.9	16	1.5	4.4	12	1.7	4.9	10	1.9	5.4	8	2.1	5.6
75	83	0.9	1.5	55	1.0	2.0	37	1.1	2.7	25	1.3	3.4	21	1.4	3.9	17	1.5	4.4	13	1.7	5.0	11	1.9	5.4	9	2.1	5.6
80	89	0.9	1.5	59	1.0	2.0	39	1.1	2.7	27	1.3	3.4	22	1.4	3.9	18	1.5	4.4	14	1.7	5.0	12	1.9	5.5	10	2.1	5.8
90	100	0.9	1.5	66	1.0	2.0	44	1.1	2.7	30	1.3	3.5	25	1.4	3.9	20	1.5	4.4	16	1.7	5.0	13	1.9	5.4	11	2.1	5.9
100				73	1.0	2.0	49	1.1	2.7	33	1.3	3.5	27	1.4	3.9	22	1.5	4.5	17	1.7	5.1	15	1.9	5.5	12	2.1	6.0

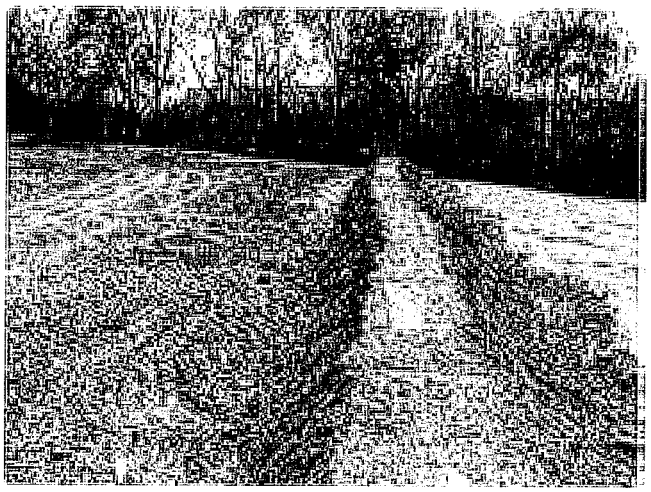
PARABOLIC DIVERSION DESIGN, WITHOUT FREEBOARD

RETARDANCE - D & C
GRADE, % - 2.0

V_1 Based on Permissible Velocity of the Soil With Retardance "D"
Top Width, Depth & V_2 Based on Retardance "C"

Q	V_1 = 2.0			V_1 = 2.5			V_1 = 3.0			V_1 = 3.5			V_1 = 4.0			V_1 = 4.5			V_1 = 5.0			V_1 = 5.5			V_1 = 6.0		
cfs	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2	T	D	V_2
15	21	0.8	1.3	13	0.9	1.9	9	1.0	2.4	7	1.2	2.9															
20	28	0.8	1.3	17	0.9	1.9	12	1.0	2.4	9	1.1	3.0	7	1.3	3.5	5	1.6	3.8									
25	35	0.8	1.3	21	0.9	1.9	15	1.0	2.4	11	1.1	3.0	8	1.3	3.7	7	1.4	4.0									
30	41	0.8	1.3	26	0.9	1.9	18	1.0	2.5	13	1.1	3.0	10	1.2	3.7	9	1.3	4.2	7	1.5	4.5						
35	48	0.8	1.3	30	0.9	1.9	22	1.0	2.4	15	1.1	3.1	11	1.2	3.8	9	1.3	4.2	8	1.5	4.7						
40	55	0.8	1.3	34	0.9	1.9	25	1.0	2.5	18	1.1	3.1	13	1.2	3.8	11	1.3	4.3	9	1.5	4.7	7	1.7	5.0			
45	62	0.8	1.3	38	0.9	1.9	28	1.0	2.5	20	1.1	3.1	14	1.2	3.8	12	1.3	4.3	10	1.6	4.8	8	1.6	5.2			
50	68	0.8	1.4	42	0.9	1.9	31	1.0	2.5	22	1.1	3.1	16	1.2	3.9	13	1.3	4.3	11	1.6	4.8	9	1.6	5.3	8	1.7	5.6
55	75	0.8	1.4	46	0.9	1.9	34	1.0	2.5	24	1.1	3.1	17	1.2	3.8	14	1.3	4.3	12	1.4	4.9	10	1.6	5.3	8	1.7	5.8
60	82	0.8	1.4	51	0.9	1.9	37	1.0	2.5	26	1.1	3.1	19	1.2	3.9	16	1.3	4.4	13	1.4	4.8	11	1.6	5.3	9	1.7	5.7
65	88	0.8	1.4	55	0.9	1.9	40	1.0	2.5	28	1.1	3.1	21	1.2	3.9	17	1.3	4.4	14	1.4	4.9	11	1.6	5.4	10	1.7	5.7
70	95	0.8	1.4	59	0.9	1.9	43	1.0	2.5	30	1.1	3.1	22	1.2	3.9	18	1.3	4.4	15	1.4	4.9	12	1.6	5.4	10	1.7	5.8
75				63	0.9	1.9	46	1.0	2.5	32	1.1	3.2	24	1.2	3.9	20	1.3	4.4	16	1.4	5.0	13	1.6	5.5	11	1.7	5.9
80				67	0.9	2.0	48	1.0	2.5	35	1.1	3.1	25	1.2	3.9	21	1.3	4.4	17	1.4	4.9	14	1.6	5.4	12	1.7	6.0
90				75	0.9	2.0	54	1.0	2.5	39	1.1	3.2	28	1.2	3.9	23	1.3	4.4	19	1.4	4.9	16	1.6	5.5	13	1.7	5.9
100				83	0.9	2.0	60	1.0	2.5	43	1.1	3.2	31	1.2	3.9	26	1.3	4.4	21	1.4	5.0	17	1.6	5.5	15	1.7	6.0

STANDARD AND SPECIFICATIONS FOR EARTH DIKE



Definition & Scope

A **temporary** berm or ridge of compacted soil, located in such a manner as to channel water to a desired location. Its purpose is to direct runoff to a sediment trapping device, thereby reducing the potential for erosion and off site sedimentation. Earth dikes can also be used for diverting clean water away from disturbed areas.

Conditions Where Practice Applies

Earth dikes are often constructed across disturbed areas and around construction sites such as graded parking lots and subdivisions. The dikes shall remain in place until the disturbed areas are permanently stabilized.

Design Criteria

See Figure 3.5 on page 3.15 for details.

General

	Dike A	Dike B
Drainage Area	<5 Ac	5-10 Ac
Dike Height	18 in.	36 in.
Dike Width	24 in.	36 in.
Flow Width	4 ft.	6 ft.
Flow Depth in Channel	8 in.	15 in.
Side Slopes	2:1 or flatter	2:1 or flatter
Grade	0.5% Min. 10% Max.	0.5% Min. 10% Max.

For drainage areas larger than 10 acres, refer to the Standard and Specifications for Diversion on page 3.9.

Stabilization

Stabilization of the dike shall be completed within 2 days of installation in accordance with the standard and specifications for seed and straw mulch or straw mulch only if not in seeding season. The flow channel shall be stabilized as per the following criteria:

Type of Treat-ment	Channel Grade[1]	Flow Channel	
		A (<5 Ac.)	B (5-10 Ac.)
1	0.5-3.0%	Seed & Straw Mulch	Seed & Straw Mulch
2	3.1-5.0%	Seed & Straw Mulch	Seed and cover with RECP, sod, or lined with plastic or 2" stone
3	5.1-8.0%	Seed and cover with RECP, Sod, or line with plastic or 2 in. stone	Line with 4-8 in. rip-rap or, geotextile
4	8.1-10%	Line with 4-8 in. rip-rap or geotextile	Site Specific Design

1 In highly erodible soils, as defined by the local approving agency, refer to the next higher slope grade for type of stabilization.

Outlet

Earth dikes shall have an outlet that functions with a minimum of erosion.

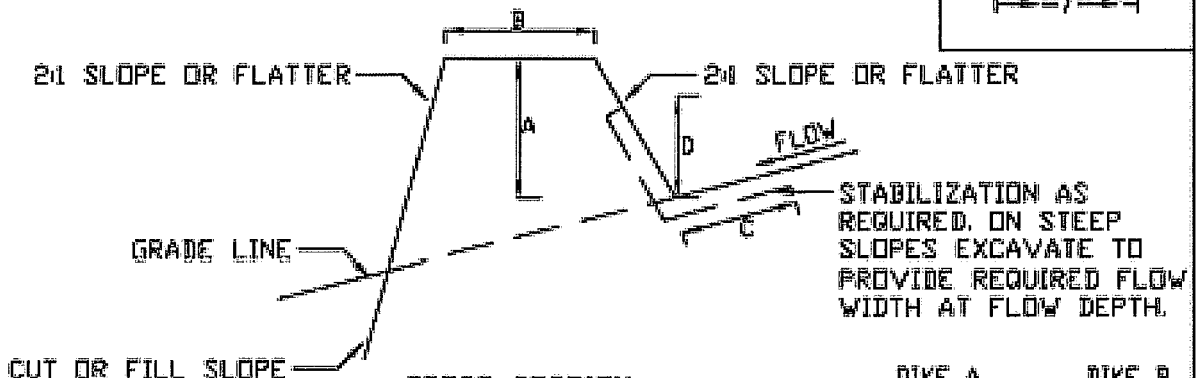
Runoff shall be conveyed to a sediment trapping device until the drainage area above the dike is adequately stabilized.

The on-site location may need to be adjusted to meet field conditions in order to utilize the most suitable outlet.

Figure 3.5
Earth Dike Detail

SYMBOL

A=2, B=3

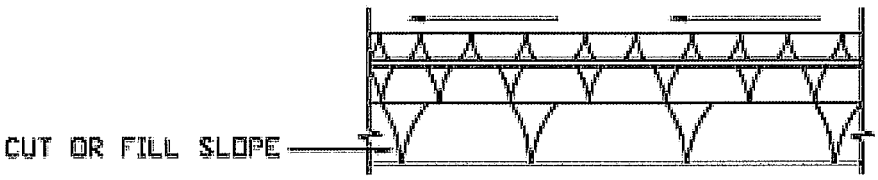


CROSS SECTION

NOT TO SCALE

	DIKE A (5 AC. OR LESS)	DIKE B (5-10AC.)
A - DIKE HEIGHT	18"	36"
B - DIKE WIDTH	24"	36"
C - FLOW WIDTH	40"	72"
D - FLOW DEPTH	8"	15"

POSITIVE DRAINAGE-GRADE SUFFICIENT TO DRAIN



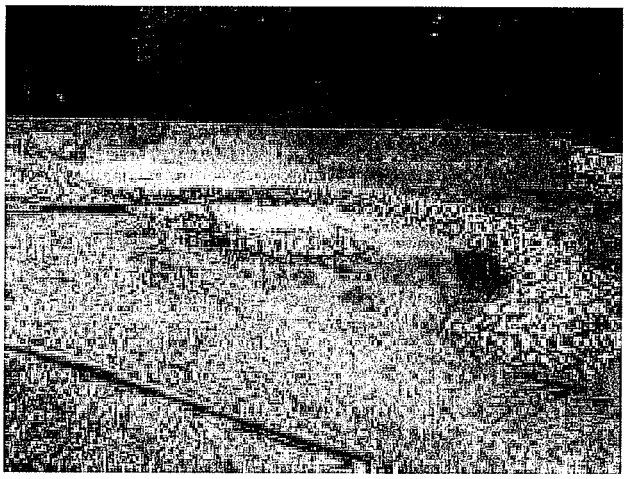
CONSTRUCTION SPECIFICATIONS

1. ALL DIKES SHALL BE COMPACTED BY EARTH-MOVING EQUIPMENT.
2. ALL DIKES SHALL HAVE POSITIVE DRAINAGE TO AN OUTLET.
3. TOP WIDTH MAY BE WIDER AND SIDE SLOPES BE FLATTER IF DESIRED TO FACILITATE CROSSING BY CONSTRUCTION TRAFFIC.
4. FIELD LOCATION SHOULD BE ADJUSTED AS NEEDED TO UTILIZE A STABILIZED SAFE OUTLET.
5. EARTH DIKES SHALL HAVE AN OUTLET THAT FUNCTIONS WITH A MINIMUM OF EROSION. RUNOFF SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE SUCH AS A SEDIMENT TRAP OR SEDIMENT BASIN WHERE EITHER THE DIKE CHANNEL OR THE DRAINAGE AREA ABOVE THE DIKE ARE NOT ADEQUATELY STABILIZED.
6. FILL STABILIZATION SHALL BE: (A) IN ACCORDANCE WITH STANDARD SPECIFICATIONS FOR SEED AND STRAW MULCH IF NOT IN SEEDING SEASON, (B) FLOW CHANNEL STABILIZATION PER THE STANDARD CHART BASED ON CHANNEL GRADE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

EARTH DIKE

STANDARD AND SPECIFICATIONS FOR FLOW DIFFUSER



Definition & Scope

A permanent non-erosive outlet for concentrated runoff constructed to diffuse flow uniformly through a stone matrix onto a stablilized area in the form of shallow, low velocity, sheet flow.

Conditions Where Practice Applies

Where sediment-free stormwater runoff can be released in low velocity sheet flow down stabilized areas without causing erosion; where the ground slope at the outlet of the diffuser is less than 30% and the runoff will not re-concentrate after release; and where construction of a flow spreader is not practicable.

Design Criteria

1. **Drainage area:** The maximum drainage area to the diffuser may not exceed 0.10 acre per foot length of the flow diffuser. The drainage area served by the diffuser discharging directly cannot be 10-20% more than half the size of the receiving buffer area.

2. **Discharge from diffuser onto receiving area:** The peak stormwater flow rate from a flow diffuser onto a receiving area from a 10-year 24-hour storm must be less than 0.25 cubic feet per second (0.25 cfs) per linear foot of weir crest length.

3. **Receiving area of buffer:** Each flow diffuser shall have a vegetated receiving area with a minimum continuous length of 150 feet and the capacity to pass the flow without erosion. The receiving area shall be stable prior to the construction of the flow diffuser. The receiving area shall have topography regular enough to prevent undue flow concentration before entering a stable watercourse but it shall have a slope that is less than 30%. If the receiving area is not presently stable, then the receiving area shall be stabilized prior to construction of the flow diffuser. The receiving area below the flow diffuser shall be protected from harm during construction. Sodding and/or turf reinforcement mat (TRM) in combination with vegetative measures shall stabilize disturbed areas. The receiving area shall not be used by the flow diffuser until stabilization has been accomplished. A temporary diversion may be necessary in this case.

4. **Cross-section:** The minimum stone diffuser cross-section shall be trapezoidal with a height of 1 foot above natural ground; top width equal to 2 foot and side slope equal to 1 horizontal to 1 vertical. The storage area behind the diffuser shall be excavated to a depth of 1 foot and overall width of storage area equal to 6 feet minimum.

5. **Sizing the diffuser:** The length of the stone diffuser is governed by the size of the stone in the structure, the height of the diffuser, and the flow length through it. The following equation is used to establish the design of the diffuser:

$$Q_d = \frac{h^{3/2} W}{[(\frac{L}{D}) + 2.5 + L^2]^{0.5}}$$

Where:

Q_d = Outflow through the stone diffuser (cfs)
h = Ponding depth behind the diffuser (ft.)
W = Linear length of the diffuser along centerline (ft.)
L = Average horizontal flow length through the diffuser perpendicular to the centerline (ft.)
D = Average stone diameter (d_{50}) in the structure (ft.)

The maximum d_{50} size shall be 9" or 0.75'.

The designer shall calculate the length of diffuser needed depending on the geometry of the cross-section and rock size to be used recognizing that the maximum allowable discharge through the diffuser shall be 0.25 cfs per foot of length.

Once the discharge is calculated for the 10 year storm for the drainage area to the diffuser (Q_{10}) it can be divided by the design discharge of the diffuser to determine the diffuser length as follows:

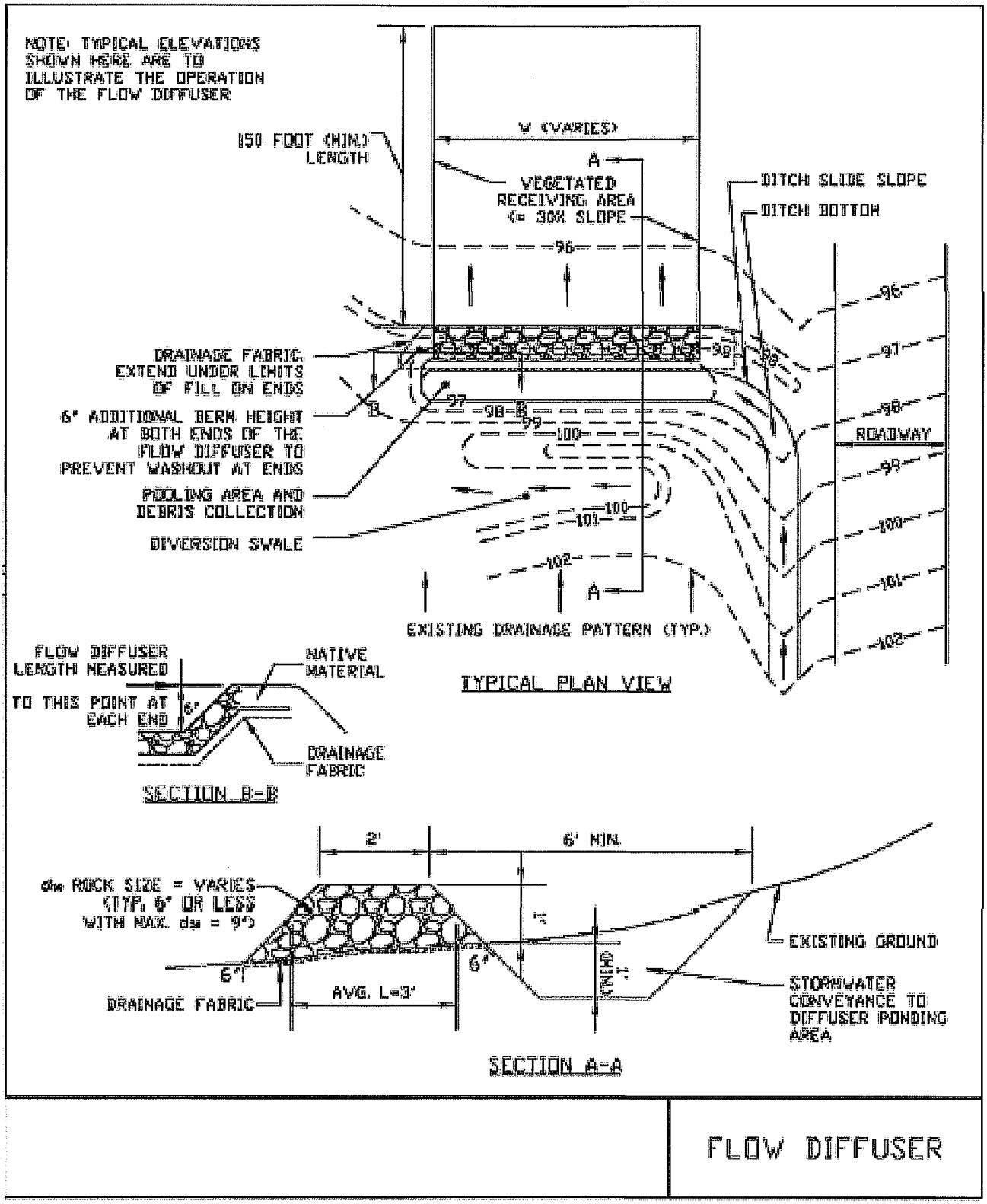
$$W = \frac{Q_{10}}{Q_d}$$

Where:

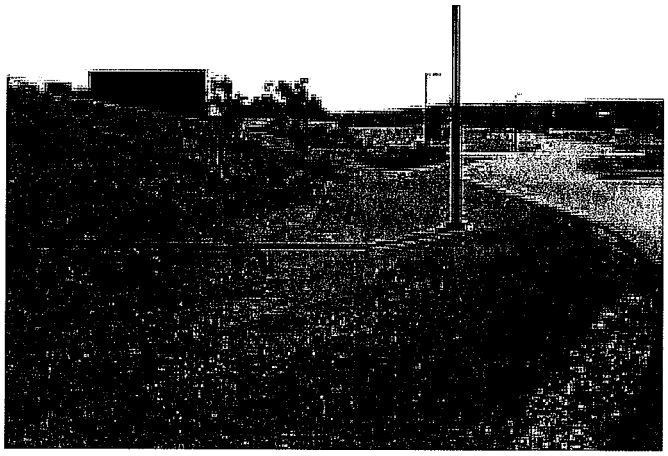
Q_d = Outflow through the stone diffuser (cfs/ft)
Q_{10} = Discharge rate for the 10 year storm (cfs)
W = Linear length of the diffuser along centerline (ft.)

Design examples are shown in Appendix B.

Figure 3.6
Flow Diffuser Detail



STANDARD AND SPECIFICATIONS FOR GRASSED WATERWAY



Definition & Scope

A natural or **permanent** man-made channel of parabolic or trapezoidal cross-section that is below adjacent ground level and is stabilized by suitable vegetation. The flow channel is normally wide and shallow and conveys the runoff down the slope without causing damage by erosion.

Conditions Where Practice Applies

Grass waterways are used where added vegetative protection is needed to control erosion resulting from concentrated runoff.

Design Criteria

Capacity

The minimum capacity shall be that required to confine the peak rate of runoff expected from a 10-year 24 hour frequency rainfall event or a higher frequency corresponding to the hazard involved. This requirement for confinement may be waived on slopes of less than one (1) percent where out-of-bank flow will not cause erosion or property damage.

Peak rates of runoff values used in determining the capacity requirements shall be computed by appropriate methods. Where there is base flow, it shall be handled by a stone center, subsurface drain, or other suitable means since sustained wetness usually prevents adequate vegetative cover. The cross-sectional area of the stone center or subsurface drain size to be provided shall be determined by using a flow rate of 0.1 cfs/acre or by actual measurement of the maximum base flow.

Velocity

Please see Table 3.1, Diversion Maximum Permissible Design Velocities on page 3.10, for seed, soil, and velocity variables.

Cross Section

The design water surface elevation of a grassed waterway receiving water from diversions or other tributary channels shall be equal to or less than the design water surface elevation in the diversion or other tributary channels.

The top width of parabolic waterways shall not exceed 30 feet and the bottom width of trapezoidal waterways shall not exceed 15 feet unless multiple or divided waterways, stone center, or other means are provided to control meandering of low flows.

Structural Measures

In cases where grade or erosion problems exist, special control measures may be needed such as lined waterways (see page 3.27), or grade stabilization measures (see page 3.21). Where needed, these measures will be supported by adequate design computations. For typical cross sections of waterways with riprap sections or stone centers, refer to Figure 3.8 on page 3.24.

The design procedures for parabolic and trapezoidal channels are available in the NRCS Engineering Field Handbook. Figure 3.9 on page 3.25 also provides a design chart for parabolic waterway.

Outlets

Each waterway shall have a stable outlet. The outlet may be another waterway, a stabilized open channel, grade stabilization structure, etc. In all cases, the outlet must discharge in such a manner as not to cause erosion. Outlets shall be constructed and stabilized prior to the operation of the waterway.

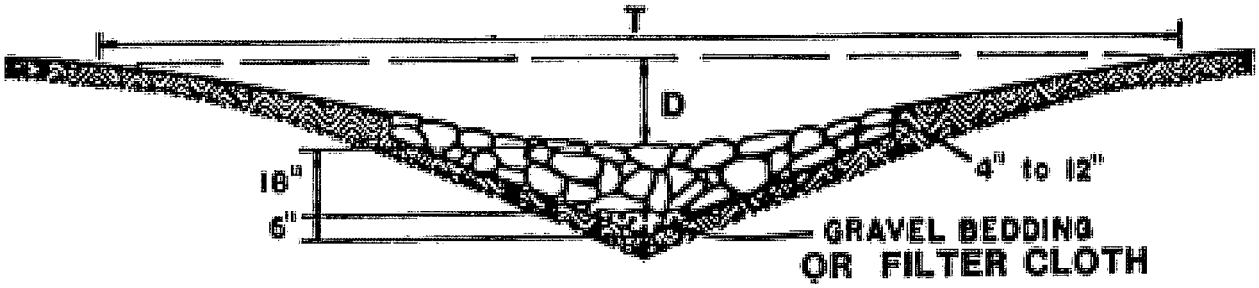
Stabilization

Waterways shall be stabilized in accordance with the appropriate vegetative stabilization standard and specifications, and will be dependent on such factors as slope, soil class, etc. See standard for Vegetating Waterways on Page 4.78.

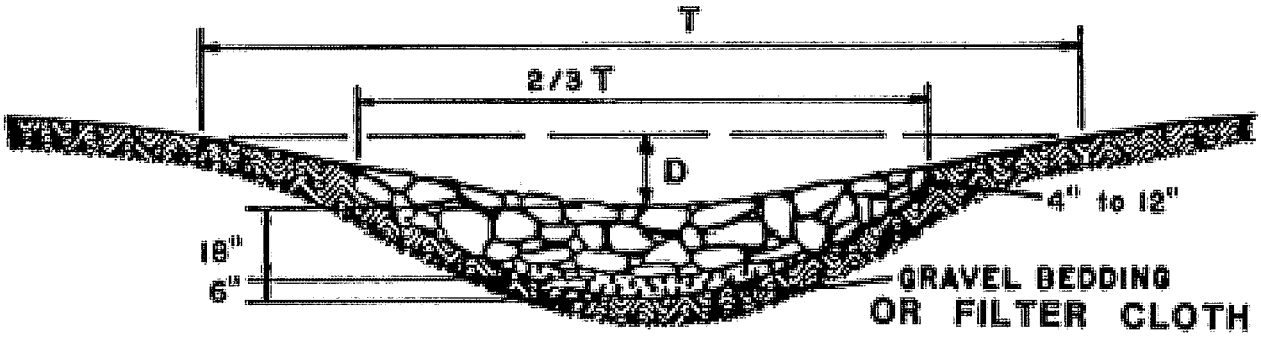
Construction Specifications

See Figure 3.10 on page 3.26 for details.

Figure 3.8
Typical Waterway Cross Sections Details



Waterway with stone center drain. "V" section shaped by motor grader.



Waterway with stone center drain. Rounded section shaped by bulldozer.

Figure 3.9
Parabolic Waterway Design Chart (USDA - NRCS)

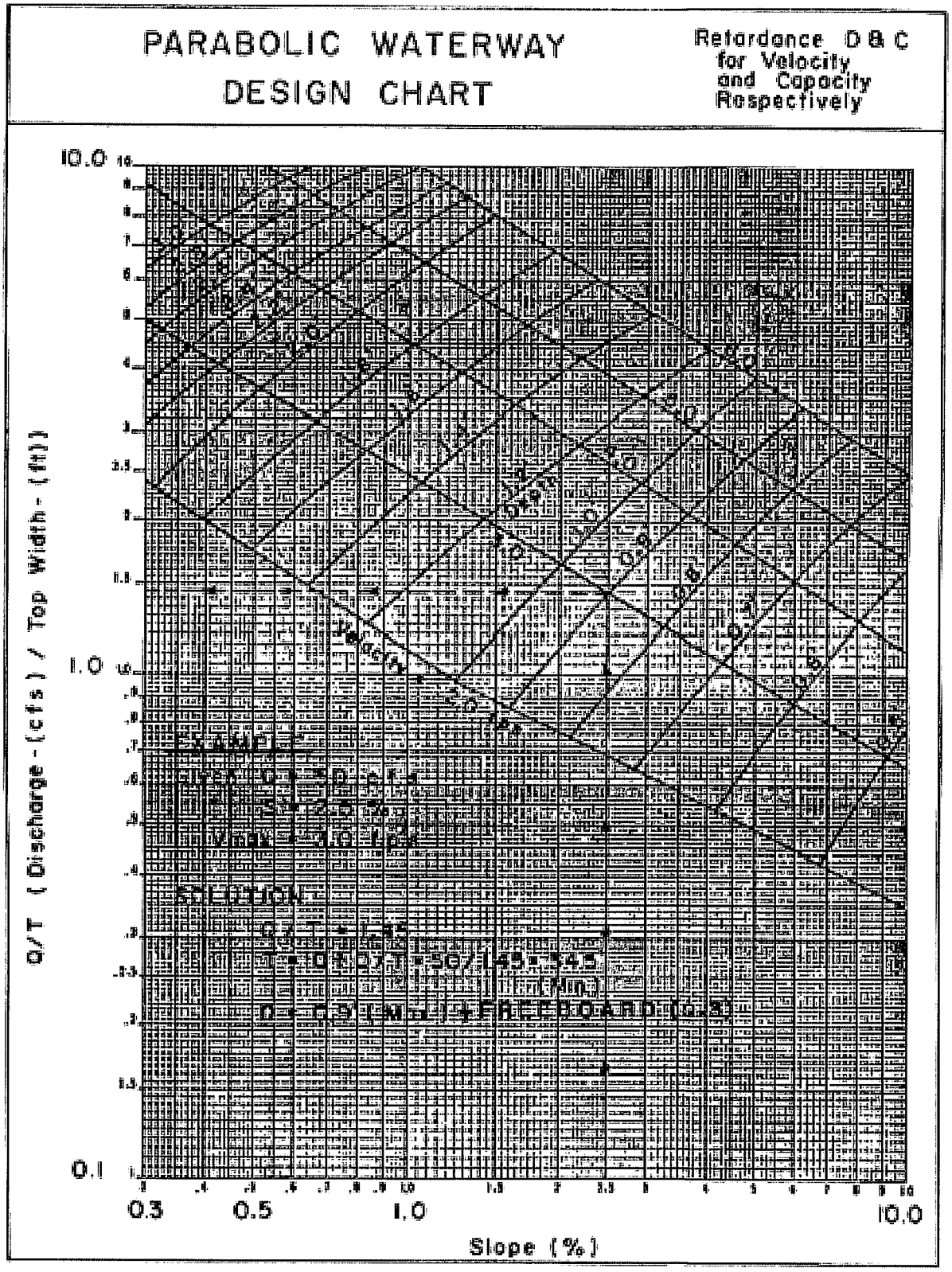
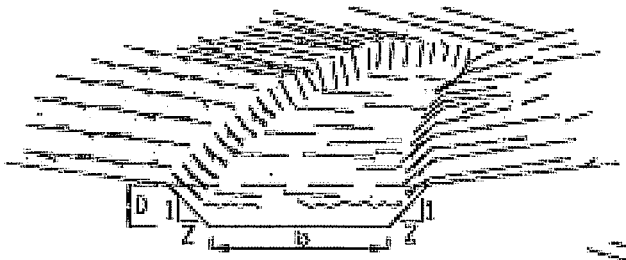
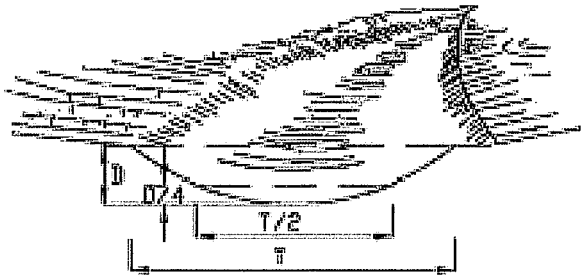


Figure 3.10
Grassed Waterway Detail



TRAPEZIODAL CROSS SECTION



PARABOLIC CROSS SECTION

SYMBOL

GL

CONSTRUCTION SPECIFICATIONS

1. ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE PROPER FUNCTIONING OF THE WATERWAY.
2. THE WATERWAY SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN, AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
3. FILLS SHALL BE COMPACTED AS NEEDED TO PREVENT UNEQUAL SETTLEMENT THAT WOULD CAUSE DAMAGE IN THE COMPLETE WATERWAY.
4. ALL EARTH REMOVED AND NOT NEEDED IN CONSTRUCTION SHALL BE SPREAD OR DISPOSED OF SO THAT IT WILL NOT INTERFERE WITH THE FUNCTIONING OF THE WATERWAY.
5. STABILIZATION SHALL BE DONE ACCORDING TO THE APPROPRIATE STANDARD AND SPECIFICATIONS FOR VEGETATIVE PRACTICES.
   A. FOR DESIGN VELOCITIES OF LESS THAN 3.5 FT. PER. SEC., SEEDING AND MULCHING MAY BE USED FOR THE ESTABLISHMENT OF THE VEGETATION. IT IS RECOMMENDED THAT, WHEN CONDITIONS PERMIT, TEMPORARY WATERWAYS OR OTHER MEANS SHOULD BE USED TO PREVENT WATER FROM ENTERING THE WATERWAY DURING THE ESTABLISHMENT OF THE VEGETATION.
   B. FOR DESIGN VELOCITIES OF MORE THAN 3.5 FT. PER. SEC., THE WATERWAY SHALL BE STABILIZED WITH SOD, WITH SEEDING PROTECTED BY JUTE OR EXCELSIOR MATTING OR WITH SEEDING AND MULCHING INCLUDING TEMPORARY DIVERSION OF THE WATER UNTIL THE VEGETATION IS ESTABLISHED.
   C. STRUCTURAL - VEGETATIVE PROTECTION
   SUBSURFACE DRAIN FOR BASE FLOW SHALL BE CONSTRUCTED AS SHOWN ON THE STANDARD DRAWING AND AS SPECIFIED IN THE STANDARD AND SPECIFICATIONS FOR SUBSURFACE DRAIN.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

GRASSED WATERWAY

STANDARD AND SPECIFICATIONS FOR LINED WATERWAY

Definition & Scope

A **permanent** waterway or outlet with a lining of concrete, stone, or other durable, hardened material. The lined section extends up the side slopes to the designed depth. The earth above the permanent lining may be vegetated or otherwise protected.

The lined waterway is constructed to provide for the disposal of concentrated runoff without damage from erosion or flooding, where grassed waterways would be inadequate due to high velocities.

Conditions Where Practice Applies

This standard applies to waterways or outlets with linings of cast-in-place concrete, flagstone mortared in place, rock riprap, gabions, or similar permanent linings. It does not apply to irrigation ditch or canal linings, grassed waterways with stone centers or small lined sections that carry prolonged low flows, or to reinforced concrete channels. Lined waterways should not be used if they are directly discharging to C(T) or higher streams unless thermal impacts are mitigated by biotechnical practices (Section 4). The maximum capacity of the waterway flowing at design depth shall not exceed 100 cubic feet per second.

This practice applies where the following or similar conditions exist:

1. Concentrated runoff is such that a lining is required to control erosion.
2. Steep grades, wetness, prolonged base flow, seepage, or piping that would cause erosion.
3. The location is such that damage from use by people or animals precludes use of vegetated waterways or outlets.
4. Soils are highly erosive or other soil and climate conditions preclude using vegetation.
5. High value property or adjacent facilities warrant the extra cost to contain design runoff in a limited space.

Design Criteria

Capacity

1. The minimum capacity shall be adequate to carry the peak rate of runoff from a 10-year, 24-hour storm. Velocity shall be computed using Manning's equation with a coefficient of roughness "n" as follows:

Lined Material	"n"
Concrete (Type):	
Trowel Finish	0.015
Float Finish	0.019
Gunite	0.019
Flagstone	0.022
Riprap	Determine from Figure 3.11 on page 3.30
Gabion	0.030

2. Riprap gradation and filter (bedding) are generally designed in accordance with criteria set forth in the National Cooperative Highway Research Program Report 108, available from the University Microfilm International, 300 N. Zeeb Road, Ann Arbor, Michigan 48106, Publication No. PB-00839; or the Hydraulic Engineering Circular No. 11, prepared by the U.S. Bureau of Public Roads, available from Federal Highway Administration, 400 7th Street, S.W., Washington, D.C. 20590, HNG-31, or the procedure in the USDA-NRCS's Engineering Field Manual, Chapter 16.

Velocity

1. Maximum design velocity shall be as shown below. Except for short transition sections, flow with a channel gradient within the range of 0.7 to 1.3 of this flow's critical slope must be avoided unless the channel is straight. Velocities exceeding critical will be restricted to straight reaches.

Design Flow Depth (ft.)	Maximum Velocity (ft./sec.)
0.0 - 0.5	25
0.5 - 1.0	15
Greater than 1.0	10

2. Waterways or outlets with velocities exceeding critical shall discharge into an energy dissipater to reduce velocity to less than critical, or to a velocity the downstream soil and vegetative conditions will allow.

Cross Section

The cross section shall be triangular, parabolic, or trapezoidal. Monolithic concrete or gabions may be rectangular.

Freeboard

The minimum freeboard for lined waterways or outlets shall be 0.25 feet above design high water in areas where erosion resistant vegetation cannot be grown adjacent to the paved side slopes. No freeboard is required where good vegetation can be grown and is maintained.

Side Slope

Steepest permissible side slopes, horizontal to vertical will be as follows:

1. Non-Reinforced Concrete
   Hand-placed, formed concrete
   Height of lining, 1.5 ft or less ..... Vertical
   Hand placed screened concrete or mortared
   In-place flagstone
   Height of lining, less than 2 ft ..... 1 to 1
   Height of lining, more than 2 ft ..... 2 to 1
2. Slip form concrete:
   Height of lining, less than 3 ft ..... 1 to 1
3. Rock Riprap ..... 2 to 1
4. Gabions ..... Vertical
5. Pre-cast Concrete Sections ..... Vertical

Lining Thickness

Minimum lining thickness shall be as follows:

1. Concrete ..... 4 in. (In most problem areas, shall be 5 in. with welded wire fabric reinforcing)

2. Rock Riprap ..... 1.5 x maximum stone size plus thickness of filter or bedding.

3. Flagstone ..... 4 in. including mortar bed.

Related Structures

Side inlets, drop structures, and energy dissipaters shall meet the hydraulic and structural requirements of the site.

Filters or Bedding

Filters or bedding to prevent piping, reduce uplift pressure, and collect water will be used as required and will be designed in accordance with sound engineering principles. Weep holes and drains should be provided as needed.

Concrete

Concrete used for lining shall be so proportioned that it is plastic enough for thorough consolidation and stiff enough to stay in place on side slopes. A dense product will be required. A mix that can be certified as suitable to produce a minimum strength of at least 3,000 pounds per square inch will be required. Cement used shall be Portland Cement, Type I, II, IV, or V. Aggregate used shall have a maximum diameter of 1 ½ inches.

Weep holes should be provided in concrete footings and retaining walls to allow free drainage of water. Pipe used for weep holes shall be non-corrosive.

Mortar

Mortar used for mortared in-place flagstone shall consist of a mix of cement, sand, and water. Follow directions on the bag of mortar for proper mixing of mortar and water.

Contraction Joints

Contraction joints in concrete linings, where required, shall be formed transversely to a depth of about one third the thickness of the lining at a uniform spacing in the range of 10 to 15 feet.

Rock Riprap or Flagstone

Stone used for riprap or gabions shall be dense and hard enough to withstand exposure to air, water, freezing, and thawing. Flagstone shall be flat for ease of placement and have the strength to resist exposure and breaking. Rock riprap maximum size shall be as follows:

Velocity (f.p.s.)	d_{max} (in.)
5.0	6
8.5	12
10	18
12	24
15	36

A complete listing riprap gradations is provided in Table 4.1, page 4.9.

Cutoff Walls

Cutoff walls shall be used at the beginning and ending of concrete lining. For rock riprap lining, cutoff walls shall be keyed into the channel bottom and at both ends of the lining.

Construction Specifications

1. The foundation area shall be cleared of trees, stumps, roots, sod, loose rock, or other objectionable material.

2. The cross-section shall be excavated to the neat lines and grades as shown on the plans. Over-excavated areas shall be backfilled with moist soil compacted to the density of the surrounding material.

3. No abrupt deviations from design grade or horizontal alignment shall be permitted.

4. Concrete linings shall be placed to the thickness shown on the plans and trowel finished. Adequate precautions shall be taken to protect freshly placed concrete from extreme (hot or cold) temperatures, to ensure proper curing.

5. Filter bedding and rock riprap shall be placed to line and grade in the manner specified.

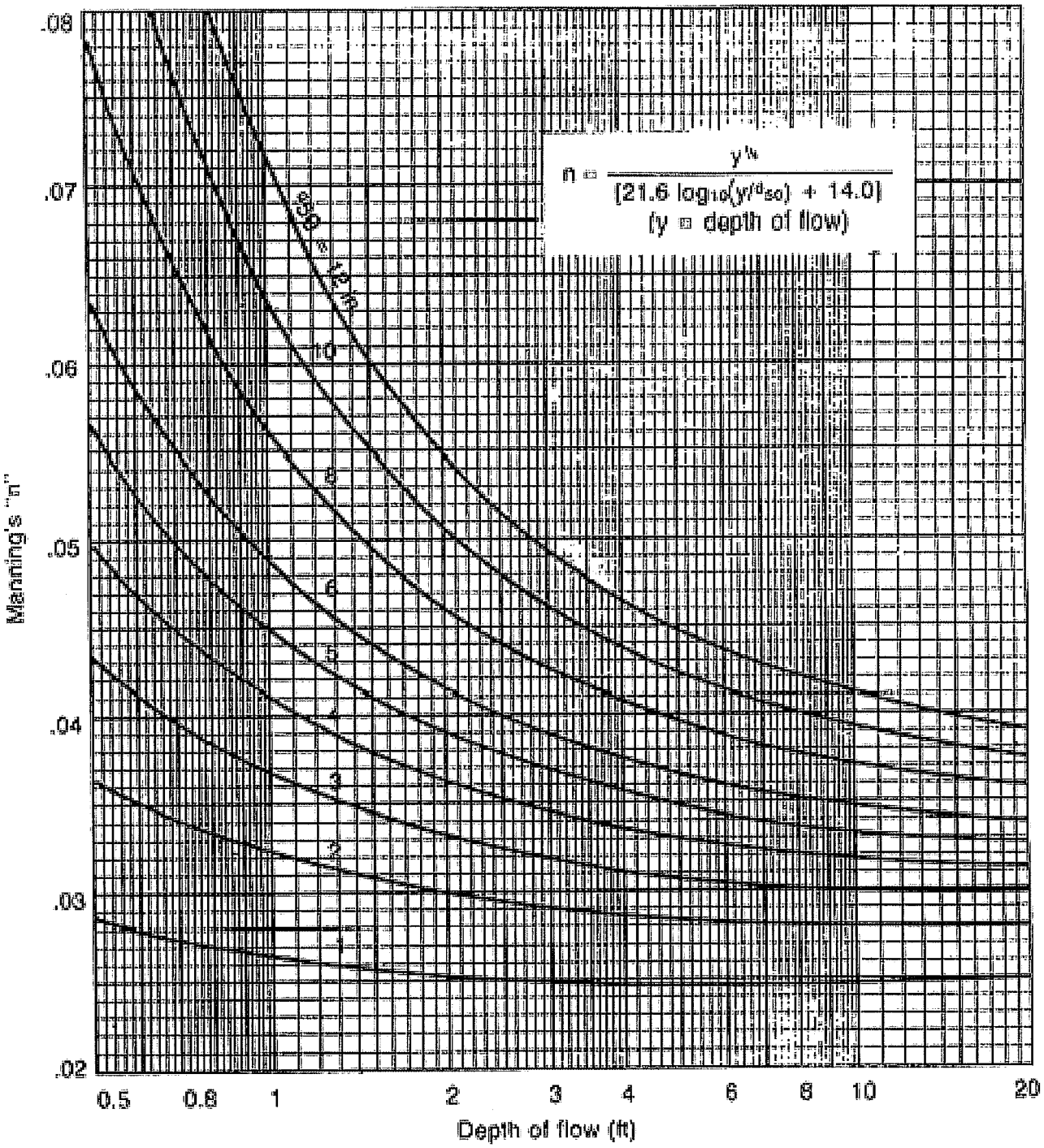
6. Construction operation shall be done in such a manner that erosion, air pollution, and water pollution will be minimized and held within legal limits. The completed job shall meet all design requirements for the appropriate finish. All disturbed areas shall be vegetated or otherwise protected against soil erosion.

Maintenance

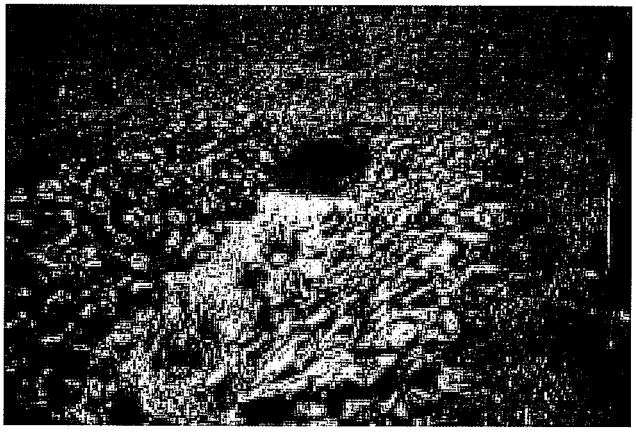
Pavement or lining should be maintained as built to prevent undermining and deterioration. Existing trees next to pavements should be removed, as roots can cause uplift damage.

Vegetation next to pavement should be maintained in good condition to prevent scouring if the pavement is overtopped. See Standard and Specifications for Permanent Construction Area Planting on page 4.42.

Figure 3.11
Determining "n" for Riprap Lined Channel using Depth of Flow Chart
(USDA - NRCS)



STANDARD AND SPECIFICATIONS FOR ROCK OUTLET PROTECTION



Definition & Scope

A **permanent** section of rock protection placed at the outlet end of the culverts, conduits, or channels to reduce the depth, velocity, and energy of water, such that the flow will not erode the receiving downstream reach.

Conditions Where Practice Applies

This practice applies where discharge velocities and energies at the outlets of culverts, conduits, or channels are sufficient to erode the next downstream reach. This applies to:

1. Culvert outlets of all types.
2. Pipe conduits from all sediment basins, dry storm water ponds, and permanent type ponds.
3. New channels constructed as outlets for culverts and conduits.

Design Criteria

The design of rock outlet protection depends entirely on the location. Pipe outlet at the top of cuts or on slopes steeper than 10 percent, cannot be protected by rock aprons or riprap sections due to re-concentration of flows and high velocities encountered after the flow leaves the apron.

Many counties and state agencies have regulations and design procedures already established for dimensions, type and size of materials, and locations where outlet protection is required. Where these requirements exist, they shall be followed.

Tailwater Depth

The depth of tailwater immediately below the pipe outlet must be determined for the design capacity of the pipe. If the tailwater depth is less than half the diameter of the outlet pipe, and the receiving stream is wide enough to accept divergence of the flow, it shall be classified as a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example. If the tailwater depth is greater than half the pipe diameter and the receiving stream will continue to confine the flow, it shall be classified as a Maximum Tailwater Condition; see Figure 3.17 on page 3.43 as an example. Pipes which outlet onto flat areas with no defined channel may be assumed to have a Minimum Tailwater Condition; see Figure 3.16 on page 3.42 as an example.

Apron Size

The apron length and width shall be determined from the curves according to the tailwater conditions:

Minimum Tailwater – Use Figure 3.16 on page 3.42
Maximum Tailwater – Use Figure 3.17 on page 3.43

If the pipe discharges directly into a well defined channel, the apron shall extend across the channel bottom and up the channel banks to an elevation one foot above the maximum tailwater depth or to the top of the bank, whichever is less.

The upstream end of the apron, adjacent to the pipe, shall have a width two (2) times the diameter of the outlet pipe, or conform to pipe end section if used.

Bottom Grade

The outlet protection apron shall be constructed with no slope along its length. There shall be no overfall at the end of the apron. The elevation of the downstream end of the apron shall be equal to the elevation of the receiving channel or adjacent ground.

Alignment

The outlet protection apron shall be located so that there are no bends in the horizontal alignment.

Materials

The outlet protection may be done using rock riprap, grouted riprap, or gabions. Outlets constructed on the bank of a stream or wetland shall not use grouted rip-rap, gabions or concrete.

Riprap shall be composed of a well-graded mixture of rock size so that 50 percent of the pieces, by weight, shall be larger than the d_{50} size determined by using the charts. A

well-graded mixture, as used herein, is defined as a mixture composed primarily of larger rock sizes, but with a sufficient mixture of other sizes to fill the smaller voids between the rocks. The diameter of the largest rock size in such a mixture shall be 1.5 times the d_{50} size.

Thickness

The minimum thickness of the riprap layer shall be 1.5 times the maximum rock diameter for d_{50} of 15 inches or less; and 1.2 times the maximum rock size for d_{50} greater than 15 inches. The following chart lists some examples:

D_{50} (inches)	d_{max} (inches)	Minimum Blanket Thickness (inches)
4	6	9
6	9	14
9	14	20
12	18	27
15	22	32
18	27	32
21	32	38
24	36	43

Rock Quality

Rock for riprap shall consist of field rock or rough unhewn quarry rock. The rock shall be hard and angular and of a quality that will not disintegrate on exposure to water or weathering. The specific gravity of the individual rocks shall be at least 2.5.

Filter

A filter is a layer of material placed between the riprap and the underlying soil surface to prevent soil movement into and through the riprap. Riprap shall have a filter placed under it in all cases.

A filter can be of two general forms: a gravel layer or a plastic filter cloth. The plastic filter cloth can be woven or non-woven monofilament yarns, and shall meet these base requirements: thickness 20-60 mils, grab strength 90-120 lbs; and shall conform to ASTM D-1777 and ASTM D-1682.

Gravel filter blanket, when used, shall be designed by comparing particle sizes of the overlying material and the base material. Design criteria are available in Standard and Specification for Anchored Slope and Channel Stabilization on page 4.7.

Gabions

Gabions shall be made of hexagonal triple twist mesh with heavily galvanized steel wire. The maximum linear dimension of the mesh opening shall not exceed 4 ½ inches and the area of the mesh opening shall not exceed 10 square inches.

Gabions shall be fabricated in such a manner that the sides, ends, and lid can be assembled at the construction site into a rectangular basket of the specified sizes. Gabions shall be of single unit construction and shall be installed according to manufacturer's recommendations.

The area on which the gabion is to be installed shall be graded as shown on the drawings. Foundation conditions shall be the same as for placing rock riprap, and filter cloth shall be placed under all gabions. Where necessary, key, or tie, the structure into the bank to prevent undermining of the main gabion structure.

Maintenance

Once a riprap outlet has been installed, the maintenance needs are very low. It should be inspected after high flows for evidence of scour beneath the riprap or for dislodged rocks. Repairs should be made immediately.

Design Procedure

1. Investigate the downstream channel to assure that nonerosive velocities can be maintained.

2. Determine the tailwater condition at the outlet to establish which curve to use.

3. Use the appropriate chart with the design discharge to determine the riprap size and apron length required. It is noted that references to pipe diameters in the charts are based on full flow. For other than full pipe flow, the parameters of depth of flow and velocity must be used to adjust the design discharges.

4. Calculate apron width at the downstream end if a flare section is to be employed.

Design Examples are demonstrated in Appendix B.

Construction Specifications

1. The subgrade for the filter, riprap, or gabion shall be prepared to the required lines and grades. Any fill required in the subgrade shall be compacted to a density of approximately that of the surrounding undisturbed material.

2. The rock or gravel shall conform to the specified grad-

ing limits when installed respectively in the riprap or filter.

3. Filter cloth shall be protected from punching, cutting, or tearing. Any damage other than an occasional small hole shall be repaired by placing another piece of cloth over the damaged part or by completely replacing the cloth. All overlaps, whether for repairs or for joining two pieces of cloth shall be a minimum of one foot.

4. Rock for the riprap or gabion outlets may be placed by equipment. Both shall each be constructed to the full course thickness in one operation and in such a manner as to avoid displacement of underlying materials. The rock for riprap or gabion outlets shall be delivered and placed in a manner that will ensure that it is reasonably homogenous with the smaller rocks and spalls filling the voids between the larger rocks. Riprap shall be placed in a manner to prevent damage to the filter blanket or filter cloth. Hand placement will be required to the extent necessary to prevent damage to the permanent works.

Figure 3.16
Outlet Protection Design—Minimum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Minimum Tailwater Condition: $T_w < 0.5D_o$) (USDA - NRCS)

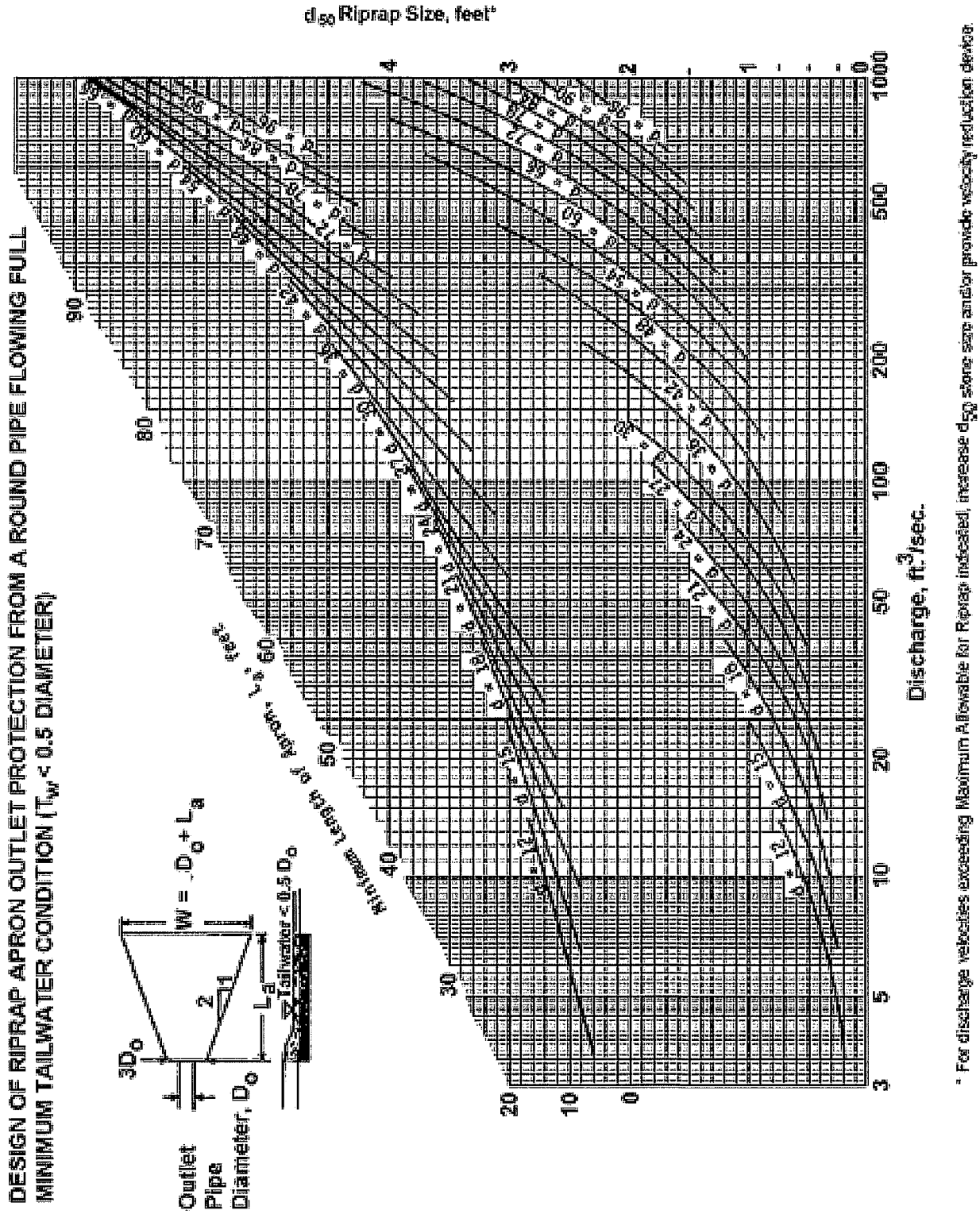


Figure 3.17
Outlet Protection Design—Maximum Tailwater Condition Chart (Design of Outlet Protection from a Round Pipe Flowing Full, Maximum Tailwater Condition: $T_w \geq 0.5D_o$) (USDA - NRCS)

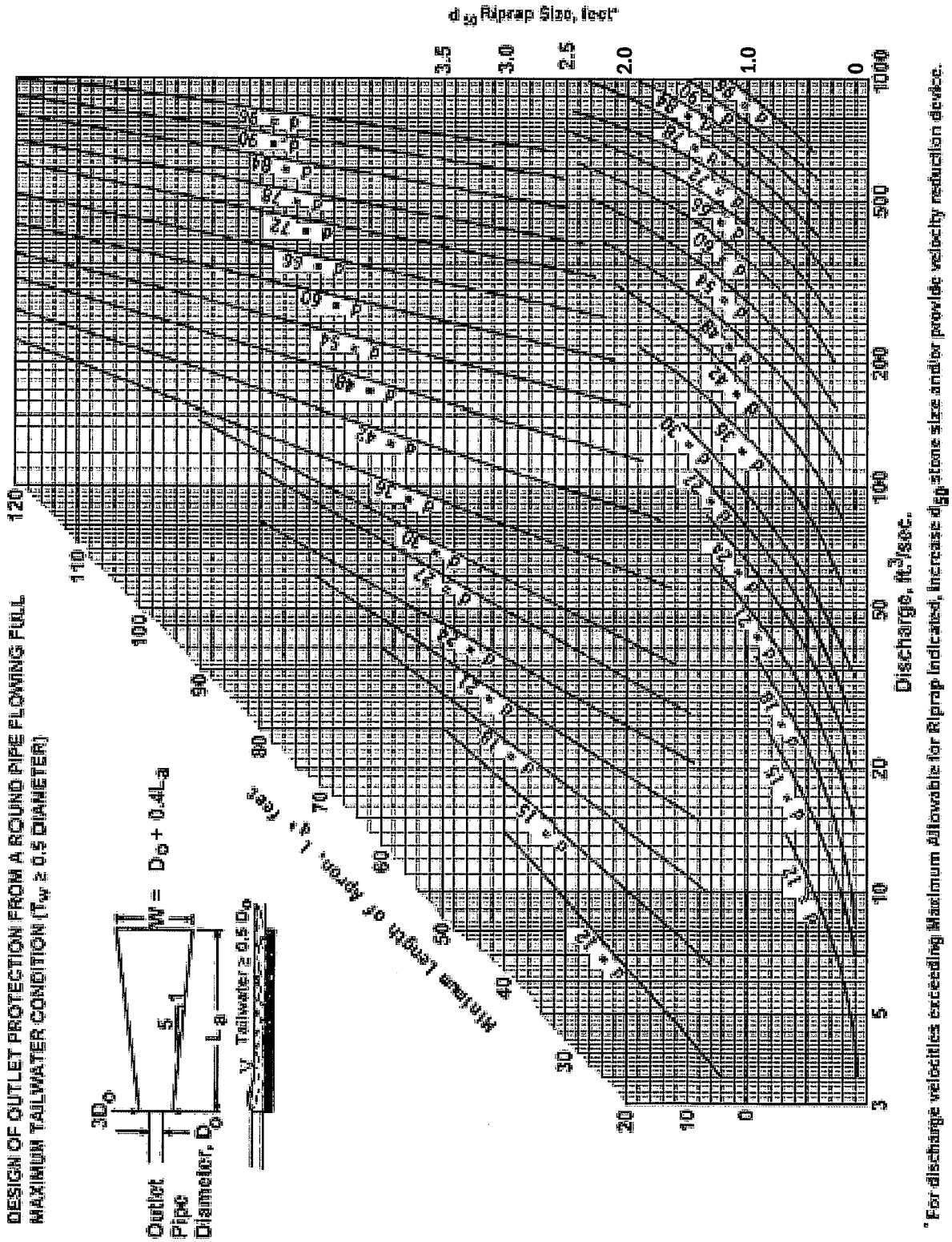


Figure 3.18
Riprap Outlet Protection Detail (1)

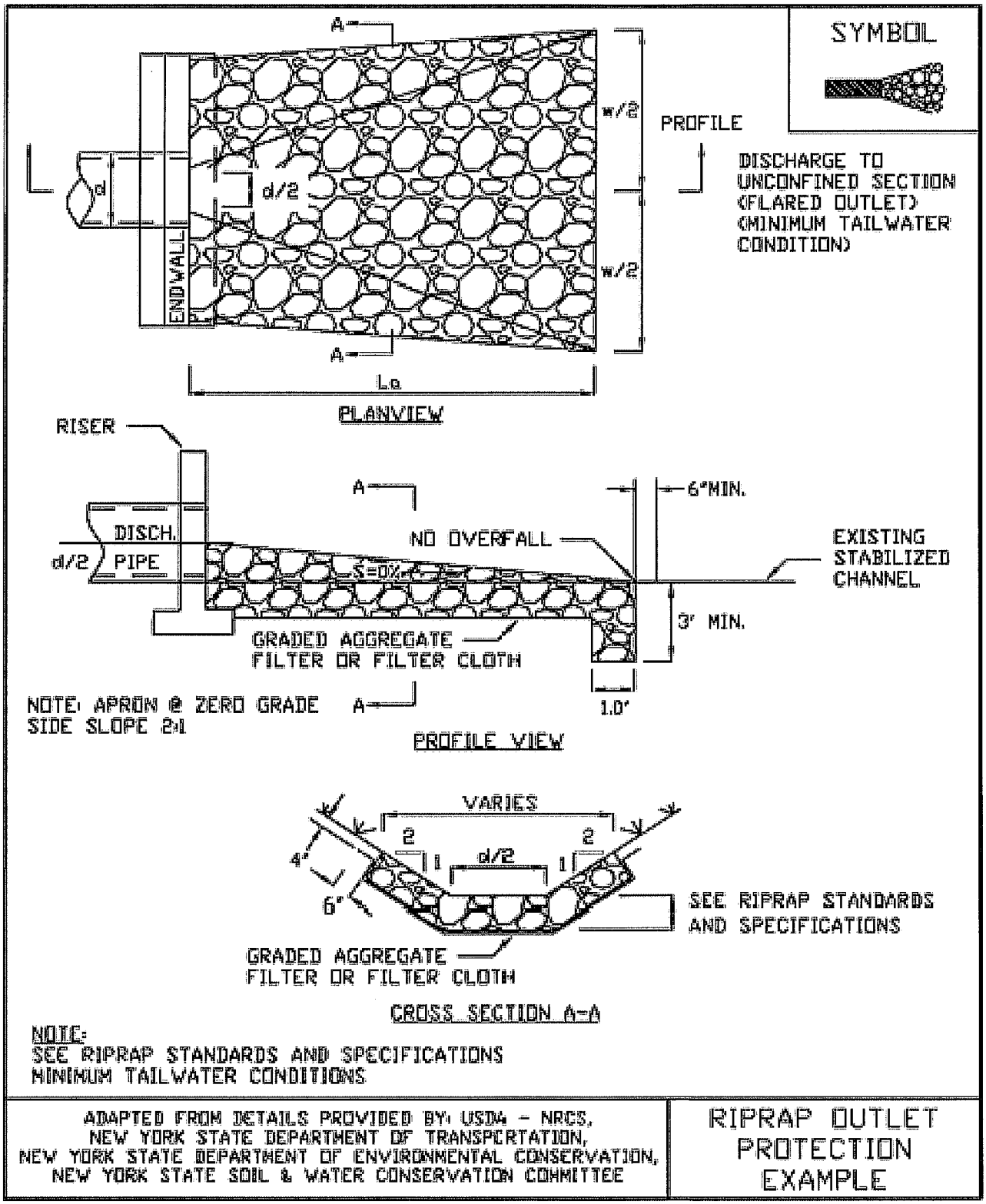
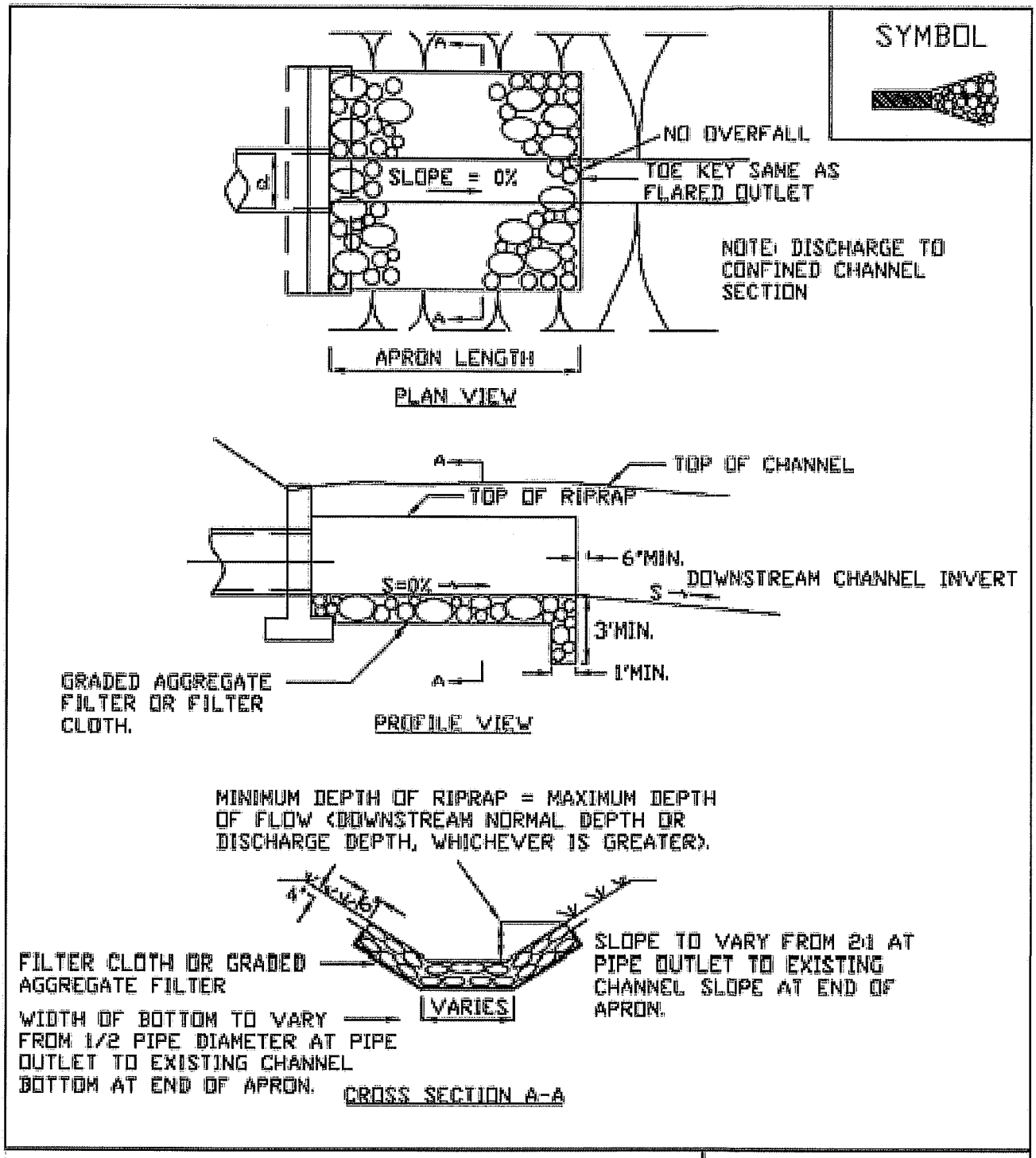
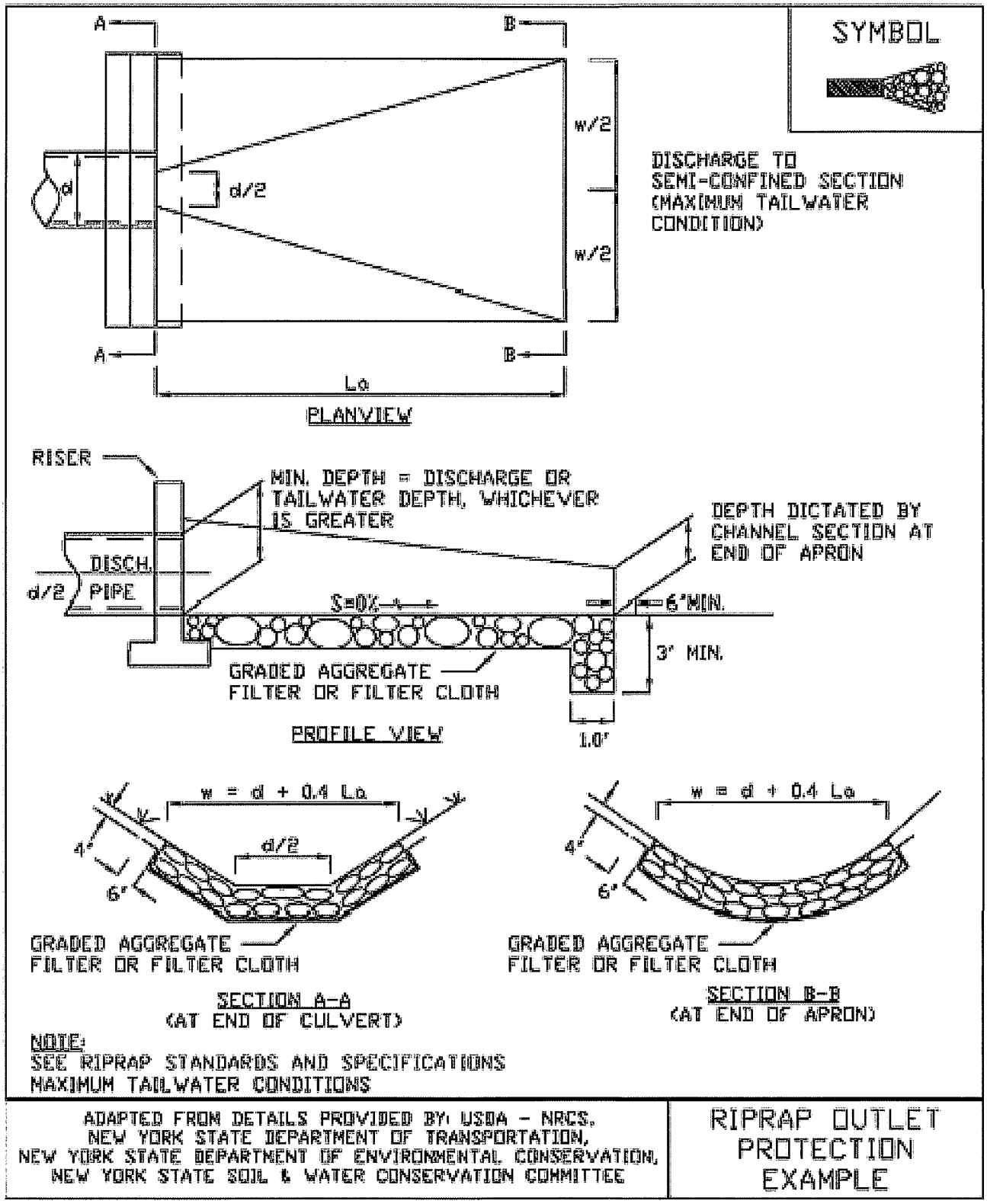


Figure 3.19
Riprap Outlet Protection Detail (2)



ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	RIPRAP OUTLET PROTECTION EXAMPLE

Figure 3.20
Riprap Outlet Protection Detail (3)



STANDARD AND SPECIFICATIONS FOR ANCHORED STABILIZATION MATTING

Definition and Scope

A **temporary** or **permanent** protective covering placed on a prepared, seeded planting area that is anchored in place by staples or other means to aid in controlling erosion by absorbing rain splash energy and withstand overland flow as well as provide a microclimate to protect and promote seed establishment.

Conditions Where Practice Applies

Anchored stabilization mats are required for seeded earthen slopes steeper than 3 horizontal to 1 vertical; in vegetated channels where the velocity of the design flow exceeds the allowable velocity for vegetation alone (usually greater than 5 feet per second); on streambanks and shorelines where moving water is likely to erode newly seeded or planted areas; and in areas where wind prevents standard mulching with straw. This standard does not apply to slopes stabilized with sod, rock riprap or hard armor material.

Design Criteria

Slope Applications - Anchored stabilization mats for use on slopes are primarily used as mulch blankets where the mesh material is within the blanket or as a netting over previously placed mulch. These stabilization mats are NOT effective in preventing slope failures.

1. Required on all slopes steeper than 3:1
2. Matting will be designed for proper longevity need and strength based on intended use.
3. All installation details and directions will be included on the site erosion and sediment control plan and will follow manufactures specifications.

Channel Applications - Anchored stabilization mats, for use in supporting vegetation in flow channels, are generally a non-degradable, three dimensional plastic structure which can be filled with soil prior to planting. This structure provides a medium for root growth where the matting and roots become intertwined forming a continuous anchor for the vegetated lining.

1. Channel stabilization shall be based on the tractive force method.
2. For maximum design shear stresses less than 2 pounds per square foot, a temporary or bio-degradable mat may be used.
3. The design of the final matting shall be based on the mats ability to resist the tractive shear stress at bank full flow.
4. The installation details and procedures shall be included on the site erosion and sediment control plan and will follow manufacturers specifications.

Construction Specifications

1. Prepare soil before installing matting by smoothing the surface, removing debris and large stone, and applying lime, fertilizer and seed. Refer to manufacturers installation details.
2. Begin at the top of the slope by anchoring the mat in a 6" deep x 6" wide trench. Backfill and compact the trench after stapling.
3. In channels or swales, begin at the downslope end, anchoring the mat at the bottom and top ends of the blanket. When another roll is needed, the upslope roll

should overlay the lower layer, shingle style, so that channel flows do not peel back the material.

4. Roll the mats down a slope with a minimum 4" overlap. Roll center mat in a channel in direction of water flow on bottom of the channel. Do not stretch blankets. Blankets shall have good continuous contact with the underlying soil throughout its entire length.

5. Place mats end over end (shingle style) with a 6" overlap, use a double row of staggered staples 4" apart to secure mats.

6. Full length edge of mats at top of side slopes must be anchored in 6" deep x 6" wide trench; backfill and compact the trench after stapling.

7. Mats on side slopes of a channel must be overlapped 4" over the center mat and stapled.

8. In high flow channel applications, a staple check slot is recommended at 30 to 40 foot intervals. Use a row of staples 4" apart over entire width of the channel. Place a second row 4" below the first row in a staggered pattern.

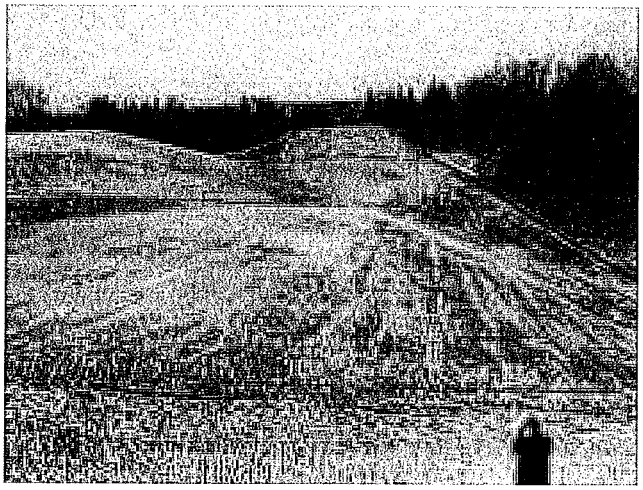
9. The terminal end of the mats must be anchored in a 6"x6" wide trench. Backfill and compact the trench after stapling.

10. Stapling and anchoring of blanket shall be done in accordance with the manufactures recommendations.

Maintenance

Blanketed areas shall be inspected weekly and after each runoff event until perennial vegetation is established to a minimum uniform 80% coverage throughout the blanketed area. Damaged or displaced blankets shall be restored or replaced within 2 calendar days.

STANDARD AND SPECIFICATIONS FOR LANDGRADING



Definition & Scope

Permanent reshaping of the existing land surface by grading in accordance with an engineering topographic plan and specification to provide for erosion control and vegetative establishment on disturbed, reshaped areas.

Design Criteria

The grading plan should be based upon the incorporation of building designs and street layouts that fit and utilize existing topography and desirable natural surrounding to avoid extreme grade modifications. Information submitted must provide sufficient topographic surveys and soil investigations to determine limitations that must be imposed on the grading operation related to slope stability, effect on adjacent properties and drainage patterns, measures for drainage and water removal, and vegetative treatment, etc.

Many municipalities and counties have regulations and design procedures already established for land grading and cut and fill slopes. Where these requirements exist, they shall be followed.

The plan must show existing and proposed contours of the area(s) to be graded. The plan shall also include practices for erosion control, slope stabilization, safe disposal of runoff water and drainage, such as waterways, lined ditches, reverse slope benches (include grade and cross section), grade stabilization structures, retaining walls, and surface and subsurface drains. The plan shall also include phasing of these practices. The following shall be incorporated into the plan:

1. Provisions shall be made to safely convey surface runoff to storm drains, protected outlets, or to stable water courses to ensure that surface runoff will not damage slopes or other graded areas; see standards and specifications for Grassed Waterway, Diversion, or Grade Stabilization Structure.

2. Cut and fill slopes that are to be stabilized with grasses shall not be steeper than 2:1. When slopes exceed 2:1, special design and stabilization consideration are required and shall be adequately shown on the plans. (Note: Where the slope is to be mowed, the slope should be no steeper than 3:1, although 4:1 is preferred because of safety factors related to mowing steep slopes.)

3. Reverse slope benches or diversion shall be provided whenever the vertical interval (height) of any 2:1 slope exceeds 20 feet; for 3:1 slope it shall be increased to 30 feet and for 4:1 to 40 feet. Benches shall be located to divide the slope face as equally as possible and shall convey the water to a stable outlet. Soils, seeps, rock outcrops, etc., shall also be taken into consideration when designing benches.

   A. Benches shall be a minimum of six feet wide to provide for ease of maintenance.

   B. Benches shall be designed with a reverse slope of 6:1 or flatter to the toe of the upper slope and with a minimum of one foot in depth. Bench gradient to the outlet shall be between 2 percent and 3 percent, unless accompanied by appropriate design and computations.

   C. The flow length within a bench shall not exceed 800 feet unless accompanied by appropriate design and computations; see Standard and Specifications for Diversion on page 3.9

4. Surface water shall be diverted from the face of all cut and/or fill slopes by the use of diversions, ditches and swales or conveyed downslope by the use of a designed structure, except where:

   A. The face of the slope is or shall be stabilized and the face of all graded slopes shall be protected from surface runoff until they are stabilized.

   B. The face of the slope shall not be subject to any concentrated flows of surface water such as from natural drainage ways, graded ditches, downspouts, etc.

   C. The face of the slope will be protected by anchored stabilization matting, sod, gravel, riprap, or other stabilization method.

5. Cut slopes occurring in ripable rock shall be serrated as shown in Figure 4.9 on page 4.26. The serrations shall be made with conventional equipment as the excavation is made. Each step or serration shall be constructed on the contour and will have steps cut at nominal two-foot intervals with nominal three-foot horizontal shelves. These steps will vary depending on the slope ratio or the cut slope. The nominal slope line is 1 ½: 1. These steps will weather and act to hold moisture, lime, fertilizer, and seed thus producing a much quicker and longer-lived vegetative cover and better slope stabilization. Overland flow shall be diverted from the top of all serrated cut slopes and carried to a suitable outlet.

6. Subsurface drainage shall be provided where necessary to intercept seepage that would otherwise adversely affect slope stability or create excessively wet site conditions.

7. Slopes shall not be created so close to property lines as to endanger adjoining properties without adequately protecting such properties against sedimentation, erosion, slippage, settlement, subsidence, or other related damages.

8. Fill material shall be free of brush, rubbish, rocks, logs, stumps, building debris, and other objectionable material. It should be free of stones over two (2) inches in diameter where compacted by hand or mechanical tampers or over eight (8) inches in diameter where compacted by rollers or other equipment. Frozen material shall not be placed in the fill nor shall the fill material be placed on a frozen foundation.

9. Stockpiles, borrow areas, and spoil shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.

10. All disturbed areas shall be stabilized structurally or vegetatively in compliance with the Permanent Construction Area Planting Standard on page 4.42.

Construction Specifications

See Figures 4.9 and 4.10 for details.

1. All graded or disturbed areas, including slopes, shall be protected during clearing and construction in accordance with the erosion and sediment control plan until they are adequately stabilized.

2. All erosion and sediment control practices and measures shall be constructed, applied and maintained in accordance with the erosion and sediment control plan and these standards.

3. Topsoil required for the establishment of vegetation shall be stockpiled in amount necessary to complete finished grading of all exposed areas.

4. Areas to be filled shall be cleared, grubbed, and stripped of topsoil to remove trees, vegetation, roots, or other objectionable material.

5. Areas that are to be topsoiled shall be scarified to a minimum depth of four inches prior to placement of topsoil.

6. All fills shall be compacted as required to reduce erosion, slippage, settlement, subsidence, or other related problems. Fill intended to support buildings, structures, and conduits, etc., shall be compacted in accordance with local requirements or codes.

7. All fill shall be placed and compacted in layers not to exceed 9 inches in thickness.

8. Except for approved landfills or nonstructural fills, fill material shall be free of frozen particles, brush, roots, sod, or other foreign objectionable materials that would interfere with, or prevent, construction of satisfactory fills.

9. Frozen material or soft, mucky or highly compressible materials shall not be incorporated into fill slopes or structural fills.

10. Fill shall not be placed on saturated or frozen surfaces.

11. All benches shall be kept free of sediment during all phases of development.

12. Seeps or springs encountered during construction shall be handled in accordance with the Standard and Specification for Subsurface Drain on page 3.48 or other approved methods.

13. All graded areas shall be permanently stabilized immediately following finished grading.

14. Stockpiles, borrow areas, and spoil areas shall be shown on the plans and shall be subject to the provisions of this Standard and Specifications.

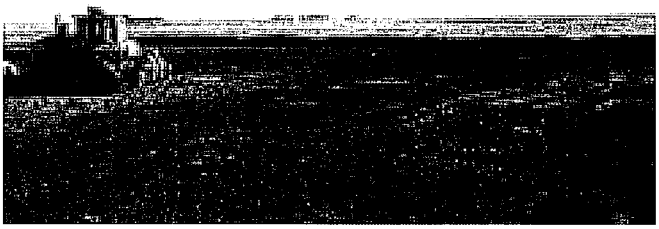
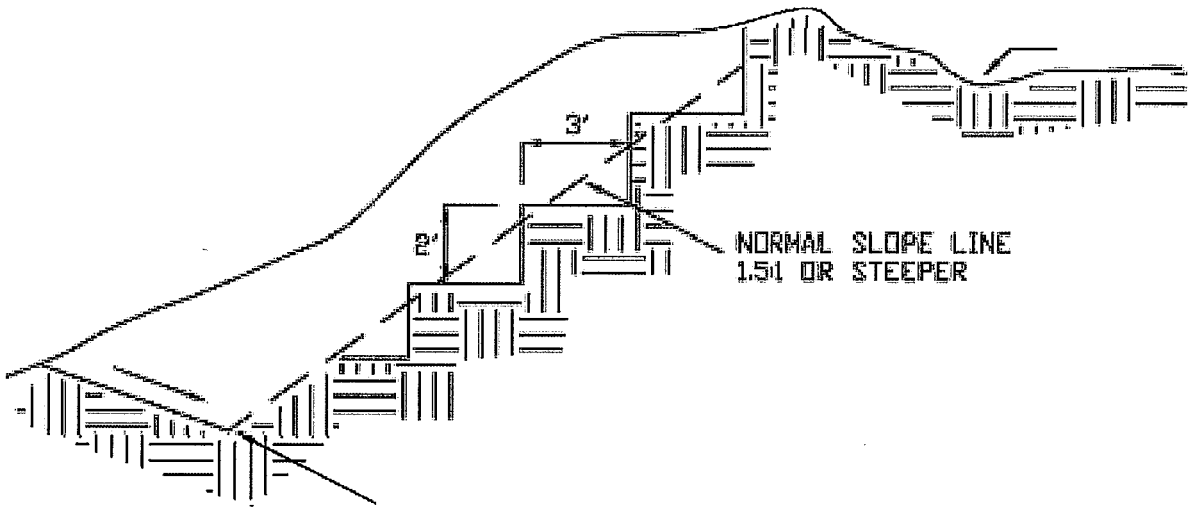


Figure 4.9
Typical Section of Serrated Cut Slope



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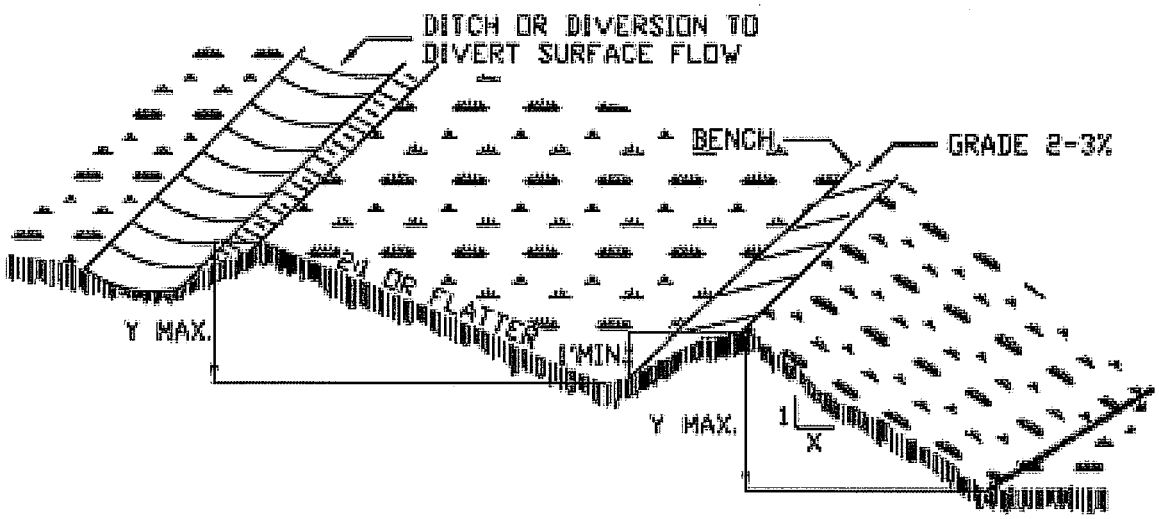
TYPICAL SECTION OF SERRATED CUT SLOPE

Figure 4.10
Landgrading



X	Y(MAX)
2	20'
3	30'
4	40'

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LANDGRADING DETAIL

Figure 4.11
Landgrading - Construction Specifications

CONSTRUCTION SPECIFICATIONS

1. ALL GRADED OR DISTURBED AREAS INCLUDING SLOPES SHALL BE PROTECTED DURING CLEARING AND CONSTRUCTION IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN UNTIL THEY ARE PERMANENTLY STABILIZED.
2. ALL SEDIMENT CONTROL PRACTICES AND MEASURES SHALL BE CONSTRUCTED, APPLIED AND MAINTAINED IN ACCORDANCE WITH THE APPROVED EROSION AND SEDIMENT CONTROL PLAN.
3. TOPSOIL REQUIRED FOR THE ESTABLISHMENT OF VEGETATION SHALL BE STOCKPILED IN AMOUNT NECESSARY TO COMPLETE FINISHED GRADING OF ALL EXPOSED AREAS.
4. AREAS TO BE FILLED SHALL BE CLEARED, GRUBBED, AND STRIPPED OF TOPSOIL TO REMOVE TREES, VEGETATION, ROOTS OR OTHER OBJECTIONABLE MATERIAL.
5. AREAS WHICH ARE TO BE TOPSOILED SHALL BE SCARIFIED TO A MINIMUM DEPTH OF FOUR INCHES PRIOR TO PLACEMENT OF TOPSOIL.
6. ALL FILLS SHALL BE COMPACTED AS REQUIRED TO REDUCE EROSION, SLIPPAGE, SETTLEMENT, SUBSIDENCE OR OTHER RELATED PROBLEMS. FILL INTENDED TO SUPPORT BUILDINGS, STRUCTURES AND CONDUITS, ETC. SHALL BE COMPACTED IN ACCORDANCE WITH LOCAL REQUIREMENTS OR CODES.
7. ALL FILL SHALL BE PLACED AND COMPACTED IN LAYERS NOT TO EXCEED 9 INCHES IN THICKNESS.
8. EXCEPT FOR APPROVED LANDFILLS, FILL MATERIAL SHALL BE FREE OF FROZEN PARTICLES, BRUSH, ROOTS, SOD, OR OTHER FOREIGN OR OTHER OBJECTIONABLE MATERIALS THAT WOULD INTERFERE WITH OR PREVENT CONSTRUCTION OF SATISFACTORY FILLS.
9. FROZEN MATERIALS OR SOFT, MUCKY OR HIGHLY COMPRESSIBLE MATERIALS SHALL NOT BE INCORPORATED IN FILLS.
10. FILL SHALL NOT BE PLACED ON SATURATED OR FROZEN SURFACES.
11. ALL BENCHES SHALL BE KEPT FREE OF SEDIMENT DURING ALL PHASES OF DEVELOPMENT.
12. SEEPS OR SPRINGS ENCOUNTERED DURING CONSTRUCTION SHALL BE HANDLED IN ACCORDANCE WITH THE STANDARD AND SPECIFICATION FOR SUBSURFACE DRAIN OR OTHER APPROVED METHOD.
13. ALL GRADED AREAS SHALL BE PERMANENTLY STABILIZED IMMEDIATELY FOLLOWING FINISHED GRADING.
14. STOCKPILES, BORROW AREAS AND SPOIL AREAS SHALL BE SHOWN ON THE PLANS AND SHALL BE SUBJECT TO THE PROVISIONS OF THIS STANDARD AND SPECIFICATION.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	LANDGRADING SPECIFICATIONS

STANDARD AND SPECIFICATIONS FOR MULCHING

Definition and Scope

Applying coarse plant residue or chips, or other suitable materials, to cover the soil surface to provide initial erosion control while a seeding or shrub planting is establishing. Mulch will conserve moisture and modify the surface soil temperature and reduce fluctuation of both. Mulch will prevent soil surface crusting and aid in weed control. Mulch can also be used alone for temporary stabilization in non-growing months. Use of stone as a mulch could be more permanent and should not be limited to non-growing months.

Conditions Where Practice Applies

On soils subject to erosion and on new seedings and shrub plantings. Mulch is useful on soils with low infiltration rates by retarding runoff.

Criteria

Site preparation prior to mulching requires the installation of necessary erosion control or water management practices and drainage systems.

Slope, grade and smooth the site to fit needs of selected mulch products.

Remove all undesirable stones and other debris to meet the needs of the anticipated land use and maintenance required.

Apply mulch after soil amendments and planting is accomplished or simultaneously if hydroseeding is used.

Select appropriate mulch material and application rate or material needs. Hay mulch shall not be used in wetlands or in areas of permanent seeding. Clean straw mulch is preferred alternative in wetland application. Determine local availability.

Select appropriate mulch anchoring material.

NOTE: The best combination for grass/legume establishment is straw (cereal grain) mulch applied at 2 ton/ acre (90 lbs./1000sq.ft.) and anchored with wood fiber mulch (hydromulch) at 500 – 750 lbs./acre (11 – 17 lbs./1000 sq. ft.). The wood fiber mulch must be applied through a hydroseeder immediately after mulching.

Table 4.2
Guide to Mulch Materials, Rates, and Uses

Mulch Material	Quality Standards	per 1000 Sq. Ft.	per Acre	Depth of Application	Remarks
Wood chips or shavings	Air-dried. Free of objectionable coarse material	500-900 lbs.	10-20 tons	2-7"	Used primarily around shrub and tree plantings and recreation trails to inhibit weed competition. Resistant to wind blowing. Decomposes slowly.
Wood fiber cellulose (partly digested wood fibers)	Made from natural wood usually with green dye and dispersing agent	50 lbs.	2,000 lbs.	—	Apply with hydromulcher. No tie down required. Less erosion control provided than 2 tons of hay or straw.
Gravel, Crushed Stone or Slag	Washed; Size 2B or 3A—1 1/2"	9 cu. yds.	405 cu. yds.	3"	Excellent mulch for short slopes and around plants and ornamentals. Use 2B where subject to traffic. (Approximately 2,000 lbs./cu. yd.). Frequently used over filter fabric for better weed control.
Hay or Straw	Air-dried; free of undesirable seeds & coarse materials	90-100 lbs. 2-3 bales	2 tons (100-120 bales)	cover about 90% surface	Use small grain straw where mulch is maintained for more than three months. Subject to wind blowing unless anchored. Most commonly used mulching material. Provides the best micro-environment for germinating seeds.
Jute twisted yarn	Undyed, unbleached plain weave. Warp 78 ends/yd., Weft 41 ends/ yd. 60-90 lbs./roll	48" x 50 yds. or 48" x 75 yds.	—	—	Use without additional mulch. Tie down as per manufacturers specifications. Good for center line of concentrated water flow.
Excelsior wood fiber mats	Interlocking web of excelsior fibers with photodegradable plastic netting	4' x 112.5' or 8' x 112.5'.	—	—	Use without additional mulch. Excellent for seeding establishment. Anchor as per manufacturers specifications. Approximately 72 lbs./roll for excelsior with plastic on both sides. Use two sided plastic for centerline of waterways.
Straw or coconut fiber, or combination	Photodegradable plastic net on one or two sides	Most are 6.5 ft. x 3.5 ft.	81 rolls	—	Designed to tolerate higher velocity water flow, centerlines of waterways, 60 sq. yds. per roll.

Table 4.3
Mulch Anchoring Guide

Anchoring Method or Material	Kind of Mulch to be Anchored	How to Apply
1. Peg and Twine	Hay or straw	After mulching, divide areas into blocks approximately 1 sq. yd. in size. Drive 4-6 pegs per block to within 2" to 3" of soil surface. Secure mulch to surface by stretching twine between pegs in criss-cross pattern on each block. Secure twine around each peg with 2 or more tight turns. Drive pegs flush with soil. Driving stakes into ground tightens the twine.
2. Mulch netting	Hay or straw	Staple the light-weight paper, jute, wood fiber, or plastic nettings to soil surface according to manufacturer's recommendations. Should be biodegradable. Most products are not suitable for foot traffic.
3. Wood cellulose fiber	Hay or straw	Apply with hydroseeder immediately after mulching. Use 500 lbs. wood fiber per acre. Some products contain an adhesive material ("tackifier"), possibly advantageous.
4. Mulch anchoring tool	Hay or straw	Apply mulch and pull a mulch anchoring tool (blunt, straight discs) over mulch as near to the contour as possible. Mulch material should be "tucked" into soil surface about 3".
5. Tackifier	Hay or straw	Mix and apply polymeric and gum tackifiers according to manufacturer's instructions. Avoid application during rain. A 24-hour curing period and a soil temperature higher than 45^0 Fahrenheit are required.

STANDARD AND SPECIFICATIONS FOR PERMANENT CONSTRUCTION AREA PLANTING

Definition & Scope

Establishing **permanent** grasses with other forbs and/or shrubs to provide a minimum 80% perennial vegetative cover on areas disturbed by construction and critical areas to reduce erosion and sediment transport. Critical areas may include but are not limited to steep excavated cut or fill slopes as well as eroding or denuded natural slopes and areas subject to erosion.

Conditions Where Practice Applies

This practice applies to all disturbed areas void of, or having insufficient, cover to prevent erosion and sediment transport. See additional standards for special situations such as sand dunes and sand and gravel pits.

Criteria

All water control measures will be installed as needed prior to final grading and seedbed preparation. Any severely compacted sections will require chiseling or disking to provide an adequate rooting zone, to a minimum depth of 12", see Soil Restoration Standard. The seedbed must be prepared to allow good soil to seed contact, with the soil not too soft and not too compact. Adequate soil moisture must be present to accomplish this. If surface is powder dry or sticky wet, postpone operations until moisture changes to a favorable condition. If seeding is accomplished within 24 hours of final grading, additional scarification is generally not needed, especially on ditch or stream banks. Remove all stones and other debris from the surface that are greater than 4 inches, or that will interfere with future mowing or maintenance.

Soil amendments should be incorporated into the upper 2 inches of soil when feasible. **The soil should be tested to determine the amounts of amendments needed.** Apply ground agricultural limestone to attain a pH of 6.0 in the upper 2 inches of soil. If soil must be fertilized before results of a soil test can be obtained to determine fertilizer needs, apply commercial fertilizer at 600 lbs. per acre of 5-5-10 or equivalent. If manure is used, apply a quantity to meet the nutrients of the above fertilizer. This requires an appropriate manure analysis prior to applying to the site. Do not use manure on sites to be planted with birdsfoot trefoil or in the path of concentrated water flow.

Seed mixtures may vary depending on location within the state and time of seeding. Generally, warm season grasses should only be seeded during early spring, April to May. These grasses are primarily used for vegetating excessively drained sands and gravels. See Standard and Specification for Sand and Gravel Mine Reclamation. Other grasses may be seeded any time of the year when the soil is not frozen and is workable. When legumes such as birdsfoot trefoil are included, spring seeding is preferred. See Table 4.4, "Permanent Construction Area Planting Mixture Recommendations" for additional seed mixtures.

General Seed Mix:	Variety	lbs./ acre	lbs/1000 sq. ft.
Red Clover[1] OR	Acclaim, Rally, Red Head II, Renegade	8[2]	0.20
Common white clover[1]	Common	8	0.20
PLUS			
Creeping Red Fescue	Common	20	0.45
PLUS			
Smooth Bromegrass OR	Common	2	0.05
Ryegrass (perennial)	Pennfine/Linn	5	0.10

[1] add inoculant immediately prior to seeding
[2] Mix 4 lbs each of Empire and Pardee OR 4 lbs of Birdsfoot and 4 lbs white clover per acre. All seeding rates are given for Pure Live Seed (PLS)

Pure Live Seed, or (PLS) refers to the amount of live seed in a lot of bulk seed. Information on the seed bag label includes the type of seed, supplier, test date, source of seed, purity, and germination. Purity is the percentage of pure seed. Germination is the percentage of pure seed that will produce normal plants when planted under favorable conditions.

To compute Pure Live Seed multiply the "germination percent" times the "purity" and divide that by 100 to get Pure Live Seed.

$$\text{Pure Live Seed (PLS)} = \frac{\%\,\text{Germination} \times \%\,\text{Purity}}{100}$$

For example, the PLS for a lot of Kentucky Blue grass with 75% purity and 96% germination would be calculated as follows:

$$\frac{(96) \times (75)}{100} = 72\%\ \text{Pure Live Seed}$$

For 10lbs of PLS from this lot =

$$\frac{10}{0.72} = 13.9\ \text{lbs}$$

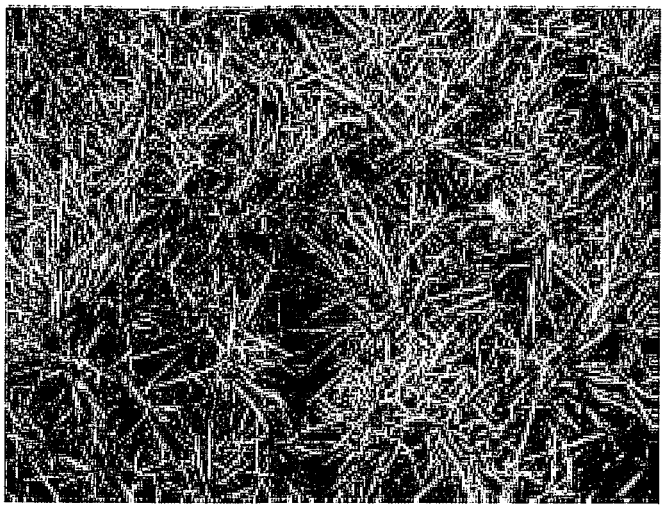
Therefore, 13.9 lbs of seed is the actual weight needed to meet 10lbs PSL from this specific seed lot.

Time of Seeding: The optimum timing for the general seed mixture is early spring. Permanent seedings may be made any time of year if properly mulched and adequate moisture is provided. Late June through early August is not a good time to seed, but may facilitate covering the land without additional disturbance if construction is completed. Portions of the seeding may fail due to drought and heat. These areas may need reseeding in late summer/fall or the following spring.

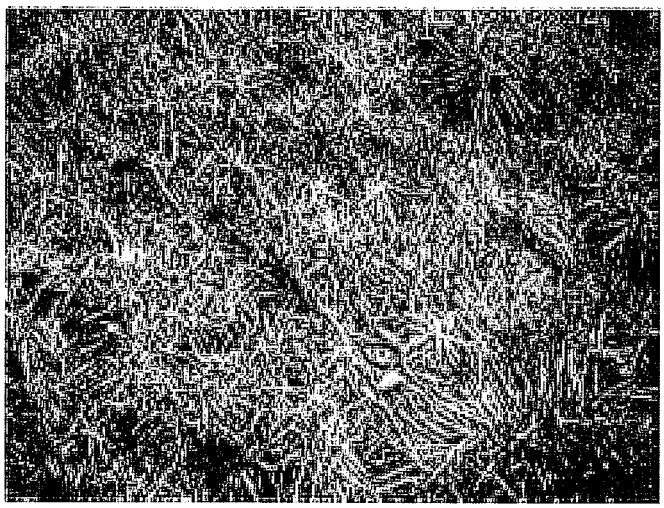
Method of seeding: Broadcasting, drilling, cultipack type seeding, or hydroseeding are acceptable methods. Proper soil to seed contact is key to successful seedings.

Mulching: Mulching is essential to obtain a uniform stand of seeded plants. Optimum benefits of mulching new seedings are obtained with the use of small grain straw applied at a rate of 2 tons per acre, and anchored with a netting or tackifier. See the Standard and Specifications for Mulching for choices and requirements.

Irrigation: Watering may be essential to establish a new seeding when a drought condition occurs shortly after a new seeding emerges. Irrigation is a specialized practice and care must be taken not to exceed the application rate for the soil or subsoil. When disconnecting irrigation pipe, be sure pipes are drained in a safe manor, not creating an erosion concern.



80% Perennial Vegetative Cover



50% Perennial Vegetative Cover

Table 4.4
Permanent Construction Area Planting Mixture Recommendations

Seed Mixture	Variety	Rate in lbs./acre (PLS)	Rate in lbs./ 1, 000 ft^2
Mix #1			
Creeping red fescue	Ensylva, Pennlawn, Boreal	10	.25
Perennial ryegrass	Pennfine, Linn	10	.25
*This mix is used extensively for shaded areas.			
Mix #2			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	20	.50
*This rate is in pure live seed, this would be an excellent choice along the upland edge of a wetland to filter runoff and provide wildlife benefits. In areas where erosion may be a problem, a companion seeding of sand lovegrass should be added to provide quick cover at a rate of 2 lbs. per acre (0.05 lbs. per 1000 sq. ft.).			
Mix #3			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	4	.10
Big bluestem	Niagara	4	.10
Little bluestem	Aldous or Camper	2	.05
Indiangrass	Rumsey	4	.10
Coastal panicgrass	Atlantic	2	.05
Sideoats grama	El Reno or Trailway	2	.05
Wildflower mix		.50	.01
*This mix has been successful on sand and gravel plantings. It is very difficult to seed without a warm season grass seeder such as a Truax seed drill. Broadcasting this seed is very difficult due to the fluffy nature of some of the seed, such as bluestems and indiangrass.			
Mix #4			
Switchgrass	Shelter, Pathfinder, Trailblazer, or Blackwell	10	.25
Coastal panicgrass	Atlantic	10	.25
*This mix is salt tolerant, a good choice along the upland edge of tidal areas and roadsides.			
Mix #5			
Saltmeadow cordgrass (Spartina patens)—This grass is used for tidal shoreline protection and tidal marsh restoration. It is planted by vegetative stem divisions. 'Cape' American beachgrass can be planted for sand dune stabilization above the saltmeadow cordgrass zone.			
Mix #6			
Creeping red fescue	Ensylva, Pennlawn, Boreal	20	.45
Chewings Fescue	Common	20	.45
Perennial ryegrass	Pennfine, Linn	5	.10
Red Clover	Common	10	.45
*General purpose erosion control mix. Not to be used for a turf planting or play grounds.			

STANDARD AND SPECIFICATIONS FOR RECREATION AREA SEEDING

Definition & Scope

Establishing **permanent** grasses, legumes, vines, shrubs, trees, or other plants, or selectively reducing stand density and trimming woody plants, to improve an area for recreation. To increase the attractiveness and usefulness of recreation areas and to protect the soil and plant resources.

Conditions Where Practice Applies

On any area planned for recreation use, lawns, and areas that will be maintained in a closely mowed condition.

Specifications

ESTABLISHING GRASSES (Turfgrass)

The following applies for playgrounds, parks, athletic fields, camping areas, picnic areas, passive recreation areas such as lawns, and similar areas.

1. Time of Planting

Fall planting is preferred. Seed after August 15. In the spring, plant until May 15.

If seeding is done between May 15 and August 15, irrigation may be necessary to ensure a successful seeding.

2. Site Preparation

   A. Install needed water and erosion control measures and bring area to be seeded to desired grades. A minimum of 4 in. topsoil is required.

   B. Prepare seedbed by loosening soil to a depth of 4-6 inches and decompacting required areas per Soil Restoration Standard.

   C. See Standard and Specification of Topsoiling.

   D. Lime to a pH of 6.5. See Lime Application Standard.

   E. **Fertilize as per soil test** or, if soil must be fertilized before results of a soil test can be obtained to determine fertilizer needs, apply commercial fertilizer at 850 pounds of 5-5-10 or equivalent per acre (20 lbs/1,000 sq. ft.). See Fertilizer Application Standard.

   F. Incorporate lime and fertilizer in top 2-4 inches of topsoil.

   G. Smooth. Remove sticks, foreign matter, and stones over 1 inch in diameter, from the surface. Firm the seedbed.

3. Planting

Use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hyroseeded, lime and fertilizer may be applied through the seeder, and rolling is not practical.

4. Mulching

Mulch all seedings in accordance with Standard and Specifications for Mulching. Small grain straw is the best material.

5. Seed Mixtures

Select seed mixture for site conditions and intended use from Table 4.5.

6. Contact Cornell Cooperative Extension Turf Specialist for suitable varieties.

Turf-type tall fescues have replaced the old KY31 tall fescues. New varieties have finer leaves and are the most resistant grass to foot traffic. Do not mix it with fine textured grasses such as bluegrass and red fescue.

Common ryegrass and redtop, which are relatively short lived species, provide quick green cover. Improved lawn cultivars of perennial ryegrass provide excellent quality turf, but continue to lack winter hardiness.

Common white clover can be added to mixtures at the rate of 1-2 lbs/acre to help maintain green color during the dry summer period; however, they will not withstand heavy traffic. Avoid using around swimming areas as flowers attract bees which can be easily stepped on.

Table 4.5
Recreation Turfgrass Seed Mixture

Site - Use	Species (% by weight)	lbs/1.000 ft^2 (PLS)	lbs/acre (PLS)
Sunny Sites (well, moderately well, and somewhat poorly drained soils)	***Athletic fields and similar areas***		
	80% Hard fescue	2.4-3.2	105-138
	20% Perennial ryegrass	0.6-0.8	25-37
		3.0-4.0	130-175
	OR, for southern and eastern, NY 50% Hard fescue	1.5-2.0	65-88
	50% perennial ryegrass	1.5-2.0	65-87
		3.0-4.0	130-175
	OR, 100% Creeping Red Fescue	3.4-4.6	150-200
	General recreation areas and lawns (Medium to high maintenance)		
	65% Creeping red fescue	2.0-2.6	85-114
	20% Perennial ryegrass	0.6-0.8	26-35
	15% Fine fescue	0.4-0.6	19-26
		3.0-4.0	130-175
	OR, 100% Creeping red fescue	3.4-4.6	150-200
Sunny Droughty Sites (general recreation areas and lawns, low maintenance) (somewhat excessively to excessively drained soils, excluding Long Island)	65% Fine fescue	2.6-3.3	114-143
	15% Perennial ryegrass	0.6-0.7	26-33
	20% Creeping red fescue	0.8-1.0	35-44
		4.0-5.0	175-220
	OR, 100% Creeping red fescue	3.4-4.6	150-200
Shady Dry Sites (well to somewhat poorly drained soils)	65% fine fescue	2.6-3.3	114-143
	15% perennial ryegrass	0.6-0.7	26-33
	20% Creeping red fescue	0.8-1.0	35-44
	OR	4.0-5.0	174-220
	80% blend of shade-tolerant Ceral rye	2.4-3.2	105-138
	20% perennial ryegrass	0.6-0.8	25-37
	OR	3.0-4.0	130-175
	100% Creeping red fescue	3.4-4.6	150-200
Shady Wet Sites (somewhat poor to poorly drained soils)	70% Creeping red fescue	1.4-2.1	60-91
	30% blend of shade-tolerant Hard fescue	0.6-0.9	25-39
	OR	2.0-3.0	85-130
	100% Chewings fescue	3.4-4.6	150-200

For varieties suitable for specific locations, contact Cornell Cooperative Extension Turf Specialist.
Reference: Thurn, M.C., N.W. Hummel, and A.M. Petrovic. Cornell Extension Pub. Info. Bulletin 185 Revised. HomeLawns Establishment and Maintenance. 1994.

7. Fertilizing—First Year

Apply fertilizer as indicated by the soil test three to four weeks after germination (spring seedlings). If test results have not been obtained, apply 1 pound nitrogen/1,000 square feet using a complete fertilizer with a 2-1-1 or 4-1-3 ratio. Summer and early fall seedings, apply as above unless air temperatures are above 85°F for an extended period. Wait for cooler temperatures to fertilize. Late fall/ winter seedings, fertilize in spring.

8. Restrict Use

New seedlings should be protected from use for one full year or a spring and fall growth cycle where possible to allow development of a dense sod with good root structure.

MAINTAINING GRASSES

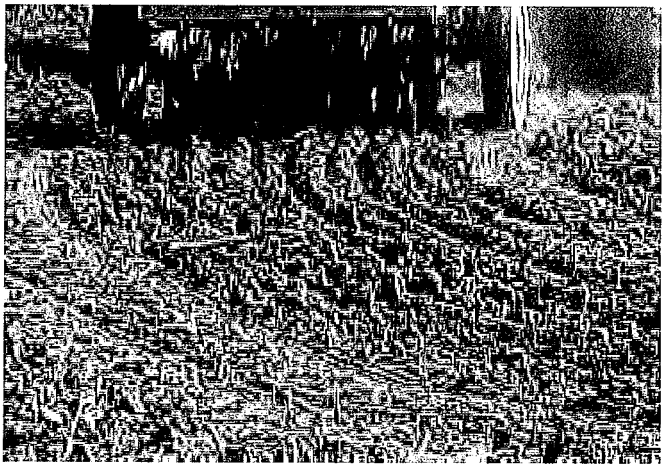
1. Maintain a pH of 6.0 - 7.0.

2. Fertilize in late May to early June as follows with 5-5-10 analysis fertilizer at the rate of 5 lbs./1,000 sq. ft. and repeat in late August if sod density is not adequate. Avoid fertilizing when heat is greater than 85°F. Top dress weak sod annually in the spring, but at least once every 2 to 3 years. **Fertilize in accordance with soil test analysis**, after determining adequate topsoil depth exists.

3. Aerate compacted or heavily used areas, like athletic fields, annually as soon as soil moisture conditions permit. Aerate area six to eight times using a spoon or hollow tine type aerator. Do not use solid spike equipment.

4. Reseed bare and thin areas annually with original seed mix.

STANDARD AND SPECIFICATIONS FOR SOIL RESTORATION



Definition & Scope

The decompaction of areas of a development site or construction project where soils have been disturbed to recover the original properties and porosity of the soil; thus providing a sustainable growth medium for vegetation, reduction of runoff and filtering of pollutants from stormwater runoff.

Conditions Where Practice Applies

Soil restoration is to be applied to areas whose heavy construction traffic is done and final stabilization is to begin. This is generally applied in the cleanup, site restoration, and landscaping phase of construction followed by the permanent establishment of an appropriate ground cover to maintain the soil structure. Soil restoration measures should be applied over and adjacent to any runoff reduction practices to achieve design performance.

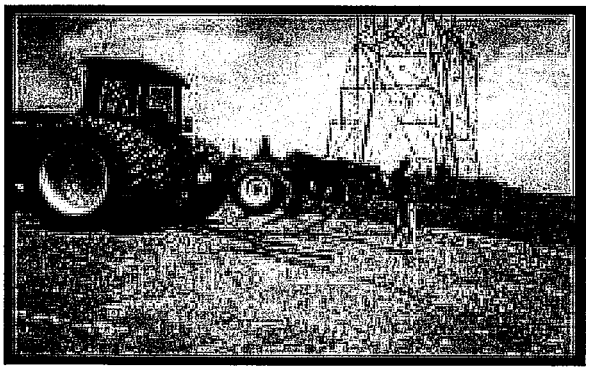
Design Criteria

1. Soil restoration areas will be designated on the plan views of areas to be disturbed.
2. Soil restoration will be completed in accordance with Table 4.6 on page 4.53.

Specification for Full Soil Restoration

During periods of relatively low to moderate subsoil moisture, the disturbed subsoils are returned to rough grade and the following Soil Restoration steps applied:

1. Apply 3 inches of compost over subsoil. The compost shall be well decomposed (matured at least 3 months), weed-free, organic matter. It shall be aerobically composted, possess no objectionable odors, and contain less than 1%, by dry weight, of man-made foreign matter. The physical parameters of the compost shall meet the standards listed in Table 5.2 - Compost Standards Table, except for "Particle Size" 100% will pass the 1/2" sieve. **Note: All biosolids compost produced in New York State (or approved for importation) must meet NYS DEC's 6 NYCRR Part 360 (Solid Waste Management Facilities) requirements. The Part 360 requirements are equal to or more stringent than 40 CFR Part 503 which ensure safe standards for pathogen reduction and heavy metals content.**



2. Till compost into subsoil to a depth of at least 12 inches using a cat-mounted ripper, tractor mounted disc, or tiller, to mix and circulate air and compost into the subsoil.
3. Rock-pick until uplifted stone/rock materials of four inches and larger size are cleaned off the site.
4. Apply topsoil to a depth of 6 inches.
5. Vegetate as required by the seeding plan. Use appropriate ground cover with deep roots to maintain the soil structure.
6. Topsoil may be manufactured as a mixture or a mineral component and organic material such as compost.

At the end of the project an inspector should be able to push a 3/8" metal bar 12 inches into the soil just with body weight. This should not be performed within the drip line of any existing trees or over utility installations that are within 24 inches of the surface.

Maintenance

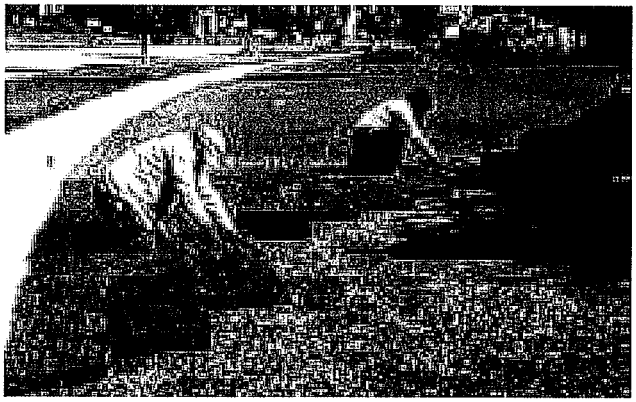
Keep the site free of vehicular and foot traffic or other weight loads. Consider pedestrian footpaths.

Table 4.6
Soil Restoration Requirements

Type of Soil Disturbance	Soil Restoration Requirement		Comments/Examples
No soil disturbance	Restoration not permitted		Preservation of Natural Features
Minimal soil disturbance	Restoration not required		Clearing and grubbing
Areas where topsoil is stripped only - no change in grade	HSG A&B	HSG C&D	Protect area from any ongoing construction activities.
	Apply 6 inches of topsoil	Aerate* and apply 6 inches of topsoil	
Areas of cut or fill	HSG A&B	HSG C&D	
	Aerate* and apply 6 inches of topsoil	Apply full Soil Restoration**	
Heavy traffic areas on site (especially in a zone 5-25 feet around buildings but not within a 5 foot perimeter around foundation walls)	Apply full Soil Restoration (decompaction and compost enhancement)		
Areas where Runoff Reduction and/or Infiltration practices are applied	Restoration not required, but may be applied to enhance the reduction specified for appropriate practices.		Keep construction equipment from crossing these areas. To protect newly installed practice from any ongoing construction activities construct a single phase operation fence area
Redevelopment projects	Soil Restoration is required on redevelopment projects in areas where existing impervious area will be converted to pervious area.		

* Aeration includes the use of machines such as tractor-drawn implements with coulters making a narrow slit in the soil, a roller with many spikes making indentations in the soil, or prongs which function like a mini-subsoiler.
** Per "Deep Ripping and De-compaction, DEC 2008".

STANDARD AND SPECIFICATIONS FOR STABILIZATION WITH SOD



Definition & Scope

Stabilizing restored, exposed soil surfaces by establishing long term stands of grass with sod to reduce damage from sediment and runoff to downstream areas and enhance natural beauty.

Conditions Where Practice Applies

On exposed soils that have a potential for causing off site environmental damage where a quick vegetative cover is desired. Moisture, either applied or natural, is essential to success.

Design Criteria

1. Sod shall be bluegrass or a bluegrass/red fescue mixture or a perennial ryegrass for average sites. (CAUTION: Perennial ryegrass has limited cold tolerance and may winter kill.) Use turf type cultivars of tall fescue for shady, droughty, or otherwise more critical areas. For variety selection, contact Cornell Cooperative Extension Turf Specialist.

2. Sod shall be machine cut at a uniform soil thickness of 3/4 inch, plus or minus 1/4 inch. Measurement for thickness shall exclude top growth and thatch.

3. Standard size sections of sod shall be strong enough to support their own weight and retain their size and shape when suspended vertically from a firm grasp on the upper 10 percent of the section.

4. Sod shall be free of weeds and undesirable coarse weedy grasses. Wild native or pasture grass sod shall not be used unless specified.

5. Sod shall not be harvested or transplanted when moisture content (excessively dry or wet) may adversely affect its survival.

6. Sod shall be harvested, delivered, and installed within a period of 36 hours. Sod not transplanted within this period shall be inspected and approved by the contracting officer or his designated representative prior to its installation.

Site Preparation

Fertilizer and lime application rates shall be determined by soil tests. Under unusual circumstances where there is insufficient time for a complete soil test and the contracting officer agrees, fertilizer and lime materials may be applied in amounts shown in subsection 2 below. Slope land such as to provide good surface water drainage. Avoid depressions or pockets.

1. Prior to sodding, the surface shall be smoothed and cleared of all trash, debris, and of all roots, brush, wire, grade stakes and other objects that would interfere with planting, fertilizing or maintenance operations.

2. **The soil should be tested to determine the amounts of amendments needed.** Where the soil is acid or composed of heavy clays, ground limestone shall be spread to raise the pH to 6.5. If the soil must be fertilized before results of a soil test can be obtained to determine fertilizer needs, apply commercial fertilizer at 20 lbs. of 5-5-10 (or equivalent) and mix into the top 3 inches of soil with the required lime for every 1,000 square feet. Soil should be moist prior to sodding. Arrange for temporary storage of sod to keep it shaded and cool.

Sod Installation

1. For the operation of laying, tamping, and irrigating for any areas, sod shall be completed within eight hours. During periods of excessively high temperature, the soil shall be lightly moistened immediately prior to laying the sod.

2. The first row of sod shall be laid in a straight line with subsequent rows placed parallel to, and tightly wedged against, each other. Lateral joints shall be staggered to promote more uniform growth and strength. Ensure that sod is not stretched or overlapped and that all joints are butted tight in order to prevent voids which would cause air drying of the roots. On sloping areas where erosion may be a problem, sod shall be laid with the long edges parallel to the contour and with

staggered joints.

3. Secure the sod by tamping and pegging, or other approved methods. As sodding is completed in any one section, the entire area shall be rolled or tamped to ensure solid contact of roots with the soil surface.

4. Sod shall be watered immediately after rolling or tamping until the underside of the new sod pad and soil surface below the sod are thoroughly wet. Keep sod moist for at least two weeks.

Sod Maintenance

1. In the absence of adequate rainfall, watering shall be performed daily, or as often as deemed necessary by the inspector, during the first week and in sufficient quantities to maintain moist soil to a depth of 4 inches. Watering should be done in the morning. Avoid excessive watering during applications.

2. After the first week, sod shall be watered as necessary to maintain adequate moisture and ensure establishment.

3. The first mowing should not be attempted until sod is firmly rooted. No more than 1/3 of the grass leaf shall be removed by the initial cutting or subsequent cuttings. Grass height shall be maintained between 2 and 3 inches unless otherwise specified. Avoid heavy mowing equipment for several weeks to prevent rutting.

4. If the soil must be fertilized before results of a soil test can be obtained to determine fertilizer needs, apply fertilizer three to four weeks after sodding, at a rate of 1 pound nitrogen/1,000 sq.ft. Use a complete fertilizer with a 2-1-1 ratio.

5. Weed Control: Target herbicides for weeds present. Consult current Cornell Pest Control Recommendations for Commercial Turfgrass Management or consult the local office of Cornell Cooperative Extension.

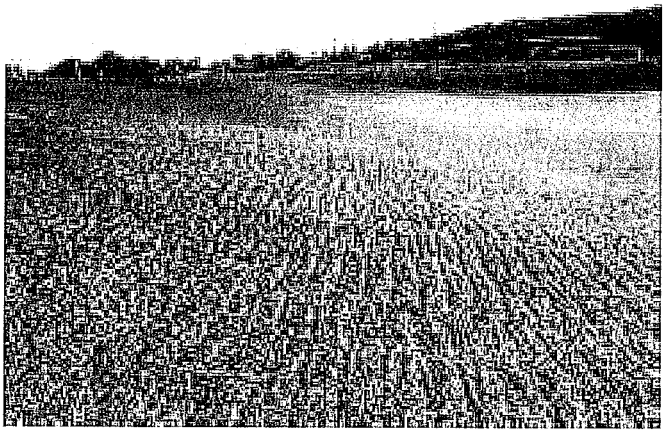
6. Disease Control: Consult the local office of the Cornell Cooperative Extension.

Additional References

1. Home Lawns, Establishment and Maintenance, CCE Information Bulletin 185, Revised November 1994. Cornell University, Ithaca, NY.

2. Installing a Sod Lawn. CCE Suffolk County, NY. Thomas Kowalsick February 1994, Revised January 1999. www.cce.cornell.edu/counties/suffolk/grownet

STANDARD AND SPECIFICATIONS FOR SURFACE ROUGHENING



Definition & Scope

Roughening a bare soil surface whether through creating horizontal grooves across a slope, stair-stepping, or tracking with construction equipment to aid the establishment of vegetative cover from seed, to reduce runoff velocity and increase infiltration, and to reduce erosion and provide for trapping of sediment.

Conditions Where Practice Applies

All construction slopes require surface roughening to facilitate stabilization with vegetation, particularly slopes steeper than 3:1.

Design Criteria

There are many different methods to achieve a roughened soil surface on a slope. No specific design criteria is required. However, the selection of the appropriate method depends on the type of slope. Methods include tracking, grooving, and stair-stepping. Steepness, mowing requirements, and/or a cut or fill slope operation are all factors considered in choosing a roughening method.

Construction Specifications

1. Cut Slope, No mowing.

   A. Stair-step grade or groove cut slopes with a gradient steeper than 3:1 (Figure 4.18).

   B. Use stair-step grading on any erodible material soft enough to be ripped with a bulldozer. Slopes of soft rock with some soil are particularly suited to stair-step grading.

   C. Make the vertical cut distance less than the horizontal distance, and slightly slope the horizontal position of the "step" to the vertical wall.

   D. Do not make vertical cuts more than 2 feet in soft materials or 3 feet in rocky materials.

Grooving uses machinery to create a series of ridges and depressions that run perpendicular to the slope following the contour. Groove using any appropriate implement that can be safely operated on the slope, such as disks, tillers, spring harrows, or the teeth of a front-end loader bucket. Do not make the grooves less than 3 inches deep or more than 15 inches apart.

2. Fill Slope, No mowing

   A. Place fill to create slopes with a gradient no steeper than 2:1 in lifts 9 inches or less and properly compacted. Ensure the face of the slope consists of loose, uncompacted fill 4 to 6 inches deep. Use grooving as described above to roughen the slope, if necessary.

   B. Do not back blade or scrape the final slope face.

3. Cuts/Fills, Mowed Maintenance

   A. Make mowed slopes no steeper than 3:1.

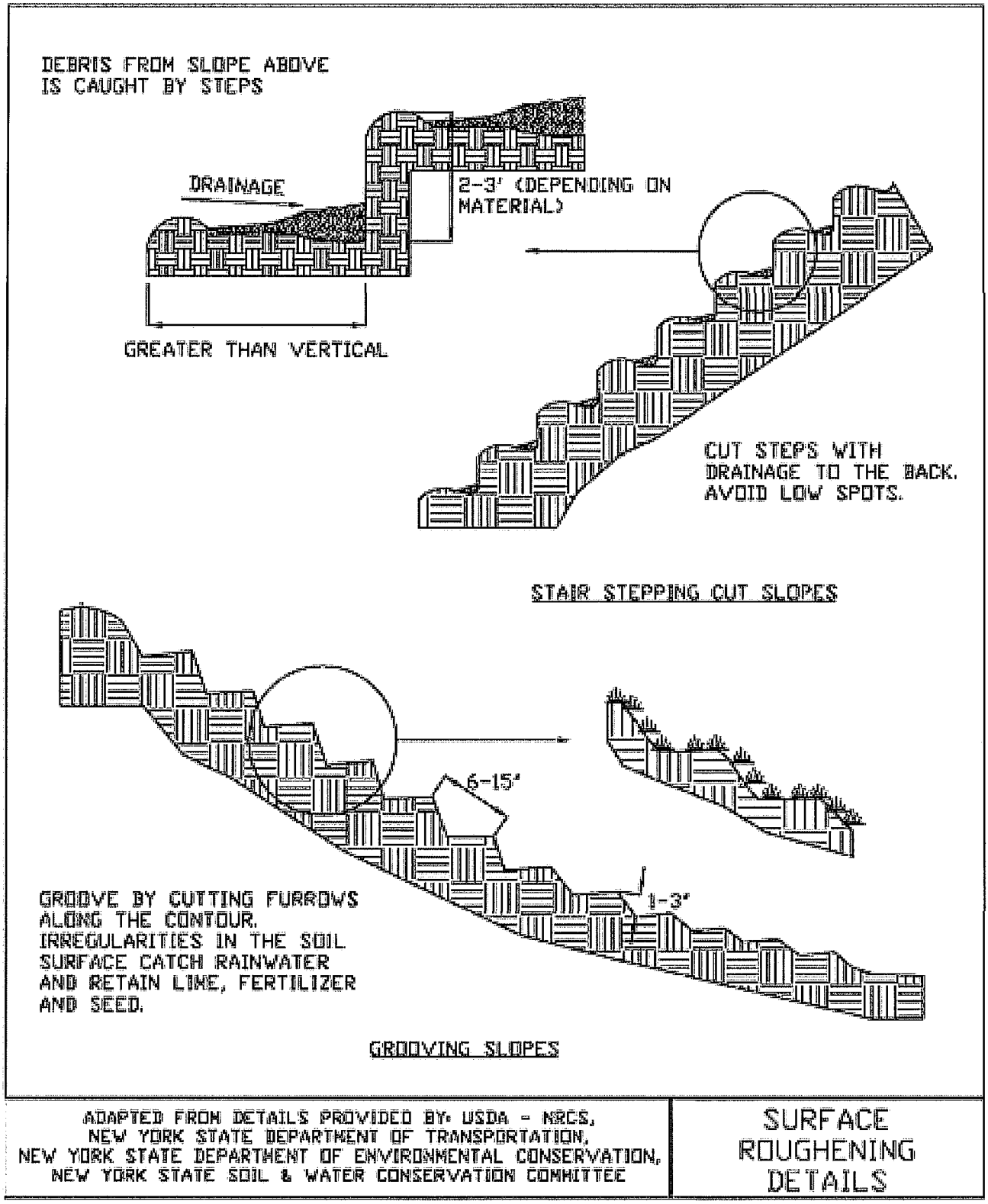
   B. Roughen these areas to shallow grooves by normal tilling, disking, harrowing, or use of cultipacker-seeder. Make the final pass of such tillage equipment on the contour.

   C. Make grooves at least 1 inch deep and a maximum of 10 inches apart.

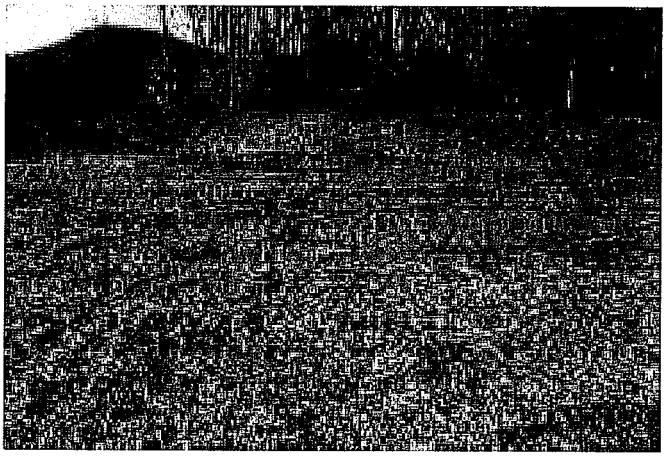
   D. Excessive roughness is undesirable where mowing is planned.

Tracking should be used primarily in sandy soils to avoid undue compaction of the soil surface. Tracking is generally not as effective as the other roughening methods described. (It has been used as a method to track down mulch.) Operate tracked machinery up and down the slope to leave horizontal depressions in the soil. Do not back-blade during the final grading operation.

Figure 4.18
Surface Roughening



STANDARD AND SPECIFICATIONS FOR TEMPORARY CONSTRUCTION AREA SEEDING



Definition & Scope

Providing temporary erosion control protection to disturbed areas and/or localized critical areas for an interim period by covering all bare ground that exists as a result of construction activities or a natural event. Critical areas may include but are not limited to steep excavated cut or fill slopes and any disturbed, denuded natural slopes subject to erosion.

Conditions Where Practice Applies

Temporary seedings may be necessary on construction sites to protect an area, or section, where final grading is complete, when preparing for winter work shutdown, or to provide cover when permanent seedings are likely to fail due to mid-summer heat and drought. The intent is to provide temporary protective cover during temporary shutdown of construction and/or while waiting for optimal planting time.

Criteria

Water management practices must be installed as appropriate for site conditions. The area must be rough graded and slopes physically stable. Large debris and rocks are usually removed. Seedbed must be seeded within 24 hours of disturbance or scarification of the soil surface will be necessary prior to seeding.

Fertilizer or lime are not typically used for temporary seedings.

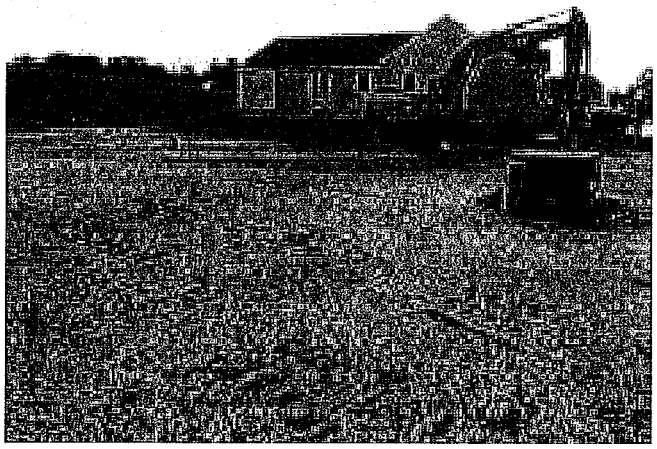
IF: Spring or summer or early fall, then seed the area with ryegrass (annual or perennial) at 30 lbs. per acre (Approximately 0.7 lb./1000 sq. ft. or use 1 lb./1000 sq. ft.).

IF: Late fall or early winter, then seed Certified 'Aroostook' winter rye (cereal rye) at 100 lbs. per acre (2.5 lbs./1000 sq. ft.).

Any seeding method may be used that will provide uniform application of seed to the area and result in relatively good soil to seed contact.

Mulch the area with hay or straw at 2 tons/acre (approx. 90 lbs./1000 sq. ft. or 2 bales). Quality of hay or straw mulch allowable will be determined based on long term use and visual concerns. Mulch anchoring will be required where wind or areas of concentrated water are of concern. Wood fiber hydromulch or other sprayable products approved for erosion control (nylon web or mesh) may be used if applied according to manufacturers' specification. Caution is advised when using nylon or other synthetic products. They may be difficult to remove prior to final seeding and can be a hazard to young wildlife species.

STANDARD AND SPECIFICATIONS FOR TOPSOILING



Definition & Scope

Spreading a specified quality and quantity of topsoil materials on graded or constructed subsoil areas to provide acceptable plant cover growing conditions, thereby reducing erosion; to reduce irrigation water needs; and to reduce the need for nitrogen fertilizer application.

Conditions Where Practice Applies

Topsoil is applied to subsoils that are droughty (low available moisture for plants), stony, slowly permeable, salty or extremely acid. It is also used to backfill around shrub and tree transplants. This standard does not apply to wetland soils.

Design Criteria

1. Preserve existing topsoil in place where possible, thereby reducing the need for added topsoil.

2. Conserve by stockpiling topsoil and friable fine textured subsoils that must be stripped from the excavated site and applied after final grading where vegetation will be established. Topsoil stockpiles must be stabilized. Stockpile surfaces can be stabilized by vegetation, geotextile or plastic covers. This can be aided by orientating the stockpile lengthwise into prevailing winds.

3. Refer to USDA Natural Resource Conservation Service soil surveys or soil interpretation record sheets for further soil texture information for selecting appropriate design topsoil depths.

Site Preparation

1. As needed, install erosion and sediment control practices such as diversions, channels, sediment traps, and stabilizing measures, or maintain if already installed.

2. Complete rough grading and final grade, allowing for depth of topsoil to be added.

3. Scarify all compact, slowly permeable, medium and fine textured subsoil areas. Scarify at approximately right angles to the slope direction in soil areas that are steeper than 5 percent. Areas that have been overly compacted shall be decompacted in accordance with the Soil Restoration Standard.

4. Remove refuse, woody plant parts, stones over 3 inches in diameter, and other litter.

Topsoil Materials

1. Topsoil shall have at least 6 percent by weight of fine textured stable organic material, and no greater than 20 percent. Muck soil shall not be considered topsoil.

2. Topsoil shall have not less than 20 percent fine textured material (passing the NO. 200 sieve) and not more than 15 percent clay.

3. Topsoil treated with soil sterilants or herbicides shall be so identified to the purchaser.

4. Topsoil shall be relatively free of stones over 1 1/2 inches in diameter, trash, noxious weeds such as nut sedge and quackgrass, and will have less than 10 percent gravel.

5. Topsoil containing soluble salts greater than 500 parts per million shall not be used.

6. Topsoil may be manufactured as a mixture of a mineral component and organic material such as compost.

Application and Grading

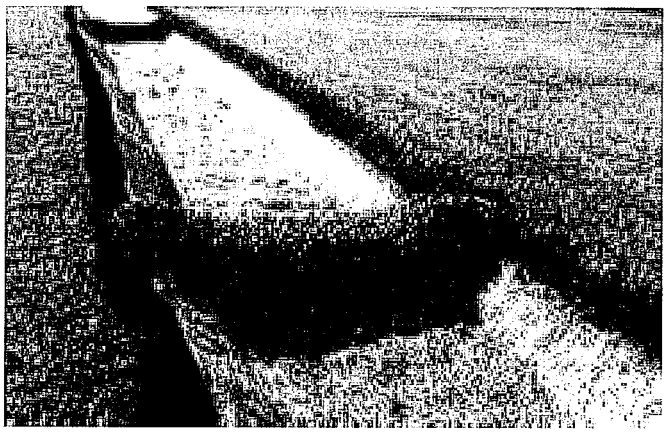
1. Topsoil shall be distributed to a uniform depth over the area. It shall not be placed when it is partly frozen, muddy, or on frozen slopes or over ice, snow, or standing water puddles.

2. Topsoil placed and graded on slopes steeper than 5 percent shall be promptly fertilized, seeded, mulched, and stabilized by "tracking" with suitable equipment.

3. Apply topsoil in the amounts shown in Table 4.7 below:

Table 4.7 - Topsoil Application Depth		
Site Conditions	**Intended Use**	**Minimum Topsoil Depth**
1. Deep sand or loamy sand	Mowed lawn	6 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	1 in.
2. Deep sandy loam	Mowed lawn	5 in.
	Tall legumes, unmowed	2 in.
	Tall grass, unmowed	none
3. Six inches or more: silt loam, clay loam, loam, or silt	Mowed lawn	4 in.
	Tall legumes, unmowed	1 in.
	Tall grass, unmowed	1 in.

STANDARD AND SPECIFICATIONS FOR VEGETATING WATERWAYS



Definition & Scope

Waterways are a **permanently** constructed conveyance channel, shaped or graded. They are vegetated for the safe transport of excess surface water from construction sites and urban areas without damage from erosion.

Conditions Where Practice Applies

This standard applies to vegetating waterways and similar water carrying structures.

Supplemental measures may be required with this practice. These may include: subsurface drainage to permit the growth of suitable vegetation and to eliminate wet spots; a section stabilized with asphalt, stone, or other suitable means; or additional storm drains to handle snowmelt or storm runoff.

Retardance factors for determining waterway dimensions are shown in Table 3.1 on page 3.10 and "Maximum Permissible Velocities for Selected Grass and Legume Mixtures" (See Table 4.10 on page 4.79).

Design Criteria

Waterways or outlets shall be protected against erosion by vegetative means as soon after construction as practical. Vegetation must be well established before diversions or other channels are outletted into them. Consideration should be given to the use of turf reinforcement mats, excelsior matting, other rolled erosion control products, or sodding of channels to provide erosion protection as soon after construction as possible. It is strongly recommended that the center line of the waterway be protected with one of the above materials to avoid center gullies and to protect seedlings from erosion before establishment.

1. Liming, fertilizing, and seedbed preparation.

   A. Lime to pH 6.5.

   B. **The soil should be tested to determine the amounts of amendments needed.** If the soil must be fertilized before results of a soil test can be obtained to determine fertilizer needs, apply commercial fertilizer at 1.0 lbs/1,000 sq. ft. of N, P_2O_5, and K_2O.

   C. Lime and fertilizer shall be mixed thoroughly into the seedbed during preparation.

   D. Channels, except for paved section, shall have at least 4 inches of topsoil.

   E. Remove stones and other obstructions that will hinder maintenance.

2. Timing of Seeding.

   A. Early spring and late August are best.

   B. Temporary cover to protect from erosion is recommended during periods when seedings may fail.

3. Seed Mixtures:

Mixtures	Rate per Acre (lbs)	Rate per 1,000 sq. ft. (lbs)
A. White clover or ladino clover[1]	8	0.20
Smooth bromegrass	20	0.45
Creeping red fescue[2]	2	0.05
Total	30	0.70
OR		
B. Smooth bromegass[3]	25	0.60
Creeping red fescue	20	0.50
Perennial ryegrass	10	0.20
Total	55	1.30

[1] Inoculate with appropriate inoculum immediately prior to seeding. Ladino or birdsfoot trefoil may be substituted for common white clover and seeded at the same rate.

[2] Perennial ryegrass may be substituted for the creeping red fescue but increase seeding rate to 5 lbs/acre (0.1 lb/1,000 sq. ft).

[3] Use this mixture in areas which are mowed frequently. Common white clover may be added if desired and seeded at 8 lbs/acre (0.2 lb/1,000 sq. ft.)

4. Seeding

Select the appropriate seed mixture and apply uniformly over the area. Rolling or cultipacking across the waterway is desirable.

Waterway centers or crucial areas may be sodded. Refer to the standard and specification for Stabilization with Sod. Be sure sod is securely anchored using staples or stakes.

5. Mulching

All seeded areas will be mulched. Channels more than 300 feet long, and/or where the slope is 5 percent or more, must have the mulch securely anchored. Refer to the standard and specifications for Mulching for details.

6. Maintenance

Fertilize, lime, and mow as needed to maintain dense protective vegetative cover.

Waterways shall not be used for roadways.

If rills develop in the centerline of a waterway, prompt attention is required to avoid the formation of gullies. Either stone and/or compacted soil fill with excelsior or filter fabric as necessary may be used during the establishment phase. See Figure 4.25, Rill Maintenance Measures. Spacing between rill maintenance barriers shall not exceed 100 feet.

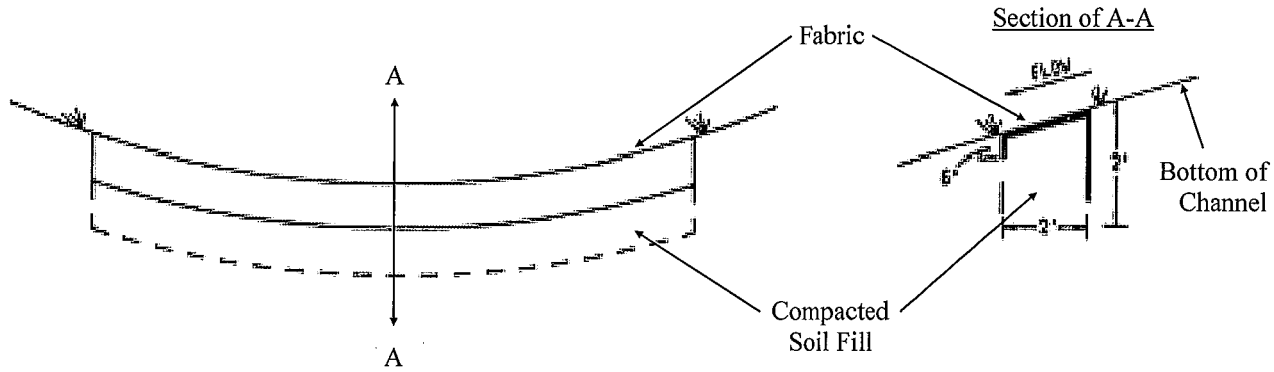
Table 4.10
Maximum Permissible Velocities for Selected Seed Mixtures

Cover	Slope Range [2] (%)	Permissible Velocity [1]	
		Erosion-resistant Soils (ft. per sec.) K=0.10 - 0.35 [3]	Easily Eroded Soils (ft. per sec.) K=0.36 - 0.80
Smooth Bromegrass Hard Fescue	0-5 5-10 Over 10	7 6 5	5 4 3
Grass Mixtures	[2] 0-5 5-10	5 4	4 3
White/Red Clover Alfalfa Red Fescue	[4] 0-5	3.5	2.5

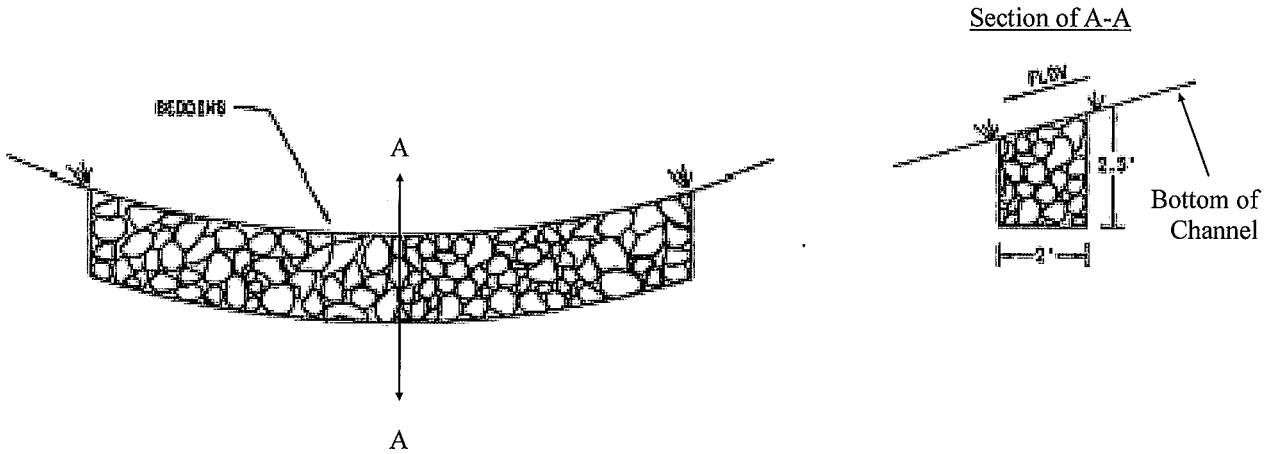
[1] Use velocities exceeding 5 feet per second only where good covers and proper maintenance can be obtained.
[2] Do not use on slopes steeper than 10 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
[3] K is the soil erodibility factor used in the Revised Universal Soil Loss Equation. Visit Appendix A or consult the appropriate USDA-NRCS technical guide for K values for New York State soils.
[4] Do not use on slopes steeper than 5 percent except for vegetated side slopes in combination with a stone, concrete, or highly resistant vegetative center section.
[5] Annuals - use on mild slopes or as temporary protection until permanent covers are established.
[6] Use on slopes steeper than 5 percent is not recommended.

Figure 4.25
Rill Maintenance Measures

Filter Fabric



Stone



STANDARD AND SPECIFICATIONS FOR BUFFER FILTER STRIP

Land Slope (%)	Minimum Filter Strip Width (ft.)
≤10	50
20	60
30	85
40	105
50	125
60	145
70	165

Definition & Scope

A **temporary/permanent** well vegetated grassed area below a disturbed area that can be used to remove sediment from runoff prior to it reaching surface waters or other designated areas of concern, such as parking lots and road pavement.

Condition Where Practice Applies

This practice is effective when the flow is in the form of sheet flow and the vegetative cover is established prior to disturbance. Surface water must be protected from sediment-laden runoff until buffer filter strip vegetation is established, and then the proposed disturbance can be undertaken. This practice is effective when the flow is in the form of sheet flow (maximum of 150 feet).

Design Criteria

1. The vegetation should be a well established perennial grass. Wooded and brushy areas are not acceptable for purposes of sediment removal.

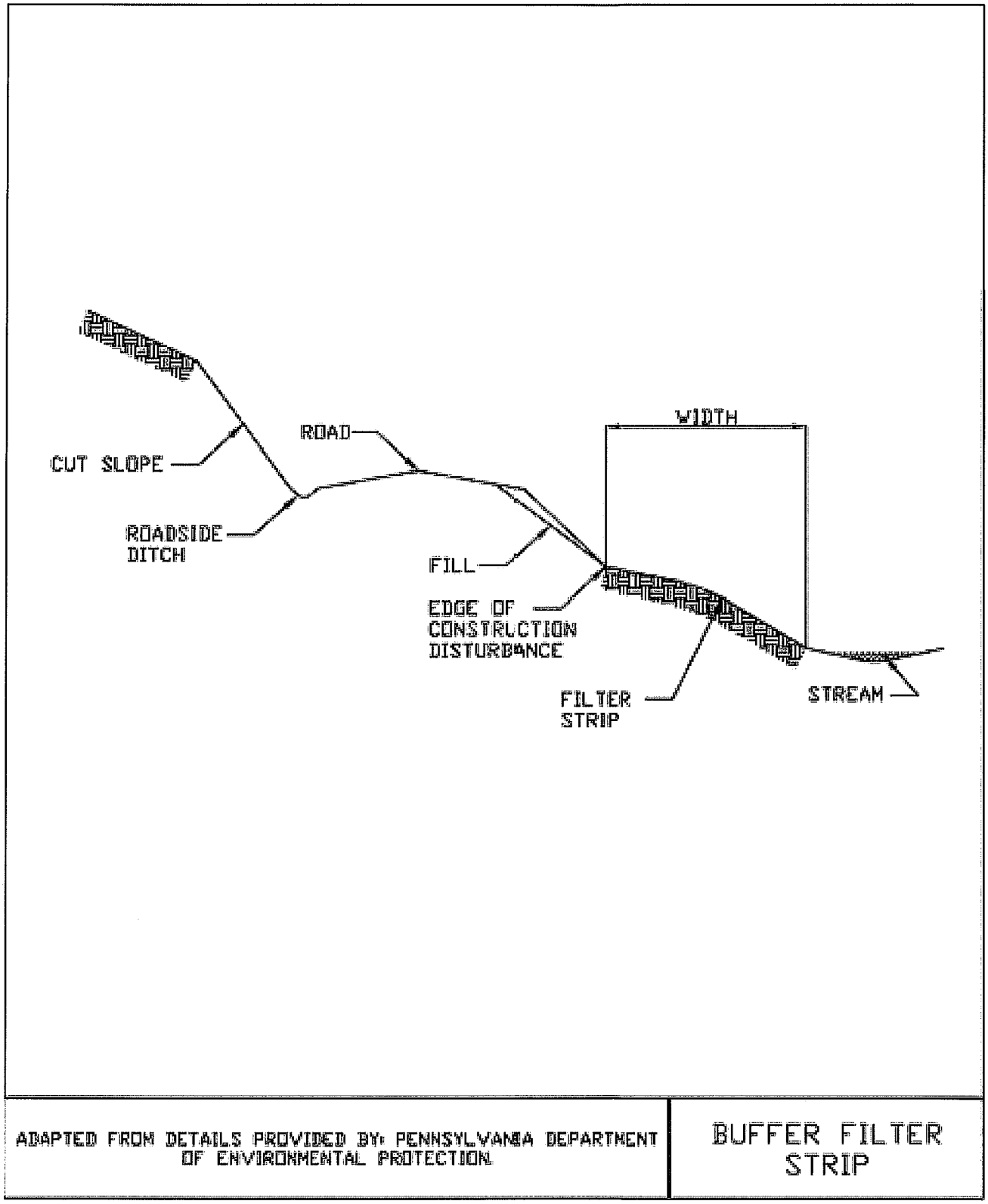
2. The minimum buffer filter strip width for stream protection shall be in accordance with the following table:

3. The minimum buffer filter strip width to protect paved areas during construction is 20 feet.

Maintenance

If at any time the width of the buffer filter strip has been reduced by sediment deposition to half its original width or concentrated flow has developed, suitable additional practices should be installed. The erosion and sediment control plan shall include these details.

Figure 5.1
Buffer Filter Strip



STANDARD AND SPECIFICATIONS FOR ROCK DAM

Definition & Scope

A rock embankment located to capture and retain sediment on the construction site and prevent sedimentation in offsite water bodies.

Conditions Where Practice Applies

The rock dam may be used instead of the standard sediment basin with barrel and riser. The rock dam is preferred when it is difficult to construct a stable, earthen embankment and rock materials are readily available. The site should be accessible for periodic sediment removal. This rock dam shall not be located in a perennial stream. The top of the dam will serve as the overflow outlet. The inside of the dam will be faced with smaller stone to reduce the rate of seepage so a sediment pool forms during runoff events.

Design Criteria

Drainage Area: The drainage area for this off stream structure is limited to 50 acres.

Location: The location of the dam should:

- provide a large area to trap sediment
- intercept runoff from disturbed areas
- be accessible to remove sediment
- not interfere with construction activities

Storage Volume: The storage volume behind the dam shall be at least 3,600 cubic feet per acre of drainage area to the dam. This volume is measured one foot below the crest of the dam.

Dam Section:

Top Width	5 feet minimum @ crest
Side Slopes	2:1 upstream slope 3:1 downstream slope
Height	6' max to spillway crest

Length of Crest: The crest length should be designed to carry the 10 yr. peak runoff with a maximum flow depth of 1 foot and 1 foot of freeboard.

Rock at the abutments should extend at least 2 feet above the spillway and be at least 2 feet thick. These rock abutments should extend at least one foot above the downstream slope to prevent abutment scour. A rock apron at least 1.5 feet thick should extend downstream from the toe of the dam a distance equal to the height of the dam to protect the outlet area from scour.

Rock Fill: The rock fill should be well graded, hard, erosion resistant stone with a minimum d_{50} size of 9 inches. A "key trench" lined with geotextile filter fabric should be installed in the soil foundation under the rock fill. The filter fabric must extend from the key trench to the downstream edge of the apron and abutments to prevent soil movement and piping under the dam.

The upstream face of the dam should be covered with a fine washed gravel (NYS-DOT #1 or #1A gravel, crushed stone or equal) a minimum 3 feet thick to reduce the drainage rate.

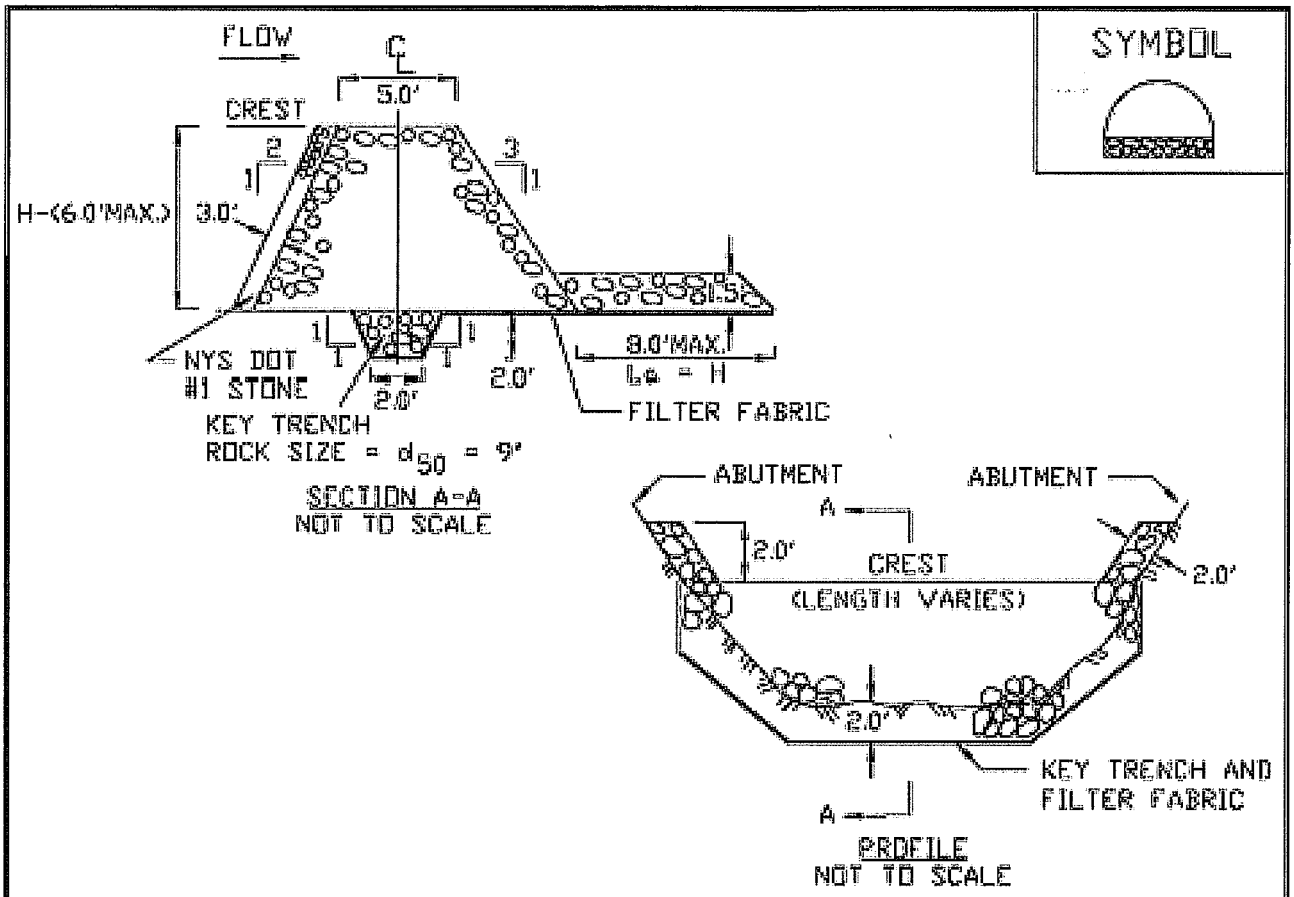
Trapping Efficiency: To obtain maximum trapping efficiency, design for a long detention period. Usually a minimum of eight (8) hours before the basin is completely drained. Maximize the length of travel of sediment laden water from the inlet to the drain for a minimum length to width ratio of 2 to 1 or greater. Achieve a surface area equal to 0.01 acres per cfs (inflow) based on the 10-year storm. See Figure 5.7 on page 5.18 for details.

Maintenance

Check the basin area after each rainfall event. Remove sediment and restore original volume when sediment accumulates to one-half the design volume. Check the structure for erosion, piping, and rock displacement after each significant event and replace immediately.

Remove the structure and any sediment immediately after the construction area has been permanently stabilized. All water should be removed from the basin prior to the removal of the rock dam. Sediment should be placed in designated disposal areas and not allowed to flow into streams or drainage ways during structure removal.

Figure 5.7
Rock Dam



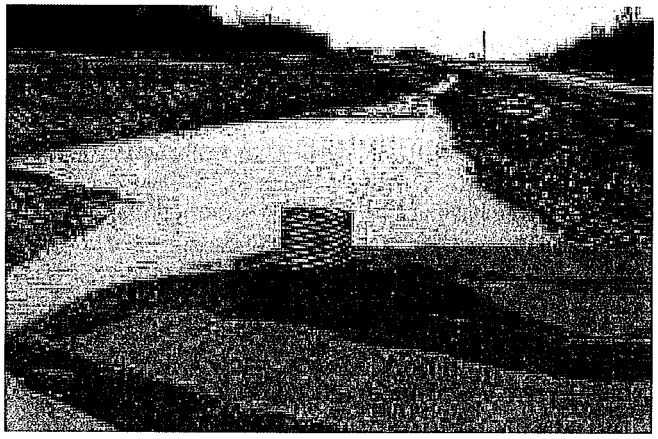
CONSTRUCTION SPECIFICATIONS

1. THE AREA UNDER THE ROCK DAM SHALL BE CLEARED AND STRIPPED OF ROOTS AND OTHER OBJECTIONABLE MATERIAL. THE RESERVOIR SHALL BE CLEARED AS NEEDED TO FACILITATE SEDIMENT REMOVAL.
2. DIMENSIONS SHOWN ARE MINIMUM. TRENCH SHALL BE EXCAVATED FROM ABUTMENT TO ABUTMENT ON THE DAM CENTERLINE. FILTER FABRIC SHALL BE PLACED FROM UPSTREAM EDGE OF KEYTRENCH TO DOWNSTREAM EDGE OF APRON. JOINTS WILL LAP A MINIMUM OF 1 FT. WITH UPSTREAM STRIP ON TOP.
3. CONSTRUCT THE ROCK EMBANKMENT TO THE DIMENSIONS SHOWN ON THE DRAWING. ROCK ABUTMENTS SHALL BE MAINTAINED 2 FT. ABOVE THE CREST.
4. THE ROCK DAM SHALL BE CONSTRUCTED PRIOR TO CLEARING THE BASIN AREA. STABILIZE ALL DISTURBED AREAS, EXCEPT THE BASIN AREA, WITH TEMPORARY SEEDING.
5. FENCES AND WARNING SIGNS SHOULD BE PLACED AS APPROPRIATE.

MAXIMUM DRAINAGE AREA: 50 ACRES

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	ROCK DAM

STANDARD AND SPECIFICATIONS FOR SEDIMENT BASIN



Definition & Scope

A **temporary** basin with a barrier or dam constructed across a drainage way or at other suitable locations to intercept sediment-laden runoff and reduce the amount of sediment leaving the disturbed area in order to protect drainageways, properties, and rights-of-way below the sediment basin.

Conditions Where Practice Applies

A sediment basin is appropriate where physical site conditions or land ownership restrictions preclude the installation of other control measures to adequately control runoff, erosion, and sedimentation. However, it is required that other erosion control measures be used with the sediment basin. The basin may be used below construction operations which expose critical areas to soil erosion. The basin shall be maintained until the disturbed area is protected against erosion by permanent stabilization.

This standard applies to the installation of temporary sediment basins on sites where: (a) failure of the structure would not result in loss of life, damage to homes or buildings, or interruption of use or service of public roads or utilities; (b) the drainage area does not exceed 50 acres; and (c) the basin is to be removed within 36 months after the beginning of construction of the basin.

Permanent (to function more than 36 months) sediment basins, or structures that temporarily function as a sediment basin but are intended for use as a permanent pool shall be classified as **permanent** structures and shall conform to criteria appropriate for permanent structures. These structures shall be designed and constructed to conform to NRCS Standard And Specification No. 378 for Ponds in the National Handbook of Conservation Practices and the New York State Department of Environmental Conservation, "Guidelines for the Design of Dams."

Design Criteria

Compliance with Laws and Regulations

Design and construction shall comply with state and local laws, ordinances, rules and regulations, including permits.

Location - Maximum Drainage Area = 50 acres

The sediment basin should be located to obtain the maximum storage benefit from the terrain and for ease of cleanout of the trapped sediment. It should be located to minimize interference with construction activities and construction of utilities. Whenever possible, sediment basins should be located so that storm drains may outfall or be diverted into the basin. **Do not locate basins in perennial streams.**

Size and Shape of the Basin

The sediment basin will contain two separate zones. The lowest zone is the sediment storage zone. This zone is sized for a volume equal to 1,000 cubic feet per disturbed acre over the course of the life of the project, contributing to the basin as measured from the bottom of the basin to the bottom of the dewatering zone. It shall have a minimum depth of 1 foot. Layered above this zone is the dewatering zone. This zone is sized for a minimum volume equal to 3,600 cubic feet per each acre draining to the basin. This volume is temporarily stored between the sediment storage zone and the crest of the principal spillway. This zone should be a minimum of 3 feet deep. See Figures 5.8 and 5.9 on pages 5.26 and 5.27. This 3,600 cubic feet per acre is equivalent to one inch of sediment per acre of drainage area. The entire drainage area is used for this computation, rather than the disturbed area above, to maximize trapping efficiency. The length to width ratio shall be 2:1 or greater, where length is the distance between the inlet and outlet. A wedge shape shall be used with the inlet located at the narrow end. See Figure 5.22 on page 5.41.

Surface Area

Research studies (Barfield and Clar 1985; Pitt, 2003) indicate that the following relationship between surface area and peak inflow rate gives a trapping efficiency of 75% for silt loam soils, and greater than 90% for loamy sand soils:

$A = 0.01\ Qp$ or, $A = 0.015x\ D.A.$ (whichever is greater)

where,

A = the basin surface area, acres, measured at the service spillway crest; and

Qp = the peak inflow rate for the design storm. (The minimum design storm will be a 10 year, 24 hour storm under construction conditions).

D.A. = contributing drainage area.

Sediment basins shall be cleaned out when the sediment storage zone volume described above is reduced by 50 percent, except in no case shall the sediment level be permitted to build up higher than one foot below the bottom of the dewatering zone. At this elevation, cleanout shall be performed to restore the original design volume to the sediment storage zone.

The elevation corresponding to the maximum allowable sediment level shall be determined and shall be stated in the design data as a distance below the top of the riser and shall be clearly marked on the riser.

The basin dimensions necessary to obtain the required basin volume as stated above shall be clearly shown on the plans to facilitate plan review, construction, and inspection.

Spillway Design

Runoff shall be computed by standard accepted hydrologic methods noted previously in this book of standards. **Runoff computations shall be based upon the worst soil cover conditions expected to prevail in the contributing drainage area during the anticipated effective life of the structure.** The combined capacities of the principal and emergency spillway shall be sufficient to pass the peak rate of runoff from a ten (10) year frequency, 24 hour duration storm.

1. Principal spillway: A spillway consisting of a vertical pipe or box type riser joined (watertight connection) to a pipe (barrel) which shall extend through the embankment and outlet beyond the downstream toe of the fill. The minimum capacity of the principal spillway shall be 0.2 cfs per acre of drainage area when the water surface is at the emergency spillway crest elevation. For those basins with no emergency spillway, the principal spillway shall have the capacity to handle the peak flow from a ten-year frequency rainfall event. The minimum size of the barrel shall be 8 inches in diameter. See Figures 5.10, 5.11 and 5.12 on pages 5.28, 5.29, and 5.30 for principal spillway sizes and capacities.

   A. Crest elevation: When used in combination with an emergency spillway, the crest elevation of the riser shall be a minimum one foot below the elevation of the control section of the emergency spillway.

   B. Watertight riser and barrel assembly: The riser and all pipe connections shall be completely watertight except for the inlet opening at the top, or a dewatering opening. There shall not be other holes, leaks, rips, or perforations in the structure.

   C. Dewatering the basin:

      1) Preferred Method- The preferred method for dewatering sediment basins is by using surface skimmers to decant the cleaner top surface water from the basin as the sediment settles out. See Dewatering Device Standard, page 5.10.

      2) Alternative Method– A fixed vertical riser pipe configured with perforations and filter fabric with a cone of pea gravel or small crushed stone is an alternative option for use. See Figure 5.5 on page 5.14.

      The sediment basin dewatering system shall be designed to release the dewatering zone volume between 2 to 7 days in watersheds not impaired by sediment, and 4-7 days in sediment impaired watersheds (check the NYSDEC Waterbody Inventory/Priority Waterbody List - **http://www.dec.ny.gov/chemical/36730.html**, to see if your site is in an impaired watershed). The design performance range will depend on the percent of silt and clay in the soils tributary to the basin. If the performance of the basin does not meet water quality objectives after 7 days, chemical treatment may be necessary.

   D. Anti-vortex device and trash rack:

      An anti-vortex device and trash rack shall be securely installed on top of the riser and shall be the concentric type as shown in Figure 5.13 and 5.14 on pages 5.31 and 5.32.

   E. Base:

      The riser shall have a base attached with a watertight connection and shall have sufficient weight to prevent flotation of the riser. Two approved bases for risers ten feet or less in height are: 1) a concrete base 18 in. thick with the riser embedded 9 in. in the base, and 2) a ¼" minimum thickness steel plate attached to the riser by a continuous weld around the circumference of the riser to form a watertight connection. The plate shall have 2.5 feet of stone, gravel, or compacted earth placed on it to prevent flotation. In either case, each side of the square base shall be twice the riser diameter.

      For risers greater than ten feet high, computations

shall be made to design a base which will prevent flotation. The minimum factor of safety shall be 1.20 (Downward forces = 1.20 x upward forces). See Figure 5.15 on page 5.33 for details.

F. Anti-Seep Collars: Anti-seep collars shall be installed around all conduits through earth fills of impoundment structures according to the following criteria:

1) Collars shall be placed to increase the seepage length along the conduit by a minimum of 15 percent of the pipe length located within the saturation zone.

2) Collar spacing shall be between 5 and 14 times the vertical projection of each collar.

3) All collars shall be placed within the saturation zone.

4) The assumed normal saturation zone (phreatic line) shall be determined by projecting a line at a slope of 4 horizontal to 1 vertical from the point where the normal water (riser crest) elevation touches the upstream slope of the fill to a point where this line intersects the invert of the pipe conduit. All fill located within this line may be assumed as saturated.

$$2(N)(P) = 1.15(L_s) \qquad N = (0.075)(L_s)/P$$

When anti-seep collars are used, the equation for revised seepage length becomes:

Where: Ls = Saturated length is length, in feet, of pipe between riser and intersection of phreatic line and pipe invert.

N = number of anti-seep collars.

P = vertical projection of collar from pipe, in feet.

5) All anti-seep collars and their connections shall be watertight. See Figures 5.16 and 5.17 on pages 5.34 and 5.35 for anti-seep collar design and Figure 5.18 on page 5.36 for construction details. Seepage diaphragms may be used in lieu of anti-seep collars. They shall be designed in accordance to USDA NRCS Pond Standard 378.

G. Outlet: An outlet shall be provided, including a means of conveying the discharge in an erosion free manner to an existing stable channel. Where discharge occurs at the property line, drainage easements will be obtained in accordance with local ordinances. Adequate notes and references will be shown on the erosion and sediment control plan.

Protection against scour at the discharge end of the pipe spillway shall be provided. Measures may include basin, riprap, revetment, excavated plunge pools, or other approved methods. See Standard and Specification for Rock Outlet Protection, Section 3, page 3.39.

2. Emergency Spillways: The entire flow area of the emergency spillway shall be constructed in undisturbed ground (not fill). The emergency spillway cross-section shall be trapezoidal with a minimum bottom width of eight feet. This spillway channel shall have a straight control section of at least 20 feet in length; and a straight outlet section for a minimum distance equal to 25 feet.

A. Capacity: The minimum capacity of the emergency spillway shall be that required to pass the peak rate of runoff from the 10 year 24-hour frequency storm, less any reduction due to flow in the pipe spillway. Emergency spillway dimensions may be determined by using the method described in Figure 5.19 on page 5.37 and the Design Tables in Figures 5.20 and 5.21 on pages 5.38 and 5.39.

B. Velocities: The velocity of flow in the exit channel shall not exceed 5 feet per second for vegetated channels. For channels with erosion protection other than vegetation, velocities shall be within the non-erosive range for the type of protection used.

C. Erosion Protection: Erosion protection shall be provided for by vegetation as prescribed in this publication or by other suitable means such as riprap, asphalt or concrete.

D. Freeboard: Freeboard is the difference between the design high water elevation in the emergency spillway and the top of the settled embankment. If there is no emergency spillway, it is the difference between the water surface elevation required to pass the design flow through the pipe and the top of the settled embankment. Freeboard shall be at least one foot.

Embankment Cross-Section

1. The maximum height of dam = 15 feet (measured from the low point of original ground at the downstream toe to the top of the dam).

2. Minimum top width of dam = 10 feet.

3. Side slopes shall be 2.5 to 1 or flatter.

Entrance of Runoff into Basin

Points of entrance of surface runoff into excavated sediment basins shall be protected to prevent erosion. Considerable care should be given to the major points of inflow into basins. In many cases the difference in elevation of the inflow and the bottom of the basin is considerable, thus creating a potential for severe gullying and sediment generation. Often a riprap drop at major points of inflow would eliminate gullying and sediment generation.

Diversions, grade stabilization structures or other water control devices shall be installed as necessary to ensure direction of runoff and protect points of entry into the basin. Points of entry should be located so as to ensure maximum travel distance of entering runoff to point of exit (the riser) from the basin.

Disposal

The sediment basin plans shall indicate the method (s) of disposing of the sediment removed from the basin. The sediment shall be placed in such a manner that it will not erode from the site. The sediment shall not be deposited downstream from the basin, adjacent to a stream or floodplain. Disposal sites will be covered by an approved sediment control plan.

The sediment basins plans shall also show the method of disposing of the sediment basin after the drainage area is stabilized, and shall include the stabilization of the sediment basin site. Water contained within the storage areas shall be removed from the basin by pumping, cutting the top of the riser, or other appropriate method prior to removing or breaching the embankment. **Sediment shall not be allowed to flush into a stream or drainageway.**

Chemical Treatment

Precipitation of sediment is enhanced with the use of specific chemical flocculants that can be applied to the sediment basin in liquid, powder, or solid form. Flocculants include anionic polyelectrolytes such as polyacrylimides, aluminum sulfate (alum), polyaluminum chloride and chitosan. Cationic polyelectrolytes have a greater toxicity to fish and other aquatic organisms than anionic polyelectrolytes because they bind to the gills of fish resulting in respiratory failure (Pitt, 2003).

Chemical treatment shall not be substituted for proper erosion and sediment control. To reduce the need for flocculants, proper controls include planning, phasing, sequencing and practice design in accordance to NY Standards. **Chemical applications shall not be applied without written approval from the NYSDEC.**

Safety

Sediment basins are attractive to children and can be very dangerous. Local ordinances and regulations must be adhered to regarding health and safety. The developer or owner shall check with local building officials on applicable safety requirements. If fencing of sediment basins is required, the location of and type of fence shall be shown on the plans.

Construction Specifications

Site Preparation

Areas under the embankment shall be cleared, grubbed, and stripped of topsoil to remove trees, vegetation, roots, or other objectionable material. In order to facilitate cleanout and restoration, the pool area (measured at the top of the pipe spillway) will be cleared of all brush, trees, and other objectionable materials.

Cutoff-Trench

A cutoff trench shall be excavated along the centerline of earth fill embankments. The minimum depth shall be two feet. The cutoff trench shall extend up both abutments to the riser crest elevation. The minimum bottom width shall be four feet, but wide enough to permit operation of excavation and compaction equipment. The side slopes shall be no steeper than 1:1. Compaction requirements shall be the same as those for embankment. The trench shall be dewatered during the back-filling/compaction operations.

Embankment

The fill material shall be taken from approved areas shown on the plans. It shall be clean mineral soil free of roots, woody vegetation, oversized stones, rocks, or other objectionable material. Relatively pervious materials such as sand or gravel (Unified Soil Classes GW, GP, SW & SP) shall not be placed in the embankment. Areas on which fill is to be placed shall be scarified prior to placement of fill. The fill material shall contain sufficient moisture so that it can be formed by hand into a ball without crumbling. If water can be squeezed out of a ball, it is too wet for proper compaction. Fill material shall be placed in six to eight-inch thick continuous layers over the entire length of the fill. Compaction shall be obtained by routing and hauling the construction equipment over the fill so that the entire surface of each layer of the fill is traversed by at least one

wheel or tread track of the equipment or by the use of a compactor. The embankment shall be constructed to an elevation 10 percent higher than the design height to allow for settlement.

Pipe Spillway

The riser shall be securely attached to the barrel or barrel stub by welding the full circumference making a watertight structural connection. The barrel stub must be attached to the riser at the same percent (angle) of grade as the outlet conduit. The connection between the riser and the riser base shall be watertight. All connections between barrel sections must be achieved by approved watertight bank assemblies. The barrel and riser shall be placed on a firm, smooth foundation of impervious soil. Pervious materials such as sand, gravel, or crushed stone shall not be used as backfill around the pipe or anti-seep collars. The fill material around the pipe spillway shall be placed in four-inch layers and compacted under and around the pipe to at least the same density as the adjacent embankment.

A minimum depth of two feet of hand compacted backfill shall be placed over the pipe spillway before crossing it with construction equipment. Steel base plates on risers shall have at least 2 ½ feet of compacted earth, stone, or gravel placed over it to prevent flotation.

Emergency Spillway

The emergency spillway shall be installed in undisturbed ground. The achievement of planned elevations, grades, design width, entrance and exit channel slopes are critical to the successful operation of the emergency spillway and must be constructed within a tolerance of +/- 0.2 feet.

Vegetative Treatment

Stabilize the embankment and emergency spillway in accordance with the appropriate vegetative standard and specification immediately following construction. In no case shall the embankment remain unstabilized for more than three (3) days.

Erosion and Pollution Control

Construction operations shall be carried out in such a manner that erosion and water pollution will be minimized. State and local laws shall be complied with concerning pollution abatement.

Safety

State and local requirements shall be met concerning fencing and signs, warning the public of hazards of soft sediment and floodwater.

Maintenance

1. Repair all damages caused by soil erosion and construction equipment at or before the end of each working day.

2. Sediment shall be removed from the basin when it reaches the specified depth for cleanout noted on the plans which will not exceed 50% of the capacity of the sediment storage zone. This sediment shall be placed in such a manner that it will not erode from the site. The sediment shall not be deposited downstream from the embankment, adjacent to a stream or floodplain.

Final Disposal

When temporary structures have served their intended purpose and the contributing drainage area has been properly stabilized, the embankment and resulting sediment deposits are to be leveled or otherwise disposed of in accordance with the approved sediment control plan. The proposed use of a sediment basin site will often dictate final disposition of the basin and any sediment contained therein. If the site is scheduled for future construction, then the basin material and trapped sediments must be removed, safely disposed of, and backfilled with a structural fill. When the basin area is to remain open space, the pond may be pumped dry, graded, and backfilled.

Information to be Submitted

Sediment basin designs and construction plans submitted for review to a local municipality, New York State DEC, New York City DEP, Soil and Water Conservation District, or other agency shall include the following:

1. Specific location of the basin.

2. Plan view of the storage basin and emergency spillway, showing existing and proposed contours.

3. Cross section of dam, principal spillway, emergency spillway, and profile of emergency spillway.

4. Details of pipe connections, riser to pipe connections, riser base, anti-seep control, trash rack cleanout elevation, and anti-vortex device.

5. Runoff calculations for 1 and 10-year frequency storms, if required.

6. Storage Computations

   A. Zones total required

   B. Zones total Available

   C. Elevation of sediment at which cleanout shall be required; also stated as a distance from the riser

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

Computed by _____ Date _____ Checked by _____ Date _____
Project _____ Basin # _____
Location _____ Total Area draining to basin (≤50 Ac.) _____ Acres

BASIN SIZE DESIGN

1. Sediment storage zone volume = 1,000 cu. ft. x number of disturbed acres = _____ cu. ft., Top of Zone Elev. _____
2. Dewatering zone volume = 3,600 cu. ft. x number of drainage area acres = _____ cu. ft., Top of Zone Elev. _____
3. Length to width ratio = _____
4. A. Cleanout at 50% of sediment storage zone volume, Elev. _____
   B. Distance below top of riser _____ feet
5. Minimum surface area is larger of 0.01 $Q_{(10)}$ _____ or, 0.015 DA = _____ use _____ acres

DESIGN OF SPILLWAYS & ELEVATIONS

Runoff

6. $Q_{p(10)}$ = _____ cfs (Attach runoff computation sheets)

Pipe Spillway (Q_{ps})

7. Min. pipe spillway cap., Q_{ps} = 0.2 x _____ Drainage Area, acres = _____ cfs
   Note: If there is no emergency spillway, then required $Q_{ps} = Q_{p(10)}$ = _____ cfs.
8. H, head = _____ ft. Barrel length = _____ ft
9. Barrel: Diam. _____ inches; Q_{ps} = (Q) _____ x (cor.fac.) _____ = _____ cfs.
10. Riser: Diam. _____ inches; Length _____ ft.; h = _____ ft. Crest Elev. _____
11. Trash Rack: Diameter = _____ inches; H, height = _____ inches

Emergency Spillway Design

12. Emergency Spillway Flow, $Q_{es} = Q_p - Q_{ps}$ = _____ - _____ = _____ cfs.
13. Width _____ ft.; H_p _____ ft Crest elevation _____; Design High Water Elev. _____
    Entrance channel slope _____ % ; Top of Dam Elev. _____
    Exit channel slope _____ %

ANTI-SEEP COLLAR/SEEPAGE DIAPHRAGM DESIGN

Collars:

14. y = _____ ft.; z = _____ :1; pipe slope = _____ %, L_s = _____ ft.
    Use _____ collars, _____ - _____ inches square; projection = _____ ft.

Diaphragms:

#_____ width_____ ft. height _____ ft.

DEWATERING ORIFICE SIZING

(Determined from the Dewatering Device Standard)

15. Dewatering orifice diameter = _____ inches. Skimmer ___ or Riser ____ (check one)
16. Design dewatering time _____ days (Min. 2 days required)

TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET INSTRUCTIONS FOR USE OF FORM

1. Minimum required sediment storage zone volume is 1,000 cubic feet per acre from each disturbed acre within the total drainage area. Minimum required dewatering zone volume is 3,600 cubic feet per total area draining to the basin.

2. The volume of a naturally shaped basin (no excavation in basin) may be approximated by the formula V = (0.4)(A)(d), where V is in cubic feet, A is the surface area of the basin, in square feet, and d is the maximum depth of the basin, in feet. Volume may be computed from contour information or other suitable methods.

3. If volume of basin is not adequate for required storage, excavate to obtain the required zone volumes.

4. The minimum surface area of the basin pool at the storage volume elevation will be the larger of the two elevations shown.

5. Use of the NRCC hydrologic data at www.precip.net with an appropriate hydrologic model, is the preferred process for runoff computation. Runoff curve numbers will be computed for the drainage area that reflects the maximum construction condition.

6. Required minimum discharge from pipe spillway equals 0.2 cfs/ac. times total drainage area. (This is equivalent to a uniform runoff of 5 in. per 24 hours). The pipe shall be designed to carry Q_p if site conditions preclude installation of an emergency spillway to protect the structure.

7. Determine value of "H" from field conditions; "H" is the interval between the centerline of the outlet pipe and the emergency spillway crest, or if there is no emergency spillway, to the design high water.

8. See Pipe Flow Charts, Figures 5.11 and 5.12 on pages 5.29 and 5.30.

9. See Riser Inflow Curves, Figure 5.10 on page 5.28.

10. Compute the orifice size required to dewater the basin over a minimum 48 hour period. See the Dewatering Device Standard on page 5.10.

11. See Trash Rack and Anti-Vortex Device Design, Figures 5.13 and 5.14 on pages 5.31 and 5.32.

12. Compute Q_{es} by subtracting actual flow carried by the pipe spillway from the total inflow, Q_p.

13. Use appropriate tables to obtain values of H_p, bottom width, and actual Q_{es}. If no emergency spillway is to be used, so state, giving reason (s).

14. See Anti-Seep Collar / Seepage Diaphragm Design (see figures 5.16, 5.17 and 5.18 on pages 5.34, 5.35 and 5.36).

15. Fill in design elevations. The emergency spillway crest must be set no closer to riser crest than value of h, which causes pipe spillway to carry the minimum, required Q. Therefore, the elevation difference between spillways shall be equal to the value of h, or one foot, whichever is greater. Design high water is the elevation of the emergency spillway crest plus the value of H_p, or if there is no emergency spillway, it is the elevation of the riser crest plus h required to handle the 10-year storm. Minimum top of dam elevation requires 1.0 ft. of freeboard above design high water.

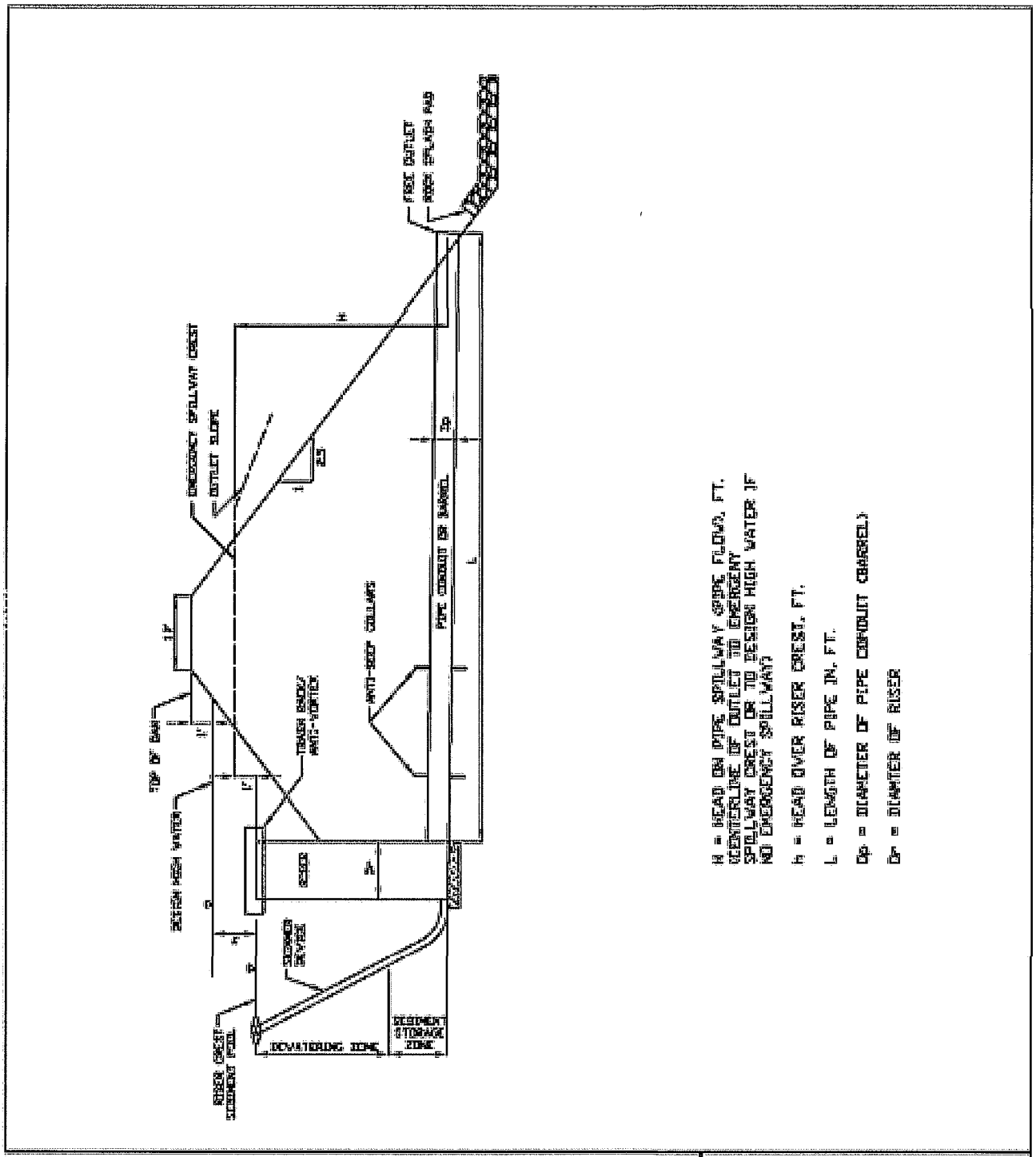
To use charts for pipe spillway design:

1. Enter chart, Figures 5.11 or 5.12 on pages 5.29 and 5.30 with H and required discharge.

2. Find diameter of pipe conduit that provides equal or greater discharge

3. Enter chart, Figure 5.10 on page 5.28 with actual pipe discharge. Read across to select smallest riser that provides discharge within weir flow portion of rating curve. Read down to find corresponding h required. This h must be 1 foot or less.

Figure 5.8
Pipe Spillway Design



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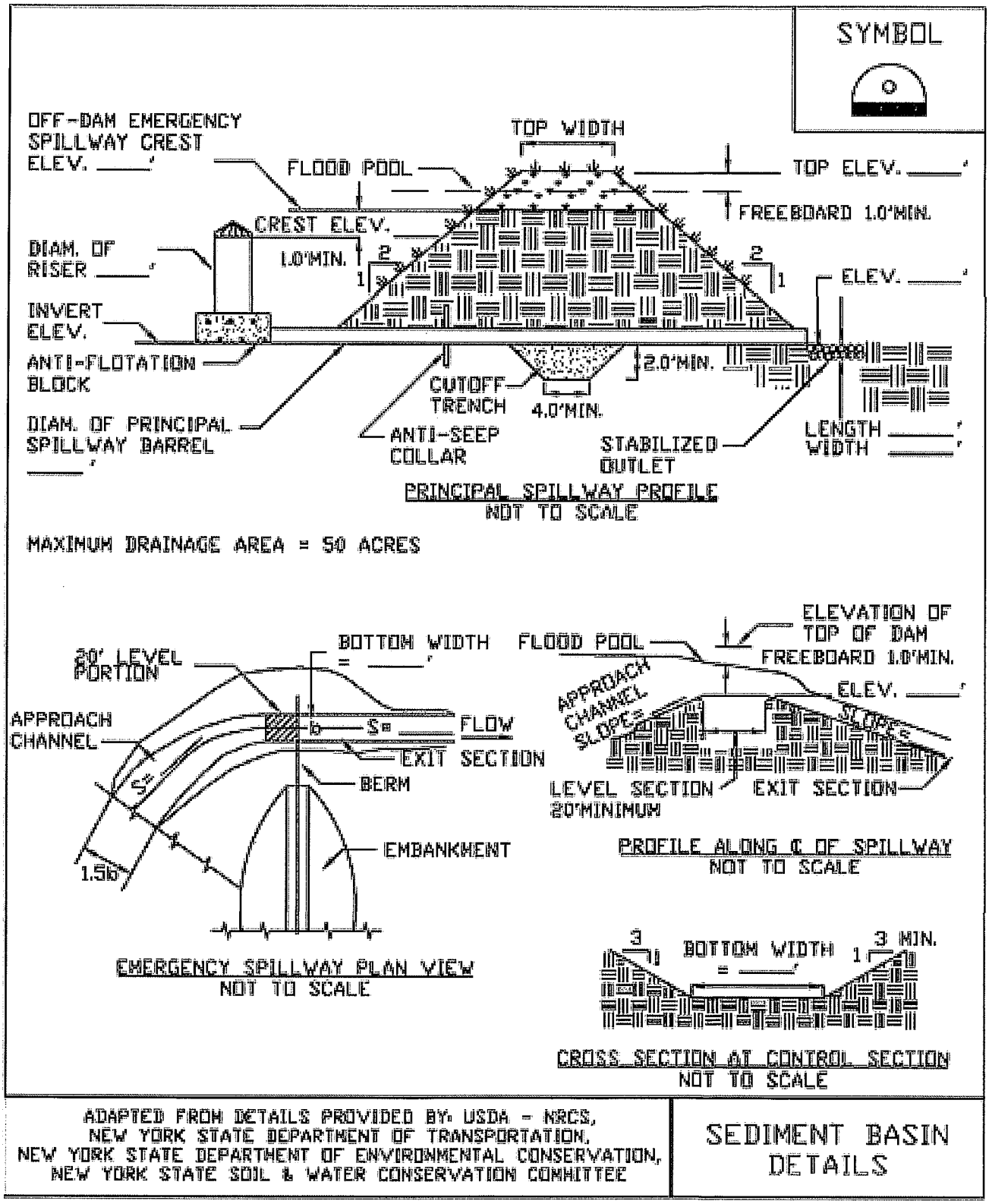
PIPE SPILLWAY DESIGN

Figure 5.9
Sediment Basin



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SEDIMENT BASIN DETAILS

Figure 5.10
Riser Inflow Chart (USDA - NRCS)

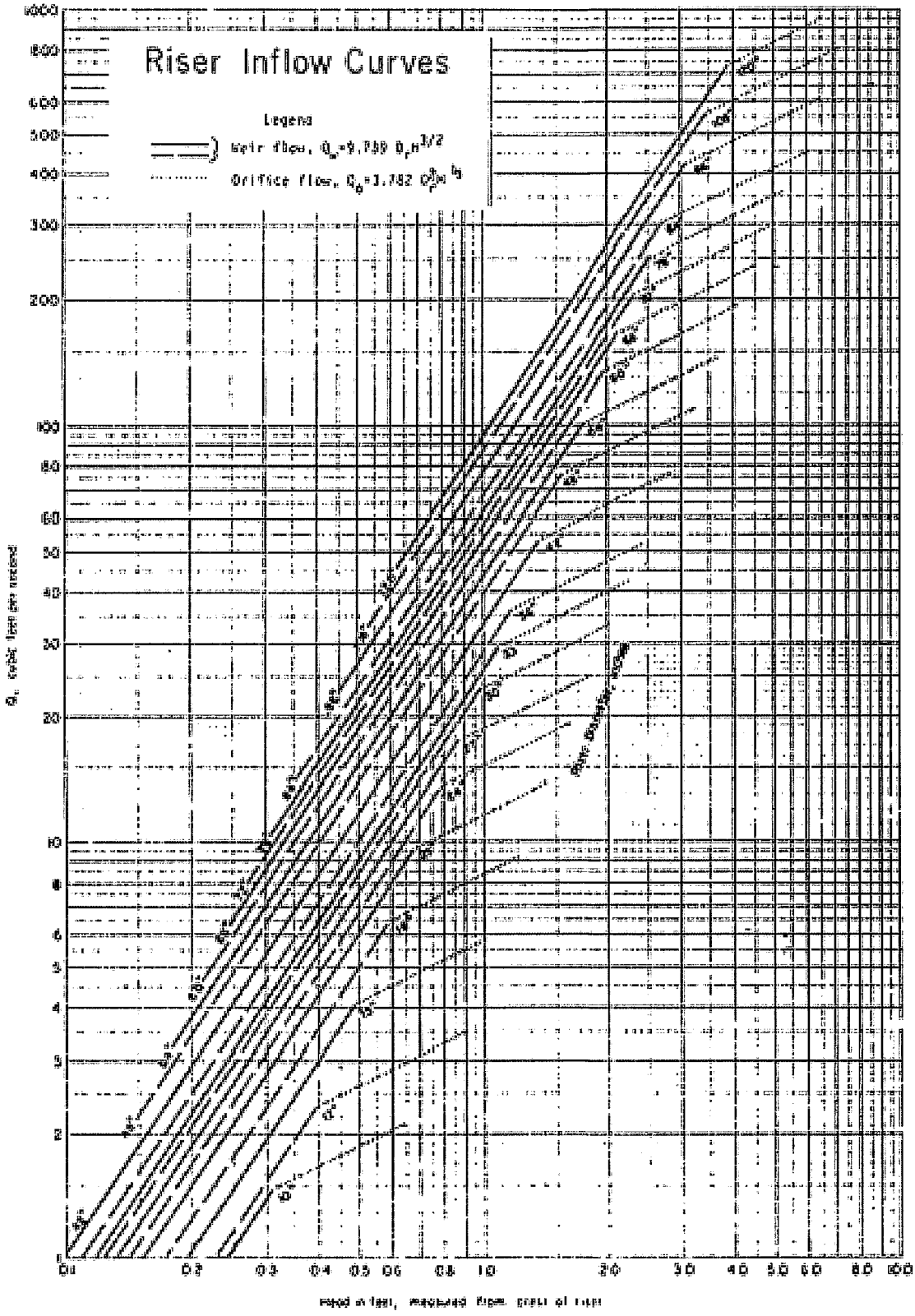


Figure 5.11
Pipe Flow Chart; "n" = 0.025 (USDA - NRCS)

PIPE FLOW CHART n = 0.025

FOR CORRUGATED METAL PIPE INLET $K_e = K_c = K_b = 1.0$ AND 70 FEET OF CORRUGATED METAL PIPE CONDUIT (full flow assumed)

Pipe correction factors for pipe lengths other than 70 feet

diameter of pipe in inches

H, in feet	6"	8"	10"	12"	15"	18"	21"	24"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"
1	0.33	0.70	1.25	1.95	3.48	5.47	7.99	11.0	18.8	28.8	41.1	55.7	72.6	91.8	113	137	163	192	222	253	290
2	0.47	0.99	1.76	2.80	4.92	7.74	11.3	15.6	26.6	40.8	58.2	78.8	102	129	160	194	231	272	314	360	410
3	0.58	1.22	2.16	3.43	6.02	9.48	13.8	19.1	32.6	49.9	71.2	96.5	126	159	196	237	282	332	384	441	503
4	0.67	1.40	2.49	3.97	6.96	10.9	16.0	22.1	37.6	57.7	82.3	111	145	184	226	274	326	383	444	510	580
5	0.74	1.57	2.79	4.43	7.78	12.2	17.9	24.7	42.1	64.5	92.0	124	162	205	253	306	365	428	496	570	648
6	0.82	1.72	3.05	4.86	8.52	13.4	19.6	27.0	46.1	70.6	101	136	178	225	277	336	399	469	544	624	710
7	0.88	1.86	3.30	5.25	9.20	14.5	21.1	29.2	49.8	76.3	109	147	192	243	300	362	431	506	587	674	767
8	0.94	1.99	3.53	5.61	9.84	15.5	22.6	31.2	53.2	81.5	116	158	205	260	320	388	461	541	628	721	820
9	1.00	2.11	3.74	5.95	10.4	16.4	24.0	33.1	56.4	86.5	123	167	218	275	340	411	489	574	666	764	870
10	1.05	2.22	3.94	6.27	11.0	17.3	25.3	34.9	59.5	91.2	130	176	230	290	358	433	516	605	702	806	917
11	1.10	2.33	4.13	6.58	11.5	18.2	26.5	36.6	62.4	95.6	136	185	241	304	376	454	541	635	736	845	962
12	1.15	2.42	4.32	6.87	12.1	19.0	27.7	38.2	65.2	99.9	143	194	252	318	393	475	565	663	769	881	1004
13	1.20	2.51	4.49	7.15	12.6	19.7	28.8	39.8	67.8	104	148	201	263	331	408	494	588	690	800	919	1045
14	1.25	2.63	4.66	7.42	13.0	20.5	29.9	41.3	70.4	108	154	209	273	343	424	513	610	716	830	953	1085
15	1.29	2.72	4.82	7.68	13.5	21.2	30.9	42.8	72.8	112	159	216	281	355	439	531	631	741	860	987	1123
16	1.33	2.81	4.98	7.93	13.9	21.9	31.8	44.2	75.2	115	165	223	290	367	453	548	652	765	888	1019	1160
17	1.37	2.90	5.14	8.18	14.3	22.6	32.8	45.5	77.5	119	170	230	299	378	467	565	671	788	915	1051	1195
18	1.41	2.98	5.29	8.41	14.8	23.2	33.6	46.8	79.8	122	174	236	308	389	480	581	691	811	942	1081	1230
19	1.45	3.06	5.43	8.64	15.2	23.8	34.5	48.1	82.0	126	179	242	316	400	494	597	710	834	967	1111	1264
20	1.49	3.14	5.57	8.87	15.6	24.5	35.4	49.4	84.1	129	184	249	325	410	506	613	729	856	991	1139	1297
21	1.53	3.22	5.71	9.09	15.9	25.1	36.3	50.6	86.2	132	188	255	333	421	519	628	747	877	1017	1168	1329
22	1.56	3.29	5.85	9.30	16.3	25.7	37.2	51.8	88.3	135	193	261	340	430	531	643	765	898	1041	1196	1360
23	1.60	3.37	5.98	9.51	16.7	26.2	38.1	53.0	90.3	138	197	267	348	440	543	657	782	918	1064	1223	1390
24	1.63	3.44	6.11	9.72	17.0	26.8	38.8	54.1	92.3	141	201	273	356	450	555	671	799	937	1087	1248	1420
25	1.66	3.51	6.23	9.92	17.4	27.4	39.6	55.2	94.0	144	206	279	363	459	566	685	815	957	1110	1274	1450
26	1.70	3.58	6.36	10.1	17.7	27.9	40.3	56.3	95.9	147	210	284	370	468	577	699	831	976	1132	1299	1478
27	1.73	3.65	6.48	10.3	18.1	28.4	41.0	57.4	97.7	150	214	290	377	477	588	712	847	994	1153	1324	1507
28	1.76	3.72	6.60	10.5	18.4	29.0	41.7	58.4	99.5	153	218	295	384	486	599	725	863	1013	1174	1348	1534
29	1.79	3.78	6.71	10.7	18.7	29.5	42.4	59.3	101	155	221	300	391	494	610	738	878	1030	1195	1373	1561
30	1.82	3.85	6.83	10.9	19.1	30.0	43.1	60.3	103	158	225	305	397	503	620	750	893	1048	1216	1396	1588

Correction Factors For Other Pipe Lengths

L, in feet																					
35	1.49	1.61	1.58	1.53	1.47	1.42	1.37	1.34	1.28	1.24	1.20	1.18	1.16	1.14	1.13	1.11	1.10	1.10	1.09	1.08	1.08
40	1.44	1.41	1.39	1.34	1.32	1.29	1.27	1.24	1.21	1.18	1.15	1.13	1.13	1.11	1.10	1.09	1.08	1.07	1.07	1.06	1.06
45	1.26	1.27	1.25	1.21	1.21	1.20	1.18	1.17	1.14	1.13	1.11	1.10	1.09	1.08	1.07	1.06	1.06	1.05	1.05	1.05	1.04
50	1.16	1.06	1.15	1.14	1.13	1.12	1.11	1.10	1.09	1.08	1.07	1.06	1.06	1.05	1.05	1.04	1.04	1.04	1.03	1.03	1.03
60	1.07	1.07	1.07	1.06	1.06	1.05	1.05	1.05	1.04	1.04	1.03	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02	1.02	1.02
70	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
80	.94	.94	.95	.95	.95	.95	.96	.96	.96	.97	.97	.97	.98	.98	.98	.98	.98	.98	.99	.99	.99
90	.89	.89	.90	.90	.91	.91	.92	.92	.93	.94	.94	.95	.95	.96	.96	.96	.97	.97	.97	.97	.98
100	.85	.85	.86	.86	.87	.88	.89	.89	.90	.91	.92	.92	.93	.94	.94	.95	.95	.95	.96	.96	.96
120	.78	.79	.79	.80	.81	.82	.83	.83	.85	.86	.87	.89	.89	.90	.91	.92	.92	.93	.93	.94	.93
140	.72	.73	.74	.75	.76	.77	.78	.79	.81	.82	.84	.85	.86	.87	.88	.89	.90	.91	.91	.92	.90
160	.68	.69	.69	.70	.71	.73	.74	.75	.77	.79	.80	.82	.83	.84	.85	.86	.87	.88	.89	.89	

Figure 5.12
Pipe Flow Chart; "n" = 0.013 (USDA - NRCS)

PIPE FLOW CHART n = 0.013

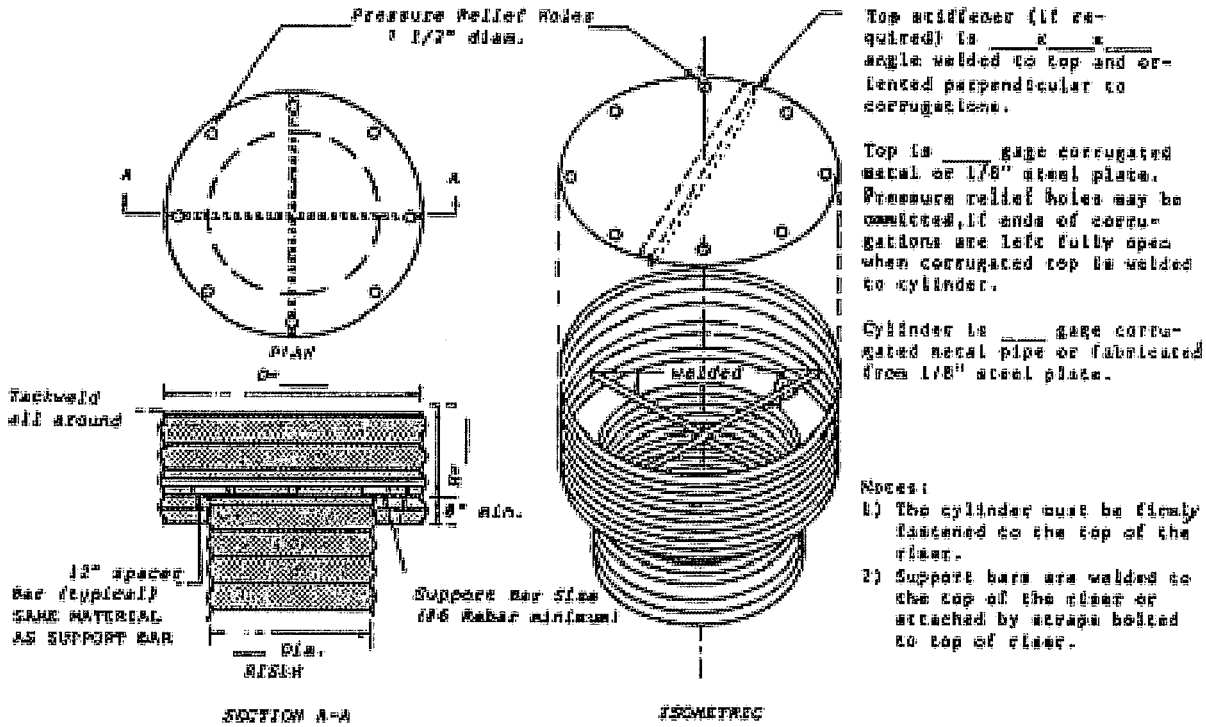
FOR REINFORCED CONCRETE PIPE INLET $K_m = K_e + K_b = 1.00$ AND 10 FEET OF REINFORCED CONCRETE PIPE CONDUIT (full flow assumed)

Note correction factors for pipe lengths other than 50 feet

diameter of pipe in inches

H, in feet	12"	15"	18"	21"	24"	30"	36"	42"	48"	54"	60"	66"	72"	78"	84"	90"	96"	102"
1	3.22	5.44	8.29	11.8	15.9	26.9	40.6	56.8	75.4	96.5	119	143	167	191	215	239	263	287
2	4.55	7.69	11.7	16.7	22.5	38.0	57.4	80.3	106	136	169	202	236	270	304	338	372	406
3	5.57	9.42	14.4	20.4	27.5	46.5	70.3	98.3	130	166	206	247	289	331	372	414	455	497
4	6.43	10.9	16.6	23.5	31.8	53.9	81.4	113	150	192	238	285	334	384	435	479	524	573
5	7.19	12.2	18.5	26.3	35.5	60.1	90.8	126	167	214	265	318	373	428	483	531	585	640
6	7.88	13.3	20.3	28.8	38.9	65.7	99.5	138	183	234	290	347	408	468	529	587	639	699
7	8.51	14.4	21.9	31.1	42.0	70.8	107	149	197	252	312	374	439	503	569	629	688	752
8	9.10	15.4	23.5	33.3	44.9	75.8	114	159	211	269	333	399	468	537	607	670	734	802
9	9.65	16.3	24.9	35.3	47.7	80.4	121	168	223	285	353	423	496	569	643	710	778	850
10	10.1	17.2	26.2	37.1	50.2	84.7	128	178	236	300	371	445	522	599	677	747	819	895
11	10.7	18.0	27.4	38.8	52.7	88.8	134	186	247	314	389	466	547	627	709	782	857	937
12	11.1	18.9	28.7	40.6	55.0	92.7	140	194	257	327	405	486	570	654	739	815	894	976
13	11.6	19.6	29.9	42.4	57.3	96.7	146	203	268	341	422	506	594	681	770	849	931	1017
14	12.0	20.4	31.0	44.1	59.4	97.3	152	211	279	355	439	526	617	708	800	882	967	1056
15	12.5	21.1	32.1	45.6	61.5	101	158	219	289	368	455	545	640	734	829	914	1002	1094
16	12.9	21.8	33.2	47.1	63.5	104	163	226	299	380	470	563	661	758	856	944	1035	1130
17	13.3	22.4	34.2	48.5	65.5	107	168	232	308	391	483	578	679	778	879	969	1062	1160
18	13.7	23.1	35.2	49.9	67.4	110	173	238	316	401	496	593	696	798	901	993	1089	1188
19	14.0	23.7	36.1	51.2	69.3	113	178	244	324	411	508	607	713	817	923	1017	1115	1217
20	14.4	24.3	37.1	52.6	71.0	116	183	250	332	421	520	621	729	836	944	1040	1140	1244
21	14.7	24.9	38.0	53.9	72.8	119	187	256	339	430	531	635	745	854	964	1061	1164	1270
22	15.1	25.5	38.9	55.2	74.5	122	192	262	346	439	542	648	760	871	984	1083	1187	1295
23	15.4	26.1	39.8	56.5	76.3	125	196	268	353	448	553	661	776	889	1004	1105	1211	1321
24	15.8	26.7	40.6	57.7	77.8	127	199	273	360	456	563	674	791	906	1023	1126	1234	1346
25	16.1	27.3	41.5	58.9	79.4	130	203	278	367	465	574	687	806	923	1042	1147	1257	1371
26	16.4	27.7	42.3	60.0	81.0	133	207	284	374	473	584	700	821	940	1061	1168	1280	1396
27	16.7	28.3	43.1	61.2	82.5	135	211	289	381	482	595	712	835	957	1080	1189	1303	1421
28	17.0	28.8	43.9	62.3	84.1	138	214	295	388	491	606	725	850	974	1099	1210	1326	1446
29	17.3	29.3	44.7	63.4	85.5	140	218	300	395	499	616	737	864	990	1117	1230	1348	1470
30	17.6	29.8	45.4	64.5	87.0	143	222	304	401	508	625	748	877	1005	1134	1249	1369	1493
L, in feet	Correction Factors For Other Pipe Lengths																	
35	1.10	1.14	1.20	1.18	1.15	1.12	1.10	1.08	1.07	1.06	1.05	1.04	1.04	1.03	1.03	1.01	1.01	1.01
40	1.22	1.18	1.15	1.13	1.12	1.09	1.08	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.02	1.02	1.02	1.02
45	1.15	1.11	1.10	1.10	1.08	1.07	1.05	1.05	1.04	1.03	1.03	1.03	1.02	1.02	1.02	1.02	1.02	1.02
50	1.09	1.08	1.07	1.06	1.05	1.04	1.04	1.03	1.03	1.02	1.02	1.02	1.02	1.01	1.01	1.01	1.01	1.01
60	1.04	1.04	1.03	1.03	1.03	1.03	1.02	1.02	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01	1.01
70	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
80	.96	.97	.97	.97	.98	.98	.98	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99	.99
90	.93	.94	.94	.95	.95	.96	.97	.97	.98	.98	.98	.98	.99	.99	.99	.99	.99	.99
100	.90	.91	.93	.93	.93	.95	.95	.96	.97	.97	.97	.98	.98	.98	.98	.98	.98	.99
120	.84	.86	.87	.89	.90	.91	.93	.94	.94	.95	.96	.96	.97	.97	.97	.97	.98	.98
140	.80	.82	.83	.85	.86	.88	.90	.91	.92	.93	.94	.94	.95	.95	.96	.96	.96	.97
160	.76	.78	.80	.82	.83	.86	.88	.89	.90	.91	.92	.93	.94	.94	.95	.95	.95	.96

Figure 5.13
Concentric Trash Rack and Anti-Vortex Device (USDA - NRCS)



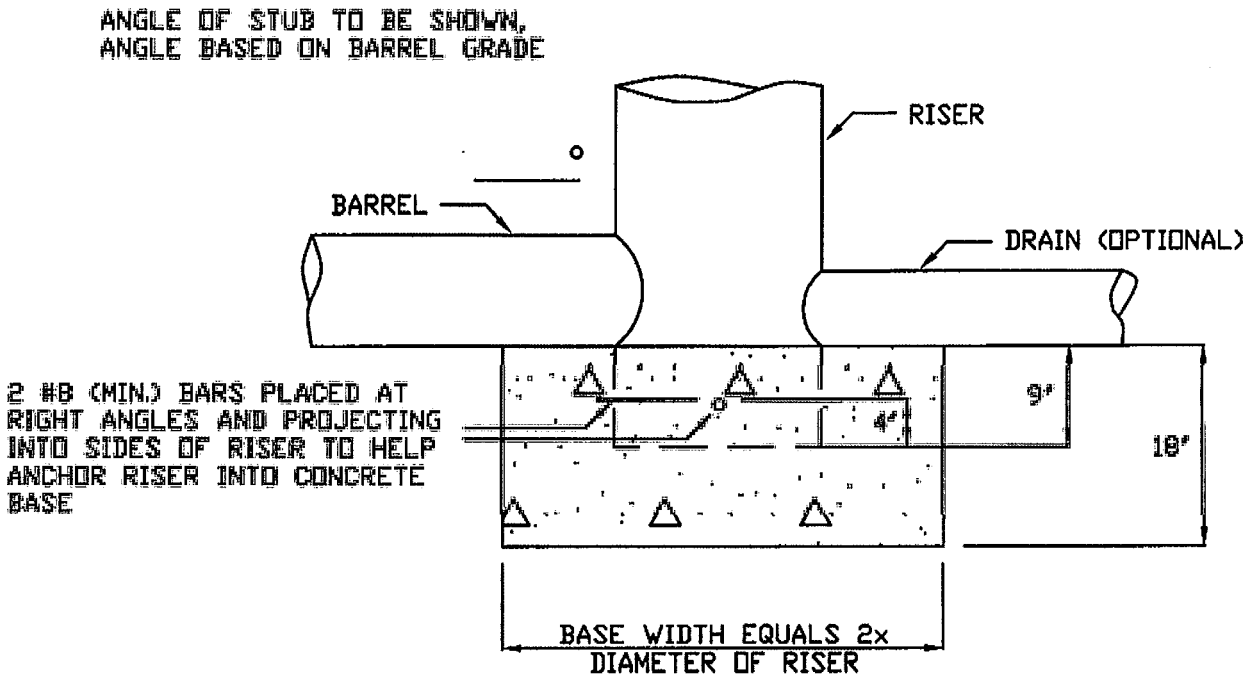
CONCENTRIC TRASH RACK AND ANTI-VORTEX DEVICE
(not to scale)

Figure 5.14
Concentric Trash Rack and Anti-Vortex Device Design Table
(USDA - NRCS)

Riser Diam.(in)	Cylinder Diam.(in.)	Thick. Gage	H (in.)	Minimum Size Support Bar	Minimum Top Thickness	Minimum Top Stiffener
12	18	16	6	#6 Rebar	16 ga.	—
15	21	16	7	#6 Rebar	16 ga.	—
18	27	16	8	#6 Rebar	16 ga.	—
21	30	16	11	#6 Rebar	16 ga.	—
24	36	16	13	#6 Rebar	14 ga.	—
27	42	16	15	#6 Rebar	14 ga.	—
36	54	14	17	#8 Rebar	12 ga.	—
42	60	14	19	#8 Rebar	12 ga.	—
48	72	12	21	1 1/4" pipe or 1 1/4x1 1/4x1/4 angle	10 ga.	—
54	78	12	25	See 48" Riser	10 ga.	—
60	90	12	29	1 1/2" pipe or 1 1/2x1 1/2x1/2 angle	8 ga.	—
66	96	10	33	2" pipe or 2x2x3/16 angle	8 ga. w/stiffener	2x2x1/4 angle
72	102	10	36	——See 66" Riser——		2 1/2x2 1/2x1/4 angle
78	114	10	39	2 1/2" pipe or 2x2x1/4 angle	See 72" Riser	See 72" Riser
84	120	10	42	2 1/2" pipe or 2 1/2x2 1/2x1/4 angle	See 72" Riser	2 1/2x 2 1/2x 5/16 angle

Note: The criteria for sizing the cylinder is that the area between the inside of the cylinder and the outside of the riser is equal to or greater than the area inside the riser. Therefore, the above table is invalid for use with concrete pipe risers.

Figure 5.15
Riser Base Details



CONSTRUCTION SPECIFICATIONS

1. THE CONCRETE BASE SHALL BE POURED IN SUCH A MANNER TO INSURE THAT THE CONCRETE FILLS THE BOTTOM OF THE RISER TO THE INVERT OF THE OUTLET PIPE TO PREVENT THE RISER FROM BREAKING AWAY FROM THE BASE.
2. WITH ALUMINUM OR ALUMINIZED PIPE, THE EMBEDDED SECTION MUST BE PAINTED WITH CHROMATE OR EQUIVALENT.
3. RISER BASE MAY BE SIZED AS COMPUTED USING FLOATATION WITH A FACTOR OF SAFETY OF 1.2.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	RISER BASE DETAIL SEDIMENT BASIN

Figure 5.16
Anti-Seep Collar Design

This procedure provides the anti-seep collar dimensions for only temporary sediment basins to increase the seepage length by 15% for various pipe slopes, embankment slopes and riser heights.

The first step in designing anti-seep collars is to determine the length of pipe within the saturated zone of the embankment. This can be done graphically or by the following equation, assuming that the upstream slope of the embankment intersects the invert of the pipe at its upstream end. (See embankment-invert intersection on the drawing below:

$$L_s = y\,(z + 4)\left[1 + \frac{\text{pipe slope}}{0.25 - \text{pipe slope}}\right]$$

Where: L_s = length of pipe in the saturated zone (ft.)

y = distance in feet from upstream invert of pipe to highest normal water level expected to occur during the life of the structure, usually the top of the riser.

z = slope of upstream embankment as a ratio of z ft. horizontal to one ft. vertical.

pipe slope = slope of pipe in feet per foot.

This procedure is based on the approximation of the phreatic line as shown in the drawing below:

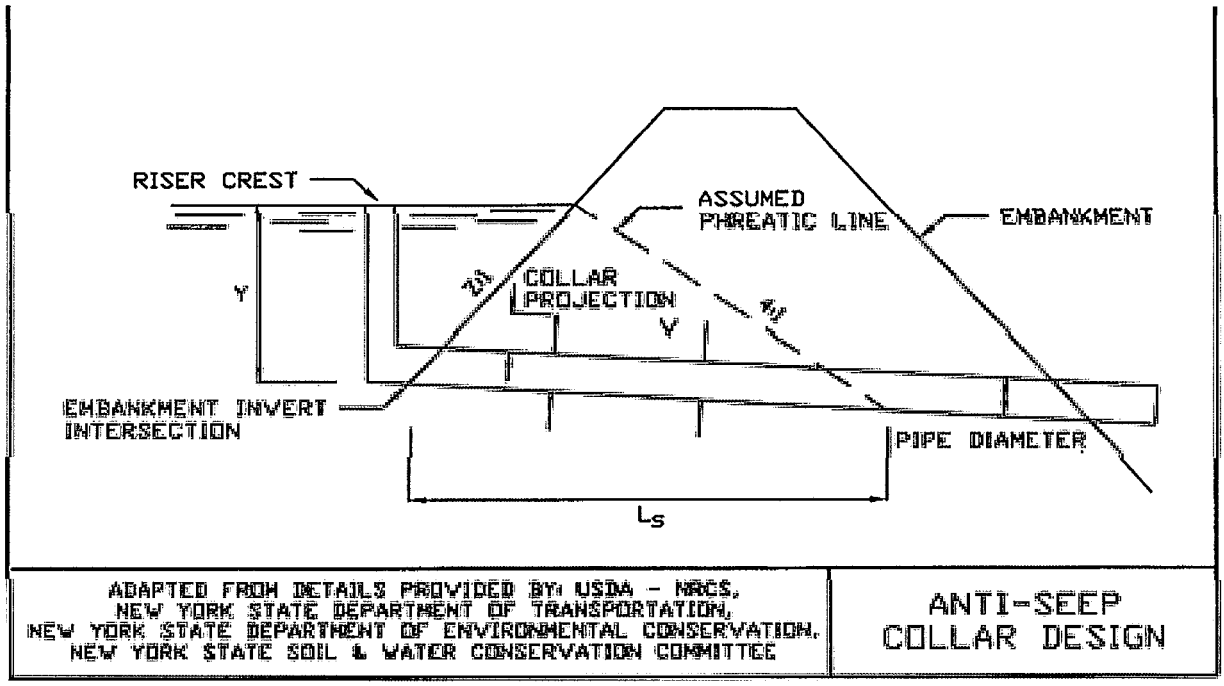
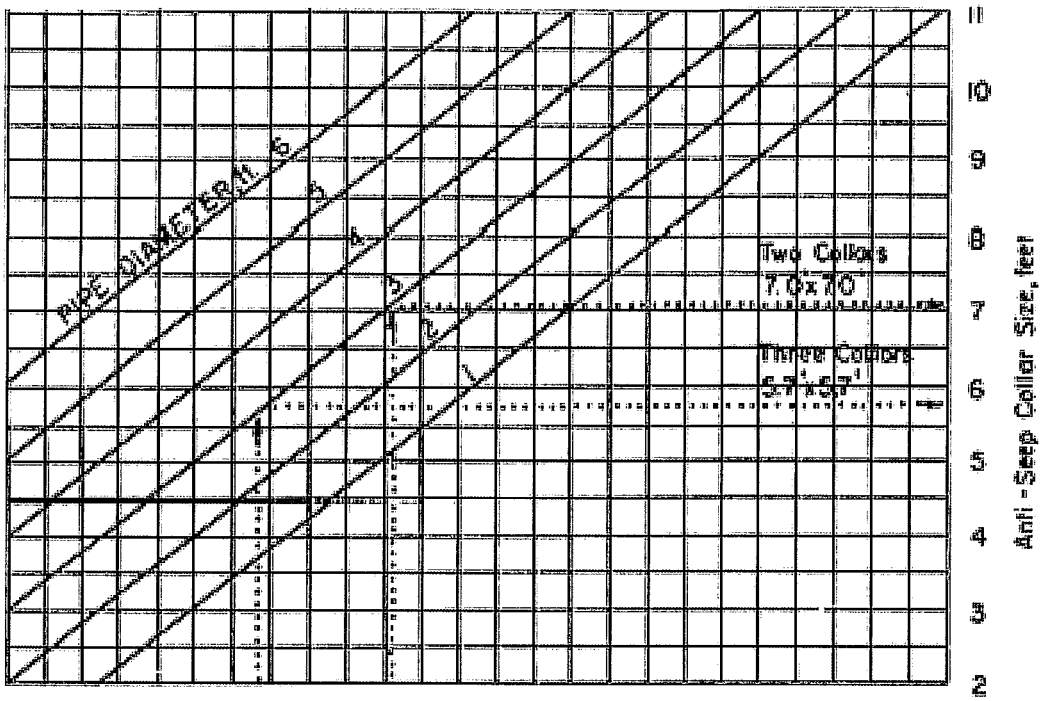


Figure 5.17
Anti-Seep Collar Design Charts (USDA - NRCS)



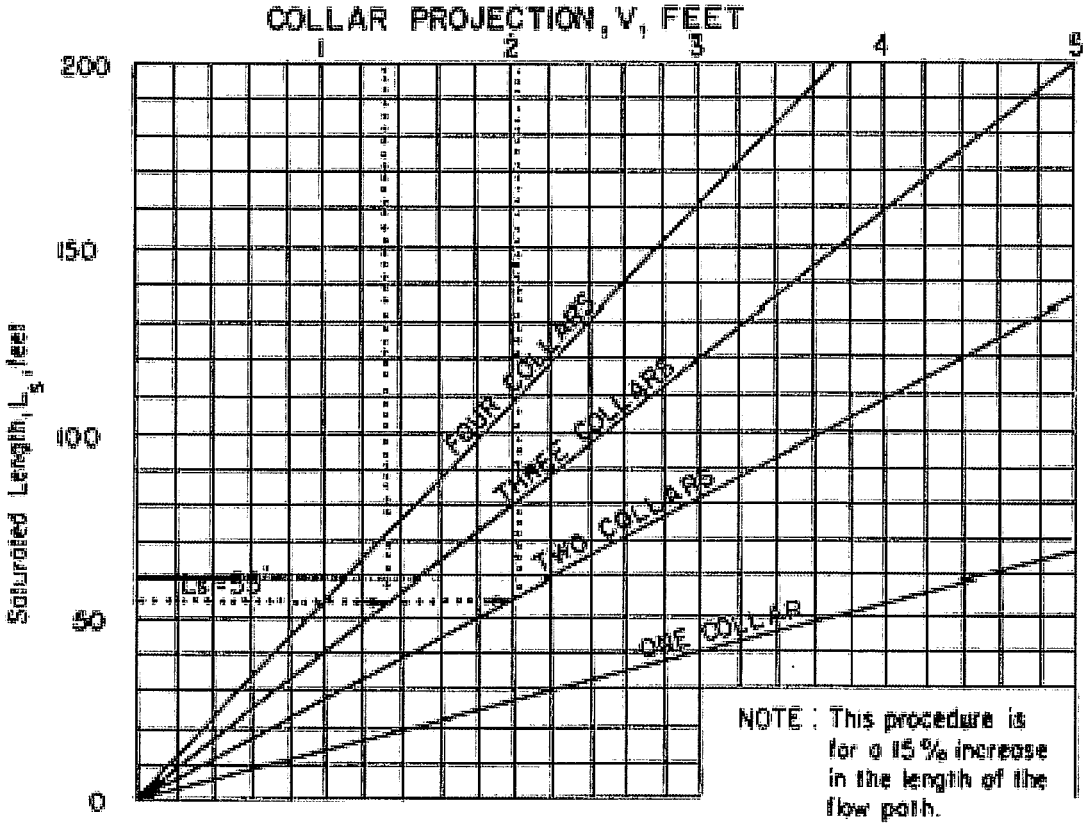


Figure 5.18
Anti-Seep Collar

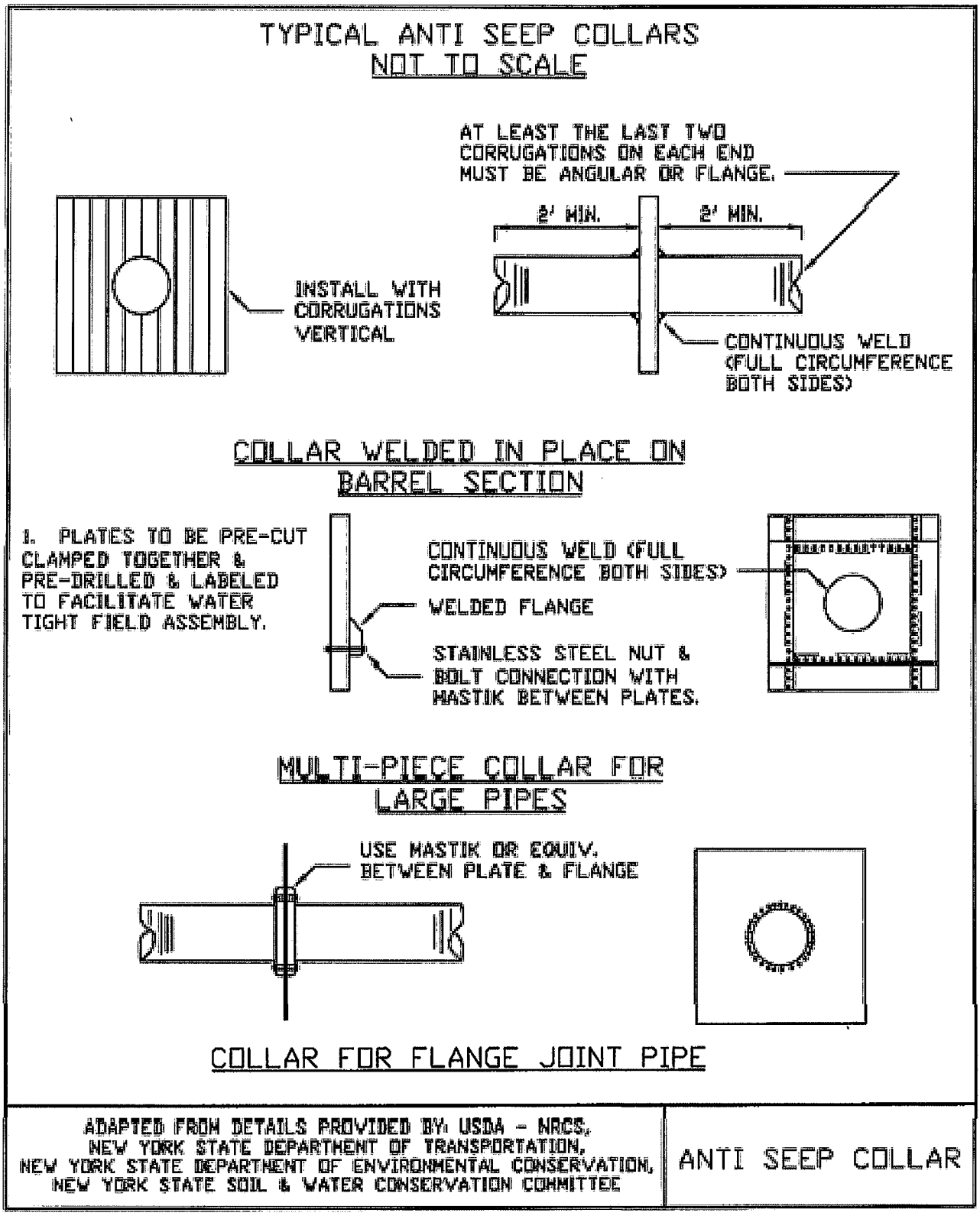
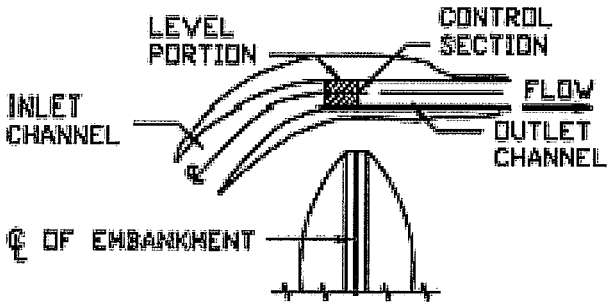
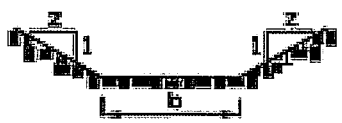


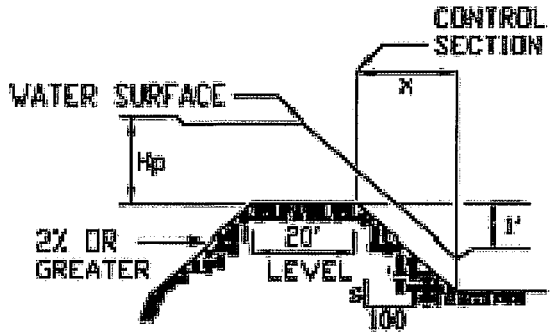
Figure 5.19
Design Data for Earth Spillways



PLAN OF EARTH SPILLWAY



CROSS SECTION OF EARTH SPILLWAY AT CONTROL SECTION



PROFILE ALONG CENTERLINE OF EARTH SPILLWAY

LEGEND

n = MANNING'S COEFFICIENT OF ROUGHNESS.

Hp = DIFFERENCE IN ELEVATION BETWEEN CREST OF EARTH SPILLWAY AT THE CONTROL SECTION AND WATER SURFACE IN RESERVOIR, IN FEET.

b = BOTTOM WIDTH OF EARTH SPILLWAY AT THE CONTROL SECTION, IN FEET.

Q = TOTAL DISCHARGE, IN cfs.

V = VELOCITY, IN FEET PER SECOND, THAT WILL EXIST IN CHANNEL BELOW CONTROL SECTION, AT DESIGN Q, IF CONSTRUCTED TO SLOPE (S) THAT IS SHOWN.

S = FLATTEST SLOPE (S), IN %, ALLOWABLE FOR CHANNEL BELOW CONTROL SECTION.

X = MINIMUM LENGTH OF CHANNEL BELOW CONTROL SECTION, IN FEET.

z = SIDE SLOPE RATIO.

NOTES:

1) FOR A GIVEN Hp A DECREASE IN THE EXIT SLOPE FROM S AS GIVEN IN THE TABLE DECREASES SPILLWAY DISCHARGE BUT INCREASING THE EXIT SLOPE FROM S DOES NOT INCREASE DISCHARGE. IF AN EXIT SLOPE (Se) STEEPER THAN S IS USED, THEN VELOCITY (Ve) IN THE EXIT CHANNEL WILL INCREASE ACCORDING TO THE FOLLOWING RELATIONSHIP:

$$Ve = V\left(\frac{Se}{S}\right)^{0.3}$$

2) DATA TO RIGHT OF HEAVY VERTICAL LINES ON DRAWINGS SHOULD BE USED WITH CAUTION, AS THE RESULTING SECTIONS WILL BE EITHER POORLY PROPORTIONED OR HAVE VELOCITIES IN EXCESS OF 6 FT/SEC.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	DESIGN DATA FOR EARTH SPILLWAYS

Figure 5.20
Design Table for Vegetated Earth Spillways in Erosion Resistant Soils, K=0.1 - 0.35, Side Slopes = 3:1

Discharge Q CFS	Slope Range Minimum Percent	Slope Range Maximum Percent	Bottom Width Feet	Stage Feet
15	3.3	12.2	8	.83
	3.5	18.2	12	.68
20	3.1	8.9	8	.97
	3.2	13.0	12	.81
	3.3	17.3	16	.70
25	2.9	7.1	8	1.09
	3.2	9.9	12	.91
	3.3	13.2	16	.79
	3.3	17.2	20	.70
30	2.9	6.0	8	1.20
	3.0	8.2	12	1.01
	3.0	10.7	16	.88
	3.3	13.8	20	.78
35	2.8	5.1	8	1.30
	2.9	6.6	12	1.10
	3.1	9.0	16	.94
	3.1	11.3	20	.85
	3.2	14.1	24	.77
40	2.7	4.5	8	1.40
	2.9	6.0	12	1.18
	2.9	7.6	16	1.03
	3.1	9.7	20	.91
	3.1	11.9	24	.83
45	2.6	4.1	8	1.49
	2.8	5.3	12	1.25
	2.9	6.7	16	1.09
	3.0	8.4	20	.98
	3.0	10.4	24	.89
50	2.7	3.7	8	1.57
	2.8	4.7	12	1.33
	2.8	6.0	16	1.18
	2.9	7.3	20	1.03
	3.1	9.0	24	.94
60	2.6	3.1	8	1.73
	2.7	3.9	12	1.47
	2.7	4.8	16	1.28
	2.8	5.9	20	1.15
	2.9	7.3	24	1.05
	3.0	8.8	28	.97
70	2.5	2.9	8	1.88
	2.6	3.3	12	1.60
	2.6	4.1	16	1.40
	2.7	5.0	20	1.28
	2.8	6.1	24	1.15
	2.9	7.0	28	1.05
80	2.5	2.9	12	1.72
	2.6	3.6	16	1.51
	2.7	4.3	20	1.35

Discharge Q CFS	Slope Range Minimum Percent	Slope Range Maximum Percent	Bottom Width Feet	Stage Feet
80	2.8	5.2	24	1.24
	2.8	5.9	28	1.14
	2.9	7.0	32	1.06
90	2.5	2.6	12	1.84
	2.5	3.1	16	1.61
	2.6	3.8	20	1.45
	2.7	4.5	24	1.32
	2.8	5.3	28	1.22
	2.8	6.1	32	1.14
100	2.5	2.8	16	1.71
	2.6	3.3	20	1.54
	2.6	4.0	24	1.41
	2.7	4.8	28	1.30
	2.7	5.3	32	1.21
	2.8	6.1	36	1.13
120	2.5	2.8	20	1.71
	2.6	3.2	24	1.58
	2.7	3.8	28	1.44
	2.7	4.2	32	1.34
	2.7	4.8	36	1.26
140	2.5	2.7	24	1.71
	2.5	3.2	28	1.58
	2.6	3.6	32	1.47
	2.6	4.0	36	1.38
	2.7	4.5	40	1.30
160	2.5	2.7	28	1.70
	2.5	3.1	32	1.58
	2.6	3.4	36	1.49
	2.6	3.8	40	1.40
	2.7	4.3	44	1.33
180	2.4	2.7	32	1.72
	2.4	3.0	36	1.60
	2.5	3.4	40	1.51
	2.6	3.7	44	1.43
200	2.3	2.7	36	1.70
	2.3	2.9	40	1.60
	2.5	3.3	44	1.52
	2.6	3.6	48	1.45
220	2.4	2.6	40	1.70
	2.5	2.9	44	1.61
	2.5	3.2	48	1.53
240	2.3	2.6	44	1.70
	2.5	2.9	48	1.62
	2.6	3.2	52	1.54
260	2.4	2.6	48	1.70
	2.3	2.9	52	1.62
280	2.4	2.6	52	1.70
300	2.5	2.6	56	1.69

Figure 5.21
Design Table for Vegetated Earth Spillways in Very Erodible Soils, K = 0.36 - 0.80, Side Slopes = 3:1

(USDA - NRCS)

Discharge Q CFS	Slope Range Minimum Percent	Slope Range Maximum Percent	Bottom Width Feet	Stage Feet
10	3.5	4.7	8	.68
15	3.4	4.4	12	.69
	3.4	5.9	16	.60
20	3.3	3.3	12	.80
	3.3	4.1	16	.70
	3.5	5.3	20	.62
25	3.3	3.3	16	.79
	3.3	4.0	20	.70
	3.5	4.9	24	.64
30	3.3	3.3	20	.78
	3.3	4.0	24	.71
	3.4	4.7	28	.65
	3.4	5.5	32	.61
35	3.2	3.2	24	.77
	3.3	3.9	28	.71
	3.5	4.6	32	.66
	3.5	5.2	36	.62
40	3.3	3.3	28	.76
	3.4	3.8	32	.71
	3.4	4.4	38	.67
	3.4	5.0	40	.64
45	3.3	3.3	32	.76
	3.4	3.8	36	.71
	3.4	4.3	40	.67
	3.4	4.8	44	.64
50	3.3	3.3	36	.75
	3.3	3.8	40	.71
	3.3	4.3	44	.68
60	3.2	3.2	44	.75
	3.2	3.7	48	.72
70	3.3	3.3	52	.75
80	3.1	3.1	56	.78

Procedure for Determining or Altering Sediment Basin Shape

As specified in the Standard and Specification, the pool area at the elevation of the crest of the principal spillway shall have a length to width ratio of at least 2.0 to 1. The purpose of this requirement is to minimize the "short circuiting" effect of the sediment laden inflow to the riser and thereby increase the effectiveness of the sediment basin. The purpose of this procedure is to prescribe the parameters, procedures, and methods of determining and modifying the shape of the basin.

The length of the flow path (L) is the distance from the point of inflow to the riser (outflow point). The point of inflow is the point that the stream enters the normal pool (pool level at the riser crest elevation). The pool area (A) is the area of the normal pool. The effective width (W_e) is found by the equation:

$$W_e = A/L \text{ and L:W ratio} = L/W_e$$

In the event there is more than one inflow point, any inflow point that conveys more than 30 percent of the total peak inflow rate shall meet the length to width ratio criteria.

The required basin shape may be obtained by proper site selection, by excavation, or by constructing a baffle in the basin. The purpose of the baffle is to increase the effective flow length from the inflow point to the riser. Baffles (see Figure 5.22 on following page) shall be placed midway between the inflow point around the end of the baffle to the outflow point. Then:

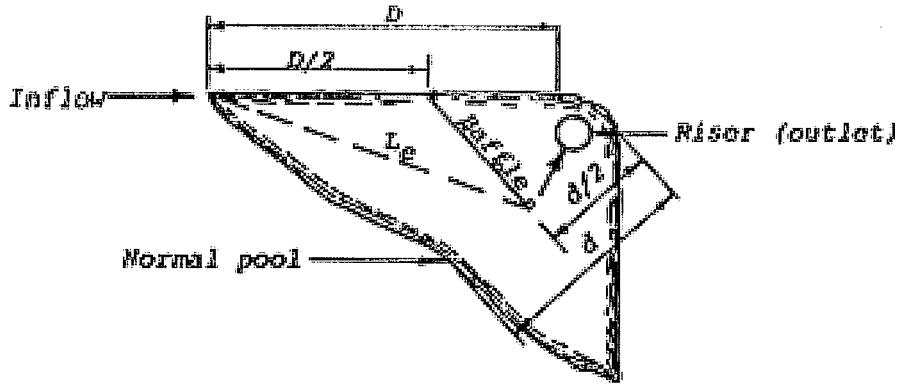
$$W_e = A/L_e \text{ and L:W ratio} = L_e/W_e$$

Three examples are shown on the following page. Note that for the special case in example C the water is allowed to go around both ends of the baffle and the effective length, $L_e = L_1 + L_2$. Otherwise, the length to width ratio computations are the same as shown above. This special case procedure for computing L_e is allowable only when the two flow paths are equal, i.e., when $L_1 = L_2$. A baffle detail is also shown in Figure 5.22 on page 5.41.

Figure 5.22
Sediment Basin Baffle Details (USDA - NRCS)

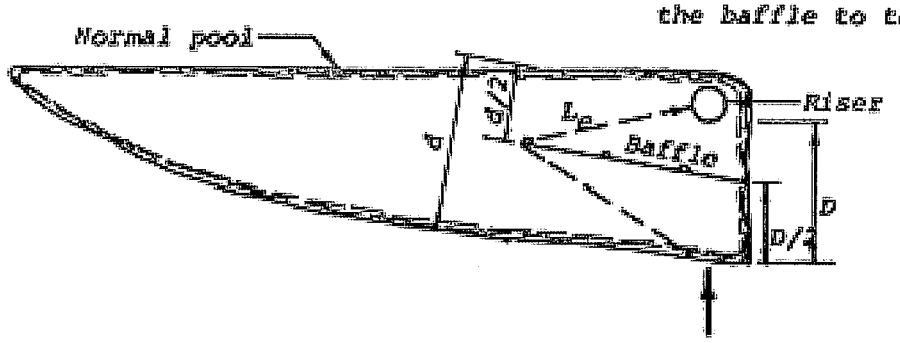
Examples: Plan Views - not to scale

A.

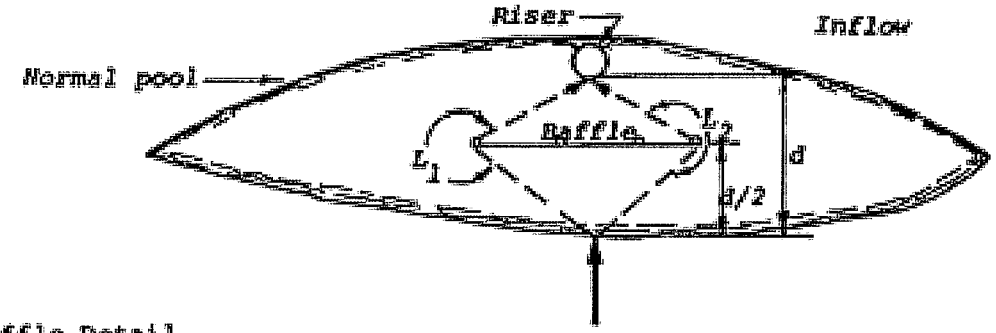


L_e = Total distance from the point of inflow around the baffle to the riser.

B.

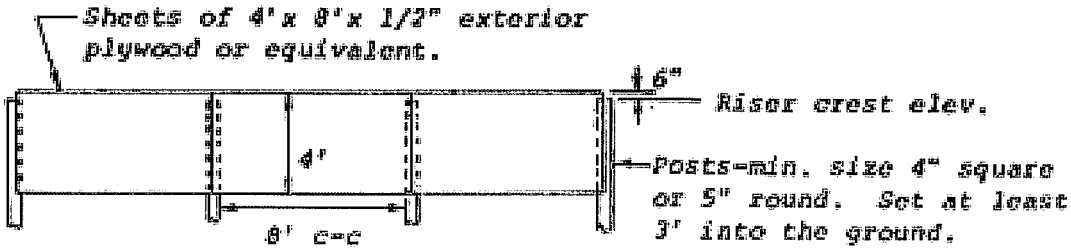


C.

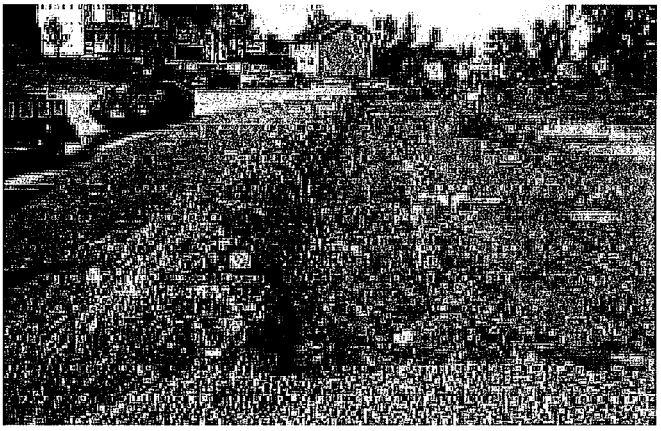


$L_e = L_1 + L_2$

Baffle Detail



STANDARD AND SPECIFICATIONS FOR SEDIMENT DIKE



Definition & Scope

A **temporary** earth dike with an excavated trench on the upslope toe placed across a slope to capture sediment laden flow from small disturbed drainage areas and allowing sediment to settle out by ponding.

Condition Where Practice Applies

This practice can be used on slopes and in areas where it is difficult to place and maintain silt fence. This practice acts as a smaller sediment trap for linear type applications. This practice will handle sheet and rill erosion for small tributary areas.

Design Criteria

1. The earth dike will be a maximum of 2 feet high with a 2 foot top width and 2:1 side slopes.

2. All earth fill will be placed on a stripped foundation, contain no stumps or woody material, and be compacted with the weight of the excavator bucket.

3. The interior capture trench will be a minimum 1.5 feet deep, 2 feet wide, with 1:1 side slopes and with a near level bottom. In areas where linear slopes exceed 4% the sediment dike system shall be segmented to maintain capture volume and ponding.

4. The system shall be used with a minimum 5 foot vegetated buffer on the down slope toe of the dike or an artificial buffer of erosion control matting.

5. The maximum ponding depth behind the dike shall be 1/2 the height of the constructed dike at its lowest elevation.

6. The ends of the dike system shall terminate with a 90° return of NYS DOT #1A crushed stone to filter any excess flow.

7. The maximum drainage area tributary to this practice shall not exceed 0.5 acres per 100 feet of dike, for slopes less than 10%. For slopes greater than 10%, the drainage area shall be 0.25 acres per 100 feet of dike.

8. The earthen dike shall be seeded and mulched to prevent erosion using an annual rye grass mixture at a rate of 1 lb. per 1, 000 square feet.

Maintenance

1. No traffic will be allowed on the dike.

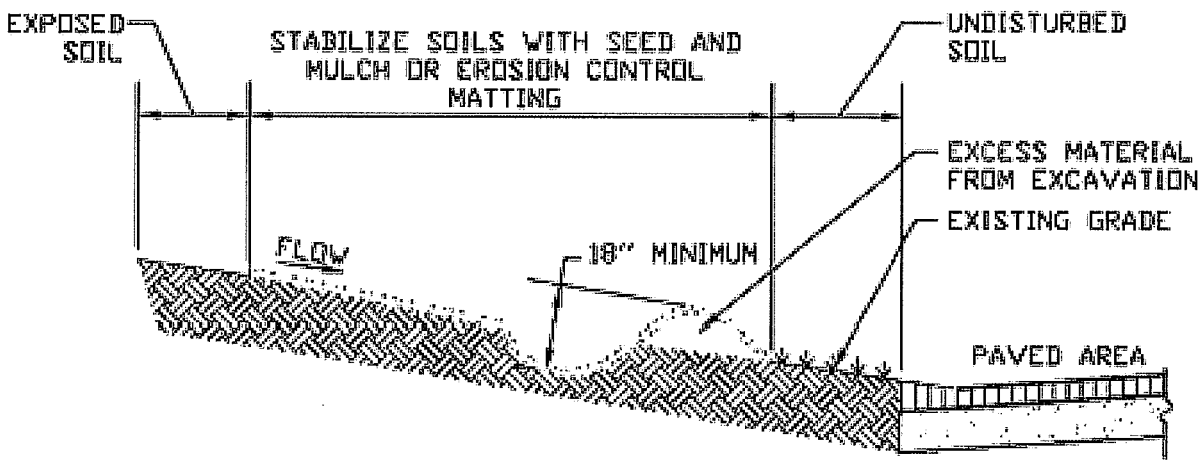
2. Dike system will be inspected weekly and after each runoff event.

3. Sediment in the system will be removed when the interior trench has filled to 75% capacity.

4. Sediment will be disposed of on-site as specified in the Erosion and Sediment Control Plan.

5. Upon stabilization of the tributary drainage area, the trench will be filled, excess dike fill removed, and the area graded and stabilized in accordance with the Erosion and Sediment Control Plan.

Figure 5.23
Sediment Dike



CONSTRUCTION NOTES:

1. ALL EARTH FILL WILL BE PLACED ON A STRIPPED FOUNDATION, CONTAIN NO STUMPS OR WOODY MATERIAL, AND BE COMPACTED WITH THE WEIGHT OF THE EXCAVATOR BUCKET.

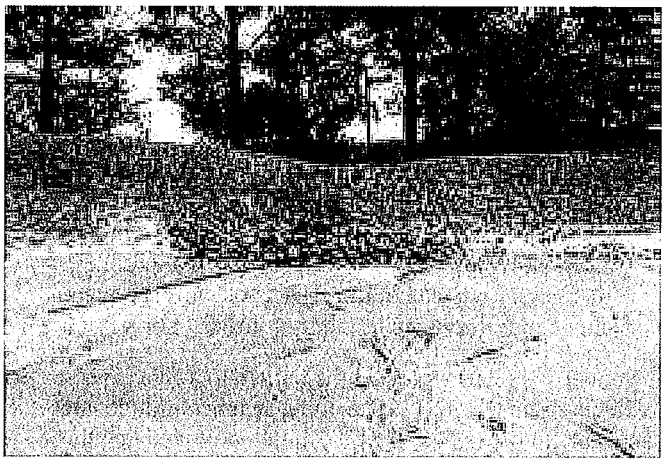
2. THE SYSTEM SHALL BE USED WITH A MINIMUM 5 FOOT VEGETATED BUFFER ON THE DOWN SLOPE TOE OF THE DIKE OR AN ARTIFICIAL BUFFER OF EROSION CONTROL MATTING.

3. THE ENDS OF THE DIKE SYSTEM SHALL TERMINATE WITH A 90 DEGREE RETURN OF NYS DOT #1A CRUSHED STONE TO FILTER ANY EXCESS FLOW.

4. THE EARTHEN DIKE SHALL BE SEEDED AND MULCHED TO PREVENT EROSION USING AN ANNUAL RYE GRASS MIXTURE AT A RATE OF 1 LB. PER 1,000 SQUARE FEET.

ADAPTED FROM DETAILS PROVIDED BY: KEN BARBER, BARBER ENGINEERING	SEDIMENT DIKE

STANDARD AND SPECIFICATIONS FOR SEDIMENT TRAP



Definition & Scope

A **temporary** sediment control device formed by excavation and/or embankment to intercept sediment-laden runoff and trap the sediment in order to protect drainageways, properties, and rights-of-way below the sediment trap from sedimentation.

Conditions Where Practice Applies

A sediment trap is usually installed in a drainageway, at a storm drain inlet, or other points of collection from a disturbed area for one construction season.

Sediment traps should be used to artificially break up the natural drainage area into smaller sections where a larger device (sediment basin) would be less effective.

Design Criteria

If the drainage area to the proposed trap location exceeds 5 acres, or the trap is in place beyond one construction season, or any of the additional design criteria presented here cannot be met, a full Sediment Basin must be used. See Standard and Specification for Sediment Basin on page 5.19.

Drainage Area

The maximum drainage area for all sediment traps shall be 5 acres.

Location

Sediment traps shall be located so that they can be installed prior to grading or filling in the drainage area they are to protect. Traps must **not be located any closer than 20 feet** from a proposed building foundation if the trap is to function during building construction. Locate traps to obtain maximum storage benefit from the terrain and for ease of cleanout and disposal of the trapped sediment.

Trap Size

The volume of a sediment trap as measured at the elevation of the crest of the outlet shall be at least 3,600 cubic feet per acre of drainage area. A minimum length to width ratio of 2:1 should be provided. The volume of a constructed trap shall be calculated using standard mathematical procedures. The volume of a natural sediment trap may be approximated by the equation: Volume (cu.ft.) = 0.4 x surface area (sq.ft.) x maximum depth (ft.).

Trap Cleanout

Sediment shall be removed and the trap restored to the original dimensions when the sediment has accumulated to ½ of the design depth of traps I-II, and 1/3 the depth for trap III. Sediment removed from the trap shall be deposited in a protected area and in such a manner that it will not erode.

Embankment

All earth embankments for sediment traps shall not exceed five (5) feet in height as measured at the low point of the original ground along the centerline of the embankment. Embankments shall have a minimum four (4) foot wide top and side slopes of 2:1 or flatter. The embankment shall be compacted by traversing with equipment while it is being constructed. The embankment shall be stabilized with seed and mulch as soon as it is completed

The elevation of the top of any dike directing water to any sediment trap will equal or exceed the maximum height of the outlet structure along the entire length of the trap.

Excavation

All excavation operations shall be carried out in such a manner that erosion and water pollution shall be minimal. Excavated portions of sediment traps shall have 1:1 or flatter slopes.

Outlet

The outlet shall be designed, constructed, and maintained in such a manner that sediment does not leave the trap and that erosion at or below the outlet does not occur.

Sediment traps must outlet onto stabilized (preferable undisturbed) ground, into a watercourse, stabilized channel, or into a storm drain system. Distance between inlet and outlet should be maximized to the longest length practicable.

All traps must be seeded and mulched immediately after construction.

Trap Details Needed on Erosion and Sediment Control Plans

Each trap shall be delineated on the plans in such a manner that it will not be confused with any other features. Each trap on a plan shall indicate all the information necessary to properly construct and maintain the structure. If the drawings are such that this information cannot be delineated on the drawings, then a table shall be developed. If a table is developed, then each trap on a plan shall have a number and the numbers shall be consecutive.

The following information shall be shown for each trap in a summary table format on the plans.

1. Trap number
2. Type of trap
3. Drainage area
4. Storage required
5. Storage provided (if applicable)
6. Outlet length or pipe sizes
7. Storage depth below outlet or cleanout elevation
8. Embankment height and elevation (if applicable)

Type of Sediment Traps

There are three (3) specific types of sediment traps which vary according to their function, location, or drainage area.

I. Pipe Outlet Sediment Trap
II. Stone Outlet Sediment Trap
III. Compost Filter Sock Sediment Trap

I. Pipe Outlet Sediment Trap

A Pipe Outlet Sediment Trap consists of a trap formed by embankment or excavation. The outlet for the trap is through a perforated riser and a pipe through the embankment. The outlet pipe and riser shall be made of steel, corrugated metal or other suitable material. The top of the embankment shall be at least 1 ½ feet above the crest of the riser. The preferred method of dewatering the sediment trap is by surface skimmer. See Dewatering Device Standard, page 5.10. If the riser alone is used for dewatering, the top 2/3 of the riser shall be perforated with one (1) inch nominal diameter holes or slits spaced six (6) inches vertically and horizontally placed in the concave portion of the corrugated pipe.

No holes or slits will be allowed within six (6) inches of the top of the horizontal barrel. All pipe connections shall be watertight. The riser shall be wrapped with ½ to ¼ inch hardware cloth wire then wrapped with filter cloth with a sieve size between #40-80 and secured with strapping or connecting band at the top and bottom of the cloth. The cloth shall cover an area at least six (6) inches above the highest hole and six (6) inches below the lowest hole. The top of the riser pipe shall not be covered with filter cloth. The riser shall have a base with sufficient weight to prevent flotation of the riser. Two approved bases are:

1. A concrete base 12 in. thick with the riser embedded 9 in. into the concrete base, or
2. One quarter inch, minimum, thick steel plate attached to the riser by a continuous weld around the circumference of the riser to form a watertight connection. The plate shall have 2.5 feet of stone, gravel, or earth placed on it to prevent flotation. In either case, each side of the square base measurement shall be the riser diameter plus 24 inches.

Pipe outlet sediment traps shall be limited to a five (5) acre maximum drainage area. Pipe outlet sediment trap is interchangeable in the field with stone outlet provided that these sediment traps are constructed in accordance with the detail and specifications for that trap.

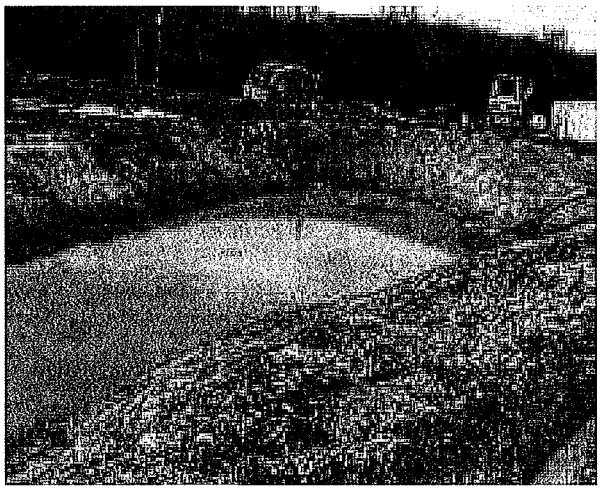
Select pipe diameter from the following table:
See details for Pipe Outlet Sediment Trap ST-I in Figure 5.25 and 5.26 on pages 5.49 and 5.50.

Optional sediment trap dewatering devices are shown on Figure 5.29 on Page 5.53.

Minimum Sizes

Barrel Diameter[1] (in.)	Riser Diameter[1] (in.)	Maximum Drainage Area (ac.)
12	15	1
15	18	2
18	21	3
21	24	4
21	27	5

[1] Barrel diameter may be same size as riser diameter



II. Stone Outlet Sediment Trap

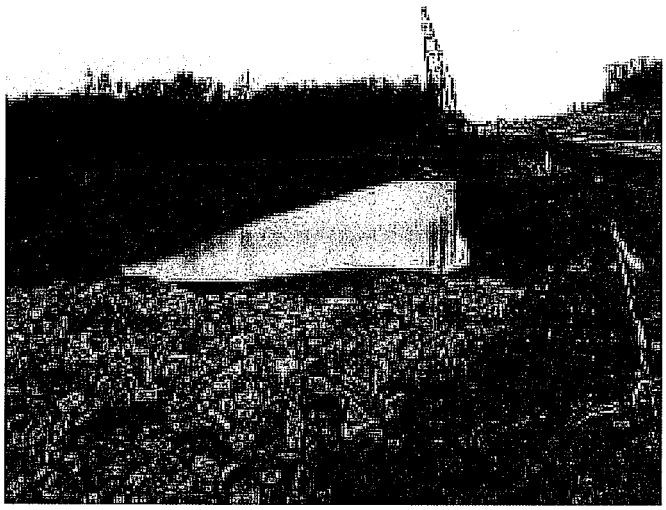
A Stone Outlet Sediment Trap consists of a trap formed by an embankment or excavation. The outlet of this trap is over a stone section placed on level ground. The minimum length (feet) of the outlet shall be equal to four (4) times the drainage area (acres).

Required storage shall be 3,600 cubic feet per acre of drainage area.

The outlet crest (top of stone in weir section) shall be level, at least one (1) foot below top of embankment and no more than one (1) foot above ground beneath the outlet. Stone used in the outlet shall be small riprap (4 in. x 8 in.). To provide more efficient trapping effect, a layer of filter cloth should be embedded one (1) foot back into the upstream face of the outlet stone or a one (1) foot thick layer of two (2) inch or finer aggregate shall be placed on the upstream face of the outlet.

Stone Outlet Sediment Traps may be interchangeable in the field with pipe outlet sediment traps provided they are constructed in accordance with the detail and specifications for those traps. Stone outlet sediment traps shall be limited to a five (5) acre maximum drainage area.

See details for Stone Outlet Sediment Trap ST-II in Figure 5.27 on page 5.51



III. Compost Sock Sediment Trap

A compost sock sediment trap consists of a trap formed by creating an enclosure of geotextile mesh tubes filled with a compost filter media. These traps are used in locations where there is no opportunity to direct runoff into larger traps or well vegetated areas. This could occur at site entrances and access points or in tight areas due to construction boundary limits.

Surface runoff can be directed to the trap with standard conveyance practices. Groundwater or surface ponding in low areas can be pumped into the compost sock sediment trap with appropriate energy dissipation at the pump outlet to prevent scour.

Design criteria for Compost Sock Sediment Trap

1. The maximum drainage area tributary to the trap shall be 5 acres.
2. The minimum settled height above ground shall be 2.0 feet formed by staking 3 compost filter socks in a pyramid as shown in Figure 5.28 on page 5.52.
3. The storage volume provided in the compost sock sediment trap shall be 3,600 cubic feet per tributary drainage acre.
4. If necessary, additional storage area can be created by excavating a sump 1 foot deep beginning at least 5 feet away from the inside sock.
5. All compost filter sock materials, mesh, and compost, will meet the material specifications listed in the Compost Filter Sock standard. No spillway is required.
6. Compost filter sock sediment traps shall be inspected weekly and after every rainfall event. Sediment shall be removed when it reaches one third, 1/3, the height of the trap.
7. The maximum limit of use for a compost sock sediment trap is one (1) year. The existing trap shall be replaced if there is a need for a trap beyond that time limit.
8. Upon completion of the work, the compost sock sediment trap shall be removed. The compost within the socks may be used during cleanup as a vegetative growth medium in accordance with the site stabilization plan.

Figure 5.25
Pipe Outlet Sediment Trap: ST-I

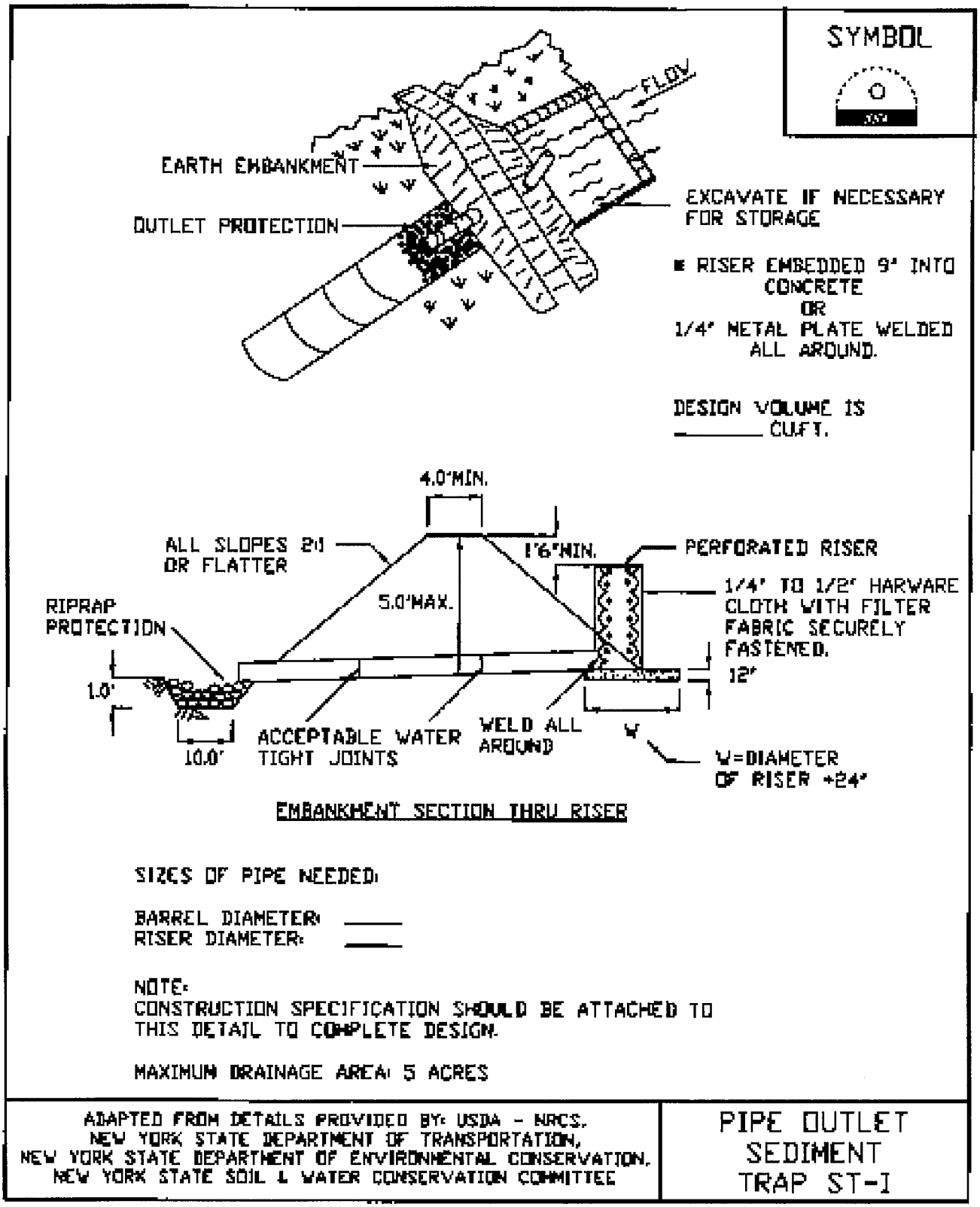


Figure 5.26
Pipe Outlet Sediment Trap: ST-I - Construction Specifications

SYMBOL

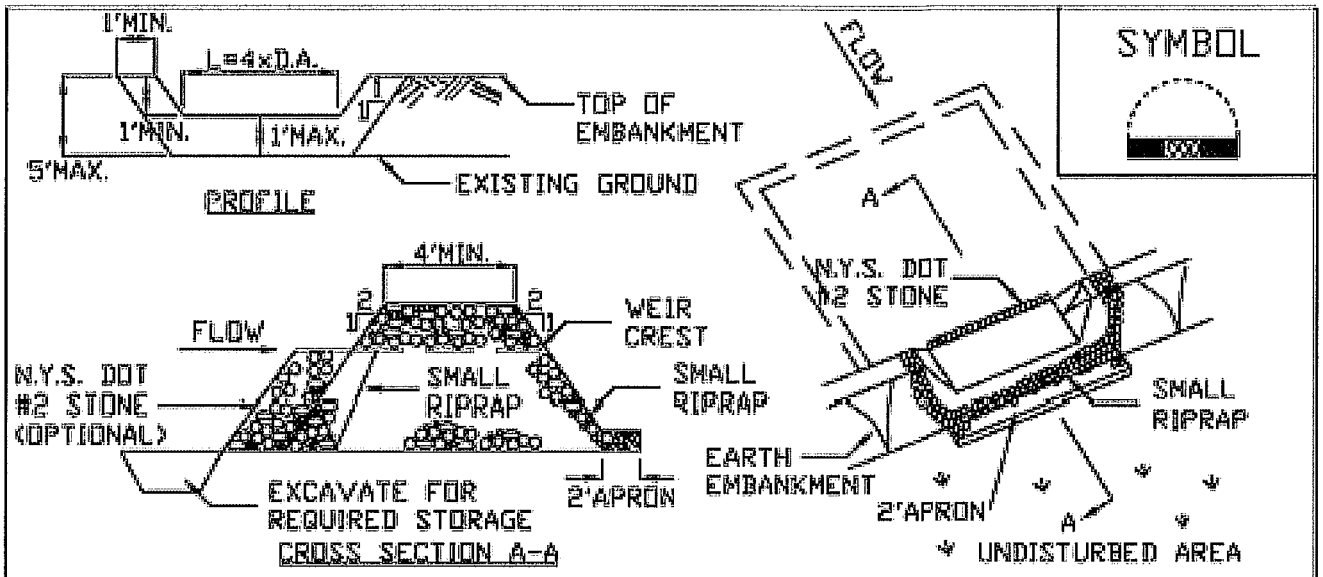
CONSTRUCTION SPECIFICATIONS

1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL, OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. VOLUME OF SEDIMENT STORAGE SHALL BE 3600 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE.
4. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND STABILIZED.
5. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
6. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
7. THE STRUCTURE SHALL BE REMOVED AND AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
8. ALL FILL SLOPES SHALL BE 2:1 OR FLATTER; CUT SLOPES 1:1 OR FLATTER.
9. ALL PIPE CONNECTIONS SHALL BE WATERTIGHT.
10. THE TOP 2/3 OF THE RISER SHALL BE PERFORATED WITH ONE (1) INCH DIAMETER HOLES OR SLITS SPACED SIX (6) INCHES VERTICALLY AND HORIZONTALLY AND PLACED IN THE CONCAVE PORTION OF PIPE. NO HOLES WILL BE ALLOWED WITHIN SIX (6) INCHES OF THE HORIZONTAL BARREL.
11. THE RISER SHALL BE WRAPPED WITH 1/4 TO 1/2 INCH HARDWARE CLOTH WIRE THEN WRAPPED WITH FILTER CLOTH (HAVING AN EQUIVALENT SIEVE SIZE OF 40-80). THE FILTER CLOTH SHALL EXTEND SIX (6) INCHES ABOVE THE HIGHEST HOLE AND SIX (6) INCHES BELOW THE LOWEST HOLE. WHERE ENDS OF THE FILTER CLOTH COME TOGETHER, THEY SHALL BE OVER-LAPPED, FOLDED AND STAPLED TO PREVENT BYPASS.
12. STRAPS OR CONNECTING BANDS SHALL BE USED TO HOLD THE FILTER CLOTH AND WIRE FABRIC IN PLACE. THEY SHALL BE PLACED AT THE TOP AND BOTTOM OF THE CLOTH.
13. FILL MATERIAL AROUND THE PIPE SPILLWAY SHALL BE HAND COMPACTED IN FOUR (4) INCH LAYERS. A MINIMUM OF TWO (2) FEET OF HAND COMPACTED BACKFILL SHALL BE PLACED OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION EQUIPMENT.
14. THE RISER SHALL BE ANCHORED WITH EITHER A CONCRETE BASE OR STEEL PLATE BASE TO PREVENT FLOTATION. FOR CONCRETE BASE THE DEPTH SHALL BE TWELVE (12) INCHES WITH THE RISER EMBEDDED NINE (9) INCHES. A 1/4 INCH MINIMUM THICKNESS STEEL PLATE SHALL BE ATTACHED TO THE RISER BY A CONTINUOUS WELD AROUND THE BOTTOM TO FORM A WATERTIGHT CONNECTION AND THEN PLACE TWO (2) FEET OF STONE, GRAVEL, OR TAMPED EARTH ON THE PLATE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS,
NEW YORK STATE DEPARTMENT OF TRANSPORTATION,
NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION,
NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

PIPE OUTLET
SEDIMENT TRAP
ST-I

Figure 5.27
Stone Outlet Sediment Trap: ST-II



OPTION: A ONE FOOT LAYER OF N.Y.S. DOT #2 STONE MAY BE PLACED ON THE UPSTREAM SIDE OF THE RIPRAP INPLACE OF THE EMBEDDED FILTER CLOTH.

CONSTRUCTION SPECIFICATIONS

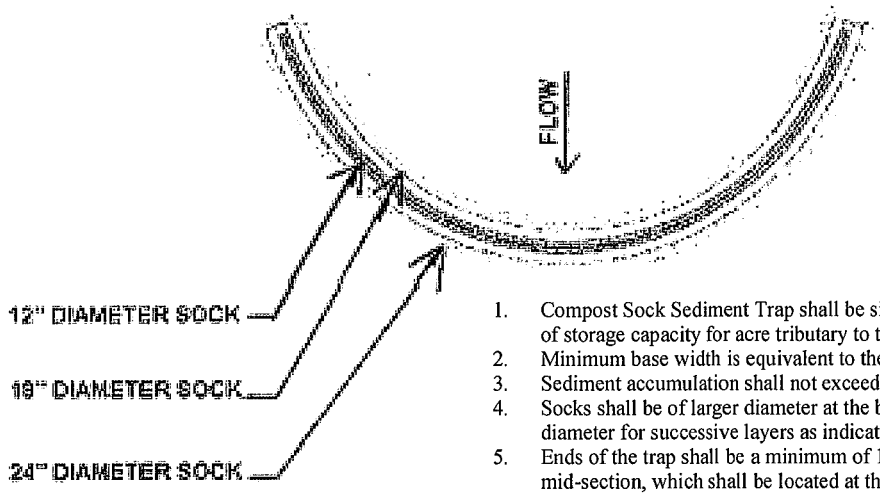
1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS AND OTHER WOODY VEGETATION AS WELL AS OVER-SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. ALL CUT AND FILL SLOPES SHALL BE 2:1 OR FLATTER.
4. THE STONE USED IN THE OUTLET SHALL BE SMALL RIPRAP 4"-8" ALONG WITH A 1' THICKNESS OF 2" AGGREGATE PLACED ON THE UP-GRADE SIDE ON THE SMALL RIPRAP OR EMBEDDED FILTER CLOTH IN THE RIPRAP.
5. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. IT SHALL BE PLACED ON SITE AND STABILIZED.
6. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
7. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND SEDIMENT ARE CONTROLLED.
8. THE STRUCTURE SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

MAXIMUM DRAINAGE AREA 5 ACRES

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STONE OUTLET SEDIMENT TRAP ST-II

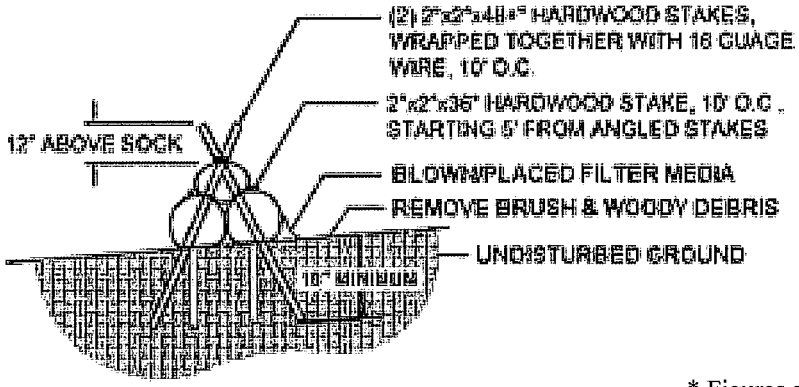
Figure 5.28
Compost Filter Sock Sediment Trap: ST-III

Plan View



1. Compost Sock Sediment Trap shall be sized to provide 3,600 cubic feet of storage capacity for acre tributary to the trap.
2. Minimum base width is equivalent to the height.
3. Sediment accumulation shall not exceed 1/3 the total height of the trap.
4. Socks shall be of larger diameter at the base of the trap and decrease in diameter for successive layers as indicated to the left.
5. Ends of the trap shall be a minimum of 1 foot higher in elevation that the mid-section, which shall be located at the point of discharge.

Staking Detail



* Figures adapted from Filtrexx

Specifications:

1. Sock infill and filter media material shall meet the standards of Table 5.1 on page 5.8 . Compost shall meet the compost filter sock standard of Table 5.2 on page 5.8.

2. Compost sock sediment traps shall not exceed three socks in height and shall be stacked in pyramidal form as shown above. Minimum trap height is one 24 inch diameter sock. Additional storage may be provided by means of an excavated sump 12 inches deep extending 1 to 3 feet upslope of the socks along the lower side of the trap.

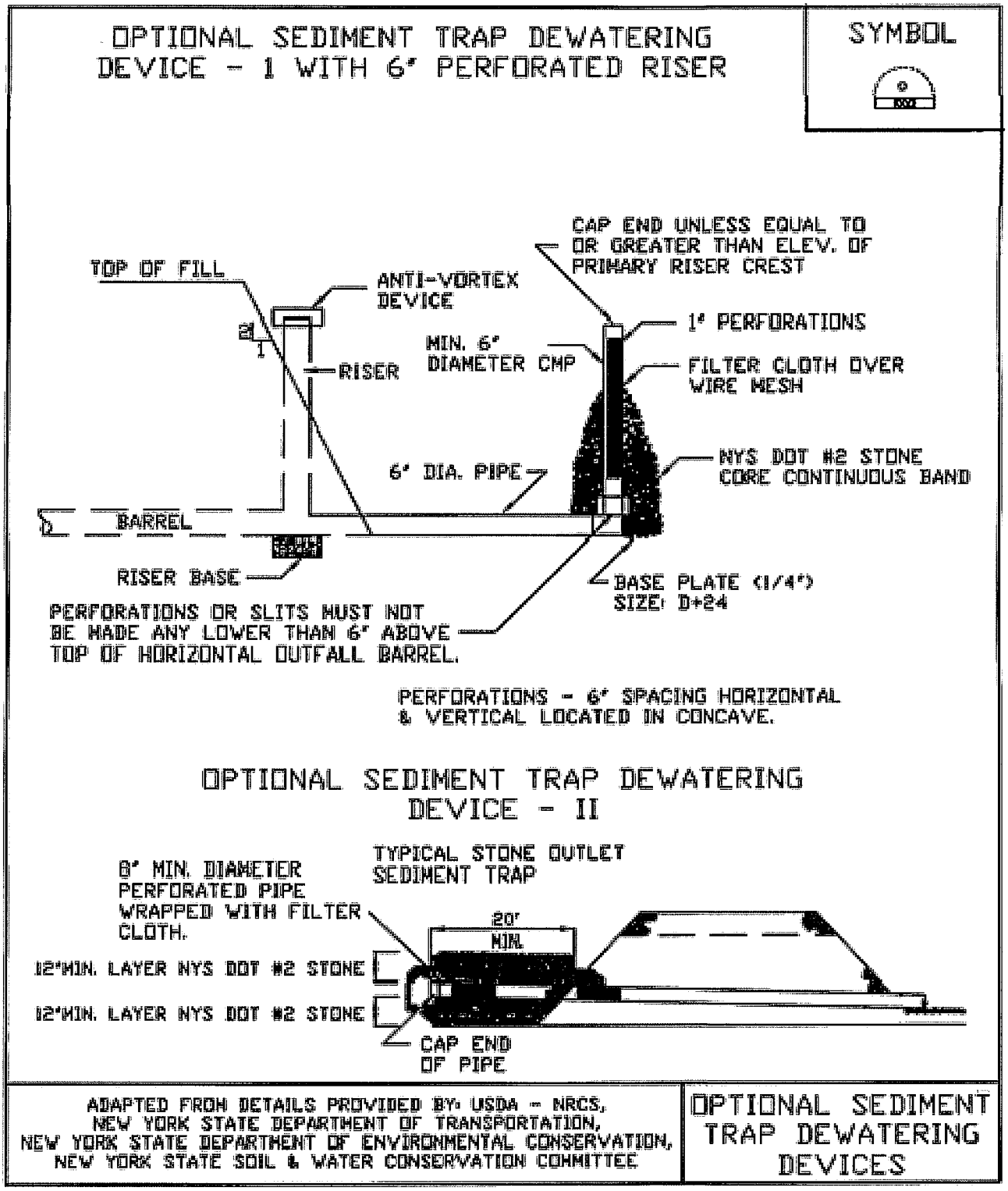
3. Compost sock sediment traps shall provide 3,600 cubic feet storage capacity with 12 inches of freeboard for each tributary drainage acreage. (See manufacturer for anticipated settlement.)

4. The maximum tributary drainage area is 5.0 acres. Since compost socks are "flow-through," no spillway is required.

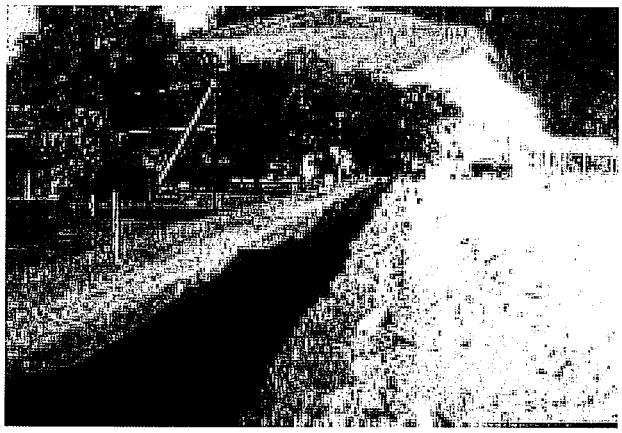
5. Compost sock sediment traps shall be inspected weekly and after each runoff event. Sediment shall be removed when it reaches 1/3 the height of the socks.

6. Photodegradable and biodegradable socks shall not be used for more than 1 year.

Figure 5.29
Optional Sediment Trap Dewatering Devices for Traps with <5 Acres Drainage Area



STANDARD AND SPECIFICATIONS FOR SILT FENCE



Definition & Scope

A **temporary** barrier of geotextile fabric installed on the contours across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil by temporarily ponding the sediment laden runoff allowing settling to occur. The maximum period of use is limited by the ultraviolet stability of the fabric (approximately one year).

Conditions Where Practice Applies

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope length and fence length will not exceed the limits shown in the Design Criteria for the specific type of silt fence used ; and
2. Maximum ponding depth of 1.5 feet behind the fence; and
3. Erosion would occur in the form of sheet erosion; and
4. There is no concentration of water flowing to the barrier; and
5. Soil conditions allow for proper keying of fabric, or other anchorage, to prevent blowouts.

Design Criteria

1. Design computations are not required for installations of 1 month or less. Longer installation periods should be designed for expected runoff.
2. All silt fences shall be placed as close to the disturbed area as possible, but at least 10 feet from the toe of a slope steeper than 3H:1V, to allow for maintenance and roll down. The area beyond the fence must be undisturbed or stabilized.
3. The type of silt fence specified for each location on the plan shall not exceed the maximum slope length and maximum fence length requirements shown in the following table:

		Slope Length/Fence Length (ft.)		
Slope	Steepness	Standard	Reinforced	Super
<2%	< 50:1	300/1500	N/A	N/A
2-10%	50:1 to 10:1	125/1000	250/2000	300/2500
10-20%	10:1 to 5:1	100/750	150/1000	200/1000
20-33%	5:1 to 3:1	60/500	80/750	100/1000
33-50%	3:1 to 2:1	40/250	70/350	100/500
>50%	> 2:1	20/125	30/175	50/250

Standard Silt Fence (SF) is fabric rolls stapled to wooden stakes driven 16 inches in the ground.
Reinforced Silt Fence (RSF) is fabric placed against welded wire fabric with anchored steel posts driven 16 inches in the ground.
Super Silt Fence (SSF) is fabric placed against chain link fence as support backing with posts driven 3 feet in the ground.

4. Silt fence shall be removed as soon as the disturbed area has achieved final stabilization.

The silt fence shall be installed in accordance with the appropriate details. Where ends of filter cloth come together, they shall be overlapped, folded and stapled to prevent sediment bypass. Butt joints are not acceptable. A detail of the silt fence shall be shown on the plan. See Figure 5.30 on page 5.56 for Reinforced Silt Fence as an example of details to be provided.

Criteria for Silt Fence Materials

1. Silt Fence Fabric: The fabric shall meet the following specifications unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

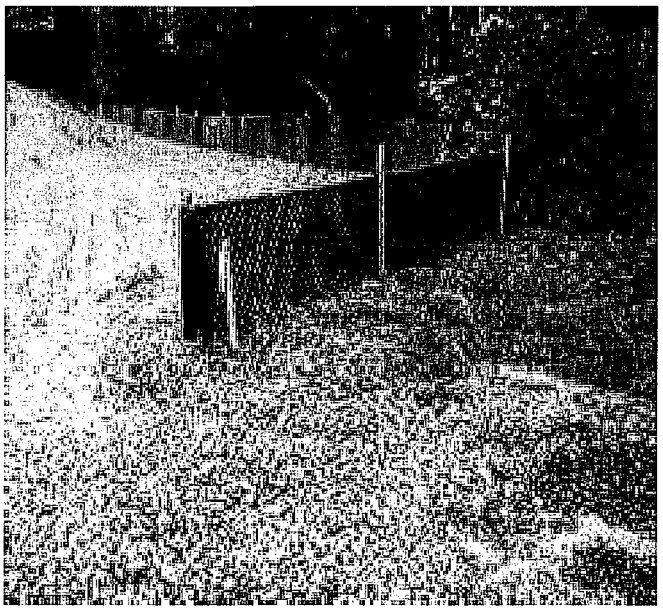
Fabric Properties	Minimum Acceptable Value	Test Method
Grab Tensile Strength (lbs)	110	ASTM D 4632
Elongation at Failure (%)	20	ASTM D 4632
Mullen Burst Strength (PSI)	300	ASTM D 3786
Puncture Strength (lbs)	60	ASTM D 4833
Minimum Trapezoidal Tear Strength (lbs)	50	ASTM D 4533
Flow Through Rate (gal/ min/sf)	25	ASTM D 4491
Equivalent Opening Size	40-80	US Std Sieve ASTM D 4751
Minimum UV Residual (%)	70	ASTM D 4355

2. Fence Posts (for fabricated units): The length shall be a minimum of 36 inches long. Wood posts will be of sound quality hardwood with a minimum cross sectional area of 3.5 square inches. Steel posts will be standard T and U section weighing not less than 1.00 pound per linear foot. Posts for super silt fence shall be standard chain link fence posts.

3. Wire Fence for reinforced silt fence: Wire fencing shall be a minimum 14 gage with a maximum 6 in. mesh opening, or as approved.

4. Prefabricated silt fence is acceptable as long as all material specifications are met.

Super Silt Fence



Reinforced Silt Fence

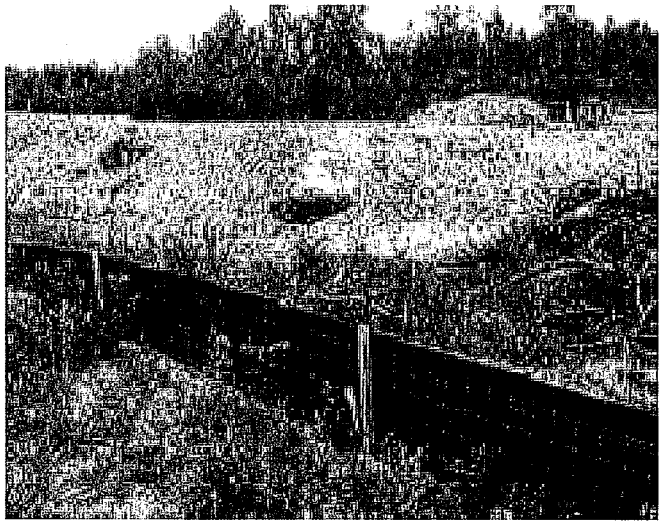
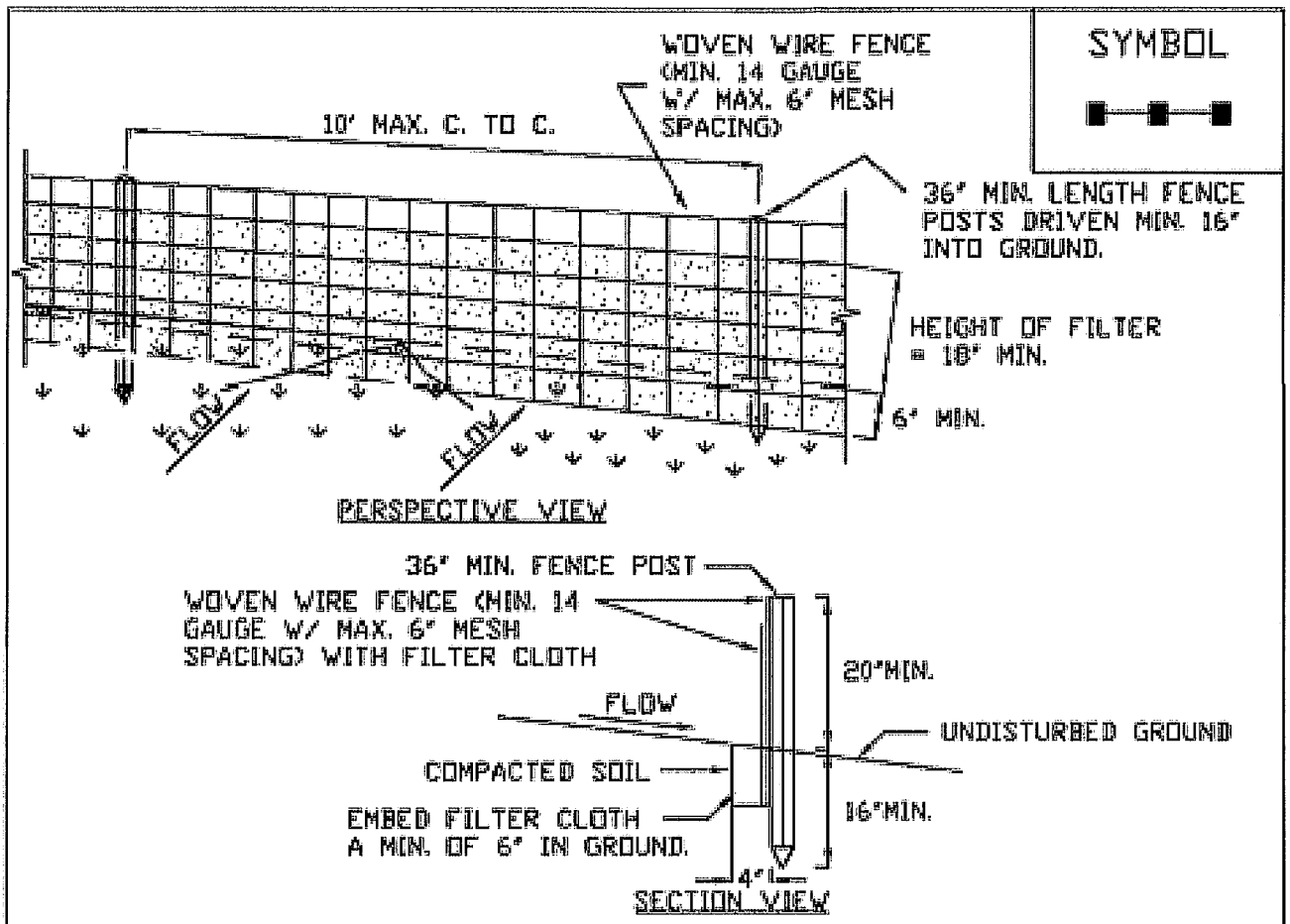


Figure 5.30
Reinforced Silt Fence



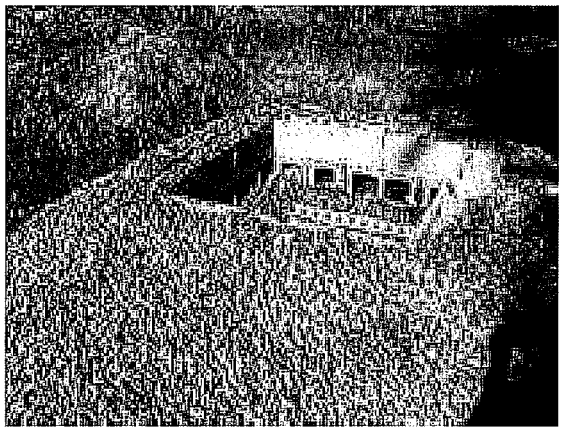
CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER THEY SHALL BE OVERLAPPED BY SIX INCHES AND FOLDED. FILTER CLOTH SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL MEET THE MINIMUM REQUIREMENTS SHOWN.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE

REINFORCED SILT FENCE

STANDARD AND SPECIFICATIONS FOR STORM DRAIN INLET PROTECTION



Definition & Scope

A **temporary** barrier with low permeability, installed around inlets in the form of a fence, berm or excavation around an opening, detaining water and thereby reducing the sediment content of sediment laden water by settling thus preventing heavily sediment laden water from entering a storm drain system.

Conditions Where Practice Applies

This practice shall be used where the drainage area to an inlet is disturbed, it is not possible to temporarily divert the storm drain outfall into a trapping device, and watertight blocking of inlets is not advisable. **It is not to be used in place of sediment trapping devices.** This practice shall be used with an upstream buffer strip if placed at a storm drain inlet on a paved surface. It may be used in conjunction with storm drain diversion to help prevent siltation of pipes installed with low slope angle.

Types of Storm Drain Inlet Practices

There are five (5) specific types of storm drain inlet protection practices that vary according to their function, location, drainage area, and availability of materials:

I. Excavated Drop Inlet Protection
II. Fabric Drop Inlet Protection
III. Stone & Block Drop Inlet Protection
IV. Paved Surface Inlet Protection
V. Manufactured Insert Inlet Protection

Design Criteria

Drainage Area – The drainage area for storm drain inlets shall not exceed one acre. Erosion control/temporary stabilization measures must be implemented on the disturbed drainage area tributary to the inlet. The crest elevations of these practices shall provide storage and minimize bypass flow.

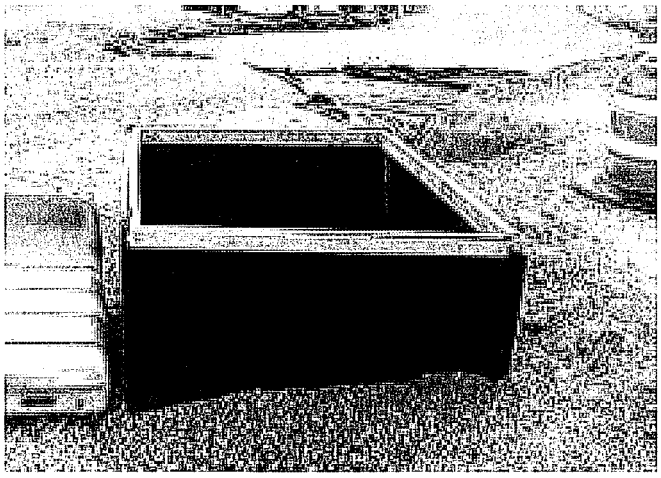
Type I – Excavated Drop Inlet Protection

This practice is generally used during initial overlot grading after the storm drain trunk line is installed.

Limit the drainage area to the inlet device to 1 acre. Excavated side slopes shall be no steeper than 2:1. The minimum depth shall be 1 foot and the maximum depth 2 feet as measured from the crest of the inlet structure. Shape the excavated basin to fit conditions with the longest dimension oriented toward the longest inflow area to provide maximum trap efficiency. The capacity of the excavated basin should be established to contain 900 cubic feet per acre of disturbed area. Weep holes, protected by fabric and stone, should be provided for draining the temporary pool.

Inspect and clean the excavated basin after every storm. Sediment should be removed when 50 percent of the storage volume is achieved This material should be incorporated into the site in a stabilized manner.

Type II – Fabric Drop Inlet Protection



This practice is generally used during final elevation grading phases after the storm drain system is completed.

Limit the drainage area to 1 acre per inlet device. Land area slope immediately surrounding this device should not exceed 1 percent. The maximum height of the fabric above the inlet crest shall not exceed 1.5 feet unless reinforced.

The top of the barrier should be maintained to allow overflow to drop into the drop inlet and not bypass the inlet to

unprotected lower areas. Support stakes for fabric shall be a minimum of 3 feet long, spaced a maximum 3 feet apart. They should be driven close to the inlet so any overflow drops into the inlet and not on the unprotected soil. Improved performance and sediment storage volume can be obtained by excavating the area.

Inspect the fabric barrier after each rain event and make repairs as needed. Remove sediment from the pool area as necessary with care not to undercut or damage the filter fabric. Upon stabilization of the drainage area, remove all materials and unstable sediment and dispose of properly. Bring the adjacent area of the drop inlet to grade, smooth and compact and stabilize in the appropriate manner to the site.

Type III – Stone and Block Drop Inlet Protection

This practice is generally used during the initial and intermediate overlot grading of a construction site.

Limit the drainage area to 1 acre at the drop inlet. The stone barrier should have a minimum height of 1 foot and a maximum height of 2 feet. Do not use mortar. The height should be limited to prevent excess ponding and bypass flow.

Recess the first course of blocks at least 2 inches below the crest opening of the storm drain for lateral support. Subsequent courses can be supported laterally if needed by placing a 2x4 inch wood stud through the block openings perpendicular to the course. The bottom row should have a few blocks oriented so flow can drain through the block to dewater the basin area.

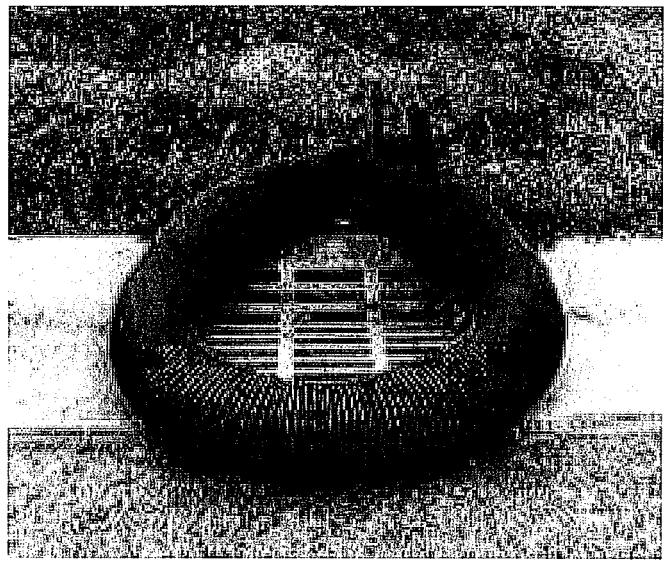
The stone should be placed just below the top of the blocks on slopes of 2:1 or flatter. Place hardware cloth of wire mesh with ½ inch openings over all block openings to hold stone in place.

As an optional design, the concrete blocks may be omitted and the entire structure constructed of stone, ringing the outlet ("doughnut"). The stone should be kept at a 3:1 slope toward the inlet to keep it from being washed into the inlet. A level area 1 foot wide and four inches below the crest will further prevent wash. Stone on the slope toward the inlet should be at least 3 inches in size for stability and 1 inch or smaller away from the inlet to control flow rate. The elevation of the top of the stone crest must be maintained 6 inches lower than the ground elevation down slope from the inlet to ensure that all storm flows pass over the stone into the storm drain and not past the structure. Temporary diking should be used as necessary to prevent bypass flow.

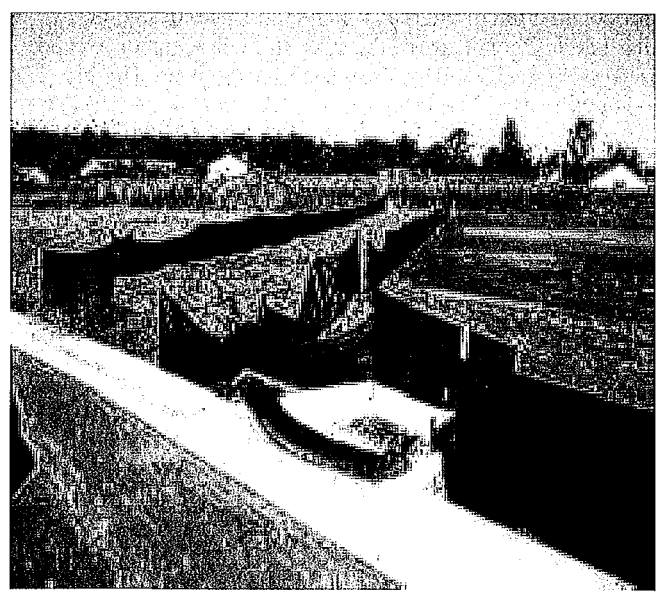
The barrier should be inspected after each rain event and repairs made where needed. Remove sediment as necessary to provide for accurate storage volume for subsequent rains. Upon stabilization of contributing drainage area, remove all materials and any unstable soil and dispose of properly.

Bring the disturbed area to proper grade, smooth, compact and stabilize in a manner appropriate to the site.

Type IV – Paved Surface Inlet Protection



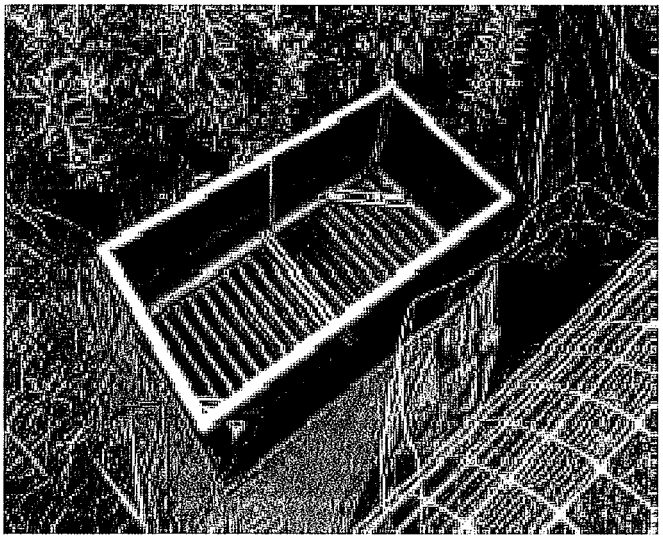
This practice is generally used after pavement construction has been done while final grading and soil stabilization is occurring. These practices should be used with upstream buffer strips in linear construction applications, and with temporary surface stabilization for overlot areas, to reduce the sediment load at the practice. This practice includes sand bags, compost filter socks, geo-tubes filled with ballast, and manufactured surface barriers. Pea gravel can also be used in conjunction with these practices to improve performance. When the inlet is not at a low point, and is offset from the pavement or gutter line, protection should be selected and installed so that flows are not diverted around the inlet.



The drainage area should be limited to 1 acre at the drain inlet. All practices will be placed at the inlet perimeter or beyond to maximize the flow capacity of the inlet. Practices shall be weighted, braced, tied, or otherwise anchored to prevent movement or shifting of location on paved surfaces. Traffic safety shall be integrated with the use of this practice. All practices should be marked with traffic safety cones as appropriate. Structure height shall not cause flooding or by-pass flow that would cause additional erosion.

The structure should be inspected after every storm event. Any sediment should be removed and disposed of on the site. Any broken or damaged components should be replaced. Check all materials for proper anchorage and secure as necessary.

Type V - Manufactured Insert Inlet Protection



The drainage area shall be limited to 1 acre at the drain inlet. All inserts will be installed and anchored in accordance with the manufacturers recommendations and design details. The fabric portion of the structure will equal or exceed the performance standard for the silt fence fabric. The inserts will be installed to preserve a minimum of 50 percent of the open, unobstructed design flow area of the storm drain inlet opening to maintain capacity for storm events.

Figure 5.31
Excavated Drop Inlet Protection

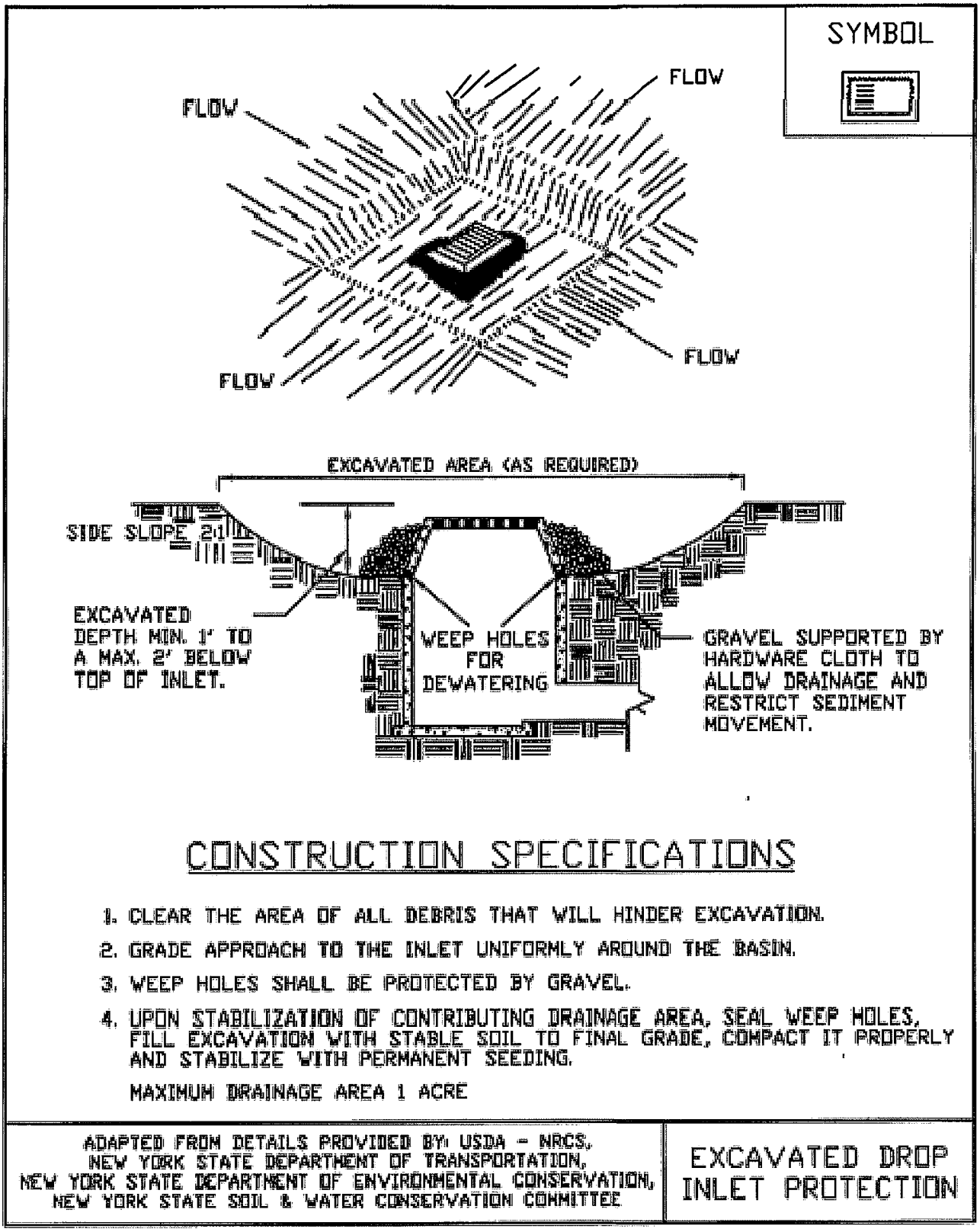
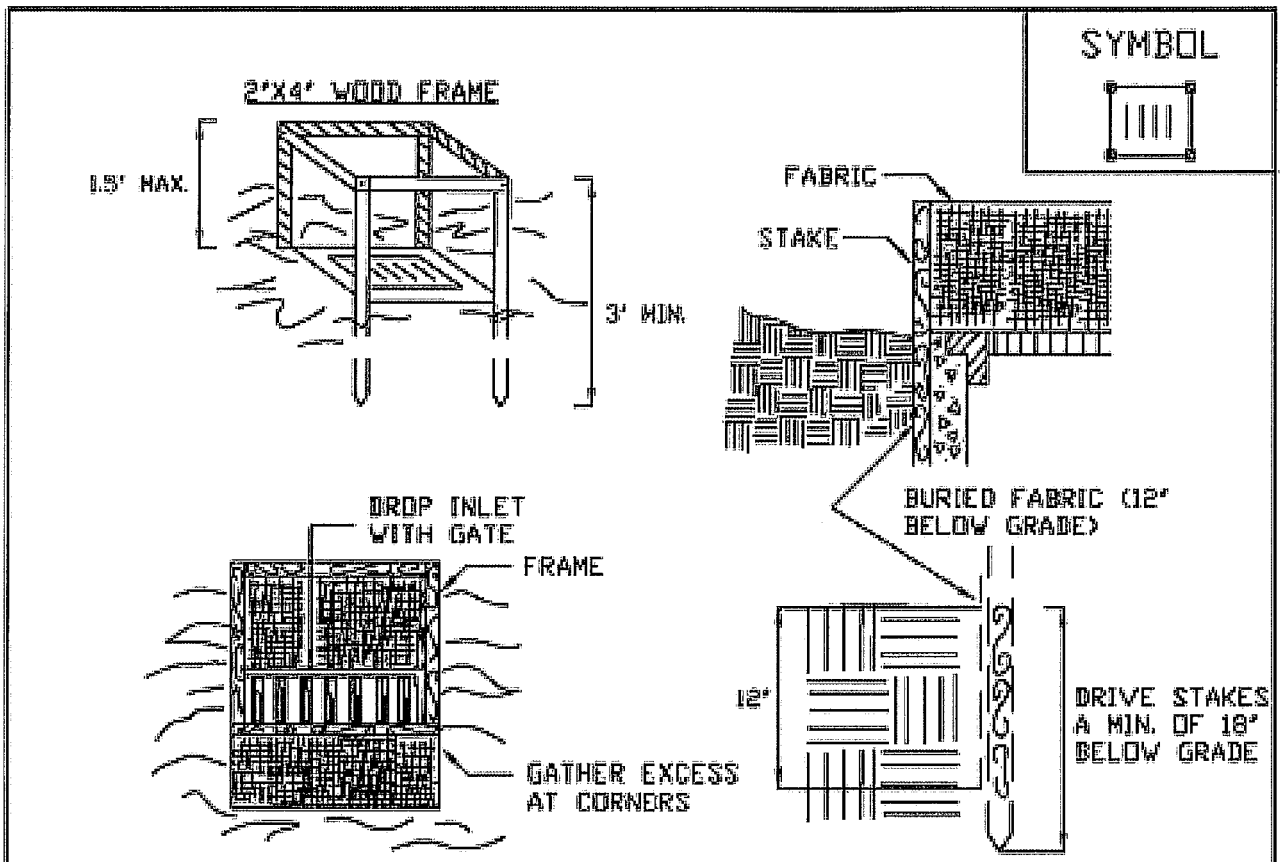


Figure 5.32
Fabric Drop Inlet Protection



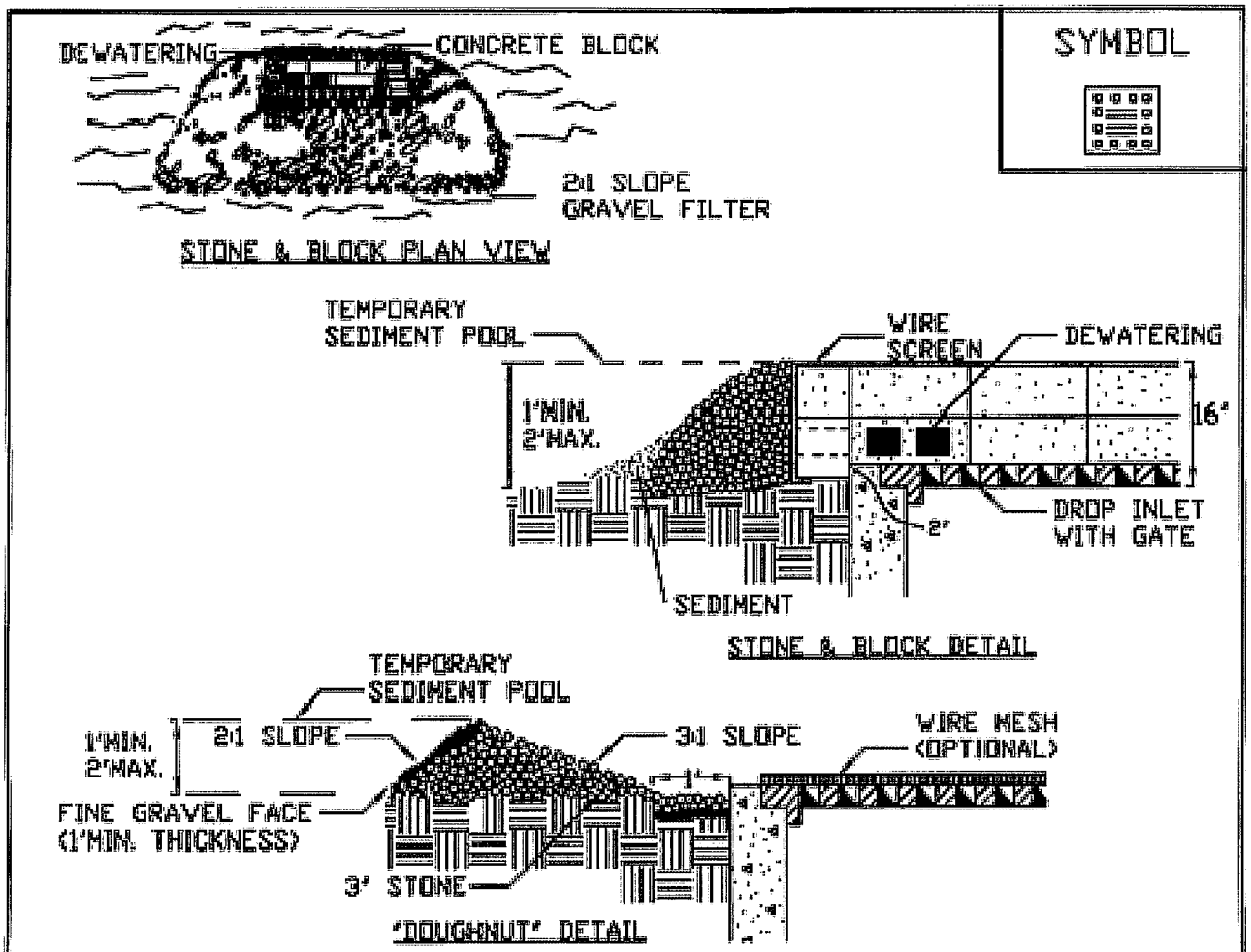
CONSTRUCTION SPECIFICATIONS

1. FABRIC SHALL HAVE AN EOS OF 40-85. BURLAP MAY BE USED FOR SHORT TERM APPLICATIONS.
2. CUT FABRIC FROM A CONTINUOUS ROLL TO ELIMINATE JOINTS. IF JOINTS ARE NEEDED THEY WILL BE OVERLAPPED TO THE NEXT STAKE.
3. STAKE MATERIALS WILL BE STANDARD 2" x 4" WOOD OR EQUIVALENT. METAL WITH A MINIMUM LENGTH OF 3 FEET.
4. SPACE STAKES EVENLY AROUND INLET 3 FEET APART AND DRIVE A MINIMUM 18 INCHES DEEP. SPANS GREATER THAN 3 FEET MAY BE BRIDGED WITH THE USE OF WIRE MESH BEHIND THE FILTER FABRIC FOR SUPPORT.
5. FABRIC SHALL BE EMBEDDED 1 FOOT MINIMUM BELOW GROUND AND BACKFILLED. IT SHALL BE SECURELY FASTENED TO THE STAKES AND FRAME.
6. A 2" x 4" WOOD FRAME SHALL BE COMPLETED AROUND THE CREST OF THE FABRIC FOR OVER FLOW STABILITY.

MAXIMUM DRAINAGE AREA 1 ACRE

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	FABRIC DROP INLET PROTECTION

Figure 5.33
Stone & Block Drop Inlet Protection



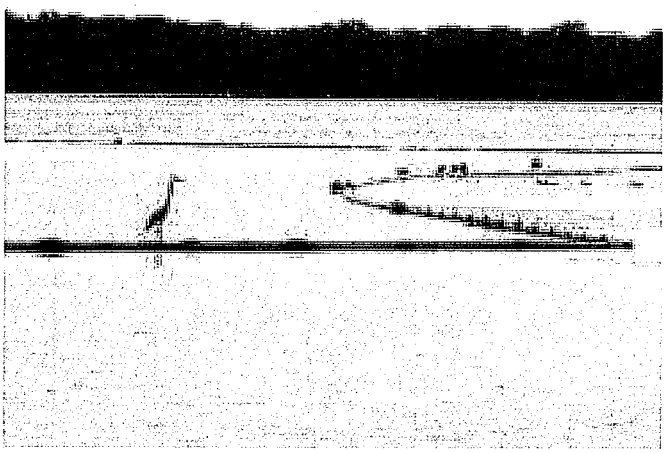
CONSTRUCTION SPECIFICATIONS

1. LAY ONE BLOCK ON EACH SIDE OF THE STRUCTURE ON ITS SIDE FOR DEWATERING. FOUNDATION SHALL BE 2 INCHES MINIMUM BELOW REST OF INLET AND BLOCKS SHALL BE PLACED AGAINST INLET FOR SUPPORT.
2. HARDWARE CLOTH OR 1/2" WIRE MESH SHALL BE PLACED OVER BLOCK OPENINGS TO SUPPORT STONE.
3. USE CLEAN STONE OR GRAVEL 1/2-3/4 INCH IN DIAMETER PLACED 2 INCHES BELOW TOP OF THE BLOCK ON A 2:1 SLOPE OR FLATTER.
4. FOR STONE STRUCTURES ONLY, A 1 FOOT THICK LAYER OF THE FILTER STONE WILL BE PLACED AGAINST THE 3 INCH STONE AS SHOWN ON THE DRAWINGS.

MAXIMUM DRAINAGE AREA 1 ACRE

ADAPTED FROM DETAILS PROVIDED BY: USDA - NRCS, NEW YORK STATE DEPARTMENT OF TRANSPORTATION, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, NEW YORK STATE SOIL & WATER CONSERVATION COMMITTEE	STONE & BLOCK DROP INLET PROTECTION

STANDARD AND SPECIFICATIONS FOR TURBIDITY CURTAIN



Definition & Scope

A **temporary** flexible, impenetrable barrier used to trap sediment in water bodies. This curtain is weighted at the bottom to achieve closure while supported at the top through a flotation system and used to prevent the migration of silt from a work site in a water environment into the larger body of water. Top bar float has to support weight of curtain material. Bottom anchor has to be flexible so that it will lie along the contour of the water body bottom.

Condition Where Practice Applies

A turbidity curtain is generally used when construction activity occurs within a waterbody or along its shoreline and is of short duration, generally less than one month. Curtains are used in calm water surfaces and not in areas of flowing water. **Turbidity curtains are not to be used across flowing watercourses.**

Design Criteria

The turbidity curtain shall be located beyond the lateral limits of the construction site and firmly anchored in place. The alignment should be set as close to the work area as possible but not so close as to be disturbed by applicable construction equipment. The height of the curtain shall be 20 percent greater than the depth of the water to allow for water level fluctuations. The area that the turbidity curtain protects shall not contain large culverts or drainage areas that if flows occur behind the curtain would cause a breach or lost contact at the bottom surface.

If water depths at the design alignment are minimal, the toe can be anchored in place by staking.

See Figure 5.35 on page 5.66.

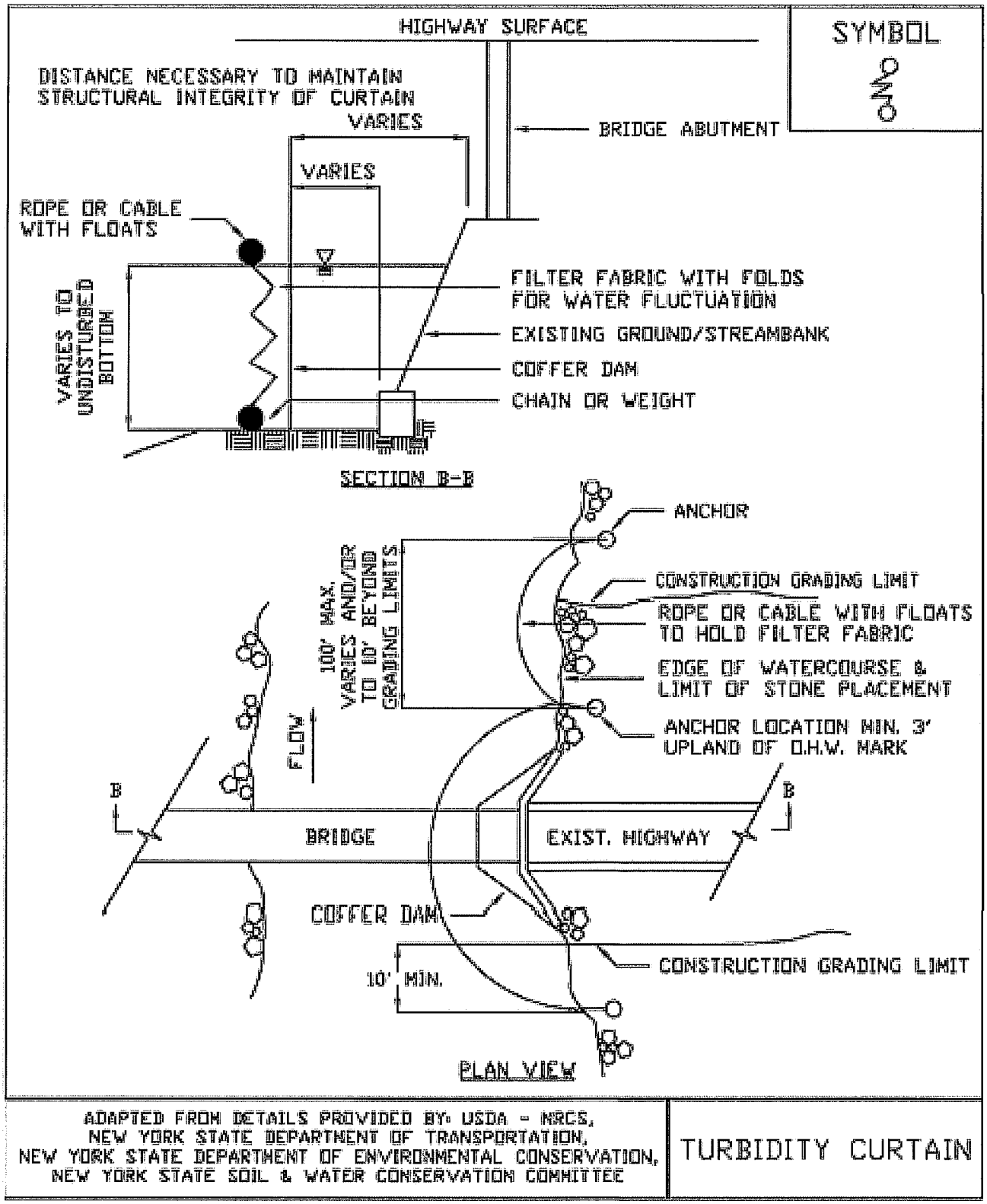
Construction Specifications

The area of proposed installation of the curtain shall be inspected for obstacles and impediments that could damage the curtain or impair its effectiveness to retain sediment. All materials shall be removed so they cannot enter the waterbody. Shallow installations can be made by securing the curtain by staking rather than using a flotation system. Supplemental anchors of the turbidity curtain toe shall be used, as needed, depending on water surface disturbances such as boats and wave action by winds.

Maintenance

The turbidity curtain shall be inspected daily and repaired or replaced immediately. It is not normally necessary to remove sediment deposited behind the curtain; but, when necessary, removal is usually done by hand prior to removal of the barrier. All removed silt is stabilized away from the waterbody. The barrier shall be removed by carefully pulling it toward the construction site to minimize the release of attached sediment. Any floating construction or natural debris shall be immediately removed to prevent damage to the curtain. If the curtain is oriented in a manner that faces the prevailing winds, frequent checks of the anchorage shall be made.

Figure 5.35
Turbidity Curtain



EROSION AND SEDIMENT CONTROL PLAN FOR SMALL HOMESITE CONSTRUCTION

Definition

Small homesite erosion and sediment control plans are a group of minimum erosion and sediment control practices and management techniques that apply to small homesite construction activity on a single residential lot, in order to prevent polluted discharge.

Purpose

This appendix lays out a series of minimum requirements for erosion and sediment control, and management practices that may be used to meet these requirements. Use of these templates will help show compliance with the general requirements for construction activities that require basic stormwater pollution prevention plans (SWPPP). This applies to the construction of small homesites. The owner/ developer must complete the relevant conditions (1-4), or small parcel erosion and sediment control plan included in this section, and submit the NOI in order to meet compliance with the SPDES General Permit for Stormwater Discharges From Construction Activities.

Criteria

Generally, several types of practices are required on any one site for effective erosion and sediment control. There are three broad categories of construction-related practices for controlling erosion and sediment on small homesite developments:

1. **Cover practices** prevent erosion by protecting the soil surface from rainfall and runoff. Prevention of erosion is the most preferable and cost-effective approach. These practices include: protection of existing vegetation; temporary covering of exposed soil by mulching, matting, or covering; and permanent site stabilization by topsoiling, seeding, and/or sodding.

2. **Structural Practices** are structural controls that either reduce erosion, control runoff, or keep sediment on the construction site. Examples of these practices include stabilized construction entrances, silt fences, sediment traps, berms, and check dams.

3. **Management Measures** are construction management methods that prevent or reduce erosion potential and ensure the proper functioning of erosion and sediment control practices. Careful construction management can dramatically reduce the costs associated with erosion and sediment problems. Examples of these management measures include:

   - Preserving existing trees and grass where possible to prevent erosion;
   - Decompacting and re-vegetating the site as soon as possible;
   - Locating soil piles away from roads or waterways;
   - Limiting tracking of mud onto streets by requiring all vehicles to use designated access drives;
   - Removing sediment carried off-site by vehicles or storms;
   - Installing downspout extenders to prevent erosion from roof runoff; and
   - Maintaining erosion and sediment practices through sediment removal, structure replacement, etc.

Specifications

Each construction site is different. The owner/developer of a small construction site may choose and follow one of the four variations of ESC plans included in this section to develop a SWPPP in compliance with the SPDES Construction Permit For Stormwater Discharges From Construction Activities. However, because of the general nature of the following conditions, **the plans included in this section may not cover all of the resource protection needs on a particular site, and this form does not exempt an owner from the responsibility of filing an NOI, if required.**

Small Homesite Minimum Requirements:

1. Stabilized Construction Entrance:

To prevent vehicles and equipment from tracking sediment and mud off-site, apply gravel or crushed rock to the driveway area and restrict traffic to this one route. This practice will help keep soil from sticking to tires and stop soil from washing off into the street. Carry out periodic inspections and maintenance including washing, top-dressing with additional stone, reworking, and compaction. Plan for periodic street cleaning to remove any sediment that may have been tracked off-site. Remove sediment by shoveling or sweeping and transport to a suitable disposal area where it can be stabilized.

2. Stabilization of Denuded Areas:

In areas where soil disturbance activity has temporarily or permanently ceased, the application of soil stabilization measures must be initiated by the end of the next business day and completed within fourteen (14) days from the date the current soil disturbance activity ceased. For construction sites that directly discharge to one of the 303 (d) segments listed in the Construction General Permit or is

located in one of the watersheds listed in Appendix C, the application of soil stabilization measures must be initiated by the end of the next business day and completed within seven (7) days from the date the current soil disturbance activity ceased.

Stabilize disturbed areas by implementing soil covering practices (e.g. mulching, matting, sodding). Exposed soils are the most prone to erosion from rainfall and runoff. Vegetation helps protect the soil from these forces and provides natural erosion control. Plan construction to limit the amount of exposed area, and avoid grading activities during the rainy season (November through March) as much as possible. Clearing limits should be clearly marked and kept as small as possible. Once construction is completed, the site must be permanently stabilized with topsoiling, seeding and plantings, or sodding if needed.

3. Protection of Adjacent Properties:

Keep sediment on-site by using structural and source control practices (e.g. vegetative buffer strips, sediment barriers, soil berms or dikes, etc). See Sections 3, 4, or 5 as appropriate. Wherever possible, preserve a buffer of existing vegetation around the site boundary. This will help to decrease runoff velocities and trap sediment suspended in the runoff. Other structural controls such as filter fence or straw bale barriers should also be used to filter runoff and trap sediment on-site.

When excavating basement soils, move the soil to a location that is, or will be, vegetated, such as in the backyard or side yard area. This will increase the distance eroded soil must travel, through vegetation, to reach the storm sewer system. Piles should be situated so that sediment does not run into the street or adjoining yards. Soil piles should be temporarily seeded and circled with silt fence until the soil is either replaced or removed. Backfill basement walls as soon as possible and rough grade the lot. This will eliminate the large soil mounds, which are highly erodible, and prepare the lot for temporary cover. After backfilling, grade or remove excess soil from the site quickly, to eliminate any sediment loss from surplus fill.

4. Concentrated Flow:

For constructed drainage ways, or other areas of concentrated flow, install check dams according to the specifications on page E.12 to reduce erosion in the channel. As with other erosion controls, check dams must be inspected regularly. Remove sediment accumulated behind the dam as needed to allow channel to drain through the stone check dam and prevent large flows from carrying sediment over the dam Replace stones as needed to maintain the design cross section of the structures. Sediment removal is crucial to the effectiveness of the dam—if not maintained, high flows could cause erosion around the sides of the structures, adding significant sediment loads downstream.

5. Maintenance:

Maintain erosion and sediment control practices through regular inspection. Regular maintenance is extremely important for the proper operation of structural practices. After initial groundbreaking, the responsible contractor shall conduct daily maintenance inspections within the active work area to ensure practices are being maintained in effective operating conditions at all times.

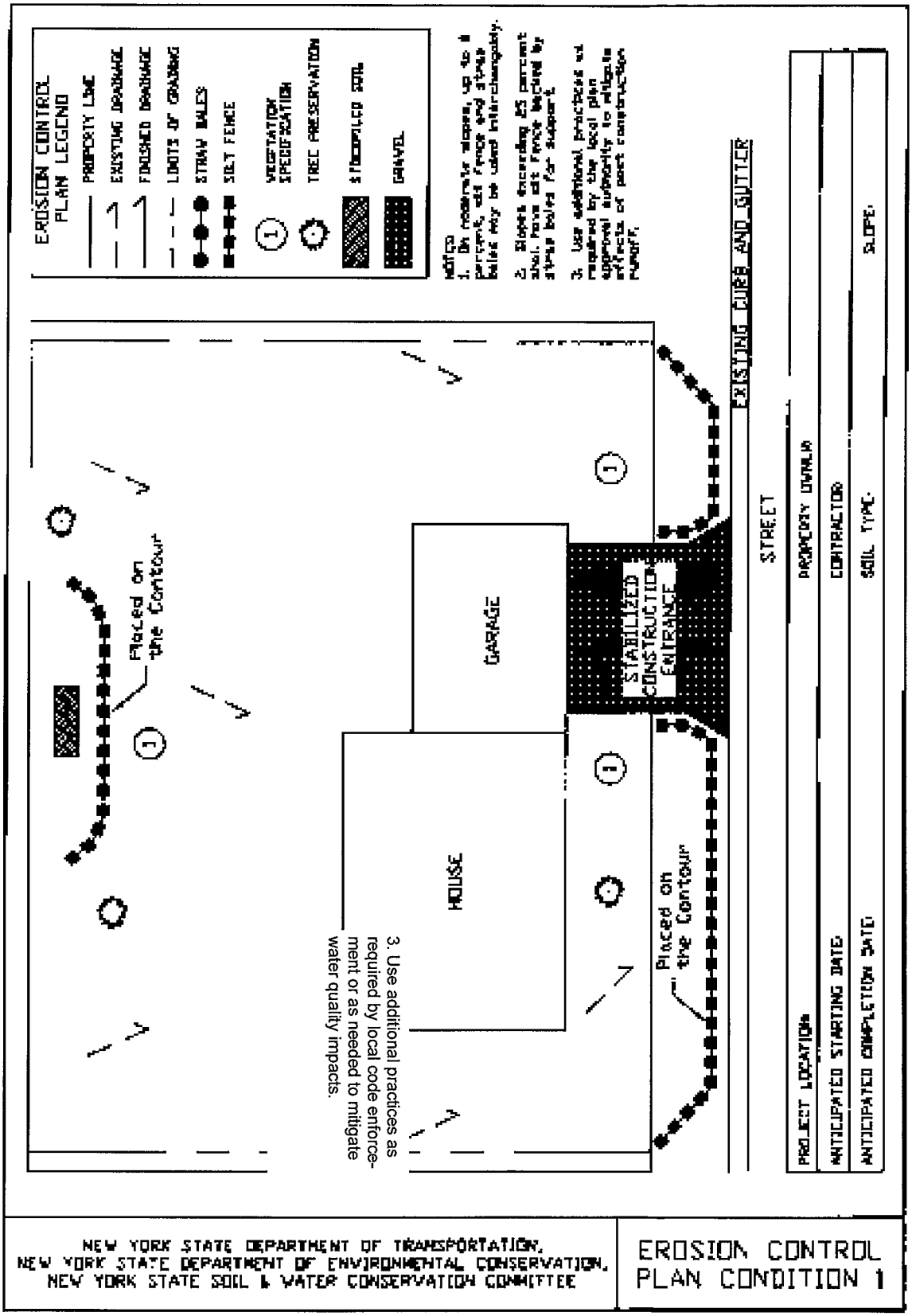
6. Soil Restoration:

Soils that have been disturbed and compacted due to construction activities should be de-compacted to restore their previous hydrologic condition. This normally involves aeration of small areas for home sites. Large areas should be restored in accordance with the Soil Restoration standard in Section 4 of this book of standards.

7. Other Practices:

Use additional practices as required by the local plan approval authority to mitigate effects of increased runoff. This may include providing additional controls to a locally protected stream or resource area, protecting riparian corridors (vegetative stream buffers), etc. Individual homeowners and/or developers are responsible for researching additional requirements related to erosion and sediment runoff control established by their local jurisdictions.

Figure D.1
Erosion Control Plan Condition 1



Condition 1—Vegetative Requirements & Compliance Form

Vegetation Requirements:

1) Site Preparation

A. Install needed water and erosion control measures and bring area to be seeded to desired grades using a minimum of 4 in. topsoil.
B. Prepare seedbed by loosening soil to a depth of 4-6 inches.
C. Lime to a pH of 6.5
D. Fertilize as per soil test or, if fertilizer must be applied before soil test results are received, apply 850 pounds of 5-10-10 or equivalent per acre (20 lbs/1,000 sq. ft.)
E. Incorporate lime and fertilizer in top 2-4 inches of topsoil.
F. Smooth. Remove all stones over 1 inch in diameter, sticks, and foreign matter from the surface. Firm the seedbed.

2) Planting—Sunny Location.

Upon completing soil de-compaction, use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hydroseeded, lime and fertilizer may be applied through the seeder and rolling is not practical. Seed using the following mix and rates:

Species (% by weight)	lbs/1,000sq. ft	lbs./acre
65% Kentucky bluegrass blend	2.0-2.6	85-114
20% perennial ryegrass	0.6-0.8	26-35
15% fine fescue	0.4-0.6	19-26
Total	3.0-4.0	130-175
or,		
100% Tall fescue, Turf-type, fine leaf	3.4-4.6	150-200

3) When using the cultipacker or broadcast seed method, mulch using small grain straw, applied at a rate of 2 tons per acre; and anchor with a netting or tackifier. Hydroseed applications should include mulch, fertilizer and seed.

Common white clover can be added to mixtures at the rate of 1-2 lbs/acre to help maintain green color during the dry summer period, however, they will not withstand heavy traffic. Fertilizing—First year, (spring seedlings) three to four weeks after germination apply 1 pound nitrogen/1,000 square feet using a complete fertilizer with a 2-1-1 or 4-1-3 ratio or as recommended by soil test results. For summer and early fall seedings, apply as above unless air temperatures are above 85°F for extended period. Wait until heat wave is over to fertilize. For late fall/ winter seedings, fertilize in spring. Restrict use—new seedlings should be protected from use for one full year to allow development of a dense sod with good root structure.

Certification Statement

Please complete and sign this 2-sided document (with Typical Erosion Control Plan) and attach to BLUEPRINTS and SITE PLAN prior to any earth disturbance. These documents must be kept on site and be available for review as requested by any agent of the NYSDEC. **This 2-sided form can be used as a basic stormwater pollution prevention plan, but will not exempt a landowner from filing a Notice of Intent.**

"I hereby certify under penalty of law that I understand and agree to comply with the terms and conditions of the SWPPP and agree to implement any corrective actions identified by the qualified inspectors during a site inspection. I also understand that the owner or operator must comply with the term and conditions of the most current version of the New York State Pollutant Discharge Elimination System (SPDES) general permit for stormwater discharges from construction activities and that is unlawful for any person to cause of contribute to a violation of water quality standards. Furthermore, I am aware that there are significant penalties for submitting false information, that I do not believe to be true, including the possibility of fine and imprisonment for know violations."

_____

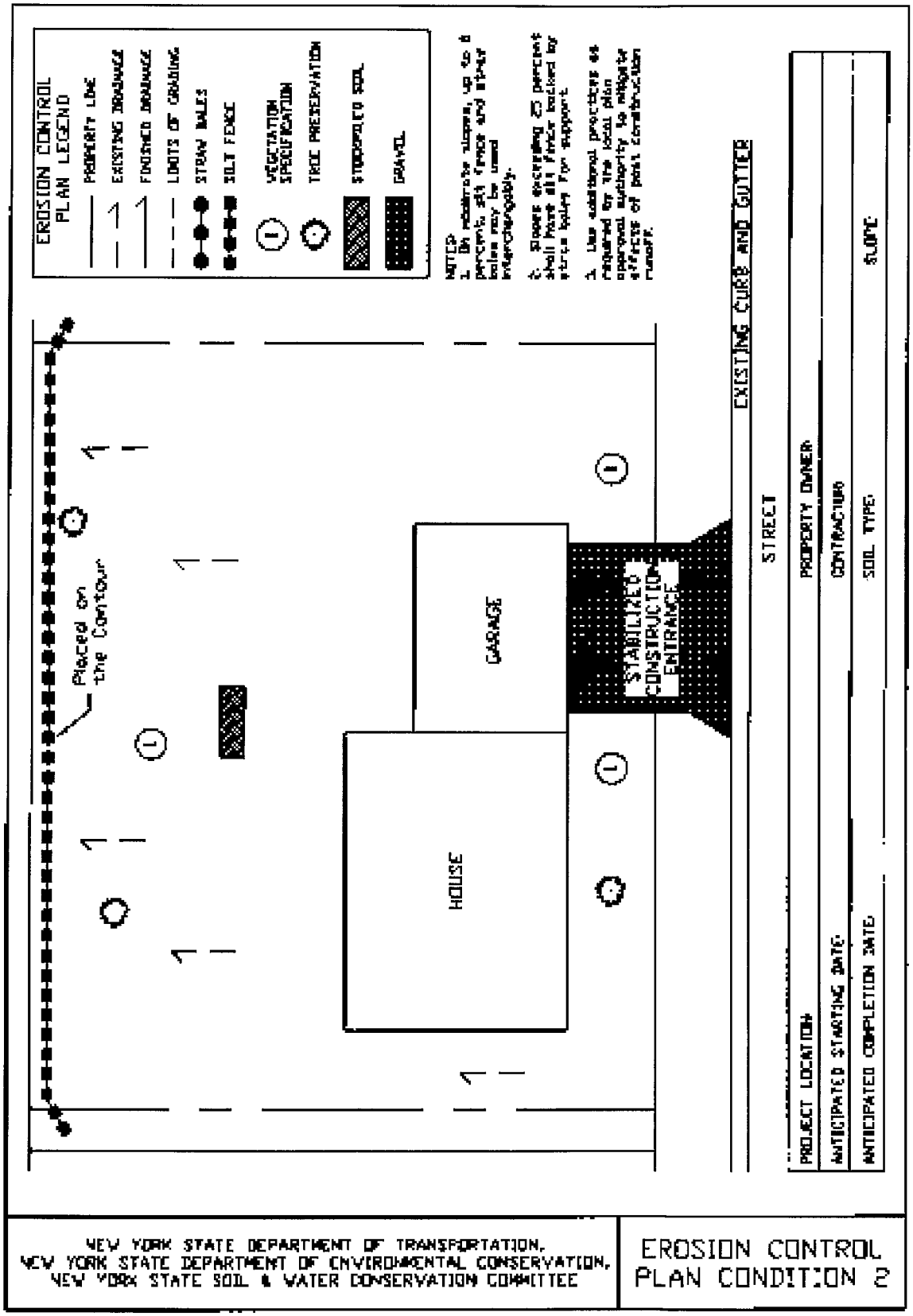
Builder/Contractor (print) Signature

_____

Address

_____

Figure D.2
Erosion Control Plan Condition 2



Condition 2—Vegetative Requirements & Compliance Form

Vegetation Requirements:

1) Site Preparation

A. Install needed water and erosion control measures and bring area to be seeded to desired grades using a minimum of 4 in. topsoil.
B. Prepare seedbed by loosening soil to a depth of 4-6 inches.
C. Lime to a pH of 6.5
D. Fertilize as per soil test or, if fertilizer must be applied before soil test results are received, apply 850 pounds of 5-10-10 or equivalent per acre (20 lbs/1,000 sq. ft.)
E. Incorporate lime and fertilizer in top 2-4 inches of topsoil.
F. Smooth. Remove all stones over 1 inch in diameter, sticks, and foreign matter from the surface. Firm the seedbed.

2) Planting—Sunny Location.

Upon completing soil de-compaction, use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hydroseeded, lime and fertilizer may be applied through the seeder and rolling is not practical. Seed using the following mix and rates:

Species (% by weight)	lbs/1,000sq. ft	lbs./acre
65% Kentucky bluegrass blend	2.0-2.6	85-114
20% perennial ryegrass	0.6-0.8	26-35
15% fine fescue	0.4-0.6	19-26
Total	3.0-4.0	130-175
or,		
100% Tall fescue, Turf-type, fine leaf	3.4-4.6	150-200

3) When using the cultipacker or broadcast seed method, mulch using small grain straw, applied at a rate of 2 tons per acre; and anchor with a netting or tackifier. Hydroseed applications should include mulch, fertilizer and seed.

Common white clover can be added to mixtures at the rate of 1-2 lbs/acre to help maintain green color during the dry summer period, however, they will not withstand heavy traffic. Fertilizing—First year, (spring seedlings) three to four weeks after germination apply 1 pound nitrogen/1,000 square feet using a complete fertilizer with a 2-1-1 or 4-1-3 ratio or as recommended by soil test results. For summer and early fall seedings, apply as above unless air temperatures are above 85°F for extended period. Wait until heat wave is over to fertilize. For late fall/ winter seedings, fertilize in spring. Restrict use—new seedlings should be protected from use for one full year to allow development of a dense sod with good root structure.

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_____

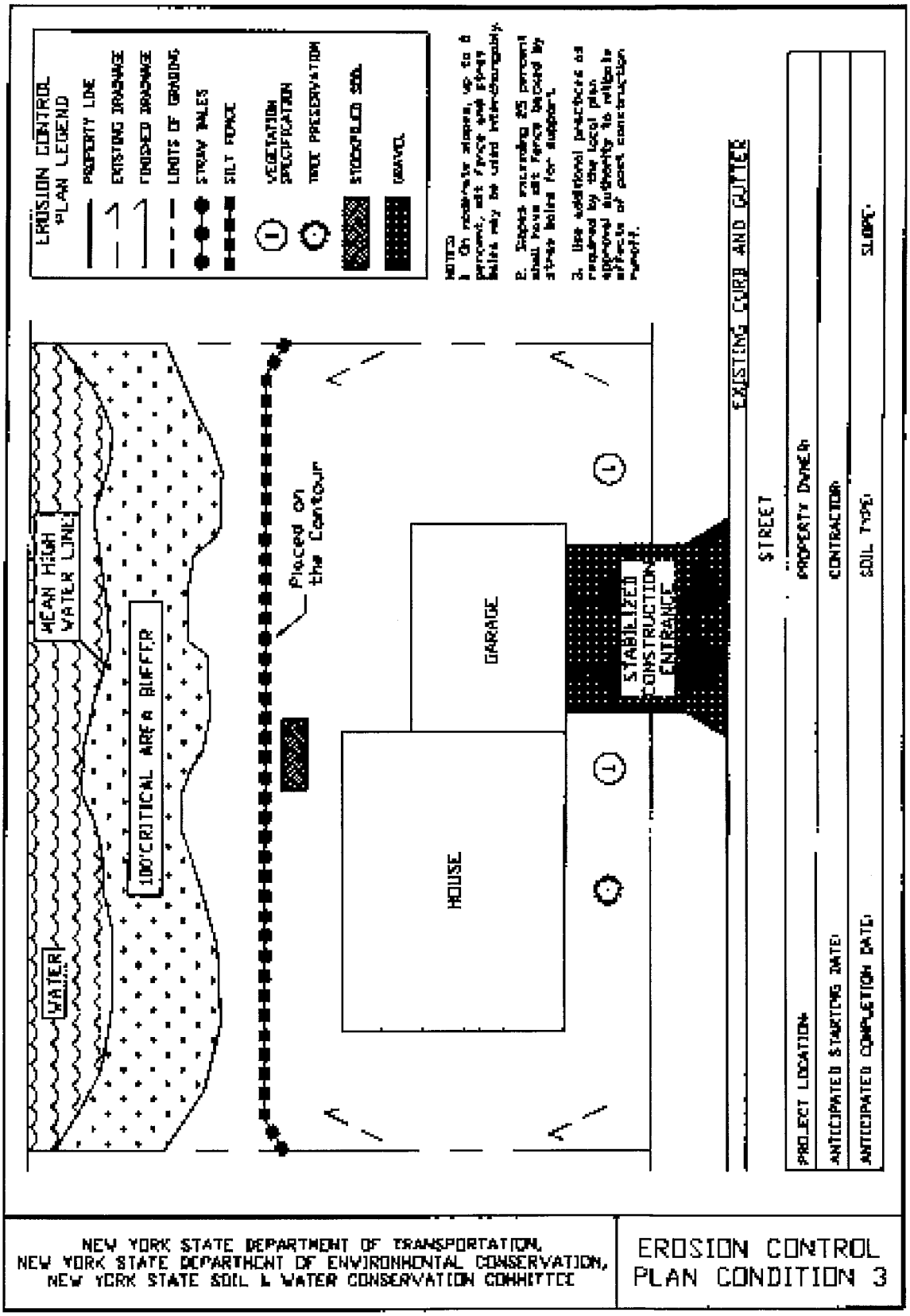
Builder/Contractor (print) Signature

_____

Address

_____

Figure D.3
Erosion Control Plan Condition 3



Condition 3—Vegetative Requirements & Compliance Form

Vegetation Requirements:

1) Site Preparation

A. Install needed water and erosion control measures and bring area to be seeded to desired grades using a minimum of 4 in. topsoil.
B. Prepare seedbed by loosening soil to a depth of 4-6 inches.
C. Lime to a pH of 6.5
D. Fertilize as per soil test or, if fertilizer must be applied before soil test results are received, apply 850 pounds of 5-10-10 or equivalent per acre (20 lbs/1,000 sq. ft.)
E. Incorporate lime and fertilizer in top 2-4 inches of topsoil.
F. Smooth. Remove all stones over 1 inch in diameter, sticks, and foreign matter from the surface. Firm the seedbed.

2) Planting—Sunny Location.

Upon completing soil de-compaction, use a cultipacker type seeder if possible. Seed to a depth of 1/8 to 1/4 inch. If seed is to be broadcast, cultipack or roll after seeding. If hydroseeded, lime and fertilizer may be applied through the seeder and rolling is not practical. Seed using the following mix and rates:

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15% fine fescue	0.4-0.6	19-26
Total	3.0-4.0	130-175
or,		
100% Tall fescue, Turf-type, fine leaf	3.4-4.6	150-200

3) When using the cultipacker or broadcast seed method, mulch using small grain straw, applied at a rate of 2 tons per acre; and anchor with a netting or tackifier. Hydroseed applications should include mulch, fertilizer and seed.

Common white clover can be added to mixtures at the rate of 1-2 lbs/acre to help maintain green color during the dry summer period, however, they will not withstand heavy traffic. Fertilizing—First year, (spring seedlings) three to four weeks after germination apply 1 pound nitrogen/1,000 square feet using a complete fertilizer with a 2-1-1 or 4-1-3 ratio or as recommended by soil test results. For summer and early fall seedings, apply as above unless air temperatures are above 85°F for extended period. Wait until heat wave is over to fertilize. For late fall/ winter seedings, fertilize in spring. Restrict use—new seedlings should be protected from use for one full year to allow development of a dense sod with good root structure.

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_____

Builder/Contractor (print) Signature

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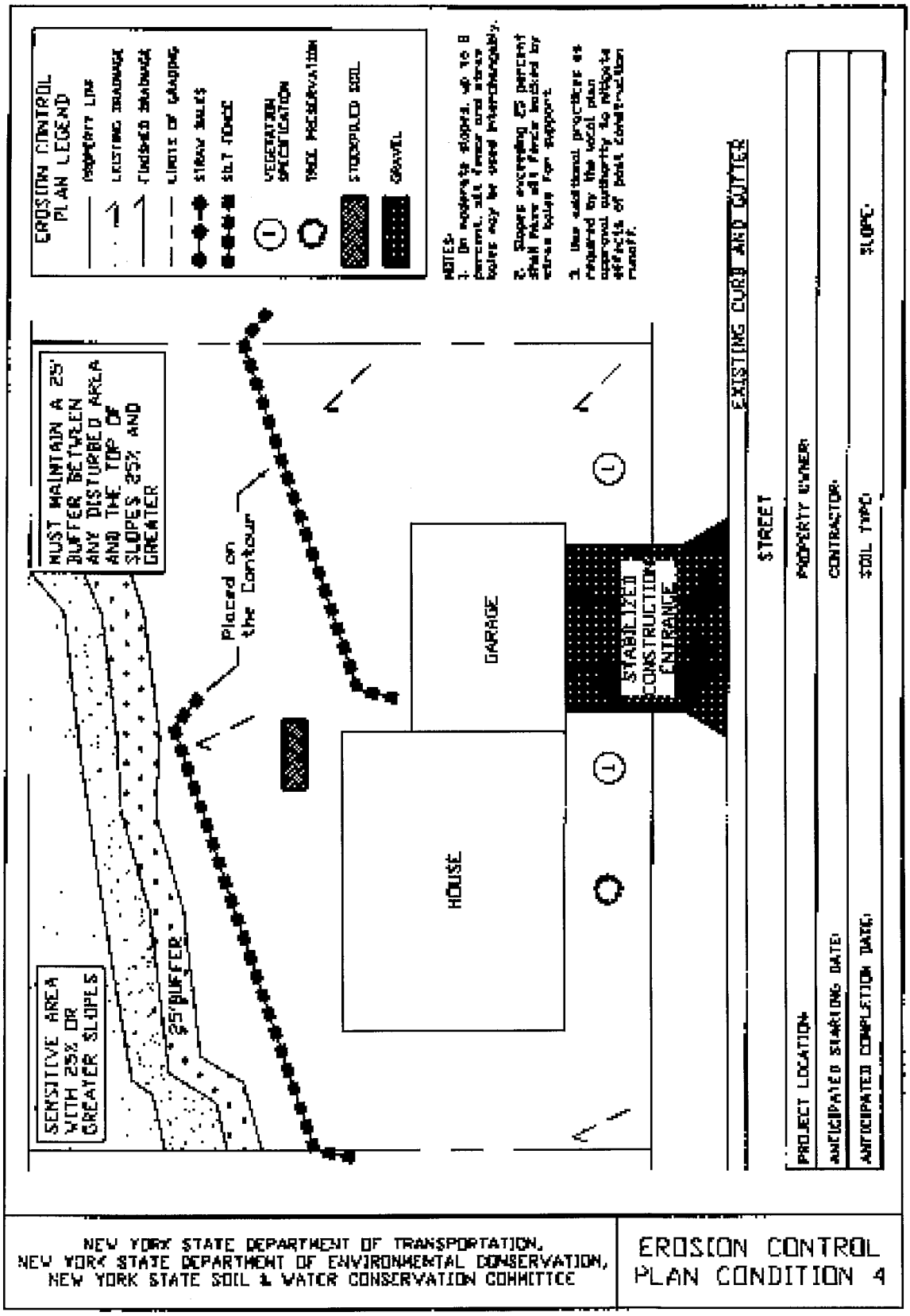
Address

_____

Figure D.4
Erosion Control Plan Condition 4



Condition 4—Vegetative Requirements & Compliance Form

Vegetation Requirements:

1) Site Preparation

A. Install needed water and erosion control measures and bring area to be seeded to desired grades using a minimum of 4 in. topsoil.
B. Prepare seedbed by loosening soil to a depth of 4-6 inches.
C. Lime to a pH of 6.5
D. Fertilize as per soil test or, if fertilizer must be applied before soil test results are received, apply 850 pounds of 5-10-10 or equivalent per acre (20 lbs/1,000 sq. ft.)
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F. Smooth. Remove all stones over 1 inch in diameter, sticks, and foreign matter from the surface. Firm the seedbed.

2) Planting—Sunny Location.

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15% fine fescue	0.4-0.6	19-26
Total	3.0-4.0	130-175
or,		
100% Tall fescue, Turf-type, fine leaf	3.4-4.6	150-200

3) When using the cultipacker or broadcast seed method, mulch using small grain straw, applied at a rate of 2 tons per acre; and anchor with a netting or tackifier. Hydroseed applications should include mulch, fertilizer and seed.

Common white clover can be added to mixtures at the rate of 1-2 lbs/acre to help maintain green color during the dry summer period, however, they will not withstand heavy traffic. Fertilizing—First year, (spring seedlings) three to four weeks after germination apply 1 pound nitrogen/1,000 square feet using a complete fertilizer with a 2-1-1 or 4-1-3 ratio or as recommended by soil test results. For summer and early fall seedings, apply as above unless air temperatures are above 85°F for extended period. Wait until heat wave is over to fertilize. For late fall/ winter seedings, fertilize in spring. Restrict use—new seedlings should be protected from use for one full year to allow development of a dense sod with good root structure.

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_____

Builder/Contractor (print) Signature

_____

Address

_____

APPENDIX 7

SITE LOG BOOK

APPENDIX F
CONSTRUCTION SITE INSPECTION AND MAINTENANCE LOG BOOK

STATE POLLUTANT DISCHARGE ELIMINATION SYSTEM FOR CONSTRUCTION ACTIVITIES

SAMPLE CONSTRUCTION SITE LOG BOOK

Table of Contents

I. Pre-Construction Meeting Documents
   a. Preamble to Site Assessment and Inspections
   b. Pre-Construction Site Assessment Checklist

II. Construction Duration Inspections
   a. Directions
   b. Modification to the SWPPP

I. PRE-CONSTRUCTION MEETING DOCUMENTS

Project Name _____

Permit No. _____ **Date of Authorization** _____

Name of Operator _____

Prime Contractor _____

a. Preamble to Site Assessment and Inspections

The Following Information To Be Read By All Person's Involved in The Construction of Stormwater Related Activities:

The Operator agrees to have a qualified inspector[1] conduct an assessment of the site prior to the commencement of construction[2] and certify in this inspection report that the appropriate erosion and sediment controls described in the SWPPP have been adequately installed or implemented to ensure overall preparedness of the site for the commencement of construction.

Prior to the commencement of construction, the Operator shall certify in this site logbook that the SWPPP has been prepared in accordance with the State's standards and meets all Federal, State and local erosion and sediment control requirements. A preconstruction meeting should be held to review all of the SWPPP requirements with construction personnel.

When construction starts, site inspections shall be conducted by the qualified inspector at least every 7 calendar days. The Operator shall maintain a record of all inspection reports in this site logbook. The site logbook shall be maintained on site and be made available to the permitting authorities upon request.

Prior to filing the Notice of Termination or the end of permit term, the Operator shall have a qualified inspector perform a final site inspection. The qualified inspector shall certify that the site has undergone final stabilization[3] using either vegetative or structural stabilization methods and that all temporary erosion and sediment controls (such as silt fencing) not needed for long-term erosion control have been removed. In addition, the Operator must identify and certify that all permanent structures described in the SWPPP have been constructed and provide the owner(s) with an operation and maintenance plan that ensures the structure(s) continuously functions as designed.

1 Refer to "Qualified Inspector" inspection requirements in the current SPDES General Permit for Stormwater Discharges from Construction Activity for complete list of inspection requirements.
2 "Commencement of construction" means the initial removal of vegetation and disturbance of soils associated with clearing, grading or excavating activities or other construction activities.
3 "Final stabilization" means that all soil-disturbing activities at the site have been completed and a uniform, perennial vegetative cover with a density of eighty (80) percent has been established or equivalent stabilization measures (such as the use of mulches or geotextiles) have been employed on all unpaved areas and areas not covered by permanent structures.

b. Pre-construction Site Assessment Checklist
(NOTE: Provide comments below as necessary)

1. Notice of Intent, SWPPP, and Contractors Certification:

Yes No NA

[ ] [ ] [ ] Has a Notice of Intent been filed with the NYS Department of Conservation?
[ ] [ ] [ ] Is the SWPPP on-site? Where?_____
[ ] [ ] [ ] Is the Plan current? What is the latest revision date?_____
[ ] [ ] [ ] Is a copy of the NOI (with brief description) onsite? Where?_____
[ ] [ ] [ ] Have all contractors involved with stormwater related activities signed a contractor's certification?

2. Resource Protection

Yes No NA

[ ] [ ] [ ] Are construction limits clearly flagged or fenced?
[ ] [ ] [ ] Important trees and associated rooting zones, on-site septic system absorption fields, existing vegetated areas suitable for filter strips, especially in perimeter areas, have been flagged for protection.
[ ] [ ] [ ] Creek crossings installed prior to land-disturbing activity, including clearing and blasting.

3. Surface Water Protection

Yes No NA

[ ] [ ] [ ] Clean stormwater runoff has been diverted from areas to be disturbed.
[ ] [ ] [ ] Bodies of water located either on site or in the vicinity of the site have been identified and protected.
[ ] [ ] [ ] Appropriate practices to protect on-site or downstream surface water are installed.
[ ] [ ] [ ] Are clearing and grading operations divided into areas <5 acres?

4. Stabilized Construction Access

Yes No NA

[ ] [ ] [ ] A temporary construction entrance to capture mud and debris from construction vehicles before they enter the public highway has been installed.
[ ] [ ] [ ] Other access areas (entrances, construction routes, equipment parking areas) are stabilized immediately as work takes place with gravel or other cover.
[ ] [ ] [ ] Sediment tracked onto public streets is removed or cleaned on a regular basis.

5. Sediment Controls

Yes No NA

[ ] [ ] [ ] Silt fence material and installation comply with the standard drawing and specifications.
[ ] [ ] [ ] Silt fences are installed at appropriate spacing intervals
[ ] [ ] [ ] Sediment/detention basin was installed as first land disturbing activity.
[ ] [ ] [ ] Sediment traps and barriers are installed.

6. Pollution Prevention for Waste and Hazardous Materials

Yes No NA

[ ] [ ] [ ] The Operator or designated representative has been assigned to implement the spill prevention avoidance and response plan.
[ ] [ ] [ ] The plan is contained in the SWPPP on page _____
[ ] [ ] [ ] Appropriate materials to control spills are onsite. Where? _____

II. CONSTRUCTION DURATION INSPECTIONS

a. Directions:

Inspection Forms will be filled out during the entire construction phase of the project.

Required Elements:

1) On a site map, indicate the extent of all disturbed site areas and drainage pathways. Indicate site areas that are expected to undergo initial disturbance or significant site work within the next 14-day period;

2) Indicate on a site map all areas of the site that have undergone temporary or permanent stabilization;

3) Indicate all disturbed site areas that have not undergone active site work during the previous 14-day period;

4) Inspect all sediment control practices and record the approximate degree of sediment accumulation as a percentage of sediment storage volume (for example, 10 percent, 20 percent, 50 percent);

5) Inspect all erosion and sediment control practices and record all maintenance requirements such as verifying the integrity of barrier or diversion systems (earthen berms or silt fencing) and containment systems (sediment basins and sediment traps). Identify any evidence of rill or gully erosion occurring on slopes and any loss of stabilizing vegetation or seeding/mulching. Document any excessive deposition of sediment or ponding water along barrier or diversion systems. Record the depth of sediment within containment structures, any erosion near outlet and overflow structures, and verify the ability of rock filters around perforated riser pipes to pass water; and

6) Immediately report to the Operator any deficiencies that are identified with the implementation of the SWPPP.

SITE PLAN/SKETCH

Inspector (print name)	**Date of Inspection**
Qualified Inspector (print name)	**Qualified Inspector Signature**

The above signed acknowledges that, to the best of his/her knowledge, all information provided on the forms is accurate and complete.

Maintaining Water Quality

Yes No NA
[ ] [ ] [ ] Is there an increase in turbidity causing a substantial visible contrast to natural conditions at the outfalls?
[ ] [ ] [ ] Is there residue from oil and floating substances, visible oil film, or globules or grease at the outfalls?
[ ] [ ] [ ] All disturbance is within the limits of the approved plans.
[ ] [ ] [ ] Have receiving lake/bay, stream, and/or wetland been impacted by silt from project?

Housekeeping

1. General Site Conditions

Yes No NA
[ ] [ ] [ ] Is construction site litter, debris and spoils appropriately managed?
[ ] [ ] [ ] Are facilities and equipment necessary for implementation of erosion and sediment control in working order and/or properly maintained?
[ ] [ ] [ ] Is construction impacting the adjacent property?
[ ] [ ] [ ] Is dust adequately controlled?

2. Temporary Stream Crossing

Yes No NA
[ ] [ ] [ ] Maximum diameter pipes necessary to span creek without dredging are installed.
[ ] [ ] [ ] Installed non-woven geotextile fabric beneath approaches.
[ ] [ ] [ ] Is fill composed of aggregate (no earth or soil)?
[ ] [ ] [ ] Rock on approaches is clean enough to remove mud from vehicles & prevent sediment from entering stream during high flow.

3. Stabilized Construction Access

Yes No NA
[ ] [ ] [ ] Stone is clean enough to effectively remove mud from vehicles.
[ ] [ ] [ ] Installed per standards and specifications?
[ ] [ ] [ ] Does all traffic use the stabilized entrance to enter and leave site?
[ ] [ ] [ ] Is adequate drainage provided to prevent ponding at entrance?

Runoff Control Practices

1. Excavation Dewatering

Yes No NA
[ ] [ ] [ ] Upstream and downstream berms (sandbags, inflatable dams, etc.) are installed per plan.
[ ] [ ] [ ] Clean water from upstream pool is being pumped to the downstream pool.
[ ] [ ] [ ] Sediment laden water from work area is being discharged to a silt-trapping device.
[ ] [ ] [ ] Constructed upstream berm with one-foot minimum freeboard.

Runoff Control Practices (continued)

2. Flow Spreader

Yes No NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Constructed on undisturbed soil, not on fill, receiving only clear, non-sediment laden flow.
[ ] [ ] [ ] Flow sheets out of level spreader without erosion on downstream edge.

3. Interceptor Dikes and Swales

Yes No NA

[ ] [ ] [ ] Installed per plan with minimum side slopes 2H:1V or flatter.
[ ] [ ] [ ] Stabilized by geotextile fabric, seed, or mulch with no erosion occurring.
[ ] [ ] [ ] Sediment-laden runoff directed to sediment trapping structure

4. Stone Check Dam

Yes No NA

[ ] [ ] [ ] Is channel stable? (flow is not eroding soil underneath or around the structure).
[ ] [ ] [ ] Check is in good condition (rocks in place and no permanent pools behind the structure).
[ ] [ ] [ ] Has accumulated sediment been removed?.

5. Rock Outlet Protection

Yes No NA

[ ] [ ] [ ] Installed per plan.
[ ] [ ] [ ] Installed concurrently with pipe installation.

Soil Stabilization

1. Topsoil and Spoil Stockpiles

Yes No NA

[ ] [ ] [ ] Stockpiles are stabilized with vegetation and/or mulch.
[ ] [ ] [ ] Sediment control is installed at the toe of the slope.

2. Revegetation

Yes No NA

[ ] [ ] [ ] Temporary seedings and mulch have been applied to idle areas.
[ ] [ ] [ ] 4 inches minimum of topsoil has been applied under permanent seedings

Sediment Control Practices

1. Silt Fence and Linear Barriers

Yes No NA

[ ] [ ] [ ] Installed on Contour, 10 feet from toe of slope (not across conveyance channels).
[ ] [ ] [ ] Joints constructed by wrapping the two ends together for continuous support.
[ ] [ ] [ ] Fabric buried 6 inches minimum.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.

Sediment accumulation is ___% of design capacity.

Sediment Control Practices (continued)

2. Storm Drain Inlet Protection (Use for Stone & Block; Filter Fabric; Curb; or, Excavated; Filter Sock or Manufactured practices)

Yes No NA

[ ] [ ] [ ] Installed concrete blocks lengthwise so open ends face outward, not upward.
[ ] [ ] [ ] Placed wire screen between No. 3 crushed stone and concrete blocks.
[ ] [ ] [ ] Drainage area is 1acre or less.
[ ] [ ] [ ] Excavated area is 900 cubic feet.
[ ] [ ] [ ] Excavated side slopes should be 2:1.
[ ] [ ] [ ] 2" x 4" frame is constructed and structurally sound.
[ ] [ ] [ ] Posts 3-foot maximum spacing between posts.
[ ] [ ] [ ] Fabric is embedded 1 to 1.5 feet below ground and secured to frame/posts with staples at max 8-inch spacing.
[ ] [ ] [ ] Posts are stable, fabric is tight and without rips or frayed areas.
[ ] [ ] [ ] Manufactured insert fabric is free of tears and punctures.
[ ] [ ] [ ] Filter Sock is not torn or flattened and fill material is contained within the mesh sock.

Sediment accumulation ___% of design capacity.

3. Temporary Sediment Trap

Yes No NA

[ ] [ ] [ ] Outlet structure is constructed per the approved plan or drawing.
[ ] [ ] [ ] Geotextile fabric has been placed beneath rock fill.
[ ] [ ] [ ] Sediment trap slopes and disturbed areas are stabilized.

Sediment accumulation is ___% of design capacity.

4. Temporary Sediment Basin

Yes No NA

[ ] [ ] [ ] Basin and outlet structure constructed per the approved plan.
[ ] [ ] [ ] Basin side slopes are stabilized with seed/mulch.
[ ] [ ] [ ] Drainage structure flushed and basin surface restored upon removal of sediment basin facility.
[ ] [ ] [ ] Sediment basin dewatering pool is dewatering at appropriate rate.

Sediment accumulation is ___% of design capacity.

Note: Not all erosion and sediment control practices are included in this listing. Add additional pages to this list as required by site specific design. All practices shall be maintained in accordance with their respective standards.

Construction inspection checklists for post-development stormwater management practices can be found in Appendix F of the New York Stormwater Management Design Manual.

CONSTRUCTION DURATION INSPECTIONS

b. Modifications to the SWPPP (To be completed as described below)

The Operator shall amend the SWPPP whenever:

1. There is a significant change in design, construction, operation, or maintenance which may have a significant effect on the potential for the discharge of pollutants to the waters of the United States and which has not otherwise been addressed in the SWPPP; or
2. The SWPPP proves to be ineffective in:
   a. Eliminating or significantly minimizing pollutants from sources identified in the SWPPP and as required by this permit; or
   b. Achieving the general objectives of controlling pollutants in stormwater discharges from permitted construction activity; and
3. Additionally, the SWPPP shall be amended to identify any new contractor or subcontractor that will implement any measure of the SWPPP.

Modification & Reason:

Appendix F: Construction Inspection Checklists

Stormwater/Wetland Pond Construction Inspection Checklist

Project:
Location:
Site Status:

Date:

Time:

Inspector:

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
Pre-Construction/Materials and Equipment		
Pre-construction meeting		
Pipe and appurtenances on-site prior to construction and dimensions checked		
1. Material (including protective coating, if specified)		
2. Diameter		
3. Dimensions of metal riser or pre-cast concrete outlet structure		
4. Required dimensions between water control structures (orifices, weirs, etc.) are in accordance with approved plans		
5. Barrel stub for prefabricated pipe structures at proper angle for design barrel slope		
6. Number and dimensions of prefabricated anti-seep collars		
7. Watertight connectors and gaskets		
8. Outlet drain valve		
Project benchmark near pond site		
Equipment for temporary de-watering		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
2. Subgrade Preparation		
Area beneath embankment stripped of all vegetation, topsoil, and organic matter		
3. Pipe Spillway Installation		
Method of installation detailed on plans		
A. Bed preparation		
Installation trench excavated with specified side slopes		
Stable, uniform, dry subgrade of relatively impervious material (If subgrade is wet, contractor shall have defined steps before proceeding with installation)		
Invert at proper elevation and grade		
B. Pipe placement		
Metal / plastic pipe		
1. Watertight connectors and gaskets properly installed		
2. Anti-seep collars properly spaced and having watertight connections to pipe		
3. Backfill placed and tamped by hand under "haunches" of pipe		
4. Remaining backfill placed in max. 8" lifts using small power tamping equipment until 2 ft cover over pipe is reached		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
3. Pipe Spillway Installation		
Concrete pipe		
1. Pipe set on blocks or concrete slab for pouring of low cradle		
2. Pipe installed with rubber gasket joints with no spalling in gasket interface area		
3. Excavation for lower half of anti-seep collar(s) with reinforcing steel set		
4. Entire area where anti-seep collar(s) will come in contact with pipe coated with mastic or other approved waterproof sealant		
5. Low cradle and bottom half of anti-seep collar installed as monolithic pour and of an approved mix		
6. Upper half of anti-seep collar(s) formed with reinforcing steel set		
7. Concrete for collar of an approved mix and vibrated into place (protected from freezing while curing, if necessary)		
8. Forms stripped and collar inspected for honeycomb prior to backfilling. Parge if necessary.		
C. Backfilling		
Fill placed in maximum 8" lifts		
Backfill taken minimum 2 ft above top of anti-seep collar elevation before traversing with heavy equipment		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
4. Riser / Outlet Structure Installation		
Riser located within embankment		
A. Metal riser		
Riser base excavated or formed on stable subgrade to design dimensions		
Set on blocks to design elevations and plumbed		
Reinforcing bars placed at right angles and projecting into sides of riser		
Concrete poured so as to fill inside of riser to invert of barrel		
B. Pre-cast concrete structure		
Dry and stable subgrade		
Riser base set to design elevation		
If more than one section, no spalling in gasket interface area; gasket or approved caulking material placed securely		
Watertight and structurally sound collar or gasket joint where structure connects to pipe spillway		
C. Poured concrete structure		
Footing excavated or formed on stable subgrade, to design dimensions with reinforcing steel set		
Structure formed to design dimensions, with reinforcing steel set as per plan		
Concrete of an approved mix and vibrated into place (protected from freezing while curing, if necessary)		
Forms stripped & inspected for "honeycomb" prior to backfilling; parge if necessary		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
5. Embankment Construction		
Fill material		
Compaction		
Embankment		
1. Fill placed in specified lifts and compacted with appropriate equipment		
2. Constructed to design cross-section, side slopes and top width		
3. Constructed to design elevation plus allowance for settlement		
6. Impounded Area Construction		
Excavated / graded to design contours and side slopes		
Inlet pipes have adequate outfall protection		
Forebay(s)		
Pond benches		
7. Auxiliary (if applicable) and Emergency Spillway Construction		
Spillway located in cut or structurally stabilized with riprap, gabions, concrete, etc.		
Excavated to proper cross-section, side slopes and bottom width		
Entrance channel, crest, and exit channel constructed to design grades and elevations		

CONSTRUCTION SEQUENCE	SATISFACTORY / UNSATISFACTORY	COMMENTS
8. Outlet Protection		
A. End section		
Securely in place and properly backfilled		
B. Endwall		
Footing excavated or formed on stable subgrade, to design dimensions and reinforcing steel set, if specified		
Endwall formed to design dimensions with reinforcing steel set as per plan		
Concrete of an approved mix and vibrated into place (protected from freezing, if necessary)		
Forms stripped and structure inspected for "honeycomb" prior to backfilling; parge if necessary		
C. Riprap apron / channel		
Apron / channel excavated to design cross-section with proper transition to existing ground		
Filter fabric in place		
Stone sized as per plan and uniformly place at the thickness specified		
9. Vegetative Stabilization		
Approved seed mixture or sod		
Proper surface preparation and required soil amendments		
Excelsior mat or other stabilization, as per plan		

CONSTRUCTION SEQUENCE	SATISFACTORY/ UNSATISFACTORY	COMMENTS
10. Miscellaneous		
Drain for ponds having a permanent pool		
Trash rack / anti-vortex device secured to outlet structure		
Trash protection for low flow pipes, orifices, etc.		
Fencing (when required)		
Access road		
Set aside for clean-out maintenance		
11. Stormwater Wetlands		
Adequate water balance		
Variety of depth zones present		
Approved pondscaping plan in place Reinforcement budget for additional plantings		
Plants and materials ordered 6 months prior to construction		
Construction planned to allow for adequate planting and establishment of plant community (April-June planting window)		
Wetland buffer area preserved to maximum extent possible		

Comments:

Actions to be Taken:

APPENDIX 8

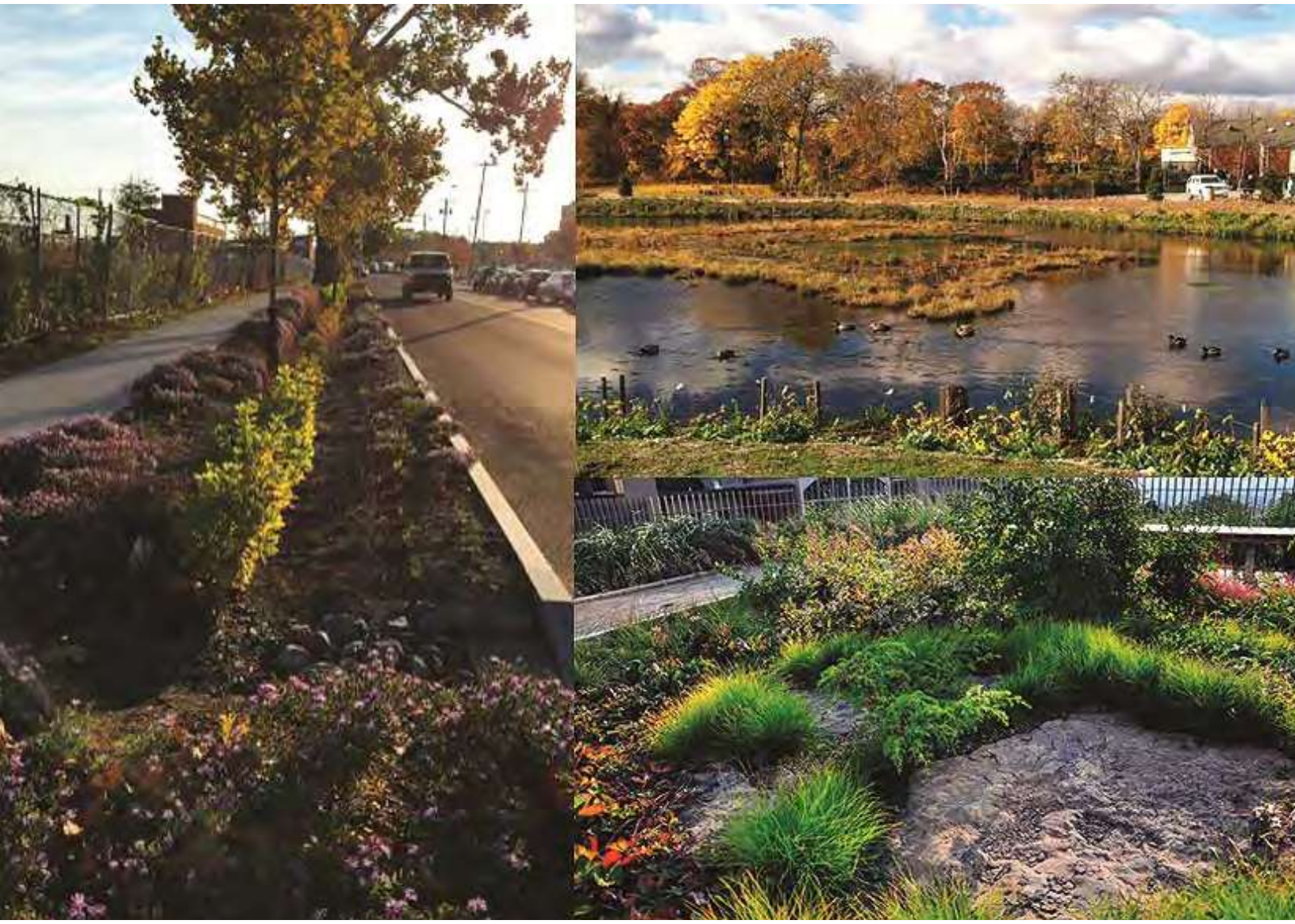
POST DEVELOPMENT MAINTENANCE

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

MAINTENANCE GUIDANCE

Stormwater Management Practices

March 31, 2017



FINAL

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Section 1. Introduction

1.1. Stormwater Management Practice (SMP) Groups

Stormwater management has become an important function for municipalities to address the quality of local water resources and to adhere to state standards. Increasingly, stormwater management practices (SMPs) are constructed as part of new development or redevelopment projects as retrofits to existing infrastructure and/or as part of local watershed restoration plan efforts.

While SMPs are proliferating, municipalities are charged with a certain level of implementation and oversight. Whether this is a new function for a municipality or an expansion of existing programs, it is important for these local programs to have some degree of guidance to successfully meet the challenge. One important area where guidance has been lacking is how to properly operate and maintain the wide range of SMPs that are constructed. This chapter was developed to address this need. It is widely understood that SMPs will not function properly to protect water resources without attention to operation and maintenance (O&M), and that O&M tasks and responsibilities must be identified and assumed by various stakeholders.

The chapter is structured around a hierarchy concept where O&M responsibilities are addressed by SMP owners/property managers, municipal staff, landscape contractors and professionals with knowledge in stormwater management (Qualified Professional). The hierarchy approach, explained in more detail below in Section 1.2, strives for a cost-efficient way to ensure long-term performance of SMPs.

The maintenance procedures described in this chapter are applied to ten separate SMP groups (**Table 1.1**). These same ten groups are used to separate maintenance inspection guidance, costs, and other guidance in the chapter.

Table 1.1 Practices Discussed in this Chapter, by Group

SMP Group	Practices Included
Rainwater Harvesting	• Rain Barrel • Cistern
Disconnection and Sheetflow	• Rooftop Disconnection • Sheetflow to Filter Strip • Sheetflow to Riparian Buffers
Swales	• Vegetated Swale • Wet Swale
Tree Planting	• Tree Planting
Bioretention	• Bioretention Cell • Dry Swale • Rain Garden • Stormwater Planters • Tree Pits
Green Roofs	• Green Roofs
Permeable Pavements	• Permeable Pavers • Porous Asphalt/Concrete
Ponds and Wetlands	• Wet Pond Design Options • Stormwater Wetland Design Options
Infiltration	• Infiltration Trench • Infiltration Basin • Dry Well
Sand and Organic Filters	• Surface Sand Filters • Underground Sand Filters • Underground Organic Filters

1.2. Maintenance Hierarchy

SMPs require inspections and maintenance to identify small problems before they become more serious and expensive to repair. For example, removing a small amount of sediment from a filtering medium or permeable pavement surface is much less expensive than replacing a surface that has already become clogged. However, it can be cost prohibitive for most communities or SMP owners to hire highly trained staff or contractors to inspect these practices or to carry out the actual maintenance tasks. This can be especially true with the advent of "micro-scale" Green Infrastructure practices, which may be distributed across many individual public and private properties, and where the absolute number of SMPs within a municipality may exceed local government inspection and maintenance capabilities.

Many SMP maintenance problems start out as fairly small, easily rectified issues as long as they are detected early enough through an inspection. For these issues, property owners or managers can likely take care of the issue in an expedient and cost-effective manner.

However, at some point, property owners or managers will encounter an issue where diagnosing the problem and knowing the appropriate remedy will exceed their technical capabilities. At this point, an individual with training in SMP inspection, operation and maintenance, such as a municipal inspector or landscape contractor, may have to be called in for assistance.

Similarly, some problems escalate to the point where a Qualified Professional (i.e. professional engineer or landscape architect) is needed to bring the SMP back to a good functioning condition. The Qualified Professional may need to bring in other experts to assess problems with the SMP. For instance, they may call in a horticulturalist to assess problems with the planting plan.

Figure 1.1 The SMP Maintenance Hierarchy Pyramid

Acknowledging this step-wise approach to SMP inspection and maintenance, the SMP Maintenance Hierarchy concept was developed. The concept uses a combination of skill levels (**Figure 1.1**) as explained in more detail below.

Level 1: Property Owners and Managers, Interns, etc.

This category includes property owners, property managers, or HOA representatives, for privately owned SMPs. For municipally owned SMPS, this could include municipal maintenance staff or interns, and volunteers. These individuals would typically have no or only very limited training in stormwater maintenance and inspection but can use available guidance to quickly identify and rectify common and simple issues with SMP performance. This level completes routine inspections and maintenance activities. For most SMPs, the majority of inspection and maintenance activities can be conducted at this skill level, thus Level 1 forms the base of the Maintenance Hierarchy pyramid. Many well-functioning SMPs can be adequately maintained for long periods of time using Level 1 capabilities.

Although many issues can be addressed at Level 1, these inspectors and maintainers need a relief valve when the SMP problems become harder to diagnose and/or the remedies require a higher level of resources and expertise. Such issues are referred to in this chapter as "kick-outs to Level 2." For instance, an SMP may have a minor amount of sediment that has accumulated at inlets or on the practice bottom. A Level 1 person may be able to take care of this with a flat shovel and wheel barrow. However, a Level 2 inspection would be triggered if the sediment is deep, widespread, keeps recurring, and/or requires more sophisticated equipment to remove.

Level 2: Trained Municipal Staff

This level of inspection and maintenance is conducted primarily by municipal employees or landscape contractors who have completed training on SMP, inspection, operation and maintenance. Level 2 inspections can take place in response to two circumstances:

1. As part of an ongoing, routine municipal inspection program whereby SMPs are visited on a rotating basis at a frequency established by the local program, or

2. In response to a “kick-out” from a Level 1 inspector based on a specific problem or problems.

Circumstance #2 obviously will require coordination and communication between the Level 1 and Level 2 inspectors, with documentation and background provided by the Level 1 inspector. This is an essential part of making the hierarchy approach successful. In the example above, the Level 2 inspector can better diagnose the sources of the sediment, whether the sediment is affecting performance of the SMP, and the specific tasks needed to remove the sediment and abate the source.

As with kick-outs from Level 1 to Level 2, the same can exist from Level 2 to Level 3. It may be that the Level 2 inspector encounters a problem where a Qualified Professional is needed to re-design certain components of the SMP, and a qualified contractor is needed to undertake a more serious repair. This is when Level 3 is activated.

Level 3: Qualified Professionals

Qualified professionals include professional engineers and landscape architects, who can revisit design issues associated with chronic or serious problems. For repair and maintenance of the SMPs at this level, individuals with specific skills and certifications, such as a certified plumber who has experience working with rainwater harvesting practices or a horticulturalist with knowledge on proper plantings may need to be called in by the Qualified Professional. Level 3 inspection or maintenance is triggered in response to specific problems identified during a Level 2 inspection.

Continuing with the example above, the Level 2 inspector identifies that the sediment is accumulating in the SMP because of the lack of pre-treatment or that the practice is not sized properly for its drainage area. The Level 2 inspector at this point should consult a Qualified Professional (Level 3) who can go back to the original or as-built plan and develop workable solutions.

Table 1.2 further describes how maintenance and inspection activities differ among the three levels of the SMP Maintenance Hierarchy.

Table 1.2 Maintenance/Inspection Hierarchy Levels

	Level 1: Owners and Untrained Staff	**Level 2: Trained Municipal Staff**	**Level 3: Qualified Professionals**
Qualifications/ Training of Inspectors	No special training, but person is provided educational materials	On-the-job training and/or short workshops Define adequate training or provide examples	Professional License such as a PE or RLA
Frequency of Inspection	At least annually	Routine as determined by the local program OR as kick-out from Level 1 inspection	Only as needed from Level 2 inspection
Inspection Guidance	Checklists are included for each practice group in **Section 2** of this chapter and in **Appendix A**.	Guidance for the inspection is included in **Section 3**, and checklists are included in **Appendix B.**	**Section 4** includes guidance for diagnosing typical problems.
Typical Maintenance Activities	Routine mowing. Trash removal. Plant care and upkeep. Mulching as needed. Removal of small amounts of sediment from pretreatment areas of the practice.	Removal of larger amounts of sediment. Structural damage repair. Minor regrading and scarification of soil surface to restore permeability.	Redesign an improperly functioning practice. Includes re-grading of the contributing drainage area, replacing soil media and plantings (new planting plan), or modifying conveyance structures.
Triggers for Inspection or Maintenance by this Level	Regular inspection (no trigger)	Level 1 Inspection Sheets (**Section 2**) describe triggers that warrant a Level 2 Inspection.	Level 2 Inspection Guidance (**Section 3**) describes triggers that warrant a Level 3 Inspection.

1.3. Using the Remainder of this Chapter

This chapter provides guidance for maintaining SMPs, including inspection, maintenance activities, and maintenance planning. The chapter includes four sections as follows:

- **Section 2** outlines Level 1 inspection and maintenance procedures in the form of visual checklists. This includes guidance for inspection of each of the 10 SMP groups/categories included in this chapter, as well as specific kick-outs for Level 2.
- **Section 3** provides guidance for Level 2 inspections as to observed conditions, remedies, and triggers for Level 3.
- **Section 4** is most relevant to Level 3 and includes diagnostic measures for specific problems, as well as guidance for performing repair activities.
- **Section 5** provides an overview of planning for maintenance, including techniques for estimating maintenance costs and elements of a maintenance plan.

Section 2. Level 1 Inspections

2.1. How to Use this Section

Section 2 provides guidance for Level 1 inspections of 10 groups of stormwater management practices (SMPs). See Section 1 of this chapter for an explanation of Level 1 in the Maintenance Hierarchy.

- **Section 2.2** provides general guidance for Level 1 inspections.
- **Sections 2.3 through 2.12** provide detailed Level 1 inspection guidance and inspection forms for each of the 10 practice categories:
    - 2.3 Rainwater Harvesting
    - 2.4 Disconnection and Sheetflow
    - 2.5 Swales
    - 2.6 Tree Planting
    - 2.7 Bioretention
    - 2.8 Green Roofs
    - 2.9 Permeable Pavement
    - 2.10 Ponds and Wetlands
    - 2.11 Infiltration
    - 2.12 Sand and Organic Filters

2.2. General Guidance for Level 1 Inspections

Regardless of which practice you are inspecting, some key procedures and equipment are necessary. Read through this guidance before going on an inspection, and use the specific guidance in **Sections 2.3 through 2.12** for the particular practice type you are inspecting. The Level 1 Inspection can be completed with minimal previous training. Typical Level 1 inspectors may include a property owner or manager (for private SMPs) or perhaps an intern or maintenance or landscape crew members in the case of a publicly owned practice. Level 1 inspections are the most frequent inspections. They are designed to identify key maintenance issues before they become more serious and to help keep up with routine maintenance tasks.

When to Conduct a Level 1 Inspection

The Level 1 Inspection should be conducted at least annually for all practices and is often supplemented with additional visits after large storms, winter salting and sanding, or other seasonal changes. In addition, it is recommended that inspections take place more frequently during the first few years after installation of an SMP. Many issues can be identified and corrected during this early period so that they do not lead to larger problems in subsequent years. Plant establishment and health is one of these key issues. Once the SMP is stable and seems to be functioning properly, the inspections can become less frequent.

What to Take into the Field

The Level 1 Inspection is fairly simple, and it is assumed that very little measurement will be needed. However, the inspector should take pictures to document findings and should also keep a record of the inspections. The list of needs for the Level 1 Inspection includes the following:

1. Safety vest (if SMP is located in an area near traffic)
2. Notes or records from past inspections
3. Digital camera or phone
4. Clipboard and pencils (if using paper forms), or Tablet or smartphone if using digital forms
5. Bug spray (if needed)
6. Sun block (if needed)
7. Tape measure (optional, to measure pipe sizes and SMP dimensions)
8. Letter of permission to access property if the inspector is from an outside agency (e.g., summer intern working for the municipality)
9. Site Plan showing SMPs, Planting Plan (includes planting/seed mixes) and details
10. Engineers scale
11. Flagging/stakes and waterproof marker (to mark problem areas that need to be visited again)

Checklist and Follow-Up Actions

The Level 1 Inspection checklists included in **Sections 2.3 through 2.12** describe follow-up actions for each observed condition (See **Figure 2.2.1** for an example). A Level 1 Inspection Table is available for each component or key area of the particular SMP group. Use as follows:

- Check the box in the LEFT column if the problem is present at the site.
- Check the appropriate follow-up actions in the RIGHT column, or add your own as needed to fix the problem.
- DOCUMENT all your actions. Keep copies of the Level 1 inspection tables, plus notes, photos, or other documentation of corrective measures to fix problems. Record dates of actions and any follow-up inspections. This will be important for communicating with Level 2 inspectors and/or the local stormwater program.
- Activate a Level 2 Inspection (**Section 3**) as guided by the table (shown in blue cells): These blue cells identify conditions when a more detailed inspection will be needed to further diagnose problems. As the problem becomes more severe, it will be necessary to activate a Level 2 inspection. Consult the local stormwater program authority for the most appropriate Level 2 inspection option.

RWH 3. Outlets

Description: An above-ground rainwater harvesting tank usually has at least two outlets—one at the top of the tank where water overflows when the tank is full, and one near the bottom of the tank for delivering the stored water by gravity feed. Many filters also have an outlet pipe to divert the first flush of roof runoff away from the tank. Any overflow outlet that spills onto the ground should have sufficient erosion control (e.g., rock or stone pad) to prevent erosion of the ground.

Instruction: Examine the outlet pipe(s) and the point at which it overflows onto the ground. Consult **Table 2.3.3** below.

Table 2.3.3 RWH Outlets

Problem (Check if Present)	Follow-Up Actions
☐ Slow flow from outlet caused by faulty or clogged valve	☐ If clogging seems to be the problem, ream out sediment from valve if this can be done from exterior. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Valve needs to be replaced or cannot be cleaned out from outside of tank.
☐ Flow from outlet is backing up toward building foundation.	☐ Add flexible pipe to end of outlet pipe to divert flow further away and downhill from building.
☐ Erosion or drainage issues at outlet	☐ Add a gravel and/or stone pad to reduce the impact from the water flowing out of the outlet pipe during storms. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills have formed, erosion or drainage problems are more severe or cannot be resolved, or there is discoloration or other unusual conditions around the outlet.

2.4. Disconnection and Sheetflow

Components of Disconnection and Sheetflow

The intent of disconnection and sheetflow is for runoff from small areas of impervious cover to spread out evenly and dissipate in a grassy or vegetated area. It is a low-technology practice intended to reduce runoff at its source. Key components to inspect for Disconnection and Sheetflow include the following:

- D&S 1. Drainage Area
- D&S 2. Level Spreader/Energy Dissipator
- D&S 3. Treatment Area

Figure 2.4.1 Key Areas for Level 1 Inspection of Disconnection and Sheetflow with filter strip shown.

R. Winston, NCSU

Note: The category of Disconnection and Sheetflow includes:

- Rooftop Disconnection – Runoff from a small rooftop is directed to a relatively flat pervious area.
- Sheetflow to Filter Strip – Runoff from a small parking lot, sidewalk, or other small impervious surface is directed to a relatively flat, uniformly graded grassy area.
- Sheetflow to Riparian Buffers – Runoff from a small parking lot, sidewalk, or other small impervious surface is directed to a relatively flat, well-vegetated riparian area.

Disconnection and Sheetflow Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (D&S 1), Level Spreader/Energy Dissipater (D&S 2), and Treatment Area (D&S 3). This inspection should be conducted twice per year, preferably in the spring and fall. If possible, inspect the practice during a storm in order to better see any active blockages, bypassing, or other problems.

D&S 1. Drainage Area

Description: The drainage area consists of rooftops and/or impervious surfaces such as parking lots, driveways, or sidewalks. Pervious areas such as lawns or forests may also be part of the drainage area.

Instruction: Visually inspect any surfaces in the drainage area. Consult **Table 2.4.1** below.

Table 2.4.1 D&S Drainage Area

Problem (Check if Present)		Follow-Up Actions
	☐ Changes in flow; more runoff; runoff bypassing the practice	☐ For rooftop areas, make sure downspouts are still disconnected and conveying water into the treatment area. ☐ Look for and remove any “dams” of sediment and grass clippings that prevent water from entering the treatment area as sheet flow. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Changes to drainage area size or amount of runoff due to construction, tillage, etc.
	☐ For parking lots in the drainage area—sediment, grass clippings, or other debris has accumulated at pavement edge.	☐ For small, isolated amounts of debris, sweep up by hand and dispose properly so that it will not be exposed to runoff. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Sediment is widespread and cannot be removed by manual sweeping.
	☐ For parking lots in the drainage area—dips or damage at pavement edge caused flow to concentrate.	☐ Kick-Out to Level 2 Inspection: This will likely require special expertise to diagnose and fix pavement edge.

D&S 2. Level Spreader/Energy Dissipator

Description: Some disconnection and sheetflow practices have a structure in place to dissipate any concentrated runoff and turn it into sheet flow. This may consist of a stone or gravel spreader a concrete or wood level spreader, or other level and stable surface.

Instruction: Inspect the energy dissipator closely, during a rain event if possible. Consult the **Table 2.4.2** below.

Table 2.4.2 D&S Level Spreader/Energy Dissipator

Problem (Check if Present)		Follow-Up Actions
	☐ Debris and/or sediment accumulated behind or around the level spreader.	☐ Remove debris and sediment by hand and ensure that the area behind the level spreader is relatively flat. Too much debris and sediment can cause runoff to bypass the level spreader structure. ☐ Other:
	☐ Sinking, cracking, sloughing, or other structural problem makes the energy dissipator no longer level.	☐ For stone/gravel spreaders, add new material or rake out as needed to make it even. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Structural issues that cannot be easily fixed by hand

D&S 3. Treatment Area

Description: After runoff is dissipated as sheet flow, it enters the treatment area–a relatively flat grassy or vegetated area.

Instruction: Examine where flow enters the treatment area as well as the whole flow path. Look for signs of concentrated flow. Consult the table below.

Table 2.4.3 D&S Treatment Area

Problem (Check if Present)	Follow-Up Actions
☐ Trash and/or debris in the treatment area	☐ Collect trash/debris and dispose of properly.
☐ Grass filter strip has grown very tall, to the point that runoff cannot easily enter or is getting concentrated.	☐ Mow filter strip twice a year or more frequently in a residential yard.
☐ Sparse vegetation or bare spots	☐ For grassy areas, add topsoil (as needed), grass seed mulch, and water during the growing season to re-establish consistent vegetation cover. ☐ Other:
☐ Rills or gullies are forming in treatment area where flow has become concentrated	☐ For minor rills, fill in with soil, compact, and add seed and straw to establish vegetation. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Rills are more than 2" to 3" deep and require more than just hand raking and re-seeding.

2.5. Swales

Areas of Swales

- Key areas to inspect for swales include the following:
- SW 1. Drainage Area
- SW 2. Inlets
- SW 3. Swale Surface Area
- SW 4. Vegetation
- SW 5. Outlets

Note: The category of Swales includes:

- Vegetated Swale – shallow channel densely planted with variety of grasses, shrubs, and/or trees (also called bioswale or drainage swale)
- Wet Swale – a cross between a wetland and a swale, this linear system intercepts groundwater to maintain wetland vegetation

For the purposes of this chapter, the term “Swale” will be used to generally describe these practices.

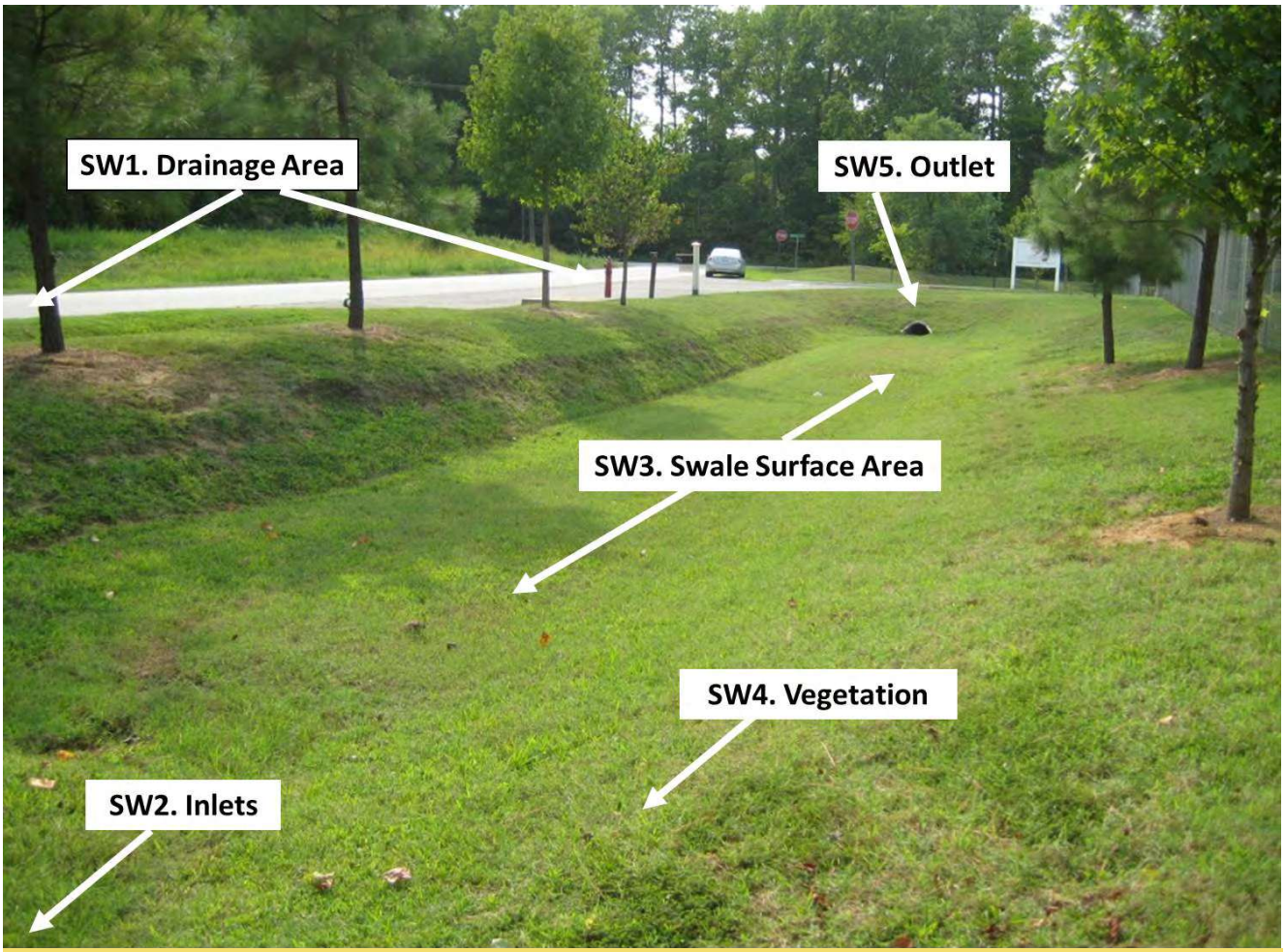


Figure 2.5.1 Key Areas for Level 1 Inspection of Swales Credit

Swale Level 1 Inspection

The Level 1 Inspection focuses on the Drainage Area (SW1), Inlets (SW2), Swale Surface Area (SW3), Vegetation (SW4), and Outlets (SW5). This inspection should be conducted on a regular basis, with an early spring inspection to ensure that the practice has survived the winter, particularly if there has been a significant amount of snow. An inspection during the growing season or in the early fall is also recommended to check on the health of vegetation.

SW 1. Drainage Area

Description: The drainage area sends runoff to and is uphill from the swale. When it rains, water runs off and flows to and along the swale.

Instruction: Look for areas that are uphill from the swale. Consult **Table 2.5.1** below.

Table 2.5.1 SW Drainage Area

Problem (Check if Present)	Follow-Up Actions
☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch or sod areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and add seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths
☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous.
	Kick-Out to Level 2 Inspection: Grass on edge of pavement continues to die off for unknown reasons. Swale edge may need to be replaced with other materials (e.g., stone diaphragm).
☐ Grass dying at edge of road	☐ Seed and mulch; add topsoil or compost if needed. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Grass on edge of pavement continues to die off for unknown reasons. Swale edge may need to be replaced with other materials (e.g., stone diaphragm).

SW 2. Inlets

Description: The inlets to a swale are where water flows in. Depending on the design, water can flow in through:

- Ditch, pipe, or curb opening at top of swale: This is the most common approach, where water enters the swale at the top.
- Along the entire edge of the swale: If the swale is along a roadway or parking lot, water may enter along the long side of the swale through defined curb openings or simply by water flowing into the swale from the pavement edge (known as “sheetflow”).

Instruction: Stand in the swale and look for all the places where water flows in. Consult **Table 2.5.2** below for possible problems.

Table 2.5.2 SW Inlets

Problem (Check if Present)	Follow-Up Actions
☐ Inlets or the swale edge are collecting grit, grass clippings, or debris or have grass/weeds growing. Some water may not be getting into the swale. The objective is to have a clear pathway for water to flow into the swale.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or opening). Parking lots will generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds, and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets or along the edge of the swale where water is supposed to enter. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the swale. ☐ Dispose of all material properly in an area where it will not re-enter the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the swale.
 ☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion are present, or there is bare dirt that is washing into the swale.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying an erosion control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Level 2 Inspection: Erosion is occurring at most of the inlets or along much of the swale edge. The inlet design may have to be modified.

SW 3. Swale Surface Area

Description: The swale surface area is the vegetated area where water flows during a storm and also the side slopes that slope down into the swale bottom. Depending on the design, the swale may also contain "check dams," which are small dams made out of earth, stone, wood, or other materials. The check dams slow down and temporarily pond water as it flows down the swale.

Instruction: Examine the entire swale surface and side slopes. Consult **Table 2.5.3** below for possible problems.

Table 2.5.3 SW Surface Area

Problem (Check if Present)	Follow-Up Actions
☐ Minor areas of sediment, grit, trash, or other debris are accumulating in the swale.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the swale. ☐ If removing the material creates a hole or low area, fill with good topsoil and add seed and straw to re-vegetate. ☐ Remove trash, vegetative debris, and other undesirable materials. ☐ If the swale is densely vegetated, it may be difficult to do the maintenance; check for excessive ponding or other issues described in this section to see if the accumulated material is causing a problem. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 3 inches deep and covers 25% or more of the swale surface. ☐ The source of sediment is unknown or cannot be controlled with simple measures.
 ☐ There is erosion in the bottom or on the side slopes. Water seems to be carving out rills as it flows through the swale or on the slopes.	☐ Try filling the eroded areas with clean topsoil, and then seed and mulch to establish vegetation. ☐ If the problem recurs, you may have to use some type of matting, stone (e.g., river cobble), or other material to fill in eroded areas. ☐ If the erosion is on a side slope, fill with soil and cover with erosion-control matting or at least straw mulch after re-seeding.
	☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3 inches deep and seems to be an issue with how water enters and moves through the swale. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water, but a collapse or sinking of the surface (e.g., "sinkhole") due to some underground problem.
☐ Water does not flow evenly down the length of the swale, but ponds in certain areas for long periods of time (e.g., 72 hours after a storm). The swale does not seem to have "positive drainage." Check during or immediately after a rain storm.	☐ If the problem is minor (just small, isolated areas), try using a metal rake or other tools to create a more even flow path; remove excessive vegetative growth, sediment, or other debris that may be blocking the flow. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Water ponds in more than 25% of the swale for three days or more after a storm. The issue may be with the underlying soil or the grade of the swale. ☐ Water ponds behind check dams for three days or more after a storm. Check dams may be clogged or not functioning properly.

Table 2.5.3 SW Surface Area	
Problem (Check if Present)	**Follow-Up Actions**
 ☐ Check dams (if present): water is flowing around the edges of check dams, creating erosion or sinkholes on the uphill or downhill side, or the check dams are breaking apart or breaching.	☐ If the problem is isolated to just a few check dams, try simple repairs. ☐ It is very important for the center of each check dam (where most of the water flows) to be lower (by at least several inches) than the edges of the check dams where they meet the side slopes. Also, the check dams should be keyed into side slopes so water does not flow between the check dam and side slope. ☐ Use a level to check the right check-dam configuration, as noted above. Repair by moving around stone, filling and compacting soil, or adding new material so that water will be directed to the center of the check dam instead of the edges. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Many check dams are impacted and/or the problem seems to be a design issue with height, spacing, shape, or materials used to construct them.

SW 4. Vegetation

Description: The health of vegetation within the swale is perhaps the most critical maintenance item for the property owner or responsible party. Many vegetated swales become overgrown, and “desirable” vegetation becomes choked out by weeds and invasive plants. It is important to know what the swale is supposed to look like and what plants seem to be thriving or doing poorly. Periodic maintenance of vegetation will prevent larger problems that are more difficult and costly to manage.

Instruction: Examine the swale vegetation. Consult **Table 2.5.4** below for possible problems.

Table 2.5.4 SW Vegetation

Problem (Check if Present)	Follow-Up Actions
 ☐ Vegetation is too overgrown to access swale for maintenance activities	☐ Mow or bush-hog the path. ☐ Other:
 ☐ Vegetation requires regular maintenance: pulling weeds, removing dead and diseased plants, adding plants to fill in areas that are not well vegetated, etc.	☐ If you can identify which plants are weeds or not intended to be part of the planting plan, eliminate these, preferably by hand pulling. ☐ If weeds are widespread, check with the local stormwater authority and/or Extension Office about proper use of herbicides for areas connected with the flow of water. ☐ Even vegetation that is intended to be present can become large, overgrown, block flow, and/or crowd out surrounding plants. Prune and thin accordingly. ☐ If weeds or invasive plants have overtaken the whole swale, bush-hog the entire area before seed heads form in the spring. It will be necessary to remove the root mat manually or with appropriate herbicides, as noted above. ☐ Replant with species that are aesthetically pleasing and seem to be doing well in the swale. ☐ Other: ☐ Kick-Out to Level 2 Inspection: You are unsure of the original planting design or the vegetation maintenance task is beyond your capabilities of time, expertise, or resources. If you are unsure of the health of the vegetation (e.g. salt damage, invasives, which plants are undesirable) or the appropriate season to conduct vegetation management, consult a landscape professional before undertaking any cutting, pruning, mowing, or brush hogging.
☐ Vegetation is too thin, is not healthy, and there are many spots that are not well vegetated.	☐ The original plants are likely not suited for the actual conditions within the swale. If you are knowledgeable about plants, select and plant more appropriate vegetation (preferably native plants) so that almost the entire surface area will be covered by the end of the second growing season. ☐ Other: ☐ Kick-Out to Level 2 Inspection: For all but small practices (e.g., in residential yards), this task will likely require a landscape design professional or horticulturalist.

SW 5. Outlets

Description: These are where water leaves the swale when it fills up or where water reaches the downstream end of the swale. There may be a small stone apron or rock dam here or even an outlet grate.

Instruction: Examine outlets that release water out of the swale. Consult **Table 2.5.5** below for possible problems.

Table 2.5.5 SW Outlets

Problem (Check if Present)	Follow-Up Actions
☐ Outlet is obstructed with mulch, sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Outlet is completely clogged or obstructed; there is too much material to remove by hand or with simple hand tools.

2.6. Tree Planting

Tree Planting Actions for Maintenance

Key actions to take for tree planting maintenance include the following:

- TP1. Watering
- TP2. Mulch
- TP3. Pruning
- TP4. Disease or pests

Note: This is a simple, "non-structural" practice and, as such, maintenance tasks are similar to any landscape maintenance. Tree planting can involve individual trees or more, such as reforesting a riparian buffer.

For this type of practice, inspection is part of maintenance to check on the health of the trees.

Figure 2.6.1. Key Areas for Inspection and Maintenance for Tree Planting

Tree Planting Level 1 Inspection

The Level 1 Inspection goes hand in hand with active maintenance and includes watering (TP1), mulching (TP2), and Pruning (TP3). Watering should occur during the growing season. Mulching and pruning occurs once a year in the spring and early spring, respectively.

TP 1. Watering

Description: Proper water management is perhaps the most crucial maintenance activity to ensure survival of newly planted trees. Watering is essential during periods of drought, while over watering can be fatal. Watering options include regular or soaker hoses, sprinklers, buckets, drip irrigation, or installation of larger capacity watering tanks for irrigation systems. Consult the maintenance plan for instructions on the timing, volume, and method of watering that is appropriate for the specific species of trees.

Instruction: Inspect the trees to determine whether they need watering. Consult **Table 2.6.1** below.

Table 2.6.1 TP Watering

Problem (Check if Present)	Follow-Up Actions
☐ Soil is not moist to the touch and/or it has not rained in a week, and leaves/needles are starting to appear wilted/dry.	☐ Water trees deeply and slowly near the base. Soaker hoses and drip irrigation work best for deep watering of trees and shrubs. ☐ Other:

2.10. Ponds and Wetlands

Areas of Ponds and Wetlands

Key areas to inspect for ponds and wetlands include the following:

- PO 1. Drainage area
- PO 2. Inlet pipes and swales
- PO 3. Pond area and embankments
- PO 4. Pond outlet

Note: This category includes the following practices:

- *Wet ponds* – have a permanent pool of water and may be divided into various "cells"
- *Stormwater wetlands* – have a variety of depth zones ranging from deep pools to shallow wetlands and are characterized by wetland vegetation

It is recommended strongly to have as-built drawings and copies of previous inspections at hand, if available. Aerial photos may be needed to help direct the inspector to the pond or wetland location if it is obscured by vegetation.

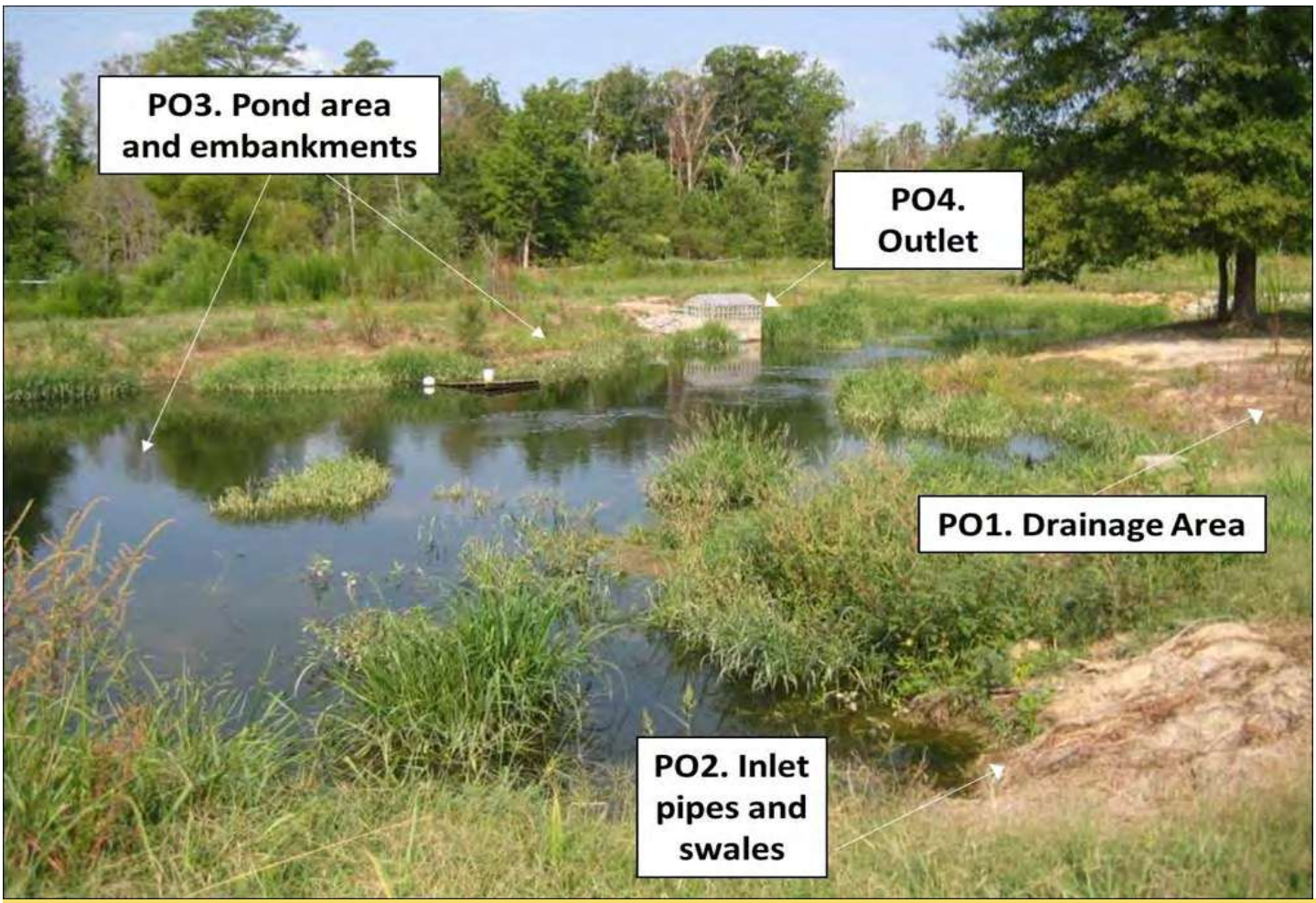


Figure 2.10.1. Key Areas for Level 1 Inspection of a Pond/Wetland

Pond and Wetland Level 1 Inspection

The Level 1 Inspection focuses on the drainage area (PW 1), inlet pipes or swales (PW 2), pond area and embankments (PW 3) and pond outlet structures and outfall (PW 4). This inspection should be conducted on a regular basis to ensure that a buildup of trash, vegetation, or sediment does not interfere with the pre-treatment, pond or wetland, and the outfall's normal flow or function. Pond embankments and dams should be regularly inspected for evidence of erosion, burrowing or tunneling animals, and large woody vegetation growing on the dam.

PW 1. Drainage Area

Description: The drainage area conveys runoff to and is uphill from the pond inlet. When it rains, water runs off through roof drains, yard drains, parking lots, roadways and underdrains to the ponds. Flow is through underground piping systems, overland via swales, or across the ground as sheetflow. Sometimes, the runoff will contain dirt, grit, grass clippings, leaves and woody debris that can collect in the drainage system. If left alone, blockages can occur and increase the chance of shallow flooding or standing water. Standing water in drainage systems foster mosquitos, pipe corrosion, and possible nuisance and odor conditions.

Instruction: Look for areas that are uphill from the pond. Consult **Table 2.10.1** below:

Table 2.10.1 PW Drainage Area

Problem (Check if Present)	Follow-Up Actions
☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in eroded areas with soil, compact, seed and mulch with straw to establish vegetation. ☐ Other: ☐ Kick-Out to Level 2 Inspection: If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ If large areas of soil have been eroded or larger channels are forming, this may require rerouting of flow paths or use of an erosion-control seed mat or blanket to reestablish acceptable ground cover or anchor sod where it is practical.
☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Remove excessive vegetation or woody debris that can block drainage systems. ☐ Other:
☐ Open containers of oil, grease, paint, or other substances exposed to rain in the drainage area	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

PW 2. Pond Inlets

Description: Free, unobstructed flow from the drainage area to stormwater ponds is necessary to prevent shallow flooding and even structural damage from flooding. Pond inlets can consist of pipes, ditches, swales, or other means to convey stormwater to the pond or wetland.

Instruction: Look for all areas where water flows into the pond during storms. Note that there may be multiple points of inflow and types of structures (e.g., pipes, open ditches, etc.). Consult **Table 2.10.2** below:

Table 2.10.2 Pond Inlets

Problem (Check if Present)	Follow-Up Actions
☐ Inlets are buried, covered or filled with silt, debris, or trash, or blocked by excessive vegetation.	☐ If the problem can be remedied with hand tools and done in a safe manner, remove vegetation, trash, woody debris, etc. from blocking inlet structures. ☐ Other: ☐ Kick-Out to Level 2 or 3 Inspection: If the amount of material is too large to handle OR there are ANY safety concerns about working in standing water, soft sediment, etc., the work will likely have to be performed by a qualified contractor.
☐ Inlets are broken, and, with pieces of pipe or concrete falling into the pond, there is erosion around the inlet, there is open space under the pipe, or there is erosion where the inlet meets the pond	☐ Kick-Out to Level 2 Inspection: These types of structural or erosion problems are more serious and will require a qualified contractor to repair.

PW 3. Pond Area and Embankments

Description: The pond area and embankment can consist of the following elements:

- Pre-treatment cell or small holding area where water first flows into the pond from the various inlets. These are commonly referred to as “forebays” and will be demarcated from the main pond area by small dams made of earth or rock. The purpose of forebays is to capture some of the sediment and pollutants before they reach the deep pool, making maintenance easier over time. Not all ponds will have forebays.
- The pond surface can be open water or a combination of open water and areas with wetland vegetation. Sometimes there is a shallow bench around the perimeter of a pond, known as an “aquatic bench.”
- The “side slopes” are areas around the perimeter of the pond where the surrounding land slopes down to the pond surface.
- Most ponds will have a “riser structure,” where the water exits a pond during storms. This can be a concrete or metal pipe that is open at the top, often with some type of trash rack. Some ponds also have an “emergency spillway,” which is an open, rock-lined channel that carries water from large storms safely across the embankment.
- The dam or embankment holds water in the pond and is constructed of compacted soil, such as clay. There is often a pipe through the embankment that carries water from the riser structure safely through the embankment to the downstream channel.

The pond’s pre-treatment areas or forebays should not be choked with vegetation or full of sediment. Removal of excessive vegetation and sediment and selective replanting are often annual maintenance activities.

Likewise, the pond’s deep pool should not to be choked with vegetation or filled with sediment. Vegetation and sediment bars can restrict flow and cause short circuiting that reduces capture of sediment. Pond volume is to be maintained at the original design capacity and free of sediment bars or debris piles. Sometimes ponds are over-maintained and have no vegetation. Algae and turbidity (muddy water) are common problems in many ponds.

Instruction: Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Table 2.10.3 PW Pond Area and Embankments

Problem (Check if Present)		Follow-Up Actions
	☐ The pretreatment area(s) or forebay(s) are filled with sediment, trash, vegetation, or other debris.	☐ If the problem can be remedied with hand tools and done in a safe manner, use a flat shovel or other equipment to remove small amounts of sediment. ☐ Remove trash and excessive vegetation from forebays if this can be done in a safe manner. ☐ Other:
		☐ Kick-Out to Level 2 Inspection: Large amounts of sediment or debris will have to be removed by a qualified contractor. ANY condition that poses a safety concern for working in standing water or soft sediments should be referred to a Level 2 Inspection or qualified contractor.

Table 2.10.3 PW Pond Area and Embankments		
Problem (Check if Present)		**Follow-Up Actions**
	☐ The pond area itself has accumulated sediment, trash, debris, or excessive vegetation that is choking the flow of the water, OR the pond area is covered with algae or aquatic plants.	☐ Level 1 includes handling only small amounts of material that can be removed by hand, or with rakes or other hand tools. Do not attempt any repair that poses a safety issue. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Most cases will call for a Level 2 Inspection and/or a qualified contractor. ☐ You are not sure what type and amount of vegetation is supposed to be in the pond. ☐ The algae or aquatic plants should be identified so that proper control techniques can be applied.
	☐ The side slopes of the pond are unstable, eroding, and have areas of bare dirt.	☐ If there are only minor areas, try filling in small rills or gullies with topsoil, compacting, and seeding and mulching all bare dirt areas with an appropriate seed. Alternatively, try using herbaceous plugs to get vegetation established in tricky areas, such as steep slopes. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Erosion and many bare dirt areas on steep side slopes will require a Level 2 Inspection and repair by a qualified contractor.
 	☐ The riser structure is clogged with trash, debris, sediment, vegetation, etc., OR is open, unlocked, or has a steep drop and poses a safety concern. The pond level may have dropped below its "normal" level.	☐ If you can safely access the riser on foot or with a small boat, clear minor amounts of debris and remove it from the pond area for safe disposal. ☐ Other: ☐ Kick-Out to Level 2 Inspection: The riser cannot be accessed safely, the amount of debris is substantial, or the riser seems to be completely clogged and the water level has risen too high. ☐ There are safety issues with the riser and concern about access to pipes, drops, or any other life safety concern. ☐ The riser is leaning, broken, settling or slumping, corroded, eroded or any other structural problem.

Table 2.10.3 PW Pond Area and Embankments		
Problem (Check if Present)		**Follow-Up Actions**
	☐ The dam/embankment is slumping, sinking, settling, eroding, or has medium or large trees growing on it.	☐ If there are small isolated areas, try to fix them by adding clean material (clay and topsoil) and seeding and mulching. ☐ Periodically mow embankments to enable inspection of the banks and to minimize establishment of woody vegetation. ☐ Remove any woody vegetation that has already established on embankments. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Most of these situations will require a Level 2 Inspection or evaluation and repair by a qualified contractor. Seepage through the dam or problems with the pipe through the dam can be a serious issue that should be addressed to avoid possible dam failure.
	☐ The emergency spillway or outfall (if it exists) has ☐ erosion, settlement, or loss of material. Rock-lined spillways have excessive debris or vegetation.	☐ Clear light debris and vegetation. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Displacement of rock lining, excessive vegetation and erosion/settlement may warrant review and decision by Level 2 Inspector to check against original plan. ☐ Any uncertainty about the integrity of the emergency spillway should be referred to a Level 2 Inspector. ☐ Erosion or settlement such that design has been compromised should be reviewed by an engineer.

PW 4. Pond Outlet

Description: The pond's outlet enables the ponded water to discharge to downstream drainage systems or stream channels. The outlet is often at the base of the dam/embankment on the downstream side. Inspection of this point can help prevent flooding of the pond and upstream drainage systems and prevent pond failure at a weak point of a pond's containment system.

Instruction: Examine the outlet of the pipe on the downstream side of the dam/embankment where it empties into a stream, channel, or drainage system. Consult the table below for possible problems.

Table 2.10.4 PW Pond Outlet

Problem (Check if Present)	Follow-Up Actions
 ☐ The pond outlet is clogged with sediment, trash, debris, vegetation, or is eroding, caving in, slumping, or falling apart.	☐ If there is a minor blockage, remove the debris or vegetation to allow free flow of water. ☐ Remove any accumulated trash at the outlet. ☐ Outlet: ☐ Kick-Out to Level 2 Inspection: ☐ If the area at the outlet cannot be easily accessed or if the blockage is substantial, a Level 2 Inspection is warranted. ☐ Erosion at and downstream of the outfall should be evaluated by a qualified professional. ☐ Any structural problems, such as broken pipes, structures falling into the stream, or holes or tunnels around the outfall pipe, should be evaluated by a Level 2 Inspector and will require repair by a qualified contractor. ☐ The pool of water at the outlet pipe is discolored, has an odor, or has excessive algae or vegetative growth.

2.11. Infiltration

Areas of Infiltration

Key areas to inspect for Infiltration include the following:

- IN 1. Drainage Area
- IN 2. Inlets
- IN 3. Infiltration Area
- IN 4. Outlets

Note: The category of Infiltration includes:

- Infiltration Trench – Long, narrow infiltration practice, usually with small gravel at the surface and a reservoir of larger gravel or stone beneath
- Infiltration Basin – Larger practice, usually covered with grass and highly permeable soil beneath
- Dry Well – Small pit filled with stone or gravel, or precast concrete chamber surrounded by stone that receives and stores runoff to enable it to infiltrate into the underlying ground.

Figure 2.11.1 Key Areas for Level 1 Inspection of Infiltration Practice

3.2. General Guidance for Level 2 and 3 Inspections

The Level 2 inspection will typically be performed by a municipal employee or landscape contractor with some training in stormwater operations and maintenance. Regardless of which type of practice is being inspected, some key procedures and equipment are necessary. Read through this guidance before going on an inspection, and use the specific guidance in **Sections 3.3 through 3.12** for the practice you are inspecting. While much of the equipment and general procedures are somewhat similar to Level 1 inspections, additional information is provided for Level 2 inspectors below.

When to Conduct a Level 2 Inspection

The Level 2 Inspection is needed for two reasons. First, routine inspections to comply with local stormwater regulations typically require a Level 2 inspector. In addition, a Level 2 inspection may be triggered to address or diagnose problems identified during a Level 1 inspection. In this situation, the Level 2 inspector should confer with the Level 1 inspector about problems they have identified and then conduct a follow-up inspection that focuses more on diagnosing the causes of the problems and possible solutions. The checklists in **Appendix B** and other resources cited in **Sections 3.3 through 3.12** can be used as tools.

The frequency of this type of inspection may be defined by the municipality. As with Level 1 inspections, the frequency may change with the age of the SMP, with higher frequencies the first couple of years after installation. Well-established and well-maintained practices may only need to be inspected every few years.

Notifying the Responsible Party

Consult the plan file and maintenance agreement to ascertain the responsible party. Confirm that there is right of access through the local code, signed maintenance agreement, or other means. Contact the responsible party at least three business days in advance of the proposed inspection. If the responsible party cannot be found or contacted, make a reasonable effort through file research to contact a property representative, and document these efforts in writing. If the inspection is in response to a Level 1 inspection and referral to your agency, try to speak with the person who conducted the Level 1 inspection and get any documentation they may have. For publicly owned and managed SMPs, the responsible party will likely be the municipality or other regulated MS4.

What to Take in the Field

Level 2 inspections may require more measurement and, as a result, need some additional materials. In addition, the Level 2 inspection may involve gaining access to private property. Consequently, additional identification is needed for these inspections. A list of recommended items to take in the field is provided in **Table 2.2.1**.

Table 3.2.1 What to Take in the Field for a Level 2 Inspection

- Safety equipment: safety vest, steel-toe shoes, traffic cones if working near traffic, etc.
- Approved plan and as-built (record drawing) if available
- Records of previous inspections if available
- Engineering scale
- Hand level and pocket rod if needed to measure relative elevations
- Digital camera
- Several copies of SMP checklist if paper forms are used (**Appendix B**)
- Clipboard and pencils if paper forms are used
- Dry erase white board and marker (optional) to include in photos to keep track of SMP tracking # in municipal database (see **Figure 3.2** as example)
- Letter on municipal letterhead granting access and/or agency photo badge
- Pipe wrench to open underdrain clean-out caps
- Flashlight to look into underdrain cleanouts and/or manholes
- Manhole puller
- Soil probe or auger
- 100' measuring tape
- Shovel
- Bug spray

Conducting the Inspection

In general, the inspection should follow a consistent, logical approach, such as outlined below.

- Conduct a quick tour of the practice to identify any obvious issues and important components: inlets (number, location), surface area, overflow structures, berms or impoundments, outfalls, downstream conveyance channels or receiving waters. Check these components against the design plan or as-built drawing (if available).
- Starting at the outlet or low point, use the checklists provided in Appendix B to evaluate the practice. The inspection will proceed from the outlet or outfall to the stormwater treatment area, berms, side slopes, inlets, and drainage area. Make sure to fill in key information on the inspection form, such as SMP identifier number, site name, inspector name, date, and weather conditions.

Figure 3.2. A white board and digital camera can be handy to note SMP tracking #, date of inspection, and other forms of documentation. Note that an inspector may alternatively tag photographs, particularly if they are recorded on a smartphone or Tablet.

- Take photos of important components or maintenance concerns, and mark photo locations and direction on a sketch.
- Review the inspection form before leaving the site to make sure that all necessary information has been collected.

Follow-Up Actions

Immediate follow-up actions include entering the inspection information in the appropriate database or hard copy file, downloading and labeling photos, and providing other necessary documentation.

Another possible follow-up action would be to activate a Level 3 inspection in certain situations. The Level 2 inspector will have to make a judgement call as to whether observed problems warrant a Level 3 investigation, and will also have to coordinate with the responsible party to pursue such an investigation. The Level 2 guidance in this chapter summarizes follow-up actions associated with various observations of SMP condition. Note that these tables are divided into “Level 2” and “Triggers for Level 3” follow-up actions, with Level 2 actions in *blue* cells and Level 3 in *green* cells. Consult **Section 4** of this chapter for more guidance on how to diagnose and correct some of the maintenance items included in these tables.

Another follow-up action involves communicating problems and corrective measures to the responsible party (private or public). This may involve instructing the responsible party to undertake a Level 3 inspection or to provide a timeframe for correcting simpler issues that do not require Level 3 involvement. Many local programs have existing procedures for sending letters or activating a compliance procedure. These procedures include verifying that repairs and corrections are completed by the responsible party.

Level 3 Inspection Guidance

The Level 3 inspection is typically conducted by a Qualified Professional such as a professional engineer or Landscape Architect. It is assumed that the Level 3 inspector is knowledgeable in stormwater management, as well as engineering and construction practices. The Level 3 inspector will not typically be completing a full practice inspection. This inspection is conducted only in response to problems identified during the Level 2 inspection, is more diagnostic in nature, assumes a greater degree of initial knowledge, and may require more extensive intervention.

The Level 3 inspection is also more results based in that it will lead to a specific repair to address the issue that triggered the inspection. **Section 4** identifies 12 problems typically addressed in a Level 3 inspection and discusses measures to diagnose the cause of the problem, as well as repairs needed to address it. It should be noted that the problems addressed in each **Section 4** subsection can occur in a variety of SMPs (e.g., erosion is a common issue in almost every type of SMP). As a result, each subsection identifies the SMPs where the problem most commonly occurs and, in some cases, an SMP-specific diagnosis procedure.

3.4. Disconnection & Sheet Flow – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Disconnection and Sheetflow practices are:

- Significant damage to level spreader/energy dissipator
- Major erosion

Table 3.4.1 Level 2 Inspection – DISCONNECTION AND SHEETFLOW

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Significant sediment on pavement that drains to disconnection area (e.g., grass strip)	
Condition 1: Sediment on parking lot is widespread Enlist a mechanical sweeper or vacuum sweeper to remove sediment across entire pavement surface. Pay special attention to downhill edges of pavement where more sediment may have accumulated.	• Sediment accumulation is so serious that it cannot be sufficiently removed with mechanical sweeper. May indicate a high sediment load from uphill in the drainage area that needs to be mitigated.
Observed Condition: Pavement edge deteriorating	
Condition 1: Dips or damage at pavement edge causing runoff to concentrate Determine whether the damaged edge is causing significant enough concentration of runoff to warrant repair or regrading of the pavement.	• Edge must be patched or re-paved to make secure and level. • Parking lot not draining properly to the energy dissipator and treatment area.
Observed Condition: Level spreader/energy dissipator	
Condition 1: Level spreader sinking or uneven If basic equipment can be used, prop up and secure any section of level spreader that is sinking. Regrade soil all around level spreader and add stone as necessary to prevent erosion and bypassing. Condition 2: Level spreader is broken These repairs can be simple for small, residential-scale practices, such as at a downspout. Ensure the level spreader is level across, keyed in to soil at the edges, and made of durable material that can withstand the flow of water running across it. Larger or more complicated level spreaders (e.g., concrete) will likely require specialized skill and equipment.	• Level spreader requires specialized equipment, regrading, or large amount of material to make level again. • Level spreader needs to be re-designed and replaced.
Observed Condition: Erosion in treatment area	
Condition 1: Rills from concentrated flow Inspect energy dissipator to see whether it needs to be improved to better spread out incoming flow. Regrade flow path to ensure that it is relatively flat (if minor). If major re-grading is needed, the treatment area may need to be redesigned and fixed with specialized equipment.	• Major rills and gullies • Treatment area needs to be re-designed and major grading needed.

3.5. Swales – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Swales are:

- Standing water, swale not draining properly (not applicable to wet swales)
- Severe erosion around or under check dams
- Large area of vegetation overrun with weeds and/or invasive species
- Severe erosion at outlet that requires redesign

Table 3.5.1 Level 2 Inspection: SWALE

Recommended Repairs	Triggers for Level 3 Inspection
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
Condition 1: Small pockets of standing water Use a soil probe or auger to examine the soil profile. If isolated areas have accumulated grit, fines, or vegetative debris or have compacted soil, try scraping off top 3 to 6 inches of soil and replacing with clean material. Also check to see that surface is level and water is not ponding selectively in certain areas. Condition 2: Standing water is widespread or covers entire surface Requires diagnosis and resolution of problem: Bad or compacted soil Filter fabric on the swale bottom Too much sediment/grit washing in from drainage area? Too much ponding depth? Longitudinal slope is too flat?	• Soil is overly compacted or clogged and problem is not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice (e.g., not enough slope down through the swale).
Observed Condition: Vegetation is predominantly weeds and invasive species	
For a small area, weed and dig up invasive plants. Replant with natives or plants from original planting plan. If longer than 100 feet, develop a new planting plan and have it professionally reviewed.	• Vegetation deviates significantly from original planting plan; swale has been neglected and suffered from deferred maintenance. • Owner/responsible party does not know how to maintain the practice. • For large area, hire a professional to develop a grading plan and develop a planting plan.

Observed Condition: Severe erosion of check dams, inlets, swale bottom, or side slopes	
	• Erosion (rills, gullies) is more than 12-inches deep at inlets or the swale bottom or more than 3-inches deep on side slopes. • Flow paths from the drainage area are higher than expected, such that the swale needs to be redesigned to handle higher flow rates and velocities.
Observed Condition: Significant sediment accumulation, indicating an uncontrolled source of sediment	
Condition 1: Isolated areas of sediment accumulation, generally less than 3-inches deep Sediment source may be from a one-time or isolated event. Remove accumulated sediment and top 2 to 3 inches of swale soil media; replace with clean material. Check drainage area for any ongoing sources of sediment. Condition 2: Majority of the surface is caked with “hard pan” (thin layer of clogging material) or accumulated sediment that is 3-inches deep or more This can be caused by improper construction sequence (drainage area not fully stabilized prior to installation of the swale) or another chronic source of sediment in the drainage area. Augering several holes down along the swale can indicate how severe the problem is; often the damage is confined to the first several inches of soil. Removing and replacing this top layer (or to the depth where sediment incursion is seen in auger holes) can be adequate, as long the problem does not recur.	• More than 2 inches of accumulated sediment cover 25% or more of the swale surface area. • “Hard pan” of thin, crusty layer covers majority of swale surface area and seems to be impeding flow of water along the swale. • New sources of sediment seem to be accumulating with each significant rainfall event.

3.10. Ponds & Wetlands – Level 2 Inspections and Triggers for Level 3

The most likely triggers for a Level 3 Inspection for Ponds and Wetlands are:

- Severe erosion
- Excessive algae or aquatic plants
- Settlement and pipe corrosion
- Major sediment buildup

Table 3.10.1 Level Inspection: PONDS and WETLANDS

Recommended Repairs and Required Skills	Triggers for Level 3 Inspection
Observed Condition: Bare Soil or Erosion in the Drainage Area	
Condition 1: Extensive problem spots, but no channels or rills forming Reseed problem areas. If problem persists or grass does not take, consider hiring a landscape contractor. Condition 2: Problem is extensive, and rills/channels are beginning to form May be necessary to divert or redirect water that is causing the erosion problem. If it appears that simple regrading—such as installing a berm or leveling a low spot–will fix the problem, make repairs and ensure that the problem is repaired after the next storm.	• Large rills or gullies are forming in the drainage area. • An attempt to regrade the drainage area has been unsuccessful. • Fixing the problem would require major regrading (i.e., redirecting more than a 100-square-foot area. • It is not clear why the problem is occurring.
Observed Condition: Manholes or Inlet Pipe Buried or Covered with Vegetation	
Condition 1: Nearest manhole and inlet pipe not found Consult as-built drawings to get to closest suspected location and use metal detector to search for metal manhole cover. If unsuccessful, identify nearest drain inlets and approximate pipe direction to locate next manhole. Condition 2: Manhole located and inspected Never enter a manhole, except by following confined-space entry protocols. If outlet pipe is not visible or greater than 25% full of sediment/debris or trash, it will typically require a qualified contractor to flush, clean and clear blockages. Condition 3: Inlet pipe not found at pond Clear vegetation and brush that may be covering the inlet pipe. Buried inlet pipes may be found through use of a metal probe. Condition 4: Inlet pipe buried in sediment or blocked by vegetation Once located, the pipe path can be cleared of vegetation with brush hook or other brush tools. Light digging may clear sediment from the end of the pipe.	• To locate buried manholes and lost storm lines, it is sometimes necessary to hire a pipeline inspection contractor with televising equipment or ground-penetrating radar and enter at the closest upstream access point. • Locating a buried inlet pipe may require wading in the edge of the pond and using a metal probe and brush axe to find and expose the pipe. • If other than light digging is necessary to remove accumulated sediment, a contractor with heavy equipment may be required.

Table 3.10.1 Level Inspection: PONDS and WETLANDS	
Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Pipe or Headwall Settlement, Erosion, Corrosion or Failure	
Condition 1: Pipe or headwall settlement or failure Severe sinkholes, settlement or corrosion should be kicked out to Level 3 Inspection. Condition 2: Flow not confined to pipe and visible outside pipe wall With flashlight, observe the inside of the pipe and note its condition. Take photographs. Look for sinkholes developing that indicate pipe failure beneath the surface. Kick out to Level 3 inspection.	• Where blockages are visible, a decision is needed on whether to clear them or leave in place. If a third of the pipe is full of sediment, it should be removed by a contractor with pipe-cleaning equipment. • Corrosion of inlet pipes that allows flow around the pipe exterior is a structural concern because it can lead to settlement, sinkholes and undermining pond embankment. Evidence of this type of failure may require specialized pipe-inspection equipment and investigation by an engineer.
Observed Condition: Pond Conditions	
Condition 1: Pond pre-treatment zone is full of sediment or not constructed as shown on as-built drawings. Condition 2: Excessive buildup of sediment or overgrowth If the pre-treatment area or pond pool is overgrown or filled with sediment so that the original design is compromised, corrective measures are required. If plants have died, then replanting is necessary. If none of the original design exists due to alteration or sediment, kick out to Level 3 inspection.	• It may require inspection by an engineer to determine next steps for clearing, replanting or reconstruction. • Erosion or settlement such that design has been compromised should be reviewed by an engineer. Recurring erosion may require redesign and/or regrading to direct flow away from eroding area. • If sediment has filled more than 50% of the pond's capacity, dredging is likely needed and should be evaluated by a qualified contractor. • Removal or control of excessive algae or aquatic plants can be assessed by a qualified pond maintenance company.

Section 4. Diagnostics and Maintenance Measures

4.1. About this Section

Section 4 summarizes the most common problems found in SMPs, as well as typical maintenance or repair solutions. The guidance provided in this section has some similarities to **Section 3** but differs in the following ways:

1. The primary audience for Section 4 is the Level 3 inspector, often a professional engineer, or landscape architect tasked with diagnosing and repairing SMPs that are not working properly. However, the information in Section 4 may also be quite useful for a Level 2 inspector seeking to diagnose a particular problem.
2. The maintenance measures described in this section are more detailed and focus on repairs to specific problems rather than on routine maintenance such as weeding or minor sediment removal.
3. Because the problems described in this section can be applied to several different practices, this section is organized by the type of problem rather than the practice type.

Problems addressed during Level 3 inspection/maintenance are summarized in **Table 4.1**. This list is not exhaustive but does address the most common issues in the SMPs that require some advanced knowledge and skill to inspect and fix. Each problem category is discussed in a separate sub-section.

Table 4.1: Common Inspection/Maintenance Issues for Level 3

Sub-Section/Category	Description
4.2 Contributing Drainage Area – Pollutant Sources	Sediment or pollution sources in the Drainage Area
4.3 Physical Obstructions	Physical obstructions to maintenance access, overflow, or emergency spillway
4.4 Erosion	Erosion on side slopes, practice bottom, at inlet or outlets. Rills and gullies forming where there should be sheetflow
4.5 Departures from Design Dimensions	Practice dimensions have been altered, either due to filling with sediment, redesign or filling in, or improper implementation.
4.6 Improper Flow Pathways	Flow is shortcircuiting the practice, or drainage pathways have been otherwise modified.
4.7 Sediment Buildup	Sediment has accumulated in a pool, practice bottom, pre-treatment area, or vault.
4.8 Clogging	The soil media or other components are clogged, and there may be standing water for longer than intended.
4.9 Vegetation	Excessive, inadequate, and/or unhealthy vegetation to support a practice
4.10 Embankment and Overflow Condition	Issues with an embankment or overflow weir or channel
4.11 Structural Damage	SMP infrastructure, such as concrete or metal elements, have been damaged.
4.12 Pool Stability	Permanent pool of water is at the improper elevation.
4.13 Pool Quality	Permanent pool of water suffers from poor quality due to algal growth or other issues.

4.2. Contributing Drainage Area – Pollutant Sources

Issue applies most commonly to: Sheetflow/Disconnection, Swales, Bioretention, Permeable Pavement, Ponds/Wetlands, Infiltration, and Sand/Organic Filters.

Problem #1: Bare soil washing into SMP from drainage area

General Approach for All Practices:

- Identify the specific source(s) of sediment in the drainage area by tracking sediment flow during a rainfall or looking for a track of sediment staining during dry weather.
- For an active sedimentation event, attempt to filter incoming runoff if conditions allow (e.g., enough space upstream of the practice for temporary ponding). Consider installing a silt fence, silt socks (at curb inlets), staked straw bales, or other filtering material at the inlets of the SMP. This will keep at least some of the sediment from getting into the practice.
- Runoff from active construction should not enter the SMP; divert to a temporary and approved sediment control practice.
- For areas of bare soil *not* due to active construction **(bottom photo)**, prep the soil and re-seed/plant with grass species or other thick ground cover appropriate for the region. May also need starter fertilizer, topsoil, and/or compost.
- For steep slopes with bare soil, consider also installing erosion-control matting to hold soil, seed, and straw in place until the vegetation becomes well established.
- For fill and topsoil stockpiles in the drainage area, provide temporary or permanent cover as soon as possible. Alternatively, surround the base of the stockpile with silt fence, or equivalent, to prevent the transport of sediment-laden runoff.

Helpful Skills:

- Erosion and sediment control knowledge and skills
- Landscaping knowledge to understand appropriate ground cover species for re-vegetating bare areas

Equipment Typically Used for Fixing Sediment Sources:

- Silt fencing and other sediment barriers
- Erosion-control matting and/or straw
- Rakes and shovels
- Light excavation or grading equipment for larger jobs
- Equipment to deliver topsoil or compost as needed
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out
- Starter fertilizer, topsoil, and/or compost

Problem #2: Other pollution sources in the drainage area

General Approach for All Practices:

- Pollutants may include: road salt, oils, fuels, food grease, wash water, paints and solvents, trash, and many others.
- Identify the source(s) of pollution.
- For pollutants spilled on the ground, remove by hand or use absorbents to soak up wet material. Absorbents and other waste materials shall be disposed of properly.
- For materials stored outside, move them to a covered area or build/add cover over the materials. Provide secondary containment, if possible.
- Make sure all waste containers have lids and fix any leaks (**see poor practices in photo at right**).
- For sites prone to frequent oil leaks and staining (e.g., vehicle maintenance yards), consider installing an oil/water separator to pre-treat runoff that enters the SMP.
- For routine dumping of wash water, grease, paints, or other pollutants, enforce behavior change and explain good housekeeping practices.
- Develop a pollution prevention plan for the site to ensure that hazardous materials and other potential pollutants are not stored where they are exposed to rainfall.
- For areas that receive a heavy salt and/or sand load during the winter, consider diverting upslope runoff, especially for practices such as permeable pavement. Some monitoring of winter road or parking lot clearing activities may also be warranted.

Helpful Skills:

- Knowledge of good housekeeping and pollution prevention practices
- Good communication with employees and managers at site (e.g., for correcting bad site operations)

Equipment Typically Used for Correcting Other Pollutant Sources:

- Tarps to cover stockpiles
- Absorbents to soak up spills
- Secondary containment barriers that will hold back any liquids or solids that may leak out of their primary container
- Storage barns, sheds, pole barns and other permanent cover for potential pollutants

4.3. Physical Obstructions

Issue Applies Most Commonly To: Rainwater Harvesting, Sheetflow/Disconnection, Swales, Bioretention, Green Roofs, Ponds/Wetlands, Infiltration, and Sand/Organic Filters

Problem #1: Maintenance access is obstructed

Ground-Level SMPs:

- Where a path for vehicles and construction equipment to access the practice was established during construction but is now overgrown, remove woody vegetation and any other tall vegetation. This path should be bush hogged once or twice a year.
- If the SMP needs a large quantity of trash and/or sediment removed in areas where access is limited due to steep grades, overgrown vegetation, etc., it will be necessary to establish safe vehicular access by clearing and possibly re-grading the area. It is advisable to have a maintained, all-weather surface to critical parts of the SMP.
- It is most important to provide access nearest to parts of the practice where sediment and trash tend to accumulate the most: forebay and riser structure.
- For an SMP blocked by fences **(photo at right)**, install a gate that is wide enough for vehicles to enter for any current or future maintenance.
- Sometimes access is blocked by unauthorized structures, such as sheds, property fences, retaining walls, etc. Confer with the local stormwater authority on the presence of any maintenance easements and means to gain access to the practice.
- The solutions above should also provide for safe foot access for routine inspection and maintenance.

Rainwater Harvesting:

- Ensure that no structures are covering the filter or the tank's access/inspection port.

Green Roofs

- Ensure that individuals can safely reach the roof with tools in hand (e.g., buckets, pruners, hoses). If the roof cannot be accessed via a walk-through door, this may require installing a wide ladder or fire escape-style stairs on the inside or outside of the building.
- If there is a concern of getting too close to the roof's edge while doing maintenance, install a railing around the edge for safety. Alternatively, for sloped roofs, workers may need to use harnesses during maintenance activities.

Helpful Skills:

- Use of motorized landscaping equipment
- Chainsaw skills
- Use of grading equipment for larger jobs
- *Note*: OSHA safety requirements and certifications may apply to green roof maintenance.

Equipment Typically Used to Regain Proper Access:

- Mower, trimmer
- For very overgrown areas, chainsaw and/or bush hog
- For areas that need to be regraded, excavator, skid steer, or other grading equipment

Problem #2: Flow is obstructed in or out of the practice

General Approach for All Practices:

- Flow can bypass an SMP when there is too much sediment/debris buildup near the inlets or due to grading changes in the drainage area (e.g., repaving of parking lot). If the cause of blockage or bypass is not obvious, inspect the practice during rainfall to watch the flow paths. (See **Section 4.6 – Improper Flow Pathways** for additional guidance.)
- Obstruction of overflow or emergency spillway structures is most often due to buildup of debris, such as trees, sticks, trash. It is *very* important to keep these structures clear of such blockages in order to avoid flooding or a dam breach (**avoid conditions caused by beaver activity - top photo**).
- Where debris cannot easily be cleared by hand, special equipment and skills may be needed. An obstructed riser structure in a wet pond may need to be accessed by boat **(bottom photo)**. In cases where large sticks, tree branches, trash, or other debris obstruct the overflow or spillway, they may need to be cut up by chainsaw. Large debris will usually need to be hauled away with a truck.

Helpful Skills:

- Chainsaw skills
- Muscle strength to haul large debris
- Boating capabilities

Equipment Typically Used to Clear Obstructions:

- Gloves, shovels, pruners, rakes, and other hand tools
- Waders for wetlands
- Chainsaw for large sticks and branches
- Cable puller (come-along) to remove large branches that cannot be pulled out by hand
- Boat and personal floatation device for riser structures in wet ponds
- Truck to haul away debris

4.4. Erosion

Issue Applies Most Commonly To: Sheetflow/Disconnection, Swales, Bioretention, and Ponds/Wetlands

Problem: Erosion on practice surface, inlets, and/or outlets

General Approach for All Practices:

- See **Section 4.10 – Embankment and Overflow Condition** for how to repair erosion on side-slope embankments.
- Rill and gully erosion occurs when runoff flow is concentrated. Deep rills and gully erosion on the practice surface **(top photo)** will require the surface to be regraded to make uniform again. Use the lightest equipment possible in order to minimize soil compaction during excavation.
- After excavation, reseed/plant the area with ground cover that is appropriate for the moisture conditions of the practice. Amend or enhance soil as needed according to a soil test; soil may need more organic material to support plants.
- To prevent further erosion on the surface of the practice, ensure that flow from the inlets can spread out adequately and has enhanced energy dissipation features. This may require installing or enhancing a stone apron outlet protection that flares out and down to the level of the practice to slow and spread out the flow. Other options include check dams, energy dissipation devices, or an armored low-flow channel. A stilling basin **(bottom photo)** can also dissipate flow as it comes out of an inlet or outlet pipe. Apply similar treatments to any outlets that are experiencing erosion.
- Any sloped soils that are disturbed during excavation will likely need erosion-control matting to hold it in place while vegetation becomes established.

Helpful Skills:

- Landscaping/Gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing
- Skills with excavation equipment
- Knowledge of sediment and erosion control practices and resources appropriate for the area

Equipment Typically Used for Fixing Erosion:

- Rakes, shovels, wheelbarrows, and other “landscaping” equipment
- Light excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move stone and other materials around
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out

4.5. Departure from Design Dimensions

Issue Applies Most Commonly To: Swales, Bioretention, Ponds/Wetlands, Infiltration, and Sand/Organic Filters

Problem: Practice dimensions have been altered

General Approach for All Practices:

- Once constructed, the dimensions of an SMP may become altered from the original design for a variety of reasons. These reasons can include:
- The SMP was not constructed to the proper dimensions at initial installation.
- Sediment accumulation in the SMP reduces the intended storage volume of the practice **(top photo).**
- Redevelopment or regrading of the site encroaches into the footprint of the SMP.
- Dumping of leaves, trash, or other debris into the SMP reduces the intended storage volume of the practice.
- If it appears that the dimensions of an SMP have been altered, proceed as follows:
- Consult the original design or as-built plans and sizing computations for the SMP to identify the intended dimensions and storage volume of the practice. Measure the length, width, and depth of the practice to estimate the current storage volume. Calculate the difference in volume to determine whether it is significant enough to warrant restoring the practice to its original dimensions. If the loss in volume is greater than about 10%, this likely warrants action.
- If the SMP's original storage volume cannot practically be restored because of current site conditions, an additional SMP may need to be built elsewhere on the site in order to regain adequate storage and treatment volume for the site.
- For problems of dumping by individuals on or near the site, install "No Dumping" or similar signage to inform people that this is not an appropriate place to dispose of debris. Any debris that has already been dumped should be removed from the practice either by hand or with equipment.

Helpful Skills:

- Basic surveying
- Understanding stormwater design plans and sizing computations
- Stormwater management design
- Skills with excavation equipment and erosion and sediment control

Equipment Typically Used to Investigate and Fix Dimensions:

- Simple level or survey equipment, tape measure, and other tools to measure SMP dimensions
- Light excavation or grading equipment for larger jobs
- Rakes, shovels, wheelbarrows, and other "landscaping" equipment for small jobs
- Soil stabilization materials

4.6. Improper Flow Paths

Issue Applies Most Commonly To: Rainwater Harvesting, Sheetflow/Disconnection, Swales, Bioretention, Infiltration, and Sand/Organic Filters

Problem #1: Flow intended to go into a practice is diverted by debris or grit buildup or capacity issues at inlets

Bioretention, Swales, Infiltration, Sand/Organic Filters:

- Grit, sediment, leaves, and other debris builds up at curb inlets or other inlets, sometimes to the point where flow is diverted completely around the practice (photos above). This is a common issue for practices that rely on curb cuts or other small inlet structures to get water into the practice for treatment. A minor amount of debris may be OK and not affect the ability of water to enter the practice. However, be aware of conditions where flow *that is supposed to be treated* is diverted to a downgradient storm drain or other structures in such a way that the stormwater treatment is entirely or partially bypassed.

- In many cases, correcting the problem may simply involve removing debris or unclogging the inlet.
- However, this problem can be chronic if the inlet design is susceptible to clogging. This can occur if the slope from the inlet into the practice is flat and/or there are controllable sources of sediment and debris in the drainage area.
- For chronic problems, consider redesigning inlets to be more clog proof. One solution is to build in a 2 to 3-inch drop from the curb inlet onto a gravel or stone diaphragm along the edge of the practice (see example in photo are right).
- Inlets that are undersized for the flow coming to them should be enlarged and armored with an appropriate erosion-resistant lining.

Rainwater Harvesting:

- Water intended to be collected in rainwater harvesting systems is sometimes not delivered to the tank or cistern if the system of gutters, downspouts, pipes, etc. is not sized properly or if the first-flush diverter or vortex filter is not functioning correctly and diverting too much water away from the tank.
- As with inlets, this may simply be a matter of routine cleaning of gutters, downspouts, vortex filters, etc.
- It may also be a design or capacity issue, in which case, installing larger gutters or a more robust piping system may be in order.

Source: Rainwater Management Solutions 1

Example of enhancing the gutter and piping system leading to a rainwater harvesting system

Helpful Skills:

- Basic surveying
- Typical landscaping skills using materials such as soil, rock/stone, edging material, mulch, etc.
- Light construction of gutters, downspouts, piping
- Some knowledge of first-flush diverter and vortex filter products

Problem #2: Flow is not uniformly accessing the entire treatment area

Bioretention, Swales, Infiltration, Disconnection and Sheetflow, Sand/Organic Filters:

Improper flow path issues in this category include:

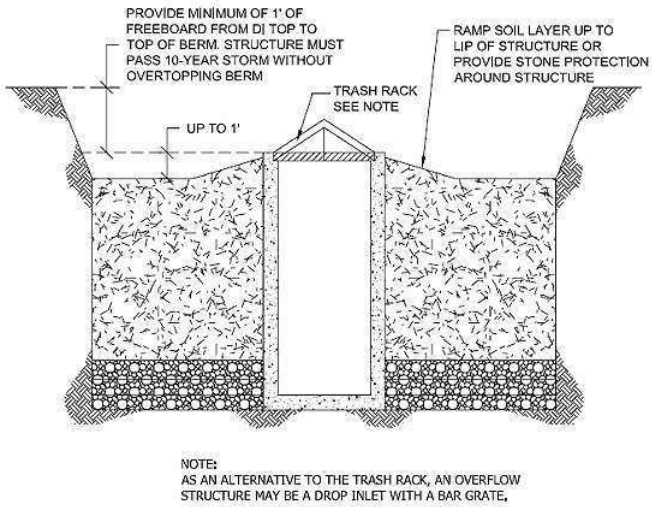
- Water forming channels or rills through the treatment bed of bioretention, swales, infiltration, or surface sand filters, and thus not spreading out across the treatment area surface
- Water ponding only at one end of the treatment area because the surface is not level
- Water piping through weak spots to an outlet or underdrain, such as where soil media meets a concrete structure
- See Section 4.4, Erosion for issues of channeling or erosion on the treatment surface.
- For uneven treatment area and preferential ponding, assess the severity of the problem. Compare the relative elevations of the "high" part of the treatment area (the area where water does NOT seem to pond) and any overflow structure or weir where high water flows will leave the practice. If there is still some freeboard (such that the overflow structure is higher than ALL of the treatment bed surface), then there will still be some ponding for larger rainfall events. Try some minor raking or moving soil media and mulch around to even out the filter bed.
- However, the problem is more serious if parts of the treatment area are higher than the overflow structure. These areas will never be valuable for treatment purposes. The treatment area is supposed to fill up like a bathtub, so some regrading is needed to level out the treatment area.
- If water is piping or shortcircuiting through the soil or sand media, forming sinkholes or otherwise bypassing the intended treatment mechanism, it will be necessary to repair these spots. Around concrete or metal overflow structures, use soil material right around the structure that can be compacted (bioretention soil media tends to be light, sandy, and fluffy and won't compact very well). Another option is to "ramp up" the soil layer to the lip of the structure so that there won't be a hydraulic jump at this potentially weak point. See the figure below.

These three issues are illustrated below:

Water from the inlet at top of photo is channeling through the bioretention area.

Water is preferentially ponding only at one end of the bioretention because the surface is not flat.

Water is "piping" down to the underdrain at the weak spot where the soil media meets the concrete overflow structure.



Ramp up soil layer to the lip of the structure to address this being a weak interface where water can work down and create bypassing. (Source: Virginia 2013 Stormwater BMP Specifications, Specification #9, Bioretention, Figure 9.13.)

Impervious Disconnection:

The most likely flow path issues with Impervious Disconnection are: (1) owners intentionally diverting downspouts away from pervious area and onto impervious area **(left photo below),** and (2) slight grading issues diverting the water away from the intended pervious receiving area **(right photo below).**

Both issues are fairly straightforward to address but involve communicating and working with property owners to explain the purpose of disconnection and how to properly maintain it. The second issue may involve some minor regrading or building low-profile berms to get water to flow to the intended disconnection area.

Helpful Skills:

- Rudimentary surveying
- Typical landscaping skills—using materials such as soil, rock/stone, edging material, mulch, etc.

Equipment Typically Used for Inspecting and Fixing Flow Paths

- Surveying equipment (i.e. Site level or total station) to get relative elevations among different parts of treatment area, inlets, overflow structures, etc.
- Small, simple tools—flat shovels, wheelbarrows, rakes, other common landscape/gardening tools
- Large, more complicated equipment—small excavators to move material around or do regrading. Always work from the side of the practice and NOT within the practice itself.

4.7. Sediment Buildup

Issue Applies Most Commonly To: Swales, Bioretention, Permeable Pavement, Ponds/Wetlands, Infiltration, and Sand/Organic Filters

Problem: Sediment accumulation more than 2 inches thick covering 25% or more of the practice surface area

Bioretention, Swales:

- Determine the source(s) of sediment. The most likely sources are: (1) premature installation of the practice during the construction process and discharge of construction site sediment loads; (2) erosion in the contributing drainage area *after* construction is complete; and (3) erosion along the practice side slope or within the practice itself. If it is an ongoing source, it must be abated (see **Sections 4.2, Contributing Drainage Area, and 4.4, Erosion).**
- Use a soil auger to auger holes in various places across the Bioretention or Swale surface area, especially in areas where sediment is accumulating. Determine how deep the sediment is penetrating into the soil media layer. Usually, it will be the top 2 to 3 inches that are most affected. Note that for swales *without* an engineered soil media, the sediment layer will likely be confined to the surface.
- Remove the "fouled" soil media to the affected depth (using flat shovels or small excavators and working from the side) and replace with clean material from an approved vendor (bioretention soil media or equivalent). If no vendors are available in your area, use the soil media specifications from the **Design Manual** to replicate the right mix of sand, topsoil, and composted organic material.
- Check to ensure that the practice is filtering at the proper rate after the next several storm events.

Infiltration:

- For infiltration practices excavated to a suitable infiltrating soil layer (e.g., not stone reservoir layer), use the same procedures as for Bioretention/Swales above.
- For infiltration trenches and basins that have a stone reservoir layer, use similar procedures, but use a shovel to dig into the stone layer to ascertain how deep the sediment incursion is into the stone. Remove down to this layer and replace with clean material.
- If the infiltration practice is clogged, see **Section 4.8: Clogging.**
- As with Bioretention, check for controllable sources of sediment in the Drainage Area (**Section 4.2**).

Permeable Pavement:

- NOTE: Routine sweeping with a regenerative air vacuum (maximum power 2,500 rpm) is important to avoid more costly repairs that result from deferred maintenance. It is best to sweep the pavement surface in the early spring after winter sanding/salting materials or snow piles have led to sediment or winter slag accumulation. Also, if the area is surrounded by tree canopy, fall cleanup is essential, as vegetative debris tends to get pulverized by vehicle traffic and ground into the pavement surface.
- Observe the pavement surface during a storm event to see whether the sediment is clogging the pavement (i.e., standing water on the surface after the storm stops). If so, see **Section 4.8: Clogging.**
- Remove several of the paver blocks in different parts of the structure to ascertain how deep the sediment is penetrating into the bedding and reservoir layers. Most of the time, sediment incursion will be limited to the top 1 or 2 inches of the pavement bedding layer (for permeable interlocking concrete pavers and concrete grid pavers).
- Based on the above observations, it may be worthwhile to quantify the infiltration rate using ASTM C-1701/1701M. This is most useful in conducting the test in the *same place within the pavement surface through the course of several years* to document reduction in infiltration rates. Repair or restorative sweeping is warranted when infiltration rates drop below around 10 inches per hour. NOTE: As stated above, this can likely be avoided if routine annual sweeping is conducted.
- If sediment covers more than 25% of the surface, is deeper than 2 inches, or vegetation is starting to grow where sediment has accumulated, consult a street-sweeping vendor about *restorative* sweeping. In this case, it will be necessary to use a higher RPM sweeper or vacuum sweeper to suck out more of the bedding pea gravel that has been fouled, then replace with clean material.

Infiltration test using ASTM C-1701

Pulling grass and weeds from the joints can damage parking surface if roots are firmly established in the bedding layer.

- Vegetation growing in the pavement joints should be removed either manually or with a water-safe herbicide (e.g., glysophate without surfactants). It is important to not let weeds proliferate in the pavement surface because pulling them out by the roots may damage the pavement structure. (Note: The application of herbicides to control invasive or undesirable vegetation within wetlands or other waters of the U.S. may require an Aquatic Pesticide Permit from the NYS DEC)
- Check the pavement surface after a storm event to ensure that it is draining properly.

The North Carolina State University (NCSU) Stormwater Engineering Group has an informative Urban Waterways publication, *Maintaining Permeable Pavements (2011):* **http://www.bae.ncsu.edu/stormwater/pubs.htm**

Routine, air-vacuum sweeping in the early spring and fall is the best approach for permeable pavement maintenance (Photo source: Toronto and Region Conservation)

Ponds and Wetlands:

- Sedimentation is an inevitable process in ponds and wetlands. NOTE that upstream erosion, especially along stream channels or ditches leading to the practice will accelerate the sedimentation process and lead to more frequent and costly sediment removal operations. Whenever possible, it is important to mitigate any upstream erosion issues.
- Forebays and/or pre-treatment areas should be cleaned out when they reach 50% of their design capacity. Once cleanout is complete, it will be worthwhile to install a graduated rod into the forebay with a clear marking of future sediment clean-out levels.
- The main body of a pond or wetland may need to be dredged on an infrequent basis or when sediment has replaced 50% of the design capacity. There are many dredging methods available. Excavators with long arms can handle most small or moderate-sized ponds. Other methods may be necessary for larger facilities. Dredging can be a complicated operation involving dewatering, storage of wet sediment, and possibly hauling to on-site or off-site disposal or reuse areas. Consult a qualified contractor to explore available methods and costs for the particular application. Once again, installation of a graduated rod can help mark future clean-out levels. Note: The dredging of accumulated sediment within regulated wetlands, ponds or at outlet structure may require permits from NYS DEC and/or USACE. In addition, removed sediment should be properly disposed of in a regulated solid waste management facility or in an upland area that is at least 100 feet from regulated wetlands or streams. Sediment managed in upland disposal areas shall be graded, seeded and mulched.

Sand/Organic Filters:

- See the section above on Bioretention/Swales as some of the procedures will be similar, especially for above-ground filters. It is important to determine whether the drainage area is generating a controllable source of sediment that can be abated.
- Underground trench or vault filters will require routine maintenance to: (1) remove accumulated sediment, trash, and floatables from the sedimentation chamber, usually with a vac truck; and (2) remove sediment, grit, and sludge from the top layer of the filter media and replace with clean material. NOTE: Depending on the configuration of the underground filter, confined-space procedures may apply. For a normally operating practice, these maintenance tasks should be conducted every two to three years. If the filter is treating a stormwater hotspot or a particularly dirty drainage area (e.g., vehicle maintenance, washing, repair), the frequency may increase to annually or more often, as dictated by Level 2 inspections. Also, in these cases, it may be warranted to test the material to ensure proper disposal.
- Some proprietary filters require replacement of special cartridges or filter material. Consult the vendor or manufacturer for special maintenance procedures.

Routine cleaning of a perimeter or "Delaware" sand filter. This can be done from the surface, but deeper, vault-type filters will require confined-space entry procedures.

Helpful Skills:

- Most common contracting skills
- Excavation, dewatering, and sediment disposal in some cases
- Knowledge of maintenance equipment, such as vac trucks, street sweepers, etc.
- Knowledge of preferred conditions for bioretention soil media
- Soil testing in some cases where sediment is being removed from stormwater hotspots

Equipment Typically Used for Sediment Removal Activities:

- Small, simple tools—flat shovels, wheelbarrows, rakes, other common tools
- Larger jobs—small or large excavators, loaders, dewatering equipment (pumps, dirt bags, etc.), trucks to haul material to on-site or off-site disposal or reuse areas, erosion and sediment-control supplies.

4.8. Clogging

Issue Applies Most Commonly To: Bioretention, Permeable Pavement, Infiltration, and Sand/Organic Filters

Problem: Filter media clogged; water standing on practice surface for 48 to 72 hours or longer after a storm

Bioretention:

Standing water on the bioretention surface 48 to 72 hours after a storm event is a sure indication of clogging (top photo). Clogging of bioretention practices can be tricky to diagnose as there are several probable causes:

a. Clogged underdrain
b. Filter fabric between soil media and underdrain stone
c. Too much sediment/grit washing in from drainage area
d. Too much ponding depth
e. Improper soil media

The following procedure can be used to work through diagnosing the most common causes, beginning with the simplest and easiest to fix and progressing through more complex remedies:

1. Look for a thin, crusty layer of sediment that covers some or all of the soil media. It is often grayish in color. This thin layer can sometimes be enough to cause slow drainage. Scrape this crust off and ascertain sources of sediment in the drainage area (see Section 4.2, Contributing Drainage Area). Often, this problem can be caused by the bioretention soil media being installed too early in the construction process, but other chronic sediment sources should also be checked.
2. Open the underdrain cleanout and pour water in to verify that the underdrains are functioning and not clogged or otherwise in need of repair. The purpose of this check is to see whether there is standing water all the way down through the soil. If there is standing water on the surface, *but not in the underdrain*, then there is clogging somewhere in the soil layer. If the underdrain and cleanout have standing water and there is not water coming out the other end (outlet) of the underdrain pipe, then the underdrain is clogged and will need to be rooted out.
3. Use a soil auger to auger several holes down through the soil media to the underdrain layer (if present) or underlying soil. Check to see whether there is a layer of filter fabric at the bottom of the soil layer. The auger will pierce through any filter fabric that is present, and pieces of fabric in the auger bucket should be removed. Notice if the fabric is “blinded” or clogged with sediment. This is a common issue with older bioretention practices. If the practice has a clogged the filter fabric layer, go to step #6, install wick drain.

Filter fabric, where present, is a likely source of clogging.

4. While checking for filter fabric in auger holes, also note whether there is a layer of saturated soil media or bad soil media (e.g., too much clay content) that may be on top of a good media layer. This will be fairly obvious as the top 3 or 4 inches will be mucky and saturated, with dry and sandy media below. If this is the case, it will be necessary to remove the bad material and replace with good, clean bioretention soil media in accordance with the design specifications. Till or incorporate the good material into the underlying existing soil media to establish a good contact.

5. If the entire profile of soil media is bad, has too much clay content, or does not appear to meet the specifications for soil media, it will be worthwhile to test the soil and compare against the recommended specifications (e.g., clay content, particle sizes, etc.). If the soil does NOT meet specifications, see steps #6 and #9 below.
6. If the problem appears to be filter fabric or bad soil media (steps #3 or #5 above), there is a critical decision to be made. It is an expensive proposition to dig up the entire facility to either remove the filter fabric or replace the entire soil layer. If the clogging problem is not severe in nature, an intermediate (and much cheaper) option may be to install wick drains. Using a 6-inch auger bucket, auger numerous vertical holes around the practice surface area, making sure to auger all the way down to the underdrain stone or underlying soil (if there is no underdrain). Hammer 6-inch perforated PVC or other type of pipe into these holes. Perforations should be about 3/8-inch diameter. Fill the pipes with clean underdrain gravel (#57 stone) mixed in with coarse construction sand. These drains will serve to wick fines from the surrounding soil media and will provide alternative drainage. Check after the next several storm events to see whether the wick drains improve drainage.

Adding sand to a wick drain. The vertical perforated PVC pipe has already been placed in the auger hole.

7. Sometimes the cause of saturated soil media is springs or some type of baseflow coming into the practice. This is a more difficult problem as bioretention is not supposed to receive this type of constant flow. It will be necessary to identify and reroute springs or baseflow or perhaps replace the bioretention practice with a different type of practice.
8. Another possible source of poor drainage or clogging is that there can be too much water on top of the soil media when the bioretention practice fills up. Most specifications call for a maximum ponding depth of 12 inches, but sometimes the ponding depth can be 18 or even 24 inches. While this increases the amount of head pushing water down through the soil media, it can also lead to compaction or too much sediment building up. If the bioretention practice has a ponding depth greater than 12 inches, consider configuring the outlet or large storm overflow to reduce the ponding depth to 12 inches or less. Check with the local stormwater authority to ensure that doing this will not compromise the required treatment volume of the practice.
9. If clogging is too severe to be fixed with wick drains or other remedies listed above, it may be necessary to rebuild the bioretention practice by digging up the existing soil, taking out any filter fabric that is between the soil media and underdrain stone, and rebuilding and replanting according to the design specifications.
10. Whatever the chosen remedy, check to ensure that the practice is filtering at the proper rate after the next several storm events.

The Chesapeake Stormwater Network (CSN) has produced an excellent reference guide for inspecting and diagnosing Bioretention issues, *Technical Bulletin #10, Bioretention Illustrated.* This tool can be used as an additional reference and can be downloaded using this link: http://chesapeakestormwater.net/category/publications/

Infiltration:

- Clogging of infiltration practices can be simple to resolve or fatal:
- On the *simple* side, clogging (or poor drainage) may arise from sediment, vegetative debris, parking lot grit, or other debris clogging the top few inches of soil or stone.
- With luck, the practice will have an observation well (vertical perforated PVC pipe with cap that extends through the stone reservoir in an infiltration trench or basin). Check the observation well three days after a storm event of ½-inch or more. If water is standing in the observation well to the surface, then the whole profile may be clogged (see below under *fatal*). If the observation well has only a few inches or no water and there is still water standing on the surface, then surface clogging is a likely culprit.
- For infiltration practices in soil (no stone reservoir), auger several holes around the infiltration surface area. If saturated soil seems to be on top of good, clean, dry soil, then surface clogging seems likely.
- For infiltration trenches and basins with a gravel reservoir, dig several holes around the surface to determine, again, whether there seems to be a layer of gravel clogged with sediment, leaves, vegetative debris, parking lot grit, etc. If possible, dig down to where the gravel meets the underlying soil to see whether a layer of filter fabric is present (which may be common with older practices). If this is the case, blinding of the filter fabric may be a cause of the clogging.
- For surface clogging, remove the affected material down to the level where the soil or gravel seems clean, and replace with clean material. If filter fabric seems to be a problem, it will be necessary to dig up the gravel, remove the filter fabric, and rebuild the reservoir layer in accordance with the current design specifications. In either case, check after a storm event to ensure that this has resolved the issue.
- On the *fatal* side, the underlying soil may not be suitable for infiltration, either due to soil characteristics, compaction during construction, or other causes. Check the original design package to see whether any soil testing was done at the time. It may be worthwhile to auger down to the infiltration interface layer (e.g., where stone reservoir meets the underlying soil and then another several inches below this interface), and take several soil samples for lab analysis to compare to current soil specifications (see information below about infiltration soil analysis).

- It may be that a geotechnical analysis would reveal that there is a good infiltration soil layer, but it is lower than the existing interface. This would still require a complete rebuild and excavation down to the suitable soil layer. Restoring porosity at the designed elevation would require replacing soil above this suitable layer and avoiding compaction.
- Another option would be to convert the practice to a bioretention practice with an underdrain. Check with the local stormwater authority to see whether this would require any site plan or stormwater plan amendments or other permits.
- Many updated state stormwater manuals and specifications include protocols for infiltration soil testing and analysis that reference various ASTM standards. For example, see: *Virginia 2013 BMP Standards & Specifications, Specification #8: Infiltration, Appendix 8-A, Infiltration and Soil Testing* at: **http://www.deq.virginia.gov/fileshare/wps/2013_DRAFT_BMP_Specs/**

Permeable Pavement:

- AS NOTED IN SECTION 4.7 – sediment buildup, routine sweeping with a regenerative air vacuum (maximum power 2,500 rpm) is important to avoid more costly repairs that result from deferred maintenance. Preventative maintenance is the best and most cost-effective way to prevent clogging in the first place.
- If there is standing water on the pavement surface 48 to 72 hours after a storm event of ½-inch or more, then the pavement surface is clogged.
- Check the design plan or as-built plan to see whether the permeable pavement design includes an underdrain. There may also be underdrain cleanouts at the edge of the permeable pavement.
- If there is an underdrain, the first thing to check is whether the underdrain is clogged, crushed, or broken. Check to see whether there is standing water in the underdrain cleanout 48 to 72 hours after a storm event. If the underdrain is dry, pour water into the underdrain with a hose and see whether it comes out the other end. If the underdrain is clogged, snake it out, as this is the first and easiest thing to try.
- If the underdrain is working, then clogging may be due to: (1) clogged surface or bedding layer; or (2) underlying soil is not suitable for infiltration for designs with no underdrain. First, refer to the guidance in Section 4.7 – Sediment Buildup, and then proceed as follows:
- IF THERE IS NO UNDERDRAIN AND THE DESIGN IS BASED ON SOIL INFILTRATION UNDER THE PAVEMENT, it will be worthwhile to check the soil because unclogging the surface layer will likely not fix the problem. Check the original design package for any soil infiltration testing. It is likely worthwhile to remove the entire pavement section in several places down to the soil layer and to do a geotechnical investigation of the soil profile. See: ASTM C-1701/1701M and/or *Virginia 2013 BMP Standards & Specifications, Specification #8: Infiltration, Appendix 8-A, Infiltration and Soil Testing* for examples of soil infiltration protocols (URL above).
- If the soil is not suitable for an infiltration design, it will probably be necessary to rebuild the pavement using an underdrain design or possibly adding subsurface drainage along the perimeter of the parking area.
- IF THERE IS AN UNDERDRAIN OR THE SOIL IS SUITABLE FOR INFILTRATION, the best approach to try to unclog the pavement is restorative sweeping with a vacuum sweeper. Regenerative air sweepers may not have enough suction to relieve the clogging.
- If vacuum sweeping is not successful, it may be necessary to rebuild any layers fouled with sediment and fines. It is likely that this will be confined to the bedding layer and gravel used in the paver stone joints, but some clogging can possibly move down into the underlying stone reservoir layer.
- The North Carolina State University (NCSU) Stormwater Engineering Group has an informative Urban Waterways publication, *Maintaining Permeable Pavements (2011):* **http://www.bae.ncsu.edu/stormwater/pubs.htm**

Water standing on the parking surface 48 to 72 hours after a storm is an indication of clogging. Snow piles at the edge of the photo point to possible clogging from winter sanding or plowing.

Sand/Organic Filters:

- See the section above on Bioretention/Swales as some of the procedures will be similar, especially for above-ground filters.
- Also see Section 4.7 – Sediment Buildup for guidance on routine maintenance of the sedimentation and filter chambers.
- As with Bioretention, there can be various causes for clogged filters:
- Filter fabric layer under the filter media that has blinded or clogged
- Clogging of the surface of the filter layer or filter cartridges
- Bad filter media (e.g., sand or organic media)
- "Plumbing" issues with configuration of overflow and underdrain pipes
- Fortunately, filters are usually confined within concrete vaults or manholes, so diagnosing and rectifying clogging problems should be more straightforward. Check the original design or as-built plans. Some of the following guidance may also be helpful:
- For proprietary cartridge or special filter media structures, consult the vendor or manufacturer for recommended solutions.
- See Section 4.7 for guidance on removing the top layer of filter media and replacing with clean material, as well as vacuuming out any sedimentation chambers.
- If it is suspected that overflow or outlet pipes are not configured correctly, check against the design plans and also standard drawings from the manufacturer.
- Chronic clogging problems are likely due to excessively dirty drainage areas, including uncontrolled sources of sediment, oil and grease washoff, vegetative debris from surrounding trees or shrubs, or other sources. It will be important to check and resolve any controllable sources of clogging in the drainage area (see **Section 4.2 – Contributing Drainage Area**).

Standing water on the parking lot is evidence that this perimeter sand filter (under the sidewalk) is clogged.

Helpful Skills:

- Soil infiltration analysis techniques as per ASTM and/or current BMP design specifications
- Excavation, dewatering, and sediment disposal in some cases
- Knowledge of maintenance equipment, such as vac trucks, street sweepers, etc.
- Knowledge of preferred conditions for bioretention, sand/organic filter media, or standard permeable pavement types and bedding layers
- General practice of trying easier or less expensive strategies before jumping right to wholesale reconstruction of a practice

Equipment Typically Used for Unclogging Activities:

- Soil infiltration testing or geotechnical equipment
- Small or large excavators, loaders, dewatering equipment (pumps, dirt bags, etc.), trucks to haul material to on-site or off-site disposal or reuse areas, erosion and sediment control supplies
- Pavement demolition and repair equipment
- Mulch, plants, filter media, and other materials needed to rebuild practices

4.9. Vegetation

Issue Applies Most Commonly To: Swales, Tree Planting, Bioretention, Green Roofs, and Ponds/Wetlands

Problem #1: Not enough vegetation; vegetation *is unhealthy*

Bioretention, Swales, Tree Planting:

- Test soil/media to ensure proper conditions exist for plant survival.
- Check water drawdown after a storm to make sure that wet/saturated conditions are not the cause of plant failure. If this IS an issue, see **Section 4.8 – Clogging.**
- Amend or enhance soil as needed; soil may need more organic material to support plants, but do NOT use uncomposted organic material or animal waste, as it will likely export undesirable nutrients to the stormwater system.
- If plants have continued to die, consider a different species or entire planting palette or revised planting plan **(photo to right shows the need for a whole new planting plan)**. Also consider using an appropriate bioretention or swale native seed mix to supplement use of plugs or other nursery stock.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.
- Replant and add mulch or ground cover as needed.

Ponds and Wetlands:

- See **Section 4.13 – Pool Quality** for general guidance on pond and wetland vegetation maintenance, as well as the following.
- For emergent vegetation, determine whether water depths are too deep or shallow for survival (i.e., depths are different from design depths, or original design included improper vegetation).
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- For large-scale plantings, drain the permanent pool and plant during the early spring.

Green Roof:

- Consult with a green roof plant vendor about possible causes of plant failure. Lack of watering during initial establishment could be the main culprit.
- Work with a qualified vendor to develop and install a new planting plan.
- Speak with building facilities maintenance personnel to ensure they understand need for watering and caring for new plants after they are installed.

Helpful Skills:

- Landscaping/gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of native plant and/or wetland plant nurseries in general region

Problem #2: Too much vegetation, overgrown (with invasive species), not maintained

General Approach for All Practices:

- Determine which invasive plants are present. For a list of regulated and prohibited invasive plants in New York State, see *New York State Prohibited and Regulated Plants* (NYS DEC, NYS Agriculture and Markets, 2014) at: http://www.dec.ny.gov/docs/lands_forests_pdf/isprohibitedplants2.pdf . Invasive plants shall be properly disposed of in a manner that renders them non-living and non-viable to prevent the establishment, introduction or spread of disposed species.
- Review whether the original planting plan relied on these plants; for example, some wetland plans may rely on "aggressive colonizers" such as cat tails.
- For more detailed information regarding appropriate control measures for each species, consult the Cornell Cooperative Extension Invasive Species Program at the following link: http://ccetompkins.org/environment/invasive-nuisance-species/invasive-plants. If invasives have taken over the facility, wholesale removal and replanting with desirable species may be necessary.
- If (non-invasive) plants are overgrown, (**example in photo to right**), remove, thin, or trim back excessive vegetation.
- If an entire new planting plan is deemed necessary, use SMP-Specific Guidance in the remainder of this manual, along with landscaping goals for the site location, to devise a plan that allows for adequate growth over a long period of time. A simple, clear planting design (**example in photo below**) with a long-term plan has the best chance of being maintained through time. Maintenance crews need to know which plants are part of the design versus weeds and how the practice should look from year to year.
- Develop a plan to ensure proper weeding, pruning, trimming, and replanting to maintain the plan over time.
- See **Section 4.13 – Pool Quality** for general guidance on pond and wetland vegetation maintenance, as well as the following.

Helpful Skills:

- Knowledge of exotic and invasive species is needed. Consult a local Cooperative Extension Office.
- Specific measures may include mechanical hand pulling, regrading (requires construction equipment), or herbicide/pesticide application *safe for aquatic environments*.
- Landscape architect
- Knowledge of wetland plants (for ponds/wetlands)
- Knowledge of SMP design (to understand hydrologic regime for plant selection)

Equipment Typically Used for Vegetation Maintenance Activities

- Soil auger to diagnose issues of soil drainage that may affect vegetation health
- Rakes, shovels, wheelbarrows, and other "landscaping" equipment
- Light excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move soil media, mulch, and other materials
- Plants and/or seed mix, plus a way to move and store plant stock without damaging it or drying it out
- Planting bars, soil drills, etc.
- For planting in standing water (e.g., ponds, wetlands), pumps or pump-around systems and dirt bags or other ways to temporarily dewater planting area

4.10. Embankment and Overflow Condition

Issue Applies Most Commonly To: Swales, Bioretention, and especially Ponds/Wetlands

Problem #1: Rill and channel erosion and bare dirt areas of embankments

Bioretention, Swales:

- Erosion and areas of bare dirt indicate two basic issues: 1) soils and moisture levels are not suitable for the plants or turf used; and 2) vegetation cannot take hold because of concentrated flow, physical wear, or poor soil conditions. Address these issues first with a soil/media test to ensure proper conditions exist for plant survival.
- High salt content from winter deicing of pavement is a common culprit of poor soil conditions for roadside plants. If this is the case, restore area with plant species that can tolerate salt levels, or replace edge plants with a stone diaphragm to intercept runoff from road.
- Amend or enhance soil as needed; soil may need more organic material to support dense ground cover.
- For concentrated flow and physical wear, redirect concentrated flow so that it disperses in mulched and vegetated areas. Stake in mulch and replant with vigorous plants recommended through the soils test.
- If plants have continued to die, consider a different species or entire planting palette or a revised planting plan (see **Section 4.9 – Vegetation and photo to right)**. Also consider using an appropriate bioretention or swale native seed mix to supplement use of plugs or other nursery stock.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.
- Replant and add mulch or ground cover as needed.

Ponds and Wetlands:

- Where erosion has deposited soil within the pond or wetland water line, remove this material and reshape the slope.
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- To address rill and channel erosion, first obtain a soil sample test to get soil amendment recommendations. Undercut the eroded sections and replace with clean amended soil, based on the soil test, and reseed as appropriate for the season.
- It may be necessary to stake in seed blankets or erosion-resistant lining (e.g., erosion-control matting or even rock in extreme situations) to stabilize eroded areas. Again, choose seed types appropriate for the season.
- Based on soil test guidance, reseed bare areas to prevent further erosion.
- For persistent problems, reroute the flow to more stable receiving areas using berms, diversions, etc.

Helpful Skills:

- Landscaping/gardening
- Consult with Cooperative Extension Office or independent laboratory for soil testing.
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of sediment and erosion control practices and resources appropriate for the area

Problem #2: Settlement, loss of armoring material, erosion of emergency overflow

General Approach for All Practices:

- Settlement, loss of armoring material, erosion and accumulated debris can affect the dimension, water velocity or capacity of the emergency overflow such that embankment failure could occur in flood events (**photos below**).
- Inspect for exposure of soil or geotextile base material in the overflow and rearmor areas of exposure.
- In cases of settlement, a qualified engineer should be sought to assess its capacity and impact on pond capacity.
- Erosion of spillways should be repaired and revegetated as described for embankments.

Helpful Skills:

- Knowledge of sediment and erosion control practices for the area
- Completion of self-guided training on dam safety through Association of State Dam Safety Officials: http://www.damsafety.org

Problem #3: Impounding structure (embankment or dam) integrity issues due to tunneling or digging animals, woody vegetation or seepage

Ponds/Wetlands:

- Impounding structure stability is a serious concern, especially where trees have become established on the slopes, or there's evidence of animal burrows or seepage.
- The best approach for trees on the crest, slopes, and adjacent to an impounding structure or embankment is to cut them down before they reach significant size. If large trees have been cut down but their root systems not removed, carefully monitor the area around the remaining stumps for signs of seepage.
- Exercise judgement for trees on the surrounding side slopes that are NOT impounding structures (not designed to hold back water in the pool). Sometimes a forested edge can enhance the appeal of a pond, but access for maintenance must also be available, and some trees can drop debris into ponds, leading to quality issues.
- Animal burrows can be dangerous to the structural integrity of the embankment because they weaken it and can create pathways for seepage. Professional exterminators may be needed to trap and remove animal pests.
- Seepage as water flow or boiling sand on the lower portion of the exterior slope or toe area of an impounding structure should be brought to the attention of a qualified engineer.
- Leakage around conveyance structures such as barrel pipes or spillways should be monitored for increase since the last inspection. A qualified engineer is needed to resolve issues of piping or seepage along the barrel pipe through a dam.
- Turbidity or cloudiness in seepage should also be brought to the attention of a qualified engineer.

Helpful Skills:

- Completion of self-guided training on dam safety through the Association of State Dam Safety Officials: http://www.damsafety.org

Equipment Typically Used for Embankment and Overflow Maintenance Activities

- Excavation or grading equipment for larger jobs
- Equipment to deliver, unload, and move soil media, mulch, and other materials
- Plants and/or seed mix, seed blanket and erosion control materials
- Rod and level for settlement measurements
- Clear glass bottle for seepage visual test

4.11. Structural Damage

Issue Applies Most Commonly To: Any Practice

Problem: Structural damage to pipes, headwalls, standpipes, inlet/outlet structures, grates, curbs, and other structural components

- Structural components are necessary for water to flow into and out of stormwater practices as intended. This is a broad category that involves components composed of concrete, metal, plastic, and other materials. Some common examples include:
- Deteriorated or broken curbs that allow water to bypass a practice
- Slumping or sinkholes where soil meets a concrete drop inlet or outlet structure
- Broken or collapsed inlets
- Connections in an inlet or manhole structure that are not parged and are leaky
- Collapsed or crushed pipes (especially corrugated metal)
- Missing or broken steps or other safety features in a manhole or riser structure
- Root penetration and clogging of underdrain or other pipes
- Broken check dams
- There are too many particular instances to mention here, but the general idea is to inspect and repair any structural components that are affecting the performance of a practice or leading to a potential health or safety issue.

Helpful Skills:

- General contracting skills—concrete work, metal, proper joint sealing
- Routing out clogged pipes
- Perhaps CCTV experience to look for broken or clogged pipes

Equipment Typically Used for Fixing Erosion:

- General contracting
- CCTV

4.12. Pool Stability

Issue Applies Most Commonly To: Ponds/Wetlands

Problem: Flooded or dry pond – outlet issues

General Approach for Ponds and Wetlands:

- Note high-water marks on structures or pond banks and compare with outlet structure weir.
- If the outlet weir is submerged, investigate downstream for plugs such as beaver dams, woody debris or sediment bars. Refer to **Section 4.3 – Physical Obstructions** for removal of obstructions.
- If the pond is retaining more water than it is supposed to and there is no flow from the outlet with no visible blockages in the outlet pipe, look for obstructions above the weir or outlet pipe. Woody debris, vegetation and silt can plug outfall weirs or blind rock outfall protection. Removal of such blockages tends to be a hand exercise. A jet/vacuum truck or other heavy equipment may be needed to clear excessive or precarious blockages (**photo on right**).
- If the pond is too low and not holding water in the designated pool, the outlet structure should be closely inspected to see whether it has settled from the original construction or there is leakage through joints or cracks. Finding no deficiencies with the structure, investigate the pond embankment as described in **Section 4.10** for evidence of seepage.
- If there is no evidence of seepage and the outlet structure has no apparent structural defects, an engineer should be consulted to review the pond design and determine the proper outlet elevation.

Helpful Skills:

- The ability to navigate uneven surfaces, to follow ditch banks and to sight drainage obstructions is implicit with this task.
- Ability to use a level to sight adequate elevation fall is helpful.

Equipment Typically Used for Pool Stability Evaluations

- Bright flashlight for pipe inspection
- Manhole hook for manhole cover access
- Brush hook to clear debris and walking surfaces
- Rod and level to check elevation differentials

4.13. Pool Quality

Issue Applies Most Commonly To: Ponds/Wetlands

Problem #1: Littoral shelves and pond edge: not enough vegetation; vegetation *is unhealthy;* invasive plants have taken over

Ponds and Wetlands:

- If there is not enough vegetation or no vegetation, determine whether maintenance practices have killed the plants. If so, work with the owner to educate those responsible for pond maintenance on correct methods. Consult plans for original planting and replant.
- For emergent vegetation, determine whether water depths are too deep or shallow for survival (i.e., depths are different from design depths, or original design included improper vegetation).
- If a small amount of supplemental vegetation is needed, plant wetland plugs per nursery guidance.
- For large-scale plantings, drain the permanent pool and plant during the early spring.If ponds are overgrown so that less than 25% of the surface area is visible, the pond water level should be lowered to enable selective plant removal.
- Invasive plants, such as phragmites or common reed, should be removed with their roots. Be sure to restore areas that have been disturbed with replacement vegetation because root removal exposes soil to erosion. Invasive plants shall be properly disposed of in a manner that renders them non-living and non-viable to prevent the establishment, introduction or spread of disposed species.
- Native plants selected based on environmental conditions have the greatest chance for survival.
- Consult a horticulturalist or plant nursery if there is evidence of disease or pests.

Helpful Skills:

- Landscaping/gardening
- If original planting plan is deemed inadequate, consult a landscape architect or horticulturalist to determine whether a revised planting plan is needed.
- Knowledge of native plants and/or wetland plant nurseries in general region
- Familiarity with New York invasive terrestrial and wetland plants and their control: http://nyis.info/

Problem #2: Pond color, scum, odor, algae and plant overgrowth

- Ponds that have algae covering more than 20% of the surface should have maintenance to remove it. Raking or mechanical harvesting of filamentous algae offers short-term control, but feasible long-term strategies should be considered.
- Pond maintenance companies should be relied on to identify the algae and appropriately control them. Pond specialists can control the algae growth in ponds, but its growth and reproduction are dependent on nutrients. When nutrients are in abundance, so will be the algae or vegetation.
- Plants can be used in shallow shelfs at inlets to take up nutrients, but they must be maintained and cuttings removed to take nutrients out of the pond system.
- If (non-invasive) plants are overgrown, remove or trim back excessive vegetation. Remove cuttings and trimmings. Do not allow vegetative debris to remain in the pond.
- Pond clarity and color can be impacted by excessive sediment discharge or flow shortcircuiting. For issues of clarity and color, follow the recommendations in **Section 4.7 – Sediment Buildup**.
- If invasive aquatic plants are identified, follow DEC guidelines for reporting and controlling invasives (see **Section 4.9 – Vegetation**).
- Some color, odor, and pond quality issues can be caused by leaks, spills, and other releases in the drainage area. Any petroleum odor or oily sheen (aside from natural rainbow sheen associated with decomposition of organic matter) should be reported to the appropriate state or local response agency. Other peculiar colors or odors can be investigated in collaboration with relevant agencies. Common issues are grease, paint, or other substances poured into storm drains, dumpster management, and stockpiles of various materials exposed to rainfall.

Helpful Skills:
• Ability to recognize invasive aquatic plants • Specific measures may include mechanical hand pulling, regrading (requires construction equipment), or herbicide/pesticide application *safe for aquatic environments*. • Knowledge of wetland plants and common types of algae and aquatic weeds • Knowledge of types of pond maintenance practices
Equipment Typically Used for Pool Quality Investigations
• High-top rubber boots • Canoes or small boats • Brush hook to clear vegetation and access pond bank • Secchi disk to check and compare pond color and clarity • Large-mouth bottle to collect algae and water quality samples • Various materials to control aquatic weeds and algae

Section 5. Planning for Stormwater Maintenance

Often, stormwater practices fall into disrepair because there is no plan in place for ensuring that they are maintained over time. As a result, maintenance can become reactive in nature, resulting in high costs for repairing damaged practices or practices becoming ineffective over time. This section outlines some key elements of stormwater maintenance planning, including:

1. Program models for stormwater maintenance
2. Inspection and maintenance checklists
3. Planning for the costs of stormwater maintenance
4. Identifying the need for infrequent maintenance items

5.1. Program Models for Stormwater Maintenance

The Maintenance Hierarchy concept (See Section 1) is discussed throughout this chapter, but the individuals who will conduct the Level 1, Level 2 and Level 3 inspections and maintenance will vary depending on how the local program is administered. While this chapter does not focus on program elements, it is important to note that the local program requirements will influence who performs ongoing maintenance. This will play an important role in how to develop a comprehensive maintenance plan.

Although there are many options for implementing a stormwater plan, they can be described by three broad categories, including: 1) Private Maintenance; 2) Local Program; and 3) Hybrid Approach. Understanding the program in the local community will influence the best techniques for developing the maintenance plan (**Table 5.1**).

Option 1: Private Maintenance

In this option, maintenance is the responsibility of the private land owner. In regulated MS4s, however, the land owner will periodically report to the local government. In this model, it is important to ensure that the maintenance plan is very easy to understand and includes pictures of key practice elements. If possible, include a list of contractors who will be able to perform maintenance items and how much these will cost. Finally, materials should point homeowners to resources so that they can learn more about the practices on their property. DEC's Maintenance Photo Library and Training Materials webpage (link) can be useful tools for this purpose.

Option 2: Local Government Maintenance

In this option, the local government takes over maintenance responsibility for all stormwater practices. While it is still important to develop a clear and simple plan, the designer can assume some level of training or supervision for the individuals conducting inspections and maintenance. For publicly maintained practices, it is helpful to find out what resources the local government has in place for developing the plan. These resources may be in the form of existing reporting and tracking procedures, which can be modified for the specific practice, or equipment such as vacuum sweepers. Maintenance access should be made available to local government staff through official easements.

Option 3: Hybrid Approach

In the hybrid approach to stormwater maintenance, larger practices or practices on public land are maintained by the local government, and smaller practices on private property are maintained by the owner. There are other hybrid models, however. For example, the local government may take responsibility for inspections but leave the owner responsible for maintenance items identified during the inspection.

Table 5.1 Maintenance Considerations for Three Program Options

Program Option	Inspection/Maintenance Performed By:	Key Considerations for the Designer
Option 1: Private	Level 1: Property owner or HOA Level 2: Private Contractor Level 3: Certified Contractor	Make the plan very simple and graphic intensive. Include a list of contractors if applicable. Provide links to educational materials.
Option 2: Local Program	Level 1: Interns or Untrained Staff Level 2: Trained Local Staff Level 3: City/Town Engineer or other individual hired by the city or town	Learn about the resources the local program has at its disposal. If government staff are being trained, develop a maintenance plan that is consistent with their knowledge and understanding. Be aware of equipment and materials on hand in this community.
Option 3: Hybrid Approach	Inspection is typically divided, where larger practices or those on private property are maintained by the public entity.	Understand how this maintenance is divided, and develop a plan that is consistent with this arrangement.

Special Considerations for Green Infrastructure Practices

Because many of the Green Infrastructure practices included in this manual, such as Tree Planting, Rain Gardens and Sheetflow and Level Spreaders, are implemented at a very small scale, they present a unique challenge in terms of stormwater maintenance. These practices are more likely to be located on private property. As a result, the designer needs to consider the *Private Maintenance* model. Maintenance plans for these small practices should be as simple as possible, and the designer should ensure that maintenance can be completed with readily available materials.

5.2. Inspection and Maintenance Checklists and Documentation

The checklists included in this chapter are specific to the maintenance hierarchy. The maintenance plan should include inspection checklists for all three hierarchies. In addition, these checklists should be modified to identify the specific practice elements included in each design. The materials developed as a part of the maintenance plan should be provided to the practice owner and local government. (See **Table 5.2**)

Table 5.2. Customizing Checklists and Guidance

Hierarchy	Checklist/Checklist Guidance	Tips for Customizing
Level 1	**Section 2** includes both the checklists and guidance.	Add photographs of the practice (once installed), and include a simple aerial photograph of the site to locate the practice. Include key local government contacts and contractors along with the checklist.
Level 2	**Section 3** includes guidance on how to respond to the Level 1 Inspection and/or activate a Level 3 investigation. **Appendix B** includes routine inspection checklists for the Level 2 Inspector.	Modify to remove elements that are not in this particular practice.
Level 3	Guidance is included in **Sections 3 and 4**.	Typically, this will not need to be modified.

5.3. Budgeting for Maintenance

A maintenance plan should include a budget for annual maintenance. In the Public Maintenance model, a single entity (the local government) will be responsible for maintenance of many practices, so the cost of maintenance for an individual practice may not be as important as estimating the average cost of maintenance across all practices. For privately maintained practices, on the other hand, it is very helpful to develop a cost estimate that is as accurate as possible for the specific location. As a result, two options for estimating costs are presented here, including:

- **Option 1**: Average or Unit Costs
  Generalized cost data are used to estimate an annual cost. This option may be used for a municipality or other institution that manages a large number of practices.
- **Option 2:** Detailed Individual Practice Budget
  Annual costs are estimated using more detailed practice information, as well as more detailed estimates of labor and materials costs.

Option 1: Average or Unit Costs

In this option, annual maintenance costs are estimated on a per-acre basis or based on a percentage of the construction costs. These prices typically range from about 1% to 4% of the construction costs (King and Hagan, 2011; **Table 5.3**).

Table 5.3 Typical Maintenance Costs (Source: King and Hagan, 2011; Adjusted to 2015 Costs)

Practice	Annual Maintenance Cost (% of Construction)	Annual Maintenance Cost ($/cubic foot of the water quality volume–WQV—treated)
Buffers	4%	$0.25-$0.35
Tree Planting	4%	$0.35
Ponds and Wetlands	4%	$0.22-$0.35
Infiltration Trench/ Basin	2%	$0.25
Filtering Practices	4%	$0.41-$0.47
Bioretention	4%	$0.44
Swales	3%	$0.18-$0.26
Permeable Pavement	1%	$0.64-$0.89

While the costs in **Table 5.3** may be a reasonable starting point, it is important to note that the actual data will vary greatly, depending on labor rates and materials costs. For example, the hourly “Open Shop” labor rate for rough grading is approximately $27/hour in Elmira and $38/hour in New York City (Means, 2015). In addition, costs for labor, materials and equipment will vary depending on the maintenance arrangement (**Table 5.4**).

Table 5.4 Variability in Maintenance Costs Based on Maintenance Arrangement			
Maintenance Arrangement	**Labor**	**Materials**	**Equipment**
Public Maintenance (Municipality)	Level 1: Intern Wage Level 2: Staff Salary Level 3: Professional Staff or Contractor	Low: Materials bought in bulk.	Low: Typically owned by Public Works or similar department.
Private Maintenance (Homeowner)	Level 1: Homeowner (Free) or Contractor Level 2: Private Landscaper or Contractor Level 3: Professional Contractor	High: Materials purchased in small quantities.	High: Specialized equipment needs to be rented if needed.
Private Maintenance (Commercial or HOA)	Level 1: Free (with HOA volunteers) or Contracted Labor Rate Level 2: Private Landscaper or Contractor Level 3: Professional Contractor	Varies: Materials may be bought in bulk or on a small scale, depending on the size of the private entity.	High: Specialized equipment needs to be rented if needed.

Option 2: Site-Based Costs

Because both the unit costs of labor and materials and the average annual costs of maintenance can be so highly variable, more detailed data will be needed to estimate costs at a particular site. One approach for estimating these costs is to generate a list of routine maintenance items, along with associated unit costs for labor, materials and equipment. This approach requires the user to enter basic design data for the practice, as well as information regarding local labor rates and other general costs. In the bioretention example below, unit costs are used to estimate routine maintenance costs, including inspections and regular maintenance.

Example Annual Cost Estimation: Bioretention

An example cost estimation for a bioretention cell follows below. The cost estimation tool used in the Maintenance Chapter will be automated. This example demonstrates how the unit cost and typical frequency data will be used to estimate average annual maintenance costs. In it, we are estimating annual maintenance costs for a bioretention practice with characteristics summarized in **Table 5.5**. **Table 5.6** then summarizes activities, their frequency and extent, and associated labor costs.

Using the assumptions for this practice, the annual costs for routine maintenance would be $1,828 ($1.15/cubic foot of Water Quality Volume) in the first year and $1,468 ($0.90/cf WQv) in subsequent years. This value is much higher than the $0.44/cf estimated using general cost data (**Table 5.3**). However, significant cost savings could be realized by using volunteer or intern-level labor for Level 1 inspections and routine maintenance.

Table 5.5. Assumptions for Bioretention Cost Example

Practice Design		**Unit Costs**	
Water Quality Volume (cf)	1,600	Level 1 Labor ($/hr)	$15
Forebay Volume (cf)	400	Level 2 Labor ($/hr)	$35
Total Practice Area (sf)	2,000	Mulch ($/cy)	$10
Filter Area (sf)	1,000	Plants ($/plant)	$1
Ponding Area (sf)	1,500	Trash Tipping Fee	$25
Slope Area (sf)	500	Seed/Mulch for a small area	$10
Turf Area (sf)	No Turf	Average Cost for a PVC Replacement Part (Planning Level)	$100
Inlets (#)	1		

Table 5.6. Bioretention Example - Routine Maintenance Costs

Task	Frequency (x/year, Decimal)	Typical Extent	Extent	Hours (Unit)	Hours/yr	Level	Materials and Equipment	Annual Costs		
								Labor	Materials and Equipment	Total
Level 1 Inspection - 1 to 5-acre drainage	1	Practice	1	1 per inspection	1	1		$15		$15
Level 2 Inspection - 1 to 5-acre drainage	0.2	Practice	1	2 per inspection	0.4	2		$14		$14
Watering - grass and plants: Year 1	16	Weekly for first growing season, over filter surface area	1,000	0.5 per 400 sf area	24	1	Assume minimal cost for water	$360		$360
Trash and Debris Removal	4	Ponding area	1,500	1 per 400 sf practice surface area	15	1	Assume $25 Tipping Fee for Each Trip	$225	$100	$325
Weeding	2	Assume 50% of practice area	1,000	4 per 400 sf practice surface area	20	1		$300		$300
Mulching	1	Ponding area	1,500	4 per 400 sf area	15	1	Bark mulch; assume 15 cy/application	$225	$150	$375
Sediment Removal (minor)	1	Assume one small area per inlet	1	1 per small area	1	1		$15		$15
Erosion Repair (minor)	1	Inlets; assume 25 sf/practice	25	1 per 25 sf	1	1	Seed, mulch and topsoil	$15	$10	$25
Erosion Repair (minor)	1	10% of slope area	50	1 per 25 sf	2	1	Seed, mulch and topsoil	$30	$20	$40
Minor Regrading	0.5	1 spot per 400 sf of practice area	5	1 per repair	2.5	2	Assume done by hand	$88		$88
Planting (plants)	0.2	Assume 50% of practice area	1,000	8 per200 sf	8	1	Assume 500 plants/planting	$120	$100	$220
Minor PVC or Metal Repairs (observation well cap, PVC riser, grates)	0.2	1 per practice	1	1 per repair	0.2	2	Assume about a $100 piece of equipment	$7	$20	$27
Sediment Removal (small forebay)	0.2	per forebay	1	2 per forebay	0.4	2	Assume removal by hand	$14		$14
							Total Costs - Year 1	**$1,428**	**$400**	**$1,828**
							Total Costs - Subsequent Years	**$1,068**	**$400**	**$1,468**

5.4. Planning for “Non-Routine” Maintenance

If the guidance provided in this chapter is followed and practices are designed properly, the routine maintenance (and budget guidance in **Section 5.3**) should be sufficient to keep a practice functioning indefinitely, but planning is needed for infrequent maintenance items. In the initial maintenance plan, identify a few of the most likely infrequent items. If initial routine inspections start to identify a more serious problem, develop a plan and budget for performing the repairs. To be more conservative, another option is to provide a contingency budget to plan for non-routine repairs over the life of the practice.

Note: Maintenance and repairs that rise to a Level 3 inspection may require permits from the NYS DEC and/or US Army Corps of Engineers if they are undertaken within or adjacent to regulated wetlands or other waters of the U.S.

NEW YORK
STATE OF
OPPORTUNITY

Department of
Environmental
Conservation

Disconnection & Sheetflow Stormwater Management Practices Level 1 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other _____	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

Table 2.4.1 D&S Drainage Area

Visually inspect any surfaces in the drainage area.

Problem (Check if Present)	**Follow-Up Actions**
 ☐ Changes in flow; more runoff; runoff bypassing the practice	☐ For rooftop areas, make sure downspouts are still disconnected and conveying water into the treatment area. ☐ Look for and remove any “dams” of sediment and grass clippings that prevent water from entering the treatment area as sheet flow. ☐ Other:

Table 2.4.1 D&S Drainage Area

Visually inspect any surfaces in the drainage area.

Problem (Check if Present)	Follow-Up Actions
	☐ Kick-Out to Level 2 Inspection: Changes to drainage area size or amount of runoff due to construction, tillage, etc.
☐ For parking lots in the drainage area—sediment, grass clippings, or other debris has accumulated at pavement edge.	☐ For small, isolated amounts of debris, sweep up by hand and dispose properly so that it will not be exposed to runoff. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Sediment is widespread and cannot be removed by manual sweeping.
☐ For parking lots in the drainage area—dips or damage at pavement edge caused flow to concentrate.	☐ Kick-Out to Level 2 Inspection: This will likely require special expertise to diagnose and fix pavement edge.

Table 2.4.2 D&S Level Spreader/Energy Dissipator

Inspect the energy dissipator closely, during a rain event if possible.

Problem (Check if Present)		Follow-Up Actions
	☐ Debris and/or sediment accumulated behind or around the level spreader.	☐ Remove debris and sediment by hand and ensure that the area behind the level spreader is relatively flat. Too much debris and sediment can cause runoff to bypass the level spreader structure. ☐ Other:
	☐ Sinking, cracking, sloughing, or other structural problem makes the energy dissipator no longer level.	☐ For stone/gravel spreaders, add new material or rake out as needed to make it even. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Structural issues that cannot be easily fixed by hand

Table 2.4.3 D&S Treatment Area

Examine where flow enters the treatment area as well as the whole flow path. Look for signs of concentrated flow.

Problem (Check if Present)		Follow-Up Actions
☐ Trash and/or debris in the treatment area		☐ Collect trash/debris and dispose of properly.
	☐ Grass filter strip has grown very tall, to the point that runoff cannot easily enter or is getting concentrated.	☐ Mow filter strip twice a year or more frequently in a residential yard.

Table 2.4.3 D&S Treatment Area	
Examine where flow enters the treatment area as well as the whole flow path. Look for signs of concentrated flow.	
Problem (Check if Present)	**Follow-Up Actions**
☐ Sparse vegetation or bare spots	☐ For grassy areas, add topsoil (as needed), grass seed, mulch, and water during the growing season to re-establish consistent vegetation cover. ☐ Other:
 ☐ Rills or gullies are forming in treatment area where flow has become concentrated	☐ For minor rills, fill in with soil, compact, and add seed and straw to establish vegetation. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Rills are more than 2" to 3" deep and require more than just hand raking and re-seeding.

Additional Notes:

Inspector:_____ Date: _____

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> "I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected."

Inspector/Operator: _____ Date: _____

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Disconnection & Sheetflow Stormwater Management Practices Level 2 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other _____	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

Level 2 Inspection – DISCONNECTION AND SHEETFLOW	
Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Significant sediment on pavement that drains to disconnection area (e.g., grass strip)	
☐ Condition 1: Sediment on parking lot is widespread Enlist a mechanical sweeper or vacuum sweeper to remove sediment across entire pavement surface. Pay special attention to downhill edges of pavement where more sediment may have accumulated.	• Sediment accumulation is so serious that it cannot be sufficiently removed with mechanical sweeper. May indicate a high sediment load from uphill in the drainage area that needs to be mitigated. ☐ Level 3 inspection necessary
Observed Condition: Pavement edge deteriorating	
☐ Condition 1: Dips or damage at pavement edge causing runoff to concentrate Determine whether the damaged edge is causing significant enough concentration of runoff to warrant repair or regrading of the pavement.	• Edge must be patched or re-paved to make secure and level. • Parking lot not draining properly to the energy dissipator and treatment area. ☐ Level 3 inspection necessary
Observed Condition: Level spreader/energy dissipator	
☐ Condition 1: Level spreader sinking or uneven If basic equipment can be used, prop up and secure any section of level spreader that is sinking. Regrade soil all around level spreader and add stone as necessary to prevent erosion and bypassing. ☐ Condition 2: Level spreader is broken These repairs can be simple for small, residential-scale practices, such as at a downspout. Ensure the level spreader is level across, keyed in to soil at the edges, and made of durable material that can withstand the flow of water running across it. Larger or more complicated level spreaders (e.g., concrete) will likely require specialized skill and equipment.	• Level spreader requires specialized equipment, regrading, or large amount of material to make level again. • Level spreader needs to be re-designed and replaced. ☐ Level 3 inspection necessary

Level 2 Inspection – DISCONNECTION AND SHEETFLOW	
Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Erosion in treatment area	
☐ Condition 1: Rills from concentrated flow Inspect energy dissipator to see whether it needs to be improved to better spread out incoming flow. Regrade flow path to ensure that it is relatively flat (if minor). If major re-grading is needed, the treatment area may need to be redesigned and fixed with specialized equipment.	• Major rills and gullies • Treatment area needs to be re-designed and major grading needed. ☐ Level 3 inspection necessary

Notes:

Inspector:_____ Date: _____

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> "I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected."

Inspector/Operator: _____ Date: _____

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Pond and Wetland Stormwater Management Practices Level 1 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other _____	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

PW Drainage Area

Look for areas that are uphill from the pond.

Problem (Check if Present)	**Follow-Up Actions**
☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and straw areas of bare soil to establish vegetation. ☐ Fill in eroded areas with soil, compact, seed and mulch with straw to establish vegetation. ☐ Other:

☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Kick-Out to Level 2 Inspection: If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ If large areas of soil have been eroded or larger channels are forming, this may require rerouting of flow paths or use of an erosion-control seed mat or blanket to reestablish acceptable ground cover or anchor sod where it is practical.
☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Remove excessive vegetation or woody debris that can block drainage systems. ☐ Other:
☐ Open containers of oil, grease, paint, or other substances exposed to rain in the drainage area	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous. ☐ Other:

Pond Inlets

Look for all areas where water flows into the pond during storms. Note that there may be multiple points of inflow and types of structures (e.g., pipes, open ditches, etc.).

Problem (Check if Present)	Follow-Up Actions
☐ Inlets are buried, covered or filled with silt, debris, or trash, or blocked by excessive vegetation.	☐ If the problem can be remedied with hand tools and done in a safe manner, remove vegetation, trash, woody debris, etc. from blocking inlet structures. ☐ Other:
	☐ Kick-Out to Level 2 or 3 Inspection: If the amount of material is too large to handle OR there are ANY safety concerns about working in standing water, soft sediment, etc., the work will likely have to be performed by a qualified contractor.

Pond Inlets

Look for all areas where water flows into the pond during storms. Note that there may be multiple points of inflow and types of structures (e.g., pipes, open ditches, etc.).

Problem (Check if Present)		Follow-Up Actions
	☐ Inlets are buried, covered or filled with silt, debris, or trash, or blocked by excessive vegetation.	☐ Kick-Out to Level 2 or 3 Inspection: If the amount of material is too large to handle OR there are ANY safety concerns about working in standing water, soft sediment, etc., the work will likely have to be performed by a qualified contractor.
	☐ Inlets are broken, and, with pieces of pipe or concrete falling into the pond, there is erosion around the inlet, there is open space under the pipe, or there is erosion where the inlet meets the pond	☐ Kick-Out to Level 2 Inspection: These types of structural or erosion problems are more serious and will require a qualified contractor to repair.

PW Pond Area and Embankments

Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Problem (Check if Present)		Follow-Up Actions
	☐ The pretreatment area(s) or forebay(s) are filled with sediment, trash, vegetation, or other debris.	☐ If the problem can be remedied with hand tools and done in a safe manner, use a flat shovel or other equipment to remove small amounts of sediment. ☐ Remove trash and excessive vegetation from forebays if this can be done in a safe manner. ☐ Other:

PW Pond Area and Embankments

Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Problem (Check if Present)		Follow-Up Actions
	☐ The pretreatment area(s) or forebay(s) are filled with sediment, trash, vegetation, or other debris.	☐ Kick-Out to Level 2 Inspection: Large amounts of sediment or debris will have to be removed by a qualified contractor. ANY condition that poses a safety concern for working in standing water or soft sediments should be referred to a Level 2 Inspection or qualified contractor.
	☐ The pond area itself has accumulated sediment, trash, debris, or excessive vegetation that is choking the flow of the water, OR the pond area is covered with algae or aquatic plants.	☐ Level 1 includes handling only small amounts of material that can be removed by hand, or with rakes or other hand tools. Do not attempt any repair that poses a safety issue. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Most cases will call for a Level 2 Inspection and/or a qualified contractor. ☐ You are not sure what type and amount of vegetation is supposed to be in the pond. ☐ The algae or aquatic plants should be identified so that proper control techniques can be applied.
	☐ The side slopes of the pond are unstable, eroding, and have areas of bare dirt.	☐ If there are only minor areas, try filling in small rills or gullies with topsoil, compacting, and seeding and mulching all bare dirt areas with an appropriate seed. Alternatively, try using herbaceous plugs to get vegetation established in tricky areas, such as steep slopes. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Erosion and many bare dirt areas on steep side slopes will require a Level 2 Inspection and repair by a qualified contractor.

PW Pond Area and Embankments

Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Problem (Check if Present)		Follow-Up Actions
	☐ The riser structure is clogged with trash, debris, sediment, vegetation, etc., OR is open, unlocked, or has a steep drop and poses a safety concern. The pond level may have dropped below its "normal" level.	☐ If you can safely access the riser on foot or with a small boat, clear minor amounts of debris and remove it from the pond area for safe disposal. ☐ Other: ☐ Kick-Out to Level 2 Inspection: The riser cannot be accessed safely, the amount of debris is substantial, or the riser seems to be completely clogged and the water level has risen too high. ☐ There are safety issues with the riser and concern about access to pipes, drops, or any other life safety concern. ☐ The riser is leaning, broken, settling or slumping, corroded, eroded or any other structural problem.
	☐ The dam/embankment is slumping, sinking, settling, eroding, or has medium or large trees growing on it.	☐ If there are small isolated areas, try to fix them by adding clean material (clay and topsoil) and seeding and mulching. ☐ Periodically mow embankments to enable inspection of the banks and to minimize establishment of woody vegetation. ☐ Remove any woody vegetation that has already established on embankments. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Most of these situations will require a Level 2 Inspection or evaluation and repair by a qualified contractor. Seepage through the dam or problems with the pipe through the dam can be a serious issue that should be addressed to avoid possible dam failure.

PW Pond Area and Embankments

Examine both interior and exterior pond banks as well as the pond body. Observe from the inlet pipes to the outfall structure and emergency overflow.

Problem (Check if Present)		Follow-Up Actions
	☐ The emergency spillway or outfall (if it exists) has ☐ Erosion, settlement, or loss of material. Rock-lined spillways have excessive debris or vegetation.	☐ Clear light debris and vegetation. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Displacement of rock lining, excessive vegetation and erosion/settlement may warrant review and decision by Level 2 Inspector to check against original plan. ☐ Any uncertainty about the integrity of the emergency spillway should be referred to a Level 2 Inspector. ☐ Erosion or settlement such that design has been compromised should be reviewed by an engineer.

PW Pond Outlet

Examine the outlet of the pipe on the downstream side of the dam/embankment where it empties into a stream, channel, or drainage system.

Problem (Check if Present)	Follow-Up Actions
 ☐ The pond outlet is clogged with sediment, trash, debris, vegetation, or is eroding, caving in, slumping, or falling apart.	☐ If there is a minor blockage, remove the debris or vegetation to allow free flow of water. ☐ Remove any accumulated trash at the outlet. ☐ Outlet: ☐ Kick-Out to Level 2 Inspection: ☐ If the area at the outlet cannot be easily accessed or if the blockage is substantial, a Level 2 Inspection is warranted. ☐ Erosion at and downstream of the outfall should be evaluated by a qualified professional. ☐ Any structural problems, such as broken pipes, structures falling into the stream, or holes or tunnels around the outfall pipe, should be evaluated by a Level 2 Inspector and will require repair by a qualified contractor. ☐ The pool of water at the outlet pipe is discolored, has an odor, or has excessive algae or vegetative growth.

Additional Notes:

Inspector:_____ Date: _____

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

"I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected."

Inspector/Operator: _____ Date: _____

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Pond and Wetland Stormwater Management Practices Level 2 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other _____	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

Level 2 Inspection: PONDS and WETLANDS

Recommended Repairs and Required Skills	Triggers for Level 3 Inspection
Observed Condition: Bare Soil or Erosion in the Drainage Area	
☐ Condition 1: Extensive problem spots, but no channels or rills forming Reseed problem areas. If problem persists or grass does not take, consider hiring a landscape contractor. ☐ Condition 2: Problem is extensive, and rills/channels are beginning to form May be necessary to divert or redirect water that is causing the erosion problem. If it appears that simple regrading—such as installing a berm or leveling a low spot–will fix the problem, make repairs and ensure that the problem is repaired after the next storm.	• Large rills or gullies are forming in the drainage area. • An attempt to regrade the drainage area has been unsuccessful. • Fixing the problem would require major regrading (i.e., redirecting more than a 100-square-foot area. • It is not clear why the problem is occurring. ☐ Level 3 inspection necessary
Observed Condition: Manholes or Inlet Pipe Buried or Covered with Vegetation	
☐ Condition 1: Nearest manhole and inlet pipe not found Consult as-built drawings to get to closest suspected location and use metal detector to search for metal manhole cover. If unsuccessful, identify nearest drain inlets and approximate pipe direction to locate next manhole. ☐ Condition 2: Manhole located and inspected Never enter a manhole, except by following confined-space entry protocols. If outlet pipe is not visible or greater than 25% full of sediment/debris or trash, it will typically require a qualified contractor to flush, clean and clear blockages. ☐ Condition 3: Inlet pipe not found at pond Clear vegetation and brush that may be covering the inlet pipe. Buried inlet pipes may be found through use of a metal probe. ☐ Condition 4: Inlet pipe buried in sediment or blocked by vegetation Once located, the pipe path can be cleared of vegetation with brush hook or other brush tools. Light digging may clear sediment from the end of the pipe.	• To locate buried manholes and lost storm lines, it is sometimes necessary to hire a pipeline inspection contractor with televising equipment or ground-penetrating radar and enter at the closest upstream access point. • Locating a buried inlet pipe may require wading in the edge of the pond and using a metal probe and brush axe to find and expose the pipe. • If other than light digging is necessary to remove accumulated sediment, a contractor with heavy equipment may be required. ☐ Level 3 inspection necessary

Level 2 Inspection: PONDS and WETLANDS	
Recommended Repairs and Required Skills	**Triggers for Level 3 Inspection**
Observed Condition: Pipe or Headwall Settlement, Erosion, Corrosion or Failure	
☐ Condition 1: Pipe or headwall settlement or failure Severe sinkholes, settlement or corrosion should be kicked out to Level 3 Inspection. ☐ Condition 2: Flow not confined to pipe and visible outside pipe wall With flashlight, observe the inside of the pipe and note its condition. Take photographs. Look for sinkholes developing that indicate pipe failure beneath the surface. Kick out to Level 3 inspection.	• Where blockages are visible, a decision is needed on whether to clear them or leave in place. If a third of the pipe is full of sediment, it should be removed by a contractor with pipe-cleaning equipment. • Corrosion of inlet pipes that allows flow around the pipe exterior is a structural concern because it can lead to settlement, sinkholes and undermining pond embankment. Evidence of this type of failure may require specialized pipe-inspection equipment and investigation by an engineer. ☐ Level 3 inspection necessary
Observed Condition: Pond Conditions	
☐ Condition 1: Pond pre-treatment zone is full of sediment or not constructed as shown on as-built drawings. ☐ Condition 2: Excessive buildup of sediment or overgrowth If the pre-treatment area or pond pool is overgrown or filled with sediment so that the original design is compromised, corrective measures are required. If plants have died, then replanting is necessary. If none of the original design exists due to alteration or sediment, kick out to Level 3 inspection.	• It may require inspection by an engineer to determine next steps for clearing, replanting or reconstruction. • Erosion or settlement such that design has been compromised should be reviewed by an engineer. Recurring erosion may require redesign and/or regrading to direct flow away from eroding area. • If sediment has filled more than 50% of the pond's capacity, dredging is likely needed and should be evaluated by a qualified contractor. • Removal or control of excessive algae or aquatic plants can be assessed by a qualified pond maintenance company. ☐ Level 3 inspection necessary

Notes:

Inspector:_____ Date: _____

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> "I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected."

Inspector/Operator: _____ Date: _____

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Swale Stormwater Management Practices
Level 1 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other _____	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

SW Drainage Area

Look at areas that are uphill from the swale.

Problem (Check if Present)	Follow-Up Actions
☐ Bare soil, erosion of the ground (rills washing out the dirt)	☐ Seed and mulch or sod areas of bare soil to establish vegetation. ☐ Fill in erosion areas with soil, compact, and add seed and straw to establish vegetation. ☐ If a rill or small channel is forming, try to redirect water flowing to this area by creating a small berm or adding topsoil to areas that are heavily compacted. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Large areas of soil have been eroded, or larger channels are forming. May require rerouting of flow paths
☐ Piles of grass clippings, mulch, dirt, salt, or other materials	☐ Remove or cover piles of grass clippings, mulch, dirt, etc. ☐ Other:
☐ Open containers of oil, grease, paint, or other substances	☐ Cover or properly dispose of materials; consult your local solid waste authority for guidance on materials that may be toxic or hazardous.
☐ Grass dying at edge of road	☐ Seed and mulch; add topsoil or compost if needed. ☐ Other: ☐ Kick-Out to Level 2 Inspection: Grass on edge of pavement continues to die off for unknown reasons. Swale edge may need to be replaced with other materials (e.g., stone diaphragm).

SW Inlets

Stand in the swale and look for all the places where water flows in.

Problem (Check if Present)	Follow-Up Actions
☐ Inlets or the swale edge are collecting grit, grass clippings, or debris or have grass/weeds growing. Some water may not be getting into the swale. The objective is to have a clear pathway for water to flow into the swale.	☐ Use a flat shovel to remove grit and debris (especially at curb inlets or opening). Parking lots will generate fine grit that will accumulate at these spots. ☐ Pull out clumps of growing grass or weeds, and scoop out the soil or grit that the plants are growing in. ☐ Remove any grass clippings, leaves, sticks, and other debris that is collecting at inlets or along the edge of the swale where water is supposed to enter. ☐ For pipes and ditches, remove sediment and debris that is partially blocking the pipe or ditch opening where it enters the swale. ☐ Dispose of all material properly in an area where it will not re-enter the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Inlets are blocked to the extent that most of the water does not seem to be entering the swale.
 ☐ Some or all of the inlets are eroding so that rills, gullies, and other erosion are present, or there is bare dirt that is washing into the swale.	☐ For small areas of erosion, smooth out the eroded part and apply rock or stone (e.g., river cobble) to prevent further erosion. Usually, filter fabric is placed under the rock or stone. ☐ In some cases, reseeding and applying an erosion control matting can be used to prevent further erosion. Some of these materials may be available at a garden center, but it may be best to consult a landscape contractor. ☐ Other:
	☐ Level 2 Inspection: Erosion is occurring at most of the inlets or along much of the swale edge. The inlet design may have to be modified.

SW Surface Area

Examine the entire swale surface and side slopes.

Problem (Check if Present)	Follow-Up Actions
☐ Minor areas of sediment, grit, trash, or other debris are accumulating in the swale.	☐ Use a shovel to scoop out minor areas of sediment or grit, especially in the spring after winter sanding materials may wash in and accumulate. Dispose of the material where it cannot re-enter the swale. ☐ If removing the material creates a hole or low area, fill with good topsoil and add seed and straw to re-vegetate. ☐ Remove trash, vegetative debris, and other undesirable materials. ☐ If the swale is densely vegetated, it may be difficult to do the maintenance; check for excessive ponding or other issues described in this section to see if the accumulated material is causing a problem. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Sediment has accumulated more than 3 inches deep and covers 25% or more of the swale surface. ☐ The source of sediment is unknown or cannot be controlled with simple measures.
 ☐ There is erosion in the bottom or on the side slopes. Water seems to be carving out rills as it flows through the swale or on the slopes.	☐ Try filling the eroded areas with clean topsoil, and then seed and mulch to establish vegetation. ☐ If the problem recurs, you may have to use some type of matting, stone (e.g., river cobble), or other material to fill in eroded areas. ☐ If the erosion is on a side slope, fill with soil and cover with erosion-control matting or at least straw mulch after re-seeding.
	☐ Kick-Out to Level 2 Inspection: The problem persists or the erosion is more than 3 inches deep and seems to be an issue with how water enters and moves through the swale. ☐ Kick-Out to Level 2 Inspection: The problem does not seem to be caused by flowing water, but a collapse or sinking of the surface (e.g., “sinkhole”) due to some underground problem.
☐ Water does not flow evenly down the length of the swale, but ponds in certain areas for long periods of time (e.g., 72 hours after a storm). The swale does not seem to have “positive drainage.” Check during or immediately after a rain storm.	☐ If the problem is minor (just small, isolated areas), try using a metal rake or other tools to create a more even flow path; remove excessive vegetative growth, sediment, or other debris that may be blocking the flow. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Water ponds in more than 25% of the swale for three days or more after a storm. The issue may be with the underlying soil or the grade of the swale. ☐ Water ponds behind check dams for three days or more after a storm. Check dams may be clogged or not functioning properly.

SW Surface Area

Examine the entire swale surface and side slopes.

Problem (Check if Present)	Follow-Up Actions
	☐ If the problem is isolated to just a few check dams, try simple repairs. ☐ It is very important for the center of each check dam (where most of the water flows) to be lower (by at least several inches) than the edges of the check dams where they meet the side slopes. Also, the check dams should be keyed into side slopes so water does not flow between the check dam and side slope. ☐ Use a level to check the right check-dam configuration, as noted above. Repair by moving around stone, filling and compacting soil, or adding new material so that water will be directed to the center of the check dam instead of the edges. ☐ Other:
☐ Check dams (if present): water is flowing around the edges of check dams, creating erosion or sinkholes on the uphill or downhill side, or the check dams are breaking apart or breaching .	☐ Kick-Out to Level 2 Inspection: Many check dams are impacted and/or the problem seems to be a design issue with height, spacing, shape, or materials used to construct them.

SW Vegetation

Assess the swale vegetation.

Problem (Check if Present)	Follow-Up Actions
	☐ Mow or bush-hog the path. ☐ Other:
☐ Vegetation is too overgrown to access swale for maintenance activities	

SW Vegetation

Assess the swale vegetation.

Problem (Check if Present)	Follow-Up Actions
 ☐ Vegetation requires regular maintenance: pulling weeds, removing dead and diseased plants, adding plants to fill in areas that are not well vegetated, etc.	☐ If you can identify which plants are weeds or not intended to be part of the planting plan, eliminate these, preferably by hand pulling. ☐ If weeds are widespread, check with the local stormwater authority and/or Extension Office about proper use of herbicides for areas connected with the flow of water. ☐ Even vegetation that is intended to be present can become large, overgrown, block flow, and/or crowd out surrounding plants. Prune and thin accordingly. ☐ If weeds or invasive plants have overtaken the whole swale, bush-hog the entire area before seed heads form in the spring. It will be necessary to remove the root mat manually or with appropriate herbicides, as noted above. ☐ Replant with species that are aesthetically pleasing and seem to be doing well in the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: You are unsure of the original planting design or the vegetation maintenance task is beyond your capabilities of time, expertise, or resources. If you are unsure of the health of the vegetation (e.g. salt damage, invasives, which plants are undesirable) or the appropriate season to conduct vegetation management, consult a landscape professional before undertaking any cutting, pruning, mowing, or brush hogging.
☐ Vegetation is too thin, is not healthy, and there are many spots that are not well vegetated.	☐ The original plants are likely not suited for the actual conditions within the swale. If you are knowledgeable about plants, select and plant more appropriate vegetation (preferably native plants) so that almost the entire surface area will be covered by the end of the second growing season. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: For all but small practices (e.g., in residential yards), this task will likely require a landscape design professional or horticulturalist.

SW Outlets

Examine outlets that release water out of the swale.

Problem (Check if Present)	Follow-Up Actions
☐ Outlet is obstructed with mulch, sediment, debris, trash, etc.	☐ Remove the debris and dispose of it where it cannot re-enter the swale. ☐ Other:
	☐ Kick-Out to Level 2 Inspection: Outlet is completely clogged or obstructed; there is too much material to remove by hand or with simple hand tools.

Additional Notes:

Inspector:_____ Date: _____

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

"I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected."

Inspector/Operator: _____ Date: _____

NEW YORK STATE OF OPPORTUNITY | Department of Environmental Conservation

Swale Stormwater Management Practices
Level 2 Inspection Checklist

SMP ID #		**SMP Owner**		☐ Private ☐ Public
SMP Location (Address; Latitude & Longitude)				
	Latitude		**Longitude**	

Party Responsible for Maintenance	**System Type**		**Type of Site**
☐ Same as SMP Owner ☐ Other _____	☐ Seasonal ☐ Continuous Use ☐ Other	☐ Above Ground ☐ Below Ground	☐ Commercial ☐ Industrial ☐ Residential ☐ State

Inspection Date		**Inspection Time**	
Inspector			
Date of Last Inspection			

Level 2 Inspection: SWALE	
Recommended Repairs	**Triggers for Level 3 Inspection**
Observed Condition: Water Stands on Surface for More than 72 Hours after Storm	
☐ Condition 1: Small pockets of standing water Use a soil probe or auger to examine the soil profile. If isolated areas have accumulated grit, fines, or vegetative debris or have compacted soil, try scraping off top 3 to 6 inches of soil and replacing with clean material. Also check to see that surface is level and water is not ponding selectively in certain areas. ☐ Condition 2: Standing water is widespread or covers entire surface Requires diagnosis and resolution of problem: • Bad or compacted soil • Filter fabric on the swale bottom • Too much sediment/grit washing in from drainage area? • Too much ponding depth? • Longitudinal slope is too flat?	• Soil is overly compacted or clogged and problem is not evident from Level 2 inspection. • Level 2 inspection identifies problem, but it cannot be resolved easily or is associated with the original design of the practice (e.g., not enough slope down through the swale). ☐ Level 3 inspection necessary
Observed Condition: Vegetation is predominantly weeds and invasive species	
For a small area, weed and dig up invasive plants. Replant with natives or plants from original planting plan. If longer than 100 feet, develop a new planting plan and have it professionally reviewed.	• Vegetation deviates significantly from original planting plan; swale has been neglected and suffered from deferred maintenance. • Owner/responsible party does not know how to maintain the practice. • For large area, hire a professional to develop a grading plan and develop a planting plan. ☐ Level 3 inspection necessary

Notes:

Inspector:_____ Date: _____

Complete the following if follow-up/corrective actions were identified during this inspection:

Certified Completion of Follow-Up Actions:

> "I hereby certify that the follow-up/corrective actions identified in the inspection performed on _____ (DATE) have been completed and any required maintenance deficiencies have been adequately corrected."

Inspector/Operator: _____ Date: _____

APPENDIX 10

NYSDEC CORRESPONDENCE

LETTER OF CONTINUEING COVERAGE

TOWN SEQRA DETERMINATION

kie@praecon.com

From: dec.sm.FWWjurisdiction <FWWjurisdiction@dec.ny.gov>
Sent: Friday, May 30, 2025 3:40 PM
To: kie@praecon.com
Subject: Wetlands Determination Request

Hello Khattar,

This email confirms you have successfully submited a request to the New York State Department of Environmental Conservation for a freshwater wetlands jurisdictional determination of your project or parcel(s).

Please confirm the information submitted below. If any of the information is incorrect, please resubmit your request.

Thank you,

Responses:

Name: Khattar Elmassalemah

Telephone Number: 845-246-3671

Email Address: kie@praecon.com

Mailing Address: PO BOX 360, Saugerties, NY 12477

Parcel County: Ulster County

Primary Parcel ID: 27.2-8-32.110 and 27.2-8-28

Praetorius and Conrad, P.C.

Professional Engineering and Land Surveying
Established 1981

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02 September 2025

N.Y.S Department of Environmental Conservation Director of the Division of Fish and Wildlife
625 Broadway
Albany, NY 12233-4750

<u>SUBJECT:</u> PROPOSED 8 RESIDENTIAL LOTS SUBDIVISION- TOWN OF SAUGERTIES -ULSTER COUNTY-NY
PARCEL ID: 27.2-8-32.110 and 27.2-8-28
Our Job No. D25-093

Dear Sir or Madam,

As per the JD process instructions, this letter serves as a written follow-up to the JD Case we submitted on Maay 30, 2025, for the SUBJECT site. We are including with this letter a copy of the Department acknowledgement email for receiving the request.

If you have any questions, or need any additional information, please feel free to contact me at this office.

Very Truly Yours,
PRAETORIUS & CONRAD, P.C.

Khattar I. Elmassalemah, P.E.

Department of Environmental Conservation

KATHY HOCHUL
Governor

AMANDA LEFTON
Commissioner

LETTER OF NO JURISDICTION – FRESHWATER WETLANDS

09/12/2025
Khattar Elmassalemah
PO BOX 360, Saugerties, NY 12477
Sent via email to: kie@praecon.com

Re: DEC Freshwater Wetlands Parcel Jurisdictional Determination for Parcel 27.2-8-32.110 , Ulster County.

Dear Khattar Elmassalemah,

Based on the parcel(s) identified in your request, the New York State Department of Environmental Conservation (DEC) has determined that there are no DEC regulated freshwater wetlands and/or adjacent areas identified on the parcel(s) referenced above. Therefore, in accordance with Article 24 of the Environmental Conservation Law (ECL) and 6 NYCRR Part 663, no freshwater wetlands permit is required. Pursuant to ECL section 24-0703, this letter shall remain valid for a period of five years from the date it is issued (through 09/10/2030).

Please note that this determination pertains only to state-regulated, freshwater wetlands and regulated adjacent areas. DEC also regulates protected streams, tidal wetlands, coastal erosion hazard areas, and other important environmental resources. Work affecting those areas may also require DEC permits. More information on other DEC permit programs is available online at https://dec.ny.gov/regulatory/permits-licenses/environmental-permits.

In addition, please note that this letter does not relieve you of the responsibility of obtaining any other necessary permits or approvals from other local, state, or federal agencies.

If you have questions regarding this determination, please email FWWjurisdiction@dec.ny.gov.

Department of Environmental Conservation

KATHY HOCHUL
Governor

AMANDA LEFTON
Commissioner

LETTER OF NO JURISDICTION – FRESHWATER WETLANDS

09/12/2025
Khattar Elmassalemah
PO BOX 360, Saugerties, NY 12477
Sent via email to: kie@praecon.com

Re: DEC Freshwater Wetlands Parcel Jurisdictional Determination for Parcel 27.2-8-28, Ulster County.

Dear Khattar Elmassalemah,

Based on the parcel(s) identified in your request, the New York State Department of Environmental Conservation (DEC) has determined that there are no DEC regulated freshwater wetlands and/or adjacent areas identified on the parcel(s) referenced above. Therefore, in accordance with Article 24 of the Environmental Conservation Law (ECL) and 6 NYCRR Part 663, no freshwater wetlands permit is required. Pursuant to ECL section 24-0703, this letter shall remain valid for a period of five years from the date it is issued (through 09/10/2030).

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In addition, please note that this letter does not relieve you of the responsibility of obtaining any other necessary permits or approvals from other local, state, or federal agencies.

If you have questions regarding this determination, please email FWWjurisdiction@dec.ny.gov.

1. TOWN SEQRA DETERMINATION

SEQRA Determination from the Town of Saugerties is not available at this time.